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# memorandum

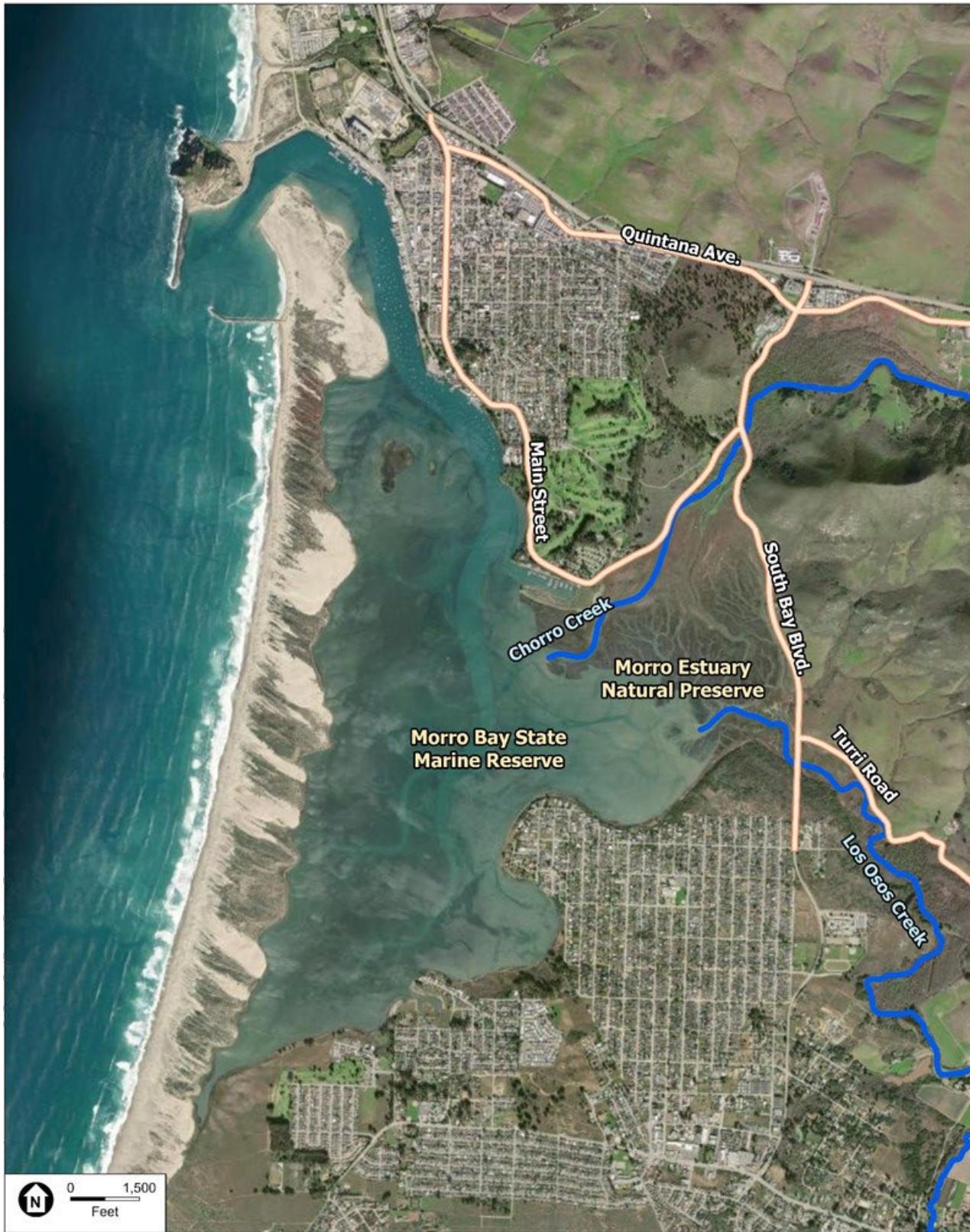
date September 26, 2025  
to John Dinunzio, SLOCOG  
from Frederico Scarelli, PhD, Shannon Fiala, Nick Garrity, PE, ESA  
subject FINAL Summary of Alternatives and Adaptation Pathways Framework Memorandum for the Morro Bay Estuary Climate Transportation Plan

## 1 Introduction

This memo presents a preliminary assessment of the alternatives and sea level rise (SLR) adaptation pathways for the Morro Bay Estuary Climate Transportation Plan (The Plan) to be used by the ESA team under contract to the San Luis Obispo Council of Governments (SLOCOG). In this memo, ESA recommends an approach for developing SLR adaptation alternatives and an adaptation pathways framework focused on a 2.5-mile stretch of South Bay Boulevard between State Route 1 and Los Osos Creek, including spurs along South Park Road (Main Street), Quintana Avenue, and Turri Road (**Figure 1**).

In partnership with technical consultants, local agencies, and the community, SLOCOG will assess which adaptation options are available to reduce risk to transportation, recreational, and natural assets threatened by SLR. The forthcoming Plan will then help the Morro Bay community and agency partners make informed adaptation and resilience decisions. The first task of the Plan consisted of preparing a Coastal Flood Hazard and Vulnerability Assessment (VA) that addresses SLR risk (ESA 2025) that is summarized in Section 2 of this memo. In Section 3, we describe the various adaptation measures that could be used to increase SLR resiliency in the project study, which extends from Morro Bay State Park to the community of Los Osos, along State Park Road and South Bay Boulevard and includes portions of Quintana Road and Turri Road. The analysis of adaptation measures includes a discussion of tradeoffs using evaluation criteria. In Section 4, ESA summarizes the SLR impact thresholds, triggers and timing of potential adaptation actions based on findings of the VA.

The information presented in this memorandum is an important step in the process of developing an adaptation plan for the transportation, recreational, and natural assets surrounding the Morro Bay Estuary. Our approach follows the adaptation planning framework developed by the California Coastal Commission and Ocean Protection Council. In addition, adaptation measures were compiled and detailed for the specific needs and suitability to the Morro Bay Estuary setting. Evaluation criteria developed for this project are based on input from the community and the SLOCOG. Next steps following this memorandum will include: 1) sharing the information in this document with the community, agency partners, and other interested parties, 2) developing a Conceptual Roadway and Multiuse Trail Alignment Plan, 3) developing a benefit-cost analysis of the preferred adaptation alternatives, and 4) developing the draft and final Plan.



**Figure 1.**  
Project Area (orange lines)

## 2 Summary of Asset Vulnerability – No Action Alternative

As described in the VA prepared for this project (ESA 2025), the vulnerability of assets is a combination of the likelihood of being flooded (hazard exposure), consequence of being flooded (asset sensitivity), and the asset's ability to be modified (adaptive capacity). The VA analyzes impacts from a hypothetical “no action” scenario, where no measures are taken to adapt to SLR. This allows SLOCOG and other decision-makers to evaluate the full extent of potential impacts, identify the most at-risk assets, and prioritize adaptation strategies accordingly. The thresholds approach, which was introduced in the Summary of Additional Guidance Memo (ESA 2024), was used to determine the approximate timeframe of asset vulnerability and it involves identifying specific amounts of SLR, or thresholds, at which assets become vulnerable, using results from the VA.

Specific assets were assigned approximate time frames as to when they may become vulnerable. The approximate date of exposure to temporary (storm) and permanent (tidal inundation) hazards for each asset was determined based on the OPC 2024 High SLR scenario and represents existing conditions, mid-century high SLR (1.8 ft of SLR), and end-of-century high SLR (6.3 ft of SLR). In addition, the hydrodynamic modelling prepared by ESA (2025) for the Morro Bay Estuary considers storm and non-storm scenarios and included 1.8 ft and 6.3 ft of SLR.

The results from the VA indicate that the assets *currently* exposed to coastal hazards are State Park Road, Windy Cove Beach and parking lot, Morro Bay State Park Marina and parking lot, Morro Bay Golf Course, South Bay Boulevard's Chorro Creek bridge, Quintana Road, and Morro Bay State Marine Reserve. The assets likely to become exposed to coastal hazards in the near future (i.e., before 2060) are South Bay Blvd between Chorro Creek bridge and Los Oso Creek bridge and Turri Road.

Table 1 presents the time frame when the transportation, recreational, and natural assets would be impacted, and highlights (bolded) the impacts that are expected to occur sooner. ESA has considered these time frames in developing the alternatives and adaptation pathways framework for the Plan.

For reference, the study corridors are represented as linear dashed lines shown in light blue, dark blue, lavender, and purple, respectively, in an overview asset map of the area of the field tour map in **Figure 2**. In addition, **Figure 3** provides a closer view of specific points of interest, which include South Bay Boulevard's Los Osos Creek bridge and Chorro Creek bridge, and Windy Cove parking lot and beach.

**TABLE 1.**  
**ASSET VULNERABILITY TIME FRAMES**

| <b>Asset</b>                                                | <b>Approximate time frame of when the asset is temporarily impacted (storm)</b>       | <b>Approximate time frame of when the asset is permanently impacted (non-storm)</b> |
|-------------------------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                                             | <b>Bay/creek water level with wind setup<br/>(ESA Hydrodynamic Model)<sup>1</sup></b> | <b>Bay water level with wind setup<br/>(ESA Hydrodynamic Model)<sup>1</sup></b>     |
| <b>Transportation – Roads and Bicycle/Pedestrian Assets</b> |                                                                                       |                                                                                     |
| State Park Road                                             |                                                                                       |                                                                                     |
| Windy Cove                                                  | <b>Now</b>                                                                            | <b>Now to 2060</b>                                                                  |
| Main St                                                     | <b>Now</b>                                                                            | <b>Now to 2060</b>                                                                  |
| South Bay Blvd                                              |                                                                                       |                                                                                     |
| Chorro Creek Bridge to Bay Pines                            | <b>2060 to 2100</b>                                                                   | <b>2100+</b>                                                                        |
| Chorro Creek Bridge to Los Osos Creek Bridge                | <b>Now to 2060</b>                                                                    | <b>Now to 2060</b>                                                                  |
| Quintana Rd                                                 | <b>Now</b>                                                                            | <b>Now to 2060</b>                                                                  |
| Turri Rd                                                    | Now to 2060                                                                           | 2060 to 2100                                                                        |
| Chorro Creek Bridge                                         | <b>Now</b>                                                                            | 2100+                                                                               |
| Los Osos Bridge                                             | <b>2100+</b>                                                                          | <b>2100+</b>                                                                        |
| <b>Recreational Assets</b>                                  |                                                                                       |                                                                                     |
| Windy Cove – Beach                                          | <b>Now</b>                                                                            | Now to 2060                                                                         |
| Morro Bay State Park Marina Parking Lot                     | <b>Now</b>                                                                            | <b>Now to 2060</b>                                                                  |
| Windy Cove Parking Lot                                      | <b>Now</b>                                                                            | <b>Now to 2060</b>                                                                  |
| Cerro Cabrillo Trailhead Parking Lot                        | <b>2060 to 2100</b>                                                                   | <b>2060 to 2100</b>                                                                 |
| Park Ridge Trailhead Parking Lot                            | <b>2100+</b>                                                                          | <b>2100+</b>                                                                        |
| Chumash Trailhead Parking Lot                               | <b>2060 to 2100</b>                                                                   | <b>2060 to 2100</b>                                                                 |
| Morro Bay State Park Marina Bicycle Parking                 | <b>Now</b>                                                                            | <b>Now to 2060</b>                                                                  |
| Morro Bay Golf Course                                       | <b>Now</b>                                                                            | <b>Now to 2060</b>                                                                  |
| <b>Natural Assets</b>                                       |                                                                                       |                                                                                     |
| Morro Bay State Marine Reserve                              | <b>Now</b>                                                                            | Now to 2060                                                                         |
| El Moro Elfin Forest Natural Preserve                       | <b>2100+</b>                                                                          | <b>2100+</b>                                                                        |

## NOTES:

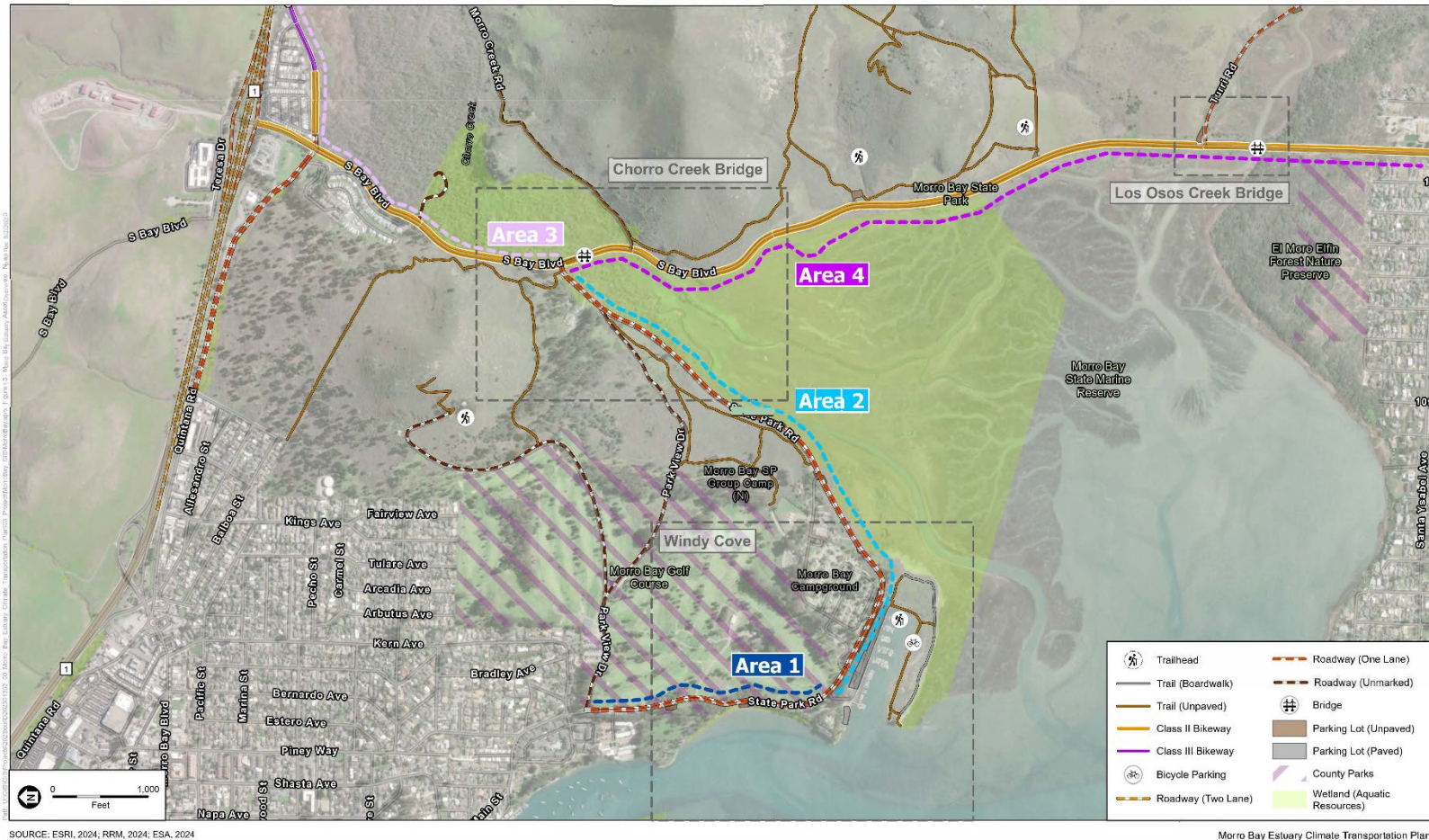
1.1.8 ft of SLR is projected in 2060 and 6.3 ft of SLR is projected in 2100 under a high SLR scenario for Port San Luis (OPC 2024)





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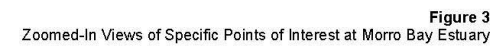


Morro Bay Estuary Climate Transportation Plan

**Figure 2**  
Morro Bay Estuary Assets Overview



**Figure 2. Morro Bay Estuary Asset Overview Map**



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## 3 Adaptation Alternatives and Pathways

For this analysis, ESA built upon state guidance and transportation guidelines to refine a suite of adaptation measures that address anticipated coastal hazards for the different physical settings in the Morro Bay Estuary. The adaptation measures span a range of types including traditional engineered structures, natural infrastructure, such as wetlands, and regulatory or land use measures. The following subsections describe the typical adaptation approaches (Section 3.1), the evaluation criteria (Section 3.2) and summarize the potential adaptation measures that could be applied at Morro Bay Estuary with future SLR based on the evaluation criteria (Section 3.3).

### 3.1 Adaptation Approaches

SLR adaptation approaches typically fall into one or more thematic strategies: protect, accommodate, and retreat.

- **Protect** – use an engineered structure or other measure to defend development (or resources) in its current location. Example measures include berm; revetments; levees; and natural or “green” methods (e.g., living shorelines and wetland restoration to buffer coastal areas); and hybrid approaches that use both engineered structures and natural infrastructure elements.
- **Accommodate** – modify existing development, or design new development in a way that decreases hazard risks and increases the resiliency of the development. Examples include elevating and/or retrofitting structures and using materials that increase the strength of development. In Morro Bay Estuary, this could include raising the elevation of roads on berms or causeways to accommodate high-water-level flooding events.
- **Retreat** – relocate or realign existing development and infrastructure, limit substantial redevelopment, or prevent new development in hazardous areas. Development setbacks, buyouts, and easements and inland roadway realignment are examples of retreat-focused measures.

The preferred adaptation strategy for a location may vary depending on the type of asset (e.g., roads, bridges, bike paths). Additionally, the strategy may change over time as conditions change (e.g., protection in the near-term and shifting to accommodation or retreat in the long-term). Note that an adaptation measure can combine more than one of the above approaches. For example, wetland restoration can play a role under a protection strategy (e.g., restoring wetlands adjacent to a road to reduce flooding) as well as a retreat strategy (e.g., restore wetland along the corridor after relocating the road).

### 3.2 Evaluation Criteria

ESA has initially developed five criteria to evaluate the adaptation measures for the Plan. The evaluation criteria capture the range of interests for Morro Bay Estuary and the various tradeoffs associated with different adaptation approaches. Considerations for each of these evaluation criteria are described in detail below.

- Engineering Considerations
- Environmental Considerations
- Regulatory Considerations

- Social Considerations
- Economic Considerations (will be addressed in the Benefit-Cost Analysis as part of Task 2.4)

### 3.2.1 Engineering Considerations

The following three categories describe potential feasibility considerations for each engineering adaptation measure.

**Feasibility:** This refers to the likelihood of implementing a measure based on the physical setting, such as topography and exposure to hazards. For instance, wetland restoration in locations such as Windy Cove and other sites, vegetation management would be more suitable.

**Effectiveness:** Effectiveness refers to whether a measure is likely to accomplish the vulnerability reduction for the particular asset and site. For example, elevating roads or creating elevated berms can reduce storm flooding/wave runup on transportation assets.

**Resilience:** Resilience refers to the ability of a measure to accommodate and recover from increased loadings such as storms and SLR. Therefore “resilience” is similar to the term ‘sensitivity’ that is often used in vulnerability assessments. For example, berms are likely to incur permanent damage and potentially fail when loadings exceed those used in design. However, natural infrastructure (e.g., ecotone levees, wetland restoration, oyster reefs) can recover following extreme events. As a result, natural infrastructure can be more resilient than traditional infrastructure.

### 3.2.2 Environmental Considerations

Potential environmental considerations include temporary and permanent impacts that an adaptation measure could have on species and their habitats, as well as the ecological benefits that a measure could provide. In many cases, the benefits of a given adaptation measure are achieved in comparison to the status quo (i.e., no action or traditional engineering measures).

To develop the environmental impacts and benefits, ESA has considered whether each adaptation measure would impact existing habitats and increase or decrease the overall ecological health of the habitats within the Morro Bay ecosystem region.

### 3.2.3 Regulatory Considerations

The diverse set of alternatives evaluated in this document would require permits from a range of jurisdictions and regulatory agencies. Depending on the nature and scale of the measure being evaluated, the geographic location of the site, and environmental sensitivity at the site, there are various jurisdictions and regulations involved. Agency staff cannot provide extensive review or definitive answers on whether such a project would be approved until there is an actual proposed project with preliminary design plans and other required information and analyses. Generally, projects with high potential levels of environmental impact are much more challenging to get permitted, and early coordination and consultation is often critical.

As with any project involving construction on the California coast, a proposed project in Morro Bay Estuary involving construction on wetlands, Environmentally Sensitive Habitat, or tidal areas would require numerous studies, surveys, and reports, and an extensive public input process. Beyond the procurement of permits, the



overall regulatory compliance process consists of environmental review (i.e., pursuant to the California Environmental Quality Act), followed by permitting and/or agency approvals, and concludes with compliance review and documentation. Permits and/or approval would typically be required from: United States Army Corps of Engineers; U.S. Fish and Wildlife Service (USFWS); National Marine Fisheries Service (NMFS); California Coastal Commission (CCC) and/or City of Morro Bay and San Luis Obispo County Local Coastal Program jurisdiction; California Department of Fish and Wildlife (CDFW); Regional Water Quality Control Board (RWQCB); and potentially, California State Lands Commission (CSLC).

### 3.2.4 Social Considerations

Social considerations address the effects of adaptation measures on public access and use of the Morro Bay estuary, emphasizing equitable access and recreation. For context, the California Coastal Commission's Environmental Justice Policy<sup>1</sup> includes principles for Respecting Tribal Concerns, Meaningful Engagement, Coastal Access, Housing, Local Government, Participation in the Process, Accountability and Transparency, Climate Change, and Habitat and Public Health. Public access and recreation are important considerations when planning for coastal adaptation, as different adaptation measures can impact access along the estuary.

### 3.2.5 Economic Considerations

Economic considerations include the cost of construction and typical maintenance of individual adaptation measures as well as how this cost is shared (individual or multiple property owners, agency, etc.). The cost of adaptation measures will also be compared to the cost of no action, e.g., from repairing damages and loss of function if no action is taken to address coastal hazards. Planning-level unit cost estimates will be compiled for individual adaptation measures based on examples from various studies and escalated to 2025 dollars. Economic considerations will be analyzed in a benefit-cost analysis of adaptation pathways in a future task for this project.

### 3.2.6 Levels for Evaluation Criteria

To clearly capture the range of interests for Morro Bay Estuary and the various tradeoffs associated with different adaptation approaches, ESA used three levels to rank the evaluation criteria for each adaptation measure, which include *low*, *medium*, and *high*. These three levels for each evaluation criteria are described below.

- **Engineering Considerations (feasibility, effectiveness, resilience):**
  - *Low*: minimal complexity and basic engineering considerations.
  - *Medium*: moderate complexity and resources required, may need specialized engineering solutions.
  - *High*: highly complexity and requiring advanced engineering solutions.
- **Environmental Considerations (habitat impacts and benefits):**
  - *Low Impact*: Low environmental impact, minimal disruption to existing habitats.
  - *Medium Impact*: Moderate environmental impacts and potential impact to existing habitats.
  - *High Impact*: Significant environmental impacts .
  - *Low Benefits*: Basic habitat benefits.

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<sup>1</sup> More information at [https://documents.coastal.ca.gov/assets/env-justice/CCC\\_EJ\\_Policy\\_FINAL.pdf](https://documents.coastal.ca.gov/assets/env-justice/CCC_EJ_Policy_FINAL.pdf)

- *Medium Impact*: Moderate habitat benefits.

*High Impact*: Significant habitat benefits.

- **Regulatory Considerations (permitting, etc.):**

- *Low*: Requires minimal regulatory approval and is straightforward to permit.

- *Medium*: Requires some regulatory approvals and may involve moderate permitting complexity.

- *High*: Requires extensive regulatory approvals and involves high permitting complexity.

- **Social Considerations (public access, recreation, equity):**

- *Low*: Maintains public access, recreation, and equity.

- *Medium*: Enhances public access, recreation, and equity.

- *High*: Significantly enhances public access, recreation, and equity.

- **Economic Considerations (cost):**

This evaluation criteria will be considered and developed as part of Task 2.4 of this project, once a set of preferred adaptation measures is defined.

### 3.3 Potential Adaptation Measures for Morro Bay Estuary

In this section, ESA presents an adaptation pathways framework that includes different adaptation actions that can be taken during the near-term (~5-20 years), mid-term (~20-50 years), and long-term (~50+ years) time horizons. At each time horizon, adaptation actions are described that would provide resilience until the next time horizon, at which point another set of potential actions would be defined. In the threshold approach, specific assets will have different sea level rise thresholds. For example, South Bay Blvd near Twin Bridges may have a different sea level rise threshold than the State Park Road bordering the bay in the Morro Bay State Park. As described above, the VA identified the potential impacts that transportation, recreational, and natural assets could face because of SLR.

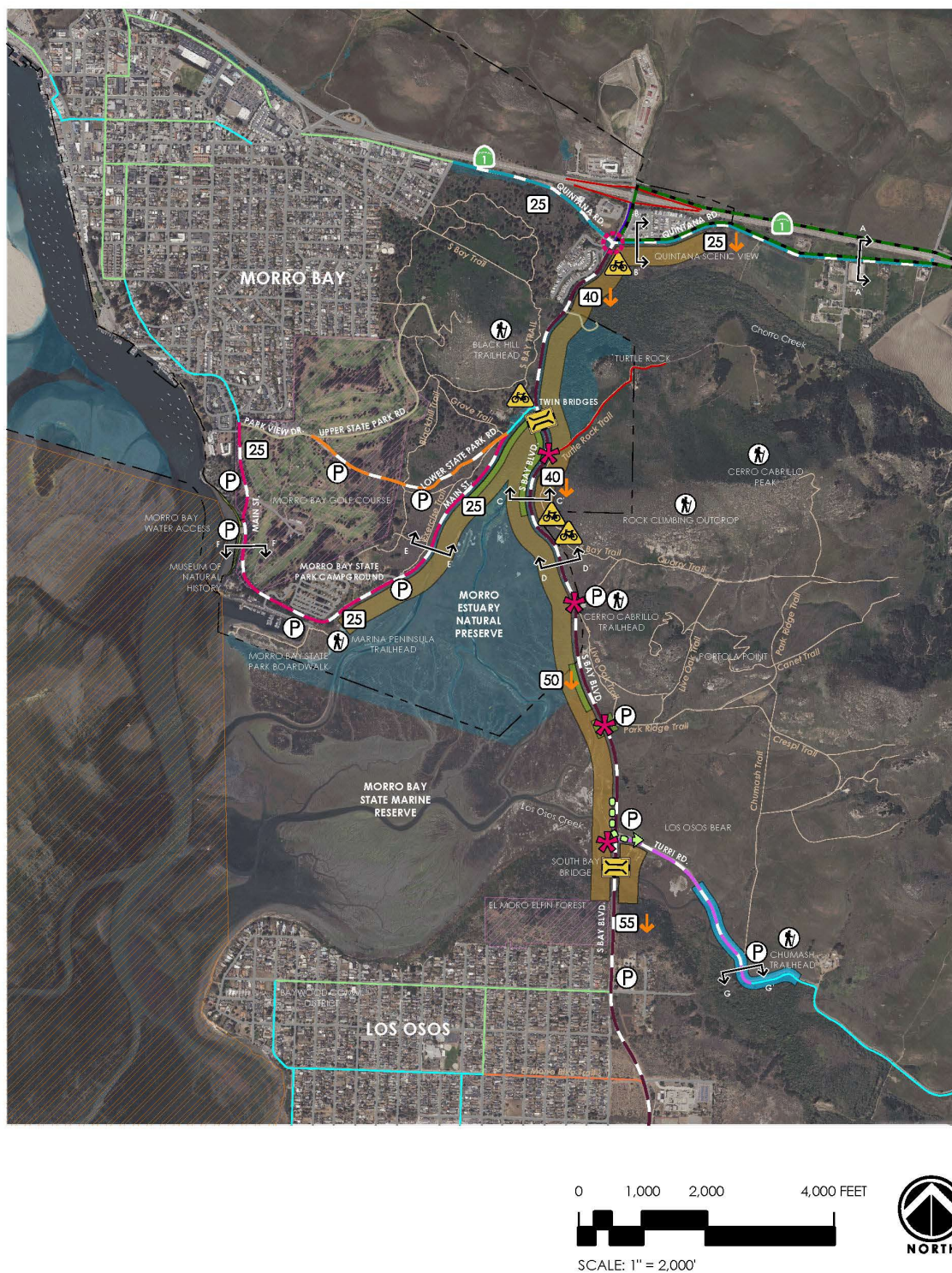
The adaptation measures are categorized into four groups that are either structural (physically constructed nature-based or traditional engineered features) or non-structural (regulatory or financial mechanisms to encourage or enforce adaptation). The adaptation measures for the near, mid, and long term for transportation, recreational, and natural assets are presented in sections 3.3.1, 3.3.2, and 3.3.3 below. The adaptation measures are illustrated with a series of cross sections. **Figure 4** provides an overview of the locations of the cross sections and the adaptation opportunities in plan view.

**TABLE 2.**  
**CATEGORIZATION OF PROPOSED ADAPTATION MEASURES**

| <b>Measure Category</b>           | <b>Description</b>                                                                                                                                                                                                                   | <b>Examples from Proposed Measures</b>                                                                                                                                                                                                                                                   |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Natural and Nature-Based Measures | Natural and nature-based measures, as well as hybrid measures that combine natural and traditional structures, can perform similarly or better than traditional structures and provide increased benefits to recreation and ecology. | <ul style="list-style-type: none"> <li>• Wetland restoration</li> <li>• Ecotone levees</li> <li>• Oyster reef restoration</li> <li>• Create retention ponds and bioswales along roadways</li> <li>• Vegetation management along roads</li> </ul>                                         |
| Traditional Structural Measures   | Traditional engineered measures can be effective to design standards (withstand erosion/wave runup forces) but may have negative side effects such as leading to the squeeze of wetland habitats.                                    | <ul style="list-style-type: none"> <li>• Raise road on fill</li> <li>• Elevate road on fill/causeway</li> <li>• Lengthen bridge spans</li> <li>• Install roundabouts</li> <li>• Install more efficient drainage system</li> <li>• Install more permeable pavement in bikeways</li> </ul> |
| Policy and Regulatory Measures    | Regulatory measures are used to manage how communities develop/redevelop and maintain themselves in a way that responds to or prepares for sea level rise.                                                                           | <ul style="list-style-type: none"> <li>• Develop asset management databases to track vulnerable infrastructure</li> <li>• Establish monitoring systems to track infrastructure performance during flooding</li> </ul>                                                                    |
| Financial Measures                | Financial measures that encourage or facilitate adaptation.                                                                                                                                                                          | <ul style="list-style-type: none"> <li>• Establish dedicated funding mechanisms</li> </ul>                                                                                                                                                                                               |



Figure 4. Plan View of Adaptation Options, including Cross Section Locations and Legend (below)



**EXISTING CONDITIONS LEGEND:**

|  |                                                   |  |             |
|--|---------------------------------------------------|--|-------------|
|  | CITY LIMIT                                        |  | PARKING     |
|  | ONE LANE ROAD                                     |  | TRAILHEAD   |
|  | TWO LANE ROAD (NO BIKE FACILITIES)                |  | SPEED LIMIT |
|  | TWO LANE ROAD (CLASS II)                          |  |             |
|  | TWO LANE ROAD (CLASS III)                         |  |             |
|  | UNMARKED ROAD                                     |  |             |
|  | CLASS IV BIKE TRAIL                               |  |             |
|  | UNPAVED TRAIL                                     |  |             |
|  | CALIFORNIA FISH AND WILDLIFE (CDFW) LAND EASEMENT |  |             |
|  | COUNTY PARKS                                      |  |             |
|  | AQUATIC RESOURCES (WETLAND)                       |  |             |

**OPPORTUNITIES LEGEND:**

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |                       |  |                         |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------------|--|-------------------------|
|  | <b>OPTIONS FOR QUINTANA ROAD:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  | VEGETATION MANAGEMENT |  | REDUCED SPEED           |
|  | <ul style="list-style-type: none"> <li>A1: WIDEN ROAD FOR CLASS II BIKE LANES</li> <li>B1: ELEVATED ROAD AND CLASS II BIKE LANES ON BERMA</li> <li>B2: ELEVATED ROAD ON CLASS I BIKE PATH ON BERMA</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  | WETLAND RESTORATION   |  | ROUNDABOUT              |
|  | <b>OPTIONS FOR SOUTH BAY BOULEVARD:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  | STORMWATER MANAGEMENT |  | BICYCLE SAFETY MEASURES |
|  | <ul style="list-style-type: none"> <li>C1: WIDEN CLASS I BIKE LANES AND SIDEWALK</li> <li>C2: ELEVATED ROAD AND CLASS I BIKE PATH ON CAUSEWAY</li> <li>C3: ELEVATED ROAD ON FILL WITH COASTAL CLASS I BIKE PATH</li> <li>C4: ELEVATED ROAD ON FILL WITH COASTAL CLASS I BIKE PATH AND LEVEE</li> <li>C5: ELEVATED ROAD ON FILL WITH INLAND CLASS I BIKE PATH</li> <li>C6: ELEVATED ROAD ON FILL WITH INLAND CLASS I BIKE PATH AND LEVEE</li> <li>C7: ADD CLASS I BIKE PATH ON FILL</li> <li>C8: ADD CLASS I BIKE PATH AND BOARDWALK</li> </ul>                                                                                                                                |  | PEDESTRIAN CROSSING   |  | SECTION VIEW            |
|  | <b>OPTIONS FOR MAIN STREET:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  | BRIDGE LENGTHENING    |  | TURN LANE               |
|  | <ul style="list-style-type: none"> <li>E1: CONVERT TO ONEWAY AND ADD CLASS I BIKE PATH</li> <li>E2: ADD CLASS II BIKE FACILITIES</li> <li>E3: ELEVATED ROAD AND CLASS II BIKE LANES ON FILL</li> <li>E4: ELEVATED ROAD AND CLASS II BIKE LANES ON FILL WITH LEVEE</li> <li>E5: ELEVATED CLASS I BIKE PATH ON FILL</li> <li>E6: ELEVATED ROAD AND CLASS II BIKE LANES ON CAUSEWAY</li> <li>F1: ELEVATED ROAD AND CLASS I BIKE PATH ON CAUSEWAY</li> <li>F2: ELEVATED ROAD AND CLASS I BIKE PATH ON FILL</li> <li>F3: CONVERT TO ONEWAY AND ADD CLASS I BIKE PATH</li> <li>F4: ADD CLASS II BIKE FACILITIES</li> <li>F5: CONVERT TO ONEWAY AND ADD CLASS I BIKE PATH</li> </ul> |  |                       |  |                         |
|  | <b>OPTIONS FOR LOWER STATE PARK ROAD:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |                       |  |                         |
|  | <ul style="list-style-type: none"> <li>C: CONVERT TO ONEWAY ROAD</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |                       |  |                         |
|  | <b>OPTIONS FOR TURRI ROAD:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |                       |  |                         |
|  | <ul style="list-style-type: none"> <li>G1: ELEVATED ROAD AND CLASS II BIKE LANES ON CAUSEWAY</li> <li>G2: ELEVATED ROAD AND CLASS II BIKE LANES ON FILL</li> <li>G3: WIDEN ROAD FOR CLASS II BIKE LANES</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |                       |  |                         |
|  | ALIGNMENT CONSIDERED IN THE CHOCOMA VALLEY TRAIL STUDY COMPLETED BY SLO COG IN AUGUST 2014                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |                       |  |                         |

### 3.3.1 Near-term (~2030-2045)

In the near-term, the focus is on addressing the assets currently exposed to coastal hazards. The vision is to implement immediate and practical measures that provide resilience against current and anticipated near-term impacts of coastal hazards and SLR. These measures aim to enhance transportation and mobility, protect critical infrastructure, increase natural defenses, and allow continued access and usability of recreational areas.

The assets currently exposed to coastal hazards, considering the storm condition (Table 1), under the categories of transportation, recreation, and natural assets, include:

#### Transportation – Roads and Mobility Assets:

- State Park Road
  - Windy Cove
  - Main St
- S Bay Blvd
  - Chorro Creek Bridge to Los Osos Creek Bridge
  - Chorro Creek Bridge
- Quintana Road

#### Recreational Assets:

- Windy Cove – Beach and Parking Lot
- Morro Bay State Park Marina Parking Lot
- Morro Bay Golf Course

#### Natural Assets:

- Morro Bay State Marine Reserve

Table 3 presents the **opportunities**, including potential solutions and enhancements that would increase resilience of the transportation, recreational and natural assets that are vulnerable in the near-term, **constraints** that may limit or restrict the ability of the opportunities to provide a feasible solution, including special status species, land use, construction /maintenance cost, permitting feasibility, and **evaluation criteria** of the measure, based on the three levels described above, that could be considered in the near-term.

**TABLE 3.**  
**NEAR-TERM MEASURES OPPORTUNITIES AND CONSTRAINTS**

| Asset                                    | Adaptation Measure                                                                                                                          | Opportunities                                                         | Constraints                                                                                                                    | Evaluation Criteria <sup>A</sup>                                                                                                                                                  |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Transportation Assets</b>             |                                                                                                                                             |                                                                       |                                                                                                                                |                                                                                                                                                                                   |
| State Park Road<br>(Main St, Windy Cove) | Protect: Construct a levee or berm to protect the road in its current alignment and elevation (See <b>Figure 5 and 6</b> for cross section) | A class I bike / ped path could be placed on top of the berm / levee. | The low-lying segments of the road may still flood due to rainfall runoff stormwater drainage; construction of the levee would | <ul style="list-style-type: none"> <li>• Engineering Considerations: <b>Medium</b></li> <li>• Environmental Considerations: <b>Medium – High Impact / Low Benefits</b></li> </ul> |

|                                                           |                                                                                                                                            |                                                                                                                                                          |                                                                                                                                                                                    |                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                           |                                                                                                                                            |                                                                                                                                                          | permanently impact habitat and parking adjacent to the road                                                                                                                        | <ul style="list-style-type: none"> <li>Regulatory Considerations: <b>Medium - High</b></li> <li>Social Considerations: <b>Medium</b></li> </ul>                                                                                                                               |
|                                                           | Accommodate: Raise the most vulnerable segments of the road on fill or a causeway (See <b>Figures 5, 7</b> and <b>8</b> for cross section) | Would serve as flood protection for golf course; bayward side of road could support a living shoreline/migration space/high tide refugia for the wetland | Potential impacts to special status species: banded dune snail or Morro shoulderband; biological and cultural resource constraints                                                 | <ul style="list-style-type: none"> <li>Engineering Considerations: <b>Medium</b></li> <li>Environmental Considerations: <b>Medium Impact / Low Benefits</b></li> <li>Regulatory Considerations: <b>Medium - High</b></li> <li>Social Considerations: <b>Medium</b></li> </ul> |
|                                                           | Retreat: Relocate the road inland into the golf course out of the coastal hazard zone or reroute traffic onto Parkview Drive               | Allows for increased inland wetland migration space; the former road alignment could be converted to coastal trail                                       | Inland relocation would impact the golf course; Potential impacts to special status species: banded dune snail or Morro shoulderband; biological and cultural resource constraints | <ul style="list-style-type: none"> <li>Engineering Considerations: <b>High</b></li> <li>Environmental Considerations: <b>High Impact / Low Benefit</b></li> <li>Regulatory Considerations: <b>High</b></li> <li>Social Considerations: <b>High</b></li> </ul>                 |
|                                                           | Mobility: Convert to one-way traffic and add Class I bike/ped facility on bayward side (See <b>Figures 9 and 10</b> for cross section)     | Use abandoned lane for bike/ped paths; short implementation time and low cost                                                                            | Impacts to traffic circulation; would not address flood vulnerability                                                                                                              | <ul style="list-style-type: none"> <li>Engineering Considerations: <b>Medium</b></li> <li>Environmental Considerations: <b>Low Impact / Low Benefits</b></li> <li>Regulatory Considerations: <b>Medium</b></li> <li>Social Considerations: <b>Low</b></li> </ul>              |
|                                                           | Mobility: Add sharrows for Class III bike lane (See <b>Figures 9 and 10</b> for cross section)                                             | Low-cost cycling improvement                                                                                                                             | Sharrow paint can decompose, affecting water quality; would not address flood vulnerability                                                                                        | <ul style="list-style-type: none"> <li>Engineering Considerations: <b>Low</b></li> <li>Environmental Considerations: <b>Low Impact / Low Benefits</b></li> <li>Regulatory Considerations: <b>Low</b></li> <li>Social Considerations: <b>Low</b></li> </ul>                    |
|                                                           | Mobility: Vegetation management                                                                                                            | Increased space and visibility for bikes/peds                                                                                                            | State Parks policies regarding vegetation management                                                                                                                               | <ul style="list-style-type: none"> <li>Engineering Considerations: <b>Low</b></li> <li>Environmental Considerations: <b>Low Impact / Medium Benefits</b></li> <li>Regulatory Considerations: <b>Low</b></li> <li>Social Considerations: <b>Low</b></li> </ul>                 |
| S Bay Blvd (Chorro Creek Bridge to Los Osos Creek Bridge) | Protect: Construct a levee or berm to protect the road in its current alignment and elevation (See <b>Figure 11</b> for cross section)     | A bike / ped path could be placed on top of the berm / levee.                                                                                            | The low-lying segments of the road may still flood due to rainfall runoff stormwater drainage                                                                                      | <ul style="list-style-type: none"> <li>Engineering Considerations: <b>Medium</b></li> <li>Environmental Considerations: <b>Medium - High</b></li> <li>Regulatory Considerations: <b>High</b></li> <li>Social Considerations: <b>Medium</b></li> </ul>                         |
|                                                           | Accommodate: Elevate the most vulnerable segments of the road on fill or a causeway (See <b>Figures 11, 13-17</b> for cross sections)      | Road could be enhanced with a living shoreline levee that provides high tide refugia for wetland species                                                 | Potential permanent Wetland/ESHA impacts                                                                                                                                           | <ul style="list-style-type: none"> <li>Engineering Considerations: <b>High</b></li> <li>Environmental Considerations: <b>Medium Impact / High Benefits</b></li> <li>Regulatory Considerations: <b>High</b></li> <li>Social Considerations: <b>Medium</b></li> </ul>           |
|                                                           | Accommodate: Lengthen span of bridges over Chorro and Los Osos Creek                                                                       | Accommodates increased water flow                                                                                                                        | Temporary/permanent riparian ESHA impacts; Would not address other flooding issues on SBB, but could be combined with other options                                                | <ul style="list-style-type: none"> <li>Engineering Considerations: <b>Medium</b></li> <li>Environmental Considerations: <b>Medium Impact / Medium Benefits</b></li> <li>Regulatory Considerations: <b>Medium</b></li> </ul>                                                   |

|               |                                                                                                                                                        |                                                                                                                                                         |                                                                                                         |                                                                                                                                                                                                                                                                                  |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               |                                                                                                                                                        |                                                                                                                                                         |                                                                                                         | <ul style="list-style-type: none"> <li>• Social Considerations: <b>Low</b></li> </ul>                                                                                                                                                                                            |
|               | Mobility: Create separated trail paralleling SBB (See <b>Figure 18</b> for cross section)                                                              | Alternative alignment options (e.g., co-located with Los Osos State Water Line)                                                                         | Permanent Wetland/ESHA impacts; Would need enhanced crosswalks, beacons/stoplights for trailhead access | <ul style="list-style-type: none"> <li>• Engineering Considerations: <b>Medium</b></li> <li>• Environmental Considerations: <b>Medium Impact / Low Benefits</b></li> <li>• Regulatory Considerations: <b>Medium</b></li> <li>• Social Considerations: <b>Low</b></li> </ul>      |
|               | Mobility: Widen NB/SB existing bike lanes (See <b>Figure 11</b> )                                                                                      | Improved cycling infrastructure                                                                                                                         | Would not address flooding vulnerability; Permanent Wetland/ESHA impacts                                | <ul style="list-style-type: none"> <li>• Engineering Considerations: <b>Medium</b></li> <li>• Environmental Considerations: <b>Medium-High Impact / Low Benefits</b></li> <li>• Regulatory Considerations: <b>Medium</b></li> <li>• Social Considerations: <b>Low</b></li> </ul> |
|               | Mobility: Vegetation management                                                                                                                        | Improved safety at SBB/State Park Road intersection where vegetation blocks drivers' views                                                              | State Parks policies                                                                                    | <ul style="list-style-type: none"> <li>• Engineering Considerations: <b>Low</b></li> <li>• Environmental Considerations: <b>Low Impact / Medium Benefits</b></li> <li>• Regulatory Considerations: <b>Low</b></li> <li>• Social Considerations: <b>Low</b></li> </ul>            |
|               | Mobility: Reduce speed limit                                                                                                                           | Improved safety for all road users                                                                                                                      | Implementation and enforcement requirements                                                             | <ul style="list-style-type: none"> <li>• Engineering Considerations: <b>Low</b></li> <li>• Environmental Considerations: <b>Low Impact / Low Benefits</b></li> <li>• Regulatory Considerations: <b>Low</b></li> <li>• Social Considerations: <b>Low</b></li> </ul>               |
| Quintana Road | Accommodate: Elevate the road on fill (See <b>Figure 19</b> for cross section)                                                                         | Maintained access during high water events; Flood protection for neighborhoods to the north; could be combined with Class I or Class II bike facilities | Potential wetland/ESHA impacts to the south                                                             | <ul style="list-style-type: none"> <li>• Engineering Considerations: <b>Low</b></li> <li>• Environmental Considerations: <b>High Impact / Low Benefits</b></li> <li>• Regulatory Considerations: <b>Medium</b></li> <li>• Social Considerations: <b>Medium</b></li> </ul>        |
|               | Mobility: Install roundabout at intersection with SBB                                                                                                  | Improved traffic flow                                                                                                                                   | Potential Wetland/ESHA impacts                                                                          | <ul style="list-style-type: none"> <li>• Engineering Considerations: <b>Low</b></li> <li>• Environmental Considerations: <b>Medium Impact / Low Benefits</b></li> <li>• Regulatory Considerations: <b>Medium</b></li> <li>• Social Considerations: <b>Low</b></li> </ul>         |
|               | Mobility: Widen road to include Class II bike lanes on both sides or Class I bike lane on north side (See <b>Figures 19 and 20</b> for cross sections) | Reduced hazards for cyclists                                                                                                                            | Would not address flooding vulnerability                                                                | <ul style="list-style-type: none"> <li>• Engineering Considerations: <b>Medium</b></li> <li>• Environmental Considerations: <b>Medium-High Impact / Low Benefits</b></li> <li>• Regulatory Considerations: <b>Medium</b></li> <li>• Social Considerations: <b>Low</b></li> </ul> |
|               | Mobility: Address storm drains and debris                                                                                                              | Reduced hazards for cyclists                                                                                                                            | Regular maintenance requirements                                                                        | <ul style="list-style-type: none"> <li>• Engineering Considerations: <b>Low</b></li> <li>• Environmental Considerations: <b>Low Impact / Low Benefits</b></li> <li>• Regulatory Considerations: <b>Medium</b></li> </ul>                                                         |

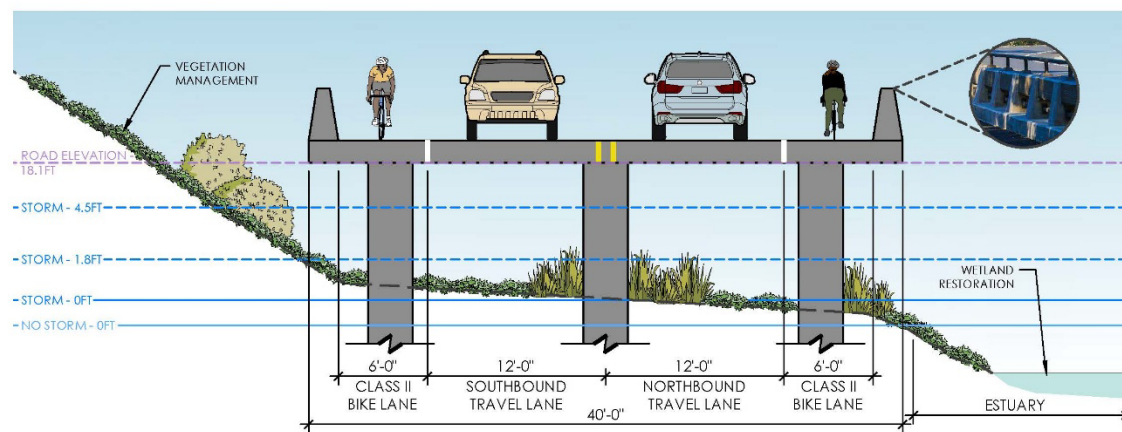
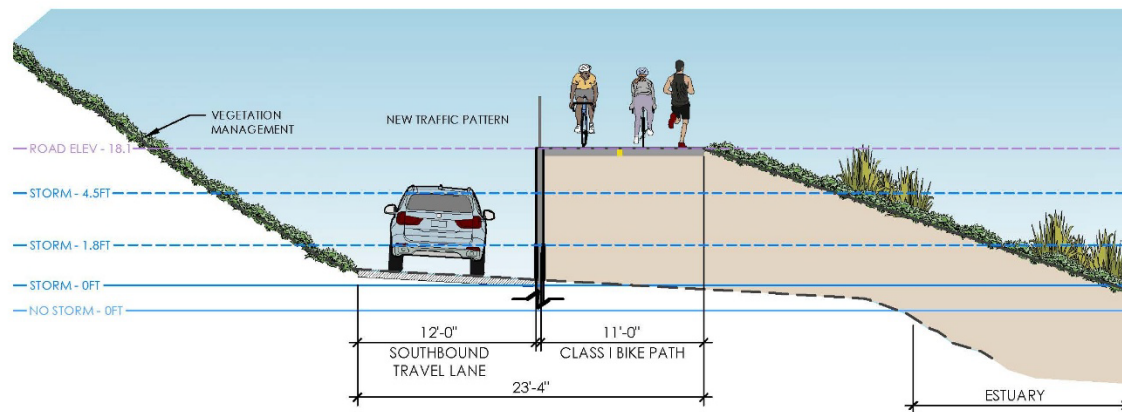
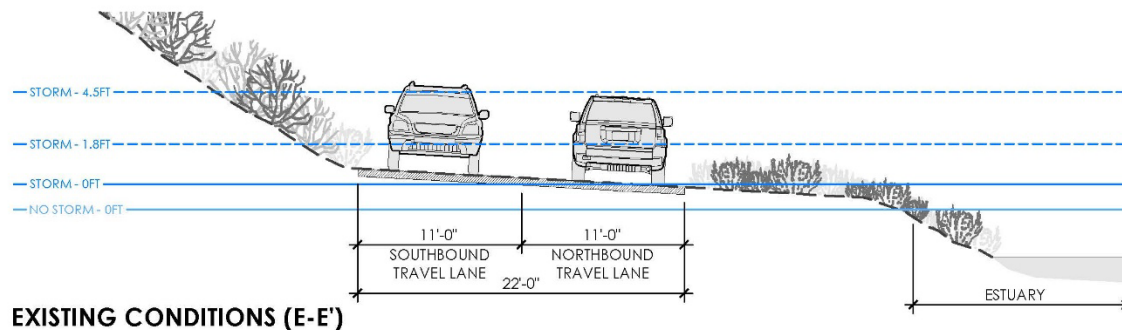


|                                         |                                                                                                                                                   |                                                                             |                                                                                                                                                                         |                                                                                                                                                                                                                                                                            |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                         |                                                                                                                                                   |                                                                             |                                                                                                                                                                         | <ul style="list-style-type: none"> <li>• Social Considerations: <b>Low</b></li> </ul>                                                                                                                                                                                      |
| <b>Recreational Assets</b>              |                                                                                                                                                   |                                                                             |                                                                                                                                                                         |                                                                                                                                                                                                                                                                            |
| Windy Cove Beach and Parking Lot        | Protect: Wetland restoration to limit waves at the shoreline and associated flooding, and mitigate potential impacts of other adaptation measures | Natural flood protection                                                    | Not needed until 2060 due to natural accretion of creek sediment; after that, availability of sediment could be a constraint to sustaining restored wetlands (See USGS) | <ul style="list-style-type: none"> <li>• Engineering Considerations: <b>Low</b></li> <li>• Environmental Considerations: <b>Low Impact / High Benefits</b></li> <li>• Regulatory Considerations: <b>Medium</b></li> <li>• Social Considerations: <b>Low</b></li> </ul>     |
| Morro Bay State Park Marina Parking Lot | Accommodate: Raise parking area on fill                                                                                                           | Maintained access during high water events                                  | Construction costs; Potential Wetland/ESHA impacts                                                                                                                      | <ul style="list-style-type: none"> <li>• Engineering Considerations: <b>Low</b></li> <li>• Environmental Considerations: <b>Medium Impact / Low Benefits</b></li> <li>• Regulatory Considerations: <b>Medium</b></li> <li>• Social Considerations: <b>Low</b></li> </ul>   |
|                                         | Accommodate: Implement flood management, such as pumps                                                                                            | Maintained access during high water events                                  | Implementation costs                                                                                                                                                    | <ul style="list-style-type: none"> <li>• Engineering Considerations: <b>Low</b></li> <li>• Environmental Considerations: <b>Low Impact / Low Benefits</b></li> <li>• Regulatory Considerations: <b>Low</b></li> <li>• Social Considerations: <b>Low</b></li> </ul>         |
| Morro Bay Golf Course                   | Accommodate: Implement flood management, such as pumps                                                                                            | Improved drainage                                                           | Implementation costs                                                                                                                                                    | <ul style="list-style-type: none"> <li>• Engineering Considerations: <b>Low</b></li> <li>• Environmental Considerations: <b>Low Impact / Low Benefits</b></li> <li>• Regulatory Considerations: <b>Low</b></li> <li>• Social Considerations: <b>Low</b></li> </ul>         |
| <b>Natural Assets</b>                   |                                                                                                                                                   |                                                                             |                                                                                                                                                                         |                                                                                                                                                                                                                                                                            |
| Morro Bay State Marine Reserve          | Protect: Wetland restoration                                                                                                                      | Increased resilience to sea level rise and enhanced ecological function     | Implementation timing and costs                                                                                                                                         | <ul style="list-style-type: none"> <li>• Engineering Considerations: <b>Low</b></li> <li>• Environmental Considerations: <b>Low Impact / High Benefits</b></li> <li>• Regulatory Considerations: <b>Medium</b></li> <li>• Social Considerations: <b>Low</b></li> </ul>     |
|                                         | Protect: Thin-layer placement of sediment to increase the elevation of the marsh                                                                  | Increased resilience to sea level rise                                      | Implementation timing and costs; temporary habitat impacts                                                                                                              | <ul style="list-style-type: none"> <li>• Engineering Considerations: <b>Medium</b></li> <li>• Environmental Considerations: <b>Medium Impact / High Benefits</b></li> <li>• Regulatory Considerations: <b>High</b></li> <li>• Social Considerations: <b>Low</b></li> </ul> |
|                                         | Protect: Implement oyster reef restoration                                                                                                        | Enhance coastal resilience through wave attenuation and habitat enhancement | Feasibility and effectiveness                                                                                                                                           | <ul style="list-style-type: none"> <li>• Engineering Considerations: <b>Low</b></li> <li>• Environmental Considerations: <b>Low Impact / Medium Benefits</b></li> <li>• Regulatory Considerations: <b>Medium</b></li> <li>• Social Considerations: <b>Low</b></li> </ul>   |

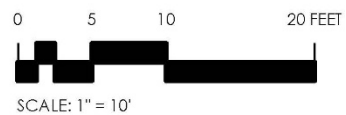
Note:

<sup>A</sup> Economic consideration not included since it will be defined in Task 2.4 of the Project

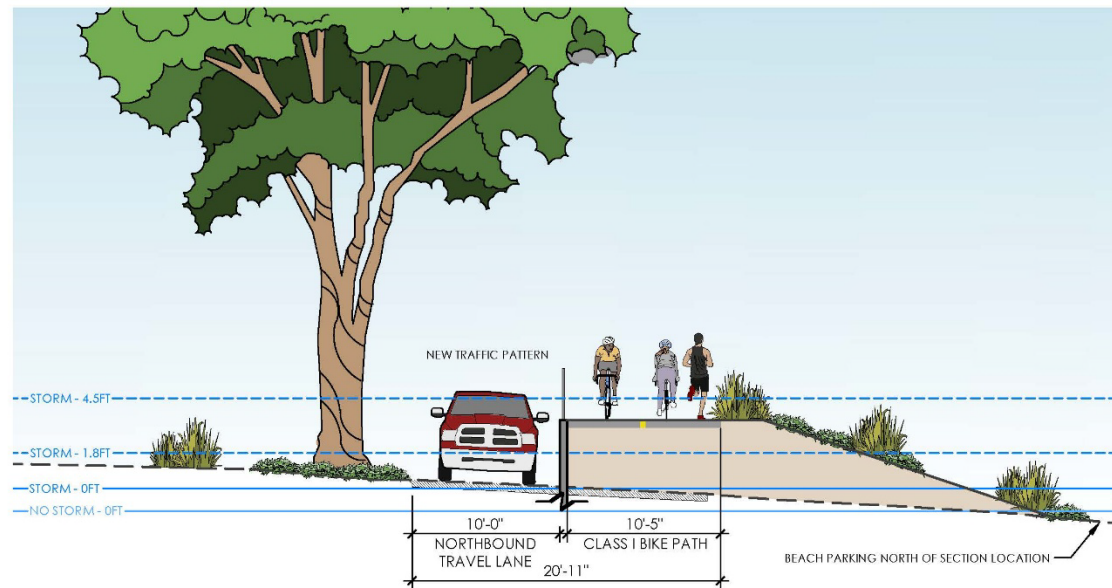
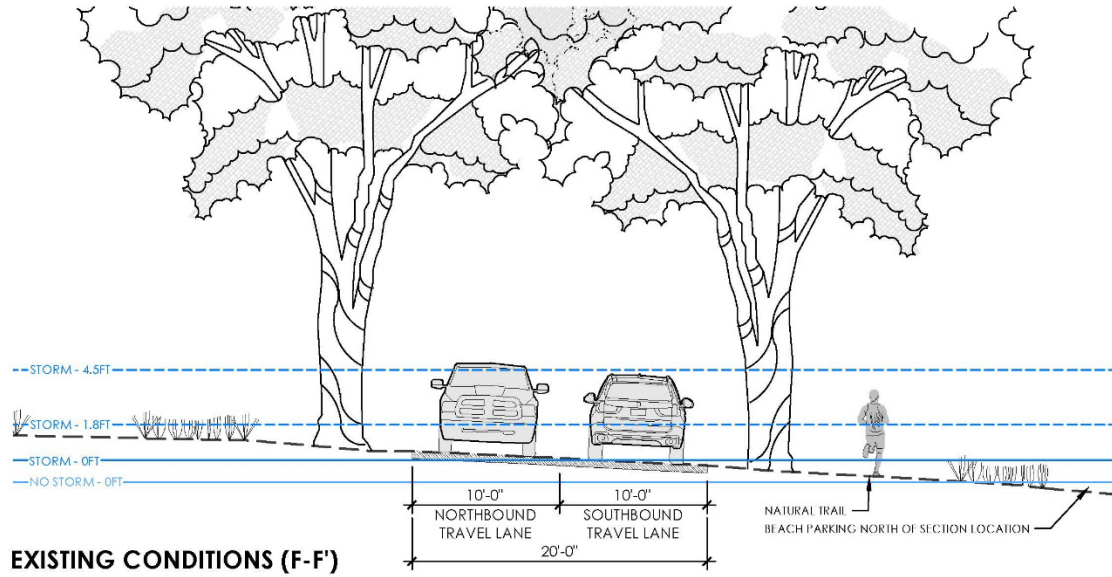
**Figure 5 Cross Sections for Near-term Adaptation Alternatives**



**E: MAIN STREET**

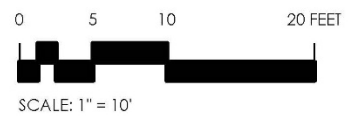


**Figure 6 Cross Sections for Near-term Adaptation Alternatives**

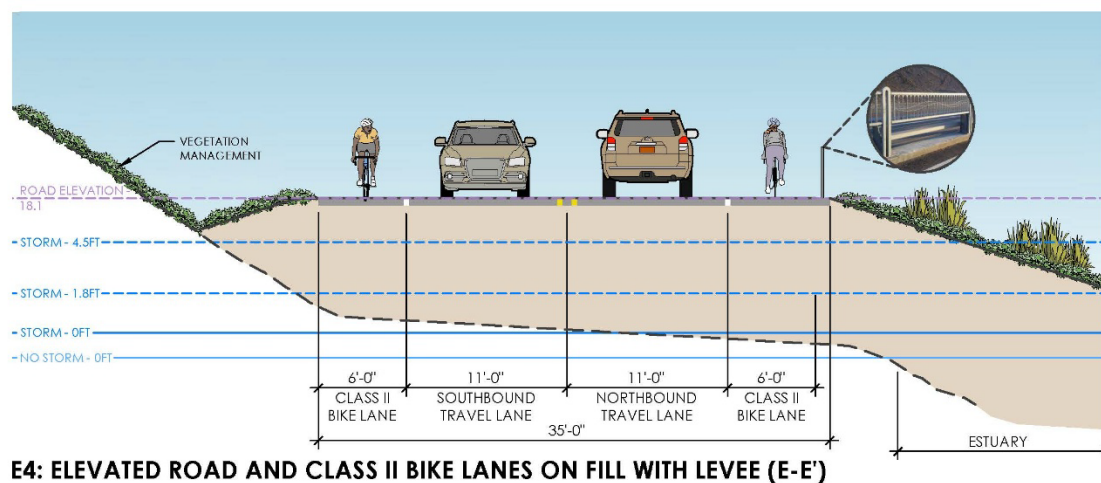
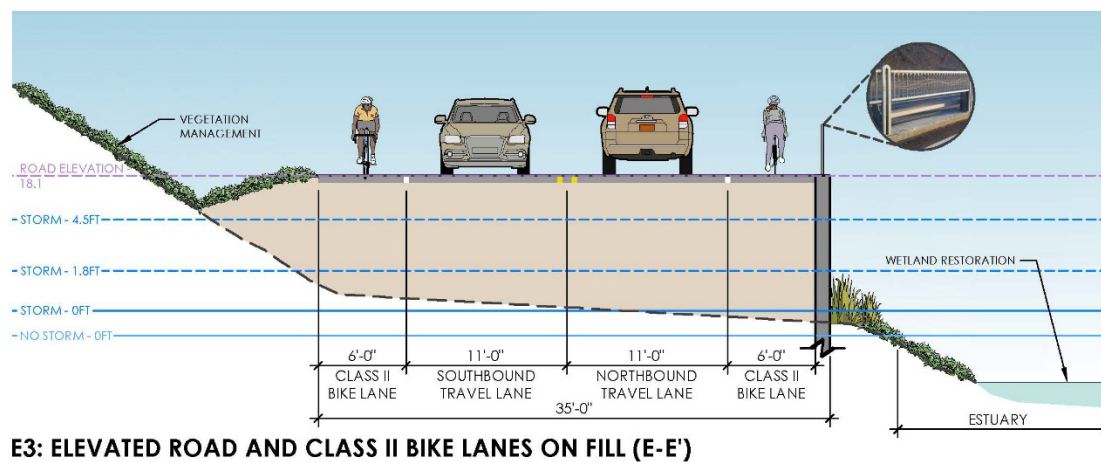
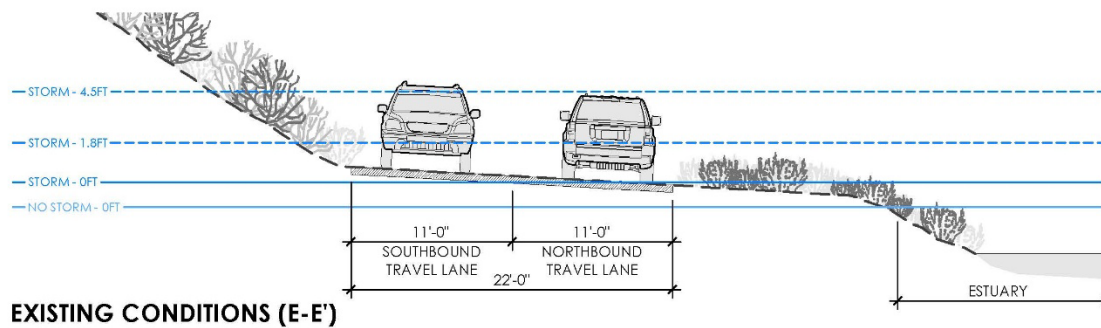


**F5: CONVERT TO ONE-WAY AND ADD CLASS I BIKE PATH (F-F')**

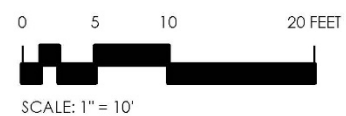
**F: WINDY COVE**



**Figure 7 Cross Sections for Near-term Adaptation Alternatives**

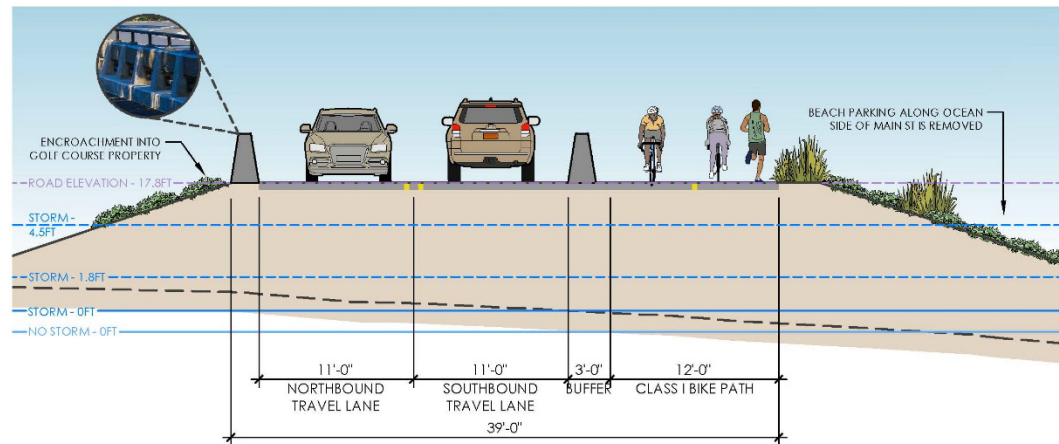
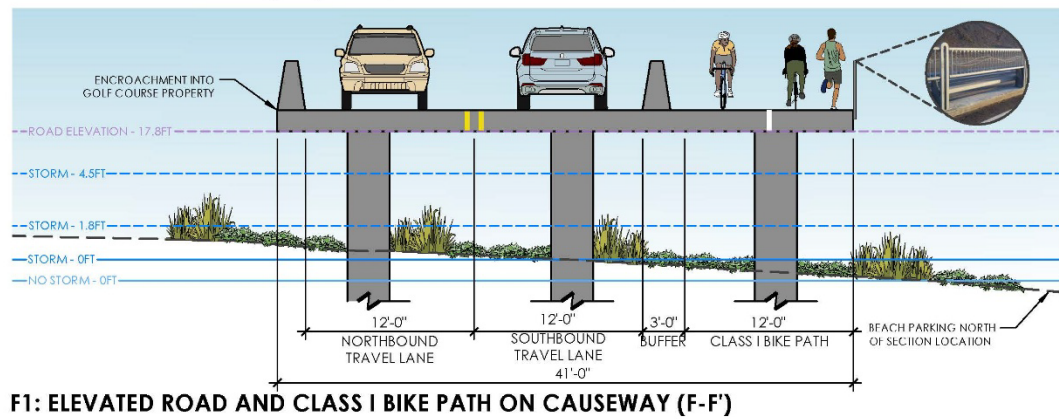
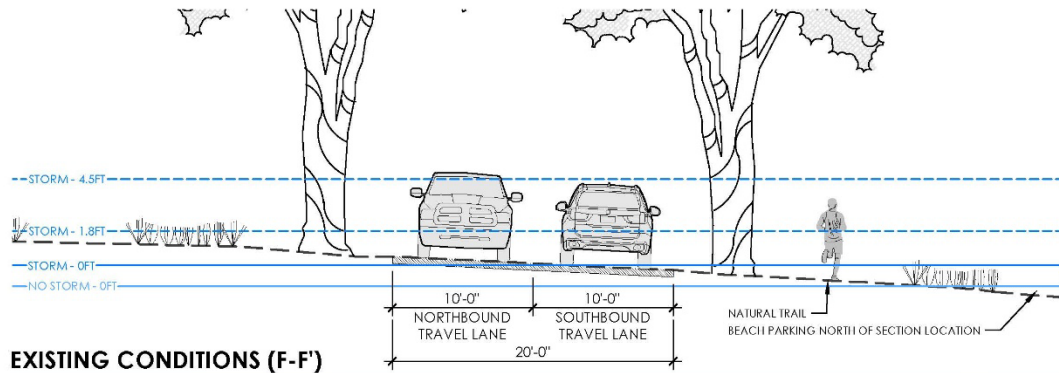


**E: MAIN STREET**



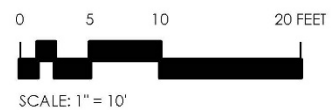


**Figure 8 Cross Sections for Near-term Adaptation Alternatives**



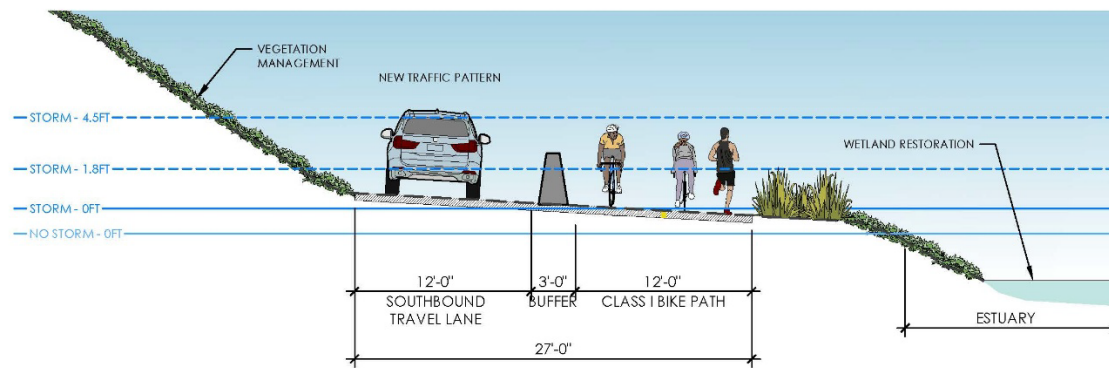
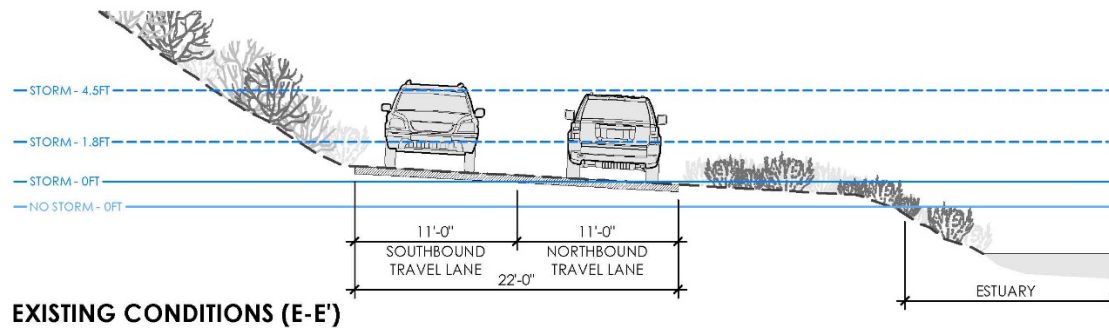
**F2: ELEVATED ROAD AND CLASS I BIKE PATH ON FILL (F-F')**

**F: WINDY COVE**

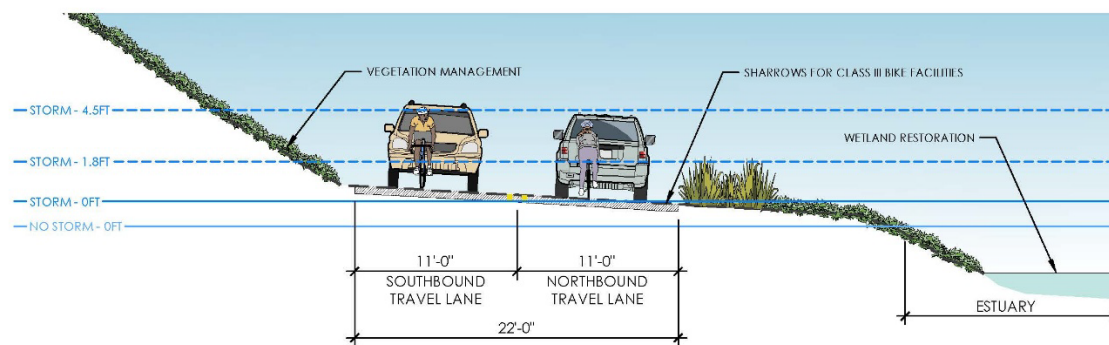




**Figure 9 Cross Sections for Near-term Adaptation Alternatives**

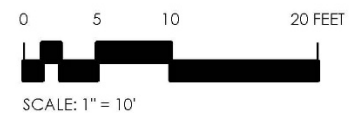


**E1: CONVERT TO ONE-WAY AND ADD CLASS I BIKE PATH (E-E')**

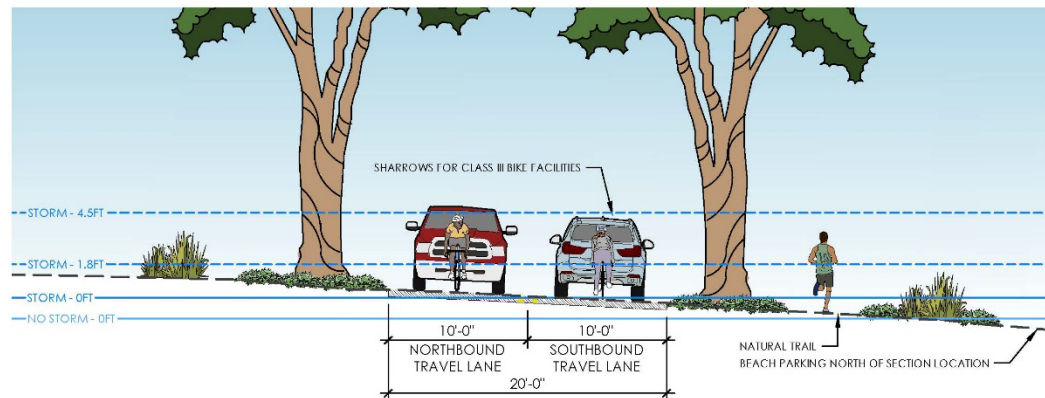
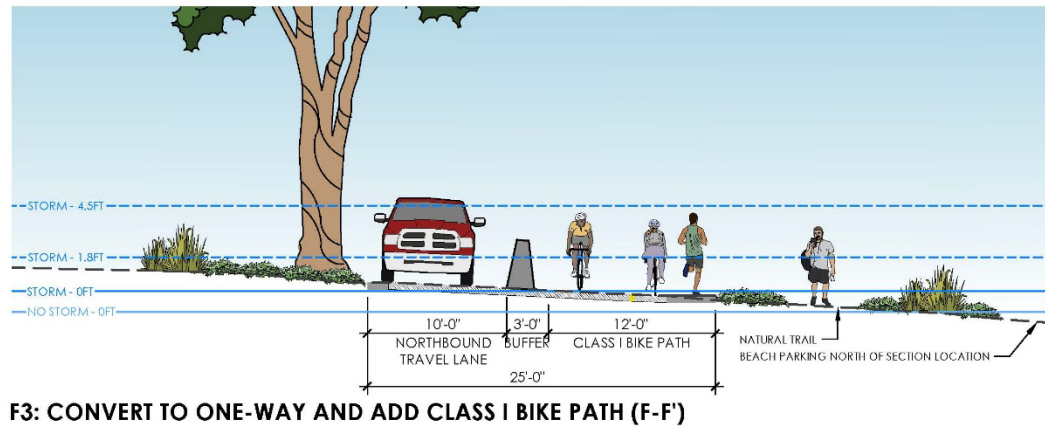
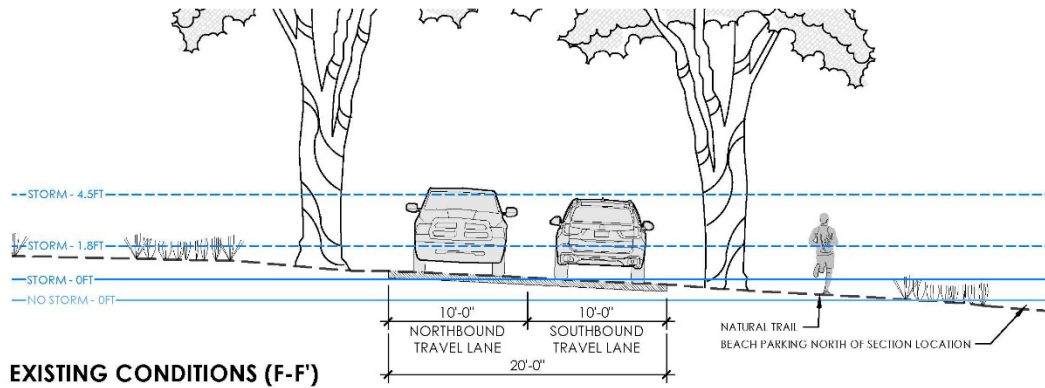


**E2: ADD CLASS III BIKE FACILITIES (E-E')**

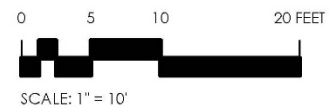
**E: MAIN STREET**



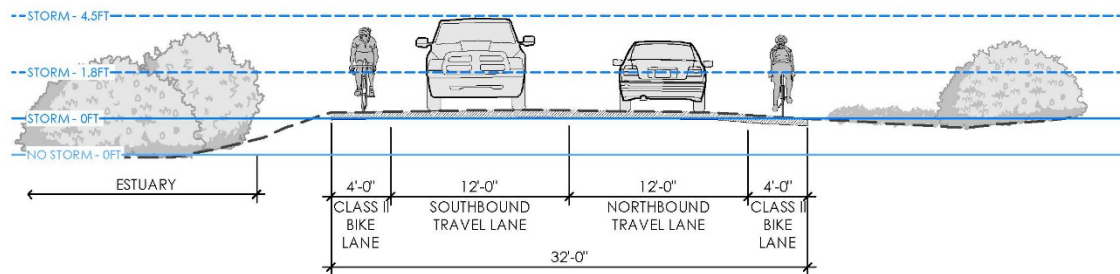
**Figure 10 Cross Sections for Near-term Adaptation Alternatives**



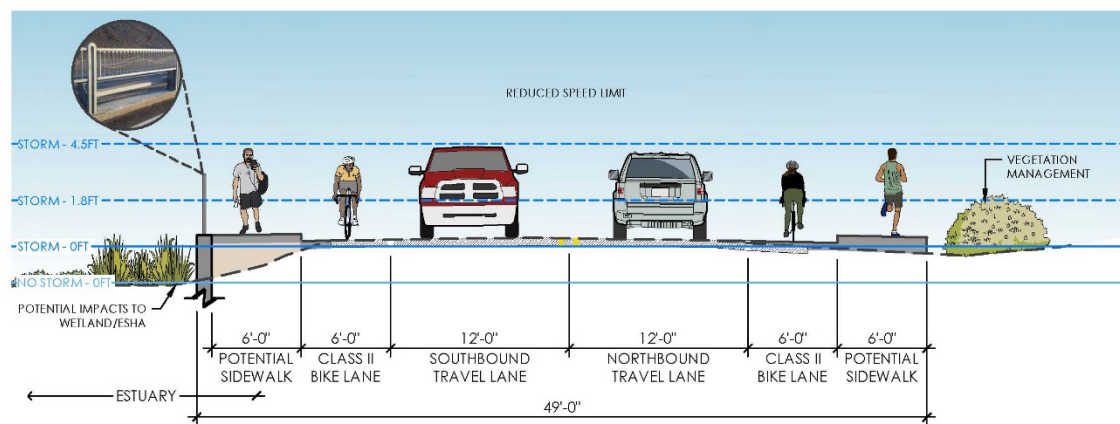
**F: WINDY COVE**



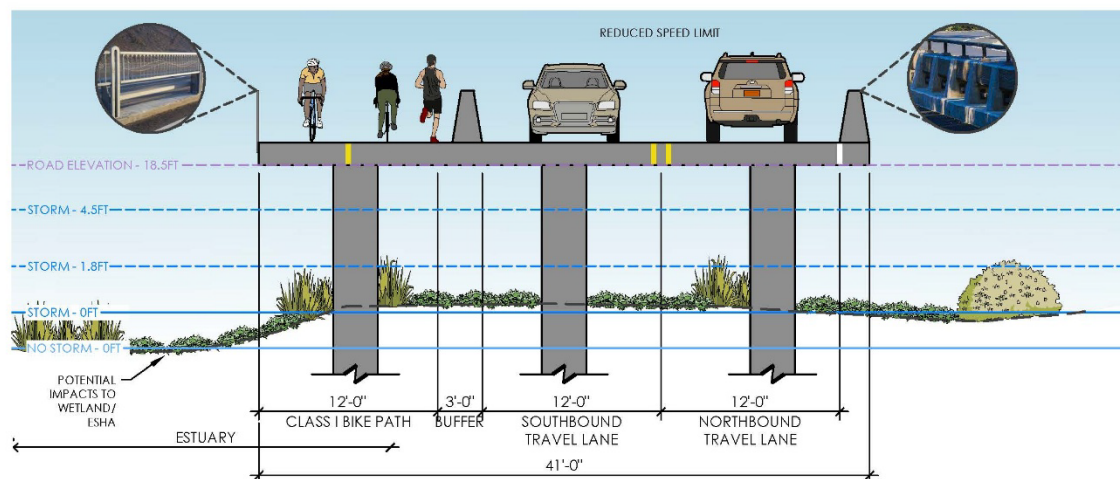
**Figure 11 Cross Sections for Near-term Adaptation Alternatives**



**EXISTING CONDITIONS (C-C')**

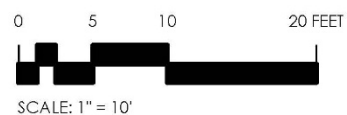


**C1: WIDEN CLASS II BIKE LANES AND SIDEWALK (C-C')**

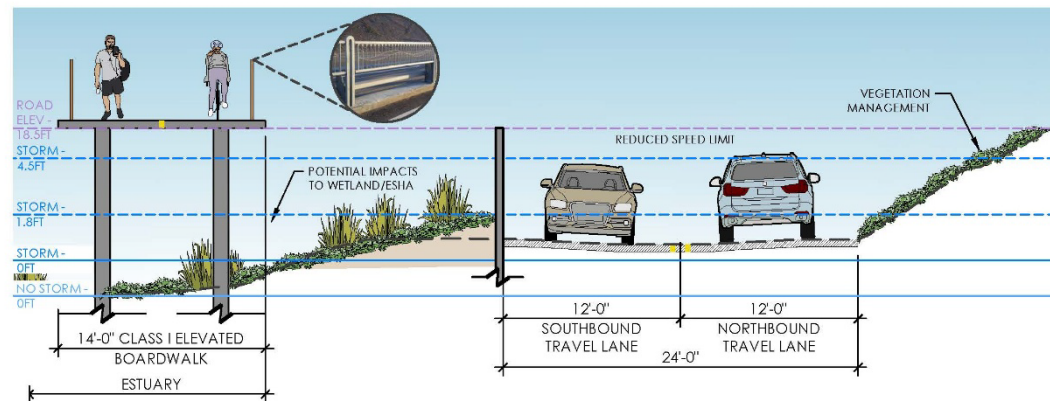
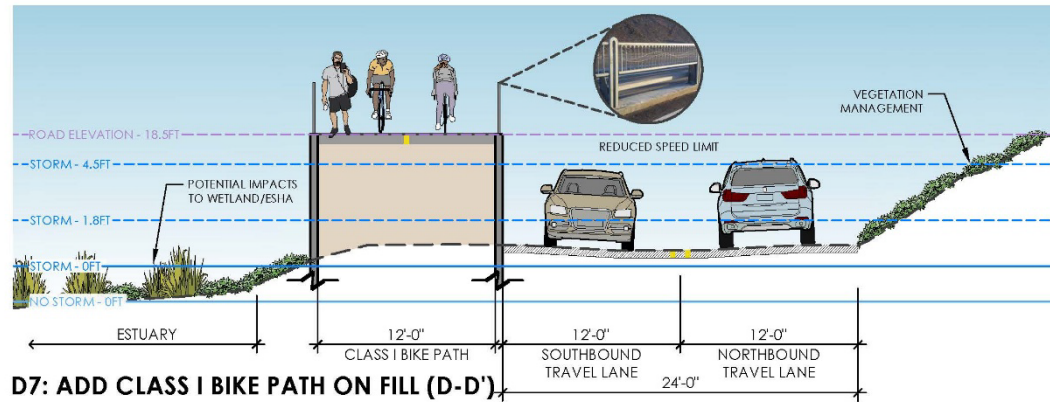
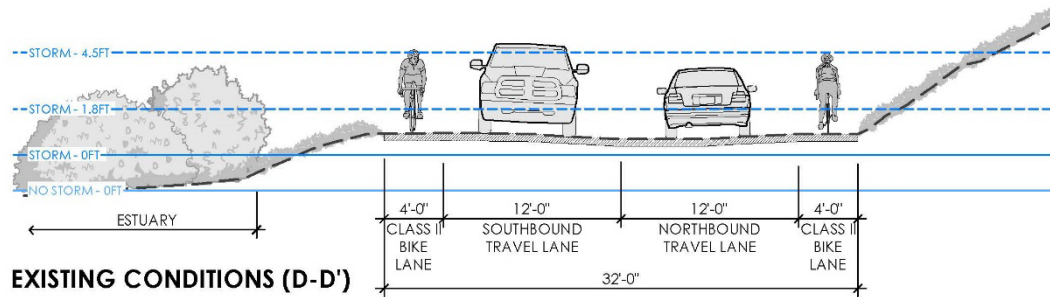


**C2: ELEVATED ROAD AND CLASS I BIKE PATH ON CAUSEWAY (C-C')**

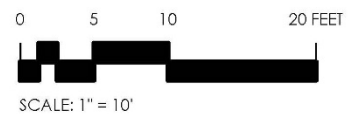
**C: SOUTH BAY BOULEVARD (NORTH)**



**Figure 12 Cross Sections for Near-term Adaptation Alternatives**

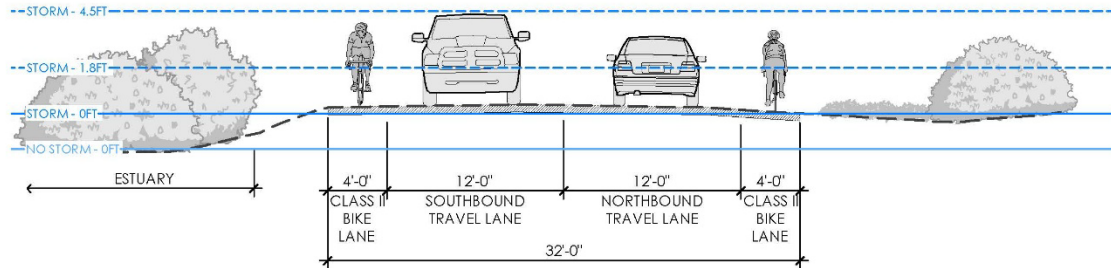


**D: SOUTH BAY BOULEVARD (SOUTH)**

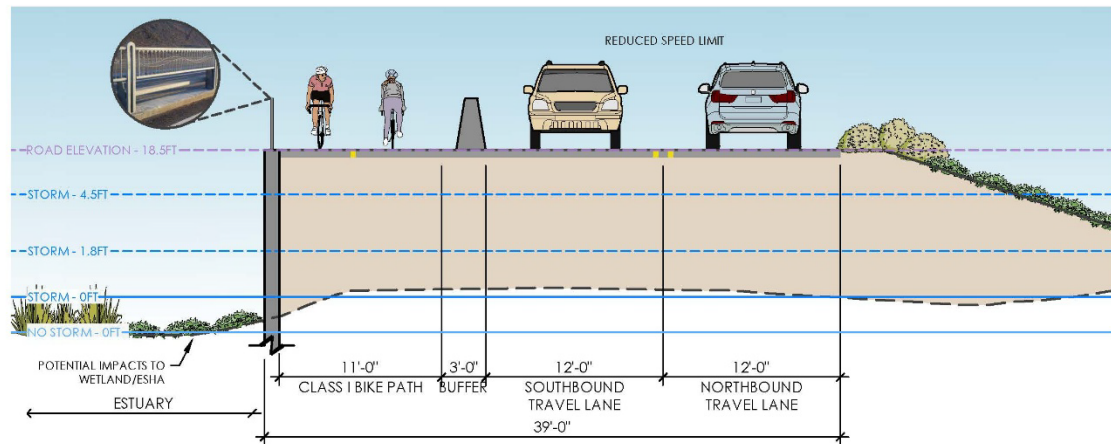




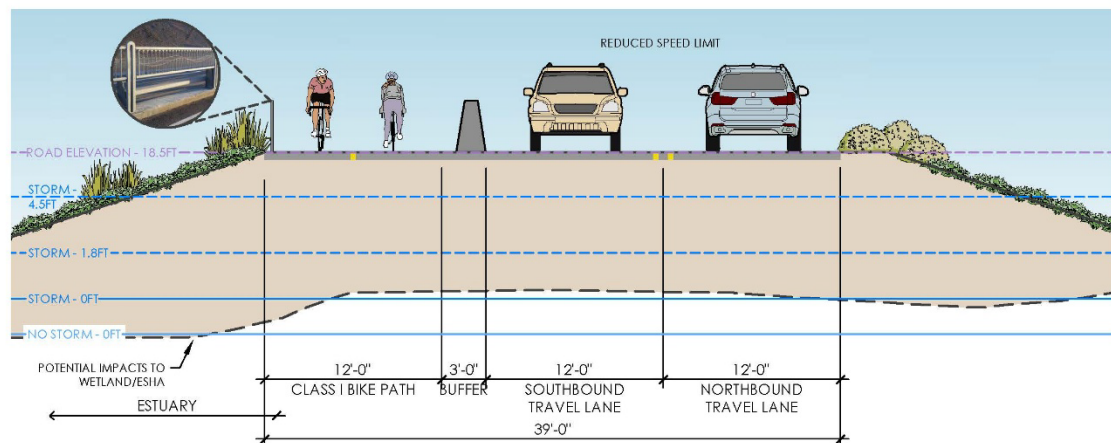
**Figure 13 Cross Sections for Near-term Adaptation Alternatives**



**EXISTING CONDITIONS (C-C')**

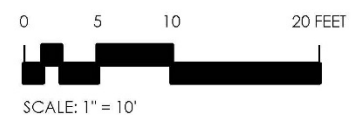


**C3: ELEVATED ROAD ON FILL WITH COASTAL CLASS I BIKE PATH (C-C')**



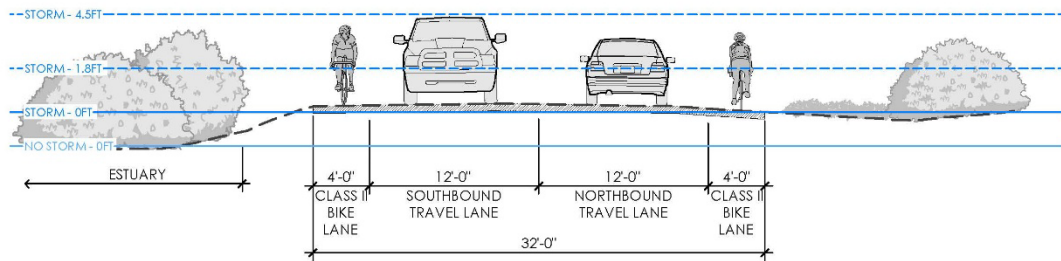
**C4: ELEVATED ROAD ON FILL WITH COASTAL CLASS I BIKE PATH AND LEVEE (C-C')**

**C: SOUTH BAY BOULEVARD (NORTH)**

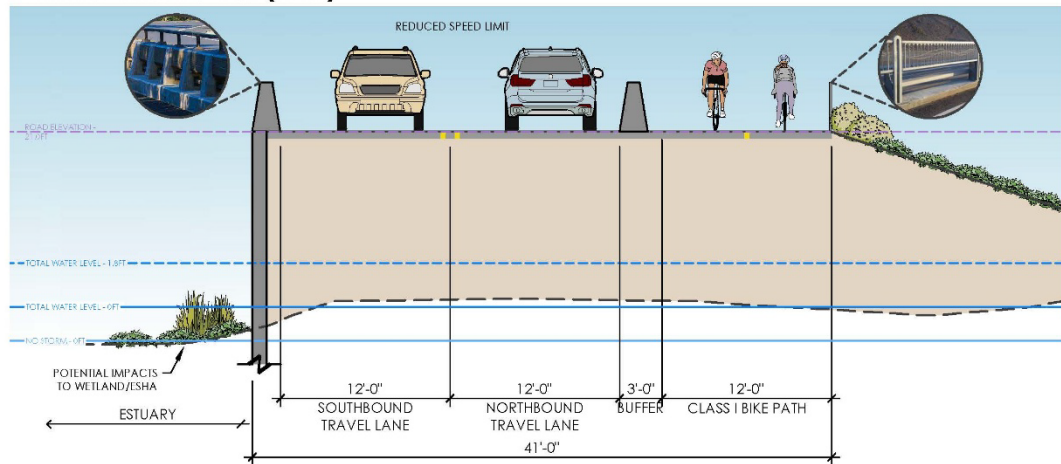




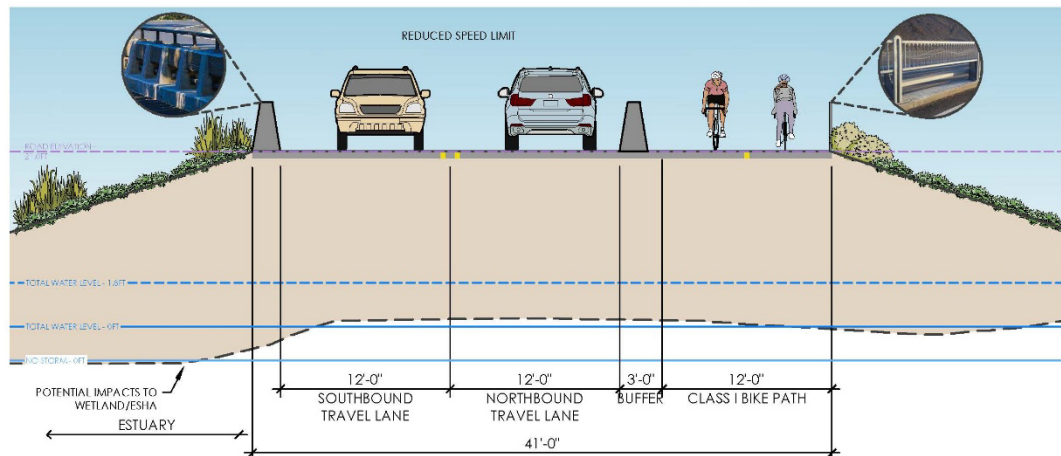
**Figure 14 Cross Sections for Near-term Adaptation Alternatives**



**EXISTING CONDITIONS (C-C')**

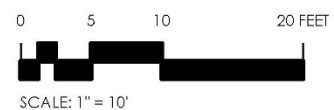


**C5: ELEVATED ROAD ON FILL WITH INLAND CLASS I BIKE PATH (C-C')**

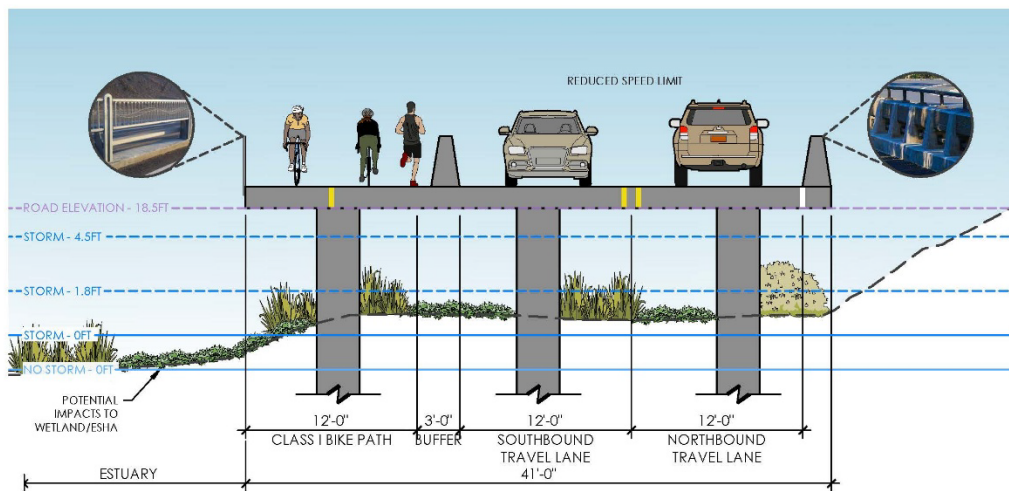
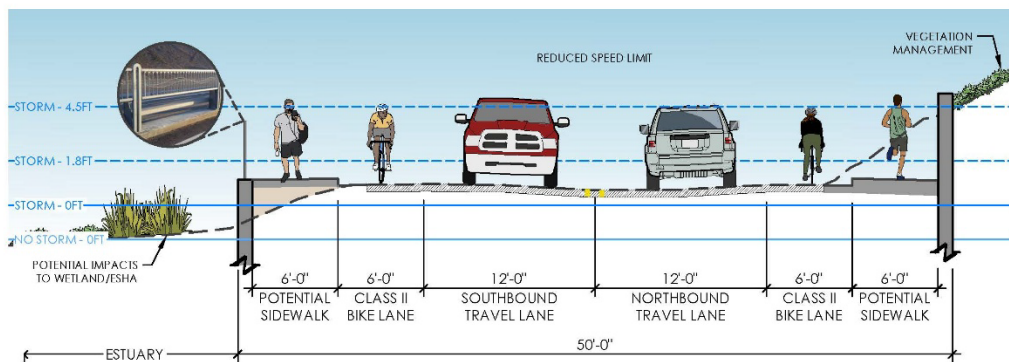
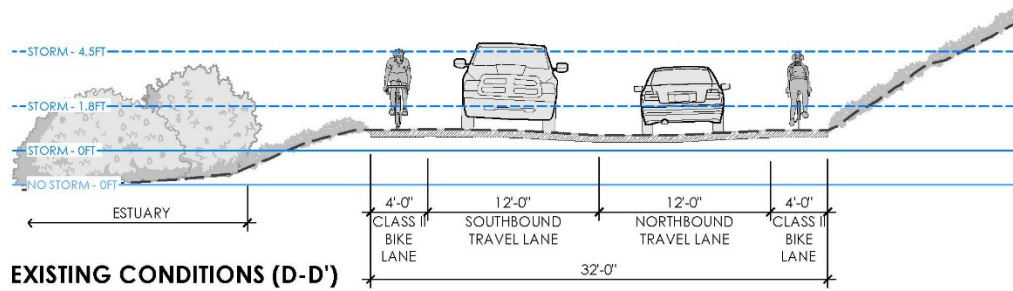


**C6: ELEVATED ROAD ON FILL WITH INLAND CLASS I BIKE PATH AND LEVEE (C-C')**

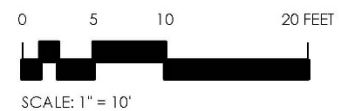
**C: SOUTH BAY BOULEVARD (NORTH)**



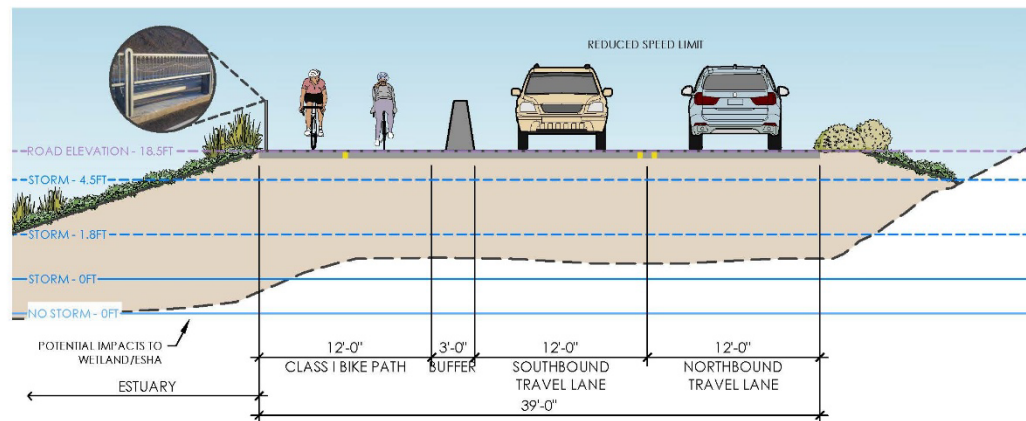
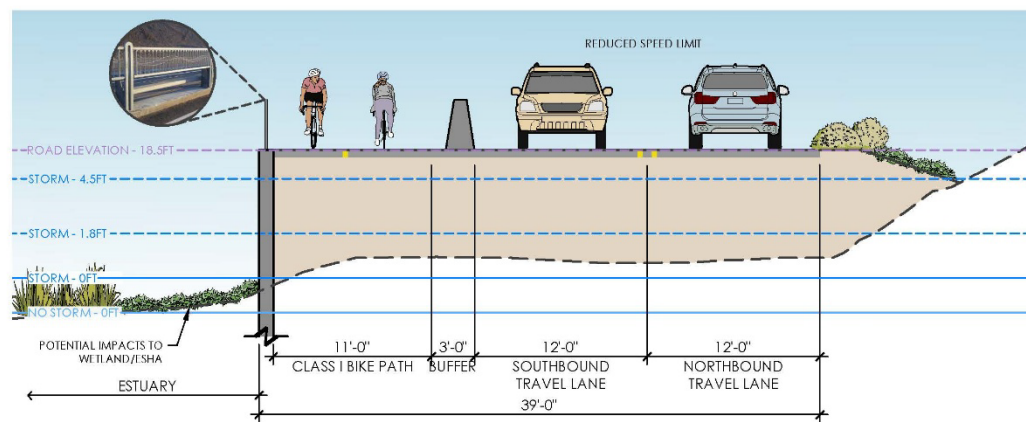
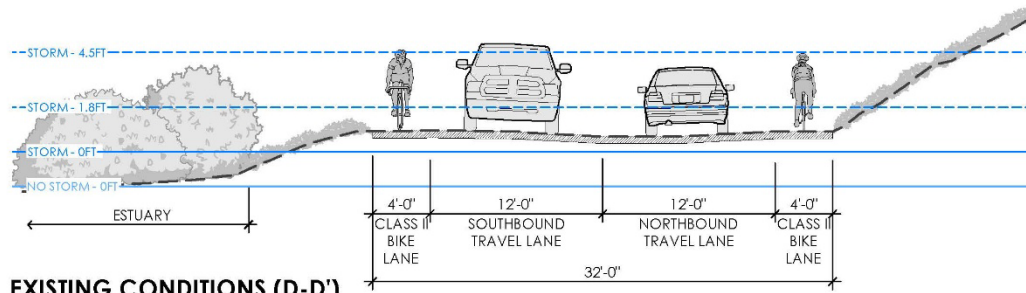
**Figure 15 Cross Sections for Near-term Adaptation Alternatives**



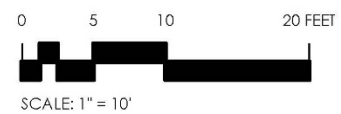
**D: SOUTH BAY BOULEVARD (SOUTH)**



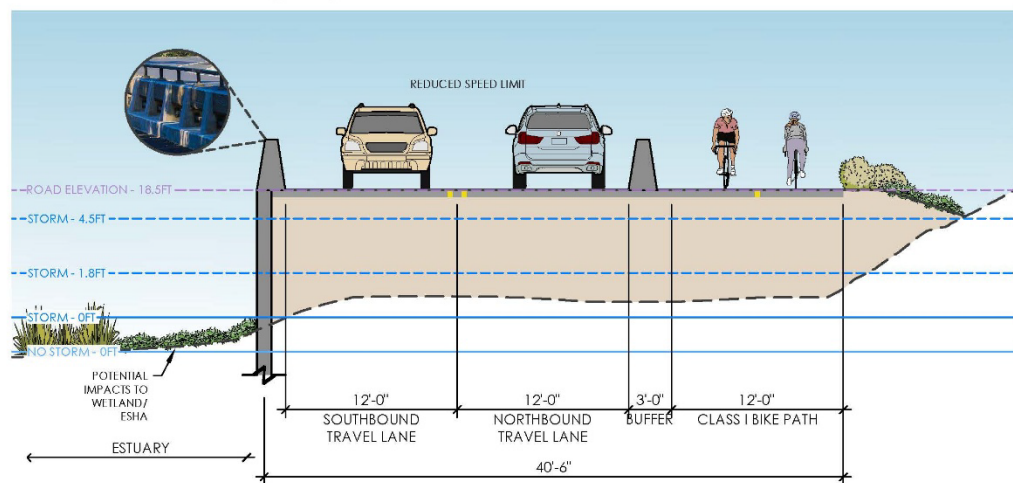
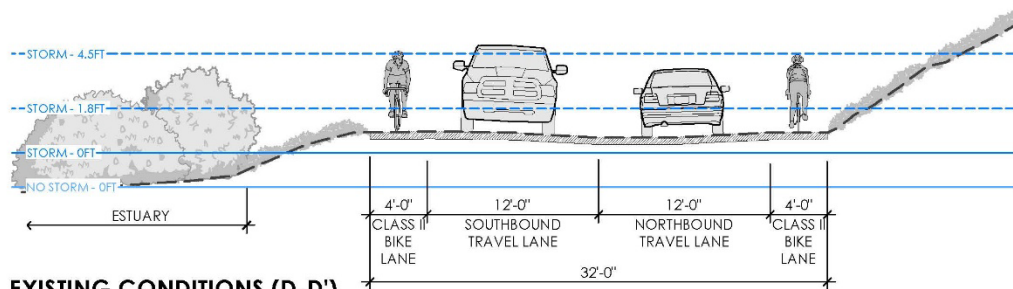
**Figure 16 Cross Sections for Near-term Adaptation Alternatives**



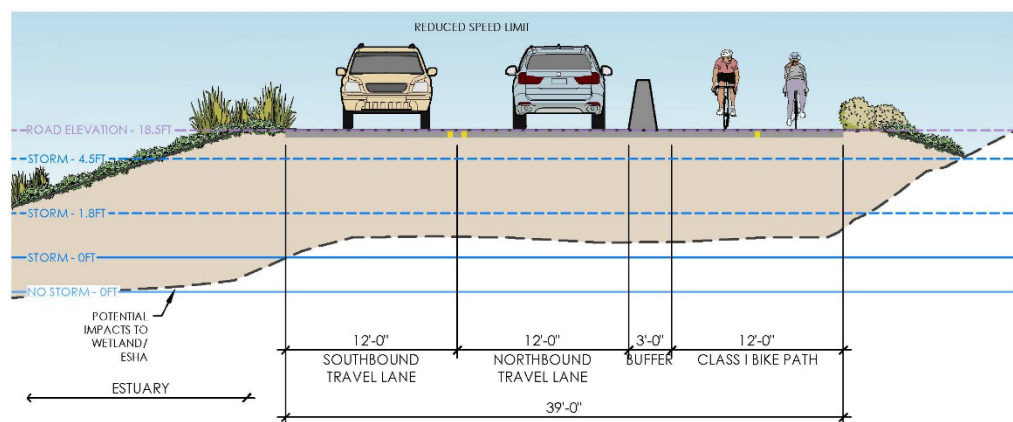
**D: SOUTH BAY BOULEVARD (SOUTH)**



**Figure 17 Cross Sections for Near-term Adaptation Alternatives**

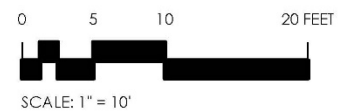


**D5: ELEVATED ROAD ON FILL WITH INLAND CLASS I BIKE PATH (D-D')**



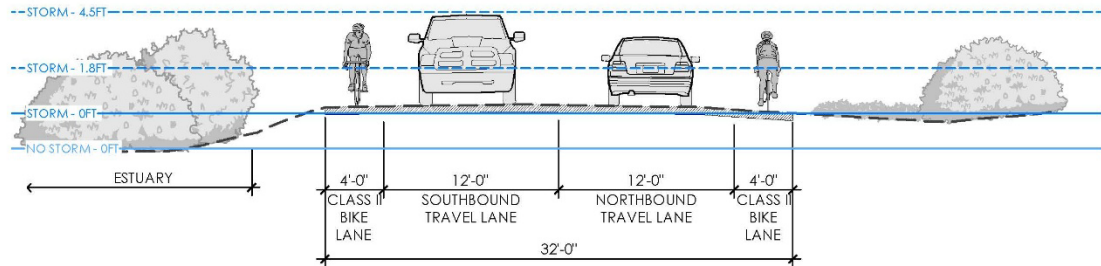
**D6: ELEVATED ROAD ON FILL WITH INLAND CLASS I BIKE PATH AND LEVEE (D-D')**

**D: SOUTH BAY BOULEVARD (SOUTH)**

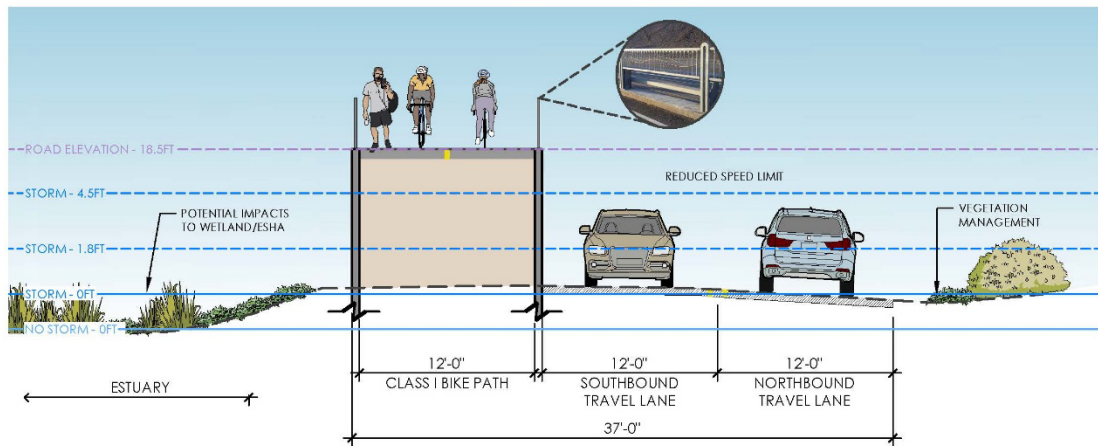




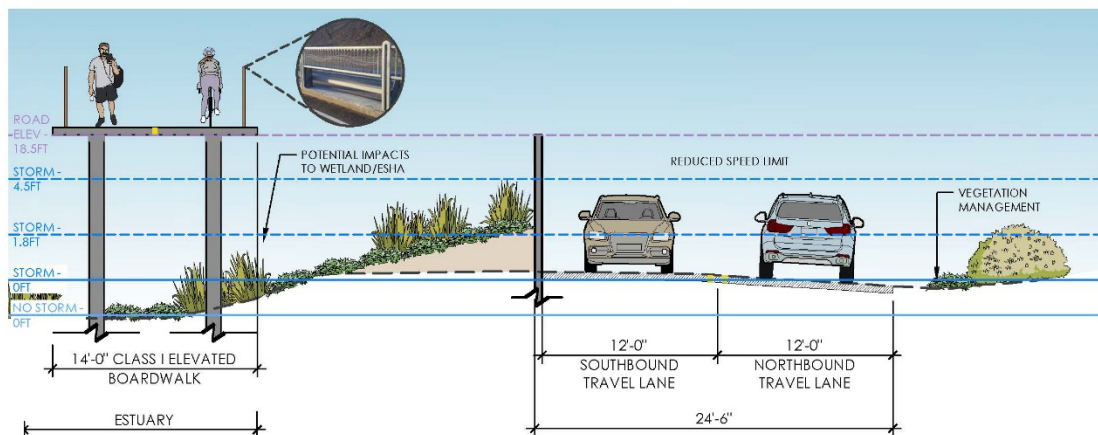
**Figure 18 Cross Sections for Near-term Adaptation Alternatives**



**EXISTING CONDITIONS (C-C')**

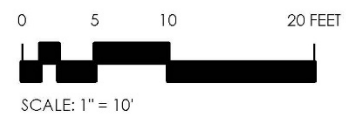


**C7: ADD CLASS I BIKE PATH ON FILL (C-C')**

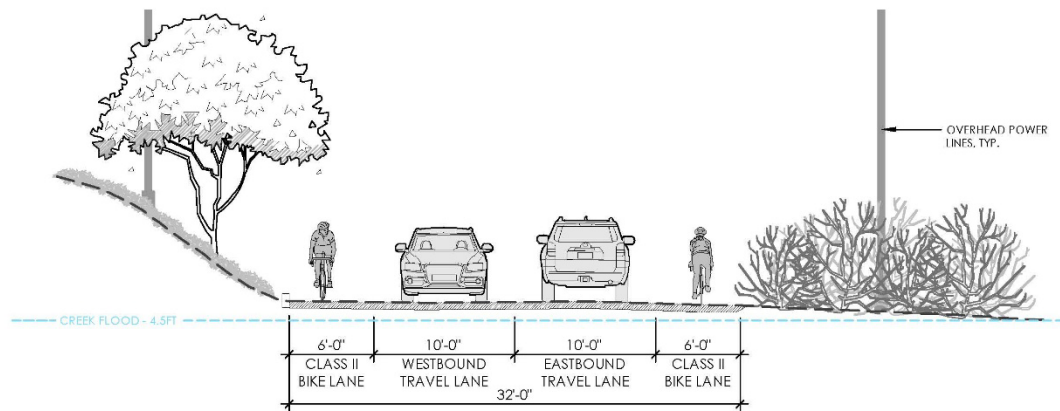


**C8: ADD CLASS I BIKE PATH AND BOARDWALK (C-C')**

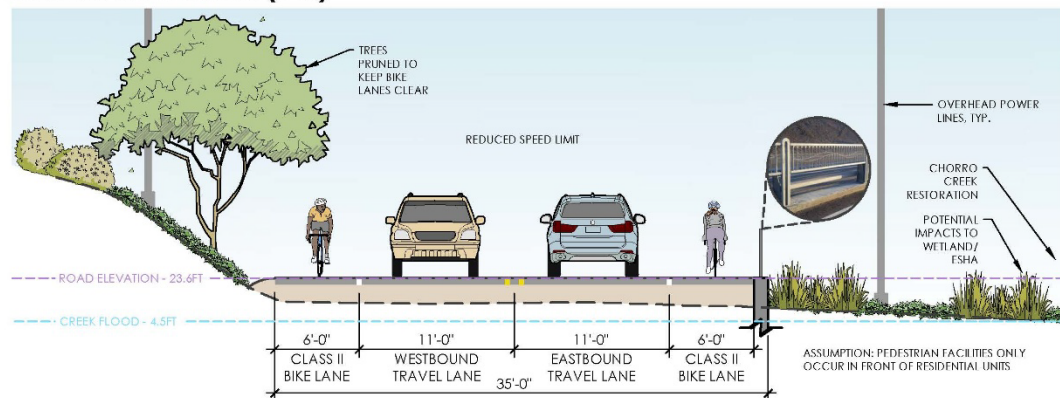
**C: SOUTH BAY BOULEVARD (NORTH)**



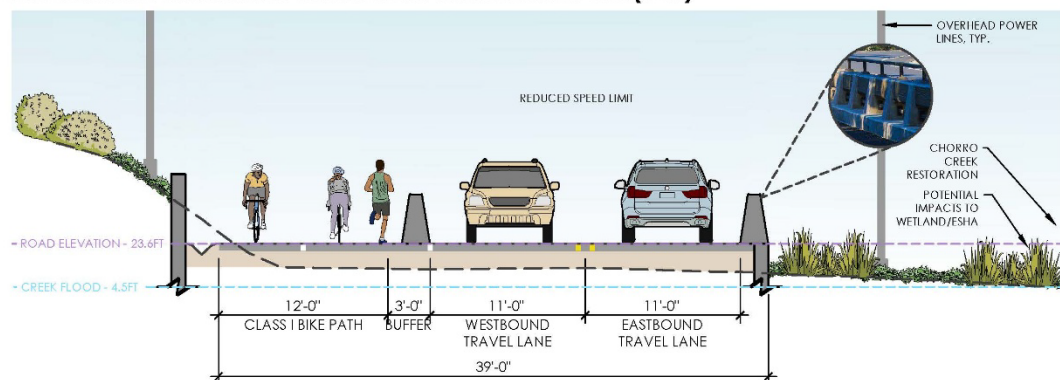
**Figure 19 Cross Sections for Near-term Adaptation Alternatives**



**EXISTING CONDITIONS (B-B')**

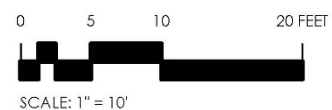


**B1: ELEVATED ROAD AND CLASS II BIKE LANES ON BERM (B-B')**

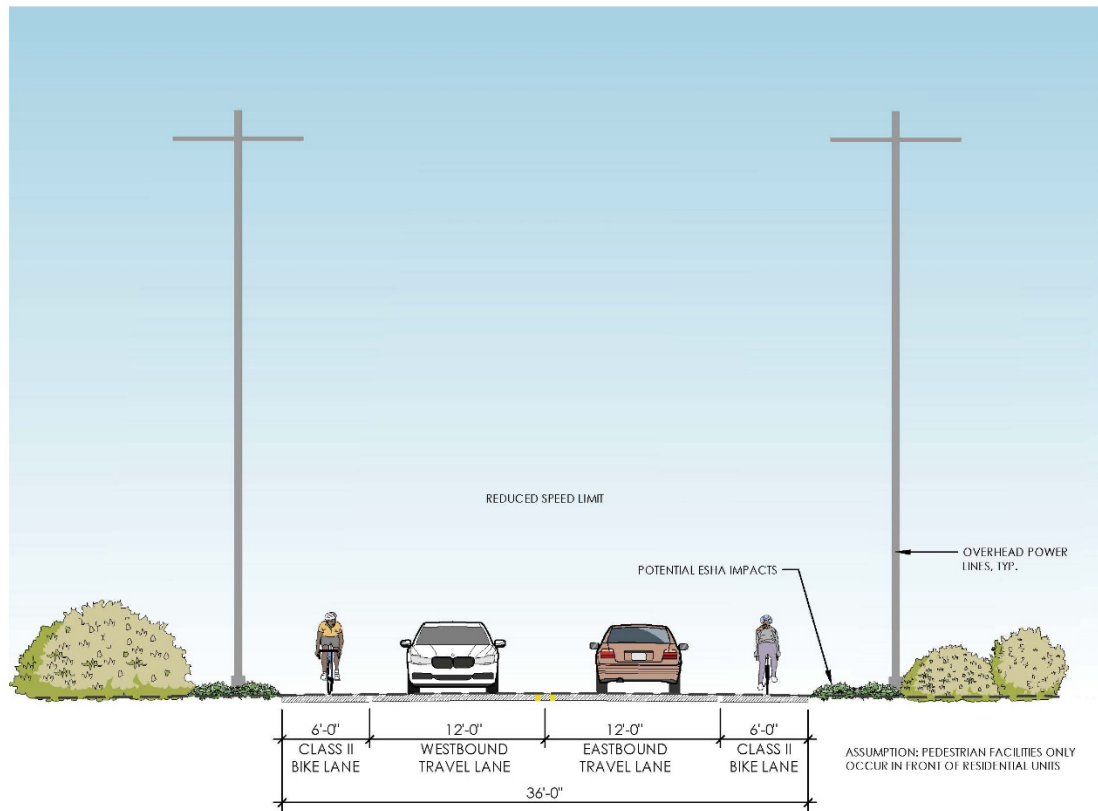
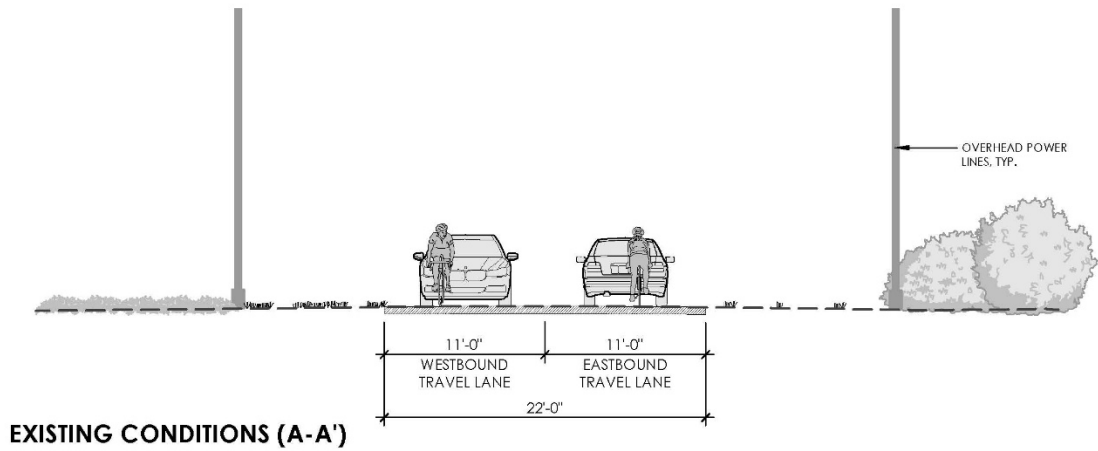


**B2: ELEVATED ROAD AND CLASS I BIKE PATH ON BERM (B-B')**

**B: QUINTANA ROAD (WEST)**

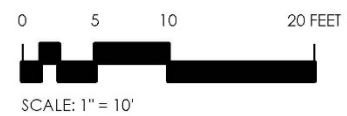


**Figure 20 Cross Sections for Near-term Adaptation Alternatives**



**A1: WIDEN ROAD FOR CLASS II BIKE LANES (A-A')**

**A: QUINTANA ROAD (EAST)**



### 3.3.2 Mid-term (~2045-2075)

In the mid-term, the focus shifts to assets that are likely to become exposed to coastal hazards in the near future. The vision is to build on the near-term actions and implement measures that provide continued resilience and adaptability to changing conditions. These measures aim to protect infrastructure, enhance natural defenses, and ensure the sustainability of recreational and natural assets.

The additional assets exposed to coastal hazards in the mid-term, considering the storm condition (Table 1), under the categories of transportation, recreation, and natural assets, include:

#### Transportation – Roads and Mobility Assets:

- S Bay Blvd
  - Chorro Creek Bridge to Bay Pines

- Turri Road

#### Recreational Assets:

- Cerro Cabrillo Trailhead Parking Lot
- Chumash Trailhead Parking Lot

Table 4 presents the **opportunities**, including potential solutions and enhancements that would increase resilience of the transportation, recreational and natural assets, **constraints** that may limit or restrict the ability of the opportunities to provide a feasible solution, including special status species, land use, construction /maintenance cost, permitting feasibility, and **evaluation criteria** of the measures that could be considered in the mid-term.



**TABLE 4.**  
**TABLE OF MID-TERM MEASURES OPPORTUNITIES AND CONSTRAINTS**

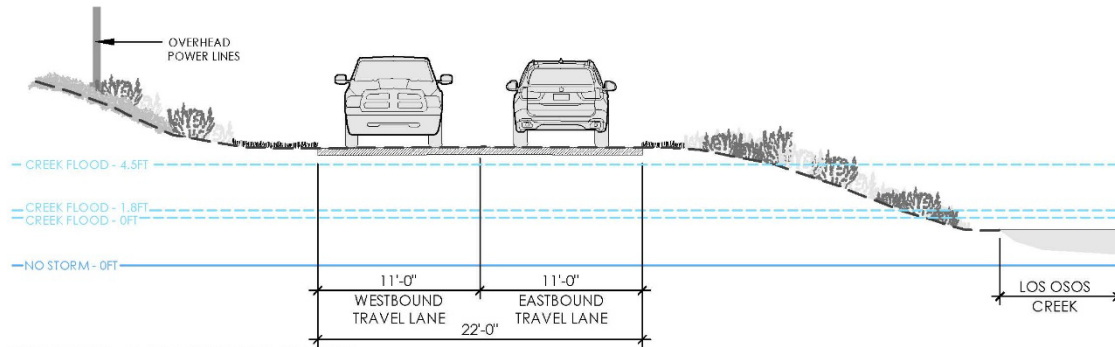
| Asset                                         | Adaptation Measure                                                                  | Opportunities                                                                                 | Constraints                                                                                             | Evaluation Criteria <sup>A</sup>                                                                                                                                                                                                                                                 |
|-----------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Transportation Assets</b>                  |                                                                                     |                                                                                               |                                                                                                         |                                                                                                                                                                                                                                                                                  |
| S Bay Blvd (Chorro Creek Bridge to Bay Pines) | Accommodate: Raise the most vulnerable segments of the road on fill/berm            | Add Class I or Class II bike lane to the widened roadway prism                                | Potential impacts to adjacent habitat                                                                   | <ul style="list-style-type: none"> <li>Engineering Considerations: <b>High</b></li> <li>Environmental Considerations: <b>Medium-High Impact / Low Benefits</b></li> <li>Regulatory Considerations: <b>Medium - High</b></li> <li>Social Considerations: <b>Medium</b></li> </ul> |
|                                               | Mobility: Create separated trail paralleling SBB                                    | Alternative alignment options (e.g., co-located with Los Osos State Water Line)               | Permanent Wetland/ESHA impacts; Would need enhanced crosswalks, beacons/stoplights for trailhead access | <ul style="list-style-type: none"> <li>Engineering Considerations: <b>Medium</b></li> <li>Environmental Considerations: <b>Medium Impact / Low Benefits</b></li> <li>Regulatory Considerations: <b>Medium</b></li> <li>Social Considerations: <b>Low</b></li> </ul>              |
|                                               | Mobility: Widen NB/SB existing bike lanes                                           | Improved cycling infrastructure                                                               | Permanent Wetland/ESHA impacts                                                                          | <ul style="list-style-type: none"> <li>Engineering Considerations: <b>Medium</b></li> <li>Environmental Considerations: <b>Medium-High Impact / Low Benefits</b></li> <li>Regulatory Considerations: <b>Medium</b></li> <li>Social Considerations: <b>Low</b></li> </ul>         |
|                                               | Mobility: Vegetation management                                                     | Improved safety at SBB/State Park Road intersection where vegetation blocks drivers' views    | State Parks policies                                                                                    | <ul style="list-style-type: none"> <li>Engineering Considerations: <b>Low</b></li> <li>Environmental Considerations: <b>Low Impact / Medium Benefits</b></li> <li>Regulatory Considerations: <b>Low</b></li> <li>Social Considerations: <b>Low</b></li> </ul>                    |
|                                               | Mobility: Reduce speed limit                                                        | Improved safety for all road users                                                            | Implementation and enforcement requirements                                                             | <ul style="list-style-type: none"> <li>Engineering Considerations: <b>Low</b></li> <li>Environmental Considerations: <b>Low Impact / Low Benefits</b></li> <li>Regulatory Considerations: <b>Low</b></li> <li>Social Considerations: <b>Low</b></li> </ul>                       |
| Turri Road                                    | Accommodate: Elevate road on fill/causeway (See <b>Figure 21</b> for cross section) | Long-term flood protection; improved bike / ped safety; Maintained access during flood events | Potential Wetland/ESHA impacts                                                                          | <ul style="list-style-type: none"> <li>Engineering Considerations: <b>High</b></li> <li>Environmental Considerations: <b>Medium-High Impact / Low Benefits</b></li> <li>Regulatory Considerations: <b>Medium</b></li> <li>Social Considerations: <b>Low</b></li> </ul>           |
|                                               | Mobility: Improved pedestrian crossing at SBB                                       | Enhanced safety for pedestrians                                                               | Implementation costs                                                                                    | <ul style="list-style-type: none"> <li>Engineering Considerations: <b>Low</b></li> </ul>                                                                                                                                                                                         |

|                                      |                                                                                                       |                                       |                                                 |                                                                                                                                                                                                                                                                     |
|--------------------------------------|-------------------------------------------------------------------------------------------------------|---------------------------------------|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                      |                                                                                                       |                                       |                                                 | <ul style="list-style-type: none"> <li>Environmental Considerations: <b>Low Impact / Low Benefits</b></li> <li>Regulatory Considerations: <b>Low</b></li> <li>Social Considerations: <b>Low</b></li> </ul>                                                          |
|                                      | Mobility: Add left turn lane on SBB                                                                   | Improved traffic flow                 | Widening roadway could impact wetland           | <ul style="list-style-type: none"> <li>Engineering Considerations: <b>Low</b></li> <li>Environmental Considerations: <b>Medium Impact / Low Benefits</b></li> <li>Regulatory Considerations: <b>Low</b></li> <li>Social Considerations: <b>Low</b></li> </ul>       |
|                                      | Mobility: Widen road at add Class II bike lanes in shoulders (See <b>Figure 22</b> for cross section) | Safer biking                          | Permanent Wetland/ESHA impacts                  | <ul style="list-style-type: none"> <li>Engineering Considerations: <b>Medium</b></li> <li>Environmental Considerations: <b>Medium Impact / Low Benefits</b></li> <li>Regulatory Considerations: <b>Medium</b></li> <li>Social Considerations: <b>Low</b></li> </ul> |
|                                      | Stormwater management                                                                                 | Reduced flooding during storm events  | Implementation costs; potential habitat impacts | <ul style="list-style-type: none"> <li>Engineering Considerations: <b>Low</b></li> <li>Environmental Considerations: <b>Low Impact / Medium Benefits</b></li> <li>Regulatory Considerations: <b>Low</b></li> <li>Social Considerations: <b>Low</b></li> </ul>       |
| <b>Recreational Assets</b>           |                                                                                                       |                                       |                                                 |                                                                                                                                                                                                                                                                     |
| Cerro Cabrillo Trailhead Parking Lot | Accommodate: increase elevation of trailhead parking lot using fill                                   | Maintained access during flood events | Implementation costs                            | <ul style="list-style-type: none"> <li>Engineering Considerations: <b>Medium</b></li> <li>Environmental Considerations: <b>Medium Impact / Low Benefits</b></li> <li>Regulatory Considerations: <b>Medium</b></li> <li>Social Considerations: <b>Low</b></li> </ul> |
| Chumash Trailhead Parking Lot        | Accommodate: increase elevation of trailhead parking lot using fill                                   | Maintained access during flood events | Implementation costs                            | <ul style="list-style-type: none"> <li>Engineering Considerations: <b>Medium</b></li> <li>Environmental Considerations: <b>Low Impact / Low Benefits</b></li> <li>Regulatory Considerations: <b>Low</b></li> <li>Social Considerations: <b>Low</b></li> </ul>       |

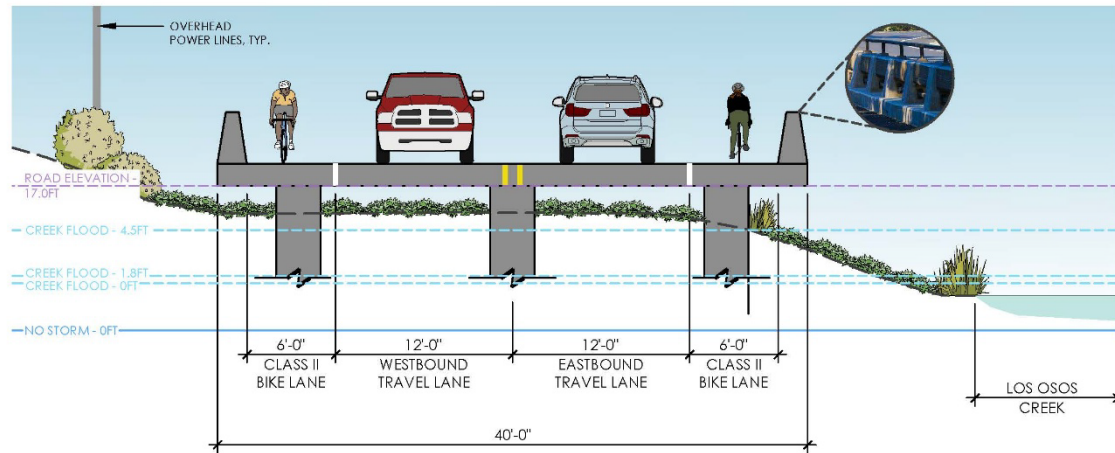
Note:

<sup>A</sup> Economic consideration is not included because it will be defined in Task 2.4 of the Project

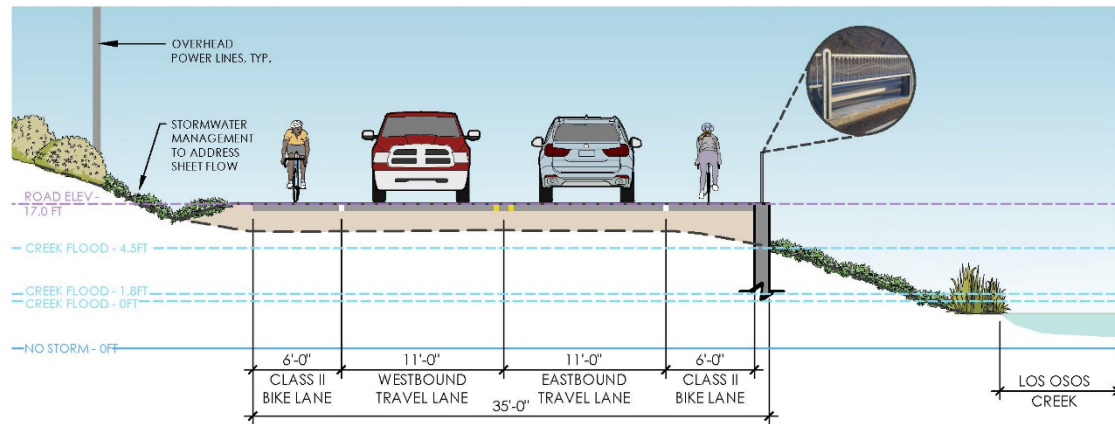
**Figure 21 Cross Sections for Mid-term Adaptation Alternatives**



**EXISTING CONDITIONS (G-G')**

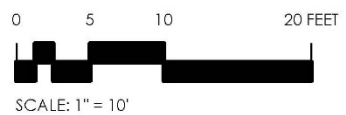


**G1: ELEVATED ROAD AND CLASS II BIKE LANES ON CAUSEWAY (G-G')**

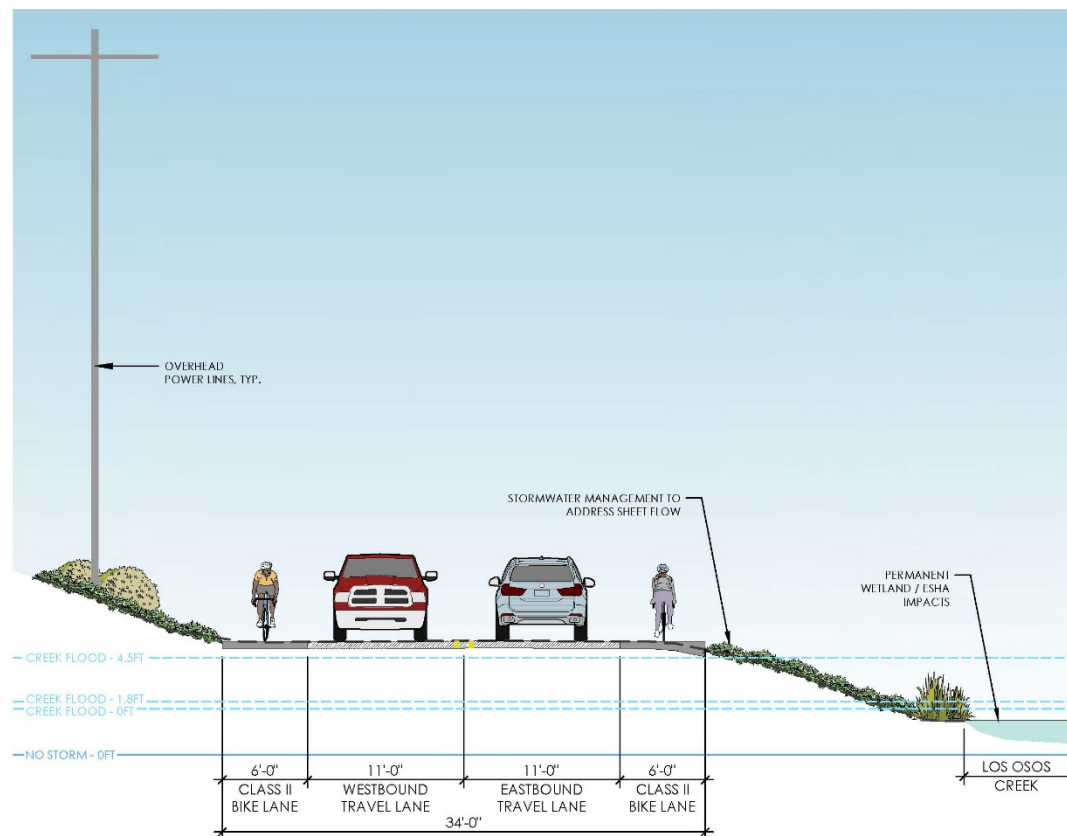
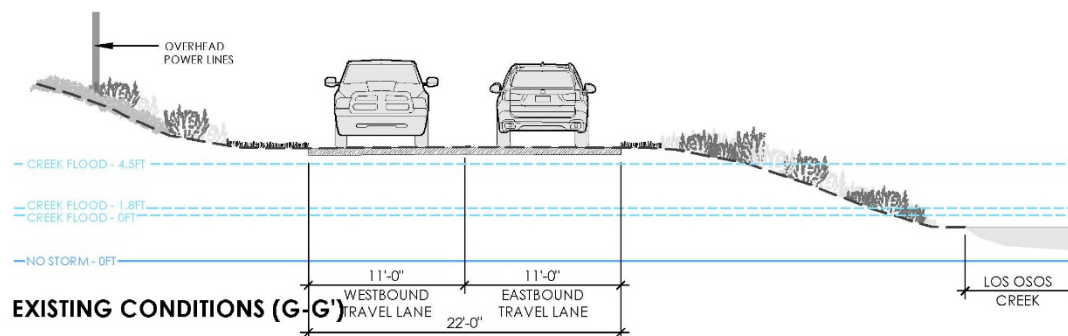


**G2: ELEVATED ROAD AND CLASS II BIKE LANES ON FILL (G-G')**

**G: TURRI ROAD**

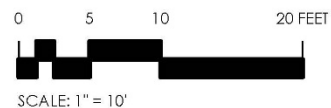


**Figure 22 Cross Sections for Mid-term Adaptation Alternatives**



**G3: WIDEN ROAD FOR CLASS II BIKE LANES (G-G')**

**G: TURRI ROAD**





### 3.3.3 Long-term (~2075+years)

The long-term vision for the Morro Bay Estuary includes creating a resilient and adaptive infrastructure that can withstand up to 6 ft of SLR. This vision will be informed by stakeholder and public input and will focus on sustainable and nature-based solutions.

The assets exposed to coastal hazards in the long-term, considering the storm condition (Table 1), under the categories of transportation, recreation, and natural assets, include:

#### Transportation – Roads and Mobility Assets:

- Los Osos Bridge

#### Recreational Assets:

- Park Ridge Trailhead Parking Lot

#### Natural Assets:

- El Moro Elfin Forest Natural Preserve

Table 5 presents the **opportunities**, including potential solutions and enhancements that would increase resilience of the transportation assets and habitats, **constraints** that may limit or restrict the ability of the opportunities to provide a feasible solution, including special status species, land use, construction /maintenance cost, permitting feasibility, and **evaluation criteria** of the measures that could be considered in the long-term.

**TABLE 5.**  
**TABLE OF LONG-TERM MEASURES OPPORTUNITIES AND CONSTRAINTS**

| Asset                                   | Adaptation Measure              | Opportunities                                    | Constraints                    | Evaluation Criteria <sup>A</sup>                                                                                                                                                                                                                                       |
|-----------------------------------------|---------------------------------|--------------------------------------------------|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Transportation Assets</b>            |                                 |                                                  |                                |                                                                                                                                                                                                                                                                        |
| Park View Drive (Lower State Park Road) | Mobility: Convert to one-way    | Would allow more space for bikes and pedestrians | Impacts to traffic circulation | <ul style="list-style-type: none"> <li>• Engineering Considerations: <b>Low</b></li> <li>• Environmental Considerations: <b>Low Impact / Low Benefits</b></li> <li>• Regulatory Considerations: <b>Low</b></li> <li>• Social Considerations: <b>Low</b></li> </ul>     |
| South Bay Blvd                          | Accommodate: Increase elevation | Long-term flood avoidance.                       |                                | <ul style="list-style-type: none"> <li>• Engineering Considerations: <b>High</b></li> <li>• Environmental Considerations: <b>High Impact / Low Benefits</b></li> <li>• Regulatory Considerations: <b>High</b></li> <li>• Social Considerations: <b>High</b></li> </ul> |

|                                       |                                                                                                            |                                                                                        |                                                                       |                                                                                                                                                                                                                                                                         |
|---------------------------------------|------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Los Osos Bridge                       | Accommodate: Elevate                                                                                       | Avoid repeated flooding                                                                | Implementation costs; sensitive habitats; visual impacts              | <ul style="list-style-type: none"> <li>Engineering Considerations: <b>High</b></li> <li>Environmental Considerations: <b>Medium-High Impact / Low Benefits</b></li> <li>Regulatory Considerations: <b>High</b></li> <li>Social Considerations: <b>Medium</b></li> </ul> |
| <b>Recreational Assets</b>            |                                                                                                            |                                                                                        |                                                                       |                                                                                                                                                                                                                                                                         |
| Park Ridge Trailhead Parking Lot      | Relocate: out of the coastal hazard zone, e.g., uphill, or increase elevation of facilities by adding fill | Maintained access                                                                      | Limited suitable alternatives                                         | <ul style="list-style-type: none"> <li>Engineering Considerations: <b>Medium</b></li> <li>Environmental Considerations: <b>Low-Medium Impact / Low Benefits</b></li> <li>Regulatory Considerations: <b>Medium</b></li> <li>Social Considerations: <b>Low</b></li> </ul> |
| <b>Natural Assets</b>                 |                                                                                                            |                                                                                        |                                                                       |                                                                                                                                                                                                                                                                         |
| Morro Bay State Marine Reserve        | Protect: Expand wetland restoration, including thin-layer placement if needed                              | Natural buffers against sea-level rise. Enhanced ecological resilience                 | Not needed until 2060 due to natural accretion; sediment availability | <ul style="list-style-type: none"> <li>Engineering Considerations: <b>Medium</b></li> <li>Environmental Considerations: <b>Low Impact / High Benefits</b></li> <li>Regulatory Considerations: <b>Medium</b></li> <li>Social Considerations: <b>Low</b></li> </ul>       |
| El Moro Elfin Forest Natural Preserve | Protect: Habitat protection and creation of wetland migration space                                        | Allowing for the conversion of habitat at the margins from upland to wetland over time | Implementation constraints                                            | <ul style="list-style-type: none"> <li>Engineering Considerations: <b>Low</b></li> <li>Environmental Considerations: <b>Low Impact / Low Benefits</b></li> <li>Regulatory Considerations: <b>Low</b></li> <li>Social Considerations: <b>Low</b></li> </ul>              |

Note:

<sup>A</sup> Economic consideration were not included because they will be defined in Task 2.4 of the Project

## 4 Thresholds, Triggers and Timing

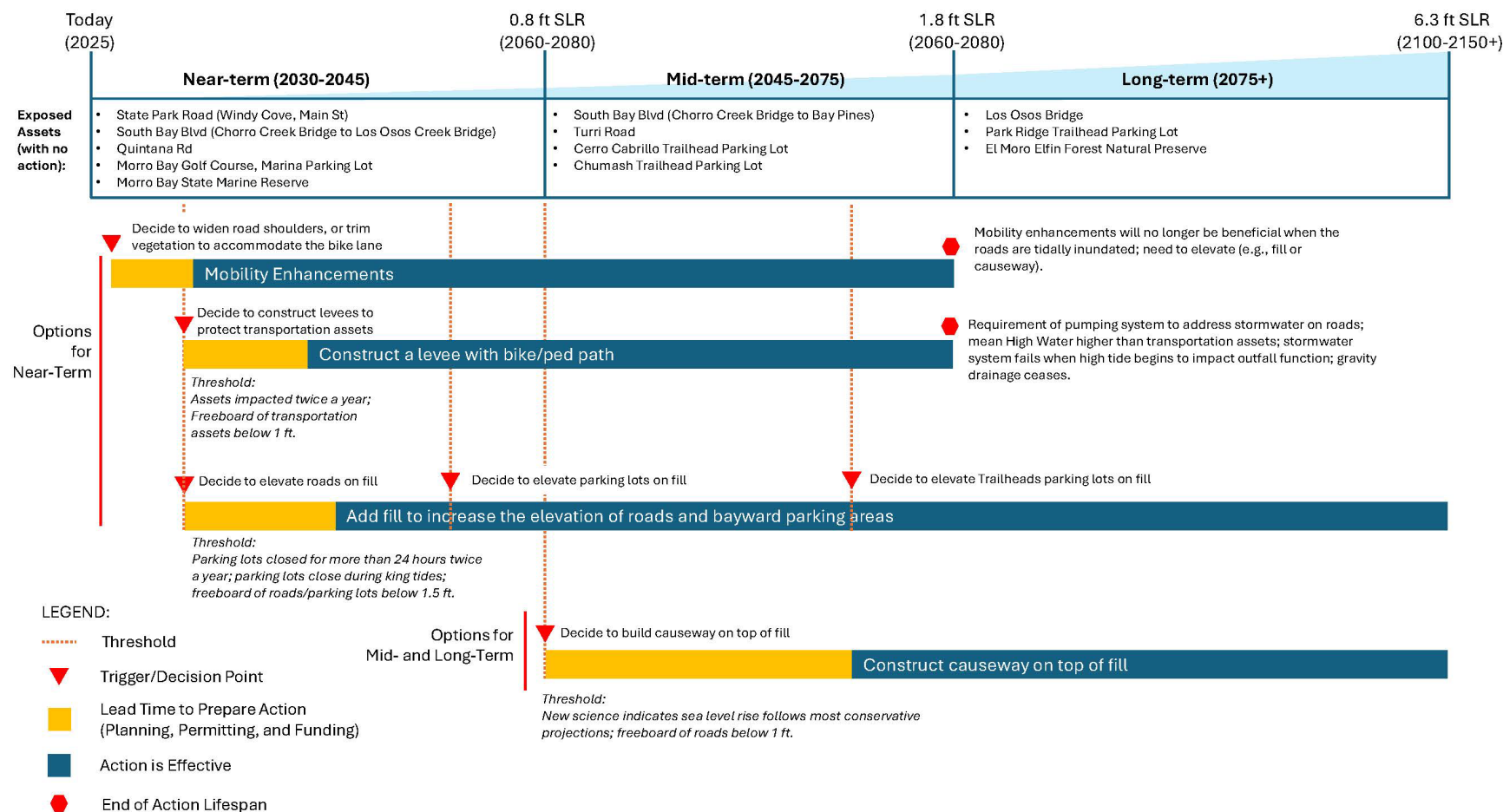
This section presents thresholds, timing, and triggers for adaptation actions to prepare for and/or respond to the coastal hazards evaluated for Morro Bay's transportation, recreational, and natural assets (ESA 2025). These elements of the adaptation process can be used to combine and sequence multiple measures to create an adaptation pathway

The Morro Bay Estuary VA Memorandum incorporates exposure thresholds for Morro Bay's transportation, recreational, and natural assets (ESA 2025). Adaptation is a process of planning and implementing successive or phased adaptation measures over time. In the context of coastal hazards and sea level rise, the timing of adaptation actions is based on the progression of coastal flooding and coastal hazards in relation to assets (e.g., roads, bridges, habitat areas). Thresholds inform the timing of implementation and maintenance of an adaptation measure or signal a need to transition to another adaptation measure as sea level rises and impacts occur or worsen. An adaptation trigger is the decision point at which to start implementation so that a measure is in place before it is needed. The duration of the typical planning and implementation process is called lead time.

Ideally, an adaptation measure should be implemented before exposure thresholds are reached, so trigger points for action must include lead times for planning and construction. Thresholds are defined for physical metrics associated with each relevant hazard that will be monitored over time (e.g., conditions of roads and bikeways, squeezing of wetlands, observed sea level rise amount). For each physical metric, the thresholds can be identified in both time (with respect to projected sea level rise) and space for the range of assets and hazard exposures evaluated in this project.

The timing of adaptation measure implementation should be informed by monitoring of sea level rise, flooding or inundation frequency, and progressive or repeated damages. Thus, implementation timing depends on the relative location and exposure of a given asset to hazard(s) with sea level rise.

**Figure 23** shows how near-, mid- and long-term adaptation measures can be phased in response to SLR. For example, mobility enhancements could be implemented in the near-term to improve bike and pedestrian safety while sea level rise adaptation projects are planned, designed, permitted and constructed. In the example used in the graphic, a levee could be constructed first to provide protection for South Bay Boulevard and State Park Road on their current alignments while also providing a separated bike and pedestrian path. If and when stormwater and/or groundwater management affects the functioning of those roadways, the roadways themselves could be elevated on fill to meet the level of the adjacent levee. Over the long-term, if the integrity of fill-raised infrastructure is compromised, then a causeway could potentially be constructed on top of the fill to provide higher levels of accommodation for storm flooding and tidal inundation.



**Figure 23. Potential adaptation pathways illustrating conceptual phasing of measures triggered by SLR.**



Lead times for planning and constructing adaptation measures should also consider the speed at which hazards are expected to worsen, translating to the relative timing of sea level rise and/or coastal erosion projections. The advanced pace of sea level rise projected later this century indicates that the timing of planning and implementing adaptation measures will be critical. For example, the 2024 State of California SLR Guidance (OPC 2024) indicates that one foot of sea level rise could occur within the next 25 years under the High SLR scenario, or around 2070 under the Intermediate SLR scenario. Individual adaptation projects for a given asset may take less severe sea level rise projections into account when developing timeframes, depending on the asset's risk tolerance and the best available sea level rise science.

According to the vulnerability assessment prepared by ESA (ESA 2025), coastal storm flooding can currently impact the transportation, recreational, and natural assets within Morro Bay Estuary. In this memo, we modelled and examined the potential exposure of extreme coastal storm events. Thresholds for coastal flooding include the impact of these assets from storm surge.

**Threshold** – The selected water level for this study is the water level obtained from verified extreme flood events that corresponds to total water levels, including wave run-up generated by wind-driven waves and the water level in creeks. The extreme flood events were analyzed in the vulnerability assessment and provides the most conservative approach (compared to the non-storm condition).

**Trigger** – Indicators that determine when to initiate future planning and/or implementation of adaptation actions. A measure is triggered when the freeboard (vertical distance between an asset and the storm flood water level) falls below a threshold equal to the projected sea level rise expected during the lead time for implementing adaptation. . For example, if a trail along the Morro Bay Estuary is expected to be inundated with 1 foot of SLR within a certain timeframe, planning and permitting should be initiated with enough time to implement the project before the trail is flooded and unusable. Note that for most transportation assets, adaptation planning and action should be triggered by projected storm flooding impacts to avoid potential damages (i.e., adaptation should occur sooner than progression of regular tidal inundation suggests).

Table 6 below lists possible lead times for different adaptation measures that address coastal flooding along the project site.

**TABLE 6.**  
**POSSIBLE LEAD TIMES FOR COASTAL FLOODING ADAPTATION**

| <b>Risk</b>                                                                       | <b>Actions</b> | <b>Adaptation Options</b>                                                            | <b>Time Frame</b>      | <b>Lead Times</b> |
|-----------------------------------------------------------------------------------|----------------|--------------------------------------------------------------------------------------|------------------------|-------------------|
| Coastal Flooding<br>Storm Condition<br>ESA<br>Hydrodynamic<br>Model (ESA<br>2025) | Protect        | Wetland Restoration                                                                  | 5-25 years (near-term) | 2-5 years         |
|                                                                                   |                | Construct a levee or berm to protect the road in its current alignment and elevation | 5-25 years (near-term) | 1-5 years         |
|                                                                                   | Accommodate    | Elevate Road on Fill or Causeway                                                     | 25-50 years (mid-term) | 5-15 years        |
|                                                                                   | Retreat        | Relocate Roads and Infrastructure Inland                                             | 50 +years (long-term)  | 10-20 years       |



## 5 Preferred Alternatives and Adaptation Pathway

The ESA team, in coordination with SLOCOG and the Advisory Committee, has selected the following preferred adaptation alternatives based on technical analysis, stakeholder input, and alignment with the project's goals. These alternatives reflect a phased approach to adaptation that balances feasibility, environmental and cultural considerations, and near, mid, and long-term resilience of SLOCOG's transportation, recreational, and natural assets to SLR.

### 5.1 Preferred Alternatives Description

#### 5.1.1 Levee Systems (near to mid-term)

Levee construction along vulnerable segments of State Park Road at Windy Cove and South Bay Boulevard would provide immediate flood protection at a lower initial cost compared to elevated structures. These earthen barriers can be constructed relatively quickly to address current flooding concerns. However, as water levels rise, levees' effectiveness would diminish, and when they approach outfall levels, pumped drainage systems would become necessary, increasing costs and complexity. This alternative could include a bicycle / pedestrian path on top of the levee system.

*Triggers, Thresholds and Adaptive Capacity:* Construction triggers when extreme events reduce freeboard of transportation assets below 1 ft. The system remains functional until 1.5 ft of freeboard and until drainage fails during high tides, requiring transition to causeway or fill when pumping systems would become necessary. Or rather than using pumping systems, the roads could be elevated to meet the height of the levee.

#### 5.1.2 Fill Elevation (near- to mid-term)

Raising road segments with engineered fill offers a practical near to mid-term solution that can be implemented with minimal disruption to surrounding resources. Using fill to increase elevation is particularly advantageous in areas with cultural resources, as it avoids the excavation that would be required for foundation systems to support a causeway while providing immediate flood protection. This alternative could include Class II bike lanes and sidewalks in the northbound and southbound shoulders or Class I protected bike lanes and pedestrian path on the bayward side.

*Triggers, Thresholds, and Adaptive Capacity:* Implementation triggers when extreme events from creek flooding or coastal storms reduce freeboard to less than 1 ft. Fill remains effective until freeboard is more than 2.0 ft of total water level, transitioning to other solutions when freeboard is 1 ft and when geometric constraints limit further raising. This approach allows for incremental raising of the roadway as conditions change, though eventual transitions to other solutions may be necessary.

#### 5.1.3 Causeway (long-term)

The causeway represents the preferred alternative for the long-term adaptation strategy. South Bay Boulevard could be raised on a causeway above projected flood levels while maintaining critical hydrologic connections beneath the roadway. The causeway design enables continued sediment transport and tidal exchange, thereby supporting the natural inland migration of wetland habitats as sea levels rise. Implementation would occur in the long-term phase, as a trigger and threshold monitoring program would inform the need for this level of protection.

This alternative could include Class II bike lanes and sidewalks in the northbound and southbound shoulders or Class I protected bike lanes and pedestrian paths on the bayward side.

*Triggers, Thresholds, and Adaptive Capacity:* Transition planning begins when fill or levee no longer maintains 1.5 ft of freeboard during extreme events. Causeways have low adaptive capacity, meaning that once they are built to a certain elevation, it is not possible to add additional elevation.

#### **5.1.4 Hybrid Approach Combining Fill and Causeway (near-, mid-, and/or long-term)**

This strategy employs a phased, hybrid approach, beginning with fill in the near-term and transitioning to a causeway in the long-term. This would allow SLOCOG and other project partners to monitor SLR and adjust plans based on observed trends rather than relying solely on present-day projections. As scientific understanding of SLR and climate change improves and local conditions evolve, the causeway design can be refined, raising or lowering its elevation to match actual needs. This approach avoids overbuilding infrastructure while maintaining adaptive capacity throughout the transition period. In addition to the mobility alternatives discussed above, all of these alternatives could be combined with a separated bicycle / pedestrian path on a boardwalk over the Morro Bay estuary.

*Triggers and Thresholds:* The transition from fill to causeway would be initiated when the fill or levee no longer maintains 1.5 ft of freeboard during extreme events or when fill maintenance costs exceed 50% of causeway construction costs over a 10-year period.

#### **5.1.5 Stormwater Management Integration (Near- to Mid-Term)**

Recognizing that traditional drainage systems become less effective as sea levels rise, the ESA team also recommends integrating stormwater management approaches with levee and fill alternatives. Near-term implementation could include constructed wetland areas designed to drain stormwater from the roads before it enters the bay system. In addition to improving flood management along transportation assets, these wetland features would serve multiple purposes: providing initial treatment for urban runoff, creating habitat value, and offering temporary storage during high tide events when gravity drainage is restricted. The wetland systems can be designed with adjustable flow controls to structures that adapt to changing water levels over time. As mean sea levels rise and outfalls are increasingly submerged, these systems can transition into tidal wetlands, continuing to provide ecological value to Morro Bay.

*Triggers and Thresholds:* Critical thresholds for stormwater system modifications occur when high tide begins to impact outfall function, and when gravity drainage ceases to function effectively during typical tidal cycles.

### **5.2 Sea Level Rise Design Basis**

Based on the Toro Creek Climate Resilience and Coastal Hazards Adaptation Study developed by Cal Poly (2025), the ESA team recommends designing the preferred alternatives to accommodate 4.5 feet of SLR. This recommendation aligns with the Coastal Design Criteria and Technical Adaptation Strategies and Designs outlined in the study (Cal Poly 2025).

The 4.5 ft SLR scenario was identified through collaborative discussions between Cal Poly, Caltrans, and project stakeholders, reflecting both technical analysis and practical implementation needs. It is consistent with the State

of California Sea Level Rise Guidance (OPC 2024) and provides a balanced, risk-based framework that supports long-term planning while avoiding unnecessary investment in projections that may not occur within the infrastructure's design life. The 4.5 ft SLR design threshold provides protection across a range of SLR scenarios:

- **Intermediate Scenario:** Projected to occur in 2130, supporting infrastructure resilience under the most likely trajectory.
- **Intermediate-High Scenario:** Provides protection through approximately 2100, aligning with typical infrastructure planning and funding cycles.
- **High Scenario:** Maintains effectiveness through approximately 2085, offering substantial protection even under accelerated ice sheet loss.

Although the planning approach for this Project considers the most conservative scenario of 6 ft of SLR, the recommended 4.5 ft design standard offers a high degree of protection for transportation and recreational assets. This approach reflects a cautious and practical balance between long-term risk and implementation feasibility. It also provides flexibility to adjust as SLR projections evolve, allowing infrastructure investments to remain aligned with the best available science and observed trends.

In addition, with an adaptive trigger and threshold monitoring program, SLOCOG and other project partners could track observed SLR and refine long-term designs, such as the causeway, based on updated science and real-world conditions. If future observations indicate that SLR is following a more extreme pathway, there would still be time and flexibility to adjust the design of long-term measures to accommodate higher SLR projections.

## 5.3 Implementation Pathway

The adaptation pathway for the preferred alternatives is structured to allow for flexibility and responsiveness to future conditions. The pathway includes:

**Near-Term Phase (2030-2045):** focuses on immediate protection through fill elevation or levee construction where flooding currently threatens infrastructure. During this period, wetland construction for stormwater management could be integrated with transportation improvements. Establishing a monitoring program is also critical to allow SLOCOG and other project partners to track actual SLR rates, storm patterns, and infrastructure performance against established thresholds.

**Mid-Term Phase (2045-2075):** represents a critical evaluation and transition period as SLR approaches 2.0 to 3.0 feet. The performance of near-term measures will be assessed against actual conditions, and planning for long-term solutions will advance based on observed trends. This phase also marks a key transition point, where the shift from temporary to more permanent protection measures, such as causeways, may be initiated. These decisions will be guided by defined thresholds and informed by updated projections and site-specific monitoring. Once triggered, the process would move through planning, design, funding procurement, and implementation phases to support timely adaptation.

**Long-Term Phase (2075 and beyond):** implements permanent solutions including causeway construction. The specific elevation and extent of these improvements will reflect measurements obtained through the monitoring program of local observations, allowing for more efficient and effective infrastructure investments tailored to actual rather than projected conditions.

This phased approach acknowledges the uncertainty inherent in long-term climate projections while providing clear decision points for infrastructure transitions. It also supports a resilient and adaptive strategy that balances engineering feasibility, environmental stewardship, and cultural sensitivity, while also allowing for continued engagement with stakeholders and the community as conditions evolve. By establishing specific triggers and thresholds, along with a monitoring program, SLOCOG and other project partners can respond proactively to changing conditions while avoiding premature infrastructure investments.

## 6 Summary

Adaptation alternatives and potential adaptation pathways were evaluated based on engineering, environmental, regulatory, social, and economic considerations. The memo outlines near-term (2030-2045), mid-term (2045-2075), and long-term (2075+) adaptation measures and pathways, including raising roads, implementing wetland restoration, and enhancing mobility options. Informed by the Coastal Hazards Vulnerability Assessment Memorandum and based on input from stakeholders, the community and the advisory committee regarding potential adaptation measures, the ESA team identified five preferred adaptation alternatives that represent the most feasible conditions up to 6 ft of SLR. These preferred alternatives are presented in Table 7 below. Conceptual graphics presenting these preferred alternatives are included in Attachment A.

**TABLE 7.**  
**DESCRIPTION OF THE PREFERRED ALTERNATIVES FOR MORRO BAY ESTUARY**

| <b>Preferred Alternative</b>      | <b>Timeframe</b>  | <b>Description</b>                                                                                                                                                                                                         |
|-----------------------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Levee Systems                     | Near to Mid-Term  | Earthen barriers along vulnerable segments to provide immediate flood protection. The elevated structure could also serve as a multi-use path for bikes and pedestrians, enhancing mobility and recreational connectivity. |
| Fill Elevation                    | Near to Mid-Term  | Raising road segments with engineered fill to avoid excavation and provide flood protection                                                                                                                                |
| Causeway Elevation                | Long-Term         | Elevated roadway allowing tidal exchange and wetland migration                                                                                                                                                             |
| Hybrid Fill + Causeway            | Near to Long-Term | Phased approach starting with fill and transitioning to causeway based on observed SLR trends                                                                                                                              |
| Stormwater Management Integration | Near to Mid-Term  | Constructed wetlands to treat runoff and store water during high tides                                                                                                                                                     |

This document outlines the framework under which adaptation pathways have been developed for the Morro Bay Estuary Climate Transportation Plan. The memo emphasizes the importance of timely implementation of adaptation measures, informed by monitoring sea level rise and coastal hazards, and will help SLOCOG, project partners, and the community make informed decisions regarding next steps for coordination, monitoring, and action. In the next phases, the project team will conduct cost-benefit analysis of the preferred alternatives to inform the development of the final Plan. Following the benefit-cost analysis, the project will culminate in the Morro Bay Estuary Climate Transportation Plan. The goal is to create a resilient and adaptive infrastructure that can withstand future SLR impacts, supporting the sustainability of transportation, recreational, and natural assets in the Morro Bay Estuary.

## 7 References

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