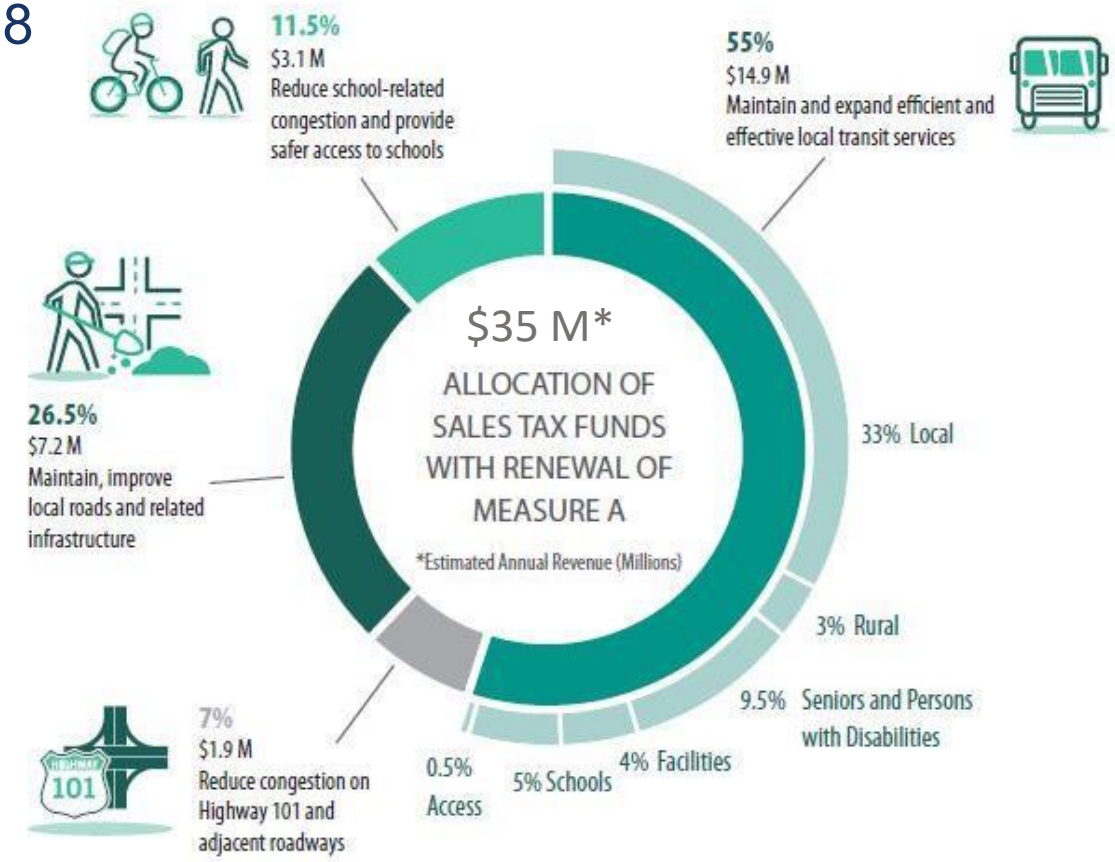
Sea Level Rise Adaptation Planning for Marin County's Transportation System

Transportation Authority of Marin

Context: Local Transportation Sales Tax

- ½-cent Sales Tax dedicated to transportation
- Measure A in 2004, Renewed as Measure AA in 2018
- Strong public support – 76.7% voter approval
- Measure AA and TAM support:
  - Improvements to Highways
  - Local Roadways
  - Safe Routes to Schools and Crossing Guards
  - Local Transit Services
- **Sea Level Rise Program**
  - **1% set aside to develop projects to address transportation impacts from sea level rise (SLR)**

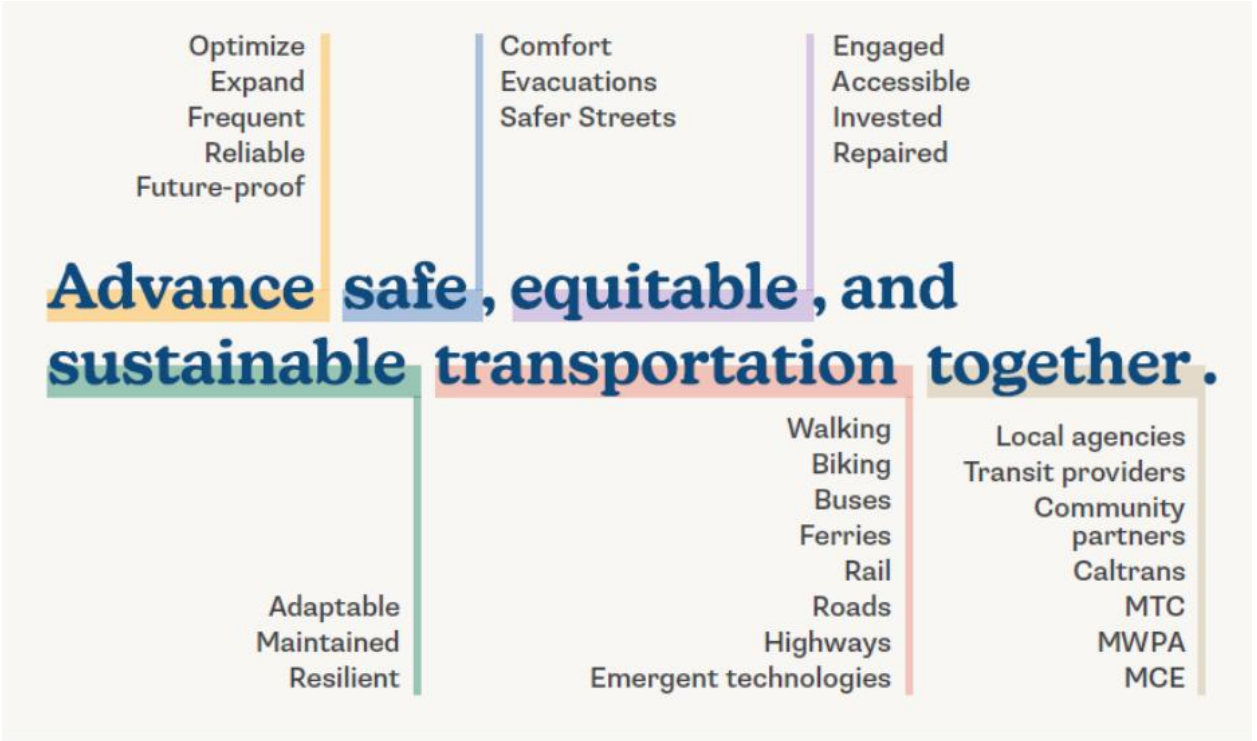


Context: CTP 2050 Sustainability Goal & Definition

A GOAL TOWARDS SUSTAINABLE TRANSPORTATION
A Sustainable Future Built on Innovation and Resilience

sustainable,

In this new era of climate change, sustainability in transportation planning involves mitigating local environmental degradation while adapting infrastructure and system operations to account for more extreme temperatures, storm events, fire risk, and sea level rise.



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Sea Level Rise: Five Key Challenges

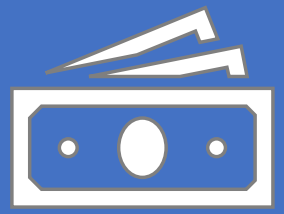
Challenge 1
Scale & Scope

Challenge 2
Governance

Challenge 3
Uncertainty & Flexibility

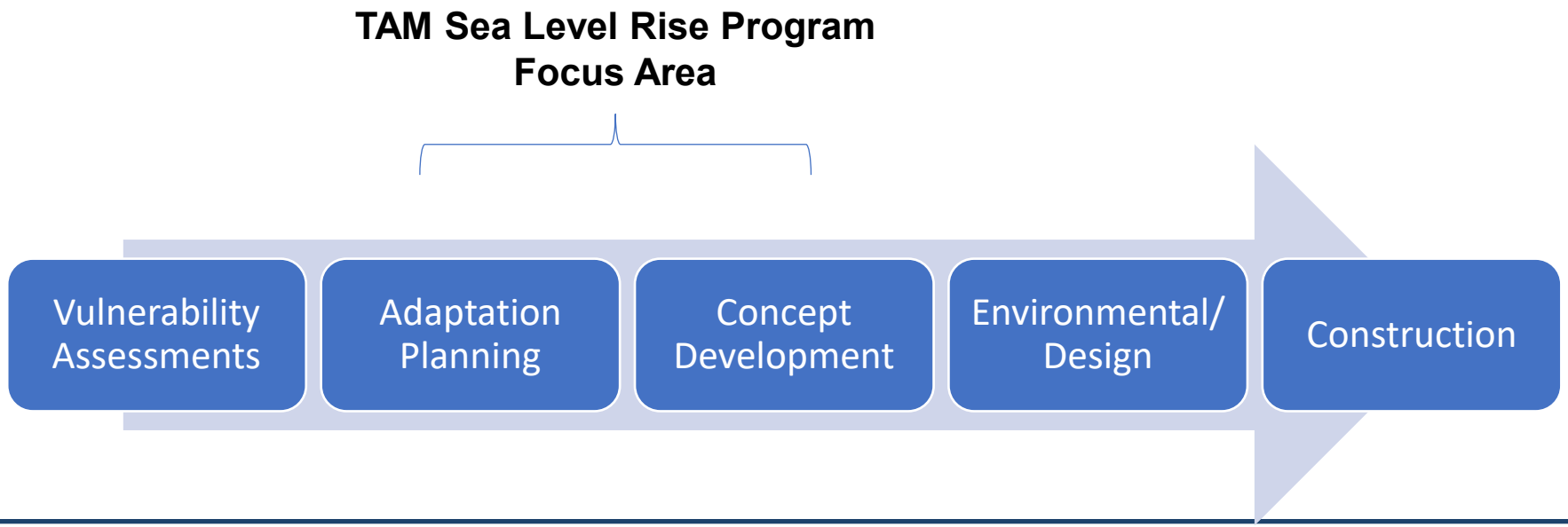
Challenge 4
Buy-in & Adoption

Challenge 5
Funding & Operations and Maintenance



TAM Sea Level Rise Program

- Protect and adapt Marin's local roadways and related infrastructure to the effects of SLR and flooding
- Build on and support partner efforts in Marin County and Region, do not duplicate
- Overall program direction:
  - Move SLR considerations from planning into initial conceptual design, and
  - Identify potential projects for development



Parallel Efforts

Local

- Mill Valley and Tiburon in development of their Subregional Shoreline Adaptation Plans
- San Rafael finalized its Shoreline Plan

County

- County of Marin potential joint Bayside Subregional Plan with partners
- County moving forward with coast side Subregional Plan

Regional

- BCDC/MTC Regional Investment Strategy
- SR-37 Corridor
- Caltrans 101 Adaptation Study: San Rafael Creek to Manzanita (including US-1 and I-580)
- US Army Corps of Engineers Marin City Flood Study

Step 1: Sea Level Rise Adaptation Study

Objectives:

(1) Identify potential SLR solutions

(2) Guide future implementation of infrastructure & TAM funding programs *focused on SLR*

Study Summary

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

Identified 19 Focus Areas, and 7 Deep Dives

Adaptation Summaries & Timelines

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

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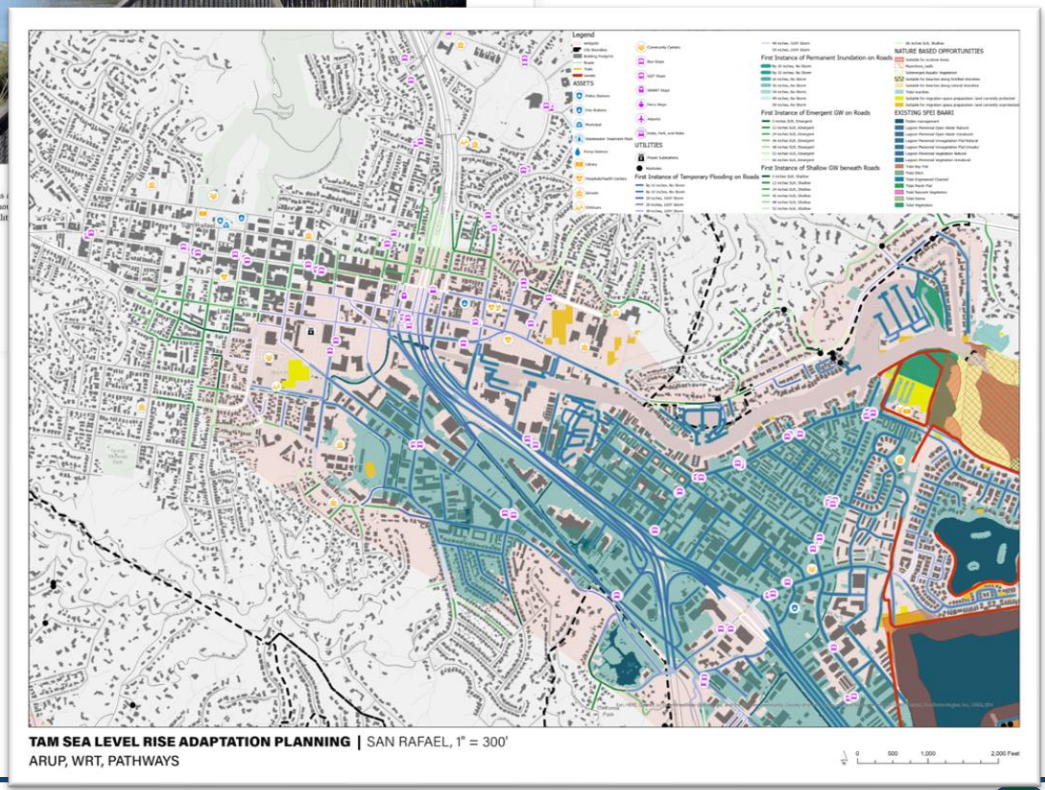
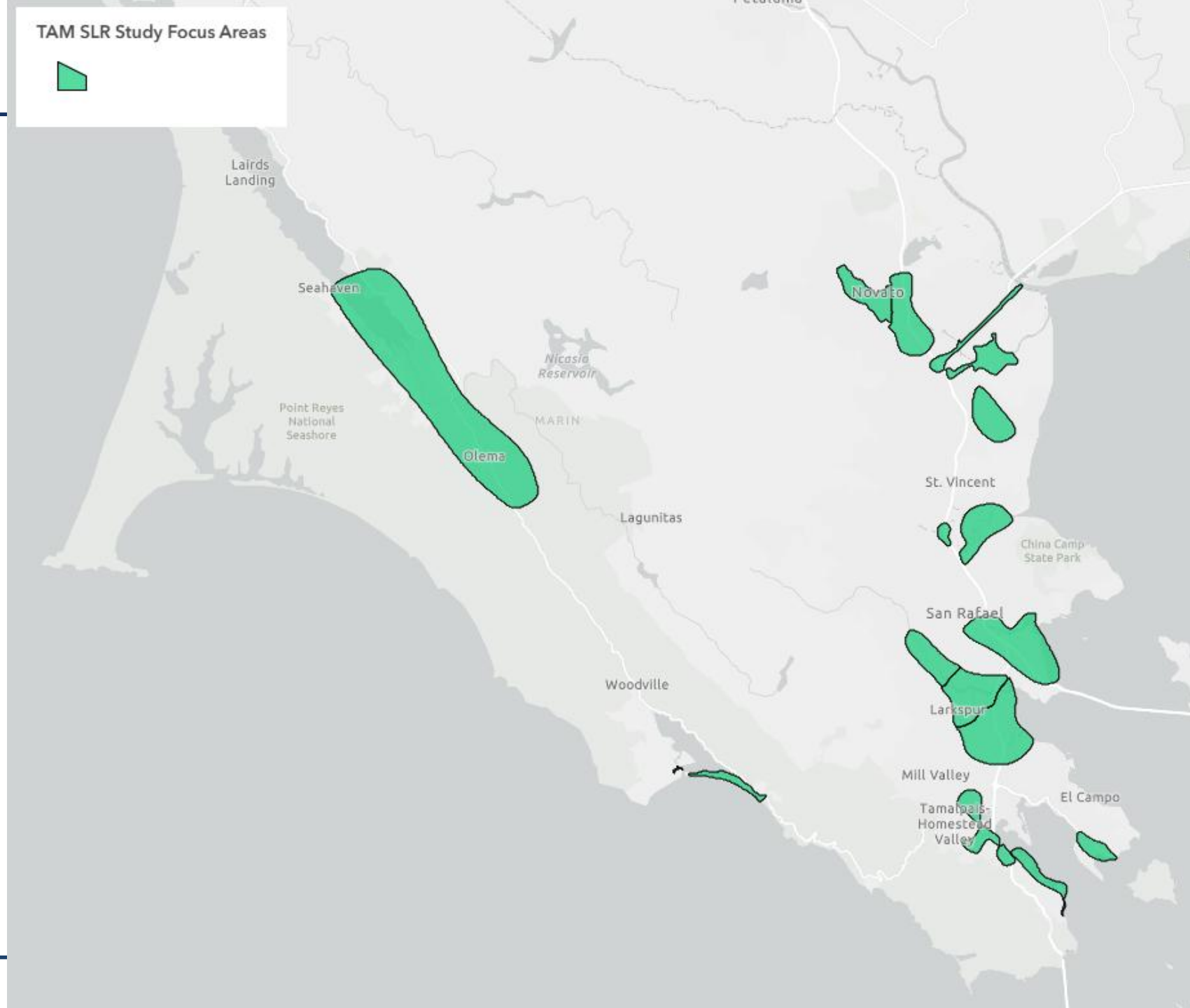
Job number 295823-00

Arup US, Inc.
560 Mission Street, Suite 700
San Francisco, CA 94105
USA
arup.com



19 Focus Areas

- Bel Marin Keys
- Belvedere/Tiburon
- Bolinas
- Corte Madera
- Hamilton Wetlands
- Inverness
- Kentfield
- Larkspur
- Marin City
- Manzanita/Tam Junction
- Mill Valley
- Novato – Downtown
- Novato – West
- San Rafael – Canal
- Santa Venetia
- Sausalito
- Stinson Beach
- SR 37/US101
- Terra Linda



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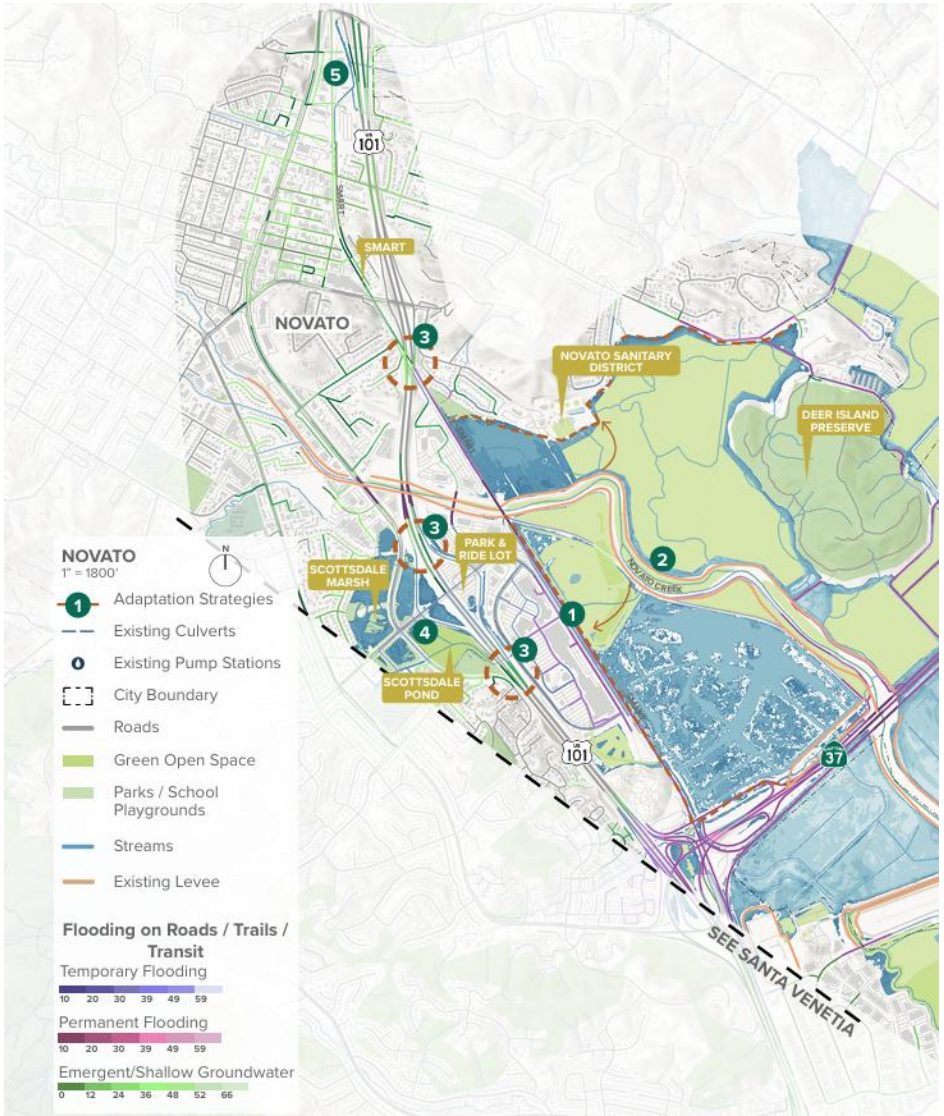
Adaptation Summaries – Example



2 MARSH SUBSIDENCE & LACK OF SEDIMENT

Location: Along Novato Creek

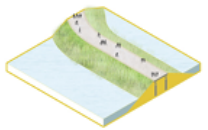
Potential Adaptation Strategy: Breaching Creek Channels

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 (as in ongoing Deer Island Basin Complex Tidal Wetlands Restoration project). 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



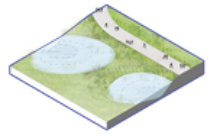
Levee

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



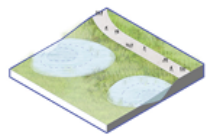
Detention Basin

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

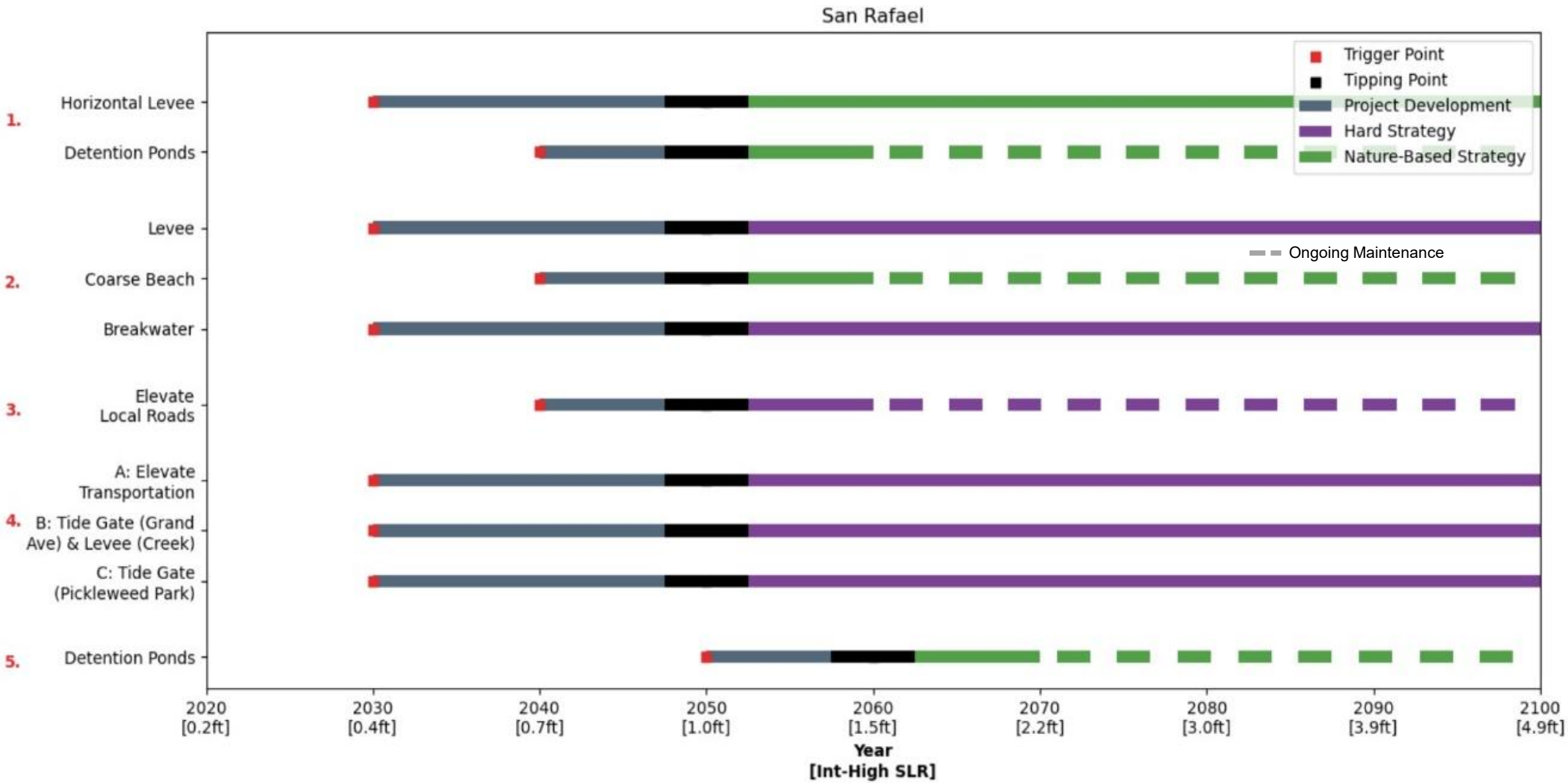
Potential Adaptation Strategy: Improve Drainage Capacity via Detention Ponds, Pump Station / Culvert



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.

Adaptation Timelines – Example



Adaptation Strategies Implementation – Example

Table 4: Detailed Physical SLR Adaptation Strategies

Adaptation Strategy	ROM Cost	Timeframe	Focus Areas	Transportation Assets	Partners	Funding Sources	Near-Term Actions	Regional precedents
TAM Facilitates								
Elevate Roads and Utilities	Medium to High	Near- to Long-term	• Gate 5 Road • Civic Center Drive • Donahue Street • Yosemite Road	• Roadways • Ingress/egress routes • Parking facilities	• Caltrans • County and local public works departments • Local transportation departments	• FHWA grants • Caltrans adaptation planning grants • Local government public works CIP • Local transportation CIP	• Develop project level engineering plan • Initiate permitting process for top priority project	• SR-37 (in progress)
Green Infrastructure	Low to Medium	Medium-term	• Bridgeway • Miller Avenue • Donahue Access • Lucky Drive	• Streetscapes • Transit routes • Adjacent bus stops	• USACE • SFEP • Caltrans • County and local public works departments • Local transportation departments • Local water management districts	• EPA Green Infrastructure Funding • MTC OBAG 3 Grants • Municipal stormwater fees (potentially)	• Develop green street master plans • Adopt Complete, Green, and Elevated Streets policy • Identify locations and pilot projects (bioswales, permeable pavements) • Train local staff on green infrastructure functions and maintenance	• San Pablo Ave Green Stormwater Spine, East Bay • San Mateo Sustainable Streets Plan • SFPUC Urban Watershed Planning
TAM Partners								
Horizontal Levees	Medium	Long-term	• Santa Venetia • Bothin Marsh • Corte Madera Creek • San Rafael Canal	• Transit hubs • Key transportation corridors	• USACE • Environmental groups like SFEP • County and local public works departments	• FEMA Hazard Mitigation Grants, Coastal Conservancy grants, local taxation measures	• Identify pilot levee project • Develop project level engineering plan • Initiate construction process in priority areas	• Oro Loma Horizontal Levee, San Lorenzo • Palo Alto Horizontal Levee, Palo Alto • First Mile Horizontal Levee, Hayward

DRAFT

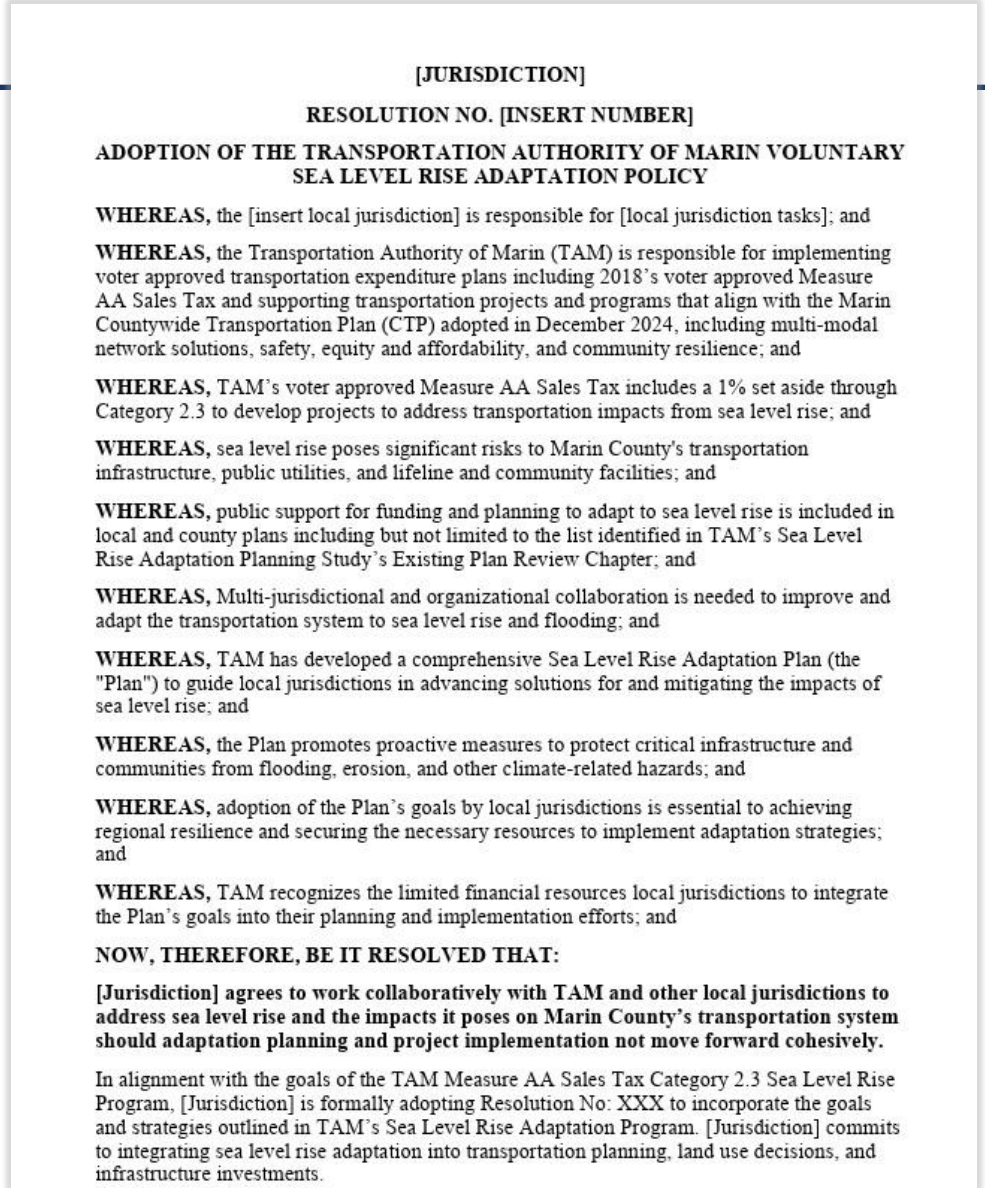
Study Implementation

Policies and Programs

- Voluntary Adaptation Policy
- Climate Resilient Transportation Design Principles
- Cohesive Subregional Planning Efforts
- Leverage Legislation/Funding
- Consistent Messaging Through Public Outreach

Infrastructure Strategies

- Elevate Roads and Utilities
- Green Infrastructure
- Horizontal Levees
- Pump Stations and Detention Basins
- Tide Gates & Floodwalls
- Embankments and Causeways



[JURISDICTION]

RESOLUTION NO. [INSERT NUMBER]

ADOPTION OF THE TRANSPORTATION AUTHORITY OF MARIN VOLUNTARY SEA LEVEL RISE ADAPTATION POLICY

WHEREAS, the [insert local jurisdiction] is responsible for [local jurisdiction tasks]; and

WHEREAS, the Transportation Authority of Marin (TAM) is responsible for implementing voter approved transportation expenditure plans including 2018's voter approved Measure AA Sales Tax and supporting transportation projects and programs that align with the Marin Countywide Transportation Plan (CTP) adopted in December 2024, including multi-modal network solutions, safety, equity and affordability, and community resilience; and

WHEREAS, TAM's voter approved Measure AA Sales Tax includes a 1% set aside through Category 2.3 to develop projects to address transportation impacts from sea level rise; and

WHEREAS, sea level rise poses significant risks to Marin County's transportation infrastructure, public utilities, and lifeline and community facilities; and

WHEREAS, public support for funding and planning to adapt to sea level rise is included in local and county plans including but not limited to the list identified in TAM's Sea Level Rise Adaptation Planning Study's Existing Plan Review Chapter; and

WHEREAS, Multi-jurisdictional and organizational collaboration is needed to improve and adapt the transportation system to sea level rise and flooding; and

WHEREAS, TAM has developed a comprehensive Sea Level Rise Adaptation Plan (the "Plan") to guide local jurisdictions in advancing solutions for and mitigating the impacts of sea level rise; and

WHEREAS, the Plan promotes proactive measures to protect critical infrastructure and communities from flooding, erosion, and other climate-related hazards; and

WHEREAS, adoption of the Plan's goals by local jurisdictions is essential to achieving regional resilience and securing the necessary resources to implement adaptation strategies; and

WHEREAS, TAM recognizes the limited financial resources local jurisdictions to integrate the Plan's goals into their planning and implementation efforts; and

NOW, THEREFORE, BE IT RESOLVED THAT:

[Jurisdiction] agrees to work collaboratively with TAM and other local jurisdictions to address sea level rise and the impacts it poses on Marin County's transportation system should adaptation planning and project implementation not move forward cohesively.

In alignment with the goals of the TAM Measure AA Sales Tax Category 2.3 Sea Level Rise Program, [Jurisdiction] is formally adopting Resolution No: XXX to incorporate the goals and strategies outlined in TAM's Sea Level Rise Adaptation Program. [Jurisdiction] commits to integrating sea level rise adaptation into transportation planning, land use decisions, and infrastructure investments.

Step 2: Design Principles

Develop

- Develop an actionable set of design principles on which Marin's jurisdictions and departments can align and implement.

Advance

- Advance the integration of resilience measures into Marin County's transportation system.

Integrate

- Integrate and build on key recommendations from TAM SLR Study.

Begins with understanding current best practices and approaches in terms of *climate-resilient design guidance.*

Design Principles Progress & Next Steps

Completed: **Research paper on best practices**

Next: Draft Design Guidelines

- Integrate County Stormwater and Green Infrastructure efforts
- Begin development of lifecycle cost assessments for local project development
- Checklist approach

Future: **Link Design Principles to TAM SLR Funding & Voluntary Adaptation Policy**

- Voluntary Adaptation Policy supports local coordination
- Flexible approach to regional resilience
- Funding available for those who adopt the policy

Thank You and Questions