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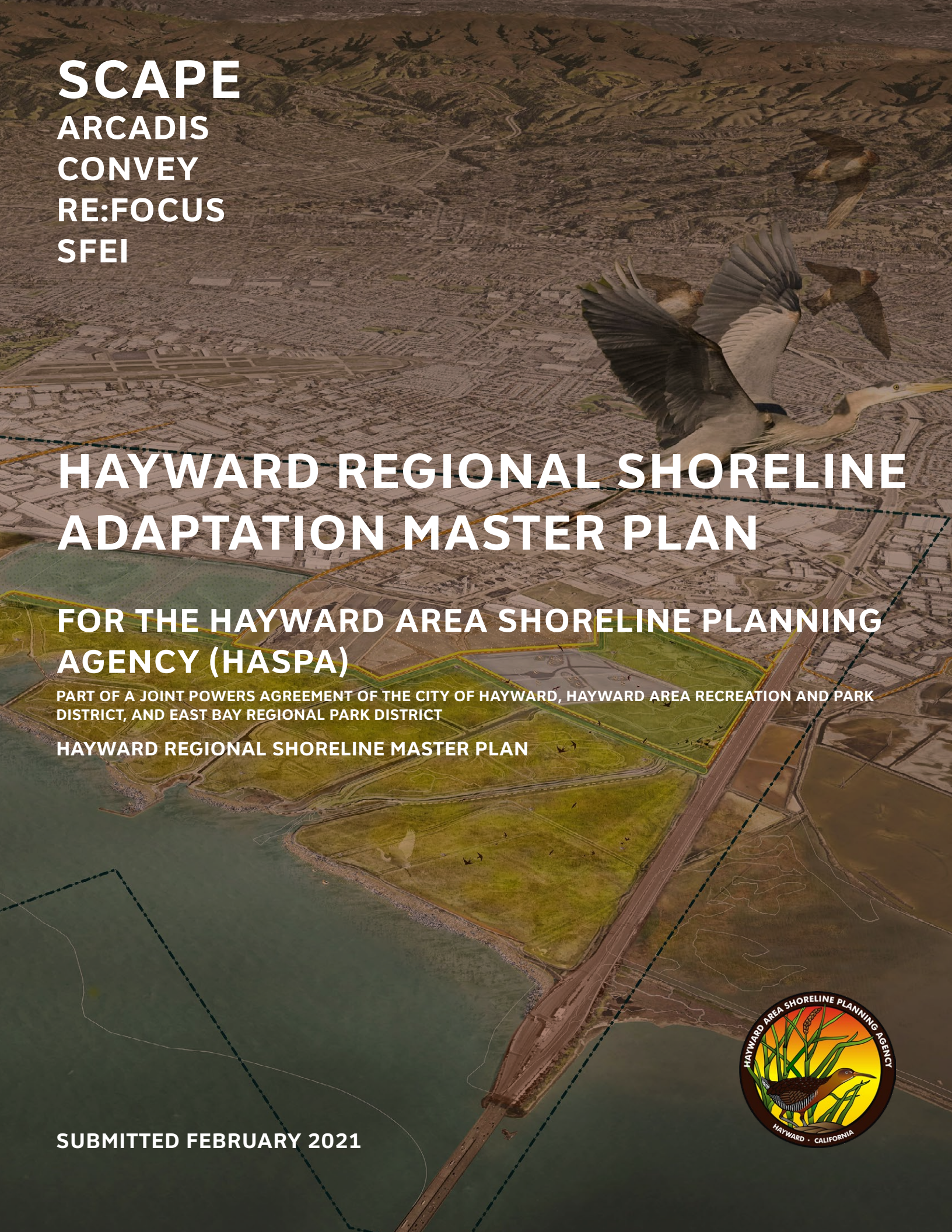
CONVEY
RE:FOCUS
SFEI



HAYWARD REGIONAL SHORELINE ADAPTATION MASTER PLAN

FOR THE HAYWARD AREA SHORELINE PLANNING AGENCY (HASPA)

PART OF A JOINT POWERS AGREEMENT OF THE CITY OF HAYWARD, HAYWARD AREA RECREATION AND PARK DISTRICT, AND EAST BAY REGIONAL PARK DISTRICT

HAYWARD REGIONAL SHORELINE MASTER PLAN

SUBMITTED FEBRUARY 2021

THE MASTER PLAN PROCESS

The Hayward Regional Shoreline Adaptation Master Plan builds upon existing planning efforts to coalesce around a shared vision to plan for, mitigate against, and adapt to sea level rise.

The Plan began with an analysis of the site's existing conditions in January 2019. This base of research led to the development of adaptation strategies that proposed ways of adapting the shoreline to sea level rise. The applicable strategies were ultimately combined to form a comprehensive plan for shoreline adaptation.

Frequent stakeholder and public engagement directly informed the Master Plan throughout every stage.

This planning document is a forward-looking tool to guide the phased implementation of projects that will adapt the Hayward Regional Shoreline as sea levels rise and mitigate the impacts of climate change.

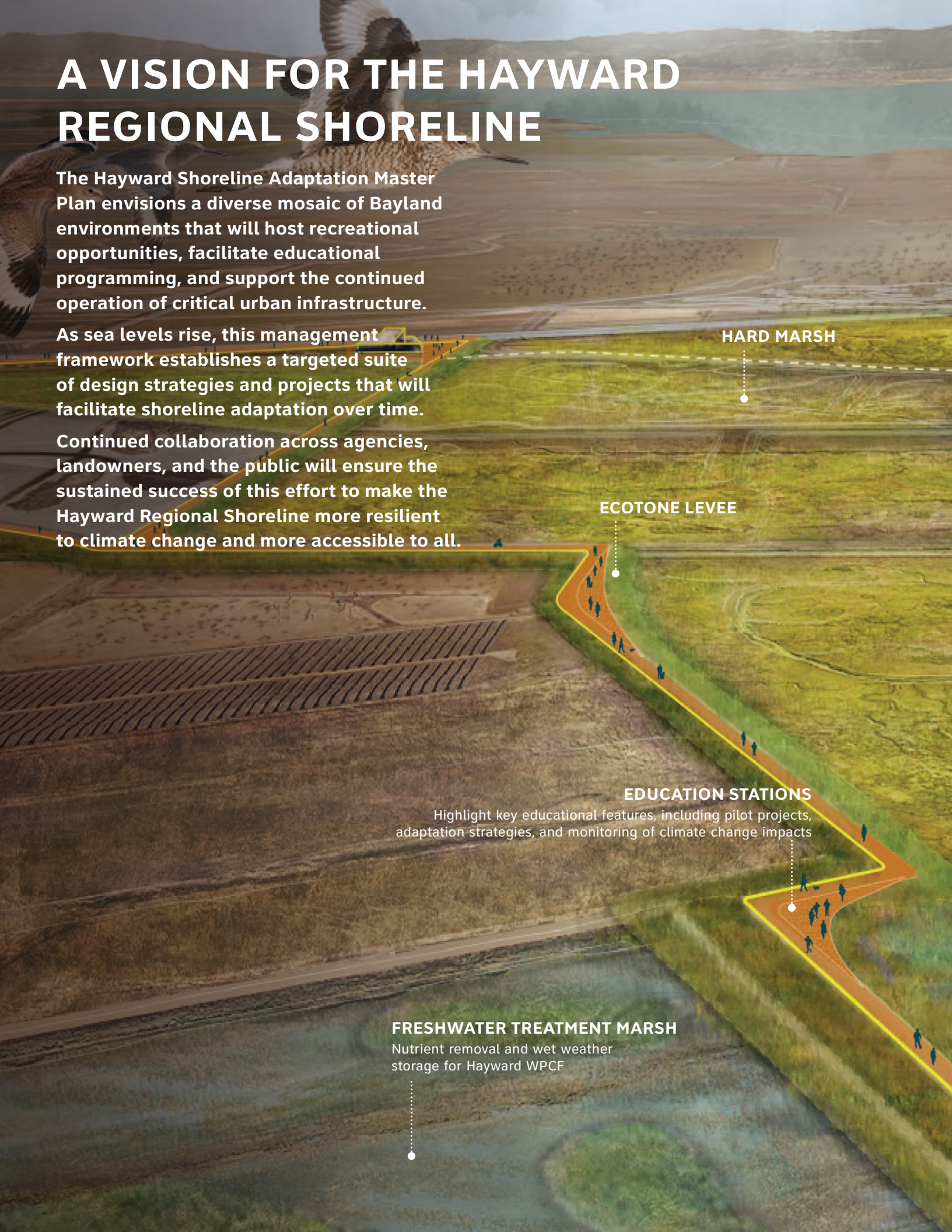

CITY OF
HAYWARD
COGSWELL
MARSH
HAYWARD
MARSH
HARD MARSH
SALT MARSH
HARVEST MOUSE
PRESERVE
OLIVER SALT PONDS
SR-92 BRIDGE APPROACH

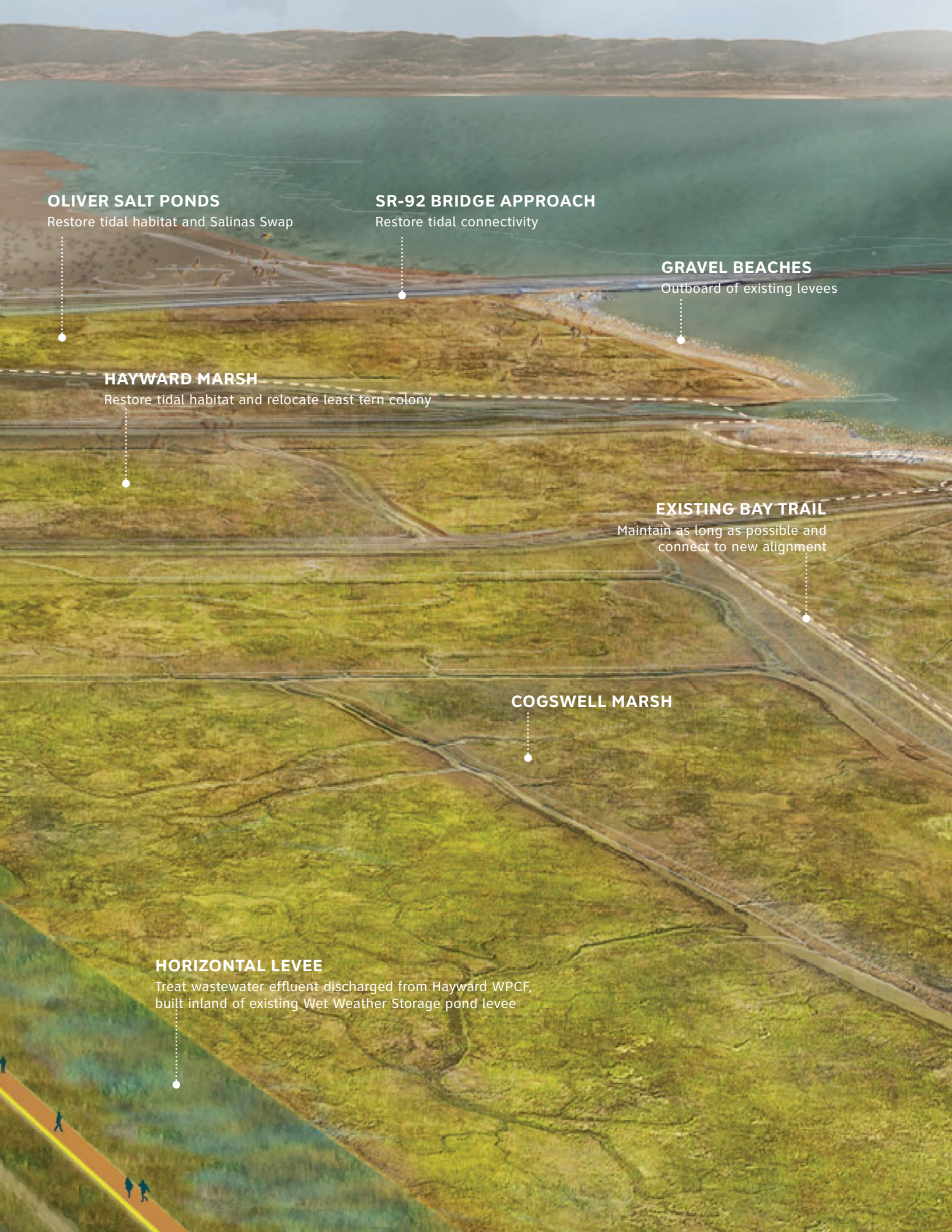
A VISION FOR THE HAYWARD REGIONAL SHORELINE

The Hayward Shoreline Adaptation Master Plan envisions a diverse mosaic of Bayland environments that will host recreational opportunities, facilitate educational programming, and support the continued operation of critical urban infrastructure.

As sea levels rise, this management framework establishes a targeted suite of design strategies and projects that will facilitate shoreline adaptation over time.

Continued collaboration across agencies, landowners, and the public will ensure the sustained success of this effort to make the Hayward Regional Shoreline more resilient to climate change and more accessible to all.




OLIVER SALT PONDS
Restore tidal habitat and Salinas Swap
SR-92 BRIDGE APPROACH
Restore tidal connectivity
GRAVEL BEACHES
Outboard of existing levees
HAYWARD MARSH
Restore tidal habitat and relocate least tern colony
EXISTING BAY TRAIL
Maintain as long as possible and connect to new alignment
COGSWELL MARSH
HORIZONTAL LEVEE
Treat wastewater effluent discharged from Hayward WPCF, built inland of existing Wet Weather Storage pond levee

A FRAMEWORK FOR ADAPTATION

The Hayward Shoreline Adaptation Master Plan provides a framework for shoreline adaptation that will guide the development of future projects to be implemented over time by proposing a piloting and monitoring strategy. Pilot projects will create opportunities to test adaptation strategies and demonstrate their efficacy. Monitoring protocols will provide data on site-specific climate change impacts and will track pilot projects to scale-up shoreline adaptation through larger scale applications of design strategies.

This framework of piloting, monitoring, and scaling-up will engage the community in shoreline adaptation, promote stewardship, and build capacity for future generations to adapt to climate change.


EXISTING TIDAL MARSH

THE ADAPTATION MASTER PLAN

How to Read this Document

Short Read (a few minutes):

Read the **Plan Overview & Goals**, which outlines the purpose of the Master Plan, the project statement, and goals. These principles lay the foundation for the Master Plan.

Medium Read (30 minutes):

Read the **Plan Overview & Goals**, **Context & Existing Conditions**, which provides an overview of the study area and existing conditions inventory, **Stakeholder Engagement**, and **A Vision for Shoreline Adaptation: The Hayward Regional Shoreline**, which describes the Master Plan proposal and associated design strategies.

Long Read (60 minutes +):

Read the full plan, which outlines the research, design, and stakeholder engagement processes, culminating in the Preferred Alternative in **A Vision for Shoreline Adaptation: The Hayward Regional Shoreline** and an analysis of **Implementation Considerations**, which provides further details on how the Master Plan will be phased, funded, permitted, and managed over time.

Key Terms:

Adaptation Strategies: Physical design strategies that will help the shoreline adapt to climate change.

Master Plan Assumptions: This set of "rules" summarizes client and stakeholder feedback and sets a framework to generate and compare the Design Alternatives.

Design Alternatives: Three initial visions for shoreline adaptation that outline spatial configurations of the Adaptation Strategies. These were formulated to solicit stakeholder, client, and public feedback, and were evaluated against a "no-action" scenario.

Preferred Alternative: The hybrid and final vision for the Hayward Shoreline. This was informed by feedback from the Design Alternatives.

Document Summary

Plan Overview & Goals

This chapter provides an introduction to the Master Plan, the project purpose, goals, and an overview of the Master Plan process. These principles lay the foundation for the master plan as a whole.

Context & Existing Conditions

The Hayward Shoreline is a mosaic of Bayland environments that support diverse wildlife habitats, infrastructural assets, and recreational resources. This section provides an overview of the study area and a broad inventory of the existing conditions. This research served as a foundation for the design and development of the Master Plan.

Stakeholder Engagement

The Hayward Shoreline Adaptation Master Plan was developed through extensive stakeholder collaboration and public engagement that informed the planning process and fostered coordination across agencies, organizations, regulators, and the public. This section provides a summary of the stakeholder engagement process, which has the potential to be replicated in other planning efforts throughout the Bay to develop cohesive visions for shoreline adaptation. A detailed inventory of Stakeholder and Public Comments can be found in Appendix A: Stakeholder and Public Comments.

Sea Level Rise and Flood Risk Impacts

This section outlines the impacts of coastal flood risk, future trends, and provides a thorough analysis of three future sea level rise scenarios. This assessment identified potential future hazard areas for planning purposes in order to formulate appropriate adaptation strategies.

Adaptation Strategies

This section is a catalog of potential design strategies based upon insight collected through public workshops and engagement, and as well as from the analysis of sea level rise scenarios and related risks. The feasibility and applicability of these strategies were evaluated across the project area in consideration of the Project Goals and Policy Considerations. This section provides an inventory of the adaptation strategies identified as the most applicable to the Hayward Shoreline.

Design Alternatives and Feedback

This section provides an overview of the project parameters and considerations, including the Master Plan assumptions and policy considerations, which set a framework for the Master Plan. Three Design Alternatives were identified that combine a suite of adaptation strategies to meet the project goals. The spatial configuration and selection of strategies were carefully evaluated based on stakeholder and public feedback. This section also outlines a summary of stakeholder feedback.

A Vision for Shoreline Adaptation: The Hayward Regional Shoreline

This section introduces the Preferred Alternative, a future vision for the Hayward Shoreline to adapt to climate change. The hybrid Preferred Alternative was selected based upon further client and stakeholder feedback and includes two alternates with embedded flexibility. This chapter breaks the broad vision down into its respective parts, organized by theme, to provide further details.

Implementation Concept

The Preferred Alternative is further evaluated in this section to provide details on how the Master Plan vision will be phased, funded, permitted, and managed over time in coordination with all associated stakeholders. The Phasing Plan breaks down the Master Plan into discrete projects that are organized by time frame, Project Fact Sheets provide a detailed assessment of specific projects identified in the Phasing Plan, Non-Structural Strategies offer an overview of policy and programmatic recommendations, including financing, permitting, feasibility, and regional considerations.

Supporting Documents:

Appendix A provides a record of all stakeholder and public comments.

Appendix B provides a detailed breakdown of cost estimates for the three Design Alternatives, as well as the Preferred Alternative.

TABLE OF CONTENTS

PLAN OVERVIEW & GOALS

This chapter includes the project purpose, timeline, project statement, and goals. These principles lay the foundation for the Adpatation Master Plan as a whole.

Fringe marsh at San Lorenzo Creek

MASTER PLAN PURPOSE

HAYWARD REGIONAL SHORELINE ADAPTATION MASTER PLAN

The Hayward Regional Shoreline Adaptation Master Plan was commissioned in 2019 by the Hayward Area Shoreline Planning Agency (HASPA), a joint powers agency consisting of representatives from the City of Hayward, East Bay Regional Park District (EBRPD), and Hayward Area Recreation and Park District (HARD).

The Master Plan will develop various multi-benefit strategies for the shoreline, its existing infrastructure, and the surrounding natural habitat in order to adapt to Sea Level Rise. Ultimately, it will act as a road map and help guide the development of future projects in a coordinated effort between state and local agencies, landowners, and the public.

Sea level rise is a climate change-induced phenomenon that will inevitably cause flooding and harm to the various recreational, transportation, infrastructural, residential, economic, and ecological assets in place along the Shoreline. While the Shoreline's eight marshes provide some level of natural flood protection for these assets, including the entrance to the State Route 92 (SR 92) and the San Francisco Bay Trail, continually rising sea levels and stronger storm events are already overtaking these barriers two to three times a year. If no adaptation actions are taken, many of the tidal marshes and managed wetlands will be inundated by 2050 and the Bay Trail will be increasingly inaccessible to its thousands of visitors. The Plan will be a forward looking tool for preparation, mitigation, and adaptation to climate change.

All Master Plan related documents, including technical information and reports, are available on the websites of each agency.

PROJECT STATEMENT & GOALS

A FUTURE VISION FOR HOW THE HAYWARD REGIONAL SHORELINE CAN ADAPT TO SEA LEVEL RISE

The Hayward Regional Shoreline Adaptation Master Plan creates a framework for resilience to prepare for sea level rise (SLR), groundwater intrusion, and storm surge. The Master Plan is being managed by the Hayward Area Shoreline Planning Agency (HASPA), a joint power authority including the City of Hayward, Hayward Area Recreation and Park District (HARD), and East Bay Regional Park District (EBRPD).

The Hayward Regional Shoreline Adaptation Master Plan project area is bounded on the north by Bockman Channel (also called the Bockman Canal) and extends approximately 3.25 miles south to the State Route 92 San Mateo Bridge approach. The extent of the project area into the Bay was defined by the outermost limit of the Hayward Area Shoreline Planning Agency Jurisdictional boundary, and the inland extent of the project area is drawn at the Union Pacific Rail Corridor. In total, the project area covers six square miles of various land uses, including open space, urban infrastructure, industrial, and residential.

The project area supports ecological Bayland resources, hosts recreational opportunities along the San Francisco Bay Trail, and facilitates educational programming for adjacent residential neighborhoods and businesses at the Hayward Shoreline Interpretive Center. The shoreline is also home to critical urban infrastructure, including wastewater treatment plants, the Hayward-San Mateo Bridge approach (State Route 92), and landfills. The Master Plan will develop various multi-benefit strategies for the shoreline, its existing infrastructure, and the surrounding natural habitat. The Master Plan will consider multiple planning time horizons and sea level rise scenarios. Additionally, it will consider a range of adaptation strategies that can evolve and respond over time to changing sea levels.

PROJECT GOALS

Create a Resilient Shoreline Environment for People and Ecology

- Enhance the shoreline's ecological value and adapt to sea level rise
- Enhance recreational opportunities and adapt to climate change
- Create a management framework for adapting to sea level rise over time
- Provide refuge to help endangered shoreline species to adapt climate change

Enhance the Shoreline Environment to Reduce Risk to Critical Infrastructure and Built Assets

- Align with and enhance existing management and capital improvement plans
- Reduce risk to regional critical utilities from sea level rise, groundwater intrusion, and flood events
- Reduce risk to transportation infrastructure from sea level rise, groundwater intrusion, and flood events
- Reduce risk to agency assets such as the San Francisco Bay Trail and marsh restoration project(s)

Build Social Resilience in the Community

- Promote social equity, environmental justice, and public health
- Preserve the local economy and increase resilience to climate change
- Prevent the disruption of key community services

Build Capacity for Future Generations to Adapt to climate change

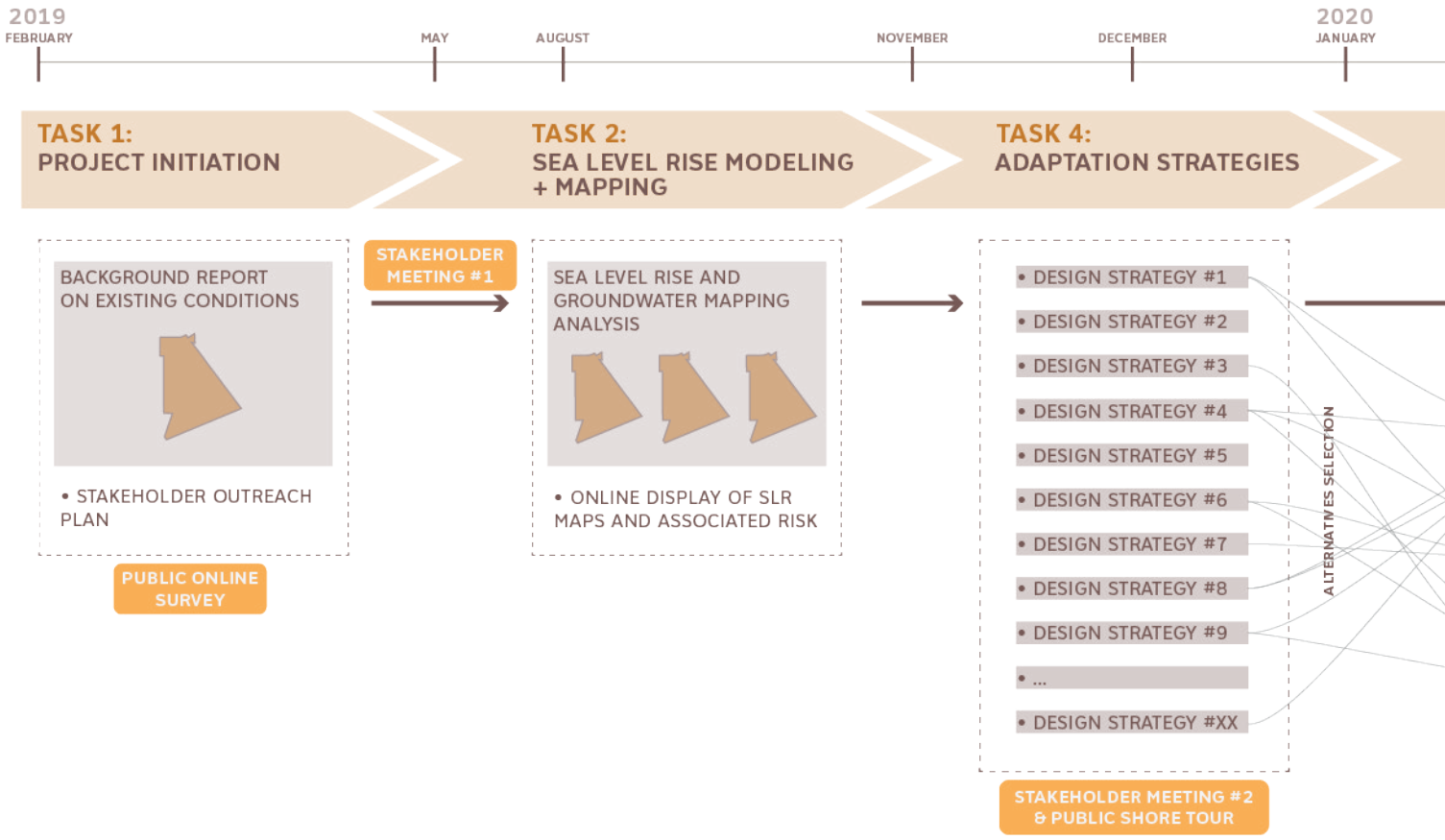
- Build organizational and community capacity
- Provide a place for education, interpretation and understanding of the shoreline and climate change
- Foster stewardship of the shoreline's cultural and ecological resources

Bay Trail at Hayward Marsh

PROJECT PROCESS

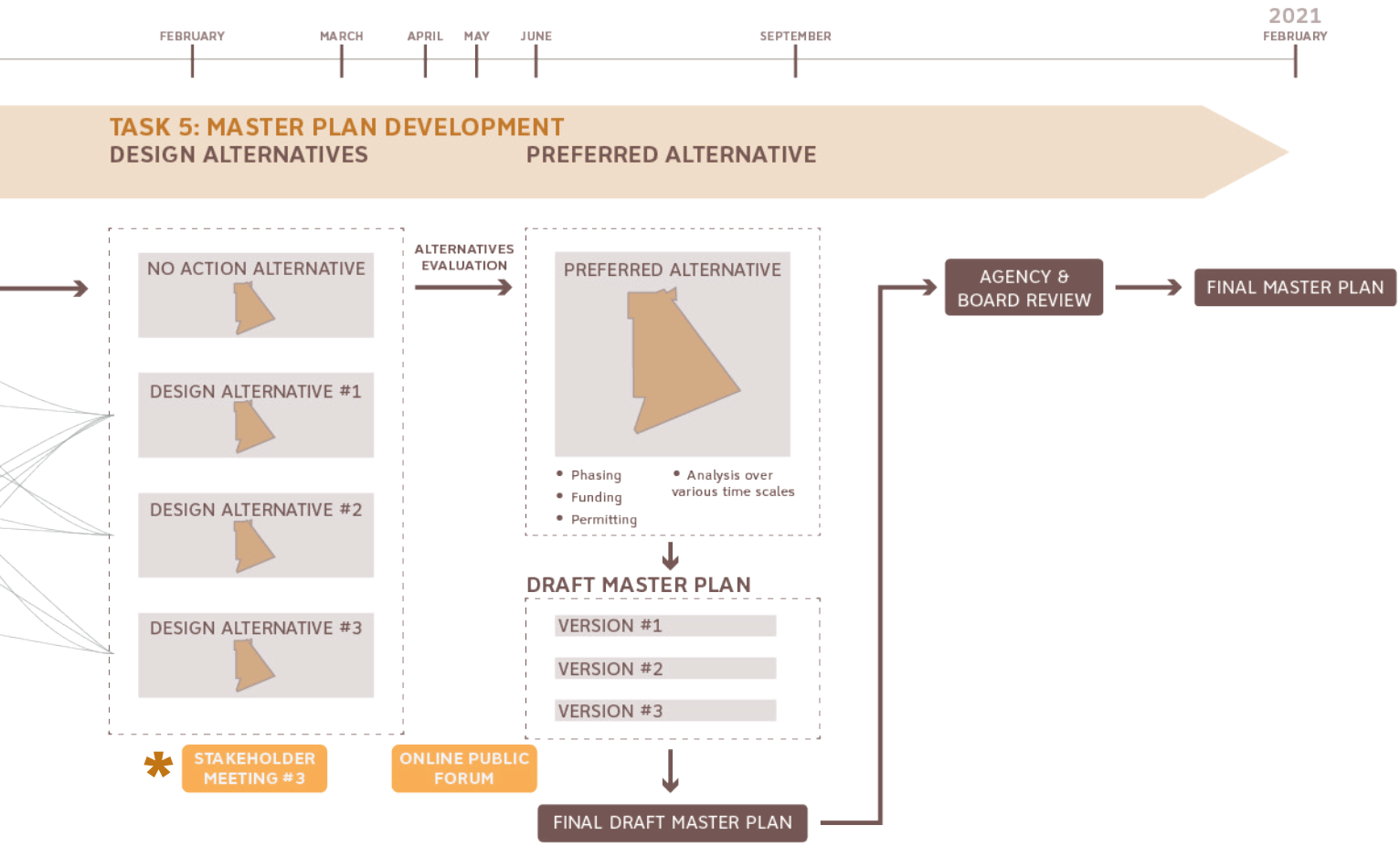
A COLLABORATIVE PROCESS

The Shoreline Adaptation Master Plan began at the end of January 2019 with the project initiation phase, where a thorough analysis of existing conditions as well as stakeholder meetings were used to understand the constraints and opportunities for the project area. The Design Team then examined future risk across multiple scenarios through sea level rise modeling and mapping across various time scales. Subsequently, the Team identified potential adaptation strategies to help the shoreline adapt to climate change. These adaptation strategies were then consolidated and combined to generate three Design Alternatives. This led to the development of a Preferred Master Plan Alternative that hybridizes various projects elements that received the most stakeholder support.



* Adaptation to virtual engagement due to COVID-19 pandemic (March 2020)

05/16/19 Stakeholder Workshop #1
(SCAPE Site Photos, 2019)



IMPLEMENTATION

AFTER THE MASTER PLAN

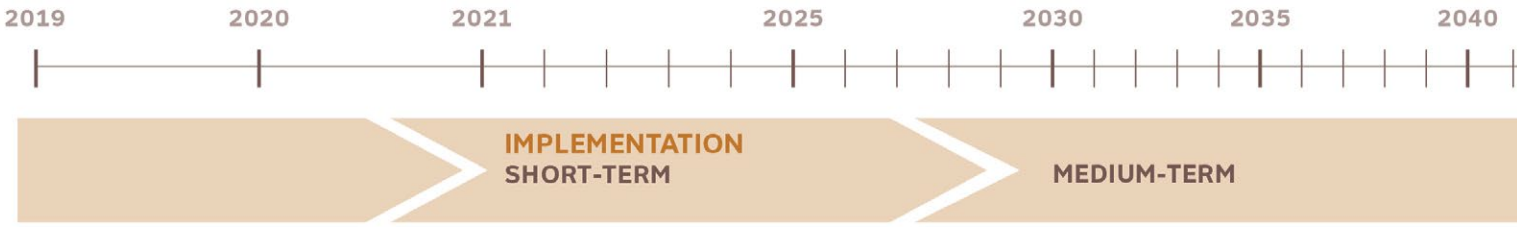
Following the adoption of the Master Plan, the project will not be over. In fact, the majority of the work will just begin.

This planning document provides a framework to adapt the Hayward Regional Shoreline to sea level rise. The strategies identified in this report should be used as starting points to guide the development, and ultimately the implementation, of projects in a coordinated effort over time.

The implementation of the Hayward Regional Shoreline Master Plan will occur over many decades. For the purposes of this report, the planning horizons were divided into short, medium, and long-term time frames. For more details about the Phasing Plan and associated projects, please refer to the Implementation Considerations chapter.

The time frame and goals for each planning horizon are outlined below:

It is recommended to re-assess and revisit the Master Plan document periodically. As projects are analyzed and developed in greater detail, new information will arise that may impact the feasibility or phasing of specific parts of the Master Plan vision. In addition, the planning assumptions will evolve as sea level rise projections, policy recommendations, and funding availability change over time.



MASTER PLAN PROCESS

- EXISTING CONDITIONS ANALYSIS
- STAKEHOLDER OUTREACH
- SEA LEVEL RISE MODELING AND MAPPING
- ADAPTATION STRATEGIES RESEARCH
- MASTER PLAN VISION
- IMPLEMENTATION CONSIDERATIONS

→

- ECOLOGICAL ENHANCEMENTS THAT ALIGN WITH EXISTING EFFORTS AND VULNERABLE SITES
- PILOT PROJECTS TO INFORM LARGER-SCALE APPLICATION OF STRATEGIES
- MONITORING PROTOCOL TO ANALYZE EXISTING CONDITIONS TO INFORM THE PRIORITIZATION OF STRATEGIES AS SEA LEVELS RISE
- INTERIM LEVEE RAISING TO REDUCE RISK UP TO THE EXISTING 100-YEAR STORM

- MULTI BENEFIT INFRASTRUCTURE
- OPPORTUNITIES FOR STORMWATER MANAGEMENT
- TIDAL HABITAT ADAPTATION THROUGH ARTIFICIAL SEDIMENT APPLICATION TO HELP MARSHES KEEP PACE WITH SEA LEVEL RISE
- PROVIDE INDEPENDENT UTILITY TO SPECIFIC INLAND AREAS THROUGH BUILDING A LINE OF PROTECTION TO REDUCE RISK UP TO 4' OF SEA LEVEL RISE PLUS THE 100-YEAR STORM

West Winton Landfill looking towards Cogswell Marsh
(SCAPE Site Photos, 2019)

2045 +

LONG-TERM

- COMPLETE FULL LINE OF PROTECTION TO REDUCE RISK UP TO 4' OF SEA LEVEL RISE PLUS THE 100-YEAR STORM

- CREATE A LAYERED SYSTEM OF EROSION CONTROL INFRASTRUCTURE

- WASTEWATER TREATMENT ADAPTATION TO FACILITATE LOCAL DISCHARGE

CONTEXT & EXISTING CONDITIONS

This chapter provides an overview of the study area and existing conditions analysis.


HAYWARD SHORELINE MASTER PLAN
SAN FRANCISCO BAYLANDS
LEGEND
PROJECT BOUNDARY
STUDY AREA
BAYLANDS
N
0
1.5
3 MI
PIEDMONT
ALAMEDA
OAKLAND
SAN FRANCISCO
ALAMEDA COUNTY
SAN LEANDRO
SAN FRANCISCO BAY
HAYWARD
SAN FRANCISCO INTERNATIONAL AIRPORT
SAN MATEO BRIDGE
UNION CITY
SAN MATEO
FREMONT
NEWARK
REDWOOD CITY
PALO ALTO

STUDY AREA

HAYWARD REGIONAL SHORELINE ADAPTATION MASTER PLAN

The Hayward Regional Shoreline Adaptation Master Plan study area is loosely defined. The northern boundary lies just above Lewelling Boulevard in San Lorenzo and the southern boundary is below Alameda Creek in Fremont. This study area is larger than the project area and was chosen to provide a regional context for the smaller and more precisely analyzed and designed project area.

The Study Area encompasses a long stretch of the East Bay shoreline, which is characterized by broad mudflats that extend for miles into the Bay itself.

Hayward Area Recreation and Park District (HARD) Marsh looking towards CalPine / Russell City Energy Center
(SCAPE Site Photos, 2019)

Shorebird habitat
(SCAPE Site Photos, 2019)

Sources:

1. San Francisco Estuary Institute and Aquatic Science Center 2015. *California Aquatic Resource Inventory.* (April 18, 2019)

PROJECT AREA

HAYWARD REGIONAL SHORELINE ADAPTATION MASTER PLAN

The Hayward Regional Shoreline Adaptation Master Plan project area is bounded on the north by Bockman Channel (also called Bockman Canal) and extends approximately 3.25 miles south to the State Route 92 San Mateo Bridge approach. The extent of the project area into the Bay was defined by the outermost limit of the Hayward Area Shoreline Planning Agency jurisdictional boundary, and the inland extents of the project area are drawn at the rail corridor. In total, the project area covers 6 square miles of various land uses, including open space, urban infrastructure, industrial, and residential.

Wet Weather Storage Ponds looking from West Winton Landfill
(SCAPE Site Photos, 2019)

Cogswell Marsh levee adjacent to the Bay
(SCAPE Site Photos, 2019)


LEGEND
TIDAL MUDFLAT
TIDAL / MUTED TIDAL MARSH
DIKED POND/ WETLAND
DIKED STORAGE AND TREATMENT PONDS
INACTIVE SALT PONDS
UPLAND LANDFILL
N
0
0.5 MI
eBIRD SIGHTINGS
SNOWY PLOVER
LEAST TERN
RIDGSWAY'S RAIL
1-10 10-100 100+
ENDANGERED SPECIES
SNOWY PLOVER
LEAST TERN
RIDGSWAY'S RAIL
SALT MARSH HARVEST MOUSE
ANCHORAGE DRIVE
GRANT AVENUE
SAN LORENZO CREEK
BOCKMAN CHANNEL
GOLF COURSE
PACIFIC FLY WAY
ORO LOMA MARSH
SULPHUR CREEK
ALAMEDA COUNTY LANDFILL
WEST WINTON AVENUE
CABOT BOULEVARD
CITY OF HAYWARD
HAYWARD LANDING CANAL
WEST WINTON LANDFILL
DEPOT ROAD
eBird hotspot
Uplands provide refuge for shorebirds and mice during high tides
Eelgrass beds (Zostera marina)
HAYWARD MARSH
Islands managed for snowy plover and least tern nesting
HARD MARSH
OLIVER SALT PONDS
eBird hotspot
STATE ROUTE 92
MT. EDEN CREEK
SAN FRANCISCO BAY TRAIL
ORO LOMA MARSH
364-acre fully tidal marsh, seasonal wetland and transitional upland managed for endangered species and the removal of non-native Spartina alterniflora
TRIANGLE MARSH
8-acre muted tidal marsh targeted for enhancing shorebird habitat
COGSWELL MARSH
250-acre fully tidal marsh with islands for nesting wildlife, managed to control invasive Spartina alterniflora
HAYWARD MARSH
Diked Bayland that hosts the federally endangered California Least Tern and the Western Snowy Plover
SALT MARSH HARVEST MOUSE PRESERVE
Muted tidal marsh with seasonal wetlands and transitional uplands. Uplands provide refuge for mice during high tides
HARD MARSH
Fully tidal marsh with comprised of mudflats and low marsh habitats.

ECOLOGICAL RESOURCES

A MOSAIC OF ECOLOGY AND INFRASTRUCTURE

The Hayward Regional Shoreline is a mosaic of Bayland environments that support diverse wildlife habitats. Formerly a zone of natural tidal marshes and salinas, this stretch of shoreline has undergone sequential transformations, resulting in the current mix of restored tidal marshes, inactive industrial salt ponds, filtration marshes, storage ponds, diked wetlands, landfills, solar fields, and biosolids drying beds. Restored tidal marsh is a dominant condition within the Hayward Regional Shoreline Adaptation Master Plan Project Area. The marshes in the Hayward Regional Shoreline serve as valuable stepping stones between the large, expansive blocks of marsh in the lower South Bay and North Bay.

Landfills are concentrated in the center of the project area where tidal Baylands were filled with unknown debris and waste. They are the two major topographic features of the shoreline and offer upland grassland habitat.

Inactive salt ponds and freshwater wetlands are also distributed throughout the site and contribute to habitat diversity. Some areas, such as the Oliver Salt Ponds, are historical resources that also support federally endangered bird species.

Below are descriptions of various endangered species habitat requirements and supporting habitats along the Hayward Regional Shoreline. Diverse habitats support wildlife.

Ridgsway's Rail, *Rallus obsoletus*: These birds nest and feed in tidal salt marshes, they rarely fly, instead they build nests adjacent to small tidal sloughs for foraging and quick escapes from predators. Ridgsway's Rails also prefer to construct "brood nests" on higher ground to protect their young, so it is essential that marshes contain features with higher elevations. Cogswell Marsh, Oro Loma Marsh, and Triangle Marsh all provide the habitats required by Ridgsway's Rail populations.

California Least Tern, *Sternula anrilarus brownie:* Sandy beaches, berms, and mudflats are typical habitats needed for nesting Least Terns. Vegetative growth is cleared by the tides, and this allows bird colonies to establish themselves. Elevated mounds have been established within Hayward Marsh to support the only Least Tern Colony in the South Bay.

Western Snowy Plover, *Charadrius alexandrinus nivosus:* Snowy Plovers forage in both wet or dry beach conditions, and nest above the high tide line on coastal beaches, dunes, and salt pans; less common habitats are dry salt ponds. Along the Hayward Regional Shoreline, Snowy Plover nests have been observed at the Oliver Salt Ponds as well elevated mounds within Hayward Marsh.

Black Skimmer, *Rynchops niger:* The Black Skimmer is a tern-like seabird that lives primarily in coastal waters and nests primarily near coasts on sandy beaches, shell banks, coastal islands, and salt pond levees. Nests are usually in association with or near terns. The Black Skimmer is a species of special concern.

Salt Marsh Harvest Mouse, *Reithrodontomys raviventris:* The Salt Marsh Harvest Mouse lives within dense stands of pickleweed, where it can swim and climb to forage and nest. During high tides, the Salt Marsh Harvest Mouse must retreat to high ground or to mature marsh plant communities with high vegetative structure. Oro Loma Marsh, Cogswell Marsh, Triangle Marsh, and the Salt Marsh Harvest Mouse Preserve are habitats along the Hayward Regional Shoreline that provide the range of marsh elevations needed for these small rodents.

Eelgrass, *Zostera marina:* Intertidal and shallow subtidal areas support the growth of eelgrass at the breach of Cogswell Marsh. Eelgrass populations have been identified at that location, and the Hayward Regional Shoreline presents additional opportunities for future eelgrass restoration.

Sources:

1. Adapting to Rising Tides, Hayward Resilience Study. January 2015.

2. Phillip Williams and Associates, LTD., Preliminary Study of the Effects of Sea Level Rise on the Resources of the Hayward Shoreline. March 2010.

Sources:
1. City of Hayward. *Power Transmission Lines*. (April 1, 2019)
2. Alameda County Flood Control & Water Conservation District. *Pump Stations*. (April 1, 2019)
3. Alameda County Flood Control & Water Conservation District. *Gate*. (April 1, 2019)
4. Alameda County Flood Control & Water Conservation District. *Culverts*. (April 1, 2019)

CRITICAL INFRASTRUCTURE

URBAN ASSETS IN THE BAYLANDS

The City of Hayward depends on infrastructural assets that treat sewage, provide clean water, produce energy, store waste, and support transportation. In the adjacent map, facilities that perform these functions are located within or directly next to the Baylands, putting the City's most critical infrastructure at risk as sea levels rise.

Transmission Lines and Utility Corridors: PG&E overhead transmission lines cross the Hayward Regional Shoreline project area. Although the towers are set on concrete bases, sea level rise can potentially pose issues of access for maintaining and repairing the infrastructure. Saltwater corrosion can specifically pose significant risks to infrastructure, resulting in increased operation costs and decreased asset lifetimes. Underground utilities, including the East Bay Dischargers Authority (EBDA) Pipeline and an abandoned Shell Oil jet fuel pipeline, also run through the project area. Sea level rise poses a risk to access roads that maintain these utilities as well.

Landfills: In the center of the Hayward Regional Shoreline, the City owned landfill and the Alameda County owned landfill are located at the edge of the bay. The landfills have been closed and capped, but this waste infrastructure is not built to withstand flooding or wave action. Sea level rise and storm events can pose a potential risk of erosion, creating public health and environmental health hazards for the City of Hayward.

Wastewater Treatment Plants and Pump Stations: The Oro Loma Wastewater Treatment Plant and the Hayward Water Pollution Control Facility (WPCF) process sewage from the City of Hayward. Both facilities discharge into the EBDA pipeline, but during storm events WPCF relies on the Wastewater Wet Weather Storage ponds for water storage. Both facilities also use selected baylands as drying beds for biosolids. These assets need proper protection to prevent health and environmental hazards.

EBDA (East Bay Dischargers Authority) Pipeline: Along the East Bay shoreline, EBDA connects various wastewater treatment facilities, allowing treated effluent to enter a single pipeline that discharges into the center of the bay. This infrastructure runs through the Hayward Regional Shoreline project area, crossing tidal marshes, diked baylands, and industrial lands. Current vulnerabilities include ageing infrastructure, insufficient capacity during wet weather events, potential damages from rising groundwater, reduced infrastructure access due to rising sea levels, and public health hazards as a result of infrastructure failure.

Solar Fields: Two solar fields have been built within the project area, one in the north adjacent to Oro Loma Wastewater Treatment Plant and one adjacent to the Hayward Treatment Facility. The solar fields are within the extent of the baylands and are currently surrounded by levees. However, many of these levees are in poor condition and could potentially fail with future climate change impacts.

Calpine Russel City Energy Center: This gas-fueled energy facility was built in 2013 and has a life expectancy of 40 years. While this infrastructure is an economic asset to the City of Hayward, many access roads and utilities that support the plant are vulnerable to sea level rise and storm surge conditions.

State Route 92 Bridge Approach: State Route 92 is a regionally significant transportation corridor that connects the East Bay and the Peninsula. The bridge approach to this corridor is surrounded by low lying baylands and currently has stormwater drainage issues. With additional sea level rise, this critical commuter route is at risk of flooding, potentially rendering it impassible if climate change issues are not addressed.

Sources:

1. Adapting to Rising Tides, Hayward Shoreline Asset Vulnerability and Risk Profile Sheets. March 2015.

Sources:
1. Metropolitan Transportation Commission. *Regional Bike Facilities*. (April 18, 2019)
2. Metropolitan Transportation Commission. *San Francisco Bay Trail*. (April 18, 2019)
3. AC Transit. *Bus Route GIS shapefiles*. (April 18, 2019)
4. City of Hayward. *Hayward Bicycle Network*. (April 18, 2019)

RECREATIONAL ASSETS

The Hayward Regional shoreline is an important recreational and educational asset for adjacent communities. Expansive trail networks traverse a diversity of Bayland environments and built infrastructure. These trails connect people to the Bay and its ecosystems while providing crucial recreational space that connects people to their environment. A popular bird watching spot, the shoreline offers opportunities to view wildlife and learn about the habitats they depend on.

Within the project area, public transportation has the potential to facilitate connections between urban developments and the Baylands. Bus routes and bus stops provide linkages throughout the City of Hayward, but only one route serves the project area along Cabot Boulevard, limiting direct connections with the Hayward Regional shoreline.

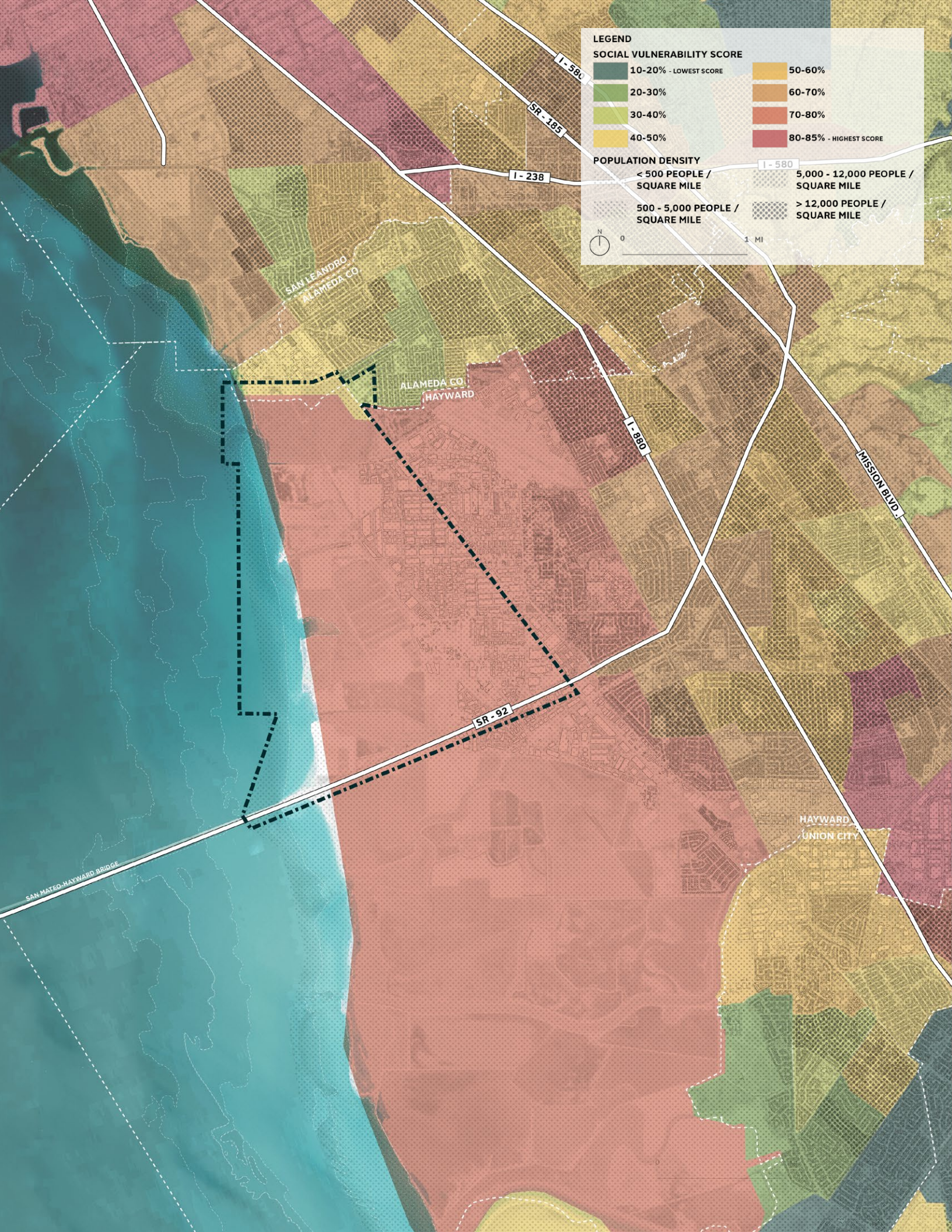
The Bay Trail, a critical piece of transportation infrastructure, offers walking, hiking, and cycling opportunities throughout the Baylands. Numerous regional cycling routes branch off from the Bay Trail and provide additional public access opportunities for adjacent communities.

Winton Road, the Hayward Shoreline Interpretive Center, and a staging area near San Lorenzo Creek serve as vehicular access points to the shoreline. While signage demarcates these access opportunities, they tend to be obscured by larger industrial developments that surround the baylands.

Major highways and roads such as State Route 92 serve as critical transportation corridors that link the City of Hayward to other regions of the Bay. These vital connections broaden opportunities to bring people to the shoreline and greatly expand upon existing site access.

Hiking along the Bay Trail.
(Ronald Horii, 2014)

State Route 92 bridge approach heading toward San Mateo
(CA COT, 2019)


LEGEND
SOCIAL VULNERABILITY SCORE
10-20% - LOWEST SCORE
20-30%
30-40%
40-50%
50-60%
60-70%
70-80%
80-85% - HIGHEST SCORE
POPULATION DENSITY
< 500 PEOPLE / SQUARE MILE
500 - 5,000 PEOPLE / SQUARE MILE
5,000 - 12,000 PEOPLE / SQUARE MILE
> 12,000 PEOPLE / SQUARE MILE
N
0
1 MI
I - 580
SR - 185
I - 238
I - 580
SAN LEANDRO
ALAMEDA CO
ALAMEDA CO
HAYWARD
I - 880
MISSION BLVD
SR - 92
HAYWARD
UNION CITY
SAN MATEO-HAYWARD BRIDGE

DEMOGRAPHICS

A DIVERSE CITY

The 2013-2017 American Community Survey ranks Hayward as one of the most diverse cities within the State of California.

Analysis of the census data shows the ethnic composition of Hayward is 62,287 Hispanic residents (40.3%), 39,187 Asian residents (25.4%), 26,470 White residents (17.1%), 16,705 Black residents (10.8%). The most common languages in addition to English in Hayward are Spanish (45,680 speakers), Tagalog (11,288 speakers), and Chinese (6,033 speakers). Compared to other American cities, Hayward has a relative high number of Tagalog, Hindi, and Other Pacific Islander language speakers.

Social Vulnerabilities: The Project Team used the CalEnviroScreen index to evaluate social vulnerabilities in the Hayward area. The CalEnviroScreen is a science-based index that helps identify California communities that are most affected by various sources of pollution and are especially vulnerable to pollution's effects. CalEnviroScreen uses environmental, health, and socioeconomic information to produce a numerical score for each census tract in the state.

A census tract with a high score experiences higher pollution burden and greater vulnerability than census tracts with low scores. CalEnviroScreen ranks census tracts based on data available from state and federal government sources. The numerical model is made up of a suite of 20 statewide indicators of pollution burden and population characteristics associated with increased vulnerability to pollution's health effects. The index uses a weighted scoring system to derive average pollution burden and population characteristics scores for each census tract. The score measures the relative pollution burdens and vulnerabilities in one census tract compared to others and is not a measure of health risk.

Population Density: Hayward ranks as the sixth largest city in the Bay Area and is home to a population of 154,507 people. The City spreads over approximately 64 square miles, 30% of which is water. The average population density in Hayward is 2,420 people per square mile, which is slightly higher than Alameda County's density, and higher than the density of the Metro Area as a whole (1,911 per sq. mi).

The median property value in Hayward is $404,500, which is lower than the median property value of Alameda County ($842,000), and from 2015 to 2016 the median property value in Hayward went from $364,600 to $404,500, a 10.9% increase. The homeownership rate of Hayward is 51%, which is lower than the national average of 63.6%. Hayward residents have an average commute time of 30.8 minutes, and most commuters in the area drive alone. Car ownership in Hayward is approximately the same as the national average, with a mean of 2 cars per household.

The economy of Hayward is specialized in transportation and warehousing, wholesale trade, administration, and waste management services, which employ respectively 1.74, 1.39, and 1.21 times more people than what would be expected in a location of this size. The largest industries in Hayward are healthcare and social assistance, manufacturing, and retail trade. The highest paying industries are utilities ($65,385), professional, scientific, tech services ($61,971), and finance ($51,291).

The median household income in Hayward is $68,138, which is lower than both Alameda County median ($79,831) and the Metro Area median ($85,947).

Poverty status has been determined for 12.5% of the population, a number that is lower than the national average of 14%.

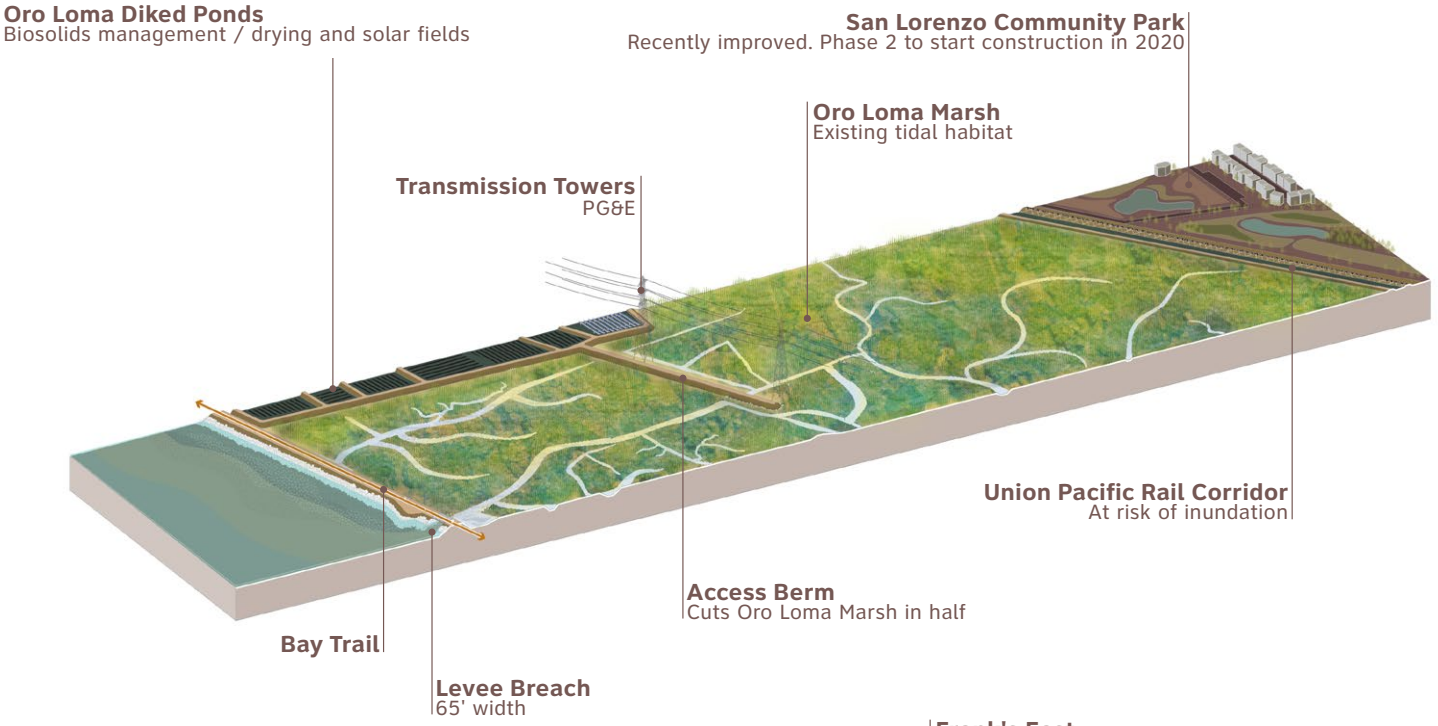
Sources:

1. Datausa.io

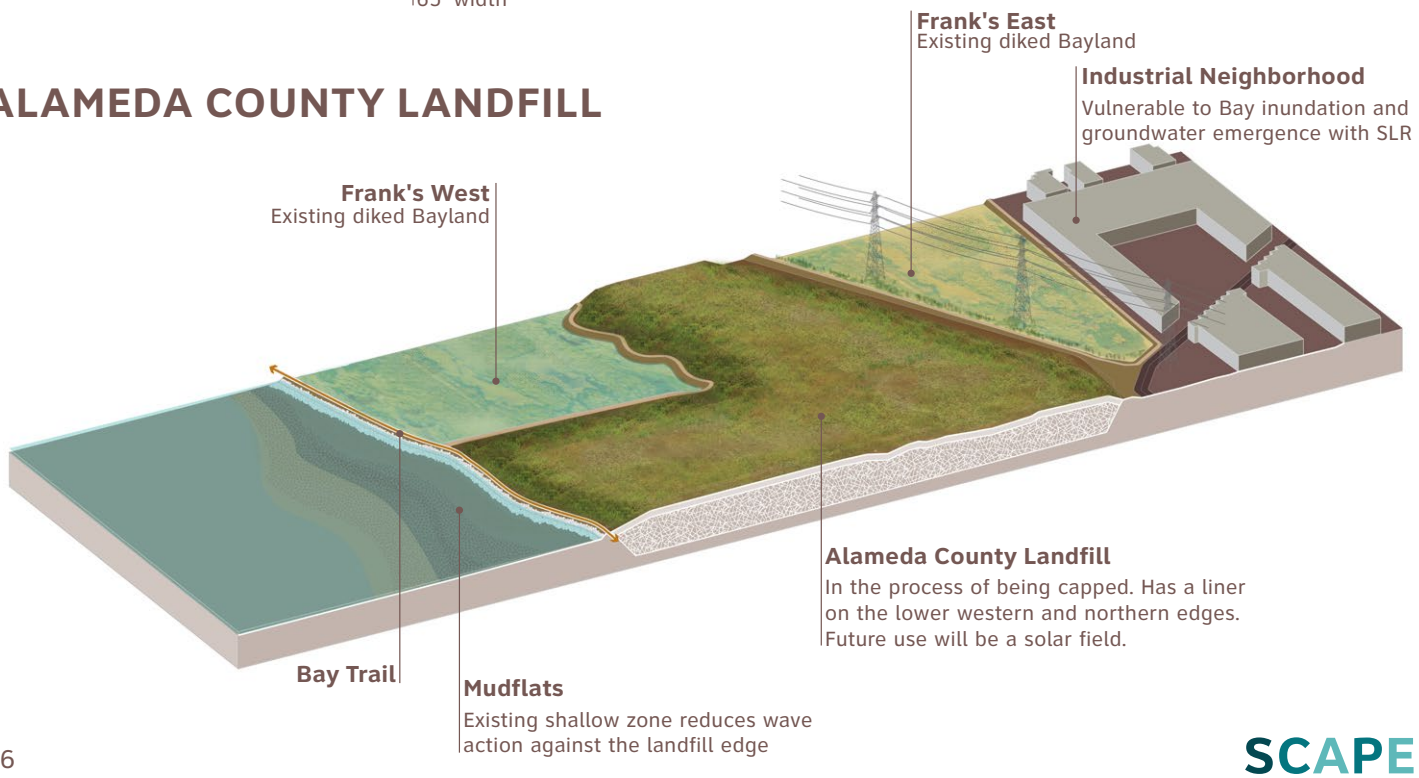
2. East Bay tops among California's most diverse places

EXISTING CONDITIONS VISUALIZATIONS

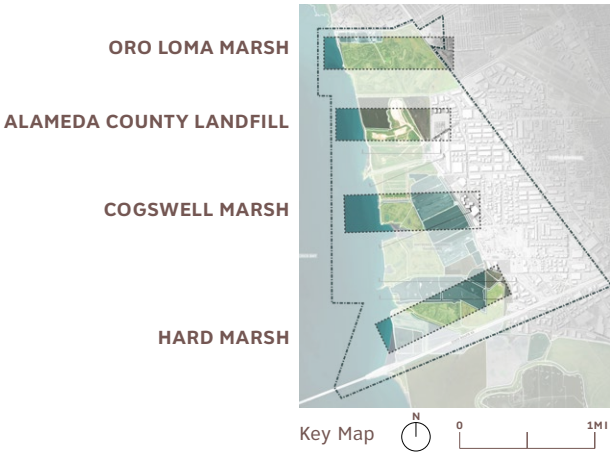
ORO LOMA MARSH



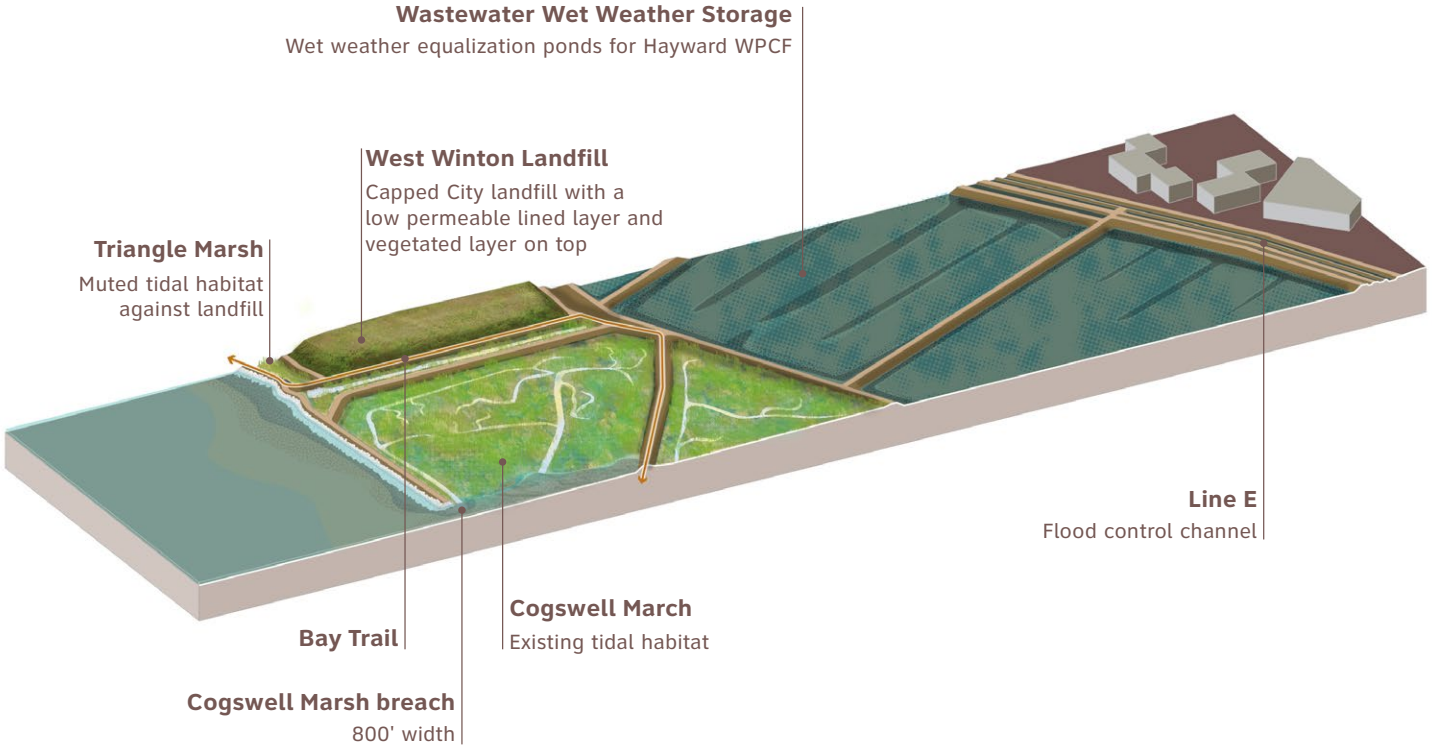
ALAMEDA COUNTY LANDFILL



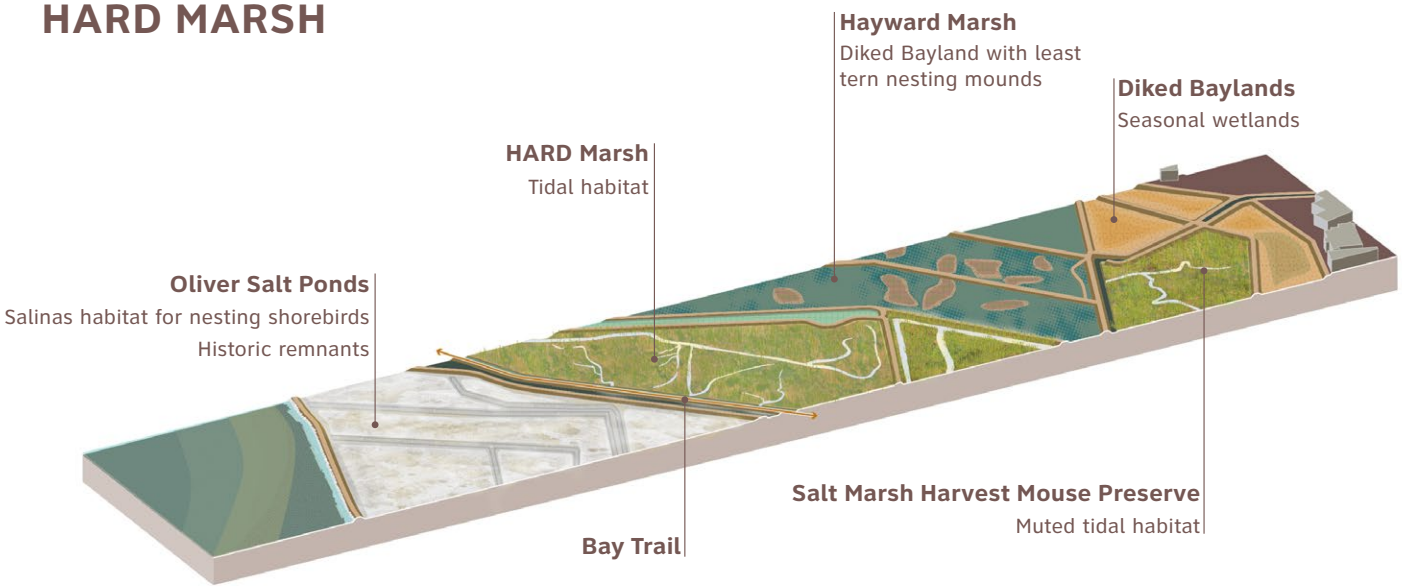
SCAPE



COGSWELL MARSH



HARD MARSH



STAKEHOLDER ENGAGEMENT

This chapter provides a summary of the stakeholder engagement and feedback received during the development of the Adaptation Master Plan.

STAKEHOLDER ENGAGEMENT

AN ONGOING PROCESS

The Hayward Regional Shoreline Adaptation Master Plan process has engaged stakeholders and the public throughout every phase of the project. Consistent meetings, events, and workshops have brought people together to discuss a cohesive vision for the Hayward Regional Shoreline that balances competing needs and constraints. Coordination across agencies, organizations, regulators, landowners, and the public has been a key part of the planning process and project deliverables have been continually reviewed and refined based upon this feedback.

2019

FEBRUARY | MAY | AUGUST | NOVEMBER | DECEMBER

TASK 1: PROJECT INITIATION

TASK 2: SEA LEVEL RISE MODELING + MAPPING

TASK 4: ADAPTATION STRATEGIES

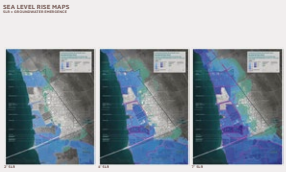
ONLINE ENGAGEMENT

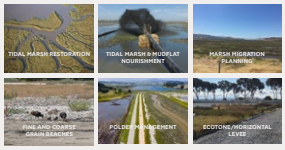
PUBLIC ONLINE SURVEY

02/27/19 - 03/15/19

- How people interact with the Shoreline and what people value about the area

STAKEHOLDER ENGAGEMENT





STAKEHOLDER INTERVIEWS

09/17/19 - 09/18/19: **7 total meetings**

- Review of SLR Maps

PUBLIC EVENTS

PUBLIC SHORE TOUR

10/27/19

- Interactive public event about the Shoreline, SLR impacts, and future plans

STAKEHOLDEVR WORKSHOPS

STAKEHOLDER WORKSHOP #1

05/16/19

- Review existing conditions research and discuss goals, opportunities, and challenges

STAKEHOLDER WORKSHOP #2

10/28/19

- Solicit feedback on the Adaptation Strategies

✱ Adaptation to virtual engagement due to COVID-19 pandemic (March 2020)

2020 JANUARY · FEBRUARY · MARCH · APRIL · MAY · JUNE · SEPTEMBER · 2021 FEBRUARY

TASK 5: MASTER PLAN DEVELOPMENT

DESIGN ALTERNATIVES — PREFERRED ALTERNATIVE

ONLINE PUBLIC FORUM

05/18/20 - 06/26/20

- Solicit feedback on the Design Alternatives

STAKEHOLDER MEETINGS

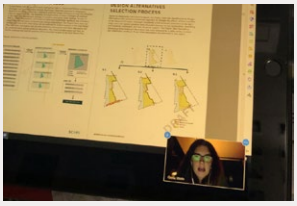
01/08/20 - 01/10/20: **6 total meetings**

- Solicit feedback on the Adaptation Strategies

PUBLIC MEETING

TBD

- Solicit feedback on the Preferred Alternative



✱ **STAKEHOLDER WORKSHOP #3**

04/08/20 - 04/13/20: **10 total meetings**

- Solicit feedback on the Design Alternatives

STAKEHOLDER WORKSHOPS

A series of three stakeholder workshops were scheduled to solicit feedback during key phases of the Master Plan.

Stakeholder Workshop #1 consisted of an overview of the existing conditions of the project area and discussion of goals, opportunities, and potential challenges. This event was used to communicate to the public and stakeholders about the project, and to initiate the process of engagement.

Stakeholder Workshop #2 was used to solicit feedback on a broad range of adaptation strategies. Discussion across agencies and organizations led to a thorough understanding of potential strategies that would best fit the site conditions, opportunities, and constraints of the Hayward Regional Shoreline.

Stakeholder Workshop #3 was held virtually due to the COVID-19 pandemic. This series of virtual zoom calls engaged stakeholders on the Draft Design Alternatives. Feedback from this multi-day event was used to inform the selection of the hybrid Preferred Alternative.

Online Public Forum #1 occurred on the project website, **www.haywardshorelinemasterplan.com**. The comment form was used to collect public feedback on the Design Alternatives.

Online Public Forum #2 used the project website to collect public feedback on the Preferred Alternative.

Additional stakeholder interviews and meetings were conducted throughout the project to solicit additional feedback on the study area to acquire a detailed understanding of the site conditions, constraints, and opportunities from relevant agencies and organizations.

Project Communication and Feedback: A key part of all stakeholder and community workshops was for the Project Team to communicate the project development to stakeholders and the public. Frequent project updates provided a platform for engagement that was used to solicit feedback that was then incorporated into the next phase of the project.

Often, the community and stakeholder workshops consisted of a presentation (project update), small group discussions, and roundtable discussions. Progress materials were printed for workshop members to mark up or add comments. These activities fostered discussions across multiple stakeholder groups and created a discourse that led to the development of the project while a coordinated vision and set of goals were established.

Conference calls with stakeholders, agencies, and organizations were held throughout the Master Plan project to share project updates and ensure coordination as the design progressed. These calls utilized screen sharing to present slides that were used as part of the discussion.

05/16/19 Public Meeting - Project Update Presentation
(SCAPE Site Photos, 2019)

05/16/19 Public Meeting - Informational Project Boards
(SCAPE Site Photos, 2019)

10/28/19 Stakeholder Workshop #2- Group Discussions
(SCAPE Site Photos, 2020)

SHORE TOUR

INTERACTIVE PUBLIC EVENT

The Shore Tour was an interactive public event to engage members of the public in the Master Plan process, educate about the Hayward Regional Shoreline, and demonstrate how sea level rise may impact the project area. Three stations centered around ecology, infrastructure, and recreation. Experts from these three fields spoke about their respective topics and engaged participants in a Q&A session to share more information.

Despite unfavorable weather conditions, the event was still successful and transitioned to be held indoors at the Hayward Shoreline Interpretive Center. Over thirty people attended and comment cards were utilized to solicit written feedback on the Master Plan project.

Species cutout cards were created as a fun activity for all ages to use for pictures and education about the shoreline's flora and fauna. These cutout cards included easily identifiable species, such as the Salt Marsh Harvest Mouse, California Least Tern, Ridgway's Rail, Bat Ray, and Lined Shore Crab, among others. The hashtag #HAYWARDSHORELINE was used to tag photos on social media.

10/27/19 Shore Tour - Shoreline Education
(SCAPE Site Photos, 2019)

10/27/19 Shore Tour - Mapping Exercise
(SCAPE Site Photos, 2019)

10/27/19 Shore Tour - Ecology Breakout Session
(SCAPE Site Photos, 2019)

ONLINE ENGAGEMENT

ONLINE SURVEY

A 23-question survey was conducted on behalf of the Hayward Area Shoreline Planning Agency (HASPA) to assess the public's general understanding of Hayward Regional Shoreline, mainly in regard to sea level rise, potential flooding, participants' feelings, concerns, and predictions regarding these issues.

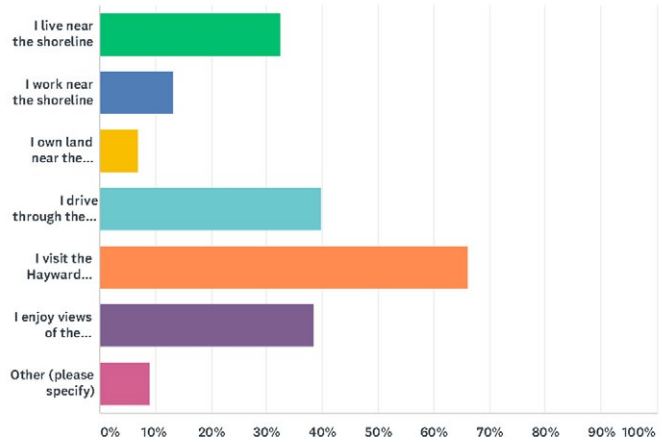
In the spring of 2019, this survey was completed by approximately 900 people throughout the Bay Area, primarily those who live, work, commute through, or recreate at or near the shoreline.

ONLINE PUBLIC FORUM

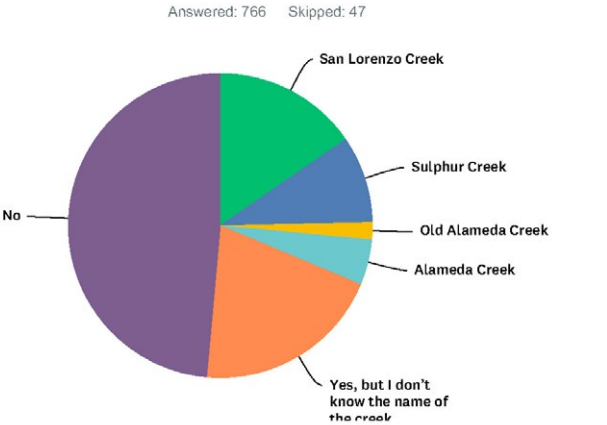
In light of the COVID-19 pandemic, the Project Team created a project website to virtually solicit feedback on the project. The website included a comment form with questions for community members to leave feedback on the Design Alternatives. In addition, the web page provided thorough descriptions of the project, Master Plan process, and work completed throughout the project. Two videos offered easily digestible narrative presentations that explained the Master Plan project and Design Alternatives in greater detail.

During the months of June and July 2020, more than 900 unique users visited the website and more than 55 community members or stakeholders submitted comments on the Design Alternatives.

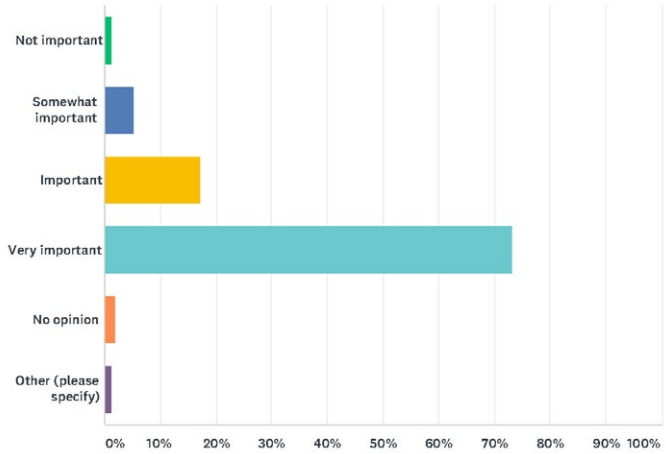
After it was utilized for feedback on the Design Alternatives, the project website transitioned to be used as a tool to share additional project updates. The comment form persisted for the public to leave additional feedback on the project.



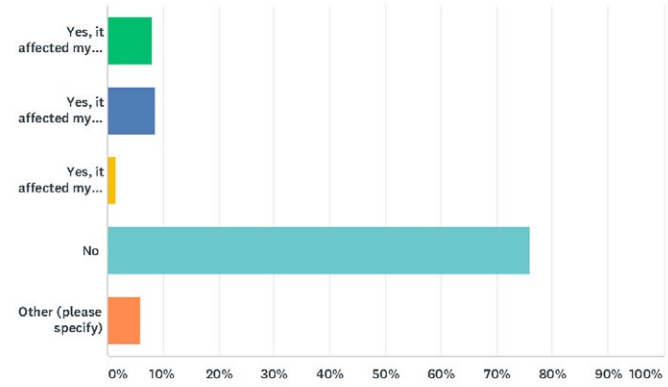
Online Survey Result
Question 2- What's your association with the project area?



Online Survey Result
Do you live or work near any of the major creeks or channels in the area?



Online Survey Result
Question 6- How important are wetlands and habitats for the health of the San Francisco Bay?



Online Survey Result
Have you or anyone close to you ever been personally affected by a flood, either here or elsewhere?

PROVIDE FEEDBACK ON THE MASTER PLAN HERE

PURPOSE OF MASTER PLAN

The **Hayward Regional Shoreline Adaptation Master Plan** was commissioned in 2019 by the **Hayward Area Shoreline Planning Agency (HASPA)** a joint powers agency consisting of representatives from the City of Hayward, East Bay Regional Park District (EBRPD), and Hayward Area Recreation and Park District (HARD).

The Master Plan will develop various multi-benefit strategies for the shoreline, its existing infrastructure, and the surrounding natural habitat in order to adapt to Sea Level Rise. Ultimately, it will act as a road map and help guide the development of future projects in a coordinated effort between state and local agencies, landowners, and the public. The Plan will be a forward looking tool for preparation, mitigation, and adaptation to climate change.

Online Public Forum- Project website with comment form
www.haywardshorelinemasterplan.com

SEA LEVEL RISE & FLOOD RISK IMPACTS

This chapter outlines the potential impacts of coastal flooding, future trends, and provides a catalog of the sea level rise maps and associated risk analyses for the project area.

UNDERSTANDING COASTAL FLOOD RISK

SEA LEVEL RISE

The California Coastal Commission Sea Level Rise Policy Guidance provides a summary of the best available science on sea level rise for California. It indicates that in the past century, global mean sea level (MSL) has increased by seven to eight inches, and that, with greater than a 95% probability, human influence has been the primary cause of the observed warming of the atmosphere and the ocean since the mid-20th century.

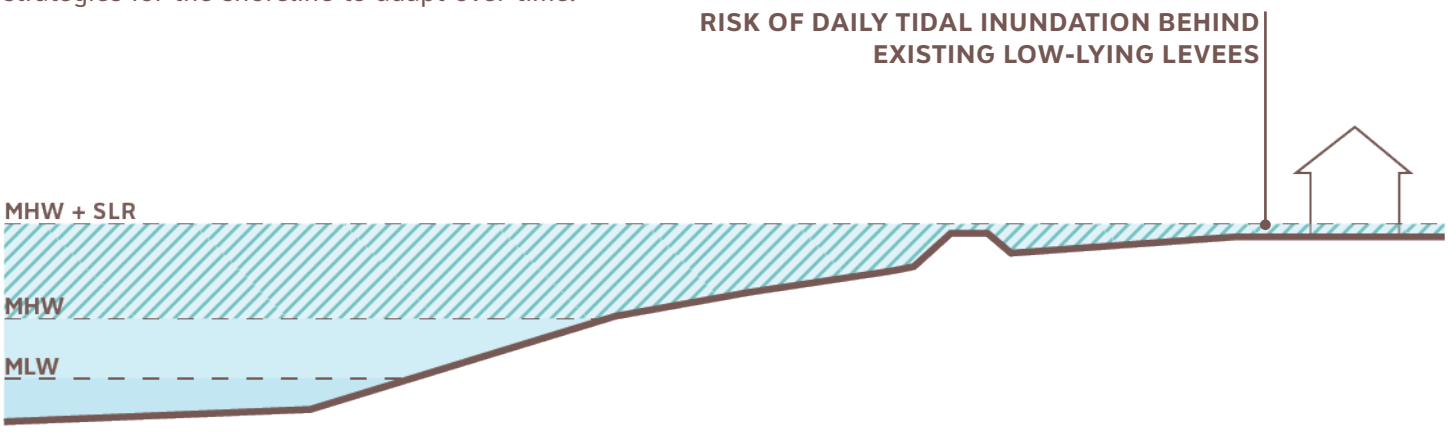
Relative average sea level rise is driven by:

- The expansion of ocean waters as they warm;
- The addition of freshwater to the ocean from melting land-based ice sheets and glaciers;
- Groundwater extraction contributing to land subsidence.

To capture regional and local factors (and thus to provide locally relevant data) that affect SLR variations, global-scale models are downscaled. *The State of California Sea Level Rise Guidance: 2018 Update* provides SLR projections that have been refined for 12 tide gauges, including the San Francisco tide gauge. These projections are given for each decade from 2030 to 2150.

Sea level rise also has the potential to increase erosion risk. As sea levels rise, shoreline levees, embankments, built infrastructure, and marsh edges will experience further wave and wind action, resulting in accelerated erosion.

For the purposes of the Adaptation Master Plan, a thorough analysis of three future sea level rise (SLR) scenarios was conducted. Sea level rise increments of 2', 4', and 7' were used to prepare inundation maps, evaluate climate change related risk and propose strategies for the shoreline to adapt over time.

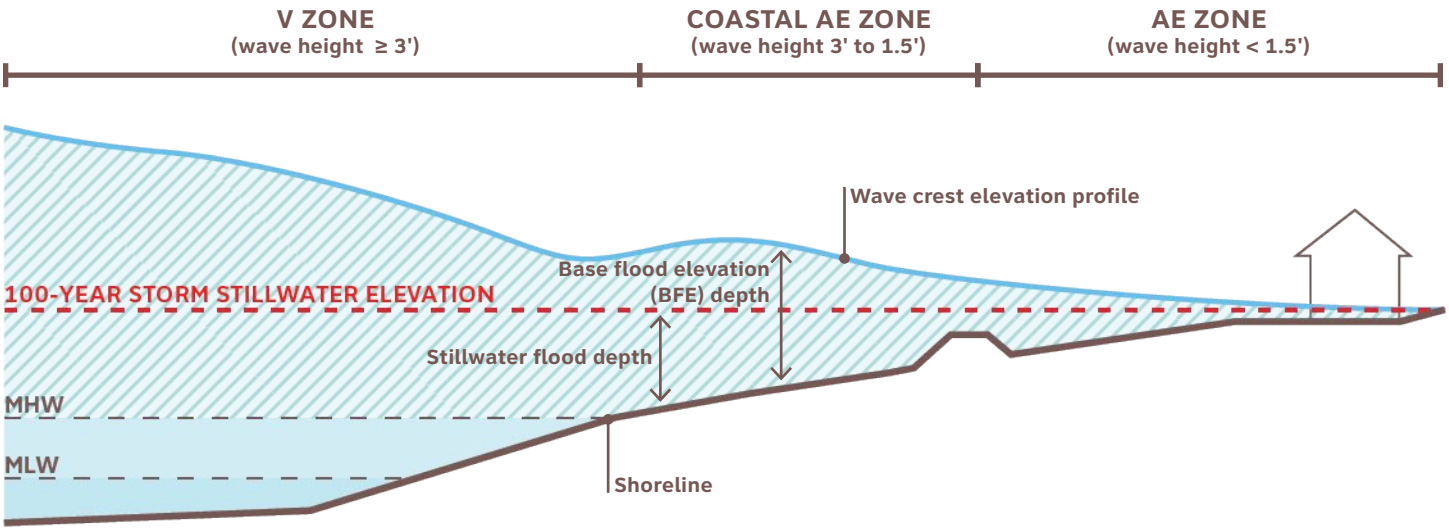


COASTAL STORM SURGE

Storm surge is a temporary increase in ocean water elevation due to low atmospheric pressure and wind effects that typically occurs during storm events. The surge is caused primarily by a storm's winds pushing water onshore. The amplitude of the storm surge at any given location depends on the orientation of the coast line with the storm track; the intensity, size, and speed of the storm; and the local bathymetry.

The maximum water level reached during a storm event, which is the combination of the surge and tide, is called a storm tide. Coupled with sea level rise, this risk and the resulting damage increase. A less powerful storm in the future will produce the same amount of flooding as a more powerful storm of today, and a future powerful storm will produce higher surge and a larger flood extent than it would today.

In the context of the Adaptation Master Plan, the Project Team has been considering the combined surge impacts of a 100-year storm with the different sea level rise increments previously defined. A 100-year flood is a flood event that has a 1 in 100 chance (1% probability) of being equaled or exceeded in any given year.

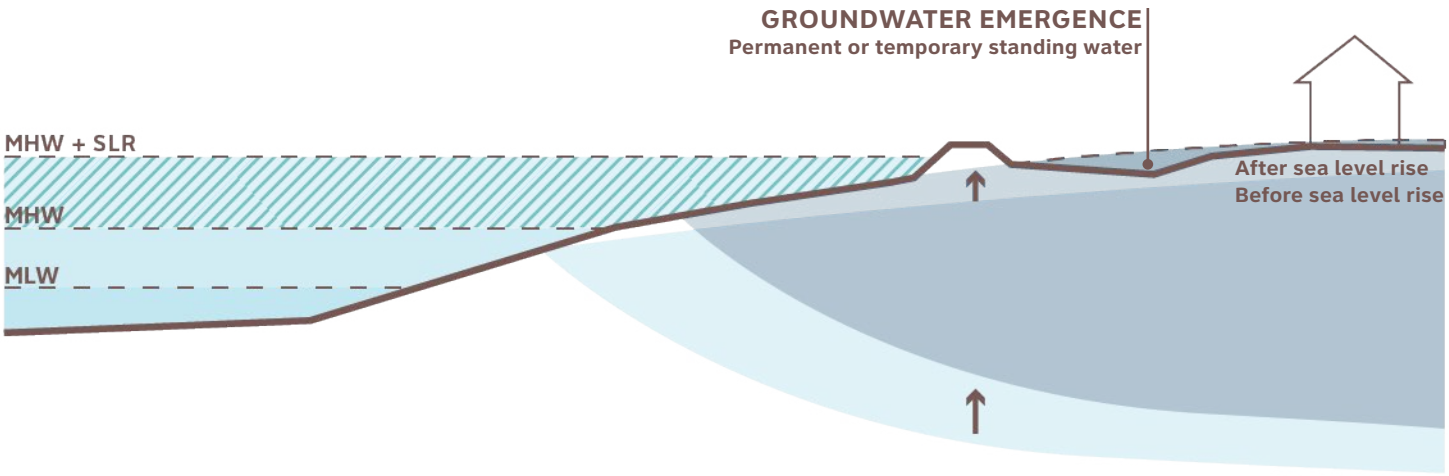


GROUNDWATER

While the potential for coastal tidal inundation due to sea level rise is well documented, it is often overlooked that low-lying coastal areas may also be vulnerable to groundwater inundation, which is localized coastal-plain flooding due to a rise of the groundwater table with sea level. Understanding the extent and response of the coastal aquifers to sea level rise is key in preparing for mitigation and adaptation measures. The main factors that may determine the degree of sea-level-rise-driven groundwater inundation and shoaling in one specific location include:

- The proximity of the water table to the ground surface;
- The local geology (including distance to the shoreline);
- The local hydrology;
- Anthropogenic factors such as of groundwater extraction or addition.

Near the shoreline, the groundwater table in unconfined aquifers typically lies above mean sea level, fluctuating with daily tides and other low-frequency sources of ocean energy. Tidal influence decreases with distance from the shoreline. As sea level rises, the water table will likely rise simultaneously. For lower-lying interior areas this could mean that the groundwater may eventually break out above the land surface, causing inundation even though the area is not at, or directly connected to, the shoreline. The increased groundwater table could create new wetlands and expand others, change surface drainage, expand saturated soil conditions, and/or inundate the land, depending on local topography. This effect is expected to be more pronounced at the coastline than further inland. Flooding may be especially intense seasonally when high tide coincides with large rainfall events.

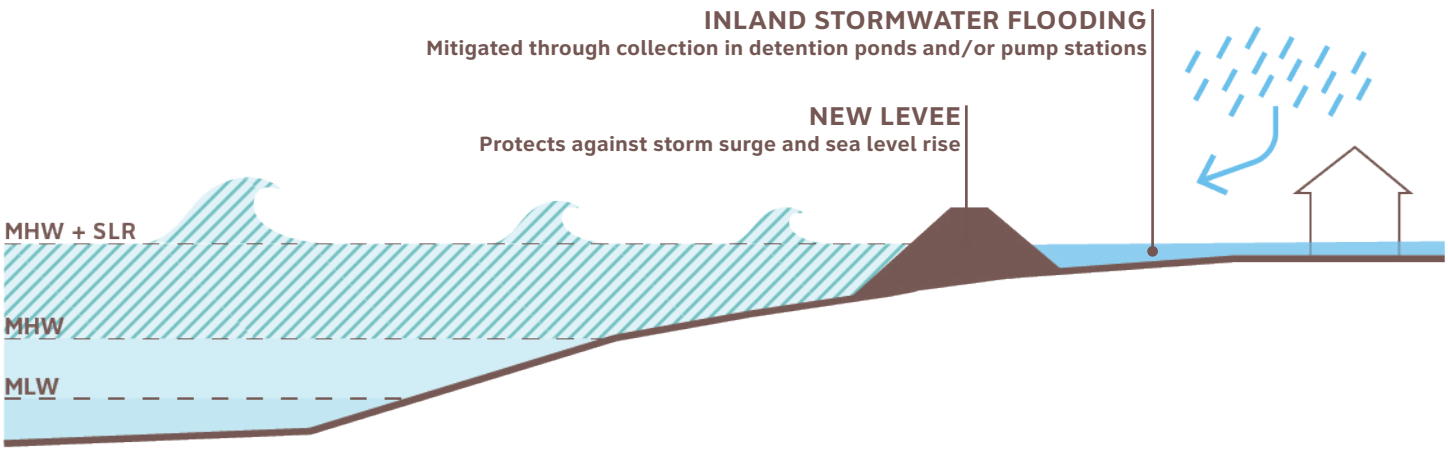


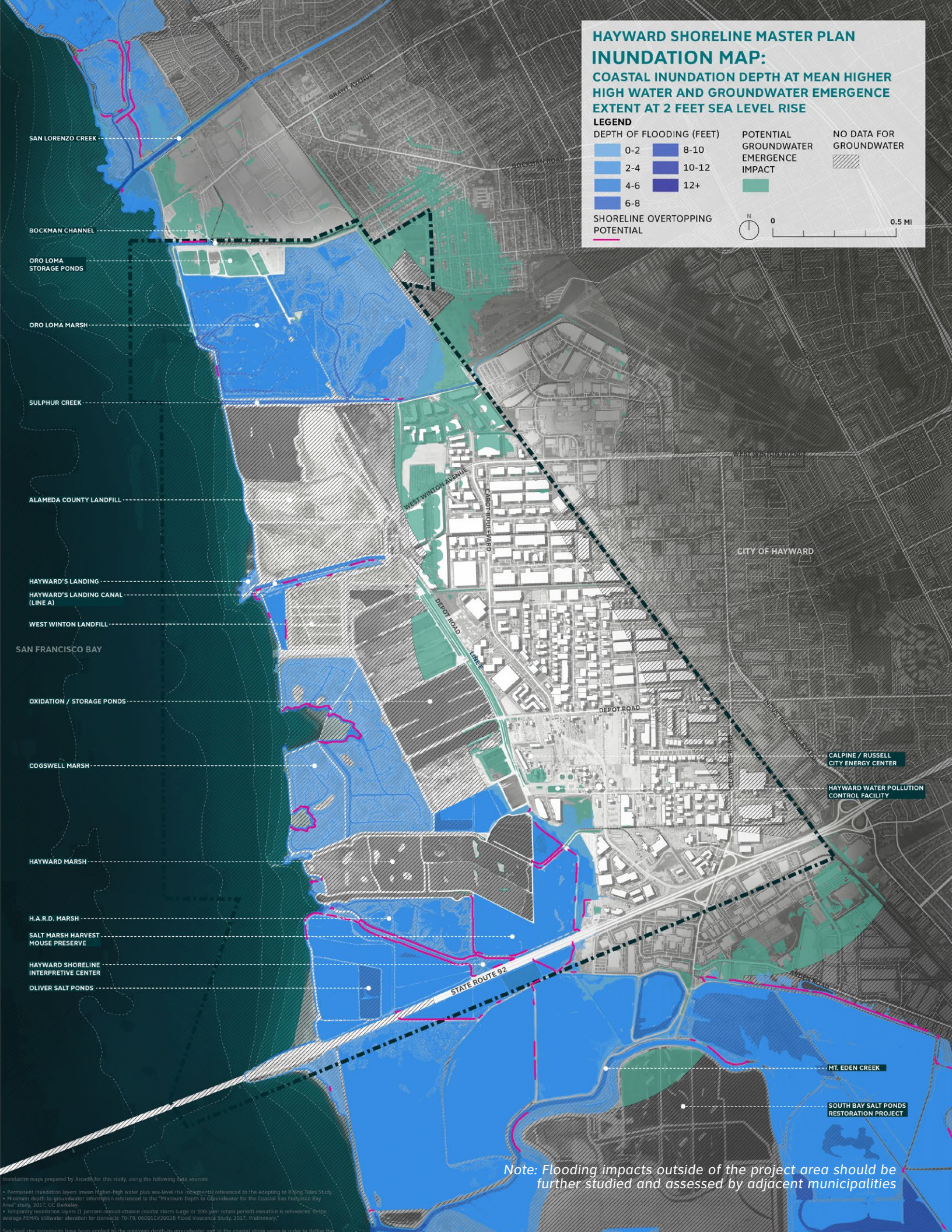
PRECIPITATION

The largest storms in the Bay Area are called "atmospheric rivers" (ARs). These storms contribute to, on average, 40% of the Sierra snowpack and can also produce heavy rainfall and consequently substantial flood risk. Atmospheric theory and climate models both indicate that in California, the largest individual storms are becoming more intense with climate change, and there is some evidence that this might be also accompanied by more frequent extremely dry precipitation periods, as well as more frequent "whiplash" events that swing from extremely dry to extremely wet conditions.

In the study area, the flooding extent shown is primarily due to coastal storm surge and sea level rise rather than rainfall-runoff flooding, as this happens in a very limited area along Line A.

Although rainfall analysis and modeling was not part of the Adaptation Master Plan study, the Project Team is aware that detailed hydraulic and hydrologic analyses are underway by the Alameda County Flood Control and Water Conservation District (ACFCWCD), and results will likely be made available by the end of year 2020. Therefore, there is the opportunity to update the maps generated as part of this project once the above-mentioned maps are made available.



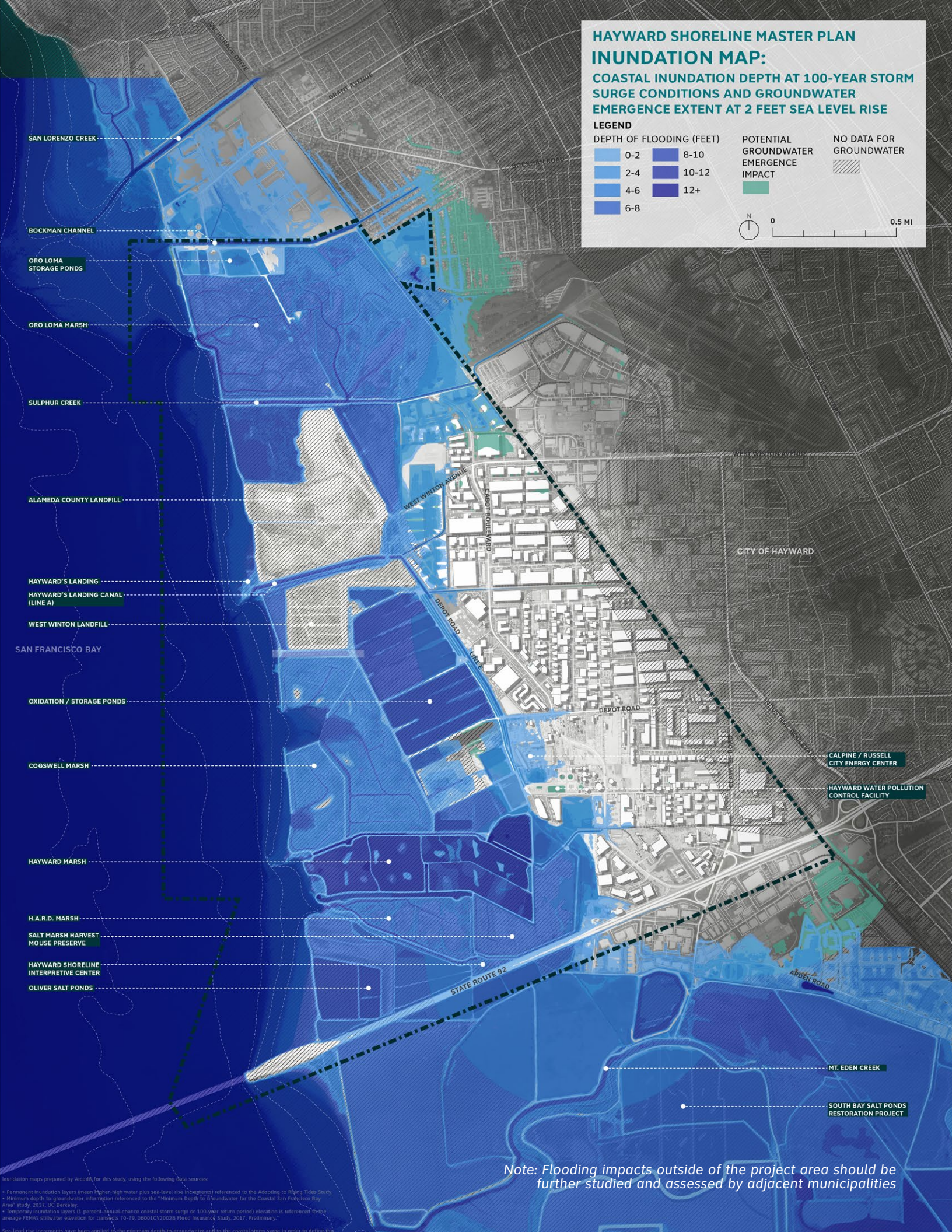

HAYWARD SHORELINE MASTER PLAN
INUNDATION MAP:
COASTAL INUNDATION DEPTH AT MEAN HIGHER HIGH WATER AND GROUNDWATER EMERGENCE EXTENT AT 2 FEET SEA LEVEL RISE
LEGEND
DEPTH OF FLOODING (FEET)
0-2
2-4
4-6
6-8
8-10
10-12
12+
POTENTIAL GROUNDWATER EMERGENCE IMPACT
NO DATA FOR GROUNDWATER
SHORELINE OVERTOPPING POTENTIAL
N
0
0.5 MI
SAN LORENZO CREEK
BOCKMAN CHANNEL
ORO LOMA STORAGE PONDS
ORO LOMA MARSH
SULPHUR CREEK
ALAMEDA COUNTY LANDFILL
HAYWARD'S LANDING
HAYWARD'S LANDING CANAL (LINE A)
WEST WINTON LANDFILL
SAN FRANCISCO BAY
OXIDATION / STORAGE PONDS
COGSWELL MARSH
HAYWARD MARSH
H.A.R.D. MARSH
SALT MARSH HARVEST MOUSE PRESERVE
HAYWARD SHORELINE INTERPRETIVE CENTER
OLIVER SALT PONDS
GRANT AVENUE
BOCKMAN ROAD
WEST WINTON AVENUE
CABOT BOULEVARD
DEPOT ROAD
LINE E
CITY OF HAYWARD
CALPINE / RUSSELL CITY ENERGY CENTER
HAYWARD WATER POLLUTION CONTROL FACILITY
STATE ROUTE 92
MT. EDEN CREEK
SOUTH BAY SALT PONDS RESTORATION PROJECT
Inundation maps prepared by Arcadis for this study, using the following data sources:
• Permanent inundation layers (mean higher-high water plus sea-level rise increments) referenced to the Adapting to Rising Tides Study.
• Minimum depth to groundwater information referenced to the "Minimum Depth to Groundwater for the Coastal San Francisco Bay Area" study, 2017, UC Berkeley.
• Temporary inundation layers (1 percent-annual-chance coastal storm surge or 100-year return period) elevation is referenced to the average FEMA's stillwater elevation for transects 70-79, 06001CV2002B Flood Insurance Study, 2017, Preliminary."
Sea-level rise increments have been applied to the minimum depth to groundwater and to the coastal storm surge in order to define the
Note: Flooding impacts outside of the project area should be further studied and assessed by adjacent municipalities

2′ SEA LEVEL RISE SCENARIO

SEA LEVEL RISE AND GROUNDWATER EMERGENCE

With 2′ of sea level rise, most of the natural features of the Hayward Regional Shoreline experience daily inundation and the lowest-lying shoreline levees and embankments are overtopped. Additionally, recreational resources start to be impacted by daily inundation, including the Bay Trail, Interpretive Center, and shoreline access points. Built assets and critical infrastructure are also more frequently inundated, which presents serious access and maintenance concerns.

The potential for groundwater emergence starts to impact the urban built area, specifically the northern end of the industrial neighborhood, as well as the San Lorenzo Community Park and adjacent residential areas.


HAYWARD SHORELINE MASTER PLAN
INUNDATION MAP:
COASTAL INUNDATION DEPTH AT 100-YEAR STORM SURGE CONDITIONS AND GROUNDWATER EMERGENCE EXTENT AT 2 FEET SEA LEVEL RISE
LEGEND
DEPTH OF FLOODING (FEET)
0-2
2-4
4-6
6-8
8-10
10-12
12+
POTENTIAL GROUNDWATER EMERGENCE IMPACT
NO DATA FOR GROUNDWATER
N
0
0.5 MI
SAN LORENZO CREEK
BOCKMAN CHANNEL
ORO LOMA STORAGE PONDS
ORO LOMA MARSH
SULPHUR CREEK
ALAMEDA COUNTY LANDFILL
HAYWARD'S LANDING
HAYWARD'S LANDING CANAL (LINE A)
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H.A.R.D. MARSH
SALT MARSH HARVEST MOUSE PRESERVE
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GRANT AVENUE
BOCKMAN ROAD
WEST WINTON AVENUE
CABOT BOULEVARD
DEPOT ROAD
LINE B
CITY OF HAYWARD
INDUSTRIAL BOULEVARD
CALPINE / RUSSELL CITY ENERGY CENTER
HAYWARD WATER POLLUTION CONTROL FACILITY
STATE ROUTE 92
ARDEN ROAD
MT. EDEN CREEK
SOUTH BAY SALT PONDS RESTORATION PROJECT
Inundation maps prepared by Arcadis for this study, using the following data sources:
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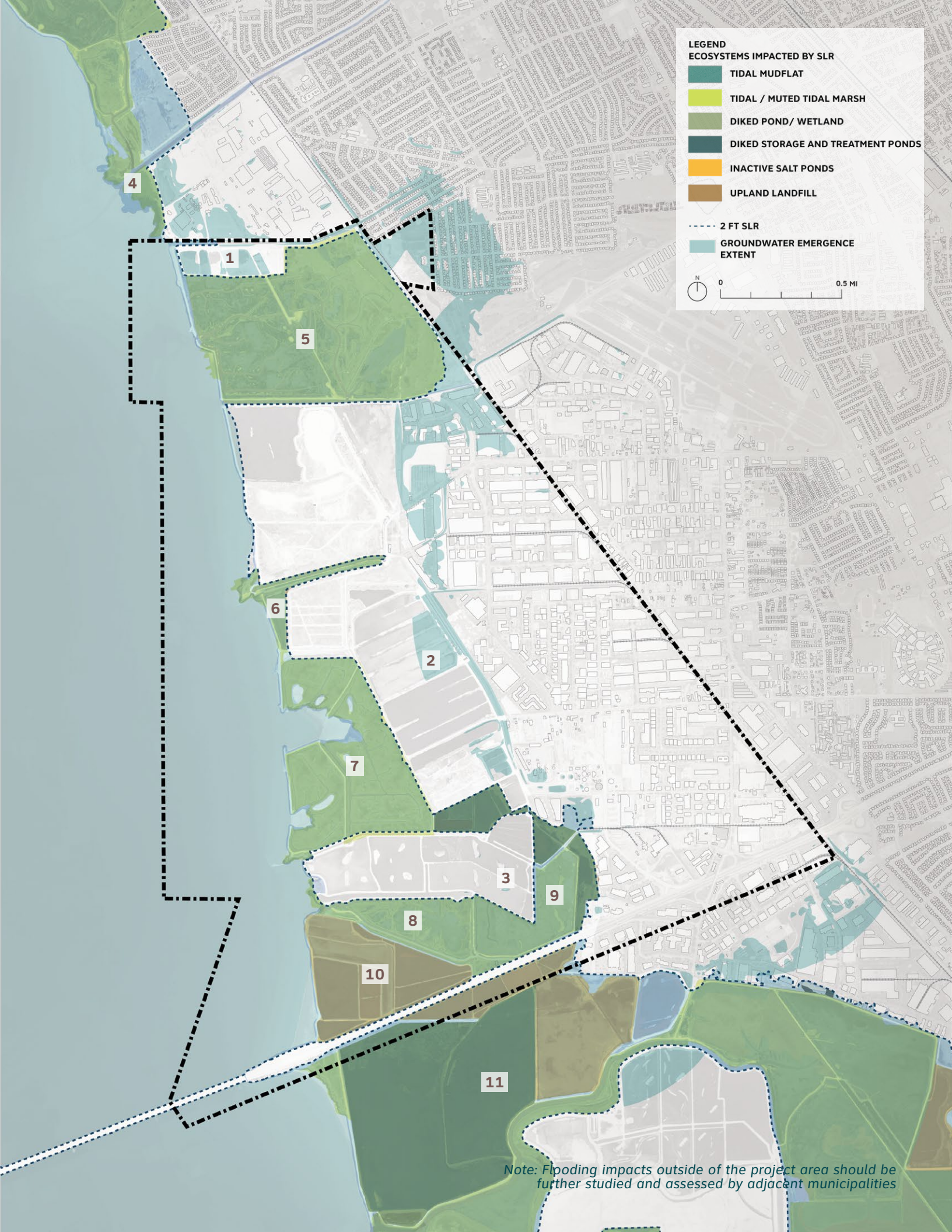
• Minimum depth to groundwater information referenced to the "Minimum Depth to Groundwater for the Coastal San Francisco Bay Area" study, 2017, UC Berkeley.
• Temporary inundation layers (1 percent-annual-chance coastal storm surge or 100-year return period) elevation is referenced to the average FEMA's stillwater elevation for transects 70-79, 06001CV2002B Flood Insurance Study, 2017, Preliminary.
Sea-level rise increments have been applied to the minimum depth to groundwater and to the coastal storm surge in order to define the
Note: Flooding impacts outside of the project area should be further studied and assessed by adjacent municipalities

100-YEAR STORM SURGE

Most of the natural features of the shoreline are inundated with a 100-year storm surge and urban built assets start to experience occasional inundation from the Bay. Areas of potential groundwater emergence in the 2’ sea level rise scenario are roughly correlated with areas of 100-year flood risk.



Note: Flooding impacts outside of the project area should be further studied and assessed by adjacent municipalities

BAYLANDS AND ECOLOGICAL FEATURES AT RISK

With 2' of sea level rise, a larger extent of the Baylands experience daily tidal inundation. The list below and associated map outline the major assets impacted.

Diked storage and treatment ponds are impacted by potential groundwater emergence extent:

1. Oro Loma Storage Ponds
2. Wet Weather Storage Ponds
3. Hayward Marsh

All tidal and muted tidal marshes experience greater inundation and potential habitat transition with sea level rise:

4. San Leandro Marshlands
5. Oro Loma Marsh
6. Triangle Marsh
7. Cogswell Marsh
8. HARD Marsh
9. Salt Marsh Harvest Mouse Preserve

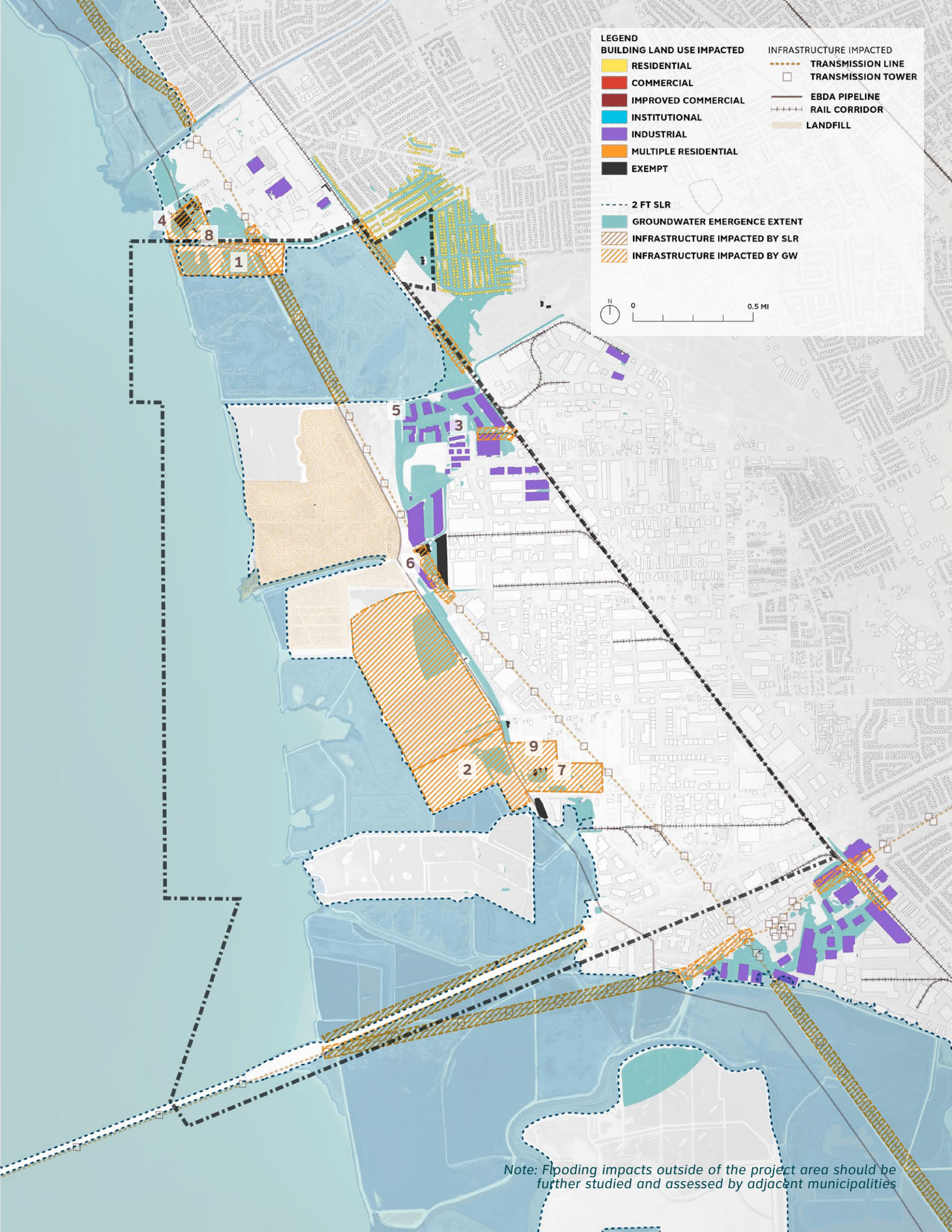
All salt ponds are inundated with sea level rise:

10. Oliver Salt Ponds

Diked ponds are impacted by potential groundwater emergence extent:

11. South Bay Salt Ponds Restoration Project

The shoreline may experience increased erosion risk with further wave and wind action as sea levels rise.



Note: Flooding impacts outside of the project area should be further studied and assessed by adjacent municipalities

BUILT ASSETS AND INFRASTRUCTURE AT RISK

With 2' of sea level rise, the risk of potential groundwater emergence impacts built assets and critical infrastructure. Additionally, increased sea levels puts access to critical infrastructure at risk. The list below and associated map outline the major assets impacted.

Solar fields and biosolids drying/ management areas are impacted by potential groundwater emergence extent:

1. Oro Loma – Castro Valley Plant

2. Hayward Water Pollution Control Facility

Northern Industrial Buildings are impacted by potential groundwater emergence extent

3. Northern Industrial Buildings

Portions of the PG&E Power Lines are impacted by sea level rise

All pump stations are impacted by potential groundwater emergence extent:

4. Oro Loma – Castro Valley Plant and Effluent Pump Station

5. Marathon Pump Station

6. Hayward Effluent Pump Station

Wastewater Treatment Plants and Energy Center are impacted by potential groundwater emergence extent:

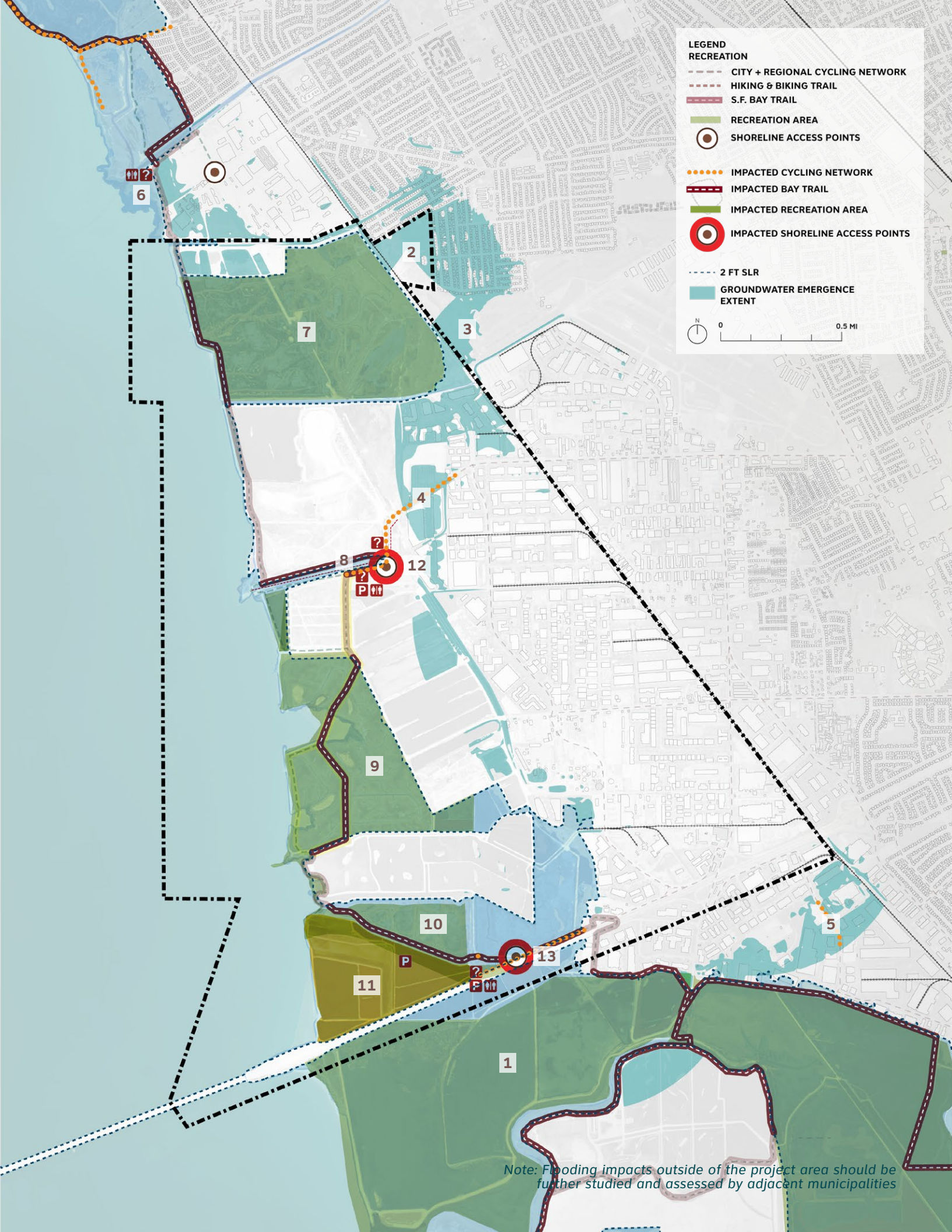
7. Hayward Water Pollution Control Facility

8. Oro Loma Wastewater Treatment Plant

9. CalPine / Russell City Energy Center

The shoreline may experience increased erosion risk with further wave and wind action as sea levels rise.

While the San Lorenzo residential neighborhood is outside of the project area, it should be noted that flood impacts can be observed.


LEGEND
RECREATION
CITY + REGIONAL CYCLING NETWORK
HIKING & BIKING TRAIL
S.F. BAY TRAIL
RECREATION AREA
SHORELINE ACCESS POINTS
IMPACTED CYCLING NETWORK
IMPACTED BAY TRAIL
IMPACTED RECREATION AREA
IMPACTED SHORELINE ACCESS POINTS
2 FT SLR
GROUNDWATER EMERGENCE EXTENT
N
0
0.5 MI
1
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4
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13
P
Note: Flooding impacts outside of the project area should be further studied and assessed by adjacent municipalities

RECREATIONAL ASSETS AT RISK

With 2' of sea level rise, shoreline access points, SLCP, and trail networks are impacted by potential groundwater emergence or daily tidal inundation. The list below and associated map outline the major assets impacted.

Recreation areas are impacted by potential groundwater emergence extent:

1. South Bay Salt Ponds Restoration Project
2. San Lorenzo Community Park (SLCP)
3. Skywest golf course

Regional bike network is impacted by potential groundwater emergence extent:

4. Winton Ave
5. Corporate Ave

All recreation areas are inundated with sea level rise

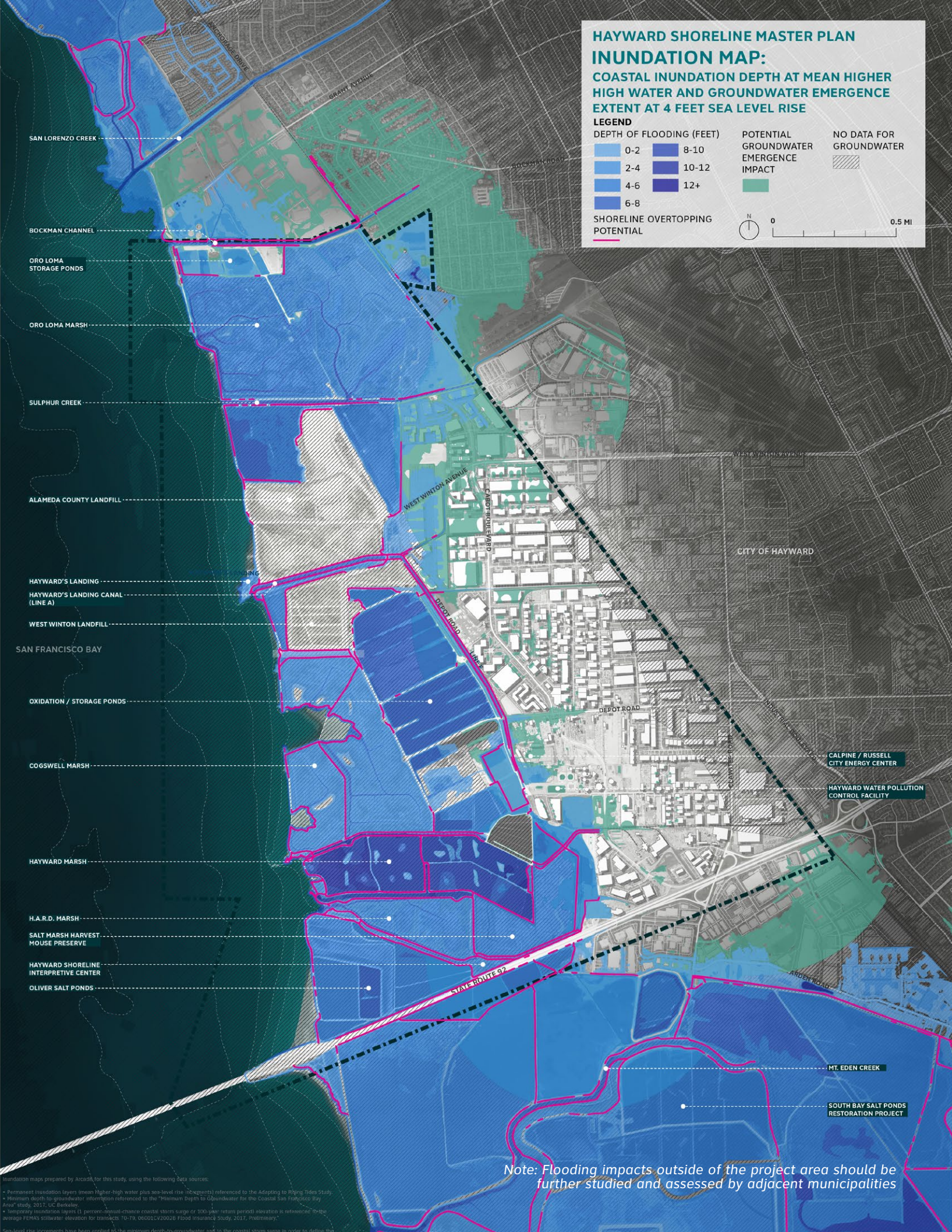
6. San Leandro Marshlands
7. Oro Loma Marsh
8. Landfills
9. Cogswell Marsh
10. H.A.R.D. Marsh
11. Oliver Salt Ponds

Some Shoreline Access Points are inundated with sea level rise

12. EBRPD Park Office Trail Entrance
13. Hayward Shoreline Interpretative Center Trail Entrance

Parts of the Bay Trail are inundated with sea level rise.

The shoreline may experience increased erosion risk with further wave and wind action as sea levels rise.


HAYWARD SHORELINE MASTER PLAN
INUNDATION MAP:
COASTAL INUNDATION DEPTH AT MEAN HIGHER HIGH WATER AND GROUNDWATER EMERGENCE EXTENT AT 4 FEET SEA LEVEL RISE
LEGEND
DEPTH OF FLOODING (FEET)
0-2
2-4
4-6
6-8
8-10
10-12
12+
POTENTIAL GROUNDWATER EMERGENCE IMPACT
NO DATA FOR GROUNDWATER
SHORELINE OVERTOPPING POTENTIAL
N
0
0.5 MI
SAN LORENZO CREEK
BOCKMAN CHANNEL
ORO LOMA STORAGE PONDS
ORO LOMA MARSH
SULPHUR CREEK
ALAMEDA COUNTY LANDFILL
HAYWARD'S LANDING
HAYWARD'S LANDING CANAL (LINE A)
WEST WINTON LANDFILL
SAN FRANCISCO BAY
OXIDATION / STORAGE PONDS
COGSWELL MARSH
HAYWARD MARSH
H.A.R.D. MARSH
SALT MARSH HARVEST MOUSE PRESERVE
HAYWARD SHORELINE INTERPRETIVE CENTER
OLIVER SALT PONDS
MT. EDEN CREEK
SOUTH BAY SALT PONDS RESTORATION PROJECT
CALPINE / RUSSELL CITY ENERGY CENTER
HAYWARD WATER POLLUTION CONTROL FACILITY
CITY OF HAYWARD
WEST WINTON AVENUE
CABOT BOULEVARD
DEPOT ROAD
GRANT AVENUE
ROCKMAN ROAD
INDUSTRIAL BOULEVARD
CHAUTAUQUA
ARDEN ROAD
STATE ROUTE 92
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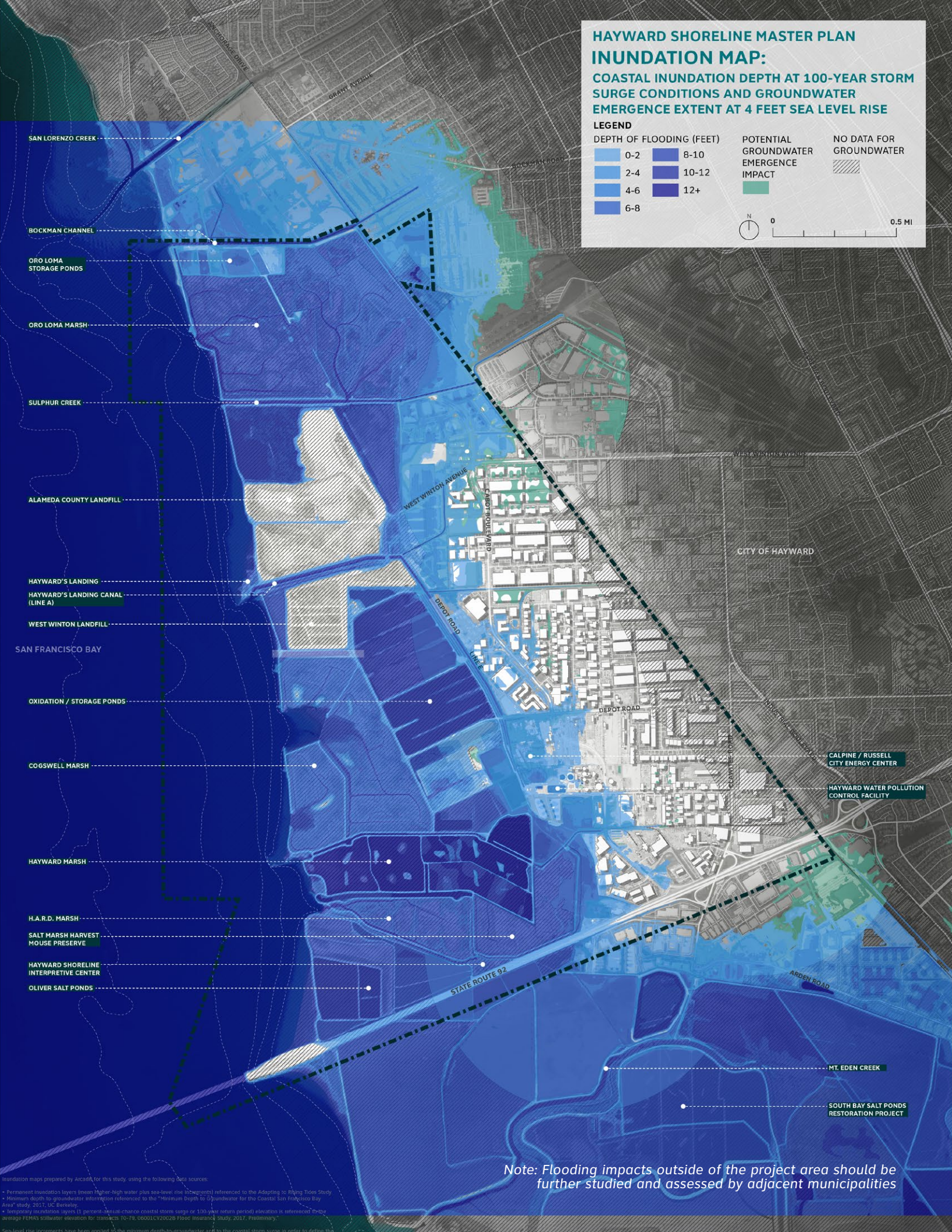
Note: Flooding impacts outside of the project area should be further studied and assessed by adjacent municipalities

4’ SEA LEVEL RISE SCENARIO

SEA LEVEL RISE AND GROUNDWATER EMERGENCE

With 4’ of sea level rise, most of the natural features of the Hayward Regional Shoreline experience a greater level of daily inundation. A significant amount of shoreline levees and embankments are overtopped. Recreational resources are significantly impacted by daily inundation, including the Bay Trail, Interpretive Center, and shoreline access points. Built assets and critical infrastructure are even more frequently inundated, and access to them for maintenance becomes a larger issue. Direct impacts to critical infrastructure (San Mateo Bridge, Oro Loma Wastewater Treatment Plant, and the rail corridor).

The potential for groundwater emergence extends further inland to encompass a greater amount of the adjacent built urban areas.



Note: Flooding impacts outside of the project area should be further studied and assessed by adjacent municipalities

Inundation maps prepared by Arcadis for this study, using the following data sources:

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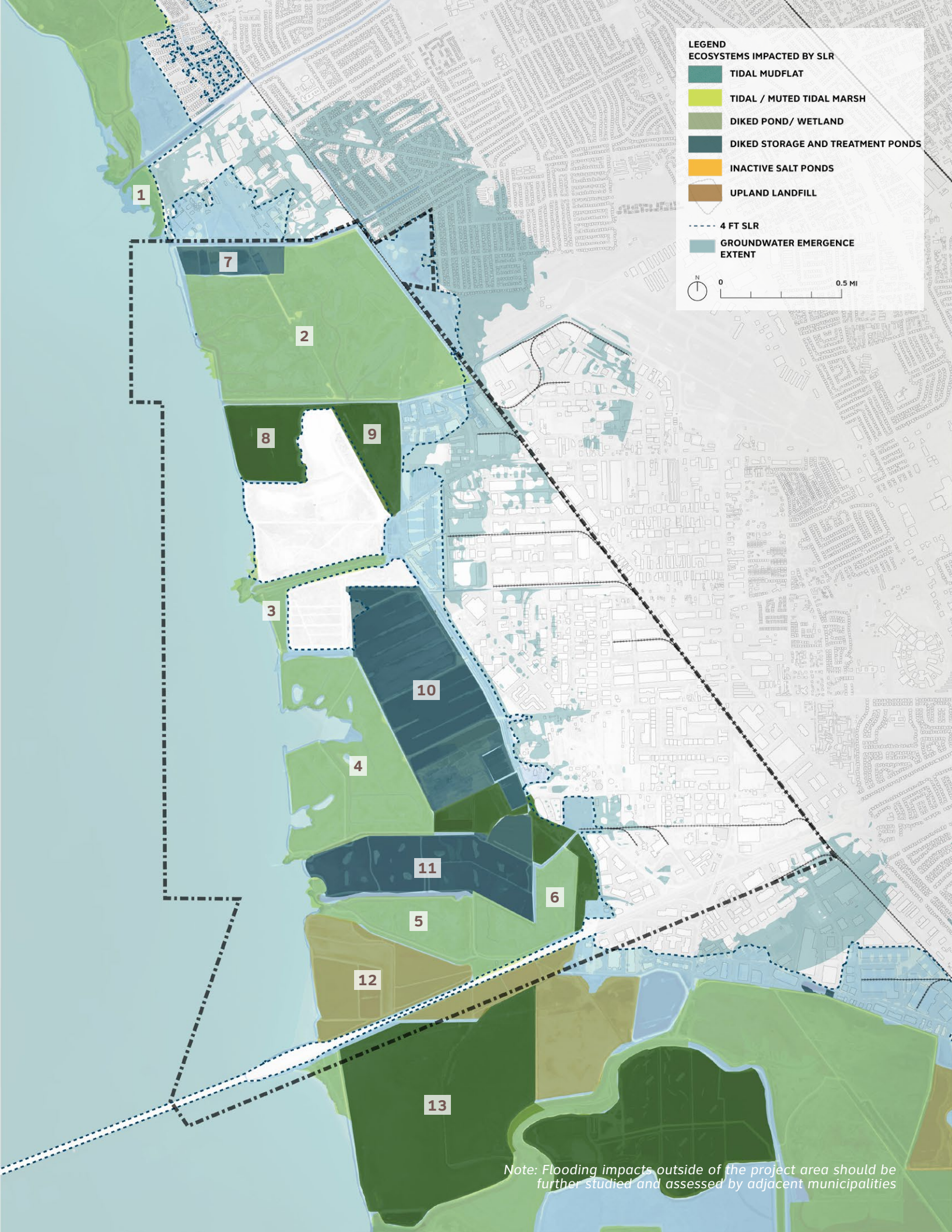
- Minimum depth to groundwater information referenced to the "Minimum Depth to Groundwater for the Coastal San Francisco Bay Area" study, 2017, UC Berkeley.
- Temporary inundation layers (1 percent-annual-chance coastal storm surge or 100-year return period) elevations referenced to the average FEMA's stillwater elevation for transects 70-79, 06001CV2002B Flood Insurance Study, 2017, Preliminary."

Sea-level rise increments have been applied to the minimum depth-to-groundwater and to the coastal storm surge in order to define the

100-YEAR STORM SURGE

Areas of potential groundwater emergence in the 4' sea level rise scenario are roughly correlated with areas of 100-year flood risk. All of the natural features of the shoreline are inundated with a 100-year storm surge and a greater extent of urban built assets experience occasional inundation from the Bay.


LEGEND
ECOSYSTEMS IMPACTED BY SLR
TIDAL MUDFLAT
TIDAL / MUTED TIDAL MARSH
DIKED POND/ WETLAND
DIKED STORAGE AND TREATMENT PONDS
INACTIVE SALT PONDS
UPLAND LANDFILL
4 FT SLR
GROUNDWATER EMERGENCE EXTENT
N
0
0.5 MI
1
2
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13
Note: Flooding impacts outside of the project area should be further studied and assessed by adjacent municipalities

BAYLANDS AND ECOLOGICAL FEATURES AT RISK

With 4' of sea level rise, a broad extent of Baylands experience daily tidal inundation. This will result in large-scale habitat transition if ecosystems are not able to adapt with sea level rise. The list below and associated map outline the major assets impacted.

All tidal and muted tidal marshes experience greater inundation and potential habitat transition with sea level rise:

1. San Leandro Marshlands
2. Oro Loma Marsh
3. Triangle Marsh
4. Cogswell Marsh
5. HARD Marsh
6. Salt Marsh Harvest Mouse Preserve

All diked storage and treatment ponds are inundated with sea level rise:

7. Oro Loma Storage Ponds
8. Frank's West
9. Frank's East
10. Wet Weather Storage Ponds
11. Hayward Marsh

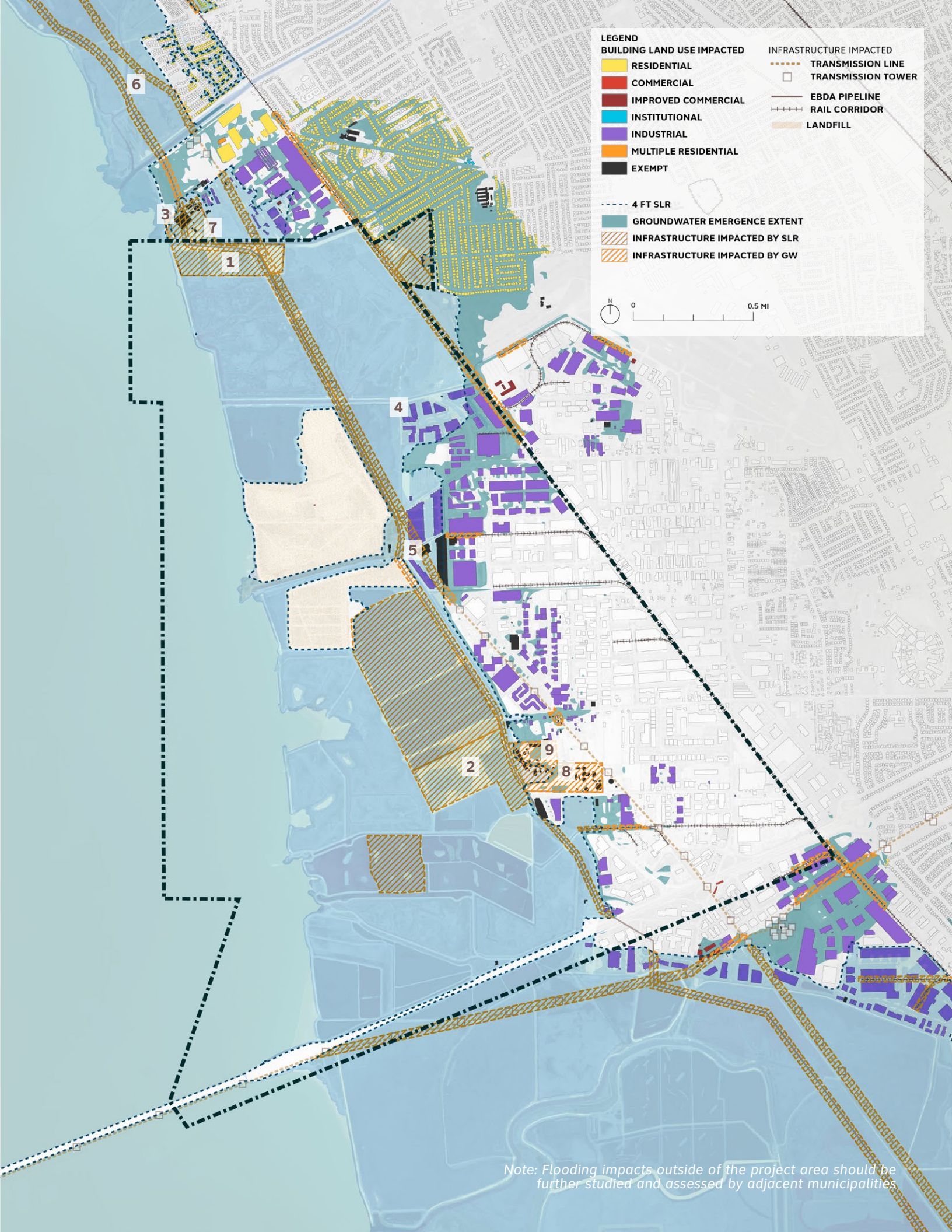
All salt ponds are inundated with sea level rise:

12. Oliver Salt Ponds

Diked ponds are impacted by potential groundwater emergence extent:

13. South Bay Salt Ponds Restoration Project

The shoreline may experience increased erosion risk with further wave and wind action as sea levels rise.



Note: Flooding impacts outside of the project area should be further studied and assessed by adjacent municipalities.

BUILT ASSET AND INFRASTRUCTURE AT RISK

With 4' of sea level rise, daily tidal inundation and the risk of potential groundwater emergence impacts a larger extent of built assets and critical infrastructure. Additionally, access becomes a major concern. The list below and associated map outline the major assets impacted.

Solar fields and biosolids drying/management areas are inundated by sea level rise:

1. Oro Loma – Castro Valley Plant
2. Hayward Water Pollution Control Facility

Northern Industrial Buildings are impacted by sea level rise and potential groundwater emergence extent

All pump stations and plants are inundated with sea level rise:

3. Oro Loma - Castro Valley Effluent Station
4. Marathon Pump Station
5. Hayward Effluent Pump Station
6. LAVWMA Valve Box

Most of the PG&E Power Lines are impacted by sea level rise

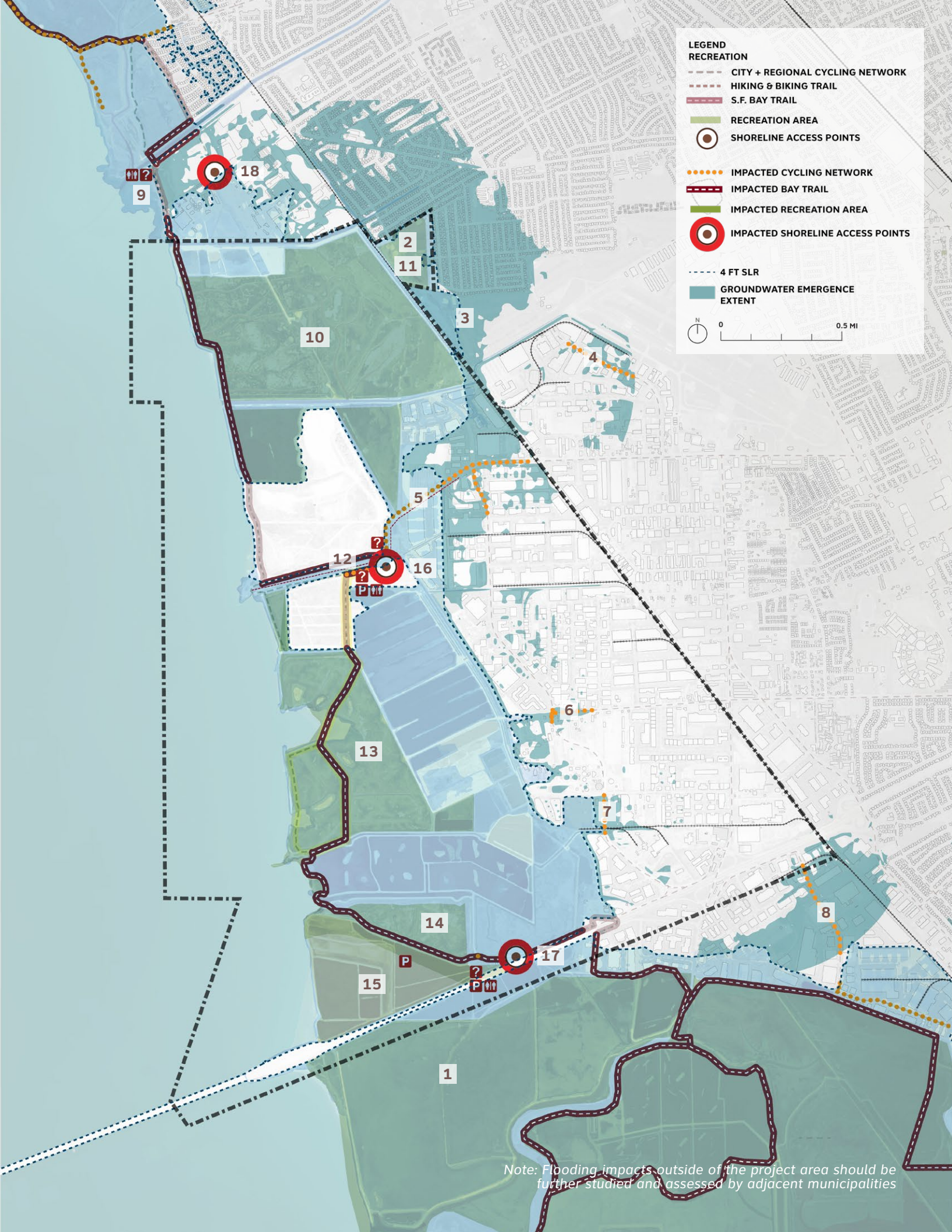
Industrial Buildings are impacted by potential groundwater extent

All Wastewater Treatment Plants and Energy Center are impacted by sea level rise:

7. Oro Loma Castro Valley Plant
8. Hayward Water Pollution Control Facility
9. Calpine/Russell City Energy Center

The shoreline may experience increased erosion risk with further wave and wind action as sea levels rise.

While the San Lorenzo and Heron Bay residential neighborhoods are outside of the project area, it should be noted that flood impacts can be observed.



Note: Flooding impacts outside of the project area should be further studied and assessed by adjacent municipalities

RECREATIONAL ASSETS AT RISK

With 4' of sea level rise, all shoreline access points, SLCP, and a large extent of trail networks are impacted by daily tidal inundation. The list below and associated map outline the major assets impacted.

Recreation areas are impacted by potential groundwater extent:

1. South Bay Salt Ponds Restoration Project
2. San Lorenzo Community Park
3. Skywest golf course

Regional bike network is impacted by sea level rise and potential groundwater extent:

4. Corsair Blvd.
5. Winton Ave
6. Depot Rd.
7. Whitesell St.
8. Corporate Ave

All recreation areas are inundated with sea level rise

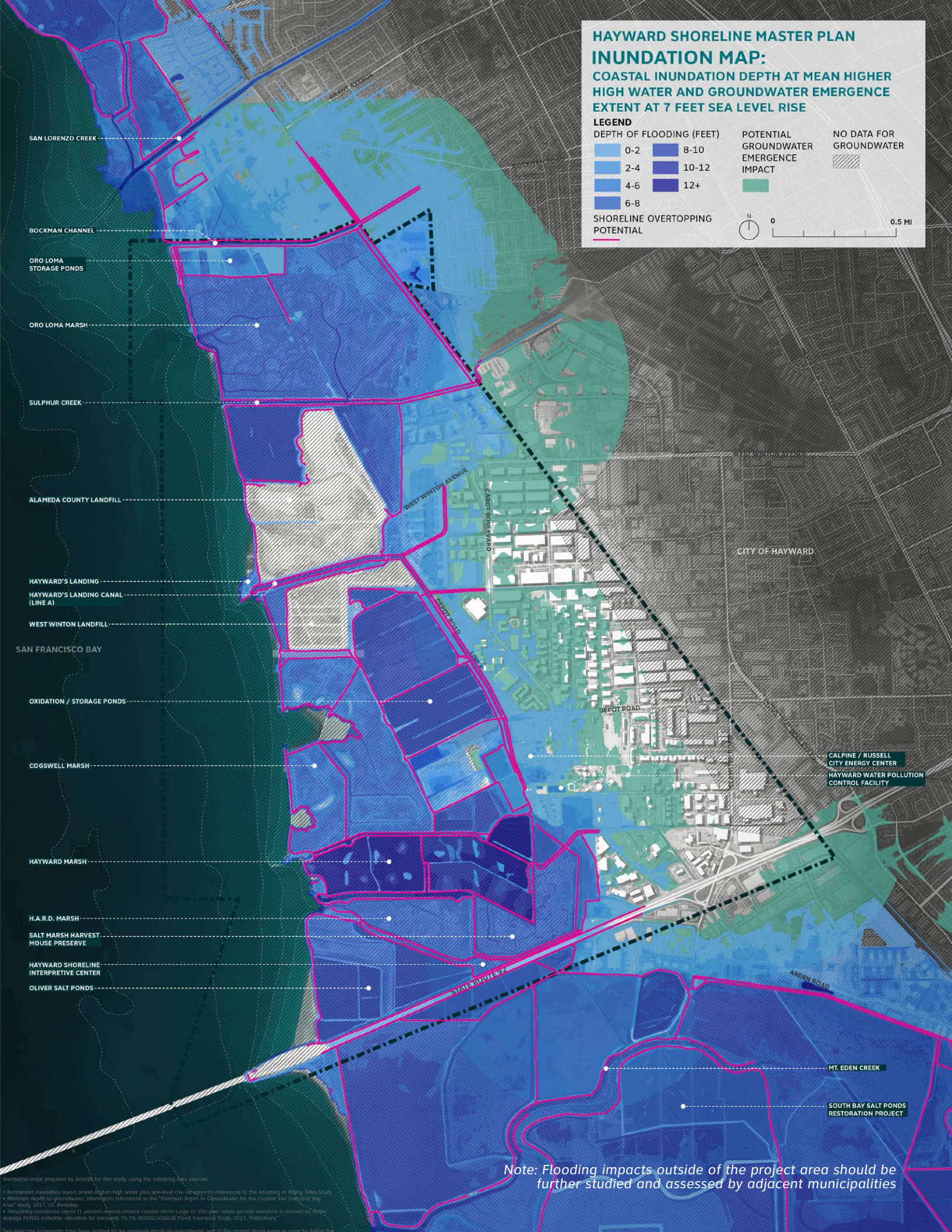
9. San Leandro Marshlands
10. Oro Loma Marsh
11. San Lorenzo Community Park (SLCP)
12. Landfill
13. Cogswell Marsh
14. H.A.R.D. Marsh
15. Oliver Salt Ponds

All Shoreline Access Points are inundated with sea level rise

16. EBRPD Park Office Trail Entrance
17. Hayward Shoreline Interpretative Center Trail Entrance
18. San Lorenzo Trail Entrance

A majority of the Bay Trail is inundated with sea level rise.

The shoreline may experience increased erosion risk with further wave and wind action as sea levels rise.



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Note: Flooding impacts outside of the project area should be further studied and assessed by adjacent municipalities

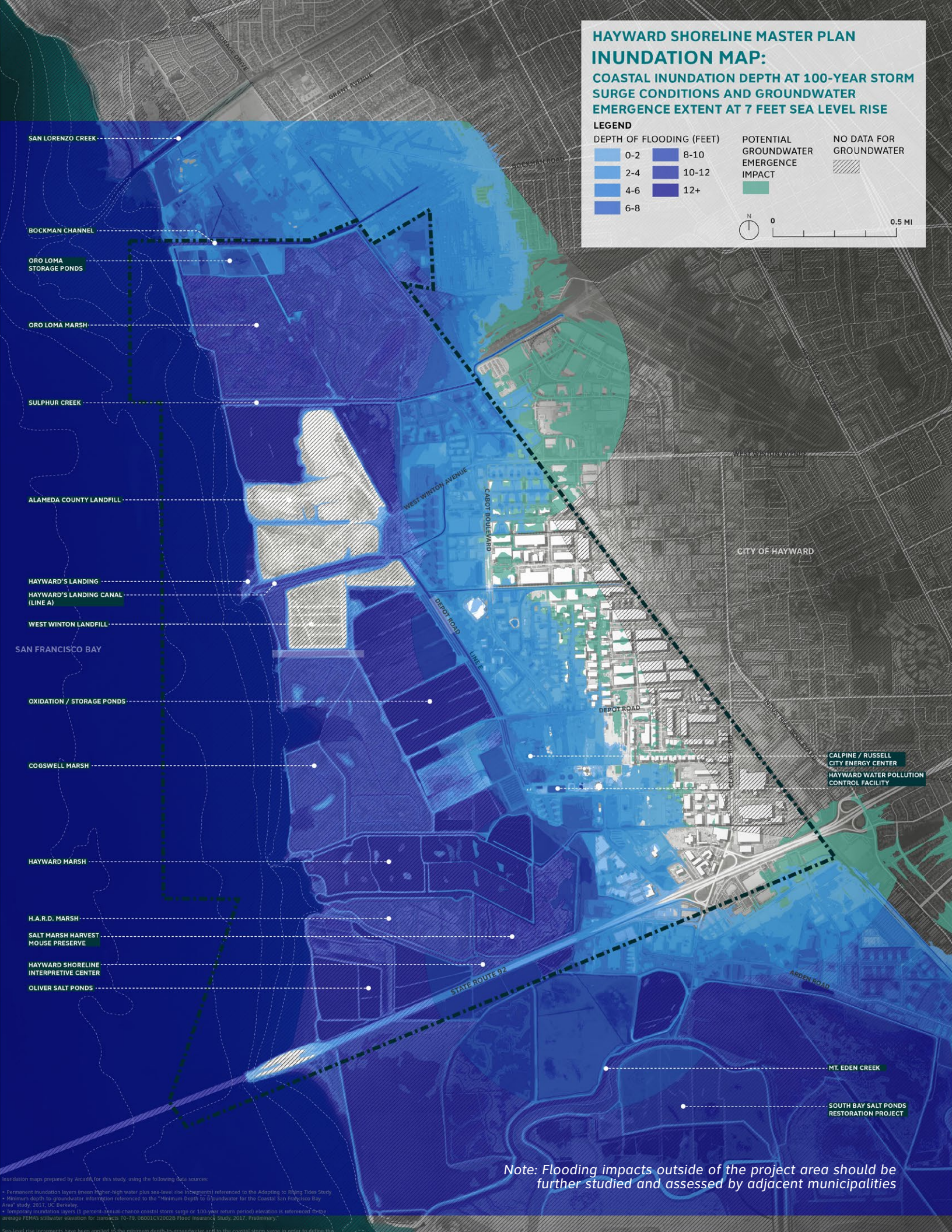
7’ SEA LEVEL RISE SCENARIO

SEA LEVEL RISE AND GROUNDWATER EMERGENCE

With 7’ of sea level rise, all of the natural and recreational features of the Hayward Regional Shoreline experience an extreme level of daily inundation. Most of the shoreline levees and embankments are overtopped in this scenario.

Almost all critical infrastructure is impacted by sea level rise, including significant impacts to the San Mateo Bridge approach and inundation of the landfill perimeters. The industrial neighborhoods experience major impacts from sea level rise and groundwater emergence. In addition, all stormwater and flood control channels experience significant backups.

The potential for groundwater emergence expands to encompass a large extent of the built urban areas.


HAYWARD SHORELINE MASTER PLAN
INUNDATION MAP:
COASTAL INUNDATION DEPTH AT 100-YEAR STORM SURGE CONDITIONS AND GROUNDWATER EMERGENCE EXTENT AT 7 FEET SEA LEVEL RISE
LEGEND
DEPTH OF FLOODING (FEET)
0-2
2-4
4-6
6-8
8-10
10-12
12+
POTENTIAL GROUNDWATER EMERGENCE IMPACT
NO DATA FOR GROUNDWATER
N
0
0.5 MI
SAN LORENZO CREEK
BOCKMAN CHANNEL
ORO LOMA STORAGE PONDS
ORO LOMA MARSH
SULPHUR CREEK
ALAMEDA COUNTY LANDFILL
HAYWARD'S LANDING
HAYWARD'S LANDING CANAL (LINE A)
WEST WINTON LANDFILL
SAN FRANCISCO BAY
OXIDATION / STORAGE PONDS
COGSWELL MARSH
HAYWARD MARSH
H.A.R.D. MARSH
SALT MARSH HARVEST MOUSE PRESERVE
HAYWARD SHORELINE INTERPRETIVE CENTER
OLIVER SALT PONDS
CALPINE / RUSSELL CITY ENERGY CENTER
HAYWARD WATER POLLUTION CONTROL FACILITY
MT. EDEN CREEK
SOUTH BAY SALT PONDS RESTORATION PROJECT
CITY OF HAYWARD
WEST WINTON AVENUE
CABOT BOULEVARD
DEPOT ROAD
LINE E
INDUSTRIAL BOULEVARD
GRANT AVENUE
BOCKMAN ROAD
STATE ROUTE 92
ARDEN ROAD
Note: Flooding impacts outside of the project area should be further studied and assessed by adjacent municipalities
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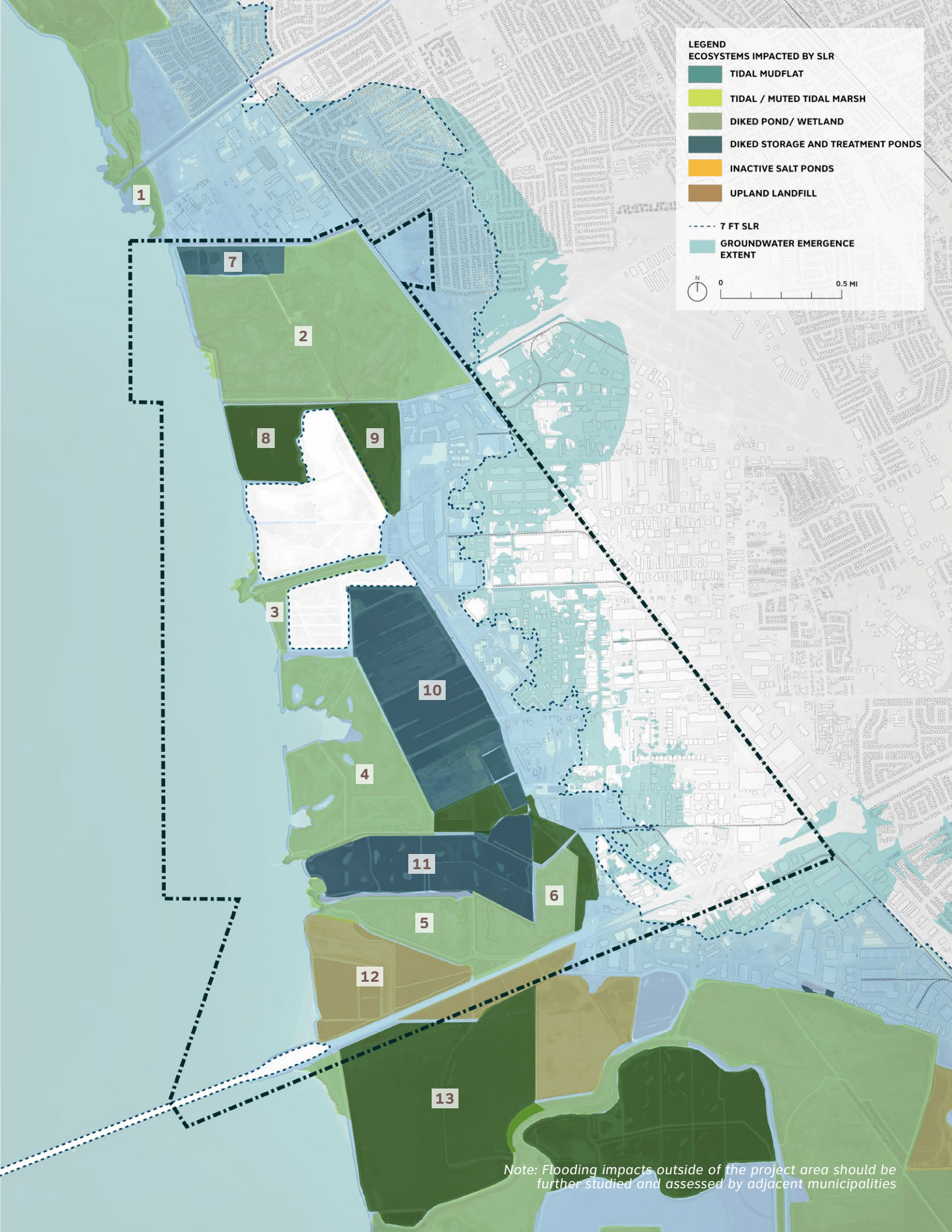
100-YEAR STORM SURGE

Areas of potential groundwater emergence in the 7' sea level rise scenario are roughly correlated with areas of 100-year flood risk. All of the natural features of the shoreline are inundated with a 100-year storm surge and a significant extent of urban built assets experience occasional inundation from the Bay.


LEGEND
ECOSYSTEMS IMPACTED BY SLR
TIDAL MUDFLAT
TIDAL / MUTED TIDAL MARSH
DIKED POND/ WETLAND
DIKED STORAGE AND TREATMENT PONDS
INACTIVE SALT PONDS
UPLAND LANDFILL
7 FT SLR
GROUNDWATER EMERGENCE EXTENT
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Note: Flooding impacts outside of the project area should be further studied and assessed by adjacent municipalities

BAYLANDS AND ECOLOGICAL FEATURES AT RISK

With 7' of sea level rise, almost all of the Baylands experience daily tidal inundation. This will result in large-scale habitat transition if ecosystems are not able to adapt with sea level rise. The list below and associated map outline the major assets impacted.

All tidal and muted tidal marshes experience greater inundation and potential habitat transition with sea level rise:

1. San Leandro Marshlands
2. Oro Loma Marsh
3. Triangle Marsh
4. Cogswell Marsh
5. HARD Marsh
6. Salt Marsh Harvest Mouse Preserve

All diked storage and treatment ponds are inundated with sea level rise:

7. Oro Loma Sludge Ponds
8. Frank's West
9. Frank's East
10. Wet Weather Storage Ponds
11. Hayward Marsh

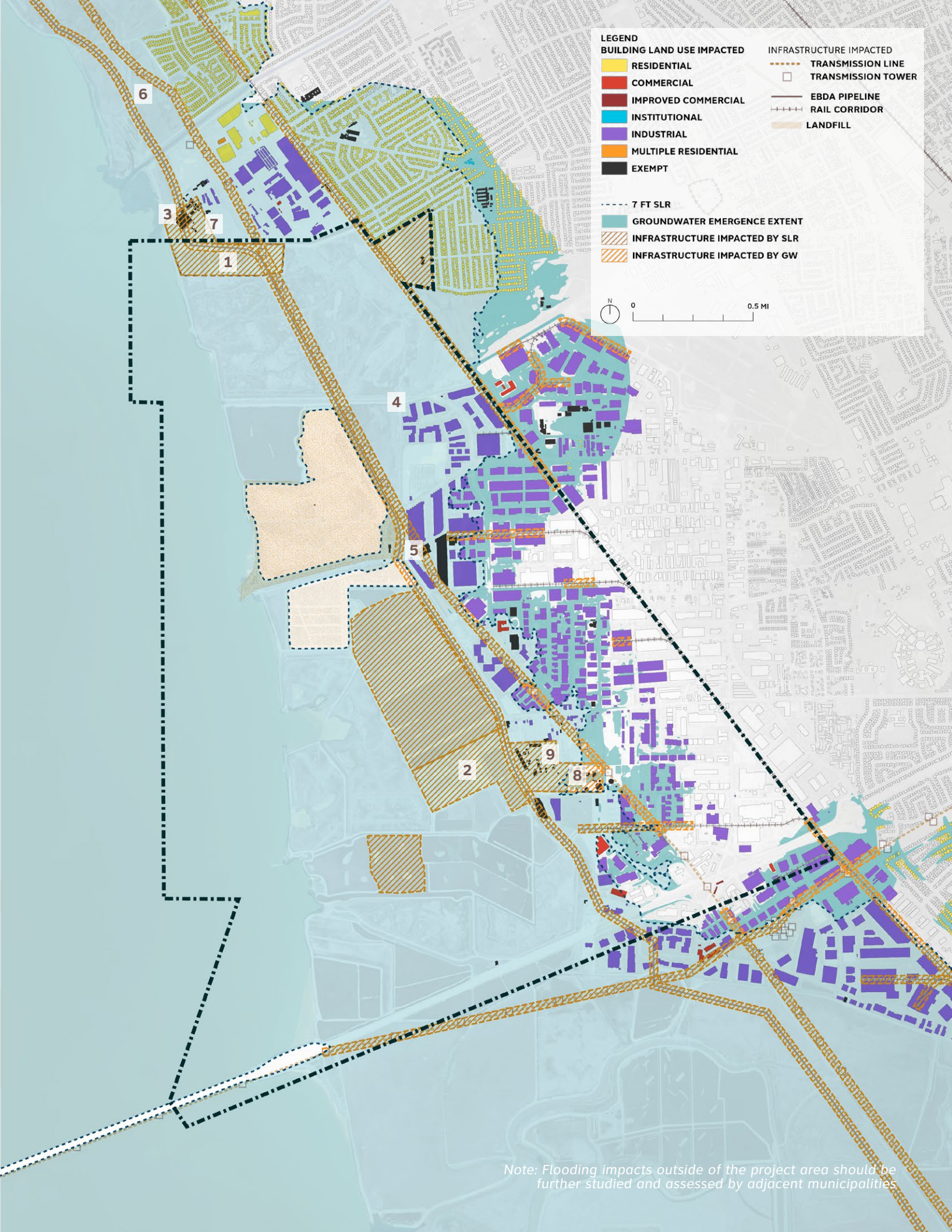
All salt ponds are inundated with sea level rise:

12. Oliver Salt Ponds

All diked ponds are inundated by sea level rise:

13. South Bay Salt Ponds Restoration Project

The shoreline may experience increased erosion risk with further wave and wind action as sea levels rise.



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BUILT ASSET AND INFRASTRUCTURE AT RISK

With 7' of sea level rise, daily tidal inundation and the risk of potential groundwater emergence impacts a broad extent of built assets and critical infrastructure. Additionally, access becomes a major concern. The list below and associated map outline the major assets impacted.

Solar fields and biosolids drying/management areas are inundated by sea level rise:

1. Oro Loma – Castro Valley Plant
2. Hayward Water Pollution Control Facility

Northern Industrial Buildings are impacted by sea level rise and potential groundwater extent

All pump stations and plants are inundated with sea level rise:

3. Oro loma Castro Valley Effluent Station
4. Marathon Pump Station
5. Hayward Effluent Pump Station
6. LAVWMA Valve Box

Most of the PG&E Power Lines are impacted by sea level rise

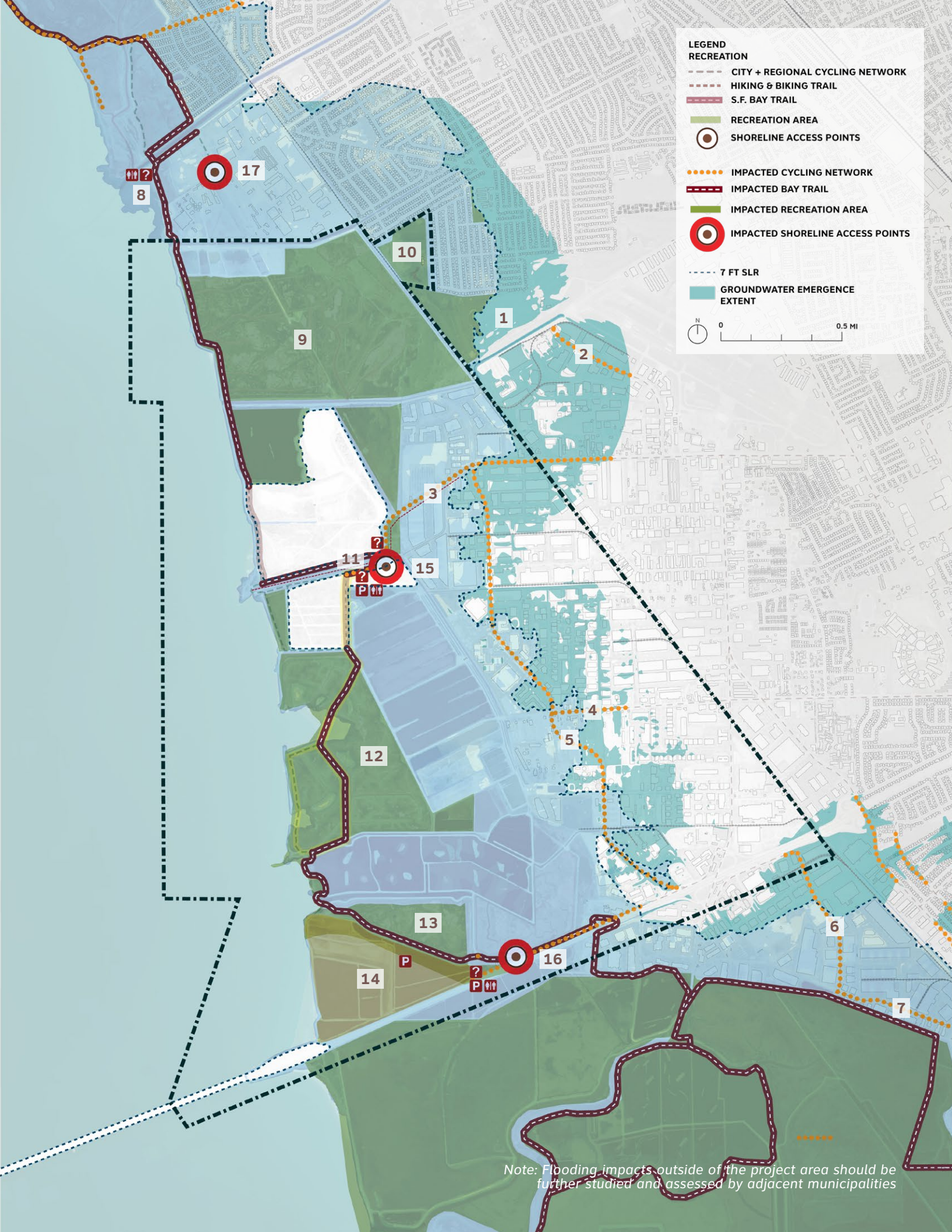
Industrial Buildings are impacted by potential groundwater extent

All Wastewater Treatment Plants and Energy Center are impacted by sea level rise:

7. Oro Loma Castro Valley Plant
8. Hayward Water Pollution Control Facility
9. Calpine/Russell City Energy Center

The shoreline may experience increased erosion risk with further wave and wind action as sea levels rise.

While the San Lorenzo, Heron Bay, and Washington Manor residential neighborhoods are outside of the project area, it should be noted that flood impacts can be observed.



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RECREATIONAL ASSETS AT RISK

With 7' of sea level rise, all shoreline access points, SLCP, and a broad extent of trail networks are impacted by daily tidal inundation. The list below and associated map outline the major assets impacted.

Recreation areas are impacted by potential groundwater extent:

1. Skywest golf course

Regional bike network is impacted by sea level rise and potential groundwater extent:

2. Corsair Blvd.
3. Winton Ave
4. Depot Rd.
5. Whitesell St.
6. Corporate Ave
7. Arden Rd.

All recreation areas are inundated with sea level rise

8. San Leandro Marshlands
9. Oro Loma Marsh
10. San Lorenzo Community Park (SLCP)
11. Landfill
12. Cogswell Marsh
13. H.A.R.D. Marsh
14. Oliver Salt Ponds

All Shoreline Access Points are inundated with sea level rise

15. EBRPD Park Office Trail Entrance
16. Hayward Shoreline Interpretative Center Trail Entrance
17. San Lorenzo Trail Entrance

A majority of the Bay Trail is inundated with sea level rise

The shoreline may experience increased erosion risk with further wave and wind action as sea levels rise.

ADAPTATION STRATEGIES

This chapter provides a catalog of nature-based solutions, hard infrastructure and non-structural adaptation strategies that the Project Team explored and eventually combined into Design Alternatives.

Frank's East, looking towards Alameda County Landfill

ADAPTATION STRATEGIES

SELECTION PROCESS

The Project Team considered the full project area of the Hayward Regional Shoreline Adaptation Master Plan, stretching over three miles from San Lorenzo Creek south to State Route 92, to produce a catalog of potential design strategies to help the shoreline adapt to climate change.

This suite of nature-based, engineered, and non-structural strategies were selected to mitigate future risk to a complex diversity of shoreline assets, including ecological features, built infrastructure, the urban fabric, and recreational resources.

An extensive list of design strategies were considered and analyzed through a process of detailed stakeholder and agency review. This chapter provides a catalog of the strategies that received the most support.

The final selection of proposed adaptation strategies are the most applicable and site-specific ways to help the Hayward Regional Shoreline adapt to climate change.

NATURE-BASED STRATEGIES

This section provides a catalog of nature-based design strategies that incorporate coastal risk reduction and ecological infrastructure to adapt shoreline assets to sea level rise.

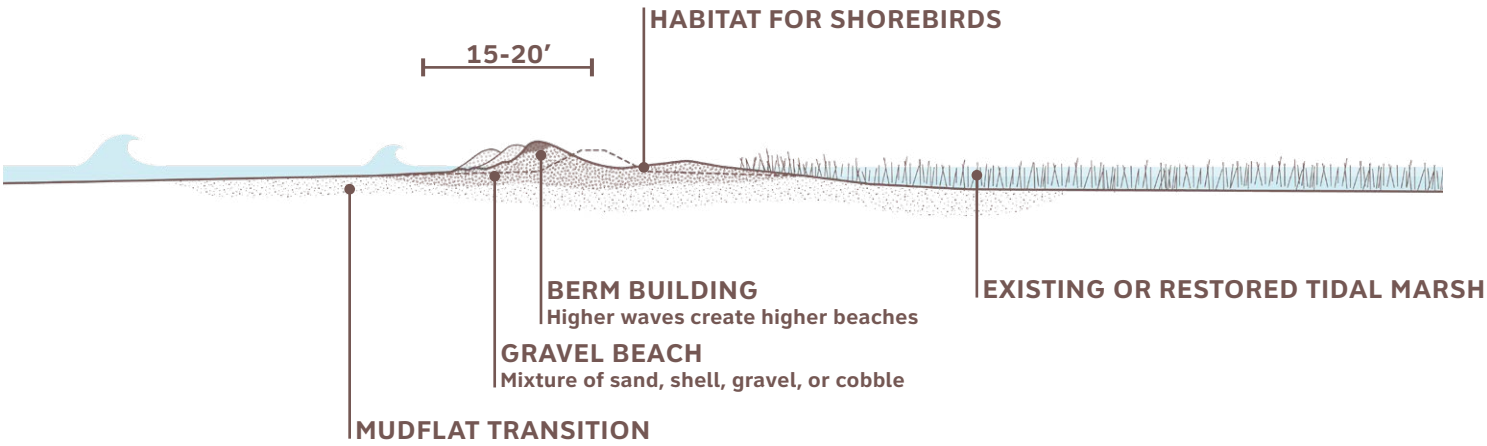
FINE AND COARSE GRAIN BEACHES

DESCRIPTION

Coarse or composite estuarine beaches are dynamic features that consist of a mixture of sand, shell, gravel, or cobble. Beaches include a supratidal beach berm and a beach face. Gravel and cobble beaches can dissipate wave energy over shorter distances and are generally more suitable within the urbanized and constrained estuary than sand beaches. They can be placed in front of levees, roads or other vulnerable infrastructure to reduce erosion. Many beaches provide habitat benefits to shorebirds.

GOAL/OBJECTIVE

- Reduce erosion of levees
- Ecological enhancement (provide shorebird nesting habitat)



Arambaru Island Enhancement Project

Marin County, CA

A restoration project to stabilize the eroding eastern shoreline, enhance habitats, and encourage seabird and seal use. A new beach gives the habitats time to transition as sea levels rise.

- Focus is on creating habitat for terns and other water birds
- Gravel, sand, and oyster shell hash shoreline with eucalyptus log stabilization infrastructure
- Larger rocks and driftwood help trap finer sediments
- Erosion of island was slowed, holding up against winter storms and continual increases in waves

Gravel Beach, Arambaru Island
(www.kqed.org)

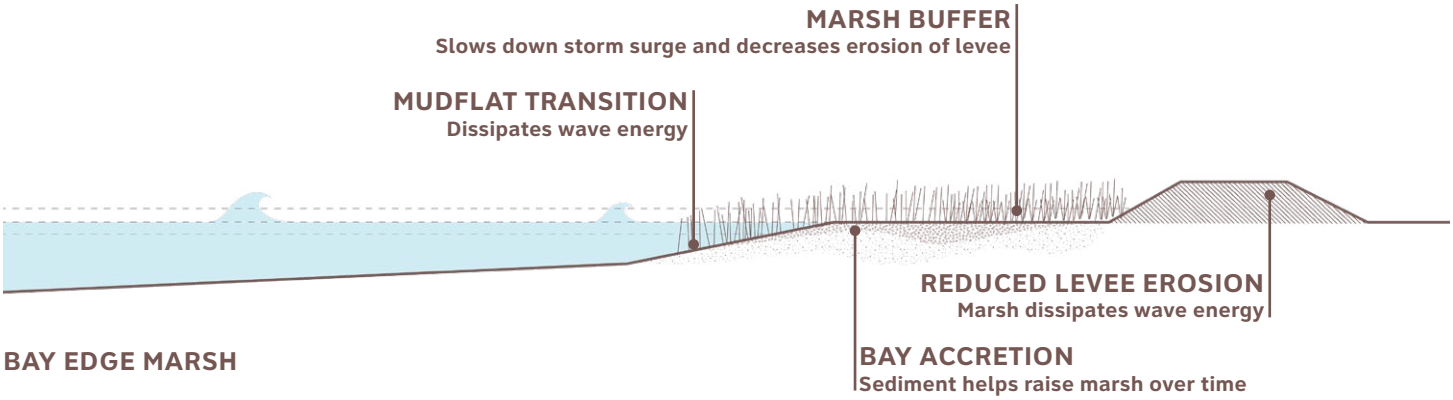
TIDAL MARSH RESTORATION

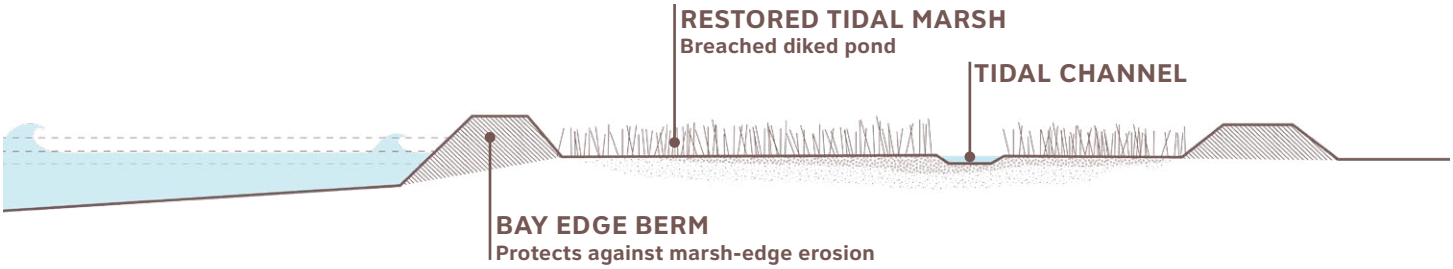
DESCRIPTION

In the face of climate change, protecting, maintaining, and restoring tidal marshes and their associated mudflats is critical to maintain flood control and ecosystem services. Techniques include restoring diked baylands, planting native species to accelerate colonization, placing sediment to raise subsided areas, and creating high tide refugia within marshes. Existing marshes have the capacity to vertically accrete along with sea level rise if they have sufficient sediment supply. In low sediment scenarios, they may convert to mudflats or subtidal ecosystems.

GOAL/OBJECTIVE

- Ecological enhancement (provide critical habitat)
- Reduce erosion risk along the shoreline and attenuate waves





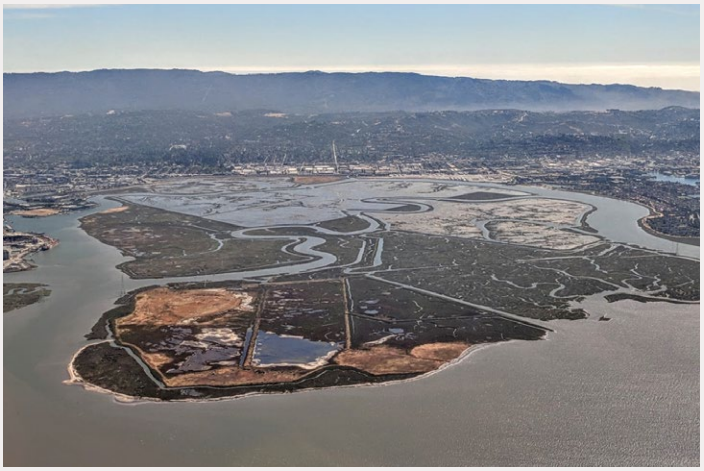
DIKED POND MARSH RESTORATION

Bair Island Wetland Restoration

Redwood City, CA

The breaching of perimeter levees of this formerly diked complex allowed for the restoration of tidal marshes to improve water quality, expand and enhance wildlife habitat, and reduce mosquito breeding conditions by restoring tidal flow.

- Formerly diked and drained for agriculture
- Restored 1,552 acres of tidal wetland
- Pedestrian bridge and trail access
- Subsided ponds were raised with dredge material and upland fill over 8 years with over 1.5 million CY of fill
- Perimeter levee was breached in the restoration



Aerial view of Bair Island after restoration
(www.smccvb.com)

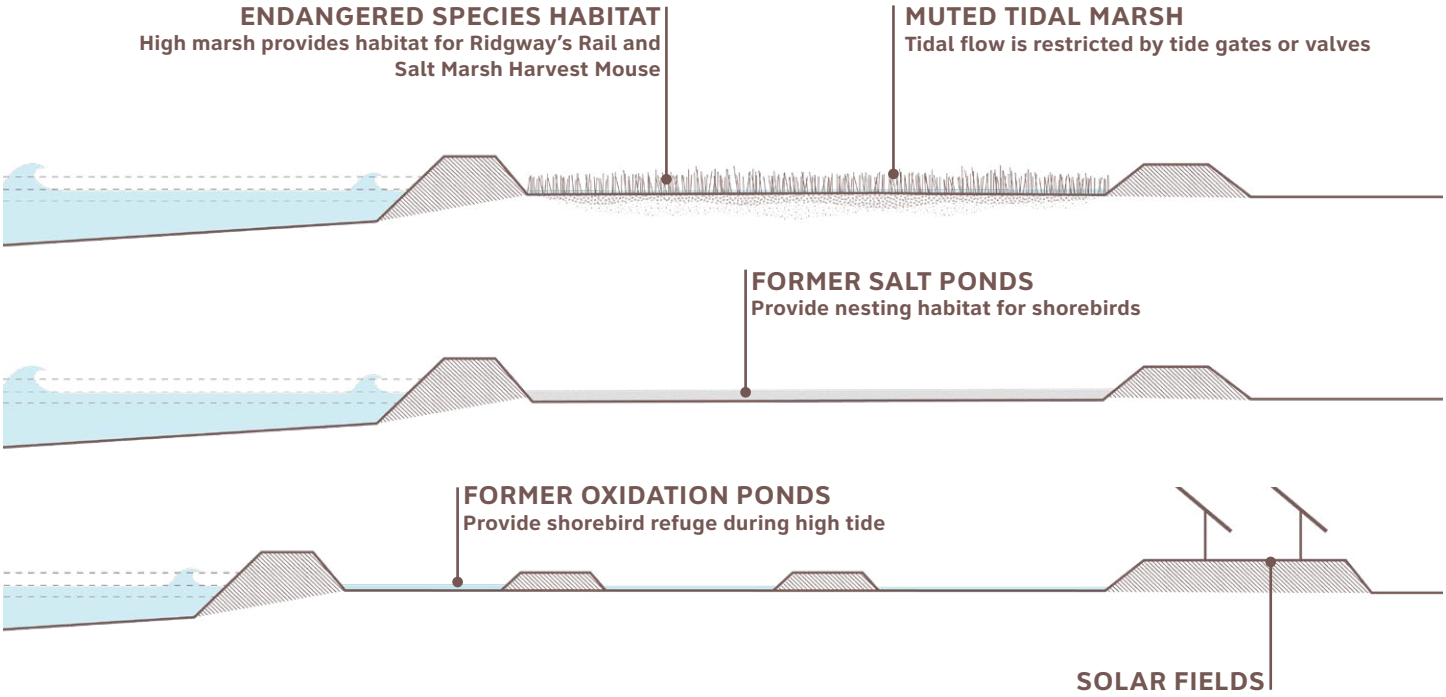
DIKED POND MANAGEMENT

DESCRIPTION

Diked baylands can be managed as flood retention basins or used for habitat purposes. Low-lying diked baylands can be used to increase stormwater storage capacity from precipitation or flood events to be drained and pumped to the Bay. They can also be used to store groundwater pumped from urban areas. Additionally, the dikes are often used to locate transmission lines, rail lines, wastewater lines, and other infrastructure. When used for habitat purposes, diked ponds can provide salt pond habitat for endangered species, particularly shorebirds.

GOAL/OBJECTIVE

- Flood control (provide stormwater storage space)
- Ecological enhancement (provide shorebird habitat)



Shorebird Marsh

Corte Madera, CA

Former tidal marsh that was diked and filled with construction refuse. Efforts between 1983-1974 restored tidal flow and designed the marsh with the dual purpose of providing shorebird habitat while serving as a stormwater detention basin.

- Delivered by a series of channels and lagoons, treated stormwater from the Town of Corte Madera collects in the low-lying marsh area
- Water levels are adjusted to increase storage capacity for winter storms and for seasonal enrichment of bird habitat. Ring levee surrounds and protects critical habitat within the marsh
- The water flow management regime reduces erosion and sedimentation from the connecting channel

Aerial view of Corte Madera Ecological Reserve
(Marin Independent Journal, 2018)

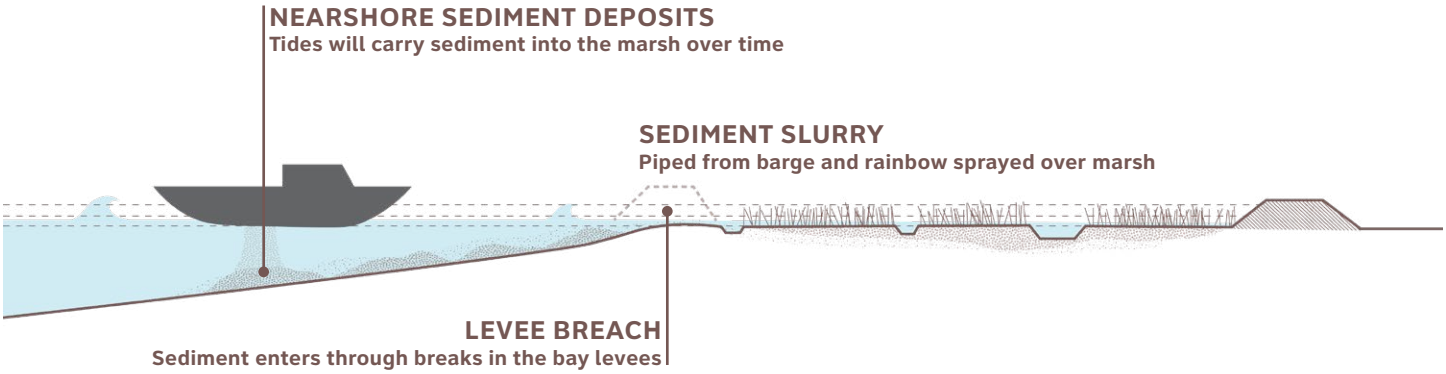
FINE SEDIMENT AUGMENTATION

DESCRIPTION

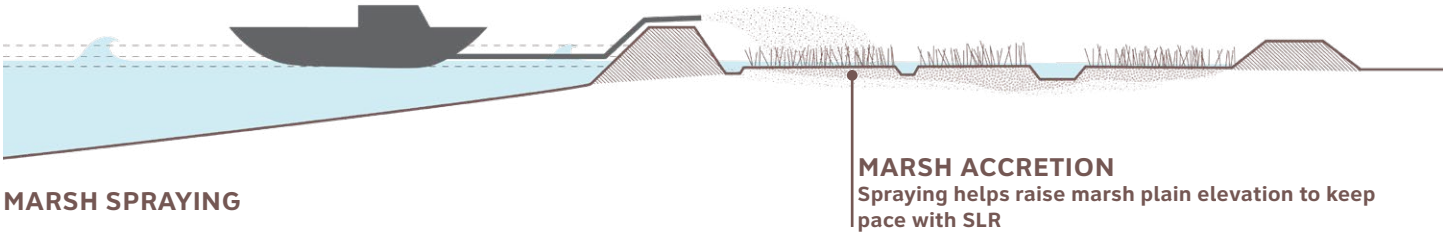
The direct or indirect placement of fine sediments increases mudflat and marsh elevation relative to the tides. This can help protect and sustain marshes, mudflats, and shorelines when sediment supply is low to help them accrete and keep pace with sea level rise. Techniques include water column seeding, nearshore placement, and thin layer placement.

GOAL/OBJECTIVE

- Maximize the potential of marshes to maintain themselves in the future with sea level rise



SHALLOW WATER PLACEMENT



MARSH SPRAYING

Salt Marsh Sediment Augmentation Project

Seal Beach, Orange County, CA

Subsidence, limited sediment accretion, and sea level rise led to the complete inundation of the refuge's Pacific cordgrass and eliminated natural rail nesting areas during high tide. The marsh was augmented with thin-layer sediment placement to raise the marsh plain to keep pace with SLR.

- 10" layer of sediment applied through rainbow spraying from sediment slurry delivered via a floating or submerged pipeline directly from a dredge or barge
- Thin-layer placement of sediment on 8 acres of existing low salt marsh habitat
- One of the goals was to improve Rail habitat

'Rainbow' spray of sediment onto the augmentation site
(Rick Nye)

TRIBUTARY CONNECTION TO BAYLANDS

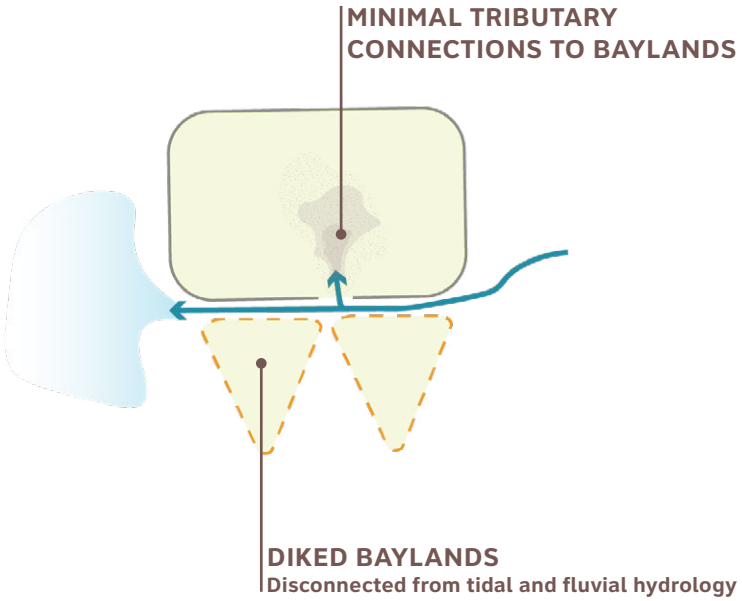
DESCRIPTION

Reconnecting creeks to their adjacent baylands through levee breaching or removal helps improve sediment supply, nutrient, and freshwater delivery to the Baylands while achieving flood risk management and habitat benefits.

GOAL/OBJECTIVE

- Ecological enhancement (restore sediment and tidal flows for marsh restoration / health)

BEFORE



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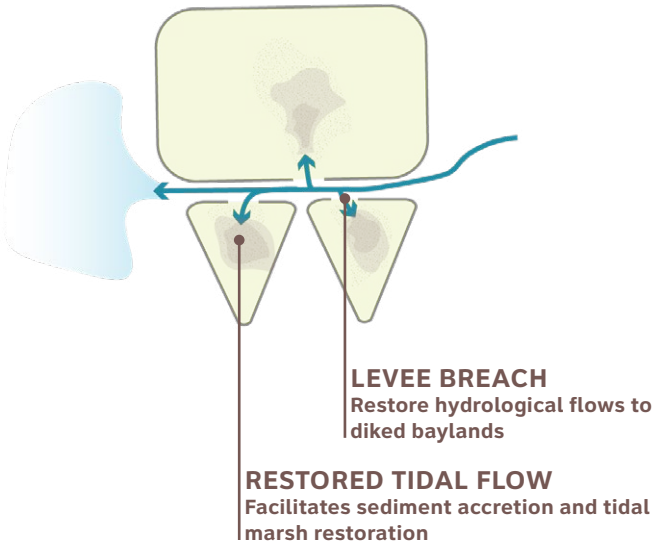


Lower Walnut Creek Restoration Project

Contra Costa County, CA

The project will restore and enhance wetlands and associated habitats while also providing sustainable flood management and increased resiliency to sea level rise. Restoration will allow increased opportunities for public access and recreation.

- In 2014, legislation removed the USACE from management of the lowest 4 miles of Walnut and Pacheco Creeks
- Creeks are now locally controlled by the FCD, allowing restoration work
- On-site placement of material
- Improved biological connectivity- levee lowering and marsh plain excavation

Walnut Creek and adjacent marsh
(www.contracosta.ca.gov)

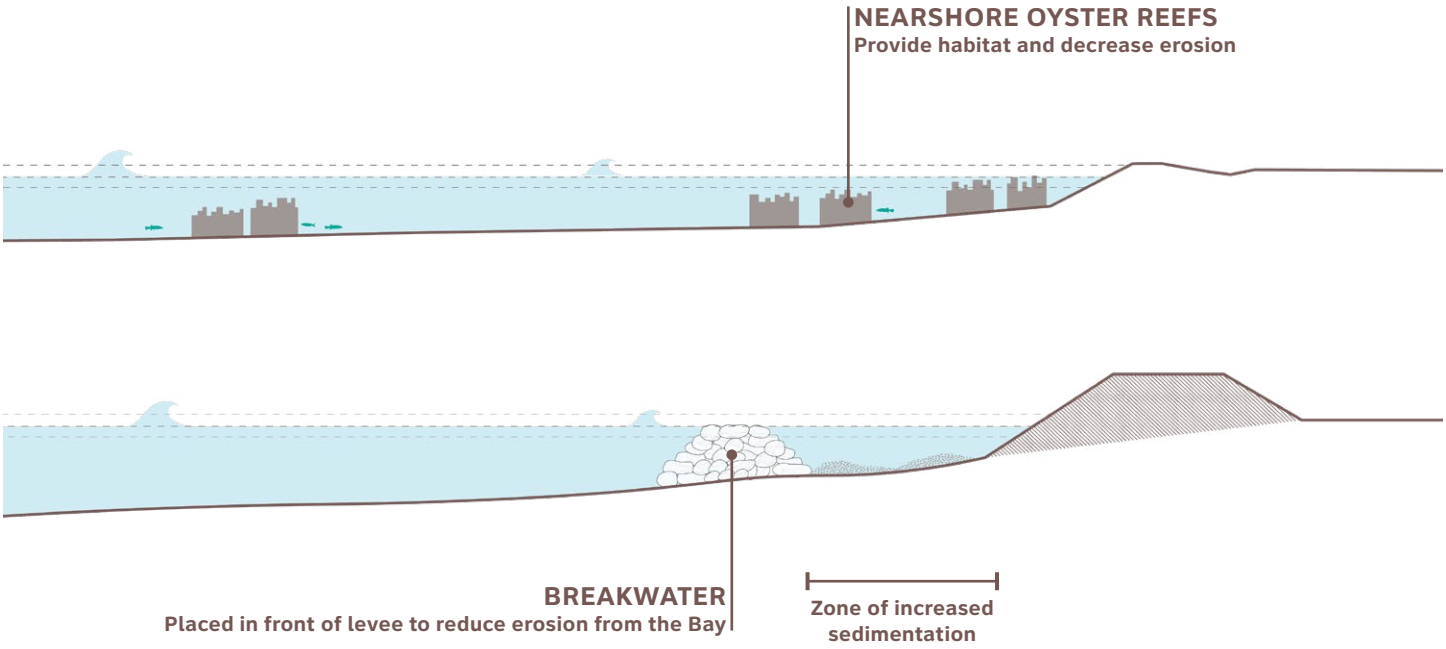
REEFS AND BREAKWATERS

DESCRIPTION

Nearshore reefs made of oyster shell and Baycrete (a cement mixture composed mostly of Bay sand and shells) provide hard substrate for shellfish and other aquatic plants and animals. They can reduce wave transmission at lower tidal elevations and stabilize areas in their lee. Breakwaters reduce the intensity of wave action in inshore waters, thereby reducing coastal erosion.

GOAL/OBJECTIVE

- Reduce erosion to critical infrastructure
- Ecological enhancement (hard substrate habitat)



SCC Living Shorelines Project

San Francisco Bay, CA

Living shorelines use nature-based infrastructure to create shoreline buffers that reduce impacts of sea level rise and erosion, while creating habitat for fish and wildlife.

- 350 oyster reef elements are made of a mixture of native sand and oyster shell mixed with cement
- Subtidal habitat restoration of native oyster and eelgrass beds, provide habitat for Pacific Herring and Olympia Oyster
- Natural structures buffer and protect adjacent tidal wetlands

Oyster Reef Installation
(www.scc.ca.gov)

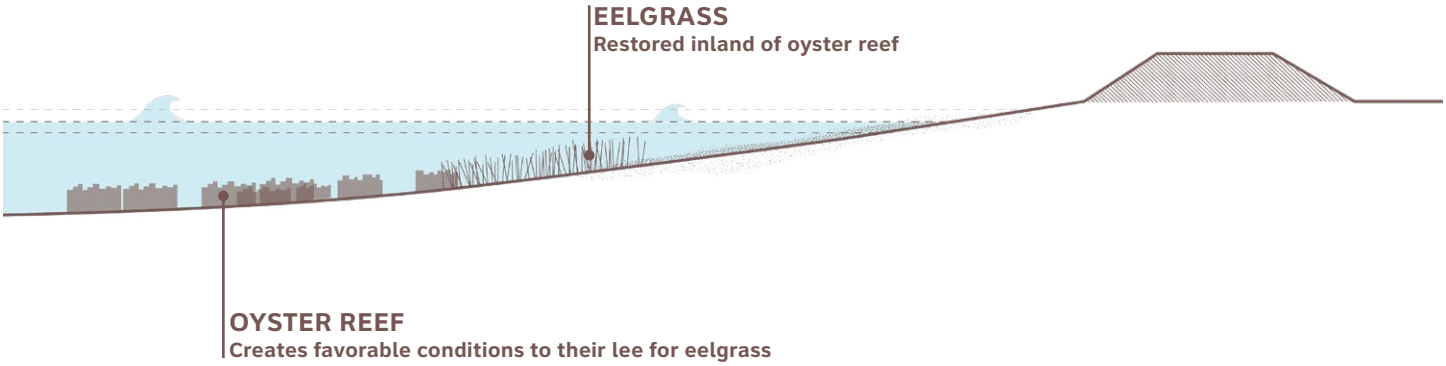
EELGRASS RESTORATION

DESCRIPTION

Eelgrass is submerged aquatic vegetation that contributes to trapping sediment and slowing shoreline erosion. Habitat suitability depends on depth of water, light, current speed, exposure to wind waves, water temperature, and salinity.

GOAL/OBJECTIVE

- Ecological enhancement (provides habitat)



SCC Living Shorelines Project

San Francisco Bay, CA

Eelgrass provides valuable ecological services by supporting diverse communities of invertebrates, fish, and waterfowl. Eelgrass is one of several habitat elements combined at Giant Marsh to create a living shoreline.

- Subtidal habitat restoration of native oyster and eelgrass beds
- Use natural structures to buffer and protect adjacent tidal wetlands

Eelgrass planting
(www.caseagrant.ucsd.edu, 2016)

Cogswell Marsh, looking towards CalPine / Russell City Energy Center

HARD INFRASTRUCTURE STRATEGIES

This section provides a catalog of engineered design strategies that are usually constructed with harder materials and mainly address the adaptation of built assets to sea level rise.

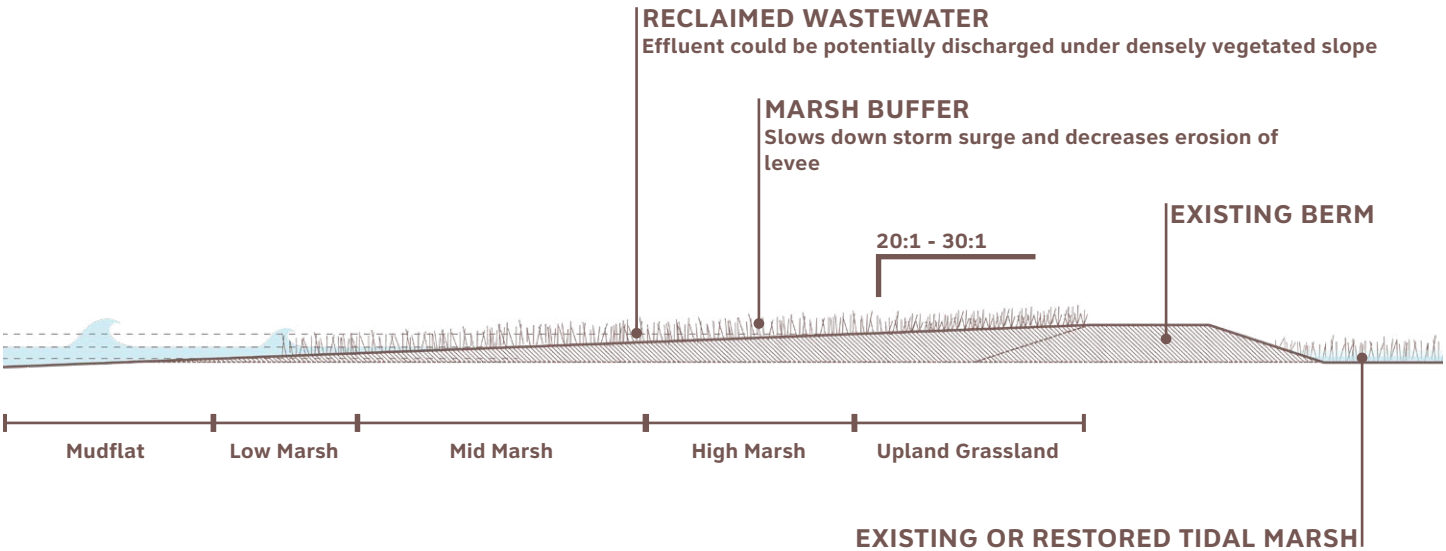
ECOTONE LEVEE

DESCRIPTION

Ecotone levees are vegetated gentle slopes or ramps on the bay side of a levee. They can attenuate waves, provide high-tide refuge for marsh wildlife, and allow room for marshes to migrate upslope with sea level rise. Ecotone levees have a larger footprint but can provide many resilience benefits.

GOAL/OBJECTIVE

- Provide flood protection
- Enhance ecological function (provide transition zone, marsh migration space)



Oro Loma Sanitary District

Alameda County, CA

A partnership between the Oro Loma and Castro Valley Sanitary Districts, UC Berkeley, Save the Bay, and others, this project is testing different techniques to utilize natural systems to filter wastewater and protect the shoreline.

- Vegetated slope on Bay side of levee serves as a natural alluvial fan / creek mouth
- Restores groundwater flow that used to occur with treated wastewater
- Vegetated slope of 30H:1V filters the water over 150 linear feet
- Potential to further decentralize EBDA pipeline

Demonstration project at Oro Loma Sanitary District
(www.oroloma.org)

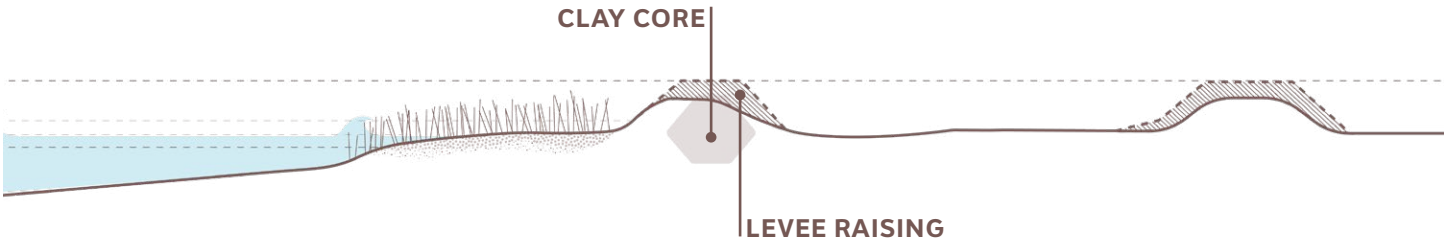
LEVEE IMPROVEMENTS

DESCRIPTION

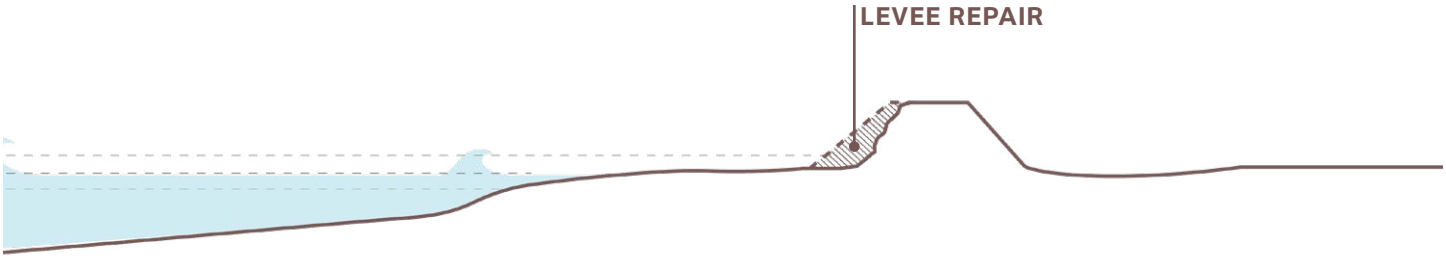
Existing levees can be raised, repaired, or strengthened to increase their resiliency to storms and sea level rise.

GOAL/OBJECTIVE

- Provide further flood protection
- Reduce erosion to marshes / infrastructure in their lee
- Enhance recreational opportunities



LEVEE RAISING



LEVEE REPAIR

Southport Sacramento River Levee Improvement Project

Sacramento County, CA

A combination of existing levee improvements and embankment setbacks will increase flood protection and repair the most vulnerable part of the City's levee system to achieve a 200-year minimum level of levee performance for West Sacramento.

- Flood-risk reduction measures along vulnerable levee segments of the Sacramento River
- Includes construction of levee embankment, cutoff walls, seepage berms, and associated relocation and improvement measures
- An increased floodplain between the old and new levee allows for wetland creation and increased storage space

Sacramento River levee
(www.blackburnconsulting.com, SkyHigh Perspectives)

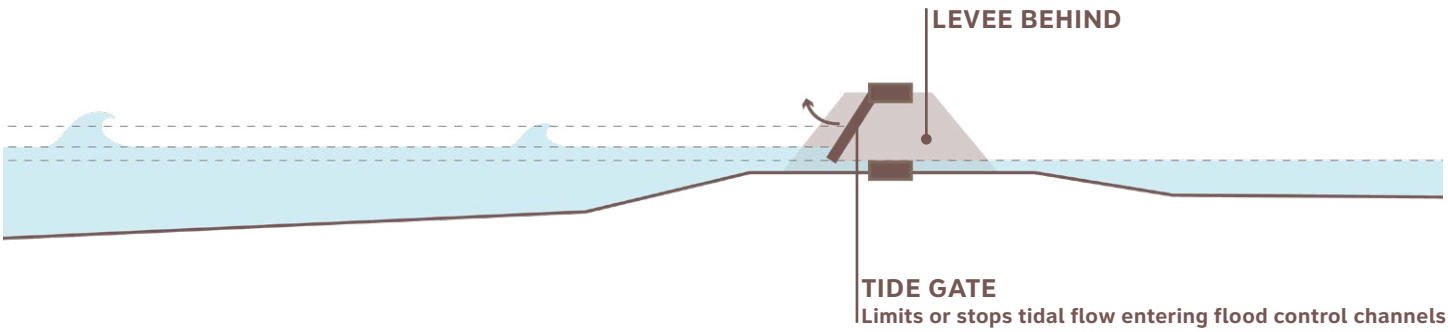
TIDE GATES & WATER CONTROL STRUCTURES

DESCRIPTION

Tide gates control the movement of water, specifically from a tidewater area and a drained, upland area. The gates have hinged doors at the end of culverts; they are controlled by mechanisms that open or close them as tides ebb and flow.

GOAL/OBJECTIVE

- Flood protection (prevent tidal water from entering channel, allow stormwater out)
- Limit maximum elevation of water ("muted tidal"- tide gates close at a certain elevation, open at same elevation on ebb tide)



Ballona Wetlands Project

Los Angeles County, CA

600 acres of the once 2,000-acre mosaic of marshes, mud flats, salt pans, and sand dunes make up the Ballona Wetlands Reserve. A new tide gate is part of the Ballona Wetlands Restoration Project to revive natural coastal wetland functions where they were drastically reduced by residential development.

- Manages flood control while allowing water to flow into the Reserve - recreating a tidal influence
- Enables fish to access wetland habitat
- Increased tidal flushing enhances aquatic habitat
- Seawater within the salt marsh reaches one meter in height

Tide gate enables water flow into the reserve
(http://www.goldenharvestinc.com/)

WASTEWATER TREATMENT ADAPTATION

DESCRIPTION

There is potential to retrofit wastewater treatment plants along the shoreline, where they are vulnerable to sea level rise. There is interest in studying the decentralization of WWTP treated discharge, the repurposing of the EBDA pipeline, and the potential to introduce freshwater inputs to the shoreline with horizontal levee features and other methods of water polishing and local discharge. There is also a need to adapt wastewater treatment infrastructure through raising critical assets or providing flood protection.

GOAL/OBJECTIVE

- Reduce risk to regional critical utilities

MAP OF EBDA PIPELINE

Novato Wastewater Treatment Plant

Novato, Marin County, CA

An upgraded plant replaced two aging facilities and combines the capacity to meet future needs with a reduced carbon footprint through greater energy efficiency.

- New WWTP was raised to improve the hydraulic gradient so wastewater flows depend more on gravity and less on pumping. Added bonus is that it is less vulnerable to sea level rise, some parts were raised 10 to 14 feet higher
- Lowered energy costs dramatically by cutting pumping demand in half
- The sewer collection system master plan is working to upgrade, improve, and maintain the whole collection system for the Novato Sanitary District

Aerial view of upgraded plant
(Novato Sanitary District)

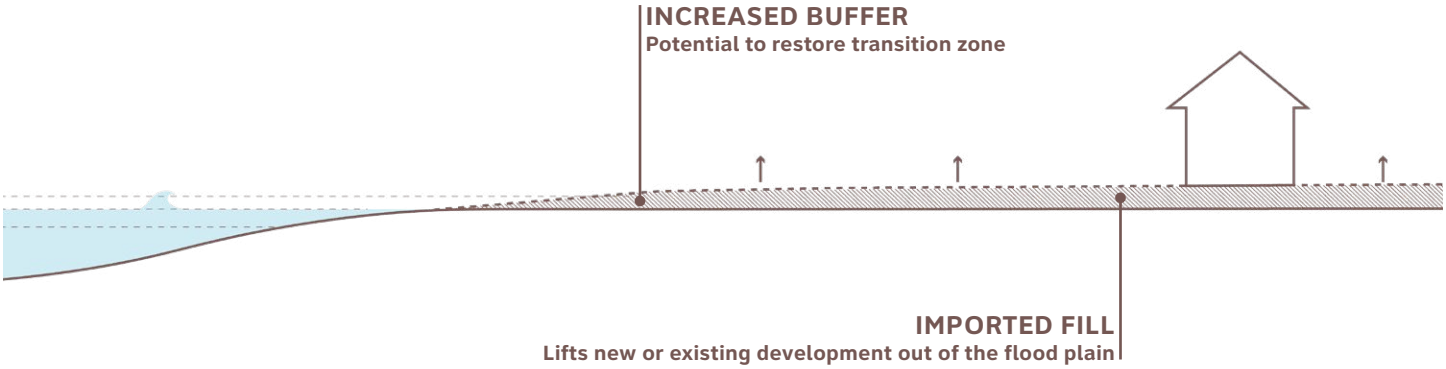
LAND ELEVATION

DESCRIPTION

Elevating the ground level at the site or district scale above the design flood elevation lifts future development and transportation assets out of the flood zone and reduces the risk of groundwater emergence. This is often done to reduce the risk of flooding for new development or new uses.

GOAL/OBJECTIVE

- Reduce risk to SLR, flood events, and groundwater emergence



Arverne-By-The-Sea

New York City, NY

Developers added more than half a million cubic yards of fill to raise most of the site 3-9' above the 100 year flood level. Combined with a number of other resiliency features such as expanded beach, fortified dunes, extensive stormwater drainage, and on-site stormwater retention, this strategy protected the infrastructure during Superstorm Sandy.

- Wide beach and fortified dunes act as first line of defense against storm surges and sea level rise.
- Sandy dunes may not settle as much as compacted fill
- Resilience measures help avoid significant damage in storm events and save costs associated with flood insurance

Aeral view of raised community
(www.housingmatters.urban.org)

HAYWARD-SAN MATEO BRIDGE LANDING

DESCRIPTION

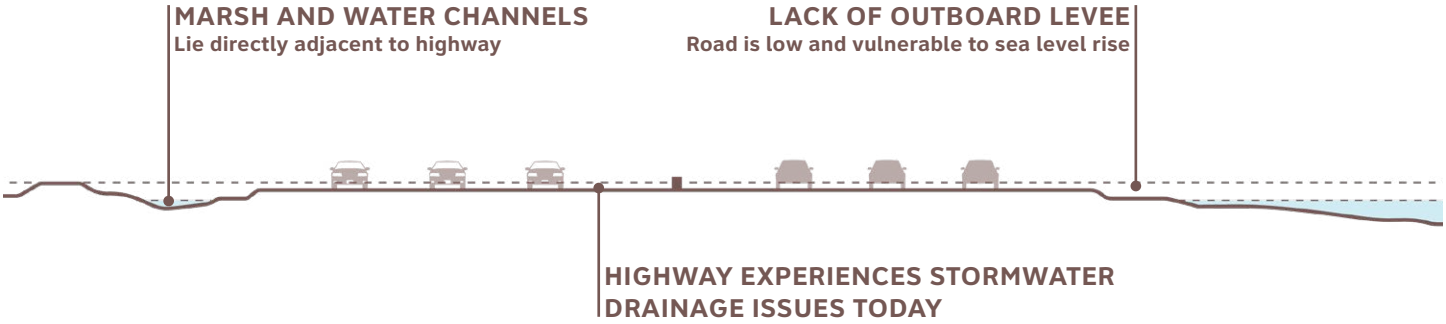
The eastern approach to the Hayward-San Mateo Bridge (SR-92) is critical infrastructure that is vulnerable to inundation by sea level rise. SR-92 is used by 86,000 passengers, 1,600 transit riders, and 6,000 trucks daily. Any flooding of the bridge and approaches would impact regional mobility and increase congestion.

The following adaptation strategies were considered by the Design Team for the Hayward-San Mateo Bridge landing:

- Flood walls on both side of SR-92
- Flood protection levees on both side of SR-92
- Elevate SR-92 / Embankment
- Raise SR-92 on Piles / Causeway
- Floating bridge

GOAL/OBJECTIVE

- Reduce risk to transportation infrastructure from SLR, groundwater intrusion, and flood events



EXISTING CONDITION

Miami Beach: Rising Above

Miami Beach, Miami-Dade County, FL

City of Miami Beach aims to have all roads elevated to 3.7'NAVD88 to mitigate flooding issues.

- Roadways in Sunset Harbor Neighborhood have been raised by approximately 3 feet
- Sidewalks and adjacent public space have been retrofitted to align with the increased road elevation

Raised road during construction
(http://www.mbrisingabove.com/)

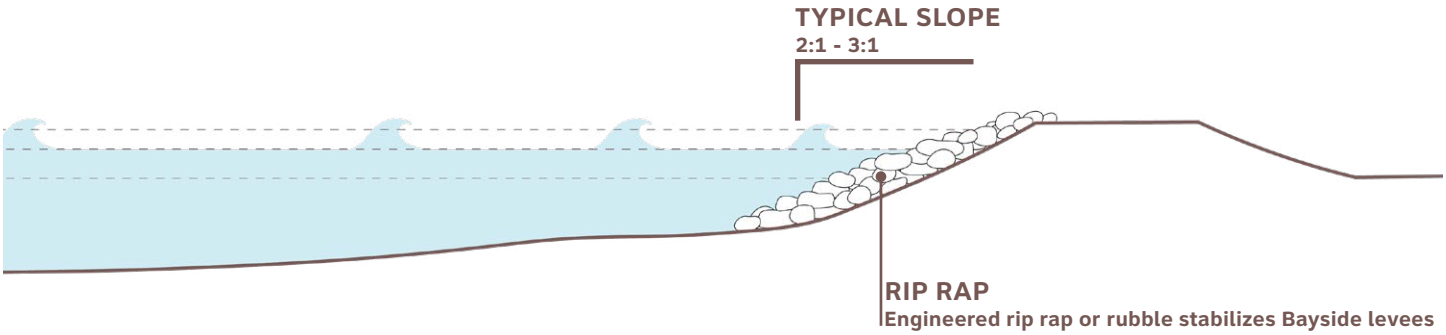
REVETMENTS

DESCRIPTION

Edge stabilization provides protection along tidal areas to prevent wave erosion. Revetments are hardened structures made of concrete, rocks, wood, or other materials that are placed along waterways to stabilize them against wave erosion. Riprap, which is rock or concrete, is the most common form of shoreline protection revetment structure in San Francisco Bay.

GOAL/OBJECTIVE

- Reduce erosion along levees, landfills, and marshes



Eastern Scheldt Dike Enhancement

Zeelandbrug, The Netherlands

Dike enhancement included the provision of tidal pools, or "eco-basins," intended to improve biodiversity and bio-productivity.

- Important design parameters include the shape and the slope of the structure, the choice of materials, the size distribution, and the porosity of the structure
- Stones were loosely stacked to provide spaces that shelter species from predators. Stones are heavy enough to withstand the forces of wave impact
- The design could be tailored to provide habitat for reef builders such as mussels and oysters (including associated species, such as crabs), or for macro-algae, which provide habitat for fish and invertebrates

Tidal pool along stabilized revetment
(www.publicwiki.deltares.nl)

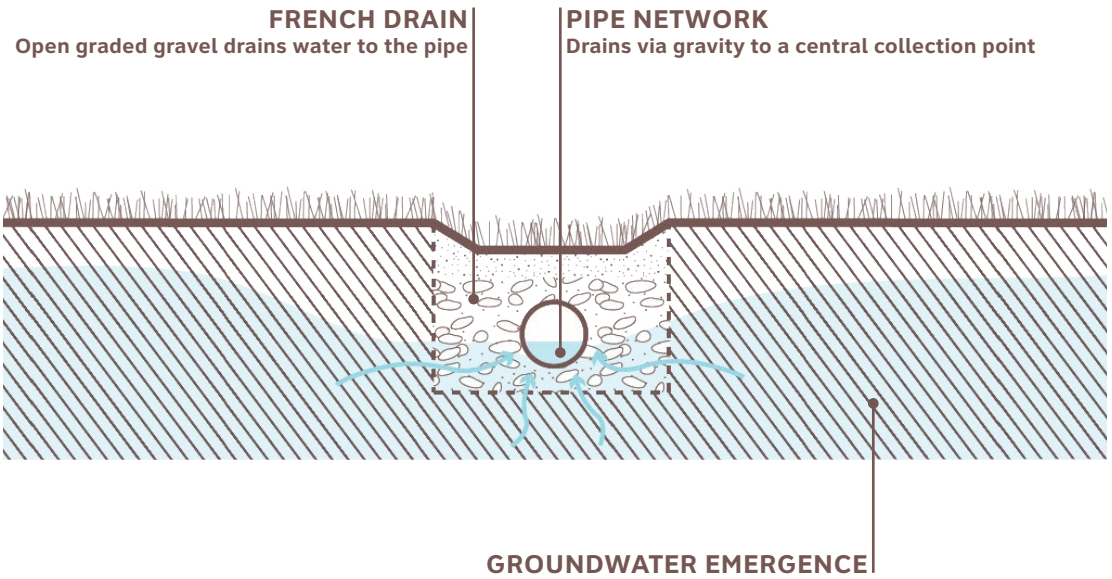
SUBSURFACE DRAINAGE

DESCRIPTION

Rising groundwater tables can be addressed through an expanded subsurface drainage network that feeds into trenches/canals that flow to the bay at low tide, or through wells and pumping. Tide gates are needed to prevent the influx of high tides. This strategy would require additional inland storage space to collect and manage groundwater during storm events while it is pumped to the Bay.

GOAL/OBJECTIVE

- Reduce risk of groundwater emergence



NON-STRUCTURAL STRATEGIES

This section provides a catalog of design strategies that deal with policies and regulations that can help built and natural assets adapt to sea level rise.

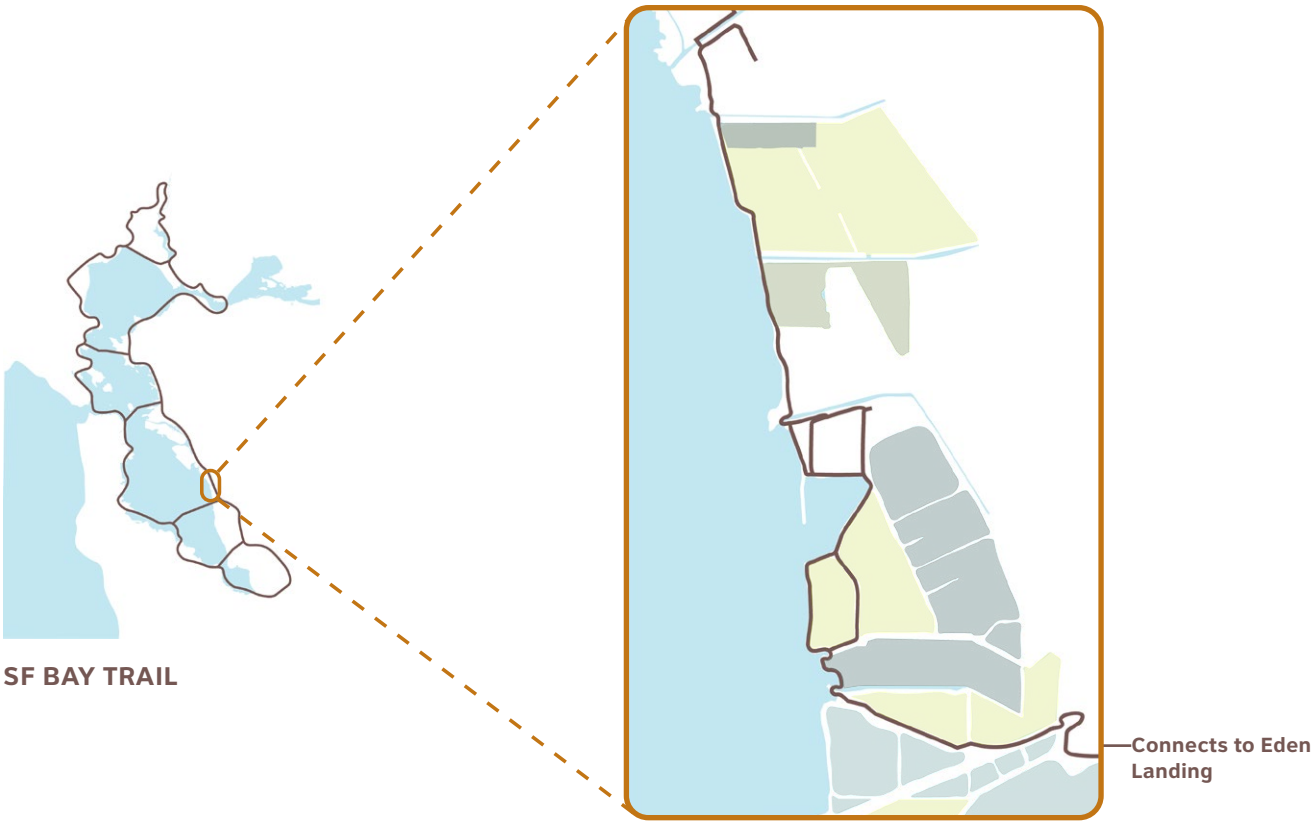
PUBLIC ACCESS & THE BAY TRAIL

DESCRIPTION

Public access strategies include Bay Trail adaptation plans, additional sites for public access, new types of recreation, expansion of the San Francisco Bay Water Trail, and enhanced connections. Aligning with other adaptation and restoration projects may enhance recreation benefits and increase community connections.

GOAL/OBJECTIVE

- Enhance recreational opportunities and adapt to SLR
- Create a management framework for adapting to SLR over time



Bay Trail flooding during Jan 2017 King Tide
(H.A.R.D., 2017)

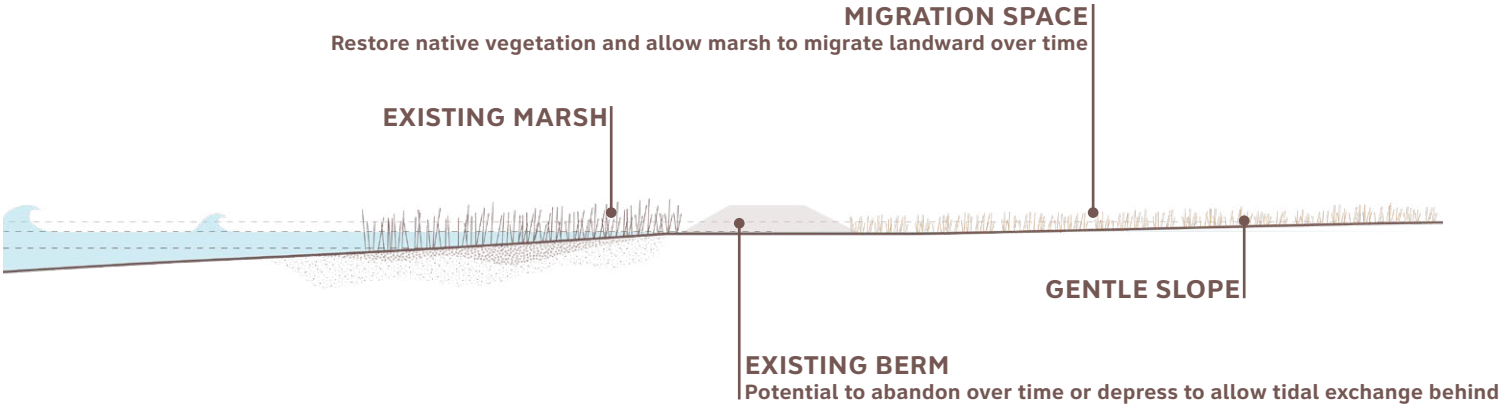
MARSH AND MUDFLAT MIGRATION PLANNING

DESCRIPTION

Natural wetland-upland transition zones adjacent to present and potential marshes can be protected, enhanced, or restored to allow marshes to migrate landward as sea level rises. This can be paired with levee / berm realignment and other flood control projects and may require the removal of berms to ensure hydrological connectivity.

GOAL/OBJECTIVE

- Create a management framework for adapting to SLR over time



North Richmond Shoreline Vision

Richmond, Contra Costa, CA

The shoreline area will provide space for marshes to migrate landward as sea level rises. The plan's strategies include:

- Acquiring contiguous shoreline parcels from willing sellers to protect and conserve open space
- Connecting and completing Bay Trail segments to improve and increase shoreline access and public understanding
- Supporting compatible uses within the transition zone such as renewable energy pilot projects
- Completing Giant Marsh Living Shorelines project and other opportunities to restore and enhance a diversity of habitats

Aerial view of North Richmond shoreline
(www.sfestuary.org)

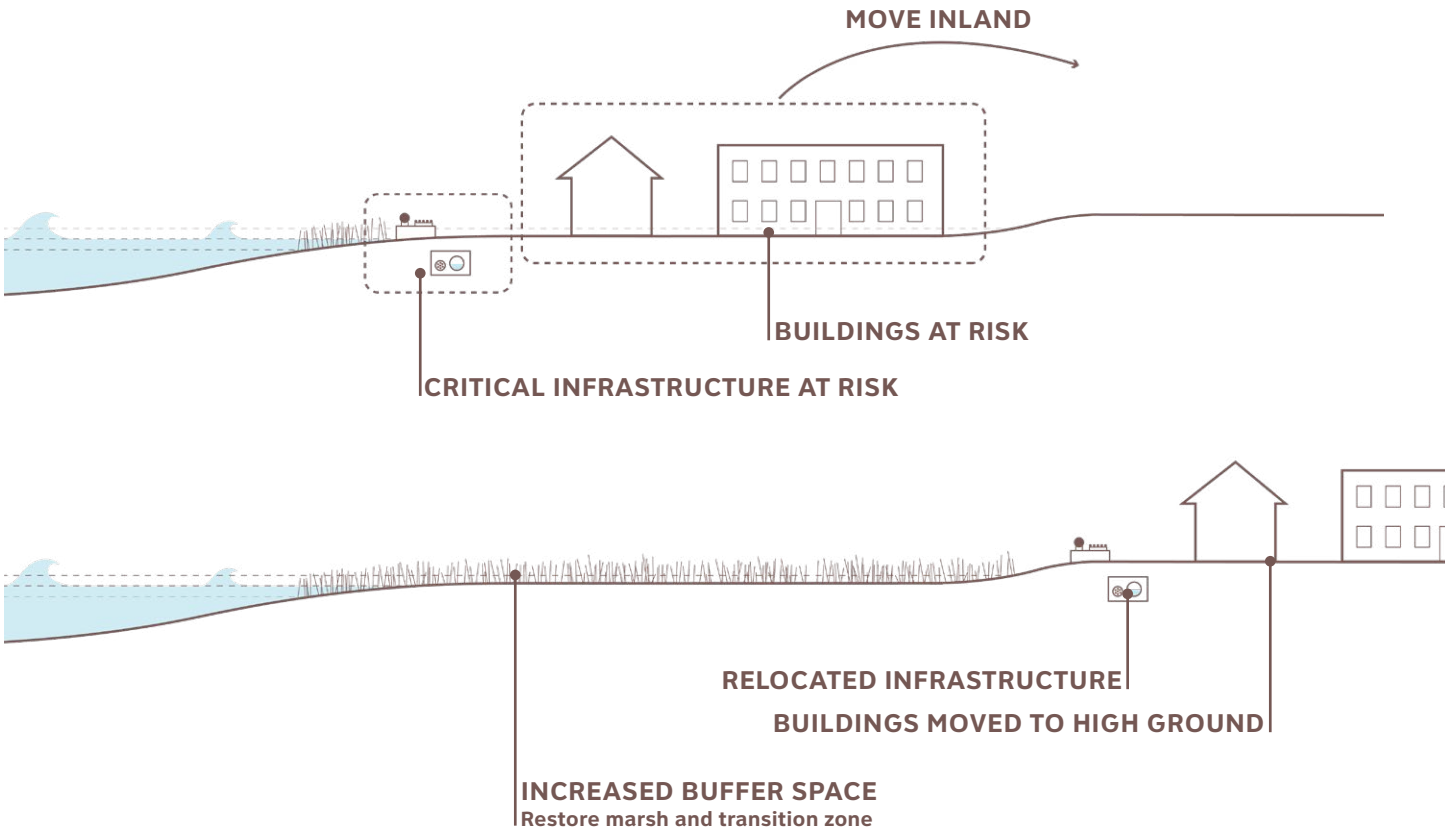
MANAGED RETREAT

DESCRIPTION

Managed retreat is a management strategy for retreating from vulnerable coastal areas, moving the shoreline inland, and restoring natural areas, thereby providing a buffer from flooding and better managing hazard risk.

GOAL/OBJECTIVE

- Create a management framework for adapting to sea level rise over time



America Center Drive

San Jose, Santa Clara County, CA

America Center is a 63-acre brownfield redevelopment project that contains 30 acres of land preserve dedicated for burrowing owl habitat. Phase 1 of the project included two six-story office buildings located on top of a closed landfill that extends 65' deep. Phase 2 added two more buildings in 2018.

- Concrete reinforced piles were used after cores were drilled out to avoid environmental contamination from pile driving through land fill

Access roads were raised to reach the higher elevation (www.steelwavellc.com)

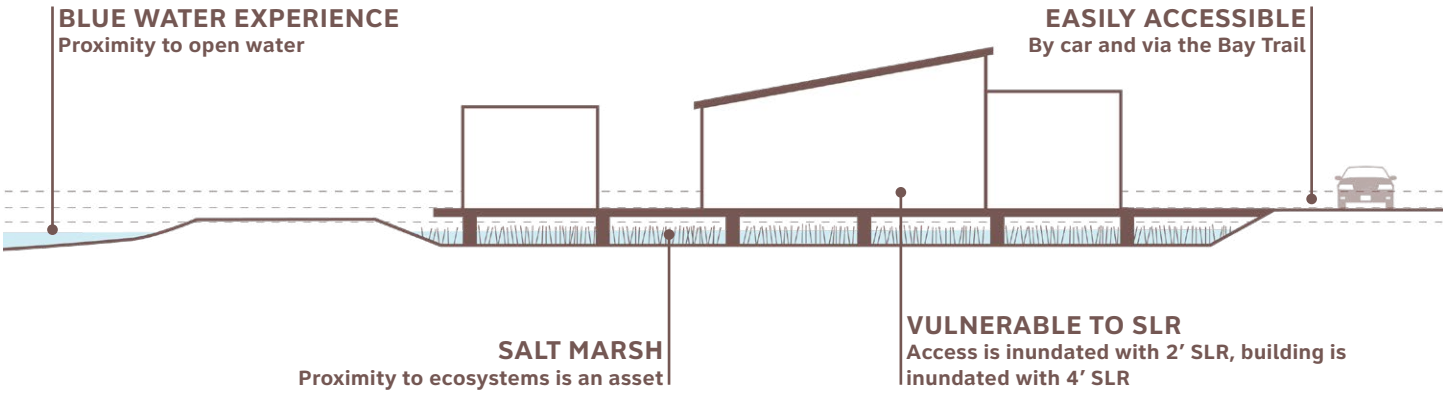
RELOCATION OF HAYWARD SHORELINE INTERPRETIVE CENTER

DESCRIPTION

Relocation or retrofitting strategies may help the Hayward Shoreline Interpretive Center maintain its educational program and adapt to sea level rise. Pairing relocation with new restoration or pilot projects can provide new educational and stewardship opportunities.

GOAL/OBJECTIVE

- Enhance educational opportunities and adapt to sea level rise
- Create a management framework for adapting to sea level rise over time



Arcata Marsh & Wildlife Sanctuary

Arcata, Humboldt County, CA

The Arcata Marsh Interpretive Center has interactive exhibits, free maps and literature, and a bookstore. It is located directly adjacent to a series of sewage treatment ponds and wetlands.

- Arcata's wastewater is treated locally, utilizing natural wetland processes
- Combination of treatment plant, publicly accessible wetlands, wildlife habitat, and recreational opportunities
- Interpretive Center has interactive exhibits, free maps and literature, bird checklists, and a bookstore.

Arcata Marsh Interpretive Center
(George Ziminsky, 2013)

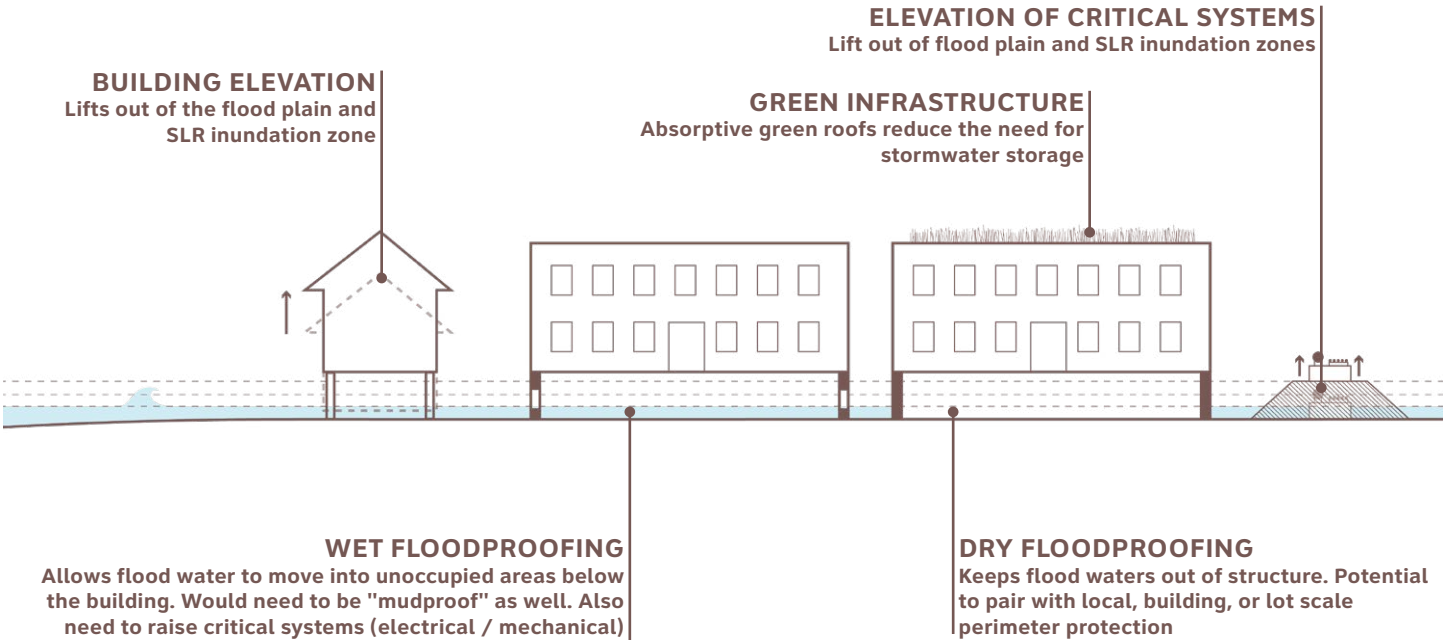
BUILDING SCALE STRATEGIES

DESCRIPTION

There are many building scale strategies that can be implemented to adapt to sea level rise, from improving standards, such as building codes and removing regulatory impediments, such as zoning height restrictions. The City can also aid businesses and homeowners to assist them with understanding the resilience options available to them and with finding the funding to support those options.

GOAL/OBJECTIVE

- Improve design of buildings to increase resiliency to SLR and climate change



HafenCity

Hamburg, Germany

To protect them from storm surge, all buildings in HafenCity are built on artificially structured plinths that are compacted to a height of 8-9 meters above sea level. In the interior of HafenCity, the plinths provide ample space for underground carparks, reducing the amount of car parking space required in the streets of the new development.

- All streets and bridges are sited at flood-protected levels, at least 7.8-8.5 meters above sea level to prevent flooding
- Water levels are adjusted to increase storage capacity for winter storms and for seasonal enrichment of bird habitat

HafenCity is designed to withstand repeated flooding front the Elbe River (Steven Valentino / WNYC)

Line A, looking south at the industrial neighborhood edge

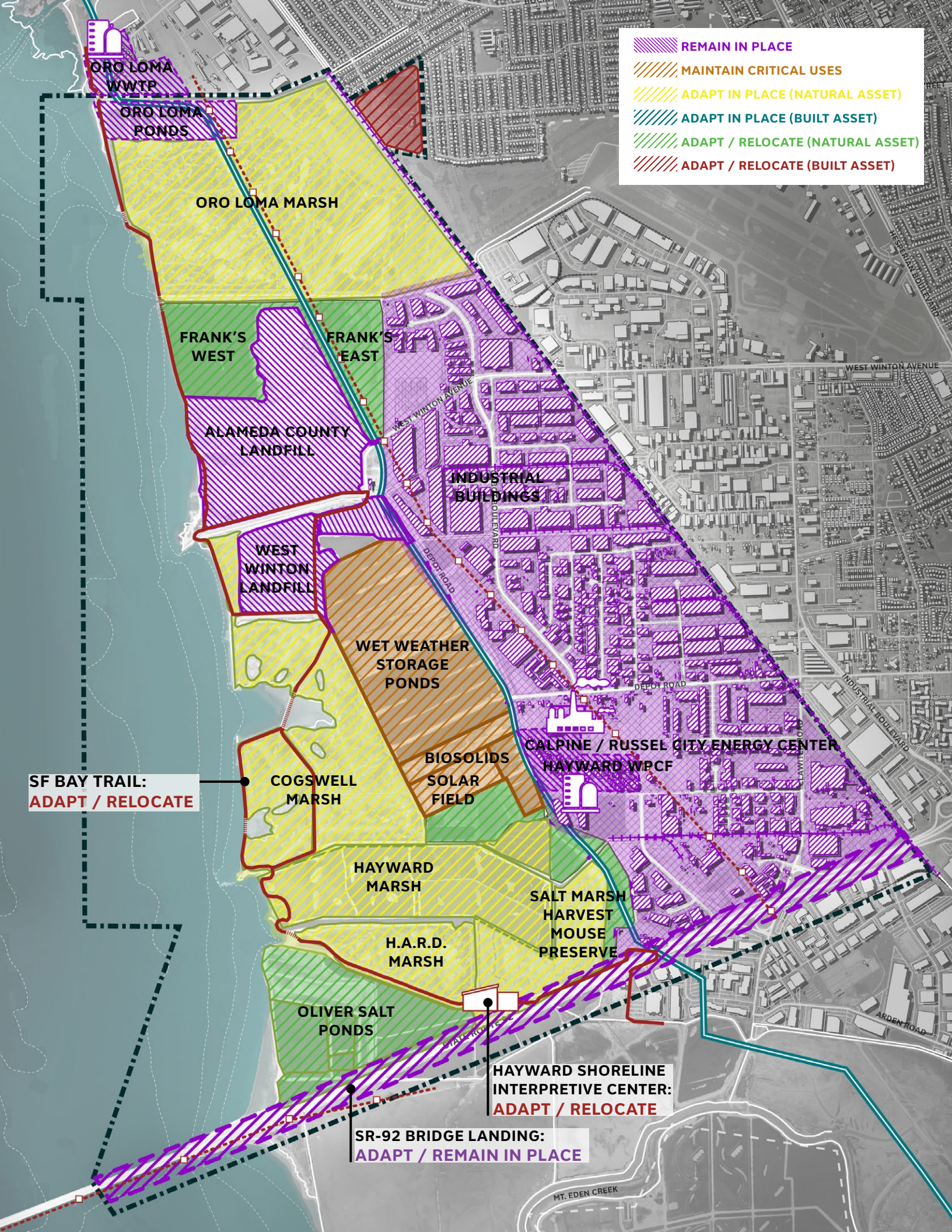

NEXT STEPS
Task 5
DESIGN STRATEGIES
DESIGN ALTERNATIVES
PREFERRED ALTERNATIVE
NO ACTION ALTERNATIVE
DESIGN ALTERNATIVE #1
DESIGN ALTERNATIVE #2
DESIGN ALTERNATIVE #3
DRAFT MP
FINAL MASTER PLAN

DESIGN ALTERNATIVES & FEEDBACK

This chapter provides an overview of the project parameters and considerations, including the Master Plan assumptions and policy considerations. It also includes a summary of the different Design Alternatives, associated feedback, and evaluation points.

PROJECT PARAMETERS & CONSIDERATIONS

This section provides an overview of the Master Plan assumptions and policy considerations.


REMAIN IN PLACE
MAINTAIN CRITICAL USES
ADAPT IN PLACE (NATURAL ASSET)
ADAPT IN PLACE (BUILT ASSET)
ADAPT / RELOCATE (NATURAL ASSET)
ADAPT / RELOCATE (BUILT ASSET)
ORO LOMA WWTP
ORO LOMA PONDS
ORO LOMA MARSH
FRANK'S WEST
FRANK'S EAST
ALAMEDA COUNTY LANDFILL
WEST WINTON LANDFILL
INDUSTRIAL BUILDINGS
WET WEATHER STORAGE PONDS
BIOSOLIDS SOLAR FIELD
CALPINE / RUSSEL CITY ENERGY CENTER
HAYWARD WPCF
SF BAY TRAIL:
ADAPT / RELOCATE
COGSWELL MARSH
HAYWARD MARSH
SALT MARSH HARVEST MOUSE PRESERVE
H.A.R.D. MARSH
OLIVER SALT PONDS
HAYWARD SHORELINE INTERPRETIVE CENTER:
ADAPT / RELOCATE
SR-92 BRIDGE LANDING:
ADAPT / REMAIN IN PLACE
WEST WINTON AVENUE
DEPOT ROAD
INDUSTRIAL BOULEVARD
LAWRENCE ROAD
ARDEN ROAD
MT. EDEN CREEK

MASTER PLAN ASSUMPTIONS

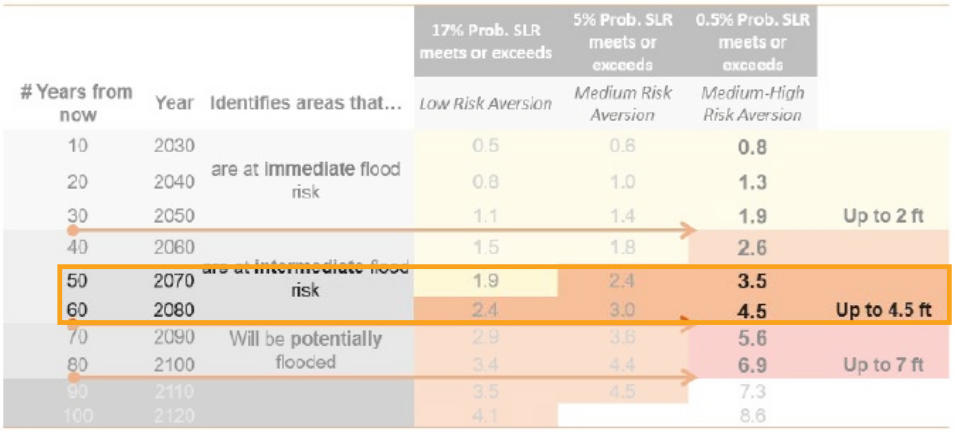
OVERARCHING ASSUMPTIONS

The Master Plan Assumptions helped inform the planning and alternative selection process. They summarize client and stakeholder feedback and set a framework to generate and compare the Design Alternatives.

- The plan aims to preserve and enhance the ecological features of the Hayward Regional Shoreline over time. Many Bayland ecosystems, like tidal marshes and mudflats, require connectivity to the Bay for survival, but are also vulnerable to sea level rise.
- The plan assumes that there will be **little change to the urban fabric** (streets, buildings), **economy, land use, and critical built infrastructure** on the site over the planning horizon.
- The plan is considering a **perimeter protection approach to critical assets** and an **adaptation approach to shoreline ecosystems.** This approach has been developed in conversation with many stakeholders and landowners in the project area.
- **Non-structural strategies,** such as retreat and land elevation, are not articulated in this plan, although they will be layered on to further reduce risk, and would likely be required to adapt to a higher SLR scenario long-term.
- The plan is looking at **reducing risk to critical assets** from **daily tidal inundation and future 100-year storm surge in a up to 4' of sea level rise scenario**.
- For planning purposes, the Project Team has been considering a **target elevation of 14.3"** (NAVD 88) to evaluate the various Design Alternatives and to assess the feasibility of the Preferred Alternative
- The plan is based on adapting the project area over a **mid-range time frame.** Based on State guidance, this time frame is estimated to be between 50 and 60 years long.

SLR	MHHW + SLR	MHHW + SLR + 100 YEAR STORM	MHHW + SLR + 100 YEAR STORM + 2' FREEBOARD	MHHW + SLR + 500 YEAR STORM
0'	7'	10.3'	12.3'	11.3'
2'	9'	12.3'	14.3'	13.3'
4'	11'	14.3'	16.3'	15.3'
7'	14'	17.3'	19.3'	18.3'

Design Flood Elevations with Sea Level Rise
(For planning purposes only)



Sea Level Rise increments by time horizon and level of risk aversion
(California Coastal Commission reccomendations, 2018)

Cogswell Marsh, looking from West Winton Landfill

MASTER PLAN ASSUMPTIONS

SITE ASSETS & PLANNING ASSUMPTIONS

This is table summarizes the Master Plan resilience planning assumptions for key shoreline assets.

	ASSET	PLANNING ASSUMPTION
WASTEWATER INFRASTRUCTURE	Oro Loma Wastewater Treatment Plant	• Remain in place
	Hayward Water Pollution Control Facility	• Remain in place
	Wastewater Wet Weather Storage	• Maintain critical uses
	Biosolids Management, Aging, Drying	• Maintain critical uses
	Solar Field	• Maintain critical uses
	EBDA Pipeline	• Adapt over time
TRANSPORTATION INFRASTRUCTURE	SR-92 Bridge Landing	• Remain in place / adapt
	Union Pacific Rail Corridor	• Remain in place
	Street Grid	• Maintain access to industrial zone from inland roads • Maintain ingress and egress to surrounding residential neighborhoods
ENERGY INFRASTRUCTURE	Transmission Lines	• Adapt / Relocate
	Jet Fuel Pipeline	• Remain in place - avoid disturbing function and use
	Natural Gas Pipeline	• Remain in place - maintain access
COMMUNICATION INFRASTRUCTURE	Fiber Optics	• Remain in place - avoid disturbing function and use
BUILDINGS & LAND USE	Industrial Land Use	• Remain in place- reevaluate at 4' SLR
RECREATIONAL INFRASTRUCTURE	Bay Trail	• Adapt / relocate • Connect through the site north-south • Access the Interpretive Center • Connect to trail heads and parking areas • Maximize blue water experience
	Hayward Shoreline Interpretive Center	• Adapt and decommission over time • Relocate • Ensure vehicular and pedestrian access and parking • Locate along the Bay Trail • Locate in proximity to educational opportunities that won't be inundated
	San Lorenzo Community Park	• Adapt and decommission over time • Relocate • Ensure vehicular and pedestrian access and parking
HABITATS & ECOSYSTEMS	Existing Tidal Habitat + Hayward Marsh Restoration	• Adapt to 4' SLR
	Muted & Managed Marsh	• Adapt or preserve Salt Marsh Harvest Mouse preserve • Adapt or preserve endangered species habitat
	Historic Salt Ponds	• Adapt / relocate
	Seasonal Wetlands	• Adapt / relocate
	Mudflats	• Enhance
LANDFILLS	Alameda County & West Winton Landfills	• Remain in place • Prevent erosion and seepage

POLICY CONSIDERATIONS

ROLE OF POLICIES IN THE HAYWARD REGIONAL SHORELINE ADAPTATION MASTER PLAN

Before developing adaptation strategies, it is important to understand the planning and policy context for the Hayward Regional Shoreline Adaptation Master Plan. There are a variety of ways in which the plans and policies of project stakeholders have informed the development of strategies and the Shoreline Adaptation Master Plan. Policies can present opportunities, such as the ability to shape a funding plan or regulatory change to promote the Shoreline Adaptation Master Plan's implementation.

KEY POLICY CONSIDERATIONS

Following an extensive review of stakeholders in the project area, the Project Team identified the following initial key policy considerations. These can be updated as the project progresses.

- **There is broad support and consensus around the need to plan for sea level rise with a focus on habitat restoration, and an evolving playbook on how to balance long-term, conflicting needs.**
  Planning agencies, regulatory bodies, and infrastructure operators are well-aligned on the need to plan for sea level rise. Not all wetland restoration projects have considered sea level rise in the past, but the concept of adaptive management is gaining acceptance and becoming part of regulation. While there is no clear answer on how to balance the needs of vulnerable infrastructure and communities with the opportunities to maintain and improve habitat, there are many active organizations focused on developing policies and plans to address all aspects of these issues.
- **There is an extensive permitting process and many regulatory requirements that will likely drive the implementation process.**
  There are numerous agencies that will likely be involved in the permitting processes for any modifications to the Hayward Regional Shoreline. Recent reforms aimed at streamlining the process are positive signs, though they are focused on ecological restoration, and it is unclear how hybrid grey infrastructure approaches will be treated.
- **There are many stakeholders in how water is managed with specific interests that will need to be navigated in order to identify an implementable strategy.**
  The Hayward Regional Shoreline contains an extensive water management infrastructure network, including water treatment, wetland management, and flood control. Changes to the system may have system-wide impacts and require buy-in the from agencies and authorities involved.
- **Innovative approaches to shoreline access may be needed to allow for a full exploration of potential strategies.**
  While the Bay Trail has historically prioritized a "blue water" experience with the trail directly adjacent to the shoreline, there is an opportunity to create a diverse shoreline recreational experience, including moving inland to accommodate shoreline habitats and the inclusion of high points at vistas.
- **There are opportunities for the Shoreline Adaptation Master Plan to advance regional policy on climate adaptation and ecosystem management.**
  There are numerous organizations and agencies active in sea level rise adaptation and habitat restoration in the Bay Area. While numerous studies and toolkits are being advanced, there is a need for built projects to test and advance innovative ideas for how to adapt to sea level rise while improving ecosystem health. This project can serve as a test bed for such ideas and serve to advance this issue across the region.
- **The East Bay Regional Park District Master Plan sets forth policies on climate change that guided the Shoreline Adaptation Master Plan.**
- Climate change is expected to affect the park's resources in various ways. Changes in the ranges of various species and increased potential for wildfires and pests are anticipated with this change in weather. In a manner consistent with the desire to "conserve and enhance" its resources, the District must closely track the impact of this phenomenon, and if necessary, act to relocate or protect in situ resources that are being degraded or potentially lost by this change.
- The District will specifically track and monitor the effects of climate change on its resources, interceding when necessary to relocate or protect in-situ resources that are being degraded or lost by this shift in the environment.

- To help mitigate the effects of climate change, the District will endeavor to conserve and connect habitat for native species through its acquisition and planning processes.
- **The City of Hayward General Plan includes a Hazards Element with policies relevant to flooding and sea level rise that guided the Shoreline Adaptation Master Plan.**
- One of the plan's goals is to "protect life and minimize property damage from potential flood hazards." As part of this goal, the plan calls for the City to coordinate with the Alameda County Flood Control and Water Conservation District to evaluate the need to expand the capacity of flood control facilities in response to climate change to promote greater public awareness of flooding hazards. And promote resources and programs to help property owners protect their homes and businesses from flood damage.
- Another goal is to "safeguard the Hayward Regional Shoreline, open space, recreational resources, and urban uses from flooding due to rising sea levels." As part of this goal, the plan calls on the city to coordinate with the Hayward Area Shoreline Planning Agency, the Bay Conservation Development Commission, and other agencies to develop and implement a "Regional Shore Realignment Master Plan" that shall identify a preferred long-term strategy and implementation program to protect the shoreline, interim standards to regulate development within areas potentially affected by sea level rise prior to the construction of shoreline protection, and potential flood mitigation measures to apply to development projects within potentially affected areas.

The attached chart provides a summary of relevant organizations, agencies, plans, and policies. The second column summarizes the agency's or organization's general role or mission. The third column highlights the specific regulatory or planning jurisdictions, land ownership, or policies that specifically relate to the study area or master plan. The last column identifies relevant regulations, plans, or guidance documents.

AGENCY OR ORGANIZATION	GENERAL ROLE(S) / MISSION	PLANNING & REGULATORY JURISDICTION / LAND OWNERSHIP RELEVANT TO STUDY AREA AND MASTER PLAN	RELEVANT REGULATIONS, PLANS, POLICIES, GUIDANCE, AND STUDIES
Hayward Area Shoreline Planning Agency (HASPA)	• Joint powers agency comprised of representatives from Hayward Area Recreation and Park District, East Bay Regional Park District, and the City of Hayward. • Works with the Hayward Area Shoreline Citizens Advisory Committee (HASCAC) to coordinate agency planning activities and adopt and carry out policies for the improvement of the Hayward Regional Shoreline for future generations.	• Under a joint exercise of powers agreement, HASPA is charged with the power to undertake all planning activities associated with sea level rise, and the power to develop plans, prepare studies and reports, and make recommendations for the Hayward Regional Shoreline. [1]	• Preliminary Study of the Effect of Sea Level Rise on the Resources of the Hayward Shoreline (2011) • Adapting to Rising Tides Resilience Study (March 2015)[2]
Hayward Area Recreation and Park District (HARD)	• Independent special use district created to provide park and recreation services for the over 280,000 residents in the Hayward area. • HARD's park system includes 104 sites covering about 1,357 acres. • Member of HASPA	• Owns and manages 788 acres in the project area including: HARD marsh (a 79-acre, fully tidal marsh), Triangle Marsh (an 8-acre muted tidal marsh system restored in 1990), Oliver Salt Ponds, the San Lorenzo Community Park and other diked ponds and wetlands south of Sulphur Creek. **Beyond the Shoreline Facilities, HARD owns and manages over 120 parks, trails, and facilities in the greater Hayward Area.**[3] • Operates the Hayward Shoreline Interpretive center.	• Regulations Governing Use of Parks, Recreation Areas, and Facilities[4] • HARD Parks Master Plan (2019) [5]
East Bay Regional Park District (EBRPD)	• Regional park district managing 73 parks and 124,000 acres of space and 1,250 miles of trails throughout East Bay in Alameda and Contra Costa counties. • Member of HASPA	• Owns and manages Cogswell Marsh (250 acres tidal/low marsh habitat), Salt Marsh Harvest Mouse Preserve (27 acres muted tidal system), and the Hayward Marsh (145-acre fresh and brackish water marsh that relies on secondary treated effluent as freshwater source). • Supports proposed project to modify Hayward Marsh to convert from a freshwater effluent fed system to a fully tidal or muted tidal system. EBRPD plans to put out a bid for full design in the future.	• Ordinance 38 Rules and Regulations[6] • 2013 Master Plan[7] - defines the mission and vision for the Park District for its stewardship and development • Board of Directors has adopted multiple plans including: ADA Self Evaluation and Transition Plan, Environmental Review Manual, Park Operations guidelines, Sustainability Policy, Wildlife Hazard Reduction and Resource Management Plan • District Standard Plans[8] - design guidelines for districts • *Resolution to Establish a Policy Framework for Managing Park Resources in a Changing Climate at The East Bay Regional Park District*. Adopted April 2018

1 https://lafco.acgov.org/lafco-assets/docs/JPAs/HASPA%20(Hayward%20Area%20Shoreline%20Planning%20Agency).pdf
2 http://www.adaptingtorisingtides.org/wp-content/uploads/2014/12/HaywardShorelineResilienceStudyReport_sm.pdf
3 https://www.hayward-ca.gov/residents/arts-leisure/parks-recreation
4 https://www.haywardrec.org/DocumentCenter/View/2874/District-Regulation-Handbook?bidId=
5 https://www.haywardrec.org/DocumentCenter/View/6911/Hayward-Area-Recreation-and-Park-District_Park-Master-Plan?bidId=
6 https://www.ebparks.org/activities/ord38.htm
7 https://www.ebparks.org/civicax/filebank/blobdload.aspx?BlobID=23499
8 https://www.ebparks.org/about/bids/district_standard_plans.htm

AGENCY OR ORGANIZATION	GENERAL ROLE(S) / MISSION	PLANNING & REGULATORY JURISDICTION / LAND OWNERSHIP RELEVANT TO STUDY AREA AND MASTER PLAN	RELEVANT REGULATIONS, PLANS, POLICIES, GUIDANCE, AND STUDIES
City of Hayward	• Land use planning and zoning • Conducts development and environmental review • Capital improvement planning • Hazard mitigation planning • Member of HASPA	• Manages capital improvement plan for city infrastructure, including the wastewater treatment plant and local roadways. • Owns and operates Hayward Executive airport. • Owns the Skywest Golf Course that is leased to HARD. • Develops changes to the zoning code to implement land use plans	• General Plan[9] • Zoning maps and use charts[10] • Capital Improvement Budget[11] • Economic Development Strategic Plan[12] • Design Guidelines[13] • Neighborhood Plans[14] • 2016 Hayward Local Hazard Mitigation Plan[15] • Green Infrastructure Plan[16]
San Francisco Bay Restoration Regulatory Integration Team (BRRIT)[17]	• Composed of staff from the six state and federal regulatory agencies with jurisdiction over wetland restoration projects: U.S. Army Corps of Engineers (Corps); U.S. Fish and Wildlife Service (USFWS); NOAA National Marine Fisheries Service (NOAA Fisheries); San Francisco Bay Regional Water Quality Control Board (RWQCB); California Department of Fish and Wildlife (DFW); and San Francisco Bay Conservation and Development Commission (BCDC). Also includes representatives from the U.S Environmental Protection Agency (EPA).	• The purpose of the BRRIT is to improve the permitting process for multi-benefit wetland restoration projects and associated flood management and public access infrastructure in San Francisco Bay.	• Webinar on how to submit projects[18]
California Natural Resources Agency	• The Natural Resources Agency develops guidelines for the implementation of the California Environmental Quality Act (CEQA), a broad environmental law with the goal of disclosing to the public the significant environmental effects of a proposed project through the preparation of an Initial Study (IS), Negative Declaration (ND), or Environmental Impact Report (EIR). • Unlike NEPA, requires adoption of all feasible measures to mitigate environmental impacts	• CEQA applies to all discretionary projects proposed to be conducted or approved by a California public agency, including private projects requiring discretionary government approval • Construction of seawalls, revetments/riprap, bulkheads, or super levee that would modify land near the shoreline or the elevation of land might trigger CEQA • Geologic Hazard Abatement Districts are exempt from CEQA • Impacts to wetlands would have to be addressed under CEQA	• Governor's Office of Planning and Research (OPR) and the Natural Resources agency develop CEQA guidelines[19]

9 https://www.hayward2040generalplan.com/
10 https://www.hayward-ca.gov/services/city-services/explore-zoning-use-charts
11 https://www.hayward-ca.gov/your-government/documents/capital-improvement-program
12 https://www.hayward-ca.gov/your-government/documents/economic-development-strategic-plan
13 https://www.hayward-ca.gov/your-government/documents/planning-documents
14 https://www.hayward-ca.gov/your-government/documents/planning-documents
15 https://www.hayward-ca.gov/sites/default/files/pdf/2016%20City%20of%20Hayward%20Local%20Hazard%20Mitigation%20Plan.pdf
16 https://www.hayward-ca.gov/green-infrastructure-plan
17 http://www.sfbayrestore.org/san-francisco-bay-restoration-regulatory-integration-team-brrit
18 https://www.youtube.com/watch?v=UBcWVP9qQfM&feature=youtu.be
19 http://opr.ca.gov/ceqa/updates/guidelines/

AGENCY OR ORGANIZATION	GENERAL ROLE(S) / MISSION	PLANNING & REGULATORY JURISDICTION / LAND OWNERSHIP RELEVANT TO STUDY AREA AND MASTER PLAN	RELEVANT REGULATIONS, PLANS, POLICIES, GUIDANCE, AND STUDIES
Alameda County Flood Control & Water Conservation District (ACFCWCD)	• Provides flood protection for the citizens and business of Alameda County, while safeguarding the Bay Area's natural environment • Prevents waste of water or diminution of the water supply • Owns and operates flood control infrastructure (system of pump stations, erosion control structures, dams, and pipeline, channels, levees, and creeks) • Works with federal, state, and local governmental agencies (USACE, FEMA, USGS, NOAA, Water Board, etc.)	• Owns and operates flood control infrastructure in the study area, including: Storm drains, channels, pipelines to San Lorenzo Creek Cull and Don Castro Reservoirs Nine pump stations (Eden Landing, Ruus Road, Besco, Westview, Alvarado, Industrial, Ameron, Stratford, Eden Shores)[1] • Channel property under ACFWCD ownership (Bockman, Sulfur, Line A) could be opened up to public access, potentially aligning with project goals (if maintenance and liability responsibilities can be passed on to another agency). • Considers larger-scale, regional flood protection planning to be beyond their mission.	• Currently conducting Coastal and Riverine Flood Assessment • Hydrology & Hydraulics Manual: Defines current practices for the hydrologic and hydraulic design of all flood control facilities in Alameda County that are subject to District approval • Alameda County Public Works Agency Engineering Design Guidelines • Floodplain Management Ordinance[2] • Stormwater Management and Discharge Ordinance[3] • Grading, Erosion, and Sediment Control Ordinance[4] • California Regional Water Quality Board, Municipal Regional Stormwater NPDES Permit[5] • Zone 3A Drainage Master Plan Study[6]
Alameda County Mosquito Abatement District (ACMAD)	• Formed by City Councils of Berkeley, San Leandro, Hayward, Oakland, Alameda, Piedmont, and Emeryville to address the problem of large flights of mosquitoes from the bay marshes to the hills from March to October • Developed ditching in the marshes to promote drainage of salt marsh mosquito breeding sources • Committed to improving the health and comfort of Alameda County residents by controlling mosquitoes and limiting the transmission of mosquito-borne diseases	• Provides assistance to local code enforcement agencies to enforce state laws, regulations, and local ordinances related to rodent, wildlife, or insect vectors that pose a threat to public health and safety	• Control Program[7] • Invasive Mosquito Response Plan[8] • ACMAD Strategic Plan 2018-2021[9] • BMPs for Mosquito Control[10]

1 http://acfloodcontrol.org/wp-content/uploads/2016/02/acfcd2004report.pdf
2 https://library.municode.com/ca/alameda_county/codes/code_of_ordinances?nodeId=TIT15BUCO_CH15.40FLMA
3 https://library.municode.com/ca/alameda_county/codes/code_of_ordinances?nodeId=TIT13PUSE_CH13.08STMADICO
4 https://library.municode.com/ca/alameda_county/codes/code_of_ordinances?nodeId=TIT15BUCO_CH15.36GRERSECO
5 https://www.waterboards.ca.gov/rwqcb2/board_decisions/adopted_orders/2009/R2-2009-0074.pdf
6 https://acfloodcontrol.org/projects-and-programs/flood-control-projects/zone-3a-drainage-master-plan-study/
7 https://www.mosquitoes.org/files/c1804f413/Control+Program.pdf
8 https://www.mosquitoes.org/files/12711fa88/ACMAD-Invasive-Mosquito-Species-Response-Plan-09_07_2017-1.pdf
9 https://www.mosquitoes.org/files/8206d6935/Alameda+Strategic+Plan.pdf
10 https://www.mosquitoes.org/files/4210fdde3/BMPsforMosquitoControl.pdf

AGENCY OR ORGANIZATION	GENERAL ROLE(S) / MISSION	PLANNING & REGULATORY JURISDICTION / LAND OWNERSHIP RELEVANT TO STUDY AREA AND MASTER PLAN	RELEVANT REGULATIONS, PLANS, POLICIES, GUIDANCE, AND STUDIES
Oro Loma Sanitary District	• Provides wastewater collection and treatment and solid waste and recycling services to 13 square mile area including San Lorenza, Ashland, Cherryland, Fairview, and parts of San Leandro and Hayward • Issues permits for connection and discharge into the to sanitary sewer system • Derives authority from California Health & Safety Code	• The Oro Loma Wastewater Treatment Plant is jointly owned by the Oro Loma Sanitary District and the Castro Valley Sanitary District • Maintains 273 miles of sewer lines and 13 sewage lift stations • Treated effluent from the plant is used for irrigation at the Skywest Golf Course	• Oro Loma Horizontal Levee pilot project • Sewer System Management Plan, Jan. 2019[11] • Ordinance No. 35-16 regulates the installation and connection of sanitary sewers[12] • Ordinance No. 39-11 regulates the use of sewers and drains and discharges into the public system[13]
Union Sanitary District	• Independent special district which provides wastewater collection, treatment and disposal services to the residents and businesses of the cities of Fremont, Newark and Union City in Southern Alameda County, CA • Sanctioned under California law to perform specific local government functions within certain boundaries • Derives authority from California Health & Safety Code	• Operates a 33 million gallon per day wastewater treatment facility in Union City and provides collection, treatment and disposal services to a total population of over 347,000 in Fremont, Newark, and Union City, CA • Maintains over 800 miles of underground pipelines in its service area	• Sewer System Management Plan[14]
East Bay Dischargers Authority (EBDA)	• Formed in 1974 by a joint exercise of powers agreement by the City of Hayward, City of San Leandro, Oro Loma Sanitary District, Union Sanitary District, and Castro Valley Sanitary District • Purpose is to collectively manage the wastewater treatment and disposal of these agencies, servicing about 1,000,000 people[15] • Owns and operates four effluent pump stations, a dechlorination facility, and a force main and Bay Outfall system for effluent disposal into the San Francisco Bay[16]	• Operates pipelines connecting various wastewater treatment facilities, allowing treated effluent to enter a single pipeline that discharges into the center of the Bay – this infrastructure runs through the Hayward Regional Shoreline project area, crossing tidal marshes, diked baylands, and industrial lands • Joint Powers Agreement (JPA) sets flow amounts, and has recently been updated for the next 20 years, to plan for future alternatives to the EBDA system	• East Bay Dischargers Authority Sea Level Rise Adaptation Planning Project, 2015[17] • Wastewater Reclamation and Reuse Study for the Union Sanitary District Area, May 1976[18] • Joint Powers Agreement
East Bay Municipal Utility District (EBMUD)	• Provides high-quality drinking water for 1.4 million East Bay customers in a 332 square mile area • Wastewater system serves 685,000 people in an 88-square mile area	• Some properties in the City of Hayward get water from EBMUD	• East Bay Watershed Master Plan[19] • Watershed Rules and Regulations[20]

11 https://oroloma.org/wp-content/uploads/SSMP-Final-.pdf
12 https://oroloma.org/wp-content/uploads/2015/10/ordinance-35-16-sewer-connections-and-permits.pdf
13 https://oroloma.org/wp-content/uploads/Ord-39-11-Final-Signed.pdf
14 https://www.unionsanitary.com/images/documents/USD-SSMP-2018-19-Update.pdf
15 http://www.ebda.org/
16 http://www.ebda.org/about-us
17 http://www.ebda.org/sites/default/files/EBDA%20Climate%20Ready%20Final%20Report%20Report_August2015.pdf
18 http://www.ebda.org/sites/default/files/WW_Reclamation_and_Reuse_Study_1976.pdf
19 https://www.ebmud.com/recreation/east-bay/east-bay-watershed-master-plan-update/
20 https://www.ebmud.com/recreation/rules-and-regulations/

AGENCY OR ORGANIZATION	GENERAL ROLE(S) / MISSION	PLANNING & REGULATORY JURISDICTION / LAND OWNERSHIP RELEVANT TO STUDY AREA AND MASTER PLAN	RELEVANT REGULATIONS, PLANS, POLICIES, GUIDANCE, AND STUDIES
Calpine (Russell City Energy Center)	• Private power company serving 600,000 households • PG&E is contracted to buy the energy produced by the plant and will ship it to San Francisco and San Mateo counties[1]	• Plant is in study area, opened in 2013, built on former landfill site, owned by Union Sanitary District. • Combined-cycle, natural gas-powered electric generating facility with advanced air emissions control technologies. Plant consists of two combustion turbine generators, two heat recovery steam generators with duct burners and a single condensing steam turbine generator. • Plant will likely be decommissioned in the next thirty years, making the land available for reuse by Sanitary District.	
San Francisco Bay Trail	• Partnered with State Coastal Conservancy to develop 500-mile regional trail • Offers grants to local entities to assist in completion of the trail • Works with state and federal agencies, towns, cities, counties, park districts, etc. • Connects communities to parks, open spaces, schools, transit and to each other and provides a commute corridor	• Bay Trail Plan adopted by the Association of Bay Area Governments per Senate Bill 100 in 1989 • Policies and design guidelines are intended to complement rather than supplant adopted regulations and guidelines of local managing agencies • Alternative locations for the Bay Trail were investigated during the Adapting to Rising Tides study, including inland routes, that were considered incompatible with the Bay Trail's 'blue water experience' that they prioritize. • Preference for hard surfaces, though may accommodate other surfaces on top of a levee.	• Bay Trail Plan, Design Guidelines & Toolkit[2]
PG&E	• Provides natural gas and electric service to 16 million people throughout a 70,000 square mile service area • Although the company has infrastructure throughout Hayward, the City now requires all commercial and residential properties to switch from PG&E and instead buy power from non-profit provider East Bay Community Energy[3] • Overseen by California Public Utilities Commission	• PG&E overhead transmission lines cross the Hayward Regional Shoreline project area. The towers are on concrete bases, but sea level rise could cause issues with access for maintenance and repairing the infrastructure. • Additional energy infrastructure is present in the study area that may impact project design.	
Union Pacific Railroad	• Freight railroad owner and operator in Western U.S.	• Owns and operates freight rail line in the study area. Part of the Union Pacific Coast Line that runs from Los Angeles to the Bay Area. • Work near the railroad must be coordinated with Union Pacific	
California Public Utilities Commmission (CPUC)	• CPUC regulates electric, natural gas, telecommunications, water, railroad, rail transit, and passenger transportation utilities and companies.	• PG&E and Union Pacific Railroad are regulated by CPUC. Changes to their assets may be subject to review by CPUC.	

1 https://www.eastbayexpress.com/oakland/foes-of-hayward-power-plant-fight-back/Content?oid=1905883
2 https://baytrail.org/wp-content/uploads/2015/12/San-Francisco-Bay-Trail_-Bay-Trail-Plan-Summary.pdf
3 https://sanfrancisco.cbslocal.com/2018/03/08/hayward-goodbye-pge-renewable-energy/

AGENCY OR ORGANIZATION	GENERAL ROLE(S) / MISSION	PLANNING & REGULATORY JURISDICTION / LAND OWNERSHIP RELEVANT TO STUDY AREA AND MASTER PLAN	RELEVANT REGULATIONS, PLANS, POLICIES, GUIDANCE, AND STUDIES
San Francisco Bay Conservation & Development Commission	• California state planning and regulatory agency with regional authority over the San Francisco Bay, the Bay's shoreline, and the Suisun Marsh • Mission is to protect and enhance San Francisco Bay and encourage the Bay's responsible and productive use • Leads the Bay Area's multi-agency regional effort to address impacts of rising sea level on shoreline communities and assets • Authority found in McAteer-Petris Act, San Francisco Bay Plan, and other special area plans and laws and policies. • Issues Coastal Zone Management consistency determination.	• Issues permits for fill in the Bay (including intertidal lands and salt ponds) and for projects within a 100-foot buffer from the bay. Permit conditions require projects to minimize any fill and maximize feasible public access for all projects within the Bay's 100-foot shoreline band. • Interested in highlighting and sharing this project as example of innovative projects in the bay and as a way to share lessons learned around the region. • The Habitat for Fill Bay Plan Amendment was recently adopted to address the need to place in increasing amount of Bay fill to restore and enhance habitat in light of seal rise impacts on Bay habitats. This change will make it easier to get a permit for fill to pursue thin layer placement, gravel beaches, strategic placement of dredge / mudflat seeding. Such projects are likely to require monitoring and adaptive management plans.[4]	• San Francisco Bay Plan (updated with environmental justice and social equity amendment) – includes policies to guide future use of the Bay and shoreline and maps that apply the policies to the Bay and shoreline • Special area plans and design guidelines[5]
California State Coastal Conservancy (SCC)	• State agency established in 1976 to protect and improve natural lands and waterways, help people access and enjoy the outdoors, and sustain local economies along the length of California's coast and San Francisco Bay[6] • Climate Ready Program helps natural resources and human communities along California's coast and San Francisco Bay adapt to the impacts of climate change	• Provides grants and guidance for climate adaptation planning and projects consistent with the Strategic Plan	• "The Baylands and Climate Change: What We Can Do: The 2015 Science Update to the Baylands Ecosystem Habitat Goals Prepared by the San Francisco Bay Area Wetlands Ecosystem Goals Project" • Strategic Plan[7] • Adaptation Tools Spreadsheet[8]
Metropolitan Transportation Commission (MTC)	• Metropolitan planning organization for nine-county San Francisco Bay Area (federal designation) and regional transportation planning agency (state designation), responsible for Bay Area transportation and long-range planning • Assigned duties by federal government, state Legislature, and Bay Area voters • Regional transportation and financing in the Bay Area, oversee toll revenue on state-owned bridges	• Have decision-making authority over the State Transportation Improvement Program (STIP) and administer various federal funding • With ABAG, developing regional plan (Bay Plan 2050), which identifies priority conservation areas, priority development areas, and priority production areas. Hayward Regional Shoreline is eligible to be a PDA-Connected Community, which may provide opportunities for transit funding. Requires passage of policies to reduce vehicle miles traveled.	• Plan Bay Area 2040[9] • Plan Bay Area 2050[10]

4 https://bcdc.ca.gov/BPAFHR/FillHabitat.html
5 https://bcdc.ca.gov/publications/
6 https://scc.ca.gov/
7 https://scc.ca.gov/files/2018/01/CoastalConservancy_StrategicPlan_2018_2022.pdf
8 https://scc.ca.gov/climate-change/climate-change-projects/#slr-adaptation
9 https://mtc.ca.gov/sites/default/files/Final_Plan_Bay_Area_2040.pdf
10 https://www.planbayarea.org/

AGENCY OR ORGANIZATION	GENERAL ROLE(S) / MISSION	PLANNING & REGULATORY JURISDICTION / LAND OWNERSHIP RELEVANT TO STUDY AREA AND MASTER PLAN	RELEVANT REGULATIONS, PLANS, POLICIES, GUIDANCE, AND STUDIES
CA State Lands Commission	• Established in 1938, manages 4 million acres of tidal and submerged lands and beds of navigable rivers, streams, lakes, bays, estuaries, inlets, and straits (mostly Public Trust lands) • Monitors sovereign land granted in trust by the California Legislature to approximately 70 local jurisdictions that generally consist of prime waterfront lands and coastal waters • Issues leases for use or development, provides public access, resolves boundaries between public and private lands, and implements regulatory programs to protect state waters from oil spills and invasive species	• Mostly has jurisdiction over sovereign land (tidal and navigable waters) and school lands (lands granted to public school system)	• Strategic Plan 2016-2020[1]
San Francisco Estuary Institute	• Aquatic and ecosystem science institute dedicated to providing scientific support and tools for decision-making and communication through collaborative efforts • Through Resilient Landscapes, develops strategies to adapt to climate change[2] • Advises state, federal, and regional agencies, as well as business and NGO leaders	• On the Hayward Regional Shoreline Adaptation Master Plan team • Prepared the San Francisco Bay Shoreline Adaptation Atlas with SPUR, which includes the study area	• San Francisco Bay Shoreline Adaptation Atlas[3] • Regional Monitoring Program for Water Quality in San Francisco Bay[4] • Alameda Creek Historical Ecology study[5] • Forthcoming Healthy Watershed Resilient Baylands study looking at an updated sediment budget for the Bay
SPUR (San Francisco Bay Area Planning and Urban Research Association)	• Non-profit research, education, and advocacy organization focused on planning and governance issues in SF	• Prepared the San Francisco Bay Shoreline Adaptation Atlas with SPUR, which includes the study area	• San Francisco Bay Shoreline Adaptation Atlas • SPUR's Agenda for Change • SPUR Regional Strategy 2070[6]
San Francisco Bay Restoration Authority	• Regional agency created to fund shoreline projects that will protect, restore, and enhance San Francisco Bay • Allocates funds raised by the Measure AA parcel tax	• Measure AA funding can go towards projects that protect, restore and enhance the San Francisco Bay, including habitat restoration projects; flood protection projects that are part of a habitat restoration project; and shoreline access and recreational amenity projects that are part of a habitat restoration project. [7]	• Grant Program Guidelines[8]

1 https://www.slc.ca.gov/wp-content/uploads/2018/07/StrategicPlan.pdf
2 https://www.sfei.org/contact#sthash.WinLZ0L2.dpbs
3 https://www.sfei.org/adaptationatlas
4 https://www.sfei.org/sites/default/files/biblio_files/2019%20Multi-Year%20Plan%20-%20SC%20Approved%2020190430%20-%20050119.pdf
5 https://www.sfei.org/projects/AlamedaCreekHE#sthash.1JuSjXnU.dpbs
6 https://www.spur.org/featured-project/regional-strategy
7 http://www.sfbayrestore.org/
8 http://sfbayrestore.org/sites/default/files/2019-09/final_grant_program_guidelines_9.17.19.pdf

AGENCY OR ORGANIZATION	GENERAL ROLE(S) / MISSION	PLANNING & REGULATORY JURISDICTION / LAND OWNERSHIP RELEVANT TO STUDY AREA AND MASTER PLAN	RELEVANT REGULATIONS, PLANS, POLICIES, GUIDANCE, AND STUDIES
Alameda County Water District (ACWD)	• Supplies water to residents and businesses of southern Alameda County • Sources of water supply – 40% State Water Project, 20% San Francisco PUC, 40% Alameda Creek Watershed Runoff • Service area includes about 357,000 residential and 84,000 business customers[9]	• The District's jurisdictional boundary includes the southern portion of the City of Hayward • Owns and operates groundwater wells in the project area	• Five Year Strategic Plan [10] • Urban Water Management Plan 2015-2020
Association of Bay Area Governments (ABAG)	• Regional planning agency and council of governments for the counties, cities, and towns of the Bay region. • Works on regional issues such as land use, environmental stewardship, energy efficiency, and water resource protection. • Shares joint responsibility for Plan Bay Area with MTC.	• With MTC, developing regional plan (Bay Plan 2050), which identifies priority conservation areas, priority development areas, and priority production areas. Hayward Regional Shoreline is eligible to be PDA-Connected Community, which may provide opportunities for transit funding. Requires the passage of policies to reduce vehicle miles traveled.	• Plan Bay Area 2050
Cal Trans (California Department of Transportation)	• Manages California's highway and freeway lanes, provides inter-city rail services • Executive department of the US State of California, part of the cabinet-level California State Transportation Agency	• Owns State Route 92 (plaza and eastern approach to Hayward-San Mateo Bridge) which is vulnerable to SLR and has drainage issues. • Cal Trans sees the need for more study of the hydrologic conditions around the bridge approach, hasn't yet developed an adaptation plan for the asset.	• Caltrans Climate Change Vulnerability Assessment[11] • Climate Change Vulnerability Assessment[12]
SF Regional Water Quality Control Board (WQCB)	• A division of the State Water Resources Control Board charged with the protection of water quality through regulation of stormwater discharges, landfills, alteration of federal water bodies, and other activities. • Issues water discharge requirements, takes enforcement action against violators, and monitors water quality	• Submerged features, like fill, require Water Board permits, as do modifications of the shoreline. • Regulates landfills and waste ponds, including both active and closed facilities. Regulation consists of design standards for liners, covers, etc., environmental monitoring, and cleanup when necessary. • Consultation likely required in permitting process.	• Water Quality Control Plan for the San Francisco Bay Basin[13]
California Department of Fish and Wildlife (CDFW)	• Mission is to manage the State's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public. • Issues permits to ensure regulatory compliance and statewide consistency with the California Endangered Species Act.	• Issues permits to ensure regulatory compliance and statewide consistency with the California Endangered Species Act. • Consultation likely required in permitting process.	

9 https://www.acwd.org/DocumentCenter/View/1264/ACWDs-2015---2020-UWMP?bidId=
10 https://www.acwd.org/DocumentCenter/View/2048/2018-ACWD-Strategic-Plan-?bidId=
11 https://dot.ca.gov/programs/transportation-planning/office-of-smart-mobility-climate-change/climate-change
12 https://www.arcgis.com/apps/webappviewer/index.html?id=517eecf1b5a542e5b0e25f337f87f5bb
13 https://www.waterboards.ca.gov/sanfranciscobay/basin_planning.html

AGENCY OR ORGANIZATION	GENERAL ROLE(S) / MISSION	PLANNING & REGULATORY JURISDICTION / LAND OWNERSHIP RELEVANT TO STUDY AREA AND MASTER PLAN	RELEVANT REGULATIONS, PLANS, POLICIES, GUIDANCE, AND STUDIES
U.S. Fish and Wildlife Service (USFWS)	• Issues permits for activities that impact plants and animals designated as endangered or threatened, and the habitats upon which they depend.	• Several known species in the study area (Salt Marsh Harvest Mouse, Ridgway's Rail, California Least Tern, and the Western Snowy Plover) are federally designated endangered species. • Consultation likely required in permitting process.	
NOAA National Marine Fisheries Service (NMFS)	• With USFWS (above) implements the National Endangered Species Act. • Responsible for endangered and threatened marine and anadromous species	• Consultation may be required in permitting process.	
Federal Emergency Management Agency (FEMA)	• Develops Flood Insurance Rate Maps (FIRMs) and administer National Flood Insurance Program • Administers standards for flood resistant construction codes	• Accreditation of flood protection structures and levees to enable neighborhoods, infrastructure, and developed areas to be eligible for reduced or eliminated flood insurance rates under the NFIP • Sets insurance rates under the NFIP, currently under reform[1]	• FIRMS[2] • Guidance on Levee Accreditation[3]
United States Army Corps of Engineers (USACE)	• Regulatory agency responsible for issuing permits for all structures and work on waterways within its jurisdiction of waters of the United States, including dredging, marinas, piers, wharves, floats, intake/outtake pipes, pilings, bulkheads, ramps, fills, and overhead transmission lines. • Develops plans for regional dredge management and is studying strategic placement of dredge material and identifying opportunities for beneficial use in the Bay Area.	• Developed and constructed Alameda County's flood control system, including the Alameda Creek, San Lorenzo Creek, and San Leandro Creek flood channels (although the channels are maintained by the ACFCWCD)	• Regional Dredge Material Management Plan[4] • Permitting regulations and guidance[5]

1 https://www.fema.gov/nfiptransformation

2 https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd&extent=-122.43945211509653,37.43674391029817,-121.86129659751919,37.708853832347565

3 https://www.fema.gov/media-library/assets/documents/9208

4 https://www.spn.usace.army.mil/Portals/68/docs/Dredging/DDMP/PMP_SFBay_RDMMP_DRAFT%205-23-19docx.pdf?ver=2019-07-09-184445-433

5 https://www.usace.army.mil/Missions/Civil-Works/Regulatory-Program-and-Permits/Federal-Regulation/

Diked Bayland adjacent to Oro Loma WWTP and San Lorenzo Creek

DESIGN ALTERNATIVES

This section provides an overview of the three Design Alternatives that were developed to solicit stakeholder and client feedback. The Design Alternatives combine the adaptation strategies into a detailed spatial configuration along the Hayward Regional Shoreline and provide different options to adapt the Project Area to sea level rise.

DESIGN ALTERNATIVES

SELECTION PROCESS

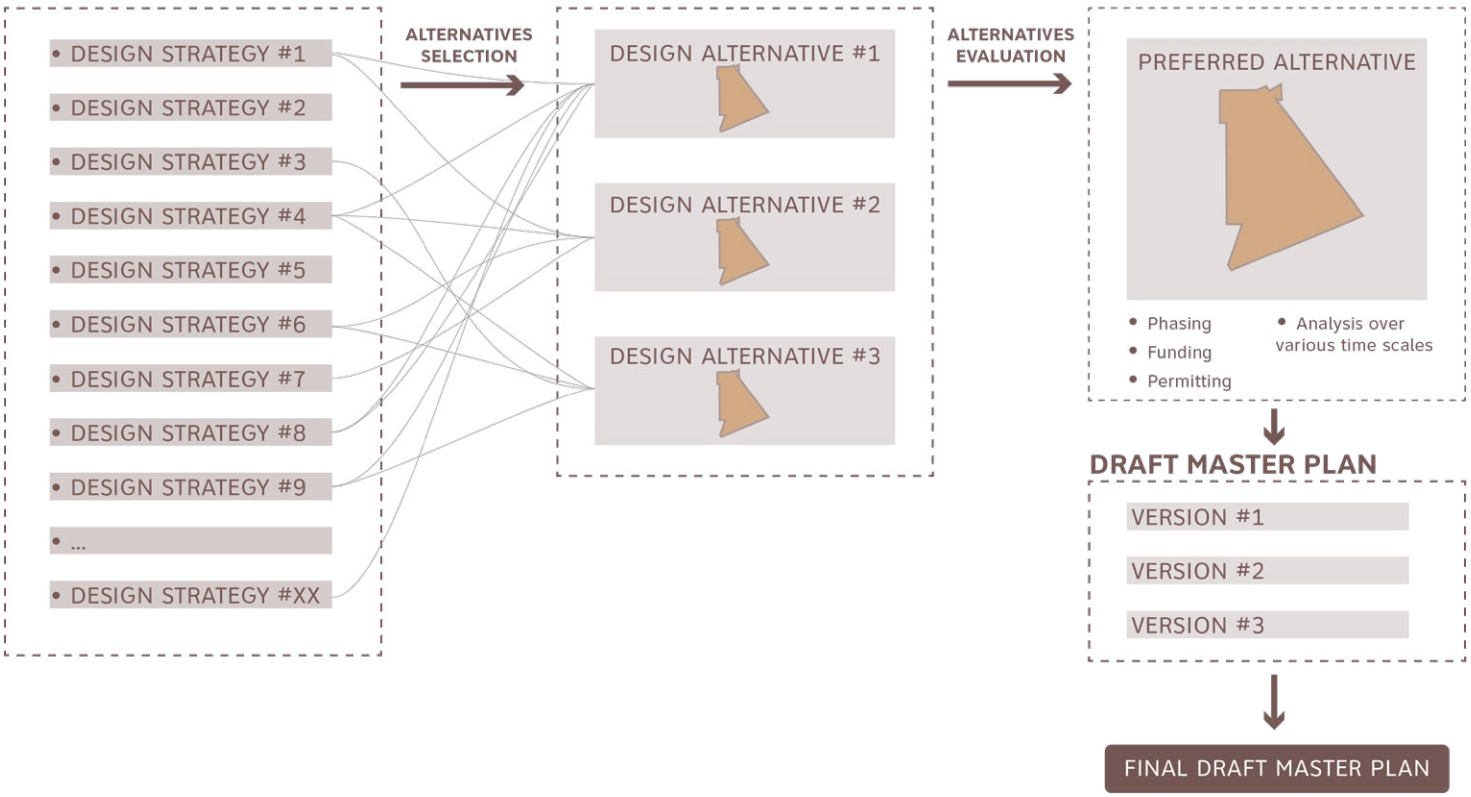
Based on stakeholder and client feedback, the Project Team identified three Design Alternatives that represent a balanced approach to mitigate the effects of sea level rise to the Hayward Regional Shoreline. Although considered, a full perimeter protection at the Bay's edge and a full retreat scenario were discarded because of cost implications, permitting and feasibility challenges, and lack of landowner and stakeholder support.

The Project Team did not assume that one of the alternatives will be selected for further analysis in the final Master Plan, but rather anticipated that discrete elements and projects from each alternative would be combined into the hybrid Preferred Alternative.

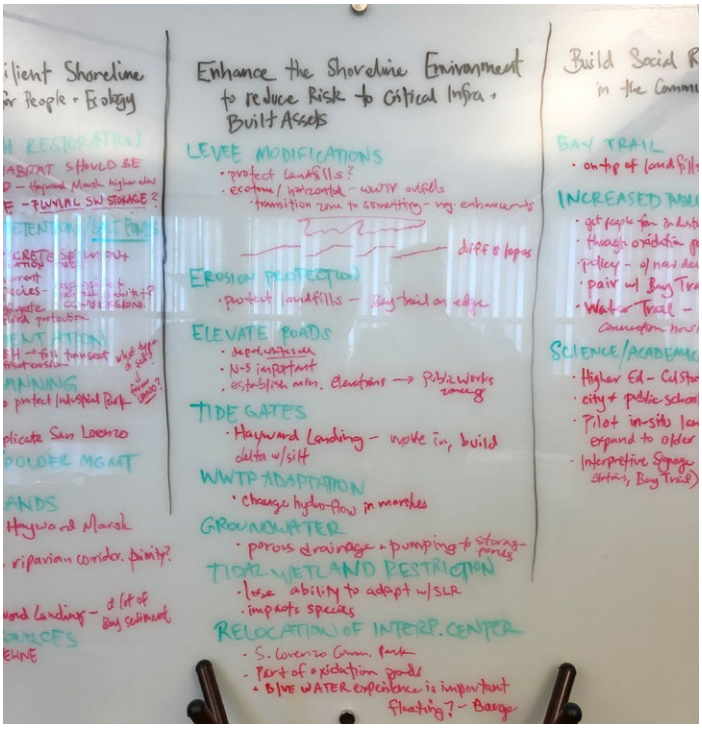
The Design Alternatives were formulated to easily compare one another to inform the Preferred Alternative selection process and for stakeholders to provide feedback.

Design Alternatives Selection Process:

The Design Alternatives were evaluated against a No Action Alternative, which is analyzed in the Sea Level Rise and Flood Risk Impacts chapter, starting at page 47.



09/30/19 TAC Charrette
(SCAPE Site Photos, 2019)



09/30/19 TAC Charrette
(SCAPE Site Photos, 2019)

09/30/19 TAC Charrette Sketches
(SCAPE Scans, 2019)

01/31/20 Design Alternative Sketches
(SCAPE Scans, 2020)

EVALUATING THE DESIGN ALTERNATIVES

In relation to the project goals and in order to help evaluate and compare the three Design Alternatives, the Project Team has defined a list of evaluation points that highlight key elements of the Shoreline Adaptation Master Plan.

Line of Protection

- All alternatives are assumed to include a continuous "line of protection" to prevent rising sea levels from inundating built assets within the study area. The line of protection is assumed to be a FEMA-certified levee that will reduce risk to inland communities by buffering the shoreline from the impacts of sea level rise and storm surge. The spatial alignment of this levee has multiple implications on cost, maintenance, and what the new flood protection infrastructure safeguards.

Tidal Habitat

- Preserving, enhancing, or creating tidal habitat is a common goal for all alternatives. The future extent of tidal habitat encompasses fully tidal areas as well as muted tidal zones, which are part of a controlled system. The spatial extent of connective blocks of marsh and proportion of tidal versus muted tidal habitat varies amongst the three alternatives.

Erosion Control

- Reducing coastal erosion is a key objective. Each alternative uses a layered strategy of erosion control that aims to reduce the risk of erosion and shelter inland marshes and ecosystems. Gravel beaches attenuate waves and provide shorebird nesting habitat and revetments provide a more conservative approach to edge stabilization for critical infrastructure.

Stormwater Management

- Once a line of protection is established, the stormwater and groundwater management inland of the levee system is critical, especially with increased precipitation events. In order to mitigate rainfall impacts and any bathtub effects on the dry side of the line of protection, all the alternatives are looking at various options to manage stormwater. A system of detention ponds, tide gates and water control structures, and flood control channels can be used to manage stormwater and move it away from inland communities.

Wastewater Treatment

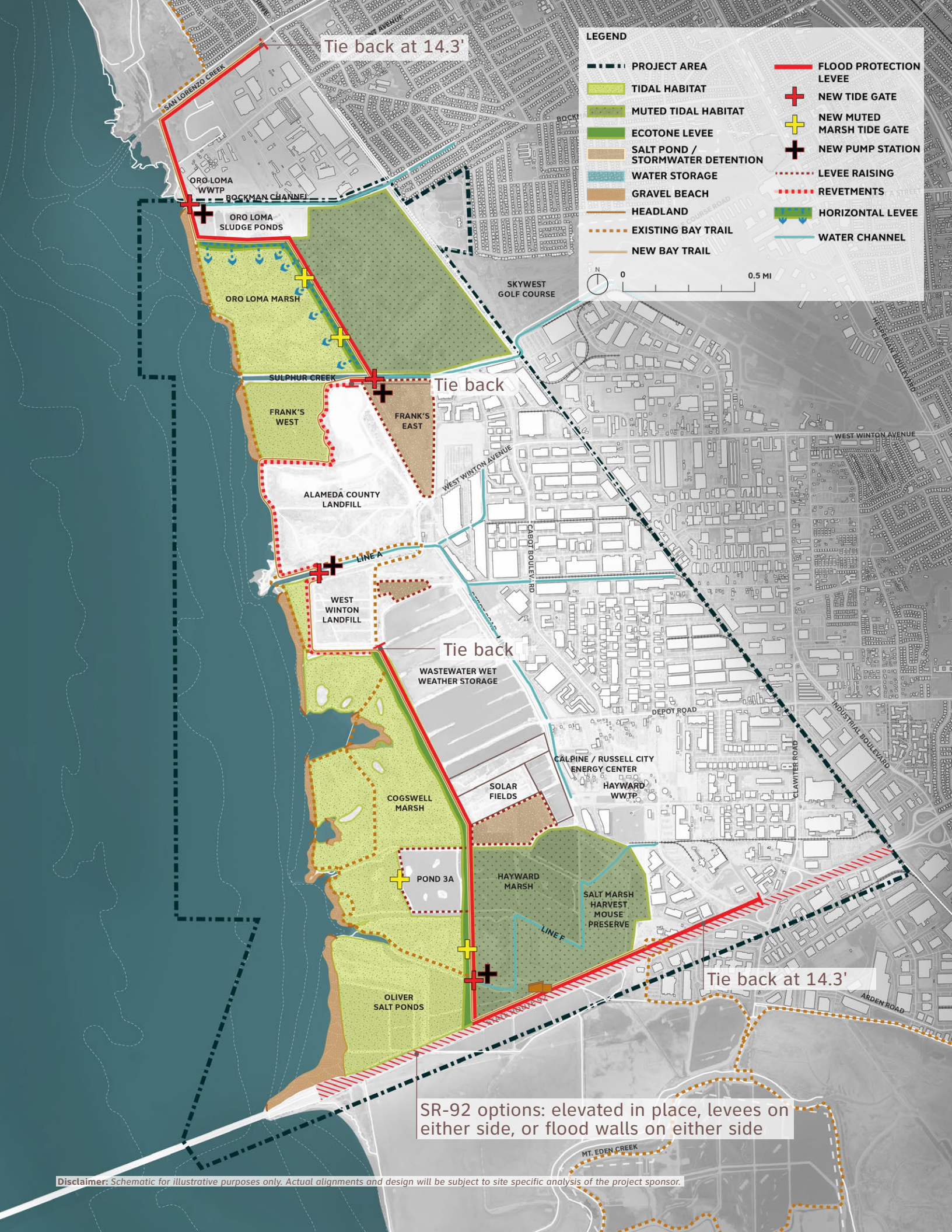
- For all the alternatives, the critical uses of wastewater treatment are maintained or enhanced with new multi-benefit infrastructure. Horizontal levees align with the First Mile project and possible future needs for local discharge.

Bay Trail

- The Bay Trail is a key feature of the Hayward Regional Shoreline, its future location prioritizes the blue water experience where possible, maintains a variety of experiences, and aligns with new infrastructure improvements. For all three alternatives, the current alignment of the Bay Trail will be maintained as long as possible (until it is inundated with sea level rise) and connect to the realignment.

Hayward Shoreline Interpretive Center

- The Hayward Shoreline Interpretive Center provides educational and programming opportunities for all community members and plays a key role in supporting and promoting social resilience in the East Bay. Its future is connected to new infrastructure improvements proposed by the plan. A variety of options are explored to retrofit the center in place and locate the center in proximity to new educational opportunities. All three alternatives maintain a link to the Bay Trail.



Disclaimer: *Schematic for illustrative purposes only. Actual alignments and design will be subject to site specific analysis of the project sponsor.*

#1: CLOSER TO THE BAY

DESCRIPTION

Alternative 1 shows a conservative line of protection closer to the Bay that reduces risk for a larger portion of the shoreline and urban assets.

In the north end of the project area, the line of protection ties back along the San Lorenzo Creek channel and wraps in front of Oro Loma Wastewater Treatment Plant to protect it in place. It then cuts through the middle of Oro Loma Marsh and ties back to high ground at the two existing landfills. In the south, the alignment then follows the western edge of the Wet Weather Storage ponds and cuts immediately south through Hayward and HARD Marsh. A raised access road along SR-92 ties back to high ground at the intersection of Clawiter Road.

The line of protection places a larger extent of marsh inland of the line of protection where marsh tidal water levels can be more carefully managed over time. However, this strategy will most likely negatively impact the existing marsh habitat by transforming part of the tidal marsh into muted tidal habitat. A zone of tidal habitats exists outboard of the line of protection, where it may accrete any available sediment faster than the muted marsh system. This option presents permitting and regulatory challenges from impacts to existing tidal marsh habitat. It also requires more active management of the muted marsh inland of the line of protection, which will become increasingly difficult with rising sea levels and subsiding land.

Vulnerable ecosystems, like the Oliver Salt Ponds, would be restored to tidal marshes as sea levels rise and make perimeter levee maintenance less feasible. Salt pond habitat is restored further inland where it is at less risk of inundation. Tidal marshes, existing and restored, would be monitored over time with an adaptive management plan that could use sediment augmentation to sustain healthy mudflat elevations in strategic areas.

Ecotone levees are proposed along most of the line of protection. Ecotone levees are shallow slope levees that provide a transition slope for marshes to adapt to Sea Level Rise.

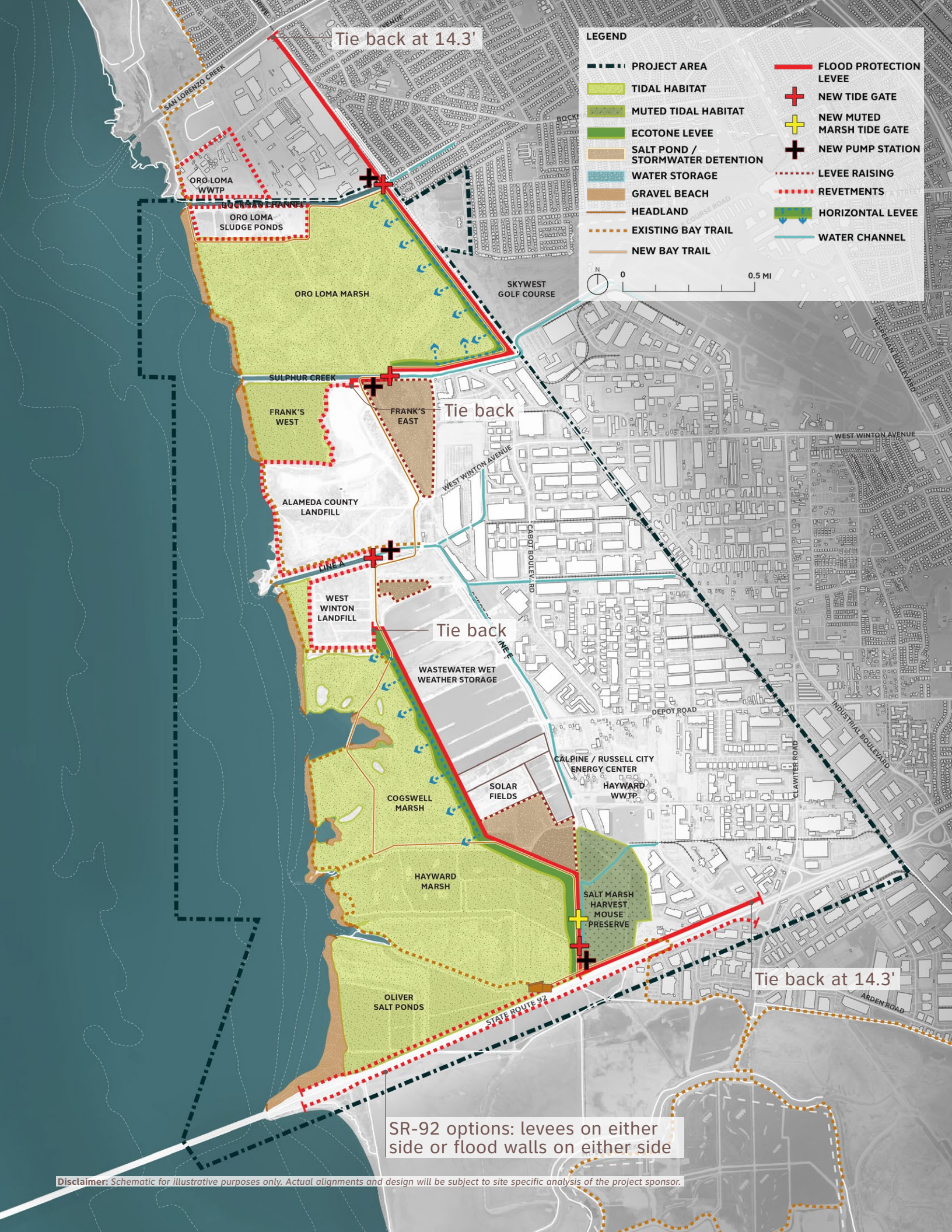
This alternative proposes a layered system of erosion control measures using gravel beaches that reduce the risk of erosion to levees that shelter the marshes behind. Bayside levees and interior levees would be retained in place to provide additional layered protection for as long as they are feasible to maintain. Revetments along the two landfills help to reduce the risk of erosion and seepage.

There is a great need for stormwater and groundwater management inland of the new line of protection to reduce the risk of flooding with increased precipitation events and reduce any bathtub effect impacts. This alternative presents inland detention ponds that serve the dual purpose of salt pond habitat and storage space during storm events to temporarily collect and hold stormwater before it is discharged to the Bay. This alternative provides the greatest storage capacity and this is a strength of this alternative.

This Alternative presents the smallest local discharge opportunity for treated wastewater effluent. Critical wastewater treatment functions are maintained and enhanced at Oro Loma Wastewater Treatment Plant with a horizontal levee that outlets effluent to Oro Loma Marsh. Horizontal levees have vegetated ecotone slopes that are irrigated by treated wastewater.

With this alternative, the Bay Trail is aligned closer to the blue water of the Bay where possible and connected to new infrastructure improvements. A phased realignment of the trail will maintain its existing alignment until sea level rise impacts to the existing trail push the trail inland over time.

Located behind the line of protection, the Hayward Shoreline Interpretive Center is protected in place. An ecotone levee in immediate adjacency to the center presents opportunities for education programming related to future restoration and adaptive management projects.



Disclaimer: *Schematic for illustrative purposes only. Actual alignments and design will be subject to site specific analysis of the project sponsor.*

#2: DOWN THE MIDDLE

DESCRIPTION

This alternative looks at an alignment that balances risk reduction and ecological enhancement with a line of protection that runs through the middle of the shoreline area.

The line of protection is pulled back in the north along the Union Pacific Rail Corridor and ties back to high ground at the San Lorenzo Creek channel. It then ties back to high ground at the two existing landfills and follows the western extent of the Wet Weather Storage ponds to the south. The alignment pulls back in the southern portion of the site and cuts through the middle of the Salt Marsh Harvest Mouse Preserve, then ties back along a new levee along the access road for SR-92.

A larger extent of tidal habitat is enhanced outboard of the line of protection. Tidal marshes, existing and restored, would be monitored over time with an adaptive management plan that could use sediment augmentation to sustain healthy mudflat elevations in strategic areas. New tidal marsh is restored at Frank's West and Hayward Marsh. Vulnerable ecosystems, like the Oliver Salt Ponds, would also be restored to tidal marshes as sea levels rise and make perimeter levee maintenance less feasible.

Similar to alternative #1, this alternative presents a layered system of erosion control measures using gravel beaches that reduce the risk of erosion to levees that shelter the marshes behind. Bayside levees and interior levees would be retained in place to provide additional layered protection for as long as they are feasible to maintain. Revetments along the two landfills reduces the risk of erosion and seepage.

In this alternative, inland detention ponds are utilized to hold stormwater before it is pumped to the Bay.

Critical wastewater treatment functions are maintained and enhanced at Oro Loma and Hayward Wastewater Treatment Plants with horizontal levees that outlet effluent to Oro Loma and Cogswell Marsh. Most of Hayward WPCFs existing function and storage capacity is maintained.

The Bay Trail is aligned to promote a diversity of experiences while reducing the risk of flooding. A phased realignment of the trail will maintain its existing alignment until sea level rise impacts to the existing trail push the trail inland over time.

The Hayward Shoreline Interpretive Center is adapted in place through the elevation of the building itself. Its location within a marsh maintains a direct connection to shoreline ecosystems.

Disclaimer: *Schematic for illustrative purposes only. Actual alignments and design will be subject to site specific analysis of the project sponsor.*

#3: FURTHER INLAND

DESCRIPTION

This alternative explores an alignment that is pulled the furthest inland to maximize ecological restoration along the shoreline and layer risk reduction infrastructure.

In the north, the line of protection is pulled back along the Union Pacific Rail Corridor and ties back to high ground at the San Lorenzo Creek channel. It then aligns to the eastern edge of Frank's East and ties back to high ground at the two existing landfills. It is pulled to the east of the Wet Weather Storage ponds and follows the eastern extent of the diked Baylands to the south before tying back to high ground with a levee parallel to SR-92 along Clawiter Road.

This alternative prioritizes a larger extent of connected tidal habitat that is Bayward of the line of protection and incorporates ecological and risk reduction infrastructure along a wider extent of Baylands. Although this alternative provides a more connected tidal habitat configuration, it also reduces the diversity of habitats and ecosystems in the study area and these ecosystems may transition to deeper water ecosystems over time with sea level rise. Tidal marshes, existing and restored, would be monitored over time with an adaptive management plan that could use sediment augmentation to sustain healthy mudflat elevations in strategic areas. New tidal marsh is restored at Frank's West and East, Hayward Marsh, inland diked ponds, and at vulnerable locations along the Bay's edge, such as Oliver Salt Ponds.

Like the previous alternatives, a layered system of erosion control measures utilizes gravel beaches that reduce the risk of erosion to levees that shelter the marshes behind. Bayside levees and interior levees would be retained in place to provide additional layered protection for as long as they are feasible to maintain. Revetments along the two landfills reduces the risk of erosion and seepage.

In this alternative, no detention space is proposed, which could lead to flooding impacts or require constant pumping from the flood control channels to the bay, which has significant long-term maintenance cost implications.

Critical wastewater treatment functions are maintained and enhanced at Oro Loma and Hayward Wastewater Treatment Plants with horizontal levees that outlet effluent to Oro Loma and Cogswell Marsh. This allows for a freshwater treatment marsh in the former wet weather equalization ponds at Hayward WPCF to facilitate local discharge to Cogswell marsh.

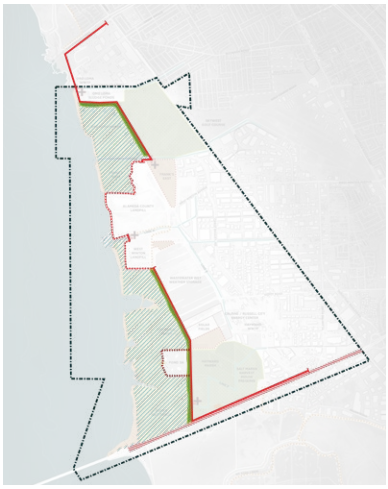
The Bay Trail is pulled back to a higher inland elevation to reduce the risk of flooding with sea level rise. A phased realignment of the trail will maintain its existing alignment until sea level rise impacts to the existing trail push the trail inland over time.

The Hayward Shoreline Interpretive Center is relocated to the West Winton landfill where it is protected from flooding. The high point maintains visibility of the structure and offers expansive views of the Bay.

EVALUATION POINTS

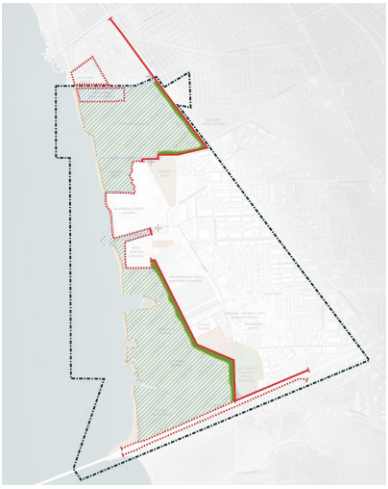
LINE OF PROTECTION

The line of protection includes a FEMA-certified levee that will reduce risk to inland communities by buffering the shoreline against the impacts of sea level rise and storm surge. The spatial alignment of this levee has multiple implications on cost, maintenance, and what the new flood protection infrastructure safeguards.



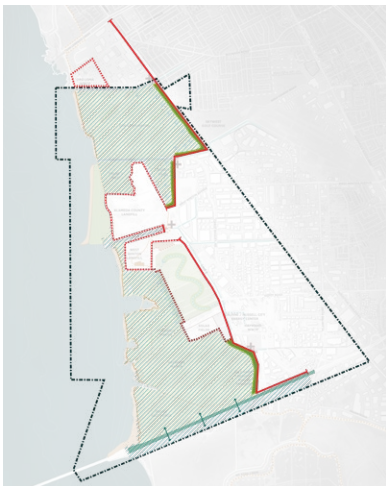
#1: CLOSER TO THE BAY

- Protects the most amount of shoreline infrastructure assets, including the Wastewater Wet Weather Storage Ponds, Oro Loma Wastewater Treatment Plant and sludge ponds, and PG&E lines.
- Shortest alignment through marsh in the southern reach and longer alignment along SR-92 to tie back to higher ground.



#2: DOWN THE MIDDLE

- Protects fewer infrastructure assets than #1 but protects a majority of the infrastructure assets along the shore, including the Wastewater Wet Weather Storage Ponds.
- PG&E lines, Oro Loma Wastewater Treatment Plant and sludge ponds are not protected by a FEMA certified levee.
- Longer alignment through marsh in the southern reach and shorter alignment along SR-92 to tie back to higher ground.

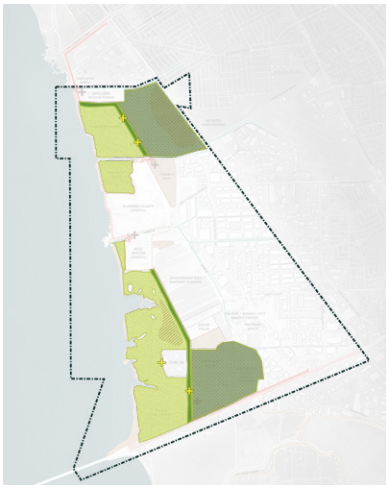


#3: FURTHER INLAND

- Protects fewer infrastructure assets than #1 and #2.
- PG&E lines, Oro Loma Wastewater Treatment Plant and sludge ponds, and Wastewater Wet Weather Storage Ponds are not protected by a FEMA certified levee.
- LOP is furthest inland and closer to urban fabric.
- Longest alignment adjacent to marsh in the southern reach and shortest alignment along SR-92 to tie back to higher ground.

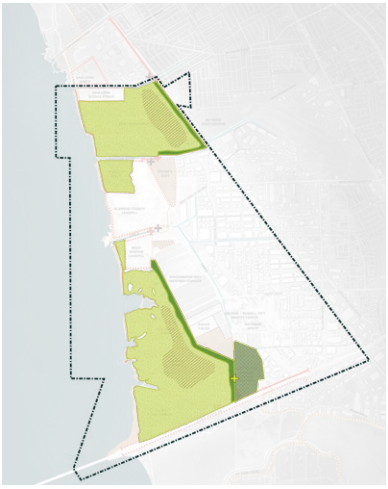
TIDAL HABITAT

The future extent of tidal habitat encompasses tidal habitat and muted tidal habitat, which is a controlled system. The spatial extent of connective blocks of marsh and proportion of tidal versus muted tidal habitat varies amongst the three alternatives.



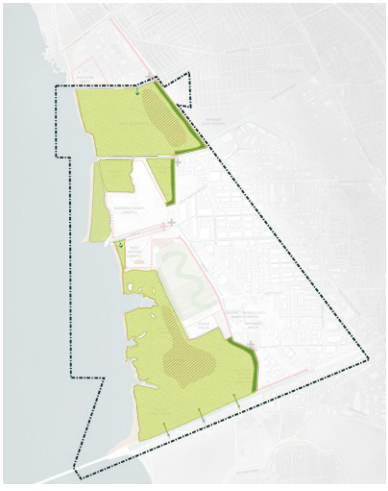
#1: CLOSER TO THE BAY

- Negative impacts to existing tidal marsh. Tidal marsh is converted to muted tidal habitat, however muted tidal habitat has limited lifespan with greater rates of SLR.
- Creates the least amount of new tidal habitat.
- Remaining tidal habitat likely to require active management /sediment nourishment over time.
- Some tidal habitat created in the middle reach.
- Protects the most amount of shoreline infrastructure assets-wet weather storage ponds. Wastewater Wet Weather Storage Ponds are protected. Shortest alignment through marsh / longer alignment along SR-92.



#2: DOWN THE MIDDLE

- Maintains existing location of tidal habitat.
- Maintains and expands muted tidal habitat. Muted tidal habitat has limited lifespan with greater rates of SLR.
- Tidal habitat likely to require active management/ sediment nourishment over time.

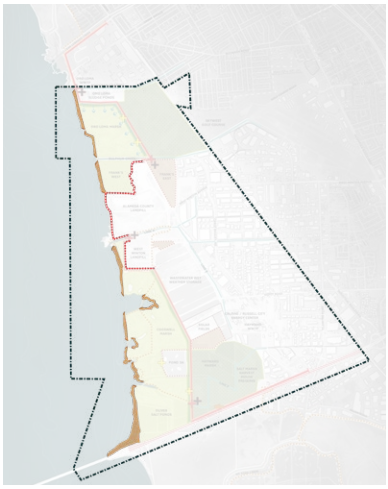


#3: FURTHER INLAND

- Maintains existing location of tidal habitat.
- Creates the most amount of new tidal habitat.
- Maintains no muted tidal habitat.
- Tidal habitat likely to require active management/ sediment nourishment over time.

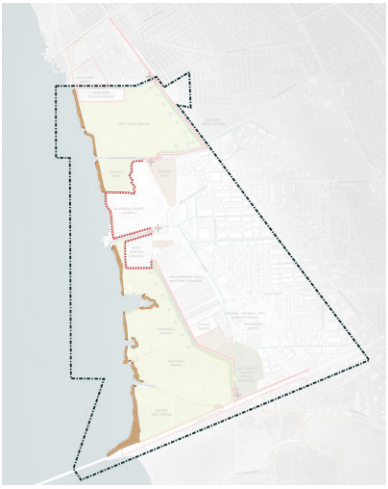
EROSION CONTROL

A layered strategy of erosion control aims to reduce the risk of erosion and shelter inland marshes and ecosystems. Gravel beaches attenuate waves and provide shorebird nesting habitat and revetments provide a more conservative approach to edge stabilization for critical infrastructure.



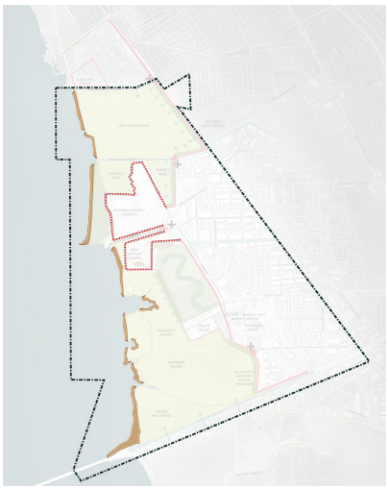
#1: CLOSER TO THE BAY

- Minimized erosion protection and subsurface cutoff along landfill edges with tide gate closer to the Bay.



#2: DOWN THE MIDDLE

- More erosion protection and subsurface cutoff than #1 along landfill edges with tide gate further inland.

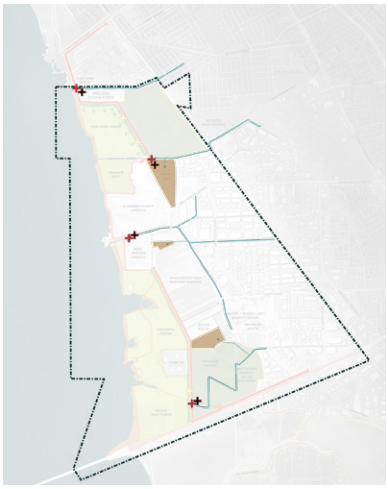


#3: FURTHER INLAND

- Greatest extent of erosion protection and subsurface cutoff along landfill edges.
- Greatest extent of gravel beaches.
- Gravel beach outboard of fringe marsh restoration adds a layer of erosion protection for the Alameda County Landfill.

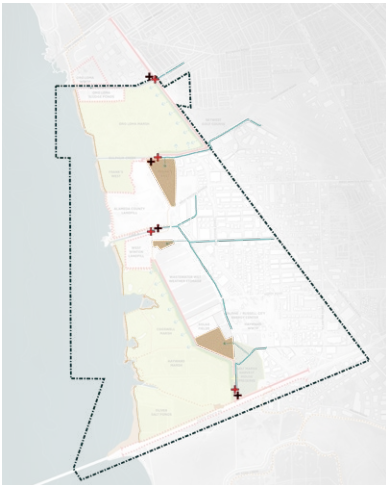
STORMWATER MANAGEMENT

Once a line of protection is established, the stormwater and groundwater management inland of the levee system is critical, especially with increased precipitation events and to mitigate impacts of any bathtub effects that are created. A system of storage ponds, tide gates and water control structures, and flood control channels is used to manage stormwater and move it away from inland communities.



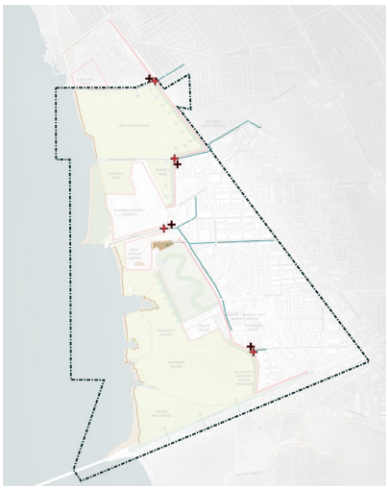
#1: CLOSER TO THE BAY

- Greatest amount of stormwater detention capacity, which provides cost savings with reduced capacity of the pump stations. Also increases redundancy and creates a less vulnerable system for flood control.
- Potential to use the back half of Oro Loma Marsh for stormwater detention from Bockman Channel and Sulphur Creek
- Stormwater storage space isn't directly adjacent to flood control channels in the southern reach.
- Potential to use muted marsh in the southern reach for detention.
- Stormwater detention at Frank's East reduces burden on the Sulphur Creek pump station.



#2: DOWN THE MIDDLE

- Stormwater detention provides cost savings with reduced capacity of the pump stations. Also increases redundancy and creates a less vulnerable system for flood control.
- Stormwater detention in the southern reach isn't directly adjacent to flood control channels.
- Potential to use muted marsh in the southern reach for detention.
- Stormwater detention at Frank's East reduces burden on the Sulphur Creek pump station.

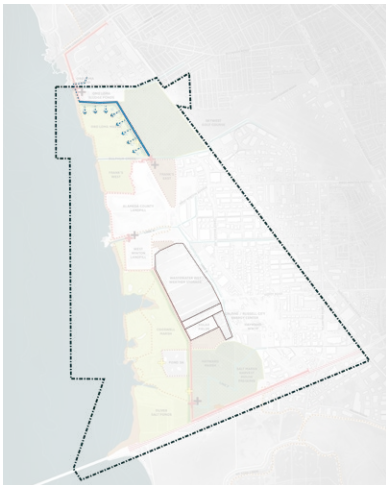


#3: FURTHER INLAND

- No stormwater detention space, which presents flood control challenges.
- No stormwater detention space increases burden on all pump stations, which are vulnerable to power outages.

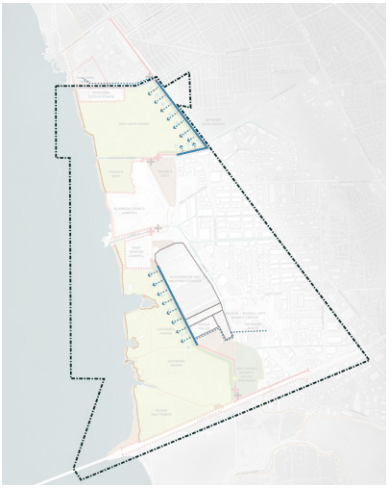
WASTEWATER TREATMENT

The critical uses of wastewater treatment are maintained or enhanced with new multi-benefit infrastructure. Horizontal levees align with the First Mile project and possible future needs for local discharge.



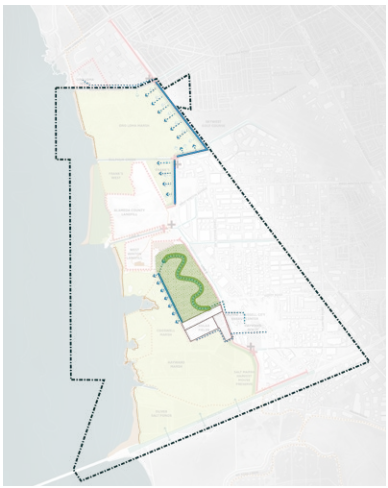
#1: CLOSER TO THE BAY

- Horizontal levee in Oro Loma Marsh provides potential for effluent discharge from Oro Loma WWTP. This location is further away from the recycled water pipeline that would be utilized for wastewater effluent.
- Maintains full capacity of the Wastewater Wet Weather Storage ponds.
- No horizontal levee for Hayward WPCF.



#2: DOWN THE MIDDLE

- Horizontal levee in Oro Loma Marsh provides potential for effluent discharge from Oro Loma WWTP. This location is also adjacent to the recycled water pipeline that would be utilized for wastewater effluent.
- Ecotone levee decreases capacity of the Wastewater Wet Weather Storage ponds.
- No horizontal levee for Hayward WPCF.

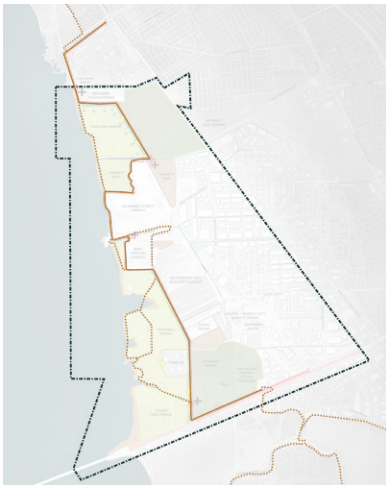


#3: FURTHER INLAND

- Horizontal levee in Oro Loma Marsh provides potential for effluent discharge from Oro Loma WWTP. This location is also adjacent to the recycled water pipeline that would be utilized for wastewater effluent.
- A treatment wetland for Hayward WPCF treats flow that is not treated by the nutrient removal plant upgrades.
- Broad support for Horizontal levee & Freshwater Treatment Marsh for Hayward WPCF effluent discharge.

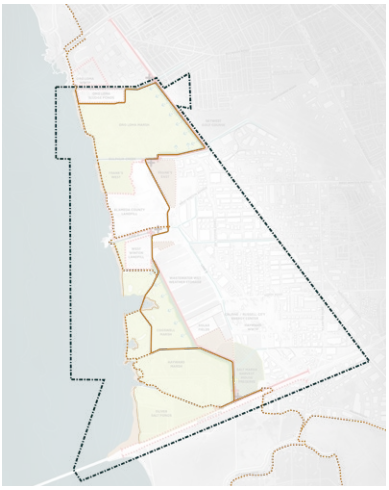
BAY TRAIL

The future location of the Bay Trail prioritizes the blue water experience where possible, maintains a variety of experiences, and aligns with new infrastructure improvements. For all three alternatives, the current alignment of the Bay Trail will be maintained for as long as possible (until it is inundated with sea level rise) and connect to the realignment.



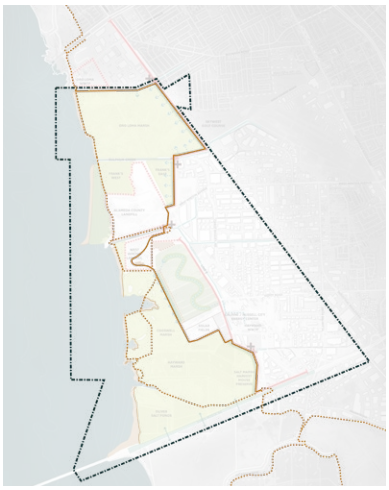
#1: CLOSER TO THE BAY

- Closest to the existing Bay's edge.
- Traverses tidal and muted tidal habitats.
- Maintains a direct link to the Hayward Shoreline Interpretive Center.



#2: DOWN THE MIDDLE

- Bay Trail pulls further back from the existing Bay's edge than #1.
- Requires levee raising to connect to existing alignment by Oro Loma WWTP.
- Proximity to the rail corridor is not favorable.
- Aligns through Cogswell Marsh on a pile supported structure to maintain a diversity of experiences- increases costs but removes the trail from wastewater uses.
- Aligns to the east of the two landfills, which completely disconnects trail users from blue water or Bay habitat.
- Maintains a spur link to the Hayward Shoreline Interpretive Center. which is not favorable.

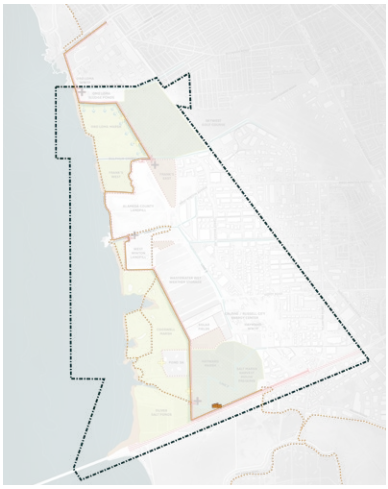


#3: FURTHER INLAND

- Bay Trail pulls the furthest back from the existing Bay's edge.
- Requires levee raising to connect to existing alignment by Oro Loma WWTP.
- Proximity to the rail corridor is not favorable.
- Aligns on top of the landfill for expansive views.
- Aligns along Bay tidal habitat but is close to industrial edge near Frank's East.
- Maintains a direct link to the Hayward Shoreline Interpretive Center.

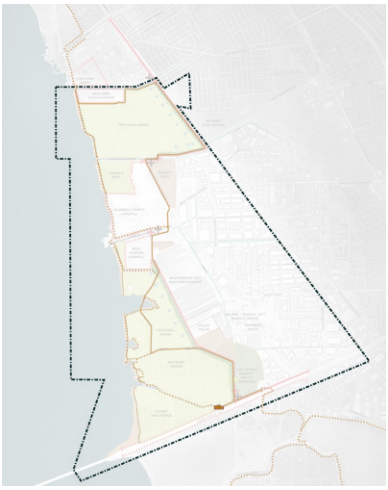
HAYWARD SHORELINE INTERPRETIVE CENTER

The future of the Hayward Shoreline Interpretive Center is connected to new infrastructure improvements. A variety of options are explored to retrofit the center in place and locate the center in proximity to new educational opportunities. All three alternatives maintain a link to the Bay Trail.



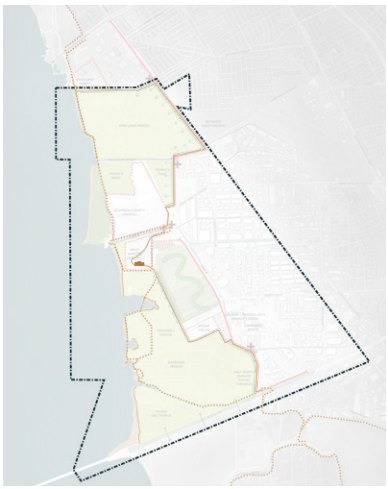
#1: CLOSER TO THE BAY

- Interpretive Center is protected in place, but would likely require structure upgrades in the planning time frame of this project.
- Proximity to future educational opportunities / new pilot projects (e.g. portion of an ecotone levee).



#2: DOWN THE MIDDLE

- Interpretive Center is retrofitted in place yet still vulnerable to wave action. Access is a concern and this alternate would require road raising.
- A floating education center was not reccomended based on the site conditions. It may be cost prohibitive to construct given the site constraints. Additionally, permits may be hard to get given the BCDC requirements (a floating barge would be considered as fill). One of the main benefits of a floating center is its ability to move to different locations, but given the very shallow water and mudflats along the Shoreline, a floating building on the Hayward Regional Shoreline would not have enough depth to move to other locations. Since there is a large range of tidal fluctuation along the shoreline, the building would likely get stuck in the mud during daily tides, which would make it increasingly vulnerable to daily flooding and storm surge.
- Proximity to future educational opportunities / new pilot projects (e.g. portion of an ecotone levee).



#3: FURTHER INLAND

- Interpretive Center is relocated to the landfill where it is protected from flooding.
- Less visibility than immediate adjacency to SR-92.
- Provides expansive Bay views of new restoration projects.
- Proximity to future educational opportunities / new pilot projects (e.g. portion of an ecotone levee).

STAKEHOLDER FEEDBACK SUMMARY

KEY TAKEAWAYS

EBRPD (East Bay Regional Park District)

- Strong emphasis on marsh nourishment and protection.
- Highlight the utilization of nature-based solutions in the Preferred Alternative, continued preservation of the Bay Trail, and maintaining public access.

COH (City of Hayward) / PUBLIC WORKS

- Preference for Alt 1 to completely protect Wet Weather Storage Ponds.
- No support for the use of Skywest Golf Course for surface/subsurface stormwater detention.

HARD (Hayward Area Recreation and Park District)

- Interest in phasing and how projects will be managed by different agencies. Priorities are protecting habitat and maintaining recreation opportunities (Bay Trail and Interpretive Center).
- Support for Interpretive Center relocating to the landfill and San Lorenzo Community Park is a recreational asset to be protected.

SFEI (San Francisco Estuary Institute)

- Ecologically, fully tidal marshes are preferable over muted tidal- they support more species and provide more ecosystem services. Prioritize sediment placement.
- Provide a gradient of habitat types on both sides of the levee (tidal marsh-muted marsh-upland-seasonal wetland).

ACMAD (Alameda County Mosquito Abatement District)

- Largest concern is access by foot or truck. Prefer Alt 1 / Southern End of Alt 2.
- Vegetation selection and long-term maintenance plans/funding are key.

BAY TRAIL

- Prefers Alt 1- maintains a Bay and Blue Water experience.
- Likes bridge structures and the Interpretive Center along the Bay Trail, not a spur.

CALTRANS

- Hydraulics office prefers a causeway for SR-92 to ensure the road is out of the flood zone and no concern over road drainage backing up.
- Raising in place will widen embankment footprint and may impact bridge touchdown.

EBDA (East Bay Dischargers Authority) / ORO LOMA / SFEP (San Francisco Estuary Partnership)

- Recycled water pipeline along the rail corridor to tap into for the wastewater source. EBDA pipeline will likely not be decommissioned, but repurposed for another use.
- EBDA likes Alt 3 for Hayward area- horizontal levee and freshwater treatment marsh (wet weather storage in the winter).

BCDC (San Francisco Bay Conservation and Development Commission)

- Alt 1 will be difficult to permit- preference for a hybrid between Alt 2 and Alt 3.
- Design for flexibility over time- increase levee elevation over time, be adaptable in the future.

SBSP (South Bay Salt Pond Restoration Project)

- Stormwater management is a big consideration. Avoid NOLA situation. Bay ecosystems are used to fluctuating stormwater.
- Get in front of regulators early and follow their recommendations- will make permitting and implementation a lot easier later.

CDFW (California Department of Fish and Wildlife)

- Think about transition zone on the inboard side of the levees- break wave run-up and provide habitat.
- Concern over hydrological connectivity south of SR-92 broad picture may impact hydrological flows and habitat restoration and flood infrastructure.

ACFCD (Alameda County Flood Control District)

- Concern over levee tie-backs and pushing water to other people.
- May not be enough area for detention for the pump stations to accommodate all of the flow.

USFWS (United States Fish and Wildlife Service)

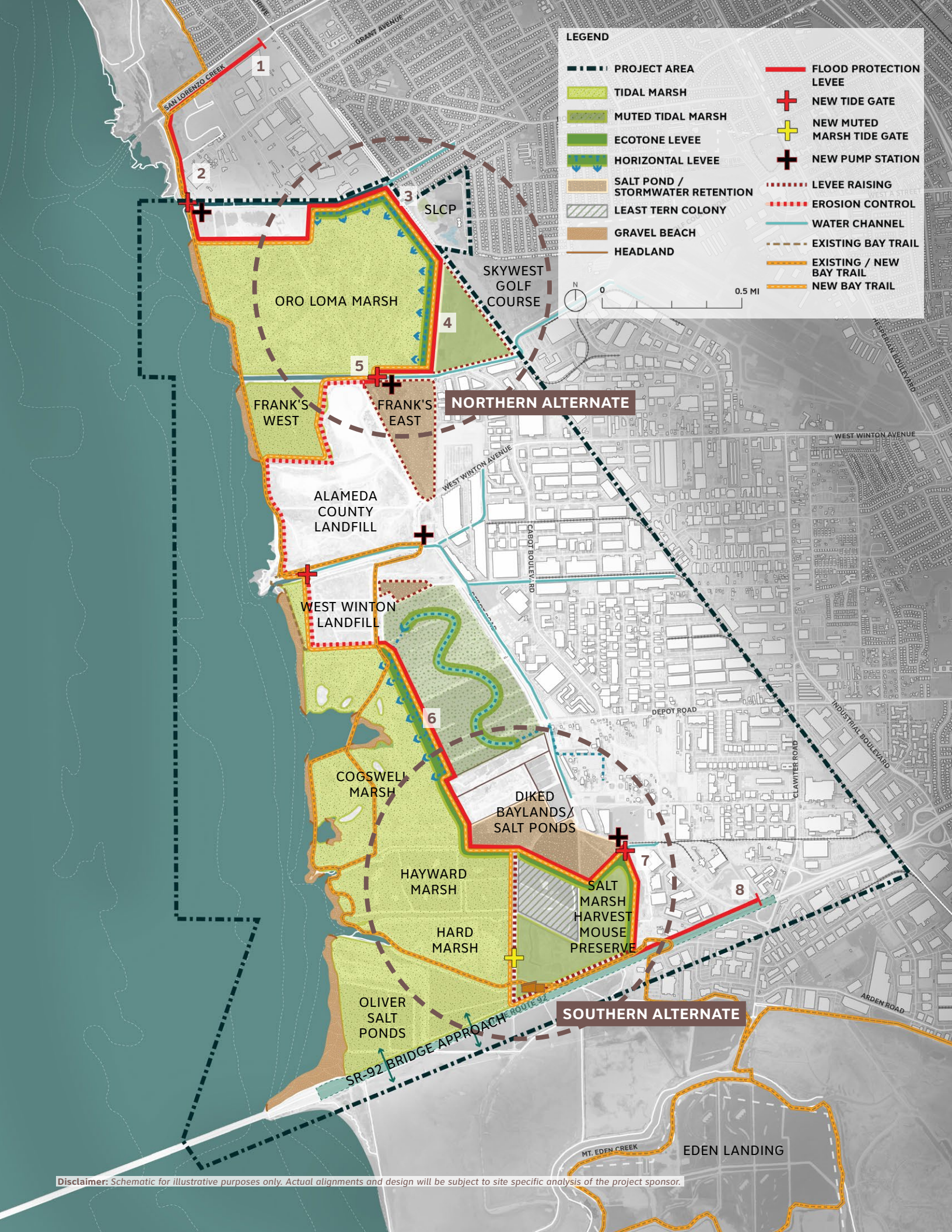
- Alt 1 raises the most concern from bisecting existing marshes in half. Preference for Alt 2 or 3, at face value.
- USFWS involvement is typically triggered under the Federal Endangered Species Act or Fish and Wildlife Coordination Act

USACE (United States Army Corps of Engineers)

- Look at overall impacts of projects- be adaptable to future permitting context.
- Alt #1 is most challenging from a regulatory perspective. USACE prefers the max area and function for waters of the US.

A VISION FOR SHORELINE ADAPTATION: THE HAYWARD REGIONAL SHORELINE

This chapter introduces the Preferred Alternative and its various components. The hybrid Preferred Alternative was selected based upon client and stakeholder feedback and includes two alternates with embedded flexibility.



Disclaimer: *Schematic for illustrative purposes only. Actual alignments and design will be subject to site specific analysis of the project sponsor.*

PREFERRED ALTERNATIVE

A COORDINATED VISION FOR THE HAYWARD REGIONAL SHORELINE

The Preferred Alternative balances risk reduction and ecological enhancement to foster a robust and layered system of shoreline adaptation. This hybrid configuration is based upon stakeholder feedback received during the Design Alternatives process.

At the north end of the project area, the line of protection ties into existing levees along San Lorenzo Creek (1) and wraps in front of Oro Loma Wastewater Treatment Plant (2) to protect it in place before crossing Bockman Channel with a new tide gate. It then pulls back along the Union Pacific Rail Corridor (3), then aligns through the southeastern corner of Oro Loma Marsh (4) before crossing Sulphur Creek with a new tide gate and tying back to high ground at the two existing landfills (5). It then follows the western extent of the Wet Weather Storage ponds to the south (6). The alignment pulls back in the southern portion of the site to wrap the back of the Salt Marsh Harvest Mouse Preserve (7), then ties back along a new levee along the access road for SR-92 (8).

A large extent of tidal habitat is enhanced outboard of the line of protection. Tidal marshes, existing and restored, would be monitored over time with an adaptive management plan that could use sediment augmentation to sustain healthy mudflat and marsh elevations in strategic areas. New tidal marsh is restored at Frank's West and Hayward Marsh. Vulnerable ecosystems, like the Oliver Salt Ponds, would also be restored to tidal marshes as sea levels rise and make perimeter levee maintenance less feasible.

A layered system of erosion control measures utilizes gravel beaches to reduce the risk of erosion to levees that shelter the marshes behind. Bayside levees and interior levees would be retained in place to provide additional layered protection for as long as they are feasible to maintain. Erosion protection and subsurface cutoff along the two landfills reduces the risk of erosion and seepage.

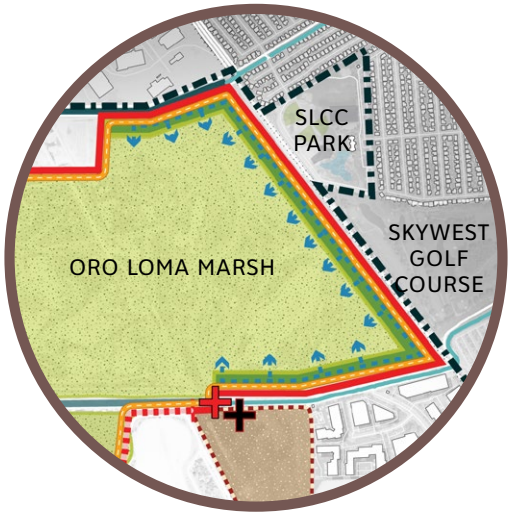
Inland detention ponds at Frank's East and the back portion of Oro Loma Marsh are utilized to hold stormwater before it is pumped to the Bay.

Critical wastewater treatment functions are maintained and enhanced at Oro Loma and Hayward Wastewater Treatment Plants with horizontal levees that outlet treated wastewater effluent across an ecotone slope. Hayward WPCF's existing functions are enhanced with a freshwater treatment marsh that provides nutrient removal and wet weather storage.

The Bay Trail is aligned to promote a diversity of experiences while reducing the risk of flooding.

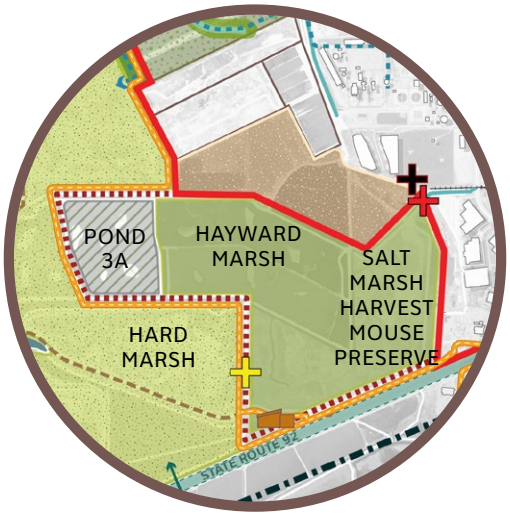
The Hayward Shoreline Interpretive Center is protected in place with interim levee raising and future adaptation could occur through the elevation of the building itself. Its location within a marsh maintains a direct connection to shoreline ecosystems. The San Lorenzo Community Park is also protected in place, but vulnerable to potential groundwater emergence.

Two alternate configurations are outlined below in two areas that may require additional flexibility to align with ongoing projects and permitting constraints.



Northern Alternate

- May be easier to permit since the LOP is outside of BCDC Jurisdiction but more expensive due to lack of stormwater storage capacity

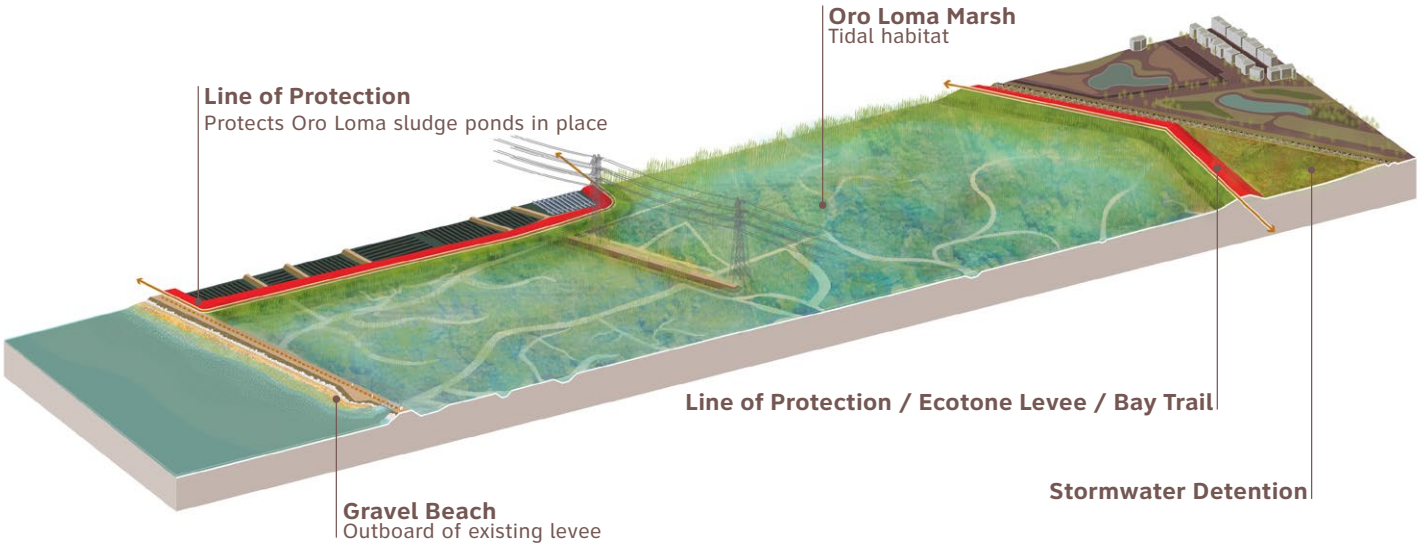


Southern Alternate

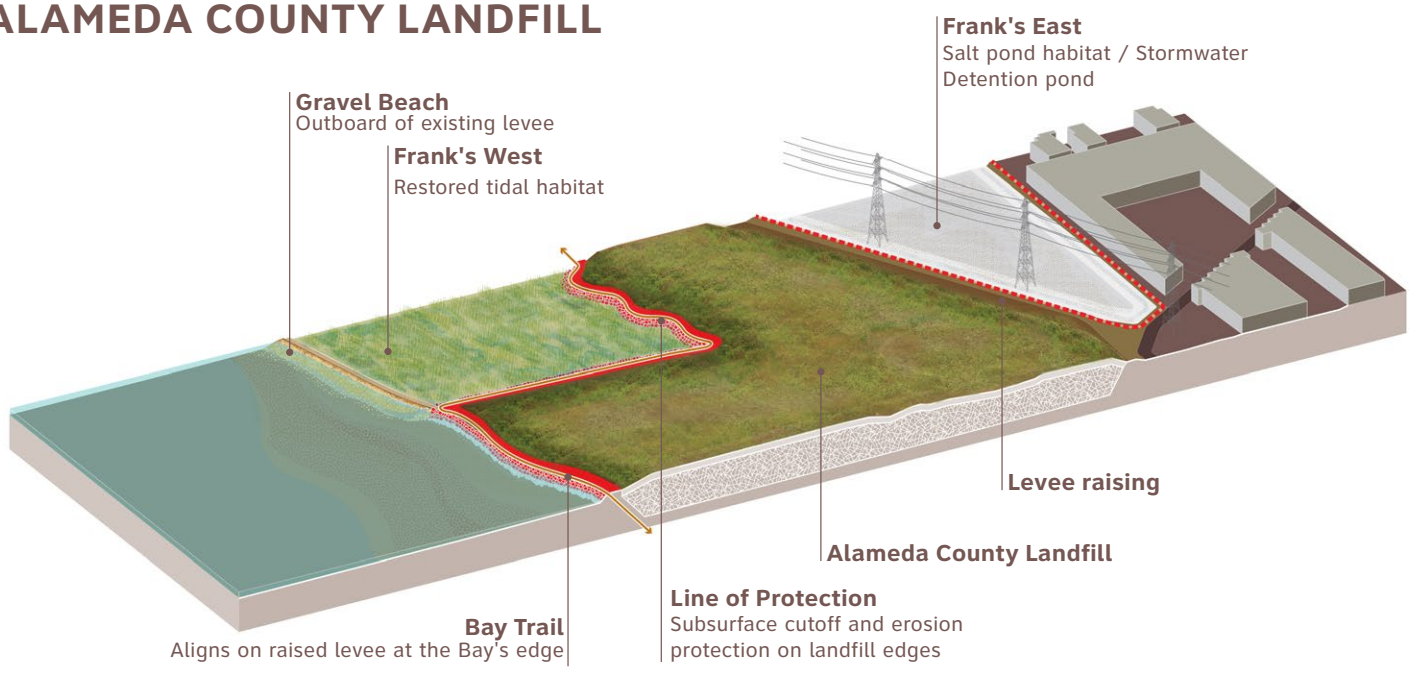
- Levee raising goes around Pond 3A (least tern nesting colony)

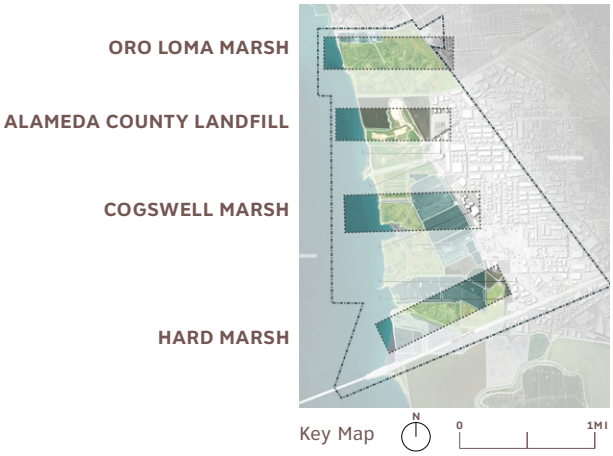
PREFERRED ALTERNATIVE VISUALIZATIONS

ORO LOMA MARSH

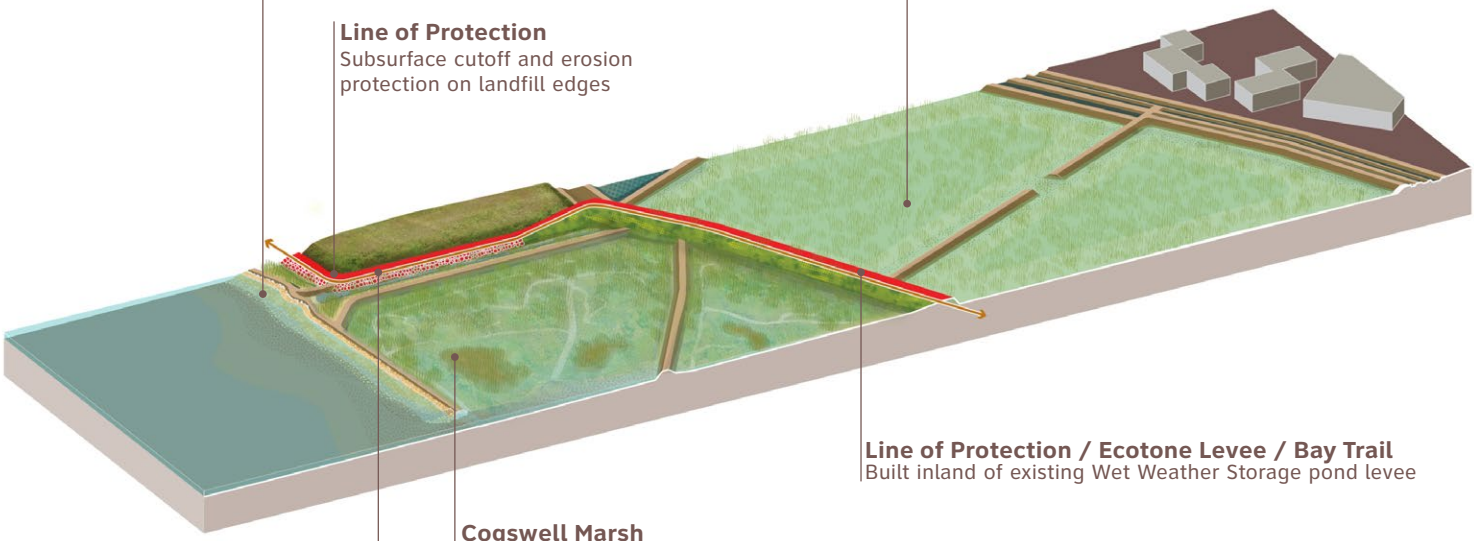


ALAMEDA COUNTY LANDFILL

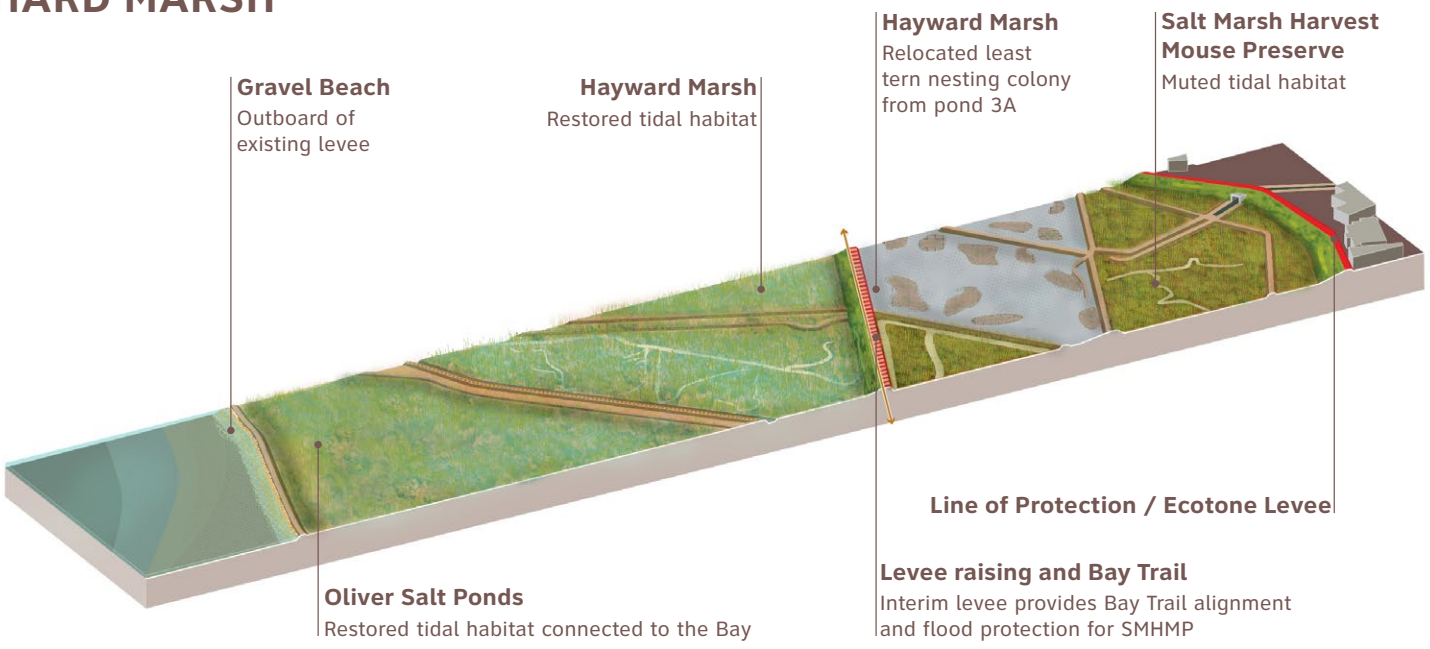


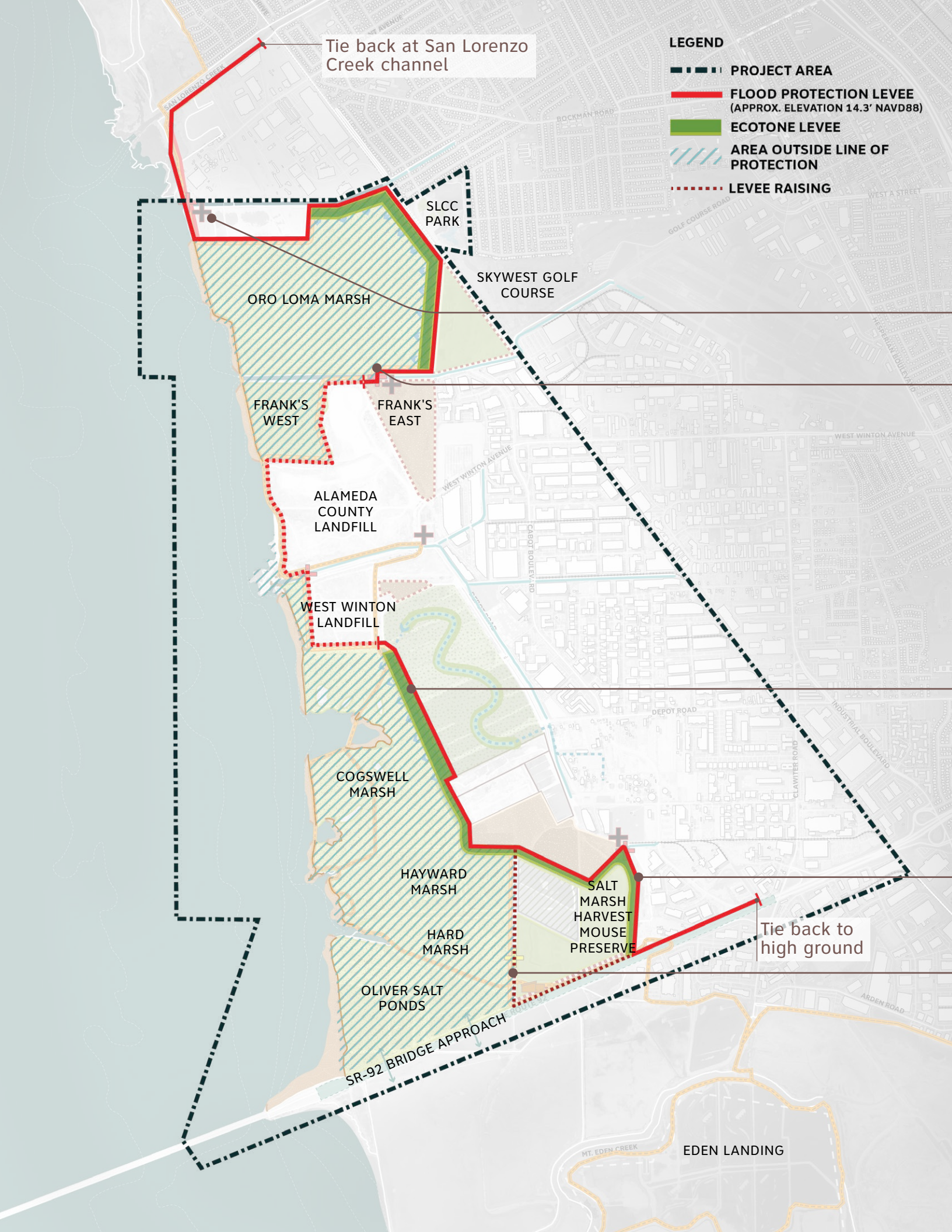


COGSWELL MARSH



HARD MARSH




Tie back at San Lorenzo Creek channel
LEGEND
PROJECT AREA
FLOOD PROTECTION LEVEE
(APPROX. ELEVATION 14.3' NAVD88)
ECOTONE LEVEE
AREA OUTSIDE LINE OF PROTECTION
LEVEE RAISING
SLCC PARK
SKYWEST GOLF COURSE
ORO LOMA MARSH
FRANK'S WEST
FRANK'S EAST
ALAMEDA COUNTY LANDFILL
WEST WINTON LANDFILL
COGSWELL MARSH
HAYWARD MARSH
HARD MARSH
OLIVER SALT PONDS
SALT MARSH HARVEST MOUSE PRESERVE
Tie back to high ground
SR-92 BRIDGE APPROACH
EDEN LANDING
SAN LORENZO CREEK
BOCKMAN ROAD
WEST A STREET
GOLF COURSE ROAD
HESPERIAN BOULEVARD
WEST WINTON AVENUE
CARROL BOULEVARD
DEPOT ROAD
INDUSTRIAL BOULEVARD
CLAWITER ROAD
ARDEN ROAD
MT. EDEN CREEK

PREFERRED ALTERNATIVE

LINE OF PROTECTION

The line of protection includes a FEMA-certified levee that will reduce risk to inland communities by buffering the shoreline against the impacts of sea level rise and storm surge. The spatial alignment of this levee has multiple implications on cost, maintenance, and the new flood protection infrastructure safeguards.

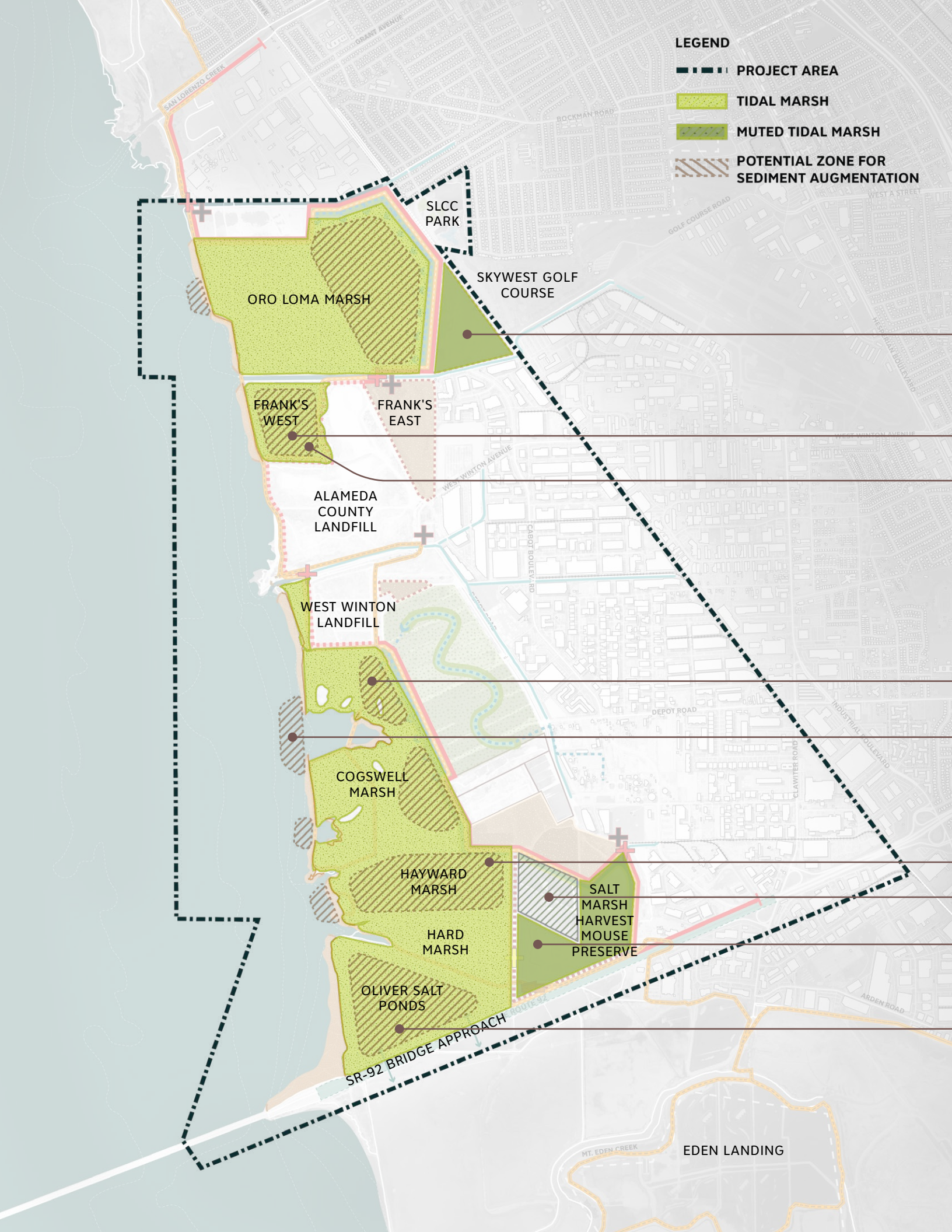
LOP protects Oro Loma Wastewater Treatment Plant and sludge ponds in place

LOP and new tide gate to preserve breach into Oro Loma Marsh

LOP aligns to the west of the Wet Weather Storage Ponds

LOP aligns in the back of the SMHMP

Interim levee raising


LEGEND
PROJECT AREA
TIDAL MARSH
MUTED TIDAL MARSH
POTENTIAL ZONE FOR SEDIMENT AUGMENTATION
SLCC PARK
SKYWEST GOLF COURSE
ORO LOMA MARSH
FRANK'S WEST
FRANK'S EAST
ALAMEDA COUNTY LANDFILL
WEST WINTON LANDFILL
COGSWELL MARSH
HAYWARD MARSH
SALT MARSH HARVEST MOUSE PRESERVE
HARD MARSH
OLIVER SALT PONDS
SR-92 BRIDGE APPROACH
EDEN LANDING
SAN LORENZO CREEK
GRANT AVENUE
BOCKMAN ROAD
GOLF COURSE ROAD
WEST A STREET
WEST WINTON AVENUE
CABOT BOULEVARD
DEPOT ROAD
INDUSTRIAL BOULEVARD
CLAWITER ROAD
ARDEN ROAD
MT. EDEN CREEK

PREFERRED ALTERNATIVE

TIDAL HABITAT

The future extent of tidal habitat encompasses tidal habitat, which is open to Bay water flows, and muted tidal habitat, which is a controlled system inland of the line of the protection where water levels can be more carefully managed over time. Tidal marshes, existing and restored, would be monitored over time with an adaptive management plan that could use sediment augmentation to sustain healthy mudflat elevations in strategic areas.

Muted tidal habitat requires more active management inland of the line of protection, which will become increasingly difficult with rising sea levels and subsiding land.

High ground in the back of Oro Loma Marsh becomes muted tidal and provides stormwater storage capacity

Tidal habitat created at Frank's West

Potential for sediment augmentation to lift diked ponds before tidal marsh restoration

Potential for sediment augmentation in the back of existing marshes to elevate the marsh plain to keep pace with SLR

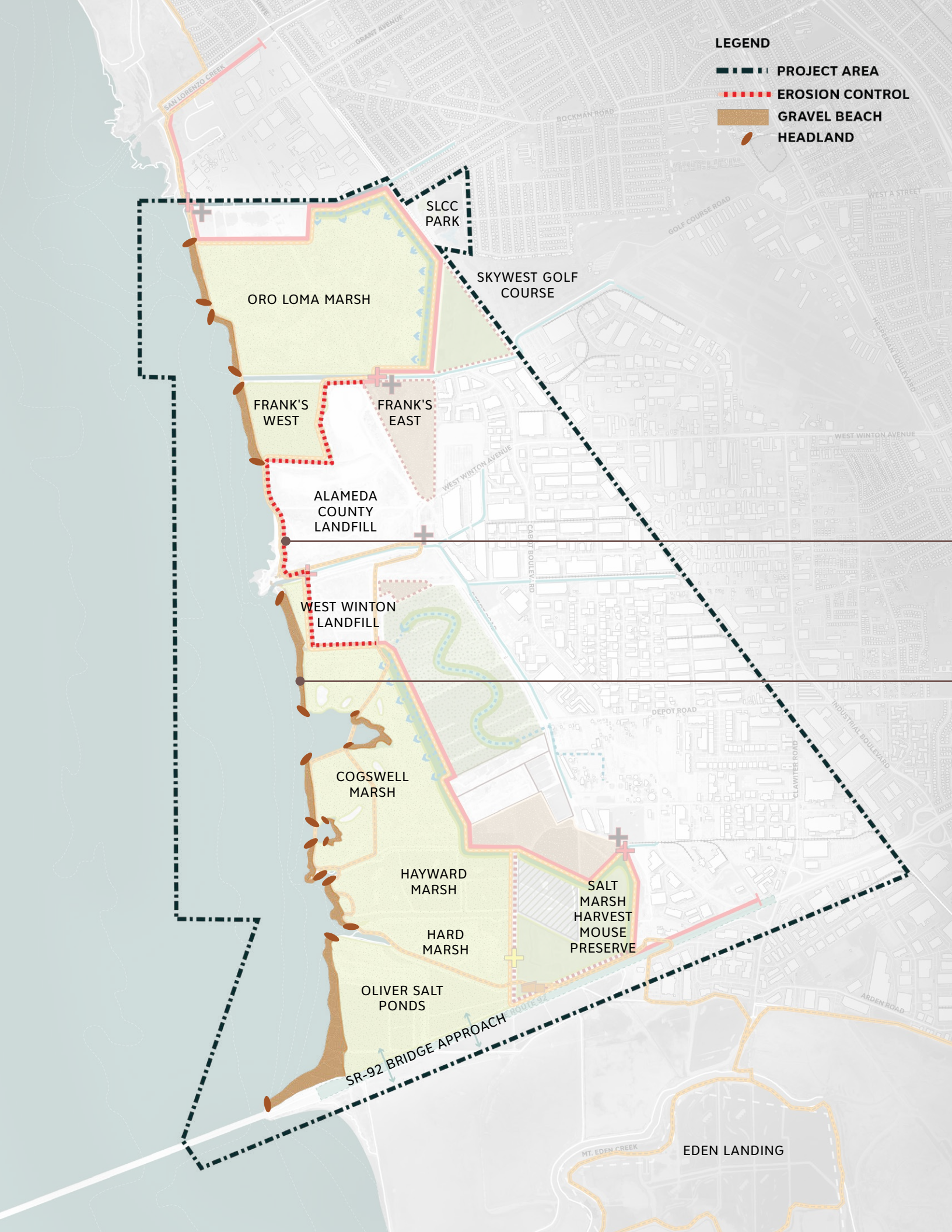
Potential for sediment augmentation at marsh breaches

Tidal habitat created at Hayward Marsh by restoring the Hayward Marsh treatment ponds

Least Tern Colony is relocated within Hayward Marsh

Salt Marsh Harvest Mouse Preserve is maintained and expanded

Tidal habitat created at Oliver Salt Ponds


LEGEND
PROJECT AREA
EROSION CONTROL
GRAVEL BEACH
HEADLAND
SLCC PARK
SKYWEST GOLF COURSE
ORO LOMA MARSH
FRANK'S WEST
FRANK'S EAST
ALAMEDA COUNTY LANDFILL
WEST WINTON LANDFILL
COGSWELL MARSH
HAYWARD MARSH
HARD MARSH
SALT MARSH HARVEST MOUSE PRESERVE
OLIVER SALT PONDS
SR-92 BRIDGE APPROACH
EDEN LANDING
SAN LORENZO CREEK
GRANT AVENUE
BOCKMAN ROAD
GOLF COURSE ROAD
WEST A STREET
HESPERIAN BOULEVARD
WEST WINTON AVENUE
CARPENTER ROAD
DEPOT ROAD
INDUSTRIAL BOULEVARD
CLAWITER ROAD
ARDEN ROAD
MT. EDEN CREEK

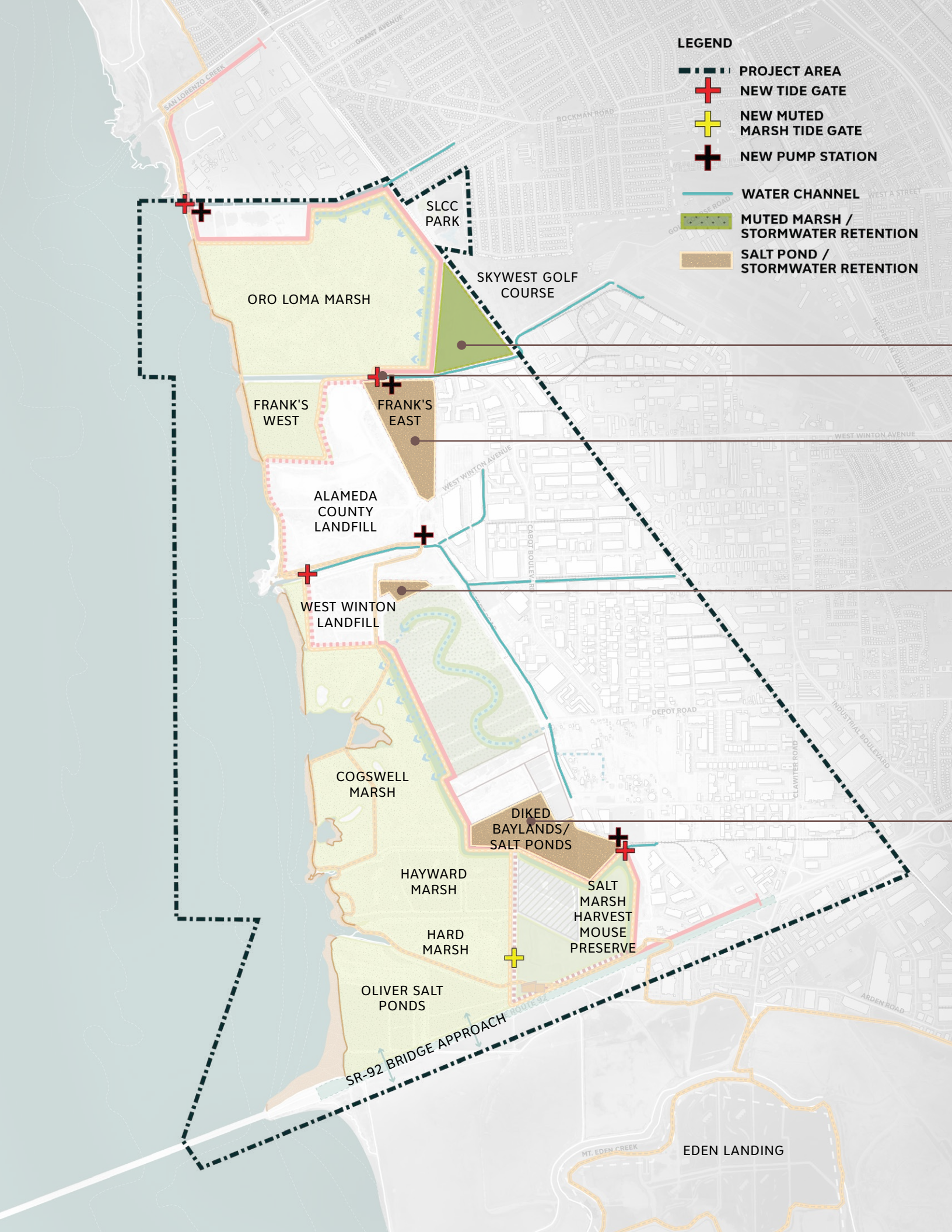
PREFERRED ALTERNATIVE

EROSION CONTROL

A layered strategy of erosion control aims to reduce the risk of erosion to the landfills, the Bay Trail and the marsh edge; and protect inland marshes and ecosystems. Gravel beaches attenuate waves and provide shorebird nesting habitat and revetments provide a more conservative approach to edge stabilization for critical infrastructure.

Erosion protection and subsurface cutoff to maintain existing landfills

Gravel beaches in front of existing levees to increase erosion protection


LEGEND
PROJECT AREA
NEW TIDE GATE
NEW MUTED MARSH TIDE GATE
NEW PUMP STATION
WATER CHANNEL
MUTED MARSH / STORMWATER RETENTION
SALT POND / STORMWATER RETENTION
SLCC PARK
SKYWEST GOLF COURSE
ORO LOMA MARSH
FRANK'S WEST
FRANK'S EAST
ALAMEDA COUNTY LANDFILL
WEST WINTON LANDFILL
COGSWELL MARSH
DIKED BAYLANDS/ SALT PONDS
HAYWARD MARSH
SALT MARSH HARVEST MOUSE PRESERVE
HARD MARSH
OLIVER SALT PONDS
SR-92 BRIDGE APPROACH
EDEN LANDING
SAN LORENZO CREEK
GRANT AVENUE
BOCKMAN ROAD
WEST A STREET
WEST WINTON AVENUE
CABOT BOULEVARD
DEPOT ROAD
INDUSTRIAL BOULEVARD
CLAWITER ROAD
ARDEN ROAD
MT. EDEN CREEK

PREFERRED ALTERNATIVE

STORMWATER MANAGEMENT

Once a line of protection is established, the stormwater and groundwater management inland of the levee system is critical, especially with increased precipitation events and to mitigate impacts of any bathtub effects that are created. A system of detention ponds, tide gates and water control structures, and flood control channels are used to manage stormwater and move it away from inland communities.

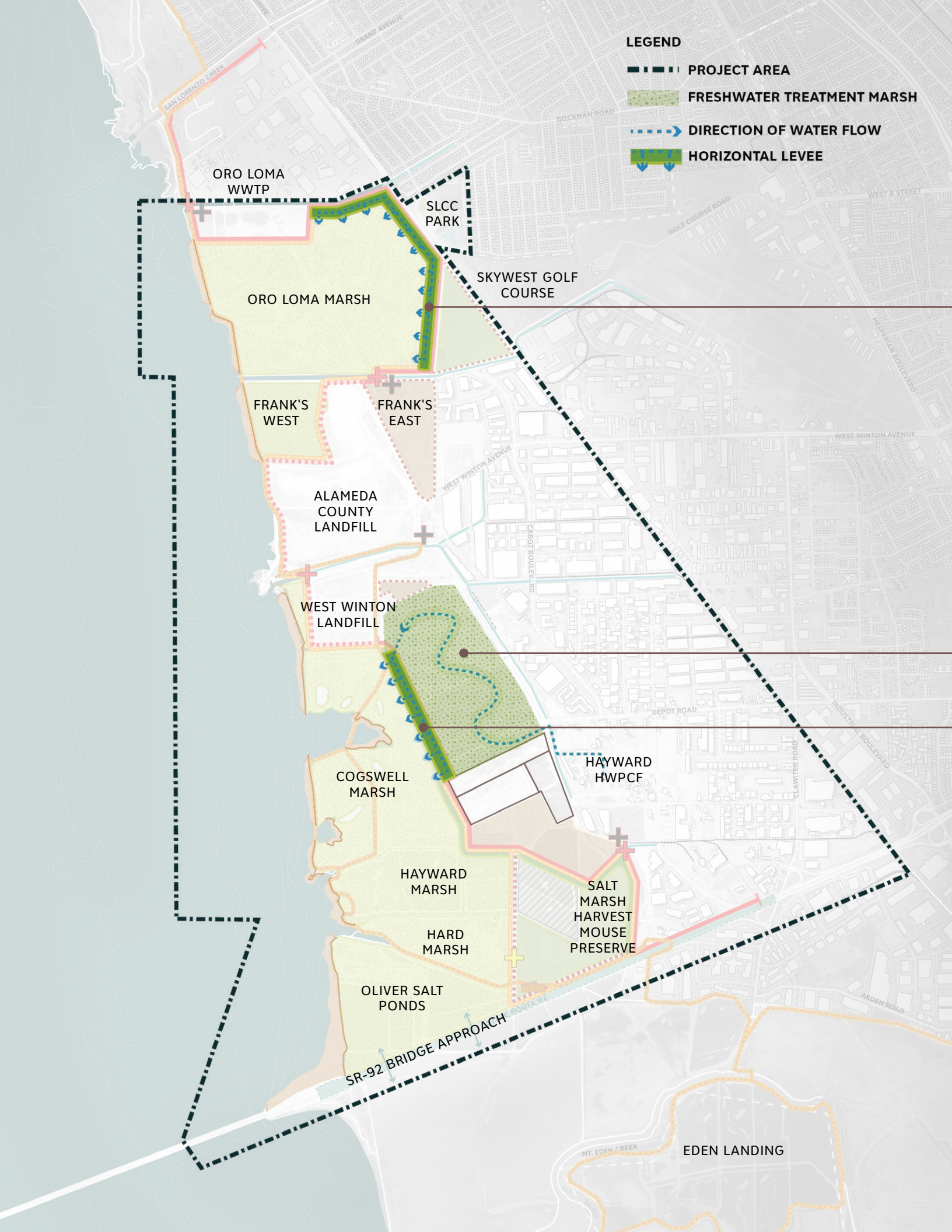
Southeastern corner of Oro Loma Marsh provides stormwater detention for Sulphur Creek

Tide gate located inland of Oro Loma Marsh breach from Sulphur Creek

Salt Pond habitat / Stormwater Detention for Sulphur Creek

Salt Pond habitat / Stormwater Detention

Salt Pond habitat expanded


LEGEND
PROJECT AREA
FRESHWATER TREATMENT MARSH
DIRECTION OF WATER FLOW
HORIZONTAL LEVEE
ORO LOMA WWTP
SLCC PARK
SKYWEST GOLF COURSE
ORO LOMA MARSH
FRANK'S WEST
FRANK'S EAST
ALAMEDA COUNTY LANDFILL
WEST WINTON LANDFILL
COGSWELL MARSH
HAYWARD HWPCF
HAYWARD MARSH
SALT MARSH HARVEST MOUSE PRESERVE
HARD MARSH
OLIVER SALT PONDS
SR-92 BRIDGE APPROACH
EDEN LANDING
SAN LORENZO CREEK
GRANT AVENUE
BOCKMAN ROAD
WEST A STREET
GOLF COURSE ROAD
HESPERIAN BOULEVARD
WEST WINTON AVENUE
CABOT BOULEVARD
DEPOT ROAD
INDUSTRIAL BOULEVARD
CLAWITER ROAD
ARDEN ROAD
MT. EDEN CREEK

PREFERRED ALTERNATIVE

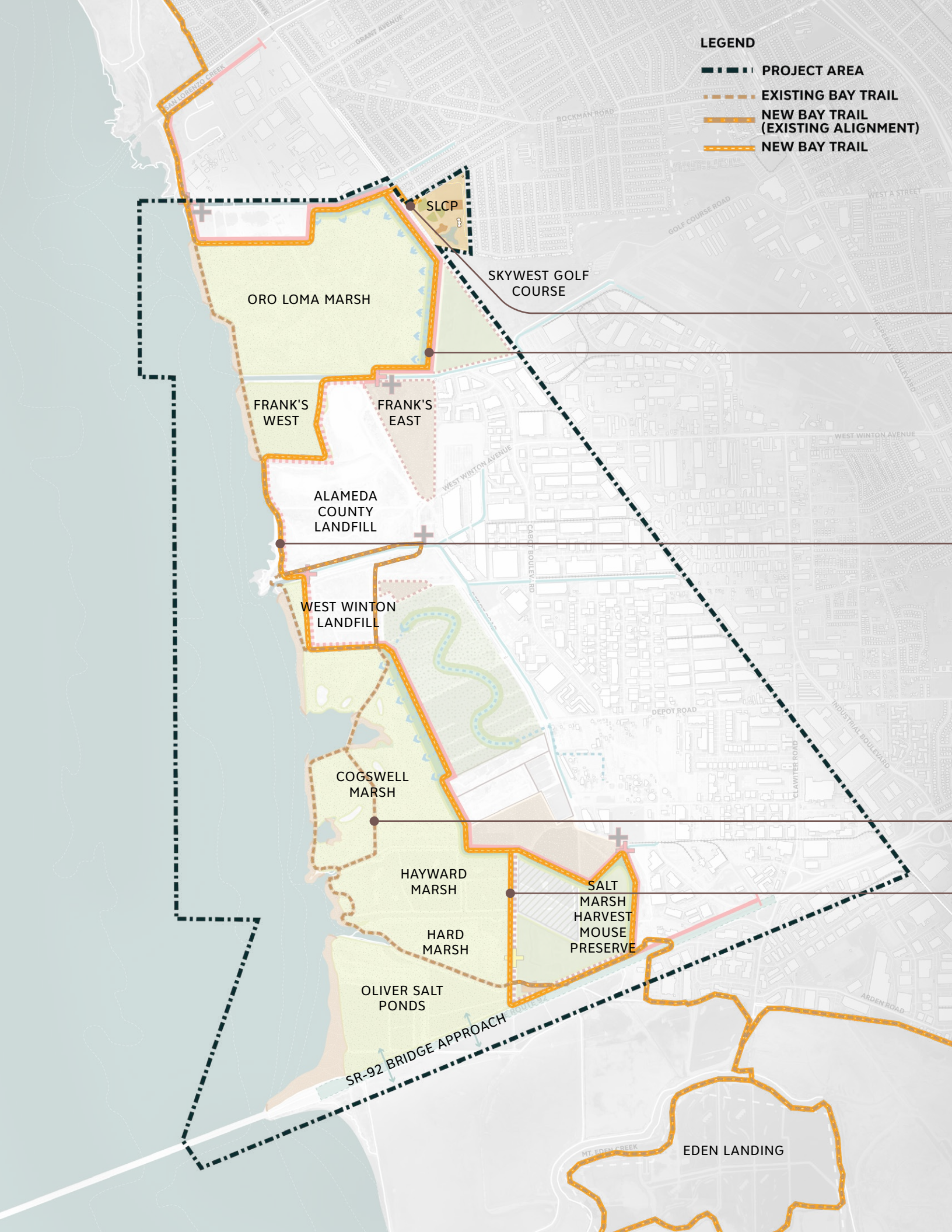
WASTEWATER TREATMENT

The critical uses of wastewater treatment are maintained or enhanced with new multi-benefit infrastructure. Horizontal levees align with the First Mile project and possible future needs for local discharge.

Horizontal levee for Oro Loma Wastewater Treatment Plant for treated wastewater effluent discharge

Freshwater treatment marsh for Hayward WPCF nutrient removal and wet weather storage

Horizontal levee for Hayward WPCF for treated wastewater effluent discharge


LEGEND
PROJECT AREA
EXISTING BAY TRAIL
NEW BAY TRAIL (EXISTING ALIGNMENT)
NEW BAY TRAIL
SLCP
SKYWEST GOLF COURSE
ORO LOMA MARSH
FRANK'S WEST
FRANK'S EAST
ALAMEDA COUNTY LANDFILL
WEST WINTON LANDFILL
COGSWELL MARSH
HAYWARD MARSH
HARD MARSH
OLIVER SALT PONDS
SALT MARSH HARVEST MOUSE PRESERVE
SR-92 BRIDGE APPROACH
EDEN LANDING
GRANT AVENUE
SAN LORENZO CREEK
BOCKMAN ROAD
GOLF COURSE ROAD
WEST A STREET
HESPERIAN BOULEVARD
WEST WINTON AVENUE
CASTRO VALLEY BLVD
DEPOT ROAD
INDUSTRIAL BOULEVARD
CLAWITER ROAD
ARDEN ROAD
MT. EDEN CREEK

PREFERRED ALTERNATIVE

BAY TRAIL

The future location of the Bay Trail prioritizes the blue water experience where possible, maintains a variety of experiences, and aligns with new infrastructure improvements. The current alignment of the Bay Trail will be maintained as long as possible (until it is inundated with sea level rise) and connected to the realignment.

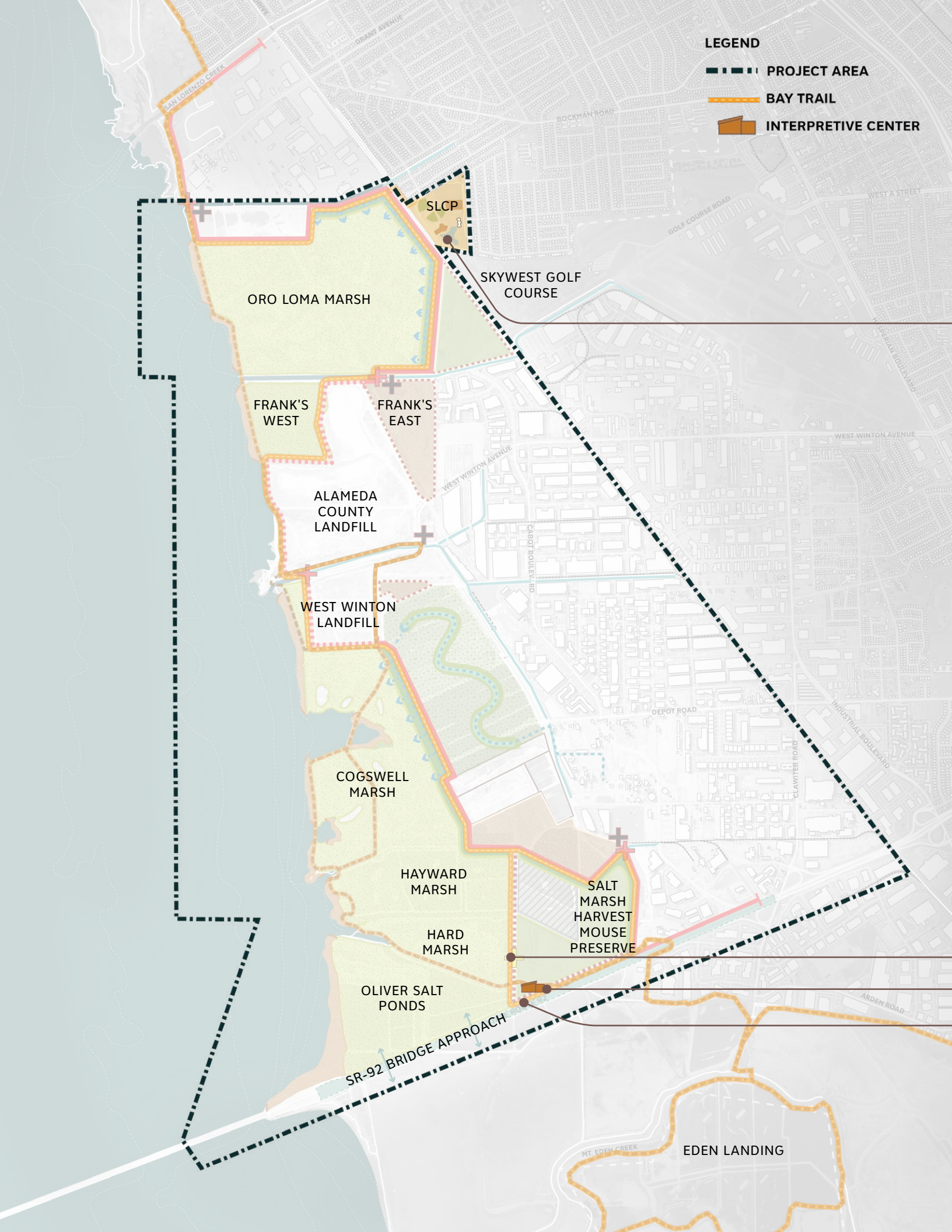
Bay Trail connects to San Lorenzo Community Park

Bay Trail aligns away from the rail corridor

Bay Trail aligns on landfill erosion control infrastructure to maintain blue water experience

Existing alignment will be maintained as long as possible and connected to the realignment

Bay Trail aligns on raised levee and provides views to tidal and muted tidal marshes


LEGEND
PROJECT AREA
BAY TRAIL
INTERPRETIVE CENTER
SLCP
SKYWEST GOLF COURSE
ORO LOMA MARSH
FRANK'S WEST
FRANK'S EAST
ALAMEDA COUNTY LANDFILL
WEST WINTON LANDFILL
COGSWELL MARSH
HAYWARD MARSH
HARD MARSH
SALT MARSH HARVEST MOUSE PRESERVE
OLIVER SALT PONDS
SR-92 BRIDGE APPROACH
EDEN LANDING
SAN LORENZO CREEK
GRANT AVENUE
BOCKMAN ROAD
GOLF COURSE ROAD
WEST A STREET
HESPERIAN BOULEVARD
WEST WINTON AVENUE
CABOT BOULEVARD
DEPOT ROAD
INDUSTRIAL BOULEVARD
CLAWITER ROAD
ARDEN ROAD
MT. EDEN CREEK

PREFERRED ALTERNATIVE

RECREATIONAL ASSETS

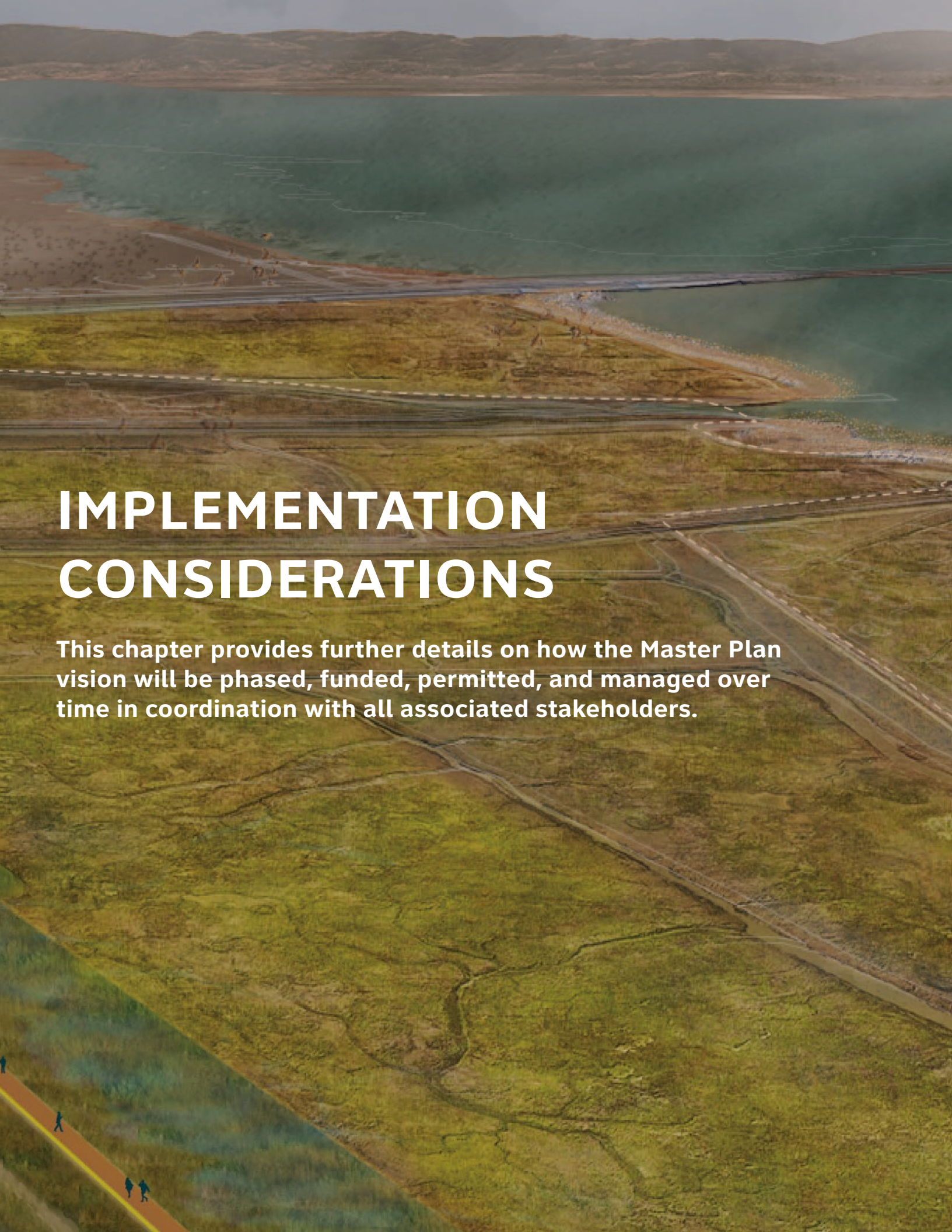
The future of Hayward Regional Shoreline's recreational assets are connected to new infrastructure improvements. The current Interpretive Center is retrofitted in place and located in proximity to new educational opportunities. A direct connection to the Bay Trail is maintained. The San Lorenzo Community Park is protected in place, yet remains vulnerable to groundwater emergence.

San Lorenzo Community Park is protected from sea level rise, but might be vulnerable to groundwater inundation. Educational programming opportunity.

Raised levee protects Interpretive Center in place short-term

Interpretive Center can be raised in place long-term

Maintains link to the Bay Trail



IMPLEMENTATION CONSIDERATIONS

This chapter provides further details on how the Master Plan vision will be phased, funded, permitted, and managed over time in coordination with all associated stakeholders.

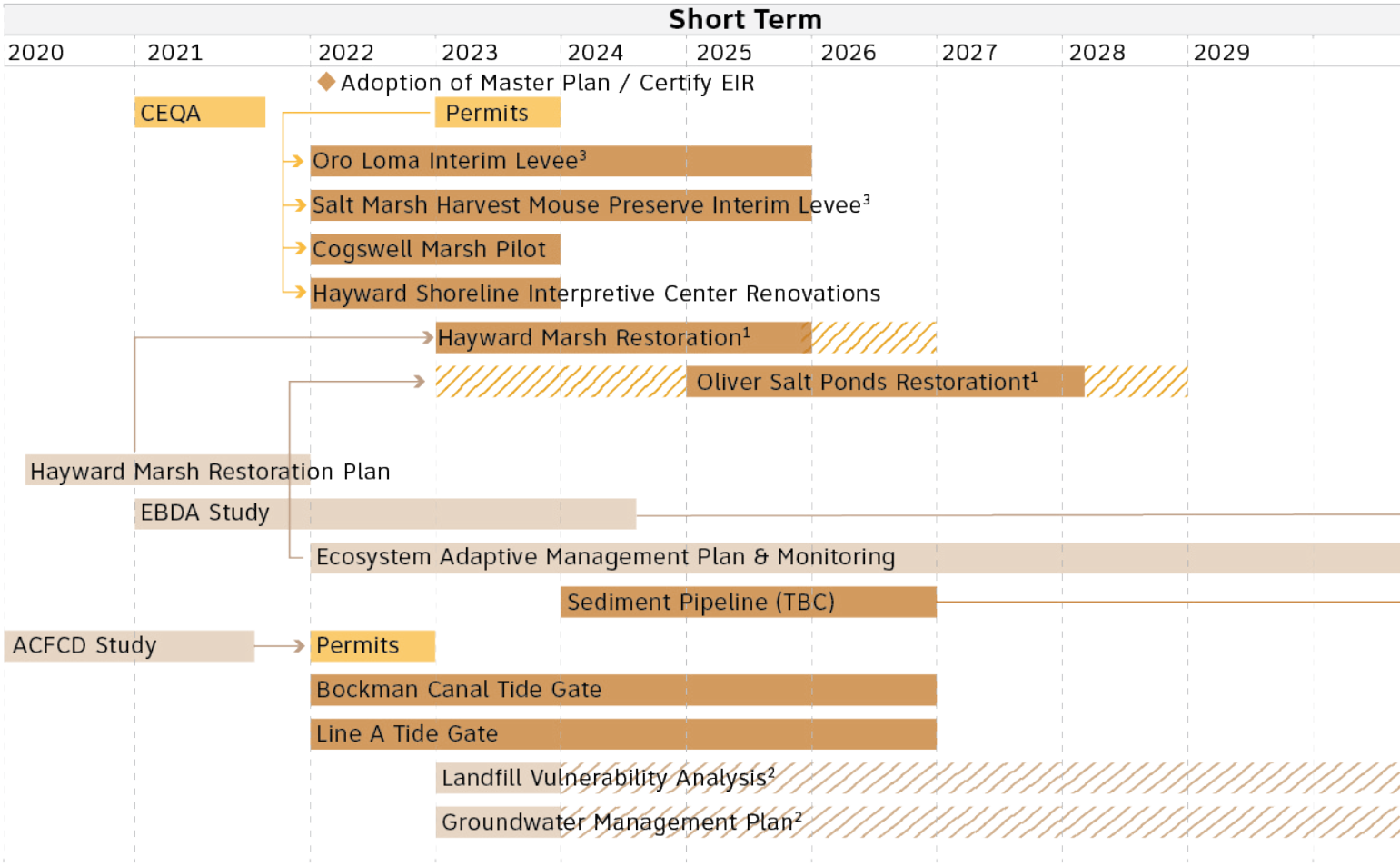
PHASING PLAN

This section breaks the Preferred Alternative down into discrete projects and provides a pathway towards implementation through different planning horizons.

PHASING STRATEGY

IMPLEMENTATION SCHEDULE

The Preferred Alternative is a long-term vision that will be broken down into discrete projects that will be phased over time. The projects identified in the Phasing Plan are initial recommendations, based on guidance from the Project Team. The actual time frames for each project will need to be flexible to align with design, permitting, funding, and construction timelines on a project basis.



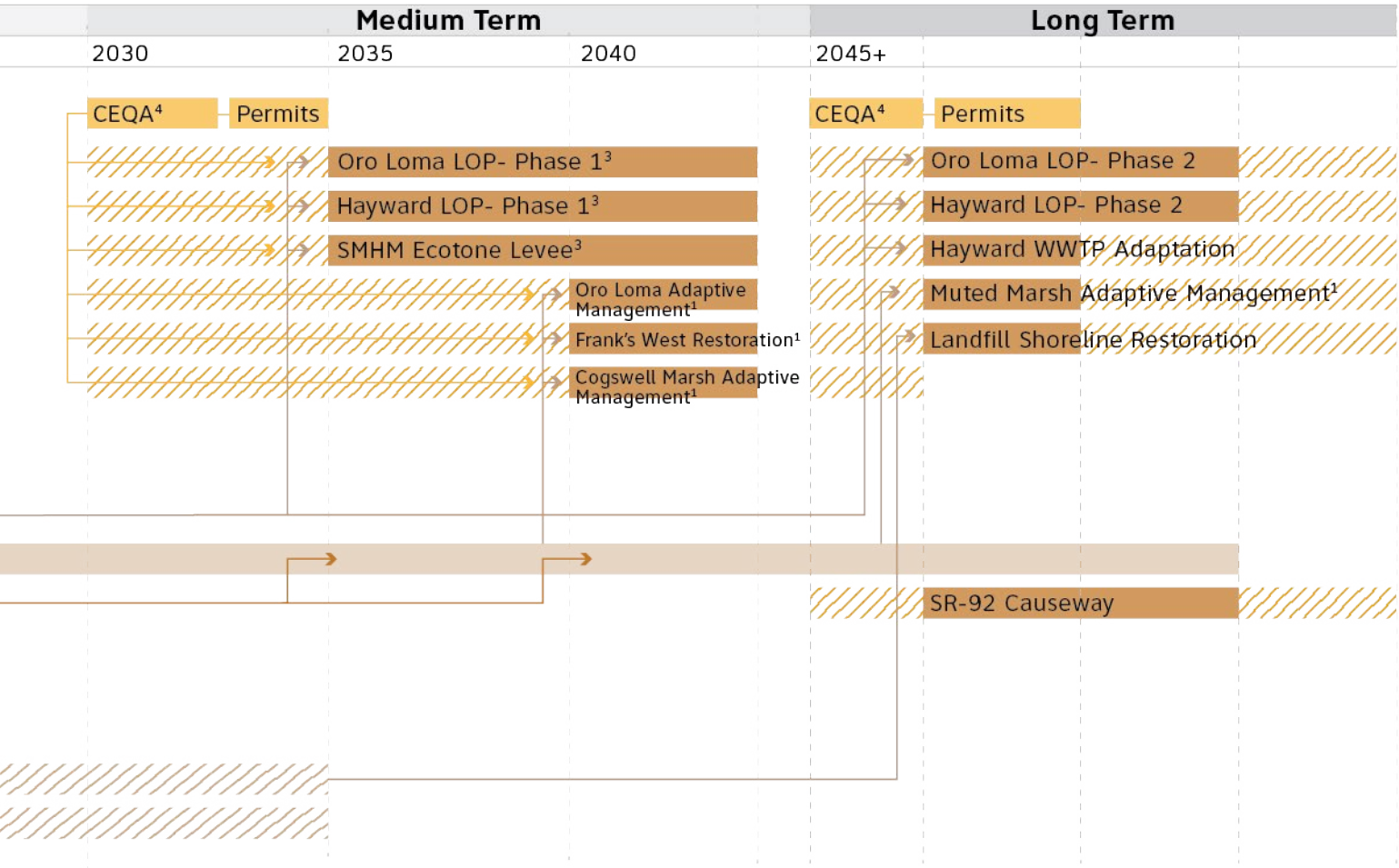
Legend

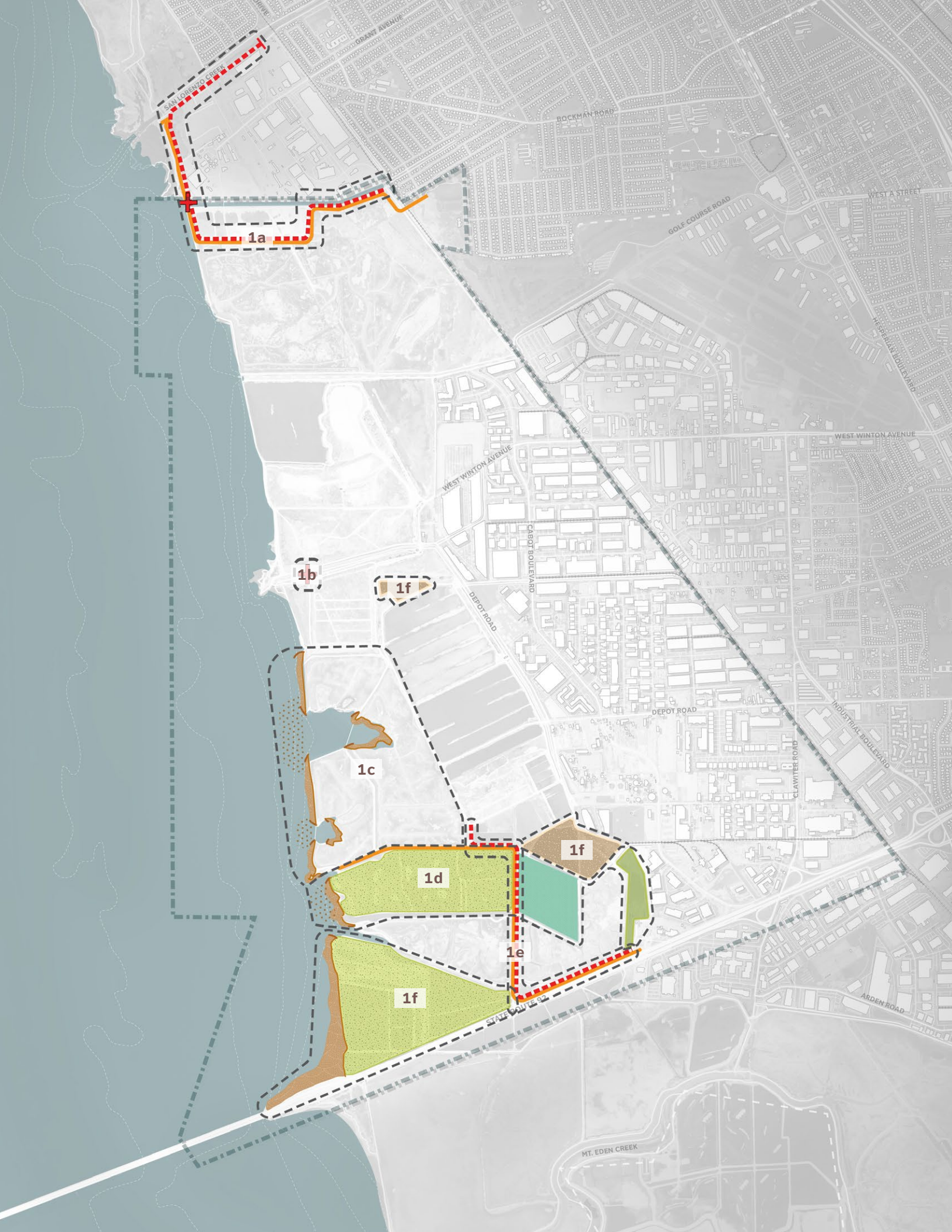
- Permitting
- Design & Construction
- Study, Monitoring

*Hatching represents timing flexibility, see foot notes for more information

Footnotes

[1] Timing dependent on rates of SLR, erosion and sediment accretion, to be monitored through this management plan
[2] Timing flexible, needed to inform medium and long term projects
[3] Timing could be staggered with aligned projects, depending on funding and permitting
[4] CEQA update dependent on changes in scope since EIR


Medium Term
Long Term
2030
2035
2040
2045+
CEQA[4]
Permits
CEQA[4]
Permits
Oro Loma LOP- Phase 1[3]
Hayward LOP- Phase 1[3]
SMHM Ecotone Levee[3]
Oro Loma Adaptive Management[1]
Frank's West Restoration[1]
Cogswell Marsh Adaptive Management[1]
Oro Loma LOP- Phase 2
Hayward LOP- Phase 2
Hayward WWTP Adaptation
Muted Marsh Adaptive Management[1]
Landfill Shoreline Restoration
SR-92 Causeway


1a
1b
1c
1d
1e
1f
1f
1f
SAN LORENZO CREEK
GRANT AVENUE
BOCKMAN ROAD
GOLF COURSE ROAD
WEST A STREET
HESPERIAN BOULEVARD
WEST WINTON AVENUE
WEST WINTON AVENUE
CABOT BOULEVARD
DEPOT ROAD
DEPOT ROAD
INDUSTRIAL BOULEVARD
CLAWITER ROAD
STATE ROUTE 92
ARDEN ROAD
MT. EDEN CREEK

SHORT TERM PROJECTS

The projects identified in the short term are projected to be constructed in less than 10 years. This time frame and associated projects are an initial idea of how the phasing may work, based on the Project Team's recommendations. These projects and time frames will need to be flexible, since the ability to implement a project depends on multiple external factors, such as funding acquisition, permitting, and construction cycles.

The short-term projects give priority to ecological enhancements that align with existing efforts and vulnerable sites.

Pilot projects will provide valuable information to inform a larger scale application of strategies in the medium and long-term.

Setting up a monitoring protocol in the short-term will provide valuable information to analyze existing conditions to inform what sites and strategies should be prioritized as sea levels rise.

Strategies such as interim levee raising aim to reduce risk up to the existing 100-year storm.

Projects shown on the map:

1a. Oro Loma Interim Levee

- Bockman Channel Pump Station
- Levee in front of Oro Loma WWTP and Sludge Ponds to the rail corridor
- Levee Raising along San Lorenzo Creek
- New Bay Trail- Oro Loma WWTP Section

1b. Line A Tide Gate Improvement

1c. Cogswell Marsh Pilot

- Gravel Beaches
- Marsh Management and Sediment Placement

1d. Hayward Marsh Restoration

- Tidal Habitat Restoration
- Muted Tidal Habitat Restoration
- Marsh Management and Sediment Placement
- Least Tern Colony Relocation
- Gravel Beach

1e. Salt Marsh Harvest Mouse Preserve Interim Levee

1f. Oliver Salt Ponds Restoration / Salinas Swap

- Gravel Beaches
- Sediment Placement
- Tidal Habitat Restoration
- Salinas habitat north of Hayward Marsh and near West Winton Landfill

Projects not shown on the map:

1g. Landfill Vulnerability Assessment

1h. Groundwater Management Plan

1i. Stormwater Management Study

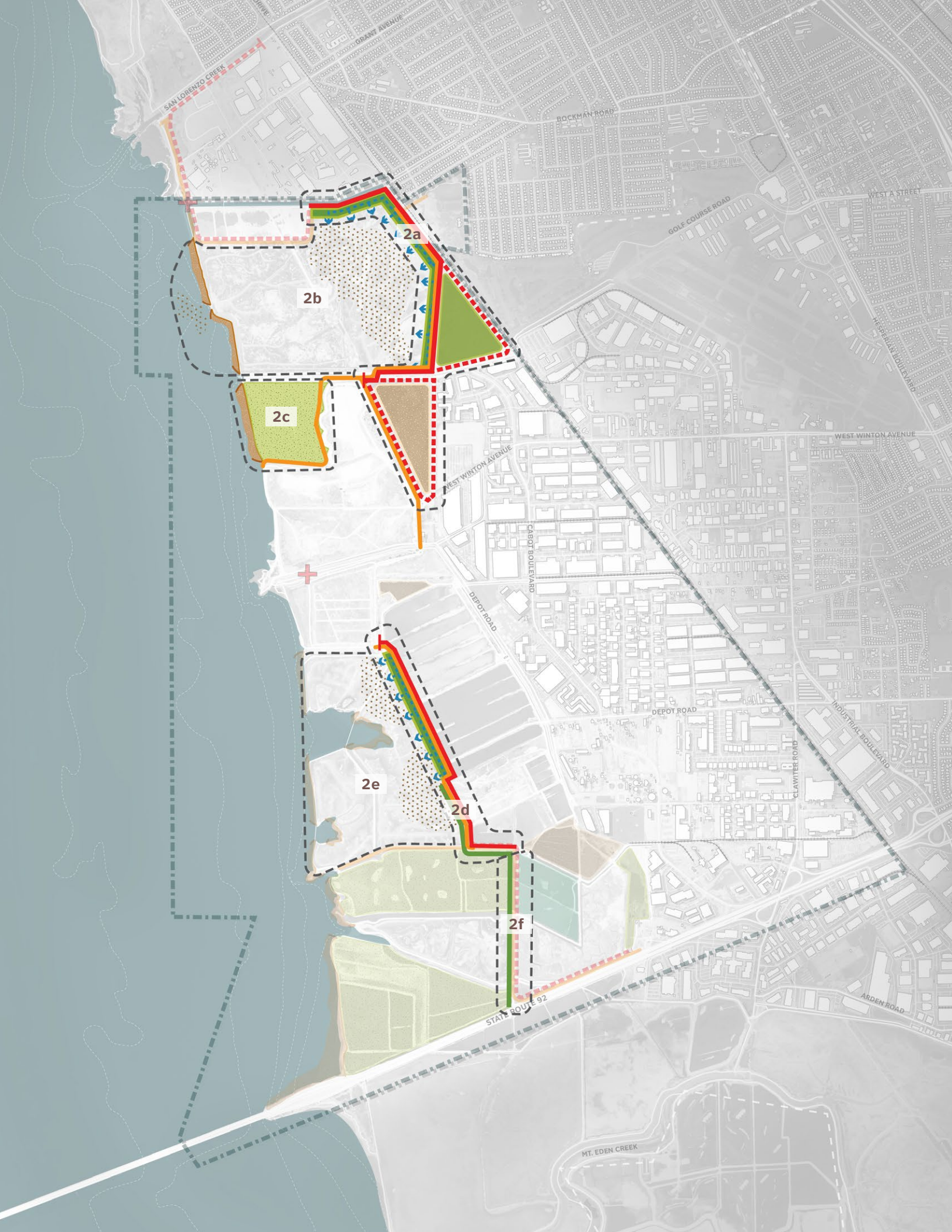
1j. EBDA Study

1k. Ecosystem Adaptive Management & Monitoring

1l. Hayward Shoreline Interpretive Center Renovation

1m. Sediment Pipeline

1n. CEQA


2a
2b
2c
2d
2e
2f
SAN LORENZO CREEK
GRANT AVENUE
BOCKMAN ROAD
GOLF COURSE ROAD
WEST A STREET
HESPERIAN BOULEVARD
WEST WINTON AVENUE
CABOT BOULEVARD
DEPOT ROAD
INDUSTRIAL BOULEVARD
CLAWITER ROAD
STATE ROUTE 92
ARDEN ROAD
MT. EDEN CREEK

MEDIUM TERM PROJECTS

The projects identified in the medium term are projected to be constructed in 10-25 years. This time frame and associated projects are an initial idea of how the phasing may work, based on the Project Team's recommendations. These projects and time frames will need to be flexible, since the ability to implement a project depends on multiple external factors, such as funding acquisition, permitting, and construction cycles.

The medium-term projects give priority to multi-benefit infrastructure and opportunities for stormwater management.

Tidal habitat adaptation to sea level rise is a crucial project in the medium-term. The rate of sea level rise and sediment accretion will provide data to inform what marshes will need artificial sediment application to keep pace with sea level rise.

Parts of the line of protection (LOP) are established to reduce risk up to 4' of sea level rise plus the 100-year storm. These discrete portions of levee provide independent utility to specific inland areas.

Projects shown on the map:

2a. Oro Loma LOP- Phase 1

- FEMA Certified Levee, designed to protect for 4' SLR plus 100-year storm
- Sulphur Creek tide gate and pump station
- Muted Tidal Habitat and Levee Raising
- Frank's East Salinas / Stormwater Detention
- First Mile Project Horizontal Levee
- New Bay Trail Section- back of Oro Loma Marsh

2b. Oro Loma Adaptive Management

- Gravel Beaches
- Marsh Management and Sediment Placement

2c. Frank's West Restoration

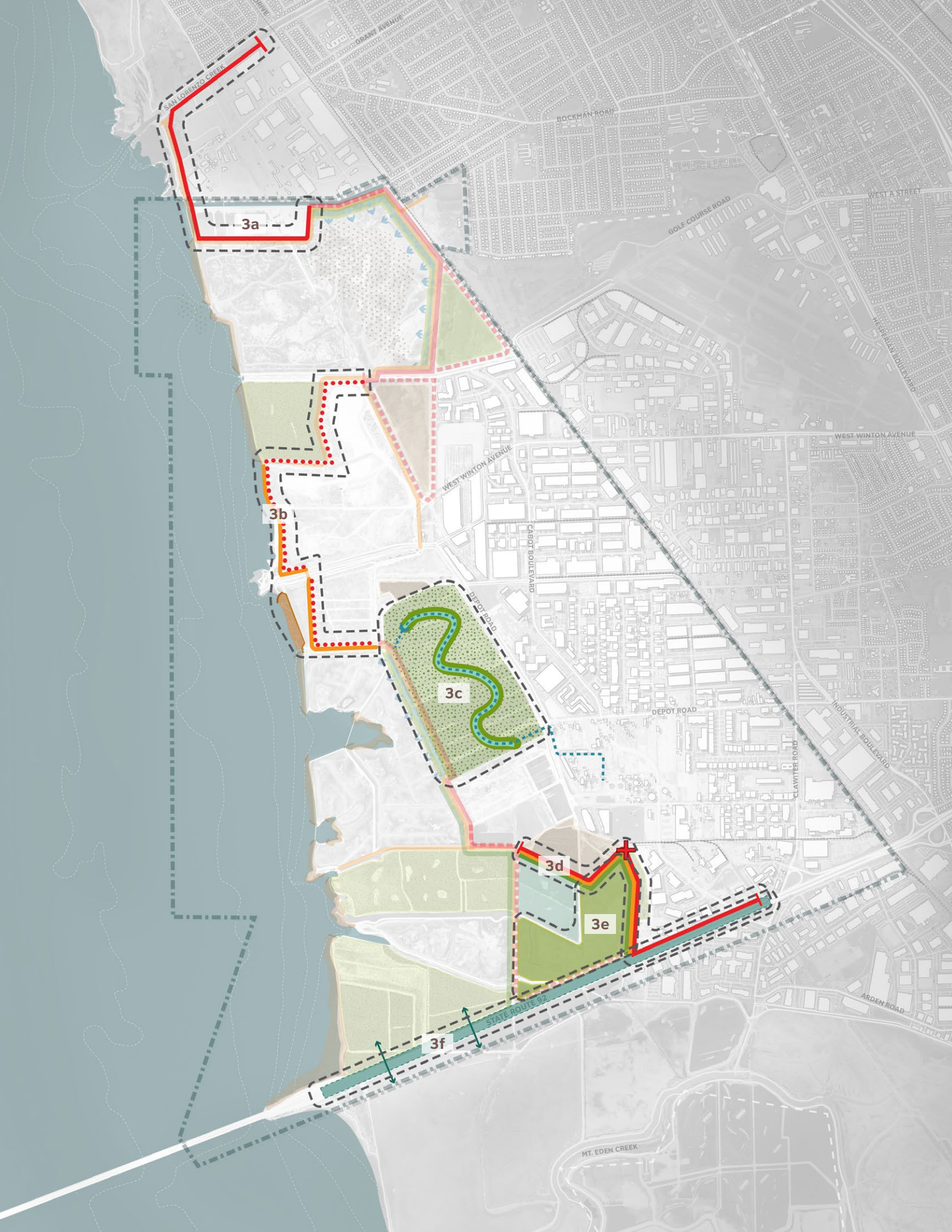
- Tidal Habitat Restoration
- Gravel Beaches

2d. Hayward LOP- Phase 1

- FEMA Certified Levee, designed to protect for 4' SLR plus 100-year storm
- Hayward WWTP Horizontal Levee
- New Bay Trail Section

2e. Cogswell Marsh Adaptive Management

2f. Salt Marsh Harvest Mouse Preserve Ecotone Levee


3a
3b
3c
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SAN LORENZO CREEK
GRANT AVENUE
BOCKMAN ROAD
GOLF COURSE ROAD
WEST A STREET
HESPERIAN BOULEVARD
WEST WINTON AVENUE
WEST WINTON AVENUE
CABOT BOULEVARD
DEPOT ROAD
DEPOT ROAD
INDUSTRIAL BOULEVARD
CLAWITER ROAD
STATE ROUTE 92
ARDEN ROAD
MT. EDEN CREEK

LONG TERM PROJECTS

The projects identified in the long term are projected to be constructed in over 25 years. This time frame and associated projects are an initial idea of how the phasing may work, based on the Project Team's recommendations. These projects and time frames will need to be flexible, since the ability to implement a project depends on multiple external factors, such as funding acquisition, permitting, and construction cycles.

The long-term projects give priority to completing a full line of protection and creating a layered system of erosion control infrastructure.

Wastewater treatment plants are adapted to facilitate local discharge.

The line of protection (LOP) is established to reduce risk up to 4' of sea level rise plus the 100-year storm. This alignment will connect the discrete portions of levees built in the medium-term scenario.

Projects shown on the map:

3a. Oro Loma LOP- Phase 2

- FEMA Certified Levee, designed to protect for 4' SLR plus 100-year storm

3b. Landfill Shoreline Restoration

- Triangle Marsh Gravel Beach
- West Winton Landfill erosion protection and subsurface cutoff
- Alameda County Landfill erosion protection and subsurface cutoff
- New Bay Trail Sections

3c. Hayward WWTP Adaptation

- Freshwater Treatment Marsh

3d. Hayward LOP- Phase 2

- FEMA Certified Levee, designed to protect for 4' SLR plus 100-year storm
- Line F Tide Gate

3e. Muted Marsh Adaptive Management

3f. SR-92 Causeway

SHORT TERM PROJECTS

ID	STANDALONE PROJECT	PROJECT COMPONENTS
1a	Oro Loma Interim Levee	• Bockman Channel pump station • Levee in front of Oro Loma + Sludge Ponds • Levee raising along San Lorenzo Creek • New Bay Trail - Oro Loma WWTP Section
1b	Line A Tide Gate Improvement	• Line A Tide Gate
1c	Cogswell Marsh Pilot	• Cogswell Marsh (sediment placement at breaches) • Cogswell Marsh gravel beaches
1d	Hayward Marsh Restoration	• Least Tern Colony relocation • Hayward Marsh gravel beach • Hayward Marsh tidal habitat restoration • Diked Baylands east of the SMHM Preserve
1e	Salt Marsh Harvest Mouse Preserve Interim Levee	• Access road from Interpretive Center to Bay Trail Pedestrian Bridge • Levee raising west of SMHM from Solar Fields to SE corner of SMHM Preserve
1f	Oliver Salt Ponds Restoration	• Oliver Salt Ponds gravel beach • Oliver Salt Ponds (sediment placement to raise pond) • Oliver Salt Ponds • Salinas habitat north of Hayward Marsh • Salinas habitat near West Winton Landfill
1g	Landfill Vulnerability Assessment	• Landfill vulnerability Assessment (characterisation, hydrogeology)
1h	Groundwater Management Plan	• Groundwater Management Plan
1i	Stormwater Management Study	• Stormwater Management Study
1j	EBDA Study	• EBDA Study
1k	Ecosystem Adaptive Management Plan & Monitoring	• Adaptive Management Plan
1l	Hayward Shoreline Interpretive Center Renovation	• Hayward Shoreline Interpretive Center renovations
1m	Sediment Pipeline	• Don Castro Sediment Pipeline
1n	CEQA	• CEQA EIR

	AGENCIES	NOTES
	ACFCD, HASPA, Oro Loma WWTP, Bay Trail, EBRPD	Designed to current 100-year, San Lorenzo Creek to rail corridor, includes new bay trail spur & near term sulphur creek tide gate/pump station
	ACFCD, HASPA	Pending results of ACFCD stormwater study, to protect from 2' of SLR
	EBRPD, BCDC, USACE	Sediment placement and gravel beaches to reduce erosion
	EBRPD, BCDC, USACE, CDFW, HASPA	Timing dependent on pilot monitoring and Adaptive Management Plan
	EBRPD, HASPA, HARD, ACFCD	Interim levee to protect from 2' of SLR, along current levee alignments from Interpretive center through HARD Marsh, ending at Hayward Marsh. Need to examine stormwater management needs. Restoration work could be separate but may be advantageous from funding/regulatory perspective to combine.
	EBRPD, BCDC, USACE, CDFW, HASPA	Timing dependent on pilot monitoring of adjacent sites and Adaptive Management Plan
	COH	To assess existing conditions and needs
	COH, Property Owners	To study feasibility of various approaches
	ACFCD	Already begun
	EBDA	To inform design of horizontal levee
	HASPA	To develop pilot and monitoring plan, identify triggers for restoration, inform future restoration plans
	HARD	ADA Access improvements and facility needs / energy retrofits
	ACFCD, EBRPD, BCDC	Deliver sediment to Baylands. Timing uncertain.
	HASPA, EBRPD, COH, HARD	CEQA EIR for Master Plan projects.

MEDIUM TERM PROJECTS

ID	STANDALONE PROJECT	PROJECT COMPONENTS
2a	**Oro Loma LOP- Phase 1**	• Frank's East salinas • Sulpur Creek Tide Gate, Pump station • Oro Loma muted tidal levee raising • First Mile project in the back of Oro Loma Marsh • Frank's East levee raising • Oro Loma southeastern triangle • New Bay Trail - back half of Oro Loma Marsh Section
2b	**Oro Loma Adaptive Management**	• Oro Loma gravel beaches • Oro Loma Marsh (sediment placement at breaches) • Oro Loma Marsh (sediment placement in eastern half)
2c	**Frank's West Restoration**	• Frank's West gravel beach • Frank's West (sediment placement to raise pond) • Frank's West tidal habitat restoration
2d	**Hayward LOP- Phase 1**	• Levee tie-back along raised SR-92 access road • New Bay Trail - WWTP to SR92 • Hayward horizontal levee (South of Landfills)
2e	**Cogswell Marsh Adaptive Management**	• Cogswell Marsh (sediment placement to raise eastern edges)
2f	**Salt Marsh Harvest Mouse Preserve Ecotone Levee**	• Ecotone levee from Wet Weather Storage Ponds to SR-92

LONG TERM PROJECTS

ID	STANDALONE PROJECT	PROJECT COMPONENTS
3a	**Oro Loma LOP- phase 2**	• FEMA levee around Oro Loma sludge ponds to tie-back at SLC channel
3b	**Landfill shoreline restoration**	• Triangle Marsh gravel beach • West Winton Landfill erosion protection + subsurface cutoff • Alameda County Landfill erosion protection + subsurface cutoff • New Bay Trail - Alameda County Landfill • New Bay Trail - West Winton Landfill
3c	**Hayward WWTP Adaptation**	• Freshwater treatment marsh
3d	**Hayward LOP- phase 2**	• Line F tide gate + pump station • Ecotone levee along new LOP around SMHM Preserve
3e	**Muted Marsh Adaptive Management**	• Marsh Management + Sediment Placement
3f	**SR-92 Causeway**	• SR-92 Causeway

	AGENCIES	NOTES
	ACFCD, HASPA, Oro Loma WWTP, Bay Trail, EBRPD	FEMA levee from Oro Loma sludge ponds to Landfill, includes stormwater improvements, sulphur creek tide gate, and Bay Trail sections
	EBRPD, BCDC, USACE	Timing dependent on pilot monitoring of adjacent sites and Adaptive Management Plan
	EBRPD, BCDC, USACE	Timing dependent on pilot monitoring of adjacent sites and Adaptive Management Plan
	ACFCD, HASPA, Oro Loma WWTP, Bay Trail, EBRPD, CalTrans, COH, Public Works	FEMA levee from Landfill to SMHM levee raising, includes horizontal levee and Bay Trail sections
	EBRPD, BCDC, USACE	Timing dependent on pilot monitoring and Adaptive Management Plan
	ACFCD, EBRPD	Ecotone levee in front of SMHM levee raising

	AGENCIES	NOTES
	Oro Loma WWTP, ACFCD, HASPA	FEMA levee from Oro Loma sludge ponds to tie back along SLC, includes stormwater improvements, Bockman tide gate, and Bay Trail sections
	EBRPD, BCDC, COH, Bay Trail	Pending vulnerability assessment, includes erosion control and subsurface cut off, includes adjacent sections of Bay Trail
	COH, Public Works, EBDA, ACFCD	Freshwater treatment marsh for local discharge using horizontal levee
	ACFCD, HASPA, EBRPD	FEMA levee from SMHM levee raising to tie back near Clawiter Rd., includes stormwater improvements, Line F tide gate, and Bay Trail sections
	EBRPD, HASPA, BCDC	Adaptive Management of muted tidal habitat inland of SMHM Interim Levee
	CalTrans	CalTrans retrofit of SR-92 Bridge approach

POTENTIAL MARSH SEDIMENT NEED TO KEEP PACE WITH 4' OF SLR

Sources:

1. San Francisco Estuary Institute and Aquatic Science Center 2015. California Aquatic Resource Inventory. (April 18, 2019)

SCAPE

STRATEGIES FOR SEDIMENT MANAGEMENT

SHORELINE ADAPTATION WITH SEA LEVEL RISE

Sediment scarcity is a regional problem in the San Francisco Bay that could greatly impact existing and new marsh restoration projects and exacerbate the risks of sea level rise.

The Hayward Regional Shoreline was historically built with sediment. However, after a series of creek channelizations in the mid-1950s, much of the sediment-rich water could no longer reach the Baylands.

Today, the Hayward Regional Shoreline Baylands are living infrastructure that contains marshes and tidal flats that buffer vulnerable edges and levees from wave action and tidal energy. Yet this protective infrastructure is at risk of being outpaced by sea level rise. As sea levels rise, the accretion of sediment is critical to Bayland survival. Without deposits of this muddy material, tidal marshes and mudflats will not be able to withstand rising water levels, and this will ultimately lead to marsh decline and marsh drowning.

Low sediment supply with sea level rise triggers habitat shifts, increased flood intensity and tidal elevations, which presents serious risks to humans and ecosystems over time.

Experts at the Department of California Fish and Wildlife, San Francisco Estuary Institute, and the US Army Corps of Engineers referenced an average sediment accretion rate of 6 mm per year for the baylands, and this number was factored into all sediment calculations. For the Hayward Regional Shoreline, sediment projections look bleak, as there are no local sources of sediment from natural creeks. It is important to note that scientists are actively researching sediment accretion in the Bay and data on this topic is subject to change.

With climate change, low-sediment or high-sediment conditions differentially impact accretion rates for Bayland resources. Because of this, it is crucial to consider new sediment sources and their potential to deliver material to the Bay.

There are a variety of strategies to be piloted and implemented for the future of sediment management along the Hayward Regional Shoreline. Many of these strategies are not permittable in the current regulatory climate, but as climate change threats become more real, pilot projects can help inform new permitting structures that facilitate ecosystem adaptation to sea level rise.

There are two main types of sediment management to consider that could help adapt the Hayward Regional Shoreline in the future:

Sediment Placement to lift Diked Baylands

Many of the diked Baylands in the Hayward Regional Shoreline have subsided over time and their elevations are close to or below mean sea level. In order to ensure successful marsh restoration projects in the future, these diked Baylands will need to be raised to marsh plain elevation before they are exposed to tidal action.

There are a variety of potential fill materials to lift the pond elevations, such as:

- Clean Construction fill may be used to lift ponds. (The Bair Island Restoration used this strategy)
- The potential Don Castro Sediment pipeline has the potential to transport trapped sediment behind the Don Castro Dam and transport it in a slurry pipeline to diked Baylands in the project area.

Sediment Augmentation for Ecosystem Adaptation with Sea Level Rise

- Dams and Reservoirs - Reservoirs such as the Don Castro Reservoir, could be used to provide sediment for thin-layer placement on existing marshes, depending on the sediment size and quality.
- Beneficial reuse of Dredge Material - Working with the USACE and BCDC, there are a variety of beneficial reuse strategies to lift existing marshes as sea levels rise. These include shallow water placement and thin-layer placement on existing marshes.
- Berms, or physical structures to reduce wind/wave fetch - Structures in marshes may reduce wave action and help sediment settle out to facilitate accretion.
- Creek widening - Opening up the mouths of creeks may help bring more sediment into marshes. Most of the sediment that is trapped in creek systems is below head of tide. Widening creek mouths may help facilitate the trapping of sediment from both fluvial and Bay sources.
- Small channel openings - Breaching existing levees at regular intervals can open up marsh systems to more tidal flow and sediment. Smaller breaches may help reduce erosion potential.
- Mud berms - Placing sediment on tidal flats in front of existing marshes may help transport sediment through tidal action to the marsh itself. This presents feasibility challenges due to the shallow water conditions of the Hayward Shoreline.

PROJECT FACT SHEETS

This section breaks provides a detailed assessment of specific projects identified in the Phasing Plan.

LANDFILL VULNERABILITY ASSESSMENT

PROJECT SUMMARY

The purpose of this project is to assess the existing conditions and resiliency issues of Alameda County and West Winton landfills. Both sites were closed in the 1970s but were not designed to experience inundation or wave action. The conditions of the cap and the contents of the landfill are largely unknown, and more data investigation and analysis are needed to understand how they may be impacted by erosion, coastal flooding, sea level rise, and groundwater emergence. Once this investigation has been done, design solutions and phasing for how to address these issues can be developed.

PROJECT SITE & OWNERSHIP

The landfills are located on the water's edge in the middle reach of the site and are owned by Alameda County and the City of Hayward.

KEY STAKEHOLDERS

- City of Hayward
- Alameda County Flood Control District

COST ESTIMATE

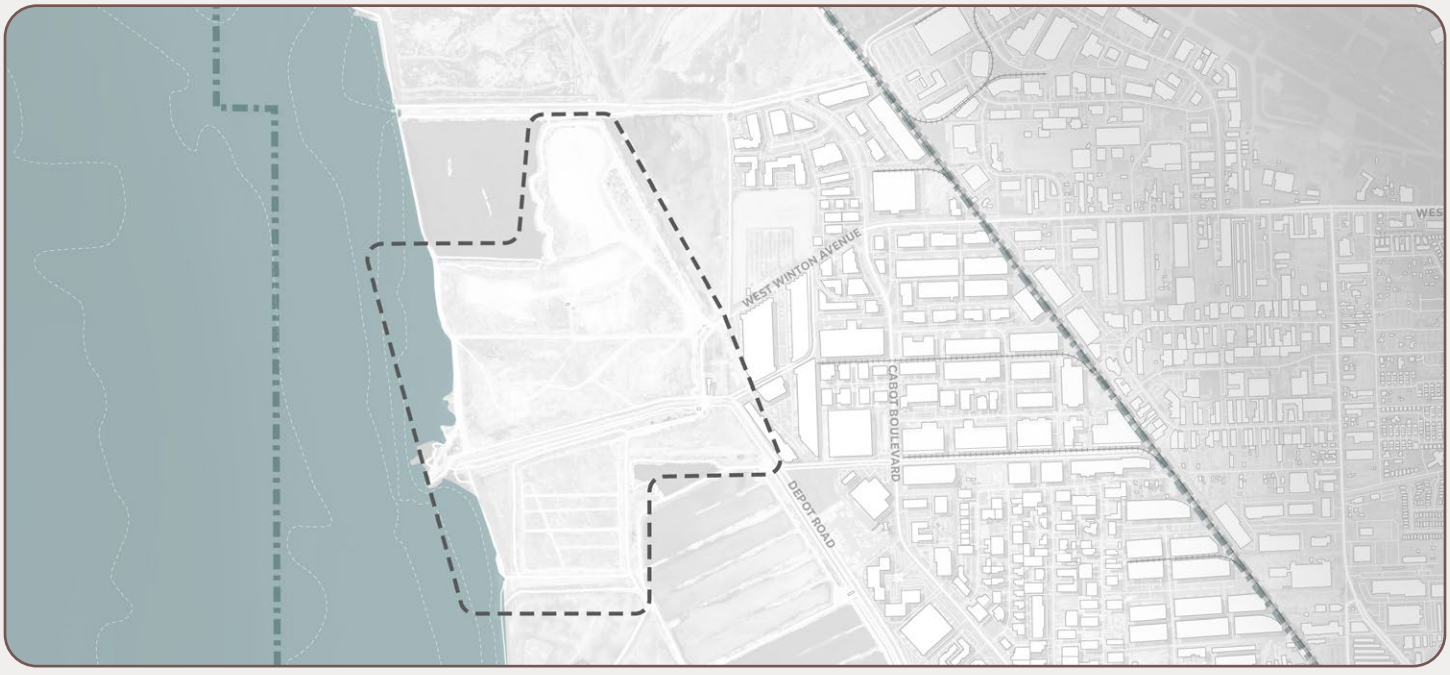
Low (<$5M)

TIME FRAME

Short Term

FUNDING & FINANCING RECOMMENDATIONS

- **U.S. EPA Brownfields Assessment or Multipurpose (MP) Grants**
  https://www.epa.gov/brownfields/types-brownfields-grant-funding
- **California Coastal Commission LCP Local Assistance Grant**
  https://www.coastal.ca.gov/lcp/grants/#:~:text=The%20Local%20Coastal%20Program,level%20rise%20and%20climate%20change.



GROUNDWATER MANAGEMENT PLAN

PROJECT SUMMARY

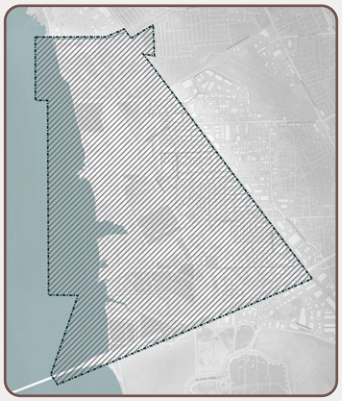
The purpose of this project is to study the feasibility of various approaches for managing rising groundwater tables due to sea level rise. As the sea level rise maps demonstrate, portions of the industrial district and residential areas are vulnerable to potential groundwater emergence with 2 feet of sea level rise and with 4 or 7 feet of sea level rise greater portions of surrounding neighborhoods are also impacted.

Rising groundwater cannot be mitigated through the approaches that address inundation from tides or coastal surge. Seepage barriers below seawalls or levees can mitigate temporary groundwater rise due to a coastal storm but are not effective at preventing elevated groundwater tables due to gradual sea level rise.

To mitigate groundwater emergence, the overall options are:

- Drainage and additional pumping
- Elevation of the land
- Relocation/retreat.

The stormwater drainage and pumping improvements proposed in the master plan will provide some benefits to groundwater management, but additional strategies are likely necessary to manage rising groundwater tables as sea levels rise. Additional drainage infrastructure may be necessary to collect and drain groundwater into the stormwater system, and land elevation may be necessary in some areas. These solutions should be further explored and tested before plans for new infrastructure or new development standards are put into place. Ultimately multiple strategies may be necessary. This is an area of evolving science and research that should be coupled with ongoing monitoring of sea level rise and groundwater tables.



The Alameda County Water District has prepared a Groundwater Sustainability Plan (GSP) for the Niles Cone Subbasin, which underlies most of the Hayward Shoreline. (https://www.acwd.org/566/Sustainable-Groundwater-Management-Act) In addition, the City of Hayward is working with the East Bay Municipal Utility District (EBMUD) to prepare a GSP for the East Bay Plain Basin, which underlies the northern portion of the shoreline area (https://www.hayward-ca.gov/content/sustainable-groundwater-management) This project will be done in coordination with the water districts and these two GSPs."

PROJECT SITE & OWNERSHIP

Whole study area

KEY STAKEHOLDERS

- City of Hayward
- Property Owners affected by groundwater emergence in the study area
- Members of the public
- Alameda County Flood Control District

COST ESTIMATE

Low (<$5M)

TIME FRAME

Short Term

FUNDING & FINANCING RECOMMENDATIONS

- **NOAA California State Sea Grant Program**
  https://seagrant.noaa.gov/state-competitions and https://caseagrant.ucsd.edu/grants-and-funding
- **California Coastal Commission LCP Local Assistance Grant**
  https://www.coastal.ca.gov/lcp/grants/#:~:text=The%20Local%20Coastal%20Program,level%20rise%20and%20climate%20change.

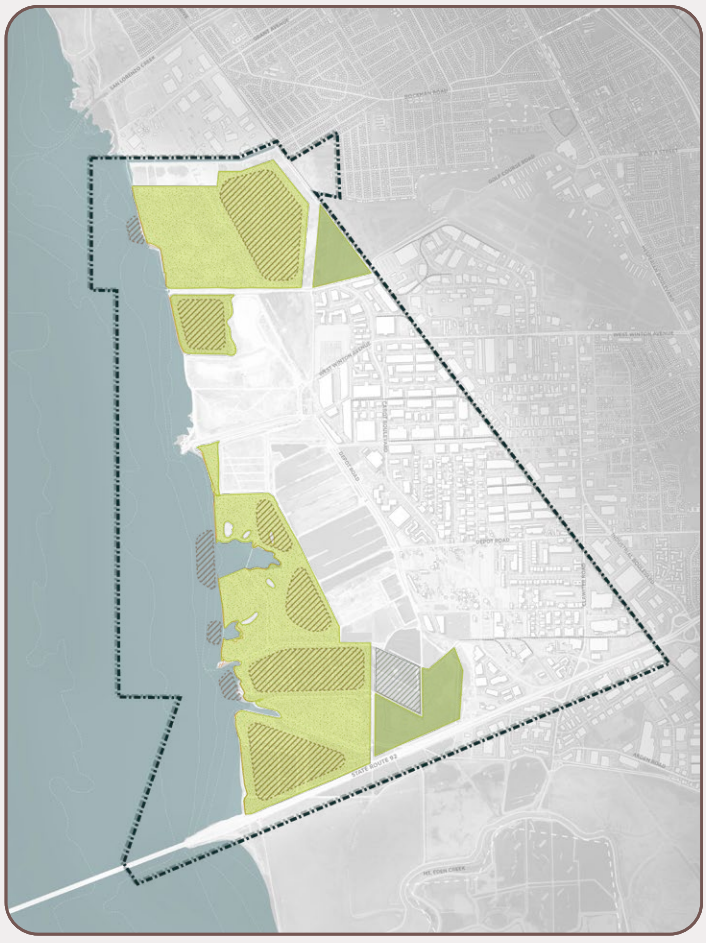
ECOSYSTEM ADAPTATIVE MANAGEMENT PLAN & MONITORING

PROJECT SUMMARY

The purpose of this project is to develop an ecosystem management plan for the mosaic of existing and proposed wetland complexes in the Hayward Regional Shoreline. This management plan will focus on identifying in greater detail the potential impacts of sea level rise on tidal wetlands and muted marshes through the development of an ongoing monitoring program. This will include monitoring of tide levels and sediment accretion, as well as tracking changes in vegetation to identify potential triggers for restoration and to inform future restoration plans. This program can include opportunities for community stewardship and volunteering, as discussed further on page 210.

PROJECT SITE & OWNERSHIP

Study area wide, potentially headquartered at the Hayward Shoreline Interpretive Center



KEY STAKEHOLDERS

- HASPA
- Hayward Area Recreation and Park District
- East Bay Regional Park District

PERMITTING ASSESSMENT

COST ESTIMATE

Low (<$5M)

TIME FRAME

Short Term

FUNDING & FINANCING RECOMMENDATIONS

- **NOAA State Sea Grant Program**
  https://seagrant.noaa.gov/state-competitions and
  https://caseagrant.ucsd.edu/grants-and-funding

LINE A TIDE GATE IMPROVEMENTS

PROJECT SUMMARY

This project is pending the results of the Alameda County Flood Control District's study of the combined impacts of sea level rise (up to 2 feet) and increased precipitation on water levels in the bay and inland waterways. This study will examine potential flood control infrastructure needs throughout the service area, including San Lorenzo Creek, Sulphur Creek, Bockman Canal, Line A, and Line F. Other improvements are proposed to be integrated into adjacent flood protection levee projects, but Line A should move forward independently. The Line A tide gate will be relocated to connect the high points of the two landfills. Potential strategies include tide gate improvements, raising of canal walls, or other features to protect the service area from flooding from stormwater, sea level rise, and storm surge.

PROJECT SITE & OWNERSHIP

- Line A is located in the middle reach of the site, between the two landfills. The site is owned by the City of Hayward.

KEY STAKEHOLDERS

- HASPA
- Alameda County Flood Control District

PERMITTING ASSESSMENT

Permitting challenges are dependent on the eventual scope and design of the project, but as an improvement to existing infrastructure it would likely be a straightforward permitting process.

EASY HARD

COST ESTIMATE

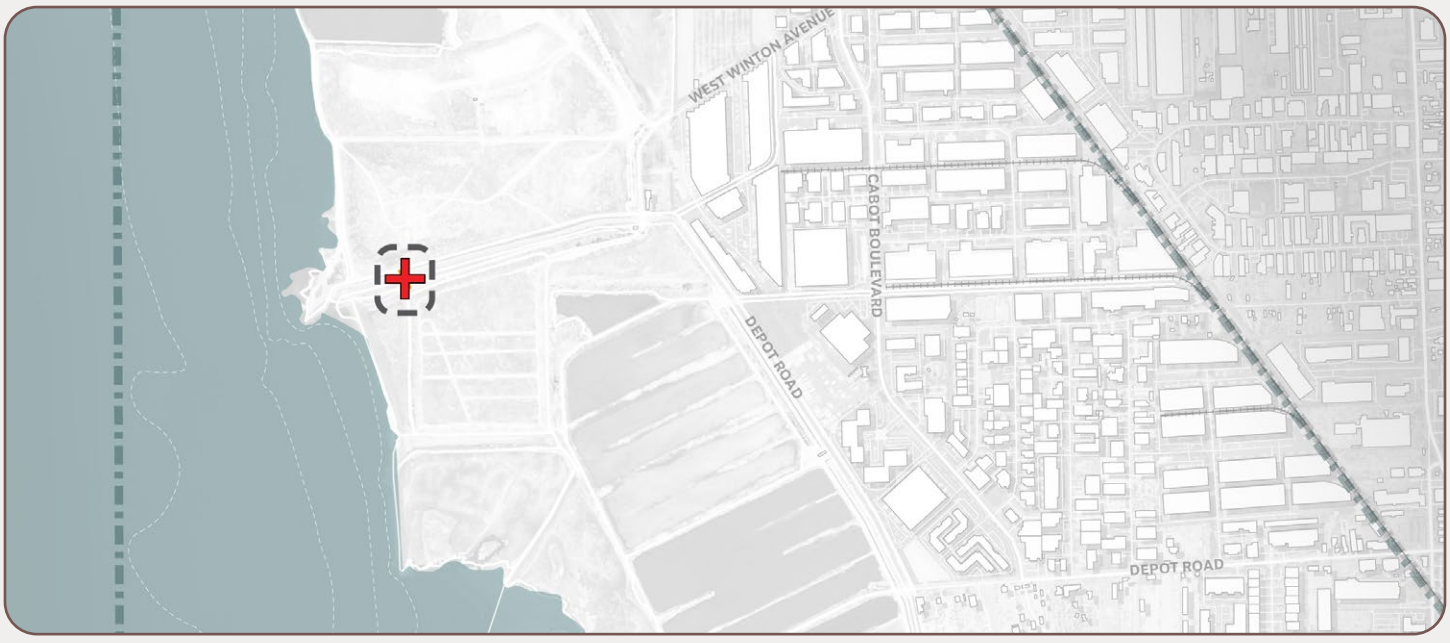
Low (<$5M)

TIME FRAME

Short Term

FUNDING & FINANCING RECOMMENDATIONS

- **State of California Department of Water Resources Coastal Watershed Flood Risk Reduction**
  https://www.grants.ca.gov/grants/coastal-watershed-flood-risk-reduction-2/
- **FEMA Building Resilient Infrastructure and Communities (BRIC)**
  https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities



ORO LOMA INTERIM LEVEE

PROJECT SUMMARY

This project is intended to protect the Oro Loma wastewater treatment plant and surrounding industrial district from flooding. It includes a flood protection levee designed to meet today's 1% annual chance flood with allowance for mid-range sea level rise, but with a foundation system that allows for the levee to be elevated in the future to accommodate a higher elevation with sea level rise.

The project also includes a new Bay Trail spur extending inland from the shoreline and could provide a connection across the rail line to San Lorenzo Community Park.

A new tide gate and pump station on Bockman Canal is also proposed, which would be planned in coordination with ACFCD pending the results of their stormwater study.

PROJECT SITE & OWNERSHIP

The site is located in the northern reach of the study area. It is owned by the Oro Loma Sanitary District.

KEY STAKEHOLDERS

- HASPA
- City of Hayward
- Oro Loma Sanitary District
- Bay Trail
- East Bay Regional Parks District
- Alameda County Flood Control District
- San Francisco Bay Conservation and Development Commission
- U.S. Army Corps of Engineers

PERMITTING ASSESSMENT

Regulators are likely to be supportive of the intent of this project, but the permitting process will be extensive.

COST ESTIMATE

High (>$20 M.)

TIME FRAME

Short Term

FUNDING & FINANCING RECOMMENDATIONS

- **State of California Department of Water Resources Coastal Watershed Flood Risk Reduction**
  https://www.grants.ca.gov/grants/coastal-watershed-flood-risk-reduction-2/
- **FEMA Building Resilient Infrastructure and Communities (BRIC)**
  https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities

SCAPE

SALT MARSH HARVEST MOUSE PRESERVE INTERIM LEVEE

PROJECT SUMMARY

This project is an interim levee designed to preserve important endangered species habitat, as well as some of the critical infrastructure inland of the site such as the Calpine / Russel City Energy Center and the Hayward Wastewater Treatment Plant. It is intended to protect against today's 1% annual chance flood and in the future will remain as a buffer from more frequent storm events while the long-term Hayward Line of Protection project located further inland will provide greater protection to inland critical infrastructure. The project includes levee raising west of the SMHM preserve from the Solar Fields to the SE corner of the SMHM Preserve. It is planned to run along the current levee alignments from the Hayward Interpretive Center through HARD Marsh. A new spur of the Bay Trail would be provided on top of the levee, which would connect back to the existing Bay Trail along the northern levee of Hayward Marsh.

PROJECT SITE & OWNERSHIP

- The project site is located in the southern reach of the study area, slightly inland from the Bay. East Bay Regional Parks District owns most of the site, with some portions owned by the City of Hayward.

KEY STAKEHOLDERS

- HASPA
- East Bay Regional Parks District
- City of Hayward
- Hayward Area Recreation and Park District
- Alameda County Flood Control District
- San Francisco Bay Conservation and Development Commission
- U.S. Army Corps of Engineers

PERMITTING ASSESSMENT

Regulators are likely to be supportive of the intent of this project, but the permitting process will be extensive. There will be special review regarding impacts on endangered species.

EASY HARD

COST ESTIMATE

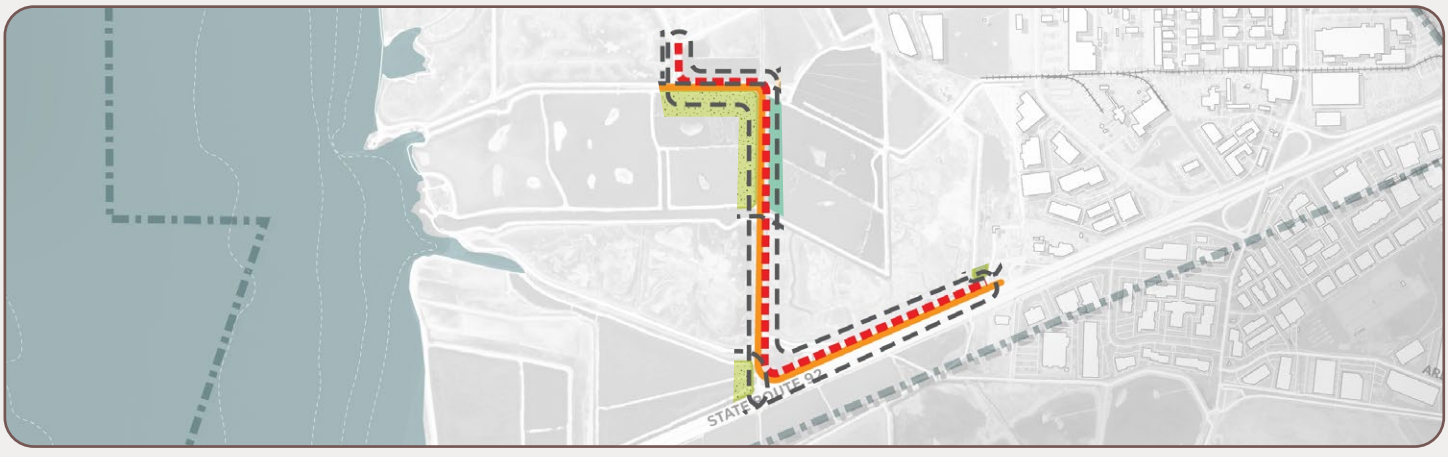
Medium ($5-$20 M.)

TIME FRAME

Short Term

FUNDING & FINANCING RECOMMENDATIONS

- **FEMA Building Resilient Infrastructure and Communities (BRIC)**
  https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities
- **CA Department of Fish and Wildlife Endangered Species Conservation and Recovery Grant Program**
  https://wildlife.ca.gov/Grants/Endangered-Species



COGSWELL MARSH PILOT

PROJECT SUMMARY

This pilot project includes sediment placement to augment the marsh and a gravel beach along the shoreline to reduce marsh erosion. This pilot is intended to test these strategies as a sustainable strategy for adapting the area marshes. The pilot will be monitored as part of the ecosystem adaptive management plan and inform mid and long term restoration projects.

PROJECT SITE & OWNERSHIP

- The project site is located along the Bay in the southern reach of the site just south of the landfills. It is owned by East Bay Regional Parks District.

KEY STAKEHOLDERS

- HASPA
- East Bay Regional Parks District
- Hayward Area Recreation and Park District
- San Francisco Bay Conservation and Development Commission
- U.S. Army Corps of Engineers

PERMITTING ASSESSMENT

As a pilot projects this is likely a simpler permitting process than other projects. Recent policy shifts towards how agencies consider fill in the bay for the purposes of ecological enhancements can benefit this project.

EASY HARD

COST ESTIMATE

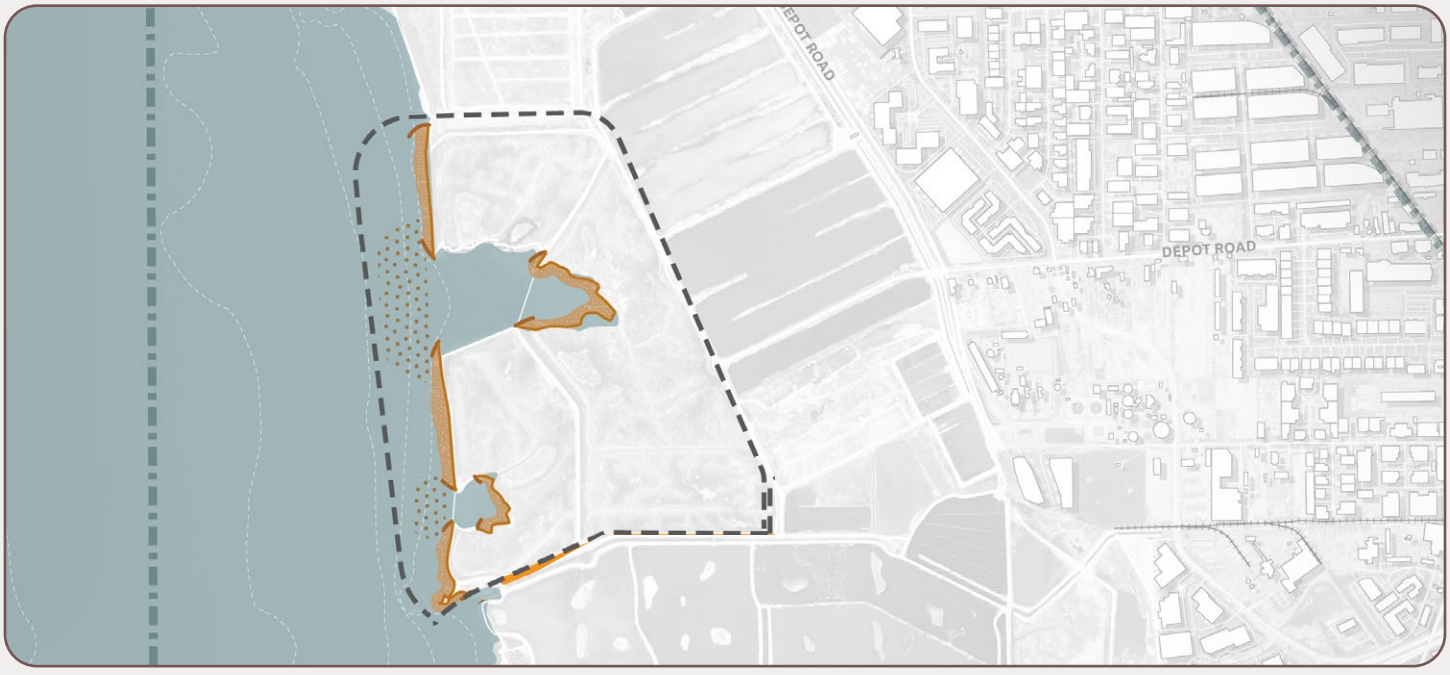
Low (<$5M.)

TIME FRAME

Short Term

FUNDING & FINANCING RECOMMENDATIONS

- **California Division of Boating and Waterways Shoreline Erosion Control & Public Beach Restoration Program**
  https://dbw.parks.ca.gov/?page_id=28766



HAYWARD SHORELINE INTERPRETIVE CENTER RENOVATION

PROJECT SUMMARY

This project includes overall improvements to address structural and programmatic needs of the interpretive center including ADA access improvements and energy retrofits.

PROJECT SITE & OWNERSHIP

- The Hayward Shoreline Interpretive Center is located in the southern reach of the project area, just north of SR-92. It is owned by Hayward Area Recreation and Park District

KEY STAKEHOLDERS

- HASPA
- East Bay Regional Parks District
- Hayward Area Recreation and Park District

PERMITTING ASSESSMENT

As an improvement to an existing facility, this is likely a simpler permitting process than other projects.

EASY HARD

COST ESTIMATE

Low (<$5M.)

TIME FRAME

Short Term

FUNDING & FINANCING RECOMMENDATIONS

- **HUD Better Buildings Financing Navigator**
  https://www.hudexchange.info/programs/better-buildings-challenge/energy-and-water-efficiency-resources/retrofit-finance/

HAYWARD MARSH RESTORATION

PROJECT SUMMARY

This project aligns with the current Hayward Marsh Restoration Plan currently underway with East Bay Regional Park District. It is intended to promote the health and resilience of Hayward Marsh and incorporate new restoration projects for shoreline resilience. The design and management of Hayward Marsh will be informed by the pilot monitoring and the Ecosystem Adaptive Management Plan. This project includes the Least Tern Colony relocation, a gravel beach, tidal habitat restoration, and includes the diked bay lands east of the SMHM Preserve.

PROJECT SITE & OWNERSHIP

- The project site is located along the Bay in the southern reach of the site south of Cogswell Marsh and north of Oliver Salt Ponds. It is owned by East Bay Regional Parks District.

KEY STAKEHOLDERS

- HASPA
- East Bay Regional Parks District
- Hayward Area Recreation and Park District
- San Francisco Bay Conservation and Development Commission
- U.S. Army Corps of Engineers

PERMITTING ASSESSMENT

Regulators are likely to be supportive of the intent of this project, but the permitting process will be extensive. Recent policy shifts towards how agencies consider fill in the bay for the purposes of ecological enhancements can benefit this project.

EASY HARD

COST ESTIMATE

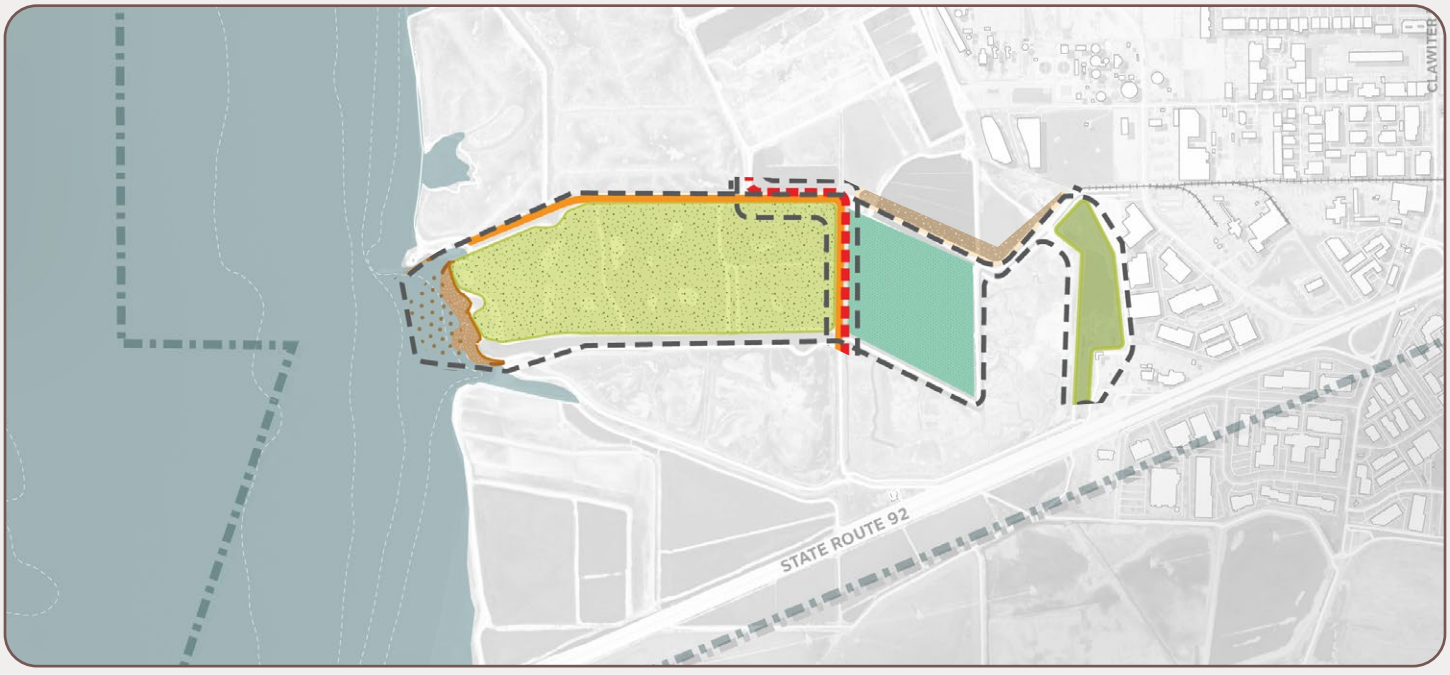
Medium ($5 - $20 M.)

TIME FRAME

Short Term

FUNDING & FINANCING RECOMMENDATIONS

- **CA Department of Fish and Wildlife Habitat Management Grants**
  https://wildlife.ca.gov/Grants



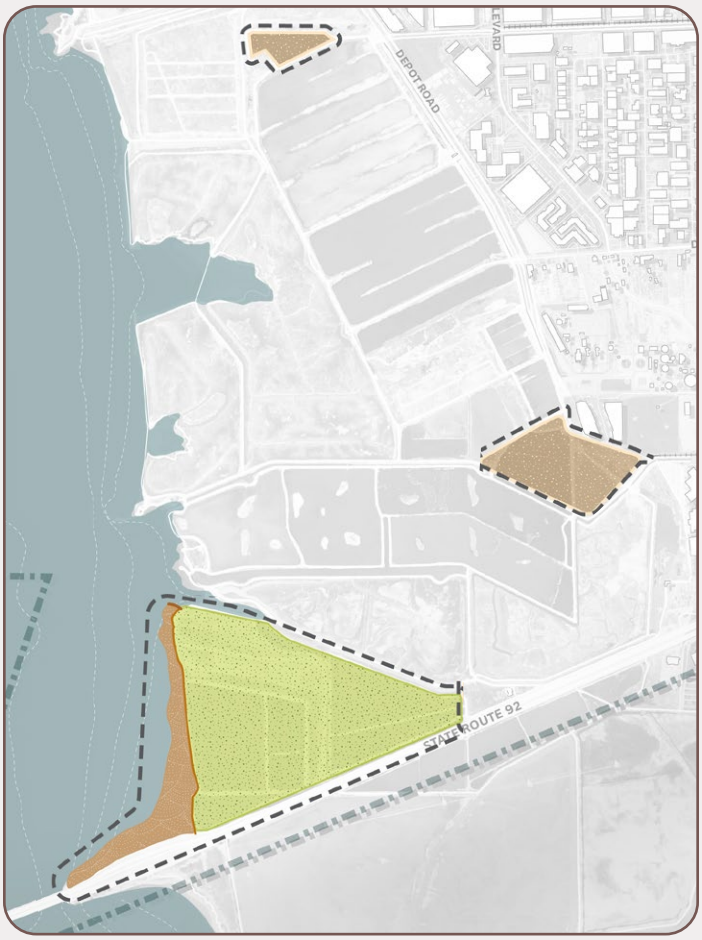
OLIVER SALT PONDS RESTORATION

PROJECT SUMMARY

The timing of this project is dependent on the pilot monitoring of adjacent sites and the Adaptive Management Plan. Oliver Salt Ponds is vulnerable to sea level rise and its restoration can facilitate long-term resilience. Tidal habitat restoration is paired with a new salt pond habitat that will provide similar shorebird habitat further inland, where it is less vulnerable to inundation. This project includes the Oliver Salt Ponds gravel beach, sediment placement, and the Salinas habitat north of Hayward Marsh and near West Winton Landfill.

PROJECT SITE & OWNERSHIP

- The site is located in the southern reach of the project area, just north of SR-92. It is owned by Hayward Area Recreation and Park District.



KEY STAKEHOLDERS

- HASPA
- East Bay Regional Parks District
- Hayward Area Recreation and Park District
- San Francisco Bay Conservation and Development Commission
- U.S. Army Corps of Engineers

PERMITTING ASSESSMENT

Regulators are likely to be supportive of the intent of this project, but the permitting process will be extensive. Recent policy shifts towards how agencies consider fill in the bay for the purposes of ecological enhancements can benefit this project.

EASY HARD

COST ESTIMATE

Medium ($5 - $20 M.)

TIME FRAME

Short Term

FUNDING & FINANCING RECOMMENDATIONS

- **CA Department of Fish and Wildlife Habitat Management Grants**
  https://wildlife.ca.gov/Grants

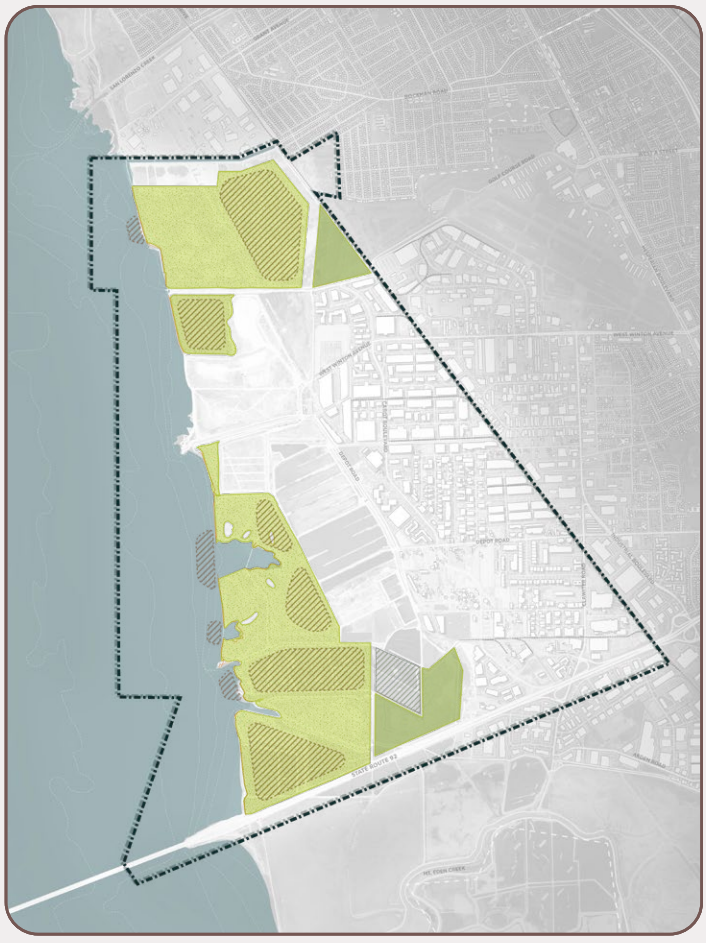
DON CASTRO SEDIMENT PIPELINE

PROJECT SUMMARY

This project is to create a pipeline from the Don Castro Reservoir to the bay to provide a sediment source for restoration and adaptation projects. The Don Castro reservoir has filled with sediment, reducing its flood control capacity. This sediment has the potential to be piped in a slurry to the Hayward Regional Shoreline for reuse. Alameda County Flood Control District has studied the pipeline as a cost-effective piece of infrastructure that would increase flood capacity. There is great potential to utilize the sediment slurry in new restoration or adaptation projects to create a multi-benefit piece of infrastructure that can be utilized over time.

PROJECT SITE & OWNERSHIP

This project is in early development and details are unknown about the alignment, but it would likely cross boundaries of multiple property owners, extending from Don Castro Reservoir, along San Lorenzo Creek, then to the Hayward Regional Shoreline.



KEY STAKEHOLDERS

- HASPA
- Alameda County Flood Control District

PERMITTING ASSESSMENT

This project is in early development but would likely involve an extensive permitting process.

COST ESTIMATE

High (>$50 M.)

TIME FRAME

Short Term

FUNDING & FINANCING RECOMMENDATIONS

- **FEMA Building Resilient Infrastructure and Communities (BRIC)**
  https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities
- **US EPA and Army Corps of Engineers — Identifying, Planning, and Financing Beneficial Use Projects Using Dredged Material [Manual]**
  https://dots.el.erdc.dren.mil/guidance/PlanningManual.pdf

COGSWELL MARSH ADAPTIVE MANGEMENT

PROJECT SUMMARY

Following the near-term Cogswell Marsh pilot to place sediment and control erosion through a gravel beach, the site will be monitored through the area-wide Ecosystem Adaptive Management Program to study how effective the pilot was to augment marsh health and resilience to sea level rise and erosion. Future adaptive measures may be necessary, including additional sediment placement and additional erosion protection measures. Strategies and timing will be further developed based on the results of the monitoring program, but it is envisioned to involve sediment placement to raise the eastern edges of the marsh to keep pace with sea level rise.

PROJECT SITE & OWNERSHIP

- The project site is located along the Bay in the southern reach of the site just south of the landfills. It is owned by East Bay Regional Parks District.

KEY STAKEHOLDERS

- HASPA
- East Bay Regional Parks District
- San Francisco Bay Conservation and Development Commission
- U.S. Army Corps of Engineers

PERMITTING ASSESSMENT

While regulators are likely supportive of the intent of this project, it is likely to be time consuming permitting process. Recent policy shifts towards how agencies consider fill in the bay for the purposes of ecological enhancements can benefit this project.

EASY HARD

COST ESTIMATE

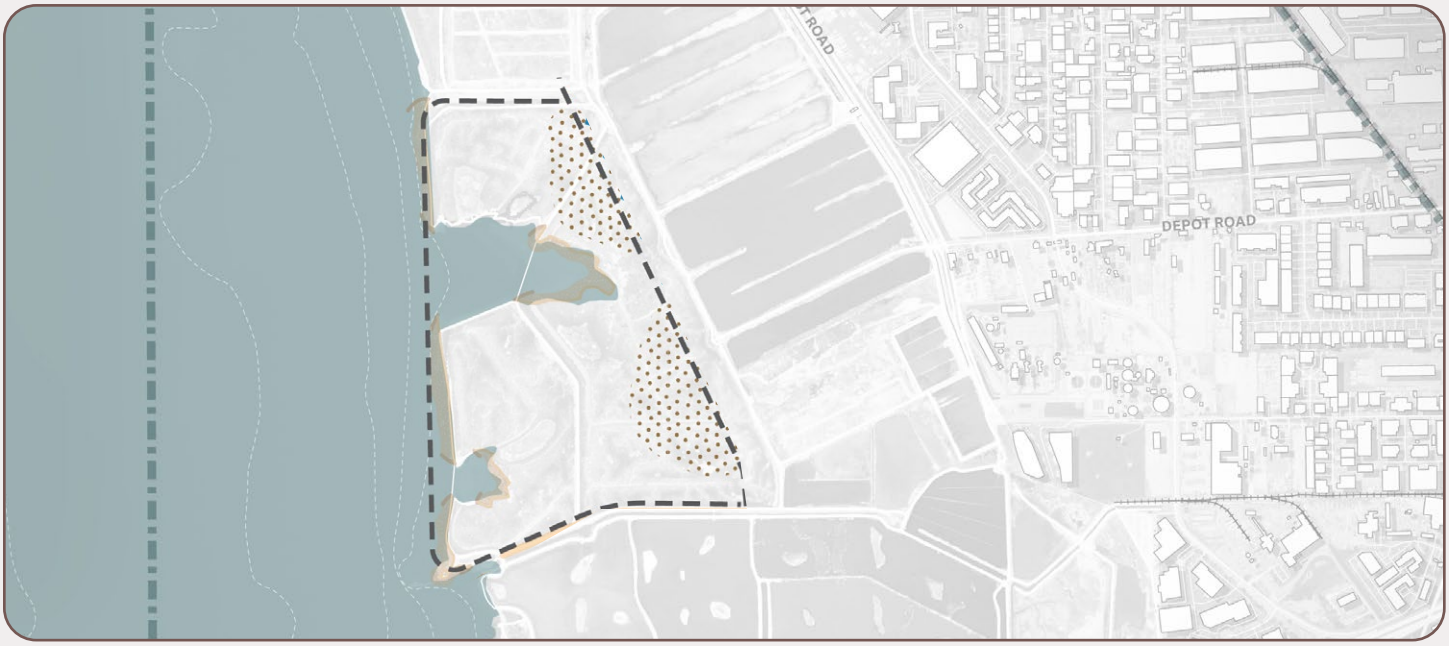
Low (<$5M)

TIME FRAME

Medium Term

FUNDING & FINANCING RECOMMENDATIONS

- **CA Department of Fish and Wildlife Habitat Management Grants**
  https://wildlife.ca.gov/Grants



ORO LOMA ADAPTIVE MANAGEMENT

PROJECT SUMMARY

This project will promote the health and resilience of Oro Loma marsh through the construction of a gravel beach to mitigate erosion, sediment placement at the breaches, and sediment placement in the eastern half of the marsh to help keep pace with sea level rise. The strategies and timing of this project will be further developed based on the results of the area-wide Ecosystem Adaptive Management Program.

PROJECT SITE & OWNERSHIP

- The site is located in the northern reach of the study area. It is owned by East Bay Regional Parks District.

KEY STAKEHOLDERS

- HASPA
- East Bay Regional Parks District
- San Francisco Bay Conservation and Development Commission
- U.S. Army Corps of Engineers

PERMITTING ASSESSMENT

While regulators are likely supportive of the intent of this project, it is likely to be time consuming permitting process. Recent policy shifts towards how agencies consider fill in the bay for the purposes of ecological enhancements can benefit this project.

COST ESTIMATE

Medium ($5-$20M)

TIME FRAME

Medium Term

FUNDING & FINANCING RECOMMENDATIONS

- **California Division of Boating and Waterways Shoreline Erosion Control & Public Beach Restoration Program**
  https://dbw.parks.ca.gov/?page_id=28766

FRANK'S WEST RESTORATION

PROJECT SUMMARY

This project is to promote the health and resilience of the Frank's West through the construction of a gravel beach to mitigate erosion, sediment placement to raise the ponds, and tidal habitat restoration. The strategies and timing of this project will be further developed based on the results of the area-wide Ecosystem Adaptive Management Program.

PROJECT SITE & OWNERSHIP

- The project site is located between the landfills and Oro Loma marsh in the north reach of the study area. It is owned by Hayward Area Recreation and Park District.

KEY STAKEHOLDERS

- HASPA
- Hayward Area Recreation and Park District
- East Bay Regional Parks District
- San Francisco Bay Conservation and Development Commission
- U.S. Army Corps of Engineers

PERMITTING ASSESSMENT

While regulators are likely supportive of the intent of this project, it is likely to be time consuming permitting process. Recent policy shifts towards how agencies consider fill in the bay for the purposes of ecological enhancements can benefit this project.

COST ESTIMATE

Medium ($5-$20M)

TIME FRAME

Medium Term

FUNDING & FINANCING RECOMMENDATIONS

- **California Division of Boating and Waterways Shoreline Erosion Control & Public Beach Restoration Program**
  https://dbw.parks.ca.gov/?page_id=28766
- **CA Department of Fish and Wildlife Habitat Management Grants**
  https://wildlife.ca.gov/Grants
- **FEMA Building Resilient Infrastructure and Communities (BRIC)**
  https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities

SALT MARSH HARVEST MARSH ECOTONE LEVEE

PROJECT SUMMARY

This project includes an ecotone levee in front of the Salt Marsh Harvest Marsh preserve from Wet Weather and storage ponds to SR-92. This levee was already raised as short-term project, so this project will be to augment the site with an ecotone, vegetated slope to create a tidal marsh transition zone that will provide wildlife refugia.

PROJECT SITE & OWNERSHIP

- The project site is located in the southern reach of the study area, slightly inland from the Bay. East Bay Regional Parks District owns most of the site, with some portions owned by the City of Hayward.

KEY STAKEHOLDERS

- HASPA
- East Bay Regional Parks District
- City of Hayward
- Alameda County Flood Control District

PERMITTING ASSESSMENT

While regulators are likely supportive of the intent of this project, it is likely to be time consuming permitting process.

COST ESTIMATE

Medium ($5-$20M)

TIME FRAME

Medium Term

FUNDING & FINANCING RECOMMENDATIONS

- **FEMA Building Resilient Infrastructure and Communities (BRIC)**
  https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities

ORO LOMA LOP – PHASE 1

PROJECT SUMMARY

This project is a FEMA-certified flood protection levee, designed to protect inland areas from the 1% annual chance storm with allowance for 4' of sea level rise. The levee will be integrated with a vegetated gradual slope to create a tidal marsh transition zone and area for the treatment of wastewater. This section is envisioned as the First Mile project in coordination with Oro Loma Wastewater Treatment Plant and the East Bay Dischargers Authority. Areas behind the line of protection will be created to store stormwater when needed, including at Franks East Salinas and the southeastern corner of Oro Loma Marsh. The levee at Frank's east will need to be raised to enhance the site's stormwater storage capacity. Additionally, a tide gate at Sulphur Creek will prevent sea level rise and storm surge from entering through the levee system. A pump station near the creek will be necessary to pump stormwater to the bay side. The project also includes additional sections of the Bay Trail, extending the portion created through the Oro Loma Interim Levee further to the south and to Alameda County Landfill.

PROJECT SITE & OWNERSHIP

- The site is located in the northern reach of the study area. It is owned by East Bay Regional Parks District.

KEY STAKEHOLDERS

- HASPA
- East Bay Regional Parks District
- Alameda County Flood Control District
- East Bay Dischargers Authority
- Oro Loma Sanitary District
- Bay Trail
- San Francisco Bay Conservation and Development Commission
- U.S. Army Corps of Engineers

PERMITTING ASSESSMENT

While regulators are likely supportive of the intent of this project, it is likely to be time consuming permitting process.

EASY HARD

COST ESTIMATE

High (>$20M)

TIME FRAME

Medium Term

FUNDING & FINANCING RECOMMENDATIONS

- **FEMA Building Resilient Infrastructure and Communities (BRIC)**
  https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities

HAYWARD LOP – PHASE 1

PROJECT SUMMARY

This project includes a FEMA-certified flood protection levee integrated with a horizontal levee and a new segment of the Bay Trail. The levee is designed to protect inland areas from the 1% annual chance storm with allowance for 4' of sea level rise and includes a tie-back along a raised SR-92 access road. This levee will protect the City of Hayward's Wastewater Wet Weather Storage ponds, as well as portions of the inland industrial area. The horizontal levee will create another opportunity for local discharge and treatment of wastewater. A new section of the Bay Trail will connect the portion to the south created by the SMHM interim levee and extend north to the landfill.

PROJECT SITE & OWNERSHIP

- The project site is located in the middle reach of the site, just inland from Cogswell Marsh and along the City if Hayward WWTP ponds. The site is owned by the City of Hayward though directly adjacent to Cogswell Marsh which is owned by East Bay Regional Parks District.

KEY STAKEHOLDERS

- HASPA
- Oro Loma Sanitary District
- East Bay Regional Parks District
- Bay Trail
- City of Hayward Public Works
- CalTrans
- Alameda County Flood Control District
- San Francisco Bay Conservation and Development Commission
- U.S. Army Corps of Engineers

PERMITTING ASSESSMENT

While regulators are likely supportive of the intent of this project, it is likely to be time consuming permitting process.

COST ESTIMATE

High (>$20M)

TIME FRAME

Medium Term

FUNDING & FINANCING RECOMMENDATIONS

- **FEMA Building Resilient Infrastructure and Communities (BRIC)**
  https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities

SCAPE

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NON-STRUCTURAL STRATEGIES

This section provides an overview of policy and programmatic recommendations.

POLICY AND PROGRAMMATIC RECOMMENDATIONS

Achieving the master plan vision for the Hayward Regional Shoreline will require collective action on behalf of numerous stakeholders in Hayward and the Bay Area. The following recommendations for policy changes and development of new programs will, along with the structural projects outlined in the master plan, advance a forward-looking vision for the Hayward Regional Shoreline. These include policies that may be pursued by HASPA, its member agencies, as well as other stakeholders in the region. Some of the concepts outlined in this section can be advanced immediately as part of the early project phases, while others will take time to develop consensus among stakeholders and work towards implementation.

The Master Plan vision was shaped through research into existing plans and policies, as well direct engagement with stakeholders charged with planning for the future of the Hayward Regional Shoreline and the Bay Area. See chart on page 126 for a summary of relevant organizations, agencies, plans, and policies.

1. Advance regional dialogue into mechanisms for balancing the protection of at-risk communities and infrastructure and restoring ecosystems.

Key Stakeholders: HASPA, BCDC, ACFCD

There is broad support and consensus throughout the region on the need to plan for sea level rise with a focus on habitat restoration, and an evolving playbook on how to balance long-term, conflicting needs. Planning agencies, regulatory bodies, and infrastructure operators are well-aligned on the need to plan for sea level rise. While there is no clear answer on how to balance the needs of vulnerable infrastructure and communities with the opportunities to maintain and improve habitat, there are many active organizations focused on developing policies and plans to address all aspects of these issues.

HASPA should coordinate with the San Francisco Bay Conservation and Development Commission (BCDC) and other area stakeholders on using the Hayward Regional Shoreline Adaptation Master Plan as a case study in developing innovative solutions that balance these conflicting needs and developing guidance for how other stakeholders in the region can undertake similar processes.

Fully implementing the Master Plan will require an extensive permitting process. Recent reforms aimed at streamlining the process are positive signs, though they are focused on ecological restoration, and it is unclear how hybrid grey infrastructure approaches will be treated. In order to advance the Master Plan as well as similar approaches throughout the region, BCDC and other permitting agencies should coordinate on additional permitting reforms to balance near-term habitat impacts with long-term ecosystem health.

In addition, HASPA should coordinate with ACFCD and other stakeholders on how to integrate this Master Plan into their long-term plans for flood protection and stormwater management.

2. Increase flood protection standards for new construction and renovations.

Key Stakeholders: City of Hayward

A significant portion of Hayward's industrial district is at risk storm surge, sea level rise and groundwater emergence. Increasing standards for new construction means incorporating higher standards of flood protection to reduce risk to future development. Some areas may be removed from the floodplain following the construction of a FEMA-certified levee, however, additional code standards are still recommended to serve as redundancy measures in the case of overtopping.

Hayward's current municipal code requires the lowest floor in any new or substantial improvement of any residential structure to be at or above the Base Flood Elevation (BFE). The lowest floor of a nonresidential structure, including the basement, is required to be floodproofed so that the structure's walls located below the base flood level are substantially impermeable to the passage of water. To increase standards for new construction, an amount of "freeboard," or additional elevation above the BFE could be required and applied to all FIRM zones. These floodplain requirements also could be extended to the 500-year floodplain.

Additional improvements could include strengthening storage requirements for hazard materials in areas at risk from storm surge, as well as modifying stormwater management standards and incorporating additional requirements to manage rising groundwater tables.

These are several examples of how codes can be modified to advance the resiliency of future development to flooding. The City should pursue a thorough review of its code standards to identify

ways in which new buildings could be designed to withstand storm surge through floodproofing and manage more stormwater on site.

3. Remove regulatory impediments to higher standards of flood protection

Key Stakeholders: City of Hayward, BCDC, BRRIT, CHARG

In Hayward, existing regulatory impediments may hinder enacting further resilience measures. These could include zoning height limits, permitting requirements and fees, and any unintended side effects of these policies. Removing regulatory impediments would make it easier, faster, and more affordable to adopt resilience measures.

Hayward's Industrial District encourages the development of industrial uses to promote a desirable and attractive working environment with a minimum disruption to surrounding properties. Currently under this zoning, there are no height limits in this area for industrial buildings. The maximum height for an office or commercial building is 40ft. Retaining walls which are not a part of walls of buildings shall not exceed 6 feet in height as measured from finished grade elevation to top of wall.

Hayward should review zoning code limits on buildings and walls to ensure that they would not pose a barrier to property pursuing floodproofing. Additional measures could include working alongside the San Francisco Bay Restoration Regulatory Integration Team (BRRIT) to improve the permitting process in terms of either shortening the length of providing technical assistance for the pre-application phase for flood management infrastructure.

4. Provide support for property owners to protect assets through loans, grants, and tax incentives.

Key Stakeholders: City of Hayward, State of California

A main deterrent to building resilient new construction projects or the retrofitting of existing buildings is funding. Funding in the form of loans, grants, and tax incentives will ensure more developers and property owners are able to promote resilient development. These funding mechanisms can be modeled after existing programs in California like water board brownfield remediation loans/grants or solar tax credits.

Brownfield remediation grant[1]:

The Targeted Site Investigation Program (TSI) is funded by the United States Environmental Protection Agency (U.S. EPA). TSI Program has been part of California Department of Toxic Substances Control (DTSC) CERCLA 128(a) State and Trial Response Program Grant. DTSC provides environmental services to local governments, school districts, and non-profit organizations to facilitate the return of brownfields to safe and productive uses. The program is focused on properties with a clear need for redevelopment, strong redevelopment potential, real or perceived contamination, and municipal/community support for redevelopment. Assessment, investigation, and cleanup planning have been provided to over 100 projects, in 68 cities, and 30 counties, throughout the State of California.

Solar tax credits[2]:

The Investment Tax Credit (ITC) grants an amount of 26% of the purchase cost of your solar system to homeowners. A tax credit is a dollar-for-dollar reduction in the income taxes that a person or company would otherwise pay the federal government. The ITC is based on the amount of investment in solar property. Both the residential and commercial ITC are equal to 26 percent of the basis that is invested in eligible solar property which has begun construction through 2019.

Using the brownfield remediation grants and solar tax credits as example funding mechanisms, Hayward could work to develop and secure funding for resilient development.

5. Develop technical support and education to help industrial businesses and residents understand risks from sea level rise and develop mitigation actions

Key Stakeholders: City of Hayward, HARD, EBRPD, private agencies, local non-profits, and community groups

In order to develop effective resilience measures within Hayward's industrial district, climate and flood risk must be broadly understood by stakeholders in the area. Providing technical support and education specifically to industrial businesses in the area may increase protection and reduce risk. Partnerships with HARD and EBRPD can increase technical support and education and may include awareness campaigns, community engagement, risk audits, risk modeling, and more.

Hayward could partner with organizations like The Business Resiliency Initiative (BRI) to promote resiliency plans for industrial businesses along the shoreline. BRI is a project launched by Valley Vision and its partners to increase the resilience of our regional economy by increasing the preparedness of the business community, and particularly the small business community, in the region. Valley

Sources:

1. https://www.cclr.org/DTSC_Funding#:~:text=Targeted%20Site%20Investigation%20(TSI)%20Program,school%20districts%2C%20and%20nonprofit%20organizations.

2. https://solartechonline.com/blog/california-solar-tax-credit/#:~:text=The%20Investment%20Tax%20Credit%20(ITC,down%20to%2022%25%20in%202021.

Vision is a civic leadership organization dedicated to improving the livability of the Sacramento region.

Foundational funding support for the BRI is provided by the Sacramento Air Quality Management District (SMAQMD); the Sacramento Municipal Utility District (SMUD) and Pacific Gas and Electric (PG&E). BRI provides a toolkit that is designed with the small business in mind, and provides a concise, accessible, action-oriented, easy-to-use guide to creating a resiliency plan for your business.

Partnerships, like this one, could provide resources for communities to more quickly recover from and more effectively prepare for future floods and climate risks.

6. Plan for long-term growth management and potential strategic relocation

Key Stakeholders: City of Hayward, BCDC

Hayward's Industrial District is one of the areas most vulnerable to future sea level rise and flooding in the City of Hayward. This district is made up of the following zoning subdistricts: Light Industrial, Industrial Park, and General industrial (See Hayward Zoning Map on next page).

The Light Industrial Subdistrict, applies to areas that generally contain small parcels located in relatively close proximity to residential areas, accommodates a wide variety of light industrial uses taking place primarily within enclosed buildings and producing minimal impacts on nearby properties.

Industrial Park Subdistrict, applies to areas with generally larger parcel sizes and uniform streetscapes, as well as areas with existing or potential industrial park development, is intended to provide areas for high technology, research and development, and industrial activities in an industrial park or campus-like atmosphere.

The General Industrial Subdistrict, applies to areas with a variety of parcel sizes and where a wide range of general industrial uses already exist, is intended to accommodate the widest variety of industrial uses including heavy industrial and warehousing/distribution uses.

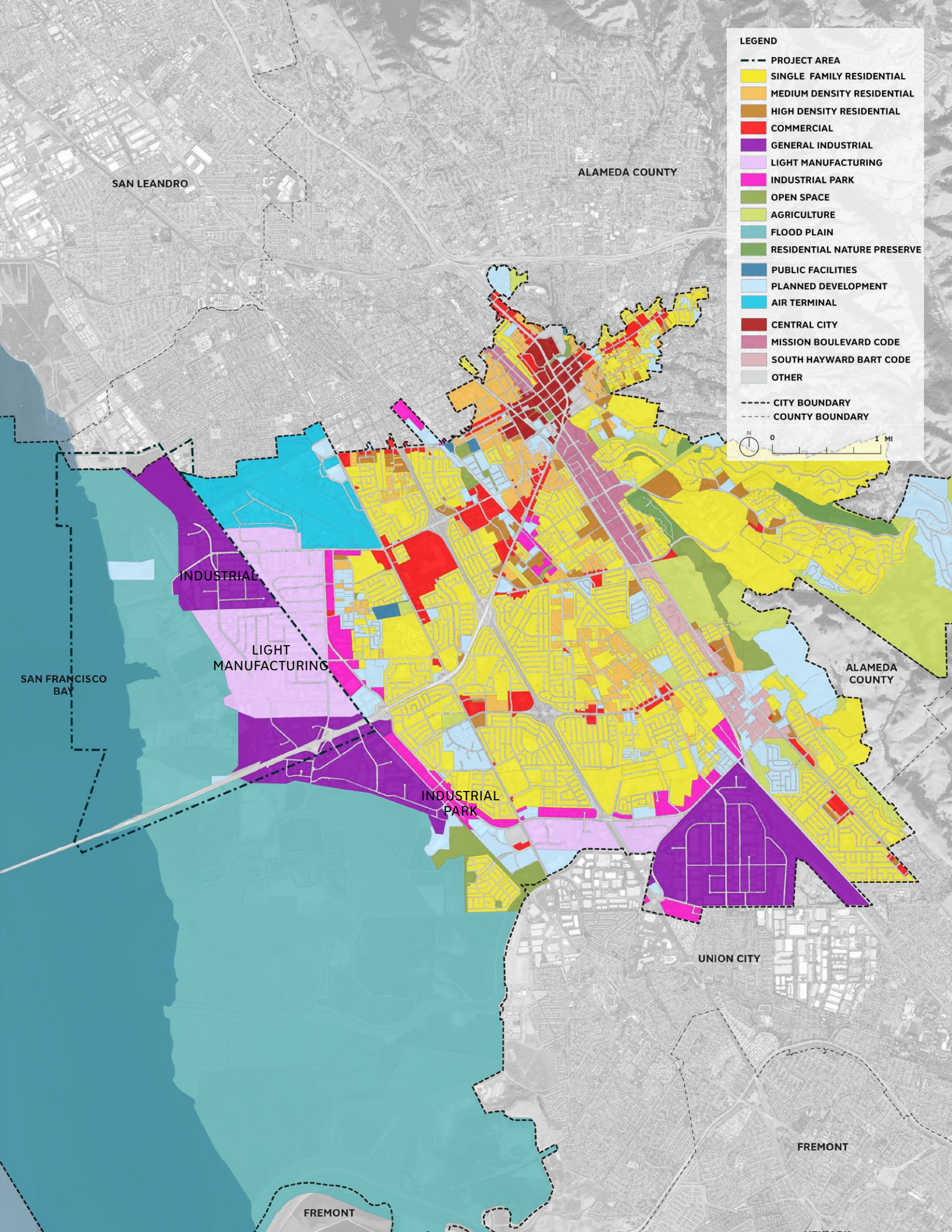
This area is also referred to as the Industrial Technology and Innovation Corridor. Future changes to this area are expected to include building and landscaping improvements, infill development, and the redevelopment of underutilized properties. The Corridor is expected to grow as an economic and employment center, achieving a balance of traditional manufacturing and information- and technology-based uses. This is also supported by Hayward's latest Capital Improvement Plan FY 2021-2030. The plan allocates technology services capital funds in the City's industrial areas to expand broadband infrastructure. The Highspeed Hayward projects aims to support business attraction efforts toward industrial areas.

Over the long-term, higher levels of sea level rise may create groundwater conditions that can no longer be managed through stormwater management strategies and will require land to either be significantly elevated or land uses to move inland. As sea level rise progresses, these issues should be monitored. Elevating the whole district would be costly, challenging to implement, and could lead to other issues, like increased subsidence and earthquake risks. Over the long-term, it may be necessary to limit additional growth and investment in the industrial district to develop a longer-term plan for more substantial changes in built form, or relocating to a safer, more viable location.

To promote reduced growth in this area in the future, zoning could be changed to other districts that allow for lower intensity of uses like Flood Plain Districts or Open Space/Parks and Recreation Districts. In addition, other planning documents and policies could be used to reduce growth in this area.

The San Francisco Bay Plan, developed by San Francisco Bay Conservation and Development Commission (BCDC), states policies and commission suggestions for the Hayward Regional Shoreline that are more aligned toward conservation. Some existing key recommendations include to preserve the interpretive center, continue to manage for wildlife and wildlife habitats, and provide wildlife compatible recreation activities. The BCDC advocates for maintaining trails and continuing to provide environmental education. The priority use in this area is designated as wildlife refuge and waterfront park/beach. These policies are consistent with reducing intensity of development in the industrial district over time.

Future changes to the Bay Plan could be used to further limit long-term growth or investment in areas at risk to sea level rise and groundwater emergence, such as the Hayward industrial district, similar to how the Bay Plan currently identifies Priority Conservation Areas (PCAs). PCAs are established through the purchase of key natural lands, or through conservation easements with willing property owners. These sites are identified in partnership with property owners, land trusts, open space districts, cities' and counties' parks and recreation departments, and other local jurisdictions. Plan Bay Area 2040 already helps to preserve over 100 regionally significant open spaces which have a broad consensus for long-term protection but face nearer-term development pressures.


LEGEND
PROJECT AREA
SINGLE FAMILY RESIDENTIAL
MEDIUM DENSITY RESIDENTIAL
HIGH DENSITY RESIDENTIAL
COMMERCIAL
GENERAL INDUSTRIAL
LIGHT MANUFACTURING
INDUSTRIAL PARK
OPEN SPACE
AGRICULTURE
FLOOD PLAIN
RESIDENTIAL NATURE PRESERVE
PUBLIC FACILITIES
PLANNED DEVELOPMENT
AIR TERMINAL
CENTRAL CITY
MISSION BOULEVARD CODE
SOUTH HAYWARD BART CODE
OTHER
CITY BOUNDARY
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ALAMEDA COUNTY
INDUSTRIAL
LIGHT MANUFACTURING
SAN FRANCISCO BAY
INDUSTRIAL PARK
ALAMEDA COUNTY
UNION CITY
FREMONT
FREMONT

STEWARDSHIP & EDUCATIONAL PROGRAMS

The Hayward Regional Shoreline is an extraordinary resource for adjacent communities, providing access to unique recreational and educational assets across a wide extent of Baylands. The future of the shoreline is dependent on active stewardship, maintenance, and education to ensure the longevity of healthy Baylands and public awareness.

The COVID-19 pandemic shed light on the importance of the Shoreline and its key role in providing accessibility to outdoor areas that benefit public health.

The diversity of ecosystems and built infrastructure that traverse the Hayward Regional Shoreline presents a variety of opportunities for education and stewardship. With new infrastructure improvements, incorporating educational programming will engage people in the new shoreline systems and recreational assets that shape the future of their environment.

Stewardship and Volunteer Programs: These have the ability to build upon existing efforts at the Hayward Shoreline Interpretive Center to engage schools and the general public in the monitoring of wildlife and climate change impacts. Tracking and analyzing shoreline change will help communicate potential risks and aid in the building of a Hayward Regional Shoreline constituency. These programs can be facilitated by Naturalists and Biologists at the Hayward Shoreline Interpretive Center.

Engagement with Schools and Service Learning: The Hayward Shoreline Interpretive Center is set up to continue engagement with schools, and service learning with high schools and elementary schools. Connecting with students will tap into the younger generation to educate about the inherent value the Shoreline has and the need to continue to preserve its assets.

Education Stations along the Bay Trail can provide areas to rest and educate about the shoreline ecosystems, climate change, and adaptation strategies to climate change. A prototype of a simple kiosk and bench can easily be replicated along the shoreline to highlight key educational features.

A robust monitoring and educational outreach strategy can be incorporated in all future projects identified in the Phasing Strategy. This will raise awareness about the adaptation strategies and projects being implemented. Citizen science can supplement larger-scale monitoring efforts to help to inform broader applications of adaptation strategies.


EXIT

ADDITIONAL CONSIDERATIONS

This section provides an overview of ongoing projects, funding and financing recommendations, permitting considerations, and feasibility and operations considerations.

ONGOING PROJECTS

The following adjacent ongoing projects present opportunities for coordinating with the implementation of elements of the Hayward Regional Shoreline Adaptation Master Plan.

1. ORO LOMA HORIZONTAL LEVEE[1]

Project Summary: The Oro Loma Horizontal Levee is a pilot project to test an innovative approach to flood protection, ecosystem restoration, and wastewater treatment. Instead of a vertical wall to protect against storm surges, the Oro Loma Horizontal Levee project uses vegetation on a slope to break waves. The project consists of two components. The first is a two-acre wetland basin that can both remove nutrients from wastewater and provide extra wet weather storage capacity. The second is an experimental levee on one side of the basin. The combination of treatment wetlands and newly designed habitats, and surface and sub-surface filtering processes, will support native plants and purify water while providing flood protection.

Current Status: The project was completed in April 2017. A UC Berkeley research team is currently monitoring and evaluating the effectiveness of the project. The results will inform future discussions about horizontal levees on the East Bay Shoreline and beyond.

Coordination Opportunity: Monitoring and evaluation of the Oro Loma Horizontal Levee pilot is an opportunity to inform the design and implementation of the proposed Hayward and First Mile / Oro Loma Horizontal Levees.

Lead Agencies/Organizations: Oro Loma Sanitary District, Castro Valley Sanitary District, UC Berkeley

2. FIRST MILE HORIZONTAL LEVEE[2]

Project Summary: The First Mile Horizontal Levee project builds off the Oro Loma Horizontal Levee project. The goal of this project is to design and seek funding for a full-scale Horizontal Levee in the East Bay Dischargers Authority service area. This project has received funding from the Environmental Protection Agency's (EPA) San Francisco Bay Water Quality Improvement Fund.

Current Status: As of December 2019, this project is in the siting, design, and permitting phase.

Coordination Opportunity: The First Mile Horizontal Levee could connect with the proposed Hayward Horizontal Levee in the northern reach of the study area to form a connective regional system for coastal protection, wastewater treatment, and ecosystem improvement.

Lead Agencies/Organizations: East Bay Dischargers Authority, San Francisco Estuary Partnership

3. TREATMENT WETLANDS STUDY FOR WET WEATHER STORAGE PONDS[3]

Project Summary: EBDA plans a feasibility study to examine the potential for seasonally repurposing the oxidation ponds for effluent treatment during the summer and wet weather storage during the winter.

Current Status: Scoping of study underway now.

Coordination Opportunity: This feasibility study could further examine the proposed horizontal levee throughout the Hayward study area as part of a regional strategy for managing wastewater and providing ecosystem restoration.

Lead Agencies/Organizations: East Bay Dischargers Authority, City of Hayward

4. HAYWARD MARSH RESTORATION STUDY[4]

Project Summary: EBRPD will be examining opportunities to improve the functioning of the tidal marsh habitat and potential for new high ground of islands for wildlife refugia, particularly least terns.

Status: Scoping of study underway now.

Coordination Opportunity: The Hayward Marsh study is an opportunity to further examine the preferred alternative and alternate configuration for Hayward Marsh including creation of tidal habitat, the alignment of coastal protection, and the location of the least tern nesting colony.

Lead Agencies/Organizations: East Bay Regional Park District

5. DON CASTRO SEDIMENT PIPELINE[5]

Project Summary: The Don Castro Sediment Pipeline will allow the Alameda County Flood Control and Water Conservation District to transport sediment removed from the bottom of the Don Castro Reservoir to the Salt Pond Restoration projects in the Eden Landing Salt Ponds. The existing sediment volume is estimated to be 450,000 cy. The preliminary design includes approximately 12.4 miles of 20" RCP and HDPE pipeline and four pump stations.

Status: Project under review and consideration by ACFCD

Coordination Opportunity: The sediment pipeline is a potential opportunity to provide a sediment source for the proposed marsh restoration projects in the Hayward Regional Shoreline Adaptation Master Plan

Lead Agencies/Organizations: Alameda County Flood Control and Water Conservation District

6. COUNTY LANDFILL SOLAR FARM[6]

Project Summary: West Winton landfill will be transformed into a solar farm, providing 6.6 megawatts of power, enough to power 1,200 homes. It is one of the largest solar project in the state and is part of the Regional Renewable Energy Procurement effort which aims to create solar network on publicly owned property around the Bay Area.

Status: Construction was expected to start in August 2015

Coordination Opportunity: Ongoing coordination is needed with the solar farm plan and the implementation of shoreline protection along West Winton Landfill

Lead Agencies/Organizations: Alameda County General Service Agency, Sun Edison

7. SAN LORENZO COMMUNITY PARK PHASE 2[7]

Project Summary: This project provides for the development of construction documents for the San Lorenzo Community Park Phase 2 & 3 portion of the existing 31-acre community park. Phase 1 improvements were completed in 2017. Phase 2 improvements include a multi-purpose field, two soccer fields, a dog park, community green, a neighborhood play area, additional picnic facilities and exercise stations and parking. Construction of Phase 2 will be funded with future Bond proceeds. The third and final phase will renovate the existing 8,200 square-foot community center as well as the remainder of the park adjacent to the center. Construction of phase 2 and 3 will be funded by future bond agreements.

Status: This project was estimated to start in the summer of 2020.

Coordination Opportunity: There is an opportunity to improve the connection from this park and other recreation assets in the region, as well provide stormwater retention, through the implementation of the Hayward Regional Shoreline Adaptation Master Plan.

Lead Agencies/Organizations: Hayward Area Recreation and Park District

8. ACFCD STORMWATER STUDY

Project Summary: ACFCD is studying the combined impacts of sea level rise (up to 2 feet) and increased precipitation on water levels in the bay and inland waterways, and examining potential flood control infrastructure needs throughout its service area.

Status: The first phase of the study to develop a model of the region is underway now. Future phases will include proposals for new and modified flood control infrastructure.

Coordination Opportunity: There is an opportunity to more deeply examine proposed near-term flood control infrastructure needs as part of this study, such as floodwalls along channels, tide gate, pump station improvements, and others as identified, in ways that are consistent with the preferred alternative.

Lead Agencies/Organizations: Alameda County Flood Control District

9. GRAVEL BEACH FOR EROSION CONTROL PILOT

Project Summary: The California State Coastal Conservancy is examining he feasibility of an expanded gravel beach in the south bay to provide shoreline habitat and reduce erosion of tidal marshes and mudflats.

Status: Under design now.

Coordination Opportunity: Monitoring and evaluation of the gravel beach pilot project offers an opportunity to inform the design and engineering of erosion control strategies for the Hayward Regional Shoreline Adaptation Master Plan.

Lead Agencies/Organizations: TBD

Sources:

1. Oro Loma Sanitary District, "Horizontal Levee Project," https://oroloma.org/horizontal-levee-project/

2. East Bay Dischargers Authority, "Projects," https://ebda.org/projects/

3. Source: Phone call with EBDA and Hayward Shoreline Master Plan Technical Advisory Committee, 6/29/2020

4. Source: Phone call with Hayward Shoreline Master Plan Technical Advisory Committee, 7/1/2020

5. Technical Memo from WRI to ACFCD, 11/15/13

6. Alameda County, Public Works Department, Resolution, May 7, 2015, http://www.acgov.org/board/bos_calendar/documents/DocsAgendaReg_05_12_15/SITTING%20AS%20THE%20FLOOD%20CONTROL%20AND%20WATER%20CONSERVATION%20DISTRICT/Regular%20Calendar/ACPWA_217937.pdf

7. Hayward Area Recreation and Parks District, Capital Improvement Projects, https://hard.icitywork.com/

FUNDING & FINANCING RECOMMENDATIONS

With the global impact of the COVID-19 crisis, cities and utilities are facing unprecedented economic challenges. The timing of lockdowns and associated revenue losses in Spring 2020 aligned with the final quarter of many local government fiscal years and the balanced budget requirements of most state and local governments are likely to make coming budget years (starting with FY21) especially difficult. With that backdrop, funding and financing for major capital projects and infrastructure investments will not be as straightforward or predictable as in years past.

Despite these challenges, there are opportunities to strategically move forward green and resilient infrastructure projects as part of a broader economic recovery strategy. Taking advantage of these resources will require a balance between being opportunistic, particularly about short-term recovery and stimulus funds, and strategic about longer-term costs and needs. The following recommendations offer a flexible approach for pursuing short, medium, and longer-term resources to advance the vision for the full Hayward Shoreline Adaptation Master Plan. Most of these funding and financing options will require coordination among multiple stakeholders and decision-makers. Depending on the source (sectoral focus) of specific funds, the lead applicant will also likely vary. Because the budget and revenue impacts of COVID-19 are anticipated to be far-reaching, none of the recommended funding sources in this section are mutually exclusive, and pursuing multiple funding sources is strongly recommended as an "all of the above" approach to maximize both public and private resources for implementation.

Recommendations

There are several key elements of the Hayward Shoreline Adaptation Master Plan that offer a strong basis for public funding and private financing to support ecosystem restoration and enable long-term risk reduction. These elements include:

- Protecting infrastructure and high-value assets (e.g., Oro Loma waste water treatment plant and sludge ponds, PG&E transmission lines)
- Protecting critical rail corridors and roadways (SR-92) from disruption
- Reducing short- and long-term flood risk and flood losses
- Enhancing regional economic resilience

The types of funds available for these kinds of projects can be divided into two main categories: ecosystem-specific funds and broader economic and regional development funding sources. While the Hayward Shoreline Adaptation Master Plan as a whole is designed to create myriad ecosystem benefits, the four elements above align particularly well with broad funder and investor interests in creating quantifiable benefits, for example, measurable risk reductions and long-term cost savings. Given the scope of the Hayward Shoreline Adaptation Master Plan, these types of funding applications should be as detailed as possible about the anticipated economic benefits and outcomes of the proposed project to support the pursuit of larger funding amounts rather than niche, piecemeal grants. For ecosystem specific funds, HASPA and its partners should seek support to quantify the economic and financial benefits of key ecosystem services for stormwater management, wastewater treatment, and erosion control, among other services to lay the data and analytic groundwork for tapping into larger and more general funding sources in future.

This section highlights several large-scale general and ecosystem-specific funding opportunities. The recommended resources are organized into three main categories:

- **Short-term:** Apply within the next 1-2 years for projects to be initiated and completed in less than 10 years
- **Medium-term:** Prepare applications for submission within 2-5 years for projects to be completed in the 10-25 year timeframe
- **Long-term:** Initiate long-term data gathering and analysis to support eventual application for projects in the 25+ year time horizon

The final sub-section lists additional non time-sensitive resources for regional projects or program-specific solutions, such as environmental education, that can also be pursued for project implementation, operations, and maintenance moving forward.

Leveraging Existing Sources of Support & Meeting Matching Fund Requirements

The Hayward Shoreline Adaptation Master Plan is well aligned with multiple complementary initiatives and investments. In addition to providing direct support for aspects of the Hayward Shoreline Adaptation Master Plan, projects that are already funded or highly likely to move forward can help meet local funding "match" or cost-share requirements that can be up to 50% of the total award for some larger federal funding applications. Examples of these types of existing and potential near-term sources of support include:

Transforming Shorelines Project—In 2019 the Oro Loma Sanitary District completed construction on a $9.1 million, 8-million gallon wetland basin or 'horizontal levee.' In addition, the USEPA made a $1.5 million award to the San Francisco Estuary Partnership to evaluate the project for its treated wastewater filtration and storm surge protection benefits and complement EBDA's related work on the First Mile Horizontal Levee Project.

US Army Corps of Engineers Resilient San Francisco Bay Project—In 2018 the Army Corps selected the San Francisco Bay as one of ten communities in its beneficial use of dredged material pilot program. The total project cost is estimated to be $51.05 million over 10 years. The California State Coastal Conservancy covers the 35% non-federal cost-share requirement for the project as the non-federal sponsor and implementing agency for four restoration sites.

Wetlands Mitigation Banking—Explore engagement with BART, CALTRANS, and other major project developers seeking wetlands mitigation options to provide funding for eligible segments of the project, including creating a publicly owned conservation or mitigation bank for eligible portions of the Hayward Shoreline Adaptation Master Plan.

Short-Term Regional and Federal Funding Opportunities

The level of detail in the Hayward Shoreline Adaptation Master Plan offers a strong basis for applying for larger regional and federal grants (~$10-$30 million) for the next level of design development and implementation. The amounts of funding and application timeframes vary by agency, but the funding opportunities below are already available or anticipated to be released in the 2020 and 2021 calendar years. These early stage funds can significantly advance the next phase of project design and implementation and lay the groundwork for seeking additional resources for future phases of work.

Department of Commerce Economic Development Administration (EDA) FY20/21 Public Works and Economic Adjustment Assistance Program

The EDA makes annual grants for projects that support sustainable regional economic growth and diversification. Two of its key investment priorities are:

(1) Recovery & Resilience: Projects that assist with economic resilience and long-term recovery from natural disasters and economic shocks.

(2) Critical Infrastructure: Projects that establish the fundamental building blocks of a prosperous and innovation-centric economy and a secure platform for American business, including physical (e.g., broadband, energy, roads, water, sewer) and other economic infrastructure.

The portions of the Hayward Shoreline Adaptation Master Plan that specifically protect infrastructure and access to critical services (via rail and roadways) are especially well suited for this type of funding. The ceiling for awards is $30 million, applications are accepted on a rolling basis until program funds are expended, and projects must connect to an existing EDA approved Comprehensive Economic Development Strategy (CEDS). An additional $1.5 billion in funds was also made available in May 2020 for projects that help communities "prevent, prepare for, and respond to coronavirus" or respond to "economic injury as a result of coronavirus."

Recommendation: Reach out to ABAG to discuss how the Hayward Shoreline Adaptation Master Plan connects to the current Bay Area CEDS and explore options for applying for $5-$30 million in funds. Identify potential matching funds to meet EDA's 50% cost-share requirement for standard public works grants and develop more detailed workforce and job creation benefits estimates in preparation

for either a CARES Act (coronavirus response) or standard application for the FY21 grant cycle.

FEMA Building Resilient Infrastructure and Communities (BRIC) Program

As part of the Disaster Recovery Reform Act of 2018 (DRRA), FEMA established a new grant program on Building Resilient Infrastructure and Communities (BRIC). This program replaces the existing Pre-Disaster Mitigation program and will be funded by a 6% set-aside from every major disaster declaration. Funds will go to a National Public Infrastructure Pre-Disaster Mitigation Fund for projects that improve community resilience before a disaster occurs. Total funds are anticipated to be $300-$500 million/year on average. The program opened its first application cycle in September 2020.

Recommendation: Review BRIC program notice of funding availability and guidance materials and begin assembling relevant risk-reduction and mitigation metrics for an application in the next one to two funding cycles.

SF Bay Restoration Authority (Measure AA funds) Grant

The SF Bay Restoration Authority awarded the first round of grants funded by Measure AA in April 2018. Since then the Authority has funded 14 projects ranging in size from $175,000 to just over $60 million. Funds are made available through a competitive RFP process at least once and up to twice each year based on the availability of and demand for funds.

Recommendation: Follow-up on the $500,000 Hayward Marsh Restoration Project application (recommended for funding in May 2020) to discuss a larger submission for the next grant application cycle and/or submittal of the Hayward Shoreline Adaptation Master Plan as a "multi-benefit wetland restoration projects for consideration and possible addition to the Bay Restoration Regulatory Integration Team's (BRRIT's) priority project list." Discuss plans for also pursuing federal funds in alignment with Measure AA's emphasis on leveraging additional resources.

Medium-Term Resources & Recovery Funds

Given the depth and breadth of COVID-19's impacts on the US economy as a whole, it is likely that the federal government will develop additional economic stimulus and recovery funding measures that stretch over the next 2-3 years. While it is unclear if any of these measures will focus specifically on infrastructure or a "green stimulus," there is a high likelihood that projects that create strong workforce and jobs benefits and support local governments through periods of significant revenue loss will be prioritized. In order to best prepare for applying for these funds once available, HASPA and its member agencies should invest up-front in developing a strong quantitative case on the regional economic (protecting infrastructure, industry, and critical services) and workforce benefits (short-term construction and longer-term O&M) of the Hayward Shoreline Adaptation Master Plan.

Other medium-term funding opportunities, to consider include:

- State stormwater and ecosystem grants (e.g. remaining Prop 1 & Prop 68 funds)
- Federal grants/loans for sector-specific project elements
    - DOT funds for SR-92 upgrade (causeway elevation) with CalTrans
    - EPA (grants & state revolving loan funds) for wastewater treatment plant upgrades and protections with the Oro Loma Sanitary District

Recommendation: Reach out to regional philanthropies with a focus on nature-based solutions and green workforce issues to pursue grant funding for a comprehensive workforce, economic resilience, and equity study to complement the Hayward Shoreline Adaptation Master Plan. Develop relevant workforce training and community partnerships in preparation for future economic recovery funding applications. Coordinate with the Oro Loma Sanitary District and CALTRANS to align interests for pursuing future EPA and DOT funds.

Longer-Term Public and Private Finance Options

Once the local economic recovery from COVID-19 has more firmly taken hold, HASPA and its member agencies can also explore how revenue mechanisms and private finance can be brought in alongside federal and state funds for implementing the Hayward Shoreline Adaptation Master Plan. The timing for pursuing any of these options will depend on the financial position of the city, utility, and local taxpayers and their respective willingness to take on additional costs or fees to support the project. Some potential options include:

- Develop a new public-private partnership (P3) with a major infrastructure fund or operating firm to finance specific project components that generate operational saving, such as reduced pumping costs, reduced maintenance or asset replacement costs, lower losses, or lower liability (for example, from flood damages). The options for designing a performance based P3 to capture savings and efficiencies will depend heavily on the financial position and interests of the primary public partner (likely the utility) and need to take into account market impacts of COVID-19. The Prince George's County Clean Water Partnership in Maryland is a highly successful example of a Community Based P3.

- Work with the beneficiaries of the proposed shoreline protections to create a new coastal Geologic Hazard Abatement District (GHAD) or risk pool to bring together a majority of beneficiaries to directly finance elements of the project. Explore options for pooling insurance savings from reduced flood losses.

    - A GHAD is an administrative entity created by a majority of property-owners or a sponsoring agency in a designated area to collect property-based fees to address probable geologic hazards, including flood and erosion risks, and help stabilize property and asset values.

    - A public entity risk pool is a not-for-profit, member-driven public organization that typically provides more affordable insurance coverage than otherwise available. Participating entities can be co-owners of the pool, and pools are typically governed by elected member boards.

For suggested models for both GHADs and risk/resource pools, see SPUR and SFEI's governance recommendations for regional shoreline protection.

Recommendation: Collaborate with one or more philanthropies in the impact investing space to convene leading private sector firms in a workshop to explore options for a new P3 or risk pool, discuss the pros and cons of specific approaches, gather market insights, and gauge interest from potential investors and partners. Explore equitable cost-share or PPP structures to avoid reinforcing existing economic and social inequities. For example, consider innovative approaches to equitable financing structures to ensure that socially and economically vulnerable residents are not paying beyond their means and/or that project areas with greater ability to pay are not receiving more immediate protection at the expense of others.

Additional Resources

In addition to the strategic funding recommendations above, below is a more general list of resources that HASPA and its members and collaborators can pursue as funds become eligible/available to implement specific aspects of the Hayward Shoreline Adaptation Master Plan.

Federal Funding Opportunities

- **EPA Water Infrastructure and Resiliency Finance Center**—Catalogue of financing tools and resources to help local decision makers make informed decisions for drinking water, wastewater, and stormwater infrastructure to protect human health and the environment.
- **DOT Federal Highway Administration (FHWA) Resilient Infrastructure**— Support for expenditures that improve the resilience of transportation assets to changing conditions are generally eligible under the National Highway Performance Program and the Surface Transportation Block Grant Program (potential grant funding for eligible Hayward Shoreline Adaptation Master Plan elements aligned with CALTRANS roadway resilience investments).
- **HUD Community Development Block Grant Mitigation (CDBG-MIT) Program**—Assistance for areas with qualifying disasters to support projects that increase resilience and reduce or eliminate the long-term risk of loss of life, injury, damage to and loss of property, and suffering and hardship by lessening the impact of future disasters.
- **EPA and National Environmental Education Foundation (NEEF) Environmental Education Grants**—Support for environmental education projects that promote awareness and stewardship and provide people with the formal and informal skills to take action to protect local and regional ecosystems, such as training for citizen science activities for baseline and predevelopment data collection and monitoring.

California State Grants

- *CA Natural Resources Agency*—State grant resources available for Trails and Greenways; Environmental Enhancement and Mitigation; Green Infrastructure; Urban Greening; and Cultural, Community and Natural Resources. https://resources.ca.gov/grants/Grant-Program-Resources
- *CA Department of Fish and Wildlife*—The State Wildlife Grant (SWG) Program provides federal grant funds for the development and implementation of programs for the benefit of wildlife and their habitat, including species that are particularly vulnerable to climate change. https://wildlife.ca.gov/Grants/State-Wildlife-Grants
- *CA Department of Parks and Recreation*—The Office of Grants and Local Services (OGALS) develops grant programs that provide funding for local, state, and nonprofit organization projects. Grant projects generally address park, recreation and resources related needs. http://www.parks.ca.gov/?page_id=29742
- *CA Department of Water Resources*—Grant and loan programs that support integrated water management activities, environmental stewardship, water supply reliability, public safety, and economic stability. https://water.ca.gov/Work-With-Us/Grants-And-Loans
- *State Water Resources Control Board (via the CA Financing Coordinating Committee)*—The SWRCB's Division of Financial Assistance provides funding for projects that preserve, enhance, and restore California's water resources. Financial assistance programs include loan and grant funding for planning, design, and construction of the following general project types: municipal sewage and water recycling facilities, drinking water infrastructure for public water systems, groundwater clean-up, storm water management, nonpoint source pollution control, and watershed protection. https://www.cfcc.ca.gov/funding-programs/
- CA Wildlife Conservation Board—Annual grants for wildlife conservation and related public recreation https://wcb.ca.gov/Grants#86211-current
- *CA Coastal Conservancy*—Annual grants to non-profit organizations, public agencies, and federally-recognized tribes for projects that restore and protect the California coast, increase public access to it, and increase communities' resilience to climate change. https://scc.ca.gov/grants/
- *SF Bay Restoration Authority (Measure AA funds)*—Annual grants for habitat restoration, flood protection, and shoreline access projects from a 20-year parcel tax (~$25 million/yr). http://sfbayrestore.org/overview

Follow-on Funding for Ongoing Regional Projects

- *Alameda County Flood Control & Water Conservation District (ACFCD)*— Explore additional funding opportunities to use the Don Castro sediment pipeline as a potential sediment source for the proposed marsh restoration projects in the Hayward Shoreline Adaptation Master Plan.
- *East Bay Dischargers Authority (EBDA)*—Opportunity to collaboratively seek funding to link the First Mile Horizontal Levee with the proposed Hayward Horizontal Levee in the northern reach of the study area to form a connective regional system for coastal protection, wastewater treatment, and ecosystem improvement and provide additional support for full-scale implementation of both projects.
- *East Bay Regional Park District (EBRPD)*—Potential for coordination with and follow-up to Hayward Marsh Restoration Study to enhance coastal protection alignment to support tidal marsh

habitat functioning and identify high ground of islands for wildlife, particularly least terns.

- *Oro Loma Sanitary District*—Data sharing from monitoring and evaluation of the Oro Loma Horizontal Levee pilot to inform design and implementation of the proposed Hayward Horizontal Levee and support additional funding applications for implementation and evaluation.

PERMITTING CONSIDERATIONS

Implementation of the Hayward Regional Shoreline Adaptation Master Plan will require numerous permits and an environmental review process. This process will engage a variety of local, state, and federal agencies, many of whom have been engaged throughout the process to lay the groundwork for the implementation of the plan.

California Environmental Quality Act (CEQA) requires state and local agencies to assess the potential environmental impacts of proposed projects, disclose this information to decision makers and the public, and reduce the impacts to the extent feasible. Following the completion of the Master Plan, HASPA will determine how to proceed with preparing an Environmental Impact Report (EIR), which should include potential elements and projects. There may be potential environmental impacts to wetlands and endangered species that will require analysis and potential mitigation. The CEQA process will also involve public review and comment, as well coordination with permitting actions by various resource agencies (see below).

If federal funding or federal discretionary approval is required by any element of the Master Plan, HASPA will also need to follow the requirements of the National Environmental Policy Act (NEPA), including the development of an Environmental Impact Statement (EIS). The EIS and EIR can be combined into a single document but must meet the requirements of both.

In addition to environmental review, permits from a variety of state and federal agencies will likely be required for elements of the master plan. This includes:

- Bay Conservation and Development Commission (BCDC)
- California Department of Fish and Wildlife (CDFW)
- San Francisco Regional Water Quality Control Board (WQCB)
- U.S Fish and Wildlife Service (USFWS)
- NOAA Marine Fisheries Service (NMFS)
- U.S. Army Corps of Engineers (USACE)

CEQA Flow Process

Notes:

1 CEQA– California Environmental Quality Act

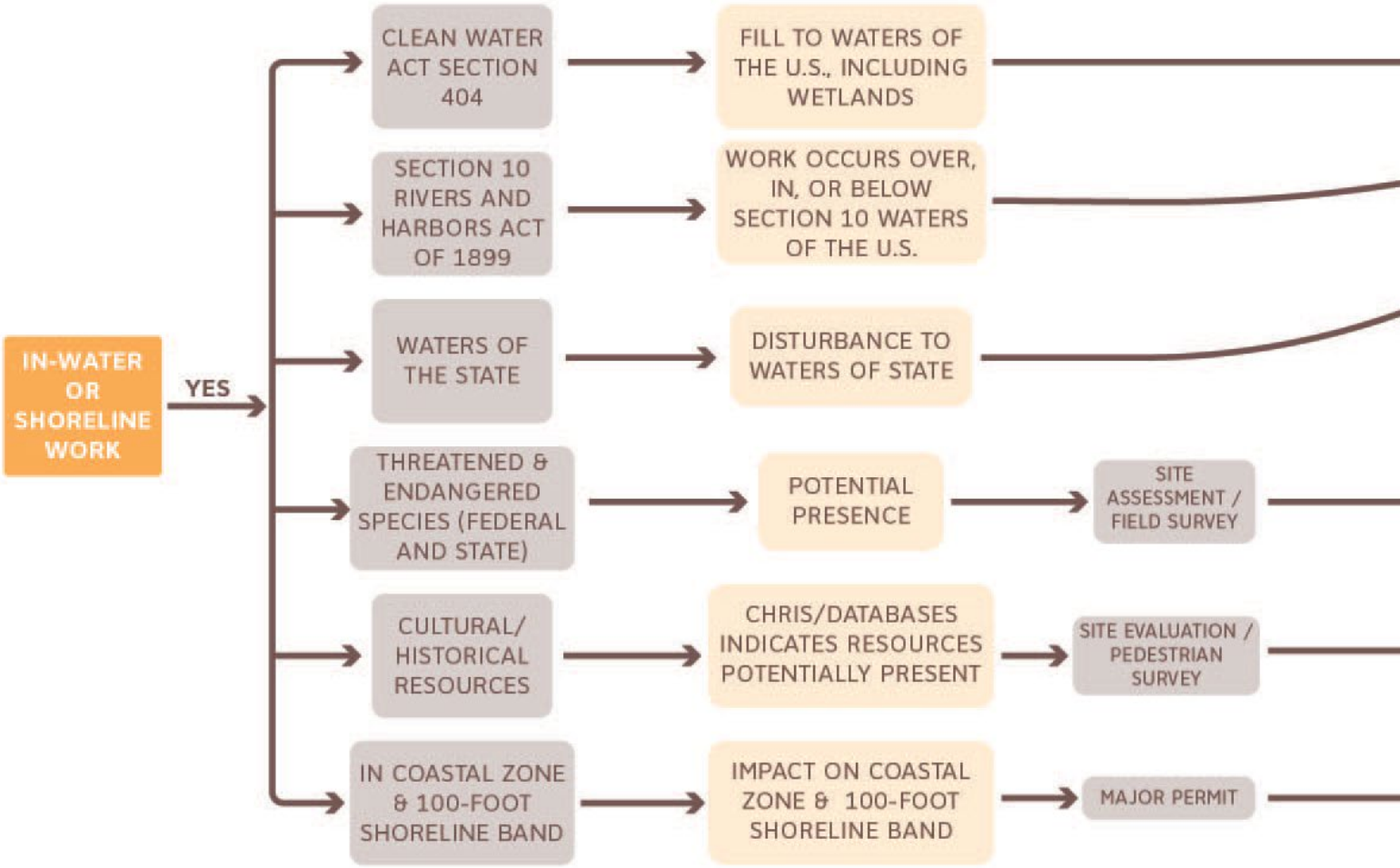
2. EIR– Environmental Impact Report

3. MMRP – Mitigation, Monitoring, and Reporting Plan

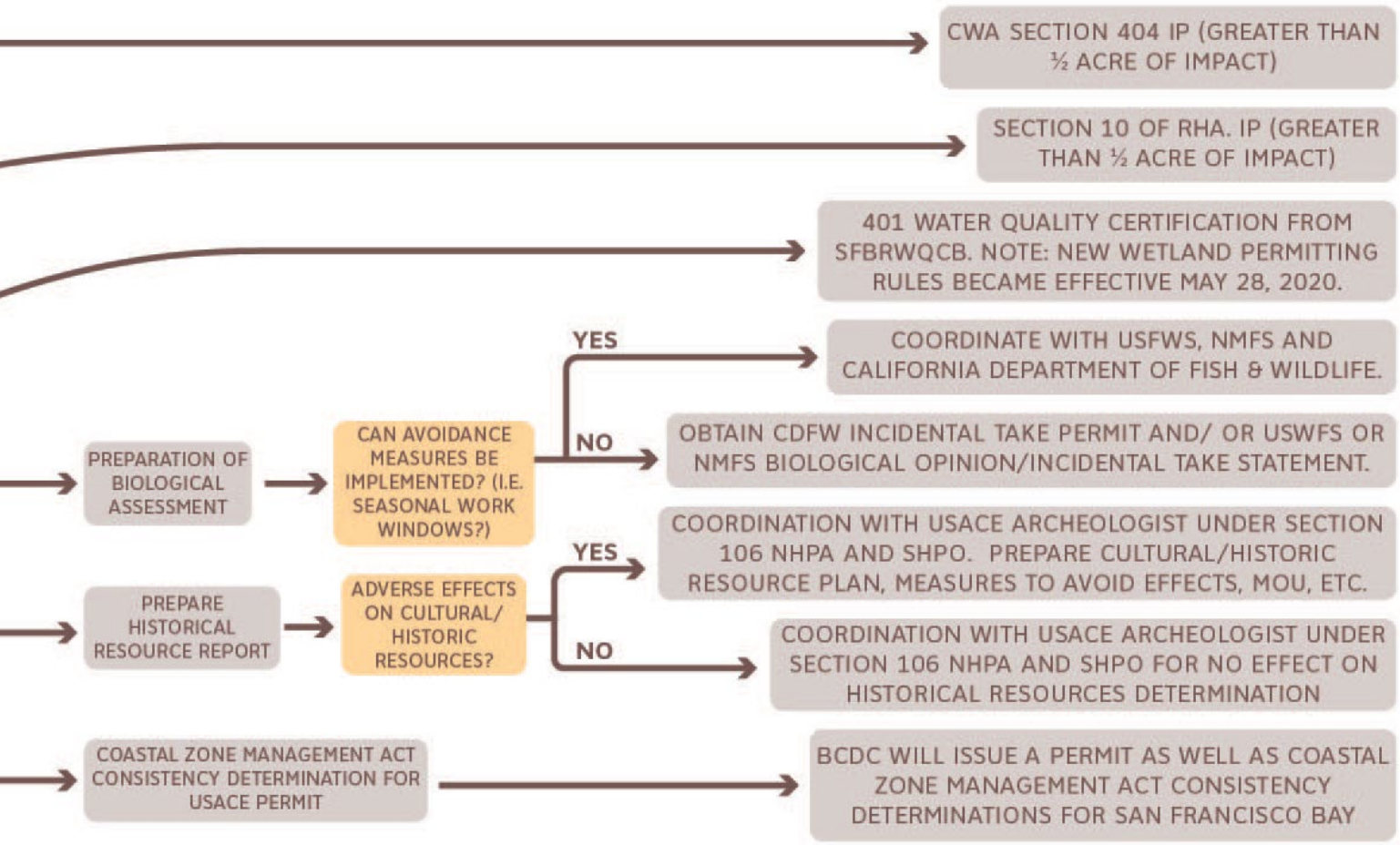
PERMITTING

Projects implemented in the Hayward Regional Shoreline involve an extensive permitting process and many regulatory requirements that involve local, state, and federal agencies. These requirements will likely drive the implementation process.

The permitting flow of in-water or shoreline projects is outlined below:

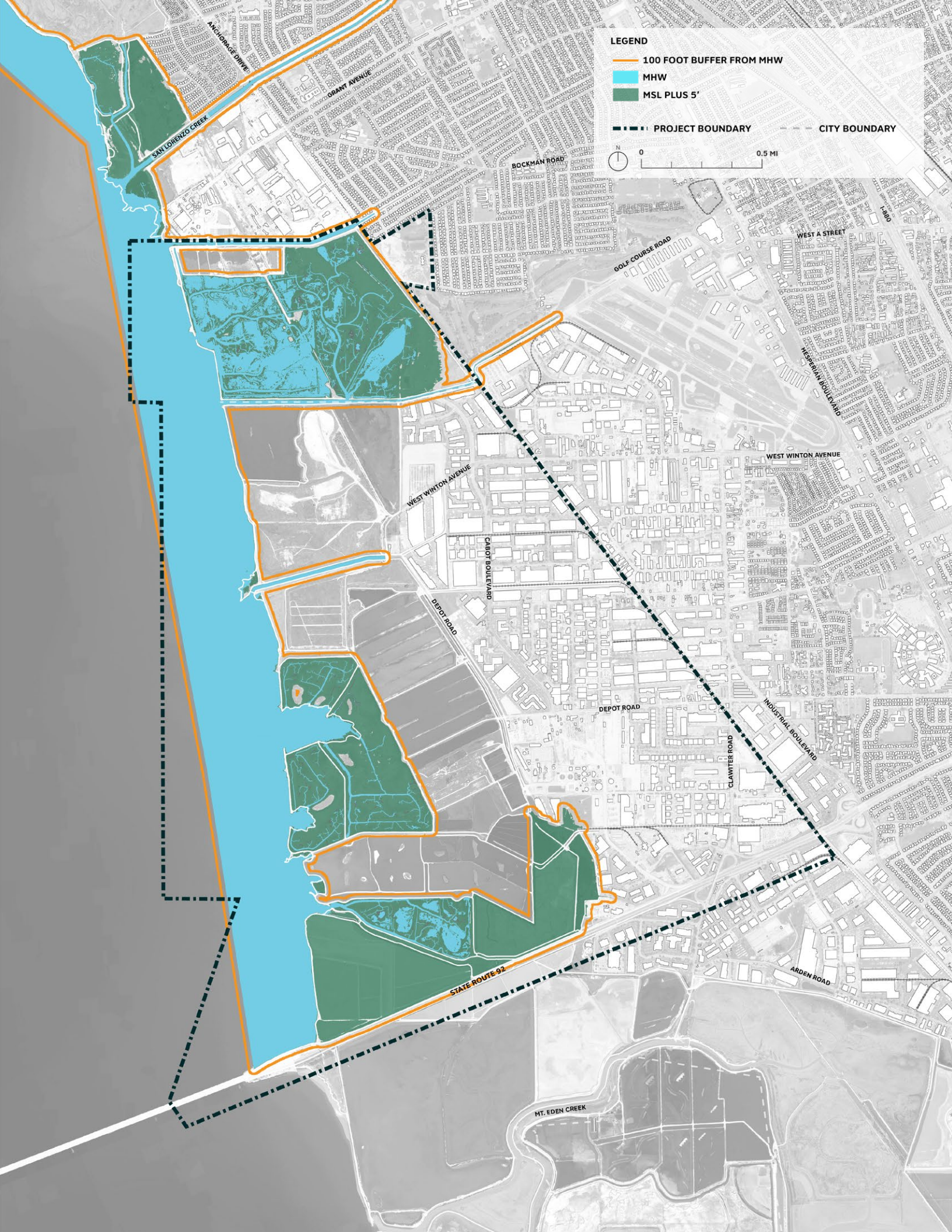


Permitting Flow Diagram



Notes:

1. BCDC – San Francisco Bay Conservation and Development Commission.
2. NHPA – Section 106 of the National Historic Preservation Act
3. USACE – United States Army Corps of Engineers
4. SHPO - State Historic Preservation Office
5. SFBRWQCB – San Francisco Bay Regional Water Quality Control Board
6. CWA – Clean Water Act, Sections 404 and 401
7. RHA – Section 10 of the Rivers and Harbors Act
8. IP – Individual Permit (under CWA Section 404)
9. CDFW – California Department of Fish and Wildlife


LEGEND
100 FOOT BUFFER FROM MHW
MHW
MSL PLUS 5'
PROJECT BOUNDARY
CITY BOUNDARY
N
0
0.5 MI
ANCHORAGE DRIVE
GRANT AVENUE
SAN LORENZO CREEK
BOCKMAN ROAD
GOLF COURSE ROAD
WEST A STREET
I-880
HESPERIAN BOULEVARD
WEST WINTON AVENUE
WEST WINTON AVENUE
CABOT BOULEVARD
DEPOT ROAD
DEPOT ROAD
INDUSTRIAL BOULEVARD
CLAWITER ROAD
ARDEN ROAD
STATE ROUTE 92
MT. EDEN CREEK

BCDC JURISDICTION MAPPING

A map depicting the jurisdiction of the Bay Conservation and Development Commission (BCDC) was developed to aid in the development of master plan consistent with the Bay Plan. The Bay Plan was adopted in 1968 to guide future uses of the Bay and the shoreline. The BCDC issues permits for activities within its jurisdiction for filling and dredging of the bay, as well as shoreline development. BCDC's bay jurisdiction includes all areas subject to tidal action, including lands under water and up to five feet above mean sea level. The shoreline band jurisdiction is defined as a band extending 100 feet landward of the shoreline. Salt ponds and managed wetlands existing as of 1969 are also included in the BCDC's jurisdiction. In addition, the map shows areas within the study area that identified as either salt ponds or tidal marshes in the Bay Plan, as well as areas with priority uses, such as waterfront park or wildlife refuge.

FEASIBILITY & CONSTRUCTABILITY CONSIDERATIONS

A broad range of feasibility and constructability considerations were incorporated into the development of alternatives and selection of the preferred alternative. However, there are additional issues that will need to be evaluated in subsequent engineering feasibility and design phases, as described below.

Line of Protection

More detailed analysis is needed to determine an optimal flood protection design height, considering costs, technical feasibility, and risk reduction benefits. A detailed cost benefit analysis should be conducted that compares the costs of the flood protection system, including design, permitting, and mitigation, to the cost of inaction.

More information and technical analysis of urban hydrology and hydraulics is needed to develop a comprehensive strategy for flood protection, in coordination with ACFCD.

Geotechnical surveys will be required to better understand subsurface conditions, which may inform the feasibility of the line of protection alignment and other project elements, as well as their eventual design.

In addition, more detailed technical analysis will be needed to evaluate the proposed tie-ins to high ground, access needs across the line of protection (for transportation connectivity, wildlife, safety, etc.) as well as evaluate the potential for increasing flood levels in surrounding communities.

Land ownership will need to be confirmed and any necessary easements (for construction as well as operations and maintenance) will need to be identified and secured.

To qualify the area for reduced flood insurance premiums, the flood protection levee will need to be designed to meet FEMA standards. This includes:

- Meeting flood elevation and freeboard requirements, which have been assumed throughout the master plan)
- Designing openings and closures following sound engineering practice, which often means limiting active deployable elements),
- Ensuring the stability of the embankment and foundation to erosion, seepage, and settlement
- Interior drainage must be managed, which will require further analysis of the joint probability of interior and exterior flooding

At the landfills, more information on existing conditions is needed to better understand what is needed from a flood control perspective, and to evaluate the need to address other issues, including the potential need for subsurface cut-off to prevent release of contaminants.

Tidal Habitat

Further analysis is needed of the proposed muted marsh tide gates at HARD Marsh to ensure water levels are maintained at elevations appropriate for target ecosystems.

Erosion Control

More detailed study of erosion process and drivers and engineering solutions will be needed, particularly around the landfill where more information is needed on existing conditions and future needs and objectives.

Stormwater Management

More detailed analysis of the stormwater management system will be needed including geotechnical surveys as mentioned above, as well as coordination with ACFCD to develop a management plan. While there has been significant new analysis of groundwater emergence risks, more analysis is needed to understand effectiveness of various approaches to managing groundwater.

In addition, while there is inland storage identified in the preferred alternative, identification of additional inland storage opportunities to reduce pumping needs is recommended.

Wastewater Treatment

Further technical engineering analysis is needed of wastewater management elements of the preferred alternative in coordination with EBDA. This includes assessing space needed for the treatment wetland.

SR-92

Additional study is needed of the proposed elevated pile-supported structure as part of a long-term plan for the bridge is needed.

OPERATION & MAINTENANCE CONSIDERATIONS

As a dynamic, highly managed coastal system, ongoing operations and maintenance will be an important element of the success of the Master Plan. Likewise, the operations and management approach of various project elements need to be adaptable and dynamic in order to respond to changes in conditions and evolving needs. The operations and management considerations outlined below will be highly dependent on the rate of sea level rise, which is highly uncertain. Thus, ongoing monitoring and reevaluation of operating procedures and maintenance needs will be necessary.

Additional coordination with ACFCD, EBDA and others will also be needed to develop more specific plans for operations and management of specific elements of the Master Plan.

Line of Protection

In addition to the design requirements to meet FEMA standards above, the flood protection levee and related stormwater drainage system needs have an operations and maintenance plan, which must include:

- Flood warning system, including triggers for emergency operation and proof of adequate time between triggers and completed operation of all closure structures and mechanized drainage elements
- Operational plan including specific names or titles of responsible individuals
- Periodic operation and inspection of closure structures and mechanized drainage systems
- Provision of manual backup for the activation of any automatic systems

In addition, FEMA requires that one or more public agencies be identified as responsible parties for the operations and maintenance plan (it cannot be a private entity).

Tidal Habitat

Sediment sources need to be identified and a plan for monitoring the impacts of sea level rise on wetlands and placement of sediment will need to be developed.

Erosion Control

Erosion should be monitored over time. Ongoing maintenance and repairs will be necessary, and needs will evolve over time dependent on storm events and the rate of sea level rise.

Stormwater Management & Wastewater Treatment

Active stormwater management and wastewater treatment structures, such as pump stations and tide gates on Bockman Channel, Sulphur Creek, and Line A will require funding for ongoing operation. These needs depend upon storage capacity and may be re-evaluated as additional storage opportunities are identified. All elements will require ongoing maintenance and repairs, as necessary.

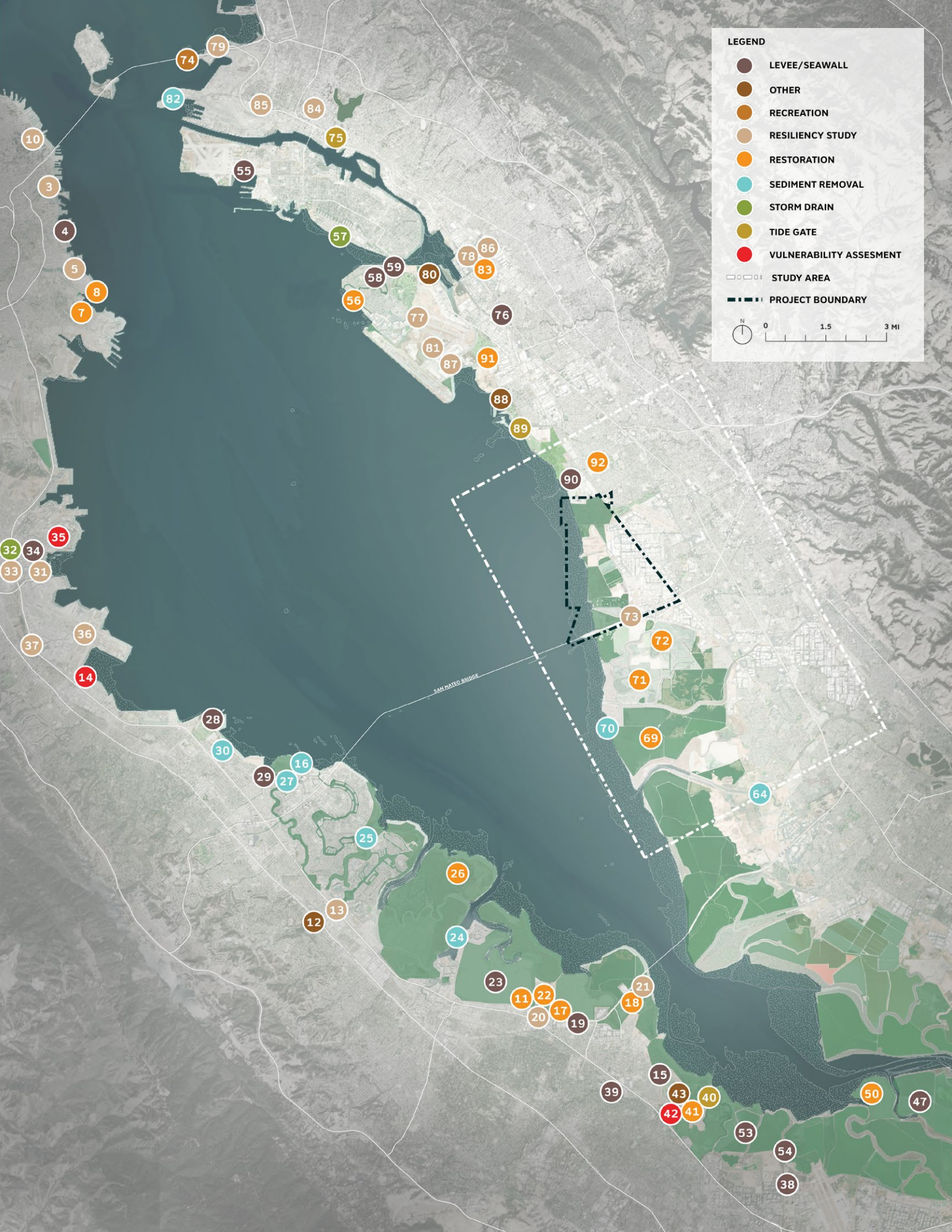
GOVERNANCE CONSIDERATIONS

COORDINATION ACROSS AGENCIES AND ORGANIZATIONS

Implementation of the full range of proposed projects that are part of the preferred alternative will rely on actions of multiple stakeholders. As the lead for the development of the master plan, HASPA and its member agencies are critical stakeholders who are likely to take a lead role in implementing elements of the proposed project that are under their direct control, however other elements will require leadership from other agencies, including Alameda County Flood Control District (ACFCD), East Bay Dischargers Authority (EBDA), CalTrans, and others. In addition, there are numerous additional projects in the study area that present near-term coordination opportunities or necessities (as discussed on page 220). To achieve the long-term vision of the Master Plan and ensure that the actions of individual agencies and private entities are coordinated, additional forms on ongoing governance should be explored. Potential options, which are not mutually exclusive, include:

- Dedicated staff at HASPA member agencies: The Technical Advisory Committee, made up of key staff from City of Hayward, EBRPD, and HARD, has led the development of the master plan. To ensure the ongoing coordination of these agencies to implement the plan, dedicated staff resources will be required. An additional option would be to create a position within one or more member agencies that is dedicated to resilience planning and the implementation of the Master Plan.
- Regional coordination entity: To facilitate implementation of projects beyond the direct control of HASPA member agencies, new forms of regional coordination are needed. There are many existing forums and potential avenues that could form the basis of this coordination within the Bay Area, such as the Bay Adapt platform led by BCDC, or the San Francisco Bay Regional Coastal Hazards Adaptation Resiliency Group (CHARG) effort led by the Bay Area Flood Protection Agencies Association. A new entity specifically focused on the Hayward Region, that includes HASPA as well as other key entities such as ACFCD, may be appropriate. This approach is being taken in other parts of the Bay Area, such as the San Mateo Flood and Sea Level Rise Resilience District, a proposed new agency created to coordinate across jurisdictional lines and leverage state and federal funding sources.

Union Pacific Rail Corridor between Skywest Golf Course and Oro Loma Marsh


LEGEND
LEVEE/SEAWALL
OTHER
RECREATION
RESILIENCY STUDY
RESTORATION
SEDIMENT REMOVAL
STORM DRAIN
TIDE GATE
VULNERABILITY ASSESMENT
STUDY AREA
PROJECT BOUNDARY
N
0
1.5
3 MI
SAN MATEO BRIDGE

REGIONAL CONSIDERATIONS

Advancing a Regional Strategy: There are numerous projects in the Bay Area seeking to provide shoreline protection, habitat restoration, and stormwater management. These are being advanced by a variety of local, state, federal and private actors. Coordinating with these actors towards a regional strategy will ultimately be necessary to build towards addressing these issues in a cohesive and comprehensive way.

Project List:

Levee/Seawall
4. Pier 70 Project
15. San Francisquito Creek - S.F. Bay to Hwy 101
19. New Facebook Campus
23. Cargill Salt Works Redwood City
28. Coyote Point Eastern Promenade
29. San Mateo Levee + Wastewater Plant Upgrade
34. Colma Creek Flood Control Zone Channel Improvement Project
38. Google Campus Expansion
39. San Francisquito Creek - Upstream of Hwy 101
44. SBSPR: Ponds A9-15, A18
47. FWS and SCVWD Levee Maintenance
53. SBSPR: Mountain View Ponds
54. Stevens Creek Levee
55. Alameda Point Development
58. Alameda-Harbor Bay Isle Lagoon Protection
59. Veteran's Court Resiliency Project
66. Laguna Creek Channel Widening and Floodwall
76. San Leandro Creek Levee Project
90. San Lorenzo Creek Levee Project

Other
12. Three Cities Creek and Novartis Improvement
43. Palo Alto Wastewater Treatment Outfall
45. RWF CIP Master Plan Projects
60. Albany Beach
68. Laguna Creek I-880 Crossing Improvement
80. Doolitle Drive Enhancements
88. San Leandro Coastal

Recreation
61. Bay Trail
74. Gateway Park

Resiliency Study
2. Alcatraz Embarkation Study
3. Mission Creek Climate Adaptation Project
5. Islais Creek Climate Adaptation Project
10. BART Sea Level Rise and Flooding Resiliency Study: Embarcadero
13. Belmont Creek Watershed Management Plan
20. Bay Front Canal and Watershed Resilience
21. East Palo Alto and Dumbarton Bridge Resilience Study
31. SFO/San Bruno Creek/Colma Creek Resiliency Study
33. South SF Flood Risk Study
36. Climate Ready SFO
37. BART Sea Level Rise and Flooding Resiliency Study: SFO/Millbrae
73. MTC/BCDC/BART/Caltrans/FHWA Project Hayward Area
77. Oakland/Alameda Resiliency Study
78. MTC/BCDC/BART/Caltrans/FHWA Project Oakland Coliseum Area
79. MTC/BCDC/BART/Caltrans/FHWA Project Bay Bridge Approach
81. Port of Oakland AB 691 SLR Analysis
84. Oakland Preliminary Sea Level Rise Road Map
85. BART Sea Level Rise and Flooding Resiliency Study: West Oakland
86. BART Sea Level Rise and Flooding Resiliency Study: Coliseum
87. BART Sea Level Rise and Flooding Resiliency Study: Oakland Airport

Restoration
1. Horseshoe Cove Restoration
7. India Basin 900 Innes Remediation
8. Heron's Head Living Shoreline
9. Crissy Marsh - Tennesse Hollow
11. Bayfront Canal and Atherton Channel Flood Management Plan
17. SBSPR: Ravenswood
18. SBSPR: SF2
22. Bayfront Canal and Atherton Channel Flood Protection and Restoration Project
26. Bair Island Restoration Project
41. Palo Alto Horizontal Levee
46. SBSPR: A8
48. SCVWD: Hg and Steelhead
49. SBSPR: A16/17
50. SBSPR: A6
51. Calabasas Creek and San Tomas Creek Realignment
56. BFI Shore Protection
62. North Basin Living Shoreline
67. SBSPR: Island Ponds
69. SBSPR: Southern Eden Landing
71. SBSPR: E8A/9/8X
72. SBSPR: E12/13
83. Zone 12 Line M Railroad Crossing
91. San Leandro Treatment Wetland
92. San Lorenzo Creek Restoration and Sediment Replacement

Sediment Removal
16. Baywinds
24. Redwood City Port Deepening Project
25. Foster City Dredging
27. San Mateo Dredging
30. North Shoreview Flood Improvements
64. Alameda Creek Dredging
70. Alameda Sediment Disposal Site
82. USACE Annual Dredging of Oakland Harbor

Storm Drain
32. Colma Creek Connector
57. Storm Drain System Upgrades

Tide Gate
40. Palo Alto Flood Basin Structure Improvement
65. Fremont Blvd. Widening and Tide Gate Structures
75. Lake Merritt Connection
89. Estudillo Canal Tide Gates

Vulnerability Assessment
6. Crissy Field SLR Analysis
14. City of Millbrae Sea Level Rise Adaptation Assessment
35. South SF Shoreline Assessment of Vulnerable Properties and Livelihoods
42. Palo Alto Baylands Vulnerability Assessment
52. Silicon Valley 2.0
63. San Francisco Bay Trail Risk Assessment and Adaptation Prioritization Plan

AFTERWORD

GLOSSARY OF TERMS

100-year flood (1% annual chance flood)

A flood that has a 1% probability of occurring in any given year. The 100-year floodplain is the extent of the area of a flood that has a 1% chance of occurring or being exceeded in any given year.

500-year flood (0.2% annual chance flood)

A flood that has a 0.2% probability of occurring in any given year. The 500-year floodplain is the extent of the area of a flood that has a 0.2% chance of occurring or being exceeded in any given year.

Adaptation

Adjustment in natural or human systems to a new or changing environment that seeks to maximize beneficial opportunities or moderate negative effects.

Base flood elevation (BFE)

The elevation of surface water resulting from a flood that has a 1% annual chance of occurring or being exceeded in any given year. The BFE is shown on the Flood Insurance Rate Map (FIRM).

Climate

The average weather (or more rigorously a statistical description of the average in terms of the mean and variability) over a period of time, usually 30 years. These quantities are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state, including a statistical description, of the climate system.

Climate change

Changes in average weather conditions that persist over multiple decades or longer. Climate change encompasses both increases and decreases in temperature, as well as shifts in precipitation, changing risk of certain types of severe weather events and changes to other variables of the climate system.

Climate change risk

The chance that investments (such as buildings and infrastructure) can be affected by the physical impacts of climate change. Risks are evaluated as a product of the likelihood of occurrence (probability) and the damages that would result if they did occur (consequences).

Climate risk assessment

A climate risk assessment involves a detailed, project-specific analysis that includes a vulnerability and risk assessment, often followed by cost-benefit analysis, to assess and select investments in climate risk mitigation. Risk is assessed as a function of the likelihood and consequence of a given climate change hazard.

Climate vulnerability

The degree to which systems and populations are at risk and unable to cope with adverse impacts. It is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity.

Design life

The life expectancy of an asset or product as determined during design. As opposed to useful life (see below).

Extreme event

Unexpected, unusual, or unpredictable weather or flooding compared to historical or future projected distribution. Extreme events include, for example, heat waves, cold waves, heavy rains, periods of drought and flooding and severe storms.

Freeboard

An additional amount of height above the base flood elevation used as a factor of safety (e.g., 2 feet above the base flood) in determining the level at which a structure's lowest floor must be elevated or floodproofed to be in accordance with state or community floodplain management regulations.

Green infrastructure

An array of practices that use or mimic natural systems to manage urban stormwater runoff. Water is either directed to engineered systems for infiltration or detained for longer periods before it enters the combined sewer system.

Resiliency

The ability to bounce back after change or adversity. The capability of preparing for, responding to and recovering from difficult conditions.

Storm surge

The water height during storms such as hurricanes that is above the normal level expected at that time and place based on the tides alone.

Tidal inundation

Flooding which occurs at high tides due to climate-related sea level rise, land subsidence and/or the loss of natural barriers.

Useful life

The period over which an asset or component is expected to be available for use by an entity. This depends on regular and adequate maintenance. This period of time typically exceeds the design life (see above). The combined effect of operational importance and useful life is practical in determining the investment in improving resilience.

Weather

The state of the atmosphere at a given time with regard to temperature, cloudiness, precipitation, wind and other meteorological conditions.

ABBREVIATIONS:

ABAG: Association of Bay Area Governments

ACFCWCD: Alameda County Flood Control & Water Conservation District

ACMAD: Alameda County Mosquito Abatement District

ACWD: Alameda County Water District

BCDC: San Francisco Bay Conservation and Development Commission

BRRIT: San Francisco Bay Restoration Regulatory Integration Team

Cal Trans: California Department of Transportation

Calpine: Russell City Energy Center

CDFW: California Department of Fish and Wildlife

CEQA: California Environmental Quality Act

COH: City of Hayward

CPUC: California Public Utilities Commission

EBDA: East Bay Dischargers Authority

EBRPD: East Bay Regional Park District

EDMUD: East Bay Municipal Utility District

FEMA: Federal Emergency Management Agency

HARD: Hayward Area Recreation and Park District

HASPA: Hayward Area Shoreline Planning Agency

MTC: Metropolitan Transportation Commission

NMFS: NOAA National Marine Fisheries Service

SCC: California State Coastal Conservancy

SLCP: San Lorenzo Community Park

SPUR: San Francisco Bay Area Planning and Urban Research Association

USACE: United States Army Corps of Engineers

USFWS: U.S. Fish and Wildlife Service

WQCB: SF Regional Water Quality Control Board


HAYWARD AREA SHORELINE PLANNING AGENCY
HAYWARD • CALIFORNIA