

San Leandro OLU Adaptation Pathways

San Francisco Estuary Institute

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Building on the Adaptation Atlas



SAN FRANCISCO BAY SHORELINE Adaptation Atlas

Working with Nature to Plan for Sea Level Rise Using Operational Landscape Units





Adaptation Pathways: San Leandro Operational Landscape Unit



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



*Alameda tide station #9414750, December 3, 1983 storm

Strategies

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 1ft 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	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

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

Example Approaches

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



POSSIBLE ADAPTATION PATHWAY

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





Disclaimer: This is a conceptual drawing, not an adaptation plan.

Additional study, planning, and engineering will be required to refine opportunities and make adaptation decisions.

POSSIBLE ADAPTATION PATHWAY

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



Phase II: Raise road again, habitat and recreation enhancements Raise road again Raise berm or maintain muted tidal connection Tidal marsh Tidal flat Shallow water Deep water 0.25 0.5 Miles

Realign Bay Trail, implement next stages of OSLA strategies

Thin layer sediment placement to raise elevation of Arrowhead Marsh

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Additional study, planning, and engineering will be required to refine opportunities and make adaptation decisions.

POSSIBLE ADAPTATION PATHWAY

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



Approach 2: Expand marsh migration space early



Expand marsh migration space early

POSSIBLE ADAPTATION PATHWAY

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



Expand marsh migration space early

Phase I: Interim flood management, expand marsh migration space and recreational opportunities Improve tidal connectivity Enhance high tide refuge for wildlife at Arrowhead Marsh at Fan Marsh Add backflow prevention to culvert Regrade low spot in roadway \cap Tidal marsh Tidal flat Shallow water Deep water 0.25 0.5 Miles

Realign Bay Trail, including transition zone enhancement and recreational elements (wellness zones)

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Additional study, planning, and engineering will be required to refine opportunities and make adaptation decisions.

Expand marsh migration space early

POSSIBLE ADAPTATION PATHWAY

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



Expand marsh migration space early



Expand marsh migration space early

Disclaimer: This is a conceptual drawing, not an adaptation plan. Phase II: Road/trail Additional study, planning, and realignment, restoration Marsh migration and engineering will be required to transition zone refine opportunities and make preparation, and habitat adaptation decisions. enhancement enhancement Reroute trail, regrade to promote marsh migration Realign Doolittle Dr (various alignments possible) Prepare for tidal restoration Prep ecotone levee/ Marsh-upland transition zone transition zone habitat Marsh migration space Tidal marsh Tidal flat Shallow water Depending on alignment Reconfigure Deep water selected, segments of facilities roadway not realigned may need to be raised 0,5 Miles 0.25

Expand marsh migration space early

POSSIBLE ADAPTATION PATHWAY

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



Expand marsh migration space early



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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