# SCAPE LANDSCAPE ARCHITECTURE DPC

# HAYWARD REGIONAL SHORELINE MASTER PLAN HASPA BOARD MEETING

# JULY 09, 2020

## AGENDA

- Project Schedule
- Summary of Design Alternatives
- Comments Received Summary
- Draft Preferred Alternative
- Next Steps

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# **PROJECT SCHEDULE**





# SUMMARY OF DESIGN ALTERNATIVES



## **MASTER PLAN ASSUMPTIONS Overarching**

- The plan aims to preserve and enhance the ecological features of the Hayward 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 aims to reduce risk to the urban fabric (streets, buildings), economy, land use, and critical built infrastructure in and adjacent to the study area. These assets are **assumed to remain in place** for 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 building scale adaptation, managed retreat, and land elevation, will be articulated in the final plan, and would likely be required to adapt to a higher SLR scenario long-term.
- The intent is to reduce risk to critical assets from daily tidal inundation and future **100-year storm surge** from **2'- 4' of SLR** on top of the current mean higher high tide.

## STAKEHOLDER FEEDBACK Compiled Assumptions

REMAIN IN PLACEMAINTAIN CRITICAL USESADAPT IN PLACE (NATURAL ASSET)ADAPT IN PLACE (BUILT ASSET)ADAPT / RELOCATE (NATURAL ASSET)

//////. ADAPT / RELOCATE (BUILT ASSET)



## ALT 1: CLOSER TO THE BAY

- Prioritizes active management and protects the most infrastructure
- Detrimental to tidal marsh habitat and creates the least amount of new tidal habitat
- Presents serious permitting challenges.
  However, this alternative may be cheaper and require less maintenance over time



## **ALT 2: DOWN THE MIDDLE**

- Balances shoreline protection and ecosystem enhancement. Maintains less diversity of habitats with SLR than #1
- Maintains more tidal marsh habitat than #1
- Still presents permitting challenges, but less than alt. 1



## **ALT 3: FURTHER INLAND**

- Prioritizes adaptive management and a layered system of shoreline enhancement.
- Maintains the most tidal marsh habitat
- Presents the least permitting challenges, but will require the most management of tidal habitat
- Potentially harder to fund because does not protect as much infrastructure
- Likely hardest to certify for FEMA accreditation because of reliance on stormwater pumping



## **DESIGN ALTERNATIVES SUMMARY**

#### **No Action**



#### **1. Closer to the Bay**

### 2. Down the Middle



#### 4' SLR + 100 YEAR STORM

COST ITEM	ALT 1	ALT 2
SUBTOTAL	\$436,310,000	\$541,149,000
DESIGN (10%)	\$43,631,000	\$54,115,000
MOBILIZATION (7%)	\$30,542,000	\$37,880,000
TOTAL	\$510,482,000	\$633,145,000
CONTINGENCY (50%)	\$255,241,000	\$316,572,000
TOTAL (WITH CONTINGENCY)	\$765,723,000	\$949,717,000

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## **3. Further Inland**



#### ALT 3 \$596,150,000 \$59,615,000

\$41,730,000

#### \$697,495,000

#### \$348,748,000

#### \$1,046,243,000

# **COMMENTS RECEIVED** SUMMARY



# **STAKEHOLDER COMMENTS**

## **EBRPD** (East Bay Regional Park District)

- Strong emphasis on marsh nourishment and protection
- Highlight the utilization of nature-based solutions in the Preferred Alternative

## **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
- San Lorenzo Community Center 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. 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

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# **STAKEHOLDER COMMENTS**

### **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 be permitted- preference for hybrid between Alt 2 and Alt 3
- Design for flexibility over time- increase levee elevation over time, be adaptable in the future



# **STAKEHOLDER COMMENTS**

### **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

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# **PUBLIC COMMENTS SUMMARY**

### **ECOSYSTEMS**

- Strong connection to the Shoreline and its natural features
- Maintain and restore natural ecosystems to the greatest extent possible
- Preserve marsh habitat, wildlife, and diversity
- Support for nature-based strategies

#### **RECREATION AND EDUCATION**

- Continued access to and preservation of recreational resources- trails, biking paths
- Continued educational programming Interpretive Center, education about habitats, wildlife, and climate change

### **BUILT ASSETS AND INFRASTRUCTURE**

- Infrastructure adaptation and preservation of built assets
- Mitigate future impacts of climate change now
- Future need to retreat vulnerable built assets with SLR



# CONSOLIDATED COMMENTS & INITIAL SKETCHES

## **BROKEN UP INTO 3 REACHES**



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## **NORTHERN REACH**



**Protecting Oro Loma WWTP may open** up more funding opportunities Eastern half of Oro Loma is higher in elevation - maintain more high marsh with SLR?

FEMA levee through the middle of Oro Loma Marsh would be the hardest to permit

Underground Storage at Skywest Golf Course is not worth the cost

Horizontal levee along the rail corridor aligns with recycled water pipeline

#### **1.** Closer to the Bay







# **NORTHERN REACH- EVALUATION MATRIX**

	LINE OF PROTECTION	TIDAL HABITAT	EROSION CONTROL	STORMWATER MANAGEMENT	WASTEWATER TREATMENT	BAY TRAIL	RECREATIONAL ASSETS
GOAL	Built Infrastructure protected by the LOP	Resilience and diversity of habitat	Robustness of erosion protection strategy	Amount of stormwater storage space	Adaptability in the future	Proximity to Bay's edge and diversity of experiences	Enhance Educational Opportunities
ALT #1	Protects the most amount of shoreline infrastructure assets- Oro Loma WWTP and sludge ponds, PG&E lines.	Negative impacts to existing tidal marsh. Tidal marsh converted to muted tidal habitat, however, has limited lifespan with greater rates of SLR. Remaining tidal habitat likely to require active management/ sediment nourishment over time.	Same across all 3	Potential to use the back half of Oro Loma Marsh for detention from Bockman Channel and Sulphur Creek.	Horizontal levee for Oro Loma WWTP is further away from the recycled water pipeline.	Closest to the Bay's edge. Traverses tidal and muted tidal habitats.	San Lorenzo Community Center park is protected in place.Tide gate might be required at inlet.
ALT #2	Protects fewer infrastructure assets than #1 but protects a majority of the infrastructure assets along the shore. PG&E lines are not protected. Does not protect Oro Loma WWTP or sludge ponds.	Maintains existing location of tidal habitat. Tidal habitat likely to require active management/sediment nourishment over time.	Same across all 3	No stormwater storage space	Horizontal levee for Oro Loma WWTP is adjacent to the recycled water pipeline.	Pulls the furthest back. Requires levee raising to connect to existing alignment by Oro Loma WWTP.	San Community Center park is protected in place. Tide gate might required at inlet.
ALT #3	Protects fewer infrastructure assets than #1 and #2. PG&E lines are not protected. Does not protect Oro Loma WWTP or sludge ponds.	Maintains existing location of tidal habitat. Tidal habitat likely to require active management/sediment nourishment over time.	Same across all 3	No stormwater storage space	Horizontal levee for Oro Loma WWTP is adjacent to the recycled water pipeline.	Pulls the furthest back. Requires levee raising to connect to existing alignment by Oro Loma WWTP.	San Community Center park is protected in place. Tide gate might required at inlet.

- ALT 1: More shoreline infrastructure assets are protected and the Bay Trail is closest to blue water. However, this is detrimental to existing tidal marsh habitat and presents permitting challenges. Least amount of fill in existing marsh but greatest impacts to existing marshes due to hydrology changes.
- ALT 2: Less shoreline infrastructure assets are protected and the Bay Trail is further from blue water. Tidal marsh is maintained and will require more management.
- ALT 3: The least amount of shoreline infrastructure assets are protected and the Bay Trail is furthest from blue water. Tidal marsh is maintained and will require more management.



## **INITIAL SKETCHES** NORTHERN REACH



**SKETCH B** 



**SKETCH C** 



LINE OF PROTECTION (FEMA) EROSION PROTECTION / SUBSURFACE TIDAL MARSH / CUTOFF MUTED MARSH SALT POND INTERM LEVEES FRESH TREATMENT MARSH

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## **SKETCH C1- PREFERRED**



- Sketch Ca provides additional stormwater detention for Sulphur Creek
   Sketch D1 may be easier to permit
   D1 does not provide stormwater
- Sketch Ca may be easier to fund with protection of Oro Loma WWTP
- Could provide \$6-7M in cost savings, and \$20-30K in annual O&M savings

#### **SKETCH D**



## SKETCH D1- ALTERNATE

 Sketch D1 may be easier to permit
 D1 does not provide stormwater storage capacity and might be more expensive to implement and maintain SCAPE

## **SOUTHERN REACH**



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#### **SCAPE**

# **SOUTHERN REACH- EVALUATION MATRIX**

	LINE OF PROTECTION	TIDAL HABITAT	EROSION CONTROL	STORMWATER MANAGEMENT	WASTEWATER TREATMENT	BAY TRAIL	RECREATIONAL ASSETS
GOAL	Built Infrastructure protected by the LOP	Resilience and diversity of habitat	Robustness of erosion protection strategy	Amount of stormwater storage space	Adaptability in the future	Proximity to Bay's edge and diversity of experiences	Enhance Educational Opportunities
ALT #1	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.	Tidal marsh converted to muted tidal habitat, however, has limited lifespan with greater rates of SLR. Maintains the most muted tidal habitat.	Same across all 3	Stormwater storage space isn't directly adjacent to flood control channels. Potential to use muted marsh for detention.	Maintains full capacity of the Wastewater Wet Weather Storage ponds. No horizontal levee for Hayward WWTP	Closest to the Bay's edge	Interpretive Center is protected, but would likely require structure upgrades in this time frame.
ALT #2	Protects fewer infrastructure assets than #1 but protects a majority of the infrastructure assets along the shore. Wastewater Wet Weather Storage Ponds are protected. Longer alignment through marsh / shorter alignment along SR-92.	Maintains a larger extent of tidal habitat than #1. Tidal habitat likely to require active management/sediment nourishment over time. Maintains some muted tidal habitat, however has limited lifespan with greater rates of SLR.	Same across all 3	Greatest stormwater storage capacity, but it isn't directly adjacent to flood control channels. Potential to use muted marsh for detention.	Ecotone levee decreases capacity of the Wastewater Wet Weather Storage ponds. No horizontal levee for Hayward WWTP	Aligns through the marsh on structure to maintain a diversity of experiences- increases costs but removes the trail from wastewater uses.	Interpretive Center is retrofitted in place yet still vulnerable to wave action. Access is a concern and would require road raising.
ALT #3	Protects fewer infrastructure assets than #1 and #2. Wastewater Wet Weather Storage Ponds not protected. Longest alignment adjacent to marsh / shortest alignment along SR-92.	Creates the largest extent of tidal habitat. Tidal habitat likely to require active management/ sediment nourishment over time. Maintains no muted tidal habitat.	Same across all 3	No stormwater storage space	Treatment wetland treats flow that is not treated by the nutrient removal plant upgrades. Broad support for Horizontal levee & Freshwater Treatment Marsh for Hayward WWTP effluent discharge	Pulls the furthest back, however it may still be close to blue water with SLR	N/A

• ALI 1: Most shoreline infrastructure assets are protected and the Bay Irail is closest to blue water. Most muted tidal habitat.

- ALT 2: Less shoreline infrastructure assets are protected and the Bay Trail is further from blue water. Some muted tidal habitat remains.
- ALT 3: The least amount of shoreline infrastructure assets are protected and the Bay Trail is furthest from blue water. Largest extent of tidal marsh habitat, which will require the most management. Increased burden on pump stations increases capital and O&M costs.

## **INITIAL SKETCHES** SOUTHERN REACH

#### **SKETCH A**



#### SKETCH B



#### **SKETCH C**





- The City of Hayward prefers a LOP to the west of the Wet Weather Storage Ponds
- In Sketch D and Da, the LOP further inland with levee raising provides greater flexibility over time (ability to adaptively manage natural assets)
- Sketch D would relocate the least tern colony inland of the levee raising
- Sketch Da protects the least tern colony in place





#### **ALT D1- ALTERNATE**



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## **MIDDLE REACH**



Frank's East offers ideal stormwater storage area along Sulphur Creek to reduce burden on the pump station

Fringe marsh may be hard to establish and vulnerable to wave/wind action

Tide gate closer to the Bay would minimize amount of landfill erosion protection/subsurface cutoff

#### **1.** Closer to the Bay





# **Bay Trail + levee fortification- dual benefit for landfill protection**



# **MIDDLE REACH- EVALUATION MATRIX**

	LINE OF PROTECTION	TIDAL HABITAT	EROSION CONTROL	STORMWATER MANAGEMENT	WASTEWATER TREATMENT	
GOAL	Built Infrastructure protected by the LOP	Resilience and diversity of habitat	Robustness of erosion protection strategy	Amount of stormwater storage space	Adaptability in the future	F
ALT #1	LOP protects inland wet weather storage ponds	Some tidal habitat created. Tidal habitat likely to require active management/sediment nourishment over time.	Minimized erosion protection and subsurface cutoff along landfill edges	Greatest storage capacity for Sulphur Creek. Reduces burden on the pump station.	N/A	• ( • [ •
ALT #2	LOP protects inland wet weather storage ponds	Some tidal habitat created. Tidal habitat likely to require active management/sediment nourishment over time.	More erosion protection and subsurface cutoff along landfill edges	Greatest storage capacity for Sulphur Creek. Reduces burden on the pump station.	N/A	ہم م f
ALT #3	LOP is furthest inland and closer to businesses	Most tidal marsh habitat created. Tidal habitat likely to require active management/sediment nourishment over time.	Greatest extent of erosion protection and subsurface cutoff along landfill edges. Greatest extent of gravel beaches with fringe marsh restoration	Minimal stormwater storage space, isn't directly adjacent to flood control channels	N/A	ے ان t

- ALT 1: Most shoreline infrastructure assets are protected and the Bay Trail is closest to blue water. Minimizes amount of revetment.
- ALT 2: Less shoreline infrastructure assets are protected and the Bay Trail is further from blue water.
- ALT 3: The least amount of shoreline infrastructure assets are protected. Most tidal marsh habitat created but no stormwater storage.

BAY TRAIL	RECREATIONAL ASSETS
Proximity to Bay's edge and diversity of experiences	Enhance Educational Opportunities
Closest to the Bay's edge.	N/A
ligns to the east of the landfills- complete disconnect rom blue water.	N/A
Aligns on top of the andfill for expansive iews. Aligns along Bay idal habitat but close o industrial edge.	Interpretive Center is relocated to the landfill where it is protected from flooding. Less visibility than immediate adjacency to SR-92

## **INITIAL SKETCHES** MIDDLE REACH

#### **SKETCH A**



**SKETCH B** 

**SKETCH C** 



- LINE OF PROTECTION (FEMA)
TIDAL MARSH / CVTOFF
MUTED MARSH
SALT POND
TRESH TREATMENT MARSH





- Alt 4 minimizes erosion protection / subsurface cutoff around the landfills
- Alt 4 to be modified with a tide gate closer to the Bay (connecting two high points of landfills)
- Alt 4 pump station would be located further inland

# **COMPILED SKETCHES**

## **NORTHERN REACH**



#### MIDDLE REACH



#### **SOUTHERN REACH**

















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# DRAFT PREFERRED ALTERNATIVE



## **DRAFT PREFERRED ALTERNATIVE ALTERNATE CONFIGURATIONS**

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

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



ORO LOMA

SKYWE

NORTHERN ALTERNATE

SOUTHERN ALTERNATE

GOLF COU

SALT MARSH HARVEST MOUSE PRESERVE

ORO LOMA MARSH

SOLAR

HAYWARD

HADD MADSH

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BOCKMAN

ORO LOMA MARSI

EAST

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OLIVE

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MARS

FRANK'S

WEST

.......

ALAMEDA COUNTY LANDFILL

> WEST WINTON

## DRAFT PREFERRED ALTERNATIVE LINE OF PROTECTION

LOP protects Oro Loma WWTP and sludge ponds in place

LOP to preserve breach into Oro Loma – Marsh from Sulphur Creek

LOP aligns to the west of the Wet Weather Storage Ponds

Levee raising

#### LEGEND

![](_page_30_Figure_7.jpeg)

MT. EDEN CREEK

BUSSELL CIT

ALAMEDA COUNTY

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## **DRAFT PREFERRED ALTERNATIVE TIDAL HABITAT**

Liah	around	in	tha	hack	<b>of</b>	Oro		March	hacomac	mutod
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	3									

Tidal habitat created at Frank's West —

Tidal habitat created at Hayward Marsh	
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

![](_page_31_Picture_6.jpeg)

![](_page_31_Picture_7.jpeg)

ALAMEDA COUNTY LANDFILL

> WEST WINTON

![](_page_32_Figure_0.jpeg)

## **DRAFT PREFERRED ALTERNATIVE STORMWATER MANAGEMENT**

Southeastern corner of Oro Loma Marsh provides stormwater detention for Sulphur Creek	ORO LOMA MARSH
Tide gate located inland of Oro Loma ————————————————————————————————————	FRANK'S REAL TO THE TRANK'S REAL TO THE THE TH
Salt Pond habitat / Stormwater Detention for Sulphur Creek —	and the second sec
	ALAMEDA COUNTY LANDFILL
Salt Pond habitat created	WEST WINTON LANDFILL
Salt Pond habitat / Stormwater Detention for Line F	HARSH HAYWARD MARSH HARD MARS SALT PONDS
HAYWARD SHORELINE MASTER PLAN July 09, 2020	A A A A A A A A A A A A A A A A A A A

![](_page_33_Figure_2.jpeg)

![](_page_33_Figure_3.jpeg)

SKYWEST GOLF COURSE

The second second

**PROJECT AREA** NEW TIDE GATE NEW MUTED MARSH TIDE GATE

NEW PUMP STATION

WATER CHANNEL

MUTED MARSH / STORMWATER RETENTION SALT POND / STORMWATER RETENTION

RIMINIMINIMINIMINI

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ALPINE / RUSSELL CITY

WWTP

SOLAR FIELDS

#1#1#1#1

## **DRAFT PREFERRED ALTERNATIVE** WASTEWATER TREATMENT

Horizontal levee for Oro Loma WWTP effluent discharge

**Freshwater treatment marsh for Hayward WWTP** nutrient removal and wet weather storage

Horizontal levee for Hayward WWTP effluent discharge

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![](_page_34_Picture_5.jpeg)

## DRAFT PREFERRED ALTERNATIVE BAY TRAIL

Bay Trail aligns away from the rail corridor

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

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

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![](_page_35_Figure_5.jpeg)

ALAMEDA COUNTY

LANDFILL

WINTON

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## **DRAFT PREFERRED ALTERNATIVE RECREATIONAL ASSETS**

San Lorenzo Community Center Park is protected from sea level rise, but might be vulnerable to groundwater inundation

**Raised levee protects Interpretive Center in place short-term Interpretive Center can be raised in place long-term** Maintains link to the Bay Trail HAYWARD SHORELINE MASTER PLAN

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![](_page_36_Figure_4.jpeg)

ALAMEDA COUNT

## **NEXT STEPS**

- Phasing Plan and identification of Implementable **Projects**
- Recommendations for funding, policy, permitting, feasibility and constructability, operation and maintenance, governance
- Draft Master Plan #1 Submission to TAC on 07/14
  - Will include Preferred Alternative cost estimate
- Draft Master Plan #2 Submission for board and agency **review on 08/25**

![](_page_37_Picture_7.jpeg)

**SCAPE** 

# THANK YOU!

# **SEA LEVEL RISE MAPS**

![](_page_39_Picture_1.jpeg)

## 2' SLR & GROUNDWATER EMERGENCE

Northern industrial neighborhood are impacted by groundwater before SLR inundation

SLR impacts tidally influenced areas & Oliver Salt Ponds

SLR impacts recreational resources include Bay – Trail, Interpretive Center, and access points

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![](_page_40_Picture_5.jpeg)

## 2' SLR + 100-YEAR STORM

Areas of groundwater emergence roughly correlate with areas of 100-year flood risk

![](_page_41_Picture_2.jpeg)

![](_page_41_Picture_3.jpeg)

#### HAYWARD SHORELINE MASTER PLAN **INUNDATION MAP: COASTAL INUNDATION DEPTH AT 100-YEAR STORM** SURGE CONDITIONS AND GROUNDWATER EMERGENCE EXTENT AT 2 FEET SEA I EVEL RISE LEGEND DEPTH OF FLOODING (FEET GROUNDWATER NO DATA FOR EMERGENCE GROUNDWATER 8-10

![](_page_41_Figure_5.jpeg)

![](_page_41_Figure_6.jpeg)

CITY OF HAYWARD

0.5 MI

MT. EDEN CREEK

APE

SOUTH BAY SALT PONDS

# 4' SLR & GROUNDWATER EMERGENCE

SLR directly impacts critical infrastructure (San Mateo, Oro Loma, railroad)

Many areas impacted by groundwater with 2' of SLR are now impacted by SLR

Most natural features are impacted by SLR -

Major SLR impacts to recreational resources include Bay Trail, Interpretive Center, and access points

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![](_page_42_Picture_6.jpeg)

## 4' SLR + 100-YEAR STORM

Areas of groundwater emergence roughly correlate with areas of 100-year flood risk

![](_page_43_Picture_2.jpeg)

#### HAYWARD SHORELINE MASTER PLAN **INUNDATION MAP: COASTAL INUNDATION DEPTH AT 100-YEAR STORM** SURGE CONDITIONS AND GROUNDWATER **EMERGENCE EXTENT AT 4 FEET SEA LEVEL RISE** LEGEND DEPTH OF FLOODING (FEET) GROUNDWATER NO DATA FOR EMERGENCE GROUNDWATER 0-2 8-10

![](_page_43_Figure_5.jpeg)

EXTENT

CITY OF HAYWARD

0.5 MI

SOUTH BAY SALT PONDS

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# 7' SLR & GROUNDWATER EMERGENCE

Almost all critical infrastructure is impacted by SLR

Major SLR and groundwater impacts to all industrial neighborhoods

All stormwater and flood control channels experience significant backups

All natural and recreational features - experience severe SLR inundation

![](_page_44_Picture_6.jpeg)

![](_page_44_Picture_7.jpeg)

## 7' SLR + 100-YEAR STORM

Areas of groundwater emergence roughly correlate with areas of 100-year flood risk

![](_page_45_Picture_3.jpeg)

#### 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) GROUNDWATER NO DATA FOR EMERGENCE GROUNDWATER 0-2 8-10 EXTENT

![](_page_45_Figure_5.jpeg)

CITY OF HAYWARD

0.5 M

CAPE

SOUTH BAY SALT POND