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Project name: Palo Alto Grade Separation Study

Project ref:

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Sea Level Rise Memo

Executive Summary

AECOM was tasked to evaluate the effects of sea level rise on the remaining railroad grade separation alternatives in the City of Palo Alto.

Two parameters were considered for the sea level rise evaluation: projected sea level rise for the years 2050 and 2100 from the City of Palo Alto Sea Level Rise Vulnerability Assessment, and increased groundwater elevations resulting from sea level rise.

- The Meadow-Charleston Trench alternative would be at some risk for the year 2100 sea level rise inundation. The remaining alternatives would not be exposed to sea level rise inundation.
- The Meadow-Charleston Trench and the Meadow-Charleston Underpass would have project components within existing groundwater elevations. Increased groundwater elevation from sea level rise increases the potential for impacts to these alternatives from emergent groundwater.
- While project components for the Meadow-Charleston Hybrid would not be within existing groundwater levels, the lowest proposed underpass elevation is close to current groundwater levels. Increased groundwater elevations from sea level rise might expose the underpass to emergent groundwater by 2100. Increased groundwater elevations from sea level rise can result in cracks, potholes, and sinkholes in the road.
- The Churchill Closure with Mitigations, the Churchill Partial Underpass, and the Meadow-Charleston Viaduct are not anticipated to be affected by sea level rise or emergent groundwater.

Sea Level Rise Evaluation

Over the past century, the sea level in the San Francisco Bay Region has increased by 8 inches (https://oehha.ca.gov/climate-change/epic-2022/impacts-physical-systems/sea-level-rise).
The majority of the alternatives would not be affected by sea-level rise (SLR) for the years 2050 and 2100, based on projections from the City of Palo Alto Sea Level Rise Vulnerability Assessment (Assessment). Furthermore, the existing Caltrain routes and stations in the City would not be exposed to inundation or 100-year storm-tide flooding at a given amount of SLR, except for less than 1 mile of Caltrain routes in the event of an 84-inch SLR scenario, per the Assessment.

The Meadow-Charleston Trench Alternative shows a profile elevation of 4 feet as the lowest proposed track elevation profile. SLR for the year 2100 is projected to be approximately 3.42 feet. In addition, this profile is shown to be constructed well into the groundwater table, which will require the use of a pump station for dewatering. The pump would be installed at an elevation just below the proposed track elevation, which would be affected by SLR projections for the year 2100. No other alternatives would be affected by SLR.

As sea levels rise, the surface of the shallow groundwater table, especially in low-lying coastal communities, will also rise. Much of the area of the City of Palo Alto is low-lying. Emergent groundwater occurs when the water table rises to or above the ground surface and creates ponding. Groundwater within 6 feet of the surface can damage roadways when it meets the bottom of the roadbed underground. Over time, the roadbed could deteriorate from below, increasing the likelihood of cracks, potholes, and sinkholes.

Per the Assessment, the future groundwater conditions were projected taking a 1:1 correlation between SLR and shallow groundwater rise, as a conservative approximation. This means that probable increases in SLR listed in the Table 1 are assumed to be the same increases for groundwater levels as well. Less than 1 mile of existing Caltrain routes would be exposed to emergent groundwater for all scenarios of SLR (12, 24, 36, 48, 66, and 84 inches).

Since the Meadow-Charleston Trench and Meadow-Charleston Underpass profiles would be constructed well into the groundwater table, emergent groundwater could be a potentially significant effect, combined with SLR. Groundwater depletion and further studies will need to be prepared to further assess the feasibility of this Alternative. The Meadow-Charleston Hybrid Alternative is at some risk for emergent groundwater.

The Churchill partial underpass Alternative, Churchill closure Alternative, and Meadow-Charleston Viaduct Alternative would not be substantially impacted by emergent groundwater projections.

Table 1 - Elevation Summary

Alternative	Lowest Proposed Track Elevation (ft)	Lowest Road or Ped/Bike Underpass Elevation (ft)	Approx. Groundwater Elevation range (ft)	Sea-level rise[a] 2050 (66% probability) (ft)	Sea-level rise[a] 2100 (66% probability) (ft)	SLR Impact Rating[b]	Emergent Groundwater Impact Rating[b]
Churchill Closure	47	27 at Kellogg, 20 at Seale	8-11	1.08	3.42	No impact	No Impact
Churchill Partial Underpass	47	25	8-11	1.08	3.42	No Impact	No Impact
Meadow-Charleston Hybrid	35	30 at Meadow	21	1.08	3.42	No Impact	Potential Impact to roadway
		34 at Charleston	22				
Meadow-Charleston Trench	4	33 at Meadow	21-22	1.08	3.42	Some Impact	Most Impact
Meadow-Charleston Underpass	36	12 at Meadow	21	1.08	3.42	No Impact	Most Impact
		16 at Charleston	22				
Meadow-Charleston Viaduct	35	33 at Meadow	21-22	1.08	3.42	No Impact	No Impact

Projections represent an SLR increase above the baseline year of 2000.

Sources:

a. City of Palo Alto. 2022. Sea Level Rise Vulnerability Assessment, Available: https://www.cityofpaloalto.org/files/assets/public/v/1/public-works/environmental-compliance/sea-level-rise/palo-alto-sea-level-rise-vulnerability-assessment-june-2022-062822-linked-final.pdf. Current Global Sea Level = 3.97 in (101mm), NASA Global Climate Change. Available: https://climate.nasa.gov/vital-signs/sea-level/

b. Per City of Palo Alto Summary of Evaluation/City Council-Adopted Criteria