

# San Pablo Baylands: Ensuring a Resilient Shoreline

October 26, 2017

## State Route 37 — Baylands Group

Audubon California

Ducks Unlimited

Friends of San Pablo Bay Wildlife Refuge

Marin Audubon Society

Point Blue Conservation Science

Road Ecology Center, UC Davis

San Francisco Bay Joint Venture

San Francisco Bay Trail Project

San Francisco Estuary Institute

Sonoma Resource Conservation District

Sonoma Ecology Center

Sonoma Land Trust

State Coastal Conservancy



State Route 37 crosses the North Bay and is shown here from the Petaluma River to the Napa-Sonoma Marshes. (Photo: Stephen Josef, 2004)

## **Purpose and Introduction**

This white paper was prepared in response to the State Route 37 (SR 37) redesign effort led by the Metropolitan Transportation Commission (MTC) and the transportation authorities of Marin, Sonoma, Napa, and Solano counties. The SR 37 — Baylands Group is comprised of North Bay wetland land managers, ecological restoration practitioners, and other stakeholders who have a long-term interest in the conservation and restoration of the tidal wetlands at the edge of the North Bay (San Pablo Baylands). Significant public investments have already been made along the length of the SR 37 corridor to protect and restore functional wetlands and ecosystem connectivity, increase climate resilience, and protect infrastructure, including SR 37. We recognize that the challenges of severe congestion and seasonal flooding that currently plague the highway will be exacerbated by sea level rise and increasing population in the North Bay, and a solution is required. However, the redesign of SR 37 must be guided by principles that protect the values and services that the natural and agricultural lands provide and increase their resilience in the future. We are committed to ensuring that the redesign is compatible with and advances the ecological restoration and conservation goals for the San Pablo Baylands. Investment in long-term resilience now will pay enormous dividends for future generations.

The redesign of SR 37 provides an unprecedented opportunity for collaboration between transportation agencies and groups who have spent decades rebuilding the bay's system of marshes. This white paper includes a set of recommendations, based on resiliency principles, for the redesign process that will protect the ecological and economic values and services of the natural and agricultural lands of the San Pablo Bay, which benefit the entire region. Our goal is to provide long-term dividends for future generations by avoiding unexpected infrastructure costs and premature infrastructure failure due to increasingly frequent extreme weather events caused by climate change, while maintaining critical ecosystem services provided by marshes such as wildlife support, flood protection, carbon storage, and water quality enhancements. We look forward to working with all local stakeholders and regulatory agencies to ensure that the SR 37 alternatives include design features that maximize the quantity, quality and connectivity of our baylands.

## **The Landscape**

The San Francisco Bay is an extraordinary resource of regional, national, and global importance<sup>1</sup> and the North Bay (Marin, Sonoma, Napa and Solano counties) is characterized by broad expanses of shallow bays and tidal and seasonal wetlands that once encompassed more than 50,000 acres fringing the San Pablo Bay. Tidal wetlands serve as a nursery for fisheries, wintering areas for migratory waterbirds, habitat for endemic species, and sources of nutrients for aquatic species.

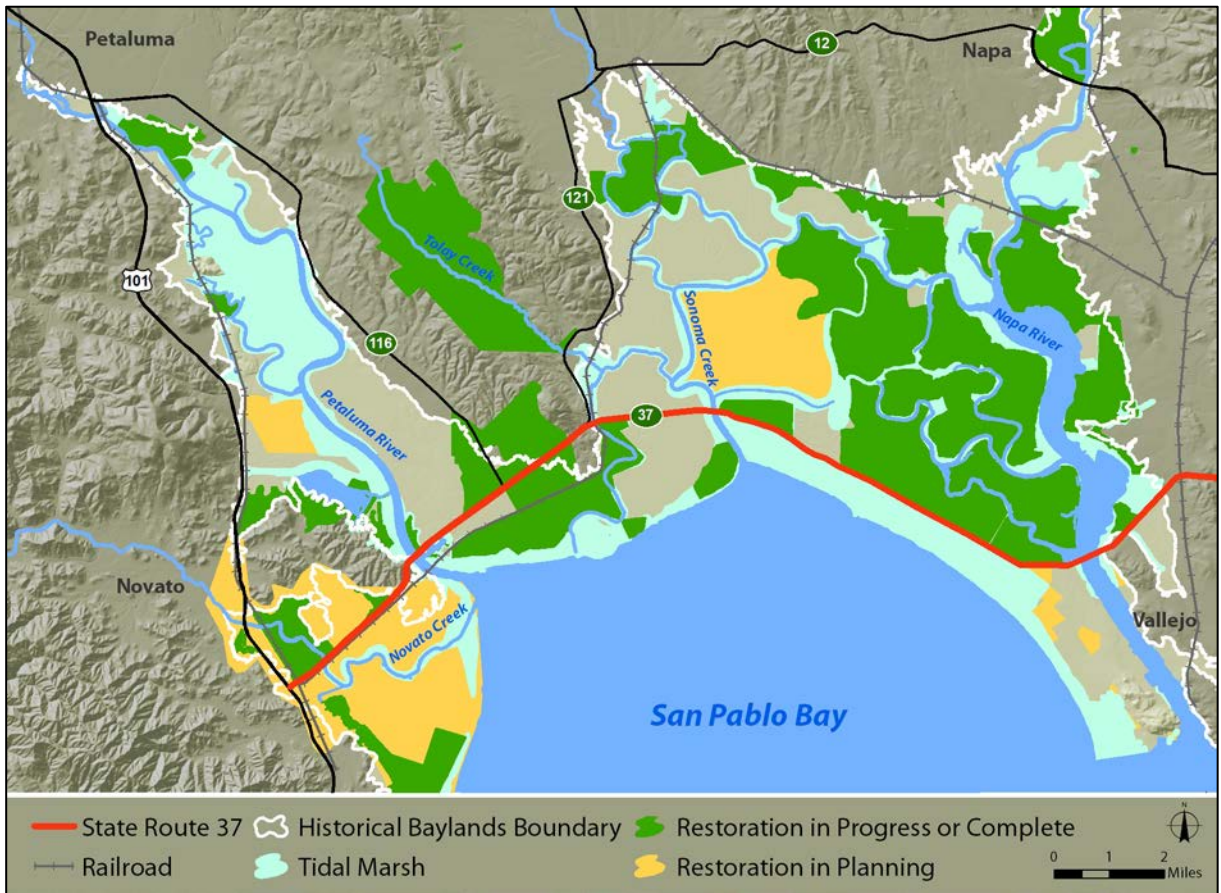
Historically, these tidal wetlands received substantial runoff from local streams that delivered sediment and nutrients essential to maintaining the wetlands and other baylands ecosystems. However, beginning in the mid-1800s, 75% of San Pablo Bay's tidal wetlands were diked, drained, and disconnected from the estuary for urban development, agriculture, salt ponds, and

---

<sup>1</sup> The San Francisco Bay Estuary has been recognized as a Wetland of International Importance by the Ramsar Convention on Wetlands, the International Union for the Conservation of Nature. The San Francisco Bay is also recognized as a Western Hemisphere Shorebird Reserve Network Site of Hemispheric Importance for shorebirds – the highest possible ranking.

infrastructure such as SR 37 and rail lines. This area of diked historical baylands extends from the edge of the bay inland along rivers and creeks to Petaluma, Novato, and the town of Sonoma. Once disconnected from the Bay, the soils dried and the land subsided up to seven feet below sea level. An extensive system of levees and pumps, primarily managed by private landowners and wildlife agencies, is now required to drain excess water and prevent daily flooding of SR 37 and other roads, railroads, farms, and residences.

The North Bay’s transportation infrastructure — SR 37 and the Sonoma-Marín Area Rail Transit (SMART) line — passes through the very heart of the San Pablo Bayland’s remaining historical tidal wetlands (see the map below). The segments of SR 37 and the SMART rail that were constructed in subsided areas are vulnerable to flooding and dependent on the aging system of berms and pumps that will be under increasing pressure as sea level rises. During the winter of 2016 – 2017, SR 37 experienced catastrophic flooding resulting in more than three weeks of road closure that forced commuters to find alternative routes. Such extreme flooding and storm events will become increasingly frequent in decades to come.



San Pablo Bay ecological restoration investments, opportunities and constraints (Map: Micha Salomon, SFEI)

### Ecological Significance

The loss of San Pablo Bay’s tidal wetlands reflect a bay-wide trend that resulted in cascading negative

impacts to regional ecosystems, our economy, and our community. Species that depend on tidal wetlands for their survival, such as California Ridgway's rail (*Rallus longirostris obsoletus*) and salt marsh harvest mouse (*Reithrodontomys raviventris*), which are only found in the San Francisco Bay Area, have been pushed to the brink of extinction due to habitat loss. Modification and loss of ecosystem functions and processes have diminished the ability of tidal wetlands to self-maintain in the face of other environmental changes, such as sea level rise and storm events. Decreased freshwater flows to the tidal wetlands and estuary have impaired water quality and quantity, and also resulted in the loss of nurseries for fish, such as steelhead trout and salmon.

Thanks to land protection and restoration efforts, stewardship of farms and ranches, and conscientious land use planning, the San Pablo Baylands remains rich in ecological resources, with tidal wetlands providing a wide array of benefits, including:

- Buffering urban areas, working lands and transportation infrastructure from the impacts of climate change, including sea level rise, flooding, and increased frequency and intensity of storm surges;
- Supporting species of conservation concern, including two endangered animals, California Ridgway's rail and salt marsh harvest mouse, and soft bird's beak (*Chloropyron molle* ssp. *molle*), an endangered plant;
- During floods and extreme high tide events, tidal wetlands reducing flood damage and erosion in low-lying areas like Petaluma, Novato, the town of Sonoma, Napa, and SR 37 by detaining floodwater and attenuating waves. This buffering action is crucial in the face of sea level rise and increased frequency and intensity of storm surges;
- Benefitting regional water quality and the sequestration and storage of carbon, augmenting statewide and global efforts to reduce greenhouse gas emissions; and
- Delivering scenic, aesthetic, recreational, historical, economic, and cultural values that provide benefits to human communities. It is estimated that recreational activities throughout baylands ecosystems, such as fishing, hunting, bird watching, and hiking, contribute between \$6.3 and \$22.9 billion to the California economy annually (SFBJV 2001). local, state, and federal agencies, conservation organizations, scientists, and members of the public agree that restoration and protection of baylands ecosystems are vitally important to maintain these benefits, as demonstrated by the collaborative Baylands Ecosystem Habitat Goals Report (Goals Project) in 1999 and 2015 and the passage of Measure AA in 2016. The Goals Project is a set of recommendations from over 100 scientists who represent a cross-section of expertise and experience in conserving the San Francisco Bay focused on the

Ecosystem processes involve the transportation of energy and materials within and between ecosystems. Baylands ecosystems rely on several different ecosystem processes for their maintenance and formation.

For example, the process of marsh migration refers to the movement of tidal wetlands upslope into their watersheds. This process is governed by sea level, hydrology, sediment supply, plants, topography, and land subsidence. If marsh migration is unable to occur, tidal wetlands may drown in rising seas and be converted to subtidal and mudflat ecosystems.

Another important ecosystem process is accretion, which is the vertical buildup of marshes with sediment and organic matter. The process of accretion has implications for whether a marsh may migrate or drown under sea level rise.

need to restore 100,000 acres to tidal marsh in the San Francisco Bay Area. Restoration of wetlands has been advanced by policy, funding, and regulatory programs and initiatives implemented by a diverse coalition of partners and stakeholders. The Goals Project also highlights the need to protect and expand investment in scenic and recreation assets such as the Bay Trail, which ultimately will be a 500-mile walking and cycling path around the entire San Francisco Bay.



SR 37 is known as the “flyway highway” because it passes through marshes that are a stopover for migratory birds on the Pacific Flyway. (Photo: Stephen Joseph, 2004)

## Restoration Investments

In comparison to the rest of the San Francisco Bay, the San Pablo Baylands are relatively undeveloped, with fairly intact natural processes. As a result, there is tremendous opportunity for restoration to create a mosaic of dynamic, diverse, and connected habitats from the bay to its watersheds. The Goals Project sets acreage targets in different habitat goal categories for protection, restoration, and enhancement, and identifies the following additional recommendations for the San Pablo Baylands:

- Restore a broad swath of tidal marsh along the shore as soon as is feasible, with the widest marshes being in the Napa-Sonoma Marsh;
- Manage the marsh bordering northern San Pablo Bay to sustain high waters as sea levels rise;
- Reconnect major tributaries (Napa River, Sonoma Creek, Novato Creek, Tolay Creek, and Petaluma River) to the bay and extend tidal wetlands into the watersheds;
- Restore riparian corridors to connect the baylands to the lower watersheds;
- Protect wet meadows, vernal pools, and swales in the lowlands adjacent to the baylands, and increase their connectivity to the baylands;
- Work with willing sellers to conserve valleys and plains with low-intensity agriculture adjacent to tidal areas for future marsh and transition zone migration; and
- Elevate SR 37 and modify or realign rail lines and other infrastructure to allow the unimpeded passage of water, sediment, and wildlife.

Since the 1980s, many organizations and agencies have actively implemented land acquisition and restoration projects, and significant progress has been made towards meeting restoration goals for the San Pablo Baylands region. Approximately \$600 million has been invested in the conservation and restoration of these baylands as private, local, state, and federal agencies work to strengthen



Setback levee built to protect SR 37 for the Cullinan Ranch tidal marsh restoration project, part of the USFWS San Pablo Bay National Wildlife Refuge. (Photo: Ducks Unlimited)

and improve habitat for threatened and endangered species. For example, California Department of Fish and Wildlife owns and manages the 15,000-acre Napa-Sonoma Marshes Wildlife Area and the U.S. Fish and Wildlife Service owns and manages the 19,200-acre San Pablo Bay National Wildlife Refuge.

### **The SR 37 Redesign**

SR 37 is the 21-mile roadway that spans the northern arc of San Pablo Bay, connecting the counties of Marin, Sonoma, Napa, and Solano. Some 40,000 cars use the road each day, which links communities across the North Bay from Vallejo to Marin and beyond to the rest of the San Francisco Bay Area. Traffic conditions on SR 37 are highly congested, and commuters face lengthy and increasing commute times.

In 2015, MTC and the transportation authorities and elected officials of Marin, Sonoma, Napa and Solano counties formed the SR 37 Policy Committee to develop a solution to the severe congestion that plagues SR 37. The flooding event and



SR 37 flooding, January 23, 2017  
(Photo: Sonoma County Transportation Authority)

closure of SR 37 during the winter of 2016 — 2017 was a dramatic demonstration of the urgent need to rebuild the highway, not only to relieve congestion, but to prepare for future flooding and sea

level rise. With approval from Caltrans, MTC initiated a Design Alternatives Assessment (DAA) to evaluate design alternatives for the highway. Completion of the DAA is scheduled for spring of 2018. The SR 37 Policy Committee is also conducting an analysis to evaluate financing options for rebuilding the highway (including construction of a toll road), and options for public, private, or public-private ownership of the highway. To ensure that the design is aligned with conservation and restoration goals for the region, MTC has formed an Environmental Working Group, which includes representatives of the SR 37 — Baylands Group, environmental regulatory agencies, and transportation agencies.



Upland to tidal marsh transition in the Sonoma Baylands (Photo: Scott Hess, 2008)

## Recommendations

This white paper demonstrates the consensus around the critical importance of protecting, enhancing, and restoring the tidal wetlands, natural resources, ecosystem services, and habitats of the San Pablo Baylands. Climate change effects, including sea level rise and extreme storm events, pose a direct and urgent threat to the ecosystems and infrastructure of the baylands. Tidal wetland restoration and acquisition of upland tidal wetland migration areas over the next two decades will help buffer infrastructure and communities from storms and flooding for the rest of the century. We recommend integration of infrastructure improvements for SR 37 with existing and future habitat planning, conservation, and restoration projects to ensure healthy ecosystem function and resilience to landscape-scale change of San Pablo Bay. Our specific recommendations include the following:

- Improvements to the SR 37 corridor should be integrated with the continued implementation of existing habitat goals and the extensive ecological planning for this region that has already occurred, to ensure ecosystem function and landscape resiliency into the future.
- Improved ecological connectivity should guide the development of alternatives for

reconstructing SR 37 along its current alignment. The Goals Project recommendation to achieve this objective is to “elevate Highway 37 and modify or realign rail lines and other infrastructure to allow the full passage of water, sediment and wildlife” (Goals Project 2015a, page 139).

- The diversity and complexity of the San Pablo Baylands require a variety of design solutions which are appropriate to the landscape setting. To support conservation and restoration of the baylands, SR 37 corridor improvement should include consideration of historical ecology; changes that have occurred since the land was diked and drained for agriculture, including subsidence; remaining historic habitats and other valuable existing habitats; habitat conservation and restoration projects that have been completed or are ongoing or planned; the impacts of projected sea level rise on wetlands, including the need for marsh migration; and the needs of specific wildlife populations. In some areas, elevation of SR 37 may be needed to restore a historical tidal connection, while in other areas elevation of the highway may be needed to improve habitat connectivity for endangered tidal marsh species, or to accommodate marsh migration due to sea level rise.
- Although the planning for the new design may be done in segments, it is essential that planning for the corridor be North Bay-wide to capture the breadth of ecological processes in the region, including the contribution from upland habitats, rather than focusing solely on the area immediately adjacent to the SR 37 corridor.
- Sea level rise and storm projections should be based on the most recent report on the subject by the Ocean Protection Council (OPC) that will be updated in January 2018. For infrastructure projects with long life spans, such as the SR 37 project, OPC recommends using long-term, end-of-century sea level rise projections. For the SR 37 project, MTC should use a range of sea level rise projections. This range should include an optimistic projection (e.g. 1.6 feet by 2100 Representative Concentration Pathway (RCP) 2.6 median), a moderate projection (e.g. 4.4 feet by 2100 RCP 8.5 5% probability) and a high projection (e.g. 10 feet by 2100 H++). Moreover, for each projection MTC should plan for storms and other extreme events in addition to sea level rise. The projections should be used to inform project design as well as to evaluate the costs and benefits of various design alternatives.
- The corridor-wide redesign of SR 37 is anticipated to occur over decades and it is likely that Caltrans will implement near-term solutions to relieve urgent congestion and flooding issues. It is imperative that wetland resources are protected and an array of restoration options remain open during implementation of these solutions. Near-term solutions should avoid filling wetlands and the bay and installation of infrastructure, such as sea walls, that would be barriers to tidal exchange. Moreover, near-term solutions should avoid foreclosing design options for the rest of the corridor. Near-term solutions should not foster acceptance of the status quo or a premature commitment to incremental improvements rather than open-minded consideration of a design that is significantly different from the current one.
- Disadvantaged communities are disproportionately affected by tolls. Therefore, the SR 37 redesign should seek opportunities to minimize financial impacts to disadvantaged drivers and to ensure that the highway design relieves, rather than redirects, transportation pressure.
- The SR 37 redesign corridor plan should include opportunities for multi-modal transportation



options that reduce greenhouse gas emissions, including passenger rail, ferries, and bike paths, as well as recreation options, such as the Bay Trail.

## References

The Bay Institute, Sonoma Land Trust, and Sonoma Ecology Center. 2003. Preliminary evaluation of the environmental impacts of a resort casino proposed by the Federated Indians of the Graton Rancheria at Lakeville Highway and State Highway 37 in southern Sonoma County, California. Produced and distributed with assistance from the San Francisco Bay Joint Venture. Novato, CA.

California Department of Transportation. 2015. Transportation concept report, State Route 37, District 4. Available online at <http://www.dot.ca.gov/dist4/systemplanning/docs/tcr/TCR-37-FINAL-SIGNED.pdf>.

Goals Project. 1999. Baylands Ecosystem Habitat Goals. A report of recommendations prepared by the San Francisco Bay Area Wetlands Ecosystem Goals Project. First Reprint. U.S. Environmental Protection Agency, San Francisco, Calif./S.F. Bay Regional Water Quality Control Board, Oakland, CA.

Goals Project. 2015a. 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.

Goals Project. 2015b. Science Foundation Chapter 6: Carbon sequestration and greenhouse gases in the Baylands. Baylands Ecosystem Habitat Goals Science Update 2015 prepared by the San Francisco Bay Area Wetlands Ecosystem Goals Project. California State Coastal Conservancy, Oakland, CA.

Griggs, G, Árvai, J, Cayan, D, DeConto, R, Fox, J, Fricker, HA, Kopp, RE, Tebaldi, C, Whiteman, EA (California Ocean Protection Council Science Advisory Team Working Group). Rising Seas in California: An Update on Sea-Level Rise Science. California Ocean Science Trust, April 2017.

Partnership for the San Pablo Baylands. 1999. San Pablo Baylands: A plan to protect and restore the region's farms and wetlands. A project of Save the Bay, funded by the San Francisco Bay Regional Water Quality Control Board. Oakland, CA.

Ramsar. 2014. *Annotated List of Wetlands of International Importance, United States of America*. Retrieved from [https://rsis Ramsar.org/sites/default/files/rsiswp\\_search/exports/Ramsar-Sites-annotated-summary-United-States-of-America.pdf?1508870180](https://rsis Ramsar.org/sites/default/files/rsiswp_search/exports/Ramsar-Sites-annotated-summary-United-States-of-America.pdf?1508870180).

San Francisco Bay Joint Venture. 2001. Restoring the Estuary: Implementation strategy of the San Francisco Bay Joint Venture. Fairfax, CA.

San Francisco Bay Joint Venture. 2008. Wetland restoration and projected impacts from climate change: Recommendations for and by partners of the San Francisco Bay Joint Venture. Fairfax, CA.

San Francisco Bay Trail Project. 2017. *Home page*. Retrieved from <http://baytrail.org/>.

San Francisco Estuary Partnership. 2016. Comprehensive Conservation and Management Plan for the

## San Francisco Estuary (Estuary Blueprint)

Shilling, FM, Ward, K, Waetjen, D (UC Davis); Vandever, J, Villafranca, J, May, K, Kassem, S, Lightner, M (AECOM), 2016. State Route 37 Integrated Traffic, Infrastructure and Sea Level Rise Analysis: Final Report. California Department of Transportation, District 4. Oakland, CA.

U.S. Fish and Wildlife Service. 2013. Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California, Volume 1. Sacramento, CA.

U.S. Fish and Wildlife Service. 2016. San Pablo Bay National Wildlife Refuge Climate Adaptation Plan. Prepared by Point Blue Conservation Science, U.S. Fish and Wildlife Service, and Michigan State University. Petaluma, CA.

Western Hemisphere Shorebird Reserve Network. 2009. *San Francisco Bay*. Retrieved from <http://www.whsrn.org/site-profile/san-francisco-bay>.