DESIGN ALTERNATIVES

#1: CLOSER TO THE BAY

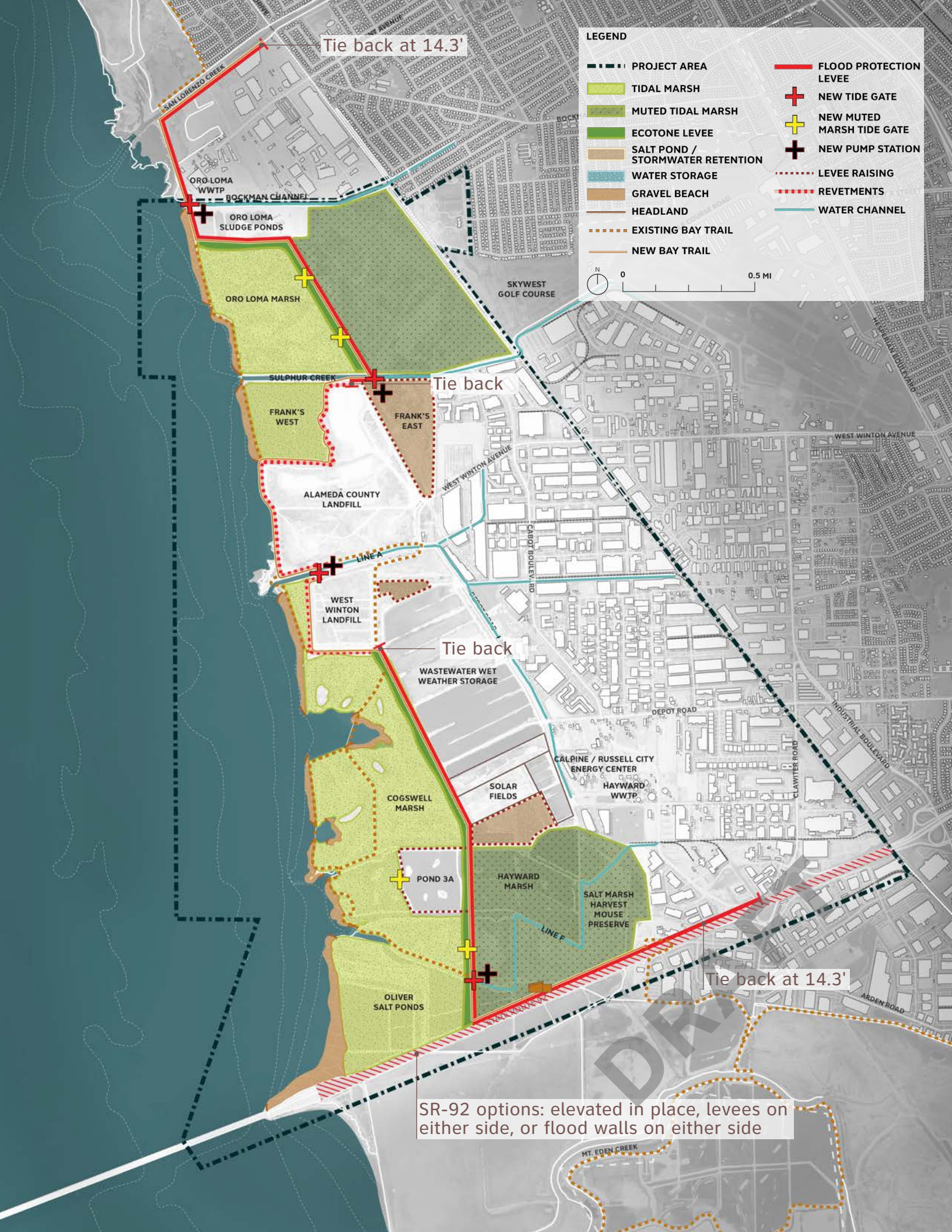
#1: CLOSER TO THE BAY

This alternative looks at an alignment for the line of protection that reduces risk for a larger portion of the shoreline with a more conservative line of protection aligned closer to the Bay.

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 WWTP 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 oxidation 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.

This line of protection places a larger extent of marsh inland of the line of protection where it is less vulnerable to inundation with sea level rise.

The assumed planning elevation for the line of protection is 14.3’ NAVD88. The final design flood elevation will require further study and cost analysis.


LEGEND
PROJECT AREA
TIDAL MARSH
MUTED TIDAL MARSH
ECOTONE LEVEE
SALT POND / STORMWATER RETENTION
WATER STORAGE
GRAVEL BEACH
HEADLAND
EXISTING BAY TRAIL
NEW BAY TRAIL
FLOOD PROTECTION LEVEE
NEW TIDE GATE
NEW MUTED MARSH TIDE GATE
NEW PUMP STATION
LEVEE RAISING
REVETMENTS
WATER CHANNEL
N
0
0.5 MI
Tie back at 14.3'
SAN LORENZO CREEK
ORO LOMA WWTP
BOCKMAN CHANNEL
ORO LOMA SLUDGE PONDS
ORO LOMA MARSH
SKYWEST GOLF COURSE
SULPHUR CREEK
Tie back
FRANK'S WEST
FRANK'S EAST
ALAMEDA COUNTY LANDFILL
WEST WINTON AVENUE
LINE A
WEST WINTON LANDFILL
Tie back
WASTEWATER WET WEATHER STORAGE
DEPOT ROAD
CALPINE / RUSSELL CITY ENERGY CENTER
HAYWARD WWTP
SOLAR FIELDS
COGSWELL MARSH
POND 3A
HAYWARD MARSH
SALT MARSH HARVEST MOUSE PRESERVE
LINE F
OLIVER SALT PONDS
Tie back at 14.3'
ARDEN ROAD
SR-92 options: elevated in place, levees on either side, or flood walls on either side
MT. EDEN CREEK
HESPERIAN BOULEVARD
INDUSTRIAL BOULEVARD
CLAWITER ROAD
CABOT BOULEVARD
DRAFT

#1: CLOSER TO THE BAY

LINE OF PROTECTION

The line of protection aligns closer to the Bay's edge to reduce risk to a greater extent of inland assets and reduce the linear feet of levee and associated construction costs. The assumed planning elevation for the line of protection is 14.3' NAVD88. The final elevation will require further study and cost analysis- this elevation will be used for planning purposes only.

Line of protection at the Bay's edge

PROS

- Shortest distance
- Cheapest

CONS

- Power Lines on top of a levee
- Cuts Oro Loma Marsh in half

Ecotone Levee

PROS

- Shortest distance
- Cheapest cost
- Protect Hayward Shoreline Interpretive Center

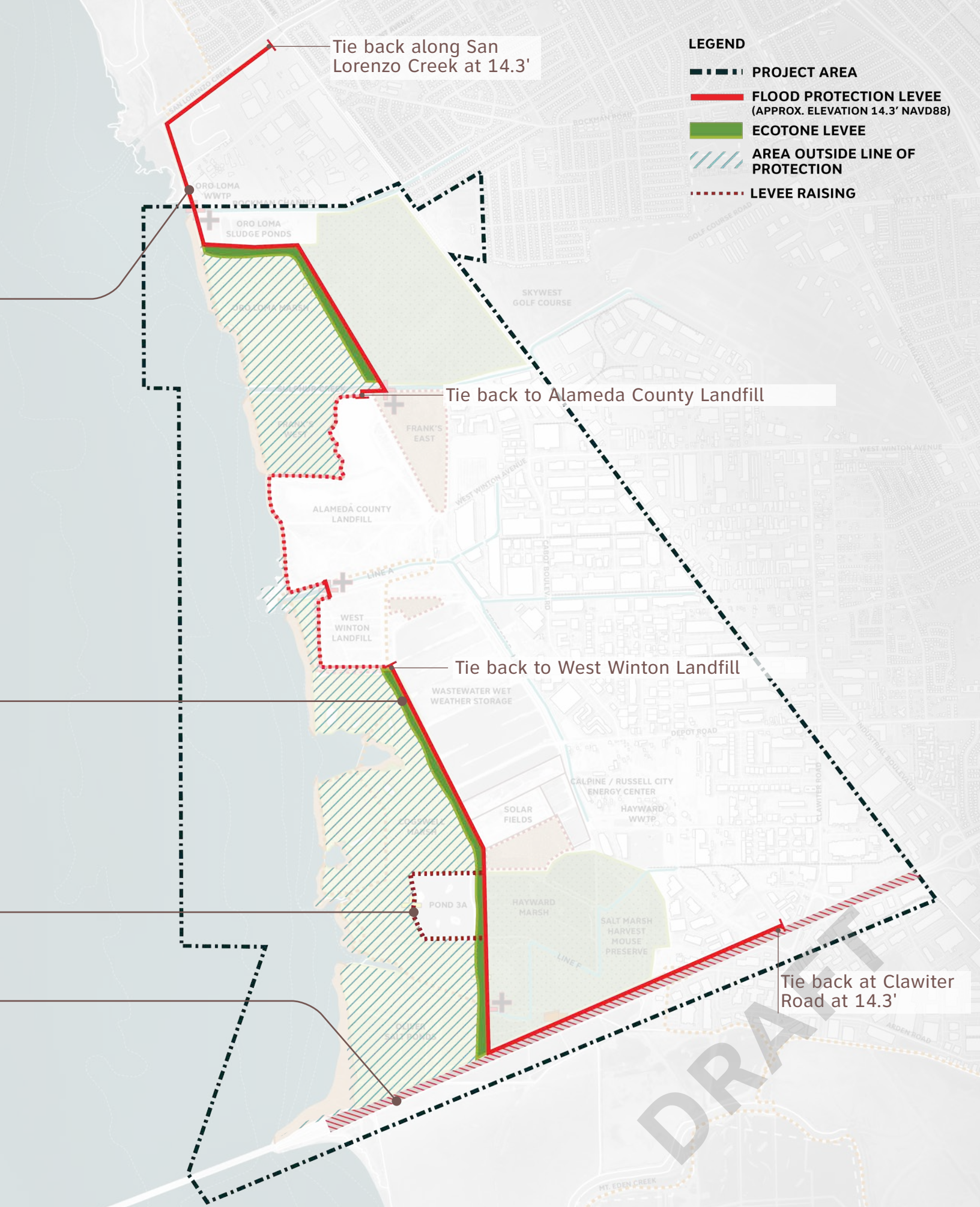
CONS

- Cuts existing tidal habitat in half

Levee Raising

SR-92 Options

- Elevate in place
- Levees on either side
- Flood walls on either side


Tie back along San Lorenzo Creek at 14.3'
LEGEND
PROJECT AREA
FLOOD PROTECTION LEVEE
(APPROX. ELEVATION 14.3' NAVD88)
ECOTONE LEVEE
AREA OUTSIDE LINE OF PROTECTION
LEVEE RAISING
Tie back to Alameda County Landfill
Tie back to West Winton Landfill
Tie back at Clawiter Road at 14.3'
ORO LOMA WWTP
ORO LOMA SLUDGE PONDS
SKYWEST GOLF COURSE
FRANK'S EAST
ALAMEDA COUNTY LANDFILL
WEST WINTON LANDFILL
WASTEWATER WET WEATHER STORAGE
CALPINE / RUSSELL CITY ENERGY CENTER
SOLAR FIELDS
HAYWARD WWTP
POND 3A
HAYWARD MARSH
SALT MARSH HARVEST MOUSE PRESERVE
WEST WINTON AVENUE
DEPOT ROAD
INDUSTRIAL BOULEVARD
CLAWITER ROAD
ARDEN ROAD
MT. EDEN CREEK
DRAFT

#1: CLOSER TO THE BAY

TIDAL HABITAT

This tidal habitat configuration favors active management of ecosystems through the muting of marshes inland of the line of protection so they are less vulnerable to inundation. A band of tidal habitats exists outboard of the line of protection. Although, this option presents important permitting and regulatory challenges and would impact exiting marsh habitat, it might help maintain high marsh habitat behind the line of protection. Habitat that could potentially be lost and transition to mudflat with a rapid and high sea level rise scenario.

Half of Oro Loma Marsh becomes muted

PROS

- High marsh habitat, behind the line of protection, is maintained with SLR and at less rick of inundation

CONS

- Existing marsh becomes muted
- Impacts to existing habitat
- Regulatory issue

Ecotone levee aligns within Cogswell Marsh

PROS

- Some high marsh habitat is maintained with SLR

CONS

- Existing marsh becomes muted
- Impacts to existing habitat
- Regulatory issue

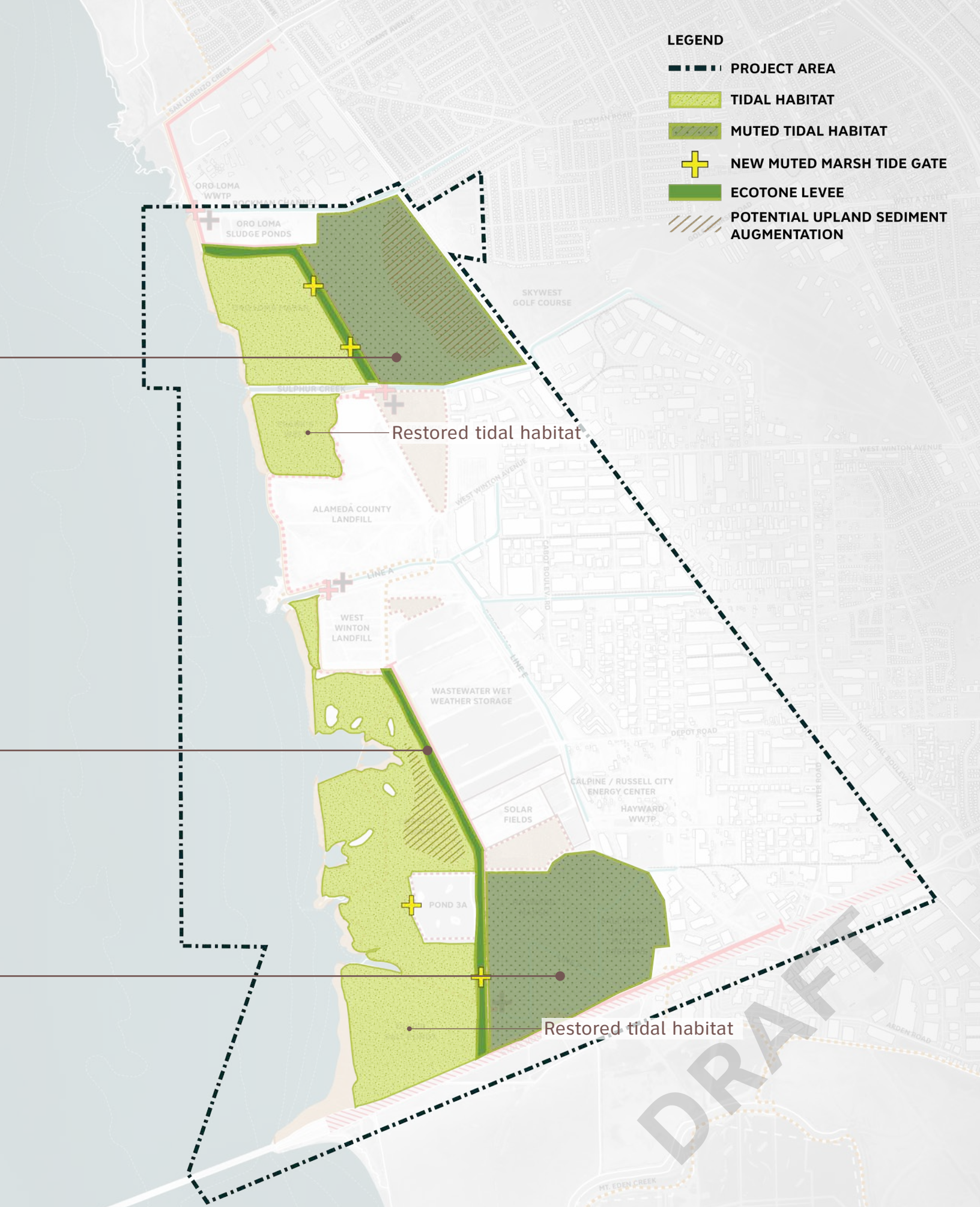
Expanded Salt Marsh Harvest Mouse Preserve

PROS

- Maximize muted tidal habitat that could be maintained with SLR

CONS

- HARD Marsh becomes muted-regulatory issue
- Impacts to existing tidal habitat


LEGEND
PROJECT AREA
TIDAL HABITAT
MUTED TIDAL HABITAT
NEW MUTED MARSH TIDE GATE
ECOTONE LEVEE
POTENTIAL UPLAND SEDIMENT AUGMENTATION
Restored tidal habitat
Restored tidal habitat
ORO LOMA WWTP
ORO LOMA SLUDGE PONDS
SKYWEST GOLF COURSE
SULPHUR CREEK
ALAMEDA COUNTY LANDFILL
WEST WINTON LANDFILL
WASTEWATER WET WEATHER STORAGE
SOLAR FIELDS
CALPINE / RUSSELL CITY ENERGY CENTER
HAYWARD WWTP
POND 3A
DRAFT

#1: CLOSER TO THE BAY

EROSION CONTROL

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. Revetments along the two landfills help to reduce the risk of erosion and seepage.

Gravel beaches in front of all marshes

PROS

- Gravel beaches provide habitat

CONS

- Beaches in front of all marshes requires a numerous groins to preserve existing breaches
- Cost
- Maintenance / replenishment

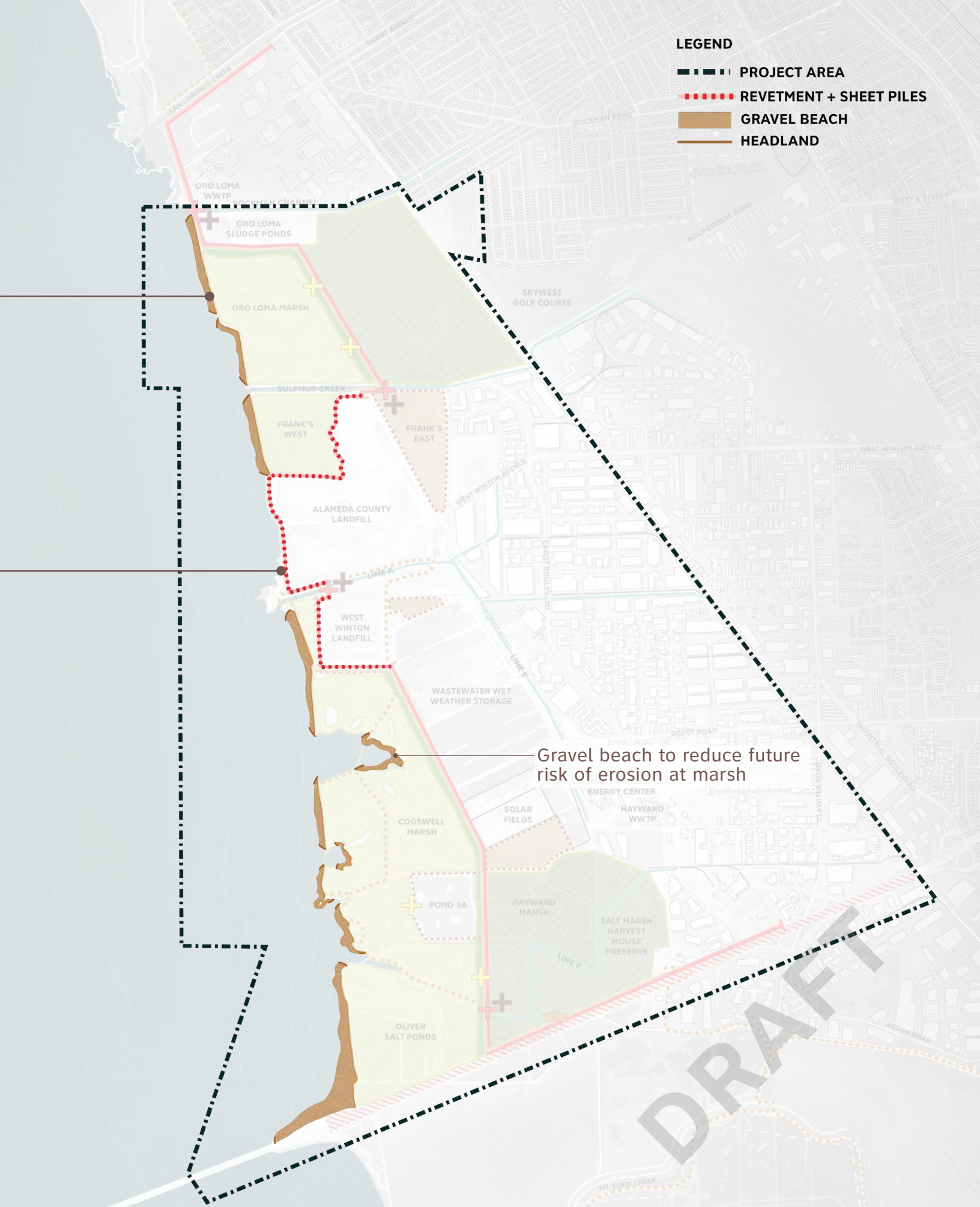
Revetment and sheet piles along landfill edge with the Bay Trail

PROS

- Increased erosion protection to the landfill
- Possibility to incorporate rocky habitat to enhance ecological value

CONS

- Cost of sheet pile is a concern for the City


LEGEND
PROJECT AREA
REVETMENT + SHEET PILES
GRAVEL BEACH
HEADLAND
ORO LOMA WWTP
ORO LOMA SLUDGE PONDS
ORO LOMA MARSH
SKYWEST GOLF COURSE
SULPHUR CREEK
FRANK'S WEST
FRANK'S EAST
ALAMEDA COUNTY LANDFILL
WEST WINTON LANDFILL
WASTEWATER WET WEATHER STORAGE
Gravel beach to reduce future risk of erosion at marsh
SOLAR FIELDS
ENERGY CENTER
HAYWARD WWTP
COGSWELL MARSH
POND 3A
HAYWARD MARSH
SALT MARSH HARVEST MOUSE PRESERVE
OLIVER SALT PONDS
WEST WINTON AVENUE
DEPOT ROAD
LINE A
LINE F
DRAFT

#1: CLOSER TO THE BAY

STORMWATER MANAGEMENT

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. Providing storage capacity to temporally hold large volumes of water before it is discharged into the Bay is an important aspect of the Master Plan. As the Plan moves forward, additional studies will be required to assess the volume needed in relation to the hydrology of the area. If gravity flow discharge in not feasible, pumping stations will be required, which can be extremely costly to maintain and operate.

This alternative presents inland detention ponds that collect and hold stormwater before it is discharged to the Bay. This alternative provides the greatest storage capacity.

Dual Salt Pond / Stormwater Detention

PROS

- Provides salt pond habitat
- Large area for stormwater storage
- Along Sulphur Creek, a natural drainage area
- Enhances bird species habitat- the birds seem to prefer fresh water over salt water

CONS

- Stormwater may impact habitat

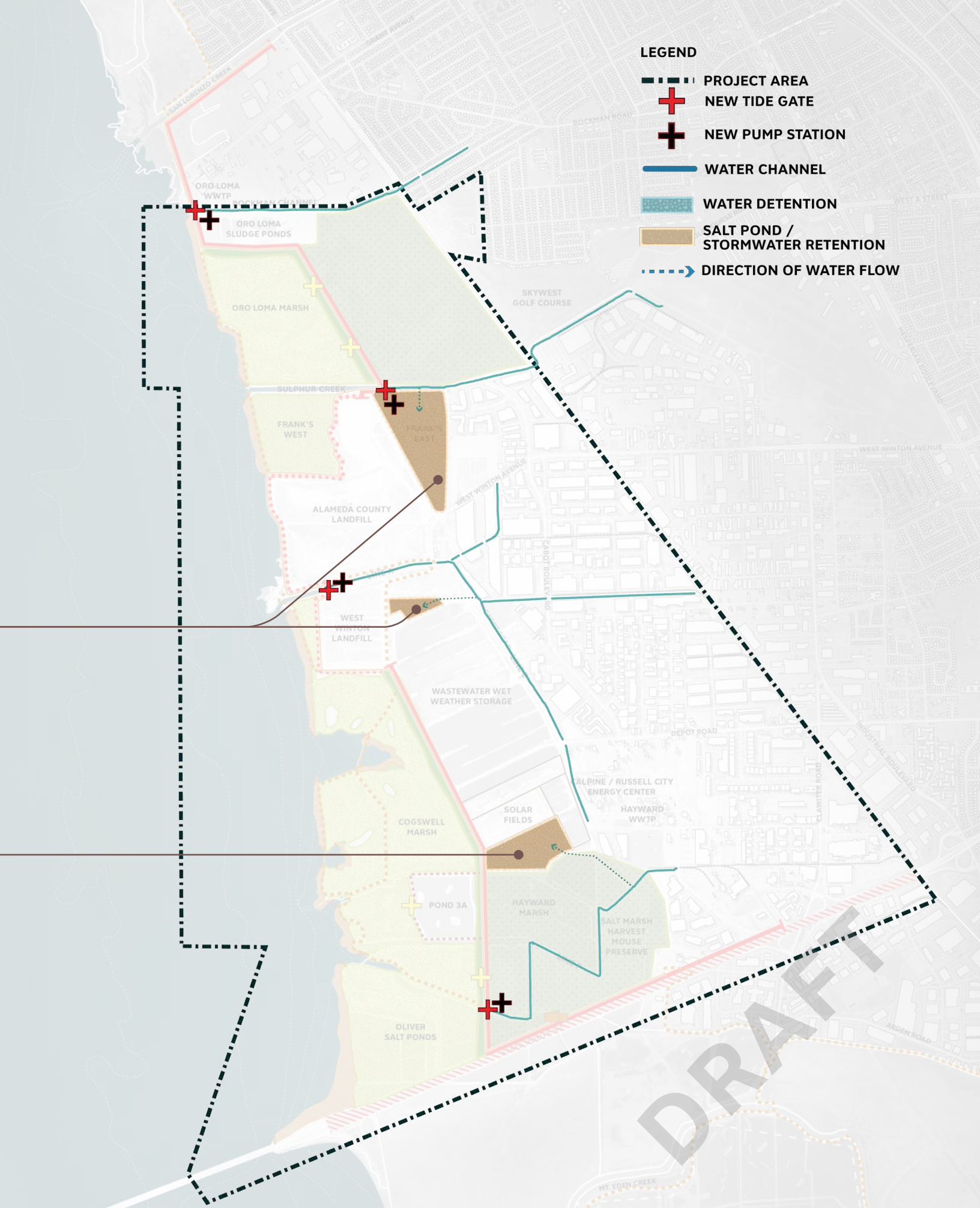
Dual Salt Pond / Stormwater Detention

PROS

- Provides salt pond habitat
- Enhances bird species habitat- the birds seem to prefer fresh water over salt water

CONS

- Not directly adjacent to substantial flow from a flood control channel
- Stormwater may impact habitat


LEGEND
PROJECT AREA
NEW TIDE GATE
NEW PUMP STATION
WATER CHANNEL
WATER DETENTION
SALT POND / STORMWATER RETENTION
DIRECTION OF WATER FLOW
ORO LOMA WWTP
ORO LOMA SLUDGE PONDS
ORO LOMA MARSH
SKYWEST GOLF COURSE
SULPHUR CREEK
FRANK'S WEST
FRANK'S EAST
ALAMEDA COUNTY LANDFILL
WEST WINTON LANDFILL
WASTEWATER WET WEATHER STORAGE
ALPINE / RUSSELL CITY ENERGY CENTER
HAYWARD WWTP
SOLAR FIELDS
COGSWELL MARSH
POND 3A
HAYWARD MARSH
SALT MARSH HARVEST MOUSE PRESERVE
OLIVER SALT PONDS
DRAFT

#1: CLOSER TO THE BAY

WASTEWATER TREATMENT

This Alternative presents the smallest local discharge opportunity. Critical wastewater treatment functions are maintained and enhanced at Oro Loma WWTP with a horizontal levee that outlets effluent to Oro Loma Marsh. All of Hayward WWTP's functions and storage capacity are maintained.

Horizontal Levee

PROS

- Discharge some of Oro Loma WWTP's effluent
- Provides transition slope

CONS

- Potential impacts to current habitat
- Would require filling in part of Oro Loma Marsh
- Mosquito abatement regulatory issues

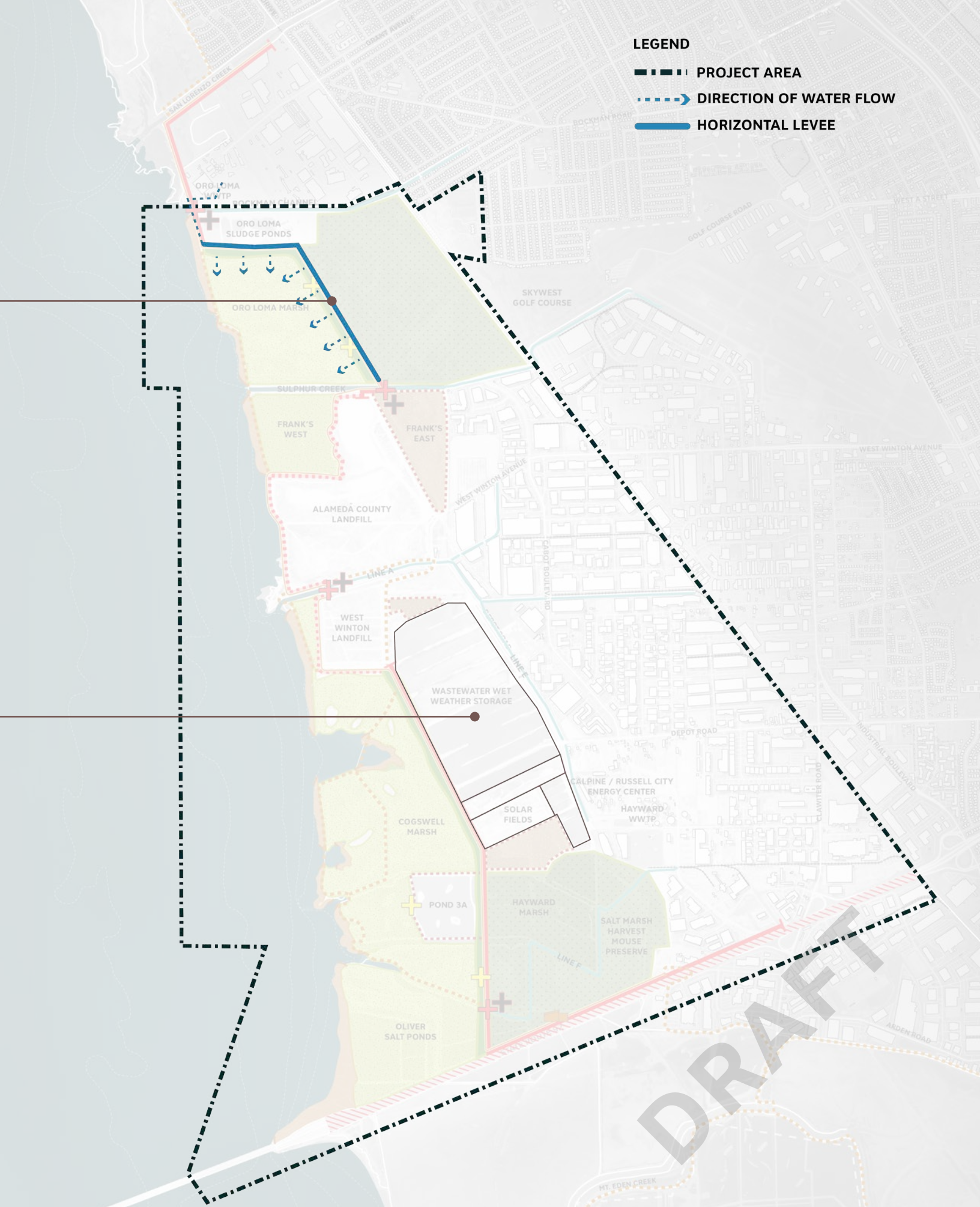
Maintain current use and capacity of Wastewater Wet Weather Storage ponds

PROS

- Maintain wet weather equalization storage capacity
- Maintain biosolids drying / management
- Maintain solar fields

CONS

- Loss of potential space for other uses


LEGEND
PROJECT AREA
DIRECTION OF WATER FLOW
HORIZONTAL LEVEE
ORO LOMA SLUDGE PONDS
ORO LOMA MARSH
SULPHUR CREEK
FRANK'S WEST
FRANK'S EAST
ALAMEDA COUNTY LANDFILL
WEST WINTON LANDFILL
LINE A
LINE E
WASTEWATER WET WEATHER STORAGE
SOLAR FIELDS
COGSWELL MARSH
POND 3A
HAYWARD MARSH
SALT MARSH HARVEST MOUSE PRESERVE
LINE F
OLIVER SALT PONDS
SKYWEST GOLF COURSE
CALPINE / RUSSELL CITY ENERGY CENTER
HAYWARD WWTP
WEST WINTON AVENUE
DEPOT ROAD
GOLF COURSE ROAD
BOCKMAN ROAD
SAN LORENZO CREEK
MT. EDEN CREEK
DRAFT

#1: CLOSER TO THE BAY

BAY TRAIL

With this alternative, the Bay Trail is aligned closer to blue water where possible and connected to new infrastructure improvements. A phased realignment of the trail will maintain its existing alignment and connect to the new alignment until it is inundated.

Bay Trail realigns through the middle of Oro Loma Marsh

PROS

- Closer to the Bay
- Marsh habitat experience

CONS

- Loss of blue water experience

Living revetment education trail

PROS

- Along the Bay's edge
- Raised levee protects landfill
- Educational component

CONS

- Proximity to landfill

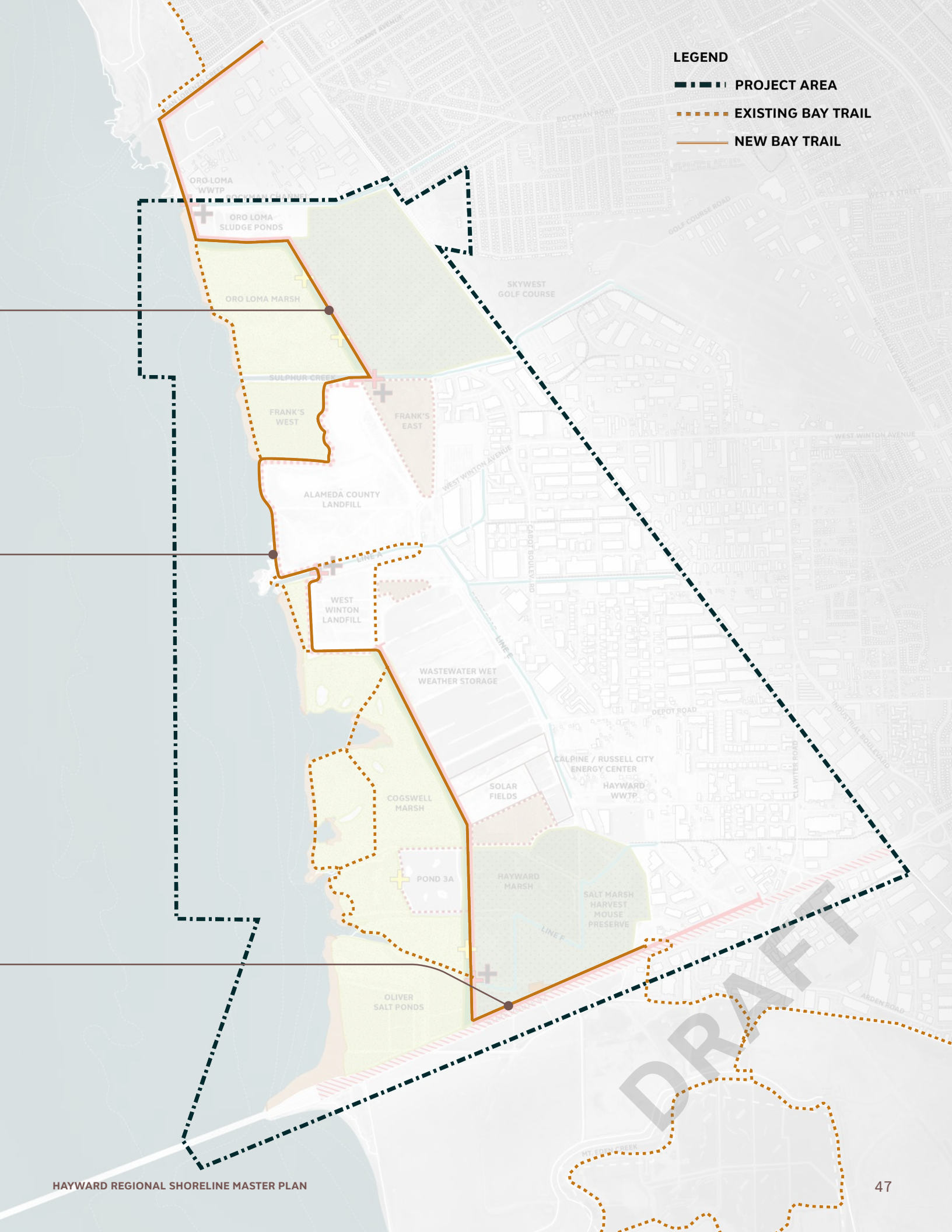
Links to the Interpretive Center

PROS

- Raised along FEMA levee to decrease flood risk

CONS

- Cuts off existing marsh


LEGEND
PROJECT AREA
EXISTING BAY TRAIL
NEW BAY TRAIL
ORO LOMA WWTP
ORO LOMA SLUDGE PONDS
ORO LOMA MARSH
SKYWEST GOLF COURSE
SULPHUR CREEK
FRANK'S WEST
FRANK'S EAST
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WEST WINTON AVENUE
DEPOT ROAD
LINE F
DRAFT

#1: CLOSER TO THE BAY

HAYWARD SHORELINE INTERPRETIVE CENTER

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.

Access road is elevated in place

PROS

- Reduced risk of flooding
- Potential to tie into CalTrans improvements

CONS

- May impact existing marsh habitat

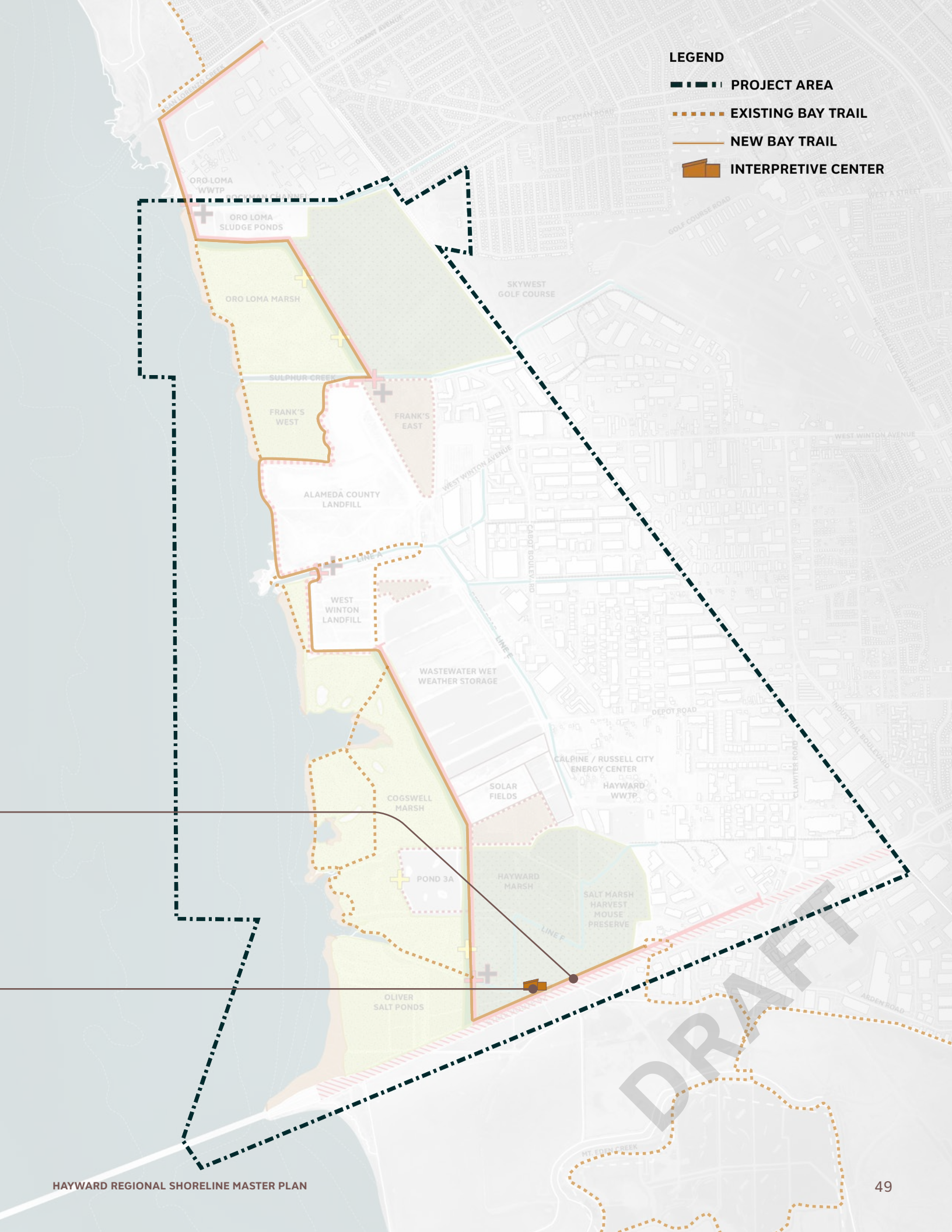
Interpretive Center is protected in place

PROS

- Interpretive Center is protected in place
- Ecotone levee related educational opportunities

CONS

- Direct visual connection to the Bay is lost


LEGEND
PROJECT AREA
EXISTING BAY TRAIL
NEW BAY TRAIL
INTERPRETIVE CENTER
ORO LOMA WWTP
ORO LOMA SLUDGE PONDS
ORO LOMA MARSH
SULPHUR CREEK
FRANK'S WEST
FRANK'S EAST
SKYWEST GOLF COURSE
ALAMEDA COUNTY LANDFILL
WEST WINTON LANDFILL
WASTEWATER WET WEATHER STORAGE
CALPINE / RUSSELL CITY ENERGY CENTER
SOLAR FIELDS
HAYWARD WWTP
COGSWELL MARSH
POND 3A
HAYWARD MARSH
SALT MARSH HARVEST MOUSE PRESERVE
OLIVER SALT PONDS
WEST WINTON AVENUE
DEPOT ROAD
GOLF COURSE ROAD
DRAFT

#2: DOWN THE MIDDLE

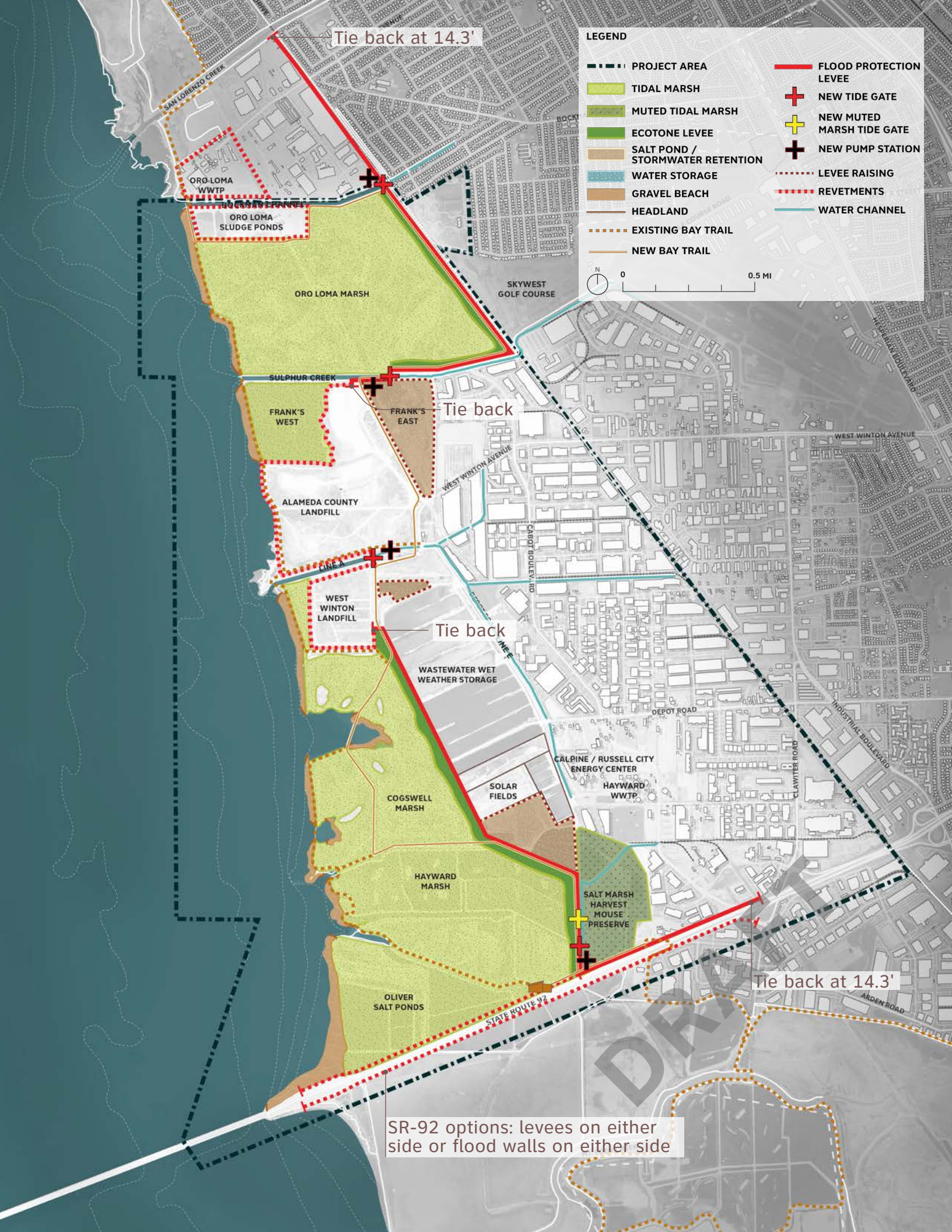
#2: DOWN THE MIDDLE

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 oxidation 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.

This alternative maintains a larger extent of tidal habitat, while still reducing risk to critical infrastructure.

The assumed planning elevation for the line of protection is 14.3’ NAVD88. The final design flood elevation will require further study and cost analysis.


LEGEND
PROJECT AREA
TIDAL MARSH
MUTED TIDAL MARSH
ECOTONE LEVEE
SALT POND / STORMWATER RETENTION
WATER STORAGE
GRAVEL BEACH
HEADLAND
EXISTING BAY TRAIL
NEW BAY TRAIL
FLOOD PROTECTION LEVEE
NEW TIDE GATE
NEW MUTED MARSH TIDE GATE
NEW PUMP STATION
LEVEE RAISING
REVETMENTS
WATER CHANNEL
N
0
0.5 MI
Tie back at 14.3'
SAN LORENZO CREEK
ORO LOMA WWTP
ORO LOMA SLUDGE PONDS
ORO LOMA MARSH
SKYWEST GOLF COURSE
SULPHUR CREEK
FRANK'S WEST
FRANK'S EAST
Tie back
WEST WINTON AVENUE
ALAMEDA COUNTY LANDFILL
LINE A
WEST WINTON LANDFILL
Tie back
WASTEWATER WET WEATHER STORAGE
CABOT BOULEVARD
DEPOT ROAD
CALPINE / RUSSELL CITY ENERGY CENTER
HAYWARD WWTP
SOLAR FIELDS
COGSWELL MARSH
HAYWARD MARSH
SALT MARSH HARVEST MOUSE PRESERVE
OLIVER SALT PONDS
STATE ROUTE 92
Tie back at 14.3'
ARDEN ROAD
INDUSTRIAL BOULEVARD
CLAWITER ROAD
HESPERIAN BOULEVARD
SR-92 options: levees on either side or flood walls on either side
DRAFT

#2: DOWN THE MIDDLE

LINE OF PROTECTION

In this alternative, the line of protection balances risk reduction and ecological enhancement through an alignment that follows the middle of the shoreline. The assumed planning elevation for the line of protection is 14.3' NAVD88. The final elevation will require further study and cost analysis- this elevation will be used for planning purposes only.

Oro Loma perimeter protection

PROS

- Protects existing sludge ponds and WWTP infrastructure

CONS

- Oro Loma WWTP not protected with line of protection
- Access to Oro Loma WWTP will be inundated

Ecotone Levee

PROS

- Medium distance ecotone levee
- Aligns with First Mile project

CONS

- Mosquito abatement issues
- Footprint of levee may impact existing marsh habitat

Ecotone Levee aligns within the oxidation ponds

PROS

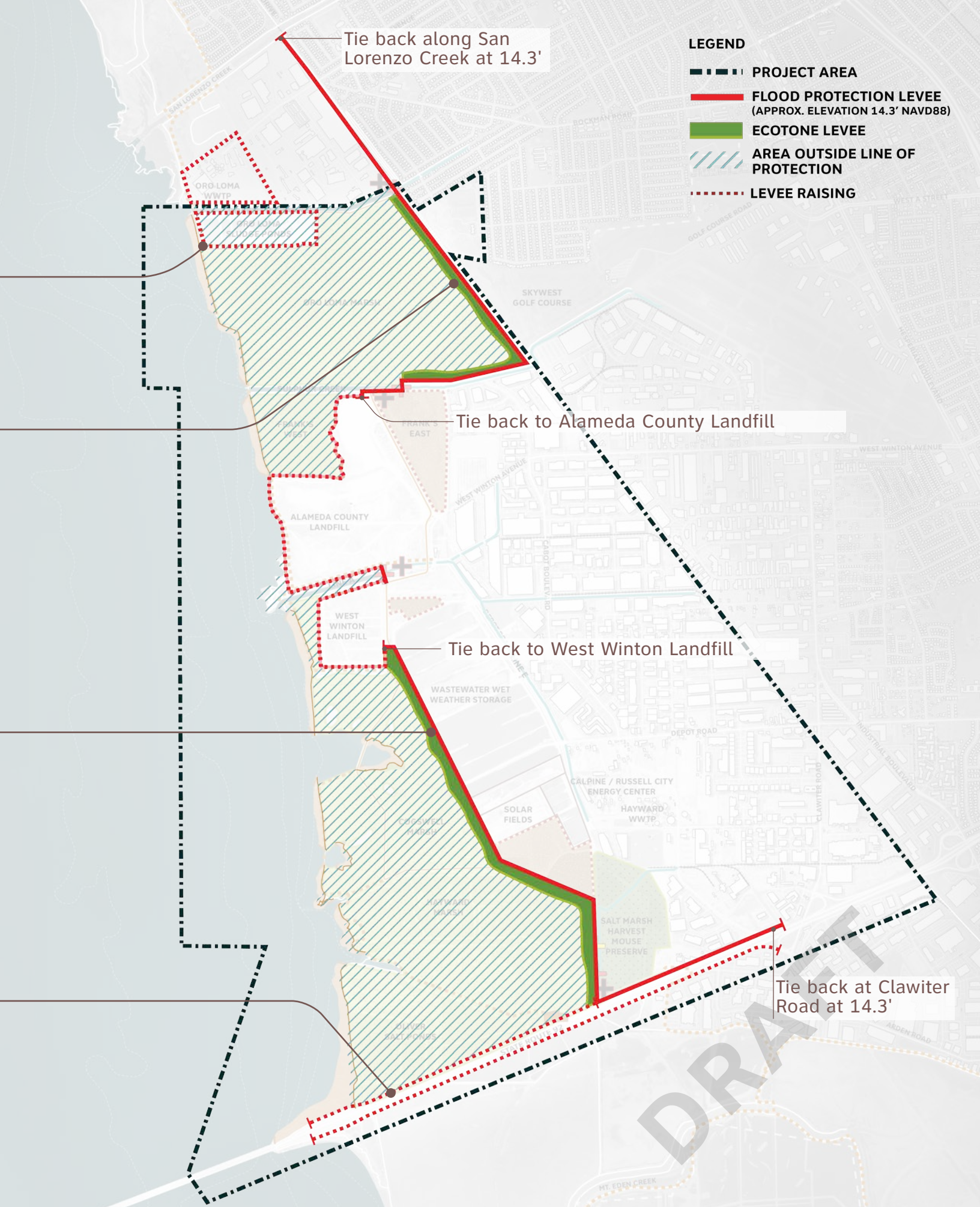
- Ecotone levee aligned within the oxidation ponds preserves marsh habitat

CONS

- Ecotone levee aligned within the oxidation ponds leads to a loss of wastewater wet weather storage capacity
- Mosquito abatement issues
- Footprint of levee may impact existing marsh habitat

SR-92 Options

- Levees on either side
- Flood walls on either side


Tie back along San Lorenzo Creek at 14.3'
LEGEND
PROJECT AREA
FLOOD PROTECTION LEVEE
(APPROX. ELEVATION 14.3' NAVD88)
ECOTONE LEVEE
AREA OUTSIDE LINE OF PROTECTION
LEVEE RAISING
Tie back to Alameda County Landfill
Tie back to West Winton Landfill
Tie back at Clawiter Road at 14.3'
ORO LOMA WWTP
SKYWEST GOLF COURSE
ALAMEDA COUNTY LANDFILL
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CALPINE / RUSSELL CITY ENERGY CENTER
SOLAR FIELDS
HAYWARD WWTP
SALT MARSH HARVEST MOUSE PRESERVE
DRAFT

#2: DOWN THE MIDDLE

TIDAL HABITAT

A larger extent of tidal habitat is enhanced outboard of the line of protection. Through marsh management and sediment placement, the shoreline's ability to accrete sediment is increased

Ecotone levee is aligned within the oxidation ponds

PROS

- Preserves Cogswell Marsh habitat

CONS

- Reduces storage capacity at Wastewater Wet Weather Storage ponds

Maximize amount of connected tidal habitat

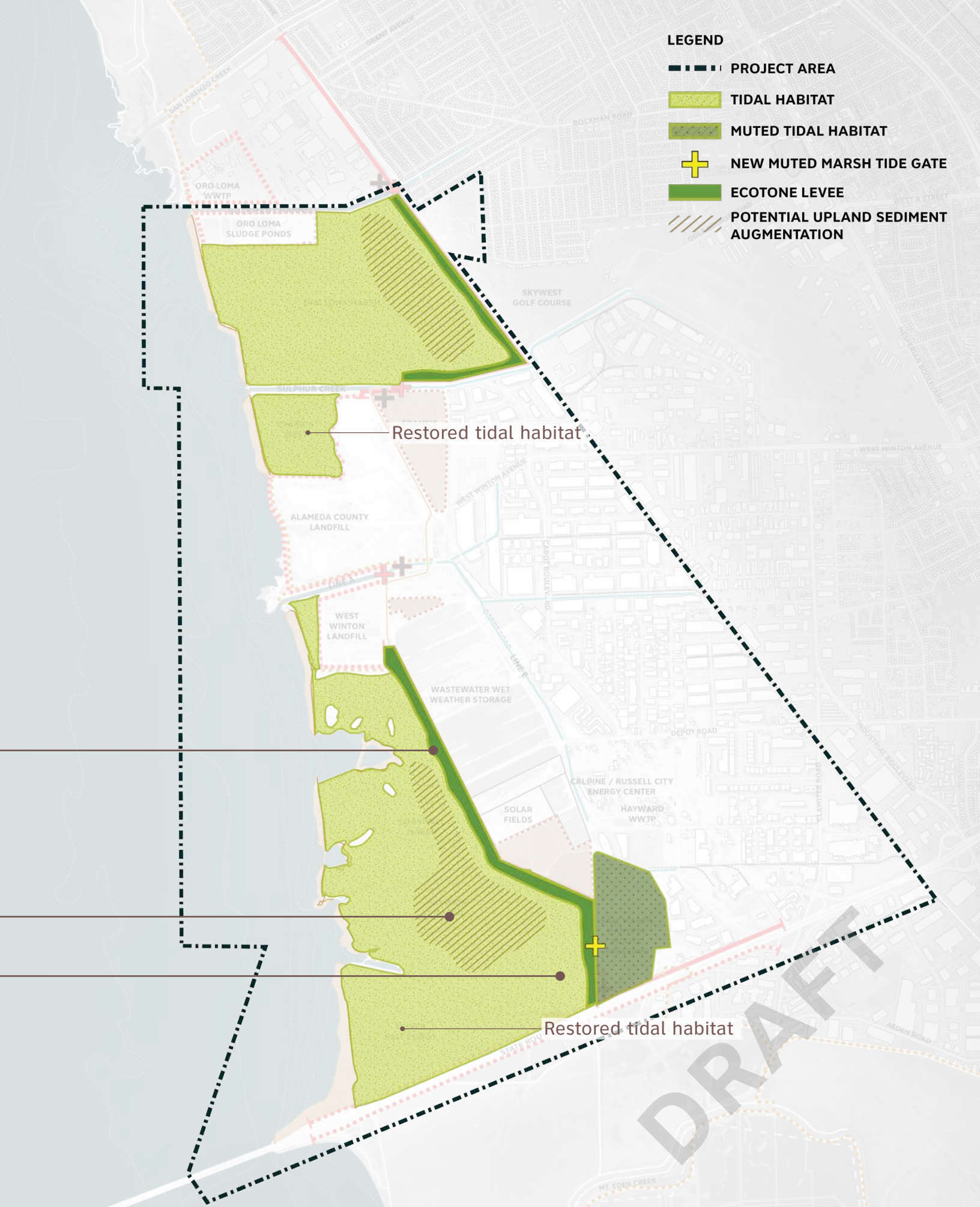
Salt Marsh Harvest Mouse Preserve is cut in half

PROS

- May help half of the Salt Marsh Harvest Mouse Preserve to accrete more tidal sediment

CONS

- Impacts to existing tidal habitat
- Regulatory issue


LEGEND
PROJECT AREA
TIDAL HABITAT
MUTED TIDAL HABITAT
NEW MUTED MARSH TIDE GATE
ECOTONE LEVEE
POTENTIAL UPLAND SEDIMENT AUGMENTATION
Restored tidal habitat
Restored tidal habitat
ORO LOMA WWTP
ORO LOMA SLUDGE PONDS
SKYWEST GOLF COURSE
SULPHUR CREEK
ALAMEDA COUNTY LANDFILL
WEST WINTON LANDFILL
WASTEWATER WET WEATHER STORAGE
SOLAR FIELDS
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WEST WINTON AVENUE
DEPOT ROAD
INDUSTRIAL BOULEVARD
CLAWITER ROAD
ARDENROAD
MT. EDEN CREEK
SAN LORENZO CREEK
BOCKMAN ROAD
DRAFT

#2: DOWN THE MIDDLE

EROSION CONTROL

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. Revetments along the two landfills to reduces the risk of erosion and seepage.

Revetment and sheet pile along landfill edge

PROS

- Increased erosion protection for the landfill
- Possibility to incorporate rocky habitat

CONS

- Cost of sheet pile is a concern for the City

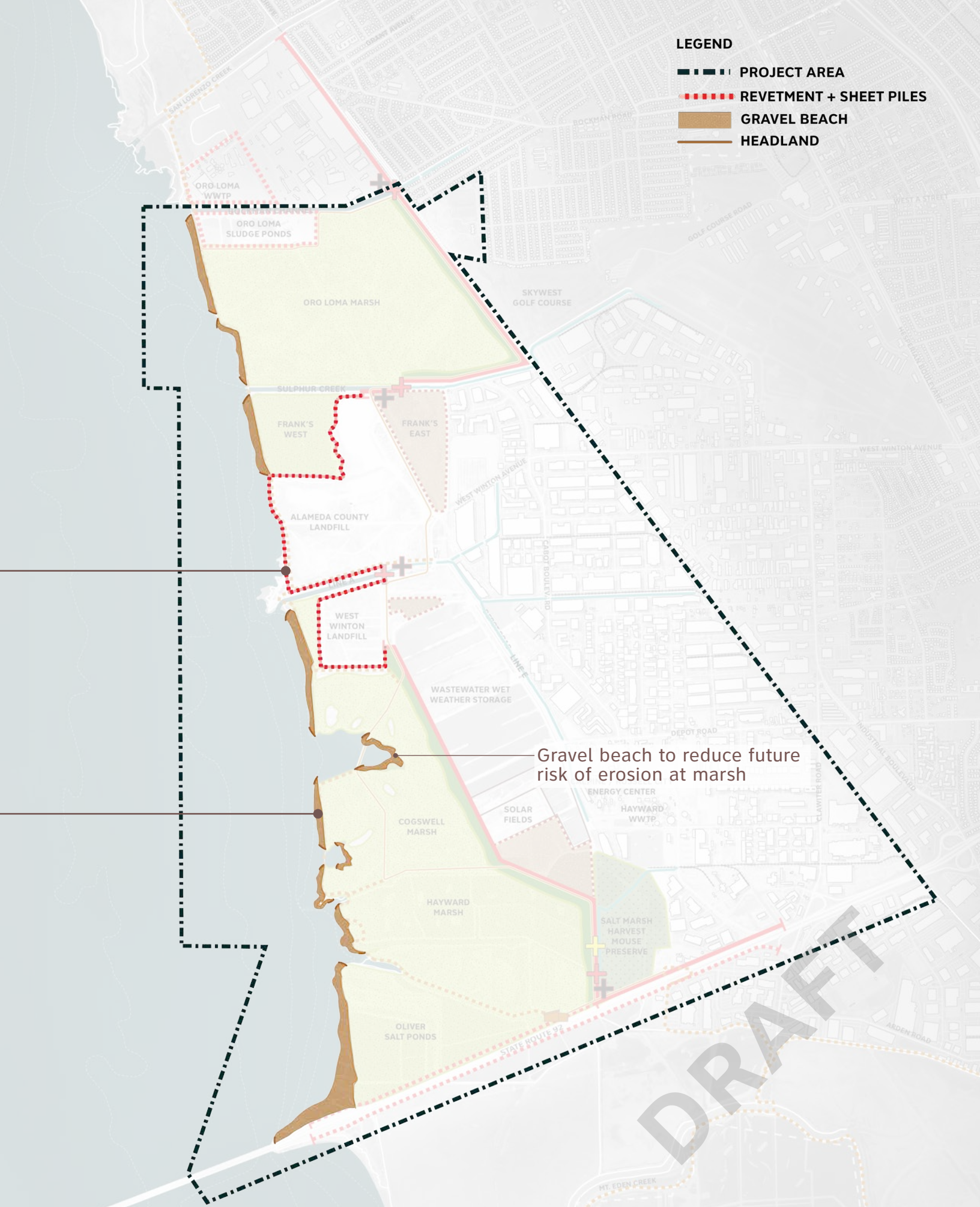
Gravel beaches in front of all marshes

PROS

- Gravel beaches provide habitat

CONS

- Beaches in front of all marshes requires a numerous groins to preserve existing breaches
- Cost
- Maintenance / replenishment


LEGEND
PROJECT AREA
REVETMENT + SHEET PILES
GRAVEL BEACH
HEADLAND
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ORO LOMA SLUDGE PONDS
ORO LOMA MARSH
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ALAMEDA COUNTY LANDFILL
WEST WINTON LANDFILL
WASTEWATER WET WEATHER STORAGE
Gravel beach to reduce future risk of erosion at marsh
SOLAR FIELDS
ENERGY CENTER
HAYWARD WWTP
COGSWELL MARSH
HAYWARD MARSH
SALT MARSH HARVEST MOUSE PRESERVE
OLIVER SALT PONDS
STATE ROUTE 92
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GOLF COURSE ROAD
SAN LORENZO CREEK
MT. EDEN CREEK
DRAFT

#2: DOWN THE MIDDLE

STORMWATER MANAGEMENT

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. Providing storage capacity to temporally hold large volumes of water before it is discharged into the Bay is an important aspect of the Master Plan. As the Plan moves forward, additional studies will be required to assess the volume needed in relation to the hydrology of the area. If gravity flow discharge in not feasible, pumping stations will be required, which can be extremely costly to maintain and operate.

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

Dual Salt Pond / Stormwater Detention

PROS

- Provides salt pond habitat
- Large area for stormwater storage
- Along Sulphur Creek
- Enhances bird species habitat- the birds seem to prefer fresh water over salt water

CONS

- Stormwater may impact habitat

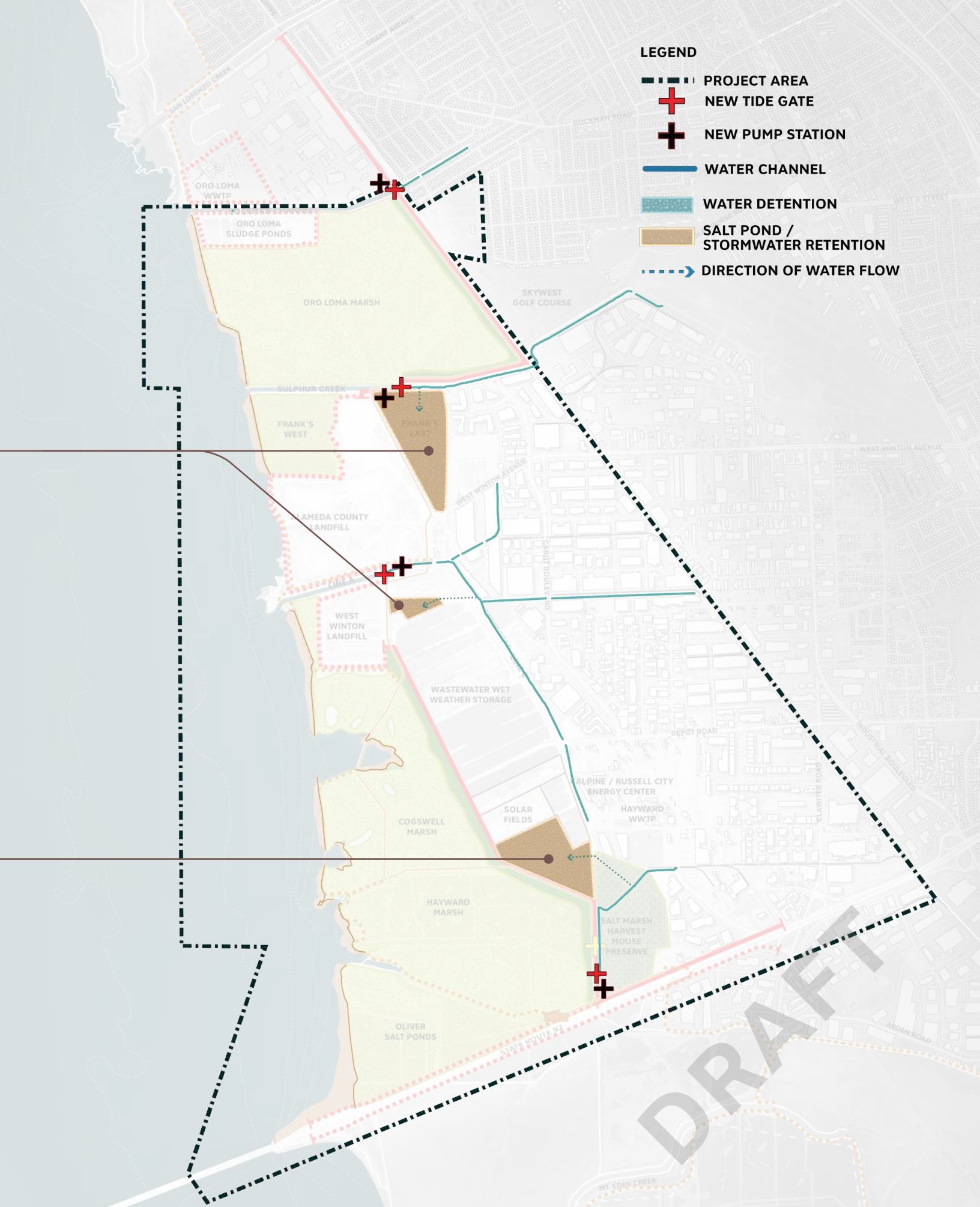
Dual Salt Pond / Stormwater Detention

PROS

- Provides salt pond habitat
- Large area for stormwater storage
- Along Sulphur Creek
- Enhances bird species habitat- the birds seem to prefer fresh water over salt water

CONS

- Stormwater may impact habitat
- Not directly adjacent to a flood control channel


LEGEND
PROJECT AREA
NEW TIDE GATE
NEW PUMP STATION
WATER CHANNEL
WATER DETENTION
SALT POND / STORMWATER RETENTION
DIRECTION OF WATER FLOW
ORO LOMA WWTP
ORO LOMA SLUDGE PONDS
ORO LOMA MARSH
SKYWEST GOLF COURSE
SULPHUR CREEK
FRANK'S WEST
FRANK'S EAST
WEST WINTON AVENUE
ALAMEDA COUNTY LANDFILL
WEST WINTON LANDFILL
WASTEWATER WET WEATHER STORAGE
DEPOT ROAD
ALPINE / RUSSELL CITY ENERGY CENTER
HAYWARD WWTP
SOLAR FIELDS
COGSWELL MARSH
HAYWARD MARSH
SALT MARSH HARVEST MOUSE PRESERVE
OLIVER SALT PONDS
STATE ROUTE 92
MT. EDEN CREEK
DRAFT

#2: DOWN THE MIDDLE

WASTEWATER TREATMENT

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

Horizontal Levee only along Union Pacific Rail Corridor

PROS

- Discharge some effluent from Oro Loma
- Aligns with First Mile project
- Provides transition slope

CONS

- Potential impacts to current habitat
- Would require filling in part of Oro Loma Marsh
- Mosquito abatement regulatory issues

Most of the Wastewater Wet Weather Storage ponds to remain

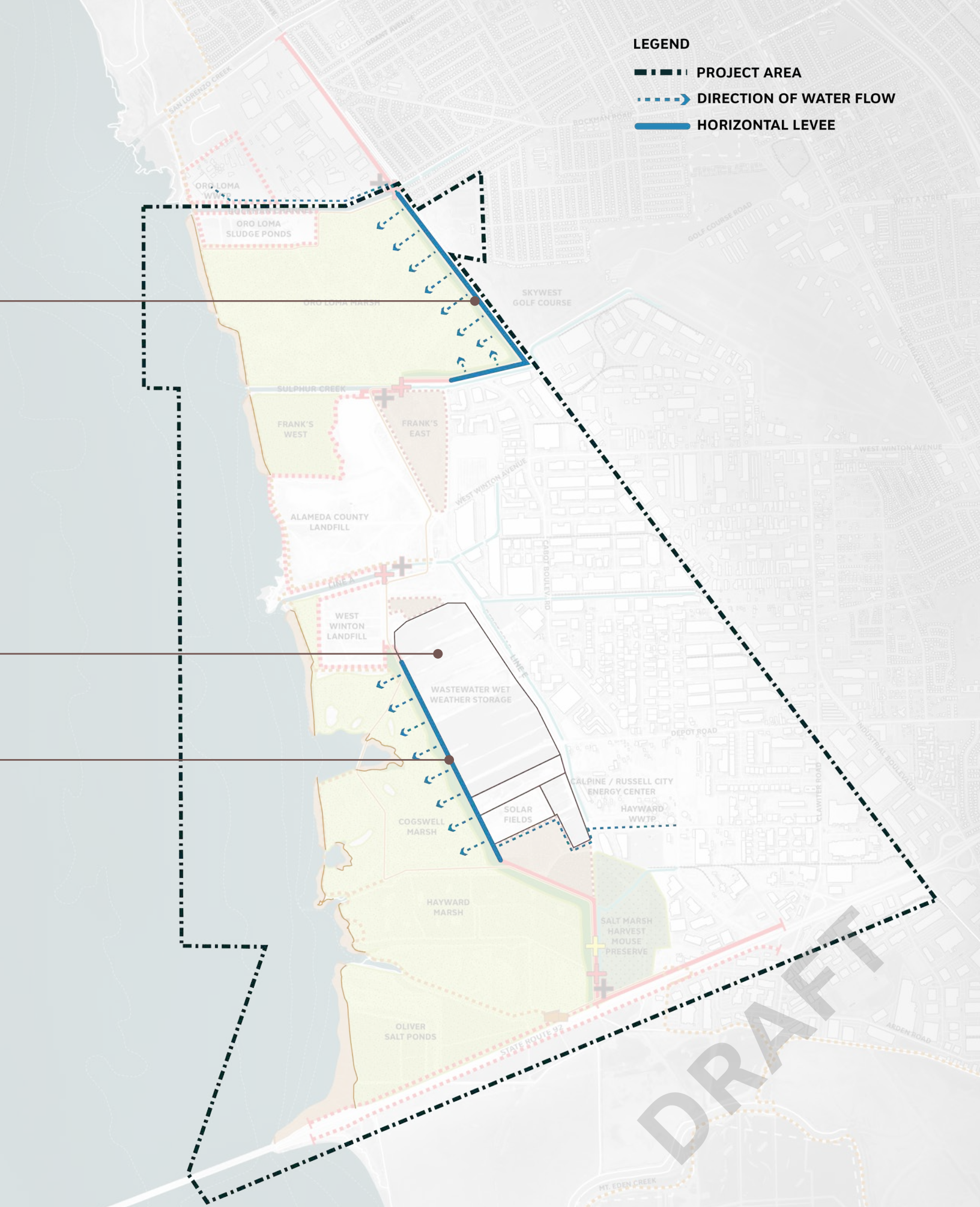
Horizontal Levee built into the oxidation ponds for Hayward WWTP local discharge

PROS

- Local Discharge for Hayward WWTP

CONS

- Loss of Wastewater Wet Weather Storage space with ecotone slope built into them
- Mosquito abatement regulatory issues
- Hayward WWTP is not currently planning for the level of treatment that may be required to discharge into protected species habitat


LEGEND
PROJECT AREA
DIRECTION OF WATER FLOW
HORIZONTAL LEVEE
ORO LOMA WWTP
ORO LOMA SLUDGE PONDS
ORO LOMA MARSH
SKYWEST GOLF COURSE
SULPHUR CREEK
FRANK'S WEST
FRANK'S EAST
ALAMEDA COUNTY LANDFILL
WEST WINTON LANDFILL
WASTEWATER WET WEATHER STORAGE
SOLAR FIELDS
CALPINE / RUSSELL CITY ENERGY CENTER
HAYWARD WWTP
COGSWELL MARSH
HAYWARD MARSH
SALT MARSH HARVEST MOUSE PRESERVE
OLIVER SALT PONDS
STATE ROUTE 92
WEST WINTON AVENUE
DEPOT ROAD
GOLF COURSE ROAD
BOCKMAN ROAD
SAN LORENZO CREEK
MT. EDEN CREEK
DRAFT

#2: DOWN THE MIDDLE

BAY TRAIL

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 and connect to the new alignment until it is inundated.

Aligns to the back of Oro Loma Marsh and Alameda County Landfill

CONS

- Further from the Bay
- No blue water experience

Bay Trail is elevated on structure

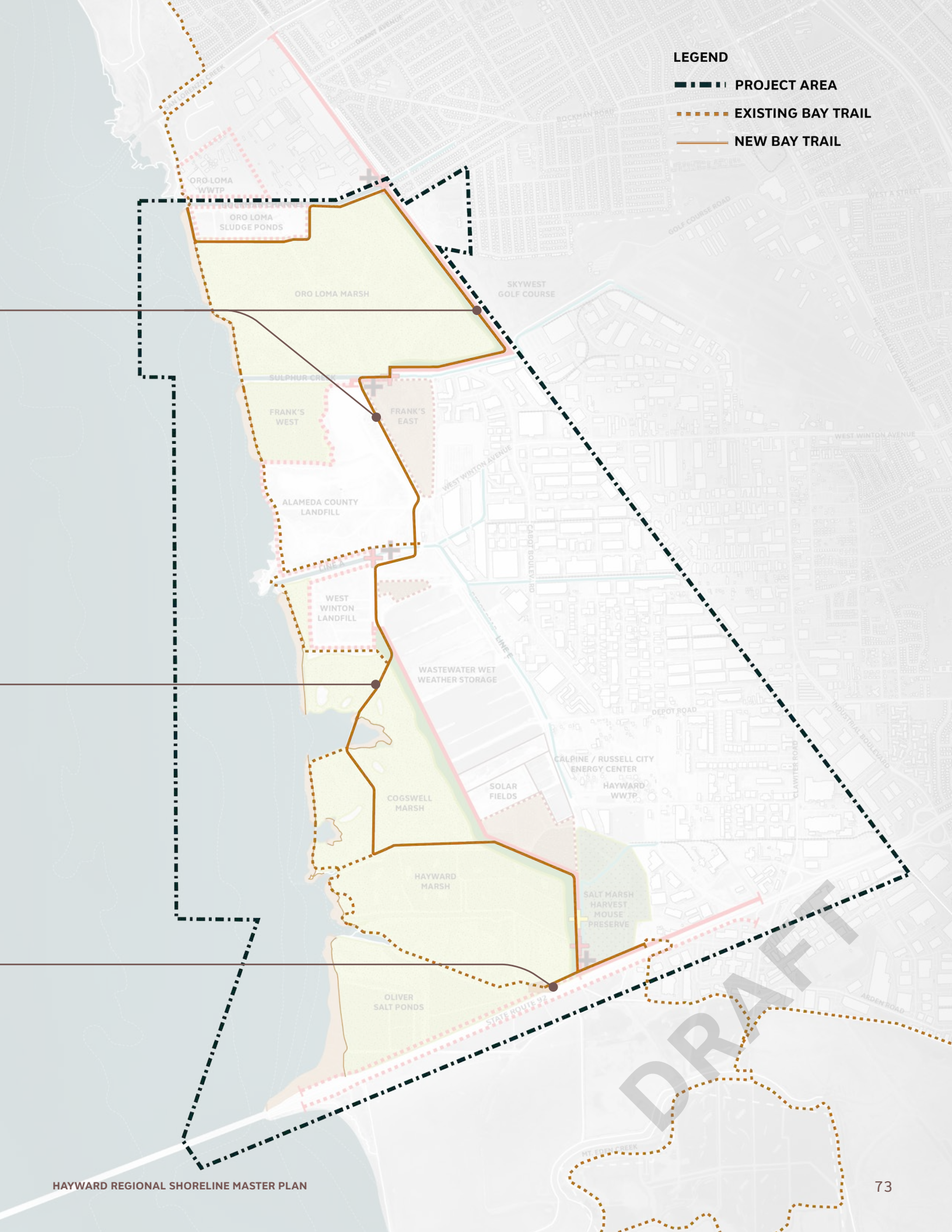
PROS

- Alignment is closer to the Bay
- Pulled away from wastewater treatment uses

CONS

- Costly to maintain bridges outside the line of protection
- Existing bridge is only at 9.75' elevation

Spur to the Interpretive Center


LEGEND
PROJECT AREA
EXISTING BAY TRAIL
NEW BAY TRAIL
ORO LOMA WWTP
ORO LOMA SLUDGE PONDS
ORO LOMA MARSH
SKYWEST GOLF COURSE
FRANK'S WEST
FRANK'S EAST
ALAMEDA COUNTY LANDFILL
WEST WINTON LANDFILL
WASTEWATER WET WEATHER STORAGE
CALPINE / RUSSELL CITY ENERGY CENTER
SOLAR FIELDS
HAYWARD WWTP
COGSWELL MARSH
HAYWARD MARSH
SALT MARSH HARVEST MOUSE PRESERVE
OLIVER SALT PONDS
WEST WINTON AVENUE
DEPOT ROAD
GOLF COURSE ROAD
BOCKMAN ROAD
INDUSTRIAL BOULEVARD
CLAWITER ROAD
ALDEN ROAD
STATE ROUTE 92
DRAFT

#2: DOWN THE MIDDLE

HAYWARD SHORELINE INTERPRETIVE CENTER

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

Access road is elevated in place

PROS

- Reduced risk of flooding
- Potential to tie into CalTrans improvements

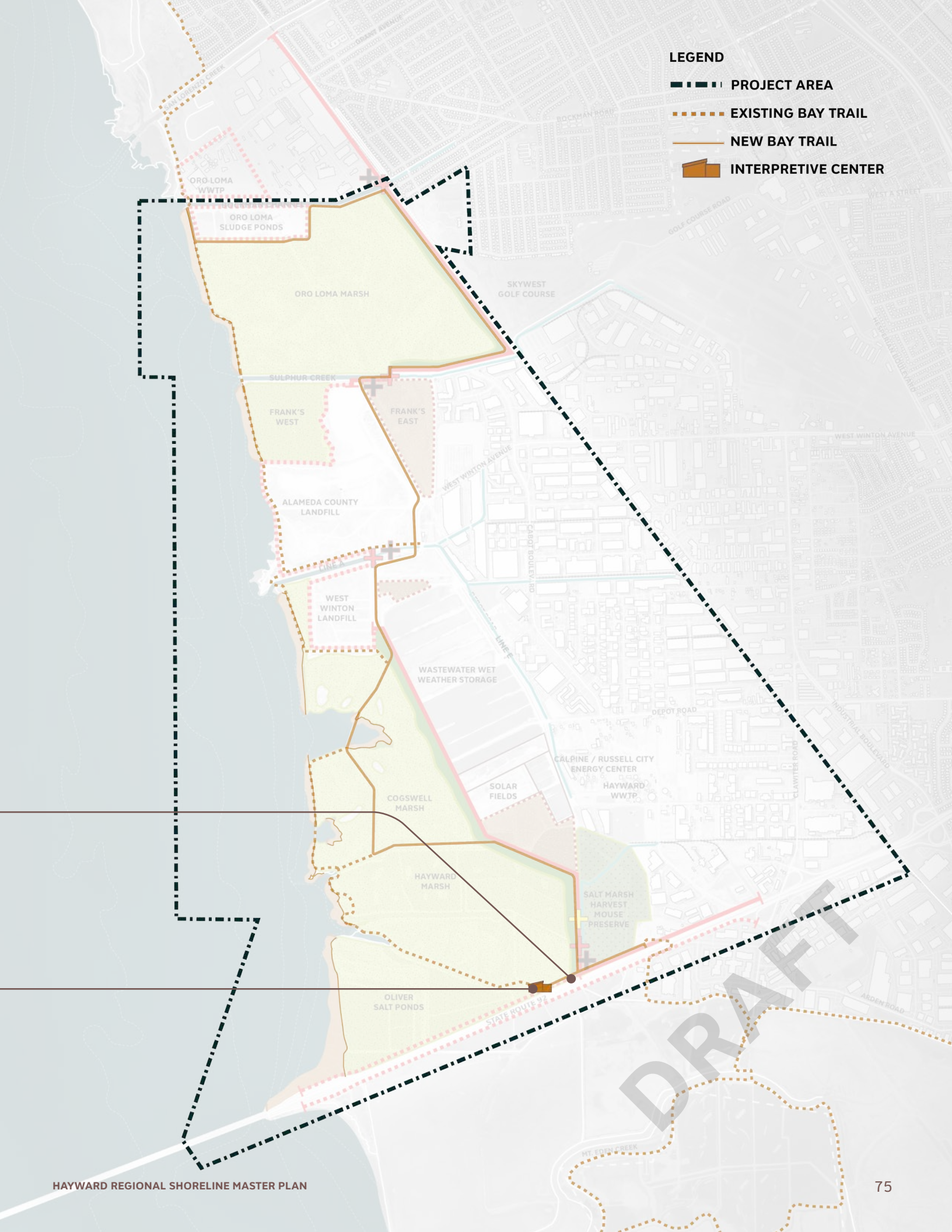
Interpretive Center becomes elevated / floating in place

PROS

- Closer to the Bay- maintain marsh connection

CONS

- Building elevation may be costly


LEGEND
PROJECT AREA
EXISTING BAY TRAIL
NEW BAY TRAIL
INTERPRETIVE CENTER
ORO LOMA WWTP
ORO LOMA SLUDGE PONDS
ORO LOMA MARSH
SKYWEST GOLF COURSE
SULPHUR CREEK
FRANK'S WEST
FRANK'S EAST
ALAMEDA COUNTY LANDFILL
WEST WINTON LANDFILL
WASTEWATER WET WEATHER STORAGE
CALPINE / RUSSELL CITY ENERGY CENTER
SOLAR FIELDS
HAYWARD WWTP
COGSWELL MARSH
HAYWARD MARSH
SALT MARSH HARVEST MOUSE PRESERVE
OLIVER SALT PONDS
STATE ROUTE 92
WEST WINTON AVENUE
DEPOT ROAD
GOLF COURSE ROAD
INDUSTRIAL BOULEVARD
CLAWITER ROAD
ARDEN ROAD
MT. EDEN CREEK
DRAFT

#3: FURTHER INLAND

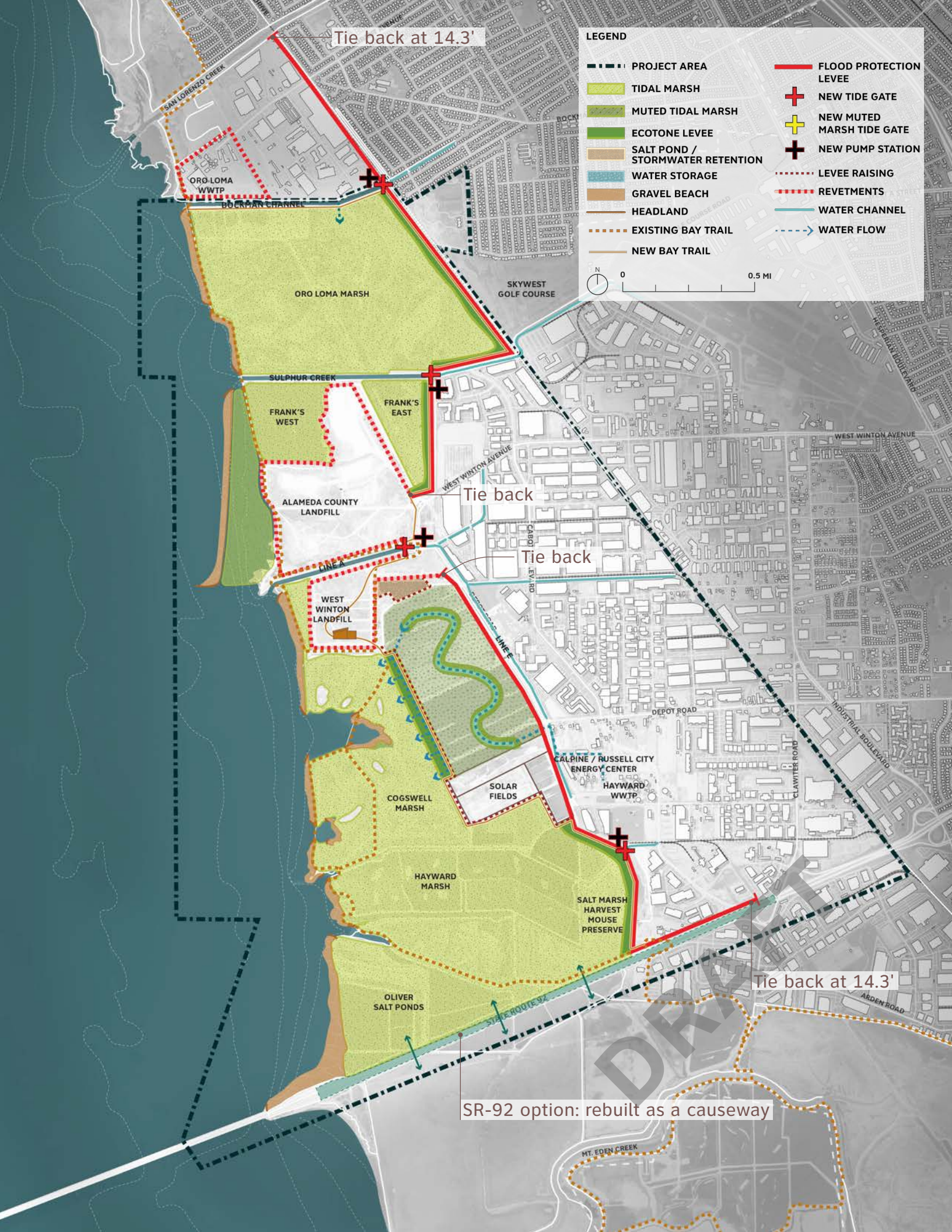
#3: FURTHER INLAND

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 oxidation 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.

The assumed planning elevation for the line of protection is 14.3' NAVD88. The final design flood elevation will require further study and cost analysis.


LEGEND
PROJECT AREA
TIDAL MARSH
MUTED TIDAL MARSH
ECOTONE LEVEE
SALT POND / STORMWATER RETENTION
WATER STORAGE
GRAVEL BEACH
HEADLAND
EXISTING BAY TRAIL
NEW BAY TRAIL
FLOOD PROTECTION LEVEE
NEW TIDE GATE
NEW MUTED MARSH TIDE GATE
NEW PUMP STATION
LEVEE RAISING
REVETMENTS
WATER CHANNEL
WATER FLOW
N
0
0.5 MI
Tie back at 14.3'
SAN LORENZO CREEK
ORO LOMA WWTP
BOCKMAN CHANNEL
ORO LOMA MARSH
SKYWEST GOLF COURSE
SULPHUR CREEK
FRANK'S WEST
FRANK'S EAST
WEST WINTON AVENUE
Tie back
ALAMEDA COUNTY LANDFILL
CASTRO VALLEY BLVD
Tie back
LINE A
WEST WINTON LANDFILL
LINE E
DEPOT ROAD
CALPINE / RUSSELL CITY ENERGY CENTER
HAYWARD WWTP
SOLAR FIELDS
COGSWELL MARSH
HAYWARD MARSH
SALT MARSH HARVEST MOUSE PRESERVE
OLIVER SALT PONDS
STATE ROUTE 92
Tie back at 14.3'
ARDEN ROAD
SR-92 option: rebuilt as a causeway
MT. EDEN CREEK
HESPERIAN BOULEVARD
INDUSTRIAL BOULEVARD
CLAWITER ROAD
DRAFT

#3: FURTHER INLAND

LINE OF PROTECTION

In this alternative, the line of protection moves inland, opening a larger extent of shoreline for ecological restoration. The assumed planning elevation for the line of protection is 14.3' NAVD88. The final elevation will require further study and cost analysis- this elevation will be used for planning purposes only.

Oro Loma perimeter protection

PROS

- Protects existing sludge ponds and WWTP infrastructure

CONS

- Oro Loma WWTP not protected with line of protection
- Access will be inundated

Oro Loma sludge ponds restored to marsh

Ecotone Levee wraps the east of Oro Loma Marsh and Frank's East

PROS

- Increase effluent discharge

CONS

- Longer distance
- More cost

Levee raising

PROS

- Multi-step layered protection
- Solar fields were raised

CONS

- Building 2 levees costs more

Line of protection moves to the east of the oxidation ponds

PROS

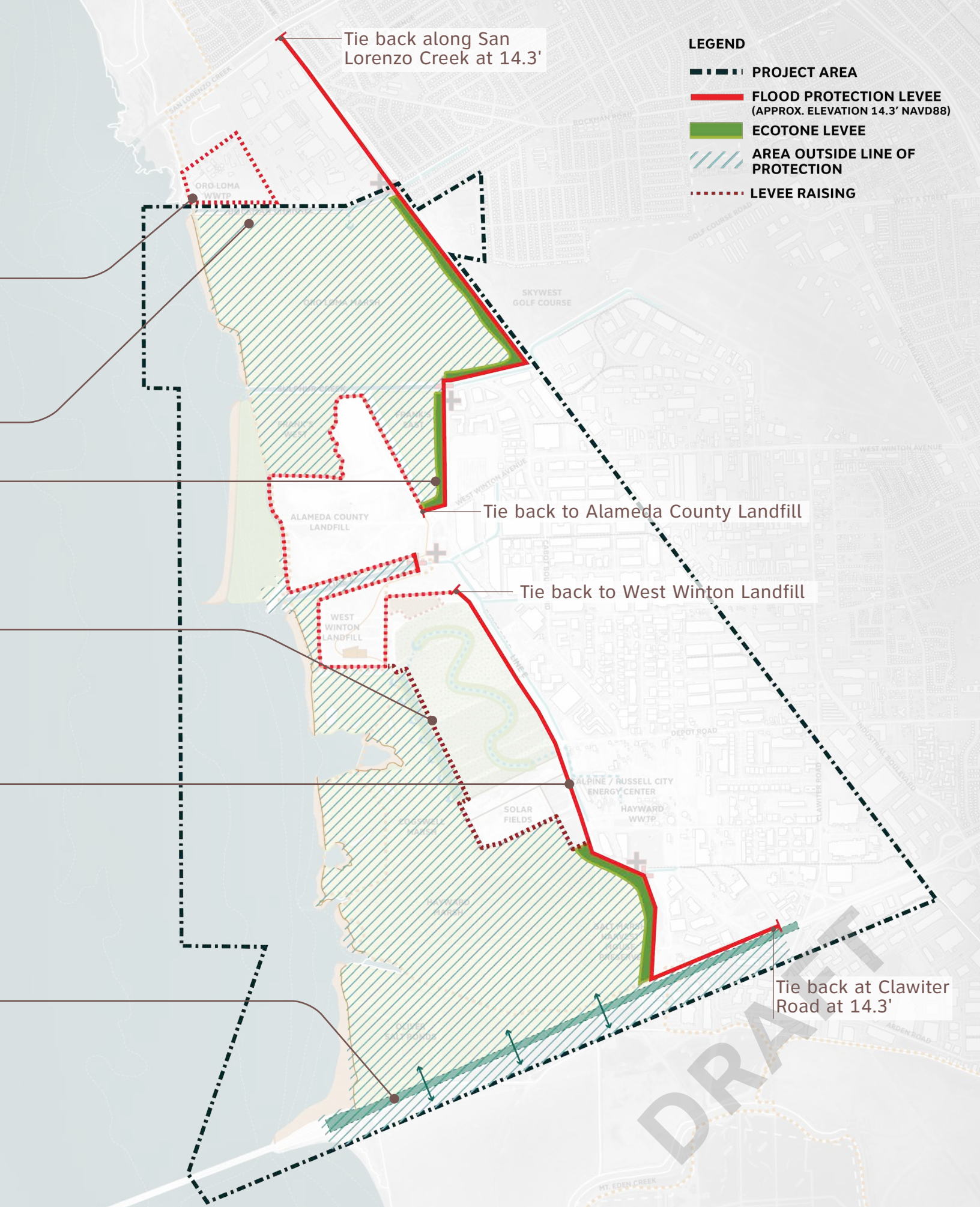
- Line of protection further inland

CONS

- Minimal space between Line E and the oxidation ponds for levee construction

SR-92 Option

- Rebuilt as a causeway


Tie back along San Lorenzo Creek at 14.3'
LEGEND
PROJECT AREA
FLOOD PROTECTION LEVEE
(APPROX. ELEVATION 14.3' NAVD88)
ECOTONE LEVEE
AREA OUTSIDE LINE OF PROTECTION
LEVEE RAISING
Tie back to Alameda County Landfill
Tie back to West Winton Landfill
Tie back at Clawiter Road at 14.3'
ORO LOMA WWTP
SKYWEST GOLF COURSE
ALAMEDA COUNTY LANDFILL
WEST WINTON LANDFILL
ALPINE / RUSSELL CITY ENERGY CENTER
HAYWARD WWTP
SOLAR FIELDS
DRAFT

#3: FURTHER INLAND

TIDAL HABITAT

In the most expansive tidal habitat system, connectivity is restored between existing and restored marshes. Through marsh management and sediment placement, the shoreline's ability to accrete sediment is also increased.

Breach at Bockman Channel

PROS

- Tributary connection to Baylands

CONS

- Bockman water quality may impact marsh health

Fringe marsh restoration

PROS

- Fringe marsh may buffer landfill

CONS

- May be hard to restore fringe marsh

Breach into Triangle Marsh

PROS

- Breaching into Triangle Marsh may help it accrete more tidal sediment

CONS

- Breaching into Triangle Marsh may impact landfill protection
- Impacts to existing habitat

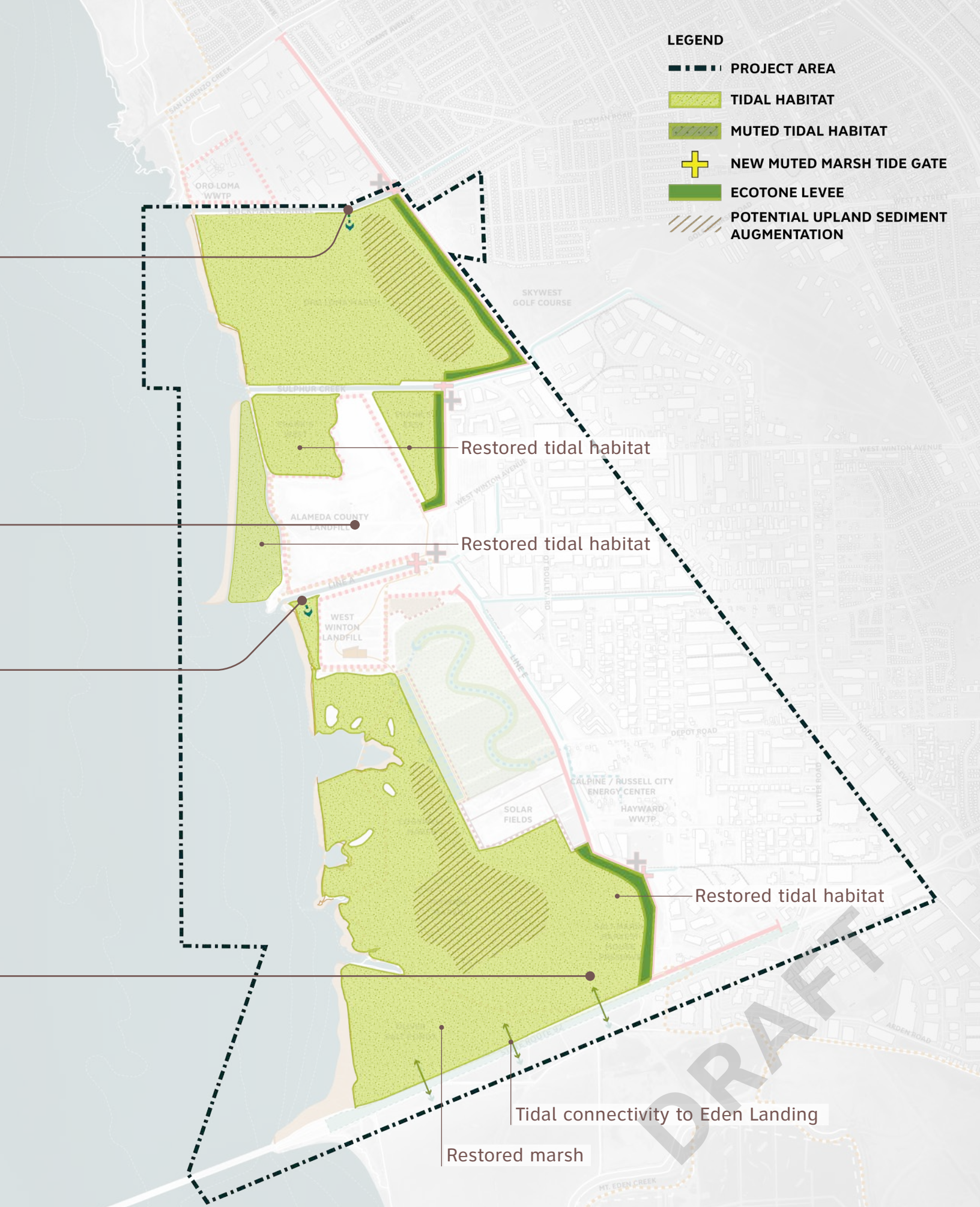
Transition Salt Marsh Harvest Mouse Preserve to tidal habitat

PROS

- Maximize muted tidal habitat that could be maintained with SLR
- Large, connected tidal habitat system
- Connection to Eden Landing through causeway

CONS

- Impacts to existing Salt Marsh Harvest Mouse Preserve habitat
- May be a regulatory issue


LEGEND
PROJECT AREA
TIDAL HABITAT
MUTED TIDAL HABITAT
NEW MUTED MARSH TIDE GATE
ECOTONE LEVEE
POTENTIAL UPLAND SEDIMENT AUGMENTATION
Restored tidal habitat
Restored tidal habitat
Restored tidal habitat
Tidal connectivity to Eden Landing
Restored marsh
DRAFT

#3: FURTHER INLAND

EROSION CONTROL

A layered system of erosion control measures utilizes gravel beaches that reduce the risk of erosion to levees that shelter the marshes behind. Revetments along the two landfills to reduces the risk of erosion and seepage.

Gravel beaches in front of all marshes

PROS

- Gravel beaches provide habitat

CONS

- Beaches in front of all marshes requires a numerous groins to preserve existing breaches
- Cost
- Maintenance / replenishment

Gravel beach and fringe marsh restoration to reduce risk to landfill

PROS

- Gravel beach provides an additional layer of protection for the landfill

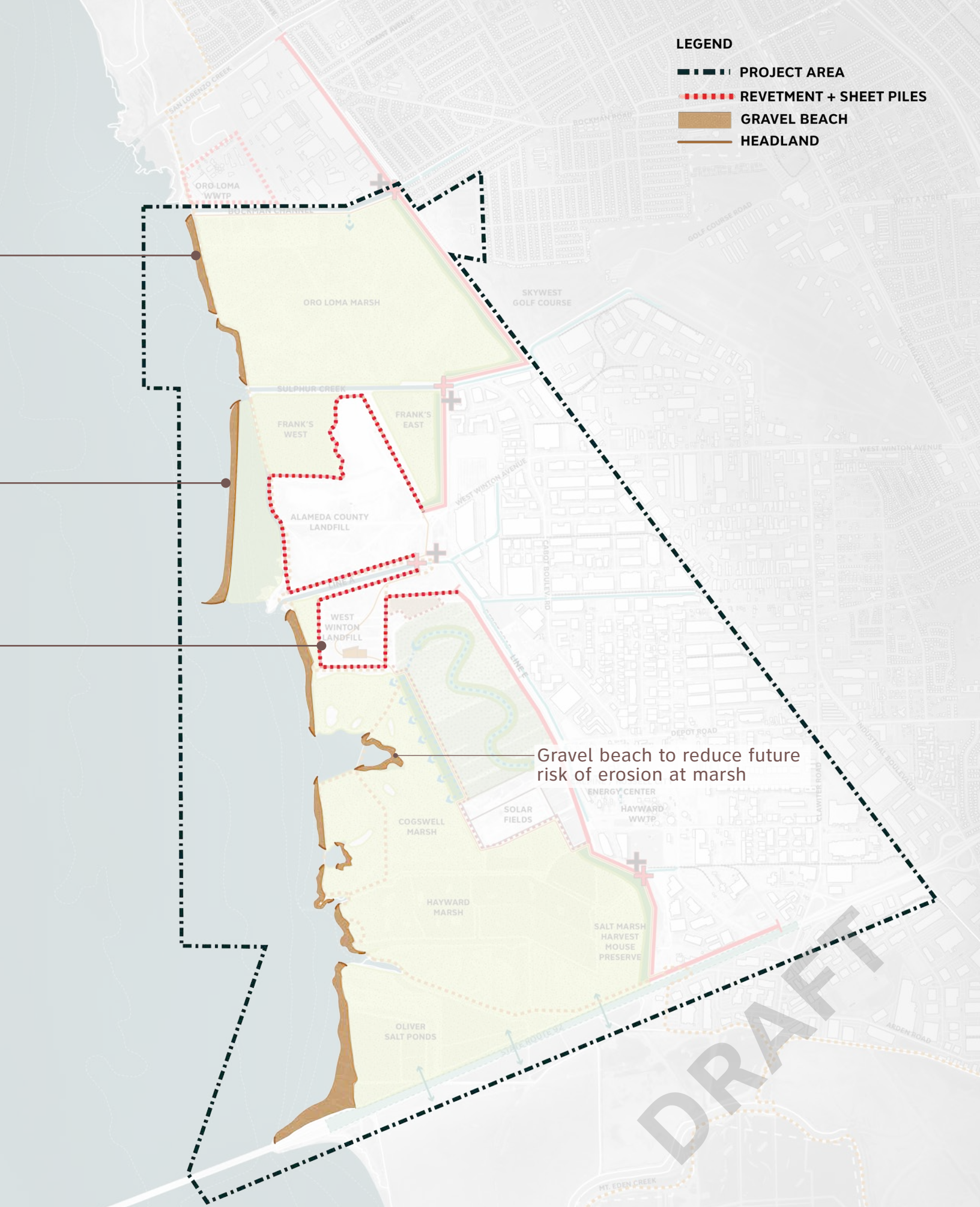
Revetments and sheet pile along landfill edges

PROS

- Increased erosion protection to the landfill
- Possibility to incorporate rocky habitat

CONS

- Full perimeter protection is more expensive
- Cost of sheet pile is a concern for the City


LEGEND
PROJECT AREA
REVETMENT + SHEET PILES
GRAVEL BEACH
HEADLAND
ORO LOMA WWTP
ORO LOMA MARSH
SKYWEST GOLF COURSE
SULPHUR CREEK
FRANK'S WEST
FRANK'S EAST
ALAMEDA COUNTY LANDFILL
WEST WINTON LANDFILL
WEST WINTON AVENUE
Gravel beach to reduce future risk of erosion at marsh
ENERGY CENTER
HAYWARD WWTP
SOLAR FIELDS
COGSWELL MARSH
HAYWARD MARSH
SALT MARSH HARVEST MOUSE PRESERVE
OLIVER SALT PONDS
DEPOT ROAD
MT. EDEN CREEK
DRAFT

#3: FURTHER INLAND

STORMWATER MANAGEMENT

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.

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.

No additional stormwater storage space

CONS

- No capacity to mitigate increased precipitation and groundwater impacts
- Need to manage stormwater inland of a line of protection

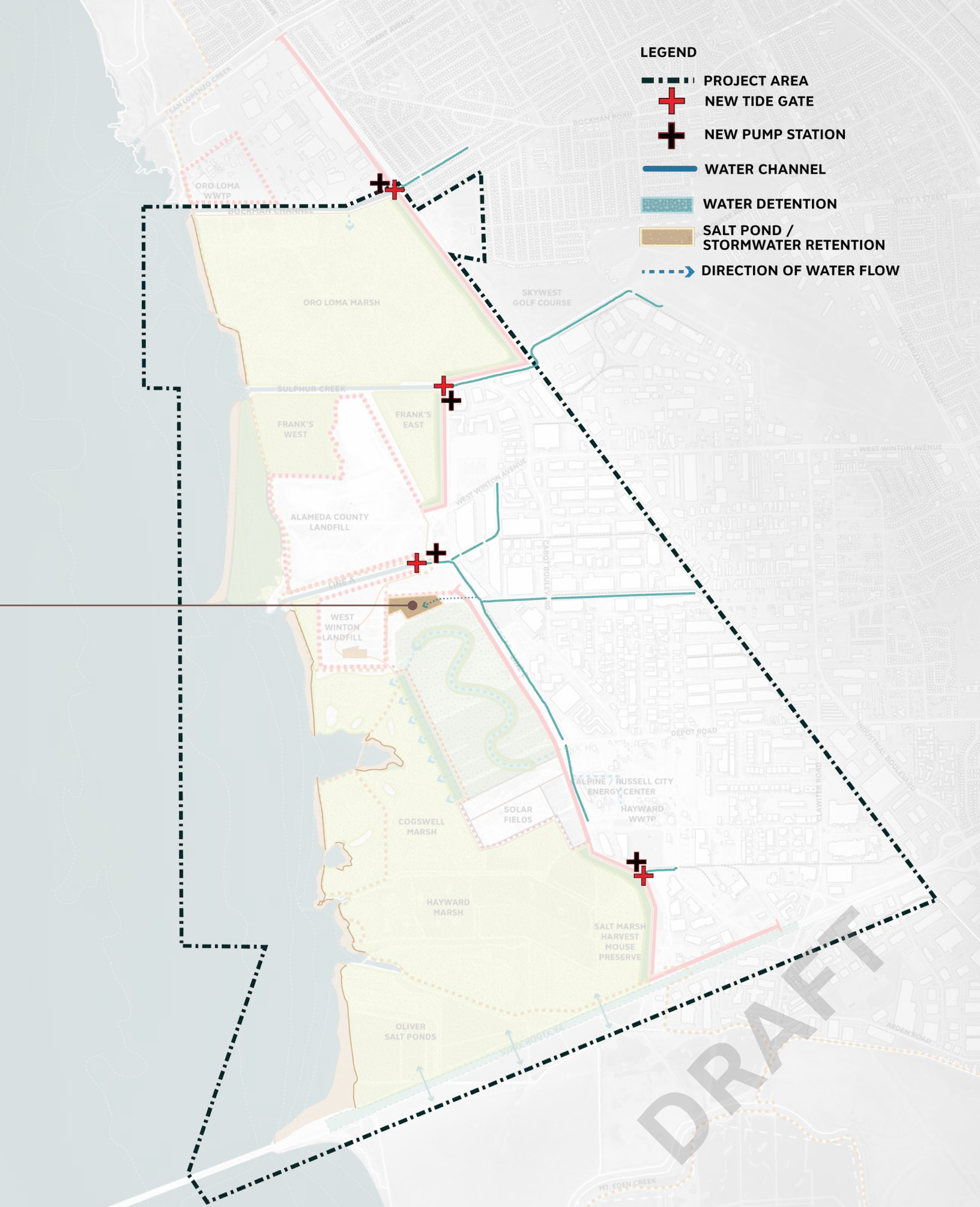
Dual Salt Pond / Stormwater Detention

PROS

- Provides salt pond habitat
- Enhances bird species habitat- the birds seem to prefer fresh water over salt water

CONS

- Very small area in comparison to future need
- Stormwater may impact habitat


LEGEND
PROJECT AREA
NEW TIDE GATE
NEW PUMP STATION
WATER CHANNEL
WATER DETENTION
SALT POND / STORMWATER RETENTION
DIRECTION OF WATER FLOW
ORO LOMA WWTP
ORO LOMA MARSH
SKYWEST GOLF COURSE
SULPHUR CREEK
FRANK'S WEST
FRANK'S EAST
WEST WINTON AVENUE
ALAMEDA COUNTY LANDFILL
WEST WINTON LANDFILL
DEPOT ROAD
ALPINE / RUSSELL CITY ENERGY CENTER
SOLAR FIELDS
HAYWARD WWTP
COGSWELL MARSH
HAYWARD MARSH
SALT MARSH HARVEST MOUSE PRESERVE
OLIVER SALT PONDS
MT. EDEN CREEK
DRAFT

#3: FURTHER INLAND

WASTEWATER TREATMENT

Critical wastewater treatment functions are maintained and enhanced at Oro Loma and Hayward WWTP's with horizontal levees that outlet effluent to Oro Loma and Cogswell Marsh. This alternative assumes that EBDA is decommissioned. This allows for a freshwater treatment marsh in the former wet weather equalization ponds at Hayward WWTP to facilitate local discharge to Cogswell marsh. The level of protection for the open water treatment wetland, solar fields, and biosolids ponds is not addressed at this time and will be investigated as part of the preferred alternative.

Horizontal Levee wraps the back of Oro Loma Marsh and Frank's East

PROS

- Discharge a larger amount of Oro Loma's effluent
- Provides transition slope
- Aligns with First Mile project

CONS

- Potential impacts to current habitat
- Would require filling in part of Oro Loma Marsh
- Mosquito abatement regulatory issues

Horizontal Levee built into the oxidation ponds for Hayward WWTP local discharge

PROS

- Local Discharge for Hayward WWTP

CONS

- Loss of Wastewater Wet Weather Storage space with ecotone slope built into them
- Mosquito abatement regulatory issues
- Hayward WWTP is not currently planning for the level of treatment that may be required to discharge into protected species habitat

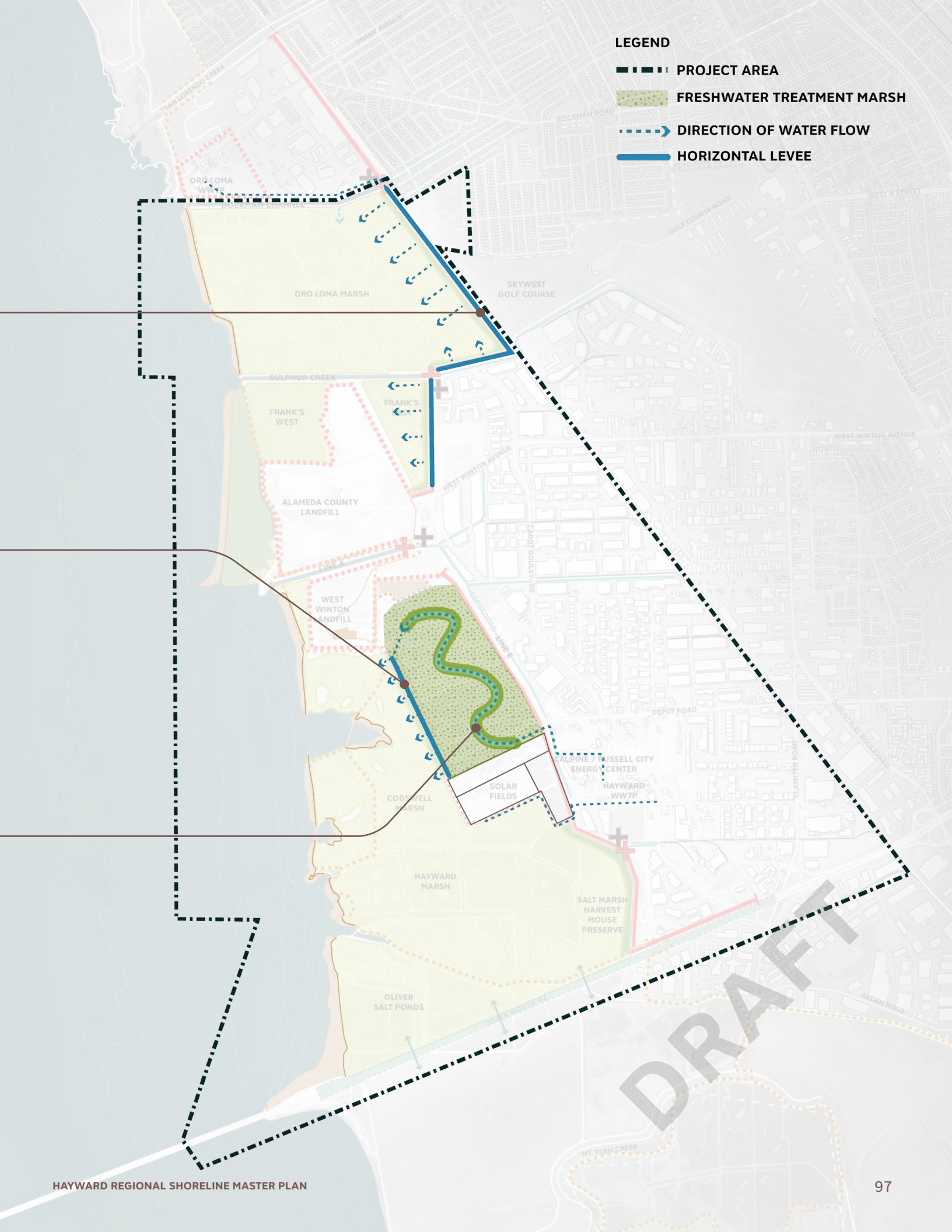
Open water treatment wetland for Hayward WWTP

PROS

- May facilitate local Discharge for Hayward WWTP

CONS

- Loss of Wastewater Wet Weather Storage ponds
- Only feasible if EBDA pipeline is decommissioned
- Hayward WWTP is not currently planning for the level of treatment that may be required to discharge into protected species habitat


LEGEND
PROJECT AREA
FRESHWATER TREATMENT MARSH
DIRECTION OF WATER FLOW
HORIZONTAL LEVEE
ORO LOMA MARSH
SKYWEST GOLF COURSE
SULPHUR CREEK
FRANK'S WEST
ALAMEDA COUNTY LANDFILL
WEST WINTON LANDFILL
SOLAR FIELDS
COGSWELL MARSH
HAYWARD MARSH
SALT MARSH HARVEST MOUSE PRESERVE
OLIVER SALT PONDS
HAYWARD WWTP
DRAFT

#3: FURTHER INLAND

BAY TRAIL

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 and connect to the new alignment until it is inundated.

Aligns to the back of Oro Loma Marsh and Frank's East

CONS

- Further from the Bay
- No blue water experience

Links to the Interpretive Center

PROS

- Landfill provides expansive Bay views

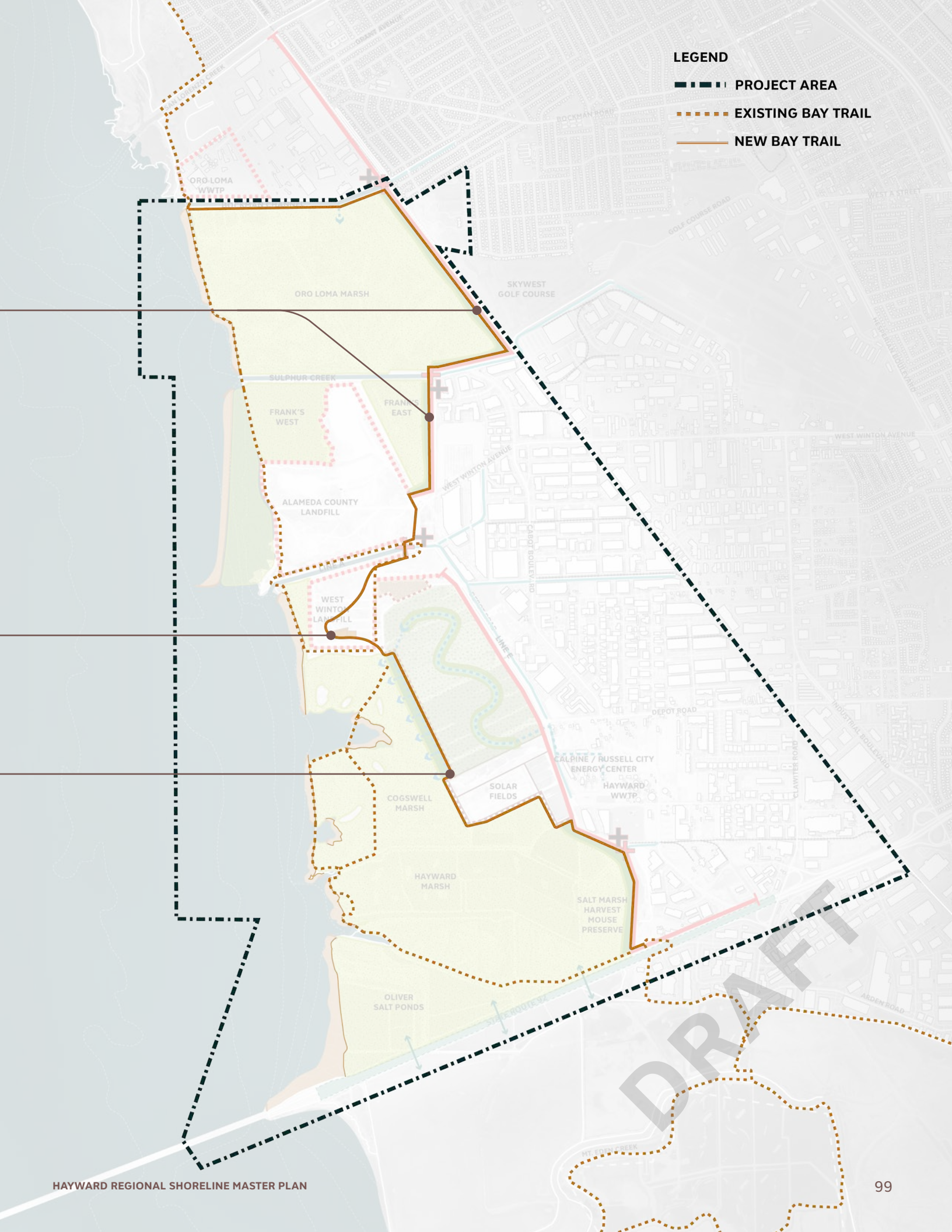
Aligns along the western extent of the oxidation ponds

PROS

- Higher elevation leads to risk reduction with sea level rise

CONS

- Proximity to wastewater uses


LEGEND
PROJECT AREA
EXISTING BAY TRAIL
NEW BAY TRAIL
ORO LOMA MARSH
SKYWEST GOLF COURSE
SULPHUR CREEK
FRANK'S WEST
FRANK'S EAST
ALAMEDA COUNTY LANDFILL
WEST WINTON AVENUE
WEST WINTON LANDFILL
CALPINE / RUSSELL CITY ENERGY CENTER
HAYWARD WWTP
SOLAR FIELDS
COGSWELL MARSH
HAYWARD MARSH
SALT MARSH HARVEST MOUSE PRESERVE
OLIVER SALT PONDS
DEPOT ROAD
DRAFT

#3: FURTHER INLAND

HAYWARD SHORELINE INTERPRETIVE CENTER

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.

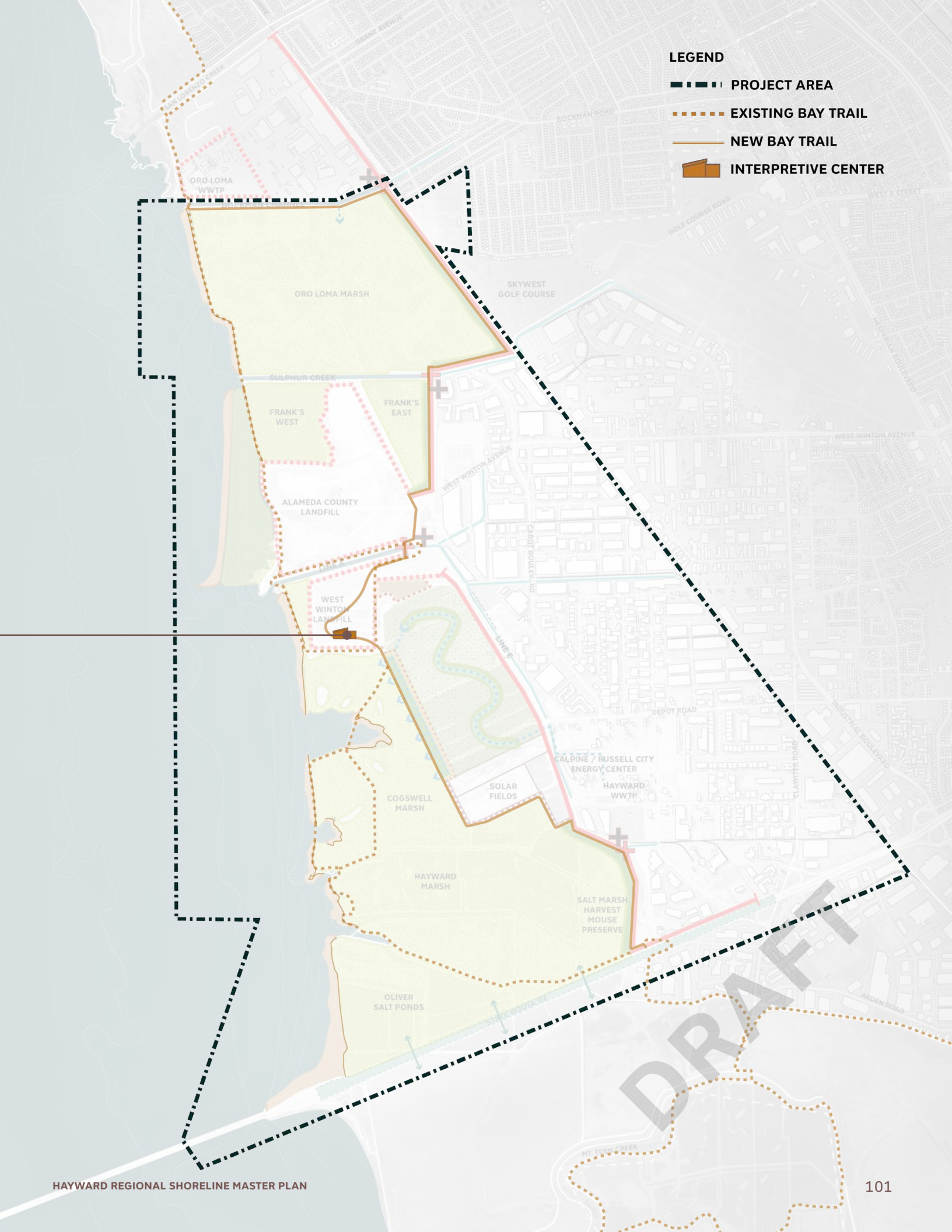
Interpretive Center is relocated to the West Winton landfill

PROS

- Access and parking is protected
- High view point
- Increased visibility

CONS

- Costly to construct on the landfill


LEGEND
PROJECT AREA
EXISTING BAY TRAIL
NEW BAY TRAIL
INTERPRETIVE CENTER
ORO LOMA WWTP
ORO LOMA MARSH
SKYWEST GOLF COURSE
SULPHUR CREEK
FRANK'S WEST
FRANK'S EAST
ALAMEDA COUNTY LANDFILL
WEST WINTON LANDFILL
WEST WINTON AVENUE
COLLECTOR LINE F
DEPOT ROAD
CALPINE / RUSSELL CITY ENERGY CENTER
HAYWARD WWTP
SOLAR FIELDS
COGSWELL MARSH
HAYWARD MARSH
SALT MARSH HARVEST MOUSE PRESERVE
OLIVER SALT PONDS
DRAFT