State Route 37 Ultimate Sea Level Rise Resilience Design Alternatives Assessment
Marin–Sonoma (US 101 – SR 121)

Executive Summary
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<thead>
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<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BATA</td>
<td>Bay Area Transportation Authority</td>
</tr>
<tr>
<td>Baylands</td>
<td>San Pablo Bay tidal marshlands</td>
</tr>
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<td>Caltrans</td>
<td>California Department of Transportation</td>
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<td>California Department of Fish and Wildlife</td>
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<td>DAA</td>
<td>Design Alternatives Assessment</td>
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<tr>
<td>DSCM</td>
<td>deep soil cement mixing</td>
</tr>
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<td>ETWG</td>
<td>Environmental Technical Working Group</td>
</tr>
<tr>
<td>ESC</td>
<td>Executive Steering Committee</td>
</tr>
<tr>
<td>mph</td>
<td>miles per hour</td>
</tr>
<tr>
<td>MTC</td>
<td>Metropolitan Transportation Commission</td>
</tr>
<tr>
<td>NEPA</td>
<td>National Environmental Policy Act</td>
</tr>
<tr>
<td>PEL</td>
<td>Planning and Environmental Linkages</td>
</tr>
<tr>
<td>PLT</td>
<td>Project Leadership Team</td>
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<tr>
<td>POLICY</td>
<td>Policy Committee</td>
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<tr>
<td>RAP</td>
<td>Resource Agencies Partners</td>
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<td>Sonoma-Marin Area Rail Transit</td>
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<td>State Route</td>
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<td>SWG</td>
<td>Stakeholder Working Group</td>
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<td>US 101</td>
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Executive Summary

Sea level rise and the increasing frequency of flood events is threatening the viability of State Route (SR) 37 as a dependable regional transportation corridor. Flooding of SR 37 (see Exhibit ES-1) leads to traffic diversions onto alternate roadways, which severely affects circulation which can result into gridlock. SR 37 is a vital connection for workers located in affordable communities who commute to business centers where housing costs are out of reach of moderate- and low-income earners. Added congestion leads to increasing greenhouse gas emissions, transportation inequities, and jeopardizes safety as SR 37 is recognized as a “recovery route” for northern San Francisco Bay Area counties (Caltrans 2015)

The severity of the situation has forged a strong coalition between the four-county transportation and congestion management authorities (Marin, Sonoma, Napa, and Solano), the Metropolitan Transportation Commission (MTC), and the California Department of Transportation (Caltrans) to evaluate and identify long-term solutions that can serve all users. Additionally, the interconnection of the roadway with surrounding San Pablo Bay tidal marshlands (Baylands) has forged a unique partnership between environmental stakeholders and transportation planners, where the roadway solutions are an integral part of ensuring environmental sustainability, resiliency, and adaptation and vice versa.

As the San Francisco Bay Area’s regional transportation agency, MTC’s role is to establish the long-range plan and vision for the region’s transportation system to support the U.S. Environmental Protection Agency’s regional air quality conformity regulations. To this objective, MTC initiated the exploration of long-term solutions for SR 37, beginning with the SR 37 Alternatives Assessment Report for the ultimate sea level rise resilience design focused on the section of SR 37 between SR 121 and Mare Island interchange (MTC 2019); see Exhibit ES-2.

Grant funding though Caltrans’ Adaptation Planning Grant and MTC/Bay Area Transportation Authority (BATA) funds help continue this planning effort for SR 37 between U.S. Highway 101 (US 101) and SR 121. For this SR 37 Ultimate Sea Level Rise Design Resilience Alternatives Assessment for US 101 to SR 121 (DAA

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1 Recovery Routes are a subset of the California Lifeline Route System. Lifeline Routes take first priority in terms of route recovery/restoration following a major incident or disaster for the purpose of emergency movement of goods and services. Recovery Routes are considered the next priority for recovery/restoration to further expand the movement of goods and services after major incidents or disasters.

2 Note that any references cited in this Executive Summary can be found in full in Chapter 8, References, of the full SR 37 Ultimate Sea Level Rise Resilience Design Alternatives Assessment for US 101 to SR 121 study report.
US 101 – SR 121 study), a range of long-term solutions were developed through a structured engagement process made up of vested environmental stakeholders, land managers, transportation and resource agency representatives, and elected officials. MTC enlisted the T.Y. Lin International consultant team to lead the DAA US 101 – SR 121 study. MTC directed this study team, which consists of planning, environmental, and engineering consultants, to take advantage of a wealth of previous studies, data, and an array of alternatives previously considered; the study team should develop feasible alternatives for the ultimate solutions considering sea level rise and corridor needs and then conduct an alternatives assessment, with the input and oversight of key environmental and vested stakeholders. Furthermore, this study contributes to updating the previous Alternatives Assessment Report for the Ultimate Project, SR 37 from SR 121 to the Mare Island Interchange (DAA SR 121 - Mare Island) (MTC 2019) with respect to advanced engineering findings and augmenting evaluation criteria (see Chapters 5, Alternatives Development, and Chapter 6, Summary of Assessment by Alternative, in the full study report) and updated ratings between the DAA US 101 – SR 121 and DAA SR 21 – Mare Island studies. These studies will benefit a broader study being led by Caltrans, referred to as the Planning and Environmental Linkage Study (PEL) for SR 37. The DAA and the PEL efforts have been collaborating, in terms of refining the purpose and need and engaging with stakeholders. The PEL will continue to build upon data developed and issues raised in this DAA for a comprehensive evaluation of alternatives.

Exhibit ES-2: SR 37 Corridor

Project Purpose

The DAA US 101 – SR 121 explored both previously developed and additional highway alignments, which were evaluated to meet the collectively developed purpose and need statement (see Chapter 2, SR 37

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3 “Collectively developed” refers to many stakeholders, agencies and study team who reviewed, provided input and reached agreement on the statements (see Chapter 3 for more detail on these entities). These efforts resulted in one purpose statement for both the DAA and PEL studies.
Marin-Sonoma Purpose and Need). The purpose of the DAA US 101 – SR 121 is to provide a transportation corridor that:

- Preserves a critical regional transportation corridor that is resilient to extreme events, while integrating ecological resiliency that facilitates adaptation to sea level rise
- Provides reliable travel time and increases in average vehicle occupancy
- Provides safe mobility for bicyclists and pedestrians
- Maintains and enhances public access, including to recreational areas
- Provides equitable transit and multimodal transportation solutions that improve access for, and provides meaningful benefits to, all users of SR 37, with special consideration of underserved communities

**Guiding Design Standards**

The development of alternatives (see Chapter 5, Alternatives Development) was guided by the following engineering principles for the DAA US 101 – SR 121:

- Meet current applicable state design criteria to achieve expressway standards of service (65 mile per hour [mph]).
- Achieve resilience to extreme events, including specifications to counter effects of earthquakes, king tides, and strong sea wave action through 2130 while considering the 100-year flood events with projected sea-level rise. These specifications allow for hydrologic connectivity demands of rising bay waters.
- Accommodate railway opportunities by maintaining a roadway gradient generally maintaining 0 to 3 percent grades, with only slight divergence of a maximum of 4 percent grade for short stretches.
- Minimize distance over the projected floodplain to the extent possible.
- Avoid built environments and existing public assets and infrastructure.
- Take advantage of existing right-of-way where possible to minimize acreage needed and reduce effects on natural ecosystems, such as existing restoration and sensitive habitat areas.

To address the 100-year design standards, the study team referenced the California Ocean Protection Council’s 2018 guidance on Sea Level Rise projections (California Ocean Protection Council 2018) and collaborated with Caltrans experts to align on sea level rise projections for the year 2130, based on greenhouse gas emission expectations and flood risk tolerance. The result is a projected range of an additional 4.4 feet to 10 feet over and above a 100-year flood event (see Section 5.2.4, Profile and Engineering Considerations and Profile Types). The study team also investigated construction approaches to counter the highly compressible alluvial sediments of San Pablo Bay mud (bay mud) conditions and calculated channel openings for bridge designs to achieve hydrologic conveyance needed through the next 100 years. These explorations led to a set of feasible profiles under the following conditions:
An at-grade profile is assumed where the proposed roadway can remain above the projected extreme water levels using the existing ground elevation. In these situations, the conditions are suitable for relatively easy construction methods using existing ground with standard roadbed improvements.

An embankment is feasible when the depth of bay mud is 90 feet or less. The bay mud would be fortified by mixing in cement within deep linear columns that stiffens the mud to resist compression (and limit subsidence). This is called deep soil cement mixing (DSCM), which would require displacing upwards of 30 percent of existing soil. Stiffening the bay mud would occur prior to installing fill material for the embankment to raise the roadway. The DSCM depth would be dictated by the depth of the bay mud to reach bedrock or conglomerate soil structure. An embankment would require slope armor to avoid erosion from wave action; this could range from riprap to other solutions that allow for natural vegetation.

A causeway resembles a long linear bridge with the roadway deck supported on piles. Typically, a causeway would seem to be more costly and difficult to construct; however, in parts of the SR 37, a causeway might be more constructable for raising a roadway above the projected sea level rise, especially in areas where the bay mud is deeper than 90 feet. The number and girth of the piles would be determined by various factors, including the depth of bay mud, load analysis, and seismic design criteria.
Alternatives Analyzed

A set of five alternatives (see Section 5.3, Range of Alternatives Under Evaluation) were evaluated against 23 criteria (see Section 4.2, Criteria and Methodologies) using a team of subject matter experts. Exhibit ES-3 provides conceptual illustration of the DAA US 101 – SR 121 alternatives under evaluation. A preliminary plan sheet for each alternative is provided in Appendix G, Preliminary Alternative Plans, in the main DAA US 101 – SR 121 study report. These alternatives include professional judgement on where a causeway, at-grade, or embankment condition can be considered, as indicated in the legend of colors in Exhibit ES-3. However, two alternatives were developed for remaining on SR 37 (On-SR 37): (1) a hybrid alternative (represented as Alternative A1A), which emphasized embankment profile, and (2) a predominantly causeway alternative (represented as Alternative A1B).

The DAA US 101 – SR 121 alternatives are listed below:

- Alternative A1A – On-SR 37 - Hybrid (predominately embankment)
- Alternative A1B – On-SR 37 - Causeway
- Alternative A2 – Over-Bay
- Alternative A3 – Bahia/Atherton
- Alternative A4 – Burdell/Hog Island

To properly align the DAA US 101 – SR 121 with the DAA SR 121 – Mare Island, Exhibit ES-3 reflects the logical connections with the alternatives in DAA SR 121 – Mare Island, as shown in dashed lines. See Section 6.2, DAA SR 121 – Mare Island Evaluation Results, for more discussion.

The DAA SR 121 – Mare Island alternatives are listed below:

- Alternative B1A – On-SR 37 - Hybrid (predominately embankment)
- Alternative B1B – On-SR 37 - Causeway
- Alternative B2 – Over-Bay

An Alternative is the combination of:

- Horizontal alignment on a map
- Cross section (the width of the transportation corridor made up of a combination of number of general purpose or high-occupancy vehicle lanes, transit-only lanes, shoulders, barriers, and pedestrian and bike pathway)
- Profile (e.g., causeway or bridge, embankment, or retained-fill and at-grade)
- Connection points with adjoining roadways or access points (e.g., an interchange or intersection)
- Other possible components: rail corridor, public access, advanced mitigation opportunities
Exhibit ES-3: Range of DAA US 101 – SR 121 Alternatives under Evaluation

Where the alternative is located above the design floodplain elevation (with projected 2130 sea level rise), the roadway is planned to be at-grade (green lines), as shown in Exhibit ES-3. Embankment construction is indicated by the orange lines. Causeway or bridge structures placed over river crossings are indicated with the blue lines. Exhibit ES-4 presents the acres of right-of-way needed and length of each profile type by alternative, followed by a summary description for each DAA US 101 – SR 121 and DAA SR 121 – Mare Island alternative.

Exhibit ES-4: Descriptive Elements Overview by Alternative, DAA US 101 – 121 and DAA SR 121 – MI

<table>
<thead>
<tr>
<th>Description Element</th>
<th>DAA US 101 - SR 121 Alternatives</th>
<th>DAA SR 121 - Mare Island Alternatives</th>
</tr>
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<tbody>
<tr>
<td>Acres of New Right-of-Way Needed</td>
<td>23</td>
<td>9</td>
</tr>
<tr>
<td>Total Length (miles)</td>
<td>7.4</td>
<td>7.4</td>
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<tr>
<td>Length of Causeway (miles)</td>
<td>1.9</td>
<td>5.9</td>
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<tr>
<td>Length of Embankment (miles)</td>
<td>4.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Length of At-grade (miles)</td>
<td>1.5</td>
<td>1.5</td>
</tr>
</tbody>
</table>

The following provides a brief description for each alternative evaluated:
DAA US 101 – SR 121 Alternatives

Alternative A1A - Hybrid: Alternative A1A-Hybrid would be built upon embankment within SR 37 right-of-way, except for bridges at water crossings and at-grade where topography is above the projected floodplain. It would include four interchanges (US 101, Atherton Avenue, Lakeville Highway, and SR 121) and frontage roads to maintain access to adjacent land uses where necessary and would result in replacing and enlarging bridges at Novato Creek, Simmons Slough, and Petaluma River.

Alternative A1B - Causeway: Alternative A1B - Causeway would be primarily causeway within SR 37 right-of-way, except for being at-grade where topography is above the projected floodplain. It would include four interchanges (US 101, Atherton Avenue, Lakeville Highway, and SR 121), and portions of the existing road could be used to maintain access to adjacent land uses where necessary. Bridges would be replaced and enlarged at Novato Creek, Simmons Slough, and Petaluma River.

Alternative A2 – Over Bay: Alternative A2 would be built upon embankment south of SR 37 and before it veers due east over the San Pablo Bay. It would replace a bridge at Novato Creek and add a new bridge over Simmons Slough, then transition to causeway over San Pablo Bay. This alternative would include a north-south leg to reach SR 121. It would include three interchanges (US 101, SR 121 [at the ‘T’ interchange located over the Bay waters], and at existing SR 37/SR 121). Much of SR 37 would remain and continue to provide access to local land uses and would not assume replacing or enlarging the existing bridge over the Petaluma River.

Alternative A3 – Bahia/ Atherton: Alternative A3 would be at-grade along the base of Atherton Hill and causeway over the projected floodplain, with a new bridge spanning the Petaluma River and embankment over the existing farmland before joining with SR 37 to reach SR 121. It would include three interchanges (US 101, Lakeville Highway, and SR 121). SR 37 would remain as is, and this alternative would not assume replacing or enlarging existing bridges at Novato Creek, Simmons Slough, and Petaluma River.

Alternative A4 – Burdell/ Hog Island: Alternative A4 would be causeway over the projected floodplain, with a new bridge spanning the Petaluma River, then at-grade along Lakeville Highway to merge with SR 37 to reach SR 121. It would include three interchanges (US 101, Lakeville Highway, and SR 121). SR 37 would remain as is, and this alternative would not assume replacing or enlarging existing bridges at Novato Creek, Simmons Slough, and Petaluma River.

DAA SR 121 – Mare Island Alternatives

On-SR 37 Alternative B1A - Hybrid: Alternative B1A would remain on SR 37 for the entire length. Because SR 37 is only two lanes, to maintain the same cross section, the DAA SR 121 – Mare Island alternative would widen to the north for the first 3 miles from SR 121 eastward, then the alignment would transition to widening on the south side of SR 37. This alternative would begin as an embankment between Tolay Creek and Sonoma Creek, and then due to the depth of bay mud, it would become a causeway.

On-SR 37 Alternative B1B – Causeway: Alternative B1B would remain on SR 37 in a causeway profile for its entire length. It would follow the same alignment and widening pattern as Alternative B1A.

Over-Bay Alternative B2: Alternative B2 would begin where Alternative A2 would end in the middle of the San Pablo Bay. (It would rely on Alternative A2 or the connecting roadway from SR 121 for traveling west of SR 121.) It would be an entirely causeway profile and link into the existing SR 37 roadway at Mare Island.
Stakeholder Involvement

Successful projects are a result of a collaborative process that integrate environmental, community, and economic goals through defensible quantitative and professional analysis conducted through a transparent process, whereby stakeholders see their input matters and can ultimately support the alternatives that result from this process. This DAA US 101 – SR 121 had the advantage of many already-formed committees made up of key public agencies with jurisdiction over SR 37 to vet, report, and provide opportunities for public engagement. These committees are described below.

Policy Committee (POLICY) is made up of three elected representatives from Marin, Sonoma, Napa, and Solano counties; the Director of Caltrans District 4; and the Executive Director of MTC to review SR 37-related progress within a public forum. The public is invited to listen and make comments at these meetings.

Executive Steering Committee (ESC) is made up of executive staff from Marin, Sonoma, Napa, and Solano counties; Caltrans, District 4; and MTC to review SR 37 work efforts and approve agenda items for the Policy Committee meetings.

Project Leadership Team (PLT) are transportation-focused staff members who lead SR 37 work efforts, make recommendations, and suggest discussion items to the ESC.

The DAA US 101 - SR 121 sought input from a broad range of stakeholders who are vested in the SR 37 outcome beyond merely the transportation elements. The study team worked in collaboration with the PLT to identify and invite the input from the following three stakeholder groups, as defined below.

Environmental Technical Working Group (ETWG) are a group of environmental technical experts (subject matter experts in geomorphology, wetland restoration, biology, wildlife refuge resources and other specialties) with knowledge of the North Bay area who provide input into the development and evaluation of a range of alternatives.

Stakeholder Workshop Group (SWG) includes members of the ETWG, agencies with jurisdiction over SR 37, and other stakeholders, such as SMART, non-profit organizations (such as Sierra Club, Greenbelt Alliance, Bay Trail, and bicycle coalitions) and sanitary and flood control districts who review, vet, and contribute to alternatives development and evaluation.

Resource Agency Partners (RAP) was formed by Caltrans and is made up of representatives from the state, and federal agencies that have a role in the environmental review process for infrastructure projects in the Bay Area. This RAP provided feedback consistent with regulatory requirements.

The full list of members for the ETWG, SWG, and RAP are in Appendix B, ETWG, SWG, and RAP Members, in the main DAA US 101 – SR 121 study report.

In addition, the public was engaged via multiple avenues, including broad announcements to attend public meetings, provide input via surveys or comments via email, review website-posted materials, and provide feedback at POLICY meetings at key milestones. See Section 3.2, Public Engagement Summary, to learn more about how the public was engaged.

Exhibit ES-5 illustrates how the DAA US 101 – SR 121 incorporated input and feedback through the public agencies, committees, stakeholder groups, and the public throughout the development of the DAA US
101 – SR 121 and how this information will be brought forward into subsequent SR 37 Corridor-wide Project development stages.

Exhibit ES-5: Roles and Process for Incorporating Input into the DAA and the SR 37 Ultimate Sea level Rise Project

Exhibit ES-6 lists the four key milestones in the DAA US 101 – SR 121 and how each of the stakeholder groups were consulted.

### DAA US 110 - SR 121 Steps And Associated Stakeholder Group Involvement

<table>
<thead>
<tr>
<th>Draft Purpose and Need, Project Objectives, Criteria, Collect Baseline Landscape Scenarios</th>
<th>Environmental Technical Working Group Meeting #1</th>
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<tbody>
<tr>
<td>Stakeholder Workshop Meeting #1</td>
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<td>Regulatory Agency Partnership Check-in #1</td>
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<tr>
<th>Review Criteria Evaluation Methodologies, Develop a Range of Transportation Elements and Alignments</th>
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<tbody>
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<td>Stakeholder Workshop Meeting #2</td>
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<tr>
<td>Public Outreach &amp; Input</td>
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<th>Review and Refine Project Alternatives (or Packages)</th>
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<td>Stakeholder Workshop Meeting #3</td>
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<td>Regulatory Agency Partnership Check-in #2</td>
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<td>Stakeholder Workshop Meeting #4</td>
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<tr>
<td>Public Outreach &amp; Input</td>
<td></td>
</tr>
</tbody>
</table>

Exhibit ES-6: DAA US 101 – SR 121 Stakeholder Group Workshop Milestones
Evaluation Criteria

All alternatives must meet the purpose statement, but project objectives help to set broad-based visions for how to achieve solutions that supports community, environmental, and economic goals. Through a collaborative process involving stakeholders, transportation agencies and resource agencies, objectives for the DAA US 101 – SR 121 alternatives were developed along with measurable criteria from which to collect and compare the alternative relative performance in meeting the objectives as outlined in Exhibit ES-7.

The study team subject specialists rated how the alternatives performed against each criterion. While the preliminary planning phase did not include field verifications, ratings benefited from input from technical experts within the stakeholder working groups with strong familiarity of the SR 37 surroundings. The methodologies (see Appendix D in the main DAA US 101 – SR 121 study report) provide information about the analyst’s credentials, definition of the criteria measurement, and the following:

- Data sources
- Methods for measurements
- Range of potential outcomes
- Elements of professional data interpretation
- How results could be normalized into a common scale with other criteria results

Exhibit ES-7: DAA US 101 – SR 121 Project Objectives and Supporting Criteria

<table>
<thead>
<tr>
<th>Category and Objectives</th>
<th>Measurable Criteria to Support the Objectives</th>
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</thead>
<tbody>
<tr>
<td><strong>TRANSPORTATION</strong></td>
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</table>
| Objective 1: Provide a resilient and reliable transportation corridor that accommodates all planned modes for safe movement of goods and people through 2100. | • Traffic Operations  
• Vehicle Miles Traveled  
• Change of Access  
• Multi-modal opportunities |
| Objective 2: Maintain and enhance accessibility (parks, public & private land ownership, and inclusive of ped and bicycle access). |                                                                                                              |
| **NATURAL RESOURCES**                    |                                                                                                              |
| Objective 1: Minimize impacts to existing natural resources and preserve potential for future conservation and ecological restoration. | • Non-tidal Marshlands  
• Tidal Wetlands  
• Waters of the US/ Critical Habitat  
• Special-status Species with Potential to Occur  
• Ecological Connectivity  
• Accommodate Future Tidal Habitats  
• Future Tidal and Transition Zone Habitat  
• Future Bird Habitat  
• Future Ecological Connectivity |
| Objective 2: Prioritize ecological connectivity in roadway design. |                                                                                                              |
| Objective 3: Facilitate ecosystem adaptation to sea level rise. |                                                                                                              |
| **BUILT ENVIRONMENT**                    |                                                                                                              |
| Objective 1: Maintain consistency with existing and future plans. | • Noise/Vibration  
• Visual  
• Hazardous Materials  
• Conversion of Land Use  
• Community Compatibility  
• Cultural Resources (archaeological and historic)  
• Air Quality  
• Park, Recreational and Refuge Resources |
| Objective 2: Avoid the roadway affecting changes to existing land use designations. |                                                                                                              |
**Category and Objectives**

**SOCIAL EQUITY**

Objective 1: Provide an equitable transportation solution for all populations regardless of age, ability, race, ethnicity, or income to secure access to jobs, services, and recreation for populations with fewer transportation choices.

* All Social Equity Criteria overlap with other categories. However, it is important to collect and comprehend the relative performance of the alternatives relative to social equity in meeting both transportation needs and minimizing disproportionate impacts on disadvantaged communities.

- Multi-modal opportunities
- Vehicle Miles Traveled
- Change of Access
- Noise/Vibration
- Visual
- Community Compatibility
- Air Quality

**FISCAL FEASIBILITY**

Objective 1: The alternatives need to be fiscally feasible with consideration for lifecycle costs (minimizes capital, construction, and annual maintenance costs).

- Capital costs
- Lifecycle Cost

**Summary of Findings**

To compare the vast amount of data collected and measured for each alternative, the results were normalized to facilitate viewing many criteria at once. The data were converted into normalized performance ratings (a scale of 1 through 5) and to further simplify, the numbers were converted into a color scale described and illustrated in Exhibit ES-8. On the color scale, the greens are more positive, and the reds represent less desirable performance.

**Exhibit ES-8: The DAA US 101 – SR 121 Normalized Performance Rating Scale Used to Simplify the Evaluation Data**

The evaluation results shown in Exhibit ES-9 provide a basis for comparing and differentiating between alternatives. The objective of this DAA US 101 – SR 121 is to provide stakeholders and the public a basis to compare, contrast, and discuss the merits and drawbacks of the alternatives.
## Exhibit ES-9: SR 37 Ultimate Sea Level Rise Design Alternatives Assessment Summary Rating

<table>
<thead>
<tr>
<th>Theme Category/ Criteria Subject</th>
<th>DAA: US 101 to SR 121 Alternatives</th>
<th>DAA: SR 121 to Mare Island Alternative</th>
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<tr>
<td></td>
<td>A2, Over-Bay</td>
<td>A3, Bahia/ Atherton</td>
</tr>
<tr>
<td></td>
<td>A4, Burdell/ Hog Island</td>
<td>B1A, On-SR 37 - Embankment (Combines with all except A2)</td>
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<tr>
<td></td>
<td>B1B, On-SR 37 - Causeway (Combines with all except A2)</td>
<td>B2, Over-Bay (Combines with only A2)</td>
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<td>Transportation</td>
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<td>Traffic Operations</td>
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<td>Vehicle Miles Traveled</td>
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<td>Change of Access</td>
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<td>Wetlands/Waters</td>
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<tr>
<td>Waters (Also Critical Habitat)</td>
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<tr>
<td>Special-status Spec. w/Potential to Occur</td>
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The DAA US 101 – SR 121 was structured to integrate environmental, community, and economic goals through defensible quantitative and professional analysis conducted through a transparent process whereby stakeholders see that their input matters. The summary of the input received from the stakeholders as of December 2021 is recorded in Exhibit ES-10.

**Exhibit ES-10: Key Trade-offs between Alternatives for DAA US 101 – SR 121 Alternatives**

<table>
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<tr>
<th>Alternatives</th>
<th>Key Differences per Assessment Results</th>
<th>Stakeholder Observations by Alternative</th>
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</table>
| Alternative A1A, On-SR 37 – Hybrid (predominately embankment) | **Key Advantages:**  
- Low wetland/water effects.  
- Low acres of right-of-way needed  
- Only 12 percent more costly than least cost alternative.  
**Primary Disadvantages:**  
- Performs poorly for future habitat and ecological connectivity  
- Worst emissions during construction  
- Deep soil mixing has potentially detrimental effects on cultural resources, if present, groundwater flows, and future tidal marsh development. | • Poor performance for most natural resources in the long term  
• Worst emissions during construction  
• Likely to result in significant environmental impacts, high mitigation requirements, and constructability challenges  
• Requires enormous amounts of clean fill to build  
• Potential impacts of deep soil mixing on groundwater and sediment transport processes  
• Costs associated with deep soil mixing anticipated to be high  
• Berms affect the migration of tidal wetlands northward across the SR 37 alignment |
| Alternative A1B, On-SR 37 – Causeway (predominately causeway) | **Key Advantages:**  
- Performs best on transportation-related criteria  
- Performs well on natural resource criteria (ranks best for non-tidal, water, ecological connectivity, and future water crossing)  
- Low acres of right-of-way needed  
**Primary Disadvantages:**  
- Not as positive for future bird habitat, noise during construction (as others), but not the worst either  
- 30 percent higher cost than least costly alternative | • A1B performed well among most criteria  
• Most advantageous of the alternatives for tidal wetlands and waters  
• Higher capital cost in comparison with the hybrid/embankment as previously understood  
• Ratings captured the superior performance of the causeway  
• Most practicable and constructible alternatives, and most likely to minimize the near-term and long-term environmental impacts of an SR 37 facility  
• Impacts of causeway on tidal wetlands are much less than stated if use ‘Clean Water Act’ definition  
• Numerous positive mentions to carry A1B forward |
<table>
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<th>Alternatives</th>
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<th>Stakeholder Observations by Alternative</th>
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| **Alternative A2, Over-Bay** | **Key Advantages:**  
• May reduce miles for the most frequent origin and destination trips pairs between Marin and Solano Counties  
**Primary Disadvantages:**  
• >300 percent more costly than least costly alternative  
• Does not encourage multimodal opportunities and poor for change of access  
• Only alternative to impact both national refuge and wildlife preserve  
• Land-side construction results in high impact on tidal wetlands and waters/ critical habitat and ecological connectivity  
• Visual impact of new in-bay crossing                                                                 |  
• High impacts for tidal wetlands and other waters  
• How a causeway mostly open water would have such a poor rating for impacts to tidal wetlands  
• High impact associated with the right-of-way in park/recreation/refuge properties  
• Large property acquisition needs  
• Performs so poorly in many of the measurements  
• Several dismissed this alternative from further consideration, listing high costs and visual impacts reasons  
• Conversely, some expressed an interest in further refining the design to reduce direct impacts to waters of the state (including wetlands)                                                                                                      |                                                                                                                                                                                            |
| **Bahia/Atherton**           | **Key Advantages:**  
• Shorter crossing of the floodplain  
**Primary Disadvantages:**  
• Nearly worst for transportation criteria  
• Generally poor on natural resources  
• Visual impact of new bay crossing  
• Would remove an existing recreational trail in Rush Creek Open Space Preserve  
• About 30 percent higher cost than least costly alternative                                                                 | A3 has low support for being carried forward because it represents the following:  
• Permanent impacts on mature marsh areas, which would likely result in negative impacts to essential fish habitat  
• Result in significant ecological impacts  
• Large number of acres of new right-of-way needed  
• Would go through CDFW Petaluma Wildlife Area and Marin County Rush Creek Preserve                                                                                                     |                                                                                                                                                                                            |
| **Burdell/Hog Island**       | **Key Advantages:**  
• Least costly alternative  
• Lowest non-tidal wetland and low waters effects  
**Primary Disadvantages:**  
• Nearly worst for transportation-related criteria  
• Generally poor on natural resources  
• High potential to affect special-status species and poor for ecological connectivity  
• Most new right-of-way needed  
• Visual impact of new bay crossing  
• Potential operation noise effects to residential areas along Lakeville Highway                                                                 | A4 has low support for being carried forward because it represents the following:  
• Permanent impacts on mature marsh areas, which would likely result in negative impacts to essential fish habitat  
• Requires acquisition of considerable private and public lands and would result in significant ecological impacts  
• Least desirable  
• Seems to avoid the floodplain, but may not justify the greater distance over On-SR 37 alternative  
• Goes through CDFW Petaluma Wildlife Area  
• Adjacent to SMART mitigation area                                                                                                                                                       |                                                                                                                                                                                            |

*CDFW = California Department of Fish and Wildlife; SMART = Sonoma-Marin Area Rail Transit*
Summary of Observations from Stakeholder Input

The summary comments documented in Exhibit ES-10 indicates that there was widespread support for Alternative A1B – On-SR 37 - Causeway. The most frequent statements justifying support were that A1B would:

- Enhance current and long-term hydrologic and wildlife connectivity
- Have benefits associated with maintaining the current alignment and taking advantage of existing right-of-way
- Result in lowest lifecycle cost
- Be most likely to minimize the near-term and long-term environmental impacts

Of those who commented, most felt that it was premature to dismiss alternatives in this stage of the study. Some expressed an interest in obtaining more detailed analysis or further refinements of the current alternatives. The primary concern was an understanding of what could become of the existing SR 37 for alternatives that would not use the SR 37 right-of-way. There is a perception that alternatives might receive a ‘credit’ for potential restoration of remnant portions of SR 37 and adjacent wetlands where portions of the existing SR 37 roadway could be returned to natural state. However, despite this potential benefit, commenters generally did not support Alternatives A3 and A4 (Bahia/Atherton and Burdell/Hog Island, respectively) because it would:

- Result in high right-of-way needs
- Impact pristine and ancient tidal marsh area
- Provide the least transportation benefits

Maintaining Momentum of the Alliance

This DAA US 101 – SR 121 has advanced engineering solutions, helped stakeholders identify areas for further exploration, and advanced the assessment for a substantial portion of the SR 37 (both DAA US 101 – SR 121 and DAA SR 121 – Mare Island). Perhaps most importantly, this study has continued and potentially strengthened a unique collaboration founded in dedicated stakeholders and agencies working toward a common goal of long-term resilient transportation solutions for the northern San Francisco Bay/San Pablo Bay. These solutions are designed to be environmentally sustainable and beneficial for furthering San Pablo Baylands ecological restoration and San Francisco Bay Area climate change adaptation.

This synergy is being continued. During the development of the DAA US 101 – SR 121, Caltrans committed to developing a PEL study. The PEL will assess a suite of long-term solutions within the entire SR 37 corridor and ultimately lead to a recommended set of alternatives to carry forward into the environmental review process. The PEL process has been codified under 23 US Code 168 to enable the Lead Agency to establish a project's purpose and need; eliminate the need to further consider alternatives deemed to be unreasonable by relying on alternatives analyses conducted during planning; and rely on future land use plans as a source of information for the cumulative impacts analysis required under the National Environmental Policy Act (NEPA). Caltrans is committed to incorporating information developed from the DAA SR 121 – Mare Island and DAA US 101 – SR 121 studies to inform the PEL as part of the process in developing and evaluating alternatives that will be carried forward into the environmental review process and by doing so, streamline the California Environmental Quality Act and NEPA review process.
This momentum is important when finalizing the ultimate project and seeking funding. Themes that will continue to help position SR 37 for these funding options are resiliency, multimodal corridor solutions, and increasing efficiencies in moving goods and persons (as opposed to enhancing capacity).

Additionally, there are opportunities to build upon the partnership with the environmental community and regulatory agencies who are committed to the ecological opportunities that the redesign of SR 37 could offer in allowing restoration and connection of valuable marsh and critical habitat areas. The San Pablo Baylands and tidal wetlands provide the following broad societal benefits:

- Reducing flood damage and erosion in low-lying areas like Petaluma, Novato, and SR 37 by absorbing floodwater and attenuating waves.
- Benefitting regional water quality.
- Sequestering and storing carbon, complementing statewide efforts to reduce greenhouse gas emissions.
- Delivering scenic, aesthetic, recreational, historical, economic, and cultural values.
- Enhancing conditions for threatened and endangered fish, such as steelhead trout and salmon.

Collaboration is key in identifying the best solution for a long-lasting and resilient SR 37.

One Corridor, One Team, Many Solutions.