



Date: 08/29/2024
To: Bethany Lopez, P.E., City of San Mateo
From: Aron Zerezghi, Gray Bowen Scott
Subject: US 101/Peninsula Avenue Interchange Reconstruction Project: Alternatives Development Workshop

Executive Summary

The purpose of conducting a alternatives development workshop for US 101 and Peninsula Avenue Interchange Reconstruction Project (Project) was to gather input from the City of San Mateo, the San Mateo County Transportation Authority (SMCTA) and AECOM (Consultant) on potential design alternatives that would significantly reduce the Projects right of way costs. The workshop provided an opportunity for industry professionals to collaborate on creative ideas, suggest modifications to design, re-evaluate previously considered alternatives and explore the possibility of new solutions. Unfortunately, the ideas examined during the workshop did not generate viable solutions to overcome challenges faced by the Project. The acquisition of right-of-way for the project is significant and creates a challenge for securing funding when measured against the overall project benefits.

While development of the environmental document was progressing, the revised Project cost estimates identified a significant challenge that would make securing project implementation funding very difficult. Both study alternatives require an extensive amount of right of way to reconstruct the Peninsula Avenue Interchange. This is the result of needing sufficient space for on-and off-ramps that meet State standards. Based on this, the baseline right of way costs are largely driven by impacts north of the interchange that would require acquisition of 15 parcels located along N. Amphlett Boulevard. Under Alternative 1, the 76-unit Bayview Apartments parcel would need to be acquired, further increasing the cost of the Project. With soaring property values in San Mateo, coupled with relocation assistance to potentially displaced residents, right of way costs were nearly double the cost of construction, a very atypical situation. Without an alternative with more balanced right of way and construction costs, there won't be a project to deliver.

After further examination of the design alternatives evaluated during the PSR-PDS phase, and a discussion of the surrounding site constraints, the alternative development workshop participants determined there is no feasible alternative to modify the existing ramp configuration. There are no design alternatives beyond what was studied that would greatly reduce the right of way needs while still meeting acceptable design standards. The controlling right of way costs are driven by the need to construct the southbound off-ramp and there is not a way to do so without impacting multiple properties along North Amphlett Boulevard. Alternatives to reduce the right-of-way needs were explored, but these only create challenges for meeting acceptable design standards and marginal reduction in right-of-way needs. In addition, the benefit of the alternatives was offset by the need to relocate costly PG&E transmission lines.

To that end, it is recommended that the Project Approval phase is stopped to avoid further expenditures on the environmental document and alleviate costs potential hardships to business owners and community members regarding the future of the project. A strategic messaging campaign should be developed to convey the outcome of this workshop with the City Council, Project partners and local community.

It should be noted that components of the Project still offer value to the local community. The improvements are relatively low-cost alternatives identified during the workshop that would enhance safety on the local roadway network. Refer to Section 3 for a list of potential standalone Projects.

1. Project Background

1.1. Project Purpose and Need

The purpose and need for this project are to improve the existing roadway deficiencies, localized circulation, and safety. The off-ramp at US 101/East Poplar Avenue creates two specific safety concerns. The first concern is the substandard deceleration length at the off-ramp and tight curvature of the off-ramp geometry which requires motorists to quickly decelerate when exiting US 101. As a result, the fatality plus injury rate at the off-ramp is slightly higher than the statewide average.

The second safety concern is at the US 101/East Poplar Avenue off-ramp terminus which has observed an increase in collisions between vehicles traveling through or turning at this intersection with vehicles exiting the freeway off-ramp. The off-ramp traffic has a free movement through the intersection, but the other three legs entering the intersection are stop-controlled. During peak hours, motorists on the three stopped-legs, often cannot find adequate gaps in the off-ramp traffic and sometimes enter the intersection impatiently and in an unsafe manner.

The Project also looks to expand the bicycle and pedestrian facilities in accordance with the City and community initiatives. Refer to Table 1-1 for additional information regarding the project purpose and need.

Table 1-1: Project Purpose and Need

Description	
Project Purpose	<ul style="list-style-type: none"> • Improve the safety of southbound US 101 and the off/on-ramps to/from Poplar Avenue. • Improve the safety and traffic operations of the intersection at East Poplar Avenue and North Amphlett Boulevard. • Improve access into north San Mateo and key local destinations including the residential and business communities within the Peninsula Avenue interchange area. • Improve bicycle and pedestrian circulation within the project limits. • Improve local circulation in the project area. • Improve the safety of southbound US 101 and the off/on-ramps to/from Poplar Avenue.

Project Need	<ul style="list-style-type: none"> • The existing single-lane East Poplar Avenue southbound on- and off-ramps are relatively short and thus have limited capacity to contain queues during peak periods. • The off- ramp at US 101/East Poplar Avenue requires drivers to quickly decelerate when exiting US 101 as the vehicles immediately enter into the intersection at East Poplar Avenue/North Amphlett Boulevard. • The Peninsula Avenue OC includes sidewalks for pedestrians and designated bike lanes in each direction, and crosswalks, with one exception: the south sidewalk on the eastbound side of the Peninsula Avenue OC ends at North Bayshore Boulevard. Pedestrians can access the north sidewalk on Peninsula Avenue via a crosswalk, but there is no marked crosswalk across North Bayshore Boulevard.
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1.2. Project Alternatives

During the planning phase of the Project, the City and SMCTA explored several alternatives that would improve safety, traffic operations, and sub-standard infrastructure. After comprehensive analysis, only two alternatives were shortlisted and carried forward for advanced study. The two alternatives are described in greater detail below. Refer to Section 2.1 for a full listing of studied alternatives during the planning phase.

1.2.1. Alternative 1 – Spread Diamond Interchange

Alternative 1 consists of one-half of a conventional diamond interchange (southbound on- and off-ramps only) that will be constructed on the west side of US 101. The Peninsula Avenue overcrossing will be widened on the westbound side to accommodate a greater storage capacity of cars. In addition, the overcrossing will be upgraded to include a buffered and vertically separated Class IV bikeway on both the eastbound and westbound sides. The Class IV bikeway will include both a striped buffer on the roadway and delineators that will physically separate the vehicle travel lanes from the bikeway. The overcrossing will also include an upgraded sidewalk on both sides of the structure and a pedestrian connection from the overcrossing to the sidewalk along North Bayshore Boulevard. Lastly, this alternative will include a new left turn pocket on westbound Peninsula Avenue that will allow vehicles to access the new southbound US 101 on-ramp. The vertical clearance of the overcrossing above the freeway will not be changed for the project. Refer to Figure to 1-1 for Alternative 1.

1.2.2. Alternative 2 – Tight Diamond Interchange

Alternative 2 consists of one-half of a tight diamond interchange (southbound on- and off-ramps only) that will be constructed on the west side of US 101. As with Alternative 1, the Peninsula Avenue overcrossing will be widened on the westbound side to accommodate a greater storage capacity of cars. In addition, the overcrossing will be upgraded to include a buffered and vertically separated Class IV bikeway on both the eastbound and westbound sides. The Class IV bikeway will include both a striped buffer on the roadway and delineators that will physically separate the vehicle travel lanes from the bikeway. The overcrossing will also include an upgraded sidewalk on both sides of the structure and a pedestrian connection from the overcrossing to the sidewalk along North Bayshore Boulevard. Lastly, this alternative will include a new left turn pocket on westbound Peninsula Avenue that will allow vehicles to access the new southbound US 101 on-ramp. The vertical clearance of the overcrossing above the freeway will not be changed for the project. Refer to Figure to 1-2 for Alternative 2.

Figure 1-1: Alternative 1 Spread Diamond

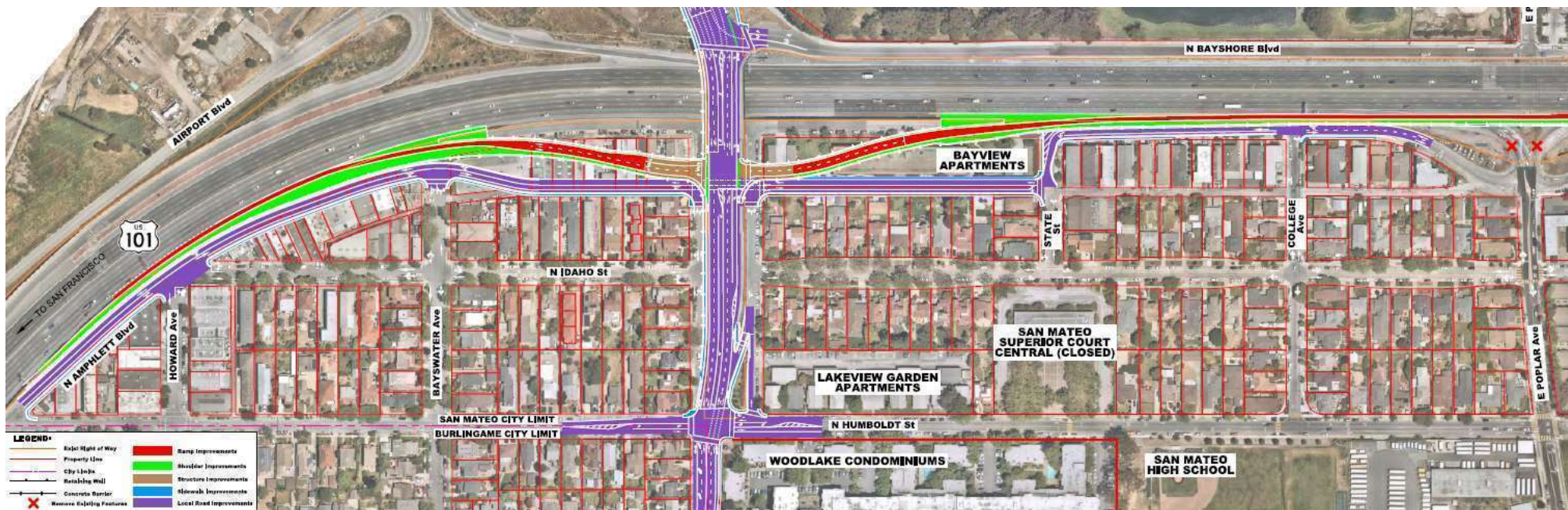


Figure 1-2: Alternative 2 Tight Diamond



1.3. Estimated Project Costs

Below is a summary of the estimated project costs prepared by AECOM and its sub-contractor, ARWS. ARWS was brought onto the Project in late 2022 and completed estimates for utility relocations and right of way costs. The right of costs consisted of land acquisitions, relocation assistance, title & escrow, and support costs. The right of way costs under both scenarios would be nearly double the cost of the estimated construction costs which includes paving, structures, and localized intersection improvements.

Table 1-2 Estimated Project Costs

Construction Costs Items	Spread Diamond (Alternative 1)	Tight Diamond (Alternative 2)	Notes
Construction	\$48.7 M (29% of total cost)	\$47.1 M (38% of total cost)	Estimated by AECOM / MTCO, July 2022.
Utilities & Right of Way	\$119.0 M (71% of total cost)	\$76.5 M (62% of total cost)	Estimated by AR/WS, January 2023.
Estimated Total	\$167.7 M	\$123.6 M	Cost Escalated to estimated start of construction, Spring 2026.

To illustrate the costs in relation to other interchange projects, Table 1-3 provides a capital cost summary for similar projects completed in the region. Generally, the right of way costs varies from nine to fifteen percent against the overall construction cost.

Table 1-3 Project Cost Comparison

Construction Costs Items	I-80 Gilman Interchange Project	US 101/Broadway Interchange Project	US 101/Willow Interchange Project
Construction	\$74.7 M (91% of total cost)	\$58.5 M (89% of total cost)	\$58.0 M (85% of total cost)
Utilities & Right of Way	\$7.0 M (9% of total cost)	\$7.6 M (11% of total cost)	\$10.0 M (15% of total cost)
Estimated Total	\$81.7M	\$66.1M	\$68.0 M

1.4. Stakeholder Engagement

An intensive public outreach effort for the project has been executed by the City of San Mateo since 2010, which included three community workshops, five Department of Public Works commission meetings, a project open house and three City of San Mateo Council Study Sessions. After several discussions between the project sponsors and the general public, consensus was reached to proceed with the tighter configuration referred to as "Option 15 (Revised)". At the September 4, 2012 City of San Mateo Council Study Session, this option was presented and San Mateo's City Council approved the further study of this option to develop a PSR-PDS. In

cooperation with SMCTA and City of Burlingame, a series of community meetings were held to engage the public between 2015 and 2021 to further evaluate the design alternatives during PA&ED. During this period of time, the public outreach efforts had increased based on concerns raised about potential property impacts and traffic operations on the surface street and at several intersection locations. In particular, the Lionheart community in the City of Burlingame raised concern about cut-through traffic and additional intersection study locations. While these locations were examined, they were excluded from the Caltrans TOAR to avoid delays in review time. Below is a summary of the meetings conducting with the public:

Stakeholder Engagement Meetings

- Public scoping meeting workshop for the PSR-PDS– May 2014
- Community Meetings held in Burlingame and San Mateo – May 2017
- Extensive Traffic Analysis Complete – Dec 2019
- Project updates provided to the San Mateo City Council – Feb 2020
- Property Owner/Business and Community-wide Meetings – Jan 2021
- Stakeholder Outreach with Local Schools around Poplar – Jan 2021
- Community Meeting – Jan 2021
- Burlingame City Council Meeting – April 2021
- Public Scoping Meeting – April 2021

1.5. Geometric challenges and other constraints

There are significant constraints that prohibit the design and construction for challenges, including the need to avoid utility lines, intersection issues at Bayshore Blvd, and impacts on commercial properties. Burlingame's requirement not to have any right-of-way impacts created additional project constraints. Efforts were also made in 2020 to engage elected officials to address these challenges and diligently address the public's concerns. Below is a summary of the geometric challenges and constraints.

1.5.1. Bayview Apartments

The current design alternatives result in either full or partial right of way acquisition of land that would significantly impact low-income residents of Bayview Apartments. There was consideration for off-site improvements to offset housing impacts, but this would require significant strategic planning efforts and zoning changes.

Under the Tight Diamond alternative, access to the existing parking structure would be located along Amphlett Blvd. This modified access point would result in the reduction of existing green space near the Bayview Apartments. In addition, a large retaining wall would be constructed between the east building face and the US 101 corridor which would create an undesirable visual impact. While Alternative 2 meets the required setback criteria and allowable Caltrans standards, it is deemed the best alternative.

1.5.2. Right of Way

For Alternative 1, impacts to properties along North Amphlett Boulevard, north of Peninsula Avenue are significant due to the proposed southbound off-ramp alignment and its physical impact to several commercial buildings. Due to the southbound on-ramp's tight configuration, impacts south of Peninsula Avenue are

expected to be minor. South of State Street, a sliver will be required across several parcels along North Amphlett Boulevard.

Alternative 2 will also impact many of the commercial buildings north of Peninsula Avenue, but overall right-of-way costs are expected to be higher because the remnant of these parcels will be smaller. In addition, the 600-foot auxiliary lane creates right-of-way impacts to several parcels on North Amphlett Boulevard just north of Howard Avenue. South of Peninsula Avenue, the on-ramp configuration requires a full acquisition. South of State Street, both alternatives have identical right-of-way impacts.

1.5.3. Poplar Creek Golf Course

The existing interchange does not have a standard diagonal off-ramp in the northbound direction of US 101. Instead, North Bayshore Boulevard (one lane in each direction) occupies the space where the diagonal off-ramp would exist in a standard diverging diamond interchange configuration. As a result, the recently constructed northbound ramps and North Bayshore Boulevard would have to be reconfigured, creating significant impacts to the Poplar Creek Golf Course on the east side of US 101. Impacts to the golf course could result in potentially challenging Section 4(f) approval requirements and costly mitigation measures.

1.5.4. Intersection Spacing

The distance between the existing intersections (N Bayshore Boulevard and N Humboldt Street) is only 800 feet. Adding a new intersection makes it impossible to attain at desirable spacing without relocating one of the existing intersections. Alternative 2 offers an advantage because it maximizes the intersection spacing with North Bayshore Blvd and provides balanced intersection spacing along Peninsula Avenue. That said, until traffic studies are done (during PA&ED), the effect of the intersection spacing on the traffic operation of Peninsula Avenue is not known.

1.5.5. Bicycle Facilities

The Project would improve bicycle connections east of the Peninsula Bridge. However, if the project does not proceed, the bridge can still be widened to allow for a Class IV bicycle facility. Furthermore, based on Caltrans Design Information Bulletin 94 (DIB 94), there could be an opportunity to narrow the general-purpose lanes to accommodate a bicycle facility across the structure. In addition, the proposed intersection improvements at North Bayshore Boulevard and Peninsula Avenue could also be improved to address the lane balance issue in the existing condition.

1.5.6. Utilities

A high voltage 230 kV underground electrical line that runs along North Amphlett Boulevard encroaches onto the shoulder of the proposed auxiliary lane. The Project would pursue a Utility Policy Variance Request (UPVR) to avoid the costly relocation of this line. However, the cost summary includes this relocation cost in case approval of the UPVR is not granted.

Figure 1-3: Key Geometric Challenges and Other Constraints



2.1. Studied Alternatives

One of the project's main purposes is to address two safety concerns related to the US 101 southbound ramps at East Poplar Avenue. The first safety concern is specific to the southbound off-ramp. The off-ramp consists of a deceleration length of approximately 300 feet, measured from the point of divergence from the mainline to the beginning of the first curve. This deceleration length of 300 feet would meet current design standards if the first curve's radius was 1,000 feet or greater, but the off-ramp's first curve is very tight with a radius of approximately 130 feet. A radius this small is generally only used on low-speed roadways (20 mph or less).

The existing ramps are a "partial interchange" configuration, which does not meet current design standards. The northbound ramps for Peninsula Avenue form a "buttonhook" configuration on Airport Boulevard. The southbound ramps for Poplar Avenue form a "buttonhook" configuration and join the local streets at the unsignalized intersection of East Poplar Avenue and North Amphlett Boulevard.

In 2011 a Traffic Impact Analysis was performed by Hexagon Transportation Consultants (Hexagon) which concluded the unsignalized intersection at East Poplar Avenue and North Amphlett Boulevard experiences a higher than normal frequency of accidents. The Hexagon Study evaluated several alternatives to improve the safety of the intersection.

The culmination of these concerns resulted in the development of several design alternatives. As shown in Table 2-1, fifteen options were evaluated during the PSR-PDS which included alternatives that were identified in the Hexagon study. It was determined that Option 15 improves the traffic operations and safety of the East Poplar Avenue/North Amphlett Boulevard intersection by removing the US 101 southbound ramps at this location and replacing these with new southbound ramps at Peninsula Avenue. This effectively removes conflicting movements at the East Poplar Avenue intersection and consolidates all of the interchange movements at a single location on US 101 at Peninsula Avenue. Interim improvements to the East Poplar Avenue/North Amphlett Boulevard intersection were also identified and the City moved swiftly to implement optimizations.

Table 2-1: Alternatives from the PSR-PDS (Planning Phase)

Option	Description	Considered Further?	Comments
1	Raised Median on Poplar at Amphlett		Restricts access from SB US 101 and does not address safety issues on Poplar at Idaho.
2	Raised Median on Poplar through Idaho		Restricts access from SB US 101, Option 2a was preferred by the City and Caltrans.
2a (See Note)	Same as 2, except left turns from the SB off-ramp allowed onto SB Amphlett	✓	This interim improvement project is scheduled for construction in early 2016.
4	Restrict SB traffic on Amphlett at Peninsula		This was intended to be a supplemental feature to Option 2a, but was dropped because 2a prohibits the SB thru-movement on Amphlett at the Poplar Ave intersection.
5	Full Closure of Poplar Interchange		Solves local intersection safety/operation, but restricts access and distributes traffic to adjacent interchanges.
6	Close off-ramp, keep on-ramp		Restricts access and would create an isolated on-ramp, which is undesirable to Caltrans.
7	Close off-ramp, Convert Poplar to one-way (EB to on-ramp)		Dismissed for reasons similar to Option 6.
8	Provide second EB lane on Poplar from Humboldt		Doesn't address safety/operational issues at the Amphlett intersection and includes major right-of-way impacts on Poplar.
9	Force off-ramp traffic onto NB Amphlett		Creates a circuitous route for off-ramp traffic and forces traffic onto local streets not designed to handle these volumes.
10	Provide second EB lane on Poplar from Idaho		Dismissed for reasons similar to Option 8.
11	Widen Poplar to four lanes		Dismissed for reasons similar to Option 8.
12	Grade separate Poplar/Amphlett		Eliminates safety/operational issues of the intersection, but cost and R/W impacts are significant. Option 2a provides similar benefits at a much lower cost.
13	Close on-ramp, keep off-ramp		Dismissed for reasons similar to Option 6.
14	Close on-ramp at Poplar, build new on-ramp at Peninsula		Would improve safety/operation of Poplar/Amphlett intersection by diverting volumes to Peninsula, but would create an isolated off-ramp, which is undesirable to Caltrans.
15	Close both ramps at Poplar, build new ramps at Peninsula	✓	Consolidates all ramps (NB & SB) at Peninsula (highly desirable by Caltrans). Currently shown in this PSR-PDS as an alternative to be analyzed further during the PA&ED phase.

Note: Option 2a was originally named "Option 3", but was renamed to 2a because it was determined to be a slight variation of Option 2.

Source: Peninsula Avenue Interchange Reconstruction Project PSR-PDS (2015)

2.2. Alternative Design Concepts from Public Comment

Alternative concepts were studied as part of the PSR-PDS in response to public comments received during the project scoping phase. The Consultant evaluated two options which are described in further detail below and summarized in a technical memorandum prepared on March 2015 for the City of San Mateo and SMCTA.

2.2.1. Flyover Concept

During the April 2015 public project scoping meeting, a comment was received that requested an alternative be studied that considered constructing a new southbound off-ramp with the existing footprint of the freeway. The goal of this concept was to avoid impacts to businesses located along North Amphlett Boulevard north of Peninsula Avenue by “landing” the ramp on the east side of US 101 at the Peninsula Avenue/North Bayshore Boulevard intersection.

2.2.2. Cantilever Concept

A business owner suggested a cantilever concept to accomplish the same thing as the flyover concept; avoid impacts to some of the properties on North Amphlett Boulevard, north of Peninsula Avenue. Although the cantilever concept minimizes right-of-way and utility impacts between Howard Avenue and Peninsula Avenue, the cost benefit gained by this could be negated because of the potential required relocation of the 230 kV line along Rollins Road.

2.2.3. Findings from the Alternative Design Concepts

Below are the advantages and disadvantages of both alternative concepts. However the goal of this exercise was to evaluate a design alternative which could potentially reduce right of way acquisition and costs of the project. In concurrence with SMCTA, Caltrans, and the City of San Mateo these options would have significant safety concerns and introduce several nonstandard design features, which would create operational challenges and unsafe conditions for road users.

Table 2-2: Alternative Concept Advantages & Disadvantages

Alternative Design Concept	Advantages	Disadvantages
Flyover	Minimizes property and utility impacts between Bayswater and Peninsula; however, property impacts north of Bayswater still exist.	<p>Introduces property impacts along Rollins Road in Burlingame.</p> <p>Additional impact (~ 800 LF) to the 230 kV line (> \$10M).</p> <p>Potential for wrong-way movements. (Off-ramp is placed where an on-ramp is typically located)</p> <p>Median column results in reduction of lane widths on the freeway.</p>
Cantilever	Minimizes property and utility impacts between Bayswater and Peninsula; however, property impacts north of Bayswater still exist.	<p>Introduces property impacts along Rollins Road in Burlingame.</p> <p>Additional impact (~ 800 LF) to the 230 kV line (> \$10M).</p> <p>Shoulder overhang might not be acceptable to Caltrans.</p> <p>Intersection spacing (with Bayshore) ~ 24 feet less than the Tight Diamond Alternative.</p>

Figure 2-1: Flyover Concept

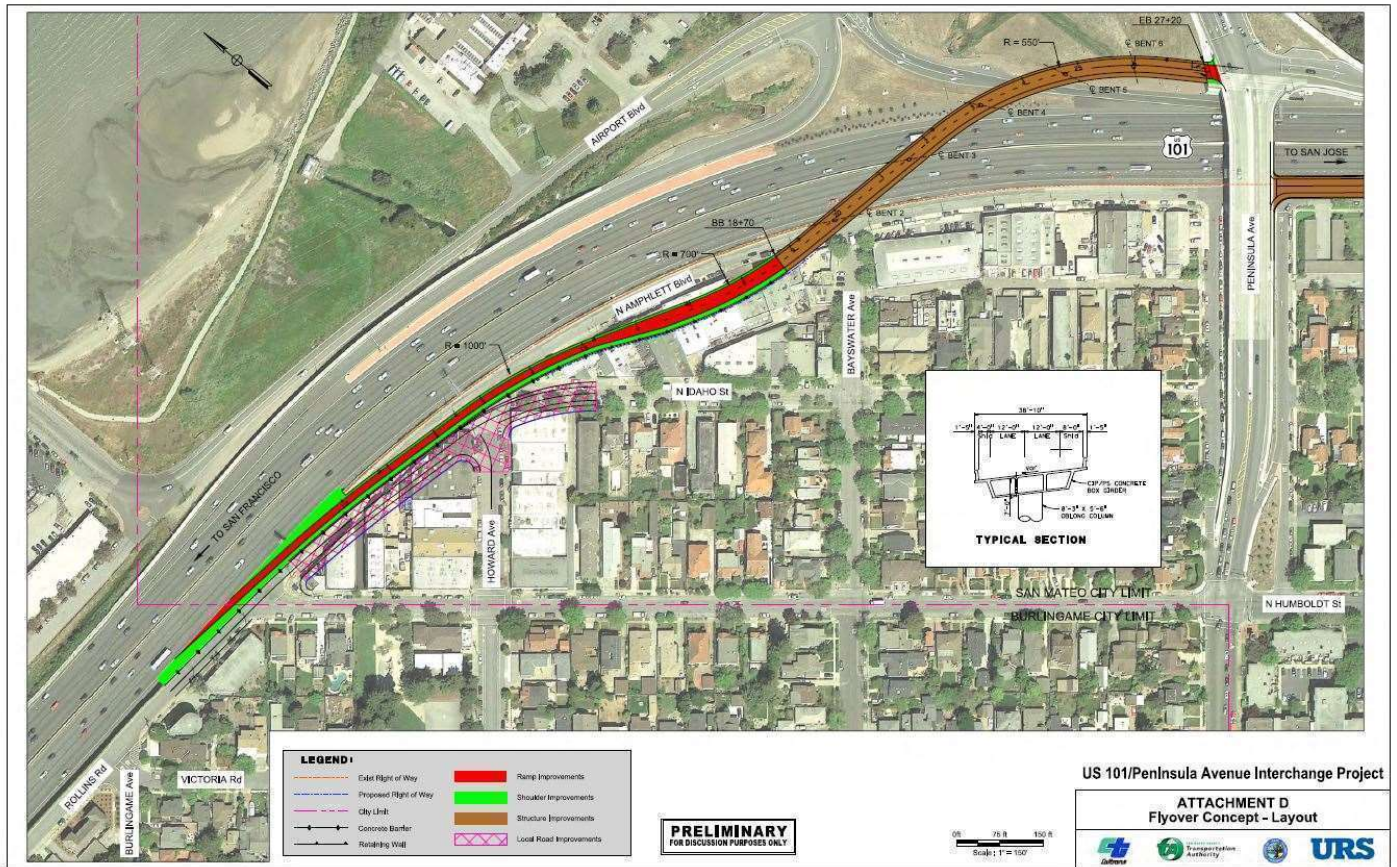
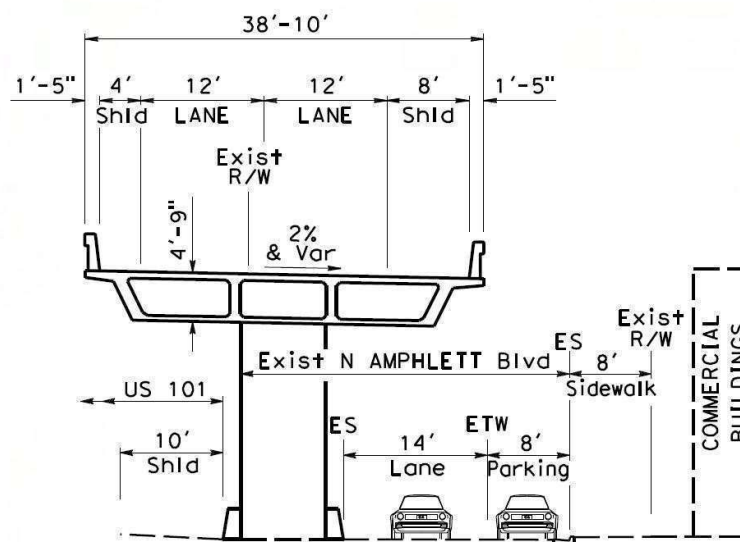
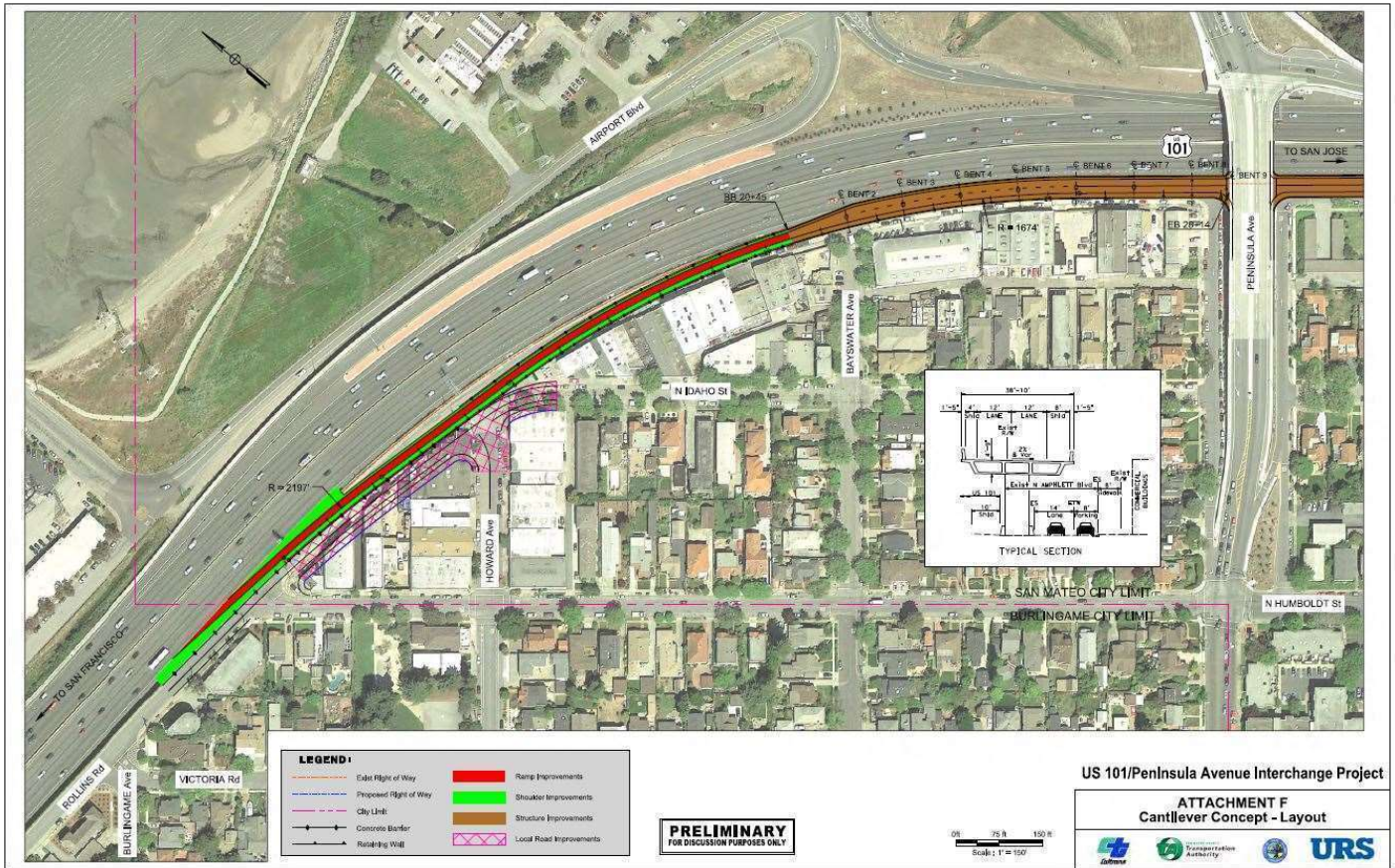


Figure 2-2 – Cantilever Concept



TYPICAL SECTION

3. Recommendations and Next Steps

The purpose of conducting an alternatives development workshop for US 101 and Peninsula Avenue Interchange Reconstruction Project (Project) was to gather input from the City of San Mateo, the San Mateo County Transportation Authority (SMCTA) and AECOM (Consultant) on potential design alternatives that might significantly reduce the Project's right of way costs. The workshop provided an opportunity for industry professionals to collaborate on creative ideas, suggest modifications to design, re-evaluate previously considered alternatives and explore the possibility of new solutions.

Design alternatives evaluated during the PSR-PDS were reexamined during the workshop, including options identified by local community members to potentially reduce right of way needs and impacts to businesses abutting the project limits. The controlling design constraint for both project alternatives is the southbound off-ramp which requires a significant amount of deceleration length to safely transition from the interstate to the local roadway. A design exception to modify the deceleration length, and cross-sectional dimensions, of the ramp was explored but was not likely to gain approval from Caltrans. A modification to the ramp geometry is not possible without impacting businesses located along North Amphlett Boulevard.

The estimated costs are further compounded under Alternative 1 which would acquire the Bayview Apartment parcel and provide assistance to displaced residents. While Alternative 2 avoids the acquisition of the Bayview Apartment parcel, it is believed that this option would not be acceptable to the current property owner as it achieves a 5-foot setback from the east building face and Peninsula Avenue southbound on-ramp facility.

Were the Project to be constructed, either of the Project alternatives would create remnant parcels along North Amphlett Boulevard that could potentially yield opportunity for future developments, but the benefit of this would not be recognized until after the Project has been constructed. The anticipated value of these remnant parcels would be small relative to the funds required to secure the right of way.

Based on the cost estimates, the Project cannot be funded. The acquisition of right-of-way for the project is a significant expense that does not justify the benefits of the Project. Typically, transportation infrastructure projects have right-of-way costs which generally vary approximately ten to twenty percent of the overall construction costs (see Table 1-3). Under both project alternatives, the right-of-way costs are nearly double the cost of construction capital. Based on this condition, the merits of the Project become a challenging proposition in pursuit of securing money from a variety of funding programs and grants for construction. Unless the City can fully fund the project, it will be nearly impossible to secure funding for the current Project as funding agencies are focusing on multimodal projects to address congestion as opposed to traditional highway projects. In addition, strong support at the regional and local levels must be demonstrated to bolster the merits of the project to potential funding programs.

To that end, it is recommended that the Project Approval phase be concluded to avoid any further incurred costs. A strategic messaging campaign should be developed to convey the outcome of this workshop with the City Council, Project partners and local community.

It should be noted that components of the Project still offer value to the local community. The improvements are relatively low-cost alternatives identified during the workshop that would enhance safety on the local roadway network. Below is a summary of the potential opportunities that should be further studied:

1. There may be an opportunity to incorporate operational enhancements to Poplar Avenue with adaptive signals to address left-hand turning movements. Since the stop sign at Poplar creates a significant bottleneck, localized improvements should be considered as an alternative to delivering the project. Before going to the council, the San Mateo team will reach out to residents to provide information and gather feedback.
2. Through DIB 94, opportunities to narrow the general-purpose lanes across the existing Peninsula Avenue undercrossing should be evaluated for the purposes of building out the Class IV bicycle facility network.