

TO: PARKS AND RECREATION COMMISSION

FROM: PUBLIC WORKS DEPARTMENT

DATE: FEBURARY 25, 2020

SUBJECT: UPDATE ON THE PALO ALTO HORIZONTAL LEVEE PILOT PROJECT

RECOMMENDATION:

This is an informational report to provide an update on the progress of the Palo Alto Horizontal Levee Pilot Project and to obtain input from the Parks and Recreation Commission on proposed project design elements. There is no staff recommendation at this time.

BACKGROUND

The City of Palo Alto in collaboration with the San Francisco Estuary Partnership (SFEP) has been evaluating the feasibility of constructing horizontal levees within the Palo Alto Baylands. A horizontal levee is a flood control levee with a gently sloping berm along the Bay shoreline which provides key transitional habitat between tidal wetlands and terrestrial uplands (Figure 1). Its target vegetation consists of grassy wet meadow, freshwater/brackish marsh, and riparian scrub. This type of habitat has been decimated by development along the shoreline that separates the uplands that surrounded historic tidal marshes from the remnant marshes that currently occupy the Bay’s margins and is a high restoration priority for resource agencies. Horizontal levees include refugia habitat and connectivity between marshes for species including endangered species found only along the Bay shoreline, such as the saltmarsh harvest mouse and Ridgway’s rails.

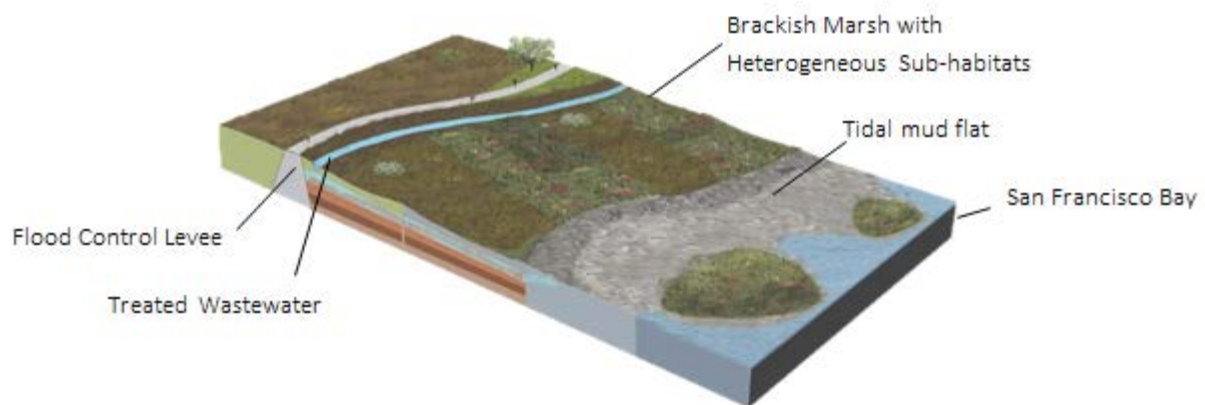


Figure 1: Illustration of an example horizontal levee system.

In addition to habitat enhancements, horizontal levees contribute to sea level rise resilience by encouraging sediment and biomass accretion that builds ground surface elevations over time. Horizontal levees also contribute to flood management by attenuating waves, allowing for flood control levees to be constructed with crest elevations up to two feet lower than conventional levees and provide erosion protection that limits the need for rip-rap on the levee face.

To replicate the natural transition from freshwater to estuarine habitats, a freshwater source is required. Since the natural seeps along the San Francisco Bay have been constrained, treated wastewater could be used to irrigate horizontal levees. In so doing, the treated wastewater would receive polishing treatment for increased removal of nutrients and trace organics as it moves through the levee prior to discharge to the Bay.

Unlike the majority of the shoreline along the San Francisco Bay, the Palo Alto shoreline, while highly developed and altered, continues to sustain tidal marsh. The Palo Alto Baylands are backed by low levees and a closed landfill. Directly behind these levees are significant City of Palo Alto infrastructure, including the City's Regional Water Quality Control Plant (RWQCP), airport, the Palo Alto Flood Basin, roads and light commercial development. Potential flooding of City infrastructure, buildings, and other development west of Highway 101 are limited by the existing levees. The existing flood control levees are not engineered to meet Federal Emergency Management Agency (FEMA) accreditation standards, and in many locations do not provide 100-year flood protection. To improve these levees, the City has partnered with nearby cities and county flood agencies as a member of the project teams for the Strategy to Advance Flood protection, Ecosystems, and Recreation along San Francisco Bay (SAFER Bay) and the South San Francisco Bay Shoreline Projects. One of the goals for these flood control levee improvement projects is to incorporate natural infrastructure, such as horizontal levees, to provide increased flood protection that can evolve in the future, restore Bay habitats, and enhance public access. As expected, these large flood control levee improvement projects will take years to plan, design, and construct. During this time, the City of Palo Alto and SFEP hope to gain valuable information from a permanent horizontal levee pilot system, which could then be fed into the design for broader implementation of horizontal levees as part of the larger flood control levee improvement projects.

As such, the City of Palo Alto in collaboration with SFEP and Environmental Science Associates has built upon the Conceptual Design Report that was completed and presented at the November 27, 2018 Parks and Recreation Commission meeting to produce a Preliminary Design Report for a pilot horizontal levee system located within the Palo Alto Baylands. Funding for the development of the Preliminary Design Report came from the United States Environmental Protection Agency's Climate Ready Estuaries Program. A link to the Preliminary Design Report is included as Attachment B and outcomes from the Report are summarized in the Discussion section below.

DISCUSSION

The Preliminary Design Report documents the vision (30% project definition) for a pilot horizontal levee adjacent to the City's RWQCP and Airport along the edge of Harbor Marsh (Figure 2). The project site is part of the Palo Alto Airport parcel and contains a public parking area, existing trail, and upland/ruderal vegetation that is largely non-native and poor habitat quality.



Figure 2: Palo Alto Horizontal Levee Pilot Project Location (yellow) Considered in Preliminary Design Report

Objectives for the Palo Alto Horizontal Levee Pilot Project are as follows:

- Improve habitat along the perimeter of Harbor Marsh for native species. Restore rare and historic broad ecotone that supports a variety of transitional plant assemblages including riparian scrub, wet meadow, freshwater marsh, and narrow band of brackish alkali-bulrush wetland within the adjacent salt marsh.
- Adapt to sea level rise by providing a transitional slope that will support freshwater plants which build organic soils that may be able to keep pace with some level of sea level rise. Saltmarsh is expected to gradually migrate up the slope with rising water levels.
- Reduce flood risk by integrating a horizontal levee on the outboard side of a traditional flood control levee providing wind-wave attenuation and vegetative protection for the flood control levee core.
- Provide polishing treatment to discharged treated wastewater.
- Maintain public access to the existing trail system while providing opportunities for compatible low-impact recreation and increased social infrastructure.
- Be on the leading edge of integrating habitat enhancement with sea level rise adaptation and novel wastewater treatment approaches around the San Francisco Bay.

The Palo Alto Horizontal Levee Pilot Project includes the following main elements:

- Construction of a Horizontal Levee and Flood Control Levee Core - The proposed horizontal levee pilot site shares the same alignment with two alternative alignments for the proposed SAFER Bay flood control levee. The horizontal levee pilot system will be constructed on the outboard side between the proposed flood control levee and adjacent Harbor Marsh. As such, sequencing and integration with future flood control levee improvements are vital to avoid habitat impacts and complicated permitting. Construction sequencing and integration plans with City flood control levee improvements have yet to be finalized, however various options are discussed in the Preliminary Design Report. The 30% design drawings and associated cost estimate are based on the option to build the core of the flood control levee at the same time as the horizontal levee pilot system. This option would require the future flood control levee improvement project to raise the levee to the design elevation during subsequent construction. This option is expected to minimize future permitting for flood control levee improvement projects while maintaining aesthetic goals for the area. Sequencing and integration are to be finalized as the design for the Palo Alto Horizontal Levee Pilot Project progresses.
- Water Distribution Infrastructure - Highly treated wastewater would be piped from an existing effluent discharge pipe and directed to a subsurface distribution chamber connected to a gravel treatment layer. Polished wastewater would seep onto the surface of the ecotone habitat slope at the terminus of the treatment zone and migrate to the adjacent salt marsh via shallow surface/ subsurface flow. Hydraulic controls would be located at both the Regional Water Quality Control Plant and the project site.
- Restoration Planting - An assemblage of native seeds and plugs would be planted to provide a diverse plant palette that would evolve over time to adapt to the unique and heterogeneous habitat niches formed by variable topography, hydrology, and salinity of the site.
- Construction of a Connecting Segment of the Marsh Front Trail - Currently the Marsh Front Trail parallels Embarcadero Road within the Project's footprint. The current trail alignment through the project area is between 20 and 100 feet from salt marsh. Based on initial environmental stakeholder feedback, the Preliminary Design relocated this trail further from Harbor Marsh than the existing trail, to address concerns with potential impacts to sensitive species while providing a similar social infrastructure function. Balancing public access with wildlife habitat goals are an important objective of this project and will require further discussions with experts and stakeholders as the design progresses.
- Long-term Operations and Maintenance - The hydrologic regime and plant colonization would be actively monitored, maintained, and adaptively managed over the establishment period. When the system reaches maturity as the plants become fully established and the hydrologic regime is fine-tuned, it is expected for it to function passively with only periodic adjustments and maintenance by City staff.

Design completion, permitting, and construction costs are estimated at \$4,745,000 (-20% to 30% accuracy).

As a part of this preliminary design process, a number of potential project challenges were identified, including: potentially lengthy and costly permitting, potentially costly compensatory mitigation requirements, and potential Federal Aviation Administration (FAA) permitting challenges associated with the nearby airport. To attempt to resolve key identified issues and streamline permitting and environmental compliance, a number of recommendations were made, including alternative site selection and continuing ongoing engagement of project stakeholders which include members of the public, permitting and wildlife agencies, CEQA-responsible agencies, and City Airport and Planning staff, to attempt to adequately resolve these potential issues and address stated concerns.

NEXT STEPS

SFEP was recently awarded \$500,000 from the California Coastal Conservancy under the recent Proposition 1 funding opportunity to progress this project to a 60% design and initial permitting. As part of this progression, the pilot location has been reconsidered and will be moved to the below location (Figure 3). This new location was previously identified under the Conceptual Design Report, is located within Harbor Marsh and therefore can utilize much of the information and data compiled under the Preliminary Design Report, and is located off airport property which is thought to help with gaining FAA approvals.

Upcoming community engagement include obtaining project specific feedback from resource agencies and industry experts at the March 2, 2020 Transforming Shorelines Collaborative meeting, and two community workshops planned for the coming year. The first workshop will focus on the trail location and the sometimes-incompatible goals of public access and habitat enhancement and the second workshop is meant to brainstorm youth and disadvantaged community involvement in the project.



Figure : Palo Alto Horizontal Levee Pilot Project Relocation (yellow – initial location; red – new location)

City staff in collaboration with SFEP continues to seek grant funding to complete the design and construction phases of the Palo Alto Horizontal Levee Pilot Project. City staff and SFEP plan on submitting an application to the United States Environmental Protection Agency's upcoming funding opportunity under the Water Quality Improvement Fund for additional funds needed to finalize the design and begin construction.

ENVIRONMENTAL REVIEW

This is a preliminary study and therefore does not require California Environmental Quality Act (CEQA) review, because the study does not meet the definition of a project under Public Resources Code 21065. An environmental assessment in accordance with CEQA will be prepared during the next phases of the project and a permitting strategy has been developed to guide the project team in this endeavor (refer to Appendix D of the Preliminary Design Report for more details).

ATTACHMENTS

- A. Factsheet – Palo Alto Horizontal Levee Pilot Project
- B. [Palo Alto Horizontal Levee Pilot Project Preliminary Design Report](#)

PREPARED BY:

Samantha Engelage
Senior Engineer
Environmental Services Division, Public Works Department
City of Palo Alto