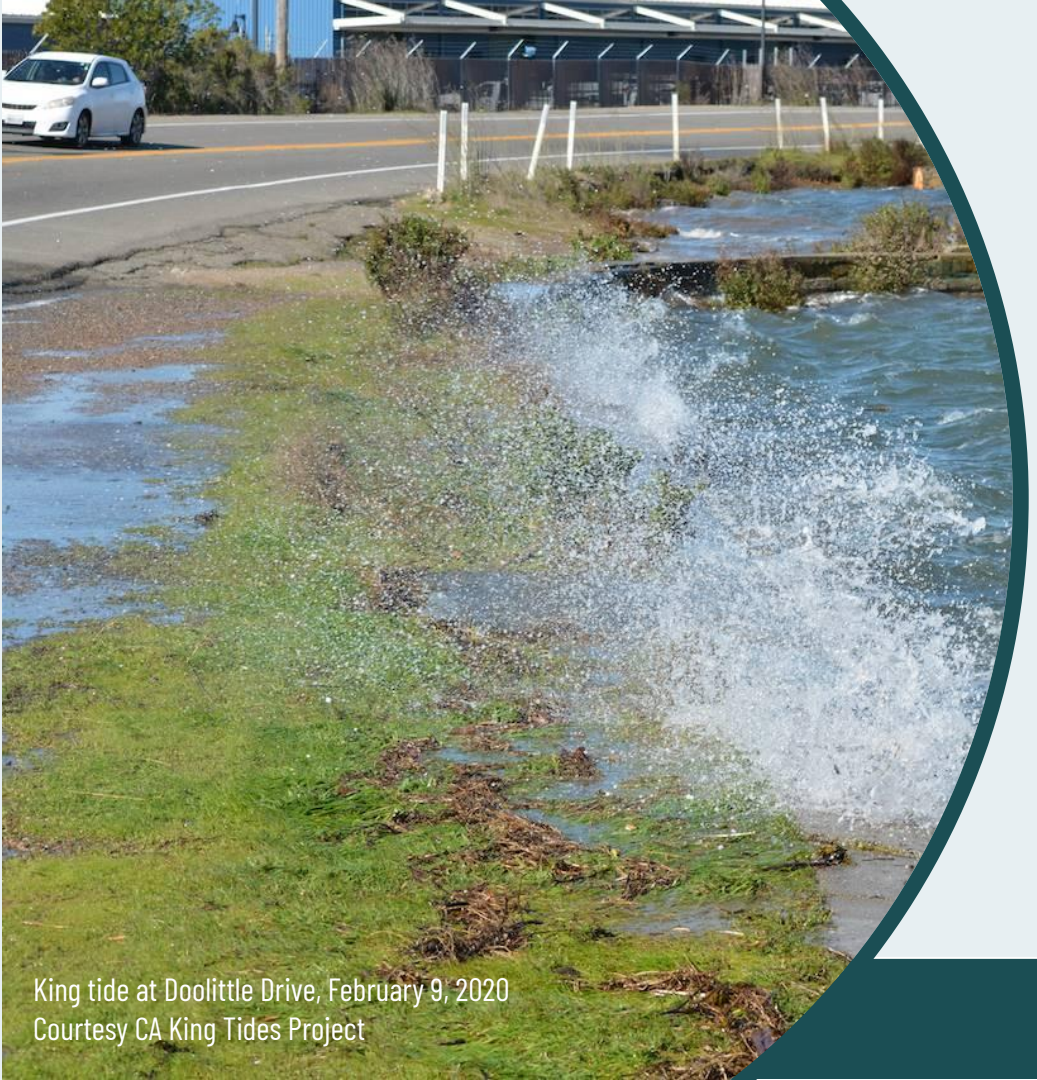


King tide at Doolittle Drive, February 9, 2020
Courtesy CA King Tides Project

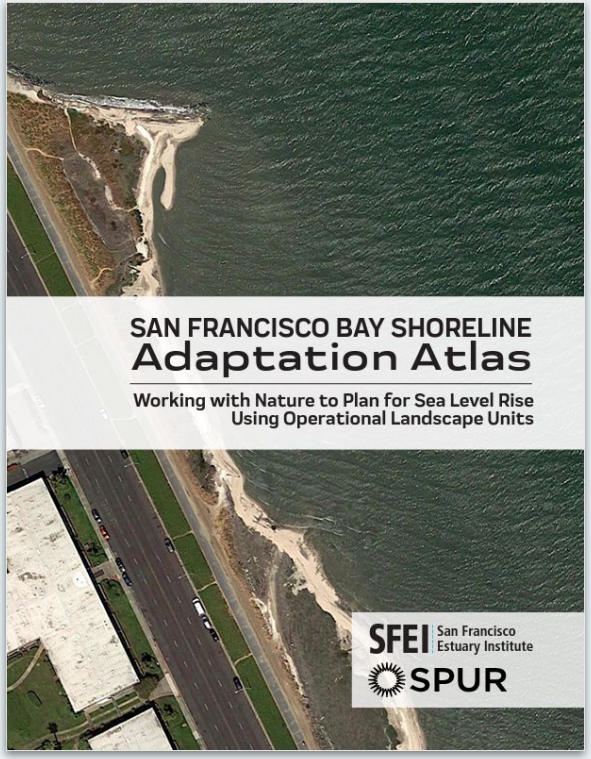
San Leandro OLU Adaptation Pathways

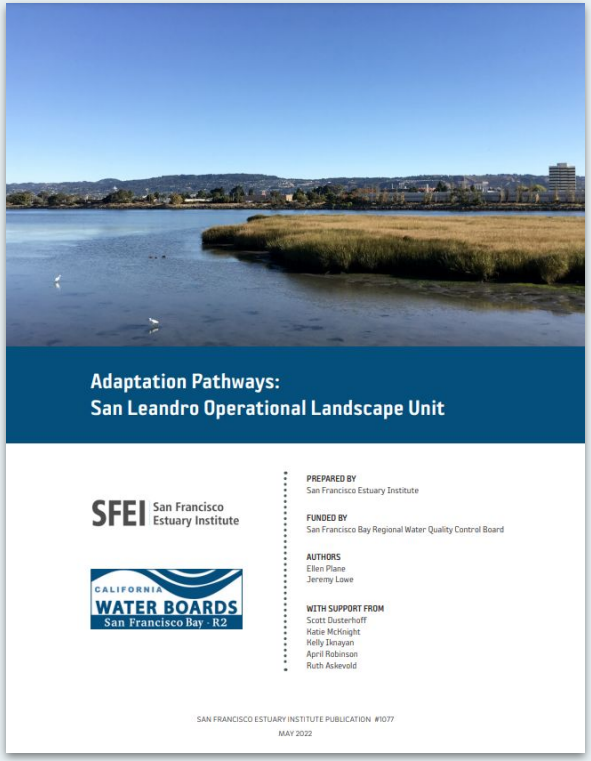
San Francisco Estuary Institute

June 8, 2022

SFEI | AQUATIC SCIENCE CENTER

Building on the Adaptation Atlas

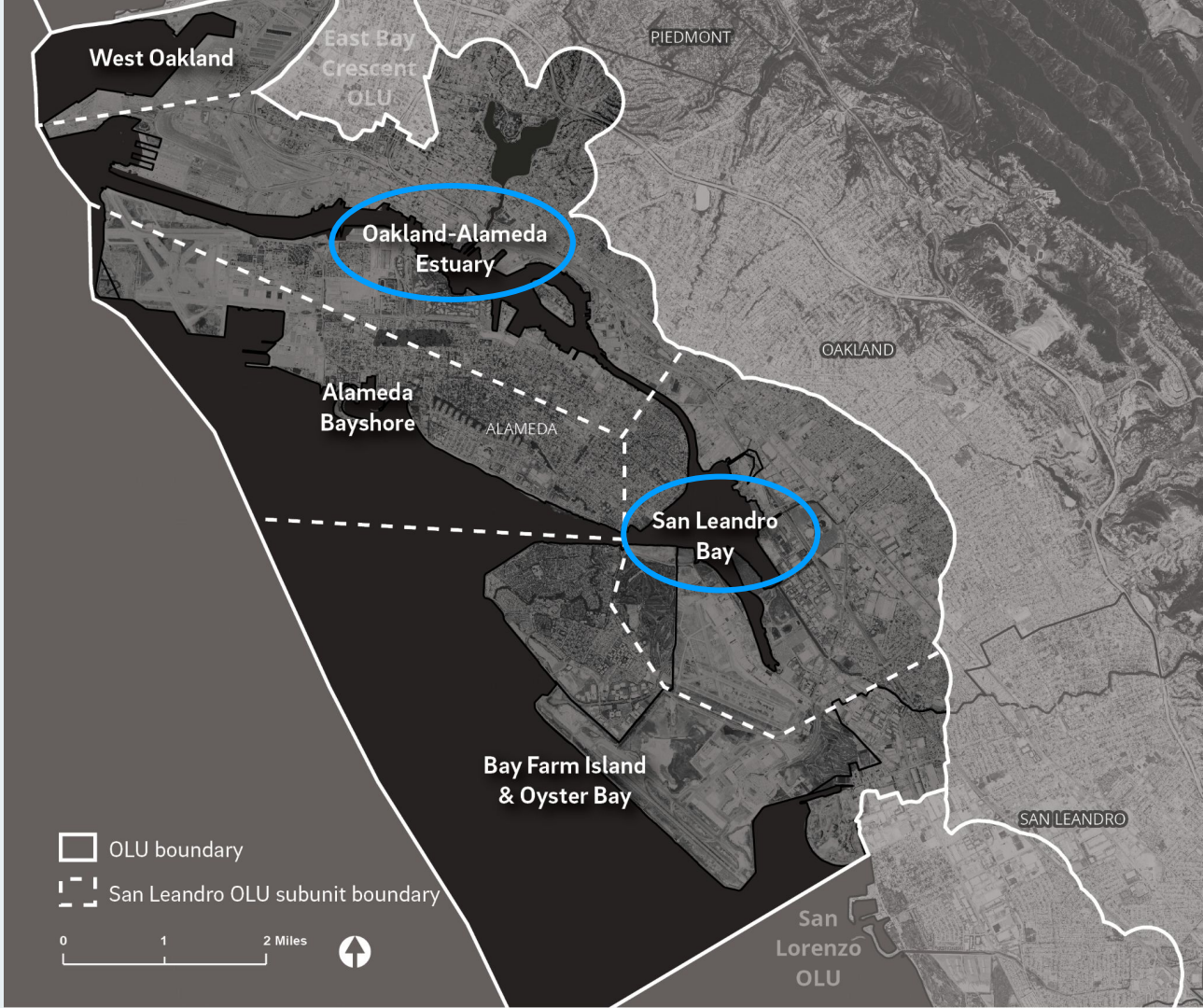




Building on existing studies and plans

- BCDC ART program
    - Alameda County Shoreline Vulnerability Assessment (2015)
    - Oakland-Alameda Resilience Study (2016)
    - Local assessment of San Leandro OLU for ART Bay Area (2020)
- City of Alameda Climate Action and Resiliency Plan (2019)
- Port of Oakland Vulnerability Assessment (2019)
- East Bay Regional Park District Risk Assessment and Adaptation Prioritization Plan (2021)
- City of Oakland LHMP 2016-2021, Sea Level Rise Roadmap (2017), Equitable Action Plan (2020)
- East Oakland Neighborhoods Initiative Community Plan (2019)
- West Oakland Environmental Indicators Project: Oakland Shoreline Leadership Academy Plans (2020)
- Baylands Ecosystem Habitat Goals Update (2015)

San Leandro OLU: Subunits



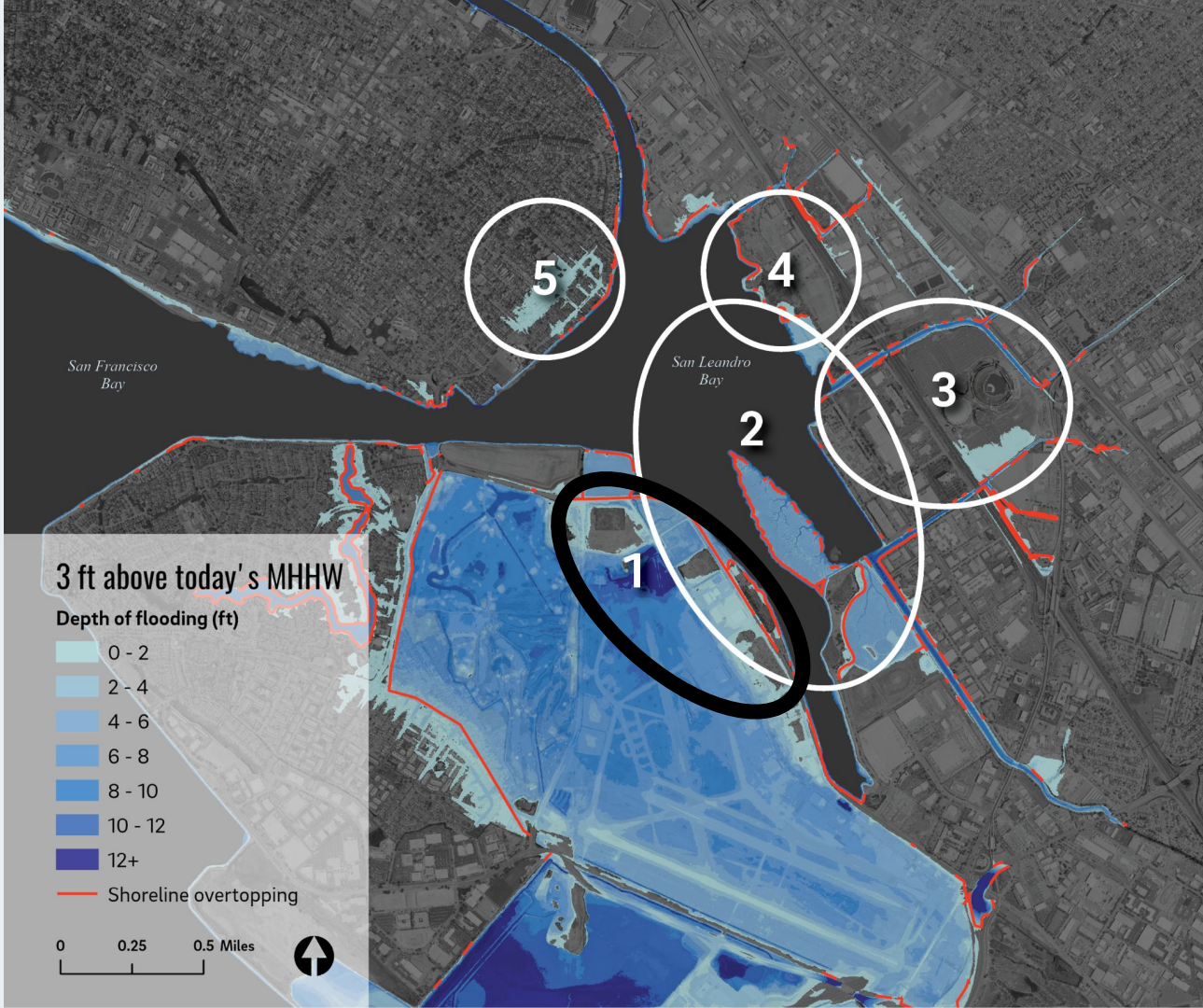
Goals of adaptation pathways for San Leandro Bay

- Maintain transportation corridors
- Improve community access to shoreline
- Improve flood protection for low-lying areas behind Doolittle Drive
- Maintain existing tidal marshes and improve high tide refuge opportunities for wildlife
- Create more marsh migration space and protect marsh-upland transition zone habitat

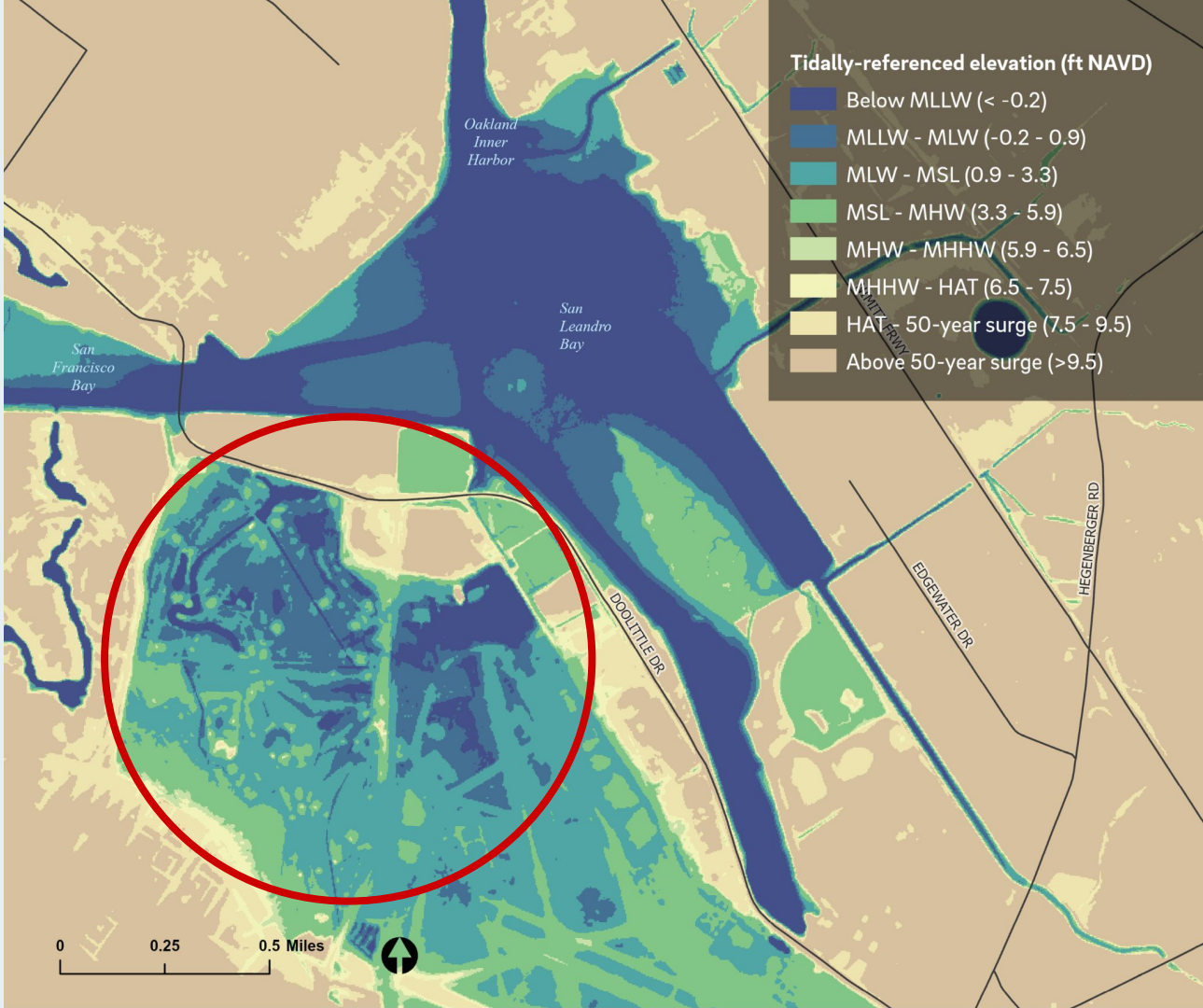
Process for developing adaptation pathways

- Identify **focus areas** and key resources vulnerable to SLR
- List **vulnerabilities** and **opportunities** associated with each resource
- Determine key SLR **thresholds**
- Develop adaptation **strategies** to address vulnerabilities and pair with key SLR thresholds

Focus areas:
San Leandro Bay subunit



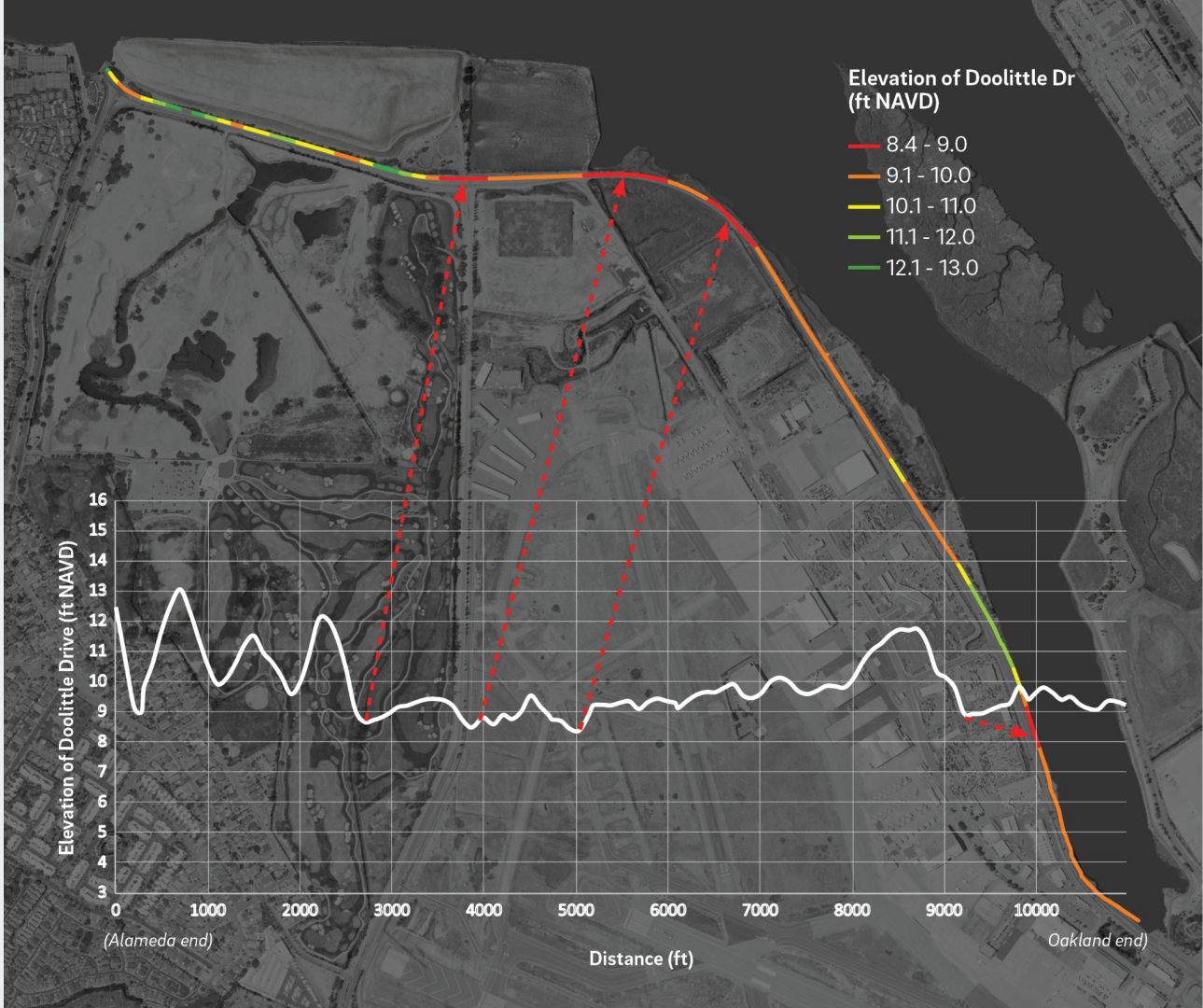
Vulnerability: **Overtopping**



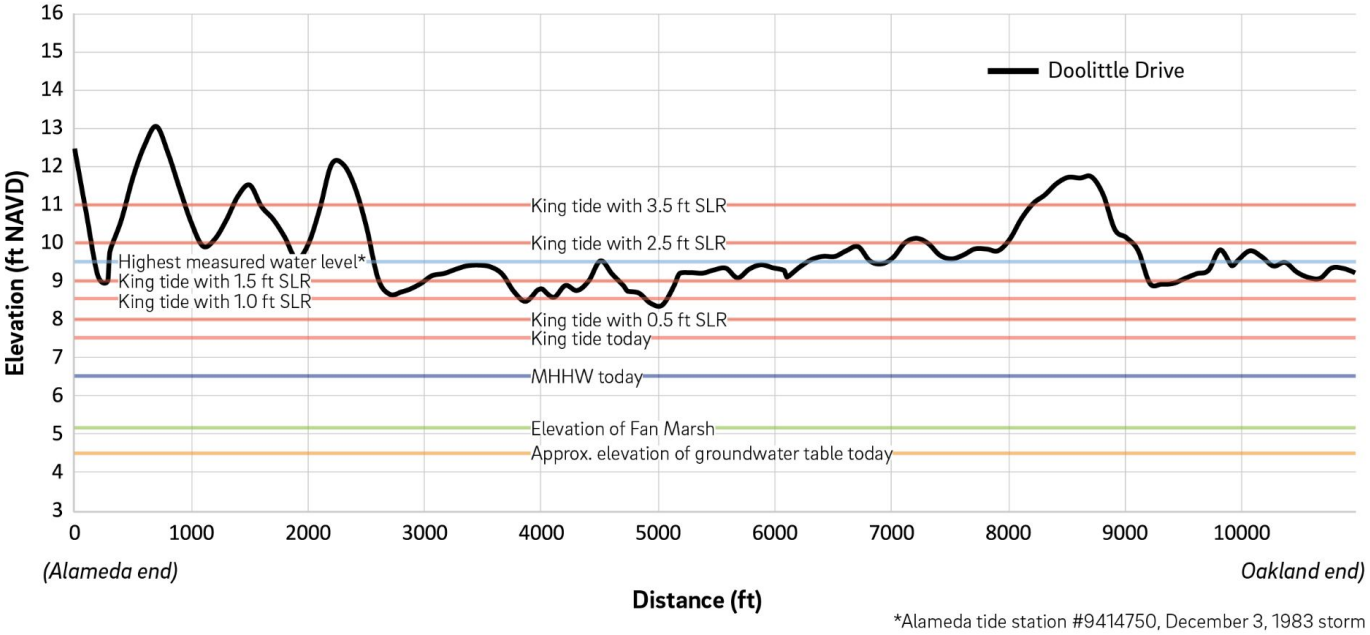
Vulnerability: **Rising groundwater**

Opportunities: **Existing plans**

Thresholds: **Road elevation**



Thresholds: **Road elevation relative to the tides**



Strategies

Table 2. Vulnerabilities, thresholds, and strategies for Approach 1: Protect In Place

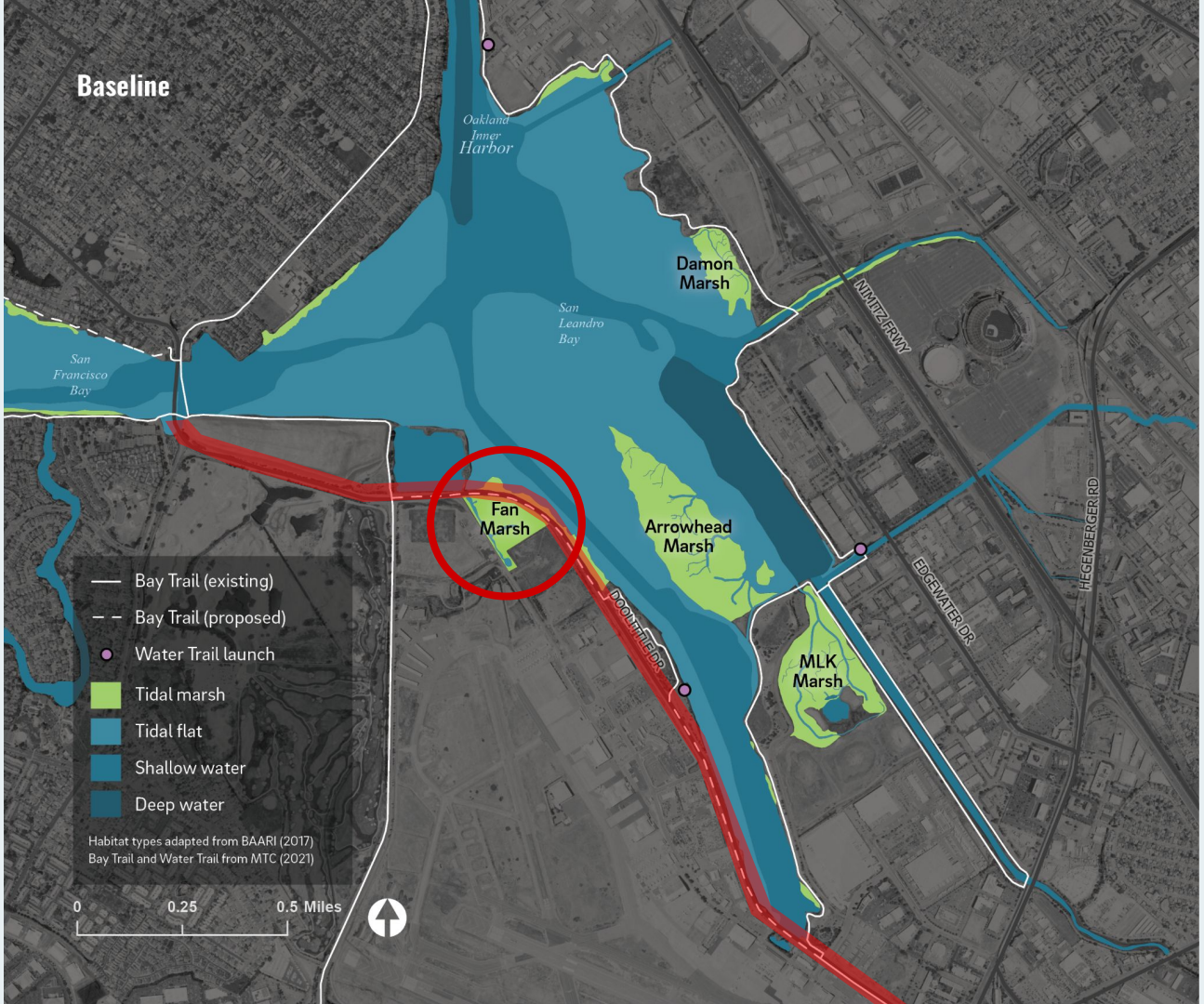
Resource	Vulnerabilities	Elevation	Threshold 1	Strategies	Threshold 2	Strategies
Doolittle Drive	Overtopping, backflow through culverts, rising groundwater, large low-lying area protected by road	8.5-13 ft NAVD	Lowest point affected 8.5 ft NAVD, overtopping at 9 ft NAVD. Target fixes by **0.5 ft SLR** to avoid flooding of Bay Farm Island with 5-year storm surge	Raise road in place (Protection to 10 ft NAVD)	With **1.5 ft SLR**, a 5-year storm surge will reach 10 ft NAVD	Raise again. Consider rerouting and raising (set back roadway/ levee realignment)
Fan Marsh	Reduced tidal exchange, lack of high tide refuge, marsh drowning	Mean marsh elevation 5.1 ft NAVD	Aligned with **road strategy**	Improve tidal exchange to ensure adequate flows to marsh, improve berm at back of marsh	Aligned with **road strategy**	Limit highest tides with water control structure (managed marsh habitat) OR raise berm at back of marsh
Arrowhead Marsh	Lack of high tide refuge, marsh drowning. Loss of essential marsh habitat patch for Ridgway's rail	Mean marsh elevation 5.1 ft NAVD	Already rapidly losing mid marsh habitat, need to implement strategies soon. Near total loss of mid marsh at **1 ft SLR**	Implement interim high tide refuge measures (marsh mounds, floating islands, or similar), thin layer placement, migration space preparation	Verge of losing all marsh habitat at **2.2 ft SLR**. Facilities (parking areas) start to flood.	Reroute of MLK Jr shoreline trail and reconfigure recreational facilities, enhance transition zone (grading and vegetation), allow marsh migration
Damon Trail	Overtopping	8-12.5 ft NAVD	8 ft NAVD is the lowest point, but occasional flooding is likely acceptable. Focus on other community targets for Phase I	Implement Oakland Shoreline Leadership Academy ideas (wellness zones and native plantings). Improve access from East Oakland.	**1.5 ft SLR**: trail overtopping at king tide	Reroute trail
Damon	Lack of high tide refuge, marsh	Mean marsh	Starting 0.6 ft higher than Arrowhead.	Implement interim high tide refuge measures (marsh mounds, floating	Aligned with **trail**	Enhance transition zone (grading and

Example Approaches

- Approach 1: “Protect in place” (for now)
- Approach 2: “Expand marsh migration space early”
- Approach 3: ???

Approach 1:

Protect in place

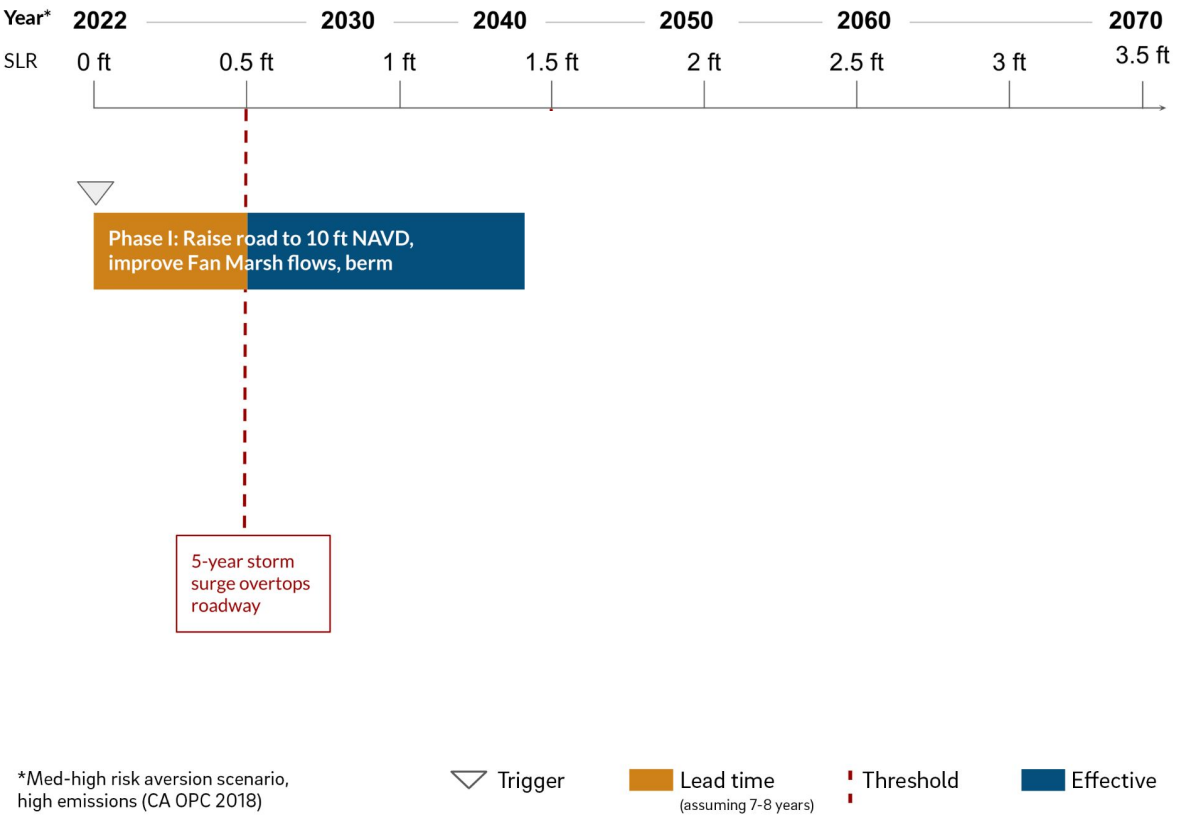


Approach 1:

Protect in place

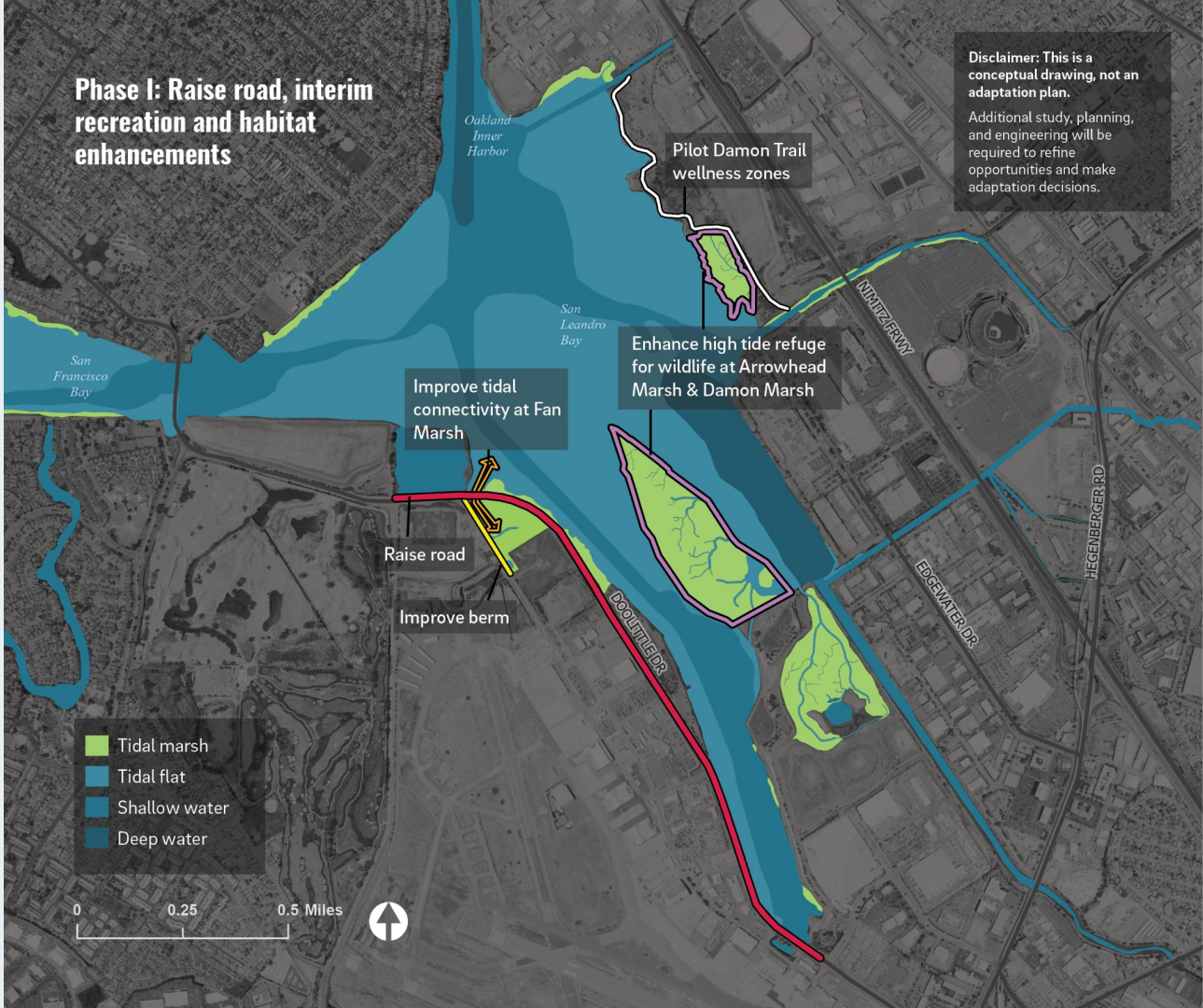
POSSIBLE ADAPTATION PATHWAY

Doolittle Drive and Fan Marsh | *Approach 1: Protect in place*



Approach 1:

Protect in place

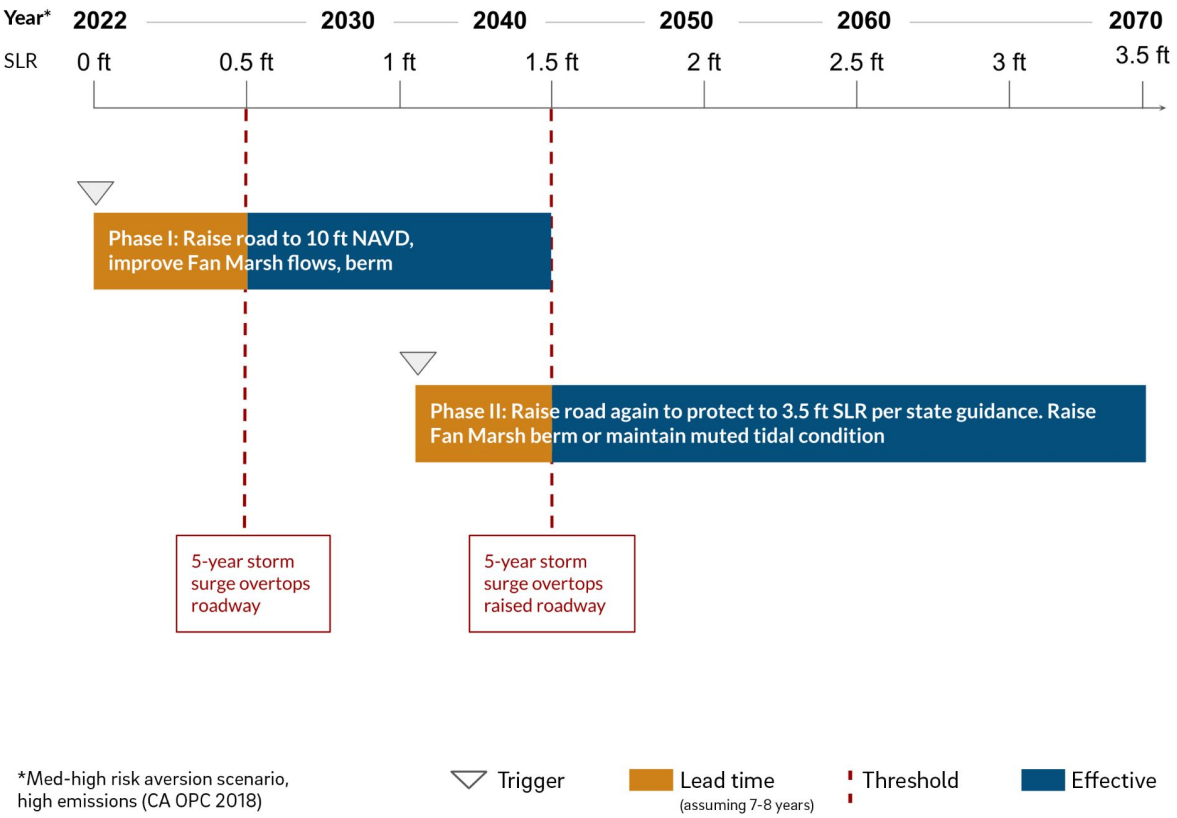


Approach 1:

Protect in place

POSSIBLE ADAPTATION PATHWAY

Doolittle Drive and Fan Marsh | *Approach 1: Protect in place*



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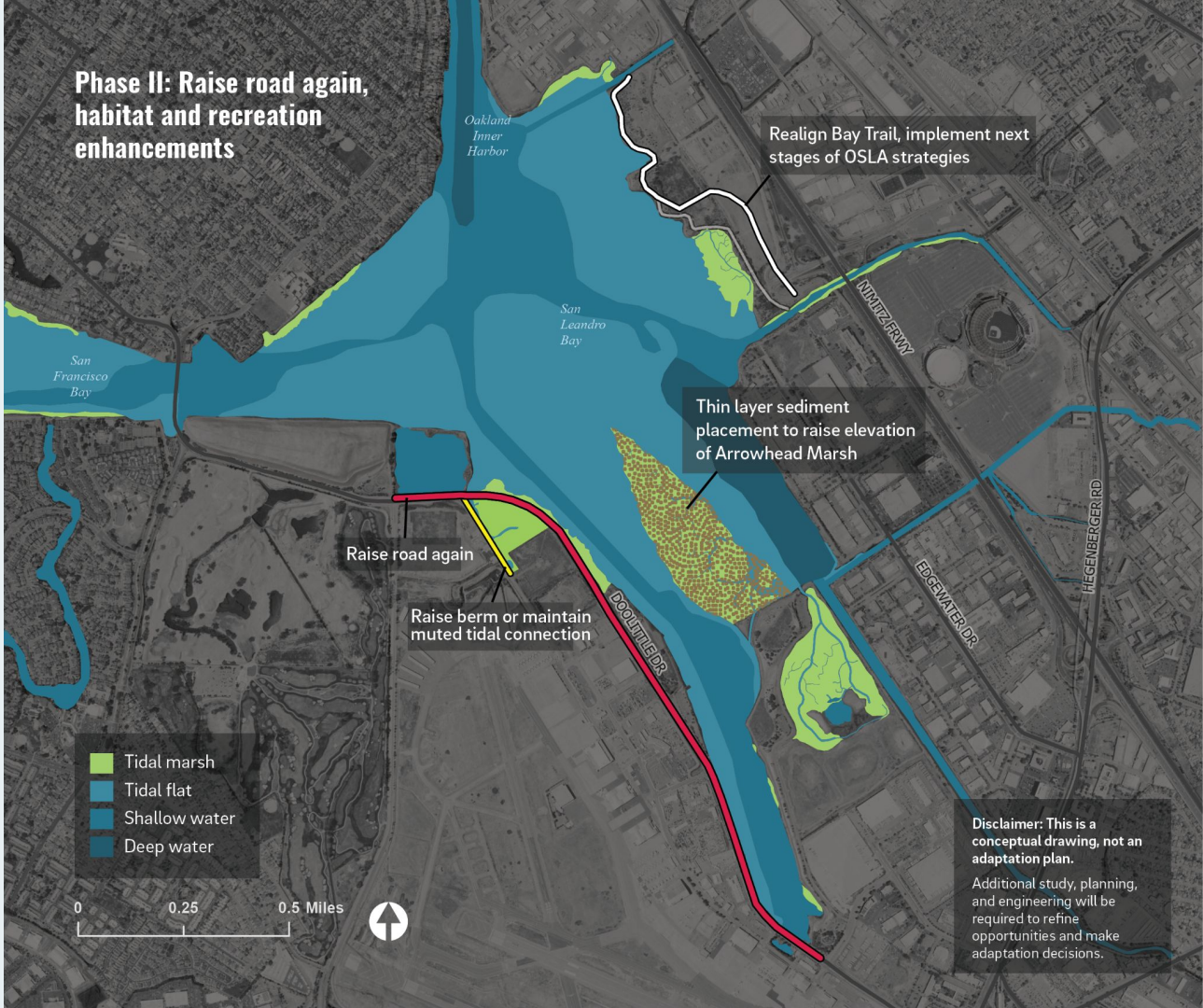
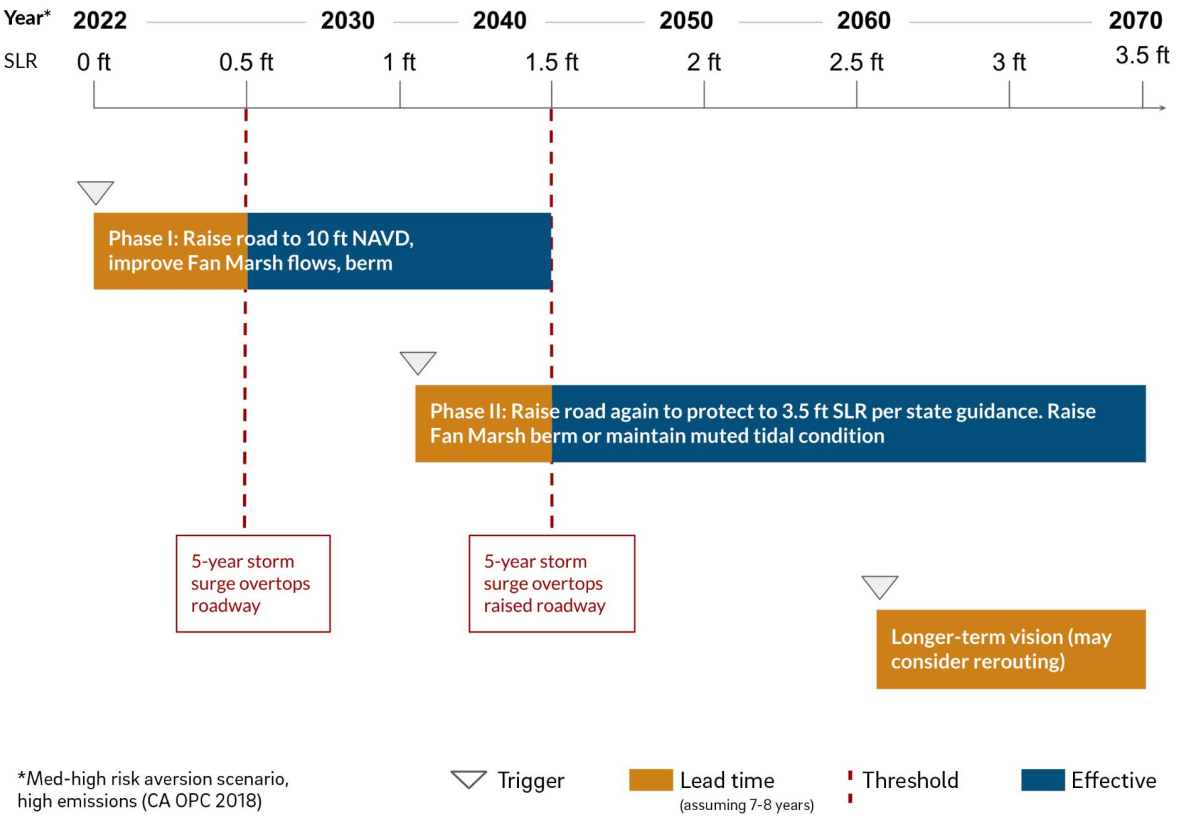


Approach 1:

Protect in place

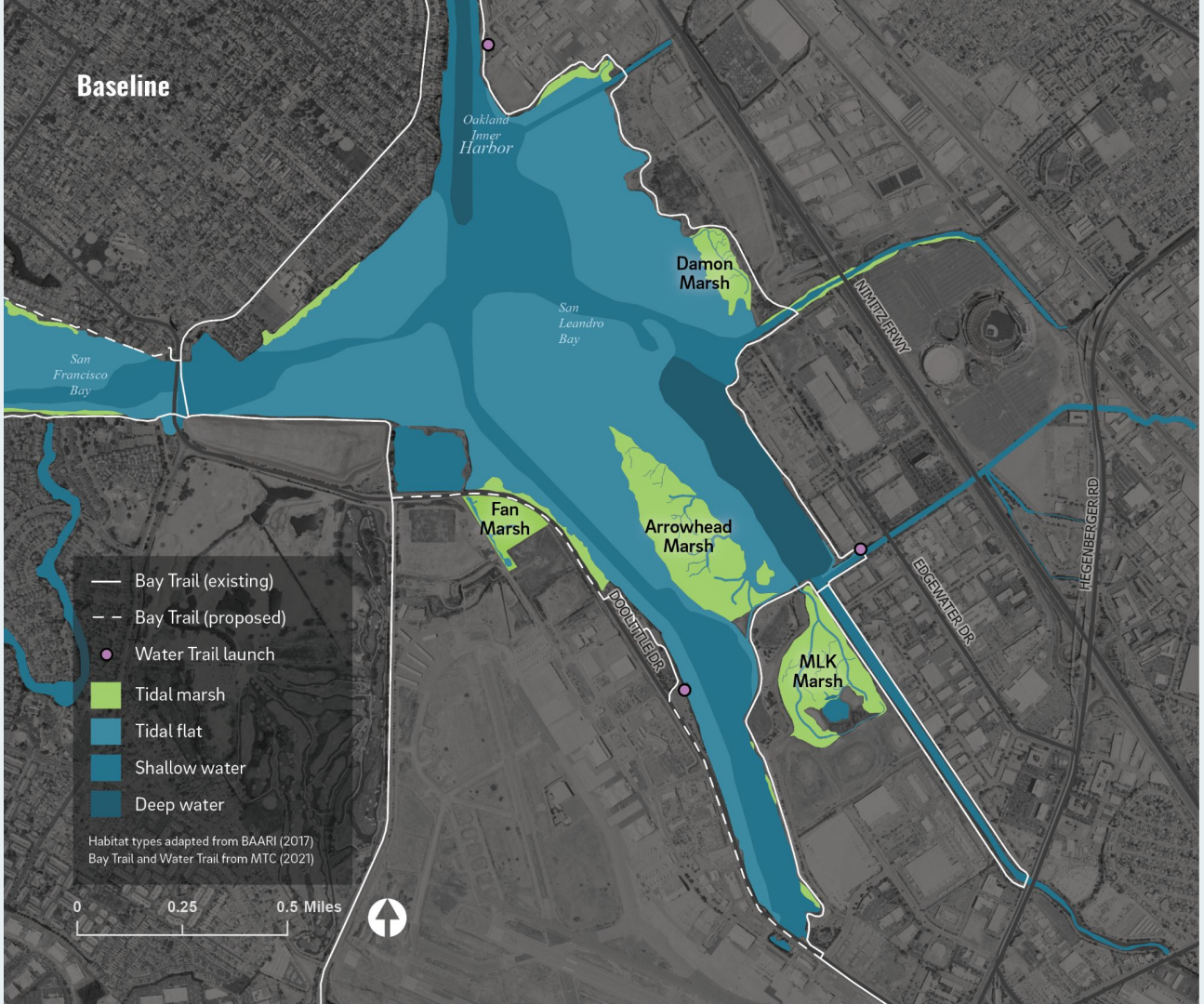
POSSIBLE ADAPTATION PATHWAY

Doolittle Drive and Fan Marsh | *Approach 1: Protect in place*



Approach 2:

Expand marsh migration space early

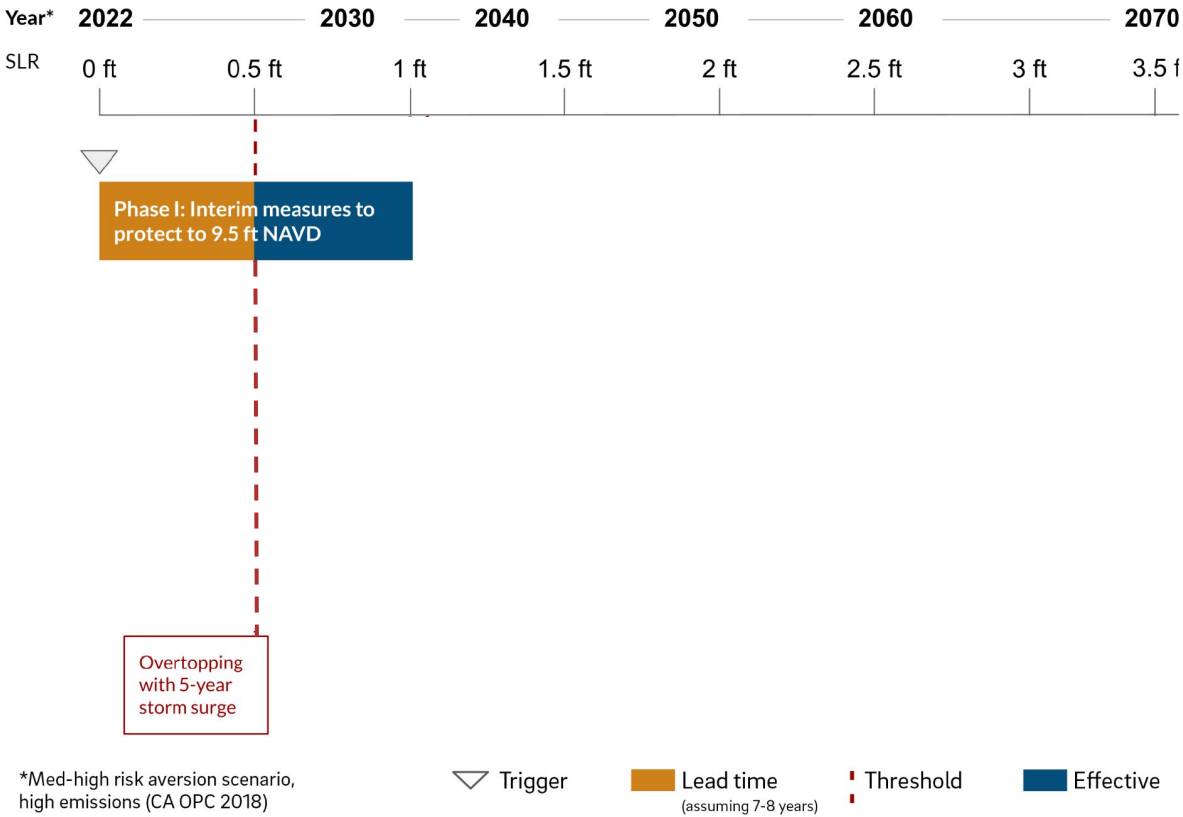


Approach 2:

Expand marsh migration space early

POSSIBLE ADAPTATION PATHWAY

Doolittle Drive and Fan Marsh | ***Approach 2: Expand marsh migration space early***



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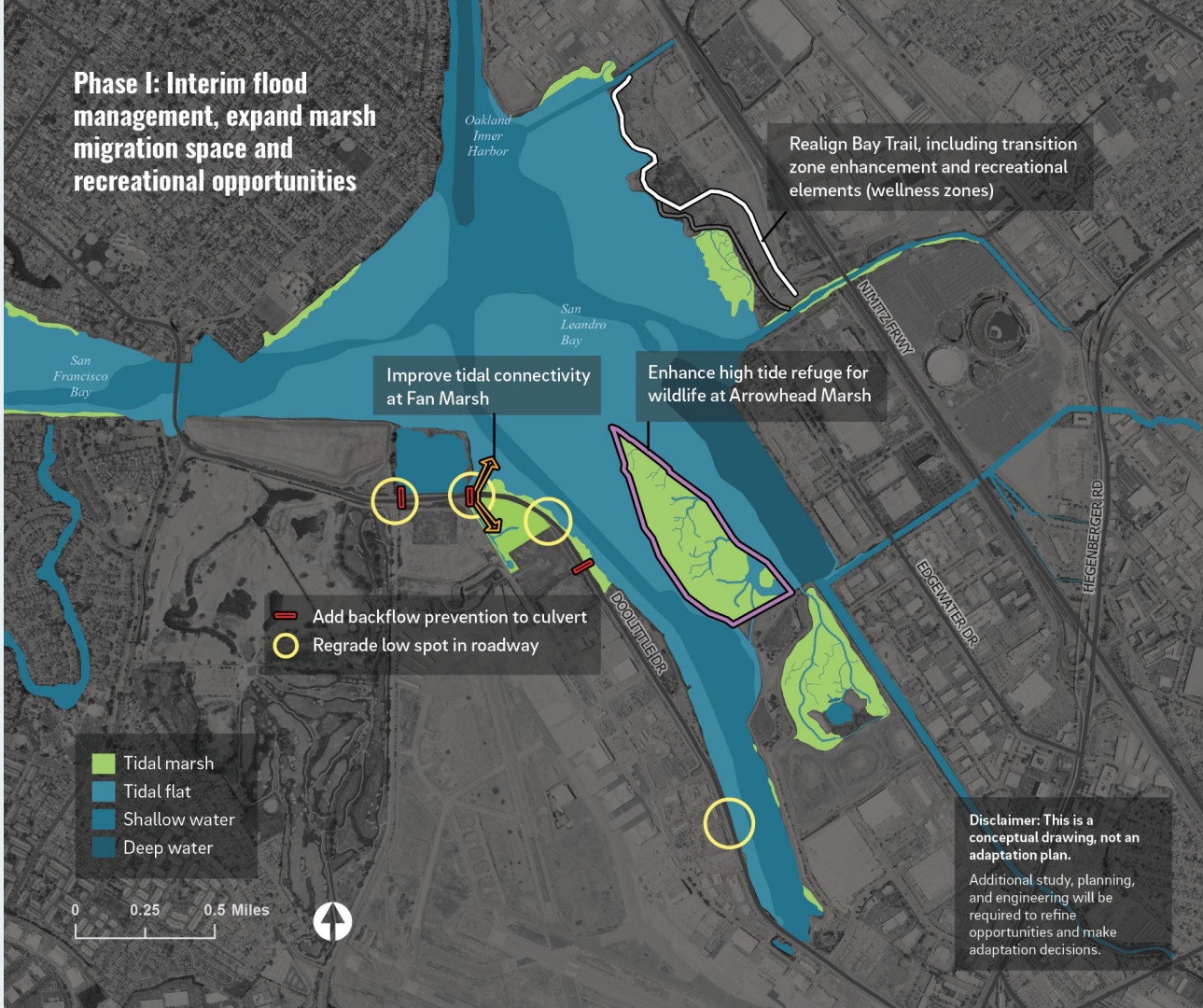
Expand marsh migration space early

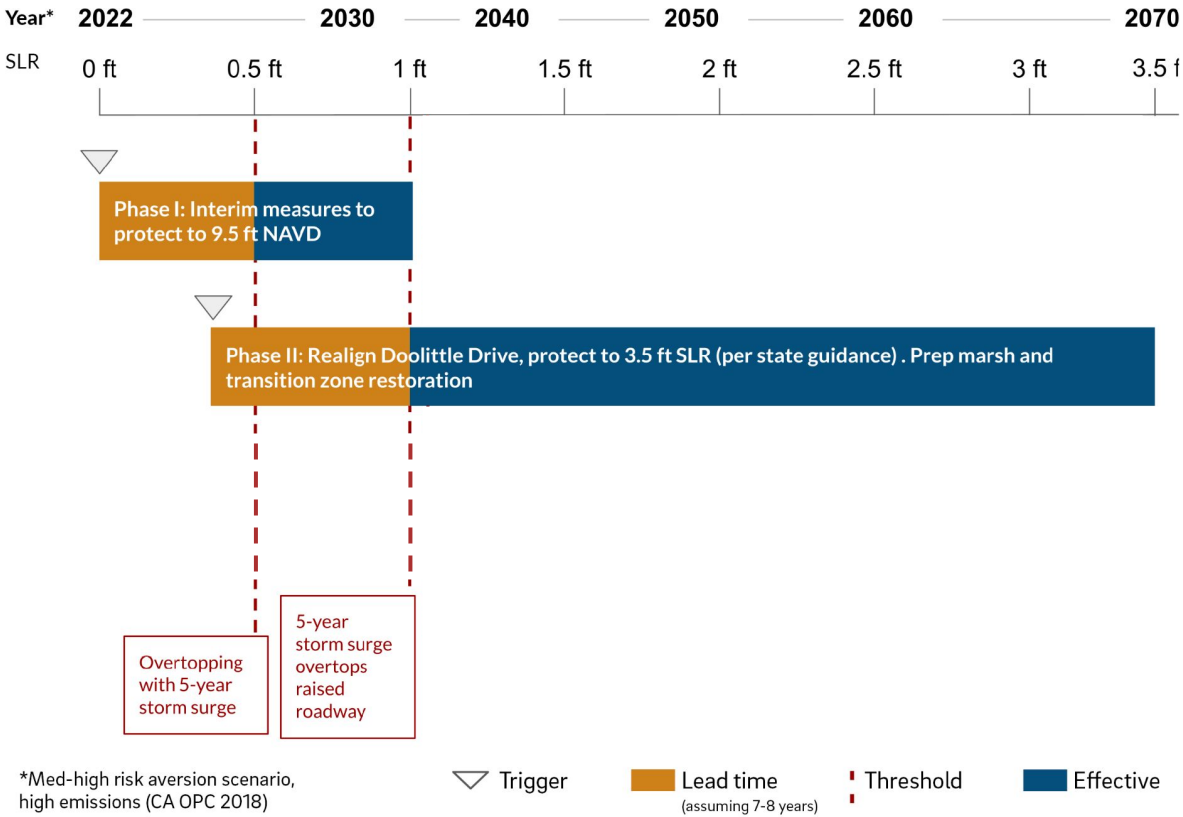


Approach 2:

Expand marsh migration space early

POSSIBLE ADAPTATION PATHWAY

Doolittle Drive and Fan Marsh | ***Approach 2: Expand marsh migration space early***



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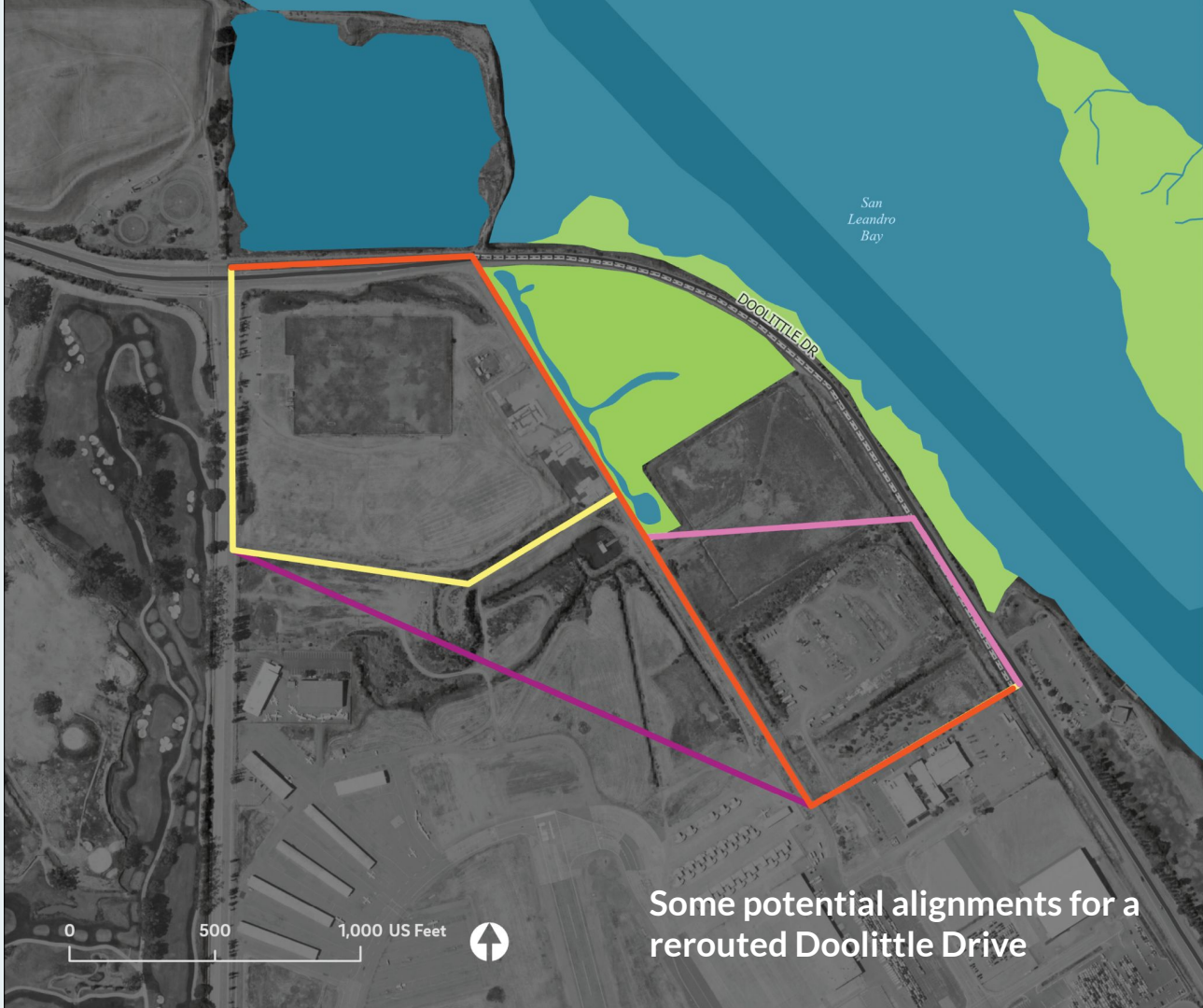
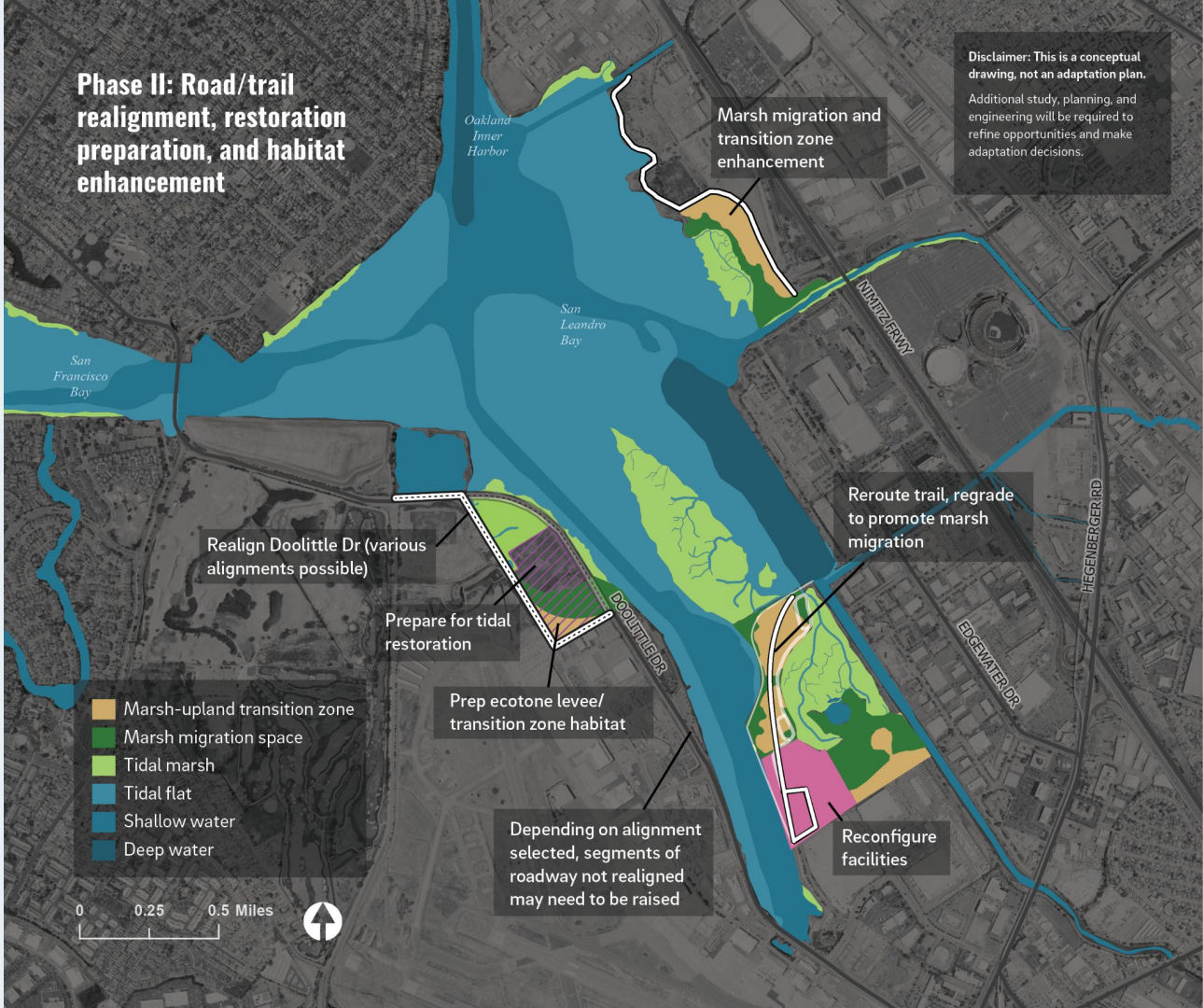
Expand marsh migration space early



Some potential alignments for a rerouted Doolittle Drive

Approach 2:

Expand marsh migration space early

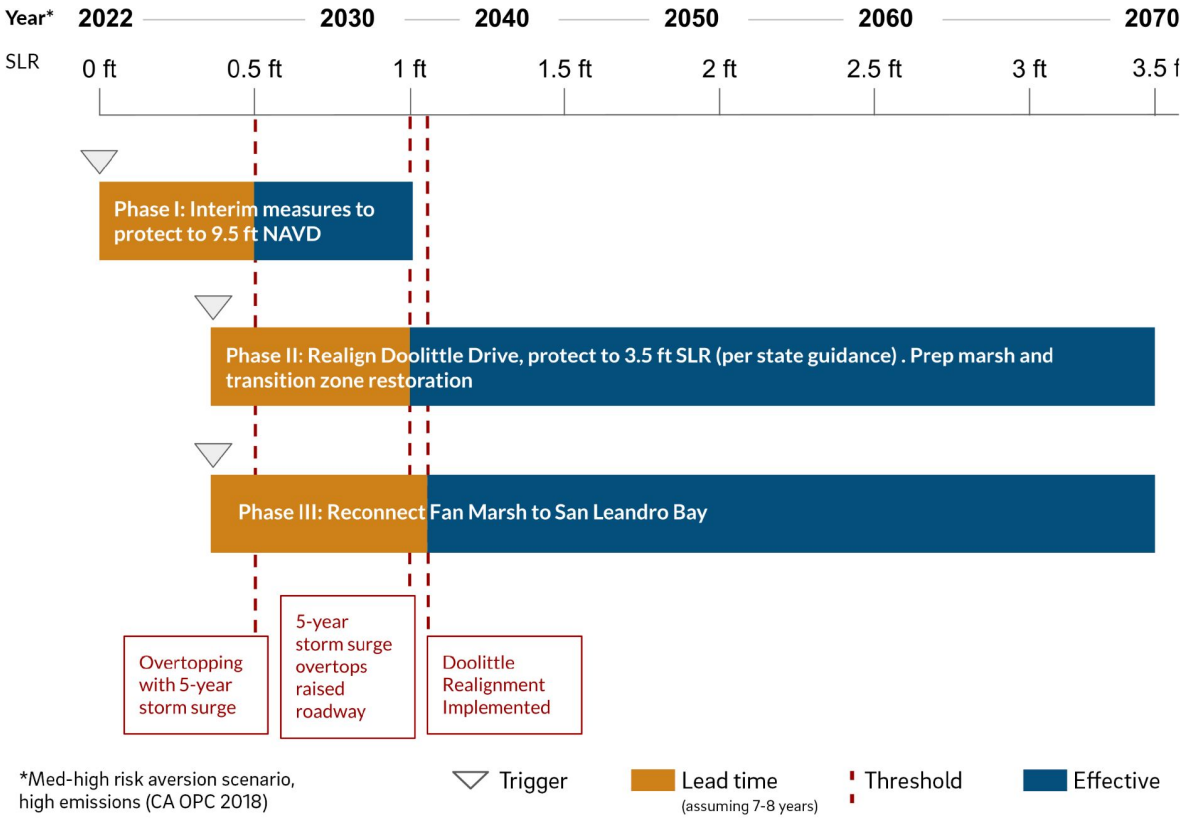


Approach 2:

Expand marsh migration space early

POSSIBLE ADAPTATION PATHWAY

Doolittle Drive and Fan Marsh | ***Approach 2: Expand marsh migration space early***



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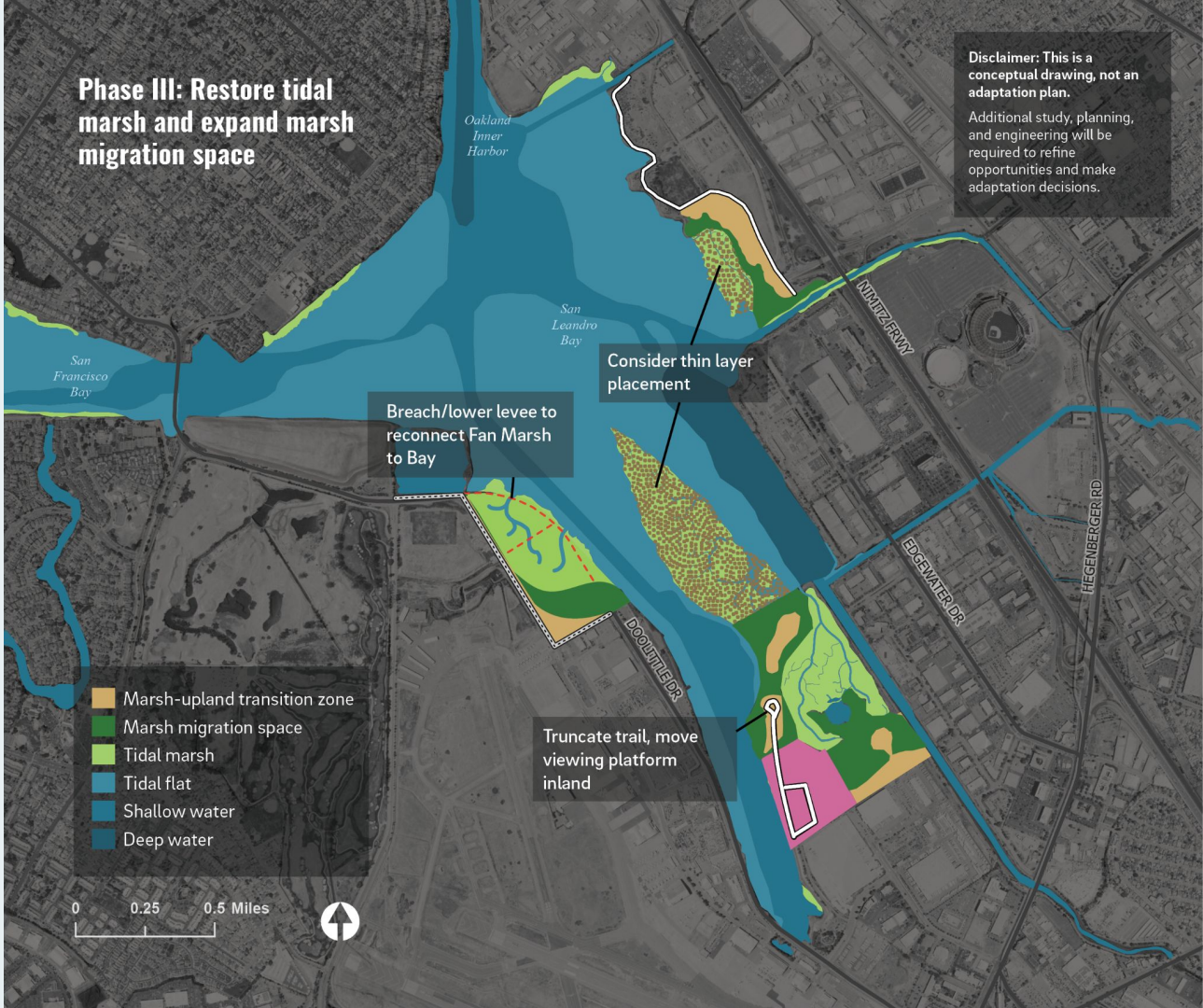
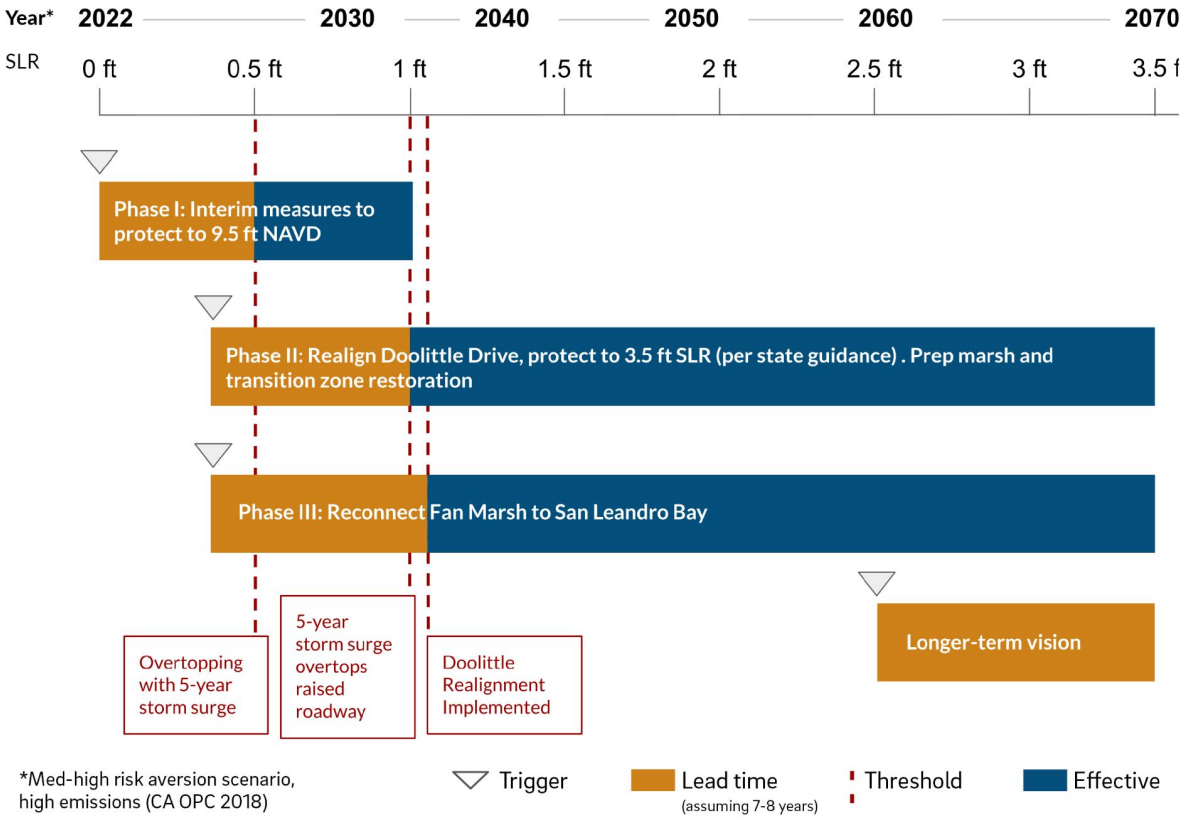


Approach 2:

Expand marsh migration space early

POSSIBLE ADAPTATION PATHWAY

Doolittle Drive and Fan Marsh | ***Approach 2: Expand marsh migration space early***



Tradeoffs between approaches

Approach 1:

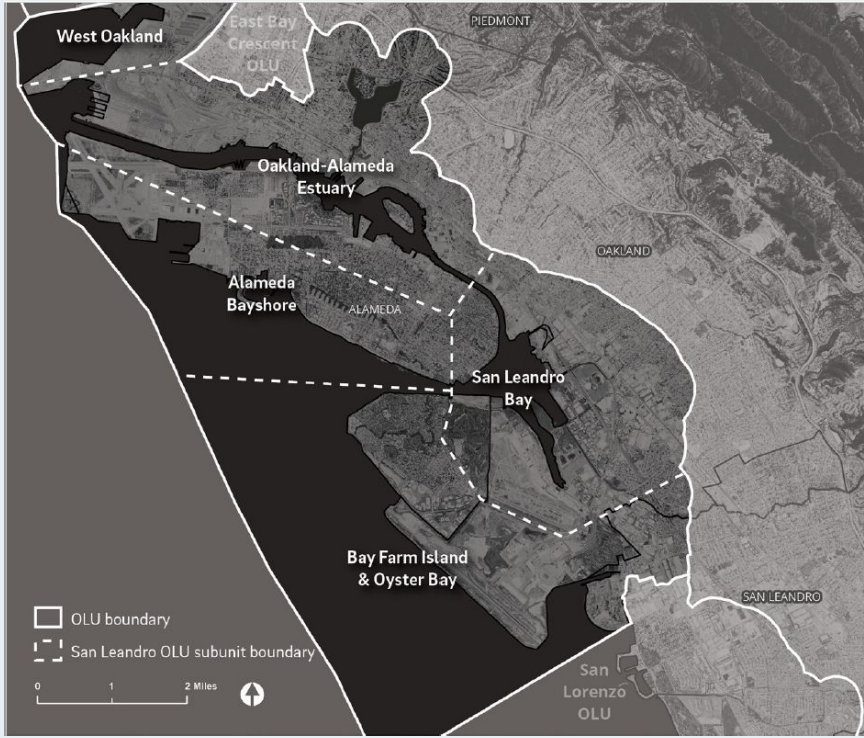
- Stays within existing alignments of roads and trails
- Reactive strategy with less habitat benefit in short and long term

Approach 2:

- Requires realignment of roads and trails
- Proactively prepares marsh migration space and creates high tide refugia

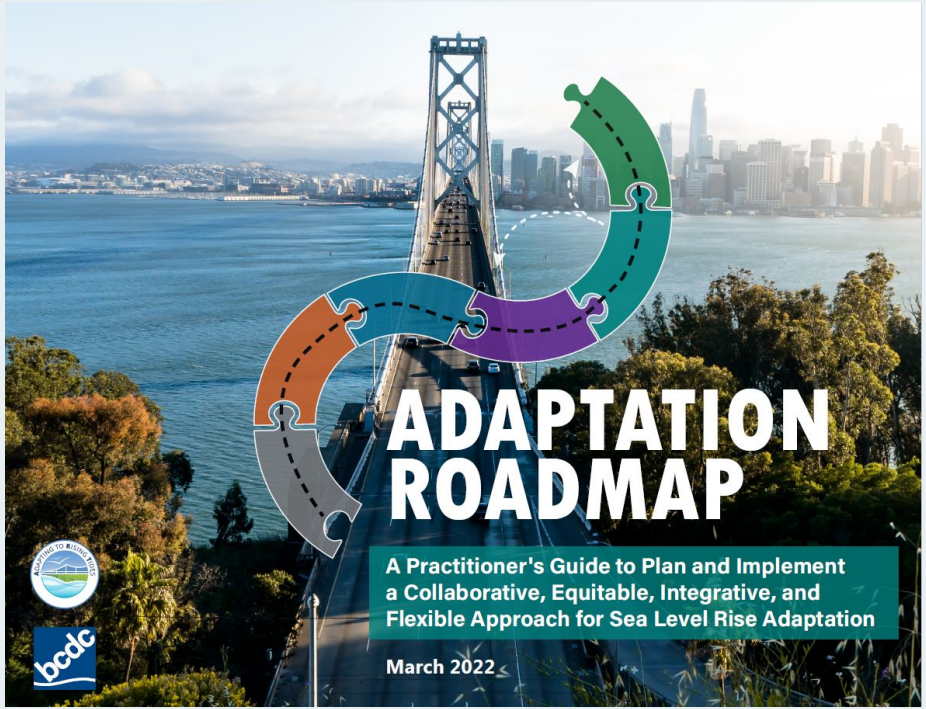
In the report...

- Pathways for other San Leandro Bay focus areas (Arrowhead & Damon Marshes, Damon Trail)
- Pathways for Oakland-Alameda Estuary subunit
- Considerations for remaining subunits (West Oakland, Alameda Bayshore, Bay Farm Island & Oyster Bay)



Possible next steps

- Apply pathway method to develop adaptation strategies
- For pathways in the report:
  - expand range of approaches
  - refine approaches, including thresholds, lead times etc.
- Suggested guidance: BCDC's recently released **Adaptation Roadmap**



Thank you!

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adaptationatlas.sfei.org

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