Final Corridor Analysis Report

# GREEN VALLEY ROAD

**El Dorado County, California**

October 2014


Prepared for:

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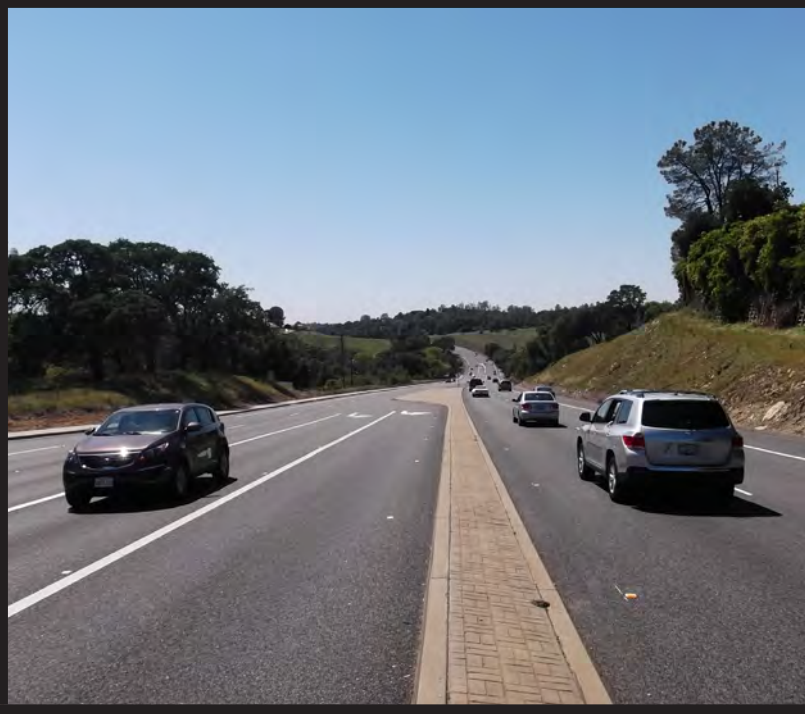

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING

MOVING**FORWARD**THINKING™

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## El Dorado County, California

Prepared For:
**County of El Dorado**
Long Range Planning, Community Development Agency
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Project No. 17805

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# PART A: EXECUTIVE SUMMARY

Traffic operations and safety has been the subject of public inquiries during open forums at the Board of Supervisors meetings and discussions at the El Dorado County Transportation Commission (EDCTC). El Dorado County has prepared this Corridor Analysis Report for Green Valley Road to examine operational and safety issues that exist on this roadway between the County line on the west and Lotus Road to the east within El Dorado County. The purpose of the study is to identify potential short-term improvements that may be implemented to improve operating and safety conditions for all users and modes of travel along the corridor. It should be acknowledged that any potential improvement to the Green Valley Road corridor may require the appropriate environmental documentation. All improvements identified in this report are "considerations" and "options". The improvements are also independent of each other. Their outcomes in improving roadway conditions vary extensively, and therefore, further engineering evaluation should be conducted to examine feasibility of these improvements.

## STUDY AREA

The study corridor spans approximately 11 miles of a predominantly rural area that includes two suburban unincorporated communities; El Dorado Hills, and Cameron Park. Green Valley Road is a two-lane arterial starting in the City of Folsom, which transitions to a four-lane roadway 260 feet west of Sophia Parkway. The four-lane roadway extends to Francisco Drive, then transitions back to a two-lane rural arterial east of Francisco Drive. The corridor remains a two-lane roadway until the end of the study area at Lotus Road. The study area was comprised of 16 intersections and 11 roadway segments.

## CAPITAL IMPROVEMENT PROGRAM (CIP)

Since the implementation of the County's 2004 General Plan, several CIP projects to improve Green Valley Road's traffic conditions have been completed within the study area, as follows:

- CIP #72354: Widening of Green Valley Road in the commercial area. Completed in December 2004
- CIP #73312: Green Valley Road/Silva Valley Parkway signalization including widening for construction of left-turn lanes and sidewalks. Completed in February 2007.
- CIP #72355: Widened portion of Green Valley Road between the County Line and Francisco Drive. Completed in September 2007.

There are also several other projects programmed along the corridor which are listed in the County's Current Year, 5-Year, 10-Year, and 20-Year CIP (see Part C: Key Findings and Improvement Considerations). In addition, the City of Folsom has received a grant to widen Green Valley Road to four-lanes from East Natoma Street to Sophia Parkway. Construction for that project is tentatively scheduled to begin in 2017.

## ANALYSIS METHODOLOGY

A field visit with El Dorado County staff was performed on April 28, 2014, with two follow-up field visits to collect inventory of roadway and intersection characteristics. In addition, the field visits also included the following facilities:

- **Speed Limit Signs:** an inventory of speed signs along the corridor was gathered;
- **Private Driveways:** an inventory of sight distance observations and measurements was gathered for the private property accesses between Loch Way and Bass Lake Road;
- **Bicycle Facilities:** an inventory of type and extent of bicycle facilities on the corridor was gathered.
- **Pleasant Grove Middle School:** traffic circulation issues in the vicinity of Pleasant Grove Middle School was observed and pick-up and drop-off activities were surveyed;
- **Purple Place Retail Center:** an inventory of its driveways and associated issues was gathered;

In order to perform operations analysis, the weekday AM (6:30 to 9:30) and PM (3:30 to 6:30) peak period turning movement counts were performed on May 6, 2014 (Tuesday) at the study intersections. School afternoon peak period (1:30 to 3:30 PM) turning movement counts were also performed on May 6, 2014 at the selected intersections. Roadway segment data were collected from May 3, 2014 to May 11, 2014 to capture a full week. Since the equipment at two segments malfunctioned in May, the data was re-collected from August 23, 2014 to August 29, 2014. The segment data included traffic counts, classification counts and speed measurements. Traffic data and field reconnaissance was used to perform operations analysis at the study locations. The methodologies used to analyze intersection and roadway segment operations are outlined in the Transportation Research Board's *Highway Capacity Manual*, 2010 version (HCM 2010). All operational analysis was performed using the County's standard procedures and methodologies. The study locations were analyzed using the Level of Service (LOS) standards outlined in the County's General Plan Policy *TC-Xd*.

## FINDINGS: TRAFFIC OPERATIONS

Intersection and roadway segment traffic conditions were evaluated based on operational analysis and field observations. Key findings and improvement considerations are presented below.

- The **Green Valley Road/El Dorado Hills Boulevard/Salmon Falls Road intersection** does not meet the County's LOS E threshold during the afternoon school peak hour. The County's CIP project, which is currently being processed to modify alignment of the northbound and southbound approaches at the El Dorado Hills Boulevard/Salmon Falls Road intersection will allow for protected left-turn phasing at these approaches. As a result, the overall intersection delay would reduce and LOS would meet County's threshold.
- The SimTraffic analysis indicated that the average delay at **the Green Valley Road/Pleasant Grove Middle School signalized intersection** currently operates at LOS E in the AM peak hour, exceeding the County's LOS D threshold. The critical movements, i.e. westbound Green Valley Road left-turn and through movements operate at LOS F and LOS D respectively. The

westbound left-turn queues at the primary western school access extend beyond the newly constructed Silver Springs Parkway. A range of improvements may be considered to enhance the school's internal circulation to alleviate queues and deficient operations at this intersection in the AM peak hour. It should be noted that El Dorado County has no jurisdiction over the school property.

- The other study intersections also meet the County's operational standards during the study peak hours. All study segments meet the County's operational standard, with most operating at LOS D or better during the AM and PM peak hours.
- Field observations and operational analysis reported extensive vehicular queues between Francisco Drive and El Dorado Hills Boulevard/Salmon Falls Road, primarily in the westbound direction in the AM peak and eastbound direction in the PM peak hour. While signal coordination and Time of Day timings plans would slightly improve the LOS, it would result in reduction of spillback issues arising from closely spaced intersections.
- The operational analysis indicates that the estimated queues at the following movements exceed the storage capacity, and thereby potentially block the adjacent through lanes. Left-turn lane pocket may be extended to provide sufficient storage at these movements.
    - Northbound Silva Valley Parkway left-turn lane at Green Valley Road
    - Westbound Green Valley Road left-turn lane at Pleasant Grove School Signalized Access
    - Northbound Cambridge Road left-turn lane at Green Valley Road
    - Westbound and northbound left-turn lanes at Green Valley Road/Cameron Park Drive intersection.

## FINDINGS: SPEED LIMIT SIGNS AND SURVEYS

Speed surveys observed 85$^{th}$ percentile speeds exceeding the posted speed limits on the following study segments by more than 5 miles per hour (mph).

- #2 Sophia Parkway to Francisco Drive – observed speeds were approximately 9-10 mph higher than the posted speed of 50 mph.
- #5 Silva Valley Parkway to Malcolm Dixon Road – observed speeds in the westbound direction were nearly 9 mph higher than the prima facie speed of 55 mph.
- #7 Deer Valley Road (West) to Bass Lake Road – observed speeds in the westbound direction were 6 mph higher than the prima facie speed of 55 mph.

There are no signs on the corridor to make motorists aware of impending downstream speed reduction or transition areas except for the one present just west of Bass Lake Road in the eastbound direction. Speed transition zone treatments could increase motorists' awareness of the context environment and potentially reduce the prevailing speeds. Treatment applications could include installing traffic signs such as W3-5, automated speed feedback signs, gateway features such as sign stating "Welcome to El Dorado Hills", and traverse rumble strips. California Highway Patrol and El Dorado County Sheriff have programs that utilize portable speed feedback trailers as "public education." These speed feedback trailers are available for County use upon request.

In addition, key intersections along the above-mentioned segments could be subject to those improvements that have potential to reduce the prevailing speeds. Traffic calming strategies such as: 1) lane narrowing concept on the major road approach with pavement markings and rumble strips; 2) major road approach splitter islands and/or approach curvature; and, 3) minor road approach splitter island should be considered. The intent of these lane narrowing concepts is to increase visibility of the intersection, reduce vehicle speeds on the major road approach, and thereby potentially reduce crashes.

## FINDINGS: CRASH ANALYSIS

Over the three-year study period, 158 total crashes were reported within the study area, Green Valley Road from the County line to the Lotus Road intersection.. Of the 158 reported crashes, 44 percent resulted in an injury and 4 percent resulted in a fatality. A total of 81 crashes occurred along a roadway segment (i.e. at least 250 feet away from a major intersection). There were more severe crashes reported along the segments than at the intersections within the study area. Rear-end, broadside and fixed-objected were predominant crash types, accounting for approximately 75 percent of all reported crashes. Approximately 70 percent of crashes along the corridor cited “unsafe speed”, “unsafe turning movement” and “Did not yield right of way” as the contributing factors for crashes.

The segment between El Dorado Hills Boulevard and Silva Valley Parkway reported the highest crash rate of 1.22 crashes per million vehicle miles along the corridor. Similarly, the Cameron Park Drive and Ponderosa Road intersection reported the highest crash rate of 0.83 per million entered vehicles along the corridor. None of the study intersections or segments exceeds the County’s benchmark of average crash rates. Therefore, the County is not required to take further actions. However, considerations are proposed to improve traffic operations, reduce speeds and enhance safety in the corridor to potentially reduce crashes and their severity.

## FINDINGS: BICYCLE FACILITIES

Class II bicycle lanes are present between the El Dorado/Sacramento County line and Francisco Drive, Pleasant Grove Middle School and Cameron Park Drive/Starbuck Road, and in the vicinity of Deer Valley Road (West). As such, there are gaps in the bicycle lanes along the corridor. The current bicycle lane pavement markings are infrequent along the corridor and are not marked at the far side of all study intersections along the corridor. The signage to mark the beginning and end of the bike lane is inconsistent. Only a few bicyclists were seen using the existing bicycle facilities. Some bicyclists were also observed to share the travel lane with motorists between the El Dorado Hills and Cameron Park communities.

The County’s 5-year CIP (#72309) project to install an 8-foot wide Class II bikeway between Loch Way and Pleasant Grove Middle School western entrance would enhance bicycle facilities in the rural region. In addition, Class II bicycle lanes between Francisco Drive and Loch Way would provide a continuous facility from the County Line on the west to Cameron Park Drive, and connect the El Dorado Hills and

Cameron Park communities with another mode of transport. The appropriate signage and markings could be provided to increase motorist's awareness for presence of the bicycle lanes. Longitudinal rumble strips could be considered along the outside edge line to augment safety of the bicyclists on the high speed rural segments.

## FINDINGS: PRIVATE DRIVEWAYS

A number of privately owned driveways exhibited insufficient intersection sight distance (ISD)[1] and stopping sight distance[2] (SSD) based on the California *Highway Design Manual*. It should be noted that the County does not improve private driveways. Any improvements, such as trimming vegetation, providing delineators to define turning radius are the responsibility of the private property owner. County could consider constructing dedicated left-turn lanes at the higher volume driveways and roadways to increase the stopping sight distance. In addition, installing an 8-foot wide shoulders or bicycle lanes (as described above) could improve the motorist's ability to avoid a crash.

## FINDINGS: PLESANT GROVE MIDDLE SCHOOL

The school provides two pick-up/drop-off areas for parents and a designated turnout for the school buses. Since a higher number of motorists access the school from the east in the morning, the western drop-off area is used more frequently than the eastern. As a result, vehicles stack up on the western driveway, as well as in the pass-by lane adjacent to the western drop-off lane. The eastern drop-off area is relatively underutilized, possibly influenced by the current closure of the eastern driveway. While County staff have modified the signal timing of the Pleasant Grove Middle School access to provide a longer green time for the westbound Green Valley Road left-turn phase (current timing sheets provide a maximum of 25 seconds of green time), queues are formed. During the field reviews that were conducted in Spring of 2014, the observed queues extended beyond the newly constructed Silver Springs Parkway. As such, extensive queues at the westbound Green Valley Road left-turn lane not only block adjacent through lane, but also prevents side-street motorists from turning left and right onto Green Valley Road. Circulation and operational issues were predominantly observed at the time of drop-off and typically last for approximately 15-20 minutes.

Although El Dorado County has no jurisdiction over the school site layout, the following improvements could be considered to improve traffic circulation within the school site:

[1] Intersection Sight Distance is also referred to as Corner Sight Distance. It is the clear line of sight in feet between the driver of a vehicle waiting at the crossroad (stop control) and the driver of an approaching vehicle on the major uncontrolled street.

[2] Stopping Sight Distance is defined as the distance needed for drivers to see an object on the roadway ahead and bring their vehicles to safe stop without colliding with the object.

- Appoint traffic monitors in the morning school peak hour to regulate the traffic flow;
- Modify pavement markings and curbs on the western driveway to clarify utilization of the pass-by lane to motorists;
- Complete a sidewalk along the eastern driveway to provide pedestrians with a continuous sidewalk between Green Valley Road and school property;
- Manage peak travel demand. Some measures include staggering school start times, expanding existing bus service, awarding incentives for those children that carpool to school, etc.

## FINDINGS: CUT-THROUGH TRAFFIC

Origin-destination (OD) data was collected using the Bluetooth™ technology enabled BlueMAC readers. BlueMAC readers were deployed at five locations to capture origin-destinations and route patterns on Allegheny Road and Salmon Falls Road. The analysis captured the origin destination data collected between Friday, May 2, 2014 and Tuesday, May 13, 2014. Four OD pairs were evaluated for the Allegheny Road cut through route: South Silva Valley Parkway to North Salmon Falls Road, South Silva Valley Parkway to Francisco Drive, East Green Valley Road to North Salmon Falls Road and East Green Valley Road to Francisco Drive. Cut-through traffic using Allegheny Road during the AM and PM peak periods ranged from 10 percent to 23 percent between the OD pairs, with the Silva Valley Parkway to Francisco Drive OD pair registering the highest proportion (23 percent) of cut through traffic in the AM peak. Two OD pairs were examined for the Salmon Falls Road cut-through traffic: South Silva Valley Parkway to Francisco Drive and East Green Valley Road to Francisco Drive. Cut-through traffic using Salmon Falls Road during the AM and PM peak periods ranged from 0 to 22 percent between the OD pairs, with the Silva Valley Parkway to Francisco Drive OD pair registering the highest proportion (23 percent) of cut through traffic in the PM peak.

Operational considerations discussed earlier could reduce the cut-through traffic on Allegheny Road and Salmon Falls Road. Enforcement and education could be used as a tool that deters motorists from driving behavior that violates existing regulations for driving maneuvers and excessive speed. Physical traffic calming measures such as rumble strips, chicane or lane narrowing could be considered. These measures are implemented in order to reduce speeds through an area, reducing the attractiveness of these streets in terms of travel time.

# Part B: Introduction

# PART B: INTRODUCTION

El Dorado County has prepared this Corridor Analysis Report for Green Valley Road to examine operational and safety issues that exist on this roadway between the County line on the west and Lotus Road to the east within El Dorado County. The purpose of the study is to identify potential short-term improvements that may be implemented to improve operating and safety conditions for all users and modes of travel in the corridor. It should be acknowledged that any potential improvement to the Green Valley Road corridor may require the appropriate environmental documentation. All improvements identified in this report are "considerations" and "options". The improvements are also independent of each other. Their outcomes in improving roadway conditions vary extensively, and therefore, further engineering evaluation should be conducted to examine feasibility of these improvements.

## STUDY BACKGROUND

Traffic operations and safety has been the subject of public inquiries during open forum at the Board of Supervisors meetings and discussions at the El Dorado County Transportation Commission (EDCTC). The Board of Supervisors directed County staff to move forward with a Corridor Analysis for Green Valley Road in July of 2013. Additional public input on the scope of the study was received at the Board of Supervisors meeting in October of 2013. The breadth of analysis presented herein is the direct result of the public comments and County staff's recommendations. Findings of this study will be brought forward and discussed at the public workshop and Board of Supervisors meeting to be held in the fall/winter of 2014 (dates to be determined).

## STUDY CORRIDOR CONTEXT

Green Valley Road extends from the Sacramento County/City of Folsom and traverses through the unincorporated County of El Dorado ending at Placerville Drive in the City of Placerville. The study corridor spans approximately 11 miles of a predominantly rural area that includes two suburban unincorporated communities; El Dorado Hills, and Cameron Park. Green Valley Road is a two-lane arterial starting in the City of Folsom, which transitions to a four-lane roadway 260 feet west of Sophia Parkway. The four-lane roadway extends to Francisco Drive, then transitions back to a two-lane rural arterial east of Francisco Drive. The corridor remains a two-lane roadway until the end of the study area at Lotus Road.

Several Capital Improvement Program (CIP) projects have been completed along the Corridor. There are also several other projects programmed along the corridor which are listed in the County's Current Year, 5-Year, 10-Year, and 20-Year CIP (see Part C: Key Findings and Improvement Considerations). In addition, the City of Folsom has received a grant to widen Green Valley Road to four-lanes from East Natoma Street to Sophia Parkway. Construction for that project is tentatively scheduled to begin in 2017.

## STUDY AREA

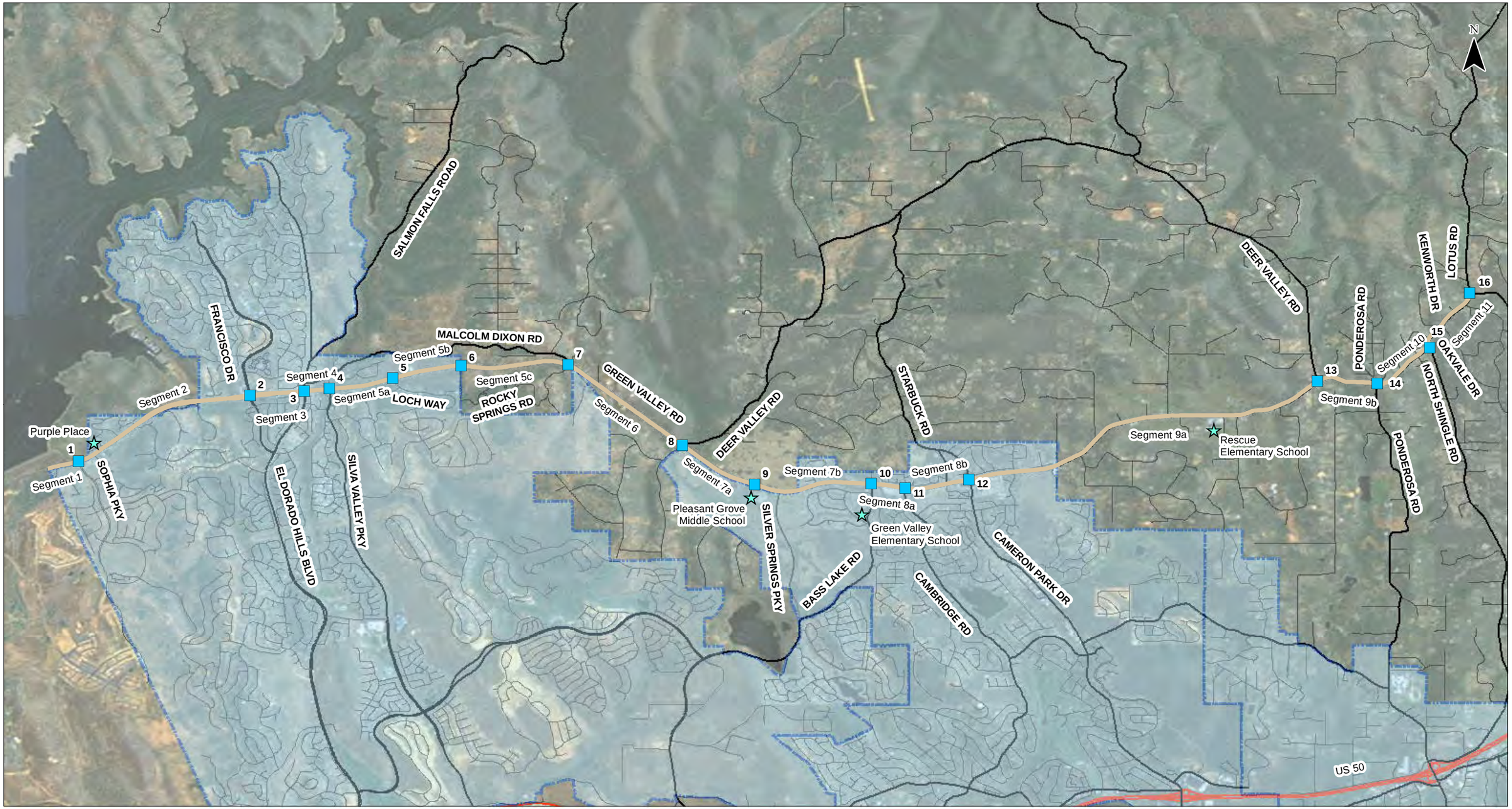
Study locations are listed below and shown in Exhibit 1.

**Intersections:**

1. Green Valley Road at Sophia Parkway
2. Green Valley Road at Francisco Drive
3. Green Valley Road at El Dorado Hills Boulevard/Salmon Falls Road
4. Green Valley Road at Silva Valley Parkway/Allegheny Road
5. Green Valley Road at Loch Way
6. Green Valley Road at Rocky Springs Road/Steves Way
7. Green Valley Road at Malcolm Dixon Road
8. Green Valley Road at Deer Valley Road (West)
9. Green Valley Road at Pleasant Grove Middle School (Main Access)
10. Green Valley Road at Bass Lake Road
11. Green Valley Road at Cambridge Road/Peridot Drive
12. Green Valley Road at Cameron Park Drive/Starbuck Road
13. Green Valley Road at Deer Valley Road (East)
14. Green Valley Road at Ponderosa Road (East)
15. Green Valley Road at North Shingle Road
16. Green Valley Road at Lotus Road

**Roadway Segments:**

1. El Dorado/Sacramento County Line/City of Folsom to Sophia Parkway
2. Sophia Parkway to Francisco Drive
3. Francisco Drive to El Dorado Hills Boulevard/Salmon Falls Road
4. El Dorado Hills Boulevard/Salmon Falls Road to Silva Valley Parkway/Allegheny Road
5. Silva Valley Parkway/Allegheny Road to Malcolm Dixon Road
6. Malcolm Dixon Road to Deer Valley Road (West)
7. Deer Valley Road (West) to Bass Lake Road
8. Bass Lake Road to Cameron Park Drive
9. Cameron Park Drive to Ponderosa Road (East)
10. Ponderosa Road (East) to North Shingle Road
11. North Shingle Road to Lotus Road




PointsOfInterest
Study Intersections
Study Segments
Highway
Major Road
Minor Road
Community Regions

**Study Intersections and Segments**
**Green Valley Road**

Exhibit **1**

*Coordinate System: GCS WGS 1984*

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## ANALYSIS APPROACH

This section briefly describes the technical approach and analysis methods used to examine current traffic operations and safety on the Green Valley Road corridor.

Field reconnaissance was undertaken and traffic data was collected to ascertain the operational characteristics of each of the study area intersections and roadway segments. Field visits were performed to collect data on physical features, measurements, and inventory of corridor characteristics. Weekday AM (6:30 to 9:30) and PM (3:30 to 6:30) peak period turning movement counts were performed on May 6, 2014 (Tuesday) at the study intersections. School afternoon peak period (1:30 to 3:30 PM) turning movement counts were also performed on May 6, 2014 at the selected intersections. Roadway segment data were collected from May 3, 2014 to May 11, 2014 to capture a full week. The segment data included traffic counts, classification counts and speed measurements.

The methodologies used to analyze intersection and roadway segment operations are outlined in the Transportation Research Board's *Highway Capacity Manual*, 2010 version (HCM 2010). All operational analysis was performed using the County's standard procedures and methodologies. General Plan Policy *TC-Xd* provides Level of Service (LOS) standards for the County operated and maintained roadways and intersections, as follows:

*Level of Service (LOS) for County-maintained roads and state highways within the unincorporated areas of the county shall not be worse than LOS E in the Community Regions or LOS D in the Rural Centers and Rural Regions except as specified in Table TC-2. The volume to capacity ratio of the roadway segments listed in Table TC-2 shall not exceed the ratio specified in that table.*

Community Region and rural area boundaries along the corridor is illustrated in Exhibit 1.

Crash data and reports were collected and analyzed along the study corridor over a three-year study period (2011–2013). These reports were used in conjunction with field observations, traffic (including speeds) conditions and physical features at the study locations to identify crash related patterns. Crash rates were calculated using the methodologies adopted by the County. The crash rate at the intersection and roadway is based on annual average crashes per Million Entering Vehicles (MEV) and Million Vehicle Miles (MVM) respectively. 1.0 crash per MEV for the intersections and 1.7 crashes per MVM for segments are the benchmarks used by the County. Any site with a crash rate above these benchmarks will be considered for additional action.

## REPORT ORGANIZATION

The remainder of the report is organized into the following three sections:

**Part C (Key Findings and Improvement Considerations)** – identifies Key Findings and presents improvement considerations related to traffic operations, safety and physical features.

**Part D (Technical Data and Analysis)** – describes analysis methodologies, key assumptions, data collection and field review summary and analysis results.

**Technical Appendix (provided under separate cover)** – provides traffic counts data, analysis inputs and output worksheets.

# Part C: Key Findings and Improvement Considerations

# PART C: KEY FINDINGS AND IMPROVEMENT CONSIDERATIONS

## TRAFFIC OPERATIONS

This section identifies existing traffic operational findings and deficiencies, and develops the improvement considerations. A detailed technical data, analysis and results are contained in *Part D* of this report.

All improvements identified in this section are "considerations" and "options". The improvements are also independent of each other. Their outcomes in improving roadway conditions vary extensively, and therefore, further engineering evaluation should be conducted to examine feasibility of these improvements.

### Key Findings

Intersection operations analysis indicated that the Green Valley Road/El Dorado Hills Boulevard/Salmon Falls Road intersection does not meet the County's Level of Service (LOS) threshold during the afternoon school peak hour, although this intersection meets the County threshold during the weekday AM and PM peak hours. The other study intersections currently meet the County's operational standards during the study peak hours. Based on SimTraffic analysis, the Pleasant Grove Middle School signalized access operates at LOS E during the AM peak hour, exceeding the County's LOS policy.

Roadway segment analysis indicates that all study segments meet the County's operational standard, with most operating at LOS D or better during the AM and PM peak hours. The segment between the County line and Sophia Parkway operates at LOS E in each direction. The westbound segment between Francisco Drive and El Dorado Hills Boulevard operates at LOS E during the AM peak hour.

Operations analysis indicates that during the AM peak hour the westbound queues at the El Dorado Hills Boulevard intersection can reach lengths of 1,000 feet, which spillback into the Silva Valley Parkway intersection. Similarly, the eastbound queues at the Silva Valley Parkway in the PM peak can extend back into the El Dorado Hills Boulevard intersection. Consistent with the field observations, operational analysis reported extensive queuing between Francisco Drive and El Dorado Hills Boulevard. Operational analysis also indicates extensive queuing at several left-turn lanes at the intersections. Left-turn queues that exceed the available storage can potentially block the adjacent through lane. This can cause "lane starvation" where available through movement capacity is not fully utilized. Intersections and movements where queues exceed the storage capacity are listed below:

- #3 El Dorado Hills Boulevard/Salmon Falls Road eastbound left-turn lane
- #4 Silva Valley Parkway northbound left-turn lane
- #9 Pleasant Grove School Access intersection's westbound left-turn lane
- #11 Cambridge Road northbound left-turn lane

- #12 Cameron Park Drive/Starbuck Road intersection's westbound and northbound left-turn lanes

The westbound left-turn queues at the primary access to Pleasant Grove Middle School were observed to exceed the available storage in the AM peak hour. The queues were observed to block the newly constructed Silver Springs Parkway and Travois Circle east of the school. The operational analysis indicates that the westbound left-turn movement operates at LOS F in the AM peak. The operational issues and associated improvement considerations specific to the Pleasant Grove Middle School are discussed later in this report, while the technical data and analysis are contained in *Part D*.

Based on speed surveys, observed 85th percentile speeds[3] on six segments, as identified below, exceeded the posted speed limits:

- o #1 County Line to Sophia Parkway – observed speeds were approximately 3 to 5 miles per hour (mph) higher than the posted speed of 50 mph.
- o #2 Sophia Parkway to Francisco Drive – observed speeds were approximately 9-10 mph higher than the posted speed of 50 mph.
- o #5 Silva Valley Parkway to Malcolm Dixon Road – observed speeds in the westbound direction were nearly 9 mph higher than the prima facie speed of 55 mph.
- o #7 Deer Valley Road (West) to Bass Lake Road – observed speeds in the eastbound and westbound directions were 3 and 6 mph higher respectively relative to the prima facie speed of 55 mph.
- o #9 Cameron Park Drive to Ponderosa Road – observed speeds were approximately 2-4 mph higher than the posted speed of 50 mph.
- o #10 Ponderosa Road to North Shingle Road – observed speeds were approximately 4 mph higher in both directions relative to the posted speed of 40 mph.

Given that the prevailing speeds are directly related with safety, a detailed discussion of prevailing speeds, potential issues and improvement considerations is in the *Safety and Physical Feature* section of this report.

## Programmed Improvements

The following capacity related projects are included on Green Valley Road in the County's 2014 Capital Improvement Program (CIP):

- CIP # 72309: Class II Bikeway (Current year project) – Loch Way to Pleasant Grove Middle School. Install striping and stencils to existing pavement with minor asphalt patching as needed.

[3] The 85th percentile speed is the speed which 85% of the vehicles are not exceeding. California Vehicle Code specifies setting the speed limit at the 85th percentile speed.

- CIP #73151 (5-year project): Install traffic signal interconnection to coordinate three traffic signals on Green Valley Road at the intersections of Francisco Drive, El Dorado Hills Boulevard, and Silva Valley Parkway. Minor widening at the El Dorado Hills Boulevard intersection will also allow for protected left-turn phasing on the northbound and southbound approaches. This project is in the process of being completed; however signal coordination was not activated at the time of this study.
- CIP #76114 (5-year project): Install improvements at the Green Valley Road/Deer Valley Road (West) intersection. This project was recently completed.
- CIP #76107 (5-year project): Construct new Silver Springs Parkway and connect with Green Valley Road. Install a signal at the Silver Springs Parkway and Green Valley Road intersection. The signal portion of the project is completed.
- CIP #GP159 (10-year project): Widen Green Valley Road between El Dorado Hills Boulevard/Salmon Falls Road and Deer Valley Road (West) from two lanes to four lanes.
- CIP #GP178 (20-year project): Widen Green Valley Road between Francisco Drive and El Dorado Hills Boulevard/Salmon Falls Road from two lanes to four lanes, including curb, gutter and sidewalk.
- CIP #GP179 (20-year project): Widening Green Valley Road from Deer Valley Road (East) to Lotus Road to two 12-foot lanes, with the addition of six left-turn pockets.

In addition to these improvements, the City of Folsom is currently preparing engineering and construction documents for the federally-funded project to widen Green Valley Road from East Natoma Street in Folsom to Sophia Parkway in El Dorado Hills. Approximately 1,100 feet of this widening project falls within El Dorado County. Construction is tentatively scheduled to begin in 2017.

## Improvement Considerations

The following considerations have potential to improve traffic operations along the corridor:

### *CIP Project Implementation*

The County's CIP project #73151, which is currently being processed to install traffic signal interconnect and modify alignment of the northbound and southbound approaches at the El Dorado Hills Boulevard/Salmon Falls Road intersection will allow for protected left-turn phasing at these approaches. As a result, the overall intersection delay would reduce and LOS would meet County's threshold. By eliminating north-south split signal phasing, the estimated queues at the eastbound left-turn lane would be accommodated within the currently available storage.

### *Signal Coordination*

Given that a coordinated signal system allows vehicles to continuously advance along the coordinated street with minimum stops and delays, coordinating the Francisco Drive, El Dorado Hills Boulevard and Silva Valley Parkway intersections along Green Valley Road for purposes of improving operations along the corridor was examined as part of this study.

In addition to the realignment improvement at the El Dorado Hills Boulevard intersection, signal coordination was evaluated for the weekday AM, PM, and afternoon school peak hours. It was determined that during the AM peak hour, coordination would minimally improve the operational performance of these three intersections (i.e. slight reduction delay with no effect on the LOS). During the PM peak hour, coordination was shown to improve the El Dorado Hills Boulevard intersection performance from LOS E to LOS D, while delays at the other two intersections would experience minimal change. Under the school peak hour conditions, signal coordination would improve LOS at the El Dorado Hills Boulevard intersection from LOS F to LOS D, which meets the County's standard. By improving the progression of vehicles to better match the respective "green times" of each intersection and developing Time of Day (TOD) coordination plans during the peak hours, signal coordination would also result in reduction of spillback issues arising from closely spaced intersections.

### *Extension of Left-turn Lanes*

Based on the traffic operations analysis, the following intersections shall be considered for the left-turn lane storage increases to accommodate the queues and reduce the possibility of queue spillback into adjacent upstream intersections:

- #4 Silva Valley Parkway/Allegheny Road: extend left-turn pocket to provide 320 feet of storage for the northbound Silva Valley Parkway approach. Extension of this lane may not be feasible given the presence of the left-turn lane for Highland Hills Drive.
- #11 Cambridge Road: extend the left-turn pocket to provide 200 feet of storage at the Cambridge Road northbound left-turn lane. Extension of this lane may not be feasible given the presence of the left-turn lane for the shopping center.
- #12 Cameron Park Drive: extend the left-turn lane to provide 230 feet of storage at the westbound Green Valley Road approach and 350 feet of storage at the northbound Cameron Park Drive approach.

These distances are approximate and should be verified prior to any improvement projects. Exhibit 2 and Exhibit 3 depict the improvement considerations related to traffic operations.


**Improvement Considerations - Traffic Operations**
**Francisco Drive to Silva Valley Parkway**
**Green Valley Road**

Exhibit **2**

Note: All referenced improvements are considerations and options for the corridor.

Coordinate System: GCS WGS 1984

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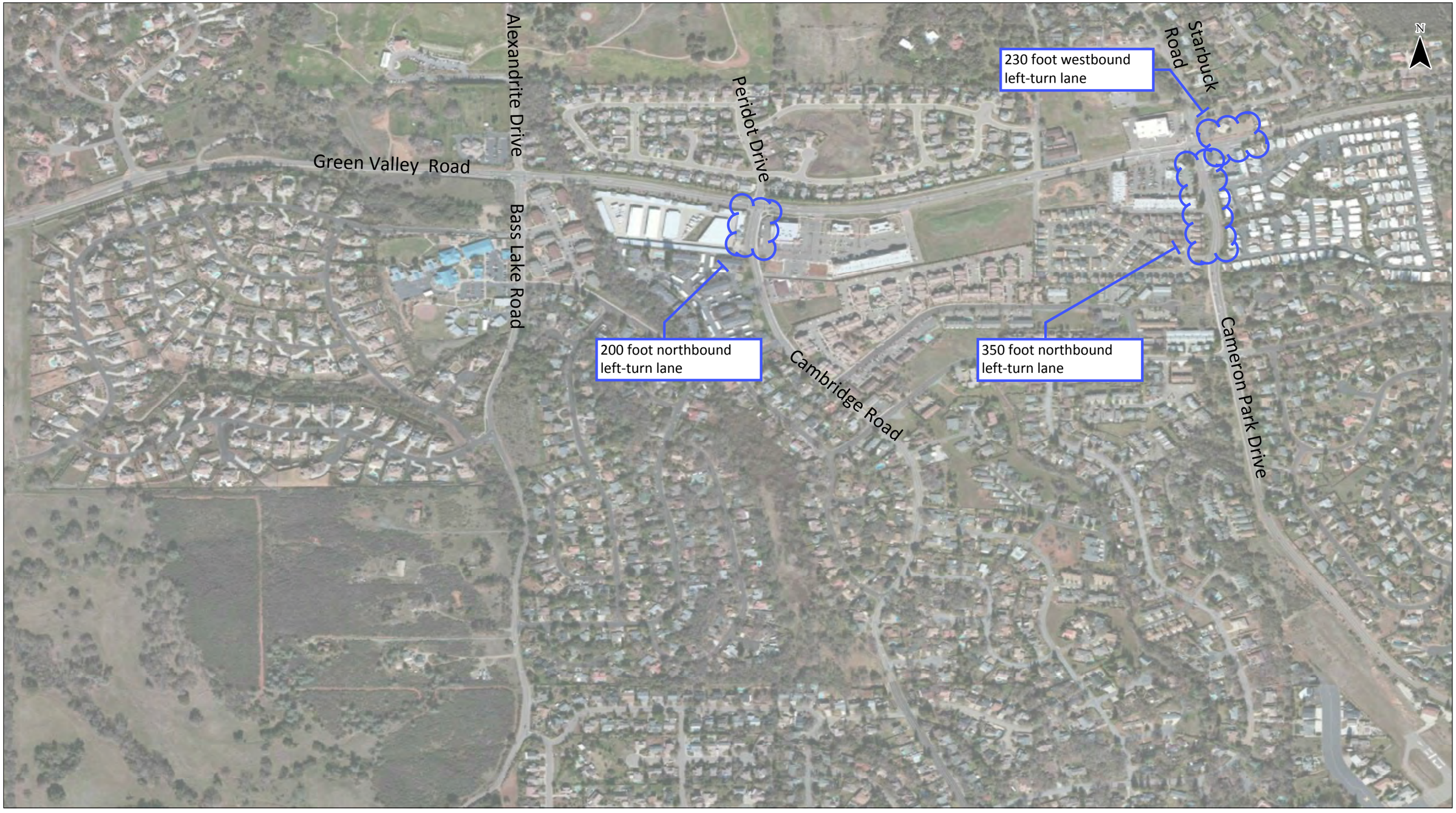


**Improvement Considerations - Traffic Operations**
**Cambridge Road to Cameron Park Drive**
**Green Valley Road**

Exhibit **3**

Note: All referenced improvements are considerations and options for the corridor.

Coordinate System: GCS WGS 1984

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# SAFETY AND PHYSICAL FEATURES

This section summarizes key findings of safety and physical features at the study locations, and develops related improvement considerations. The detailed technical data, analysis and results are contained in *Part D* of this report. As described later in the report, none of the study intersections or segments exceeds the County's benchmark of average crash rates. Therefore, the County is not required to take further actions; however, improvements suggested in this section should be considered to enhance safety in the corridor. The suggested improvements are not necessarily cumulatively needed to potentially enhance safety. Additional engineering assessment shall be conducted to verify feasibility of considerations outlined in this section.

## Study Segments

### *Segment #1: County Line to Sophia Parkway*

*Programmed Improvements*

- Widening from two to four lanes with turn lanes as needed (from East Natoma Street in the City of Folsom to Sophia Parkway in El Dorado County).

*Key Findings*

- Unsafe left-turning movement into the Green Valley Nursery and Landscape using a median refuge marked by double yellow markings.

*Improvement Considerations*

- Install a physical barrier (raised median) between Sophia Parkway and Shadowfax Lane for proper access to the Green Valley Nursery and Landscape.

### *Segment #2: Sophia Parkway to Francisco Drive*

*Programmed Improvements*

- None.

*Key Findings*

- A total of 22 crashes (the highest among the segments) occurred. These were predominately injury and fatality crashes.
    - Six of the 22 reported crashes reported "did not yield right of way" as a contributing factor.
    - Four of the 22 crashes reported "unsafe speed" as a contributing factor, while three registered "unsafe turning movement" as a contributing factor.

  - Rear-end was the predominant type of crash, followed by broadside and fixed object crash types.
  - Four of the 22 crashes occurred at night.
- Observed 85th percentile speeds reported to be 60 mph, exceeding the posted speed limits by 10 mph.
- Intersection sight distance at the western Purple Place access looking east is limited. Similarly, intersection sight distance at the eastern access looking west is limited.

*Improvement Considerations*

- Install a dynamic warning sign upstream of the westbound approach at the Mormon Island Drive intersection. Through sensors in the pavement, these signs are activated by the vehicles that exceed a predetermined speed limit (or posted limit) or by potential vehicle conflicts at the intersection. Exhibit 4 and Exhibit 5 are some examples of dynamic warning signs as outlined in the NCHRP Report 613[4]. This treatment is estimated to achieve a speed reduction ranging from 4 to 7 mph, although the benefits may diminish over time as the motorists become aware of the presence and purpose of these signs. Local law enforcement agencies, California Highway Patrol and El Dorado County Sheriff, have programs that utilize speed feedback trailers as "public education." These speed feedback trailers are available for public use upon request. An example of a speed feedback trailer is shown in Exhibit 6.

**Exhibit 4. Speed Feedback Sign**


[4] National Cooperative Highway Research Program (NCHRP) Report 613: Guidelines for Selection of Speed Reduction Treatments at High-Speed Intersections, Transportation Research Board, Washington D.C., 2008.

**Exhibit 5. Dynamic Warning Sign**


**Exhibit 6. Speed Feedback Trailer**


Source: http://www.ru2systems.com/products/radartrailers/

- Increase speed enforcement along this segment for a period of time.
- Install high friction pavement/surface, although this consideration alone may not be sufficient to reduce speeds along the segment. This treatment tends to cause a reduction in average speeds along the segment.
- Consider installation of an acceleration and deceleration lane at each Purple Place business driveway, consistent with the County's design standards. Acceleration/deceleration lane

provides motorists with an opportunity to speed up or slow down in a space not used high-speed through traffic.

- Install a raised median along this segment with provision of left-turn pockets at the unsignalized cross streets and driveways.

### *Segment #3: Francisco Drive to El Dorado Hills Boulevard/Salmon Falls Road*

#### *Programmed Improvements*

- CIP #GP178 (20-year project): Widen Green Valley Road between Francisco Drive and El Dorado Hills Boulevard/Salmon Falls Road from two lanes to four lanes, including curb, gutter and sidewalk.

#### *Key Findings*

- Shoulders are inconsistent on both sides of the roadway. Shoulders at east end of the segment are narrow, particularly on the south side.
- There are no bicycle facilities[5] (i.e., Class II lanes or paths).
- There are gaps in pedestrian facilities (i.e., sidewalks) along this segment.
- Three of four crashes recorded along this segment occurred during at night. The segment does not have street lighting on either side.

#### *Improvement Considerations*

- Increase pedestrian connectivity by extending the sidewalk on the north side and connect it with the El Dorado Hills Boulevard/Salmon Falls Road intersection.
- Install an 8-foot wide Class II bikeway in each direction.
- Appropriate Landscape and Lighting district could install lighting along the segment on one or both sides of the roadway.

### *Segment #4: El Dorado Hills Boulevard to Silva Valley Parkway*

#### *Programmed Improvements*

- CIP #GP159 (10-year project): Widen Green Valley Road between El Dorado Hills Boulevard/Salmon Falls Road and Deer Valley Road (West) from two lanes to four lanes.

[5] Bicycle facilities include Class I, Class II or Class II bicycle lanes. Class I provides a separated right of way for the exclusive use of bicycles and pedestrians with minimal cross-flow. Class II provides a stripped lane for bicyclists on the street or highway adjacent to auto travel lanes. Class II provides for shared use portion of the roadway with pedestrian or auto traffic.

*Key Findings*

- The segment reported the highest crash rate of 1.22 crashes per million vehicle miles along the corridor. However, this rate does not meet the County's benchmark to warrant for further evaluation.
- Most of the crashes that occurred along this segment were attributed to unsafe speeds; although the speed surveys did not reveal excessive speeding along the segment.
- Five of the seven crashes occurred during at night. The segment does not have light poles on either side.
- There are no bicycle or pedestrian facilities (i.e. Class II lanes, sidewalks) along the segment.

*Improvement Considerations*

- Install an 8-foot wide Class II bikeway in each direction.
- Increase pedestrian connectivity by providing a sidewalk on the north side of the road, consistent with Segment #3.
- Appropriate Landscape and Lighting district could install lighting along the segment on one or both sides of the roadway.

***Segment #5: Silva Valley Parkway /Allegheny Road to Malcolm Dixon Road***

*Programmed Improvements*

- CIP #GP159 (10-year project): Widen Green Valley Road between El Dorado Hills Boulevard/Salmon Falls Road and Deer Valley Road (West) from two lanes to four lanes.
- CIP #72309: Class II Bikeway (Current year project) – Loch Way to Pleasant Grove Middle School.

Key Findings

- Multiple private driveways along this segment have limited intersection and stopping sight distance due to vegetation, hillside, and roadway characteristics (horizontal and vertical curvatures).
- There are no bicycle facilities along the segment, although bicyclists were observed.
- Six of the nine reported crashes on this segment were a result of unsafe turning movements.
- Five of the nine reported crashes involved roadway departure and resulted in a fixed object (e.g. trees, pole, signs, etc.) crash.
- This segment had the highest proportion of roadway departure crashes during at night.
- This segment exhibited the greatest differential between the posted speed (55 mph which is the "maximum speed limit" for a local roadway CVC 22349) and 85$^{th}$ percentile speed (64 mph). This segment is the longest stretch (1.6 miles) of Green Valley Road without any posted speed limit signs except for a sign in each direction just east of the Silva Valley Parkway intersection. This is a prima facie speed limit (55 mph), thus it is not signed at a certain interval (CVC 22349).

*Improvement Considerations*

The first two Improvements recommended at the Loch Way, Rocky Springs Road/Steves Way and Malcolm Dixon Road intersections are likely to reduce speeds on this segment. In addition, intersection improvement considerations are included in the next section.

- Install a speed limit sign in each direction along the corridor, preferably between Loch Way and Malcolm Dixon Road. Local law enforcement may place a speed trailer at 3 – 6 month intervals for public "speed education."
- Increase speed enforcement along this segment for a period of time.
- Additional considerations for this segment are discussed in the *Speed Limit Signs* section.
- Upgrade existing shoulders to 8-foot wide shoulders for the entire segment. Shoulders can act as an acceleration and deceleration area at the private driveways, with the potential to improve sight distance.
- Construct a Class II bicycle lane in each direction along the segment (CIP #72309). The striping of a Class II bicycle lane can give the appearance of a narrower auto lane. Narrower lanes have been shown to encourage decreased automobile speeds.

### *Segment #6: Malcolm Dixon Road to Deer Valley Road (West)*

*Programmed Improvements*

- CIP #GP159 (10-year project): Widen Green Valley Road between El Dorado Hills Boulevard/Salmon Falls Road and Deer Valley Road (West) from two lanes to four lanes.
- CIP #72309: Class II Bikeway (Current year project) – Loch Way to Pleasant Grove Middle School.

*Key Findings*

- Half of the reported crashes involving animals on the entire study corridor occurred on this segment; although, "Deer Crossing" signs are posted along this segment.
- There are no Class II bicycle lanes along the segment with the exception of the eastern segment near Deer Valley Road (West) intersection which has a Class II bike lane in each direction.
- Multiple access points along the segment have limited stopping and intersection sight distances due to vegetation and the horizontal and vertical curvature of the roadway.

*Improvement Considerations*

- Widen roadway to include bicycle lanes or a multi-use path along the roadway in line with the more rural character of the area.
- Upgrade existing shoulders to 8-foot wide shoulders for the entire segment. Shoulders can act as an acceleration and deceleration area at the private driveways, with the potential to improve sight distance.

### *Segment #7: Deer Valley Road (West) to Bass Lake Road*

*Programmed Improvements*

- CIP #72309: Class II Bikeway (Current year project) – Loch Way to Pleasant Grove Middle School.

*Key Findings*

- There are no bicycle facilities east of the Pleasant Grove School's western access.
- Private accesses just east of Deer Valley Road (West) have limited stopping and intersection sight distances due to vegetation and the horizontal and vertical curvature of the roadway.
- The segment had multiple vulnerable road user crashes, including two bicycle crashes and one pedestrian crash.

*Improvement Considerations*

- Widen roadway to include Class II bicycle lanes or a multi-use side path along the roadway in line with the more rural character of the area.
- Request the Rescue School District improve circulation within the Pleasant Grove Middle School to reduce queue spillbacks during the AM peak. This improvement is further discussed in the *Pleasant Grove Middle School* section.
- Install a speed limit sign east and west of the Deer Valley Road (West) intersection in each direction.
- Upgrade existing shoulders to 8-foot wide shoulders for the entire segment. Shoulders can act as an acceleration and deceleration area at the private driveways, with the potential to improve sight distance.

### *Segment #8: Bass Lake Road to Cameron Park Drive/Starbuck Road*

*Programmed Improvements*

- No improvements have been identified in the County's 2014 CIP.

*Key Findings*

- Sidewalk on the south side is discontinuous.

*Improvement Considerations*

- Install sidewalks in gap areas to provide continuous sidewalk on the south side of this segment.
- Upgrade existing shoulders to 8-foot wide shoulders for the entire segment. Shoulders can act as an acceleration and deceleration area at the private driveways, with the potential to improve sight distance.

### *Segment #9: Cameron Park Drive/Starbuck Road to Ponderosa Road*

#### *Programmed Improvements*

- CIP #GP179 (20-year project): Widen Green Valley Road from Deer Valley Road (East) to Lotus Road to provide two 12-foot lanes, with addition of six left-turn pockets.

#### *Key Findings*

- Half of the reported crashes caused an injury. There were 2 fatalities in 3 years.
- Fixed-object crashes were the predominant crash type. All the fixed-objected crashes were due to departing the roadway. Approximately 20 percent of the reported crashes occurred on wet roadway surface conditions.
- "Unsafe turning movement" and "unsafe speed" were the top two contributing factors of crashes, although the speed surveys did not reveal excessive speeding along the segment.
- This segment has narrow roadway with no shoulder in either direction east of Crowdis Lane.

#### *Improvement Considerations*

- Install raised or post mounted delineators[6] along the edge of the pavement, especially at horizontal curves and near intersections with minor streets. An example of post mounted delineators is illustrated in Exhibit 7.

**Exhibit 7. Post Mounted Delineator Example**

[6] Delineators are guidance devices and beneficial at locations where the alignment might be confusing or unexpected to motorists.

Source: www.pexco.com

- Install an 8-foot wide shoulder in each direction. Shoulders can act as an acceleration and deceleration area at the private driveways, with the potential to improve sight distance.
- Consider providing a left-turn lane at those collector or local street intersections that present sight distance and safety concerns along the segment. These streets may include: La Crescenta Drive, Ulenkamp Road, and Deer Valley Road (East).
- Install advance intersection warning signs (W2 series) on Green Valley Road for each of the major side-street intersections to alert motorists about the upcoming intersection and potential conflicts.

### *Segment #10: Ponderosa Road to North Shingle Road*

#### *Programmed Improvements*

- CIP #GP179 (20-year project): Widen Green Valley Road from Deer Valley Road (East) to Lotus Road to provide two 12-foot lanes, with addition of six left-turn pockets.

#### *Key Findings*

- There are no shoulders in either eastbound or westbound direction.
- Observed 85$^{th}$ percentile speed on this segment was recorded to be 5 mph over the posted speed limit.

#### *Improvement Considerations*

- Supplement the posted speed limit sign (R2-1) just west of North Shingle Road in the westbound direction with an automated speed feedback sign. Local law enforcement may place a speed trailer at 3 – 6 month intervals for public "speed education."
- Install an 8-foot wide shoulder in each direction. Shoulders can act as an acceleration and deceleration area at the private driveways, with the potential to improve sight distance.

### *Segment #11: North Shingle Road to Lotus Road*

#### *Programmed Improvements*

- CIP #GP179 (20-year project): Widen Green Valley Road from Deer Valley Road (East) to Lotus Road to provide two 12-foot lanes, with addition of six left-turn pockets.

#### *Key Findings*

- Observed 85$^{th}$ percentile speed in the westbound direction was recorded to be 10 mph over the posted speed limit. Likewise, the eastbound speeds were approximately 5 mph over the posted limit.

- No shoulders or bike lanes are present east of Kenworth Drive/Oakvale Drive.

*Improvement Considerations*

- Supplement the posted speed limit signs (R2-1) on this segment with an automated speed feedback sign. Local law enforcement may place a speed trailer at 3 – 6 month intervals for public "speed education."
- Install an 8-foot wide shoulder or Class II bike lanes east of Kenworth Drive/Oakvale Drive in each direction. Shoulders can act as an acceleration and deceleration area at the private driveways, with the potential to improve sight distance.

## Study Intersections

### *Intersection #1: Green Valley Road & Sophia Parkway*

*Programmed Improvements*

- Widen Green Valley Road from East Natoma Street in Folsom to Sophia Parkway in El Dorado Hills to provide two travel lanes in each direction. SACOG Project Green Valley Road (SAC21280).

*Key Findings*

- A total of 15 crashes (the highest among the study intersections), predominantly rear-end and broadside.
    - Nine of the 15 reported collisions reported unsafe speeds as a contributing factor.
    - Two resulted from red-light violations.
    - Most of crashes occurred during daylight.
- A dedicated Class II bike lane, connecting the existing Class II bike lane on the upstream segment is not provided on any of the approaches.

*Improvement Considerations*

- Add a signal head for the westbound through movement on the signal pole in the southeast corner of the intersection. This treatment has the potential to augment motorists' reaction time when the signal is red.
- Install a dynamic warning sign upstream of the eastbound and westbound approaches. These signs are activated by the vehicles that exceed a predetermined speed limit (or posted limit) or by potential vehicle conflicts at the intersection. Exhibit 4 and Exhibit 5 are some examples of

dynamic warning signs as outlined in the NCHRP Report 613[7]. Local law enforcement may place a speed trailer at 3 – 6 month intervals for public "speed education."

- Install a Class II bike lane on the northbound Sophia Parkway and eastbound Green Valley Road approaches in accordance with the County's design standards.

### *Intersection #2: Green Valley Road & Francisco Drive*

*Programmed Improvements*

- No programmed improvements have been identified.

*Key Findings*

- A dedicated Class II bike lane is not provided on the eastbound approach.
- Pedestrian curb ramps on the southwest and southeast corners are not ADA compliant. There are no sidewalks on the west side of Francisco Drive.
- Higher proportion of nighttime crashes relative to daytime crashes.

*Improvement Considerations*

- Provide sidewalk facilities on the east of Francisco Drive north of the intersection.
- Improve southwest and southeast corners with ADA compliant ramps.
- Appropriate Landscape and Lighting district could install street lighting east of the intersection on the south side where a lane drop occurs.
- Install a Class II bike lane on the eastbound and westbound Green Valley Road approaches.

### *Intersection #3: Green Valley Road & El Dorado Hills Boulevard/Salmon Falls Road*

*Programmed Improvements*

- CIP #GP178 (20-year project): Widen Green Valley Road between Francisco Drive and El Dorado Hills Boulevard/Salmon Falls Road from two lanes to four lanes, including curb, gutter and sidewalk. This project is anticipated to add an additional eastbound and westbound through lane at this intersection.

*Key Findings*

- Pedestrian landings at all four corners are not ADA compliant and do not provide detectable[8] warnings.

[7] National Cooperative Highway Research Program (NCHRP) Report 613: Guidelines for Selection of Speed Reduction Treatments at High-Speed Intersections, Transportation Research Board, Washington D.C., 2008.

- There are no sidewalks at this intersection.

*Improvement Considerations*

- Install ADA compliant curb ramps at all four corners.
- Provide a sidewalk at the northwest corner of the intersection.

### *Intersection #4: Green Valley Road & Silva Valley Parkway/Allegheny Road*

*Programmed Improvements*

- CIP #GP159 (10-year project): Widen Green Valley Road between El Dorado Hills Boulevard/Salmon Falls Road and Deer Valley Road (West) from two lanes to four lanes. This project is anticipated to add an additional eastbound and westbound through lane at this intersection.

*Key Findings*

- Only the southwestern corner has detectable warnings and pedestrian access to the corner.
- There are no sidewalks approaching the corners except one on the west side of Silva Valley Parkway.

*Improvement Considerations*

- Install curb ramps and detectable warnings consistent with ADA guidelines.

### *Intersection #5: Green Valley Road & Loch Way*

*Programmed Improvements*

- CIP #GP159 (10-year project): Widen Green Valley Road between El Dorado Hills Boulevard/Salmon Falls Road and Deer Valley Road (West) from two lanes to four lanes. This project is anticipated to add an additional eastbound and westbound through lane at this intersection.

[8] Detectable warnings are an Americans with Disabilities Act (ADA) requirement in the current Americans with Disabilities Act Accessibility Guidelines (ADAAG) for the use of detecting the boundary between the sidewalk and the street. Placing a detectable warning at the bottom of a curb ramp identifies the transition between the sidewalk and the street for people with vision impairments.

### *Key Findings*

- Intersection sight distance looking west is somewhat limited by continuously growing vegetative foliage.
- While motorists wait for an acceptable suitable gap to turn left into Loch Way, trailing vehicles pass by them using the shoulder on the right. Vehicle skid marks were seen on the roadway surface.
- Higher than posted speeds were observed passing through this intersection.

### *Improvement Considerations*

- Widen Green Valley Road approaches to accommodate a minimum of 8-foot wide Class II bike lane or shoulder. This improvement can also improve intersection sight distance.
- Trim and maintain vegetation to improve intersection sight distance.
- Widen Green Valley Road from Loch Way to the church access to the east to provide back-to-back left-turn lanes.
- Traffic calming strategies such as: 1) Lane narrowing concept on the major road approach with pavement markings and rumble strips in the center island; and, 2) Minor road approach splitter island may be considered. The intent of the lane narrowing concept is to increase visibility of the intersection, reduce vehicle speeds on the major road approach, and thereby potentially reduce crashes. The intent of the minor road approach splitter island is to increase visibility of the intersection, improve traffic control compliance and thereby potentially reduce crashes. Exhibit 8 and Exhibit 9 illustrate these two concepts.

**Exhibit 8. Major Road Lane Narrowing Concept**

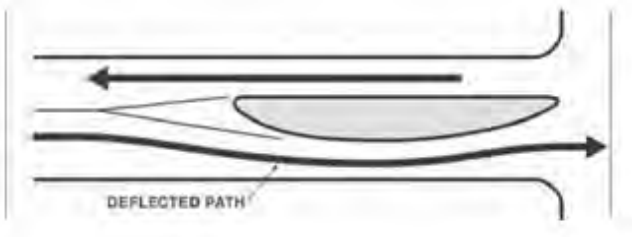


Pennsylvania – FHWA-HRT-08-063, Figure 10

**Exhibit 9. Minor Road Splitter Island Concept**


- Green Valley Road west of this intersection transitions from a rural to suburban area. The speed limit west of this intersection drops from 55 mph to 50 mph; however, drivers may not be recognizing their prevailing speeds even after passing this intersection from the east. In order to increase driver awareness of this transition, major road approach splitter islands and/or approach curvature can be considered on the higher speed roadway. The intent is to slow vehicles before they reach the new speed zone or different corridor context. Exhibit 10 illustrates this concept. This concept can be implemented on the westbound approach of this intersection.

**Exhibit 10. Roadway Approach Curvature/Splitter Island**




Source: NCHRP 613, Exhibit 4-18

### *Intersection #6: Green Valley Road & Rocky Springs Road/Steves Way*

*Programmed Improvements*

- CIP #GP159 (10-year project): Widen Green Valley Road between El Dorado Hills Boulevard/Salmon Falls Road and Deer Valley Road (West) from two lanes to four lanes. This project is anticipated to add an additional eastbound and westbound through lane at this intersection.

*Key Findings*

- The intersection does not have stop bars and stop signs on both the Rocky Springs Road and Steves Way approaches, as neither are County maintained roads.
- Due to the horizontal curvature of the roadway and overgrown foliage, the Rocky Springs Road approach has limited intersection sight distance looking east and west.
- Higher than posted speeds were observed passing through this intersection.
- Rocky Springs Road and Steve's Way are not County maintained roadways.

*Improvement Considerations*

- Widen Green Valley Road approaches to accommodate a minimum of 8-foot wide Class II bike lane or shoulder.
- Private property owners install and maintain stop signs and bars at the side street approaches
- Install post-mounted delineators (type "E") at all four corners to better define the intersection.

***Intersection #7: Green Valley Road & Malcolm Dixon Road***

*Programmed Improvements*

- CIP #GP159 (10-year project): Widen Green Valley Road between El Dorado Hills Boulevard/Salmon Falls Road and Deer Valley Road (West) from two lanes to four lanes. This project is anticipated to add an additional eastbound and westbound through lane at this intersection.

*Key Findings*

- Stopping sight distance is limited to motorists approaching from the east due to the horizontal curvature of the roadway and overgrown tree branches.
- There are no advance intersection warnings signs (W2 series) or street name signs in either direction along Green Valley Road.

*Improvement Considerations*

- Widen Green Valley Road approaches to accommodate a minimum of 8-foot wide Class II bike lane or shoulder. This improvement can improve intersection sight distance, and allows motorists to decelerate while making right-turn into the side street.
- Re-align Malcolm Dixon Road to form a standard right-angle intersection.
- Install advance intersection warning signs (W2 series) or street name signs on the Green Valley Road approaches.
- Widen the eastbound approach to provide a left-turn lane on Green Valley Road. This will allow vehicles to slow down safely to turn onto Malcolm Dixon Road.
- Consider the lane narrowing concept or splitter island concept on the major road approaches, as described for the Loch Way intersection.

- Upgrade post-mounted delineators (Type "E") at the intersection to better define the turning radius.

### *Intersection #8: Green Valley Road & Deer Valley Road (West)*

*Programmed Improvements*

- CIP #GP159 (10-year project): Widen Green Valley Road between El Dorado Hills Boulevard/Salmon Falls Road and Deer Valley Road (West) from two lanes to four lanes. This project is anticipated to add an additional eastbound and westbound through lane at this intersection.

*Key Findings*

- Four of the seven collisions at the intersection resulted in an injury. One resulted in a fatality and was caused by an unsafe turning movement by an impaired driver.
- Most collisions were rear-end (4) or fixed object collisions (2) and the contributing causes were primarily unsafe speeds (4) and unsafe turning movements (2).

*Improvement Considerations*

- This intersection was recently improved with the provision of turning lanes, bike lanes and delineation. Intersection traffic and crash data should be monitored to gauge if these improvements result in operational and safety benefits.

### *Intersection #9: Green Valley Road & Pleasant Grove Middle School Access*

*Programmed Improvements*

- No improvements have been identified in the County's 2014 CIP.

*Key Findings*

- The County has no jurisdiction over the school site.
- In the AM peak, left-turn queues at the westbound Green Valley Road approach block the adjacent through lane and extend beyond the new Silver Springs Parkway.
- There are no bicycle facilities west of the intersection.
- Both pedestrian ramps on the south side of the intersection do not have detectable warnings.

*Improvement Considerations*

- Install ADA compliant pedestrian ramps at the southeast and southwest corners.

- Rescue School District should improve internal circulation of the Pleasant Valley Middle School to prevent extensive queue spillback on Green Valley Road. Specific recommendations are described in the *Pleasant Grove Middle School* section.

### *Intersection #10: Green Valley Road & Bass Lake Road*

*Programmed Improvements*

- No improvements have been identified in the County's 2014 CIP.

*Key Findings*

- Pedestrian ramps at all four corners of the intersection do not have detectable warnings.

*Improvement Considerations*

- Install ADA compliant pedestrian ramps at all four corners.

### *Intersection #11: Green Valley Road & Cambridge Road/Peridot Drive*

*Programmed Improvements*

- No improvements have been identified in the County's 2014 CIP.

*Key Findings*

- Three of four crashes occurred at night, however, there were no trends in the crash data and overhead street lighting is provided at the intersection.

*Improvement Considerations*

- None.

### *Intersection #12: Green Valley Road & Cameron Park Drive/Starbuck Road*

*Programmed Improvements*

- No improvements have been identified in the County's 2014 CIP.

*Key Findings*

- Eight of the 15 crashes at the intersection were broadside/turning movement crashes. Of those broadside crashes, seven occurred on the south leg of the intersection, which could be influenced by the business accesses along Cameron Park Drive. The northbound Cameron Park Drive left-turn serves 207 and 275 vehicles in the weekday AM and PM peak hours respectively.

- Ten of the 15 crashes cited "crossed double yellow line" as a contributing factor.
- The northbound Cameron Park Drive and westbound Green Valley Road left-turn lanes are 9-10 feet wide, potentially contributing to the crash trends at this intersection.

*Improvement Considerations*

- Prohibit left-turn movements from the strip mall located in the southeast corner of this intersection by constructing a raised median on the northbound Cameron Park Drive and westbound Green Valley Road approaches.
- Widen northbound Cameron Park Drive and westbound Green Valley Road left-turn lanes to 11 feet and allow U-turns from these lanes to access the strip mall in the southeast corner. The southeast and southwest corners would be modified to increase the turning radius to accommodate California legal size trucks. In addition, departure lanes at the south and east legs should provide wide shoulders or an extra lane for the U-turning vehicles. A detailed analysis should be performed to assess the feasibility of this recommendation.

### *Intersection #13: Green Valley Road & Deer Valley Road (East)*

*Programmed Improvements*

- CIP #GP179 (20-year project): Widen Green Valley Road from Deer Valley Road (East) to Lotus Road to provide two 12-foot lanes, with addition of six left-turn pockets.

*Key Findings*

- Stopping sight distance for the westbound vehicles is limited due to horizontal curvature.
- There are insufficient delineators to define intersection alignment and corners.

*Improvement Considerations*

- Construct a left-turn pocket on the eastbound Green Valley Road approach to separate the turning vehicles from the through lane.
- Install an 8-foot wide shoulder on the eastbound and westbound Green Valley Road approaches. Shoulders can act as an acceleration and deceleration area, with the potential to improve sight distance.
- Install post-mounted delineators (Type "E") to define intersection radius to motorists.

### *Intersection #14: Green Valley Road and Ponderosa Road (East)*

*Programmed Improvements*

- CIP #GP179 (20-year project): Widen Green Valley Road from Deer Valley Road (East) to Lotus Road to provide two 12-foot lanes, with addition of six left-turn pockets.

*Key Findings*

- The crash rate at this intersection is the highest (0.83 crashes per MEV) among all study intersections.
- Four of the five crashes that occurred at this intersection reported a fatality or an injury. One of the two fatality crashes involved Driving under Influence (DUI), and second resulted from a tree branch falling on the car (force majeure).
- Observed 85$^{th}$ percentile speed east of this intersection was recorded to be five miles per hour over the posted speed limit. Unsafe speeds were cited as the contributing factor for two of the five crashes at the intersection.
- No shoulders or bike lanes are provided.
- This intersection is located at a vertical crest and on the horizontal curve, resulting in highly restrictive intersection and stopping sight distances.

*Improvement Considerations*

- Add a westbound left-turn lane to separate motorists turning left from the through lane.
- Realign Ponderosa Road (South) opposite to Ponderosa Road (North) to eliminate two offset intersections.
- Reconstruct the intersection with flat grades on the approaches and evaluate intersection control options.

### *Intersection #15: Green Valley Road & North Shingle Road*

*Programmed Improvements*

- No improvements have been identified in the County's 2014 CIP.

*Key Findings*

- The improvement of this intersection was completed within the past 2 years.

*Improvement Considerations*

- None.

### *Intersection #16: Green Valley Road & Lotus Road*

*Programmed Improvements*

- No improvements have been identified in the County's 2014 CIP.

*Key Findings*

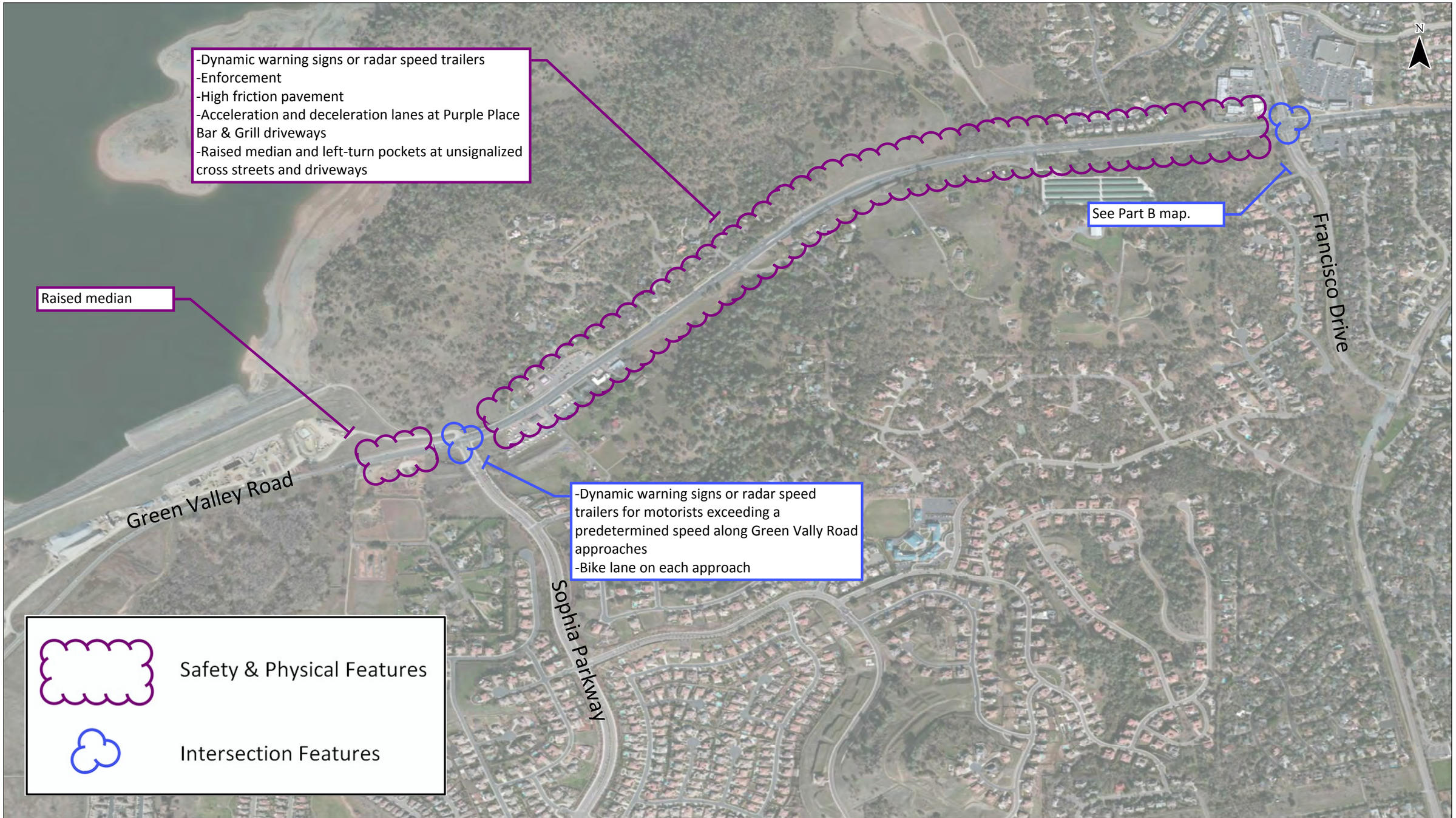
- None.

### *Improvement Considerations*

- None.

The improvement considerations summarized above are displayed in Exhibit 11 through Exhibit 16.

**Exhibit 11. Safety and Physical Features Improvement Considerations - A**




**Improvement Considerations - Part A**
**Green Valley Road**

Exhibit **11**

Note: All referenced improvements are considerations and options for the corridor.

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Coordinate System: GCS WGS 1984

-Extended sidewalk on north side
-Curb on both sides

-Improve various intersections to reduce speeds
-Speed limit signs in each direction
-Speed feedback signs or radar speed trailers
-8-ft wide shoulders

-Sidewalk
-ADA compliant ramps

-Sidewalk at northwest corner of intersection
-ADA compliant ramps

-Sidewalk along Francisco Drive
-ADA compliant ramps
-Street lighting east and south of intersection
-Bike lane on eastbound and westbound approaches

-Stop signs and bars at side street approaches
-Advance intersection warning signs on Green Valley Road
-8-ft wide shoulders
-Post-mounted delineators at all corners

Bi-directional 8-ft Class II bikeway from Francisco Drive to Pleasant Grove Middle School

-Back-to-back left-turn lanes on Green Valley Road between Loch Way and church access
-Regular vegetation trimming and maintenance
-Lane markings and rumble strips on major road approach to increase intersection visibility
-Splitter island on minor approach to improve intersection visibility and improve traffic control compliance

Green Valley Road
Loch Way
Rocky Springs Rd
Francisco Drive
El Dorado Hills Blvd
Silva Valley Parkway

N

Safety & Physical Features
Bicycle Facilities
Intersection Features

**Improvement Considerations - Part B**
**Green Valley Road**

Exhibit **12**

Note: All referenced improvements are considerations and options for the corridor.

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Coordinate System: GCS WGS 1984

Malcolm Dixon Road

Green Valley Road

-Improve intersection with Malcolm Dixon Road
-8-foot wide shoulders

-Realignment to form standard T-intersection
-Advance intersection warning signs on Green Valley Road
-Left-turn lane for eastbound traffic on Green Valley Road
-Lane markings and rumble strips on major road approach to increase intersection visibility
-Splitter island on minor approach to improve intersection visibility and improve traffic control compliance
-Upgraded post-mounted delineators

Bi-directional 8-ft Class II bikeway from Francisco Drive to Pleasant Grove Middle School

Deer Valley Road

-Monitoring of recent improvements

-ADA compliant pedestrian landings
-Improvements discussed further in Pleasant Grove Middle School section

-Pleasant Grove Middle School:
Improved internal circulation
-New speed limit signs

Green Valley Road

Pleasant Grove Middle School

N

Safety & Physical Features

Bicycle Facilities

Intersection Features

**Improvement Considerations - Part C**
**Green Valley Road**

Exhibit **13**

Note: All referenced improvements are considerations and options for the corridor.

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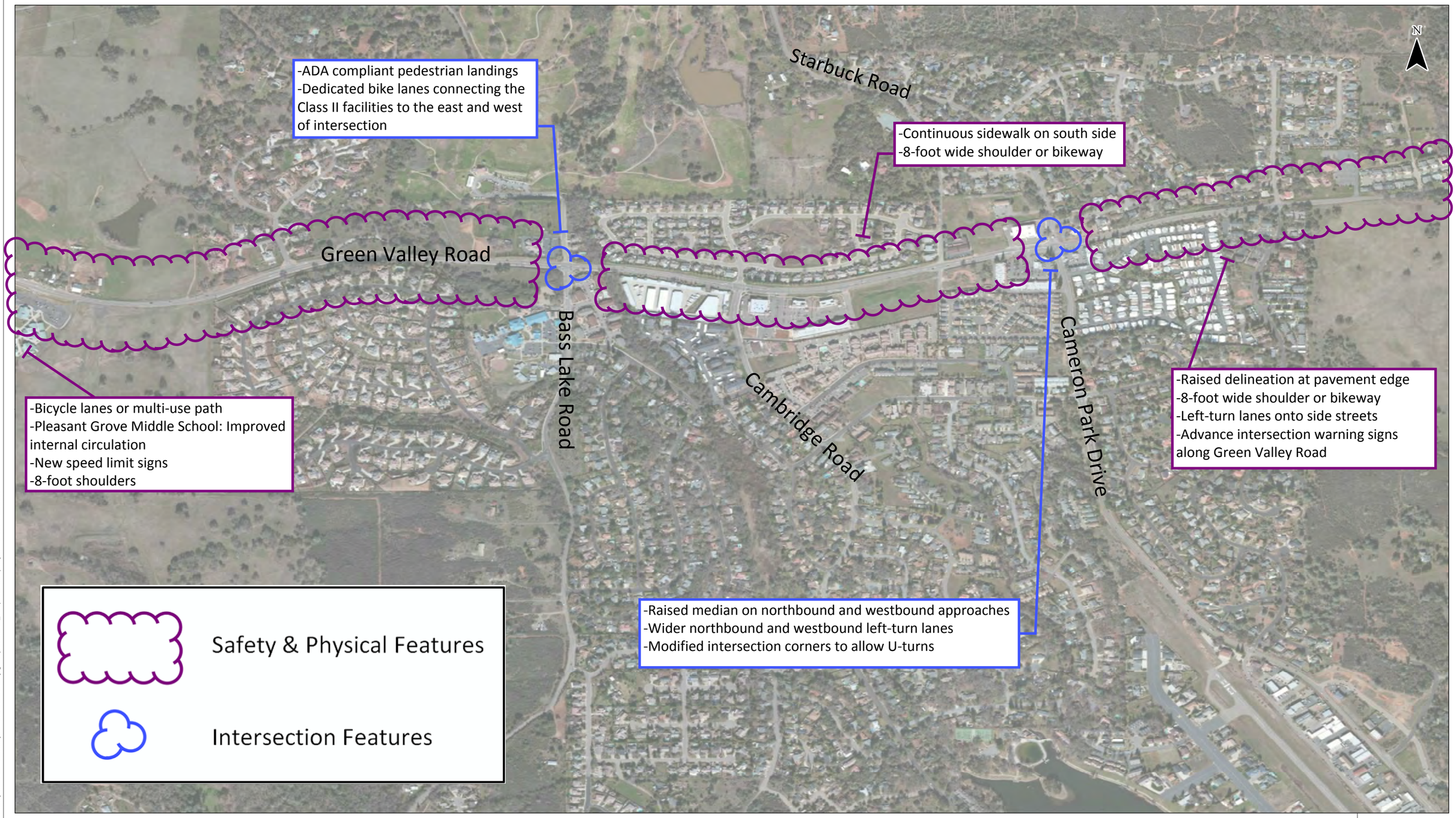
Coordinate System: GCS WGS 1984




**Improvement Considerations - Part D**
**Green Valley Road**

Exhibit **14**

Note: All referenced improvements are considerations and options for the corridor.

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Coordinate System: GCS WGS 1984

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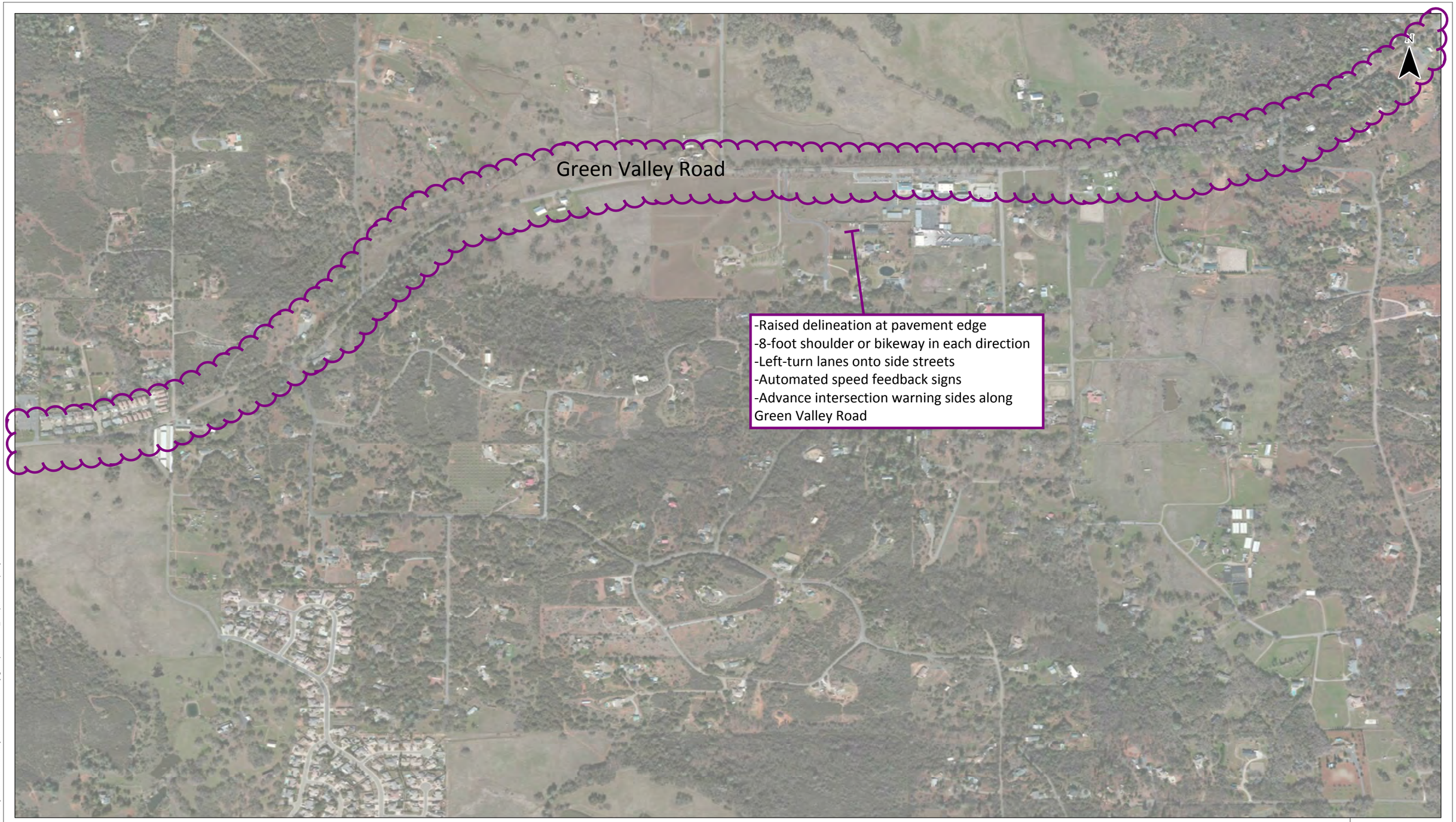
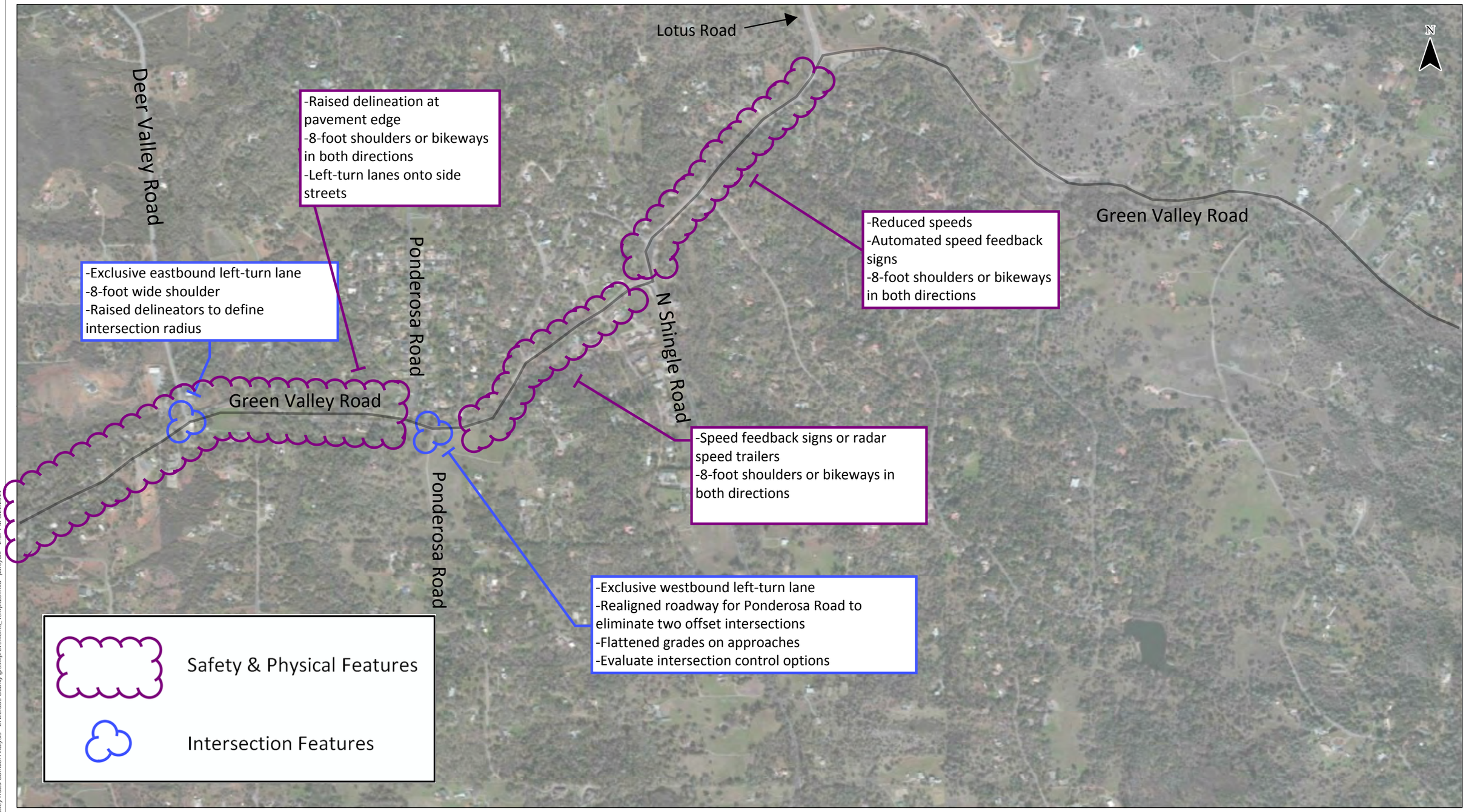



**Improvement Considerations - Part E**
**Green Valley Road**

Exhibit **15**

Note: All referenced improvements are considerations and options for the corridor.




**Improvement Considerations - Part F**
**Green Valley Road**

Exhibit **16**

Note: All referenced improvements are considerations and options for the corridor.

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Coordinate System: GCS WGS 1984

# BICYCLE FACILITIES

This section summarizes key findings and identifies improvement considerations to make bicycle facilities safer.

## Key Findings

Field observations of bicycle facilities along the corridor noted existing gaps in the bicycle lanes along Green Valley Road on the following two segments:

- Francisco Drive to west of Deer Valley Road (West); and,
- East of Deer Valley Road (West) to the Pleasant Grove Middle School Access.

Field observations noted that the current bicycle lane pavement markings are infrequent along the corridor and are not marked at the far side of all study intersections along the corridor. The signage to mark the beginning and end of the bike lane is inconsistent. Given that Green Valley Road is primarily an arterial with the posted speed of 40-55 mph; bicyclists may feel vulnerable to the high-speed vehicles. Only a few bicyclists were seen using the existing bicycle facilities. Some bicyclists were also observed to share the travel lane with motorists between El Dorado Hills and Cameron Park.

## Programmed Improvements

CIP #72309 (five-year project): The roadway segment between Loch Way and Pleasant Grove Middle School western entrance is currently programmed for an 8-foot bicycle lane on each side of the roadway.

## Improvement Considerations

The following considerations have the potential to improve bicycling conditions along the corridor:

### *Fill Gaps in Bicycle Facilities*

Fill existing gaps in bicycle lanes along Green Valley Road to provide a more consistent bicycling environment. Bicycle lanes should be 8-feet wide to provide adequate separation from motor vehicles and reduce the potential for collisions. Current gaps (excluding programmed improvements) include:

- Francisco Drive to Loch Way

### *Paint Bicycle Markings & Signage*

The existing bicycle lane markings should be re-painted at a regular interval to increase driver awareness of the facility and cyclists. Additionally, bicycle lane markings should be painted at the far end of all intersections and major access points where bicycle lanes are present to alert drivers entering

the roadway with the bicycle facilities. The beginning and end of the separated bike lane shall be facilitated with the standard signage.

### *Multi-Use Path*

The provision of a multi-use path in lieu of the currently programmed CIP project may be considered. A multi-use path is physically separated from motor vehicle traffic, and can be either within the roadway right-of-way or within an independent right-of-way. Given the high prevailing speeds along Green Valley Road, bicyclists may feel safer in the multi-use paths than the Class II bike lanes. Multi-use pathways can include bicycles as well as pedestrians. Generally, multi-use paths can be safer for the recreational bicyclists. Alternatively, longitudinal rumble strips could be considered along outside the edge line to augment safety of the bicyclists on the high speed rural segments.

# PRIVATE DRIVEWAYS

This section summarizes key findings and identifies considerations to improve access to private properties along the corridor. It is important to note that the County does not maintain private driveways and is not responsible for any improvements on private property.

## Key Findings

Initial intersection sight distances (ISD) and stopping sight distances (SSD) were evaluated at the private property driveways on Green Valley Road between Sophia Parkway and Bass Lake Road, with more detailed measurements collected at locations where limited sight distances were perceived based on visual observations. Field observations confirmed that a number of locations along the study corridor had limited ISD and/or SSD due to vegetation, horizontal curves, vertical curves, and other obstructions. A complete list of driveways exhibiting sight distance limitations is provided in *Part D* of this report.

## Improvement Considerations

To address intersection and stopping sight distance deficiencies, the following improvements shall be considered:

- Private property owners are responsible for trimming and maintaining overgrown foliage that impede sight distances at access points and intersections;
- Provide at least 8-foot wide shoulders and/or bicycle lanes, particularly in areas with a high density of driveways (such as, between Malcolm Dixon Road and Deer Valley Road (West) to increase driver's field of view and improve the motorists ability to avoid a crash. Wider shoulders can be utilized as acceleration and declaration lanes; and,
- Private property owners should better define radius and frontage of driveways through improved driveway aprons[9] on their private property accesses.
- Add exclusive turn lanes at the high volume driveways and roadways. For example, provision of back-to-back left-turn lanes at Loch Way and the church's access will separate out vehicles waiting for an acceptable gap to turn left into the site.

[9] Area at the beginning of a private driveway with a curb cut in the sidewalk or beyond the edge line.

# PLEASANT GROVE MIDDLE SCHOOL

This section summarizes key findings and identifies considerations to improve traffic circulation into and out of Pleasant Grove Middle School. It should be noted that El Dorado County has no jurisdiction over the school site layout.

## Key Findings

Pleasant Grove Middle School is located along Green Valley Road between Silver Springs Parkway and Deer Valley Road (West). Field observations during the weekday AM and afternoon school peak hours at Pleasant Grove Middle School, in the Spring of 2014, identified a number of operational and circulation issues at the access points and within the internal circulation of the school. The westbound left-turn queues at the primary western school access extend beyond the newly constructed Silver Springs Parkway. Queue lengths sometimes reach Bass Lake Road which is three-quarters of a mile east of the primary school access. Internal circulation and high demand over a short period of time are primary factors contributing to extensive queues on Green Valley Road during weekday mornings.

According to Rescue Union School District Superintendent and staff, additional internal striping has been added to the school site and the westbound left-turn queues in the AM peak have noticeably decreased.

Detailed field observations are discussed under *Part D* of this report.

## Improvement Considerations

The following considerations have the potential to improve traffic operations and internal circulation at Pleasant Grove Middle School:

### *Traffic Monitors*

According to school staff, there is a team of traffic monitors to help direction vehicular traffic within the site. However, the monitors primarily work in the afternoon school peak hour. The school could also designate and train traffic monitors who would ensure that no queuing would occur at the western access during the AM peak hour. They would also ensure that student pick-up and drops offs would not occur in undesignated areas, such as at the pass-by lane at the western drop-off, or at red-curbed area. Traffic monitors should be trained to safely install temporary traffic control devices within the site. A minimum of two monitors should be recruited. A monitor could be placed west of the western drop-off to direct drivers to the available space in the western drop-off area. Another monitor could be stationed at the end of the western drop-off location to efficiently direct motorists to the eastern drop-off as well as to help motorists exit the site.

### *Internal Striping and Curb Improvements*

Adjust the curb island and striping of the access road to clarify and encourage use of the eastern drop-off location. Restriping the current internal left-turn for the drop-off zone to direct motorists to the eastern drop-off zone and restriping the current through-only lane to a through-left lane to allow more efficient use of the drop-off zones and help prevent queues from forming where motorists cannot access the eastern drop-off zone.

### *Eastern Access*

The right-out exit on the eastern end of the parking lot was observed to be closed. School staff has indicated that the driveway's grade is too steep to allow vehicular traffic. As such, the driveway was closed and will remain as an emergency vehicle access only. Vehicles exiting the site can continue to use the middle access.

The school is planning to construct a sidewalk along the eastern driveway to provide pedestrians with a continuous sidewalk into and out of the school property.

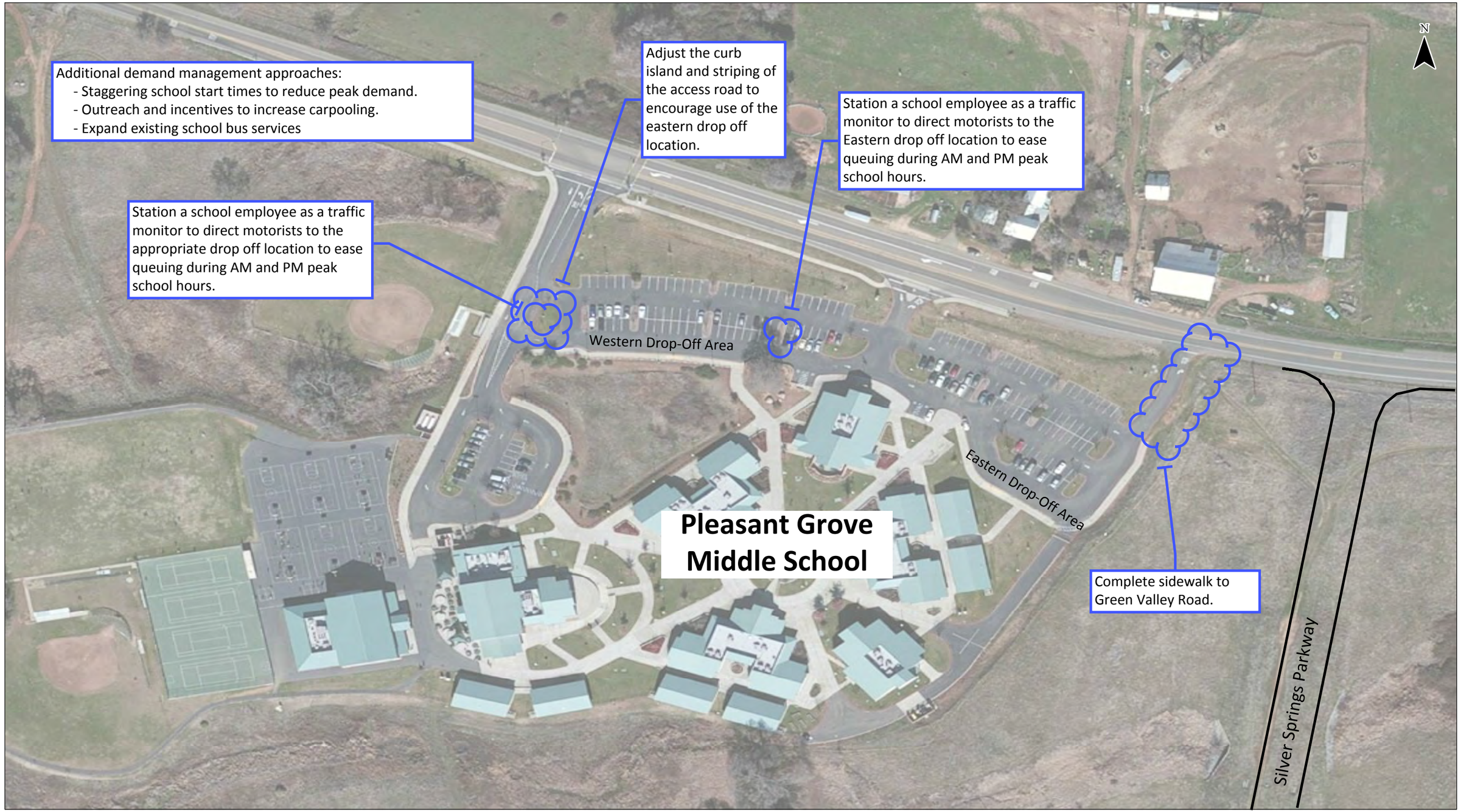
### *Demand Management*

Implementing staggered class start times by grade level would spread the peak traffic demand of the school. This would serve to reduce the operational and safety issues caused by extensive vehicular queuing during school start time. Establishing two separate start times with a 15-30 minute gap between would reduce the peak 15-minute demand. As a result, the traffic generated by the school could be dispersed over an hour period. Circulation of traffic on-site will improve with the peak hour spreading.

The school could also explore demand management approaches to reduce the number of vehicles accessing the school. This could include an outreach effort with parents to encourage carpooling. The school could also assist by helping match parents and children willing to carpool through a ride-matching program. This program could also include incentives, such as monthly raffles for carpooling students, to encourage more participation. The school bus services could be expanded to decrease the vehicular traffic in and out of the school.

The school's recent efforts at demand management have proven successful. According to school officials, bus ridership increased significantly since last year.

Pleasant Grove Middle School improvement considerations are shown in Exhibit 17.




**Improvement Considerations**
**Pleasant Grove Middle School**
**Green Valley Road**

Exhibit **17**

Note: All referenced improvements are considerations and options for the school site.

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Coordinate System: GCS WGS 1984

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# SPEED LIMIT SIGNS

This section summarizes key findings and identifies considerations to increase driver awareness of the posted speeds along the corridor.

## Key Findings

The posted speeds along the study corridor vary from 40 mph to 55 mph, with speeds reducing to 25 mph through the Pleasant Grove Middle School and Rescue Elementary School area during the peak school hours (when children are present). Locations of posted speed limit signs throughout the corridor are shown in Exhibit 40 under *Part D* of this report.

The observed 85$^{th}$ percentile speeds were 9 mph above the posted speed limit in the westbound direction on Segment #5 (Silva Valley Parkway to Malcom Dixon Road), the highest along the corridor. A section of Green Valley Road between Loch Way and Silver Springs Parkway which measures approximately 3.2 miles long has no speed limit signs. This is a prima facie speed limit (55 mph), thus it is not signed at a certain interval (CVC 22349).

There are no signs to make motorists aware of impending downstream speed reduction or transition areas. The only sign in the study corridor that marks a speed transition is installed just west of Bass Lake Road for the eastbound vehicles.

Barring the segment between new Silver Springs Parkway and Cameron Park Drive, the County has recently upgraded the speed limit signs on Green Valley Road to provide higher retro-reflectivity. The segment between Silver Springs Parkway and Cameron Park Drive is slated for retro-reflectivity upgrades in the winter of 2014/2015.

## Improvement Considerations

The following considerations have the potential to reduce speeding along the corridor:

### *Speed Limit Sign Locations*

Additional speed limit signs should be installed in the 3.2 mile long segment between Loch Way and Silver Springs Parkway. To better ensure speed adherence by motorists, speed limit signs should be located on both sides of Green Valley Road along the horizontal curve near the Malcolm Dixon Road intersection, as well as at the Deer Valley Road (West) intersection. The following additional measures should also be considered.

### *Speed Transition Zone*

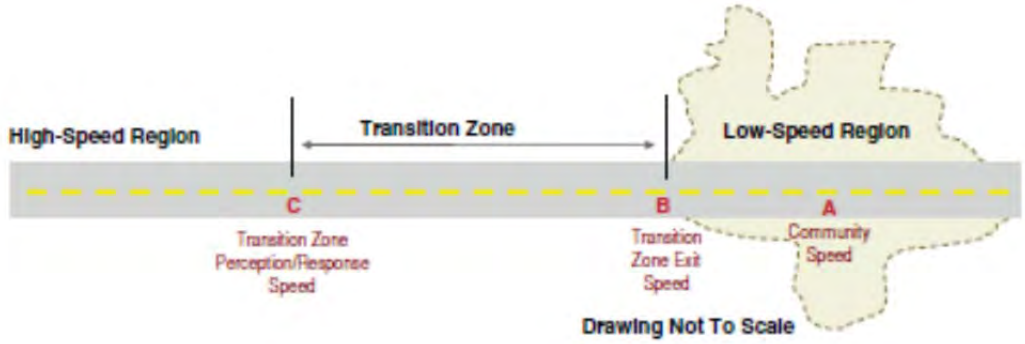
*NCHRP Report 613*[10] suggests speed limit signs should be located at the points of transition from one speed limit to another, showing the next speed limit for drivers continuing downstream. Signs shall also be installed beyond major intersections. Speed limit signs upstream of an intersection may also be necessary to establish a transition zone for drivers to adjust their speeds to the target speed. Speed limit signs are also recommended to be placed at other locations where it is necessary to remind motorists of the limit that is applicable, such as upstream of the horizontal and vertical curves in the roadway.

The following three speed transition zones shall be enhanced with the appropriate treatments identified in this section:

- Westbound direction between Malcolm Dixon Road and Silva Valley Parkway
- Eastbound direction between Silver Springs Parkway and Bass Lake Road
- Eastbound near Rescue Elementary School

Exhibit 18 illustrates the conceptual layout of different speed zones, including the transition zone along a rural roadway.

**Exhibit 18. Speed Zones along the Rural Roads**




Source: NCHRP Report 737: Design Guidelines for High-Speed to Low-Speed Transition Zones for Rural Highways

Treatment applications could include:

- Traffic signs consistent with the California MUTCD[11], as shown in Exhibit 19.

[10] NCHRP Report 613, Guidelines for Selection of Speed Reduction Treatments at High-Speed Intersections. Transportation Research Board, Washington D.C., 2008.

[11] Manual of Uniform Traffic Control Devices, 2012 Edition

**Exhibit 19. Reduced Speed Signs**

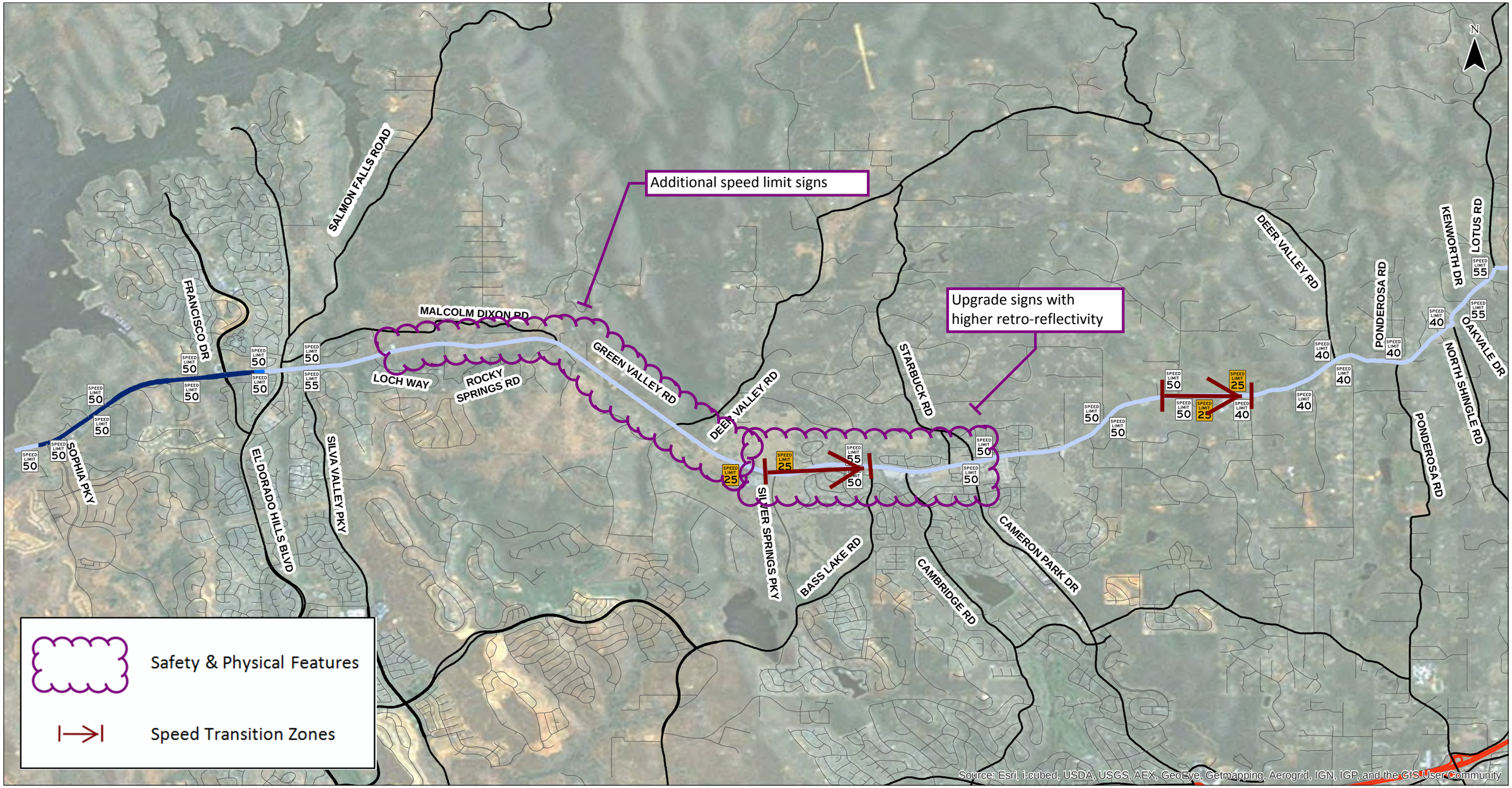

Source: California MUTCD

- Automated speed feedback signs, as shown in Exhibit 4.
- Gateway treatments such as a sign stating "Welcome to El Dorado Hills", "Welcome to Cameron Park" and "Welcome to Rescue". A physical sign or landmark may increase driver awareness for change in environment and corridor context. These signs should be installed in the speed transition zones.
- Transverse rumble strips, as shown in Exhibit 20 below. Rumble strips, or raised pavement markers may be placed in the travel lanes perpendicular to the direction of travel to alert drivers of a change in the environment or corridor context. They may also be installed from higher to lower speed zones.

**Exhibit 20. Traverse Rumble Strip Example**

Source: NCHRP Report 737

Exhibit 21 illustrates potential considerations to improve speed signs and zones along the corridor.




**Number of Lanes**
- 2 Lanes
- 3 Lanes
- 4 Lanes

**Roadway Classification**
- Highway
- Major Road
- Minor Road

## Number of Lanes and Posted Speed Limit Signs
## Green Valley Road

Exhibit **21**

*Coordinate System: GCS WGS 1984*

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# CUT-THROUGH TRAFFIC

This section summarizes key findings and identifies considerations to minimize the cut-through traffic on Allegheny Road and Malcolm Dixon Road within the El Dorado Hills community.

## Key Findings

During the morning and afternoon commute peak hours, Green Valley Road occasionally becomes congested and motorists cut-through neighborhoods to avoid delays on the arterials. Origin-destination data was collected using Bluetooth technology. BlueMAC readers were deployed at five locations to capture cut-through traffic on Allegheny Road and El Dorado Hills Boulevard north of Green Valley Road. It should be noted that there are no published guidelines to gauge whether the recorded cut-through traffic is considered significant and what treatments could be implemented. A detailed description of the methodology used to capture cut-through traffic and analysis results is discussed in *Part D* of this report.

Cut-through traffic using Allegheny Road during the weekday AM peak period (7-9 AM) averaged 18 percent of the total traffic that has Silva Valley Parkway as an origin and Salmon Falls Road or Francisco Drive as a destination. Similarly, 14 percent of the traffic with Green Valley Road on the east as an origin and Salmon Falls Road or Francisco Drive as destination cut through using Allegheny Road. The AM peak period had the highest percentage of cut-through traffic.

Cut-through traffic using Allegheny Road during the weekday PM peak period (4-6 PM) averaged 14 percent of the total traffic that has Silva Valley Parkway as an origin and Salmon Falls Road or Francisco Drive as a destination. Similarly, 10 percent of the traffic with Green Valley Road on the east as an origin and Salmon Falls Road or Francisco Drive as destination cut through using Allegheny Road. The AM peak period had the highest percentage of cut-through traffic.

### Improvement Considerations

The following considerations have the potential to reduce cut-through traffic along the corridor:

#### *Signal Operations*

Operational considerations discussed in the *Traffic Operations* section above would reduce queue lengths and improve overall corridor performance between Francisco Drive and El Dorado Hills Boulevard. These improvements could reduce the demand for cut-through traffic on Allegheny Road.

#### *Education and Enforcement*

Enforcement is a tool that deters motorists from driving behavior that violates existing regulations for driving maneuvers and excessive speed. The neighborhood watch is another tool or an educational program which requires the involvement and commitment from the neighborhood. As part of this

program, neighborhood residents will receive a flyer informing them about traffic issues in their community and the need for their participation to relieve the concerns.

### *Physical Controls*

Physical traffic calming measures would physically guide or restrict all or selected movements along Allegheny Road and Malcolm Dixon Road could be considered as well. Generally, these measures are implemented in order to reduce speeds through an area, reducing the attractiveness of these streets in terms of travel time. A list of these measures is shown below:

- Median barriers
- Forced turn channelization
- Diverters
- Single lane slow points
- Chicane
- Rumble strips

While the other measures could involve significant cost, rumble strips on the local roads are popular and low-cost physical control to curtail speeds and decrease attractiveness. Rumble strips create an area with an uncomfortable roadway surface which may influence motorists to drive slower. Installing a rumble strip each on Allegheny Road and Malcolm Dixon Road will likely reduce attractiveness of these roads being used as cut-through route.

# FINANCING STRATEGY

This section provides "planning level" cost estimates for the operational and safety improvements, and identifies potential funding resources to fund improvements in the study corridor.

## Cost Estimates

Generalized planning level cost estimates for each of the improvement considerations listed in this section were developed to provide "ball park" and "per unit" cost estimates. Table 1 provides the planning level and per unit cost estimates of the identified improvements. Worksheets to illustrate cost estimates for each component are provided in Appendix 1.

These cost estimates were based on the reasonable linear foot and square foot cost estimates for roadway reconstruction and a cost samples of like improvement types. The rates typically include construction costs including roadway, curbs, sidewalk, striping, signage, drainage and minor earthwork. It doesn't include major earthwork, major structures and right-of-way costs. Actual costs for implementing the identified improvements will vary by location and the unique circumstances at each location, e.g., right-of-way constraints and costs, underground utilities, etc. In particular, the widening and realignment improvements could vary significantly depending on the length and width of new roadway.

## Table 1. Planning Level (per Unit) Cost Estimates of Improvements

| Improvement | Candidate Location | Unit of Measure ($) | Per Unit Cost ($) |
|---|---|---|---|
| Signal Coordination[1] | Intersection 2; Intersection 3; Intersection 4 | LS[4] | $ 5,000 - 50,000 |
| Raised Median[2] | Segment 1; Segment 2; Intersection 12 | LF[5] | $ 476.31 |
| Sidewalks[2] | Segment 3; Segment 4; Segment 8; Intersection 2; Intersection 3 | LF | $ 498.56 |
| Class II bike lanes[2] | Segment 3; Segment 4; Segment 5; Segment 6; Segment 7; Intersection 1; Intersection 2; Intersection 5; Intersection 6; Intersection 7 | LF | $ 239.72 |
| Widening shoulder (not including acquisition of ROW)[2] | Segment 5; Segment 6; Segment 7; Segment 9; Segment 10; Segment 11; Intersection 13 | LF | $ 509.06 |
| Left-turn lane/pockets[2] | Segment 9; Intersection 3; Intersection 4; Intersection 5; Intersection 7; Intersection 11; Intersection 12; Intersection 13; Intersection 14 | LF | $ 643.54 |
| Minor street realignment (not including ROW)[2] | Intersection 7; Intersection 14 | LF | $ 1,518.33 |
| Widen vehicle travel lane width[2] | Intersection 12 | LF | $ 414.83 |
| ADA compliant ramps[3] | Intersection 2; Intersection 3; Intersection 4; Intersection 9; Intersection 10 | EA[6] | $ 4,800.00 |
| Automated speed feedback sign[1] | Segment 2; Segment 10; Segment 11 | EA | $ 2,000 - 10,000 |
| Lighting[2] | Segment 3; Segment 4; Intersection 2 | LS | $ 24,400.00 |
| Speed limit sign[1] | Segment 5; Segment 7 | EA | $ 1,000.00 |
| Advanced intersection warning signs[1] | Intersection 6; Intersection 7 | EA | $ 5,000 - 15,000 |
| Dynamic warning signs[1] | Segment 9; Intersection 1; | EA | $ 10,000 - 25,000 |
| Post mounted delineators[1] | Segment 9; Intersection 6; Intersection 7; Intersection 13 | EA | $ 55.00 |

Notes: [1] Source: *Low-Cost Enhancements for Stop-Controlled and Signalized Intersections,* U.S. Department of Transportation, Federal Highway Administration, May 2009; [2] Includes the estimated roadway item construction costs, 40% contingency of construction costs, and capital costs equaling 50% of estimated construction costs; [3] Source: *ADA Curb Ramp & Sidewalk Improvement Program,* Prepared for Unified Government by GBA Architects and Engineers, April 2011, includes the average total for design, construction, and inspection; [4] LS = Lump Sum; [5] LF = Linear Foot; [6] EA = Each.

## Funding Resources

The following potential funding resources can be considered:

- There may be spots or improvement projects that could be added to the existing plans and bundled into a number of consolidated application requests. If possible, the improvements should be integrated with the County's CIP projects. For example, County's CIP project of widening Green Valley Road from El Dorado Hills Boulevard/Salmon Falls Road and Deer Valley Road (West) could include provision of Class II bike lanes, wide shoulders, as well as left-turn pockets at key intersections.
- Active Transportation Program grant, especially for those projects that are designed to improve pedestrian and bicycle facilities.
- Highway Safety Improvement Program grant, especially for those projects that have potential to reduce severe crashes.
- Safe Route to School grant, primarily to improve circulation of all modes of transport within the Pleasant Grove Middle School

# NOISE ANALYSIS

The Noise Report prepared by Rincon Consultants is attached in Appendix 2.

# Part D: Technical Data, Analysis and Results

# PART D: TECHNICAL DATA, ANALYSIS AND RESULTS

## FIELD REVIEW AND OBSERVATIONS

A field visit with El Dorado County staff was performed on April 28, 2014, with two follow-up field visits to collect site distance and roadway measurements, and inventory intersection and corridor characteristics. Key observations from the field visits for each study location are summarized below.

### Study Segments Observations

This section summarizes key characteristics and field observations on roadway segments.

#### *Segment #1: County Line to Sophia Parkway*

Key characteristics and observations on this segment include:

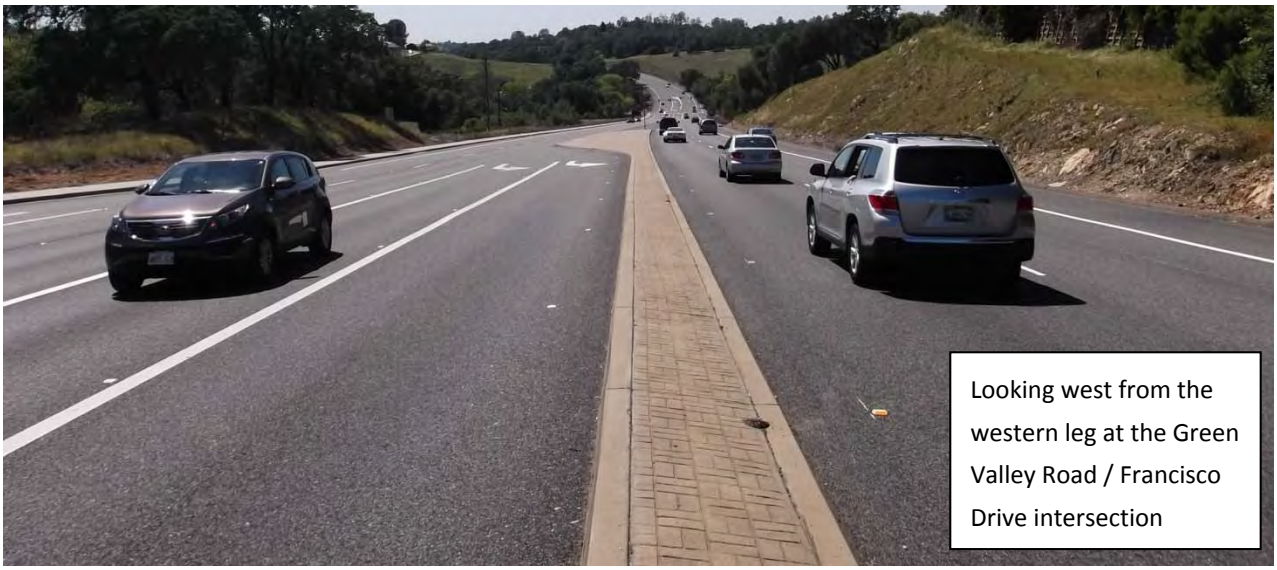
- The 0.21-mile long undivided segment provides one travel lane in each direction with the posted speed limit of 50 mph.
- Green Valley Road widens to four lanes approximately 250 feet west of the Sophia Parkway intersection.
- The typical cross-section provides two 12-foot travel lanes with 8-foot paved bike lanes/shoulder on both sides.
- There is no sidewalk on either side of this segment.
- A 100-foot long westbound left-turn pocket is provided for the Shadowfax Lane inbound vehicles.
- The segment is uninterrupted with the exception of Shadowfax Lane and the Green Valley Nursery.
- A continuous Class II bike lane is provided on the north side, whereas on the south side a bike lane ends just east of Shadowfax Lane.
- Green Valley Road west of Shadowfax Lane has a passing zone, established by broken single-yellow pavement markings.
- Observations indicate that motorists inappropriately use the paved median shelter between Sophia Parkway and Shadowfax Lane to turn left into the Green Valley Nursery (see picture below).

Looking west from the western leg of the Green Valley Road / Sophia Parkway intersection

### *Segment #2: Sophia Parkway to Francisco Drive*

Key characteristics and observations on this segment include:

- The 1.35-mile long divided segment provides two travel lanes in each direction with the posted speed limit of 50 mph.
- The typical cross-section provides four 12-foot travel lanes with a 6 to 16-foot raised median or center left-turn lane.
- A Class II bike lane is provided on the north and south sides.
- Sidewalk on the north side starts at the Sophia Parkway intersection and ends at the Lakeridge Oaks Drive/Mormon Island Drive intersection. The southern sidewalk begins at the Lakeridge Oaks Drive/Mormon Island Drive intersection, connects with a trail east of the Miller Road intersection, and resumes east of the Miller Road intersection.
- The western segment is interrupted with two consecutive commercial driveways on either side of the roadway.
- Due to 3% to 5% downgrade in the westbound direction (see picture below), vehicles were observed to travel at speeds that exceeded the posted speed limit.



Looking west from the western leg at the Green Valley Road / Francisco Drive intersection

### *Segment #3: Francisco Drive to El Dorado Hills Boulevard/Salmon Falls Road*

Key characteristics and observations on this segment include:

- The 0.36-mile long segment provides one or two travel lanes in each direction with the posted speed limit of 50 mph.
- Green Valley Road narrows to two lanes approximately 850 feet east of the Francisco Drive intersection.
- The typical cross-section provides two 12-foot travel lanes with a 3 to 8-foot wide shoulder on each side.
- The south side has no sidewalk, whereas the sidewalk on the north side ends near the eastern property line of the Safeway plaza.
- The segment is interrupted with a driveway access to the Safeway plaza on the north side and two retail driveways on the south side.
- There are no bike lanes on this segment.
- Beyond the shoulder on the north side, a clearance zone[12] of 8 to 12 feet is present (see picture below on the left). This area may be used to provide recovery of errant vehicles that may run off the road. On the south side, private properties are situated approximately 18 to 20 feet from edge of the shoulder. The area beyond the shoulder on the south side is occupied with vegetation and trees (see picture below), presenting limited recovery opportunities for errant vehicles.

[12] Clearance zone is the unobstructed, traversable areas provided beyond the edge of the through traveled lane.


### *Segment #4: El Dorado Hills Boulevard/Salmon Falls Road to Silva Valley Parkway/Allegheny Road*

Key characteristics and observations on this segment include:

- The 0.17-mile long segment provides one travel lane in each direction with the posted speed limit of 50 mph.
- The typical cross-section provides two 12-foot travel lanes with a 3 to 6-foot wide shoulder on each side.
- The area beyond shoulders is recessed on both sides and occupied with trees and vegetation. A continuous curb is provided on either side of Green Valley Road to prevent errant vehicles from running off the road (see pictures below).


- There are no bike lanes or sidewalks on this segment.
- This segment is uninterrupted.

### *Segment #5: Silva Valley Parkway/Allegheny Road to Malcolm Dixon Road*

Key characteristics and observations on this segment include:

- The 1.66-mile long undivided segment provides one travel lane in each direction with the posted speed limit of 55 mph.
- The typical cross-section provides two 12-foot travel lanes with a 3 to 7-foot wide shoulder on each side. The road provides narrower shoulders west of Loch Way on both sides.
- Beyond the shoulders, the clearance zone is generally not present on both sides and is occupied with vegetation. When the area beyond the shoulder is recessed, curbs and pole-mounted delineators are installed on either side of the segment.
- There are no bike lanes or sidewalks on this segment.
- This segment is interrupted with Loch Way and a number of private property driveways.
- East of Loch Way, this segment provides a westbound passing zone, established by broken and solid yellow pavement markings.

### *Segment #6: Malcolm Dixon Road to Deer Valley Road (West)*

Key characteristics and observations on this segment include:

- The 1.04-mile long undivided segment provides one travel lane in each direction with the posted speed limit of 55 mph.
- The typical cross-section provides two 12-foot travel lanes with a 3 to 8-foot wide shoulder on each side.
- Beyond the shoulders, the clearance zone is generally not present on both sides and is occupied with vegetation. When the area beyond the shoulder is raised, curbs are installed on either side of the roadway.
- There are no sidewalks on this segment. A Class II bike lane is provided on both sides of the roadway within 800 feet of the Deer Valley Road (West) intersection.
- This segment is interrupted by multiple private property driveways on both sides.
- Grades are typically range from 1% to 4% on this segment.

### *Segment #7: Deer Valley Road (West) to Bass Lake Road*

Key characteristics and observations on this segment include:

- The 1.42-mile long undivided segment provides one travel lane in each direction. The posted speed limit in the westbound direction is 55 mph. In the eastbound direction, this segment has posted speed limit of 55 mph west of Silver Springs Parkway and 50 mph between Silver Springs Parkway and Bass Lake Road. In the vicinity of Pleasant Grove Middle School, the reduced speed of 25 mph is enforced when children are present.
- The typical cross-section west of Pleasant Grove School provides two 12-foot travel lanes with a 6 to 8-foot wide shoulder in each direction. A Class II bike lane is provided on each side of the

roadway within 800 feet of the Deer Valley Road (West) intersection and east of Pleasant Grove Middle School.
- Curbs and post-mounted delineators are installed on the north side to prevent errant vehicles from running off the road.
- Continuous sidewalk is provided on the south side between Pleasant Grove School and Bass Lake Road.
- This segment is interrupted by multiple private property driveways on the north side.
- Roadway grade ranges from 0% to 4% on this segment.

### *Segment #8: Bass Lake Road to Cameron Park Drive*

Key characteristics and observations on this segment include:

- The 0.67-mile long segment provides one travel lane in each direction with the posted speed limit of 50 mph.
- The typical cross-section provides two 12-foot travel lanes with a 6-foot wide Class II bike lane in each direction.
- This segment provides variable medians. A 5-foot wide painted median is installed between Bass Lake Road and Cambridge Road. The segment between Cambridge Road and Cameron Park Drive accommodates five left-turn pockets, as well as provides a 10-foot wide painted median. A 370-foot long raised median is installed west of the Cameron Park Drive intersection.
- Sidewalk is provided intermittently on the south side. There is no sidewalk on the north side.
- This segment is interrupted by multiple commercial driveways on both sides.

### *Segment #9: Cameron Park Drive to Ponderosa Road*

Key characteristics and observations on this segment include:

- The 3.04-mile long undivided segment provides one travel lane in each direction with the posted speed limit of 50 mph west of the Rescue Elementary School. The posted speed drops to 40 mph east of the Rescue Elementary School. In the vicinity of the school, the reduced speed of 25 mph is enforced when children are present.
- Within the Cameron Park area, the typical cross-section includes two 12-foot travel lanes with a 6-foot wide shoulder on each side. Within the rural area (east of Cameron Park), the segment provides two 10- to 11-foot wide travel lanes with either soft (containing gravel, sand, etc.) shoulder or no shoulder (see picture below).

- There are no bike lanes or sidewalks on this segment.
- An intermittent clearance zone of 2 to 10 feet is present beyond the shoulder on each side. This area may not be sufficient to provide a recovery area for the errant vehicles that may run off the road given the property lines or fences that are placed at the edge of clearance zone.
- This segment is interrupted with multiple private property driveways on both sides.

### *Segment #10: Ponderosa Road to North Shingle Road*

Key characteristics and observations on this segment include:

- The 0.49-mile long undivided segment provides one travel lane in each direction with the posted speed limit of 40 mph.
- This segment provides two 10-11 foot wide travel lanes with either soft (containing gravel, sand, etc.) or no shoulder on either side (see below).

- There are no bike lanes or sidewalks on this segment.

- An intermittent clearance zone of 2 to 8 feet is present beyond the shoulder on each side. This area may not be sufficient to provide a recovery area for the errant vehicles that may run off the road given the property lines or fences that are placed at the edge of clearance zone.
- This segment is interrupted by multiple private property driveways on both sides.
- Grade ranges from 0% to 5% on this segment.

#### *Segment #11: North Shingle Road to Lotus Road*

Key characteristics and observations on this segment include:

- The 0.57-mile long undivided segment provides one travel lane in each direction with the posted speed limit of 55 mph.
- This segment provides two 11 to 12 foot wide travel lanes in each direction with no shoulders, except for those installed in the vicinity of the North Shingle Road and Lotus Road intersections.
- There are no bike lanes or sidewalks on this segment.
- This segment is interrupted by multiple private property driveways on both sides.
- Grade ranges from 1% to 4% on this segment.

### Study Intersection Observations

This section summarizes key characteristics and field observations at intersections.

#### *Intersection #1: Green Valley Road at Sophia Parkway*

The Sophia Parkway intersection is a four-legged signalized intersection. Exhibit 22 shows an aerial of this intersection.

**Exhibit 22. Green Valley Road and Sophia Parkway Intersection**


Key characteristics at the intersection include:

- A large number of pedestrians and bicyclists negotiate this intersection to access the Browns Ravine Recreation Area trails on the north side of Green Valley Road. This often leads to pedestrian conflicts with right-turning vehicles from Sophia Parkway. A "Yield to Pedestrians" sign is posted on the signal pole to educate motorists about an impending conflict with pedestrians within the crosswalk.
- Sophia Parkway provides wide shoulders south of Green Valley Road. These shoulders are being utilized as an on-street parking area by the motorists who typically park their cars and walk or bike to the Browns Ravine Recreation Area.

- To access ongoing construction activity at the nearby Folsom Lake Dam (see picture below), a significant volume of heavy-duty trucks utilize this intersection.


- Class II bicycle lanes are provided on both sides of the east and south legs of this intersection. A Class II bicycle lane is available in the westbound direction on the west leg.
- No sidewalk is provided on the west and north legs of the intersection.
- Pedestrians are prohibited from crossing Green Valley Road on the west leg.
- Continuous sidewalks are present south and east of the intersection on both sides of the road.

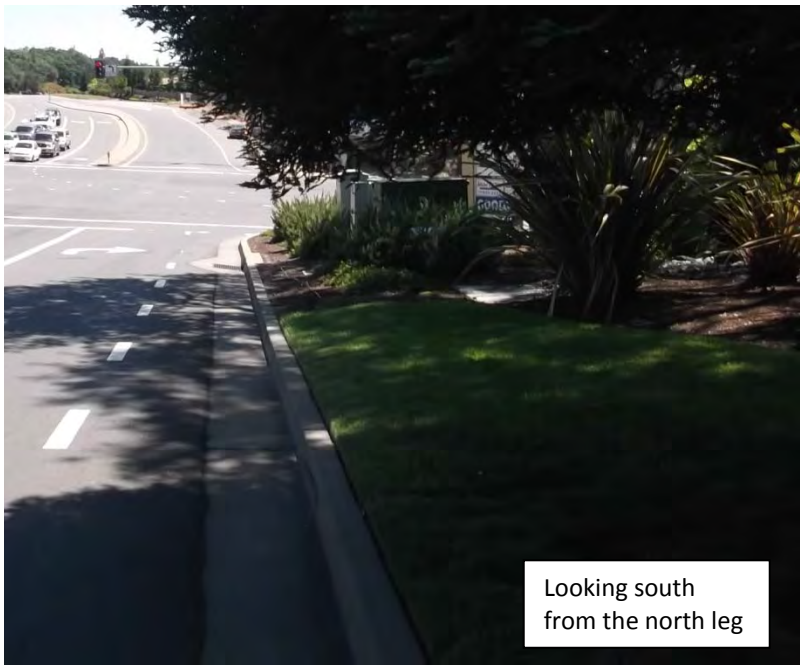
### *Intersection #2: Green Valley Road at Francisco Drive*

The Francisco Drive intersection is a four-legged signalized intersection. Exhibit 23 shows an aerial of this intersection.

**Exhibit 23. Green Valley Road and Francisco Drive Intersection**


Key characteristics at the intersection include:

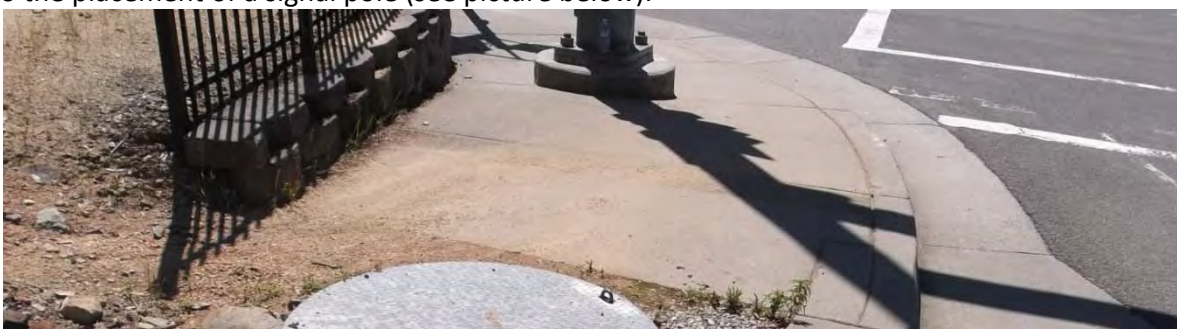
- Pedestrians and bicyclists use this intersection to access the market and village center on the north side of Green Valley Road.
- There are a large number of U-turns from the westbound left-turn lane of Green Valley Road. The majority of U-turn vehicles exited the Safeway shopping center from the driveway located approximately 480 feet east of this intersection. Some U-turns were also destined to the shopping center located in the southeast corner of this intersection.
- There are no sidewalks approaching the northwest corner of the intersection (see picture below).




- Sidewalk is not present along the west side of Francisco Drive to the south of the intersection (see picture below).


- Sidewalk is terminated from southeast corner of this intersection to the east (see picture below).


- Sidewalk in the southeast corner does not provide adequate clear width per ADA guidelines due to the placement of a signal pole (see picture below).



- Curb ramps in the southeast and southwest corners do not have detectable warning[13].
- Pedestrians are prohibited from crossing Green Valley Road on the west leg.
- A Class II bike lane is provided on either side of Green Valley Road to the west of this intersection. However, the stripped bike lane is dropped on the eastbound approach of this intersection to accommodate the right-turn lane. Similarly, a Class II bike lane is provided on

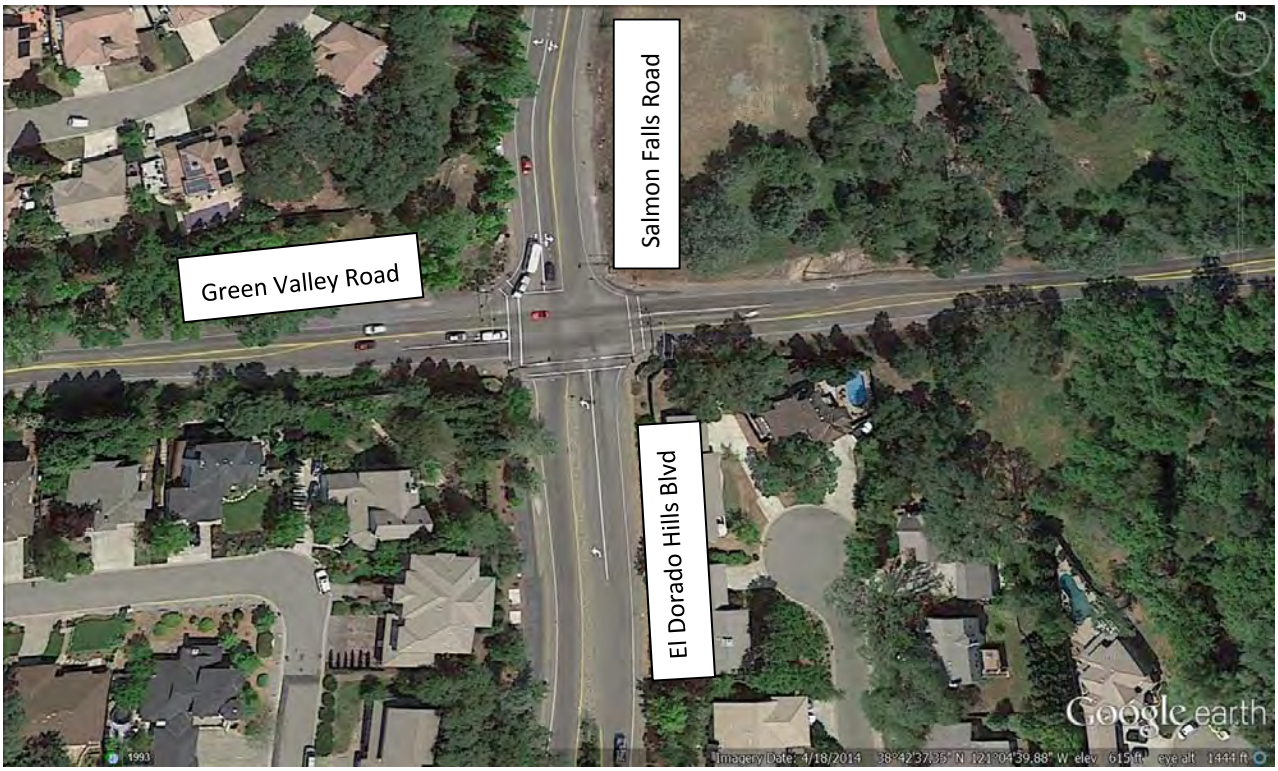
[13] Detectable warnings are an Americans with Disabilities Act (ADA) requirement in the current Americans with Disabilities Act Accessibility Guidelines (ADAAG) for the use of detecting the boundary between the sidewalk and the street. Placing a detectable warning at the bottom of a curb ramp identifies the transition between the sidewalk and the street for people with vision impairments.

both sides of Francisco Drive north of Green Valley Road without a dedicated bike lane on the southbound approach. Bike lanes do not exist to the east and south of this intersection.

### *Intersection #3: Green Valley Road at El Dorado Hills Boulevard/Salmon Falls Road*

The El Dorado Hills Boulevard intersection is a four-legged signalized intersection. Exhibit 24 shows an aerial of this intersection.

**Exhibit 24. Green Valley Road and El Dorado Hills Boulevard/Salmon Falls Road Intersection**




Key characteristics at the intersection include:

- The northbound and southbound approaches at this intersection operate with split phasing. That means all movements originating from one direction followed by all movements from the opposing direction.
- Pedestrians and bicyclists cross this intersection north-south. Residents north of this intersection navigate through this intersection to access an elementary school to the south.
- Traffic occasionally backs up on both the eastbound and westbound Green Valley Road approaches during the AM, midday and PM peak periods, but clears over one or two signal cycles.
- A pedestrian path is present on the west side of El Dorado Hills Boulevard south of this intersection.
- Pedestrian crossing is prohibited across the north leg of the intersection.

- There are numerous ADA concerns with no detectable warnings at any corner of the intersection, and a lack of pedestrian facilities at each corner (see figure below).

### *Intersection #4: Green Valley Road at Silva Valley Parkway/Allegheny Road*

The Silva Valley Parkway intersection is a four-legged signalized intersection. Exhibit 25 shows an aerial of this intersection.

**Exhibit 25. Green Valley Road and Silva Valley Parkway/Allegheny Road Intersection**


Key characteristics at the intersection include:

- Neighborhood residents are concerned about cut-through traffic to Salmon Falls Road via Allegheny Road to avoid the El Dorado Hills Boulevard/Salmon Falls Road intersection.
- Pedestrian crossings on Green Valley Road are common.
- There are no sidewalks approaching the intersection other than a pedestrian path approaching the intersection from nearby Timberline Ridge Court.
- Only the southwestern corner of the intersection has been improved to be consistent with ADA guidelines, the other corners lack detectable warnings and pedestrian access to the corner.
- Pedestrian crossings are prohibited across the east leg of the intersection.
- A pedestrian path is present on the west side of El Dorado Hills Boulevard south of this intersection (see picture below).


### *Intersection #5: Green Valley Road at Loch Way*

The Loch Way intersection is a three-legged intersection with stop-control on the minor (Loch Way) approach. Exhibit 26 shows an aerial of this intersection.

**Exhibit 26. Green Valley Road and Loch Way Intersection**


Key characteristics at the intersection include:

- There are no pedestrian or bicycle facilities at the intersection.
- A photo of the driver's eye view from the stop bar looking west indicates that the Intersection sight distance could be improved by trimming back vegetation (see picture below).

- Trailing vehicles pass around the leading vehicle(s) that are stopped waiting for an acceptable gap to make a left-turn movement into Loch Way. Vehicle skid marks were observed at the intersection.
- In-curb delineators are provided on the entry and exit radius to define the intersection for drivers at night.
- An advance intersection warning sign is provided in the eastbound and westbound direction.
- Loch Way serves residential neighborhoods south of Green Valley Road.
- The grades for the eastbound and westbound approaches are 2.3% upgrade and 3.6% downgrade respectively.
- Observations indicated no apparent stopping sight distance limitations at this intersection.

### *Intersection #6: Green Valley Road at Rocky Springs Road/Steve's Way*

The Rocky Springs Road/Steve's Way intersection is a four-legged offset intersection with assumed stop-control on the minor approaches. Exhibit 27 shows an aerial of this intersection. This is not a County maintained intersection.

**Exhibit 27. Green Valley Road and Rocky Springs Road/Steve's Way Intersection**


Key characteristics at the intersection include:

- The intersection does not have a marked stop bar or a stop sign on both Rocky Springs Road and Steve's Way as they are private roads.

- Both Rocky Springs Road and Steve's Way provide local access to a small number of single family residences.


- There are no bicycle or pedestrian facilities on any approach to the intersection.
- There are no advanced intersection warning signs in either direction.
- Due to the horizontal curvature of the roadway and overgrown foliage, the Rocky Springs Road approach has limited intersection sight distance looking east and west.
- The grade for both eastbound and westbound approaches is over 3%.
- There are opportunities to provide delineation to better define the intersection for motorists.

### *Intersection #7: Green Valley Road at Malcolm Dixon Road*

The Malcolm Dixon Road intersection is a three-legged intersection with the stop-control on the minor approach. Exhibit 28 shows an aerial of this intersection.

**Exhibit 28. Green Valley Road and Malcolm Dixon Road Intersection**


Key characteristics at the Green Valley Road and Malcolm Dixon Road intersection include:

- Due to the wide curve combined with an upgrade on Malcolm Dixon Road, vehicles typically slow down to make a left-turn onto Malcolm Dixon Road. This can present safety issues for the trailing motorists (see picture below).

- There are no pedestrian or bike facilities at the intersection.
- Observations indicate the intersection has limited stopping sight distance for vehicles approaching from the east due to the horizontal curvature and overgrown tree branches. Sight distance could be improved by trimming overgrown tree branches.
- The shoulder in the northwest quadrant of the intersection is narrow and contains gravel.
- Post-mounted delineators are provided in the northwest and northeast corners to define the intersection radius. However, there are opportunities to improve them.
- There are no advance intersection warning signs.

### *Intersection #8: Green Valley Road at Deer Valley Road (West)*

The Deer Valley Road (West) intersection is a four-legged intersection with the stop-control on minor approaches. This intersection was recently improved with the addition of turn lanes and bike lanes on Green Valley Road. Exhibit 29 shows an aerial of this intersection.

**Exhibit 29. Green Valley Road and Deer Valley Road (West) Intersection**


Key characteristics at the intersection include:

- Stopping sight distances and intersection sight distances were determined to be acceptable based on criteria contained in the most recent version of Caltrans *Highway Design Manual* (HDM).
- The roadway has grades of over 3% on the east, west, and south leg of the intersection.
- New Class II bike lanes are provided on Green Valley Road.

- Post-mounted delineators are installed at all four corners to define the intersection radius.

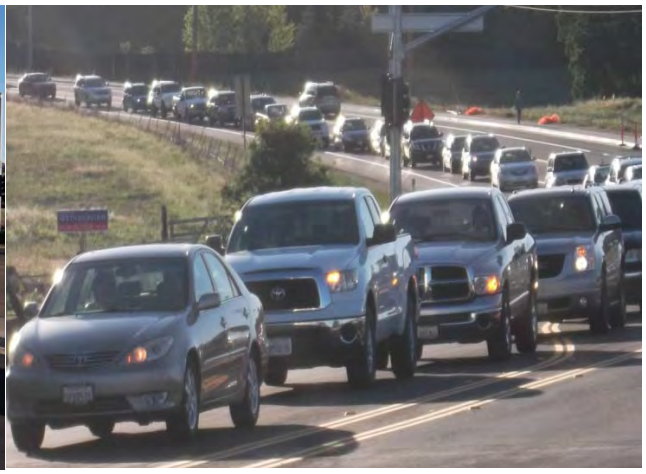
### *Intersection #9: Green Valley Road at Pleasant Grove Middle School*

The Pleasant Grove Middle School main access intersection is a three-legged signalized intersection. Exhibit 30 shows an aerial of this intersection. A detail discussion related to school traffic is included in the *Pleasant Grove Middle School* section.

**Exhibit 30. Green Valley Road and Pleasant Grove Middle School Intersection**


Key characteristics, as observed in the Spring of 2014, at the intersection include:

- There are significant operational issues at the intersection, which serves as the primary entrance to Pleasant Grove Middle School during the AM peak hour.
    - Most the school traffic travels to/from the east (Cameron Park).
    - 10-12 cars stack up internally for the drop-off activity. This prevents left-turning vehicles and right-turning vehicles from Green Valley Road from entering the school driveway despite a very long left-turn phase. This leads to queues of 25+ vehicles on Green Valley Road (see pictures below).

- Westbound vehicles can't access the secondary drop-off due to the driveway geometrics and striping along Green Valley Road. Vehicles accessing the school using the primary access were unable to drive down to the secondary drop-off area to the east due to not only internal queuing, and possibly the current closure of the eastern right-out exit (see pictures below).


- Drivers leaving during the AM and PM peak are primarily turning right out.

  - Westbound left-turn queues at the school access during the AM peak may lead to operational issues at the newly opened Silver Springs Parkway signalized intersection, as the demand of Silver Springs Parkway grows. The motorists would be unable to turn left out of Silver Springs Parkway when the downstream queues block their receiving lane. Similarly, access to the westbound Green Valley Road left-turn lane at Silver Springs Parkway could be restricted as a result of queues in the adjacent through lane.
- There are Class II bicycle lanes on both sides of the east leg but no bicycle facilities to the west of the intersection;
- There are sidewalks on both the east and west legs on the southern side of the intersection but no pedestrian facilities on the northern side of the road;
- Pedestrians are prohibited from crossing on the west leg;
- Pedestrians accessing the school typically come to/from the east and use the most-easterly driveway to access the school site. Therefore there is little pedestrian activity at this intersection.

### *Intersection #10: Green Valley Road at Bass Lake Road*

The Bass Lake Road intersection is a four-legged signalized intersection. Exhibit 31 shows an aerial of this intersection.

**Exhibit 31. Green Valley Road and Bass Lake Road Intersection**


Key characteristics at the intersection include:

- The intersection has a fair amount of pedestrian activity given Green Valley Elementary School is located just south of the intersection and Pleasant Grove Middle School is west of the intersection.
- The northwest corner of the intersection presents ADA concerns and does not have sidewalks from either approach.
- Pedestrian crossings are prohibited across the west leg of the intersection.
- The northbound and southbound approaches operate with split signal phasing. That means, all movements originating from one direction followed by all movements from the opposing direction.
- There are Class II bicycle lanes on Green Valley Road in both directions approaching and departing the intersection.

### *Intersection #11: Green Valley Road at Cambridge Road/Peridot Drive*

The Cambridge Road/Peridot Drive intersection is a four-legged signalized intersection. Exhibit 32 shows an aerial of this intersection.

**Exhibit 32. Green Valley Road and Cambridge Road/Peridot Drive Intersection**


Key characteristics at the intersection include:

- There are Class II bicycle lanes on Green Valley Road in both directions approaching and departing the intersection but no bicycle facilities on Cambridge Road or Peridot Drive.

- While the corners of the intersection have been improved and are ADA compliant, there are no sidewalks approaching or departing the intersection on the north side of Green Valley Road. Minimal asphalt paths are provided on the west side of Cambridge Road and the south side of the Green Valley Road approach (see picture below).

- Some pedestrian activity occurs from residents from neighborhoods accessing nearby stores and schools.
- The northbound and southbound approaches operate with split signal phasing.
- Pedestrian crossings are prohibited across the west leg of the intersection.

### *Intersection #12: Green Valley Road at Cameron Park Drive/Starbuck Road*

The Cameron Park Drive/Starbuck Road intersection is a four-legged signalized intersection. Exhibit 33 shows an aerial of this intersection.

**Exhibit 33. Green Valley Road and Cameron Park Drive/Starbuck Road Intersection**


Key characteristics at the intersection include:

- East of the intersection, Green Valley Road narrows and loses shoulders on both sides.
- There are Class II bicycle lanes on the west leg of the intersection, but no bicycle facilities on any of the other approaches.
- There are sidewalks in the northwest quadrant. The other corners have either no pedestrian facilities or very poorly maintained asphalt paths that are not ADA compliant.
- There is a bus stop on the west side of the Cameron Park Drive approach with no sidewalk (see picture below).


### *Intersection #13: Green Valley Road at Deer Valley Road (East)*

The Deer Valley Road (East) intersection is a three-legged intersection with stop-control on the minor approach. Exhibit 34 shows an aerial of this intersection.

**Exhibit 34. Green Valley Road and Deer Valley Road (East) Intersection**


Key characteristics at the intersection include:

- Advance intersection warning signs are installed in both directions on Green Valley Road.
- Green Valley Road is approximately 21-22 feet wide at the intersection.
- The bridge on Deer Valley Road approaching the intersection is narrow at 19 feet across with signs of vehicles scraping the bridge sides in the past (see picture below).

- There are no shoulders on any approach of this intersection.
- Observations indicate that the stopping sight distance for the southbound motorists is limited due to horizontal curvature (see figure below).

- There are no bicycle or pedestrian facilities on any approach.

- The westbound Green Valley Road approach has approximately 1.9% upgrade, while the eastbound approach is relatively flat with 0.7% downgrade.
- There are opportunities to provide delineation to define the intersection radius for drivers.
- A guard rail is provided on the north side of Green Valley Road on the east leg.

### *Intersection #14: Green Valley Road at Ponderosa Road*

The Ponderosa Road intersection is a three-legged intersection with stop-control on the minor approach. Exhibit 35 shows an aerial of this intersection.

**Exhibit 35. Green Valley Road and Ponderosa Road Intersection**


Key characteristics at the intersection include:

- Ponderosa Road (West) is located approximately 285 feet east of Ponderosa Road (East). As such, north and south Ponderosa Road creates an offset intersection with Green Valley Road.
- There is no shoulder along Green Valley Road or Ponderosa Road approaching or departing the intersection (see figure below).

- A traverse rumble strip is installed on the westbound approach to help reduce speeds and increase driver's awareness of the upcoming intersection.
- A vertical crest at the intersection contributes to highly restricted intersection and stopping sight distances at both intersections on Green Valley Road. Green Valley Road has 4.4% and 6.7% grades east and west of this intersection respectively (see figure below).

- Due to the vertical crest and horizontal curvature, several drivers were observed to correct their path of travel once reaching the crest to follow the curve of the road. Chevron signs have been provided to negotiate the path.
- There are no bicycle or pedestrian facilities on any approach of this intersection.
- Green Valley Road is approximately 20-21 feet wide at this intersection.
- Advance intersection warning signs, speed advisory signs, as well as chevron signs are provided on Green Valley Road.
- Delineators are provided in the southwest and southeast corners to define intersection radius. However, there are opportunities to improve them.

### *Intersection #15: Green Valley Road at North Shingle Road*

The North Shingle Road intersection is a three-legged signalized intersection. Exhibit 36 shows an aerial of this intersection.

**Exhibit 36. Green Valley Road and North Shingle Road Intersection**


Key characteristics at the intersection include:

- Green Valley Road narrows and loses shoulders west of this intersection which is warned by a traffic sign.
- Pedestrian crossings are prohibited on the north leg of the intersection.
- There are no sidewalks on any approach to the intersection beyond a small ADA compliant landing at the corners (see picture below).

- There are no bicycle facilities on any approach to the intersection.
- Shoulders are provided on each leg of this intersection.
- Southbound right-turn signal operates with an overlap phase with the eastbound left-turns.

### *Intersection #16: Green Valley Road at Lotus Road*

The Lotus Road intersection is a three-legged intersection with stop-control on the westbound Green Valley Road approach. Exhibit 37 shows an aerial of this intersection.

**Exhibit 37. Green Valley Road and Lotus Road Intersection**


Key characteristics at the intersection include:

- There are no bicycle or pedestrian facilities on any approach to the intersection;
- Observations indicated that the intersection sight distance from the westbound Green Valley Road approach looking right is limited due to horizontal curvature (see picture below).

- Observations indicated that the southbound Lotus Road has limited stopping sight distance due to the horizontal curvature and overgrown tree branches. Sight distance could be improved by trimming tree branches.
- One or two post-mounted delineators are installed in the northeast and southeast corners to define the intersection radius for drivers.

## Field Review: Private Driveways

It should be noted that the County does not improve private driveways. Any improvements are the responsibility of the private property owner. During the field visits, an inventory of private property driveways on Green Valley Road between Sophia Parkway and Bass Lake Road was performed. A cursory evaluation of intersection sight distance (ISD)[14] and stopping sight distance[15] (SSD) was also performed at these driveways, whereas detailed measurements were collected at the locations with apparent intersection and stopping sight distance issues. Sight distance in and out of these driveways was assessed based on the latest version of the California *Highway Design Manual*[16]. The measured and/or observed sight distances were evaluated against the criteria contained in the referenced document and included in Table 2.

**Table 2. Sight Distance Criteria**

| Design Speed (mph) | Intersection Sight Distance (ft) | Stopping Sight Distance (ft) |
|---|---|---|
| 25 | 275 | 150 |
| 30 | 330 | 200 |
| 35 | 385 | 250 |
| 40 | 440 | 300 |
| 45 | 495 | 360 |
| 50 | 550 | 430 |
| 55 | 605 | 500 |
| 60 | 660 | 580 |
| 65 | 715 | 660 |
| 70 | 770 | 750 |
| Source: California Highway Design Manual, 2012 | | |

A total of 36 actively used driveway access points were identified and inventoried. The location of these driveways is shown in Exhibit 38. Driveways with identified sight issues are summarized below.

[14] Intersection Sight Distance is also referred to as Corner Sight Distance. It is the clear line of sight in feet between the driver of a vehicle waiting at the crossroad (stop control) and the driver of an approaching vehicle on the major uncontrolled street.

[15] Stopping Sight Distance is defined as the distance needed for drivers to see an object on the roadway ahead and bring their vehicles to safe stop without colliding with the object.

[16] *Highway Design Manual.* California Department of Transportation (2012)

### *Limited Intersection Sight Distance*

The following access points had identified intersection sight distance issues:

- **The Purple Place Retail Center:** the eastern access has limited sight distance looking west, and the western access has limited sight distance looking east. The retaining walls and a vertical curve are primarily contributing factors limiting the sight distance for right and left out movements.
- **1072 Green Valley Road:** ISD is limited in both directions due to vegetation.
- **1530/1532/1540 Green Valley Road:** Line of sight for the right-turning vehicles looking west is limited due to the horizontal and vertical curvature of the road.
- **1680 Green Valley Road:** Line of sight to the east and west is limited due to vegetation and a horizontal curve. Trimming of the vegetation could improve ISD to the west, and all sight distances were acceptable when the vehicle position was moved to 10 feet from the edge of the roadway.
- **1840 Green Valley Road Home and Eastern Strawberry Entrance:** Line of sight to the west from both the 1840 Green Valley Road home access and the second entrance to the strawberry stand (coming from the west) is limited due to vegetation but could be improved with tree removal by the private property owner. ISD to the east is limited from the home driveway due to the vertical crest of the road.
- **1855 Green Valley Road:** ISD is limited in both directions due to vegetation to the west and vertical curvature to the east. ISD to the west for the unmarked access across the street is also limited due to vertical curvature.
- **Lexi Way:** ISD to the east is restrictive due to the vertical crest in the roadway.
- **1870/1880 Green Valley Road:** ISD to the east was extremely limited due to the vertical crest in the roadway.
- **1901 Green Valley Road:** ISD is poor in both directions due to the hillside, vegetation, and vertical and horizontal curvature.
- **Unknown Driveway (Lion Entrance):** ISD is limited to the west because of horizontal and vertical curves and vegetation.
- **1937 Green Valley Road:** ISD is limited to the east because of vegetation, but would be improved with the trimming.
- **1960 Green Valley Road:** ISD is limited in both directions due to the vertical crest in the road and vegetation.
- **2001 Green Valley Road:** ISD is poor to the west due to vegetation, hillside, and vertical curvature. ISD is limited to the east due to the vertical curve of the roadway.
- **2020 Green Valley Road:** ISD is limited to the west because of a vertical crest in the roadway.
- **2045/2046 Green Valley Road:** ISD is limited to the west because of a vertical crest in the roadway.
- **2321 Green Valley Road:** ISD is limited to the west due to the vertical curve in the road, and poor to the east due to vegetation and combined vertical and horizontal curvature. Trimming of vegetation will likely not improve ISD.

- **Driveway east of 2801 Green Valley Road:** ISD is limited to the east because of the hillside, but improves by reducing the setback distance to 10 feet from the edge of pavement.

### *Limited Stopping Sight Distance*

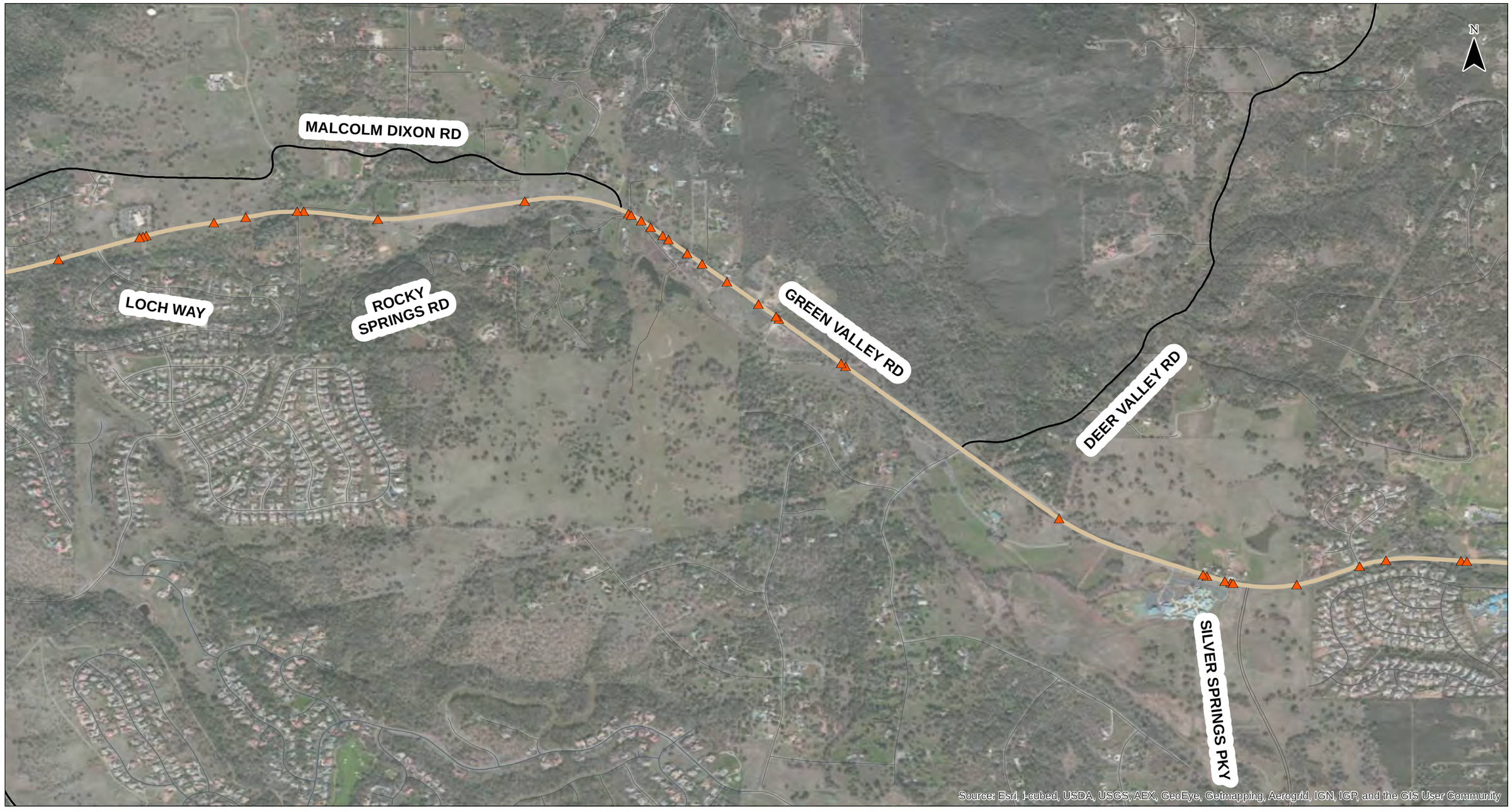
The following access points were identified with the stopping sight distance issues:

- **1530/1532/1540 Green Valley Road:** SSD for eastbound approaching vehicles was limited due to the horizontal and vertical curvature of the road.
- **1680 Green Valley Road:** Stopping sight distance for eastbound approaching vehicles was limited due to the horizontal and vertical curvature of the road.
- **1870/1880 Green Valley Road:** SSD for westbound vehicles approaching the driveway from the east was poor due to the vertical crest in the roadway.
- **1901 Green Valley Road:** SSD is limited for westbound approaching vehicles due to the hillside, vegetation, and horizontal curvature.
- **1960 Green Valley Road:** SSD is limited for westbound approaching vehicles because of vertical curvature and vegetation.
- **2001 Green Valley Road:** SSD is limited for westbound approaching vehicles because of vertical curvature and vegetation.
- **2321 Green Valley Road:** SSD is limited for westbound approaching vehicles due to the vertical crest in the road.
- **Travois Circle:** SSD is limited for westbound approaching vehicles due to the horizontal curve of the roadway.

### *The Purple Place Retail Center*

The Purple Place Retail Center is located on the north side of Green Valley Road east of Sophia Parkway. In the westbound direction, Green Valley Road provides a 2% to 3% downgrade near The Purple Place. Motorists traveling in the westbound direction and wanting to enter The Purple Place Retail Center must decelerate to negotiate tight right-turn radii at the driveway. As a result, trailing motorists in the outside lane either slow down or move into the adjacent lane. This could potentially reduce roadway capacity and pose safety issues. Corner sight distance at the western driveway looking east was observed to be limited, primarily due to a horizontal curve. The eastern driveway has limited corner sight distance looking west due to a retaining wall.

Weekday AM and PM peak hour traffic volumes indicate that the western driveway was used more frequently relative to the eastern driveway.




Driveways and Access Points
Study Segments
Highway
Major Road
Minor Road

**Driveways and Access Points**
**Green Valley Road**

Exhibit **38**

*Coordinate System: GCS WGS 1984*

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## Field Review: Pleasant Grove Middle School

Pleasant Grove Middle School is served by a signalized full-access driveway (western), a right-in/right-out (RIRO) access (middle) and a right-out only access (eastern). Field observations were collected during the school AM and PM peak hours, in the Spring of 2014. During the field visit, the eastern right-out only driveway was closed.

The school provides two pick-up/drop-off areas for parents. The western area is located in front of the play area and eastern area is in front of the school building. The western drop-off area provides a 170-foot long curbside lane, while the eastern area has curbside space of equal length to accommodate loading/unloading vehicles. After loading/unloading, vehicles typically exit the site by either turning around the parking spaces to the north returning to the primary access driveway or by continuing towards the RIRO driveway. The western drop-off area also provides a pass-by lane which allows vehicles to move past the stopped vehicles and access the eastern drop-off area and parking lot. The western drop-off area was observed to be utilized more frequently and heavily relative to the eastern, potentially causing some internal circulation issues which ultimately propagate onto Green Valley Road. School circulation provides a one-way counter-clockwise flow around the parking spaces. A dedicated pick-up/drop-off area as well as bus turnout is provided for the school buses which is located in the southwest of the school site.

Parents, students and employees were observed accessing the school by walking. A continuous sidewalk with appropriate ramps is provided on the south side of Green Valley Road to safely cross the conflicting traffic. However, the site has no internal path or marked crosswalks to direct pedestrian flows to/from the Green Valley Road sidewalk at the RIRO driveway. The sidewalk along the eastern edge of the school site does not extend to connect with the Green Valley Road sidewalk. There were no monitors in the AM peak to direct students and parents to loading/unloading activities.

*Operational Observations:*

- Most the motorists access the school from the east. Given the western drop-off area is closer to the primary school access, a higher number of parents use this location. Approximately 10 to 12 vehicles were observed to queue up in this area occupying not only the assigned drop-off lane, but also the adjacent pass-by lane. Approximately 10 to 12 vehicles were observed to queue up in the driveway blocking the access the Green Valley Road (see figure below). These queues can also delay the buses from accessing their assigned loading/unloading area.

- When the internal circulation activities peak, parents were observed using the pass-by lane at the western drop-off location as well as parking areas. Some parents were also observed to park vehicles and walk their kids to the curbside.
- The eastern drop-off area is relatively underutilized (see picture below). Use of the eastern drop-off location is also possibly influenced by the current closure of the eastern right-out exit only driveway.

- Some vehicles were using the "red-curbed zone" (where drop-off activities are not allowed) to unload kids.
- Most of traffic exits the school by turning right at the RIRO driveway. Motorists destined to the west must use the signalized driveway.
- While County staff have modified the signal timing of the Pleasant Grove Middle School access to provide a longer green time for the westbound Green Valley Road left-turn phase (current timing sheets provide a maximum of 25 seconds of green time), there are still significant operational issues at this intersection. The westbound Green Valley Road left-turn queues at the

primary school access extend beyond the newly constructed Silver Springs Parkway. The queues lengths sometimes reach Bass Lake Road (see pictures below) which is three-quarters of a mile east of the primary school access. According to Rescue Union School District Superintendent and staff, additional internal striping has been added to the school site since the field review and the westbound left-turn queues in the AM peak have noticeably decreased.

- Circulation and operational issues were predominantly observed at the time of drop-off and typically last for approximately 15-20 minutes.
- Finally, with the recent opening of Silver Springs Parkway, there is a potential that parents would drop-off children at the bus pullout located just south of Green Valley Road. Traffic counts were taken in the AM peak period at the intersection to assess potential vehicles accessing Silver Springs Parkway for the drop-off activities. Seven vehicles accessed Silver Springs Parkway and four vehicles turned onto Green Valley Road from Silver Spring Parkway, potentially representing some vehicles using the newly opened roadway for the school drop-off.

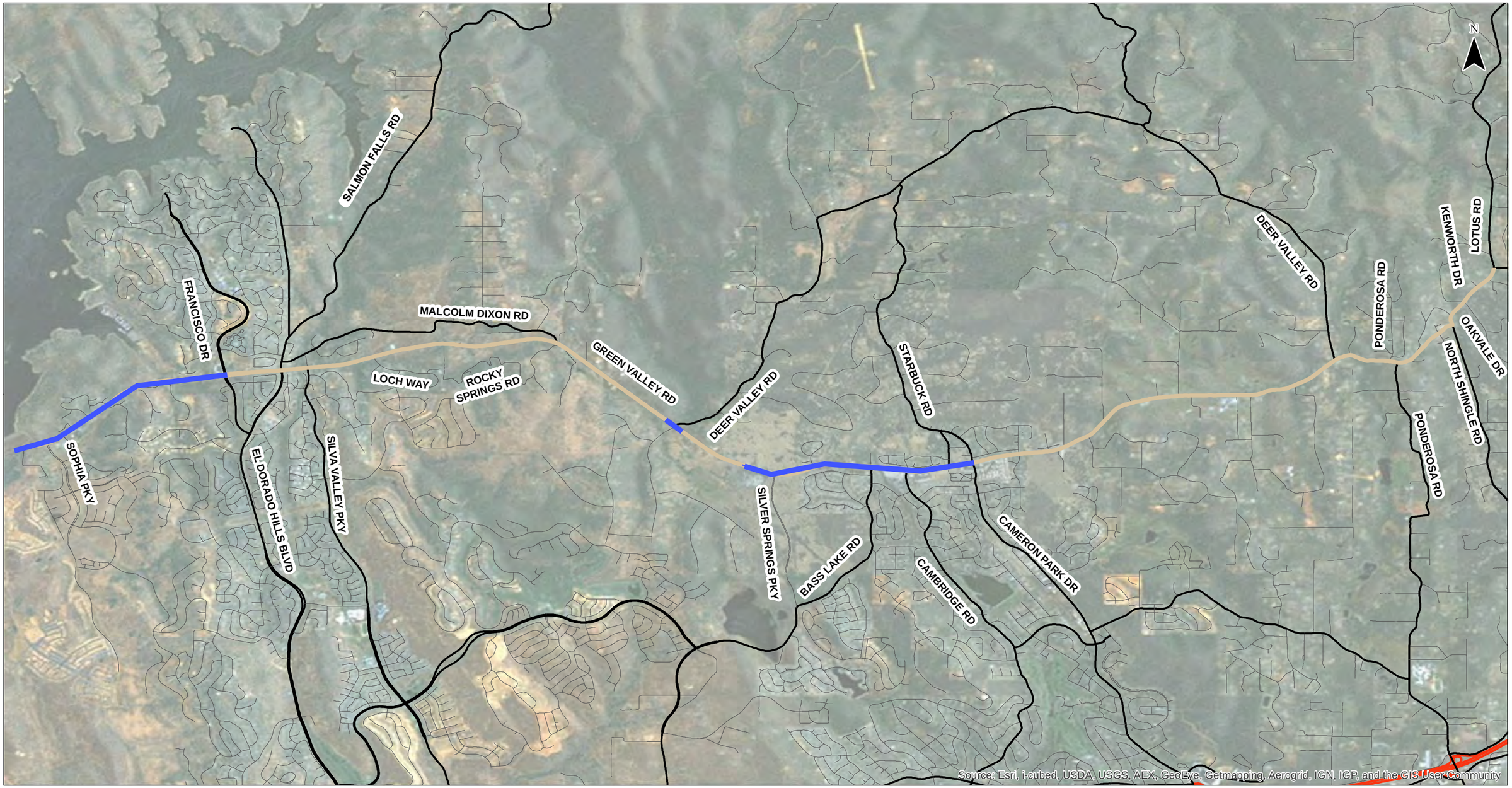
## Field Review: Bike Facilities

Class II bicycle lanes are present along portions of the corridor including:

- Westbound:
  - From Cameron Park Drive/Starbuck Road to the Pleasant Grove Middle School main access;
  - From east of Deer Valley Road (West) to west of Deer Valley Road (West); and,
  - From Francisco Drive to the El Dorado/Sacramento County Line.
- Eastbound:
  - From the El Dorado/Sacramento County Line to west of Sophia Parkway;
  - From east of Sophia Parkway to Francisco Drive;
  - From west of Deer Valley Road (West) to east of Deer Valley Road (West); and,
  - From the Pleasant Grove Middle School primary access to Cameron Park Drive/Starbuck Road.

Bike facilities along the corridor are shown in Exhibit 39.

Recreational bicyclists were observed in the above-mentioned Class II bike lanes along the study corridor at different times of the day. Bicyclists were also observed to share the travel lane with motorists from Silva Valley Parkway to Deer Valley Road (West), and from Cameron Park Drive to Ponderosa Road. Bicycle signs marking beginning and end of Class II lanes were inconsistent throughout the corridor. Field observations noted that bicycle lane pavement markings are infrequent along the corridor and are not marked at the far side of all study intersections along the corridor.




Class II Bicycle Lanes
Study Corridor

**Roadway Classification**

Highway
Major Road
Minor Road

**Bicycle Facilities**
**Green Valley Road**

Exhibit
**39**

*Coordinate System: GCS WGS 1984*

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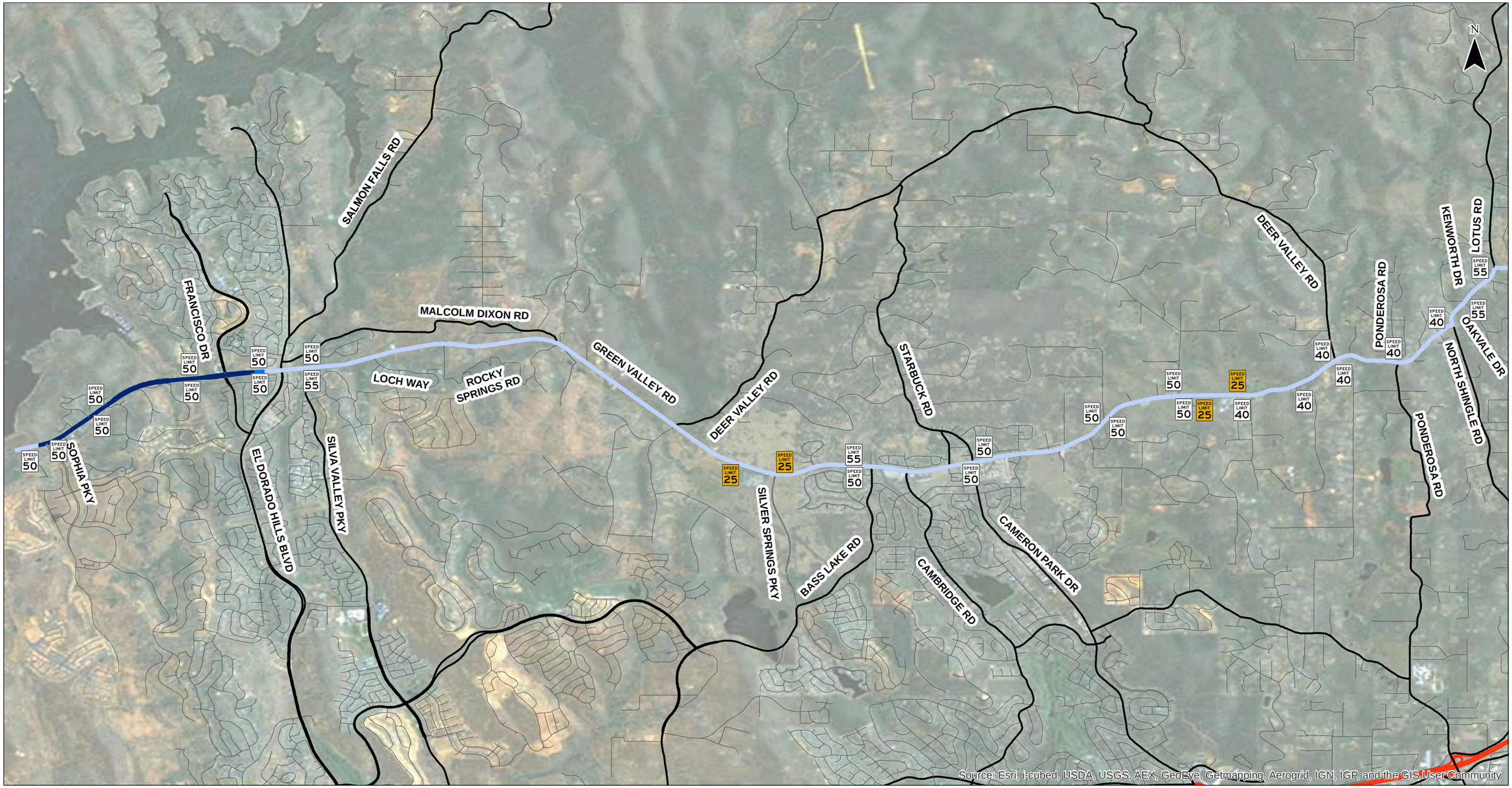
## Field Review: Speed Limit Signs

Location and placement of speed limit signs were inventoried and observed. Exhibit 40 illustrates posted speed limits and sign locations in the study corridor. The posted speed limit in the study corridor ranges from 40 to 55 mph; although the corridor should provide adequate signage to mark transition from one speed limit to another. The only segment that provides such transitional treatment is eastbound Green Valley Road just west of Bass Lake Road. When children are present in the vicinity of Pleasant Grove Middle and Rescue Elementary schools, an advisory speed limit of 25 mph is enforced. Barring the segment between Silver Springs Parkway and Cameron Park Drive, the County has recently upgraded the speed limit signs on Green Valley Road to provide higher retro-reflectivity. The County is scheduled to add new retro-reflectivity signage between Silver Springs Parkway and Cameron Park Drive in winter of 2014/2015.

There are no speed limit signs between Silva Valley Parkway and newly constructed Silver Springs Parkway. This is a prima facie speed limit (55 mph), thus it is not signed at a certain interval (CVC 22349). This section of Green Valley Road is approximately 3.2 miles long with several private driveways and minor-street stop controlled intersections.




**Number of Lanes**
- 2 Lanes
- 3 Lanes
- 4 Lanes

**Roadway Classification**
- Highway
- Major Road
- Minor Road

## Number of Lanes and Posted Speed Limit Signs
## Green Valley Road

Exhibit **40**

*Coordinate System: GCS WGS 1984*

KITTELSON & ASSOCIATES, INC.
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# CRASH DATA AND STATISTICS

This subsection summarizes crash data, analysis and results at the study locations.

## Historical Crash Data and Descriptive Statistics

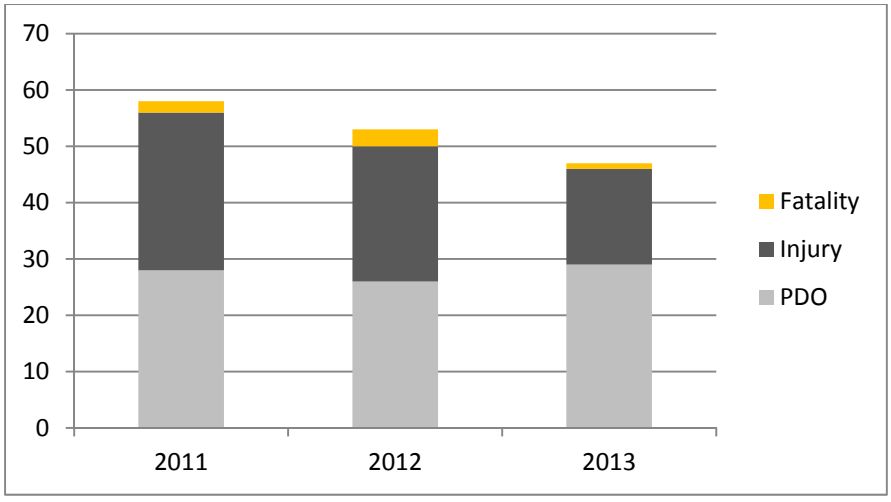
KAI obtained crash data and crash reports along the study corridor of Green Valley Road in El Dorado County over a three-year study period (2011–2013). The crash data and reports were used to conduct a review of the crash history along the study corridor throughout the study period. KAI summarized the crash history and identified characteristics such as: severity (fatal, injury, or property damage only), year and month, collision type, lighting conditions, number of vehicles involved, and frequency by location.

### *Overall Corridor Trends and Data*

Over the study period (January 1, 2011 to December 31, 2013), 158 crashes were reported along the Green Valley Road study corridor. The study corridor spans approximately 10.85 miles along Green Valley Road, from the El Dorado County line to the intersection at Lotus Road.

Of the 158 reported crashes that occurred during the study period, 52 percent resulted in property damage only (PDO), 44 percent resulted in an injury, and four percent resulted in a fatality. Crash severity by year throughout the study period is presented in Exhibit 41. A total of 69 injury crashes, resulting in 113 injuries, and six fatal crashes, resulting in seven fatalities, were reported over the study period.

**Exhibit 41. Crash Severity by Year (2011 - 2013)**



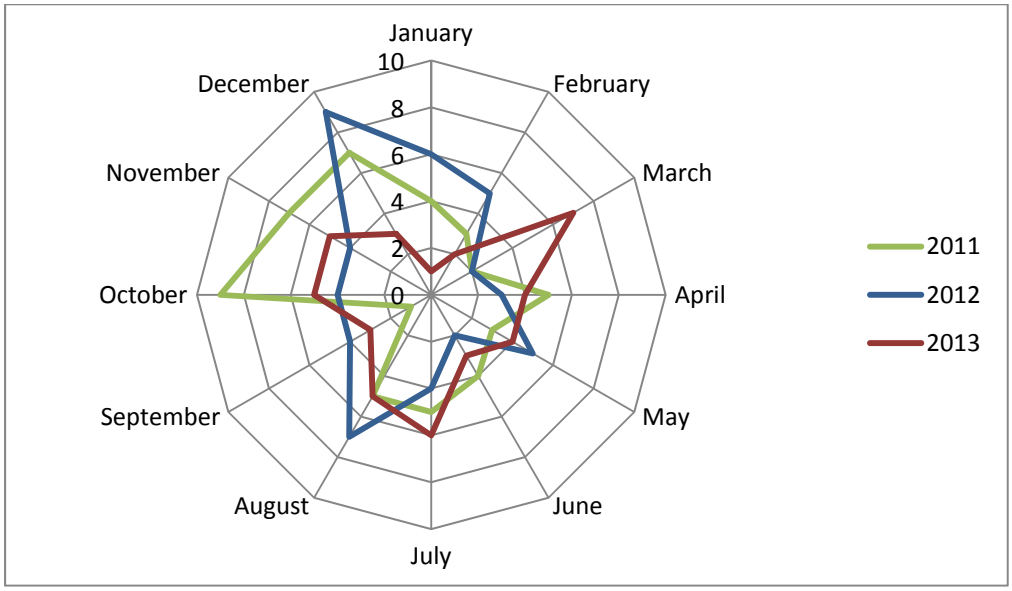

From 2011 to 2013, reported crashes decreased 19 percent along the study corridor. A total of 58 and 53 crashes were reported in the year 2011 and 2012 respectively. The total number of reported crashes reduced to 47 in the year 2013. In 2013, there were also fewer injury and fatality crashes than those reported in 2011 and 2012. In 2011 and 2012, half (50 percent) of the reported crashes had an injury

involved, whereas approximately one-thirds of reported crashes had an injury in 2013. The number of injury crashes decreased by 39 percent, while property damage only crashes increased by roughly 4 percent between 2011 and 2013. Each of three years reported at least one fatality with 2012 registering three fatalities.

### *Crash Frequency by Month*

The crash frequency by year and month is shown Exhibit 42. The crash data does not show a consistent trend during the months throughout the study period. Each year experienced a different peak month for crashes. There were no apparent crash patterns from the crash data to suggest that time of year factors into the frequency and severity of the crashes along the study corridor.

**Exhibit 42. Crash Frequency by Month (2011 – 2013)**




### *Crash Type*

In addition to identifying when crashes occurred throughout the corridor, KAI also reviewed the type of collisions that occurred and considered trends in contributing factors. Table 3 summarizes the collision types within the study corridor.

**Table 3. Frequency by Crash Type**

| Crash Type | Frequency | Percentage |
|---|---|---|
| Head-on | 4 | 3% |
| Sideswipe | 8 | 5% |
| Rear-end | 52 | 33% |
| Broadside | 31 | 20% |
| Fixed-object | 31 | 20% |
| Overturned | 5 | 3% |
| Pedestrian | 4 | 3% |
| Bicycle | 6 | 4% |
| Animal | 6 | 4% |
| Parked Vehicle | 0 | 0% |
| Snow Removal Equipment | 0 | 0% |
| Other | 5 | 3% |
| Motorcycle | 6 | 4% |
| School bus | 0 | 0% |

Rear-end crashes were the most frequent crash type (33 percent) throughout the study corridor; with approximately 50 percent of rear-end crashes occurring within the influence area of an intersection[17] (within 250 feet of an intersection). Broadside crashes, generally defined as turning movement and angle crashes, accounted for 20 percent of all crashes along the study corridor. Approximately two-thirds of the broadside crashes occurred within an intersection's influence area.

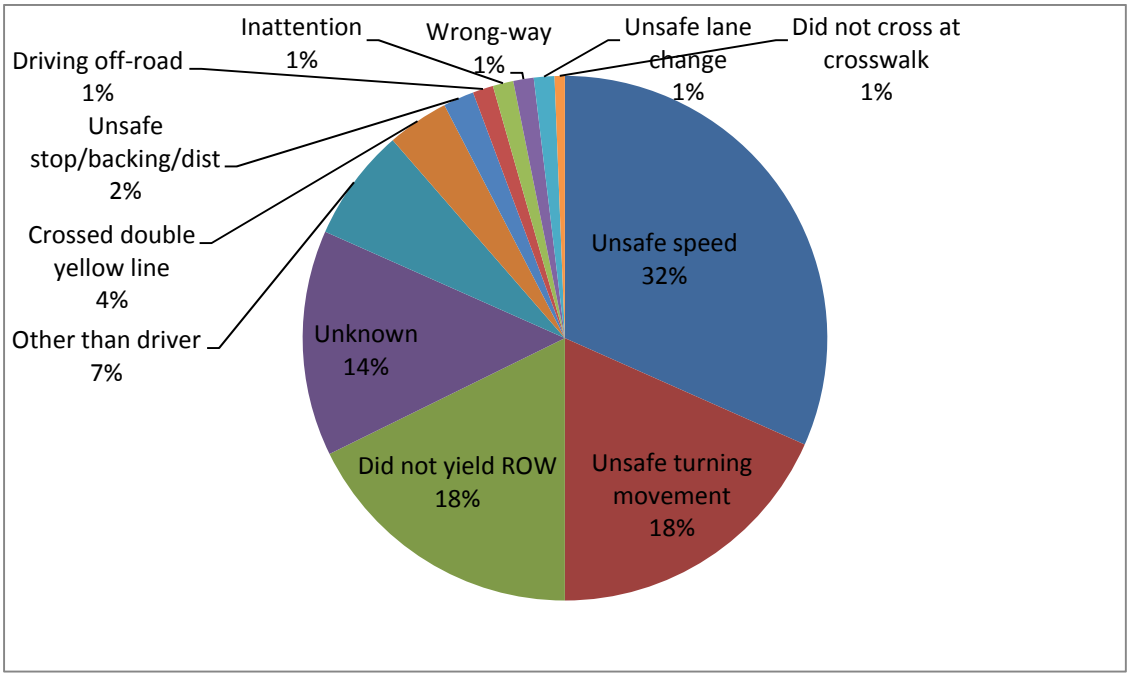
Twenty percent of crashes were fixed-object. Fixed-object crashes, as well as overturned vehicles were included in the analysis of the "Roadway Departure Crashes" section below. Crashes that involved a pedestrian and/or bicycle accounted for seven percent of reported crashes.

### *Contributing Factors*

The crash data provided by the County of El Dorado included the contributing factors for each of the reported crashes. The contributing factors included in the crash reports were used to analyze crash data to identify areas along the study segment that may benefit from improvement. Exhibit 43 provides an overview of the contributing factors for the reported crashes along the Green Valley Road corridor.

[17] Crash data provided at each intersection determined the influence area.

**Exhibit 43. Corridor-Wide Contributing Factors of Crashes (2011 - 2013)**




The crash data includes 12 contributing factors for crashes along the corridor. Approximately one-third of crashes along the corridor cited "unsafe speed" as a contributing factor for the crash. Unsafe speed was cited as the contributing factor for approximately 70 percent of all reported rear-end crashes, the most common crash type. "Unsafe turning movement" and "Did not yield right of way (ROW)" accounted for 36 percent of reported crashes. These crashes generally involved vehicles making left or right turns at intersections. "Other than driver" is noted as a crash factor when the police officer determined that the crash was unavoidable or did not result from the driver's fault. Eighty percent of the "Other than driver" crashes note hitting an animal as a factor contributing to the incident. Contributing factors of crashes on the roadway segments and at the intersections are discussed further in the Contributing Factors by Location section of the report.

### *Roadway Departure Crashes*

Twenty-nine percent (46 crashes) of all reported crashes along the corridor were single vehicle crashes, meaning another vehicle was not involved in the incident. Of the 46 single vehicle crashes, roughly three-quarters of them involved roadway departures, resulting in fixed object collisions and/or overturned vehicles. Forty-four percent of the roadway departure crashes resulted in injury.

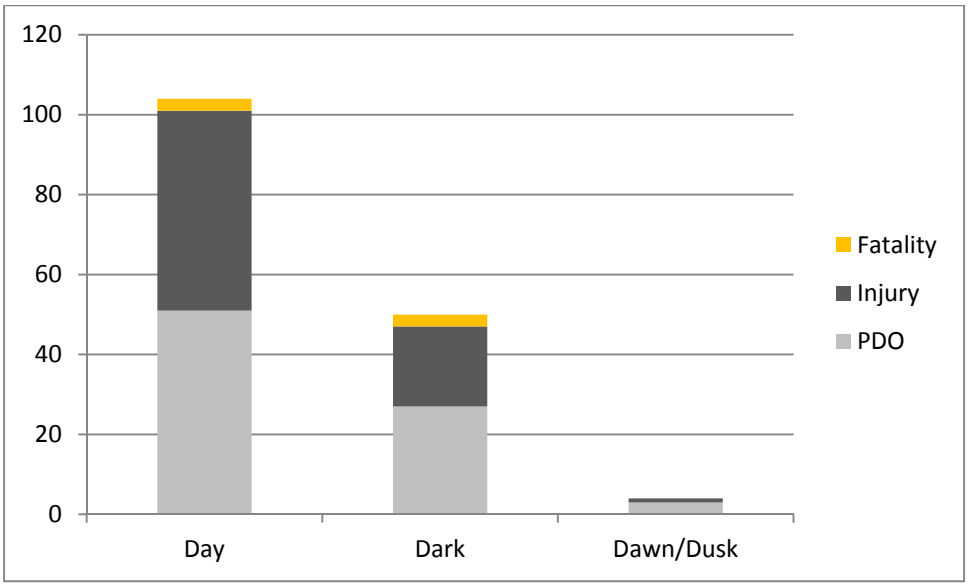
A total of 17 alcohol-related crashes were reported during the study period. Crash reports indicate that approximately one-third of the roadway departure crashes involved alcohol and nearly 60 percent of all crashes involving alcohol resulted in a roadway departure crash. In addition, wet or icy/snowy pavement conditions were cited in one-quarter of the roadway departure crashes.

### *Lighting*

Approximately one-third of the reported crashes on the corridor occurred in non-daylight lighting conditions (dawn, dusk or dark), as seen in Exhibit 44. When considering roadway segments exclusively, the percentage of non-daylight crashes increases to 40 percent. Although the majority of crashes typically occurred in daylight condition, the crashes occurring during non-daylight hours were spread throughout the study corridor. However, there is a concentration of non-daylight crashes that occurred on the eastbound and westbound approaches of the Green Valley Road/El Dorado Hills Boulevard/Salmon Falls Road intersection.

During field studies, KAI observed the corridor and the surrounding area was dark in the evening, with the exception of the Sophia Parkway and Francisco Drive intersections. The majority of the roadway segments and intersections are unlighted in particular the unsignalized intersections. Light poles were observed at select intersections, positioned to illuminate the minor approach and pedestrian crosswalk. Light poles are present at the these intersections: Sophia Parkway, Francisco Drive, El Dorado Hills Boulevard/Salmon Falls Road, Silva Valley Parkway/Allegheny Road, Pleasant Grove School Access, Silver Springs Parkway/Bass Lake Road, Cambridge Road, Cameron Park Drive, and North Shingle Road.

**Exhibit 44. Crashes by Lighting Conditions (2011 – 2013)**




## *Location Specific Crash Data Trends and Patterns*

This section presents the crash data and observations at the study intersections and study segments.

### *Severity, Frequency and Rate by Location*

Green Valley Road corridor crash data was reviewed and analyzed by KAI on a corridor wide level, as well as by intersection and roadway segment. Table 2 categorizes the crashes by severity that occurred

along the study roadway segments. A total of 81 crashes or approximately 51 percent of all crashes along the corridor occurred on roadway segments. The crash rate[18] is calculated based on annual average crashes per Million Vehicles Miles (MVM). The County has a threshold of 1.7 crashes per MVM for the segment to be considered for further evaluation and possible treatments[19]. As illustrated in Table 4, none of the roadway segments exceeded that threshold during the study period. The locations with the highest crash rates are El Dorado Hills Boulevard to Silva Valley Parkway (1.22 crashes per MVM), Cameron Park Drive to Ponderosa Road (0.90 crashes per MVM) and Malcom Dixon Road to Deer Valley Road (West) (0.65 crashes per MVM). The segment of Sophia Parkway to Francisco Drive had the highest number of crashes, however it also serves the highest amount of traffic, and therefore the crash rate is lower than other locations with fewer crashes. The Sophia Parkway to Francisco Drive segment registered more severe crashes than PDO crashes in the study period.

Table 3 categorizes all of the crashes that occurred within the intersection influence area of study intersections along the Green Valley Road corridor. Overall, approximately 49 percent of crashes occurred at study intersections along the corridor. The crash rate is calculated based on annual average crashes per Million Entering Vehicles (MEV). Intersections with crash rates above 1.0 crash per MEV are considered for further evaluation[20]. As illustrated in Table 5, none of the study intersections exceeded that threshold during the study period. The locations with the highest crash rates are Cameron Park Drive (0.83 crashes per MEV), Ponderosa Road (0.83 crashes per MEV), and Deer Valley Road (West) (0.52 crashes per MEV) intersections. While the Sophia Parkway intersection recorded the highest number of crashes, it also serves a high number of vehicles; therefore the crash rate is lower than other locations with fewer crashes. The Ponderosa Road intersection had a higher proportion of severe crashes than the other study intersections.

Crash frequency alone is often inadequate when comparing multiple intersections or prioritizing locations for improvement. Crash rates can be a useful tool to determine how a specific intersection or segment compares to the average on the roadway network. However, using a crash rate alone to identify potential safety issues has a disadvantage: lower volume sites tend to experience a higher crash rate and higher volumes may reflect a lower crash rate.

[18] The ratio of crash frequency (crashes per year) to vehicle exposure (number of vehicles entering the intersection or segment) results in a crash rate.

[19] Annual Accident Location Study, El Dorado County – Department of Transportation prepared on May 18, 2012

[20] Annual Accident Location Study, El Dorado County – Department of Transportation prepared on May 18, 2012

**Table 4. Crash Severity and Frequency by Segment**

| Segment | No. of Crashes | Corridor Percent | PDO | Injury | Fatal | Crash Rate per MVM |
|---|---|---|---|---|---|---|
| 1. County Line to Sophia Parkway | 1 | 1% | 0 | 1 | 0 | 0.18 |
| 2. Sophia Parkway to Francisco Drive | 22 | 14% | 8 | 12 | 2 | 0.60 |
| 3. Francisco Parkway to El Dorado Hills Boulevard | 4 | 3% | 2 | 2 | 0 | 0.64 |
| 4. El Dorado Hills Boulevard to Silva Valley Parkway | 7 | 4% | 4 | 3 | 0 | 1.22 |
| 5. Silvia Valley Parkway to Malcom Dixon Road | 7 | 4% | 4 | 3 | 0 | 0.33 |
| 6. Malcom Dixon Road to Deer Valley Road (W) | 8 | 5% | 6 | 2 | 0 | 0.65 |
| 7. Deer Valley Road (W) to Bass Lake Road | 8 | 5% | 3 | 5 | 0 | 0.49 |
| 8. Bass Lake Road to Cameron Park Drive | 2 | 1% | 0 | 2 | 0 | 0.23 |
| 9. Cameron Park Drive to Ponderosa Road | 19 | 12% | 9 | 9 | 1 | 0.90 |
| 10. Ponderosa Road to N Shingle Road | 1 | 1% | 1 | 0 | 0 | 0.42 |
| 11. N Shingle Road to Lotus Road | 2 | 1% | 2 | 0 | 0 | 0.40 |
| ENTIRE CORRIDOR | 81 | 51% | 39 | 39 | 3 | 0.51 |
| Source: Kittelson & Associates | | | | | | |

**Table 5. Crashes at Study Intersections**

| Green Valley Road Intersection with | No. of Crashes | Corridor Percent | PDO | Injury | Fatal | Crash Rate per MEV |
|---|---|---|---|---|---|---|
| 1. Sophia Parkway | 15 | 9% | 10 | 5 | 0 | 0.38 |
| 2. Francisco Drive | 8 | 5% | 7 | 1 | 0 | 0.19 |
| 3. El Dorado Hills Boulevard/Salmon Falls Road | 6 | 4% | 4 | 2 | 0 | 0.19 |
| 4. Silva Valley Parkway/Allegheny Road | 0 | 0% | 0 | 0 | 0 | 0.00 |
| 5. Loch Way | 2 | 1% | 0 | 2 | 0 | 0.15 |
| 6. Rocky Springs Road/Steve's Way | 1 | 1% | 0 | 1 | 0 | 0.08 |
| 7. Malcom Dixon Road | 3 | 2% | 2 | 1 | 0 | 0.23 |
| 8. Deer Valley Road (West) | 7 | 4% | 2 | 4 | 1 | 0.52 |
| 9. Pleasant Grove School Access | 2 | 1% | 1 | 1 | 0 | 0.15 |
| 10. Bass Lake Road | 1 | 1% | 0 | 1 | 0 | 0.05 |
| 11. Cambridge Road/Peridot Drive | 4 | 3% | 4 | 0 | 0 | 0.24 |
| 12. Cameron Park Drive | 15 | 9% | 12 | 3 | 0 | 0.83 |
| 13. Deer Valley Road (East) | 2 | 1% | 0 | 2 | 0 | 0.30 |
| 14. Ponderosa Road | 5 | 3% | 1 | 2 | 2 | 0.83 |
| 15. North Shingle Road | 4 | 3% | 1 | 3 | 0 | 0.37 |
| 16. Lotus Road | 2 | 1% | 1 | 1 | 0 | 0.17 |
| ENTIRE CORRIDOR | 77 | 49% | 45 | 29 | 3 | 0.27 |
| Source: Kittelson & Associates | | | | | | |

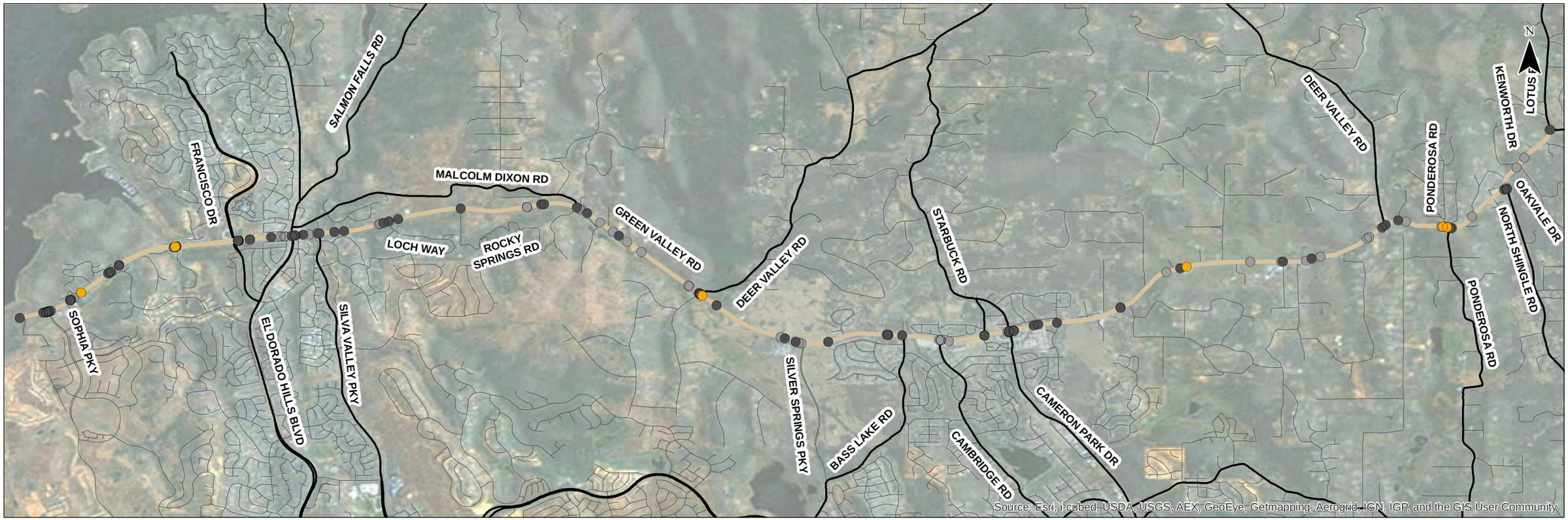
There are two separate corresponding locations along the study corridor that have a higher than average crash frequency than the rest of the corridor: Sophia Parkway to Francisco Drive and Cameron Park Drive to Ponderosa Road. In addition, fatal crashes were reported at these segment locations as well.

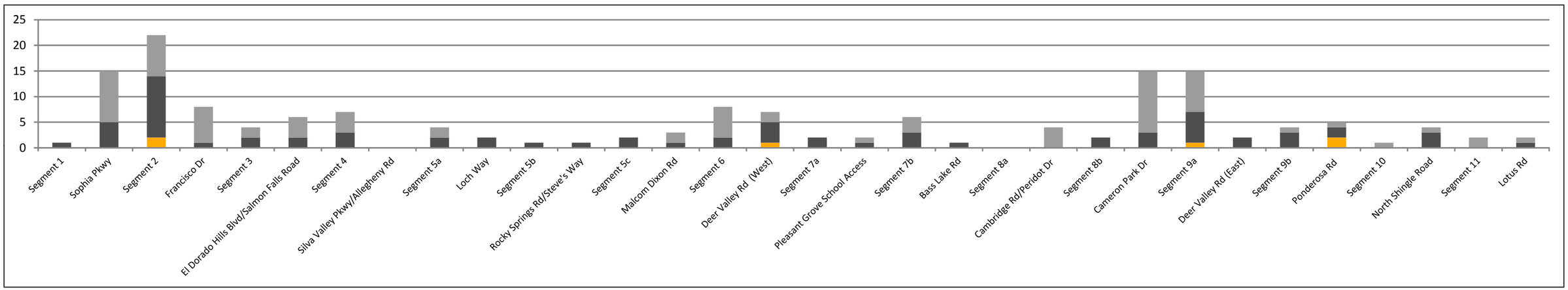
Crash frequency and crash severity (property damage only, injury crash, and fatality) is plotted by location in Exhibit 45. Segments #5, 7, 8 and 9 were divided into smaller sub-segments to enable review of crashes that occurred between the study intersections. Sub-segments are referred to by letter (e.g., Segment #5b).

On the west side of the study corridor, the roadway segment east of Sophia Parkway to west of the Francisco Drive intersection (Segment #2) had 22 reported crashes throughout the study period. Additionally, there were 15 crashes reported at the Sophia Parkway intersection, five of which were reported as injury crashes. Along Segment #2, 22 crashes were reported, two of which involved a fatality and twelve of which resulted in injuries. Segment #2 also had the highest mid-week (Tuesday-Thursday) average daily traffic (ADT) of 26,300 vehicles.

On the east side of the Green Valley Road corridor reported crashes were concentrated at the Cameron Park Drive intersection (Intersection #12) and the roadway segment between Cameron Park Drive and Deer Valley Road (East) (Segment #9a). There were a total of 30 crashes at these two locations, with 15 reported crashes at Intersection #12 and 15 reported crashes along Segment #9a. Two-thirds of the crashes at these two locations were reported as property damage only, with one fatal crash reported along Segment #9a.

Overall, 51 percent (81 crashes) of all crashes were reported along the roadway segments and 49 percent (77 crashes) of crashes were reported at study intersections along the Green Valley Road study corridor. Approximately 60 percent of injury crashes were reported along the roadway segments, while the majority (54 percent) of property damage only crashes occurred at the study intersections along the study corridor. Two of the six fatal crashes occurred at the intersection of Green Valley Road/Ponderosa Road (Intersection #14) and on the segment between Sophia Parkway and Francisco Drive each. One of the two fatality crashes at the Ponderosa Road intersection involved Driving under Influence (DUI), and second resulted from fall of a tree branch on the car.




**Collisions by Severity**
- Fatal
- Injury
- PDO

Study Corridor
- Major Road
- Minor Road

**Crash Frequency and Severity**
**Green Valley Road**
**2011 - 2013**

Exhibit **45**

*Coordinate System: GCS WGS 1984*

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### *Crash Type by Location*

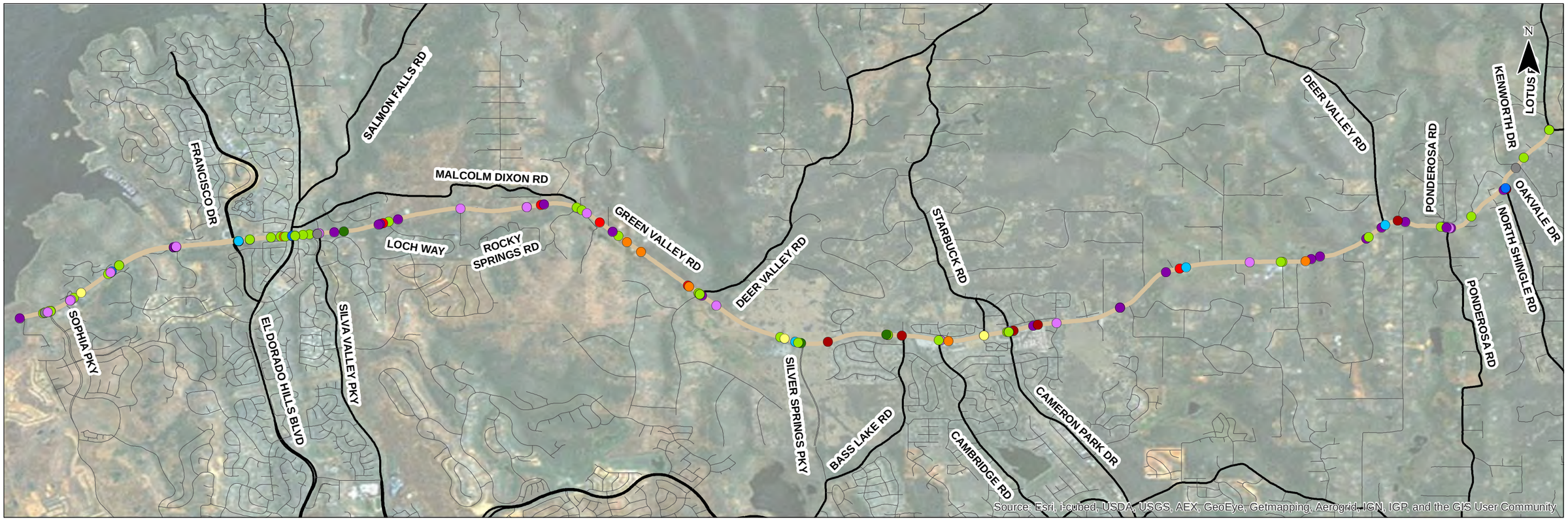
There were three crash types that accounted for nearly three-quarters of the crashes along the Green Valley Road study corridor. One-third of crashes were reported as rear-end crashes, followed by 20 percent broadside or turning collision crashes, and 20 percent fixed-object crashes. The study intersections accounted for 52 percent of rear-end crashes, 58 percent of broadside crashes, and 65 percent of the fixed-object crashes occurred between the study intersections. Crash type by location along the Green Valley Road study corridor is illustrated in Exhibit 46. In addition to the plots of crash type by location, the exhibit provides a bar chart with overall crash type statistics at each study intersection and roadway segment.

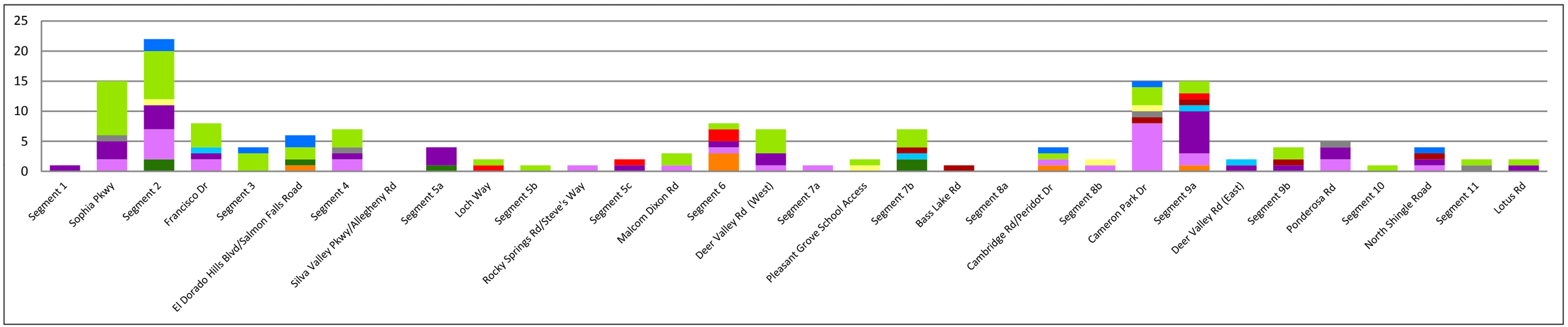
The Sophia Parkway intersection accounted for approximately 32 percent of rear-end crashes along the corridor. This intersection carries the highest ADT along the corridor. Eight of the nine rear-end crashes that occurred at the Sophia Parkway intersection cited unsafe speed as the contributing factor. The Francisco Drive and Deer Valley Road (West) intersection reported four rear-end crashes each. Two of the four rear-end crashes that occurred at the Francisco Drive reported unsafe speed as the contributing factor, while all four rear-end crashes at the Deer Valley Road (West) intersection cited unsafe speed as the contributing factor.

Segment #2 (east of Sophia Parkway to west of Francisco Drive) accounted for approximately 22 percent of broadside crashes along the corridor. This segment carries the highest ADT along the corridor. Segment #2 is one of the few roadway segments that include a two-way left-turn lane. This allows vehicles to make permitted left-turns across oncoming traffic to access commercial properties and residential development on either side of Green Valley Road. Three of the five broadside crashes that occurred along this segment involved left-turns from minor streets or driveways where the two-way left-turn lane is present. Each of those crashes reported a failure to yield right-of-way as the contributing factor of the crash. The highest concentration (25 percent) of broadside crashes occurred at the Cameron Park Drive intersection. The intersection includes left-turn lanes and a protected signal phase on each approach. The southbound approach has a business access driveway within the intersection influence area. Seven of the eight broadside crashes occurred on the south leg of the intersection, potentially influenced by the business driveways that feed onto Cameron Park Drive

The roadway segment #9 (from Cameron Park Drive to Ponderosa Road) accounted for 25 percent of the fixed-object crashes along the study corridor. This roadway segment has two undivided travel lanes, with unpaved shoulders in either direction between Crowdis Lane and Ponderosa Road. Guard rails along the side of the road are intermittently placed throughout the segment. In addition to the fixed-object crashes, this segment also had one animal-related crash. Crash reports did not specify the type of objects that were struck by vehicles.

There were six animal-related crashes reported along the corridor; half of them occurred on roadway Segment #6. This is roughly a one mile segment east of the Malcom Dixon Road intersection to west of the Deer Valley Road (West) intersection. Segment #6 provides one lane in each direction with open fields and undeveloped land on either side of the roadway.




**Collisions by Crash Type**

- Head-on
- Sideswipe
- Rear-end
- Broadside
- Fixed object
- Overturned
- Pedestrian
- Bicycle
- Motorcycle
- Animal
- Other
- Study Corridor
- State Route 50
- Major Road
- Minor Road

## Crashes by Types
## Green Valley Road
## 2011 - 2013

Exhibit **46**

*Coordinate System: GCS WGS 1984*

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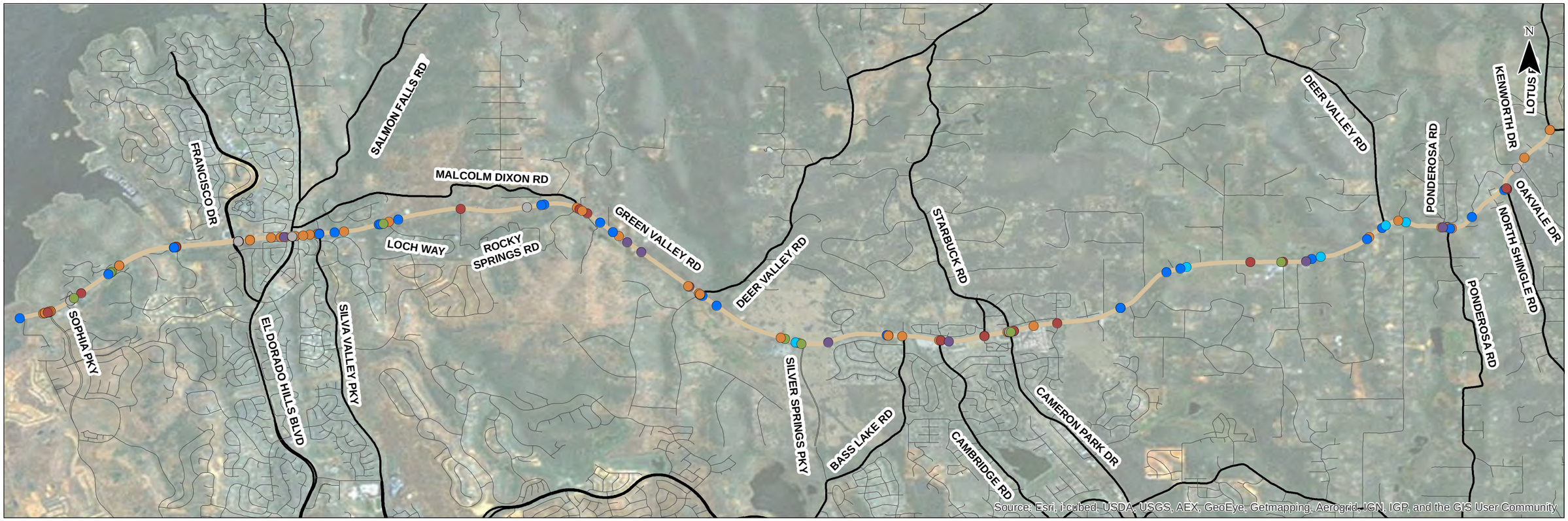
### *Contributing Factors by Location*

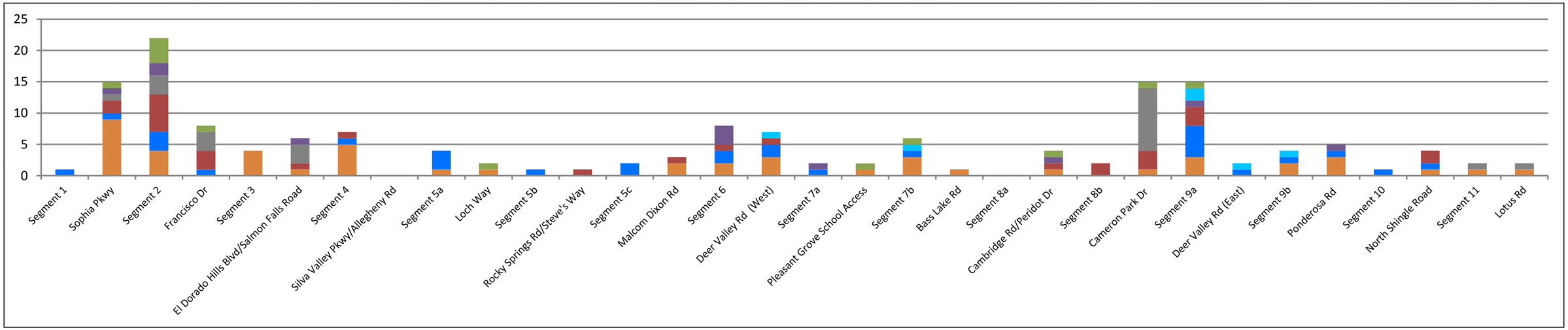
Exhibit 47 shows each location of a crash by its contributing factor along the Green Valley Road corridor. Approximately one-third of crashes cited unsafe speed as a contributing factor of an incident. The Sophia Parkway intersection accounted for a total of nine of those crashes which is the most at any intersection or roadway segment. The 85$^{th}$ percentile speed east of this intersection was recorded as 60 miles per hour (mph) in both directions. Most of the crashes on Segment #2, #3 and #4, which experienced higher traffic volumes relative to other study segments, cited unsafe speed as one of the top contributing factor.

The other top contributing factors were "unsafe turning movement" and "did not yield Right of Way (ROW)". Segment #2 also recorded six crashes where the driver did not yield ROW. It is also the only segment with a continuous two-way left-turn lane for the majority of the segment. Drivers that did not yield ROW accounted for 18 percent of crashes along the corridor.

Crashes that cited unsafe turning movements as a contributing factor for an incident also accounted for 18 percent of the crashes along the corridor. Segment #5 (east of Silva Valley Parkway to west of Malcom Dixon Road) and Segment #9 (east of Cameron Park Drive to west of Deer Valley Road (East)) recorded nearly 30 percent (11 crashes) of crashes with unsafe turning movements as a contributable factor of the crash. These roadway segments are similar in that they have one travel lane in each direction and no exclusive right or left-turn lanes for vehicles entering or departing Green Valley Road onto or from local streets.

The contributing factor of 14 percent of crashes along the corridor was cited as unknown. While this amount of unknown factors is not unusual considering the amount of crash data provided, it is worth noting that approximately 71 percent or 10 of the unknown factors for a crash occurred at the Cameron Park Drive intersection. Of those ten collisions, seven were classified as broadside crashes on the south leg of the intersection.




**Contributing Factor**

- Unsafe Speed
- Did Not Yield ROW
- Unsafe Turning Movement
- Crossed Double Yellow Line
- Other Than Driver
- Other Factor
- Unknown Factor
- Study Corridor
- State Route 50
- Major Road
- Minor Road

## Crashes by Contributing Factor
## Green Valley Road
## 2011 - 2013

Exhibit **47**

*Coordinate System: GCS WGS 1984*

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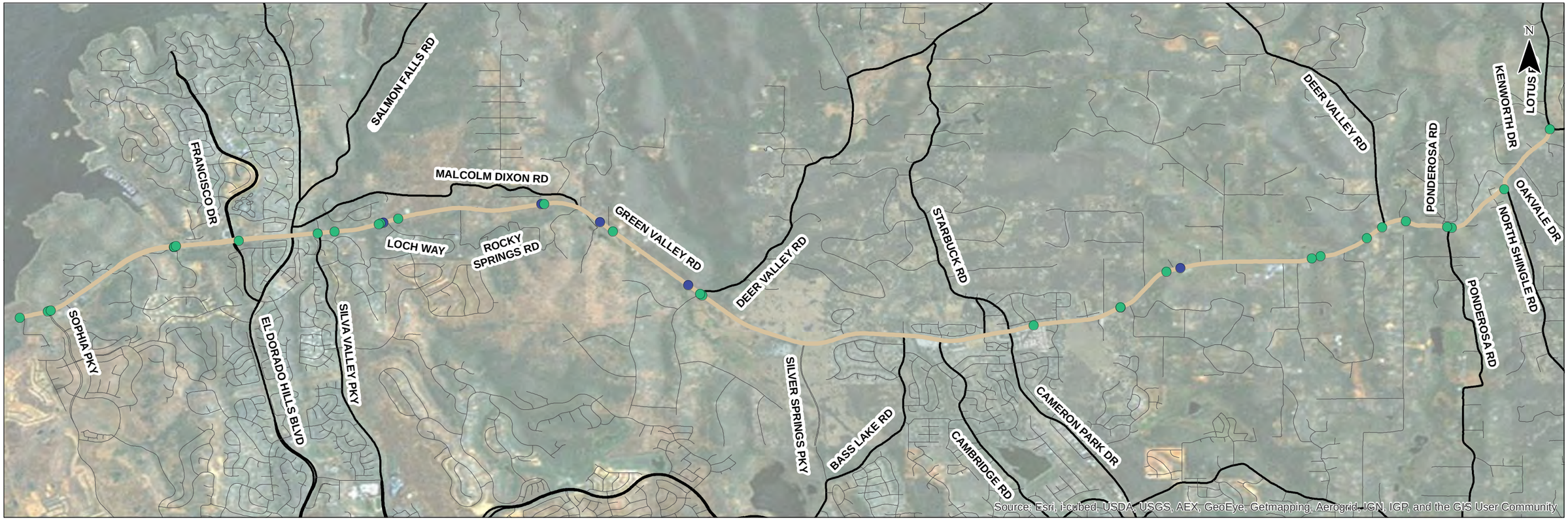
### *Roadway Departure Crashes*

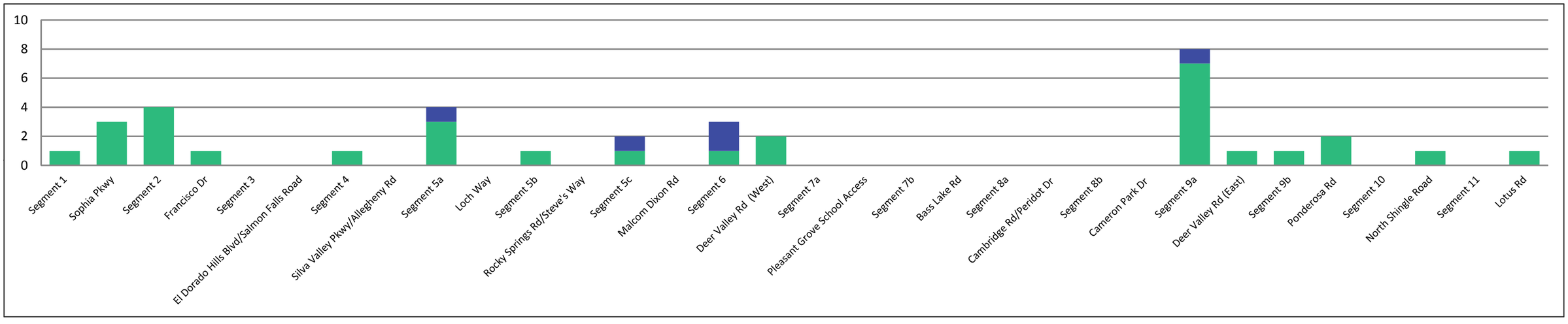
As mentioned previously, twenty-nine percent (46 crashes) of the reported crashes along the corridor were single vehicle crashes. Of the 46 single vehicle crashes, roughly three-quarters of them involved roadway departures resulting in fixed object collisions and/or overturned vehicles. Exhibit 48 displays roadway departure crashes resulting in fixed-object collisions or overturned vehicles by their location.

Approximately one-quarter of roadway departure crashes occurred on Segment #9 (from east of Cameron Park Drive to west of Ponderosa Road). Segment #5 (from Silva Valley Parkway to west of Malcom Dixon Road) and Segment #2 (from east of Sophia Parkway to west of Francisco Drive) recorded five and four roadway departure crashes respectively. Five of seven roadway departure crashes on Segment #5 occurred at night.

### *Lighting Incidents by Location*

Exhibit 49 illustrates the crashes along the corridor by natural lighting conditions. Approximately 65 percent of reported crashes occurred during the day. Of the crashes that did occur at night, 62 percent of them occurred on roadway segments where street lighting was not present. Segment #9 had eight crashes at night, the most at any intersection or roadway segment along the corridor. The highest concentration of non-daylight crashes occurred on the eastbound and westbound approaches of the Green Valley Road/El Dorado Hills Boulevard/Salmon Falls Road intersection. Although there are overhead street lights, crash data does not provide enough evidence to suggest that lighting was a contributing factor on the cause of a crash. Crash data indicates that fifteen of the 36 roadway departure crashes (42 percent) occurred at night.




**Roadway Departure Collisions**
- Fixed object
- Overturned

Study Corridor
Major Road
Minor Road

## Roadway Departure Crashes
## Green Valley Road
## 2011 - 2013

Exhibit **48**

Coordinate System: GCS WGS 1984

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING

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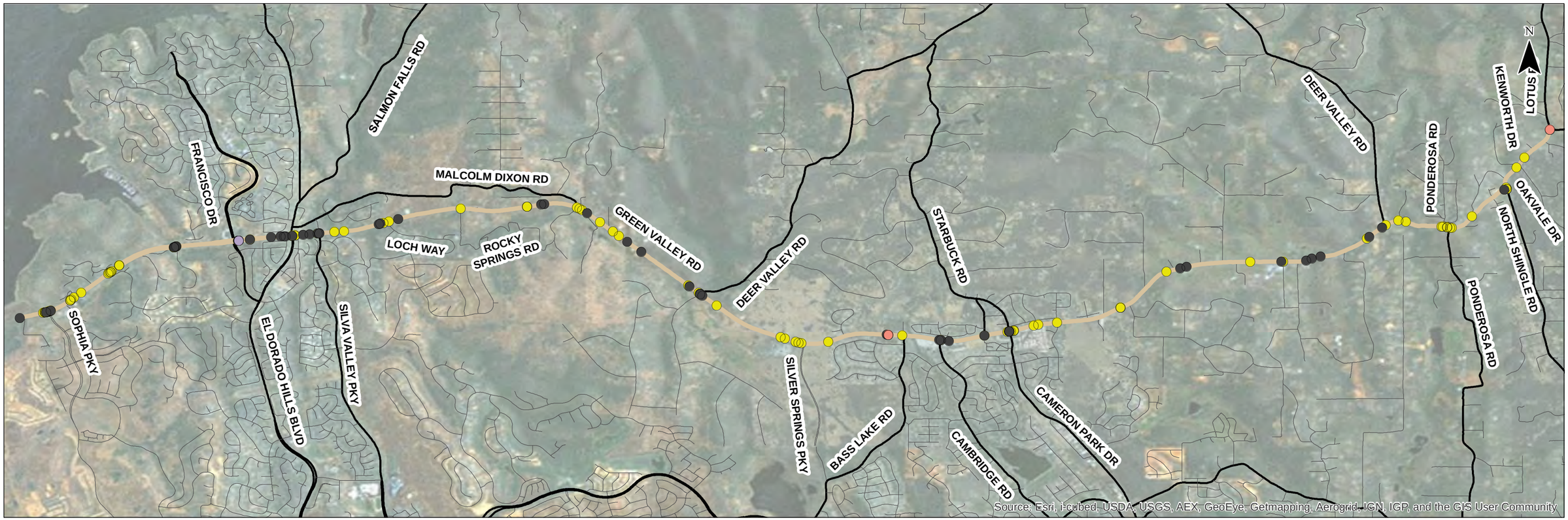


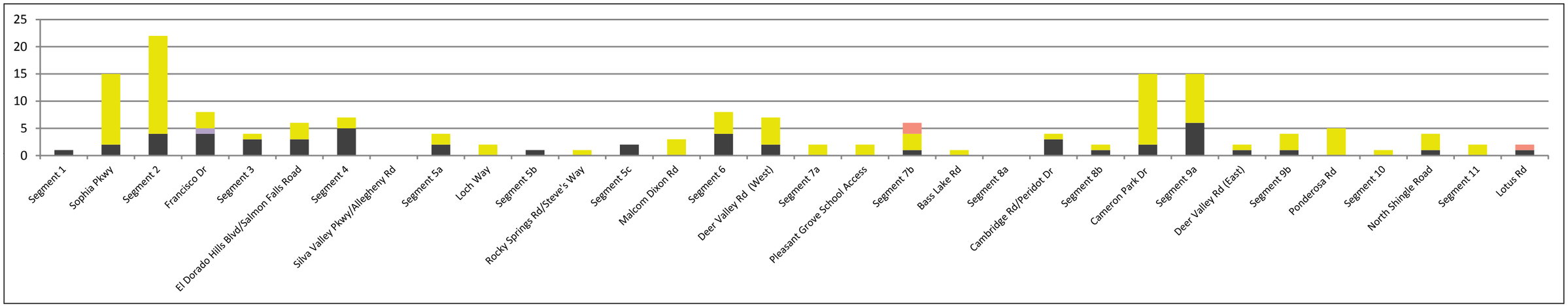


**Collisions by Time of Day**

- Dawn
- Dusk
- Dark
- Day

- Study Corridor
- Major Road
- Minor Road

## Crashes by Time of Day
## Green Valley Road
## 2011 - 2013

Exhibit **49**

Coordinate System: GCS WGS 1984

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING

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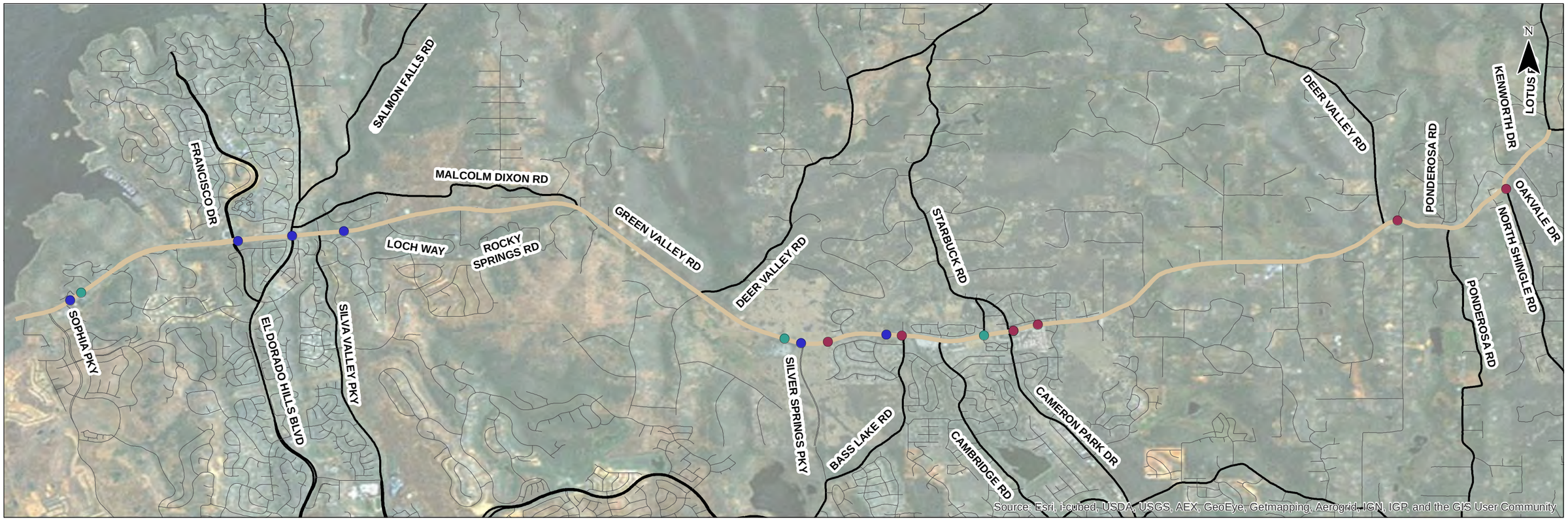
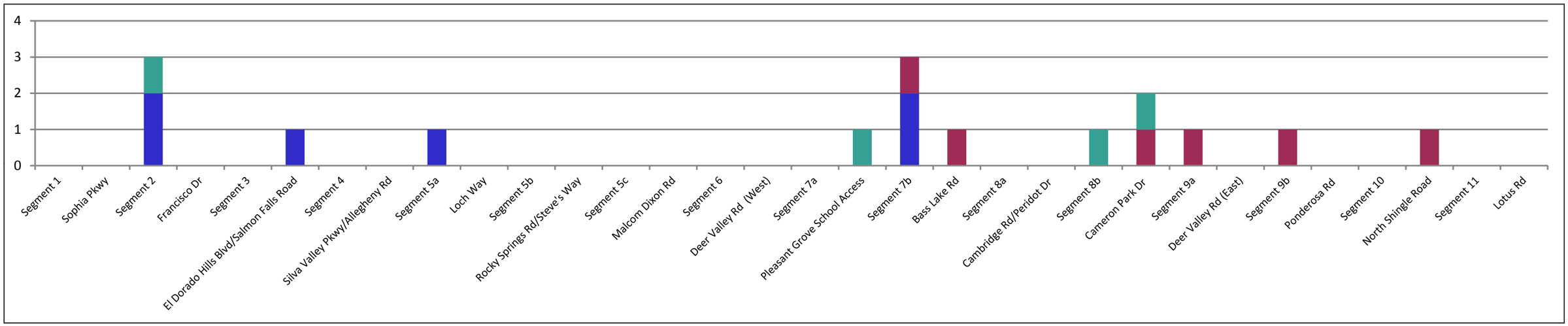
### *Vulnerable Road User Crashes*

Vulnerable road user crashes are defined as crashes that involved pedestrians, bicycles, and motorcycles. There were a total of 16 crashes involving vulnerable road users which accounted for approximately 10 percent of all reported crashes along the corridor. There were two crashes involving bicycles on Segment #7, as well as a pedestrian related crash at the Pleasant Grove School Access. There is a note in the police report which indicated that the pedestrian-related incident at the Pleasant Grove School Access did not use a designated crosswalk on Green Valley Road. The remaining pedestrian incidents note that a contributing factor was the motorist did not yield right-of-way to the pedestrian. Four of the six motorcycle incidents reported unsafe speed as a contributing factor. Each of these six motorcycle crashes occurred during dry and daylight conditions. Each of the six motorcycle crashes occurred on the eastside of the corridor, between Pleasant Grove Middle School and Lotus Road.

Five of the six bicycle crashes occurred along Segments #2, #5, and #7. Bike lanes are present in both directions along Segments #2 and #7. Bike lane signs do not exist along Segment #5, however, approximately five- to seven-foot wide shoulder on either side of Green Valley Road can accommodate bicyclists. Exhibit 50 illustrates the crashes along the Green Valley Road corridor that involved vulnerable road users.

**Exhibit 50. Vulnerable Roadway User Crashes by Location**




**Vulnerable Road User Collisions**
- Pedestrian
- Bicycle
- Motorcycle

Study Corridor
- Major Road
- Minor Road

**Crashes by Vulnerable Road User**
**Green Valley Road**
**2011 - 2013**

Exhibit **50**

*Coordinate System: GCS WGS 1984*

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING

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# TRAFFIC OPERATIONS ANALYSIS

This subsection summarizes traffic data collection, historical traffic count data, operational analysis methodology and results at the study locations.

## Analysis Methodology

Field reconnaissance was undertaken to ascertain the operational characteristics of each of the study area intersections and roadway segments. Roadway operations are typically governed by, and most constrained at, intersections. The measure of effectiveness commonly used to determine the quality or level of service (LOS) experienced by motorists at intersections is average control delay. The methodology used to analyze intersection LOS is outlined in the Transportation Research Board's Highway Capacity Manual, 2010 version (HCM 2010). LOS is a qualitative measure of driver satisfaction and is quantitatively expressed by the level of delay and congestion experienced by motorists using an intersection. LOS is designated by the letters A through F, with A being the best condition and F being the worst (high delay and congestion).

### *Signalized Intersections Analysis*

Signal-controlled intersections were analyzed using the operational methodology outlined in the HCM 2010, Chapter 18. This procedure calculates the average control delay per vehicle at a signalized intersection, and assigns a LOS designation based upon the delay. The SYNCHRO 8.0 software package was used to perform LOS analysis. Intersection geometrics were based on aerial imagery and field observations. Peak hour traffic volumes were based on empirical traffic counts collected during May 2014 while school was in session. Peak hour factors (i.e., the ratio of total hourly volume to the peak 15-minute flow rate within the hour) were calculated for each intersection approach using the traffic count data. Heavy vehicle percentages were based on vehicle classification counts and were applied for each movement. Bicycle and pedestrian counts were used, with a minimum of two pedestrians per approach per peak hour. Signal phasing and timings were based on current timing sheets provided by El Dorado County.

### *Unsignalized Intersections Analysis*

Two-way stop-controlled intersections were analyzed utilizing the methodology outlined in the HCM 2010, Chapter 19. This method calculates average delay per vehicle for each major street movement and minor street left-turn movements - based on the availability of adequate gaps in the main street through traffic. At intersections with minor street stop control, most of the major street traffic experiences little or no delay, and by definition have acceptable conditions. The major street left-turn movements and the minor street movements are all susceptible to delay of varying degrees. Generally, the higher the major street traffic volumes, the higher the delay for the minor movements.

Intersection geometrics and traffic control data were gathered using aerial imagery and field observations. Peak hour traffic volumes were observed and entered according to the peak hours

studied for each intersection. Peak hour factors for each intersection and peak period were calculated based on traffic counts and applied to each approach at the intersection. Heavy vehicle percentages were also calculated based on traffic counts and were applied for each movement. Counted bicycle and pedestrian volumes were used.

Table 6 shows the intersection LOS criteria for signalized and unsignalized intersections according to the HCM 2010.

**Table 6. LOS Criteria for Signalized and Unsignalized Intersections**

| LOS | Average Delay (sec/veh) | | Description |
|---|---|---|---|
| | Signalized | Unsignalized | |
| A | ≤ 10.0 | ≤ 10.0 | Very Low Delay: This occurs when progression is extremely favorable and most vehicles arrive during a green phase. Most vehicles do not stop at all. |
| B | >10.0 & ≤20.0 | >10.0 & ≤15.0 | Minimal Delays: This generally occurs with good progression, short cycle lengths, or both. More vehicles stop than at LOS A, causing higher levels of average delay. |
| C | >20.0 & ≤35.0 | >15.0 & ≤25.0 | Acceptable Delay: Delay increases due to only fair progression, longer cycle lengths, or both. Individual cycle failures (*to service all waiting vehicles*) may begin to appear at this level of service. The number of vehicles stopping is significant, though many still pass through the intersection without stopping. |
| D | >35.0 & ≤55.0 | >25.0 & ≤35.0 | Approaching Unstable/Tolerable Delays: The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable. |
| E | >55.0 & ≤80.0 | >35.0 & ≤50.0 | Unstable Operation/Significant Delays: These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent occurrences. |
| F | >80.0 | >50.0 | Excessive Delays: This level, considered to be unacceptable to most drivers, often occurs with oversaturation (i.e., when arrival flow rates exceed the capacity of the intersection). It may also occur at high v/c ratios below 1.00 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing causes to such delay levels. |
| Source: *Highway Capacity Manual,* Transportation Research Board, Washington D.C, 2010 | | | |

### *Roadway Segment Analysis*

Roadway segment LOS was determined using the methodology for multilane highways and two-lane highways outlined in the HCM 2010, Chapters 14 and 15. For multilane highways the calculation of the density of the traffic stream determines level of service. Density measures the proximity of vehicles to each other in the traffic stream.

For two-lane highways, the level of service calculation is dependent on the class of the roadway. Class I two-lane highways are highways where motorists expect to travel at high speeds. Class II two-lane highways are lower speed highways and serve scenic routes or areas of rugged terrain. Class III two-lane highways serve moderately developed areas with higher densities of local traffic and roadside access. Roadway segments along Green Valley Road are made up of Class II and Class III two-lane highways. For Class II highways, LOS is determined based on the percent time spend following (PTSF). This measure is calculated as the percentage of vehicles traveling at headways of less than three seconds. For Class III highways, the percent of free-flow speed is used to determine LOS. This measure represents the ability of vehicles to travel at the posted speed limit.

Table 7 and Table 8 show the segment LOS criteria for multilane highways and two-lane highways, respectively, according to the HCM 2010.

**Table 7. LOS Criteria for Multilane Highway Segments**

| LOS | Free Flow Speed (mi/h) | Density (pc/mi/ln) |
|---|---|---|
| **A** | All | >0 -11 |
| **B** | All | >11-18 |
| **C** | All | >18-26 |
| **D** | All | >26-35 |
| **E** | 60 | >35-40 |
| | 55 | >35-41 |
| | 50 | >35-43 |
| | 45 | >35-45 |
| **F** | Demand Exceeds Capacity | |
| | 60 | >40 |
| | 55 | >41 |
| | 50 | >43 |
| | 45 | >45 |
| Source: *Highway Capacity Manual,* Transportation Research Board, Washington D.C, 2010 | | |

**Table 8. LOS Criteria for Two-Lane Highway Segments**

| LOS | Class II Highways: Percent Time Spent Following (%) | Class III Highways: Percent Free-Flow Speed (%) |
|---|---|---|
| **A** | 0-40 | >91.7 |
| **B** | >40-55 | >83.3-91.7 |
| **C** | >55-70 | >75.0-83.3 |
| **D** | >70-85 | >66.7-75.0 |
| **E** | >85 | 0-66.7 |
| Source: *Highway Capacity Manual,* Transportation Research Board, Washington D.C., 2010 | | |

### *Thresholds of Significance*

Circulation Policy TC-Xd of the El Dorado County General Plan provides level of service standards for County-maintained roads and state highways as follows:

> *Level of Service (LOS) for County-maintained roads and state highways within the unincorporated areas of the county shall not be worse than LOS E in the Community Regions or LOS D in the Rural Centers and Rural Regions except as specified in Table TC-2. The volume to capacity ratio of the roadway segments listed in Table TC-2 shall not exceed the ratio specified in that table. Level of Service will be as defined in the latest edition of the Highway Capacity Manual (Transportation Research Board, National Research Council) and calculated using the methodologies contained in that manual. Analysis periods shall be based on the professional judgment of the Department of Transportation which shall consider periods including, but not limited to, Weekday Average Daily Traffic (ADT), AM Peak Hour, and PM Peak hour traffic volumes.*

As such, intersections and segments in the community region will be evaluated against LOS E threshold, while those in rural region will be against LOS D.

## Existing and Historical Traffic Data

Intersection and roadway segment counts were collected to evaluate the existing traffic conditions. Weekday AM (6:30 to 9:30) and PM (3:30 to 6:30) peak period turning movement counts were performed on May 6, 2014 (Tuesday) at the study intersections. School afternoon peak period (1:30 to 3:30 PM) turning movement counts were also performed on May 6, 2014 at the selected intersections. Peak hour[21] within these count periods varies by intersection; although, traffic volumes at the study intersections generally peaked for an hour between 7:00 and 8:30 in the weekday morning and 4:45 and 6:00 in the weekday afternoon.

Roadway segment data were collected from May 3, 2014 to May 11, 2014 to capture a full week. The segment data included traffic counts, classification counts and speed measurements. The road tubes that capture volume and speed data malfunctioned at Segment #7 and 9. Therefore, the traffic data collected in May was discounted. Once the Rescue School District and Folsom Lake College resumed in August, traffic data was re-collected at these two locations from August 23, 2014 to August 29, 2014.

The raw traffic data is provided in Appendix 3.

No major incidents or construction closures appeared during the data collection efforts that could have affected the traffic patterns along Green Valley Road. A traffic signal at the Silver Springs Parkway and Green Valley Road intersection was activated on May 28, 2014.

[21] Highest hourly volumes within the count period.

Historical traffic data was obtained from the County of El Dorado from 2010 to 2014. These counts were provided for study roadway segments and intersections along the Green Valley Road corridor to analyze five year trends in average daily traffic (ADT) and turning movement volumes along the Green Valley Road corridor. In addition to the counts provided by the County of El Dorado, KAI collected segment and intersection traffic counts during the first week of May 2014. These counts were used in conjunction with the historical counts to calculate the 2014 ADT along the study corridor. The comparison of existing 2014 data with historical counts was used to verify that existing counts accurately reflected growth and historical trends. This was done to ensure that the new counts were representative and identify discrepancies for further review. The 2014 counts collected by KAI also included westbound and eastbound speeds along each of the study segments. A summary of the analysis of the corridor's counts and speeds are presented below.

### *Historical Roadway Counts Summary*

Historical counts provided by the County of El Dorado were collected during the summer and winter months from 2010 to 2014. The majority of the counts were collected during January and July. Not all count data was available for each identified study segment, and some counts were only provided during one time of the year. Counts were averaged based on the historical count data that was provided. The 2014 ADT also include the counts collected by KAI.

The historical counts included vehicular volumes for one week during each of the data collection periods. This allowed KAI to calculate a mid-weekday, weekly, and weekend average. Mid-week days include Tuesday, Wednesday, and Thursday and generally represent the highest ADT during the week. Weekly data includes the entire week, while weekend data includes only Saturday and Sunday. Table 9 summarizes the data that was collected and provided for each of the study segments. Segment data that includes at least one year of historical data was used to calculate the percent change in ADT relative to 2014. It should be noted that the historical count data was not available for Segment #5 (east of Silva Valley Parkway to west of Malcolm Dixon Road) and Segment #6 (east of Malcolm Dixon Road to Deer Valley Road (West)). As a result, the 2014 data for Segment #5 and 6 were excluded from the calculation of average ADTs.

The traffic conditions along the corridor vary from one end to the other. Overall, the 2014 ADT on the study segments match fairly closely with the historical data, verifying trends. In some cases, the 2014 ADT reflects a positive growth compared to the historical data, while for some other cases 2014 data indicates a slight decline in traffic volumes. All the data being compared were not collected in the same month, and therefore, small deviation from a year to another is plausible. Average mid-week and weekly traffic volumes in 2014 slightly declined relative to historical data at two segments: Sophia Parkway to Francisco Drive, and Cameron Park Drive to Ponderosa Road. Weekly and weekend average ADT in 2014 also experienced mixed growth (i.e. positive or negative) relative to previous years data.

**Table 9. ADT along Green Valley Road Corridor (2010 - 2014)**

| Segment | Duration | Average Daily Traffic | | | | | Percent Change in 2014 from Prior Years | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 2010 | 2011 | 2012 | 2013 | 2014 | 2010 | 2011 | 2012 | 2013 |
| 1. County Line to Sophia Parkway | Mid-Weekday Avg | 23,926 | 24,666 | 23,671 | 23,862 | 24,346 | 1.8% | -1.3% | 2.9% | 2.0% |
| | Weekly Avg | 22,874 | 23,370 | 22,697 | 22,475 | 23,884 | 4.4% | 2.2% | 5.2% | 6.3% |
| | Weekend Avg | 20,115 | 20,162 | 19,913 | 19,470 | 21,469 | 6.7% | 6.5% | 7.8% | 10.3% |
| 2. Sophia Parkway to Francisco Drive | Mid-Weekday Avg | 26,600 | 27,080 | 25,640 | 25,987 | 25,539 | -4.0% | -5.7% | -0.4% | -1.7% |
| | Weekly Avg | 25,161 | 25,610 | 24,675 | 25,881 | 25,001 | -0.6% | -2.4% | 1.3% | -3.4% |
| | Weekend Avg | 21,946 | 21,830 | 21,782 | 21,699 | 22,861 | 4.2% | 4.7% | 5.0% | 5.4% |
| 3. Francisco Drive to El Dorado Hills Boulevard | Mid-Weekday Avg | - | - | - | 14,857 | 15,889 | - | - | - | 7.0% |
| | Weekly Avg | - | - | - | 14,467 | 15,871 | - | - | - | 9.7% |
| | Weekend Avg | - | - | - | 13,324 | 15,410 | - | - | - | 15.7% |
| 4. El Dorado Hills Boulevard to Silva Valley Parkway | Mid-Weekday Avg | 14,522 | 14,682 | 14,195 | 12,334 | 14,527 | 0.0% | -1.1% | 2.3% | 17.8% |
| | Weekly Avg | 12,925 | 14,341 | 13,665 | 12,033 | 14,565 | 12.7% | 1.6% | 6.6% | 21.0% |
| | Weekend Avg | 11,388 | 12,819 | 12,372 | 11,029 | 13,618 | 19.6% | 6.2% | 10.1% | 23.5% |
| 7. Deer Valley Road (West) to Bass Lake Road | Mid-Weekday Avg | 9,963 | 10,970 | 10,997 | 10,759 | 10,871 | 9.1% | -0.9% | -1.1% | 1.0% |
| | Weekly Avg | 10,078 | 9,893 | 10,193 | 11,035 | 10,210 | 1.3% | 3.2% | 0.2% | -7.5% |
| | Weekend Avg | 9,238 | 8,493 | 8,153 | 8,475 | 8,688 | -6.0% | 2.3% | 6.6% | 2.5% |
| 8. Bass Lake Road to Cameron Park Drive | Mid-Weekday Avg | 11,165 | 10,776 | 11,065 | 11,358 | 12,662 | 13.4% | 17.5% | 14.4% | 11.5% |
| | Weekly Avg | 10,194 | 10,732 | 10,439 | - | 11,970 | 17.4% | 11.5% | 14.7% | - |
| | Weekend Avg | 8,559 | 9,394 | 8,913 | - | 10,199 | 19.2% | 8.6% | 14.4% | - |
| 9. Cameron Park Drive to Ponderosa Road | Mid-Weekday Avg | 6,337 | 6,832 | 6,692 | - | 6,290 | -0.7% | -7.9% | -6.0% | - |
| | Weekly Avg | 5,737 | 6,857 | 5,971 | - | 6,341 | 10.5% | -7.5% | 6.2% | - |
| | Weekend Avg | 4,901 | 4,965 | 4,448 | - | 4,884 | -0.3% | -1.6% | 9.8% | - |
| 10. Ponderosa Rd to N Shingle Road | Mid-Weekday Avg | - | - | - | 4,071 | 4,651 | - | - | - | 14.2% |
| | Weekly Avg | - | - | - | 4,267 | 4,418 | - | - | - | 3.5% |
| | Weekend Avg | - | - | - | 3,299 | 3,902 | - | - | - | 18.3% |
| 11. N Shingle Rd to Lotus Road | Mid-Weekday Avg | 7,282 | 7,605 | 7,091 | - | 8,349 | 14.7% | 9.8% | 17.7% | - |
| | Weekly Avg | 6,586 | - | 7,019 | - | 7,979 | 21.2% | - | 13.7% | - |
| | Weekend Avg | 5,511 | 5,908 | 6,431 | - | 6,987 | 26.8% | 18.3% | 8.6% | - |

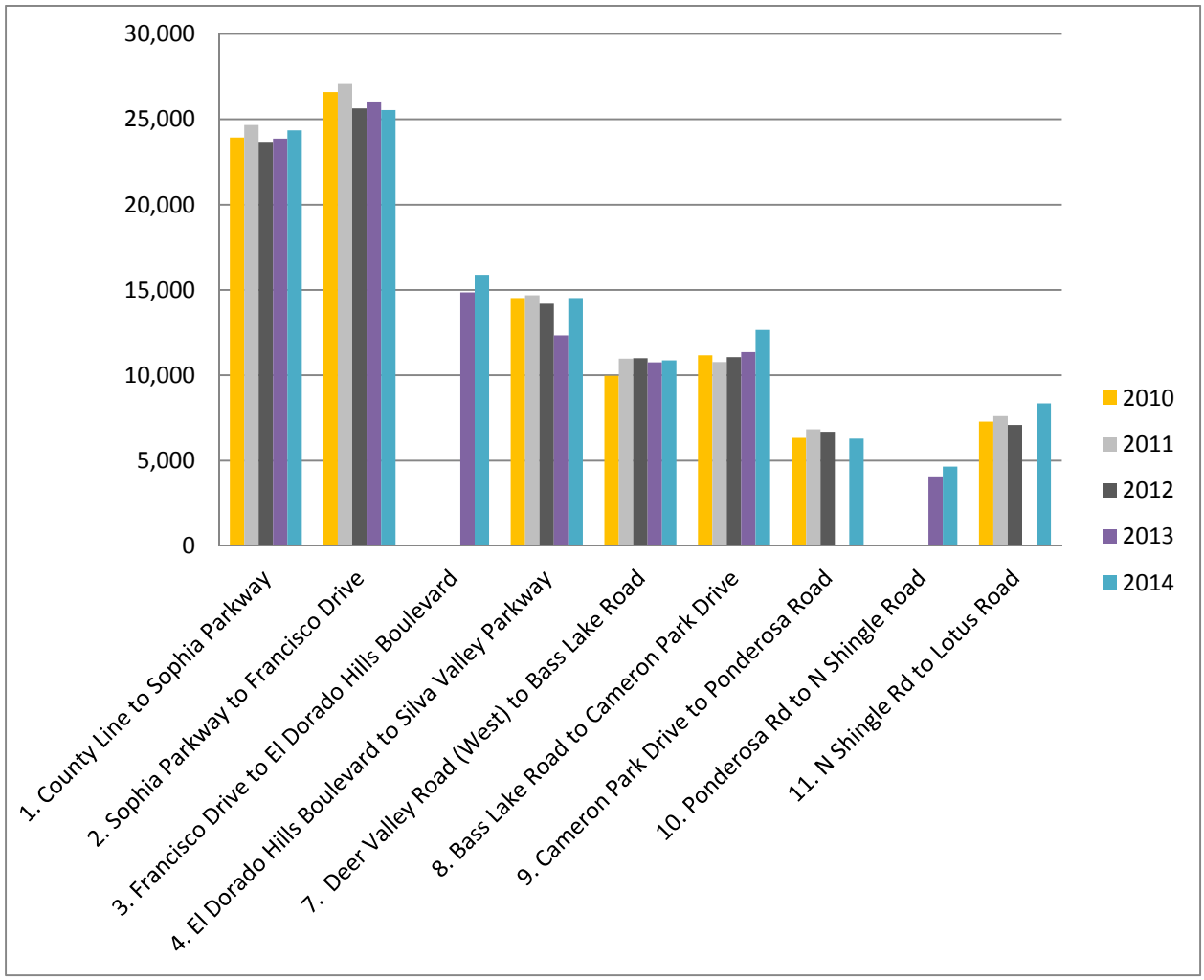
Source: Kittelson & Associates, 2014

### *Mid-Week Average Daily Traffic*

With exception to Segment #2 (Sophia Parkway to Francisco Drive) and Segment #9 (Cameron Park Drive to Ponderosa Road), the mid-week ADT along the corridor grew ranging from 2.5 percent to 17 percent relative to the prior year. Throughout the study period, Segment #2 (Sophia Parkway to Francisco Drive) had the highest ADT among all of the study segments, with 2013 registering the highest traffic volumes during mid-week days. The majority of commercial development along the study corridor is located on the north and south sides of Segment #2 and #3. In addition, Segment #2 serves many residential subdivisions that access Green Valley Road and provide accessibility to El Dorado Hills Boulevard, which provides a route to U.S. 50 to the south which runs parallel to Green Valley Road. As such, this segment provides one of the main routes into and out of the County and is subject to

commute traffic leaving the residential subdivisions. The lowest ADT (approximately 4,650) occurred along Segment #10 (Ponderosa Road to North Shingle Road), which provides very little development and access to three local streets along the segment. Exhibit 51 shows the ADT per year of mid-weekdays throughout the study period. Overall trend for the mid-week ADT indicates that the current year (2014) volumes may not be highest at all study segments, but match very closely with the historical data.

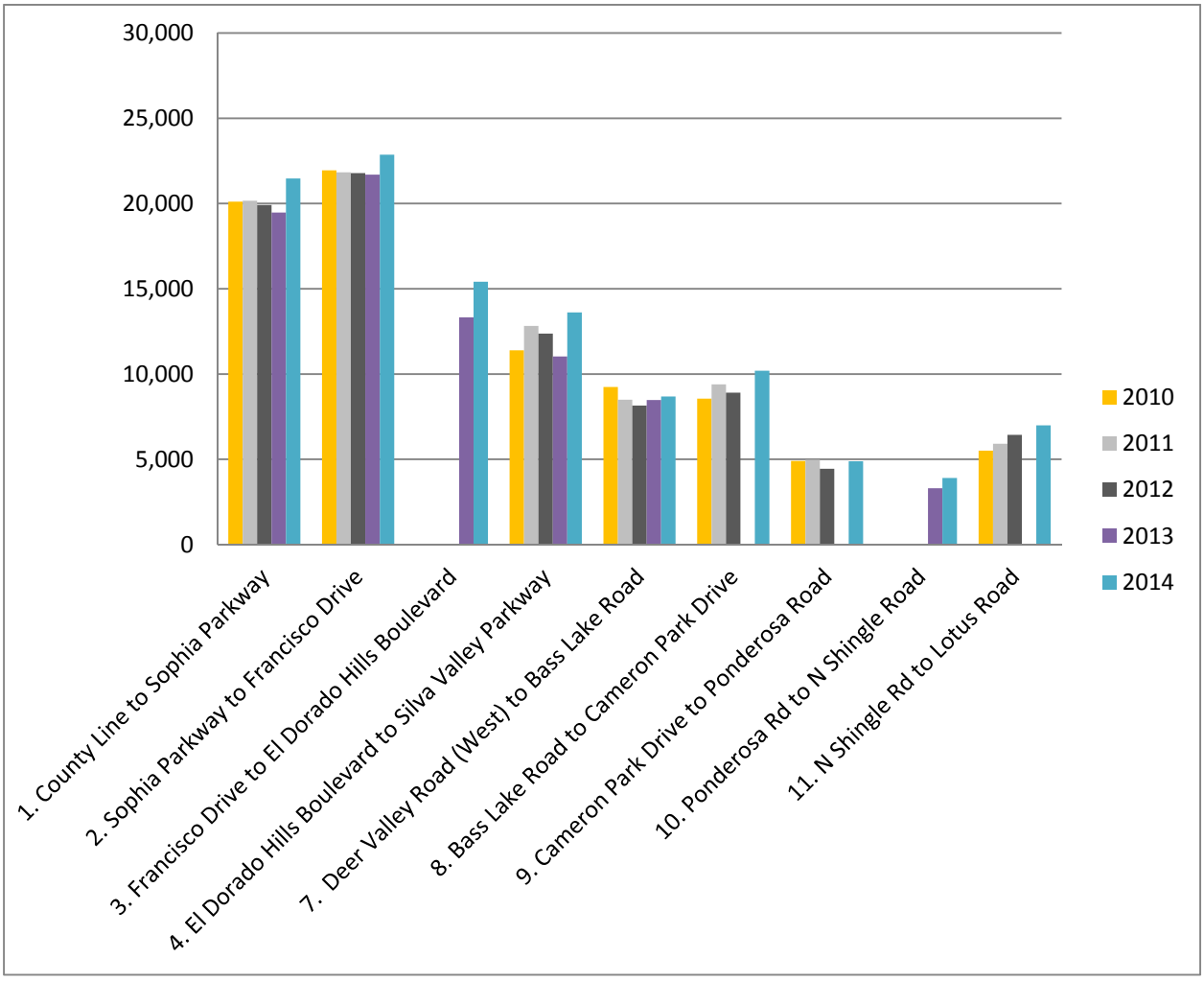
**Exhibit 51. Average Mid-Week ADT (2010 - 2014)**




### *Weekend Average Daily Traffic*

The weekend ADT volumes were calculated using the average daily volumes from Saturday and Sunday. As expected the weekend ADT volumes were lower on each of the study segments compared to the mid-week ADT volumes. This is attributed to the decrease of commuting traffic during non-weekdays. From 2010 to 2014, the ADT on weekend days grew significantly on each study segment. Contrary to overall trends along the corridor during mid-week, 2014 had the highest ADT along the corridor. Exhibit 52 shows each of the segments weekend ADT from 2010 to 2014. Overall trend for the weekend ADT indicates that the current year (2014) volumes match closely with the historical data.

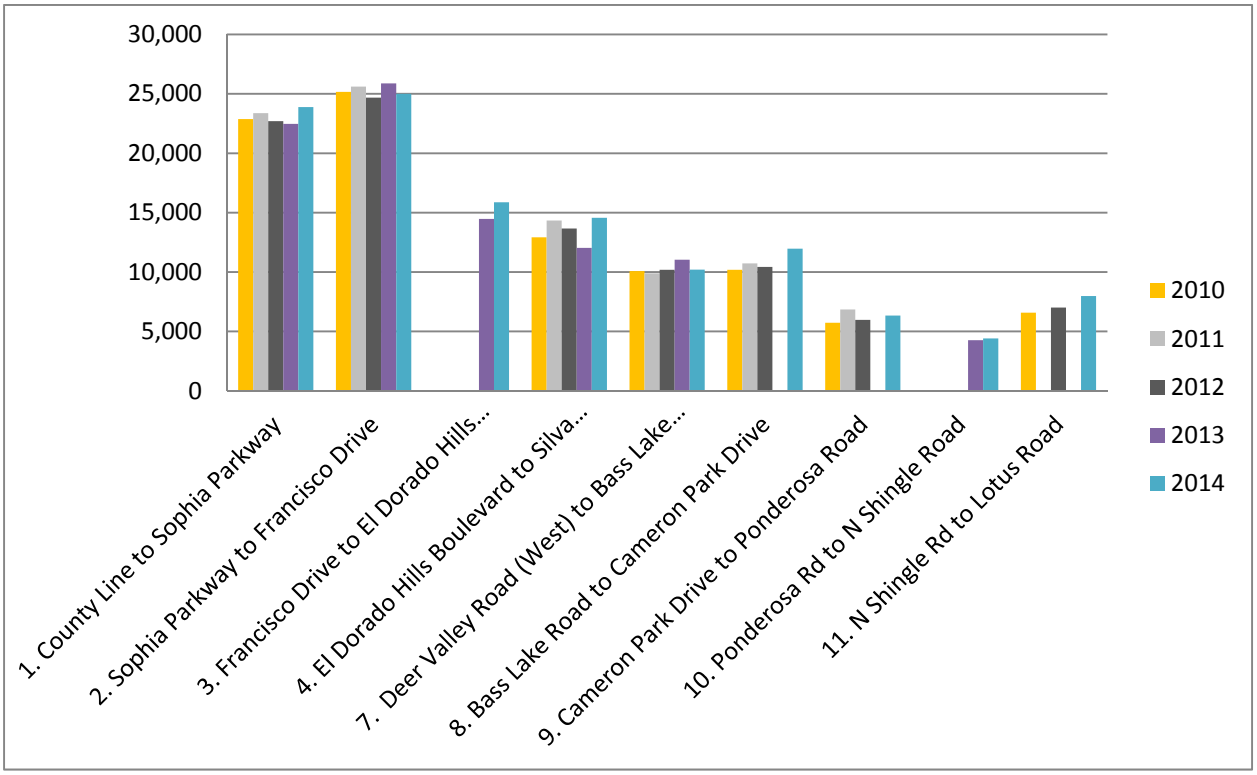
**Exhibit 52. Average Weekend ADT (2010 - 2014)**




### *Weekly Average Daily Traffic*

The weekly ADT volumes were calculated by taking the average of the Sunday through Saturday counts along each segment throughout the five year study period. Because the weekly average includes all days of the week, weekly ADT volumes are between the mid-weekday and weekend ADT volumes. Exhibit 53 illustrates the weekly ADT throughout the five year study period. When comparing total weekly volumes on each study segment, 2014 ADTs were the highest at some segments, but decreased from peak volumes in previous years.

**Exhibit 53. Average Weekly ADT (2010 - 2014)**




### *Historical Intersection Data Summary*

Similar to roadways, intersection turning movement data for the most recent five years available was obtained from the County staff. Table 10 compares KAI collected 2014 counts with the historical data. Traffic volumes depict the total entering intersection volumes. Overall, intersection turning movements during the peak hours increased by 4.5 percent relative the most recent prior year's available data (January 2013 for all intersections except for Sophia Parkway, where the most recent available count was from November 2012). A few individual intersections show a marginal decline in turning movements relative to previous year's data. Growth was more substantial in the PM peak hour than the AM peak hour.

Given the lack of any serious deviation from historical counts and the fact that growth rates were relatively consistent it was determined that the 2014 turning movement counts at the intersection could be considered without the need to recount locations.

**Table 10. Historical Intersection Turning Movements (2011-2014)**

| ID | Green Valley Road & Cross Street | Traffic Volumes | | | | Growth in 2014 from Prior Years | | |
|---|---|---|---|---|---|---|---|---|
| | | May-14 | Jan-13 | Nov-12 | Oct-11 | Jan-13 | Nov-12 | Oct-11 |
| 1 | Sophia Parkway | | | | | | | |
| | *AM Peak* | 2,257 | - | 2,270 | - | - | -0.6% | - |
| | *PM Peak* | 2,800 | - | 2,760 | - | - | 1.4% | - |
| 2 | Francisco Drive | | | | | | | |
| | *AM Peak* | 2,831 | 2,633 | - | 2,733 | 7.5% | - | 3.6% |
| | *PM Peak* | 3,344 | 3,145 | - | 3,308 | 6.3% | - | 1.1% |
| 3 | El Dorado Hills Boulevard | | | | | | | |
| | *AM Peak* | 1,809 | 1,740 | - | 1,792 | 4.0% | - | 0.9% |
| | *PM Peak* | 2,091 | 1,941 | - | 2,023 | 7.7% | - | 3.4% |
| 4 | Silva Valley Parkway | | | | | | | |
| | *AM Peak* | 1,512 | 1,423 | - | 1,503 | 6.3% | - | 0.6% |
| | *PM Peak* | 1,720 | 1,538 | - | 1,677 | 11.8% | - | 2.6% |
| 5 | Loch Way | | | | | | | |
| | *AM Peak* | 908 | 894 | - | - | 1.6% | - | - |
| | *PM Peak* | 1,132 | 1,054 | - | - | 7.4% | - | - |
| 7 | Malcolm Dixon Road | | | | | | | |
| | *AM Peak* | 870 | 829 | - | - | 4.9% | - | - |
| | *PM Peak* | 1,106 | 1,032 | - | - | 7.2% | - | - |
| 8 | Deer Valley Road (West) | | | | | | | |
| | *AM Peak* | 864 | 826 | - | - | 4.6% | - | - |
| | *PM Peak* | 1,112 | 1,058 | - | - | 5.1% | - | - |
| 10 | Bass Lake Road | | | | | | | |
| | *AM Peak* | 1,531 | 1,502 | - | 1,543 | 1.9% | - | -0.8% |
| | *PM Peak* | 1,477 | 1,357 | - | 1,326 | 8.8% | - | 11.4% |
| 11 | Cambridge Road | | | | | | | |
| | *AM Peak* | 1,276 | 1,240 | - | 1,287 | 2.9% | - | -0.9% |
| | *PM Peak* | 1,348 | 1,288 | - | 1,260 | 4.7% | - | 7.0% |
| 12 | Cameron Park Drive | | | | | | | |
| | *AM Peak* | 1,183 | 1,196 | - | 1,163 | -1.1% | - | 1.7% |
| | *PM Peak* | 1,402 | 1,428 | - | 1,315 | -1.8% | - | 6.6% |

Notes:
Jan 2013 and Oct 2011 counts were obtained from the Dixon Ranch Traffic Study
Nov 2012 counts were obtained from the Arco AM/PM Traffic Study
Source: Kittelson & Associates, 2014

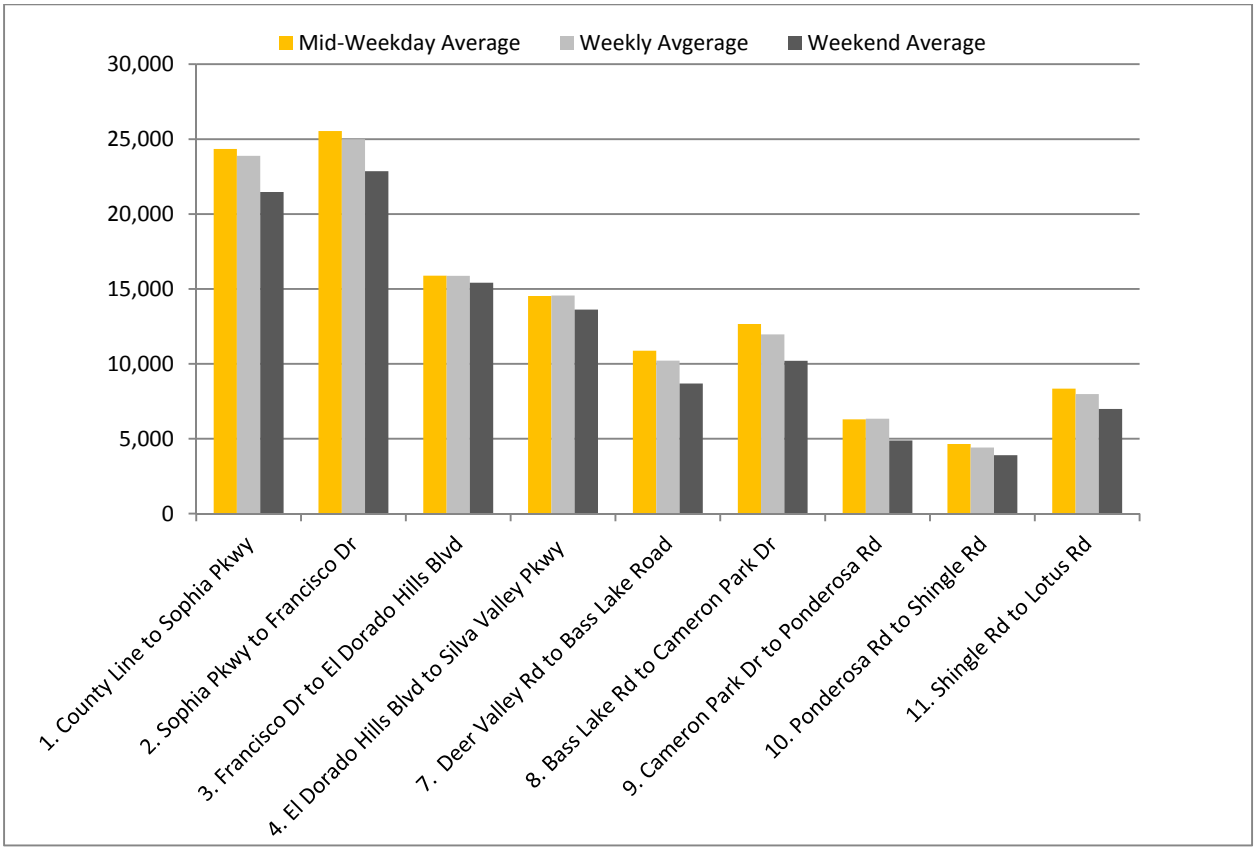
### *Existing 2014 Data Assessment*

As noted above, 2014 traffic volumes collected by KAI show consistency relative to previous year's data, and therefore, were considered for further evaluation.

### *Traffic Volumes*

Exhibit 54 illustrates 2014 ADTs for each study segment. It clearly shows the ADT gradually declines along each of the study segments from west to east. Moving east from the El Dorado County line, residential development gradually becomes less dense which contributes to the lower ADT along the study roadway segments on the east side of the study corridor. Exhibit 54 also shows that each study location carries highest traffic volumes during mid-week.

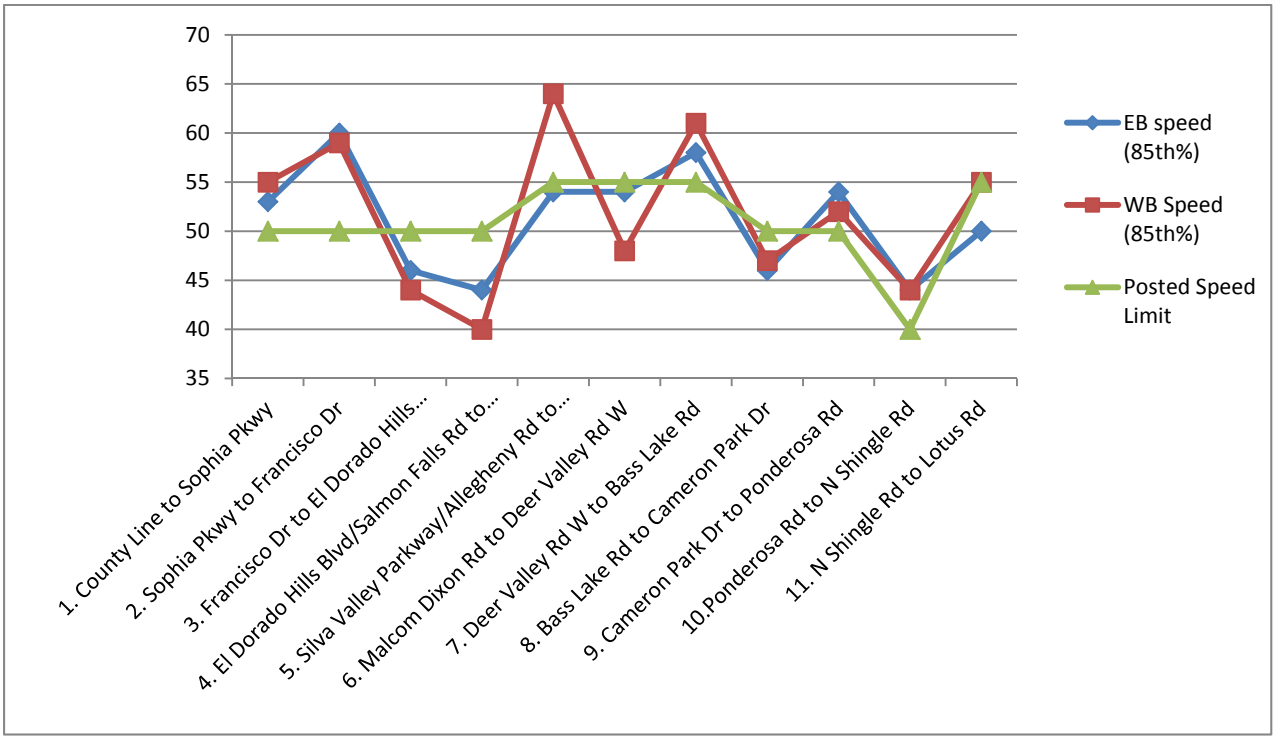
**Exhibit 54. Green Valley Road 2014 ADT Summary**




### *Speeds*

The 2014 tube counts collected along Green Valley Road corridor included speed. These speeds were summarized to the 85$^{th}$ percentile speed along each segment. The 85$^{th}$ percentile speed represents the speed at which 85 percent of the vehicles drive at or below. Exhibit 55 illustrates the 85$^{th}$ percentile speeds along each segment in both the eastbound and westbound directions. The figure also compares these speeds to the posted speed on each of the study segments.

**Exhibit 55. Green Valley Road Speed Data**




Posted speeds along the study corridor vary from 40 mph to 55 mph. In general the majority of 85th percentile speeds were within 5 mph of the posted or maximum allowed speed limit, exceptthe following:

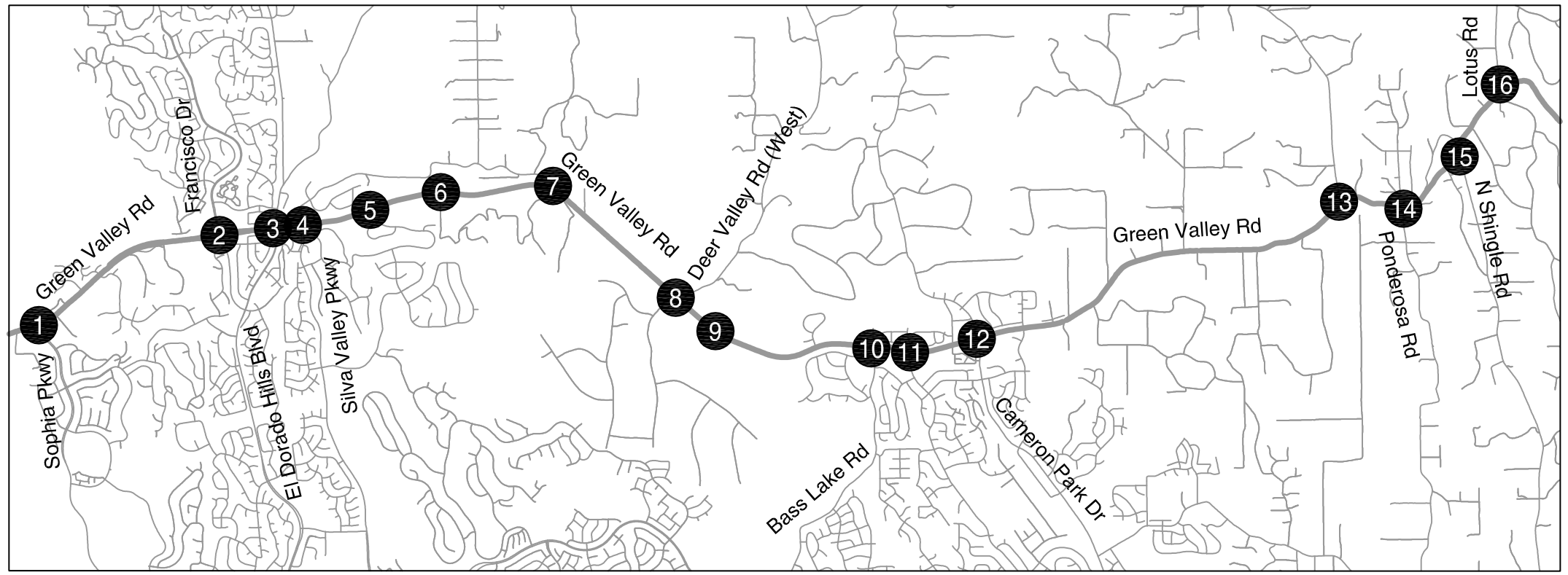
Segment #2, which had the highest ADT and most collisions along the study corridor, also reported one of the highest speeds (60 mph) on the corridor for both directions. The maximum allowed speed along Segment #5 is 55 mph in each direction, whereas the 85th percentile speed was 64 mph in the westbound direction, 9 mph higher than the prima facie speed. The 85th percentile speed in the westbound direction on Segment #7 was recorded approximately 6 mph higher than the prima facie speed limit of 55 mph. This could potentially be caused by a westbound downgrade between Silver Springs Parkway and Bass Lake Road.

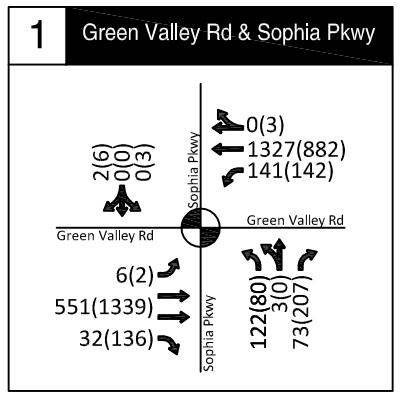
Although Segment #3 and 4 has two of the higher ADT volumes along the corridor, 85th percentile speeds in both directions were below the posted speed limits on the segments. Overall, when looking at the whole study corridor, the average posted speed along the Green Valley Road corridor is 50 mph. This speed is in line with the 85th percentile speed of 51 mph in both eastbound and westbound directions.

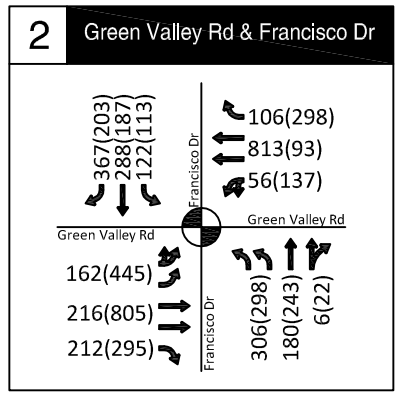
## Existing Traffic Volumes

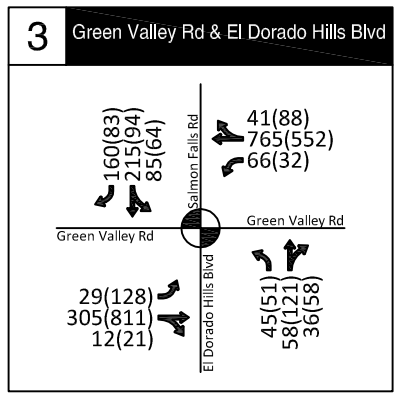
Exhibit 56 and Exhibit 57 show peak hour intersection turning movement counts along with the existing lane configuration and traffic control for each intersection.

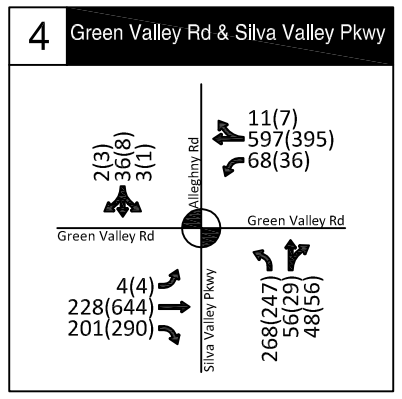
AM(PM) - Traffic Volume
- Stop Sign
- Traffic Signal
- (##) - Study Intersection
- * - Not Included in Analysis

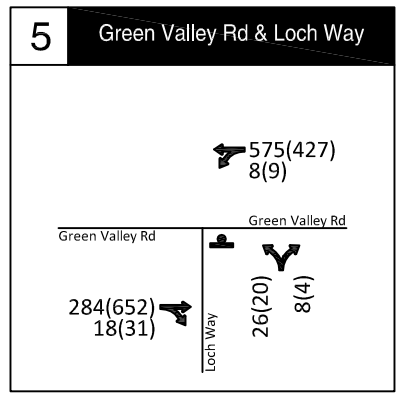


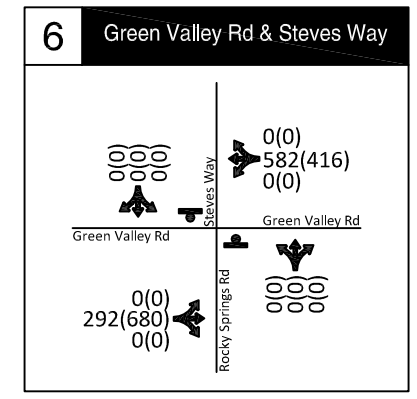



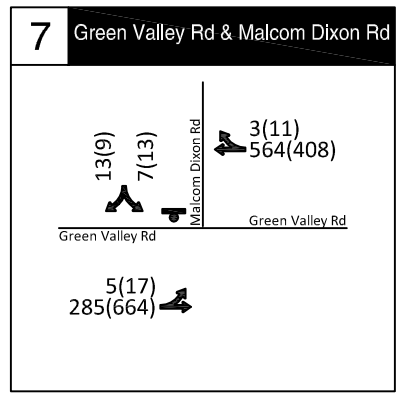



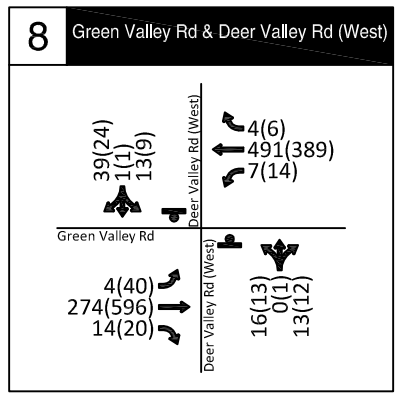



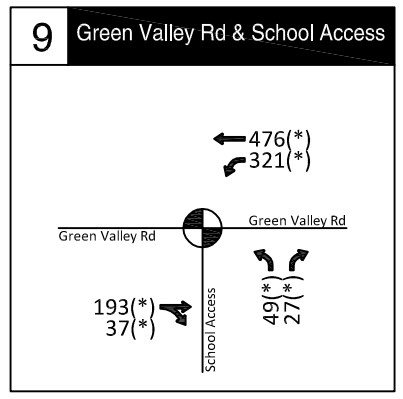



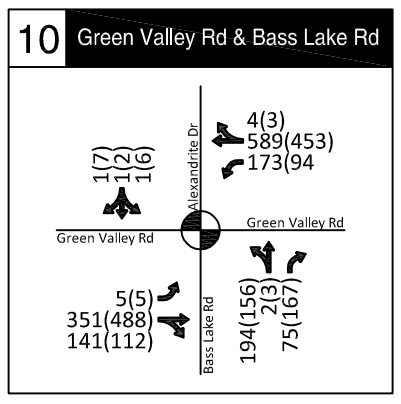



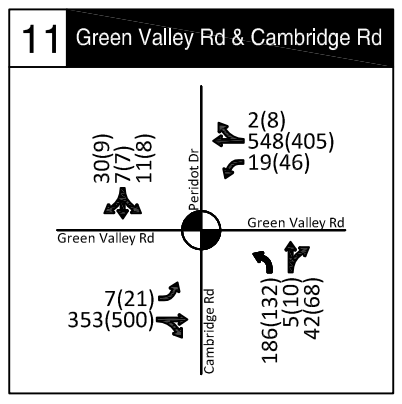



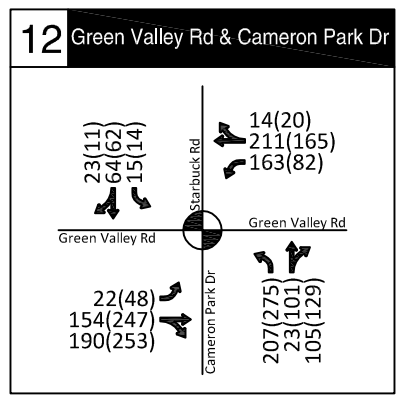



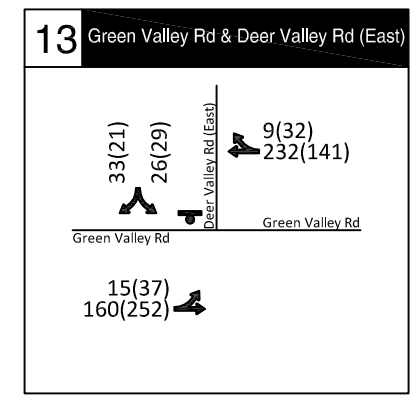



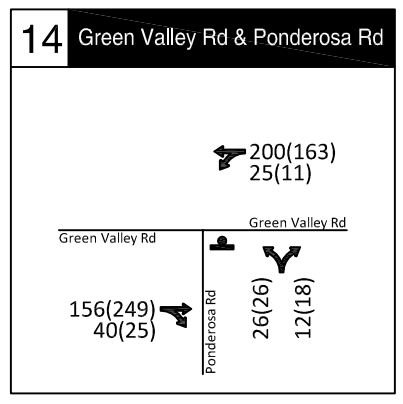



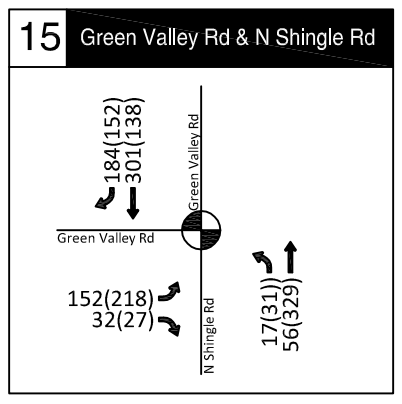



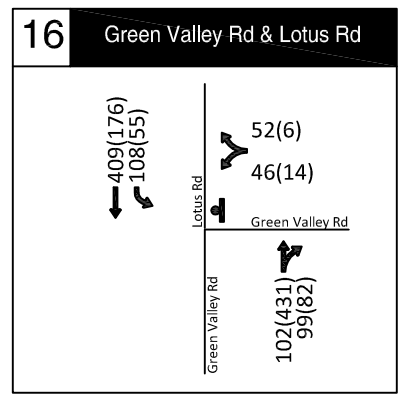



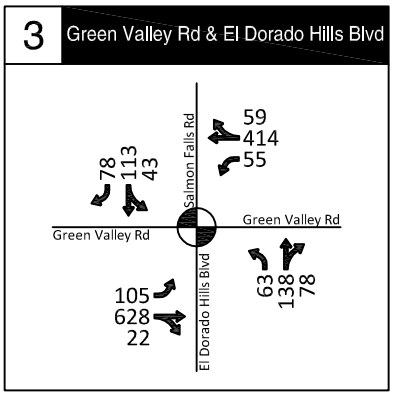



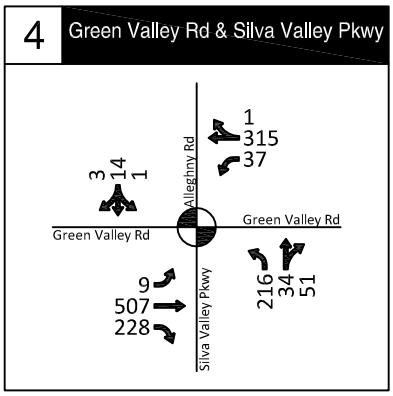



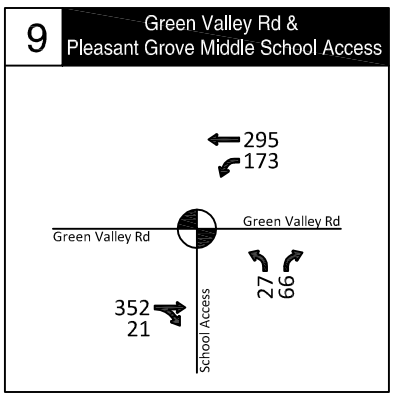




Existing AM and PM Traffic Volumes
El Dorado County, California

Exhibit 56


- Traffic Signal

School Peak Hour Traffic Volumes
El Dorado County, California

Exhibit
57

## Existing Traffic Operations

The results of the Existing Conditions intersection LOS analysis are shown in Table 11. All study intersections currently meet El Dorado County's LOS standards during the weekday AM, PM and school peak hours with exception of the El Dorado Hills Boulevard intersection which currently operates at LOS F during the afternoon school peak hour. The El Dorado Hills Boulevard intersection operates at LOS E during the weekday AM and PM peak hours. The Loch Way, Deer Valley Road (West), Pleasant Grove Middle School Access, and Lotus Road intersections operate at LOS D.

Based on the HCM operational methodology, LOS at the Pleasant Grove Middle School access intersection meets the County's threshold during the weekday AM and afternoon school peak hours. While the westbound Green Valley Road left-turn movement is projected to operate at LOS F in the AM peak, consistent with the field observations, the average delays and queues on the westbound Green Valley Road approach did not match field observations. Therefore, SimTraffic[22] analysis was performed to verify HCM operational results at the Pleasant Grove Middle School primary access intersection during the AM peak hour. The simulation was conducted for the entire peak hour using four 15-minute intervals within the peak hour. The results were averaged for ten model runs. The SimTraffic model was reasonably calibrated to match field observations. The average delay indicated that the intersection currently operates at LOS E, exceeding the County's LOS threshold. The critical movements, i.e. westbound Green Valley Road left-turn and through movements operate at LOS F and LOS D respectively.

Operational analysis indicates extensive queuing at several left-turn lanes at the intersections during one or more peak hours. Intersections and movements where queues exceed the storage capacity are listed below:

- #3 El Dorado Hills Boulevard eastbound left-turn lane
- #4 Silva Valley Parkway northbound left-turn lane
- #9 Pleasant Grove School Access westbound left-turn lane
- #11 Cambridge Road northbound left-turn lane
- #12 Cameron Park Drive westbound and northbound left-turn lanes

[22] Micro-simulation analysis tool included in the Synchro Suite package.

**Table 11. Existing Level of Service for AM, PM, and School Peak Hours**

| # | Green Valley Road & Cross Street | Control | LOS Threshold | AM Peak | | PM Peak | | School Peak | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Delay | LOS | Delay | LOS | Delay | LOS |
| 1 | Sophia Parkway / Access Road | Signalized | E | 16.5 | B | 22.8 | C | -- | -- |
| 2 | Francisco Drive | Signalized | E | 40.7 | D | 33.5 | C | -- | -- |
| 3 | El Dorado Hills Boulevard / Salmon Falls Road | Signalized | E | 66.2 | E | 57.4 | E | **80.8** | **F** |
| 4 | Silva Valley Parkway / Allegheny Road | Signalized | E | 23.2 | C | 18.2 | B | 20.8 | C |
| 5 | Loch Way | TWSC | D | 0.8 (18.7) | A (C) | 0.7 (26.6) | A (D) | -- | -- |
| 6 | Rocky Springs Road | TWSC | D | 0.0 (0.0) | A (A) | 0.0 (0.0) | A (A) | -- | -- |
| 7 | Malcolm Dixon Road | TWSC | D | 0.5 (14.8) | A (B) | 0.7 (22.3) | A (C) | -- | -- |
| 8 | Deer Valley Road (West) | TWSC | D | 1.8 (17.8) | A (C) | 1.8 (26.9) | A (D) | -- | -- |
| 9 | Pleasant Grove Middle School Access | Signalized | D | 59.8 | **E** | -- | -- | 15.7 | B |
| 10 | Bass Lake Road / Alexandrite Drive | Signalized | E | 42.3 | D | 20.1 | C | -- | -- |
| 11 | Cambridge Road / Peridot | Signalized | E | 23.6 | C | 16.6 | B | -- | -- |
| 12 | Cameron Park Drive / Starbuck Road | Signalized | E | 30.7 | C | 23.4 | C | -- | -- |
| 13 | Deer Valley Road (East) | TWSC | D | 1.7 (11.8) | A (B) | 2.0 (12.4) | A (B) | -- | -- |
| 14 | Ponderosa Road (East) | TWSC | D | 1.7 (12.5) | A (B) | 1.4 (12.3) | A (B) | -- | -- |
| 15 | North Shingle Road | Signalized | D | 10.5 | B | 9.7 | B | -- | -- |
| 16 | Lotus Road | TWSC | D | 3.1 (17) | A (C) | 8.5 (33.5) | A (D) | -- | -- |

TWSC = Two Way Stop Control, intersection average delay and LOS is reported first followed by the delay and LOS for the worst movement in parentheses.

Source: Kittelson & Associates, 2014

For the roadway segment analysis, the highest volume mid-week day was chosen for operational assessment at each study segment. The AM and PM peak hour volumes were extracted for this analysis.

The results of the existing conditions roadway segment LOS analysis are shown in Table 12. The table reports the relatively worse peak hour operations. All study segments currently operate acceptably per El Dorado County LOS standards during the weekday AM and PM peak hours.

**Table 12. Existing Roadway Segment LOS Results by Direction of Travel**

| ID | Location | Facility Type | LOS Threshold | Eastbound | | | Westbound | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | PTSF / PFFS (%) | V/C (Density, pc/mi/h) | LOS | PTSF / PFFS (%) | V/C (Density, pc/mi/h) | LOS |
| 1 | County Line to Sophia Parkway | Two-Lane, Class II | E | 94.2 | 0.82 | E | 97.1 | 0.93 | E |
| 2 | Sophia Parkway to Francisco Drive | Multilane | E | -- | (12.3) | B | -- | (15.2) | B |
| 3 | Francisco Drive to El Dorado Hills Boulevard | Two-Lane, Class II | E | 83.4 | 0.44 | D | 93.7 | 0.68 | E |
| 4 | El Dorado Hills Boulevard to Silva Valley Parkway | Two-Lane, Class II | E | 83 | 0.44 | D | 83.4 | 0.47 | D |
| 5 | Silva Valley Parkway to Malcolm Dixon Road | Two-Lane, Class II | D | 83.9 | 0.46 | D | 80.6 | 0.41 | D |
| 6 | Malcolm Dixon Road to Deer Valley Road (West) | Two-Lane. Class II | D | 84.7 | 0.51 | D | 77.9 | 0.43 | D |
| 7 | Deer Valley Road (West) to Bass Lake Road | Two-Lane, Class II | D | 81.4 | 0.44 | D | 78.6 | 0.42 | D |
| 8 | Bass Lake Road to Cameron Park Drive | Two-Lane, Class III | E | 75.6 | 0.42 | C | 75.3 | 0.49 | C |
| 9 | Cameron Park Drive to Ponderosa Road (East) | Two-Lane, Class II | D | 70.9 | 0.25 | D | 69.4 | 0.25 | C |
| 10 | Ponderosa Road to North Shingle Road | Two-Lane, Class II | D | 68.2 | 0.26 | C | 60.1 | 0.19 | C |
| 11 | North Shingle Road to Lotus Road | Two-Lane, Class II | D | 77.7 | 0.42 | D | 72.5 | 0.37 | D |
| Source: Kittelson & Associates, 2014 | | | | | | | | | |

Synchro and HCS analysis worksheets are provided in Appendix 4 and Appendix 5 respectively.

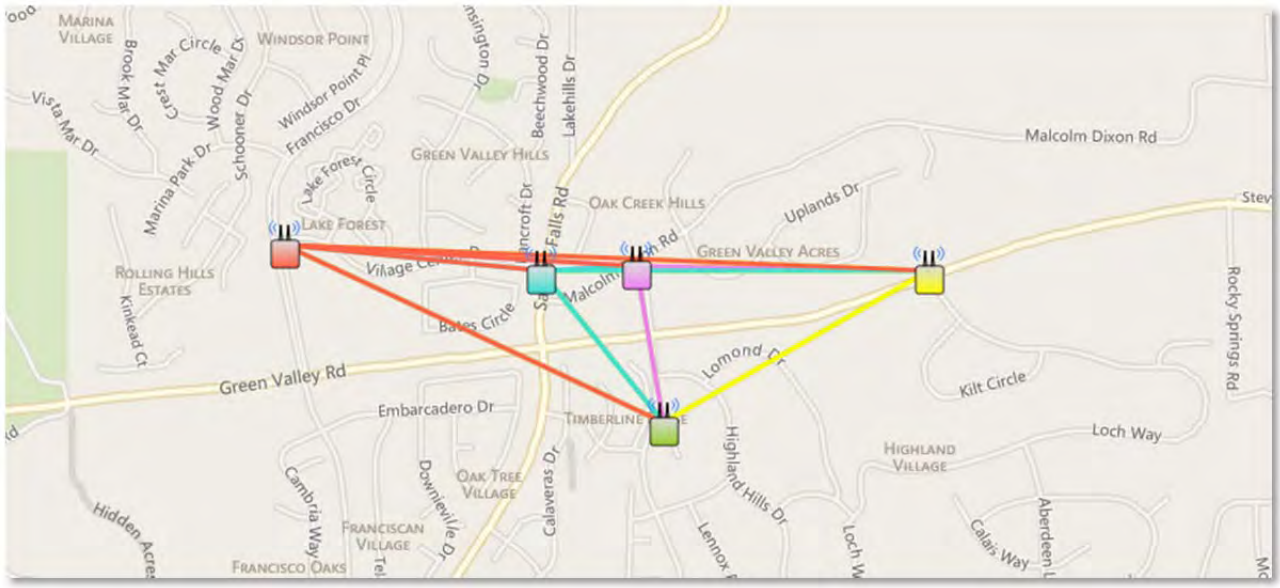
## CUT-THROUGH TRAFFIC

This section summarizes the data and methodology used to analyze cut-through traffic on Allegheny Road and El Dorado Hills Boulevard. In order to determine traffic volumes to and from specific roadways, origin-destination (OD) data was collected using Bluetooth™ technology. BlueMAC readers were used. They detect anonymous MAC addresses and wireless identifications used to connect Bluetooth™ technologies on mobile devices in vehicles such as phones, headsets and music players. The system calculates travel time, estimated origin-destinations and route patterns through analysis of subsequent detections.

BlueMAC readers were deployed at five locations to capture origin-destinations and route patterns on Allegheny Road and El Dorado Hills Boulevard. The BlueMAC readers were stationed at the following five locations and as shown in Exhibit 58.

- Red: Francisco Drive & Village Center Drive;
- Cyan: Salmon Falls Road & Village Center Drive;
- Purple: Allegheny Road & Malcom Dixon Road;
- Green: Silva Valley Parkway & Shortlidge Court; and
- Yellow: Loch Way & Green Valley Road.

**Exhibit 58. BlueMAC Reader Locations**




Origin-destination data is presented for each cut-through route, capturing the total origin-destination demand and providing the percentage of cut-through traffic along that particular route. The analysis captured the origin destination data collected between Friday, May 2, 2014 and Tuesday, May 13, 2014. Origin-destination data was analyzed for the mid-weekdays (Tuesday, Wednesday, and Thursday) to

find the percentage of cut-through traffic for the AM and PM peak periods (7-9 AM and 4-6 PM respectively) and daily totals.

### *Cut-Through Route: Allegheny Road*

Cut-through traffic using Allegheny Road to access destinations north of Salmon Falls Road and Francisco Drive averaged 10 percent of the total traffic between the OD pair during mid-week days within a twenty-four hour time period. Table 13 shows the results of possible cut-through traffic using Allegheny Road between various origin and destinations during the each time period.

**Table 13. Allegheny Road Cut-Through Traffic Results**

| Origin | Destination | Time Period | Total OD Demand | Cut-Through Traffic | Percentage of Cut-Through Traffic |
|---|---|---|---|---|---|
| Silva Valley Pkwy/ South of Green Valley Road | North on Salmon Falls Road | Study Period | 278 | 49 | 18% |
| | | Mid-Week AM Peak | 15 | 2 | 13% |
| | | Mid-Week PM Peak | 40 | 7 | 18% |
| Silva Valley Pkwy/ South of Green Valley Road | Francisco Drive | Study Period | 183 | 22 | 12% |
| | | Mid-Week AM Peak | 22 | 5 | 23% |
| | | Mid-Week PM Peak | 18 | 2 | 11% |
| East of Silva Valley Pkwy/Green Valley Road | North on Salmon Falls Road | Study Period | 279 | 16 | 6% |
| | | Mid-Week AM Peak | 27 | 5 | 19% |
| | | Mid-Week PM Peak | 29 | 3 | 10% |
| East of Silva Valley Pkwy/Green Valley Road | Francisco Drive | Study Period | 182 | 5 | 3% |
| | | Mid-Week AM Peak | 21 | 2 | 10% |
| | | Mid-Week PM Peak | 21 | 2 | 10% |
| Source: Kittelson & Associates, 2014 | | | | | |

Cut-through traffic using Allegheny Road during the AM peak period averaged 16 percent of the total traffic between the OD pairs. The AM peak period had the highest percentage of cut-through traffic during peak time periods. The highest percentage of cut-through traffic occurred between vehicles accessing Francisco Drive from Silva Valley Parkway. Vehicles cutting through on Allegheny Road would bypass traffic signals at the Green Valley Road/El Dorado Hills Boulevard and Green Valley Road/Francisco Drive intersections. The signal operations analysis based on traffic counts collected by KAI in May 2014 at the Green Valley Road/El Dorado Hills Boulevard intersection, indicate the LOS for the westbound approach during the AM peak is LOS F. Motorists from Silva Valley Parkway electing to use Green Valley Road to access the developments to the north, off of Francisco Drive, could potentially incur up to two minutes of delay if stopped at both intersections.

Cut-through traffic using Allegheny Road during the PM peak period averaged 12 percent of the total traffic between OD pairs. During the PM peak period, 18 percent of traffic originated on Silva Valley

Parkway used Allegheny Road to cut-through to developments north off of Salmon Falls Road. Although, there were no apparent traffic operational issues on the westbound Green Valley Road approach at El Dorado Hills Boulevard.

### *Cut-Through Route: Salmon Falls Road*

Cut-through traffic using Salmon Falls Road to access destinations to the north, off of Francisco Drive averaged 19 percent of the total traffic between OD pairs during mid-week days within a twenty-four hour time period. The highest percentage (22) of cut-through traffic occurred between vehicles on Silva Valley Parkway south of Green Valley Road, using Salmon Falls Road to access Francisco Drive during the PM peak period. Although, there were no apparent traffic operational issues on the westbound Green Valley Road approaches at El Dorado Hills Boulevard and Francisco Drive. Table 14 displays the results for vehicles using Salmon Falls Road to cut-through to Francisco Drive.

**Table 14. Salmon Falls Road Cut-Through Traffic Results**

| Origin | Destination | Time Period | Total OD Demand | Cut-Through Traffic | Percentage of Cut-Through Traffic |
|---|---|---|---|---|---|
| South of Silva Valley Pkwy/Green Valley Road | Francisco Drive | Study Period | 183 | 41 | 22% |
| | | Mid-Week AM Peak | 22 | 0 | 0% |
| | | Mid-Week PM Peak | 18 | 4 | 22% |
| East of Silva Valley Pkwy/Green Valley Road | Francisco Drive | Study Period | 182 | 29 | 16% |
| | | Mid-Week AM Peak | 21 | 2 | 10% |
| | | Mid-Week PM Peak | 21 | 1 | 5% |
| Source: Kittelson & Associates, 2014 | | | | | |

The raw OD data collected by BlueMAC readers are attached in Appendix 6.

# Part E: Community Outreach and Next Steps

# PART E: COMMUNITY OUTREACH AND NEXT STEPS

## COMMUNITY OUTREACH

A community outreach meeting was conducted on September 17, 2014 at the Pleasant Grove Middle School from 6:00 to 8:00 PM. The purpose of the meeting was to present and discuss the findings of the draft study and to solicit public feedback through comments. A survey was also provided at the meeting and provided on the LRP web page. El Dorado County Community Development Agency, Long Range Planning (LRP) Division sent emails to several individuals and organizations who advocated for the Green Valley Road Corridor study. The organizations notified included: Rescue Community Center; Shingle Springs Community Alliance; Cameron Park and El Dorado Hills Community Services District(s) (CSD); El Dorado County, El Dorado Hills and Shingle Springs-Cameron Park Chamber of Commerce(s); El Dorado Hills Area Planning Advisory Committee (APAC); County Office of Education; El Dorado County Farm Bureau; Cameron Park, El Dorado Hills and Shingle Springs Fire Department(s); Rescue Fire Board; Green Valley Alliance; El Dorado Union High School District; Rescue Historical Society; Francisco Oaks, Green Springs Ranch, Highland Hills and Sterlingshire Home Owners Association(s) (HOA); County Libraries in Cameron Park and El Dorado Hills; and Rescue Union School District. A notice of the meeting was also posted on the County website. The draft study and technical documents were uploaded on the County website to provide easy access to the residents prior to the meeting. Approximately 21 residents attended the meeting.

Informational boards were prepared to present key findings of the elements listed below:

1. Introduction of the study
2. Study Corridor
3. Traffic Conditions
4. Safety and Physical Conditions
5. Bicycle Lanes, Speed Limits and Speed Surveys
6. Access and Cut-Through Traffic Evaluation
7. Pleasant Grove Middle School

Throughout the meeting, residents were encouraged to fill out the comment cards to provide their feedback for consideration. Participants were also asked to fill out brief survey forms to express their concerns in the corridor and to rank treatment types and locations. The comments and surveys were processed and are contained in Appendix 7.

## NEXT STEPS

KAI and county staff will present the study to the Board of Supervisors for their consideration. The findings of the study, public comments and surveys will be considered during the on-going update to the Traffic Impact Mitigation (TIM) Fees and the West Slope Capital Improvement Program (CIP).

County staff will use the information as the basis of additional engineering assessments and for potential grant applications.