Sonoma Creek Baylands Strategy - Executive Summary

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Introduction

Prior to the 1850s, the Sonoma Creek baylands were a vast mosaic of tidal and seasonal wetlands. Fresh water, sediment, and nutrients were delivered from the upper watershed to mix with the tidal waters of San Pablo Bay, creating a small estuary teeming with life. Floods along Sonoma Creek and Schell Creek spread out in an alluvial fan in the region south of present-day State Route (SR) 121, creating distributary channels and depositing sediment.

During the late 19th and early 20th centuries, the Sonoma Creek baylands, along with 80 percent of wetlands around San Francisco Bay, were diked and drained for agriculture and other purposes. This created discrete parcels and simplified creek networks. Flow of water and sediment across the alluvial fans was blocked and confined to the creek channels. As a result, portions of Schellville and surrounding areas in southern Sonoma County are frequently flooded during relatively small winter storm events, when flows overtop the banks of Sonoma and Schell creeks, resulting in road closures at the junction of SR 121 and SR 12 that affect travel and public safety.

Much of what used to be tidal marsh has been transformed into other habitat types including diked agricultural fields. Narrow strips of tidal marsh have developed adjacent to the tidal slough channels that run between the diked agricultural baylands.

Development within the Sonoma Creek baylands continues despite the chronic flooding that is caused by filling and fragmentation of the floodplain. Flooding, and loss of habitat, species, and ecological function will increase with climate change-driven sea level rise and increased storm intensity.

Project Purpose

The purpose of this strategy is to provide Sonoma Land Trust and partners with a clear and comprehensive plan that:

- Coordinates the protection, acquisition, restoration, and enhancement of diverse baylands habitats,
- Integrates natural processes to increase climate resilience,
- Identifies opportunities for public access, and
- Provides recommendations for SR 37 and the SMART rail line.

Implementation of this strategy is intended to benefit species including the following special status species: California Ridgway's Rail, California black rail, salt marsh harvest mouse, Chinook salmon, and steelhead.

Background

The study area falls entirely within Sonoma County and includes the Sonoma Creek and Tolay Creek baylands between SR 121 and the bay and adjacent wetland-to-upland transition zones (Figure 1).

Figure 1. Study Area

This project was funded by San Francisco Bay Restoration Authority, U.S. Fish and Wildlife Service, Resources Legacy Fund, and the Dolby Family Fund. The project team included Sonoma Land Trust, San Francisco Estuary Institute, Environmental Science Associates, Ducks Unlimited, Point Blue Conservation Science, U.S. Fish and Wildlife Service, California Department of Fish and Wildlife, and Sonoma Water. The project was guided by a Science Advisory Panel. Public and private landowners throughout the study area were interviewed as part of the development of the strategy. The project team consulted with

Sonoma Water, Caltrans, Metropolitan Transportation Commission, Sonoma County Transportation Authority, and SMART.

This document provides a summary of the Sonoma Creek Baylands Strategy including future scenarios, opportunities and constraints, alternatives evaluated, key findings, and implementation.

Future Scenarios

The strategy considers a planning horizon of 100 years and incorporates predicted changing conditions within the planning area over time. The projected sea level rise in San Francisco Bay is 1.9 feet by 2050, and 5.7 feet by 2100. This projection is recommended by the Ocean Protection Council for medium to high risk aversion planning purposes.

Opportunities for Tidal Marsh Restoration

- Public and private landowners have expressed interest in completing conservation and restoration projects on their land.
- Fringing marsh habitat along the tidal creek and slough channels could provide a nucleus from which to build restorations.
- The alluvial fans of Sonoma and Tolay creeks could provide connectivity to upland habitats.
- There is adequate water from multiple sources including fresh water from the Sonoma Creek watershed and the North Bay Water Reuse Program recycled water pipeline, and tidal flows from San Pablo Bay.
- The natural sediment supply could be reestablished by reconnecting with inputs from the watershed and San Pablo Bay, and elevations of subsided parcels could be augmented through beneficial reuse of dredged sediment.
- Woody debris collects in the study area following big storms. Restoring the currently diked parcels would open new areas where woody debris could collect and provide habitat complexity.
- Tidal marsh restoration would result in restoration of tidal action through the diked baylands, which could reduce the depth, extent, and duration of flooding in the Schellville area around SR 121 by reducing backwater effects and enhancing drainage.

Constraints to Tidal Marsh Restoration

- Transportation infrastructure, including SR 37 and SR 121 and the Sonoma-Marin Area Rail Transit (SMART) rail line, presents a major constraint to restoration. Larger planning efforts to address congestion and flooding along the SR 37 corridor are underway, and restoration in the Sonoma Creek Baylands will need to be coordinated with these efforts. The major constraints presented by SR 37 are the channel crossings at Tolay and Sonoma creeks, which limit the width of the channel and thus the amount of tidal volume that can be accommodated when diked baylands are restored. At Tolay Creek, the current channel crossing is too small to accommodate any additional tidal volume, so the bridge would have to be lengthened to allow restoration in the Tolay Creek watershed.
- The SMART rail line runs through many of the diked properties, limiting future restoration options. The tracks, projected to be inundated by rising seas, are vulnerable to flooding and dependent on the aging system of berms and pumps that will be under increasing pressure as sea level rises.
- Sonoma Valley Airport is a small municipal airport with a single runway located along SR 121. The airport is surrounded by various safety zones as identified in the Sonoma County General Plan,

which constrain uses in the vicinity of the airport. Due to potential bird strike hazards, large water features including wetlands, may be prohibited in airport safety zones.
- The FAA requires that the VORTAC navigational aid on the eastern side of Skaggs Island and its access be maintained during and after restoration.
- Vector control can place a constraint on the range of design options available because restoration should not increase mosquito populations that can adversely impact human health.
- PG&E electric transmission lines and gas pipelines and Sonoma Water's North Bay Water Reuse Program pipeline run through the project area. Access to these utilities will need to be maintained and incorporated into site-specific restoration designs.
- One logistical constraint may be the piecemeal acquisition of properties from willing sellers, which could limit the potential to complete restorations as envisioned in this document. Therefore, project designs will need to carefully consider changes to hydrodynamics and tidal prism to ensure that the levees of adjacent properties are not undermined by the restorations.

Alternatives Evaluated

Four landscape-scale restoration alternatives were created to provide a mosaic of functional and resilient habitats. The alternatives were hydrologically modeled under various combinations of tidal and streamflow conditions, for the present day and the year 2050. The alternatives were also evaluated using a landscape evolution model to understand how well each succeeds at achieving habitat resilience up to the year 2100, based on their initial designs and response to sea level rise.

The alternatives incorporate current and predicted conditions in the region. Most of the diked baylands properties are at or below low water. This means the tidal flow volume following levee breaching is the maximum it can be and will not increase with future sea level rise. Therefore, alternatives that can accommodate this present-day potential flow volume can accommodate much higher flows associated with sea level rise. The alternatives are designed to maximize the balance of cut and fill within each parcel, reducing the need to import or export fill between parcels. In recognition of the relative lack of sediment in the San Francisco Bay, likely accretion rates relative to projected sea level rise, and the desire to reduce dependence on imported fill, the alternatives include significant shallow subtidal and mudflat habitats, mimicking historical conditions in the San Pablo baylands. The alternatives are summarized below:

- *No Restoration* alternative reflects current conditions with assumed foreseeable climate change-caused changes in the absence of new, large-scale wetland restoration. (Figure 2)
- *Alternative 1: Maximum Tidal* represents a broad scale tidal restoration. It was assumed that the diked baylands parcels would include a mix of habitat elevations including mudflat and low to high tidal marsh. It was also assumed that tidal volume would be routed through the existing channel network, which would adjust to the additional tidal volume from the restored parcels. (Figure 3)
- *Alternative 2: Avoid the Railroad* represents the least extensive tidal restoration and least amount of fill in the restored parcels. The purpose of this alternative was to evaluate a condition that minimizes impacts to SMART infrastructure, therefore reducing the need for and cost to protect the railroad. (Figure 4)
- *Alternative 3: Enhanced Maximum Tidal* represents a modification of Alternative 1 with the primary conveyance for tidal and stream flows routed through the center of the diked parcels. Whether through planned tidal marsh restoration projects or unplanned erosion and breaching of dikes caused by sea level rise, flow volumes within the tidal channels of Sonoma Creek have the potential to increase. If flow volumes increase, then channel size will increase as well, which could result in

the erosion of the linear strips of tidal marsh that have developed in the creek and slough channels, and scouring around SR 37 bridge abutments. This alternative is configured to protect existing marsh habitat in the channel network by focusing flow and tidal volume in newly graded channels rather than scouring the existing channels. (Figure 5)

Key Findings

SR 37 & SMART

The present bridge crossings and embankments disrupt hydrologic and habitat connectivity between the baylands and the bay, and inhibit the ability to implement restoration projects. To achieve a fully integrated design for maximizing hydrologic and habitat connectivity, SMART and SR 37 should be collocated on an elevated causeway (similar to the Yolo Bypass in the Sacramento Valley) adjacent to the existing SR 37 alignment, reducing the length of track and minimizing ecological disruption. Alternatively, SMART and SR 37 should be raised on piled causeways along their existing alignments.

SR 37

As an alternative to elevating SR 37 and SMART tracks on a causeway, SR 37 design should accommodate reconnecting baylands and tributaries, allowing for the passage of water, sediment, and species. These reconnections should center around the Sonoma and Tolay creek bridge crossings and surrounding marshes. Tolay Creek bridge should be lengthened and elevated sufficiently to accommodate the increased tidal volume that would result from restoration in the Tolay Creek baylands. Tidal volume beneath the Sonoma Creek bridge increases in all the alternatives, including the no-action alternative. A more detailed analysis along with close coordination with Caltrans will be required to investigate the scour potential of the concrete piles to ensure the structural integrity of the bridges required by the increased tidal exchange.

SMART

All alternatives except the no-action alternative require protection of the SMART railroad from tidal waters to maintain the existing level of flood protection. Potential protection measures include relocating the railroad outside of tidally influenced areas, raising the railroad embankment above tidal and floodwaters, raising the railroad on a pile-supported causeway, and isolating the existing embankment with levees. Currently, both Railroad and Wingo slough bridges constrain floodwater and are proposed to be modified. The legal obligations of landowners to protect the railroad from flooding were not investigated and require further examination. A more detailed analysis will be required along with close coordination with SMART.

Public Access

Public access to open space is vital to public health and the wellbeing of our community and will be provided to the maximum extent feasible. Public access and recreation in the planning area is and will continue to be limited and access in the diked baylands should be considered temporary given the anticipated change over time as sea level rise and other ecological changes alter the landscape. The project team and Science Advisory Panel developed the following guiding principles for new public access:

1. Options for public access should be considered during every project phase.

2. Before access is included in site design, ensure that resources, including funding and the entity responsible for the design, construction, maintenance, law enforcement, and ownership of the access facility have been identified.
3. Build trails from natural, soft materials that may deteriorate with sea level rise, flooding, and inundation without harm to surrounding habitat.
4. Access should be adaptable to ensure on-going facility safety and maintenance. Facility safety and maintenance needs may change with anticipated changing landscape conditions.
5. Improve signage at existing access facilities (e.g. Eliot Trail) to increase awareness of existing public access opportunities.

Implementation

Alternative 3 emerged as the most feasible alternative overall, as it ranked the highest for meeting project goals, followed by Alternative 1 and Alternative 2. Alternatives 1 and 3 are similar in terms of infrastructure impacts, while Alternative 2 emerged as most feasible regarding infrastructure impacts because interactions with the railroad were avoided. Alternative 2 could be implemented on the shortest timeline due to infrastructure avoidance, smaller restoration area, and the need to acquire fewer properties.

It is likely that Alternative 2 will be implemented in the process of implementing Alternative 3. Alternative 3 provided the greatest level of resource protection and restoration, highest rate of carbon sequestration, greatest sea level rise adaptability, and maximized environmental benefits, mainly due to the protection of existing outboard marshes and the species that rely on them.

Feasibility level opinions of probable construction costs were developed for the three restoration alternatives (Table 1). The costs of acquisition were not included.

Table 1. Feasibility level opinion of probable cost

		Construction (includes admin and management)		
Alternative	Design & Permitting	Restoration	Infrastructure Protection	Total
1	$23.6M	$154.0M	$171.8M	**$349.4M**
2	$18.5M	$124.8M	$82.6M	**$225.9M**
3	$23.6M	$185.7M	$171.8M	**$381.1M**

Sonoma Land Trust and project partners will continue to coordinate with the SR 37 redesign and SMART to envision and implement an integrated transportation and restoration project. Simultaneously, Sonoma Land Trust and partners will continue to develop site-specific conservation and restoration projects moving toward implementation of Alternative 3. Sonoma Land Trust is committed to an accelerated implementation of the strategy, following guidance from the Bay Ecosystem Habitat Goals Project that wetland habitats restored and established prior to 2030 will be most resilient to and best able to buffer the impacts of sea level rise as it increases toward the middle of the century[1].

[1] Goals Project. 2015. The Baylands and Climate Change: What We Can Do. Baylands Ecosystem Habitat Goals Science Update 2015 prepared by the San Francisco Bay Area Wetlands Ecosystem Goals Project. California State Coastal Conservancy, Oakland, CA.

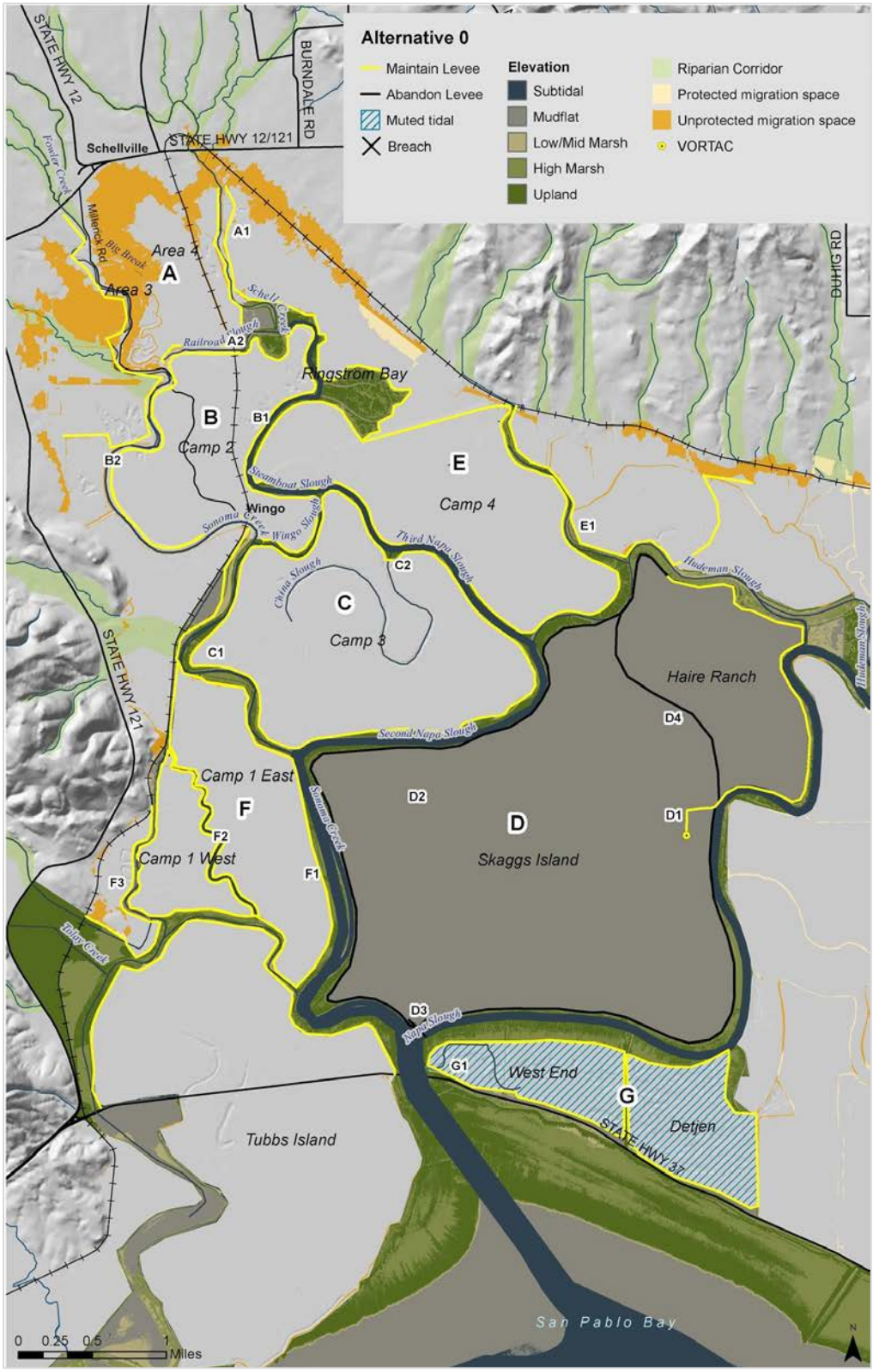

Figure 2. No Action

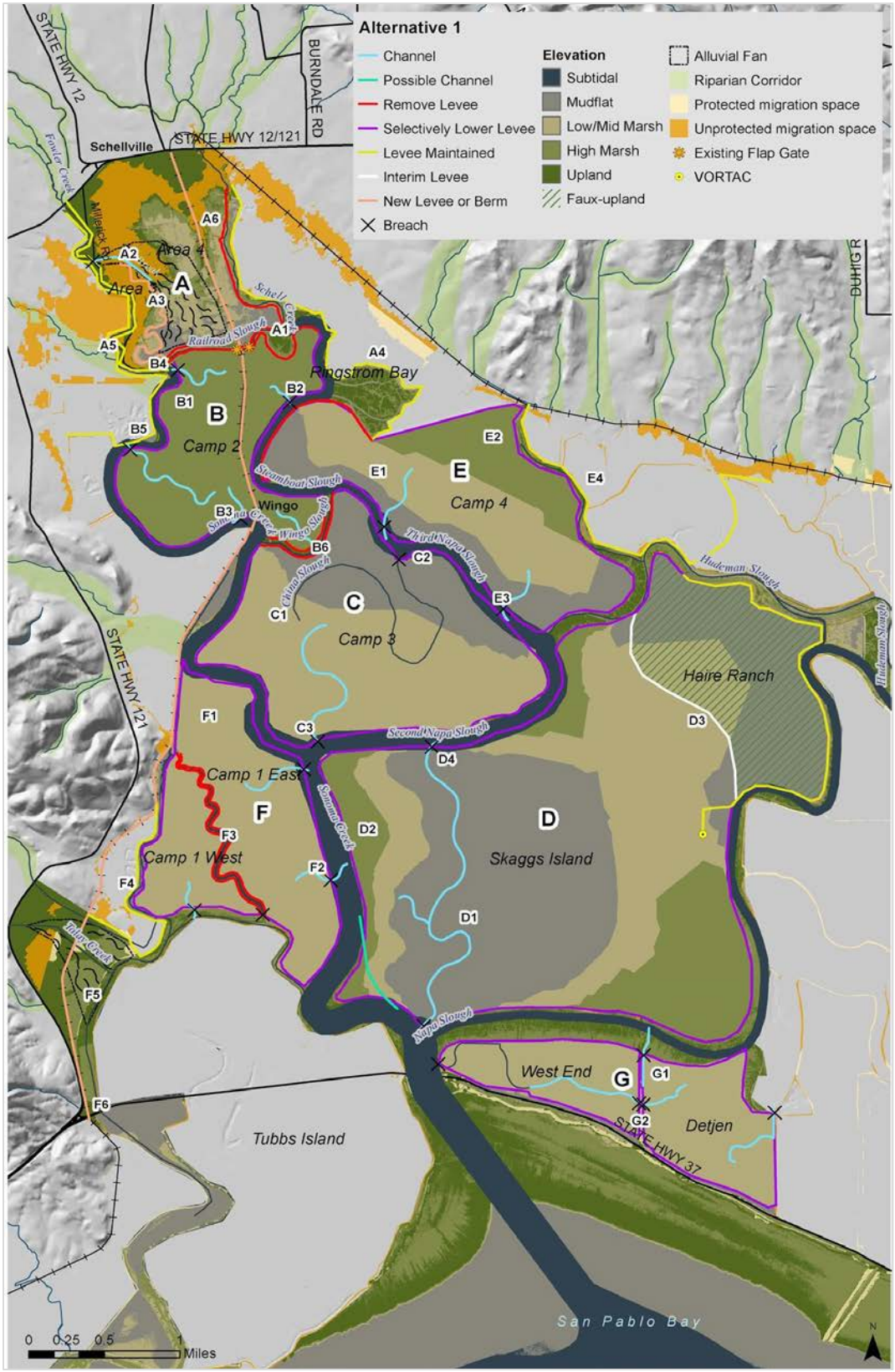

Figure 3. Alternative 1 Maximum Tidal

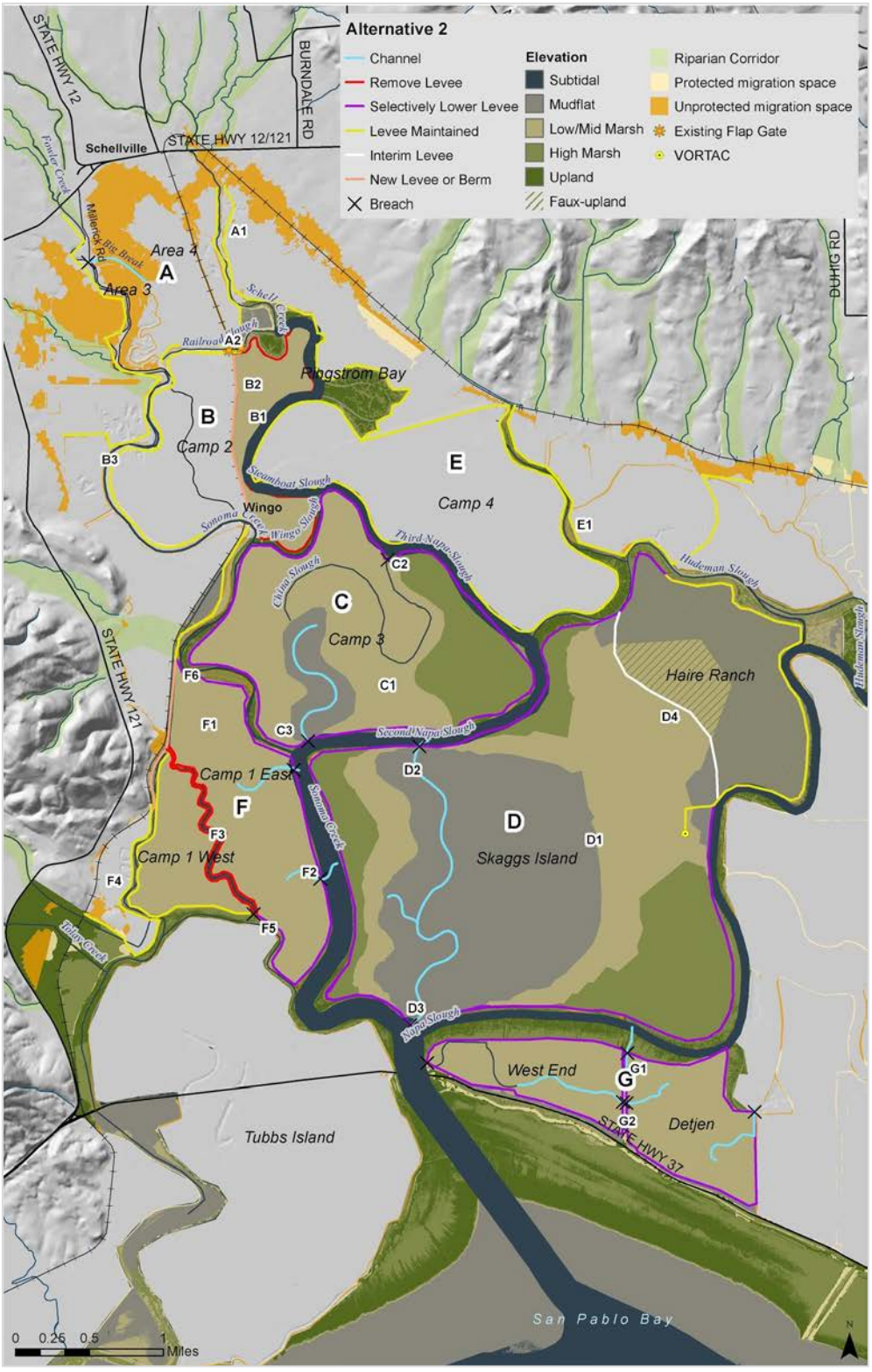

Figure 4. Alternative 2 Avoid the Railroad

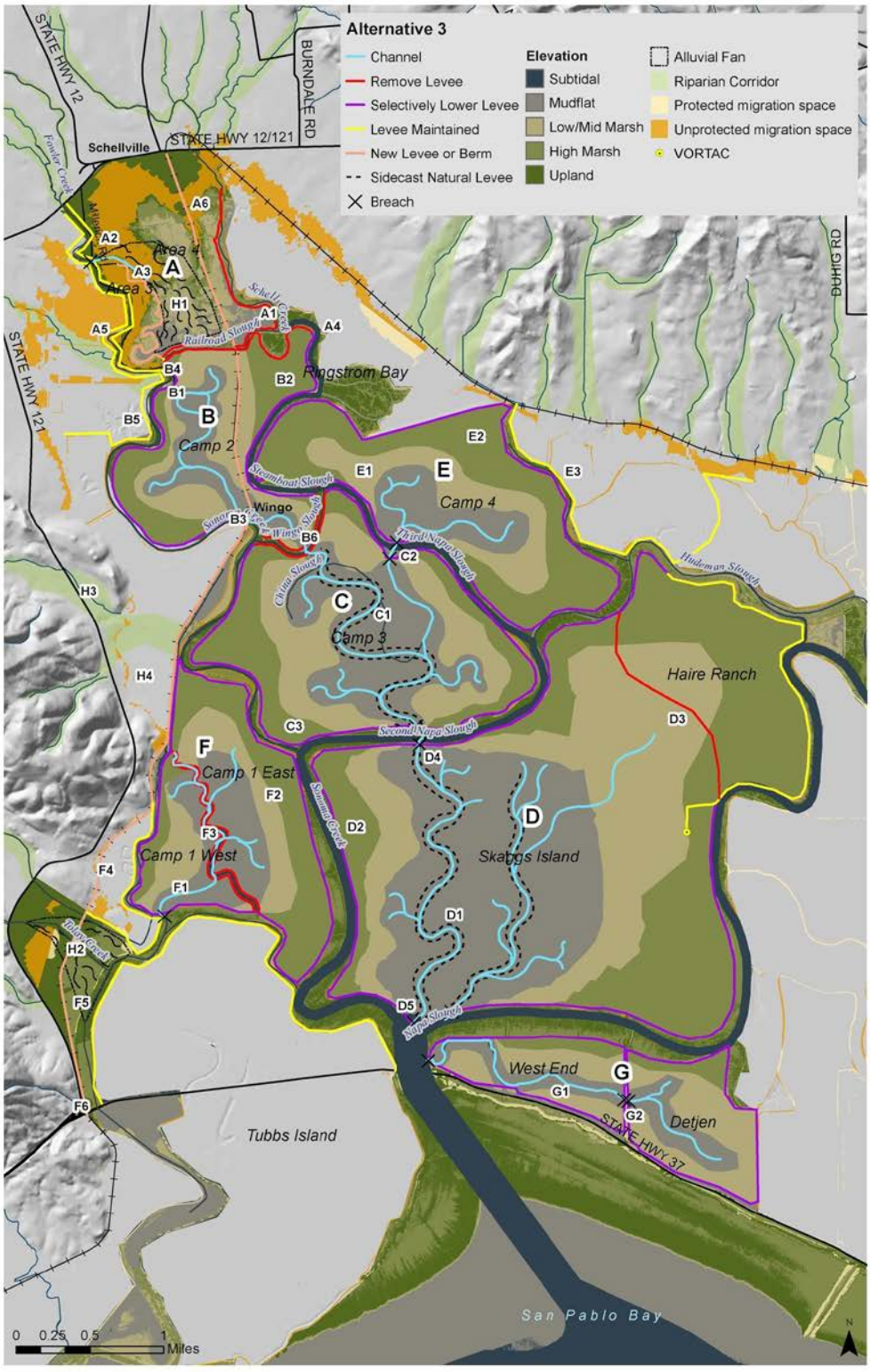

Figure 5. Alternative 3 Enhanced Maximum Tidal