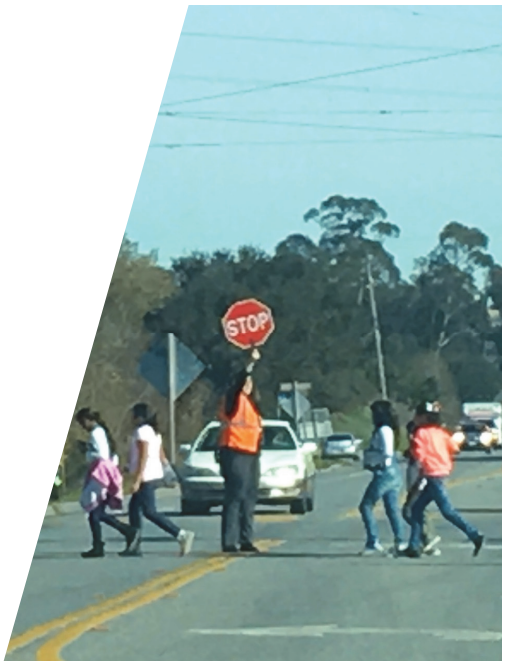
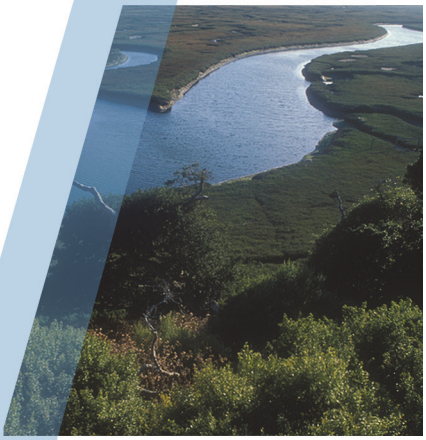


G12: Pajaro to Prunedale Corridor Study

Transportation Agency for Monterey County

Final Report



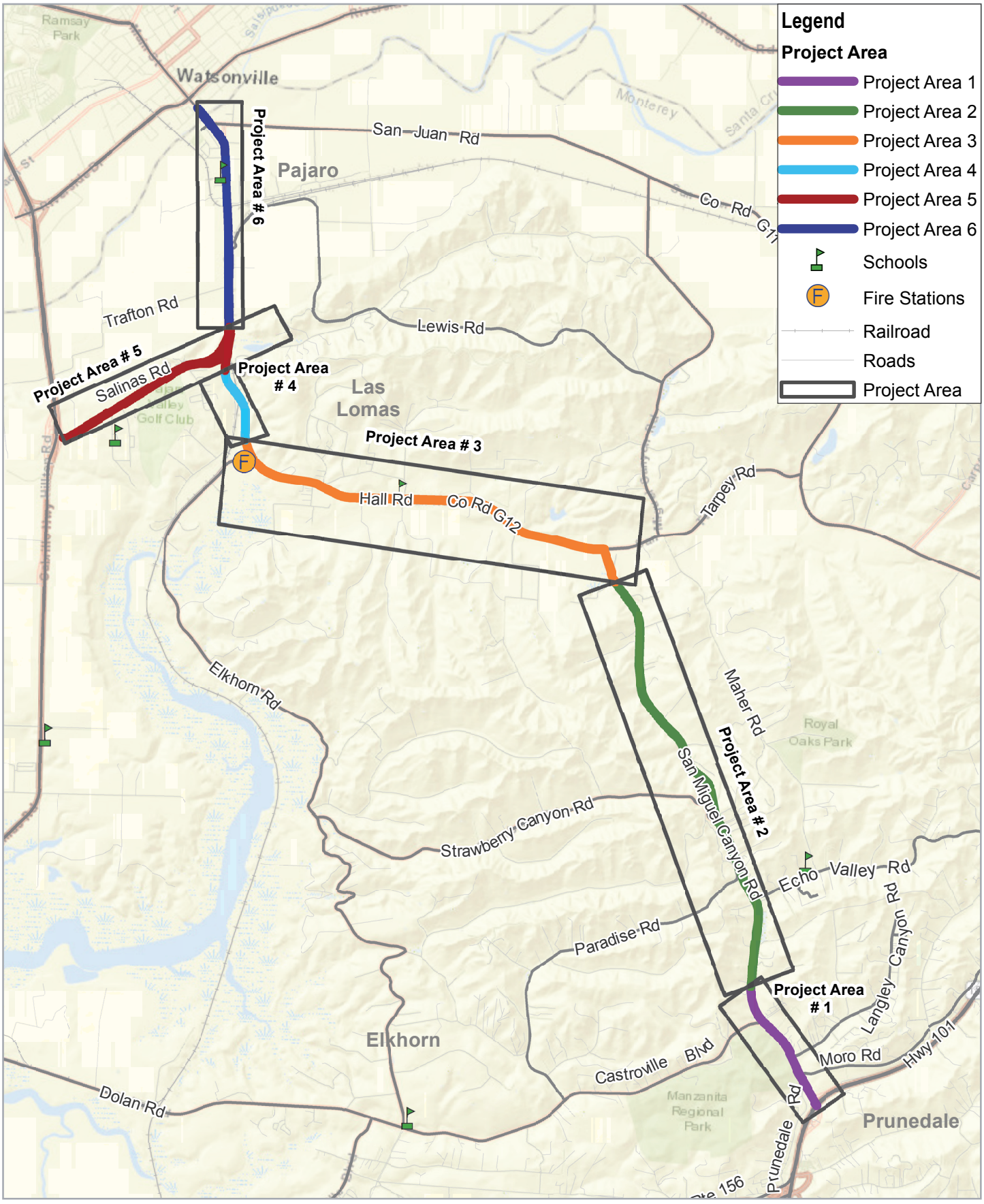
Executive Summary

This corridor study was initiated by the Transportation Agency for Monterey County (TAMC) and the County of Monterey to address safety and congested traffic conditions experienced along a generally north-south travel corridor, known as G12, between Pajaro and Prunedale, in northern Monterey County. Over the past five years, with improved connections to Highway 1 to the northwest, and US 101 to the south, the G12 corridor has become a viable alternative for regional north-south travel between population centers in Santa Cruz County and Monterey County. Unfortunately, this attractive alternative regional route now competes with the local agricultural and rural travel needs of the communities of Pajaro, Las Lomas and Prunedale. The G12 corridor has seen an increase in travel as well as an increase in the number of collisions over the past few years. There were 832 reported collisions along the G12 corridor over five years (2012-2016), with 11 fatalities, and 27 bicycle and pedestrian collisions. The collision rate for G12 is calculated to be 2.14 accidents per million miles traveled. This collision rate is three times higher than the statewide basic average rate for similar facilities.

The G12 corridor is 10.5 miles in length and extends south along Porter Drive and Salinas Road from the Santa Cruz County/City of Watsonville limits, then east on Elkhorn Road and Hall Road, then south again on San Miguel Canyon Road, terminating at US 101 in Prunedale. The G12 corridor traverses the drainage basin for the Elkhorn Slough National Estuarine Reserve, which in turn flows into the Monterey Bay at Moss Landing. The special status of the Elkhorn Slough and Monterey Bay Marine Sanctuary make planning for stormwater management and runoff a high priority.

The G12 corridor had been segmented into five Corridor Zones which were utilized and further detailed in the *Existing Conditions Report* (Appendix A). These corridor zones were segmented based on existing roadway characteristics, adjacent land uses, and field observations. For strategic funding purposes, the G12 corridor has now been re-segmented into six Project Areas, as identified below. This report will focus only on the reference to the Project Areas, which are analyzed as separate Chapters within this Corridor Study. Figure E.1 presents the Study Area Map and identifies the locations of the Project Areas.

Project Area 1 – San Miguel Canyon Road (Prunedale to Castroville Boulevard)
Project Area 2 – San Miguel Canyon Road
Project Area 3 – Hall Road (Las Lomas)
Project Area 4 – Elkhorn Road Bridge
Project Area 5 – G12 at Werner Road/Salinas Road
Project Area 6 – Salinas Road & Pajaro



Paper Size ANSI A

0 0.25 0.5 0.75 1

Miles

Map Projection: Lambert Conformal Conic
Horizontal Datum: NAD 1983 2011
Grid: NAD 1983 2011 StatePlane California IV FIPS 0404 Ft US

N

GHD

Transportation Agency for Monterey County
G12 Corridor: Pajaro to Prunedale Corridor Study

Study Area Map

Project No. **11152201**
Revision No. **-**
Date **5/8/2019**

FIGURE E.1

K:\PRJ\2453\G2453\G12 Corridor_ProjectArea.mxd
Print date: 08 May 2019 - 08:35

Public Outreach

A robust public outreach process was implemented, with the goal to be inclusive and interactive, to engage the public, and obtain input from a broad range of people. Creation of a project logo and project website was used to provide meeting and project information, www.pajarotoprunedalestudy.org. TAMC formed a Focus Group for stakeholders and community leaders. Two sets of public meetings were held at three locations throughout the corridor, the first set occurred in May, 2018 and the second set occurred in December, 2018. All online materials, flyers, and public meetings provided Spanish translation services. The workshops and website were structured to provide multiple opportunities for community members to provide input and feedback on the study. For both sets of community meetings, there were over 120 attendees in total. Overall, congestion and safety were the main concerns of the meeting attendees, and pedestrian safety was of higher concern in the Las Lomas and Pajaro areas. Feedback on the improvement concepts was generally favorable; valid concerns were expressed as well as supportive comments.

Existing Conditions Analysis

To initiate the study, an Existing Conditions Report was prepared to fully understand current travel conditions along the entire G12 corridor. The report included the following:

- Socio-economic trends
- Roadway Conditions
    - Daily and Peak Hour traffic operations by Level of Service (LOS)
    - Multimodal facilities, including pedestrian, bicycle, and public transit
    - Bicycle Level of Traffic Stress
    - Travel Time Studies
    - Truck Routes
- Collision History
- Stormwater management and water quality

Travel Forecasts

In addition to understanding existing travel conditions, forecasted travel conditions within Monterey County also needed to be understood. Using the AMBAG Regional Travel Demand Model, year 2040 travel forecasts were obtained and alternative improvements studied to derive a set of recommended operational and safety multimodal improvements for the G12 corridor.

Improvement Concepts

This study addresses the circulation and safety needs for travel along the G12 corridor and the rural communities of Prunedale, Las Lomas, and Pajaro, specifically enhancing connections for pedestrians, bicycles and transit users, improving operations for motorists, and providing a safe environment for all users. While not every street can be designed to serve all users equally, there are opportunities to enhance service and safety for all users while maintaining its principal

transportation function. These concepts developed for the G12 corridor incorporate community values and retain the distinctive transitions between the adjacent land uses while ensuring safety and mobility for all users. These concepts support sustainable growth and livability, consistent with the Monterey County Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS, or "Long-range Plan"), while preserving the special rural town sites of Prunedale, Las Lomas, and Pajaro. Overall, this study proposes to construct seven roundabouts and three traffic signals along the entire corridor, and a road diet along Salinas Road. Figure E.2 presents a summary of the improvements proposed within this corridor study along G12.

Corridor-wide** improvements **include:

- Continuous bicycle facilities throughout G12:
  - Class I bike path, on southbound San Miguel Canyon Road, between the current Bike Lane and Prunedale North Road;
  - Class II Bike Lanes along San Miguel Canyon Road and Hall Road, between Prunedale North Road and Salinas Road;
  - Buffered Bike Lanes on Salinas Road (G12) between Salinas Road and Pajaro;
  - Class II Bike Lanes within Pajaro, including a buffer where feasible;
- Continuous sidewalks within the communities of Prunedale, Las Lomas, and Pajaro;
- Two-Way Center Left-Turn Lanes at strategic locations throughout the corridor for safety and operations:
  - On San Miguel Canyon Road between Pond Derosa Lane and Paradise Road;
  - On San Miguel Canyon Road between Mark Ryan Estates and Woodland Hill Lane;
  - On Hall Road west of Willow Road (approximately 1,000 feet in length);
- Roundabouts at the following locations:
  - San Miguel Canyon Road/Castroville Boulevard;
  - San Miguel Canyon Road/Echo Valley Road (recommended option);
  - San Miguel Canyon Road/Strawberry Road;
  - Hall Road/Sill Road (recommended option);
  - Hall Road/Las Lomas Drive;
  - Hall Road/Elkhorn Road;
  - Elkhorn Road/Werner Road/Salinas Road;
- Traffic Signals at the following locations:
  - San Miguel Canyon Road/Langley Canyon Road (adaptive timing with other adjacent signals);
  - Salinas Road/Fruitland Avenue (if and when warranted);
  - Salinas Road/Hillcrest Road (if and when warranted);
- Lane modification improvements:
  - Add northbound lane on San Miguel Canyon Road between Moro Road and Castroville Boulevard;

- Remove eastbound free right turn at Hall Road/San Miguel Canyon Road;
- Provide frontage road access on Hall Road west of Willow Road to consolidate driveways;
- Implement at Road Diet on Salinas Road between Elkhorn Road/Salinas Road and the railroad crossing in Pajaro;
- Modify lane configuration on Porter Drive/Main Street southbound approaching San Juan Road intersection to have 2 left turn lanes, 1 thru lane, and 1 receiving lane (remove lane merge downstream);

- Widen bridge across railroad tracks to accommodate pedestrians and bicycles (Class II Bike lanes on both sides, and sidewalk on south side);
- Reconfigure the parking north of Bishop Street on the west side of G12 (Salinas Road) to be off-street;
- Install Rectangular Rapid Flashing Beacons (RRFB) at existing mid-block crossing south of Bishop Street (in current County plans);
- Safety enhancement features including rumble strips, flashing beacons, intersection and roadway lighting, vehicle speed feedback signs, and guard rail as needed.

Operational Analysis (LOS, Corridor Travel Times)

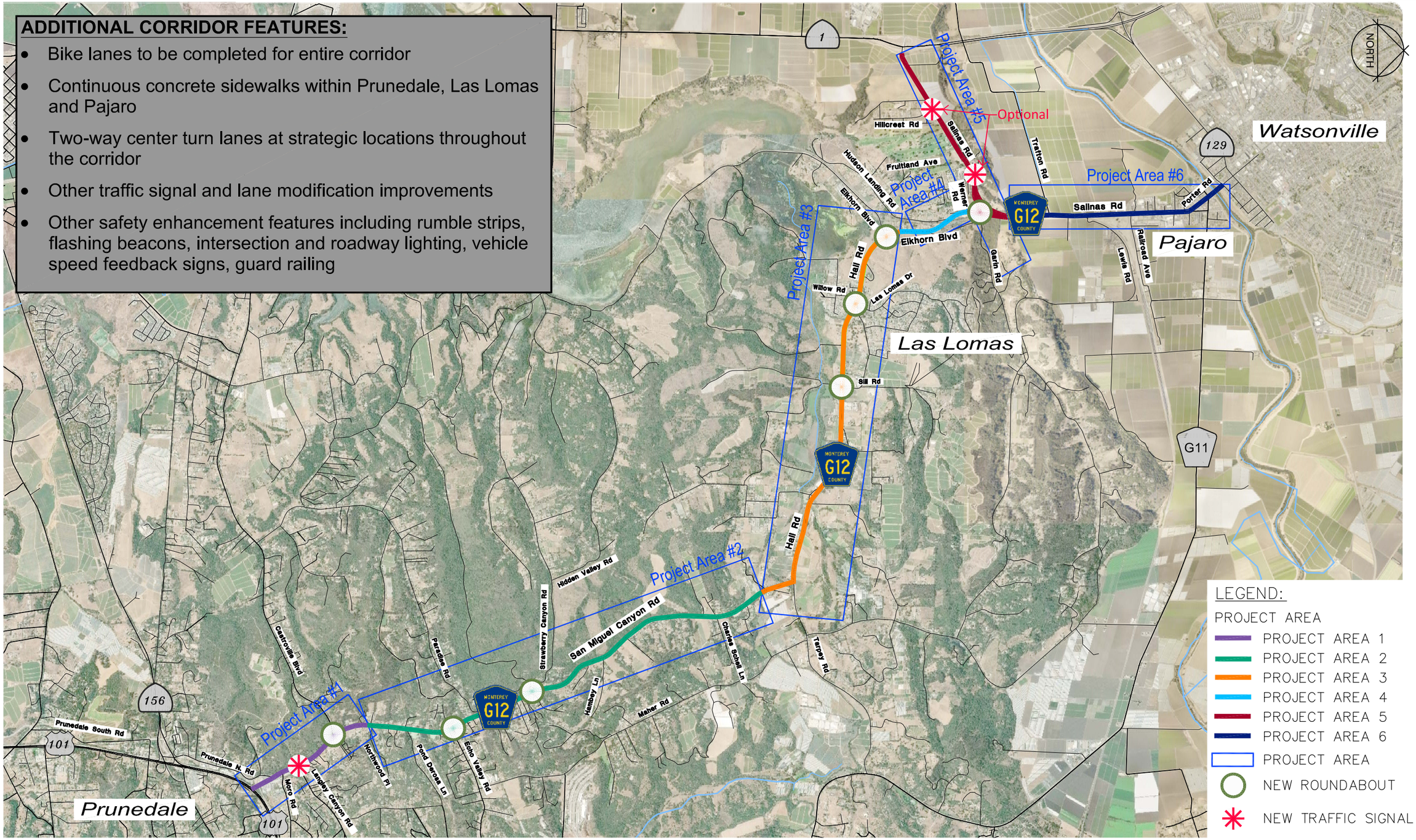
Forecasted travel is expected to experience growth in the next approximate 20 years. By 2040, travel conditions will exacerbate traffic congestion along the G12 corridor, and result in worsening peak hour operations at the intersections, with the majority operating at LOS E/F. With the proposed preferred improvements throughout the corridor, intersections are projected to operate acceptably at LOS D or better for 2040 forecasted peak hour travel conditions. Generally, travel times along the corridor will be similar to current conditions, with a small increase to the corridor travel times with the added growth in traffic and the implementation of the proposed improvements. The travel times are projected to increase with the proposed improvements by approximately no more than 2 minutes, under 2040 conditions. Travel speeds will generally be slower through the local communities and roundabouts, however the delay to the side streets will be significantly reduced.

Stormwater Management and Water Quality

The G12 corridor traverses across a wide range of topographic and hydrologic conditions. As a complete segment, the G12 corridor crosses three twelve-digit Hydrologic Unit Code (HUC) watersheds, four Special Flood Hazard Areas (SFHA) subject to inundation by the 1% annual chance flood as determined by the Federal Emergency Management Agency (FEMA) National Flood Insurance Program (NFIP), four defined drainages, including the Elkhorn Slough Basin, and adjacent floodplains, and a host of other minor drainages. All proposed improvements will minimize or avoid impacts to biological resources, floodplains, base flow elevations, and the function of the existing drainage systems and their capacity. All unavoidable impacts will be minimized and mitigated through appropriate pollution control measures and post-construction water treatment requirements. The specific identification and design of stormwater management and water quality improvements cannot be determined in detail until further design of the transportation improvements occurs, identifying areas of stormwater impact and required mitigation.

ADDITIONAL CORRIDOR FEATURES:

- Bike lanes to be completed for entire corridor
- Continuous concrete sidewalks within Prunedale, Las Lomas and Pajaro
- Two-way center turn lanes at strategic locations throughout the corridor
- Other traffic signal and lane modification improvements
- Other safety enhancement features including rumble strips, flashing beacons, intersection and roadway lighting, vehicle speed feedback signs, guard railing



Prepared for: TAMC Transportation Agency for Monterey County; Monterey G12 County

G12 CORRIDOR IMPROVEMENTS
ENTIRE PAJARO TO PRUNEDALE CORRIDOR
WITH KEY INTERSECTION IMPROVEMENTS

0 3500
Scale: 1"= 3500'

GHD

Transportation Agency of Monterey County
G12 Corridor: Pajaro to Prunedale Corridor Study

Project No. 11152201
Report No. -
Date 4/2/2019

Figure E.2

Filename: K:\PRJ\2453\2453EX024.dwg Plot Date: 7 May 2019 - 3:07 PM

Source:

Improvement Cost Estimates

A series of planning-level cost estimates have been prepared for the proposed improvement concepts for the G12 corridor. The preliminary cost estimates for the improvement concepts for each Project Area are attached in Appendix D. The sources used for the creation of these cost estimates are the 2018 Contract Cost Data provided by the State of California Department of Transportation, Caltrans, and bid summary results of recent projects to determine the unit costs. The cost estimates, also referred to as capital costs, are necessary to determine the funding required for the transportation improvements.

All cost estimates include the cost of preliminary project design and approval, environmental considerations, final design, construction, administration, right-of-way, and construction management and inspection. Construction costs include basic roadway construction items such as paving, storm drainage, lighting, signing, and striping. The total cost for improvements along the G12 corridor (all Project Areas, i.e. the total project) is $54.8 million. The Project Area with the highest capital cost is Project Area 5 (Elkhorn Road/Salinas Road/Werner Road), with a project cost of $15 million. Table E.2 presents the cost estimates for the improvements for each Project Area.

Table E.1 G12 Corridor Project Costs

Project Area	Capital Cost Estimate
Project Area 1 (Prunedale)	$ 4,515,000
Project Area 2 (San Miguel Canyon Road)	$ 12,022,500
Project Area 3 (Las Lomas)	$ 14,571,000
Project Area 4 (Elkhorn Road Bridge)	$ 6,765,000
Project Area 5 (Elkhorn Road/Salinas Road/Werner Road)	$ 15,016,500
Project Area 6 (Salinas Road and Pajaro)	$ 1,950,000
Total Project Cost	**$ 54,840,000**

Project Benefit-Cost

Benefit cost (B/C) ratios were calculated for the entire corridor. The B/C ratio measures the expected return on investment for comparing the no-build scenario to the build scenario with the proposed improvements. The total life-cycle cost for the design year 2040 for the no-build scenario, without any improvements, is estimated to be $1,313,952,400 and for the build scenario with the proposed improvements the life-cycle cost is estimated to be $635,144,824. Safety is a notable performance metric driving the B/C Ratio. Without any improvements, the cost for predicted collisions is significantly higher compared to the predicted cost with the safety improvements which reduce collisions. Table E.2 presents the breakdown of the life-cycle costs for the no-build scenario and the build scenario for the proposed improvements along the G12 corridor. Table E.3 presents the B/C ratio for the proposed improvements along the G12 corridor. The benefit-cost ratio is calculated to be 13.3 for the corridor improvements as a whole.

Table E.2 G12 Corridor Life-Cycle Costs

Life-Cycle Costs	2040 No-Build	2040 with Improvements	Benefit
Travel Time & Vehicle Operation	$ 77,359,000	$ 86,348,000	$ (8,989,000)
Emissions/GHG	$ 823,000	$ 1,170,000	$ (347,000)
Predicted Collisions/Safety	$1,235,190,100	$ 491,786,524	$ 743,403,576
Initial Capital/Project Costs	$ -	$ 54,840,000	$ (54,840,000)
Operation & Maintenance	$ 580,300	$ 1,000,300	$ (420,000)
Total Life-Cycle Costs	**$1,313,952,400**	**$ 635,144,824**	**$ 678,807,576**

Table E.3 G12 Corridor B/C Ratio

Life Cycle Benefit/Cost Ratio	
Build vs No-Build	
Safety Benefit	$ 743,403,576
Delay Reduction & Fuel Benefit	$ (8,989,000)
GHG Benefit	$ (347,000)
Total Benefits	**$ 734,067,576**
Added Operations & Maintenance Costs	$ 420,000
Added Capital Costs	$ 54,840,000
Total Project Costs	**$ 55,260,000**
Life Cycle Benefit/Cost Ratio	**13.3**

Table E.4 presents a summary of the safety benefit, cost and the associated benefit-cost ratio for each project area. As shown, Project Area 6 (Pajaro) has the highest B/C due to the relatively low-cost countermeasures proposed for implementation, and the high benefit from safety due to the number and type of collisions experienced in Pajaro.

Table E.4 Project Area Summary for Safety B/C Ratio

Project Area	Safety Benefit	Capital Cost	Safety B/C
Project Area 1	$ 84,698,056	$ 4,515,000	18.8
Project Area 2	$ 140,766,074	$ 12,022,500	11.7
Project Area 3	$ 63,419,986	$ 14,571,000	4.4
Project Area 4	$ 3,500,073	$ 6,765,000	0.5
Project Area 5	$ 118,113,085	$ 15,016,500	7.9
Project Area 6	$ 81,289,250	$ 1,950,000	41.7
Total Project Cost	**$ 491,786,524**	**$ 54,840,000**	**9.0**

Table of Contents

Figure Index

Table Index

Appendix Index

1. Introduction

This corridor study was initiated by the Transportation Agency for Monterey County (TAMC) to address safety and congested traffic conditions experienced along a generally north-south travel corridor, known as G12, between Pajaro and Prunedale, in northern Monterey County. The G12 corridor is identified as a major roadway in the Monterey County General Plan. In addition to the corridor's growing traffic congestion, the route is experiencing a particularly high number of collisions, including bicycle and pedestrian incidents and fatalities. Over the past five years, with improved connections to Highway 1 to the northwest, and Highway 101 to the south, the G12 corridor has become a viable alternative for regional north-south travel between population centers in Santa Cruz County and Monterey County. Unfortunately, this attractive alternative regional route now competes with the local agricultural and rural travel needs of the communities of Pajaro, Las Lomas and Prunedale.

This G12: Pajaro to Prunedale Corridor Study evaluates how to improve operations and safety to accommodate its current and future travel patterns to achieve and maintain safe and efficient local and regional access between the Santa Cruz County Line to the north, State Route 1 to the west, and U.S. 101 to the south. The G12 corridor is 10.5 miles in length and extends south along Porter Drive and Salinas Road from the Santa Cruz County/City of Watsonville limits, then east on Elkhorn Road and Hall Road, then south again on San Miguel Canyon Road, terminating at U.S. 101 in Prunedale. Lastly, the G12 corridor traverses the drainage basin for the Elkhorn Slough National Estuarine Reserve, which in turn flows into the Monterey Bay at Moss Landing. The special status of the Elkhorn Slough and Monterey Bay Marine Sanctuary make planning for stormwater management and runoff a high priority.

As part of this study, an *Existing Conditions Report* was completed in August, 2018, and is attached with this document. The Existing Conditions Report includes further details on existing planning framework, socioeconomic trends, descriptions of each Corridor Zone, truck routes, detailed stormwater management and water quality conditions, roadway and intersection operations, travel time run analysis, collision analysis, and bicycle Level of Traffic Stress (LTS) conditions.

The balance of this chapter provides an overview of the corridor setting, related planning documents, key technical assumptions and parameters, community input, and forecast methodology.

1.1 Existing Setting

The G12 Corridor is one of northern Monterey County's important regional routes. It is diverse in terms of its functions and the communities it serves. While the G12 Corridor is made up of County roadways, the corridor functions much like a State Highway. It carries a variable mixture of local travelers, regional travelers, and even interregional travelers. Historically, the corridor carried mostly local travelers, but over the years, the mixture of traffic has gone from primarily local in nature to a much wider user base resulting in traffic volumes that have grown to over 25,000 vehicles per day. Only a few short years ago, the corridor primarily served residents in the area who valued the rural lifestyle and still reasonable proximity to jobs and shopping in the Cities of Salinas, Watsonville,

Monterey, Santa Cruz, and San Jose. Now, a number of corridor users are going from city to city and region to region. Based on Google Maps directions, GPS, and other route-finding mobile applications, the most favorable route today between San Luis Obispo to Santa Cruz, directs you onto the G12 corridor, exiting/entering US 101 at San Miguel Canyon Road in Prunedale.

On the surface, it might appear that travelers choose the G12 Corridor for interregional trips due to ever-increasing congestion on the following State Highways in northern Monterey County: US Route 101, State Route 1, State Route 68, State Route 156, and State Route 183. Congestion and travel time are certainly primary factors in route choice and one reason why Google Maps and other route-finding programs direct users to the G12 Corridor when traveling between Salinas and Santa Cruz. However, State Highway congestion is not the only reason why traffic has increased on G12.

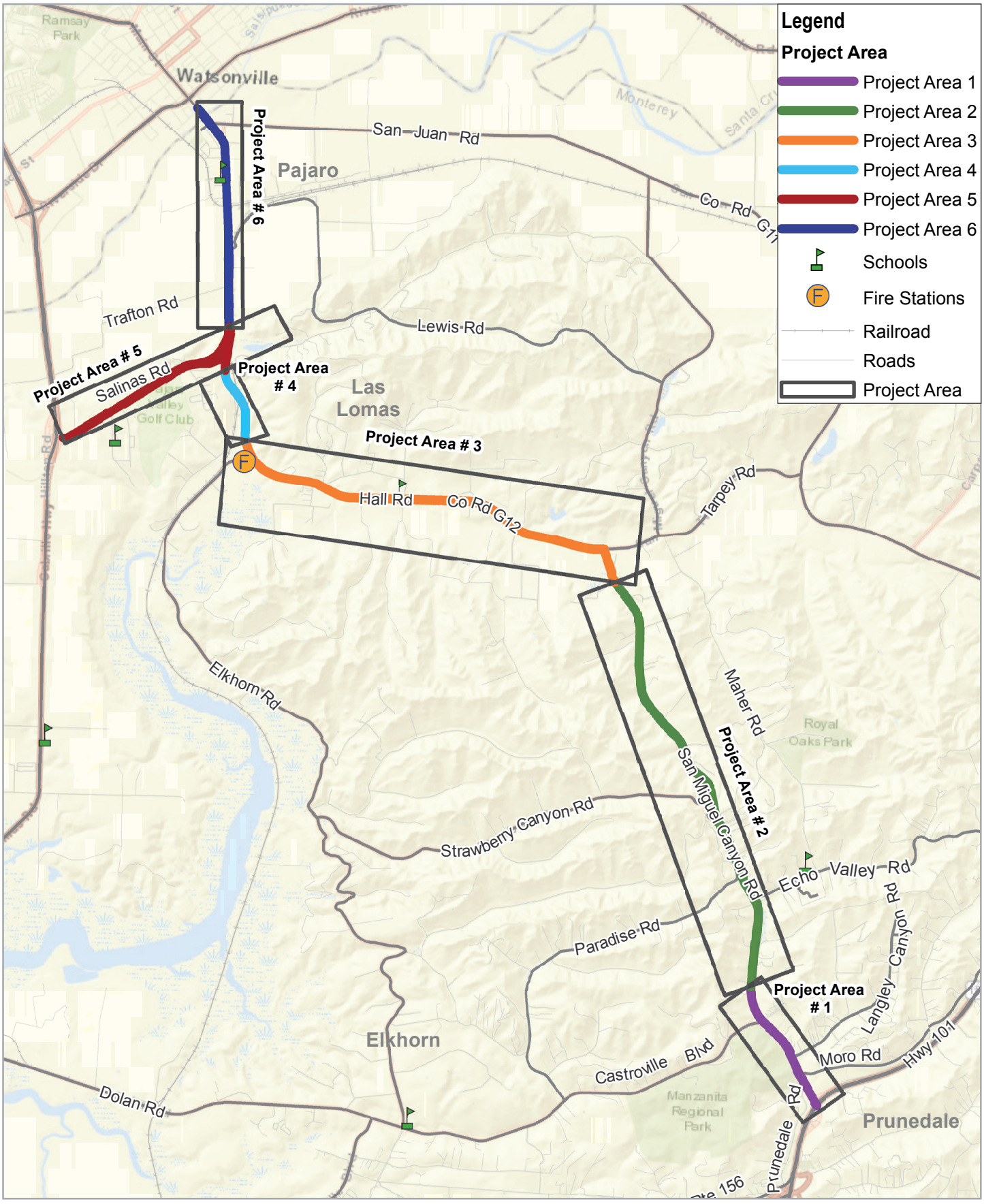
TAMC, in strong partnership with Caltrans District 5 and Monterey County, has implemented a Capital Improvement Program over the last 10 years that has focused on interchange improvements. A new interchange was constructed at Salinas Road/State Route 1, and several interchanges or overcrossings were constructed or improved for the Prunedale Improvement Project along US 101 between San Juan Road and Espinosa Road/Russell Road, including San Miguel Canyon Road. These new interchanges and overcrossings have greatly improved safety, and have made access to and from the G12 Corridor more convenient for motorists. These access improvements have made the G12 Corridor a more attractive alternative to the State Highways that are growing ever more congested.

1.1.1 Project Areas

The G12 corridor had been segmented into five Corridor Zones which were utilized and identified in the *Existing Conditions Report* (attached as Appendix A). These corridor zones were segmented based on existing roadway characteristics, adjacent land uses, and field observations. The G12 corridor has now been re-segmented into six Project Areas, for strategic funding purposes, as identified below. This report will focus only on the reference to the Project Areas, which are analyzed as separate Chapters within this Corridor Study.

Project Area 1 – San Miguel Canyon Road (Prunedale to Castroville Boulevard)
Project Area 2 – San Miguel Canyon Road
Project Area 3 – Hall Road (Las Lomas)
Project Area 4 – Elkhorn Road Bridge
Project Area 5 – G12 at Werner Road/Salinas Road
Project Area 6 – Salinas Road & Pajaro

Figure 1.1 presents the Study Area Map and identifies the locations of the Project Areas.



Paper Size ANSI A

0 0.25 0.5 0.75 1

Miles

Map Projection: Lambert Conformal Conic
Horizontal Datum: NAD 1983 2011
Grid: NAD 1983 2011 StatePlane California IV FIPS 0404 Ft US

N

GHD

Transportation Agency for Monterey County
G12 Corridor: Pajaro to Prunedale Corridor Study

Study Area Map

Project No. **11152201**
Revision No. **-**
Date **5/8/2019**

FIGURE 1.1

K:\PRJ\2453\G2453\G12 Corridor_ProjectArea.mxd
Print date: 08 May 2019 - 08:33

1.2 Current Related Planning Documents

Below lists current planning documents that guide or regulate transportation planning decisions related to this corridor study. These are further described in the Existing Conditions Report.

- Transportation Agency for Monterey County 2018 Regional Transportation Plan (TAMC RTP)
- Monterey County General Plan
- 2040 Metropolitan Transportation Plan/Sustainable Communities Strategy (MPT/SCS, or "Long-Rang Plan")
- TAMC Bicycle and Pedestrian Master Plan (December 2011)
- TAMC Regional Roundabout Study (March 2016)
- Safe Routes to School Plan

1.3 Roadway & Intersection Level of Service (LOS) Methodology

To evaluate current and 2040 forecast traffic operational conditions, Levels of Service (LOS) was sued as one of the key metrics in determining alternative improvement solutions using the following methodologies. LOS were calculated for all rural two-lane highway study segments and for all study intersection control types using the methods documented in the Transportation Research Board Publication *Highway Capacity Manual, Sixth Edition, A Guide for Multimodal Mobility Analysis. 2016* (HCM 6). The Highway Capacity Software (HCS), Version 7 was utilized to implement HCM 6 methodologies for rural two-lane highway operations, where applicable. Segment LOS for Four-Lane and Two-Lane Arterials are based on Average Daily Traffic volumes, planning applications of the Highway Capacity Manual, and the Florida Department of Transportation Quality/LOS Handbook. These roadway segments are not classified as rural two-lane highways. The *Synchro 10 (*Trafficware) software program was used to implement the HCM 6 and Synchro analysis methodologies. Additionally, traffic signal warrant analysis was conducted for unsignalized intersections that operate deficiently, based on the criteria for the Peak-Hour-Volume based Warrant 3 presented in the latest edition of the Federal Highway Administration's (FHWA) Manual on Uniform Traffic Control Devices (MUTCD). For further details on the technical analysis parameters, methodology and assumptions, refer to the *Existing Conditions Report*, provided in Appendix A.

1.3.1 Bicycle Level of Traffic Stress

To measure the safety and comfort of the corridor from the bicyclist perspective, bicycle conditions were analyzed utilizing a standardized Bicycle Level of Traffic Stress (LTS) methodology. The methodology used for the LTS analysis was adapted from the paper, "Low Stress Bicycling and Network Connectivity", Mineta Transportation Institute, Report 11-19, May 2012. Bicycle LTS is generally a perception-based rating system of the safety, comfort, and convenience of transportation facilities from the perspective of the user. The rating system measures the effects of traffic-based stress on bicycle riders, with LTS 1 being the lowest stress or most comfortable, and LTS 4 being the highest stress or least comfortable. The Bicycle LTS methodology is broken into three categories for each direction of travel: segments (along), intersection approaches (turn lanes), and intersection crossings (unsignalized). The overall score for each section is aggregated for the

three categories, with the dimension with the worst level of stress governing. Further details on the Bicycle LTS analysis methodology are contained in the *Existing Conditions Report*.

1.3.2 Travel Time Run Analysis

Travel times of the G12 corridor were collected on Wednesday, January 31 and Thursday, February 1, 2018 from 7:00 to 9:00 a.m. for the AM peak period, and from 4:00 to 6:00 p.m. for the PM peak period. The travel time runs were conducted using the test vehicle method and "Average-Car" or "Floating-Car" technique. In addition to the test vehicle method, all of the travel time runs were recorded using GPS. Overall, the average travel times for the northbound direction were consistent between AM and PM peak hours (15:36-15:42 minutes). The average travel times for the southbound direction were a little faster than the northbound, with 12:56 as the total average time in the AM peak and 14:25 in the PM peak. Additional details are provided in the *Existing Conditions Report*.

1.4 Community Outreach

To appropriately identify problem locations, consider potential improvement solutions, and gauge overall public acceptance of alternative corridor plans, the need for a robust public outreach process was established. Therefore, the public outreach process was inclusive, interactive, and productive in order to build support and momentum for the study while conveying technical issues in a clear and easy-to-understand manner. Various types of outreach were included as opportunities for community input. This included the creation of a project logo and project website: www.pajarotoprunedalestudy.org, which serves as a central location for project information including background information, project documents, upcoming meeting information, and allowing the public to provide further input in addition to public meetings. The website was also translated into Spanish. TAMC formed a Focus Group for stakeholders and community leaders, and held meetings throughout the project to discuss the corridor and provide input on key areas of concern, coordinating potential improvements with current plans, and advising on the development of conceptual design alternatives.

In coordination with TAMC, and with assistance from Strategic Initiatives, two sets of public meetings were held at three locations throughout the corridor. Meetings were held at the Prunedale Grange Hall in Prunedale, the Hall District Elementary School in Las Lomas, the Our Lady of the Assumption Church in Pajaro (which also provided child care), and the Pajaro Middle School in Pajaro. All meetings provided Spanish translation services and/or fluent Spanish-speaking personnel.

To get the word out for upcoming meetings, flyers and posters were distributed in English and Spanish throughout the Community in public areas such as bus stops, churches, and grocery stores. These flyers and posters were also posted on the project website and distributed to residents via water bills, door-to-door, via a mailing list set up for stakeholders and community members, and to the local schools via www.PeachJar.com. Figure 1.2 presents one of the flyers distributed.

Figure 1.2 Community Outreach Flyer

The workshops were structured to provide multiple opportunities for community members to talk with and provide feedback to representatives of TAMC and the GHD consultant team. The first set of public meetings was held on Wednesday, May 23, and Thursday, May 24, 2018 to provide an introduction of the study to the public, gain input on current areas of concern, and aid to evaluate existing conditions. During the first workshops, a formal meeting was held with a slide presentation to present the purpose for the study and discuss the current conditions. Maps of the G12 corridor were laid out on tables and the public were encouraged to use color-coded dots to identify areas of concern throughout the corridor for safety, congestion, biking, walking, and other categories. Post-it notes were provided for attendees to describe their concerns and possible solutions. General comment cards were also available for workshop participants to provide feedback. After the "dot boards" session, interactive polling technology was used to collect the participants' opinions and concerns in real time. The anonymous results of each poll were immediately displayed, and the participants discussed the results to provide greater insight and understanding.

The second set of public meetings was held on December 3, 5, and 6, 2018 to present the alternative concepts throughout the corridor, for each Project Area. Improvement concepts are presented for each Project Area, subsequently within this document. For both sets of community meetings, there were over 120 attendees in total. Overall, congestion and safety were the main concerns of the meeting attendees, and pedestrian safety was of higher concern in the Las Lomas and Pajaro areas. Feedback on the improvement concepts was generally favorable; valid concerns were expressed as well as supportive comments. A detailed summary of the public outreach is included in Appendix B.

1.5 Forecast Methodology

This study considers forecasted travel conditions to recommend improvements that not only resolve current operational and safety issues, but also sustain acceptable levels over the next 20 years.

The Association of Monterey Bay Area Governments (AMBAG) develops, maintains and applies a Regional Travel Demand Model to support metropolitan transportation planning activities and decision-making processes. The model encompasses the three counties of Santa Cruz, Monterey, and San Benito. AMBAG and the three Regional Transportation Planning Agencies for Monterey, San Benito and Santa Cruz Counties use the AMBAG model in the development of their regional planning documents and plans as well as other land use and traffic impact studies. The AMBAG model was utilized as the tool to develop traffic forecasts for the G12 corridor study. The current AMBAG model reflects transportation projects adopted by the AMBAG Board of Directors in June of 2014. The current 2014 model has a base year of 2010 and a forecast year of 2035.

A technical memorandum dated November 13, 2018 was prepared to summarize findings from the regional travel demand model and to provide traffic forecasts that reflect future conditions represented by local and regional growth in approximately 20 years. The forecasting memorandum is included in the Appendix C. The 2040 forecasts were derived utilizing the average growth rate over 22 years (2018 to 2040) from the 2014 model, based on three sections along G12. The three growth rate sections on G12 identified are based on alignment of the road (north-south vs east-west), and they present consistent growth patterns throughout each section. The average growth rate for each of the three sections was applied to the existing 2018 daily traffic counts, as applicable. Similarly to the daily traffic projections, the AM and PM peak hour traffic volumes at the study intersections were also projected utilizing the average growth rate over the 22-year period for their perspective location in each of the three sections of G12. Operational analyses were also conducted for the 2040 projected conditions, and are summarized in subsequent sections of this document.

1.6 Benefit-Cost Ratio & Collision Modification Factor Analysis

Collision modification factors are multiplicative factors used to compute the expected number of collisions after implementing a given countermeasure. Collision modification factors have been developed for a variety of countermeasures (including intersection control) through decades of safety research; however collision modification factors may not be available for all countermeasure types. The collision modification factor is utilized in the Highway Safety Improvement Program (HSIP) Analyzer (in PDF format) to calculate the Safety Benefit cost. The Safety Benefit calculated in the HSIP Analyzer monetizes the societal cost associated with the predicted number and severity of collisions that may occur for each proposed countermeasure or intersection control, estimated to reflect the design life of the countermeasure. The HSIP Analyzer utilizes the collision modification factors published in the Local Roadway Safety Manual for California Local Road Owners (Version 1.4, June 2018), and the societal crash cost based on the Highway Safety Manual, First Edition, 2010, adjusted to 2018 Dollars. These parameters are identical to those resident in Cal-B/C, the statewide analysis tool for benefit-cost analyses. A B/C ratio greater than 1.0 indicates that the benefits exceed the cost. The proposed improvements, collision data and estimated costs were utilized in the HSIP Analyzer to calculate Benefit-Cost Ratios for each Project Area based on a maximum of three applicable countermeasures. The HSIP Analyzer PDF forms are included in Appendix E.

2. Project Area 1 – San Miguel Canyon Road (Prunedale)

This section consists of the southern portion of the G12 corridor, in Prunedale between US 101 and Castroville Boulevard.

2.1 Project Area 1 Description

Project Area 1 on San Miguel Canyon Road is approximately 0.75 miles long, extending between US 101 and Castroville Boulevard. The Prunedale area has seen substantial growth in overall traffic volumes and general activity. With the construction of the US 101/San Miguel Canyon Road interchange and the recent signalization of the Southbound US 101 off-ramp, access to the commercial center just west of US 101 has become easier and traffic has increased in turn. As a result, there has been an increase in traffic using the Prunedale North Road signalized intersection at San Miguel Canyon Road, and the Prunedale North Road/Prunedale South Road corridor that serves as a frontage road to US 101, which provides access to an increasing number of businesses. At the north end of Project Area 1, the Castroville Boulevard T-intersection is stop-sign-controlled on the Castroville Boulevard approach, has a dedicated left turn lane for northbound traffic, and a channelized right turn pocket for southbound traffic on San Miguel Canyon Road. This intersection provides an important connection to the City of Castroville from the Prunedale area.

Although not in close proximity, the improvement of the Highway 1/Salinas Road interchange has also contributed to the increased volumes on San Miguel Canyon Road through Project Area 1. With the improved access and safety at this new interchange to Salinas Road, the G-12 corridor has become a desirable alternative route to the use of Highway 1 between Santa Cruz County and the Salinas area.

Through Project Area 1, San Miguel Canyon Road is four lanes between US 101 and Moro Road, and two lanes north of Moro Road. Signalized intersections along San Miguel Canyon Road are located at the US 101 southbound off-ramp, Prunedale North Road and Moro Road intersections. Traveling in the northbound direction, San Miguel Canyon Road traps the outside through lane into a right-turn lane at Moro Road, forcing through vehicles to merge into the inside through northbound lane. With stoppage at the signal controlled Moro Road, queuing of through traffic during peak hours is extensive. The County has installed flexible posts at the intersection's approach to help guide traffic, channelizing the right turn lane, and attempting to restrict vehicles from merging at the last moment. However, most of the delineating posts are missing or damaged, revealing that through vehicles have difficulty merging at the appropriate location.

In the southbound direction, as motorists enter the Prunedale area from the more rural setting along San Miguel Canyon Road, the speed limit transitions from 55 mph to 35 mph at Langley Canyon Road. While some of the southbound motorists on San Miguel Canyon Road are intending to access the commercial businesses clustered near the US 101 interchange, at Prunedale North Road and Moro Road, a substantial number intend on accessing US 101 and are focused on transitioning to freeway speed. Although an additional southbound through lane is added south of Moro Road, the capacity benefit of the additional through lane is limited as most through travelers must remain in a single lane to enter the southbound US 101 on-ramp.

Overall, during peak hours, traffic in the Prunedale area is congested in both directions along San Miguel Canyon Road. Northbound traffic will queue back beyond the US 101 overpass onto 101 North, further congesting traffic at Vierra Canyon Road and SR 156. In the southbound direction, traffic queue backs through the traffic signals at Prunedale-North and Moro Road and to the Langley Canyon Road intersection during both AM and PM peak hours.

2.1.1 Existing Multimodal Facilities

The Monterey-Salinas Transit (MST) operates two fixed transit routes that have stops along the G12 corridor. MST Route 28 provides service between Salinas and Watsonville via SR 1 and Salinas Road, and MST Route 29 provides service between Salinas and Watsonville via G12. Both routes have two-hour headways in each direction. North of Prunedale North Road, there are two bus stops, one in each direction, that provide service for MST Route 29. The northbound bus stop has a bus turnout, shelter and bench. The southbound bus stop has a shelter and bench, and provides service to the Prunedale Park & Ride lot on Prunedale North Road. Additionally, there is a bus stop northbound at Langley Canyon Road, and a bus stop southbound at Castroville Boulevard, neither provide shelter or a bench.

Within the more urbanized area of Prunedale, there are sidewalks adjacent to the Prunedale Shopping Center, but are incomplete with missing sidewalk connections up to Langley Canyon Road. South of Moro Road, there are no dedicated bicycle lanes and cyclists must compete with motorized vehicles. The Class 2 southbound bike lane on San Miguel Canyon Road ends just south of the signalized intersection at Moro Road, and continues as a Class III Bike Route on Prunedale North Road.

2.2 Existing Conditions Analysis

2.2.1 Existing Data Collection

In coordination with TAMC, daily roadway counts and AM and PM peak hour intersection turning movement counts were collected along the entire corridor. For this specific Project Area within Prunedale, daily roadway counts were collected on San Miguel Canyon Road between US 101 and Langley Canyon Road, and five selected intersections between US 101 and Castroville Boulevard. For further details, refer to the Existing Conditions Report. Daily and peak hour counts were conducted on January 31 and February 1, 2018.

In addition to traffic counts, field surveys were conducted to inventory physical conditions including existing geometry, intersection controls, multimodal facilities, key destinations and routes, and traffic

operations along the corridor. To also inform this study, existing parcel and right-of-way data was acquired from Monterey County, and related planning efforts were reviewed to coordinate the potential improvements.

2.2.2 Roadway and Intersection Operations

Roadway segment operations for Project Area 1, based on daily traffic volumes (26,274 vehicles), are currently estimated to operate at LOS C for a four-lane arterial. Table 2.1 summarizes the peak hour operational analysis of the existing conditions at the study intersections within Project Area 1.

Table 2.1 Project Area 1: Existing Conditions Intersection Operations

Intersection	Control Type	AM Peak Hour		PM Peak Hour		Signal Warrant Met?
		Delay	LOS	Delay	LOS	
San Miguel Canyon Rd & US 101 SB Ramps	**Signal**	10.2	B	**55.8**	**E**	-
San Miguel Canyon Rd & Prunedale North Rd	Signal	18.2	B	42.7	D	-
San Miguel Canyon Rd & Moro Rd	Signal	31.9	C	48.7	D	-
San Miguel Canyon Rd & Langley Canyon Rd	**TWSC**	**45.9**	**E**	**36.8**	**E**	**Yes**
San Miguel Canyon Rd & Castroville Blvd	**TWSC**	**45.1**	**E**	**184.4**	**F**	**Yes**

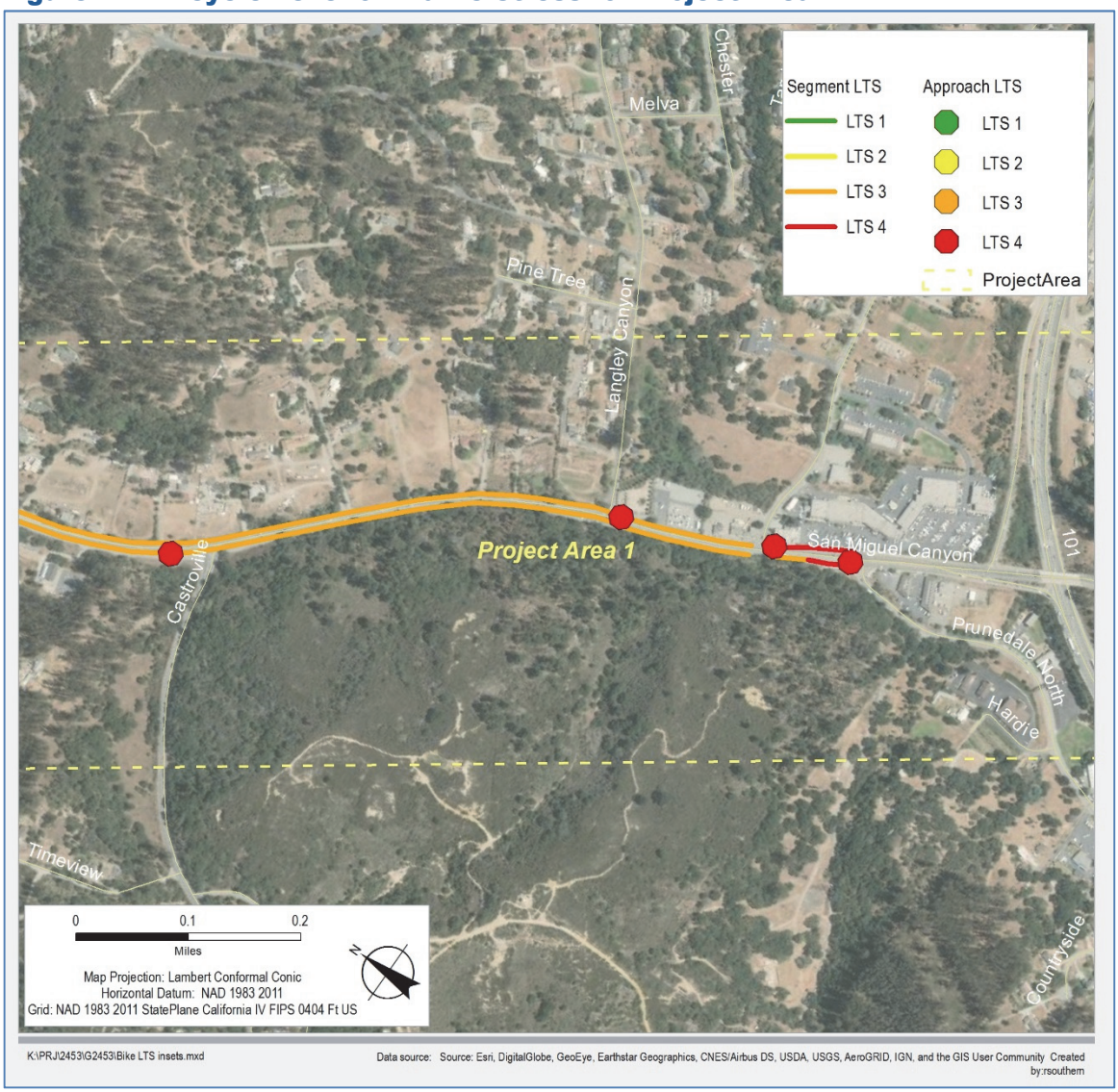
Notes: 1. TWSC = Two-Way or Side-Street Stop Control
2. LOS = Delay based on worst minor street approach for TWSC intersections, average of all approaches for Signalized intersections
3. Signal Warrant is based on California Manual on Uniform Traffic Control Devices Warrant 3
*4. **Bold** indicates intersections operating deficiently*

Based on the operational analysis conducted, the signalized intersection of San Miguel Canyon Road at US 101 Southbound Off-ramp operates at LOS E in the PM peak hour. The stop-controlled intersections of San Miguel Canyon Road at Langley Canyon Road and at Castroville Boulevard operate at LOS E in the AM peak hour, and LOS E/F in the PM peak hour. Traffic and congestion are very heavy in the peak hours within Prunedale and long delays are experienced at the intersections. Traffic in the Prunedale area queues in both directions in the PM peak hour. Most vehicles are heading to US 101 Southbound, and traffic will queue through the traffic signals and past Langley Canyon Road. Northbound traffic will also queue beyond the US 101 overpass during the PM peak hour due to the lane utilization imbalance created by the second northbound lane drop at Moro Road. Improvements for Project Area 1 will consider capacity and safety improvements to alleviate the congestion experienced. Installing a traffic signal at Langley Canyon Road and adaptive signal timing will improve flow, minimize queues, and reduce the potential for rear-end collisions.

2.2.3 Bicycle Level of Traffic Stress (LTS)

Existing bicycle conditions for Project Area 1 were analyzed utilizing a standardized Bicycle Level of Traffic Stress (LTS) methodology. Within Project Area 1, Class II bike lanes are present on both sides of the roadway north of Moro Road. South of Moro Road, there are no dedicated bicycle lanes and cyclists must compete with motorized vehicles. The Class II bike lane on San Miguel Canyon Road southbound ends just south of the signalized intersection at Moro Road. Bike LTS was not analyzed southeast of Prunedale North Road because cyclists are not expected to continue onto the US 101 ramps. Figure 2.1 presents the Bicycle LTS analysis within Project Area 1. In summary, this section scored LTS 3 and LTS 4 for segments and approaches, resulting in an overall LTS 4. This LTS is high and relates to stressful bicycling conditions. This is due to the lack of bicycle connectivity to the Prunedale Shopping Center, and the high level of stress associated with the conflict zones at approaches where right-turning vehicles mix with bicyclists, as well as the high vehicle speeds.

Figure 2.1 Bicycle Level of Traffic Stress for Project Area 1



2.2.4 Travel Time Run Analysis

Travel times of the G12 corridor were collected for the AM and PM peak periods using the "Floating-Car" technique and were recorded using GPS. Additional details are provided in the *Existing Conditions Report*. For Project Area 1, the average travel time northbound between US 101 and Castroville Boulevard was recorded to be 1:12 in the AM peak hour (in minutes and seconds), and 1:52 in the PM peak hour. The average travel time southbound between Castroville Boulevard and US 101 was recorded to be 2:25 in the AM peak hour, and 2:42 in the PM peak hour.

Figure 2.2 presents the speed of the travel time runs for Project Area 1, based on the GPS recorded data. The delays and congestion in the Prunedale area are shown in orange and red, showing slower vehicle speeds for the various runs, southbound between Prunedale North Road and beyond Langley Canyon Road, and northbound between Moro Road and US 101. In the Prunedale area, the speed and delays are more apparent in the PM peak hour, in both directions. For southbound, congestion and delays occur around Langley Canyon Road, and in the Northbound direction, congestion queues to the US 101 overpass.

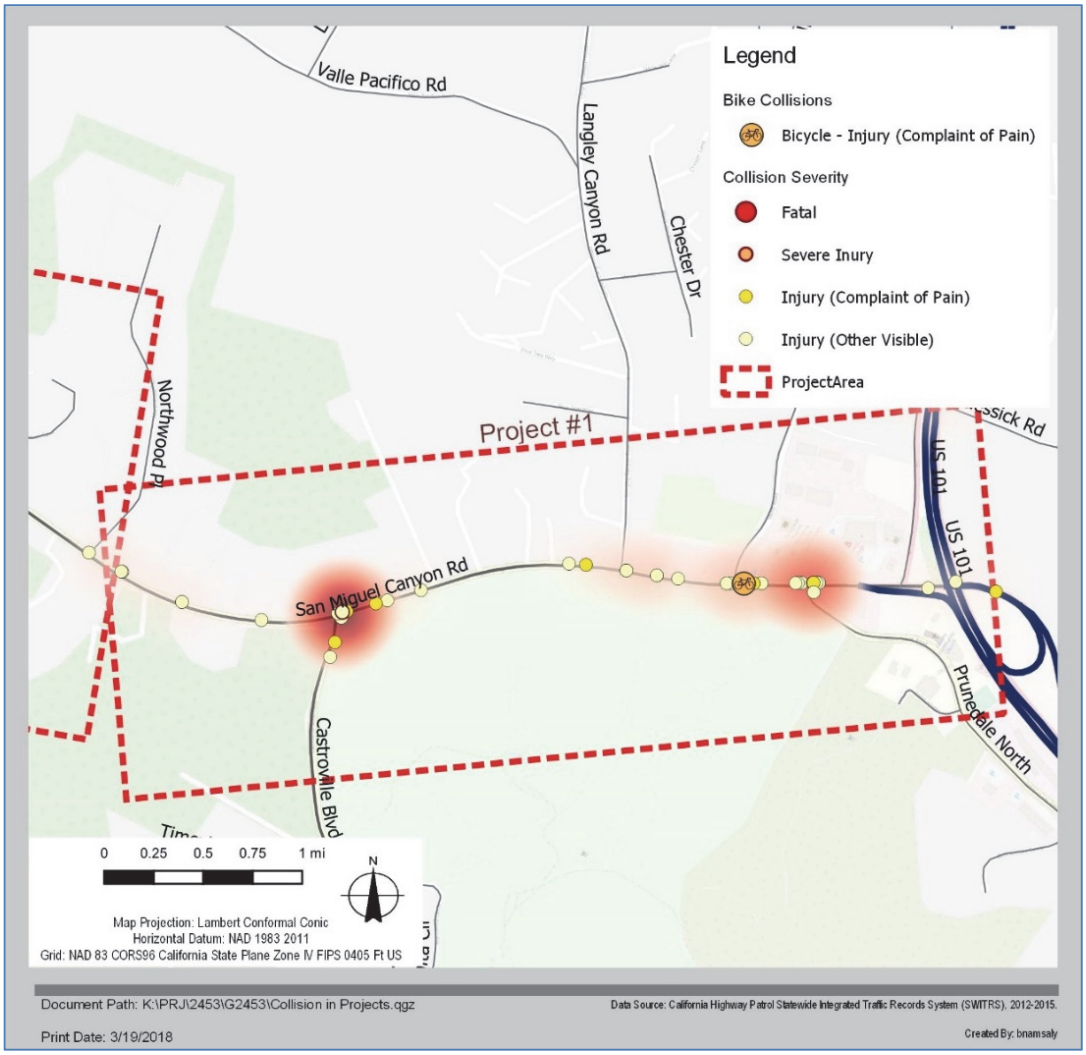
Figure 2.2 Travel Time Runs for Project Area 1

2.2.5 Collision Analysis

Collision data for the study roadways and intersections were derived from the California Highway Patrol Statewide Integrated Traffic Records System (SWITRS). Data was collected on the G12 corridor for a five-year period between January 1, 2012 and December 31, 2016. Based on the collision data, there were 832 reported collisions along the G12 corridor.

Project Area 1 experienced 181 collisions over the five-year period, with 0 fatal collisions, 3 severe injury collisions, 16 injury (other visible), 53 injury (complaint of pain), and 109 property damage only collisions. There was 1 bicycle-related collision, and 1 pedestrian-related collision. Castroville Boulevard is considered a “hot spot” for collisions, and has the highest number of collisions occurring along the G12 corridor, with 34 collisions at the intersection. Figure 2.3 presents the location and severity for collisions in Project Area 1.

Figure 2.3 Collision Severity for Project Area 1



2.3 2040 Forecasts

The forecasts were developed utilizing the AMBAG regional travel demand model. Table 2.2 presents the existing 2018 average daily traffic count, the 2040 forecast daily traffic projection, and the average growth rate utilized for Project Area 1.

Table 2.2 Daily Roadway 2040 Forecasts for Project Area 1

Location	Existing 2018 Count	2040 Projection	Average Growth %
San Miguel Canyon Road s/o Castroville Boulevard	26,274	28,365	8.0%

2.4 Improvement Concepts

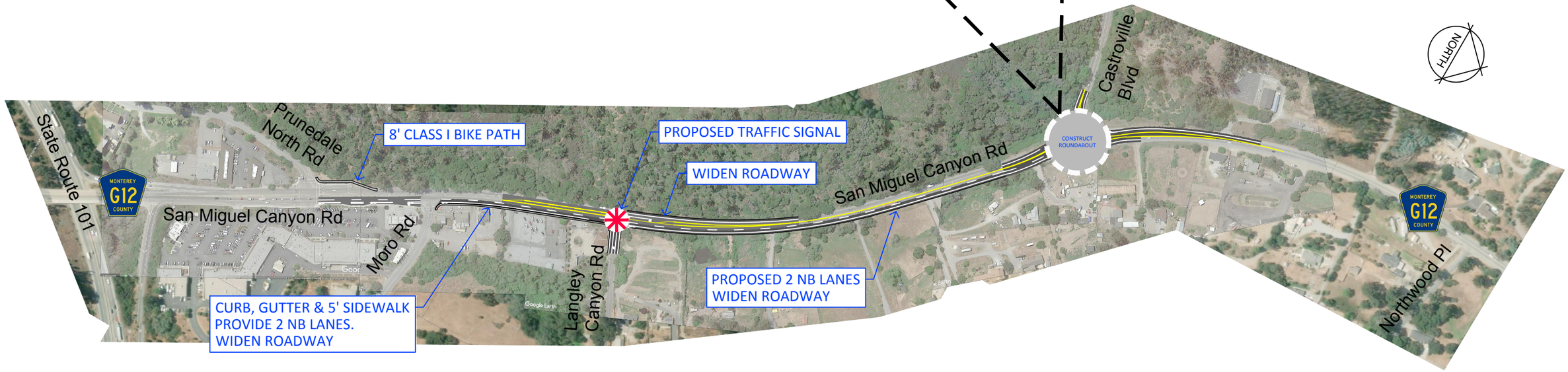
This section discusses the proposed multimodal improvements for Project Area 1, addressing the circulation needs for pedestrians, bicycles, transit users, and automobiles. While not every street can be designed to serve all users equally, there are opportunities to enhance service for all users while maintaining its principal transportation function. These concepts developed for the G12 corridor incorporate community values and retain the distinctive transitions between the adjacent land uses while ensuring safety and mobility for all users. These concepts support sustainable growth and livability, consistent with the Monterey County Long-range Plan, while preserving the special rural town site of Prunedale. Project Area 1 is predominantly in the urbanized area of Prunedale and transitions to rural character north of Moro Road. The proposed improvements include:

- Addition of northbound lane on San Miguel Canyon Road between Moro Road and Castroville Boulevard,
- Installing a traffic signal at San Miguel Canyon Road and Langley Canyon Road,
- Providing signal coordination and adaptive timing optimization between the Langley Canyon Road and US 101,
- Installing a modern roundabout at San Miguel Canyon Road and Castroville Boulevard,
- Installing a 8-foot Class I Bike Path southbound on San Miguel Canyon Road between the current Bike Lane and Prunedale North Road, and
- Installing sidewalk, curb & gutter northbound between Moro Road and Langley Canyon Road.

Alternative improvements were analyzed for all intersections within Prunedale, including consideration of modern roundabouts. Given the context of the corridor for the Prunedale area, and the adjacent traffic signals, the recommended improvement is to create a coordinated system by installing a traffic signal at Langley Canyon Road and upgrading the other signalized intersections to have adaptive signal timing. The adaptive traffic signal control for all signalized intersections in this project area will aim to improve flow, minimize queues, and reduce the potential for rear-end crashes. Additionally, TAMC conducted a Regional Roundabout Study for selected intersections Countywide, utilizing Caltrans' Intersection Control Evaluation (ICE) process. The study evaluated a traffic signal and a roundabout as control alternatives at the San Miguel Canyon Road at Castroville Boulevard intersection. The study evaluated various performance measures including safety, delay reduction, operations and maintenance, and initial capital costs to calculate the benefit-cost (B/C)

ratio. In summary, the study identified a roundabout as the preferred alternative for San Miguel Canyon Road at Castroville Boulevard, with a B/C of 7.74. Figure 2.5 presents the improvement concept for Project Area 1. Figure 2.6 presents a closer detail for a portion of Project Area 1.

CASTROVILLE Blvd



Prepared for: TAMC Transportation Agency for Monterey County; MONTEREY G12 COUNTY

G12 CORRIDOR IMPROVEMENTS
SAN MIGUEL CANYON RD
(STATE ROUTE 101 to CASTROVILLE BLVD)

0 400
Scale: 1"= 400'

GHD

Transportation Agency of Monterey County
G12 Corridor: Pajaro to Prunedale Corridor Study

PROJECT AREA #1

Project No. **11152201**
Report No. **-**
Date **03/27/2019**

Figure 2.4

Filename: K:\PRJ\2453\2453EX017.dwg Plot Date: 4 June 2019 - 11:48 AM

Source:

LEGEND

Existing Bus Stop

Existing Traffic Signal

Prunedale North Rd

SR 101 SB On Ramp

SR 101 SB Off Ramp

8' CLASS I BIKE PATH

BIKES

BIKE LANE

END

BIKE LANE

BEGIN

San Miguel Canyon Rd

Moro Rd

CURB, GUTTER & 5' SIDEWALK
PROVIDE 2 NB LANES
WIDEN ROADWAY

MATCH LINE – SEE BELOW

NORTH

MONTEREY G12 COUNTY

MATCH LINE – SEE ABOVE

San Miguel Canyon Rd

PROPOSED TRAFFIC SIGNAL

WIDEN ROADWAY

CURB, GUTTER & 5' SIDEWALK
PROVIDE 2 NB LANES
WIDEN ROADWAY

Langley Canyon Rd

CONTINUE 2 NB LANES
TO CASTROVILLE BLVD
WIDEN ROADWAY

SAN MIGUEL CANYON Rd

Prepared for:

TAMC TRANSPORTATION AGENCY FOR MONTEREY COUNTY

MONTEREY G12 COUNTY

G12 CORRIDOR IMPROVEMENTS
SAN MIGUEL CANYON RD
(STATE ROUTE 101 to NORTHWOOD PLACE)

0 100
Scale: 1"= 100'

GHD

Transportation Agency of Monterey County
G12 Corridor: Pajaro to Prunedale Corridor Study

PROJECT AREA #1
(DETAIL)

Project No. 11152201
Report No. -
Date 03/27/19

Figure 2.5

Filename: K:\PRJ\2453\2453EX017.dwg Plot Date: 4 June 2019 - 1:44 PM

Source:

2.4.1 Operations Comparison

Traffic operations were analyzed for projected long-term conditions with and without the proposed improvement concepts. Roadway segment operations for Project Area 1, based on daily traffic volumes (28,365 vehicles), are projected to continue to operate at LOS C for a four-lane arterial. Table 2.3 presents the comparison of intersection operations with and without the proposed improvements under the Year 2040 forecasted conditions for the AM peak hour. Table 2.4 presents the comparison of intersection operations with and without the proposed improvements under the Year 2040 forecasted conditions for the PM peak hour.

Table 2.3 Project Area 1: Year 2040 Intersection Operation Improvement Comparison – AM Peak Hour

Intersection	Control Type Change	2040		2040 Improved		Signal Warrant Met?
		Delay	LOS	Delay	LOS	
San Miguel Canyon Rd & US 101 SB Ramps	Signal	9.7	A	5.7	A	-
San Miguel Canyon Rd & Prunedale North Rd	Signal	24.9	C	11.7	B	-
San Miguel Canyon Rd & Moro Rd	Signal	54.2	D	31.7	C	-
San Miguel Canyon Rd & Langley Canyon Rd	**Stop Control to Signal**	**65.2**	**F**	10.5	B	**Yes**
San Miguel Canyon Rd & Castroville Blvd	Stop Control to Roundabout	32.2	D	15.7	B	-

Notes: 1. LOS and Delay based on worst minor street approach for stop-controlled intersections, average of all approaches for Signalized intersections

2. Signal Warrant is based on California Manual on Uniform Traffic Control Devices Warrant 3

*3. **Bold** indicates intersections operating deficiently*

Table 2.4 Project Area 1: Year 2040 Intersection Operation Improvement Comparison – PM Peak Hour

Intersection	Control Type Change	2040		2040 with Improvements		Signal Warrant Met?
		Delay	LOS	Delay	LOS	
San Miguel Canyon Rd & US 101 SB Ramps	**Signal**	**79.3**	**E**	9.2	A	-
San Miguel Canyon Rd & Prunedale North Rd	**Signal**	**75.8**	**E**	19.7	B	-
San Miguel Canyon Rd & Moro Rd	**Signal**	**77.5**	**E**	44.3	D	-
San Miguel Canyon Rd & Langley Canyon Rd	**Stop Control to Signal**	**OVR**	**F**	10.8	B	**Yes**
San Miguel Canyon Rd & Castroville Blvd	**Stop Control to Roundabout**	**OVR**	**F**	25.8	D	**Yes**

Notes: 1. LOS and Delay based on worst minor street approach for stop-controlled intersections, average of all approaches for Signalized intersections
2. Signal Warrant is based on California Manual on Uniform Traffic Control Devices Warrant 3
*3. **Bold** indicates intersections operating deficiently*
*4. **OVR** indicates delays over 300 seconds*

As shown in Tables 2.3 and 2.4, under the projected 2040 conditions without any improvements, the intersection of San Miguel Canyon Road at Langley Canyon Road operates at LOS F in the AM peak hour, and all of the intersections through Prunedale operate beyond the LOS threshold of D in the PM peak hour. The closely-spaced signalized intersections operate at LOS E, and the stop-controlled intersections of San Miguel Canyon Road at Langley Canyon Road, and San Miguel Canyon Road at Castroville Boulevard operating at LOS F. With the proposed improvements through Prunedale, all intersections are projected to operate acceptably during the AM and PM peak hours, under 2040 conditions.

2.4.2 Bicycle Level of Traffic Stress (LTS)

Currently, there are no bike lane markings northbound between Prunedale North Road and Moro Road. The proposed improvements include pavement marking and delineation of a bike lane, in the northbound direction approaching the Moro Road intersection. This improvement will close the gap in bicycle connectivity to the Prunedale Shopping Center. The bike lane is proposed to be delineated to the left of the right turn pocket at Moro Road. With these improvements, this section of the bicycle facility will be improved from LTS 4 to LTS 3. In the southbound direction, a 8-foot Class I bike path is proposed to connect the existing bike lane to Prunedale North Road, to provide a safe

and continuous bicycle facility, separated from the traveled way. This will provide an LTS score of 1 along this section, compared to the current LTS 4 due to the bike lane ending just north of Prunedale North Road.

2.5 Improvement Cost Estimates

A series of planning-level cost estimates have been prepared for the proposed improvement concepts for Project Area 1. The preliminary cost estimates for the improvement concepts for Project Area 1 are attached in Appendix D. The sources used for the creation of these cost estimates are the 2018 Contract Cost Data provided by the State of California Department of Transportation, Caltrans, and recent bid summary results of recent projects to determine the unit costs. The cost estimates are necessary to determine the funding required for the transportation improvements. All cost estimates include the cost of preliminary project design and approval, environmental considerations, final design, construction, administration, right-of-way, and construction management and inspection. Construction costs include basic roadway construction items such as paving, storm drainage, lighting, signing, and striping. Table 2.5 presents the cost estimates for the improvements within Project Area 1.

Table 2.5 Project Area 1 Cost Estimates

Project Area 1 Improvements	Cost Estimate
Roundabout at Castroville Boulevard	$ 2,190,000
Traffic Signal at Langley Canyon Road	$ 538,500
Sidewalk, Bike facilities, Roadway widening	$ 1,786,500
Project Area 1 Total Cost	**$ 4,515,000**

2.5.1 Safety Benefit

Based on the SWITRS and TIMS collision data over the five year period between 2012 and 2016, there were a total of 181 collisions for Project Area 1, with 72 collisions involving injuries. The following collision characteristics represent the greatest potential for safety improvement along the corridor within Project Area 1.

- Unsafe speeds;
- Passing or Turning to/from corridor;
- Roadway departures (head-on, run-off road, sideswipe, hit-object, overturned);
- Lighting; and
- Bicycle/Pedestrian collisions

Possible mitigations to address these types of collisions include:

- Installing dynamic speed feedbacks signs and increasing enforcement along the corridor;

- Install additional advance intersection warning signs to improve visibility of major access points;
- Install centerline and edge-line rumble strips to reduce head-on, sideswipe, run-off road and hit-object collisions;
- Install left- and right-turn pockets and/or a traffic signal to provide safer deceleration for turning vehicles or safer and more efficient intersection control;
- Provide or improve illumination along the segment and/or at intersections to reduce collisions in dark or low lighting conditions; and
- Provide bicycle and pedestrian facilities to fill in gaps in the network, providing access to key destinations such as the Prunedale Shopping Center, and provide separation from the traveled way for safe travel for active modes

2.5.2 Benefit-Cost Ratio & Collision Modification Factor Analysis

The proposed improvements, collision data and estimated costs were utilized in the Highway Safety Improvement Program (HSIP) Analyzer to calculate Benefit-Cost Ratios for the roadway improvements and each intersection control improvement based on a maximum of three applicable countermeasures. Table 2.6 presents the Benefit Cost and Project Cost for the traffic signal and roundabout intersection improvements, the roadway improvements, and the overall Benefit-Cost for Project Area 1. The HSIP Analyzer PDF forms are included in Appendix E. As shown, the roundabout at Castroville Boulevard will have a substantial safety benefit that far exceeds the cost, while the safety benefits for the traffic signal and other roadway improvements only slightly exceed the costs. The project overall (B/C of 18.8) has high benefit compared to the costs.

Table 2.6 Safety Benefit-Cost Summary for Project Area 1

Improvement	Traffic Signal at Langley Canyon Road	Roundabout at Castroville Boulevard	Roadway Improvements (Sidewalk, Bike Lane, accel./decel. Lanes)	Project Area 1 Total
Total Benefit	$593,056.00	$76,797,838.00	$7,307,162.00	$84,698,056.00
Total Project Cost	$538,600.00	$2,190,000.00	$1,786,600.00	$4,515,200.00
B/C	1.1	35.1	4.1	**18.8**

2.6 Stormwater Management

2.6.1 Existing Hydrology

Project Area 1 is situated within the Alisal Slough – Tembladero Slough Watershed (12 digit Hydrologic Unit Code: 180600150103) and is part of the Monterey County NPDES Municipal General Permit Area. The project area traverses and runs parallel to San Miguel Canyon Creek, which has a determined base flood elevation (Special Flood Hazard Area Zone AE) as identified by the Federal Emergency Management Agency National Flood Insurance Program. Existing storm

water management systems consist of one known culvert, various catch basins, storm drain networks, and sheet drainage to roadside ditches.

2.6.2 Proposed Transportation Improvements

Roadway and intersection improvements are summarized below to determine the areas where potential for increasing impervious surface could occur. Project Area 1 proposes a variety of transportation-related improvement recommendations including:

- Roadway Widening
    - Curb, Gutter, Sidewalk
    - Additional Vehicle Lane(s)
    - Bike Lane(s)
- Intersection Improvements
    - Roundabouts
    - Signalization

The proposed improvements for this project area will disturb approximately 2.7 acres and it is estimated that the improvements will result in less than a 5% increase in impervious surface across the project area as a whole. However, individual improvements within this overall project area may result in greater increases to impervious surface within their respective sub-watersheds and associated drainage capture and conveyance systems.

2.6.3 Potential Impacts to Water Systems and Biological Resources

Most of the proposed improvements within Project Area 1 will result in an increase in impervious surface. As a result, there is the potential for an increase in offsite drainage and higher volume peak flows. Increased water volume during these peak flows has the potential to exceed the existing drainage conveyance systems. An exceedance in the capacity of the hydraulic systems may result in upstream flooding, uncontrolled discharge, and erosion. It is recommended that any proposed improvement inventories the existing hydrologic and hydraulic drainage systems to determine if there are deficiencies that require replacement or upgrades to ensure adequate function and capacity.

Construction activities resulting in ground disturbance present the risk for discharge of pollutants of concern into State Clean Water Act Section 303(d) listed waterbodies. There are no 303(d) listed waterbodies in or immediately adjacent to Project Area 1 improvements; however, there is the potential for indirect discharge to Tembladero Slough – a listed 303(d) waterbody. At a minimum, construction related activities present sediment and pH water quality risks to the adjacent water systems.

Increases in pollutant discharge may also result in negative impacts to existing biological resources. Project Area 1 improvements occur in biological community areas that support a host of sensitive and protected habitats and species. Many of these species are dependent on the existing hydrology and water resources within this project area and larger watershed. Species of specific concern in or adjacent to the project area include California red-legged frog and Yadon's rein orchid. It is undetermined if the proposed project improvements would impact the existing sensitive biological resources; therefore, environmental investigations are needed to determine the impact potential.

2.6.4 Minimization and Mitigation Measures

There are a multitude of minimization and mitigation measures that can be implemented during the design and planning phase to help reduce the impact the proposed improvements have on the existing water and environmental resources. Of these, a top priority is to reduce the area of new impervious surface and preserve existing vegetation. Once this is accomplished to the best extent possible while maintaining the safety and function of the proposed improvement, a hydrology analysis and report (drainage study) should be completed to identify, at a minimum, the following:

- Stormwater design standards and criteria
- Soils and land use
- Existing hydrology and site drainage / runoff
- Changes in site drainage and discharge volume and the impacts to the existing hydraulics.
- Storm water quality and post-construction water treatment / low impact development requirements
- Recommendations for treatment of water quality / volume and drainage facility upgrades.

In addition to a drainage study, there are a host of other investigations that should be done to identify potential impacts to the water and environmental resources and help assist in further design development. The type, scope, and existing availability of these additional studies should be determined during the design and planning phase of the proposed improvements; however, it is anticipated that, at a minimum, this would include an environmental analysis and report to identify all potential impacts to the environment resulting from the proposed improvements.

As part of the project-planning phase, regulatory agencies and policies will need to be consulted to determine their jurisdictional applicability and what additional minimization and mitigation measures are required (i.e. United States Army Corps of Engineers, United States Fish and Wildlife Service, California Department of Fish and Wildlife, the Regional Water Quality Control Board - Central Coast Region 3, Monterey County Resource Management Agency – Environmental Services, etc…). Further, the proposed improvements shall undergo stakeholder consultation to determine recommended minimization and mitigation measures (i.e. Transportation Agency for Monterey County, Association of Monterey Bay Area Governments, etc…).

Lastly, best management practices (BMPs) should be developed and specific measures shall be identified on project plans and project related documents (i.e. a Storm Water Pollution Prevention Plan) to reduce and control construction related erosion and discharge of pollutants into offsite water resources.

To minimize the potential for discharge of pollutants, all regulatory and stakeholder requirements, as determined applicable to the proposed improvement, shall be implemented during the construction phase. Additionally, all construction related BMPs including temporary soil stabilization measures, temporary sediment control measures, wind erosion control, tracking control, non-storm water management, and waste management and materials pollution control shall be implemented and maintained during construction.

Following construction completion and final site stabilization, it is recommended that a long-term maintenance plan be developed to address any on-going pollutant risks. This plan should identify the pollutant, the risk, the source, and the maintenance action needed to help reduce and mitigate the impact of the pollutant in perpetuity.

3. Project Area 2 – San Miguel Canyon Road

This section of San Miguel Canyon Road (G12) is located north of Prunedale between Castroville Boulevard and Corto San Miguel Road.

3.1 Project Area 2 Description

Project Area 2 is largely undeveloped from a commercial/industrial standpoint, but has gradually seen growth in rural residential development. The primary roads within Project Area 2 that intersect San Miguel Canyon Road are Echo Valley Road, Paradise Road, and Strawberry Road. Each of these intersections has a dedicated left-turn lane, allowing turning traffic to occur out of the through lane. Echo Valley Road provides access to Echo Valley Elementary School and continues to U.S. 101. There is a relatively short continuous left-turn lane extending southerly from Pond Derosa Lane that provides turning refuge for several driveways, but it does not extend to Northwood Place or Garlen Lane.

There are quite a few private roads or driveways accessing San Miguel Canyon Road which do not have dedicated turn lanes on San Miguel Canyon Road. These include Northwood Place, Mathew Lane, Garlen Lane, Wilson Way, Strong Circle, Hambey Lane, Charles Schell Lane, and Apricot Lane. Each of these uncontrolled intersections creates a conflict point. Project Area 2 makes up approximately third of the 10.5 mile long G12 Corridor at 3.75 miles in length.

Between Wilson Way and Hambey Lane, G12 transitions into steeper, rolling terrain, mostly going downhill in the northbound direction, the posted speed limit for this section is 50 mph. The posted speed limit on San Miguel Canyon Road otherwise in Project Area 2 is 55 mph. Passing lanes are provided on San Miguel Canyon Road north of Hambey Lane to approximately 1,100 feet north of Mark Ryan Estates, and between Woodland Hill Lane and Charles Schell Lane. Any considerations for access control within the passing lane sections would also need to consider potential implications for the passing lane and operational capacity of the roadway. The Monterey County Public Works (San Miguel District) Maintenance Yard is also located north of Charles Schell Lane, providing a truck crossing at its intersection with San Miguel Canyon Road.

3.1.1 Existing Multimodal Facilities

The Monterey-Salinas Transit (MST) operates two fixed transit routes that have stops along the G12 corridor. MST Route 28 provides service between Salinas and Watsonville via SR 1 and Salinas Road, and MST Route 29 provides service between Salinas and Watsonville via G12. Both routes have two-hour headways in each direction. Within Project Area 2, there are 19 bus stops that provide service for MST Route 29 along San Miguel Canyon Road, located approximately at ¼ mile spacing. Bus stops are at major roadways and other points of interest or more densely residential areas. None of the bus stops within Project Area 2 provide shelters or benches, and are usually

located off the roadway, in the gravel or grass. There are no sidewalks within Project Area 2, however Class II Bike Lanes are present along the shoulders.

3.2 Existing Conditions Analysis

3.2.1 Existing Data Collection

In coordination with TAMC, daily roadway counts and AM and PM peak hour intersection turning movement counts were collected along the entire corridor. For this specific Project Area, daily roadway counts were collected on San Miguel Canyon Road south of Echo Valley Road and south of Woodland Hill Lane, and two selected intersections between Castroville Boulevard and Corto San Miguel Road. For further details, refer to the Existing Conditions Report. Daily and peak hour counts were conducted on January 31 and February 1, 2018.

In addition to traffic counts, field surveys were conducted to inventory physical conditions including existing geometry, intersection controls, multimodal facilities, key destinations and routes, and traffic operations along the corridor. To also inform this study, existing parcel and right-of-way data was acquired from Monterey County, and related planning efforts were reviewed to coordinate the potential improvements.

3.2.2 Roadway and Intersection Operations

Table 3.1 presents a summary of the rural two-lane highway operations for the roadway segments for Project Area 2. Table 3.2 summarizes the peak hour operational analysis of the existing conditions at the study intersections within Project Area 2.

Table 3.1 Project Area 2: Existing Conditions Roadway Operations

Roadway	Location	Facility Type	2018 Existing ADT	Directional ADT		Peak Hour	Peak Hr NB/WB Volume	Peak Hr SB/EB Volume
				NB/WB	SB/EB			
San Miguel Canyon Road	Garlen Lane to Pond-Derosa Lane	Class III	19,435	9,989	9,446	7:00-8:00 AM	751	777
						4:30-5:30 PM	769	788
San Miguel Canyon Road	Apricot Lane to Strawberry Road	Class III	16,175	8,313	7,862	7:00-8:00 AM	687	546
						4:45-5:45 PM	632	719

Roadway	Location	Free-Flow Speed	Avg. Travel Speed		Percent Free-Flow Speed (PFFS %)		Segment LOS	
			NB/WB	SB/EB	NB/WB	SB/EB	NB/WB	SB/EB
San Miguel Canyon Road	Garlen Lane to Pond-Derosa Lane	55.8	41.2	41.2	73.9	73.9	D	D
		55.8	41.5	41.5	74.4	74.4	D	D
San Miguel Canyon Road	Apricot Lane to Strawberry Road	55.0	42.2	42.6	76.8	77.4	C	C
		55.0	42.1	41.9	76.6	76.2	C	C

Table 3.2 Project Area 2: Existing Conditions Intersection Operations

Intersection	Control Type	AM Peak Hour		PM Peak Hour		Signal Warrant Met?
		Delay	LOS	Delay	LOS	
San Miguel Canyon Rd & Echo Valley Rd	**TWSC**	**OVR**	**F**	**OVR**	**F**	**Yes**
San Miguel Canyon Rd & Paradise Rd	**TWSC**	**35.0**	**E**	29.4	D	**No**

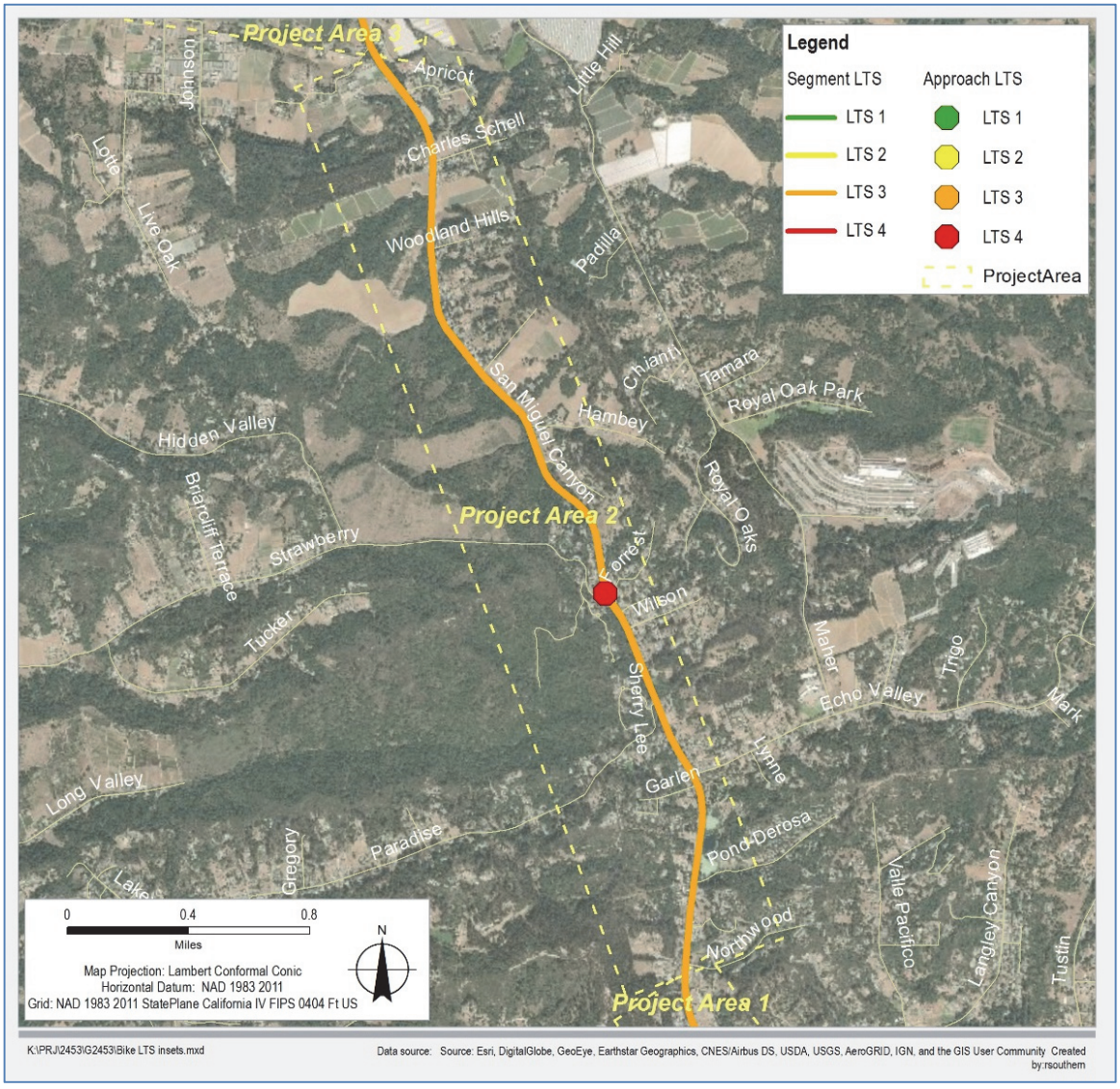
Notes: 1. TWSC = Two-Way or Side-Street Stop Control
2. LOS = Delay based on worst minor street approach for TWSC intersections, average of all approaches for Signalized intersections
3. Signal Warrant is based on California Manual on Uniform Traffic Control Devices Warrant 3
*4. **Bold** indicates intersections operating deficiently*
*5. **OVR** indicates delays over 300 seconds*

Based on the operational analyses conducted, the peak hour two-lane highway analysis shows that San Miguel Canyon Road operates at LOS C north of Strawberry Road, and LOS D south of Garlen Lane. LOS C and D are travel conditions which could be attributed by constant traffic flow, temporary delays due to turning vehicles, or large trucks. However, the intersection of San Miguel Canyon Road at Echo Valley Road operates at LOS F in the AM and PM peak hours, and San Miguel Canyon Road at Paradise Road operates at LOS E in the AM peak hour. These poor LOS conditions are due to the delay experienced on the side streets (stop-controlled intersections) by vehicles trying to enter San Miguel Canyon Road. Long queues on Echo Valley Road and Paradise Road are likely experienced at these intersections, for vehicles waiting for a break in the traffic flow to turn onto San Miguel Canyon Road. Without improvements at these intersections, delays will continue to worsen on the approaches to San Miguel Canyon Road.

3.2.3 Bicycle Level of Traffic Stress (LTS)

Existing bicycle conditions for Project Area 2 were analyzed utilizing a standardized Bicycle Level of Traffic Stress (LTS) methodology. Within Project Area 2, Class II bike lanes are present on both sides of the roadway throughout. Figure 3.1 presents the Bicycle LTS analysis within Project Area 2. In summary, this section scored LTS 3 and LTS 4 for segments and approaches, resulting in an overall LTS 4. This LTS is high and relates to stressful bicycling conditions. This is due to the high level of stress associated with the conflict zones at approaches where right-turning vehicles mix with bicyclists, as well as the high vehicle speeds throughout.

Figure 3.1 Bicycle Level of Traffic Stress for Project Area 2

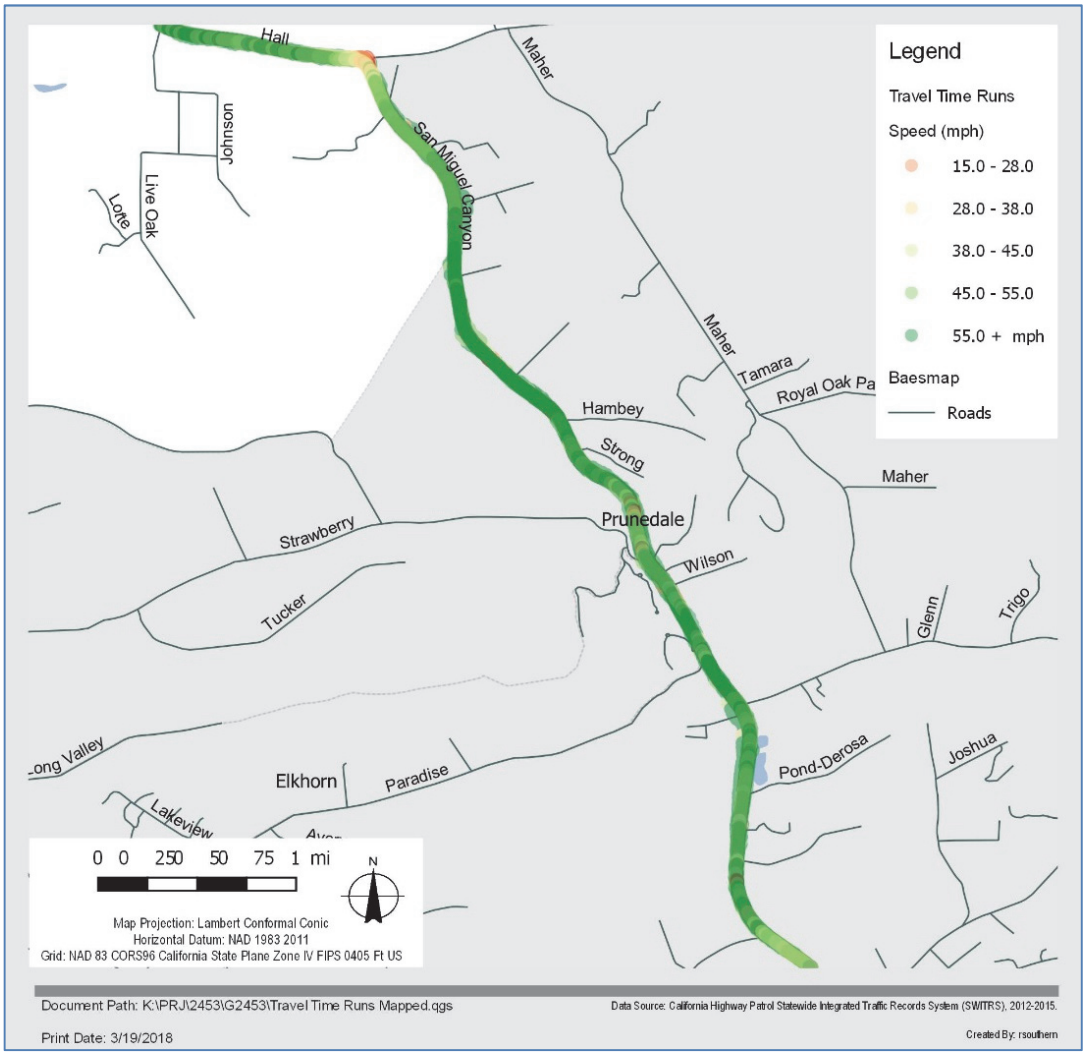


3.2.4 Travel Time Run Analysis

Travel times of the G12 corridor were collected for the AM and PM peak periods using the "Floating-Car" technique and were recorded using GPS. Additional details are provided in the *Existing Conditions Report*. For Project Area 2, the average travel time northbound between Castroville Boulevard and Hall Road was recorded to be 5:02 in the AM peak hour (in minutes and seconds), and 4.44 in the PM peak hour. The average travel time southbound between Hall Road and Castroville Boulevard was recorded to be 4:24 in the AM peak hour, and 4:38 in the PM peak hour.

Figure 3.2 presents the speed of the travel time runs for Project Area 2, based on the GPS recorded data. The delays in Project Area 2 are shown in yellow and orange, showing slower vehicle speeds for the various runs, approaching the signalized intersection of Hall Road at San Miguel Canyon Road, and near Strawberry Lane. Green represents free-flow speeds. Overall, this segment did not experience any delays for through traffic on San Miguel Canyon Road.

Figure 3.2 Travel Time Runs for Project Area 2

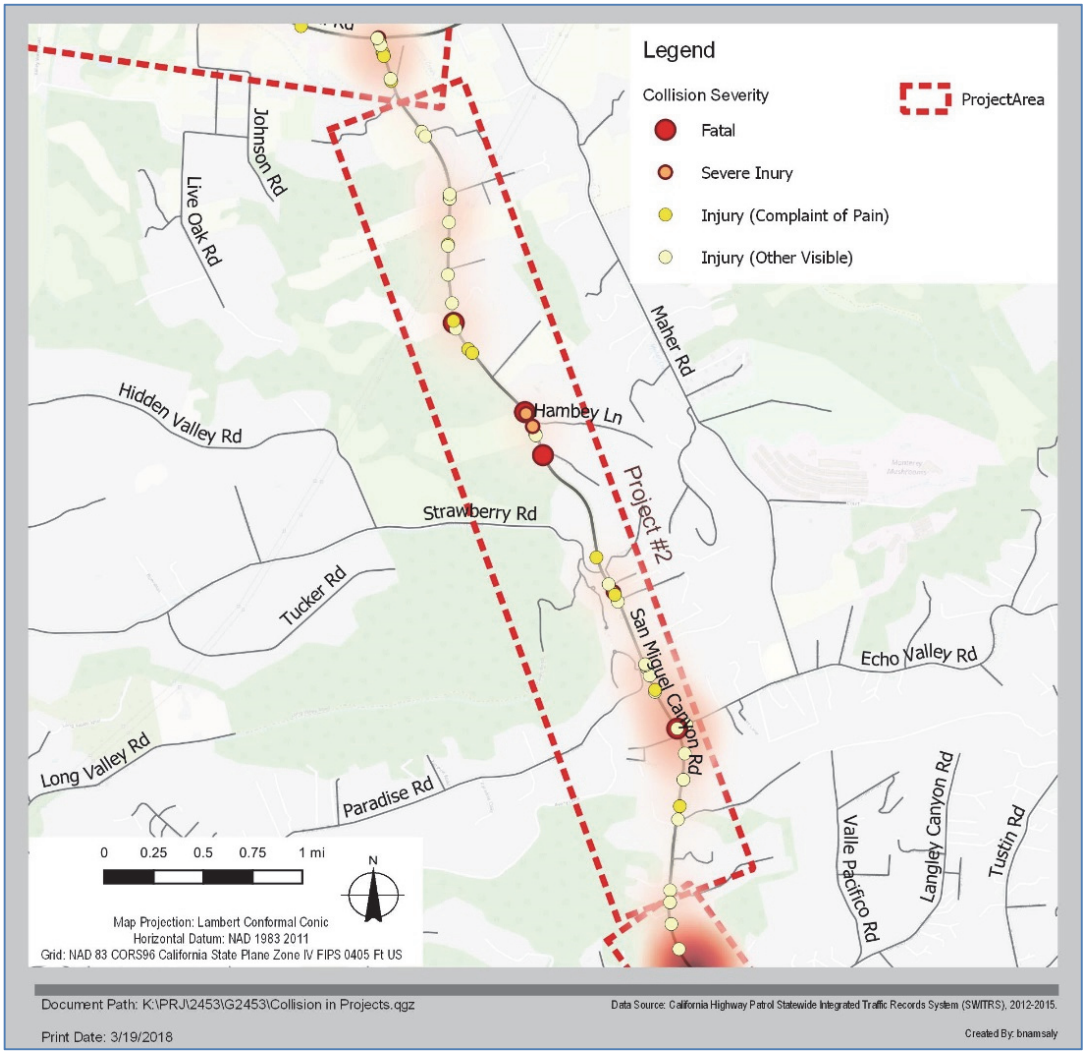


3.2.5 Collision Analysis

Collision data for the study roadways and intersections were derived from the California Highway Patrol Statewide Integrated Traffic Records System (SWITRS). Data was collected on the G12 corridor for a five-year period between January 1, 2012 and December 31, 2016. Based on the collision data, there were 832 reported collisions along the G12 corridor.

Project Area 2 experienced 134 collisions over the five-year period, with 4 fatal collisions, 3 severe injury collisions, 15 injury (other visible), 31 injury (complaint of pain), and 81 property damage only collisions. There were no bicycle-related or pedestrian-related collisions. The majority of collisions occurred at driveway accesses, which were broadside, rear end, or sideswipe collision types. Figure 3.3 presents the location and severity for collisions in Project Area 2.

Figure 3.3 Collision Severity for Project Area 2



3.3 2040 Forecasts

The forecasts were developed utilizing the AMBAG regional travel demand model. Table 3.3 presents the existing 2018 average daily traffic count, the 2040 forecast daily traffic projection, and the average growth rate utilized for Project Area 2.

Table 3.3 Daily Roadway 2040 Forecasts for Project Area 2

Location	Existing 2018 Count	2040 Projection	Average Growth %
San Miguel Canyon Road s/o Echo Valley Road	19,435	20,985	8.0%
San Miguel Canyon Road s/o Woodland Hill Lane	16,175	17,465	8.0%

3.4 Improvement Concepts

This section discusses the proposed multimodal improvements for Project Area 2, addressing the circulation needs for regional and local automotive users and non-automotive users. While not every street can be designed to serve all users equally, there are opportunities to enhance service for all users while maintaining its principal transportation function. These concepts developed for the G12 corridor incorporate community values and retain the distinctive transitions between the adjacent land uses while ensuring safety and mobility for all users. These concepts support sustainable growth and livability, consistent with the Monterey County Long-range Plan, while preserving the special rural town site of Prunedale.

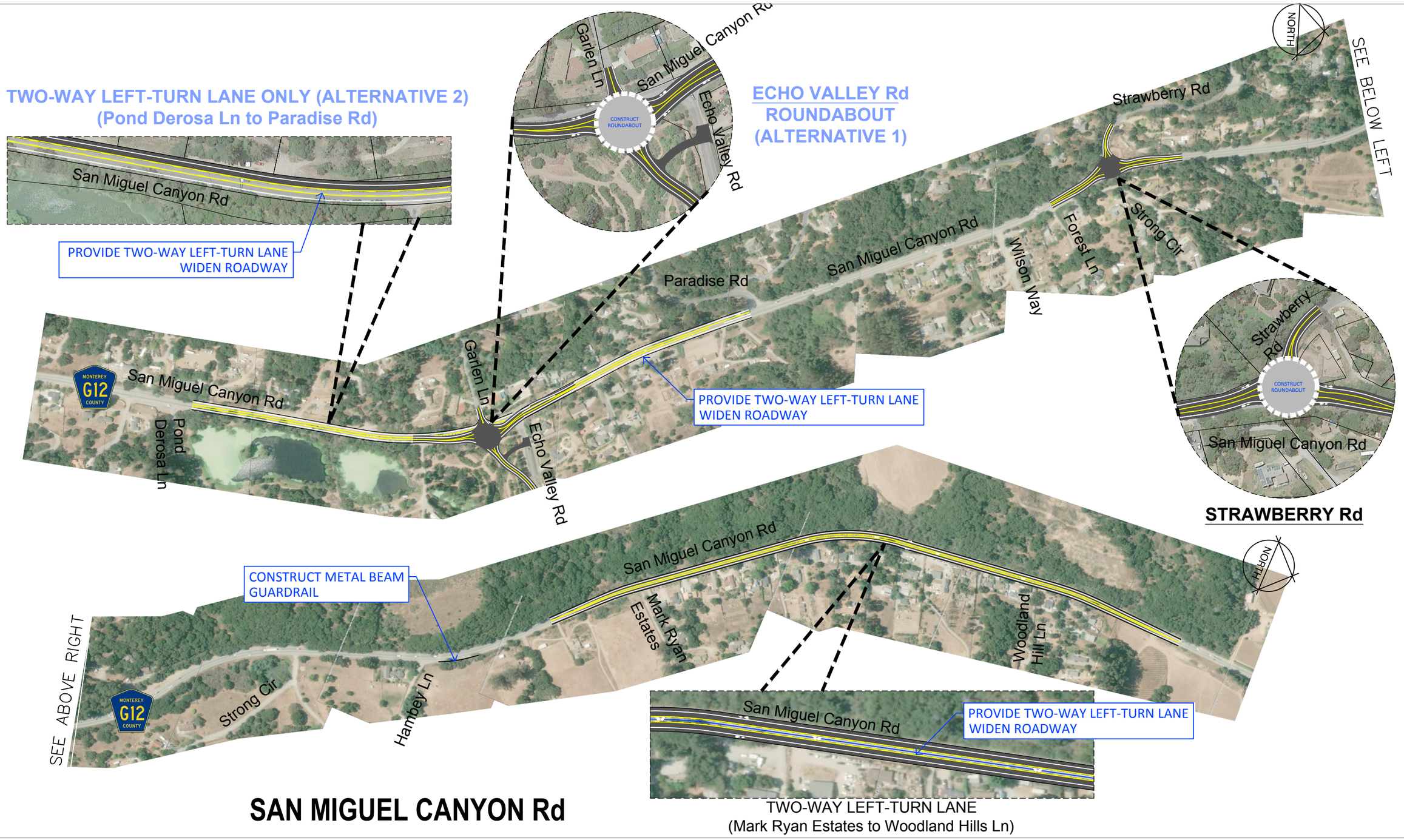
Project Area 2 is predominantly of rural character, with many residential areas accessing directly to G12. The proposed improvement concepts include:

- Echo Valley Road Alternative 1:
  - Realigning Echo Valley Road approach at San Miguel Canyon Road to align with Garlen Lane and Installing a Roundabout at the junction; and
  - Widen to provide a center two-way left-turn lane on San Miguel Canyon Road between Pond Derosa Lane and Paradise Road;
- Echo Valley Road Alternative 2:
  - Widen to provide a center two-way left-turn lane on San Miguel Canyon Road between Pond Derosa Lane and Paradise Road (only);
- Install a Roundabout at San Miguel Canyon Road and Strawberry Road; and
- Widen to provide a center two-way left-turn lane on San Miguel Canyon Road between Mark Ryan Estates and Woodland Hill Lane

The intersection of San Miguel Canyon Road at Strawberry Road is located at the crest of a hill, and a roundabout will slow vehicles approaching the intersection while allowing continuous circulating flow and alleviate the delays to the side street. Similarly, a roundabout at Echo Valley Road will provide the capacity needed to accommodate the intersection's projected traffic volumes during the peak hours, while providing safer left turn movements to and from San Miguel Canyon Road. Realignment of the Echo Valley Road approach, south to align with Garlen Lane, will provide safer

entrance and departure between the two closely-spaced intersections. Installing a roundabout at Echo Valley Road without any realignment would not provide enough room for vehicles turning left out of Garlen Lane. The two roundabouts will also help meter traffic flows northbound and southbound for adjacent intersections and driveways. Providing a center two-way left-turn lane will provide safer deceleration for turning vehicles, and allow vehicles to wait in the center lane to turn left without blocking the through lane.

Figure 3.4 presents the improvement concept for Project Area 2. Figure 3.5 presents a closer detail for a portion of Project Area 2.



Prepared for:

TAMC TRANSPORTATION AGENCY FOR MONTEREY COUNTY

MONTEREY G12 COUNTY

G12 CORRIDOR IMPROVEMENTS

SAN MIGUEL CANYON RD
(POND DEROSA LN TO WOODLAND HILL LN)

0 500
Scale: 1"= 500'

GHD

Transportation Agency of Monterey County
G12 Corridor: Pajaro to Prunedale Corridor Study

PROJECT AREA #2

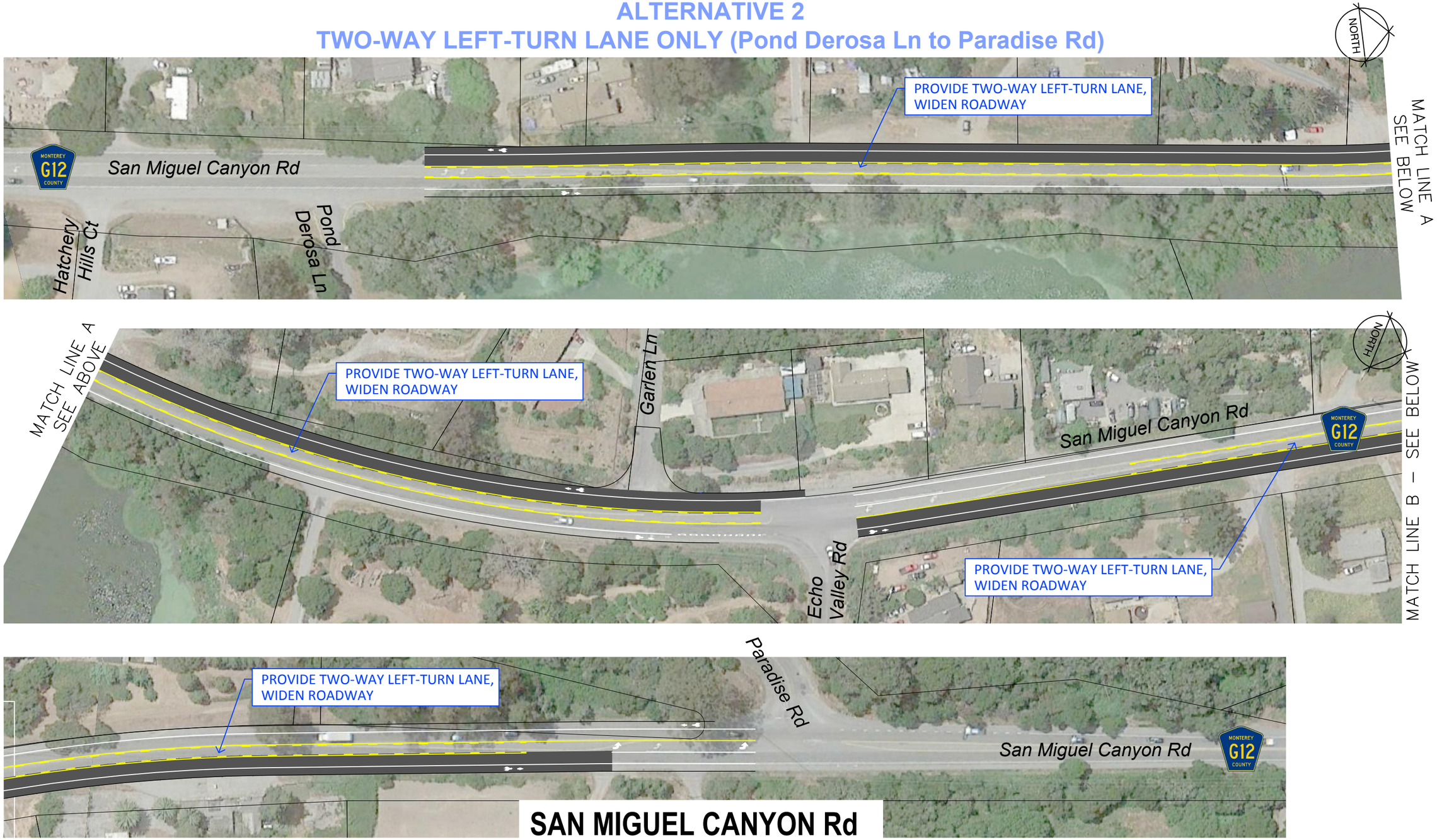
Project No. **11152201**
Report No. **-**
Date **03/27/2019**

Figure 3.4

Filename: K:\PRJ\2453\2453EX018.dwg Plot Date: 4 June 2019 - 12:04 PM

Source:

ALTERNATIVE 2
TWO-WAY LEFT-TURN LANE ONLY (Pond Derosa Ln to Paradise Rd)



Prepared for: TAMC Transportation Agency for Monterey County; Monterey G12 County

G12 CORRIDOR IMPROVEMENTS
SAN MIGUEL CANYON RD
(POND DEROSA LN TO PARADISE RD)

0 100
Scale: 1"= 100'

GHD

Transportation Agency of Monterey County
G12 Corridor: Pajaro to Prunedale Corridor Study

PROJECT AREA #2
(DETAIL)

Project No. 11152201
Report No. -
Date 03/27/2019

Figure 3.5

Filename: K:\PRJ\2453\2453EX018.dwg Plot Date: 4 June 2019 - 12:06 PM

Source:

3.4.1 Operations Comparison

Traffic operations were analyzed for projected long-term conditions with and without the proposed improvement concepts. Roadway segment operations for Project Area 2 are projected to continue to operate at LOS C and D for a two-lane highway. Portions of San Miguel Canyon Road which have center left-turn lanes proposed would require removal of the passing lane at or adjacent to these locations. Table 3.4 presents the comparison of intersection operations with and without the proposed improvements under the Year 2040 forecasted conditions for the AM peak hour. Table 3.5 presents the comparison of intersection operations with and without the proposed improvements under the Year 2040 forecasted conditions for the PM peak hour.

Table 3.4 Project Area 2: Year 2040 Intersection Operation Improvement Comparison – AM Peak Hour

Intersection	Control Type Change	2040		2040 Improved		Signal Warrant Met?
		Delay	LOS	Delay	LOS	
San Miguel Canyon Rd & Echo Valley Road	**Stop Control to Roundabout**	**OVR**	**F**	10.5	B	**Yes**
San Miguel Canyon Rd & Paradise Road	**Stop Control**	**37.8**	**E**	21.1	C	**No**

Notes: 1. LOS = Delay based on worst minor street approach for TWSC intersections, average of all approaches for Signalized Intersections

2. Signal Warrant is based on California Manual on Uniform Traffic Control Devices Warrant 3

*3. **Bold** indicates intersections operating deficiently*

*4. **OVR** indicates delays over 300 seconds*

Table 3.5 Project Area 2: Year 2040 Intersection Operation Improvement Comparison – PM Peak Hour

Intersection	Control Type Change	2040		2040 with Improvements		Signal Warrant Met?
		Delay	LOS	Delay	LOS	
San Miguel Canyon Rd & Echo Valley Road	**Stop Control to Roundabout**	**79.3**	**E**	10.8	B	**Yes**
San Miguel Canyon Rd & Paradise Road	**Stop Control**	**40.3**	**E**	21.8	C	**No**

Notes: 1. LOS = Delay based on worst minor street approach for stop-controlled intersections, average of all approaches for Signal
2. Warrant = Based on California MUTCD Warrant 3
*3. **Bold** indicates intersections operating deficiently*

As shown in Tables 3.4 and 3.5, under the projected 2040 conditions without any improvements, the intersection of San Miguel Canyon Road at Langley Canyon Road operates at LOS F in the AM peak hour, and all of the intersections through Prunedale operate beyond the LOS threshold of D in the PM peak hour. The closely-spaced signalized intersections operate at LOS E, and the stop-controlled intersections of San Miguel Canyon Road at Langley Canyon Road, and San Miguel Canyon Road at Castroville Boulevard operating at LOS F. With the proposed improvements through Prunedale, all intersections are projected to operate acceptably during the AM and PM peak hours, under 2040 conditions.

3.4.2 Bicycle Level of Traffic Stress (LTS)

Class II bike lanes are present on both sides of the roadway throughout Project Area 2. The proposed improvements include installation of a roundabout at Strawberry Road, and at Echo Valley Road. These improvements will provide safer bicycle facilities through the intersections. With these improvements, the corridor will be improved from LTS 4 to LTS 3.

3.5 Improvement Cost Estimates

A series of planning-level cost estimates have been prepared for the proposed improvement concepts for Project Area 2. The preliminary cost estimates for the improvement concepts for Project Area 2 are attached in Appendix D. The sources used for the creation of these cost estimates are the 2018 Contract Cost Data provided by the State of California Department of Transportation, Caltrans, and recent bid summary results of recent projects to determine the unit costs. The cost estimates are necessary to determine the funding required for the transportation improvements. All cost estimates include the cost of preliminary project design and approval, environmental considerations, final design, construction, administration, right-of-way, and construction management and inspection. Construction costs include basic roadway construction items such as paving, storm drainage, lighting, signing, and striping. Table 3.6 presents the cost estimates for the improvements within Project Area 2.

Table 3.6 Project Area 2 Cost Estimates

Project Area 2 Improvements	Cost Estimate
Roundabout at Echo Valley Rd	$ 5,057,250
Roundabout at Strawberry Rd	$ 2,495,250
Center Turn Lanes	$ 4,470,000
Project Area 2 Total Cost	**$ 12,022,500**

3.5.1 Safety Benefit

Based on the SWITRS and TIMS collision data over the five year period between 2012 and 2016, there were a total of 134 collisions for Project Area 2, with 4 fatal collisions, and 49 collisions involving injuries. The following collision characteristics represent the greatest potential for safety improvement along the corridor within Project Area 2.

- Unsafe speeds;
- Passing or Turning to/from corridor;
- Roadway departures (head-on, run-off road, sideswipe, hit-object, overturned); and
- Lighting;

Possible mitigations to address these types of collisions include:

- Installing dynamic speed feedbacks signs and increasing enforcement along the corridor;
- Install additional advance intersection warning signs to improve visibility of major access points;
- Install centerline and edge-line rumble strips to reduce head-on, sideswipe, run-off road and hit-object collisions;
- Install guardrail to reduce roadway departure collisions;
- Install left- and right-turn pockets or a center two-way left-turn lane to provide safer deceleration;
- Install roundabouts to provide safer and more efficient intersection control; and
- Providing or improving illumination along the segment and/or at intersections to reduce collisions in dark or low lighting conditions

3.5.2 Benefit-Cost Ratio & Collision Modification Factor Analysis

The proposed improvements, collision data and estimated costs were utilized in the Highway Safety Improvement Program (HSIP) Analyzer to calculate Benefit-Cost Ratios for the roadway improvements and each intersection control improvement based on a maximum of three applicable countermeasures. Table 3.7 presents the Benefit Cost and Project Cost for the intersection improvements (Roundabouts), the roadway improvements, and the overall Benefit-Cost for Project Area 2. The HSIP Analyzer PDF forms are included in Appendix E. As shown, the roadway

improvements have greater safety benefits compared to the roundabouts, but both projects have considerable safety benefits that outweigh the costs.

Table 3.7 Safety Benefit-Cost Summary for Project Area 2

Improvement	Roundabouts at Echo Valley Road and Strawberry Road	Roadway Improvements (Two-Way Left-Turn Lane)	Project Area 2 Total
Total Benefit	$72,308,224	$68,457,850	$140,766,074
Total Project Cost	$7,552,500	$4,470,000	$12,022,500
B/C	9.6	15.3	**11.7**

3.6 Stormwater Management

3.6.1 Existing Hydrology

Project Area 2 straddles both the Alisal Slough – Tembladero Slough Watershed (12 digit Hydrologic Unit Code: 180600150103) and the Elkhorn Slough Watershed (12 digit Hydrologic Unit Code: 180600150301) and is part of the Monterey County NPDES Municipal General Permit Area. From Echo Valley Road to the Northwood Place, the project area runs parallel to multiple ponds and San Miguel Canyon Creek, both of which have a determined base flood elevation (Special Flood Hazard Area (SFHA) Zone AE) as identified by the Federal Emergency Management Agency National Flood Insurance Program. After crossing over the ridgeline into the Elkhorn Slough Watershed, the project area drops into the ecologically sensitive and protected Elkhorn Slough basin and ends at Carneros Creek, a SFHA Zone AE designated floodplain and direct tributary to Elkhorn slough. Existing storm water management systems consist of 14 known culverts, a bridge crossing, and sheet drainage to roadside ditches.

3.6.2 Proposed Transportation Improvements

Roadway and intersection improvements are summarized below to determine the areas where potential for increasing impervious surface could occur. Project Area 2 proposes two alternatives and a variety of improvement recommendations including:

- Roadway Widening
    - Additional Vehicle Lane(s)
    - Bike Lane(s)
- Intersection Improvements
    - Roundabouts
    - Signalization

The project area offers two (2) improvement alternatives. The proposed improvements for the project area for alternative 1 will disturb approximately 6.3 acres and the proposed improvements for the project area for alternative 2 will disturb approximately 5.8 acres. It is estimated that the improvements for either alternative will result in less than a 5% increase in impervious surface

across the project area as a whole. However, individual improvements within this overall project area may result in greater increases to impervious surface within their respective sub-watersheds and associated drainage capture and conveyance systems.

3.6.3 Potential Impacts to Water Systems and Biological Resources

Most of the proposed improvements within Project Area 2 will result in an increase in impervious surface. As a result, there is the potential for an increase in offsite drainage and higher volume peak flows. Increased water volume during these peak flows has the potential to exceed the existing drainage conveyance systems. An exceedance in the capacity of the hydraulic systems may result in upstream flooding, uncontrolled discharge, and erosion. It is recommended that any proposed improvement inventories the existing hydrologic and hydraulic drainage systems to determine if there are deficiencies that require replacement or upgrades to ensure adequate function and capacity.

Construction activities resulting in ground disturbance present the risk for discharge of pollutants of concern into State Clean Water Act Section 303(d) listed waterbodies. There are no 303(d) listed waterbodies in or immediately adjacent to Project Area 2 improvements; however, there is the potential for indirect discharge to Carneros Creek – a listed 303(d) waterbody. At a minimum, construction related activities present sediment and pH water quality risks to the adjacent water systems.

Increases in pollutant discharge may also result in negative impacts to existing biological resources. Project Area 2 improvements occur in biological community areas that support a host of sensitive and protected habitats and species, specifically in the Elkhorn Slough basin. Many of these species are dependent on the existing hydrology and water resources within this project area and larger watershed. Species of specific concern in or adjacent to the project area include California red-legged frog, Yadon's rein orchid, and Monterey spineflower. It is undetermined if the proposed project improvements would impact the existing sensitive biological resources; therefore, environmental investigations are needed to determine the impact potential.

3.6.4 Minimization and Mitigation Measures

There are a multitude of minimization and mitigation measures that can be implemented during the design and planning phase to help reduce the impact the proposed improvements have on the existing water and environmental resources. Of these, a top priority is to reduce the area of new impervious surface and preserve existing vegetation. Once this is accomplished to the best extent possible while maintaining the safety and function of the proposed improvement, a hydrology analysis and report (drainage study) should be completed to identify, at a minimum, the following:

- Stormwater design standards and criteria
- Soils and land use
- Existing hydrology and site drainage / runoff
- Changes in site drainage and discharge volume and the impacts to the existing hydraulics.
- Storm water quality and post-construction water treatment / low impact development requirements
- Recommendations for treatment of water quality / volume and drainage facility upgrades.

In addition to a drainage study, there are a host of other investigations that should be done to identify potential impacts to the water and environmental resources and help assist in further design development. The type, scope, and existing availability of these additional studies should be determined during the design and planning phase of the proposed improvements; however, it is anticipated that, at a minimum, this would include an environmental analysis and report to identify all potential impacts to the environment resulting from the proposed improvements.

As part of the project-planning phase, regulatory agencies and policies will need to be consulted to determine their jurisdictional applicability and what additional minimization and mitigation measures are required (i.e. United States Army Corps of Engineers, United States Fish and Wildlife Service, California Department of Fish and Wildlife, the Regional Water Quality Control Board - Central Coast Region 3, Monterey County Resource Management Agency – Environmental Services, etc…). Further, the proposed improvements shall undergo stakeholder consultation to determine recommended minimization and mitigation measures (i.e. Transportation Agency for Monterey County, Association of Monterey Bay Area Governments, Elkhorn Slough Foundation (ESF), etc…).

Lastly, best management practices (BMPs) should be developed and specific measures shall be identified on project plans and project related documents (i.e. a Storm Water Pollution Prevention Plan) to reduce and control construction related erosion and discharge of pollutants into offsite water resources.

To minimize the potential for discharge of pollutants, all regulatory and stakeholder requirements as determined applicable to the proposed improvement shall be implemented during the construction phase. Additionally, all construction related BMPs including temporary soil stabilization measures, temporary sediment control measures, wind erosion control, tracking control, non-storm water management, and waste management and materials pollution control shall be implemented and maintained during construction.

Following construction completion and final site stabilization, it is recommended that a long-term maintenance plan be developed to address any on-going pollutant risks. This plan should identify the pollutant, the risk, the source, and the maintenance action needed to help reduce and mitigate the impact of the pollutant in perpetuity.

4. Project Area 3 – Hall Road (Las Lomas Area)

This section entails the Las Lomas area, between San Miguel Canyon Road and Elkhorn Road.

4.1 Project Area 3 Description

Project Area 3 of the G12 corridor serves the unincorporated community of Las Lomas. For a number of years, there has been a sometimes "over-focus" on motorized traffic in the Las Lomas area and lack of provision for pedestrians in particular. In recent years, there has been an increasing focus on improving safety and mobility for all users of Hall Road (G12). The community of Las Lomas is defined as economically disadvantaged under CalEnviroScreen Version 2.0 and the community is primarily made up of farm worker families with English often being a second language. The majority of the homes are located on the north side of Hall Road, off Las Lomas Drive and Sill Road. Sill Road also provides access to Hall District Elementary School. The Las Lomas Market is the only commercial area for the community, and is located on the south side of Hall Road, between Las Lomas Drive and Willow Road. Crosswalks for Las Lomas are provided at the Las Lomas Drive intersection.

The intersection of San Miguel Canyon Road at Hall Road is signalized with dedicated left turn lanes, and a channelized right turn lane from eastbound Hall Road to southbound San Miguel Canyon Road. On Hall Road, there is a passing lane located west of San Miguel Canyon Road and east of Johnson Road, and in between Pini Road and Sill Road. Elkhorn Road at Hall Road (G12) is a large side-street stop-controlled intersection, with channelized right turns southbound and eastbound, and an acceleration lane northbound on G12 for left turning vehicles onto G12. Additionally, the North County Fire Station No. 3 is also located at this intersection.

Key intersections for Project Area 3 include Hall Road at San Miguel Canyon Road, Sill Road, which has an unsignalized school crossing, Las Lomas Drive, which is currently signalized, Willow Road, and Elkhorn Road. Left turn lanes are provided at these major intersections. Numerous private and local driveways have direct access to Hall Road west of Willow Road in the Las Lomas community. However, Las Lomas Drive, Sill Road, and Willow Road provide access for the majority of the residents within Las Lomas. The intersection of Sill Road at Las Lomas Drive is very close to the Hall Road/Las Lomas Drive intersection, approximately 60 feet from the stop bar. Project Area 3 is approximately 2.8 miles in length. The posted speed limit is 45 mph within the Las Lomas community.

4.1.1 Existing Multimodal Facilities

The Monterey-Salinas Transit (MST) operates two fixed transit routes that have stops along the G12 corridor. MST Route 28 provides service between Salinas and Watsonville via SR 1 and

Salinas Road, and MST Route 29 provides service between Salinas and Watsonville via G12. Both routes have two-hour headways in each direction.

There is a bus stop with a shelter and bench on the opposite side of Willow Road, going northbound. Pedestrians cross Hall Road at Willow Drive to access this bus stop, but a marked crosswalk is not currently present. Access to this bus stop along the north side of Hall Road is blocked by guardrail and a drainage structure. Pedestrians have made evident pathways through the grass/dirt where sidewalks are needed. A bus stop is also provided in the southbound direction, located on the near side of the Las Lomas Drive intersection, adjacent to the Las Lomas Market, but without a shelter or bench. Project Area 3 has dedicated Class II Bike Lanes along the shoulders. Sidewalks are only provided on the west side of the Las Lomas Drive intersection, but do not connect anywhere to the adjacent land uses.

4.2 Existing Conditions Analysis

4.2.1 Existing Data Collection

In coordination with TAMC, daily roadway counts and AM and PM peak hour intersection turning movement counts were collected along the entire corridor. For this specific Project Area within Las Lomas, daily roadway counts were collected on Hall Road west of San Miguel Canyon Road and east of Elkhorn Road, and five selected intersections between San Miguel Canyon Road and Elkhorn Road. For further details, refer to the Existing Conditions Report. Daily and peak hour counts were conducted on January 31 and February 1, 2018.

In addition to traffic counts, field surveys were conducted to inventory physical conditions including existing geometry, intersection controls, multimodal facilities, key destinations and routes, and traffic operations along the corridor. To also inform this study, existing parcel and right-of-way data was acquired from Monterey County, and related planning efforts were reviewed to coordinate the potential improvements.

4.2.2 Roadway and Intersection Operations

Table 4.1 presents a summary of the rural two-lane roadway operations. Table 4.2 summarizes the peak hour operational analysis of the existing conditions at the study intersections within Project Area 3.

Table 4.1 Project Area 3: Existing Conditions Roadway Operations

Roadway	Location	Facility Type	2018 Existing ADT	Directional ADT		Peak Hour	Peak Hr NB/WB Volume	Peak Hr SB/EB Volume
				NB/WB	SB/EB			
Hall Road	San Miguel Canyon Road to Sill Road	Class III	17,975	8,904	9,072	7:00-8:00 AM	754	611
						4:15-5:15 PM	755	714
Hall Road	Willow Road to Elkhorn Road	Class III	22,116	10,977	11,139	7:00-8:00 AM	1,150	591
						4:30-5:30 PM	987	790

Table 4.1 Project Area 3: Existing Conditions Roadway Operations

Roadway	Location	Free-Flow Speed	Avg. Travel Speed		Percent Free-Flow Speed (PFFS %)		Segment LOS	
			NB/WB	SB/EB	NB/WB	SB/EB	NB/WB	SB/EB
Hall Road	San Miguel Canyon Road to Sill Road	56.3	43.2	43.6	76.8	77.6	C	C
		56.3	42.9	43.0	76.2	76.4	C	C
Hall Road	Willow Road to Elkhorn Road	50.0	33.5	34.3	67.1	68.7	D	D
		50.0	34.3	34.5	68.7	69.0	D	D

Table 4.2 Project Area 3: Existing Conditions Intersection Operations

Intersection	Control Type	AM Peak Hour		PM Peak Hour		Signal Warrant Met?
		Delay	LOS	Delay	LOS	
Hall Rd & San Miguel Canyon Rd	Signal	18.0	B	18.0	B	-
Hall Rd & Sill Rd	**TWSC**	**91.5**	**F**	**51.6**	**F**	**Yes**
Hall Rd & Las Lomas Dr	Signal	26.0	C	35.5	D	-
Hall Rd & Willow Rd	**TWSC**	**OVR**	**F**	**145.9**	**F**	**Yes**
Hall Rd & Elkhorn Rd	**TWSC**	**36.0**	**E**	24.2	C	**Yes**

Notes: 1. TWSC = Two-Way or Side-Street Stop Control
2. LOS = Delay based on worst minor street approach for TWSC intersections, average of all approaches for Signalized intersections
3. Signal Warrant is based on California Manual on Uniform Traffic Control Devices Warrant 3
*4. **Bold** indicates intersections operating deficiently*
*5. **OVR** indicates delays over 300 seconds*

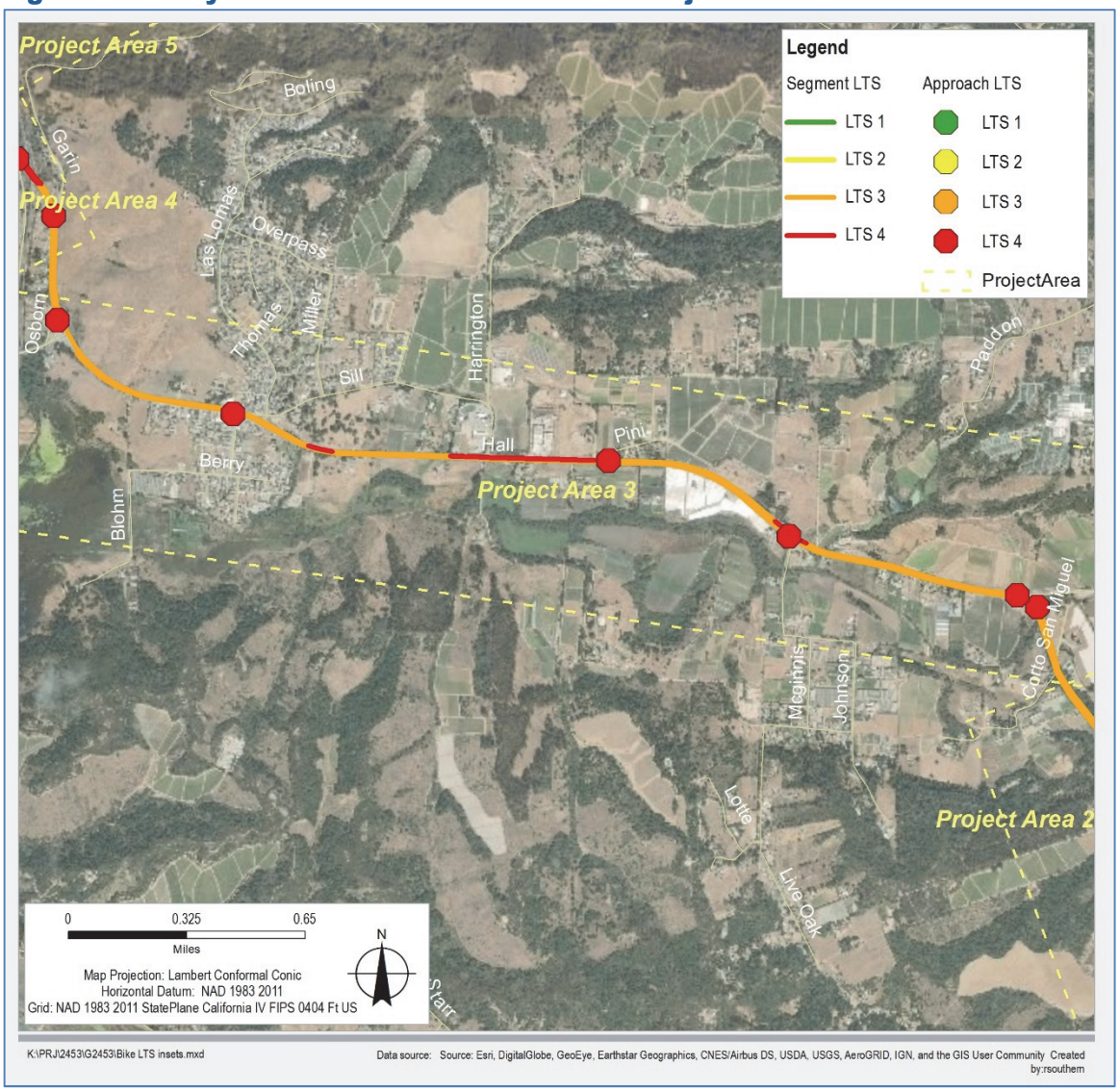
Based on the operational analysis conducted, the peak hour two-lane highway analysis shows that Hall Road operates at LOS C west of San Miguel Canyon Road, and LOS D west of Willow Road. LOS C and D are travel conditions which could be attributed by constant traffic flow, temporary delays due to turning vehicles, or large trucks. The unsignalized intersections of Hall Road at Sill Road and Hall Road at Willow Road operate at LOS F during both AM and PM peak hours. The unsignalized intersection of Hall Road at Elkhorn Road operates at LOS E during the AM peak hour. These poor LOS conditions are due to the delay experienced on the side streets, resulting in long queues on Sill Road, Willow Road, and Elkhorn Road. The signalized intersections in Project Area 3 operate acceptably with little delays. However, traffic queues in both directions approaching the

signal at Las Lomas Drive. The constant vehicle presence in both directions makes it difficult to turn left from Sill Road and from Willow Road.

4.2.3 Bicycle Level of Traffic Stress (LTS)

Existing bicycle conditions for Project Area 3 were analyzed utilizing a standardized Bicycle Level of Traffic Stress (LTS) methodology. Within Project Area 3, Class II bike lanes are present on both sides of the roadway throughout, except for areas where temporary retaining walls have been put in place on the shoulder and cyclists have limited or no shoulder and must compete with vehicles in the travel lane. Figure 4.1 presents the Bicycle LTS analysis within Project Area 3. In summary, this section scored LTS 3 and LTS 4 for segments and LTS 4 for approaches, resulting in an overall LTS 4. This LTS is high and relates to stressful bicycling conditions. This is due to the high level of stress associated with the conflict zones at approaches where right-turning vehicles mix with bicyclists, high vehicle speeds, and sections which have limited or no shoulder for bicyclists travel.

Figure 4.1 Bicycle Level of Traffic Stress for Project Area 3

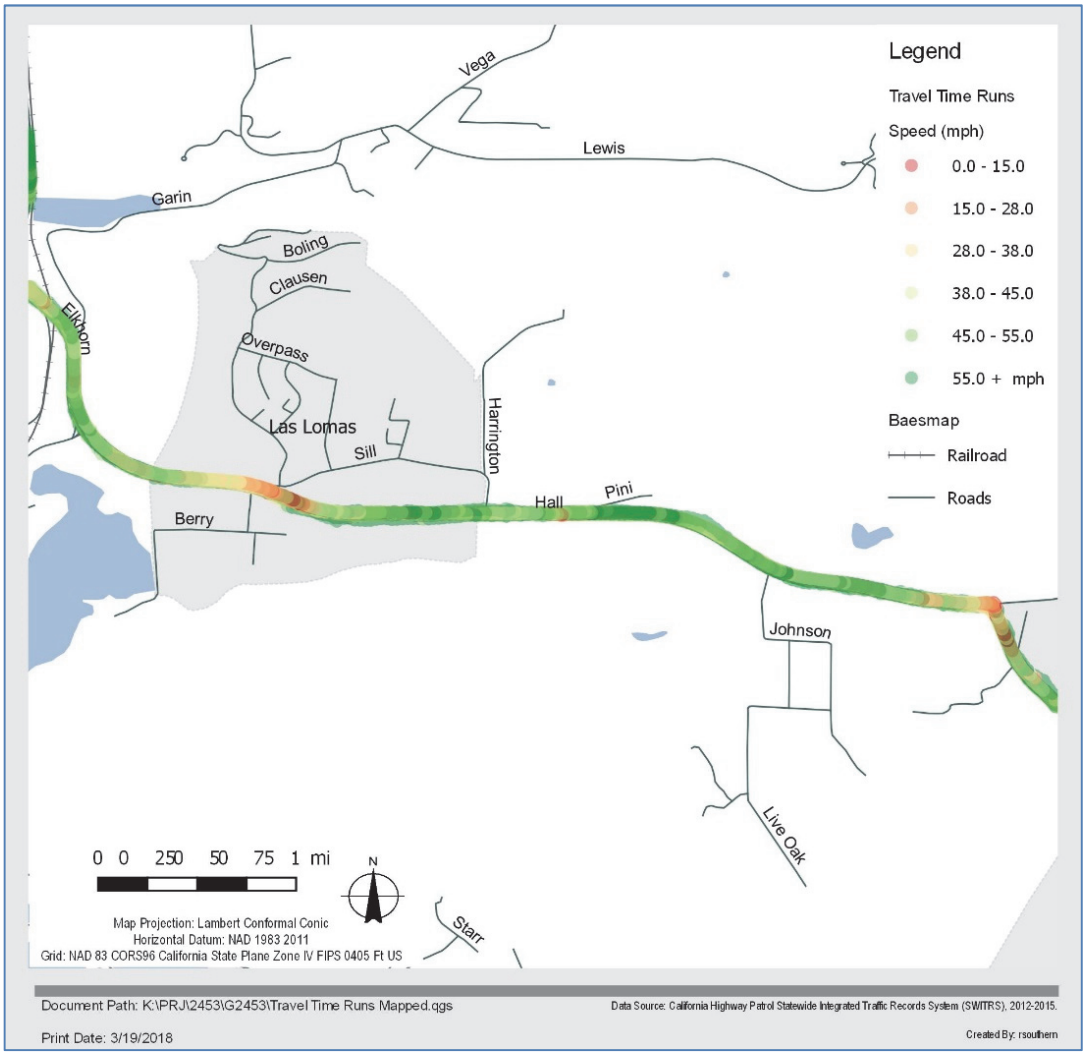


4.2.4 Travel Time Run Analysis

Travel times of the G12 corridor were collected for the AM and PM peak periods using the "Floating-Car" technique and were recorded using GPS. Additional details are provided in the *Existing Conditions Report*. For Project Area 3, the average travel time westbound between San Miguel Canyon Road and Elkhorn Road was recorded to be 4.14 in the AM peak hour (in minutes and seconds), and 4:01 in the PM peak hour. The average travel time westbound between Elkhorn Road and San Miguel Canyon Road was recorded to be 3:29 in the AM peak hour, and 3:50 in the PM peak hour.

Figure 4.2 presents the speed of the travel time runs for Project Area 3, based on the GPS recorded data. The delays and congestion in the Las Lomas area are shown in yellow, orange and red, showing slower vehicle speeds for the various runs, in both directions. Green represents free-flow speeds. The majority of the slowing and stopping occurred at the signalized intersections.

Figure 4.2 Travel Time Runs for Project Area 3

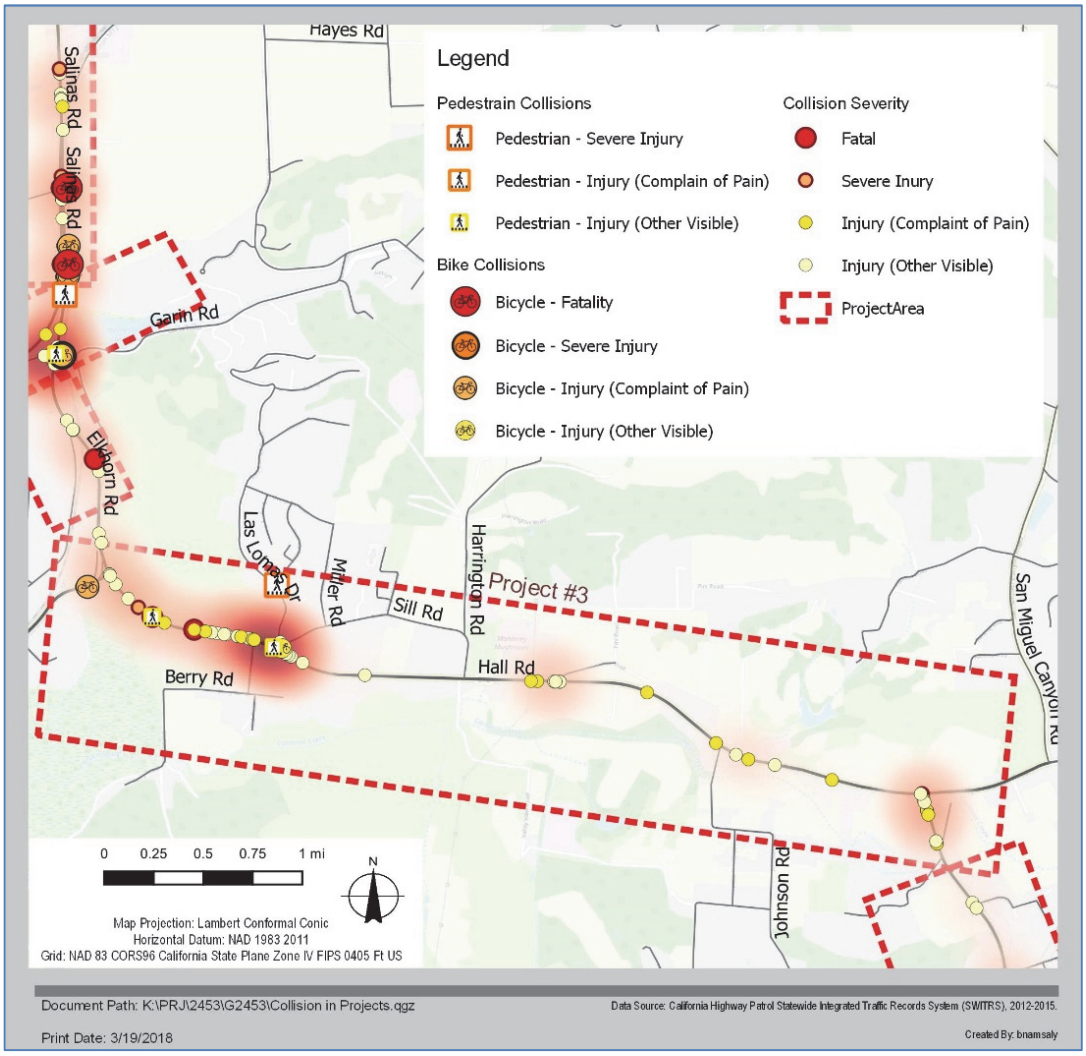


4.2.5 Collision Analysis

Collision data for the study roadways and intersections were derived from the California Highway Patrol Statewide Integrated Traffic Records System (SWITRS). Data was collected on the G12 corridor for a five-year period between January 1, 2012 and December 31, 2016. Based on the collision data, there were 832 reported collisions along the G12 corridor.

Project Area 3 experienced 180 collisions over the five-year period, with 2 fatal collisions, 2 severe injury collisions, 20 injury (other visible), 39 injury (complaint of pain), and 117 property damage only collisions. There were 2 bicycle-related collisions, and 2 pedestrian-related collisions. Figure 4.3 presents the location and severity for collisions in Project Area 3.

Figure 4.3 Collision Severity for Project Area 3



4.3 2040 Forecasts

The forecasts were developed utilizing the AMBAG regional travel demand model. Table 4.3 presents the existing 2018 average daily traffic count, the 2040 forecast daily traffic projection, and the average growth rate utilized for Project Area 3.

Table 4.3 Daily Roadway 2040 Forecasts for Project Area 3

Location	Existing 2018 Count	2040 Projection	Average Growth %
Hall Road w/o San Miguel Canyon Road	17,975	18,635	3.6%
Hall Road e/o Elkhorn Road	22,116	22,920	3.6%

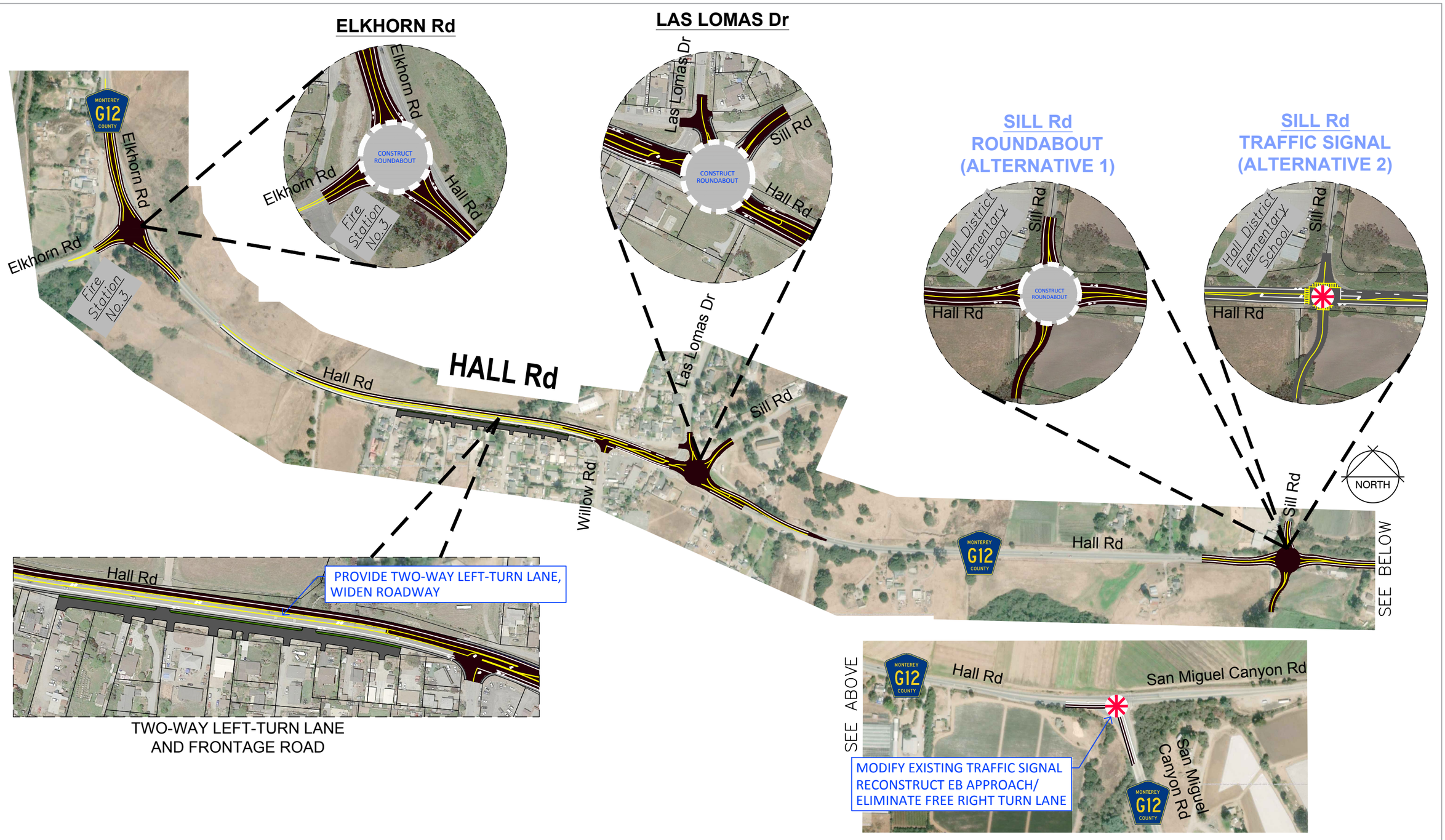
4.4 Improvement Concepts

This section discusses the proposed multimodal improvements for Project Area 3, addressing the circulation needs for pedestrians, bicycles, transit users, and automobiles. While not every street can be designed to serve all users equally, there are opportunities to enhance service for all users while maintaining its principal transportation function. These concepts developed for the G12 corridor incorporate community values and retain the distinctive transitions between the adjacent land uses while ensuring safety and mobility for all users. These concepts support sustainable growth and livability, consistent with the Monterey County Long-range Plan, while preserving the special rural community of Las Lomas.

The proposed improvements for Project Area 3 (Las Lomas Area) include:

- Hall Road at San Miguel Canyon Road;
  - Modify existing traffic signal, remove free right turn eastbound
- Hall Road at Sill Road Alternatives;
  - Alternative 1: Roundabout (preferred)
  - Alternative 2: Traffic Signal
- Hall Road at Las Lomas Drive, and Willow Road;
  - Install a modern Roundabout
  - Realign Sill Road and Las Lomas Drive east of the intersection, to form a single junction point at Hall Road
  - Restrict left turns out of Willow Road, rerouted to turn around at roundabout
- Widen Hall Road to provide a center two-way left-turn lane west of Willow Road;
- Install a frontage road on the south side of Hall Road to consolidate the multiple driveways and provide two access points on Hall Road; and
- Install curb, gutter, sidewalk and a landscaped buffer along Hall Road adjacent to the frontage road. Install Sidewalk between Willow Road and Las Lomas Drive on both sides of Hall Road.

Figure 4.4 presents the improvement concept for Project Area 3.



Prepared for: TAMC Transportation Agency for Monterey County; Monterey G12 County

G12 CORRIDOR IMPROVEMENTS

HALL ROAD

(SAN MIGUEL CANYON RD to ELKHORN RD)

0 500

Scale: 1"= 500'

GHD

Transportation Agency of Monterey County
G12 Corridor: Pajaro to Prunedale Corridor Study

PROJECT AREA #3

Project No. 11152201
Report No. -
Date 03/27/2019

Figure 4.4

Filename: K:\PRJ\2453\2453EX019.dwg Plot Date: 4 June 2019 - 12:12 PM

Source:

4.4.1 Operations Comparison

Traffic operations were analyzed for projected long-term conditions with and without the proposed improvement concepts. Roadway segment operations for Project Area 3 are projected to continue to operate at LOS C and D for a two-lane highway, and a two-lane arterial with turn lanes and roundabouts. Table 4.5 presents the comparison of intersection operations with and without the proposed improvements under the Year 2040 forecasted conditions for the AM peak hour. Table 4.5 presents the comparison of intersection operations with and without the proposed improvements under the Year 2040 forecasted conditions for the PM peak hour.

Table 4.4 Project Area 3: Year 2040 Intersection Operation Improvement Comparison – AM Peak Hour

Intersection	Control Type Change	2040		2040 with Improvements		Signal Warrant Met?
		Delay	LOS	Delay	LOS	
Hall Rd & San Miguel Canyon Rd	Signal	20.1	C	20.1	C	-
Hall Rd & Sill Rd	**Stop Control to Roundabout**	**80.9**	**F**	10.3	B	**Yes**
Hall Rd & Las Lomas Dr	Signal to Roundabout	32.3	C	13.1	B	-
Hall Rd & Willow Rd	**Stop Control**	**OVR**	**F**	18.8	C	**Yes**
Hall Rd & Elkhorn Rd	**Stop Control to Roundabout**	**43.8**	**E**	23.6	C	**Yes**

Notes: 1. LOS and Delay based on worst minor street approach for stop-controlled intersections, average of all approaches for Signal

2. Signal Warrant is based on California Manual on Uniform Traffic Control Devices Warrant 3

*3. **Bold** indicates intersections operating deficiently*

*4. **OVR** indicates delays over 300 seconds*

Table 4.5 Project Area 3: Year 2040 Intersection Operation Improvement Comparison – PM Peak Hour

Intersection	Control Type Change	2040		2040 with Improvements		Signal Warrant Met?
		Delay	LOS	Delay	LOS	
Hall Rd & San Miguel Canyon Rd	Signal	20.4	C	20.8	C	-
Hall Rd & Sill Rd	**Stop Control to Roundabout**	**71.8**	**F**	8.1	A	**Yes**
Hall Rd & Las Lomas Dr	Signal to Roundabout	53.9	D	14.6	B	-
Hall Rd & Willow Rd	**Stop Control**	**OVR**	**F**	15.8	C	**Yes**
Hall Rd & Elkhorn Rd	Stop Control to Roundabout	27.3	D	13.0	B	-

Notes: 1. LOS and Delay based on worst minor street approach for stop-controlled intersections, average of all approaches for Signal
2. Signal Warrant is based on California Manual on Uniform Traffic Control Devices Warrant 3
*3. **Bold** indicates intersections operating deficiently*
*4. **OVR** indicates delays over 300 seconds*

As shown in Tables 4.4 and 4.5, under the projected 2040 conditions without any improvements, the intersection of Hall Road at Sill Road, Willow Road, and Elkhorn Road will continue to operate at poor LOS E and LOS F, and queues throughout the Las Lomas community will worsen, causing undue delays for the side streets. With the proposed improvements, all intersections are projected to operate acceptably during the AM and PM peak hours, under 2040 conditions.

The roundabouts at Sill Road and at Elkhorn Road will help slow traffic entering the Las Lomas community and provide safer access for vehicles to enter or exit on side streets or driveways. The roundabouts provide the additional capacity needed for the projected increase in traffic volume, reducing the delays experienced at intersections, and slowing travel speeds through the Las Lomas community. The roundabout at Las Lomas Drive/Sill Road will also provide for continuous flow of traffic, but with less delay and queuing characteristics than a traffic signal, overall. With the roundabout at Las Lomas Drive, delays approaching Willow Road will be significantly reduced, as the left-turn-out will be rerouted to turn around at the roundabout. The roundabouts will also provide significantly safer mobility for pedestrian and bicyclists to access either side of Hall Road. Vehicle speeds along Hall Road within the Las Lomas community will be reduced with implementation of the roundabouts, resulting in safer conditions for not only vehicles, but for non-motorized users as well.

4.4.2 Bicycle Level of Traffic Stress (LTS)

Class II bike lanes are present on both sides of the roadway throughout Project Area 3. The proposed improvements include installation of roundabouts at Sill Road, Las Lomas Drive, and Elkhorn Road. These improvements will provide safer bicycle facilities through the intersections. It is also anticipated that the temporary retaining walls within these sections, which were initially installed to control hillside erosion, will be removed with as a continued County maintenance function. With these improvements, the corridor will be improved from LTS 4 to LTS 3.

4.5 Improvement Cost Estimates

A series of planning-level cost estimates have been prepared for the proposed improvement concepts for Project Area 3. The preliminary cost estimates for the improvement concepts for Project Area 2 are attached in Appendix D. The sources used for the creation of these cost estimates are the 2018 Contract Cost Data provided by the State of California Department of Transportation, Caltrans, and recent bid summary results of recent projects to determine the unit costs. The cost estimates are necessary to determine the funding required for the transportation improvements. All cost estimates include the cost of preliminary project design and approval, environmental considerations, final design, construction, administration, right-of-way, and construction management and inspection. Construction costs include basic roadway construction items such as paving, storm drainage, lighting, signing, and striping. Table 4.6 presents the cost estimates for the improvements within Project Area 3.

Table 4.6 Project Area 3 Cost Estimates

Project Area 3 Improvements	Cost Estimate
Hall Road/San Miguel Canyon Rd Intersection Improvements	$ 621,000
Roundabout at Sill Rd	$ 2,760,000
Roundabout at Las Lomas Dr	$ 5,235,000
Roundabout at Elkhorn Rd	$ 3,135,000
Roadway Improvements (Center Turn Lane, Frontage Rd, sidewalk)	$ 2,820,000
Project Area 3 Total Cost	**$ 14,571,000**

4.5.1 Safety Benefit

Based on the SWITRS and TIMS collision data over the five year period between 2012 and 2016, there were a total of 180 collisions for Project Area 3, with 2 fatal collisions, and 61 collisions involving injuries. The following collision characteristics represent the greatest potential for safety improvement along the corridor within Project Area 3.

- Unsafe speeds;

- Passing or Turning to/from corridor;
- Roadway departures (head-on, run-off road, sideswipe, hit-object, overturned);
- Lighting; and
- Bicycle/Pedestrian collisions

Possible mitigations to address these types of collisions include:

- Installing dynamic speed feedbacks signs and increasing enforcement along the corridor;
- Install additional advance intersection warning signs to improve visibility of major access points;
- Install centerline and edge-line rumble strips to reduce head-on, sideswipe, run-off road and hit-object collisions;
- Install left- and right-turn pockets or a center two-way left-turn lane to provide safer deceleration for turning vehicles;
- Install roundabouts and/or traffic signals to provide safer and more efficient intersection control;
- Consolidate driveway access via a frontage road to provide access control and reduce collisions;
- Providing or improving illumination along the segment and/or at intersections to reduce collisions in dark or low lighting conditions; and
- Provide bicycle and pedestrian facilities to fill in gaps in the network, providing access to key destinations such as the Las Lomas Market, and provide separation from the traveled way for safe travel for active modes

4.5.2 Benefit-Cost Ratio & Collision Modification Factor Analysis

The proposed improvements, collision data and estimated costs were utilized in the Highway Safety Improvement Program (HSIP) Analyzer to calculate Benefit-Cost Ratios for the roadway improvements and each intersection control improvement based on a maximum of three applicable countermeasures. Table 4.7 presents the Benefit Cost and Project Cost for the intersection improvements (Roundabouts), the roadway improvements, and the overall Benefit-Cost for Project Area 3. The HSIP Analyzer PDF forms are included in Appendix E. As shown, the roundabouts present greater safety benefits than the roadway improvements, and Project Area 3 as a whole will be beneficial in terms of the safety benefits related to the cost.

Table 4.7 Safety Benefit-Cost Summary for Project Area 3

	Roundabouts	Roadway Improvements	**Project Area 3 Total**
Total Benefit	$ 57,078,285	$ 6,341,701	**$ 63,419,986**
Total Cost	$ 11,130,000	$ 2,820,000	**$ 14,571,000**
B/C	5.1	2.2	**4.4**

Note: Total cost for Project Area 3 includes other costs for the entire project area not associated with the countermeasures identified, therefore Total Project Cost may be greater than the total costs for each countermeasure. The B/C for Project Area 3 Total is calculated based on the total benefit and the total project cost.

4.6 Stormwater Management

4.6.1 Existing Hydrology

Project Area 3 is situated within the Elkhorn Slough Watershed (12 digit Hydrologic Unit Code: 180600150301) and is part of the Monterey County NPDES Municipal General Permit Area. The project area begins at and runs parallel to Carneros Creek to the south, which has a determined base flood elevation (Special Flood Hazard Area (SFHA) Zone AE) as identified by the Federal Emergency Management Agency (FEMA) National Flood Insurance Program (NFIP). At the town of Las Lomas, the project area crosses an un-named tributary with a SFHA Zone A floodplain in which no base flood elevation has been determined as part of the FEMA NFIP study. The entire project area is located within the ecologically sensitive and protected Elkhorn Slough basin. Existing storm water management systems consist of 8 known culverts and sheet drainage to roadside ditches.

4.6.2 Proposed Transportation Improvements

Roadway and intersection improvements are summarized below to determine the areas where potential for increasing impervious surface could occur. Project Area 3 proposes two alternatives and a variety of improvement recommendations including:

- Roadway Widening
    - Additional Vehicle Lane(s)
    - Bike Lane(s)
    - Curb, Gutter, and Sidewalk
    - Frontage Road
- Intersection Improvements
    - Roundabouts
    - Signalization

The project area offers two (2) improvement alternatives. The proposed improvements for the project area for alternative 1 will disturb approximately 8.6 acres and the proposed improvements for the project area for alternative 2 will disturb approximately 8.1 acres. It is estimated that the improvements for either alternative will result in less than a 5% increase in impervious surface across the project area as a whole. However, individual improvements within this overall project area may result in greater increases to impervious surface within their respective sub-watersheds and associated drainage capture and conveyance systems.

4.6.3 Potential Impacts to Water Systems and Biological Resources

Most of the proposed improvements within Project Area 3 will result in an increase in impervious surface. As a result, there is the potential for an increase in offsite drainage and higher volume peak flows. Increased water volume during these peak flows has the potential to exceed the existing drainage conveyance systems. An exceedance in the capacity of the hydraulic systems may result in upstream flooding, uncontrolled discharge, and erosion. It is recommended that any proposed improvement inventories the existing hydrologic and hydraulic drainage systems to determine if there are deficiencies that require replacement or upgrades to ensure adequate function and capacity.

Construction activities resulting in ground disturbance present the risk for discharge of pollutants of concern into State Clean Water Act Section 303(d) listed waterbodies. The project area has the potential for discharge into Carneros Creek and there is the potential for indirect discharge to Elkhorn Slough – both listed as 303(d) waterbodies. At a minimum, construction related activities present sediment and pH water quality risks to the adjacent water systems and efforts should be taken to minimize the discharge of these and other listed pollutants of concern into these waterbodies.

Increases in pollutant discharge may also result in negative impacts to existing biological resources. Project Area 3 improvements occur in biological community areas that support a host of sensitive and protected habitats and species, specifically in the Elkhorn Slough basin. Many of these species are dependent on the existing hydrology and water resources within this project area and larger watershed. Species of specific concern in or adjacent to the project area include California red-legged frog and Santa Cruz tarplant. It is undetermined if the proposed project improvements would impact the existing sensitive biological resources; therefore, environmental investigations are needed to determine the impact potential.

4.6.4 Minimization and Mitigation Measures

There are a multitude of minimization and mitigation measures that can be implemented during the design and planning phase to help reduce the impact the proposed improvements have on the existing water and environmental resources. Of these, a top priority is to reduce the area of new impervious surface and preserve existing vegetation. Once this is accomplished to the best extent possible while maintaining the safety and function of the proposed improvement, a hydrology analysis and report (drainage study) should be completed to identify, at a minimum, the following:

- Stormwater design standards and criteria
- Soils and land use
- Existing hydrology and site drainage / runoff
- Changes in site drainage and discharge volume and the impacts to the existing hydraulics.
- Storm water quality and post-construction water treatment / low impact development requirements
- Recommendations for treatment of water quality / volume and drainage facility upgrades.

In addition to a drainage study, there are a host of other investigations that should be done to identify potential impacts to the water and environmental resources and help assist in further design development. The type, scope, and existing availability of these additional studies should be determined during the design and planning phase of the proposed improvements; however, it is anticipated that, at a minimum, this would include an environmental analysis and report to identify all potential impacts to the environment resulting from the proposed improvements.

As part of the project-planning phase, regulatory agencies and policies will need to be consulted to determine their jurisdictional applicability and what additional minimization and mitigation measures are required (i.e. United States Army Corps of Engineers, United States Fish and Wildlife Service, California Department of Fish and Wildlife, the Regional Water Quality Control Board - Central Coast Region 3, Monterey County Resource Management Agency – Environmental Services, etc…). Further, the proposed improvements shall undergo stakeholder consultation to determine

recommended minimization and mitigation measures (i.e. Transportation Agency for Monterey County, Association of Monterey Bay Area Governments, Elkhorn Slough Foundation (ESF), etc…).

Lastly, best management practices (BMPs) should be developed and specific measures shall be identified on project plans and project related documents (i.e. a Storm Water Pollution Prevention Plan) to reduce and control construction related erosion and discharge of pollutants into offsite water resources.

To minimize the potential for discharge of pollutants, all regulatory and stakeholder requirements as determined applicable to the proposed improvement shall be implemented during the construction phase. Additionally, all construction related BMPs including temporary soil stabilization measures, temporary sediment control measures, wind erosion control, tracking control, non-storm water management, and waste management and materials pollution control shall be implemented and maintained during construction.

Following construction completion and final site stabilization, it is recommended that a long-term maintenance plan be developed to address any on-going pollutant risks. This plan should identify the pollutant, the risk, the source, and the maintenance action needed to help reduce and mitigate the impact of the pollutant in perpetuity.

5. Project Area 4 – Elkhorn Road Bridge

This section entails the part of G12, known as Elkhorn Road, between Hall Road/Elkhorn Road and Werner Road, and specifically focuses on the narrow bridge crossing over the railroad tracks.

5.1 Project Area 4 Description

The approximate 35 foot wide Elkhorn Road bridge is flanked by two intersections, Hudson Landing Road, about 140 feet to the north and Garin Road, about 470 feet to the south. Hudson Landing Road serves as the only access for many residences and some small farms located north of the railroad tracks and south of the Pajaro Valley Golf Club. Garin Road connects through to Lewis Road, Vega Road, and San Miguel Canyon Road, serving mainly rural residential areas and some agriculture uses. The intersections of Hudson Landing Road and Garin Road with Elkhorn Road are side-street stop-controlled, and have short left turn pockets along Elkhorn Road. The speed limit is 55 mph and no bike lanes nor sidewalks exist over the bridge.

5.1.1 Existing Multimodal Facilities

The Monterey-Salinas Transit (MST) operates two fixed transit routes that have stops along the G12 corridor. MST Route 28 provides service between Salinas and Watsonville via SR 1 and Salinas Road, and MST Route 29 provides service between Salinas and Watsonville via G12. Both routes have two-hour headways in each direction.

There are bus stops south of Garin Road and north of Hudson Landing Road, that provide service for MST Route 29. The bus stop that is south of Garin Road, in the northbound direction of travel, has a wide paved shoulder, enough room for a bus to fit. None of the bus stops within Project Area 4 provide shelters or benches, and are located off the roadway, in the gravel or grass. There are no sidewalks within Project Area 4. Class II Bike Lanes are provided within the shoulders throughout most of Project Area 4. A narrow bridge over the railroad, just north of Garin Road, does not provide room for Class II Bike Lanes, but “Share the Road” bicycle-warning signs are posted in both directions prior to the bridge.

5.2 Existing Conditions Analysis

5.2.1 Existing Data Collection

In coordination with TAMC, daily roadway counts and AM and PM peak hour intersection turning movement counts were collected along the entire corridor. For this specific Project Area, daily roadway counts were collected on Elkhorn Road north of Garin Road. For further details, refer to the Existing Conditions Report. Daily and peak hour counts were conducted on January 31 and February 1, 2018.

In addition to traffic counts, field surveys were conducted to inventory physical conditions including existing geometry, intersection controls, multimodal facilities, key destinations and routes, and traffic operations along the corridor. To also inform this study, existing parcel and right-of-way data was acquired from Monterey County, and related planning efforts were reviewed to coordinate the potential improvements.

5.2.2 Roadway Operations

Table 5.1 presents a summary of the rural two-lane roadway operations. As shown in the table below, this section of G12 operates at LOS D. LOS D represents travel conditions which are attributed by constant traffic flow, delays due to turning vehicles, and/or large trucks. Additionally, the narrow bridge over the railroad tracks poses a restrictive geometric feature, which could cause slower travel speeds.

Table 5.1 Project Area 4: Existing Conditions Roadway Operations

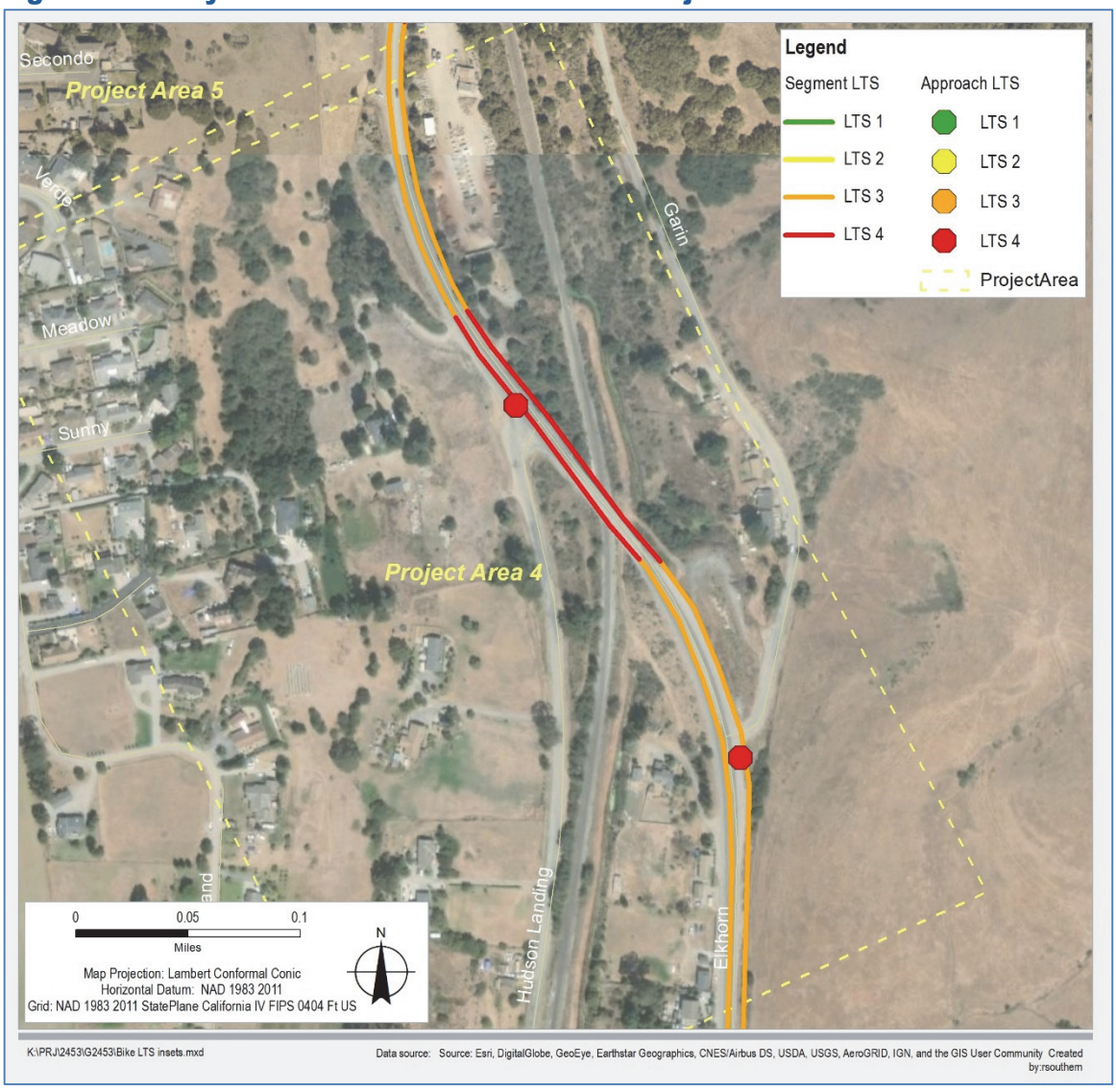
Roadway	Location	Facility Type	2018 Existing ADT	Directional ADT		Peak Hour	Peak Hr NB/WB Volume	Peak Hr SB/EB Volume
				NB/WB	SB/EB			
Elkhorn Road	Werner Road to Garin Road	Class III	23,760	11,870	11,890	7:00-8:00 AM	1,180	607
						4:30-5:30 PM	819	1,097

Roadway	Location	Free-Flow Speed	Avg. Travel Speed		Percent Free-Flow Speed (PFFS %)		Segment LOS	
			NB/WB	SB/EB	NB/WB	SB/EB	NB/WB	SB/EB
Elkhorn Road	Werner Road to Garin Road	57.5	40.6	42.1	70.6	73.3	D	D
		57.5	41.0	40.8	71.4	70.9	D	D

5.2.1 Bicycle Level of Traffic Stress (LTS)

Existing bicycle conditions for Project Area 4 were analyzed utilizing a standardized Bicycle Level of Traffic Stress (LTS) methodology. Within Project Area 4, Class II bike lanes are present on both sides of the roadway, except for across the bridge. Figure 5.1 presents the Bicycle LTS analysis within Project Area 4. In summary, this section scored LTS 3 and LTS 4 for segments and LTS 4 for approaches, resulting in an overall LTS 4. This LTS is high and relates to stressful bicycling conditions. This is due to the high level of stress associated with traveling across the bridge, the conflict zones at approaches where right-turning vehicles mix with bicyclists, and high vehicle speeds.

Figure 5.1 Bicycle Level of Traffic Stress for Project Area 4

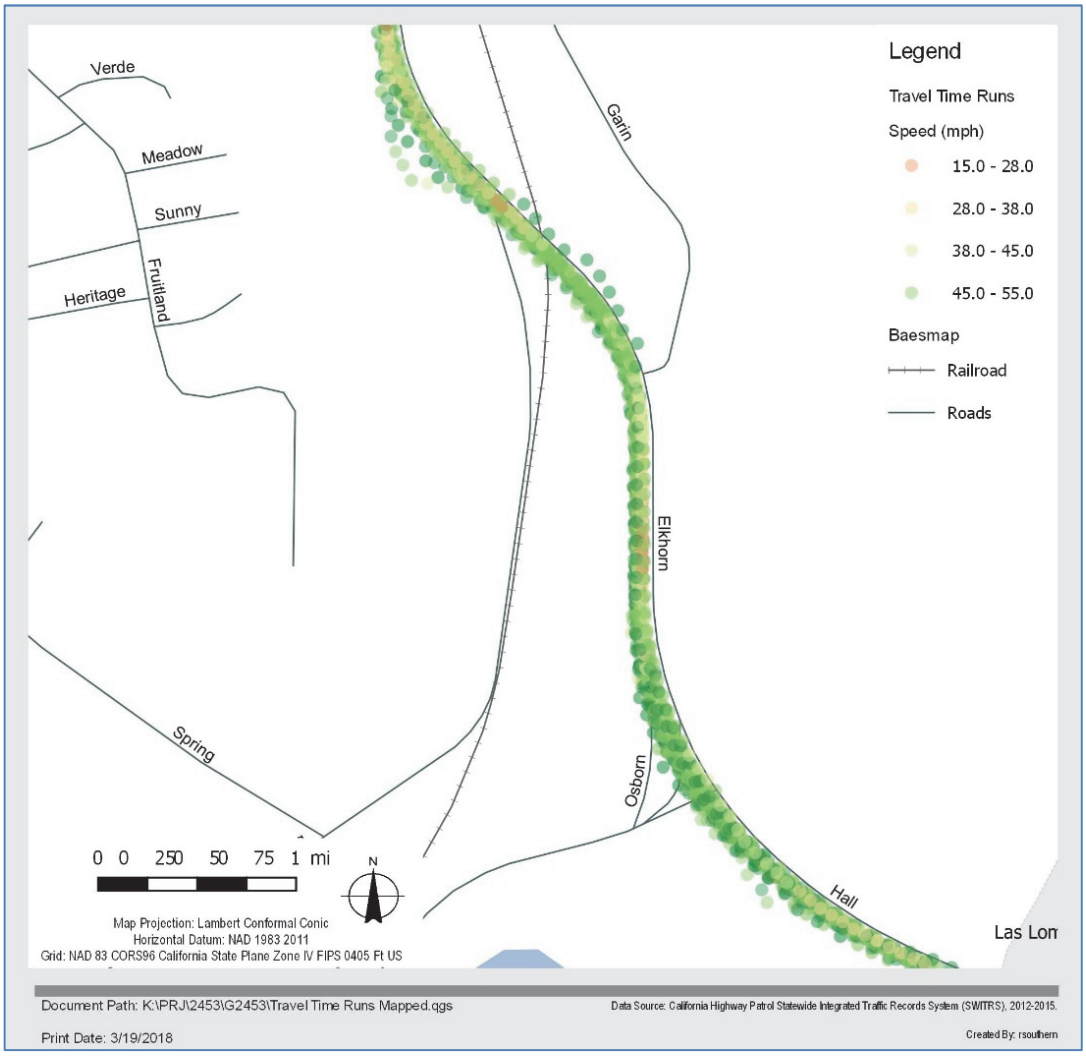


5.2.2 Travel Time Run Analysis

Travel times of the G12 corridor were collected for the AM and PM peak periods using the "Floating-Car" technique and were recorded using GPS. Additional details are provided in the *Existing Conditions Report*. For Project Area 4, the average travel time northbound between Elkhorn Road and Werner Road was recorded to be 1:05 in the AM peak hour (in minutes and seconds), and 1:02 in the PM peak hour. The average travel time southbound between Werner Road and Elkhorn Road was recorded to be 0:56 in the AM peak hour, and 1:02 in the PM peak hour.

Figure 5.2 presents the speed of the travel time runs for Project Area 4, based on the GPS recorded data. The delays and congestion in this area are shown in yellow, orange and red, showing slower vehicle speeds for the various runs, in both directions. Green represents free-flow speeds. The majority of the slowing and stopping occurred crossing the bridge, and approaching the Werner Road intersection.

Figure 5.2 Travel Time Runs for Project Area 4

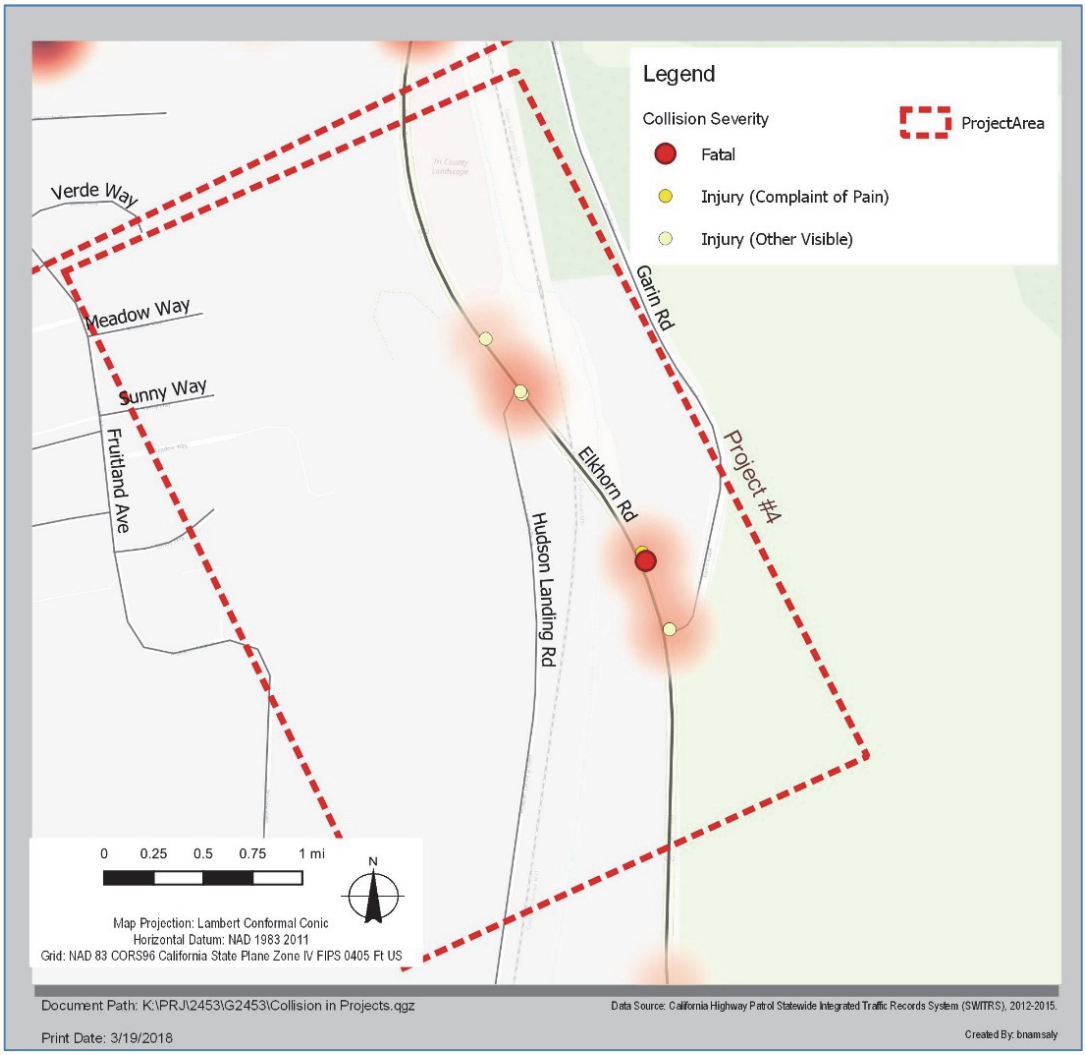


5.2.3 Collision Analysis

Collision data for the study roadways and intersections were derived from the California Highway Patrol Statewide Integrated Traffic Records System (SWITRS). Data was collected on the G12 corridor for a five-year period between January 1, 2012 and December 31, 2016. Based on the collision data, there were 832 reported collisions along the G12 corridor.

Project Area 3 experienced 20 collisions over the five-year period, with 1 fatal collision, 0 severe injury collisions, 3 injury (other visible), 6 injury (complaint of pain), and 10 property damage only collisions. There were no bicycle-related or pedestrian-related collisions within Project Area 4. Figure 5.3 presents the location and severity for collisions in Project Area 4.

Figure 5.3 Collision Severity for Project Area 4



5.3 2040 Forecasts

The forecasts were developed utilizing the AMBAG regional travel demand model. Table 5.2 presents the existing 2018 average daily traffic count, the 2040 forecast daily traffic projection, and the average growth rate utilized for Project Area 4.

Table 5.2 Daily Roadway 2040 Forecasts for Project Area 4

Location	Existing 2018 Count	2040 Projection	Average Growth %
Elkhorn Road n/o Garin Road	23,760	24,630	3.6%

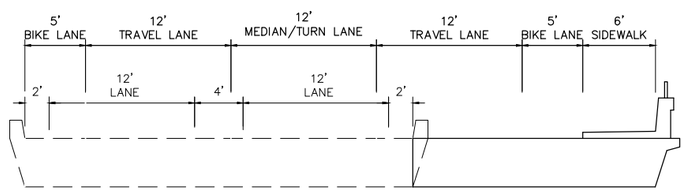
5.4 Improvement Concepts

This section discusses the proposed multimodal improvements for Project Area 4, addressing the circulation needs for pedestrians, bicycles, transit users, and automobiles. While not every street can be designed to serve all users equally, there are opportunities to enhance service for all users while maintaining its principal transportation function. These concepts developed for the G12 corridor incorporate community values and retain the distinctive transitions between the adjacent land uses while ensuring safety and mobility for all users. These concepts support sustainable growth and livability, consistent with the Monterey County Long-range Plan, while preserving the special rural characteristics within Project Area 4.

The proposed improvements for Project Area 4 include:

- Widen Elkhorn Road Bridge to accommodate Class II Bike Lanes on both sides, a sidewalk on south side

Providing a safer and continuous route for bicyclists and pedestrians across the bridge will close a gap in connectivity to the surrounding communities. Figure 5.4 presents the improvement concept for Project Area 4.



SECTION A
BRIDGE WIDENING

Prepared for: TAMC TRANSPORTATION AGENCY FOR MONTEREY COUNTY

MONTEREY G12 COUNTY

G12 CORRIDOR IMPROVEMENTS
ELKHORN RD
(GARIN RD TO HUDSON LANDING RD)

0 100
Scale: 1"= 100'

GHD

Transportation Agency of Monterey County
G12 Corridor: Pajaro to Prunedale Corridor Study

PROJECT AREA #4

Project No. **11152201**
Report No. **-**
Date **03/27/2019**

Figure 5.4

Filename: K:\PRJ\2453\2453EX020.dwg Plot Date: 4 June 2019 - 12:17 PM

Source:

5.4.1 Operations Comparison

Traffic operations were analyzed for projected long-term conditions with and without the proposed improvement concepts. Roadway segment operations for Project Area 4 are projected to continue to operate at LOS D for a two-lane highway with 24,630 vehicles daily. Lengthening the left turn pockets across the bridge will provide additional space for vehicles to decelerate and queue without impeding through traffic, resulting in safer conditions and less risk of rear-end collisions.

5.4.2 Bicycle Level of Traffic Stress (LTS)

The proposed improvements include widening the bridge for Class II Bike Lanes, providing a safe and continuous connection for cyclists. With these improvements, the segment LTS will be improved from LTS 4 to LTS 3, specifically across the bridge.

5.5 Improvement Cost Estimates

A series of planning-level cost estimates have been prepared for the proposed improvement concepts for Project Area 4. The preliminary cost estimates for the improvement concepts for Project Area 4 are attached in Appendix D. The sources used for the creation of these cost estimates are the 2018 Contract Cost Data provided by the State of California Department of Transportation, Caltrans, and recent bid summary results of recent projects to determine the unit costs. The cost estimates are necessary to determine the funding required for the transportation improvements.

All cost estimates include the cost of preliminary project design and approval, environmental considerations, final design, construction, administration, right-of-way, and construction management and inspection. Construction costs include basic roadway construction items such as paving, storm drainage, lighting, signing, and striping. Of the total estimated improvement, cost for Project Area 4 is $6.8 million, which includes widening the bridge over the railroad tracks to accommodate Class II Bike Lanes, installing sidewalk, and constructing a retaining wall on the south side of Elkhorn Road.

5.5.1 Safety Benefit

Based on the SWITRS and TIMS collision data over the five year period between 2012 and 2016, there were a total of 20 collisions for Project Area 4, with 1 fatal collisions, and 9 collisions involving injuries. The following collision characteristics represent the greatest potential for safety improvement along the corridor within Project Area 4.

- Unsafe speeds;
- Turning to/from corridor;
- Roadway departures (head-on, run-off road, sideswipe, hit-object, overturned); and
- Lighting;

Possible mitigations to address these types of collisions include:

- Installing dynamic speed feedbacks signs and increasing enforcement along the corridor;
- Install additional advance intersection warning signs to improve visibility of major access points;

- Install centerline and edge-line rumble strips to reduce head-on, sideswipe, run-off road and hit-object collisions;
- Install left- and right-turn pockets or a center two-way left-turn lane to provide safer deceleration for turning vehicles; and
- Providing or improving illumination along the segment and/or at intersections to reduce collisions in dark or low lighting conditions;

Although there were no pedestrian or bicycle collisions reported within Project Area 4, the railroad presents a barrier for pedestrian and bicycle access. The bridge across the railroad tracks along G12 is the only connection provided across, and does not accommodate pedestrians or bicycles. Installation of bicycle lanes and sidewalk would fill in the gap in multimodal connectivity between the Las Lomas Community and areas northwest of Las Lomas, including residential areas and farms.

5.5.2 Benefit-Cost Ratio & Collision Modification Factor Analysis

The proposed improvements, collision data and estimated costs were utilized in the Highway Safety Improvement Program (HSIP) Analyzer to calculate Benefit-Cost Ratios for the roadway improvements and each intersection control improvement based on a maximum of three applicable countermeasures. Table 5.3 presents the Benefit Cost and Project Cost for the roadway improvements and the overall Benefit-Cost for Project Area 4. The HSIP Analyzer PDF forms are included in Appendix E.

Table 5.3 Safety Benefit-Cost Summary for Project Area 4

Improvement	Widen Bridge for Bike Lanes, Sidewalk, Extend Turn Pockets
Total Benefit	$3,500,073
Total Project Cost	$6,765,000
B/C	0.52

The benefit-cost ratio, solely from the safety standpoint, is less than 1.0, and may be unfavorable for funding programs such as HSIP. However, an alternative funding source for this Project Area could potentially be Caltrans' Local Highway Bridge Program.

5.6 Stormwater Management

5.6.1 Existing Hydrology

Project Area 4 is situated within the Elkhorn Slough Watershed (12 digit Hydrologic Unit Code: 180600150301) and is part of the Monterey County NPDES Municipal General Permit Area. The project area consists of bridge improvements that crosses over Watsonville Creek, which has a determined base flood elevation (Special Flood Hazard Area (SFHA) Zone AE) as identified by the Federal Emergency Management Agency (FEMA) National Flood Insurance Program (NFIP). The entire project area is located within the ecologically sensitive and protected Elkhorn Slough basin. Existing storm water management systems consist a bridge overcrossing of Watsonville Creek.

5.6.2 Proposed Transportation Improvements

Roadway and intersection improvements are summarized below to determine the areas where potential for increasing impervious surface could occur. Project Area 4 proposes a variety of improvement recommendations including:

- Bridge Widening
    - Additional Vehicle Lane(s)
    - Bike Lane(s)
    - Curb, Gutter, and Sidewalk

The proposed improvements for this project area will disturb approximately 0.4 acres and it is estimated that the improvements will result in an approximate 15% increase in impervious surface across the project area as a whole. However, individual improvements within this overall project area may result in varying increases to impervious surface within their respective sub-watersheds and associated drainage capture and conveyance systems.

5.6.3 Potential Impacts to Water Systems and Biological Resources

Most of the proposed improvements within Project Area 4 will result in an increase in impervious surface. As a result, there is the potential for an increase in offsite drainage and higher volume peak flows. Increased water volume during these peak flows has the potential to exceed the existing drainage conveyance systems. An exceedance in the capacity of the hydraulic systems may result in upstream flooding, uncontrolled discharge, and erosion. It is recommended that any proposed improvement inventories the existing hydrologic and hydraulic drainage systems to determine if there are deficiencies that require replacement or upgrades to ensure adequate function and capacity.

Construction activities resulting in ground disturbance present the risk for discharge of pollutants of concern into State Clean Water Act Section 303(d) listed waterbodies. The project area has the potential for discharge into Watsonville Creek and there is the potential for indirect discharge to Elkhorn Slough – both listed as 303(d) waterbodies. At a minimum, construction related activities present sediment and pH water quality risks to the adjacent water systems and efforts should be taken to minimize the discharge of these and other listed pollutants of concern into these waterbodies.

Increases in pollutant discharge may also result in negative impacts to existing biological resources. Project Area 4 improvements occur in biological community areas that support a host of sensitive and protected habitats and species, specifically in the Elkhorn Slough basin. Many of these species are dependent on the existing hydrology and water resources within this project area and larger watershed. Species of specific concern in or adjacent to the project area include California red-legged frog and Santa Cruz tarplant. It is undetermined if the proposed project improvements would impact the existing sensitive biological resources; therefore, environmental investigations are needed to determine the impact potential.

5.6.4 Minimization and Mitigation Measures

There are a multitude of minimization and mitigation measures that can be implemented during the design and planning phase to help reduce the impact the proposed improvements have on the

existing water and environmental resources. Of these, a top priority is to reduce the area of new impervious surface and preserve existing vegetation. Once this is accomplished to the best extent possible while maintaining the safety and function of the proposed improvement, a hydrology analysis and report (drainage study) should be completed to identify, at a minimum, the following:

- Stormwater design standards and criteria
- Soils and land use
- Existing hydrology and site drainage / runoff
- Changes in site drainage and discharge volume and the impacts to the existing hydraulics.
- Storm water quality and post-construction water treatment / low impact development requirements
- Recommendations for treatment of water quality / volume and drainage facility upgrades.

In addition to a drainage study, there are a host of other investigations that should be done to identify potential impacts to the water and environmental resources and help assist in further design development. The type, scope, and existing availability of these additional studies should be determined during the design and planning phase of the proposed improvements; however, it is anticipated that, at a minimum, this would include an environmental analysis and report to identify all potential impacts to the environment resulting from the proposed improvements.

As part of the project-planning phase, regulatory agencies and policies will need to be consulted to determine their jurisdictional applicability and what additional minimization and mitigation measures are required (i.e. United States Army Corps of Engineers, United States Fish and Wildlife Service, California Department of Fish and Wildlife, the Regional Water Quality Control Board - Central Coast Region 3, Monterey County Resource Management Agency – Environmental Services, etc…). Further, the proposed improvements shall undergo stakeholder consultation to determine recommended minimization and mitigation measures (i.e. Transportation Agency for Monterey County, Association of Monterey Bay Area Governments, Elkhorn Slough Foundation (ESF), etc…).

Lastly, best management practices (BMPs) should be developed and specific measures shall be identified on project plans and project related documents (i.e. a Storm Water Pollution Prevention Plan) to reduce and control construction related erosion and discharge of pollutants into offsite water resources.

To minimize the potential for discharge of pollutants, all regulatory and stakeholder requirements, as determined applicable to the proposed improvement, shall be implemented during the construction phase. Additionally, all construction related BMPs including temporary soil stabilization measures, temporary sediment control measures, wind erosion control, tracking control, non-storm water management, and waste management and materials pollution control shall be implemented and maintained during construction.

Following construction completion and final site stabilization, it is recommended that a long-term maintenance plan be developed to address any on-going pollutant risks. This plan should identify the pollutant, the risk, the source, and the maintenance action needed to help reduce and mitigate the impact of the pollutant in perpetuity.

6. Project Area 5 – G12 at Werner Road/Salinas Road

This section includes the junction of Salinas Road and Elkhorn Road, including Werner Road and Salinas Road from G12 to Bay Farms Road.

6.1 Project Area 5 Description

As the communities of Las Lomas and Pajaro grow, Project Area 5 is going to have added importance in terms of efficiently moving people and goods. Increasing congestion on the two-lane SR 1 through Moss Landing is also going to influence how much traffic diverts to Salinas Road and Elkhorn Road, a County road that parallels SR 1 to the east.

Werner Road, along with Salinas Road, is a part of a network of County roads that are increasingly used as a "short cut" between the relatively new Salinas Road/SR 1 interchange and the Prunedale interchange constructed in 2013. Motorists use the G12 corridor as an alternate route to SR 1 between Watsonville and Salinas. Traffic currently backs up Werner Road and onto Salinas Road in the PM peak hour, and backs up from Salinas Road to G12 in the AM peak hour. Additionally, eastbound/southbound motorists along Salinas Road were observed to divert up Salinas Road, make a U-turn at Trafton Road, and continue south on G12 past Werner Road, as opposed to waiting in the long queue for turning right at Werner Road/G12. Werner Road also has a steep grade going down to G12 from Salinas Road. North of Werner Road, G12 merges with Salinas Road and transitions to a four-lane divided arterial. Southbound motorists who wish to continue on G12 from Pajaro must turn left at the Salinas Road/Elkhorn Road (G12) intersection and yield the right-of-way to oncoming traffic on Salinas Road.

6.1.1 Existing Multimodal Facilities

The Monterey-Salinas Transit (MST) operates two fixed transit routes that have stops along the G12 corridor. MST Route 28 provides service between Salinas and Watsonville via SR 1 and Salinas Road, and MST Route 29 provides service between Salinas and Watsonville via G12. Both routes have two-hour headways in each direction.

The bus stops in Project Area 5 do not have shelters or benches, and are located off the roadway, in the gravel or grass. There are bus stops located on G12 north of Werner Road, and on Salinas Road at Fruitland Avenue and at the Pajaro Valley Golf Club. Class II Bike Lanes are provided within the shoulders throughout most of Project Area 5. At Werner Road, the paved shoulder width diminishes in the northbound direction, and could be a potential issue for cyclists competing with motorists for the roadway. There are no sidewalks within Project Area 5.

6.2 Existing Conditions Analysis

6.2.1 Existing Data Collection

In coordination with TAMC, daily roadway counts and AM and PM peak hour intersection turning movement counts were collected along the entire corridor. For this specific Project Area, daily roadway counts were collected on Salinas Road east of Hillcrest Road, and two selected intersections Werner Road/G12 (Elkhorn Road) and Salinas Road/G12 (Elkhorn Road). For further details, refer to the Existing Conditions Report. Daily and peak hour counts were conducted on January 31 and February 1, 2018.

In addition to traffic counts, field surveys were conducted to inventory physical conditions including existing geometry, intersection controls, multimodal facilities, key destinations and routes, and traffic operations along the corridor. To also inform this study, existing parcel and right-of-way data was acquired from Monterey County, and related planning efforts were reviewed to coordinate the potential improvements.

6.2.2 Roadway and Intersection Operations

Roadway segment operations for Salinas Road east of Hillcrest Road, based on daily traffic volumes (16,012 vehicles), are estimated to operate at LOS E for a two-lane arterial with turn lanes. This poor LOS is attributed by congested travel conditions and long delays. Table 6.1 summarizes the peak hour operational analysis of the existing conditions at the study intersections within Project Area 5.

Table 6.1 Project Area 5: Existing Conditions Intersection Operations

Intersection	Control Type	AM Peak Hour		PM Peak Hour		Signal Warrant Met?
		Delay	LOS	Delay	LOS	
Elkhorn Rd & Werner Rd	**TWSC**	25.9	D	**205.4**	**F**	**Yes**
Salinas Rd & Elkhorn Rd*	**Yield**	15.9	C	**230.1**	**F**	**Yes**

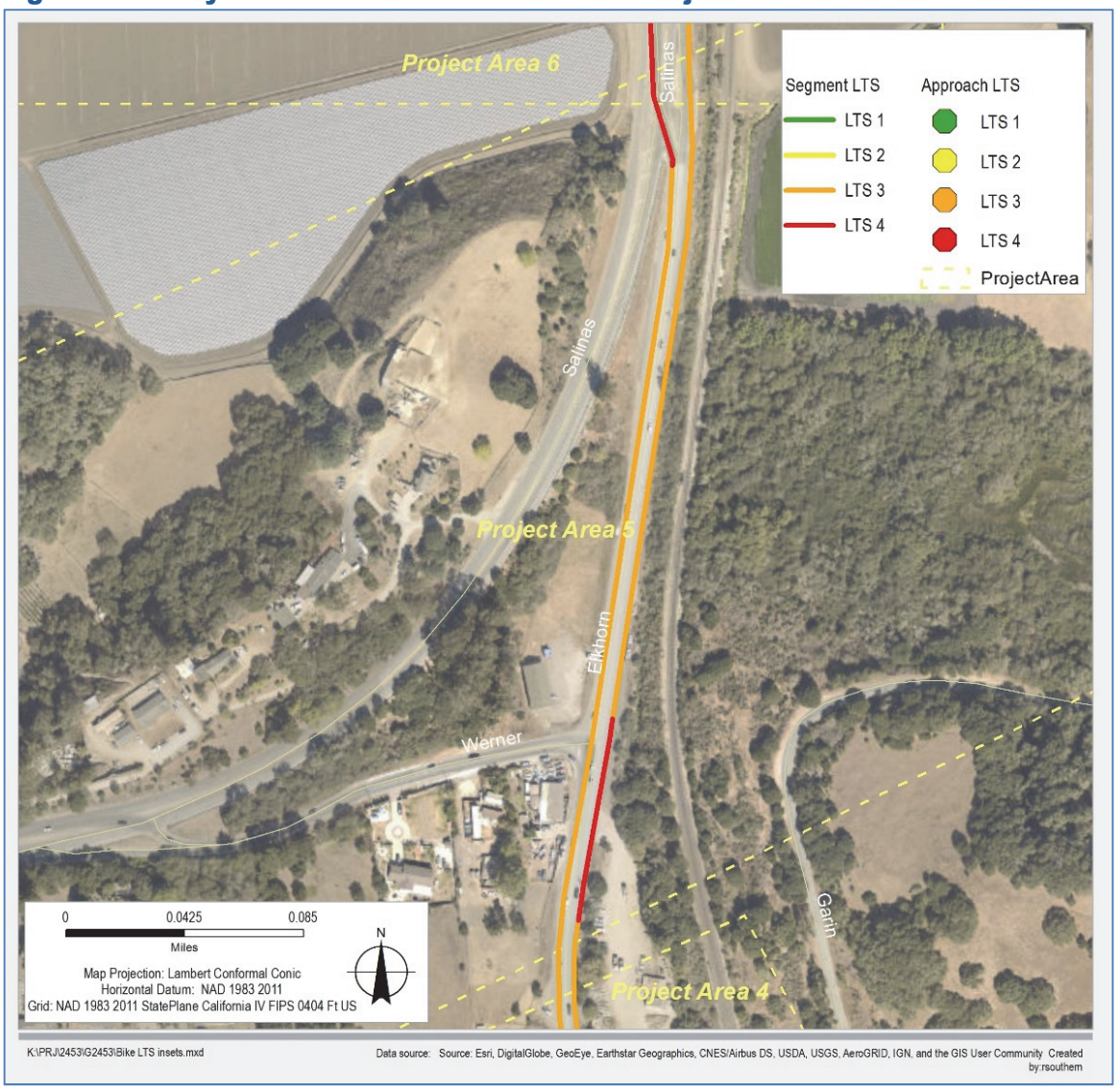
Notes: 1. TWSC = Two-Way or Side-Street Stop Control
2. LOS = Delay based on worst minor street approach for TWSC intersections, average of all approaches for Signal
3. Signal Warrant is based on California Manual on Uniform Traffic Control Devices Warrant 3
*4. **Bold** indicates intersections operating deficiently*
** LOS determined based on SimTraffic*

Based on the operational analyses conducted, the intersections of Elkhorn Road/Werner Road and Elkhorn Road/Salinas Road operate at LOS F in the PM peak hour with significant delays. During the AM peak hour, the upstream intersection of Salinas Road at Werner Road experiences delays on Werner Road, and causes a long queue along Werner Road that extends down to G12/Elkhorn Road. Consequently, the northbound left turn on Elkhorn Road at Werner Road experiences delays during the AM peak hour that may not be represented in the analysis. Therefore, the intersection of Elkhorn Road at Werner Road may experience a LOS worse than calculated during the AM peak hour. The poor LOS presented by the analysis in the PM peak hour indicates severe congestion at this intersection with significant delays and long queues.

6.2.3 Bicycle Level of Traffic Stress (LTS)

Existing bicycle conditions for Project Area 5 were analyzed utilizing a standardized Bicycle Level of Traffic Stress (LTS) methodology. Within Project Area 5, Class II bike lanes are present on both sides of G12, except for northbound approaching Werner Road where the paved shoulder is not wide enough to accommodate cyclists. For cyclists traveling southbound, cyclists experience a high level of stress when crossing Salinas Road and continue south on G12. Figure 6.1 presents the Bicycle LTS analysis within Project Area 5. In summary, this section scored LTS 3 and LTS 4 for segments and approaches, resulting in an overall LTS 4. This LTS is high and relates to stressful bicycling conditions.

Figure 6.1 Bicycle Level of Traffic Stress for Project Area 5

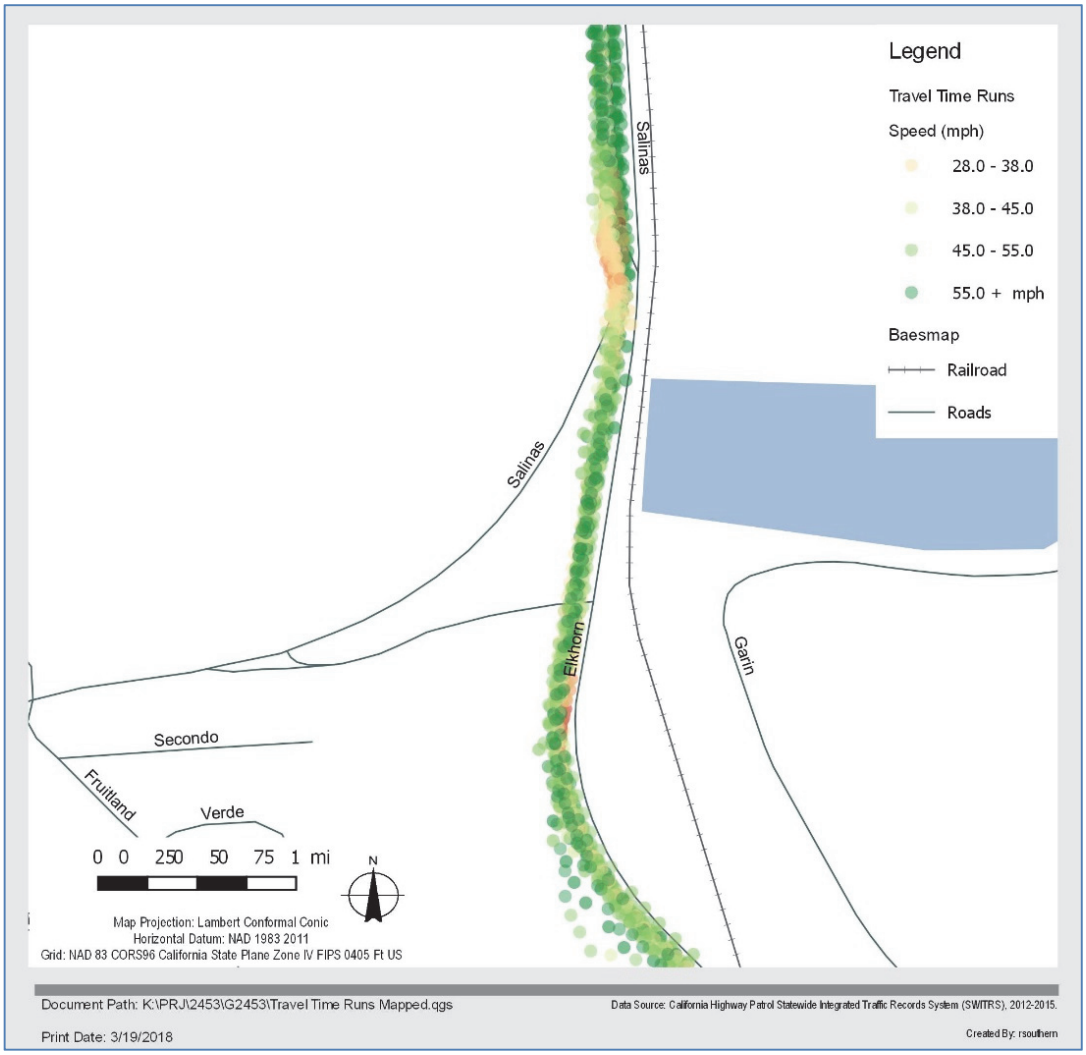


6.2.4 Travel Time Run Analysis

Travel times of the G12 corridor were collected for the AM and PM peak periods using the "Floating-Car" technique and were recorded using GPS. Additional details are provided in the *Existing Conditions Report*. For Project Area 5, the average travel time northbound between Elkhorn Road and Werner Road was recorded to be 1:05 in the AM peak hour (in minutes and seconds), and 1:02 in the PM peak hour. The average travel time southbound between Werner Road and Elkhorn Road was recorded to be 0:56 in the AM peak hour, and 1:02 in the PM peak hour.

Figure 6.2 presents the speed of the travel time runs for Project Area 5, based on the GPS recorded data. The delays and congestion in this area are shown in yellow, orange and red, showing slower vehicle speeds for the various runs, in both directions. Green represents free-flow speeds. The majority of the slowing and stopping occurred southbound approaching Salinas Road at G12, and northbound G12 approaching the Werner Road intersection. The travel time runs conducted do not take into account the delays and congestion experienced along Werner Road and Salinas Road west of G12.

Figure 6.2 Travel Time Runs for Project Area 5

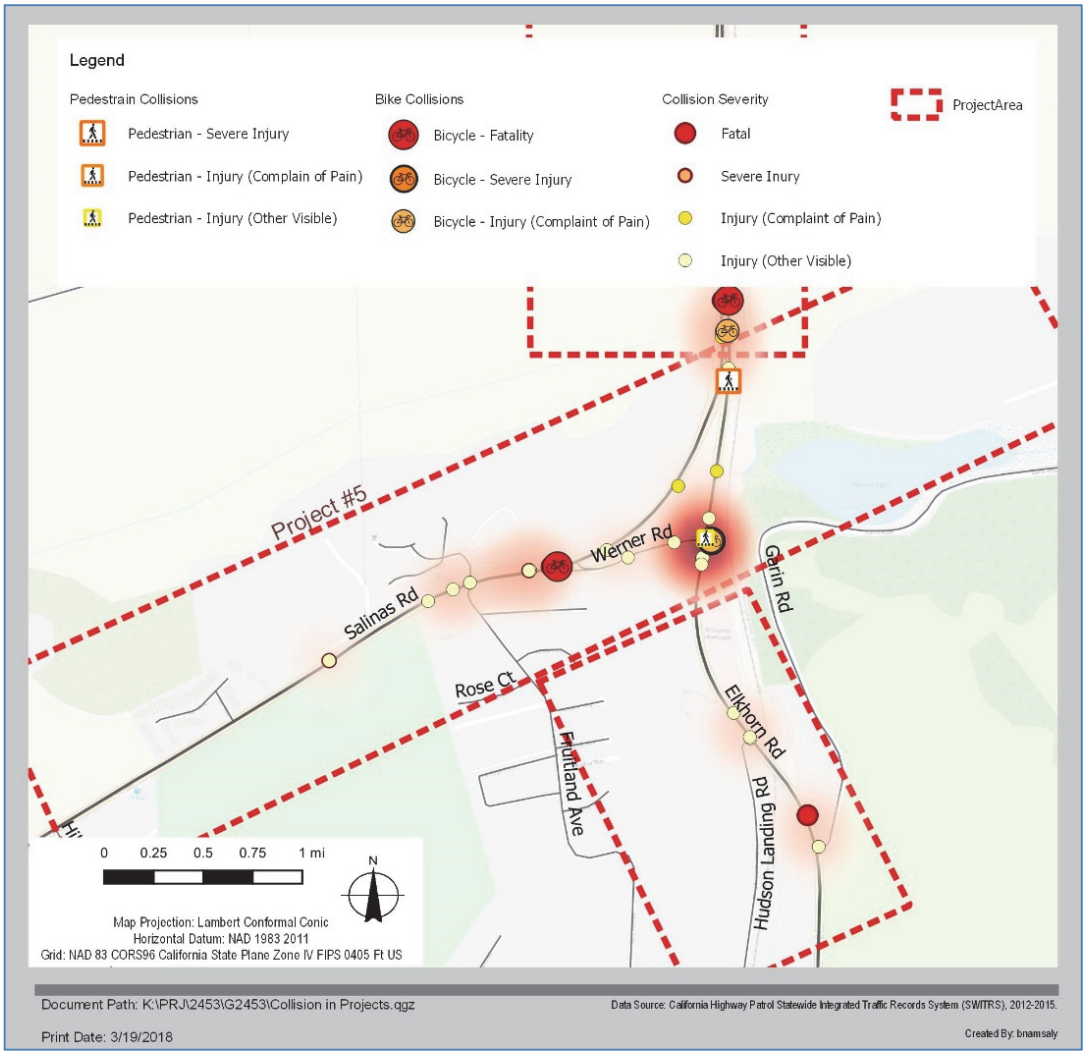


6.2.5 Collision Analysis

Collision data for the study roadways and intersections were derived from the California Highway Patrol Statewide Integrated Traffic Records System (SWITRS). Data was collected on the G12 corridor for a five-year period between January 1, 2012 and December 31, 2016. Based on the collision data, there were 832 reported collisions along the G12 corridor.

Project Area 5 experienced 93 collisions over the five-year period, with 1 fatal collision, 3 severe injury collisions, 8 injury (other visible), 26 injury (complaint of pain), and 55 property damage only collisions. Of these collisions, there was 1 bicycle-related fatality, 3 bicycle-related injuries, and 2 pedestrian-related injury collisions. The majority of collisions occurred at G12 and Werner Road, and at Werner Road and Salinas Road. The majority of collision types were broadside, rear end, or sideswipe collisions. Figure 6.3 presents the location and severity for collisions in Project Area 5.

Figure 6.3 Collision Severity for Project Area 5



6.3 2040 Forecasts

The forecasts were developed utilizing the AMBAG regional travel demand model. Table 6.2 presents existing 2018 average daily traffic count, the 2040 forecast daily traffic projection, and the average growth rate utilized for Project Area 5.

Table 6.2 Daily Roadway 2040 Forecasts for Project Area 5

Location	Existing 2018 Count	2040 Projection	Average Growth %
Salinas Road east of Hillcrest Road	16,012	17,575	9.7%

6.4 Improvement Concepts

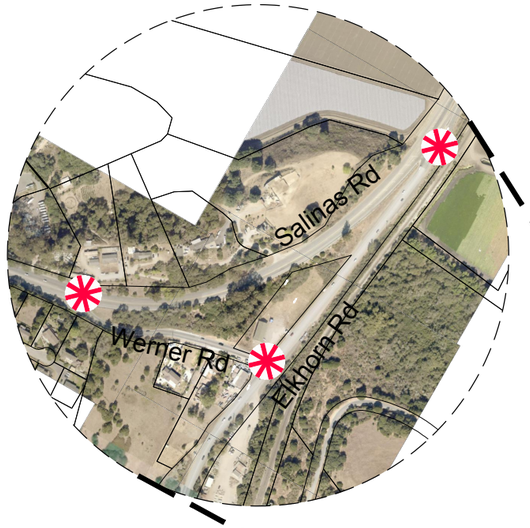
This section discusses the proposed multimodal improvements for Project Area 5, addressing the circulation needs for regional and local automotive users and non-automotive users. While not every street can be designed to serve all users equally, there are opportunities to enhance service for all users while maintaining its principal transportation function. These concepts developed for the G12 corridor connecting to Salinas Road incorporate community values and retain the distinctive transitions between the adjacent land uses while ensuring safety and mobility for all users. These concepts support sustainable growth and livability, consistent with the Monterey County Long-range Plan, while preserving the rural nature of G12.

The proposed improvements for Project Area 5 include:

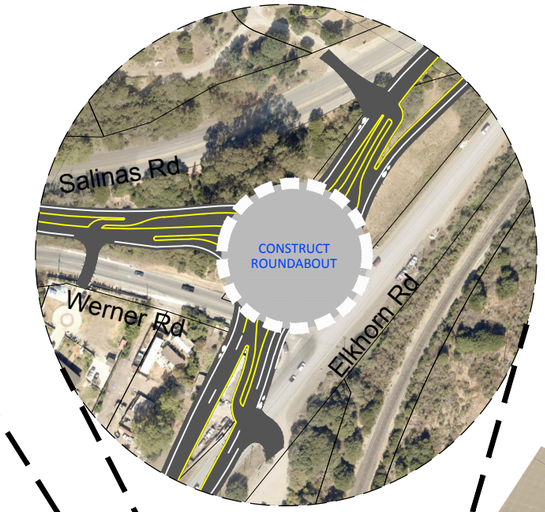
- G12 (Elkhorn Road) / Werner Road / Salinas Road junction;
  - Alternative 1 – Roundabout (preferred)
    - Combine the three intersections into one and install a modern roundabout
    - Remove Salinas Road between Werner Road and G12
    - Provide driveway access to local residents and businesses
    - Relocate the grange hall in northwest corner
  - Alternative 2 – Traffic Signals
    - Install three traffic signals at G12/Werner Road, Salinas Road/Werner Road, and Salinas Road/G12.
- If and when warranted, install a traffic signal at Salinas Road and Fruitland Avenue;
- If and when warranted, install a traffic signal at Salinas Road and Hillcrest Road
- Provide a Class II Bike Lane throughout G12

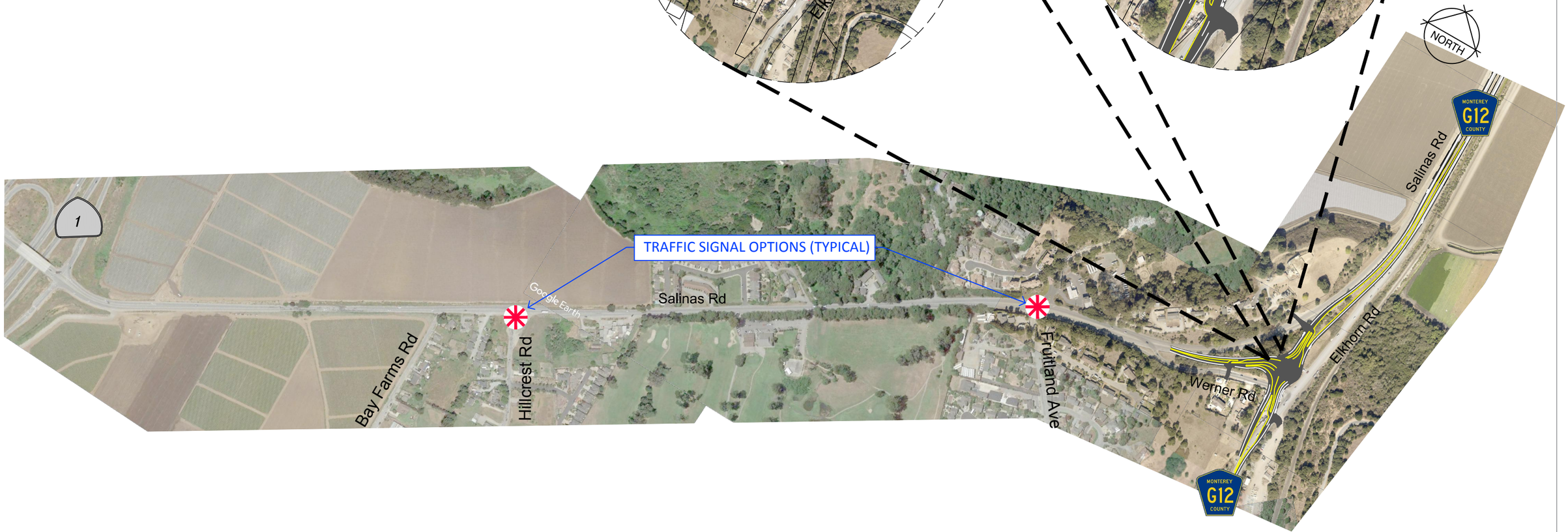
Figure 6.4 presents the improvement concept for Project Area 5.

WERNER Rd / SALINAS Rd
TRAFFIC SIGNALS
(ALTERNATIVE 2)



WERNER Rd / SALINAS Rd
ROUNDABOUT
(ALTERNATIVE 1)





Prepared for: TAMC TRANSPORTATION AGENCY FOR MONTEREY COUNTY

MONTEREY G12 COUNTY

G12 CORRIDOR IMPROVEMENTS
SALINAS RD, WERNER RD and ELKHORN RD
(STATE ROUTE 1 TO ELKHORN RD/SALINAS RD)

0 600
Scale: 1"= 600'

GHD

Transportation Agency of Monterey County
G12 Corridor: Pajaro to Prunedale Corridor Study

PROJECT AREA #5

Project No. **11152201**
Report No. **-**
Date **03/27/2019**

Figure 6.4

Filename: K:\PRJ\2453\2453EX021.dwg Plot Date: 4 June 2019 - 12:21 PM

Source:

6.4.1 Operations Comparison

Traffic operations were analyzed for projected long-term conditions with and without the proposed improvement concepts. Roadway segment operations for Project Area 5 are projected to continue to operate at E for a two-lane arterial without any improvements, however, with implementation of a roundabout at Werner Road/G12/Salinas Road, the arterial capacity would be improved. Table 6.3 presents the comparison of intersection operations with and without the proposed improvements under the Year 2040 forecasted conditions for the AM peak hour. Table 6.4 presents the comparison of intersection operations with and without the proposed improvements under the Year 2040 forecasted conditions for the PM peak hour.

Table 6.3 Project Area 5: Year 2040 Intersection Operation Improvement Comparison – AM Peak Hour

Intersection	Control Type Change	2040		2040 with Improvements		Signal Warrant Met?
		Delay	LOS	Delay	LOS	
Elkhorn Rd & Werner Rd	**Stop Control to Roundabout**	**OVR**	**F**	11.6	B	**Yes**
Salinas Rd & Elkhorn Rd*	Yield to Removed	D	10.3	Intersection Removed		-

Notes: 1. LOS and Delay based on worst minor street approach for stop-controlled intersections, average of all approaches for Signalized intersections

3. Signal Warrant is based on California Manual on Uniform Traffic Control Devices Warrant 3

*4. **Bold** indicates intersections operating deficiently*

*5. **OVR** indicates delays over 300 seconds*

** LOS determined based on SimTraffic*

Table 6.4 Project Area 5: Year 2040 Intersection Operation Improvement Comparison – PM Peak Hour

Intersection	Control Type Change	2040		2040 with Improvements		Signal Warrant Met?
		Delay	LOS	Delay	LOS	
Elkhorn Rd & Werner Rd	**Stop Control to Roundabout**	**OVR**	**F**	20.8	C	**Yes**
Salinas Rd & Elkhorn Rd*	**Yield to Removed**	**214.6**	**F**	Intersection Removed		-

Notes: 1. LOS and Delay based on worst minor street approach for stop-controlled intersections, average of all approaches for Signalized intersections

3. Signal Warrant is based on California Manual on Uniform Traffic Control Devices Warrant 3

*4. **Bold** indicates intersections operating deficiently*

*5. **OVR** indicates delays over 300 seconds*

** LOS determined based on SimTraffic*

As shown in Tables 6.3 and 6.4, under the projected 2040 conditions without any improvements, the intersection of G12 (Elkhorn Road) at Werner Road and G12 (Elkhorn Road) at Salinas Road will continue to operate at very poor LOS F, and queues throughout these intersections will continue to worsen, causing undue delays along Werner Road and Salinas Road in both AM and PM peak hours. With the proposed improvements, under 2040 conditions, the intersections are combined into one intersection with a roundabout, and projected to operate acceptably during the AM and PM peak hours.

The proposed roundabout will have greater capacity to be able to efficiently accommodate the current and projected traffic forecasts through the intersection of G12/Salinas Road/Werner Road. The potential for traffic signal(s) (Optional) upstream on Salinas Road at Hillcrest Road and/or at Fruitland Avenue will help meter traffic approaching the roundabout intersection, allowing additional gaps in traffic flow for vehicles to enter or exit on Salinas Road via side streets or driveways. Either of these intersections identified for potential signalization would need to meet signal warrants before they should be installed. The roundabout at G12/Salinas Road/Werner Road will provide for continuous flow of traffic, but with less delay and queuing characteristics than the second alternative, which is to install three traffic signals. The option to install three traffic signals could be implemented in the short-term, however, it will not address the safety concerns and severe congestion experienced currently.

With the roundabout, delays approaching the intersection will be significantly reduced, as the conceptual layout would likely include a dedicated lane for the northbound left and eastbound right turn at the roundabout. The roundabout will also provide significantly safer mobility for pedestrian and bicyclists' access between Pajaro and Las Lomas. Vehicle speeds approaching the intersection

will be reduced throughout the day with implementation of the roundabout, resulting in safer conditions for not only vehicles, but for non-motorized users as well throughout the day.

6.4.2 Bicycle Level of Traffic Stress (LTS)

The proposed improvements include installation of a roundabout at G12/Elkhorn Road/Salinas Road. This improvement will provide safe bicycle facilities through the intersection, providing sufficient shoulder width for the continuation of the Class II Bike Lane approaching the intersection northbound, and eliminating the need for bicyclists to cross Salinas Road to continue south along G12. With these improvements, bicyclists will experience less stress along this section of the corridor, and the LTS will be improved from LTS 4 to LTS 3.

6.5 Improvement Cost Estimates

A series of planning-level cost estimates have been prepared for the proposed improvement concepts for Project Area 5. The preliminary cost estimates for the improvement concepts for Project Area 5 are attached in Appendix D. The sources used for the creation of these cost estimates are the 2018 Contract Cost Data provided by the State of California Department of Transportation, Caltrans, and recent bid summary results of recent projects to determine the unit costs. The cost estimates are necessary to determine the funding required for the transportation improvements. All cost estimates include the cost of preliminary project design and approval, environmental considerations, final design, construction, administration, right-of-way, and construction management and inspection. Construction costs include basic roadway construction items such as paving, storm drainage, lighting, signing, and striping. Table 6.5 presents the cost estimates for the improvements within Project Area 5.

Table 6.5 Project Area 5 Cost Estimates

Project Area 5 Improvements	Cost Estimate	
Roundabout at Elkhorn/Salinas	$	13,308,000
Traffic Signals	$	1,708,500
Project Area 5 Total Cost	**$**	**15,016,500**

6.5.1 Safety Benefit

Based on the SWITRS and TIMS collision data over the five year period between 2012 and 2016, there were a total of 93 collisions for Project Area 5, with 1 fatal collisions, and 37 collisions involving injuries. The following collision characteristics represent the greatest potential for safety improvement along the corridor within Project Area 5.

- Unsafe speeds;
- Passing or Turning to/from corridor (major intersection);
- Roadway departures (head-on, run-off road, sideswipe, hit-object, overturned);
- Lighting; and
- Bicycle/Pedestrian collisions

Possible mitigations to address these types of collisions include:

- Installing dynamic speed feedbacks signs and increasing enforcement along the corridor;
- Install additional advance intersection warning signs to improve visibility of major access points;
- Install centerline and edge-line rumble strips to reduce head-on, sideswipe, run-off road and hit-object collisions;
- Install a roundabout and/or traffic signals to provide safer and more efficient intersection control;
- Providing or improving illumination along the segment and/or at intersections to reduce collisions in dark or low lighting conditions; and
- Provide bicycle and pedestrian facilities to fill in gaps in the network, providing access between local communities, and provide separation from the traveled way for safe travel for active modes

6.5.2 Benefit-Cost Ratio & Collision Modification Factor Analysis

The proposed improvements, collision data and estimated costs were utilized in the Highway Safety Improvement Program (HSIP) Analyzer to calculate Benefit-Cost Ratios for the roadway improvements and each intersection control improvement based on a maximum of three applicable countermeasures. Table 6.6 presents the Benefit Cost and Project Cost for the different intersection improvement types, and the overall Benefit-Cost for Project Area 5. The HSIP Analyzer PDF forms are included in Appendix E. As shown, the roundabout at Elkhorn Road/Salinas Road presents significant safety benefits compared to the cost, and the optional traffic signals on Salinas Road have a higher cost compared to the small safety benefit.

Table 6.6 Safety Benefit-Cost Summary for Project Area 5

	Roundabout	Traffic Signals	Project Area 5 Total
Total Benefit	$ 118,089,497	$ 23,588	$ 118,113,085
Total Cost	$ 13,308,000	$ 1,708,500	$ 15,016,500
B/C	8.9	0.0	**7.9**

6.6 Stormwater Management

Project Area 5 straddles both the Elkhorn Slough Watershed (12 digit Hydrologic Unit Code: 180600150301) and the Lower Pajaro River Watershed (12 digit Hydrologic Unit Code: 18060020805) and is part of the Monterey County NPDES Municipal General Permit Area. The project area intersection of Salinas Road and Elkhorn Road is located within the Pajaro River outer floodplain, which has a determined base flood elevation (Special Flood Hazard Area (SFHA) Zone AE) as identified by the Federal Emergency Management Agency (FEMA) National Flood Insurance Program (NFIP). The intersection is also located adjacent to the Watsonville Creek floodplain, which is also identified as a SFHA Zone AE. Existing storm water management systems consist of no known culverts at the time of this study and it is assumed that the majority of runoff is handled through sheet drainage to roadside ditches.

6.6.1 Proposed Transportation Improvements

Roadway and intersection improvements are summarized below to determine the areas where potential for increasing impervious surface could occur. Project Area 5 proposes two alternatives and a variety of improvement recommendations including:

- Roadway Widening
    - Additional Vehicle Lane(s)
    - Bike Lane(s)
- Intersection Improvements
    - Roundabouts
    - Signalization

The project area offers two (2) improvement alternatives. The proposed improvements for the project area for alternative 1 will disturb approximately 4.5 acres and the proposed improvements for the project area for alternative 2 will disturb less than 0.1 acres, as this alternative only consists of signalization and striping. It is estimated that the improvements for alternative 1 will result in more than a 50% increase in impervious surface at the intersection of Salinas Road and Elkhorn Road, while other improvement areas within the project area and alternative 2 will result in less than 1% increase in impervious surface. However, individual improvements within this overall project area may result in greater increases to impervious surface within their respective sub-watersheds and associated drainage capture and conveyance systems.

6.6.2 Potential Impacts to Water Systems and Biological Resources

The proposed intersection improvement within Project Area 5 will result in an increase in impervious surface. As a result, there is the potential for an increase in offsite drainage and higher volume peak flows. Increased water volume during these peak flows has the potential to exceed the existing drainage conveyance systems. An exceedance in the capacity of the hydraulic systems may result in upstream flooding, uncontrolled discharge, and erosion. It is recommended that any proposed improvement inventories the existing hydrologic and hydraulic drainage systems to determine if there are deficiencies that require replacement or upgrades to ensure adequate function and capacity.

Construction activities resulting in ground disturbance present the risk for discharge of pollutants of concern into State Clean Water Act Section 303(d) listed waterbodies. The project area has the potential for discharge into Watsonville Creek and there is the potential for indirect discharge to Elkhorn Slough and the Pajaro River – all are listed as 303(d) waterbodies. At a minimum, construction related activities present sediment and pH water quality risks to the adjacent water systems and efforts should be taken to minimize the discharge of these and other listed pollutants of concern into these waterbodies.

Increases in pollutant discharge may also result in negative impacts to existing biological resources. Project Area 5 improvements occur in biological community areas that support a host of sensitive and protected habitats and species, specifically in the Elkhorn Slough basin. Many of these species are dependent on the existing hydrology and water resources within this project area and larger watershed. Species of specific concern in or adjacent to the project area include California red-legged frog. It is undetermined if the proposed project improvements would impact the existing

sensitive biological resources; therefore, environmental investigations are needed to determine the impact potential.

6.6.3 Minimization and Mitigation Measures

There are a multitude of minimization and mitigation measures that can be implemented during the design and planning phase to help reduce the impact the proposed improvements have on the existing water and environmental resources. Of these, a top priority is to reduce the area of new impervious surface and preserve existing vegetation. Once this is accomplished to the best extent possible while maintaining the safety and function of the proposed improvement, a hydrology analysis and report (drainage study) should be completed to identify, at a minimum, the following:

- Stormwater design standards and criteria
- Soils and land use
- Existing hydrology and site drainage / runoff
- Changes in site drainage and discharge volume and the impacts to the existing hydraulics.
- Storm water quality and post-construction water treatment / low impact development requirements
- Recommendations for treatment of water quality / volume and drainage facility upgrades.

In addition to a drainage study, there are a host of other investigations that should be done to identify potential impacts to the water and environmental resources and help assist in further design development. The type, scope, and existing availability of these additional studies should be determined during the design and planning phase of the proposed improvements; however, it is anticipated that, at a minimum, this would include an environmental analysis and report to identify all potential impacts to the environment resulting from the proposed improvements.

As part of the project-planning phase, regulatory agencies and policies will need to be consulted to determine their jurisdictional applicability and what additional minimization and mitigation measures are required (i.e. United States Army Corps of Engineers, United States Fish and Wildlife Service, California Department of Fish and Wildlife, the Regional Water Quality Control Board - Central Coast Region 3, Monterey County Resource Management Agency – Environmental Services, etc…). Further, the proposed improvements shall undergo stakeholder consultation to determine recommended minimization and mitigation measures (i.e. Transportation Agency for Monterey County, Association of Monterey Bay Area Governments, Elkhorn Slough Foundation (ESF), etc…).

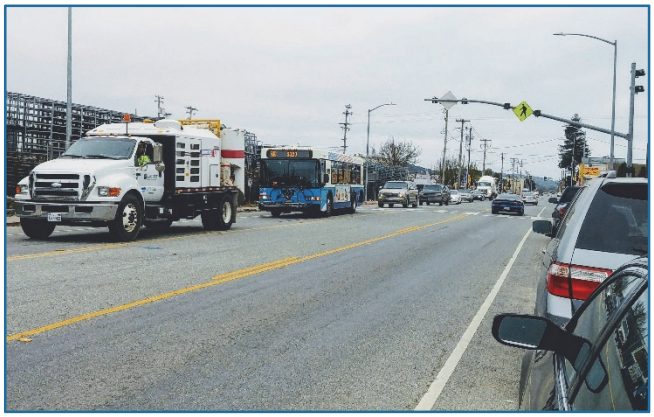
Lastly, best management practices (BMPs) should be developed and specific measures shall be identified on project plans and project related documents (i.e. a Storm Water Pollution Prevention Plan) to reduce and control construction related erosion and discharge of pollutants into offsite water resources. To minimize the potential for discharge of pollutants, all regulatory and stakeholder requirements, as determined applicable to the proposed improvement, shall be implemented during the construction phase. Additionally, all construction related BMPs including temporary soil stabilization measures, temporary sediment control measures, wind erosion control, tracking control, non-storm water management, and waste management and materials pollution control shall be implemented and maintained during construction. Following construction completion and final site stabilization, it is recommended that a long-term maintenance plan be developed to address any on-going pollutant risks. This plan should identify the pollutant, the risk, the source, and the maintenance action needed to help reduce and mitigate the impact of the pollutant in perpetuity.

7. Project Area 6 – Salinas Road & Pajaro

This section extends north along Salinas Road from the junction of Werner Road and G12 to the community of Pajaro, terminating at the bridge over the Pajaro River along Porter Drive.

7.1 Project Area 6 Description

Project Area 6, the northern end of the G12 corridor, is approximately 1.6 mile in length and serves the unincorporated community of Pajaro. Pajaro is identified in the County General Plan to be a Community Planning Area. The population of Pajaro is small and has been subject to some fluctuation in terms of total numbers. What has remained constant, however, is the large percentage of children and young people in the Community. Another constant has been the large percentage of Hispanic families. The G12 corridor (Salinas Road and Porter Drive) serves as Pajaro's "Main Street" and is the direct connection to the City of Watsonville to the north via the bridge over the Pajaro River. G12 though Pajaro is deserving of an impressive makeover. This corridor study can serve as the launch pad for some innovative improvements to their "Main Street" that will promote multi-modal safety and make G12 a "Complete Street".



The Pajaro Middle School is located on Salinas Road mid-way in Pajaro and is accessed via a signalized intersection at Matiasevich Lane. Unfortunately, the sidewalks leading to the school, where present, are narrow and obstructed with utility poles, etc. Continuous but narrow sidewalks are provided throughout most of Pajaro. Many of the local businesses are fronting the sidewalk. There are no designated Bike Lanes in Pajaro, which makes biking a difficult and potentially unsafe modal choice for schoolchildren and others traveling along G12. The large numbers of heavy trucks, mostly related to the surrounding agriculture industry, present a challenge in terms of making this stretch of the G12 "complete" for multimodal options.

Salinas Road north of the G12/Salinas Road junction is a four-lane divided arterial with a posted speed limit of 55 mph. This section is 0.75 miles in length, and then immediately transitions to three lanes with 25 mph speed limit just before the railroad tracks/Railroad Avenue. The existing roadway through Pajaro is primarily three lanes, with a northbound lane, a southbound lane, and a continuous center left-turn lane. There is a short 5-lane section (2 travel lanes in each direction and a center turn lane) at the northern end of Pajaro just south of the Porter Drive/San Juan Road intersection.

Where the road turns near the northern end of Pajaro, Salinas Road transitions into Porter Drive (G12) and continues north into Watsonville, and Salinas Road continues as a local street east of G12. At this junction, Stender Ave is closely-spaced to the south of the Salinas Road/Porter

Drive/G12 intersection. These two intersections, Salinas Road and Stender Avenue, access G12 at a significant skew where the road turns, and function as one intersection instead of two separately.

Parking is generally prohibited through the corridor except between San Juan Road and Stender Ave/Porter Drive/Salinas Road. The majority of on-street parking is parallel, except for a section on the west side of Salinas Road north of Bishop Street. Front-end diagonal parking is provided here adjacent to the roadway for the local businesses, and adjacent to the skewed intersection of Stender Ave/Porter Drive/Salinas Road. Vehicles that park here must back up into the roadway to exit, and oncoming vehicles are difficult to see due to the curve in the roadway. This location presents operational and safety concerns due to vehicles entering and existing at the skewed intersection, and vehicles making parking maneuvers.

7.1.1 Existing Multimodal Facilities

The Monterey-Salinas Transit (MST) operates two fixed transit routes that have stops along the G12 corridor. MST Route 28 provides service between Salinas and Watsonville via SR 1 and Salinas Road, and MST Route 29 provides service between Salinas and Watsonville via G12. Both routes have two-hour headways in each direction.

Within Pajaro, bus stops for MST Route 28 and Route 29 are provided at various locations; signs are posted along the sidewalk, but no bus shelters or benches are provided. There is a marked, mid-block crosswalk between Jonathan Street and Bishop Street. This crosswalk also has overhead flashing beacons that are actuated by pedestrian pushbuttons. Other marked crosswalks are provided at the signalized intersections of San Juan Road/Porter Drive and Salinas Road/Pajaro Middle School, which are far apart. Pedestrians have been observed to cross the road midblock or at unmarked crossings. There are no designated Class II Bike Lanes, which makes biking a difficult and potentially unsafe modal choice for schoolchildren and others traveling along G12.

The four-lane section of Salinas Road has “Share the Road” bicycle-warning signs posted, shoulder widths are minimal if none, and a section of guardrail is at the edge of pavement in the northbound direction. There is a warning sign prior to the railroad crossing that says, “Slow, Flooded”, indicating that the road may flood when it rains.

7.2 Existing Conditions Analysis

7.2.1 Existing Data Collection

In coordination with TAMC, daily roadway counts and AM and PM peak hour intersection turning movement counts were collected along the entire corridor. For this specific Project Area, daily roadway counts were collected on Salinas Road north of Railroad Avenue, and three selected intersections. For further details, refer to the Existing Conditions Report. Daily and peak hour counts were conducted on January 31 and February 1, 2018.

In addition to traffic counts, field surveys were conducted to inventory physical conditions including existing geometry, intersection controls, multimodal facilities, key destinations and routes, and traffic operations along the corridor. To also inform this study, existing parcel and right-of-way data was

acquired from Monterey County, and related planning efforts were reviewed to coordinate the potential improvements.

7.2.2 Roadway and Intersection Operations

Roadway segment operations for Salinas Road north of Railroad Avenue, based on daily traffic volumes (18,765 vehicles), are estimated to operate at LOS E for a two-lane arterial with turn lanes, and at LOS B for a four-lane divided arterial. The poor LOS E indicates congested travel conditions along the corridor, during the peak hours, within Pajaro. Table 7.1 summarizes the peak hour operational analysis of the existing conditions at the study intersections within Project Area 6.

Table 7.1 Project Area 6: Existing Conditions Intersection Operations

Intersection	Control Type	AM Peak Hour		PM Peak Hour		Signal Warrant Met?
		Delay	LOS	Delay	LOS	
Salinas Rd & Pajaro Middle School/ Matiasevich Ln	Signal	10.7	B	6.1	A	-
Porter Dr & Salinas Rd/Stender Ave*	**TWSC**	**54.2**	**F**	**65.8**	**F**	**No**
Main St/Porter Dr & San Juan Rd	Signal	26.1	C	41.2	D	-

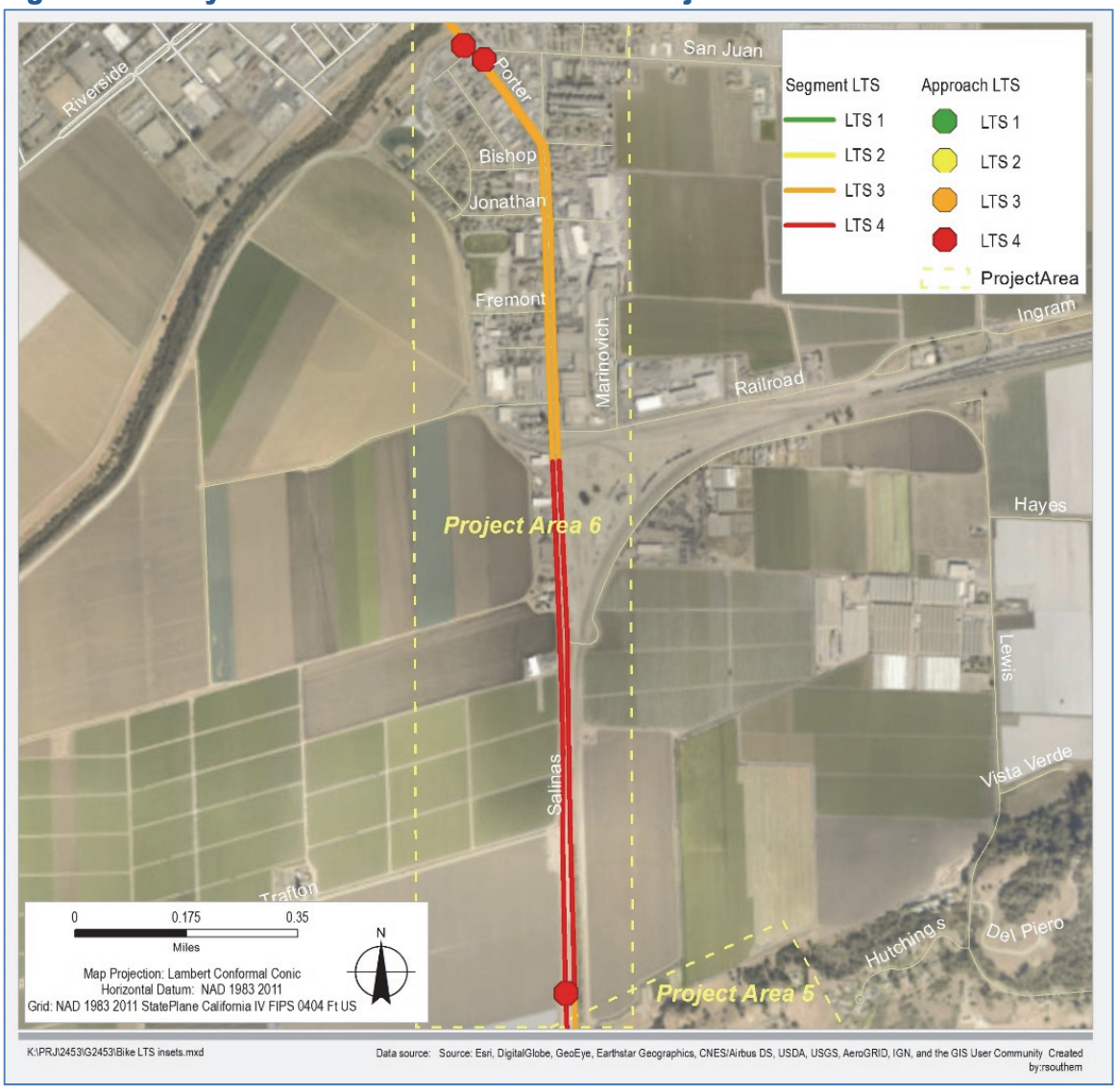
Notes: 1. TWSC = Two-Way or Side-Street Stop Control
2. LOS = Delay based on worst minor street approach for TWSC intersections, average of all approaches for Signalized intersections
3. Signal Warrant is based on California Manual on Uniform Traffic Control Devices Warrant 3
*4. **Bold** indicates intersections operating deficiently.*
** LOS determined based on SimTraffic*

Based on the operational analyses conducted, the intersection of Porter Driver/Salinas Road/Stender Avenue operates at LOS F in the AM and PM peak hours, and does not meet the peak hour traffic signal warrant. This poor LOS is due to the long delays experienced on the side street approach during the peak hours. Although there is high delay on these side-streets, there is minimal to low volume during the peak hours on these approaches.

7.2.3 Bicycle Level of Traffic Stress (LTS)

Existing bicycle conditions for Project Area 6 were analyzed utilizing a standardized Bicycle Level of Traffic Stress (LTS) methodology. Within Project Area 6, there are no bike lanes, and in the four-lane section, the paved shoulder is not wide enough to accommodate cyclists. Portions of this section also have guardrail which further limit the space for cyclists. Within Pajaro, vehicular speeds are lower and cyclists also share the road with motorists. Figure 7.1 presents the Bicycle LTS analysis within Project Area 6. In summary, this section scored LTS 3 and LTS 4 for segments and approaches, resulting in an overall LTS 4. This LTS is high and relates to stressful bicycling conditions.

Figure 7.1 Bicycle Level of Traffic Stress for Project Area 6

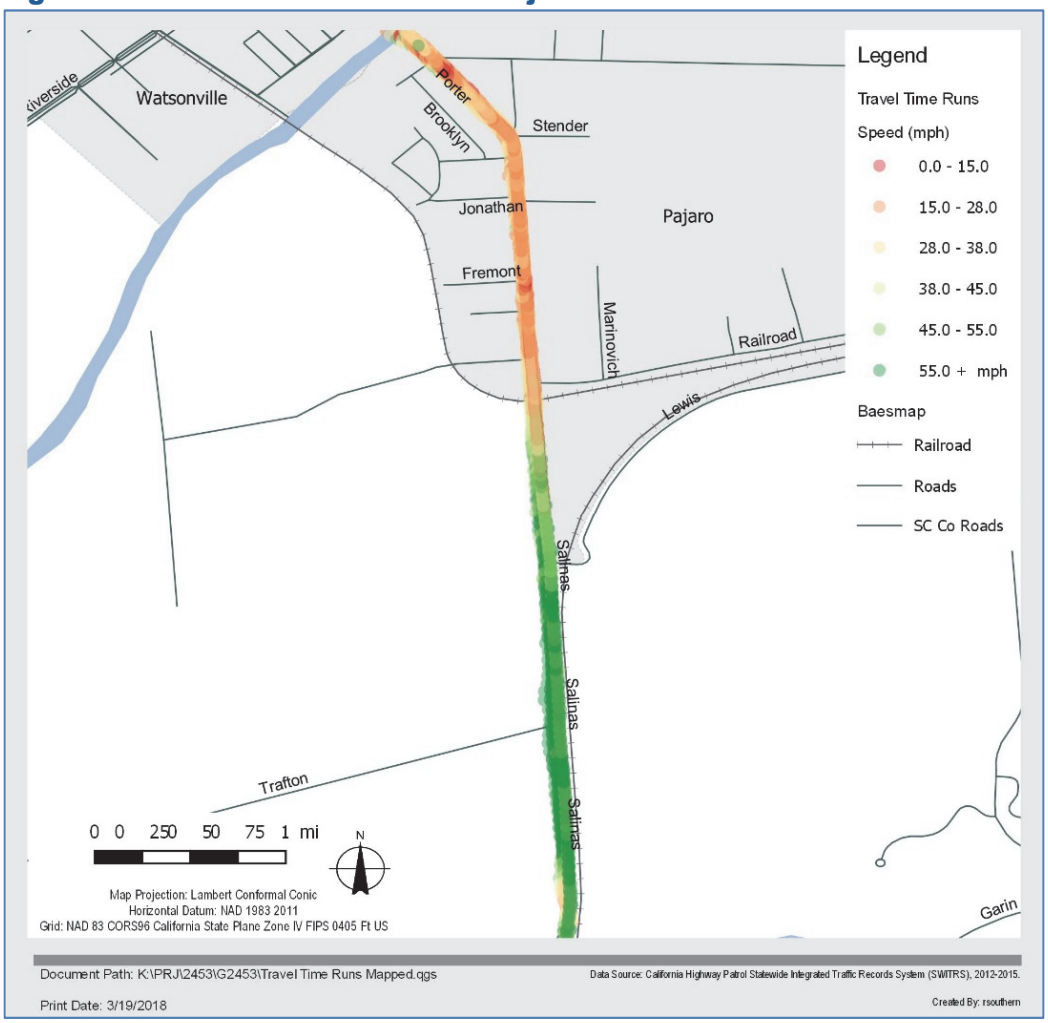


7.2.4 Travel Time Run Analysis

Travel times of the G12 corridor were collected for the AM and PM peak periods using the "Floating-Car" technique and were recorded using GPS. Additional details are provided in the *Existing Conditions Report*. For Project Area 6, the average travel time northbound between Elkhorn Road/Salinas Road and Porter Drive/San Juan Road was recorded to be 4:09 in the AM peak hour (in minutes and seconds), and 3:58 in the PM peak hour. The average travel time southbound between Porter Drive/San Juan Road and Elkhorn Road/Salinas Road was recorded to be 2:47 in the AM peak hour, and 2:51 in the PM peak hour.

Figure 7.2 presents the speed of the travel time runs for Project Area 6, for both directions based on the GPS recorded data. The delays and congestion in this area are shown in yellow, orange and red, showing slower vehicle speeds for the various runs, and green represents free-flow speeds. The majority of congestion is experienced southbound after the intersection of Porter Drive/San Juan Road due to the two lanes merging into one. This also occurs northbound approaching the railroad tracks and entering Pajaro, as two lanes transition into one lane and the speed limit changes from 55 mph to 25 mph.

Figure 7.2 Travel Time Runs for Project Area 6

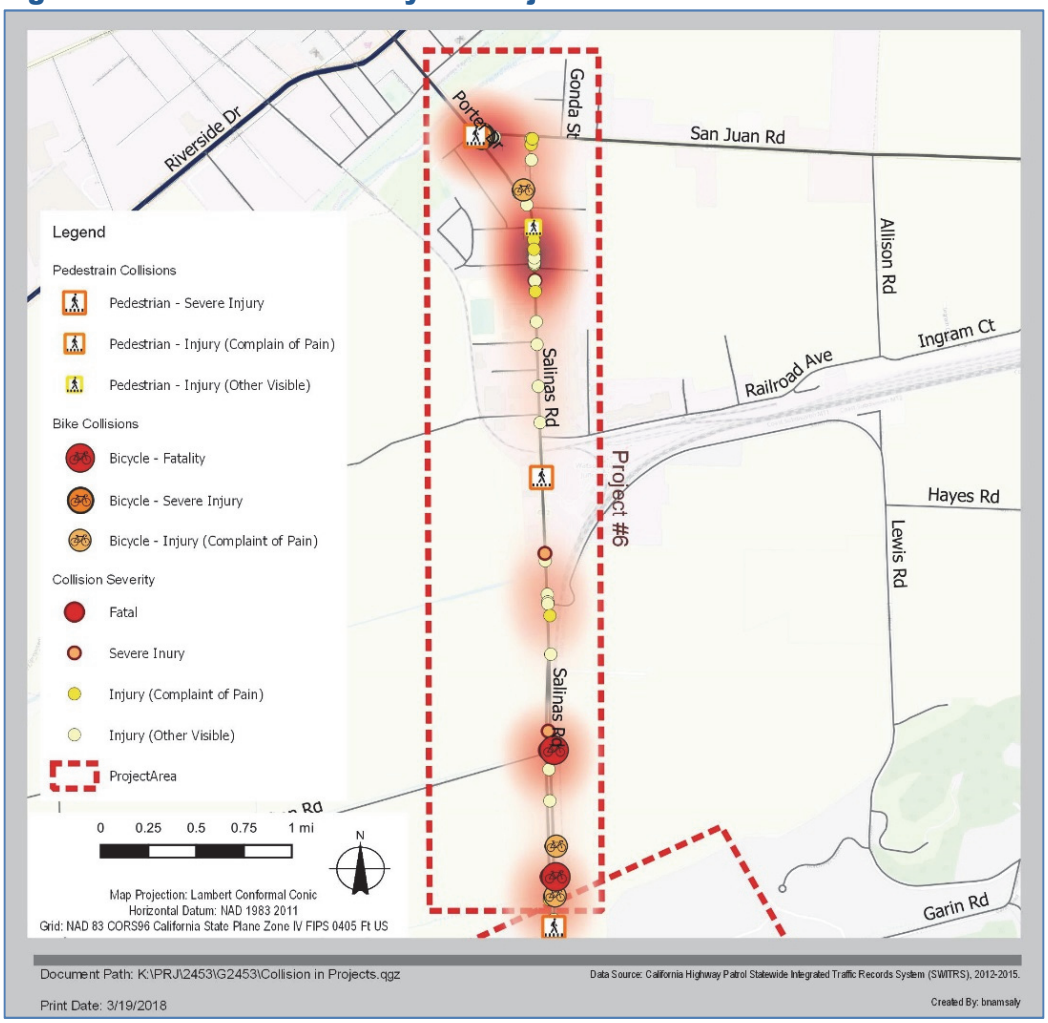


7.2.5 Collision Analysis

Collision data for the study roadways and intersections were derived from the California Highway Patrol Statewide Integrated Traffic Records System (SWITRS). Data was collected on the G12 corridor for a five-year period between January 1, 2012 and December 31, 2016. Based on the collision data, there were 832 reported collisions along the G12 corridor.

Project Area 6 experienced 226 collisions over the five-year period, with 3 fatal collisions, 8 severe injury collisions, 11 injury (other visible), 34 injury (complaint of pain), and 170 property damage only collisions. Of these collisions, there were 2 bicycle-related fatalities, 5 bicycle-related injuries, and 8 pedestrian-related injury collisions. All of the bicycle-related fatalities and most of the bicycle-related injuries occurred in the four-lane divided section of Salinas Road. This section has high vehicular travel speeds, limited shoulder southbound, and no shoulder northbound for bicyclists, creating a high stress environment for cyclists and a very high safety concern. The majority of pedestrian collisions occurred within the Pajaro community between Jonathan Street and Bishop Street. The majority of collision types were broadside, rear end, or sideswipe collisions. Figure 7.3 presents the location and severity for collisions in Project Area 6.

Figure 7.3 Collision Severity for Project Area 6



7.3 2040 Forecasts

The forecasts were developed utilizing the AMBAG regional travel demand model. Table 7.2 presents the existing 2018 average daily traffic (ADT) count, the 2040 forecast daily traffic projection, and the average growth rate utilized for Project Area 6.

Table 7.2 Daily Roadway 2040 Forecasts for Project Area 6

Location	Existing 2018 Count	2040 Projection	Average Growth %
Salinas Road north of Railroad Avenue	18,765	20,165	7.4%

7.4 Improvement Concepts

This section discusses the proposed multimodal improvements for Project Area 6, addressing the circulation needs for regional and local automotive users and non-automotive users. While not every street can be designed to serve all users equally, there are opportunities to enhance service for all users while maintaining its principal transportation function. These concepts developed for the G12 corridor connecting to Salinas Road incorporate community values and retain the distinctive transitions between the adjacent land uses while ensuring safety and mobility for all users. These concepts support sustainable growth and livability, consistent with the Monterey County Long-range Plan, while preserving the rural nature of G12.

The proposed improvements for Project Area 6 include:

- Implement a Road Diet on Salinas Road;
    - Reduce from 4 lanes to 2 lanes
    - Install a Buffered Bike Lane (8’ Class II Bike Lane with 6’ Buffer)
- South of the Railroad Crossing, install a raised median on Salinas Road and an overhead arch sign with “Welcome to Pajaro”, to provide entry features and an improved transition into Pajaro;
- Install 5’ Class II Bike Lanes and 3’ Buffer where feasible within Pajaro;
- Construct 5’ Sidewalk where needed to fill in gaps in the pedestrian network, between Railroad Avenue and San Juan Road;
- Install Rectangular Rapid Flashing Beacons (RRFB) at existing mid-block crossing south of Bishop Street (in current County plans);
- Reconfigure the parking north of Bishop Street on the west side of G12 (Salinas Road) to be off-street;
    - Adjacent to roadway, construct curb, gutter, 5’ minimum sidewalk with 3' landscaped buffer
    - Provide diagonal front-end parking
    - Provide a 13’ one-way Aisle for parking maneuvers, entry and exit
    - Provide a 5’ minimum buffer adjacent to the building face
    - Provide entrance on Salinas Road, and exit on Bishop Street
- Convert Salinas Road east leg approach at Porter Drive to be right turn only (outbound);

- Reconfigure the southbound approach of Porter Drive/Main Street at San Juan Road to include:
  - 1 Right Turn Pocket
  - 1 Thru Lane
  - 2 Left Turn Lanes (1 trap left turn lane and 1 left turn pocket)
  - 1 Receiving Lane southbound

The option to install a traffic signal at Bishop Street and relocate the mid-block crosswalk to this intersection was considered. However, the County already has plans to improve the current crosswalk by installing a RRFB.

Figure 7.4 presents the improvement concept for Project Area 6. Figure 7.5 presents a closer detail for the southern Salinas Road portion of Project Area 6. Figure 7.6 presents a closer detail of Salinas Road in southern Pajaro within Project Area 6. Figure 7.7 presents a closer detail between Jonathan Street and Porter Drive/Salinas Road within Project Area 6. Figure 7.8 presents a closer detail of Porter Drive/Main Street at San Juan Road within Project Area 6.

Pajaro/Watsonville Multimodal Transportation Station

The Pajaro/Watsonville commuter rail station is Phase 2 of the Monterey County Rail Extension project. The proposed Pajaro/Watsonville station is proposed to be located on Salinas Road (G12) just north of Lewis Road. Potential reconfiguration of the roadway geometry on Salinas Road and intersection control at Lewis Road has also been identified as part of the project. The preliminary plan proposes to install two new driveways on Salinas Road, with a center turn lane and access restrictions, and install a traffic signal at the intersection of Salinas Road and Lewis Road. With the implementation of the road diet and Class II buffered bike lanes along Salinas Road, coordination on geometry that is compatible with the proposed multimodal rail station and this plan will be necessary.

Prepared for:

TAMC TRANSPORTATION AGENCY FOR MONTEREY COUNTY

MONTEREY G12 COUNTY

G12 CORRIDOR IMPROVEMENTS

SALINAS RD, PORTER DR and MAIN ST

(ELKHORN RD / SALINAS RD TO RIVERSIDE DR-STATE ROUTE 129)

0 300

Scale: 1"= 300'

GHD

Transportation Agency of Monterey County

G12 Corridor: Pajaro to Prunedale Corridor Study

PROJECT AREA #6

(OVERALL)

Project No. **11152201**

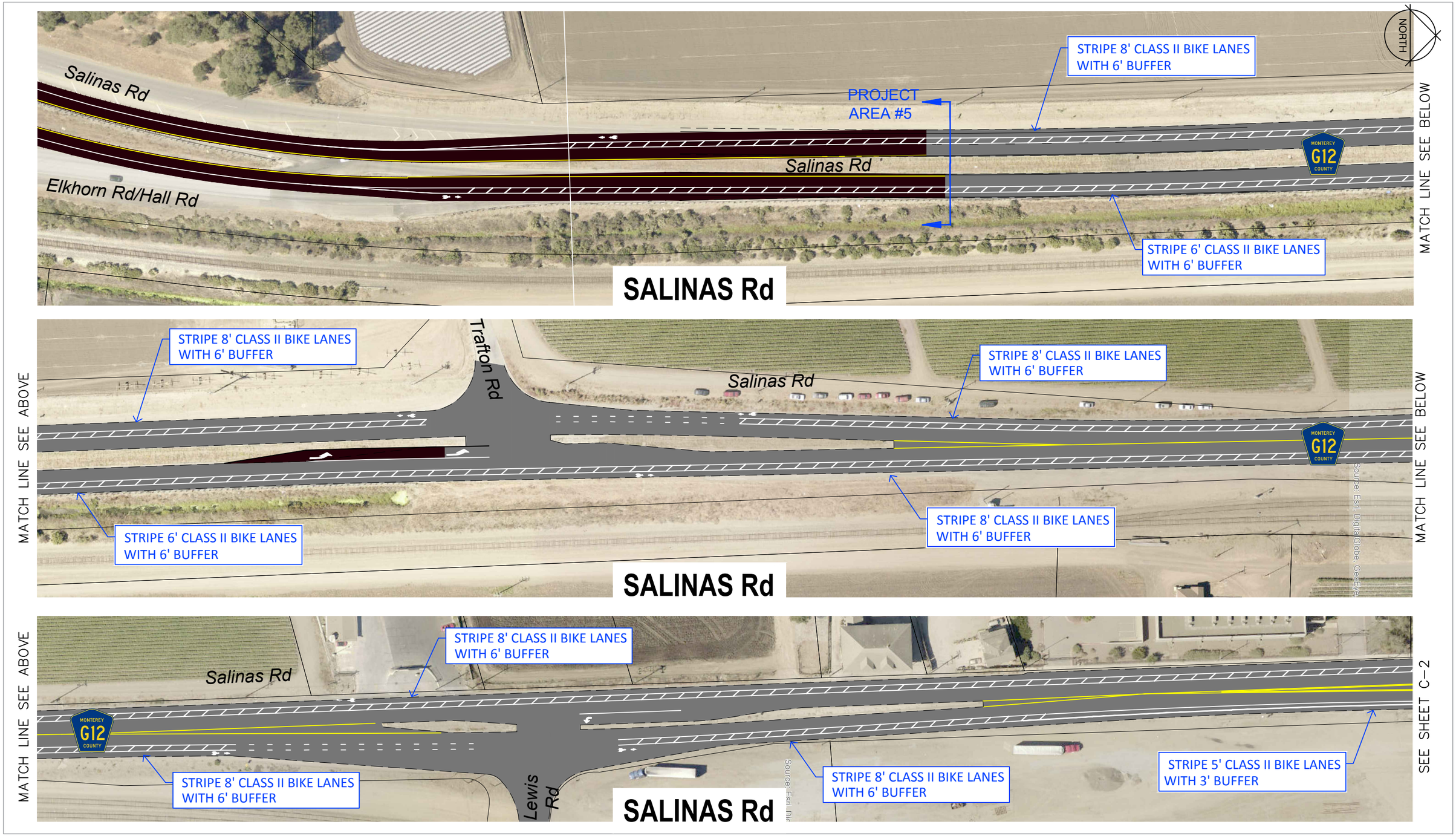
Report No. **-**

Date **03/27/2019**

Figure 7.4

Filename: K:\PRJ\2453\2453EX022.dwg Plot Date: 21 May 2019 - 10:53 AM

Source:



Prepared for:

TAMC TRANSPORTATION AGENCY FOR MONTEREY COUNTY

MONTEREY G12 COUNTY

G12 CORRIDOR IMPROVEMENTS

SALINAS RD

(ELKHORD RD / SALINAS RD TO SOUTH OF PAJARO)

0 100

Scale: 1"= 100'

GHD

Transportation Agency of Monterey County
G12 Corridor: Pajaro to Prunedale Corridor Study

PROJECT AREA #6
(DETAIL #1)

Project No. **11152201**
Report No. **-**
Date **3/27/2019**

Figure 7.5

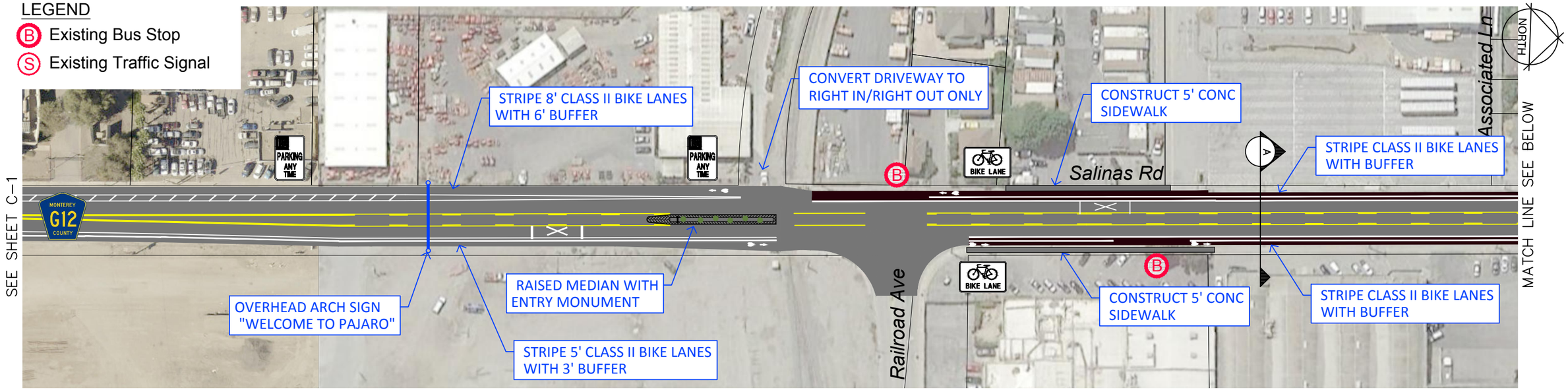
Filename: K:\PRJ\2453\2453EX022.dwg Plot Date: 4 June 2019 - 10:04 AM

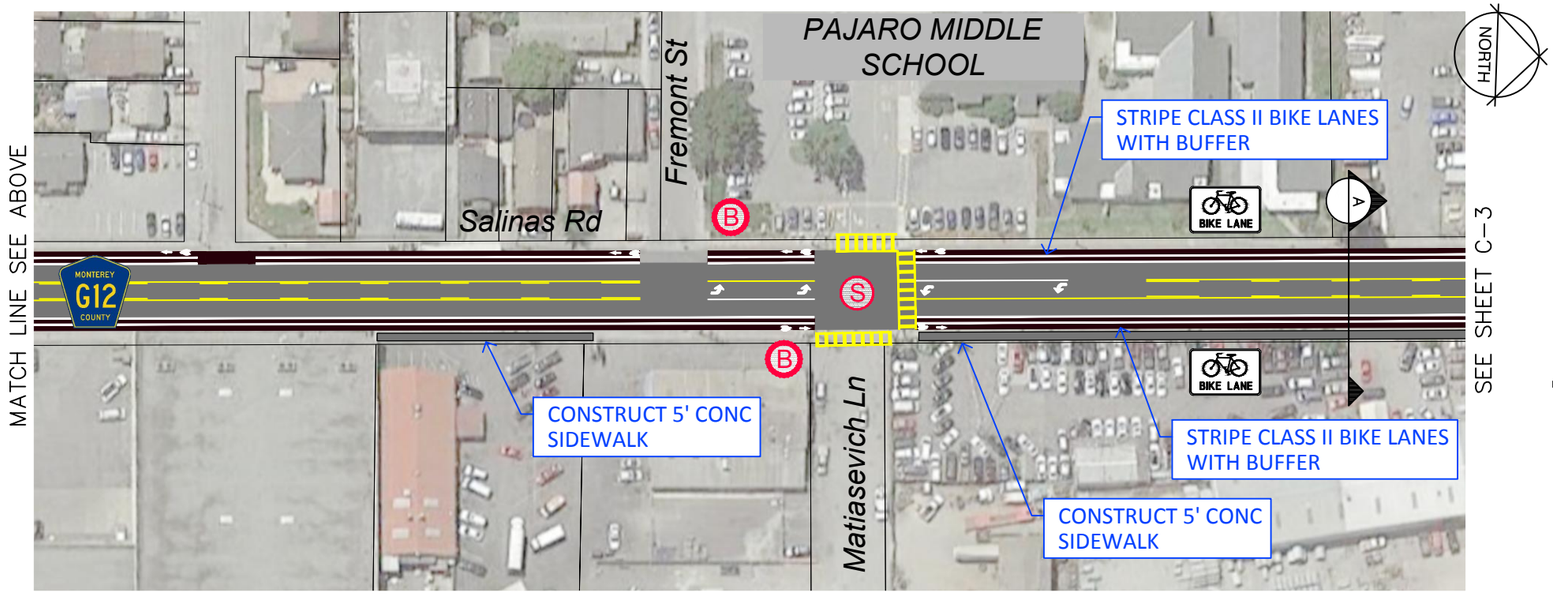
Source:

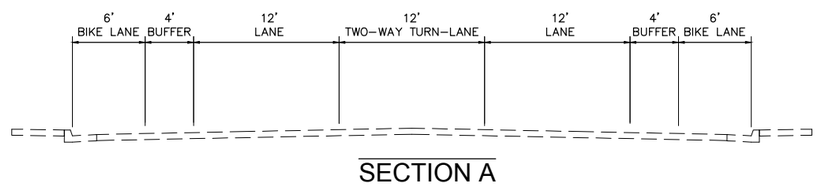
LEGEND

Ⓑ Existing Bus Stop

Ⓢ Existing Traffic Signal







SECTION A

SALINAS Rd

Prepared for: TAMC Transportation Agency for Monterey County; Monterey G12 County

G12 CORRIDOR IMPROVEMENTS
SALINAS RD
(SOUTH OF PAJARO TO MATIASEVICH LN)

Scale: 1"= 100' (0 – 100)

GHD

Transportation Agency of Monterey County
G12 Corridor: Pajaro to Prunedale Corridor Study

PROJECT AREA #6
(DETAIL #2)

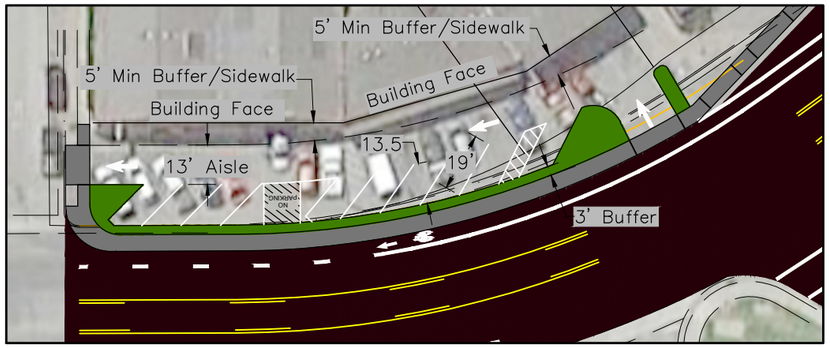
Project No. 11152201
Report No. -
Date 03/27/2019

Figure 7.6

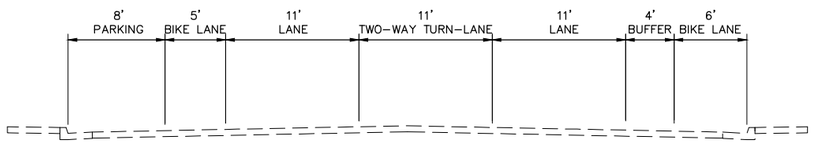
Filename: K:\PRJ\2453\2453EX022.dwg Plot Date: 4 June 2019 - 10:06 AM

Source:

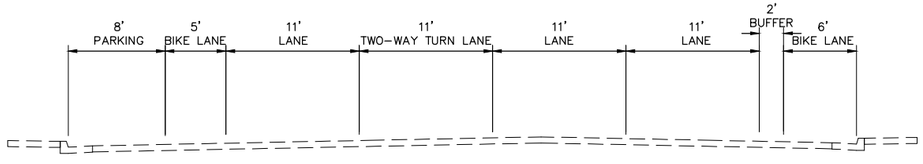
ALTERNATIVE 1
NO TRAFFIC SIGNAL AT BISHOP St
UPGRADE EXISTING CROSSING



PARKING RECONFIGURATION DETAIL



SECTION B



SECTION C

Prepared for: TAMC Transportation Agency for Monterey County; Monterey G12 County

G12 CORRIDOR IMPROVEMENTS
SALINAS RD and PORTER DR
(MATIASEVICH LN TO SALINAS RD/PORTER DR)

0 100
Scale: 1"= 100'

GHD

Transportation Agency of Monterey County
G12 Corridor: Pajaro to Prunedale Corridor Study

PROJECT AREA #6
(DETAIL #3)

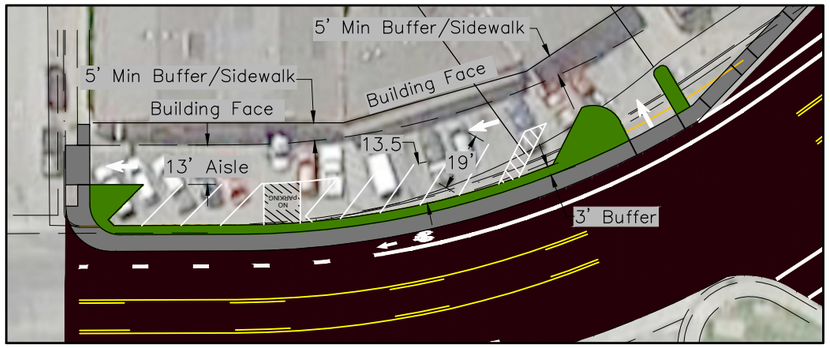
Project No. **11152201**
Report No. **-**
Date **03/27/2019**

Figure 7.7

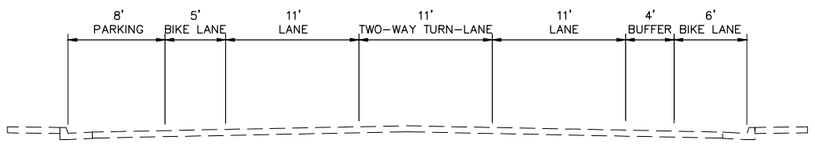
Filename: K:\PRJ\2453\2453EX022.dwg Plot Date: 4 June 2019 - 10:07 AM

Source:

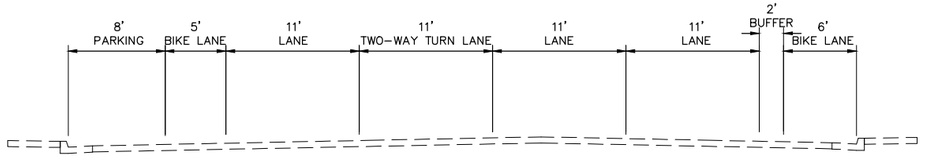
ALTERNATIVE 1
NO TRAFFIC SIGNAL AT BISHOP St
UPGRADE EXISTING CROSSING



PARKING RECONFIGURATION DETAIL



SECTION B



SECTION C

Prepared for: TAMC Transportation Agency for Monterey County; Monterey G12 County

G12 CORRIDOR IMPROVEMENTS
SALINAS RD and PORTER DR
(MATIASEVICH LN TO SALINAS RD/PORTER DR)

0 100
Scale: 1"= 100'

GHD

Transportation Agency of Monterey County
G12 Corridor: Pajaro to Prunedale Corridor Study

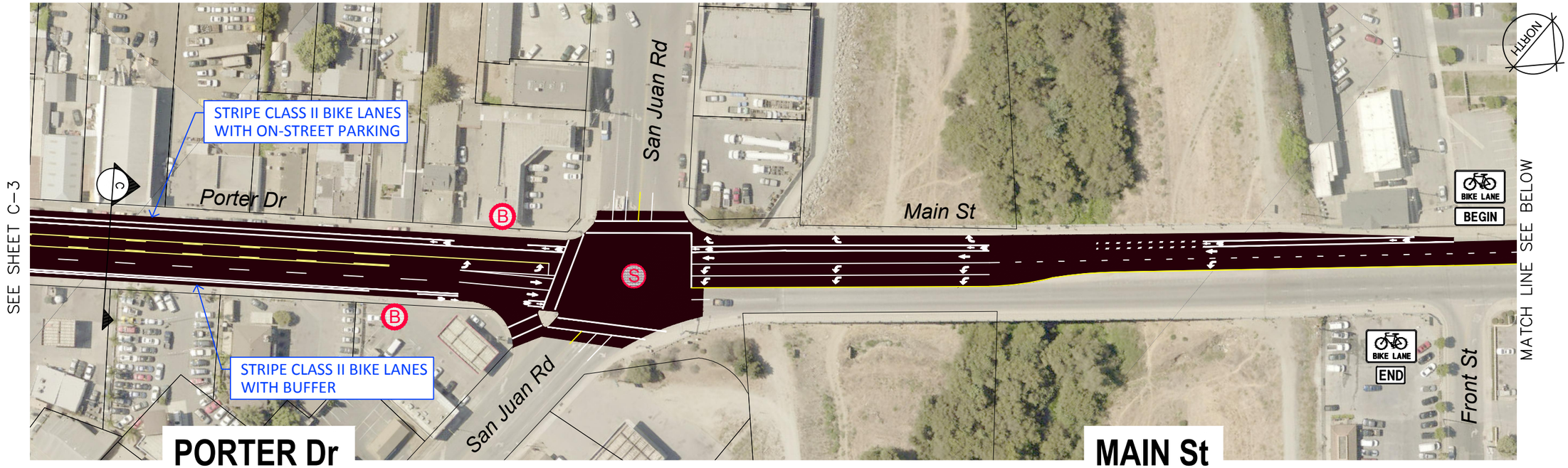
PROJECT AREA #6
(DETAIL #3)

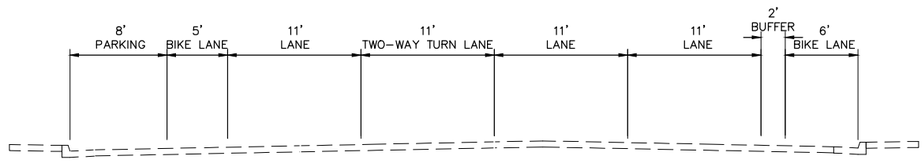
Project No. **11152201**
Report No. **-**
Date **03/27/2019**

Figure 7.7

Filename: K:\PRJ\2453\2453EX022.dwg Plot Date: 7 June 2019 - 10:42 AM

Source:





SECTION C

Prepared for: TAMC TRANSPORTATION AGENCY FOR MONTEREY COUNTY

MONTEREY G12 COUNTY

G12 CORRIDOR IMPROVEMENTS

PORTER DR and MAIN ST

(SALINAS RD / PORTER DR TO RIVERSIDE DR-STATE ROUTE 129)

0 100

Scale: 1"= 100'

GHD

Transportation Agency of Monterey County
G12 Corridor: Pajaro to Prunedale Corridor Study

PROJECT AREA #6
(DETAIL #4)

Project No. 11152201
Report No. -
Date 03/27/2019

Figure 7.8

Filename: K:\PRJ\2453\2453EX022.dwg Plot Date: 4 June 2019 - 10:09 AM

Source:

7.4.1 Operations Comparison

Traffic operations were analyzed for projected long-term conditions with and without the proposed improvement concepts. Table 7.3 presents the comparison of intersection operations with and without the proposed improvements under the Year 2040 forecasted conditions for the AM peak hour. Table 7.4 presents the comparison of intersection operations with and without the proposed improvements under the Year 2040 forecasted conditions for the PM peak hour.

Table 7.3 Project Area 6: Year 2040 Intersection Operation Improvement Comparison – AM Peak Hour

Intersection	Control Type Change	2040		2040 Improved		Signal Warrant Met?
		Delay	LOS	Delay	LOS	
Salinas Rd & Pajaro School	Signal	11.9	B	11.9	B	-
Porter Dr & Salinas Rd/Stender Ave*	**Stop Control to Right Out Only**	**65.8**	**F**	14.0	B	**No**
Main St/Porter Dr & San Juan Rd	Signal	24.0	C	25.9	C	-

Table 7.4 Project Area 6: Year 2040 Intersection Operation Improvement Comparison – PM Peak Hour

Intersection	Control Type Change	2040		2040 with Improvements		Signal Warrant Met?
		Delay	LOS	Delay	LOS	
Salinas Rd & Pajaro School	Signal	6.3	A	6.5	A	-
Porter Dr & Salinas Rd/Stender Ave*	**Stop Control to Right Out Only**	**67.3**	**F**	21.2	C	**No**
Main St/Porter Dr & San Juan Rd	Signal	49.2	D	40.2	D	-

Notes: 1. LOS and Delay based on worst minor street approach for stop-controlled intersections, average of all approaches for Signal
2. Signal Warrant is based on California Manual on Uniform Traffic Control Devices Warrant 3
*3. **Bold** indicates intersections operating deficiently*
** LOS determined based on SimTraffic*

Roadway segment operations for Project Area 6 are projected to continue to operate at LOS E/F for a two-lane arterial with left turn lanes. As shown in Tables 7.3 and 7.4, under the projected 2040 conditions without any improvements, the intersection of Porter Dive/Salinas Road/Stender Avenue, operates at LOS F in the AM and PM peak hours.

With the proposed improvements through Pajaro, all of the study intersections are projected to operate acceptably during the AM and PM peak hours, under 2040 conditions. Converting the Salinas Road approach to G12 to be right-turn-out only not only alleviates the delay for the left turns, but provides for a safer intersection given potential conflicts with turning traffic on G12 and on Stender Avenue. Reconfiguring the pull-in parking area north of Bishop Street with curb, gutter, and sidewalk adjacent to the roadway, and parking between the sidewalk and the building

7.4.2 Bicycle Level of Traffic Stress (LTS)

The proposed improvements include installation of 8' wide Class II Bike Lanes with a 6' Buffer along Salinas Road south of Pajaro, and then Class II bike lanes at minimum, install a 3' buffer where feasible within Pajaro. These improvements will provide safer bicycle facilities through Pajaro and connecting south to Elkhorn Road/Hall Road. With these improvements, the corridor will be improved from LTS 4 to LTS 3.

7.5 Improvement Cost Estimates

A series of planning-level cost estimates have been prepared for the proposed improvement concepts for Project Area 6. The preliminary cost estimates for the improvement concepts for Project Area 6 are attached in Appendix D. The sources used for the creation of these cost estimates are the 2018 Contract Cost Data provided by the State of California Department of Transportation, Caltrans, and recent bid summary results of recent projects to determine the unit costs. The cost estimates are necessary to determine the funding required for the transportation improvements. All cost estimates include the cost of preliminary project design and approval, environmental considerations, final design, construction, administration, right-of-way, and construction management and inspection. Construction costs include basic roadway construction items such as paving, storm drainage, lighting, signing, and striping. Table 7.5 presents the cost estimates for the improvements within Project Area 6.

Table 7.5 Project Area 6 Cost Estimates

Project Area 6 Improvements	Cost Estimate
Salinas Rd - Road Diet with Buffered Bike Lanes	$ 315,000
Improvements within Pajaro	$ 1,635,000
Project Area 6 Total Cost	**$ 1,950,000**

7.5.1 Safety Benefit

Based on the SWITRS and TIMS collision data over the five year period between 2012 and 2016, there were a total of 226 collisions for Project Area 6, with 3 fatal collisions, and 53 collisions involving injuries. The following collision characteristics represent the greatest potential for safety improvement along the corridor within Project Area 6.

- Unsafe speeds;
- Passing or Turning to/from corridor;
- Roadway departures (head-on, run-off road, sideswipe, hit-object, overturned);
- Lighting; and
- Bicycle/Pedestrian collisions

Possible mitigations to address these types of collisions include:

- Install Buffered Bike Lanes to reduce bicycle-related collisions (can also be implemented with a Road Diet);
- Provide flashing beacons (RRFB) at mid-block crossing to increase visibility for pedestrians;
- Installing dynamic speed feedbacks signs and increasing enforcement along the corridor;
- Install additional advance intersection warning signs to improve visibility of major access points;
- Install left- and right-turn pockets or a center two-way left-turn lane to provide safer deceleration for turning vehicles;
- Install a median barrier to prevent head-on collisions and reduce more severe collisions,
- Providing or improving illumination along the segment and/or at intersections to reduce collisions in dark or low lighting conditions; and
- Provide bicycle and pedestrian facilities to fill in gaps in the network, providing access between local communities and to key destinations, and provide separation from the traveled way for safe travel for active modes

7.5.2 Benefit-Cost Ratio & Collision Modification Factor Analysis

The proposed improvements, collision data and estimated costs were utilized in the Highway Safety Improvement Program (HSIP) Analyzer to calculate Benefit-Cost Ratios for the roadway improvements and each intersection control improvement based on a maximum of three applicable countermeasures. Table 7.6 presents the Benefit Cost and Project Cost for the road diet improvement south of Pajaro, some of the roadway and intersection countermeasures within Pajaro, and the overall Benefit-Cost for Project Area 6. The HSIP Analyzer PDF forms are included in Appendix E. As shown, all improvements within Project Area 6 are low-cost countermeasures which present significant safety benefits which immensely exceed the costs. Project Area 6 has the highest B/C ratio compared to the other Project Areas.

Table 7.6 Safety Benefit-Cost Summary for Project Area 6

Countermeasure	Road Diet	Rectangular Rapid Flashing Beacon, Median Entry, & Channelization	Bike Lane Pajaro	Project Area 6 Total
Benefit	$ 45,079,502	$ 23,802,514	$ 12,407,234	$ 81,289,250
Cost	$ 315,000	$ 253,500	$ 225,000	$ 1,950,000
B/C	143.1	93.9	55.1	**41.7**

Note: Total cost for Project Area 6 includes other costs for the entire project area not associated with the countermeasures identified, therefore Total Project Cost may be greater than the total costs for each countermeasure. The B/C for Project Area 6 Total is calculated based on the total benefit and the total project cost.

7.6 Stormwater Management

7.6.1 Existing Hydrology

Project Area 6 is situated within the Lower Pajaro River Watershed (12 digit Hydrologic Unit Code: 18060020805) and is part of the Monterey County NPDES Municipal General Permit Area. The project area runs perpendicular through the Pajaro River floodplain, which has a determined base flood elevation (Special Flood Hazard Area (SFHA) Zone AE) and a SFHA flood zone with flood depths of 1 to 3 feet as identified by the Federal Emergency Management Agency (FEMA) National Flood Insurance Program (NFIP). Existing storm water management systems consist of no known culverts at the time of this study, but does include various catch basins, storm drain networks, and sheet drainage to roadside ditches.

7.6.2 Proposed Transportation Improvements

Roadway and intersection improvements are summarized to determine the areas where potential for increasing impervious surface could occur. Project Area 6 consists of mostly surface striping, but does include new sidewalks, medians, and a parking lot improvement.

The proposed improvements for this project area will likely disturb approximately 0.4 acres and it is estimated that the improvements will result in less than a 1% increase in impervious surface across the project area as a whole. However, individual improvements within this overall project area may result in greater increases to impervious surface within their respective sub-watersheds and associated drainage capture and conveyance systems.

7.6.3 Potential Impacts to Water Systems and Biological Resources

Most of the proposed improvements within Project Area 6 are within areas that are currently paved and most improvements are surface treatments (striping). Therefore, the increase to impervious surface is negligible. However, some improvement areas, specifically in areas of new sidewalk and where parking lot improvements are to occur, there is a possibility for changes to the offsite drainage flow patterns and volumes. Any increase in impervious surface has the potential to overburden the existing drainage conveyance systems. An exceedance in the capacity of the hydraulic systems may result in upstream flooding, uncontrolled discharge, and erosion. It is recommended that any proposed improvement within the project area that increase impervious surface triggers an inventory of the existing hydrologic and hydraulic drainage systems within the

project area to determine if there are deficiencies that require replacement or upgrades to ensure adequate function and capacity.

Construction activities resulting in ground disturbance present the risk for discharge of pollutants of concern into State Clean Water Act Section 303(d) listed waterbodies. The project area has the potential for discharge into the Pajaro River – a listed 303(d) waterbody. At a minimum, construction related activities present sediment and pH water quality risks to the adjacent water systems and efforts should be taken to minimize the discharge of these and other listed pollutants of concern into these waterbodies.

Increases in pollutant discharge may also result in negative impacts to existing biological resources. Project Area 6 improvements occur in biological community areas that support a host of sensitive and protected habitats and species. Many of these species are dependent on the existing hydrology and water resources within this project area and larger watershed. Species of specific concern in or adjacent to the project area include the bank swallow. It is undetermined if the proposed project improvements would impact the existing sensitive biological resources; therefore, environmental investigations are needed to determine the impact potential.

7.6.4 Minimization and Mitigation Measures

There are a multitude of minimization and mitigation measures that can be implemented during the design and planning phase to help reduce the impact the proposed improvements have on the existing water and environmental resources. Of these, a top priority is to reduce the area of new impervious surface and preserve existing vegetation. Once this is accomplished to the best extent possible while maintaining the safety and function of the proposed improvement, a hydrology analysis and report (drainage study) should be completed to identify, at a minimum, the following:

- Stormwater design standards and criteria
- Soils and land use
- Existing hydrology and site drainage / runoff
- Changes in site drainage and discharge volume and the impacts to the existing hydraulics.
- Storm water quality and post-construction water treatment / low impact development requirements
- Recommendations for treatment of water quality / volume and drainage facility upgrades.

In addition to a drainage study, there are a host of other investigations that should be done to identify potential impacts to the water and environmental resources and help assist in further design development. The type, scope, and existing availability of these additional studies should be determined during the design and planning phase of the proposed improvements; however, it is anticipated that, at a minimum, this would include an environmental analysis and report to identify all potential impacts to the environment resulting from the proposed improvements.

As part of the project-planning phase, regulatory agencies and policies will need to be consulted to determine their jurisdictional applicability and what additional minimization and mitigation measures are required (i.e. United States Army Corps of Engineers, United States Fish and Wildlife Service, California Department of Fish and Wildlife, the Regional Water Quality Control Board - Central Coast Region 3, Monterey County Resource Management Agency – Environmental Services, etc…). Further, the proposed improvements shall undergo stakeholder consultation to determine

recommended minimization and mitigation measures (i.e. Transportation Agency for Monterey County, Association of Monterey Bay Area Governments, etc…).

Lastly, best management practices (BMPs) should be developed and specific measures shall be identified on project plans and project related documents (i.e. a Storm Water Pollution Prevention Plan) to reduce and control construction related erosion and discharge of pollutants into offsite water resources.

To minimize the potential for discharge of pollutants, all regulatory and stakeholder requirements, as determined applicable to the proposed improvement, shall be implemented during the construction phase. Additionally, all construction related BMPs including temporary soil stabilization measures, temporary sediment control measures, wind erosion control, tracking control, non-storm water management, and waste management and materials pollution control shall be implemented and maintained during construction.

Following construction completion and final site stabilization, it is recommended that a long-term maintenance plan be developed to address any on-going pollutant risks. This plan should identify the pollutant, the risk, the source, and the maintenance action needed to help reduce and mitigate the impact of the pollutant in perpetuity.

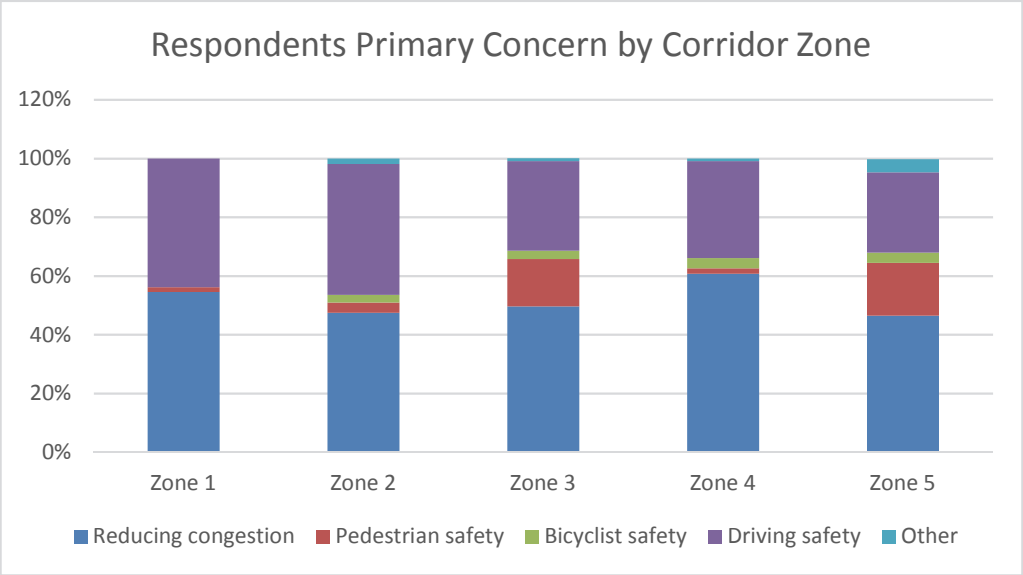
8. Summary

8.1 Public Outreach

The public outreach process was inclusive, interactive, and productive to inform the public of the study and obtain public input. TAMC formed a Focus Group for stakeholders and community leaders, and held meetings throughout the project to discuss the corridor and provide input on key areas of concern, coordinating potential improvements with current plans, and advising on the development of conceptual design alternatives.

Various types of outreach were included as opportunities for community input, including the creation of a project logo and project website: www.pajarotoprunedalestudy.org, which serves as a central location for project information and allowing the public to provide further input in addition to public meetings. Two sets of public meetings were held at three locations throughout the corridor, the first set occurred in May 2018 and the second set occurred December 2018. To get the word out for upcoming meetings, flyers and posters were distributed in English and Spanish throughout the Community in public areas. The website was translated into Spanish, and all public meetings provided Spanish translation services and/or fluent Spanish-speaking personnel.

The workshops were structured to provide multiple opportunities for community members to provide input and feedback on the study. During the first set of public meetings, in addition to a presentation, Maps of the G12 corridor were laid out on tables and the public were encouraged to use color-coded dots to identify areas of concern throughout the corridor for safety, congestion, biking, walking, and other categories. After the “dot boards” session, interactive polling technology was used to collect the participants’ opinions and concerns in real time. The second set of public meetings presented the improvement concepts via a presentation and on maps/boards. For both sets of community meetings, there were over 120 attendees in total. The chart below presents the overall results for the polling question asked during the first public meetings, “What is your Primary Concern”, for each Corridor Zone. Overall, congestion and safety were the main concerns of the meeting attendees, and pedestrian safety was of higher concern in the Las Lomas and Pajaro areas. Feedback on the improvement concepts was generally favorable; valid concerns were expressed as well as supportive comments. A detailed summary of the public outreach is included in Appendix B.



8.2 Existing and Forecasted Conditions Analysis

An Existing Conditions Report, dated August 2018, was prepared to fully understand current travel conditions along the entire G12 corridor, and is included in Appendix A. In addition to understanding existing travel conditions, forecasted travel conditions within Monterey County also needed to be understood. Using the AMBAG Regional Travel Demand Model, year 2040 travel forecasts were obtained and alternative improvements studied to derive a set of recommended operational and safety multimodal improvements for the G12 corridor. A technical memorandum, dated November 13, 2018, was prepared to summarize the development of forecasts that reflect future conditions represented by local and regional growth in approximately 20 years. The forecasting memorandum is included in the Appendix C.

8.3 Safety

8.3.1 Collision History

The G12 corridor has seen an increase in travel as well as an increase in the number of collisions over the past few years. There were 832 reported collisions along the G12 corridor over five years (2012-2016), with 11 fatalities, and 27 bicycle and pedestrian collisions. The collision rate for G12 is calculated to be 2.14 accidents per million miles traveled. This collision rate is three times higher than the statewide basic average rate for similar facilities. Table 8.1 presents a summary of the collision severity by Project Area.

Table 8.1 G12 Collision Severity Summary by Project Area

Project Area	Total Collisions	Fatal	Severe Injury	Injury (Other Visible)	Injury (COP)	PDO
1	178	0	3	16	50	109
2	135	4	3	15	31	82
3	180	2	2	20	39	117
4	20	1	0	3	6	10
5	93	1	3	8	26	55
6	226	3	8	11	34	170
Total	832	11	19	73	186	543

8.3.2 Potential for Reduced Collisions

Crash Reduction Factors provide the estimated percentage crash reduction that may be expected following the implementation of an intersection/roadway improvement or countermeasure at a given location. A higher Crash Reduction Factor provides greater potential for reducing the number of collisions. Typically, Crash Reduction Factors for intersection improvements are referred from the Federal Highway Administration (FHWA) Report No. FHWA-SA-08-011, *Desktop Reference for Crash Reduction Factors*. Crash Reduction Factors provided by the FHWA are estimations based on nationwide collision data. However, to maintain the locality of the data, this study used Crash Reduction Factors developed by Caltrans. Unlike the Crash Reduction Factors developed by the FHWA, Caltrans uses only statewide historical collision data to estimate Crash Reduction Factors . However this data was also checked with FHWA and Washington DOT and found to be consistent with their predicted crash numbers. The source for the Caltrans Crash Reduction Factors is Caltrans' *Local Roadway Safety, A Manual for California's Local Road Owners*, Version 1.4, April 2016. California's Local HSIP focuses on infrastructure projects with nationally recognized Crash Reduction Factors.

8.3.3 Improvements & Countermeasures

Collisions at intersections result in more severe crash types (head-on, broadside), especially when higher speeds are involved. Most of the collisions occurred due to unsafe speeds. The improvements proposed for the G12 corridor include a wide variety of countermeasures to reduce collisions along the corridor, including reducing the speeds along G12, especially in the rural communities of Prunedale, Las Lomas, and Pajaro. This study proposes to install seven roundabouts along the G12 corridor, which will significantly enhance the corridor's safety for collisions which occur at intersections.

Typically, the roundabout design forces the driver to reduce the speed in the intersection to 25-30 mph. However, drivers can travel an intersection with signal control at higher speeds due to no geometric constraints. Due to reduced travel speeds through the intersection and fewer conflict points, the installation of roundabouts along the G12 corridor is likely to eliminate most severe crash types (i.e. head-on, broadside) at intersections.

8.4 Improvement Concepts

This study addresses the circulation and safety needs for travel along the G12 corridor and the rural communities of Prunedale, Las Lomas, and Pajaro, specifically enhancing connections for pedestrians, bicycles and transit users, improving operations for motorists, and providing a safe environment for all users. While not every street can be designed to serve all users equally, there are opportunities to enhance service for all users while maintaining its principal transportation function. These concepts developed for the G12 corridor incorporate community values and retain the distinctive transitions between the adjacent land uses while ensuring safety and mobility for all users. These concepts support sustainable growth and livability, consistent with the Monterey County Regional Transportation Plan/Sustainable Communities Strategy (Long-range Plan), while preserving the special rural town sites of Prunedale, Las Lomas, and Pajaro. Overall, this study proposes to construct seven roundabouts and two traffic signals along the entire corridor, with improvements to two currently signalized intersections.

Corridor-wide improvements include:

- Bike Lanes throughout
- Sidewalks within Prunedale, Las Lomas, and Pajaro
- Two-way center left-turn lanes at strategic locations throughout the corridor for safety and operations;
- Other signal and lane modification improvements; and
- Other safety enhancement features including rumble strips, flashing beacons, intersection and roadway lighting, vehicle speed feedback signs, and guard rail as needed

Table 8.2 below presents a brief summary of the improvements by Project Area.

Table 8.2 G12 Corridor Improvement Concepts Summary

Project Area	Improvement Concepts
1. San Miguel Canyon Road, US 101 to Castroville Boulevard (Prunedale)	• Traffic Signal at Langley Canyon Road • Roundabout at Castroville Boulevard • 2 Lanes northbound between Moro Road and Castroville Boulevard • Sidewalk between Moro Road and Langley Canyon Road • Class I Bake Path connecting from Bike Lane to Prunedale North Road • Class II Bike Lane northbound between Prunedale North Road and Moro Road
2. San Miguel Canyon Road, north of Castroville Boulevard to Hall Road	• Echo Valley Road – Alternatives: ○ Roundabout (preferred) and Center Left Turn Lane south to Pond Derosa Lane, or ○ Center Left Turn Lane south to Pond Derosa Lane • Roundabout at Strawberry Road • Center Left Turn Lane between Echo Valley Road and Paradise Road, and between Mark Ryan Estates and Woodland Hill Lane • Guardrail north of Hambey Lane
3. Hall Road, San Miguel Canyon Road to Elkhorn Road (Las Lomas)	• Remove channelized right turn at San Miguel Canyon Road/Hall Road traffic signal • Sill Road – Alternatives: ○ Roundabout (preferred) or Traffic Signal • Realign Las Lomas Drive and Sill Road, construct Roundabout • Restrict left turns out at Willow Road • Center Left Turn Lane, Frontage Road, and Sidewalk west of Willow Road • Roundabout at Elkhorn Road
4. Elkhorn Road Bridge	• Widen bridge to install Bike Lanes on both sides, and sidewalk on south side
5. Elkhorn Road/Werner Road/Salinas Road	• G12/Werner Road/Salinas Road – Alternatives: ○ Consolidate intersections into one, construct roundabout, or ○ Install 3 traffic signals • Install Traffic Signal at Hillcrest Road • Install Traffic Signal at Fruitland Avenue (optional; if meets warrants)
6. Salinas Road/Porter Drive, north of Salinas Road/Elkhorn Road to Pajaro River Bridge (Pajaro)	• Road Diet with Buffered Bike Lanes along Salinas Road (current 4-lane section) south of Pajaro • Entry Median and overhead Welcome sign south of Railroad Tracks • Class II Bike Lanes (with Buffer where feasible) within Pajaro • Continuous 5' sidewalk within Pajaro • Flashing Beacons (RRFB) at mid-block crosswalk • Reconfigure diagonal on-street parking north of Bishop Street to be separated from roadway • Convert Salinas Road minor road approach at Porter Drive to be Right Turn Only out • Reconfigure southbound Porter Drive south of San Juan Road to be one lane (remove lane merge) • Reconfigure southbound approach lane geometry of Porter Drive/Main Street at San Juan Road to have one right turn pocket, one thru lane, and two left turn lanes (one continuous lane, one turn pocket) • Install overhead sign for southbound traffic

8.5 Operational Analysis (LOS, Corridor Travel Times)

Forecasted travel is expected to experience growth in the next approximate 20 years. By 2040, travel conditions will exacerbate current traffic congestion along the G12 corridor, and result in worsening peak hour operations at the intersections, with the majority operating at LOS E/F. With the proposed preferred improvements throughout the corridor, intersections are projected to operate acceptably at LOS D or better for 2040 forecasted peak hour travel conditions.

Generally, travel times along the corridor will be similar to current conditions, with a small increase to the corridor travel times with the added growth in traffic and the implementation of the proposed improvements. The travel times are projected to increase with the proposed improvements by approximately no more than 2 minutes, under 2040 conditions. Travel speeds will generally be slower through the local communities and roundabouts, however the delay to the side streets will be significantly reduced.

8.6 Stormwater Management and Water Quality

The G12 corridor traverses across a wide range of topographic and hydrologic conditions. As a complete segment, the G12 corridor crosses three (3) twelve digit Hydrologic Unit Code (HUC) watersheds, four (4) Special Flood Hazard Areas (SFHA) subject to inundation by the 1% annual chance flood as determined by the Federal Emergency Management Agency (FEMA) National Flood Insurance Program (NFIP), four (4) defined drainages and adjacent floodplains, and a host of other minor drainages. Of particular consideration to water quality and storm water management is the segment of the corridor running through the Elkhorn Slough Basin.

All recommended improvements along the corridor reflect these sensitivities and are considerate to both the water resources and the plant and animal species that depend on the healthy function of these drainages. All unavoidable impacts will be minimized and mitigated through appropriate pollution control measures and post-construction water treatment requirements. Additionally, all proposed improvements will minimize or avoid impacts to floodplains, base flow elevations, and the function of the existing drainage systems and their capacity.

8.7 Life-Cycle Costs

The following section presents brief summaries of the parameters used in assessing the life cycle costs for the entire corridor.

Collison Costs

Costs associated with collisions anticipated for each proposed intersection improvement was quantified using the Highway Safety Improvement Program (HSIP) Analyzer (in PDF format) to calculate the Safety Benefit cost. The Safety Benefit calculated in the HSIP Analyzer monetizes the societal cost associated with the predicted number and severity of collisions that may occur for each proposed countermeasure or intersection control, estimated to reflect the design life of the countermeasure. The HSIP Analyzer utilizes the collision modification factors published in the Local Roadway Safety Manual for California Local Road Owners (Version 1.4, June 2018), and the societal crash cost based on the Highway Safety Manual (HSM)), First Edition, 2010, adjusted to 2018 Dollars. The HSM, Part B - Chapter 7, includes more details on conducting Economic

Appraisal for roadway safety projects. Local agencies will be required to utilize the HSIP Analyzer to calculate the B/C ratio as part of their application for HSIP funding. Starting in Cycle 7 call for projects, the fatality and severe injury costs have been combined for calculating the benefit. The collision costs (in 2018 Current Dollar Value) are as follows:

- Fatal & Severe Injury Combined (KA)
    - Roadway/: $2,000,000
    - Non Signalized Intersection: $2,310,000
    - Signalized Intersection: $1,460,000
- Evident Injury – Other Visible (B): $126,500
- Possible Injury – Complaint of Pain (C): $71,900
- Property Damage Only (O) Accidents: $11,800

The letters in parenthesis (K, A, B, C and O) refer to the KABCO scale; it is commonly used by law enforcement agencies in their crash reporting efforts and is further documented in the Highway Safety Manual. Figures were calculated based on an average Fatality (K) / Severe Injury (A) ratio for each area type, a crash cost for a Fatality (K) of $6,418,400, and a crash cost of a Severe/Disabling Injury (A) of $345,800. These costs are used in the HSIP Analyzer, and are based on *Table 7-1, Highway Safety Manual (HSM), First Edition, 2010*, Adjusted to 2018 Dollars.

The HSIP Analyzer was utilized, for each Project Area, to monetize the societal cost associated with the predicted number and severity of collisions that may occur for each proposed countermeasure or intersection control, estimated to reflect the design life of the countermeasure. Other unit costs below are from Vehicle Operation Cost Parameters 2016 published by Caltrans.

Delay Costs

To calculate the delay costs for the build and no-build scenarios (alternatives), the value of travel time was quantified for each. The delay costs were computed using the delay for the PM peak hour periods. In assessing the delay costs, the costing for the value of time for automobiles ($13.65/person hours) and for trucks ($31.40/person hours) was used.

Fuel Costs

To calculate the fuel cost for the alternatives, the vehicle operating costs were quantified. The fuel costs (vehicle operating costs) were computed using the delay for the AM and PM peak hour periods for both the Alternatives. An Average fuel price (for Regular Unleaded automobile fuel) of $3.18 is used.

Environmental Costs

To calculate the environmental cost, the greenhouse gas emissions costs were quantified for the project. The health cost of Carbon Monoxide (CO) in a rural California is $75/ton while that of Nitrogen Oxide (NOx) is $13,900/ton.

Construction Cost

Based on the concept-level preliminary project cost estimates (see Appendix D), the total estimated project construction costs (including design, environmental, right-of-way, construction and construction management costs) for each alternative were used.

Operation & Maintenance Cost

Another important component of the cost associated with both alternatives will be related to its operation & maintenance costs. The maintenance and operation cost for a traffic signal includes providing power service to the signal and street lighting ($600/yr), signal retiming ($1,500/3 yrs), and signal maintenance for power outages/new detector loops/etc ($5000/yr). The roundabout alternative would incur much lower operation and maintenance costs limited to the cost to power street lighting, which is estimated at $250 annually.

Service Life

The build alternative analyzed for the ultimate design year is projected to provide acceptable levels of service for the Design Year 2040; however, the no-build scenario is projected to operate unacceptably. It can be concluded that the build alternative will provide increased benefit with regards to service life when compared to the no-build alternative.

Landscape Maintenance Cost

The landscape maintenance cost is directly proportional to the area covered by the landscape for this project and other areas to be maintained within the entire County. Roundabouts typically have a central island covered by landscaping, in addition to median areas not typical for a signal. An estimated cost of about $5000/yr is used for the Roundabout while $0/yr was used for Signal alternative.

8.7.1 Benefit-Cost Ratio

Benefit cost (B/C) ratios were calculated for the entire corridor. The B/C ratio measures the expected return on investment for comparing the no-build scenario to the build scenario with the proposed improvements. Safety is a notable performance metric driving the B/C Ratio. Without any improvements, the cost for predicted collisions is significantly higher compared to the predicted cost with the safety improvements which reduce collisions. The total life-cycle cost for the design year 2040 for the no-build scenario is estimated to be $1,313,952,400 and for the build scenario with the proposed improvements the life-cycle cost is estimated to be $635,144,824. The benefit-cost ratio is calculated to be 13.3 for the corridor improvements as a whole. Table 8.3 presents the breakdown of the life-cycle costs for the no-build scenario and the build scenario for the proposed improvements along the G12 corridor. Table 8.4 the B/C ratio for the proposed improvements along the G12 corridor. The B/C ratio for the proposed improvements along G12 corridor-wide is 13.3.

Table 8.3 G12 Corridor Life-Cycle Costs

Life-Cycle Costs	2040 No-Build	2040 with Improvements	Benefit
Travel Time & Vehicle Operation	$ 77,359,000	$ 86,348,000	$ (8,989,000)
Emissions/GHG	$ 823,000	$ 1,170,000	$ (347,000)
Predicted Collisions/Safety	$1,235,190,100	$ 491,786,524	$ 743,403,576
Initial Capital/Project Costs	$ -	$ 54,840,000	$ (54,840,000)
Operation & Maintenance	$ 580,300	$ 1,000,300	$ (420,000)
Total Life-Cycle Costs	**$1,313,952,400**	**$ 635,144,824**	**$ 678,807,576**

Table 8.4 G12 Corridor B/C Ratio

Life Cycle Benefit/Cost Ratio	
Build vs No-Build	
Safety Benefit	$ 743,403,576
Delay Reduction & Fuel Benefit	$ (8,989,000)
GHG Benefit	$ (347,000)
Total Benefits	**$ 734,067,576**
Added Operations & Maintenance Costs	$ 420,000
Added Capital Costs	$ 54,840,000
Total Project Costs	**$ 55,260,000**
Life Cycle Benefit/Cost Ratio	**13.3**

about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

Martin Inouye
Martin.Inouye@ghd.com
916.782.8688

Rosanna Southern
Rosanna.Southern@ghd.com
916.782.8688

www.ghd.com