North McCarran Boulevard Safety Management Plan

Final Report



Prepared For

Nevada DOT
Safe and Connected

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Acronyms and Abbreviations

ADA	Americans with Disabilities Act
AADT	Annual Average Daily Traffic
DDI	Diverging Diamond Interchange
DU	Dwelling Unit
HCM	Highway Capacity Manual
HSM	Highway Safety Manual
LOS	Level-of-Service
LPI	Leading Pedestrian Interval
MPH	Miles-per-Hour
NDOT	Nevada Department of Transportation
ONTP	One Nevada Transportation Plan
PHF	Peak Hour Factor
PDO	Property Damage Only
RTC	Regional Transportation Commission of Washoe County
RTP	Regional Transportation Plan
RSA	Road Safety Assessment
SMP	Safety Management Plan
SPUI	Single-Point Urban Interchange
STIP	Statewide Transportation Improvement Program
TAC	Technical Advisory Committee
TRINA	Traffic Records Information Access
TRB	Transportation Research Board
UNR	University of Nevada, Reno

ES.0 Executive Summary

ES.1 Background

The McCarran Boulevard Safety Management Plan (SMP) is a transportation planning effort that focuses on traffic safety for all users, incorporating corridor studies, access management, public and stakeholder input, crash analysis, roadway engineering, and the application of the Highway Safety Manual (HSM) methods to reduce roadway crashes. The SMP process is consistent with the Nevada Strategic Highway Safety Plan's goal of significantly reducing the number and severity of roadway crashes in the state.

The McCarran Boulevard SMP study area, located within northwest Reno, Nevada, is approximately 6-miles long and extends from I-80 to US 395, as shown in **Figure ES-1**. The corridor crosses both City of Reno and Washoe County jurisdictions and consists of residential, commercial, parks, and recreation with undeveloped land north of McCarran Boulevard in the middle of the study area. The roadway configuration of McCarran Boulevard within the study area varies between 4-lanes with a center median island to 6-lanes with a center median island; all of which has a posted speed limit of 50 miles-per-hour (MPH), except the segment between Sutro Street and US 395, which is 45 MPH.



Figure ES-1: Study Area

ES.2 Existing Crash Conditions

The study team obtained five-year crash history data from the Nevada Department of Transportation (NDOT) for the time period between January 1, 2013 to December 31, 2017. A corresponding heat map was developed to illustrate the crash activity for the five-year period and is shown in **Figure ES-2**.

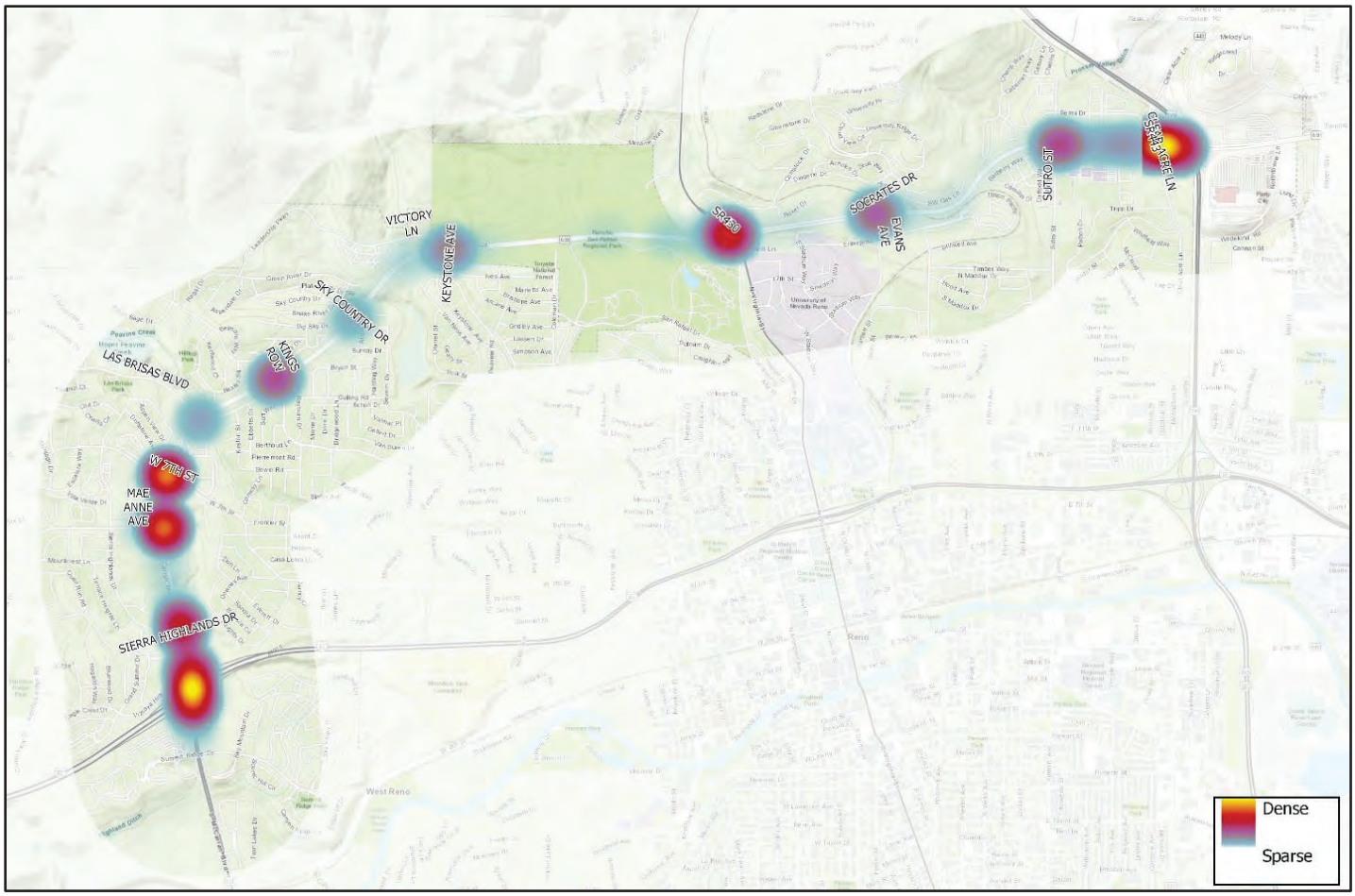


Figure ES-2: Crash Density Heat Map

A total of 724 crashes occurred along McCarran Boulevard from I-80 to US 395 during the five-year period, resulting in 6 fatalities (2 of which were just outside of the 5-year period, but included in the analysis), 478 injuries, and 394 property damage only (PDO) crashes; including 11 pedestrian crashes, 6 bicycle crashes, 20 motorcycle crashes, and 1 bus crash.

ES.3 Existing Corridor Conditions

The McCarran Boulevard SMP study team conducted field reviews to determine existing physical conditions. The roadway configuration of McCarran Boulevard changes throughout the study area and consists of the following:

- Sky Mountain Drive merge to I-80 – 5-lanes with a center median island
- I-80 to Las Brisas Boulevard – 6-lanes with a center median island (drops to 5 lanes just south of Las Brisas Boulevard)
- Las Brisas Boulevard to Virginia Street – 4-lanes with a center median island
- Virginia Street to Evans Road/Socrates Drive – 6-lanes with a center median island
- Evans Road/Socrates Drive to Clear Acre Lane – 4-lanes with a center median island (drops from 5-lanes just east of Evans Road/Socrates Drive)
- Clear Acre Lane to US 395 – 6 lanes with a center median island

Next, the McCarran Boulevard SMP study team conducted three separate road safety assessments (RSA) along the McCarran Boulevard corridor. Overall findings in the corridor include lighting needs to be improved along the roadway and at intersections; crosswalk and bike lane markings need to be improved; where bike lanes transition across right-turn lanes, they should utilize green lane markings; bushes and shrubs should be trimmed where they encroach into the pedestrian walkways and the walkways swept of debris; signal heads do not have retroreflective backplates; pedestrian push buttons and curb cut ramps are substandard throughout the corridor; and signal heads are not properly aligned with vehicular lanes.

At the time of the RSA, NDOT also conducted a Speed Study for the McCarran Boulevard study area to determine typical operating speeds and observed that all segments have an 85th percentile speed greater than the posted speed limit, with the greatest difference of 9 MPH from Las Brisas Boulevard to Virginia Street, a distance of 2.4-miles.

Subsequently, McCarran Boulevard within the study area was analyzed for existing traffic operations. As a result, five out of sixteen analyzed intersections perform at a level-of-service (LOS) E or LOS F in both the AM and PM peak hours, including:

- McCarran Boulevard and I-80 Eastbound Ramps
- McCarran Boulevard and Las Brisas Boulevard
- McCarran Boulevard and Sky Country Drive
- McCarran Boulevard and Virginia Street
- McCarran Boulevard and Clear Acre Lane

Additionally, ten out of sixteen McCarran Boulevard analyzed intersections have at least one queue length longer than the queue storage during the AM and/or PM peak hours.

ES.4 Relevant Policies, Plans, and Studies

The following plans and/or projects have been identified by the project team as being relevant to this study:

- Reginal Transportation Commission of Washoe County (RTC) 2040 Regional Transportation Plan (RTP)
- RTC Bicycle and Pedestrian Master Plan
- RTC Complete Streets Master Plan
- RTC Americans with Disabilities Act (ADA) Transition Plan
- Keystone Avenue Corridor Study
- Virginia Street Corridor Investment Plan
- University of Nevada, Reno (UNR) Campus Master Plan
- McCarran Boulevard and Keystone Avenue Intersection RSA (February 25, 2008)
- McCarran Boulevard and Sutro Street Intersection RSA (March 22, 2011)
- McCarran Boulevard – 4th Street to Las Brisas Drive RSA (April 2, 2008)
- McCarran Boulevard RSA – Las Brisas Boulevard to Rock Boulevard (November 16, 2016)

ES.5 Land Use Analysis

Land use is a critical element that effects the current and future travel demand and transportation characteristics of any corridor. Using a 0.5-mile buffer around the McCarran Boulevard study area, an analyzation of the City of Reno's and Washoe County's zoning codes and master plans were reviewed to find similarities in land use; this was to highlight the main users of the study area and to determine their impact in relation to transportation. Some key land use considerations within the McCarran Boulevard study area include:

- The Corridor is primarily surrounded by existing development, with less than 4-percent vacant parcels (129 out of 3,349 total parcels)
- The corridor has a mixture of single-family residential, multi-family residential, commercial and special land uses such as parks, UNR owned land, religious centers, and a water treatment plant
- Four schools, including UNR, are located within this corridor
- The corridor is part of the McCarran Boulevard Loop, an arterial roadway used to connect local streets to freeway entrances in an efficient manner
- 83-percent of the parcels in this corridor have a residential zoning designation, with unit density ranging from 1 dwelling unit (du)/acre (LLR1) to 30 du/acre (MF30)
- 17-percent of the corridor is designated as non-residential or mixed-use zoning including retail, office industrial, and other uses
- Less than 1-percent of the corridor has a Public Facility or Open Space zoning designation, which includes Rancho San Rafael Park, Washoe County schools, and other areas of Open Space

ES.6 Economic Development Potential

The study area is highly built out, with most of the vacant land categorized as National Forest. Therefore, the majority of the growth will revolve around the expansion of UNR and infill into higher density uses such as apartment complexes.

ES.7 Crash Risk and Factors Summary

McCarran Boulevard is emblematic of many arterials in urban Nevada, with high speeds between major intersections, high volumes at major intersections, and has gaps in supportive infrastructure for alternate transportation modes. The combination of these problems, numerous local roadway cross streets accessing residential neighborhoods, and several commercial driveways near busy intersections, results in a high number of crashes. While most of the corridor does not exceed average crash rates for similar facilities, the sheer volume of traffic within and crossing McCarran Boulevard, and the high speeds along the corridor, result in high overall crash numbers. As a result, alternatives developed as part of the mitigation portion of this SMP focused on reducing speed, channelization, and supporting alternative modes.

ES.8 SMP Alternatives

Corridor alternatives that revise the roadway cross-sectional configuration were developed for each segment of the corridor to better accommodate all modes and improve safety. In some cases, more than one promising option was developed without any recommendation of one versus the other. It will be up to decision-makers to determine which alternative to advance, if any, based on numerous factors in addition to safety performance.

Summit Ridge to I-80

Reduce the northbound inside shoulder and reduce the right-turn lane to 11-feet to provide a 3-foot buffer for the existing bike lane. The southbound direction has sufficient width to simply stripe a formal bike buffer for the existing bike lane, as shown in **Figure ES-3**.

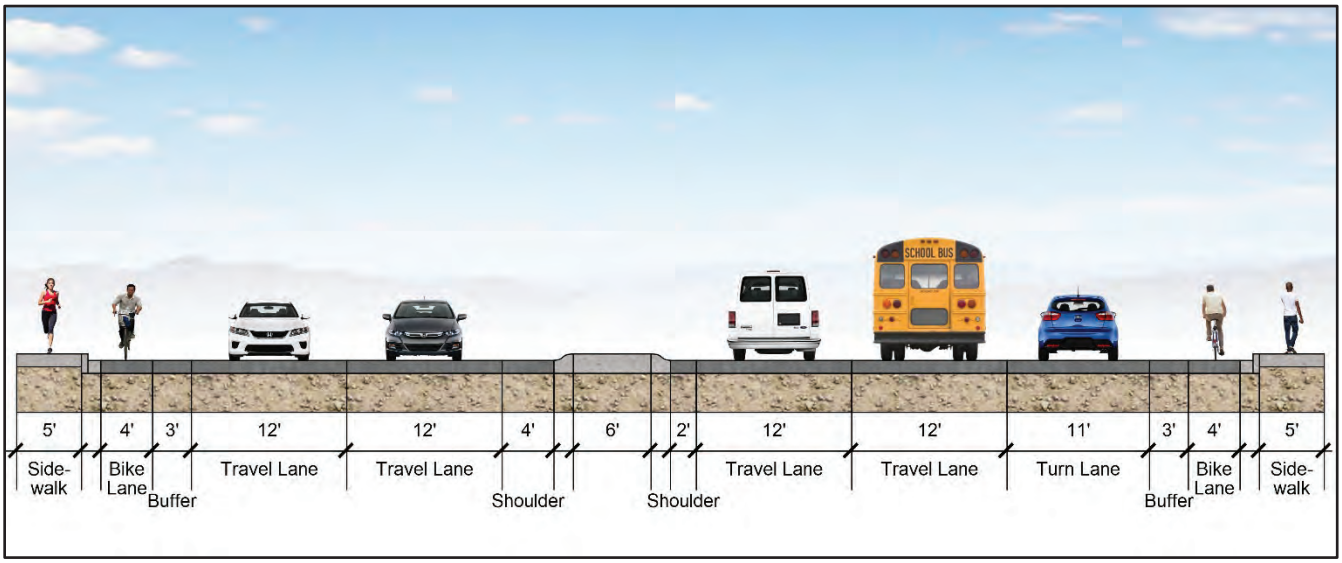


Figure ES-3: Design Alternative – Summit Ridge to I-80 Buffered Bike Lanes

I-80 to Las Brisas Boulevard

Given the number of lanes and the volumes in the area, the existing bike lanes are uncomfortable for riders, therefore the lane widths in this section could be slightly reduced to 11-feet to provide a 3-foot buffer for the bike lanes and increase rider comfort, as shown in **Figure ES-4**.

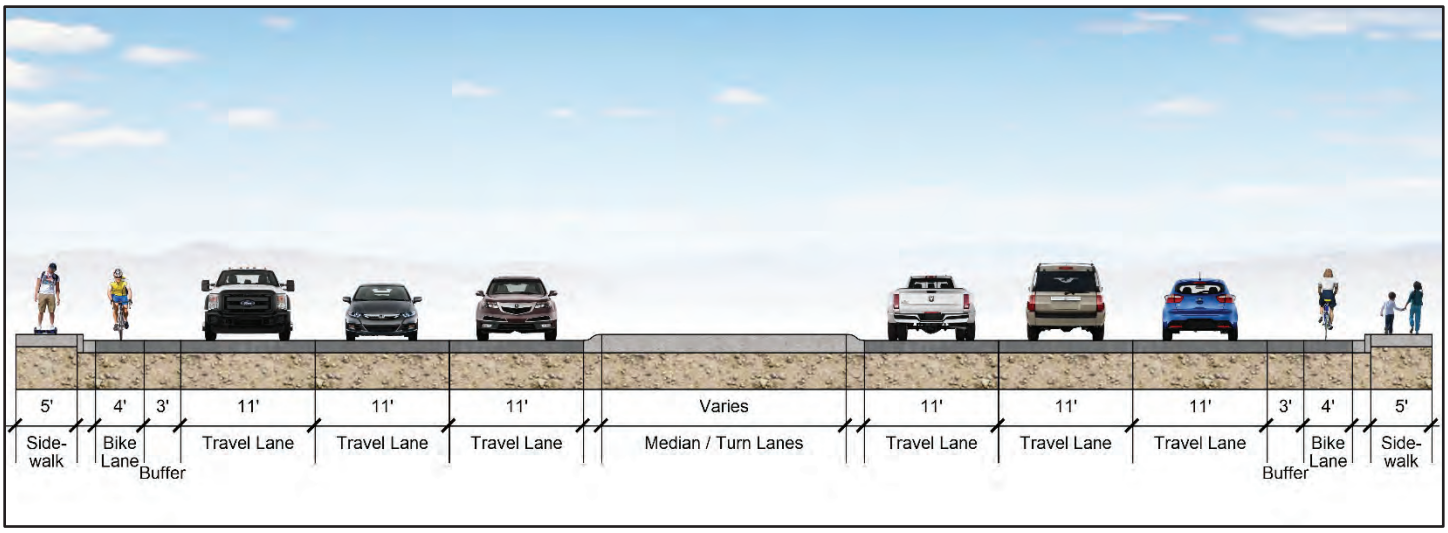


Figure ES-4: Design Alternative – I-80 to Las Brisas Boulevard Buffered Bike Lanes

Las Brisas Boulevard to North Virginia Street

With important origins/destinations along and near this segment, travelers could benefit from improved active transportation infrastructure, which can be accomplished one of two ways. The first option is to reduce the outside lane to 11-feet and stripe a formal bike lane and buffer while also adding sidewalks on both sides, as shown in **Figure ES-5**.

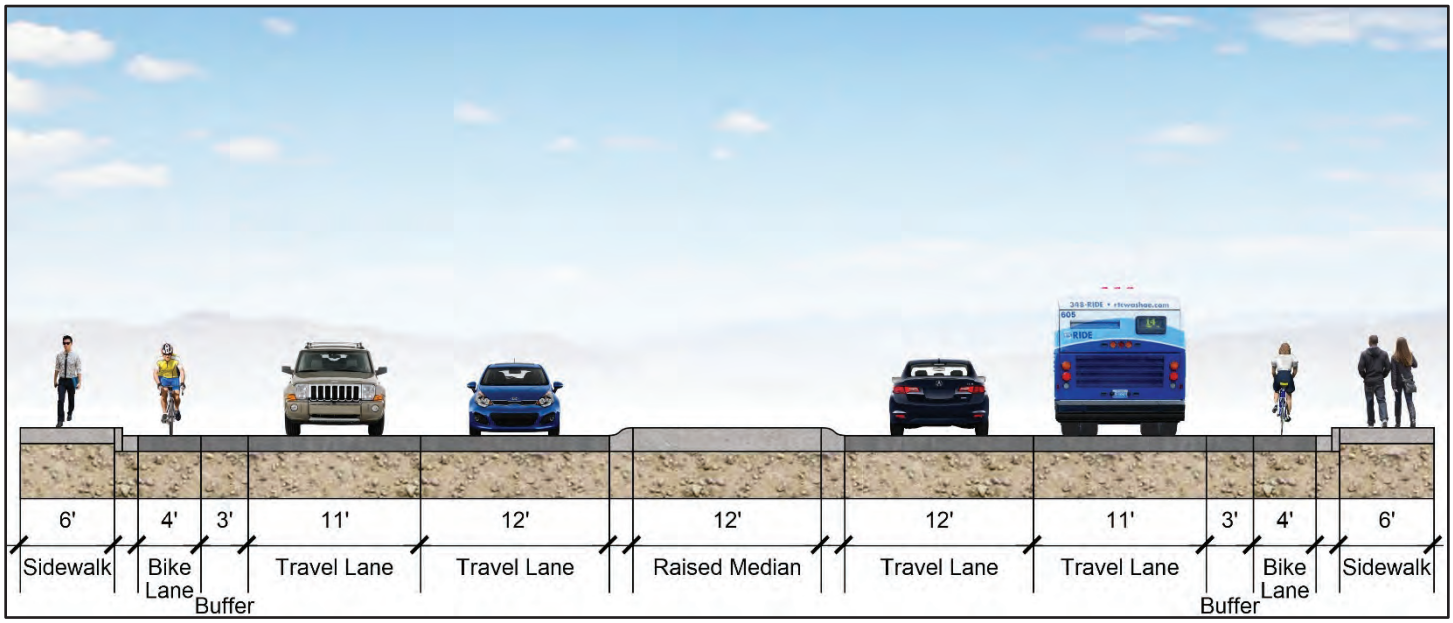


Figure ES-5: Design Alternative #1 – Las Brisas Boulevard to North Virginia Street Buffered Bike Lanes and Sidewalks

The second option is to take advantage of the fact that east of Sky Country Drive, there are very few origins/destinations on the north side of McCarran Boulevard, and combine bicycle and pedestrian facilities into a multi-use path along the south side. Lane widths could be reduced to help reduce speeds along this section as well, as illustrated in **Figure ES-6**.

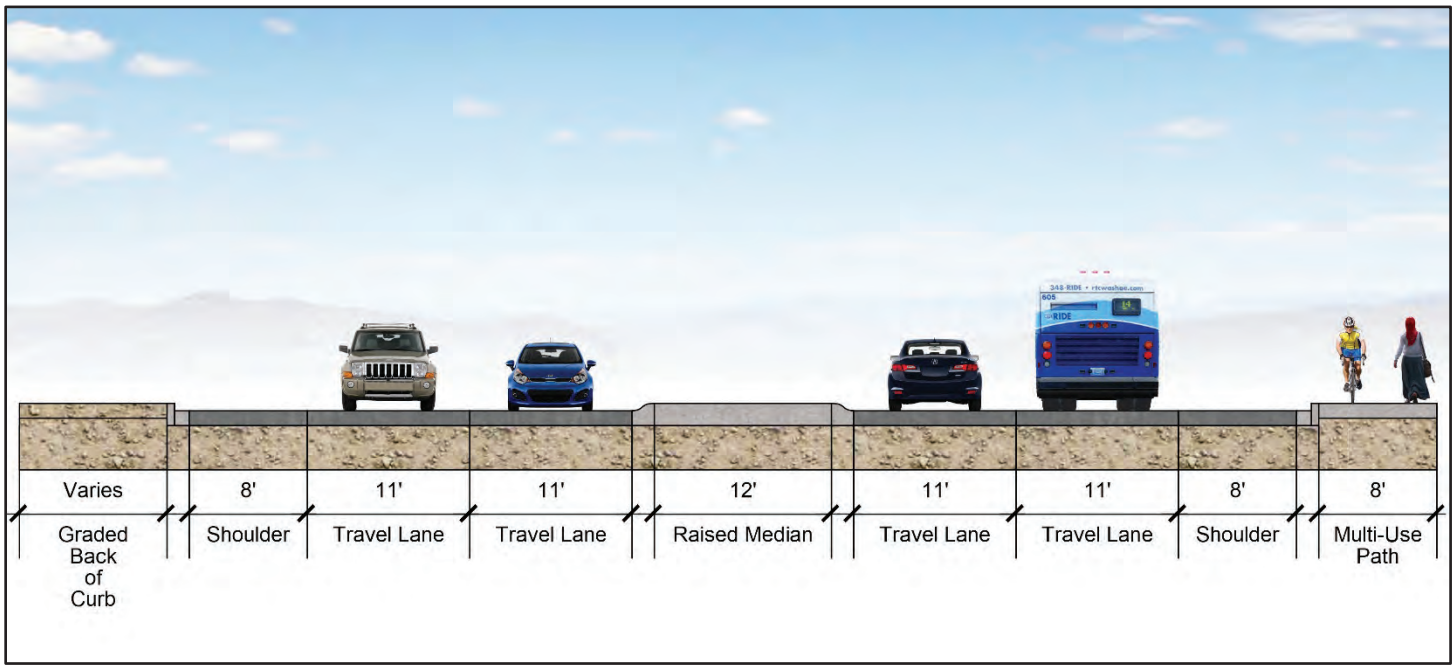


Figure ES-6: Design Alternative #2 – Las Brisas Boulevard to North Virginia Street Multi-Use Path

North Virginia Street to Evans Avenue/Socrates Drive

To improve safety in this segment, one option is to take advantage of the outside lanes by repurposing those lanes to provide a wide bike lane and buffer, as shown in **Figure ES-7**. Furthermore, to support pedestrian activity near UNR, 8-foot-wide sidewalks could be installed.

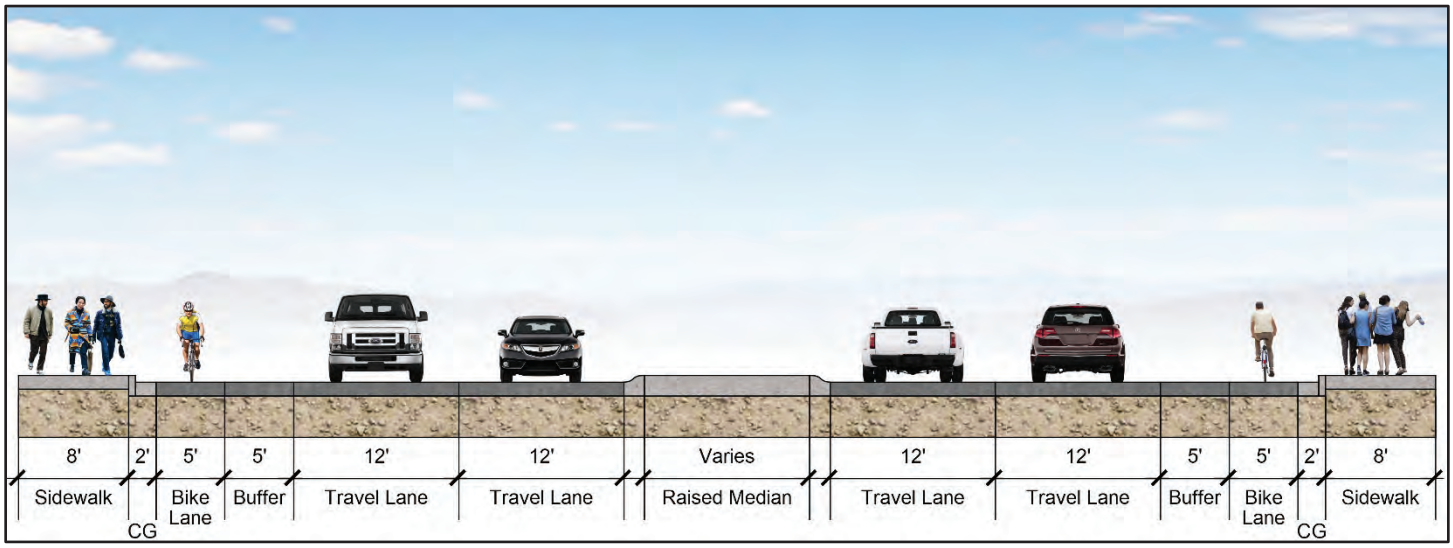


Figure ES-7: Design Alternative #1 – North Virginia Street to Evans Avenue/Socrates Drive Lane Reduction

If the preference is not to reduce the roadway capacity from 6-lanes, the lanes could be reduced to 10-foot-wide lanes while still providing standard buffered bike lanes and sidewalks, as shown in **Figure ES-8**.

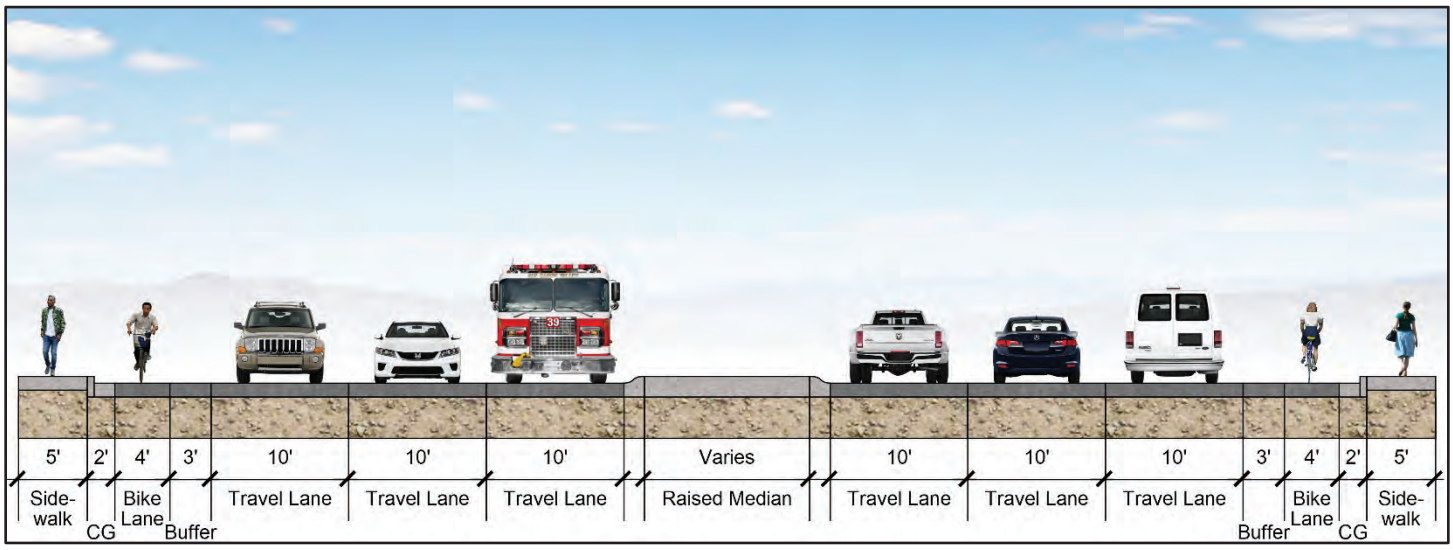


Figure ES-8: Design Alternative #2 – North Virginia Street to Evans Avenue/Socrates Drive Buffered Bike Lanes and Sidewalk

Evans Avenue/Socrates Drive to Sutro Street

The first option is to reduce lane widths to encourage slower speeds and use the additional width to add buffered bike lanes and curb, gutter, and sidewalk in both directions, as shown in **Figure ES-9**.

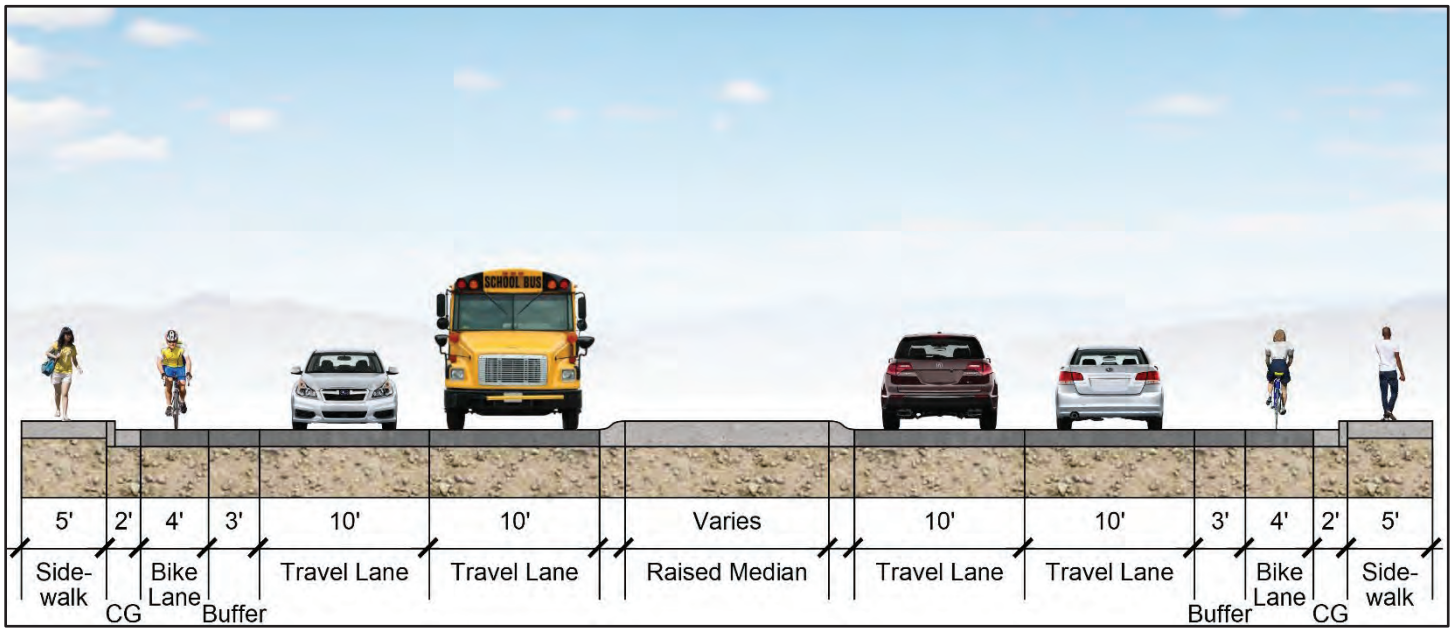


Figure ES-9: Design Alternative #1 – Evans Avenue/Socrates Drive to Sutro Street Buffered Bike Lanes and Sidewalks

A second option would be to formalize the bike lane in the westbound direction with striping and a buffer, and add a multi-use path in the eastbound direction by reducing travel lanes to 11-feet, as shown in **Figure ES-10**. Similar to the Las Brisas Boulevard to North Virginia Street segment, there are few origins/destinations on northside of McCarran Boulevard, making a multi-use path feasible.

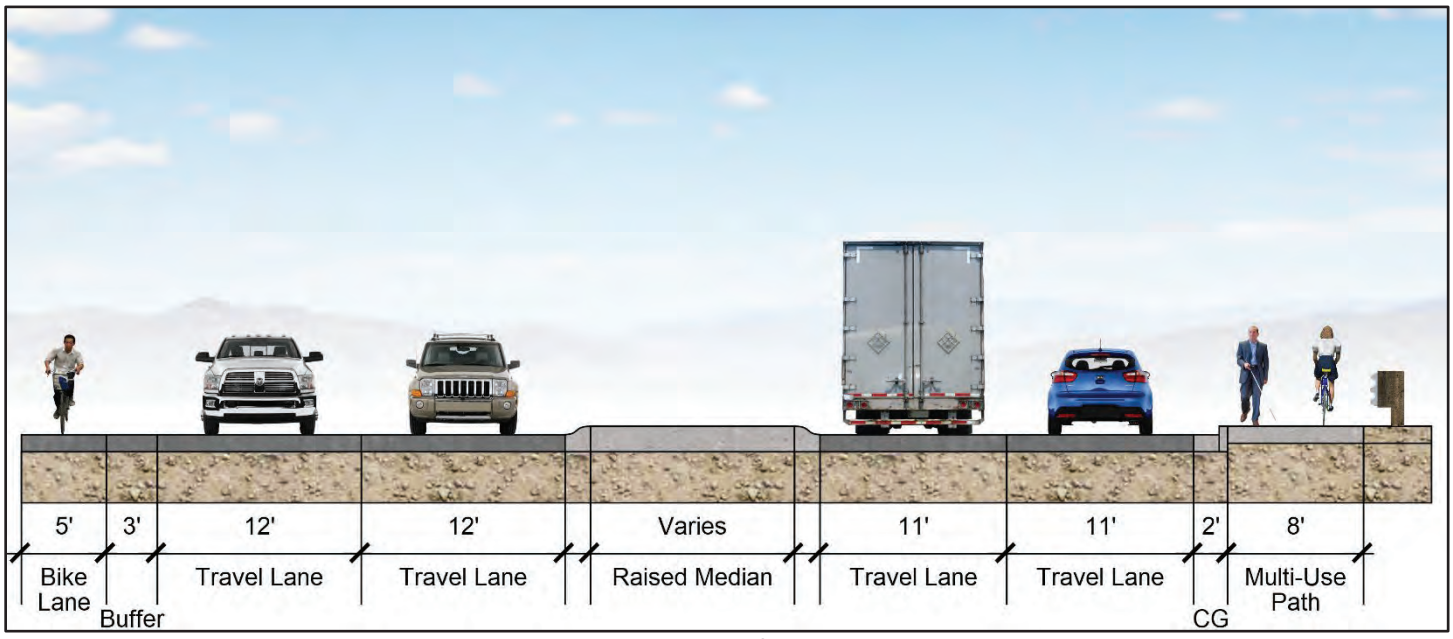


Figure ES-10: Design Alternative #2 – Evans Avenue/Socrates Drive to Sutro Street Multi-Use Path

Sutro Street to Clear Acre Lane

It is recommended to complete sidewalks throughout this segment and the travel lanes could be reduced to 11-feet to also provide a buffered bike lane, illustrated in **Figure ES-11**. To help discourage unprotected mid-block pedestrian crossings, pedestrian fencing could be added to the center median, channelizing pedestrians to cross at either Sutro Street or Clear Acre Lane crosswalks.

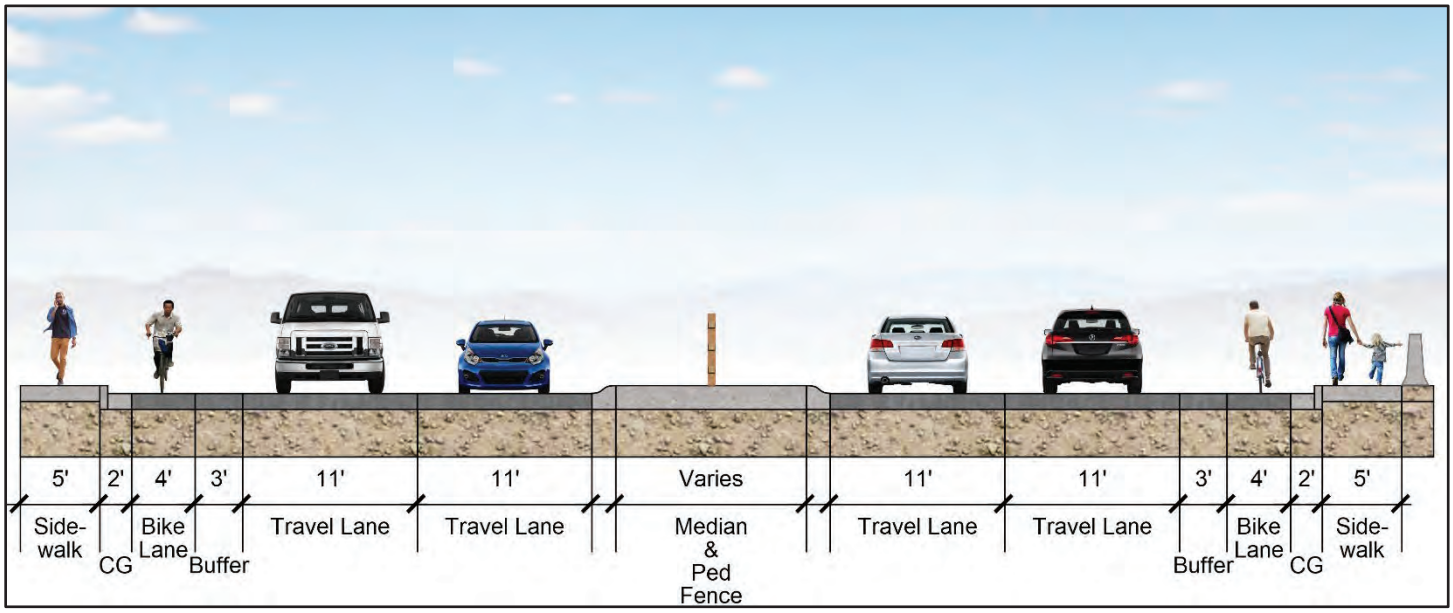


Figure ES-11: Design Alternative – Sutro Street to Clear Acre Lane Buffered Bike Lanes and Sidewalks

East of Clear Acre Lane, no corridor improvements are recommended. The US 395 interchange area functions adequately and future projects on US 395 are likely to reconfigure the freeway ramps.

Spot Location Alternatives

Spot improvements are those safety strategies that effect singular, finite locations; and for this study, spot locations mostly consist of intersection improvements.

I-80 Interchange

The interchange could be reconfigured into a different interchange type to improve safety and operations. Of particular promise is a Diverging Diamond Interchange (DDI) configuration, which crosses traffic to opposite sides of the roadway, allowing left-turning traffic to freely enter the interchange on-ramps before crossing back over and collecting right-turning exit ramp traffic, as shown in **Figure ES-12**. DDI's simplify intersection operations by reducing down to only two signal phases versus four signal phases with a traditional intersection. This reduction in signal phases would likely improve the existing operations.

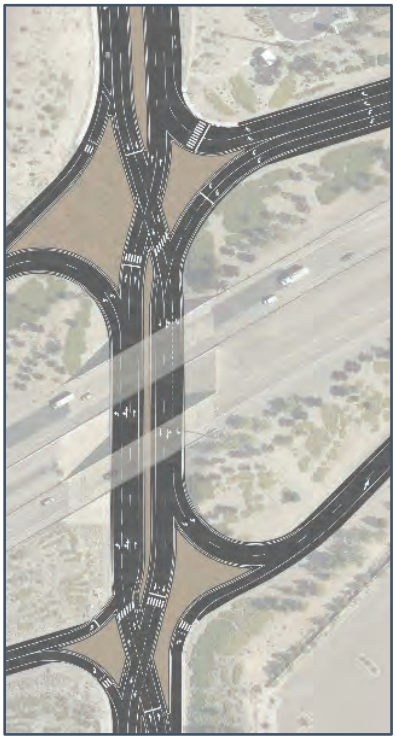


Figure ES-12: I-80 Diverging Diamond

Las Brisas Boulevard Intersection

An analysis was completed at the McCarran Boulevard and Las Brisas Boulevard intersection to consider alternative intersection configurations. The two configurations that emerged as the most promising are a roundabout and signalized High-T intersection, as shown in **Figure ES-13**. The determination as to which intersection configuration to implement, if any, must balance the best safety option over the infrastructure's useful life against operations, cost, and other factors.

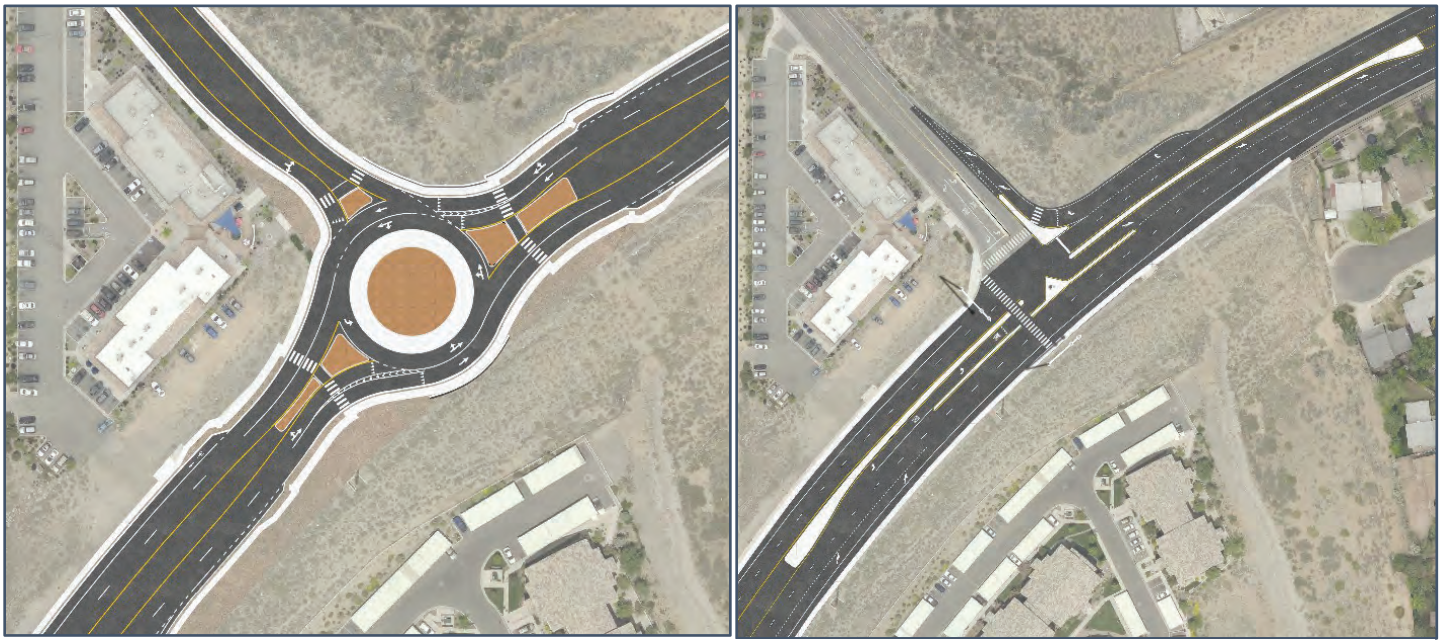


Figure ES-13: Las Brisas Boulevard Roundabout and Hight-T Configurations

Keystone Avenue/Leadership Parkway Intersection

A near-term recommendation for the Keystone Avenue/Leadership Parkway intersection is to extend the length of the existing worm island through raised delineators to further discourage illegal left-turns. This could be done with minor initial capital investment; however, it is recognized that delineators often need to be replaced, putting a burden on maintenance forces.

A more permanent option is to convert the intersection into a roundabout, as shown in **Figure ES-14**. A roundabout at this location would have several benefits including:

- Restoring full movements for all intersection traffic
- Providing speed reduction between signalized intersections
- Support safer bike and pedestrian crossings

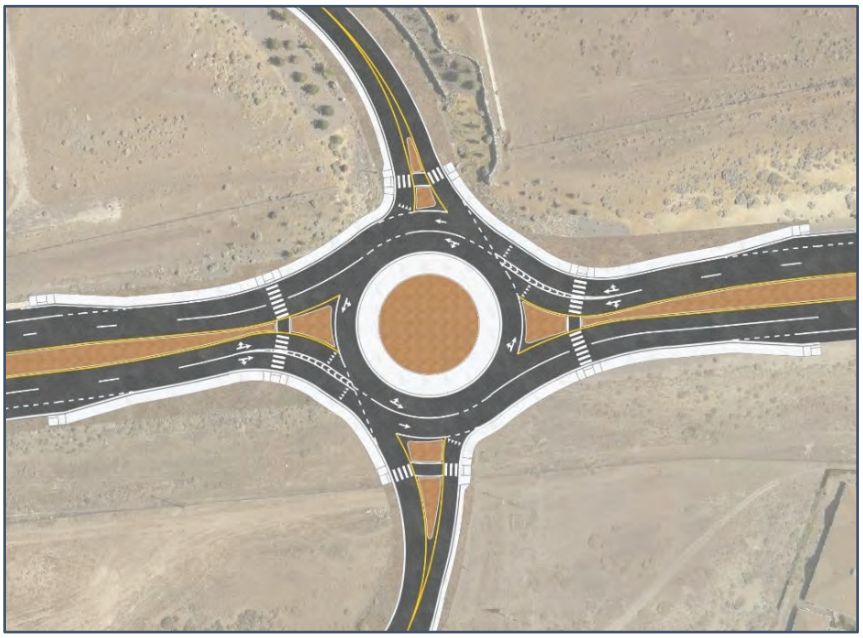


Figure ES-14: Keystone Avenue/Leadership Parkway Roundabout

North Virginia Street Intersection

North Virginia Street connects directly to UNR and downtown Reno, as well as to the North Valleys. Therefore, the intersection with McCarran Boulevard carries significant traffic volumes. The intersection was expanded in 2017 to add capacity and the improvements also included crosswalks, ADA ramps, and bike lanes. With this recent improvement, this SMP is not recommending any major reconfigurations at this location. However, the right-turn lanes in three of the four intersection quadrants could be modified to tighten the right-turn radii, which would slow speeds through the turn lanes and improve safety for crossing pedestrians.

Evans Avenue/Socrates Drive Intersection

The existing signalized intersection at Evans Avenue/Socrates Drive provides access to UNR and to residences to the north. The intersection includes pedestrian signals, full crosswalks, and ADA ramps in three of four quadrants. Yet, there were two pedestrian fatalities at this location. The corridor improvements section included an option to reduce a lane in each direction on the west leg of the intersection, which would reduce the number of lanes for pedestrians to cross. The corridor improvements to the west would also complete sidewalks and ramps in all quadrants. Both of these corridor improvements benefit the Evans Avenue/Socrates Drive intersection from a multi-modal point of view. Furthermore, should the west leg be reduced to a four-lane section, this would enhance the possibility for the intersection to be converted into a roundabout, as shown in **Figure ES-15**. The roundabout would bring multiple benefits including:

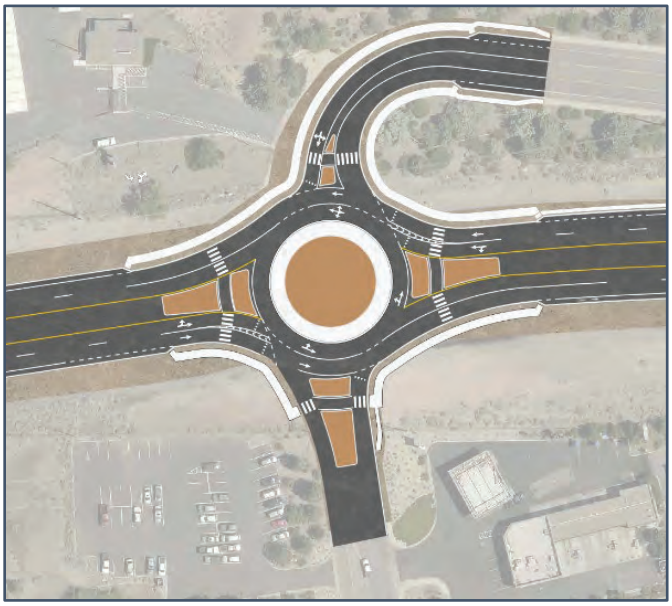


Figure ES-15: Evans Ave/Socrates Dr Roundabout

- Provide an easier crossing for pedestrians to negotiate with refuges in between each direction of travel
- A potential 30-percent reduction in crashes
- Force all McCarran Boulevard through vehicles to slow down

Sutro Street Intersection

The existing signalized intersection with Sutro Street serves a popular convenience store to the north and Hug High School to the south of McCarran Boulevard. During breaks, a lot of students were observed crossing McCarran Boulevard to visit the convenience store.

Given the pedestrian traffic in the area, tightening the right turn lane radii in each quadrant would encourage vehicles to slow down where pedestrians cross, increasing safety and reducing the severity of any conflicts. A longer-term opportunity is to reconfigure the intersection into a roundabout, slowing vehicles down, reducing conflict points with other vehicles, and reducing the severity of incidents.

Other Alternatives

In addition to the corridor and intersection safety recommendations, other minor spot improvements were identified throughout the corridor, which include:

- Reduce the 50 MPH posted speed limit to 45 MPH to help reduce average vehicle speeds
- Add roadway lighting from Sky Mountain Drive to I-80 and at Victory Lane
- Add rip rap to sidewalk slopes to address erosion from Sky Mountain through the I-80 interchange

- Revise left-turn channelization to Sierra Highlands Drive to better define the receiving driveway
- Increase the right-in curb extension at the 7-11, Chili's, and Walmart driveways to further discourage wrong way movements out of the driveway
- Incorporate leading pedestrian interval (LPI) to the signal at Evans Avenue/Socrates Drive. Other potential locations include West 7th Street and Sutro Street intersections
- Install a speed feedback sign between Keystone Avenue/Leadership Parkway and North Virginia Street
- Add green paint to bike lane transitions across right-turn lanes
- Extend turn lane queue lengths as needed and optimize signal timings

Transit Recommendations

The study area is served by RTC Transit Routes 3 and 4, with nine stops located from West 7th Street to Las Brisas Boulevard. The RTC regularly updates routes and frequency as part of their ongoing program, thus no analysis was completed regarding these elements. The study team did review transit stop locations and their accessibility for safety improvements, and two locations were identified for potential improvements – West 7th Street and the Viewcrest Shopping Center.

West 7th Street and McCarran Boulevard

The existing transit stop could be relocated south of the commercial entrance, a distance of approximately 450-feet from McCarran Boulevard. This would eliminate the conflict with a drop lane and put the transit stop where vehicles will have already merged into a single lane. Furthermore, during the public outreach process, it was suggested to incorporate a protected pedestrian crossing to not only serve the transit stop but also the Vintage Hills Senior Apartments on West 7th Street.

Viewcrest Shopping Center

Given the site constraints, driveways and circulation could be improved to better denote exits while also providing for a safer transit stop location, one that eliminates the existing conflict and moves waiting passengers behind a concrete curb.

ES.9 One Nevada Transportation Plan

The One Nevada Transportation Plan (ONTP) is Nevada's federally-mandated long-range transportation plan that addresses the state's transportation needs, priorities, and issues over a 20-year horizon. The ONTP identifies the goals, priorities, strategies, and actions necessary to maintain a safe and efficient transportation system with limited future funding. To aid the planning process, the corridor and major spot improvement alternatives have been qualitatively considered against the ONTP goals.

ES.10 Stakeholder & Public Participation Plan

The study team incorporated an active collaboration process to coordinate and shape the development of the SMP, thus a Technical Advisory Committee (TAC) was assembled to provide a venue for interagency collaboration. Participating agencies included the NDOT Traffic Safety Engineering Division, NDOT Traffic Operations, NDOT District II, the City of Reno, RTC of Washoe County, Washoe County Parks, Washoe County, Reno Police Department, Nevada Department of Public Safety, UNR, UNR Police Department, Reno Fire Department, and the Nevada Highway Patrol.

The general public was given an opportunity to provide input on the SMP as well. Thus, a public meeting was held at Rancho San Rafael Park and approximately 55 participants attended and made comments.

1.0 Background

The McCarran Boulevard Safety Management Plan (SMP) is a transportation planning effort that focuses on traffic safety for all users, incorporating corridor studies, access management, public and stakeholder input, crash analysis, roadway engineering, and the application of the Highway Safety Manual (HSM) methods to reduce roadway crashes. The SMP process is consistent with the Nevada Strategic Highway Safety Plan's goal of significantly reducing the number and severity of roadway crashes in the state.

1.1 Study Area

The McCarran Boulevard SMP study area, located within northwest Reno, Nevada, is approximately 6-miles long and extends from I-80 to US 395, as shown in **Figure 1**. The corridor crosses both City of Reno and Washoe County jurisdictions and consists of residential, commercial, parks, and recreation with undeveloped land north of McCarran Boulevard in the middle of the study area. The roadway configuration of McCarran Boulevard within the study area varies between 4-lanes with a center median island to 6-lanes with a center median island; all of which has a posted speed limit of 50 miles-per-hour (MPH), except the segment between Sutro Street and US 395, which is 45 MPH.



Figure 1: Study Area

2.0 Existing Crash Conditions

2.1 Crash Analysis Overview

As discussed in the *North McCarran SMP Existing Conditions Report*, an important consideration in determining appropriate safety alternatives is identifying locations and segments with a history of crashes. This information can help focus the analysis to hot spot locations with the greatest potential for crash reduction. To that end, the study team obtained five-year crash history data from the Nevada Department of Transportation (NDOT) for the time period between

January 1, 2013 to December 31, 2017. A corresponding heat map was developed to illustrate the crash activity for the five-year period and is shown in **Figure 2**.

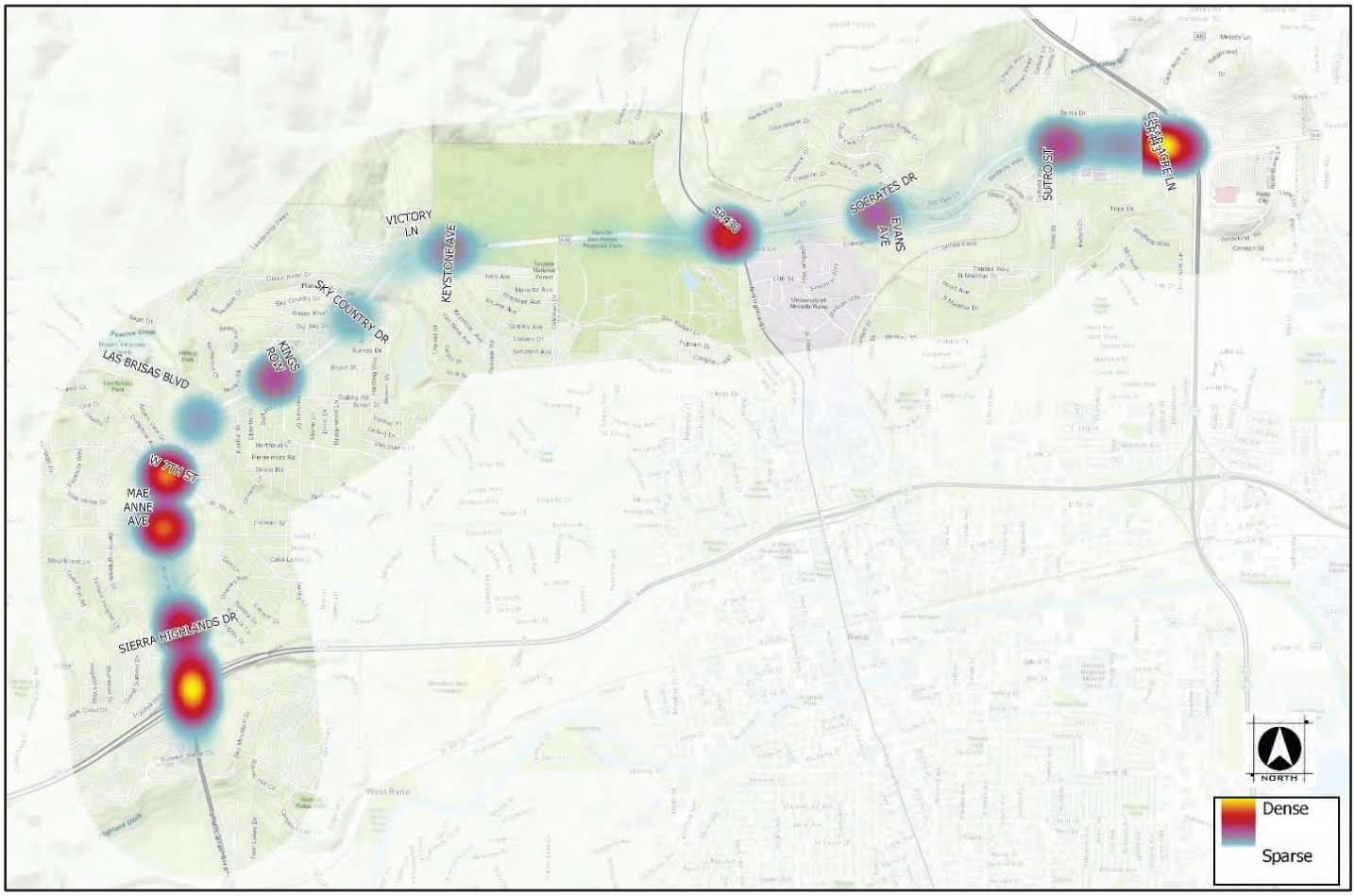


Figure 2: Crash Density Heat Map

2.2 Crash Analysis Results

The five-year crash data was categorized to differentiate between mode (vehicle, bicycle, pedestrian, motorcycle) and severity (property damage only (PDO), injury, fatality). Each crash location, type, and severity were then displayed graphically on plan sheets for both intersections and segments. The following is a list of intersection and segment crash categories:

- Crashes by Age of Driver
- Crashes by Hour of Day
- Crashes by Day of Week
- Crashes by Month
- Lighting Conditions
- Vehicle 1 Driver Factor
- Crash Type
- Vehicle 1 Most Harmful Event
- Weather Factor
- Vehicle 1 Vehicle Factor
- Bus, Motorcycle/Moped, Pedal Cycle, Pedestrian, and Vehicle Crashes

An example of each type of crash plan sheet can be seen in **Figure 3** (Crash Type – Full Set in **Appendix A**), **Figure 4** (Intersection Crash Factors – Full Set in **Appendix B**), and **Figure 5** (Crash Severity – Full Set in **Appendix C**).

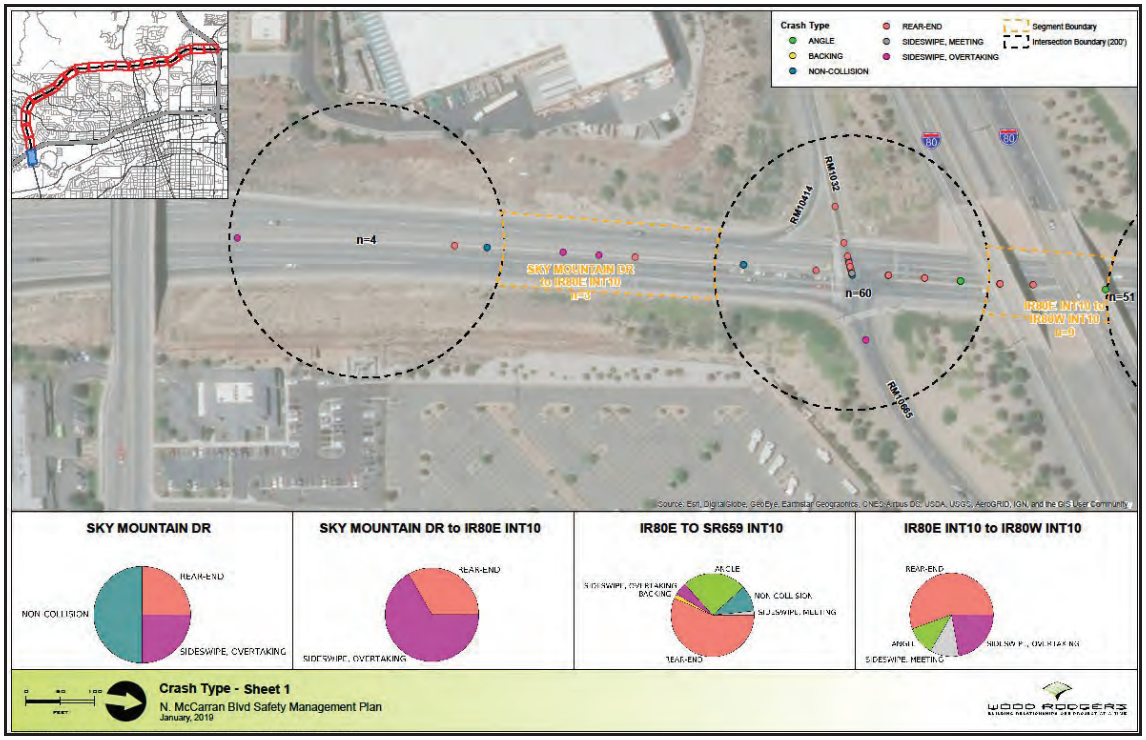


Figure 3: Crash Type Example Map

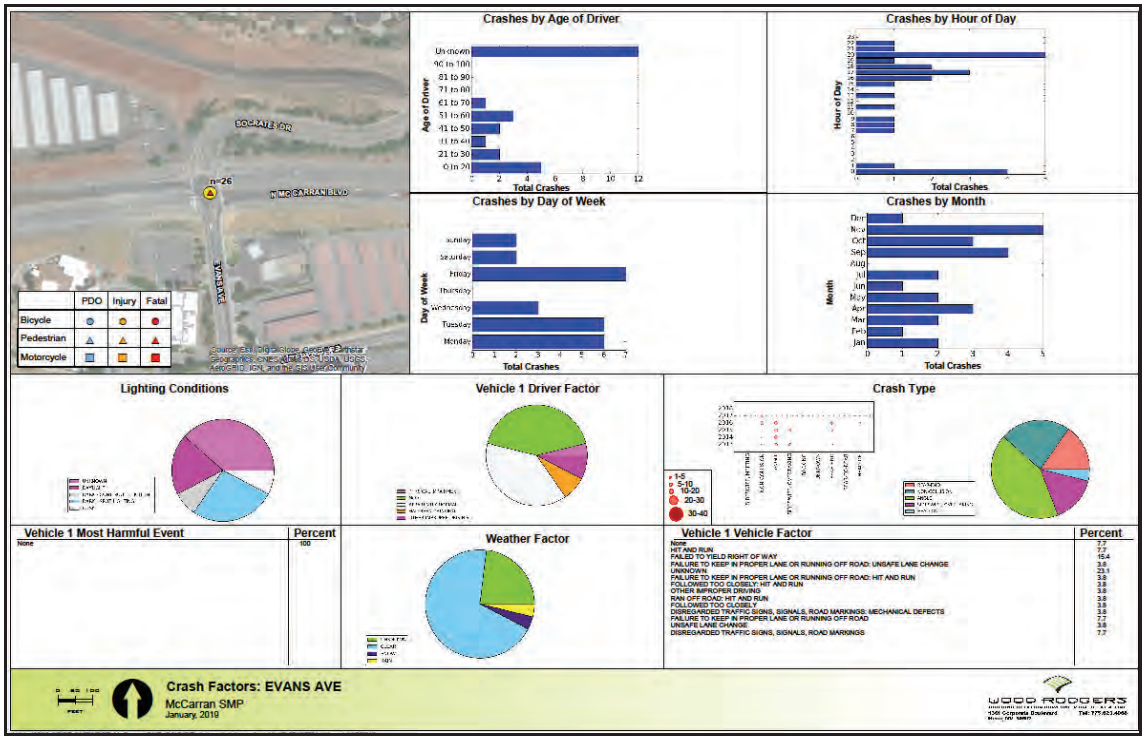


Figure 4: Intersection Crash Factors Example Map

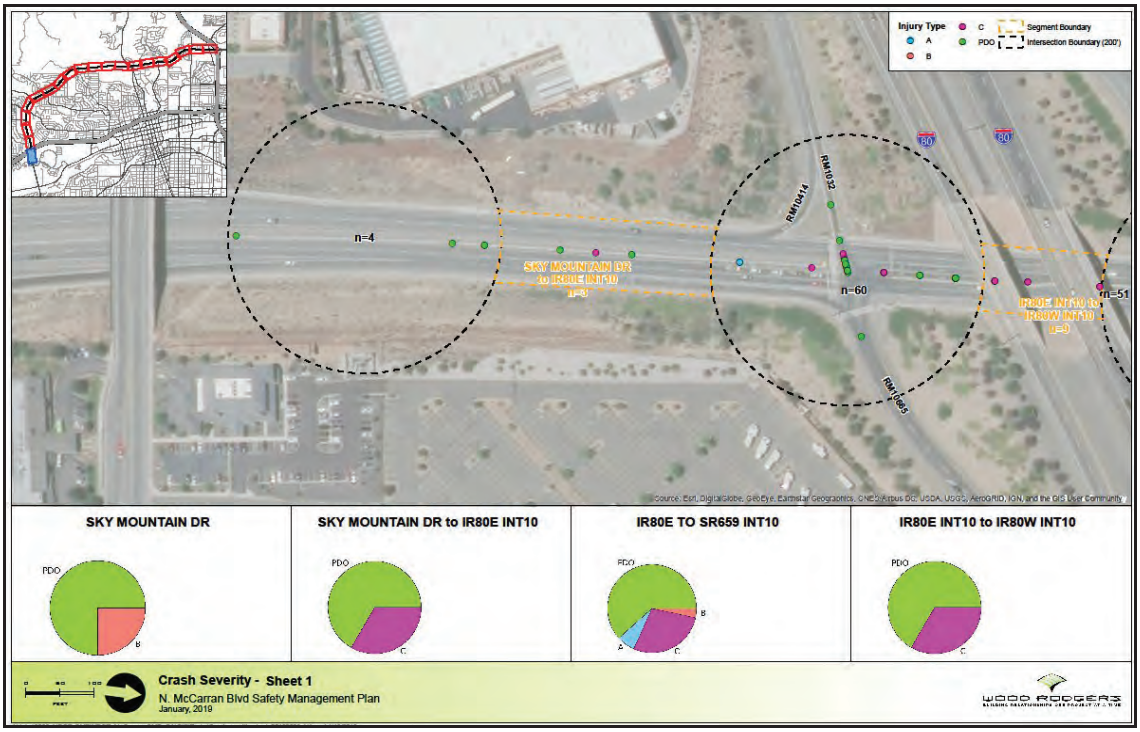


Figure 5: Crash Severity Example Map

As shown in **Figure 2**, and throughout **Appendix A**, **Appendix B**, and **Appendix C**, the McCarran Boulevard corridor experiences increased crashes at highly traveled signalized intersections. A total of 724 crashes occurred along McCarran Boulevard from I-80 to US 395 during the five-year period. This data does not include crashes that occurred on the side streets not attributable to an intersection. The 724 total crashes resulted in 6 fatalities (2 of which were just outside of the 5-year period, but included in the analysis), 478 injuries, and 394 PDO crashes; including 11 pedestrian crashes, 6 bicycle crashes, 20 motorcycle crashes, and 1 bus crash.

The total number of crashes does not exactly equal the combination of fatality crashes, injury crashes, and PDO crashes due to some overlap of multiple injuries during a crash and the combination of injury crashes and fatality crashes within the same crash.

As mentioned, within the study area there were four fatal crashes that occurred within the five-year period. Three of the fatal crashes involved pedestrians and one involved a moped; the fatalities occurred at the following locations:

- Pedestrian fatality 1 – McCarran Boulevard and Evans Road/Socrates Drive intersection during nighttime hours
- Pedestrian fatality 2 – McCarran Boulevard and Evans Road/Socrates Drive intersection during nighttime hours
- Pedestrian fatality 3 – 1,050-feet west of McCarran Boulevard and Sutro Street during nighttime hours
- Moped fatality – McCarran Boulevard and Mae Anne Avenue during nighttime hours

Two additional fatal crashes occurred just outside of the five-year period, but were included in the analysis; one of which also involved a pedestrian fatality. The two additional fatal crashes include:

- Ambulance and motorcycle crash – McCarran Boulevard and Clear Acre Lane intersection during daytime hours
- Pedestrian fatality – 1,050-feet east of McCarran Boulevard and Virginia Street during nighttime hours

McCarran Boulevard was designated for analysis due to the large number of crashes that have occurred on this Other Principal Arterial facility. Therefore, crash rates were calculated at intersections and for McCarran Boulevard segments to determine which locations were higher than the 2017 NDOT Other Principal Arterial Average Rates. These crash rates were used to decipher high crash locations and will be used for mitigation purposes during the recommendations phase of this SMP. Crash rates for major intersections can be viewed in **Table 1** and crash rates for each McCarran Boulevard segment can be viewed in **Table 2** (*Note: The segment from Clear Acre Lane to US 395 was not calculated because the segment is extremely short.*). Those segments exceeding statewide average crash rates for Other Principal Arterials are highlighted in red.

Table 1: Intersection Crash Rates

McCarran Boulevard Cross Street	AADT	PDO			Injury			Fatal			Total		
		Number of Incidents	Crash Rate	State Crash Rate	Number of Incidents	Crash Rate	State Crash Rate	Number of Incidents	Crash Rate	State Crash Rate	Number of Incidents	Crash Rate	State Crash Rate
Sky Mountain Drive	41,000	3	0.04		1	0.01		0	0.00		4	0.05	
I-80 Eastbound Ramps	41,000	37	0.49		23	0.31		0	0.00		60	0.80	
I-80 Westbound Ramps	44,000	29	0.36		22	0.27		0	0.00		51	0.64	
Sierra Highlands Drive	44,000	29	0.36		22	0.27		0	0.00		51	0.64	
Mae Anne Avenue	44,000	40	0.50		30	0.37		1	0.01		71	0.88	
Seventh Street	29,000	44	0.83		31	0.59		0	0.00		75	1.42	
Las Brisas Boulevard	29,000	8	0.15		6	0.11		0	0.00		14	0.26	
Kings Row	23,000	16	0.38	1.1466	15	0.36	0.611	0	0.00	0.005	31	0.74	1.7626
Sky Country Drive	23,000	4	0.10		7	0.17		0	0.00		11	0.26	
Victory Lane	23,000	0	0.00		3	0.07		0	0.00		3	0.07	
Keystone Avenue/Leadership Parkway	23,000	7	0.17		12	0.29		0	0.00		19	0.45	
Virginia Street	24,000	30	0.68		24	0.55		0	0.00		54	1.23	
Evans Road/Socrates Drive	24,000	18	0.41		6	0.14		2	0.05		26	0.59	
Sutro Street	26,000	14	0.30		18	0.38		0	0.00		38	0.80	
Clear Acre Lane	26,000	33	0.70		21	0.44		0	0.00		54	1.14	
US 395 Southbound Ramps	39,000	22	0.31		15	0.21		1	0.01		38	0.53	

As shown in **Table 1** and **Table 2**, and also illustrated in **Figure 6**, the following locations have crash rates higher than the statewide average for Other Principal Arterials:

- McCarran Boulevard and Mae Anne Avenue (Fatal Crash Rate)
- McCarran Boulevard and Evans Road/Socrates Drive (Fatal Crash Rate)
- McCarran Boulevard and US 395 Southbound (Fatal Crash Rate)
- McCarran Boulevard from I-80 Eastbound Ramps to I-80 Westbound Ramps (PDO Crash Rate, Injury Crash Rate, Total Crash Rate)
- McCarran Boulevard from Virginia Street to Evans Road/Socrates Drive (Fatal Crash Rate)
- McCarran Boulevard from Evans Road/Socrates Drive to Sutro Street (Fatal Crash Rate)

Table 2: Segment Crash Rates																
McCarran Boulevard Segment	Segment Length (ft)	Segment Length (mi)	AADT	PDO			Injury			Fatal			Total			
				Number of Incidents	Crash Rate	State Crash Rate	Number of Incidents	Crash Rate	State Crash Rate	Number of Incidents	Crash Rate	State Crash Rate	Number of Incidents	Crash Rate	State Crash Rate
Sky Mountain Drive to I-80 Eastbound Ramps	308	0.1	41,000	2	0.46	1.1466	1	0.23	0.611	0	0.00	0.005	4	0.92	1.7626
I-80 Eastbound Ramps to I-80 Westbound Ramps	173	0.0	42,500	6	2.36		3	1.18		0	0.00		9	3.53	
I-80 Westbound Ramps to Sierra Highlands Drive	633	0.1	44,000	7	0.73		3	0.31		0	0.00		10	1.04	
Sierra Highlands Drive to Mae Anne Avenue	1,777	0.3	44,000	4	0.15		10	0.37		0	0.00		14	0.52	
Mae Anne Avenue to Seventh Street	696	0.1	36,500	0	0.00		1	0.11		0	0.00		1	0.11	
Seventh Street to Las Brisas Boulevard	977	0.2	29,000	0	0.00		1	0.10		0	0.00		1	0.10	
Las Brisas Boulevard to Kings Row	1,457	0.3	23,000	2	0.17		2	0.17		0	0.00		4	0.35	
Kings Row to Sky Country Drive	1,669	0.3	23,000	1	0.08		2	0.15		0	0.00		3	0.23	
Sky Country Drive to Victory Lane	1,299	0.2	23,000	0	0.00		3	0.29		0	0.00		3	0.29	
Victory Lane to Keystone Avenue/Leadership Parkway	497	0.1	23,000	2	0.51		0	0.00		0	0.00		2	0.51	
Keystone Avenue/Leadership Parkway to Virginia Street	5,561	1.1	24,000	14	0.30		10	0.22		0	0.00		24	0.52	
Virginia Street to Evans Road/Socrates Drive	2,651	0.5	24,000	4	0.18		2	0.09		1	0.05		7	0.32	
Evans Road/Socrates Drive to Sutro Street	3,812	0.7	26,000	4	0.12		9	0.26		1	0.03		14	0.41	
Sutro Street to Clear Acre Lane	1,391	0.3	32,500	14	0.90		8	0.51		0	0.00		25	1.60	

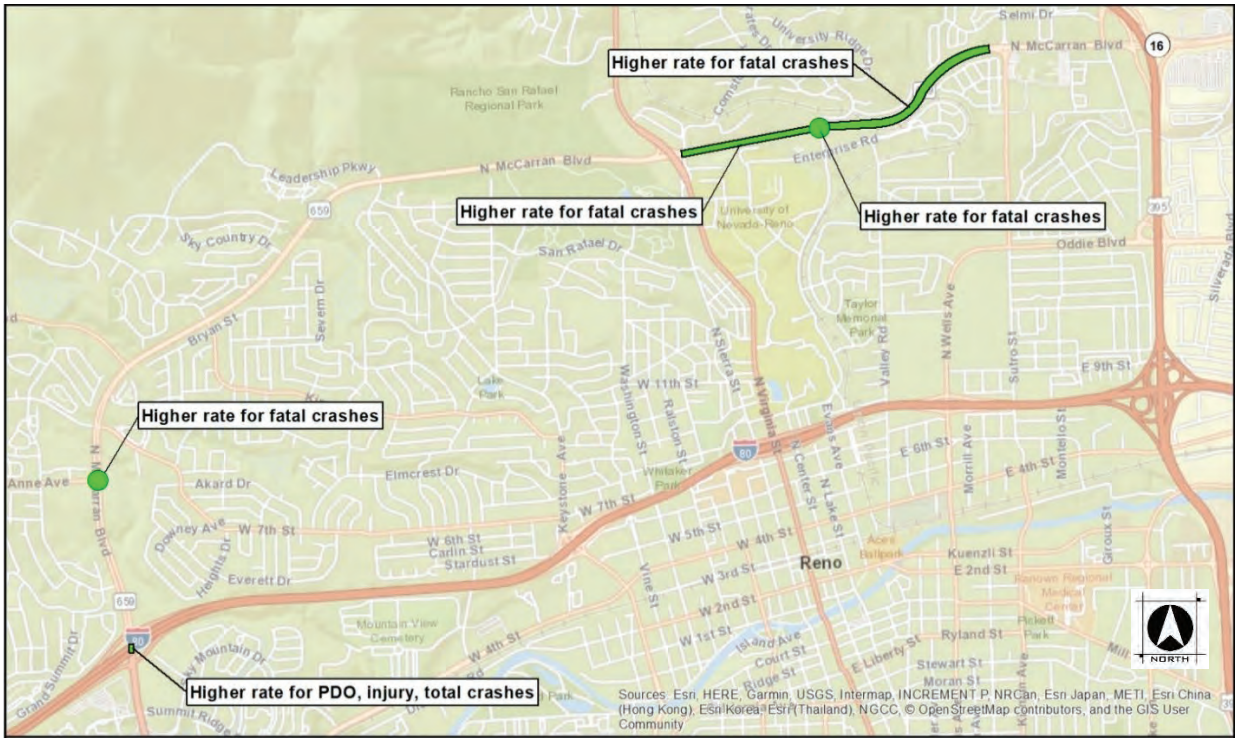


Figure 6: Above Statewide Average Crash Rate

3.0 Existing Corridor Conditions

The roadway configuration of McCarran Boulevard changes throughout the study area and consists of the following:

- Sky Mountain Drive merge to I-80 – 5-lanes with a center median island – See **Figure 7**
- I-80 to Las Brisas Boulevard – 6-lanes with a center median island (drops to 5 lanes just south of Las Brisas Boulevard) – See **Figure 8**
- Las Brisas Boulevard to Virginia Street – 4-lanes with a center median island – See **Figure 9**
- Virginia Street to Evans Road/Socrates Drive – 6-lanes with a center median island – See **Figure 10**
- Evans Road/Socrates Drive to Clear Acre Lane – 4-lanes with a center median island (drops from 5-lanes just east of Evans Road/Socrates Drive) – See **Figure 11**
- Clear Acre Lane to US 395 – 6 lanes with a center median island – See **Figure 12**

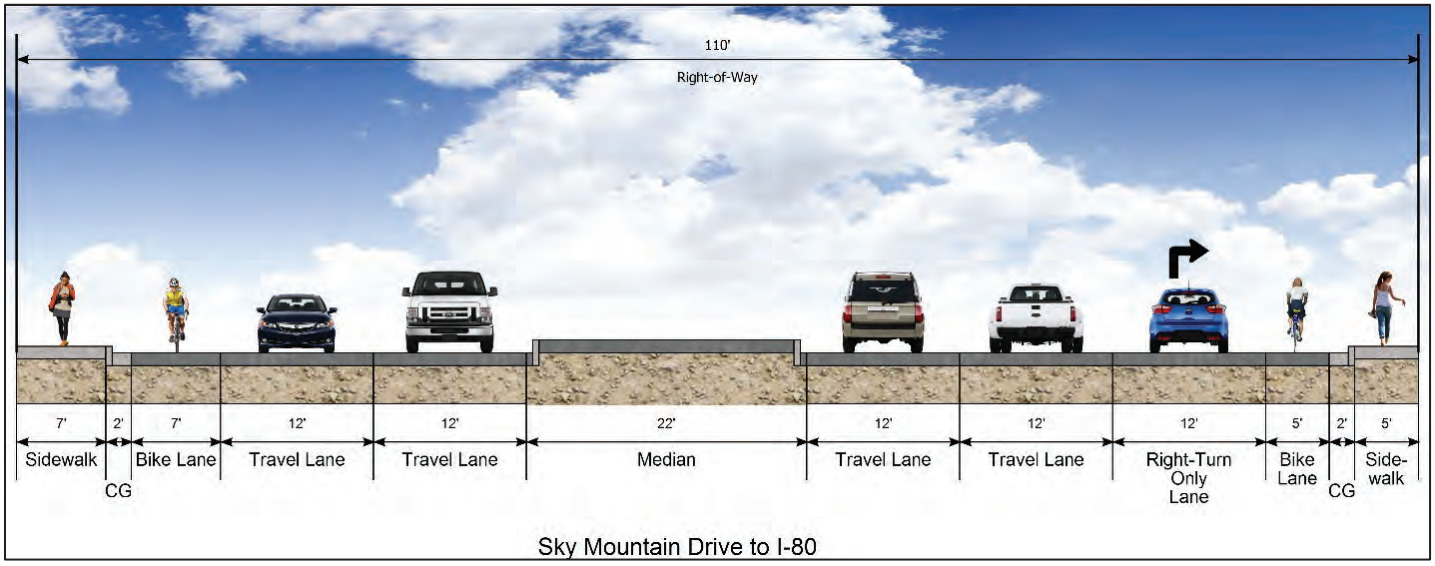


Figure 7: Cross Section of McCarran Boulevard from Sky Mountain Drive to I-80

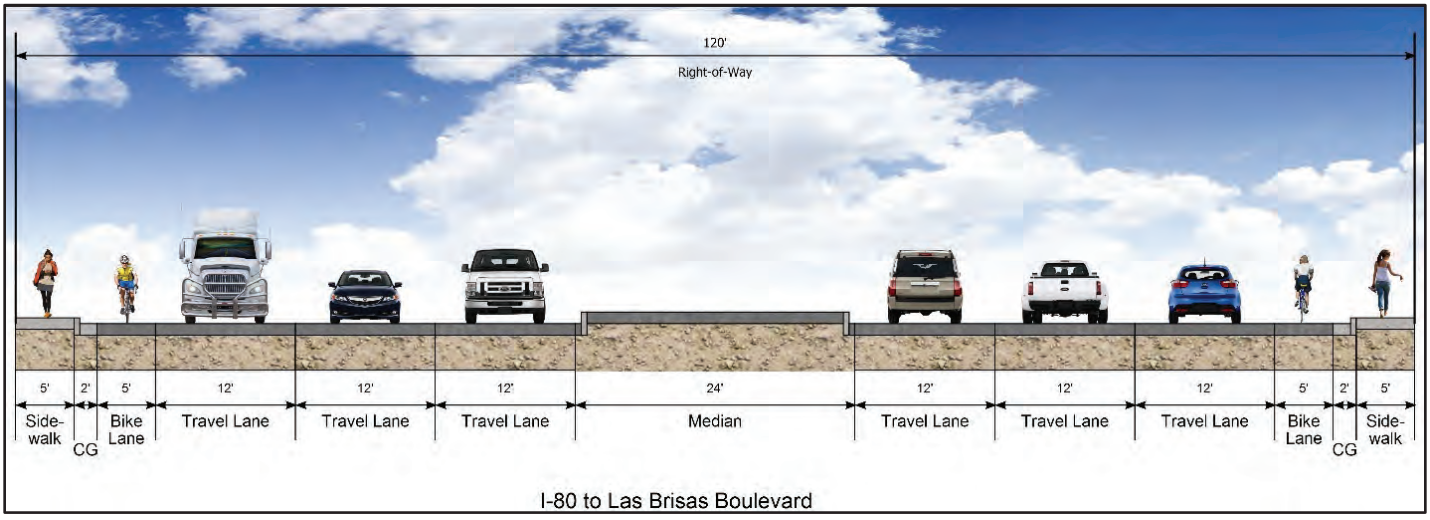


Figure 8: Cross Section of McCarran Boulevard from I-80 to Las Brisas Boulevard

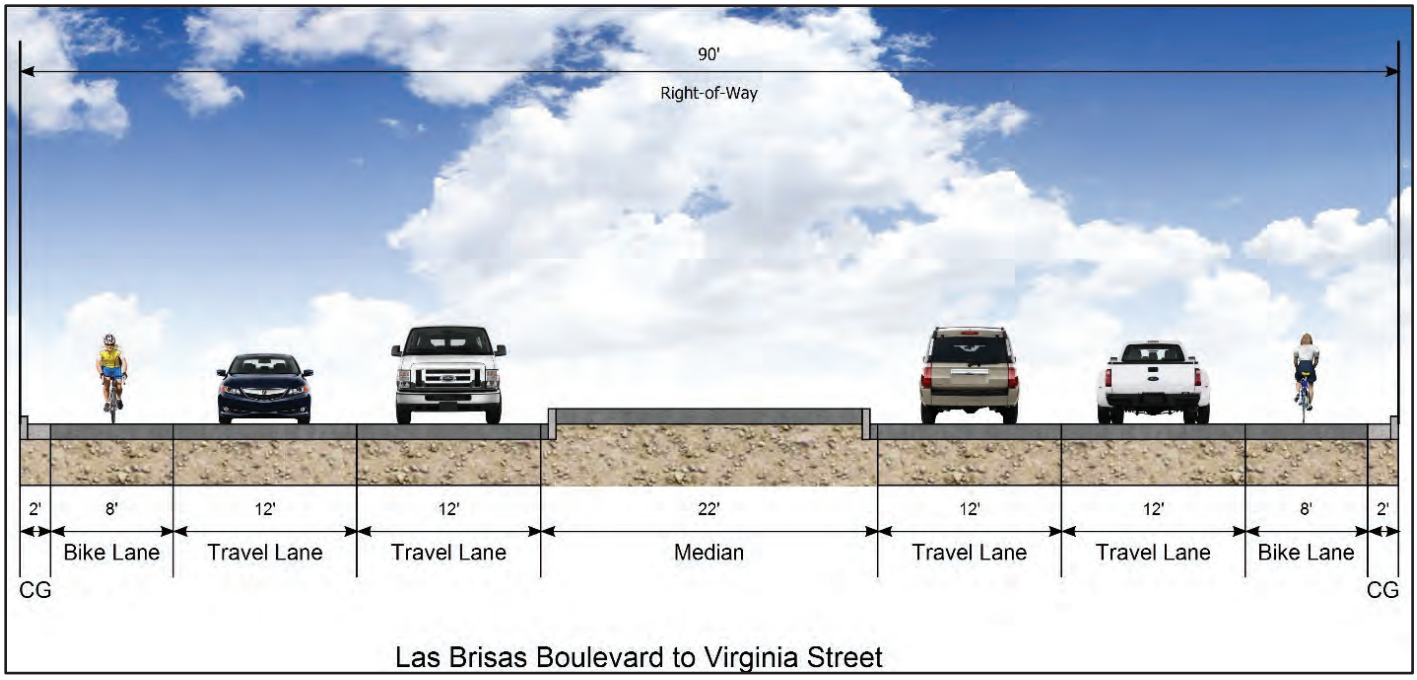


Figure 9: Cross Section of McCarran Boulevard from Las Brisas Boulevard to Virginia Street

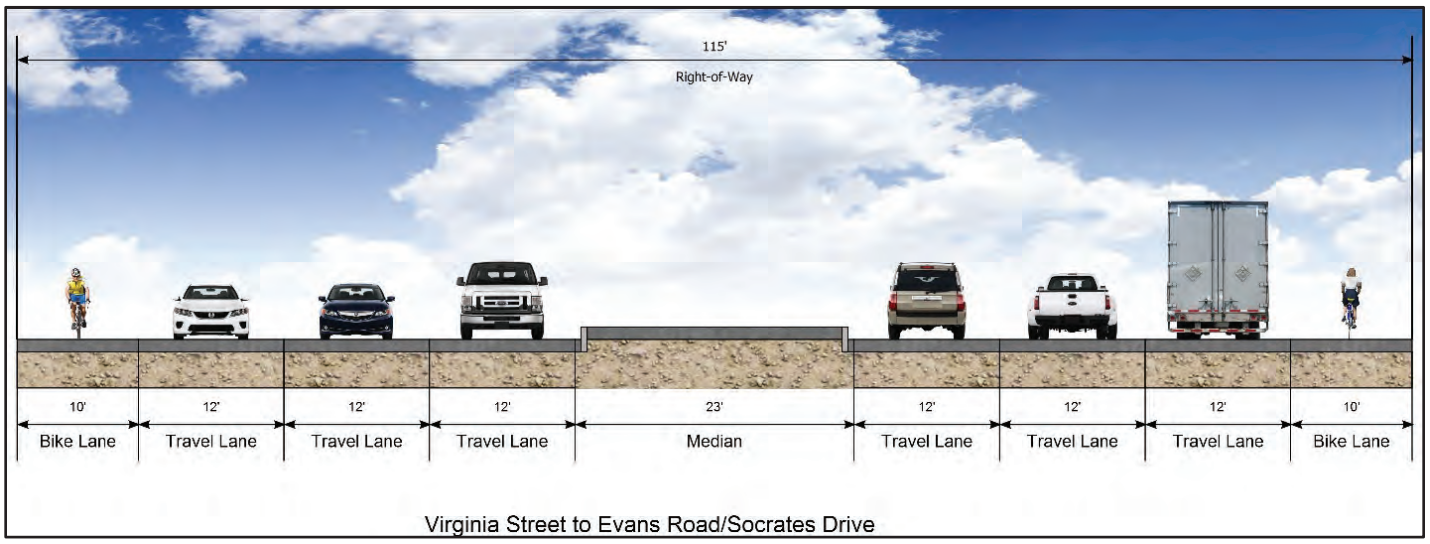


Figure 10: Cross Section of McCarran Boulevard from Virginia Street to Evans Road/Socrates Drive

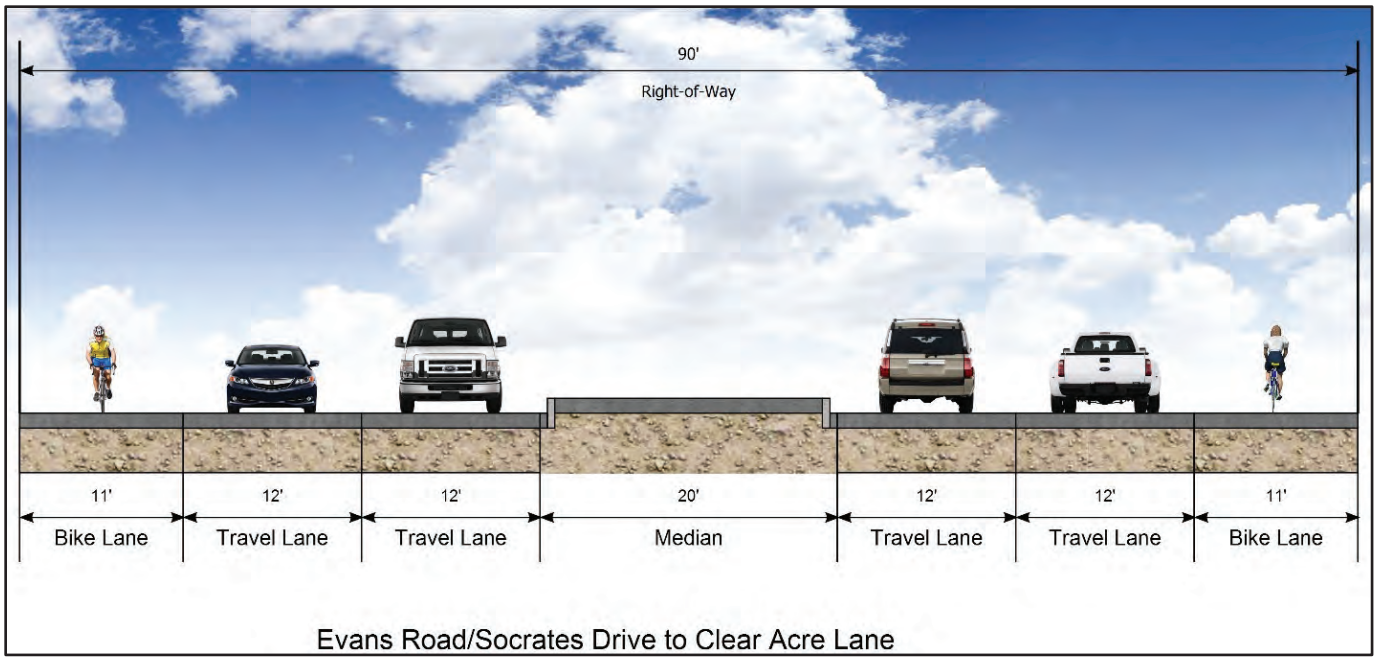


Figure 11: Cross Section of McCarran Boulevard from Evans Road/Socrates Drive to Clear Acre Lane

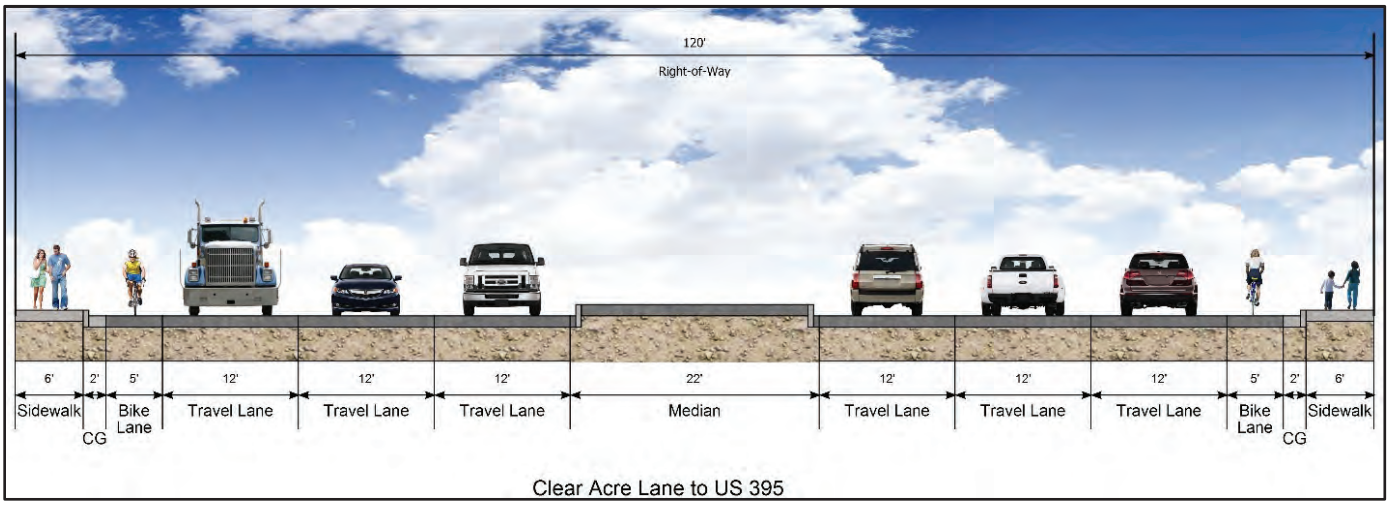


Figure 12: Cross Section of McCarran Boulevard from Clear Acre Lane to US 395

As mentioned, the speed limit is 50 MPH throughout the majority of the study area except the segment between Sutro Street and US 395, which is 45 MPH. Furthermore, the geometry of McCarran Boulevard changes from north-south movements, to east-west movements as you travel from I-80 to US 395. Additionally, there are steep roadside grades on both sides of McCarran Boulevard throughout the study area.

Supplementary study area data was collected along the McCarran Boulevard corridor, including locations for the following:

- Right-of-way
- Roadway Medians
- Driveways
- Bicycle Facilities
- Bus Stops
- Pedestrian Network
- Crosswalks
- Traffic Signals

Figure 13 is an example of GIS plan sheets identifying the bulleted supplementary data, the entire collection of which can be viewed in **Appendix D**.

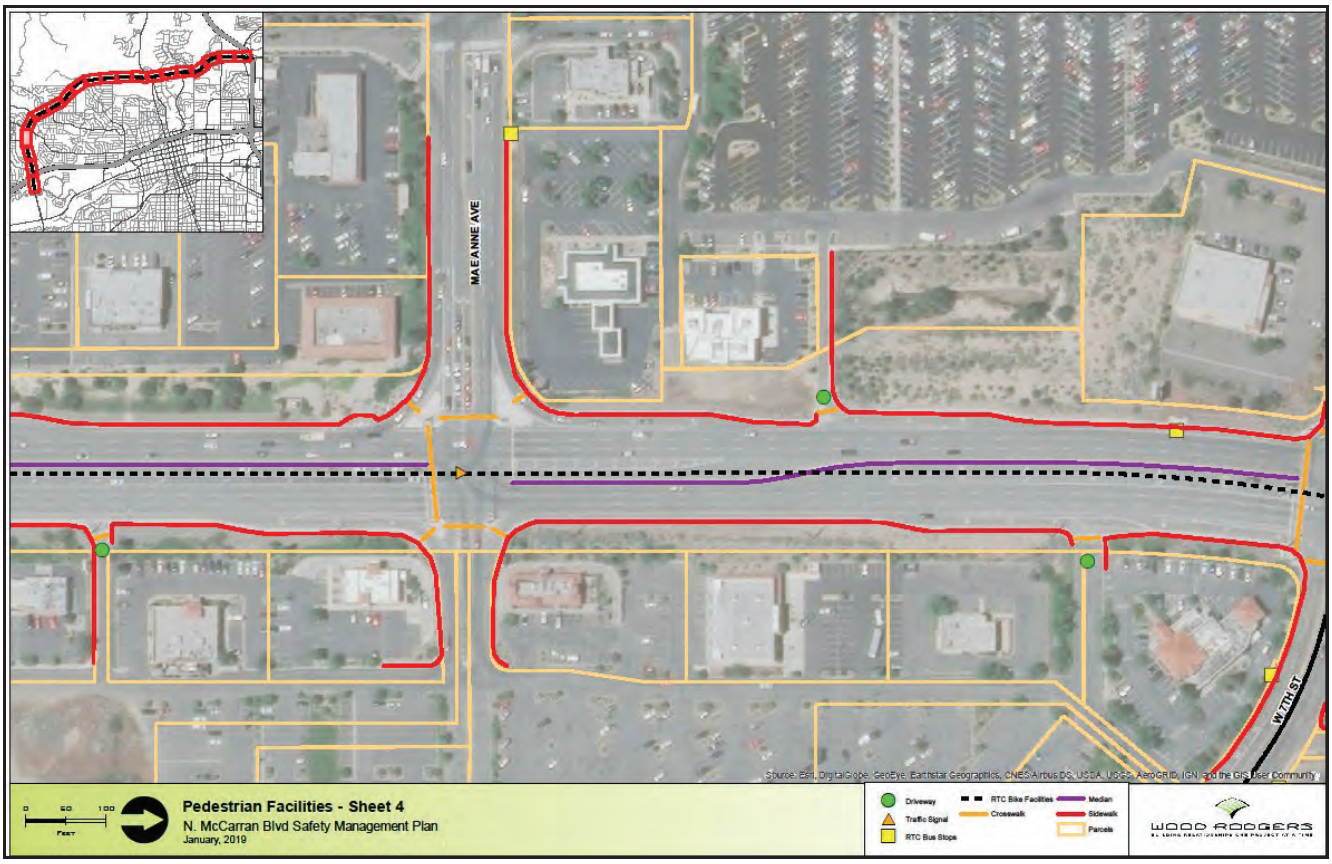


Figure 13: Supplementary GIS Data Example Map

The intersection lane configurations were also collected through a combination of field reviews and Google Earth. **Figure 14** illustrates the location of each of the analyzed intersections and **Figure 15** illustrates the corresponding intersection configuration of each of the analyzed intersections throughout the McCarran Boulevard Study area.

Additional information collected during the existing conditions review included the location of on-street parking and the utilities along the McCarran Boulevard corridor. Currently, there is no on-street parking allowed along McCarran Boulevard and the following utilities were observed along the McCarran Boulevard corridor:

- NV Energy Electric
- NV Energy Gas
- Truckee Meadows Water Authority
- Zayo Communications
- AT&T Communications
- Charter Communications
- City of Reno - Sewer

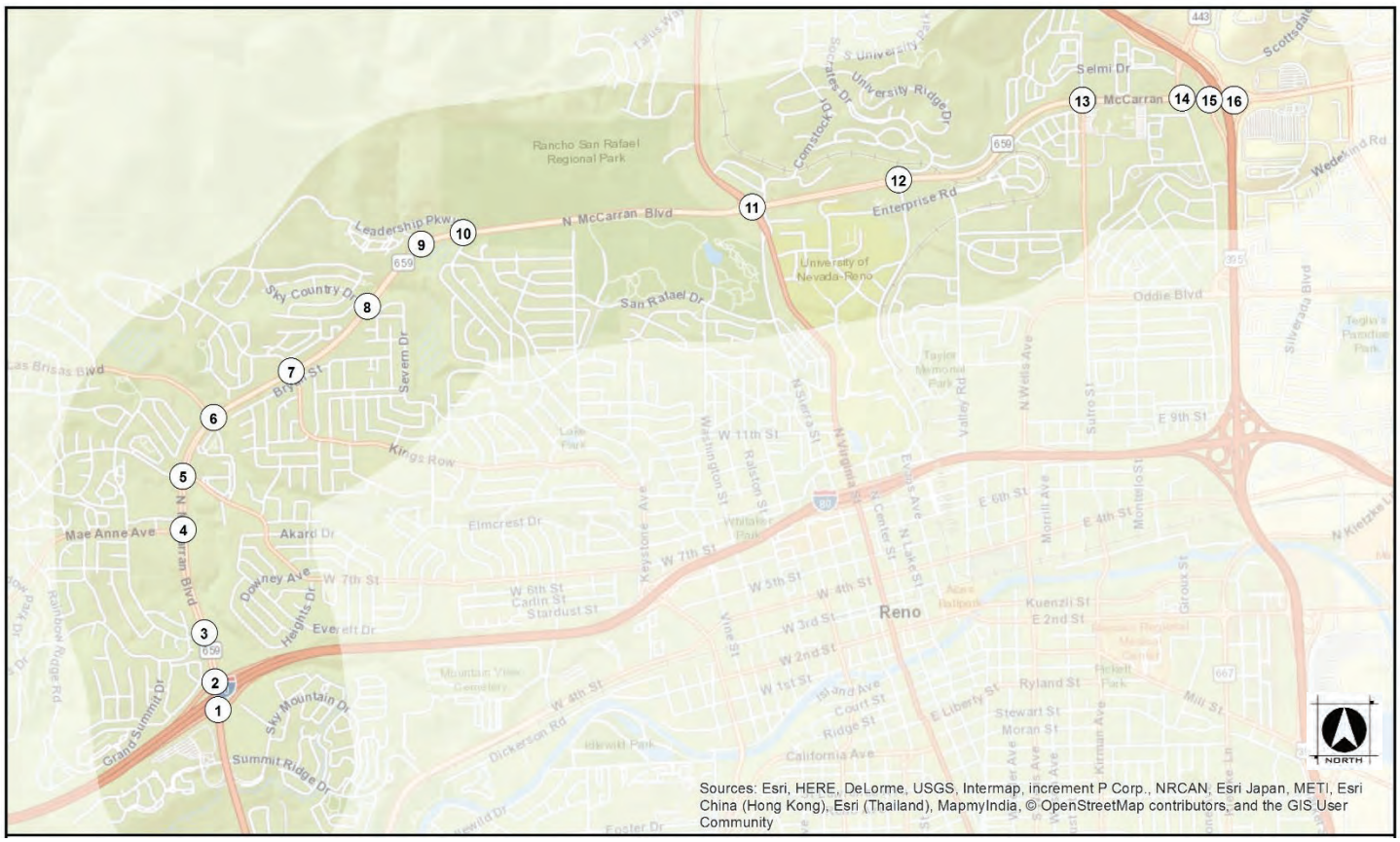


Figure 14: Intersection Locations

3.1 Road Safety Assessment (RSA)

The RSA Team conducted three separate audits along the McCarran Boulevard corridor. The first audit (October 25, 2018) involved the entire Technical Advisory Committee (TAC) and included stopping at signalized intersections during the daylight to observe concerns in the field. The second audit (November 13, 2018) involved Wood Rodgers' staff walking the entire McCarran Boulevard corridor along both sides of the street during daylight. Finally, a third nighttime review was conducted (December 10, 2018) to view the corridor when the sun was down during low light conditions.

Overall findings in the corridor include lighting needs to be improved along the roadway and at intersections; crosswalk and bike lane markings need to be improved; where bike lanes transition across right-turn lanes, they should utilize green lane markings; bushes and shrubs should be trimmed where they encroach into the pedestrian walkways and the walkways swept of debris; signal heads do not have retroreflective backplates; pedestrian push buttons and curb cut ramps are substandard throughout the corridor; and signal heads are not properly aligned with vehicular lanes.

A complete list of the RSA recommendations can be found in *the North McCarran Boulevard Road Safety Assessment* located in **Appendix E**.

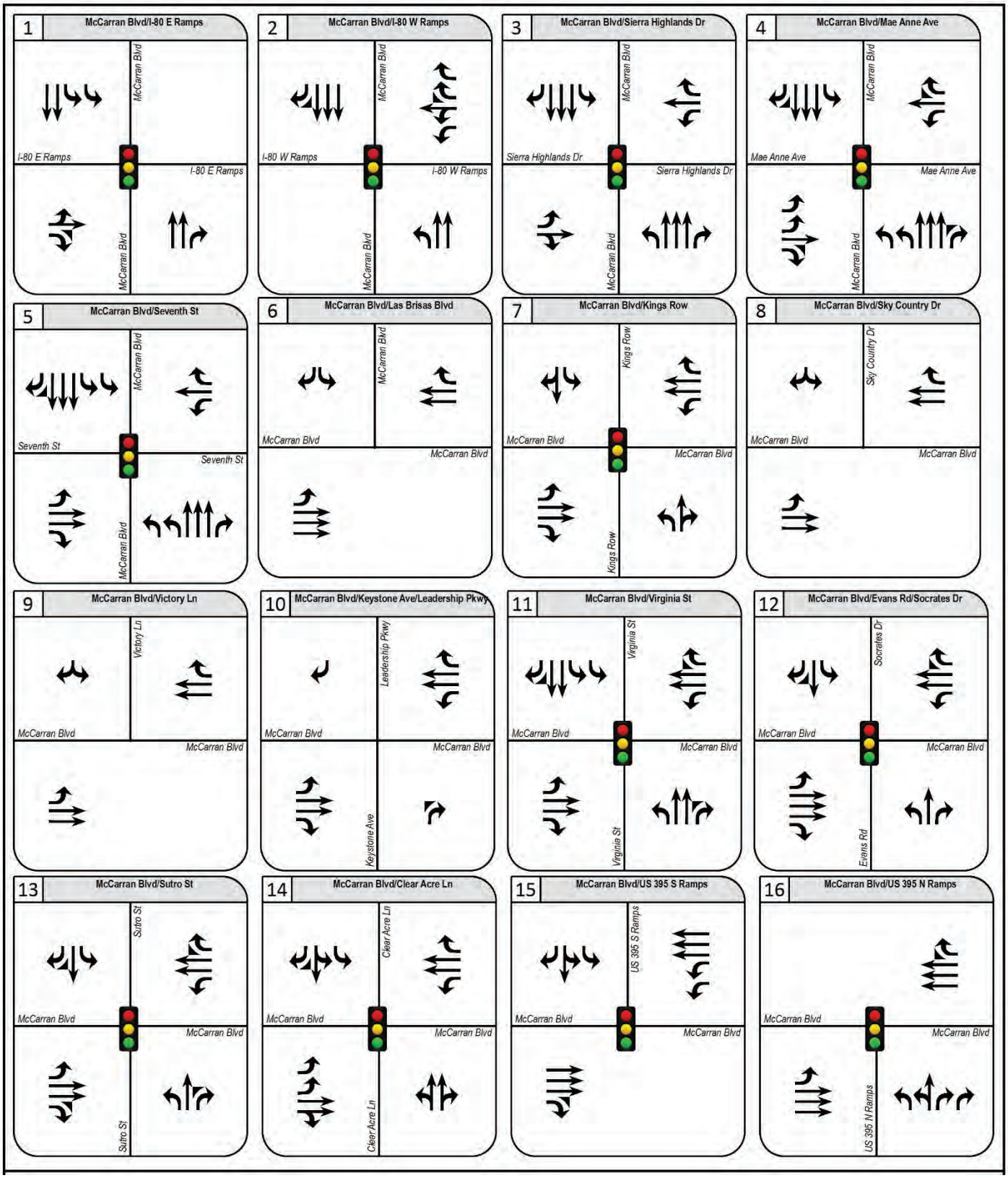


Figure 15: Intersection Configurations

3.2 Speed Study

NDOT conducted a Speed Study for the McCarran Boulevard study area to determine typical operating speeds. The Speed Study broke the study area up into four segments, identifying the posted speed limit and 85th percentile speed, as shown in **Table 3**.

Table 3: Speed Study Results		
Segment	Posted Speed Limit	85th Percentile Speed
Segment 1 – I-80 to Las Brisas Boulevard	50 MPH	51 MPH
Segment 2 – Las Brisas Boulevard to Virginia Street	50 MPH	59 MPH
Segment 3 – Virginia Street to Northbound 45 MPH Sign	50 MPH	57 MPH
Segment 4 – Northbound 45 MPH Sign to US 395	45 MPH	49 MPH

As the Speed Study observed, all four segments have an 85th percentile speed greater than the posted speed limit, with the greatest difference of 9 MPH from Las Brisas Boulevard to Virginia Street, a distance of 2.4-miles. A copy of the Speed Study can be found in **Appendix F**.

3.3 Existing Traffic and Road User Data

McCarran Boulevard within the study area was analyzed for existing traffic conditions and other road user data. This information is used to identify areas where traffic operational deficiencies could be contributing to crashes and to inform alternatives development.

One important data set is the existing Annual Average Daily Traffic (AADT). This data was obtained from NDOT's Traffic Records Information Access (TRINA) application for key corridor segments and is summarized in **Table 4**.

Table 4: 2017 NDOT AADT Volumes	
Road Segment	**2017 Traffic volumes**
McCarran Blvd - 755 ft N of Summit Ridge Drive	41,000
McCarran Blvd - 545 ft N of I-80 WB Ramps	44,000
McCarran Blvd - 364 ft N of Seventh Street	29,000
McCarran Blvd - 343 ft E of Kings Row	23,000
McCarran Blvd - 638 ft W of Virginia Street	24,000
McCarran Blvd - 750 ft E of Virginia Street	24,000
McCarran Blvd - 665 ft E of Sutro Street	26,000
McCarran Blvd - 410 ft E of US 395	39,000

These daily volumes all fall within typically acceptable planning-level capacity ranges for their designated segment, except the AADT between Sky Mountain Drive and I-80, which has a high AADT for a road segment with four through lanes (planning level-of-service (LOS) between LOS E and LOS F). Therefore, segment capacity is not anticipated to be an issue along the McCarran Boulevard corridor except potentially the segment south of the I-80 Eastbound Ramps.

The cumulative corridor AADT data for a 10-year period was also obtained and is summarized in **Figure 16**. As illustrated, McCarran Boulevard experienced volume reductions during the Great Recession, bottoming out in 2013, and the volumes

have increased significantly since then, to its current peak in 2017. This increase is likely to continue due to background growth and University of Nevada, Reno (UNR) expansion.

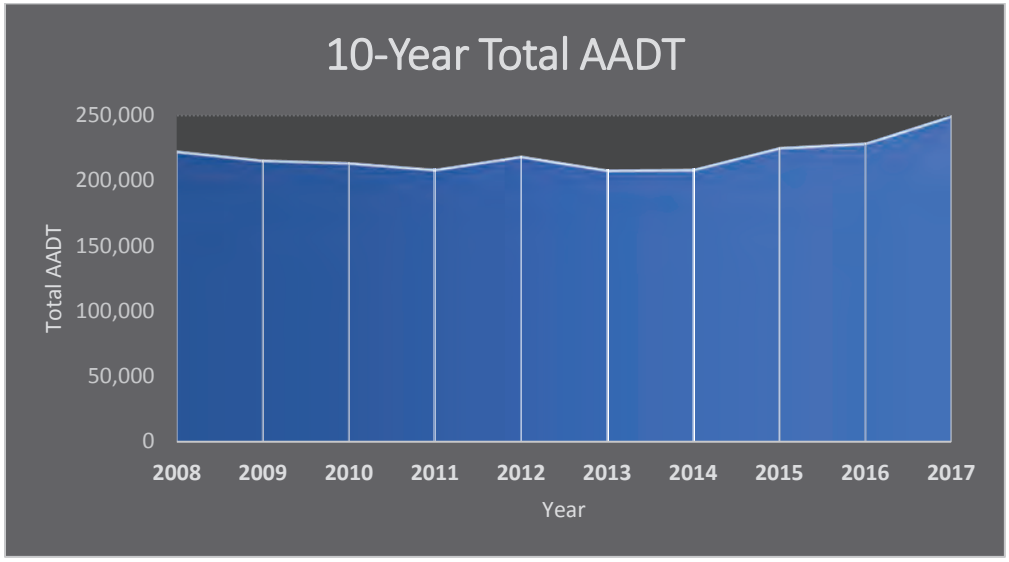


Figure 16: 10-Year Total AADT

In addition to segment traffic volumes, intersection volumes, including turning movement counts, were obtained. The AM and PM peak hour vehicular, pedestrian, bicycle, wheelchair, and motorcycle traffic counts were conducted in 2018 on October 10, October 11, October 16, and October 17. The McCarran Boulevard intersections where the counts were performed are illustrated in **Figure 17.**

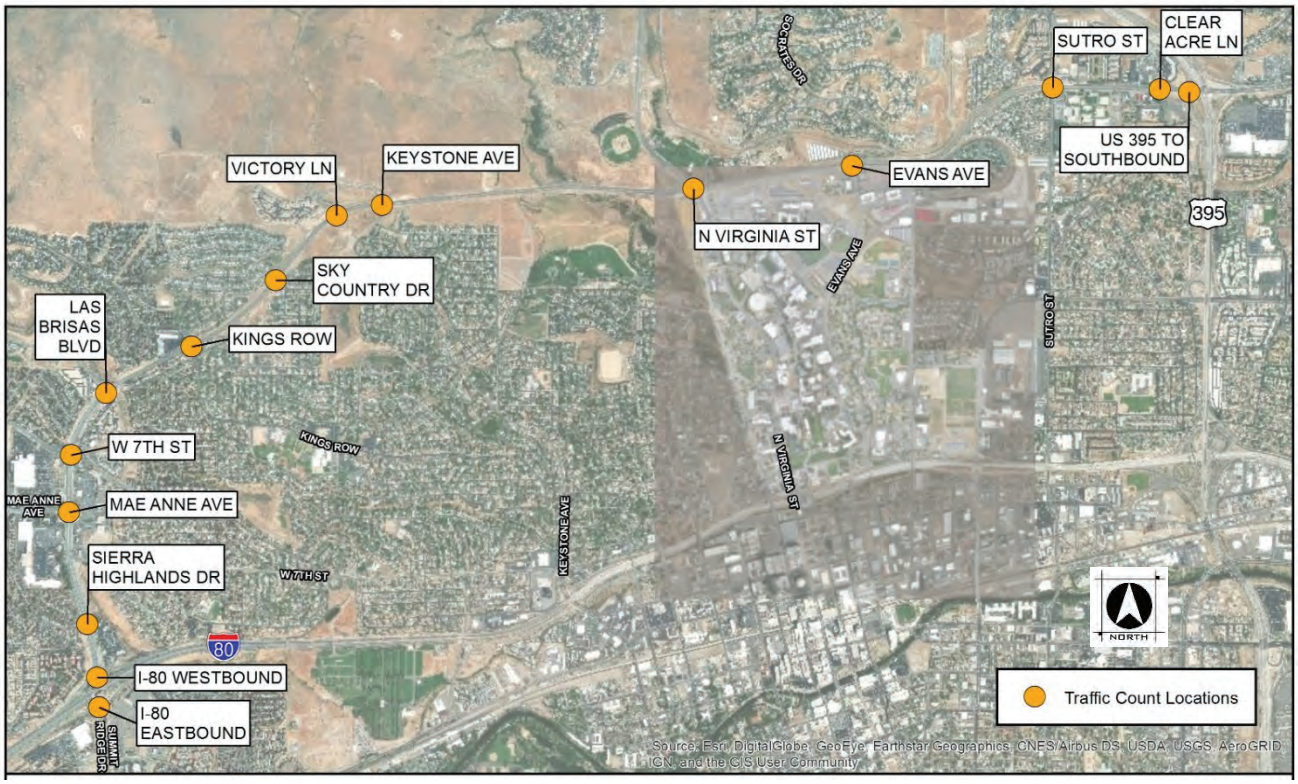


Figure 17: Traffic Count Locations

3.4 Intersection Level-of-Service

Traffic operations in this study have been quantified through the determination of LOS. LOS has been calculated for all intersection control types using methods documented in the Transportation Research Board (TRB) Publication *Highway Capacity Manual, Fourth Edition, 2010* (HCM-2010).

Synchro 10 microsimulation software was utilized to calculate the LOS at 16 McCarran Boulevard intersections within the study area. The collected traffic volumes (vehicular, pedestrian, bicycle) and corresponding peak hour factor (PHF) were a few of the inputs used in the analysis. Existing signal timings were supplied by the City of Reno and used as an additional input into Synchro 10. Existing lane geometries were collected through field visits and Google Earth.

LOS is a qualitative measure of traffic operating conditions, whereby a letter grade "A" through "F" is assigned to study facilities, representing progressively worsening traffic operations.

The resulting LOS for all approaches and overall intersections is displayed in **Table 5**. A more detailed description of each intersection, including their delay times, can be viewed in **Appendix G**. LOS considered below threshold (LOS E and LOS F) are highlighted in red, whereas LOS C and LOS D are highlighted in orange, and LOS A and LOS B are highlighted in yellow. Four of the sixteen analyzed intersections (Las Brisas Boulevard, Sky County Drive, Victory Lane, Keystone Avenue/Leadership Parkway) are unsignalized intersections and the intersection delay and LOS for unsignalized intersections is identical to the "worst-case" approach.

Table 5: Approach and Intersection LOS for Existing Conditions

McCarran Boulevard Cross Street	AM LOS					PM LOS				
	EB	WB	NB	SB	Intersection	EB	WB	NB	SB	Intersection
I-80 Eastbound Ramps (S)	E	-	F	E	F	F	-	F	F	F
I-80 Westbound Ramps (S)	-	D	B	C	C	-	F	C	C	D
Sierra Highlands Drive (S)	C	F	B	C	C	C	F	C	D	D
Mae Anne Avenue (S)	D	D	B	C	C	D	D	C	D	C
Seventh Street (S)	C	C	B	C	C	C	C	C	C	C
Las Brisas Boulevard (U)	A	A	-	F	F	C	A	-	F	F
Kings Row (S)	D	C	C	C	C	C	C	D	C	C
Sky Country Drive (U)	A	A	-	F	F	A	A	-	F	F
Victory Lane (U)	A	A	-	C	C	A	A	-	D	D
Keystone Avenue/Leadership Parkway (U)	A	A	D	B	D	A	A	D	B	D
Virginia Street (S)	F	E	D	F	F	F	D	F	D	F
Evans Road/Socrates Drive (S)	C	C	C	C	C	B	C	F	C	D
Sutro Street (S)	C	B	C	C	C	D	B	C	C	D
Clear Acre Lane (S)	E	E	D	F	F	F	F	E	F	F
US 395 Southbound Ramps (S)	B	B	-	D	B	A	B	-	E	B
US 395 Northbound Ramps (S)	B	B	D	-	C	B	C	E	-	C

(S) = Signalized Intersection, (U) = Unsignalized Intersection

As shown in **Table 5**, five out of sixteen analyzed intersections perform at a LOS E or LOS F in both the AM and PM peak hours, including:

- McCarran Boulevard and I-80 Eastbound Ramps
- McCarran Boulevard and Las Brisas Boulevard
- McCarran Boulevard and Sky Country Drive
- McCarran Boulevard and Virginia Street
- McCarran Boulevard and Clear Acre Lane

The location of each of the intersections performing at LOS E and LOS F are illustrated in **Figure 18**.



Figure 18: LOS Locations Below Thresholds

In addition to the LOS, a queue analysis was performed to determine if the existing queue storage lengths are sufficient to hold the vehicles utilizing the existing turn pockets during the peak hours, details of which can be found in **Appendix G**. As a result, ten out of sixteen McCarran Boulevard analyzed intersections have at least one queue length longer than the queue storage during the AM and/or PM peak hours and are illustrated in **Figure 19**.



Figure 19: Queue Locations Exceeding Capacity

4.0 Relevant Policies, Plans, and Studies

The following plans and/or projects have been identified by the project team as being relevant to this study:

- Regional Transportation Commission of Washoe County (RTC) 2040 Regional Transportation Plan (RTP)
- RTC Bicycle and Pedestrian Master Plan
- RTC Complete Streets Master Plan
- RTC Americans with Disabilities Act (ADA) Transition Plan
- Keystone Avenue Corridor Study
- Virginia Street Corridor Investment Plan
- UNR Campus Master Plan
- McCarran Boulevard and Keystone Avenue Intersection RSA (February 25, 2008)
- McCarran Boulevard and Sutro Street Intersection RSA (March 22, 2011)
- McCarran Boulevard – 4th Street to Las Brisas Drive RSA (April 2, 2008)
- McCarran Boulevard RSA – Las Brisas Boulevard to Rock Boulevard (November 16, 2016)

A summarized breakdown of each of the plans and/or projects can be found in the *North McCarran SMP Existing Conditions Report* and a detailed breakdown of the same plans and/or projects can be viewed in **Appendix H**.

5.0 Land Use Analysis

Land use is a critical element that effects the current and future travel demand and transportation characteristics of any corridor. Using a 0.5-mile buffer around the McCarran Boulevard study area, an analyzation of the City of Reno's and Washoe County's zoning codes and master plans were reviewed to find similarities in land use; this was to highlight the main users of the study area and to determine their impact in relation to transportation. Some key land use considerations within the McCarran Boulevard study area include:

- The Corridor is primarily surrounded by existing development, with less than 4-percent vacant parcels (129 out of 3,349 total parcels)
- The corridor has a mixture of single-family residential, multi-family residential, commercial and special land uses such as parks, UNR owned land, religious centers, and a water treatment plant
- Four schools, including UNR, are located within this corridor
- The corridor is located within the McCarran Boulevard Loop, an arterial roadway used to connect local streets to freeway entrances in an efficient manner
- 83-percent of the parcels in this corridor have a residential zoning designation, with unit density ranging from 1 dwelling unit (du)/acre (LLR1) to 30 du/acre (MF30)
- 17-percent of the corridor is designated as non-residential or mixed-use zoning including retail, office industrial, and other uses
- Less than 1-percent of the corridor has a Public Facility or Open Space zoning designation, which includes Rancho San Rafael Park, Washoe County schools, and other areas of Open Space

5.1 Existing Land Use

The McCarran Boulevard study area is bound by US 395 to the east and I-80 to the west. Several planning areas are located adjacent to the corridor study area, including the McQueen Neighborhood Planning Area to the west, the UNR Regional Center towards the east, and small sections of the West University Neighborhood Planning Area and the North Virginia Street Transit Corridor. McCarran Boulevard right-of-way sizes range from 160-feet to 410-feet and are owned by NDOT. As mentioned earlier, this road is classified as a Principal Arterial Urban – Other.

The McCarran Boulevard corridor is surrounded by built environment consisting of existing residences, commercial developments, UNR parcels, and areas of undeveloped open space. The only vacant land is located at the McCarran Boulevard intersections of Keystone Avenue/Leadership Parkway and Las Brisas Boulevard. The rest of the corridor is developed with the exception of a larger group of parcels zoned as "open space" where Rancho San Rafael Park is located. Rancho San Rafael Park, a regional park, is also a notable feature in this corridor, located on the southwest corner of North Virginia Street and North McCarran Boulevard. The corridor includes a mixture of zoning designations including "Residential" (single-family and multi-family), "Commercial" (community, neighborhood, industrial, and arterial), "Office", "Public Facility" (school sites), and "Open Space" (parks and natural resources). **Figure 20** illustrates the existing zoning for the McCarran Boulevard study area.

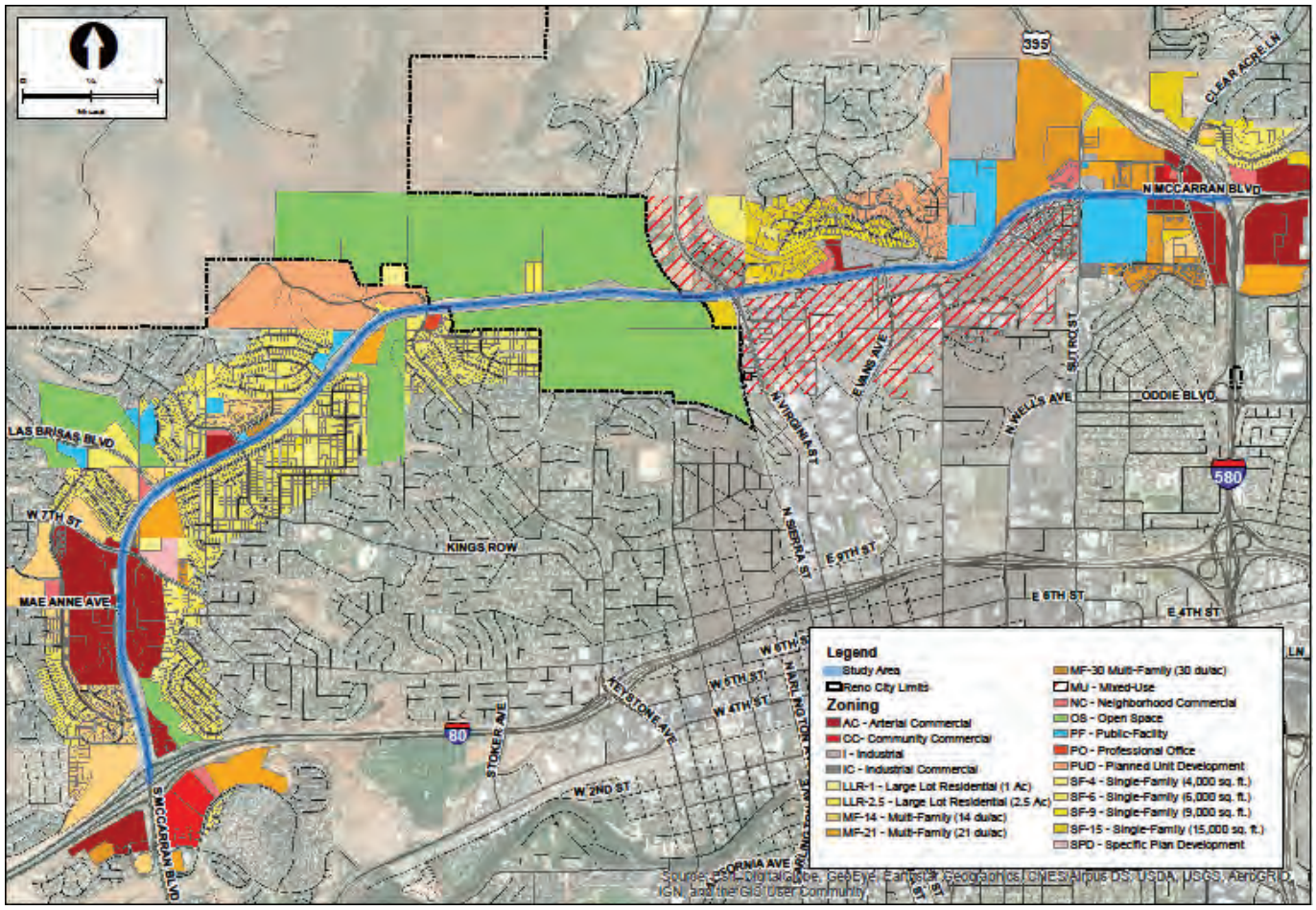


Figure 20: Existing Zoning

5.2 ReImagine Reno Master Plan: McCarran Loop

The *ReImagine Reno Master Plan* differentiates between land use areas "within" and "outside" the McCarran Boulevard Loop. Due to the location of this corridor, adjacent land uses can be characterized as both within and outside the loop. The interior of the McCarran Boulevard Loop, particularly areas closer to downtown Reno, are considered part of the "urban corridor." Urban corridors are priority locations for infill and redevelopment and are meant to serve areas within the McCarran Boulevard Loop. Multimodal transportation options, including high-frequency transit, should be available in these areas and the land use types are generally a mixture of residential, retail, commercial, and other employment and service-oriented uses. The structure plan in the *ReImagine Reno Master Plan*, shown in **Figure 21**, demonstrates an urban corridor exists along North Virginia Street within the corridor study area.

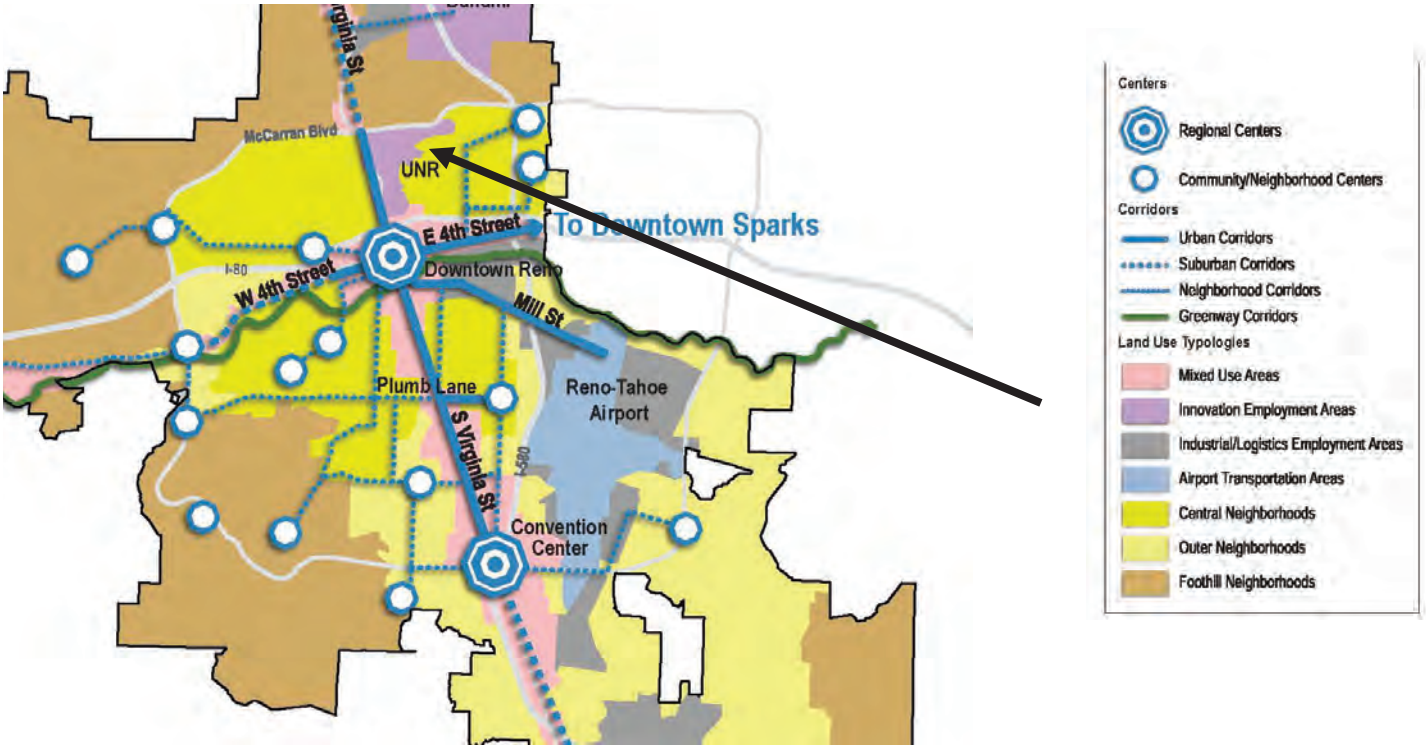


Figure 21: Structure Plan, *ReImagine Reno Master Plan*

Suburban corridors are generally areas outside of the McCarran Boulevard Loop. A suburban corridor is located along North Virginia Street on the north side of the study corridor. These corridors generally contain a mixture of intensity and density, with higher intensity development encouraged at major intersections and near existing/planned transit stations. Neighborhood corridors connected to community/neighborhood centers are also located on the northeast and northwest sides of this study area; neighborhood corridors are predominantly residential, with community/neighborhood centers providing supporting services (restaurants, cafes, small retail stores, medical offices) to meet the needs of nearby neighborhoods.

One employment area is located within the corridor study area – the innovation employment area at UNR, intended to serve as a support area for a range of academic/institutional uses, research facilities, and innovative work spaces, in addition to higher-density residential types and supporting office, retail, and commercial uses. Other land uses within the corridor area are designated as mixed-use areas and central neighborhoods.

5.3 Land Use Analyses by Roadway Section

For this land use analysis, the project area has been broken into three "planning areas." Each planning area is described in detail on the following pages and can be viewed in **Figure 22**.

5.3.1 Planning Area 1: I-80 to Kings Row

This area has a mixture of land uses including residential and commercial parcels. A large commercial/retail center is located on the far western end of the project area. Within the *ReImagine Reno Master Plan*, this is considered a "community/neighborhood center". These types of centers are intended to "meet the needs of the immediate neighborhood" (*ReImagine Reno Master Plan, page 114*). However, the presence of many popular, big box retail stores draws in a wider population from the overall community. This area also provides access to I-80 for adjacent neighborhoods and businesses. An additional draw to this corridor, although outside of the study area, includes three elementary schools, Clayton Middle School, and McQueen High School, indicated in the community facilities map in **Figure 23**.

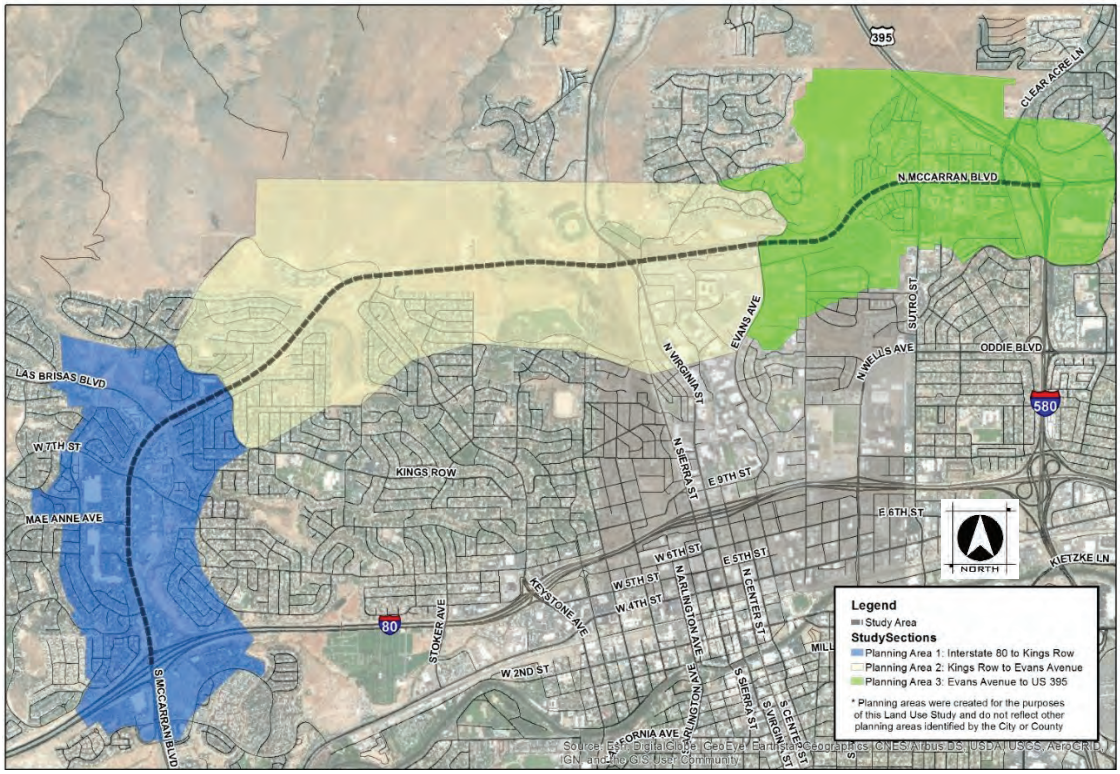


Figure 22: McCarran Boulevard Planning Areas

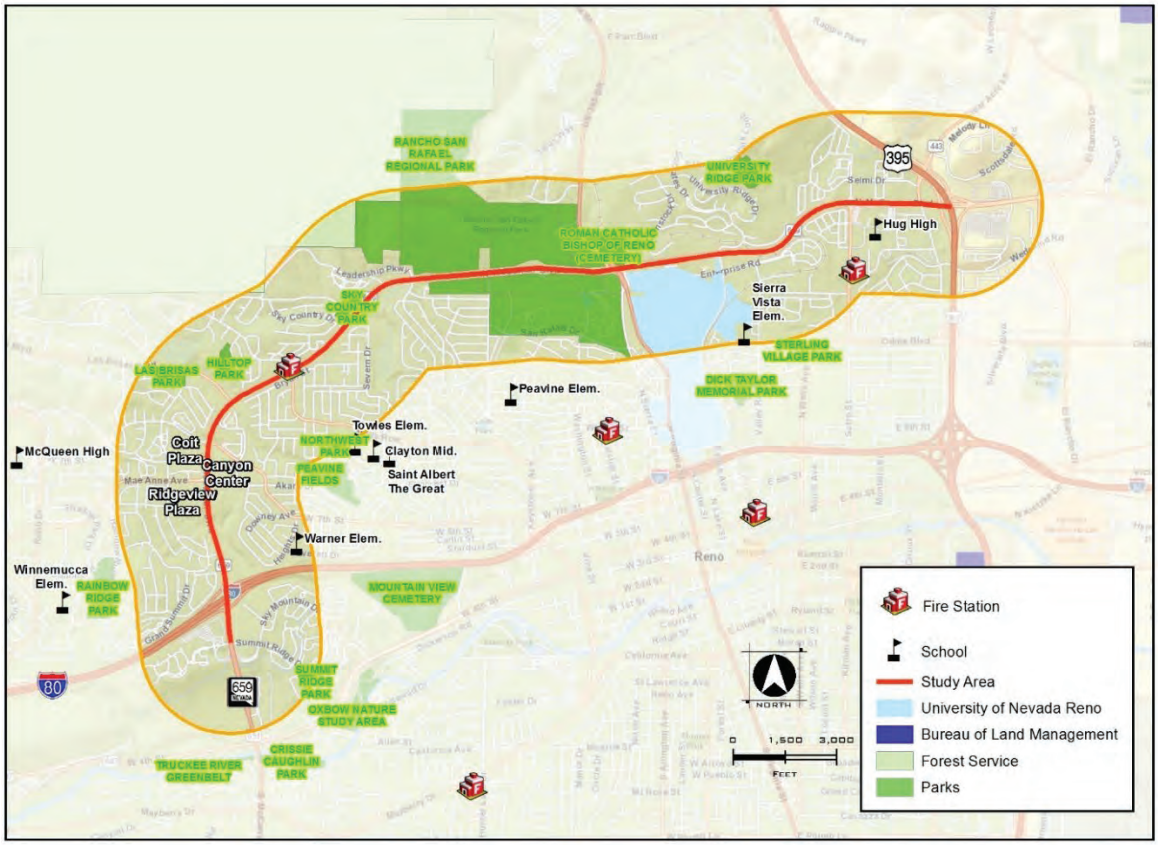


Figure 23: Community Facilities Map

The large commercial center located along the study corridor is surrounded by a mix of high-density neighborhoods located within the McCarran Boulevard Loop. These residents generally access the commercial center via W Seventh Street, making the intersection of W Seventh Street and McCarran Boulevard one of the busiest along the study corridor. Less dense single-family neighborhoods located outside of the McCarran Boulevard Loop to the west can access the commercial area via three roads; W Seventh Street, Mae Anne Avenue, and Sierra Highlands Drive. This commercial area provides many of the supporting services for these neighborhoods, as well as access to I-80 and residents outside of the area who access these commercial facilities while traveling along I-80.

Street Environment

Sidewalks and bicycle lanes are located near commercial centers in this section, connecting to some but not all neighborhoods. The intersection of West Seventh Street to Sierra Highlands Drive, will be receiving pedestrian and bicycle improvements by the RTC and NDOT (Statewide Transportation Improvement Program (STIP) Project ID: WA20110314). Moderate speed limits of the road combined with high traffic volumes create cyclist safety concerns. A gap in connectivity is apparent on the multimodal transportation map, shown in **Figure 24**. Bus shelters are infrequent for the transit line that serves the area from Kings Row to I-80.

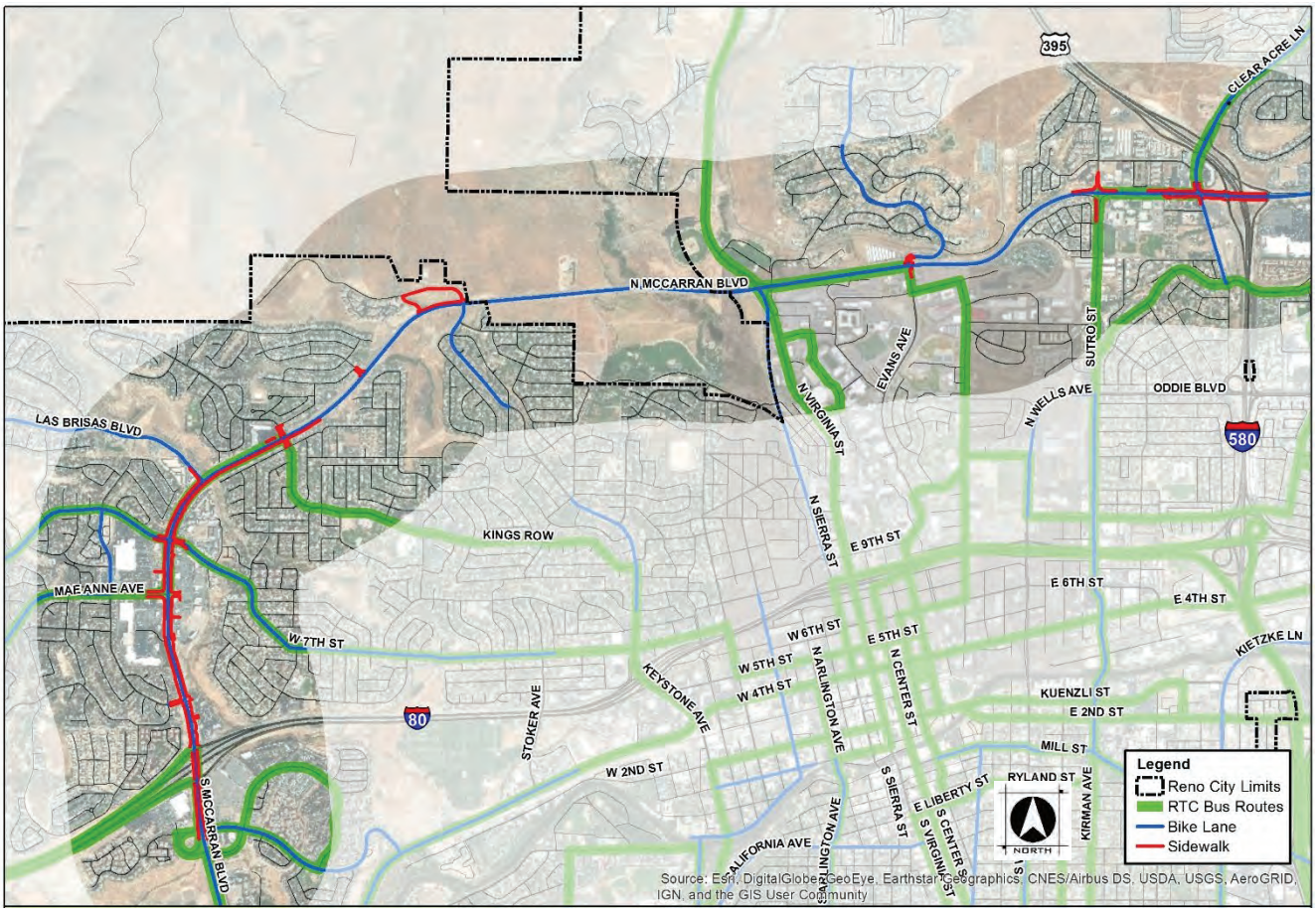


Figure 24: Multimodal Transportation Map

Crash data for this corridor indicates a high density of vehicle crashes at intersections, in particular, the entrance to I-80 on the far west of the study area, as shown in the crash heat map in **Figure 2**.

5.3.2 Planning Area 2: Kings Row to Evans Road/Socrates Drive

This area contains a mixture of single-family residential, multi-family residential, UNR, and recreational properties. In comparison to other areas of the corridor, this area contains a greater amount of open space due to the presence of Rancho San Rafael Park and less dense residential neighborhood properties directly related to UNR. New multifamily residences located north of the intersection of Keystone Avenue within this section of the corridor are designed to serve a growing student and faculty population at UNR. Several multifamily housing complexes and a senior assisted living center are located within this section, with residents likely to require alternative transportation options to travel to UNR and other commercial services within the area. Major draws in this area include Rancho San Rafael Regional Park, a Washoe County regional park used frequently for community events and recreational activities, and UNR, which is also host to many community, sporting, and academic events.

Events in this area frequently draw regional and national attention, including the Reno Balloon Races at Rancho San Rafael Park, illustrated in **Figure 25**, and college sporting events and conventions at UNR. Unlike other sections of this project area, this Planning Area does not contain a direct connection to the freeway from the study area, requiring vehicles to use local streets like McCarran Boulevard to access UNR and Rancho San Rafael Park for employment, educational, or recreational activities. Although most visitors who travel to these events will use Virginia Street to access Rancho San Rafael Park and UNR, many residents will typically access these sites from US-395 to the east. These events typically bring intermittent heavy traffic to the area but the regular flow of traffic along this section of the study corridor is usually from residents of the surrounding area accessing Rancho San Rafael Park and UNR. Because of these uses, there is an increased need for multimodal transportation elements when compared to the rest of the corridor. Virginia Street, which intersects McCarran Boulevard at UNR and Rancho San Rafael Park, is also a major travel corridor that provides access to downtown Reno to the south and residential uses to the north.



Figure 25: Reno Balloon Races at Rancho San Rafael Park

Many residents and visitors also use McCarran Boulevard to access N Virginia Street, another major arterial which provides direct access to downtown Reno to the south, and surrounding residential neighborhoods and industrial/commercial uses to the north. These two major arterials intersect between Rancho San Rafael Park to the west and UNR to the east, making this intersection one of the busiest along the study corridor.

Street Environment

Bicycle lanes are provided along this section of the corridor. However, the moderate speed of the road combined with high traffic volumes creates cyclist safety concerns. Additionally, incomplete ADA accessible routes exist in the section

between Kings Row and N Virginia Street. Pedestrians must walk along shoulders or within the right-of-way along McCarran Boulevard to reach destinations by foot. Bus shelters are infrequent for the transit line that serves the area from Kings Row to Evans Road/Socrates Drive. Additionally, no accessible routes to transit are available to residents in the area between Kings Row and N Virginia Street. A gap in connectivity is apparent on the multimodal transportation map shown in **Figure 24**.

Crash data for this section of the corridor indicates a low amount of vehicle crashes in this planning area in comparison to other sections of the corridor. The density of crashes is concentrated around intersections, as shown in the crash heat map in **Figure 2**.

5.3.3 Planning Area 3: Evans Road/Socrates Drive to US 395

This section of the corridor is generally mixed, containing an assortment of residential, multi-family, industrial, religious centers, schools, and commercial developments. Multi-family and single-family residences are interspersed with mixed use and neighborhood, community, and arterial commercial developments. Small neighborhood commercial services provide some support to the surrounding residents along this section of the corridor and do not attract a lot of outside visitors with the exception of a large big box retail commercial development located to the east, outside of the study area. A major draw to this area is Hug High School, located at the intersection of Sutro Street and McCarran Boulevard. Although there is no direct access to the school from McCarran Boulevard, students from surrounding neighborhoods to the north, east, and west generally travel along McCarran Boulevard to access the school, funneling most school traffic along the study area.

Hug High School is planned to be repurposed into a Career and Tech Academy in 2022

This area also sees a large amount of traffic as an alternative route for residents outside of the area accessing Rancho San Rafael Park or UNR. The entrance/exit of US 395/I-580 is located at the eastern section of this study area, and this section of the study area generally sees traffic from residents located in the neighborhoods between US 395 and N Virginia Street using this as their main access to the freeway. However, for employees of UNR, as well as residents from around the region, this route is used as an alternative to Virginia Street to access Rancho San Rafael Park or UNR.

Street Environment

Due to the proximity to UNR and the presence of many multifamily developments, a higher percentage of residents in this area are likely to need alternative transportation options. However, the area between the McCarran Boulevard intersections of Evans Road/Socrates Drive and US 395 contains many gaps in pedestrian connectivity. Few sidewalks exist along this planning area, with the exception of sidewalks surrounding commercial areas at the far east end of this planning area, illustrated in the multimodal transportation map shown in **Figure 24**. Bicycle lanes are provided along this section of the corridor, however the moderate speed of the road combined with high traffic volumes create cyclist safety concerns.

Crash data for this corridor indicates a moderate density of vehicle crashes at intersections and particularly the entrance to US 395 on the far east of this planning area, as shown in the crash heat map in **Figure 2**.

6.0 Economic Development Potential

This section presents an evaluation of economic development conditions and opportunities surrounding this corridor and summarizes information from various planning documents relevant to the study area.

6.1 Current Social/Economic Concerns

McCarran Boulevard is a major arterial within Reno-Sparks, forming a loop around the densest development in the Reno-Sparks metro area. This area serves as an important connection between the community and educational, employment, and recreational opportunities. Notable features in this area include Rancho San Rafael Regional Park, a Washoe County

regional park used frequently for community events and recreational activities; and UNR, a school, major employment center, and host to many community, sporting, and academic events. The events frequently draw regional and national attention, including the Reno Balloon Races at Rancho San Rafael Park and college sporting events and conventions UNR. Combined with the surrounding neighborhoods and the draw of commercial/retail service and employment opportunities to serve residents and visitors, this corridor is a significant roadway for the region, economically and socially.

Improving safety, multimodal connectivity, and accessibility on this roadway will more adequately serve residents within areas adjacent to the roadway and provide greater access for the broader Reno-Sparks area. Bicycle lanes are already present within this corridor; however due to the moderate speed limits on McCarran Boulevard, bicycle safety and ease of use by cyclists is a concern. Additionally, few transit opportunities and accessible pedestrian facilities exist for residents along this corridor. New multi-family residences within this corridor are designed to serve a growing student and faculty population at UNR. However, incomplete ADA accessible routes exist in these areas and pedestrians must walk along shoulders or within the right-of-way along McCarran Boulevard to reach destinations by foot. Bus shelters are infrequent for the transit line that serves the area from Kings Row to I-80. Additionally, no accessible routes to transit are available to residents in the area between Kings Row and North Virginia Street; this gap in connectivity is notable as it also contains several multi-family housing complexes and a senior assisted living center, with residents likely to require alternative transportation options.

6.2 RTC Planning Documents

This corridor provides a vital connection between residents and employment and educational opportunities at UNR, downtown Reno, regional parks, and various retail and commercial centers. A goal of the RTC's RTP is to, "support the economic vitality of the region by promoting safety, providing accessible places to walk and bike, improving connectivity between where people live and work, and conserving resources through environmentally and fiscally sustainable practices" (*2040 Regional Transportation Plan*, page 4). One section of the McCarran Boulevard corridor, from the intersections of West Seventh Street to Sierra Highlands Drive, will be receiving pedestrian and bicycle improvements by the RTC and NDOT (STIP Project ID: WA20110314). Improvements to the entirety of this corridor would fill gaps in bicycle and pedestrian connectivity as well as improve safety, accessibility, and efficiency of transportation for all users.

ReImagine Reno Master Plan

Intensification of uses within the McCarran Boulevard Loop is encouraged by the *ReImagine Reno Master Plan*. Necessary infrastructure to accommodate intensification of uses include improved transit opportunities, bicycle facilities, and accessible transportation options to allow for affordable and equitable transportation options.

Summary

In general, the study area is highly built out, with most of the vacant land categorized as National Forest. Therefore, the majority of the growth will revolve around the expansion of UNR and infill into higher density uses such as apartment complexes.

7.0 Crash Risk and Factors Summary

McCarran Boulevard is emblematic of many arterials in urban Nevada, with high speeds between major intersections, high volumes at major intersections, and has gaps in supportive infrastructure for alternate modes. The combination of these problems, numerous local roadway cross streets accessing residential neighborhoods, and several commercial driveways near busy intersections, results in a high number of crashes. While most of the corridor does not exceed average crash rates for similar facilities, the sheer volume of traffic within and crossing McCarran Boulevard, and the high speeds along the corridor, result in high overall crash numbers. As a result, alternatives developed as part of the mitigation portion of this SMP focused on reducing speed, channelization, and supporting alternative modes.

8.0 SMP Alternatives

Note: All SMP alternatives are conceptual and for consideration purposes only. It will be up to decision-makers to determine which, if any, alternatives are implemented.

8.1 Alternatives Background

Vehicular, bicycle, pedestrian, and transit safety alternatives have been categorized into both corridor and spot safety improvements for the North McCarran SMP. Corridor improvements run linearly along roadway segments between intersections while spot improvements effect singular, finite locations (e.g. intersections, pedestrian crossings, etc.). The alternatives were developed by focusing on high crash locations identified in the crash analysis, field reviews and observations, and by applying engineering judgement. Existing and future traffic volumes were also taken into consideration to ensure alternatives would not have a significant negative impact on traffic operations. However, it should be noted that some safety recommendations could reduce traffic performance and these tradeoffs should be balanced against safety performance. In many cases, alternatives were developed with the intent of better supporting all modes of travel through a complete streets philosophy.

"Complete streets are streets for everyone. They are designed and operated to enable safe access for all users, including pedestrians, bicyclists, motorists and transit riders of all ages and abilities. Complete streets make it easy to cross the street, walk to shops, and bicycle to work."
Smartgrowthamerica.org

The alternatives outlined in this chapter have been identified and developed at a planning-level. Further refinement, traffic analysis, and engineering may be required to identify issues and further determine feasibility.

8.2 Corridor Alternatives

Corridor alternatives that revise the roadway cross-sectional configuration were developed for each segment of the corridor to better accommodate all modes and improve safety. In some cases, more than one promising option was developed and each of these options are outlined below without any recommendation of one versus the other. It will be up to decision-makers to determine which alternative to advance, if any, based on numerous factors in addition to safety performance.

Summit Ridge to I-80

From Summit Ridge to the I-80 interchange, McCarran Boulevard consists of four general purpose lanes, a dedicated right-turn lane from northbound McCarran Boulevard to the I-80 East entrance ramp, bike lanes, and sidewalks. The northbound bike lane is a minimum width lane (4-feet) and is climbing uphill while the southbound bike lane (downhill) consists of bike symbol markings in the shoulder area. Both directions have a 4-foot inside shoulder, as shown in **Figure 26**.

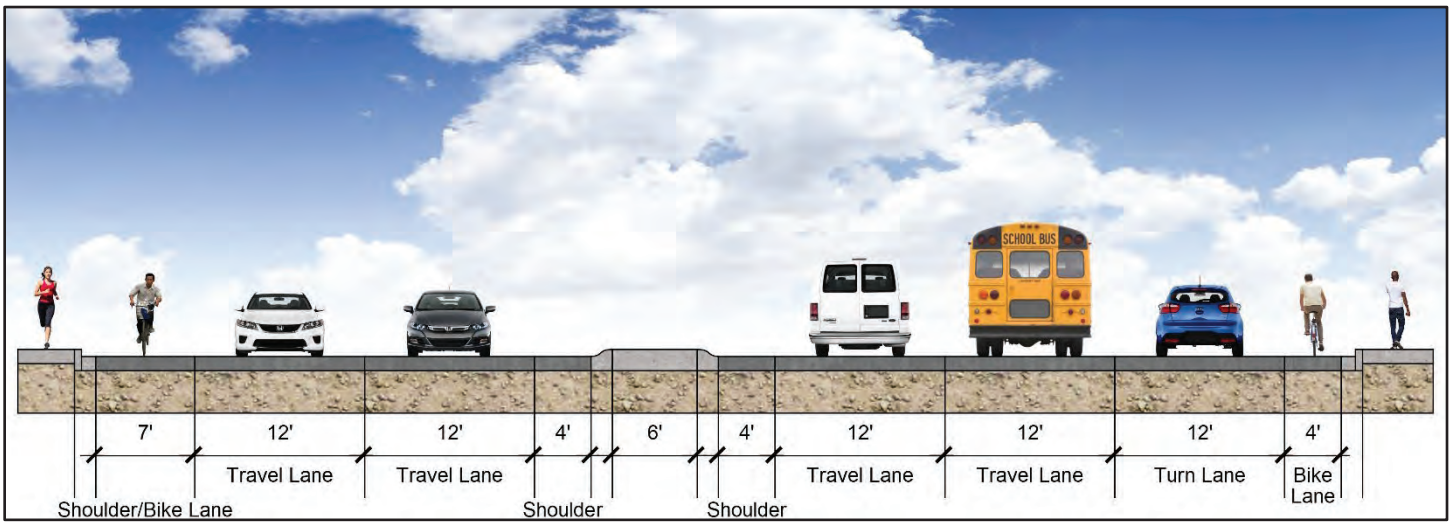


Figure 26: Existing Summit Ridge to I-80

Option 1 would reduce the northbound inside shoulder and reduce the right-turn lane to 11-feet to provide a 3-foot buffer for the bike lane. The southbound direction has sufficient width to simply stripe a formal bike buffer for the existing bike lane, as shown in **Figure 27**.

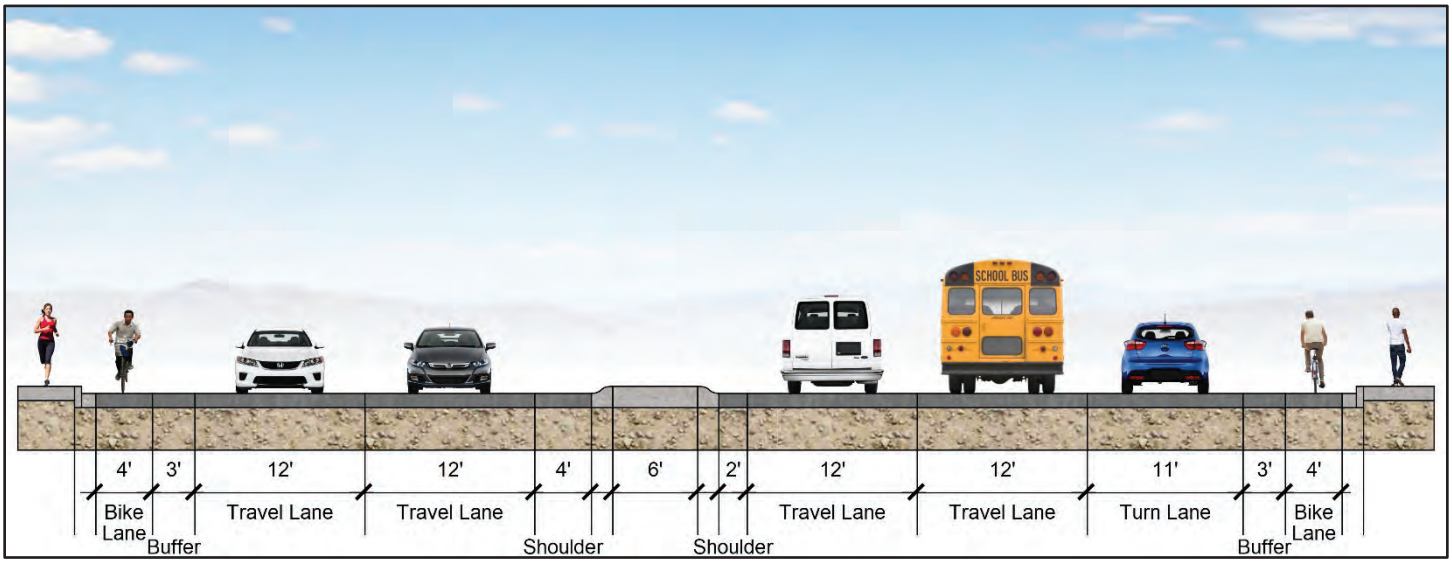


Figure 27: Design Alternative – Summit Ridge to I-80 Buffered Bike Lanes

I-80 to Las Brisas Boulevard

McCarran Boulevard from I-80 to Las Brisas Boulevard consists of a 6-lane section with bike lanes, sidewalks, and a raised center median, as shown in **Figure 28**. This area is congested with multiple commercial center driveways.

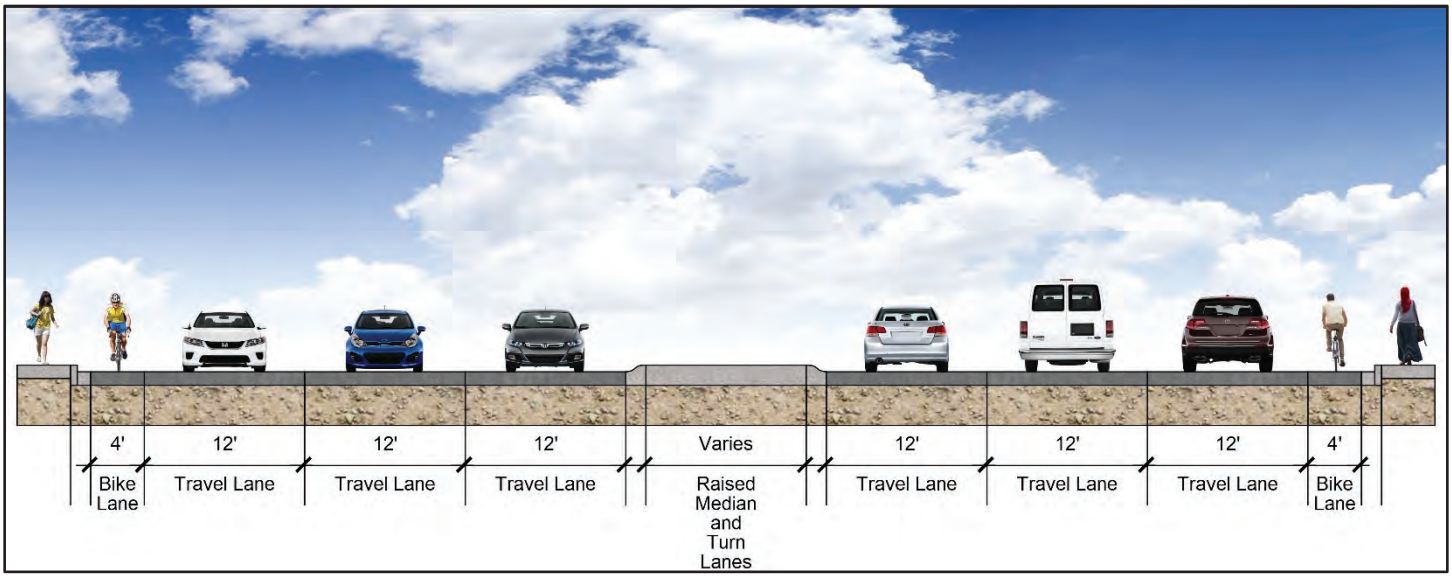


Figure 28: Existing I-80 to Las Brisas Boulevard

Given the number of lanes and the volumes in the area, the bike lanes are uncomfortable for riders. The lane widths in this section could be slightly reduced to 11-feet to provide a 3-foot buffer for the bike lanes and increase rider comfort, as shown in **Figure 29**. Buffers can improve safety for riders by as much as 16-percent.

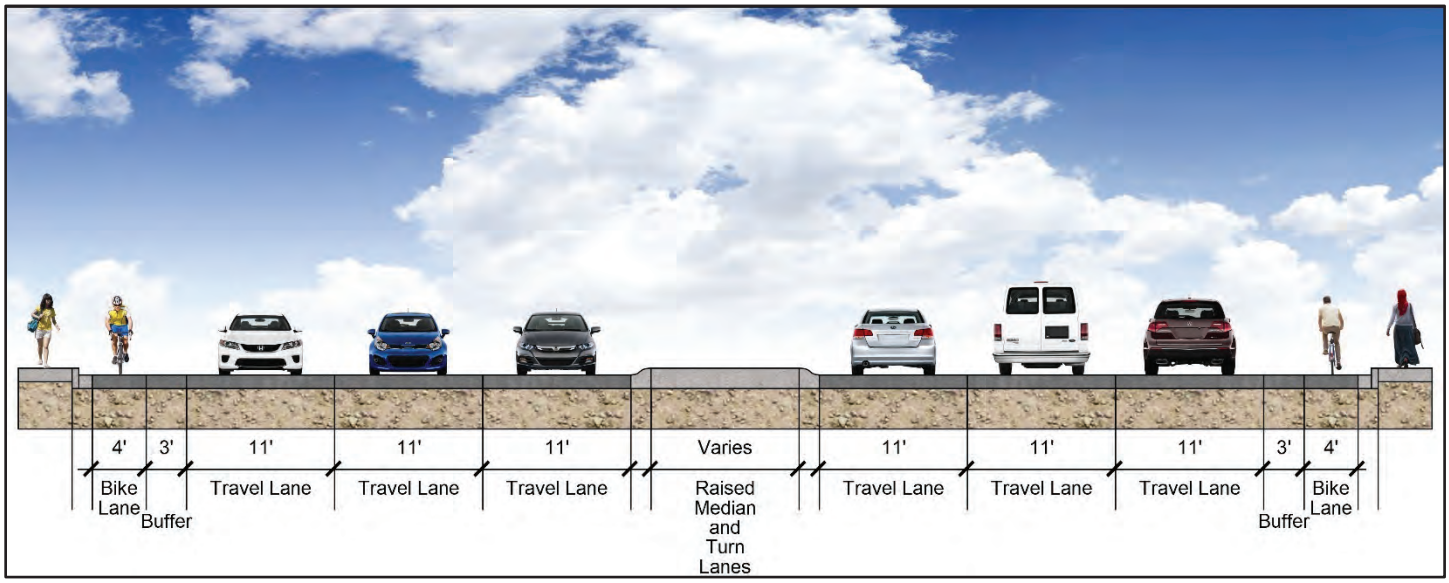


Figure 29: Design Alternative – I-80 to Las Brisas Boulevard Buffered Bike Lanes

Las Brisas Boulevard to North Virginia Street

The segment from Las Brisas Boulevard to North Virginia Street is the longest segment at nearly 2.5-miles and is adjacent to both residential and park/open space areas. The existing roadway consists of a 4-lane section with outside shoulders, curb and gutter, and graded turf with no pedestrian facilities. The outside shoulder does contain bike symbol markings. See **Figure 30** for the existing cross section.

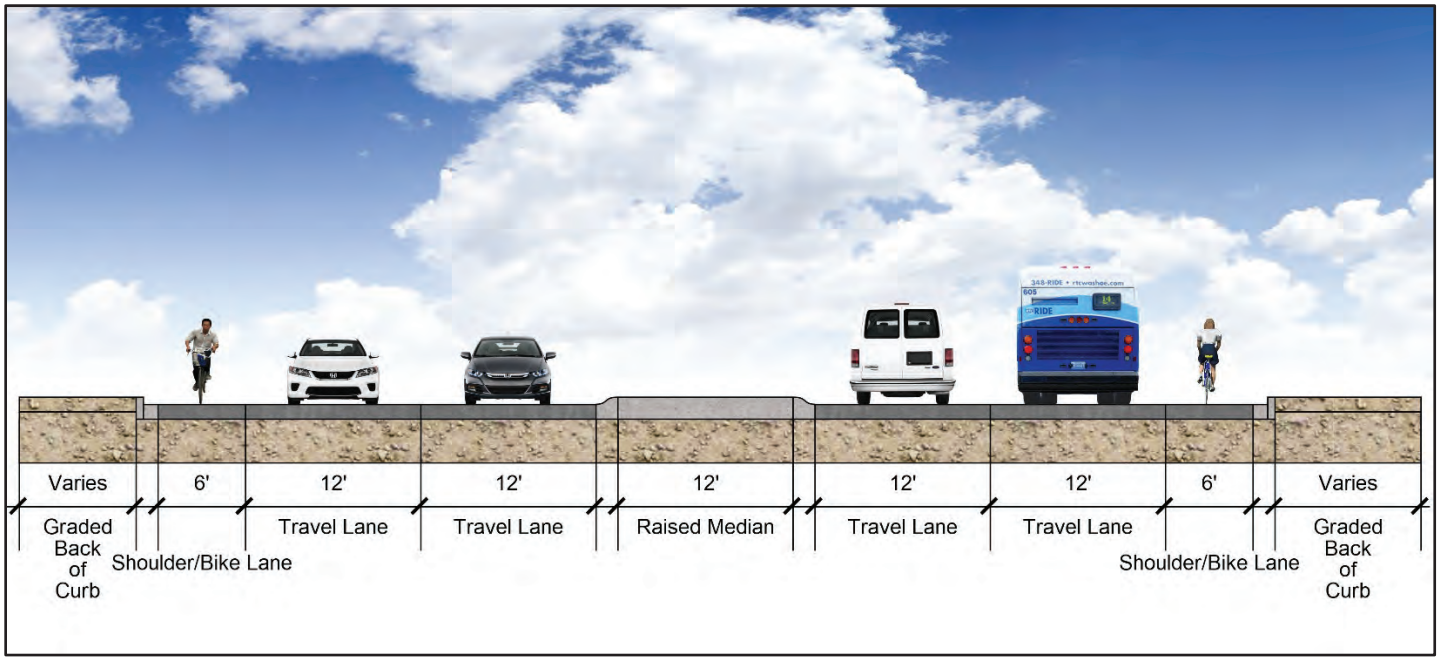


Figure 30: Existing Las Brisas Boulevard to North Virginia Street

With important origins/destinations along and near this segment, travelers could benefit from improved active transportation infrastructure, which can be accomplished one of two ways. The first option is to reduce the outside lane to 11-feet and stripe a formal bike lane and buffer while also adding sidewalks on both sides, as shown in **Figure 31**. This would complete the urban section started with the existing curb and gutter.

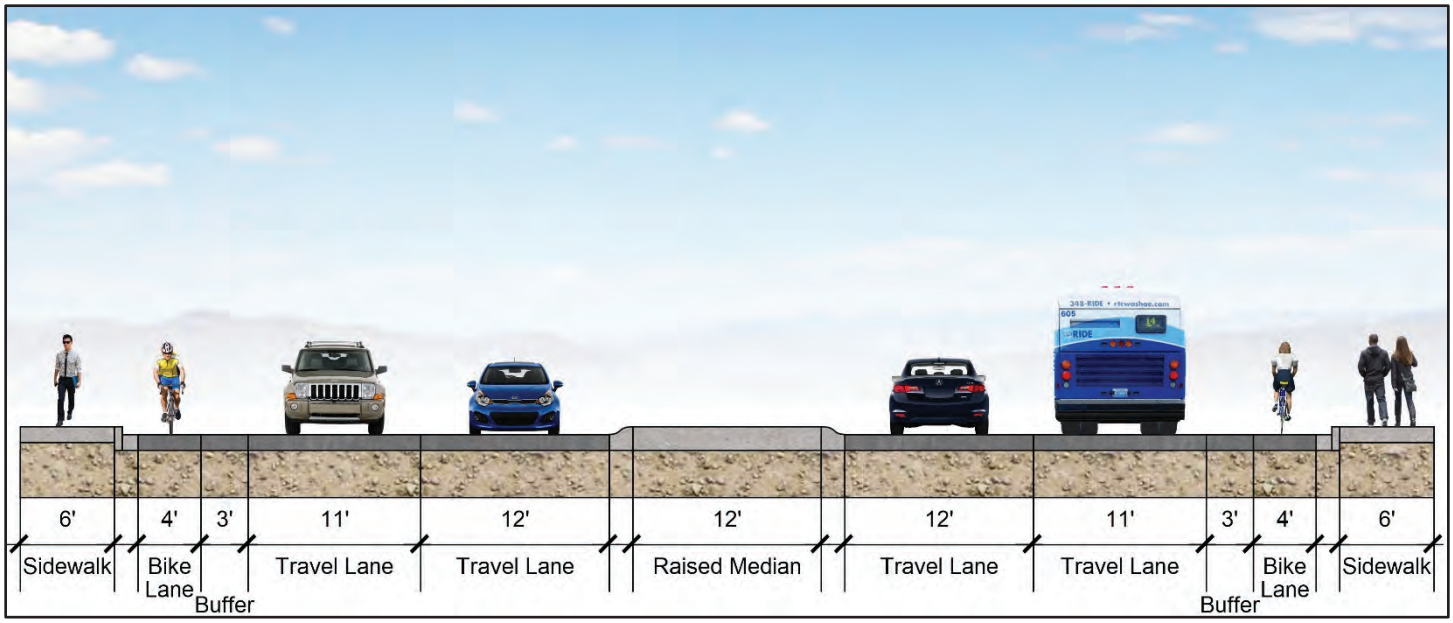


Figure 31: Design Alternative #1 – Las Brisas Boulevard to North Virginia Street Buffered Bike Lanes and Sidewalks

The second option is to take advantage of the fact that east of Sky Country Drive, there are very few origins/destinations on the north side of McCarran Boulevard, and combine bicycle and pedestrian facilities into a multi-use path along the south side. Lane widths could be reduced to help reduce speeds along this section as well, as illustrated in **Figure 32**.

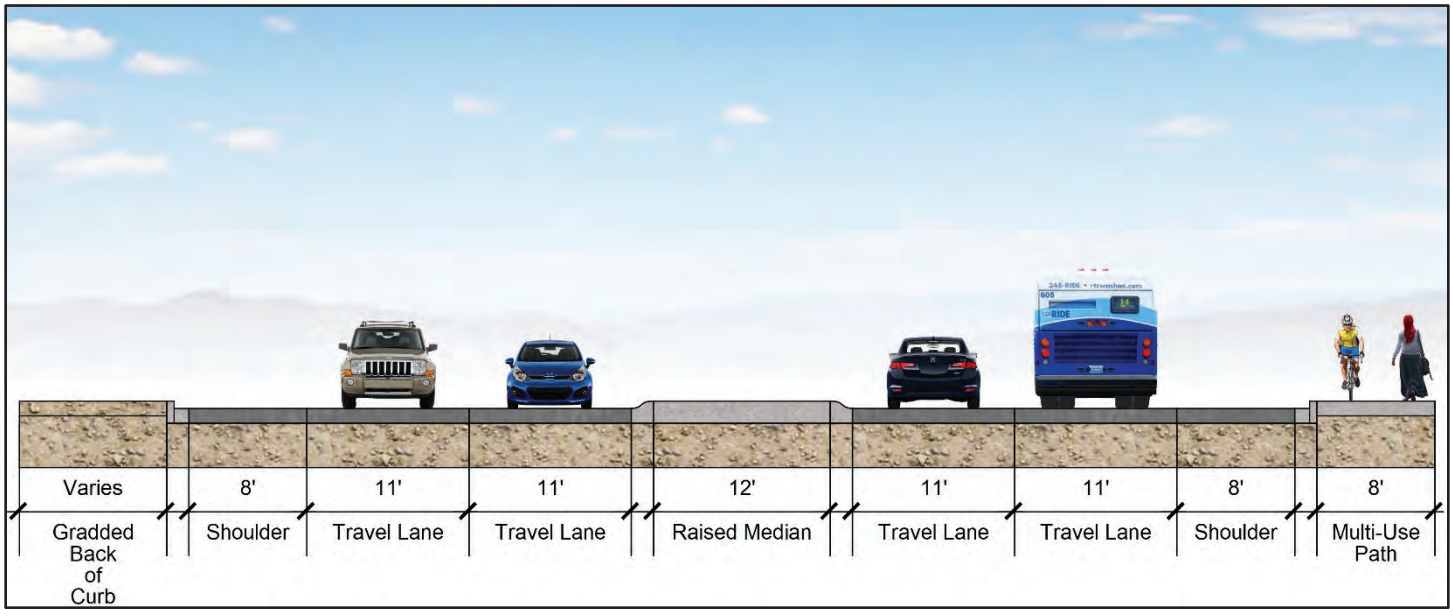


Figure 32: Design Alternative #2 – Las Brisas Boulevard to North Virginia Street Multi-Use Path

North Virginia Street to Evans Avenue/Socrates Drive

From North Virginia Street to Evans Avenue/Socrates Drive, McCarran Boulevard abuts UNR to the south and homes to the north. This is the only segment outside of the freeway interchanges at either end that has six lanes. The additional lanes quickly transition back to a 4-lane section past Evans Avenue/Socrates Drive. Yet, the daily volumes are not appreciably higher in this segment versus adjacent segments. The existing roadway cross section is shown in **Figure 33**.

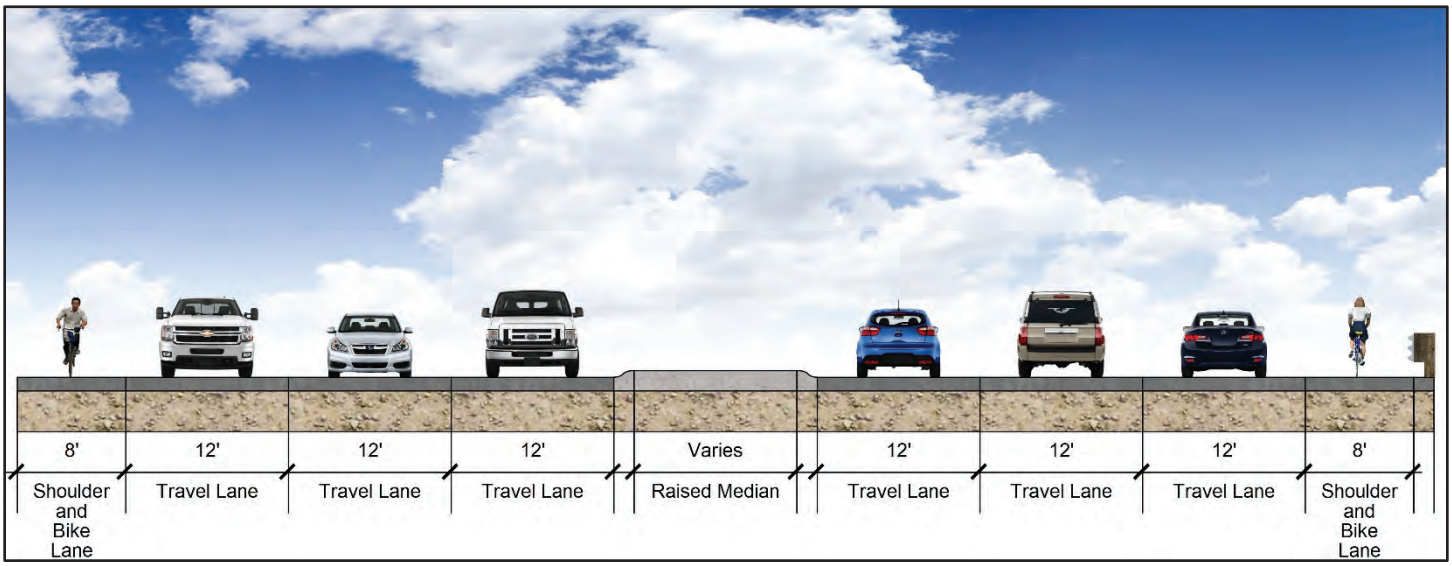


Figure 33: Existing North Virginia Street to Evans Avenue/Socrates Drive

To improve safety in this segment, one option is to take advantage of the outside lanes by repurposing those lanes to provide a wide bike lane and buffer, as shown in **Figure 34**. Furthermore, to support pedestrian activity near UNR, 8-foot-wide sidewalks could be installed.

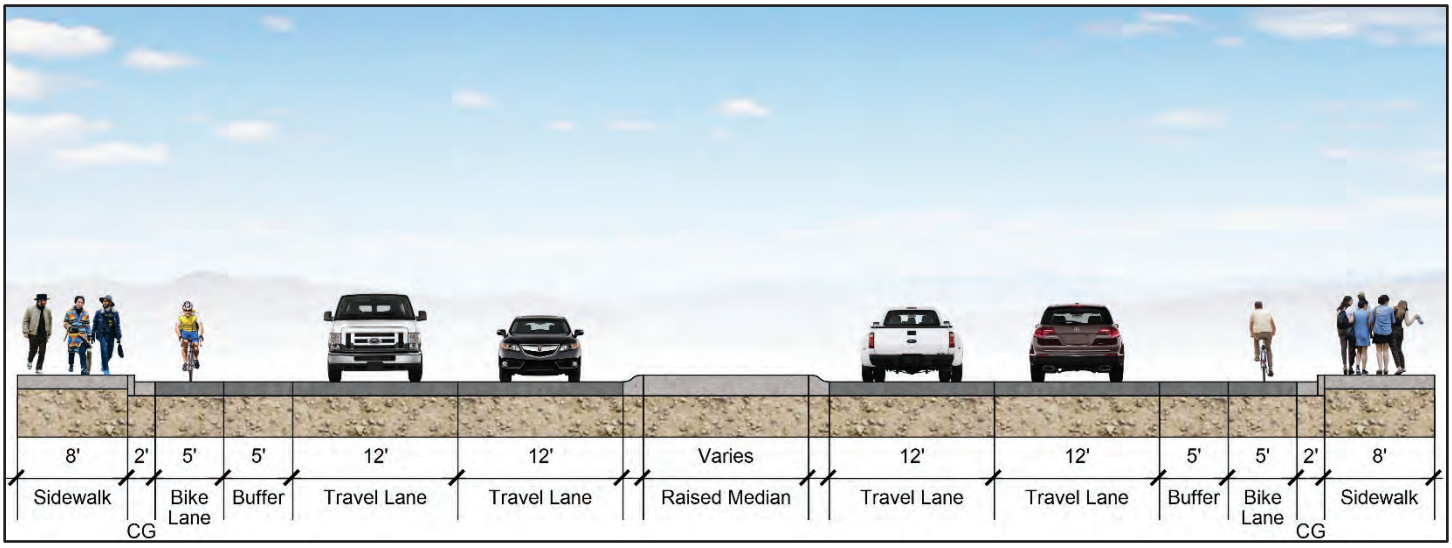


Figure 34: Design Alternative #1 – North Virginia Street to Evans Avenue/Socrates Drive Lane Reduction

If the preference is not to reduce the roadway capacity from 6-lanes, the lanes could be reduced to 10-foot-wide lanes while still providing standard buffered bike lanes and sidewalks, as shown in **Figure 35**.

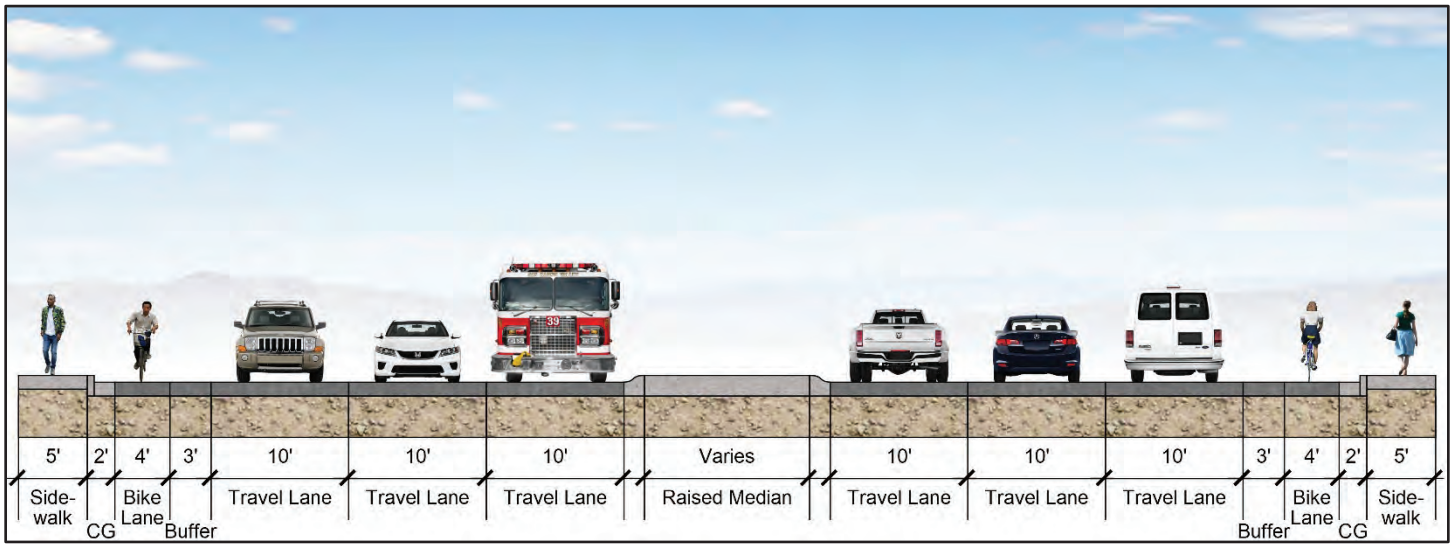


Figure 35: Design Alternative #2 – North Virginia Street to Evans Avenue/Socrates Drive Buffered Bike Lanes and Sidewalk

Evans Avenue/Socrates Drive to Sutro Street

East of Evans Avenue/Socrates Drive to Sutro Street, McCarran Boulevard reverts back to a 4-lane section with shoulders and bike symbols in the shoulder, as shown in **Figure 36**. Similar to the Las Brisas Boulevard to North Virginia Street segment, there are two options to improve safety and transportation choice.

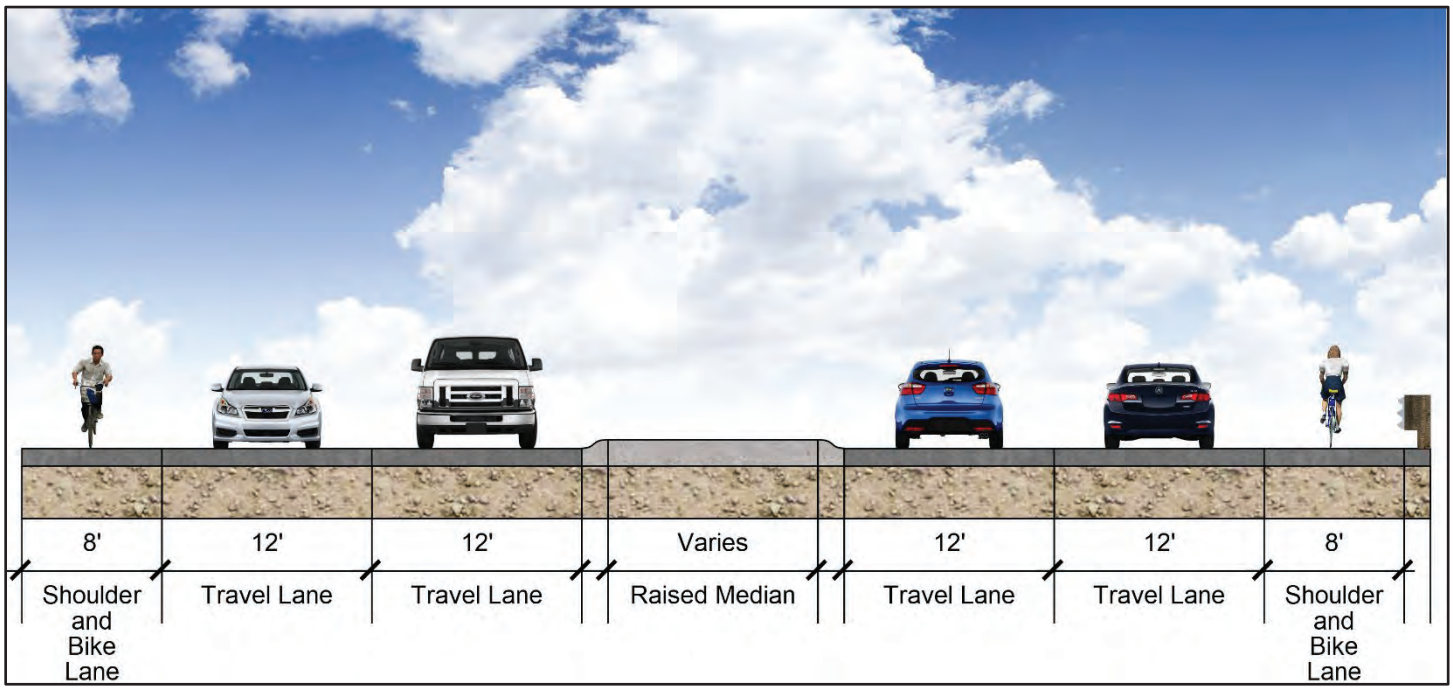


Figure 36: Existing Evans Avenue/Socrates Drive to Sutro Street

The first option is to reduce lane widths to encourage slower speeds and use the additional width to add buffered bike lanes and curb, gutter, and sidewalk in both directions, as shown in **Figure 37**.

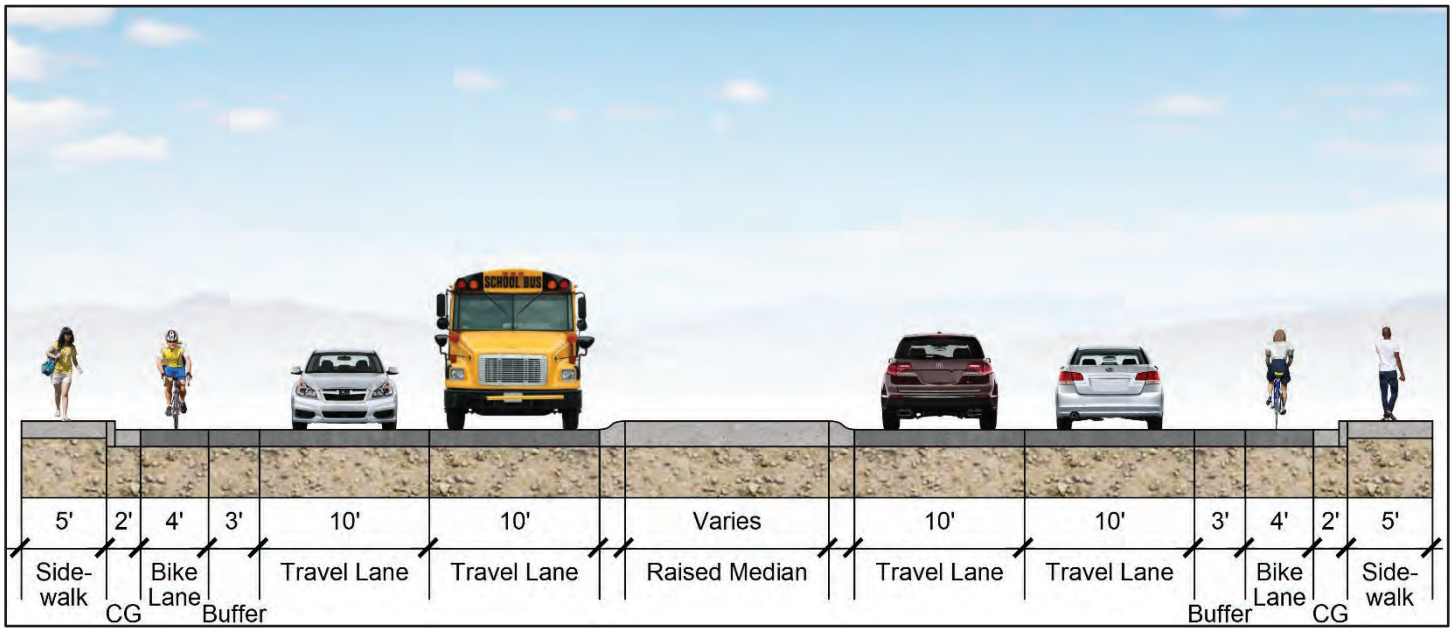


Figure 37: Design Alternative #1 – Evans Avenue/Socrates Drive to Sutro Street Buffered Bike Lanes and Sidewalks

A second option would be to formalize the bike lane in the westbound direction with striping and a buffer, and add a multi-use path in the eastbound direction by reducing travel lanes to 11-feet, as shown in **Figure 38**. Similar to the Las Brisas Boulevard to North Virginia Street segment, there are few origins/destinations on northside of McCarran Boulevard, making a multi-use path feasible.

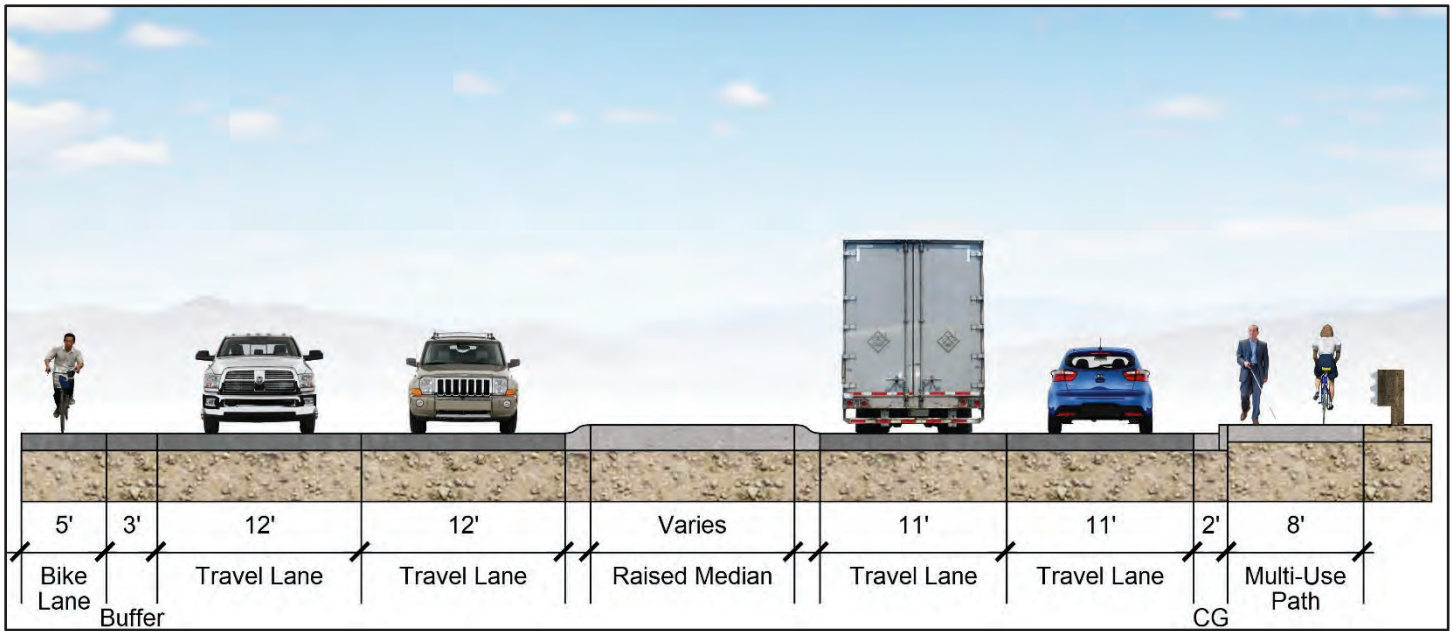


Figure 38: Design Alternative #2 – Evans Avenue/Socrates Drive to Sutro Street Multi-Use Path

Sutro Street to Clear Acre Lane

From Sutro Street to Clear Acre Lane, the existing roadway section is similar to the previous section, shown in **Figure 36**. One exception is sidewalk does exist for portions of both the eastbound and westbound sides near Clear Acre Lane. With this, it is recommended to complete sidewalks throughout. The travel lanes could be reduced to 11-feet to also provide a buffered bike lane, illustrated in **Figure 39**. To help discourage unprotected mid-block pedestrian crossings, pedestrian fencing could be added to the center median, channelizing pedestrians to cross at either Sutro Street or Clear Acre Lane crosswalks.

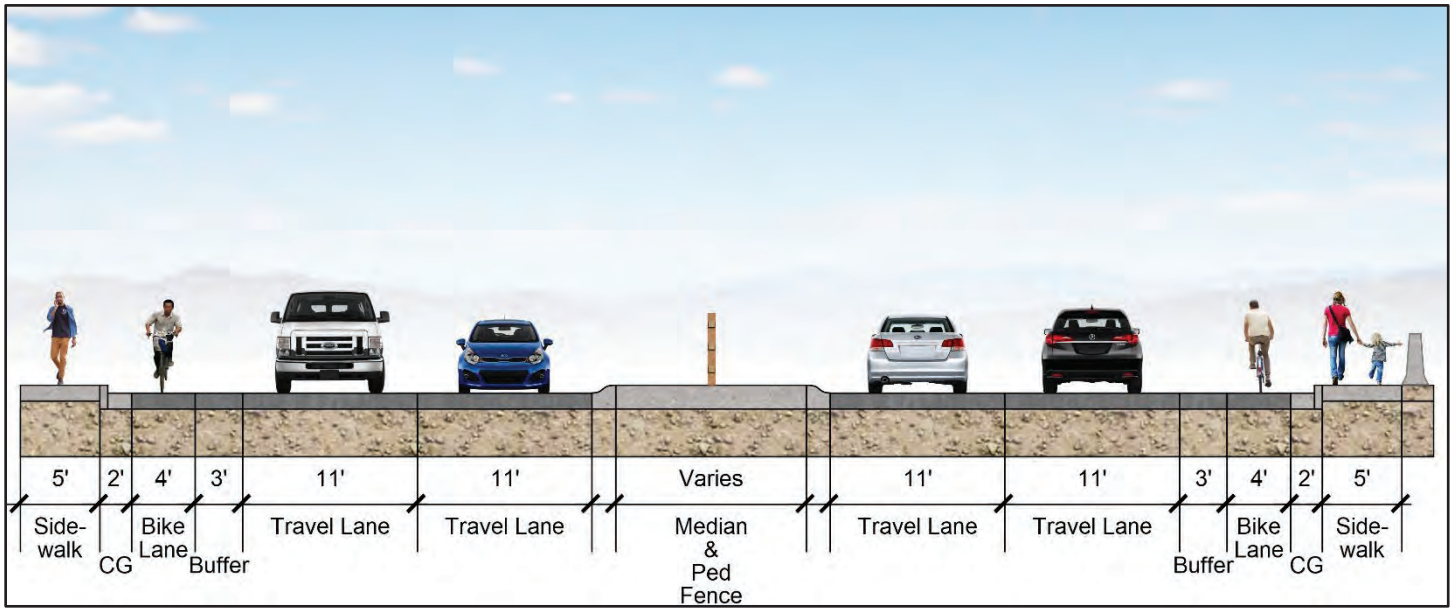


Figure 39: Design Alternative – Sutro Street to Clear Acre Lane Buffered Bike Lanes and Sidewalks

East of Clear Acre Lane, no corridor improvements are recommended. The US 395 interchange area functions adequately and future projects on US 395 are likely to reconfigure the freeway ramps.

8.3 Corridor Alternatives Summary

The previous section outlined several corridor alternatives that could be considered to improve safety and develop complete streets in the study area. The potential safety benefits of these corridor alternatives are summarized in **Table 6** along with their corresponding benefit-cost calculation. This information may be used to inform alternative selection and/or prioritization.

Table 6: Corridor Alternatives Summary

Corridor Alternative	*Potential Multi-Modal Crash Reduction*	*Conceptual Cost*	*Safety Benefit-Cost*
Summit Ridge to I-80 – Buffered Bike Lanes	16%	$20,000	4.99
I-80 to Las Brisas Blvd. – Buffered Bike Lanes	16%	$50,000	4.99
Las Brisas Blvd. to N. Virginia St. – Buffered Bike Lanes & Sidewalks	19%	$1,700,000	0.10
Las Brisas Blvd. to N. Virginia St. – Multi-Use Path	74%	$1,200,000	0.58
N. Virginia St. to Evans Ave./Socrates Dr. – Lane Reduction, Bike Lanes, & Sidewalk	24%	$450,000	30.41
N. Virginia St. to Evans Ave./Socrates Dr. – Buffered Bike Lanes & Sidewalk	16%	$650,000	14.03
Evans Ave./Socrates Dr. to Sutro St. - Buffered Bike Lanes & Sidewalks	16%	$600,000	15.20
Evans Ave./Socrates Dr. to Sutro St. – Multi-Use Path	74%	$675,000	62.51
Sutro St. to Clear Acre Ln. - Buffered Bike Lanes & Sidewalks	12%	$200,000	0.56

8.4 Spot Location Alternatives

Spot improvements are those safety strategies that effect singular, finite locations; and for this study, spot locations mostly consist of intersection improvements. Spot location alternatives were identified through a combination of the RSA, additional field reviews, crash data analysis, stakeholder and public input, as well as applying engineering judgement and safety best practices. It will be up to decision-makers to determine which alternative(s) to advance, if any, based on numerous factors in addition to safety performance.

I-80 Interchange

The I-80 Interchange with McCarran Boulevard consists of a traditional diamond interchange configuration. Given extensive residential and commercial growth in the northwest and west, this suburban interchange experiences high volumes and turning movements. Of particular concern is the eastbound ramp intersection which operates at LOS F in both the AM and PM peak periods. These factors combine to result in numerous crashes at the two ramp terminal intersections. Both intersections are signal controlled, with the signals maintained by the City of Reno.

The interchange could be reconfigured into a different interchange type to improve safety and operations. Of particular promise is a Diverging Diamond Interchange (DDI) configuration, illustrated in **Figure 40**. A DDI crosses traffic to opposite sides of the roadway, allowing left-turning traffic to freely enter the interchange on-ramps before crossing back over and collecting right-turning exit ramp traffic. DDI's simplify intersection operations by reducing down to only two signal phases versus four signal phases with a traditional intersection. This reduction in signal phases would likely improve the existing operations as shown in **Table 7**, LOS outputs can be viewed in **Appendix I**.

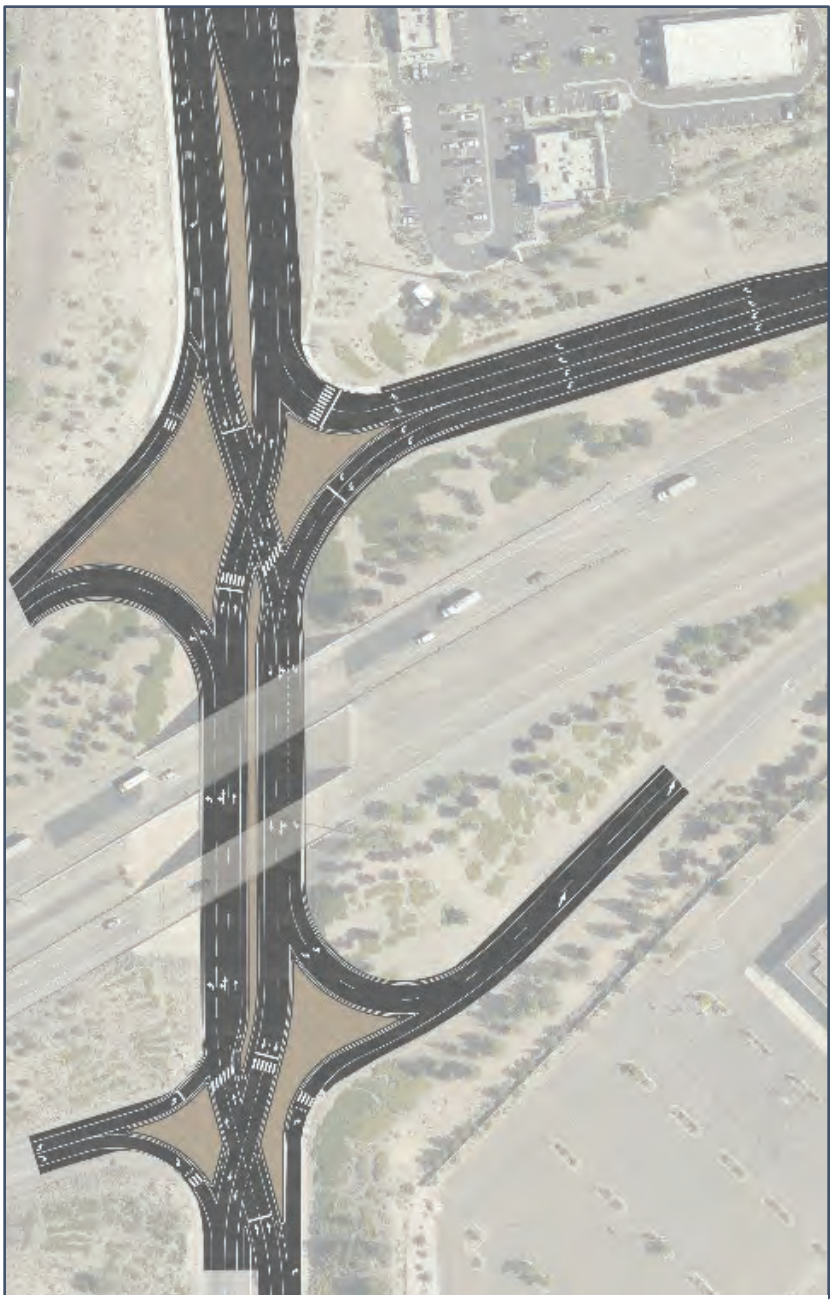


Figure 40: I-80 Diverging Diamond

Table 7: DDI LOS Comparison

Ramp Intersection	Existing LOS (AM/PM)	DDI LOS (AM/PM)
I-80 Eastbound	F/F	B/D
I-80 Westbound	C/D	B/D

One concern with DDIs is that they tend to operate too well and push too much traffic to the next signals upstream and downstream, overloading adjacent intersections. Qualitatively, the I-80 interchange is located far enough from the adjacent signalized intersections (West 4th Street and Sierra Highlands Drive) to avoid this tendency.

From a safety point of view, a DDI would significantly improve safety through the interchange, by not only improving operations but by reducing the number of conflict points. Conflict points are locations where two travel paths cross and crashes can occur.

A traditional diamond interchange contains 26 total conflict points across the two ramp terminal intersections. The DDI configuration simplifies the overall configuration, reducing the number of conflict points from 26 to 14, as shown in **Figure 41**. The resulting safety improvement could reduce potential crashes by 33-percent.

The DDI spot alternative was analyzed at a planning level only to determine initial viability. This concept would need to be analyzed further, including a network analysis containing the next intersections upstream and downstream, at a minimum.

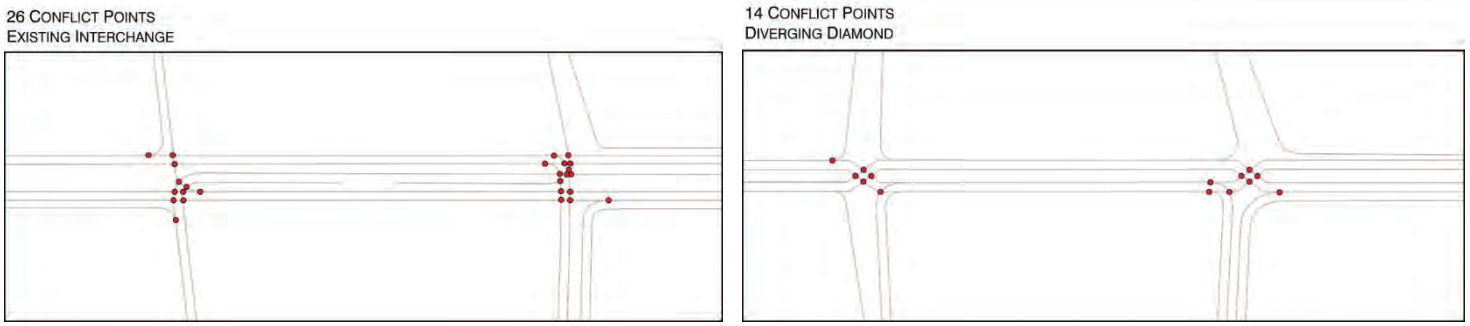


Figure 41: Comparison of Conflict Points

Las Brisas Boulevard Intersection

The existing Las Brisas Boulevard intersection consists of a three-leg intersection with Las Brisas stop-controlled and McCarran Boulevard traffic free-flow. The southbound Las Brisas movement currently operates at a LOS F with left-turning vehicles experiencing sizable delay while waiting for a gap to turn. This creates unsafe conditions, where frustrated drivers can sometimes make risky maneuvers across oncoming traffic.

An intersection analysis was completed at the McCarran Boulevard and Las Brisas Boulevard intersection to consider alternative intersection configurations. The two configurations that emerged as the most promising are a roundabout and signalized High-T intersection, as shown in **Figure 42**. The roundabout option could improve safety at the intersection by approximately 44-percent, while the High-T intersection could improve safety by approximately 17-percent. However, as shown in the intersection analysis in **Appendix J**, the roundabout operations may begin to deteriorate under future 2040 traffic volumes and would need to be replaced if McCarran Boulevard is widened to six-lanes (*RTC Washoe 2040 RTP*). Whereas the High-T intersection would operate at an acceptable LOS under 2040 conditions and need to only be expanded under a future McCarran Boulevard widening. The determination as to which intersection configuration to implement, if any, must balance the best safety option over the infrastructure's useful life against operations, cost, and other factors.

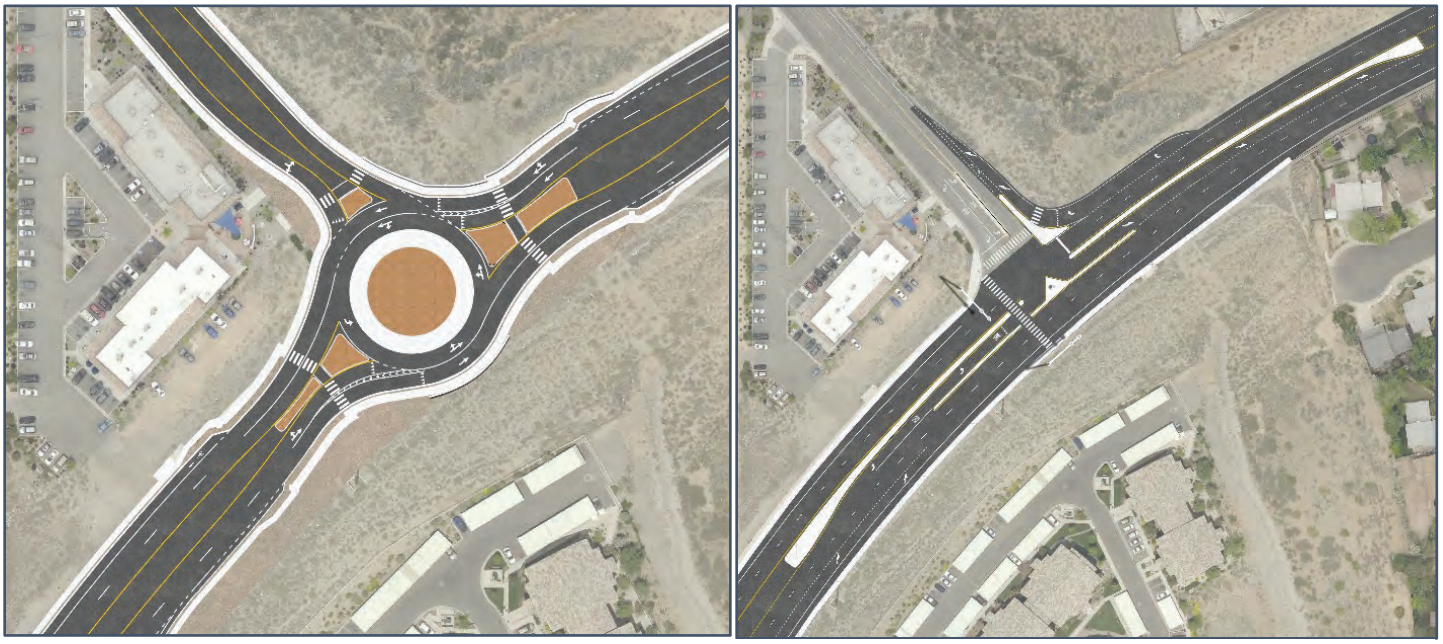


Figure 42: Las Brisas Boulevard Roundabout and Hight-T Configurations

Keystone Avenue/Leadership Parkway Intersection

The existing Keystone Avenue/Leadership Parkway intersection is not a full-movement intersection, with left-turns not permitted from both Keystone Avenue and Leadership Parkway, as shown in **Figure 43**. A worm island is in place to prevent left-turns and left-turning vehicles must make a right-turn followed by a U-turn at the next median opening. Feedback from area residents during the study and multiple complaints submitted to NDOT District II, reveal that it is not uncommon for vehicles to go around the worm island in the wrong direction to make a left-turn – an extremely unsafe, illegal movement. The City of Reno is monitoring the intersection as new developments off Leadership Parkway come online to see if signal warrants are met, however, according to City of Reno staff, warrants have not been met to date and will likely not be met in the near future.



Figure 43: Existing Keystone Avenue/Leadership Parkway

A near-term recommendation for the Keystone Avenue/Leadership Parkway intersection is to extend the length of the worm island through raised delineators to further discourage illegal left-turns. This could be done with minor initial capital investment; however, it is recognized that delineators often need to be replaced.

A more permanent option is to convert the intersection into a roundabout, as shown in **Figure 44**. A roundabout at this location would have several benefits including:

- Restoring full movements for all intersection traffic - Left-turning vehicles from the cross-streets would no longer have to make U-turns at the next median opening to the east or west.
- Providing speed reduction - Keystone Avenue/Leadership Parkway is located almost directly between the North Virginia Street and Kings Row intersections, a total distance of two-miles. This segment experiences high speeds (Posted Speed: 50 MPH, 85th Percentile Speed: 59 MPH) and incorporating a roundabout would force all McCarran Boulevard vehicles to slow down to below 25 MPH to traverse through the roundabout. This could significantly reduce average speeds in this segment.
- Support safer bike and pedestrian crossings - Peavine Mountain to the north is a popular place for hiking and biking and a bicycle store is planned to be built just west of the intersection. The existing intersection does not provide any crosswalks, thus a roundabout with crosswalks in each leg would eliminate this issue.



Figure 44: Keystone Avenue/Leadership Parkway Roundabout

The roundabout was modeled under existing traffic conditions using Sidra analysis software and found it would operate at LOS A. It was estimated to operate at LOS D and F under 2030 and 2040 conditions respectively, however, given the existing configuration, the turning movement traffic counts do not provide counts for vehicles turning left from the cross-streets and a conservative approach of assuming all right-turns are left-turns was used. Therefore, these LOS estimates for future years are very conservative. The LOS outputs can be viewed in **Appendix K**.

One challenge with a roundabout at Keystone Avenue/Leadership Parkway is the fact that the *RTC Washoe 2040 RTP* identifies McCarran Boulevard to be widened to six lanes from West 7th Street to North Virginia Street in the 2030-2040 horizon. With a McCarran Boulevard widening, the roundabout would need to be converted to a signalized intersection. However, the roundabout would provide the benefits noted above for the next 15 to 20 years before the widening occurs, assuming a widening continues to be warranted in future RTP updates.

North Virginia Street Intersection

North Virginia Street connects directly to UNR and downtown Reno, as well as to the North Valleys. Therefore, the intersection with McCarran Boulevard carries significant traffic volumes. The intersection was expanded in 2017 to add capacity and the improvements also included crosswalks, ADA ramps, and bike lanes. With these recent improvements, this SMP is not recommending any major reconfigurations at this location. However, the right-turn lanes in three of the four intersection quadrants could be modified to tighten the right-turn radii, as shown in **Figure 45**. This would slow speeds through the turn lanes and improve safety for crossing pedestrians.



Figure 45: North Virginia St. Right-Turns

Evans Avenue/Socrates Drive Intersection

The existing signalized intersection at Evans Avenue/Socrates Drive provides access to UNR and to residences to the north. The intersection includes pedestrian signals, full crosswalks, and ADA ramps in three of four quadrants. Yet, there were two pedestrian fatalities at this location. The corridor improvements section included an option to reduce a lane in each direction on the west leg of the intersection, which would reduce the number of lanes for pedestrians to cross. The corridor improvements to the west would also complete sidewalks and ramps in all quadrants. Both of these corridor improvements benefit the Evans Avenue/Socrates Drive intersection from a multi-modal point of view. Furthermore, should the west leg be reduced to a four-lane section, this would enhance the possibility for the intersection to be converted into a roundabout, as shown in **Figure 46**. The roundabout would bring multiple benefits including:

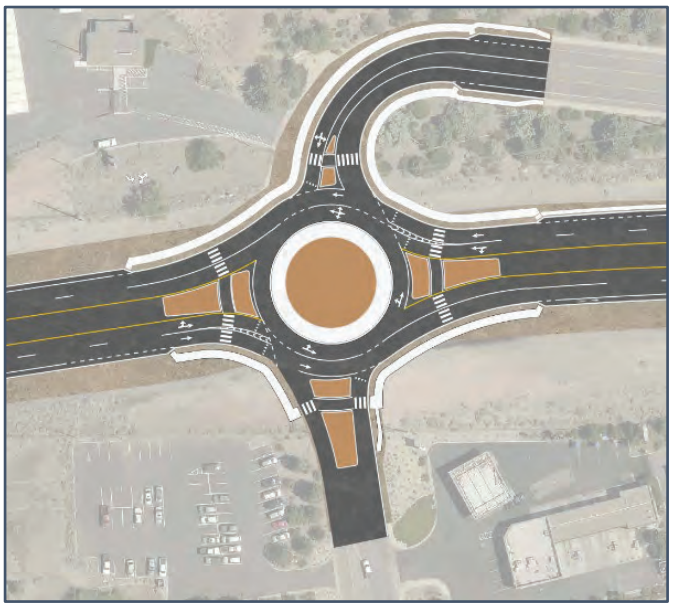


Figure 46: Evans Ave/Socrates Dr Roundabout

- Provide an easier crossing for pedestrians to negotiate with refuges in between each direction of travel
- A potential 30-percent reduction in crashes
- Force all McCarran Boulevard through vehicles to slow down

The roundabout was analyzed using Sidra analysis software and found that it would operate at a LOS C in the AM peak and LOS E in the PM peak. This compares to LOS C in the AM peak and LOS D in the PM peak with the existing signalized intersection. While the PM peak appears materially worse from a LOS standpoint, the calculated difference in delay is only 1.5 seconds. The LOS outputs can be viewed in **Appendix K**.

In the near-term, the signalization at Evans Avenue could be optimized to improve intersection performance and incorporate a leading pedestrian interval (LPI). Additional lighting was installed during the study and therefore not included in near-term recommendations.

Sutro Street Intersection

The existing signalized intersection with Sutro Street serves a popular convenience store to the north and Hug High School to the south of McCarran Boulevard. During breaks, a lot of students were observed crossing McCarran Boulevard to visit the convenience store. Hug High School is slated to be repurposed as a vocational high school, however, there will likely still be demand for pedestrian traffic across McCarran Boulevard. With that, potential safety improvements were considered for this location.

Given the pedestrian traffic in the area, tightening the right turn lane radii in each quadrant would encourage vehicles to slow down where pedestrians cross, increasing safety and reducing the severity of any conflicts. A longer-term opportunity is to reconfigure the intersection into a roundabout, slowing vehicles down, reducing conflict points with other vehicles, and reducing the severity of incidents. The roundabout concept could reduce crashes by one-third. **Figure 47** illustrates the Sutro Street and McCarran Boulevard intersection alternatives and the LOS outputs can be viewed in **Appendix K**.



Figure 47: Sutro Street Alternatives

It should be noted that traffic volumes in the future at this location could exceed the operational capacity of a roundabout. Therefore, a detailed ICE analysis should be conducted to compare the safety benefits over the installation's lifespan against the implementation cost.

Spot Alternatives Summary

The previous section outlined spot location intersection alternatives that could be considered to improve safety and reduce crashes in the study area. The potential operational and safety benefits of these intersection alternatives are summarized in **Table 7**, along with their corresponding benefit-cost calculations. The benefit-cost calculations reflect those stemming from crash reduction only. A more detailed analysis would be required to address broader benefits, such as changes in delay, emissions, etc. This information may be used to inform alternative selection and/or prioritization.

Table 7: Spot Location Alternatives Summary

Spot Location Alternative	*Existing LOS (AM/PM)*	*Proposed LOS (AM/PM)*	*Potential Crash Reduction*	*Conceptual Cost*	*Safety Benefit-Cost*
I-80 Diverging Diamond Interchange	F/F (EB) C/D (WB)	B/D (EB) B/D (WB)	33%	$8,000,000	0.50
Las Brisas High-T Intersection	F/F	C	17%	$630,000	0.61
Las Brisas Roundabout Intersection	F/F	A/B	44%	$2,800,000	0.36
Keystone Avenue/Leadership Parkway Roundabout	D/D	A/A	30%	$2,600,000	0.28
N. Virginia Street Tighten Right-Turns	-	-	5%	$350,000	1.29
Evans Ave./Socrates Dr. Roundabout Intersection	C/D	C/E	30%	$2,500,000	6.90
Sutro Street Tighten Right-Turns	-	-	5%	$300,000	0.95
Sutro Street Roundabout Intersection	C/D	B/C	30%	$2,500,000	0.68

8.5 Other Safety Recommendations

In addition to the corridor and spot safety recommendations described above, other minor spot improvements were identified throughout the corridor, which include:

- Reduce the 50 MPH posted speed limit to 45 MPH to help reduce average vehicle speeds
- Add roadway lighting from Sky Mountain Drive to I-80 and at Victory Lane
- Add rip rap to sidewalk slopes to address erosion from Sky Mountain through the I-80 interchange
- Revise left-turn channelization to Sierra Highlands Drive to better define the receiving driveway (**Figure 48**)
- Increase the right-in curb extension at the 7-11, Chili's, and Walmart driveways to further discourage wrong way movements out of the driveway (**Figure 49**)
- Incorporate LPI to the signal at Evans Avenue/Socrates Drive. Other potential locations include West 7th Street and Sutro Street intersections
- Install a speed feedback sign between Keystone Avenue/Leadership Parkway and North Virginia Street
- Add green paint to bike lane transitions across right-turn lanes
- Extend turn lane queue lengths as needed and optimize signal timings

8.6 Transit Recommendations

The study area is served by RTC Transit Routes 3 and 4, with nine stops located from West 7th Street to Las Brisas Boulevard. The RTC regularly updates routes and frequency as part of their ongoing program, thus no analysis was completed regarding these elements. The study team did review transit stop locations and their accessibility for safety improvements, and two locations were identified for potential improvements – West 7th Street and the Viewcrest Shopping Center.



Figure 48: Sierra Highlands Drive Left-Turn Channelization

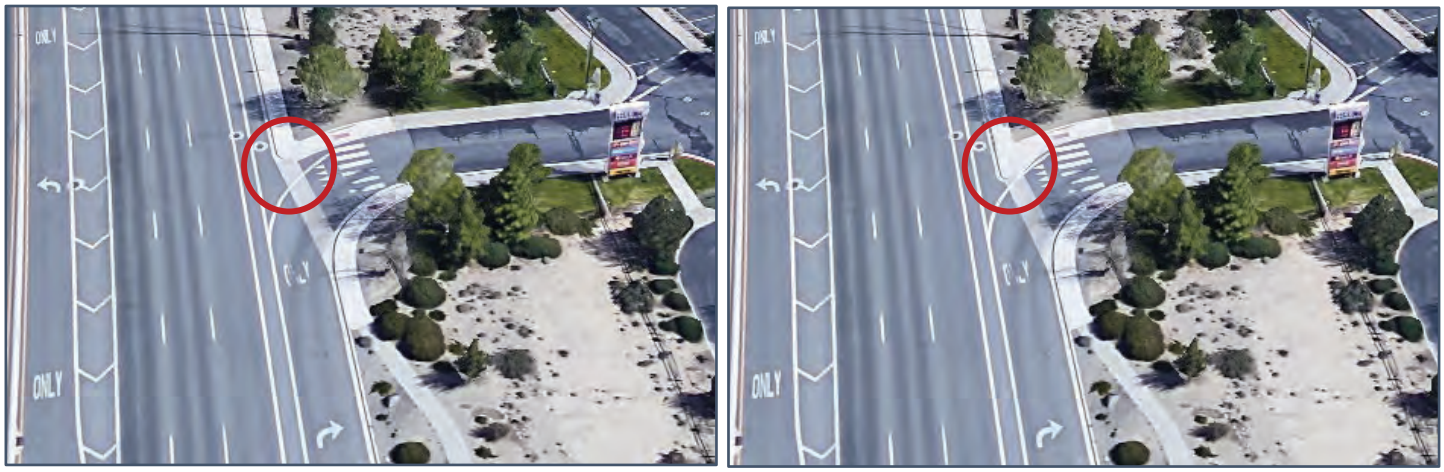


Figure 49: Increase Right-In Curb Extension

West 7th Street and McCarran Boulevard

The existing transit stop, located at the southeast corner of the West 7th Street and McCarran Boulevard intersection, serves RTC Route 4 inbound and consists of a bench and shelter. The transit stop lies approximately 150-feet from McCarran Boulevard. There is no turnout and buses stop in what is a drop lane into a commercial center, one of two lanes receiving left-turning vehicles from McCarran Boulevard. When buses are loading and unloading, left-turning vehicles in the outside lane are quickly impeded by the stopped bus. This can cause erratic merging maneuvers, hard braking, and back-ups into McCarran Boulevard. To alleviate this situation, the existing transit stop could be relocated south of the commercial entrance, a distance of approximately 450-feet from McCarran Boulevard. This would eliminate the conflict with the drop lane and put the transit stop where vehicles will have already merged into a single lane. Furthermore, during the public outreach process, it was suggested to incorporate a signalized pedestrian crossing to not only serve the transit stop but also the Vintage Hills Senior Apartments on West 7th Street.

Viewcrest Shopping Center

The Viewcrest shopping center is located on the northwest quadrant of the McCarran Boulevard/Kings Row intersection. A transit stop exists in front of the shopping center serving outbound Route 3, it does not have any amenities, and is denoted by a single sign. The sign is located in slope paving separating the shopping center delivery driveway from an acceleration lane and McCarran Boulevard shoulder, as shown in **Figure 50**. Waiting riders must stand in an active acceleration lane with no barrier or protection, which creates a potential multi-modal conflict. Furthermore, the existing driveway configuration has mutiple points of on-site circulation accessing the same exit, creating additional confusion.



Figure 50: Viewcrest Transit Stop

Given the site constraints, driveways and circulation could be improved to better denote exits while also providing for a safer transit stop location, one that eliminates the existing conflict and moves waiting passengers behind a concrete curb. **Figure 51** illustrates a layout of this potential concept.

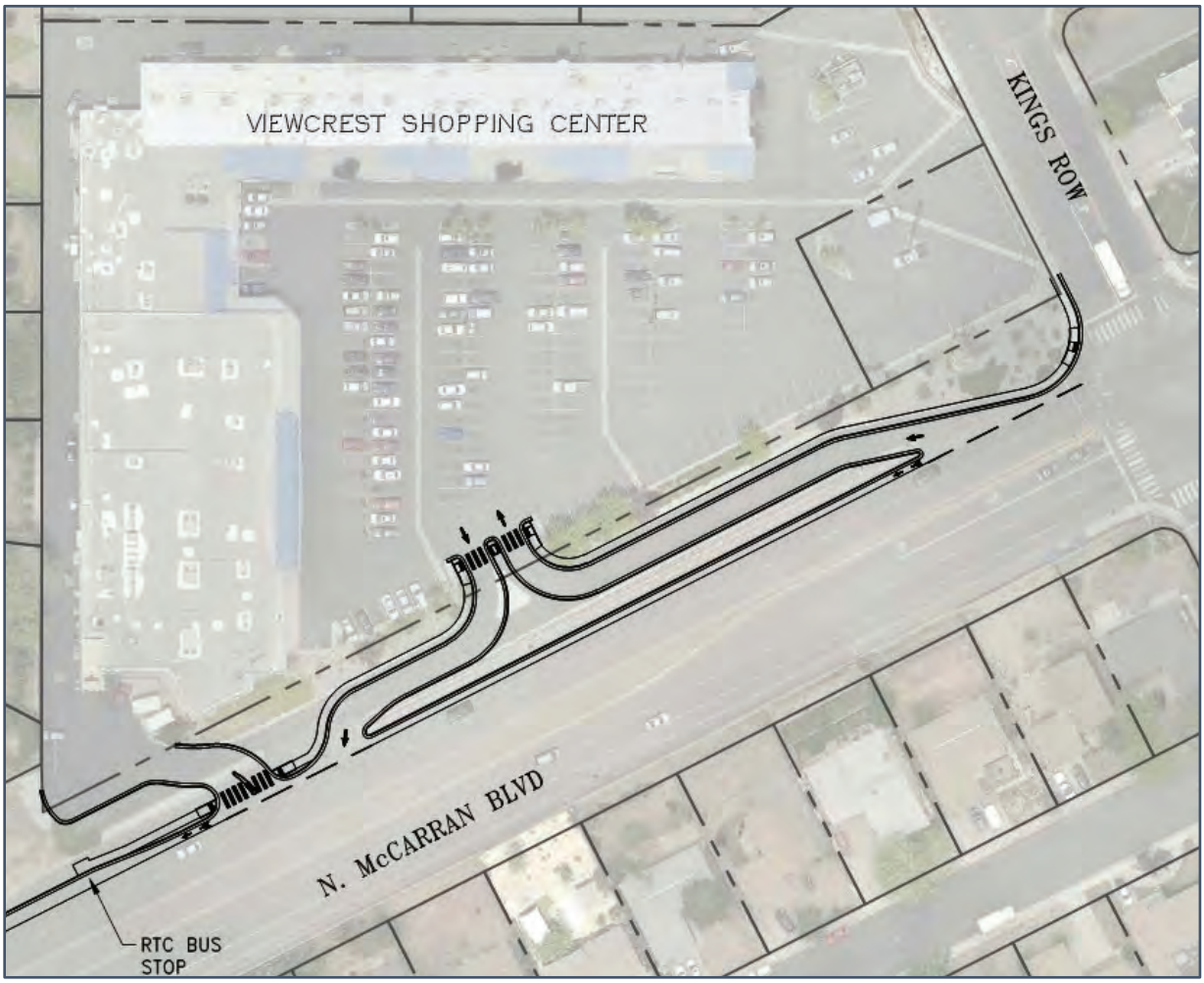


Figure 51: Viewcrest Access and Transit Stop Reconfiguration

8.7 Alternatives Considered but not Recommended

Several alternatives were considered but not included in the list of recommendations. It is important to document these along with why they were not advanced as recommendations, so decision-makers understand the full scope of the study. **Table 8** lists those concepts that were considered but not recommended along with the reasons why.

Table 8: Summary of Dismissed Alternatives

Alternative Concept	Reasons for Dismissal
Convert I-80 interchange into a single-point urban interchange (SPUI)	The existing skew between I-80 and McCarran Boulevard causes ramps to bow out considerably; furthermore, the SPUI would likely not improve overall safety compared to the existing condition
Roundabout at Sky Country	This location was dismissed in lieu of a roundabout recommendation at Keystone Avenue/Leadership Parkway
Roundabout at Victory Lane	This location was dismissed in lieu of a roundabout recommendation at Keystone Avenue/Leadership Parkway
Lane reductions (road diets)	Existing and/or near-term traffic volumes preclude lane reductions due to capacity demands, outside of North Virginia Street to Evans Avenue/Socrates Drive

8.8 Environmental Considerations

Due to the conceptual nature of the alternatives outlined, impacts to the natural and human environment were not considered quantitatively or in detail, but rather at a planning level. This consideration did not have a significant impact on alternative development.

9.0 One Nevada Transportation Plan

The One Nevada Transportation Plan (ONTP) is Nevada's federally-mandated long-range transportation plan that addresses the state's transportation needs, priorities, and issues over a 20-year horizon. The ONTP identifies the goals, priorities, strategies, and actions necessary to maintain a safe and efficient transportation system with limited future funding. The ONTP incorporates six major goals, as shown in **Figure 52**, and sets forth a project prioritization process that matches needs and potential projects to these goals. Therefore, those needs and projects that best address multiple goals will be more favorable for advancing through the project development process.



Figure 52: One Nevada Transportation Plan Goals

To aid the planning process, the corridor and major spot improvement alternatives described in Section 8 have been qualitatively considered against the ONTP goals. **Table 9** provides a sketch planning-level review of how well each alternative supports each of the six goals areas. These factors will need to be further refined prior to detailed project prioritization, but provides an initial snapshot for consideration. A qualitative scoring system is used ranging from "Highly Unsupportive" to "Highly Supportive."

Table 9: ONTP Comparison

Alternative Description	Enhance Safety	Preserve Infrastructure	Optimize Mobility	Transform Economies	Foster Sustainability	Connect Communities
Corridor Alternatives						
Summit Ridge to I-80 – Buffered Bike Lanes	^	-	^	-	^	^
I-80 to Las Brisas Blvd. – Buffered Bike Lanes	^	-	^	-	^	^
Las Brisas Blvd. to N. Virginia St. – Buffered Bike Lanes & Sidewalks	^^	v	^^	-	^^	^
Las Brisas Blvd. to N. Virginia St. – Multi-Use Path	^^	v	^^	-	^^	^
N. Virginia St. to Evans Ave./Socrates Dr. – Lane Reduction, Bike Lanes, & Sidewalk	^^	v	^^	^	^^	^
N. Virginia St. to Evans Ave./Socrates Dr. – Buffered Bike Lanes & Sidewalk	^^	v	^^	^	^^	^
Evans Ave./Socrates Dr. to Sutro St. - Buffered Bike Lanes & Sidewalks	^^	v	^^	-	^^	^
Evans Ave./Socrates Dr. to Sutro St. – Multi-Use Path	^^	v	^^	-	^^	^
Sutro St. to Clear Acre Ln. - Buffered Bike Lanes & Sidewalks	^^	v	^^	-	^^	^
Spot Alternatives						
I-80 Diverging Diamond Interchange	^^	-	^^	-	^	-
Las Brisas High-T Intersection	^	v	^	-	-	-
Las Brisas Roundabout Intersection	^^	-	^	-	-	-
Keystone Avenue/Leadership Parkway Roundabout	^^	-	^	^	-	-
N. Virginia Street Tighten Right-Turns	^	-	-	-	-	-
Evans Ave./Socrates Dr. Roundabout Intersection	^^	^	-	^	-	-
Sutro Street Tighten Right-Turns	^	-	-	-	-	-
Sutro Street Roundabout Intersection	^^	-	^	-	-	-
W. 7th St. and McCarran Blvd. Transit Improvement	^^	-	^	-	-	-
Viewcrest Shopping Center Transit Improvement	^^	-	^	-	-	-

10.0 Stakeholder & Public Participation Plan

The study team incorporated an active collaboration process to coordinate and shape the development of the SMP, therefore a TAC was assembled to provide a venue for interagency collaboration. Participating agencies included the NDOT Traffic Safety Engineering Division, NDOT Traffic Operations, NDOT District II, the City of Reno, RTC of Washoe County, Washoe County Parks, Washoe County, Reno Police Department, Nevada Department of Public Safety, UNR, UNR Police Department, Reno Fire Department, and the Nevada Highway Patrol. Three TAC meetings were held in addition to a TAC RSA; materials for each meeting can be found in **Appendix L**.

The general public was given an opportunity to provide input on the SMP as well. On May 1, 2019, a public meeting was held at Rancho San Rafael Park from 11:30 AM until 1:00 PM and from 5:00 PM to 6:30 PM. The meeting was advertised in the Reno Gazette Journal one week ahead and the day before the meeting, as well as 1,500 banner ads in the digital edition. Approximately 55 participants attended and the meeting was informal with participants interacting directly with the study team.

An online overview video was provided at computer stations along with an interactive "story map" that illustrated the alternatives under consideration. The story map provided an online venue to detail SMP alternatives using both narratives and visual renderings with separate pages for corridor, spot, and other safety opportunities. Being online and linked to the NDOT North McCarran SMP webpage, the story map also allowed interested residents who could not attend the public meeting to view the same information and provide feedback to the study team.

In addition to the story map, roll plots of the study area were also provided for public meeting participants to write on, documenting issues and opportunities the public was familiar with. See **Appendix M** for copies of the public meeting handout, roll plot scans, and the comments received.

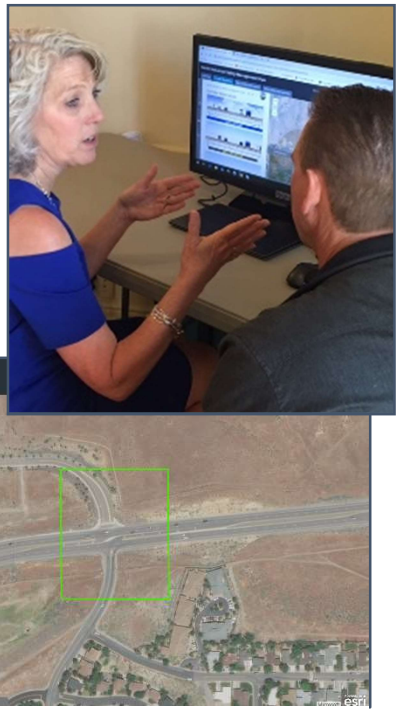
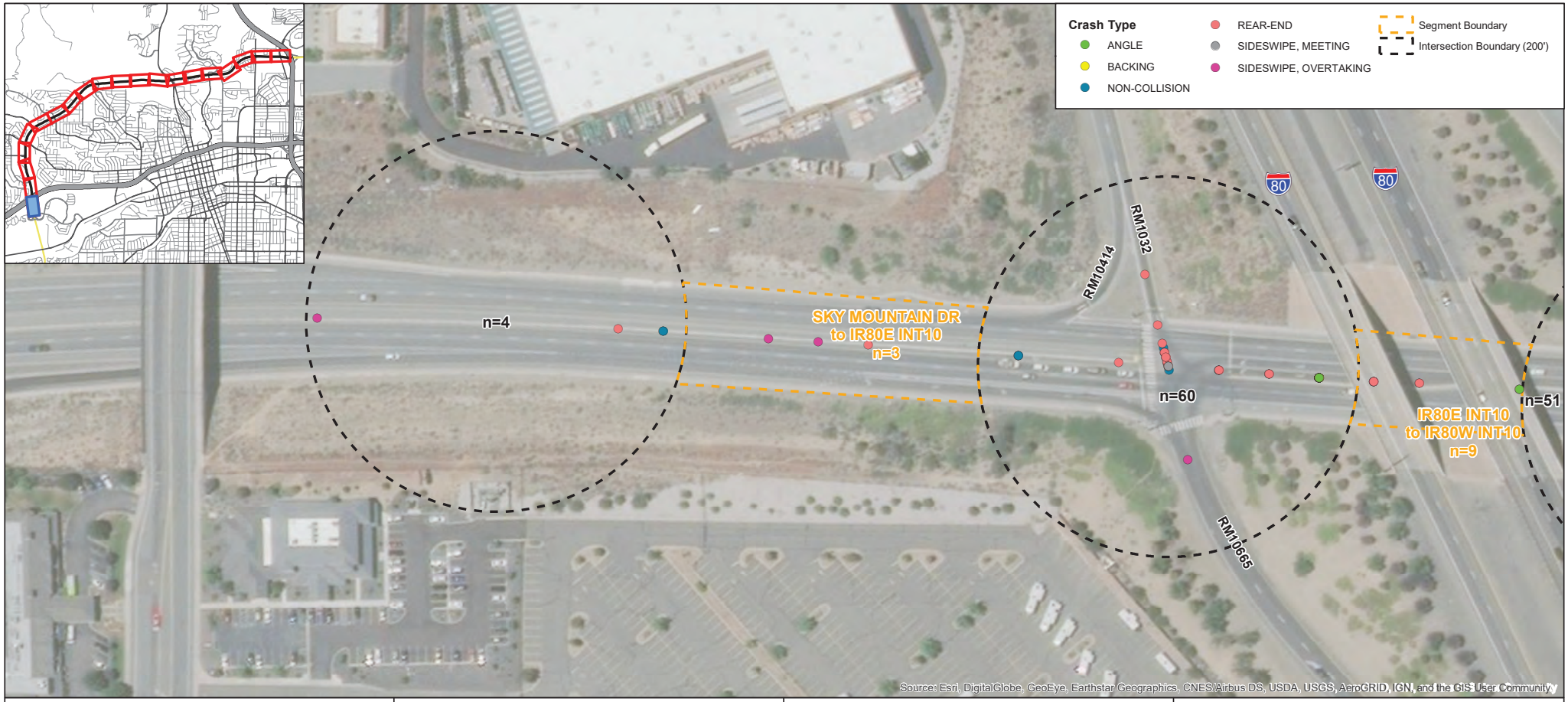
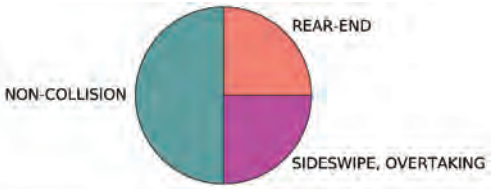


Figure 53: Public Meeting and Story Map Images

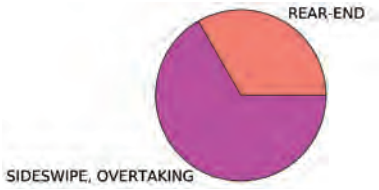
Appendix A
Crash Type Maps



SKY MOUNTAIN DR



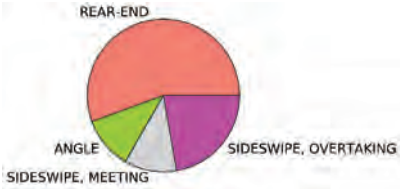
SKY MOUNTAIN DR to IR80E INT10



IR80E TO SR659 INT10



IR80E INT10 to IR80W INT10



0 50 100
FEET

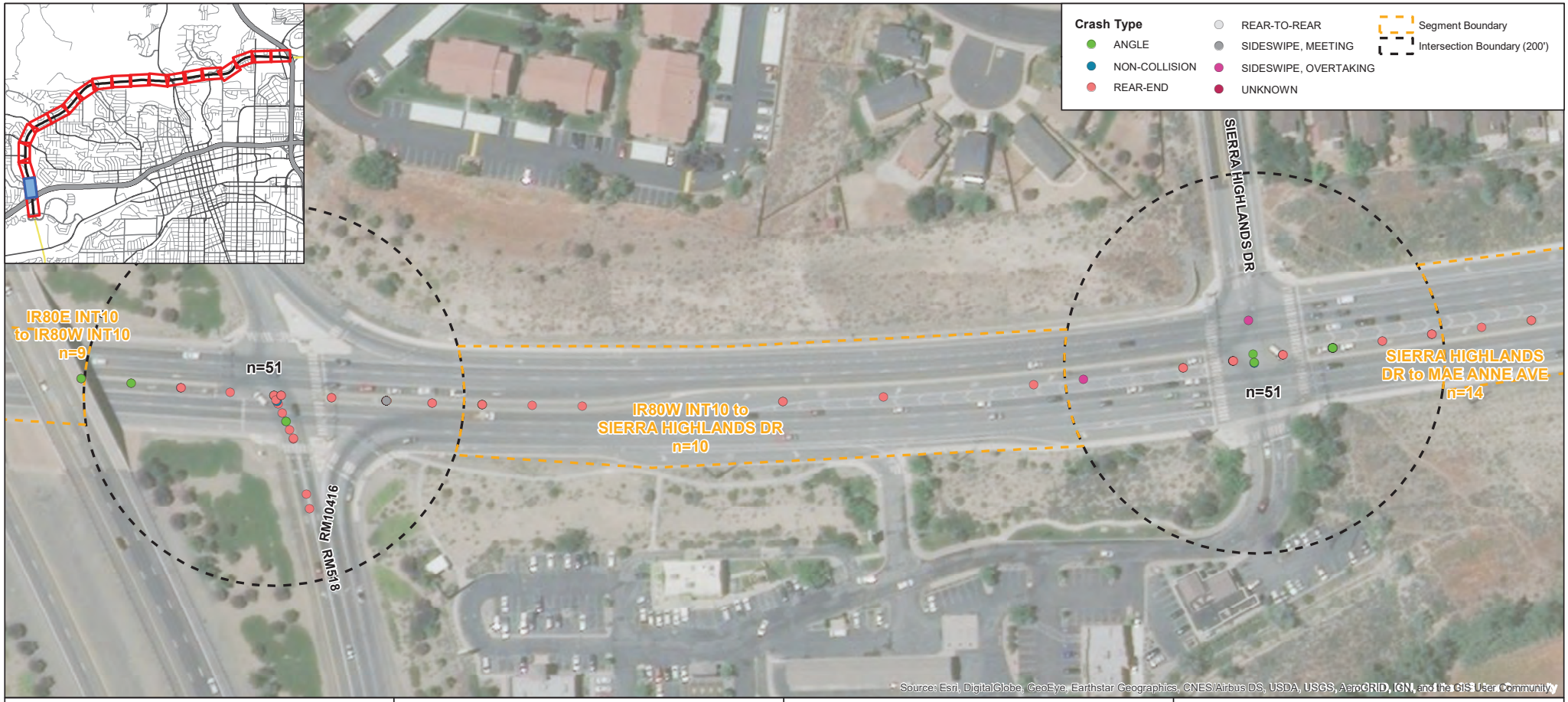
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N. McCarran Blvd Safety Management Plan

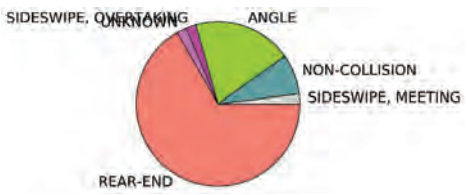
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

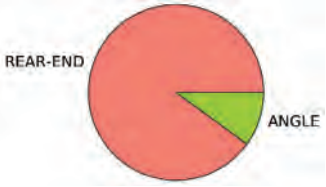
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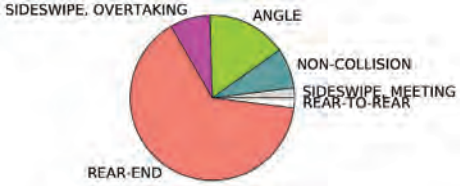
IR80W TO SR659 INT10



IR80W INT10 to SIERRA HIGHLANDS DR



SIERRA HIGHLANDS DR



0 50 100 FEET

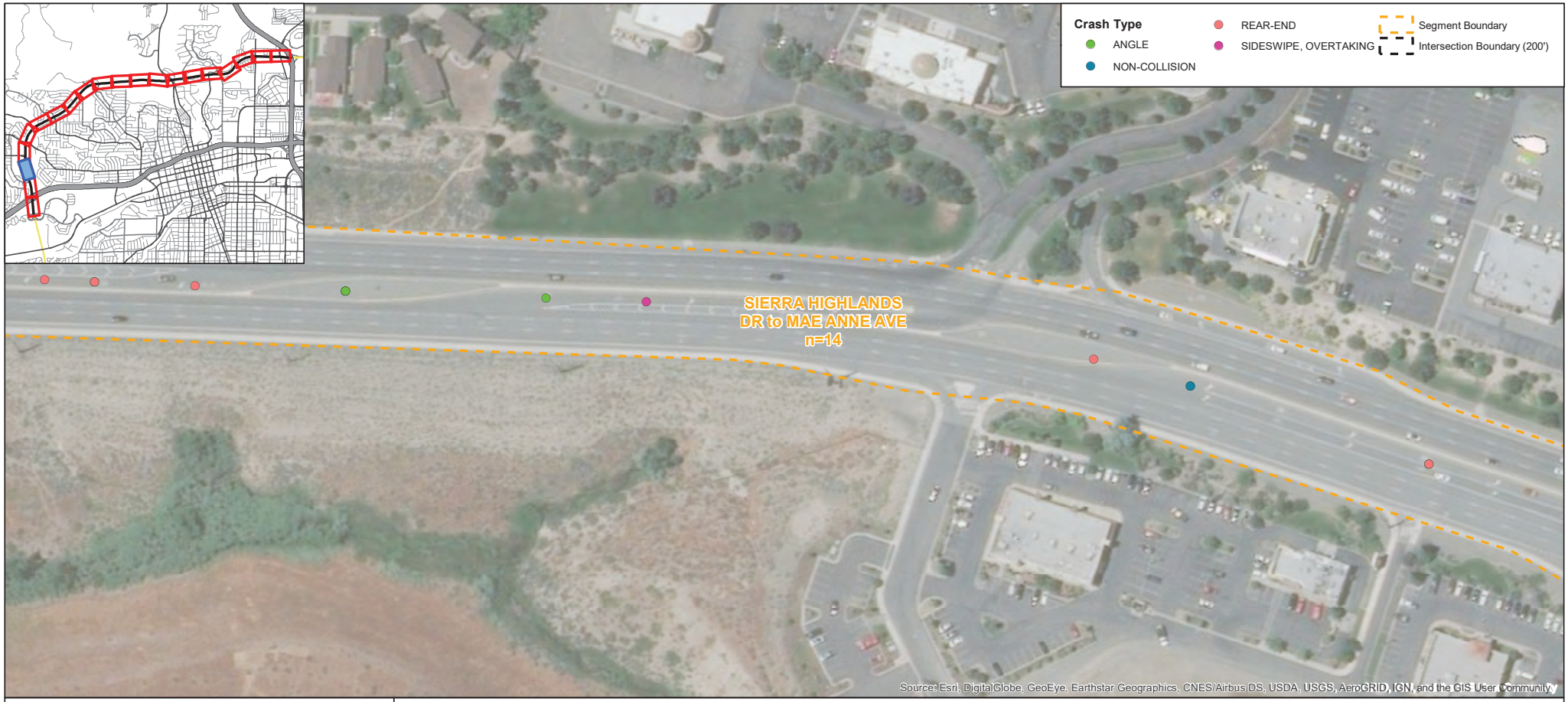
Crash Type - Sheet 2

N. McCarran Blvd Safety Management Plan

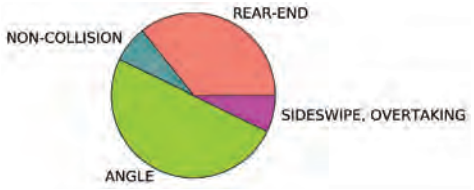
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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SIERRA HIGHLANDS DR to MAE ANNE AVE



0 50 100
FEET

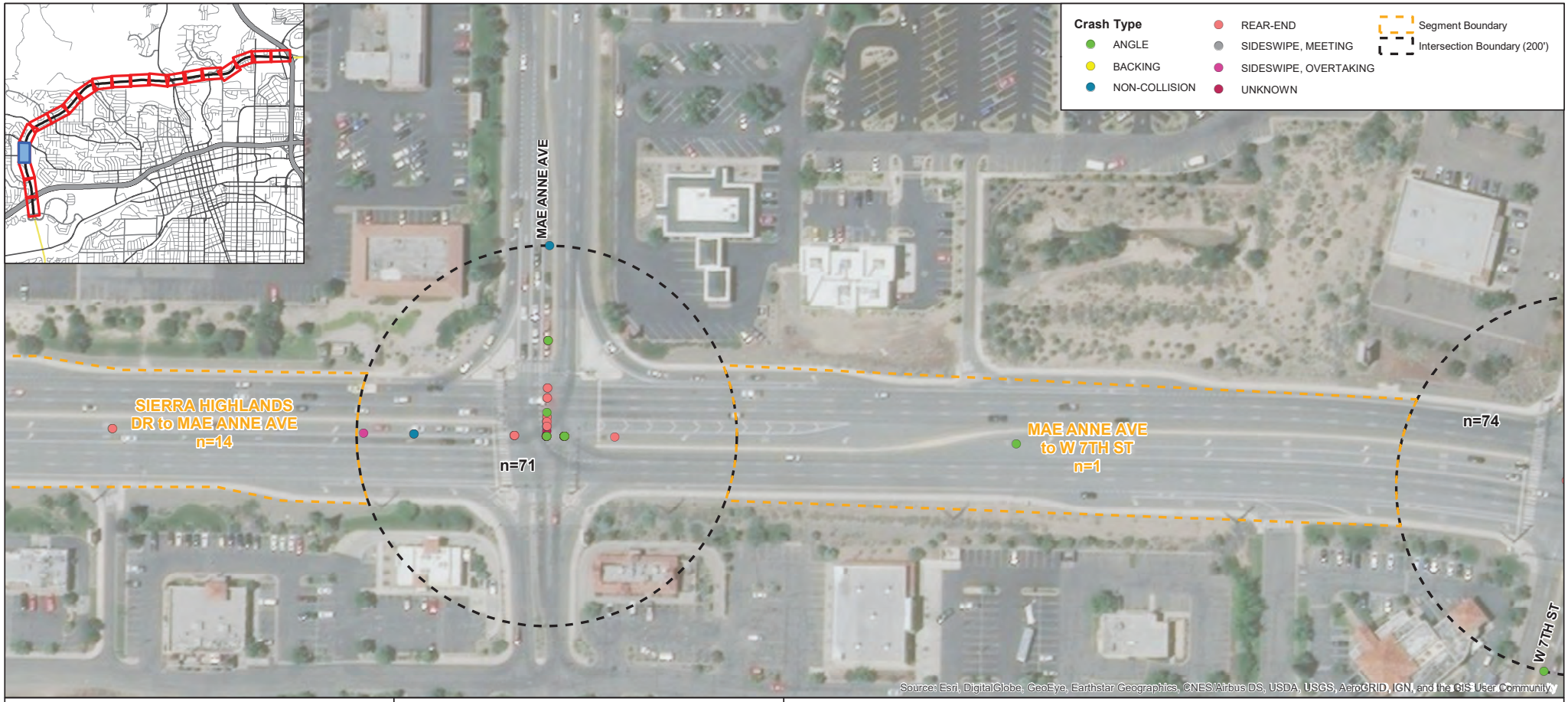
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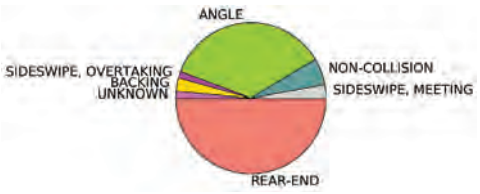
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

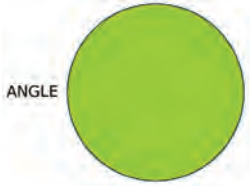
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MAE ANNE AVE



MAE ANNE AVE to W 7TH ST



0 50 100
Feet

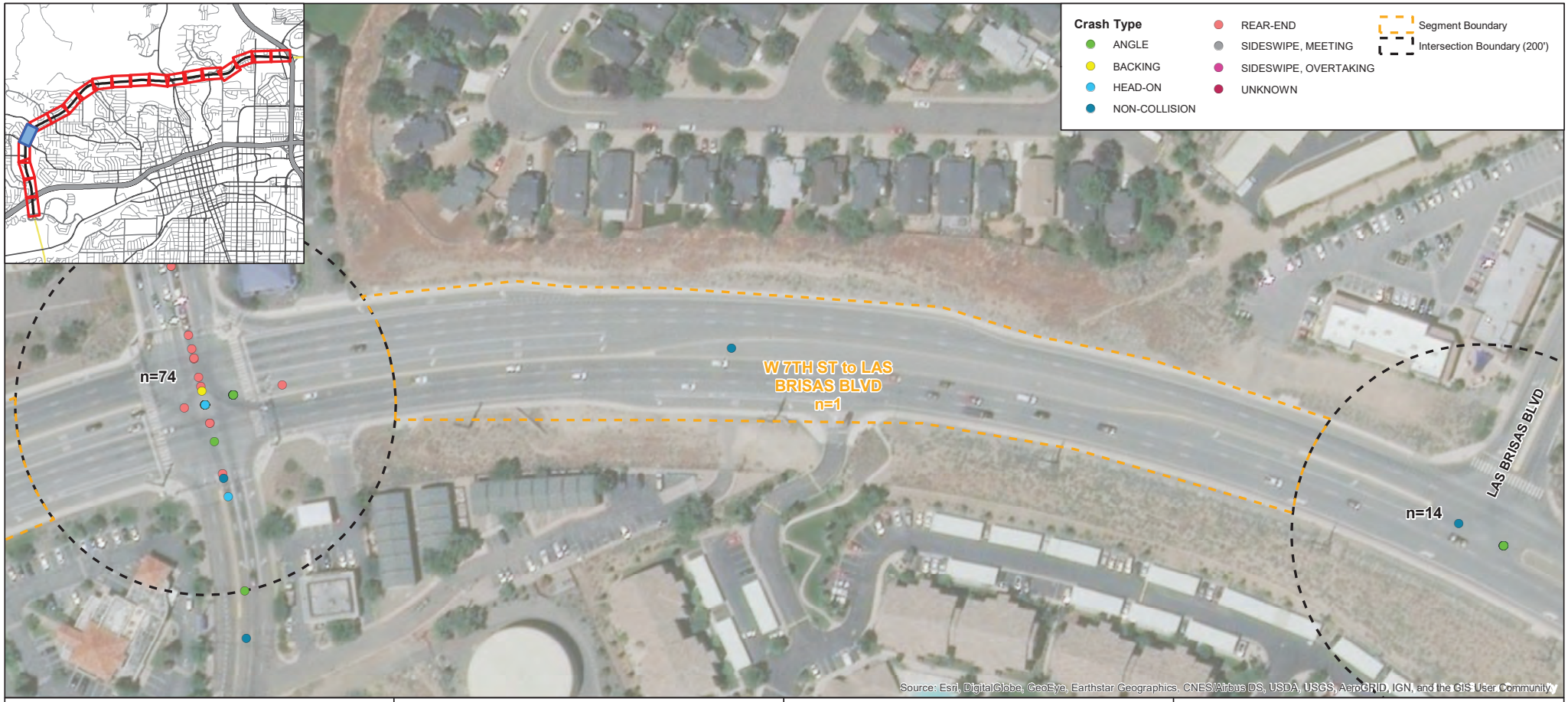
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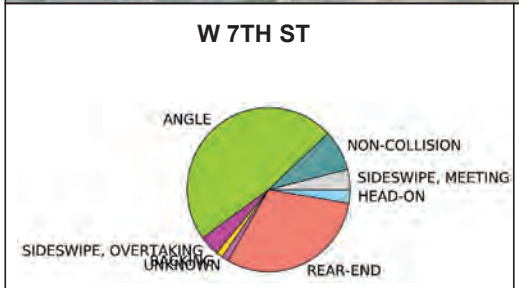
N. McCarran Blvd Safety Management Plan

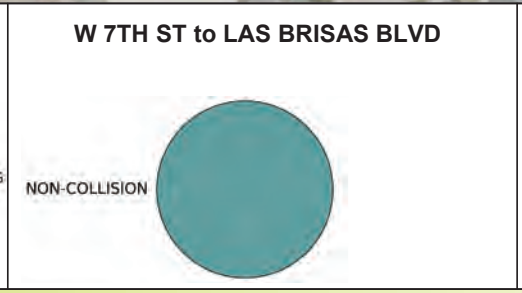
March 2019

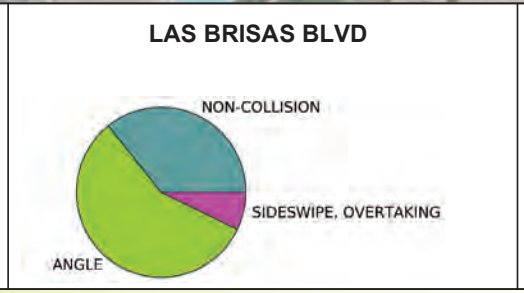
WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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0 50 100
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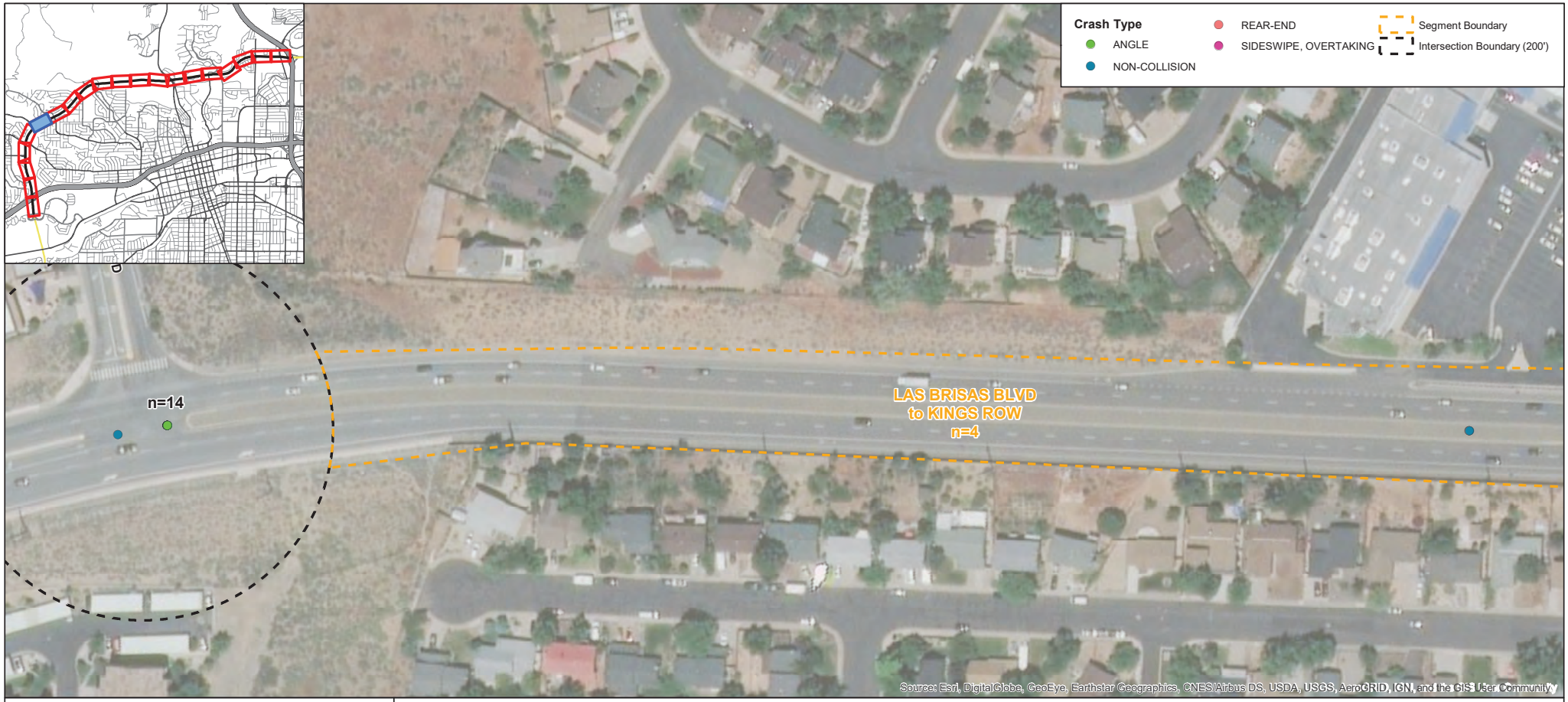
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N. McCarran Blvd Safety Management Plan

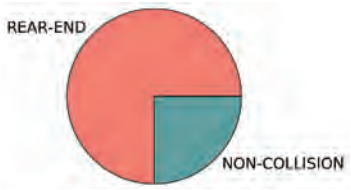
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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LAS BRISAS BLVD to KINGS ROW



0 50 100
FEET

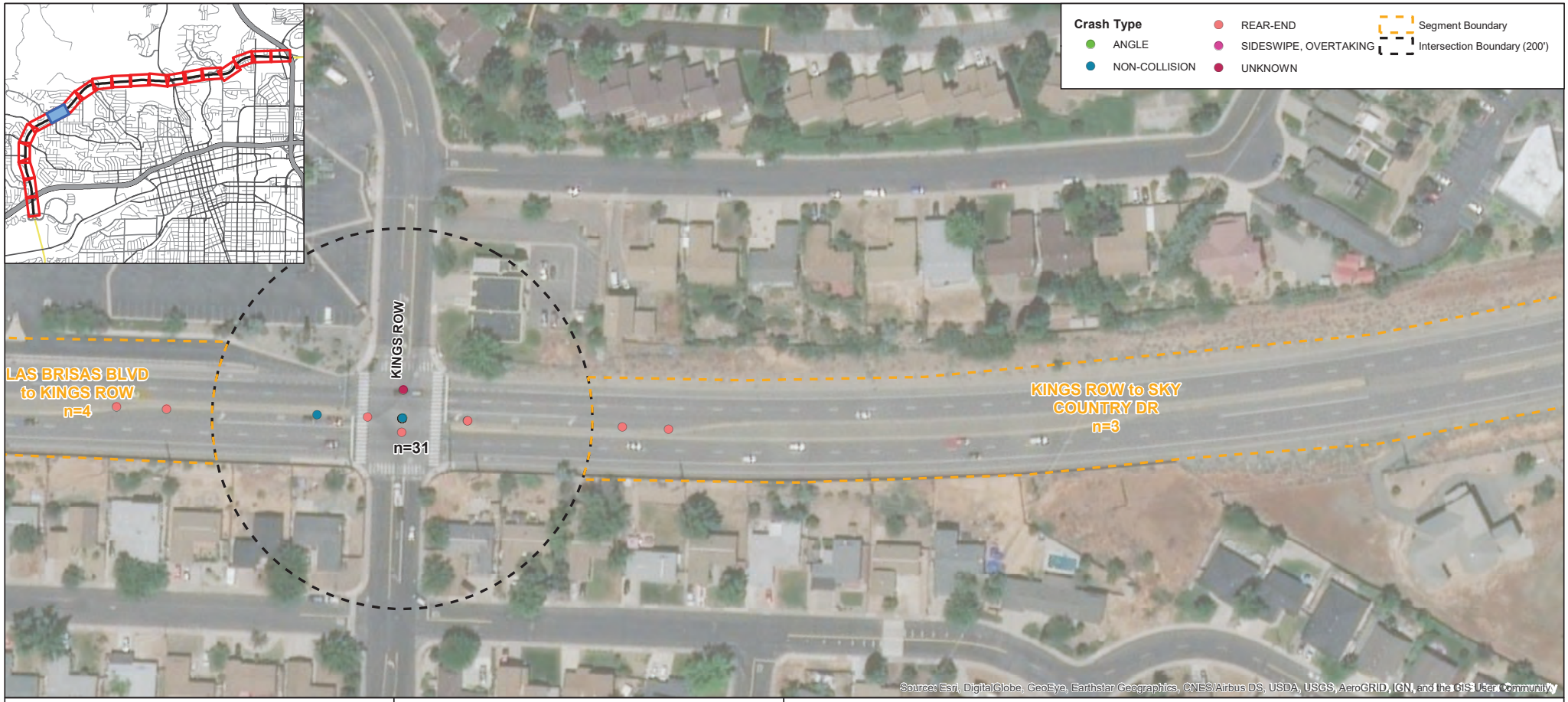
Crash Type - Sheet 6

N. McCarran Blvd Safety Management Plan

March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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KINGS ROW



KINGS ROW to SKY COUNTRY DR



0 50 100
FEET

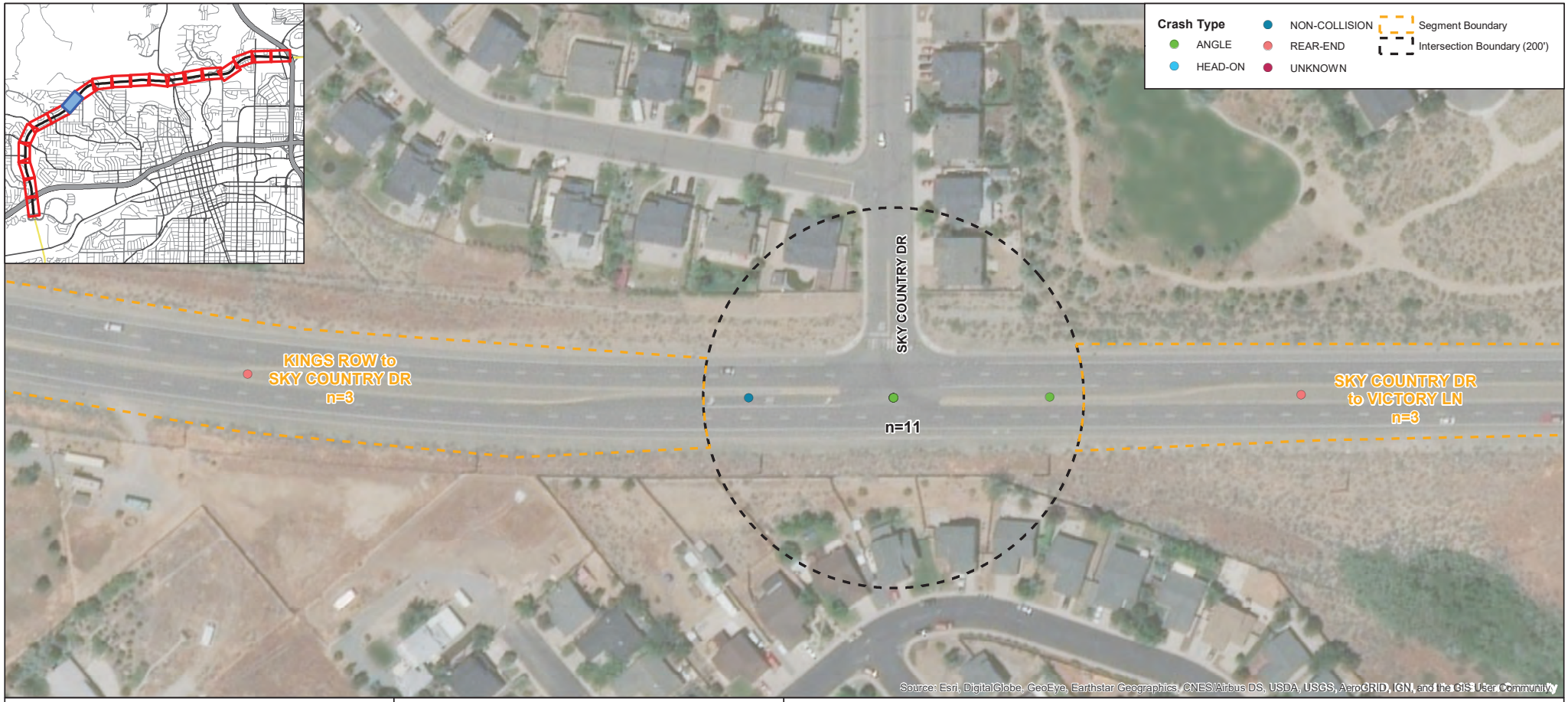
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N. McCarran Blvd Safety Management Plan

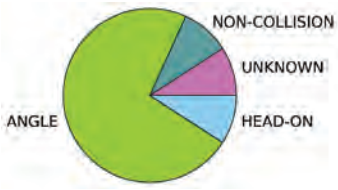
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

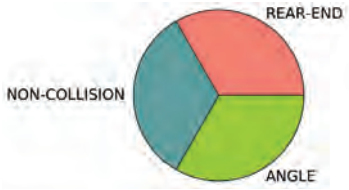
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SKY COUNTRY DR



SKY COUNTRY DR to VICTORY LN



0 50 100
FEET

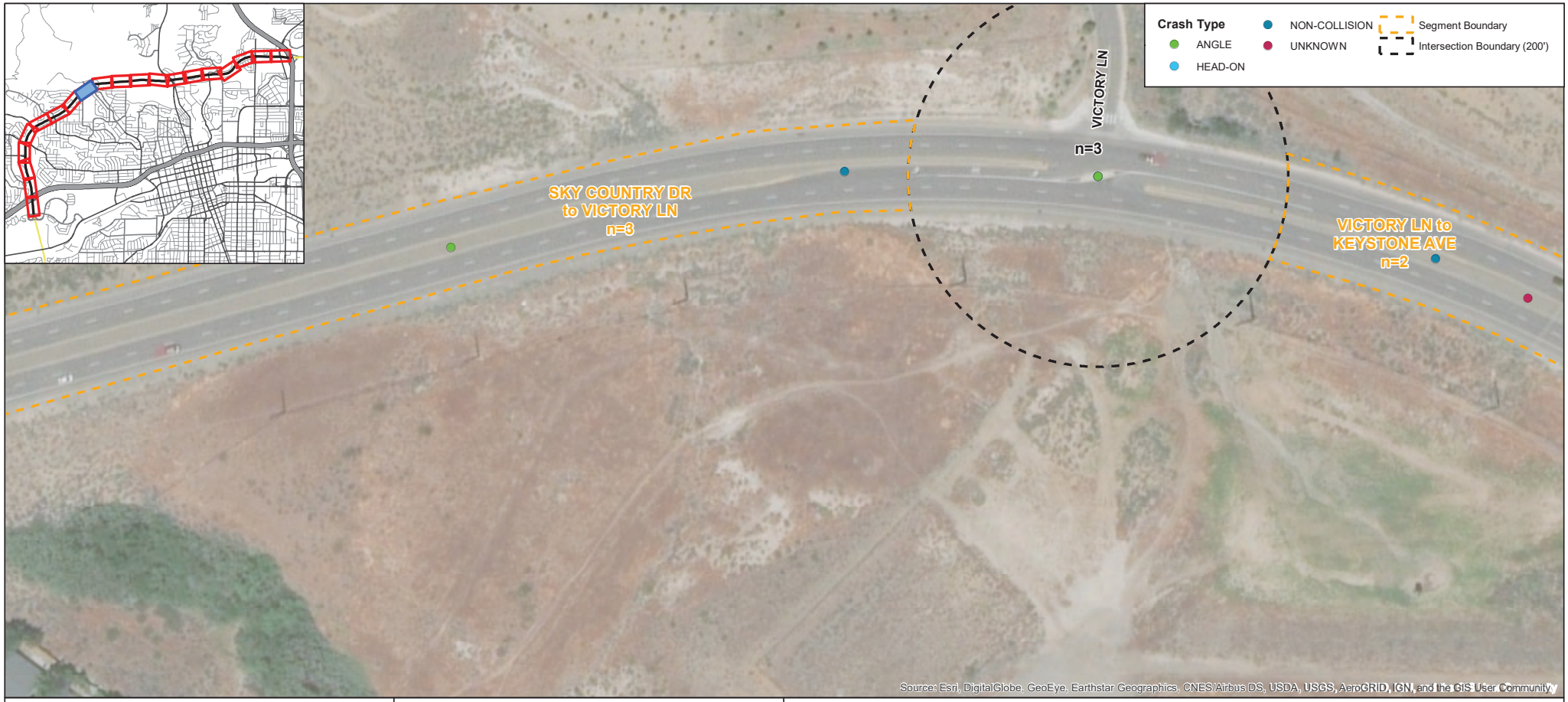
Crash Type - Sheet 8

N. McCarran Blvd Safety Management Plan

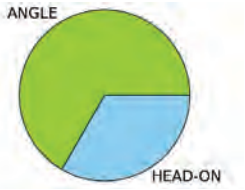
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

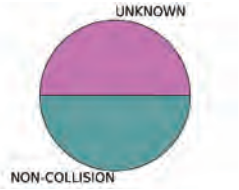
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VICTORY LN



VICTORY LN to KEYSTONE AVE



0 50 100
FEET

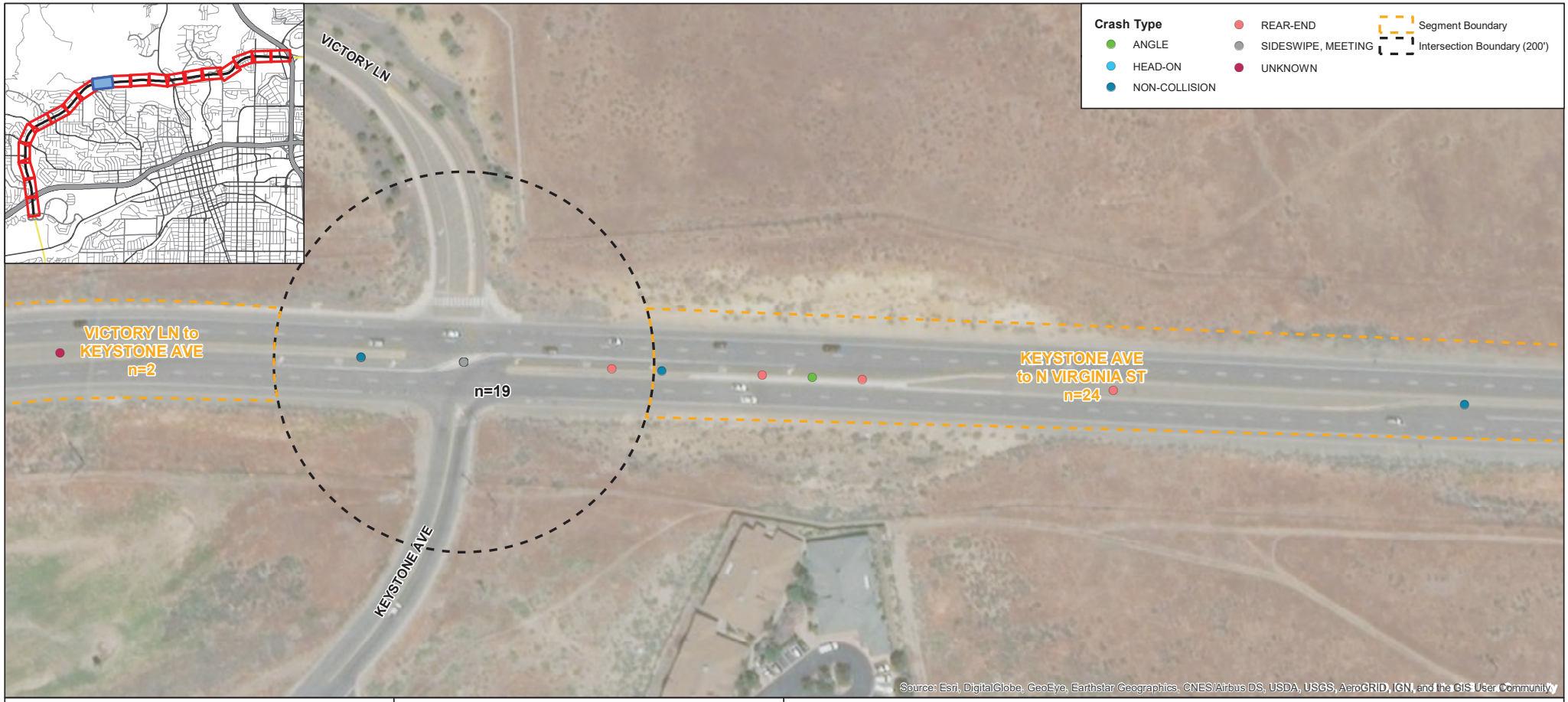
Crash Type - Sheet 9

N. McCarran Blvd Safety Management Plan

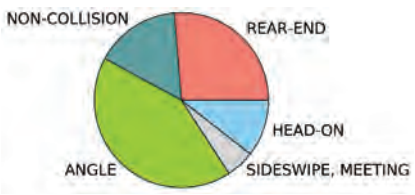
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

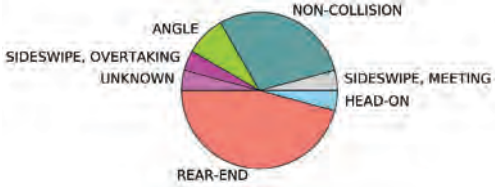
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KEYSTONE AVE



KEYSTONE AVE to N VIRGINIA ST



0 50 100
FEET

Crash Type - Sheet 10

N. McCarran Blvd Safety Management Plan

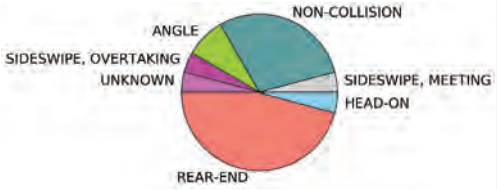
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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KEYSTONE AVE to N VIRGINIA ST



0 50 100
FEET

Crash Type - Sheet 11

N. McCarran Blvd Safety Management Plan

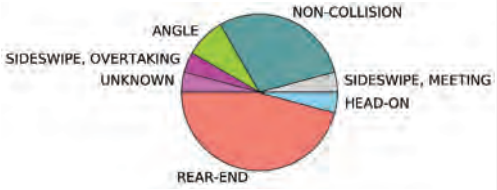
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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KEYSTONE AVE to N VIRGINIA ST



0 50 100
FEET

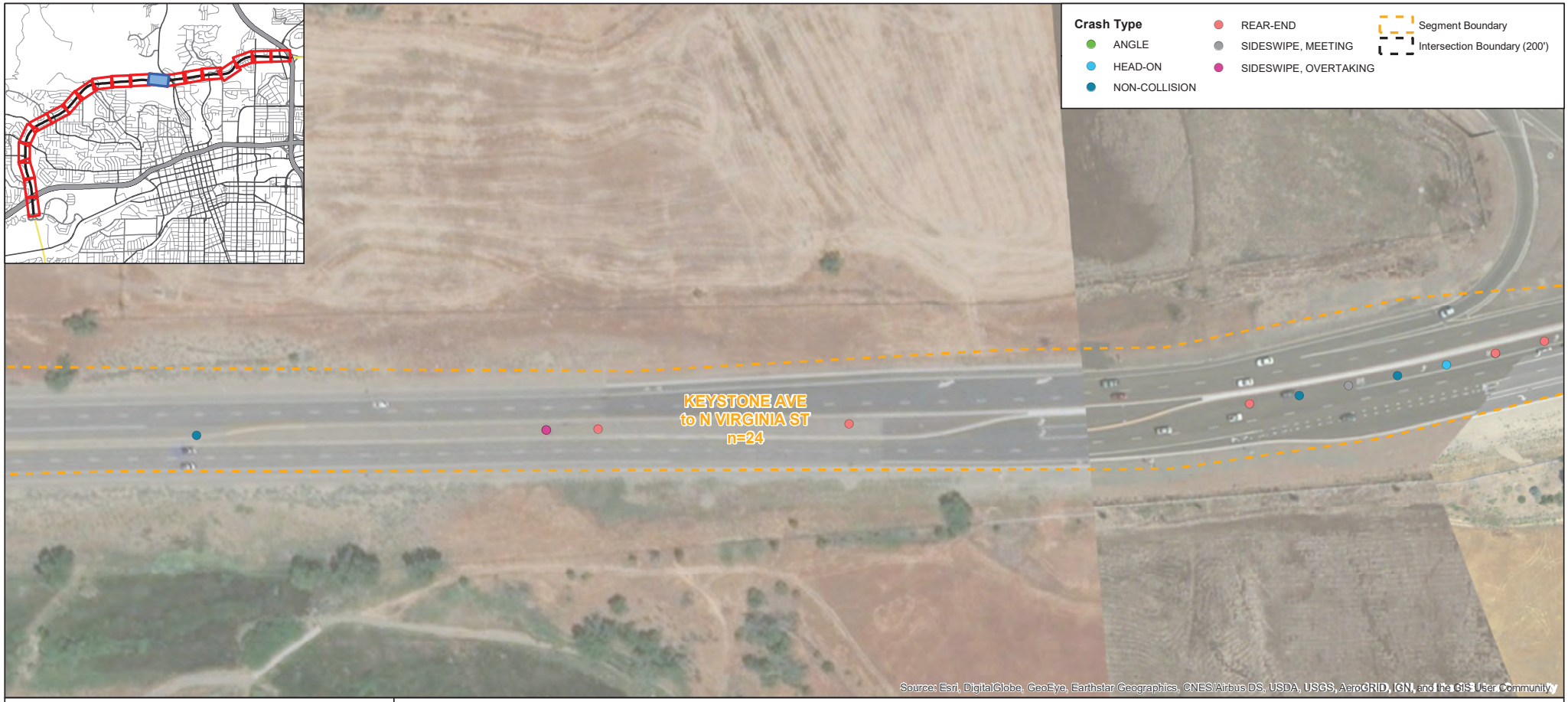
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N. McCarran Blvd Safety Management Plan

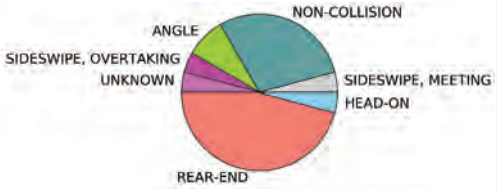
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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KEYSTONE AVE to N VIRGINIA ST



0 50 100
FEET

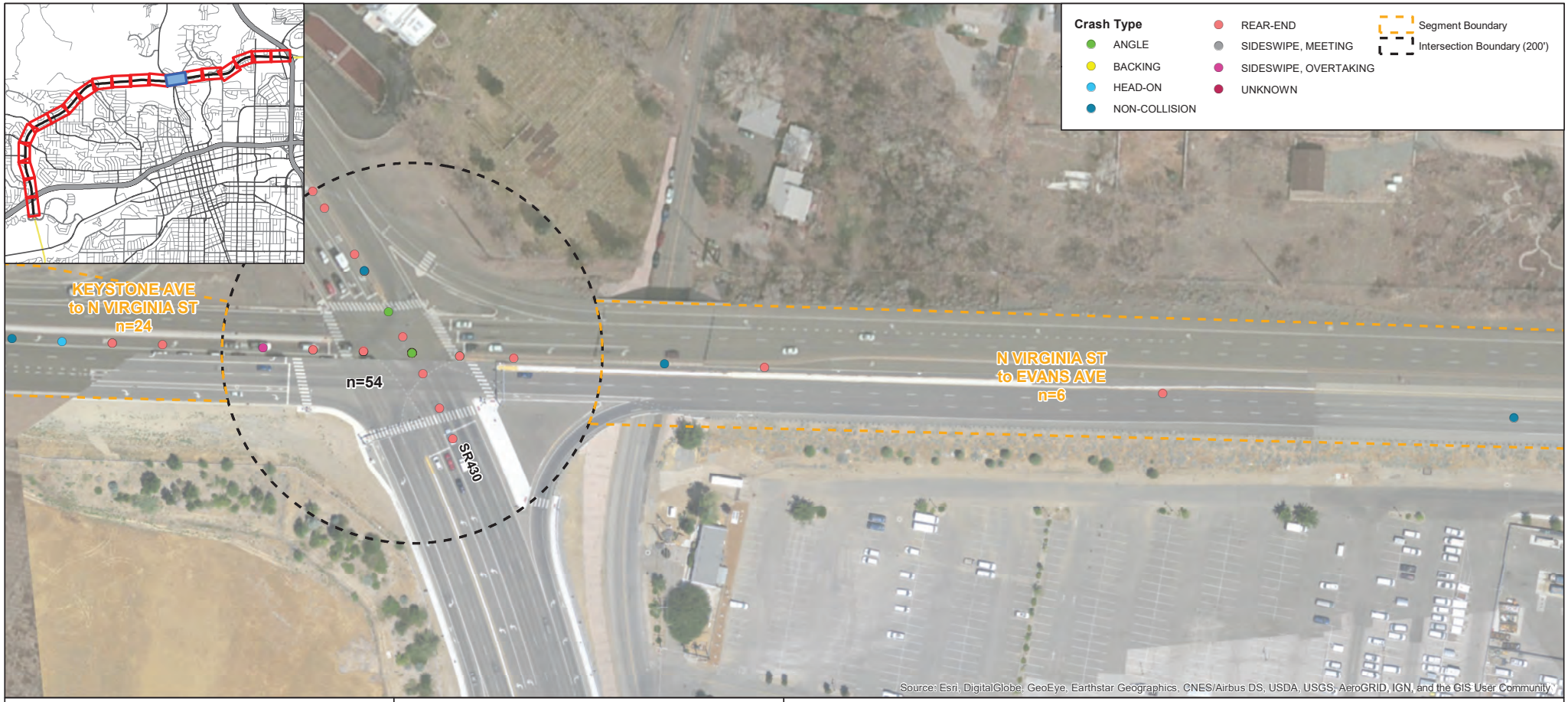
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N. McCarran Blvd Safety Management Plan

March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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N VIRGINIA ST



N VIRGINIA ST to EVANS AVE



0 50 100
Feet

Crash Type - Sheet 14

N. McCarran Blvd Safety Management Plan

March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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N VIRGINIA ST to EVANS AVE



0 50 100
Feet

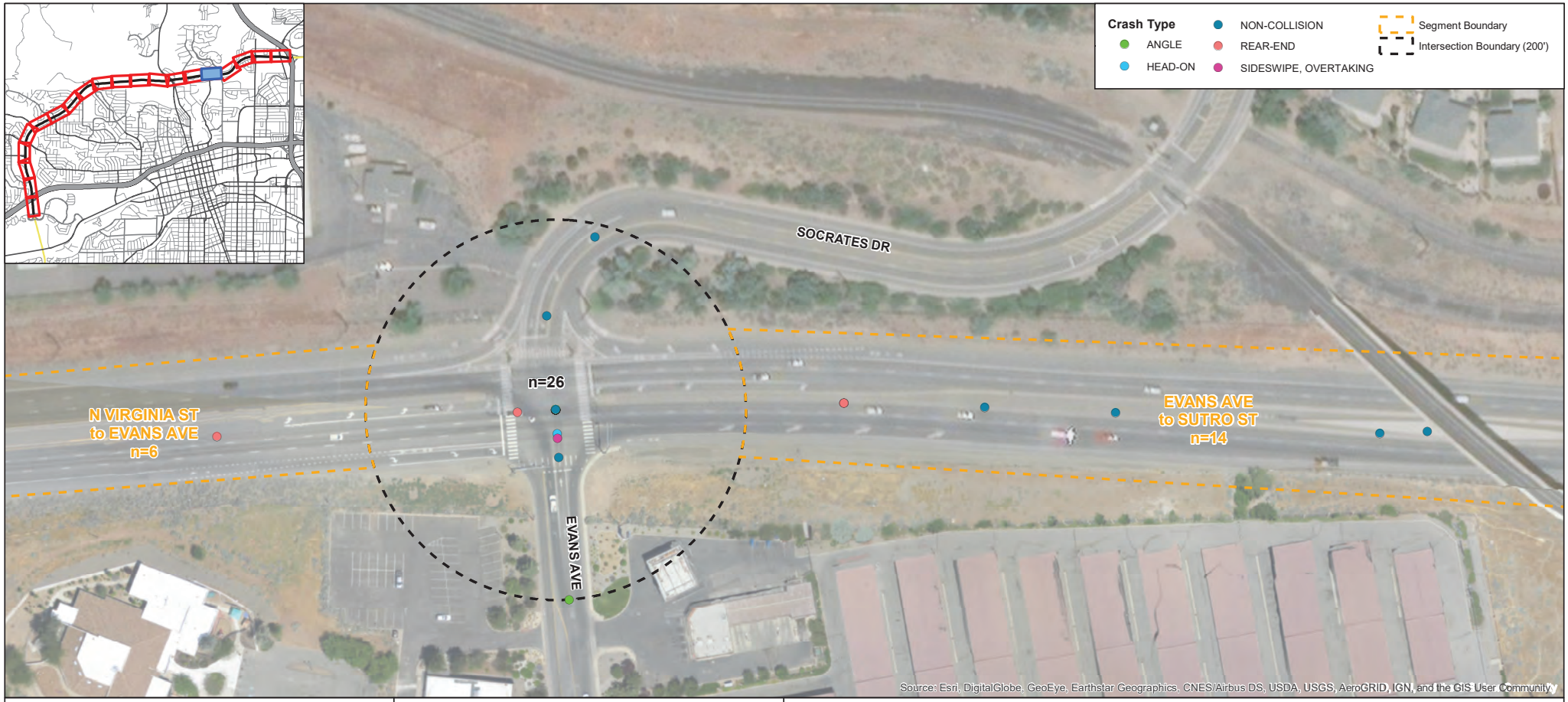
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N. McCarran Blvd Safety Management Plan

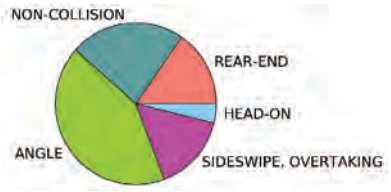
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

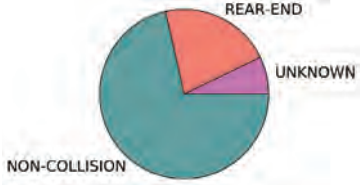
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EVANS AVE



EVANS AVE to SUTRO ST



0 50 100
Feet

Crash Type - Sheet 16

N. McCarran Blvd Safety Management Plan

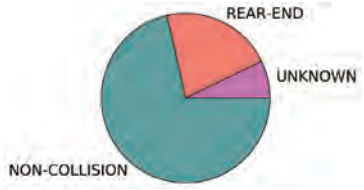
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

J:\Jobs\8595_NDOT_SMP\NDOT_McCarran_SMP_OA\GIS\Tasks\Crashes_with_chart_20180823_V1.mxd 3/14/2019



EVANS AVE to SUTRO ST



0 50 100
FEET

Crash Type - Sheet 17

N. McCarran Blvd Safety Management Plan

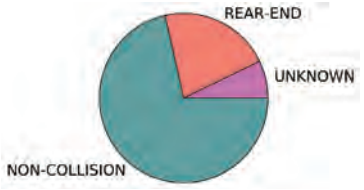
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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EVANS AVE to SUTRO ST



0 50 100
FEET

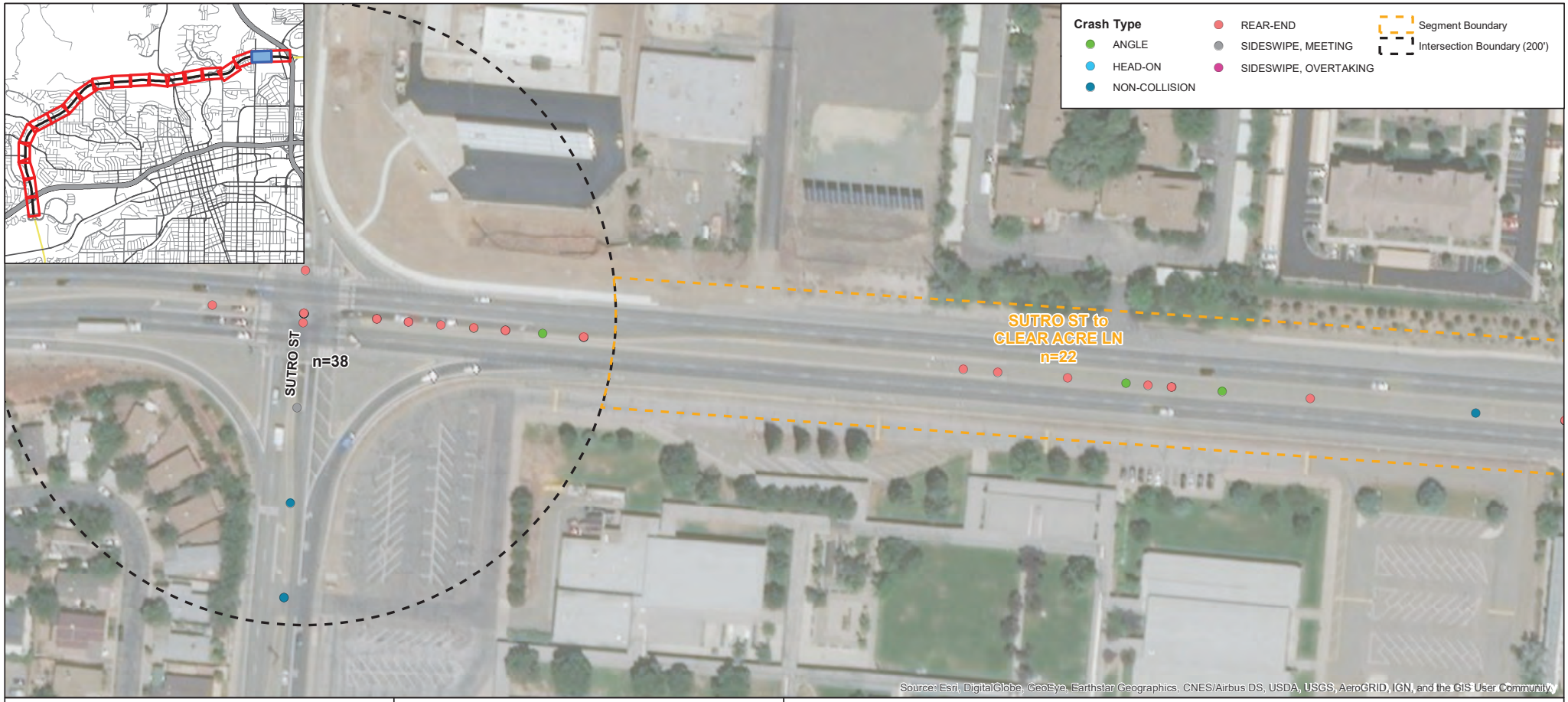
Crash Type - Sheet 18

N. McCarran Blvd Safety Management Plan

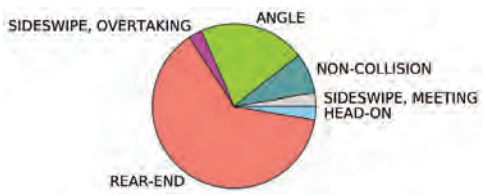
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

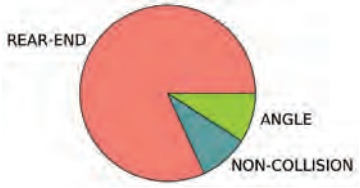
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SUTRO ST



SUTRO ST to CLEAR ACRE LN



0 50 100
FEET

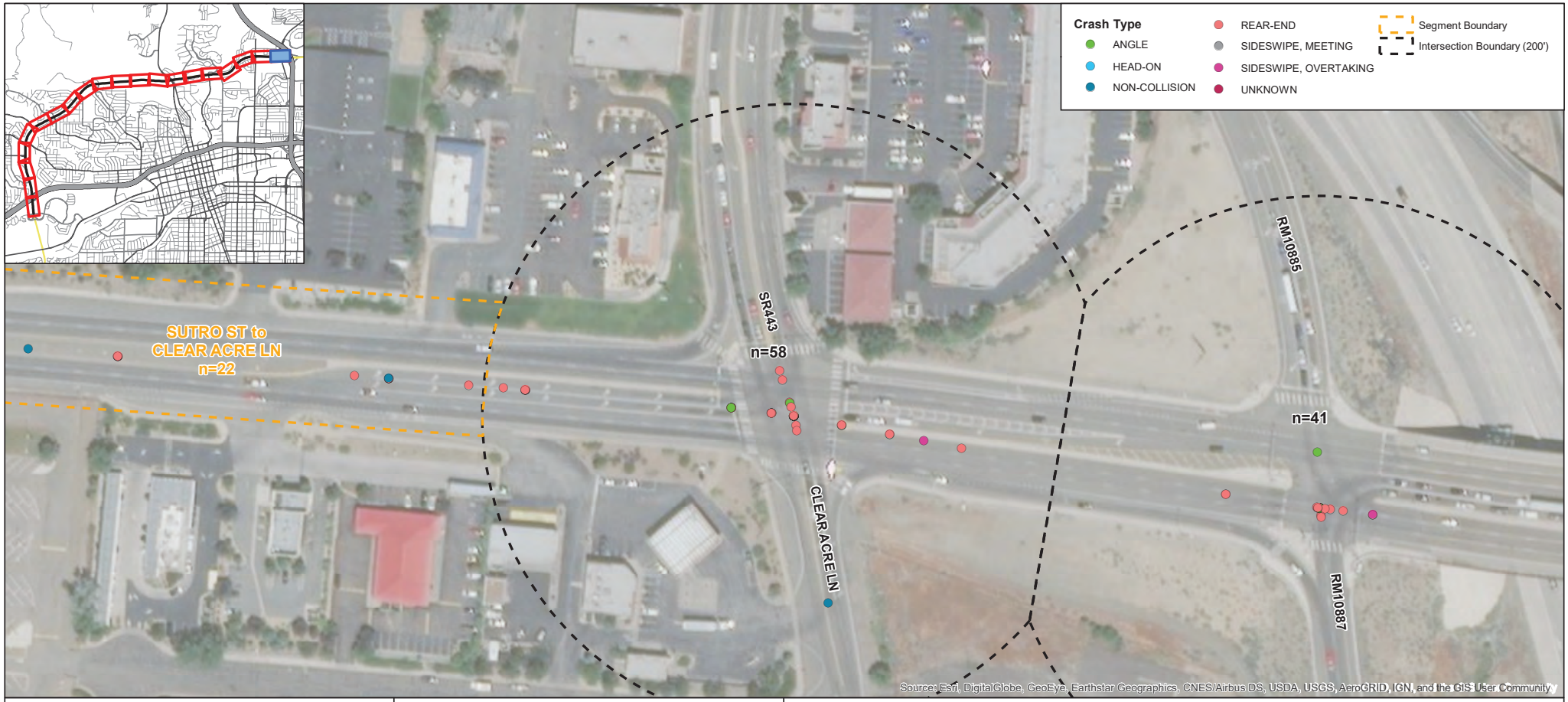
Crash Type - Sheet 19

N. McCarran Blvd Safety Management Plan

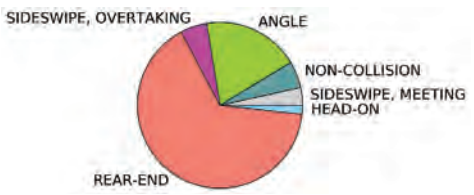
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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CLEAR ACRE LN



US 395 TO SR659 INT70



0 50 100
FEET

Crash Type - Sheet 20

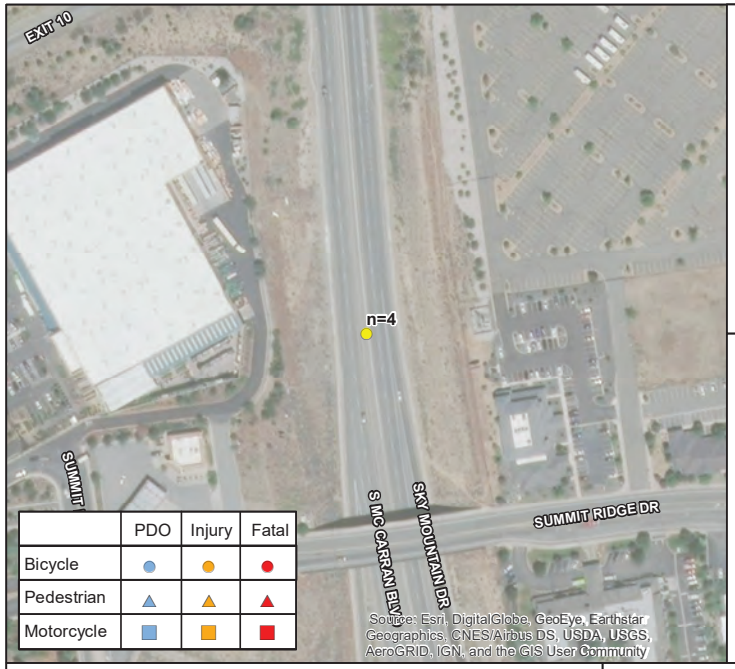
N. McCarran Blvd Safety Management Plan

March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

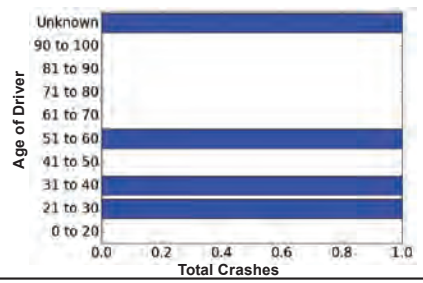
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Appendix B
Intersection Crash Factors Maps

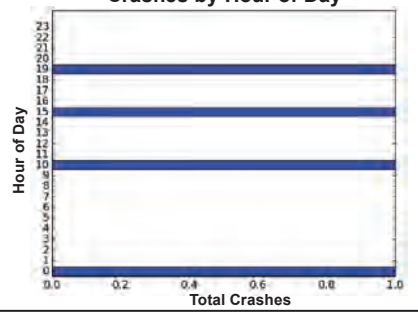


	PDO	Injury	Fatal
Bicycle			
Pedestrian			
Motorcycle			

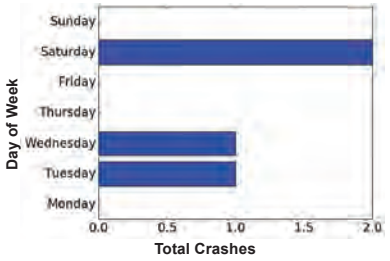
Crashes by Age of Driver



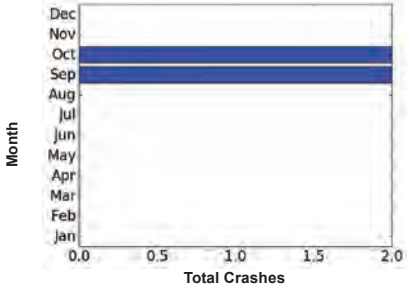
Crashes by Hour of Day



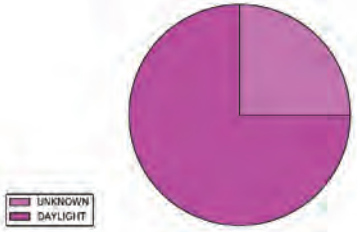
Crashes by Day of Week



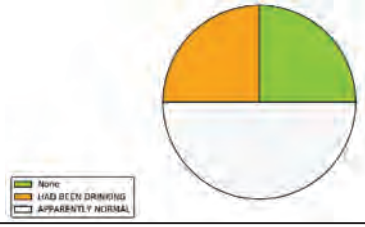
Crashes by Month



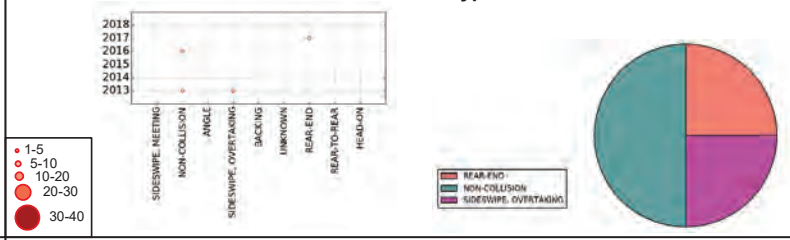
Lighting Conditions



Vehicle 1 Driver Factor

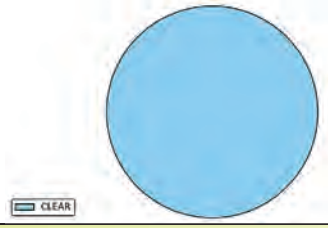


Crash Type



Vehicle 1 Most Harmful Event	Percent
None	75
MOTOR VEHICLE IN TRANSPORT	25

Weather Factor



Vehicle 1 Vehicle Factor	Percent
UNKNOWN	25
DRIVING TOO FAST FOR CONDITIONS: OVER-CORRECTING/OVER-STEERING	25
FOLLOWED TOO CLOSELY	25
None	25

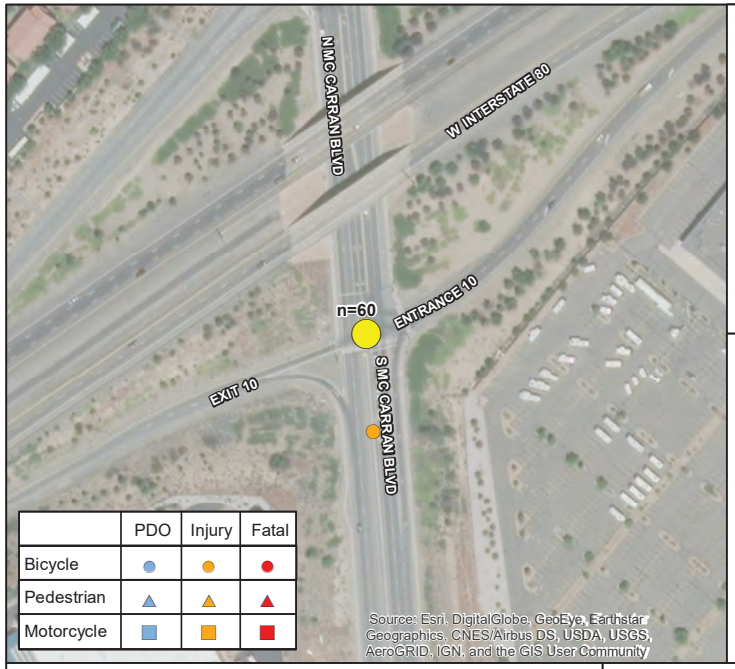
0 50 100
FEET

Crash Factors: SKY MOUNTAIN DR

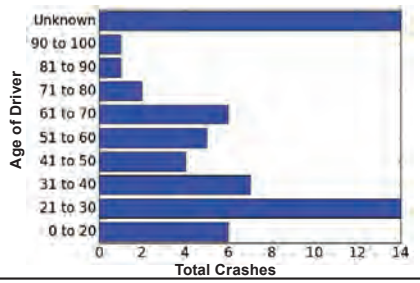
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March 2019

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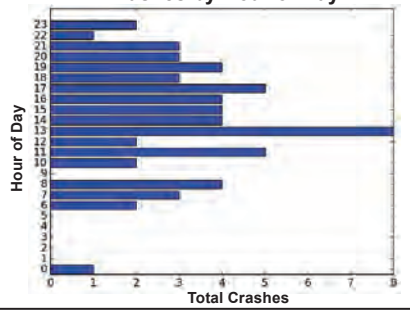
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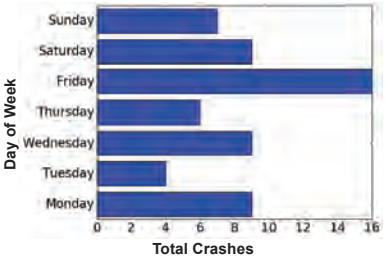
Crashes by Age of Driver



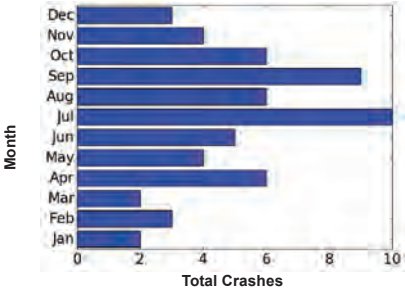
Crashes by Hour of Day



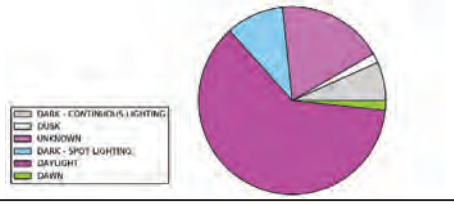
Crashes by Day of Week



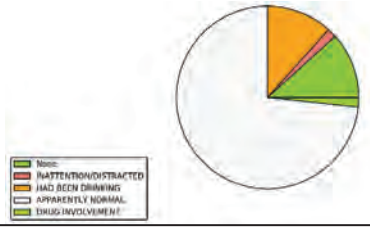
Crashes by Month



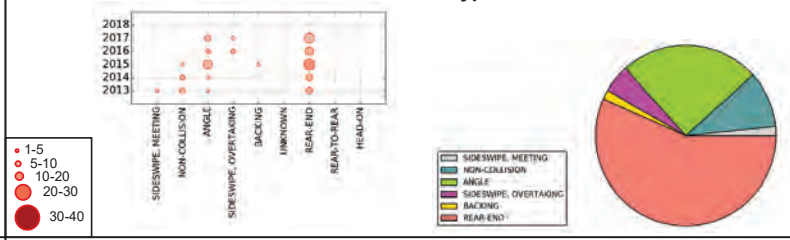
Lighting Conditions



Vehicle 1 Driver Factor

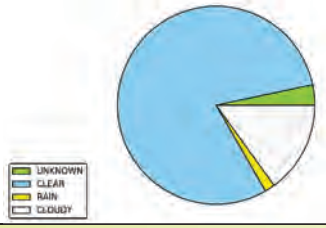


Crash Type



Vehicle 1 Most Harmful Event	Percent
None	100

Weather Factor



Vehicle 1 Vehicle Factor	Percent
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD: RAN OFF ROAD: HIT AND RUN	1.7
HIT AND RUN	3.3
OTHER IMPROPER DRIVING	16.7
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD: UNSAFE LANE CHANGE	3.3
UNKNOWN	8.3
DRIVING TOO FAST FOR CONDITIONS	6.7
FAILED TO YIELD RIGHT OF WAY	5
OPERATING VEHICLE IN ERRATIC, RECKLESS, CARELESS, NEGLIGENT OR AGGRESSIVE MANNER	5
None	20
FOLLOWED TOO CLOSELY	8.3
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD	1.7
UNSAFE LANE CHANGE	6.7
OBJECT AVOIDANCE	1.7
OPERATING VEHICLE IN ERRATIC, RECKLESS, CARELESS, NEGLIGENT OR AGGRESSIVE MANNER: HIT AND RUN	1.7
DISREGARDED TRAFFIC SIGNS, SIGNALS, ROAD MARKINGS	10

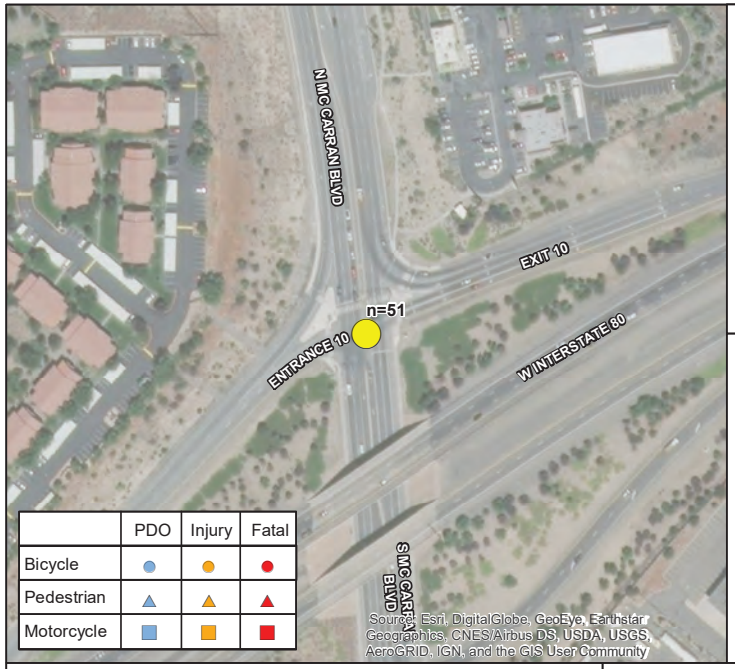
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FEET

Crash Factors: IR80E TO SR659 INT10

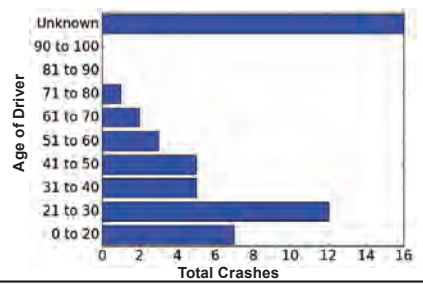
McCarran SMP
March 2019

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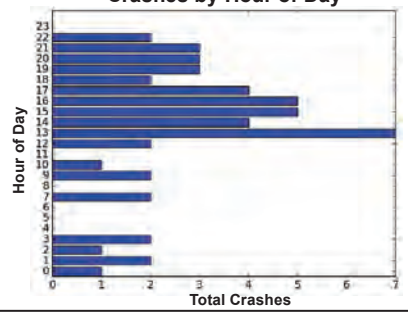
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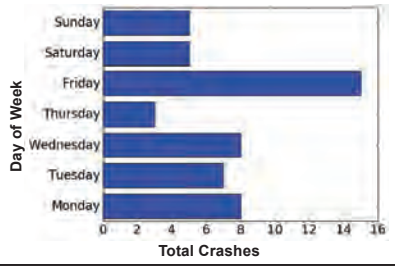
Crashes by Age of Driver



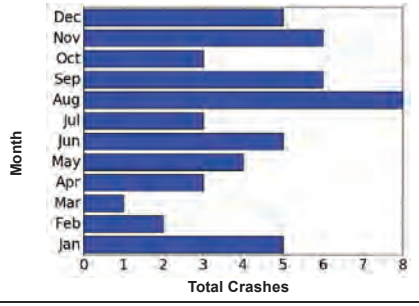
Crashes by Hour of Day



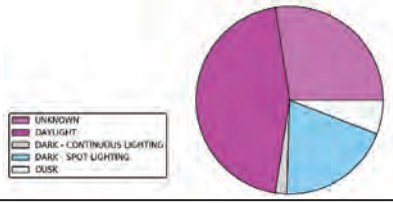
Crashes by Day of Week



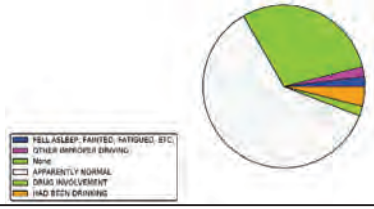
Crashes by Month



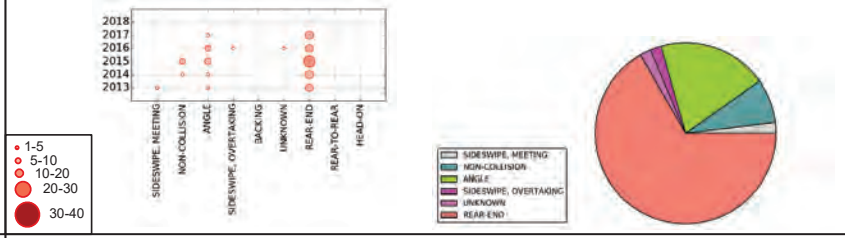
Lighting Conditions



Vehicle 1 Driver Factor

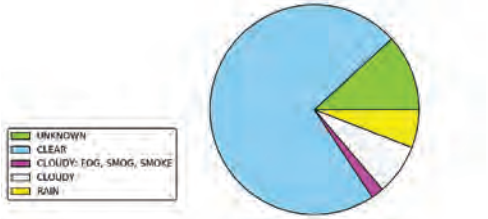


Crash Type



Vehicle 1 Most Harmful Event	Percent
None	94.1
SLOW/STOPPED VEHICLE	5.9

Weather Factor



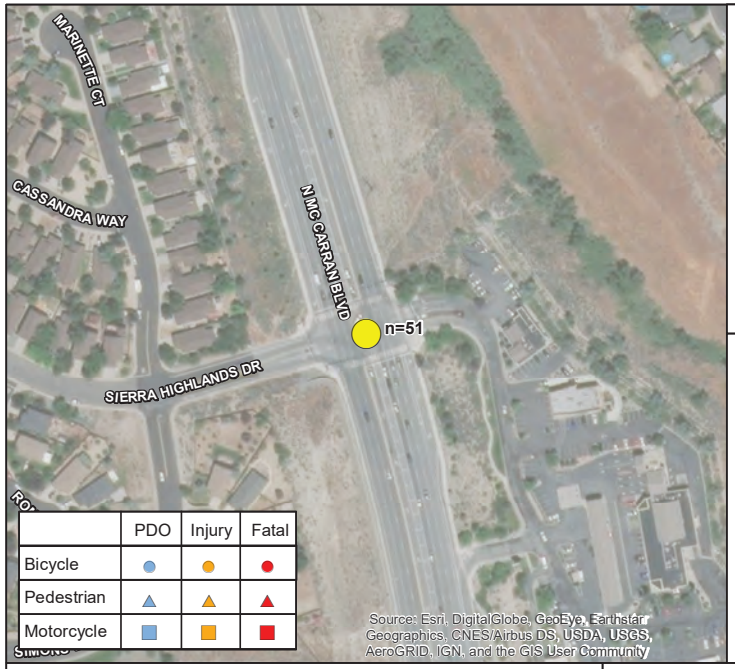
Vehicle 1 Vehicle Factor	Percent
OPERATING VEHICLE IN ERRATIC, RECKLESS, CARELESS, NEGLIGENT OR AGGRESSIVE MANNER	2
FAILED TO YIELD RIGHT OF WAY: FOLLOWED TOO CLOSELY	2
None	9.8
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD: UNSAFE LANE CHANGE	3.9
UNKNOWN	11.8
FAILED TO YIELD RIGHT OF WAY	2
MADE AN IMPROPER TURN	5.9
OTHER IMPROPER DRIVING	17.6
DRIVING TOO FAST FOR CONDITIONS	7.8
NO IMPROPER DRIVING	2
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD	2
HIT AND RUN	7.8
FOLLOWED TOO CLOSELY	19.6
DISREGARDED TRAFFIC SIGNS, SIGNALS, ROAD MARKINGS	5.9

0 50 100
FEET

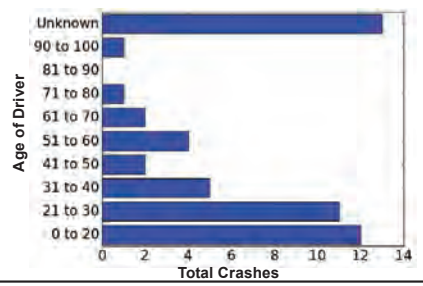
Crash Factors: IR80W TO SR659 INT10

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March 2019

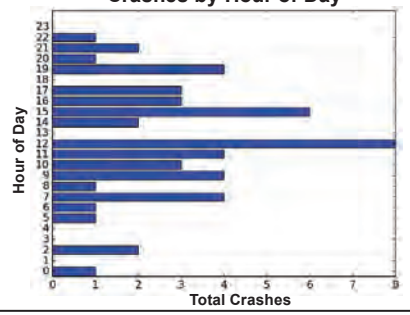
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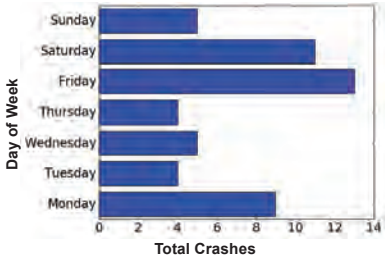
Crashes by Age of Driver



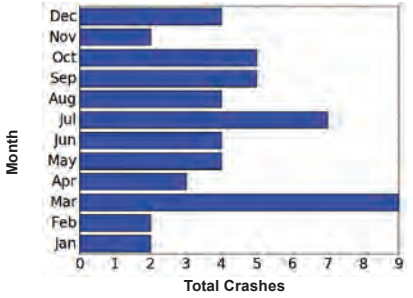
Crashes by Hour of Day



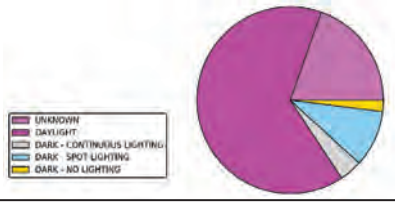
Crashes by Day of Week



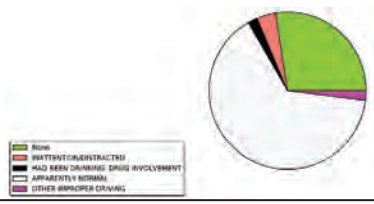
Crashes by Month



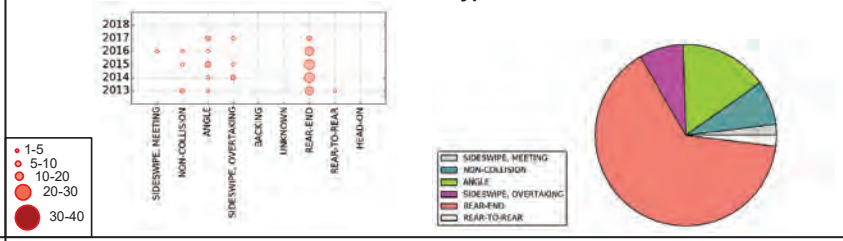
Lighting Conditions



Vehicle 1 Driver Factor

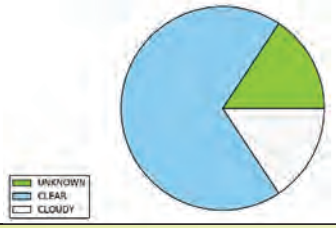


Crash Type



Vehicle 1 Most Harmful Event	Percent
None	100

Weather Factor



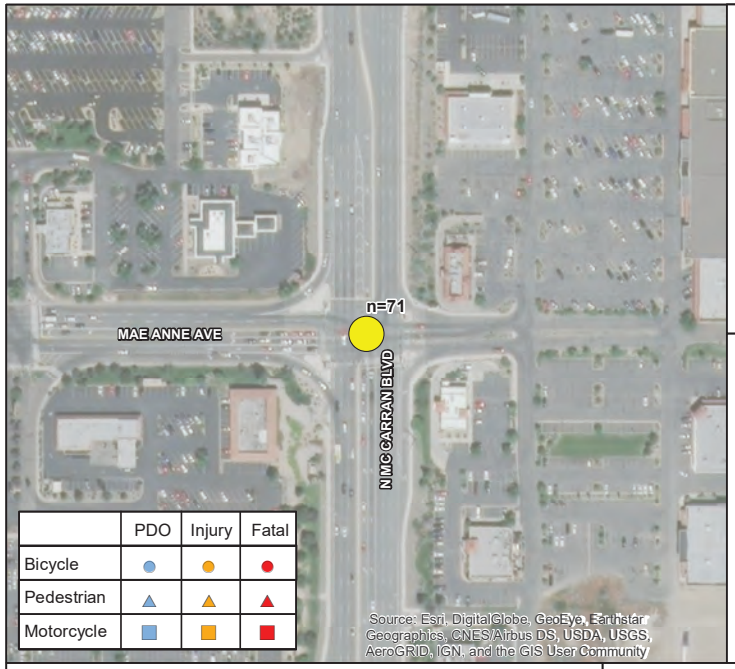
Vehicle 1 Vehicle Factor	Percent
HIT AND RUN	2
FAILED TO YIELD RIGHT OF WAY: MECHANICAL DEFECTS	2
FAILED TO YIELD RIGHT OF WAY	5.9
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD: UNSAFE LANE CHANGE	2
UNKNOWN	21.6
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD: HIT AND RUN: UNSAFE LANE CHANGE	3.9
OTHER IMPROPER DRIVING	21.6
FOLLOWED TOO CLOSELY	23.5
NO IMPROPER DRIVING	2
EXCEEDED AUTHORIZED SPEED LIMIT: FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD: OVER-CORRECTING	2
UNSAFE LANE CHANGE	3.9
None	5.9
DISREGARDED TRAFFIC SIGNS, SIGNALS, ROAD MARKINGS	3.9

0 50 100
FEET

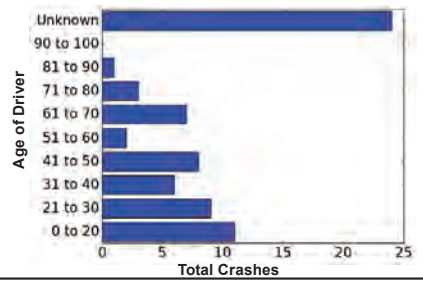
Crash Factors: SIERRA HIGHLANDS DR

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March 2019

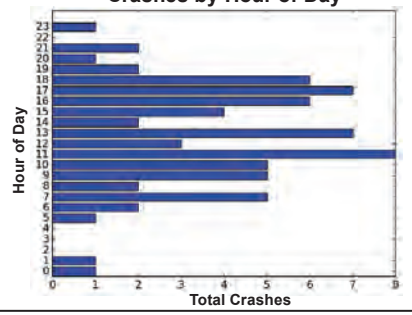
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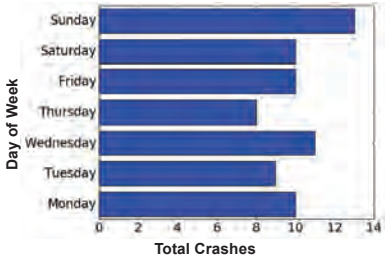
Crashes by Age of Driver



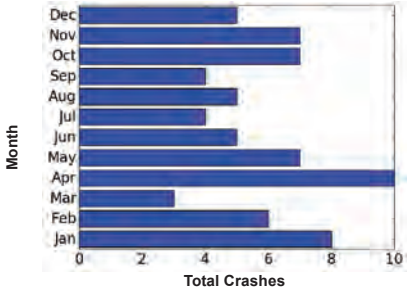
Crashes by Hour of Day



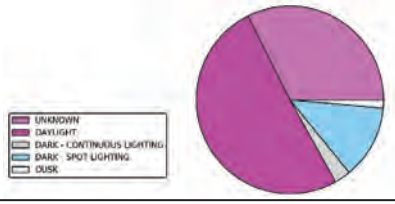
Crashes by Day of Week



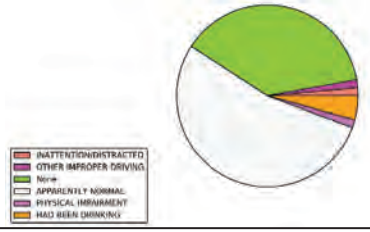
Crashes by Month



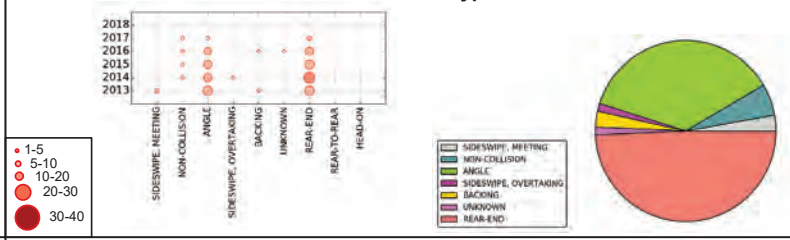
Lighting Conditions



Vehicle 1 Driver Factor

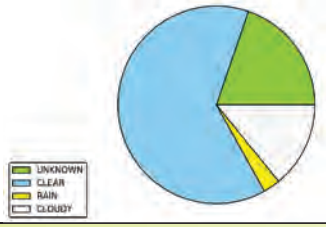


Crash Type



Vehicle 1 Most Harmful Event	Percent
None	100

Weather Factor



Vehicle 1 Vehicle Factor	Percent
OBJECT AVOIDANCE	1.4
HIT AND RUN	5.6
FAILED TO YIELD RIGHT OF WAY	8.5
FAILED TO YIELD RIGHT OF WAY: DISREGARDED TRAFFIC SIGNS, SIGNALS, ROAD MARKINGS	1.4
UNKNOWN	33.8
None	5.6
OPERATING VEHICLE IN ERRATIC, RECKLESS, CARELESS, NEGLIGENT OR AGGRESSIVE MANNER	2.8
OTHER IMPROPER DRIVING	9.9
DRIVING TOO FAST FOR CONDITIONS	1.4
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD	2.8
MADE AN IMPROPER TURN	1.4
UNSAFE LANE CHANGE	1.4
FOLLOWED TOO CLOSELY	14.1
DISREGARDED TRAFFIC SIGNS, SIGNALS, ROAD MARKINGS	9.9

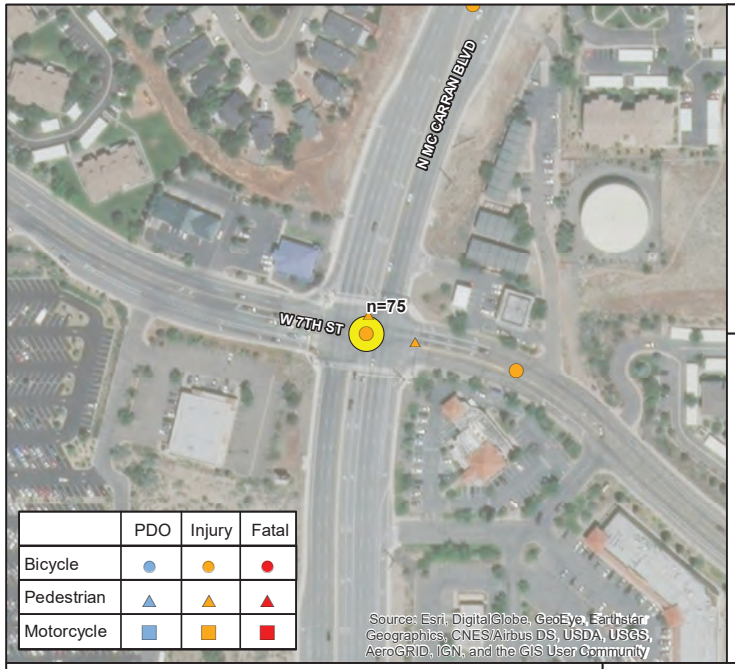
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FEET

Crash Factors: MAE ANNE AVE

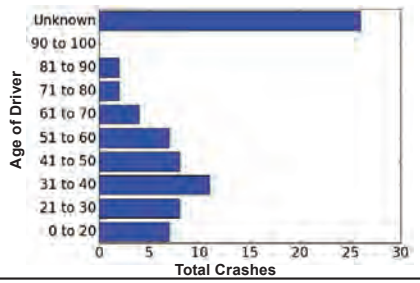
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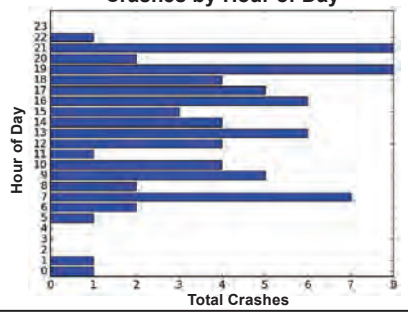
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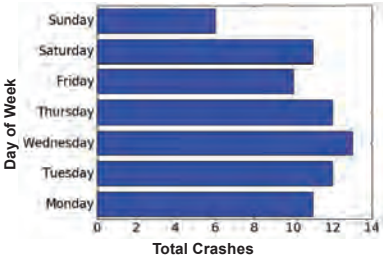
Crashes by Age of Driver



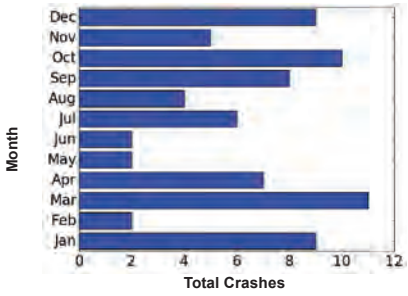
Crashes by Hour of Day



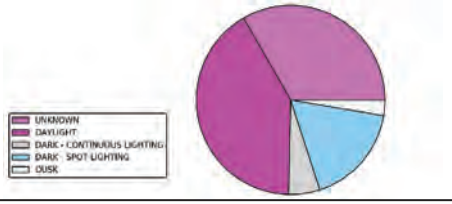
Crashes by Day of Week



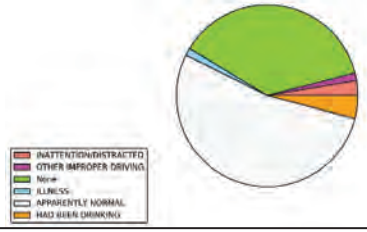
Crashes by Month



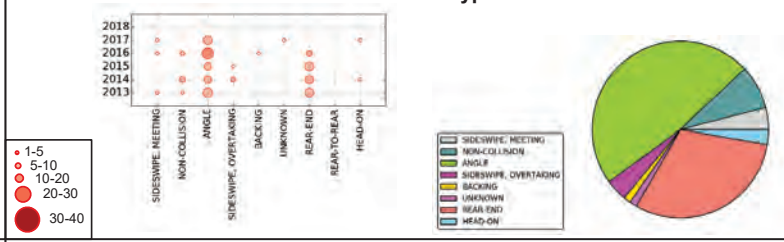
Lighting Conditions



Vehicle 1 Driver Factor

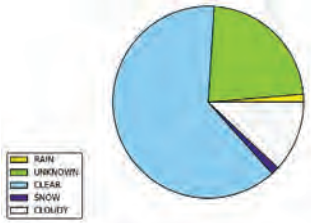


Crash Type



Vehicle 1 Most Harmful Event	Percent
None	100

Weather Factor



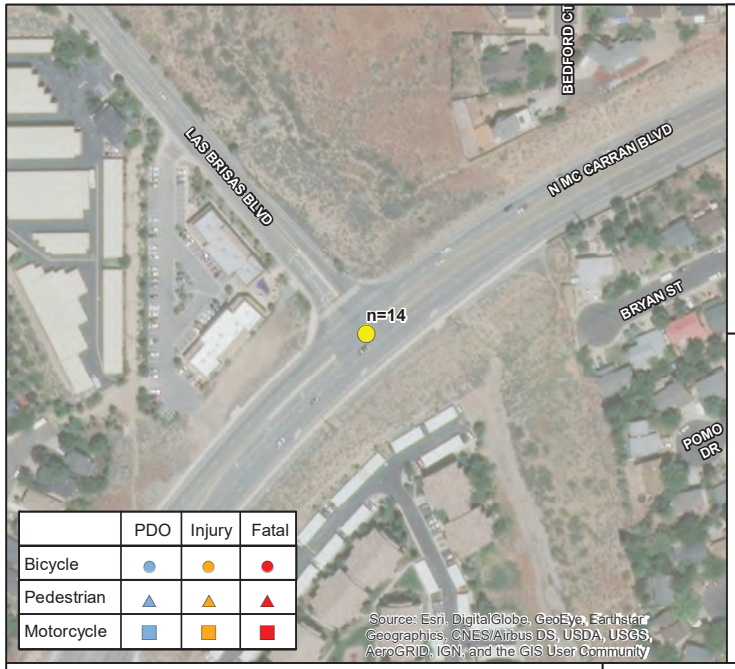
Vehicle 1 Vehicle Factor	Percent
UNSAFE BACKING	1.3
HIT AND RUN	9.3
FAILED TO YIELD RIGHT OF WAY	14.7
UNKNOWN	25.3
UNSAFE LANE CHANGE: OTHER IMPROPER DRIVING	1.3
DISREGARDED TRAFFIC SIGNS, SIGNALS, ROAD MARKINGS: HIT AND RUN	1.3
FAILED TO YIELD RIGHT OF WAY: UNSAFE LANE CHANGE	1.3
FOLLOWED TOO CLOSELY: HIT AND RUN	2.7
None	8
DRIVING TOO FAST FOR CONDITIONS	8
OTHER IMPROPER DRIVING	2.7
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD	1.3
MADE AN IMPROPER TURN	2.7
UNSAFE LANE CHANGE	1.3
FOLLOWED TOO CLOSELY	8
DISREGARDED TRAFFIC SIGNS, SIGNALS, ROAD MARKINGS	10.7

0 50 100
FEET

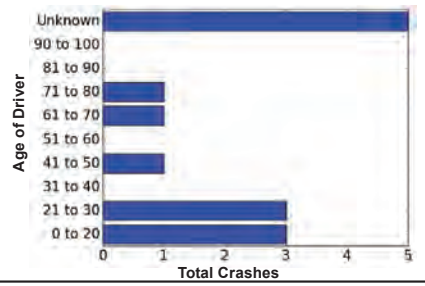
Crash Factors: W 7TH ST

McCarran SMP
March 2019

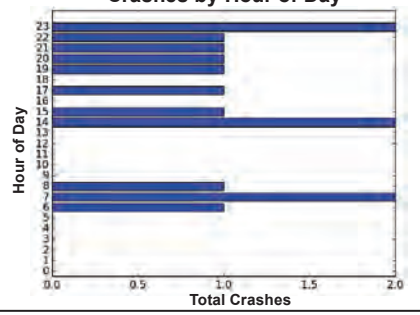
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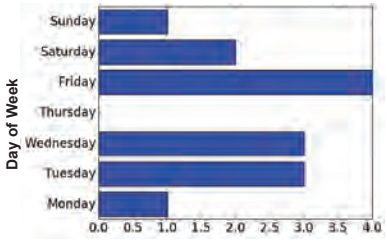
Crashes by Age of Driver



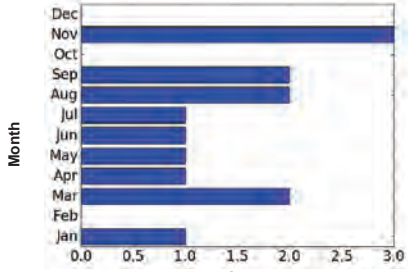
Crashes by Hour of Day



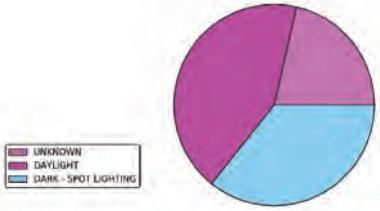
Crashes by Day of Week



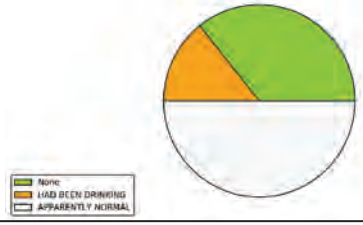
Crashes by Month



Lighting Conditions



Vehicle 1 Driver Factor

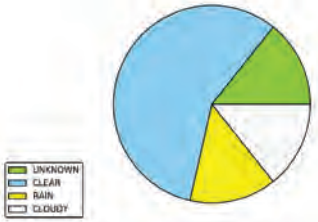


Crash Type



Vehicle 1 Most Harmful Event	Percent
None	100

Weather Factor



Vehicle 1 Vehicle Factor	Percent
HIT AND RUN	7.1
FAILED TO YIELD RIGHT OF WAY	35.7
UNKNOWN	14.3
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD: HIT AND RUN	7.1
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD: MECHANICAL DEFECTS	7.1
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD	21.4
UNSAFE LANE CHANGE	7.1

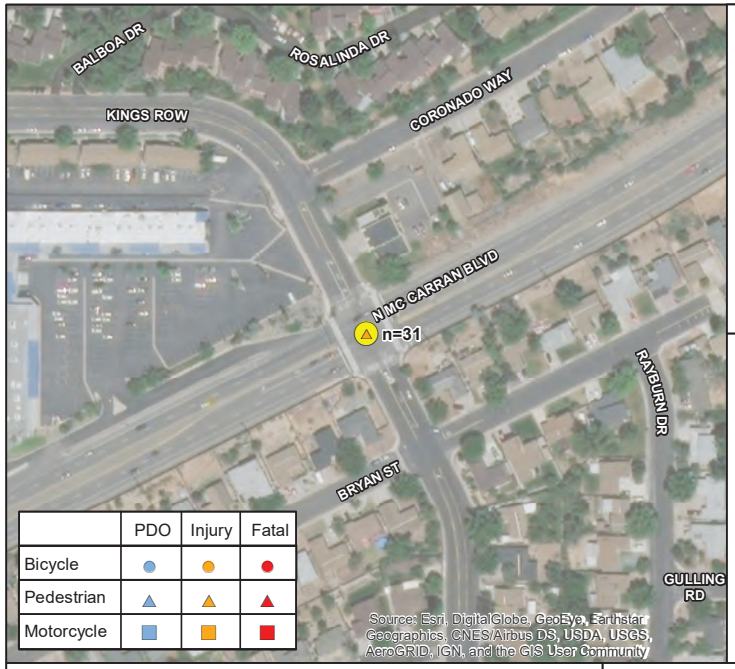
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FEET

Crash Factors: LAS BRISAS BLVD

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March 2019

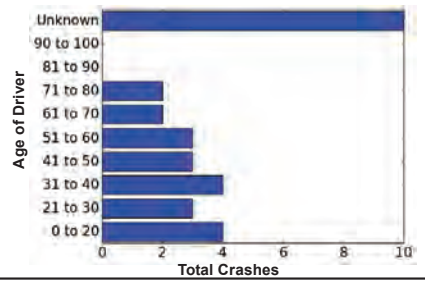
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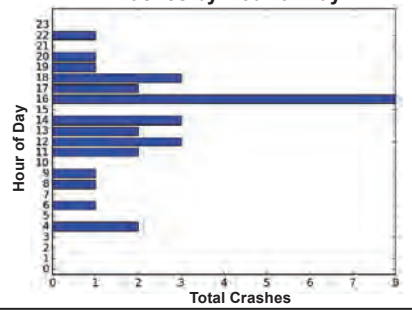


	PDO	Injury	Fatal
Bicycle	●	●	●
Pedestrian	▲	▲	▲
Motorcycle	■	■	■

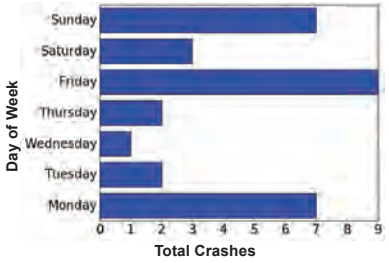
Crashes by Age of Driver



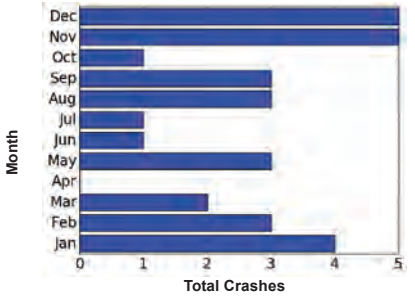
Crashes by Hour of Day



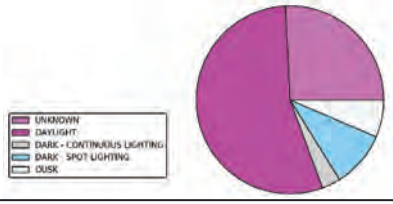
Crashes by Day of Week



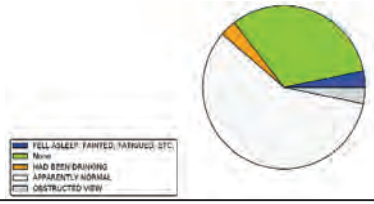
Crashes by Month



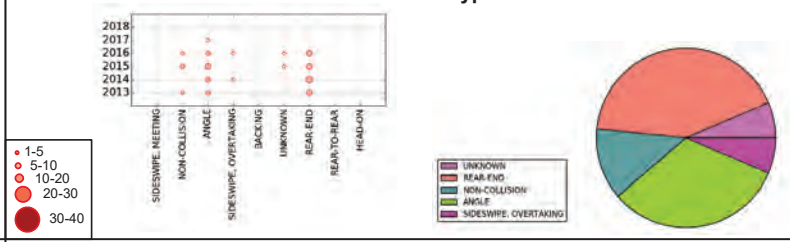
Lighting Conditions



Vehicle 1 Driver Factor

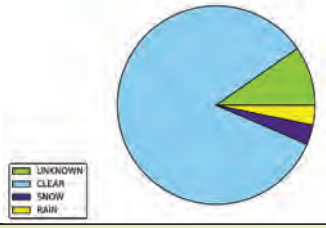


Crash Type



Vehicle 1 Most Harmful Event	Percent
None	100

Weather Factor



Vehicle 1 Vehicle Factor	Percent
DRIVING TOO FAST FOR CONDITIONS: FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD: HIT AND RUN	3.2
RAN OFF ROAD	3.2
OTHER IMPROPER DRIVING	3.2
UNKNOWN	25.8
FAILED TO YIELD RIGHT OF WAY	12.9
OPERATING VEHICLE IN ERRATIC, RECKLESS, CARELESS, NEGLIGENT OR AGGRESSIVE MANNER	3.2
None	9.7
FOLLOWED TOO CLOSELY	6.5
NO IMPROPER DRIVING	3.2
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD	9.7
VISIBILITY OBSTRUCTED: OTHER IMPROPER DRIVING	3.2
HIT AND RUN: OTHER IMPROPER DRIVING	3.2
UNSAFE LANE CHANGE	3.2
DISREGARDED TRAFFIC SIGNS, SIGNALS, ROAD MARKINGS	9.7

0 50 100
FEET

Crash Factors: KINGS ROW

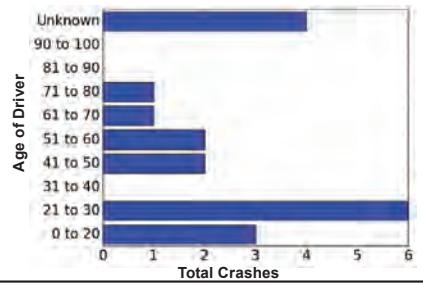
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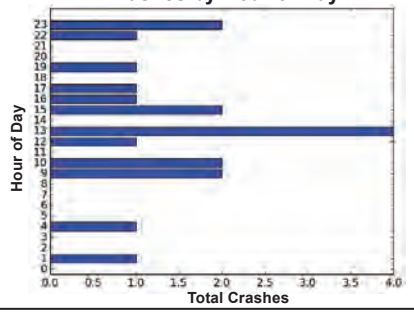
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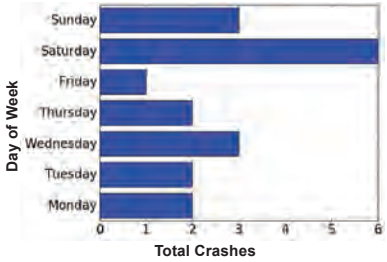
Crashes by Age of Driver



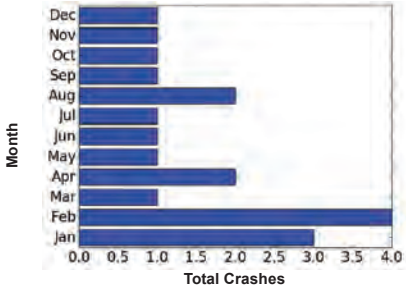
Crashes by Hour of Day



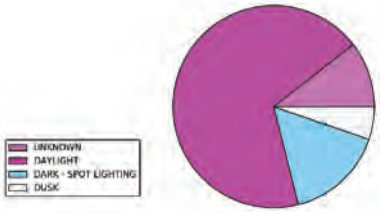
Crashes by Day of Week



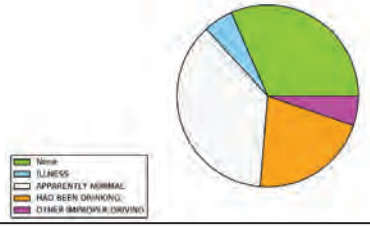
Crashes by Month



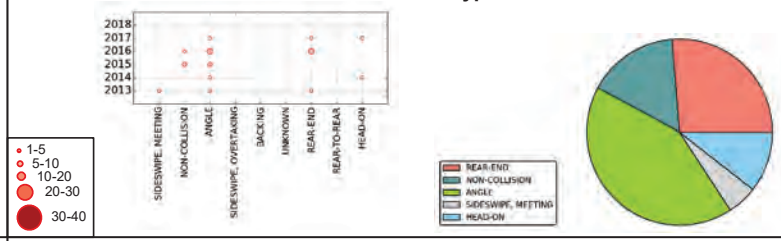
Lighting Conditions



Vehicle 1 Driver Factor

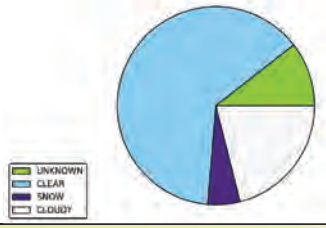


Crash Type



Vehicle 1 Most Harmful Event	Percent
None	100

Weather Factor



Vehicle 1 Vehicle Factor	Percent
MADE AN IMPROPER TURN	5.3
FAILED TO YIELD RIGHT OF WAY	42.1
WRONG SIDE OR WRONG WAY: FOLLOWED TOO CLOSELY	5.3
DRIVING TOO FAST FOR CONDITIONS	5.3
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD: DROVE LEFT OF CENTER	5.3
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD: HIT AND RUN	5.3
OTHER IMPROPER DRIVING	5.3
FOLLOWED TOO CLOSELY	10.5
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD	5.3
HIT AND RUN: OTHER IMPROPER DRIVING	5.3
OPERATING VEHICLE IN ERRATIC, RECKLESS, CARELESS, NEGLIGENT OR AGGRESSIVE MANNER: HIT AND RUN	5.3

0 50 100
FEET

Crash Factors: KEYSTONE AVE

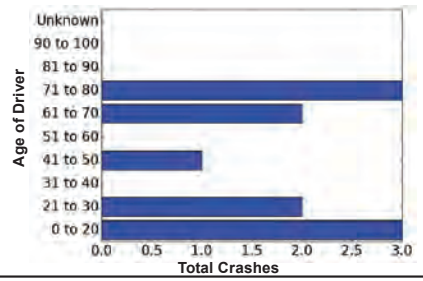
McCarran SMP
March 2019

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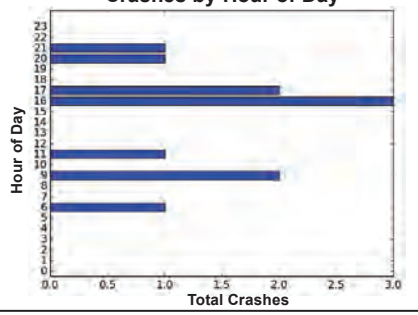
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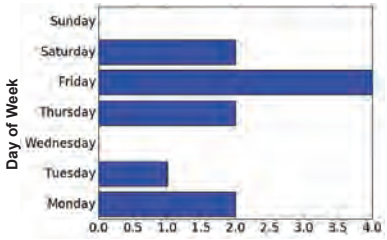
Crashes by Age of Driver



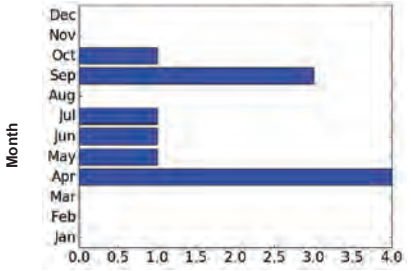
Crashes by Hour of Day



Crashes by Day of Week



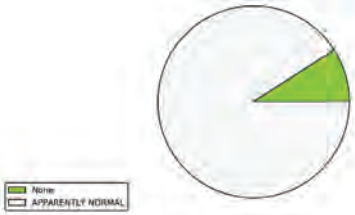
Crashes by Month



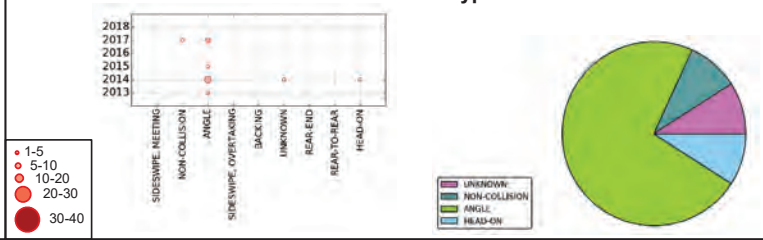
Lighting Conditions



Vehicle 1 Driver Factor

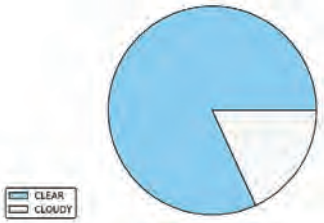


Crash Type



Vehicle 1 Most Harmful Event	Percent
None	100

Weather Factor



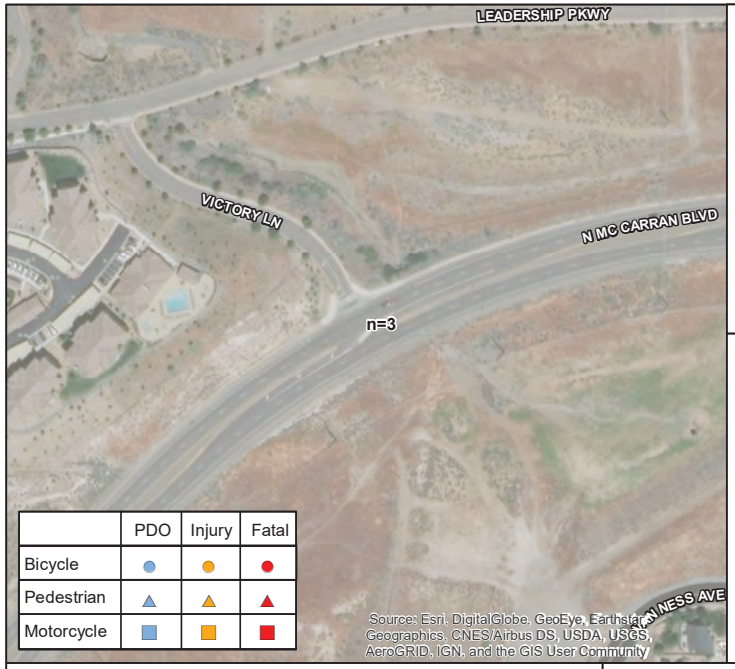
Vehicle 1 Vehicle Factor	Percent
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD: UNSAFE LANE CHANGE	9.1
MADE AN IMPROPER TURN	18.2
FAILED TO YIELD RIGHT OF WAY	72.7

0 50 100
FEET

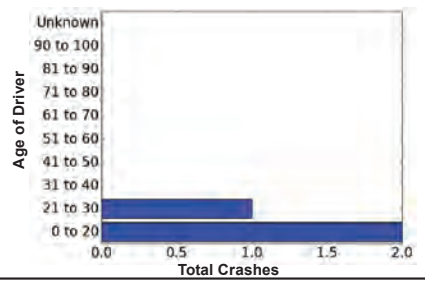
Crash Factors: SKY COUNTRY DR

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March 2019

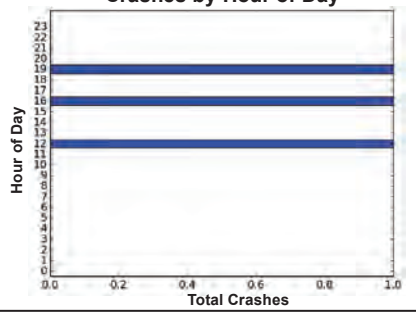
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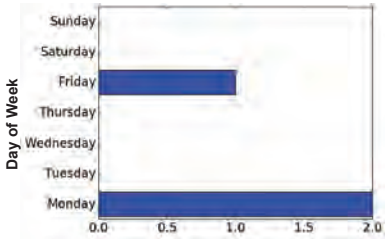
Crashes by Age of Driver



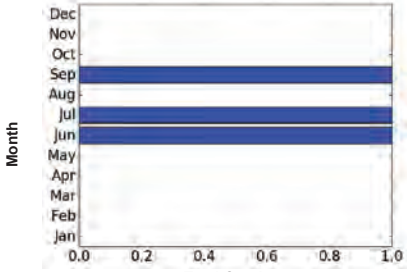
Crashes by Hour of Day



Crashes by Day of Week



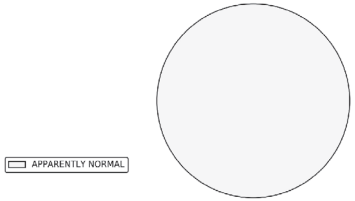
Crashes by Month



Lighting Conditions



Vehicle 1 Driver Factor

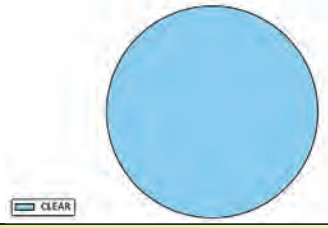


Crash Type



Vehicle 1 Most Harmful Event	Percent
None	100

Weather Factor



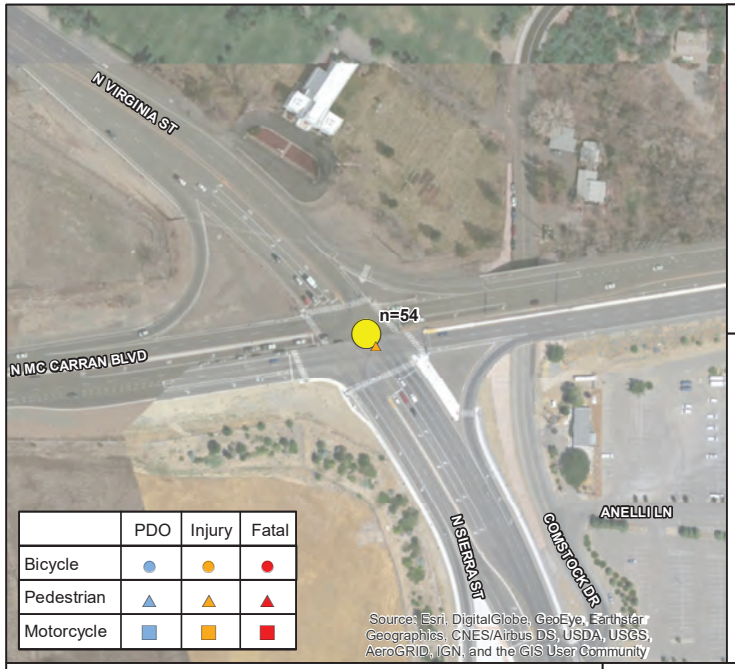
Vehicle 1 Vehicle Factor	Percent
FAILED TO YIELD RIGHT OF WAY: DISREGARDED TRAFFIC SIGNS, SIGNALS, ROAD MARKINGS	33.3
MECHANICAL DEFECTS	33.3
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD	33.3

0 50 100
FEET

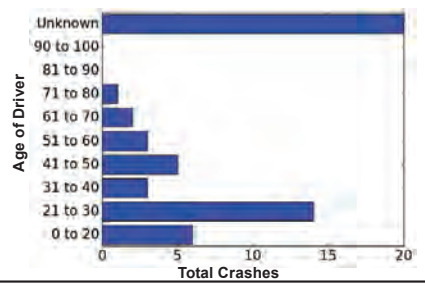
Crash Factors: VICTORY LN

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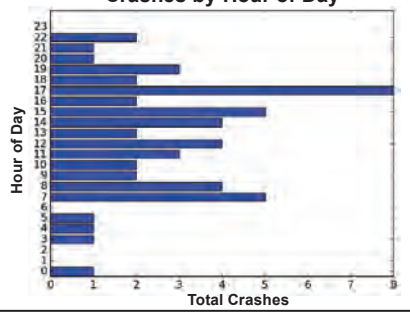
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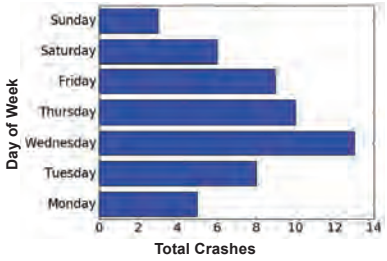
Crashes by Age of Driver



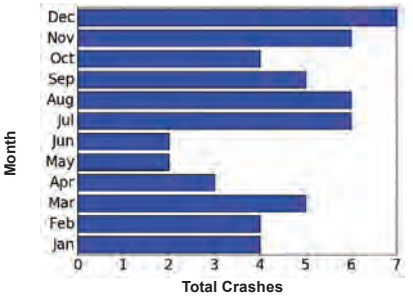
Crashes by Hour of Day



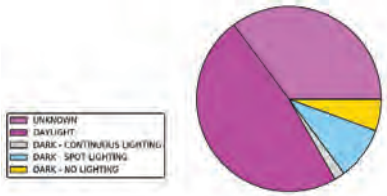
Crashes by Day of Week



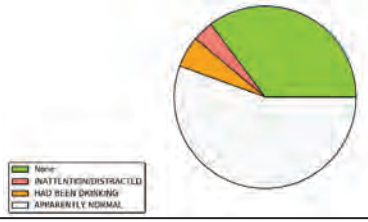
Crashes by Month



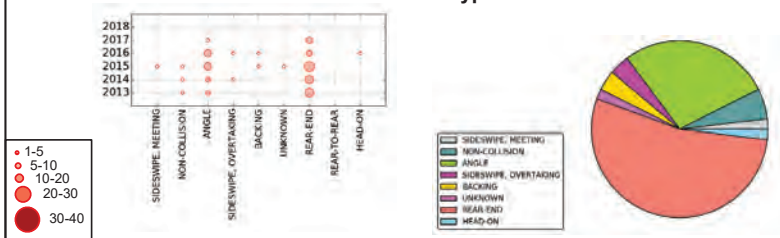
Lighting Conditions



Vehicle 1 Driver Factor



Crash Type



Vehicle 1 Most Harmful Event	Percent
None	100

Weather Factor



Vehicle 1 Vehicle Factor	Percent
OVER-CORRECTING/OVER-STEERING: RAN OFF ROAD	1.9
UNSAFE BACKING	1.9
MADE AN IMPROPER TURN	1.9
FAILED TO YIELD RIGHT OF WAY	3.7
FAILED TO YIELD RIGHT OF WAY: DISREGARDED TRAFFIC SIGNS, SIGNALS, ROAD MARKINGS	1.9
UNKNOWN	27.8
DRIVING TOO FAST FOR CONDITIONS	5.6
FOLLOWED TOO CLOSELY: OTHER IMPROPER DRIVING	1.9
FOLLOWED TOO CLOSELY: HIT AND RUN	1.9
OTHER IMPROPER DRIVING	7.4
FOLLOWED TOO CLOSELY	11.1
NO IMPROPER DRIVING	3.7
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD	1.9
HIT AND RUN	9.3
UNSAFE LANE CHANGE	1.9
None	3.7
DISREGARDED TRAFFIC SIGNS, SIGNALS, ROAD MARKINGS	13

0 50 100
FEET

Crash Factors: N VIRGINIA ST

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March 2019

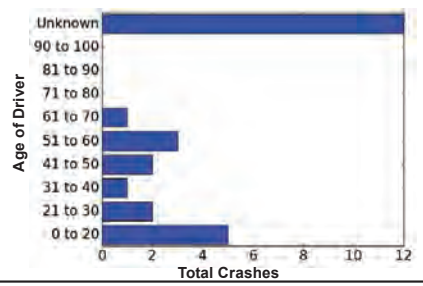
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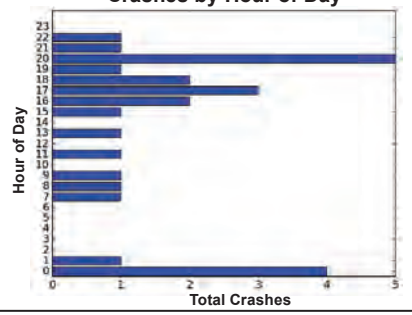


	PDO	Injury	Fatal
Bicycle	●	●	●
Pedestrian	▲	▲	▲
Motorcycle	■	■	■

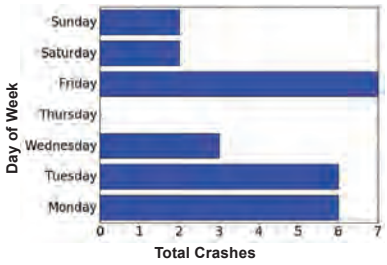
Crashes by Age of Driver



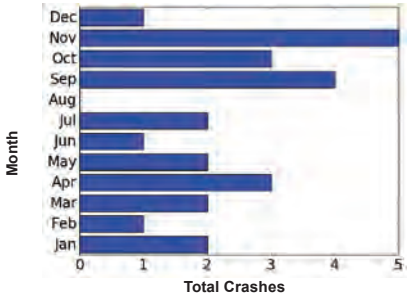
Crashes by Hour of Day



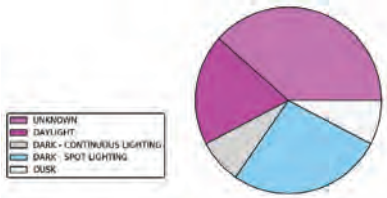
Crashes by Day of Week



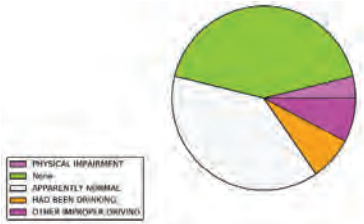
Crashes by Month



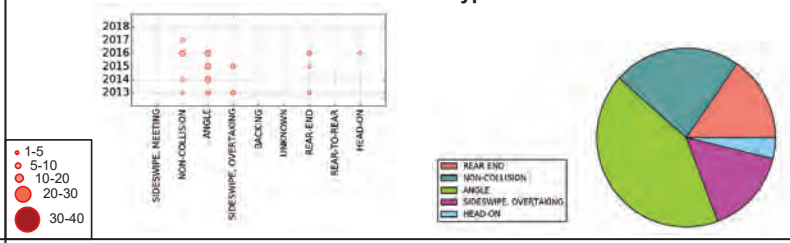
Lighting Conditions



Vehicle 1 Driver Factor

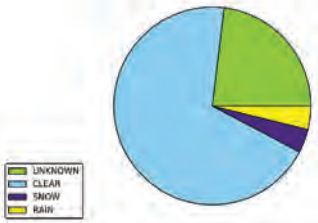


Crash Type



Vehicle 1 Most Harmful Event	Percent
None	100

Weather Factor



Vehicle 1 Vehicle Factor	Percent
HIT AND RUN	7.7
FAILED TO YIELD RIGHT OF WAY	15.4
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD: UNSAFE LANE CHANGE	3.8
UNKNOWN	23.1
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD: HIT AND RUN	3.8
FOLLOWED TOO CLOSELY: HIT AND RUN	3.8
OTHER IMPROPER DRIVING	3.8
RAN OFF ROAD: HIT AND RUN	3.8
FOLLOWED TOO CLOSELY	3.8
DISREGARDED TRAFFIC SIGNS, SIGNALS, ROAD MARKINGS: MECHANICAL DEFECTS	3.8
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD	7.7
UNSAFE LANE CHANGE	3.8
None	7.7
DISREGARDED TRAFFIC SIGNS, SIGNALS, ROAD MARKINGS	7.7

0 50 100
FEET

Crash Factors: EVANS AVE

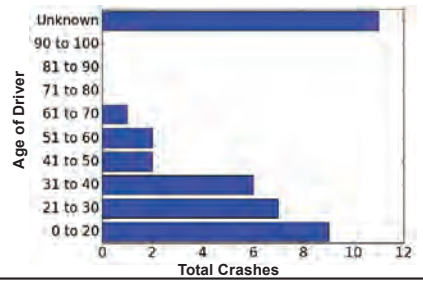
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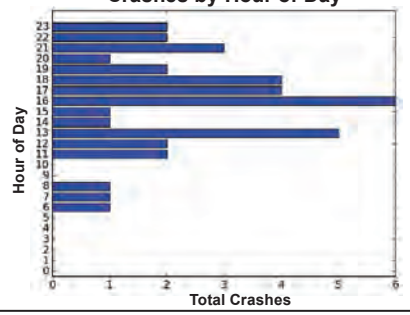


	PDO	Injury	Fatal
Bicycle	●	●	●
Pedestrian	▲	▲	▲
Motorcycle	■	■	■

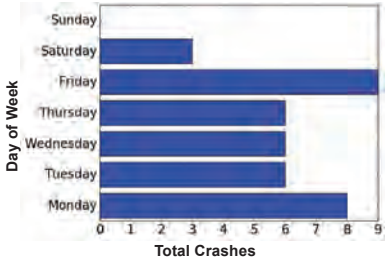
Crashes by Age of Driver



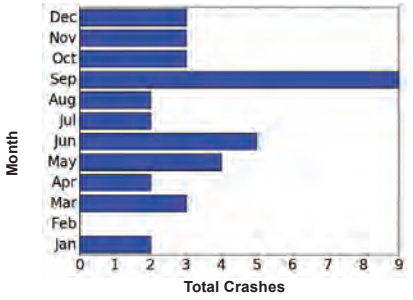
Crashes by Hour of Day



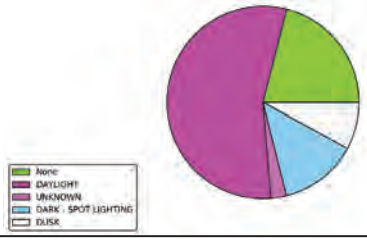
Crashes by Day of Week



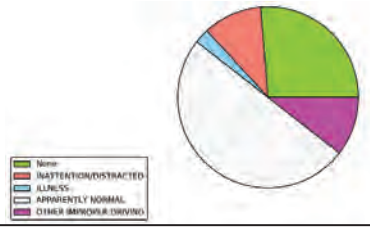
Crashes by Month



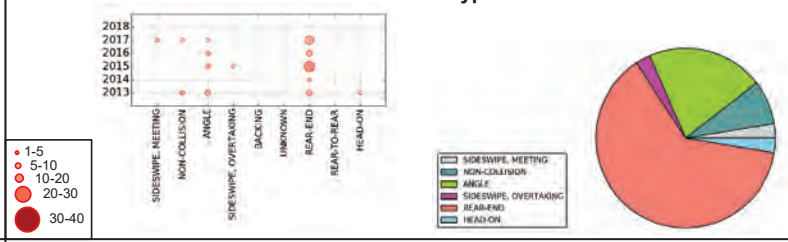
Lighting Conditions



Vehicle 1 Driver Factor

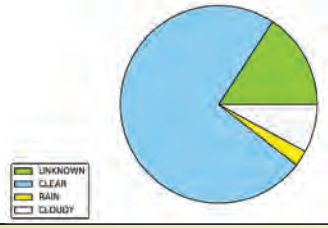


Crash Type



Vehicle 1 Most Harmful Event	Percent
None	100

Weather Factor



Vehicle 1 Vehicle Factor	Percent
MADE AN IMPROPER TURN	2.6
FAILED TO YIELD RIGHT OF WAY: FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD	2.6
FAILED TO YIELD RIGHT OF WAY	2.6
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD: UNSAFE LANE CHANGE	2.6
None	10.5
OPERATING VEHICLE IN ERRATIC, RECKLESS, CARELESS, NEGLIGENT OR AGGRESSIVE MANNER	2.6
OTHER IMPROPER DRIVING	18.4
FOLLOWED TOO CLOSELY	18.4
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD	5.3
UNKNOWN	13.2
HIT AND RUN: OTHER IMPROPER DRIVING	2.6
HIT AND RUN	5.3
UNSAFE LANE CHANGE	2.6
DISREGARDED TRAFFIC SIGNS, SIGNALS, ROAD MARKINGS	10.5

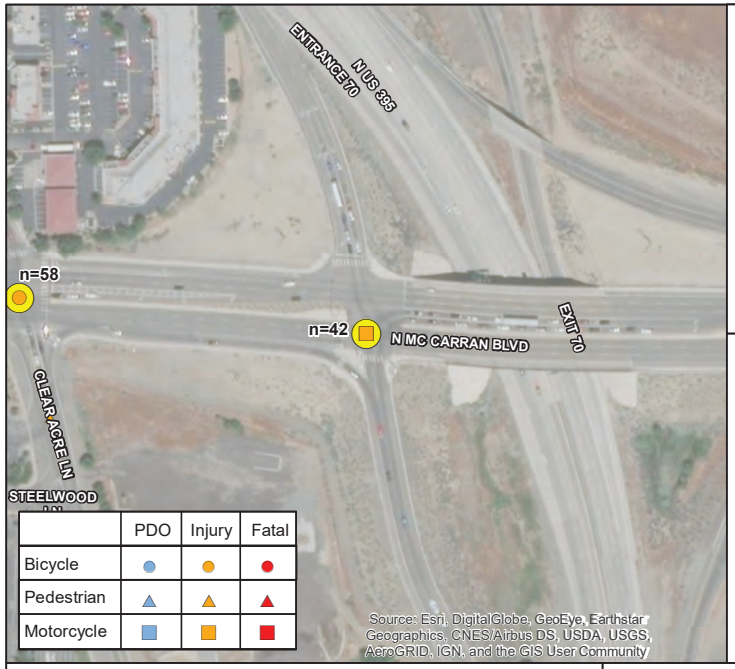
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FEET

Crash Factors: SUTRO ST

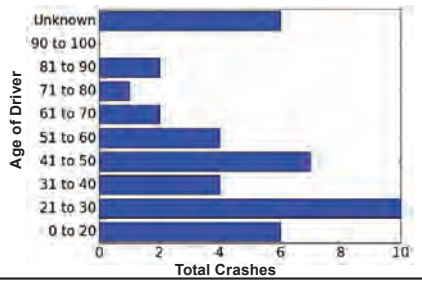
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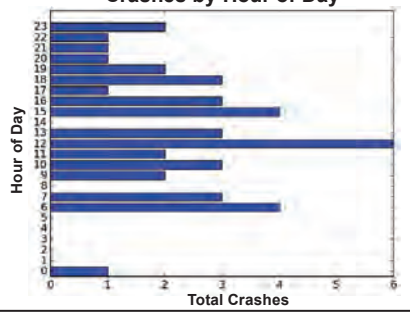
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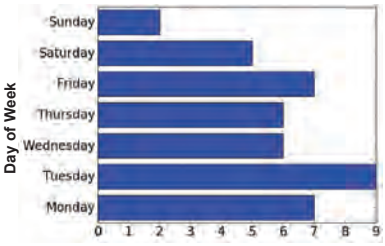
Crashes by Age of Driver



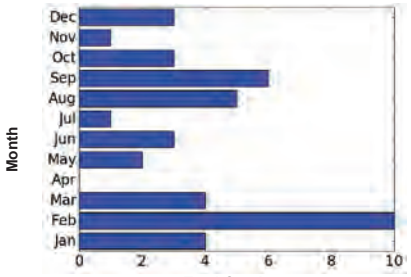
Crashes by Hour of Day



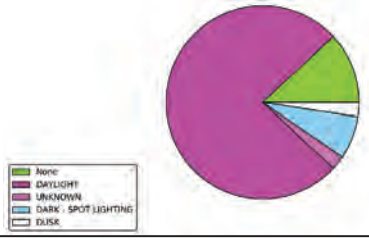
Crashes by Day of Week



Crashes by Month



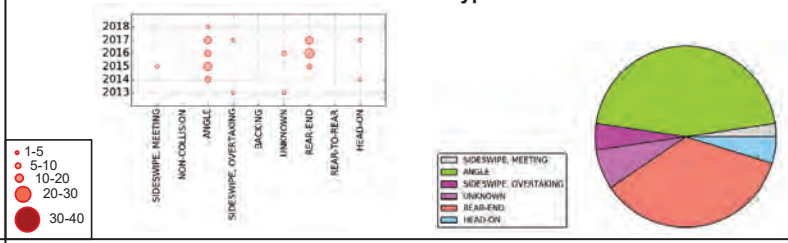
Lighting Conditions



Vehicle 1 Driver Factor

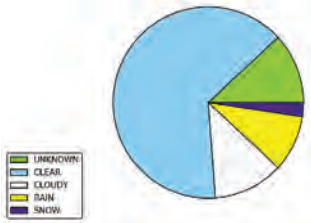


Crash Type



Vehicle 1 Most Harmful Event	Percent
None	97.6
MOTOR VEHICLE IN TRANSPORT	2.4

Weather Factor



Vehicle 1 Vehicle Factor	Percent
HIT AND RUN	4.8
OTHER IMPROPER DRIVING	7.1
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD: UNSAFE LANE CHANGE	2.4
UNKNOWN	11.9
FOLLOWED TOO CLOSELY	4.8
FAILED TO YIELD RIGHT OF WAY: DISREGARDED TRAFFIC SIGNS, SIGNALS, ROAD MARKINGS	2.4
None	7.1
DRIVING TOO FAST FOR CONDITIONS	11.9
UNSAFE LANE CHANGE	4.8
OBJECT AVOIDANCE	4.8
DISREGARDED TRAFFIC SIGNS, SIGNALS, ROAD MARKINGS	35.7
FAILED TO YIELD RIGHT OF WAY	2.4

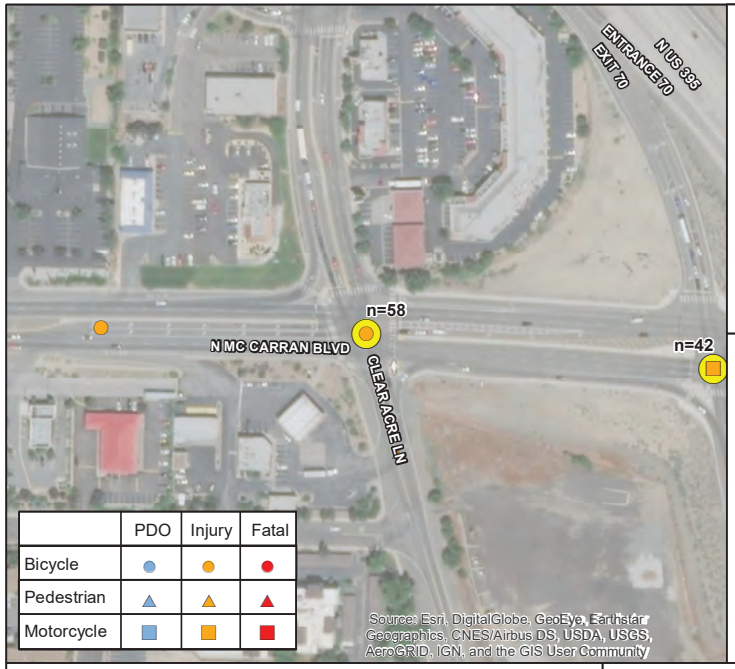
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FEET

Crash Factors: US 395 TO SR659 INT70

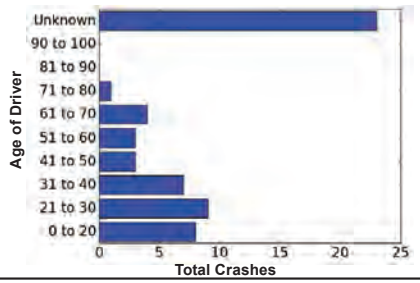
McCarran SMP
March 2019

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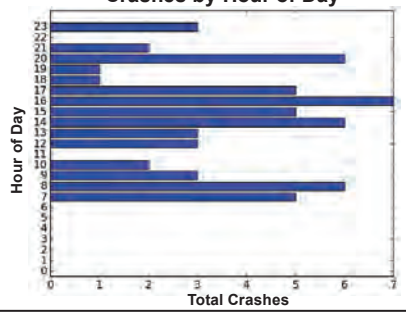
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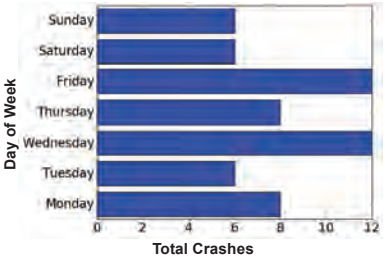
Crashes by Age of Driver



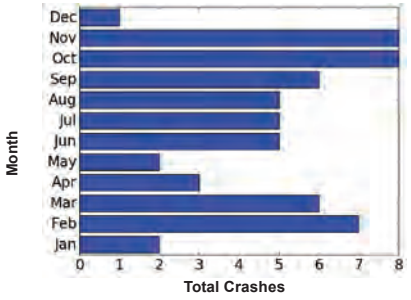
Crashes by Hour of Day



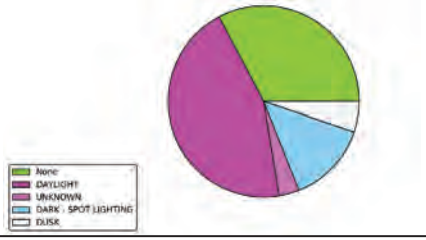
Crashes by Day of Week



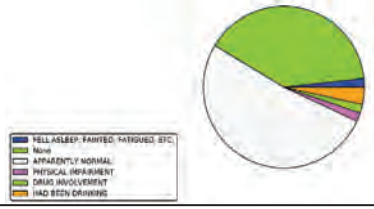
Crashes by Month



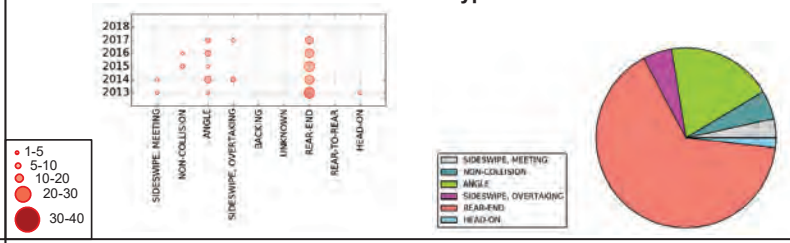
Lighting Conditions



Vehicle 1 Driver Factor

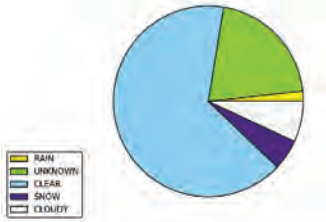


Crash Type



Vehicle 1 Most Harmful Event	Percent
None	100

Weather Factor



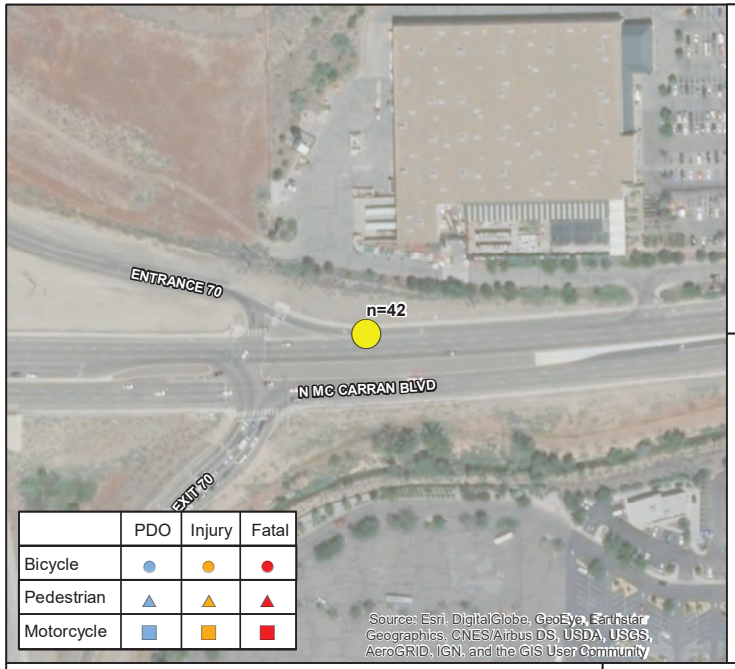
Vehicle 1 Vehicle Factor	Percent
HIT AND RUN	8.6
None	5.2
UNKNOWN	22.4
DRIVING TOO FAST FOR CONDITIONS	1.7
FAILED TO YIELD RIGHT OF WAY	3.4
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD: MECHANICAL DEFECTS	1.7
OPERATING VEHICLE IN ERRATIC, RECKLESS, CARELESS, NEGLIGENT OR AGGRESSIVE MANNER	3.4
OTHER IMPROPER DRIVING	17.2
FOLLOWED TOO CLOSELY	12.1
NO IMPROPER DRIVING	1.7
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD	1.7
FAILED TO YIELD RIGHT OF WAY: HIT AND RUN	1.7
HIT AND RUN: OTHER IMPROPER DRIVING	1.7
UNSAFE LANE CHANGE	6.9
DISREGARDED TRAFFIC SIGNS, SIGNALS, ROAD MARKINGS	10.3

0 50 100
FEET

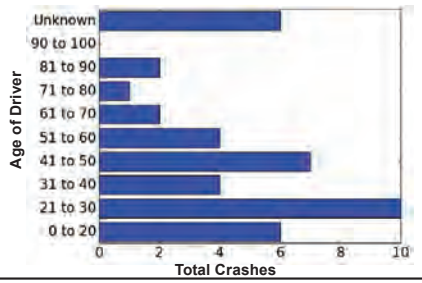
Crash Factors: CLEAR ACRE LN

McCarran SMP
March 2019

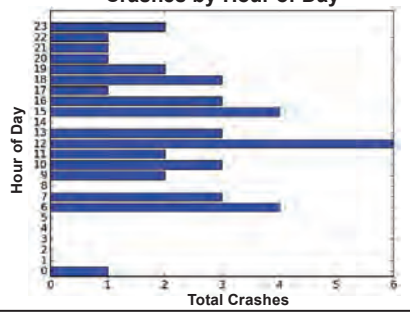
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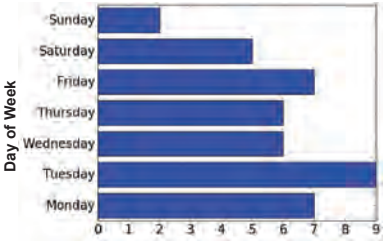
Crashes by Age of Driver



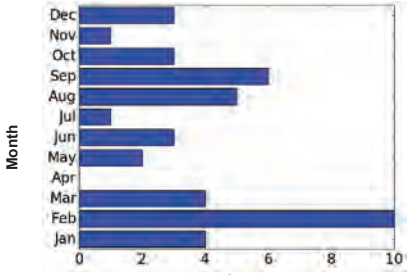
Crashes by Hour of Day



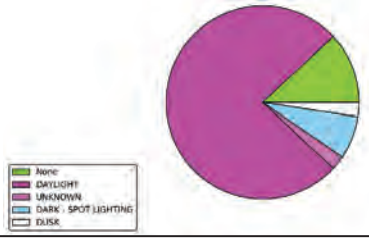
Crashes by Day of Week



Crashes by Month



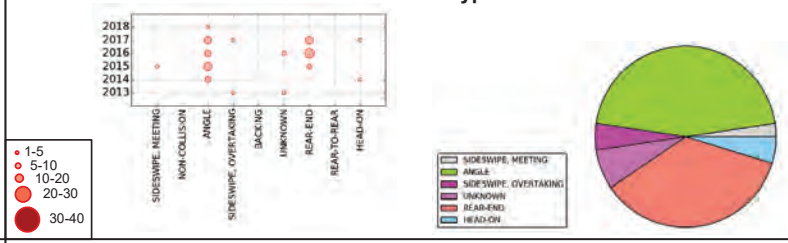
Lighting Conditions



Vehicle 1 Driver Factor

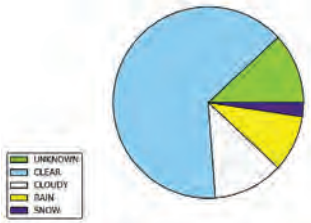


Crash Type



Vehicle 1 Most Harmful Event	Percent
None	97.6
MOTOR VEHICLE IN TRANSPORT	2.4

Weather Factor



Vehicle 1 Vehicle Factor	Percent
HIT AND RUN	4.8
OTHER IMPROPER DRIVING	7.1
FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD: UNSAFE LANE CHANGE	2.4
UNKNOWN	11.9
FOLLOWED TOO CLOSELY	4.8
FAILED TO YIELD RIGHT OF WAY: DISREGARDED TRAFFIC SIGNS, SIGNALS, ROAD MARKINGS	2.4
None	7.1
DRIVING TOO FAST FOR CONDITIONS	11.9
UNSAFE LANE CHANGE	4.8
OBJECT AVOIDANCE	4.8
DISREGARDED TRAFFIC SIGNS, SIGNALS, ROAD MARKINGS	35.7
FAILED TO YIELD RIGHT OF WAY	2.4

0 50 100
FEET

Crash Factors: US 395 TO SR659 INT70

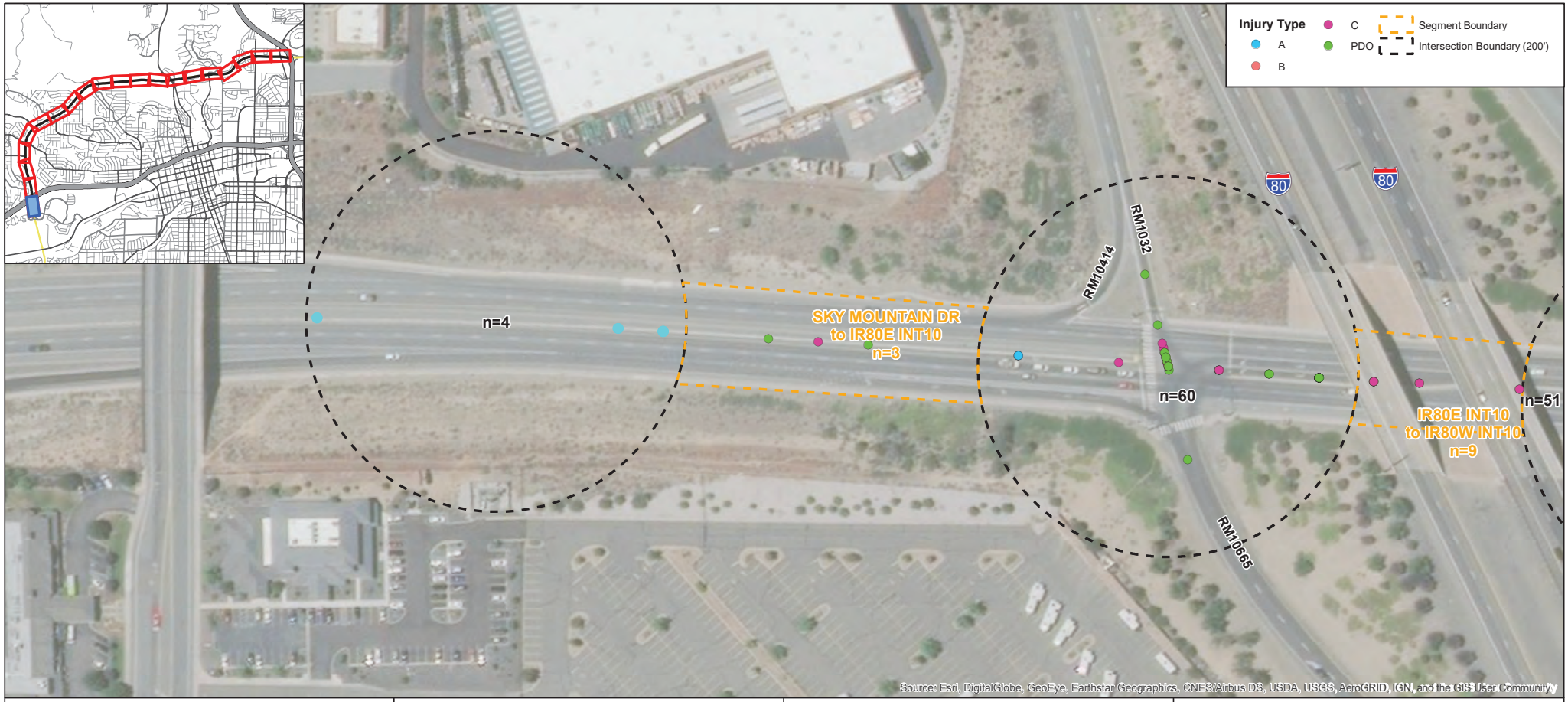
McCarran SMP

March 2019

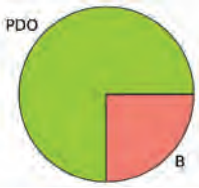
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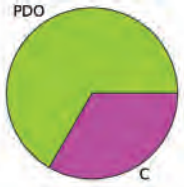
Appendix C
Crash Severity Maps



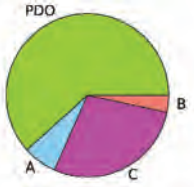
SKY MOUNTAIN DR



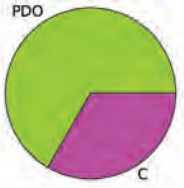
SKY MOUNTAIN DR to IR80E INT10



IR80E TO SR659 INT10



IR80E INT10 to IR80W INT10



0 50 100
FEET

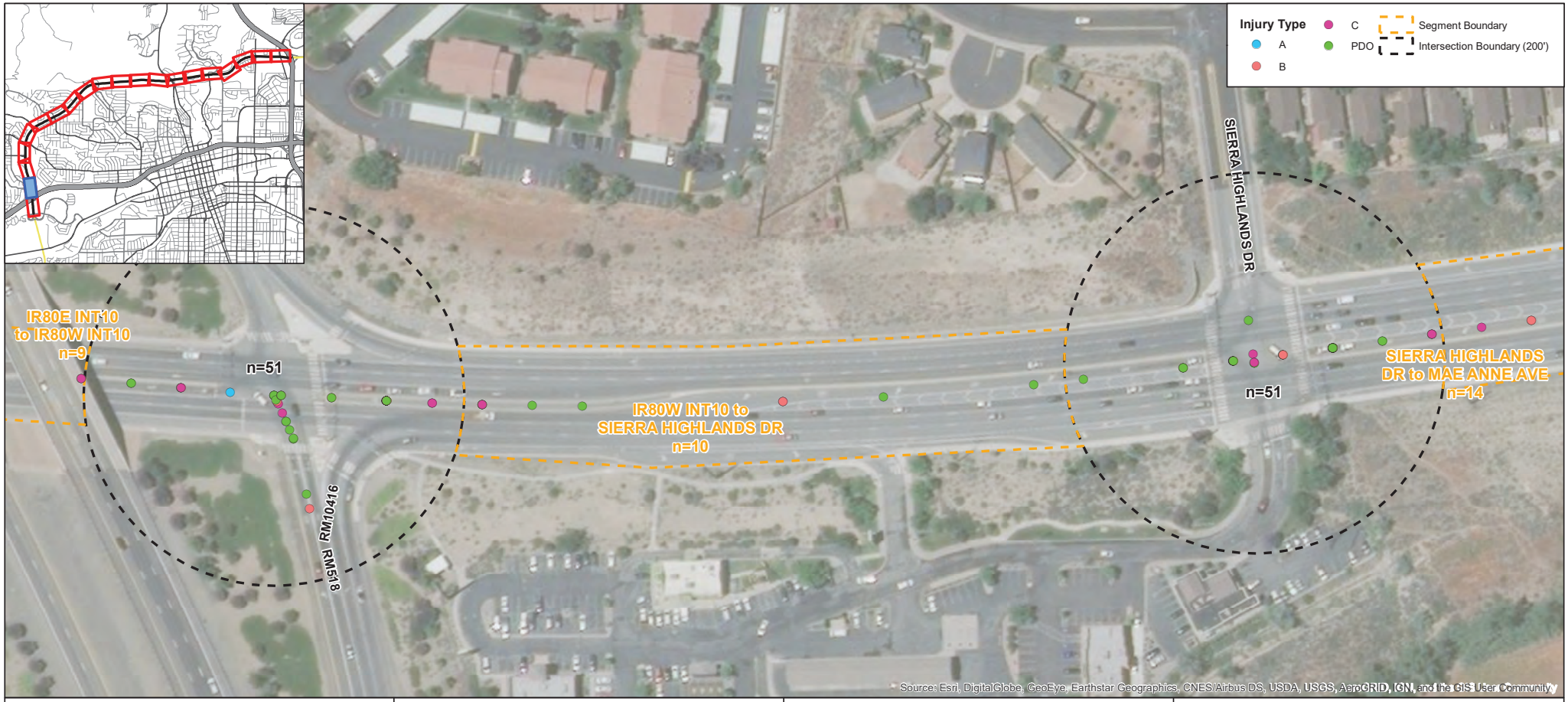
Crash Severity - Sheet 1

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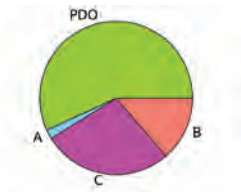
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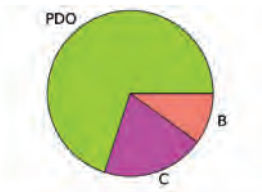
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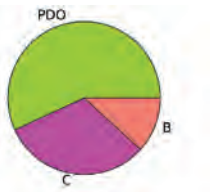
IR80W TO SR659 INT10



IR80W INT10 to SIERRA HIGHLANDS DR



SIERRA HIGHLANDS DR



0 50 100 FEET

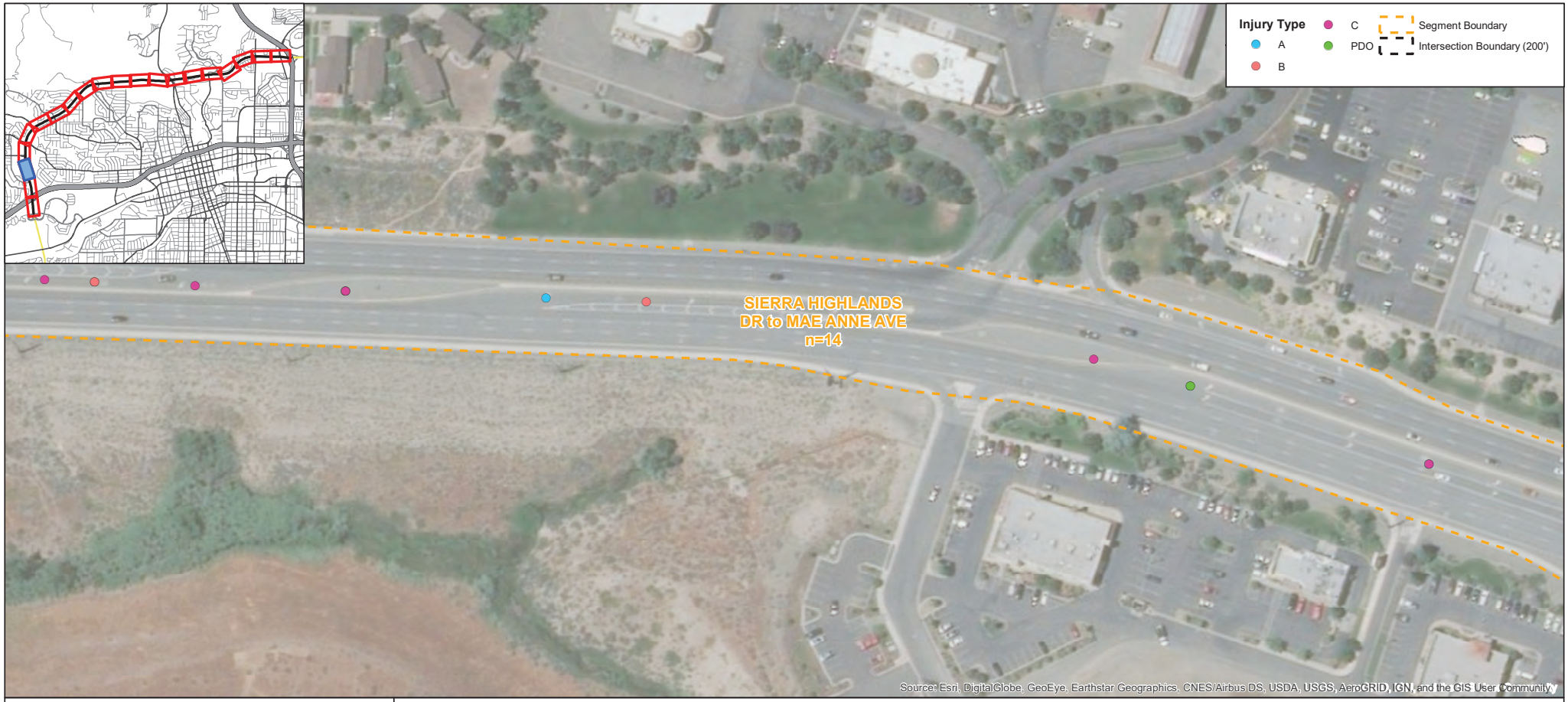
Crash Severity - Sheet 2

N. McCarran Blvd Safety Management Plan

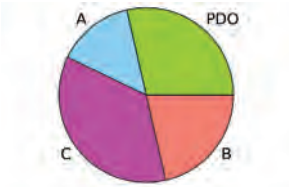
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SIERRA HIGHLANDS DR to MAE ANNE AVE



0 50 100 FEET

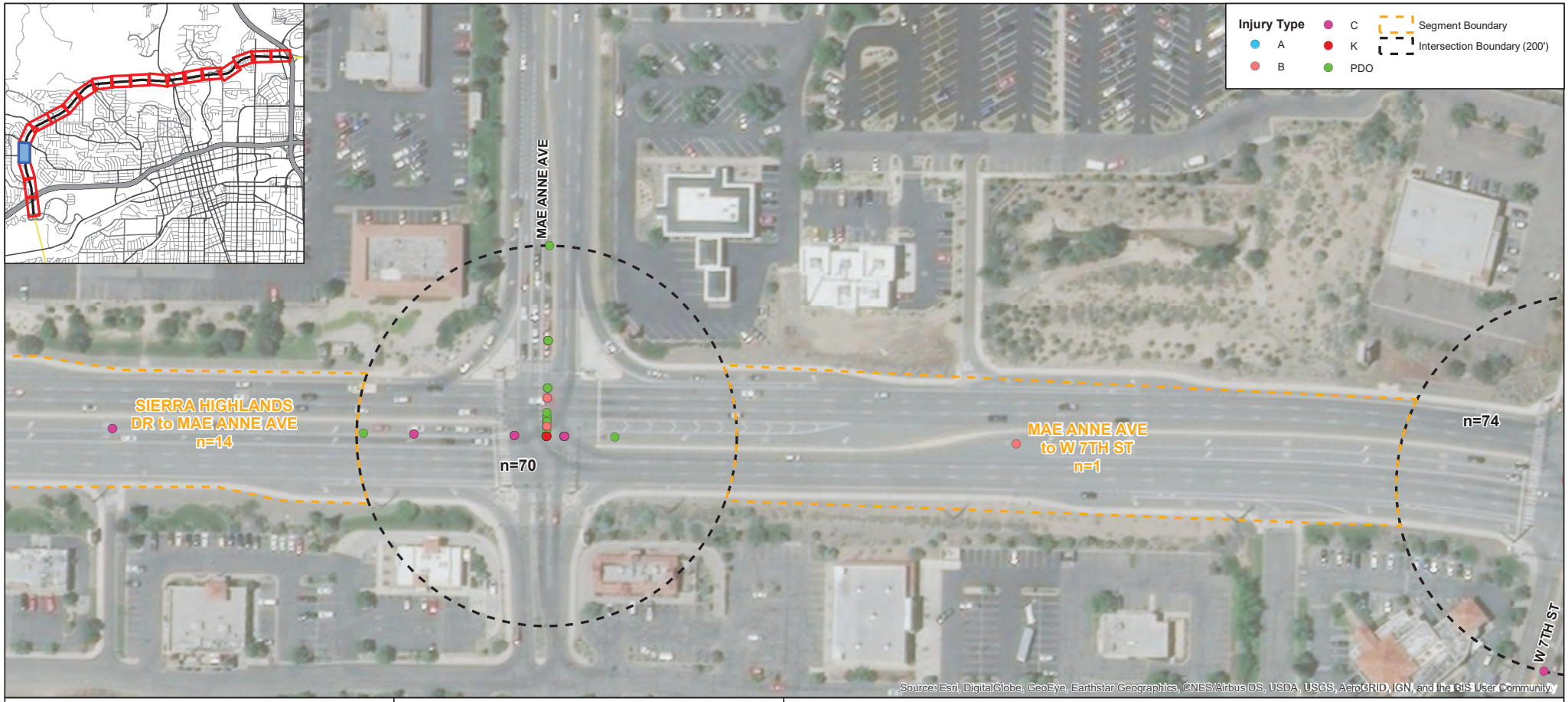
Crash Severity - Sheet 3

N. McCarran Blvd Safety Management Plan

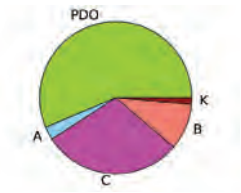
March 2019

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MAE ANNE AVE



MAE ANNE AVE to W 7TH ST



0 50 100 FEET

Crash Severity - Sheet 4

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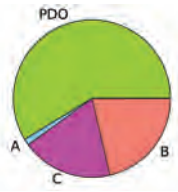
March 2019

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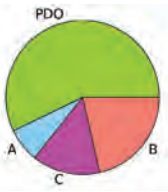
W 7TH ST



W 7TH ST to LAS BRISAS BLVD



LAS BRISAS BLVD



0 50 100
FEET

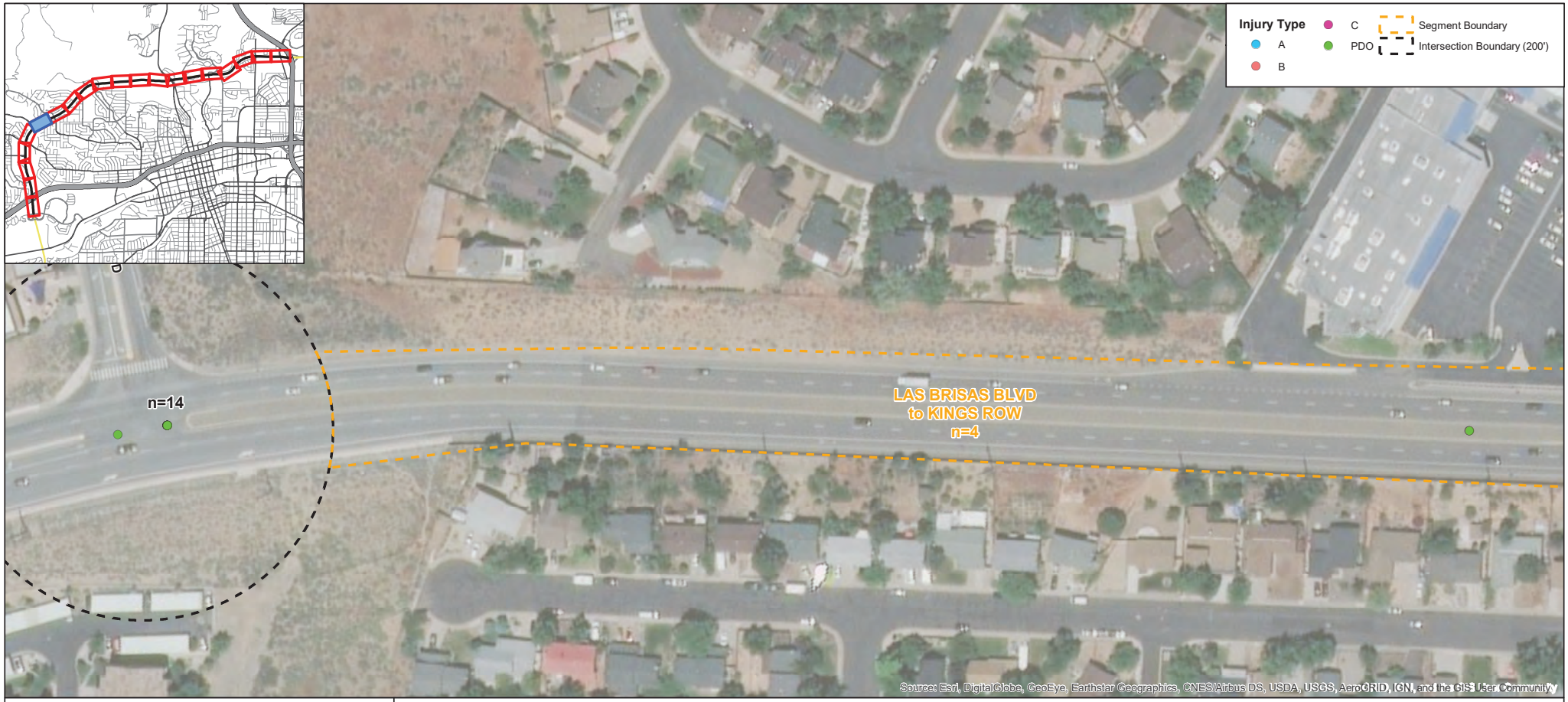
Crash Severity - Sheet 5

N. McCarran Blvd Safety Management Plan

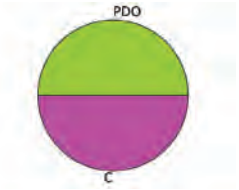
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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LAS BRISAS BLVD to KINGS ROW



0 50 100
FEET

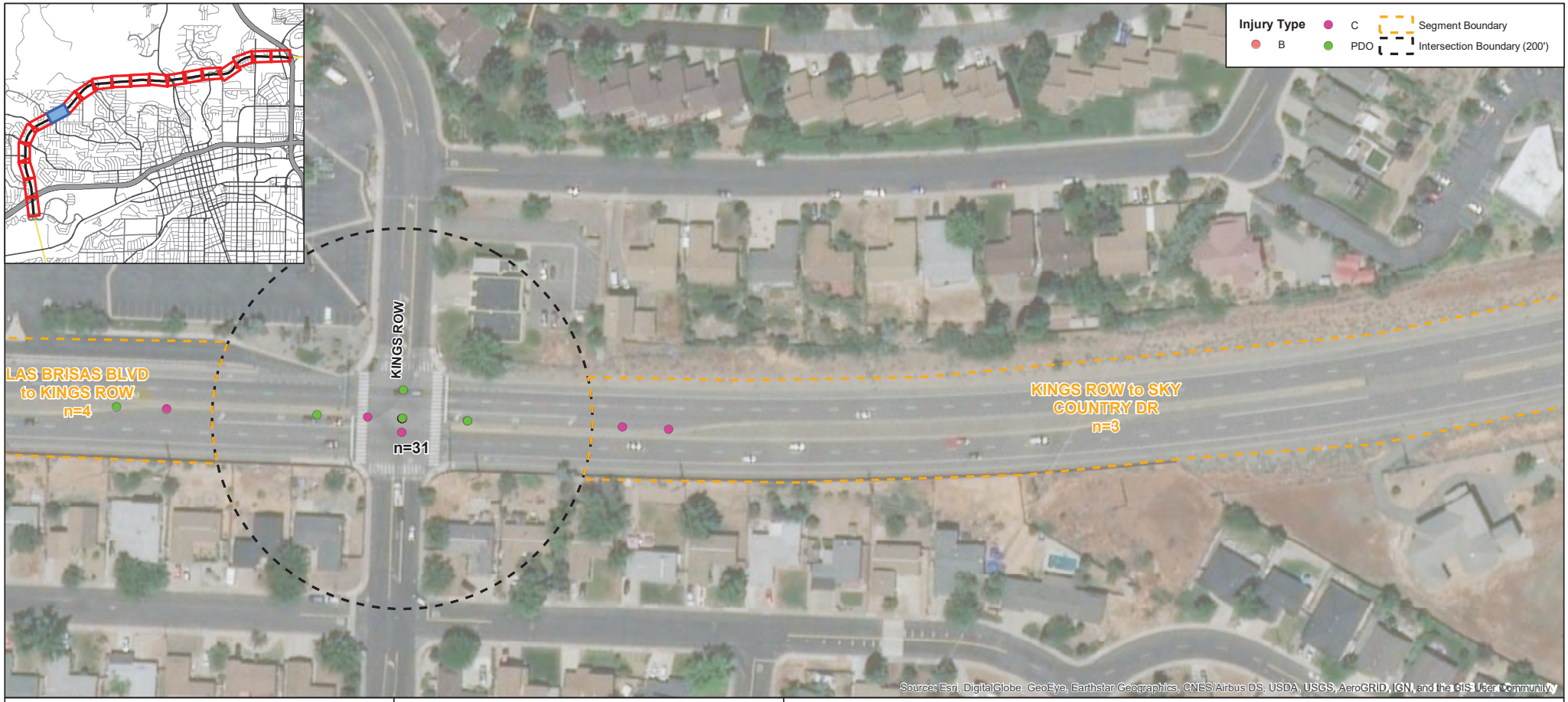
Crash Severity - Sheet 6

N. McCarran Blvd Safety Management Plan

March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

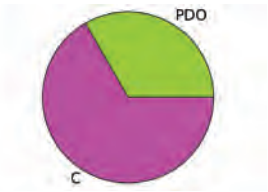
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KINGS ROW



KINGS ROW to SKY COUNTRY DR



0 50 100
FEET

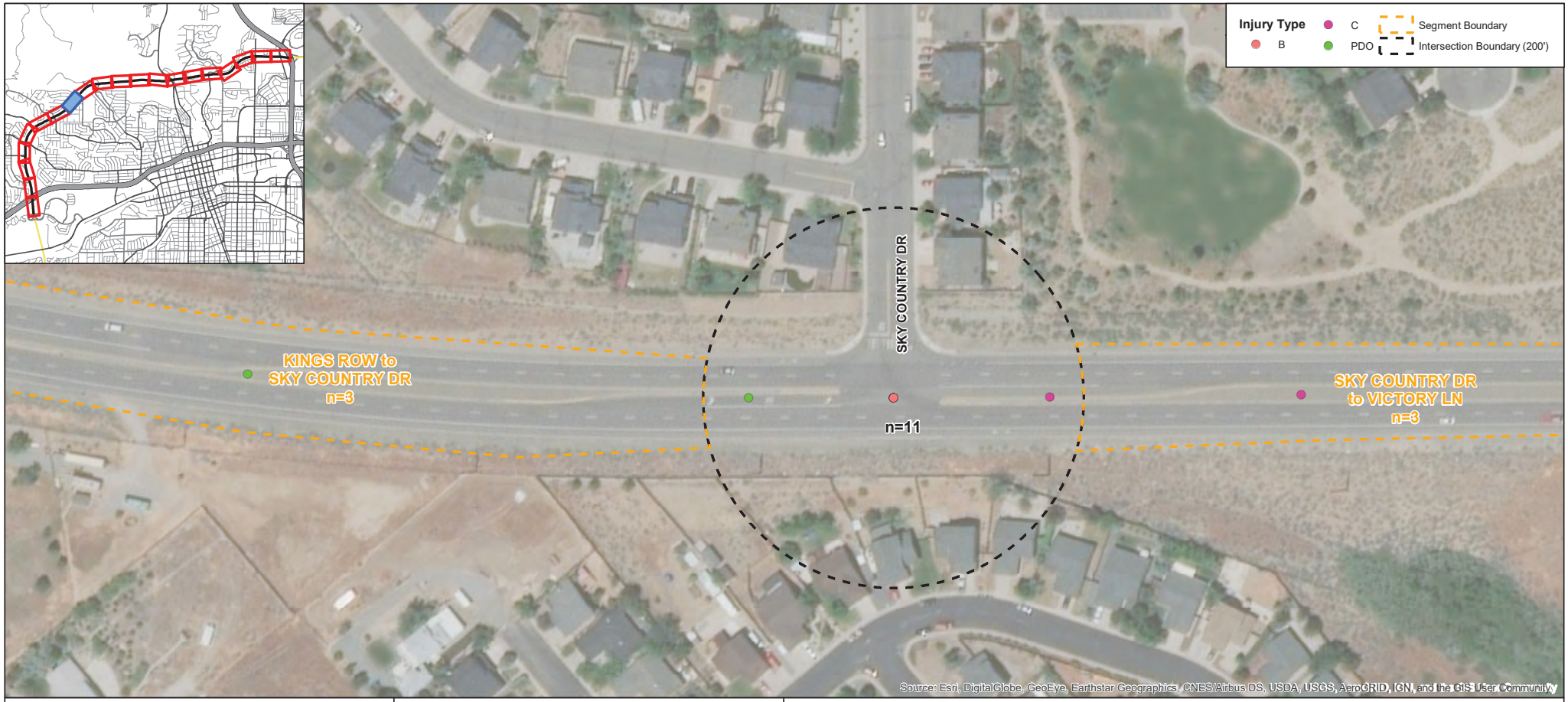
Crash Severity - Sheet 7

N. McCarran Blvd Safety Management Plan

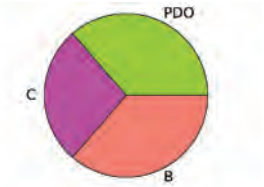
March 2019

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BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

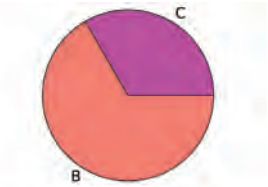
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SKY COUNTRY DR



SKY COUNTRY DR to VICTORY LN



0 50 100
FEET

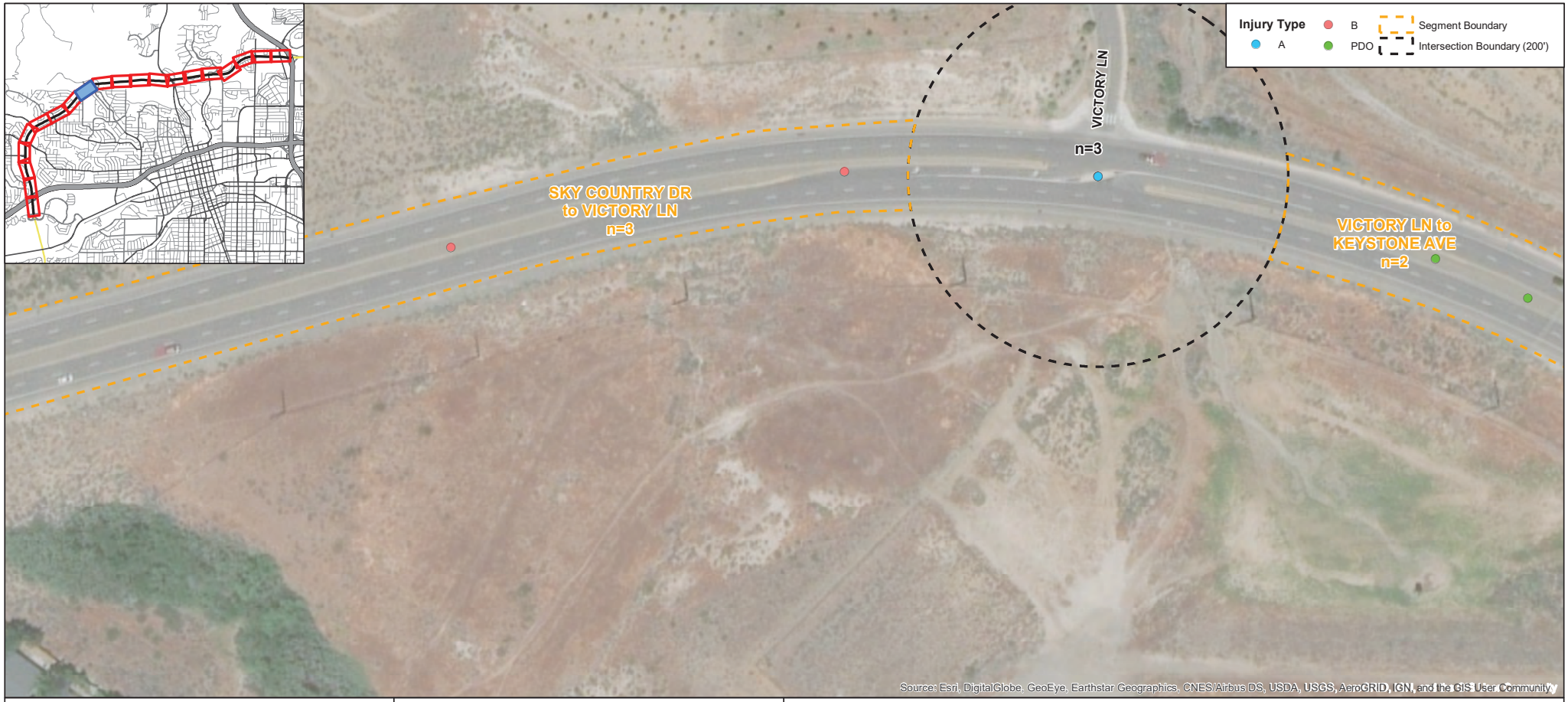
Crash Severity - Sheet 8

N. McCarran Blvd Safety Management Plan

March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

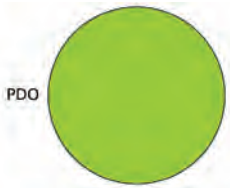
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VICTORY LN



VICTORY LN to KEYSTONE AVE



0 50 100
FEET

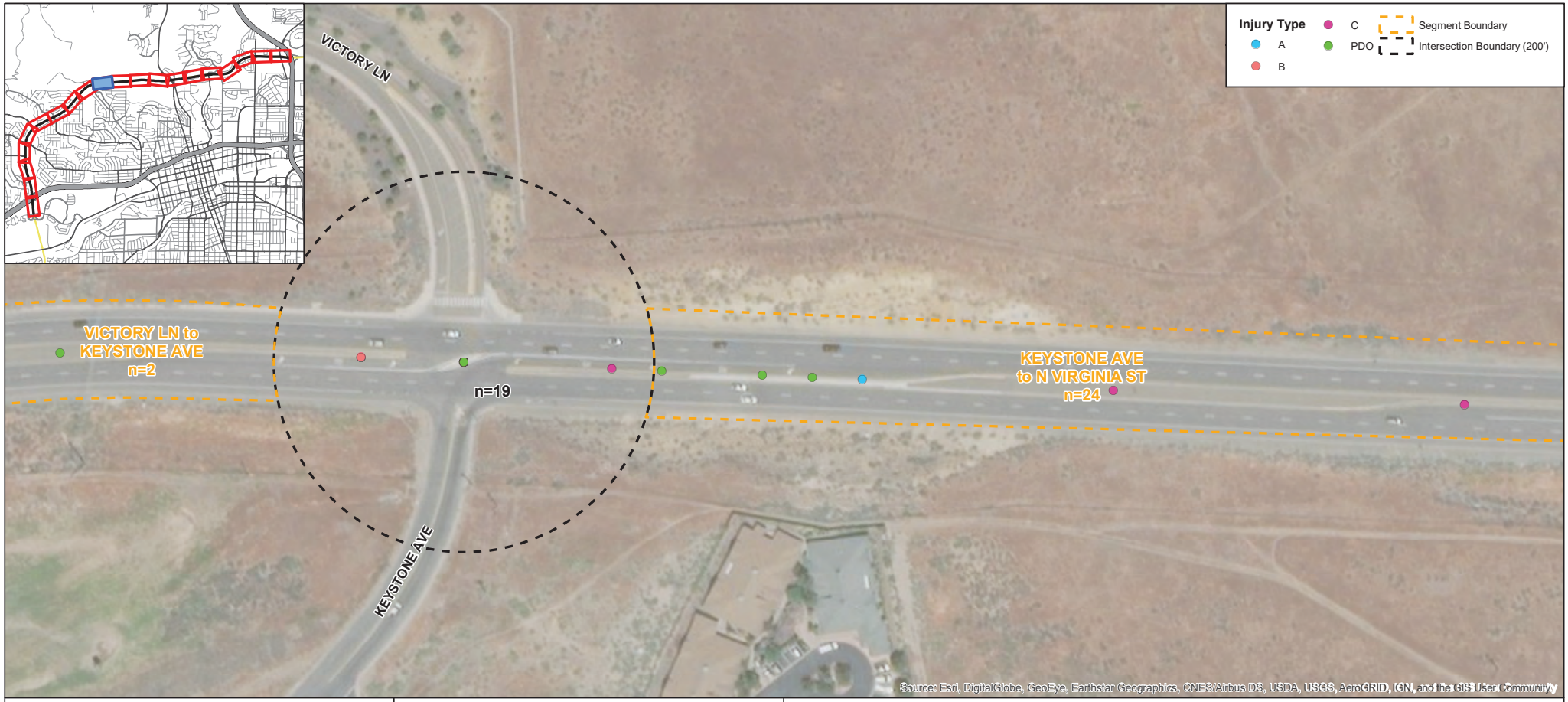
Crash Severity - Sheet 9

N. McCarran Blvd Safety Management Plan

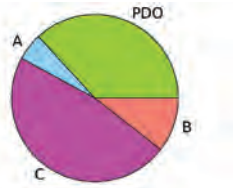
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

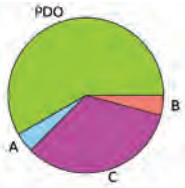
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KEYSTONE AVE



KEYSTONE AVE to N VIRGINIA ST



0 50 100
FEET

Crash Severity - Sheet 10

N. McCarran Blvd Safety Management Plan

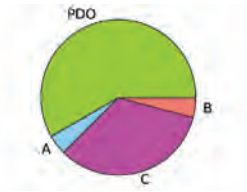
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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KEYSTONE AVE to N VIRGINIA ST



0 50 100
FEET

Crash Severity - Sheet 11

N. McCarran Blvd Safety Management Plan

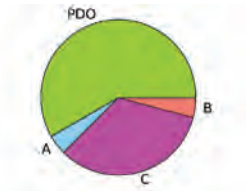
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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KEYSTONE AVE to N VIRGINIA ST



0 50 100
FEET

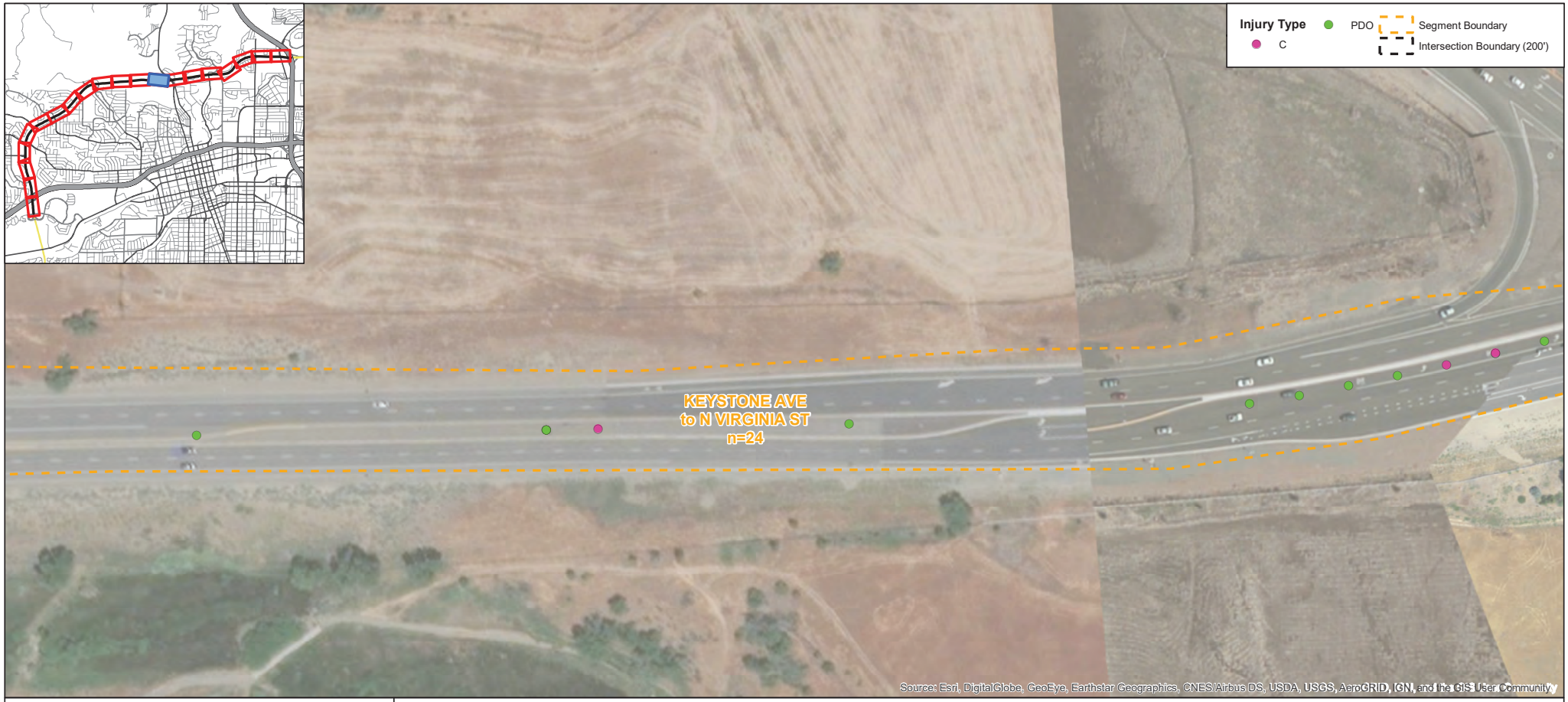
Crash Severity - Sheet 12

N. McCarran Blvd Safety Management Plan

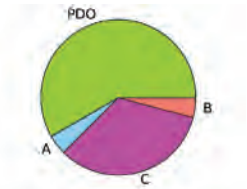
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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KEYSTONE AVE to N VIRGINIA ST



0 50 100
FEET

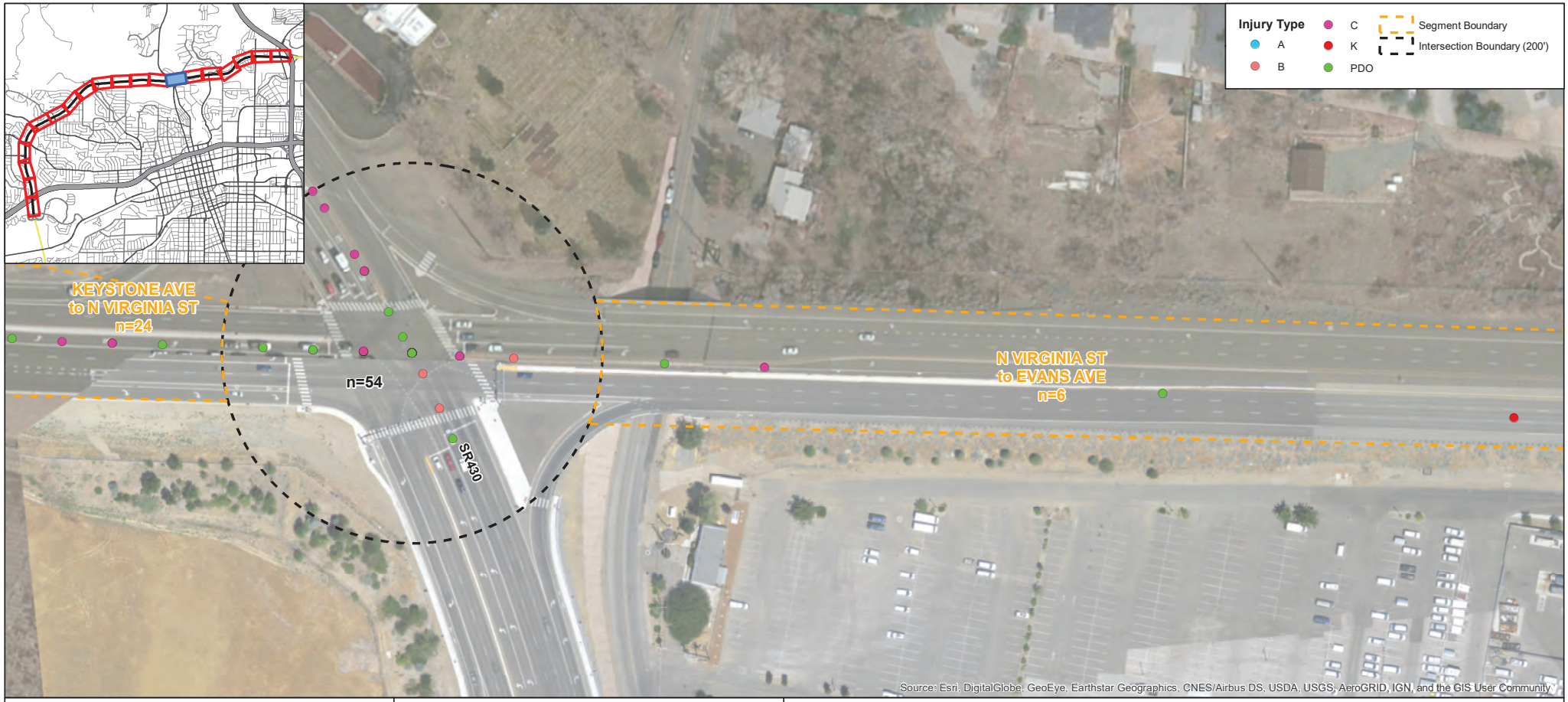
Crash Severity - Sheet 13

N. McCarran Blvd Safety Management Plan

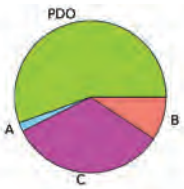
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

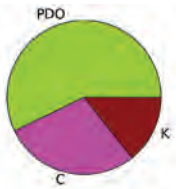
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N VIRGINIA ST



N VIRGINIA ST to EVANS AVE



0 50 100 FEET

Crash Severity - Sheet 14

N. McCarran Blvd Safety Management Plan

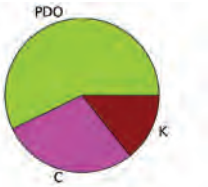
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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N VIRGINIA ST to EVANS AVE



0 50 100
FEET

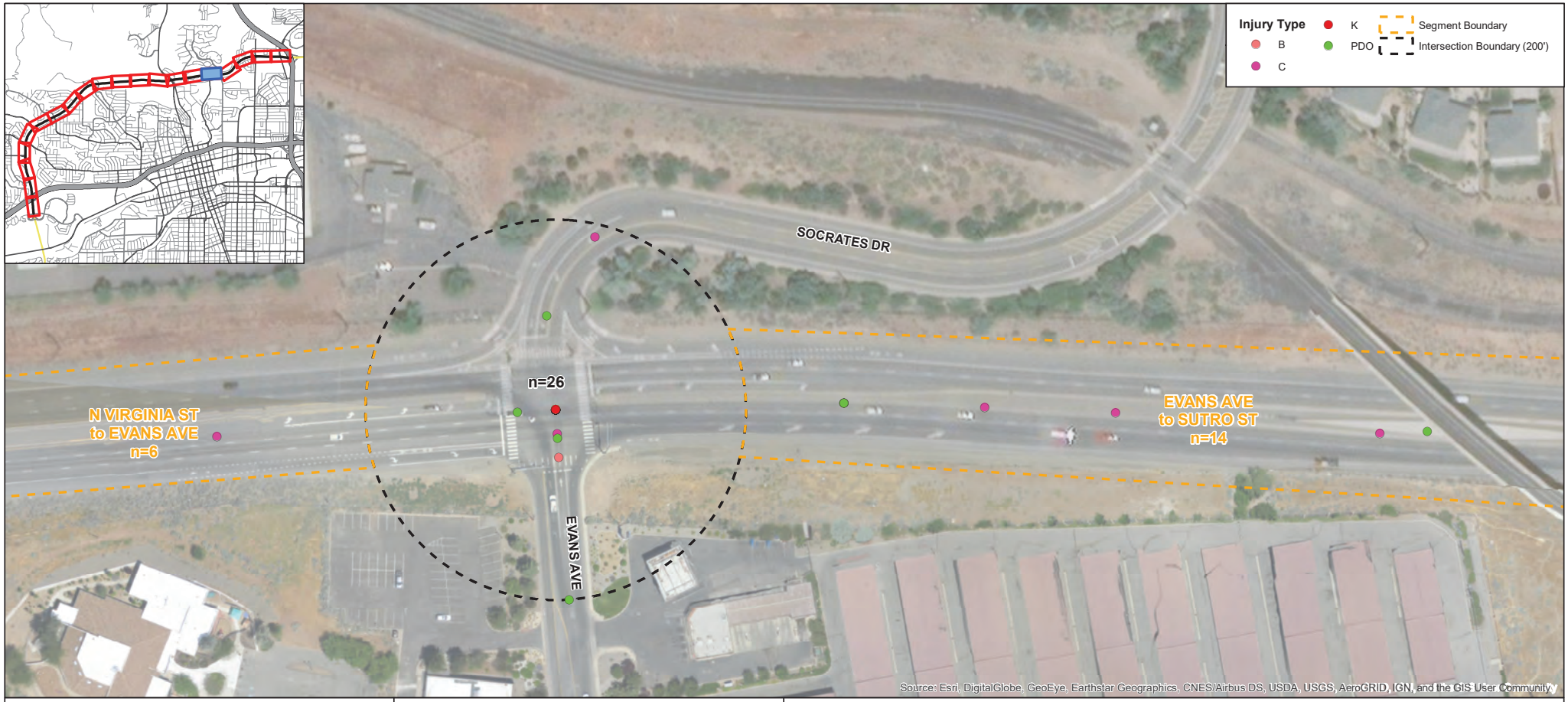
Crash Severity - Sheet 15

N. McCarran Blvd Safety Management Plan

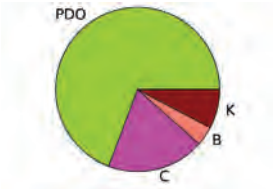
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

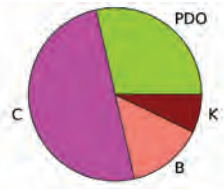
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EVANS AVE



EVANS AVE to SUTRO ST



0 50 100
FEET

Crash Severity - Sheet 16

N. McCarran Blvd Safety Management Plan

March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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EVANS AVE to SUTRO ST



0 50 100
FEET

Crash Severity - Sheet 17

N. McCarran Blvd Safety Management Plan

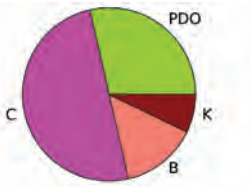
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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EVANS AVE to SUTRO ST



0 50 100 FEET

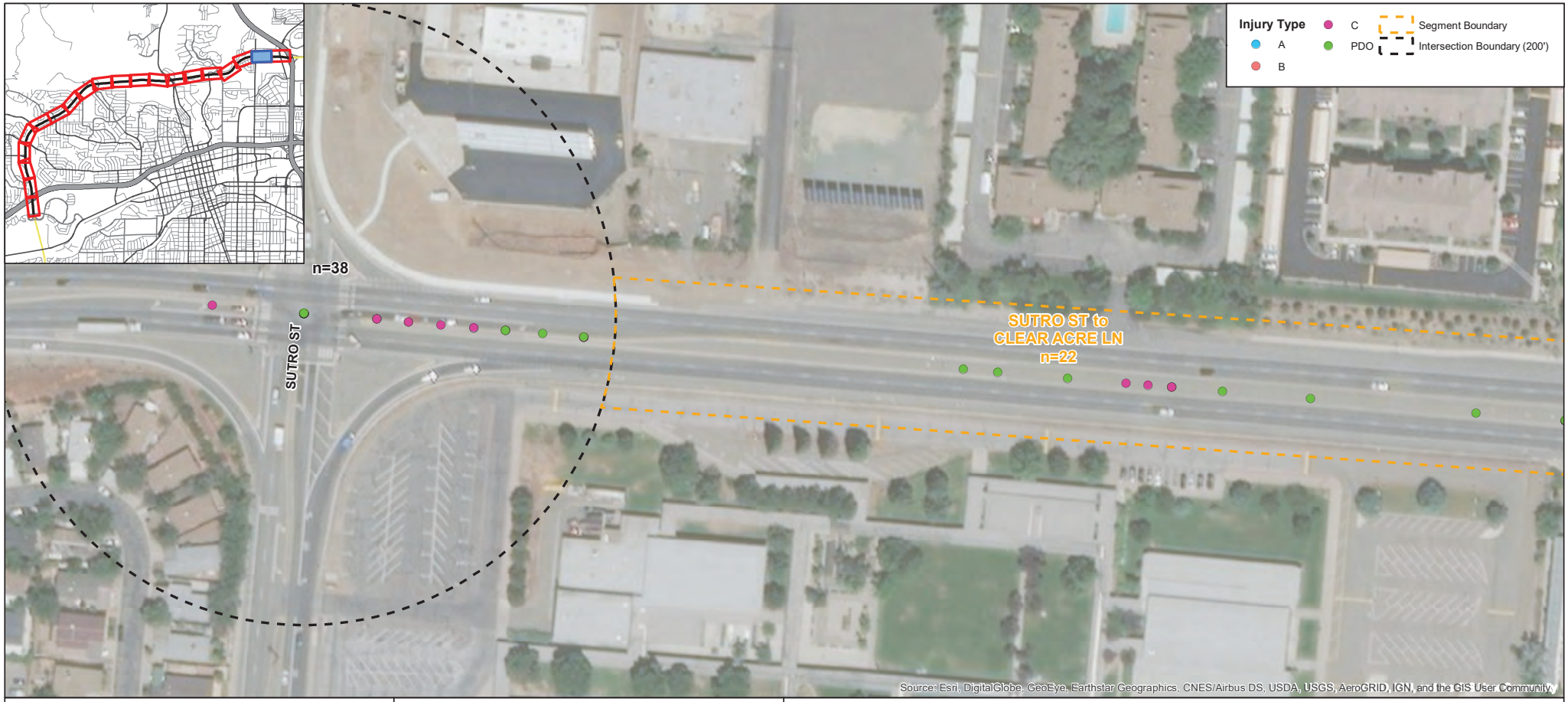
Crash Severity - Sheet 18

N. McCarran Blvd Safety Management Plan

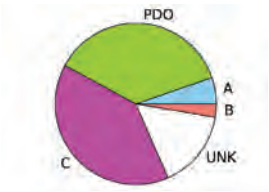
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

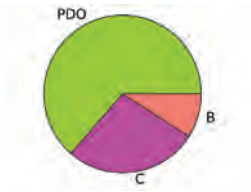
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SUTRO ST



SUTRO ST to CLEAR ACRE LN



0 50 100
FEET

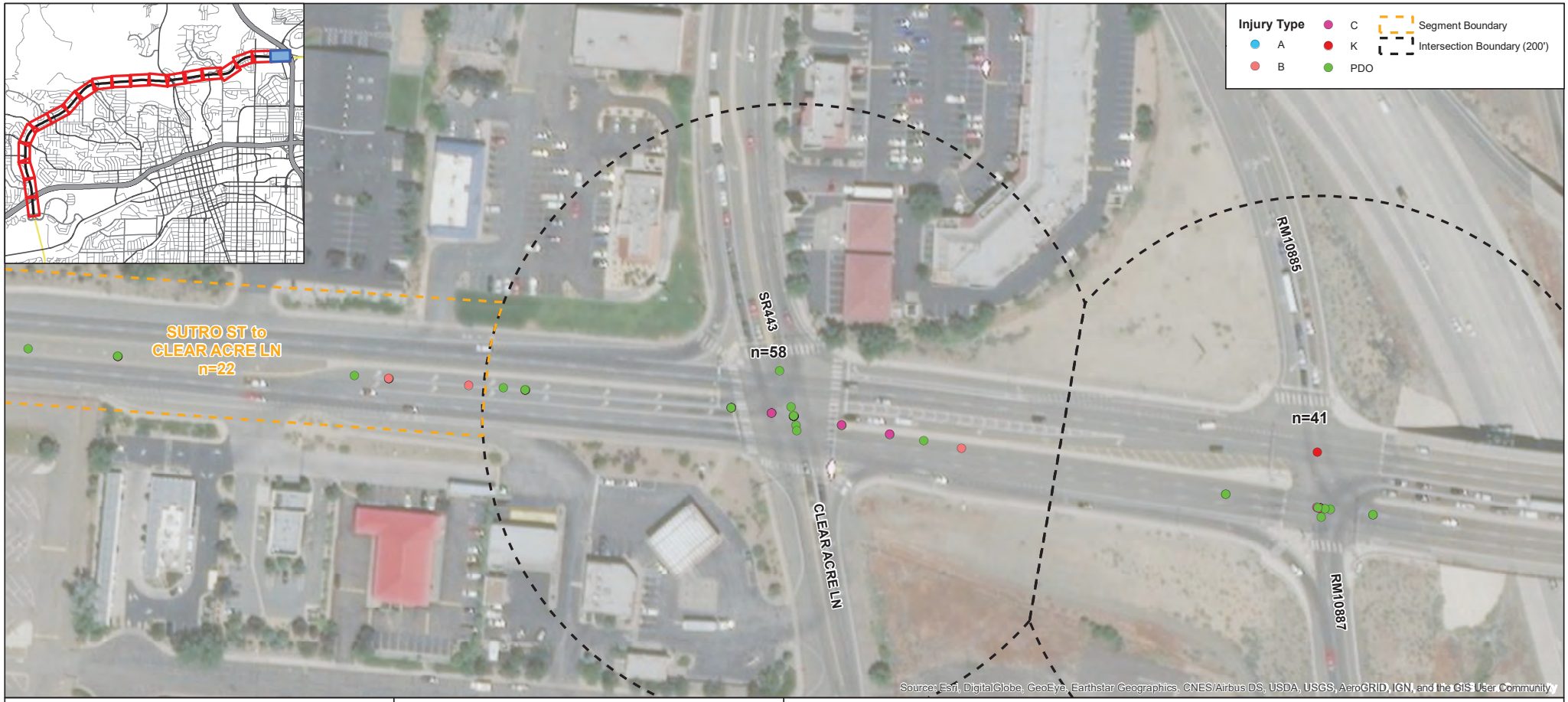
Crash Severity - Sheet 19

N. McCarran Blvd Safety Management Plan

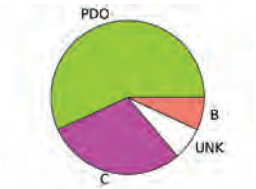
March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

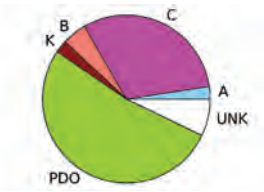
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CLEAR ACRE LN



US 395 TO SR659 INT70



0 50 100
FEET

Crash Severity - Sheet 20

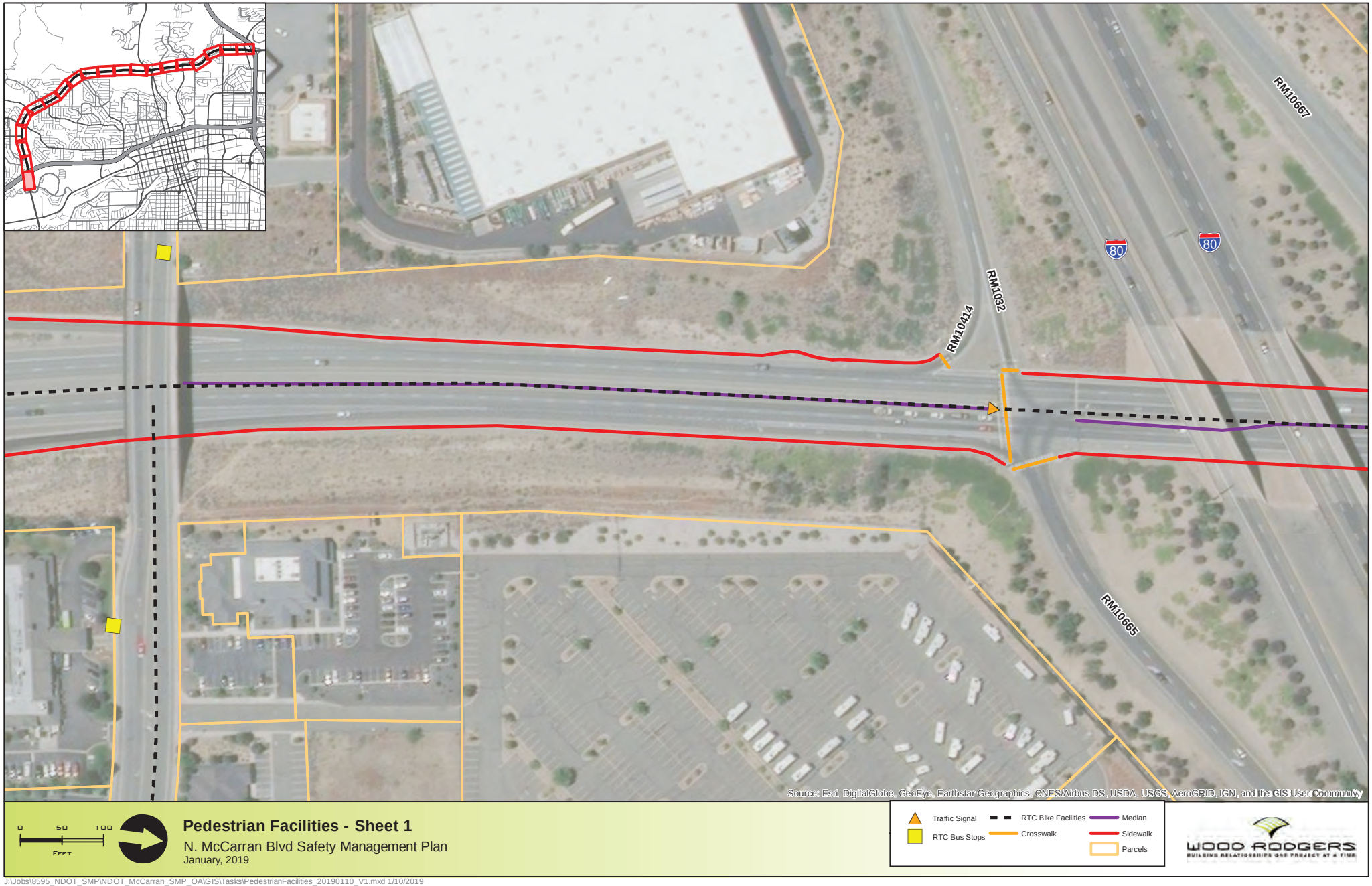
N. McCarran Blvd Safety Management Plan

March 2019

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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Appendix D
Supplementary GIS Maps



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Pedestrian Facilities - Sheet 1

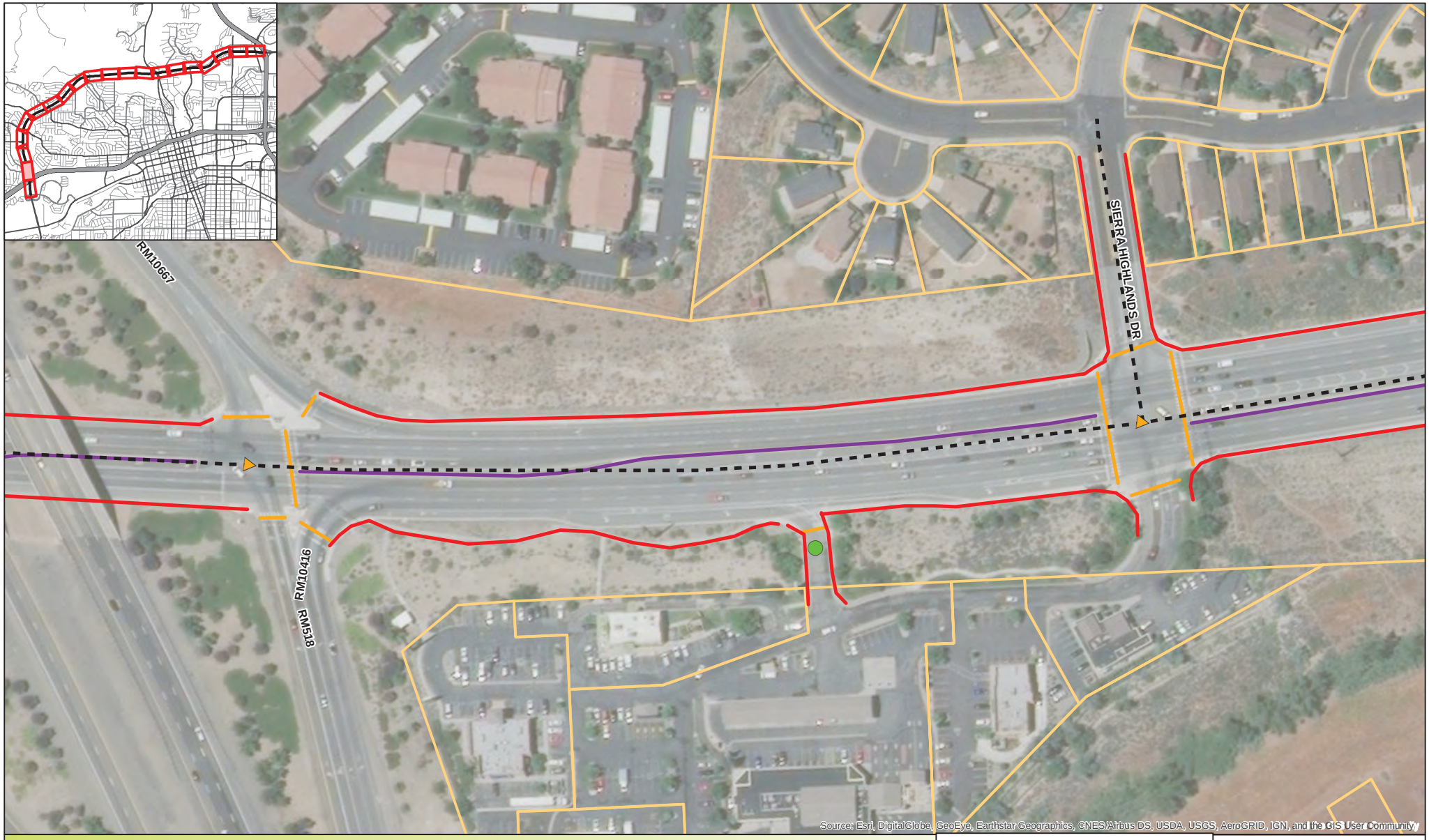
N. McCarran Blvd Safety Management Plan

January, 2019

Traffic Signal
RTC Bus Stops
RTC Bike Facilities
Crosswalk
Median
Sidewalk
Parcels

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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0 50 100
Feet

Pedestrian Facilities - Sheet 2

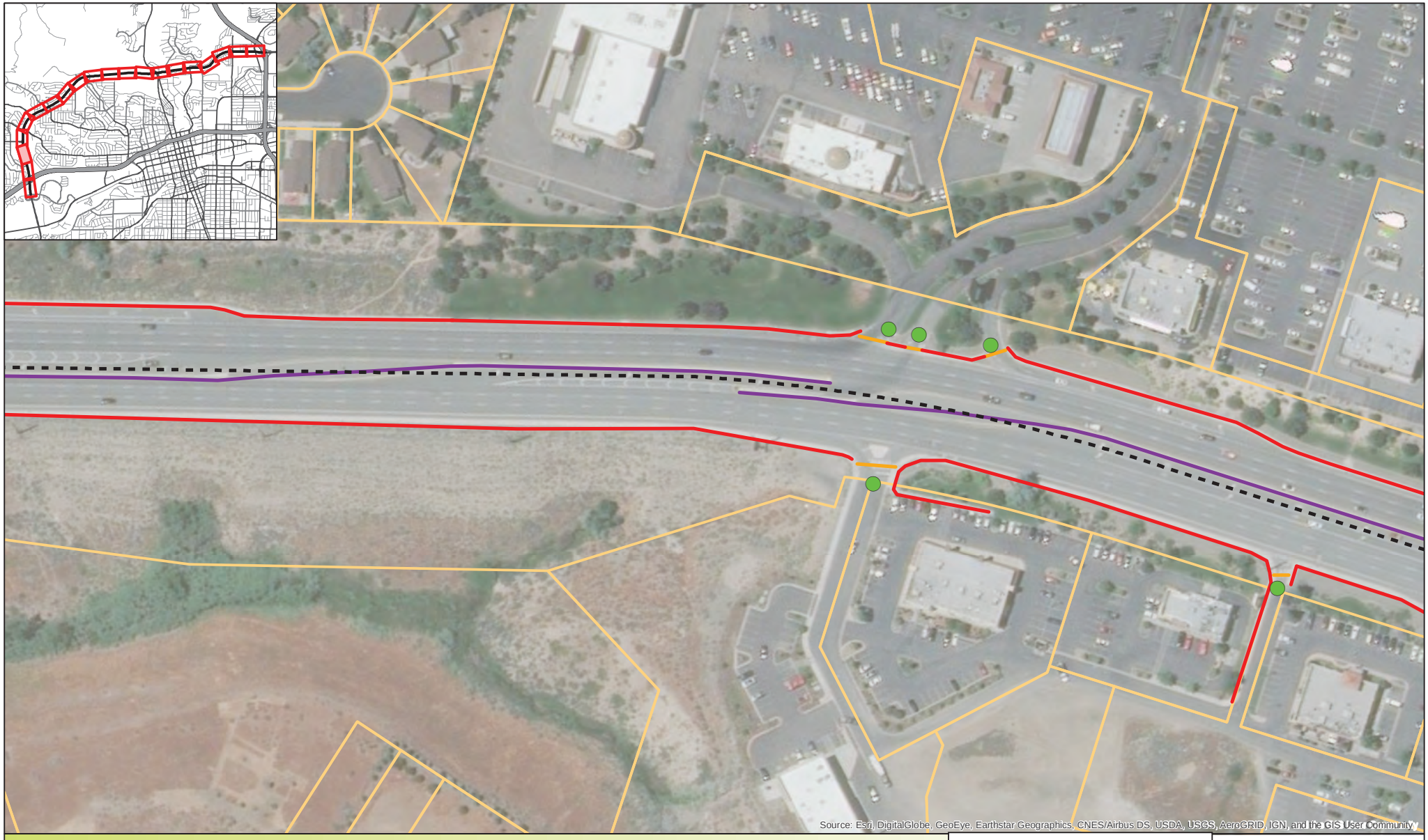
N. McCarran Blvd Safety Management Plan

January, 2019

Driveway
Traffic Signal
RTC Bike Facilities
Crosswalk
Median
Sidewalk
Parcels

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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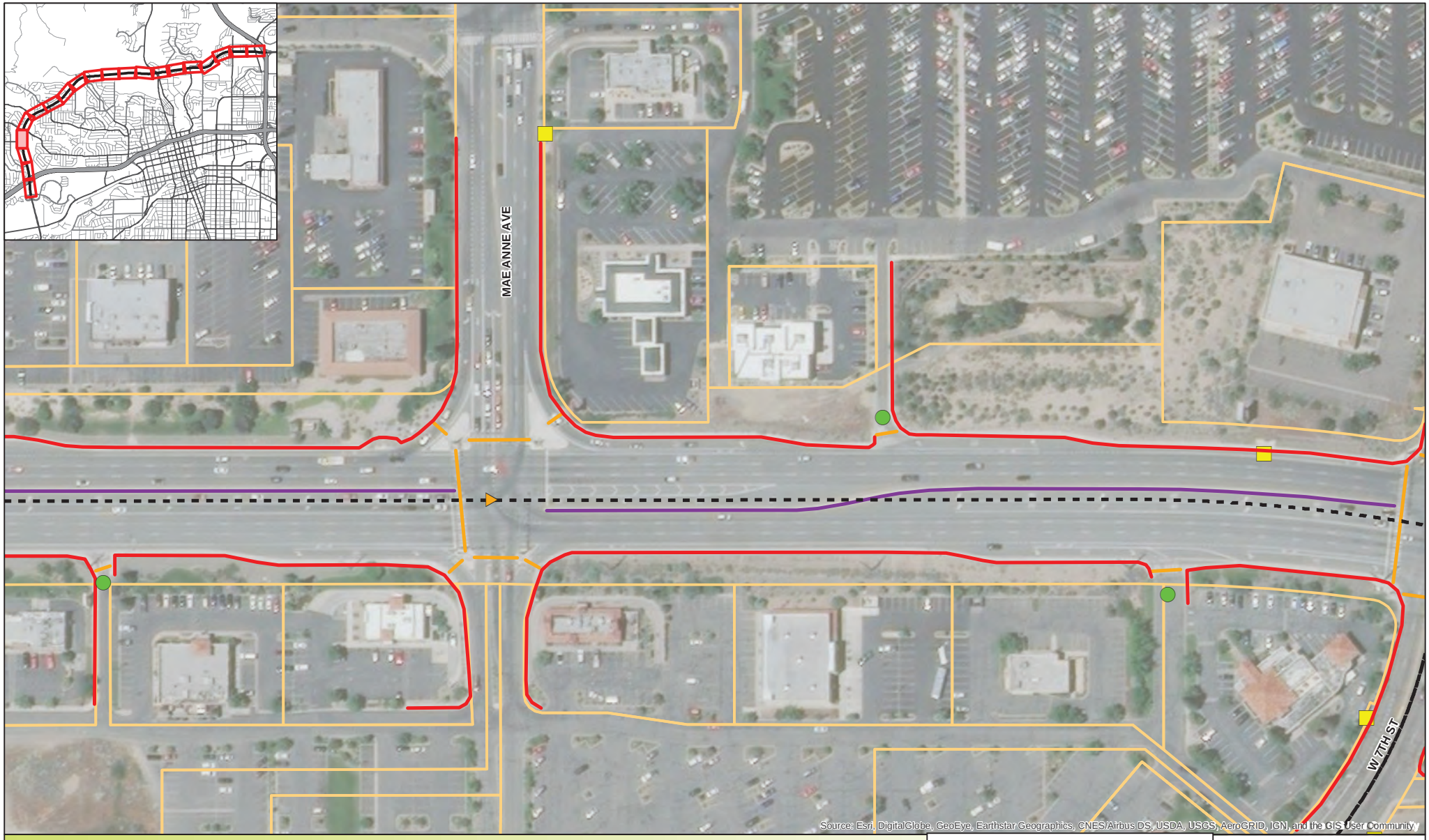


Pedestrian Facilities - Sheet 3

N. McCarran Blvd Safety Management Plan

January, 2019

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Pedestrian Facilities - Sheet 4

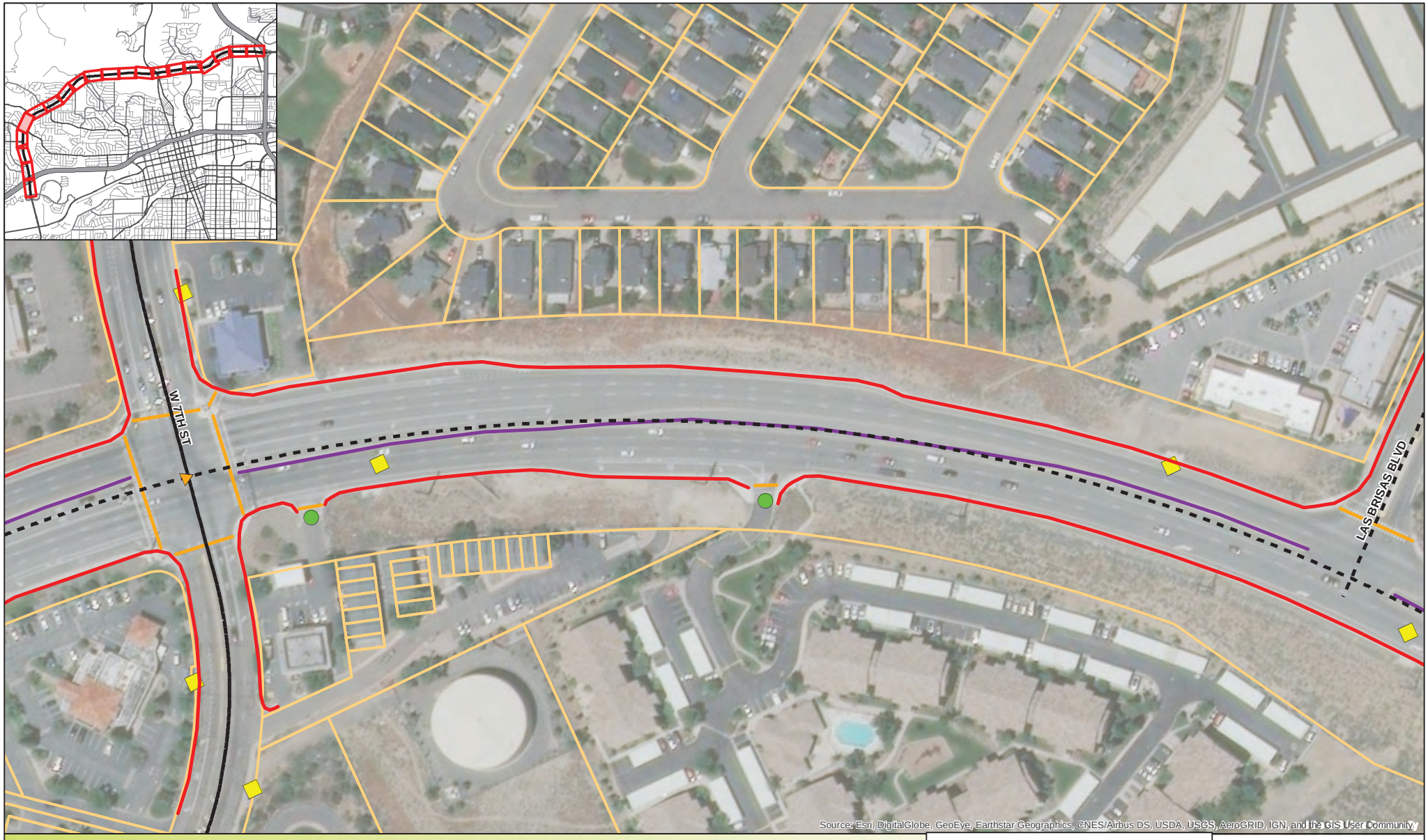
N. McCarran Blvd Safety Management Plan

January, 2019

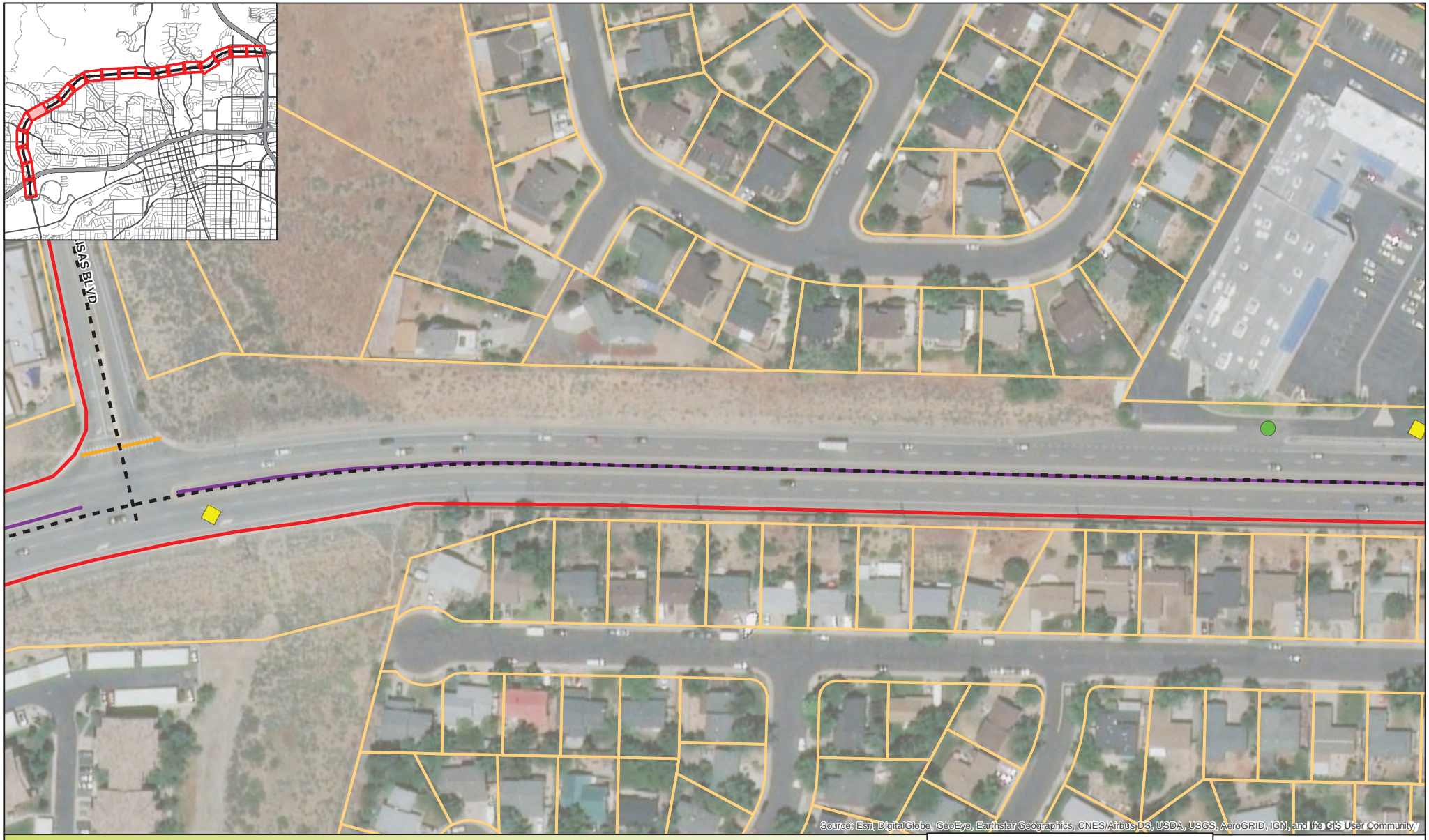
WOOD RODGERS

BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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Pedestrian Facilities - Sheet 6

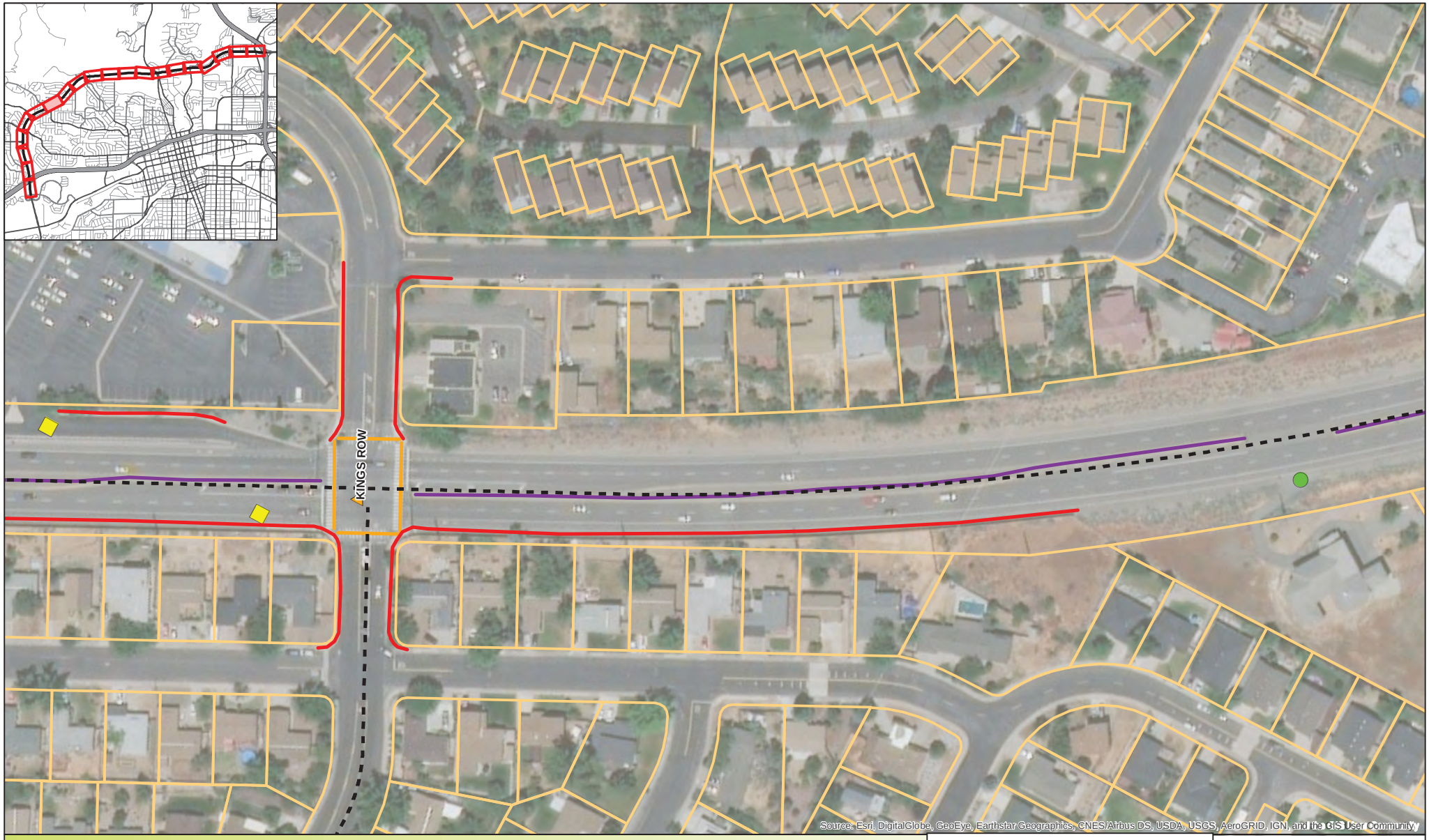
N. McCarran Blvd Safety Management Plan

January, 2019

WOOD RODGERS

BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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0 50 100
Feet

Pedestrian Facilities - Sheet 7

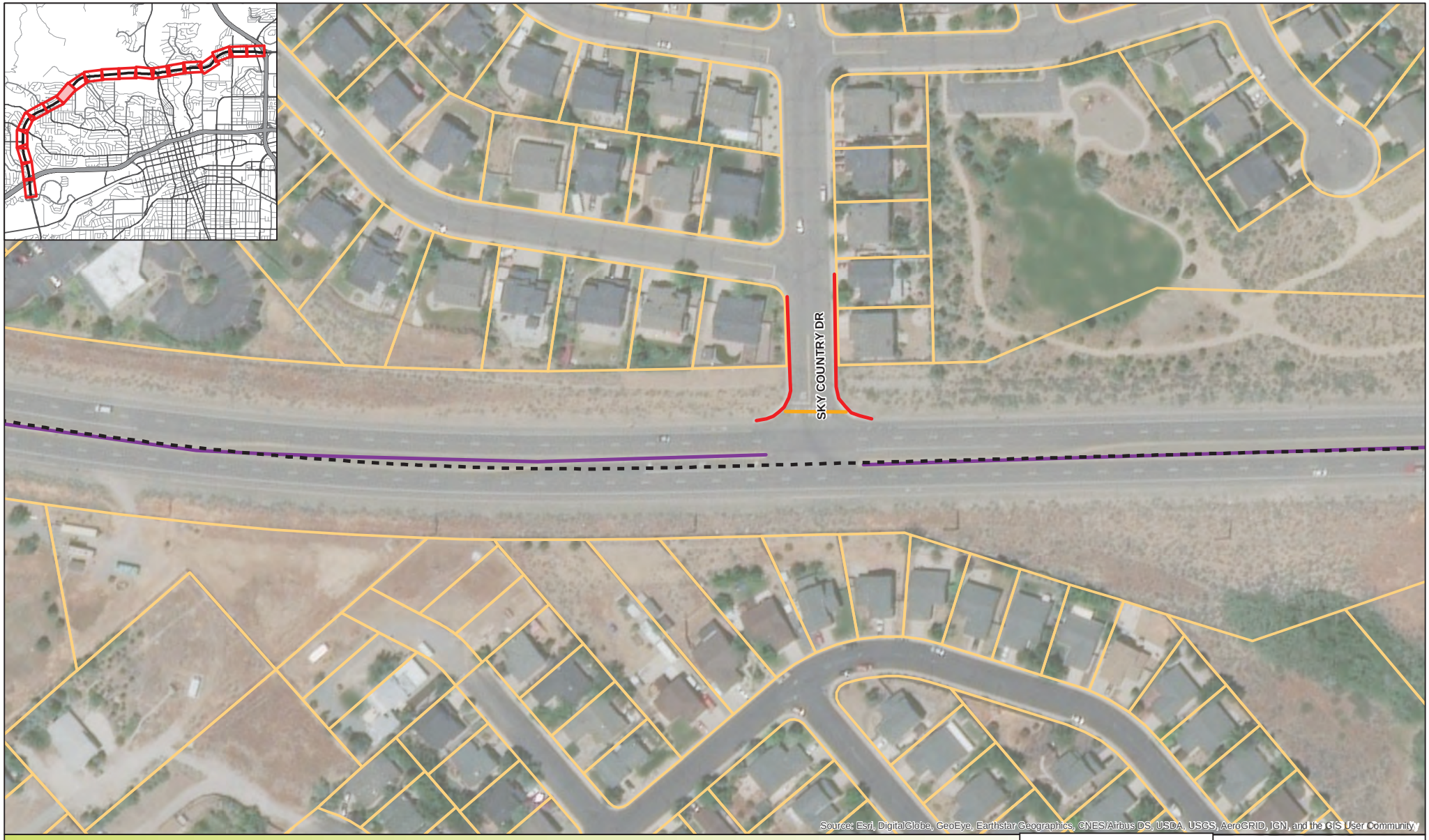
N. McCarran Blvd Safety Management Plan

January, 2019

Driveway
Traffic Signal
RTC Bus Stops
RTC Bike Facilities
Crosswalk
Median
Sidewalk
Parcels

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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Pedestrian Facilities - Sheet 8

N. McCarran Blvd Safety Management Plan

January, 2019

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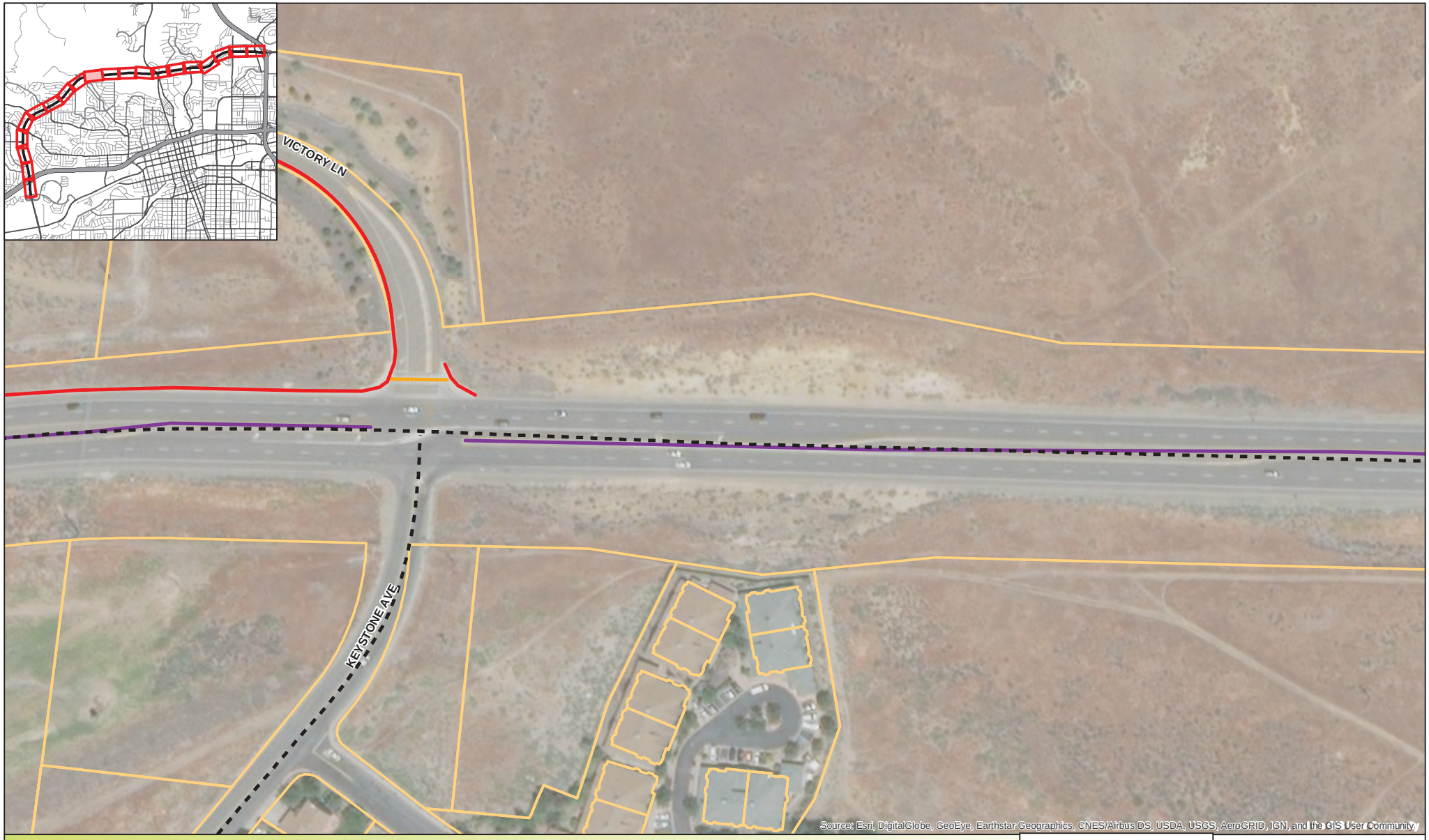


Pedestrian Facilities - Sheet 9

N. McCarran Blvd Safety Management Plan

January, 2019

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0 50 100
Feet

Pedestrian Facilities - Sheet 10

N. McCarran Blvd Safety Management Plan

January, 2019

RTC Bike Facilities
Crosswalk
Median
Sidewalk
Parcels

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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Pedestrian Facilities - Sheet 11

N. McCarran Blvd Safety Management Plan

January, 2019

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0 50 100
Feet

Pedestrian Facilities - Sheet 12

N. McCarran Blvd Safety Management Plan

January, 2019

Driveway
RTC Bike Facilities
Median
Parcels

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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0 50 100
Feet

Pedestrian Facilities - Sheet 13

N. McCarran Blvd Safety Management Plan

January, 2019

RTC Bike Facilities
Median
Parcels

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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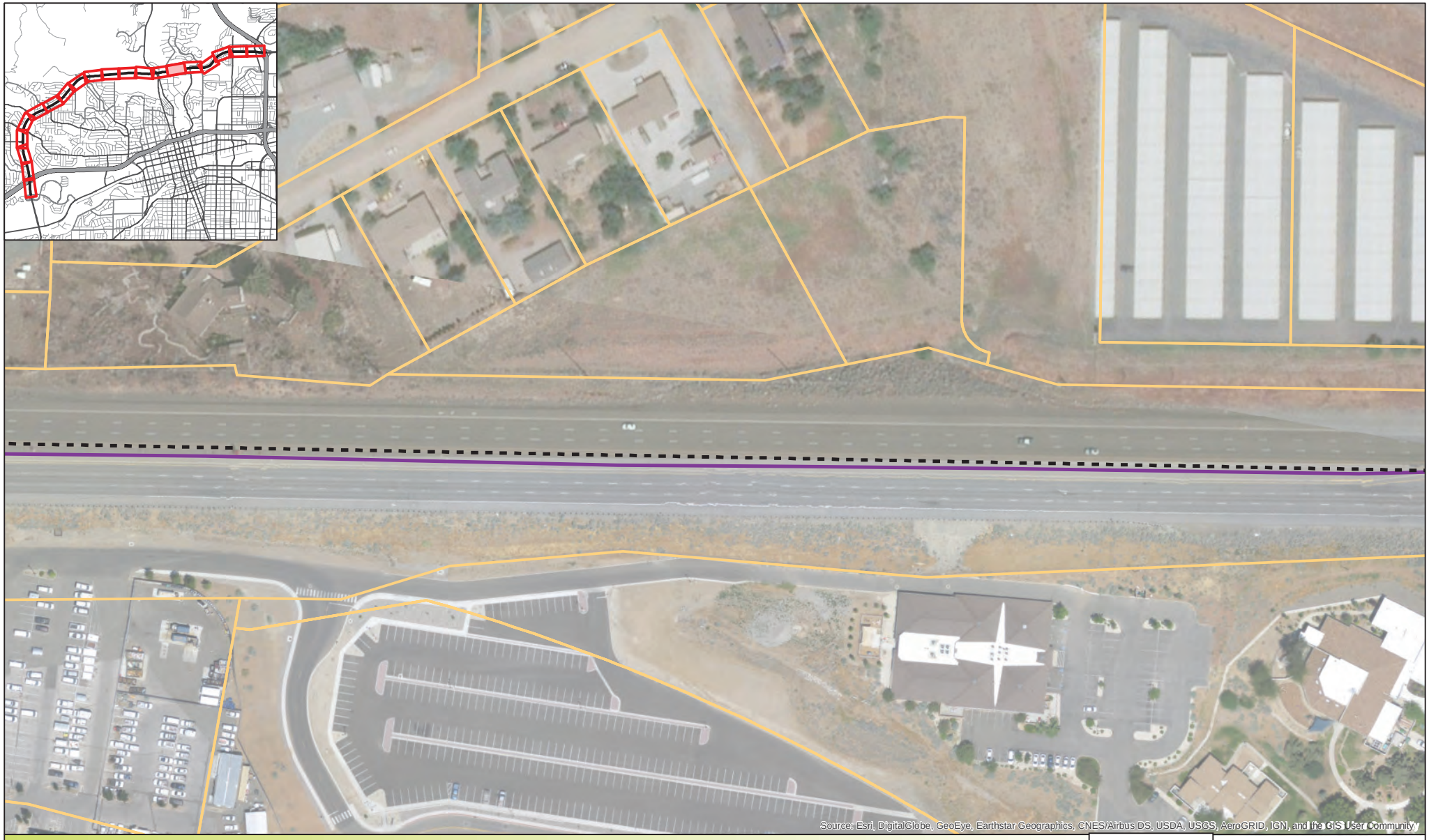


Pedestrian Facilities - Sheet 14

N. McCarran Blvd Safety Management Plan

January, 2019

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0 50 100
Feet

Pedestrian Facilities - Sheet 15

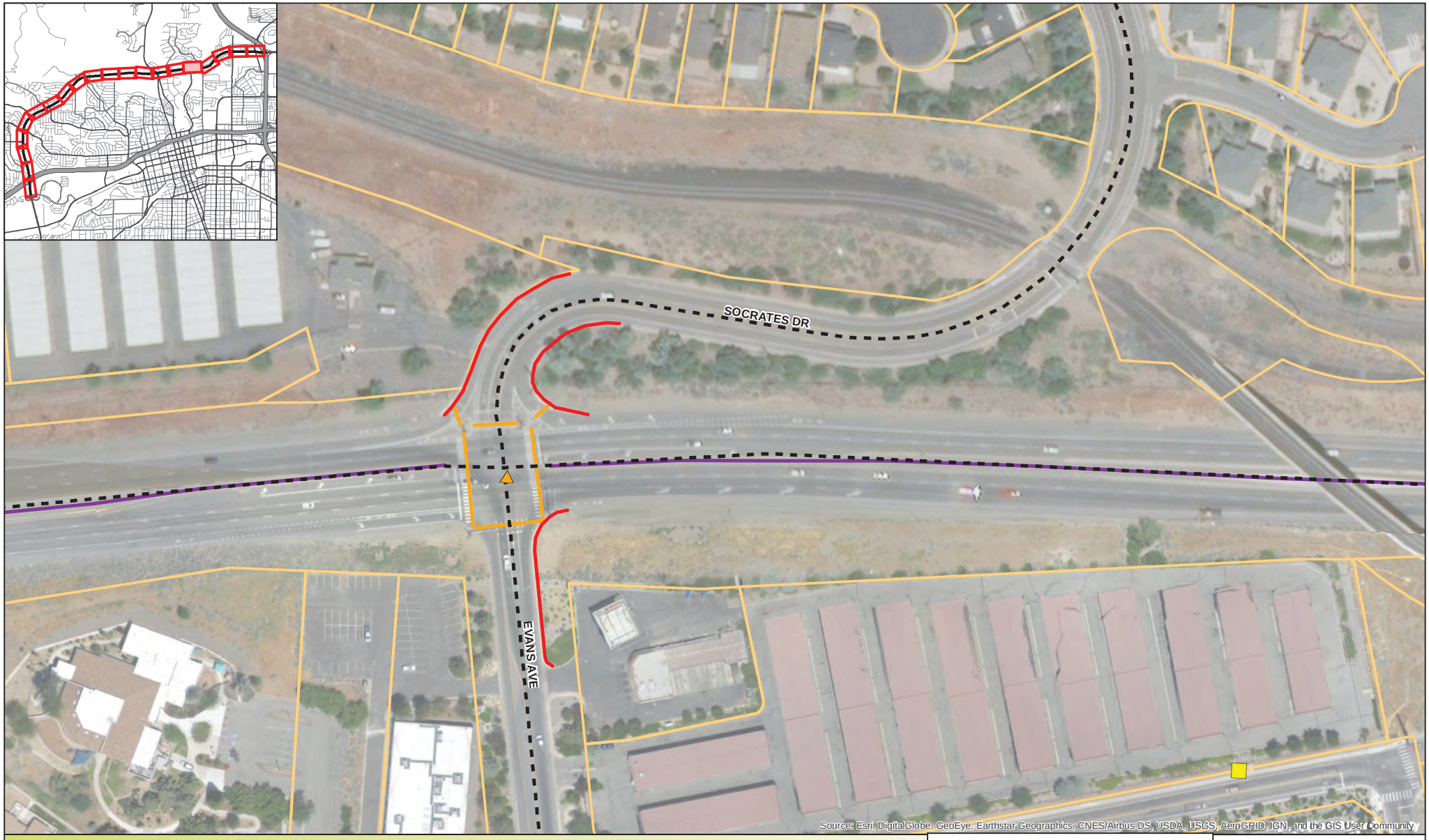
N. McCarran Blvd Safety Management Plan

January, 2019

RTC Bike Facilities
Median
Parcels

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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Feet

Pedestrian Facilities - Sheet 16

N. McCarran Blvd Safety Management Plan
January, 2019

Traffic Signal
RTC Bus Stops
RTC Bike Facilities
Crosswalk
Median
Sidewalk
Parcels

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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Pedestrian Facilities - Sheet 17

N. McCarran Blvd Safety Management Plan

January, 2019

RTC Bike Facilities
Median
Parcels

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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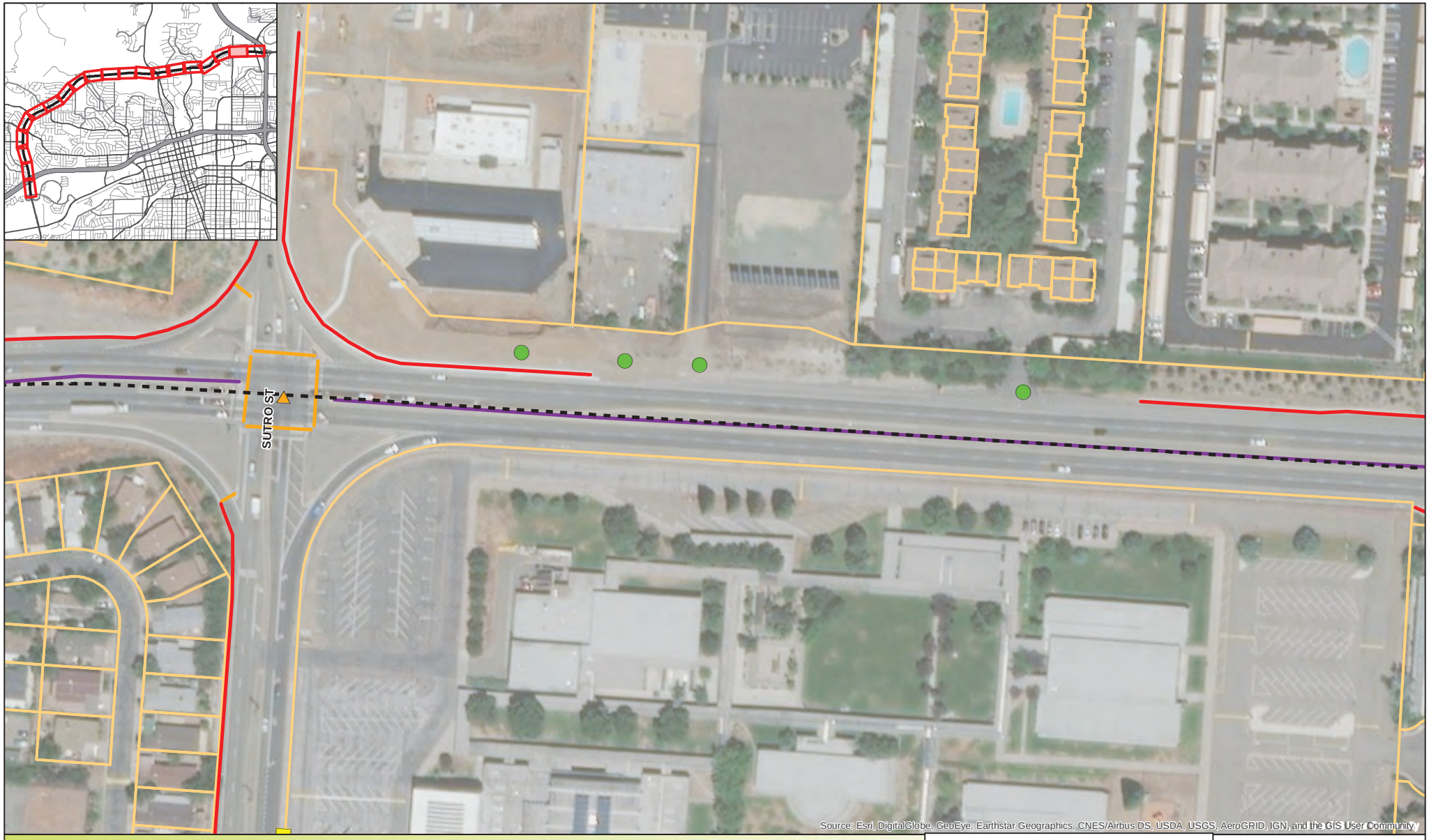


Pedestrian Facilities - Sheet 18

N. McCarran Blvd Safety Management Plan

January, 2019

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Pedestrian Facilities - Sheet 19

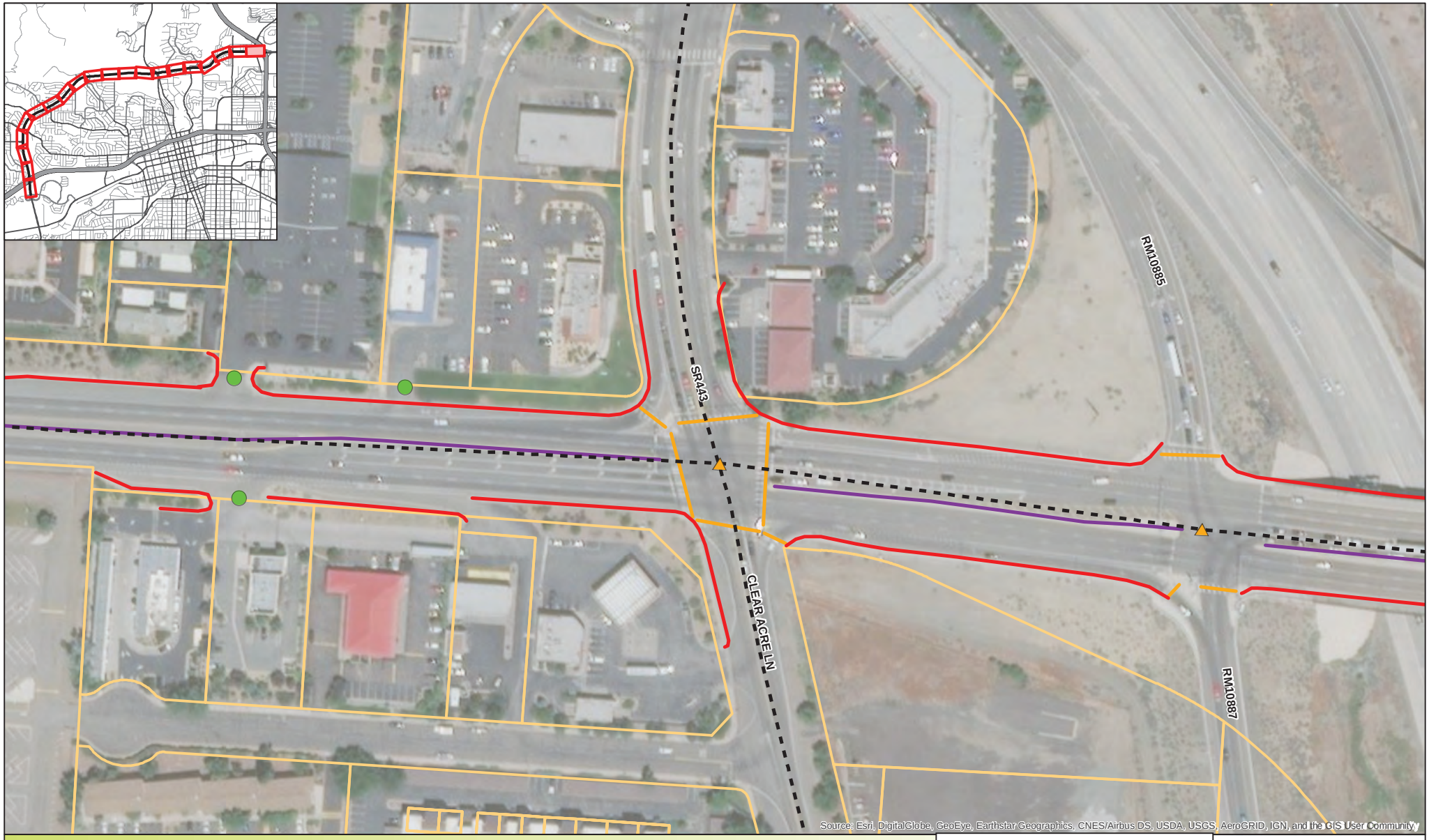
N. McCarran Blvd Safety Management Plan

January, 2019

Driveway
Traffic Signal
RTC Bus Stops
RTC Bike Facilities
Crosswalk
Median
Sidewalk
Parcels

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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Pedestrian Facilities - Sheet 20

N. McCarran Blvd Safety Management Plan

January, 2019

Driveway
Traffic Signal
RTC Bike Facilities
Crosswalk
Median
Sidewalk
Parcels

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

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Appendix E
North McCarran Boulevard
Road Safety Assessment

North McCarran Boulevard
Road Safety Assessment



Prepared For

Nevada DOT
Safe and Connected

Prepared By

Wood Rodgers
Building Relationships One Project at a Time
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EXECUTIVE SUMMARY

The Nevada Department of Transportation (NDOT) Traffic Safety Engineering section requested a Road Safety Assessment (RSA) be conducted on North McCarran Boulevard as part of the Safety Management Plan for the northwest portion extending from the I-80 Interchange to the US-395 Interchange, as shown in Figure ES-1. The purpose of the RSA is to identify potential road safety issues (vehicular, pedestrian, bicycle, transit) and recommend countermeasures to mitigate those safety issues in the North McCarran Boulevard Safety Management Plan (SMP)

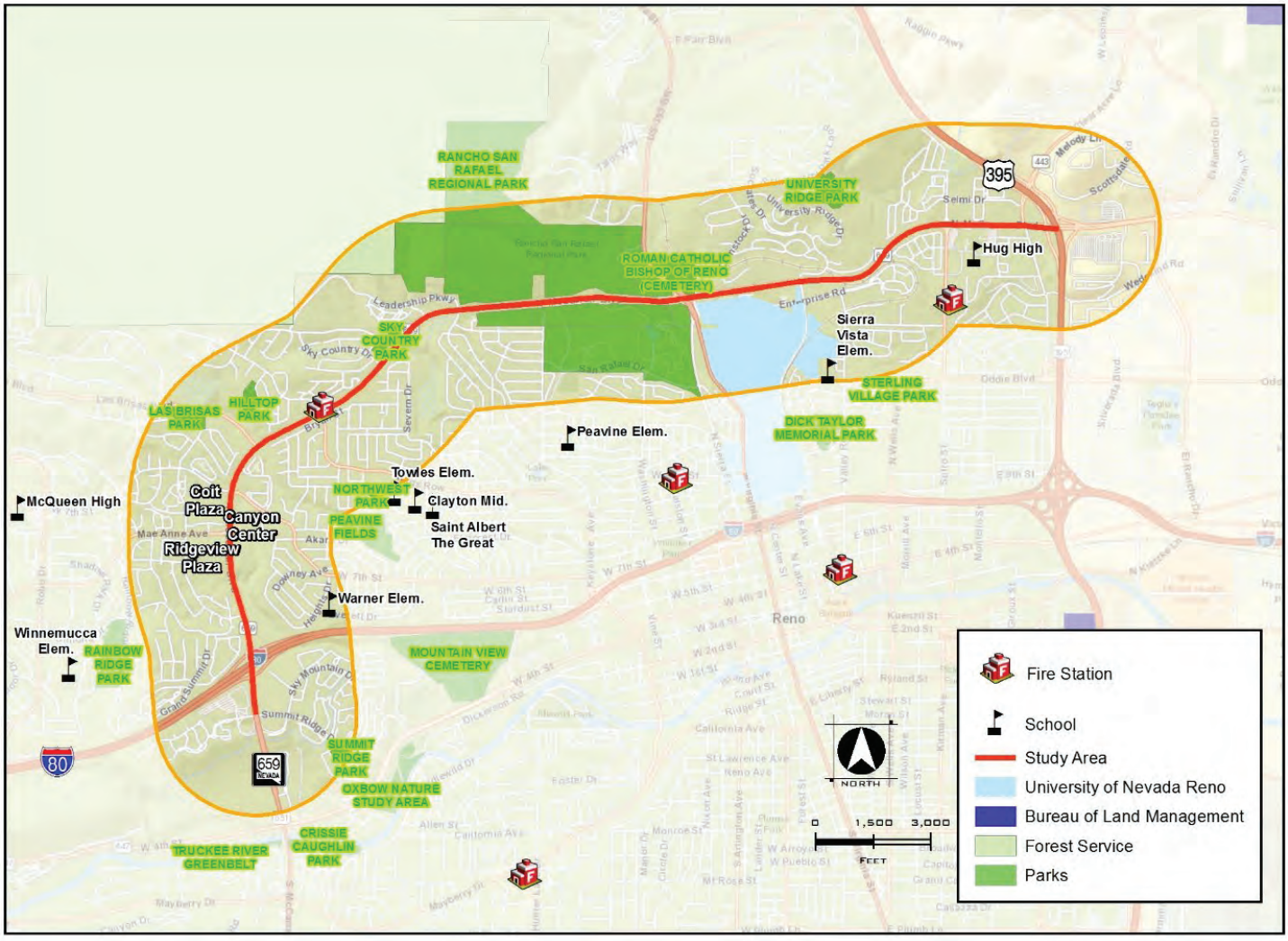


Figure ES-1: North McCarran Boulevard Study Area Map

The North McCarran Boulevard study area extends from the northbound merge at Sky Mountain Drive onto McCarran Boulevard in the northbound direction and then easterly to the North McCarran Boulevard and US-395 Interchange. The roadway configuration changes throughout the study area and consists of the following:

- Sky Mountain Drive merge to I-80 – 5 lanes with a center median island
- I-80 to Las Brisas Boulevard – 6 lanes with a center median island (drops to 5 lanes slightly south of Las Brisas Boulevard)
- Las Brisas Boulevard to Virginia Street – 4 lanes with a center median island
- Virginia Street to Evans Road/Socrates Drive – 6 lanes with a center median island

- Evans Road/Socrates Drive to Clear Acre Lane – 4 lanes with a center median island (drops from 5 lanes slightly east of Evans Road/Socrates Drive)
- Clear Acre Lane to US 395 – 6 lanes with a center median island

The speed limit is 50 mph throughout the majority of the corridor with a 45-mph zone between Sutro Street and the US-395 Interchange. Traffic volumes are the highest in the vicinity of US-395 and I-80. The NDOT 2017 Annual Average Daily Traffic (AADT) is shown in **Table 1**.

Table 1: 2017 NDOT AADT Volumes

Road Segment	2017 Traffic volumes
McCarran Blvd - 755 ft N of Summit Ridge Drive	41,000
McCarran Blvd - 545 ft N of I-80 WB Ramps	44,000
McCarran Blvd - 364 ft N of Seventh Street	29,000
McCarran Blvd - 343 ft E of Kings Row	23,000
McCarran Blvd - 638 ft W of Virginia Street	24,000
McCarran Blvd - 750 ft E of Virginia Street	24,000
McCarran Blvd - 665 ft E of Sutro Street	26,000
McCarran Blvd - 410 ft E of US 395	39,000

CRASH ANALYSIS

The five-year crash data for the period between January 1, 2013 and January 1, 2018 was analyzed. The crash history included six fatal crashes four of which involved pedestrians. Two pedestrian/vehicle crashes occurred at the Socrates Drive/Evans Avenue intersection during nighttime. A pedestrian/vehicle fatal crash occurred approximately 1000' east of Virginia Street, also at night. Another pedestrian/vehicle crash occurred 1320' west of Sutro Street, also at night. The other vehicular fatal crashes involved an ambulance and a motorcycle at the Clear Acre Lane intersection during daylight hours, and a fatal crash between a vehicle and a moped at the Mae Anne Avenue intersection. This crash involved impairment of both drivers.

Table 2 below shows the statewide average crash rates on Urban Principal Arterials.

Table 2: 2017 Statewide Average Crash Rates Urban Principal Arterial

PDO Crash Rate	Injury Crash Rates	Fatal Crash Rates
1.147	0.611	0.005

Table 3 below shows the crash rates for the major intersections within the study area. The North McCarran intersection crash rates for Property Damage Only (PDO) are well below the statewide average. The crash rates for Injury Crashes at the intersections of West 7th Street and North Virginia Street are approaching the statewide averages. The three intersections and two segments where fatal crashes have occurred exceed the statewide average for fatal crashes.

Table 3: Crash Rates per Million Vehicle Miles at Major Intersections

Intersection	PDO Crash Rate	Injury Crash Rate	Fatal Crash Rate
Sky Mountain	0.04	0.01	0.00
I-80 EB Ramps	0.49	0.31	0.00
I-80 WB Ramps	0.36	0.27	0.00
Sierra Highlands Drive	0.36	0.27	0.00
Mae Anne Avenue	0.50	0.37	0.01
West 7th Street	0.83	0.59	0.00
Las Brisas Boulevard	0.15	0.11	0.00
Kings Row	0.38	0.36	0.00
Sky Country Drive	0.10	0.17	0.00
Victory Lane	0.00	0.07	0.00
Keystone Avenue/Leadership Parkway	0.17	0.29	0.00
North Virginia Street	0.68	0.55	0.00
Evans Avenue/Socrates Drive	0.41	0.14	0.05
Sutro Street	0.30	0.34	0.00
Clear Acre Lane	0.70	0.44	0.00
US-395 SB Ramps	0.31	0.21	0.01

Table 4 below shows the crash rates for the segments between the intersections within the study area. The PDO average rates are exceed within the I-80 interchange area on the segment between the eastbound and westbound ramp terminals. The crash rates for fatalities exceeds the statewide average in the segments between Virginia Street and Sutro Street.

Table 4: Crash Rates per Million Vehicle Miles at the Segments Between Major Intersections

From	To	PDO Crash Rate	Injury Crash Rate	Fatal Crash Rate
Sky Mountain Drive	**I-80 Eastbound Ramps**	0.46	0.23	0.00
I-80 Eastbound Ramps	**I-80 Westbound Ramps**	2.36	1.18	0.00
I-80 Westbound Ramps	**Sierra Highlands Drive**	0.73	0.31	0.00
Sierra Highlands Drive	**Mae Anne Avenue**	0.15	0.37	0.00
Mae Anne Avenue	**Seventh Street**	0.00	0.11	0.00
Seventh Street	**Las Brisas Boulevard**	0.00	0.10	0.00
Las Brisas Boulevard	**Kings Row**	0.17	0.17	0.00
Kings Row	**Sky Country Drive**	0.08	0.15	0.00
Sky Country Drive	**Victory Lane**	0.00	0.29	0.00
Victory Lane	**Keystone/Leadership**	0.51	0.00	0.00
Keystone/Leadership	**Virginia Street**	0.30	0.22	0.00
Virginia Street	**Evans Road/Socrates Drive**	0.18	0.09	0.05
Evans Road/Socrates Drive	**Sutro Street**	0.12	0.26	0.03
Sutro Street	**Clear Acre Lane**	0.90	0.51	0.00

General Observations

The following general observations were recorded during the field reviews of North McCarran Boulevard:

Overall corridor lighting needs to be improved along the roadway and at intersections; crosswalk and bike lane markings need to be improved; where bike lanes transition across right-turn lanes, they should utilize the green lane markings; bushes and shrubs should be trimmed where they encroach into the pedestrian walkways and the walkways swept of debris; signal heads do not have retroreflective backplates; pedestrian push buttons and curb cut ramps are substandard throughout the corridor; and signal heads are not properly aligned with vehicular lanes.

Additionally, a request was made to the NDOT District Office to consider installing a signal system at the intersection of Las Brisas Boulevard and North McCarran Boulevard. This area was looked at during the field review and other options to a signal system were discussed, including a roundabout and a High T intersection configuration. An Intersection Control Evaluation (ICE) analysis will be performed.

A complete list of the RSA recommendations can be found on page 18 of this document. Additionally, detailed geolocated data can be found on the following webpage link:

https://wrgis.maps.arcgis.com/apps/View/index.html?appid=e97b761fb52d43f5a71aa95be9b03c86

INTRODUCTION

The NDOT Traffic Safety Engineering section requested a Road Safety Assessment (RSA) be conducted on North McCarran Boulevard from the merge area of Sky Mountain Drive south of I-80 to US-395. The purpose of the RSA is to identify potential road safety issues (vehicular, pedestrian, bicycle, transit) and recommend countermeasures to mitigate those safety issues in the North McCarran Boulevard SMP.

SCOPE

The RSA Team conducted three separate audits along the North McCarran Boulevard corridor. The first audit (October 25, 2018) involved the entire Technical Advisory Committee (TAC) and included stopping at signalized intersections during the daylight to observe concerns in the field. The second audit (November 13, 2018) involved Wood Rodgers staff walking the entire North McCarran Boulevard corridor along both sides of the street during daylight. Finally, a third nighttime review was conducted on the evening of December 10, 2018.

The RSA team recognizes that compliance with design standards does not necessarily result in an optimally safe road design and the failure to comply with standards does not necessarily result in an unsafe design. The goal of this RSA was to identify potential road safety issues and identify opportunities for improvements in safety for all road users. It is not intended as a replacement for design quality control, standard compliance checks, traffic impact or safety impact study, road safety inventory program, or a traffic safety modeling effort. The assessment is also not intended as a means of evaluating design work, investigating crashes, or providing a safety review. Rather, the team strives to look at safety issues from a different perspective and develop recommendations for potential safety enhancements.

Statutory Notice

23 U.S.C. § 409: US Code - Section 409: Discovery and admission as evidence of certain reports and surveys

Notwithstanding any other provision of law, reports, surveys, schedules, lists, or data compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential accident sites, hazardous roadway conditions, or railway-highway crossings, pursuant to sections 130, 144, and 148 of this title or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing Federal-aid highway funds shall not be subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

Objectives

- Identify potential safety issues that may be addressed by the upcoming North McCarran Boulevard SMP and include improvements in upcoming projects, thereby reducing the risk and severity of crashes.
- From the road user's viewpoint, identify confusing and/or misleading messages.
- Improve awareness of safe maintenance practices.

Briefing Meeting

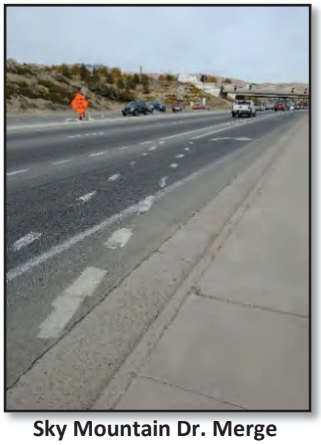
The Briefing Meeting for the initial field audit for the RSA Team was held on October 25th at the NDOT District II Main Office Conference Room at 310 Galletti Way in Sparks, NV. Jeff Hale and Brian Martinezmoles, both from Wood Rodgers, began the meeting with a brief presentation outlining the RSA process, study limits, and general information about the corridor. A discussion of the types of issues and conditions that may be encountered in the field as well as what possible resolutions the group might come to, was held. The group then travelled to the corridor for the field review portion of the RSA.

The following RSA Team members attended the Briefing Meeting:		
Lori Campbell – NDOT	Shaun Wang – NDOT	Dean Hitchcock – UNR
Jon King – University of Nevada (UNR)	Sgt. Stefik – Nevada Highway Patrol	Eric MacGill – NDOT
Tod Miller – UNR Police	Jamie Borino – NDOT	Kurt Dietrich – City of Reno
Jeff Hale – Wood Rodgers	Brian Martinezmoles – Wood Rodgers	Samuel Ahiamadi - NDOT
Stephen Hughey – Wood Rodgers		

Field Review #1

Following the briefing meeting, the RSA Team drove the corridor and made stops at major intersections within the study area. The RSA Team began at the Sky Mountain merge area with the northbound to I-80 east traffic movement. The team then travelled to the McCarran Boulevard intersections with West 7th Street, Las Brisas Boulevard, Kings Row, North Virginia Street, and Evans Avenue/Sutro Street.

A summary of the discussions among the RSA Team members during the first field review by location is shown in the following:



Sky Mountain Dr. Merge

North McCarran Boulevard from Sky Mountain Drive to the I-80 Interchange

Observations of the weaving area of northbound McCarran Boulevard from Sky Mountain Drive to the I-80 eastbound on-ramp revealed that bike lane transitions across the weave area warrants improved striping and green bike lane indications. There were no pedestrian signals or compliant ADA facilities crossing the base of the eastbound I-80 off-ramp.

It was also noted that the former K-Mart building adjacent to the study area is being redeveloped into residential use and has the potential to significantly increase the pedestrian activity in this area.

North McCarran Boulevard and West 7th Street

This busy intersection had a high number of pedestrians crossing during the review. The intersection crossing provides access to shopping from single and multi-family housing neighborhoods. Additionally, there are a high number of angle crashes at this location. The low afternoon sun leads to a strong glare that may block signal head visibility and contribute to the number of angle crashes here.



West 7th St. Signal



Las Brisas Blvd. EB Bus Stop

North McCarran Boulevard and Las Brisas Boulevard

NDOT has been requested to evaluate the installation of a new signal system at this location. One of the observations made by the RSA Team at this location was the proximity of transit stops on each side of McCarran Boulevard. One stop for the outbound routes and one for the inbound routes with no marked crosswalks or advance warning devices to protect pedestrians crossing McCarran Boulevard to access the stops.

The RSA Team discussed possible intersection configurations that could be implemented which would produce safety benefits. A roundabout and a High T configuration should be investigated further for possible implementation at this location.



West entrance to Leadership Pkwy

North McCarran Boulevard and Keystone Avenue/Leadership Parkway

Observations at this location were made as to the inadequacy of the existing worm islands to prevent motorists from making left-turns onto McCarran Boulevard from Leadership Parkway and Victory Lane. NDOT is planning a project to extend the island noses which will eliminate the gap that people use to turn left.

The Keystone Avenue/Leadership Parkway intersection is also used by both bicyclists and pedestrians to cross McCarran Boulevard and access the recreation trails on the north side of the roadway. There are no crosswalks across McCarran Boulevard at or near this area. There is overhead lighting at Keystone Avenue/Leadership Parkway but lacking at Victory Lane to the west.

North McCarran Boulevard and Evans Avenue/Socrates Dive

The Evans Ave./Socrates Dr. intersection was the site of 2 pedestrian fatalities. One of the improvements NDOT is planning is to increase the lighting at this location by adding additional mast arms and lighting heads to the existing signal poles.

Pedestrian movements to and from the University of Reno across McCarran Boulevard should be reviewed to determine what, if any deficiencies exist. The recent RTC Evans Avenue project added bike lanes along Evans Avenue south of North McCarran Boulevard which have increased the mobility options in this area.

The RSA Team recommended that a roundabout should be considered for this location.



Westbound at Socrates Drive

Field Review #2

The second technical field review was conducted to perform a thorough investigation of the existing conditions within the study area. This review measured and assessed all ADA facilities, mobility and safety issues or concerns that were present within the corridor. It was conducted on November 13, 2018, by the following Wood Rodgers staff:

- Scott Rickert
- Jeff Hale
- Stephen Hughey

The review team walked the McCarran Boulevard corridor along both sides, including all legs at each of the signalized intersections. The team utilized a custom application to geolocate areas of concern and included photos at each of the identified areas. The detailed geolocated data can be found on the following webpage link:

https://wrgis.maps.arcgis.com/apps/View/index.html?appid=e97b761fb52d43f5a71aa95be9b03c86

A follow up nighttime field review was conducted on December 10, 2018 by Jeff Hale and Stephen Hughey from Wood Rodgers. Findings included: The lighting conditions and pavement markings at several locations including Clear Acre Lane, Sutro Street, Evans Avenue/Socrates Drive and Virginia Street could be improved by adding an additional mast arm and LED light standard at a 90-degree offset from the existing arm. The Victory Lane approach does not have any lighting and should have overhead lights installed, similar to the east approach at Leadership Parkway. Pavement markings, while not currently in bad condition, should still be improved for maximum visibility high pedestrian crossing intersections such as West 7th Street, Kings Row, Sutro Street and Clear Acre Lane.

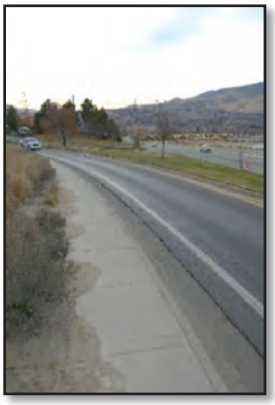
The following is a summary of the findings by location with recommendations for spot improvements based on field reviews conducted within the study area.

Sky Mountain Drive to the I-80 Interchange

Beginning at the merge from Sky Mountain Drive northbound onto McCarran Boulevard there is a lack of pedestrian connectivity across Sky Mountain Drive.

Traffic merging onto McCarran Boulevard does not have to stop or otherwise yield for pedestrians crossing the roadway along the east side of McCarran Boulevard.

Improve pedestrian connectivity across the Sky Mountain northbound entrance to McCarran Blvd. by installing walkways, ramps and pavement markings across Sky Mountain and Summit Ridge.



Sky Mountain Dr. On Ramp



Ped Use at Summit Ridge

Pedestrians are also accessing McCarran Boulevard from Sky Mountain Drive along the east slope at the structure over McCarran Boulevard. This is causing slope erosion and debris to collect on the sidewalks which impedes accessibility.

The merge zone from northbound Sky Mountain Drive to North McCarran Boulevard does not have overhead lighting.

Construct an accessible walkway from Summit Ridge down to McCarran Blvd. along the slope on the east side and install overhead lighting along the merge area. Remove dirt and debris from the walkways throughout the interchange area.

At the intersection of the eastbound on/off ramps, ADA facilities are substandard or lacking altogether. Pedestrian push buttons are higher than the 42" standard and the ramps that are present have poor grades and lack truncated domes.



EB I-80 Off Ramp



WB I-80 On Ramp

As identified in the first field review, the bike lane striping transitioning the bike lanes across the right-turn lanes needs to be improved. Yield signs were missing for the pedestrian crossings at each of the ramp crossings.

Add retroreflective backplates to all signal heads and add green bike lane markings at right turn lane transitions.

Replace all substandard ADA facilities including pedestrian pushbuttons and curb cut ramps.

I-80 Interchange to Mae Anne Avenue

This section of roadway had sidewalks on both sides. The eastern sidewalks were overgrown with vegetation in several areas that reduced accessible widths. Pedestrian push button heights at the entrances to the shopping center at Sierra Highlands Drive were above the ADA standard heights. Crosswalk markings were also worn and in need of replacement.

The sidewalks and pedestrian ramp areas within this segment were modern, however the grades at the landing areas exceeded two percent and the ramp slopes often exceeded eight percent. Overhead lighting could also be improved.

The truncated domes in the ramps were not aligned properly with the crosswalks. Crosswalk markings are worn and in need of replacement.

Notify adjacent property owners of walkway maintenance responsibilities. Replace pavement markings and all substandard ADA facilities including pedestrian pushbuttons and curb cut ramps.

Install retroreflective backplates on all signal heads and add additional lighting heads to the exiting signal poles if they have sufficient structural capacity.

The median island configuration at the entrance to the Safeway Shopping center on the west side encourages cars to enter the driveway on the wrong side. There was evidence of vehicles impacting the driveway median curb after entering into the exiting roadway.

Extend the median island nose 50' north to discourage wrong way access.



WB I-80 On Ramp



WB I-80 Ped. Ramps



Pedestrian Railing

Mae Anne Avenue to West 7th Street

This segment was lined with sidewalks along both sides. The mid-block entrance into the Walmart shopping center on the west side had worn crosswalk markings and misaligned truncated domes. In two locations along the roadway there were pedestrian railings that no longer meet standard designs.

Replace pavement markings, truncated domes and outdated pedestrian railings.

A pedestrian yield sign was missing from the Walmart entrance right-turn lane and the bike lane striping appeared to be narrow.

Replace Yield to Pedestrian signs and place existing signs in the correct locations.

At the northbound right-turn lane into the SaveMart shopping center on the west side, bike lane transitions across the lane need to be striped. This entrance is also signed to prohibit cars exiting and turning northbound onto McCarran Boulevard. The curb and gutter/sidewalk area should be better aligned to discourage drivers entering McCarran Boulevard at this location.

Extend curb and gutter to discourage vehicles from exiting at this location. Add green bike lane markings at all right turn lane transitions.

The intersection of McCarran Boulevard and West 7th Street had a high number of pedestrians at the time of both field reviews. Crosswalk markings should be improved for better visibility in low light conditions.

Lighting also needs to be improved. The existing overhead lights are LED; however, an additional arm should be added to cover each direction of the crosswalk. Retroreflective backplates should be added to the signal heads.



W. 7th Street



W. 7th St. NB Right Turn

Replace pavement markings, add overhead lighting and install retroreflective backplates to all signal heads.

The sidewalks and curb cuts at the intersection were all modern yet did not comply with the minimum ADA grades and cross-slopes. The pedestrian push button heights were also typically above the 42" standard.

Upgrade ADA facilities to current standards.

7th Street to Las Brisas Boulevard

This segment has a five-lane configuration (three lanes EB and two WB), which reduces to a four-lane configuration in the vicinity of Las Brisas Boulevard. The roadway in this section is lined on both sides by sidewalks.

The NDOT District Office has received a request to evaluate the installation of a signal system at this location due to the difficulty in making left turns. McCarran Boulevard traffic travels above the posted 50 mph speed limit (See attached NDOT Speed Study in **Appendix A**) as they approach the intersection, reducing the time available to make the desired left turns.

Perform ICE analysis of potential intersection configurations.

There are 2 bus stops for RTC Route 3CC/3CL on either side of McCarran Boulevard at the Las Brisas intersection. This is a normal configuration for transit stops however, there are no pedestrian crossing facilities to accommodate transit riders that need to access the stops on the opposite sides of McCarran Boulevard.

Install pedestrian crosswalk across McCarran Blvd. to provide access to the RTC bus stop.



Broken Sidewalk



Las Brisas Blvd. Looking East

A broken section of sidewalk needs to be replaced adjacent to the apartment complex along the south side of the roadway near Las Brisas Boulevard.

Replace broken sidewalk panel.

Other areas have material sloughed across the sidewalk from cross drainage erosion and vegetation overgrowth reduces the effective width of the sidewalks. Walkways to the east, end on both sides of McCarran Boulevard.

Notify adjacent property owners of walkway maintenance responsibilities.

Las Brisas Boulevard to Kings Row

This section has no adjacent concrete sidewalks. Pedestrian accessibility is along wide compacted dirt areas adjacent to the back of curb. A Bus stop exists in the acceleration area of cars entering McCarran Boulevard from the Viewcrest shopping center. There are no existing accessible facilities servicing this bus stop.

Modify the Viewcrest Shopping center access to include channelization and improved pedestrian accessibility.



Looking South on Kings Row



Viewcrest Bus Stop

Overhead lighting is LED but additional 90-degree arms and heads are needed to improve lighting at this high pedestrian crossing. ADA ramp and walkway grades exceed minimums as well as the height of the pedestrian signal push buttons. Truncated domes are mis-aligned from the marked crosswalks. Concrete curb cut ramps are provided but have no connecting concrete sidewalks along McCarran Boulevard.

Install Retroreflective backplates on all signal heads, improve overhead lighting and ADA facilities.



Driveway and Mailbox

Kings Row to Keystone Avenue/Leadership Parkway

Two residential driveways exist on the southside of McCarran Boulevard halfway between Kings Row and Sky Country Drive. The driveways are non-standard and do not have crash rated mailbox supports.

Install standard driveway approach and crash rated mailbox stands.

The curb cut ramp grades at the Sky Country Drive intersection are not standard and the truncated domes are mis-aligned from the faded crosswalk markings.

Replace substandard ADA facilities.

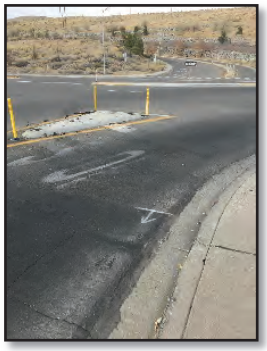
At the Victory Lane entrance, there is no overhead lighting and the worm islands need to be extended to prevent left-turns being made onto North McCarran Boulevard. This needs to be done at both the east and west intersections to ensure the roadways are both right-in-right-out.

Add overhead lighting and extend the island noses to prevent left turns onto McCarran Blvd.

This section of sidewalk between the Leadership Parkway and Victory Lane entrances needs to be replaced. Curb cut ramps exceed minimum grades at each of the Leadership Parkway approaches as well.



Broken Sidewalk



Keystone Ave. Looking North



Pedestrian Ramp



Worm Island at Leadership

Replace broken sidewalk panel and substandard ADA facilities.

Tire marks at the Keystone Avenue intersection indicate vehicles are making prohibited left-turns. Extending the noses of the median worm islands, as recommended earlier, are likely to stop this unsafe movement.

Extend the island noses to prevent left turns onto McCarran Blvd.

Looking east from southbound Leadership Parkway there appears to be a sight distance problem. The slope may be reduced to improve this sight distance for right-turning vehicles. The crosswalk and stop bar may also be adjusted towards McCarran Boulevard as well.

Regrade adjacent roadway slopes to improve sight distances.

Additional lighting needs to be added on the Keystone Avenue side of McCarran Boulevard. This area may warrant a pedestrian crossing with advance warning flashers.

Improve overhead lighting and provide a pedestrian crossing across McCarran Blvd. at Keystone Ave.



East Leadership Pkwy



Keystone Ave. Looking South

Leadership Parkway to North Virginia Street

Two approaches provide access to parking areas that serve Rancho San Rafael Regional Park on the south side and trail head access on the north side. The approaches do not meet standards and should be improved to provide smooth transitions to and from the roadway and prevent mud and dirt from being tracked across the bike lane and onto the roadway. There are several other informal driveways within this segment where there is only a depressed curb which should be evaluated to determine if the access is warranted and under permit.

Construct standard approaches at the Rancho San Rafael Park and public lands access areas.

The intersection at north McCarran Boulevard and North Virginia Street was reconstructed within the last 3 years with significant improvements made to accessibility and in left-turn lane storage. Given the width of roadway that must be crossed by pedestrians, it is recommended that additional mast arms and LED lights be added to each light pole.

Improve overhead lighting and add green bike lane markings to the bike lane transitions across right-turn lanes.



Looking West at North Virginia St.



WB Approach at Park



Bike Lane North Virginia St.



EB Approach at Park

North Virginia Street to Socrates Drive/Evans Road

This road segment has experienced 3 pedestrian fatalities in the last 4 years, all of which were at night or in dark conditions. It is recommended that additional mast arms and lights be added to each pole to improve the lighting on each leg of the intersections. Pavement markings should also be kept fresh as some of the markings are becoming worn. Retroreflective backplates should be added to the signal heads and proper lane alignment of the heads should also be completed.

Increase overhead lighting, replace pavement markings and add retroreflective backplates to all signal heads. Align signal heads to the proper lanes.

On the west side of the UPRR overpass structure, several object markers need to be replaced and vegetation removed that obstructs their visibility.

Replace damaged object markers and remove overgrown vegetation.



Object Markers



Looking South on Evans

Socrates Drive/Evans Road to Sutro Street

In the afternoon at the North McCarran Boulevard and Sutro Street intersection, there were a high number of students leaving Hug High School and walking north to cross North McCarran Boulevard. Many were headed to the Maverik convenience store located on the north side of McCarran Boulevard. Pedestrian and accessible infrastructure at this intersection were lacking or severely sub-standard where the students were present.

No pedestrian walkway exists on the southside of McCarran Boulevard along the edge of the Hug High School property on Sutro Street. Pedestrians are forced to cross sweeping right turn lanes that lack ADA facilities. Students walking north from Hug High School had to use the shoulder of the right-turn lane.

Bike lane markings are also faded and in need of replacement throughout this area.

Improve pedestrian facilities, replace sweeping right turn lanes with right turn "Stubbies" and replace pavement markings.

Additional mast arms and lighting should be added for visibility and dedicated accessible pedestrian facilities should be added at all four quadrants of the intersections. The right-turn lane pedestrian crosswalks are poorly lit during nighttime.

Align signal heads and add retroreflective backplates.



Sutro St. Ped Crossing



SE Corner Island at Sutro



Looking West at Sutro St.



SE Corner at Hug High

Sutro Street to US-395 Interchange

No accessible pedestrian walkways exist along North McCarran Boulevard in several areas within this section. Sidewalk begins approximately 500-feet west of the Clear Acre Lane intersection.

Bike lane transitions across right-turn lanes should be designated with green markings and fresh delineation.

Extend accessible walkway on the southside of McCarran Blvd. from Sutro St. to the existing facilities at Clear Acre Ln.



EB Shoulder at Clear Acre Ln.



WB Shoulder at Clear Acre Ln.



Bike Lane at US-395



US-395 Looking East

Additional mast arms with LED light fixtures should be added at 90-degrees on the existing poles to improve the lighting conditions in this segment. There was one motorcycle fatality at the Clear Acre intersection when an ambulance pulled in front of the motorcyclist.

The installation of retroreflective backplates will improve signal head visibility in the morning and evening lighting conditions.

Improve overhead lighting and install retroreflective backplates on all signal heads.

SUMMARY OF RECOMMENDATIONS FOR NORTHWEST MCCARRAN BOULEVARD FROM SKY MOUNTAIN DRIVE TO THE US-395 INTERCHANGE

Priority 1 – Defined as those improvements that can be done in the immediate future by NDOT maintenance crews or City of Reno staff.

1. Restripe bike lane transitions across right-turn lanes using green bike lane markings
2. Restripe all crosswalk markings
3. Implement leading pedestrian interval signal timings at the West 7th Street, Kings Row, Sutro Street, and Clear Acre Lane intersections
4. Trim overgrown vegetation and sweep material from along walkways at the I-80 interchange
5. Advise adjacent property owners of sidewalk maintenance responsibilities
6. Replace damaged or vandalized signs throughout the corridor
7. Add "Yield to Pedestrians" signs at all right-turn lane pedestrian crossings

Priority 2 – Defined as those improvements that can be included in the future Northwest McCarran Boulevard SMP or other major maintenance projects.

1. Update all existing signal heads, flashing signal heads, and flashing beacons to include retroreflective backplates
2. Provide continuous ADA accessible walkways or multi-use paths throughout the corridor
3. Replace substandard pedestrian railing at the NV Energy Pole at south entrance of Canyon Center and at the southbound Walmart entrance with new standard railing
4. Upgrade and/or replace substandard ADA ramps and signal buttons throughout the study area
5. Correct all ADA deficiencies at the North McCarran and Sutro Street Intersection and provide safe accessible walkways along the southeast corner from Hug High School to the Clear Acre Lane intersection
6. Update intersection and crosswalk lighting at all signalized intersections
7. Request the Washoe RTC to add bus stop and accessibility improvements to the stop located at the westbound driveway at the Viewcrest shopping center
8. Conduct a study at the Las Brisas Boulevard and North McCarran Boulevard intersection to determine the optimum intersection configuration that maximizes safety benefits for both vehicles and pedestrians
9. Upgrade driveways adjacent to the Rancho San Rafael Regional Park

Appendix A
NDOT Speed Study

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

MEMORANDUM

12/20/2018

TO: **Lori Campbell, Traffic Safety Engineering Program Manager**

FROM: **Mark Wooster, Traffic Information Division Assistant Chief**

SUBJECT: **Speed Study**
SR-659 (McCarran Blvd.) MP WA 7.1–12.5, Reno, Washoe County

In response to a request from your office, a Speed Study was conducted on the subject roadway. This study area was divided into 4 segments. Analysis of the speed data produced the following results:

1. Segment 1

Site Data: This study area is a 6 lane *Urban Principal Arterials - Other* roadway that begins at IR-80 (MP WA-7.1) and continues north to Las Brisas Blvd (MP WA-8.2) for a segment length of 1.1 miles. This segment is a 50 MPH speed zone both directions.

Field Data:

Posted Speed Limit	50 MPH
85th Percentile Speed	51 MPH
Pace	40-50 MPH
% in the pace	56%
50th Percentile speed	44 MPH (mean)

Mitigating Factors:
None.

Objective Analysis: The following is objective analysis using predetermined formulae and field data to aid in determination of speed limits. This information is used by the engineer as a factor when determining appropriate speed limits; however, it is not the only information considered. Determination of speed limits is practice of engineering, requires consideration of many variables and mitigating factors, and is subject to the discretion of the Traffic Engineer. *The use of the Refined Study Analysis data is used as a guide only in determining roadside characteristics relative to speed.*

Analysis Method	Theoretical Limit
85th Percentile Speed[1]	51 MPH
Minimum Study Analysis[2]	48 MPH
US Limits 2[3]	50 MPH

2. Segment 2

Site Data: This study area is a 4 lane *Urban Principal Arterials - Other* roadway that begins at Las Brisas Blvd (MP WA-8.2) and continues north to N Virginia St (MP WA-10.6) for a segment length of 2.4 miles. This segment is a 50 MPH speed zone both directions.

Field Data:

Posted Speed Limit	50 MPH
85th Percentile Speed	59 MPH
Pace	50-60 MPH
% in the pace	68%
50th Percentile speed	54 MPH (mean)

Mitigating Factors:
None.

Objective Analysis: The following is objective analysis using predetermined formulae and field data to aid in determination of speed limits. This information is used by the engineer as a factor when determining appropriate speed limits; however, it is not the only information considered. Determination of speed limits is practice of engineering, requires consideration of many variables and mitigating factors, and is subject to the discretion of the Traffic Engineer. *The use of the Refined Study Analysis data is used as a guide only in determining roadside characteristics relative to speed.*

Analysis Method	Theoretical Limit
85th Percentile Speed[1]	59 MPH
Minimum Study Analysis[2]	58 MPH
US Limits 2[3]	55 MPH

3. Segment 3

Site Data: This study area is a 4 lane *Urban Principal Arterials - Other* roadway that begins at N Virginia St (MP WA-10.6) and continues north to the northbound 45 mph sign (MP WA-11.9) for a segment length of 1.3 miles. This segment is a 50 MPH speed zone both directions.

Field Data:

Posted Speed Limit	50 MPH
85th Percentile Speed	57 MPH
Pace	48-57 MPH
% in the pace	71%
50th Percentile speed	52 MPH (mean)

Mitigating Factors:
None.

Objective Analysis: The following is objective analysis using predetermined formulae and field data to aid in determination of speed limits. This information is used by the engineer as a factor when determining appropriate speed limits; however, it is not the only information considered. Determination of speed limits is practice of engineering, requires consideration of many variables and mitigating factors, and is subject to the discretion of the Traffic Engineer. *The use of the Refined Study Analysis data is used as a guide only in determining roadside characteristics relative to speed.*

Analysis Method	**Theoretical Limit**
85th Percentile Speed[1]	57 MPH
Minimum Study Analysis[2]	56 MPH
US Limits 2[3]	55 MPH

4. Segment 4

Site Data: This study area is a 4 lane *Urban Principal Arterials - Other* roadway that begins at the northbound 45 mph sign (MP WA-11.9) and continues north to US-395 (MP WA-12.5) for a segment length of 0.6 miles. This segment is a 45 MPH speed zone both directions.

Field Data:

Posted Speed Limit	45 MPH
85th Percentile Speed	49 MPH
Pace	40-50 MPH
% in the pace	63%
50th Percentile speed	43 MPH (mean)

Mitigating Factors:
None.

Objective Analysis: The following is objective analysis using predetermined formulae and field data to aid in determination of speed limits. This information is used by the engineer as a factor when determining appropriate speed limits; however, it is not the only information considered. Determination of speed limits is practice of engineering, requires consideration of many variables and mitigating factors, and is subject to the discretion of the Traffic Engineer. *The use of the Refined Study Analysis data is used as a guide only in determining roadside characteristics relative to speed.*

Analysis Method	**Theoretical Limit**
85th Percentile Speed[1]	49 MPH
Minimum Study Analysis[2]	47 MPH
US Limits 2[3]	45 MPH

CRASH DATA:

A 3-year crash rate (01/2015-01/2018) was computed for the study area and indicated the following:

Segment 1:	
Total Crashes	104
Fatal Crashes	0
Crashes Per MVMT[4]	2.58
Segment 2:	
Total Crashes	70
Fatal Crashes	0
Crashes Per MVMT[4]	1.12
Segment 3:	
Total Crashes	43
Fatal Crashes	2
Crashes Per MVMT[3]	1.34
Segment 4:	
Total Crashes	92
Fatal Crashes	0
Crashes Per MVMT[3]	6.61

Comparison rates for Urban Principal Arterials Other roads in the state are 3.21 per million vehicle miles traveled. Attached you will find the Crash Rates for your review.

The information in this report is based on the application of data collected to standard evaluation criteria. Final recommendations by the Chief Traffic Engineer must consider conditions unique to the area, which may include other criteria in addition to the standard evaluation criteria.

Should you require clarification, additional information, or would like to review either the raw data or analysis of the data, please contact Mark Wooster at (775) 888-7156 or Lisa Wood at (775) 888-7382.

MJW:cdw:lw

Attachments: Crash Rates
Maps

cc: Hoang Hong, Principal Operations Engineer

1. ITE Speed Zoning Guidelines, Published by ITE, ITE Committee 4M-25, date unknown
2. Speed Zone Methodology, Traffic Institute, Northwestern University, date unknown
3. USLimits2 Expert System for Recommending Speed Limits in Speed Zones, USDOT FHWA, March 2012
4. MVMT = Million Vehicle Miles Travelled

CRASH RATES

SR659

SEGMENT	NUMBER OF YEARS	AADT	SEGMENT LENGTH (MILES)	PDO CRASHES	PDO RATE	INJURY CRASHES	INJURY RATE	FATAL CRASHES	FATAL RATE	TOTAL CRASHES	TOTAL RATES	TOTAL INJURIES	TOTAL INJURY RATE	TOTAL FATALITIES	TOTAL FATALITY RATE
1	3	33500	1.10	53	1.31	51	1.26	0	0.00	104	2.58	75	1.86	0	0.0000
2	3	23800	2.40	32	0.51	38	0.61	0	0.00	70	1.12	57	0.91	0	0.0000
3	3	22600	1.30	18	0.56	23	0.71	2	0.06	43	1.34	31	0.96	2	0.0622
4	3	21200	0.60	51	3.66	41	2.94	0	0.00	92	6.61	64	4.59	0	0.0000
				154		153		2		309		227		2	

**CRASH RATES PER MILLION VEHICLE MILES*

COMPARISON RATES - 2017

PRINCIPAL ARTERIAL-OTHER URBAN	PDO CRASHES	PDO RATE	INJURY CRASHES	INJURY RATE	FATAL CRASHES	FATAL RATE	TOTAL CRASHES	TOTAL RATES	TOTAL INJURIES	TOTAL INJURY RATE	TOTAL FATALITIES	TOTAL FATALITY RATE
	0	1.70	4,896	1.48	65	0.02	4,961	3.21	7,803	2.36	69	0.02

**CRASH RATES PER MILLION VEHICLE MILES*

SR-659 (McCarran Blvd.) MP WA 7.1 – 12.5, Reno, WA




Segment 3
Segment 4
MP WA-10.6
MP WA-11.9
MP WA-12.5
Tie: MP WA-11.6
Tie: MP WA-12.1
NORTHEAST RENO
Reno Vista at Panorama Village
Sun Villa
The Home Depot
Sonic Drive-In
Procter R Hug Secondary School
WinCo Foods
Community Garden Apartments
The Highlands
Our Mother of Sorrows Catholic Cemetery
Rancho San Rafael Regional Park
University of Nevada, Reno
Northgate Mobile Village
N McCarran Blvd
N VIRGINIA ST
N Sierra St
Evans Ave
Sutro St
CLEAR ACRE LN
N Wells Ave
Oddie Blvd
Carson-Reno Hwy
MLK Jr Memorial Hwy

Appendix F
NDOT Speed Study

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

MEMORANDUM

12/20/2018

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FROM: **Mark Wooster, Traffic Information Division Assistant Chief**

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cc: Hoang Hong, Principal Operations Engineer

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SR659

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**CRASH RATES PER MILLION VEHICLE MILES*

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PRINCIPAL ARTERIAL-OTHER URBAN	PDO CRASHES	PDO RATE	INJURY CRASHES	INJURY RATE	FATAL CRASHES	FATAL RATE	TOTAL CRASHES	TOTAL RATES	TOTAL INJURIES	TOTAL INJURY RATE	TOTAL FATALITIES	TOTAL FATALITY RATE
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**CRASH RATES PER MILLION VEHICLE MILES*

SR-659 (McCarran Blvd.) MP WA 7.1 – 12.5, Reno, WA




Segment 3
Segment 4
MP WA-10.6
MP WA-11.9
MP WA-12.5
Tie: MP WA-11.6
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NORTHEAST RENO
Reno Vista at Panorama Village
Sun Villa
The Home Depot
Sonic Drive-In
Procter R Hug Secondary School
WinCo Foods
Community Garden Apartments
The Highlands
Our Mother of Sorrows Catholic Cemetery
Rancho San Rafael Regional Park
University of Nevada, Reno
Northgate Mobile Village
N McCarran Blvd
N VIRGINIA ST
N Sierra St
Evans Ave
Sutro St
CLEAR ACRE LN
N Wells Ave
Oddie Blvd
Carson-Reno Hwy
MLK Jr Memorial Hwy

Appendix G
Existing Conditions Intersection Delays, Queues, and Synchro Results

TABLE X: MCCARRAN BOULEVARD LEVEL-OF-SERVICE - EXISTING CONDITIONS													
McCarran Boulevard Intersection	Signalization	Time	Approach Delay (Seconds) & LOS								Intersection Delay (Seconds) & LOS	
			EB		WB		NB		SB			
I-80 Eastbound Ramps	Signalized	AM	70.5	E	-	-	119.7	F	67.5	E	86.7	F
		PM	182.3	F	-	-	149.3	F	91.0	F	132.1	F
I-80 Westbound Ramps	Signalized	AM	-	-	48.6	D	17.8	B	22.8	C	28.1	C
		PM	-	-	90.5	F	20.7	C	22.3	C	48.1	D
Sierra Highlands Drive	Signalized	AM	22.8	C	120.4	F	18.3	B	28.6	C	30.5	C
		PM	31.3	C	102.9	F	30.3	C	37.2	D	37.0	D
Mae Anne Avenue	Signalized	AM	35.9	D	44.0	D	19.0	B	23.5	C	28.0	C
		PM	40.7	D	47.7	D	47.7	D	27.1	C	41.1	D
Seventh Street	Signalized	AM	34.2	C	33.8	C	17.1	B	21.8	C	24.5	C
		PM	30.9	C	38.2	D	30.2	C	26.6	C	30.2	C
Las Brisas Boulevard	Unsignalized	AM	0.8	A	0.0	A	-	-	141.5	F	141.5	F
		PM	21.1	C	0.0	A	-	-	ERROR	F	ERROR	F
Kings Row	Signalized	AM	40.5	D	30.2	C	27.0	C	23.5	C	33.9	C
		PM	25.4	C	33.8	C	39.4	D	25.7	C	30.2	C
Sky Country Drive	Unsignalized	AM	0.4	A	0.0	A	-	-	187.8	F	187.8	F
		PM	1.3	A	0.0	A	-	-	207.9	F	207.9	F
Victory Lane	Unsignalized	AM	0.2	A	0.0	A	-	-	15.9	C	15.9	C
		PM	0.4	A	0.0	A	-	-	34.0	D	34.0	D
Keystone Avenue/ Leadership Parkway	Unsignalized	AM	0.0	A	3.1	A	27.5	D	13.1	B	27.5	D
		PM	0.0	A	1.9	A	27.1	D	14.9	B	27.1	D
Virginia Street	Signalized	AM	135.0	F	75.2	E	51.4	D	258.7	F	172.2	F
		PM	204.9	F	51.6	D	347.8	F	39.2	D	186.1	F
Evans Road/Socrates Drive	Signalized	AM	26.7	C	32.3	C	23.7	C	28.3	C	28.6	C
		PM	20.2	C	32.1	C	103.1	F	27.0	C	47.0	D
Sutro Street	Signalized	AM	25.4	C	17.9	B	23.4	C	33.5	C	23.2	C
		PM	49.0	D	8.5	A	29.2	C	30.9	C	32.3	C
Clear Acre Lane	Signalized	AM	55.1	E	55.2	E	43.9	D	284.0	F	107.8	F
		PM	123.8	F	125.8	F	62.4	E	431.6	F	168.1	F
US 395 Southbound Ramps	Signalized	AM	11.5	B	16.8	B	-	-	51.4	D	17.5	B
		PM	7.3	A	18.4	B	-	-	58.4	E	17.5	B
US 395 Northbound Ramps	Signalized	AM	17.3	B	13.0	B	53.5	D	-	-	20.7	C
		PM	10.8	B	21.2	C	62.8	E	-	-	28.9	C

Source: Wood Rodgers, September 2019

TABLE X: MCCARRAN BOULEVARD QUEUE LENGTHS - EXISTING CONDITIONS

McCarran Boulevard Intersection	Time	Eastbound						Westbound						Northbound						Southbound					
		Left-Turn Bays			Right-Turn Bays			Left-Turn Bays			Right-Turn Bays			Left-Turn Bays			Right-Turn Bays			Left-Turn Bays			Right-Turn Bays		
		Number of Lanes	Queue Storage (ft)	Queue Length (ft) at Peak Hour	Number of Lanes	Queue Storage (ft)	Queue Length (ft) at Peak Hour	Number of Lanes	Queue Storage (ft)	Queue Length (ft) at Peak Hour	Number of Lanes	Queue Storage (ft)	Queue Length (ft) at Peak Hour	Number of Lanes	Queue Storage (ft)	Queue Length (ft) at Peak Hour	Number of Lanes	Queue Storage (ft)	Queue Length (ft) at Peak Hour	Number of Lanes	Queue Storage (ft)	Queue Length (ft) at Peak Hour	Number of Lanes	Queue Storage (ft)	Queue Length (ft) at Peak Hour
I-80 Eastbound Ramps	AM	-	-	-	1	400	509	-	-	-	-	-	-	-	-	-	-	-	-	1 (2)	200	582	-	-	-
	PM			-			900			-			-			-			-			597			-
I-80 Westbound Ramps	AM	-	-	-	-	-	-	-	-	-	2	500	187	1	200	111	-	-	-	-	-	-	1	300	46
	PM			-			-			-			878			162			-			-			3
Sierra Highlands Drive	AM	1	60	73	-	-	-	1	75	218	1	70	0	1	530	122	1	170	2	1	390	95	1	390	2
	PM			137			-			182			46			363			0			121			67
Mae Anne Avenue	AM	1 (2)	170	134	1	400	73	1	100	311	1	50	0	2	675	134	1	225	86	1	315	77	1	250	6
	PM			207			73			201			0			300			152			83			50
Seventh Street	AM	1	195	177	1	280	33	1	150	133	-	-	-	2	530	56	1	170	27	2	375	46	1	310	10
	PM			161			42			160			-			118			105			76			200
Las Brisas Boulevard	AM	1	280	12	-	-	-	-	-	-	1	75	0	-	-	-	-	-	-	1	100	237	-	-	-
	PM			334			-			-			0			-			-			ERROR			-
Kings Row	AM	1	235	76	1	45	76	1	220	161	1	65	0	1	125	132	-	-	-	1	95	69	-	-	-
	PM			222			31			163			29			197			-			81			-
Sky Country Drive	AM	1	220	7	-	-	-	-	-	-	1	50	0	-	-	-	-	-	-	-	-	-	-	-	-
	PM			22			-			-			0			-			-			-			-
Victory Lane	AM	1	210	3	-	-	-	-	-	-	1	50	0	-	-	-	-	-	-	-	-	-	-	-	-
	PM			7			-			-			0			-			-			-			-
Keystone Avenue/ Leadership Parkway	AM	1	240	0	1	60	0	1	415	54	1	50	0	-	-	-	-	-	-	-	-	-	-	-	-
	PM			0			0			43			0			-			-			-			-
Virginia Street	AM	1	550	800	1	430	247	1	325	642	-	-	-	1	110	116	1	475	0	2	300	611	1	675	346
	PM			1240			56			318			-			923			0			130			266
Evans Road/ Socrates Drive	AM	1	315	43	1	170	56	1	310	395	1	140	3	1	130	139	1	130	35	1	165	119	1	160	0
	PM			68			24			272			18			640			330			98			9
Sutro Street	AM	1	145	99	1	450	24	1	270	185	1	175	1	1	95	122	-	-	-	1	50	127	1	150	7
	PM			160			27			191			0			175			-			117			33
Clear Acre Lane	AM	2	400	125	-	-	-	1	320	143	-	-	-	-	-	-	-	-	-	-	-	-	1	215	83
	PM			215			-			110			-			-			-			-			69
US 395 Southbound Ramps	AM	-	-	-	1	400	1	2	500	170	-	-	-	-	-	-	-	-	-	-	-	-	1	290	0
	PM			-			0			296			-			-			-			-			0
US 395 Northbound Ramps	AM	1	100	26	-	-	-	-	-	-	1	525	35	1	285	116	2	285	223	-	-	-	-	-	-
	PM			72			-			-			70			160			529			-			-

Source: Wood Rodgers, September 2019



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	0	456	0	0	0	0	557	1025	904	1203	0
Future Volume (vph)	100	0	456	0	0	0	0	557	1025	904	1203	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		400	0		0	0		0	200		0
Storage Lanes	0		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt			0.850						0.850			
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1770	1583	0	0	0	0	3539	1583	3433	3539	0
Flt Permitted		0.950								0.950		
Satd. Flow (perm)	0	1770	1583	0	0	0	0	3539	1583	3433	3539	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			88						593			
Link Speed (mph)		45			45			50			50	
Link Distance (ft)		611			520			680			622	
Travel Time (s)		9.3			7.9			9.3			8.5	
Peak Hour Factor	0.64	0.92	0.79	0.92	0.92	0.92	0.92	0.85	0.93	0.87	0.89	0.92
Adj. Flow (vph)	156	0	577	0	0	0	0	655	1102	1039	1352	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	156	577	0	0	0	0	655	1102	1039	1352	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1					2	1	1	2	
Detector Template	Left	Thru	Right					Thru	Right	Left	Thru	
Leading Detector (ft)	20	100	20					100	20	20	100	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	20	6	20					6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94						94			94	
Detector 2 Size(ft)		6						6			6	
Detector 2 Type		Cl+Ex						Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0						0.0			0.0	
Turn Type	Split	NA	Perm					NA	Perm	Prot	NA	
Protected Phases	4	4						2		1	6	
Permitted Phases			4						2			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4	4					2	2	1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0					6.0	6.0	6.0	6.0	
Minimum Split (s)	44.1	44.1	44.1					26.3	26.3	11.9	18.8	
Total Split (s)	45.0	45.0	45.0					37.0	37.0	38.0	75.0	
Total Split (%)	37.5%	37.5%	37.5%					30.8%	30.8%	31.7%	62.5%	
Maximum Green (s)	37.9	37.9	37.9					30.7	30.7	32.1	68.2	
Yellow Time (s)	5.6	5.6	5.6					4.8	4.8	4.4	5.3	
All-Red Time (s)	1.5	1.5	1.5					1.5	1.5	1.5	1.5	
Lost Time Adjust (s)		0.0	0.0					0.0	0.0	0.0	0.0	
Total Lost Time (s)		7.1	7.1					6.3	6.3	5.9	6.8	
Lead/Lag								Lag	Lag	Lead		
Lead-Lag Optimize?								Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0					3.0	3.0	3.0	3.0	
Recall Mode	None	None	None					C-Max	C-Max	None	C-Max	
Walk Time (s)	10.0	10.0	10.0					9.0	9.0		7.0	
Flash Dont Walk (s)	27.0	27.0	27.0					11.0	11.0		5.0	
Pedestrian Calls (#/hr)	0	0	0					0	0		0	
Act Effct Green (s)		37.9	37.9					30.7	30.7	32.1	68.2	
Actuated g/C Ratio		0.32	0.32					0.26	0.26	0.27	0.57	
v/c Ratio		0.28	1.03					0.72	1.30	1.13	0.67	
Control Delay		32.5	80.8					46.2	163.3	103.1	30.1	
Queue Delay		0.0	0.0					0.0	0.0	0.0	10.1	
Total Delay		32.5	80.8					46.2	163.3	103.1	40.1	
LOS		C	F					D	F	F	D	
Approach Delay		70.5						119.7			67.5	
Approach LOS		E						F			E	
90th %ile Green (s)	37.9	37.9	37.9					30.7	30.7	32.1	68.2	
90th %ile Term Code	Max	Max	Max					Coord	Coord	Max	Coord	
70th %ile Green (s)	37.9	37.9	37.9					30.7	30.7	32.1	68.2	
70th %ile Term Code	Max	Max	Max					Coord	Coord	Max	Coord	
50th %ile Green (s)	37.9	37.9	37.9					30.7	30.7	32.1	68.2	
50th %ile Term Code	Max	Max	Max					Coord	Coord	Max	Coord	
30th %ile Green (s)	37.9	37.9	37.9					30.7	30.7	32.1	68.2	
30th %ile Term Code	Max	Max	Max					Coord	Coord	Max	Coord	
10th %ile Green (s)	37.9	37.9	37.9					30.7	30.7	32.1	68.2	
10th %ile Term Code	Max	Max	Max					Coord	Coord	Max	Coord	
Stops (vph)		73	344					497	393	743	1139	
Fuel Used(gal)		2	14					15	45	34	30	
CO Emissions (g/hr)		137	950					1067	3113	2373	2069	
NOx Emissions (g/hr)		27	185					208	606	462	403	
VOC Emissions (g/hr)		32	220					247	722	550	480	
Dilemma Vehicles (#)		4	0					23	0	0	22	
Queue Length 50th (ft)		90	~429					244	~733	~477	575	
Queue Length 95th (ft)		148	#509					291	#994	#582	615	
Internal Link Dist (ft)		531			440			600			542	
Turn Bay Length (ft)			400							200		
Base Capacity (vph)		559	560					905	846	918	2011	
Starvation Cap Reductn		0	0					0	0	0	641	

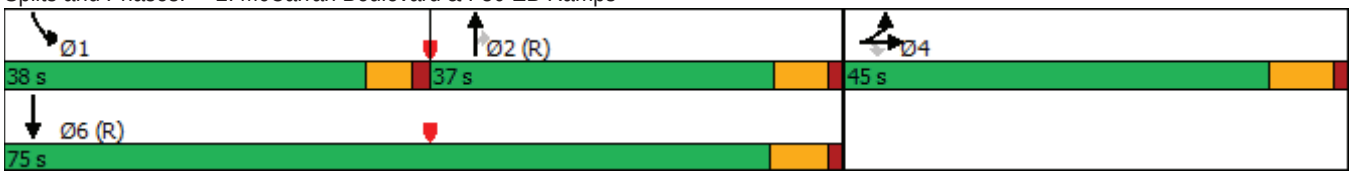
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn		0	0					0	0	0	0	
Storage Cap Reductn		0	0					0	0	0	0	
Reduced v/c Ratio		0.28	1.03					0.72	1.30	1.13	0.99	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green			
Natural Cycle: 125			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.30			
Intersection Signal Delay: 86.7		Intersection LOS: F	
Intersection Capacity Utilization 110.9%		ICU Level of Service H	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: McCarran Boulevard & I-80 EB Ramps





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	466	0	385	177	569	0	0	1616	210
Future Volume (vph)	0	0	0	466	0	385	177	569	0	0	1616	210
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		500	200		0	0		300
Storage Lanes	0		0	1		2	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.88	1.00	0.95	1.00	1.00	0.91	1.00
Frt						0.850						0.850
Flt Protected				0.950	0.950		0.950					
Satd. Flow (prot)	0	0	0	1681	1681	2787	1770	3539	0	0	5085	1583
Flt Permitted				0.950	0.950		0.950					
Satd. Flow (perm)	0	0	0	1681	1681	2787	1770	3539	0	0	5085	1583
Right Turn on Red			Yes			No			Yes			Yes
Satd. Flow (RTOR)												241
Link Speed (mph)		45			45			50			50	
Link Distance (ft)		185			1135			622			1004	
Travel Time (s)		2.8			17.2			8.5			13.7	
Peak Hour Factor	0.92	0.92	0.92	0.86	0.92	0.88	0.85	0.82	0.92	0.92	0.89	0.82
Adj. Flow (vph)	0	0	0	542	0	438	208	694	0	0	1816	256
Shared Lane Traffic (%)				50%								
Lane Group Flow (vph)	0	0	0	271	271	438	208	694	0	0	1816	256
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	2	1	1	2			2	1
Detector Template				Left	Thru	Right	Left	Thru			Thru	Right
Leading Detector (ft)				20	100	20	20	100			100	20
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				20	6	20	20	6			6	20
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 2 Position(ft)					94			94			94	
Detector 2 Size(ft)					6			6			6	
Detector 2 Type					Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)					0.0			0.0			0.0	
Turn Type				Split	NA	custom	Prot	NA			NA	Perm
Protected Phases				8	8	1 8	5	2			6	
Permitted Phases												6

Lane Group	Ø1
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	1
Permitted Phases	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase				8	8	1 8	5	2			6	6
Switch Phase												
Minimum Initial (s)				6.0	6.0		4.0	6.0			6.0	6.0
Minimum Split (s)				36.4	36.4		9.7	34.5			25.8	25.8
Total Split (s)				38.0	38.0		30.0	57.0			52.0	52.0
Total Split (%)				31.7%	31.7%		25.0%	47.5%			43.3%	43.3%
Maximum Green (s)				31.6	31.6		24.3	50.5			45.2	45.2
Yellow Time (s)				4.9	4.9		4.2	5.0			5.3	5.3
All-Red Time (s)				1.5	1.5		1.5	1.5			1.5	1.5
Lost Time Adjust (s)				0.0	0.0		0.0	0.0			0.0	0.0
Total Lost Time (s)				6.4	6.4		5.7	6.5			6.8	6.8
Lead/Lag							Lead	Lag			Lag	Lag
Lead-Lag Optimize?							Yes	Yes			Yes	Yes
Vehicle Extension (s)				3.0	3.0		3.0	3.0			3.0	3.0
Recall Mode				None	None		None	C-Max			C-Max	C-Max
Walk Time (s)				8.0	8.0			7.0			9.0	9.0
Flash Dont Walk (s)				22.0	22.0			21.0			10.0	10.0
Pedestrian Calls (#/hr)				0	0			0			0	0
Act Effct Green (s)				26.0	26.0	38.8	19.0	69.2			56.2	56.2
Actuated g/C Ratio				0.22	0.22	0.32	0.16	0.58			0.47	0.47
v/c Ratio				0.75	0.75	0.49	0.75	0.34			0.76	0.29
Control Delay				56.3	56.3	33.8	46.9	9.0			25.7	2.2
Queue Delay				4.3	4.3	0.0	0.0	0.0			0.0	0.0
Total Delay				60.6	60.6	33.8	46.9	9.0			25.7	2.2
LOS				E	E	C	D	A			C	A
Approach Delay					48.6			17.8			22.8	
Approach LOS					D			B			C	
90th %ile Green (s)				31.6	31.6		24.3	63.1			45.2	45.2
90th %ile Term Code				Max	Max		Max	Coord			Coord	Coord
70th %ile Green (s)				30.9	30.9		22.0	64.1			48.2	48.2
70th %ile Term Code				Gap	Gap		Gap	Coord			Coord	Coord
50th %ile Green (s)				27.0	27.0		19.3	68.1			54.8	54.8
50th %ile Term Code				Gap	Gap		Gap	Coord			Coord	Coord
30th %ile Green (s)				23.0	23.0		16.6	72.3			61.5	61.5
30th %ile Term Code				Gap	Gap		Gap	Coord			Coord	Coord
10th %ile Green (s)				17.3	17.3		12.6	78.2			71.2	71.2
10th %ile Term Code				Gap	Gap		Gap	Coord			Coord	Coord
Stops (vph)				212	212	295	113	382			1512	41
Fuel Used(gal)				7	7	9	4	9			42	2
CO Emissions (g/hr)				491	491	640	288	640			2933	144
NOx Emissions (g/hr)				96	96	124	56	125			571	28
VOC Emissions (g/hr)				114	114	148	67	148			680	33
Dilemma Vehicles (#)				0	8	0	0	2			8	0
Queue Length 50th (ft)				205	205	152	61	223			540	4
Queue Length 95th (ft)				275	292	187	111	263			m#600	m46
Internal Link Dist (ft)		105			1055			542			924	
Turn Bay Length (ft)						500	200					300
Base Capacity (vph)				442	442	1177	358	2039			2380	869
Starvation Cap Reductn				0	0	0	0	0			0	0

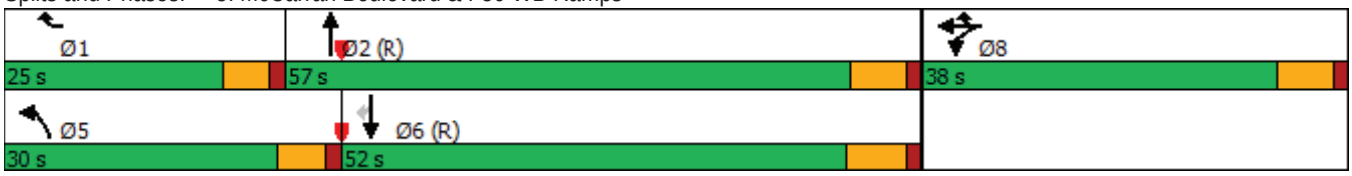
Lane Group	Ø1
Detector Phase	
Switch Phase	
Minimum Initial (s)	6.0
Minimum Split (s)	25.0
Total Split (s)	25.0
Total Split (%)	21%
Maximum Green (s)	19.5
Yellow Time (s)	4.0
All-Red Time (s)	1.5
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lead
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	12.5
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	6.9
90th %ile Term Code	Gap
70th %ile Green (s)	6.6
70th %ile Term Code	Gap
50th %ile Green (s)	6.5
50th %ile Term Code	Gap
30th %ile Green (s)	6.3
30th %ile Term Code	Gap
10th %ile Green (s)	6.1
10th %ile Term Code	Gap
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn				106	106	0	0	0			0	0
Storage Cap Reductn				0	0	0	0	0			0	0
Reduced v/c Ratio				0.81	0.81	0.37	0.58	0.34			0.76	0.29

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 43 (36%), Referenced to phase 2:NBT and 6:SBT, Start of Green			
Natural Cycle: 100			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.76			
Intersection Signal Delay: 28.1		Intersection LOS: C	
Intersection Capacity Utilization 110.9%		ICU Level of Service H	
Analysis Period (min) 15			

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: McCarran Boulevard & I-80 WB Ramps



Lane Group	Ø1
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	74	24	325	116	12	49	83	772	19	71	1429	33
Future Volume (vph)	74	24	325	116	12	49	83	772	19	71	1429	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	60		0	75		70	530		170	390		390
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Ped Bike Factor		0.99		1.00					0.98			0.98
Frt		0.864				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1591	0	1770	1863	1583	1770	5085	1583	1770	5085	1583
Flt Permitted	0.744			0.193			0.950			0.950		
Satd. Flow (perm)	1386	1591	0	359	1863	1583	1770	5085	1545	1770	5085	1546
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		249				148			75			81
Link Speed (mph)		25			25			50			50	
Link Distance (ft)		347			206			1004			2182	
Travel Time (s)		9.5			5.6			13.7			29.8	
Confl. Peds. (#/hr)			1	1					1			1
Confl. Bikes (#/hr)									1			
Peak Hour Factor	0.64	0.55	0.75	0.81	0.60	0.77	0.69	0.87	0.68	0.71	0.96	0.64
Adj. Flow (vph)	116	44	433	143	20	64	120	887	28	100	1489	52
Shared Lane Traffic (%)												
Lane Group Flow (vph)	116	477	0	143	20	64	120	887	28	100	1489	52
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

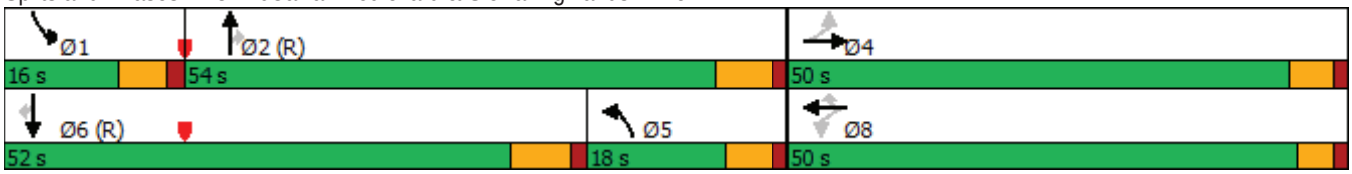


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA		Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8			2			6
Detector Phase	4	4		8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	10.0	10.0	4.0	10.0	10.0
Minimum Split (s)	49.3	49.3		48.7	48.7	48.7	9.7	25.6	25.6	9.9	24.8	24.8
Total Split (s)	50.0	50.0		50.0	50.0	50.0	18.0	54.0	54.0	16.0	52.0	52.0
Total Split (%)	41.7%	41.7%		41.7%	41.7%	41.7%	15.0%	45.0%	45.0%	13.3%	43.3%	43.3%
Maximum Green (s)	44.7	44.7		45.3	45.3	45.3	12.3	47.4	47.4	10.1	45.2	45.2
Yellow Time (s)	3.8	3.8		3.2	3.2	3.2	4.2	5.1	5.1	4.4	5.3	5.3
All-Red Time (s)	1.5	1.5		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.3	5.3		4.7	4.7	4.7	5.7	6.6	6.6	5.9	6.8	6.8
Lead/Lag							Lag	Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	10.0	10.0		10.0	10.0	10.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)	34.0	34.0		34.0	34.0	34.0		12.0	12.0		11.0	11.0
Pedestrian Calls (#/hr)	1	1		0	0	0		1	1		1	1
Act Effct Green (s)	38.9	38.9		39.5	39.5	39.5	12.3	53.5	53.5	9.8	51.0	51.0
Actuated g/C Ratio	0.32	0.32		0.33	0.33	0.33	0.10	0.45	0.45	0.08	0.42	0.42
v/c Ratio	0.26	0.70		1.21	0.03	0.10	0.66	0.39	0.04	0.69	0.69	0.07
Control Delay	29.6	21.1		187.6	24.2	0.3	59.0	13.4	1.2	74.7	26.4	1.1
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.6	21.1		187.6	24.2	0.3	59.0	13.4	1.2	74.7	26.4	1.1
LOS	C	C		F	C	A	E	B	A	E	C	A
Approach Delay		22.8			120.4			18.3			28.6	
Approach LOS		C			F			B			C	
90th %ile Green (s)	44.7	44.7		45.3	45.3	45.3	12.3	47.4	47.4	10.1	45.2	45.2
90th %ile Term Code	Hold	Hold		Max	Max	Max	Max	Coord	Coord	Max	Coord	Coord
70th %ile Green (s)	44.7	44.7		45.3	45.3	45.3	12.3	47.4	47.4	10.1	45.2	45.2
70th %ile Term Code	Hold	Hold		Max	Max	Max	Max	Coord	Coord	Max	Coord	Coord
50th %ile Green (s)	44.4	44.4		45.0	45.0	45.0	12.3	47.4	47.4	10.4	45.5	45.5
50th %ile Term Code	Hold	Hold		Gap	Gap	Gap	Max	Coord	Coord	Max	Coord	Coord
30th %ile Green (s)	36.7	36.7		37.3	37.3	37.3	12.3	55.0	55.0	10.5	53.2	53.2
30th %ile Term Code	Hold	Hold		Gap	Gap	Gap	Hold	Coord	Coord	Gap	Coord	Coord
10th %ile Green (s)	23.9	23.9		24.5	24.5	24.5	12.3	70.5	70.5	7.8	66.0	66.0
10th %ile Term Code	Hold	Hold		Gap	Gap	Gap	Hold	Coord	Coord	Gap	Coord	Coord
Stops (vph)	51	150		96	8	0	81	347	1	62	1216	2
Fuel Used(gal)	1	3		5	0	0	3	12	0	3	46	0
CO Emissions (g/hr)	60	217		350	8	6	194	863	10	211	3224	35
NOx Emissions (g/hr)	12	42		68	2	1	38	168	2	41	627	7
VOC Emissions (g/hr)	14	50		81	2	1	45	200	2	49	747	8
Dilemma Vehicles (#)	0	0		0	0	0	0	6	0	0	41	0
Queue Length 50th (ft)	61	143		~122	10	0	99	113	0	74	398	2
Queue Length 95th (ft)	73	64		#218	18	0	122	127	2	95	468	2
Internal Link Dist (ft)		267			126			924			2102	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)	60			75		70	530		170	390		390
Base Capacity (vph)	516	748		135	703	689	181	2268	730	150	2162	703
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.22	0.64		1.06	0.03	0.09	0.66	0.39	0.04	0.67	0.69	0.07

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 29 (24%), Referenced to phase 2:NBT and 6:SBT, Start of Green			
Natural Cycle: 95			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.21			
Intersection Signal Delay: 30.5		Intersection LOS: C	
Intersection Capacity Utilization 79.3%		ICU Level of Service D	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 8: McCarran Boulevard & Sierra Highlands Drive





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	238	117	352	168	97	32	241	501	128	42	558	101
Future Volume (vph)	238	117	352	168	97	32	241	501	128	42	558	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	170		400	100		50	675		225	315		250
Storage Lanes	1		1	1		1	2		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	0.97	0.91	1.00	1.00	0.91	1.00
Ped Bike Factor			0.99									0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	1863	1583	1770	1863	1583	3433	5085	1583	1770	5085	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	1863	1560	1770	1863	1583	3433	5085	1583	1770	5085	1562
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			383			191			180			165
Link Speed (mph)		35			25			50			50	
Link Distance (ft)		563			259			2182			1094	
Travel Time (s)		11.0			7.1			29.8			14.9	
Confl. Peds. (#/hr)			3									1
Peak Hour Factor	0.71	0.73	0.92	0.89	0.78	0.70	0.91	0.88	0.84	0.88	0.85	0.87
Adj. Flow (vph)	335	160	383	189	124	46	265	569	152	48	656	116
Shared Lane Traffic (%)												
Lane Group Flow (vph)	335	160	383	189	124	46	265	569	152	48	656	116
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm



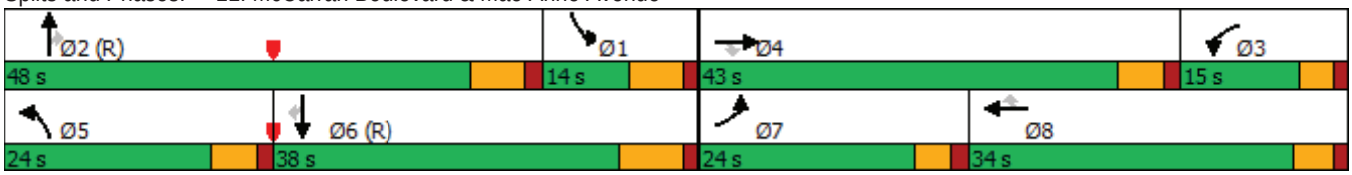
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	6.0	6.0	4.0	6.0	6.0	4.0	8.0	8.0	7.0	8.0	8.0
Minimum Split (s)	8.8	41.8	41.8	8.5	11.0	11.0	9.6	23.4	23.4	13.2	30.2	30.2
Total Split (s)	24.0	43.0	43.0	15.0	34.0	34.0	24.0	48.0	48.0	14.0	38.0	38.0
Total Split (%)	20.0%	35.8%	35.8%	12.5%	28.3%	28.3%	20.0%	40.0%	40.0%	11.7%	31.7%	31.7%
Maximum Green (s)	19.2	37.2	37.2	10.5	29.0	29.0	18.4	41.6	41.6	7.8	30.8	30.8
Yellow Time (s)	3.3	4.3	4.3	3.0	3.5	3.5	4.1	4.9	4.9	4.7	5.7	5.7
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.8	5.8	5.8	4.5	5.0	5.0	5.6	6.4	6.4	6.2	7.2	7.2
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lead	Lead	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)		8.0	8.0					7.0	7.0		9.0	9.0
Flash Dont Walk (s)		28.0	28.0					10.0	10.0		14.0	14.0
Pedestrian Calls (#/hr)		3	3					0	0		1	1
Act Effct Green (s)	16.5	19.0	19.0	21.6	24.6	24.6	14.5	51.6	51.6	7.6	41.9	41.9
Actuated g/C Ratio	0.14	0.16	0.16	0.18	0.20	0.20	0.12	0.43	0.43	0.06	0.35	0.35
v/c Ratio	0.71	0.54	0.67	0.59	0.33	0.10	0.64	0.26	0.19	0.42	0.37	0.18
Control Delay	58.1	51.5	9.9	55.3	43.1	0.4	34.9	14.9	6.9	57.5	24.8	2.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.1	51.5	9.9	55.3	43.1	0.4	34.9	14.9	6.9	57.5	24.8	2.4
LOS	E	D	A	E	D	A	C	B	A	E	C	A
Approach Delay		35.9			44.0			19.0			23.5	
Approach LOS		D			D			B			C	
90th %ile Green (s)	19.2	36.0	36.0	11.7	29.0	29.0	18.4	41.6	41.6	7.8	30.8	30.8
90th %ile Term Code	Max	Ped	Ped	Max	Hold	Hold	Max	Coord	Coord	Max	Coord	Coord
70th %ile Green (s)	18.7	18.9	18.9	22.6	23.3	23.3	16.1	47.8	47.8	7.8	39.3	39.3
70th %ile Term Code	Gap	Gap	Gap	Gap	Hold	Hold	Gap	Coord	Coord	Max	Coord	Coord
50th %ile Green (s)	16.9	16.6	16.6	22.5	22.7	22.7	14.5	50.2	50.2	7.8	43.3	43.3
50th %ile Term Code	Gap	Gap	Gap	Gap	Hold	Hold	Gap	Coord	Coord	Max	Coord	Coord
30th %ile Green (s)	15.1	13.4	13.4	23.4	22.2	22.2	12.9	52.5	52.5	7.8	47.2	47.2
30th %ile Term Code	Gap	Gap	Gap	Gap	Hold	Hold	Gap	Coord	Coord	Hold	Coord	Coord
10th %ile Green (s)	12.5	10.0	10.0	27.6	25.6	25.6	10.6	65.7	65.7	0.0	48.7	48.7
10th %ile Term Code	Gap	Gap	Gap	Gap	Hold	Hold	Gap	Coord	Coord	Skip	Coord	Coord
Stops (vph)	222	102	34	132	81	0	224	398	64	40	400	18
Fuel Used(gal)	5	2	2	3	1	0	8	15	3	1	13	1
CO Emissions (g/hr)	381	173	168	193	96	5	593	1018	205	98	896	72
NOx Emissions (g/hr)	74	34	33	38	19	1	115	198	40	19	174	14
VOC Emissions (g/hr)	88	40	39	45	22	1	138	236	48	23	208	17
Dilemma Vehicles (#)	0	4	0	0	0	0	0	5	0	0	4	0
Queue Length 50th (ft)	128	118	0	135	84	0	98	125	52	36	135	12
Queue Length 95th (ft)	134	121	73	#311	114	0	134	163	86	m77	158	6
Internal Link Dist (ft)		483			179			2102			1014	
Turn Bay Length (ft)	170		400	100		50	675		225	315		250

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	549	577	747	318	450	527	526	2184	782	115	1773	652
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.28	0.51	0.59	0.28	0.09	0.50	0.26	0.19	0.42	0.37	0.18

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 107 (89%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.71
Intersection Signal Delay: 28.0 Intersection LOS: C
Intersection Capacity Utilization 65.9% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: McCarran Boulevard & Mae Anne Avenue





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	237	102	247	179	101	66	71	658	113	57	858	173
Future Volume (vph)	237	102	247	179	101	66	71	658	113	57	858	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	195		280	150		0	530		170	375		310
Storage Lanes	1		1	1		1	2		1	2		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	0.97	0.91	1.00	0.97	0.91	1.00
Ped Bike Factor			0.98			0.98			0.97			0.98
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	1863	1583	3433	5085	1583	3433	5085	1583
Flt Permitted	0.557			0.661			0.950			0.950		
Satd. Flow (perm)	1038	3539	1557	1231	1863	1552	3433	5085	1542	3433	5085	1548
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			307			134			153			315
Link Speed (mph)		35			35			50			50	
Link Distance (ft)		596			464			1094			839	
Travel Time (s)		11.6			9.0			14.9			11.4	
Confl. Peds. (#/hr)			6			9			9			7
Peak Hour Factor	0.76	0.71	0.78	0.73	0.74	0.81	0.71	0.76	0.74	0.84	0.98	0.55
Adj. Flow (vph)	312	144	317	245	136	81	100	866	153	68	876	315
Shared Lane Traffic (%)												
Lane Group Flow (vph)	312	144	317	245	136	81	100	866	153	68	876	315
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm



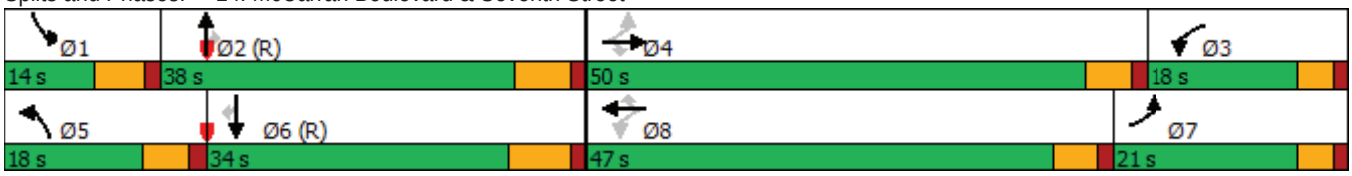
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	10.7	49.6	49.6	10.6	45.5	45.5	11.6	29.4	29.4	12.0	31.0	31.0
Total Split (s)	21.0	50.0	50.0	18.0	47.0	47.0	18.0	38.0	38.0	14.0	34.0	34.0
Total Split (%)	17.5%	41.7%	41.7%	15.0%	39.2%	39.2%	15.0%	31.7%	31.7%	11.7%	28.3%	28.3%
Maximum Green (s)	16.3	44.4	44.4	13.4	41.5	41.5	12.4	31.6	31.6	8.0	27.0	27.0
Yellow Time (s)	3.2	4.1	4.1	3.1	4.0	4.0	4.1	4.9	4.9	4.5	5.5	5.5
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.7	5.6	5.6	4.6	5.5	5.5	5.6	6.4	6.4	6.0	7.0	7.0
Lead/Lag	Lag	Lead	Lead	Lag	Lead	Lead	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)		9.0	9.0		10.0	10.0		8.0	8.0		7.0	7.0
Flash Dont Walk (s)		35.0	35.0		30.0	30.0		15.0	15.0		17.0	17.0
Pedestrian Calls (#/hr)		6	6		9	9		9	9		7	7
Act Effct Green (s)	34.3	16.6	16.6	37.6	18.3	18.3	8.9	56.9	56.9	7.8	53.3	53.3
Actuated g/C Ratio	0.29	0.14	0.14	0.31	0.15	0.15	0.07	0.47	0.47	0.06	0.44	0.44
v/c Ratio	0.78	0.29	0.66	0.52	0.48	0.23	0.39	0.36	0.19	0.30	0.39	0.37
Control Delay	52.1	45.2	11.5	35.5	49.7	2.2	57.4	14.6	5.1	55.1	24.8	6.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.1	45.2	11.5	35.5	49.7	2.2	57.4	14.6	5.1	55.1	24.8	6.2
LOS	D	D	B	D	D	A	E	B	A	E	C	A
Approach Delay		34.2			33.8			17.1			21.8	
Approach LOS		C			C			B			C	
90th %ile Green (s)	11.6	44.0	44.0	7.6	40.0	40.0	11.2	36.1	36.1	9.7	34.4	34.4
90th %ile Term Code	Hold	Ped	Ped	Gap	Ped	Ped	Gap	Coord	Coord	Gap	Coord	Coord
70th %ile Green (s)	22.1	12.4	12.4	26.1	16.4	16.4	9.9	50.3	50.3	8.6	48.8	48.8
70th %ile Term Code	Gap	Gap	Gap	Hold	Gap	Gap	Gap	Coord	Coord	Gap	Coord	Coord
50th %ile Green (s)	20.0	10.3	10.3	23.9	14.2	14.2	8.9	55.4	55.4	7.8	54.1	54.1
50th %ile Term Code	Gap	Gap	Gap	Hold	Gap	Gap	Gap	Coord	Coord	Gap	Coord	Coord
30th %ile Green (s)	17.1	9.1	9.1	20.0	12.0	12.0	7.9	61.3	61.3	7.0	60.2	60.2
30th %ile Term Code	Gap	Gap	Gap	Hold	Gap	Gap	Gap	Coord	Coord	Gap	Coord	Coord
10th %ile Green (s)	12.9	7.4	7.4	14.4	8.9	8.9	6.5	81.6	81.6	0.0	68.9	68.9
10th %ile Term Code	Gap	Gap	Gap	Hold	Gap	Gap	Gap	Coord	Coord	Skip	Coord	Coord
Stops (vph)	248	86	28	135	87	1	67	276	21	52	492	25
Fuel Used(gal)	5	2	2	3	2	0	2	11	1	2	19	2
CO Emissions (g/hr)	377	142	130	203	141	18	164	752	85	135	1356	148
NOx Emissions (g/hr)	73	28	25	40	27	4	32	146	17	26	264	29
VOC Emissions (g/hr)	87	33	30	47	33	4	38	174	20	31	314	34
Dilemma Vehicles (#)	0	3	0	0	3	0	0	8	0	0	66	0
Queue Length 50th (ft)	195	56	7	146	102	0	37	120	16	25	142	1
Queue Length 95th (ft)	177	48	33	133	101	0	56	127	27	m46	219	10
Internal Link Dist (ft)		516			384			1014			759	
Turn Bay Length (ft)	195		280	150			530		170	375		310

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	422	1309	769	485	644	624	354	2412	812	241	2257	862
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.74	0.11	0.41	0.51	0.21	0.13	0.28	0.36	0.19	0.28	0.39	0.37

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 92 (77%), Referenced to phase 2:NBT and 6:SBT, Start of Green			
Natural Cycle: 105			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.78			
Intersection Signal Delay: 24.5		Intersection LOS: C	
Intersection Capacity Utilization 63.9%		ICU Level of Service B	
Analysis Period (min) 15			

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 14: McCarran Boulevard & Seventh Street





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	76	1010	882	36	100	167
Future Volume (vph)	76	1010	882	36	100	167
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	280			75	100	0
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.91	0.95	1.00	1.00	1.00
Ped Bike Factor						
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	5085	3539	1583	1770	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	5085	3539	1583	1770	1583
Link Speed (mph)		50	50		35	
Link Distance (ft)		540	1872		569	
Travel Time (s)		7.4	25.5		11.1	
Confl. Peds. (#/hr)	6			6	6	6
Peak Hour Factor	0.83	0.84	0.88	0.69	0.83	0.83
Adj. Flow (vph)	92	1202	1002	52	120	201
Shared Lane Traffic (%)						
Lane Group Flow (vph)	92	1202	1002	52	120	201
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane					Yes	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 45.5%		ICU Level of Service A	
Analysis Period (min) 15			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	857	109	126	754	12	121	25	119	61	47	116
Future Volume (vph)	47	857	109	126	754	12	121	25	119	61	47	116
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	235		45	220		65	125		0	95		0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.98				1.00	0.99		1.00	0.99	
Frt			0.850			0.850		0.879			0.900	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1615	0	1770	1657	0
Flt Permitted	0.950			0.950			0.526			0.560		
Satd. Flow (perm)	1770	3539	1549	1770	3539	1583	976	1615	0	1039	1657	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			86			50		149			90	
Link Speed (mph)		50			50			30			30	
Link Distance (ft)		1872			2072			245			265	
Travel Time (s)		25.5			28.3			5.6			6.0	
Confl. Peds. (#/hr)			1				5		5	5		5
Peak Hour Factor	0.59	0.73	0.57	0.72	0.92	0.75	0.63	0.69	0.80	0.66	0.68	0.83
Adj. Flow (vph)	80	1174	191	175	820	16	192	36	149	92	69	140
Shared Lane Traffic (%)												
Lane Group Flow (vph)	80	1174	191	175	820	16	192	185	0	92	209	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes			Yes	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100	20	20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6	20	20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	

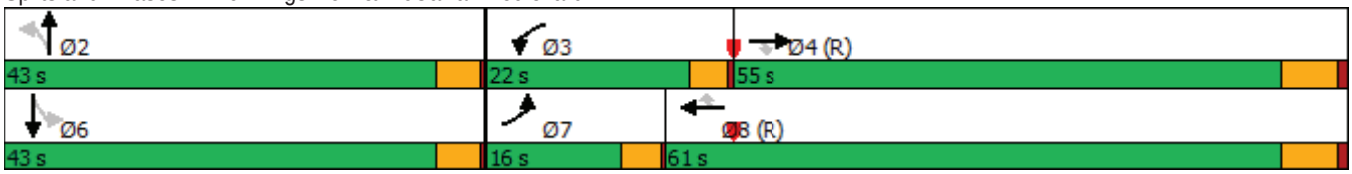


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4			8	2			6		
Detector Phase	7	4	4	3	8	8	2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	12.0	12.0	4.0	12.0	12.0	6.0	6.0		6.0	6.0	
Minimum Split (s)	8.0	40.0	40.0	8.0	40.0	40.0	38.5	38.5		35.5	35.5	
Total Split (s)	16.0	55.0	55.0	22.0	61.0	61.0	43.0	43.0		43.0	43.0	
Total Split (%)	13.3%	45.8%	45.8%	18.3%	50.8%	50.8%	35.8%	35.8%		35.8%	35.8%	
Maximum Green (s)	12.0	49.0	49.0	18.0	55.0	55.0	38.5	38.5		38.5	38.5	
Yellow Time (s)	3.5	5.0	5.0	3.5	5.0	5.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	0.5	1.0	1.0	0.5	1.0	1.0	0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	6.0	6.0	4.0	6.0	6.0	4.5	4.5		4.5	4.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	Max	Max		Max	Max	
Walk Time (s)		7.0	7.0		7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		27.0	27.0		27.0	27.0	27.0	27.0		24.0	24.0	
Pedestrian Calls (#/hr)		1	1		0	0	5	5		5	5	
Act Effct Green (s)	10.1	51.3	51.3	15.7	59.1	59.1	38.5	38.5		38.5	38.5	
Actuated g/C Ratio	0.08	0.43	0.43	0.13	0.49	0.49	0.32	0.32		0.32	0.32	
v/c Ratio	0.54	0.78	0.27	0.76	0.47	0.02	0.61	0.30		0.28	0.35	
Control Delay	61.3	42.2	22.0	70.5	22.1	0.1	44.4	9.0		33.2	19.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	61.3	42.2	22.0	70.5	22.1	0.1	44.4	9.0		33.2	19.2	
LOS	E	D	C	E	C	A	D	A		C	B	
Approach Delay		40.5			30.2			27.0			23.5	
Approach LOS		D			C			C			C	
90th %ile Green (s)	12.0	49.0	49.0	18.0	55.0	55.0	38.5	38.5		38.5	38.5	
90th %ile Term Code	Max	Coord	Coord	Max	Coord	Coord	MaxR	MaxR		MaxR	MaxR	
70th %ile Green (s)	12.0	49.0	49.0	18.0	55.0	55.0	38.5	38.5		38.5	38.5	
70th %ile Term Code	Max	Coord	Coord	Max	Coord	Coord	MaxR	MaxR		MaxR	MaxR	
50th %ile Green (s)	10.7	49.9	49.9	17.1	56.3	56.3	38.5	38.5		38.5	38.5	
50th %ile Term Code	Gap	Coord	Coord	Gap	Coord	Coord	MaxR	MaxR		MaxR	MaxR	
30th %ile Green (s)	9.0	52.4	52.4	14.6	58.0	58.0	38.5	38.5		38.5	38.5	
30th %ile Term Code	Gap	Coord	Coord	Gap	Coord	Coord	MaxR	MaxR		MaxR	MaxR	
10th %ile Green (s)	0.0	56.1	56.1	10.9	71.0	71.0	38.5	38.5		38.5	38.5	
10th %ile Term Code	Skip	Coord	Coord	Gap	Coord	Coord	MaxR	MaxR		MaxR	MaxR	
Stops (vph)	45	731	99	118	488	0	103	28		45	69	
Fuel Used(gal)	2	29	3	5	21	0	2	1		1	1	
CO Emissions (g/hr)	128	2010	231	369	1454	11	132	49		55	95	
NOx Emissions (g/hr)	25	391	45	72	283	2	26	9		11	18	
VOC Emissions (g/hr)	30	466	53	85	337	3	31	11		13	22	
Dilemma Vehicles (#)	0	49	0	0	32	0	0	0		0	0	
Queue Length 50th (ft)	63	426	51	131	225	0	125	19		53	67	
Queue Length 95th (ft)	76	440	76	161	287	0	132	35		69	82	
Internal Link Dist (ft)		1792			1992			165			185	
Turn Bay Length (ft)	235		45	220		65	125			95		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	177	1512	711	265	1741	804	313	619		333	592	
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio	0.45	0.78	0.27	0.66	0.47	0.02	0.61	0.30		0.28	0.35	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 65 (54%), Referenced to phase 4:EBT and 8:WBT, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.78			
Intersection Signal Delay: 33.9		Intersection LOS: C	
Intersection Capacity Utilization 84.5%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 19: Kings Row & McCarran Boulevard





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	26	1096	809	18	53	55
Future Volume (vph)	26	1096	809	18	53	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	220			50	0	0
Storage Lanes	1			1	1	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850	0.929	
Flt Protected	0.950				0.977	
Satd. Flow (prot)	1770	3539	3539	1583	1691	0
Flt Permitted	0.950				0.977	
Satd. Flow (perm)	1770	3539	3539	1583	1691	0
Link Speed (mph)		50	50		25	
Link Distance (ft)		2072	1713		451	
Travel Time (s)		28.3	23.4		12.3	
Peak Hour Factor	0.46	0.82	0.83	0.45	0.77	0.72
Adj. Flow (vph)	57	1337	975	40	69	76
Shared Lane Traffic (%)						
Lane Group Flow (vph)	57	1337	975	40	145	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 43.3%		ICU Level of Service A	
Analysis Period (min) 15			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	18	1145	801	3	3	35
Future Volume (vph)	18	1145	801	3	3	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	210			50	0	0
Storage Lanes	1			1	1	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor						
Frt				0.850	0.876	
Flt Protected	0.950				0.996	
Satd. Flow (prot)	1770	3539	3539	1583	1625	0
Flt Permitted	0.950				0.996	
Satd. Flow (perm)	1770	3539	3539	1583	1625	0
Link Speed (mph)		50	50		25	
Link Distance (ft)		1713	885		573	
Travel Time (s)		23.4	12.1		15.6	
Confl. Peds. (#/hr)	1			1	1	1
Peak Hour Factor	0.64	0.83	0.88	0.38	0.75	0.80
Adj. Flow (vph)	28	1380	910	8	4	44
Shared Lane Traffic (%)						
Lane Group Flow (vph)	28	1380	910	8	48	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	42.0%	ICU Level of Service	A
Analysis Period (min)	15		



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	1112	54	178	834	15	0	0	189	0	0	69
Future Volume (vph)	1	1112	54	178	834	15	0	0	189	0	0	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	240		60	415		50	0		0	0		0
Storage Lanes	1		1	1		1	0		1	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.865			0.865
Flt Protected	0.950			0.950								
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	0	0	1611	0	0	1611
Flt Permitted	0.950			0.950								
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	0	0	1611	0	0	1611
Link Speed (mph)		50			50			25			25	
Link Distance (ft)		885			6000			403			668	
Travel Time (s)		12.1			81.8			11.0			18.2	
Peak Hour Factor	0.25	0.84	0.71	0.85	0.86	0.47	0.92	0.92	0.75	0.92	0.92	0.82
Adj. Flow (vph)	4	1324	76	209	970	32	0	0	252	0	0	84
Shared Lane Traffic (%)												
Lane Group Flow (vph)	4	1324	76	209	970	32	0	0	252	0	0	84
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 49.1%		ICU Level of Service A	
Analysis Period (min) 15			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	447	536	322	358	374	110	64	157	84	549	924	587
Future Volume (vph)	447	536	322	358	374	110	64	157	84	549	924	587
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	550		430	325		0	110		475	300		675
Storage Lanes	1		1	1		1	1		1	2		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor			0.98			0.99			0.99			0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	3433	3539	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	3539	1556	1770	3539	1563	1770	3539	1564	3433	3539	1562
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			189			167			220			501
Link Speed (mph)		50			50			35			35	
Link Distance (ft)		6000			3039			1173			2354	
Travel Time (s)		81.8			41.4			22.9			45.9	
Confl. Peds. (#/hr)			4			1			1			1
Peak Hour Factor	0.73	0.80	0.85	0.92	0.91	0.76	0.66	0.70	0.80	0.82	0.92	0.84
Adj. Flow (vph)	612	670	379	389	411	145	97	224	105	670	1004	699
Shared Lane Traffic (%)												
Lane Group Flow (vph)	612	670	379	389	411	145	97	224	105	670	1004	699
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Free	Prot	NA	Perm

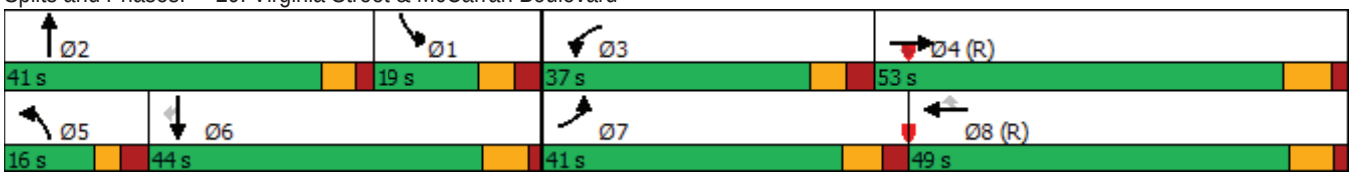


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			Free			6
Detector Phase	7	4	4	3	8	8	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	6.0	8.0	8.0	6.0	8.0	8.0	6.0	8.0		6.0	8.0	8.0
Minimum Split (s)	13.5	42.3	42.3	13.1	47.7	47.7	12.0	39.7		13.1	39.6	39.6
Total Split (s)	41.0	53.0	53.0	37.0	49.0	49.0	16.0	41.0		19.0	44.0	44.0
Total Split (%)	27.3%	35.3%	35.3%	24.7%	32.7%	32.7%	10.7%	27.3%		12.7%	29.3%	29.3%
Maximum Green (s)	33.5	45.7	45.7	29.9	42.3	42.3	10.0	35.3		11.9	37.4	37.4
Yellow Time (s)	4.5	5.4	5.4	4.1	5.0	5.0	3.0	3.8		4.1	5.0	5.0
All-Red Time (s)	3.0	1.9	1.9	3.0	1.7	1.7	3.0	1.9		3.0	1.6	1.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	7.5	7.3	7.3	7.1	6.7	6.7	6.0	5.7		7.1	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lead		Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	Max		None	Max	Max
Walk Time (s)		9.0	9.0		9.0	9.0		8.0			8.0	8.0
Flash Dont Walk (s)		26.0	26.0		32.0	32.0		26.0			25.0	25.0
Pedestrian Calls (#/hr)		4	4		1	1		1			1	1
Act Effct Green (s)	33.5	45.7	45.7	29.9	42.3	42.3	9.9	35.3	150.0	11.9	37.5	37.5
Actuated g/C Ratio	0.22	0.30	0.30	0.20	0.28	0.28	0.07	0.24	1.00	0.08	0.25	0.25
v/c Ratio	1.55	0.62	0.63	1.11	0.41	0.26	0.83	0.27	0.07	2.46	1.14	0.91
Control Delay	297.4	47.8	26.7	133.1	45.3	4.6	114.9	47.9	0.1	695.3	124.8	32.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	297.4	47.8	26.7	133.1	45.3	4.6	114.9	47.9	0.1	695.3	124.8	32.5
LOS	F	D	C	F	D	A	F	D	A	F	F	C
Approach Delay		135.0			75.2			51.4			258.7	
Approach LOS		F			E			D			F	
90th %ile Green (s)	33.5	45.7	45.7	29.9	42.3	42.3	10.0	35.3		11.9	37.4	37.4
90th %ile Term Code	Max	Coord	Coord	Max	Coord	Coord	Max	MaxR		Max	MaxR	MaxR
70th %ile Green (s)	33.5	45.7	45.7	29.9	42.3	42.3	10.0	35.3		11.9	37.4	37.4
70th %ile Term Code	Max	Coord	Coord	Max	Coord	Coord	Max	MaxR		Max	MaxR	MaxR
50th %ile Green (s)	33.5	45.7	45.7	29.9	42.3	42.3	10.0	35.3		11.9	37.4	37.4
50th %ile Term Code	Max	Coord	Coord	Max	Coord	Coord	Max	MaxR		Max	MaxR	MaxR
30th %ile Green (s)	33.5	45.7	45.7	29.9	42.3	42.3	10.0	35.3		11.9	37.4	37.4
30th %ile Term Code	Max	Coord	Coord	Max	Coord	Coord	Max	MaxR		Max	MaxR	MaxR
10th %ile Green (s)	33.5	45.7	45.7	29.9	42.3	42.3	9.6	35.3		11.9	37.8	37.8
10th %ile Term Code	Max	Coord	Coord	Max	Coord	Coord	Gap	MaxR		Max	MaxR	MaxR
Stops (vph)	316	451	146	304	298	7	57	125	0	332	794	194
Fuel Used(gal)	49	33	16	21	15	2	2	4	1	90	45	15
CO Emissions (g/hr)	3420	2274	1136	1487	1065	163	173	266	50	6258	3156	1071
NOx Emissions (g/hr)	665	442	221	289	207	32	34	52	10	1218	614	208
VOC Emissions (g/hr)	793	527	263	345	247	38	40	62	12	1450	731	248
Dilemma Vehicles (#)	0	18	0	0	12	0	0	5	0	0	26	0
Queue Length 50th (ft)	~841	296	161	~431	172	0	96	95	0	~558	~601	228
Queue Length 95th (ft)	#800	315	247	#642	225	12	116	103	0	#611	#738	#346
Internal Link Dist (ft)		5920			2959			1093			2274	
Turn Bay Length (ft)	550		430	325			110		475	300		675

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	395	1078	605	352	997	560	118	832	1564	272	884	766
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.55	0.62	0.63	1.11	0.41	0.26	0.82	0.27	0.07	2.46	1.14	0.91

Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 88 (59%), Referenced to phase 4:EBT and 8:WBT, Start of Green			
Natural Cycle: 145			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 2.46			
Intersection Signal Delay: 172.2		Intersection LOS: F	
Intersection Capacity Utilization 125.4%		ICU Level of Service H	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 29: Virginia Street & McCarran Boulevard



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	21	664	430	362	592	32	125	19	111	108	38	35
Future Volume (vph)	21	664	430	362	592	32	125	19	111	108	38	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	315		170	310		140	130		130	165		160
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.98				1.00					0.98
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5085	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.950			0.713			0.739		
Satd. Flow (perm)	1770	5085	1548	1770	3539	1583	1323	1863	1583	1377	1863	1558
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			493			60			135			88
Link Speed (mph)		50			50			25			25	
Link Distance (ft)		3039			491			522			1079	
Travel Time (s)		41.4			6.7			14.2			29.4	
Confl. Peds. (#/hr)			1				4					4
Peak Hour Factor	0.75	0.80	0.72	0.84	0.84	0.53	0.78	0.68	0.82	0.76	0.56	0.73
Adj. Flow (vph)	28	830	597	431	705	60	160	28	135	142	68	48
Shared Lane Traffic (%)												
Lane Group Flow (vph)	28	830	597	431	705	60	160	28	135	142	68	48
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	Perm

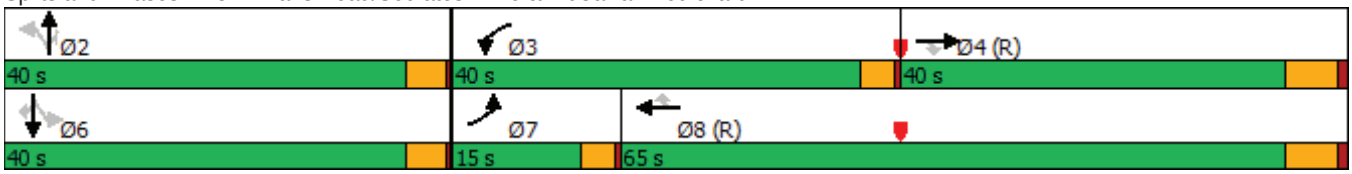


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4			8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	4.0	8.0	8.0	4.0	8.0	8.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	7.5	34.7	34.7	7.5	26.7	26.7	38.1	38.1	38.1	38.1	38.1	38.1
Total Split (s)	15.0	40.0	40.0	40.0	65.0	65.0	40.0	40.0	40.0	40.0	40.0	40.0
Total Split (%)	12.5%	33.3%	33.3%	33.3%	54.2%	54.2%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%
Maximum Green (s)	11.5	34.3	34.3	36.5	59.3	59.3	35.9	35.9	35.9	35.9	35.9	35.9
Yellow Time (s)	3.0	4.7	4.7	3.0	4.7	4.7	3.6	3.6	3.6	3.6	3.6	3.6
All-Red Time (s)	0.5	1.0	1.0	0.5	1.0	1.0	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.5	5.7	5.7	3.5	5.7	5.7	4.1	4.1	4.1	4.1	4.1	4.1
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	Max	Max	Max	Max	Max	Max
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		19.0	19.0		11.0	11.0	27.0	27.0	27.0	27.0	27.0	27.0
Pedestrian Calls (#/hr)		1	1		0	0	0	0	0	4	4	4
Act Effct Green (s)	7.4	37.9	37.9	32.9	67.1	67.1	35.9	35.9	35.9	35.9	35.9	35.9
Actuated g/C Ratio	0.06	0.32	0.32	0.27	0.56	0.56	0.30	0.30	0.30	0.30	0.30	0.30
v/c Ratio	0.26	0.52	0.72	0.89	0.36	0.07	0.41	0.05	0.24	0.35	0.12	0.09
Control Delay	58.7	35.6	12.9	62.8	16.0	3.9	37.3	30.4	6.3	35.8	31.4	1.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.7	35.6	12.9	62.8	16.0	3.9	37.3	30.4	6.3	35.8	31.4	1.5
LOS	E	D	B	E	B	A	D	C	A	D	C	A
Approach Delay		26.7			32.3			23.7			28.3	
Approach LOS		C			C			C			C	
90th %ile Green (s)	9.8	34.3	34.3	36.5	61.0	61.0	35.9	35.9	35.9	35.9	35.9	35.9
90th %ile Term Code	Gap	Coord	Coord	Max	Coord	Coord	MaxR	MaxR	MaxR	MaxR	MaxR	MaxR
70th %ile Green (s)	8.3	34.3	34.3	36.5	62.5	62.5	35.9	35.9	35.9	35.9	35.9	35.9
70th %ile Term Code	Gap	Coord	Coord	Max	Coord	Coord	MaxR	MaxR	MaxR	MaxR	MaxR	MaxR
50th %ile Green (s)	7.3	36.0	36.0	34.8	63.5	63.5	35.9	35.9	35.9	35.9	35.9	35.9
50th %ile Term Code	Gap	Coord	Coord	Gap	Coord	Coord	MaxR	MaxR	MaxR	MaxR	MaxR	MaxR
30th %ile Green (s)	0.0	39.7	39.7	31.1	74.3	74.3	35.9	35.9	35.9	35.9	35.9	35.9
30th %ile Term Code	Skip	Coord	Coord	Gap	Coord	Coord	MaxR	MaxR	MaxR	MaxR	MaxR	MaxR
10th %ile Green (s)	0.0	45.4	45.4	25.4	74.3	74.3	35.9	35.9	35.9	35.9	35.9	35.9
10th %ile Term Code	Skip	Coord	Coord	Gap	Coord	Coord	MaxR	MaxR	MaxR	MaxR	MaxR	MaxR
Stops (vph)	20	533	97	332	318	4	98	14	14	83	27	1
Fuel Used(gal)	1	26	11	20	23	1	2	0	1	2	1	0
CO Emissions (g/hr)	67	1803	762	1379	1620	68	132	18	48	147	49	23
NOx Emissions (g/hr)	13	351	148	268	315	13	26	3	9	29	9	5
VOC Emissions (g/hr)	16	418	177	320	376	16	30	4	11	34	11	5
Dilemma Vehicles (#)	0	28	0	0	25	0	0	0	0	0	0	0
Queue Length 50th (ft)	21	196	60	314	162	0	99	15	0	86	38	0
Queue Length 95th (ft)	43	213	56	395	197	3	139	29	35	119	45	0
Internal Link Dist (ft)		2959			411			442			999	
Turn Bay Length (ft)	315		170	310		140	130		130	165		160

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	169	1607	826	538	1979	911	395	557	568	411	557	527
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.52	0.72	0.80	0.36	0.07	0.41	0.05	0.24	0.35	0.12	0.09

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 13 (11%), Referenced to phase 4:EBT and 8:WBT, Start of Green			
Natural Cycle: 95			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.89			
Intersection Signal Delay: 28.6		Intersection LOS: C	
Intersection Capacity Utilization 86.6%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 32: Evans Road/Socrates Drive & McCarran Boulevard





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	62	586	213	273	708	31	88	56	199	91	118	80
Future Volume (vph)	62	586	213	273	708	31	88	56	199	91	118	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	145		450	270		175	95		0	50		150
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.99			0.90						0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.950			0.605			0.706		
Satd. Flow (perm)	1770	3539	1562	1770	3539	1421	1127	1863	1583	1315	1863	1563
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			277			76			269			131
Link Speed (mph)		50			45			35			25	
Link Distance (ft)		3868			2027			668			642	
Travel Time (s)		52.7			30.7			13.0			17.5	
Confl. Peds. (#/hr)			1			28						
Confl. Bikes (#/hr)						2						1
Peak Hour Factor	0.78	0.88	0.77	0.81	0.89	0.70	0.79	0.72	0.74	0.88	0.81	0.65
Adj. Flow (vph)	79	666	277	337	796	44	111	78	269	103	146	123
Shared Lane Traffic (%)												
Lane Group Flow (vph)	79	666	277	337	796	44	111	78	269	103	146	123
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

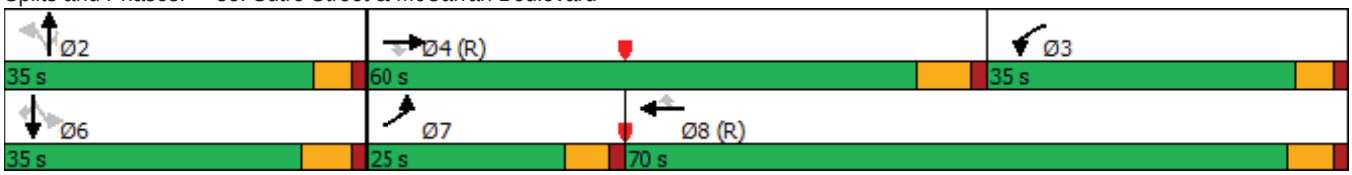


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4			8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	4.0	8.0	8.0	4.0	8.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	9.8	29.8	29.8	9.2	28.0	28.0	30.2	30.2	30.2	31.3	31.3	31.3
Total Split (s)	25.0	60.0	60.0	35.0	70.0	70.0	35.0	35.0	35.0	35.0	35.0	35.0
Total Split (%)	19.2%	46.2%	46.2%	26.9%	53.8%	53.8%	26.9%	26.9%	26.9%	26.9%	26.9%	26.9%
Maximum Green (s)	19.2	53.2	53.2	29.8	64.0	64.0	29.8	29.8	29.8	28.7	28.7	28.7
Yellow Time (s)	4.3	5.3	5.3	3.7	4.5	4.5	3.7	3.7	3.7	4.8	4.8	4.8
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.8	6.8	6.8	5.2	6.0	6.0	5.2	5.2	5.2	6.3	6.3	6.3
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	Max	Max	Max	Max	Max	Max
Walk Time (s)		7.0	7.0		7.0	7.0	7.0	7.0	7.0	8.0	8.0	8.0
Flash Dont Walk (s)		16.0	16.0		15.0	15.0	18.0	18.0	18.0	17.0	17.0	17.0
Pedestrian Calls (#/hr)		1	1		28	28	0	0	0	0	0	0
Act Effct Green (s)	11.1	53.2	53.2	29.8	74.6	74.6	29.8	29.8	29.8	28.7	28.7	28.7
Actuated g/C Ratio	0.09	0.41	0.41	0.23	0.57	0.57	0.23	0.23	0.23	0.22	0.22	0.22
v/c Ratio	0.52	0.46	0.35	0.83	0.39	0.05	0.43	0.18	0.47	0.36	0.36	0.28
Control Delay	68.5	29.3	4.0	37.8	10.4	1.4	49.0	41.7	7.6	47.0	45.8	7.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	68.5	29.3	4.0	37.8	10.4	1.4	49.0	41.7	7.6	47.0	45.8	7.5
LOS	E	C	A	D	B	A	D	D	A	D	D	A
Approach Delay		25.4			17.9			23.4			33.5	
Approach LOS		C			B			C			C	
90th %ile Green (s)	15.5	53.2	53.2	29.8	67.7	67.7	29.8	29.8	29.8	28.7	28.7	28.7
90th %ile Term Code	Gap	Coord	Coord	Max	Coord	Coord	MaxR	MaxR	MaxR	MaxR	MaxR	MaxR
70th %ile Green (s)	12.9	53.2	53.2	29.8	70.3	70.3	29.8	29.8	29.8	28.7	28.7	28.7
70th %ile Term Code	Gap	Coord	Coord	Max	Coord	Coord	MaxR	MaxR	MaxR	MaxR	MaxR	MaxR
50th %ile Green (s)	11.1	53.2	53.2	29.8	72.1	72.1	29.8	29.8	29.8	28.7	28.7	28.7
50th %ile Term Code	Gap	Coord	Coord	Max	Coord	Coord	MaxR	MaxR	MaxR	MaxR	MaxR	MaxR
30th %ile Green (s)	9.3	53.2	53.2	29.8	73.9	73.9	29.8	29.8	29.8	28.7	28.7	28.7
30th %ile Term Code	Gap	Coord	Coord	Hold	Coord	Coord	MaxR	MaxR	MaxR	MaxR	MaxR	MaxR
10th %ile Green (s)	0.0	53.2	53.2	29.8	89.0	89.0	29.8	29.8	29.8	28.7	28.7	28.7
10th %ile Term Code	Skip	Coord	Coord	Hold	Coord	Coord	MaxR	MaxR	MaxR	MaxR	MaxR	MaxR
Stops (vph)	58	414	16	193	179	1	74	44	20	76	98	10
Fuel Used(gal)	3	26	6	8	13	0	2	1	1	2	2	1
CO Emissions (g/hr)	242	1821	441	566	912	30	130	75	99	116	148	42
NOx Emissions (g/hr)	47	354	86	110	177	6	25	15	19	23	29	8
VOC Emissions (g/hr)	56	422	102	131	211	7	30	17	23	27	34	10
Dilemma Vehicles (#)	0	23	0	0	59	0	0	2	0	0	0	0
Queue Length 50th (ft)	65	212	0	153	77	0	81	53	0	74	105	0
Queue Length 95th (ft)	99	259	24	m185	m152	m1	122	77	23	127	151	7
Internal Link Dist (ft)		3788			1947			588			562	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)	145		450	270		175	95			50		150
Base Capacity (vph)	261	1448	802	405	2030	847	258	427	570	290	411	447
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.46	0.35	0.83	0.39	0.05	0.43	0.18	0.47	0.36	0.36	0.28

Intersection Summary			
Area Type:	Other		
Cycle Length: 130			
Actuated Cycle Length: 130			
Offset: 41 (32%), Referenced to phase 4:EBT and 8:WBT, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.83			
Intersection Signal Delay: 23.2		Intersection LOS: C	
Intersection Capacity Utilization 61.2%		ICU Level of Service B	
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 35: Sutro Street & McCarran Boulevard





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	171	631	51	94	821	73	65	106	134	128	272	349
Future Volume (vph)	171	631	51	94	821	73	65	106	134	128	272	349
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		0	320		0	0		0	0		215
Storage Lanes	2		0	1		1	0		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.95	0.95	1.00	0.95	1.00	0.95	0.95	0.95	0.95	0.95	1.00
Ped Bike Factor		1.00				0.98		0.99				0.97
Frt		0.988				0.850		0.927				0.850
Flt Protected	0.950			0.950				0.991		0.950	0.998	
Satd. Flow (prot)	3433	3484	0	1770	3539	1583	0	3224	0	1681	1766	1583
Flt Permitted	0.950			0.950				0.807		0.119	0.400	
Satd. Flow (perm)	3433	3484	0	1770	3539	1556	0	2622	0	211	708	1543
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7				120		169				384
Link Speed (mph)		45			45			35			35	
Link Distance (ft)		2027			568			239			473	
Travel Time (s)		30.7			8.6			4.7			9.2	
Confl. Peds. (#/hr)			9			3	11		3	3		11
Confl. Bikes (#/hr)									1			1
Peak Hour Factor	0.81	0.78	0.71	0.59	0.85	0.83	0.81	0.72	0.63	0.84	0.87	0.91
Adj. Flow (vph)	211	809	72	159	966	88	80	147	213	152	313	384
Shared Lane Traffic (%)										10%		
Lane Group Flow (vph)	211	881	0	159	966	88	0	440	0	137	328	384
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2		1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100	20	20	100		20	100	20
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6	20	20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

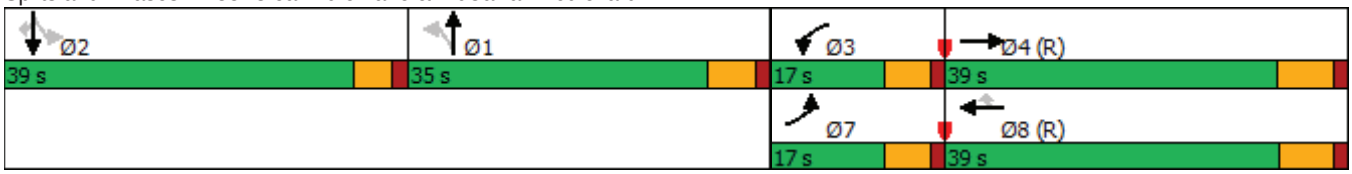


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8			1			2	
Permitted Phases						8	1			2		2
Detector Phase	7	4		3	8	8	1	1		2	2	2
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.9	29.9		9.8	29.8	29.8	34.1	34.1		38.3	38.3	38.3
Total Split (s)	17.0	39.0		17.0	39.0	39.0	35.0	35.0		39.0	39.0	39.0
Total Split (%)	13.1%	30.0%		13.1%	30.0%	30.0%	26.9%	26.9%		30.0%	30.0%	30.0%
Maximum Green (s)	11.1	32.1		11.2	32.2	32.2	28.9	28.9		33.7	33.7	33.7
Yellow Time (s)	4.4	5.4		4.3	5.3	5.3	4.6	4.6		3.8	3.8	3.8
All-Red Time (s)	1.5	1.5		1.5	1.5	1.5	1.5	1.5		1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	0.0
Total Lost Time (s)	5.9	6.9		5.8	6.8	6.8		6.1		5.3	5.3	5.3
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lag	Lag		Lead	Lead	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Max		None	C-Max	C-Max	None	None		Max	Max	Max
Walk Time (s)		7.0			4.0	4.0	4.0	4.0		4.0	4.0	4.0
Flash Dont Walk (s)		16.0			19.0	19.0	24.0	24.0		29.0	29.0	29.0
Pedestrian Calls (#/hr)		9			3	3	3	3		11	11	11
Act Effct Green (s)	12.4	34.7		17.6	39.9	39.9		19.9		33.7	33.7	33.7
Actuated g/C Ratio	0.10	0.27		0.14	0.31	0.31		0.15		0.26	0.26	0.26
v/c Ratio	0.65	0.94		0.67	0.89	0.16		0.81		2.54	1.79	0.56
Control Delay	84.3	48.1		65.7	57.4	11.9		43.9		764.7	407.3	7.1
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	0.0
Total Delay	84.3	48.1		65.7	57.4	11.9		43.9		764.7	407.3	7.1
LOS	F	D		E	E	B		D		F	F	A
Approach Delay		55.1			55.2			43.9			284.0	
Approach LOS		E			E			D			F	
90th %ile Green (s)	12.0	32.1		12.1	32.2	32.2	28.0	28.0		33.7	33.7	33.7
90th %ile Term Code	Max	Coord		Max	Coord	Coord	Ped	Ped		MaxR	MaxR	MaxR
70th %ile Green (s)	14.9	32.1		17.3	34.5	34.5	22.8	22.8		33.7	33.7	33.7
70th %ile Term Code	Gap	Coord		Max	Coord	Coord	Gap	Gap		MaxR	MaxR	MaxR
50th %ile Green (s)	13.4	32.3		20.1	39.0	39.0	19.8	19.8		33.7	33.7	33.7
50th %ile Term Code	Gap	Coord		Gap	Coord	Coord	Gap	Gap		MaxR	MaxR	MaxR
30th %ile Green (s)	11.9	36.0		19.5	43.6	43.6	16.7	16.7		33.7	33.7	33.7
30th %ile Term Code	Gap	Coord		Gap	Coord	Coord	Gap	Gap		MaxR	MaxR	MaxR
10th %ile Green (s)	9.8	41.0		19.0	50.2	50.2	12.2	12.2		33.7	33.7	33.7
10th %ile Term Code	Gap	Coord		Gap	Coord	Coord	Gap	Gap		MaxR	MaxR	MaxR
Stops (vph)	168	577		85	664	20		184		75	193	32
Fuel Used(gal)	7	23		3	21	1		5		19	26	2
CO Emissions (g/hr)	508	1596		186	1460	49		324		1318	1822	136
NOx Emissions (g/hr)	99	310		36	284	9		63		256	354	26
VOC Emissions (g/hr)	118	370		43	338	11		75		306	422	31
Dilemma Vehicles (#)	0	21		0	35	0		9		0	6	0
Queue Length 50th (ft)	94	~403		143	453	16		119		~202	~435	0
Queue Length 95th (ft)	125	#421		143	#578	44		113		#317	#608	83
Internal Link Dist (ft)		1947			488			159			393	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)	400			320								215
Base Capacity (vph)	334	934		239	1086	560		714		54	183	684
Starvation Cap Reductn	0	0		0	0	0		0		0	0	0
Spillback Cap Reductn	0	0		0	0	0		0		0	0	0
Storage Cap Reductn	0	0		0	0	0		0		0	0	0
Reduced v/c Ratio	0.63	0.94		0.67	0.89	0.16		0.62		2.54	1.79	0.56

Intersection Summary			
Area Type:	Other		
Cycle Length: 130			
Actuated Cycle Length: 130			
Offset: 49 (38%), Referenced to phase 4:EBT and 8:WBT, Start of Green			
Natural Cycle: 115			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 2.54			
Intersection Signal Delay: 107.8		Intersection LOS: F	
Intersection Capacity Utilization 85.8%		ICU Level of Service E	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 38: Clear Acre Lane & McCarran Boulevard





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	501	389	592	986	0	0	0	0	224	0	3
Future Volume (vph)	0	501	389	592	986	0	0	0	0	224	0	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		400	500		0	0		0	0		290
Storage Lanes	0		1	2		0	0		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	1.00	1.00	1.00	1.00	0.95	0.95	1.00
Frt			0.850									0.850
Flt Protected				0.950						0.950	0.950	
Satd. Flow (prot)	0	5085	1583	3433	5085	0	0	0	0	1681	1681	1583
Flt Permitted				0.950						0.950	0.950	
Satd. Flow (perm)	0	5085	1583	3433	5085	0	0	0	0	1681	1681	1583
Right Turn on Red			Yes			No			No			Yes
Satd. Flow (RTOR)			394									77
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		568			822			596			656	
Travel Time (s)		8.6			12.5			9.0			9.9	
Peak Hour Factor	0.92	0.68	0.80	0.66	0.86	0.92	0.92	0.92	0.92	0.89	0.92	0.38
Adj. Flow (vph)	0	737	486	897	1147	0	0	0	0	252	0	8
Shared Lane Traffic (%)										50%		
Lane Group Flow (vph)	0	737	486	897	1147	0	0	0	0	126	126	8
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		2	1	1	2					1	2	1
Detector Template		Thru	Right	Left	Thru					Left	Thru	Right
Leading Detector (ft)		100	20	20	100					20	100	20
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		6	20	20	6					20	6	20
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 2 Position(ft)		94			94						94	
Detector 2 Size(ft)		6			6						6	
Detector 2 Type		Cl+Ex			Cl+Ex						Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0						0.0	
Turn Type		NA	Perm	Prot	NA					Split	NA	Perm
Protected Phases		4		3	8					6	6	
Permitted Phases			4									6



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase		4	4	3	8					6	6	6
Switch Phase												
Minimum Initial (s)		12.0	12.0	6.0	12.0					6.0	6.0	6.0
Minimum Split (s)		22.5	22.5	11.4	28.2					22.5	22.5	22.5
Total Split (s)		50.0	50.0	50.0	100.0					30.0	30.0	30.0
Total Split (%)		38.5%	38.5%	38.5%	76.9%					23.1%	23.1%	23.1%
Maximum Green (s)		44.0	44.0	44.6	93.8					22.8	22.8	22.8
Yellow Time (s)		4.5	4.5	3.9	4.7					5.7	5.7	5.7
All-Red Time (s)		1.5	1.5	1.5	1.5					1.5	1.5	1.5
Lost Time Adjust (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Total Lost Time (s)		6.0	6.0	5.4	6.2					7.2	7.2	7.2
Lead/Lag		Lead	Lead	Lag								
Lead-Lag Optimize?		Yes	Yes	Yes								
Vehicle Extension (s)		3.0	3.0	3.0	3.0					3.0	3.0	3.0
Recall Mode		C-Max	C-Max	None	C-Max					Max	Max	Max
Walk Time (s)		7.0	7.0		7.0							
Flash Dont Walk (s)		6.0	6.0		15.0							
Pedestrian Calls (#/hr)		0	0		0							
Act Effct Green (s)		44.0	44.0	44.6	93.8					22.8	22.8	22.8
Actuated g/C Ratio		0.34	0.34	0.34	0.72					0.18	0.18	0.18
v/c Ratio		0.43	0.61	0.76	0.31					0.43	0.43	0.02
Control Delay		17.4	1.1	31.2	5.5					53.0	53.0	0.0
Queue Delay		0.0	1.4	0.0	0.0					0.0	0.0	0.0
Total Delay		17.4	2.5	31.2	5.5					53.0	53.0	0.0
LOS		B	A	C	A					D	D	A
Approach Delay		11.5			16.8						51.4	
Approach LOS		B			B						D	
90th %ile Green (s)		44.0	44.0	44.6	93.8					22.8	22.8	22.8
90th %ile Term Code		Coord	Coord	Max	Coord					MaxR	MaxR	MaxR
70th %ile Green (s)		44.0	44.0	44.6	93.8					22.8	22.8	22.8
70th %ile Term Code		Coord	Coord	Hold	Coord					MaxR	MaxR	MaxR
50th %ile Green (s)		44.0	44.0	44.6	93.8					22.8	22.8	22.8
50th %ile Term Code		Coord	Coord	Hold	Coord					MaxR	MaxR	MaxR
30th %ile Green (s)		44.0	44.0	44.6	93.8					22.8	22.8	22.8
30th %ile Term Code		Coord	Coord	Hold	Coord					MaxR	MaxR	MaxR
10th %ile Green (s)		44.0	44.0	44.6	93.8					22.8	22.8	22.8
10th %ile Term Code		Coord	Coord	Hold	Coord					MaxR	MaxR	MaxR
Stops (vph)		195	24	512	237					99	99	0
Fuel Used(gal)		6	2	13	9					3	3	0
CO Emissions (g/hr)		423	127	928	651					204	204	1
NOx Emissions (g/hr)		82	25	181	127					40	40	0
VOC Emissions (g/hr)		98	29	215	151					47	47	0
Dilemma Vehicles (#)		10	0	0	34					0	4	0
Queue Length 50th (ft)		73	8	291	81					101	101	0
Queue Length 95th (ft)		m62	m1	170	87					166	168	0
Internal Link Dist (ft)		488			742			516			576	
Turn Bay Length (ft)			400	500								290
Base Capacity (vph)		1721	796	1177	3669					294	294	341
Starvation Cap Reductn		0	150	0	0					0	0	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn		0	0	0	0					0	0	0
Storage Cap Reductn		0	0	0	0					0	0	0
Reduced v/c Ratio		0.43	0.75	0.76	0.31					0.43	0.43	0.02

Intersection Summary			
Area Type:	Other		
Cycle Length: 130			
Actuated Cycle Length: 130			
Offset: 54 (42%), Referenced to phase 4:EBT and 8:WBT, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.76			
Intersection Signal Delay: 17.5		Intersection LOS: B	
Intersection Capacity Utilization 62.7%		ICU Level of Service B	
Analysis Period (min) 15			

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 41: US 395 SB Ramps & McCarran Boulevard





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	709	0	0	1428	287	155	0	329	0	0	0
Future Volume (vph)	14	709	0	0	1428	287	155	0	329	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	0		525	285		285	0		0
Storage Lanes	1		0	0		1	1		2	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	0.95	0.95	0.88	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950	0.950				
Satd. Flow (prot)	1770	5085	0	0	5085	1583	1681	1681	2787	0	0	0
Flt Permitted	0.950						0.950	0.950				
Satd. Flow (perm)	1770	5085	0	0	5085	1583	1681	1681	2787	0	0	0
Right Turn on Red			No			Yes			No			No
Satd. Flow (RTOR)						330						
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		822			1229			704			595	
Travel Time (s)		12.5			18.6			10.7			9.0	
Peak Hour Factor	0.50	0.76	0.92	0.92	0.86	0.87	0.84	0.92	0.88	0.92	0.92	0.92
Adj. Flow (vph)	28	933	0	0	1660	330	185	0	374	0	0	0
Shared Lane Traffic (%)							50%					
Lane Group Flow (vph)	28	933	0	0	1660	330	92	93	374	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2	1	1	2	1			
Detector Template	Left	Thru			Thru	Right	Left	Thru	Right			
Leading Detector (ft)	20	100			100	20	20	100	20			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	20	6			6	20	20	6	20			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 2 Position(ft)		94			94			94				
Detector 2 Size(ft)		6			6			6				
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex				
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0				
Turn Type	Prot	NA			NA	Perm	Split	NA	Prot			
Protected Phases	7	4			8		2	2	2			
Permitted Phases						8						



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4			8	8	2	2	2			
Switch Phase												
Minimum Initial (s)	4.0	6.0			6.0	6.0	6.0	6.0	6.0			
Minimum Split (s)	9.4	35.3			17.9	17.9	11.8	11.8	11.8			
Total Split (s)	19.0	99.0			80.0	80.0	31.0	31.0	31.0			
Total Split (%)	14.6%	76.2%			61.5%	61.5%	23.8%	23.8%	23.8%			
Maximum Green (s)	13.6	92.7			74.1	74.1	25.2	25.2	25.2			
Yellow Time (s)	3.9	4.8			4.4	4.4	4.3	4.3	4.3			
All-Red Time (s)	1.5	1.5			1.5	1.5	1.5	1.5	1.5			
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Total Lost Time (s)	5.4	6.3			5.9	5.9	5.8	5.8	5.8			
Lead/Lag	Lag				Lead	Lead						
Lead-Lag Optimize?	Yes				Yes	Yes						
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Recall Mode	None	C-Max			C-Max	C-Max	Max	Max	Max			
Walk Time (s)		11.0			7.0	7.0						
Flash Dont Walk (s)		18.0			5.0	5.0						
Pedestrian Calls (#/hr)		0			0	0						
Act Effct Green (s)	10.5	92.7			81.7	81.7	25.2	25.2	25.2			
Actuated g/C Ratio	0.08	0.71			0.63	0.63	0.19	0.19	0.19			
v/c Ratio	0.20	0.26			0.52	0.30	0.28	0.29	0.69			
Control Delay	73.0	15.7			15.2	2.0	47.5	47.5	56.4			
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Total Delay	73.0	15.7			15.2	2.0	47.5	47.5	56.4			
LOS	E	B			B	A	D	D	E			
Approach Delay		17.3			13.0			53.5				
Approach LOS		B			B			D				
90th %ile Green (s)	13.6	92.7			74.1	74.1	25.2	25.2	25.2			
90th %ile Term Code	Hold	Coord			Coord	Coord	MaxR	MaxR	MaxR			
70th %ile Green (s)	13.6	92.7			74.1	74.1	25.2	25.2	25.2			
70th %ile Term Code	Hold	Coord			Coord	Coord	MaxR	MaxR	MaxR			
50th %ile Green (s)	13.6	92.7			74.1	74.1	25.2	25.2	25.2			
50th %ile Term Code	Hold	Coord			Coord	Coord	MaxR	MaxR	MaxR			
30th %ile Green (s)	0.0	92.7			93.1	93.1	25.2	25.2	25.2			
30th %ile Term Code	Skip	Coord			Coord	Coord	MaxR	MaxR	MaxR			
10th %ile Green (s)	0.0	92.7			93.1	93.1	25.2	25.2	25.2			
10th %ile Term Code	Skip	Coord			Coord	Coord	MaxR	MaxR	MaxR			
Stops (vph)	13	533			769	14	64	65	302			
Fuel Used(gal)	0	13			25	3	2	2	9			
CO Emissions (g/hr)	31	886			1774	181	132	134	632			
NOx Emissions (g/hr)	6	172			345	35	26	26	123			
VOC Emissions (g/hr)	7	205			411	42	31	31	146			
Dilemma Vehicles (#)	0	7			55	0	0	3	0			
Queue Length 50th (ft)	19	230			312	0	70	71	168			
Queue Length 95th (ft)	26	225			332	35	116	126	223			
Internal Link Dist (ft)		742			1149			624			515	
Turn Bay Length (ft)	100					525	285		285			
Base Capacity (vph)	185	3625			3195	1117	325	325	540			
Starvation Cap Reductn	0	0			0	0	0	0	0			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn	0	0			0	0	0	0	0			
Storage Cap Reductn	0	0			0	0	0	0	0			
Reduced v/c Ratio	0.15	0.26			0.52	0.30	0.28	0.29	0.69			

Intersection Summary			
Area Type:	Other		
Cycle Length: 130			
Actuated Cycle Length: 130			
Offset: 91 (70%), Referenced to phase 4:EBT and 8:WBT, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.69			
Intersection Signal Delay: 20.7		Intersection LOS: C	
Intersection Capacity Utilization 62.7%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 44: US 395 NB Ramps & McCarran Boulevard





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	349	0	601	0	0	0	0	1523	944	754	1547	0
Future Volume (vph)	349	0	601	0	0	0	0	1523	944	754	1547	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		400	0		0	0		0	200		0
Storage Lanes	0		1	0		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frt			0.850						0.850			
Flt Protected		0.950								0.950		
Satd. Flow (prot)	0	1770	1583	0	0	0	0	3539	1583	3433	3539	0
Flt Permitted		0.950								0.950		
Satd. Flow (perm)	0	1770	1583	0	0	0	0	3539	1583	3433	3539	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			83						631			
Link Speed (mph)		45			45			50			50	
Link Distance (ft)		611			520			680			622	
Travel Time (s)		9.3			7.9			9.3			8.5	
Peak Hour Factor	0.85	0.92	0.80	0.92	0.92	0.92	0.92	0.87	0.79	0.85	0.88	0.92
Adj. Flow (vph)	411	0	751	0	0	0	0	1751	1195	887	1758	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	411	751	0	0	0	0	1751	1195	887	1758	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1					2	1	1	2	
Detector Template	Left	Thru	Right					Thru	Right	Left	Thru	
Leading Detector (ft)	20	100	20					100	20	20	100	
Trailing Detector (ft)	0	0	0					0	0	0	0	
Detector 1 Position(ft)	0	0	0					0	0	0	0	
Detector 1 Size(ft)	20	6	20					6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94						94			94	
Detector 2 Size(ft)		6						6			6	
Detector 2 Type		Cl+Ex						Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0						0.0			0.0	
Turn Type	Split	NA	Perm					NA	Perm	Prot	NA	
Protected Phases	4	4						2		1	6	
Permitted Phases			4						2			

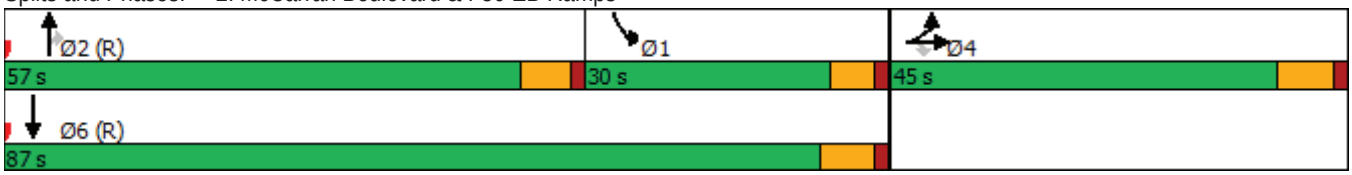


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	4	4	4					2	2	1	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0					6.0	6.0	6.0	6.0	
Minimum Split (s)	44.1	44.1	44.1					26.3	26.3	11.9	18.8	
Total Split (s)	45.0	45.0	45.0					57.0	57.0	30.0	87.0	
Total Split (%)	34.1%	34.1%	34.1%					43.2%	43.2%	22.7%	65.9%	
Maximum Green (s)	37.9	37.9	37.9					50.7	50.7	24.1	80.2	
Yellow Time (s)	5.6	5.6	5.6					4.8	4.8	4.4	5.3	
All-Red Time (s)	1.5	1.5	1.5					1.5	1.5	1.5	1.5	
Lost Time Adjust (s)		0.0	0.0					0.0	0.0	0.0	0.0	
Total Lost Time (s)		7.1	7.1					6.3	6.3	5.9	6.8	
Lead/Lag								Lead	Lead	Lag		
Lead-Lag Optimize?								Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0					3.0	3.0	3.0	3.0	
Recall Mode	None	None	None					C-Max	C-Max	None	C-Max	
Walk Time (s)	10.0	10.0	10.0					9.0	9.0		7.0	
Flash Dont Walk (s)	27.0	27.0	27.0					11.0	11.0		5.0	
Pedestrian Calls (#/hr)	0	0	0					0	0		0	
Act Effct Green (s)		37.9	37.9					50.7	50.7	24.1	80.2	
Actuated g/C Ratio		0.29	0.29					0.38	0.38	0.18	0.61	
v/c Ratio		0.81	1.46					1.29	1.20	1.42	0.82	
Control Delay		57.4	250.7					170.4	118.3	229.0	21.0	
Queue Delay		0.0	0.0					0.1	0.0	0.0	0.3	
Total Delay		57.4	250.7					170.4	118.3	229.0	21.3	
LOS		E	F					F	F	F	C	
Approach Delay		182.3						149.3			91.0	
Approach LOS		F						F			F	
90th %ile Green (s)	37.9	37.9	37.9					50.7	50.7	24.1	80.2	
90th %ile Term Code	Max	Max	Max					Coord	Coord	Max	Coord	
70th %ile Green (s)	37.9	37.9	37.9					50.7	50.7	24.1	80.2	
70th %ile Term Code	Max	Max	Max					Coord	Coord	Max	Coord	
50th %ile Green (s)	37.9	37.9	37.9					50.7	50.7	24.1	80.2	
50th %ile Term Code	Max	Max	Max					Coord	Coord	Max	Coord	
30th %ile Green (s)	37.9	37.9	37.9					50.7	50.7	24.1	80.2	
30th %ile Term Code	Max	Max	Max					Coord	Coord	Max	Coord	
10th %ile Green (s)	37.9	37.9	37.9					50.7	50.7	24.1	80.2	
10th %ile Term Code	Max	Max	Max					Coord	Coord	Max	Coord	
Stops (vph)		312	396					1212	454	559	745	
Fuel Used(gal)		9	38					78	34	47	24	
CO Emissions (g/hr)		653	2655					5452	2362	3265	1688	
NOx Emissions (g/hr)		127	517					1061	459	635	328	
VOC Emissions (g/hr)		151	615					1264	547	757	391	
Dilemma Vehicles (#)		13	0					44	0	0	79	
Queue Length 50th (ft)		328	~831					~1002	~888	~517	394	
Queue Length 95th (ft)		#485	#900					#1082	#859	#597	468	
Internal Link Dist (ft)		531			440			600			542	
Turn Bay Length (ft)			400							200		
Base Capacity (vph)		508	513					1359	996	626	2150	
Starvation Cap Reductn		0	0					0	0	0	80	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn		0	0					23	0	0	0	
Storage Cap Reductn		0	0					0	0	0	0	
Reduced v/c Ratio		0.81	1.46					1.31	1.20	1.42	0.85	

Intersection Summary			
Area Type:	Other		
Cycle Length: 132			
Actuated Cycle Length: 132			
Offset: 28 (21%), Referenced to phase 2:NBT and 6:SBT, Start of Green			
Natural Cycle: 135			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.46			
Intersection Signal Delay: 132.1		Intersection LOS: F	
Intersection Capacity Utilization 115.4%		ICU Level of Service H	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 2: McCarran Boulevard & I-80 EB Ramps





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	823	0	1205	262	1303	0	0	1478	260
Future Volume (vph)	0	0	0	823	0	1205	262	1303	0	0	1478	260
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		500	200		0	0		300
Storage Lanes	0		0	1		2	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.88	1.00	0.95	1.00	1.00	0.91	1.00
Frt						0.850						0.850
Flt Protected				0.950	0.950		0.950					
Satd. Flow (prot)	0	0	0	1681	1681	2787	1770	3539	0	0	5085	1583
Flt Permitted				0.950	0.950		0.950					
Satd. Flow (perm)	0	0	0	1681	1681	2787	1770	3539	0	0	5085	1583
Right Turn on Red			Yes			No			Yes			Yes
Satd. Flow (RTOR)												279
Link Speed (mph)		45			45			50			50	
Link Distance (ft)		185			1135			622			1004	
Travel Time (s)		2.8			17.2			8.5			13.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.93	0.83	0.98	0.92	0.92	0.95	0.88
Adj. Flow (vph)	0	0	0	895	0	1296	316	1330	0	0	1556	295
Shared Lane Traffic (%)				50%								
Lane Group Flow (vph)	0	0	0	447	448	1296	316	1330	0	0	1556	295
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	2	1	1	2			2	1
Detector Template				Left	Thru	Right	Left	Thru			Thru	Right
Leading Detector (ft)				20	100	20	20	100			100	20
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				20	6	20	20	6			6	20
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 2 Position(ft)					94			94			94	
Detector 2 Size(ft)					6			6			6	
Detector 2 Type					Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)					0.0			0.0			0.0	
Turn Type				Split	NA	custom	Prot	NA			NA	Perm
Protected Phases				8	8	1 8	5	2			6	
Permitted Phases												6

Lane Group	Ø1
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	1
Permitted Phases	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase				8	8	1 8	5	2			6	6
Switch Phase												
Minimum Initial (s)				6.0	6.0		4.0	6.0			6.0	6.0
Minimum Split (s)				36.4	36.4		9.7	34.5			25.8	25.8
Total Split (s)				45.0	45.0		35.0	72.0			52.0	52.0
Total Split (%)				34.1%	34.1%		26.5%	54.5%			39.4%	39.4%
Maximum Green (s)				38.6	38.6		29.3	65.5			45.2	45.2
Yellow Time (s)				4.9	4.9		4.2	5.0			5.3	5.3
All-Red Time (s)				1.5	1.5		1.5	1.5			1.5	1.5
Lost Time Adjust (s)				0.0	0.0		0.0	0.0			0.0	0.0
Total Lost Time (s)				6.4	6.4		5.7	6.5			6.8	6.8
Lead/Lag							Lead	Lead			Lag	Lag
Lead-Lag Optimize?							Yes	Yes			Yes	Yes
Vehicle Extension (s)				3.0	3.0		3.0	3.0			3.0	3.0
Recall Mode				None	None		None	C-Max			C-Max	C-Max
Walk Time (s)				8.0	8.0			7.0			9.0	9.0
Flash Dont Walk (s)				22.0	22.0			21.0			10.0	10.0
Pedestrian Calls (#/hr)				0	0			0			0	0
Act Effct Green (s)				38.6	38.6	54.5	26.9	65.5			47.6	47.6
Actuated g/C Ratio				0.29	0.29	0.41	0.20	0.50			0.36	0.36
v/c Ratio				0.91	0.91	1.13	0.88	0.76			0.85	0.39
Control Delay				69.0	69.3	105.1	56.4	6.4			25.8	3.6
Queue Delay				0.0	0.0	0.0	0.0	5.8			0.0	0.0
Total Delay				69.0	69.3	105.1	56.4	12.2			25.8	3.6
LOS				E	E	F	E	B			C	A
Approach Delay					90.5			20.7			22.3	
Approach LOS					F			C			C	
90th %ile Green (s)				38.6	38.6		29.3	65.5			45.2	45.2
90th %ile Term Code				Max	Max		Max	Coord			Coord	Coord
70th %ile Green (s)				38.6	38.6		29.3	65.5			45.2	45.2
70th %ile Term Code				Max	Max		Max	Coord			Coord	Coord
50th %ile Green (s)				38.6	38.6		29.3	65.5			45.2	45.2
50th %ile Term Code				Max	Max		Max	Coord			Coord	Coord
30th %ile Green (s)				38.6	38.6		25.8	65.5			48.7	48.7
30th %ile Term Code				Max	Max		Gap	Coord			Coord	Coord
10th %ile Green (s)				38.6	38.6		20.8	65.5			53.7	53.7
10th %ile Term Code				Max	Max		Gap	Coord			Coord	Coord
Stops (vph)				365	367	1030	221	615			1366	70
Fuel Used(gal)				13	13	47	7	16			38	3
CO Emissions (g/hr)				933	938	3319	520	1138			2667	204
NOx Emissions (g/hr)				181	182	646	101	221			519	40
VOC Emissions (g/hr)				216	217	769	120	264			618	47
Dilemma Vehicles (#)				0	15	0	0	0			38	0
Queue Length 50th (ft)				389	390	~728	202	122			499	65
Queue Length 95th (ft)				#600	#601	#878	m162	m102			514	3
Internal Link Dist (ft)		105			1055			542			924	
Turn Bay Length (ft)						500	200					300
Base Capacity (vph)				491	491	1150	392	1756			1833	749
Starvation Cap Reductn				0	0	0	0	370			0	0

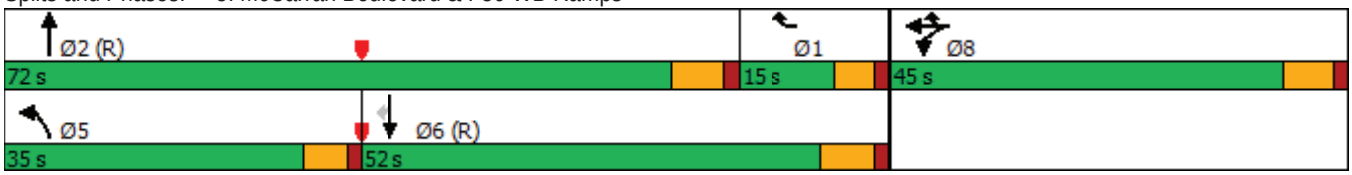
Lane Group	Ø1
Detector Phase	
Switch Phase	
Minimum Initial (s)	6.0
Minimum Split (s)	15.0
Total Split (s)	15.0
Total Split (%)	11%
Maximum Green (s)	9.5
Yellow Time (s)	4.0
All-Red Time (s)	1.5
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	Lag
Lead-Lag Optimize?	Yes
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	2.5
Pedestrian Calls (#/hr)	0
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	9.5
90th %ile Term Code	Max
70th %ile Green (s)	9.5
70th %ile Term Code	Max
50th %ile Green (s)	9.5
50th %ile Term Code	Max
30th %ile Green (s)	9.5
30th %ile Term Code	Max
10th %ile Green (s)	9.5
10th %ile Term Code	Max
Stops (vph)	
Fuel Used(gal)	
CO Emissions (g/hr)	
NOx Emissions (g/hr)	
VOC Emissions (g/hr)	
Dilemma Vehicles (#)	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn				0	0	0	0	0			0	0
Storage Cap Reductn				0	0	0	0	0			0	0
Reduced v/c Ratio				0.91	0.91	1.13	0.81	0.96			0.85	0.39

Intersection Summary			
Area Type:	Other		
Cycle Length: 132			
Actuated Cycle Length: 132			
Offset: 65 (49%), Referenced to phase 2:NBT and 6:SBT, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.13			
Intersection Signal Delay: 48.1		Intersection LOS: D	
Intersection Capacity Utilization 115.4%		ICU Level of Service H	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: McCarran Boulevard & I-80 WB Ramps



Lane Group	Ø1
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	97	17	164	85	20	135	327	2128	19	81	1408	116
Future Volume (vph)	97	17	164	85	20	135	327	2128	19	81	1408	116
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	60		0	75		70	530		170	390		390
Storage Lanes	1		0	1		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Ped Bike Factor									0.97			0.97
Frt		0.871				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1622	0	1770	1863	1583	1770	5085	1583	1770	5085	1583
Flt Permitted	0.731			0.269			0.950			0.950		
Satd. Flow (perm)	1362	1622	0	501	1863	1583	1770	5085	1541	1770	5085	1535
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		193				161			68			157
Link Speed (mph)		25			25			50			50	
Link Distance (ft)		347			206			1004			2182	
Travel Time (s)		9.5			5.6			13.7			29.8	
Confl. Peds. (#/hr)									2			3
Peak Hour Factor	0.87	0.53	0.85	0.85	0.50	0.84	0.89	0.93	0.68	0.68	0.93	0.74
Adj. Flow (vph)	111	32	193	100	40	161	367	2288	28	119	1514	157
Shared Lane Traffic (%)												
Lane Group Flow (vph)	111	225	0	100	40	161	367	2288	28	119	1514	157
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100		20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8			2			6
Detector Phase	4	4		8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	10.0	10.0	4.0	10.0	10.0
Minimum Split (s)	49.3	49.3		48.7	48.7	48.7	9.7	25.6	25.6	9.9	24.8	24.8
Total Split (s)	50.0	50.0		50.0	50.0	50.0	35.0	64.0	64.0	18.0	47.0	47.0
Total Split (%)	37.9%	37.9%		37.9%	37.9%	37.9%	26.5%	48.5%	48.5%	13.6%	35.6%	35.6%
Maximum Green (s)	44.7	44.7		45.3	45.3	45.3	29.3	57.4	57.4	12.1	40.2	40.2
Yellow Time (s)	3.8	3.8		3.2	3.2	3.2	4.2	5.1	5.1	4.4	5.3	5.3
All-Red Time (s)	1.5	1.5		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.3	5.3		4.7	4.7	4.7	5.7	6.6	6.6	5.9	6.8	6.8
Lead/Lag							Lag	Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None		None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)	10.0	10.0		10.0	10.0	10.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)	34.0	34.0		34.0	34.0	34.0		12.0	12.0		11.0	11.0
Pedestrian Calls (#/hr)	0	0		0	0	0		2	2		3	3
Act Effct Green (s)	18.7	18.7		19.3	19.3	19.3	29.3	80.9	80.9	14.5	66.2	66.2
Actuated g/C Ratio	0.14	0.14		0.15	0.15	0.15	0.22	0.61	0.61	0.11	0.50	0.50
v/c Ratio	0.58	0.57		1.37	0.15	0.44	0.94	0.73	0.03	0.61	0.59	0.19
Control Delay	63.1	15.6		274.6	46.9	10.2	70.5	24.2	0.3	66.8	37.4	13.2
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.1	15.6		274.6	46.9	10.2	70.5	24.2	0.3	66.8	37.4	13.2
LOS	E	B		F	D	B	E	C	A	E	D	B
Approach Delay		31.3			102.9			30.3			37.2	
Approach LOS		C			F			C			D	
90th %ile Green (s)	28.7	28.7		29.3	29.3	29.3	29.3	66.2	66.2	19.3	56.2	56.2
90th %ile Term Code	Hold	Hold		Gap	Gap	Gap	Max	Coord	Coord	Gap	Coord	Coord
70th %ile Green (s)	22.3	22.3		22.9	22.9	22.9	29.3	75.1	75.1	16.8	62.6	62.6
70th %ile Term Code	Hold	Hold		Gap	Gap	Gap	Max	Coord	Coord	Gap	Coord	Coord
50th %ile Green (s)	18.5	18.5		19.1	19.1	19.1	29.3	81.0	81.0	14.7	66.4	66.4
50th %ile Term Code	Hold	Hold		Gap	Gap	Gap	Max	Coord	Coord	Gap	Coord	Coord
30th %ile Green (s)	14.8	14.8		15.4	15.4	15.4	29.3	86.9	86.9	12.5	70.1	70.1
30th %ile Term Code	Hold	Hold		Gap	Gap	Gap	Max	Coord	Coord	Gap	Coord	Coord
10th %ile Green (s)	9.3	9.3		9.9	9.9	9.9	29.3	95.5	95.5	9.4	75.6	75.6
10th %ile Term Code	Gap	Gap		Gap	Gap	Gap	Hold	Coord	Coord	Gap	Coord	Coord
Stops (vph)	87	35		66	17	17	285	1601	0	78	1156	77
Fuel Used(gal)	2	1		5	0	1	11	49	0	3	48	3
CO Emissions (g/hr)	130	87		360	20	41	780	3397	9	239	3351	217
NOx Emissions (g/hr)	25	17		70	4	8	152	661	2	47	652	42
VOC Emissions (g/hr)	30	20		84	5	9	181	787	2	55	777	50
Dilemma Vehicles (#)	0	0		0	0	0	0	97	0	0	76	0
Queue Length 50th (ft)	90	24		~113	30	0	305	584	0	105	442	34
Queue Length 95th (ft)	137	0		#182	32	46	m#363	m610	m0	121	523	67
Internal Link Dist (ft)		267			126			924			2102	
Turn Bay Length (ft)	60			75		70	530		170	390		390

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	461	676		171	639	649	392	3118	971	202	2549	847
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.24	0.33		0.58	0.06	0.25	0.94	0.73	0.03	0.59	0.59	0.19

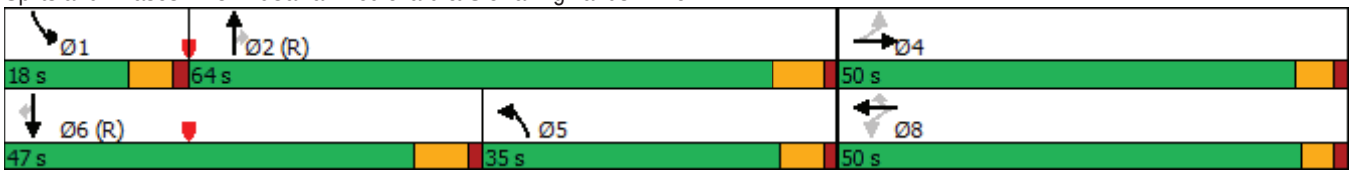
Intersection Summary			
Area Type:	Other		
Cycle Length: 132			
Actuated Cycle Length: 132			
Offset: 79 (60%), Referenced to phase 2:NBT and 6:SBT, Start of Green			
Natural Cycle: 125			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.37			
Intersection Signal Delay: 37.0		Intersection LOS: D	
Intersection Capacity Utilization 80.1%		ICU Level of Service D	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: McCarran Boulevard & Sierra Highlands Drive





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	351	120	378	146	103	69	468	1234	188	70	820	172
Future Volume (vph)	351	120	378	146	103	69	468	1234	188	70	820	172
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	170		400	100		50	675		225	315		250
Storage Lanes	1		1	1		1	2		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	0.97	0.91	1.00	1.00	0.91	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	1863	1583	1770	1863	1583	3433	5085	1583	1770	5085	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	1863	1583	1770	1863	1583	3433	5085	1583	1770	5085	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			440			174			185			200
Link Speed (mph)		35			25			50			50	
Link Distance (ft)		563			259			2182			1094	
Travel Time (s)		11.0			7.1			29.8			14.9	
Peak Hour Factor	0.93	0.81	0.86	0.91	0.78	0.72	0.84	0.96	0.90	0.80	0.97	0.86
Adj. Flow (vph)	377	148	440	160	132	96	557	1285	209	88	845	200
Shared Lane Traffic (%)												
Lane Group Flow (vph)	377	148	440	160	132	96	557	1285	209	88	845	200
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6



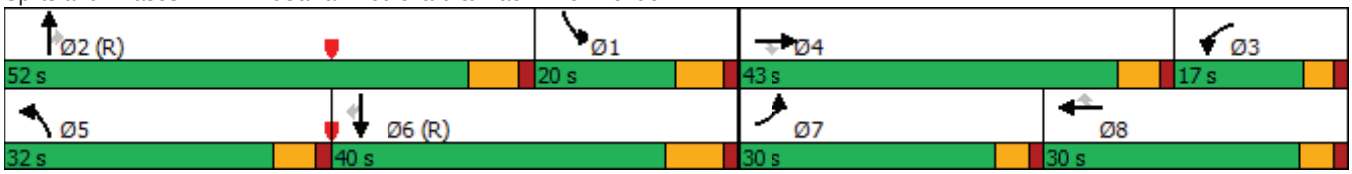
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	6.0	6.0	4.0	6.0	6.0	4.0	8.0	8.0	7.0	8.0	8.0
Minimum Split (s)	8.8	41.8	41.8	8.5	11.0	11.0	9.6	23.4	23.4	13.2	30.2	30.2
Total Split (s)	30.0	43.0	43.0	17.0	30.0	30.0	32.0	52.0	52.0	20.0	40.0	40.0
Total Split (%)	22.7%	32.6%	32.6%	12.9%	22.7%	22.7%	24.2%	39.4%	39.4%	15.2%	30.3%	30.3%
Maximum Green (s)	25.2	37.2	37.2	12.5	25.0	25.0	26.4	45.6	45.6	13.8	32.8	32.8
Yellow Time (s)	3.3	4.3	4.3	3.0	3.5	3.5	4.1	4.9	4.9	4.7	5.7	5.7
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.8	5.8	5.8	4.5	5.0	5.0	5.6	6.4	6.4	6.2	7.2	7.2
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lead	Lead	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)		8.0	8.0					7.0	7.0		9.0	9.0
Flash Dont Walk (s)		28.0	28.0					10.0	10.0		14.0	14.0
Pedestrian Calls (#/hr)		0	0					0	0		0	0
Act Effct Green (s)	19.7	16.6	16.6	19.4	16.8	16.8	26.1	59.3	59.3	13.8	46.8	46.8
Actuated g/C Ratio	0.15	0.13	0.13	0.15	0.13	0.13	0.20	0.45	0.45	0.10	0.35	0.35
v/c Ratio	0.74	0.64	0.75	0.62	0.56	0.27	0.82	0.56	0.26	0.48	0.47	0.29
Control Delay	62.4	66.3	13.4	63.0	62.5	1.9	71.3	42.1	19.2	53.1	29.2	7.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	62.4	66.3	13.4	63.0	62.5	1.9	71.3	42.1	19.2	53.1	29.2	7.0
LOS	E	E	B	E	E	A	E	D	B	D	C	A
Approach Delay		40.7			47.7			47.7			27.1	
Approach LOS		D			D			D			C	
90th %ile Green (s)	24.5	23.3	23.3	23.0	22.3	22.3	29.8	49.0	49.0	13.8	32.8	32.8
90th %ile Term Code	Gap	Gap	Gap	Gap	Hold	Hold	Max	Coord	Coord	Max	Coord	Coord
70th %ile Green (s)	21.7	19.1	19.1	21.0	18.9	18.9	29.0	55.2	55.2	13.8	39.8	39.8
70th %ile Term Code	Gap	Gap	Gap	Gap	Hold	Hold	Gap	Coord	Coord	Max	Coord	Coord
50th %ile Green (s)	19.7	16.8	16.8	19.7	17.3	17.3	26.7	58.8	58.8	13.8	45.7	45.7
50th %ile Term Code	Gap	Gap	Gap	Gap	Hold	Hold	Gap	Coord	Coord	Hold	Coord	Coord
30th %ile Green (s)	17.7	13.5	13.5	18.2	14.5	14.5	24.3	63.6	63.6	13.8	52.9	52.9
30th %ile Term Code	Gap	Gap	Gap	Gap	Hold	Hold	Gap	Coord	Coord	Hold	Coord	Coord
10th %ile Green (s)	14.8	10.1	10.1	15.2	11.0	11.0	20.8	70.0	70.0	13.8	62.8	62.8
10th %ile Term Code	Gap	Gap	Gap	Gap	Hold	Hold	Gap	Coord	Coord	Hold	Coord	Coord
Stops (vph)	327	111	39	136	94	0	468	904	107	54	357	33
Fuel Used(gal)	8	3	3	3	2	0	20	42	5	2	16	2
CO Emissions (g/hr)	584	206	200	190	133	13	1430	2904	348	145	1121	136
NOx Emissions (g/hr)	114	40	39	37	26	2	278	565	68	28	218	26
VOC Emissions (g/hr)	135	48	46	44	31	3	331	673	81	34	260	32
Dilemma Vehicles (#)	0	3	0	0	0	0	0	85	0	0	75	0
Queue Length 50th (ft)	161	122	0	130	107	0	261	310	49	39	105	0
Queue Length 95th (ft)	207	164	73	201	144	0	300	461	m152	83	186	50
Internal Link Dist (ft)		483			179			2102			1014	
Turn Bay Length (ft)	170		400	100		50	675		225	315		250
Base Capacity (vph)	655	525	762	260	352	440	719	2285	813	185	1802	690
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.58	0.28	0.58	0.62	0.38	0.22	0.77	0.56	0.26	0.48	0.47	0.29

Intersection Summary			
Area Type:	Other		
Cycle Length: 132			
Actuated Cycle Length: 132			
Offset: 89 (67%), Referenced to phase 2:NBT and 6:SBT, Start of Green			
Natural Cycle: 105			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.82			
Intersection Signal Delay: 41.1		Intersection LOS: D	
Intersection Capacity Utilization 61.9%		ICU Level of Service B	
Analysis Period (min) 15			

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: McCarran Boulevard & Mae Anne Avenue





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	178	213	149	173	212	150	234	1192	231	121	832	337
Future Volume (vph)	178	213	149	173	212	150	234	1192	231	121	832	337
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	195		280	150		0	530		170	375		310
Storage Lanes	1		1	1		1	2		1	2		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00	0.97	0.91	1.00	0.97	0.91	1.00
Ped Bike Factor			0.97			0.98			0.97			0.94
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	1863	1583	3433	5085	1583	3433	5085	1583
Flt Permitted	0.384			0.550			0.950			0.950		
Satd. Flow (perm)	715	3539	1539	1025	1863	1554	3433	5085	1530	3433	5085	1490
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			175			181			185			374
Link Speed (mph)		35			35			50			50	
Link Distance (ft)		596			464			1094			839	
Travel Time (s)		11.6			9.0			14.9			11.4	
Confl. Peds. (#/hr)			18			7			13			29
Peak Hour Factor	0.92	0.88	0.85	0.90	0.88	0.83	0.84	0.94	0.81	0.74	0.93	0.90
Adj. Flow (vph)	193	242	175	192	241	181	279	1268	285	164	895	374
Shared Lane Traffic (%)												
Lane Group Flow (vph)	193	242	175	192	241	181	279	1268	285	164	895	374
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes			Yes							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm

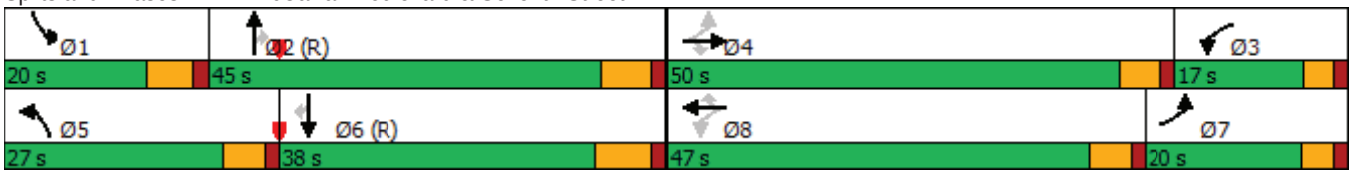


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	10.7	49.6	49.6	10.6	45.5	45.5	11.6	29.4	29.4	12.0	31.0	31.0
Total Split (s)	20.0	50.0	50.0	17.0	47.0	47.0	27.0	45.0	45.0	20.0	38.0	38.0
Total Split (%)	15.2%	37.9%	37.9%	12.9%	35.6%	35.6%	20.5%	34.1%	34.1%	15.2%	28.8%	28.8%
Maximum Green (s)	15.3	44.4	44.4	12.4	41.5	41.5	21.4	38.6	38.6	14.0	31.0	31.0
Yellow Time (s)	3.2	4.1	4.1	3.1	4.0	4.0	4.1	4.9	4.9	4.5	5.5	5.5
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.7	5.6	5.6	4.6	5.5	5.5	5.6	6.4	6.4	6.0	7.0	7.0
Lead/Lag	Lag	Lead	Lead	Lag	Lead	Lead	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Walk Time (s)		9.0	9.0		10.0	10.0		8.0	8.0		7.0	7.0
Flash Dont Walk (s)		35.0	35.0		30.0	30.0		15.0	15.0		17.0	17.0
Pedestrian Calls (#/hr)		18	18		7	7		13	13		29	29
Act Effct Green (s)	43.1	31.1	31.1	35.8	24.6	24.6	16.0	56.0	56.0	11.6	51.4	51.4
Actuated g/C Ratio	0.33	0.24	0.24	0.27	0.19	0.19	0.12	0.42	0.42	0.09	0.39	0.39
v/c Ratio	0.52	0.29	0.35	0.57	0.70	0.42	0.67	0.59	0.38	0.54	0.45	0.46
Control Delay	41.6	40.0	6.4	39.5	59.8	8.1	62.7	27.5	10.5	57.8	27.5	10.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.6	40.0	6.4	39.5	59.8	8.1	62.7	27.5	10.5	57.8	27.5	10.7
LOS	D	D	A	D	E	A	E	C	B	E	C	B
Approach Delay		30.9			38.2			30.2			26.6	
Approach LOS		C			D			C			C	
90th %ile Green (s)	11.1	44.0	44.0	7.1	40.0	40.0	20.2	43.5	43.5	14.8	37.9	37.9
90th %ile Term Code	Hold	Ped	Ped	Gap	Ped	Ped	Gap	Coord	Coord	Gap	Coord	Coord
70th %ile Green (s)	27.8	44.0	44.0	9.4	25.6	25.6	17.7	43.1	43.1	12.9	38.1	38.1
70th %ile Term Code	Hold	Ped	Ped	Gap	Gap	Gap	Gap	Coord	Coord	Gap	Coord	Coord
50th %ile Green (s)	30.4	44.0	44.0	9.0	22.6	22.6	16.0	44.8	44.8	11.6	40.2	40.2
50th %ile Term Code	Hold	Ped	Ped	Gap	Gap	Gap	Gap	Coord	Coord	Gap	Coord	Coord
30th %ile Green (s)	10.0	12.8	12.8	16.7	19.5	19.5	14.2	69.6	69.6	10.3	65.5	65.5
30th %ile Term Code	Gap	Gap	Gap	Hold	Gap	Gap	Gap	Coord	Coord	Gap	Coord	Coord
10th %ile Green (s)	6.9	10.5	10.5	11.5	15.1	15.1	11.8	79.0	79.0	8.4	75.4	75.4
10th %ile Term Code	Gap	Gap	Gap	Hold	Gap	Gap	Gap	Coord	Coord	Gap	Coord	Coord
Stops (vph)	134	163	15	132	193	17	195	1010	123	105	653	123
Fuel Used(gal)	3	4	1	3	5	1	8	30	4	4	22	6
CO Emissions (g/hr)	229	271	66	207	331	61	531	2128	279	286	1535	389
NOx Emissions (g/hr)	45	53	13	40	64	12	103	414	54	56	299	76
VOC Emissions (g/hr)	53	63	15	48	77	14	123	493	65	66	356	90
Dilemma Vehicles (#)	0	7	0	0	7	0	0	4	0	0	18	0
Queue Length 50th (ft)	102	77	0	101	199	0	89	366	110	64	249	108
Queue Length 95th (ft)	161	109	42	160	239	41	118	459	105	76	302	200
Internal Link Dist (ft)		516			384			1014			759	
Turn Bay Length (ft)	195		280	150			530		170	375		310

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	419	1190	633	372	585	612	556	2157	755	368	1980	808
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.46	0.20	0.28	0.52	0.41	0.30	0.50	0.59	0.38	0.45	0.45	0.46

Intersection Summary			
Area Type:	Other		
Cycle Length: 132			
Actuated Cycle Length: 132			
Offset: 97 (73%), Referenced to phase 2:NBT and 6:SBT, Start of Green			
Natural Cycle: 105			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.70			
Intersection Signal Delay: 30.2		Intersection LOS: C	
Intersection Capacity Utilization 76.2%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 14: McCarran Boulevard & Seventh Street





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	249	1157	1130	158	44	142
Future Volume (vph)	249	1157	1130	158	44	142
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	280			75	100	0
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.91	0.95	1.00	1.00	1.00
Ped Bike Factor						
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	5085	3539	1583	1770	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	5085	3539	1583	1770	1583
Link Speed (mph)		50	50		35	
Link Distance (ft)		540	1872		569	
Travel Time (s)		7.4	25.5		11.1	
Confl. Peds. (#/hr)	11			11	11	11
Peak Hour Factor	0.65	0.83	0.74	0.90	0.91	0.78
Adj. Flow (vph)	383	1394	1527	176	48	182
Shared Lane Traffic (%)						
Lane Group Flow (vph)	383	1394	1527	176	48	182
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane					Yes	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 61.4%		ICU Level of Service B	
Analysis Period (min) 15			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	157	1117	177	111	1093	51	150	74	117	55	36	77
Future Volume (vph)	157	1117	177	111	1093	51	150	74	117	55	36	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	235		45	220		65	125		0	95		0
Storage Lanes	1		1	1		1	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.95			0.98	1.00	0.99				
Frt			0.850			0.850		0.907			0.899	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1672	0	1770	1675	0
Flt Permitted	0.950			0.950			0.556			0.435		
Satd. Flow (perm)	1770	3539	1506	1770	3539	1547	1032	1672	0	810	1675	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			48			45		63			80	
Link Speed (mph)		50			50			30			30	
Link Distance (ft)		1872			2072			245			265	
Travel Time (s)		25.5			28.3			5.6			6.0	
Confl. Peds. (#/hr)			15			1	4		4			
Confl. Bikes (#/hr)						1						
Peak Hour Factor	0.96	0.93	0.83	0.83	0.96	0.75	0.83	0.77	0.75	0.92	0.64	0.66
Adj. Flow (vph)	164	1201	213	134	1139	68	181	96	156	60	56	117
Shared Lane Traffic (%)												
Lane Group Flow (vph)	164	1201	213	134	1139	68	181	252	0	60	173	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane								Yes			Yes	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100	20	20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6	20	20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

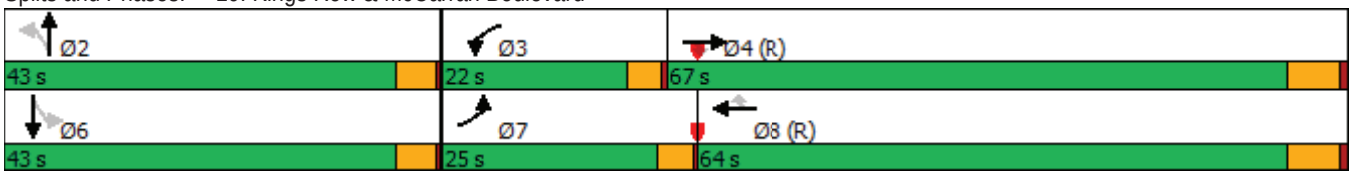


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4			8	2			6		
Detector Phase	7	4	4	3	8	8	2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	12.0	12.0	4.0	12.0	12.0	6.0	6.0		6.0	6.0	
Minimum Split (s)	8.0	40.0	40.0	8.0	40.0	40.0	38.5	38.5		35.5	35.5	
Total Split (s)	25.0	67.0	67.0	22.0	64.0	64.0	43.0	43.0		43.0	43.0	
Total Split (%)	18.9%	50.8%	50.8%	16.7%	48.5%	48.5%	32.6%	32.6%		32.6%	32.6%	
Maximum Green (s)	21.0	61.0	61.0	18.0	58.0	58.0	38.5	38.5		38.5	38.5	
Yellow Time (s)	3.5	5.0	5.0	3.5	5.0	5.0	4.0	4.0		4.0	4.0	
All-Red Time (s)	0.5	1.0	1.0	0.5	1.0	1.0	0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	6.0	6.0	4.0	6.0	6.0	4.5	4.5		4.5	4.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	Max	Max		Max	Max	
Walk Time (s)		7.0	7.0		7.0	7.0	7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		27.0	27.0		27.0	27.0	27.0	27.0		24.0	24.0	
Pedestrian Calls (#/hr)		15	15		1	1	4	4		0	0	
Act Effct Green (s)	16.9	64.4	64.4	14.6	62.1	62.1	38.5	38.5		38.5	38.5	
Actuated g/C Ratio	0.13	0.49	0.49	0.11	0.47	0.47	0.29	0.29		0.29	0.29	
v/c Ratio	0.73	0.70	0.28	0.68	0.68	0.09	0.60	0.47		0.25	0.32	
Control Delay	90.1	19.7	7.2	73.7	30.5	9.4	49.9	31.8		39.4	20.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	90.1	19.7	7.2	73.7	30.5	9.4	49.9	31.8		39.4	20.9	
LOS	F	B	A	E	C	A	D	C		D	C	
Approach Delay		25.4			33.8			39.4			25.7	
Approach LOS		C			C			D			C	
90th %ile Green (s)	21.0	61.0	61.0	18.0	58.0	58.0	38.5	38.5		38.5	38.5	
90th %ile Term Code	Max	Coord	Coord	Max	Coord	Coord	MaxR	MaxR		MaxR	MaxR	
70th %ile Green (s)	20.0	61.4	61.4	17.6	59.0	59.0	38.5	38.5		38.5	38.5	
70th %ile Term Code	Gap	Coord	Coord	Gap	Coord	Coord	MaxR	MaxR		MaxR	MaxR	
50th %ile Green (s)	17.4	63.8	63.8	15.2	61.6	61.6	38.5	38.5		38.5	38.5	
50th %ile Term Code	Gap	Coord	Coord	Gap	Coord	Coord	MaxR	MaxR		MaxR	MaxR	
30th %ile Green (s)	14.9	66.1	66.1	12.9	64.1	64.1	38.5	38.5		38.5	38.5	
30th %ile Term Code	Gap	Coord	Coord	Gap	Coord	Coord	MaxR	MaxR		MaxR	MaxR	
10th %ile Green (s)	11.2	69.5	69.5	9.5	67.8	67.8	38.5	38.5		38.5	38.5	
10th %ile Term Code	Gap	Coord	Coord	Gap	Coord	Coord	MaxR	MaxR		MaxR	MaxR	
Stops (vph)	150	951	37	105	838	12	129	117		42	47	
Fuel Used(gal)	7	32	3	5	34	1	3	2		1	1	
CO Emissions (g/hr)	493	2262	205	331	2378	67	176	157		55	68	
NOx Emissions (g/hr)	96	440	40	64	463	13	34	31		11	13	
VOC Emissions (g/hr)	114	524	47	77	551	15	41	36		13	16	
Dilemma Vehicles (#)	0	26	0	0	42	0	0	0		0	0	
Queue Length 50th (ft)	147	517	18	112	395	10	133	132		39	60	
Queue Length 95th (ft)	222	596	31	163	502	29	197	171		81	67	
Internal Link Dist (ft)		1792			1992			165			185	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)	235		45	220		65	125			95		
Base Capacity (vph)	281	1725	758	241	1664	751	301	532		236	545	
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio	0.58	0.70	0.28	0.56	0.68	0.09	0.60	0.47		0.25	0.32	

Intersection Summary			
Area Type:	Other		
Cycle Length: 132			
Actuated Cycle Length: 132			
Offset: 0 (0%), Referenced to phase 4:EBT and 8:WBT, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.73			
Intersection Signal Delay: 30.2		Intersection LOS: C	
Intersection Capacity Utilization 88.1%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 19: Kings Row & McCarran Boulevard





Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	90	1146	1131	62	28	47
Future Volume (vph)	90	1146	1131	62	28	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	220			50	0	0
Storage Lanes	1			1	1	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850	0.915	
Flt Protected	0.950				0.982	
Satd. Flow (prot)	1770	3539	3539	1583	1674	0
Flt Permitted	0.950				0.982	
Satd. Flow (perm)	1770	3539	3539	1583	1674	0
Link Speed (mph)		50	50		25	
Link Distance (ft)		2072	1713		451	
Travel Time (s)		28.3	23.4		12.3	
Peak Hour Factor	0.75	0.98	0.93	0.78	0.78	0.77
Adj. Flow (vph)	120	1169	1216	79	36	61
Shared Lane Traffic (%)						
Lane Group Flow (vph)	120	1169	1216	79	97	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	50.7%	ICU Level of Service	A
Analysis Period (min)	15		



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	37	1150	1172	28	6	42
Future Volume (vph)	37	1150	1172	28	6	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	210			50	0	0
Storage Lanes	1			1	1	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850	0.889	
Flt Protected	0.950				0.991	
Satd. Flow (prot)	1770	3539	3539	1583	1641	0
Flt Permitted	0.950				0.991	
Satd. Flow (perm)	1770	3539	3539	1583	1641	0
Link Speed (mph)		50	50		25	
Link Distance (ft)		1713	885		573	
Travel Time (s)		23.4	12.1		15.6	
Peak Hour Factor	0.84	0.96	0.94	0.70	0.50	0.75
Adj. Flow (vph)	44	1198	1247	40	12	56
Shared Lane Traffic (%)						
Lane Group Flow (vph)	44	1198	1247	40	68	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 42.4%		ICU Level of Service A	
Analysis Period (min) 15			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1170	53	151	1212	58	0	0	246	0	0	26
Future Volume (vph)	0	1170	53	151	1212	58	0	0	246	0	0	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	240		60	415		50	0		0	0		0
Storage Lanes	1		1	1		1	0		1	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt			0.850			0.850			0.865			0.865
Flt Protected				0.950								
Satd. Flow (prot)	1863	3539	1583	1770	3539	1583	0	0	1611	0	0	1611
Flt Permitted				0.950								
Satd. Flow (perm)	1863	3539	1583	1770	3539	1583	0	0	1611	0	0	1611
Link Speed (mph)		50			50			25			25	
Link Distance (ft)		885			6000			403			668	
Travel Time (s)		12.1			81.8			11.0			18.2	
Confl. Peds. (#/hr)			2	2					2			
Peak Hour Factor	0.92	0.94	0.83	0.77	0.91	0.68	0.92	0.92	0.91	0.92	0.92	0.65
Adj. Flow (vph)	0	1245	64	196	1332	85	0	0	270	0	0	40
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1245	64	196	1332	85	0	0	270	0	0	40
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 54.5%		ICU Level of Service A	
Analysis Period (min) 15			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	619	542	162	217	579	358	373	727	524	169	339	496
Future Volume (vph)	619	542	162	217	579	358	373	727	524	169	339	496
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	550		430	325		0	110		475	300		675
Storage Lanes	1		1	1		1	1		1	2		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor			0.98			0.99			0.99			0.99
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	3433	3539	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	3539	1554	1770	3539	1563	1770	3539	1564	3433	3539	1561
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			169			193			610			420
Link Speed (mph)		50			50			35			35	
Link Distance (ft)		6000			3039			1173			2354	
Travel Time (s)		81.8			41.4			22.9			45.9	
Confl. Peds. (#/hr)			5			1						1
Confl. Bikes (#/hr)									1			1
Peak Hour Factor	0.89	0.95	0.96	0.86	0.84	0.92	0.82	0.89	0.80	0.96	0.91	0.92
Adj. Flow (vph)	696	571	169	252	689	389	455	817	655	176	373	539
Shared Lane Traffic (%)												
Lane Group Flow (vph)	696	571	169	252	689	389	455	817	655	176	373	539
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

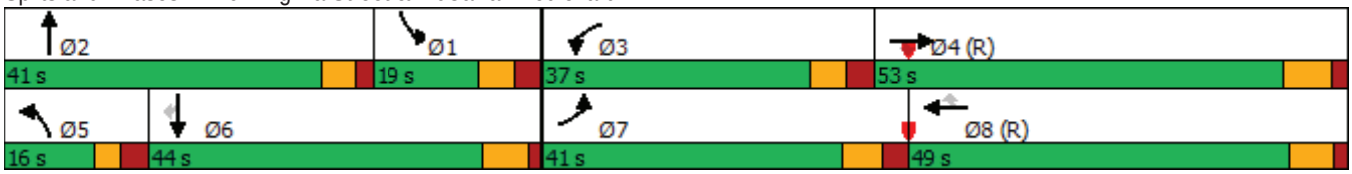


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Free	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			Free			6
Detector Phase	7	4	4	3	8	8	5	2		1	6	6
Switch Phase												
Minimum Initial (s)	6.0	8.0	8.0	6.0	8.0	8.0	6.0	8.0		6.0	8.0	8.0
Minimum Split (s)	13.5	42.3	42.3	13.1	47.7	47.7	12.0	39.7		13.1	39.6	39.6
Total Split (s)	41.0	53.0	53.0	37.0	49.0	49.0	16.0	41.0		19.0	44.0	44.0
Total Split (%)	27.3%	35.3%	35.3%	24.7%	32.7%	32.7%	10.7%	27.3%		12.7%	29.3%	29.3%
Maximum Green (s)	33.5	45.7	45.7	29.9	42.3	42.3	10.0	35.3		11.9	37.4	37.4
Yellow Time (s)	4.5	5.4	5.4	4.1	5.0	5.0	3.0	3.8		4.1	5.0	5.0
All-Red Time (s)	3.0	1.9	1.9	3.0	1.7	1.7	3.0	1.9		3.0	1.6	1.6
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	7.5	7.3	7.3	7.1	6.7	6.7	6.0	5.7		7.1	6.6	6.6
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lead		Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	Max		None	Max	Max
Walk Time (s)		9.0	9.0		9.0	9.0		8.0			8.0	8.0
Flash Dont Walk (s)		26.0	26.0		32.0	32.0		26.0			25.0	25.0
Pedestrian Calls (#/hr)		5	5		1	1		0			1	1
Act Effct Green (s)	33.5	50.1	50.1	25.5	42.3	42.3	10.0	35.3	150.0	11.9	37.4	37.4
Actuated g/C Ratio	0.22	0.33	0.33	0.17	0.28	0.28	0.07	0.24	1.00	0.08	0.25	0.25
v/c Ratio	1.76	0.48	0.27	0.84	0.69	0.67	3.86	0.98	0.42	0.65	0.42	0.77
Control Delay	386.6	42.1	6.2	83.5	52.3	29.7	1321.7	83.6	0.8	78.7	49.0	19.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	386.6	42.1	6.2	83.5	52.3	29.7	1321.7	83.6	0.8	78.7	49.0	19.6
LOS	F	D	A	F	D	C	F	F	A	E	D	B
Approach Delay		204.9			51.6			347.8			39.2	
Approach LOS		F			D			F			D	
90th %ile Green (s)	33.5	45.7	45.7	29.9	42.3	42.3	10.0	35.3		11.9	37.4	37.4
90th %ile Term Code	Max	Coord	Coord	Max	Coord	Coord	Max	MaxR		Max	MaxR	MaxR
70th %ile Green (s)	33.5	45.8	45.8	29.8	42.3	42.3	10.0	35.3		11.9	37.4	37.4
70th %ile Term Code	Max	Coord	Coord	Gap	Coord	Coord	Max	MaxR		Max	MaxR	MaxR
50th %ile Green (s)	33.5	49.1	49.1	26.5	42.3	42.3	10.0	35.3		11.9	37.4	37.4
50th %ile Term Code	Max	Coord	Coord	Gap	Coord	Coord	Max	MaxR		Max	MaxR	MaxR
30th %ile Green (s)	33.5	52.5	52.5	23.1	42.3	42.3	10.0	35.3		11.9	37.4	37.4
30th %ile Term Code	Max	Coord	Coord	Gap	Coord	Coord	Max	MaxR		Hold	MaxR	MaxR
10th %ile Green (s)	33.5	57.4	57.4	18.2	42.3	42.3	10.0	35.3		11.9	37.4	37.4
10th %ile Term Code	Max	Coord	Coord	Gap	Coord	Coord	Max	MaxR		Hold	MaxR	MaxR
Stops (vph)	409	424	17	208	508	169	243	663	0	161	279	130
Fuel Used(gal)	79	32	7	11	25	12	105	24	5	7	11	11
CO Emissions (g/hr)	5491	2222	464	773	1756	815	7364	1644	316	475	786	796
NOx Emissions (g/hr)	1068	432	90	150	342	159	1433	320	62	92	153	155
VOC Emissions (g/hr)	1273	515	107	179	407	189	1707	381	73	110	182	184
Dilemma Vehicles (#)	0	18	0	0	19	0	0	23	0	0	11	0
Queue Length 50th (ft)	~1011	236	0	240	318	173	~803	422	0	87	162	108
Queue Length 95th (ft)	#1240	306	56	318	358	298	#923	#550	0	130	214	266
Internal Link Dist (ft)		5920			2959			1093			2274	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)	550		430	325			110		475	300		675
Base Capacity (vph)	395	1182	631	352	997	579	118	832	1564	272	882	704
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.76	0.48	0.27	0.72	0.69	0.67	3.86	0.98	0.42	0.65	0.42	0.77

Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 150			
Offset: 88 (59%), Referenced to phase 4:EBT and 8:WBT, Start of Green			
Natural Cycle: 145			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 3.86			
Intersection Signal Delay: 186.1		Intersection LOS: F	
Intersection Capacity Utilization 138.5%		ICU Level of Service H	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 29: Virginia Street & McCarran Boulevard





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	44	963	201	156	704	92	428	64	428	82	18	31
Future Volume (vph)	44	963	201	156	704	92	428	64	428	82	18	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	315		170	310		140	130		130	165		160
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						0.97			0.99	1.00		
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5085	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.950			0.742			0.681		
Satd. Flow (perm)	1770	5085	1583	1770	3539	1538	1382	1863	1563	1267	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			253			120			218			56
Link Speed (mph)		50			50			25			25	
Link Distance (ft)		3039			491			522			1079	
Travel Time (s)		41.4			6.7			14.2			29.4	
Confl. Peds. (#/hr)						3			1	1		
Peak Hour Factor	0.65	0.76	0.79	0.88	0.94	0.76	0.83	0.67	0.88	0.82	0.80	0.70
Adj. Flow (vph)	68	1267	254	177	749	121	516	96	486	100	23	44
Shared Lane Traffic (%)												
Lane Group Flow (vph)	68	1267	254	177	749	121	516	96	486	100	23	44
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	Perm

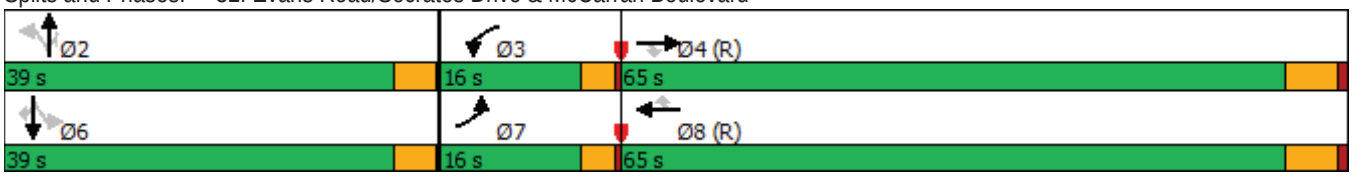


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4			8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	4.0	8.0	8.0	4.0	8.0	8.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	7.5	34.7	34.7	7.5	26.7	26.7	38.1	38.1	38.1	38.1	38.1	38.1
Total Split (s)	16.0	65.0	65.0	16.0	65.0	65.0	39.0	39.0	39.0	39.0	39.0	39.0
Total Split (%)	13.3%	54.2%	54.2%	13.3%	54.2%	54.2%	32.5%	32.5%	32.5%	32.5%	32.5%	32.5%
Maximum Green (s)	12.5	59.3	59.3	12.5	59.3	59.3	34.9	34.9	34.9	34.9	34.9	34.9
Yellow Time (s)	3.0	4.7	4.7	3.0	4.7	4.7	3.6	3.6	3.6	3.6	3.6	3.6
All-Red Time (s)	0.5	1.0	1.0	0.5	1.0	1.0	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.5	5.7	5.7	3.5	5.7	5.7	4.1	4.1	4.1	4.1	4.1	4.1
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	Max	Max	Max	Max	Max	Max
Walk Time (s)		10.0	10.0		10.0	10.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		19.0	19.0		11.0	11.0	27.0	27.0	27.0	27.0	27.0	27.0
Pedestrian Calls (#/hr)		0	0		3	3	1	1	1	0	0	0
Act Effct Green (s)	9.7	59.3	59.3	12.5	64.0	64.0	34.9	34.9	34.9	34.9	34.9	34.9
Actuated g/C Ratio	0.08	0.49	0.49	0.10	0.53	0.53	0.29	0.29	0.29	0.29	0.29	0.29
v/c Ratio	0.48	0.50	0.28	0.96	0.40	0.14	1.29	0.18	0.80	0.27	0.04	0.09
Control Delay	63.2	21.3	2.9	111.0	18.2	3.3	182.8	33.0	32.2	35.3	31.0	6.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.2	21.3	2.9	111.0	18.2	3.3	182.8	33.0	32.2	35.3	31.0	6.1
LOS	E	C	A	F	B	A	F	C	C	D	C	A
Approach Delay		20.2			32.1			103.1			27.0	
Approach LOS		C			C			F			C	
90th %ile Green (s)	12.5	59.3	59.3	12.5	59.3	59.3	34.9	34.9	34.9	34.9	34.9	34.9
90th %ile Term Code	Max	Coord	Coord	Max	Coord	Coord	MaxR	MaxR	MaxR	MaxR	MaxR	MaxR
70th %ile Green (s)	11.5	59.3	59.3	12.5	60.3	60.3	34.9	34.9	34.9	34.9	34.9	34.9
70th %ile Term Code	Gap	Coord	Coord	Max	Coord	Coord	MaxR	MaxR	MaxR	MaxR	MaxR	MaxR
50th %ile Green (s)	10.0	59.3	59.3	12.5	61.8	61.8	34.9	34.9	34.9	34.9	34.9	34.9
50th %ile Term Code	Gap	Coord	Coord	Max	Coord	Coord	MaxR	MaxR	MaxR	MaxR	MaxR	MaxR
30th %ile Green (s)	8.4	59.3	59.3	12.5	63.4	63.4	34.9	34.9	34.9	34.9	34.9	34.9
30th %ile Term Code	Gap	Coord	Coord	Max	Coord	Coord	MaxR	MaxR	MaxR	MaxR	MaxR	MaxR
10th %ile Green (s)	0.0	59.3	59.3	12.5	75.3	75.3	34.9	34.9	34.9	34.9	34.9	34.9
10th %ile Term Code	Skip	Coord	Coord	Max	Coord	Coord	MaxR	MaxR	MaxR	MaxR	MaxR	MaxR
Stops (vph)	41	622	14	133	407	8	336	47	232	62	13	4
Fuel Used(gal)	2	32	4	10	28	3	19	1	6	2	0	0
CO Emissions (g/hr)	143	2257	294	691	1979	191	1337	63	392	110	23	24
NOx Emissions (g/hr)	28	439	57	134	385	37	260	12	76	21	4	5
VOC Emissions (g/hr)	33	523	68	160	459	44	310	14	91	26	5	5
Dilemma Vehicles (#)	0	40	0	0	29	0	0	0	0	0	0	0
Queue Length 50th (ft)	51	234	0	139	181	0	~508	56	200	60	13	0
Queue Length 95th (ft)	68	220	24	#272	240	18	#640	72	330	98	30	9
Internal Link Dist (ft)		2959			411			442			999	
Turn Bay Length (ft)	315		170	310		140	130		130	165		160

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	184	2512	910	184	1887	876	401	541	609	368	541	500
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.50	0.28	0.96	0.40	0.14	1.29	0.18	0.80	0.27	0.04	0.09

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 103 (86%), Referenced to phase 4:EBT and 8:WBT, Start of Green			
Natural Cycle: 85			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.29			
Intersection Signal Delay: 47.0		Intersection LOS: D	
Intersection Capacity Utilization 69.1%		ICU Level of Service C	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 32: Evans Road/Socrates Drive & McCarran Boulevard





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	113	1202	113	214	673	87	135	119	361	82	55	101
Future Volume (vph)	113	1202	113	214	673	87	135	119	361	82	55	101
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	145		450	270		175	95		0	50		150
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			0.99			0.79						
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.950			0.710			0.574		
Satd. Flow (perm)	1770	3539	1562	1770	3539	1248	1323	1863	1583	1069	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			140			128			378			131
Link Speed (mph)		50			45			35			25	
Link Distance (ft)		3868			2027			668			642	
Travel Time (s)		52.7			30.7			13.0			17.5	
Confl. Peds. (#/hr)			1			66						
Confl. Bikes (#/hr)						1						
Peak Hour Factor	0.79	0.82	0.81	0.90	0.89	0.68	0.75	0.80	0.81	0.81	0.76	0.93
Adj. Flow (vph)	143	1466	140	238	756	128	180	149	446	101	72	109
Shared Lane Traffic (%)												
Lane Group Flow (vph)	143	1466	140	238	756	128	180	149	446	101	72	109
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

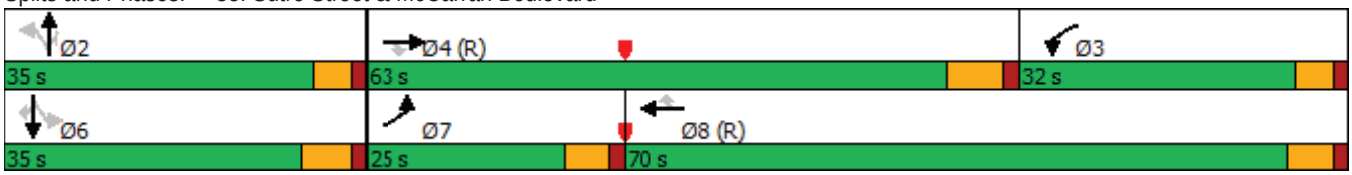


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4			8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	4.0	8.0	8.0	4.0	8.0	8.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	9.8	29.8	29.8	9.2	28.0	28.0	30.2	30.2	30.2	31.3	31.3	31.3
Total Split (s)	25.0	63.0	63.0	32.0	70.0	70.0	35.0	35.0	35.0	35.0	35.0	35.0
Total Split (%)	19.2%	48.5%	48.5%	24.6%	53.8%	53.8%	26.9%	26.9%	26.9%	26.9%	26.9%	26.9%
Maximum Green (s)	19.2	56.2	56.2	26.8	64.0	64.0	29.8	29.8	29.8	28.7	28.7	28.7
Yellow Time (s)	4.3	5.3	5.3	3.7	4.5	4.5	3.7	3.7	3.7	4.8	4.8	4.8
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.8	6.8	6.8	5.2	6.0	6.0	5.2	5.2	5.2	6.3	6.3	6.3
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	Max	Max	Max	Max	Max	Max
Walk Time (s)		7.0	7.0		7.0	7.0	7.0	7.0	7.0	8.0	8.0	8.0
Flash Dont Walk (s)		16.0	16.0		15.0	15.0	18.0	18.0	18.0	17.0	17.0	17.0
Pedestrian Calls (#/hr)		1	1		66	66	0	0	0	0	0	0
Act Effct Green (s)	15.3	56.2	56.2	26.8	67.9	67.9	29.8	29.8	29.8	28.7	28.7	28.7
Actuated g/C Ratio	0.12	0.43	0.43	0.21	0.52	0.52	0.23	0.23	0.23	0.22	0.22	0.22
v/c Ratio	0.69	0.96	0.19	0.65	0.41	0.18	0.59	0.35	0.68	0.43	0.18	0.24
Control Delay	71.8	51.1	4.1	24.8	4.8	0.2	54.0	44.8	13.9	50.2	42.5	5.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	71.8	51.1	4.1	24.8	4.8	0.2	54.0	44.8	13.9	50.2	42.5	5.4
LOS	E	D	A	C	A	A	D	D	B	D	D	A
Approach Delay		49.0			8.5			29.2			30.9	
Approach LOS		D			A			C			C	
90th %ile Green (s)	19.2	56.2	56.2	26.8	64.0	64.0	29.8	29.8	29.8	28.7	28.7	28.7
90th %ile Term Code	Max	Coord	Coord	Max	Coord	Coord	MaxR	MaxR	MaxR	MaxR	MaxR	MaxR
70th %ile Green (s)	18.1	56.2	56.2	26.8	65.1	65.1	29.8	29.8	29.8	28.7	28.7	28.7
70th %ile Term Code	Gap	Coord	Coord	Hold	Coord	Coord	MaxR	MaxR	MaxR	MaxR	MaxR	MaxR
50th %ile Green (s)	15.7	56.2	56.2	26.8	67.5	67.5	29.8	29.8	29.8	28.7	28.7	28.7
50th %ile Term Code	Gap	Coord	Coord	Hold	Coord	Coord	MaxR	MaxR	MaxR	MaxR	MaxR	MaxR
30th %ile Green (s)	13.4	56.2	56.2	26.8	69.8	69.8	29.8	29.8	29.8	28.7	28.7	28.7
30th %ile Term Code	Gap	Coord	Coord	Hold	Coord	Coord	MaxR	MaxR	MaxR	MaxR	MaxR	MaxR
10th %ile Green (s)	9.9	56.2	56.2	26.8	73.3	73.3	29.8	29.8	29.8	28.7	28.7	28.7
10th %ile Term Code	Gap	Coord	Coord	Hold	Coord	Coord	MaxR	MaxR	MaxR	MaxR	MaxR	MaxR
Stops (vph)	108	1074	11	205	104	1	120	97	70	70	44	8
Fuel Used(gal)	6	62	3	6	11	1	3	2	3	2	1	1
CO Emissions (g/hr)	450	4350	237	451	756	81	212	167	230	109	66	48
NOx Emissions (g/hr)	88	846	46	88	147	16	41	32	45	21	13	9
VOC Emissions (g/hr)	104	1008	55	104	175	19	49	39	53	25	15	11
Dilemma Vehicles (#)	0	45	0	0	6	0	0	5	0	0	0	0
Queue Length 50th (ft)	117	620	0	182	40	0	136	106	47	74	50	0
Queue Length 95th (ft)	160	626	27	m191	m57	m0	175	150	103	117	77	33
Internal Link Dist (ft)		3788			1947			588			562	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)	145		450	270		175	95			50		150
Base Capacity (vph)	261	1529	754	364	1849	713	303	427	654	236	411	451
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.55	0.96	0.19	0.65	0.41	0.18	0.59	0.35	0.68	0.43	0.18	0.24

Intersection Summary			
Area Type:	Other		
Cycle Length: 130			
Actuated Cycle Length: 130			
Offset: 62 (48%), Referenced to phase 4:EBT and 8:WBT, Start of Green			
Natural Cycle: 100			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.96			
Intersection Signal Delay: 32.3		Intersection LOS: C	
Intersection Capacity Utilization 75.8%		ICU Level of Service D	
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 35: Sutro Street & McCarran Boulevard





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	448	1076	23	64	723	181	63	188	108	174	166	252
Future Volume (vph)	448	1076	23	64	723	181	63	188	108	174	166	252
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	400		0	320		0	0		0	0		215
Storage Lanes	2		0	1		1	0		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.95	0.95	1.00	0.95	1.00	0.95	0.95	0.95	0.95	0.95	1.00
Ped Bike Factor		1.00				0.98		0.99				0.98
Frt		0.996				0.850		0.954				0.850
Flt Protected	0.950			0.950				0.990		0.950	0.993	
Satd. Flow (prot)	3433	3521	0	1770	3539	1583	0	3325	0	1681	1757	1583
Flt Permitted	0.950			0.950				0.815		0.119	0.240	
Satd. Flow (perm)	3433	3521	0	1770	3539	1549	0	2735	0	211	425	1555
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2				185		49				277
Link Speed (mph)		45			45			35			35	
Link Distance (ft)		2027			568			239			473	
Travel Time (s)		30.7			8.6			4.7			9.2	
Confl. Peds. (#/hr)			8			6	5		4	4		5
Confl. Bikes (#/hr)			1									
Peak Hour Factor	0.94	0.94	0.82	0.73	0.89	0.85	0.56	0.73	0.66	0.89	0.84	0.91
Adj. Flow (vph)	477	1145	28	88	812	213	113	258	164	196	198	277
Shared Lane Traffic (%)										16%		
Lane Group Flow (vph)	477	1173	0	88	812	213	0	535	0	165	229	277
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2		1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100	20	20	100		20	100	20
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6	20	20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

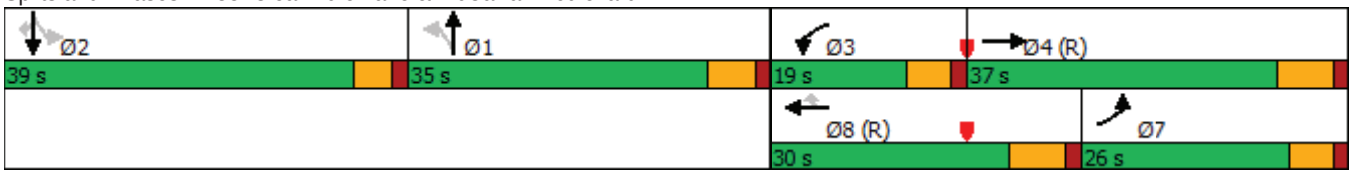


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Prot	NA		Prot	NA	Perm	Perm	NA		Perm	NA	Perm
Protected Phases	7	4		3	8			1			2	
Permitted Phases						8	1			2		2
Detector Phase	7	4		3	8	8	1	1		2	2	2
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.9	29.9		9.8	29.8	29.8	34.1	34.1		38.3	38.3	38.3
Total Split (s)	26.0	37.0		19.0	30.0	30.0	35.0	35.0		39.0	39.0	39.0
Total Split (%)	20.0%	28.5%		14.6%	23.1%	23.1%	26.9%	26.9%		30.0%	30.0%	30.0%
Maximum Green (s)	20.1	30.1		13.2	23.2	23.2	28.9	28.9		33.7	33.7	33.7
Yellow Time (s)	4.4	5.4		4.3	5.3	5.3	4.6	4.6		3.8	3.8	3.8
All-Red Time (s)	1.5	1.5		1.5	1.5	1.5	1.5	1.5		1.5	1.5	1.5
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	0.0
Total Lost Time (s)	5.9	6.9		5.8	6.8	6.8		6.1		5.3	5.3	5.3
Lead/Lag	Lag	Lag		Lead	Lead	Lead	Lag	Lag		Lead	Lead	Lead
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Max		None	C-Max	C-Max	None	None		Max	Max	Max
Walk Time (s)		7.0			4.0	4.0	4.0	4.0		4.0	4.0	4.0
Flash Dont Walk (s)		16.0			19.0	19.0	24.0	24.0		29.0	29.0	29.0
Pedestrian Calls (#/hr)		8			6	6	4	4		5	5	5
Act Effct Green (s)	20.1	34.2		11.1	25.2	25.2		26.9		33.7	33.7	33.7
Actuated g/C Ratio	0.15	0.26		0.09	0.19	0.19		0.21		0.26	0.26	0.26
v/c Ratio	0.90	1.26		0.59	1.19	0.47		0.88		3.06	2.08	0.46
Control Delay	50.6	153.5		79.9	154.8	34.2		62.4		990.5	542.6	6.8
Queue Delay	0.0	0.0		0.0	0.0	0.0		0.0		0.0	0.0	0.0
Total Delay	50.6	153.5		79.9	154.8	34.2		62.4		990.5	542.6	6.8
LOS	D	F		E	F	C		E		F	F	A
Approach Delay		123.8			125.8			62.4			431.6	
Approach LOS		F			F			E			F	
90th %ile Green (s)	20.1	30.1		13.2	23.2	23.2	28.9	28.9		33.7	33.7	33.7
90th %ile Term Code	Max	Coord		Max	Coord	Coord	Max	Max		MaxR	MaxR	MaxR
70th %ile Green (s)	20.1	30.1		13.2	23.2	23.2	28.9	28.9		33.7	33.7	33.7
70th %ile Term Code	Max	Coord		Max	Coord	Coord	Max	Max		MaxR	MaxR	MaxR
50th %ile Green (s)	20.1	31.5		11.8	23.2	23.2	28.9	28.9		33.7	33.7	33.7
50th %ile Term Code	Max	Coord		Gap	Coord	Coord	Max	Max		MaxR	MaxR	MaxR
30th %ile Green (s)	20.1	36.2		9.9	26.0	26.0	26.1	26.1		33.7	33.7	33.7
30th %ile Term Code	Max	Coord		Gap	Coord	Coord	Gap	Gap		MaxR	MaxR	MaxR
10th %ile Green (s)	20.1	43.2		7.2	30.3	30.3	21.8	21.8		33.7	33.7	33.7
10th %ile Term Code	Hold	Coord		Gap	Coord	Coord	Gap	Gap		MaxR	MaxR	MaxR
Stops (vph)	386	733		64	597	109		309		98	126	25
Fuel Used(gal)	15	58		2	33	3		8		31	23	1
CO Emissions (g/hr)	1070	4049		145	2298	229		525		2159	1610	98
NOx Emissions (g/hr)	208	788		28	447	45		102		420	313	19
VOC Emissions (g/hr)	248	938		34	533	53		122		500	373	23
Dilemma Vehicles (#)	0	55		0	2	0		12		0	3	0
Queue Length 50th (ft)	185	~675		79	~470	93		208		~253	~320	0
Queue Length 95th (ft)	m215	m#768		110	#595	155		209		#362	#454	69
Internal Link Dist (ft)		1947			488			159			393	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)	400			320								215
Base Capacity (vph)	530	928		179	685	449		646		54	110	608
Starvation Cap Reductn	0	0		0	0	0		0		0	0	0
Spillback Cap Reductn	0	0		0	0	0		0		0	0	0
Storage Cap Reductn	0	0		0	0	0		0		0	0	0
Reduced v/c Ratio	0.90	1.26		0.49	1.19	0.47		0.83		3.06	2.08	0.46

Intersection Summary			
Area Type:	Other		
Cycle Length: 130			
Actuated Cycle Length: 130			
Offset: 78 (60%), Referenced to phase 4:EBT and 8:WBT, Start of Green			
Natural Cycle: 145			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 3.06			
Intersection Signal Delay: 168.1		Intersection LOS: F	
Intersection Capacity Utilization 93.8%		ICU Level of Service F	
Analysis Period (min) 15			
~ Volume exceeds capacity, queue is theoretically infinite.			
Queue shown is maximum after two cycles.			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 38: Clear Acre Lane & McCarran Boulevard





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	929	454	463	984	0	0	0	0	300	0	5
Future Volume (vph)	0	929	454	463	984	0	0	0	0	300	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		400	500		0	0		0	0		290
Storage Lanes	0		1	2		0	0		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	1.00	1.00	1.00	1.00	0.95	0.95	1.00
Frt			0.850									0.850
Flt Protected				0.950						0.950	0.950	
Satd. Flow (prot)	0	5085	1583	3433	5085	0	0	0	0	1681	1681	1583
Flt Permitted				0.950						0.950	0.950	
Satd. Flow (perm)	0	5085	1583	3433	5085	0	0	0	0	1681	1681	1583
Right Turn on Red			Yes			No			No			Yes
Satd. Flow (RTOR)			468									77
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		568			822			596			656	
Travel Time (s)		8.6			12.5			9.0			9.9	
Peak Hour Factor	0.92	0.95	0.97	0.87	0.97	0.92	0.92	0.92	0.92	0.95	0.92	0.42
Adj. Flow (vph)	0	978	468	532	1014	0	0	0	0	316	0	12
Shared Lane Traffic (%)										50%		
Lane Group Flow (vph)	0	978	468	532	1014	0	0	0	0	158	158	12
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		2	1	1	2					1	2	1
Detector Template		Thru	Right	Left	Thru					Left	Thru	Right
Leading Detector (ft)		100	20	20	100					20	100	20
Trailing Detector (ft)		0	0	0	0					0	0	0
Detector 1 Position(ft)		0	0	0	0					0	0	0
Detector 1 Size(ft)		6	20	20	6					20	6	20
Detector 1 Type		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Queue (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 1 Delay (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Detector 2 Position(ft)		94			94						94	
Detector 2 Size(ft)		6			6						6	
Detector 2 Type		Cl+Ex			Cl+Ex						Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0						0.0	
Turn Type		NA	Perm	Prot	NA					Split	NA	Perm
Protected Phases		4		3	8					6	6	
Permitted Phases			4									6



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase		4	4	3	8					6	6	6
Switch Phase												
Minimum Initial (s)		12.0	12.0	6.0	12.0					6.0	6.0	6.0
Minimum Split (s)		22.5	22.5	11.4	28.2					22.5	22.5	22.5
Total Split (s)		65.0	65.0	37.0	102.0					28.0	28.0	28.0
Total Split (%)		50.0%	50.0%	28.5%	78.5%					21.5%	21.5%	21.5%
Maximum Green (s)		59.0	59.0	31.6	95.8					20.8	20.8	20.8
Yellow Time (s)		4.5	4.5	3.9	4.7					5.7	5.7	5.7
All-Red Time (s)		1.5	1.5	1.5	1.5					1.5	1.5	1.5
Lost Time Adjust (s)		0.0	0.0	0.0	0.0					0.0	0.0	0.0
Total Lost Time (s)		6.0	6.0	5.4	6.2					7.2	7.2	7.2
Lead/Lag		Lead	Lead	Lag								
Lead-Lag Optimize?		Yes	Yes	Yes								
Vehicle Extension (s)		3.0	3.0	3.0	3.0					3.0	3.0	3.0
Recall Mode		C-Max	C-Max	None	C-Max					Max	Max	Max
Walk Time (s)		7.0	7.0		7.0							
Flash Dont Walk (s)		6.0	6.0		15.0							
Pedestrian Calls (#/hr)		0	0		0							
Act Effct Green (s)		59.0	59.0	31.6	95.8					20.8	20.8	20.8
Actuated g/C Ratio		0.45	0.45	0.24	0.74					0.16	0.16	0.16
v/c Ratio		0.42	0.48	0.64	0.27					0.59	0.59	0.04
Control Delay		9.0	1.4	47.2	3.3					60.6	60.6	0.2
Queue Delay		0.0	2.4	0.0	0.0					0.0	0.0	0.0
Total Delay		9.0	3.8	47.2	3.3					60.6	60.6	0.2
LOS		A	A	D	A					E	E	A
Approach Delay		7.3			18.4						58.4	
Approach LOS		A			B						E	
90th %ile Green (s)		59.0	59.0	31.6	95.8					20.8	20.8	20.8
90th %ile Term Code		Coord	Coord	Hold	Coord					MaxR	MaxR	MaxR
70th %ile Green (s)		59.0	59.0	31.6	95.8					20.8	20.8	20.8
70th %ile Term Code		Coord	Coord	Hold	Coord					MaxR	MaxR	MaxR
50th %ile Green (s)		59.0	59.0	31.6	95.8					20.8	20.8	20.8
50th %ile Term Code		Coord	Coord	Hold	Coord					MaxR	MaxR	MaxR
30th %ile Green (s)		59.0	59.0	31.6	95.8					20.8	20.8	20.8
30th %ile Term Code		Coord	Coord	Hold	Coord					MaxR	MaxR	MaxR
10th %ile Green (s)		59.0	59.0	31.6	95.8					20.8	20.8	20.8
10th %ile Term Code		Coord	Coord	Hold	Coord					MaxR	MaxR	MaxR
Stops (vph)		266	40	455	182					139	139	0
Fuel Used(gal)		8	2	13	8					4	4	0
CO Emissions (g/hr)		589	161	879	572					295	295	2
NOx Emissions (g/hr)		115	31	171	111					57	57	0
VOC Emissions (g/hr)		137	37	204	133					68	68	0
Dilemma Vehicles (#)		19	0	0	5					0	6	0
Queue Length 50th (ft)		52	0	247	57					131	131	0
Queue Length 95th (ft)		m40	m0	296	66					211	211	0
Internal Link Dist (ft)		488			742			516			576	
Turn Bay Length (ft)			400	500								290
Base Capacity (vph)		2307	974	834	3747					268	268	317
Starvation Cap Reductn		0	367	0	0					0	0	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn		0	0	0	0					0	0	0
Storage Cap Reductn		0	0	0	0					0	0	0
Reduced v/c Ratio		0.42	0.77	0.64	0.27					0.59	0.59	0.04

Intersection Summary			
Area Type:	Other		
Cycle Length: 130			
Actuated Cycle Length: 130			
Offset: 84 (65%), Referenced to phase 4:EBT and 8:WBT, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.64			
Intersection Signal Delay: 17.5		Intersection LOS: B	
Intersection Capacity Utilization 65.1%		ICU Level of Service C	
Analysis Period (min) 15			

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 41: US 395 SB Ramps & McCarran Boulevard





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	38	1191	0	0	1184	577	263	0	762	0	0	0
Future Volume (vph)	38	1191	0	0	1184	577	263	0	762	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	0		525	285		285	0		0
Storage Lanes	1		0	0		1	1		2	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.91	1.00	1.00	0.91	1.00	0.95	0.95	0.88	1.00	1.00	1.00
Frt						0.850			0.850			
Flt Protected	0.950						0.950	0.950				
Satd. Flow (prot)	1770	5085	0	0	5085	1583	1681	1681	2787	0	0	0
Flt Permitted	0.950						0.950	0.950				
Satd. Flow (perm)	1770	5085	0	0	5085	1583	1681	1681	2787	0	0	0
Right Turn on Red			No			Yes			No			No
Satd. Flow (RTOR)						648						
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		822			1229			704			595	
Travel Time (s)		12.5			18.6			10.7			9.0	
Peak Hour Factor	0.63	0.98	0.92	0.92	0.93	0.89	0.82	0.92	0.95	0.92	0.92	0.92
Adj. Flow (vph)	60	1215	0	0	1273	648	321	0	802	0	0	0
Shared Lane Traffic (%)							50%					
Lane Group Flow (vph)	60	1215	0	0	1273	648	160	161	802	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2			2	1	1	2	1			
Detector Template	Left	Thru			Thru	Right	Left	Thru	Right			
Leading Detector (ft)	20	100			100	20	20	100	20			
Trailing Detector (ft)	0	0			0	0	0	0	0			
Detector 1 Position(ft)	0	0			0	0	0	0	0			
Detector 1 Size(ft)	20	6			6	20	20	6	20			
Detector 1 Type	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Queue (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 1 Delay (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Detector 2 Position(ft)		94			94			94				
Detector 2 Size(ft)		6			6			6				
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex				
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0				
Turn Type	Prot	NA			NA	Perm	Split	NA	Prot			
Protected Phases	7	4			8		2	2	2			
Permitted Phases						8						



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Detector Phase	7	4			8	8	2	2	2			
Switch Phase												
Minimum Initial (s)	4.0	6.0			6.0	6.0	6.0	6.0	6.0			
Minimum Split (s)	9.4	35.3			17.9	17.9	11.8	11.8	11.8			
Total Split (s)	28.0	86.0			58.0	58.0	44.0	44.0	44.0			
Total Split (%)	21.5%	66.2%			44.6%	44.6%	33.8%	33.8%	33.8%			
Maximum Green (s)	22.6	79.7			52.1	52.1	38.2	38.2	38.2			
Yellow Time (s)	3.9	4.8			4.4	4.4	4.3	4.3	4.3			
All-Red Time (s)	1.5	1.5			1.5	1.5	1.5	1.5	1.5			
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Total Lost Time (s)	5.4	6.3			5.9	5.9	5.8	5.8	5.8			
Lead/Lag	Lag				Lead	Lead						
Lead-Lag Optimize?	Yes				Yes	Yes						
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0			
Recall Mode	None	C-Max			C-Max	C-Max	Max	Max	Max			
Walk Time (s)		11.0			7.0	7.0						
Flash Dont Walk (s)		18.0			5.0	5.0						
Pedestrian Calls (#/hr)		0			0	0						
Act Effct Green (s)	19.3	79.7			57.7	57.7	38.2	38.2	38.2			
Actuated g/C Ratio	0.15	0.61			0.44	0.44	0.29	0.29	0.29			
v/c Ratio	0.23	0.39			0.56	0.61	0.32	0.33	0.98			
Control Delay	53.4	8.7			29.6	4.7	38.1	38.2	72.6			
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0	0.0			
Total Delay	53.4	8.7			29.6	4.7	38.1	38.2	72.6			
LOS	D	A			C	A	D	D	E			
Approach Delay		10.8			21.2			62.8				
Approach LOS		B			C			E				
90th %ile Green (s)	22.6	79.7			52.1	52.1	38.2	38.2	38.2			
90th %ile Term Code	Hold	Coord			Coord	Coord	MaxR	MaxR	MaxR			
70th %ile Green (s)	22.6	79.7			52.1	52.1	38.2	38.2	38.2			
70th %ile Term Code	Hold	Coord			Coord	Coord	MaxR	MaxR	MaxR			
50th %ile Green (s)	22.6	79.7			52.1	52.1	38.2	38.2	38.2			
50th %ile Term Code	Hold	Coord			Coord	Coord	MaxR	MaxR	MaxR			
30th %ile Green (s)	22.6	79.7			52.1	52.1	38.2	38.2	38.2			
30th %ile Term Code	Hold	Coord			Coord	Coord	MaxR	MaxR	MaxR			
10th %ile Green (s)	0.0	79.7			80.1	80.1	38.2	38.2	38.2			
10th %ile Term Code	Skip	Coord			Coord	Coord	MaxR	MaxR	MaxR			
Stops (vph)	38	824			867	42	100	102	684			
Fuel Used(gal)	1	19			27	6	3	3	23			
CO Emissions (g/hr)	76	1308			1912	397	200	203	1626			
NOx Emissions (g/hr)	15	255			372	77	39	39	316			
VOC Emissions (g/hr)	18	303			443	92	46	47	377			
Dilemma Vehicles (#)	0	0			46	0	0	5	0			
Queue Length 50th (ft)	54	132			310	0	110	111	381			
Queue Length 95th (ft)	72	204			361	70	160	178	#529			
Internal Link Dist (ft)		742			1149			624			515	
Turn Bay Length (ft)	100					525	285		285			
Base Capacity (vph)	307	3117			2256	1062	493	493	818			
Starvation Cap Reductn	0	0			0	0	0	0	0			

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn	0	0			0	0	0	0	0			
Storage Cap Reductn	0	0			0	0	0	0	0			
Reduced v/c Ratio	0.20	0.39			0.56	0.61	0.32	0.33	0.98			

Intersection Summary			
Area Type:	Other		
Cycle Length: 130			
Actuated Cycle Length: 130			
Offset: 95 (73%), Referenced to phase 4:EBT and 8:WBT, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.98			
Intersection Signal Delay: 28.9		Intersection LOS: C	
Intersection Capacity Utilization 65.1%		ICU Level of Service C	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 44: US 395 NB Ramps & McCarran Boulevard



Appendix H
Policies, Plans, and Studies

2040 Regional Transportation Plan

The 2040 Regional Transportation Plan (RTP) identifies the long-term transportation investments that will be made in the urbanized area of Reno, Sparks, and Washoe County, Nevada, also known as the Truckee Meadows. The plan was founded on a people-based approach, which included extensive collaboration with the community and federal, state and local partner agencies. The RTP process was shaped by four guiding principles derived from community input:

- Safe and healthy communities
- Economic development and diversification
- Sustainability
- Increased travel choices

The projects in this RTP (see Appendix A) support the vision that the Truckee Meadows is the best place to live, work, recreate, visit, and invest. The plan includes transportation projects, programs and services for walking, biking, driving, and riding transit. In addition, the plan provides for maintaining existing infrastructure in good condition and improving the operation of existing services.

The goals of the RTP, which are discussed further in each chapter of the plan, include the following:

- Improve safety
- Integrate land use and economic development
- Promote healthy communities and sustainability
- Manage existing systems efficiently
- Integrate all types of transportation
- Focus on regional connectivity
- Promote equity and environmental justice
- Improve freight and goods movement, and
- Invest strategically

Programmatic Investments

In support of these guiding principles and goals, the RTP includes four programmatic investments that will be ongoing throughout the life of the plan.

- Accessibility improvements under the Americans with Disabilities Act (ADA)
    - Ongoing implementation of the ADA Transition Plan is a priority for the RTC. With the segment of the population over 75 years old being the fastest growing demographic in the region, the importance of accessible pedestrian facilities will continue to grow. Annual funding will be programmed for spot improvements throughout the region to upgrade sidewalks, crosswalks, and curb ramps.
- Pedestrian and bicycle facility improvements
    - Ongoing implementation of the RTC Bicycle Pedestrian Master Plan will be funded throughout the RTP planning horizon. These spot improvements will enhance the safety and regional connectivity of the pedestrian and bicycle network.
- Traffic Signals and Intelligent Transportation Systems (ITS) Operations
    - Technology and traffic operations strategies promote faster travel times on the existing roadway network. Investments in ITS have proven to be a costeffective alternative to adding road capacity. The plan identifies annual funding to upgrade traffic signals and associated communications technologies.
- Pavement Preservation

- Maintaining roads and bridges in good condition and extending the useful life of pavement on regional roads is a proven way to minimize long term costs. The RTP identifies annual funding to apply the appropriate pavement preservation treatment to regional roads and bridge decks, which can include surface seals, resurfacing, or reconstruction. RTC partners with the NDOT Highway Bridge Program to provide funding to replace or rehabilitate substandard bridges.

Transit Investments

Transit is recognized as an essential part of the local economy that helps thousands of Washoe County residents get to work and access essential services each day. Transit helps shape development patterns and is an economic development tool that supports a higher density, mixed-use urban form. The Virginia Street RTC RAPID project is an example where a transit investment is helping spur new and revitalized investments from Downtown to Midtown and Meadowood Mall.

The environmental benefits of transit are also well recognized: reducing the number of cars on the road reduces traffic congestion and air pollution. With the aging of the population, the public is also concerned with mobility issues that will face many residents over the next 20 years. A clear message expressed during the community outreach process is the need to plan, build, and operate services such as accessible bus stops and sidewalks, transit lines, and roadways that support an aging population.

RTC recently developed the Short-Range Transit Plan (SRTP), which provides a strategy for transit service over the next five years. The short-term fiscally constrained transit program includes existing service plus the following modifications planned for FY 2018 through 2022:

- Extension of RTC RAPID on 4th Street/Prater Way (Lincoln Line)
- Extension of RTC RAPID to the University of Nevada, Reno
- Reallocation of service hours to achieve greater efficiency
- Expansion of the RTC Villanova Maintenance Facility to accommodate larger and more technologically complex vehicles as well as an expanded fleet of electric vehicles in FY 2017
- Pilot program for 2-3 day per week circulator service in outlying areas, targeted to senior citizens
- Increase subsidy and expand eligibility for Taxi Bucks/Washoe Senior Ride Program
- Continue the FTA 5310 grant program to fund non-profit transportation services

Unfunded Vision for Transit

The RTP outreach process provided an opportunity to develop a vision for transit in the Truckee Meadows over the next 20 years. This vision is not constrained by available financial resources. A series of community planning workshops and an online survey were used to gather input about the unfunded vision. The vision includes the following elements:

- Streetcar transit to connect the Reno-Tahoe International Airport to Virginia Street
- Streetcar service on Virginia Street from the Reno Tahoe Convention Center to the University of Nevada, Reno
- Expanded downtown circulator bus service
- Express bus service on South Virginia to serve the Summit and UNR/TMCC Redfield Campus
- Express bus service on US 395 to serve the North Valleys
- Service between Reno and Truckee, California, connecting the RTC RIDE and TART system
- Service between Reno and Lake Tahoe, including Incline Village, and the South Shore transit service provided by the Tahoe Transportation District
- Express bus on Pyramid Highway to serve north Sparks and Spanish Springs
- Express bus service from Reno and Sparks to the Tahoe Reno Industrial Center
- Commuter rail service from Reno and Sparks to the Tahoe Reno Industrial Center

- Larger maintenance facility for long-term expansion

Complete Streets Investments

This RTP includes a package of roadway investments that promote livability and regional connectivity. All of these projects incorporate a Complete Streets design concept, which addresses the needs of all roadway users in a way that is sensitive to the local land use context. The primary purpose of Complete Street projects is to provide safe access and travel for pedestrians, bicyclists, motorists and transit users of all ages and abilities. Safety is an important aspect of all project planning, with high crash locations being improved through many of the recommended projects. Complete Street designs have reduced crashes up to 46% on regional roads in Washoe County.

Projects that focus on regional connectivity link major concentrations of employment and housing across the Truckee Meadows. Completion of the region's outstanding major capacity investments include the Southeast Connector, I-80/US 395/ I-580 Interchange, US 395 North Widening, I-80 Widening, and the Pyramid Highway/US 395 Connector.

Other projects focus primarily on neighborhood livability and economic development. While these projects may not add new lanes for autos, they do improve ADA accessibility, connectivity of the regional bicycle network, facilitate safety through traffic calming, and improve the streetscape appearance through landscaping and unified design. Key livability projects are described on the following page.

Conclusion

This RTP was driven by the feedback of local residents, businesses, and partner agencies as well as the recognition that transportation plays a critical role in the region's efforts to improve safety and sustain long-term opportunities. This plan identifies a path to improve the quality of life in the Truckee Meadows. Roadways are an important part of the local community and shape the daily experience of the people that travel them, whether on bus, bike, foot, or in a car. This plan supports the economic vitality of the region by promoting safety, providing accessible places to walk and bike, improving connectivity between where people live and work, and conserving resources through environmentally and fiscally sustainable practices.

7
I-80
Rock Blvd to McCarran Blvd
Widen bridges to add travel lane in each direction
$15,000,000
Federal/Local/State

8
Glendale Ave
Kietzke Ave to McCarran Blvd
Pavement reconstruction & multimodal improvements
$16,400,000
Federal/State

16
Pyramid Hwy
@ McCarran Blvd
Improve capacity, safety & multimodal access (under construction)
$30,000,000

Federal/Local/State

23
US 395
N McCarran to Parr Blvd
Freeway widening PE/NEPA
$1,500,000
Federal/Local/State

24
US 395/I-580/I-80
Spaghetti Bowl (Kietzke to N McCarran, Keystone to Pyramid)
Capacity expansion at Spaghetti Bowl, PE/NEPA
$12,800,000
State/Federal

10
I-80/I-580/US 395 (Spaghetti Bowl)
I-80/I-580/US 395 interchange & southbound lanes on US 395 from I-80 to McCarran Blvd
Operational & capacity improvements - widen US 395 to 8 lanes, Phase 1
$93,500,000
Federal/Local/State

20
North Virginia St
Stead Blvd to McCarran Blvd
Sidewalks and bike lanes. An off-street shared-use path may be considered
$28,100,000
Federal/Local/State

6
Baring Boulevard
McCarran Boulevard to Vista Boulevard
Bike lanes
$10,200,000
Federal/State/Local

17
I-80
W McCarran Blvd to Vista Blvd
Capacity and operational improvements
$109,300,000
Federal/State

19
I-80/I-580/US 395 (Spaghetti Bowl)
I-80/I-580/US 395 interchange & southbound lanes on US 395 from I-80 to McCarran Blvd
Operational & capacity improvements - widen US 395 to 8 lanes, Phase 2
$306,100,000
Federal/Local/State

22
Kings Row
McCarran Boulevard to Keystone
Bike lanes
$9,900,000
Federal/State/Local

25
Lakeside Drive
McCarran Boulevard to Plumb Lane
Bike lanes
$12,200,000
Federal/State/Local

27
McCarran & Kietzke Intersection
Intersection improvement
Intersection improvement
$43,400,000
Federal/State/Local

28
McCarran & Lakeside Intersection
Intersection improvement
Intersection improvement
$43,400,000
Federal/State/Local

29
McCarran & Rock intersection
Intersection improvement
Intersection improvement
$43,400,000
Federal/State/Local

30
McCarran Blvd
7th St to N Virginia St
Widen 4 to 6 lanes
$62,600,000
Federal/State/Local

31
McCarran Blvd
El Rancho Dr to Rock Blvd
Widen 4 to 6 lanes
$26,800,000
Federal/State/Local

32
McCarran Blvd

Sky Mountain Dr to I-80
Widen 4 to 6 lanes
$7,900,000
Federal/State/Local

33
McCarran Boulevard
Greg Street to Prater Way
Sidewalks and bike lanes
$9,000,000
Federal/State/Local

34
Mira Loma Dr
McCarran Blvd to SouthEast Connector
Widen 2 to 4 lanes
$11,100,000
Federal/State/Local

36
Neil Road
McCarran Boulevard to Moana Lane
Bike lanes
$6,700,000
Federal/State/Local

48
Rock Boulevard
Prater Way to McCarran Boulevard
Enhanced sidewalks and bike lanes
$2,100,000
Federal/State/Local

56
Sutro St
McCarran Blvd to Sunvilla Blvd
Widen 2 to 4 lanes
$17,400,000
Federal/State/Local

7
I-580
S Virginia St/Kietzke Ln to N McCarran Blvd
Widen to 10 lanes
$244,400,000

9
I-80
W McCarran Blvd to Keystone Ave
Widen to 6 lanes
$39,700,000

15
McCarran Blvd
Plumb Ln to Mayberry Dr
Widen 4 to 6 lanes
$13,700,000

16
McCarran Blvd
Lakeside Dr to Manzanita Ln
Widen 4 to 6 lanes
$33,300,000

Bicycle and Pedestrian Master Plan

The Reno Sparks region is a pleasant, thriving, healthy, and sustainable community that strives to meet the needs of all its citizens in an environmentally sensitive manner. Walking and bicycling as a means of transportation or for recreation and fitness requires safe and accessible infrastructure. High quality infrastructure for bicycling and walking contributes to a higher quality of life for people in the region by encouraging an active lifestyle and reducing automobile traffic with its associated noise pollution, congestion, and reliance on oil. The purpose of the Bicycle and Pedestrian Master Plan is to make the region as bicycle and pedestrian friendly as possible in order to encourage people of all ages, abilities, and means to walk and/or bicycle.

The Bicycle and Pedestrian Master Plan is part of the Regional Transpiration Commission's (RTC) Regional Transportation Plan (RTP). The RTP guides transportation investments in Reno, Sparks, and part of Washoe County over a 20-30 year period. This Bicycle and Pedestrian Master Plan is the official policy document addressing the development of bicycle and pedestrian facilities for transportation purposes in the Truckee Meadows.

The Bicycle and Pedestrian Master Plan describes public outreach and solicitation efforts through social media pertaining to projects and input on this document. The master plan also contains information on existing bicycle and pedestrian conditions, bikeway support facilities, types of bicyclists and pedestrians, data on bicycle and pedestrian crashes, existing programs in the Reno Sparks area as well as a sample of programs that can be used as tools to educate the public, and a list of funding sources that could be used by the Reno Sparks region for implementation of bike and pedestrian projects.

VISION STATEMENT:

To support walking and bicycling, the Region will have an integrated system of safe, convenient and comfortable bicycle, pedestrian and other non-motorized facilities that provide access to schools, jobs, shopping, neighborhoods, community facilities, parks and regional trails.

The Bicycle and Pedestrian Master Plan addresses the following types of bicycle and pedestrian facilities:

- Shared Use Paths
    - Shared use paths are facilities which are placed completely separated from the roadway for exclusive use of pedestrian and bicyclists. Shared use paths are built to avoid cross flow by motor vehicles and are therefore more commonly found on vacant rail corridors, along recreational areas such as creeks, or along busy roadways
- Bike Boulevards and Sharrows
    - Shared bikeways indicate that bicycles share the vehicle travel lane and are marked with signs and pavement markings designating the shared travel way.
- Bike Lane
    - Bike lanes are areas on the paved roadway that are marked for the semi-exclusive use of bicyclists. Cross flow is generally permitted near intersections and around driveways. Bike lanes can be seen throughout the Truckee Meadows.
- Bus Bike Shared Lane
    - A shared bus lane is a bus lane that allows cyclists to use it. These are marked with pavement markings and can be found on South Virginia Street in Reno.
- Cycle Track
    - A cycle track is an exclusive bike facility that is physically separated from motor vehicle traffic and sidewalk so that each road user has a separate path to drive, ride, or walk on. Victorian Square in Sparks has a cycle track.
- Enhanced Intersection

    - Enhanced intersections highlight potential conflict points between bicyclists and motor vehicles. The green pavement markings draw attention to drivers that bicyclists may be in the intersection. There are enhanced bikeways on Moana Lane and Keystone Avenue.
- Sidewalks
    - Sidewalks should be wide enough to support the expected pedestrian demand. The minimum width for sidewalks is 4 feet on residential and local roadways and 5 feet on collectors and arterials. 5 feet is desirable for two people to walk side by side comfortably. Sidewalks in areas with high pedestrian volumes, such as downtown areas and TODs should have widths of 6 feet or more.

In addition to sidewalks, certain aspects of pedestrian planning must involve careful consideration in the placement of facilities in order to accommodate pedestrian demand, such as mid-block crossings.

Safety is a priority to the RTC. Collaborations with organizations and programs throughout the community that focus on safety, encouragement, and enforcement are highlighted in this plan. RTC is a partner with the Washoe County Safe Routes to School Program for example, this program teaches safety to children K-8th grades.

Improving Safety is one of RTCs performance measures. A current performance measure is to reduce the number of fatalities (vehicle, bike, and pedestrian)/ Number of fatalities per Vehicle Miles Traveled (VMT) by 50% by 2020. The 2016 status of this performance measure indicated 49 traffic fatalities (1.36 per 100 million VMT), including 24 auto occupants (0.67 per 100 million VMT), 1 cyclists (0.03 per 100 million VMT) and 15 pedestrians 0.42 per 100 million VMT) which indicates progress towards this goal.

In 2016 4.5 miles of bike lanes were added, 2.8 miles of sidewalk were added, 1 mile of paved multi-use path was installed, seven crosswalks were replaced, four new crosswalks were installed, four pair of crosswalk warning devices were installed, crosswalk lighting was installed at eight locations and 44 pedestrian ramps were installed. These improvements help achieve the performance target of adding 3-7% of implementing the Bicycle Pedestrian Master Plan per year and implementing 3-7% of the ADA Transition Plan per year.

PROPOSED IMPROVEMENT

- New to this plan is a prioritized pedestrian project list and an updated bicycle project list. Projects were prioritized and ranked “high, medium, or low” priority based on a numerical point system. Proposed projects included in the Bicycle and Pedestrian Master Plan were identified through input from partnering agencies, the public, and existing plans and project lists such as:

- Existing 2011 Bicycle Pedestrian Master Plan
- Corridor Studies
- Complete Streets Master Plan
- Bus Stop ADA Accessibility Inventory
- Regional Sidewalk Inventory
- Partnering Agencies and Public Input
    - The point system used to prioritize improvements was approved by the Technical Advisory Committee and Citizens Multimodal Advisory Committee. Projects were given points if they were:
        - In an existing plan
        - Located on a regional road or located on a non-regional road that would provide connectivity to an existing bicycle or pedestrian facility between, or leading to, regional roads
        - Eliminate a gap in connectivity
        - Located in a low income/economically challenged neighborhood
        - Serve a block group with poverty level below the Washoe County Average
        - Connect to transit

- Located near essential services (school, governmental, social services, affordable housing, medical services, etc.).
- Ease of constructability.

There were 339 miles of sidewalk identified in projects and 116 miles of bike infrastructure identified for implementation in this plan.

IMPLEMENTATION STRATEGIES

This document is complementary to the Regional Transportation Plan (RTP) and many projects are identified in the RTP for funding along with several corridor studies and complete street projects. There are some projects that have not been identified for funding however, the RTP is a 20 year document and with the performance measure of implementing 3-7% of projects in this master plan over the lifetime of the plan it is believed that this can be achieved.

Projects otherwise not specified in the Regional Transportation Project (RTP)

	Bicycle Projects	*Pedestrian Projects*
High Priority Ranking	$1.933.363.31	$26,044,768
Medium Priority Ranking	$3,723,145.59	$38,124,761
Low Priority Ranking	$154,836.98	$25,956,568
Total	*$5,811,345.87*	*$90,126,098*

CONCLUSION

This Bicycle and Pedestrian Master Plan was driven by the feedback of local residents, partner agencies, the RTC Technical Advisory Committee and Citizen's Multimodal Advisory Committees. The project selection process was streamlined from the previous master plan. Projects in this master plan support the Regional Transportation Plan and were identified from the 2011 Bicycle Pedestrian Master Plan, Corridor Studies completed by the RTC, the Complete Streets Master Plan, Bus Stop ADA Accessibility Inventory, and Regional Sidewalk Inventory. The purpose of the Bicycle and Pedestrian Master Plan is to encourage investment in the bicycle and pedestrian infrastructure in the region and promote the use of active transportation as a viable mode for people of all ages, abilities, and means.

BACKGROUND

The Reno-Sparks Metropolitan region in Washoe County has made significant investments in the pedestrian and bicycle network since the adoption of the 2011 Reno Sparks Bicycle and Pedestrian Master Plan (RSBPMP). Over 50 miles of bicycle lanes, 20 miles of sidewalks, and 500 curb ramps have been constructed by RTC since 2011. This includes major projects such as the Southeast McCarran Boulevard widening, which widened the roadway from four to six lanes, added a multi-use path on the south/east side of the road, and included a separate multi-use bridge over the Truckee River, the installation of a cycle track on Nichols Boulevard from Victorian Avenue to McCarran Boulevard. Sidewalk and ADA improvements have been implemented on Harvard Way from Linden Street to Yale Way and Sivlerada Boulevard from E 9th Street to Fantastic Drive. Other significant bicycle and pedestrian improvements have been constructed on Sutro Street, West Plumb Lane, and Plumas Street. This revised Regional Transportation Commission (RTC) Bicycle Pedestrian Master Plan (BPMP) includes policies, measurable goals and recommendations for specific infrastructure improvements to enhance pedestrian and bicycle connectivity and mobility around the region. These recommendations cover a wide range of physical improvements, including rebuilding existing sidewalks, intersection crossing improvements, constructing new bicycle and pedestrian infrastructure and implementing recommendations such as new shared use paths as identified in various corridor studies and master plans. Included in this BPMP are updates highlighting implemented bicycle and pedestrian facilities and improvements in the region. This plan also provides a framework for prioritizing bicycle and pedestrian improvements throughout the region.

City of Reno Master Plan

As of the date of this document, the City of Reno is in the process of updating their master plan. The new Re-imagine Reno plan will reflect the community's desire for enhanced pedestrian and bicycle connections between neighborhoods and centers, and is intended to help prioritize transit supportive infill and redevelopment (generally within the McCarran Loop) while providing opportunities for less intensive mixed-use development in outlying locations where transit is not in place. Re-imagine Reno will evaluate land use and transportation policies and goals in the context of urban, suburban, and neighborhood corridors. Public input received as part of the plan process indicated strong support for increasing bicycle and pedestrian infrastructure.

ON-STREET NORTH-SOUTH ROUTES

The Reno-Sparks region lacks a well-connected north-south bicycle system. In Reno, bicycle lanes are provided on Double R Boulevard, Airway Drive, and El Rancho Drive. The majority of Kietzke Lane and West McCarran Boulevard also have bicycle lanes with small missing sections throughout. Other roadways such as Wells Avenue, Terminal Way, Holcomb Avenue, Clear Acre Lane, and Sun Valley Boulevard provide short segments of north-south bicycle facilities, but connections between the facilities are not available. In Sparks, Pyramid Highway and Sparks Boulevard provide bicycle facilities for north-south travelers. Vista Boulevard also provides a section of bicycle lanes.

ON-STREET EAST-WEST ROUTES

West 7th Street in Northwest Reno provides approximately 2 miles of bicycle lanes from west of McCarran Boulevard to Keystone Avenue for east-west travelers. Other roadways such as Victorian Avenue, Mill Street, and California Avenue provide short segments of east-west bicycle facilities, but connections between the facilities are not available.

Virginia Street Corridor Investment Plan

- Multimodal analysis of pedestrian, bicycle, transit, and automobile for potential transportation improvements on Virginia Street between North McCarran Boulevard to Mt. Rose Highway

Evans Street Bicycle and Pedestrian Improvements

Evans Avenue is a vital link for the University of Nevada, Reno to downtown. The Evans Avenue Project will upgrade bicycle/pedestrian facilities from McCarran Boulevard just north of the University to 2nd Street with its proximity to 4th Street Station, Aces Ballpark and downtown Reno. This project will provide a multi-use path from McCarran Boulevard to Jodi Way. This path will enhance the safety for pedestrian and bike riders coming from university housing to their classes at UNR. From Jodi Way to 9th Street, a bicycling climbing lane will be striped to enable bike riders to have their own lane to climb the hill. From 9th Street to 4th Street, new bike lanes will be added on both sides of the roadway. On street parking will remain in this area, but bicycles will now have their own lane to ride in which should also slow speeds in the neighborhood. From 4th Street to 2nd Street, due to narrow roadway widths, sharrows will be installed to allow vehicles and bikes to share the lane.

Jurisdiction	**Location**	**Limits**	**Length (miles)**
Reno	Capitol Blvd	S McCarran Boulevard to Rock Boulevard	0.56
Reno	Caughlin Pkwy	S McCarran Boulevard to Caughlin Square	3.95
Reno	Evans Ave	N McCarran Boulevard to E Plaza Street	1.35
Reno	Keystone Ave	McCarran to Jones St	2.12
Reno/Sparks	Kietzke Ln	S McCarran Boulevard to Victorian Avenue	3.26
Sparks	Kings Row	N McCarran Boulevard to Keystone Avenue	1.04
Reno	Las Brisas Blvd	N McCarran Boulevard to Silverado Creek Drive	2.39
Reno	McCarran Blvd	4th to Clear Acre	7.90
Reno	McCarran Blvd	Lakeside to 4th	1.75
Reno/Sparks	McCarran Boulevard	Clear Ave Lane to Mill Street	6.26
Reno	Mill St	E McCarran Boulevard to Lake Street	4.26

Reno	Mira Loma Dr	S McCarran Boulevard to SE Connector	0.56
Reno	Neil Rd	S McCarran Boulevard to Gentry Way	1.01
Reno	Pembroke Dr	S McCarran Boulevard to SE Connector	2.47
Reno	Plumb Ln	S McCarran Boulevard to Watt Street	0.17
Reno	Prater Way	Pyramid Way to N McCarran Boulevard	1.04
Sparks	Pyramid Highway	McCarran Boulevard to Nugget Avenue	1.64
Reno/Sparks	Rock Boulevard	Prater Way to McCarran Boulevard	1.37
Sparks	Rock Boulevard	Victorian Avenue to S McCarran Boulevard	4.16
Reno	S Virginia St	Moran St to McCarran Blvd	0.57
Reno	S Virginia St	McCarran to Mt Rose Hwy	5.45
Reno	Sierra Highlands Dr	N McCarran Boulevard to Cassandra Way	0.33
Reno	Skyline Blvd	S McCarran Boulevard to Plumb Lane	4.19
Reno	Smithridge Dr	S McCarran Boulevard to E Peckham Lane	1.27
Reno	Talbot Ln	Sierra Rose Drive to 650 ft. S of S. McCarran Boulevard	0.13
Reno/Sparks	Wedekind Rd	Sutro to McCarran	1.86
Sparks	Wedekind Rd	McCarran to Pyramid	1.94

Jurisdiction	**Location**	**Limits**	**Improvements**	**Length (miles)**
Reno	Baring Boulevard	McCarran Boulevard to Vista Boulevard	Bike Lane	1.64
Reno	Evans Avenue	McCarran Boulevard to 9th Street	Bike Lane	1.14
Reno	Keystone Ave	McCarran Boulevard to Durango Court	Bike Lane	0.21
Reno	Kings Row	McCarran Boulevard to Keystone Avenue	Bike Lane	1.62
Reno	Lakeside Drive	Plumb Lane to McCarran Boulevard	Bike Lane	2.04
Sparks	Lincoln Way	McCarran Boulevard to Howard Drive	Bike Lane	0.18
Sparks	McCarran Boulevard	Greg Street to Prater Way	Sidewalks and Bike Lanes	1.48
Reno	N Virginia Street	Stead Boulevard to McCarran Boulevard	Bike lanes or Off-street shared-use path	6.28
Reno	N. McCarran Blvd	Sierra Highlands Drive to W 7th Street	Bike Lanes	0.62
Reno	N. McCarran Blvd	W. 7th Street to Kings Row	NB Bike Lanes	0.61
Sparks	N. McCarran Blvd	I-80 Interchange to Sierra Highlands Drive	NB Bike Lanes	0.26
Washoe County	Neil Road	McCarran Boulevard to Gentry Way	Bike Lanes	1.27
Sparks	Prater Way	Pyramid Way to McCarran Boulevard	Enhanced sidewalks and Bike Lanes	1.04
Reno	Prater Way	McCarran Boulevard to Vista Boulevard	Bike Lanes	1.61
Sparks	Rock Boulevard	Prater Way to McCarran Boulevard	Sidewalks and Bike Lanes	1.37

Complete Streets Master Plan

EXECUTIVE SUMMARY

E.1. What are Complete Streets?

Complete Streets are streets for everyone. They are designed and operated to enable safe access for all users. Pedestrians, bicyclists, motorists and transit riders of all ages and abilities must be able to safely move along and across a complete street. Complete Streets make it easy to cross the street, walk to shops, and bicycle to work. They allow buses to run on time and make it safe for people to walk to and from destinations. These elements are incorporated into the roadway design while at the same time allowing for safe, efficient movement of vehicular traffic.

E.2. Project Purpose

The purpose of the Complete Streets Master Plan is to identify the Regional Transportation Commission of Washoe County's (RTC) long range strategy for complete street treatments in the Reno-Sparks metropolitan area. This plan addresses:

- Safety,
- Traffic flow, and
- Connections for all modes of travel.

Although, this plan recognizes the need to ensure complete street improvements meet American's with Disability Act (ADA) Compliance, this plan is not intended as an ADA self-assessment or transition plan.

E.3. Project Overview

The Complete Streets Master Plan project includes five primary task assignments. The following is a brief description of the tasks associated with this project, with a more detailed description of each task in subsequent sections of this document.

- *Review Existing Reports and Data* – National complete streets guidance was reviewed along with complete streets reports and studies prepared by the RTC. A summary of these documents is provided within this report.
- *Level of Service Analysis* – A vehicular Level of Service (LOS) analysis was conducted at five unsignalized locations along roadways where a lane reduction complete street had been implemented and found minimal impact of lane reduction complete streets on side street vehicle turning movements.
- *Analysis for Complete Streets* – Potential locations for possible lane reduction complete streets were identified. The RTC input the locations of potential lane reduction complete streets into their Regional Transportation Demand Model to determine impacts to the surrounding road network, and modifications were made to the recommendations.
- *Agency and Community Outreach* – A Technical Advisory Committee (TAC) was formed to help guide the project and obtain feedback from agencies. Meetings were held throughout the project with the TAC committee to gain feedback on locations of existing complete streets, identify locations for the LOS, obtain input on the evaluation criteria, and review project recommendations. Four public meetings were held to inform the public on the progress of the project and obtain feedback on recommendations for complete street improvements.
- *Complete Streets Master Plan* – A Complete Streets Master Plan (this document) was developed summarizing the project components, and identifying a master plan for prioritized locations for consideration of complete streets.

E.4. Recommendations

Prioritized locations for complete streets were determined based on the results of the evaluation criteria, filling gaps in the network, and the identification of locations where lane reduction complete street projects could be considered. Comments received from the RTC, the Technical Advisory Committee (TAC) and the public were incorporated into the plan.

The recommendations identify priority locations where complete street improvements should be considered. Complete streets are not one-size-fits-all, rather they tend to be designed to meet the needs of the corridor and the community they serve. Depending upon the context and need of users, the complete street could include sidewalks, safer pedestrian crossings, bike lanes, wide outside lanes, median islands, narrower travel lanes, special transit amenities, and more. The context of the street is understood through deliberate analysis of travel conditions, including all modes, as well as stakeholder outreach throughout the community. Along corridors where lane reductions are recommended, existing access controls and future traffic volumes should be considered.

The complete street priority recommendations included in Figure E1 and Table E1 warrant further consideration with respect to feasibility of construction and the context and need of the users. It is recommended that the RTC conduct site specific corridor studies in instances where they have not been previously completed, to determine the appropriate complete streets treatments for each location. Complete street improvements are recommended to comply with the most current edition of the AASHTO Green Book, MUTCD, NACTO Urban Street Design Guide, ADA requirements, and/or local guidelines.

As the RTC moves forward with implementation of the project recommendations, the following items should be considered when evaluating corridors for complete street improvements:

- Give full consideration to the accommodation of the transportation needs of all users, regardless of age or ability, including those traveling by private vehicle, mass transit, foot, wheelchair, and bicycle.
- Investigate multiple treatment options, including conversion of a travel lane to a bike lane, and/or a parallel roadway if right-of-way is constrained on the proposed roadway.
- Solutions should be developed to fit within the context(s) of the community and those solutions should be flexible so that the needs of the corridor can be met.

As new development and redevelopment occur, it is recommended that adequate bicycle, pedestrian, and transit facilities be provided through the local jurisdiction's development process. In areas experiencing significant growth with respect to demand, project prioritization may be modified or revisited to address the changes in the area. Finally, the RTC is anticipated to partner with the local jurisdictions to increase transportation mode choices along corridors.

Road Name	**From**	**To**	**Complete Street Considerations for Further Review and Study**
North Virginia Street	Stead Boulevard	McCarran Boulevard	Sidewalks and bike lanes. An off-street shared-use path may be considered
Kings Row	McCarran Boulevard	Keystone Avenue	Bike lanes
4th Street (Sparks)	Prater Way	McCarran Boulevard	Bike lanes
Baring Boulevard	McCarran Boulevard	Vista Boulevard	Bike lanes
McCarran Boulevard	Greg Street	Prater Way	Sidewalks and bike lanes
Rock Boulevard	Prater Way	McCarran Boulevard	Enhanced sidewalks and bike lanes
Lakeside Drive	McCarran Boulevard	Plumb Lane	Bike lanes
Neil Road	McCarran Boulevard	Moana Lane	Bike lanes

3.2.6. Virginia Street Corridor Investment Plan (2013)

The *Virginia Street Corridor Investment Plan* investigated existing conditions, community assets, and opportunities on the Virginia Street Corridor from North McCarran Boulevard to Mt. Rose Highway. The study focused on identifying areas where mobility and accessibility could be well balanced. The recommendations of this plan include safety improvements between Maple Street and Liberty Street, Liberty Street and Plumb Lane, Plumb Lane and Patriot Boulevard, and between Patriot Boulevard and Mt. Rose Highway. Recommendations for multi-modal improvements encompassed the areas between North McCarran Boulevard and Maple Street, Liberty Street and Plumb Lane, and Patriot Boulevard and Mt. Rose Highway. Extension of RAPID transit service to the University of Nevada Reno (UNR) is currently under development including pedestrian enhancements in the Midtown District

A - North Virginia Street
From: Stead Boulevard
To: McCarran Boulevard
General Conditions/Observations:

- Vehicle Travel Lanes – varies from 1 lane each direction to 2 lanes each direction with TWLTL
- Sidewalks – Intermittent along the corridor
- Bike Lanes – None
- Transit – Yes
- Land Use – Parks, Multi-Family Housing, Single-Family Housing
- Other – A portion of the corridor is rural.

Complete Street Considerations for Further Review and Study: Consider providing sidewalks throughout the corridor (or other pedestrian facility) and accommodation for bike lanes. An off-street shared-use path may be considered.

F - Kings Row
From: McCarran Boulevard
To: Keystone Avenue
General Conditions/Observations:

- Vehicle Travel Lanes – 1 each direction with TWLTL
- Sidewalks – Existing
- Bike Lanes – None
- Transit – Yes
- Land Use – Single-Family Housing, schools, church, park
- Other – On-Street Parking

Complete Street Considerations for Further Review and Study: Consider providing accommodation for bike lanes.

J - 4th Street (Sparks)
From: Prater Way
To: McCarran Boulevard
General Conditions/Observations:

- Vehicle Travel Lanes – 1 each direction
- Sidewalks – Existing
- Bike Lanes – None
- Transit – Yes
- Land Use – Schools, Multi-Family Housing, Single-Family Housing
- Other – On-Street Parking

Complete Street Considerations for Further Review and Study: Consider providing accommodation for bike lanes.

K - Baring Boulevard
From: McCarran Boulevard
To: Vista Boulevard
General Conditions/Observations:

- Vehicle Travel Lanes – 2 each direction with raised medians with landscaping
- Sidewalks – Existing
- Bike Lanes – None
- Transit – Yes
- Land Use – Schools, Medial Facilities, Multi-Family Housing, Single-Family Housing

Complete Street Considerations for Further Review and Study: Consider providing accommodation for bike lanes.

R - McCarran Boulevard
From: Greg Street
To: Prater Way
General Conditions/Observations:

- Vehicle Travel Lanes – 3 each direction
- Sidewalks – Intermittent along the corridor
- Bike Lanes – Intermittent along the corridor
- Transit – No
- Land Use – Multi-Family Housing, Gas Stations, Interstate Interchange
- Other – Conditions and surrounding land use vary widely along the corridor

Complete Street Considerations for Further Review and Study: Consider providing sidewalks and accommodation for bike lanes along the entire corridor.

AG - Rock Boulevard
From: Prater Way
To: McCarran Boulevard
General Conditions/Observations:
§ Vehicle Travel Lanes – 2 each direction, some TWLTL, some raised/landscaped medians
§ Sidewalks – Existing
§ Bike Lanes – None
§ Transit – Yes
§ Land Use – Schools, Church, Single-Family Housing
Complete Street Considerations for Further Review and Study: Consider providing enhanced sidewalks and accommodation for bike lanes.

AK - Lakeside Drive
From: McCarran Boulevard
To: Plumb Lane
General Conditions/Observations:

- Vehicle Travel Lanes – Varies, 1 or 2 each direction
- Sidewalks – Existing
- Bike Lanes – None
- Transit – Yes
- Land Use – Parks, Multi-Family Housing, Single-Family Housing, On-street parking
- Other – Virginia Lake

Complete Street Considerations for Further Review and Study: Consider providing accommodation for bike lanes.

AM - Neil Road
From: McCarran Boulevard
To: Moana Lane
General Conditions/Observations:

- Vehicle Travel Lanes – 1 each direction with TWLTL
- Sidewalks – Existing
- Bike Lanes – Intermittent along the corridor
- Transit – Yes
- Land Use – Parks, Schools, Multi-Family Housing, Single-Family Housing, Church
- Other – On-Street Parking, Strip Mall

Complete Street Considerations for Further Review and Study: Consider providing accommodation for bike lanes throughout the corridor.

ADA Transition Plan

1 INTRODUCTION

1.1 NDOT MISSION

It is the Nevada Department of Transportation's (NDOT) mission to provide a better transportation system for Nevada through unified and dedicated efforts.

NDOT is committed to improving Nevada's quality of life by providing for a safe, efficient and accessible transportation system that is independently usable by a broad spectrum of users.

The following NDOT Americans with Disability Act Transition Plan (Transition Plan) is intended to serve as a guide to further the mission, vision, core values and goals of NDOT.

1.2 PURPOSE

The purpose of the following Transition Plan is to provide NDOT staff, state and local partners, and the citizens of Nevada, NDOT's policies, procedures, and practices to fulfill the requirements of Section 504 of the Rehabilitation Act of 1973 and Title II of the Americans with Disabilities Act of 1990. Additionally, this Transition Plan provides information about NDOT's efforts to ensure equal accessibility to NDOT programs and services as well as outlining how NDOT will transition from non-compliance to compliance with ADA for public rights of way accessibility.

1.3 BACKGROUND/REQUIREMENTS

1.3.1 Section 504 of the Rehabilitation Act of 1973

Section 504 of the Rehabilitation Act makes it illegal for the federal government, federal contractors and state and local governments receiving federal funds to discriminate on the basis of disability. It requires state and local governments ensure persons with disabilities have equal access to any programs, services or activities receiving federal funding. It also requires them to ensure their employment practices do not discriminate on the basis of disability.

1.3.2 Americans with Disabilities Act of 1990

The Americans with Disabilities Act (ADA) was signed into law in 1990. The ADA builds upon the requirements of Section 504 of the Rehabilitation Act and is an important civil rights legislation that prohibits discrimination against people on the basis of disability. This act ensures people with disabilities have equal rights and opportunities as able-bodied people. The ADA is comprised of the following five titles that cover different aspects of public life:

- Title I (Employment)
- Title II (State and Local Government)
- Title III (Public Accommodations)
- Title IV (Telecommunications)
- Title V (Miscellaneous Provisions)

The focus of this Transition Plan is Title II of the ADA which applies to state and local governments and the programs, services and activities they provide. As a State government, NDOT must ensure its programs, services and activities provided to the public are accessible to individuals with disabilities regardless of the source of funding. Under Title II, NDOT must meet the following requirements:

- Designate an ADA/Section 504 Coordinator responsible for coordinating NDOT's efforts to comply with and carry out its responsibilities under Title II
- Make available to applicants, participants, beneficiaries, and other interested parties information regarding Title II and its applicability to the services, programs or activities of NDOT (Notice to the Public)
- Complete a self-assessment of services, policies and practices on compliance with the requirements of Title II
- Adopt and publish a grievance procedure for complaints alleging any action that violates Title II
- Develop a Transition Plan to address how and when NDOT will correct the identified accessibility deficiencies

1.4 STATEMENT OF POLICY

The Nevada Department of Transportation (NDOT) is committed to full compliance with Title II of the Americans with Disabilities Act of 1990, Section 504 of the Rehabilitation Act of 1973 and all related regulations, laws, executive orders and directives.

The Deputy Director of Southern Nevada, Tracy Larkin-Thomason as the ultimate responsible person for Title II and Section 504 compliance, assures that no qualified individual with a disability shall, on the basis of disability, be excluded from participation in or be denied the benefits of the services, programs, or activities of a public entity, or be subjected to discrimination by any public entity.

https://ndot.maps.arcgis.com/home/

Keystone Avenue Corridor Study

Executive Summary

The Keystone Avenue Corridor Study identifies, evaluates, and recommends potential multimodal (vehicular, transit, pedestrian, and bicycle) transportation improvements along Keystone Avenue from California Avenue to North McCarran Boulevard in an effort to improve safety for all users of the corridor. The recommendations presented in the study will be included in the Regional Transportation Plan 2013-2035 for implementation.

Keystone Avenue is a mature corridor with two distinctive areas; 1) the southern segment between California Avenue and West 7th Street consists mostly of commercial businesses and shopping areas, 2) the northern segment from West 7th Street to North McCarran Boulevard is predominantly residential in nature. These two distinct areas have unique challenges and require different approaches to development of recommendations.

Public participation was a key aspect in the development of the study goals and selection of the recommended improvements. A technical advisory committee consisting of agency representatives, and a stakeholder working group consisting of residents, business owners, and advisory groups were assembled to guide and provide input on the alternatives. Four public meetings were held to present information gathered and solicit input regarding potential alternatives. Recommendations made for the Keystone Corridor draw from suggestions, ideas, and guidance provided from the representatives of these various groups and from members of the public.

Goals developed for the corridor are listed below.

- Improve pedestrian, ADA, bicycle safety, and connectivity to businesses, residences, and existing facilities.
- Balance improvements for all modes.
- Foster meaningful community participation for the entire corridor by reaching out to the public.
- Coordinate improvements with development and business needs.
- Identify logical and buildable phases of improvements to maintain progress over time.
- Improve aesthetics and user experience in the corridor.

Corridor issues were identified through the public outreach process, field investigations, traffic analyses, and with input from NDOT. A summary of issues identified for the corridor is provided in Chapter 4; however, the major issues identified are listed below.

- There are non-ADA compliant sidewalks and bus stops throughout the corridor.
- High crash rates exist at some intersections.
- Insufficient turn pocket storage exists at intersections.
- There are limited provisions for bicycles within the corridor.
- Multiple and closely spaced driveways at several locations.
- Speed and sight distance problems persist.
- Ensure accommodation of future traffic volumes.

Several alternatives were developed for different segments of the corridor to address the identified issues at that particular location. These alternatives were then shortlisted based on engineering analysis, information received from project stakeholders, and input gathered from members of the public to a recommended set of alternatives. Additional analysis to refine the alternatives occurred, and a final set of corridor recommendations was developed as described in Chapter 6.

From the complete menu of alternatives, a set of potential projects encompasses the recommended improvements within a particular segment of Keystone Avenue. A list of the recommended projects by segment is summarized in the table below. The table also includes a planning level cost estimate and a phasing category recommendation. These

projects should be implemented based on immediate needs and funding availability. Each recommendation is consistent with the Corridor Study's goals as well as the goals of the RTC's Regional Transportation Plan. The proposed set of recommended projects will provide solutions to many of the identified issues in the corridor and will lead to improved safety for all users including motorists, pedestrians, cyclists, and transit users regardless of their age or ability.

Summary of Recommended Projects

Project Description		
California Avenue to I-80	*Cost**	*Phasing Category*
California / Keystone Intersection Alternative F (Includes changes to the signalized intersection along with ADA ramp and bike improvements along California Ave.)	$ 1,000,000	Short-term
Jones Street to 4th Street access management and ADA improvements	$ 500,000	Short-term
Vine Street and Washington Street Bike Lanes	$ 500,000	Short-term
4th Street to I-80 Access Management, roadway and sidewalk reconstruction	$ 3,000,000	Mid-term
Replace the Keystone Avenue Bridge	$ 30,000,000	Long-term
Jones Street to 4th Street roadway and sidewalk improvements	$ 4,500,000	Long-term
I-80 SPUI re-construction	$ 6,500,000	Long-term
I-80 to McCarran Blvd		
W. 7th Street to Coleman Drive ADA and crosswalk improvements	$ 500,000	Short-term
Coleman Drive to McCarran Boulevard Safety Improvements	$ 500,000	Mid-term
W. 7th Street to Coleman Drive Complete Street roadway section, access management, and transit improvements	$ 5,000,000	Mid-term

**Costs rounded to the nearest $ 500,000*
See Chapter 6 for a full description of these projects.

1.1. Setting

Keystone Avenue is a unique and mature corridor that serves several residential areas and commercial centers in Reno, Nevada. Keystone Avenue, classified as an urban minor arterial in the Washoe County Roadway System, extends from California Avenue in the south to North McCarran Boulevard in the north. Figure 1-1 illustrates the location of Keystone Avenue in relation to the region. Interstate 80 (I-80) bisects Keystone Avenue. The land use along Keystone Avenue north of I-80 is predominantly residential whereas the land use south of I-80 is mostly commercial.

1.2. Corridor Study Limits

The focus of this corridor study is Keystone Avenue between California Avenue and Coleman Drive, approximately 1.8 miles in length, with some minor analysis extending to North McCarran Boulevard. Booth Street, Foster Drive, and California Avenue, located in the vicinity of Keystone Avenue, are also included. The study area corridor consists of:

- Keystone Avenue from California Avenue in the south to North McCarran Boulevard in the north
- California Avenue from Cherry Lane in the west to Newlands Circle in the east
- Booth Street from California Avenue in the south to Riverside Drive in the north (i.e., entire length of Booth Street)
- Foster Drive from Booth Street in the west to Keystone Avenue in the east

In order to develop and analyze alternatives, the corridor was divided into two distinct segments correlating with surrounding land uses. The southern segment is more commercial in nature. It begins at the intersection of Keystone Avenue / California Avenue and runs north to West 7th Street. The northern segment, consisting primarily of single-

family residential, begins at West 7th Street, includes the intersections of University Terrace, Kings Row, and Coleman Drive, and ends at North McCarran Boulevard.

Road Safety Audit Report – Keystone Avenue from 4th Street to California Avenue (April 2012) and Road Safety Audit Report – Keystone Avenue from 4th Street to North McCarran Boulevard (February 2014): NDOT conducted two separate road safety audits (RSA) for Keystone Avenue. The first one covered 4th Street to California Avenue and the second one covered 4th Street to North McCarran Boulevard. The RSAs identified potential road safety issues and recommended countermeasures to mitigate those safety issues for inclusion into future projects. Both RSAs are included in Appendix B, and their recommendations are included throughout this report in the appropriate sections. Improvements proposed in this corridor study incorporate recommendations from the RSAs.

West University Neighborhood Plan: The West University Neighborhood is bound by I-80 to the south, North McCarran Boulevard to the north, Keystone Avenue to the west, and Virginia Street to the east. The entire northern segment of Keystone Avenue lies adjacent to the West University Neighborhood. The neighborhood is mostly single family residential. Commercial properties are located within the "West 7th Street Business Corridor" (along W. 7th Street at and east of Keystone Avenue). The plan's vision includes a balanced neighborhood with safe and pleasant walking opportunities to most services and activities. Consistent with this vision, the plan encourages sidewalk improvements. The plan also has a section on traffic calming that discusses the need for a comprehensive approach to neighborhood traffic calming for residential areas west of Sierra Street.

It is also noteworthy to mention two planned developments/redevelopments with potential to impact travel demands along the corridor.

- A gaming property (hotel/casino) on the vacant land adjacent to Keystone Avenue between 5th Street and I-80 is planned. The development plans are currently on hold.
- A residential development (an apartment complex) at the Keystone Avenue / McCarran Boulevard intersection is proposed.

2.10.4. Road Safety Audits

As described in Section 2.1, two separate RSAs were conducted for Keystone Avenue (Appendix B). The first one, conducted in 2012, covered California Avenue to 4th Street. The second one, conducted in 2014, covered 4th Street to North McCarran Boulevard.

A summary of the crash data from the first RSA (California Avenue to 4th Street) is as follows:

- There were 54 total crashes during the three-year time-period of July 2008 to June 2011. There were 15 injury crashes and no fatalities. The overall crash rate was 3.70, which is higher than the year 2010 overall crash rate for the same functional class, and met the high crash location criteria.
- The predominant crash type was rear-end (26).
- Keystone Avenue / 4th Street intersection met the high crash location criteria with 45 intersection crashes within the same three-year time-period.

A summary of the crash data from the second RSA (4th Street to McCarran Boulevard) is as follows:

- There were 95 total crashes during the three-year time-period of June 2010 to June 2013. There were 38 injury crashes and no fatalities. The overall crash rate was 1.92, which is lower than the year 2011 overall crash rate for the same functional class.
- The predominant crash types were angle (37) and rear-end (24).
- Keystone Avenue/4th Street intersection once again met the high crash location criteria with 32 intersection crashes; however, this is significantly lower than the 45 crashes that occurred in the previous three-year period

evaluated in the first RSA. The gas station on the southwest corner of the intersection has been closed since the first RSA; the decrease in the number of crashes are likely attributable to this closure.

- **Keystone Avenue Coleman Drive to McCarran Boulevard:**
    - Issue: There is a designated bike lane that begins just north of Peavine Road. The first 250 feet is located from the curb and gutter to the shoulder stripe, roughly five feet in width. This section was observed with parked vehicles in the bike lane.
    - Recommendation: Add No Parking signs to the first 250 feet of the bike lane north of Peavine Road.
    - Issue: The first traffic calming chicane north of Peavine Road blocks the northbound bike lane.
    - Recommendation: Reconfigure the chicane to allow for unimpeded bicycle flow through the traffic calming device.
    - Issue: There is no continuation of the bike lane south of Peavine Road, but there appears to be enough roadway width to have a bike lane striped for the northbound uphill section starting at Coleman Drive.
    - Recommendation: Add a bike lane on the northbound side and Share the Road signs for the southbound direction.
    - Issue: The pedestrian crossing at Putman Drive has school crossing signs that are not florescent yellow-green per the MUTCD. Also, the crossings are not lit at night.
    - Recommendation: Change the signs to yellow-green per the MUTCD. Add streetlights to the crossings.

- **Keystone Avenue / North McCarran Boulevard:**
    - Issue: A worm island to restrict left turn movements from Keystone Avenue onto North McCarran Boulevard was previously installed. The worm island does not extend beyond the left turn pocket median on North McCarran allowing for traffic from Keystone to proceed around the island and make the left turn onto North McCarran.
    - Recommendation: Coordinate with NDOT District II to extend the worm island in the east and west direction beyond the nose of the left turn islands.

Street	Location	Issues	Opportunities
Keystone	Coleman to McCarran	No bike lanes between Coleman and Peavine and cars park in the NB bike lane within the first 250 feet north of Peavine Road	Add a NB bike lane between Coleman and Peavine, add no parking signs, add share the road signs for the southbound direction.
Keystone	McCarran	The median island to restrict left turn onto McCarran is being ignored	Extend the island in the east and west direction beyond the nose of the left turn island.

5.2. Northern Segment

The northern segment of the Keystone Avenue corridor begins at W. 7th Street, runs through University Terrace and King Row, and ends at Coleman Drive. Also included in the northern segment is the section from Coleman Drive to McCarran Boulevard. Table 4-2 listed each issue identified along this segment. The major issue is pedestrian and bicyclist safety because of several factors, including:

- Lack of bicycle facilities
- Narrow sidewalks in poor condition with multiple obstructions directly adjacent to travel lanes
- Limited crosswalk options not connecting to sidewalks
- Poor sight distance
- Speeding due to the four-lane segment with low traffic volumes

These issues can be mitigated by developing several roadway section alternatives and other associated

improvements.

5.2.5. Keystone Avenue / Kings Row

Approximately 45 percent of the traffic on Keystone Avenue turns at Kings Row, as Kings Row provides access to many residential areas and provides direct connection with full movements to North McCarran Boulevard. A summary of issues identified for the Keystone Avenue / Kings Row intersection include:

- The existing crosswalk on the south leg does not connect to a sidewalk. The sidewalk along the eastern side of Keystone Avenue is missing between Kimbal Drive and Gear Street.
- There is inadequate left turn storage.
- The proximity and existing striping of Gear Street causes driver confusion.
- The sight distance when looking north is blocked by a freestanding decorative brick wall and turret. Because of the curved geometry of Keystone, this wall blocks the view of the right lane when looking north.
- There are no bicycle facilities through the intersection.
- For a three-lane Complete Street alternative, the LOS for the right-turn movement from Kings Row to southbound Keystone Avenue degrades to F during the AM peak hour.

6.1.3. Keystone Avenue Bridge

The Keystone Avenue Bridge over the Truckee River was constructed in 1966. The existing bridge is beginning to show signs of deterioration. Spawling and cracking is occurring at the piers and abutments, and rebar is exposed in a few locations. Based on NDOT''s bridge inspection reports (included in Appendix C), the bridge has a sufficiency rating of 28 out of 100 and is considered structurally deficient under NDOT bridge inspection criteria. Lastly, the existing bridge has no shoulders and does not provide accommodations for bicycles or pedestrians. The bridge has an estimated remaining life of nine years.

In 2011, the City of Reno submitted a project submittal application for replacement of the bridge to NDOT. No follow up action occurred. It is recommended that following this study, a more formal request be compiled that outlines what is envisioned, approximate costs, future needs, and the relationship of the Keystone Avenue Bridge to Booth Street and to the Truckee River Flood Project.

Any replacement structure proposed for the bridge should provide four travel lanes with additional width for bike lanes. The new bridge should also include sidewalks for pedestrian access. Figure 6-4 depicts a possible roadway section for the bridge. Providing accommodations for bicycles and pedestrians becomes critical when the adjacent Booth Street Bridge is replaced as part of the Flood Project. Since the existing Keystone Avenue Bridge cannot accommodate bikes and pedestrians, it is recommended that it be replaced prior to replacement of the Booth Street Bridge to avoid eliminating all cross-river access (Keystone Avenue / Booth Street are the only river crossings between McCarran Boulevard and Arlington Avenue).

6.2.2. Coleman Drive to North McCarran Boulevard Improvements

Recommendations for the segment along Keystone Avenue from Coleman Drive to North McCarran Boulevard stem directly from the recommendations outlined in the RSA performed by NDOT. The recommended improvements include:

- Place No Parking signs on the first 250 feet of the bike lane north of Peavine Road.
- Reconfigure the existing chicanes to allow for unimpeded bicycle flow through the traffic calming device.
- Add a bike lane on the northbound side with Share the Road signs and sharrows for the southbound direction.
- Replace the existing signs to yellow-green per the MUTCD and add streetlights to the crosswalks.

- Coordinate with NDOT District II at McCarran Boulevard to extend the worm island in the east and west direction beyond the nose of the left turn islands to prevent left turn and through traffic.

Location	*Recommended Improvements*	*Phasing Category*
Coleman Drive to McCarran Blvd	Implement recommendations from the NDOT RSA.	Mid-term
Keystone/McCarran Intersection	Coordinate with NDOT District II on median improvements.	Short-term

Project Description	*Cost*	*Phasing Category*
I-80 to McCarran Blvd		
W. 7th Street to Coleman Drive ADA and crosswalk improvements	$ 500,000	Short-term
Coleman Drive to McCarran Boulevard Safety Improvements	$ 500,000	Mid-term
W. 7th Street to Coleman Drive Complete Street roadway section, access management, and transit improvements	$ 5,000,000	Mid-term

Street	*Location*	*Issues*	*Resolution*
Keystone	Coleman to McCarran	No bike lanes between Coleman and Peavine and cars park in the NB bike lane within the first 250 feet north of	Add a northbound bike lane between Coleman and Peavine and install 'Share the Road' signs for the southbound direction. Install additional no parking signs.
Keystone	McCarran	The median island to restrict left turn onto McCarran is being ignored	NDOT is leading the effort to install an improved median island at this intersection.

Virginia Street Corridor Study

The Virginia Street Corridor Investment Plan identifies near term and long-term transportation improvements that will be made along Virginia Street from North McCarran Boulevard to Mount Rose Highway. These recommended improvements will be included in the Regional Transportation Plan 2013-2035 for implementation. The study follows a context sensitive approach that identifies:

- Decision-making process
- Virginia Street context, including geography and community values
- Vision and goals
- Area needs
- Investment plan

Decision making process. This approach is based on an extensive stakeholder involvement and public outreach process. The Regional Transportation Commission of Washoe County (RTC) partnered with the City of Reno, University of Nevada, Reno (UNR), local business owners, and community advocates to identify transportation investments and programs which will support the evolution of the Virginia Street Corridor into a Transit Oriented Development (TOD) Corridor. Through this process, the RTC solicited feedback from the community and acknowledges the benefits of their participation. Decisions made in this study draw on suggestions, advocacy, guidance, and engineering recommendations made through surveys and multiple public meetings. These decisions are further explained and consolidated in the following report.

Context. Five distinct areas are identified along the corridor: UNR, Downtown, Midtown, Convention Area, and South Reno Area. Recognition of the five distinct areas guided both the study process and the organization of this report. This allows the evaluation to focus on the uniqueness and distinct characteristics of each area. Strategies are identified to increase mobility and safety within the context of each area through existing conditions, community assets, and opportunities.

Vision and Goals. The Virginia Street corridor continues to evolve into a TOD Corridor. Large regional employers, whose employees make up the highest transit ridership in the RTC transit system, and the energy from the corridor's communities drive this evolution. The input generated through valuable discussions with stakeholders and the public helped identify the goals that support this vision of Virginia Street as a TOD Corridor. Transportation investments recommended in this study are based on the following goals:

- Make Virginia Street safe and inviting for all modes of transportation
- Improve UNR – Downtown – Midtown connectivity
- Provide transportation solutions that make Midtown a unique place to live and visit
- Enhance safety and improve accessibility for disabled users

Area Needs. This plan builds upon findings from previous studies and plans as well as the feasibility analysis of extending RAPID to UNR. Safety, parking, transit connectivity, roadway, pedestrian, and bicycle facilities were investigated along the corridor.

The issues identified along the corridor through multiple planning efforts, studies, and stakeholder and public input include:

- Efficient transit connectivity between UNR and other parts of the corridor
- Access to RAPID transit stations due to ADA deficiencies, narrow sidewalks, inadequate bicycle connectivity, lighting, and pedestrian amenities
- Safety concerns due to high vehicular speeds and low access management
- Parking availability in Midtown area

The common theme of increasing connectivity was also identified between the five areas. The purpose of making transportation investments in the Virginia Street Corridor and along the RAPID route is to provide solutions that address multiple transportation needs. The identified issues have been articulated into a formal purpose and need statement provided in Section 7 - Transit of this report.

Investment plan. The recommendations within this study are in accordance with the goals of the Regional Transportation Plan. This study addresses the identified needs by integrating all types of transportation and provides solutions that focus on corridor-wide connectivity. Proposed solutions listed below comply with complete streets2 design principles and are appropriate to the context of each area. These solutions enable the RTC and other stakeholders to design and construct streets that provide safe access and travel for all users, including pedestrians, bicyclists, motorists, and transit users of all ages and abilities.

Summary of Recommendations

no.	**Project**	**Description**	**Year of expenditure Cost $uS**
1	**extending RaPiD to unR** North mcCarran Boulevard to maple Street	Transit and multimodal improvements including the extension of the RAPId route, UNR gateway feature, transit signal priority, pedestrian facilities, lighting.	7,000,000
2	**Virginia Street** maple Street to Liberty Street	Safety enhancements including pedestrian ramps, striping, audible equipment for signal heads, traffic signal head back plates, signage.	150,000
3	**Virginia Street** Liberty Street to Plumb Lane	Phase I - Safety and multimodal Improvements including restriping, road diet, and improving side street bicycle connectivity, bicycle parking and wayfinding.	700,000
4	**Virginia Street** Liberty Street to Plumb Lane	Phase II – Road Reconstruction and multimodal improvements including sidewalk widening, streetscape improvements, lighting, safety enhancements.	16,500,000
5	**Virginia Street** Plumb Lane to Patriot Boulevard	Safety enhancements including striping, traffic signal modifications, signage, lighting, signal timing and intersection modifications.	900,000
6	**Transit** meadowood transit station	Improvement to existing meadowood mall station including bus loading bay expansion, additional shelters, restrooms, and outside seating and landscaping areas.	5,000,000

7	**Transit** meadowood transit station	Phase I - Safety and multimodal Improvements including road diet, restriping, multimodal lane, safety enhancement to Tamarack Junction, access management plan, and alternative evaluation of	15,500,000
8	**Virginia Street** Patriot Boulevard to mount Rose Highway	Phase II - Safety and multimodal Improvements including the construction of improvements recommended by access management plan, and	6,000,000

The Virginia Street corridor study area extends from McCarran Boulevard in the north to Mount Rose Highway in the south. Five distinct areas were identified along Virginia Street based on the characteristics of each area and the types of destinations. These areas are referred to as UNR, Downtown, Midtown, Convention Area, and South Reno. (**Figure1.1**). Major destinations located along Virginia Street within the study area include: UNR, Downtown, Midtown, Meadowood Mall, Reno-Sparks Convention Center, numerous hotels and casinos, and the University of Nevada, Reno Redfield Campus. Land uses within the corridor study area include hotel casinos, convention venues, retail, civic, and residential.

The intersections of North Virginia Street with North McCarran Boulevard and Sierra Street/Comstock Drive are planned to have capacity improvements within the Regional Transportation Improvement Program.

Virginia Street within the University of Nevada Reno (UNR) Area is located from Interstate 80 in the south to North McCarran Boulevard in the North. The *City of Reno Strategic Plan* of 2013 identifies “Make Reno a University Town” as one of the goals that would support the priority of “Promoting a Sustainable and Vibrant Economy in Reno” (City of Reno). Strong transit connections to colleges and universities are key elements of many other successful college communities, stemming from the low availability of vehicles to students and the benefits that transit can bring to busy activity centers such as university campuses.

Roadway and Safety. Virginia Street is also an important vehicular, pedestrian, and bicycle corridor in the Reno area’s roadway system. The roadway geometry consists of two undivided travel lanes in each direction and parking on both sides of the street. Vehicle volume on Virginia Street, based on NDOT 2012 traffic count data, ranges from 24,000 per day near the I-580 interchange to 8,700 per day just south of North McCarran Boulevard.

There were 141 total crashes registered on Virginia Street from North McCarran Boulevard to Maple Street (06/1/2009 to 5/31/2012). Of these crashes, four involved fatalities, 55 had injuries, 82 resulted in property damage, and 8 involved pedestrians. A UNR student conducted a study with data obtained from the City of Reno Police Department over the period of 2010 to 2013. Her analysis indicates that a total of 268 pedestrian and bicycle crashes were recorded in the roadway network within one-mile radius from UNR.

Route 7 (Stead) provides service every 30 minutes over a long service day (from roughly 5:00 am to 2:00 am). It serves the Virginia Street Corridor from Fourth Street Station to the north beyond North McCarran Parkway.

This is a high crash location with 39 total crashes 23 being rear end crashes. During UNR games, people use the intersection islands at Virginia Street and North McCarran as parking areas. This blocks sight distances for all the pedestrian crossings and some of the traffic movements. RTC has a planned project to redesign this intersection which will improve the islands and sight distances and approach angles.

Bicycle connectivity between UNR-Downtown-Midtown. Virginia Street is the primary facility used by vehicular traffic to enter the UNR campus via I-80 or McCarran Boulevard. Very few vehicles use Evans Avenue to enter campus. The

proposed concept uses arterials parallel to Virginia Street to improve bicycle connectivity between UNR, Downtown, and Midtown. This concept offers less friction with vehicular traffic than Virginia Street. The map shown in *Figure 2.13* indicates types of improvements on Evans Avenue and shows how the route is connected to Midtown and Downtown. The route is located less than one-fifth of a mile from Virginia Street in Downtown or approximately a one to two-minute bike ride assuming an average speed of five to ten miles per hour. The distance from Virginia Street is reduced where the route approaches Midtown. In areas where roadway width is available, the route will use paths or dedicated bicycle lanes. On narrow streets with less traffic, bicycles will share the road with the vehicular traffic. "Wayfinding" signs will be provided along the route indicating how to reach Virginia Street or other important destinations. (*Figure 2.14*)

The intersection of Virginia Street with South McCarran Boulevard is identified by the RSA as a high crash location with more than 30 crashes during the three-year period of study (*Figure 5.2*). There are a significant number of U-turn movements at this intersection by southbound drivers who are trying to access the northbound I-580 on-ramp just north of south McCarran Boulevard. The recently opened northbound onramp from the extension of Meadowood Mall Way provides a nearby access to I-580 for southbound drivers on Virginia Street.

The northbound shared right through lane on Virginia Street approaching south McCarran Boulevard allows right turn access to eastbound South McCarran Boulevard and access to the I-580 northbound on-ramp. Many drivers are confused by this multi-purpose lane and assume that it does not provide access to I-580 because it appears to be a long right turn lane to south McCarran Boulevard.

Other deficiencies that might impact safety include lane and signal head alignments, street lighting, and roadway signing and marking.

This intersection is identified as a high crash location. The U-turns being made by southbound drivers from the left turn lane conflict with the westbound to northbound right turn on red movements from So. McCarran Boulevard. The drivers making the U-turns are trying to access the northbound I-580 on-ramp just north of So. McCarran Boulevard. The recently opened northbound on-ramp from the extension of Meadowood Mall Way provides a nearby access to I-580 for southbound drivers on Virginia Street.

The number 4 northbound through lane allows right turn access to eastbound South McCarran Boulevard and access to the I-580 northbound on-ramp. Many drivers are confused by multipurpose of this lane and assume that it does not provide access to I-580 because it physically appears to be a long right turn lane to South McCarran Boulevard.

Note: There were 136 angle crashes between Kietzke Lane and North McCarran Boulevard. This section of the roadway has numerous driveways, unsignalized side street which contribute to angle crashes.

2. Multimodal improvements from the I-80 bridge to North McCarran Boulevard including:

- Provide a Gateway feature
- Bring infrastructure up to ADA standards
- Provide pedestrian facilities including a pedestrian control device
- Improve lighting

1. Extend current RAPID service to UNR and provide multimodal Improvements from North McCarran Boulevard to Mapple Street including a gateway feature, a roundabout, bringing infrastructure up to ADA standards, pedestrian facilities, and lighting.

- Stations: approximately a half mile apart located at Manzanita Hall and Lawlor building.

- Alignment: RAPID buses would exit the Fourth Street Station; head north on Evans Avenue, west on 9th Street and then north on Virginia Street. A roundabout just north of the Lawlor stop will serve as an area for the buses to turn around. The overall length of the extended route will be 1.8 miles or 3.6 miles round-trip.
- Guideway: The RAPID will operate in mixed traffic lanes from the 4th Street transit station to the terminus in both directions.

UNR Campus Master Plan

Vision

Since its last campus master plan in 2004, the University of Nevada, Reno (UNR) has added nearly 5,000 student headcount (HC) and enrollment as of fall 2014 was approximately 20,000 students. The University foresees continued growth and expects to eclipse 22,000-student HC within the next few years. Other dynamic changes are underway as the University reinforces its role in the economic and civic life of the City of Reno. The University's expansion south to Interstate 80 (I-80) will create a vital campus mixed-use precinct and will serve as a catalyst to development south of I-80 and to the regeneration of Downtown Reno.

This document comprises UNR's Campus Master Plan (CMP) and the City of Reno's University Regional Center Plan (URCP). The URCP encompasses lands owned by the Board of Regents on behalf of the University of Nevada, Reno and the University District consisting of several blocks north of I-80 and land south of I-80 within the URCP boundary.

The CMP and URCP result from a twelve-month process that engaged a broad range of public, private, community, and institutional stakeholders. The University, the City of Reno, and the Regional Transportation Commission (RTC) each contributed funding to this process. Each recognized that a coordinated strategy would leverage the greatest benefits to the University, the city, and the region.

UNIVERSITY, CITY OF RENO, AND THE REGION

The region and the City of Reno are experiencing economic recovery after the significant recession that began in 2008. Since then, the gaming industry in Downtown Reno has declined. Civic leaders recognize that the local and regional economy must be diversified and stabilized. They look to the University as a key instrument in this recovery.

Two recent studies share this strategy. In 2012, IBM selected Reno as one of 33 cities worldwide to receive a Smarter Cities Challenge as part of IBM's citizenship efforts to build a Smarter Planet. And, in 2013, Reno served as a case study for the Mayor's Institute on City Design. The IBM report found that the region needed to efficiently apply and use its community assets, such as the University, to strengthen the economy. The study stated, "Entities should work together to develop a common, integrated regional economic development strategy, founded on principles of collaboration and joint success."

The Mayor's Institute report built upon the IBM study citing the role of urban design in aiding the University and the City of Reno to reestablish its town-gown relationship and to foster a high-quality environment between the University and Downtown Reno. It encouraged the University to invest off-campus to create urban micro areas that contain housing, academic and research space, and urban amenities with an integrated transportation system as a key element in this strategy.

The City of Reno and the RTC have embraced these findings by encouraging the University to build south to I-80 and to use the University's physical and intellectual proximity to catalyze development south of the freeway to the Downtown. As a result of the campus master plan process, the RTC has shared and refined its plans for the extension of the Rapid bus transit system and enhancements for bicyclists.

UNIVERSITY STRATEGIC PLAN 2015-2021

While preparing the Campus Master Plan (CMP), the University prepared the UNR Strategic Plan (UNRSP) 2015–2021. This timing provided a unique opportunity to freshly align the CMP with the UNRSP.

The University of Nevada, Reno's vision is to educate and graduate the best prepared leaders for the state, national and global community; to be the nexus for research and creativity that focuses on the vital issues of our time; and to serve as a catalyst and resource for betterment of our society.

Values

In all of its activities, the University is guided by the following values:

- *Excellence* in all of our endeavors.
- *Integrity* in all our actions.
- *Inclusiveness* of diverse cultures and identities.
- *Collaboration* between disciplines and programs and with community partners and stakeholders.

Strategic Responses

In the 2013 self-study document prepared for the Northwest Commission on Colleges and Universities (NWCCU), the University identified three "core themes" for its broad mission. The Strategic Plan restates these as Learning, Discovery, and Engagement, a critical component of the University's broad mission. Within each of these themes the Strategic Plan establishes goals, action items, and metrics for measuring progress.

The Strategic Plan also commits the University to steward its resources, both human and physical, to support the fulfillment of the University's Mission.

Theme 1—Learning
Prepare graduates to compete globally through high-quality undergraduate and graduate degree programs in the liberal arts, sciences, and selected professional programs.

Theme 2 —Discovery
Create new knowledge through basic and applied research, scholarship, and artistry in strategically selected fields relevant to Nevada and its role in the wider world.

Theme 3—Engagement
Strengthen the social, economic, and environmental wellbeing of Nevada citizens, communities, organizations, and governments through community outreach and reciprocal partnerships.

CAMPUS MASTER PLAN

The ten-year campus master plan (CMP) identifies improvements to the campus to create a vibrant, pedestrian-friendly campus to serve 22,000 students (HC) and to set a framework to guide campus development in the long-term, including:

- Long-term expansion of research facilities and the School of Medicine
- Expansion of physical fitness facilities and fields west and east of Evans Avenue to meet the athletic, recreation, and physical education needs of the students, faculty, staff, and alumni
- Expansion of engineering research facilities and renovation of existing engineering and science facilities
- Improvements to the indoor and outdoor learning and research environments in the campus Mid and South precincts
- Continued infill (new, replacement, and repurposed facilities) for academic and research uses
- Enhancements to key University entrances, including landscape treatments, signage, and lighting, along North Virginia Street and Evans Avenue.
- Continued interest in the nearby Washoe County School District property as a key land acquisition

- Creation at the southern boundary of the campus, the Campus Gateway Precinct—a mix of campus community-serving uses with a welcoming program for the broader Reno community. This area would include: University housing, academic space, University innovation and research partnership opportunities, student amenities, and vibrant streets and public spaces. It is one of the first steps to catalyze the revitalization of the land between I-80 and Downtown Reno.

A key goal of the campus master plan is to emulate early planning at the University clearly seen in the campus's historic precinct--the tree-lined quad flanked by academic buildings, administrative offices, and student residences. It was the mixed-use precinct of its time that gave equal importance to the University's buildings and open space system. To this end, the CMP encourages the University to reinvest in its outdoor spaces by increasing the campus tree cover and enhancing the pedestrian environment. This should be the underpinning of all campus improvements.

UNIVERSITY REGIONAL CENTER PLAN

The University Regional Center Plan (URCP) replaces in its entirety the University of Nevada Reno Regional Center Plan (UNRRCP), adopted by City Council April 27, 2005 and amended September 23, 2009. The URCP shifts the current regional center plan eastern boundary west and the southern boundary south toward Downtown Reno.

The URCP contains policies for planning, land use, streetscape, urban design, circulation, and public-rights-of-way. It proposes a University Sphere of Influence to establish the intent of the City of Reno to encourage University and University-associated or -induced uses well beyond the boundaries of the URCP.

THE UNIVERSITY DISTRICT

The URCP identifies the University District as an area generally inscribed by 9th Street to Downtown Reno, bounded in most part by North Virginia Street and Evans Avenue. The goal is to catalyze this area with University-induced uses to create a vibrant safe and secure mixed-use neighborhood—the missing "town" in the town-gown relationship of the University and the City of Reno. The University District will contain a mix of uses to create a vital, pedestrian-oriented, and economic generator for the City of Reno, including:

- Residential uses including apartments, stacked townhouses and condominiums, and live/work spaces
- Innovation and research including co-worker, maker, start-up, incubator/accelerator spaces
- Commercial space including office, light industrial, retail, and grocery store
- Community-serving uses including school(s), child care, public spaces (parks), and shared parking
- North Virginia Street and Evans Avenue corridors connecting from the campus to the Downtown; North Virginia Main Street Corridor (1) fronted by active ground-floor uses including retail and commercial, and the Evans Innovation Corridor (2) fronted by active innovation and research uses

THE CAMPUS GATEWAY PRECINCT

The Campus Gateway is a new precinct for the University as it expands to I-80. It is a subarea within the University District identified for a mix of University uses and a multimodal stop for the Rapid bus transit, shuttles, and bicyclists.

CREATING AN INTELLECTUAL, SOCIAL, AND CULTURAL FRAMEWORK

The University is a collegial community interconnected in its mission to gather, create, and distribute knowledge. The ideal goal of campus planning and design is to create a physical vision that fosters an intellectual, social, and cultural environment to uniquely promote an institution's academic, research, and community mission. Campus master plans do this by addressing the unique character of each campus through its setting, its daily and civic functions, and by its shared identity—all bound by institutional purpose and culture. Properly conceived and nurtured, the vision of UNR's

Campus Master Plan will promote a strong sense of place—a sense of belonging to UNR for current and future generations.

The CMP is both visionary and functional. It presents a framework of growth. This plan is a guide to the University. It displays the manifestation of the University's program based on its core values, mission, and goals. The plan allocates land uses and facilities to create beneficial synergies today and into the future. While the plan identifies where to best locate new development to address near-term needs, it also sets aside land, by designation, for future uses. It integrates a system-wide approach to transportation, and identifies key elements to set into motion the University's expansion south to I-80 and the catalytic benefits it can use to influence the revitalization of land south of the freeway.

As a plan to guide and be stewarded by the University, the CMP strongly recommends that the University establish a campus master and strategic plan review committee to oversee campus development. This committee will ensure that future projects benefit both the campus and the project users. This process should report directly to the University's leadership.

Campuses change. UNR must inevitably respond to changing demographics, funding, and unforeseen events. Change within a shared physical vision will enhance the University's identity, maximize its resources, and effectively direct its investments to benefit current and future generations.

Evans Avenue would also undergo changes to facilitate pedestrians and bicyclists. Over the near-term, RTC plans to eliminate street parking north of Jodi Drive. The CMP adds protected bicycle lanes in each direction between Jodi Drive and 9th Street with bicycle lanes connecting to Downtown. Evans Avenue would continue to provide one travel lane in each direction. Curbside parking would be eliminated on the entirety of the roadway between 9th Street and North McCarran Boulevard.

Distributing vehicles through the street network

Although CMP concepts for the Gateway District and North Virginia Street work for normal peak conditions, the reduced capacity could slightly constrain special event traffic entering from the southeast, including traffic from UNR's main exit off I-80. However, there is adequate capacity in the overall road network. Freeway signage can direct drivers on Highway 395 and westbound I-80 to approach the campus via 395's McCarran Boulevard exit, entering the northern campus parking facilities via Evans Avenue and North Virginia Street.

North Virginia Street and Evans Avenue can also function temporarily as one-way streets traveling in the peak directions for pre-game and post-game traffic flows. All of these changes will reduce traffic volumes on North Virginia Street, ensuring that the conceptual capacity built around the everyday peak is also adequate for special events.

PLAN ORGANIZATION

URCP Boundary

The URCP boundary is shown in the accompanying map. This boundary modifies the 2009 UNRRCP boundary by shifting its eastern boundary west towards the UNR campus and shifting its southern boundary towards the Downtown.

Generally, the boundary is:

- *North* – McCarran Boulevard
- *South* – West Fifth Street between West Street and Lake Street and the railroad tracks between Lake Street and Valley Road
- *West* – North Sierra Street between McCarran Boulevard and West 7th Street (excluding certain residential parcels east of Sierra between Hillside and College); West 7th street to North Virginia, North Virginia to West

5th Street, West 5th to Lake Street, Lake Street to 3rd Street (ReTrac), 3rd Street (ReTrac) to Evans Avenue, Evans Avenue to 4th, 4th to Valley Road (less the northwest corner parcels)

- *East* – Valley Road between McCarran Boulevard and Sadlier Way; North Wells Avenue between Sadlier Way and I-80, and Valley Road between I-80 and the railroad tracks

Circulation Concept

Access will be provided through an integrated vehicular, transit, bicycle, and pedestrian system. The major north-south circulation system will be on North Virginia Street and Evans Avenue. A multi-use path will be constructed on the east side of Evans Avenue between McCarran Boulevard and Jodi Drive, a bicycle climbing lane and sharrows will be installed from Jodi Drive to approximately 9th Street, and bike lanes on both sides of the street will be added between 9th Street and 4th Street.

McCarran & Keystone Intersection RSA

Road Safety Assessment Report
McCarran Blvd @ Keystone Ave/Leadership Parkway Intersection
Reno, Nevada

Introduction

The Safety Engineering Section received a request by District 2 Traffic on January 10, 2008, for a Road Safety Audit (Appendix 1) of McCarran Blvd @ Keystone Ave Intersection. Because the subject intersection is not identified as a high crash location, a Road Safety Assessment was performed instead. The purpose was to identify potential road safety hazards on Keystone Ave and Leadership Parkway approaches and recommend countermeasures to mitigate those safety hazards.

Objectives

- Identify potential road safety hazards on intersection approaches
- From a road user's viewpoint, identify confusing and/or misleading messages.

The daytime field review on February 25, 2008, was attended by:

- Jaime Tuddao.....NDOT Safety Engineering
- Dave Partee.....NDOT Traffic Engineering
- Mike Fuess.....NDOT District 2
- Ken Mammen.....NDOT Roadway Design
- Jacob Ludel.....NDOT District 2

The nighttime field review on February 25, 2008 was attended by:

- Jaime Tuddao.....NDOT Safety Engineering
- Mike Fuess.....NDOT District 2

Intersection General Roadway Features

- This intersection is unsignalized. It is a dual location and situated on top of a vertical crest curve. McCarran Blvd is the major roadway (east to west), Keystone Ave. on the south leg and Leadership Parkway on the north leg as shown in Photo 1.
- McCarran Blvd is a four-lane divided roadway with concrete/asphalt filled Median Island, also shown in Photo 1. There are turn outs/cross overs every about half a mile along McCarran Blvd.
- Leadership Parkway was constructed in preparation for the future development on the north side of McCarran Blvd. This newly constructed roadway is linked to Victory Lane about one fourth mile west of the subject intersection. Observations show no traffic on Leadership Parkway.
- Subject intersection did not meet the warrants for a traffic signal as shown in Appendix 2. Per NDOT Traffic Information Division, the traffic volume on McCarran Blvd and Keystone Ave have decreased by 6% and 18 % from 2006 to 2007 respectively.
- The posted speed limit of 50 MPH along the McCarran Blvd appears to be appropriate.
- Subject intersection is not identified as a high crash location. There were thirteen (13) roadway crashes that occurred on this intersection during the three-year study period (January 1, 2004 to December 31, 2006), eight (8) were injury crashes and no fatal crash. The crash data also shows no pedestrian/bicycle crashes, and out of the eight (8) injury crashes, five (5) were angle crashes. This intersection has no record of crashes in 2007.
- During the field review, there was no pedestrian or bicyclist crossing the McCarran Blvd from Keystone Ave to Leadership Parkway or vice versa.
- As observed during the afternoon field review, motorists on Keystone Ave turning onto McCarran Blvd during afternoon peak hours have difficulty finding gaps.
- The subject mentioned intersection has no deceleration and acceleration lanes.
- A northbound vehicle on Keystone Ave turning left onto McCarran Blvd has mini- mum sight distance in the direction of any eastbound vehicles as shown in Photo 2.
- There is no street name sign on the existing advance intersection warning sign on McCarran Blvd (eastbound and westbound) as shown on Photo 3.
- There are overgrown shrubs on the south west corner of the intersection.
- Some pavement markings and striping are faded and retro-reflective intensity at night is diminished.
- Although there is overhead lighting (on the northeast corner and the southeast corner), the illumination appears to be inadequate.

To improve the road safety on this intersection, the following are recommended:

1. Since the subject intersection is not identified as high crash location and no record of crashes in 2007, and the traffic volume is reduced, we recommend monitoring this intersection for crash trend.

Another option is to install a concrete Median Island at the intersection (along McCarran Blvd) for Right in /Right out, to reduce the potential angle crashes. The Right in/Right out would improve the Level of Service (LOS) on this intersection due to decrease delay. The Right in/Right out is a temporary measure until a Traffic Signal or Roundabout is warranted and the fund becomes available.

Action: District 2 Traffic for Right in/Right out Median Island.

1. Restripe the shoulder for the right turn lane on eastbound right (McCarran Blvd) onto Keystone Ave.
Action: District 2 Traffic and District 2 Maintenance.

Remove the existing advance warning intersection sign and Install a street name sign.
Action: District 2 Traffic and District 2 Maintenance.

1. *Restripe the existing striping and pavement markings in accordance with the NDOT Plans for Road and Bridge Construction, 2007*
   Action: District 2 Traffic and District 2 Maintenance

1. *Trim the overgrown shrubs along McCarran Blvd on the southwest corner of the intersection.*
   Action: District 2 Traffic and District 2 Maintenance

1. *Install additional overhead lightings.*
   Action: Roadway Design is requested to look into the feasibility of adding overhead lightings on this intersection in the on-going 3/R project.

1. *Extend the westbound left storage lane for improve visibility and sight distance (if Right in/Right out will not be installed).*
   Action: Roadway Design is requested to look into the feasibility of extending the westbound left storage lane in the on-going 3/R project.

8. Request Roadway Design to reflect the above safety improvements such as pavement markings in the on- going 3/R project.

McCarran & Sutro Intersection RSA

Introduction

The NDOT Safety Engineering Section received a request from the Tamarack Junction Casino Project Manager on February 9, 2011, (Appendix 1), for a site assessment of the junction of SR 430 (South Virginia Street) at Tamarack Junction Casino. Also, NDOT District 2 requested a similar field review on SR 659, McCarran Boulevard at Sutro Street due to the recent pedestrian fatal crash that occurred at that intersection.

In response to the above requests, an interdisciplinary, independent safety team was organized for a Road Safety Assessment (RSA) on the locations. An RSA was performed on March 22, 2011.

Scope of Road Safety Reassessment

The team conducted a Road Safety Assessment at the junction of the Tamarack Junction Casino on South Virginia Street (SR 430) and on SR 659, McCarran Boulevard at the Sutro Street intersection. The team recognizes that compliance with design standards does not necessarily result in an optimally safe road design and that the failure to comply with standards does not necessarily result in an unsafe design. The goal of this Road Safety Assessment was to identify potential road safety issues and identify opportunities for improvements in safety for all road users. However, the Road Safety Assessment was not intended as a replacement for design quality control or standard compliance checks, a traffic impact or safety impact study, a road safety inventory program, or a traffic safety modeling effort. Nor was the Road Safety Assessment intended as a means of evaluating design work, checking compliance with standards, investigating crashes, or providing a safety review. Instead, the team strived to look at safety issues from a different perspective and develop recommendations for potential safety enhancement.

Objectives

- Identify existing and potential road safety issues.
- From a road user's viewpoint, identify confusing and/or misleading messages.

The following personnel attended the briefing meeting on March 22, 2011 at 2:00 P.M.:

- Kurt Dietrich ..... City of Reno
- Wes Myers .....Reno Police Dept - Traffic
- Chris Waddle .....Reno Police Dept – Traffic
- Jason Peard .....NDOT District 2 Maintenance
- Jason Marty.....NDOT District 2 Maintenance
- Anita Lyday .....NDOT District 2 Traffic
- John Eiche.....NDOT Roadway Design
- Jaime Tuddao.....NDOT Safety Engineering

Paul Solaegui from SOLAEGUI ENGINEERS LTD gave a brief presentation on the various elements of their improvement project on Virginia Street at Tamarack Junction Casino and Kurt Dietrich from City of Reno briefly discussed the safety issues on McCarran Boulevard at Sutro intersection.

A compilation of the observations and recommendations from the March 22, 2011 field reviews and debriefing meeting follows. Team observations are noted as bulleted items and *recommendations are noted in bold italics.*

Priority 1 - is defined as those improvements that can be done in the immediate future by NDOT District 2 staff.

Priority 2 - is defined as those improvements that can be done when funding becomes available or could be considered in the next scheduled 3R preservation project.

Recommendations are only one method of mitigation presented by the RSA team for discussion, other mitigation strategies can and should be explored by the Design Team wherever possible during the project contract preparation.

General Roadway Features: SR 430, South Virginia Street at Tamarack Junction Casino:

- The functional classification of SR 430 on this subject road segment is *Other Principal Arterial*.
- The Annual Average Daily Traffic (AADT) has decreased from 17,000 AADT in 2007 to 15,500 AADT in 2009.
- The speed limit is 50 MPH.
- Tamarack Junction Casino has two approaches to So. Virginia Street (SR 430), the south and north approaches as shown in Appendix 1. The north approach is the casino main entrance and exit, while the south approach is normally closed and used only for emergency purposes.
- There were a total 4 crashes that occurred at the north approach junction of the casino for the three (3) year study period from December 31, 2007 to January 1, 2011. Three were angle crashes and one a non collision crash involving a bicyclist. Out of the 4 crashes, two were fatal crashes. One fatal crash was northbound turning left towards the casino entrance (entering the casino north approach) while the other fatal crash was eastbound from the casino exit turning left into So. Virginia Street northbound (exiting the casino north approach). The fatal crashes occurred in April 2010 and August 2010 respectively.

Observations at the junction of SR 430 (Virginia Street) and Tamarack Junction Casino North Approach

- This north approach junction of So. Virginia Street at the Tamarack Junction Casino is an undivided multilane arterial with three (3) general purpose lanes in each direction and center Two Way left Turn (TWLT) as shown in Photo 1–travelling southbound). The road shoulder is about 8 ft to 10 ft.
    - The casino north approach is about 1400 ft south of the Damonte Ranch Parkway which is a signalized intersection.
    - The traffic movement count (by SOLAEGUI ENGINEERS LTD) conducted on January 6, 2011, shows 763 PM Peak Hour (PPH) volume southbound and 476 northbound. It was also noted that the eastbound right traffic volume at the intersection of Damonte Ranch Parkway is 60 vehicles which is in addition to the traffic volume in the southbound direction.
    - The RSA team noted no sight distance issues for vehicular traffic coming in or going out the casino north approach. However, the RSA team speculates that “wait for gaps in traffic” may be an issue due to the volume of through traffic, especially for motorist departing from the casino north approach towards So. Virginia Street northbound crossing four lanes of roadway and road shoulder.

- There were no pedestrians crossing during the time of the field reviews.
- The nighttime field review revealed a dim spot at the entrance of the casino north approach.
- The retro reflectivity of the road pavement markings and signage on this road segment of So. Virginia Street appears to be adequate.
- The team focused their discussion on various options to address the safety issues and thereby reducing potential crashes at this intersection. The *options* are the following:
    1. Right in/right out with a raised median island on So. Virginia Street from Damonte Ranch Parkway intersection to south of the Tamarack Junction Casino south approach. This will entail constructing a pork chop concrete raised island at the casino north approach.
    2. Right in/right out and left in also with raised median island from the Damonte Ranch Parkway intersection to south of the Tamarack Junction Casino south approach.
    3. High Tee along So. Virginia Street at the junction of the casino north or south approach.
    4. Over Head Flashing Yellow Beacon – suggested by SOLAEGUI ENGINEERS LTD.
    5. Intersection advance warning sign with a flashing beacon mounted on top of the sign. This was also suggested by SOLAEGUI ENGINEERS LTD.

- The positive benefits and negative outcomes of the above options are the following:

1. *Right in/right out* with raised median island on So. Virginia Street from Damonte Ranch Parkway intersection to south of the Tamarack Junction Casino south approach. This will entail constructing a pork chop concrete raised island on casino north approach.
   Positive benefit:
    - Significantly reduce traffic conflicts (motorists entering/exiting the Tamarack Junction Casino will be turning right in/right out only) and thus reducing number and severity of angle crashes.

   Constraints:
    - It requires a study to determine a feasible/acceptable route for a U-turn at the south of the casino approach. ***Note:*** Northbound traffic volume (PPH) is 476 while the southbound traffic volume is 765.
    - Motorists exiting the casino from the north approach and desiring to go on northbound on So. Virginia Street will have to make a U-turn at the end of the proposed raised median island. Likewise, motorists wishing to enter the casino from the northbound direction will have to make a U-turn at the intersection of Damonte Ranch Parkway.
    - Requires additional overhead lighting.
    - Other business approaches north of Tamarack Junction Casino such as Hawk's Nest Bar may be affected.

2. *Right in/right out and left in* - also with raised median island from Damonte Ranch Parkway intersection to south of the Tamarack Junction Casino south approach.
   Positive benefits:
    - It allows the northbound motorists to turn left and enter the casino north approach from the median island instead of making a U-turn at the Damonte Ranch Parkway intersection.

Constraints:
    - It does not address the conflict of the northbound left turn motorists with the southbound motorists at the junction of the casino north approach. Please note there was one fatal crash that occurred at this junction turning left from the TWLT lane.

- Motorist exiting the casino from the north approach and desiring to go northbound on So. Virginia Street will have to make a U-turn at the end of the proposed raised median island.
- Requires additional overhead lighting.
- Other business approaches north of Tamarack Junction Casino such as Hawk's Nest Bar may be affected.

3. *High Tee along So. Virginia Street at the junction of the casino north or south approach.*
   Positive benefits:
   - It allows the motorist to use the median lane as an acceleration lane to safely merge on northbound direction.

   Constraints:
   - It does not address the angle crashes.
   - Crash data shows no sideswipe crashes.
   - It requires more overhead lighting.
   - It may impact the nearby Damonte Ranch Parkway intersection northbound approach due to the required acceleration lane length.

4. *Over Head Flashing Yellow Beacon*
   Positive benefits:
   - Enhancement. It provides extra awareness to through traffic (southbound and northbound directions) that vehicles are entering when flashing.

Constraints:
   - Flashing Yellow Beacon is not usually used on business approaches. It is used if warranted at stop-controlled street intersections. Moreover, there is already an existing large business sign (Photo 2) that is very visible to motorists.
   - It does not positively address the angle crashes.
   - It may be misinterpreted as indicating an all way stop at locations where there is actually only a one-way stop (at the business approach), thereby causing motorists on through traffic to suddenly stop and thereby cause rear end crashes. Likewise, the motorists on the business approach may tend to pull out in front of approaching vehicles because they assume those vehicles would stop.

5. *Intersection advance warning sign (W2-2) with flashing beacon mounted on top of the sign.*
   Positive benefits:
   - It *may* provide an advance warning to the through traffic (southbound and northbound directions) to indicate a business approach.

   Constraints:
   - An intersection advance warning sign is usually used in advance of an intersection but not on a business approach. One of the reasons for the intersection advance warning sign is to inform motorists of the upcoming intersection and the possibility of turning into the intersection cross street. However, a large business sign (Photo 2) already existing and it is very visible to the motorists and works rather than using an advance warning sign.
   - It does not positively address the angle crashes.
   - There is a tendency that a flashing beacon may be ignored by motorists due to its continuous flashing. If the flashing beacon is an activated type, it may be misinterpreted as indicating an all way stop at locations where there was actually only a one-way stop

(at the business approach), thereby causing motorists on through traffic to suddenly stop and then cause rear end crashes. Likewise, the motorists on the business approach may tend to pull out in front of approaching vehicles because they assume those vehicles would stop.

RSA team recommendation:

Priority 2 - is defined as those improvements that can be done when funding becomes available or could be considered in the next scheduled 3R preservation project.

1. *Based on the above positive benefits and their corresponding constraints, the RSA team recommends the Right in/right out with raised median island on So. Virginia Street from Damonte Ranch Parkway intersection to south of the Tamarack Junction Casino south approach. This will entail constructing a pork chop concrete raised island on casino north approach.*

Estimated Cost: $200,000.00

General Intersection Features: SR 659, McCarran Boulevard at Sutro Street:

- The functional classification of SR 659, McCarran Boulevard on this subject intersection is *Other Principal Arterial*.
- The Annual Average Daily Traffic (AADT) on McCarran Boulevard near Sutro Street has decreased from 23,000 AADT in 2007 to 21,000 AADT in 2009.
- The speed limit on this subject roadway is 50 MPH.
- The intersection of McCarran Boulevard at Sutro Street is a four legged signalized intersection with wide radius of right turn lanes as shown in Appendix 2 and Photos 3& 4.
- There were 27 total crashes that occurred at this intersection for the 3-year study period from December 31, 2007 to January 1, 2011. Out of the 27 crashes, 13 were injury crashes with 16 injuries and no fatal crashes. The predominant crash type is rear end with 12 crashes.
- The subject intersection is not identified as a high crash location.
- The southeast corner of this intersection is Hug High School.

Observations at the Intersection of McCarran Boulevard and Sutro Street:

- This signalized intersection is equipped with a pedestrian countdown signal.
- Only 2 pedestrians crossed the intersection during the afternoon field review.
- Per the Reno Police Department representative, there was a pedestrian fatal crash that occurred at this intersection in January 2011 involving an 83-year-old pedestrian. The pedestrian was crossing McCarran Boulevard (northbound direction on the west leg of intersection, Photo 5).
- The asphalt pavement surfaces of the pork chop islands on the four corners of the intersection have deteriorated, exposing loose gravel as shown in Photo 5. The team speculates that pedestrians with disabilities may have difficulty traversing the island due to the loose gravel surface.
- There is a concrete barrier rail (Photos 6 & 7) on the southeast corner of the intersection (corner of Hug High School).The barrier rail occupies the intended walkway. Apparently, the barrier rail was installed to protect the perimeter fence of Hug High School from being struck by errant vehicles. However, the barrier rail greatly reduces the pedestrian shy distance. Also, the pedestrian may have difficulty seeing the oncoming vehicles in the northbound right direction.

- The pedestrian crosswalk on the southwest corner of the intersection is located on the sharp segment of the curve as shown in Photo 8. The sidewalk does not extend to the crosswalk and there are shrubs along the pathway. A pedestrian intending to use this subject crosswalk may have difficulty seeing the oncoming vehicle in the eastbound right direction. Similarly, a motorist may not become aware of the presence of the pedestrian on the crosswalk.
- The pedestrian ramps are not ADA standard. The marked crosswalk pavement markings are faded and have diminished retro reflectivity (Photo 9).

RSA team recommendations:

Priority 1 - is defined as those improvements that can be done in the immediate future by NDOT District 2 staff.

1. *Refresh the pavement markings on the subject intersection.*
2. *Remove the shrubs on the pedestrian pathway at the southwest corner of the intersection (Photo 8).*

Priority 2 - is defined as those improvements that can be done when funding becomes available or could be considered in the next scheduled 3R preservation project.

1. *Reconfigure the intersection to improve safety for all road users. Consider replacing the wide radius right turn lanes with a right turn lane that intersect the cross street at an angle closer to a right angle and add a proper acceleration lane if feasible. This will improve driver and pedestrian visibility of oncoming traffic (especially older driver and pedestrian) and reduce conflicts where right turning traffic must merge with cross street through traffic.*

Estimated Cost: To be determined

SUMMARY OF RECOMMENDATIONS

Post-Construction Phase RSA

SR 430, South Virginia Street at Tamarack Junction Casino:

Priority 2 - is defined as those improvements that can be done when funding becomes available or could be considered in the next scheduled 3R preservation project.

1. *Based on the above positive benefits and their corresponding constraints, the RSA team recommends the Right in/right out with raised median island on So. Virginia Street from Damonte Ranch Parkway intersection to south of the Tamarack Junction Casino south approach. This will entail constructing a pork chop concrete raised island on casino north approach*.

Estimated Cost: $200,000.00

SR 659, McCarran Boulevard at Sutro Street:

Priority 1 - is defined as those improvements that can be done in the immediate future by NDOT District 2 staff.

1. *Refresh the pavement markings on the subject intersection.*

2. *Remove the shrubs on the pedestrian pathway at the southwest corner of the intersection (Photo 8).*

Priority 2 - is defined as those improvements that can be done when funding becomes available or could be considered in the next scheduled 3R preservation project.

1. *Reconfigure the intersection to improve safety for all road users. Consider replacing the wide radius right turn lanes with a right turn lane that intersect the cross street at an angle closer to a right angle and add a proper acceleration lane if feasible. This will improve driver and pedestrian visibility of oncoming traffic (especially older driver and pedestrian) and reduce conflicts where right turning traffic must merge with cross street through traffic.*

Estimated Cost: To be determined

McCarran 4th to Las Brisas RSA

Introduction

NDOT Safety/Traffic Engineering Division in coordination with Roadway Design Division has conducted a Road Safety Audit (RSA) on SR 651, West McCarran Blvd, from 4th Street to Las Brisas Ave. The audit covers the segment of SR 651 from 4th Street to the I80 Interchange which is programmed for a preservation project and from the I80 interchange to Las Brisas Ave programmed for a widening project. The purpose was to identify potential road safety deficiencies and recommend measures to mitigate those safety issues.

Scope of Audit

The Safety Audit Team conducted an RSA, a formal safety performance evaluation, on SR 651, West McCarran Blvd from 4th St. to Las Brisas Blvd. on April 2, 2008. The Safety Audit Team recognizes that compliance with design standards does not necessarily result in an optimally safe road design and that the failure to comply with standards does not necessarily result in an unsafe design. The goal of this road safety audit was to identify potential road safety issues and identify opportunities for improvements in safety for all road users. However, the road safety audit was not intended as a replacement for design quality control or standard compliance checks, a traffic impact or safety impact study, a road safety inventory program, or a traffic safety modeling effort. Neither was the audit intended as a means of evaluating design work, checking compliance with standards, investigating crash data, or providing a safety review. Instead, the Team strived to look at safety issues from a different perspective and develop recommendations for potential safety enhancement.

Objectives

- Identify potential safety hazards that may be addressed by the proposed project or by the NDOT District 2 forces, thereby reducing the risk and severity of crashes.
- From the road user's viewpoint, identify confusing and/or misleading messages.
- Improve awareness of safe maintenance practices.

The project consists of the following elements:

- Widen the road from four to six lanes, starting at I80 interchange up to 7th Street; and improve the road from 7th Street to Las Brisas
- 3/R preservation starting the I80 Interchange up to 4th Street

The RSA Team convened on April 2, 2008, at 2:30 PM at the NDOT District 2 office in Sparks, Nevada. Rod Schilling from Roadway Design gave a brief discussion on the various elements of the project. Jaime Tuddao from Safety Engineering made a brief presentation of Road Safety Audit Procedures and Guidelines. Subsequently, the RSA team briefing meeting was conducted.

SUMMARY OF RECOMMENDATIONS
SR 651, West McCarran Blvd from 4th Street to Las Brisas Ave.
Preliminary Design Stage

A. *SAFETY RECOMMENDATIONS TO BE DONE BY DISTRICT 2 FORCES (within 12 months):*
   SR 651 – From 4th Street to Las Brisas Ave.:

1. *In coordination with the City of Reno replace the broken bulbs of the overhead street lights.*
2. *Repaint/restripe all pavement markings and striping.*
3. *Replace faded traffic signs.*
4. *Clear the dirt and debris off the pedestrian sidewalk (below the interchange bridges) as shown in Photo 17.*
5. *Remove the existing shrubs (Photo 4b) along the pedestrian sidewalk.*

B. *SAFETY RECOMMENDATIONS FOR INCLUSION IN THE PROPOSED 3/R PROJECT*
SR 651 – From 4th Street to I80 Interchange:

6. *Reconstruct/modify pedestrian ramps to meet ADA standards and conform to NDOT Standard Plans for Road and Bridge Construction 2007.*
7. *Request Roadway Design to review the feasibility of installing a pedestrian sidewalk and crosswalk along the island on Sky Mountain Drive to enhance pedestrian safety especially at night*
8. *Install overhead lighting at the intersection of Sky Mountain Drive off ramp (towards I80 EB on Ramp, Photo 2b), and on the off ramp (from Summit Ridge Drive, Photo 3).*
9. *Recommend installing underpass luminaires on the bridge of Summit Ridge Drive.*
10. *Recommend extending/constructing pedestrian sidewalk from 4th Street to WTP*
11. *Request Roadway Design to verify the intended usage of existing paved travelled way and install appropriate sign to indicate the usage.*
12. *Construct/extend the pedestrian sidewalk from WTP to I80 interchange, if the paved travelled way is not for pedestrians. If the paved travelled way is for pedestrians, install overhead lightings along the travelled way.*
13. *Replace outdated bicycle signs.*
14. *Replace/modify drainage inlets grates to conform to NDOT Standard Plans for Road and Bridge Construction 2007.*
15. *Replace rigid type sign posts with breakaway type to conform to NDOT Standard Plans for Road and Bridge Construction 2007.*
16. *Review and if necessary adjust the height of the one way arrow sign.*

West McCarran Blvd. @ 4th Street Intersection

17. *Review the feasibility of installing loop detectors and emergency vehicle detection.*
18. *To enhance pedestrian safety, review the feasibility of installing appropriate sign or other safety means to discourage pedestrians crossing on the south and east legs of the intersection.*
19. *Conduct a feasibility study to improve visibility to both motorists and pedestrians' at the southwest corner of this intersection (Photos 9a & 9b)by installing appropriate signs and or reflectors on top of the guardrails, pavement markings and other safety enhancements.*
20. *Review the pedestrian ramps on this intersection and replace/modify to meet ADA standards.*
21. *Relocate/replace the existing push buttons at the southwest corner (Photo 10) with ADA standard ones for easy access by pedestrians, especially the disabled.*
22. *Road Design is requested to ensure that all electrical junction boxes/manholes are properly grounded to avoid the risk of electric shock.*
23. *Review the feasibility of installing a shared right turn and bike lane (southbound right), Photo 11a.*
24. *Review the feasibility of having a straight crosswalk (Photo 11b). This may be accomplished by moving the crosswalk back towards the north or constructing a triangular refuge island near the northwest corner of the intersection.*
25. *Review the pedestrian crossing time and adjust the traffic signal timing if required.*

C. *SAFETY RECOMMENDATIONS FOR INCLUSION IN THE PROPOSED WIDENING PROJECT (Project ID No. 72969)*
SR 651 (West McCarran Blvd.)– From I80 Interchange to Las Brisas Blvd.

26. *Request Traffic engineering to conduct a speed study for (current conditions, and future conditions with the project widening) on this segment of West McCarran Blvd., to reduce rear end crashes and possible red light running.*
27. *Recommend planted strip be installed between pedestrian sidewalk and back of curb approximately from Sta. 56 +70.00 to 65+00.00.*
28. *Verify if the embankment (Sta. 67+00 to 78+00) is not within the clear zone. Otherwise, conduct a feasibility study to install roadside protection to enhance safety.*
29. *Recommend installing underpass luminaires on bridge at I80 interchange.*
30. *Replace/modify drainage inlets grates to conform to NDOT Standard Plans for Road and Bridge Construction 2007.*

West McCarran Blvd. @ I80 Interchange

31. *Install appropriate sign for prohibiting bike and pedestrian on freeway.*
32. *Reconstruct/modify as appropriate the existing pedestrian ramps to meet ADA standards.*
33. *Roadway Design is requested to review the feasibility of installing a low level retaining wall along the inside face of the pedestrian sidewalk, Photo 17 (on the unprotected embankment) or to stabilize the unprotected embankment to minimize debris from falling onto the sidewalk.*
34. *Review the feasibility of replacing the traffic signal arm (Photo 18) with longer type to align the traffic lights to through traffic.*

West McCarran Blvd. @ Sierra Highlands Dr/Peavine Plaza

35. *Reconstruct/modify pedestrian ramps to meet ADA standards in this intersection.*

West McCarran Blvd. @ Mae Anne Ave.

36. *Roadway Design is requested to review the feasibility of installing a pedestrian crosswalk at the north leg of the intersection.*
37. *Review the pedestrian crossing time in this intersection. Otherwise, review the feasibility of installing a Refuge Island (at Median Island) for pedestrians due to long walking distances.*
38. *Reconstruct/modify pedestrian ramps to meet ADA standards.*
39. *Request Roadway Design to review the feasibility of either:*
    a. *Reducing the corner radius of eastbound right (Photo22) for improved older driver's sight distance <u>or</u>*
    b. *Constructing an acceleration lane.*
40. *40. Install additional overhead lighting at the southwest corner of the intersection to enhance visibility during nighttime driving.*
41. *41. Recommend relocating the Bus Stop to be near the Wal-Mart approach entrance lane.*

West McCarran Blvd. @ 7th Street

42. *Recommend constructing pedestrian sidewalk (adjacent to proposed retaining wall at the north west corner) wider than 5 feet (about 6.5' to 7.0') to give allowance for shy distance.*
43. *Reconstruct/modify pedestrian ramps to meet ADA standards.*

West McCarran Blvd. @ Las Brisas Avenue

44. *Recommend adding an acceleration lane (High Tee) on McCarran Blvd. northbound to reduce potential rear end crashes.*
45. *Recommend moving back the merging arrow pavement markings (out from the intersection) to minimize conflict and reduce potential sideswipe crashes.*

McCarran Las Brisas to Rock

EXECUTIVE SUMMARY

NDOT Safety Engineering had the Burns Group conduct a Road Safety Assessment (RSA) on SR 659 - McCarran Boulevard from Caughlin Parkway/Cashill Boulevard to 4th Street (requested by the City of Reno) and from Las Brisas Boulevard to Rock Boulevard (requested by NDOT District II). The purpose of the RSA is to identify potential road safety issues and recommend countermeasures to mitigate those safety issues be included in a future NDOT project.

Generally, the study corridors along McCarran Boulevard consists of two or three general purpose lanes in each direction with left turn lanes at intersections and right turn lanes at some of the intersections. There are existing raised medians also installed between the intersections. The posted speed limit is 50 mph for the section of McCarran Boulevard from Caughlin Parkway/Cashill Boulevard to 4th Street. The posted speed limit varies from 45 mph to 50 mph for the section of McCarran Boulevard from Las Brisas Boulevard to Rock Boulevard.

The Average Annual Daily Traffic (AADT) for this segment of McCarran Boulevard from Caughlin Parkway/Cashill Boulevard to 4th Street varies from 19,900 AADT (located 365 feet south of Plumb Lane) to 29,500 AADT (located 500 feet north of Mayberry Drive).

The AADT for this segment of McCarran Boulevard from Las Brisas Boulevard to Rock Boulevard varies from 10,500 AADT (located 0.1 miles east of North Virginia Street) to 40,500 AADT (located 0.1 miles east of US 395). The AADT for the same locations in 2008 were about the same or a little lower than 2013.

There were a total of 58 crashes that occurred on the section of McCarran Boulevard from Caughlin Parkway/Cashill Boulevard to 4th Street from April 1, 2013 to April 1, 2016. There were a total of 32 injury crashes with 47 injuries and 26 property damage only (PDO) crashes. Of these 58 crashes, there were 19 angle crashes, 20 rear end crashes, 4 sideswipe crashes, 14 non-collision crashes, 0 bicycle crashes and 0 pedestrian crashes. There were no fatal crashes on this section of McCarran Boulevard.

There were a total of 413 crashes that occurred on this section of McCarran Boulevard from Las Brisas Boulevard to Rock Boulevard from April 1, 2013 to April 1, 2016. There were a total of 204 injury crashes with 295 injuries and 207 property damage only (PDO) crashes. Of these 413 crashes, there were 241 rear end crashes, 110 angle crashes, 32 non-collision crashes, 15 sideswipes, 9 head-on crashes, 2 pedestrian crashes, 2 bicycle crashes and 1 backing crash. There were 2 fatal crashes on this section of McCarran Boulevard from Las Brisas Boulevard to Rock Boulevard. The 2 fatal crashes that resulted in 2 pedestrian fatalities occurred at the intersection of McCarran Boulevard and Evans Avenue.

During field reviews, the McCarran Boulevard study corridors were observed to be lit with street lights at most of the intersections with some corridor lighting. General features of the study corridors observed to be in need of improvement included: there is no corridor lighting installed along some of the sections of roadway; some signing and striping is difficult to see at night; some of the pedestrian facilities are not up to current standards or there are not any pedestrian walkways installed. There were existing bicycle facilities along the corridors. The majority of the crashes that occurred at the intersections were angle and rear end crashes. Based on the above field observations and review of the crash history, the RSA team recommends to consider installing more corridor street lighting; improving

pedestrian facilities along the corridor; replace and/or upgrade striping and signing on the roadway where it is needed. Retiming signals; adding flashing yellow arrows at signalized intersections; installing new worm islands and/or redesigning existing worm islands at some of the unsignalized intersections to mitigate angles and rear end crashes.

A complete listing of the RSA recommendations can be found on pages 67 – 78 of this document. The RSA team recommendations are subdivided into Priorities 1A, 1B, 1C and 2A, 2B, 2C and 2D representing immediate and future NDOT, City of Reno, City of Sparks and Washoe RTC Project recommendations.

- *Priority 1A* **-** is defined as those improvements that can be done in the immediate future by NDOT staff during their periodic maintenance of this subject road segment.
- *Priority 1B* - is defined as those improvements that can be done in the immediate future by the City of Reno staff during periodic maintenance, under the City of Reno jurisdiction, along subject road segment.
- *Priority 1C* - is defined as those improvements that can be done in the immediate future by the City of Sparks staff during periodic maintenance, under the City of Sparks jurisdiction, along subject road segment.
- *Priority 2A* **-** is defined as those improvements that can be included in a future NDOT Project.
- *Priority 2B* **-** is defined as those improvements that can be included in a future City of Reno Project.
- *Priority 2C* **-** is defined as those improvements that can be included in a future City of Sparks Project.
- *Priority 2D* **-** is defined as those improvements that can be included in a future Washoe RTC Project.

SUMMARY OF RECOMMENDATIONS

MCCARRAN BOULEVARD FROM CAUGHLIN PARKWAY/CASHILL BOULEVARD TO 4TH STREET AND FROM LAS BRISAS BOULEVARD TO ROCK BOULEVARD

Priority 1A - is defined as those improvements that can be done in the immediate future by NDOT staff during their periodic maintenance of this subject road segment.

1. Replace or refresh pavement markings, roadway signs and intersection and corridor lighting as needed. See Pages 6 and 9 and Photos 1 and 2.
2. Consider conducting a speed limit study along the corridor to determine if the existing speed limits are appropriate and coordinate with NDOT Traffic Information division. See Page 6 and Photo 1.
3. Review all pedestrian crosswalks to determine if the existing curb cut ramps, tactile strips and curb cuts are installed and aligned with the crosswalk and that they meet current ADAAG and/or PROWAG standards. If not, upgrade as needed. See Page 11 and Photo 4.
4. Consider trimming or removing the existing trees, and removing the existing “School Crossing Ahead” sign that is not needed at this location, so that you can see the pedestrians standing on the southwest corner of the intersection of McCarran Boulevard and Caughlin Parkway/Cashill Boulevard so that motorists can see the pedestrians. See Pages 17 and 18 and Photos 10 and 11.
5. Consider replacing the existing “Limited Sight Distance Ahead” sign with a “Signal Ahead” sign (W3-3 or W3-3a), with flashing lights that come on when the signal is changing to red, on southbound McCarran Boulevard approaching the intersection of Caughlin Parkway/Cashill

Boulevard. This will let motorists know there is a signal ahead and there could be stopped vehicles ahead approaching the intersection. See Pages 19 and 20 and Photos 12 and 13.

6. Consider installing a “Signal Ahead” sign (W3-3 or W3-3a), with flashing lights that come on when the signal is changing to red, on northbound McCarran Boulevard approaching the intersection of Caughlin Parkway/Cashill Boulevard. This will let motorists know there is a signal ahead and there could be stopped vehicles ahead approaching the intersection. See Pages 19 and 20 and Photos 12 and 13.
7. Consider installing a W2-2R Side Road sign (with a supplemental street name sign for Greensburg Circle) northbound on McCarran Boulevard approaching the intersection of Greensburg Circle. This will give better advance warning of the upcoming intersection. This could reduce potential crashed at this intersection. See Pages 21 and 22 and Photos 14 and 15.
8. Consider upgrading the existing raised median island delineators to T-type markers for better delineation. See Page 22 and Photo 15.
9. Consider moving the existing object markers (OM3-R) from behind the drop inlets to in front of the drop inlets to provide earlier warning to bicyclists of the location of the drop inlets along this section McCarran Boulevard. See Page 23 and Photo 16
10. Consider modifying or replacing the existing drop inlets in the shoulder along McCarran Boulevard from Greensburg Circle Plumb Lane so that a bicyclist cannot drop a tire in the drop inlet if they veer off of the pavement into the drop inlet as they drive by. See Page 23 and Photo 16.
11. Consider installing a crosswalk on the south leg of the intersection of McCarran Boulevard and Plumb Lane/Caughlin Parkway where it currently does not exist and review the existing crosswalks to determine if they are still needed. See Page 25 and Photo 17.
12. Consider installing a R-9-3 (No Pedestrian Crossing sign) with a R9-3b (Use Crosswalk with left arrow) sign, in the sidewalk on northeast corner of the intersection, to let pedestrians know that the northbound sidewalk on the eastside of McCarran does not continue all the way to 4th and they should cross to the west side of McCarran Boulevard and use the sidewalk along the west side of McCarron Boulevard to walk northbound to the intersection of 4th Street and beyond. See Pages 28, 29 and 30 and Photos 19, 20 and 21.
13. Consider installing a new crosswalk on the north leg of the intersection of McCarran Boulevard and 4th Street so that is straight and does not have a bend in it. This would be better for the vison impaired pedestrians trying to cross the north leg of McCarran Boulevard at the intersection of 4th Street. See Page 32 and Photo 22.
14. Consider trimming and/or removing bushes and/or trees within the ROW on the northeast corner of the intersection of McCarran Boulevard and Kings Row so that southbound to westbound right turning vehicles can see if there is westbound though traffic approaching the intersection so they can make a right turn on red. See Page 36 and Photo 27.
15. Consider installing a “Signal Ahead” sign (W3-3 or W3-3a) with flashing lights that come on when the signal is changing to red in the eastbound direction on McCarran Boulevard approaching the intersection of Kings Row. This will let motorists know there is a signal ahead and there could be stopped vehicles ahead approaching the intersection. See Page 36 and Photo 27.
16. Consider extending the ends of the existing worm raised median island in the median opening on McCarran Boulevard to further discourage and restrict the left turn out movement from Victory Lane onto McCarran Boulevard. See Page 41 and Photo 31.
17. Consider installing temporary glue down candlesticks to extend the ends of the existing worm raised median island, in the median opening on McCarran Boulevard, to further discourage and restrict the left turn out movement from the northbound and southbound left turns at the

intersection of Keystone Avenue/ Leadership. This could reduce crashes at this intersection. See Pages 42, 43 and 44 and Photos 32, 33 and 34.

18. Consider increasing the spacing between the existing roadway signs westbound on McCarran Boulevard approaching the intersection with Evans Avenue/Socrates Drive. Also, consider removing the existing "Signal Ahead" (W3-3) sign from this series of signs. It appears it is not needed along this section of McCarran Boulevard and removing it would reduce the sign clutter at this location. See Page 45 Photo 36.
19. Review the standing water issue in the southwest corner of the intersection of McCarran Boulevard of the intersection Evans Avenue/Socrates Drive and make improvements as needed to drain the water in this area. See Page 47 and Photo 39.
20. Consider replacing or refreshing pavement markings, roadway signs and intersection and corridor lighting as needed. See Page 49 and Photo 41.
21. Consider installing a W11-2 Pedestrian sign with a W16-9p Ahead Plaque installed below in the eastbound right turn lane on McCarran Boulevard approaching the intersection of Sutro Street to warn drivers up the upcoming crosswalk that is located at the end of the right turn lane. See Pages 48 and 49 and Photos 40 and 41.
22. Consider installing new crosswalk markings at the intersection. This will make the crosswalks more visible to the motorists approaching this intersection. See Pages 52 and 53 and Photos 46 and 47.
23. Consider replacing or refreshing pavement markings when they become less visible. This will let the motorists know which lane they should be in approaching the intersections. See Pages 54, 55 and 56 and Photos 48, 49, 50 and 51.
24. Consider removing vegetation encroaching on the sidewalks at this intersection. This should will provide pedestrians with full access to the sidewalks and the pedestrian push buttons. See Page 58 and Photo 54.
25. Consider refreshing pavement markings when they become less visible. This will help the motorists see pavement markings at this intersection. See Page 60 and Photos 57 and 58.
26. Consider refreshing pavement markings at the intersection that have become less visible. This will help the motorists see pavement markings at this intersection. See Page 62 and Photo 60.
27. Consider installing a crosswalk on the west leg of the intersection where it currently does not exist. See Page 66 and Photo 64.

Priority 1B - is defined as those improvements that can be done in the immediate future by City of Reno staff during their periodic maintenance of this subject road segment.

1. Replace or refresh pavement markings, roadways signs and intersection and corridor lighting as needed. See Page 12 and Photo 5.
2. Review all internally illuminated street name signs at night and repair or replace the ones that are not on or working correctly. See Page 15 and Photo 8.
3. Review all of the existing pedestrian push buttons at the signals along the McCarran Boulevard corridor to see if they meet current ADAAG and/or PROWAG standards. See Page 10 and Photo 3.
4. Consider upgrading the existing lighting at the intersection of McCarran Boulevard and Greenburg Circle to LED luminaries. See Page 22 and Photo 15.
5. Consider upgrading the existing pedestrian push buttons on the signal poles to the current standard and height at the intersection of McCarran Boulevard and Plumb Lane/Caughlin Parkway intersection. See Pages 25 and 27 and Photos 17 and 18.

6. Consider reviewing the signal timing at the intersection of McCarran Boulevard and Plumb Lane/Caughlin Parkway to determine if it can be revised to reduce number of angle crashes at the intersection. See Pages 25 and 27 and Photos 17 and 18.
7. Review the pedestrian signal timing at the intersection of McCarran Boulevard and 4th Street to make sure that there is enough time for the pedestrians to cross the street**.** See Page 32 and Photo 22.
8. Review the signal timing during the peak hours to try to reduce the traffic backup at the intersection in the peak hours. See Page 33 and Photos 23 and 24.
9. Consider installing a new access cover on the bottom of the signal to keep dirt, water and animals from getting into the inside of the pole. See Page 37 and Photo 28.
10. Consider changing the left turn signal head from a permissive only to a protected/permissive movement by installing a flashing yellow arrow in the northbound and southbound direction at the intersection of McCarran Boulevard and Evans Avenue/Socrates Drive. See Pages 46 and 47 and Photos 37 and 48.
11. Consider replacing or refreshing pavement markings, roadway signs and intersection and corridor lighting as needed at the intersection of McCarran Boulevard and Sutro Street. See Page 49 and Photo 41.

Priority 1C - is defined as those improvements that can be done in the immediate future by the City of Sparks staff during their periodic maintenance on this subject road segment.

1. Replace or refresh pavement markings, roadway signs and intersection and corridor lighting as needed. See Page 63 and Photo 61.
2. Review all internally illuminated street name signs at night and repair or replace the ones that are not on or working correctly. See Page 15 and Photo 8.
3. Review all of the existing pedestrian push buttons at the signals along the McCarran Boulevard corridor to see if they meet current ADAAG and/or PROWAG standards. See Page 10 and Photo 3.
4. Consider refreshing and/or replacing the existing pavement markings on the south leg at the intersection that have become less visible. This will help the northbound motorists approaching the intersection see the pavement markings.

Priority 2A – is defined as improvements that can be included in the future NDOT Project.

1. Conduct a feasibility study to evaluate the need for installing LED intersection and corridor street lighting along this section of McCarran Boulevard at locations where it currently does not exist. Installing intersection and/or corridor street lighting at locations that currently do not have street lighting, may reduce crashes at those intersections and corridors. See Page 12 and Photo 5.
2. Conduct a feasibility study to consider installing a Complete Streets concept on some sections of McCarran Boulevard in a future NDOT project. This may provide a buffer area between motorists and bicycles along this section of McCarran Boulevard. See Pages 6 and 14 and Photos 1 and 7.
3. Conduct a feasibility study to determine if guardrail and/or barrier rail should be installed along this section of McCarran Boulevard in future NDOT project. See Page 6 and Photo 1.
4. If upgrading the existing curb cut ramps, tactile strips and curb cuts are installed and aligned with the crosswalk and that they meet current ADAAG and/or PROWAG standards cannot be

completed by maintenance staff, they should be included in a future NDOT project. See Page 11 and Photo 4.

5. Construct through areas on the corner islands for the existing exclusive right turn lanes at some of the signalized intersections so that they are upgraded to meet the current ADAAG and/or PROWAG standards. See Page 59 and Photo 56.
6. Conduct an access management study along this corridor to reduce the amount of angle crashes at the existing driveway locations. See Page 6 and Photo 1.
7. Install reflective borders to all of the existing traffic signal head back plates on this corridor of SR 659 (McCarran Boulevard***).*** See Page 12 and Photo 5.
8. Review all of the pedestrian push buttons along the McCarran Boulevard corridor to see if they meet current ADAAG and/or PROWAG standards. Any upgrades should be included in a future NDOT project. See Page 10 and Photo 3.
9. Recommend that all pedestrian crosswalks be reviewed to determine if they have existing curb cut ramps, tactile strips, curb cuts are aligned with the crosswalk and that they meet current ADAAG and/or PROWAG standards. Any upgrades should be included in a future NDOT project. See Page 11 and Photo 4.
10. Recommend upgrading existing signal mast arms and installing a signal head centered over each through and/or turn lane to meet current MUTCD recommended policies along these segment of McCarran Boulevard be included in a future NDOT project. See Page 12 and Photo 5.
11. Recommend the existing sidewalks on this section of roadway be reviewed for sections of sidewalk that have heaved or cracked and need to be replaced or new sidewalk installed to provide connectivity for pedestrians be included in a future NDOT project. See Page 13 and Photo 6.
12. The locations of the existing power poles and signal poles should be reviewed to determine if they can be relocated to provide adequate area for pedestrians to walk on the sidewalk be included in a future NDOT project. See Pages 15 and 16 and Photos 8 and 9.
13. If installing a “Signal Ahead” sign (W3-3 or W3-3a), with flashing lights that come on when the signal is changing to red, on southbound McCarran Boulevard approaching the intersection of Caughlin Parkway/Cashill Boulevard cannot be installed by NDOT maintenance, it should be included in a future NDOT project. See Pages 19 and 20 and Photos 12 and 13.
14. If installing a “Signal Ahead” sign (W3-3 or W3-3a), with flashing lights that come on when the signal is changing to red, on northbound McCarran Boulevard approaching the intersection of Caughlin Parkway/Cashill Boulevard cannot be installed by NDOT maintenance, it should be included in a future NDOT project. See Pages 19 and 20 and Photos 12 and 13.
15. Consider installing more street lighting at the intersection of McCarran Boulevard and Greensburg Circle to make the intersection more visible at night. See Page 22 and Photo 15.
16. If modifying or replacing the existing drop inlets in the shoulder along McCarran Boulevard from Greensburg Circle Plumb Lane so that a bicyclist cannot drop a tire in the drop inlet if they veer off of the pavement into the drop inlet as they drive by cannot be done by maintenance, it should be included in a future NDOT project. See Page 23 and Photo 16.
17. Consider installing additional sidewalk between the existing sidewalk and the signal pole on the southwest corner of the intersection of McCarran Boulevard and Plumb Lane/Caughlin Parkway so that the pedestrian can access the pedestrian push button without walking on the grass. See Pages 25 and 27 and Photos 17 and 18.
18. Install tactile strips on the pedestrian ramps where they are on currently installed at the intersection of McCarran Boulevard and Plumb Lane/Caughlin Parkway so that the visually impaired pedestrians know that they are entering the street. See Pages 25 and 27 and Photos 17 and 18.

19. Consider upgrading the existing pedestrian push buttons on the signal poles to the current standard and height. Page 28 and Photo 19.
20. Consider installing tactile strips on the pedestrian ramps where they are not currently installed. Page 28 and Photo 19.
21. Consider removing the existing sidewalk on the eastside of McCarran, north of the intersection of McCarran Boulevard and 4th Street, which does not continue all the way to 4th Street. This should be included in a future NDOT project. See Pages 28 and 30 and Photos 19 and 21.
22. Consider installing an acceleration lane northbound on McCarran Boulevard for the westbound to northbound right turn at the intersection of McCarran Boulevard and Mayberry Drive. This will provide motorists making the westbound to northbound right turn movement a chance to merge into the northbound through traffic on McCarran Boulevard instead of stopping and waiting for a gap in the northbound traffic, especially during the peak hours. This should be included in a future NDOT project. See Pages 29 and 30 and Photos 20 and 21.
23. Conduct an engineering study between Plumb Lane and Mayberry Drive to consider installing a higher raised median island to discourage vehicles from crossing over into the opposite through lane. See Page 31 and Photo 21a.
24. Consider installing a raised worm median island in the median opening on McCarran Boulevard to allow only the left turn in, right in and right out movements at the intersection of Las Brisas Boulevard and McCarran Boulevard. See Pages 34 and 35 and Photos 25 and 26.
25. Consider installing a sidewalk extension to the existing signal pole on the northeast corner of the intersection of McCarran Boulevard and Kings Row so that pedestrians can have access to the push buttons on the signal pole. See Pages 36 and 37 and Photos 27 and 28.
26. If installing a “Signal Ahead” sign (W3-3 or W3-3a) with lights in the eastbound direction on McCarran Boulevard approaching the intersection of Kings Row cannot be installed by NDOT maintenance, it should be included in a future NDOT project. See Page 36 and Photo 27.
27. Consider installing a raised worm median island in the median opening on McCarran Boulevard to allow only the left turn in, right in and right out movements at the intersection Sky Country Drive and McCarran Boulevard. See Pages 39 and 40 and Photos 29 and 30.
28. If extending the ends of the existing worm raised median island in the median opening on McCarran Boulevard to further discourage and restrict the left turn out movement from Victory Lane onto McCarran Boulevard cannot be installed by NDOT Maintenance, this should be included in a future NDOT project. See Page 41 and Photo 31.
29. Consider extending the ends of the existing worm raised median island, in the median opening on McCarran Boulevard, to further discourage and restrict the left turn out movement from the northbound and southbound left turns at the intersection of Keystone Avenue/ Leadership. This could reduce crashes at this intersection. See Pages 42, 43 and 44 and Photos 32, 33 and 34.
30. Consider upgrading and/or installing more street lighting at the intersection of McCarran Boulevard and Keystone Avenue/Leadership Drive to help motorists see this intersection as they approach it. See Pages 42, 43 and 44 and Photos 32, 33 and 34.
31. Consider installing higher intensity and/or more street lighting at this intersection. This may help motorists see pedestrians at this intersection. See Pages 45, 46 and 47 and Photos 36, 37 and 38.
32. If making improvements to remove the standing water issue in the southwest corner of the intersection of McCarran Boulevard of the intersection Evans Avenue/Socrates Drive and make improvements as needed to drain the water in this area cannot be done by NDOT Maintenance, this should be included in a future NDOT project. This could help reduce crashes at this intersection. See Page 47 and Photo 39.

33. Recommend that each existing signal pole in each of the quadrants of the existing signalized intersection have street light arms and luminaires installed over each crosswalk from the street corner included in a future NDOT project. This could help reduce crashes at this intersection. See Page 50 and Photo 43.
34. Consider extending the existing sidewalk on the west side of Sutro Street from the crosswalk at the end of the eastbound right lane at the intersection of McCarran Boulevard and Sutro Street south to the existing sidewalk. This will give the pedestrians on the west side of south Sutro Street a place to walk up to the intersection to the signal to cross McCarran Boulevard. This could help reduce crashes at this intersection. See Page 50 and Photo 42.
35. Consider installing a sidewalk behind the barrier rail on the southeast corner at the intersection of McCarran Boulevard and Sutro Street from the existing driveway to Hug High School to McCarran Boulevard. See Pages 50 and 51 and Photos 43, 44 and 45.
36. Coordinate the signal timing at this intersection with the ramp meters being installed at the McCarran Boulevard and US 395 southbound ramps intersection in the future NDOT ITS project. See Page 52 and Photo 46.
37. Repair and/or replace some of the pavement at the intersection that is deteriorating and allowing moisture into the subgrade under the pavement. See Page 60 and Photo 58.
38. Consider installing additional sidewalk between the existing sidewalk and the signal pole on the southwest and northeast corners of the intersection of McCarran Boulevard and Sullivan Lane so that pedestrian can access the pedestrian push button without walking on the gravel. This will provide pedestrians access to the pedestrian push button without walking on the gravel. See Pages 61 and 62 and Photos 59 and 60.
39. Consider installing new pedestrian facilities (sidewalks and ADA ramps) on the southeast, northeast and northwest quadrants. This will provide continuity for pedestrians in the area. See Page 63 and Photo 61.
40. Conduct a signal warrant analysis with Traffic Information to see if a signal is warranted at this intersection. Installing a signal at this intersection could reduce the crashes at this intersection. See Pages 63 and 64 and Photos 61 and 64.
41. After the existing construction is completed at the intersection of McCarran Boulevard and Rock Boulevard, consider installing new pedestrian facilities west of the intersection of Rock Boulevard. This will provide continuity for pedestrians in the area. See Pages 65 and 66 and Photos 63 and 64.

Priority 2B – is defined as improvements that can be included in the future City of Reno Project.

1. Signal timing parameters should be reviewed and advanced detection at signalized intersections along this corridor be verified for location and operation. This could reduce the rear-end crashes on this corridor. The signal parameters such as gap-out time, yellow clearance time and all-red time should be checked to ensure that vehicles in the dilemma zone have time to safely cross the intersection. See Page 9 and Photo 9.

Priority 2C – is defined as improvements that can be included in the future City of Sparks Project.

1. If the internally illuminated street name signs cannot be repaired or replaced by the City of Sparks, they should be included in a future City of Sparks project. See Page 15 and photo 8.

Priority 2D – is defined as improvements that can be included in the future Washoe RTC Project.

1. Adjust pedestrian clearance intervals for the signals along McCarran Boulevard, if needed, to the current standards and coordinate with the City of Reno and the City of Sparks.
2. Signal timing parameters should be reviewed and advanced detection at signalized intersections along this corridor be verified for location and operation. This could reduce the rear-end crashes on this corridor. The signal parameters such as gap-out time, yellow clearance time and all-red time should be checked to ensure that vehicles in the dilemma zone have time to safely cross the intersection. See Page 33 and Photos 23 and 24.
3. Review the existing bus stops along these corridors to propose improvements that are needed and/or possible moving locations of the existing bus stops to better locations be included in a future Washoe RTC project. See Page 15 and Photo 8.
4. Signal timing parameters should be reviewed and advanced detection at signalized intersections along this corridor be verified for location and operation. This could reduce the rear-end crashes on this corridor. The signal parameters such as gap-out time, yellow clearance time and all-red time should be checked to ensure that vehicles in the dilemma zone have time to safely cross the intersection. See Page17 and 18 and Photos 10 and 11.
5. Signal timing parameters should be reviewed and advanced detection at intersection be verified for location and operation and coordinate with the City of Reno. This could reduce the rear-end crashes at this intersection and on this corridor. The signal parameters such as gap-out time, yellow clearance time and all-red time should be checked to ensure that vehicles in the dilemma zone have time to safely cross the intersection. See Pages 25, 27 and 28 and Photos 17, 18 and 19.
6. If upgrading the existing pedestrian push buttons on the signal poles to the current standard and height cannot be done by City of Reno staff, it should be included in a future Washoe RTC project. See Pages 25, 27 and 28 and Photos 17, 18 and 19.
7. Signal timing parameters should be reviewed and advanced detection at intersection be verified for location and operation and coordinate with the City of Reno. This could reduce the rear-end crashes at this intersection and on this corridor. The signal parameters such as gap-out time, yellow clearance time and all-red time should be checked to ensure that vehicles in the dilemma zone have time to safely cross the intersection. See Page 28 and Photo 19.
8. Signal timing parameters should be reviewed and advanced detection at intersection be verified for location and operation and coordinate with the City of Reno. This could reduce the rear-end crashes at this intersection and on this corridor. The signal parameters such as gap-out time, yellow clearance time and all-red time should be checked to ensure that vehicles in the dilemma zone have time to safely cross the intersection. See Page 32 and Photo 22.
9. Signal timing parameters should be reviewed and advanced detection at intersection be verified for location and operation and coordinate with the City of Reno. This could reduce the rear-end crashes at this intersection and on this corridor. The signal parameters such as gap-out time, yellow clearance time and all-red time should be checked to ensure that vehicles in the dilemma zone have time to safely cross the intersection. See Page 36 and Photo 27.
10. Signal timing parameters should be reviewed and advanced detection at intersection be verified for location and operation and coordinate with the City of Reno. This could reduce the rear-end crashes at this intersection and on this corridor. The signal

parameters such as gap-out time, yellow clearance time and all-red time should be checked to ensure that vehicles in the dilemma zone have time to safely cross the intersection. See Page 45 and Photo 36.

11. Signal timing parameters should be reviewed and advanced detection at intersection be verified for location and operation and coordinate with the City of Reno. This could reduce the rear-end crashes at this intersection and on this corridor. The signal parameters such as gap-out time, yellow clearance time and all-red time should be checked to ensure that vehicles in the dilemma zone have time to safely cross the intersection. See Page 48 and Photo 40.
12. Signal timing parameters should be reviewed and advanced detection at intersection be verified for location and operation and coordinate with the City of Reno. This could reduce the rear-end crashes at this intersection and on this corridor. The signal parameters such as gap-out time, yellow clearance time and all-red time should be checked to ensure that vehicles in the dilemma zone have time to safely cross the intersection. See Page 52 and Photo 46.
13. Signal timing parameters should be reviewed and advanced detection at intersection be verified for location and operation and coordinate with the City of Reno. This could reduce the rear-end crashes at this intersection and on this corridor. The signal parameters such as gap-out time, yellow clearance time and all-red time should be checked to ensure that vehicles in the dilemma zone have time to safely cross the intersection. See Page 52 and Photo 46.
14. Signal timing parameters should be reviewed and advanced detection at intersection be verified for location and operation and coordinate with the City of Reno. This could reduce the rear-end crashes at this intersection and on this corridor. The signal parameters such as gap-out time, yellow clearance time and all-red time should be checked to ensure that vehicles in the dilemma zone have time to safely cross the intersection. See Page 57 and Photo 52.
15. Signal timing parameters should be reviewed and advanced detection at intersection be verified for location and operation and coordinate with the City of Reno. This could reduce the rear-end crashes at this intersection and on this corridor. The signal parameters such as gap-out time, yellow clearance time and all-red time should be checked to ensure that vehicles in the dilemma zone have time to safely cross the intersection. See Page 59 and Photo 56.
16. Signal timing parameters should be reviewed and advanced detection at intersection be verified for location and operation and coordinate with the City of Sparks. This could reduce the rear-end crashes at this intersection and on this corridor. The signal parameters such as gap-out time, yellow clearance time and all red time should be checked to ensure that vehicles in the dilemma zone have time to safely cross the intersection. See Page 62 and Photo 60.
17. Signal timing parameters should be reviewed and advanced detection at intersection be verified for location and operation and coordinate with the City of Sparks. This could reduce the rear-end crashes at this intersection and on this corridor. The signal parameters such as gap-out time, yellow clearance time and all red time should be checked to ensure that vehicles in the dilemma zone have time to safely cross the intersection. See Page 66 and Photo 64.

Appendix I
I-80 Diverging Diamond Interchange

TABLE X: MCCARRAN BOULEVARD LEVEL-OF-SERVICE - EXISTING CONDITIONS												
McCarran Boulevard Intersection	Signalization	Time	Approach Delay (Seconds) & LOS								Intersection Delay (Seconds) & LOS	
			EB		WB		NB		SB			
I-80 Eastbound Ramps	Signalized	AM	70.5	E	-	-	119.7	F	66.7	E	86.3	F
		PM	184.0	F	-	-	149.3	F	93.1	F	133.2	F
I-80 Eastbound Ramps	Signalized - DDI	AM	30.0	C	-	-	8.4	A	16.9	B	15.1	B
		PM	33.5	C	-	-	47.6	D	77.5	E	54.3	D

TABLE X: MCCARRAN BOULEVARD LEVEL-OF-SERVICE - EXISTING CONDITIONS												
McCarran Boulevard Intersection	Signalization	Time	Approach Delay (Seconds) & LOS								Intersection Delay (Seconds) & LOS	
			EB		WB		NB		SB			
I-80 Westbound Ramps	Signalized	AM	-	-	48.6	D	17.8	B	14.5	B	23.7	C
		PM	-	-	90.5	F	28.9	C	26.3	C	51.8	D
I-80 Westbound Ramps	Signalized - DDI	AM	-	-	15.4	B	17.9	B	15.1	B	15.7	B
		PM	-	-	46.5	D	78.9	E	35.9	D	46.5	D

DDI Alternative																																					
McCarran Boulevard Intersection	Intersection Control	Time	Delay, LOS, & Queue																																		
			EB								WB								NB							SB								Intersection	
			Left			Right			Approach		Left			Right			Approach		Through			Right			Approach		Through			Right			Approach			
			Delay	LOS	Queue	Delay	LOS	Queue	Delay	LOS	Delay	LOS	Queue	Delay	LOS	Queue	Delay	LOS	Delay	LOS	Queue	Delay	LOS	Queue	Delay	LOS	Delay	LOS	Queue	Delay	LOS	Queue	Delay	LOS	Delay	LOS
I-80 EB Ramps	Signalized	AM	1.7	A	16	36.2	D	330	30.0	C	-	-	-	-	-	-	-	-	19.0	B	139	2.6	A	0	8.4	A	16.9	B	339	-	-	-	16.9	B	**15.1**	**B**
		PM	18.8	B	216	42.1	D	555	33.5	C	-	-	-	-	-	-	-	-	**75.9**	**E**	681	2.1	A	0	47.6	D	**77.5**	**E**	702	-	-	-	**77.5**	**E**	**54.3**	**D**
I-80 WB Ramps	Signalized	AM	-	-	-	-	-	-	-	-	23.5	C	134	5.7	A	55	15.4	B	17.9	B	178	-	-	-	17.9	B	17.0	B	389	0.2	A	0	15.1	B	**15.7**	**B**
		PM	-	-	-	-	-	-	-	-	22.8	C	260	43.0	D	572	46.5	D	**78.9**	**E**	579	-	-	-	**78.9**	**E**	42.1	D	617	0.2	A	0	35.9	D	**46.5**	**D**



Lane Group	EBL2	EBR	NBL	NBR2	SWL
Lane Configurations					
Traffic Volume (vph)	100	456	557	1025	1203
Future Volume (vph)	100	456	557	1025	1203
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Storage Length (ft)		400	0		0
Storage Lanes		1	2		2
Taper Length (ft)			25		25
Lane Util. Factor	1.00	1.00	0.97	1.00	0.97
Frt		0.850		0.850	
Flt Protected	0.950		0.950		0.950
Satd. Flow (prot)	1770	1583	3433	1583	3433
Flt Permitted	0.950		0.950		0.950
Satd. Flow (perm)	1770	1583	3433	1583	3433
Right Turn on Red	Yes	Yes		Yes	
Satd. Flow (RTOR)	138	31		1091	
Link Speed (mph)			30		30
Link Distance (ft)			871		262
Travel Time (s)			19.8		6.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	109	496	605	1114	1308
Shared Lane Traffic (%)					
Lane Group Flow (vph)	109	496	605	1114	1308
Enter Blocked Intersection	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left
Median Width(ft)			24		24
Link Offset(ft)			0		0
Crosswalk Width(ft)			16		16
Two way Left Turn Lane					
Headway Factor	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15	9	15
Number of Detectors	1	1	1	1	1
Detector Template	Left	Right	Left	Right	Left
Leading Detector (ft)	20	20	20	20	20
Trailing Detector (ft)	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0
Detector 1 Size(ft)	20	20	20	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel					
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0
Turn Type	D.Pm	Perm	Prot	Free	Prot
Protected Phases			2		1
Permitted Phases	1	2		Free	
Detector Phase	1	2	2		1
Switch Phase					
Minimum Initial (s)	1.0	1.0	1.0		1.0
Minimum Split (s)	23.0	23.0	23.0		23.0
Total Split (s)	38.0	32.0	32.0		38.0



Lane Group	EBL2	EBR	NBL	NBR2	SWL
Total Split (%)	54.3%	45.7%	45.7%		54.3%
Maximum Green (s)	33.0	27.0	27.0		33.0
Yellow Time (s)	4.0	4.0	4.0		4.0
All-Red Time (s)	1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0
Total Lost Time (s)	5.0	5.0	5.0		5.0
Lead/Lag	Lead	Lag	Lag		Lead
Lead-Lag Optimize?	Yes	Yes	Yes		Yes
Vehicle Extension (s)	3.0	3.0	3.0		3.0
Recall Mode	C-Max	None	None		C-Max
Walk Time (s)	7.0	7.0	7.0		7.0
Flash Dont Walk (s)	11.0	11.0	11.0		11.0
Pedestrian Calls (#/hr)	0	0	0		0
Act Effct Green (s)	35.4	24.6	24.6	70.0	35.4
Actuated g/C Ratio	0.51	0.35	0.35	1.00	0.51
v/c Ratio	0.11	0.86	0.50	0.70	0.75
Control Delay	1.7	36.2	19.0	2.6	15.8
Queue Delay	0.0	0.0	0.0	0.0	1.1
Total Delay	1.7	36.2	19.0	2.6	16.9
LOS	A	D	B	A	B
Approach Delay			8.4		16.9
Approach LOS			A		B
90th %ile Green (s)	33.0	27.0	27.0		33.0
90th %ile Term Code	Coord	Max	Max		Coord
70th %ile Green (s)	33.0	27.0	27.0		33.0
70th %ile Term Code	Coord	Max	Max		Coord
50th %ile Green (s)	33.0	27.0	27.0		33.0
50th %ile Term Code	Coord	Max	Max		Coord
30th %ile Green (s)	36.1	23.9	23.9		36.1
30th %ile Term Code	Coord	Gap	Gap		Coord
10th %ile Green (s)	42.1	17.9	17.9		42.1
10th %ile Term Code	Coord	Gap	Gap		Coord
Stops (vph)	7	369	410	2	954
Fuel Used(gal)	1	8	8	8	12
CO Emissions (g/hr)	48	572	574	526	811
NOx Emissions (g/hr)	9	111	112	102	158
VOC Emissions (g/hr)	11	132	133	122	188
Dilemma Vehicles (#)	0	0	0	0	0
Queue Length 50th (ft)	0	172	96	0	248
Queue Length 95th (ft)	16	#330	139	0	339
Internal Link Dist (ft)			791		182
Turn Bay Length (ft)		400			
Base Capacity (vph)	964	629	1324	1583	1738
Starvation Cap Reductn	0	0	0	0	210
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.11	0.79	0.46	0.70	0.86

Intersection Summary

Area Type:	Other		
Cycle Length: 70			
Actuated Cycle Length: 70			
Offset: 47 (67%), Referenced to phase 1:EBSWL, Start of Green			
Natural Cycle: 55			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.86			
Intersection Signal Delay: 15.1		Intersection LOS: B	
Intersection Capacity Utilization 67.4%		ICU Level of Service C	
Analysis Period (min) 15			

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1:



Lane Group	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	0	0	0	0	904	1203
Future Volume (vph)	0	0	0	0	904	1203
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	0.91	0.91
Frt						
Flt Protected					0.950	0.992
Satd. Flow (prot)	0	0	0	0	1610	3363
Flt Permitted					0.950	0.992
Satd. Flow (perm)	0	0	0	0	1610	3363
Right Turn on Red		Yes		Yes	Yes	
Satd. Flow (RTOR)						
Link Speed (mph)	30		30			30
Link Distance (ft)	275		262			252
Travel Time (s)	6.3		6.0			5.7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	983	1308
Shared Lane Traffic (%)					24%	
Lane Group Flow (vph)	0	0	0	0	747	1544
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	0		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Turn Type					Perm	NA
Protected Phases						8
Permitted Phases					8	
Minimum Split (s)					22.5	22.5
Total Split (s)					70.0	70.0
Total Split (%)					100.0%	100.0%
Maximum Green (s)					65.5	65.5
Yellow Time (s)					3.5	3.5
All-Red Time (s)					1.0	1.0
Lost Time Adjust (s)					0.0	0.0
Total Lost Time (s)					4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Walk Time (s)					7.0	7.0
Flash Dont Walk (s)					11.0	11.0
Pedestrian Calls (#/hr)					0	0
Act Effct Green (s)					70.0	70.0
Actuated g/C Ratio					1.00	1.00
v/c Ratio					0.46	0.46
Control Delay					0.6	0.3
Queue Delay					0.0	0.2
Total Delay					0.6	0.4

Lane Group	NWL	NWR	NET	NER	SWL	SWT
LOS					A	A
Approach Delay						0.5
Approach LOS						A
Stops (vph)					0	0
Fuel Used(gal)					4	9
CO Emissions (g/hr)					311	637
NOx Emissions (g/hr)					61	124
VOC Emissions (g/hr)					72	148
Dilemma Vehicles (#)					0	0
Queue Length 50th (ft)					0	0
Queue Length 95th (ft)					m0	0
Internal Link Dist (ft)	195		182			172
Turn Bay Length (ft)						
Base Capacity (vph)					1610	3363
Starvation Cap Reductn					0	0
Spillback Cap Reductn					0	725
Storage Cap Reductn					0	0
Reduced v/c Ratio					0.46	0.59

Intersection Summary			
Area Type:	Other		
Cycle Length: 70			
Actuated Cycle Length: 70			
Offset: 0 (0%), Referenced to phase 2: and 6:, Start of Green			
Natural Cycle: 40			
Control Type: Pretimed			
Maximum v/c Ratio: 0.46			
Intersection Signal Delay: 0.5		Intersection LOS: A	
Intersection Capacity Utilization 88.1%		ICU Level of Service E	
Analysis Period (min) 15			

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5:





Lane Group	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations						
Traffic Volume (vph)	0	1025	0	0	904	0
Future Volume (vph)	0	1025	0	0	904	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	1863	0	0	3433	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	0	0	3433	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		374	359		275	
Travel Time (s)		8.5	8.2		6.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1114	0	0	983	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1114	0	0	983	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		24	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Yield	Stop		Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 100.7%		ICU Level of Service G	
Analysis Period (min) 15			



Lane Group	WBL2	WBR	SBL	SBR2	NEL
Lane Configurations					
Traffic Volume (vph)	466	385	1616	210	569
Future Volume (vph)	466	385	1616	210	569
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Storage Length (ft)		500	0		0
Storage Lanes		2	2		2
Taper Length (ft)			25		25
Lane Util. Factor	0.97	0.88	0.97	1.00	0.97
Frt		0.850		0.850	
Flt Protected	0.950		0.950		0.950
Satd. Flow (prot)	3433	2787	3433	1583	3433
Flt Permitted	0.950		0.950		0.950
Satd. Flow (perm)	3433	2787	3433	1583	3433
Right Turn on Red	Yes	Yes		Yes	
Satd. Flow (RTOR)	39	76		142	
Link Speed (mph)			30		30
Link Distance (ft)			934		262
Travel Time (s)			21.2		6.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	507	418	1757	228	618
Shared Lane Traffic (%)					
Lane Group Flow (vph)	507	418	1757	228	618
Enter Blocked Intersection	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left
Median Width(ft)			24		24
Link Offset(ft)			0		0
Crosswalk Width(ft)			16		16
Two way Left Turn Lane					
Headway Factor	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15	9	15
Number of Detectors	1	1	1	1	1
Detector Template	Left	Right	Left	Right	Left
Leading Detector (ft)	20	20	20	20	20
Trailing Detector (ft)	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0
Detector 1 Size(ft)	20	20	20	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel					
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	Prot	Prot	Free	Prot
Protected Phases	2	1	1		2
Permitted Phases				Free	
Detector Phase	2	1	1		2
Switch Phase					
Minimum Initial (s)	1.0	1.0	1.0		1.0
Minimum Split (s)	23.0	23.0	23.0		23.0
Total Split (s)	23.0	47.0	47.0		23.0

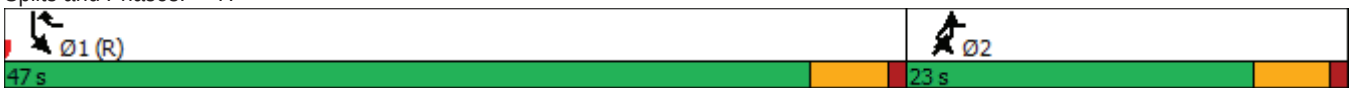


Lane Group	WBL2	WBR	SBL	SBR2	NEL
Total Split (%)	32.9%	67.1%	67.1%		32.9%
Maximum Green (s)	18.0	42.0	42.0		18.0
Yellow Time (s)	4.0	4.0	4.0		4.0
All-Red Time (s)	1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0
Total Lost Time (s)	5.0	5.0	5.0		5.0
Lead/Lag	Lag	Lead	Lead		Lag
Lead-Lag Optimize?	Yes	Yes	Yes		Yes
Vehicle Extension (s)	3.0	3.0	3.0		3.0
Recall Mode	Max	C-Max	C-Max		Max
Walk Time (s)	7.0	7.0	7.0		7.0
Flash Dont Walk (s)	11.0	11.0	11.0		11.0
Pedestrian Calls (#/hr)	0	0	0		0
Act Effct Green (s)	18.0	42.0	42.0	70.0	18.0
Actuated g/C Ratio	0.26	0.60	0.60	1.00	0.26
v/c Ratio	0.56	0.25	0.85	0.14	0.70
Control Delay	23.5	5.7	17.0	0.2	16.8
Queue Delay	0.0	0.0	0.0	0.0	1.2
Total Delay	23.5	5.7	17.0	0.2	17.9
LOS	C	A	B	A	B
Approach Delay			15.1		17.9
Approach LOS			B		B
90th %ile Green (s)	18.0	42.0	42.0		18.0
90th %ile Term Code	MaxR	Coord	Coord		MaxR
70th %ile Green (s)	18.0	42.0	42.0		18.0
70th %ile Term Code	MaxR	Coord	Coord		MaxR
50th %ile Green (s)	18.0	42.0	42.0		18.0
50th %ile Term Code	MaxR	Coord	Coord		MaxR
30th %ile Green (s)	18.0	42.0	42.0		18.0
30th %ile Term Code	MaxR	Coord	Coord		MaxR
10th %ile Green (s)	18.0	42.0	42.0		18.0
10th %ile Term Code	MaxR	Coord	Coord		MaxR
Stops (vph)	359	134	1216	0	504
Fuel Used(gal)	8	4	24	2	6
CO Emissions (g/hr)	525	274	1683	107	412
NOx Emissions (g/hr)	102	53	328	21	80
VOC Emissions (g/hr)	122	63	390	25	95
Dilemma Vehicles (#)	0	0	0	0	0
Queue Length 50th (ft)	89	34	284	0	124
Queue Length 95th (ft)	134	55	389	0	178
Internal Link Dist (ft)			854		182
Turn Bay Length (ft)		500			
Base Capacity (vph)	911	1702	2059	1583	882
Starvation Cap Reductn	0	0	0	0	103
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.56	0.25	0.85	0.14	0.79

Intersection Summary

Area Type:	Other		
Cycle Length: 70			
Actuated Cycle Length: 70			
Offset: 0 (0%), Referenced to phase 1:SBL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.85			
Intersection Signal Delay: 15.7		Intersection LOS: B	
Intersection Capacity Utilization 87.3%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 7:



Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	0	0	177	569	0	0
Future Volume (vph)	0	0	177	569	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.91	0.91	1.00	1.00
Frt						
Flt Protected			0.950	0.999		
Satd. Flow (prot)	0	0	1610	3387	0	0
Flt Permitted			0.950	0.999		
Satd. Flow (perm)	0	0	1610	3387	0	0
Right Turn on Red		Yes	Yes			Yes
Satd. Flow (RTOR)						
Link Speed (mph)	30			30	30	
Link Distance (ft)	283			226	262	
Travel Time (s)	6.4			5.1	6.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	192	618	0	0
Shared Lane Traffic (%)			10%			
Lane Group Flow (vph)	0	0	173	637	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Turn Type			Perm	NA		
Protected Phases				4		
Permitted Phases			4			
Minimum Split (s)			22.5	22.5		
Total Split (s)			70.0	70.0		
Total Split (%)			100.0%	100.0%		
Maximum Green (s)			65.5	65.5		
Yellow Time (s)			3.5	3.5		
All-Red Time (s)			1.0	1.0		
Lost Time Adjust (s)			0.0	0.0		
Total Lost Time (s)			4.5	4.5		
Lead/Lag						
Lead-Lag Optimize?						
Walk Time (s)			7.0	7.0		
Flash Dont Walk (s)			11.0	11.0		
Pedestrian Calls (#/hr)			0	0		
Act Effct Green (s)			70.0	70.0		
Actuated g/C Ratio			1.00	1.00		
v/c Ratio			0.11	0.19		
Control Delay			0.1	0.1		
Queue Delay			0.0	0.0		
Total Delay			0.1	0.1		

Lane Group	SEL	SER	NEL	NET	SWT	SWR
LOS			A	A		
Approach Delay				0.1		
Approach LOS				A		
Stops (vph)			0	0		
Fuel Used(gal)			1	4		
CO Emissions (g/hr)			67	245		
NOx Emissions (g/hr)			13	48		
VOC Emissions (g/hr)			15	57		
Dilemma Vehicles (#)			0	0		
Queue Length 50th (ft)			0	0		
Queue Length 95th (ft)			0	0		
Internal Link Dist (ft)	203			146	182	
Turn Bay Length (ft)						
Base Capacity (vph)			1610	3387		
Starvation Cap Reductn			0	0		
Spillback Cap Reductn			0	122		
Storage Cap Reductn			0	0		
Reduced v/c Ratio			0.11	0.20		

Intersection Summary			
Area Type:	Other		
Cycle Length: 70			
Actuated Cycle Length: 70			
Offset: 0 (0%), Referenced to phase 2: and 6:, Start of Green			
Natural Cycle: 40			
Control Type: Pretimed			
Maximum v/c Ratio: 0.19			
Intersection Signal Delay: 0.1		Intersection LOS: A	
Intersection Capacity Utilization 32.0%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 15:





Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Traffic Volume (vph)	0	0	0	210	177	0
Future Volume (vph)	0	0	0	210	177	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	0	0	1863	3433	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	0	0	1863	3433	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	714			351	283	
Travel Time (s)	16.2			8.0	6.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	228	192	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	228	192	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	24	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Stop			Yield	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 32.0%		ICU Level of Service A	
Analysis Period (min) 15			



Lane Group	EBL2	EBR	NBL	NBR2	SWL
Lane Configurations					
Traffic Volume (vph)	349	601	1523	944	1547
Future Volume (vph)	349	601	1523	944	1547
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Storage Length (ft)		400	0		0
Storage Lanes		1	2		2
Taper Length (ft)			25		25
Lane Util. Factor	1.00	1.00	0.97	1.00	0.97
Frt		0.850		0.850	
Flt Protected	0.950		0.950		0.950
Satd. Flow (prot)	1770	1583	3433	1583	3433
Flt Permitted	0.950		0.950		0.950
Satd. Flow (perm)	1770	1583	3433	1583	3433
Right Turn on Red	Yes	Yes		Yes	
Satd. Flow (RTOR)	24	24		529	
Link Speed (mph)			30		30
Link Distance (ft)			871		262
Travel Time (s)			19.8		6.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	379	653	1655	1026	1682
Shared Lane Traffic (%)					
Lane Group Flow (vph)	379	653	1655	1026	1682
Enter Blocked Intersection	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left
Median Width(ft)			24		24
Link Offset(ft)			0		0
Crosswalk Width(ft)			16		16
Two way Left Turn Lane					
Headway Factor	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15	9	15
Number of Detectors	1	1	1	1	1
Detector Template	Left	Right	Left	Right	Left
Leading Detector (ft)	20	20	20	20	20
Trailing Detector (ft)	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0
Detector 1 Size(ft)	20	20	20	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel					
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0
Turn Type	D.Pm	Perm	Prot	Free	Prot
Protected Phases			2		1
Permitted Phases	1	2		Free	
Detector Phase	1	2	2		1
Switch Phase					
Minimum Initial (s)	1.0	1.0	1.0		1.0
Minimum Split (s)	23.0	23.0	23.0		23.0
Total Split (s)	45.0	45.0	45.0		45.0



Lane Group	EBL2	EBR	NBL	NBR2	SWL
Total Split (%)	50.0%	50.0%	50.0%		50.0%
Maximum Green (s)	40.0	40.0	40.0		40.0
Yellow Time (s)	4.0	4.0	4.0		4.0
All-Red Time (s)	1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0
Total Lost Time (s)	5.0	5.0	5.0		5.0
Lead/Lag	Lead	Lag	Lag		Lead
Lead-Lag Optimize?	Yes	Yes	Yes		Yes
Vehicle Extension (s)	3.0	3.0	3.0		3.0
Recall Mode	C-Max	None	None		C-Max
Walk Time (s)	7.0	7.0	7.0		7.0
Flash Dont Walk (s)	11.0	11.0	11.0		11.0
Pedestrian Calls (#/hr)	0	0	0		0
Act Effct Green (s)	40.0	40.0	40.0	90.0	40.0
Actuated g/C Ratio	0.44	0.44	0.44	1.00	0.44
v/c Ratio	0.47	0.91	1.09	0.65	1.10
Control Delay	18.8	42.1	75.9	2.1	77.4
Queue Delay	0.0	0.0	0.0	0.0	0.1
Total Delay	18.8	42.1	75.9	2.1	77.5
LOS	B	D	E	A	E
Approach Delay			47.6		77.5
Approach LOS			D		E
90th %ile Green (s)	40.0	40.0	40.0		40.0
90th %ile Term Code	Coord	Max	Max		Coord
70th %ile Green (s)	40.0	40.0	40.0		40.0
70th %ile Term Code	Coord	Max	Max		Coord
50th %ile Green (s)	40.0	40.0	40.0		40.0
50th %ile Term Code	Coord	Max	Max		Coord
30th %ile Green (s)	40.0	40.0	40.0		40.0
30th %ile Term Code	Coord	Max	Max		Coord
10th %ile Green (s)	40.0	40.0	40.0		40.0
10th %ile Term Code	Coord	Max	Max		Coord
Stops (vph)	223	489	1302	1	1290
Fuel Used(gal)	5	12	41	7	35
CO Emissions (g/hr)	328	804	2871	476	2423
NOx Emissions (g/hr)	64	157	559	93	471
VOC Emissions (g/hr)	76	186	665	110	562
Dilemma Vehicles (#)	0	0	0	0	0
Queue Length 50th (ft)	137	326	~549	0	~562
Queue Length 95th (ft)	216	#555	#681	0	#702
Internal Link Dist (ft)			791		182
Turn Bay Length (ft)		400			
Base Capacity (vph)	800	716	1525	1583	1525
Starvation Cap Reductn	0	0	0	0	57
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.47	0.91	1.09	0.65	1.15

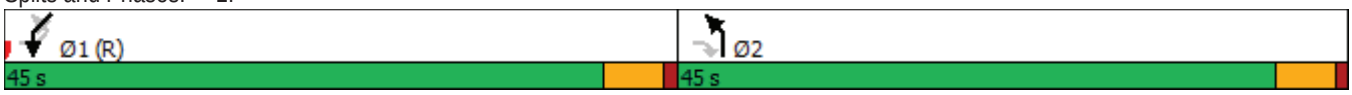
Intersection Summary

Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 51 (57%), Referenced to phase 1:EBSWL, Start of Green			
Natural Cycle: 120			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.10			
Intersection Signal Delay: 54.3		Intersection LOS: D	
Intersection Capacity Utilization 118.6%		ICU Level of Service H	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1:



Lane Group	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	0	0	0	0	754	1547
Future Volume (vph)	0	0	0	0	754	1547
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	0.91	0.91
Frt						
Flt Protected					0.950	0.998
Satd. Flow (prot)	0	0	0	0	1610	3383
Flt Permitted					0.950	0.998
Satd. Flow (perm)	0	0	0	0	1610	3383
Right Turn on Red		Yes		Yes	Yes	
Satd. Flow (RTOR)						
Link Speed (mph)	30		30			30
Link Distance (ft)	275		262			252
Travel Time (s)	6.3		6.0			5.7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	820	1682
Shared Lane Traffic (%)					10%	
Lane Group Flow (vph)	0	0	0	0	738	1764
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	0		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Turn Type					Perm	NA
Protected Phases						8
Permitted Phases					8	
Minimum Split (s)					22.5	22.5
Total Split (s)					90.0	90.0
Total Split (%)					100.0%	100.0%
Maximum Green (s)					85.5	85.5
Yellow Time (s)					3.5	3.5
All-Red Time (s)					1.0	1.0
Lost Time Adjust (s)					0.0	0.0
Total Lost Time (s)					4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Walk Time (s)					7.0	7.0
Flash Dont Walk (s)					11.0	11.0
Pedestrian Calls (#/hr)					0	0
Act Effct Green (s)					90.0	90.0
Actuated g/C Ratio					1.00	1.00
v/c Ratio					0.46	0.52
Control Delay					0.5	0.3
Queue Delay					0.0	0.5
Total Delay					0.5	0.8

Lane Group	NWL	NWR	NET	NER	SWL	SWT
LOS					A	A
Approach Delay						0.7
Approach LOS						A
Stops (vph)					0	0
Fuel Used(gal)					4	10
CO Emissions (g/hr)					306	728
NOx Emissions (g/hr)					60	142
VOC Emissions (g/hr)					71	169
Dilemma Vehicles (#)					0	0
Queue Length 50th (ft)					0	0
Queue Length 95th (ft)					m0	m0
Internal Link Dist (ft)	195		182			172
Turn Bay Length (ft)						
Base Capacity (vph)					1610	3383
Starvation Cap Reductn					0	0
Spillback Cap Reductn					0	1006
Storage Cap Reductn					0	0
Reduced v/c Ratio					0.46	0.74

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2: and 6:, Start of Green			
Natural Cycle: 40			
Control Type: Pretimed			
Maximum v/c Ratio: 0.52			
Intersection Signal Delay: 0.7		Intersection LOS: A	
Intersection Capacity Utilization 77.9%		ICU Level of Service D	
Analysis Period (min) 15			

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5:





Lane Group	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations						
Traffic Volume (vph)	0	944	0	0	754	0
Future Volume (vph)	0	944	0	0	754	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	1863	0	0	3433	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	0	0	3433	0
Link Speed (mph)		30	30		30	
Link Distance (ft)		374	359		275	
Travel Time (s)		8.5	8.2		6.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1026	0	0	820	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1026	0	0	820	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		24	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Yield	Stop		Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 99.9%		ICU Level of Service F	
Analysis Period (min) 15			



Lane Group	WBL2	WBR	SBL	SBR2	NEL
Lane Configurations					
Traffic Volume (vph)	823	1205	1478	260	1303
Future Volume (vph)	823	1205	1478	260	1303
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Storage Length (ft)		500	0		0
Storage Lanes		2	2		2
Taper Length (ft)			25		25
Lane Util. Factor	0.97	0.88	0.97	1.00	0.97
Frt		0.850		0.850	
Flt Protected	0.950		0.950		0.950
Satd. Flow (prot)	3433	2787	3433	1583	3433
Flt Permitted	0.950		0.950		0.950
Satd. Flow (perm)	3433	2787	3433	1583	3433
Right Turn on Red	Yes	Yes		Yes	
Satd. Flow (RTOR)	24	24		150	
Link Speed (mph)			30		30
Link Distance (ft)			934		262
Travel Time (s)			21.2		6.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	895	1310	1607	283	1416
Shared Lane Traffic (%)					
Lane Group Flow (vph)	895	1310	1607	283	1416
Enter Blocked Intersection	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left
Median Width(ft)			24		24
Link Offset(ft)			0		0
Crosswalk Width(ft)			16		16
Two way Left Turn Lane					
Headway Factor	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15	9	15
Number of Detectors	1	1	1	1	1
Detector Template	Left	Right	Left	Right	Left
Leading Detector (ft)	20	20	20	20	20
Trailing Detector (ft)	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0
Detector 1 Size(ft)	20	20	20	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel					
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0
Turn Type	Prot	Prot	Prot	Free	Prot
Protected Phases	2	1	1		2
Permitted Phases				Free	
Detector Phase	2	1	1		2
Switch Phase					
Minimum Initial (s)	1.0	1.0	1.0		1.0
Minimum Split (s)	23.0	23.0	23.0		23.0
Total Split (s)	42.0	48.0	48.0		42.0



Lane Group	WBL2	WBR	SBL	SBR2	NEL
Total Split (%)	46.7%	53.3%	53.3%		46.7%
Maximum Green (s)	37.0	43.0	43.0		37.0
Yellow Time (s)	4.0	4.0	4.0		4.0
All-Red Time (s)	1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0
Total Lost Time (s)	5.0	5.0	5.0		5.0
Lead/Lag	Lag	Lead	Lead		Lag
Lead-Lag Optimize?	Yes	Yes	Yes		Yes
Vehicle Extension (s)	3.0	3.0	3.0		3.0
Recall Mode	Max	C-Max	C-Max		Max
Walk Time (s)	7.0	7.0	7.0		7.0
Flash Dont Walk (s)	11.0	11.0	11.0		11.0
Pedestrian Calls (#/hr)	0	0	0		0
Act Effct Green (s)	37.0	43.0	43.0	90.0	37.0
Actuated g/C Ratio	0.41	0.48	0.48	1.00	0.41
v/c Ratio	0.63	0.97	0.98	0.18	1.00
Control Delay	22.8	43.0	42.1	0.2	43.6
Queue Delay	0.0	0.0	0.0	0.0	35.3
Total Delay	22.8	43.0	42.1	0.2	78.9
LOS	C	D	D	A	E
Approach Delay			35.9		78.9
Approach LOS			D		E
90th %ile Green (s)	37.0	43.0	43.0		37.0
90th %ile Term Code	MaxR	Coord	Coord		MaxR
70th %ile Green (s)	37.0	43.0	43.0		37.0
70th %ile Term Code	MaxR	Coord	Coord		MaxR
50th %ile Green (s)	37.0	43.0	43.0		37.0
50th %ile Term Code	MaxR	Coord	Coord		MaxR
30th %ile Green (s)	37.0	43.0	43.0		37.0
30th %ile Term Code	MaxR	Coord	Coord		MaxR
10th %ile Green (s)	37.0	43.0	43.0		37.0
10th %ile Term Code	MaxR	Coord	Coord		MaxR
Stops (vph)	613	1015	1269	0	1163
Fuel Used(gal)	13	25	30	2	21
CO Emissions (g/hr)	912	1726	2128	133	1443
NOx Emissions (g/hr)	177	336	414	26	281
VOC Emissions (g/hr)	211	400	493	31	334
Dilemma Vehicles (#)	0	0	0	0	0
Queue Length 50th (ft)	197	392	443	0	~419
Queue Length 95th (ft)	260	#572	#617	0	#579
Internal Link Dist (ft)			854		182
Turn Bay Length (ft)		500			
Base Capacity (vph)	1425	1344	1640	1583	1411
Starvation Cap Reductn	0	0	0	0	148
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.63	0.97	0.98	0.18	1.12

Intersection Summary

Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 1:SBL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.00			
Intersection Signal Delay: 46.5		Intersection LOS: D	
Intersection Capacity Utilization 114.5%		ICU Level of Service H	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 7:





Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	0	0	262	1303	0	0
Future Volume (vph)	0	0	262	1303	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.91	0.91	1.00	1.00
Frt						
Flt Protected			0.950	0.999		
Satd. Flow (prot)	0	0	1610	3387	0	0
Flt Permitted			0.950	0.999		
Satd. Flow (perm)	0	0	1610	3387	0	0
Right Turn on Red		Yes	Yes			Yes
Satd. Flow (RTOR)						
Link Speed (mph)	30			30	30	
Link Distance (ft)	283			226	262	
Travel Time (s)	6.4			5.1	6.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	285	1416	0	0
Shared Lane Traffic (%)			10%			
Lane Group Flow (vph)	0	0	256	1445	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Turn Type			Perm	NA		
Protected Phases				4		
Permitted Phases			4			
Minimum Split (s)			22.5	22.5		
Total Split (s)			90.0	90.0		
Total Split (%)			100.0%	100.0%		
Maximum Green (s)			85.5	85.5		
Yellow Time (s)			3.5	3.5		
All-Red Time (s)			1.0	1.0		
Lost Time Adjust (s)			0.0	0.0		
Total Lost Time (s)			4.5	4.5		
Lead/Lag						
Lead-Lag Optimize?						
Walk Time (s)			7.0	7.0		
Flash Dont Walk (s)			11.0	11.0		
Pedestrian Calls (#/hr)			0	0		
Act Effct Green (s)			90.0	90.0		
Actuated g/C Ratio			1.00	1.00		
v/c Ratio			0.16	0.43		
Control Delay			0.1	0.1		
Queue Delay			0.0	0.1		
Total Delay			0.1	0.2		

Lane Group	SEL	SER	NEL	NET	SWT	SWR
LOS			A	A		
Approach Delay				0.2		
Approach LOS				A		
Stops (vph)			0	0		
Fuel Used(gal)			1	8		
CO Emissions (g/hr)			99	556		
NOx Emissions (g/hr)			19	108		
VOC Emissions (g/hr)			23	129		
Dilemma Vehicles (#)			0	0		
Queue Length 50th (ft)			0	0		
Queue Length 95th (ft)			m0	m0		
Internal Link Dist (ft)	203			146	182	
Turn Bay Length (ft)						
Base Capacity (vph)			1610	3387		
Starvation Cap Reductn			0	0		
Spillback Cap Reductn			0	732		
Storage Cap Reductn			0	0		
Reduced v/c Ratio			0.16	0.54		

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2: and 6:, Start of Green			
Natural Cycle: 40			
Control Type: Pretimed			
Maximum v/c Ratio: 0.43			
Intersection Signal Delay: 0.2		Intersection LOS: A	
Intersection Capacity Utilization 49.9%		ICU Level of Service A	
Analysis Period (min) 15			

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 15:





Lane Group	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Traffic Volume (vph)	0	0	0	260	262	0
Future Volume (vph)	0	0	0	260	262	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	0.97	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	0	0	1863	3433	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	0	0	1863	3433	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	714			351	283	
Travel Time (s)	16.2			8.0	6.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	283	285	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	283	285	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	24	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Stop			Yield	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 49.9%		ICU Level of Service A	
Analysis Period (min) 15			

Appendix J
McCarran Boulevard & Las Brisas Boulevard Intersection Analysis

SIGNAL WARRANT ANALYSIS

The existing intersection includes stop control for the southbound Las Brisas Boulevard movement only. The first consideration is to potentially convert the intersection into a traditional signalized intersection, controlling all legs and movements. Thus, a signal warrant analysis was conducted to determine if a signal is warranted for the intersection.

According to the *Manual on Uniform Traffic Control Devices* (MUTCD): "*The investigation of the need for a traffic control signal shall include an analysis of factors related to the existing operation and safety at the study location and the potential to improve these conditions, and the applicable factors contained in the following traffic signal warrants:*"

- *Warrant 1 – Eight-Hour Vehicular Volume*
- *Warrant 2 – Four-Hour Vehicular Volume*
- *Warrant 3 – Peak Hour*
- *Warrant 4 – Pedestrian Volume*
- *Warrant 5 – School Crossing*
- *Warrant 6 – Coordinated Signal System*
- *Warrant 7 – Crash Experience*
- *Warrant 8 – Roadway Network*
- *Warrant 9 – Intersection Near a Grade Crossing*

To determine if the intersection of McCarran Boulevard and Las Brisas Boulevard meets signal warrants, all nine MUTCD signal warrants were analyzed. An intersection need only meet one of the nine warrants to be considered for a signal, however, engineering judgement is applied to determine the overall applicability.

Warrant 1 – Eight-Hour Vehicular Volume

Eight-hour vehicular volume counts were not collected on McCarran Boulevard or Las Brisas Boulevard for the SMP. As part of the scope of services, AM (7 AM – 9 AM) and PM (4 PM – 6 PM) peak hour turning movement volumes were collected for the SMP. The lack of eight-hour volumes does not allow Warrant 1 to be fully analyzed. However, McCarran Boulevard is significantly more congested during the AM and PM peak periods than it is the rest of the day. Therefore, engineering judgement can be used to determine Warrant 1 likely will not be met.

Warrant 2 – Four-Hour Vehicular Volume

Due to the fact that four hours of data was collected for the SMP, Warrant 2 can be fully analyzed. To determine if the warrant would be met, the following was calculated from the peak hour traffic counts (heaviest four hours) located in **Appendix A**:

- Vehicles per hour on McCarran Boulevard (total of both the eastbound and westbound directions) were 2,246 vehicles/hour
- Vehicles per hour on Las Brisas Boulevard (one direction) in the southbound direction were initially calculated as 202 vehicles/hour

According to the MUTCD, "*Right-turn traffic should not be included in the minor-street volume if the movement enters the major street with minimal conflict. The approach should be evaluated as a one-lane approach with only the traffic volume in the through/left-turn lane considered*." This appears to be the

case at this location. Therefore, the Las Brisas Boulevard southbound movement drops from 202 vehicles/hour to 66 vehicles/hour for analysis purposes.

Utilizing Figure 4C-2 in the MUTCD:

- NDOT conducted a Speed Study, shown in **Appendix B**, which calculated the following 85th-percentile speeds on McCarran Boulevard around Las Brisas Boulevard:
    - I-80 – Las Brisas Boulevard – 51 MPH
    - Las Brisas Boulevard – Virginia Street – 59 MPH

  Both of the locations around Las Brisas Boulevard have operating speeds greater than 40 MPH, therefore Figure 4C-2 can be used.
- Utilizing the line for two or more lanes on McCarran Boulevard and one lane on Las Brisas Boulevard, results in 60 vehicles/hour as the lower threshold volume limit
- Since the net 66 vehicles/hour is greater than 60 vehicles/hour, Warrant 2 is met.

Warrant 2 meets the signal warrant.

Warrant 3 – Peak Hour

According to the MUTCD, "*This signal warrant shall be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.*" This is not the case at Las Brisas Boulevard; however, the peak hour warrant was still analyzed.

As mentioned, peak hour volumes were collected for the SMP, therefore Warrant 3 can be fully analyzed. To determine if the warrant would be met, the following was calculated from the traffic counts located in **Appendix A**:

AM Peak Hour

- Total AM peak hour volume of both McCarran Boulevard approaches is 2,033 vehicles/hour.
- Initially, the total volume of the Las Brisas Boulevard southbound approach was calculated as 267 vehicles/hour, however utilizing the same approach used in Warrant 2 regarding right-turning traffic should not be included, the updated eastbound approach volume is revised to 100 vehicles/hour.
- Utilizing Figure 4C-4 in the MUTCD for speeds greater than 40 MPH, the line for two or more lanes on McCarran Boulevard and one lane on Las Brisas Boulevard has a lower threshold volume limit of 75 vehicles/hour.
- Since Las Brisas has an approach volume of 100 vehicles/hour, which is greater than the 75 vehicles/hour threshold, Warrant 3 is met.

PM Peak Hour

- Total volume of both approaches is 2,692 vehicles/hour.
- Similar to AM, initially the Las Brisas Boulevard southbound approach was 187 vehicles/hour, but it was updated to 44 vehicles/hour once the right-turning volume was removed.
- Unlike the AM peak hour, the Las Brisas Boulevard 44 vehicles/hour does not meet the minimum threshold of 75 vehicles/hour.

In conclusion, even though Warrant 3 should only be applied in unusual cases, when it is analyzed, *Warrant 3 meets the signal warrant*.

Warrant 4 – Pedestrian Volume

The peak hour pedestrian volumes, shown in **Appendix A**, do not come close to either the four-hour or one-hour pedestrian thresholds. Therefore, Warrant 4 is not met.

Warrant 5 – School Crossing

The number of schoolchildren crossing at the highest hour is lower than the minimum of 20 needed to warrant a signal. Therefore, Warrant 5 is not met.

Warrant 6 – Coordinated Signal System

Seventh Street (approximately 0.25-miles from Las Brisas Boulevard) and Kings Row (approximately 0.35-miles from Las Brisas Boulevard) are the closest signalized intersections in both directions along McCarran Boulevard from the Las Brisas Boulevard intersection. The close proximity of the existing signals allows for the necessary degree of platooning and thus Warrant 6 is not met.

Warrant 7 – Crash Experience

There was a total of 14 crashes at the intersection of McCarran Boulevard and Las Brisas Boulevard over a 5-year period, which averages to less than three crashes per year. Three crashes per year is less than the minimum threshold of five crashes per year, therefore Warrant 7 is not met.

Warrant 8 – Roadway Network

The intersection of McCarran Boulevard and Las Brisas Boulevard has an entering volume greater than 1,000 vehicles/hour during the peak hour of a typical weekend and it currently meets (and will continue to meet) Warrant 2 and Warrant 3. Additionally, McCarran Boulevard is a major route that serves as the principal roadway network for through traffic flow as part of metro Reno's ring road. Therefore, Warrant 8 is met.

Warrant 9 – Intersection Near a Grade Crossing

The intersection of McCarran Boulevard and Las Brisas Boulevard is not near a grade crossing, therefore Warrant 9 is not met.

Warrant Conclusion

Warrant 2, Warrant 3, and Warrant 8 all meet their signal warrants, thus a signal could be considered at the intersection of McCarran Boulevard and Las Brisas Boulevard.

SUGGESTED CONTROL

According to the *ICE Process Informational Guide*, an initial screening based on average daily traffic (ADT) can be used as a guide to determine which type of intersection control is needed. The following information was used in the initial screening process:

- NDOT collected the following annual average daily traffic (AADT) volumes near the intersection of McCarran Boulevard and Las Brisas Boulevard in 2017:
  - McCarran Boulevard, 364-feet north of W 7th Street, is 29,000 AADT
  - McCarran Boulevard, 343-feet east of Kings Row, is 23,000 AADT
  - Las Brisas Boulevard, 200-feet west of McCarran Boulevard, is 4,800 AADT

- Therefore, the total AADT entering the intersection of McCarran Boulevard and Las Brisas Boulevard is between 25,000 and 80,000
- Referring to **Table 1** (*Table 1 in the ICE Process Informational Guide*), the total entering ADT would suggest a signalized or a multi-lane roundabout intersection be considered.

Table 1: Suggested Intersection Control Strategies by Total ADT Entering

Total ADT Entering	All-Way Stop	Signal	Yield (RBT)	Grade Separation
7,500 - 15,000	X		X (single-lane)	
15,000 - 25,000	X	X	X (single-lane)	
25,000 - 80,000		X	X (multi-lane)	
>80,000				X

Existing Unsignalized Intersection

Traffic operations at McCarran Boulevard and Las Brisas Boulevard have been quantified through the determination of Level-of-Service (LOS), which is a qualitative measure of traffic operating conditions, whereby a letter grade "A" through "F" is assigned, representing progressively worsening traffic operations. LOS has been calculated using methods documented in the Transportation Research Board (TRB) Publication *Highway Capacity Manual, Sixth Edition* (HCM). Synchro 10 microsimulation software was utilized to calculate the LOS and delay time at this intersection against the regional standard of LOS D or better at intersections during peak hours.

For the existing conditions, the intersection is an unsignalized, one-way-stop-controlled intersection where the traffic is stop controlled on Las Brisas Boulevard. For unsignalized intersections, the delay and LOS is calculated as the "worst-case" approach, which is the southbound Las Brisas Boulevard approach in both the AM and PM peak hours. The existing conditions approach delay, approach LOS, intersection delay, and intersection LOS for McCarran Boulevard and Las Brisas Boulevard can be seen in **Table 2** and the Synchro results can be found in **Appendix C**.

TABLE 2: MCCARRAN BOULEVARD LEVEL-OF-SERVICE - EXISTING CONDITIONS

McCarran Boulevard Intersection	Signalization	Time	Approach Delay (Seconds) & LOS								Intersection Delay (Seconds) & LOS	
			EB		WB		NB		SB			
Las Brisas Boulevard	Unsignalized	AM	0.8	A	0.0	A	-	-	141.5	F	141.5	F
		PM	21.1	C	0.0	A	-	-	ERROR	F	ERROR	F

Source: Wood Rodgers, April 2019

"Error" denotes delay greater than Synchro will quantify

Signalized Intersection

As mentioned, the intersection of McCarran Boulevard and Las Brisas Boulevard meets multiple signal warrants, and according to **Table 1**, the AADT would suggest a signalized intersection or multi-lane roundabout at McCarran Boulevard and Las Brisas Boulevard. Therefore, a traditional signalized intersection option was identified to include the following:

- The McCarran Boulevard eastbound lane drop from three-lanes to two-lanes was reconfigured to occur before the intersection, instead of directly after the intersection, which allows for only two eastbound through lanes.

- Standard turn pockets including
  - 300-foot eastbound left-turn pocket
  - 150-foot westbound right-turn pocket
  - 300-foot southbound left-turn pocket
- Crosswalk in the southbound direction across McCarran Boulevard to perpetuate access to an existing transit stop.
- Actuated-coordinated signals with the same signal timings as similar signals during the peak hour (AM – 120 seconds, PM – 132 seconds) and a flashing yellow left arrow in the eastbound direction.

When this configuration is placed within the existing conditions network, all queue lengths are contained within the standard turn pockets and all approach and intersection delays are LOS C or better, as shown in the comparison of the existing unsignalized intersection and the proposed signalized intersection in **Table 3**. The accompanying Synchro results can be found in **Appendix C**.

TABLE 3: MCCARRAN BOULEVARD LEVEL-OF-SERVICE - EXISTING CONDITIONS

McCarran Boulevard Intersection	Signalization	Time	Approach Delay (Seconds) & LOS								Intersection Delay (Seconds) & LOS	
			EB		WB		NB		SB			
Las Brisas Boulevard	Unsignalized	AM	0.8	A	0.0	A	-	-	141.5	F	141.5	F
		PM	21.1	C	0.0	A	-	-	ERROR	F	ERROR	F
Las Brisas Boulevard	Signalized	AM	8.9	A	7.9	A	-	-	18.2	B	9.6	A
		PM	12.2	B	28.6	C	-	-	17.4	B	20.1	C

Source: Wood Rodgers, April 2019

"Error" denotes delay greater than Synchro will quantify

The unsignalized intersection goes from a LOS F to a LOS B in the AM peak hour when signalized, similarly the unsignalized intersection goes from a LOS F to a LOS C in the PM peak hour when signalized. It must be noted that the existing unsignalized intersection LOS is measured by the worst approach whereas signalized intersections are measured based on the overall intersection LOS.

In addition to the existing conditions, 2030 and 2040 volumes were projected (shown in **Appendix D**) and analyzed. As shown in **Table 4**, the intersection LOS functions at LOS D or better in both the AM and PM peak hours in 2030. However, in 2040 the PM peak hour results in an overall intersection LOS F. Additionally, the eastbound left-turn pocket will need to be extended in the future to accommodate the queue lengths in both the 2030 and 2040 conditions, which can be viewed in **Appendix E**.

TABLE 4: MCCARRAN BOULEVARD LEVEL-OF-SERVICE - FUTURE CONDITIONS

McCarran Boulevard Intersection	Signalization	Year	Time	Approach Delay (Seconds) & LOS								Intersection Delay (Seconds) & LOS	
				EB		WB		NB		SB			
Las Brisas Boulevard	Signalized	2030	AM	9.1	A	11.6	B	-	-	23.5	C	11.8	B
		2030	PM	29.4	C	63.1	E	-	-	17.4	B	44.2	D
Las Brisas Boulevard	Signalized	2040	AM	11.4	B	12.9	B	-	-	31.0	C	14.4	B
		2040	PM	53.9	D	128.5	F	-	-	17.6	B	85.9	F

Source: Wood Rodgers, April 2019

Roundabout

As mentioned in the previous section, according to **Table 1**, the AADT would suggest a signalized intersection or multi-lane roundabout at McCarran Boulevard and Las Brisas Boulevard, therefore a

roundabout was laid out at this intersection to determine if it was a feasible option. As shown in **Figure 2**, the roundabout is a two-lane roundabout, where the eastbound McCarran Boulevard through lanes drop from three-lanes to two-lanes before the intersection, opposed to directly after the intersection as in the existing condition.



Figure 2: Roundabout Layout

Table 5 shows the difference in the approach and intersection delays between the existing unsignalized intersection and the proposed roundabout. More detailed Sidra 8 roundabout analysis can be viewed in **Appendix F**.

TABLE 5: MCCARRAN BOULEVARD LEVEL-OF-SERVICE - EXISTING CONDITIONS

McCarran Boulevard Intersection	Signalization	Time	Approach Delay (Seconds) & LOS								Intersection Delay (Seconds) & LOS	
			EB		WB		NB		SB			
Las Brisas Boulevard	Unsignalized	AM	0.8	A	0.0	A	-	-	141.5	F	141.5	F
		PM	21.1	C	0.0	A	-	-	ERROR	F	ERROR	F
Las Brisas Boulevard	Roundabout	AM	8.3	A	6.7	A	-	-	15.2	C	8.5	A
		PM	9.9	A	14.4	B	-	-	16.5	C	12.3	B

Source: Wood Rodgers, April 2019

"Error" denotes delay greater than Synchro will quantify

The unsignalized intersection goes from a LOS F to a LOS A in the AM peak hour when the intersection configuration is redesigned into a roundabout, similarly the unsignalized intersection goes from a LOS F to a LOS B in the PM peak hour when the intersection configuration is redesigned into a roundabout.

Similar to the signalized intersection option, the projected 2030 and 2040 volumes were analyzed within the roundabout configuration. As shown in **Table 6**, the intersection LOS of McCarran Boulevard and Las Brisas Boulevard functions at LOS C or better in both the AM and PM peak hours in 2030. However, in 2040 the PM peak hour results in an overall intersection LOS F. Unlike the signalized intersection option, the roundabout option does not include turn pockets, so the queue lengths are for the entire approach only and can be viewed in **Appendix E**.

TABLE 6: MCCARRAN BOULEVARD LEVEL-OF-SERVICE - FUTURE CONDITIONS

McCarran Boulevard Intersection	Signalization	Year	Time	Approach Delay (Seconds) & LOS								Intersection Delay (Seconds) & LOS	
				EB		WB		NB		SB			
Las Brisas Boulevard	Roundabout	2030	AM	11.3	B	8.3	A	-	-	35.1	E	13.0	B
		2030	PM	14.9	B	33.8	D	-	-	38.7	E	24.9	C
Las Brisas Boulevard	Roundabout	2040	AM	15.8	C	10.5	B	-	-	125.2	F	26.8	D
		2040	PM	27.5	D	106.4	F	-	-	64.4	F	64.6	F

Source: Wood Rodgers, April 2019

It should be noted, according to *the ICE Process Informational Guide*, roundabouts can be screened from further consideration if the footprint has a major impact on the built environment. This does not appear to be the case for the intersection of McCarran Boulevard and Las Brisas Boulevard; however, considerations need to be made regarding the topography of this location. The steep drop-off to the south of the intersection would require a retaining wall of up to approximately 15-feet in height.

High-T Intersection

A High-T Intersection was the third alternative analyzed at the intersection of McCarran Boulevard and Las Brisas Boulevard. The High-T intersection, also known as a seagull intersection, continuous green T-intersection, and turbo-T, would allow for continuous movement of the eastbound through traffic on McCarran Boulevard, unless the proposed crosswalk across McCarran Boulevard is actuated. The High-T Intersection would have a signal for Las Brisas Boulevard, McCarran Boulevard westbound movement, and McCarran Boulevard eastbound left-turn; as well as deceleration and acceleration lanes in the eastbound McCarran Boulevard direction. Similar to the signalized intersection, the following was assumed for this intersection:

- The southbound left-turn movement from Las Brisas Boulevard to McCarran Boulevard will become an acceleration lane.
- Standard turn pockets including
  - 150-foot westbound right-turn pocket
  - 300-foot southbound left-turn pocket
- Crosswalk in the southbound direction across McCarran Boulevard
- Actuated-coordinated signals with the same signal timings as similar signals during the peak hour (AM – 120 seconds, PM – 132 seconds)

With this configuration, all queue lengths are contained within the standard turn pockets and all approach and intersection delays are LOS C or better, as shown in the comparison of the existing unsignalized

intersection and the proposed High-T Intersection in **Table 7**. The configuration is illustrated in **Figure 3** and the accompanying Synchro results can be found in **Appendix C**.



Figure 3: High-T Intersection Layout

TABLE 7: MCCARRAN BOULEVARD LEVEL-OF-SERVICE - EXISTING CONDITIONS

McCarran Boulevard Intersection	Signalization	Time	Approach Delay (Seconds) & LOS								Intersection Delay (Seconds) & LOS	
			EB		WB		NB		SB			
Las Brisas Boulevard	Unsignalized	AM	0.8	A	0.0	A	-	-	141.5	F	141.5	F
		PM	21.1	C	0.0	A	-	-	ERROR	F	ERROR	F
Las Brisas Boulevard	High-T	AM	49.2	D	17.8	B	-	-	25.4	C	21.3	C
		PM	47.9	D	23.8	C	-	-	28.6	C	27.8	C
Las Brisas Boulevard	High-T (EB Through)	AM	1.2	A	-	-	-	-	-	-	1.2	A
		PM	3.9	A	-	-	-	-	-	-	3.9	A

Source: Wood Rodgers, April 2019

"Error" denotes delay greater than Synchro will quantify

The unsignalized intersection goes from a LOS F to a LOS C (LOS A in the eastbound direction) in the AM peak hour when the intersection configuration is redesigned into a High-T Intersection, similarly the unsignalized intersection goes from a LOS F to a LOS C (LOS A in the eastbound direction) in the PM peak hour when the intersection configuration is redesigned into a High-T Intersection.

Similar to the previous intersection options, the projected 2030 and 2040 volumes were analyzed within the High-T intersection configuration. As shown in **Table 8**, the intersection LOS of McCarran Boulevard and Las Brisas Boulevard functions at LOS C or better in both the AM and PM peak hours in 2030. Likewise, the intersection LOS of McCarran Boulevard and Las Brisas Boulevard functions at LOS D or better in both the AM and PM peak hours in 2040. The only future concern is the length of the eastbound left-turn bay, which will need to be extended to at least 373-feet in 2030 and 525-feet in 2040 to accommodate future traffic volumes. The queue lengths for the High-T intersection can be seen in **Appendix E**.

TABLE 8: MCCARRAN BOULEVARD LEVEL-OF-SERVICE - FUTURE CONDITIONS

McCarran Boulevard Intersection	Signalization	Year	Time	Approach Delay (Seconds) & LOS								Intersection Delay (Seconds) & LOS	
				EB		WB		NB		SB			
Las Brisas Boulevard	High-T	2030	AM	52.4	D	19.2	B	-	-	31.9	C	23.9	C
		2030	PM	53.7	D	29.5	C	-	-	33.3	C	33.4	C
Las Brisas Boulevard	High-T (EB Through)	2030	AM	1.4	A	-	-	-	-	-	-	1.4	A
		2030	PM	4.7	A	-	-	-	-	-	-	4.7	A
Las Brisas Boulevard	High-T	2040	AM	54.7	D	21.2	C	-	-	37.1	D	26.6	C
		2040	PM	77.0	E	36.4	D	-	-	36.7	D	42.3	D
Las Brisas Boulevard	High-T (EB Through)	2040	AM	1.7	A	-	-	-	-	-	-	1.7	A
		2040	PM	5.7	A	-	-	-	-	-	-	5.7	A

Source: Wood Rodgers, April 2019

SUMMARY OF TECHNICAL FINDINGS

The final step of the analysis includes determining a variety of technical findings including estimated cost to implement, estimated service life, estimated crash savings, and a benefit-cost ratio. All of the technical findings are shown in **Table 9**.

Table 9: Summary of Technical Findings

Control Option	Estimated Cost to Implement	Estimated Service Life	Estimated Crash Savings	Benefit vs. Cost Index
Signal	$585,000	20 Years	$113,769	0.19
Roundabout	$2,800,000	20 Years	$1,001,170	0.36
High-T	$630,000	20 Years	$386,816	0.61

CONCLUSION

When considering control options at the intersection of N. McCarran Boulevard and Las Brisas Boulevard, a number of items should be considered, including:

- According to the *Access Management System and Standards (NDOT, 2017)*, the minimum spacing for signalized intersections on other principal arterials with posted speeds of 40-55 mph is 2,640 feet (0.5 miles). The existing signalized intersection at W 7th Street is located approximately 1,320 feet (0.25 miles) to the west and Kings Row is located 1,848-fee (0.35 miles) to the east. Therefore, both the signal and High-T intersection options do not meet this standard and would require a

deviation. The roundabout option minimum spacing to adjacent intersections is less at 1,320 feet and meets intersection spacing standards.

- The benefit-cost ratio is below one for all control options, meaning the cost of installing is greater than the benefit with respect to crash reduction. There are other costs and benefits that could be considered in this calculation. However, given the safety focus of this SMP, focusing solely on crash benefits is appropriate.
- The RTC Washoe Regional Transportation Plan has identified N. McCarran Boulevard from, W 7th Street to N. Virginia, to be widened from four to six lanes by 2040. A six-lane section would be difficult to accommodate entering/exiting a roundabout. The standard signal and High-T options could be expanded to accommodate any future widening.

Considering all of the issues and opportunities noted above, it is recommended that a roundabout be considered for the N. McCarran Boulevard and Las Brisas Boulevard intersection given that it provides the greatest safety benefit and meets access management intersection spacing standards while improving existing and near-term operations. This would be with the understanding that, with increased traffic volumes and a potential widening of McCarran Boulevard, the roundabout would need to be replaced with a higher volume intersection control in the future, likely a High-T. This could be done as part of the future widening project. However, approximately 20 years of benefits could be realized until such time.

Appendix A
Traffic Counts

Silver State Traffic Data Collection, LLC

1819 Quarley Place
Henderson, Nevada 89014
702-898-1968 - Office
702-217-1968 - Cell
sstraffic@msn.com

File Name : McCarran-Las Brisas
Site Code : 00000000
Start Date : 10/10/2018
Page No : 1

Groups Printed- Unshifted

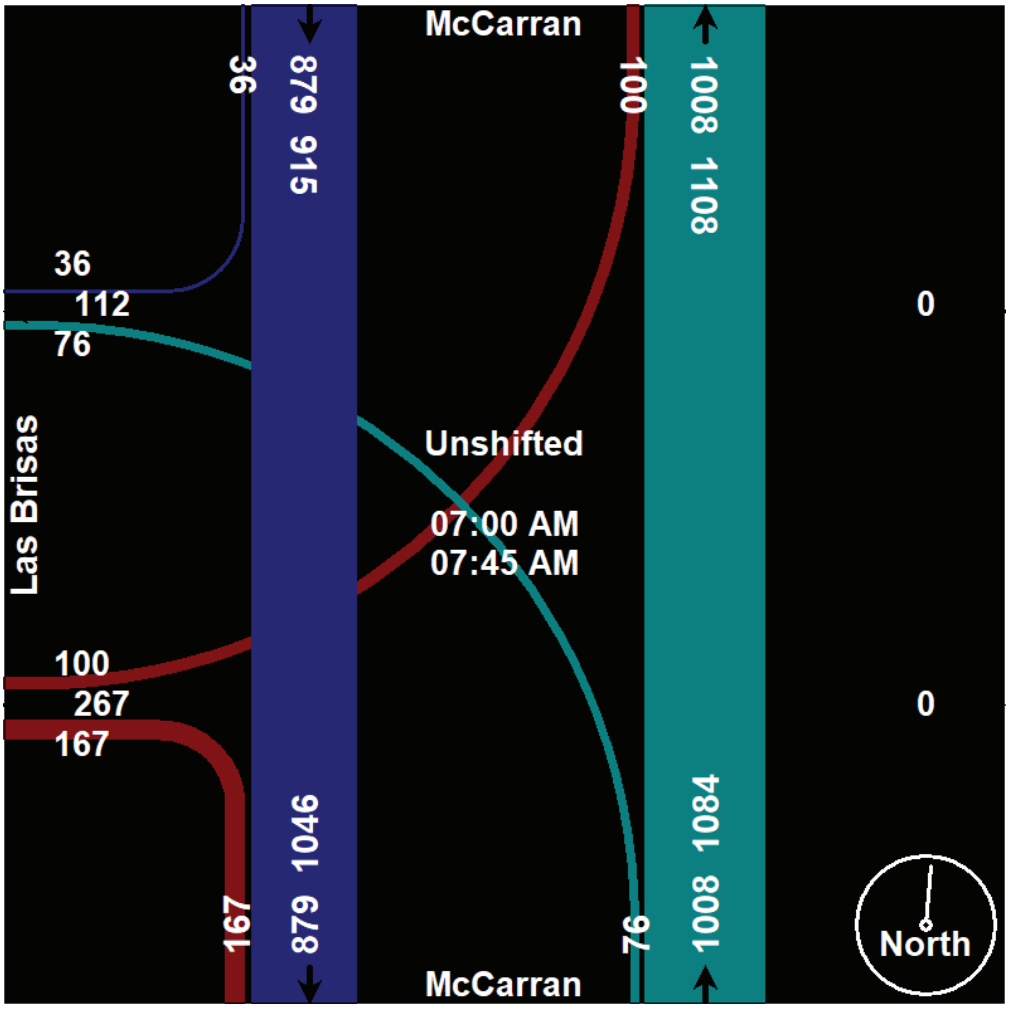
	McCarran Southbound				McCarran Northbound				Las Brisas Eastbound				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	3	200	0	0	0	220	15	0	36	0	21	0	495
07:15 AM	12	251	0	0	0	243	23	0	39	0	19	0	587
07:30 AM	8	225	0	0	0	300	20	0	42	0	30	0	625
07:45 AM	13	203	0	0	0	245	18	0	50	0	30	0	559
Total	36	879	0	0	0	1008	76	0	167	0	100	0	2266
08:00 AM	13	184	0	0	0	174	20	0	37	0	22	0	450
08:15 AM	14	170	0	0	0	189	21	0	35	0	20	0	449
08:30 AM	8	201	0	0	0	220	24	0	39	0	23	0	515
08:45 AM	9	207	0	0	0	201	26	0	20	0	16	0	479
Total	44	762	0	0	0	784	91	0	131	0	81	0	1893
*** BREAK ***													
04:00 PM	11	224	0	0	0	309	55	0	27	0	9	0	635
04:15 PM	28	303	0	0	0	342	52	0	20	0	11	0	756
04:30 PM	31	247	0	0	0	309	61	0	24	0	5	0	677
04:45 PM	18	248	0	0	0	313	40	0	31	0	13	0	663
Total	88	1022	0	0	0	1273	208	0	102	0	38	0	2731
05:00 PM	51	255	0	0	0	300	41	0	30	0	8	0	685
05:15 PM	38	309	0	0	0	321	69	0	38	0	7	0	782
05:30 PM	44	302	0	0	0	280	54	0	43	0	12	0	735
05:45 PM	25	258	0	0	0	251	84	0	31	0	17	0	666
Total	158	1124	0	0	0	1152	248	0	142	0	44	0	2868
Grand Total	326	3787	0	0	0	4217	623	0	542	0	263	0	9758
Apprch %	7.9	92.1	0	0	0	87.1	12.9	0	67.3	0	32.7	0	
Total %	3.3	38.8	0	0	0	43.2	6.4	0	5.6	0	2.7	0	

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File Name : McCarran-Las Brisas
Site Code : 00000000
Start Date : 10/10/2018

	McCarran Southbound					Westb ound	McCarran Northbound					Las Brisas Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	3	200	0	0	203	0	0	220	15	0	235	36	0	21	0	57	495
07:15 AM	12	**251**	0	0	**263**	0	0	243	**23**	0	266	39	0	19	0	58	587
07:30 AM	8	225	0	0	233	0	0	**300**	20	0	**320**	42	0	**30**	0	72	**625**
07:45 AM	**13**	203	0	0	216	0	0	245	18	0	263	**50**	0	30	0	**80**	559
Total Volume	36	879	0	0	915	0	0	1008	76	0	1084	167	0	100	0	267	2266
% App. Total	3.9	96.1	0	0			0	93	7	0		62.5	0	37.5	0		
PHF	.692	.875	.000	.000	.870	.000	.000	.840	.826	.000	.847	.835	.000	.833	.000	.834	.906

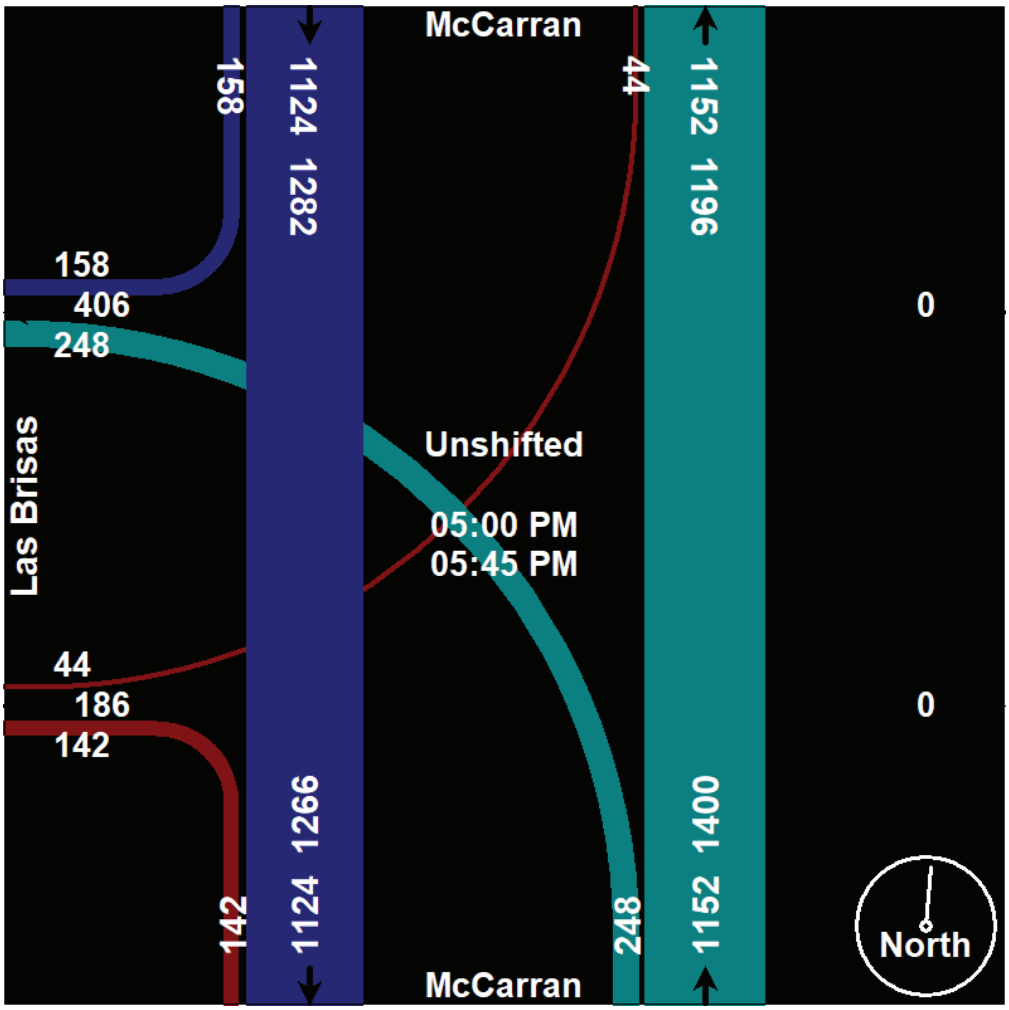


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File Name : McCarran-Las Brisas
Site Code : 00000000
Start Date : 10/10/2018
Page No : 3

	McCarran Southbound					Westb ound	McCarran Northbound					Las Brisas Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	**51**	255	0	0	306	0	0	300	41	0	341	30	0	8	0	38	685
05:15 PM	38	**309**	0	0	**347**	0	0	**321**	69	0	**390**	38	0	7	0	45	**782**
05:30 PM	44	302	0	0	346	0	0	280	54	0	334	**43**	0	12	0	**55**	735
05:45 PM	25	258	0	0	283	0	0	251	**84**	0	335	31	0	**17**	0	48	666
Total Volume	158	1124	0	0	1282	0	0	1152	248	0	1400	142	0	44	0	186	2868
% App. Total	12.3	87.7	0	0			0	82.3	17.7	0		76.3	0	23.7	0		
PHF	.775	.909	.000	.000	.924	.000	.000	.897	.738	.000	.897	.826	.000	.647	.000	.845	.917



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File Name : McCarran-Las Brisas - Motorcycles
Site Code : 00000000
Start Date : 10/10/2018
Page No : 1

Groups Printed- Unshifted

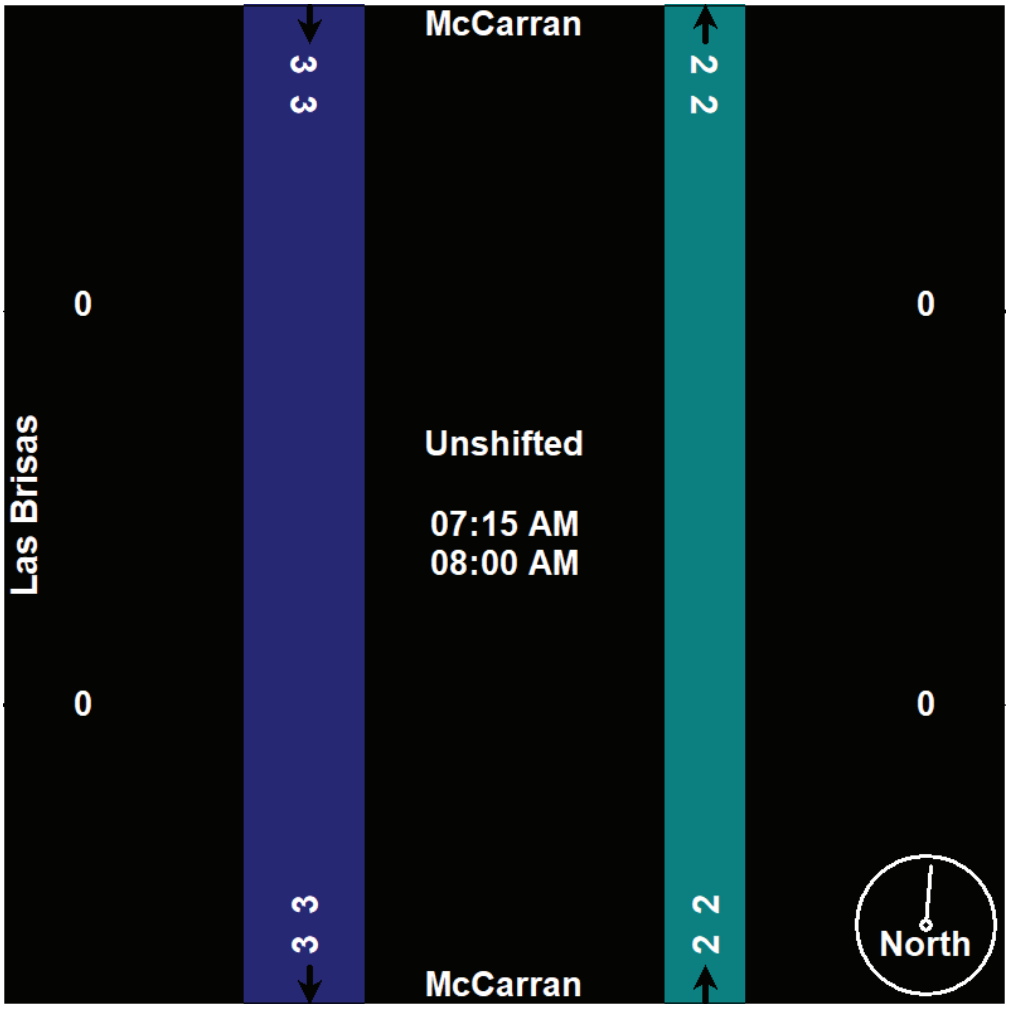
	McCarran Southbound				McCarran Northbound				Las Brisas Eastbound				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
*** BREAK ***													
07:15 AM	0	0	0	0	0	1	0	0	0	0	0	0	1
07:30 AM	0	0	0	0	0	1	0	0	0	0	0	0	1
07:45 AM	0	2	0	0	0	0	0	0	0	0	0	0	2
Total	0	2	0	0	0	2	0	0	0	0	0	0	4
08:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	1
*** BREAK ***													
08:30 AM	0	0	0	0	0	0	1	0	0	0	0	0	1
08:45 AM	0	1	0	0	0	1	0	0	0	0	0	0	2
Total	0	2	0	0	0	1	1	0	0	0	0	0	4
*** BREAK ***													
04:00 PM	0	1	0	0	0	1	0	0	0	0	0	0	2
04:15 PM	0	1	0	0	0	2	1	0	0	0	0	0	4
04:30 PM	0	1	0	0	0	1	0	0	0	0	0	0	2
04:45 PM	0	1	0	0	0	2	0	0	0	0	0	0	3
Total	0	4	0	0	0	6	1	0	0	0	0	0	11
05:00 PM	0	3	0	0	0	0	0	0	0	0	0	0	3
05:15 PM	0	1	0	0	0	1	0	0	0	0	0	0	2
05:30 PM	0	1	0	0	0	2	0	0	0	0	0	0	3
05:45 PM	0	0	0	0	0	2	0	0	1	0	0	0	3
Total	0	5	0	0	0	5	0	0	1	0	0	0	11
Grand Total	0	13	0	0	0	14	2	0	1	0	0	0	30
Apprch %	0	100	0	0	0	87.5	12.5	0	100	0	0	0	
Total %	0	43.3	0	0	0	46.7	6.7	0	3.3	0	0	0	

Silver State Traffic Data Collection, LLC

1819 Quarley Place
Henderson, Nevada 89014
702-898-1968 - Office
702-217-1968 - Cell
sstraffic@msn.com

File Name : McCarran-Las Brisas - Motorcycles
Site Code : 00000000
Start Date : 10/10/2018

	McCarran Southbound					Westb ound	McCarran Northbound					Las Brisas Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	0	0	0	0	0	0	0	**1**	0	0	**1**	0	0	0	0	0	1
07:30 AM	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
07:45 AM	0	**2**	0	0	**2**	0	0	0	0	0	0	0	0	0	0	0	**2**
08:00 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Total Volume	0	3	0	0	3	0	0	2	0	0	2	0	0	0	0	0	5
% App. Total	0	100	0	0			0	100	0	0		0	0	0	0		
PHF	.000	.375	.000	.000	.375	.000	.000	.500	.000	.000	.500	.000	.000	.000	.000	.000	.625

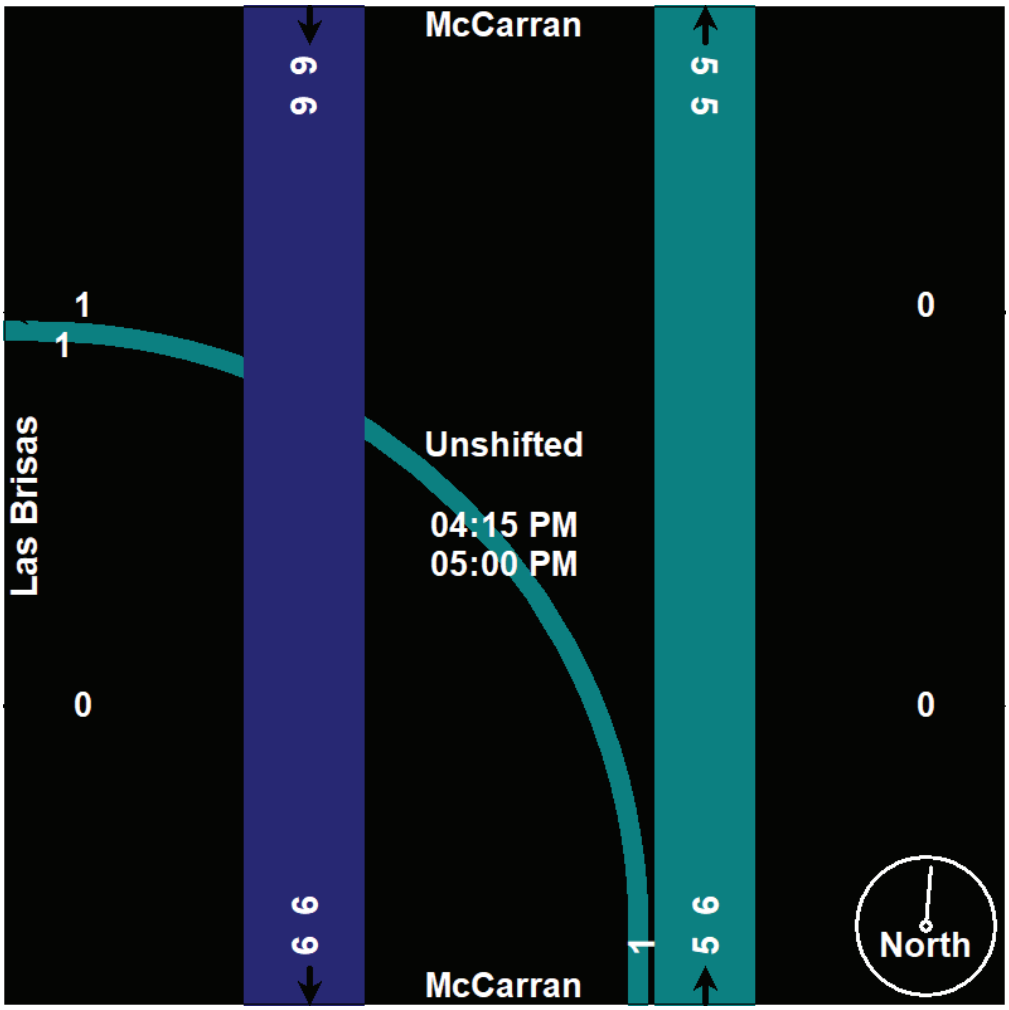


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Site Code : 00000000
Start Date : 10/10/2018

	McCarran Southbound					Westb ound	McCarran Northbound					Las Brisas Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	0	1	0	0	1	0	0	**2**	**1**	0	**3**	0	0	0	0	0	**4**
04:30 PM	0	1	0	0	1	0	0	1	0	0	1	0	0	0	0	0	2
04:45 PM	0	1	0	0	1	0	0	2	0	0	2	0	0	0	0	0	3
05:00 PM	0	**3**	0	0	**3**	0	0	0	0	0	0	0	0	0	0	0	3
Total Volume	0	6	0	0	6	0	0	5	1	0	6	0	0	0	0	0	12
% App. Total	0	100	0	0			0	83.3	16.7	0		0	0	0	0		
PHF	.000	.500	.000	.000	.500	.000	.000	.625	.250	.000	.500	.000	.000	.000	.000	.000	.750



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File Name : McCarran-Las Brisas - Peds-Bikes-Wheelchairsppd
Site Code : 00000000
Start Date : 10/10/2018
Page No : 1

Groups Printed- Unshifted

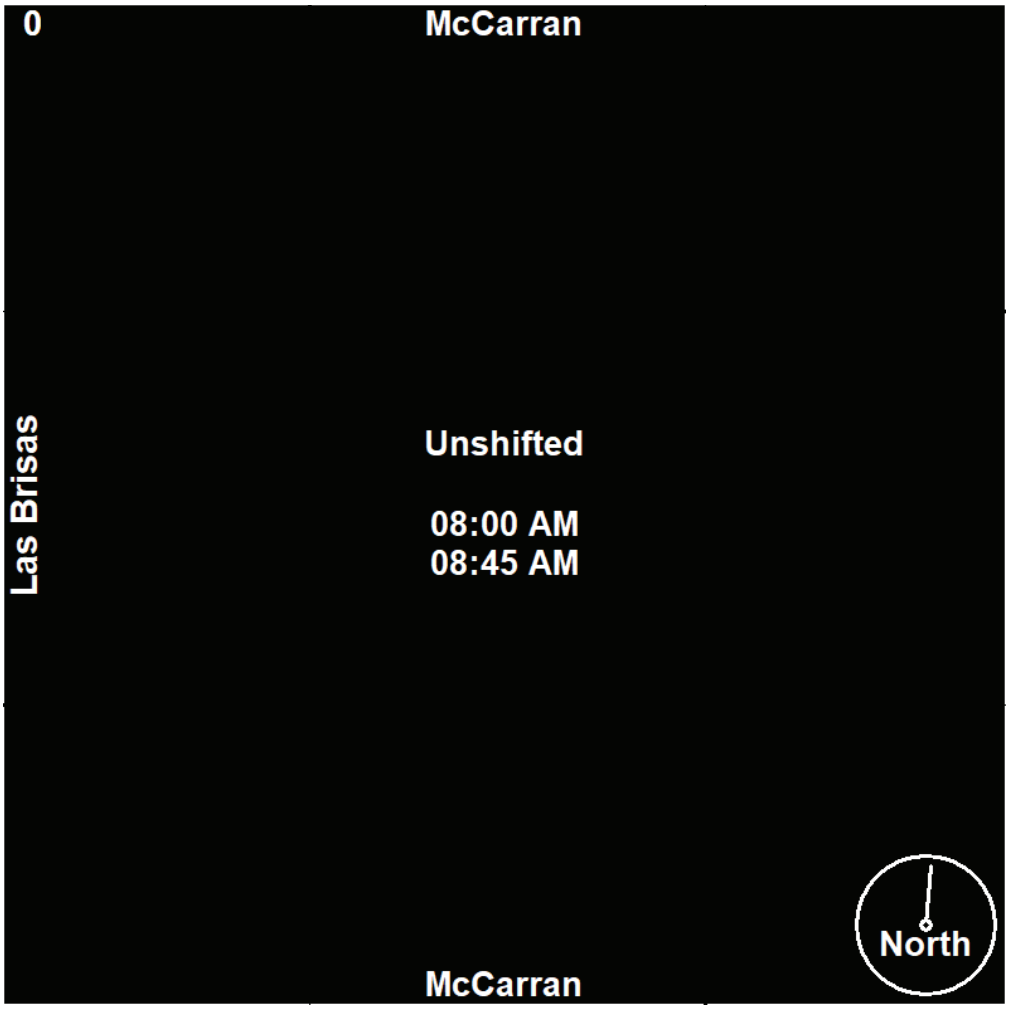
	McCarran Southbound				Westbound				McCarran Northbound				Las Brisas Eastbound				
Start Time		Wheel Chair	Bikes	Peds		Wheel Chair	Bikes	Peds		Wheel Chair	Bikes	Peds		Wheel Chair	Bikes	Peds	Int. Total
*** BREAK ***																	
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
07:30 AM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	2
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Total	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	4
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
*** BREAK ***																	
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6
*** BREAK ***																	
04:00 PM	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	3
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4
Total	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	9	11
*** BREAK ***																	
05:15 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
05:30 PM	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	2	6
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	3
Total	0	0	0	4	0	0	0	0	0	0	1	1	0	0	0	4	10
Grand Total	0	0	1	4	0	0	0	1	0	0	1	2	0	0	0	22	31
Apprch %	0	0	20	80	0	0	0	100	0	0	33.3	66.7	0	0	0	100	
Total %	0	0	3.2	12.9	0	0	0	3.2	0	0	3.2	6.5	0	0	0	71	

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Site Code : 00000000
Start Date : 10/10/2018

	McCarran Southbound					Westbound					McCarran Northbound					Las Brisas Eastbound					
Start Time		Wheel Chair	Bikes	Peds	App. Total		Wheel Chair	Bikes	Peds	App. Total		Wheel Chair	Bikes	Peds	App. Total		Wheel Chair	Bikes	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 12:30 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**3**	**3**	**3**
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6	6
% App. Total	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	100		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.500	.500	.500

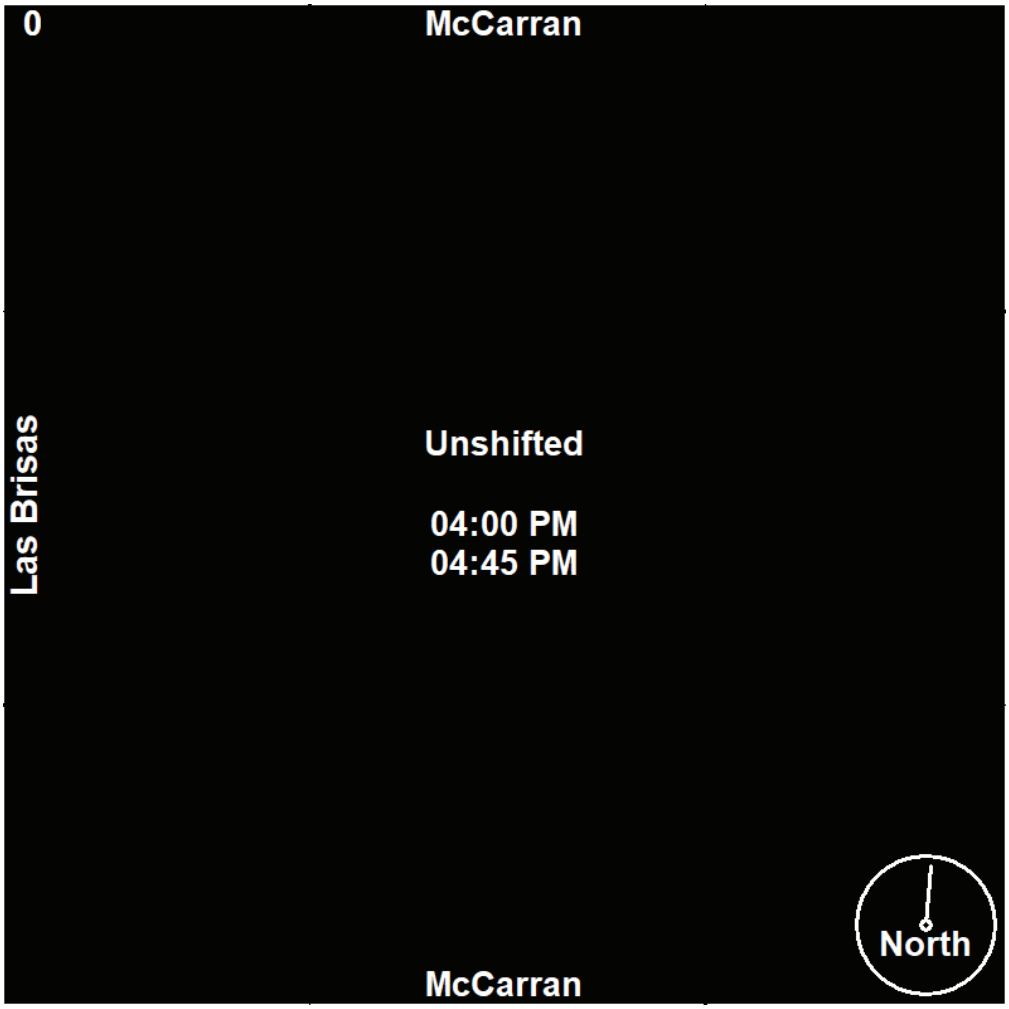


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File Name : McCarran-Las Brisas - Peds-Bikes-Wheelchairsppd
Site Code : 00000000
Start Date : 10/10/2018
Page No : 3

	McCarran Southbound					Westbound					McCarran Northbound					Las Brisas Eastbound					
Start Time		Wheel Chair	Bikes	Peds	App. Total		Wheel Chair	Bikes	Peds	App. Total		Wheel Chair	Bikes	Peds	App. Total		Wheel Chair	Bikes	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:45 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	0	0	0	0	0	0	**1**	**1**	0	0	0	0	0	0	0	0	0	0	1
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	**1**	0	0	0	2	2	3
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**4**	**4**	**4**
Total Volume	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	0	0	9	9	11
% App. Total	0	0	0	0		0	0	0	100		0	0	0	100		0	0	0	100		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.250	.250	.000	.000	.000	.250	.250	.000	.000	.000	.563	.563	.688



McCarran Boulevard								
	Westbound			Eastbound				
Time	Right	Through	Left	Right	Through	Left	Total	Average
Cars & Trucks								
7-8	36	879	0	0	1008	76		
8-9	44	762	0	0	784	91		
4-5	88	1022	0	0	1273	208		
5-6	158	1124	0	0	1152	248	Total	Average
Total	**326**	**3787**	**0**	**0**	**4217**	**623**	**8953**	**2238**
Motorcycles								
7-8	0	2	0	0	2	0		
8-9	0	2	0	0	1	1		
4-5	0	4	0	0	6	1		
5-6	0	5	0	0	5	0	Total	Average
Total	**0**	**13**	**0**	**0**	**14**	**2**	**29**	**7**
Total								
7-8	36	881	0	0	1010	76		
8-9	44	764	0	0	785	92		
4-5	88	1026	0	0	1279	209		
5-6	158	1129	0	0	1157	248	Total	Average
Total	**326**	**3800**	**0**	**0**	**4231**	**625**	**8982**	**2246**

Las Brisas Boulevard					
	Southbound				
Time	Right	Through	Left	Total	Average
Cars & Trucks					
7-8	167	0	100		
8-9	131	0	81		
4-5	102	0	38		
5-6	142	0	44	Total	Average
Total	**542**	**0**	**263**	**805**	**201**
Motorcycles					
7-8	0	0	0		
8-9	0	0	0		
4-5	0	0	0		
5-6	1	0	0	Total	Average
Total	**1**	**0**	**0**	**1**	**0**
Total					
7-8	167	0	100		
8-9	131	0	81		
4-5	102	0	38		
5-6	143	0	44	Total	Average
Total	**543**	**0**	**263**	**806**	**202**

Las Brisas Boulevard					
	Southbound				
Time	Right	Through	Left	Total	Average
Cars & Trucks					
7-8	167	0	100		
8-9	131	0	81		
4-5	102	0	38		
5-6	142	0	44	Total	Average
Total	**542**	**0**	**263**	**263**	**66**
Motorcycles					
7-8	0	0	0		
8-9	0	0	0		
4-5	0	0	0		
5-6	1	0	0	Total	Average
Total	**1**	**0**	**0**	**0**	**0**
Total					
7-8	167	0	100		
8-9	131	0	81		
4-5	102	0	38		
5-6	143	0	44	Total	Average
Total	**543**	**0**	**263**	**263**	**66**

McCarran Boulevard							
	Westbound			Eastbound			
Time	Right	Through	Left	Right	Through	Left	Total
Cars & Trucks							
7-8	36	879	0	0	1008	76	**1999**
5-6	158	1124	0	0	1152	248	**2682**
Motorcycles							
7-8	0	2	0	0	2	0	**4**
5-6	0	5	0	0	5	0	**10**
Total							
7-8	36	881	0	0	1010	76	**2003**
5-6	158	1129	0	0	1157	248	**2692**

Las Brisas Boulevard				
	Southbound			
Time	Right	Through	Left	Total
Cars & Trucks				
7-8	167	0	100	**267**
5-6	142	0	44	**186**
Motorcycles				
7-8	0	0	0	**0**
5-6	1	0	0	**1**
Total				
7-8	167	0	100	**267**
5-6	143	0	44	**187**

Las Brisas Boulevard				
	Southbound			
Time	Right	Through	Left	Total
Cars & Trucks				
7-8	167	0	100	**100**
5-6	142	0	44	**44**
Motorcycles				
7-8	0	0	0	**0**
5-6	1	0	0	**0**
Total				
7-8	167	0	100	**100**
5-6	143	0	44	**44**

Appendix B

NDOT Speed Study

STATE OF NEVADA
DEPARTMENT OF TRANSPORTATION

MEMORANDUM

12/20/2018

TO: **Lori Campbell, Traffic Safety Engineering Program Manager**

FROM: **Mark Wooster, Traffic Information Division Assistant Chief**

SUBJECT: **Speed Study**
SR-659 (McCarran Blvd.) MP WA 7.1–12.5, Reno, Washoe County

In response to a request from your office, a Speed Study was conducted on the subject roadway. This study area was divided into 4 segments. Analysis of the speed data produced the following results:

1. Segment 1

Site Data: This study area is a 6 lane *Urban Principal Arterials - Other* roadway that begins at IR-80 (MP WA-7.1) and continues north to Las Brisas Blvd (MP WA-8.2) for a segment length of 1.1 miles. This segment is a 50 MPH speed zone both directions.

Field Data:

Posted Speed Limit	50 MPH
85th Percentile Speed	51 MPH
Pace	40-50 MPH
% in the pace	56%
50th Percentile speed	44 MPH (mean)

Mitigating Factors:
None.

Objective Analysis: The following is objective analysis using predetermined formulae and field data to aid in determination of speed limits. This information is used by the engineer as a factor when determining appropriate speed limits; however, it is not the only information considered. Determination of speed limits is practice of engineering, requires consideration of many variables and mitigating factors, and is subject to the discretion of the Traffic Engineer. *The use of the Refined Study Analysis data is used as a guide only in determining roadside characteristics relative to speed.*

Analysis Method	Theoretical Limit
85th Percentile Speed[1]	51 MPH
Minimum Study Analysis[2]	48 MPH
US Limits 2[3]	50 MPH

2. Segment 2

Site Data: This study area is a 4 lane *Urban Principal Arterials - Other* roadway that begins at Las Brisas Blvd (MP WA-8.2) and continues north to N Virginia St (MP WA-10.6) for a segment length of 2.4 miles. This segment is a 50 MPH speed zone both directions.

Field Data:

Posted Speed Limit	50 MPH
85th Percentile Speed	59 MPH
Pace	50-60 MPH
% in the pace	68%
50th Percentile speed	54 MPH (mean)

Mitigating Factors:
None.

Objective Analysis: The following is objective analysis using predetermined formulae and field data to aid in determination of speed limits. This information is used by the engineer as a factor when determining appropriate speed limits; however, it is not the only information considered. Determination of speed limits is practice of engineering, requires consideration of many variables and mitigating factors, and is subject to the discretion of the Traffic Engineer. *The use of the Refined Study Analysis data is used as a guide only in determining roadside characteristics relative to speed.*

Analysis Method	Theoretical Limit
85th Percentile Speed[1]	59 MPH
Minimum Study Analysis[2]	58 MPH
US Limits 2[3]	55 MPH

3. Segment 3

Site Data: This study area is a 4 lane *Urban Principal Arterials - Other* roadway that begins at N Virginia St (MP WA-10.6) and continues north to the northbound 45 mph sign (MP WA-11.9) for a segment length of 1.3 miles. This segment is a 50 MPH speed zone both directions.

Field Data:

Posted Speed Limit	50 MPH
85th Percentile Speed	57 MPH
Pace	48-57 MPH
% in the pace	71%
50th Percentile speed	52 MPH (mean)

Mitigating Factors:
None.

Objective Analysis: The following is objective analysis using predetermined formulae and field data to aid in determination of speed limits. This information is used by the engineer as a factor when determining appropriate speed limits; however, it is not the only information considered. Determination of speed limits is practice of engineering, requires consideration of many variables and mitigating factors, and is subject to the discretion of the Traffic Engineer. *The use of the Refined Study Analysis data is used as a guide only in determining roadside characteristics relative to speed.*

Analysis Method	**Theoretical Limit**
85th Percentile Speed[1]	57 MPH
Minimum Study Analysis[2]	56 MPH
US Limits 2[3]	55 MPH

4. Segment 4

Site Data: This study area is a 4 lane *Urban Principal Arterials - Other* roadway that begins at the northbound 45 mph sign (MP WA-11.9) and continues north to US-395 (MP WA-12.5) for a segment length of 0.6 miles. This segment is a 45 MPH speed zone both directions.

Field Data:

Posted Speed Limit	45 MPH
85th Percentile Speed	49 MPH
Pace	40-50 MPH
% in the pace	63%
50th Percentile speed	43 MPH (mean)

Mitigating Factors:
None.

Objective Analysis: The following is objective analysis using predetermined formulae and field data to aid in determination of speed limits. This information is used by the engineer as a factor when determining appropriate speed limits; however, it is not the only information considered. Determination of speed limits is practice of engineering, requires consideration of many variables and mitigating factors, and is subject to the discretion of the Traffic Engineer. *The use of the Refined Study Analysis data is used as a guide only in determining roadside characteristics relative to speed.*

Analysis Method	**Theoretical Limit**
85th Percentile Speed[1]	49 MPH
Minimum Study Analysis[2]	47 MPH
US Limits 2[3]	45 MPH

CRASH DATA:

A 3-year crash rate (01/2015-01/2018) was computed for the study area and indicated the following:

Segment 1:	
Total Crashes	104
Fatal Crashes	0
Crashes Per MVMT[4]	2.58
Segment 2:	
Total Crashes	70
Fatal Crashes	0
Crashes Per MVMT[4]	1.12
Segment 3:	
Total Crashes	43
Fatal Crashes	2
Crashes Per MVMT[3]	1.34
Segment 4:	
Total Crashes	92
Fatal Crashes	0
Crashes Per MVMT[3]	6.61

Comparison rates for Urban Principal Arterials Other roads in the state are 3.21 per million vehicle miles traveled. Attached you will find the Crash Rates for your review.

The information in this report is based on the application of data collected to standard evaluation criteria. Final recommendations by the Chief Traffic Engineer must consider conditions unique to the area, which may include other criteria in addition to the standard evaluation criteria.

Should you require clarification, additional information, or would like to review either the raw data or analysis of the data, please contact Mark Wooster at (775) 888-7156 or Lisa Wood at (775) 888-7382.

MJW:cdw:lw

Attachments: Crash Rates
Maps

cc: Hoang Hong, Principal Operations Engineer

1. ITE Speed Zoning Guidelines, Published by ITE, ITE Committee 4M-25, date unknown
2. Speed Zone Methodology, Traffic Institute, Northwestern University, date unknown
3. USLimits2 Expert System for Recommending Speed Limits in Speed Zones, USDOT FHWA, March 2012
4. MVMT = Million Vehicle Miles Travelled

CRASH RATES

SR659

SEGMENT	NUMBER OF YEARS	AADT	SEGMENT LENGTH (MILES)	PDO CRASHES	PDO RATE	INJURY CRASHES	INJURY RATE	FATAL CRASHES	FATAL RATE	TOTAL CRASHES	TOTAL RATES	TOTAL INJURIES	TOTAL INJURY RATE	TOTAL FATALITIES	TOTAL FATALITY RATE
1	3	33500	1.10	53	1.31	51	1.26	0	0.00	104	2.58	75	1.86	0	0.0000
2	3	23800	2.40	32	0.51	38	0.61	0	0.00	70	1.12	57	0.91	0	0.0000
3	3	22600	1.30	18	0.56	23	0.71	2	0.06	43	1.34	31	0.96	2	0.0622
4	3	21200	0.60	51	3.66	41	2.94	0	0.00	92	6.61	64	4.59	0	0.0000
				154		153		2		309		227		2	

**CRASH RATES PER MILLION VEHICLE MILES*

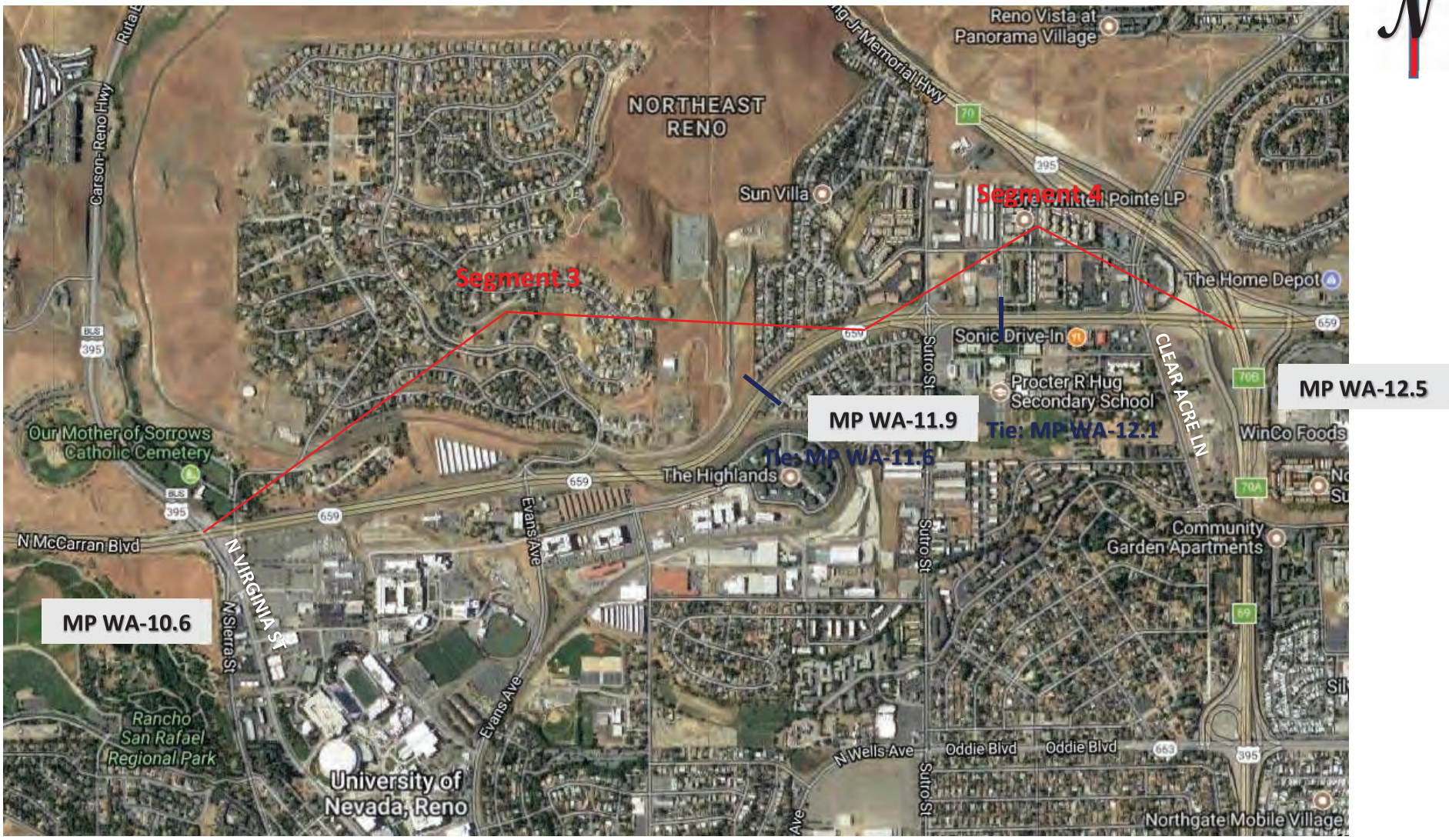
COMPARISON RATES - 2017

PRINCIPAL ARTERIAL-OTHER URBAN	PDO CRASHES	PDO RATE	INJURY CRASHES	INJURY RATE	FATAL CRASHES	FATAL RATE	TOTAL CRASHES	TOTAL RATES	TOTAL INJURIES	TOTAL INJURY RATE	TOTAL FATALITIES	TOTAL FATALITY RATE
	0	1.70	4,896	1.48	65	0.02	4,961	3.21	7,803	2.36	69	0.02

**CRASH RATES PER MILLION VEHICLE MILES*

SR-659 (McCarran Blvd.) MP WA 7.1 – 12.5, Reno, WA




Segment 3
Segment 4
MP WA-10.6
MP WA-11.9
MP WA-12.5
Tie: MP WA-11.6
Tie: MP WA-12.1
NORTHEAST RENO
Reno Vista at Panorama Village
Sun Villa
The Home Depot
Sonic Drive-In
Procter R Hug Secondary School
WinCo Foods
Community Garden Apartments
The Highlands
Our Mother of Sorrows Catholic Cemetery
Rancho San Rafael Regional Park
University of Nevada, Reno
Northgate Mobile Village
N McCarran Blvd
N Virginia St
N Sierra St
Evans Ave
Sutro St
CLEAR ACRE LN
N Wells Ave
Oddie Blvd
Carson-Reno Hwy
395
659
70
80

Appendix C
Synchro Results

Existing AM

Intersection	
Int Delay, s/veh	14.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	76	1010	882	36	100	167
Future Vol, veh/h	76	1010	882	36	100	167
Conflicting Peds, #/hr	6	0	0	6	6	6
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	280	-	-	75	100	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	83	84	88	69	83	83
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	92	1202	1002	52	120	201

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1060	0	-	0	1679	513
Stage 1	-	-	-	-	1008	-
Stage 2	-	-	-	-	671	-
Critical Hdwy	4.14	-	-	-	6.29	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	6.04	-
Follow-up Hdwy	2.22	-	-	-	3.67	3.32
Pot Cap-1 Maneuver	653	-	-	-	~ 109	506
Stage 1	-	-	-	-	306	-
Stage 2	-	-	-	-	439	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	649	-	-	-	~ 92	500
Mov Cap-2 Maneuver	-	-	-	-	~ 92	-
Stage 1	-	-	-	-	261	-
Stage 2	-	-	-	-	436	-

Approach	EB	WB	SB
HCM Control Delay, s	0.8	0	115.8
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	649	-	-	-	92	500
HCM Lane V/C Ratio	0.141	-	-	-	1.31	0.402
HCM Control Delay (s)	11.5	-	-	-	280.9	17
HCM Lane LOS	B	-	-	-	F	C
HCM 95th %tile Q(veh)	0.5	-	-	-	8.7	1.9

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Existing PM

Intersection	
Int Delay, s/veh	10.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	249	1157	1130	158	44	142
Future Vol, veh/h	249	1157	1130	158	44	142
Conflicting Peds, #/hr	11	0	0	11	11	11
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	280	-	-	75	100	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	65	83	74	90	91	78
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	383	1394	1527	176	48	182

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1714	0	-	0	2873	786
Stage 1	-	-	-	-	1538	-
Stage 2	-	-	-	-	1335	-
Critical Hdwy	4.14	-	-	-	6.29	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	6.04	-
Follow-up Hdwy	2.22	-	-	-	3.67	3.32
Pot Cap-1 Maneuver	~ 366	-	-	-	~ 20	335
Stage 1	-	-	-	-	160	-
Stage 2	-	-	-	-	191	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	~ 362	-	-	-	0	328
Mov Cap-2 Maneuver	-	-	-	-	0	-
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	189	-

Approach	EB	WB	SB
HCM Control Delay, s	21.1	0	
HCM LOS			-

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	~ 362	-	-	-	-	328
HCM Lane V/C Ratio	1.058	-	-	-	-	0.555
HCM Control Delay (s)	98.1	-	-	-	-	28.8
HCM Lane LOS	F	-	-	-	-	D
HCM 95th %tile Q(veh)	13.4	-	-	-	-	3.2

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Existing AM – Signal



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	76	1010	882	36	100	167
Future Volume (vph)	76	1010	882	36	100	167
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			150	300	0
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor				0.96	0.99	0.98
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.197				0.950	
Satd. Flow (perm)	367	3539	3539	1519	1754	1550
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				44		201
Link Speed (mph)		50	50		35	
Link Distance (ft)		540	294		569	
Travel Time (s)		7.4	4.0		11.1	
Confl. Peds. (#/hr)	6			6	6	6
Peak Hour Factor	0.83	0.84	0.88	0.69	0.83	0.83
Adj. Flow (vph)	92	1202	1002	52	120	201
Shared Lane Traffic (%)						
Lane Group Flow (vph)	92	1202	1002	52	120	201
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane					Yes	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2	1	1	1
Detector Template	Left	Thru	Thru	Right	Left	Right
Leading Detector (ft)	20	100	100	20	20	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	6	20	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm



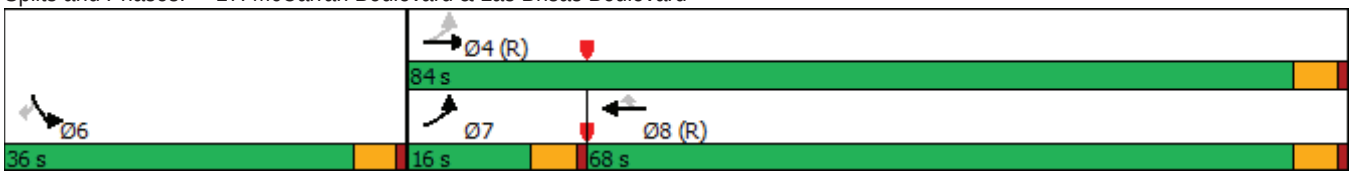
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Protected Phases	7	4	8		6	
Permitted Phases	4			8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	1.0	1.0	1.0	1.0	1.0	1.0
Minimum Split (s)	6.0	6.0	22.0	22.0	29.0	29.0
Total Split (s)	16.0	84.0	68.0	68.0	36.0	36.0
Total Split (%)	13.3%	70.0%	56.7%	56.7%	30.0%	30.0%
Maximum Green (s)	11.0	79.0	63.0	63.0	31.0	31.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	C-Max	Max	Max
Walk Time (s)			7.0	7.0	7.0	7.0
Flash Dont Walk (s)			10.0	10.0	17.0	17.0
Pedestrian Calls (#/hr)			6	6	6	6
Act Effct Green (s)	79.0	79.0	66.3	66.3	31.0	31.0
Actuated g/C Ratio	0.66	0.66	0.55	0.55	0.26	0.26
v/c Ratio	0.28	0.52	0.51	0.06	0.26	0.37
Control Delay	8.7	8.9	8.2	2.1	37.3	6.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.7	8.9	8.2	2.1	37.3	6.8
LOS	A	A	A	A	D	A
Approach Delay		8.9	7.9		18.2	
Approach LOS		A	A		B	
90th %ile Green (s)	9.5	79.0	64.5	64.5	31.0	31.0
90th %ile Term Code	Gap	Coord	Coord	Coord	MaxR	MaxR
70th %ile Green (s)	8.4	79.0	65.6	65.6	31.0	31.0
70th %ile Term Code	Gap	Coord	Coord	Coord	MaxR	MaxR
50th %ile Green (s)	7.7	79.0	66.3	66.3	31.0	31.0
50th %ile Term Code	Gap	Coord	Coord	Coord	MaxR	MaxR
30th %ile Green (s)	7.0	79.0	67.0	67.0	31.0	31.0
30th %ile Term Code	Gap	Coord	Coord	Coord	MaxR	MaxR
10th %ile Green (s)	6.0	79.0	68.0	68.0	31.0	31.0
10th %ile Term Code	Gap	Coord	Coord	Coord	MaxR	MaxR
Stops (vph)	25	417	250	3	78	19
Fuel Used(gal)	1	17	16	0	2	1
CO Emissions (g/hr)	83	1193	1103	34	123	74
NOx Emissions (g/hr)	16	232	215	7	24	14
VOC Emissions (g/hr)	19	276	256	8	28	17
Dilemma Vehicles (#)	0	6	22	0	0	0
Queue Length 50th (ft)	21	145	114	3	74	0
Queue Length 95th (ft)	m29	m143	137	6	117	44
Internal Link Dist (ft)		460	214		489	
Turn Bay Length (ft)	300			150	300	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Base Capacity (vph)	370	2329	1954	858	457	549
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.25	0.52	0.51	0.06	0.26	0.37

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 82 (68%), Referenced to phase 4:EBTL and 8:WBT, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.52			
Intersection Signal Delay: 9.6		Intersection LOS: A	
Intersection Capacity Utilization 61.1%		ICU Level of Service B	
Analysis Period (min) 15			

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 17: McCarran Boulevard & Las Brisas Boulevard



Existing PM – Signal



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	249	1157	1130	158	44	142
Future Volume (vph)	249	1157	1130	158	44	142
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			150	300	0
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor				0.94	0.98	0.97
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.058				0.950	
Satd. Flow (perm)	108	3539	3539	1485	1737	1536
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				81		182
Link Speed (mph)		50	50		35	
Link Distance (ft)		540	1872		569	
Travel Time (s)		7.4	25.5		11.1	
Confl. Peds. (#/hr)	11			11	11	11
Peak Hour Factor	0.65	0.83	0.74	0.90	0.91	0.78
Adj. Flow (vph)	383	1394	1527	176	48	182
Shared Lane Traffic (%)						
Lane Group Flow (vph)	383	1394	1527	176	48	182
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane					Yes	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2	1	1	1
Detector Template	Left	Thru	Thru	Right	Left	Right
Leading Detector (ft)	20	100	100	20	20	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	6	20	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Protected Phases	7	4	8		6	
Permitted Phases	4			8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	1.0	1.0	1.0	1.0	1.0	1.0
Minimum Split (s)	6.0	6.0	22.0	22.0	29.0	29.0
Total Split (s)	34.0	103.0	69.0	69.0	29.0	29.0
Total Split (%)	25.8%	78.0%	52.3%	52.3%	22.0%	22.0%
Maximum Green (s)	29.0	98.0	64.0	64.0	24.0	24.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag		Lead	Lead		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	C-Max	Max	Max
Walk Time (s)			7.0	7.0	7.0	7.0
Flash Dont Walk (s)			10.0	10.0	17.0	17.0
Pedestrian Calls (#/hr)			11	11	11	11
Act Effct Green (s)	98.0	98.0	64.0	64.0	24.0	24.0
Actuated g/C Ratio	0.74	0.74	0.48	0.48	0.18	0.18
v/c Ratio	0.86	0.53	0.89	0.23	0.15	0.43
Control Delay	36.6	5.5	31.4	5.1	46.9	9.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.6	5.5	31.4	5.1	46.9	9.6
LOS	D	A	C	A	D	A
Approach Delay		12.2	28.6		17.4	
Approach LOS		B	C		B	
90th %ile Green (s)	29.0	98.0	64.0	64.0	24.0	24.0
90th %ile Term Code	Max	Coord	Coord	Coord	MaxR	MaxR
70th %ile Green (s)	29.0	98.0	64.0	64.0	24.0	24.0
70th %ile Term Code	Max	Coord	Coord	Coord	MaxR	MaxR
50th %ile Green (s)	29.0	98.0	64.0	64.0	24.0	24.0
50th %ile Term Code	Max	Coord	Coord	Coord	MaxR	MaxR
30th %ile Green (s)	29.0	98.0	64.0	64.0	24.0	24.0
30th %ile Term Code	Hold	Coord	Coord	Coord	MaxR	MaxR
10th %ile Green (s)	29.0	98.0	64.0	64.0	24.0	24.0
10th %ile Term Code	Hold	Coord	Coord	Coord	MaxR	MaxR
Stops (vph)	226	240	1018	52	37	17
Fuel Used(gal)	8	15	36	3	1	1
CO Emissions (g/hr)	524	1055	2535	198	61	69
NOx Emissions (g/hr)	102	205	493	39	12	13
VOC Emissions (g/hr)	122	245	587	46	14	16
Dilemma Vehicles (#)	0	29	23	0	0	0
Queue Length 50th (ft)	278	75	629	45	35	0
Queue Length 95th (ft)	107	66	574	m52	73	37
Internal Link Dist (ft)		460	1792		489	
Turn Bay Length (ft)	300			150	300	

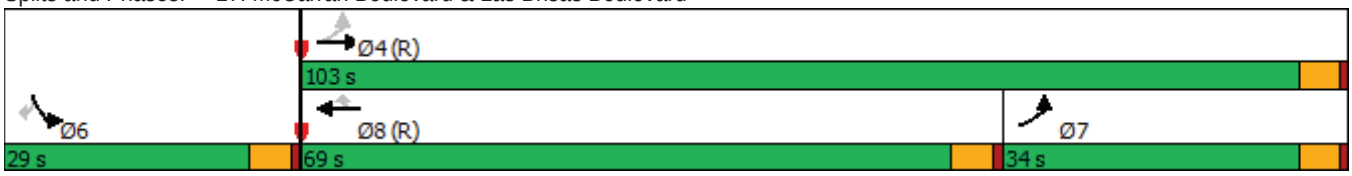


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Base Capacity (vph)	445	2627	1715	761	321	428
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.86	0.53	0.89	0.23	0.15	0.43

Intersection Summary			
Area Type:	Other		
Cycle Length: 132			
Actuated Cycle Length: 132			
Offset: 64 (48%), Referenced to phase 4:EBTL and 8:WBT, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.89			
Intersection Signal Delay: 20.1		Intersection LOS: C	
Intersection Capacity Utilization 77.5%		ICU Level of Service D	
Analysis Period (min) 15			

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 17: McCarran Boulevard & Las Brisas Boulevard



2030 AM – Signal



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	94	1249	1090	45	124	206
Future Volume (vph)	94	1249	1090	45	124	206
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			150	300	0
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor				0.96	0.99	0.98
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.144				0.950	
Satd. Flow (perm)	268	3539	3539	1519	1754	1550
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				47		200
Link Speed (mph)		50	50		35	
Link Distance (ft)		540	294		569	
Travel Time (s)		7.4	4.0		11.1	
Confl. Peds. (#/hr)	6			6	6	6
Peak Hour Factor	0.83	0.84	0.88	0.69	0.83	0.83
Adj. Flow (vph)	113	1487	1239	65	149	248
Shared Lane Traffic (%)						
Lane Group Flow (vph)	113	1487	1239	65	149	248
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane					Yes	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2	1	1	1
Detector Template	Left	Thru	Thru	Right	Left	Right
Leading Detector (ft)	20	100	100	20	20	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	6	20	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm



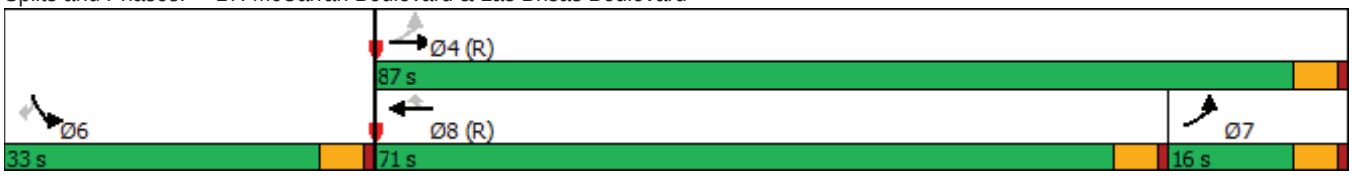
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Protected Phases	7	4	8		6	
Permitted Phases	4			8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	1.0	1.0	1.0	1.0	1.0	1.0
Minimum Split (s)	6.0	6.0	22.0	22.0	29.0	29.0
Total Split (s)	16.0	87.0	71.0	71.0	33.0	33.0
Total Split (%)	13.3%	72.5%	59.2%	59.2%	27.5%	27.5%
Maximum Green (s)	11.0	82.0	66.0	66.0	28.0	28.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag		Lead	Lead		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	C-Max	Max	Max
Walk Time (s)			7.0	7.0	7.0	7.0
Flash Dont Walk (s)			10.0	10.0	17.0	17.0
Pedestrian Calls (#/hr)			6	6	6	6
Act Effct Green (s)	82.0	82.0	66.0	66.0	28.0	28.0
Actuated g/C Ratio	0.68	0.68	0.55	0.55	0.23	0.23
v/c Ratio	0.35	0.61	0.64	0.08	0.36	0.48
Control Delay	11.9	8.9	12.1	1.6	41.5	12.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.9	8.9	12.1	1.6	41.5	12.7
LOS	B	A	B	A	D	B
Approach Delay		9.1	11.6		23.5	
Approach LOS		A	B		C	
90th %ile Green (s)	11.0	82.0	66.0	66.0	28.0	28.0
90th %ile Term Code	Hold	Coord	Coord	Coord	MaxR	MaxR
70th %ile Green (s)	11.0	82.0	66.0	66.0	28.0	28.0
70th %ile Term Code	Hold	Coord	Coord	Coord	MaxR	MaxR
50th %ile Green (s)	11.0	82.0	66.0	66.0	28.0	28.0
50th %ile Term Code	Hold	Coord	Coord	Coord	MaxR	MaxR
30th %ile Green (s)	11.0	82.0	66.0	66.0	28.0	28.0
30th %ile Term Code	Hold	Coord	Coord	Coord	MaxR	MaxR
10th %ile Green (s)	11.0	82.0	66.0	66.0	28.0	28.0
10th %ile Term Code	Hold	Coord	Coord	Coord	MaxR	MaxR
Stops (vph)	40	562	435	4	102	44
Fuel Used(gal)	2	22	22	1	2	2
CO Emissions (g/hr)	116	1525	1559	43	163	119
NOx Emissions (g/hr)	23	297	303	8	32	23
VOC Emissions (g/hr)	27	354	361	10	38	28
Dilemma Vehicles (#)	0	16	36	0	0	0
Queue Length 50th (ft)	25	194	202	3	97	30
Queue Length 95th (ft)	m36	m191	204	3	146	83
Internal Link Dist (ft)		460	214		489	
Turn Bay Length (ft)	300			150	300	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Base Capacity (vph)	320	2418	1946	856	413	515
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.61	0.64	0.08	0.36	0.48

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 60 (50%), Referenced to phase 4:EBTL and 8:WBT, Start of Green			
Natural Cycle: 65			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.64			
Intersection Signal Delay: 11.8		Intersection LOS: B	
Intersection Capacity Utilization 67.8%		ICU Level of Service C	
Analysis Period (min) 15			

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 17: McCarran Boulevard & Las Brisas Boulevard



2030 PM – Signal



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	308	1430	1397	195	54	176
Future Volume (vph)	308	1430	1397	195	54	176
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			150	300	0
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor				0.94	0.98	0.97
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.056				0.950	
Satd. Flow (perm)	104	3539	3539	1485	1737	1536
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				83		226
Link Speed (mph)		50	50		35	
Link Distance (ft)		540	1872		569	
Travel Time (s)		7.4	25.5		11.1	
Confl. Peds. (#/hr)	11			11	11	11
Peak Hour Factor	0.65	0.83	0.74	0.90	0.91	0.78
Adj. Flow (vph)	474	1723	1888	217	59	226
Shared Lane Traffic (%)						
Lane Group Flow (vph)	474	1723	1888	217	59	226
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane					Yes	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2	1	1	1
Detector Template	Left	Thru	Thru	Right	Left	Right
Leading Detector (ft)	20	100	100	20	20	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	6	20	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Protected Phases	7	4	8		6	
Permitted Phases	4			8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	1.0	1.0	1.0	1.0	1.0	1.0
Minimum Split (s)	6.0	6.0	22.0	22.0	29.0	29.0
Total Split (s)	32.0	103.0	71.0	71.0	29.0	29.0
Total Split (%)	24.2%	78.0%	53.8%	53.8%	22.0%	22.0%
Maximum Green (s)	27.0	98.0	66.0	66.0	24.0	24.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag		Lead	Lead		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	C-Max	Max	Max
Walk Time (s)			7.0	7.0	7.0	7.0
Flash Dont Walk (s)			10.0	10.0	17.0	17.0
Pedestrian Calls (#/hr)			11	11	11	11
Act Effct Green (s)	98.0	98.0	66.0	66.0	24.0	24.0
Actuated g/C Ratio	0.74	0.74	0.50	0.50	0.18	0.18
v/c Ratio	1.14	0.66	1.07	0.28	0.18	0.49
Control Delay	115.2	5.8	69.7	6.2	47.5	9.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	115.2	5.8	69.7	6.2	47.5	9.6
LOS	F	A	E	A	D	A
Approach Delay		29.4	63.1		17.4	
Approach LOS		C	E		B	
90th %ile Green (s)	27.0	98.0	66.0	66.0	24.0	24.0
90th %ile Term Code	Max	Coord	Coord	Coord	MaxR	MaxR
70th %ile Green (s)	27.0	98.0	66.0	66.0	24.0	24.0
70th %ile Term Code	Max	Coord	Coord	Coord	MaxR	MaxR
50th %ile Green (s)	27.0	98.0	66.0	66.0	24.0	24.0
50th %ile Term Code	Max	Coord	Coord	Coord	MaxR	MaxR
30th %ile Green (s)	27.0	98.0	66.0	66.0	24.0	24.0
30th %ile Term Code	Max	Coord	Coord	Coord	MaxR	MaxR
10th %ile Green (s)	27.0	98.0	66.0	66.0	24.0	24.0
10th %ile Term Code	Max	Coord	Coord	Coord	MaxR	MaxR
Stops (vph)	230	397	1260	66	45	20
Fuel Used(gal)	13	20	56	4	1	1
CO Emissions (g/hr)	940	1419	3897	250	76	85
NOx Emissions (g/hr)	183	276	758	49	15	17
VOC Emissions (g/hr)	218	329	903	58	18	20
Dilemma Vehicles (#)	0	17	30	0	0	0
Queue Length 50th (ft)	~431	140	~945	51	43	0
Queue Length 95th (ft)	#352	86	723	82	86	37
Internal Link Dist (ft)		460	1792		489	
Turn Bay Length (ft)	300			150	300	

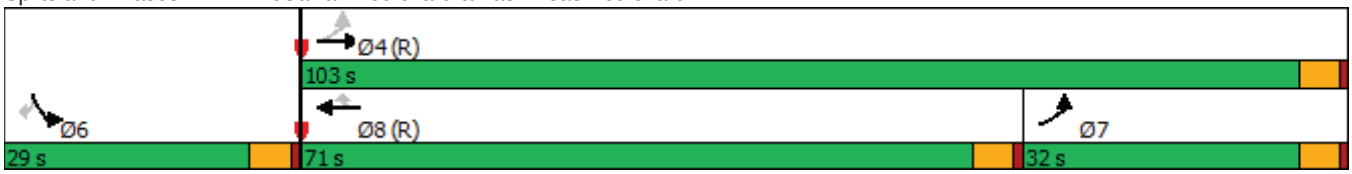
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Base Capacity (vph)	417	2627	1769	784	321	464
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.14	0.66	1.07	0.28	0.18	0.49

Intersection Summary			
Area Type:	Other		
Cycle Length: 132			
Actuated Cycle Length: 132			
Offset: 64 (48%), Referenced to phase 4:EBTL and 8:WBT, Start of Green			
Natural Cycle: 150			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.14			
Intersection Signal Delay: 44.2		Intersection LOS: D	
Intersection Capacity Utilization 88.2%		ICU Level of Service E	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 17: McCarran Boulevard & Las Brisas Boulevard



2040 AM – Signal



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	111	1477	1290	53	146	244
Future Volume (vph)	111	1477	1290	53	146	244
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			150	300	0
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor				0.96	0.99	0.98
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.096				0.950	
Satd. Flow (perm)	179	3539	3539	1519	1754	1550
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				48		180
Link Speed (mph)		50	50		35	
Link Distance (ft)		540	294		569	
Travel Time (s)		7.4	4.0		11.1	
Confl. Peds. (#/hr)	6			6	6	6
Peak Hour Factor	0.83	0.84	0.88	0.69	0.83	0.83
Adj. Flow (vph)	134	1758	1466	77	176	294
Shared Lane Traffic (%)						
Lane Group Flow (vph)	134	1758	1466	77	176	294
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane					Yes	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2	1	1	1
Detector Template	Left	Thru	Thru	Right	Left	Right
Leading Detector (ft)	20	100	100	20	20	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	6	20	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Protected Phases	7	4	8		6	
Permitted Phases	4			8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	1.0	1.0	1.0	1.0	1.0	1.0
Minimum Split (s)	6.0	6.0	22.0	22.0	29.0	29.0
Total Split (s)	16.0	89.0	73.0	73.0	31.0	31.0
Total Split (%)	13.3%	74.2%	60.8%	60.8%	25.8%	25.8%
Maximum Green (s)	11.0	84.0	68.0	68.0	26.0	26.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag		Lead	Lead		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	C-Max	Max	Max
Walk Time (s)			7.0	7.0	7.0	7.0
Flash Dont Walk (s)			10.0	10.0	17.0	17.0
Pedestrian Calls (#/hr)			6	6	6	6
Act Effct Green (s)	84.0	84.0	68.0	68.0	26.0	26.0
Actuated g/C Ratio	0.70	0.70	0.57	0.57	0.22	0.22
v/c Ratio	0.49	0.71	0.73	0.09	0.46	0.62
Control Delay	23.9	10.5	13.5	2.1	45.5	22.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.9	10.5	13.5	2.1	45.5	22.4
LOS	C	B	B	A	D	C
Approach Delay		11.4	12.9		31.0	
Approach LOS		B	B		C	
90th %ile Green (s)	11.0	84.0	68.0	68.0	26.0	26.0
90th %ile Term Code	Max	Coord	Coord	Coord	MaxR	MaxR
70th %ile Green (s)	11.0	84.0	68.0	68.0	26.0	26.0
70th %ile Term Code	Hold	Coord	Coord	Coord	MaxR	MaxR
50th %ile Green (s)	11.0	84.0	68.0	68.0	26.0	26.0
50th %ile Term Code	Hold	Coord	Coord	Coord	MaxR	MaxR
30th %ile Green (s)	11.0	84.0	68.0	68.0	26.0	26.0
30th %ile Term Code	Hold	Coord	Coord	Coord	MaxR	MaxR
10th %ile Green (s)	11.0	84.0	68.0	68.0	26.0	26.0
10th %ile Term Code	Hold	Coord	Coord	Coord	MaxR	MaxR
Stops (vph)	85	745	692	6	125	91
Fuel Used(gal)	3	28	29	1	3	3
CO Emissions (g/hr)	197	1922	2060	52	202	196
NOx Emissions (g/hr)	38	374	401	10	39	38
VOC Emissions (g/hr)	46	446	477	12	47	45
Dilemma Vehicles (#)	0	26	44	0	0	0
Queue Length 50th (ft)	30	246	226	5	119	77
Queue Length 95th (ft)	m41	m240	256	8	175	145
Internal Link Dist (ft)		460	214		489	
Turn Bay Length (ft)	300			150	300	

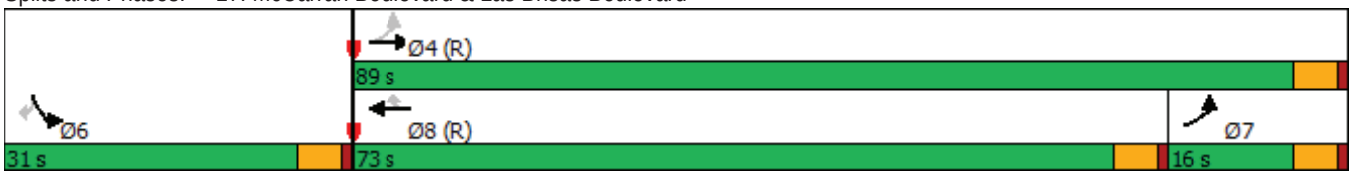


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Base Capacity (vph)	271	2477	2005	881	383	476
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.49	0.71	0.73	0.09	0.46	0.62

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 57 (48%), Referenced to phase 4:EBTL and 8:WBT, Start of Green			
Natural Cycle: 75			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.73			
Intersection Signal Delay: 14.4		Intersection LOS: B	
Intersection Capacity Utilization 74.3%		ICU Level of Service D	
Analysis Period (min) 15			

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 17: McCarran Boulevard & Las Brisas Boulevard



2040 PM – Signal



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	364	1692	1652	231	64	208
Future Volume (vph)	364	1692	1652	231	64	208
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300			150	300	0
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Ped Bike Factor				0.94	0.98	0.97
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3539	1583	1770	1583
Flt Permitted	0.056				0.950	
Satd. Flow (perm)	104	3539	3539	1485	1737	1536
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				85		267
Link Speed (mph)		50	50		35	
Link Distance (ft)		540	1872		569	
Travel Time (s)		7.4	25.5		11.1	
Confl. Peds. (#/hr)	11			11	11	11
Peak Hour Factor	0.65	0.83	0.74	0.90	0.91	0.78
Adj. Flow (vph)	560	2039	2232	257	70	267
Shared Lane Traffic (%)						
Lane Group Flow (vph)	560	2039	2232	257	70	267
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane					Yes	
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2	1	1	1
Detector Template	Left	Thru	Thru	Right	Left	Right
Leading Detector (ft)	20	100	100	20	20	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	6	20	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Protected Phases	7	4	8		6	
Permitted Phases	4			8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	1.0	1.0	1.0	1.0	1.0	1.0
Minimum Split (s)	6.0	6.0	22.0	22.0	29.0	29.0
Total Split (s)	31.0	103.0	72.0	72.0	29.0	29.0
Total Split (%)	23.5%	78.0%	54.5%	54.5%	22.0%	22.0%
Maximum Green (s)	26.0	98.0	67.0	67.0	24.0	24.0
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag		Lead	Lead		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	C-Max	Max	Max
Walk Time (s)			7.0	7.0	7.0	7.0
Flash Dont Walk (s)			10.0	10.0	17.0	17.0
Pedestrian Calls (#/hr)			11	11	11	11
Act Effct Green (s)	98.0	98.0	67.0	67.0	24.0	24.0
Actuated g/C Ratio	0.74	0.74	0.51	0.51	0.18	0.18
v/c Ratio	1.38	0.78	1.24	0.32	0.22	0.54
Control Delay	215.9	9.4	142.4	8.4	48.1	9.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	215.9	9.4	142.4	8.4	48.1	9.6
LOS	F	A	F	A	D	A
Approach Delay		53.9	128.5		17.6	
Approach LOS		D	F		B	
90th %ile Green (s)	26.0	98.0	67.0	67.0	24.0	24.0
90th %ile Term Code	Max	Coord	Coord	Coord	MaxR	MaxR
70th %ile Green (s)	26.0	98.0	67.0	67.0	24.0	24.0
70th %ile Term Code	Max	Coord	Coord	Coord	MaxR	MaxR
50th %ile Green (s)	26.0	98.0	67.0	67.0	24.0	24.0
50th %ile Term Code	Max	Coord	Coord	Coord	MaxR	MaxR
30th %ile Green (s)	26.0	98.0	67.0	67.0	24.0	24.0
30th %ile Term Code	Max	Coord	Coord	Coord	MaxR	MaxR
10th %ile Green (s)	26.0	98.0	67.0	67.0	24.0	24.0
10th %ile Term Code	Max	Coord	Coord	Coord	MaxR	MaxR
Stops (vph)	247	726	1364	91	55	23
Fuel Used(gal)	23	29	88	5	1	1
CO Emissions (g/hr)	1606	2039	6182	317	91	100
NOx Emissions (g/hr)	312	397	1203	62	18	20
VOC Emissions (g/hr)	372	473	1433	73	21	23
Dilemma Vehicles (#)	0	28	32	0	0	0
Queue Length 50th (ft)	~596	201	~1264	78	52	0
Queue Length 95th (ft)	#482	137	#996	118	98	37
Internal Link Dist (ft)		460	1792		489	
Turn Bay Length (ft)	300			150	300	

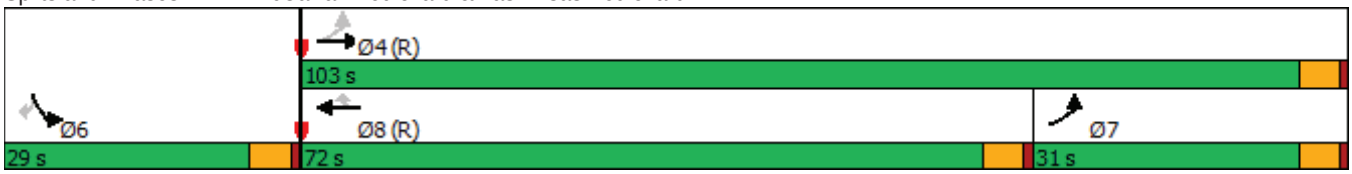
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Base Capacity (vph)	405	2627	1796	795	321	497
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	1.38	0.78	1.24	0.32	0.22	0.54

Intersection Summary			
Area Type:	Other		
Cycle Length: 132			
Actuated Cycle Length: 132			
Offset: 69 (52%), Referenced to phase 4:EBTL and 8:WBT, Start of Green			
Natural Cycle: 150			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.38			
Intersection Signal Delay: 85.9		Intersection LOS: F	
Intersection Capacity Utilization 98.3%		ICU Level of Service F	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 17: McCarran Boulevard & Las Brisas Boulevard



Existing AM – High-T



Lane Group	WBT	WBR	SBL	SBR2	NEL
Lane Configurations					
Traffic Volume (vph)	882	36	100	167	76
Future Volume (vph)	882	36	100	167	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Storage Length (ft)		150	300		0
Storage Lanes		1	1		1
Taper Length (ft)			25		25
Lane Util. Factor	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor		0.96	0.97	0.97	0.98
Frt		0.850		0.850	
Flt Protected			0.950		0.950
Satd. Flow (prot)	3539	1583	1770	1583	1770
Flt Permitted			0.950		0.950
Satd. Flow (perm)	3539	1519	1724	1540	1734
Right Turn on Red		Yes		Yes	
Satd. Flow (RTOR)		64		101	
Link Speed (mph)	50		35		50
Link Distance (ft)	986		498		297
Travel Time (s)	13.4		9.7		4.1
Confl. Peds. (#/hr)		6	6	6	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	959	39	109	182	83
Shared Lane Traffic (%)					
Lane Group Flow (vph)	959	39	109	182	83
Enter Blocked Intersection	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left
Median Width(ft)	0		12		12
Link Offset(ft)	0		0		0
Crosswalk Width(ft)	16		16		16
Two way Left Turn Lane			Yes		
Headway Factor	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15	9	15
Number of Detectors	2	1	1	1	1
Detector Template	Thru	Right	Left	Right	Left
Leading Detector (ft)	100	20	20	20	20
Trailing Detector (ft)	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0
Detector 1 Size(ft)	6	20	20	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel					
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)	94				
Detector 2 Size(ft)	6				
Detector 2 Type	Cl+Ex				
Detector 2 Channel					
Detector 2 Extend (s)	0.0				
Turn Type	NA	Perm	Prot	Perm	Prot



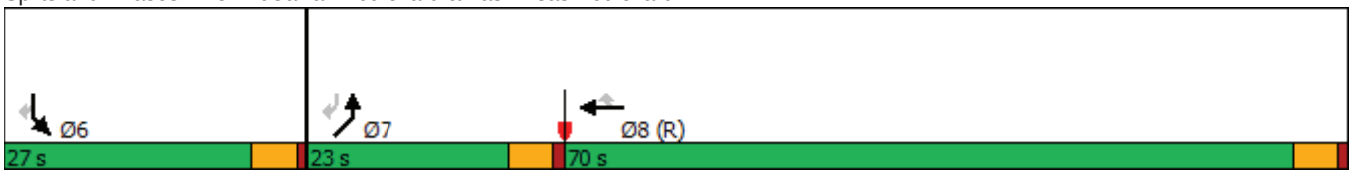
Lane Group	WBT	WBR	SBL	SBR2	NEL
Protected Phases	8		6		7
Permitted Phases		8		6 7	
Detector Phase	8	8	6	6 7	7
Switch Phase					
Minimum Initial (s)	1.0	1.0	1.0		1.0
Minimum Split (s)	22.0	22.0	19.0		6.0
Total Split (s)	70.0	70.0	27.0		23.0
Total Split (%)	58.3%	58.3%	22.5%		19.2%
Maximum Green (s)	65.0	65.0	22.0		18.0
Yellow Time (s)	4.0	4.0	4.0		4.0
All-Red Time (s)	1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0
Total Lost Time (s)	5.0	5.0	5.0		5.0
Lead/Lag	Lag	Lag			Lead
Lead-Lag Optimize?	Yes	Yes			Yes
Vehicle Extension (s)	3.0	3.0	3.0		3.0
Recall Mode	C-Max	C-Max	Max		Max
Walk Time (s)	7.0	7.0	7.0		
Flash Dont Walk (s)	10.0	10.0	7.0		
Pedestrian Calls (#/hr)	6	6	6		
Act Effct Green (s)	65.0	65.0	22.0	45.0	18.0
Actuated g/C Ratio	0.54	0.54	0.18	0.38	0.15
v/c Ratio	0.50	0.05	0.34	0.28	0.31
Control Delay	18.4	1.3	46.0	13.0	49.2
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	18.4	1.3	46.0	13.0	49.2
LOS	B	A	D	B	D
Approach Delay	17.8		25.4		49.2
Approach LOS	B		C		D
90th %ile Green (s)	65.0	65.0	22.0		18.0
90th %ile Term Code	Coord	Coord	MaxR		MaxR
70th %ile Green (s)	65.0	65.0	22.0		18.0
70th %ile Term Code	Coord	Coord	MaxR		MaxR
50th %ile Green (s)	65.0	65.0	22.0		18.0
50th %ile Term Code	Coord	Coord	MaxR		MaxR
30th %ile Green (s)	65.0	65.0	22.0		18.0
30th %ile Term Code	Coord	Coord	MaxR		MaxR
10th %ile Green (s)	65.0	65.0	22.0		18.0
10th %ile Term Code	Coord	Coord	MaxR		MaxR
Stops (vph)	531	2	85	52	66
Fuel Used(gal)	17	0	2	1	2
CO Emissions (g/hr)	1187	19	135	100	134
NOx Emissions (g/hr)	231	4	26	19	26
VOC Emissions (g/hr)	275	4	31	23	31
Dilemma Vehicles (#)	37	0	0	0	0
Queue Length 50th (ft)	235	0	74	41	58
Queue Length 95th (ft)	291	8	130	96	108
Internal Link Dist (ft)	906		418		217
Turn Bay Length (ft)		150	300		



Lane Group	WBT	WBR	SBL	SBR2	NEL
Base Capacity (vph)	1916	852	324	640	265
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.50	0.05	0.34	0.28	0.31

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 8:WBT, Start of Green			
Natural Cycle: 50			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.50			
Intersection Signal Delay: 21.3		Intersection LOS: C	
Intersection Capacity Utilization 52.8%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 3: McCarran Boulevard & Las Brisas Boulevard



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø6
Lane Configurations							
Traffic Volume (vph)	1010	0	0	0	0	0	
Future Volume (vph)	1010	0	0	0	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	0.95	1.00	1.00	1.00	1.00	1.00	
Frt							
Flt Protected							
Satd. Flow (prot)	3539	0	0	0	0	0	
Flt Permitted							
Satd. Flow (perm)	3539	0	0	0	0	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)							
Link Speed (mph)	50			50	30		
Link Distance (ft)	287			296	53		
Travel Time (s)	3.9			4.0	1.2		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	1098	0	0	0	0	0	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	1098	0	0	0	0	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(ft)	0			0	0		
Link Offset(ft)	0			0	0		
Crosswalk Width(ft)	16			16	16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)		9	15		15	9	
Number of Detectors	2						
Detector Template	Thru						
Leading Detector (ft)	100						
Trailing Detector (ft)	0						
Detector 1 Position(ft)	0						
Detector 1 Size(ft)	6						
Detector 1 Type	Cl+Ex						
Detector 1 Channel							
Detector 1 Extend (s)	0.0						
Detector 1 Queue (s)	0.0						
Detector 1 Delay (s)	0.0						
Detector 2 Position(ft)	94						
Detector 2 Size(ft)	6						
Detector 2 Type	Cl+Ex						
Detector 2 Channel							
Detector 2 Extend (s)	0.0						
Turn Type	NA						
Protected Phases	4						6
Permitted Phases							
Detector Phase	4						
Switch Phase							
Minimum Initial (s)	1.0						1.0



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø6
Minimum Split (s)	19.0						19.0
Total Split (s)	101.0						19.0
Total Split (%)	84.2%						16%
Maximum Green (s)	96.0						14.0
Yellow Time (s)	4.0						4.0
All-Red Time (s)	1.0						1.0
Lost Time Adjust (s)	0.0						
Total Lost Time (s)	5.0						
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0						3.0
Recall Mode	C-Max						None
Walk Time (s)	7.0						7.0
Flash Dont Walk (s)	7.0						7.0
Pedestrian Calls (#/hr)	6						6
Act Effct Green (s)	115.2						
Actuated g/C Ratio	0.96						
v/c Ratio	0.32						
Control Delay	1.2						
Queue Delay	0.0						
Total Delay	1.2						
LOS	A						
Approach Delay	1.2						
Approach LOS	A						
90th %ile Green (s)	96.0						14.0
90th %ile Term Code	Coord						Ped
70th %ile Green (s)	115.0						0.0
70th %ile Term Code	Coord						Skip
50th %ile Green (s)	115.0						0.0
50th %ile Term Code	Coord						Skip
30th %ile Green (s)	115.0						0.0
30th %ile Term Code	Coord						Skip
10th %ile Green (s)	115.0						0.0
10th %ile Term Code	Coord						Skip
Stops (vph)	69						
Fuel Used(gal)	3						
CO Emissions (g/hr)	220						
NOx Emissions (g/hr)	43						
VOC Emissions (g/hr)	51						
Dilemma Vehicles (#)	10						
Queue Length 50th (ft)	0						
Queue Length 95th (ft)	128						
Internal Link Dist (ft)	207			216	1		
Turn Bay Length (ft)							
Base Capacity (vph)	3397						
Starvation Cap Reductn	0						
Spillback Cap Reductn	0						
Storage Cap Reductn	0						
Reduced v/c Ratio	0.32						

Intersection Summary		
Area Type:	Other	
Cycle Length: 120		
Actuated Cycle Length: 120		
Offset: 0 (0%), Referenced to phase 4:EBT, Start of Green		
Natural Cycle: 40		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 0.32		
Intersection Signal Delay: 1.2		Intersection LOS: A
Intersection Capacity Utilization 32.1%		ICU Level of Service A
Analysis Period (min) 15		

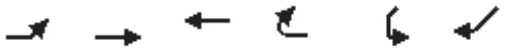
Splits and Phases: 5: McCarran Boulevard





Lane Group	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations						
Traffic Volume (vph)	0	1010	0	0	100	0
Future Volume (vph)	0	1010	0	0	100	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	3539	0	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	3539	0	0	1770	0
Link Speed (mph)		50	50		50	
Link Distance (ft)		296	411		305	
Travel Time (s)		4.0	5.6		4.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1098	0	0	109	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1098	0	0	109	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Stop		Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 40.1%		ICU Level of Service A	
Analysis Period (min) 15			



Lane Group	EBL	EBT	WBT	WBR	SWL	SWR
Lane Configurations						
Traffic Volume (vph)	76	1010	0	0	0	0
Future Volume (vph)	76	1010	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00
Frt						
Flt Protected	0.950					
Satd. Flow (prot)	1770	3539	0	0	0	0
Flt Permitted	0.950					
Satd. Flow (perm)	1770	3539	0	0	0	0
Link Speed (mph)		50	50		50	
Link Distance (ft)		603	287		297	
Travel Time (s)		8.2	3.9		4.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	83	1098	0	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	83	1098	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		0	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Stop		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 31.3%		ICU Level of Service A	
Analysis Period (min) 15			

Existing PM – High-T



Lane Group	WBT	WBR	SBL	SBR2	NEL
Lane Configurations					
Traffic Volume (vph)	1130	158	44	142	249
Future Volume (vph)	1130	158	44	142	249
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Storage Length (ft)		150	300		0
Storage Lanes		1	1		1
Taper Length (ft)			25		25
Lane Util. Factor	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor		0.94	0.95	0.96	0.98
Frt		0.850		0.850	
Flt Protected			0.950		0.950
Satd. Flow (prot)	3539	1583	1770	1583	1770
Flt Permitted			0.950		0.950
Satd. Flow (perm)	3539	1485	1678	1516	1733
Right Turn on Red		Yes		Yes	
Satd. Flow (RTOR)		105		42	
Link Speed (mph)	50		35		50
Link Distance (ft)	986		498		297
Travel Time (s)	13.4		9.7		4.1
Confl. Peds. (#/hr)		11	11	11	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1228	172	48	154	271
Shared Lane Traffic (%)					
Lane Group Flow (vph)	1228	172	48	154	271
Enter Blocked Intersection	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left
Median Width(ft)	0		12		12
Link Offset(ft)	0		0		0
Crosswalk Width(ft)	16		16		16
Two way Left Turn Lane			Yes		
Headway Factor	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15	9	15
Number of Detectors	2	1	1	1	1
Detector Template	Thru	Right	Left	Right	Left
Leading Detector (ft)	100	20	20	20	20
Trailing Detector (ft)	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0
Detector 1 Size(ft)	6	20	20	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel					
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)	94				
Detector 2 Size(ft)	6				
Detector 2 Type	Cl+Ex				
Detector 2 Channel					
Detector 2 Extend (s)	0.0				
Turn Type	NA	Perm	Prot	Perm	Prot

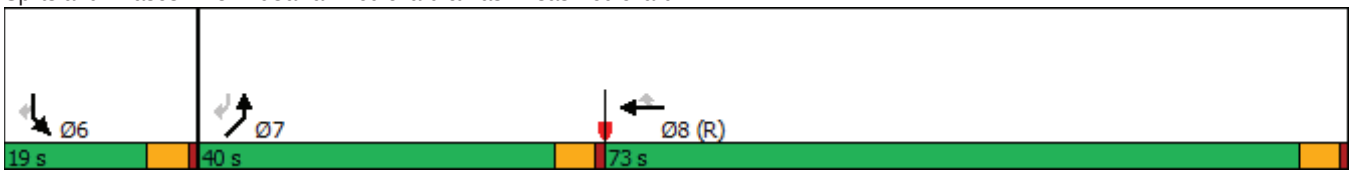


Lane Group	WBT	WBR	SBL	SBR2	NEL
Protected Phases	8		6		7
Permitted Phases		8		6 7	
Detector Phase	8	8	6	6 7	7
Switch Phase					
Minimum Initial (s)	1.0	1.0	1.0		1.0
Minimum Split (s)	22.0	22.0	19.0		6.0
Total Split (s)	73.0	73.0	19.0		40.0
Total Split (%)	55.3%	55.3%	14.4%		30.3%
Maximum Green (s)	68.0	68.0	14.0		35.0
Yellow Time (s)	4.0	4.0	4.0		4.0
All-Red Time (s)	1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0
Total Lost Time (s)	5.0	5.0	5.0		5.0
Lead/Lag	Lag	Lag			Lead
Lead-Lag Optimize?	Yes	Yes			Yes
Vehicle Extension (s)	3.0	3.0	3.0		3.0
Recall Mode	C-Max	C-Max	Max		Max
Walk Time (s)	7.0	7.0	7.0		
Flash Dont Walk (s)	10.0	10.0	7.0		
Pedestrian Calls (#/hr)	11	11	11		
Act Effct Green (s)	68.0	68.0	14.0	54.0	35.0
Actuated g/C Ratio	0.52	0.52	0.11	0.41	0.27
v/c Ratio	0.67	0.21	0.26	0.24	0.58
Control Delay	26.1	7.6	58.2	19.4	47.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	26.1	7.6	58.2	19.4	47.9
LOS	C	A	E	B	D
Approach Delay	23.8		28.6		47.9
Approach LOS	C		C		D
90th %ile Green (s)	68.0	68.0	14.0		35.0
90th %ile Term Code	Coord	Coord	MaxR		MaxR
70th %ile Green (s)	68.0	68.0	14.0		35.0
70th %ile Term Code	Coord	Coord	MaxR		MaxR
50th %ile Green (s)	68.0	68.0	14.0		35.0
50th %ile Term Code	Coord	Coord	MaxR		MaxR
30th %ile Green (s)	68.0	68.0	14.0		35.0
30th %ile Term Code	Coord	Coord	MaxR		MaxR
10th %ile Green (s)	68.0	68.0	14.0		35.0
10th %ile Term Code	Coord	Coord	MaxR		MaxR
Stops (vph)	813	35	39	65	213
Fuel Used(gal)	26	2	1	2	6
CO Emissions (g/hr)	1786	124	68	109	431
NOx Emissions (g/hr)	347	24	13	21	84
VOC Emissions (g/hr)	414	29	16	25	100
Dilemma Vehicles (#)	43	0	0	0	0
Queue Length 50th (ft)	398	28	38	60	202
Queue Length 95th (ft)	477	69	80	112	297
Internal Link Dist (ft)	906		418		217
Turn Bay Length (ft)		150	300		

Lane Group	WBT	WBR	SBL	SBR2	NEL
Base Capacity (vph)	1823	815	187	645	469
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.67	0.21	0.26	0.24	0.58

Intersection Summary			
Area Type:	Other		
Cycle Length: 132			
Actuated Cycle Length: 132			
Offset: 0 (0%), Referenced to phase 8:WBT, Start of Green			
Natural Cycle: 65			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.67			
Intersection Signal Delay: 27.8		Intersection LOS: C	
Intersection Capacity Utilization 69.2%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 3: McCarran Boulevard & Las Brisas Boulevard



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø6
Lane Configurations							
Traffic Volume (vph)	1157	0	0	0	0	0	
Future Volume (vph)	1157	0	0	0	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	0.95	1.00	1.00	1.00	1.00	1.00	
Frt							
Flt Protected							
Satd. Flow (prot)	3539	0	0	0	0	0	
Flt Permitted							
Satd. Flow (perm)	3539	0	0	0	0	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)							
Link Speed (mph)	50			50	30		
Link Distance (ft)	287			296	53		
Travel Time (s)	3.9			4.0	1.2		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	1258	0	0	0	0	0	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	1258	0	0	0	0	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(ft)	0			0	0		
Link Offset(ft)	0			0	0		
Crosswalk Width(ft)	16			16	16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)		9	15		15	9	
Number of Detectors	2						
Detector Template	Thru						
Leading Detector (ft)	100						
Trailing Detector (ft)	0						
Detector 1 Position(ft)	0						
Detector 1 Size(ft)	6						
Detector 1 Type	Cl+Ex						
Detector 1 Channel							
Detector 1 Extend (s)	0.0						
Detector 1 Queue (s)	0.0						
Detector 1 Delay (s)	0.0						
Detector 2 Position(ft)	94						
Detector 2 Size(ft)	6						
Detector 2 Type	Cl+Ex						
Detector 2 Channel							
Detector 2 Extend (s)	0.0						
Turn Type	NA						
Protected Phases	4						6
Permitted Phases							
Detector Phase	4						
Switch Phase							
Minimum Initial (s)	1.0						1.0



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø6
Minimum Split (s)	19.0						19.0
Total Split (s)	113.0						19.0
Total Split (%)	85.6%						14%
Maximum Green (s)	108.0						14.0
Yellow Time (s)	4.0						4.0
All-Red Time (s)	1.0						1.0
Lost Time Adjust (s)	0.0						
Total Lost Time (s)	5.0						
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0						3.0
Recall Mode	C-Max						Max
Walk Time (s)	7.0						7.0
Flash Dont Walk (s)	7.0						7.0
Pedestrian Calls (#/hr)	11						11
Act Effct Green (s)	108.0						
Actuated g/C Ratio	0.82						
v/c Ratio	0.43						
Control Delay	3.9						
Queue Delay	0.0						
Total Delay	3.9						
LOS	A						
Approach Delay	3.9						
Approach LOS	A						
90th %ile Green (s)	108.0						14.0
90th %ile Term Code	Coord						MaxR
70th %ile Green (s)	108.0						14.0
70th %ile Term Code	Coord						MaxR
50th %ile Green (s)	108.0						14.0
50th %ile Term Code	Coord						MaxR
30th %ile Green (s)	108.0						14.0
30th %ile Term Code	Coord						MaxR
10th %ile Green (s)	108.0						14.0
10th %ile Term Code	Coord						MaxR
Stops (vph)	291						
Fuel Used(gal)	7						
CO Emissions (g/hr)	524						
NOx Emissions (g/hr)	102						
VOC Emissions (g/hr)	121						
Dilemma Vehicles (#)	44						
Queue Length 50th (ft)	128						
Queue Length 95th (ft)	154						
Internal Link Dist (ft)	207			216	1		
Turn Bay Length (ft)							
Base Capacity (vph)	2895						
Starvation Cap Reductn	0						
Spillback Cap Reductn	0						
Storage Cap Reductn	0						
Reduced v/c Ratio	0.43						

Intersection Summary		
Area Type:	Other	
Cycle Length: 132		
Actuated Cycle Length: 132		
Offset: 0 (0%), Referenced to phase 4:EBT, Start of Green		
Natural Cycle: 45		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 0.43		
Intersection Signal Delay: 3.9		Intersection LOS: A
Intersection Capacity Utilization 36.1%		ICU Level of Service A
Analysis Period (min) 15		

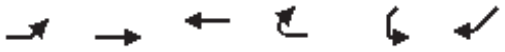
Splits and Phases: 5: McCarran Boulevard





Lane Group	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations						
Traffic Volume (vph)	0	1157	0	0	44	0
Future Volume (vph)	0	1157	0	0	44	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	3539	0	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	3539	0	0	1770	0
Link Speed (mph)		50	50		50	
Link Distance (ft)		296	411		305	
Travel Time (s)		4.0	5.6		4.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1258	0	0	48	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1258	0	0	48	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Stop		Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 42.0%		ICU Level of Service A	
Analysis Period (min) 15			



Lane Group	EBL	EBT	WBT	WBR	SWL	SWR
Lane Configurations						
Traffic Volume (vph)	249	1157	0	0	0	0
Future Volume (vph)	249	1157	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00
Frt						
Flt Protected	0.950					
Satd. Flow (prot)	1770	3539	0	0	0	0
Flt Permitted	0.950					
Satd. Flow (perm)	1770	3539	0	0	0	0
Link Speed (mph)		50	50		50	
Link Distance (ft)		603	287		297	
Travel Time (s)		8.2	3.9		4.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	271	1258	0	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	271	1258	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		0	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Stop		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 35.3%		ICU Level of Service A	
Analysis Period (min) 15			

2030 AM – High-T



Lane Group	WBT	WBR	SBL	SBR2	NEL
Lane Configurations					
Traffic Volume (vph)	1090	45	124	206	94
Future Volume (vph)	1090	45	124	206	94
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Storage Length (ft)		150	300		0
Storage Lanes		1	1		1
Taper Length (ft)			25		25
Lane Util. Factor	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor		0.96	0.97	0.97	0.98
Frt		0.850		0.850	
Flt Protected			0.950		0.950
Satd. Flow (prot)	3539	1583	1770	1583	1770
Flt Permitted			0.950		0.950
Satd. Flow (perm)	3539	1519	1724	1540	1732
Right Turn on Red		Yes		Yes	
Satd. Flow (RTOR)		64		59	
Link Speed (mph)	50		35		50
Link Distance (ft)	986		498		297
Travel Time (s)	13.4		9.7		4.1
Confl. Peds. (#/hr)		6	6	6	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1185	49	135	224	102
Shared Lane Traffic (%)					
Lane Group Flow (vph)	1185	49	135	224	102
Enter Blocked Intersection	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left
Median Width(ft)	0		12		12
Link Offset(ft)	0		0		0
Crosswalk Width(ft)	16		16		16
Two way Left Turn Lane			Yes		
Headway Factor	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15	9	15
Number of Detectors	2	1	1	1	1
Detector Template	Thru	Right	Left	Right	Left
Leading Detector (ft)	100	20	20	20	20
Trailing Detector (ft)	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0
Detector 1 Size(ft)	6	20	20	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel					
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)	94				
Detector 2 Size(ft)	6				
Detector 2 Type	Cl+Ex				
Detector 2 Channel					
Detector 2 Extend (s)	0.0				
Turn Type	NA	Perm	Prot	Perm	Prot



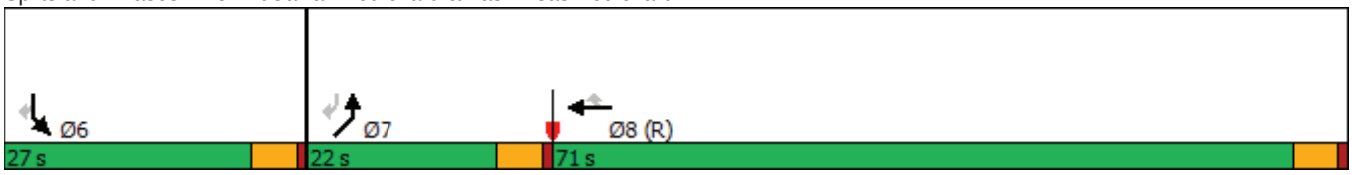
Lane Group	WBT	WBR	SBL	SBR2	NEL
Protected Phases	8		6		7
Permitted Phases		8		6 7	
Detector Phase	8	8	6	6 7	7
Switch Phase					
Minimum Initial (s)	1.0	1.0	1.0		1.0
Minimum Split (s)	22.0	22.0	19.0		6.0
Total Split (s)	71.0	71.0	27.0		22.0
Total Split (%)	59.2%	59.2%	22.5%		18.3%
Maximum Green (s)	66.0	66.0	22.0		17.0
Yellow Time (s)	4.0	4.0	4.0		4.0
All-Red Time (s)	1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0
Total Lost Time (s)	5.0	5.0	5.0		5.0
Lead/Lag	Lag	Lag			Lead
Lead-Lag Optimize?	Yes	Yes			Yes
Vehicle Extension (s)	3.0	3.0	3.0		3.0
Recall Mode	C-Max	C-Max	Max		Max
Walk Time (s)	7.0	7.0	7.0		
Flash Dont Walk (s)	10.0	10.0	7.0		
Pedestrian Calls (#/hr)	6	6	6		
Act Effct Green (s)	66.0	66.0	22.0	44.0	17.0
Actuated g/C Ratio	0.55	0.55	0.18	0.37	0.14
v/c Ratio	0.61	0.06	0.42	0.37	0.41
Control Delay	20.0	2.1	47.9	22.2	52.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	20.0	2.1	47.9	22.2	52.4
LOS	B	A	D	C	D
Approach Delay	19.2		31.9		52.4
Approach LOS	B		C		D
90th %ile Green (s)	66.0	66.0	22.0		17.0
90th %ile Term Code	Coord	Coord	MaxR		MaxR
70th %ile Green (s)	66.0	66.0	22.0		17.0
70th %ile Term Code	Coord	Coord	MaxR		MaxR
50th %ile Green (s)	66.0	66.0	22.0		17.0
50th %ile Term Code	Coord	Coord	MaxR		MaxR
30th %ile Green (s)	66.0	66.0	22.0		17.0
30th %ile Term Code	Coord	Coord	MaxR		MaxR
10th %ile Green (s)	66.0	66.0	22.0		17.0
10th %ile Term Code	Coord	Coord	MaxR		MaxR
Stops (vph)	708	3	107	109	85
Fuel Used(gal)	22	0	2	2	2
CO Emissions (g/hr)	1546	24	172	174	174
NOx Emissions (g/hr)	301	5	33	34	34
VOC Emissions (g/hr)	358	6	40	40	40
Dilemma Vehicles (#)	45	0	0	0	0
Queue Length 50th (ft)	312	0	93	91	73
Queue Length 95th (ft)	381	13	157	159	130
Internal Link Dist (ft)	906		418		217
Turn Bay Length (ft)		150	300		



Lane Group	WBT	WBR	SBL	SBR2	NEL
Base Capacity (vph)	1946	864	324	602	250
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.61	0.06	0.42	0.37	0.41

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 8:WBT, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.61			
Intersection Signal Delay: 23.9		Intersection LOS: C	
Intersection Capacity Utilization 59.5%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 3: McCarran Boulevard & Las Brisas Boulevard



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø6
Lane Configurations							
Traffic Volume (vph)	1249	0	0	0	0	0	
Future Volume (vph)	1249	0	0	0	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	0.95	1.00	1.00	1.00	1.00	1.00	
Frt							
Flt Protected							
Satd. Flow (prot)	3539	0	0	0	0	0	
Flt Permitted							
Satd. Flow (perm)	3539	0	0	0	0	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)							
Link Speed (mph)	50			50	30		
Link Distance (ft)	287			296	53		
Travel Time (s)	3.9			4.0	1.2		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	1358	0	0	0	0	0	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	1358	0	0	0	0	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(ft)	0			0	0		
Link Offset(ft)	0			0	0		
Crosswalk Width(ft)	16			16	16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)		9	15		15	9	
Number of Detectors	2						
Detector Template	Thru						
Leading Detector (ft)	100						
Trailing Detector (ft)	0						
Detector 1 Position(ft)	0						
Detector 1 Size(ft)	6						
Detector 1 Type	Cl+Ex						
Detector 1 Channel							
Detector 1 Extend (s)	0.0						
Detector 1 Queue (s)	0.0						
Detector 1 Delay (s)	0.0						
Detector 2 Position(ft)	94						
Detector 2 Size(ft)	6						
Detector 2 Type	Cl+Ex						
Detector 2 Channel							
Detector 2 Extend (s)	0.0						
Turn Type	NA						
Protected Phases	4						6
Permitted Phases							
Detector Phase	4						
Switch Phase							
Minimum Initial (s)	1.0						1.0



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø6
Minimum Split (s)	19.0						19.0
Total Split (s)	101.0						19.0
Total Split (%)	84.2%						16%
Maximum Green (s)	96.0						14.0
Yellow Time (s)	4.0						4.0
All-Red Time (s)	1.0						1.0
Lost Time Adjust (s)	0.0						
Total Lost Time (s)	5.0						
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0						3.0
Recall Mode	C-Max						None
Walk Time (s)	7.0						7.0
Flash Dont Walk (s)	7.0						7.0
Pedestrian Calls (#/hr)	6						6
Act Effct Green (s)	115.2						
Actuated g/C Ratio	0.96						
v/c Ratio	0.40						
Control Delay	1.4						
Queue Delay	0.0						
Total Delay	1.4						
LOS	A						
Approach Delay	1.4						
Approach LOS	A						
90th %ile Green (s)	96.0						14.0
90th %ile Term Code	Coord						Ped
70th %ile Green (s)	115.0						0.0
70th %ile Term Code	Coord						Skip
50th %ile Green (s)	115.0						0.0
50th %ile Term Code	Coord						Skip
30th %ile Green (s)	115.0						0.0
30th %ile Term Code	Coord						Skip
10th %ile Green (s)	115.0						0.0
10th %ile Term Code	Coord						Skip
Stops (vph)	97						
Fuel Used(gal)	4						
CO Emissions (g/hr)	288						
NOx Emissions (g/hr)	56						
VOC Emissions (g/hr)	67						
Dilemma Vehicles (#)	12						
Queue Length 50th (ft)	0						
Queue Length 95th (ft)	175						
Internal Link Dist (ft)	207			216	1		
Turn Bay Length (ft)							
Base Capacity (vph)	3397						
Starvation Cap Reductn	0						
Spillback Cap Reductn	0						
Storage Cap Reductn	0						
Reduced v/c Ratio	0.40						

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 4:EBT, Start of Green			
Natural Cycle: 45			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.40			
Intersection Signal Delay: 1.4		Intersection LOS: A	
Intersection Capacity Utilization 38.7%		ICU Level of Service A	
Analysis Period (min) 15			

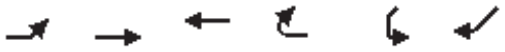
Splits and Phases: 5: McCarran Boulevard





Lane Group	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations						
Traffic Volume (vph)	0	1249	0	0	124	0
Future Volume (vph)	0	1249	0	0	124	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	3539	0	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	3539	0	0	1770	0
Link Speed (mph)		50	50		50	
Link Distance (ft)		296	411		305	
Travel Time (s)		4.0	5.6		4.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1358	0	0	135	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1358	0	0	135	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Stop		Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 48.1%		ICU Level of Service A	
Analysis Period (min) 15			



Lane Group	EBL	EBT	WBT	WBR	SWL	SWR
Lane Configurations						
Traffic Volume (vph)	94	1249	0	0	0	0
Future Volume (vph)	94	1249	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00
Frt						
Flt Protected	0.950					
Satd. Flow (prot)	1770	3539	0	0	0	0
Flt Permitted	0.950					
Satd. Flow (perm)	1770	3539	0	0	0	0
Link Speed (mph)		50	50		50	
Link Distance (ft)		603	287		297	
Travel Time (s)		8.2	3.9		4.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	102	1358	0	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	102	1358	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		0	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Stop		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 37.9%		ICU Level of Service A	
Analysis Period (min) 15			

2030 PM – High-T



Lane Group	WBT	WBR	SBL	SBR2	NEL
Lane Configurations					
Traffic Volume (vph)	1397	195	54	176	308
Future Volume (vph)	1397	195	54	176	308
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Storage Length (ft)		150	300		0
Storage Lanes		1	1		1
Taper Length (ft)			25		25
Lane Util. Factor	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor		0.94	0.95	0.96	0.98
Frt		0.850		0.850	
Flt Protected			0.950		0.950
Satd. Flow (prot)	3539	1583	1770	1583	1770
Flt Permitted			0.950		0.950
Satd. Flow (perm)	3539	1485	1678	1516	1733
Right Turn on Red		Yes		Yes	
Satd. Flow (RTOR)		104		19	
Link Speed (mph)	50		35		50
Link Distance (ft)	986		498		297
Travel Time (s)	13.4		9.7		4.1
Confl. Peds. (#/hr)		11	11	11	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1518	212	59	191	335
Shared Lane Traffic (%)					
Lane Group Flow (vph)	1518	212	59	191	335
Enter Blocked Intersection	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left
Median Width(ft)	0		12		12
Link Offset(ft)	0		0		0
Crosswalk Width(ft)	16		16		16
Two way Left Turn Lane			Yes		
Headway Factor	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15	9	15
Number of Detectors	2	1	1	1	1
Detector Template	Thru	Right	Left	Right	Left
Leading Detector (ft)	100	20	20	20	20
Trailing Detector (ft)	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0
Detector 1 Size(ft)	6	20	20	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel					
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)	94				
Detector 2 Size(ft)	6				
Detector 2 Type	Cl+Ex				
Detector 2 Channel					
Detector 2 Extend (s)	0.0				
Turn Type	NA	Perm	Prot	Perm	Prot

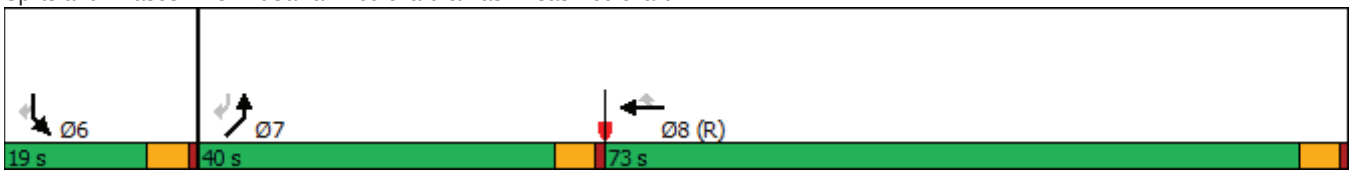


Lane Group	WBT	WBR	SBL	SBR2	NEL
Protected Phases	8		6		7
Permitted Phases		8		6 7	
Detector Phase	8	8	6	6 7	7
Switch Phase					
Minimum Initial (s)	1.0	1.0	1.0		1.0
Minimum Split (s)	22.0	22.0	19.0		6.0
Total Split (s)	73.0	73.0	19.0		40.0
Total Split (%)	55.3%	55.3%	14.4%		30.3%
Maximum Green (s)	68.0	68.0	14.0		35.0
Yellow Time (s)	4.0	4.0	4.0		4.0
All-Red Time (s)	1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0
Total Lost Time (s)	5.0	5.0	5.0		5.0
Lead/Lag	Lag	Lag			Lead
Lead-Lag Optimize?	Yes	Yes			Yes
Vehicle Extension (s)	3.0	3.0	3.0		3.0
Recall Mode	C-Max	C-Max	Max		Max
Walk Time (s)	7.0	7.0	7.0		
Flash Dont Walk (s)	10.0	10.0	7.0		
Pedestrian Calls (#/hr)	11	11	11		
Act Effct Green (s)	68.0	68.0	14.0	54.0	35.0
Actuated g/C Ratio	0.52	0.52	0.11	0.41	0.27
v/c Ratio	0.83	0.26	0.32	0.30	0.71
Control Delay	32.3	9.6	59.6	25.1	53.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	32.3	9.6	59.6	25.1	53.7
LOS	C	A	E	C	D
Approach Delay	29.5		33.3		53.7
Approach LOS	C		C		D
90th %ile Green (s)	68.0	68.0	14.0		35.0
90th %ile Term Code	Coord	Coord	MaxR		MaxR
70th %ile Green (s)	68.0	68.0	14.0		35.0
70th %ile Term Code	Coord	Coord	MaxR		MaxR
50th %ile Green (s)	68.0	68.0	14.0		35.0
50th %ile Term Code	Coord	Coord	MaxR		MaxR
30th %ile Green (s)	68.0	68.0	14.0		35.0
30th %ile Term Code	Coord	Coord	MaxR		MaxR
10th %ile Green (s)	68.0	68.0	14.0		35.0
10th %ile Term Code	Coord	Coord	MaxR		MaxR
Stops (vph)	1154	53	49	105	276
Fuel Used(gal)	36	2	1	2	8
CO Emissions (g/hr)	2491	169	85	162	572
NOx Emissions (g/hr)	485	33	17	32	111
VOC Emissions (g/hr)	577	39	20	38	133
Dilemma Vehicles (#)	53	0	0	0	0
Queue Length 50th (ft)	563	47	47	98	261
Queue Length 95th (ft)	668	95	94	158	373
Internal Link Dist (ft)	906		418		217
Turn Bay Length (ft)		150	300		

Lane Group	WBT	WBR	SBL	SBR2	NEL
Base Capacity (vph)	1823	815	187	631	469
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.83	0.26	0.32	0.30	0.71

Intersection Summary			
Area Type:	Other		
Cycle Length: 132			
Actuated Cycle Length: 132			
Offset: 0 (0%), Referenced to phase 8:WBT, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.83			
Intersection Signal Delay: 33.4		Intersection LOS: C	
Intersection Capacity Utilization 79.8%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 3: McCarran Boulevard & Las Brisas Boulevard



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø6
Lane Configurations							
Traffic Volume (vph)	1430	0	0	0	0	0	
Future Volume (vph)	1430	0	0	0	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	0.95	1.00	1.00	1.00	1.00	1.00	
Frt							
Flt Protected							
Satd. Flow (prot)	3539	0	0	0	0	0	
Flt Permitted							
Satd. Flow (perm)	3539	0	0	0	0	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)							
Link Speed (mph)	50			50	30		
Link Distance (ft)	287			296	53		
Travel Time (s)	3.9			4.0	1.2		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	1554	0	0	0	0	0	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	1554	0	0	0	0	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(ft)	0			0	0		
Link Offset(ft)	0			0	0		
Crosswalk Width(ft)	16			16	16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)		9	15		15	9	
Number of Detectors	2						
Detector Template	Thru						
Leading Detector (ft)	100						
Trailing Detector (ft)	0						
Detector 1 Position(ft)	0						
Detector 1 Size(ft)	6						
Detector 1 Type	Cl+Ex						
Detector 1 Channel							
Detector 1 Extend (s)	0.0						
Detector 1 Queue (s)	0.0						
Detector 1 Delay (s)	0.0						
Detector 2 Position(ft)	94						
Detector 2 Size(ft)	6						
Detector 2 Type	Cl+Ex						
Detector 2 Channel							
Detector 2 Extend (s)	0.0						
Turn Type	NA						
Protected Phases	4						6
Permitted Phases							
Detector Phase	4						
Switch Phase							
Minimum Initial (s)	1.0						1.0



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø6
Minimum Split (s)	19.0						19.0
Total Split (s)	113.0						19.0
Total Split (%)	85.6%						14%
Maximum Green (s)	108.0						14.0
Yellow Time (s)	4.0						4.0
All-Red Time (s)	1.0						1.0
Lost Time Adjust (s)	0.0						
Total Lost Time (s)	5.0						
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0						3.0
Recall Mode	C-Max						Max
Walk Time (s)	7.0						7.0
Flash Dont Walk (s)	7.0						7.0
Pedestrian Calls (#/hr)	11						11
Act Effct Green (s)	108.0						
Actuated g/C Ratio	0.82						
v/c Ratio	0.54						
Control Delay	4.7						
Queue Delay	0.0						
Total Delay	4.7						
LOS	A						
Approach Delay	4.7						
Approach LOS	A						
90th %ile Green (s)	108.0						14.0
90th %ile Term Code	Coord						MaxR
70th %ile Green (s)	108.0						14.0
70th %ile Term Code	Coord						MaxR
50th %ile Green (s)	108.0						14.0
50th %ile Term Code	Coord						MaxR
30th %ile Green (s)	108.0						14.0
30th %ile Term Code	Coord						MaxR
10th %ile Green (s)	108.0						14.0
10th %ile Term Code	Coord						MaxR
Stops (vph)	414						
Fuel Used(gal)	10						
CO Emissions (g/hr)	721						
NOx Emissions (g/hr)	140						
VOC Emissions (g/hr)	167						
Dilemma Vehicles (#)	54						
Queue Length 50th (ft)	182						
Queue Length 95th (ft)	216						
Internal Link Dist (ft)	207			216	1		
Turn Bay Length (ft)							
Base Capacity (vph)	2895						
Starvation Cap Reductn	0						
Spillback Cap Reductn	0						
Storage Cap Reductn	0						
Reduced v/c Ratio	0.54						

Intersection Summary		
Area Type:	Other	
Cycle Length: 132		
Actuated Cycle Length: 132		
Offset: 0 (0%), Referenced to phase 4:EBT, Start of Green		
Natural Cycle: 55		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 0.54		
Intersection Signal Delay: 4.7		Intersection LOS: A
Intersection Capacity Utilization 43.7%		ICU Level of Service A
Analysis Period (min) 15		

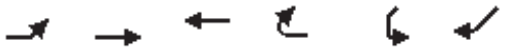
Splits and Phases: 5: McCarran Boulevard





Lane Group	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations						
Traffic Volume (vph)	0	1430	0	0	54	0
Future Volume (vph)	0	1430	0	0	54	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	3539	0	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	3539	0	0	1770	0
Link Speed (mph)		50	50		50	
Link Distance (ft)		296	411		305	
Travel Time (s)		4.0	5.6		4.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1554	0	0	59	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1554	0	0	59	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Stop		Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 49.5%		ICU Level of Service A	
Analysis Period (min) 15			



Lane Group	EBL	EBT	WBT	WBR	SWL	SWR
Lane Configurations						
Traffic Volume (vph)	308	1430	0	0	0	0
Future Volume (vph)	308	1430	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00
Frt						
Flt Protected	0.950					
Satd. Flow (prot)	1770	3539	0	0	0	0
Flt Permitted	0.950					
Satd. Flow (perm)	1770	3539	0	0	0	0
Link Speed (mph)		50	50		50	
Link Distance (ft)		603	287		297	
Travel Time (s)		8.2	3.9		4.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	335	1554	0	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	335	1554	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		0	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Stop		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 42.9%		ICU Level of Service A	
Analysis Period (min) 15			

2040 AM – High-T



Lane Group	WBT	WBR	SBL	SBR2	NEL
Lane Configurations					
Traffic Volume (vph)	1290	53	146	244	111
Future Volume (vph)	1290	53	146	244	111
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Storage Length (ft)		150	300		0
Storage Lanes		1	1		1
Taper Length (ft)			25		25
Lane Util. Factor	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor		0.96	0.97	0.97	0.98
Frt		0.850		0.850	
Flt Protected			0.950		0.950
Satd. Flow (prot)	3539	1583	1770	1583	1770
Flt Permitted			0.950		0.950
Satd. Flow (perm)	3539	1519	1724	1540	1732
Right Turn on Red		Yes		Yes	
Satd. Flow (RTOR)		64		36	
Link Speed (mph)	50		35		50
Link Distance (ft)	986		498		297
Travel Time (s)	13.4		9.7		4.1
Confl. Peds. (#/hr)		6	6	6	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1402	58	159	265	121
Shared Lane Traffic (%)					
Lane Group Flow (vph)	1402	58	159	265	121
Enter Blocked Intersection	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left
Median Width(ft)	0		12		12
Link Offset(ft)	0		0		0
Crosswalk Width(ft)	16		16		16
Two way Left Turn Lane			Yes		
Headway Factor	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15	9	15
Number of Detectors	2	1	1	1	1
Detector Template	Thru	Right	Left	Right	Left
Leading Detector (ft)	100	20	20	20	20
Trailing Detector (ft)	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0
Detector 1 Size(ft)	6	20	20	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel					
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)	94				
Detector 2 Size(ft)	6				
Detector 2 Type	Cl+Ex				
Detector 2 Channel					
Detector 2 Extend (s)	0.0				
Turn Type	NA	Perm	Prot	Perm	Prot

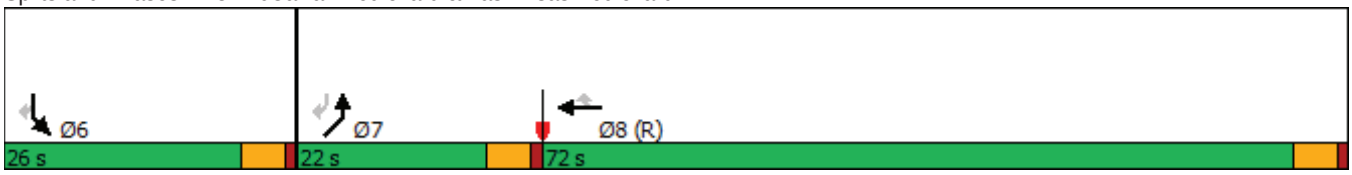


Lane Group	WBT	WBR	SBL	SBR2	NEL
Protected Phases	8		6		7
Permitted Phases		8		6 7	
Detector Phase	8	8	6	6 7	7
Switch Phase					
Minimum Initial (s)	1.0	1.0	1.0		1.0
Minimum Split (s)	22.0	22.0	19.0		6.0
Total Split (s)	72.0	72.0	26.0		22.0
Total Split (%)	60.0%	60.0%	21.7%		18.3%
Maximum Green (s)	67.0	67.0	21.0		17.0
Yellow Time (s)	4.0	4.0	4.0		4.0
All-Red Time (s)	1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0
Total Lost Time (s)	5.0	5.0	5.0		5.0
Lead/Lag	Lag	Lag			Lead
Lead-Lag Optimize?	Yes	Yes			Yes
Vehicle Extension (s)	3.0	3.0	3.0		3.0
Recall Mode	C-Max	C-Max	Max		Max
Walk Time (s)	7.0	7.0	7.0		
Flash Dont Walk (s)	10.0	10.0	7.0		
Pedestrian Calls (#/hr)	6	6	6		
Act Effct Green (s)	67.0	67.0	21.0	43.0	17.0
Actuated g/C Ratio	0.56	0.56	0.18	0.36	0.14
v/c Ratio	0.71	0.07	0.51	0.46	0.48
Control Delay	21.9	2.8	51.6	28.5	54.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	21.9	2.8	51.6	28.5	54.7
LOS	C	A	D	C	D
Approach Delay	21.2		37.1		54.7
Approach LOS	C		D		D
90th %ile Green (s)	67.0	67.0	21.0		17.0
90th %ile Term Code	Coord	Coord	MaxR		MaxR
70th %ile Green (s)	67.0	67.0	21.0		17.0
70th %ile Term Code	Coord	Coord	MaxR		MaxR
50th %ile Green (s)	67.0	67.0	21.0		17.0
50th %ile Term Code	Coord	Coord	MaxR		MaxR
30th %ile Green (s)	67.0	67.0	21.0		17.0
30th %ile Term Code	Coord	Coord	MaxR		MaxR
10th %ile Green (s)	67.0	67.0	21.0		17.0
10th %ile Term Code	Coord	Coord	MaxR		MaxR
Stops (vph)	908	5	130	161	102
Fuel Used(gal)	28	0	3	4	3
CO Emissions (g/hr)	1941	31	212	245	210
NOx Emissions (g/hr)	378	6	41	48	41
VOC Emissions (g/hr)	450	7	49	57	49
Dilemma Vehicles (#)	54	0	0	0	0
Queue Length 50th (ft)	398	0	113	135	88
Queue Length 95th (ft)	482	17	184	216	150
Internal Link Dist (ft)	906		418		217
Turn Bay Length (ft)		150	300		

Lane Group	WBT	WBR	SBL	SBR2	NEL
Base Capacity (vph)	1975	876	309	574	250
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.71	0.07	0.51	0.46	0.48

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 8:WBT, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.71			
Intersection Signal Delay: 26.6		Intersection LOS: C	
Intersection Capacity Utilization 66.0%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 3: McCarran Boulevard & Las Brisas Boulevard



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø6
Lane Configurations							
Traffic Volume (vph)	1477	0	0	0	0	0	
Future Volume (vph)	1477	0	0	0	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	0.95	1.00	1.00	1.00	1.00	1.00	
Frt							
Flt Protected							
Satd. Flow (prot)	3539	0	0	0	0	0	
Flt Permitted							
Satd. Flow (perm)	3539	0	0	0	0	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)							
Link Speed (mph)	50			50	30		
Link Distance (ft)	287			296	53		
Travel Time (s)	3.9			4.0	1.2		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	1605	0	0	0	0	0	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	1605	0	0	0	0	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(ft)	0			0	0		
Link Offset(ft)	0			0	0		
Crosswalk Width(ft)	16			16	16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)		9	15		15	9	
Number of Detectors	2						
Detector Template	Thru						
Leading Detector (ft)	100						
Trailing Detector (ft)	0						
Detector 1 Position(ft)	0						
Detector 1 Size(ft)	6						
Detector 1 Type	Cl+Ex						
Detector 1 Channel							
Detector 1 Extend (s)	0.0						
Detector 1 Queue (s)	0.0						
Detector 1 Delay (s)	0.0						
Detector 2 Position(ft)	94						
Detector 2 Size(ft)	6						
Detector 2 Type	Cl+Ex						
Detector 2 Channel							
Detector 2 Extend (s)	0.0						
Turn Type	NA						
Protected Phases	4						6
Permitted Phases							
Detector Phase	4						
Switch Phase							
Minimum Initial (s)	1.0						1.0



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø6
Minimum Split (s)	19.0						19.0
Total Split (s)	101.0						19.0
Total Split (%)	84.2%						16%
Maximum Green (s)	96.0						14.0
Yellow Time (s)	4.0						4.0
All-Red Time (s)	1.0						1.0
Lost Time Adjust (s)	0.0						
Total Lost Time (s)	5.0						
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0						3.0
Recall Mode	C-Max						None
Walk Time (s)	7.0						7.0
Flash Dont Walk (s)	7.0						7.0
Pedestrian Calls (#/hr)	6						6
Act Effct Green (s)	115.2						
Actuated g/C Ratio	0.96						
v/c Ratio	0.47						
Control Delay	1.7						
Queue Delay	0.0						
Total Delay	1.7						
LOS	A						
Approach Delay	1.7						
Approach LOS	A						
90th %ile Green (s)	96.0						14.0
90th %ile Term Code	Coord						Ped
70th %ile Green (s)	115.0						0.0
70th %ile Term Code	Coord						Skip
50th %ile Green (s)	115.0						0.0
50th %ile Term Code	Coord						Skip
30th %ile Green (s)	115.0						0.0
30th %ile Term Code	Coord						Skip
10th %ile Green (s)	115.0						0.0
10th %ile Term Code	Coord						Skip
Stops (vph)	131						
Fuel Used(gal)	5						
CO Emissions (g/hr)	364						
NOx Emissions (g/hr)	71						
VOC Emissions (g/hr)	84						
Dilemma Vehicles (#)	15						
Queue Length 50th (ft)	0						
Queue Length 95th (ft)	233						
Internal Link Dist (ft)	207			216	1		
Turn Bay Length (ft)							
Base Capacity (vph)	3397						
Starvation Cap Reductn	0						
Spillback Cap Reductn	0						
Storage Cap Reductn	0						
Reduced v/c Ratio	0.47						

Intersection Summary		
Area Type:	Other	
Cycle Length: 120		
Actuated Cycle Length: 120		
Offset: 0 (0%), Referenced to phase 4:EBT, Start of Green		
Natural Cycle: 55		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 0.47		
Intersection Signal Delay: 1.7		Intersection LOS: A
Intersection Capacity Utilization 45.0%		ICU Level of Service A
Analysis Period (min) 15		

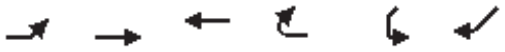
Splits and Phases: 5: McCarran Boulevard





Lane Group	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations						
Traffic Volume (vph)	0	1477	0	0	146	0
Future Volume (vph)	0	1477	0	0	146	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	3539	0	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	3539	0	0	1770	0
Link Speed (mph)		50	50		50	
Link Distance (ft)		296	411		305	
Travel Time (s)		4.0	5.6		4.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1605	0	0	159	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1605	0	0	159	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Stop		Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 55.6%		ICU Level of Service B	
Analysis Period (min) 15			



Lane Group	EBL	EBT	WBT	WBR	SWL	SWR
Lane Configurations						
Traffic Volume (vph)	111	1477	0	0	0	0
Future Volume (vph)	111	1477	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00
Frt						
Flt Protected	0.950					
Satd. Flow (prot)	1770	3539	0	0	0	0
Flt Permitted	0.950					
Satd. Flow (perm)	1770	3539	0	0	0	0
Link Speed (mph)		50	50		50	
Link Distance (ft)		603	287		297	
Travel Time (s)		8.2	3.9		4.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	121	1605	0	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	121	1605	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		0	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Stop		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 44.2%		ICU Level of Service A	
Analysis Period (min) 15			

2040 PM – High-T



Lane Group	WBT	WBR	SBL	SBR2	NEL
Lane Configurations					
Traffic Volume (vph)	1652	231	64	208	364
Future Volume (vph)	1652	231	64	208	364
Ideal Flow (vphpl)	1900	1900	1900	1900	1900
Storage Length (ft)		150	300		0
Storage Lanes		1	1		1
Taper Length (ft)			25		25
Lane Util. Factor	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor		0.94	0.95	0.96	0.98
Frt		0.850		0.850	
Flt Protected			0.950		0.950
Satd. Flow (prot)	3539	1583	1770	1583	1770
Flt Permitted			0.950		0.950
Satd. Flow (perm)	3539	1485	1678	1516	1729
Right Turn on Red		Yes		Yes	
Satd. Flow (RTOR)		110		17	
Link Speed (mph)	50		35		50
Link Distance (ft)	986		498		297
Travel Time (s)	13.4		9.7		4.1
Confl. Peds. (#/hr)		11	11	11	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1796	251	70	226	396
Shared Lane Traffic (%)					
Lane Group Flow (vph)	1796	251	70	226	396
Enter Blocked Intersection	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left
Median Width(ft)	0		12		12
Link Offset(ft)	0		0		0
Crosswalk Width(ft)	16		16		16
Two way Left Turn Lane			Yes		
Headway Factor	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15	9	15
Number of Detectors	2	1	1	1	1
Detector Template	Thru	Right	Left	Right	Left
Leading Detector (ft)	100	20	20	20	20
Trailing Detector (ft)	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0
Detector 1 Size(ft)	6	20	20	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel					
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)	94				
Detector 2 Size(ft)	6				
Detector 2 Type	Cl+Ex				
Detector 2 Channel					
Detector 2 Extend (s)	0.0				
Turn Type	NA	Perm	Prot	Perm	Prot

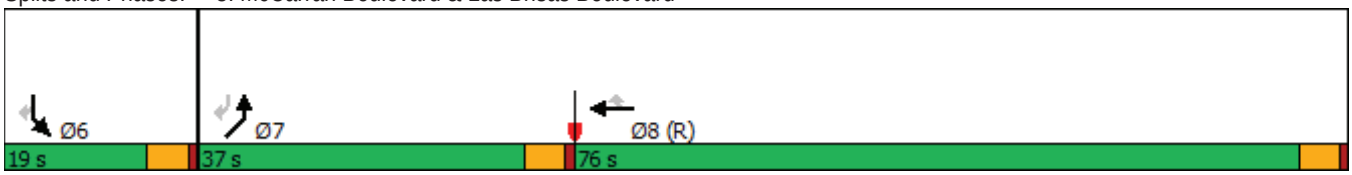


Lane Group	WBT	WBR	SBL	SBR2	NEL
Protected Phases	8		6		7
Permitted Phases		8		6 7	
Detector Phase	8	8	6	6 7	7
Switch Phase					
Minimum Initial (s)	1.0	1.0	1.0		1.0
Minimum Split (s)	22.0	22.0	19.0		6.0
Total Split (s)	76.0	76.0	19.0		37.0
Total Split (%)	57.6%	57.6%	14.4%		28.0%
Maximum Green (s)	71.0	71.0	14.0		32.0
Yellow Time (s)	4.0	4.0	4.0		4.0
All-Red Time (s)	1.0	1.0	1.0		1.0
Lost Time Adjust (s)	0.0	0.0	0.0		0.0
Total Lost Time (s)	5.0	5.0	5.0		5.0
Lead/Lag	Lag	Lag			Lead
Lead-Lag Optimize?	Yes	Yes			Yes
Vehicle Extension (s)	3.0	3.0	3.0		3.0
Recall Mode	C-Max	C-Max	Max		Max
Walk Time (s)	7.0	7.0	7.0		
Flash Dont Walk (s)	10.0	10.0	7.0		
Pedestrian Calls (#/hr)	11	11	11		
Act Effct Green (s)	71.0	71.0	14.0	51.0	32.0
Actuated g/C Ratio	0.54	0.54	0.11	0.39	0.24
v/c Ratio	0.94	0.30	0.37	0.38	0.92
Control Delay	40.1	10.0	61.2	29.1	77.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	40.1	10.0	61.2	29.1	77.0
LOS	D	A	E	C	E
Approach Delay	36.4		36.7		77.0
Approach LOS	D		D		E
90th %ile Green (s)	71.0	71.0	14.0		32.0
90th %ile Term Code	Coord	Coord	MaxR		MaxR
70th %ile Green (s)	71.0	71.0	14.0		32.0
70th %ile Term Code	Coord	Coord	MaxR		MaxR
50th %ile Green (s)	71.0	71.0	14.0		32.0
50th %ile Term Code	Coord	Coord	MaxR		MaxR
30th %ile Green (s)	71.0	71.0	14.0		32.0
30th %ile Term Code	Coord	Coord	MaxR		MaxR
10th %ile Green (s)	71.0	71.0	14.0		32.0
10th %ile Term Code	Coord	Coord	MaxR		MaxR
Stops (vph)	1441	69	59	137	324
Fuel Used(gal)	46	3	1	3	11
CO Emissions (g/hr)	3211	208	103	210	794
NOx Emissions (g/hr)	625	40	20	41	155
VOC Emissions (g/hr)	744	48	24	49	184
Dilemma Vehicles (#)	61	0	0	0	0
Queue Length 50th (ft)	733	60	57	127	333
Queue Length 95th (ft)	#928	113	107	199	#525
Internal Link Dist (ft)	906		418		217
Turn Bay Length (ft)		150	300		

Lane Group	WBT	WBR	SBL	SBR2	NEL
Base Capacity (vph)	1903	849	187	596	429
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.94	0.30	0.37	0.38	0.92

Intersection Summary			
Area Type:	Other		
Cycle Length: 132			
Actuated Cycle Length: 132			
Offset: 0 (0%), Referenced to phase 8:WBT, Start of Green			
Natural Cycle: 100			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.94			
Intersection Signal Delay: 42.3		Intersection LOS: D	
Intersection Capacity Utilization 90.0%		ICU Level of Service E	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 3: McCarran Boulevard & Las Brisas Boulevard



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø6
Lane Configurations							
Traffic Volume (vph)	1692	0	0	0	0	0	
Future Volume (vph)	1692	0	0	0	0	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Util. Factor	0.95	1.00	1.00	1.00	1.00	1.00	
Frt							
Flt Protected							
Satd. Flow (prot)	3539	0	0	0	0	0	
Flt Permitted							
Satd. Flow (perm)	3539	0	0	0	0	0	
Right Turn on Red		Yes				Yes	
Satd. Flow (RTOR)							
Link Speed (mph)	50			50	30		
Link Distance (ft)	287			296	53		
Travel Time (s)	3.9			4.0	1.2		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	1839	0	0	0	0	0	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	1839	0	0	0	0	0	
Enter Blocked Intersection	No	No	No	No	No	No	
Lane Alignment	Left	Right	Left	Left	Left	Right	
Median Width(ft)	0			0	0		
Link Offset(ft)	0			0	0		
Crosswalk Width(ft)	16			16	16		
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Turning Speed (mph)		9	15		15	9	
Number of Detectors	2						
Detector Template	Thru						
Leading Detector (ft)	100						
Trailing Detector (ft)	0						
Detector 1 Position(ft)	0						
Detector 1 Size(ft)	6						
Detector 1 Type	Cl+Ex						
Detector 1 Channel							
Detector 1 Extend (s)	0.0						
Detector 1 Queue (s)	0.0						
Detector 1 Delay (s)	0.0						
Detector 2 Position(ft)	94						
Detector 2 Size(ft)	6						
Detector 2 Type	Cl+Ex						
Detector 2 Channel							
Detector 2 Extend (s)	0.0						
Turn Type	NA						
Protected Phases	4						6
Permitted Phases							
Detector Phase	4						
Switch Phase							
Minimum Initial (s)	1.0						1.0



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR	Ø6
Minimum Split (s)	19.0						19.0
Total Split (s)	113.0						19.0
Total Split (%)	85.6%						14%
Maximum Green (s)	108.0						14.0
Yellow Time (s)	4.0						4.0
All-Red Time (s)	1.0						1.0
Lost Time Adjust (s)	0.0						
Total Lost Time (s)	5.0						
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0						3.0
Recall Mode	C-Max						Max
Walk Time (s)	7.0						7.0
Flash Dont Walk (s)	7.0						7.0
Pedestrian Calls (#/hr)	11						11
Act Effct Green (s)	108.0						
Actuated g/C Ratio	0.82						
v/c Ratio	0.64						
Control Delay	5.7						
Queue Delay	0.0						
Total Delay	5.7						
LOS	A						
Approach Delay	5.7						
Approach LOS	A						
90th %ile Green (s)	108.0						14.0
90th %ile Term Code	Coord						MaxR
70th %ile Green (s)	108.0						14.0
70th %ile Term Code	Coord						MaxR
50th %ile Green (s)	108.0						14.0
50th %ile Term Code	Coord						MaxR
30th %ile Green (s)	108.0						14.0
30th %ile Term Code	Coord						MaxR
10th %ile Green (s)	108.0						14.0
10th %ile Term Code	Coord						MaxR
Stops (vph)	578						
Fuel Used(gal)	14						
CO Emissions (g/hr)	974						
NOx Emissions (g/hr)	189						
VOC Emissions (g/hr)	226						
Dilemma Vehicles (#)	64						
Queue Length 50th (ft)	252						
Queue Length 95th (ft)	297						
Internal Link Dist (ft)	207			216	1		
Turn Bay Length (ft)							
Base Capacity (vph)	2895						
Starvation Cap Reductn	0						
Spillback Cap Reductn	0						
Storage Cap Reductn	0						
Reduced v/c Ratio	0.64						

Intersection Summary		
Area Type:	Other	
Cycle Length: 132		
Actuated Cycle Length: 132		
Offset: 0 (0%), Referenced to phase 4:EBT, Start of Green		
Natural Cycle: 60		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 0.64		
Intersection Signal Delay: 5.7		Intersection LOS: A
Intersection Capacity Utilization 50.9%		ICU Level of Service A
Analysis Period (min) 15		

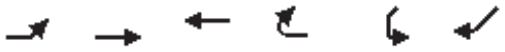
Splits and Phases: 5: McCarran Boulevard





Lane Group	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations						
Traffic Volume (vph)	0	1692	0	0	64	0
Future Volume (vph)	0	1692	0	0	64	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	3539	0	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	3539	0	0	1770	0
Link Speed (mph)		50	50		50	
Link Distance (ft)		296	411		305	
Travel Time (s)		4.0	5.6		4.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1839	0	0	70	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1839	0	0	70	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Stop		Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 57.0%		ICU Level of Service B	
Analysis Period (min) 15			



Lane Group	EBL	EBT	WBT	WBR	SWL	SWR
Lane Configurations						
Traffic Volume (vph)	364	1692	0	0	0	0
Future Volume (vph)	364	1692	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	1.00	1.00
Frt						
Flt Protected	0.950					
Satd. Flow (prot)	1770	3539	0	0	0	0
Flt Permitted	0.950					
Satd. Flow (perm)	1770	3539	0	0	0	0
Link Speed (mph)		50	50		50	
Link Distance (ft)		603	287		297	
Travel Time (s)		8.2	3.9		4.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	396	1839	0	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	396	1839	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		0	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Stop		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 50.1%		ICU Level of Service A	
Analysis Period (min) 15			

Appendix D

2030 and 2040 Projected Traffic Volumes

TECHNICAL MEMORANDUM

To: Lori Campbell, NDOT Project Manager

From: Bryan Gant, Wood Rodgers Project Manager

Date: January 31, 2019, updated March 25, 2019

Re: **N. McCarran Safety Management Plan – Future Traffic Volumes**

Background

The N. McCarran Boulevard Safety Management Plan (SMP) is a transportation planning effort that focuses on traffic safety for all road users, incorporating corridor studies, access management, public and stakeholder input, crash analysis, roadway engineering and application of the Highway Safety Manual (HSM) methods to reduce roadway crashes. The SMP process is consistent with the Nevada Strategic Highway Safety Plan's goals of reducing the number and severity of roadway crashes in the state.

The N. McCarran Boulevard SMP study area extends approximately 5.8 miles along N. McCarran Boulevard from Summit Ridge Drive, north and east to US 395 as shown in **Figure 1**. The corridor crosses both City of Reno and Washoe County jurisdictions and consists mostly of established residential and commercial land uses, parks and open space. There is little vacant land for new development within the study area, however, this section of McCarran Boulevard can be used to access new residential areas in the Sommerset Community and to access the University of Nevada Reno which is expanding.

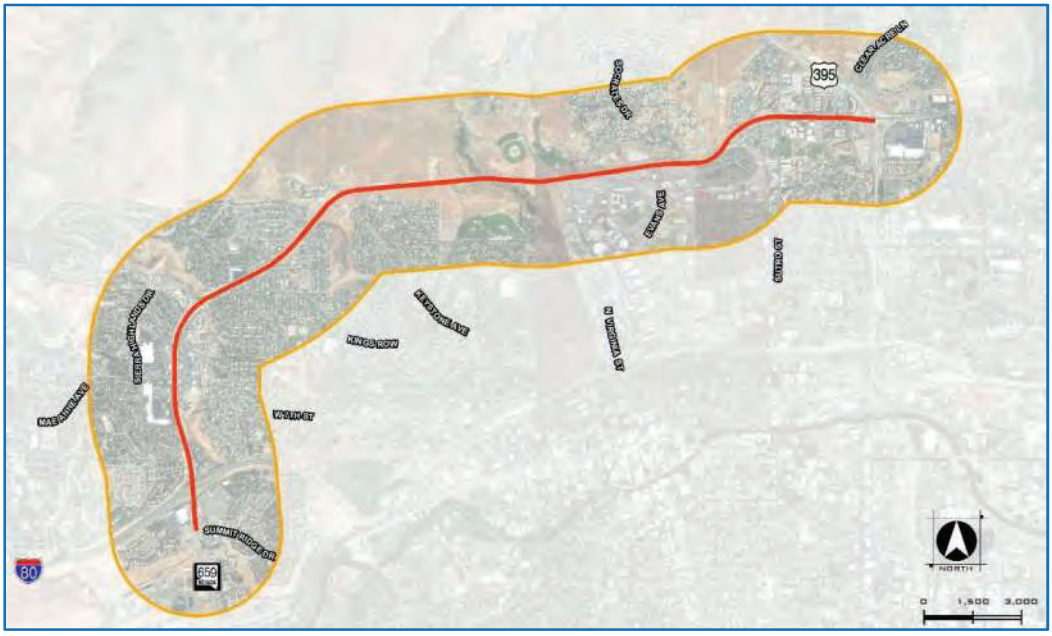


Figure 1: Study Area

Purpose

The purpose of this technical memorandum is to analyze traffic data-sets to support the recommendation of future segment volumes along N. McCarran. These future volumes provide a means for analyzing the planning-level performance of study recommendations. It is recognized that future volumes will vary greatly depending on growth patterns, regional economic development, driver behavior and a myriad of other factors. The estimated future volumes are a simplistic approach used for SMP purposes only.

Historic Traffic Volumes

NDOT's Traffic Records Information Access (TRINA) system was used to identify historic volumes for count locations along N. McCarran Boulevard. These volumes are reported by NDOT as Average Annual Daily Traffic (AADT) for individual roadway segments. **Table 1** below lists the historic volumes for nine count locations along the corridor. The ten years shown represents the extent of available data.

Table 1: 10 Year Historic Traffic Volumes

Count Station	Segment	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
310656	Summit Ridge to I-80	37,000	36,000	35,000	34,000	34,000	36,500	37,000	39,500	39,000	41,000
310662	I-80 WB to Sierra Highlands Dr.	38,000	38,000	37,000	38,000	38,000	38,000	39,000	41,500	45,000	44,000
312220	Mae Anne Ave. to W 7th St.	24,000	23,000	23,000	24,000	25,100	24,400	25,000	26,700	27,100	27,900
310663	W 7th St. to Las Brisas Blvd.	24,000	23,000	22,000	23,000	22,000	21,500	22,000	25,500	28,000	29,000
310931	Kings Row to Keystone Ave.	21,000	20,000	19,000	18,000	22,500	18,000	18,500	20,000	21,000	23,000
310664	Keystone Ave. to Virginia St.	22,000	21,000	20,000	20,000	22,500	21,000	20,000	22,500	23,000	24,000
310464	Virginia St. to Evans Ave.	19,000	17,000	18,000	16,000	16,000	12,500	10,000	10,500	11,000	24,000
310416	Sutro St. to Clear Acre Ln.	23,000	21,000	23,000	20,000	25,000	23,500	24,000	25,500	26,000	26,000
310414	Clear Acre Ln. to US 395 NB	39,000	40,000	40,000	40,000	39,000	37,500	38,500	40,500	36,000	39,000

As can be seen, corridor traffic volumes were susceptible to variations stemming from the economic downturn. However, 2017 volumes generally do exceed 2008 volumes suggesting overall traffic growth along the corridor. No known major construction projects occurred within this period that could have had a significant impact on traffic volumes.

2030 and 2040 Adjusted Model Projections

Wood Rodgers obtained future volumes from the Regional Transportation Commission of Washoe County's (RTC) 2040 travel demand model. Projections for those segment locations identified in **Table 1** as well as other segments available in the model were extracted. The annual growth rate between model horizon years was calculated for each segment. The model growth rates were then applied to corresponding 2017 actual count data to better reflect potential future volumes. This process is

consistent with the *NDOT Traffic Forecasting Guidelines*, ratio adjustment method. The results are shown in **Table 2**.

Table 2: Annual Average Projected Growth Rate and Adjusted Future Traffic Volumes

Segment	2020 Model	2030 Model	2040 Model	2020-2030 Annual Growth	2017 Trina	Estimated 2030 Volume	2030-2040 Annual Growth	Estimated 2040 Volume
Summit Ridge to I-80	30,796	30,994	33,305	0.50%	41,000	43,746	0.72%	47,008
I-80 EB to I-80 WB	35,121	35,732	39,112	0.50%	NA	*43,000*	0.91%	*47,068*
I-80 WB to Sierra Highlands Dr.	41,837	42,379	46,751	0.50%	44,000	46,947	0.99%	51,791
Sierra Highlands to Mae Anne Ave.	34,676	34,970	38,494	0.50%	NA	*44,000*	0.96%	*48,434*
Mae Anne Ave. to W 7th St.	26,335	27,649	32,853	0.50%	27,900	29,769	1.74%	35,372
W 7th St. to Las Brisas Blvd.	25,382	27,336	32,704	0.74%	29,000	31,935	1.81%	38,206
Las Brisas Blvd. to Kings Row	21,888	24,984	29,940	1.33%	NA	*30,000*	1.83%	*35,951*
Kings Row to Keystone Ave.	17,353	20,483	26,025	1.67%	23,000	28,533	2.42%	36,253
Keystone Ave. to Virginia St.	17,765	21,037	27,413	1.70%	24,000	29,899	2.68%	38,961
Virginia St. to Evans Ave.	11,014	12,586	15,797	1.34%	24,000	28,545	2.30%	35,828
Evans Ave. to Sutro St.	16,420	20,235	24,100	2.11%	NA	*31,000*	1.76%	*36,921*
Sutro St. to Clear Acre Ln.	18,444	22,446	16,616	1.98%	26,000	33,562	0.50%	35,278
Clear Acre Ln. to US 395 SB	19,433	17,641	16,974	0.50%	39,000	41,612	0.50%	43,741
US 395 SB to US 395 NB	27,877	23,775	21,679	0.50%	39,000	41,612	0.50%	43,741

Note 1: Numbers in italics are estimates based on adjoining segment volumes

Note 2: Shaded growth rates reflect the NDOT minimum 0.5% growth rate

A look at adjusted volumes within the corridor suggest varying growth projections. Moderate growth is reflected near the I-80 interchange through to Kings Row, an area that is generally mature and built out. Higher increases are projected between Keystone Avenue and Evans Avenue, likely reflective of projected growth at the University of Nevada, Reno and infill in downtown Reno. From Sutro Street through the US 395 interchange, volumes are projected to ultimately decrease. This decrease is likely due to planned projects north of the Spaghetti Bowl such as the Pyramid/US 395 Connector which will affect travel patterns and routes once completed. For those segments projecting a negative growth, a minimum 0.5-percent growth rate was assumed consistent with NDOT methodology.

Historic Trend Comparison and Recommended Future Volumes

The adjusted model volumes were then compared to projections based on historic trends. Using the 10-year historic volumes from **Table 1,** best-fit linear equations were determined for each segment and corresponding future volumes calculated based on historic trends. Linear regression was used over logarithmic or exponential best-fit curves given that the non-linear regression equations resulted in negative future estimated growth for a majority of the corridor and deemed not reasonable. The results of the historic trend analysis and comparison to the adjusted model volumes are shown in **Table 3**.

Analyzing the results of the comparison in **Table 3** reveals varying results. The historic trend volumes appear more reasonable for the western most third of the corridor (Summit Ridge to Las Brisas Boulevard) while the adjusted model volumes appear more reasonable for the eastern two-thirds of the corridor (Las Brisas Boulevard to US 395). The adjusted model volumes for the Summit Ridge to Las Brisas Boulevard are based on the minimum NDOT growth rate of 0.5-percent and likely low. Conversely, from Las Brisas

Table 3: Historic Trend Comparison and Recommended Future Volumes

Segment	2017 Trina	Estimated 2030 Volume	Historic Trend 2030 Volume	Estimated 2040 Volume	Historic Trend 2040 Volume	Recommended 2030 Volume	Recommended 2040 Volume
Summit Ridge to I-80	41,000	43,746	46,552	47,008	52,067	46,552	52,067
I-80 EB to I-80 WB	NA	43,000	N/A	47,068	N/A	43,000	47,068
I-80 WB to Sierra Highlands Dr.	44,000	46,947	53,279	51,791	61,067	53,279	61,067
Sierra Highlands to Mae Anne Ave.	N/A	44,000	N/A	48,434	N/A	44,000	48,434
Mae Anne Ave. to W 7th St.	27,900	29,769	34,131	35,372	39,318	34,131	39,318
W 7th St. to Las Brisas Blvd.	29,000	31,935	33,970	38,206	39,667	33,970	39,667
Las Brisas Blvd. to Kings Row	N/A	30,000	N/A	35,951	N/A	30,000	35,951
Kings Row to Keystone Ave.	23,000	28,533	22,964	36,253	24,600	28,533	36,253
Keystone Ave. to Virginia St.	24,000	29,899	26,161	38,961	28,767	29,899	38,961
Virginia St. to Evans Ave.	24,000	28,545	NULL	35,828	NULL	28,545	35,828
Evans Ave. to Sutro St.	N/A	31,000	N/A	36,921	N/A	31,000	36,921
Sutro St. to Clear Acre Ln.	26,000	33,562	32,715	35,278	37,867	33,562	35,278
Clear Acre Ln. to US 395 SB	39,000	41,612	NULL	43,741	NULL	41,612	43,741
US 395 SB to US 395 NB	39,000	41,612	N/A	43,741	N/A	41,612	43,741

Boulevard to US 395, the historic trend volumes are negative in several locations (denoted by "NULL") and the adjusted model volumes appear more reasonable. Therefore, the recommended 2030 and 2040 volumes noted in **Table 3** are a mix of historic trend volumes and adjusted model volumes.

Conclusion

The recommended 2030 and 2040 traffic volumes listed in **Table 3** will be used for planning-level analysis of proposed SMP alternatives to ensure their long-term viability. Should any recommendations be advanced into preliminary design, a more detailed traffic forecasting and operations analysis may be required consistent with the *NDOT Traffic Forecasting Guidelines*.

		SBR	SBL		
		167	100		
EBL	76	Existing AM		36	WBR
EBT	1,010			882	WBT

		SBR	SBL		
		142	44		
EBL	249	Existing PM		158	WBR
EBT	1,157			1,130	WBT

		SBR	SBL		
		206	124		
EBL	94	2030 AM		45	WBR
EBT	1,249			1,090	WBT

		SBR	SBL		
		176	54		
EBL	308	2030 PM		195	WBR
EBT	1,430			1,397	WBT

		SBR	SBL		
		244	146		
EBL	111	2040 AM		53	WBR
EBT	1,477			1,290	WBT

		SBR	SBL		
		208	64		
EBL	364	2040 PM		231	WBR
EBT	1,692			1,652	WBT

Appendix E

2030 and 2040 Traffic Conditions

TABLE X: MCCARRAN BOULEVARD & LAS BRISAS BOULEVARD QUEUE LENGTHS

McCarran Boulevard Intersection	Time	Eastbound						Westbound						Northbound						Southbound					
		Left-Turn Bays			Right-Turn Bays			Left-Turn Bays			Right-Turn Bays			Left-Turn Bays			Right-Turn Bays			Left-Turn Bays			Right-Turn Bays		
		Number of Lanes	Queue Storage (ft)	Queue Length (ft) at Peak Hour	Number of Lanes	Queue Storage (ft)	Queue Length (ft) at Peak Hour	Number of Lanes	Queue Storage (ft)	Queue Length (ft) at Peak Hour	Number of Lanes	Queue Storage (ft)	Queue Length (ft) at Peak Hour	Number of Lanes	Queue Storage (ft)	Queue Length (ft) at Peak Hour	Number of Lanes	Queue Storage (ft)	Queue Length (ft) at Peak Hour	Number of Lanes	Queue Storage (ft)	Queue Length (ft) at Peak Hour	Number of Lanes	Queue Storage (ft)	Queue Length (ft) at Peak Hour
UNSIGNALIZED - EXISTING																									
Las Brisas Boulevard	**AM**	1	280	12	-	-	-	-	-	-	1	75	0	-	-	-	-	-	-	1	100	**237**	-	-	-
	PM			**334**			-			-			0			-			-			**ERROR**			-
SIGNALIZED - EXISTING																									
Las Brisas Boulevard	AM	1	300	29	-	-	-	-	-	-	1	150	6	-	-	-	-	-	-	1	300	117	-	-	-
	PM			107			-			-			52			-			-			73			-
SIGNALIZED - 2030																									
Las Brisas Boulevard	AM	1	300	36	-	-	-	-	-	-	1	150	3	-	-	-	-	-	-	1	300	146	-	-	-
	PM			**352**			-			-			82			-			-			86			-
SIGNALIZED - 2040																									
Las Brisas Boulevard	AM	1	300	41	-	-	-	-	-	-	1	150	8	-	-	-	-	-	-	1	300	175	-	-	-
	PM			**482**			-			-			118			-			-			98			-
ROUNDABOUT - EXISTING																									
Las Brisas Boulevard	**AM**	36						25						-						30					
	PM	55						103						-						23					
ROUNDABOUT - 2030																									
Las Brisas Boulevard	**AM**	57						36						-						67					
	PM	101						293						-						50					
ROUNDABOUT - 2040																									
Las Brisas Boulevard	**AM**	140						52						-						298					
	PM	260						766						-						95					
HIGH-T - SIGNALIZED - EXISTING																									
Las Brisas Boulevard	**AM**	1	300	108	-	-	-	-	-	-	1	150	8	-	-	-	-	-	-	1	300	130	-	-	-
	PM			297			-			-			69			-			-			80			-
HIGH-T - SIGNALIZED - 2030																									
Las Brisas Boulevard	**AM**	1	300	130	-	-	-	-	-	-	1	150	13	-	-	-	-	-	-	1	300	157	-	-	-
	PM			**373**			-			-			95			-			-			94			-
HIGH-T - SIGNALIZED - 2040																									
Las Brisas Boulevard	**AM**	1	300	150	-	-	-	-	-	-	1	150	17	-	-	-	-	-	-	1	300	184	-	-	-
	PM			**525**			-			-			113			-			-			107			-

Source: Wood Rodgers, April 2019

Appendix F

Sidra Results

Existing AM – Roundabout

DELAY (CONTROL)

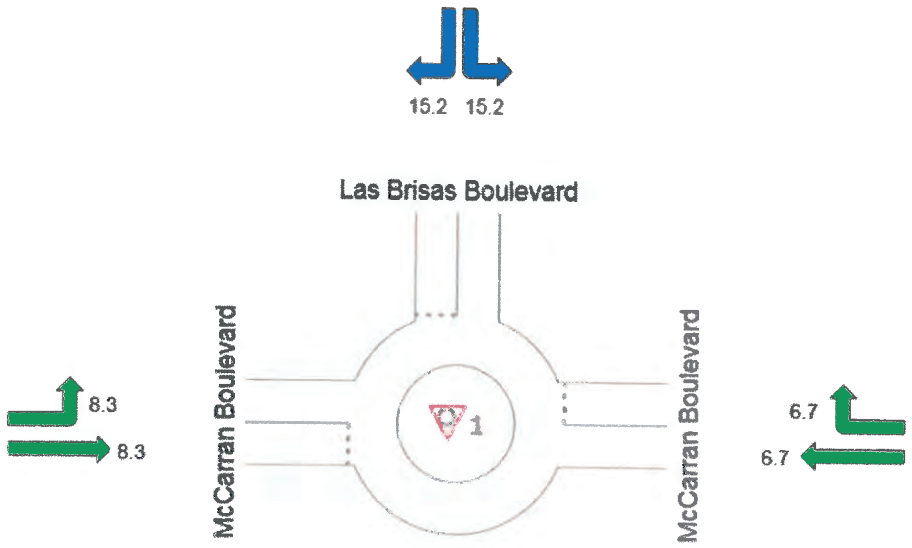
Average control delay per vehicle, or average pedestrian delay (seconds)

Site: 1 [McCarran Boulevard and Las Brisas Boulevard]

Roundabout
Site Category: (None)
Roundabout

All Movement Classes

	Approaches			Intersection
	East	North	West	
Delay (Control)	6.7	15.2	8.3	8.5
LOS	A	C	A	A



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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QUEUE DISTANCE (AVER)

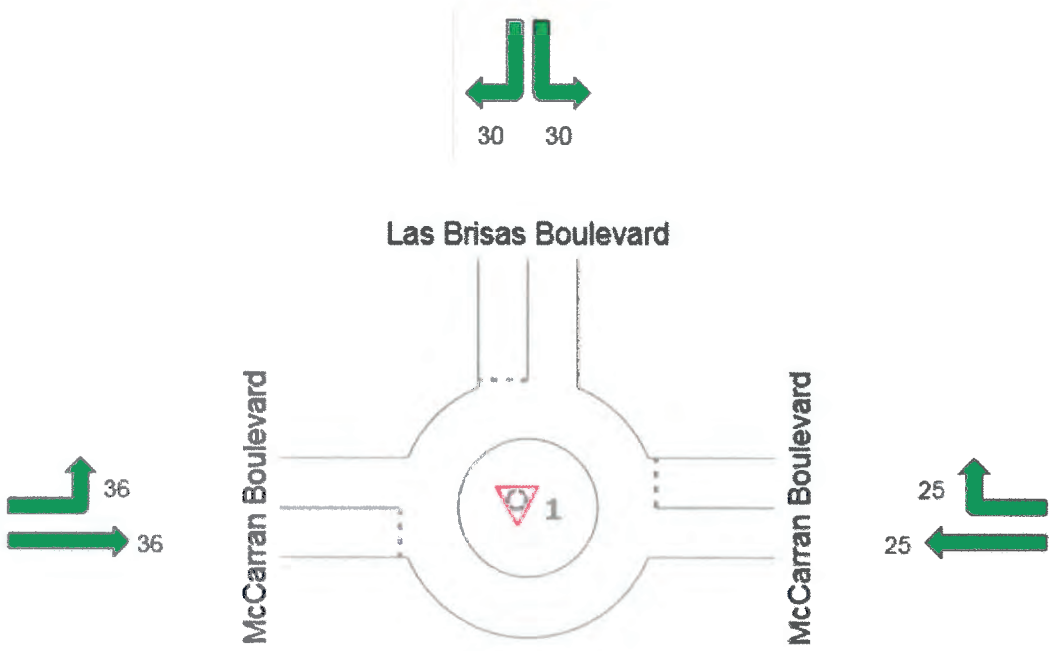
Average Back of Queue Distance for any lane used by vehicle movement (feet)

Site: 1 [McCarran Boulevard and Las Brisas Boulevard]

Roundabout
Site Category: (None)
Roundabout

All Movement Classes

	Approaches			Intersection
	East	North	West	
Queue Distance (Aver)	25	30	36	36



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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Existing PM – Roundabout

DELAY (CONTROL)

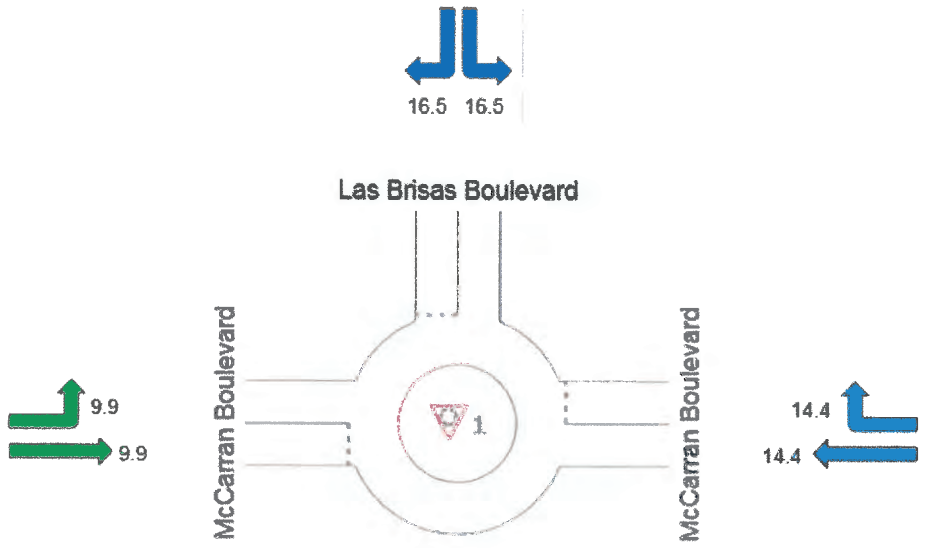
Average control delay per vehicle, or average pedestrian delay (seconds)

Site: 1 [McCarran Boulevard and Las Brisas Boulevard]

Roundabout
Site Category: (None)
Roundabout

All Movement Classes

	Approaches			Intersection
	East	North	West	
Delay (Control)	14.4	16.5	9.9	12.3
LOS	B	C	A	B



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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QUEUE DISTANCE (AVER)

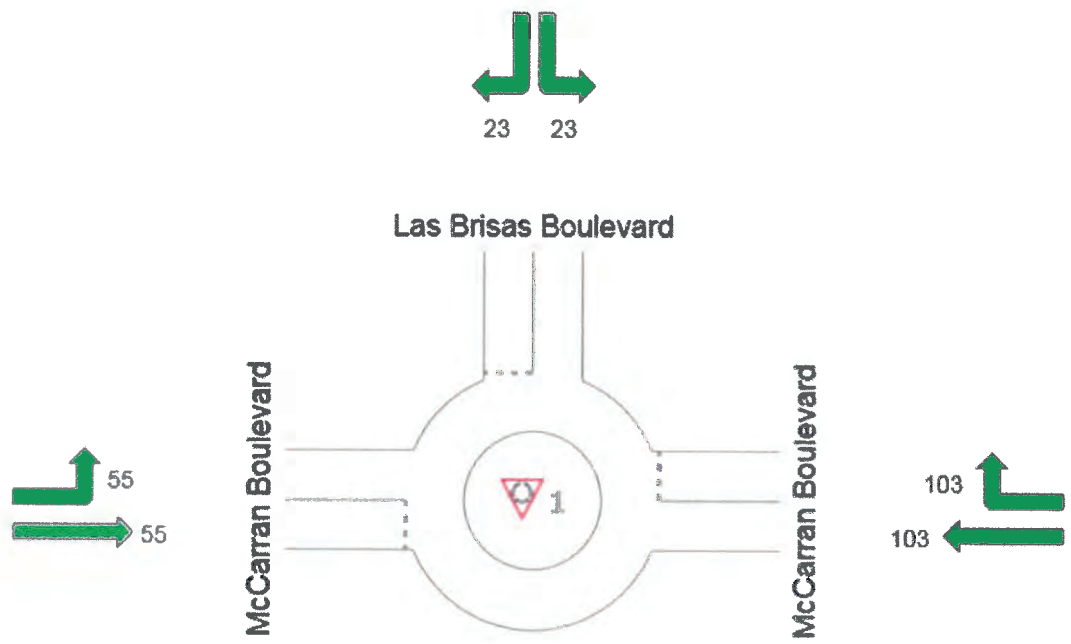
Average Back of Queue Distance for any lane used by vehicle movement (feet)

Site: 1 [McCarran Boulevard and Las Brisas Boulevard]

Roundabout
Site Category: (None)
Roundabout

All Movement Classes

	Approaches			Intersection
	East	North	West	
Queue Distance (Aver)	103	23	55	103



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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2030 AM – Roundabout

DELAY (CONTROL)

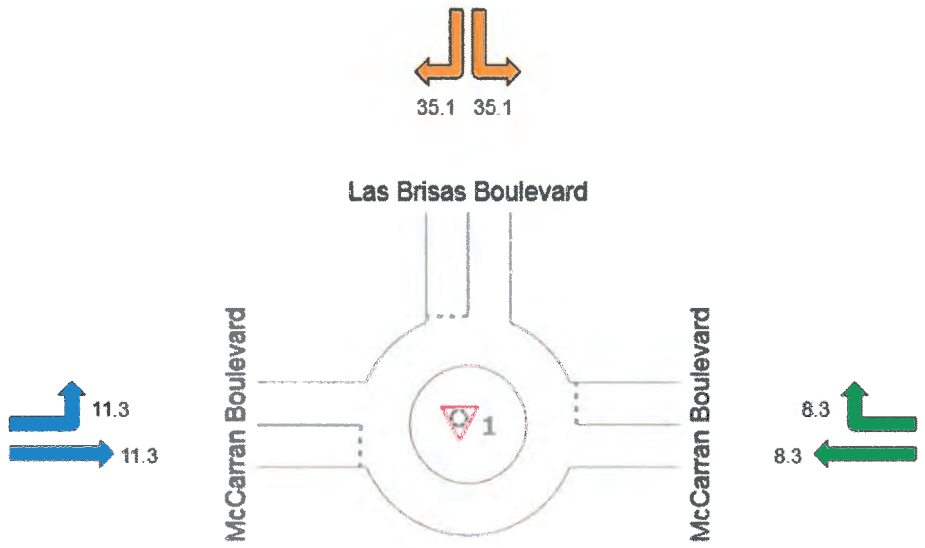
Average control delay per vehicle, or average pedestrian delay (seconds)

Site: 1 [McCarran Boulevard and Las Brisas Boulevard]

Roundabout
Site Category: (None)
Roundabout

All Movement Classes

	Approaches			Intersection
	East	North	West	
Delay (Control)	8.3	35.1	11.3	13.0
LOS	A	E	B	B



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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QUEUE DISTANCE (AVER)

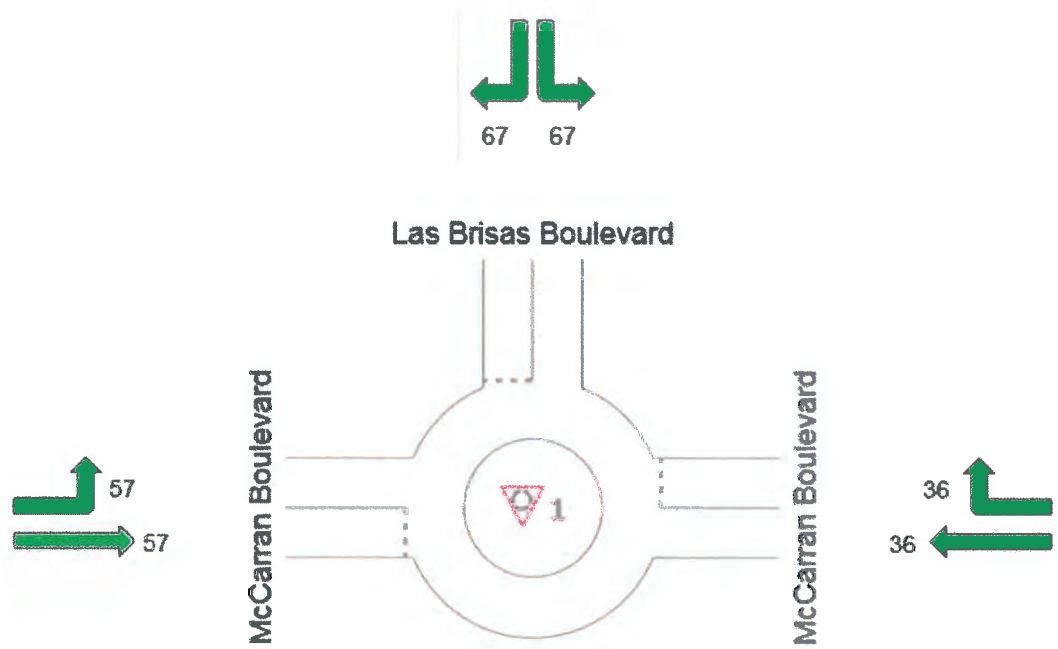
Average Back of Queue Distance for any lane used by vehicle movement (feet)

Site: 1 [McCarran Boulevard and Las Brisas Boulevard]

Roundabout
Site Category: (None)
Roundabout

All Movement Classes

	Approaches			Intersection
	East	North	West	
Queue Distance (Aver)	36	67	57	67



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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2030 PM – Roundabout

DELAY (CONTROL)

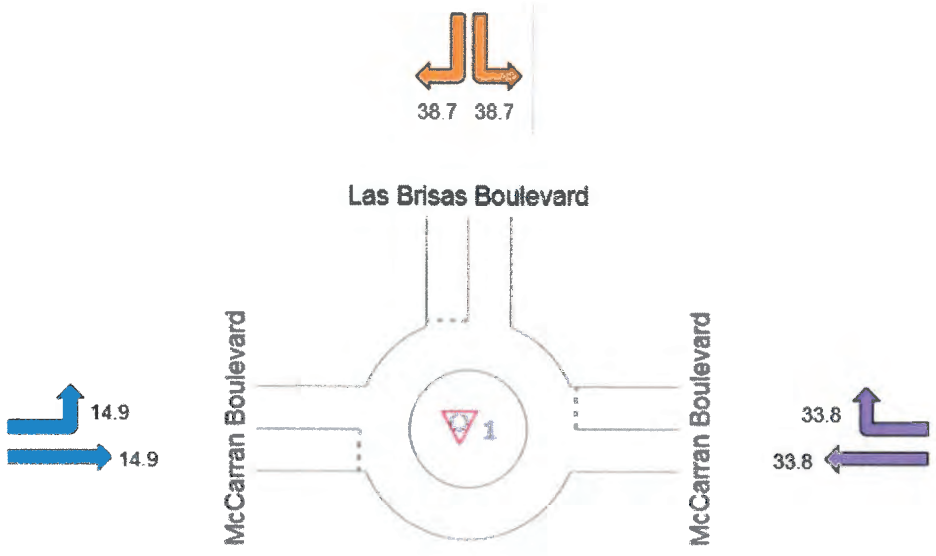
Average control delay per vehicle, or average pedestrian delay (seconds)

Site: 1 [McCarran Boulevard and Las Brisas Boulevard]

Roundabout
Site Category: (None)
Roundabout

All Movement Classes

	Approaches			Intersection
	East	North	West	
Delay (Control)	33.8	38.7	14.9	24.9
LOS	D	E	B	C



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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QUEUE DISTANCE (AVER)

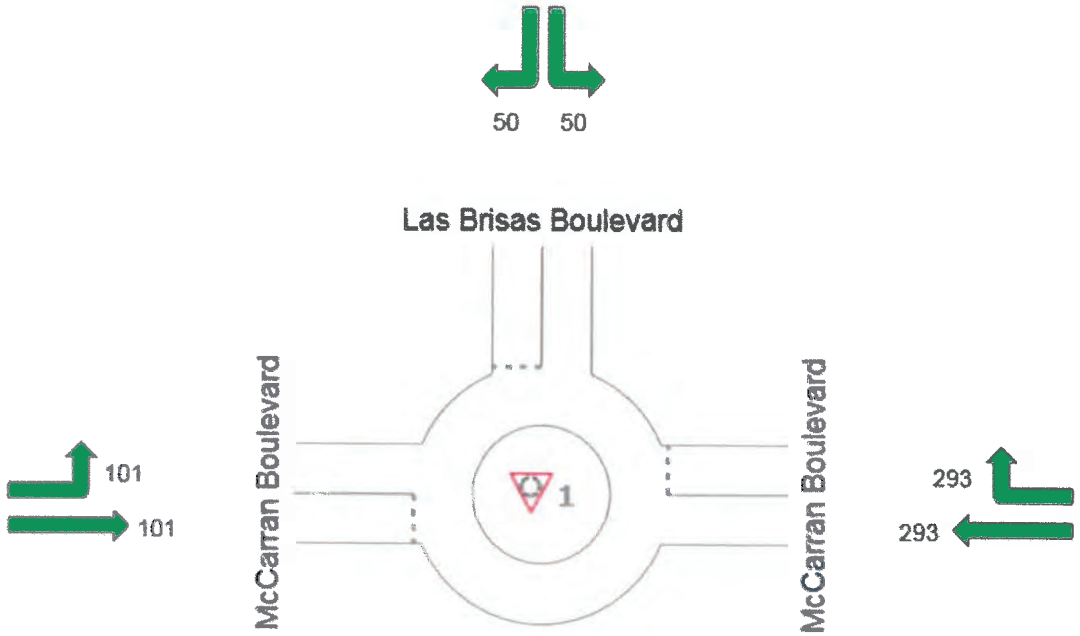
Average Back of Queue Distance for any lane used by vehicle movement (feet)

Site: 1 [McCarran Boulevard and Las Brisas Boulevard]

Roundabout
Site Category: (None)
Roundabout

All Movement Classes

	Approaches			Intersection
	East	North	West	
Queue Distance (Aver)	293	50	101	293



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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2040 AM – Roundabout

DELAY (CONTROL)

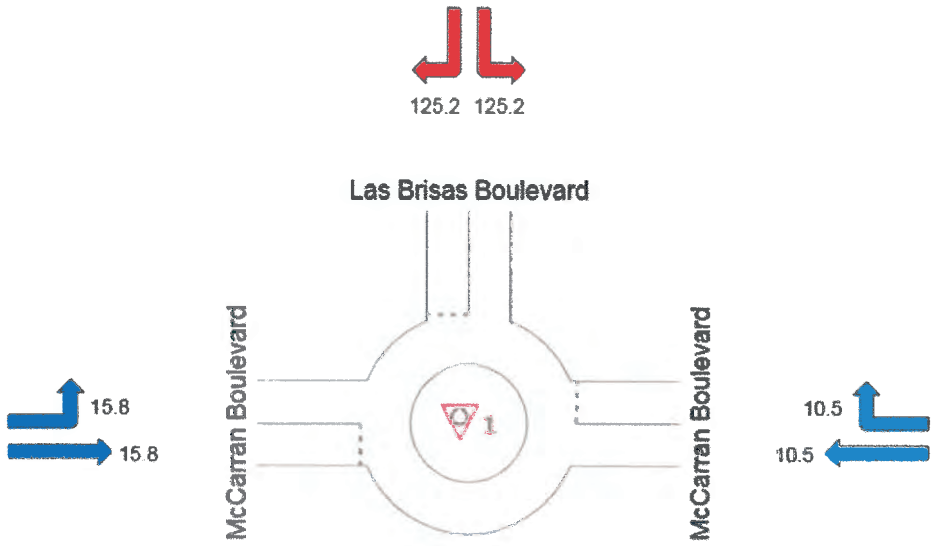
Average control delay per vehicle, or average pedestrian delay (seconds)

Site: 1 [McCarran Boulevard and Las Brisas Boulevard]

Roundabout
Site Category: (None)
Roundabout

All Movement Classes

	Approaches			Intersection
	East	North	West	
Delay (Control)	10.5	125.2	15.8	26.8
LOS	B	F	C	D



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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QUEUE DISTANCE (AVER)

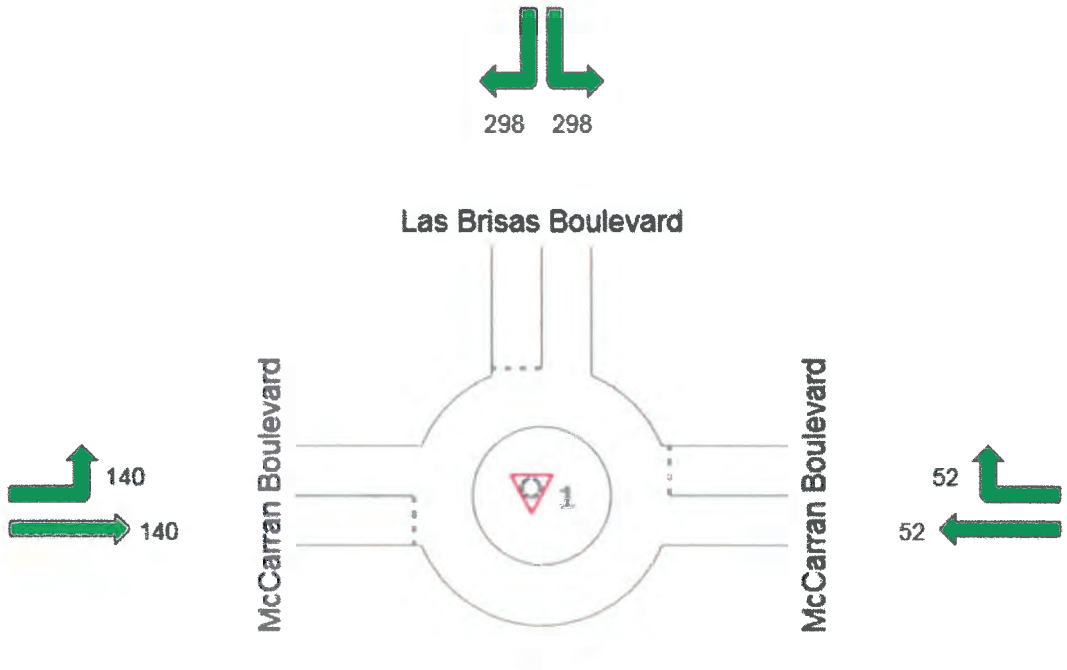
Average Back of Queue Distance for any lane used by vehicle movement (feet)

Site: 1 [McCarran Boulevard and Las Brisas Boulevard]

Roundabout
Site Category: (None)
Roundabout

All Movement Classes

	Approaches			Intersection
	East	North	West	
Queue Distance (Aver)	52	298	140	298



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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2040 PM – Roundabout

DELAY (CONTROL)

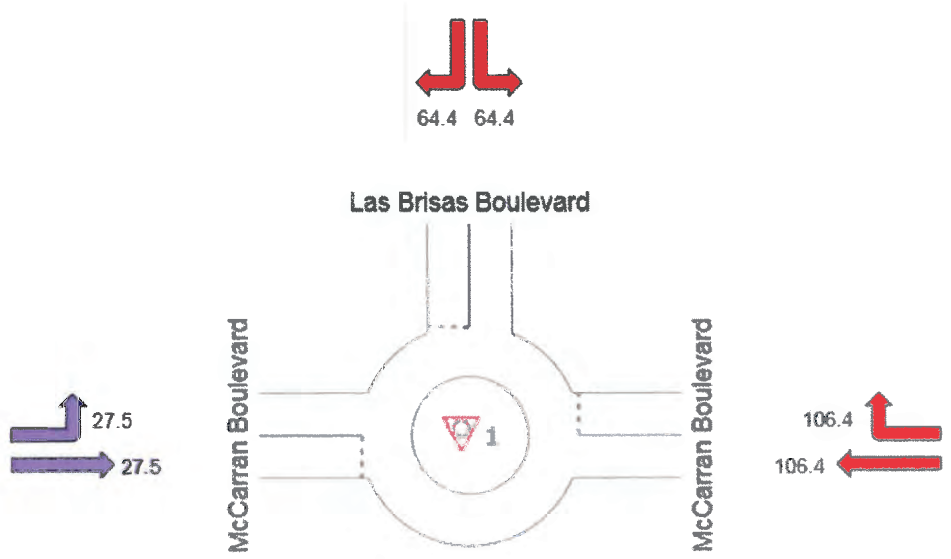
Average control delay per vehicle, or average pedestrian delay (seconds)

Site: 1 [McCarran Boulevard and Las Brisas Boulevard]

Roundabout
Site Category: (None)
Roundabout

All Movement Classes

	Approaches			Intersection
	East	North	West	
Delay (Control)	106.4	64.4	27.5	64.6
LOS	F	F	D	F



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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QUEUE DISTANCE (AVER)

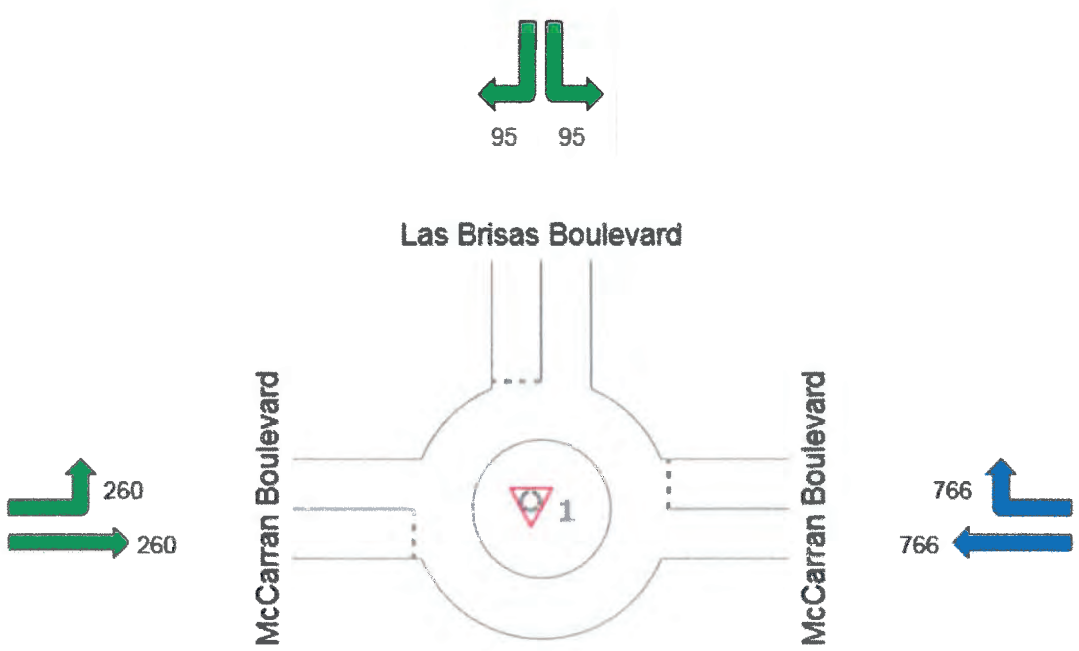
Average Back of Queue Distance for any lane used by vehicle movement (feet)

Site: 1 [McCarran Boulevard and Las Brisas Boulevard]

Roundabout
Site Category: (None)
Roundabout

All Movement Classes

	Approaches			Intersection
	East	North	West	
Queue Distance (Aver)	766	95	260	766



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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Appendix K
Roundabout Alternatives

Keystone Avenue/Leadership Parkway Delay

Evans Road/Socrates Drive Delay

Sutro Street Delay

Keystone Avenue/Leadership Parkway Future Delay

TABLE X: MCCARRAN BOULEVARD LEVEL-OF-SERVICE - EXISTING CONDITIONS												
McCarran Boulevard Intersection	Signalization	Time	Approach Delay (Seconds) & LOS								Intersection Delay (Seconds) & LOS	
			EB		WB		NB		SB			
Keystone Avenue/ Leadership Parkway	Unsignalized	AM	0.0	A	3.1	A	27.5	D	13.1	B	**27.5**	**D**
		PM	0.0	A	1.9	A	27.1	D	14.9	B	**27.1**	**D**
Keystone Avenue/ Leadership Parkway	Roundabout	AM	10.6	B	6.6	A	19.9	C	9.1	A	**9.7**	**A**
		PM	9.5	A	8.7	A	18.8	C	11.0	B	**9.9**	**A**

TABLE X: MCCARRAN BOULEVARD LEVEL-OF-SERVICE - EXISTING CONDITIONS												
McCarran Boulevard Intersection	Signalization	Time	Approach Delay (Seconds) & LOS								Intersection Delay (Seconds) & LOS	
			EB		WB		NB		SB			
Evans Road/Socrates Drive	Signalized	AM	26.7	C	32.3	C	23.7	C	28.3	C	**28.6**	**C**
		PM	20.2	C	32.1	C	**103.1**	**F**	27.0	C	**47.0**	**D**
Evans Road/Socrates Drive	Roundabout	AM	**37.9**	**E**	8.9	A	15.2	C	19.2	C	**23.4**	**C**
		PM	15.7	C	9.0	A	**754.8**	**F**	11.0	B	**221.7**	**F**
East Portion of Roundabout is 2 Lanes												
McCarran Boulevard Intersection	Signalization	Time	Approach Delay (Seconds) & LOS								Intersection Delay (Seconds) & LOS	
			EB		WB		NB		SB			
Evans Road/Socrates Drive	Signalized	PM	20.2	C	32.1	C	**103.1**	**F**	27.0	C	**47.0**	**D**
Evans Road/Socrates Drive	Roundabout	PM	15.7	C	9.3	A	**754.8**	**F**	11.0	B	**221.8**	**F**
Northbound Right-turn Separated from Roundabout (2-lanes NB to 3-lanes EB)												
McCarran Boulevard Intersection	Signalization	Time	Approach Delay (Seconds) & LOS								Intersection Delay (Seconds) & LOS	
			EB		WB		NB		SB			
Evans Road/Socrates Drive	Signalized	PM	20.2	C	32.1	C	**103.1**	**F**	27.0	C	**47.0**	**D**
Evans Road/Socrates Drive	Roundabout	PM	15.7	C	12.2	B	**135.8**	**F**	13.3	B	**48.4**	**E**
Both												
McCarran Boulevard Intersection	Signalization	Time	Approach Delay (Seconds) & LOS								Intersection Delay (Seconds) & LOS	
			EB		WB		NB		SB			
Evans Road/Socrates Drive	Signalized	PM	20.2	C	32.1	C	**103.1**	**F**	27.0	C	**47.0**	**D**
Evans Road/Socrates Drive	Roundabout	PM	15.7	C	12.6	B	**135.8**	**F**	13.3	B	**48.5**	**E**

TABLE X: MCCARRAN BOULEVARD LEVEL-OF-SERVICE - EXISTING CONDITIONS												
McCarran Boulevard Intersection	Signalization	Time	Approach Delay (Seconds) & LOS								Intersection Delay (Seconds) & LOS	
			EB		WB		NB		SB			
Sutro Street	Signalized	AM	24.6	C	35.1	D	23.4	C	33.8	C	**29.6**	**C**
		PM	39.3	D	33.5	C	34.4	C	31.3	C	**36.1**	**D**
Sutro Street	Roundabout	AM	7.3	A	9.9	A	3.5	A	30.2	D	**10.6**	**B**
		PM	20.6	C	14.2	B	**35.3**	**E**	17.3	C	**21.5**	**C**

TABLE X: MCCARRAN BOULEVARD LEVEL-OF-SERVICE												
McCarran Boulevard Intersection	Signalization	Time	Approach Delay (Seconds) & LOS								Intersection Delay (Seconds) & LOS	
			EB		WB		NB		SB			
Existing												
Keystone Avenue/ Leadership Parkway	Unsignalized	AM	0.0	A	3.1	A	27.5	D	13.1	B	**27.5**	**D**
		PM	0.0	A	1.9	A	27.1	D	14.9	B	**27.1**	**D**
Keystone Avenue/ Leadership Parkway	Roundabout	AM	10.6	B	6.6	A	19.9	C	9.1	A	**9.7**	**A**
		PM	9.5	A	8.7	A	18.8	C	11.0	B	**9.9**	**A**
Keystone Avenue/ Leadership Parkway	Roundabout - NB/SB Rights Now Lefts	AM	12.0	B	8.7	A	16.9	C	10.5	B	**10.9**	**B**
		PM	9.9	A	14.2	B	17.7	C	13.0	B	**12.7**	**B**
2030												
Keystone Avenue/ Leadership Parkway	Roundabout	AM	17.5	C	8.1	A	**61.3**	**F**	13.2	B	**17.3**	**C**
		PM	14.4	B	12.1	B	**55.4**	**F**	16.5	C	**16.7**	**C**
Keystone Avenue/ Leadership Parkway	Roundabout - NB/SB Rights Now Lefts	AM	23.0	C	12.4	B	**39.7**	**E**	15.9	C	**19.5**	**C**
		PM	15.6	C	34.0	D	**47.2**	**E**	20.4	C	**27.4**	**D**
2040												
Keystone Avenue/ Leadership Parkway	Roundabout	AM	**70.0**	**F**	11.4	B	**295.8**	**F**	26.0	D	**64.1**	**F**
		PM	**43.9**	**E**	25.4	D	**350.4**	**F**	33.8	D	**60.3**	**F**
Keystone Avenue/ Leadership Parkway	Roundabout - NB/SB Rights Now Lefts	AM	**113.1**	**F**	25.6	D	**118.2**	**F**	32.9	D	**74.7**	**F**
		PM	**42.7**	**E**	**97.5**	**F**	**309.8**	**F**	24.7	C	**90.9**	**F**

Keystone Avenue/Leadership Parkway

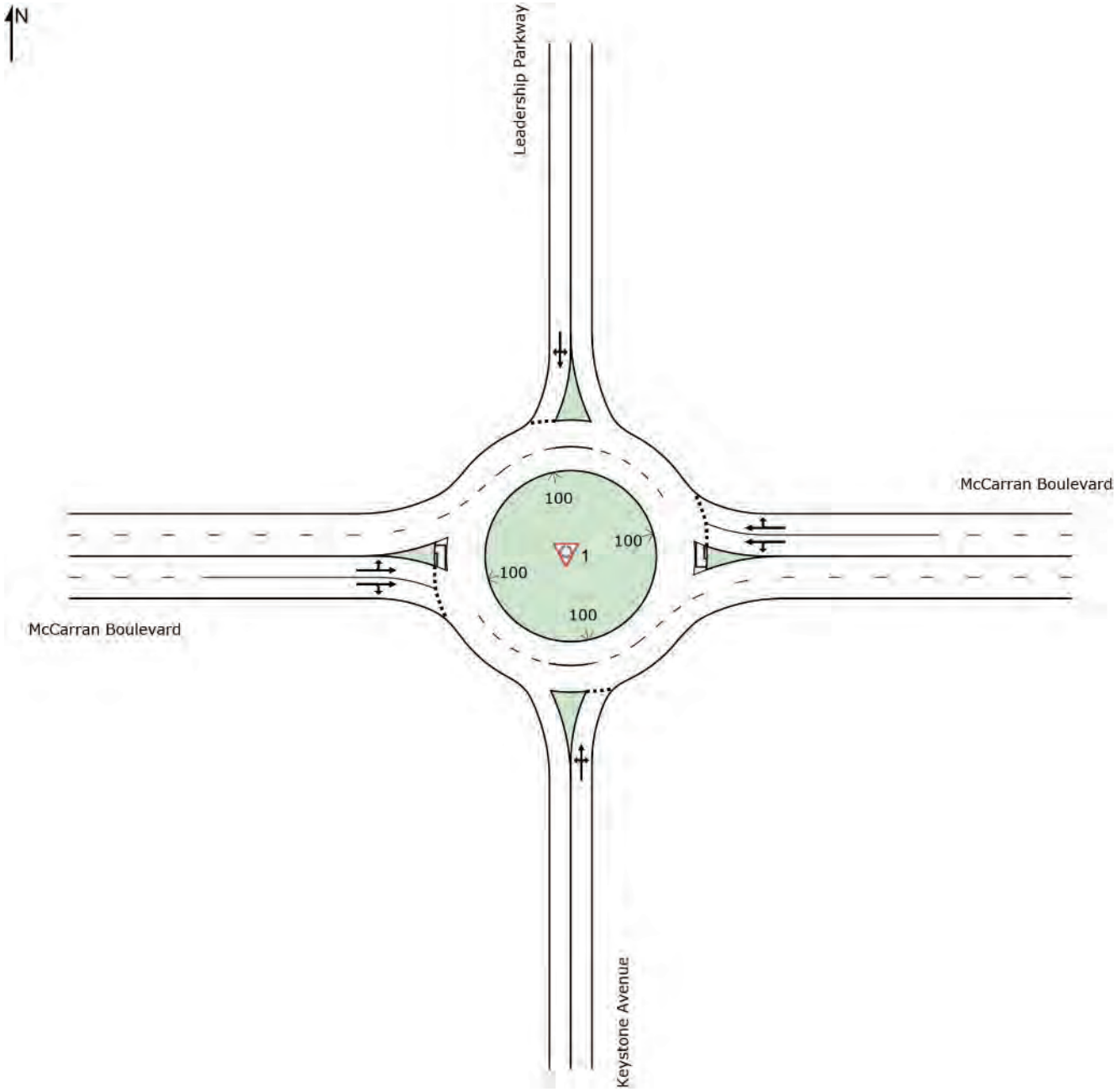
- ***Layout***
- ***Existing Volumes***
    - ***AM – Delay & Queue***
    - ***PM – Delay & Queue***
- ***Existing Volumes – All Rights Become Lefts***
    - ***AM – Delay & Queue***
    - ***PM – Delay & Queue***
- ***2030 Volumes***
    - ***AM – Delay & Queue***
    - ***PM – Delay & Queue***
- ***2030 Volumes – All Rights Become Lefts***
    - ***AM – Delay & Queue***
    - ***PM – Delay & Queue***
- ***2040 Volumes***
    - ***AM – Delay & Queue***
    - ***PM – Delay & Queue***
- ***2040 Volumes – All Rights Become Lefts***
    - ***AM – Delay & Queue***
    - ***PM – Delay & Queue***

SITE LAYOUT

Site: 1 [McCarran Boulevard & Keystone Avenue/Leadership Parkway]

Roundabout Alternative

Site Category: (None)
Roundabout



DELAY (CONTROL)

Average control delay per vehicle, or average pedestrian delay (seconds)

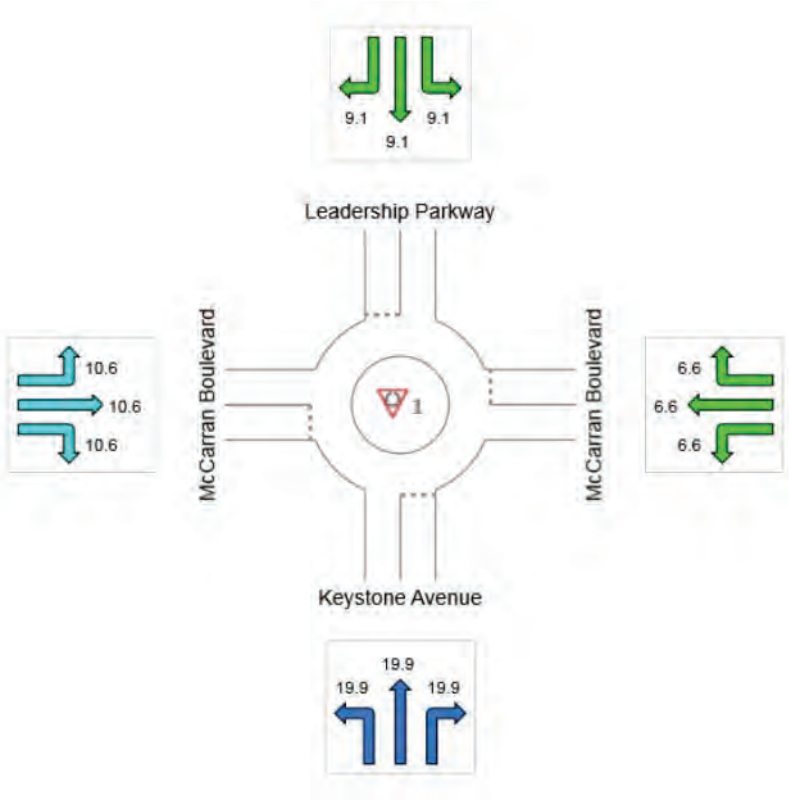
Site: 1 [McCarran Boulevard & Keystone Avenue/Leadership Parkway]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Delay (Control)	19.9	6.6	9.1	10.6	9.7
LOS	C	A	A	B	A



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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QUEUE DISTANCE (AVER)

Average Back of Queue Distance for any lane used by vehicle movement (feet)

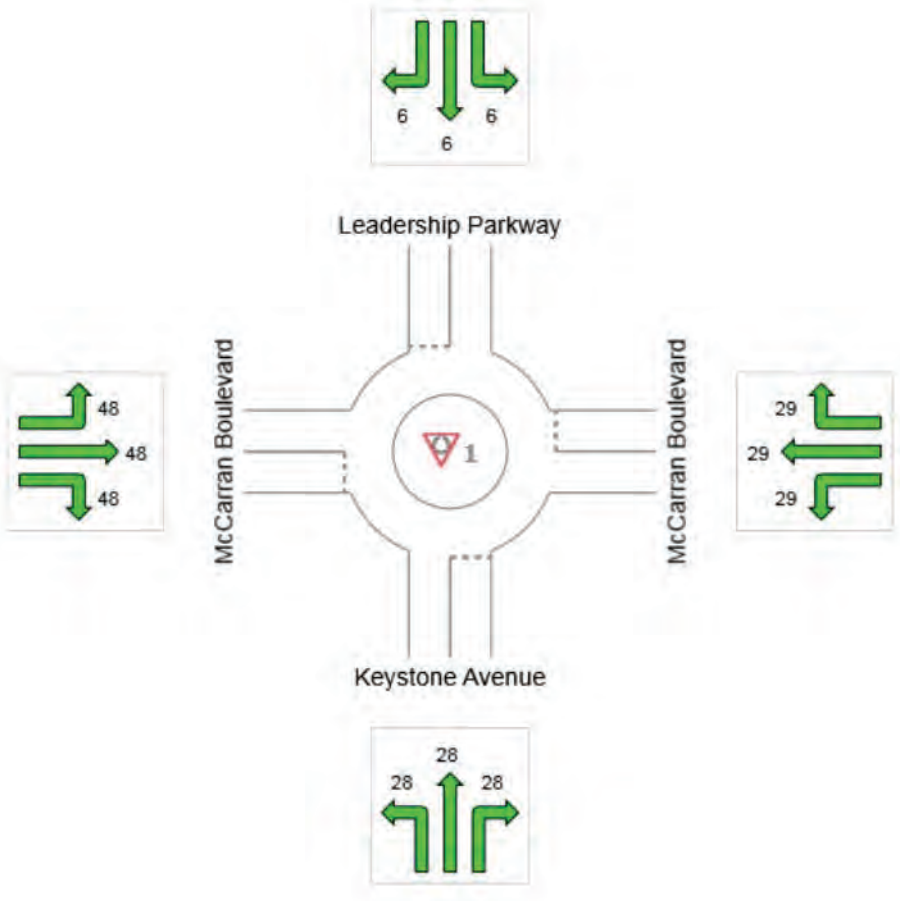
Site: 1 [McCarran Boulevard & Keystone Avenue/Leadership Parkway]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Queue Distance (Aver)	28	29	6	48	48



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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DELAY (CONTROL)

Average control delay per vehicle, or average pedestrian delay (seconds)

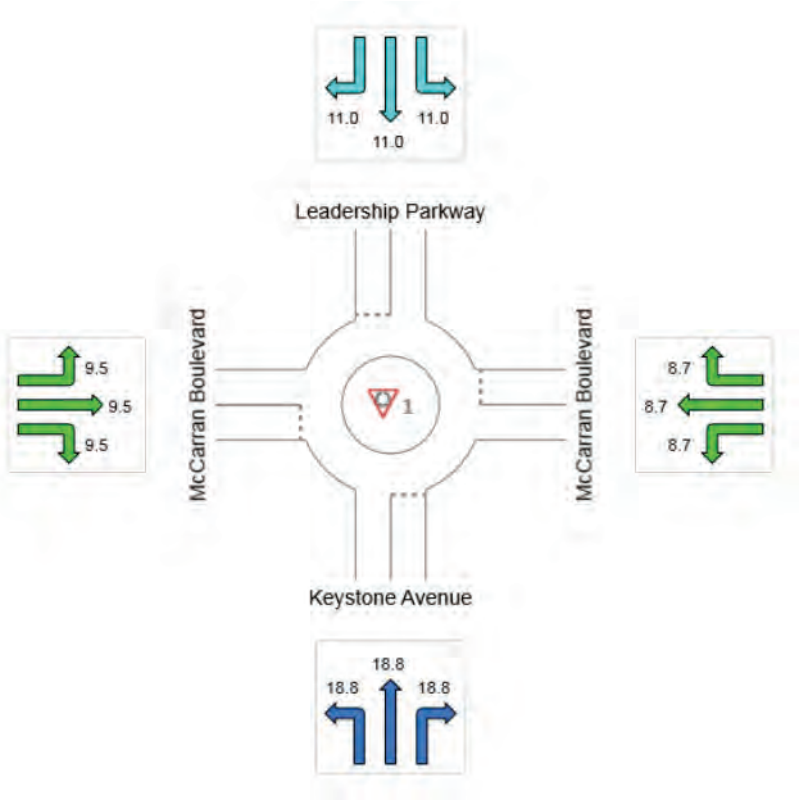
Site: 1 [McCarran Boulevard & Keystone Avenue/Leadership Parkway]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Delay (Control)	18.8	8.7	11.0	9.5	9.9
LOS	C	A	B	A	A



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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QUEUE DISTANCE (AVER)

Average Back of Queue Distance for any lane used by vehicle movement (feet)

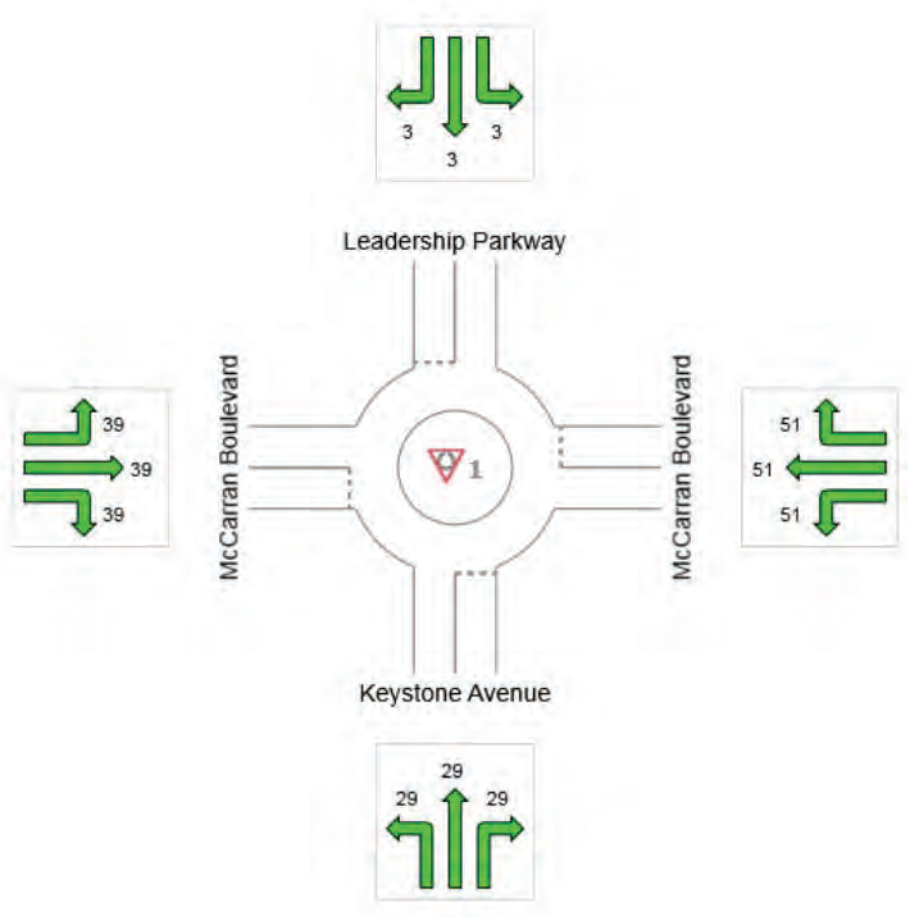
Site: 1 [McCarran Boulevard & Keystone Avenue/Leadership Parkway]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Queue Distance (Aver)	29	51	3	39	51



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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DELAY (CONTROL)

Average control delay per vehicle, or average pedestrian delay (seconds)

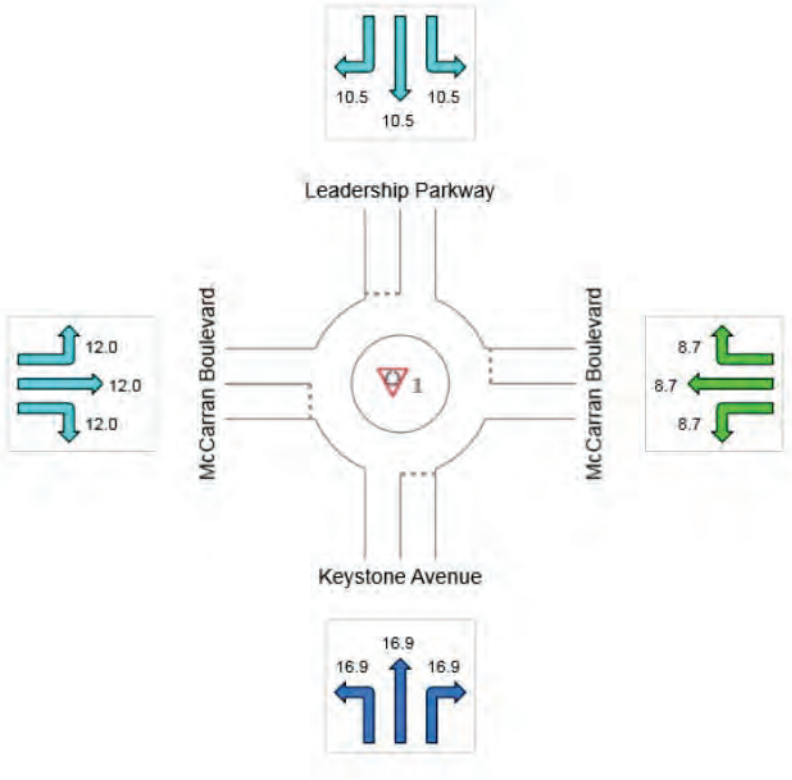
Site: 1 [McCarran Boulevard & Keystone Avenue/Leadership Parkway]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Delay (Control)	16.9	8.7	10.5	12.0	10.9
LOS	C	A	B	B	B



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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QUEUE DISTANCE (AVER)

Average Back of Queue Distance for any lane used by vehicle movement (feet)

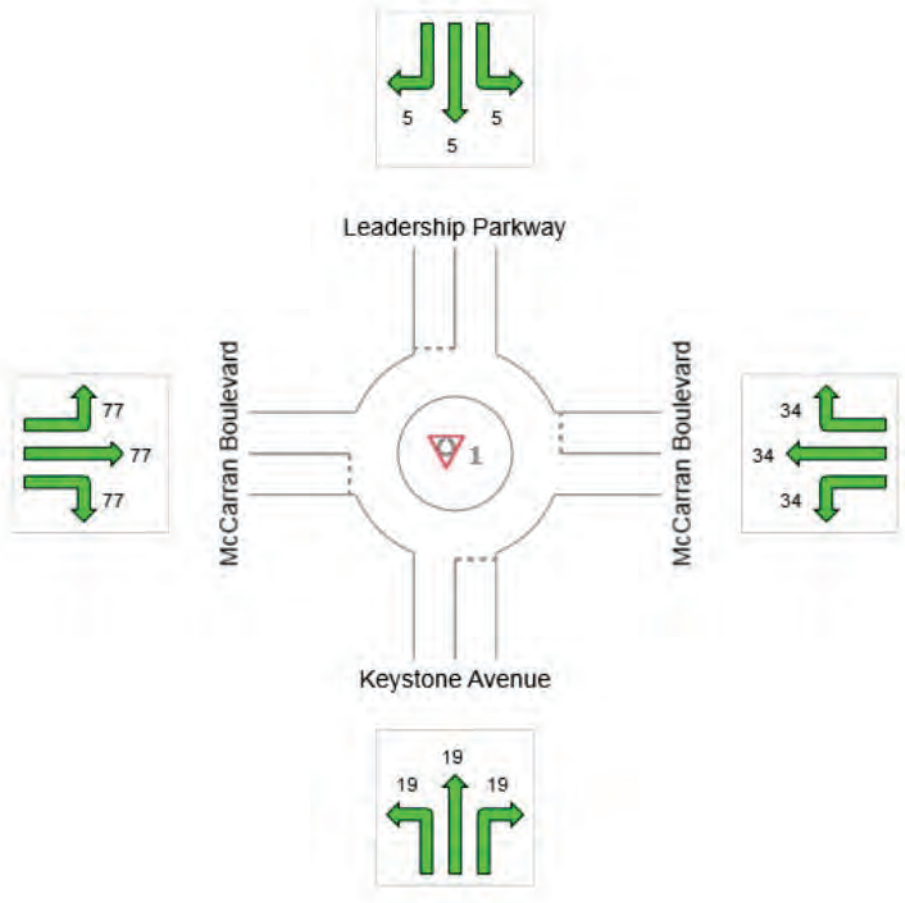
Site: 1 [McCarran Boulevard & Keystone Avenue/Leadership Parkway]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Queue Distance (Aver)	19	34	5	77	77



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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DELAY (CONTROL)

Average control delay per vehicle, or average pedestrian delay (seconds)

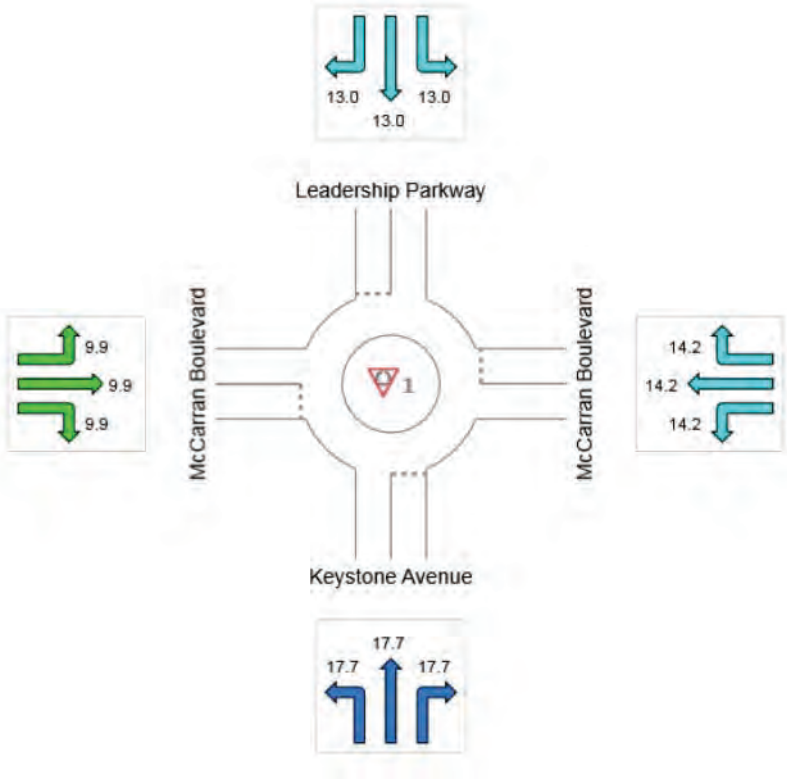
Site: 1 [McCarran Boulevard & Keystone Avenue/Leadership Parkway]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Delay (Control)	17.7	14.2	13.0	9.9	12.7
LOS	C	B	B	A	B



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

QUEUE DISTANCE (AVER)

Average Back of Queue Distance for any lane used by vehicle movement (feet)

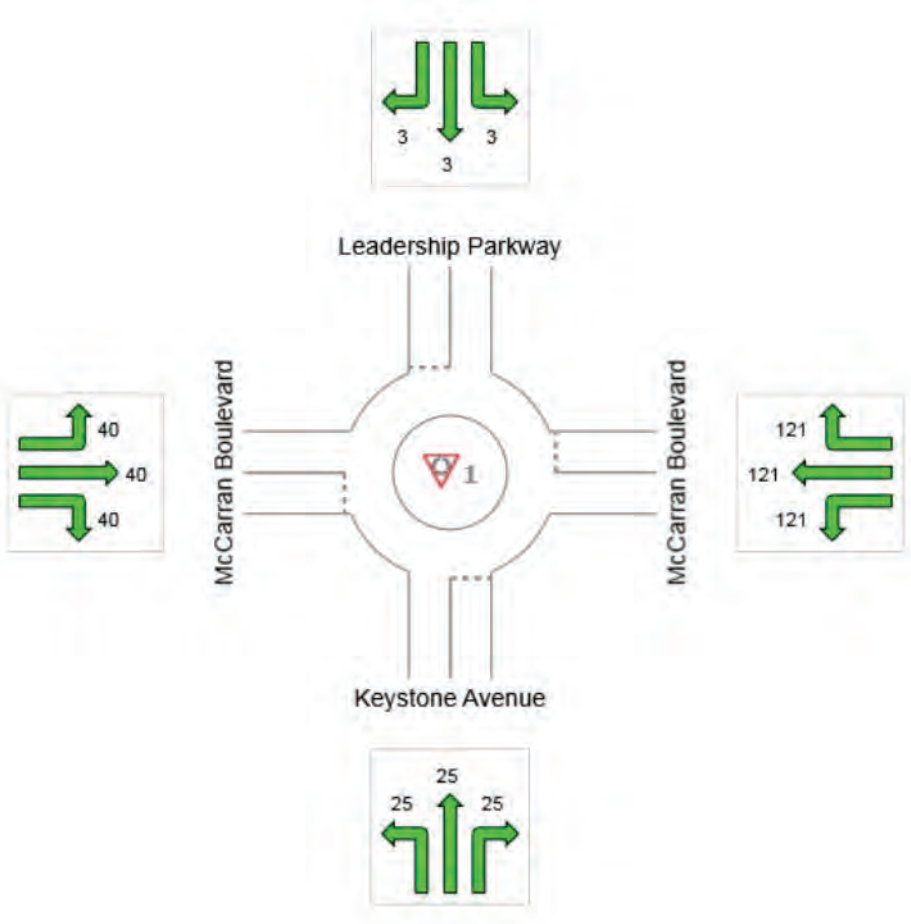
Site: 1 [McCarran Boulevard & Keystone Avenue/Leadership Parkway]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Queue Distance (Aver)	25	121	3	40	121



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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DELAY (CONTROL)

Average control delay per vehicle, or average pedestrian delay (seconds)

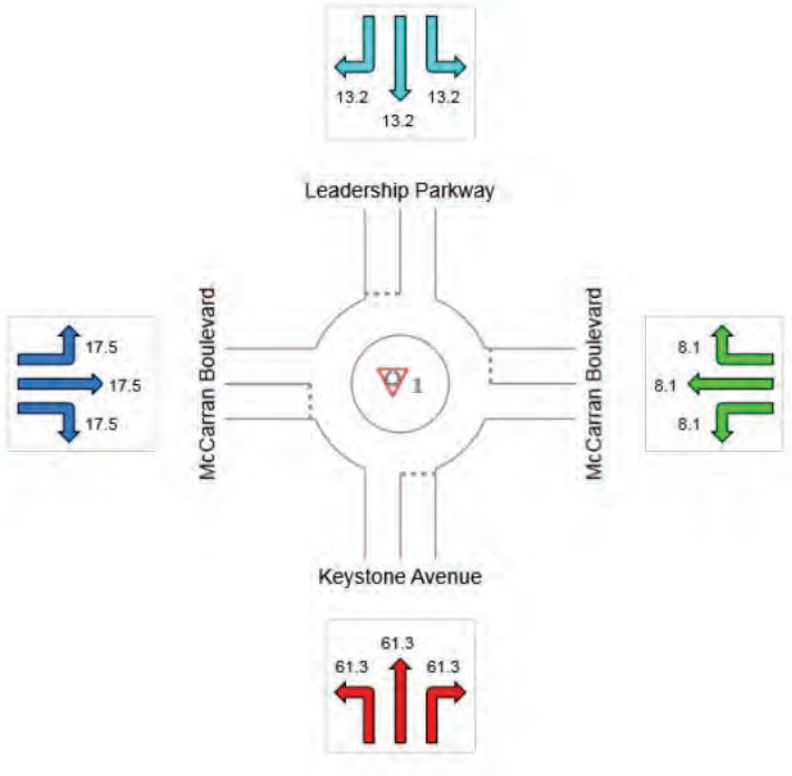
Site: 1 [McCarran Boulevard & Keystone Avenue/Leadership Parkway]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Delay (Control)	61.3	8.1	13.2	17.5	17.3
LOS	F	A	B	C	C



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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QUEUE DISTANCE (AVER)

Average Back of Queue Distance for any lane used by vehicle movement (feet)

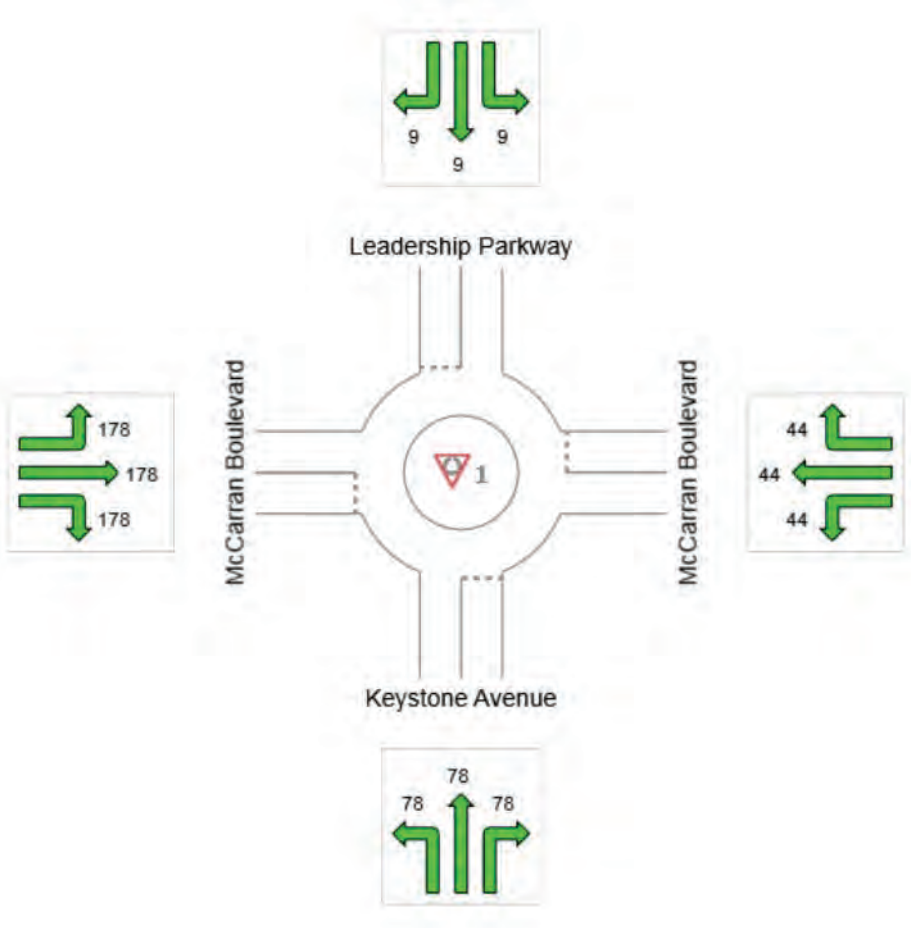
Site: 1 [McCarran Boulevard & Keystone Avenue/Leadership Parkway]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Queue Distance (Aver)	78	44	9	178	178



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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DELAY (CONTROL)

Average control delay per vehicle, or average pedestrian delay (seconds)

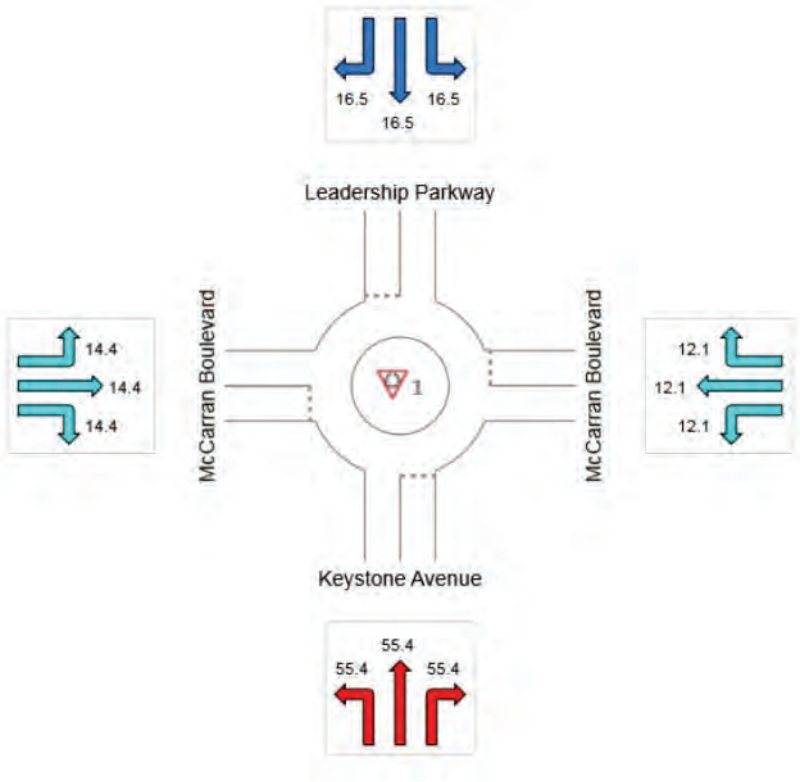
Site: 1 [McCarran Boulevard & Keystone Avenue/Leadership Parkway]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Delay (Control)	55.4	12.1	16.5	14.4	16.7
LOS	F	B	C	B	C



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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QUEUE DISTANCE (AVER)

Average Back of Queue Distance for any lane used by vehicle movement (feet)

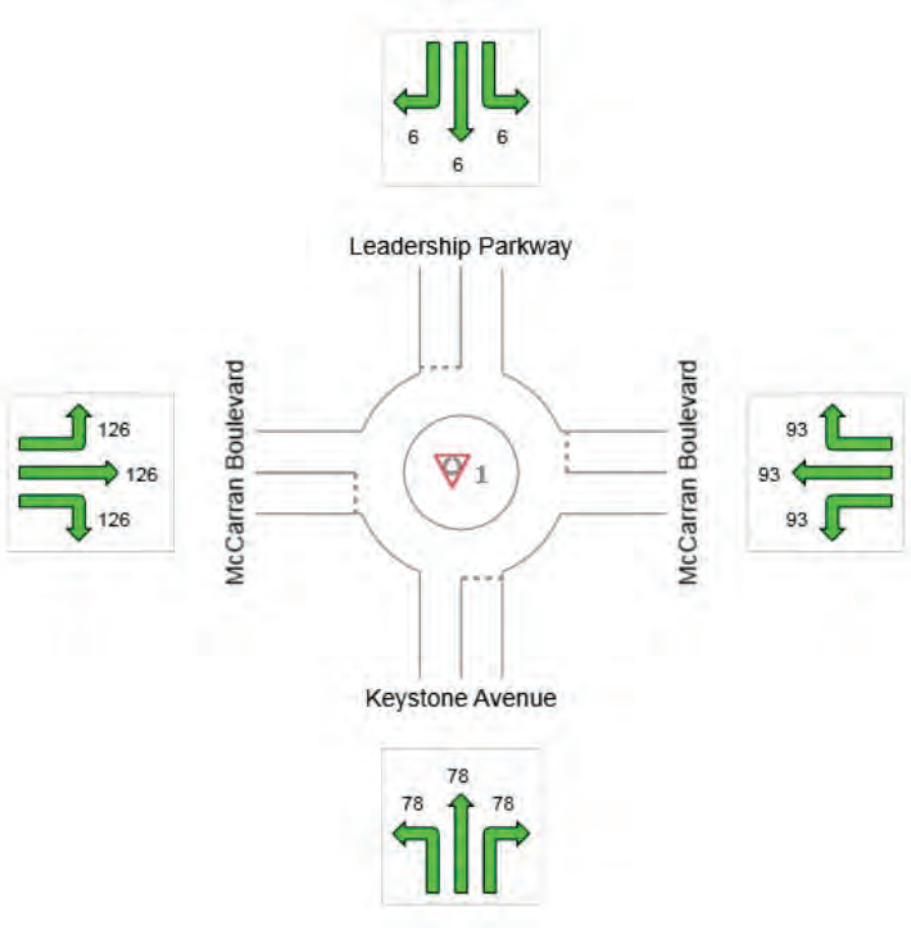
Site: 1 [McCarran Boulevard & Keystone Avenue/Leadership Parkway]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Queue Distance (Aver)	78	93	6	126	126



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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DELAY (CONTROL)

Average control delay per vehicle, or average pedestrian delay (seconds)

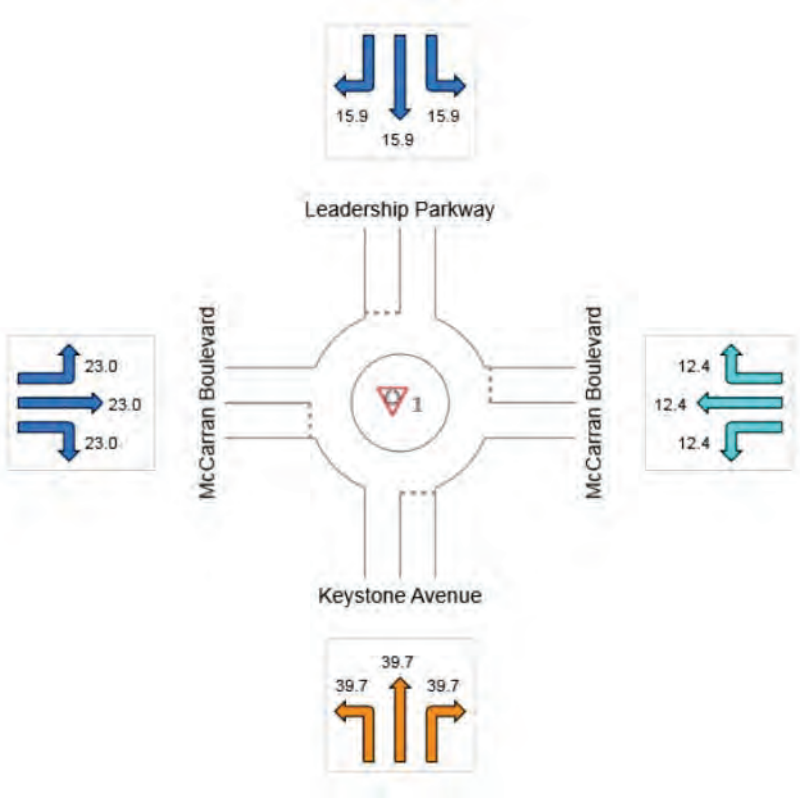
Site: 1 [McCarran Boulevard & Keystone Avenue/Leadership Parkway]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Delay (Control)	39.7	12.4	15.9	23.0	19.5
LOS	E	B	C	C	C



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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QUEUE DISTANCE (AVER)

Average Back of Queue Distance for any lane used by vehicle movement (feet)

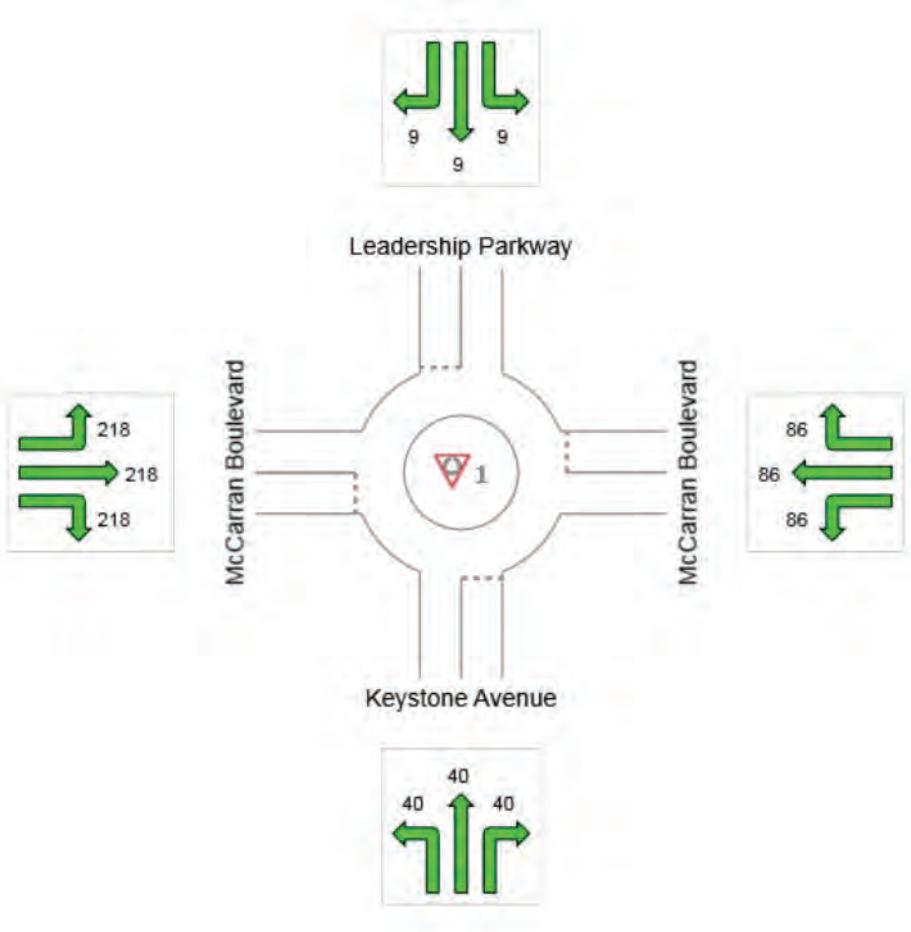
Site: 1 [McCarran Boulevard & Keystone Avenue/Leadership Parkway]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Queue Distance (Aver)	40	86	9	218	218



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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DELAY (CONTROL)

Average control delay per vehicle, or average pedestrian delay (seconds)

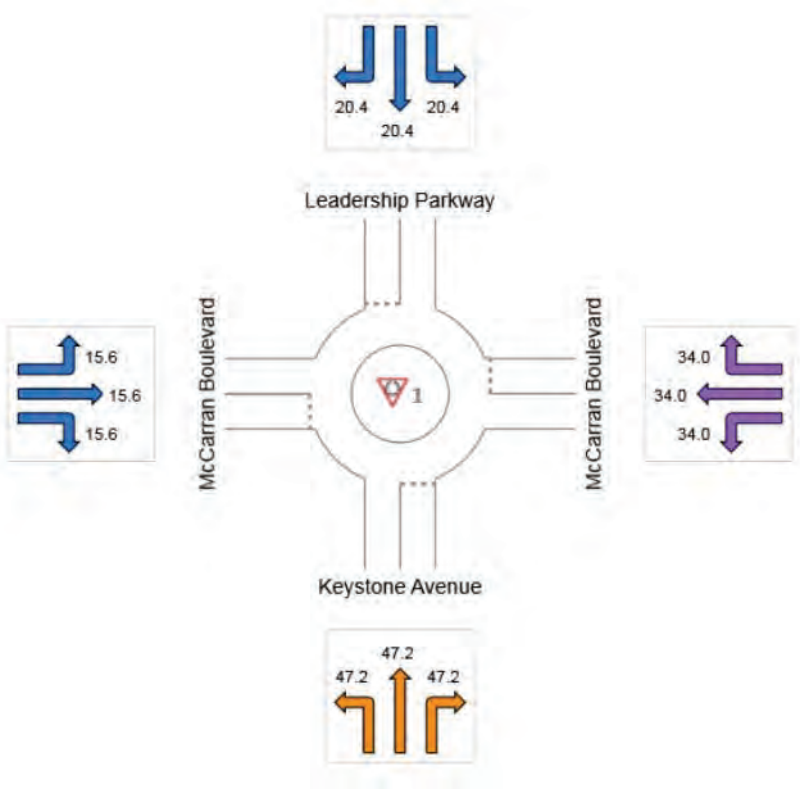
Site: 1 [McCarran Boulevard & Keystone Avenue/Leadership Parkway]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Delay (Control)	47.2	34.0	20.4	15.6	27.4
LOS	E	D	C	C	D



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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QUEUE DISTANCE (AVER)

Average Back of Queue Distance for any lane used by vehicle movement (feet)

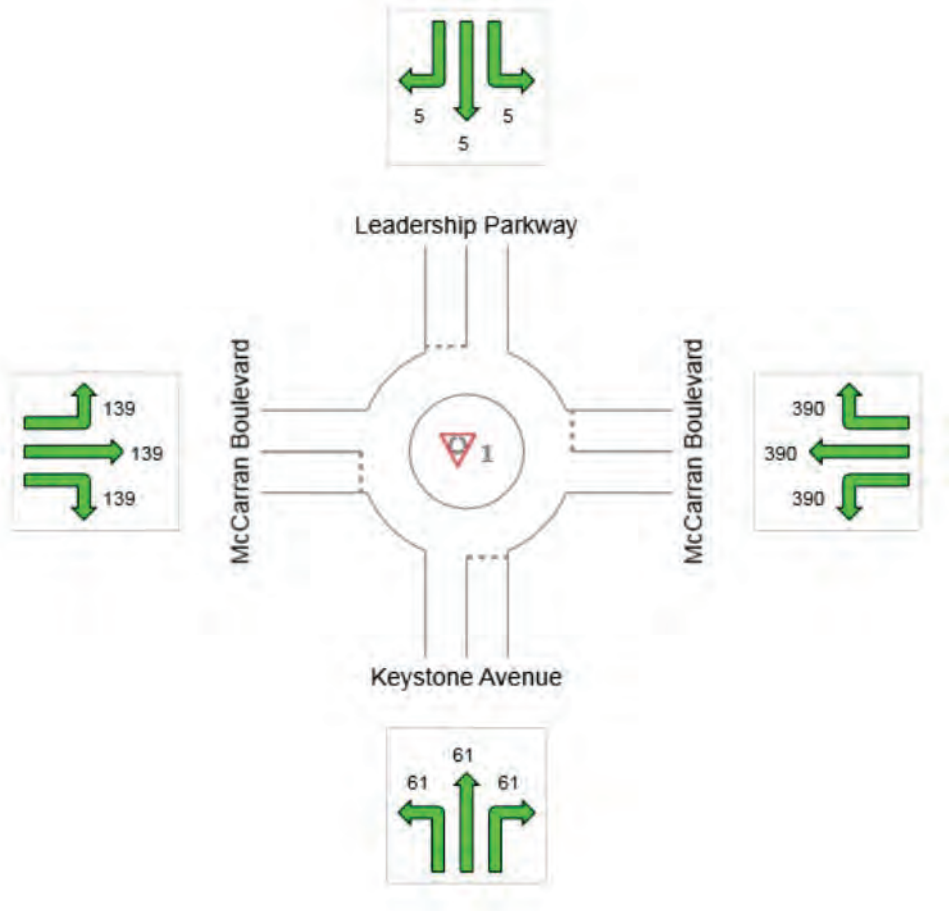
Site: 1 [McCarran Boulevard & Keystone Avenue/Leadership Parkway]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Queue Distance (Aver)	61	390	5	139	390



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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DELAY (CONTROL)

Average control delay per vehicle, or average pedestrian delay (seconds)

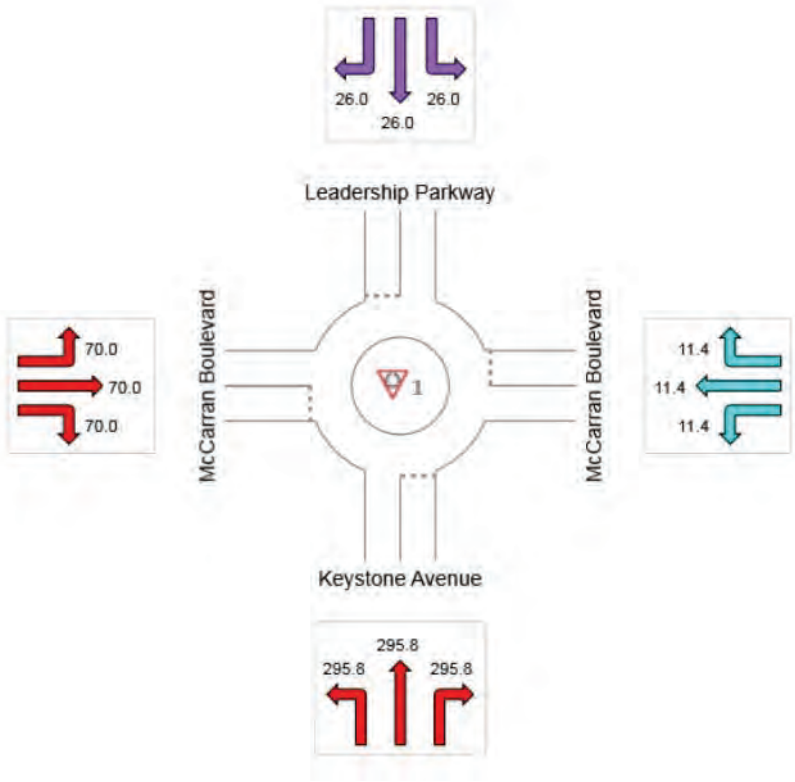
Site: 1 [McCarran Boulevard & Keystone Avenue/Leadership Parkway]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Delay (Control)	295.8	11.4	26.0	70.0	64.1
LOS	F	B	D	F	F



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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QUEUE DISTANCE (AVER)

Average Back of Queue Distance for any lane used by vehicle movement (feet)

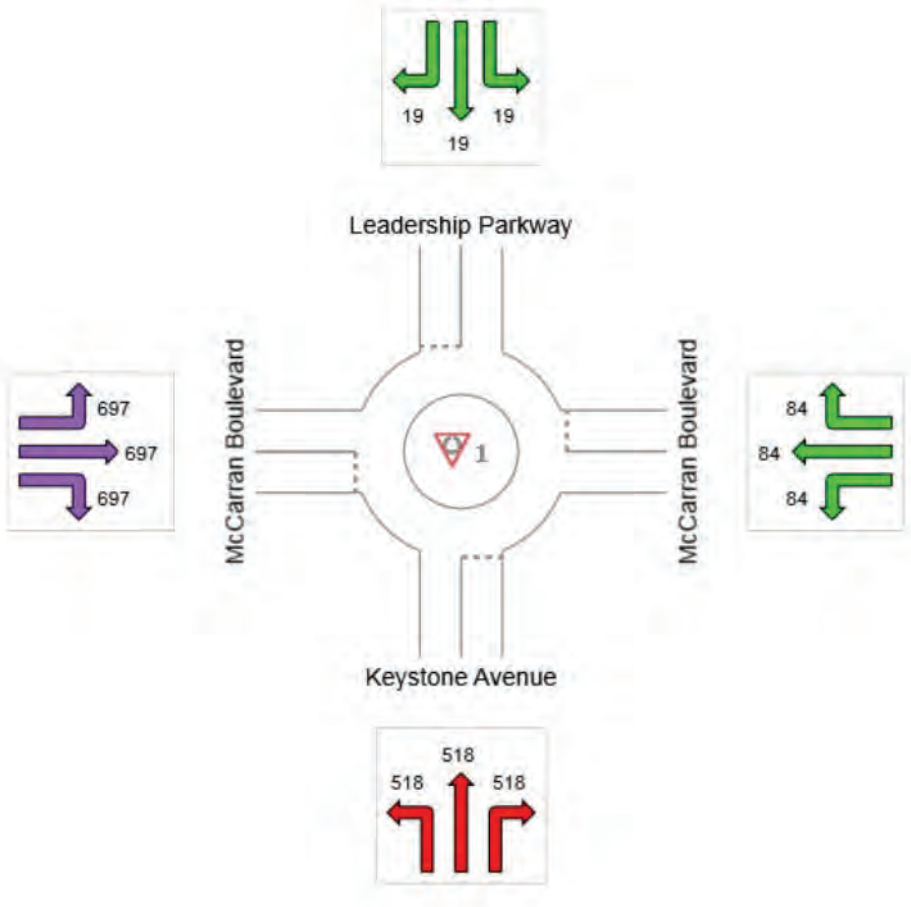
Site: 1 [McCarran Boulevard & Keystone Avenue/Leadership Parkway]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Queue Distance (Aver)	518	84	19	697	697



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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DELAY (CONTROL)

Average control delay per vehicle, or average pedestrian delay (seconds)

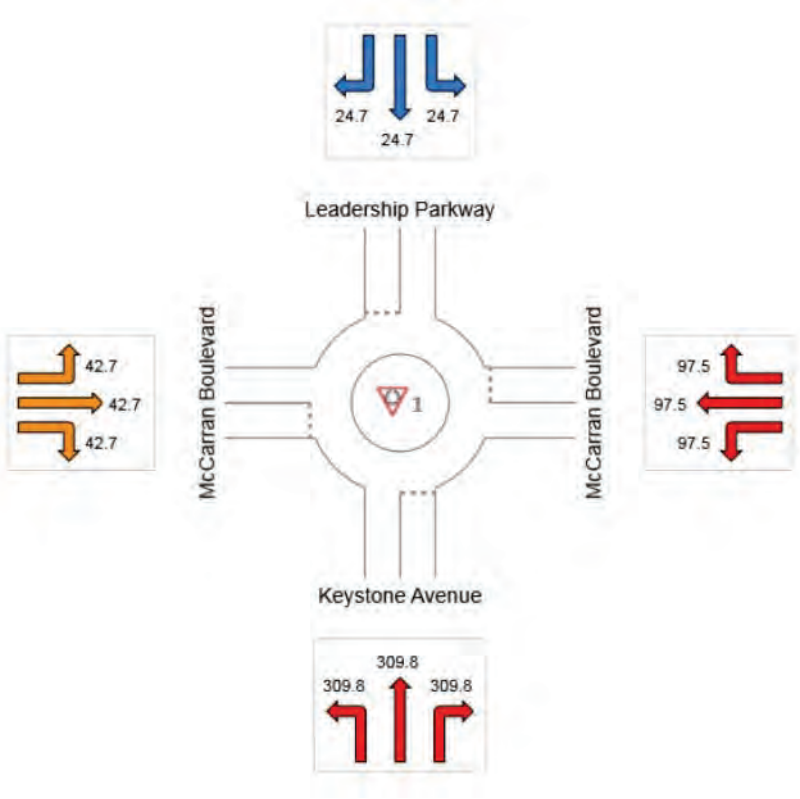
Site: 1 [McCarran Boulevard & Keystone Avenue/Leadership Parkway]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Delay (Control)	309.8	97.5	24.7	42.7	90.9
LOS	F	F	C	E	F



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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QUEUE DISTANCE (AVER)

Average Back of Queue Distance for any lane used by vehicle movement (feet)

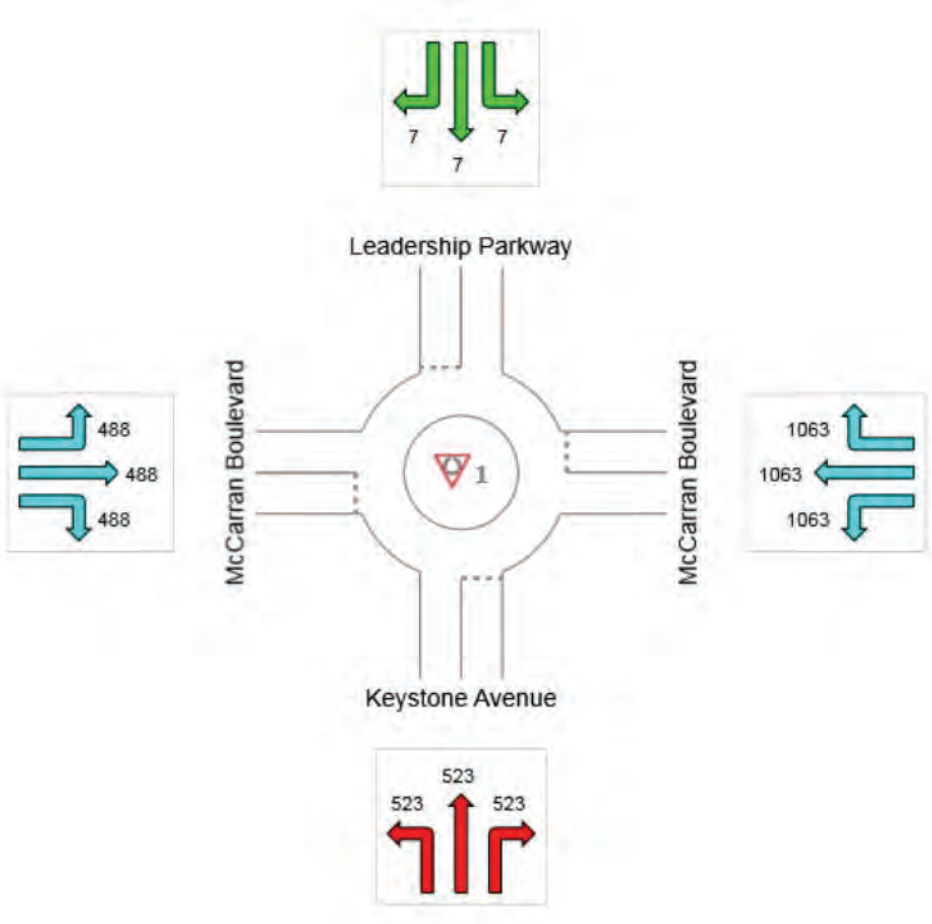
Site: 1 [McCarran Boulevard & Keystone Avenue/Leadership Parkway]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Queue Distance (Aver)	523	1063	7	488	1063



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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DELAY (CONTROL)

Average control delay per vehicle, or average pedestrian delay (seconds)

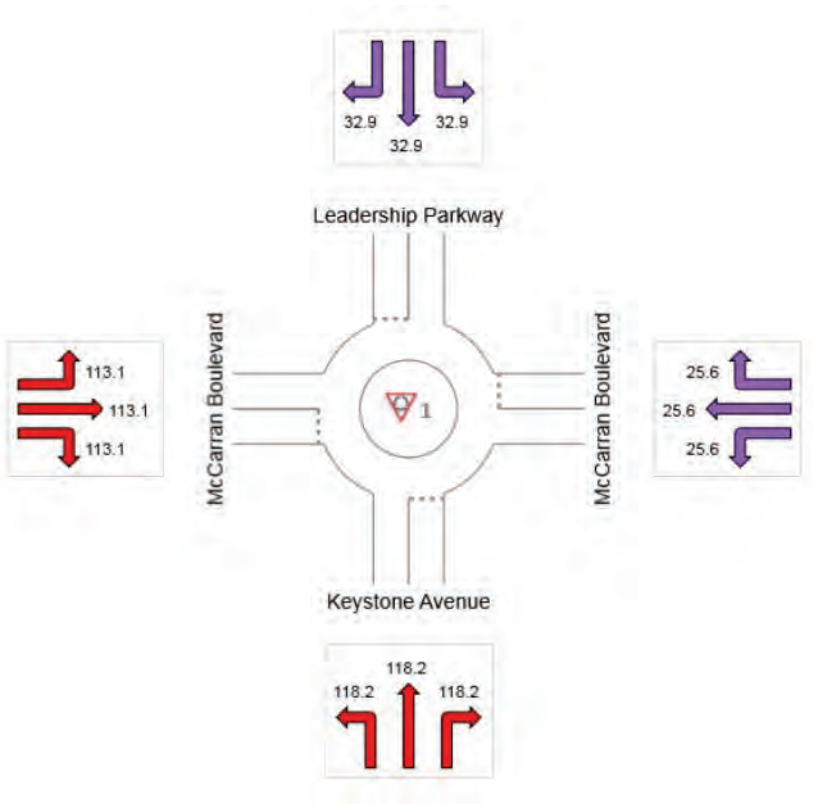
Site: 1 [McCarran Boulevard & Keystone Avenue/Leadership Parkway]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Delay (Control)	118.2	25.6	32.9	113.1	74.7
LOS	F	D	D	F	F



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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QUEUE DISTANCE (AVER)

Average Back of Queue Distance for any lane used by vehicle movement (feet)

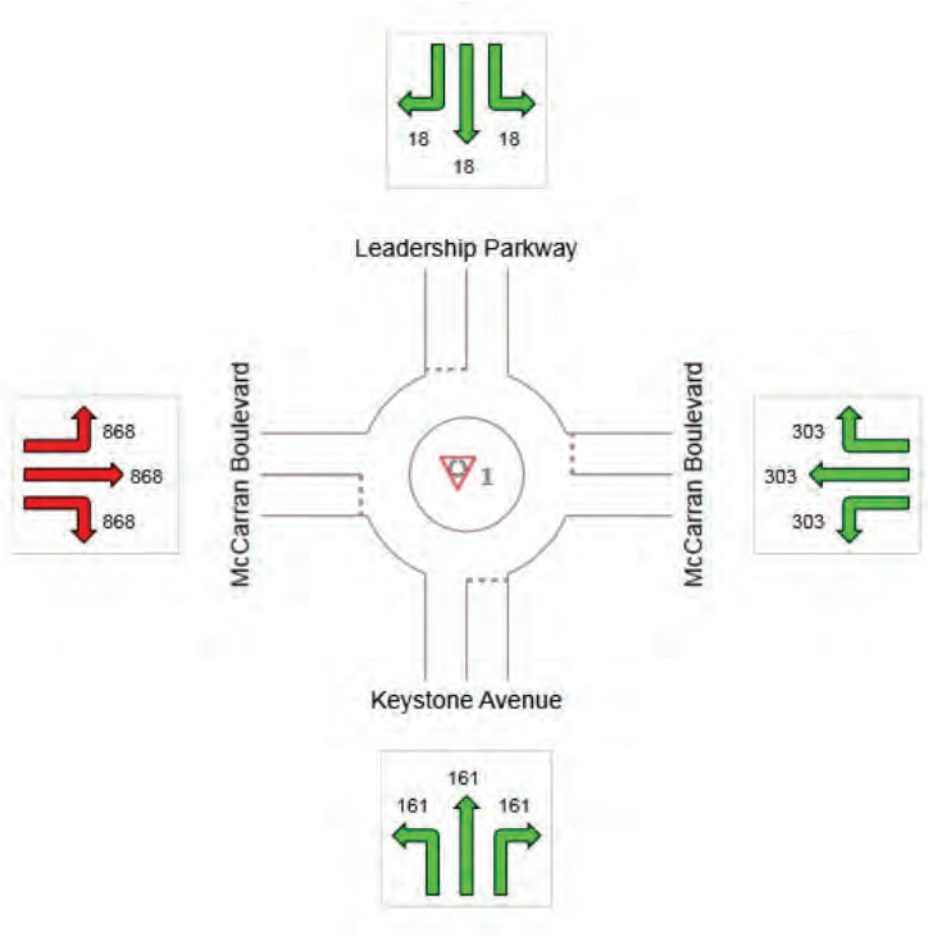
Site: 1 [McCarran Boulevard & Keystone Avenue/Leadership Parkway]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Queue Distance (Aver)	161	303	18	868	868



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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DELAY (CONTROL)

Average control delay per vehicle, or average pedestrian delay (seconds)

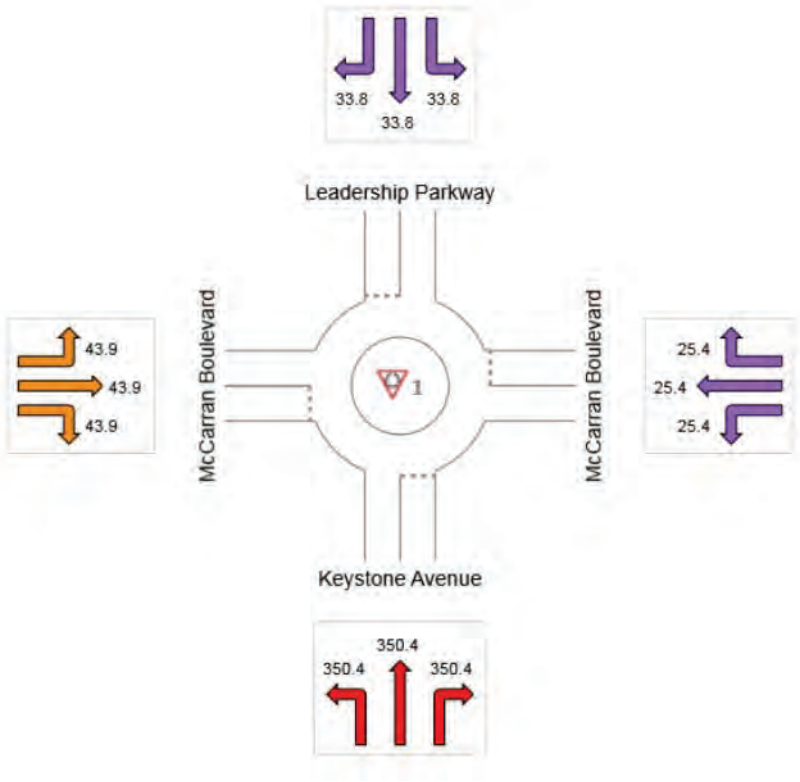
Site: 1 [McCarran Boulevard & Keystone Avenue/Leadership Parkway]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Delay (Control)	350.4	25.4	33.8	43.9	60.3
LOS	F	D	D	E	F



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

QUEUE DISTANCE (AVER)

Average Back of Queue Distance for any lane used by vehicle movement (feet)

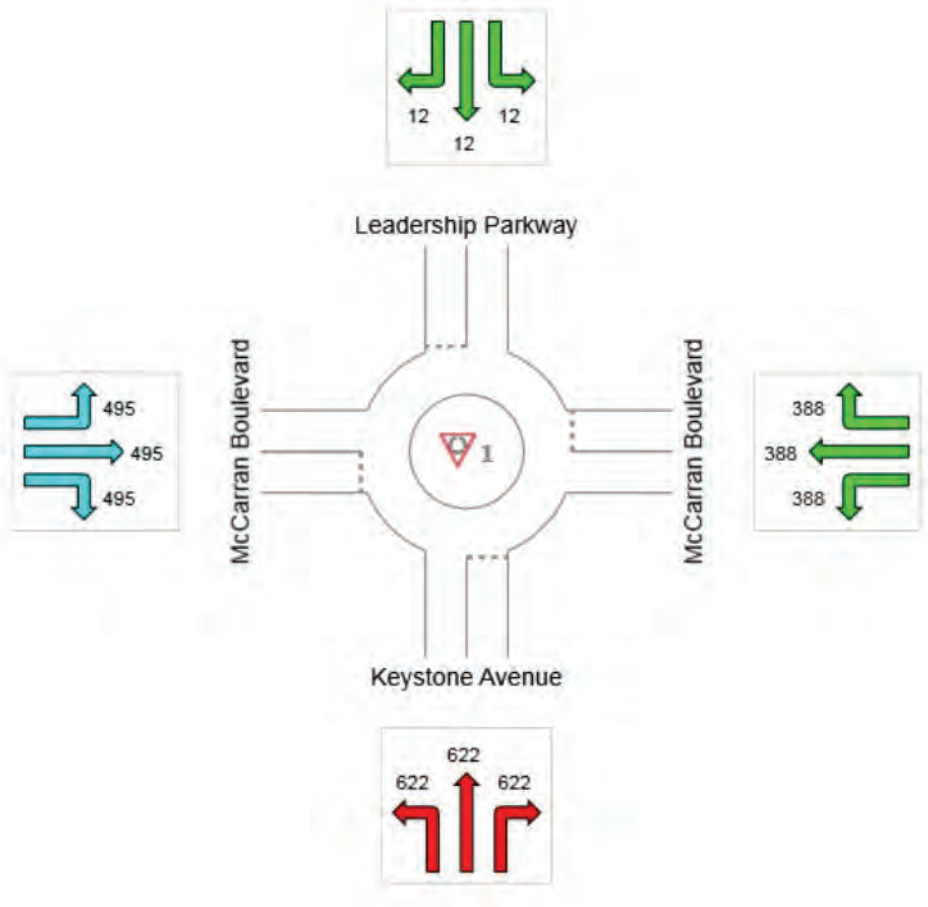
Site: 1 [McCarran Boulevard & Keystone Avenue/Leadership Parkway]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Queue Distance (Aver)	622	388	12	495	622



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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Evans Road/Socrates Drive

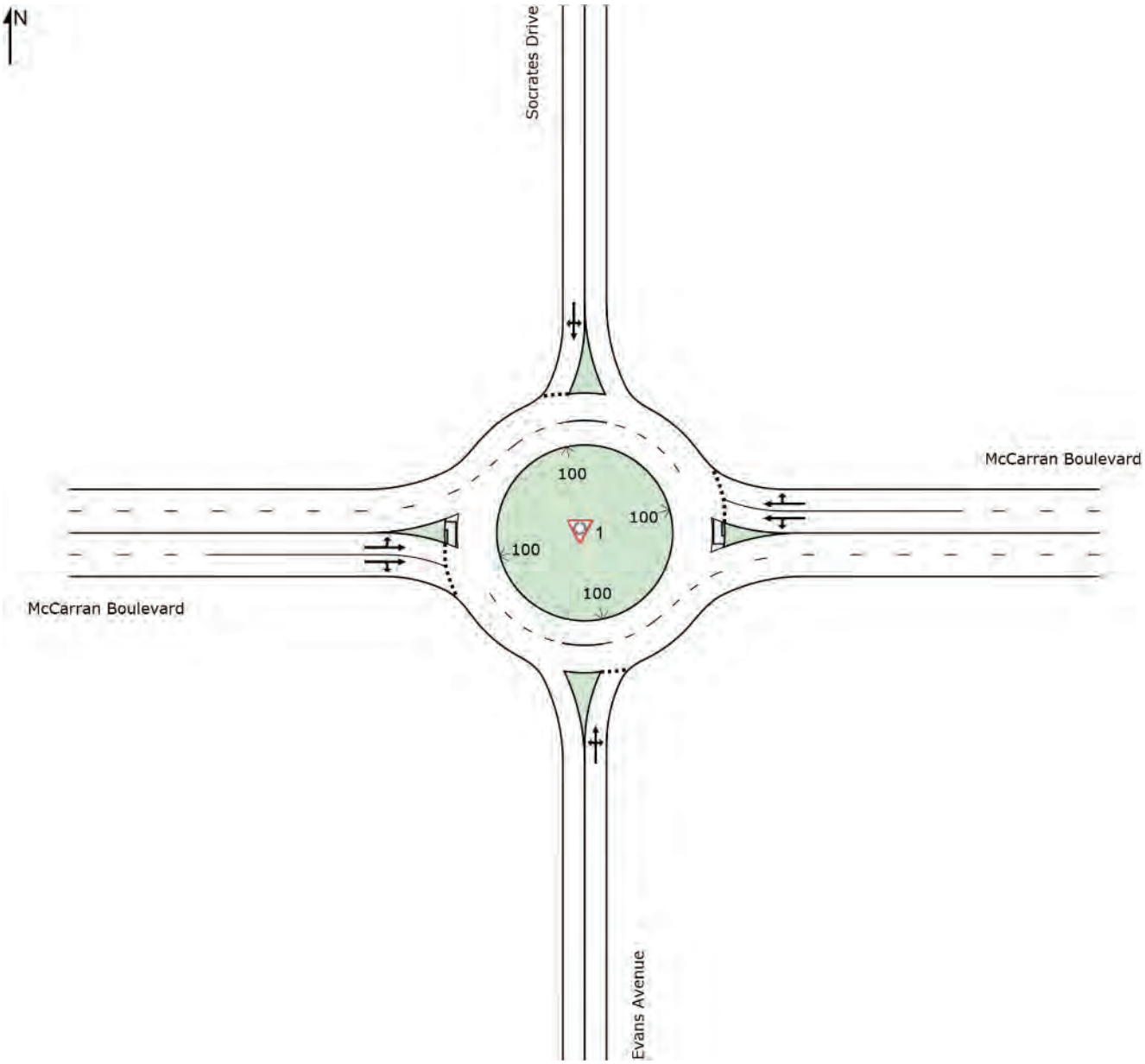
- ***Existing Volumes***
  - ***Layout***
  - ***AM – Delay & Queue***
  - ***PM – Delay & Queue***
- ***2 Eastbound Roundabout Lanes***
  - ***Layout***
  - ***PM – Delay & Queue***
- ***2 Northbound Lanes – Separated Right***
  - ***Layout***
  - ***PM – Delay & Queue***
- ***2 Eastbound Roundabout Lanes and 2 Northbound Lanes (Separated Right)***
  - ***Layout***
  - ***PM – Delay & Queue***

SITE LAYOUT

Site: 1 [McCarran Boulevard & Socrates Drive/Evans Avenue]

Roundabout Alternative

Site Category: (None)
Roundabout



DELAY (CONTROL)

Average control delay per vehicle, or average pedestrian delay (seconds)

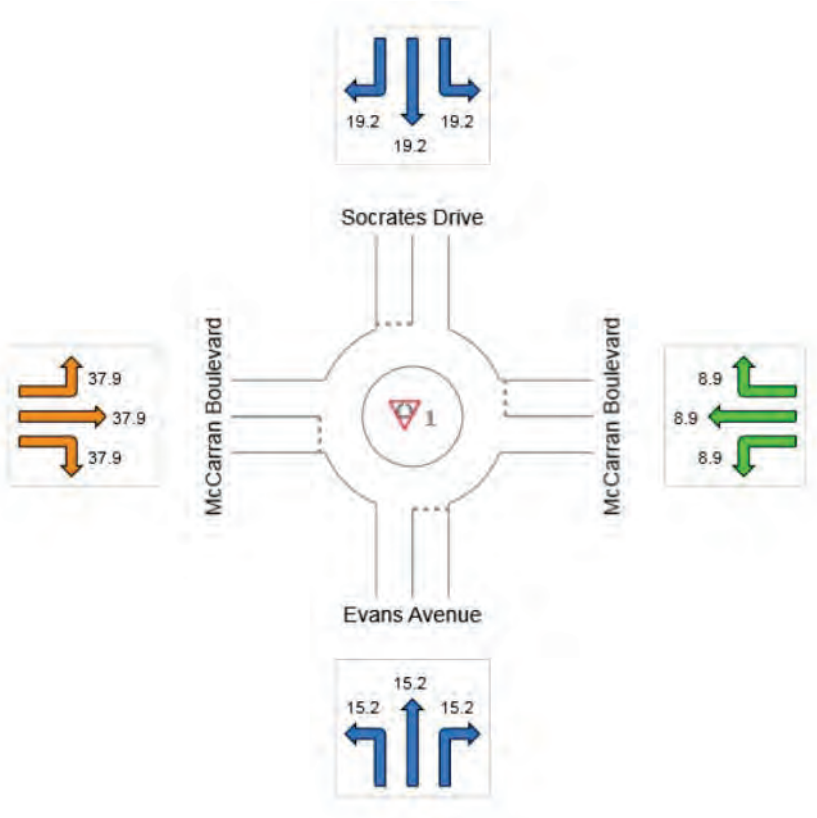
Site: 1 [McCarran Boulevard & Socrates Drive/Evans Avenue]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Delay (Control)	15.2	8.9	19.2	37.9	23.4
LOS	C	A	C	E	C



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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QUEUE DISTANCE (AVER)

Average Back of Queue Distance for any lane used by vehicle movement (feet)

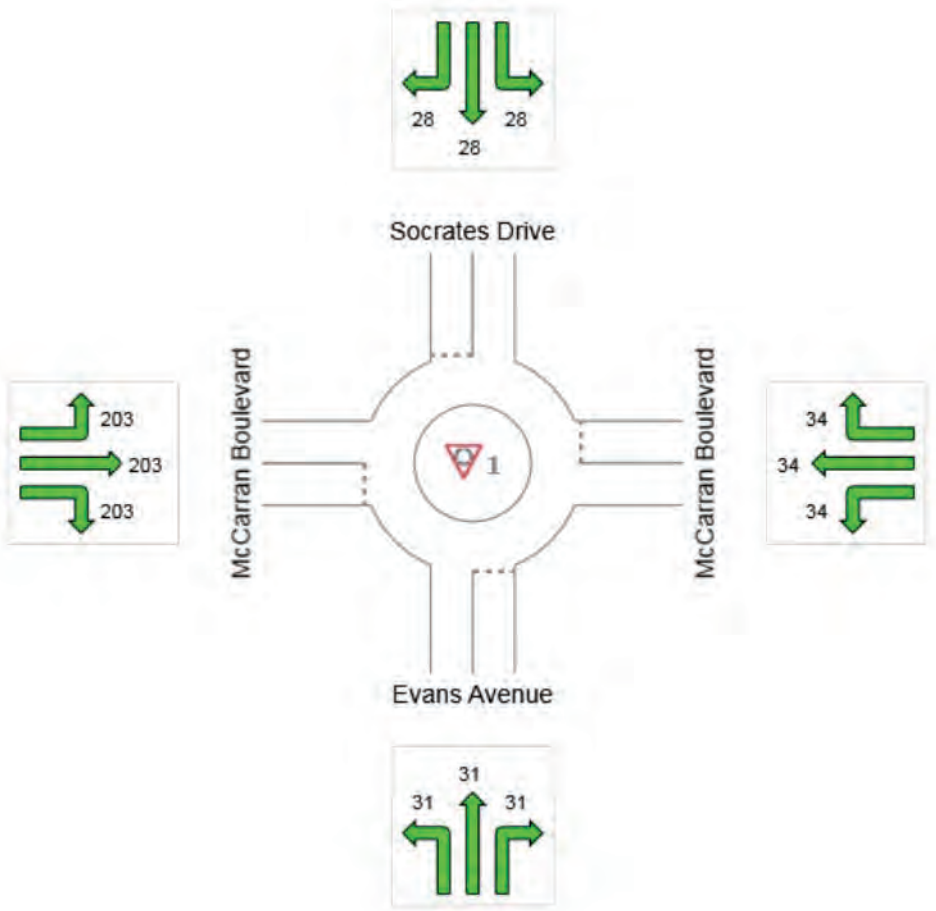
Site: 1 [McCarran Boulevard & Socrates Drive/Evans Avenue]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Queue Distance (Aver)	31	34	28	203	203



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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DELAY (CONTROL)

Average control delay per vehicle, or average pedestrian delay (seconds)

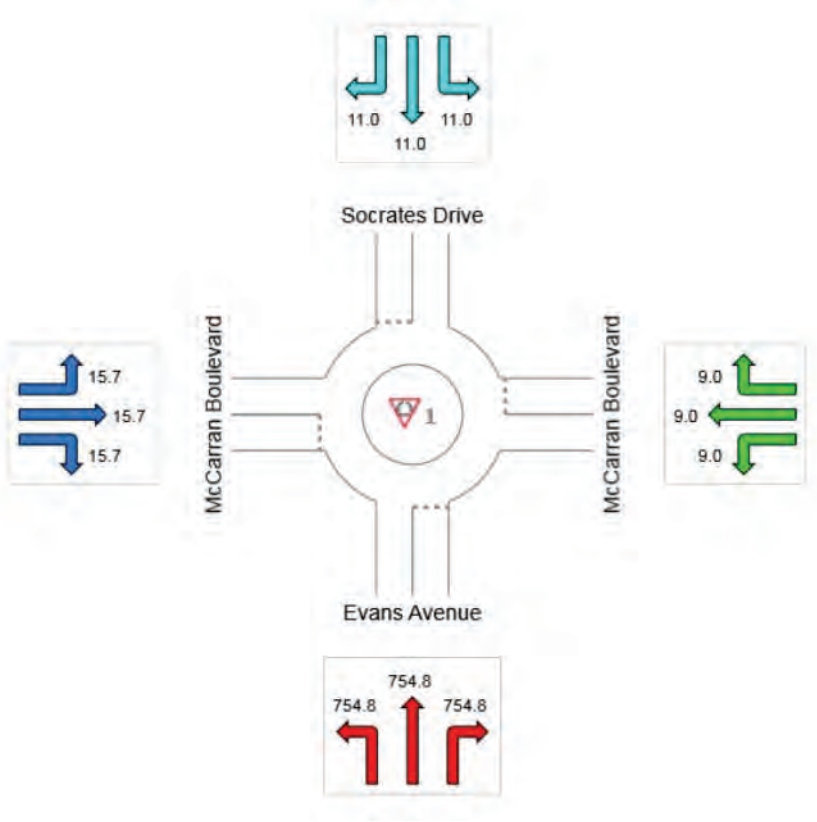
Site: 1 [McCarran Boulevard & Socrates Drive/Evans Avenue]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Delay (Control)	754.8	9.0	11.0	15.7	221.7
LOS	F	A	B	C	F



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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QUEUE DISTANCE (AVER)

Average Back of Queue Distance for any lane used by vehicle movement (feet)

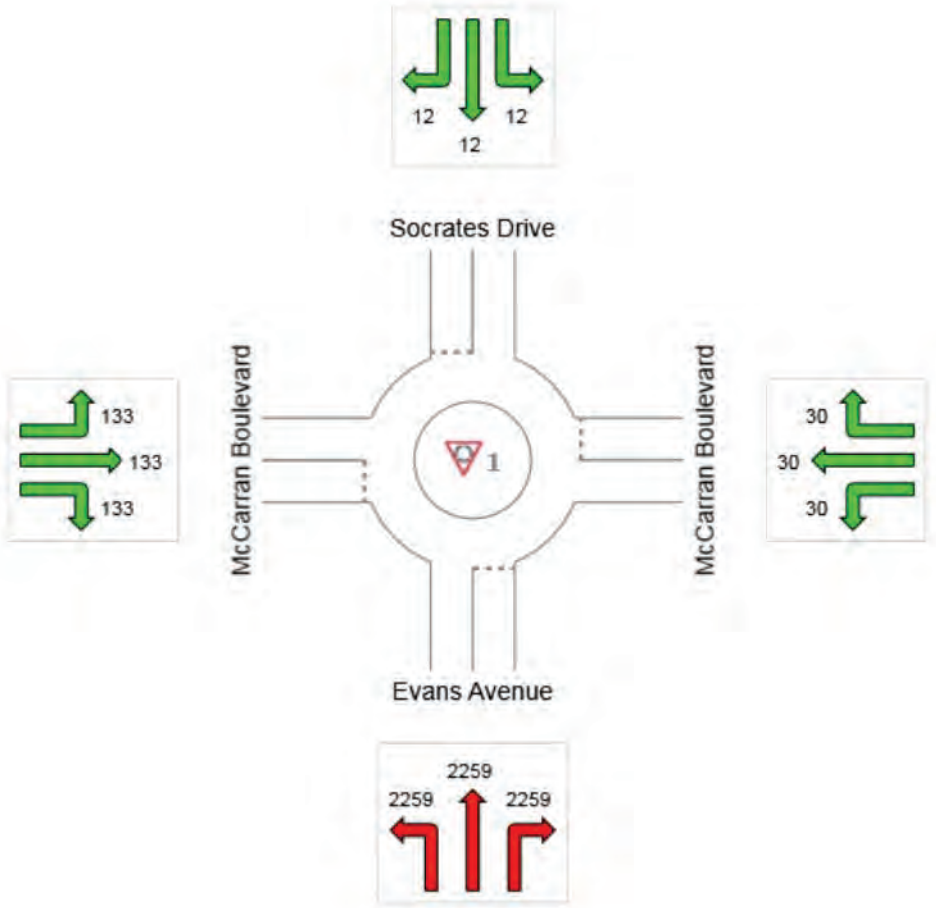
Site: 1 [McCarran Boulevard & Socrates Drive/Evans Avenue]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Queue Distance (Aver)	2259	30	12	133	2259



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

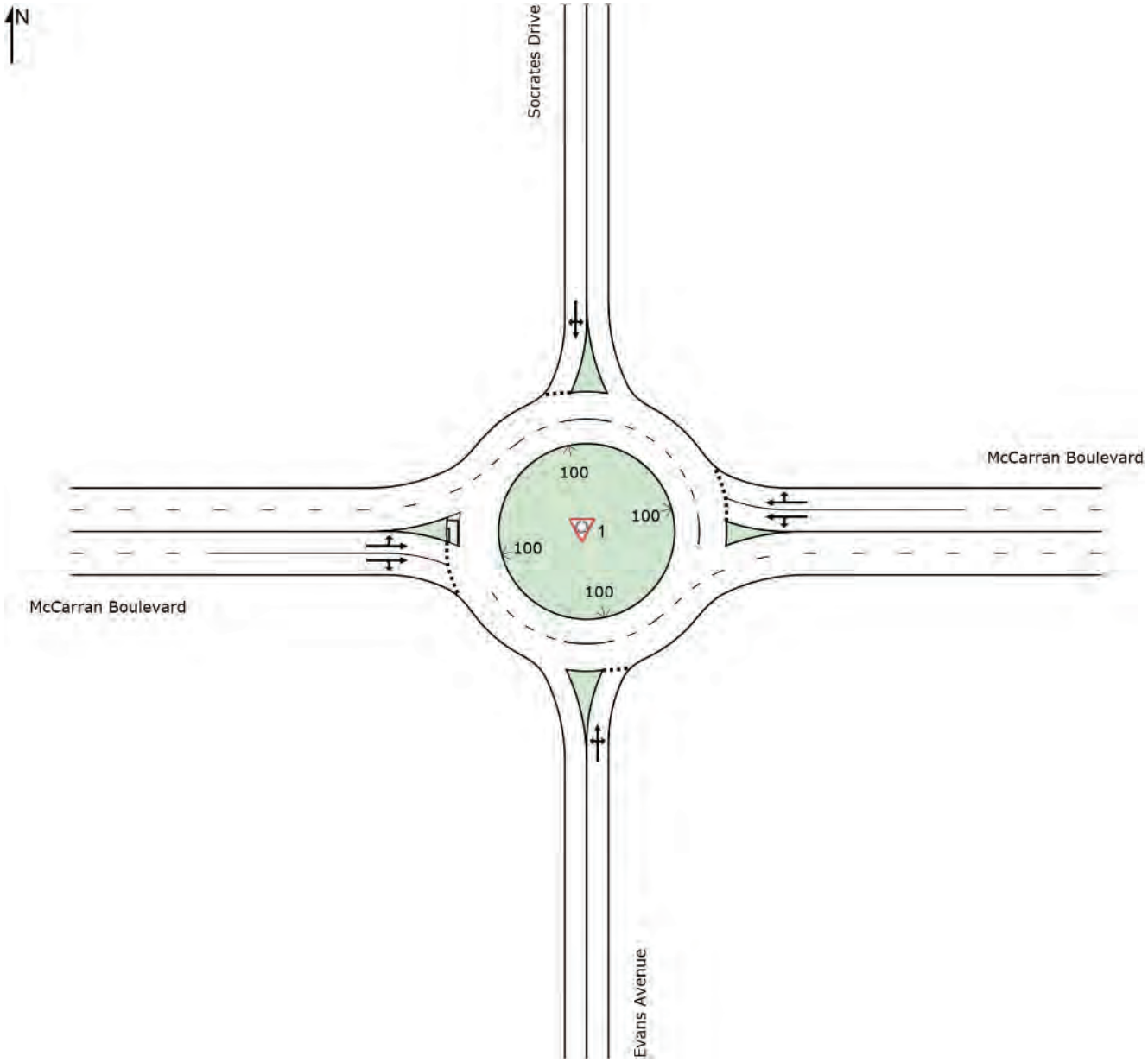
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SITE LAYOUT

Site: 1 [McCarran Boulevard & Socrates Drive/Evans Avenue]

Roundabout Alternative

Site Category: (None)
Roundabout



DELAY (CONTROL)

Average control delay per vehicle, or average pedestrian delay (seconds)

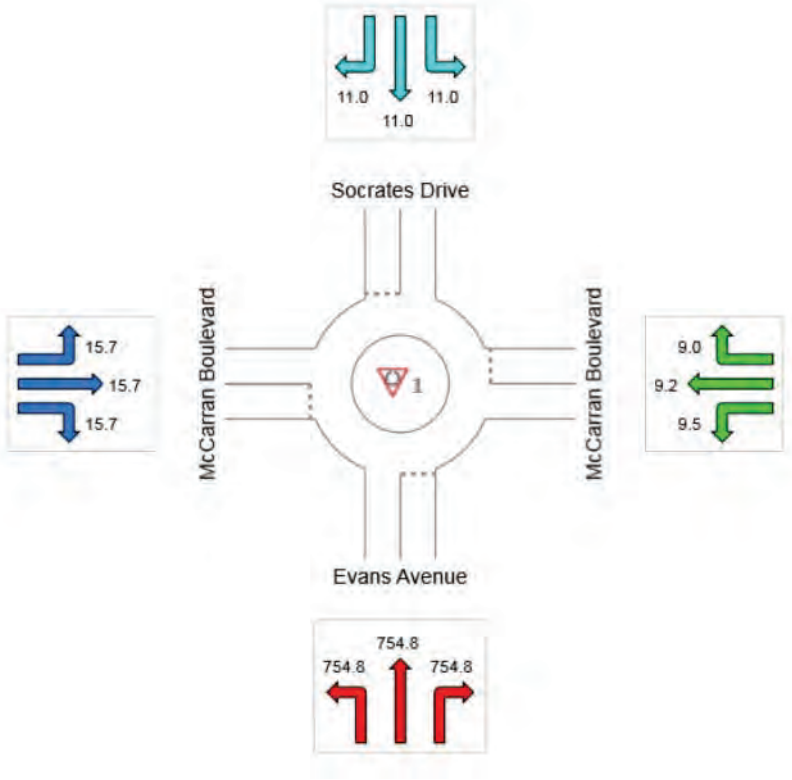
Site: 1 [McCarran Boulevard & Socrates Drive/Evans Avenue]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Delay (Control)	754.8	9.3	11.0	15.7	221.8
LOS	F	A	B	C	F



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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QUEUE DISTANCE (AVER)

Average Back of Queue Distance for any lane used by vehicle movement (feet)

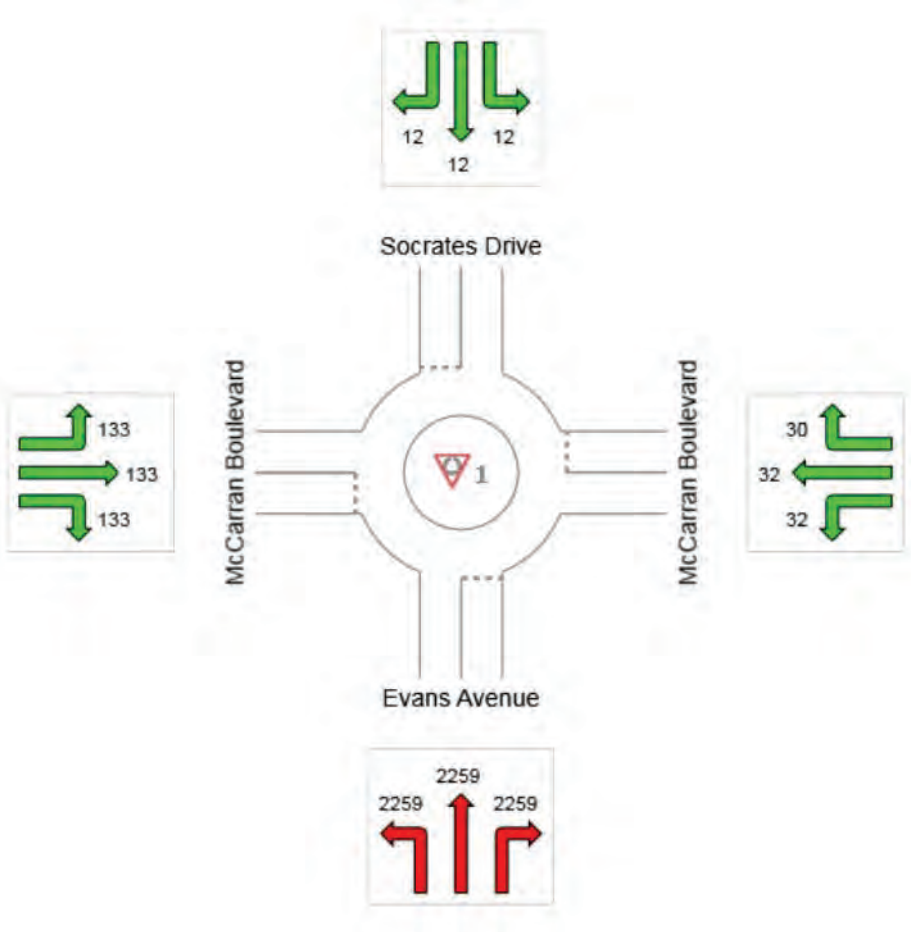
Site: 1 [McCarran Boulevard & Socrates Drive/Evans Avenue]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Queue Distance (Aver)	2259	32	12	133	2259



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

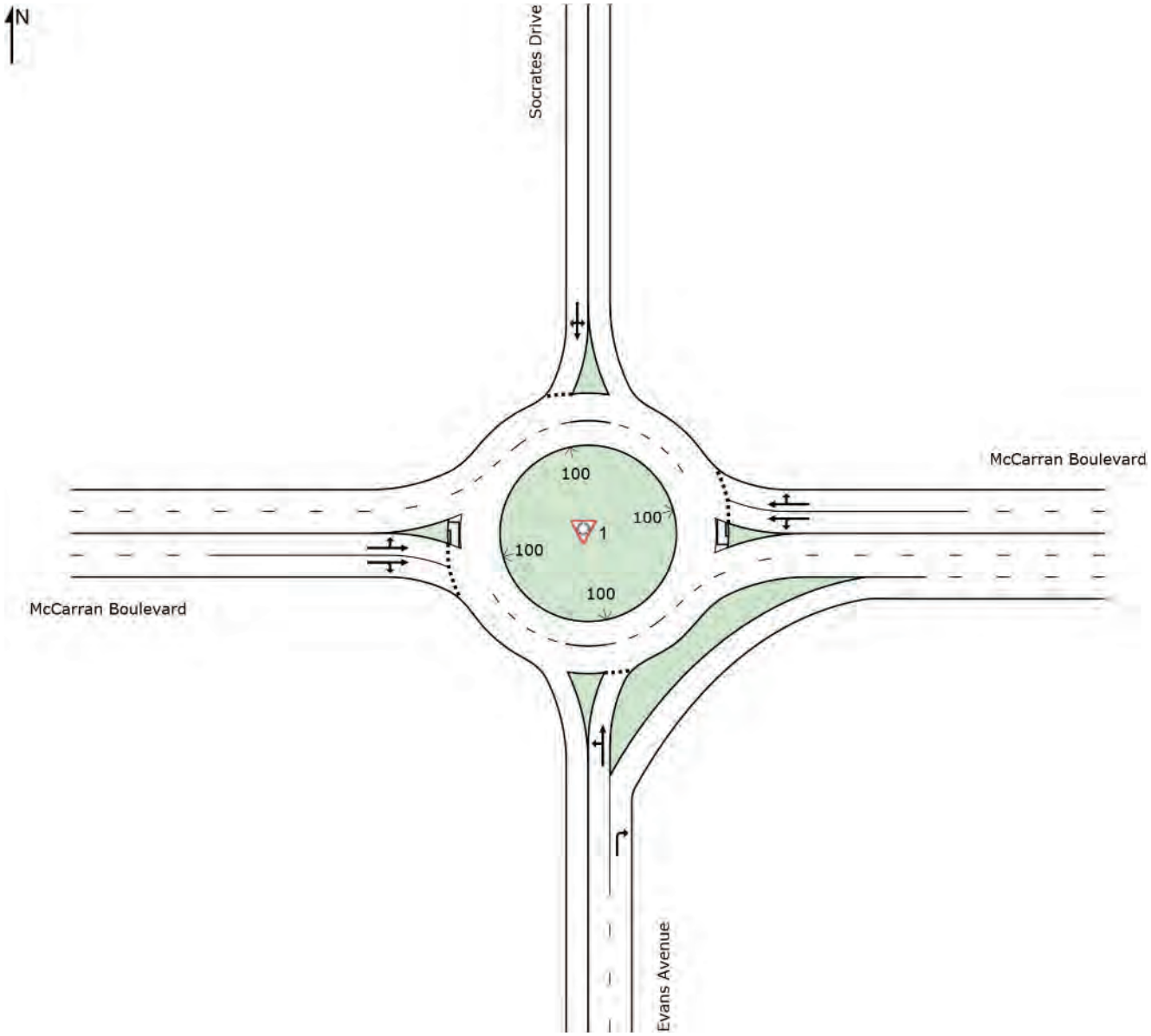
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SITE LAYOUT

Site: 1 [McCarran Boulevard & Socrates Drive/Evans Avenue]

Roundabout Alternative

Site Category: (None)
Roundabout



DELAY (CONTROL)

Average control delay per vehicle, or average pedestrian delay (seconds)

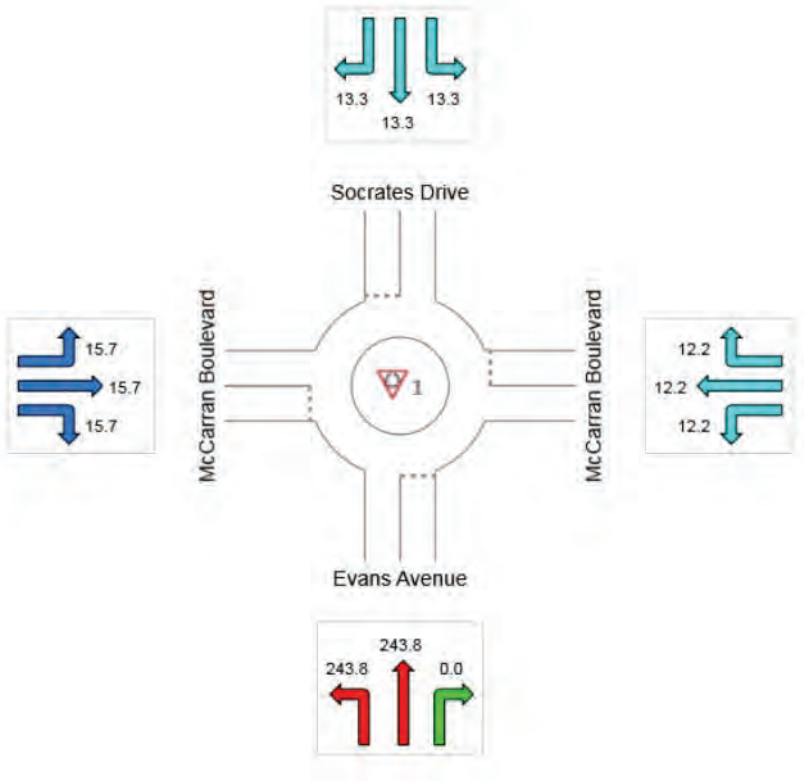
Site: 1 [McCarran Boulevard & Socrates Drive/Evans Avenue]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Delay (Control)	135.8	12.2	13.3	15.7	48.4
LOS	F	B	B	C	E



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Roundabout Level of Service Method: Same as Sign Control
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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QUEUE DISTANCE (AVER)

Average Back of Queue Distance for any lane used by vehicle movement (feet)

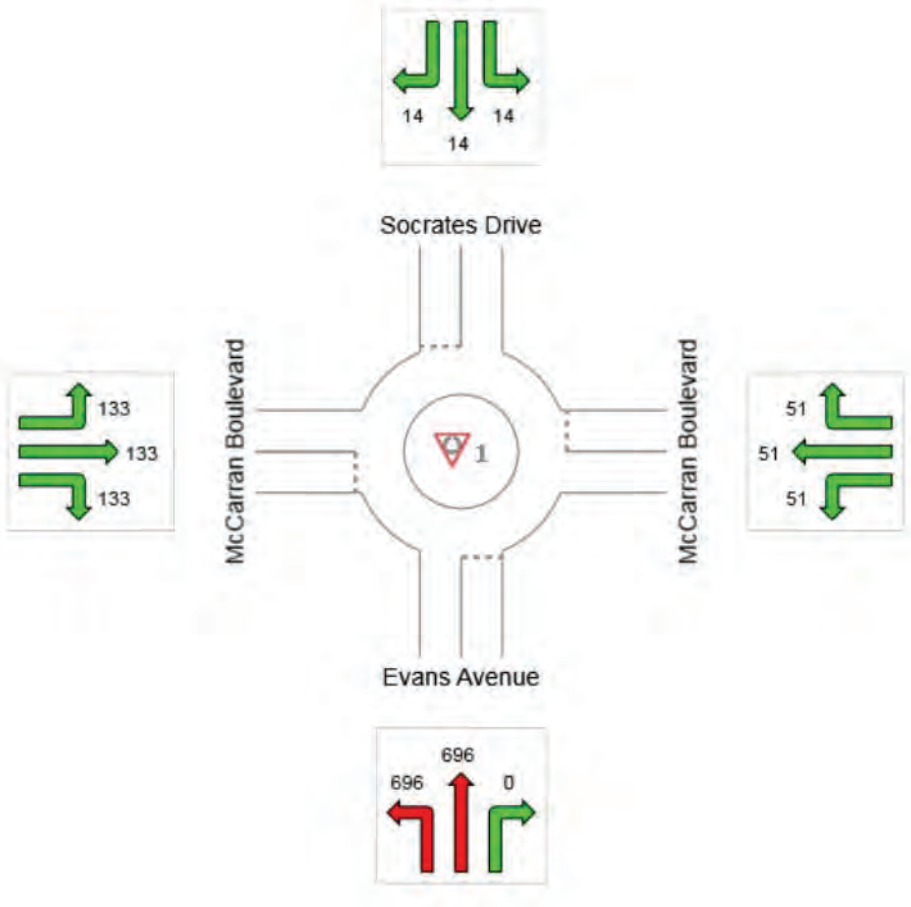
Site: 1 [McCarran Boulevard & Socrates Drive/Evans Avenue]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Queue Distance (Aver)	696	51	14	133	696



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

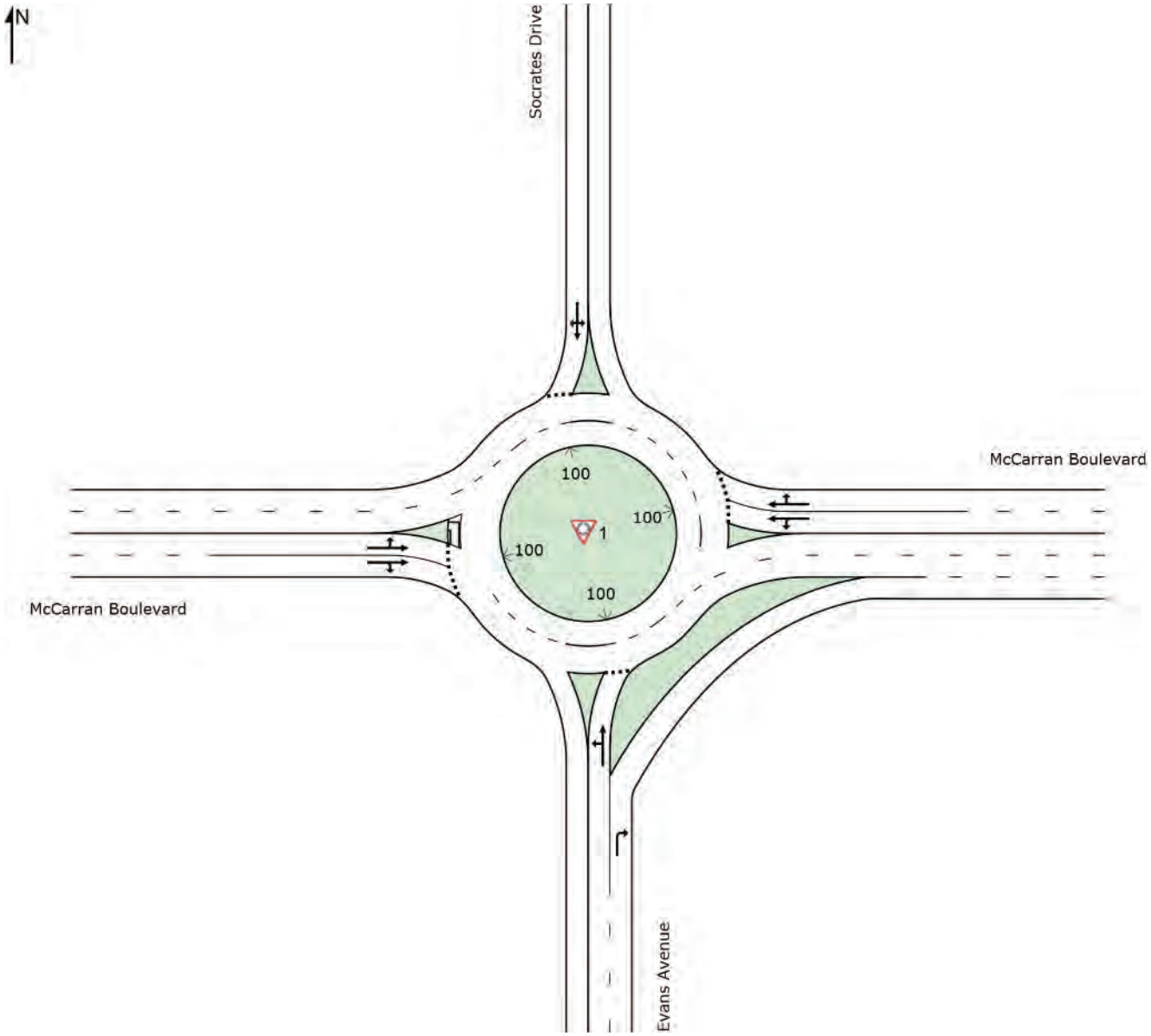
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SITE LAYOUT

Site: 1 [McCarran Boulevard & Socrates Drive/Evans Avenue]

Roundabout Alternative

Site Category: (None)
Roundabout



DELAY (CONTROL)

Average control delay per vehicle, or average pedestrian delay (seconds)

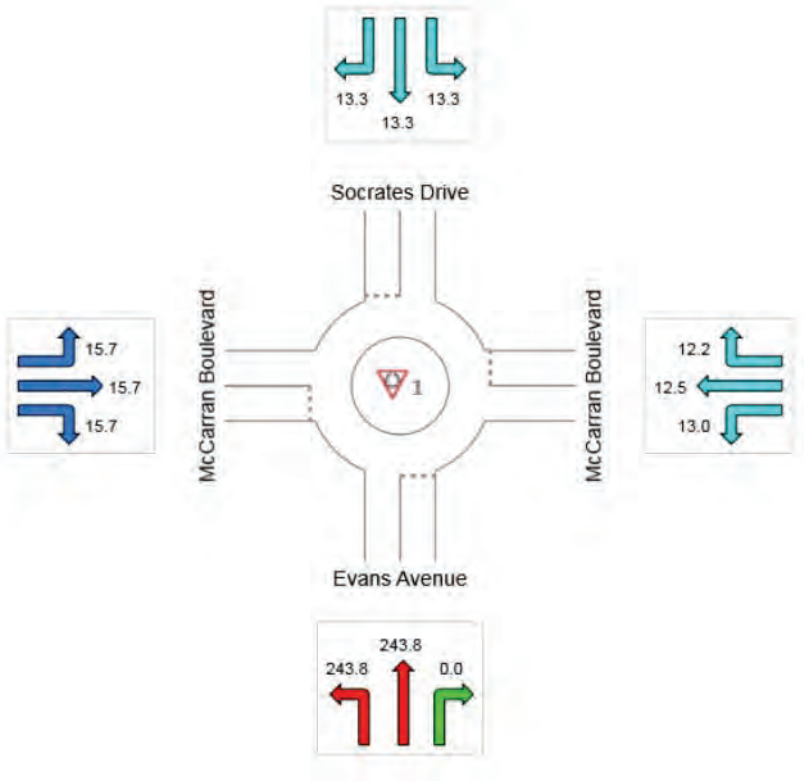
Site: 1 [McCarran Boulevard & Socrates Drive/Evans Avenue]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Delay (Control)	135.8	12.6	13.3	15.7	48.5
LOS	F	B	B	C	E



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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QUEUE DISTANCE (AVER)

Average Back of Queue Distance for any lane used by vehicle movement (feet)

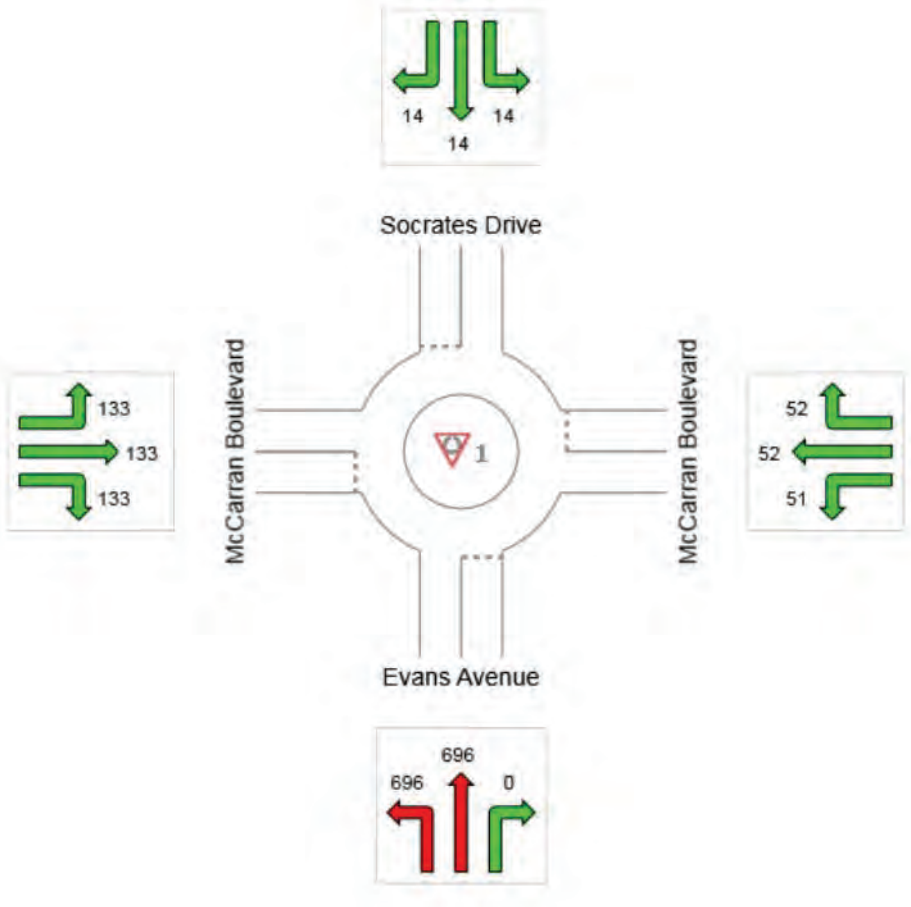
Site: 1 [McCarran Boulevard & Socrates Drive/Evans Avenue]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Queue Distance (Aver)	696	52	14	133	696



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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Sutro Street

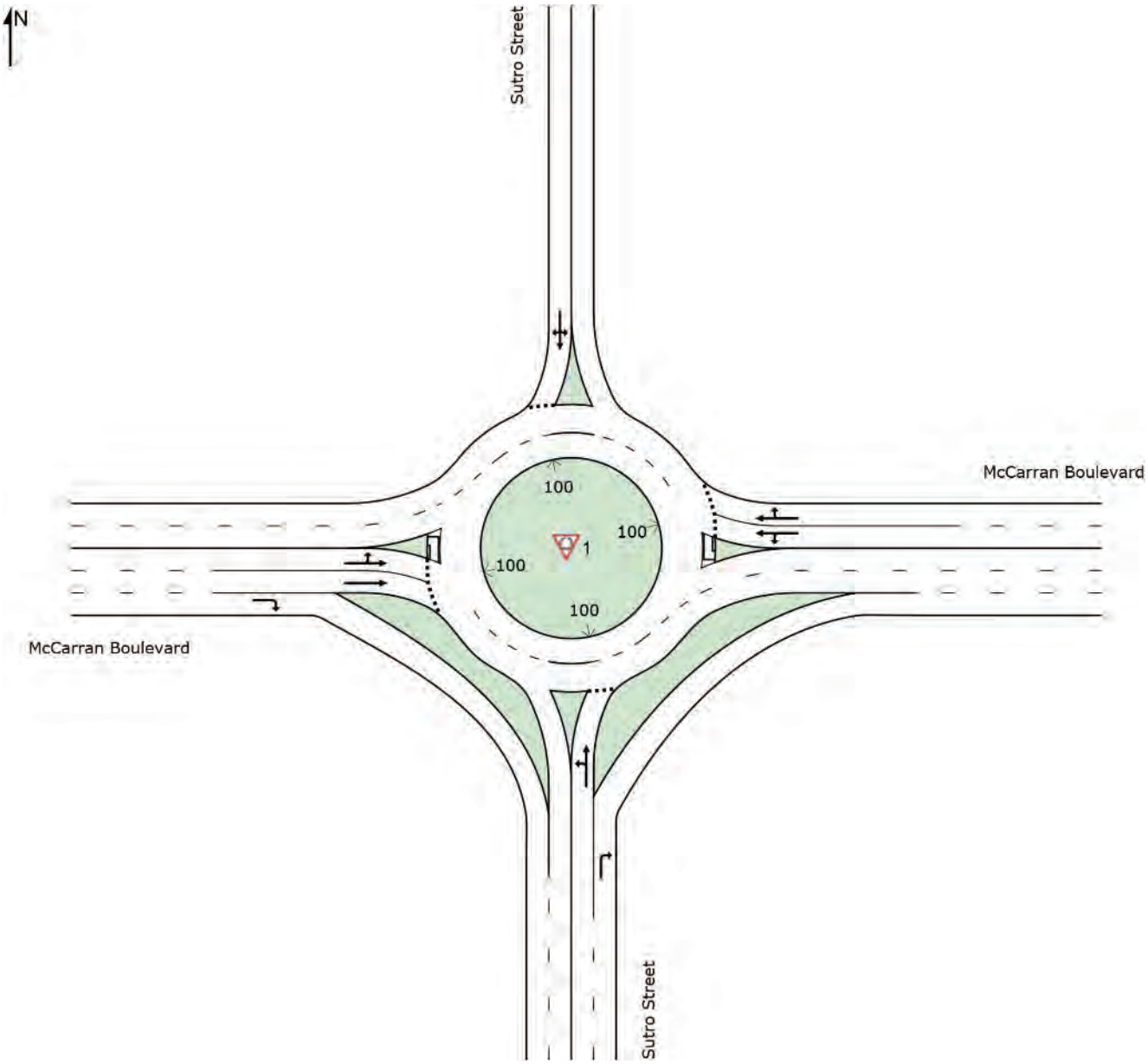
- ***Layout***
- ***AM – Delay & Queue***
- ***PM – Delay & Queue***

SITE LAYOUT

Site: 1 [McCarran Boulevard & Sutro Street]

Roundabout Alternative

Site Category: (None)
Roundabout



DELAY (CONTROL)

Average control delay per vehicle, or average pedestrian delay (seconds)

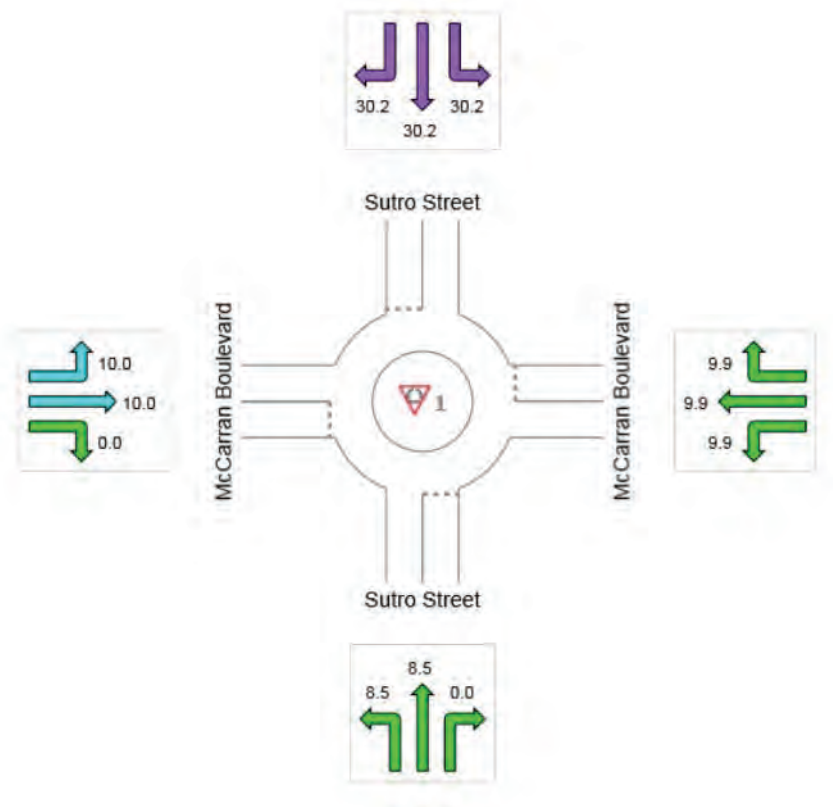
Site: 1 [McCarran Boulevard & Sutro Street]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Delay (Control)	3.5	9.9	30.2	7.3	10.6
LOS	A	A	D	A	B



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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QUEUE DISTANCE (AVER)

Average Back of Queue Distance for any lane used by vehicle movement (feet)

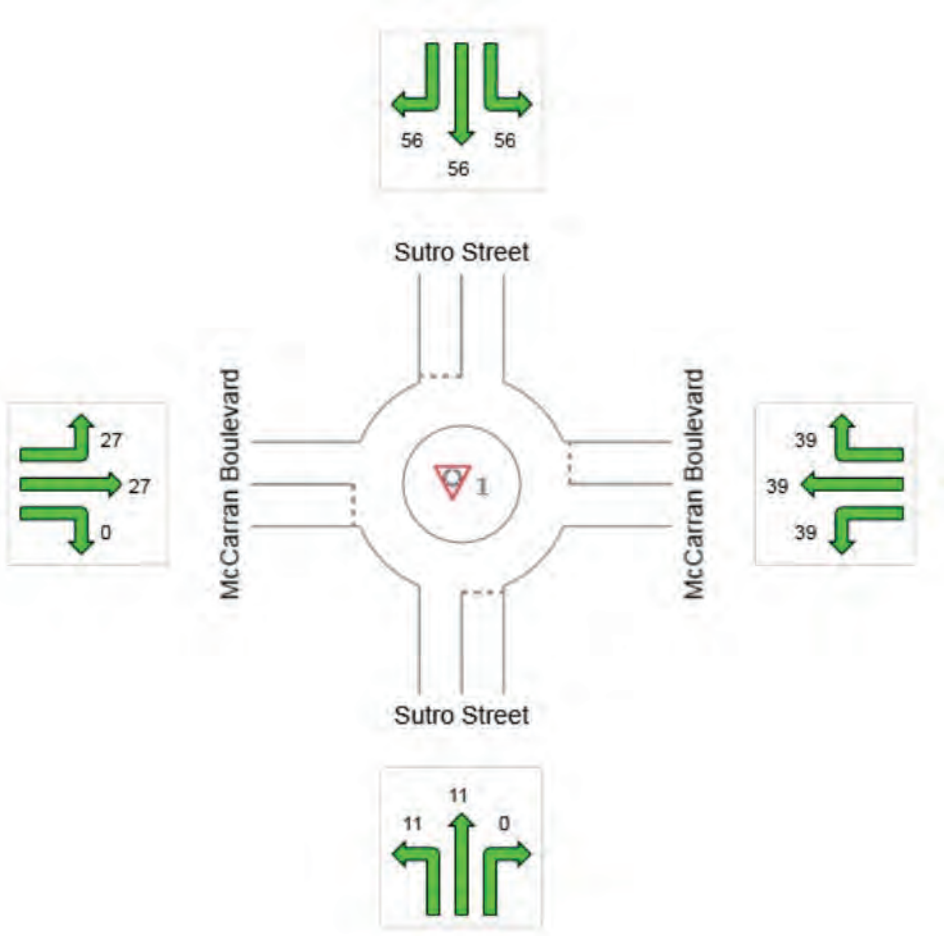
Site: 1 [McCarran Boulevard & Sutro Street]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Queue Distance (Aver)	11	39	56	27	56



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

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DELAY (CONTROL)

Average control delay per vehicle, or average pedestrian delay (seconds)

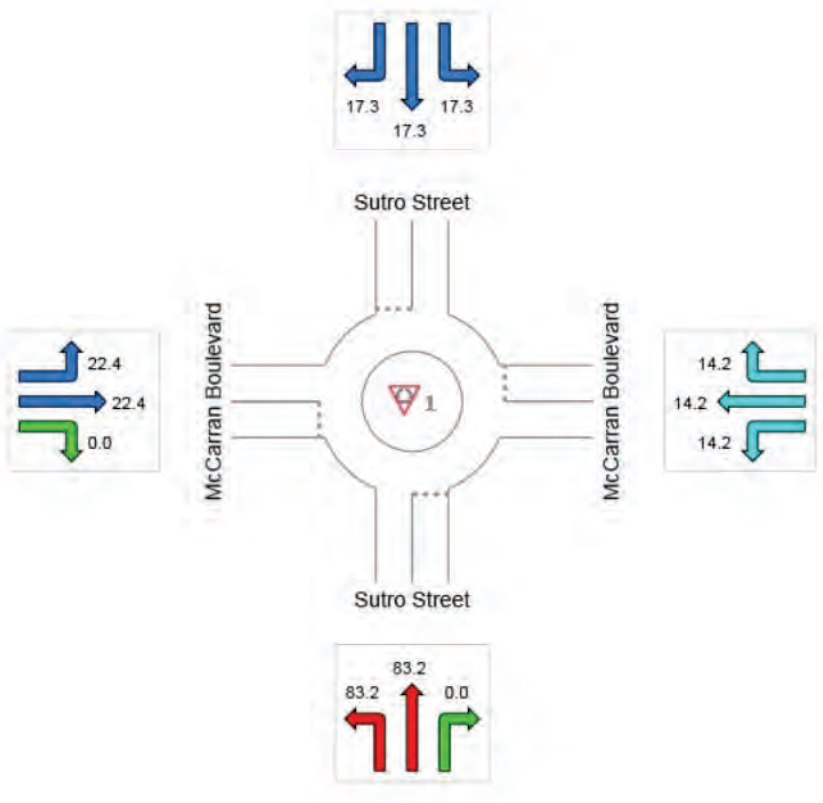
Site: 1 [McCarran Boulevard & Sutro Street]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Delay (Control)	35.3	14.2	17.3	20.6	21.5
LOS	E	B	C	C	C



Colour code based on Level of Service

LOS A | LOS B | LOS C | LOS D | LOS E | LOS F

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
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QUEUE DISTANCE (AVER)

Average Back of Queue Distance for any lane used by vehicle movement (feet)

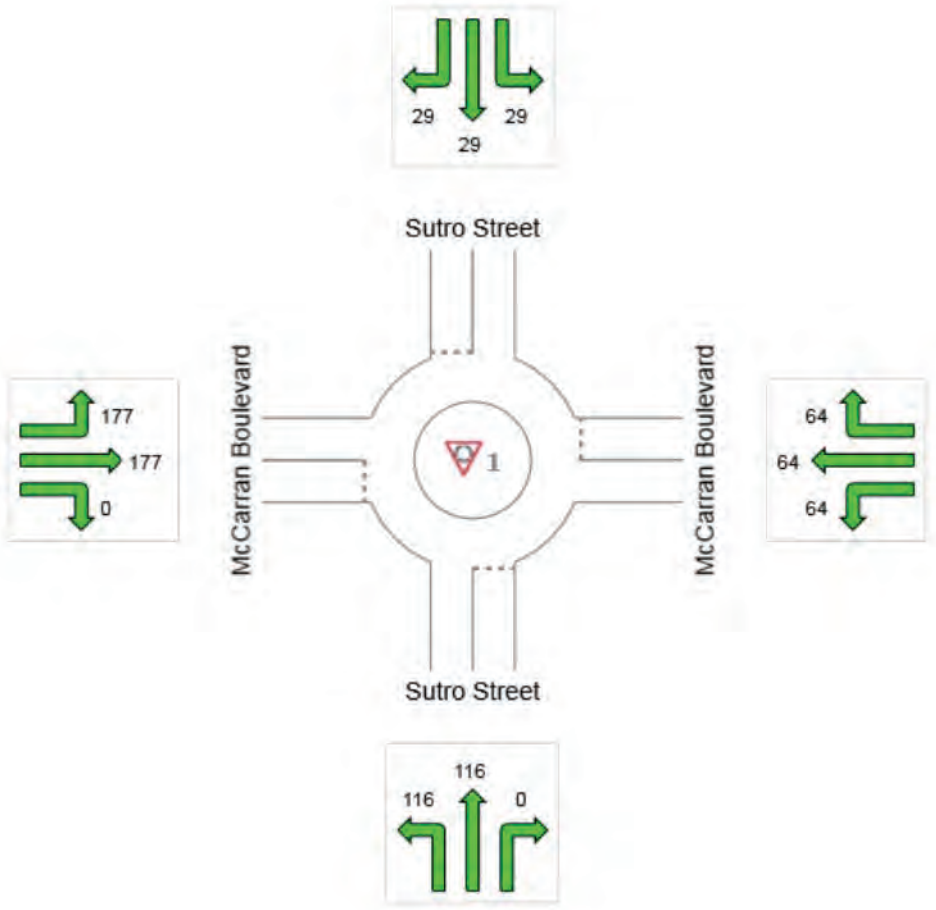
Site: 1 [McCarran Boulevard & Sutro Street]

Roundabout Alternative

Site Category: (None)
Roundabout

All Movement Classes

	Approaches				Intersection
	South	East	North	West	
Queue Distance (Aver)	116	64	29	177	177



Colour code based on Queue Storage Ratio

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 1.0] [> 1.0]

Appendix L
TAC Meetings



Technical Advisory Committee Meeting #1

September 4, 2018

WOOD RODGERS

NEVADA DOT
SAFE AND CONNECTED

Agenda

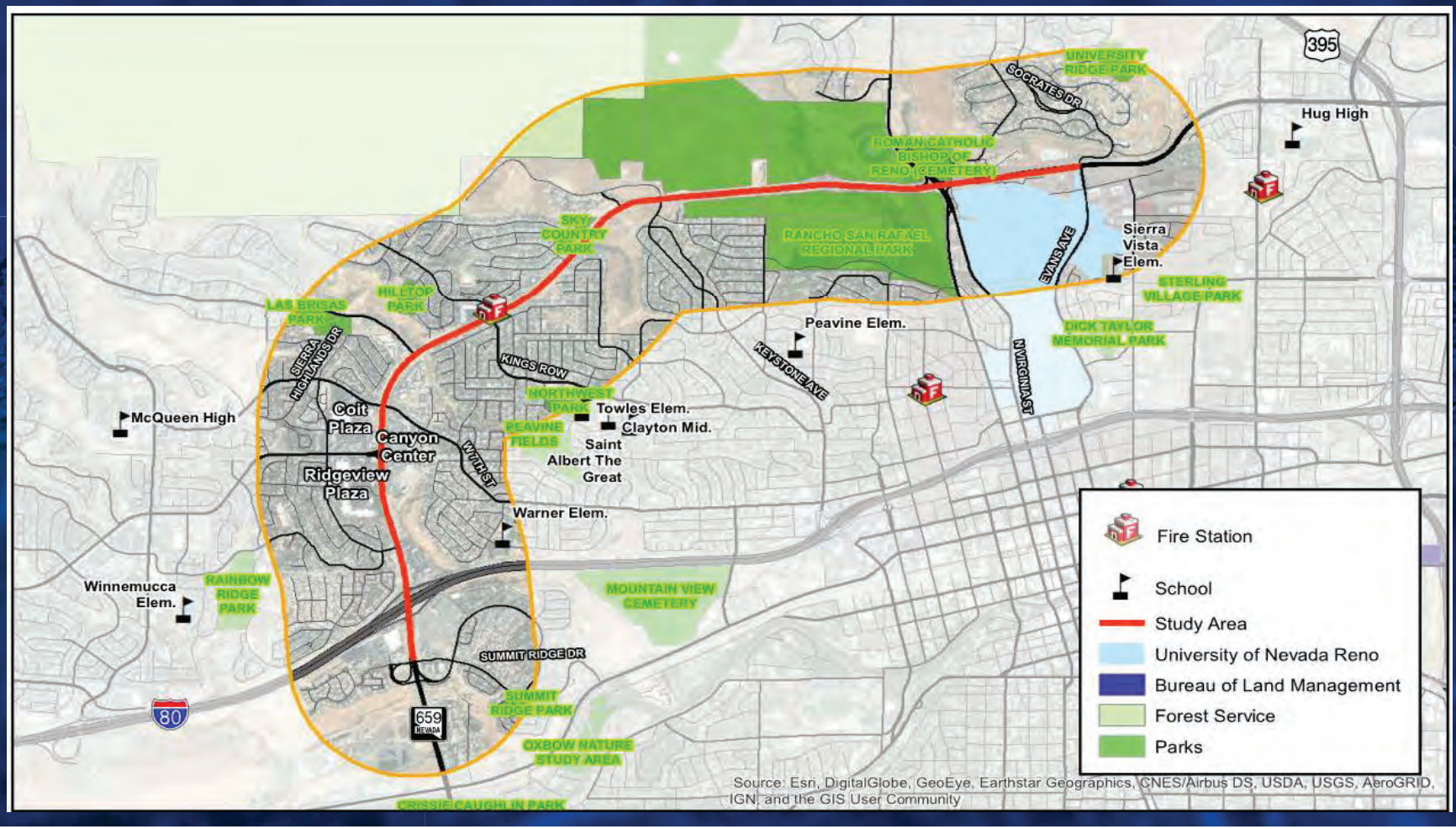
- Introductions
- What is a SMP?
- Study Area
- Existing Conditions
- Crash Analysis
- Sample Recommendations
- Projects & Plans
- SMP Schedule
- Adjourn

What is a Safety Management Plan?

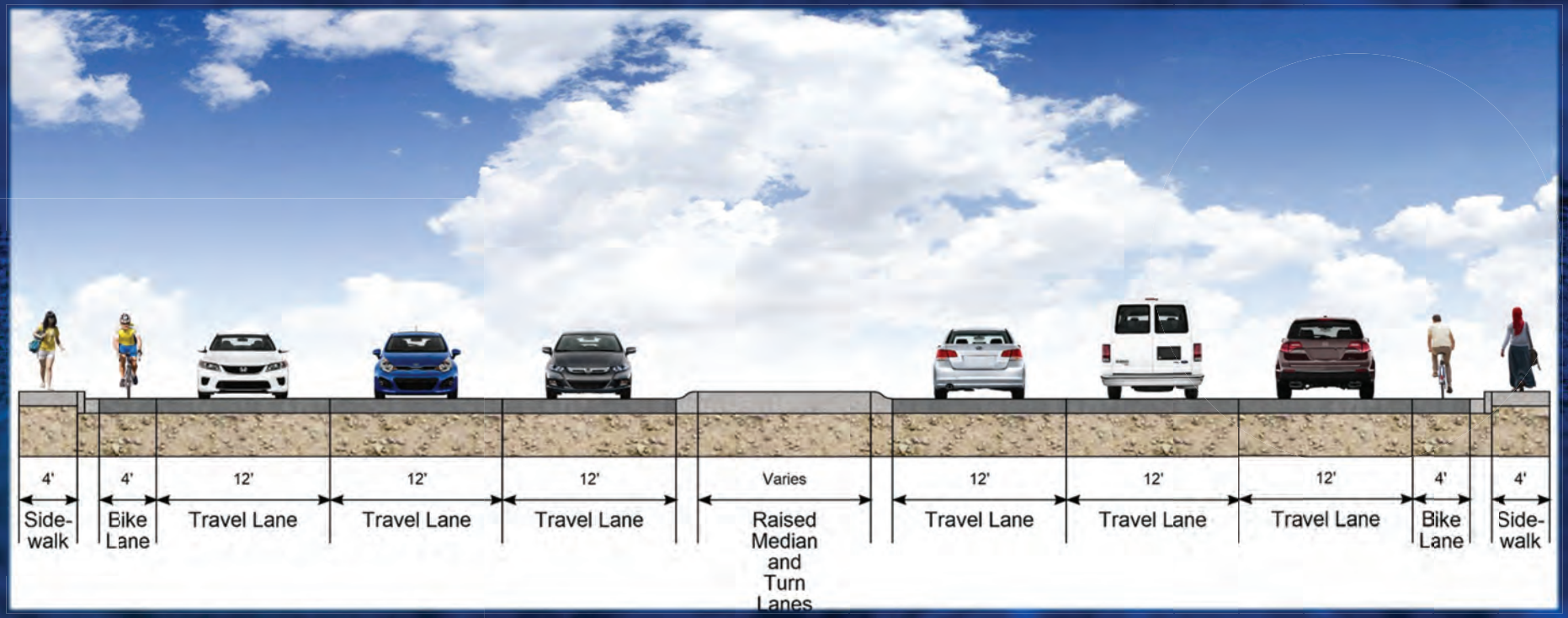
- Corridor Study Focused on Safety over Traffic Operations/Capacity Analysis
- Incorporates Highway Safety Manual Methodologies
  - Crash Reduction
  - IHSDM
  - Prioritization
- SMP ≠ RSA
- Final Product is a Planning Document



Study Area

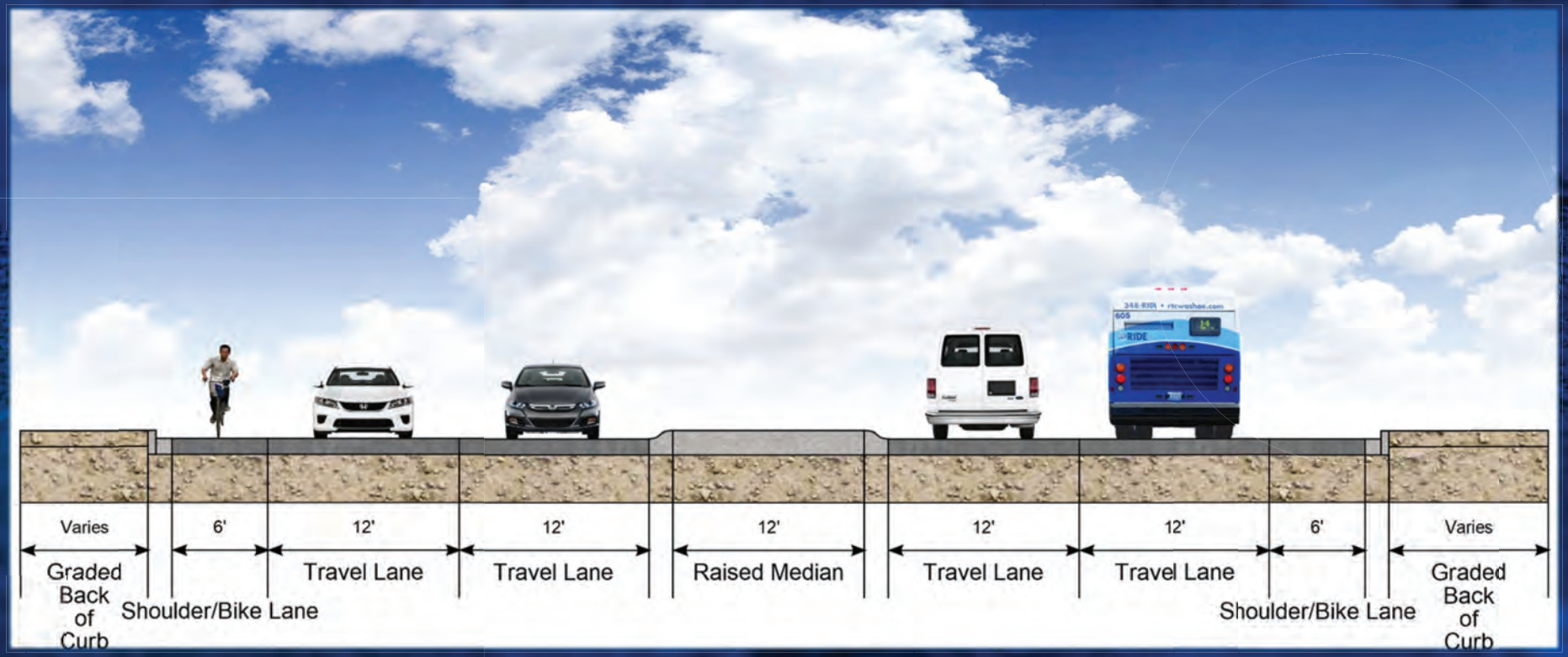

395
UNIVERSITY RIDGE PARK
SOCRATES DR
Hug High
ROMAN CATHOLIC BISHOP OF RENO CEMETERY
SKY COUNTRY PARK
RANCHO SAN RAFAEL REGIONAL PARK
EVANS AVE
Sierra Vista Elem.
STERLING VILLAGE PARK
HILLTOP PARK
LAS BRISAS PARK
SIERRA HIGHLANDS DR
KINGS ROW
Peavine Elem.
KEYSTONE AVE
N VIRGINIA ST
DICK TAYLOR MEMORIAL PARK
NORTHWEST PARK
Towles Elem.
Clayton Mid.
PEAVINE FIELDS
Saint Albert The Great
McQueen High
Coit Plaza
Canyon Center
Ridgeview Plaza
WITHST
Warner Elem.
Winnemucca Elem.
RAINBOW RIDGE PARK
MOUNTAIN VIEW CEMETERY
SUMMIT RIDGE DR
SUMMIT RIDGE PARK
80
659 NEVADA
OXBOW NATURE STUDY AREA
CRISSIE CAUGHLIN PARK
Fire Station
School
Study Area
University of Nevada Reno
Bureau of Land Management
Forest Service
Parks
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Existing McCarran Blvd.



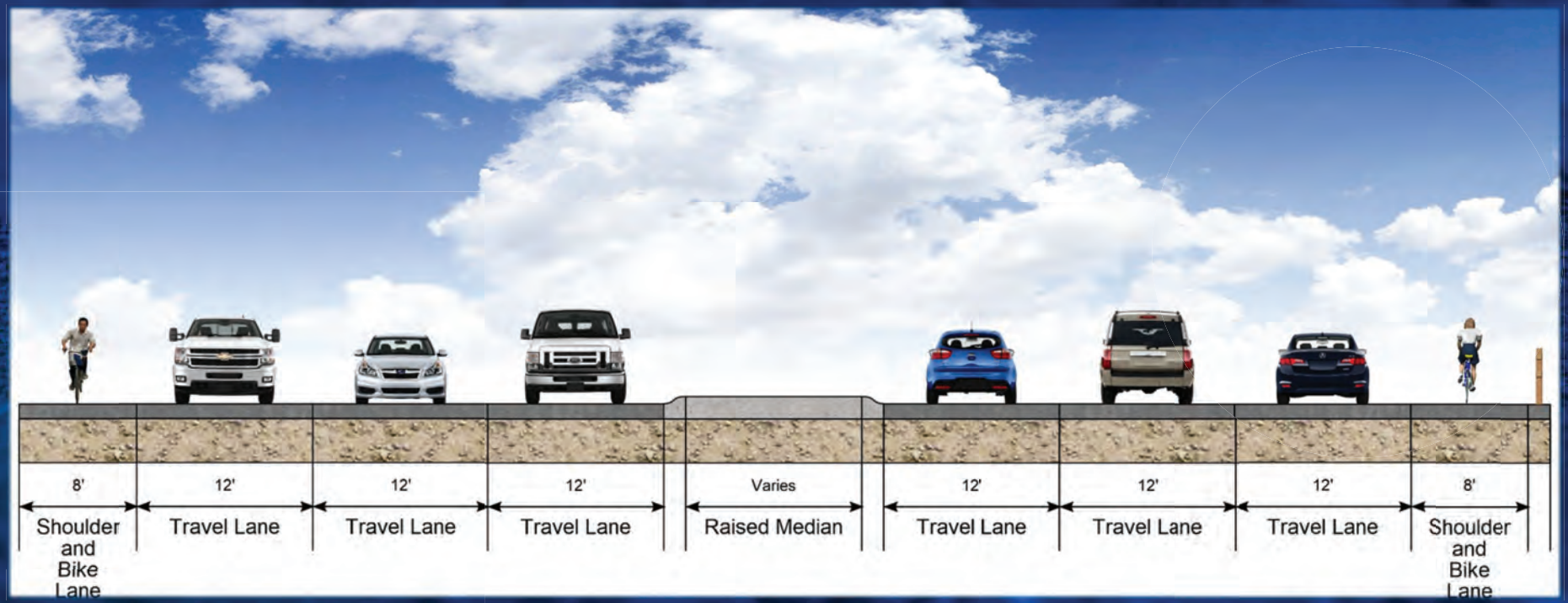
I-80 to N. of W 7th St.

Existing McCarran Blvd.



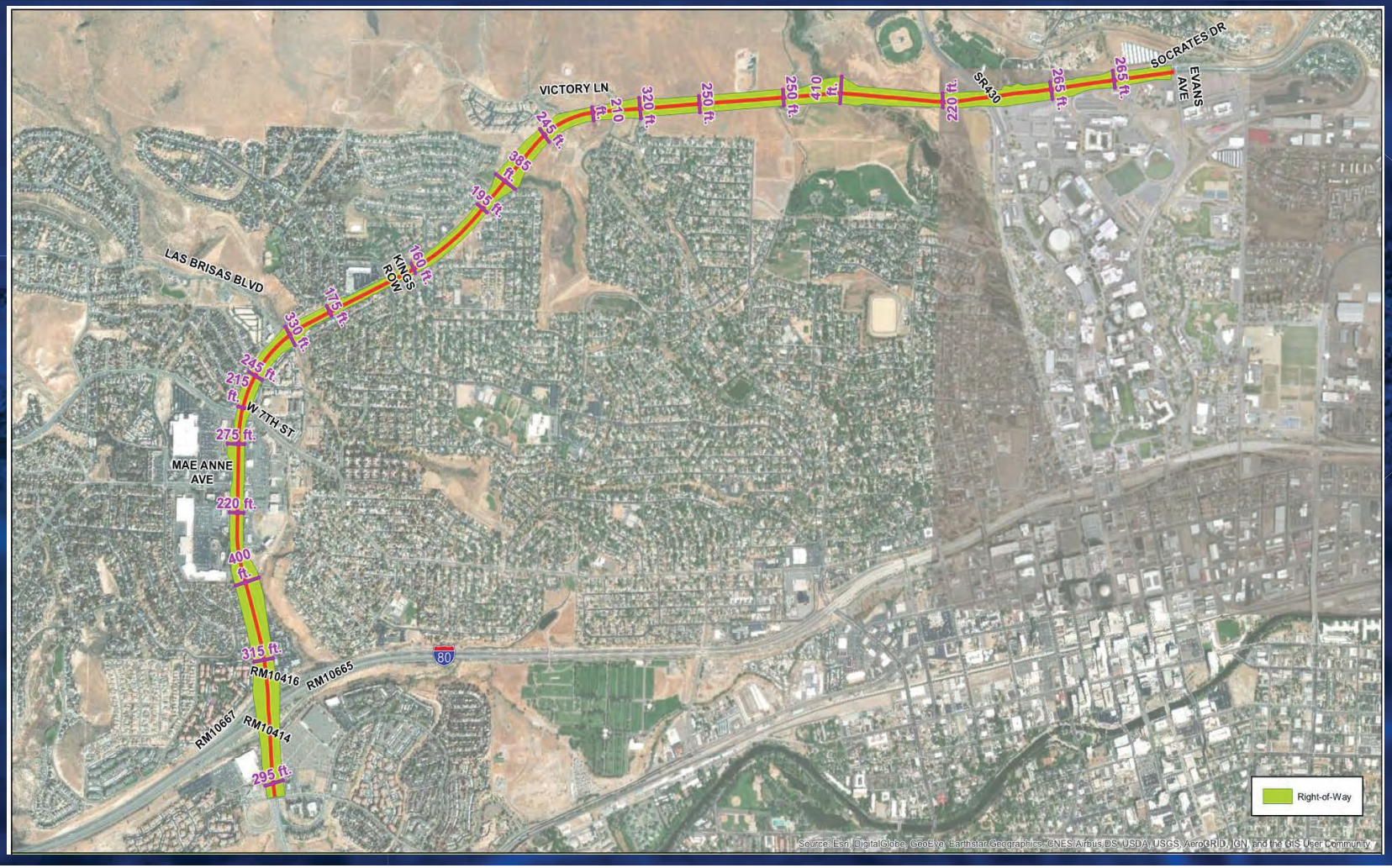
N. of W 7th St. to N. Virginia St.

Existing McCarran Blvd.

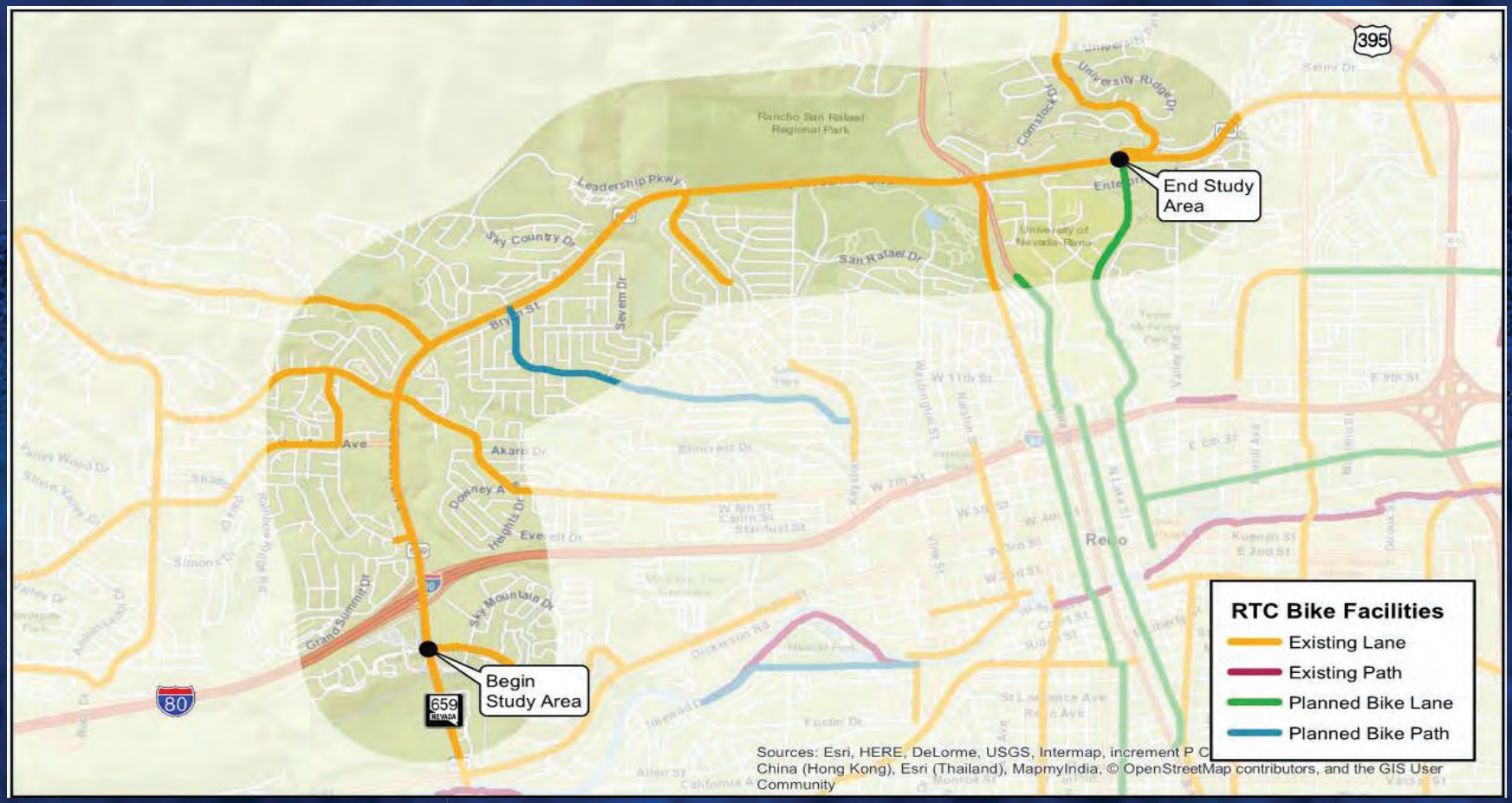


N. Virginia St. to Evans Ave.

Existing Right-of-Way



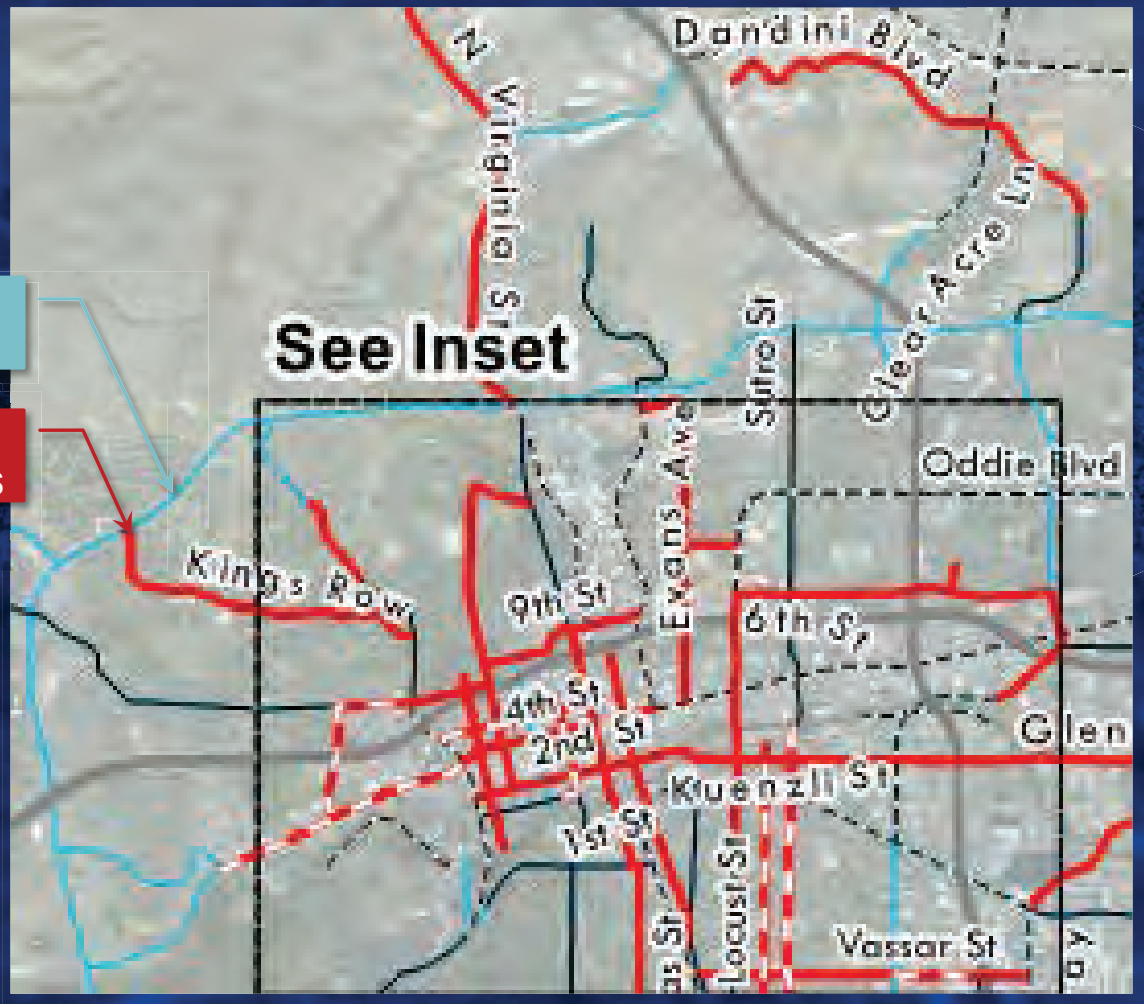
Bicycle Facilities Map



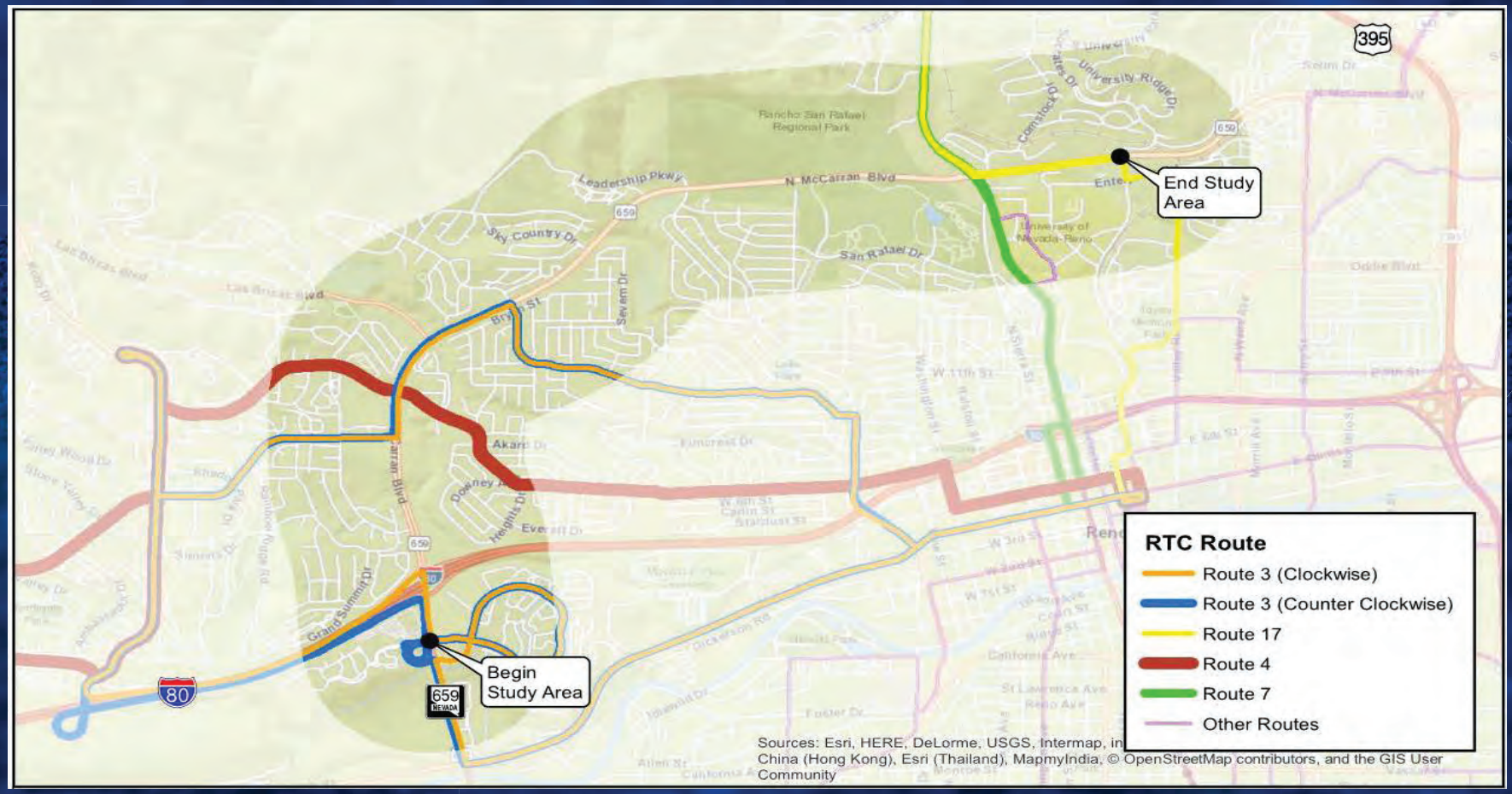
Complete Streets Master Plan

McCarran Blvd.

Proposed Complete Streets



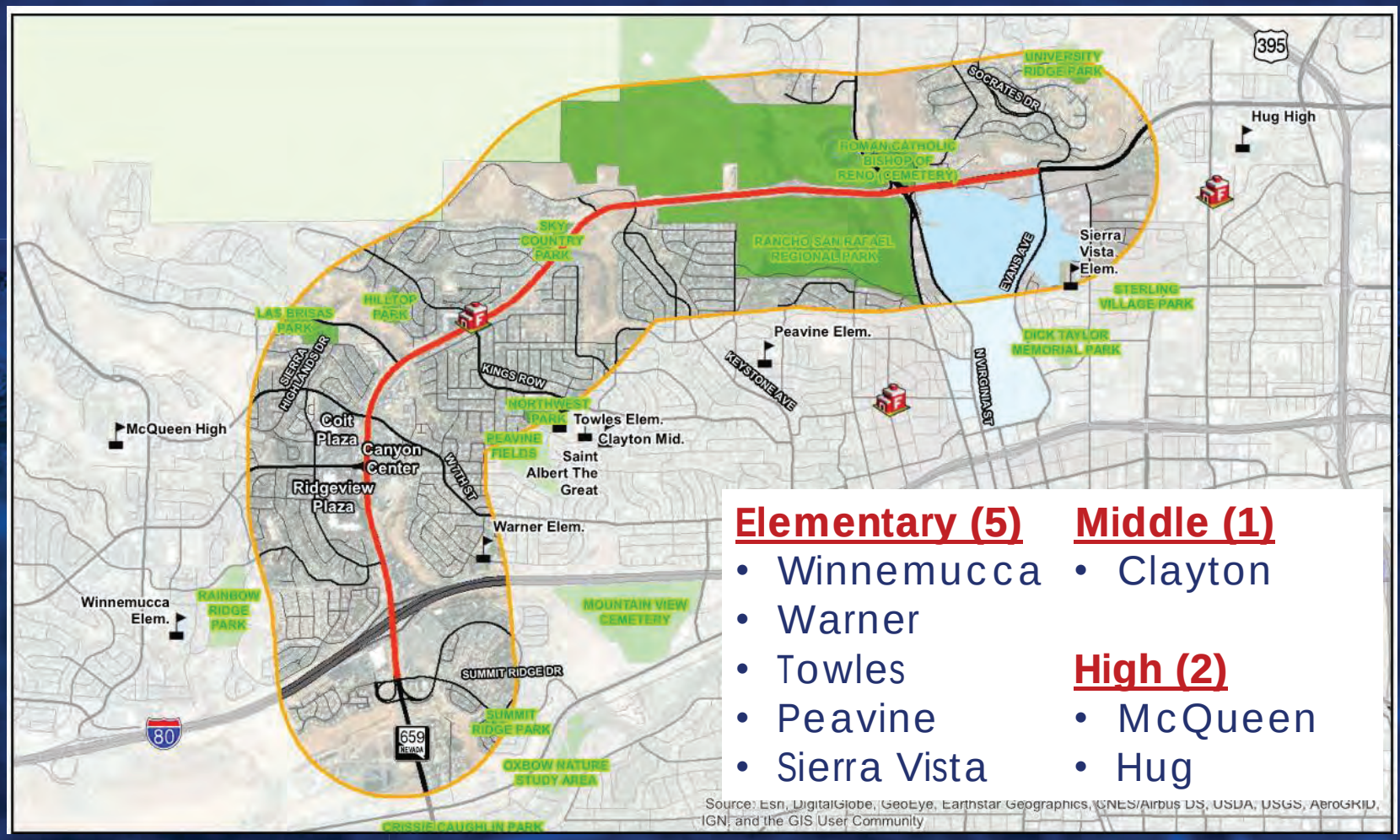
Transit Routes


End Study Area
Begin Study Area
RTC Route
Route 3 (Clockwise)
Route 3 (Counter Clockwise)
Route 17
Route 4
Route 7
Other Routes
Sources: Esri, HERE, DeLorme, USGS, Intermap, in
China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
395
80
659
N McCarran Blvd
Leadership Pkwy
Sky Country Dr
San Rafael Dr
Rancho San Rafael Regional Park
University of Nevada-Reno
Las Brisas Blvd
Arlington Ave
Virginia St
Kietzke Ln
Terminal Way
Grand Summit Dr
Akari Dr
Downey Dr
Heights Dr
Everett Dr
Sierra Dr
Sutro St
Lake St
Ralston St
Washington St
Fuller Dr
Idlewild Dr
Allen St
Monroe St
Vassar St
Reno Ave
California Ave
St Lawrence Ave
Cricket Field
Idlewild Park
Mayor's Park
Fuji Park
Moana Pool
Evelyn Mount Park
Whitaker Park
Powning Park
Manzanita Lake
Rancho San Rafael Park
Lake

2040 RTP Projects



Study Area Schools



Elementary (5)

- Winnemucca
- Warner
- Towles
- Peavine
- Sierra Vista

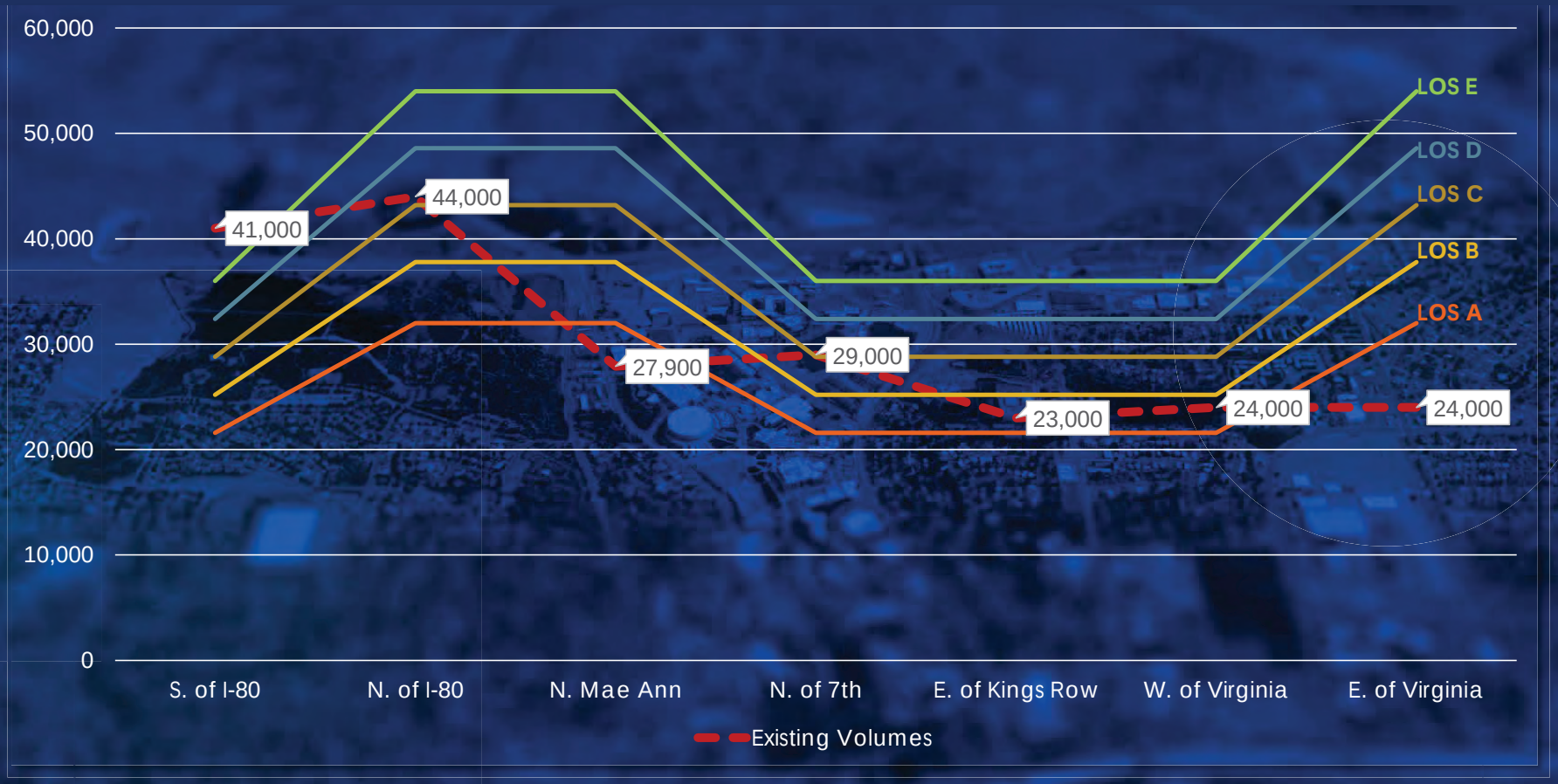
Middle (1)

- Clayton

High (2)

- McQueen
- Hug

2017 AADT


60,000
50,000
40,000
30,000
20,000
10,000
0
S. of I-80
N. of I-80
N. Mae Ann
N. of 7th
E. of Kings Row
W. of Virginia
E. of Virginia
LOS E
LOS D
LOS C
LOS B
LOS A
41,000
44,000
27,900
29,000
23,000
24,000
24,000
Existing Volumes

Planned Traffic Counts

24-Hour Classification Counts

- 15-Minute Intervals
- Vehicular, Motorcycle, Pedestrian, Bicycle, Wheelchair

McCarran Locations

- Mae Ann Ave.
- W 7th St.
- Kinds Row
- Keystone Ave.
- Virginia St.

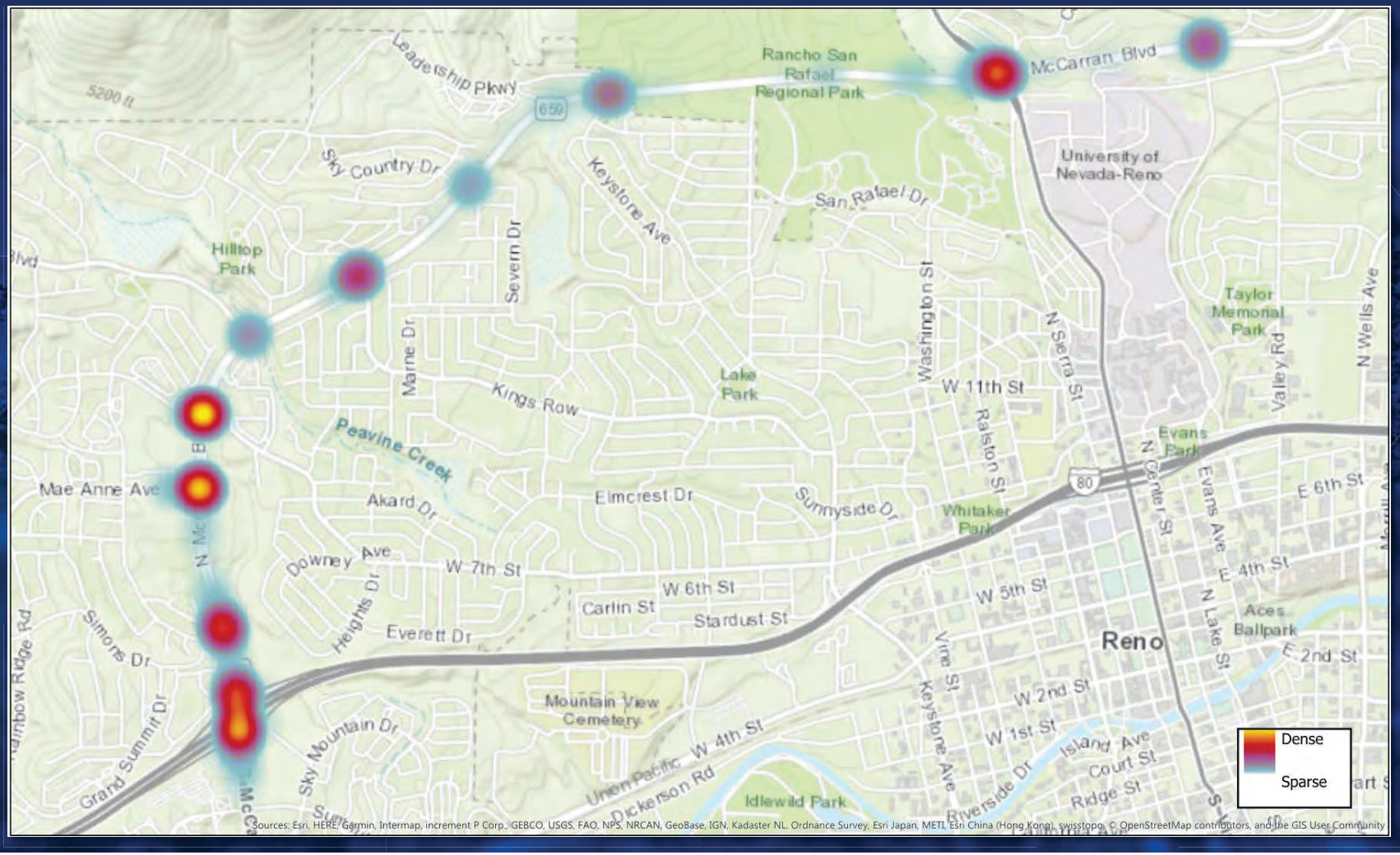
Peak Hour Traffic Counts

- 7 AM – 9 AM & 4 PM – 6 PM
- Vehicular, Motorcycle, Pedestrian, Bicycle, Wheelchair

Cross Streets

- EB I-80 Ramps
- WB I-80 Ramps
- Sierra Highlands Dr.
- Mae Anne Ave.
- W 7th St.
- Las Brisas Blvd.
- Kings Row
- Sky Country Dr.
- Victory Ln.
- Keystone Ave.
- Virginia St.
- Evans Ave/Socrates

Crash Analysis (5 Year)



Crash Analysis Takeaways

- Highest Activity at I-80 Ramps and the 6-Lane McCarran Area
- Only Fatalities at McCarran/Evans
- Multi-Modal Crashes Highest at McCarran/W 7th
- Segments Experience Far Fewer Crashes
- Speed Likely an Issue as Vehicles Approach Intersections
- Lighting also a Concern in Some Locations

Sample Recommendations

Pedestrians

- Pedestrian Signalization
- New/Widened Sidewalks
- Intersection Improvements

Bicycles

- Buffered Bike Lanes
- Multi-Use Paths
- Recreational Route Connectivity

Transit Stops

- Amenity Improvements

Roadway

- Width Reductions
- Intersection Improvements
  - Dedicated Turn-Lanes
  - Signal Optimization
- Access Management
- Speed Reduction Opportunities
- Interchange Configurations

Projects, Plans, and Studies

- 2040 Regional Transportation Plan
- Bicycle and Pedestrian Master Plan
- Complete Streets Master Plan
- ADA Transition Plan
- Keystone Avenue Corridor Study
- Virginia Street Corridor Study
- UNR Campus Master Plan
- Others?



Schedule


Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
Existing Conditions
Develop Recommendations
TAC Meetings
Public Meetings
Agency Updates
Report Preparation
Intro & Crash Summary
Alternative Analysis
Final SMP

Contacts

NDOT
Lori Campbell
lcampbell@dot.state.nv.us
775-888-7462

Wood Rodgers
Bryan Gant
bgant@woodrodgers.com
775-225-3184

TAC MEETING #1
SIGN IN SHEET

Name	Organization	Email
Dean Hitchcock	UNR Planning + Construction	dhitchcock@cnr.edu
Shaun Wang	NDOT Traffic safety Engineering	xwang@dot.nv.gov.
Bryan Harrower	Washoe County Parks (CSD)	bharrower@washoecounty.us
Lord Campbell	NDOT	
JEFF HALE	WR	
Richard M. Daievolk	NDOT DII	rdajevolk@dot.nv.gov.
KURT DIETRICH	CAR	DIETRICHK@RENO.GOV
BLAINE PETERSEN	RTC	bpetersen@rtcwashoe.com

September 4, 2018



TAC Field Review

October 25, 2018

WOOD RODGERS

NEVADA DOT
SAFE AND CONNECTED

Agenda

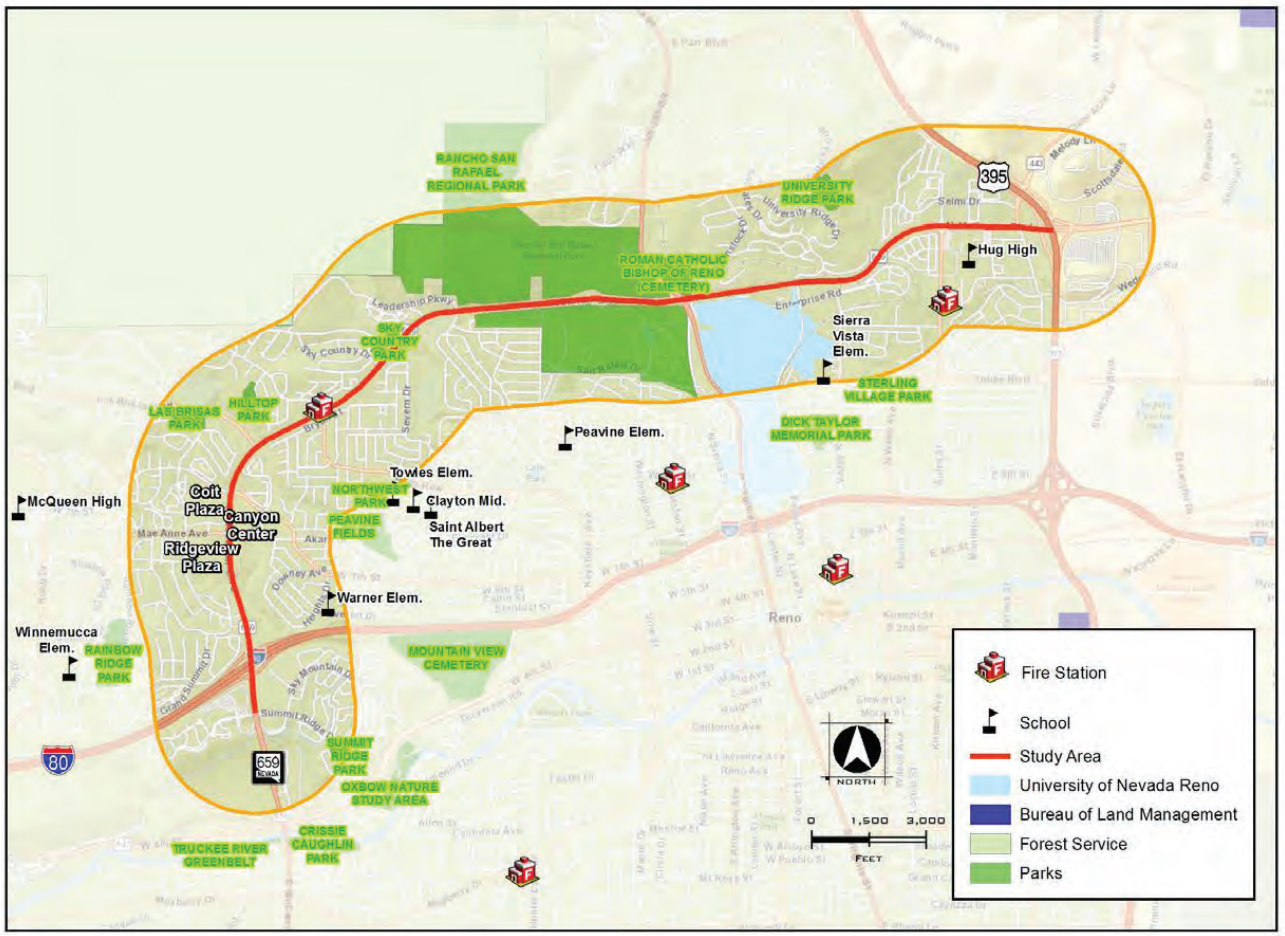
- Introductions
- What is a SMP?
- Study Area
- Existing Roadway
- Crash Analysis Overview
- Sample Recommendations
- SMP Schedule
- Field Review

What is a Safety Management Plan?

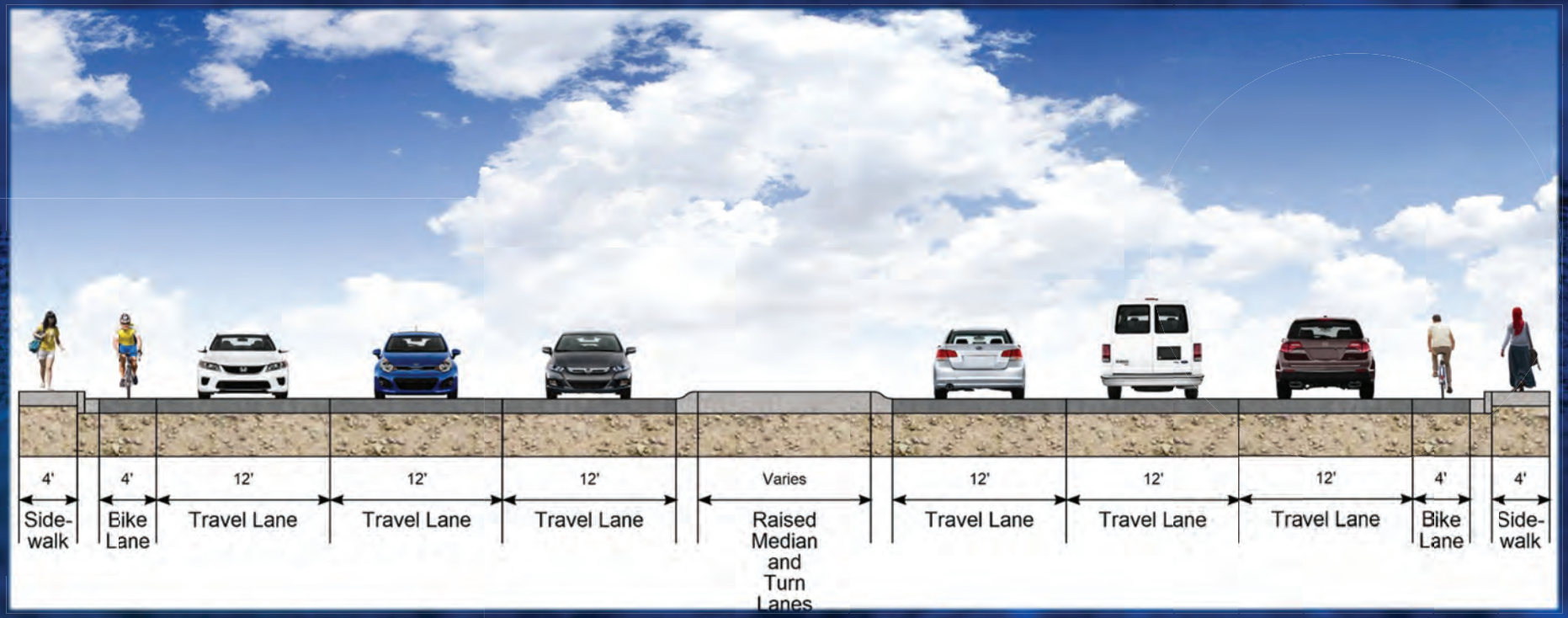
- Corridor Study Focused on Safety over Traffic Operations/Capacity Analysis
- Incorporates Highway Safety Manual Methodologies
  - Crash Reduction
  - IHSDM (Interactive Highway Safety Design Model)
  - Prioritization
- SMP Incorporates RSA Issues/Recommendations
- Final Product is a Planning Document



Study Area

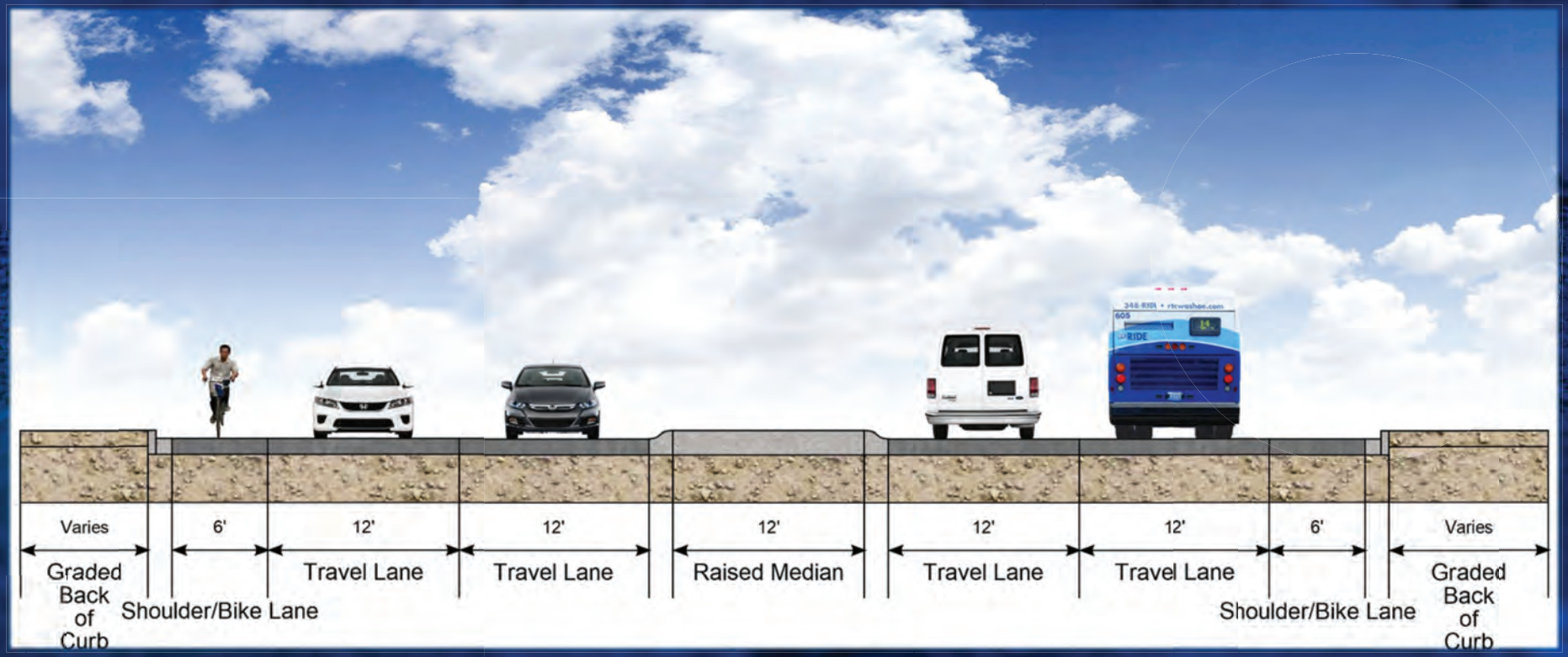

RANCHO SAN RAFAEL REGIONAL PARK
UNIVERSITY RIDGE PARK
ROMAN CATHOLIC BISHOP OF RENO (CEMETERY)
Hug High
Sierra Vista Elem.
STERLING VILLAGE PARK
DICK TAYLOR MEMORIAL PARK
SKY COUNTRY PARK
LAS BRISAS PARK
HILLTOP PARK
Peavine Elem.
Towles Elem.
NORTHWEST PARK
Clayton Mid.
Saint Albert The Great
PEAVINE FIELDS
McQueen High
Coit Plaza
Canyon Center
Ridgeview Plaza
Warner Elem.
Winnemucca Elem.
RAINBOW RIDGE PARK
MOUNTAIN VIEW CEMETERY
SUMMIT RIDGE PARK
OXBOW NATURE STUDY AREA
CRISSIE CAUGHLIN PARK
TRUCKEE RIVER GREENBELT
Reno
395
80
659
NORTH
0 1,500 3,000
FEET
Fire Station
School
Study Area
University of Nevada Reno
Bureau of Land Management
Forest Service
Parks

Existing McCarran Blvd.



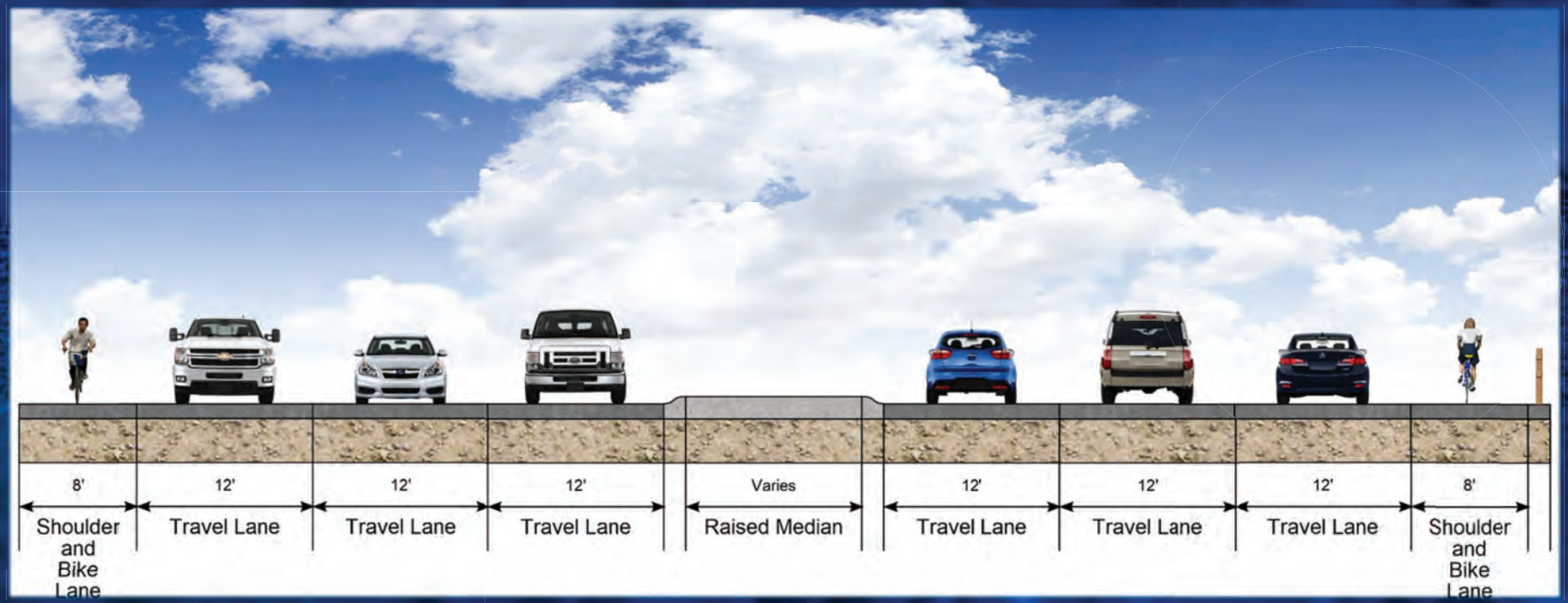
I-80 to N. of W 7th St.

Existing McCarran Blvd.



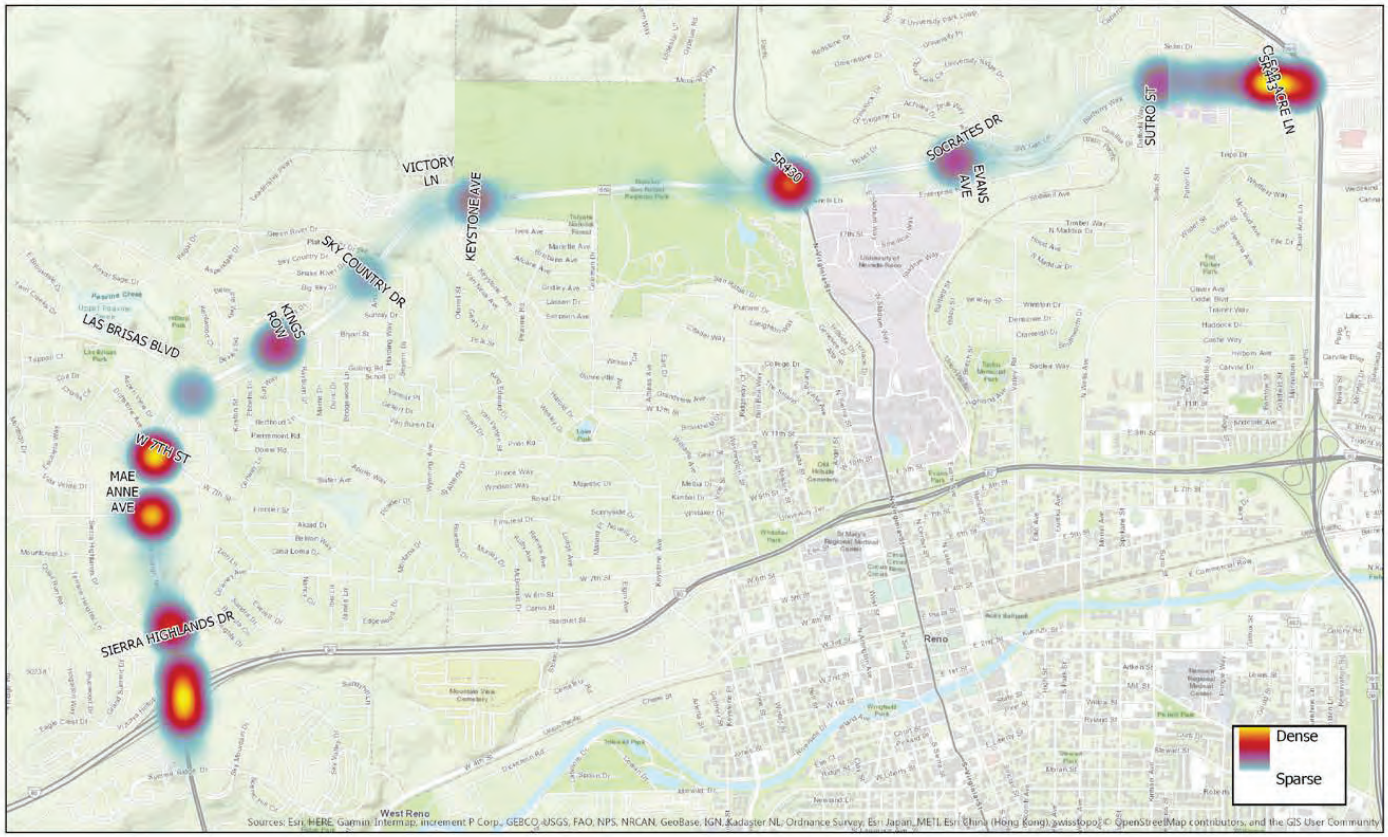
N. of W 7th St. to N. Virginia St.

Existing McCarran Blvd.



N. Virginia St. to Evans Ave.

Crash Analysis (5 Year)



Crash Analysis Takeaways

- Highest Activity at I-80 Ramps and the 6-Lane McCarran Area
- Only Fatalities at McCarran/Evans
- Multi-Modal Crashes Highest at McCarran/W 7th
- Segments Experience Far Fewer Crashes
- Speed Likely an Issue as Vehicles Approach Intersections
- Lighting also a Concern in Some Locations

Sample Recommendations

Pedestrians

- Pedestrian Signalization
- New/Widened Sidewalks
- Intersection Improvements

Bicycles

- Buffered Bike Lanes
- Multi-Use Paths
- Recreational Route Connectivity

Transit Stops

- Amenity Improvements

Roadway

- Width Reductions
- Intersection Improvements
  - Dedicated Turn-Lanes
  - Signal Optimization
- Access Management
- Speed Reduction Opportunities
- Interchange Configurations

Schedule


Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
Existing Conditions
Develop Recommendations
TAC Meetings
Public Meetings
Agency Updates
Report Preparation
Intro & Crash Summary
Alternative Analysis
Final SMP

Field Review

- Will Drive the Corridor and Stop at Intersections and Locations of Interest
- Meant to Help Capture Existing Issues
- Focus on “Big Picture” Deficiencies and Safety Concerns
- If You See Something, Please Write it Down!
- We Will Ride the Corridor Again at Dusk (optional)



Field Review Focus Areas

G.O.R.E.

Geometry

- Horizontal Curves
- Vertical Curves
- Sight Distance
- Roadway Layout

Operations

- Signal Phasing/Timing
- Pedestrian Timing
- Queuing
- Weaving

Field Review Focus Areas

G.O.R.E.

Road Users

- Bicycle Facilities
- Pedestrian Areas
- Transit Amenities
- Mode Transfers

Environment

- Glare and Lighting
- Snow Conditions
- Blowing Dust
- Adjacent Uses

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TAC FIELD REVIEW
SIGN IN SHEET

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Lori		

October 25, 2018

TAC FIELD REVIEW
SIGN IN SHEET

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October 25, 2018



TAC Meeting #2

December 18, 2018

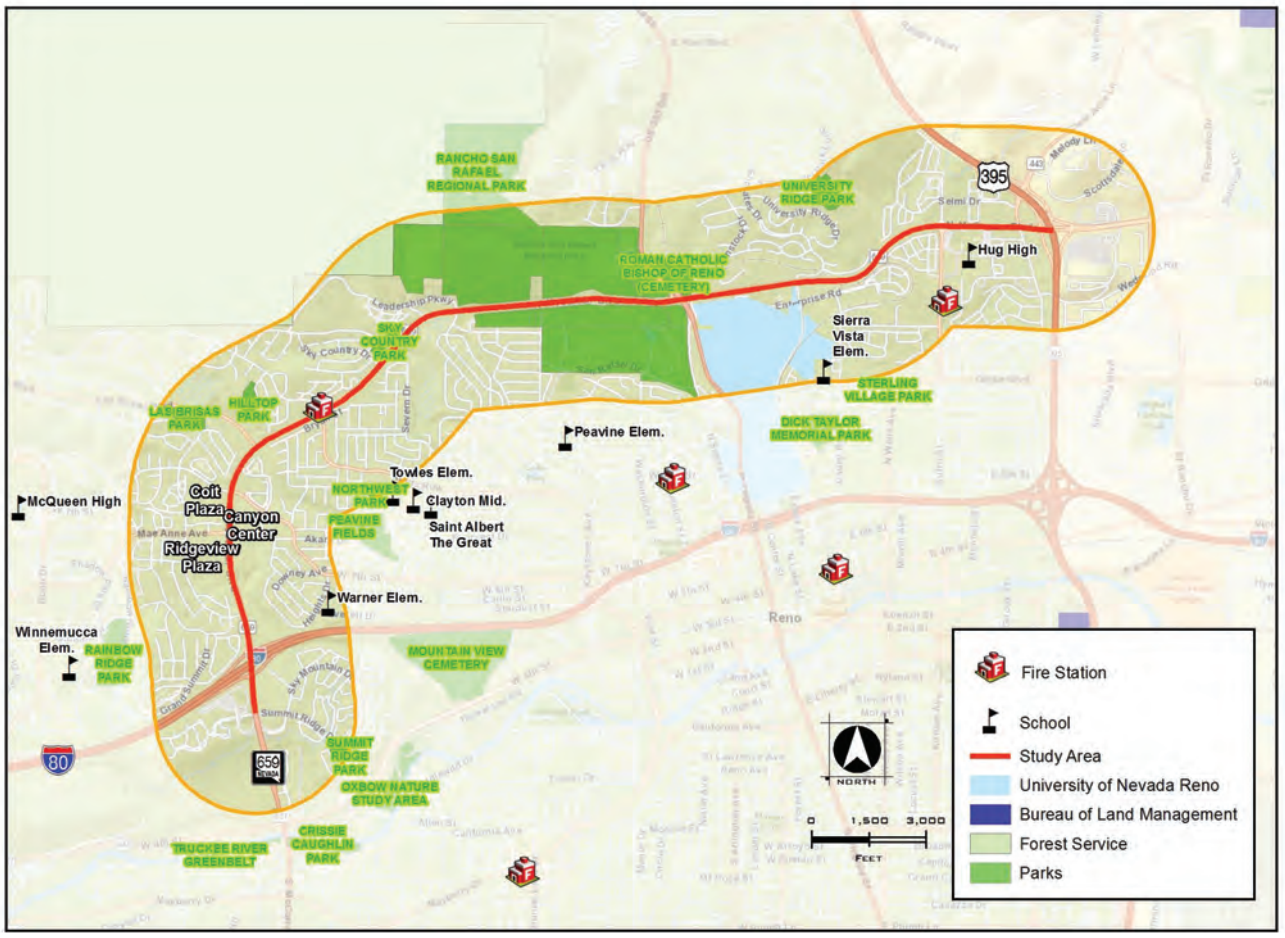
WOOD RODGERS

NEVADA DOT
SAFE AND CONNECTED

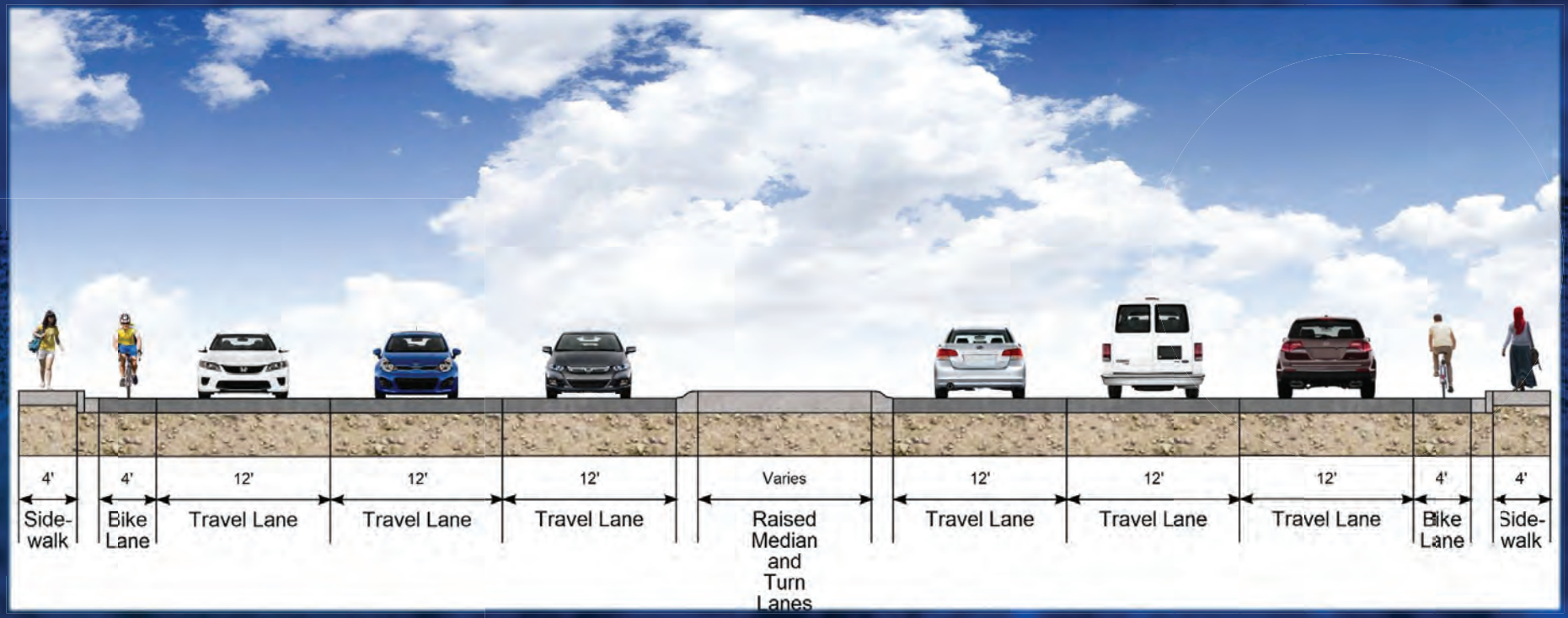
Agenda

- Introductions & Corridor Overview
- Corridor Crash and Existing Traffic Operations Update
- Road Safety Assessment Review
- Road Safety Assessment Recommendations
- Alternatives Analysis Focus Areas
- Next Steps

Study Area

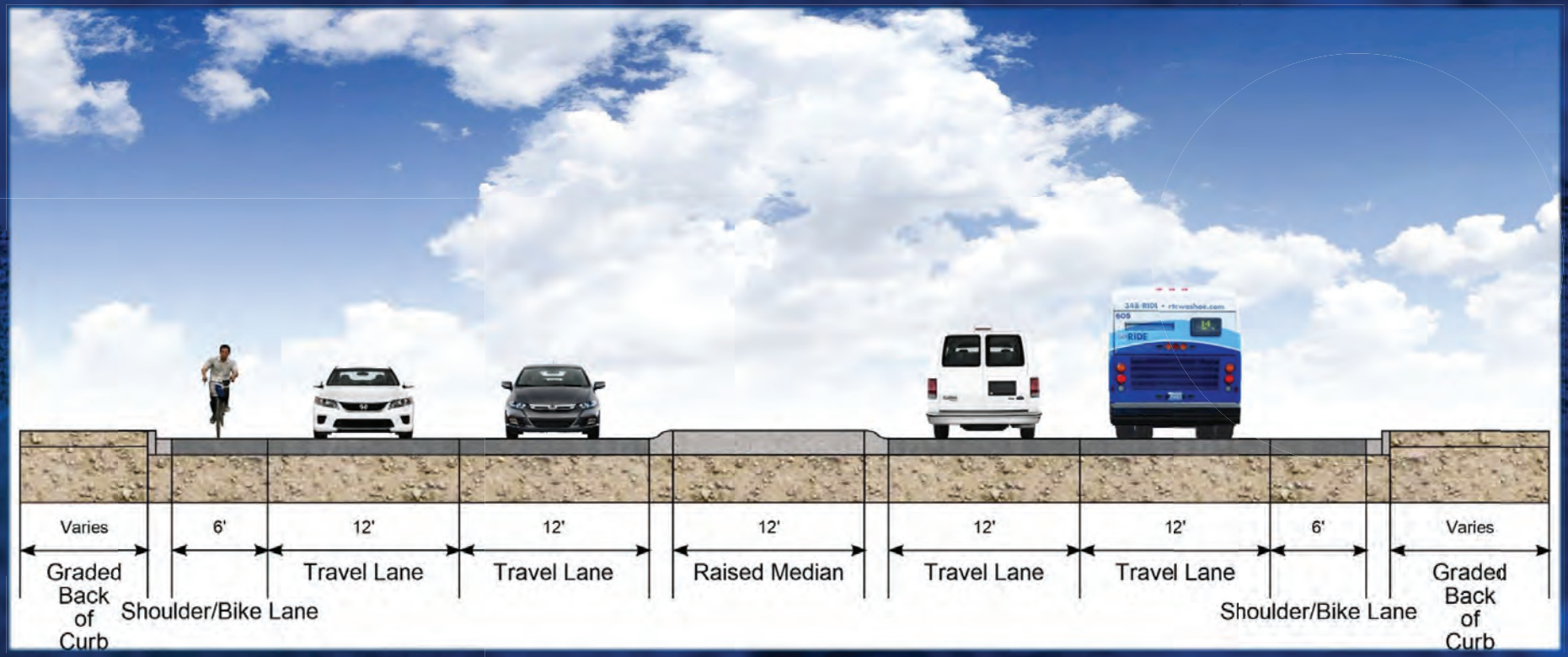

RANCHO SAN RAFAEL REGIONAL PARK
UNIVERSITY RIDGE PARK
ROMAN CATHOLIC BISHOP OF RENO (CEMETERY)
395
Hug High
Sierra Vista Elem.
STERLING VILLAGE PARK
DICK TAYLOR MEMORIAL PARK
SKY COUNTRY PARK
LAS BRISAS PARK
HILLTOP PARK
Peavine Elem.
Towles Elem.
NORTHWEST PARK
Clayton Mid.
Saint Albert The Great
McQueen High
Coit Plaza
Canyon Center
Ridgeview Plaza
PEAVINE FIELDS
Warner Elem.
Winnemucca Elem.
RAINBOW RIDGE PARK
MOUNTAIN VIEW CEMETERY
Reno
80
659
SUMMIT RIDGE PARK
OXBOW NATURE STUDY AREA
CRISSIE CAUGHLIN PARK
TRUCKEE RIVER GREENBELT
NORTH
0 1,500 3,000
FEET
Fire Station
School
Study Area
University of Nevada Reno
Bureau of Land Management
Forest Service
Parks

Existing McCarran Blvd.



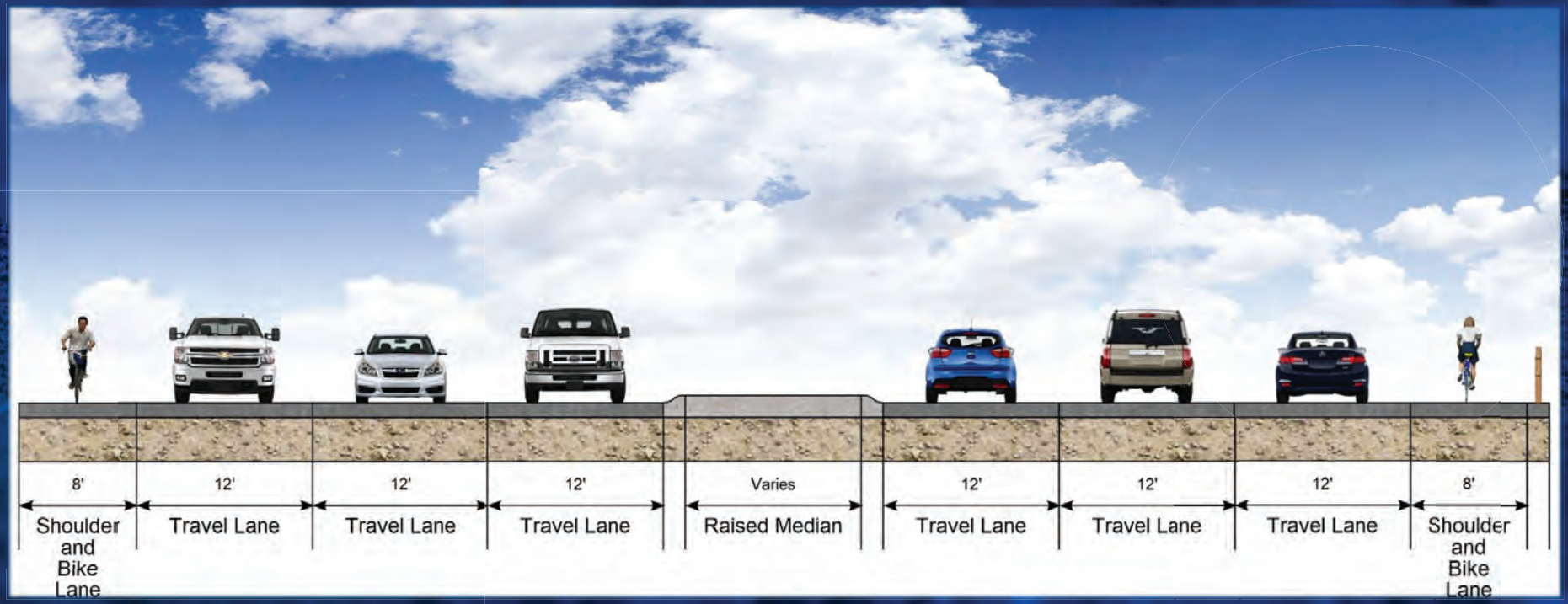
I-80 to N. of W 7th St.

Existing McCarran Blvd.



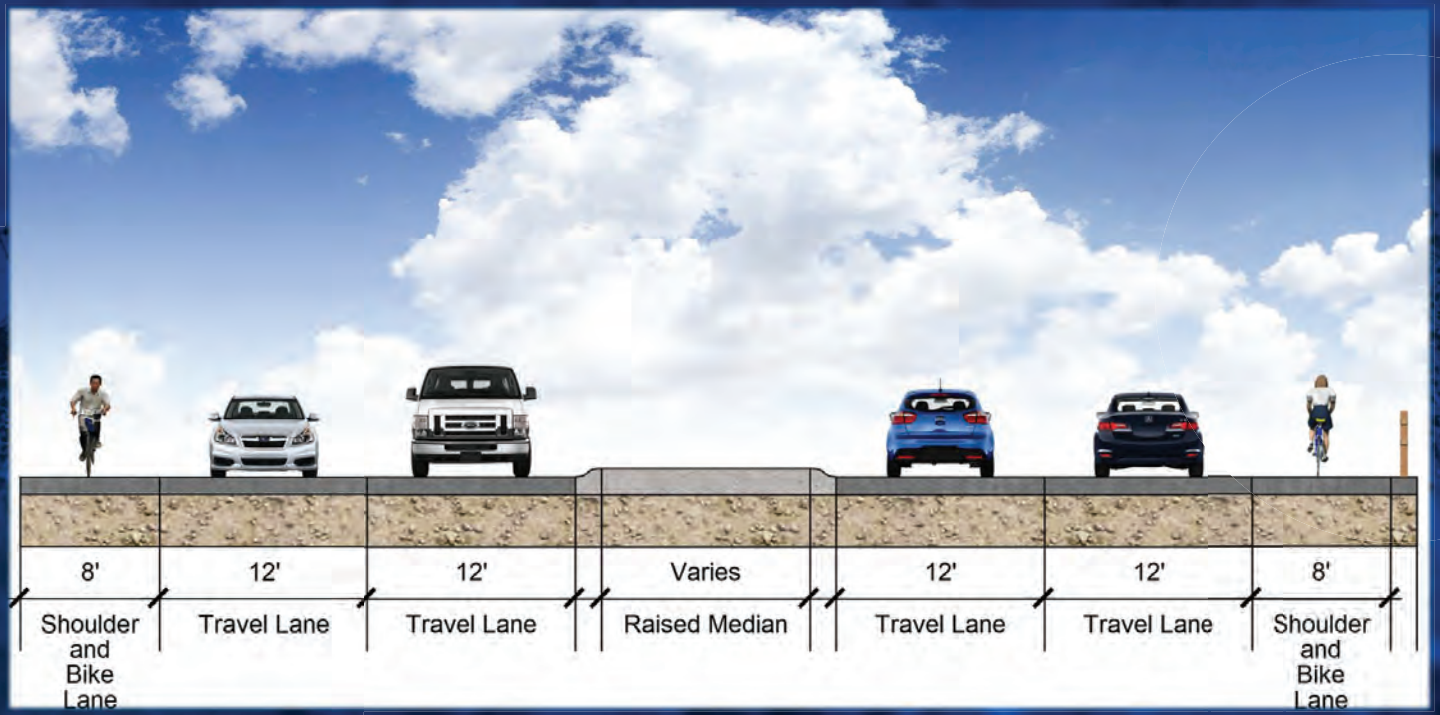
N. of W 7th St. to N. Virginia St.

Existing McCarran Blvd.



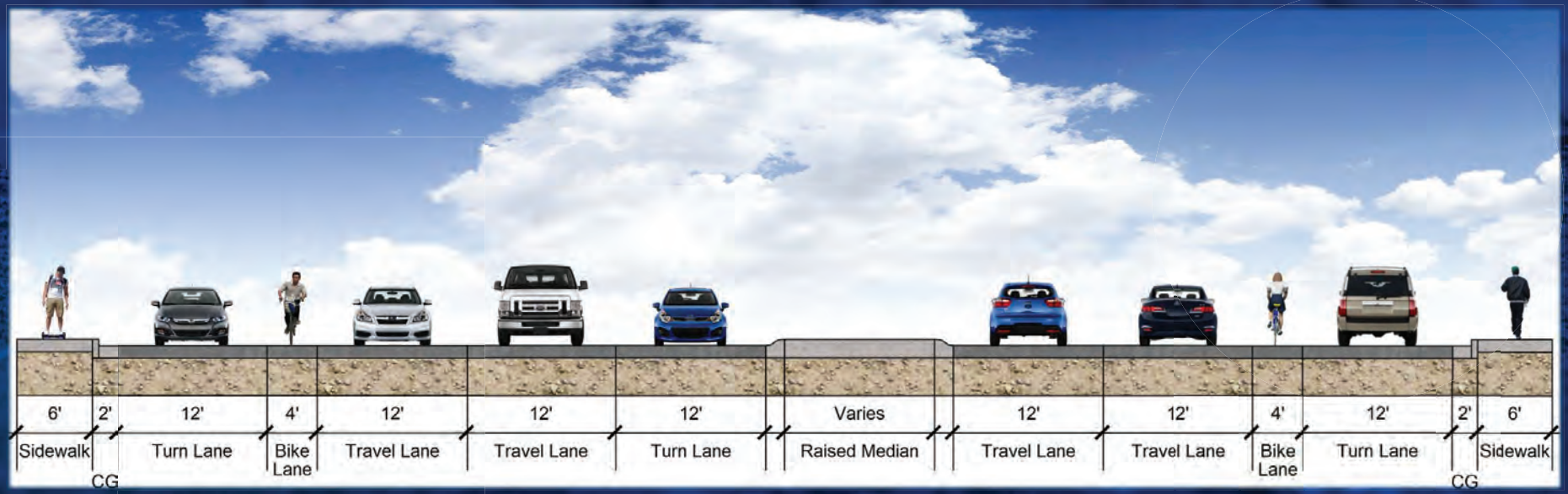
N. Virginia St. to Evans Ave.

Existing McCarran Blvd.



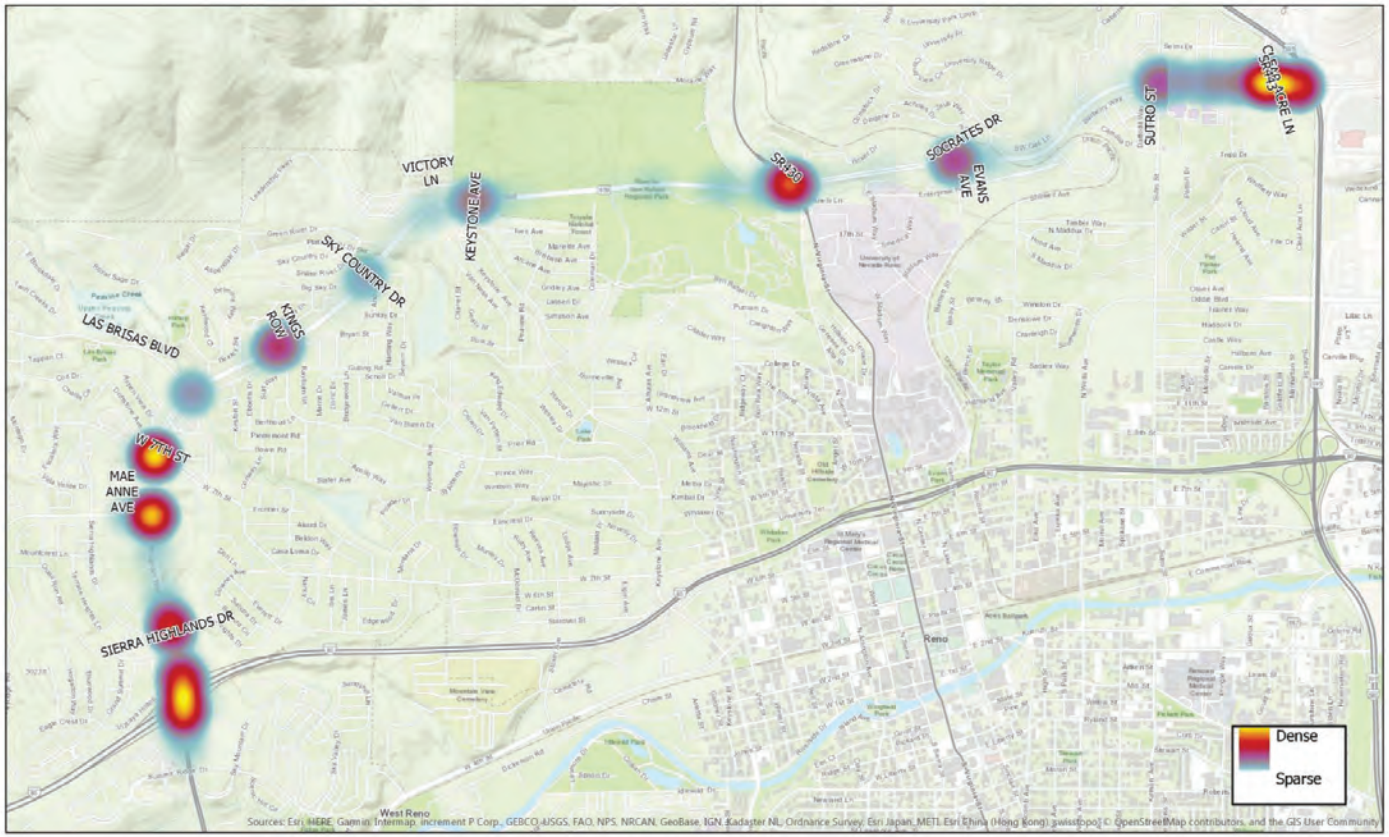
Evans Ave. to Clear Acre Ln.

Existing McCarran Blvd.

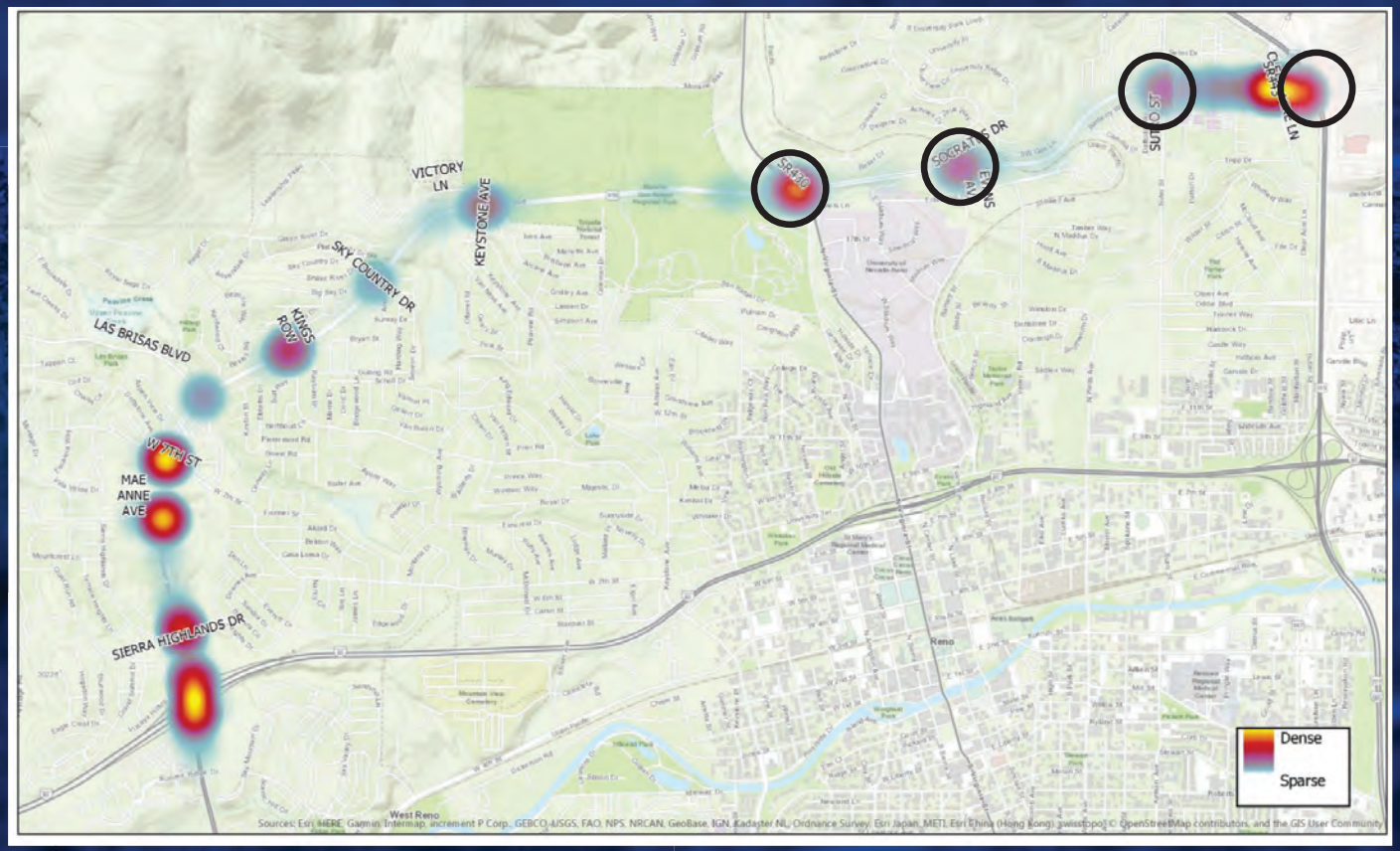


Clear Acre Ln. to US 395

Crash Analysis (3 Year)



Intersections Exceeding Statewide Averages



Exceed Avg. for Fatalities

- Virginia Street
- Evans Avenue
- Clear Acre Lane
- US 395 Ramps

TABLE X: MCCARRAN BOULEVARD LEVEL-OF-SERVICE - EXISTING CONDITIONS

McCarran Boulevard Intersection	Signalization	Time	Approach Delay (Seconds) & LOS								Intersection Delay (Seconds) & LOS	
			EB		WB		NB		SB			
I-80 Eastbound Ramps	Signalized	AM	70.5	E	-	-	119.7	F	69.6	E	87.7	F
		PM	184.0	F	-	-	149.3	F	93.3	F	133.3	F
I-80 Westbound Ramps	Signalized	AM	-	-	63.5	E	28.3	C	13.5	B	29.3	C
		PM	-	-	1319.0	F	28.8	C	25.1	C	524.6	F
Sierra Highlands Drive	Signalized	AM	26.8	C	121.1	F	16.2	B	29.4	C	31.0	C
		PM	31.3	C	102.9	F	17.0	B	42.4	D	31.9	C
Mae Anne Avenue	Signalized	AM	40.7	D	120.2	F	24.5	C	21.5	C	39.7	D
		PM	41.9	D	73.0	E	26.5	C	34.2	C	35.7	D
Seventh Street	Signalized	AM	99.6	F	114.8	F	22.0	C	22.2	C	50.5	D
		PM	50.5	D	73.3	E	33.4	C	36.5	D	42.2	D
Las Brisas Boulevard	Unsignalized	AM	0.8	A	0.0	A	-	-	141.5	F	141.5	F
		PM	21.1	C	0.0	A	-	-	ERROR	F	ERROR	F
Kings Row	Signalized	AM	38.4	D	30.2	C	27.0	C	23.5	C	32.9	C
		PM	22.0	C	33.8	C	39.4	D	25.7	C	28.8	C
Sky Country Drive	Unsignalized	AM	0.4	A	0.0	A	-	-	187.8	F	187.8	F
		PM	1.3	A	0.0	A	-	-	207.9	F	207.9	F
Victory Lane	Unsignalized	AM	0.2	A	0.0	A	-	-	15.9	C	15.9	C
		PM	0.4	A	0.0	A	-	-	34.0	D	34.0	D
Keystone Avenue/ Leadership Parkway	Unsignalized	AM	0.0	A	3.1	A	27.5	D	13.1	B	27.5	D
		PM	0.0	A	1.9	A	27.1	D	14.9	B	27.1	D
Virginia Street	Signalized	AM	135.2	F	75.6	E	51.4	D	258.7	F	172.4	F
		PM	204.9	F	53.4	D	346.2	F	39.6	D	186.0	F
Evans Road/ Socrates Drive	Signalized	AM	26.7	C	32.3	C	23.7	C	28.3	C	28.6	C
		PM	20.2	C	32.1	C	103.1	F	27.0	C	47.0	D
Sutro Street	Signalized	AM	24.6	C	35.1	D	23.4	C	33.8	C	29.6	C
		PM	39.3	D	33.5	C	34.4	C	31.3	C	36.1	D
Clear Acre Lane	Signalized	AM	83.7	F	96.0	F	55.1	E	30.6	C	71.8	E
		PM	167.4	F	148.1	F	149.2	F	37.3	D	137.5	F
US 395 Southbound Ramps	Signalized	AM	10.4	B	28.0	C	-	-	51.4	D	23.6	C
		PM	6.4	A	26.8	C	-	-	58.4	E	21.0	C
US 395 Northbound Ramps	Signalized	AM	4.9	A	11.3	B	53.5	D	-	-	16.3	B
		PM	13.1	B	15.7	B	62.8	E	-	-	27.2	C

Source: Wood Rodgers, December 2018

Pedestrian Counts

Sierra Highlands
AM: 3
PM: 5

Mae Anne
AM: 4
PM: 0

W. 7th Street
AM: 31
PM: 67

Las Brisas
AM: 6
PM: 11

Kings Row
AM: 11
PM: 20

Sky Country
AM: 1
PM: 0

Victory Lane
AM: 1
PM: 0

Keystone/Leadership
AM: 2
PM: 2

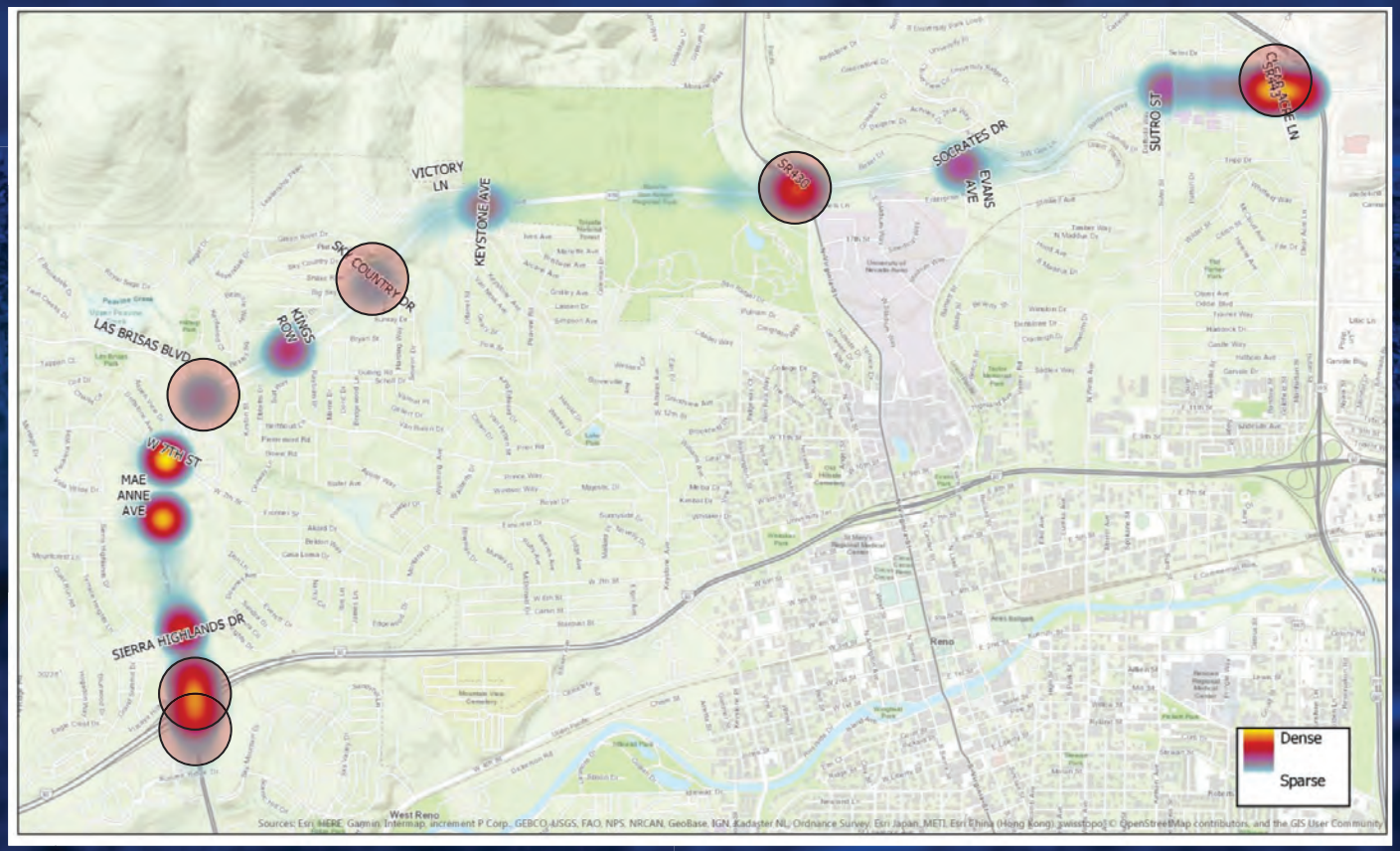
Virginia Street
AM: 7
PM: 8

Socrates/Evans
AM: 5
AM: 4

Sutro Street
AM: 29
PM: 67

Clear Acre
AM: 26
PM: 23

Intersections with Poor LOS



- I-80 Ramps
- Las Brisas Blvd.
- Sky Country Dr.
- Virginia St.
- Clear Acre Lane

Road Safety Assessment (RSA)

- TAC Field Review Conducted October 25, 2018
- Detailed Review November 13, 2018





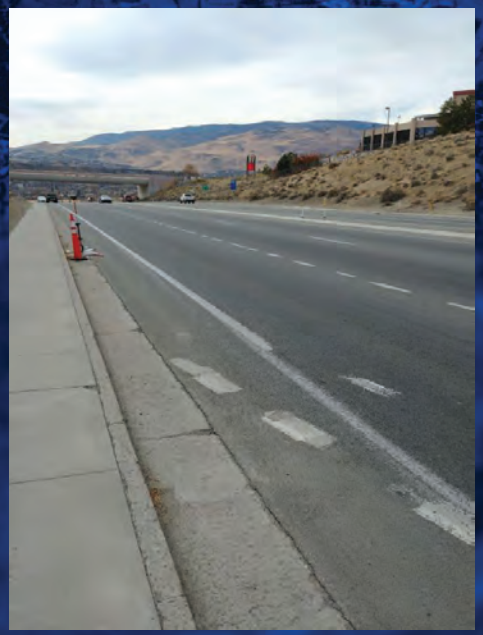

RSA General Observations

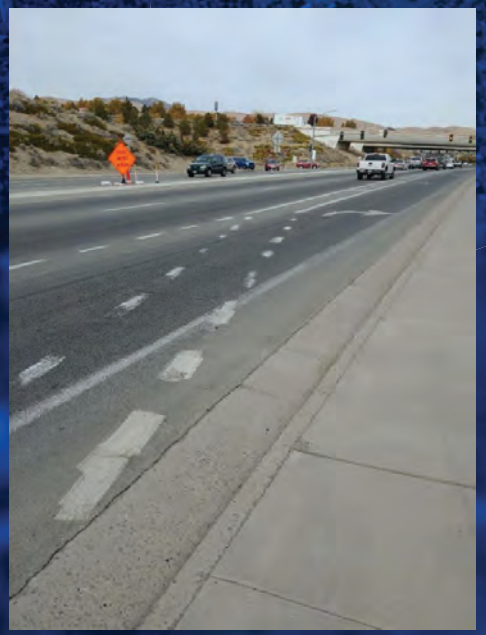
- High speeds in certain segments
- Bike/ped facility gaps with low comfort segments
- Opportunities to improve lighting throughout
- Crosswalk and bike lane markings need improvement
- No reflective backplates on signal heads
- Signal heads not aligned with lanes
- Ped push buttons and curb ramps substandard
- Debris and vegetations obstructing pedestrian ways
- Opportunities to improve intersections

Sky Mountain Northbound McCarran Blvd. Merge Area

- No pedestrian connectivity to the south across the free right turn lane and north bound on-ramp
- Bike lane transition across the right turn lane should be updated with green markings
- Provide overhead lighting for the approximately 500’ long merge area







I-80 Interchange

- Pedestrian facilities are circa 1970
- Push button heights are substandard
- Bicycle lane transitions should be better identified
- Signal heads should have reflective backplates installed

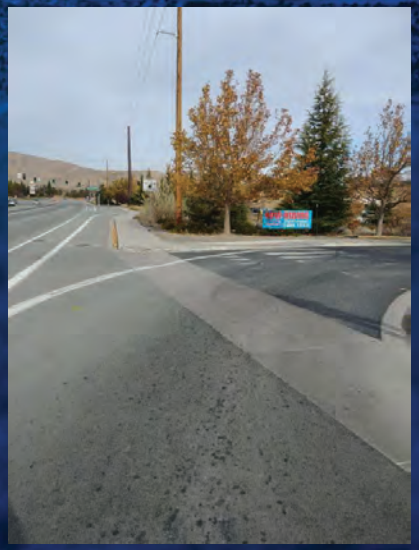




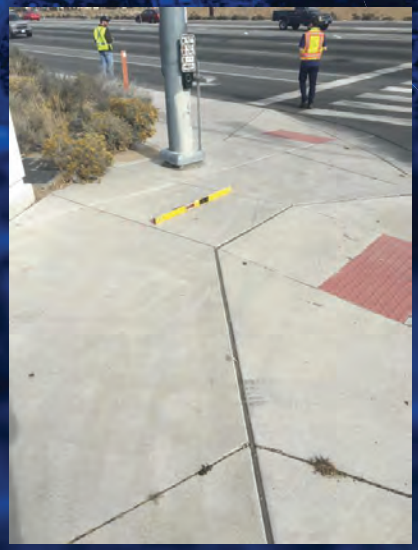


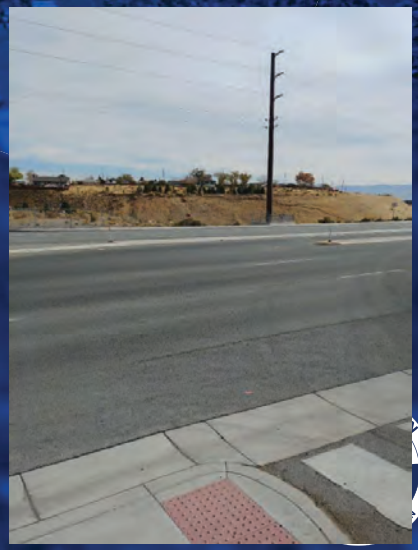
I-80 Interchange to Mae Anne Avenue

- Improve radius curve at the south 7-11 driveway to discourage right turns
- Pedestrian push buttons and ramps are substandard
- Bike lane markings and signing need to be improved
- Extend island nose of left turn pocket into Safeway









Mae Anne Avenue to W 7th Street

- Improve cross walk markings and curb cut ramps
- Improve substandard push button heights
- Improve advance warning signage for pedestrian crossings
- Add reflective backplates on all signal heads









West 7th Street to Las Brisas Boulevard

- Improve lighting, bike lane and crosswalk markings
- ADA ramp grades and push buttons







Las Brisas Boulevard to Kings Row

- Opportunity for a new intersection configuration at Las Brisas Boulevard intersection
- High speed conditions with limited sight distance
- Bus stops on both sides of McCarran at this location







Las Brisas Boulevard to Kings Row

- Improve overhead lighting
- Reflective back plates on signal heads
- Improve pedestrian connectivity
- Improve bus stop located in Viewcrest Center driveway

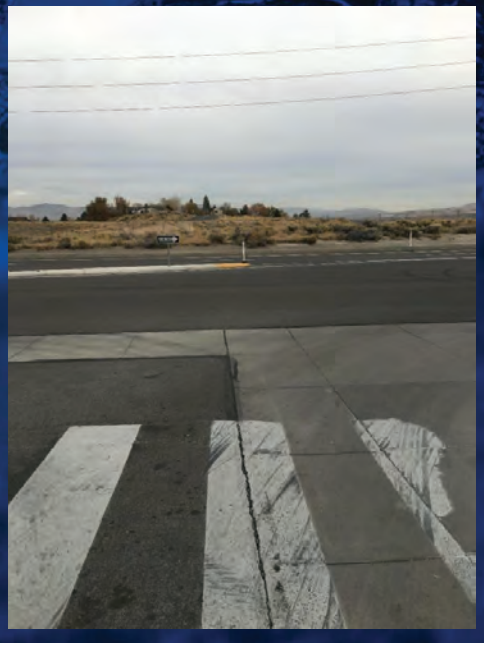






Kings Row to Keystone Avenue/Leadership Parkway

- Install overhead lighting at Sky Country Drive and Victory Lane
- Pedestrian crossing should be installed at Keystone Avenue
- Extend median worm islands to prohibit left turns to McCarran from both Leadership Parkway's







Keystone Avenue to North Virginia Street

- Improve approaches at recreation access areas
- Improve lighting at the North Virginia Street intersection
- Improve bike lane transitions across right turn lanes









North Virginia Street to Socrates Drive/Evans Road

- Improve overhead lighting
- Install retroreflective back plates on signal heads
- Improve pedestrian facilities and connectivity
- Improve bike lane markings







Socrates Drive/Evans Avenue to Sutro Street

- High pedestrian activity area with limited and substandard facilities
- Construct pedestrian walkway and upgrade ADA facilities and overhead lighting
- High speed, large radius right turn lanes







Sutro Street to the US-395 Interchange

- Improve pedestrian connectivity and facilities
- Improve bike lane markings and overhead lighting
- Install retroreflective backplates on signal heads







RSA Recommendations – Priority 1

1. Restripe bike lane transitions across right-turn lanes using green bike lane markings
2. Restripe all crosswalk markings
3. Implement leading pedestrian interval signal timings at the West 7th Street, Kings Row, Sutro Street, and Clear Acre Lane intersections
4. Trim overgrown vegetation and sweep material from walkways at the I-80 interchange

RSA Recommendations – Priority 1

5. Advise adjacent property owners of sidewalk maintenance responsibilities
6. Replace damaged or vandalized signs throughout the corridor
7. Add “Yield to Pedestrians” signs at all right-turn lane pedestrian crossings

RSA Recommendations – Priority 2

1. Update all existing signal heads, flashing signal heads, and flashing beacons to include retroreflective backplates
2. Provide continuous ADA accessible walkways or multi-use paths throughout the corridor
3. Replace substandard pedestrian railing at the NV Energy Pole at south entrance of Canyon Center and at the southbound Walmart entrance with new standard railing
4. Upgrade and/or replace substandard ADA ramps and signal buttons throughout the study area

RSA Recommendations – Priority 2

5. Correct all ADA deficiencies at the North McCarran and Sutro Street Intersection and provide safe accessible walkways along the southeast corner from Hug High School to the Clear Acre intersection
6. Update intersection and crosswalk lighting at all signalized intersections
7. Request the Washoe RTC to add bus stop and accessibility improvements to the stop located at the westbound driveway at the Viewcrest shopping center.

RSA Recommendations – Priority 2

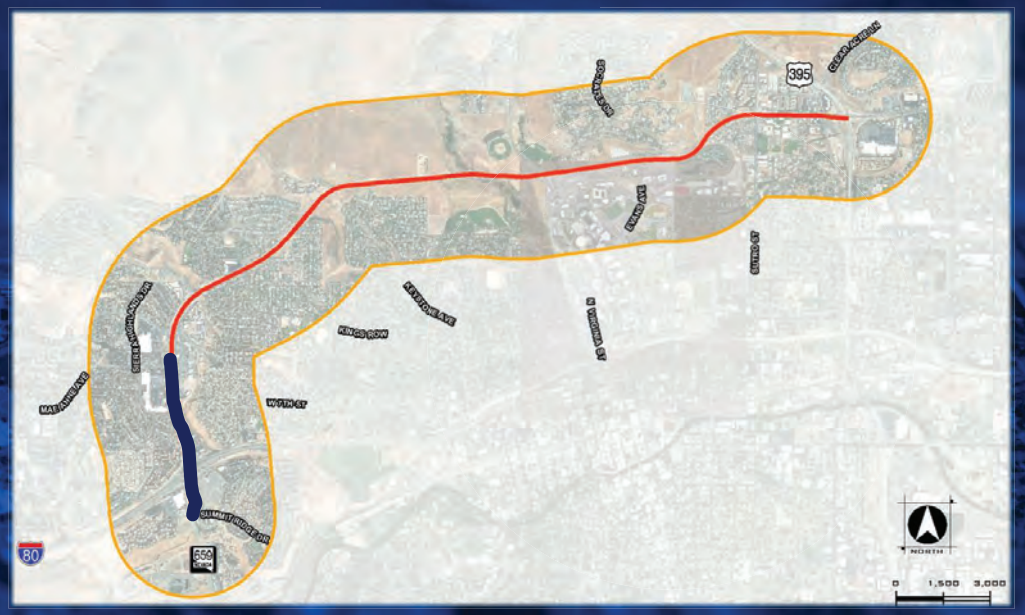
8. Conduct an ICE Analysis at the Las Brisas Boulevard and North McCarran Boulevard intersection to determine the optimum intersection configuration that maximizes safety benefits for both vehicles and pedestrians

9. Upgrade driveways adjacent to the Rancho San Rafael Regional Park

Key Alternatives to be Analyzed

Sky Mountain Drive to W 7th Street

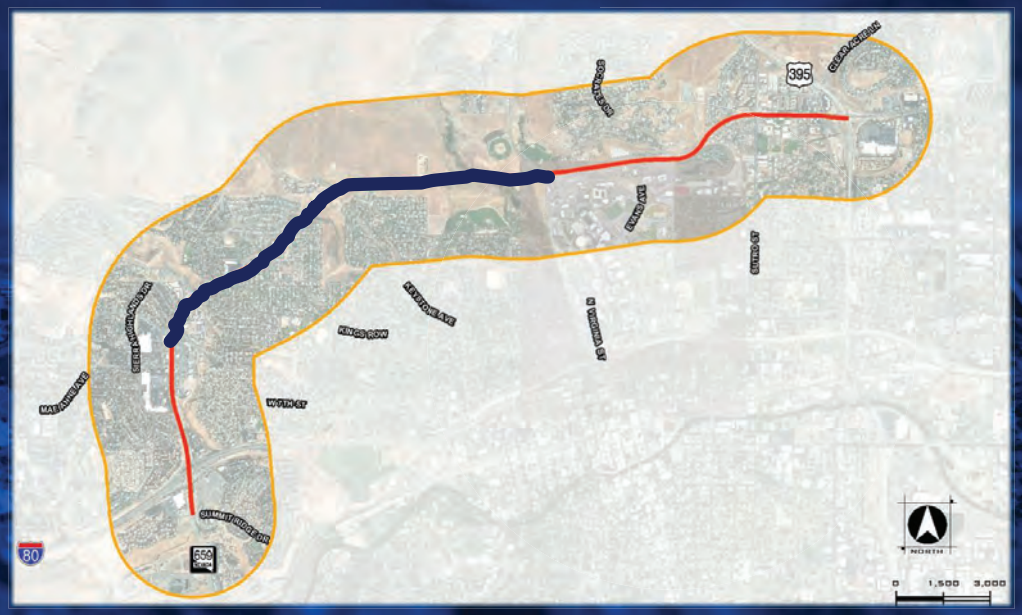
- Sky Mountain Dr. pedestrian connectivity
- I-80 interchange improvements
- Mae Anne Ave. intersection improvements
- Access management
- Transit accessibility
- W 7th St. bike and pedestrian improvements



Key Alternatives to be Analyzed

W 7th Street to N Virginia St.

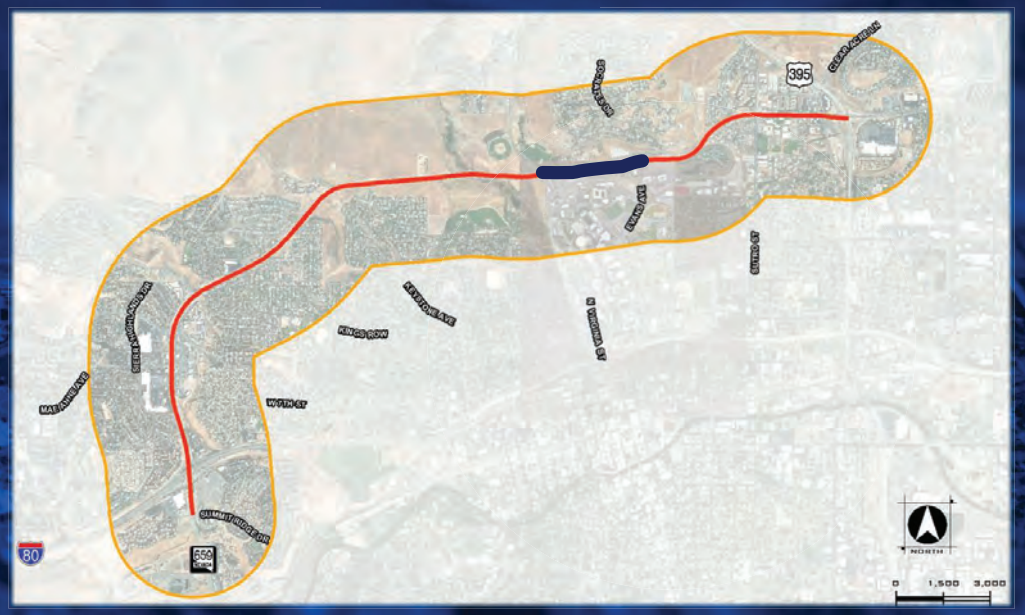
- Las Brisas intersection configuration (ICE)
- Keystone Ave. intersection improvements
- Multi-modal connectivity
  - Multi-use path, buffered bike lane, sidewalks, etc.
- N Virginia St. intersection improvements
- Strategies to reduce speeds



Key Alternatives to be Analyzed

N Virginia St. to Evans Ave.

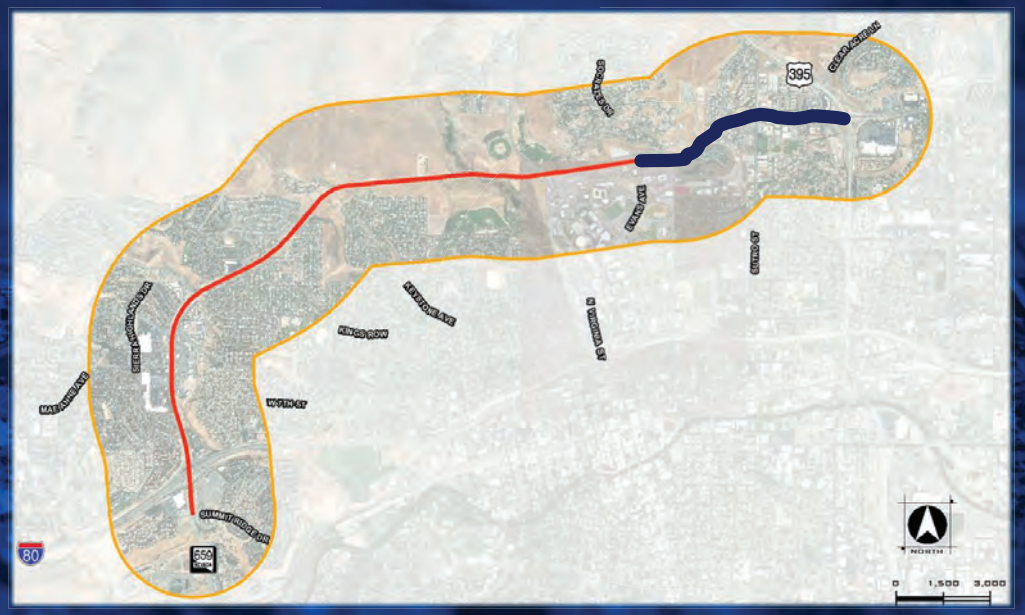
- Multi-modal connectivity
  - Multi-use path, buffered bike lane, sidewalks, etc.
- Evans Ave. intersection configuration (ICE)
- Pedestrian crossing improvements
- Tighten radius at right turn pockets



Key Alternatives to be Analyzed

Evans Ave. to US 395

- Multi-modal connectivity
  - Multi-use path, buffered bike lane, sidewalks, etc.
- Clear Acre Ln. intersection improvements
- Pedestrian crossing improvements
- US 395 intersection configurations
- Strategies to reduce speed
- Tighten radius at right turn pockets



Schedule


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Intro & Crash Summary
RSA & Alternative Analysis
Final SMP

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TAC MEETING #2
SIGN IN SHEET

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PETER SHAW	NDOT - ADA	PSHAW@DOT.NV.GOV

December 18, 2018



TAC Meeting #3

February 13, 2019

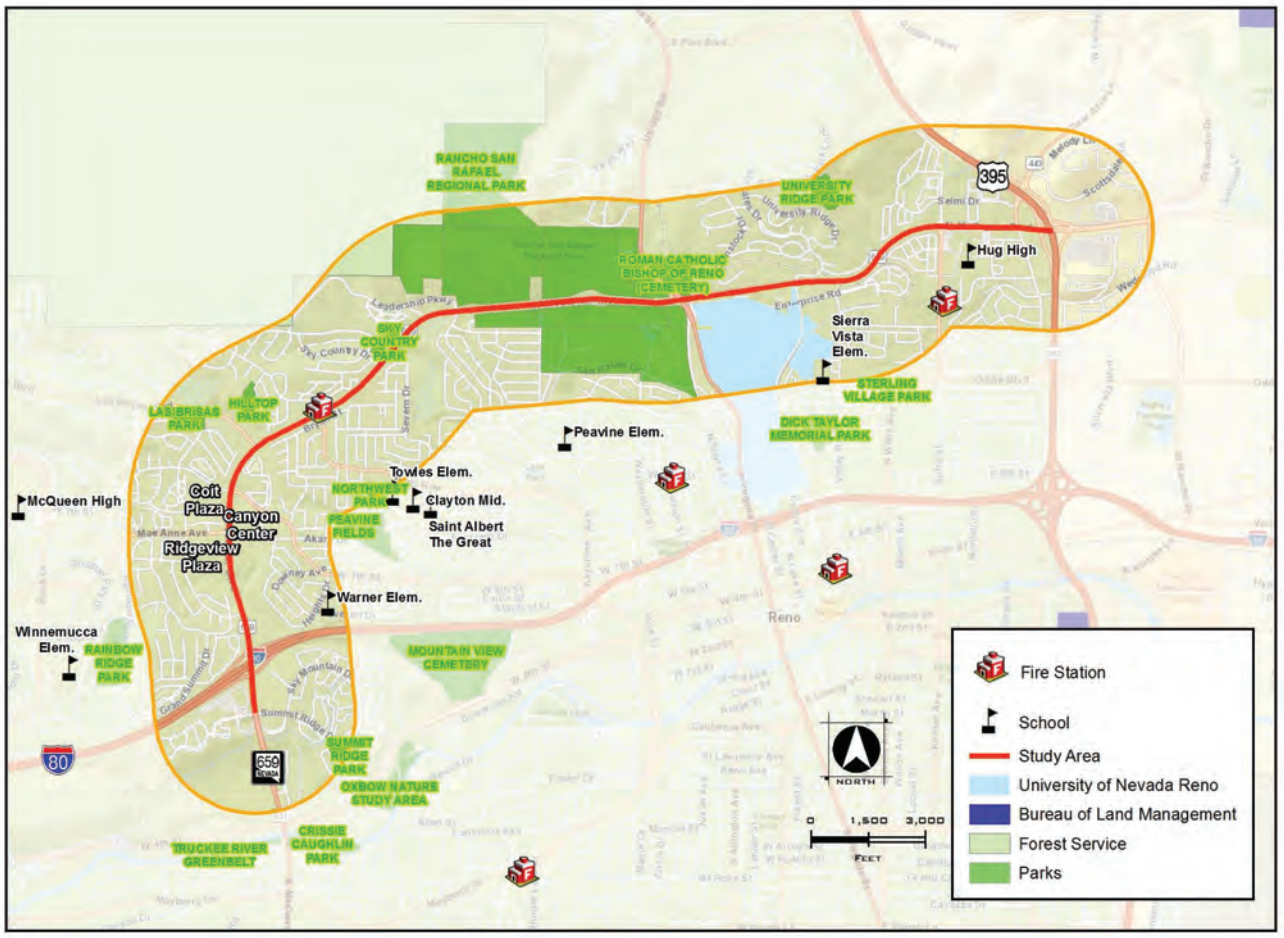
WOOD RODGERS

NEVADA DOT
SAFE AND CONNECTED

Agenda

- Introductions & SMP Review
- Existing Conditions Report
- Corridor Improvement Alternatives
- Spot Improvement Alternatives
- Next Steps

Study Area


RANCHO SAN RAFAEL REGIONAL PARK
UNIVERSITY RIDGE PARK
ROMAN CATHOLIC BISHOP OF RENO (CEMETERY)
395
Hug High
Sierra Vista Elem.
STERLING VILLAGE PARK
DICK TAYLOR MEMORIAL PARK
SKY COUNTRY PARK
LAS BRISAS PARK
HILLTOP PARK
Peavine Elem.
Towles Elem.
NORTHWEST PARK
Clayton Mid.
Saint Albert The Great
PEAVINE FIELDS
McQueen High
Coit Plaza
Canyon Center
Ridgeview Plaza
Warner Elem.
Winnemucca Elem.
RAINBOW RIDGE PARK
MOUNTAIN VIEW CEMETERY
Reno
80
659
SUMMIT RIDGE PARK
OXBOW NATURE STUDY AREA
CRISSIE CAUGHLIN PARK
TRUCKEE RIVER GREENBELT
NORTH
0 1,500 3,000
FEET
Fire Station
School
Study Area
University of Nevada Reno
Bureau of Land Management
Forest Service
Parks

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Public Meetings
Agency Updates
Report Preparation
Intro & Crash Summary
RSA & Alternative Analysis
Final SMP

Existing Conditions Report *(Draft)*

- Crash Conditions and Analysis
- Roadway Conditions, Traffic and User Data
- Intersection LOS
- Relevant Policies, Plans and Studies
- Land Use Analysis
- Economic Development Potential
- Crash Risk Factors Summary

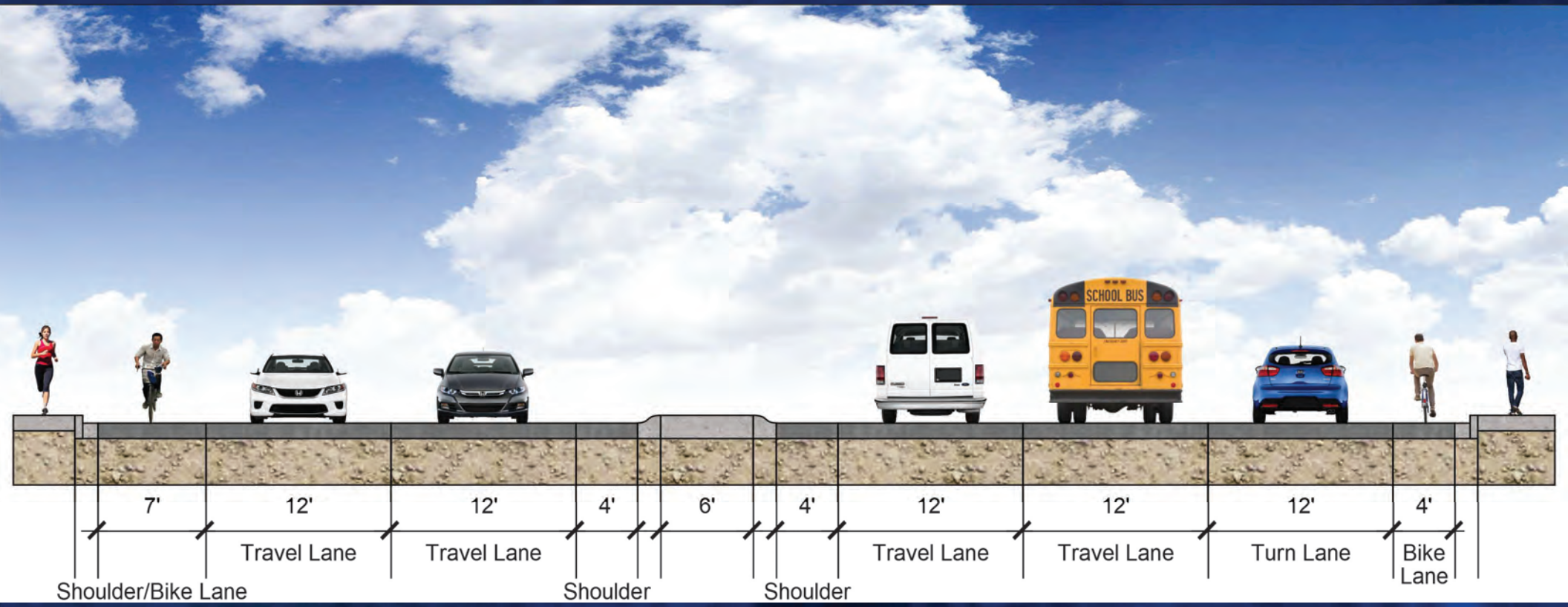


Corridor Improvement Alternatives

Corridor Alternatives Comparison

Alternative	Potential Crash Reduction	Conceptual Construction Cost
Add Buffer to Bike Lane	16%	$1.40/ft
Add Buffer to Bike Lane and Install Sidewalks	1%-16%	$40/ft/side
Multi-Use Path	25%	$53/ft
Lane Reduction	29%	Varies

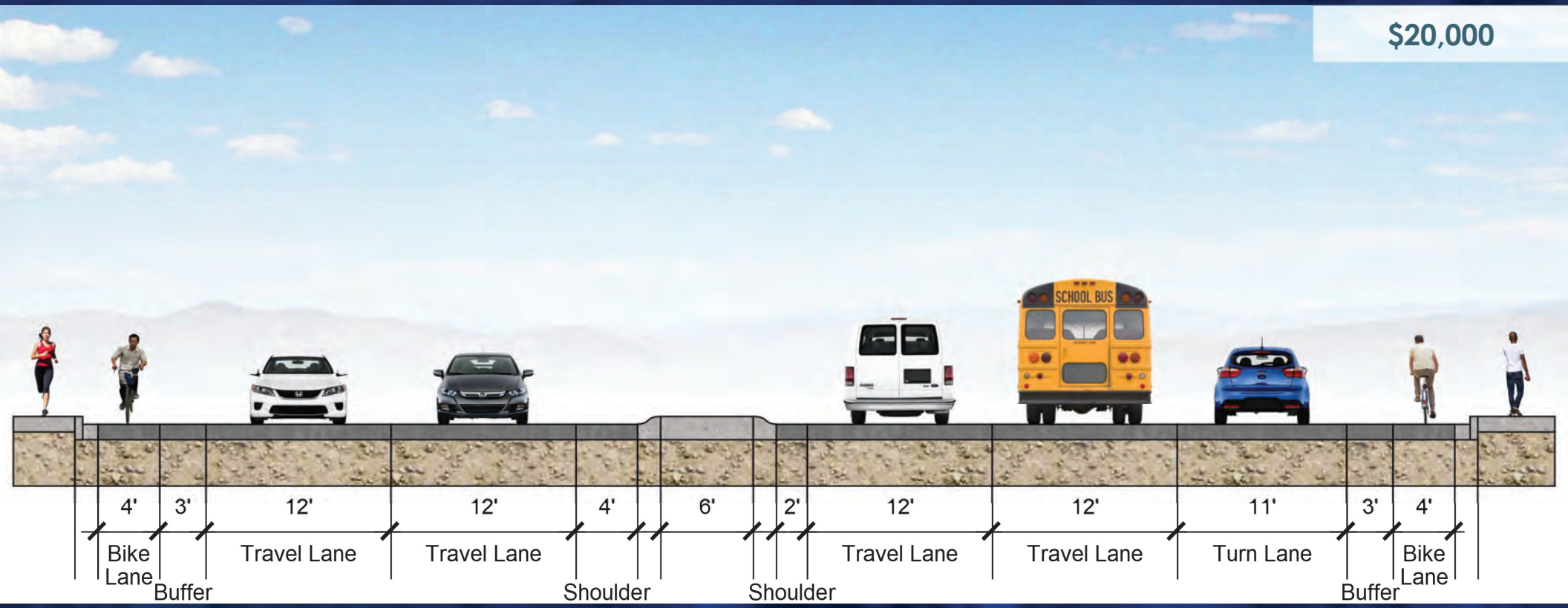
Summit Ridge to I-80



Existing

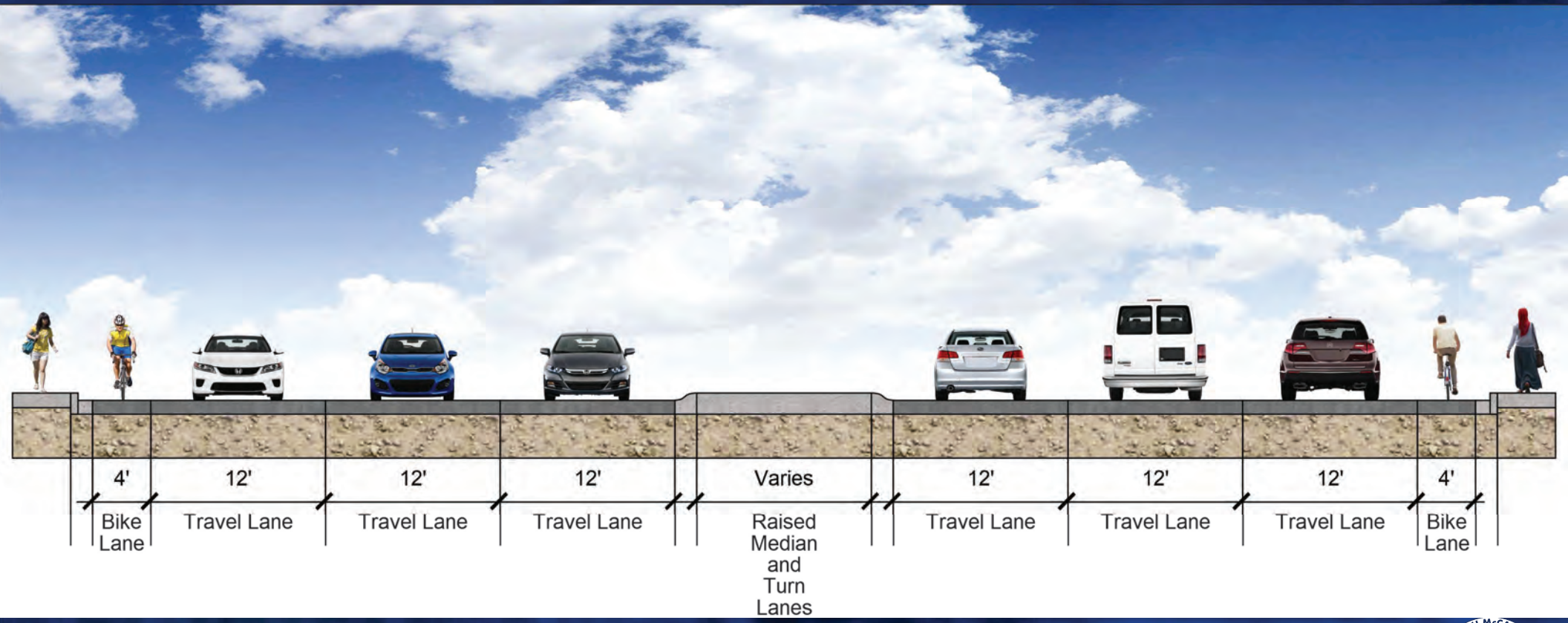
Summit Ridge to I-80

$20,000



Add Buffered Bike Lanes

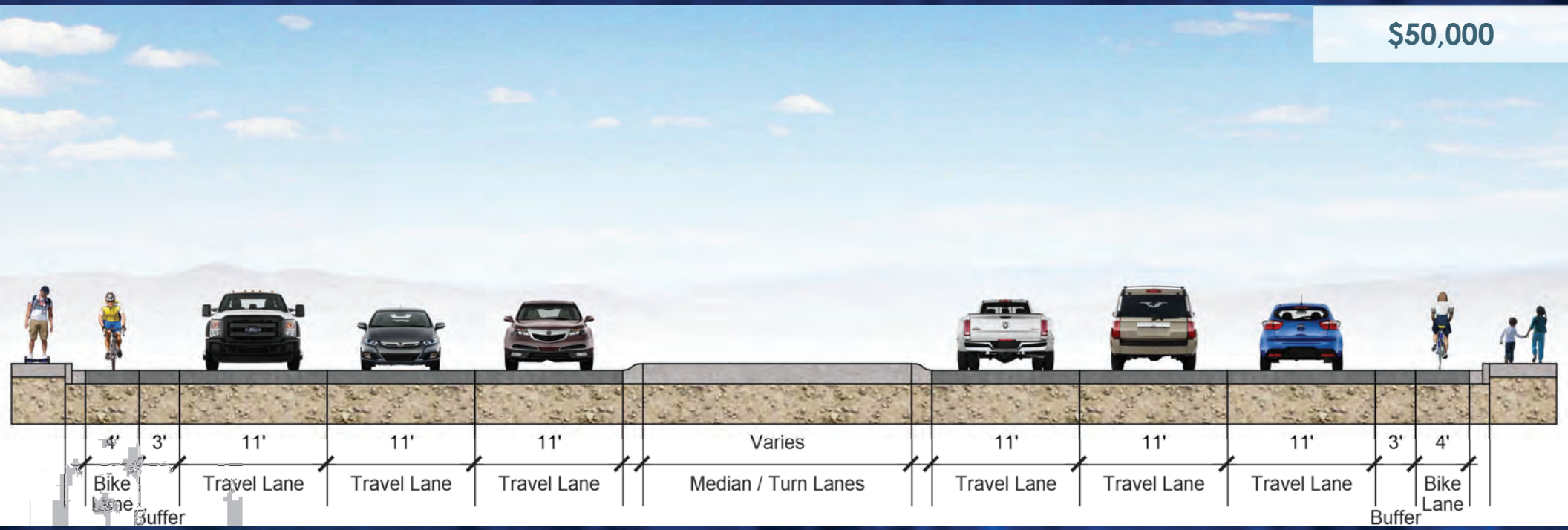
I-80 to Las Brisas



Existing

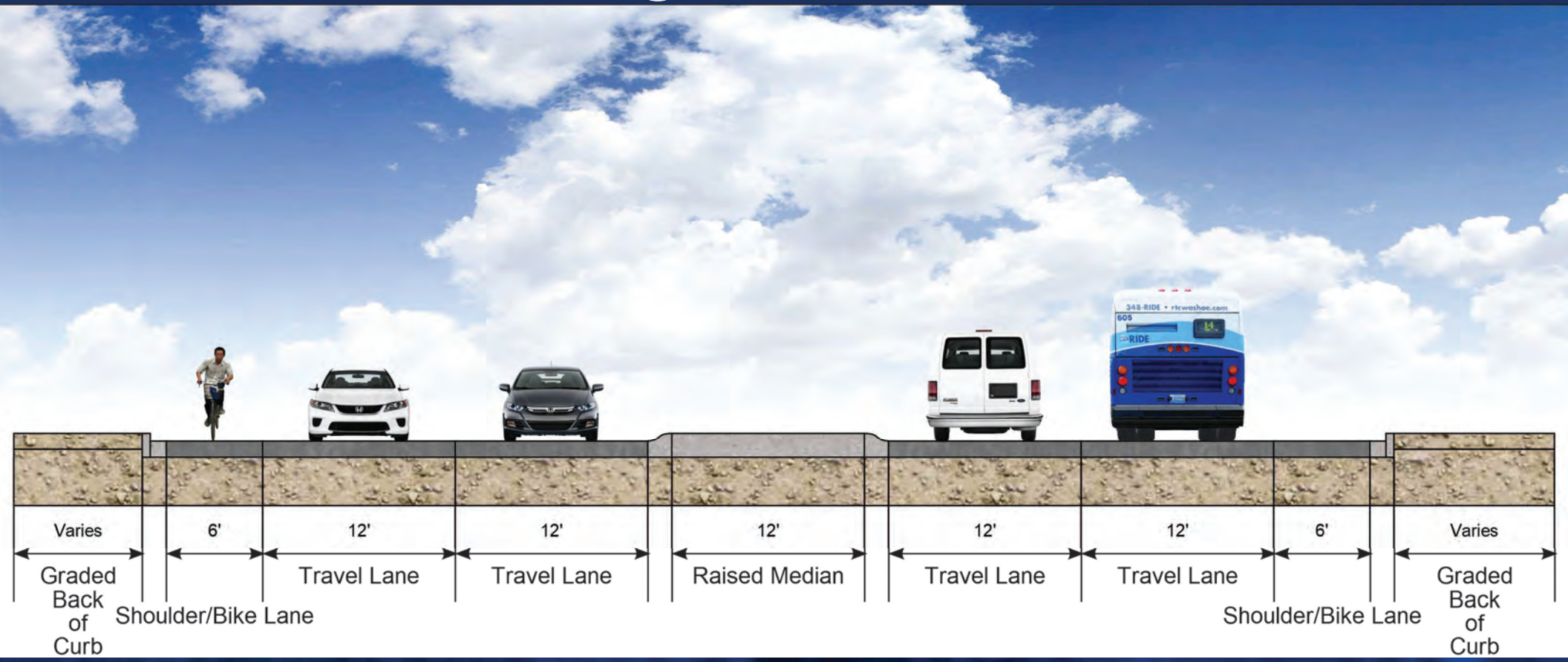
I-80 to Las Brisas

$50,000



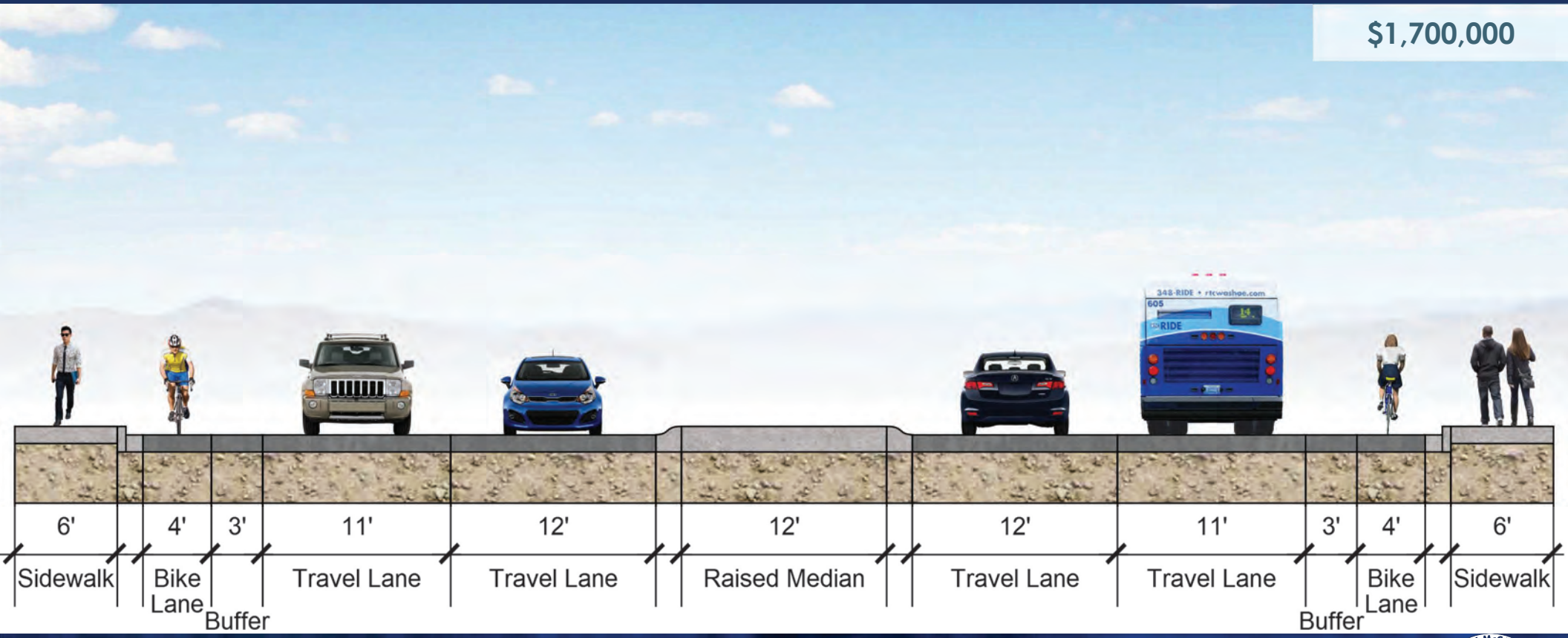
Buffered Bike Lane

Las Brisas to N. Virginia



Existing

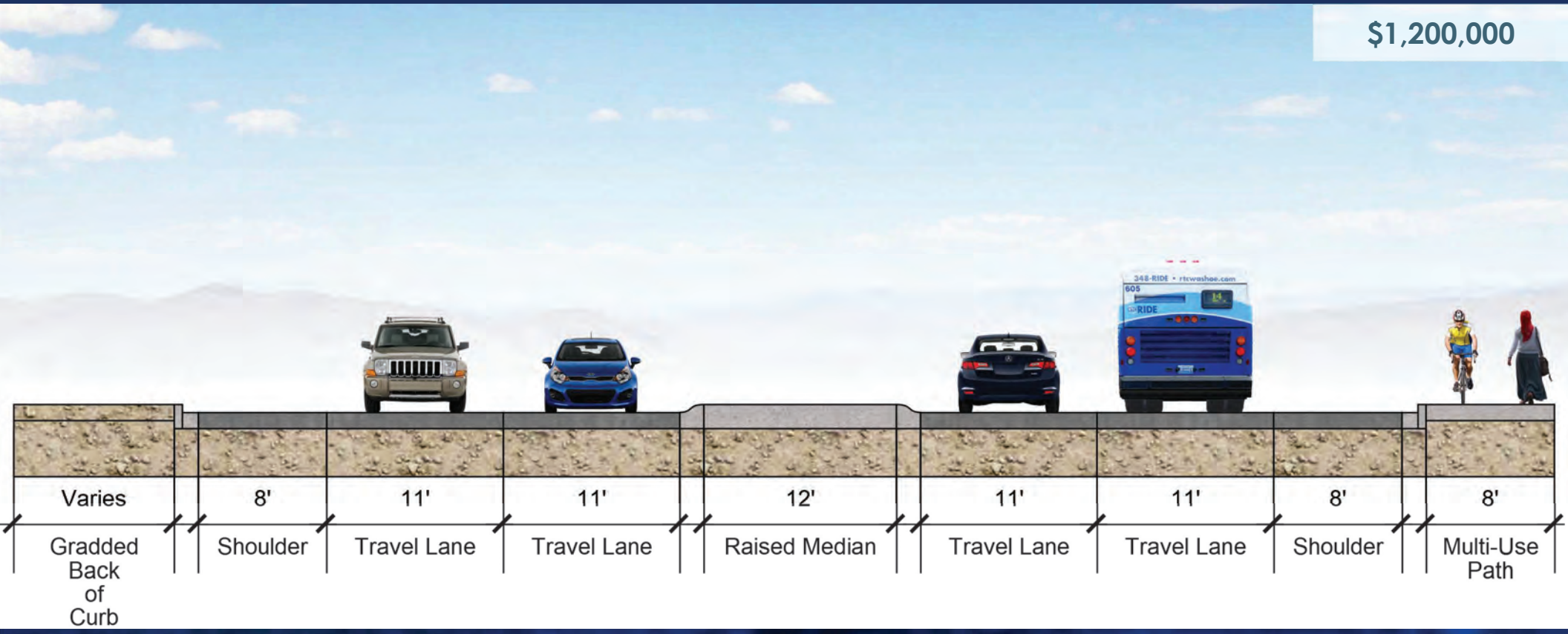
Las Brisas to N. Virginia: Option 1



Sidewalk & Buffered Bike

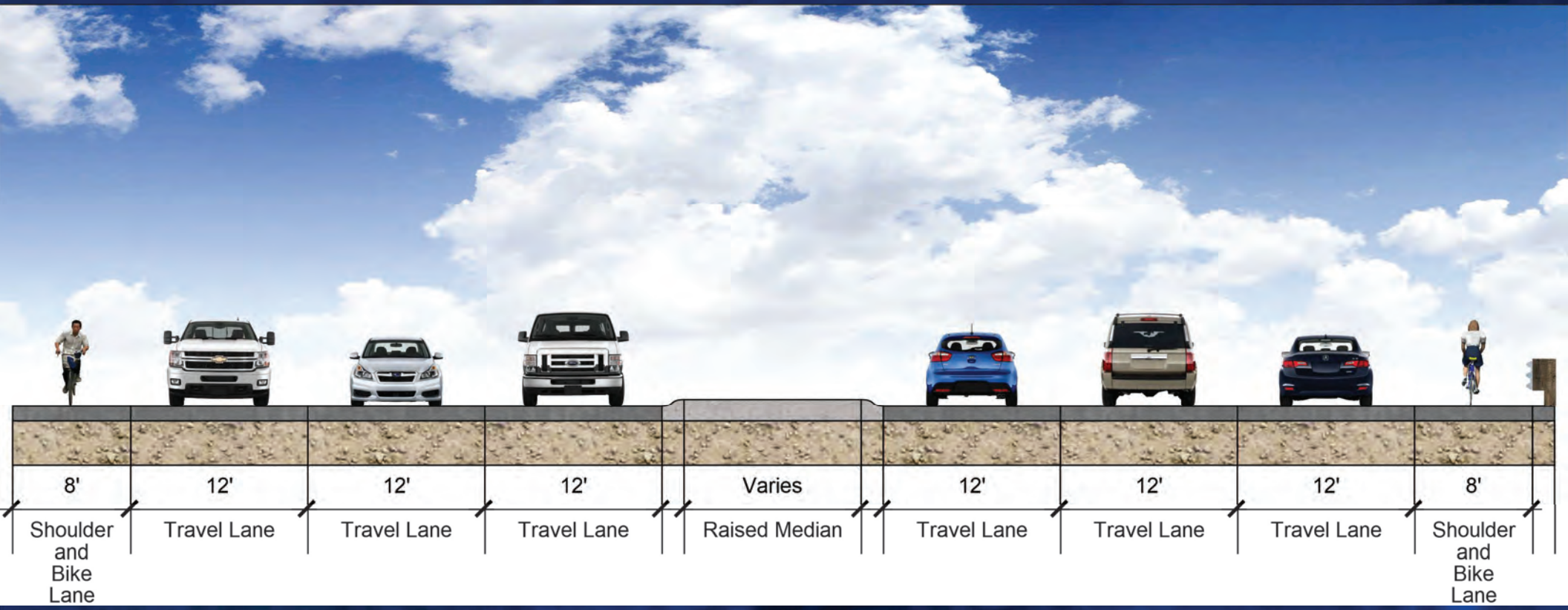
Las Brisas to N. Virginia: Option 2

$1,200,000



Multi-Use Path

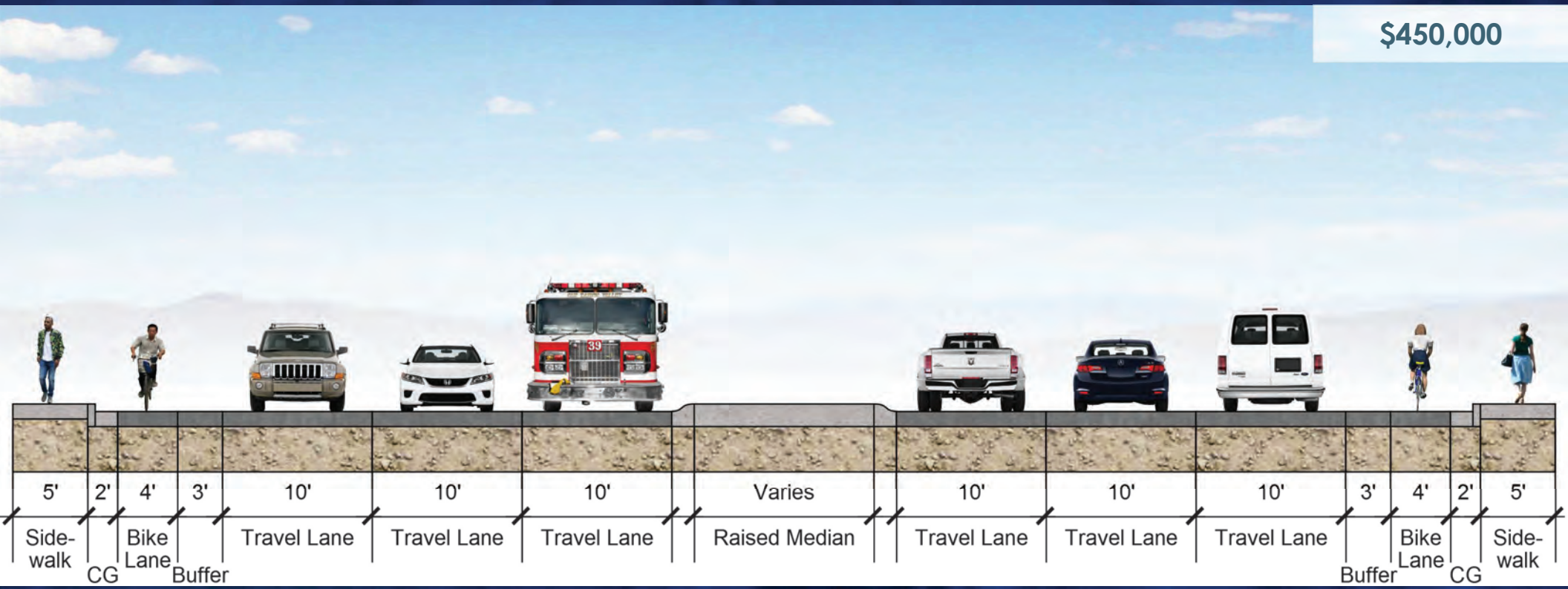
N. Virginia to Evans Ave.



Existing

N. Virginia to Evans Ave.: Option 1

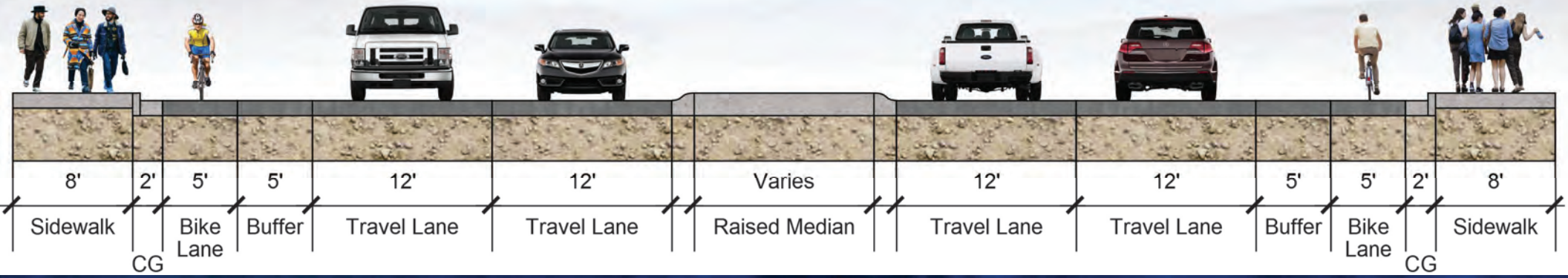
$450,000



Sidewalk & Buffered Bike

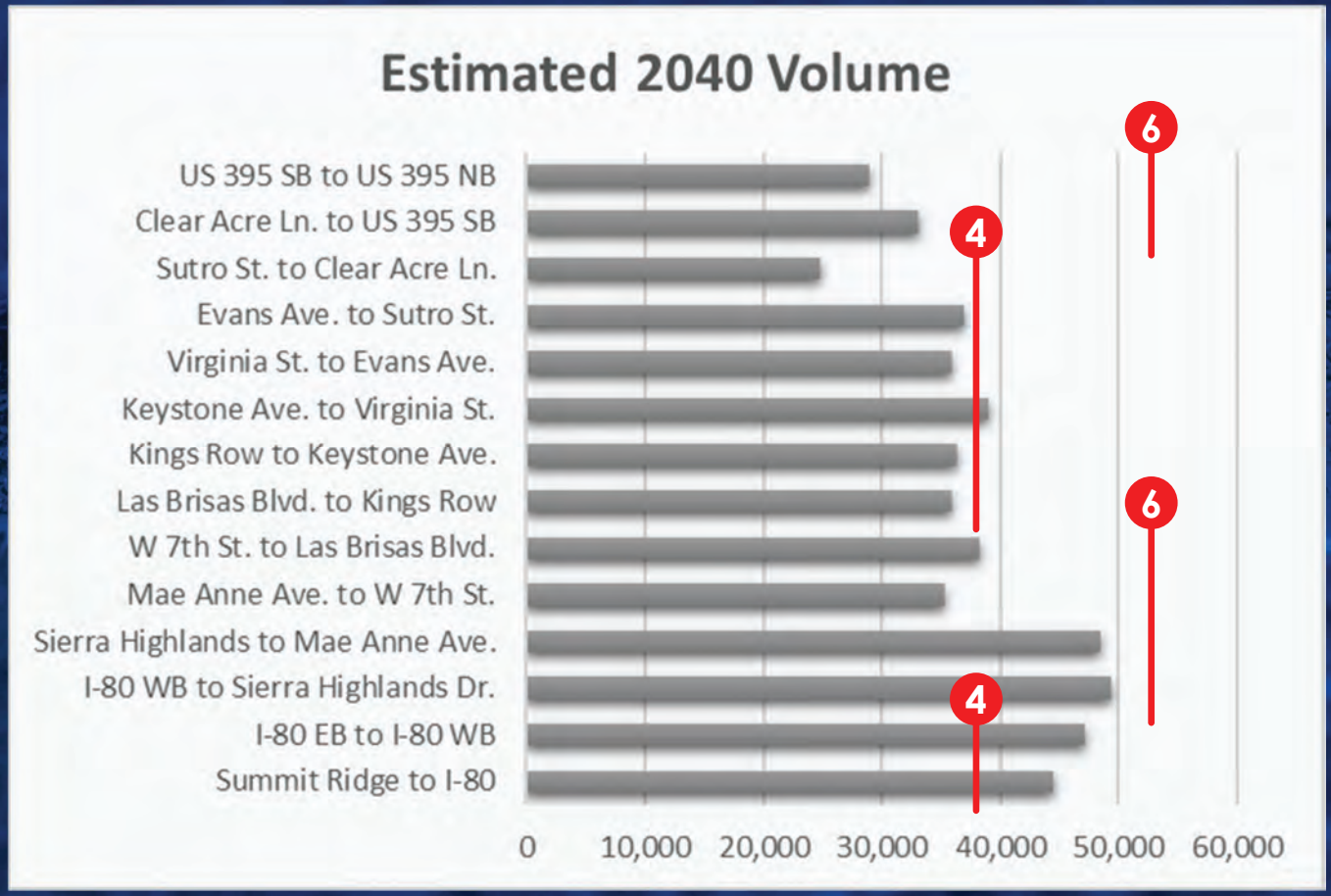
N. Virginia to Evans Ave.: Option 2

$650,000



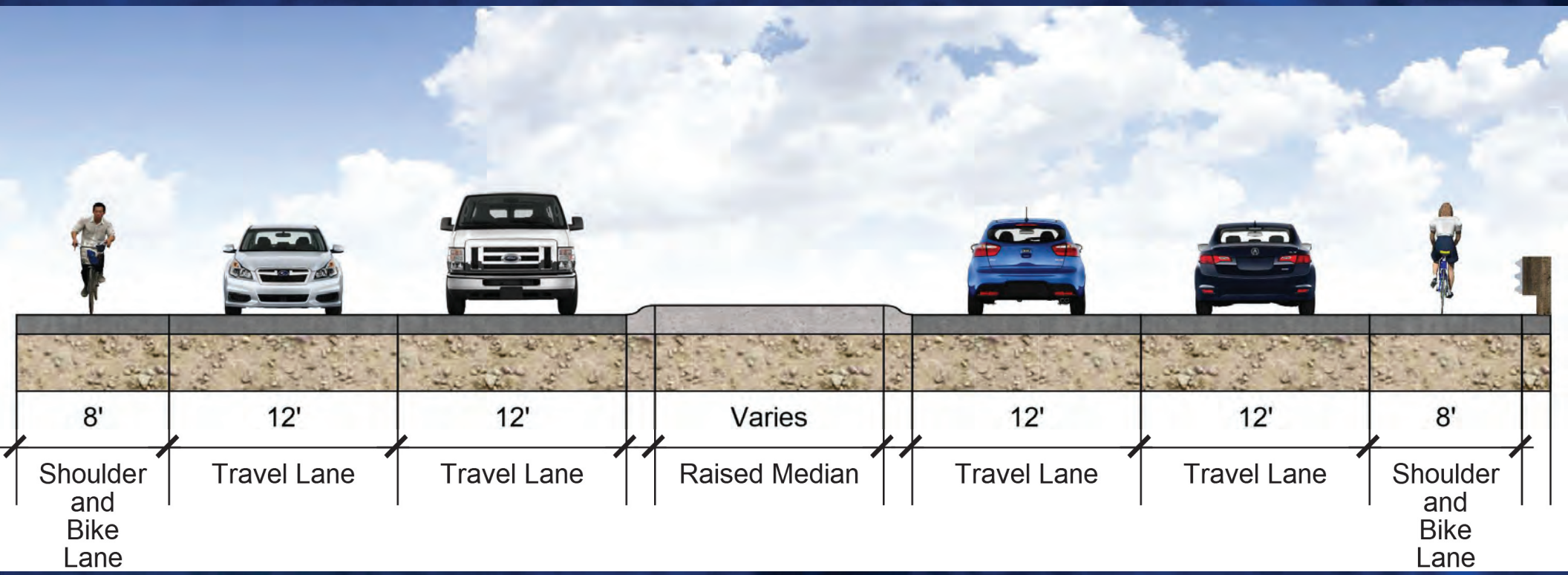
Lane Reduction & Sidewalk

2040 Traffic Volumes



X # Lanes

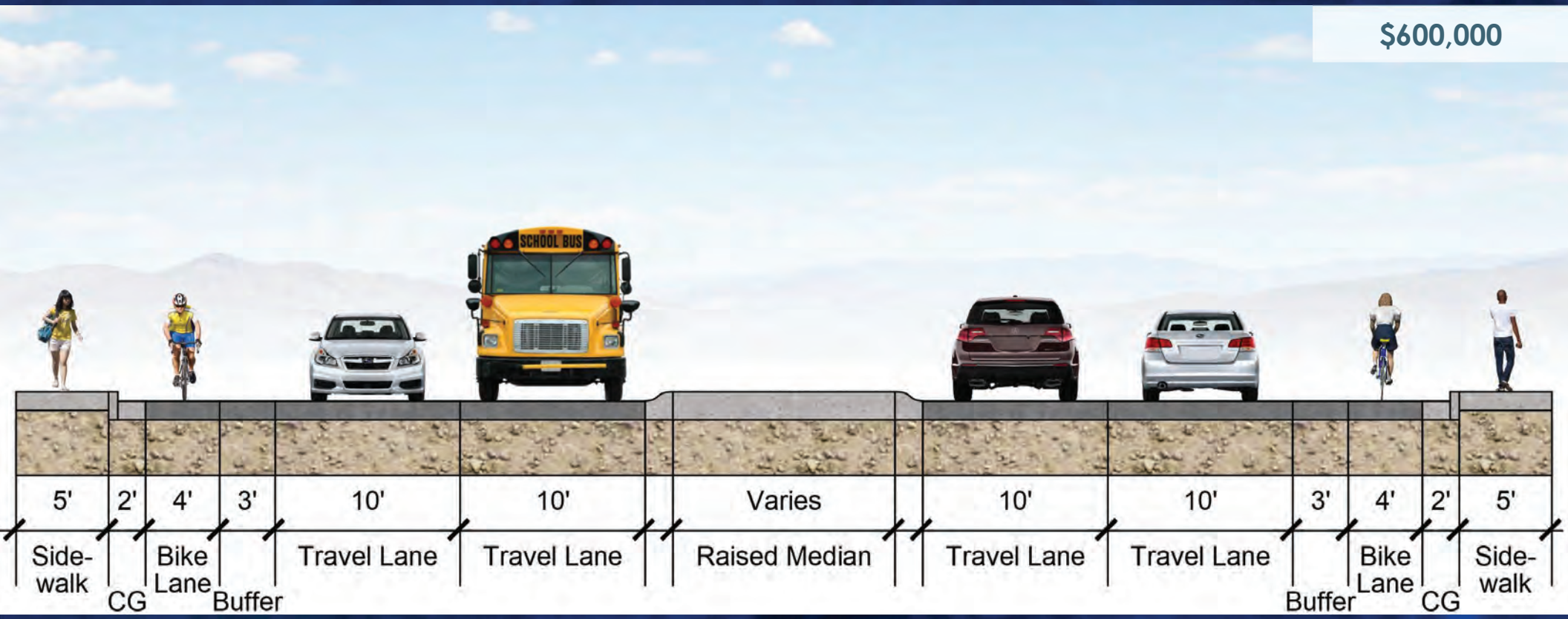
Evans Ave. to Sutro St.



Existing

Evans Ave. to Sutro St.: Option 1

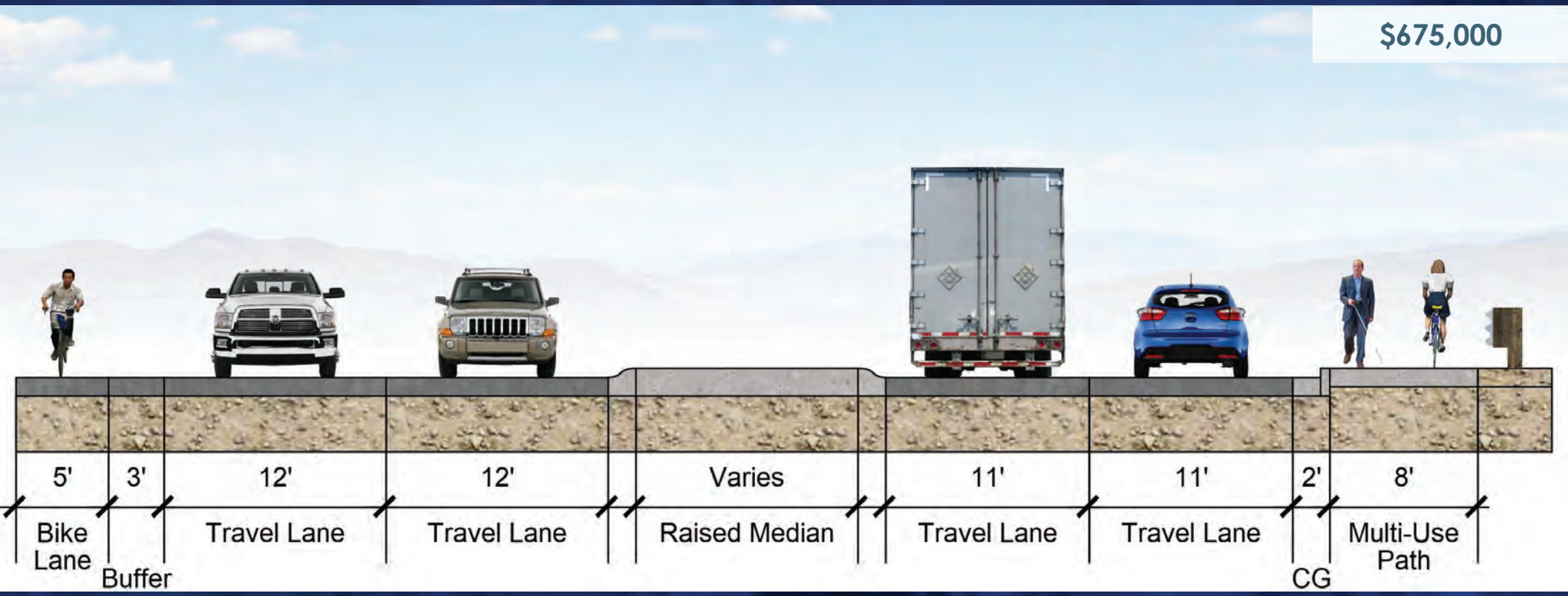
$600,000



Sidewalk & Buffered Bike

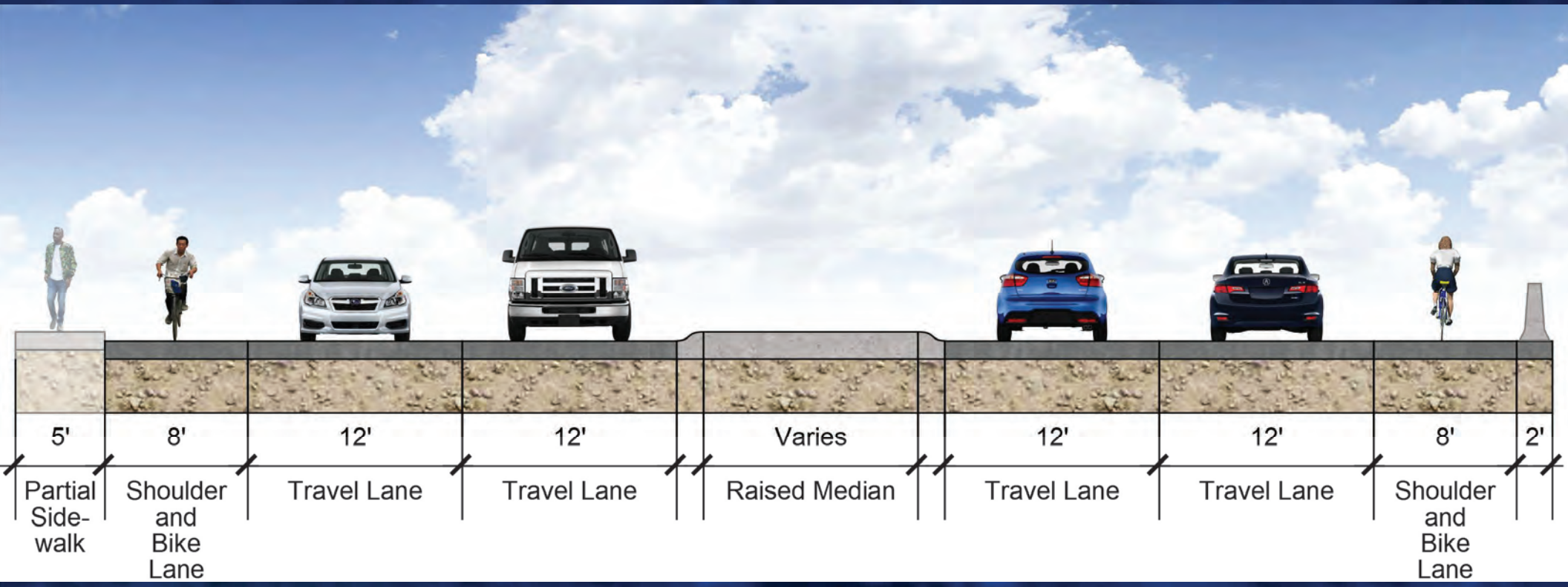
Evans Ave. to Sutro St.: Option 1

$675,000



Multi-Use Path

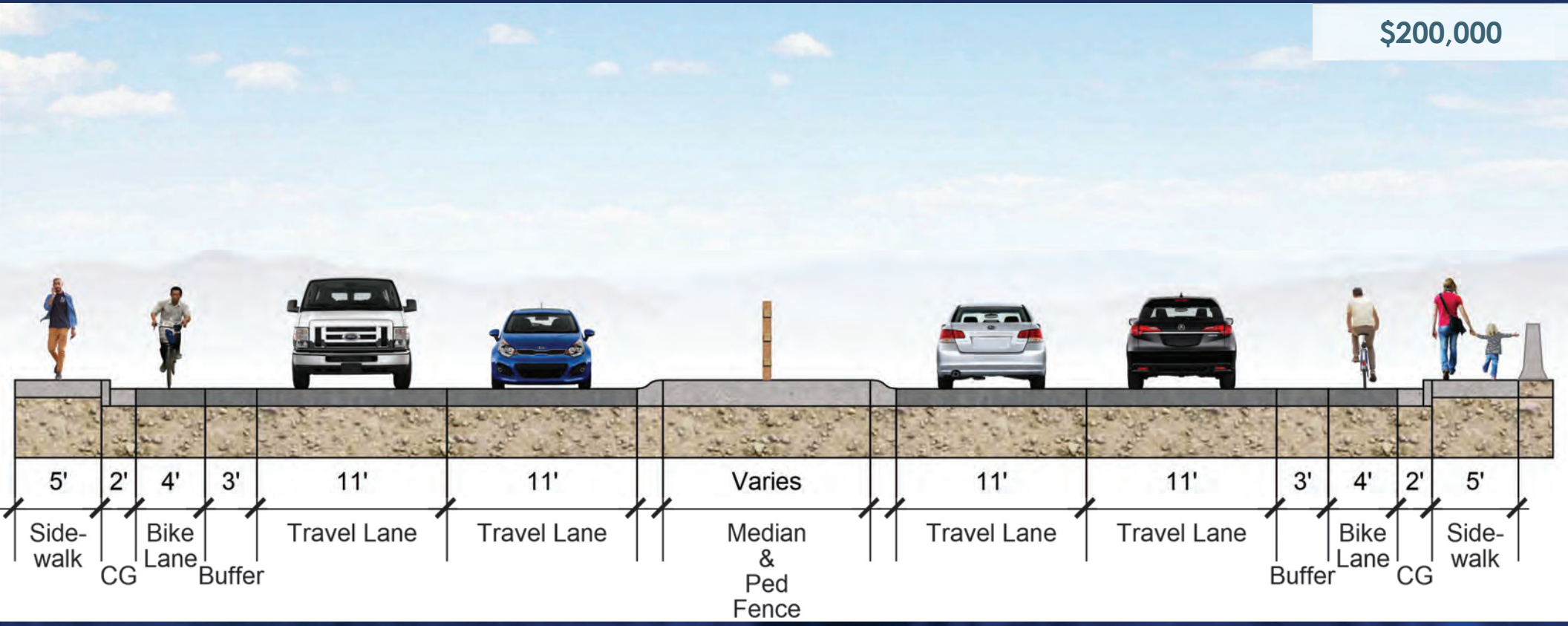
Sutro St. to Clear Acre Ln.



Existing

Sutro St. to Clear Acre Ln.

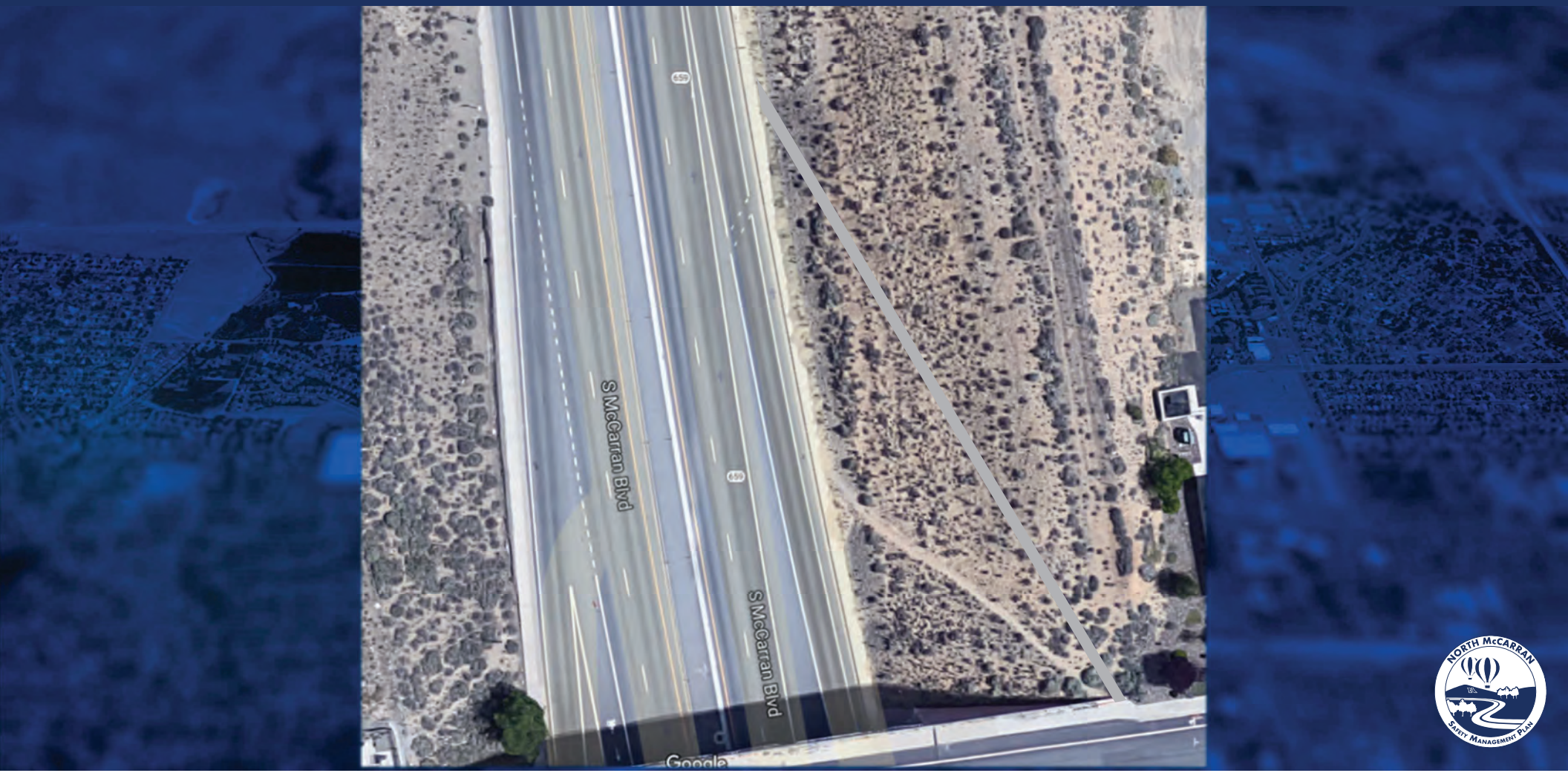
$200,000



Sidewalk & Buffered Bike

Spot Improvement Alternatives

Sky Mountain Pedestrian Connectivity



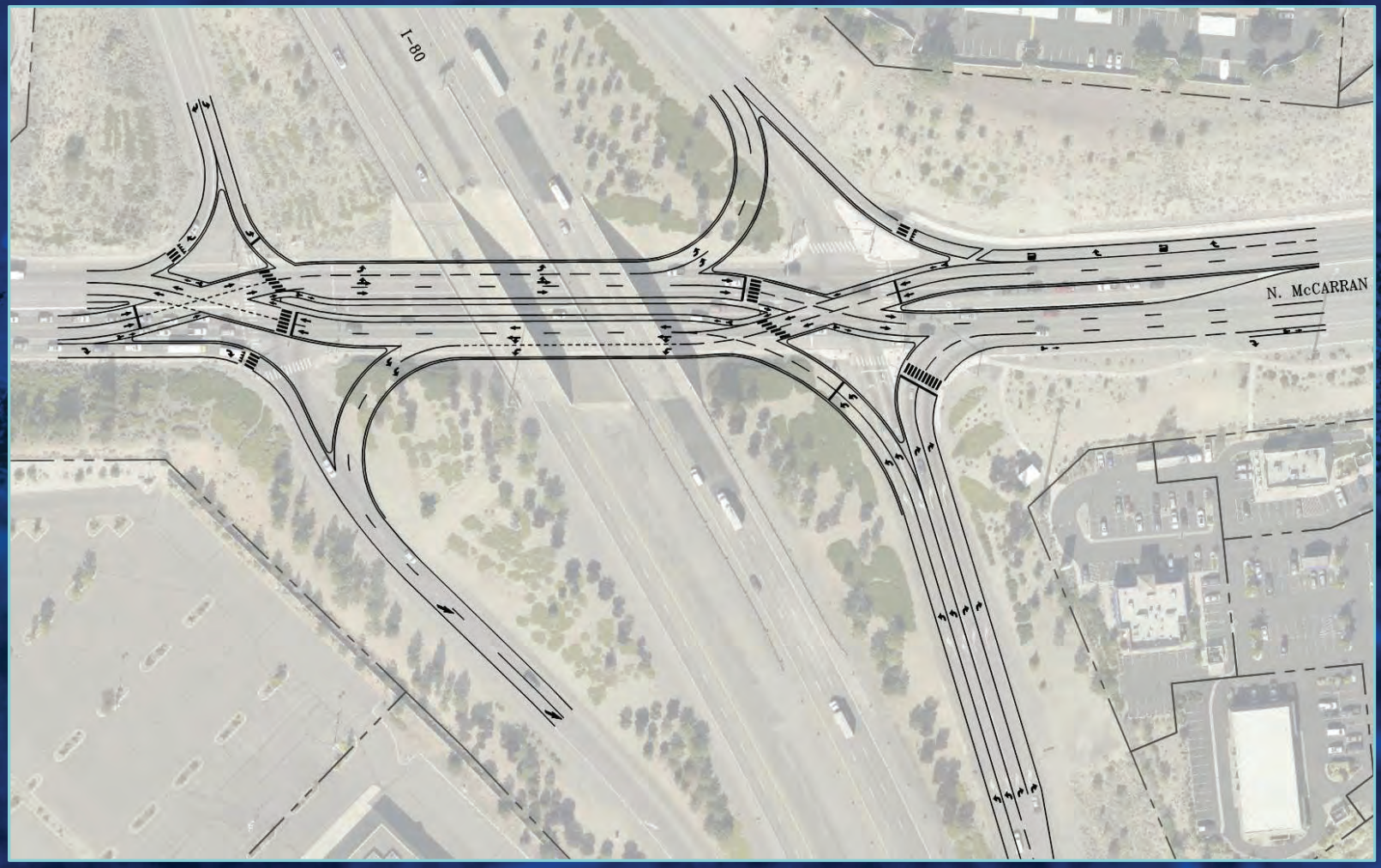
Sky Mountain Crosswalks



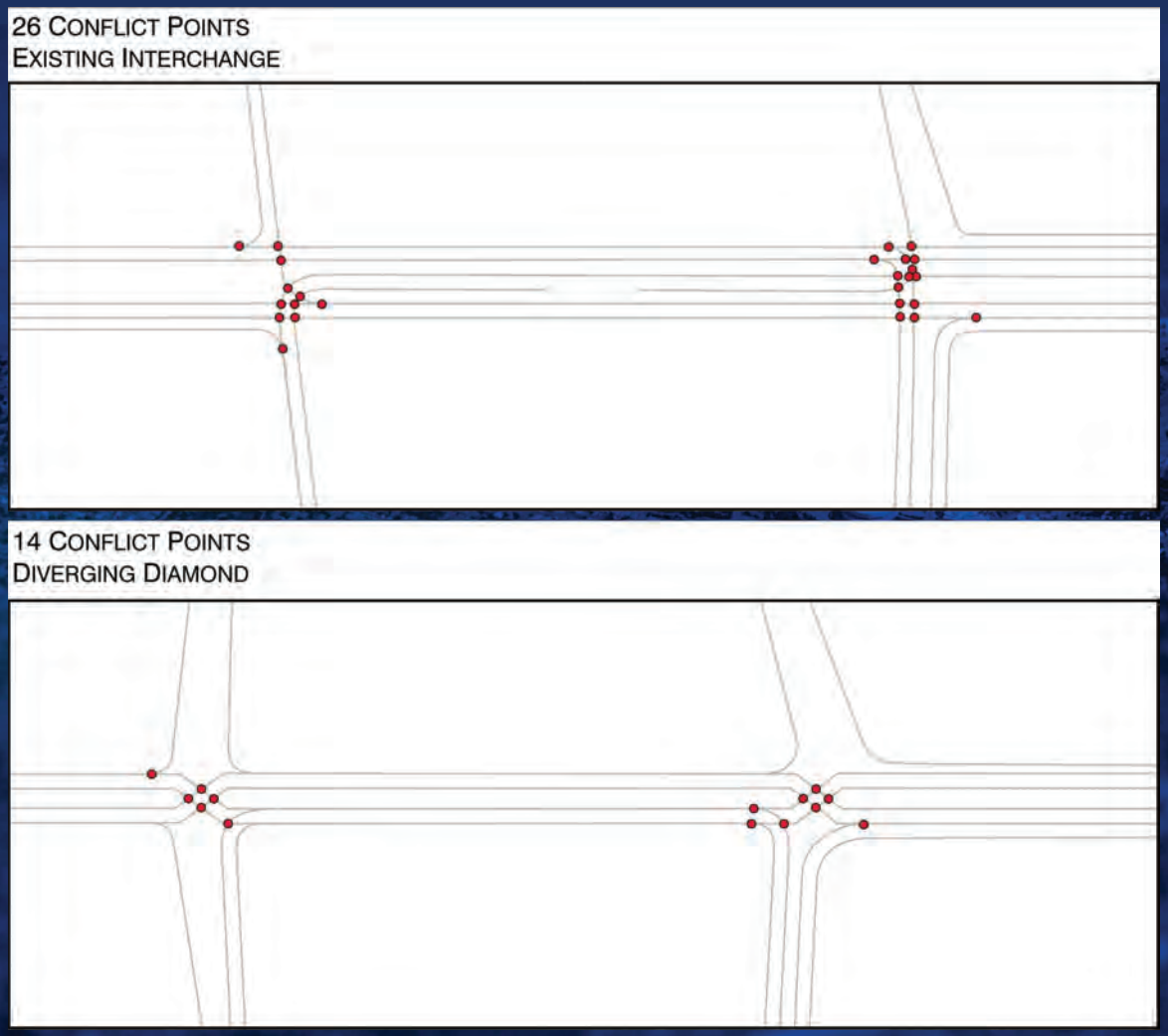
I-80 Interchange Conversion - SPUI



I-80 Interchange Conversion - DDI



I-80 Interchange Conversion - DDI



Intersection	Existing (AM/PM)	DDI (AM/PM)
I-80 Eastbound	F/F	B/D
I-80 Westbound	C/D	B/D

Potential Crash Reduction 33%

Increase Right-Out Nose

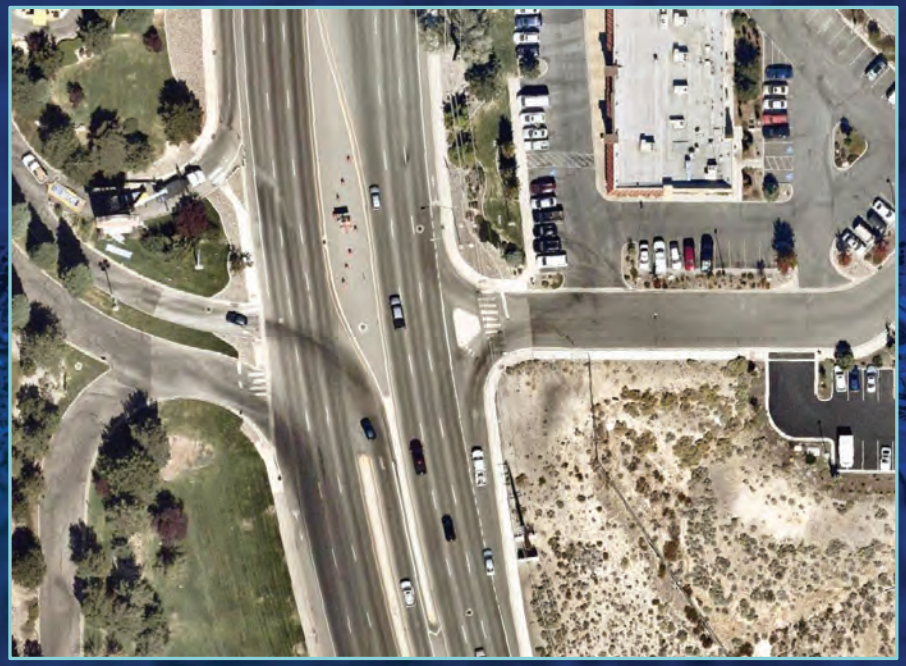


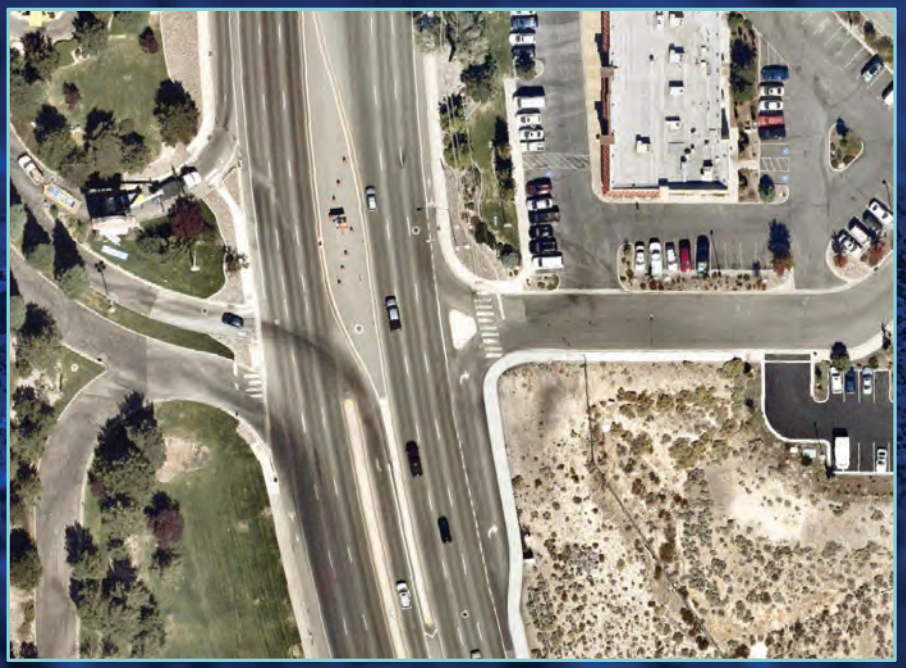


3 Locations:

- 7-11
- Chilis
- Walmart

Improve Left and Right Turns



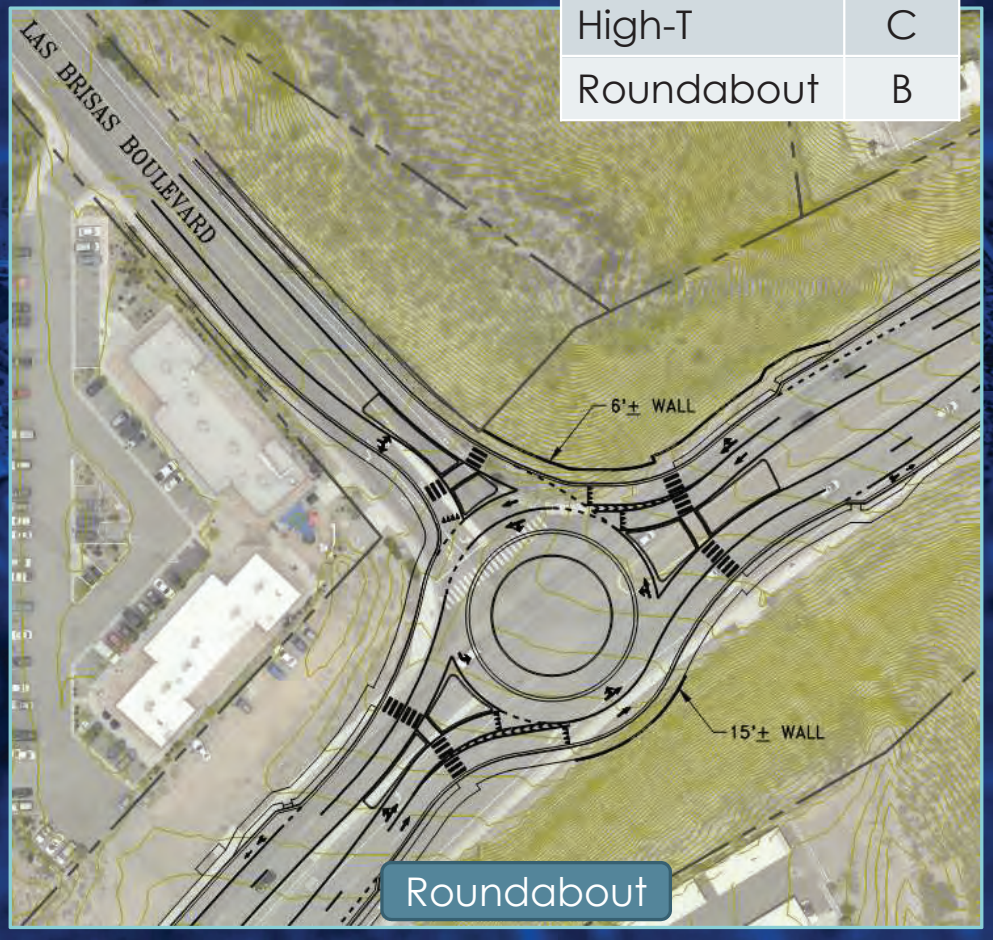


Las Brisas Intersection (ICE)

Intersection LOS	
Unsignalized	F
Signalized	C
High-T	C
Roundabout	B



High-T



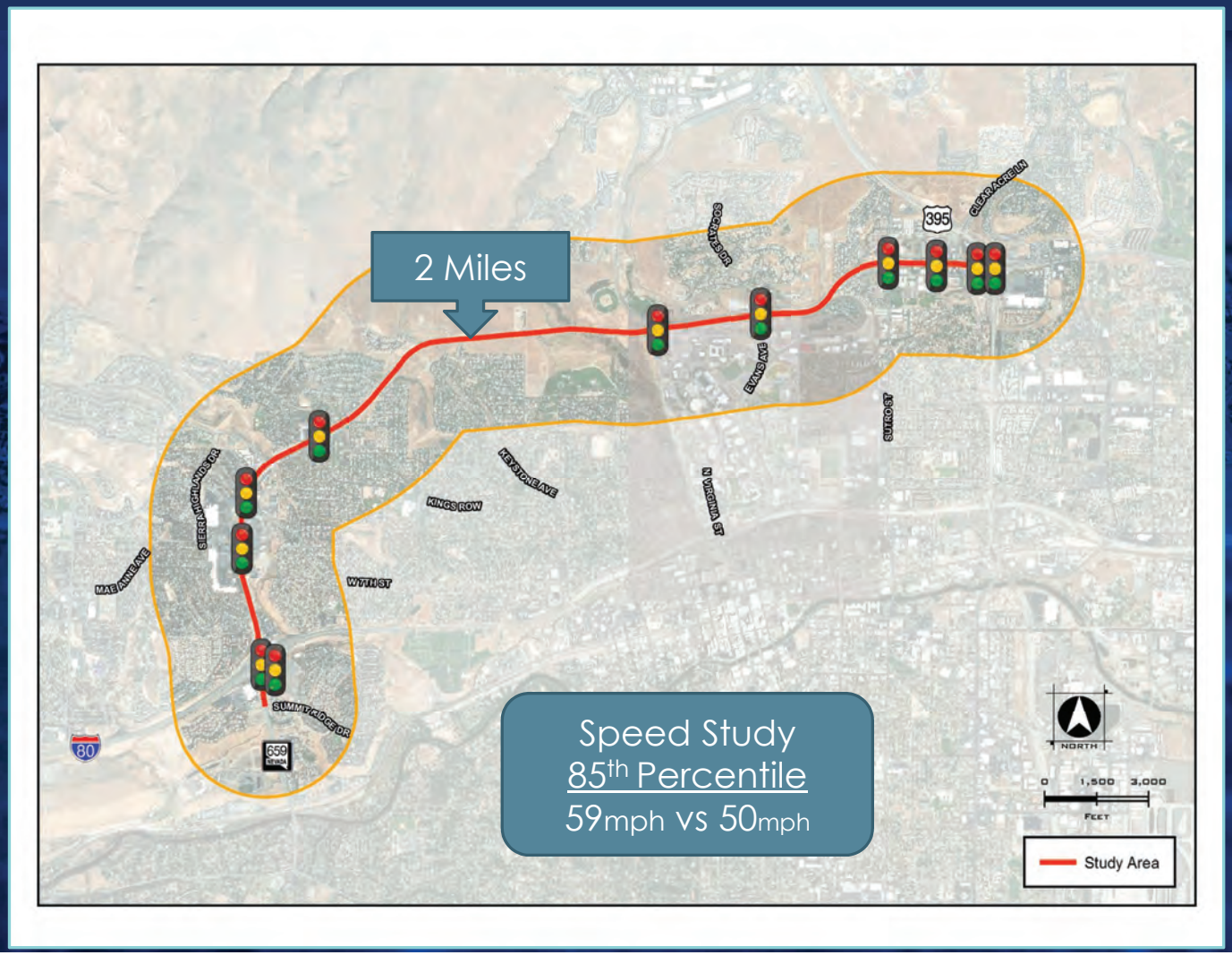
Roundabout

Viewcrest Access & RTC Transit Stop

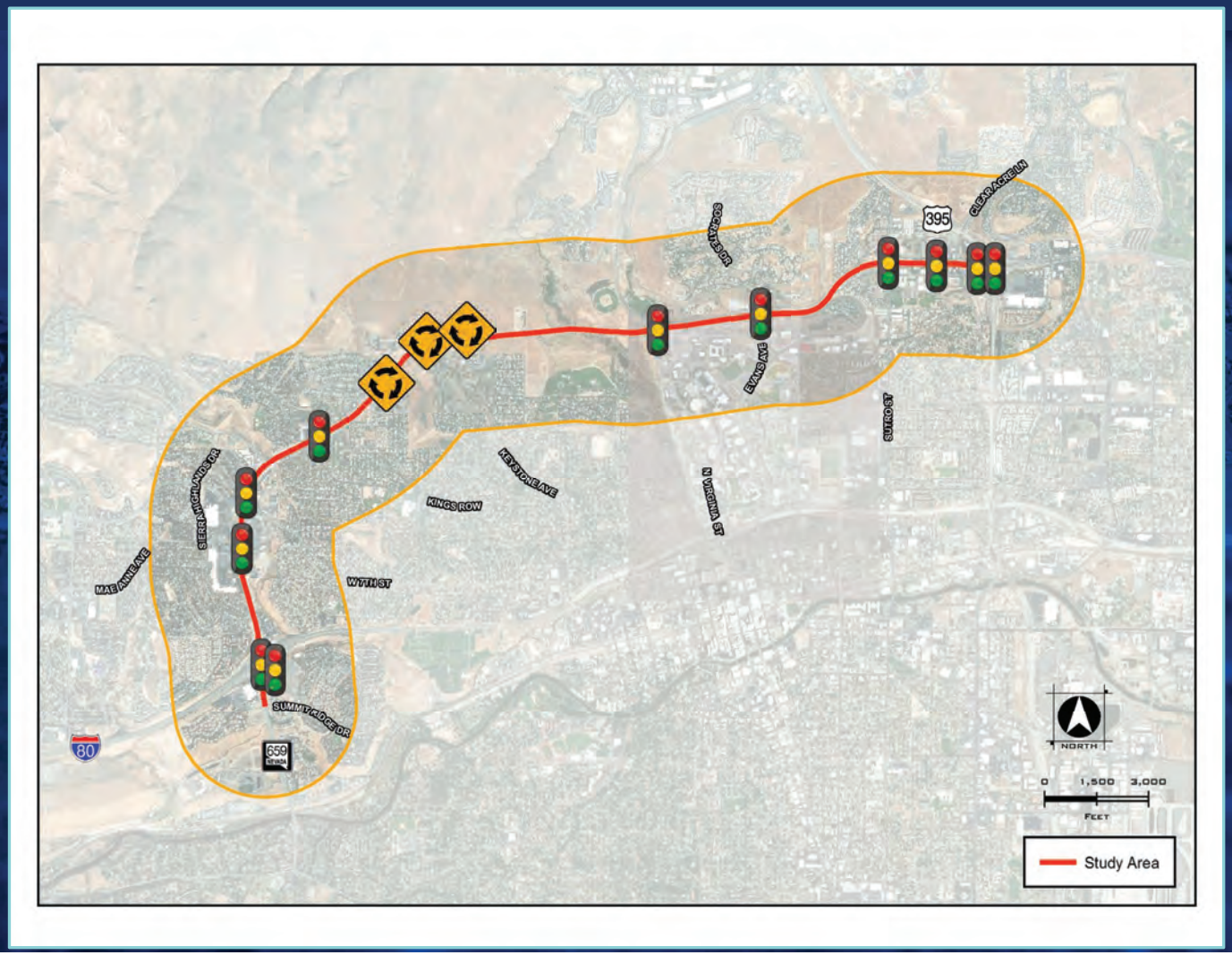




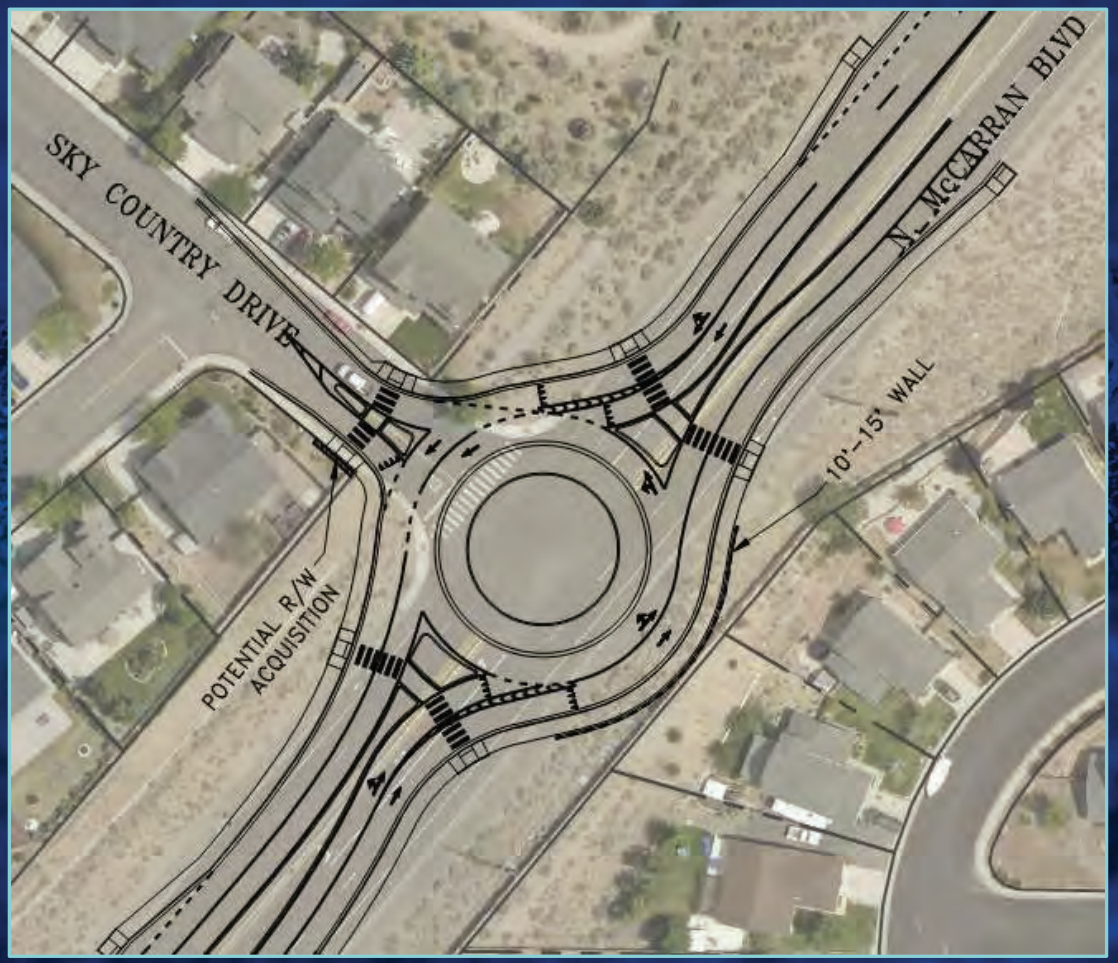
Center Segment High Speeds



Center Segment RAB Opportunities



Center Segment RAB – Sky Country



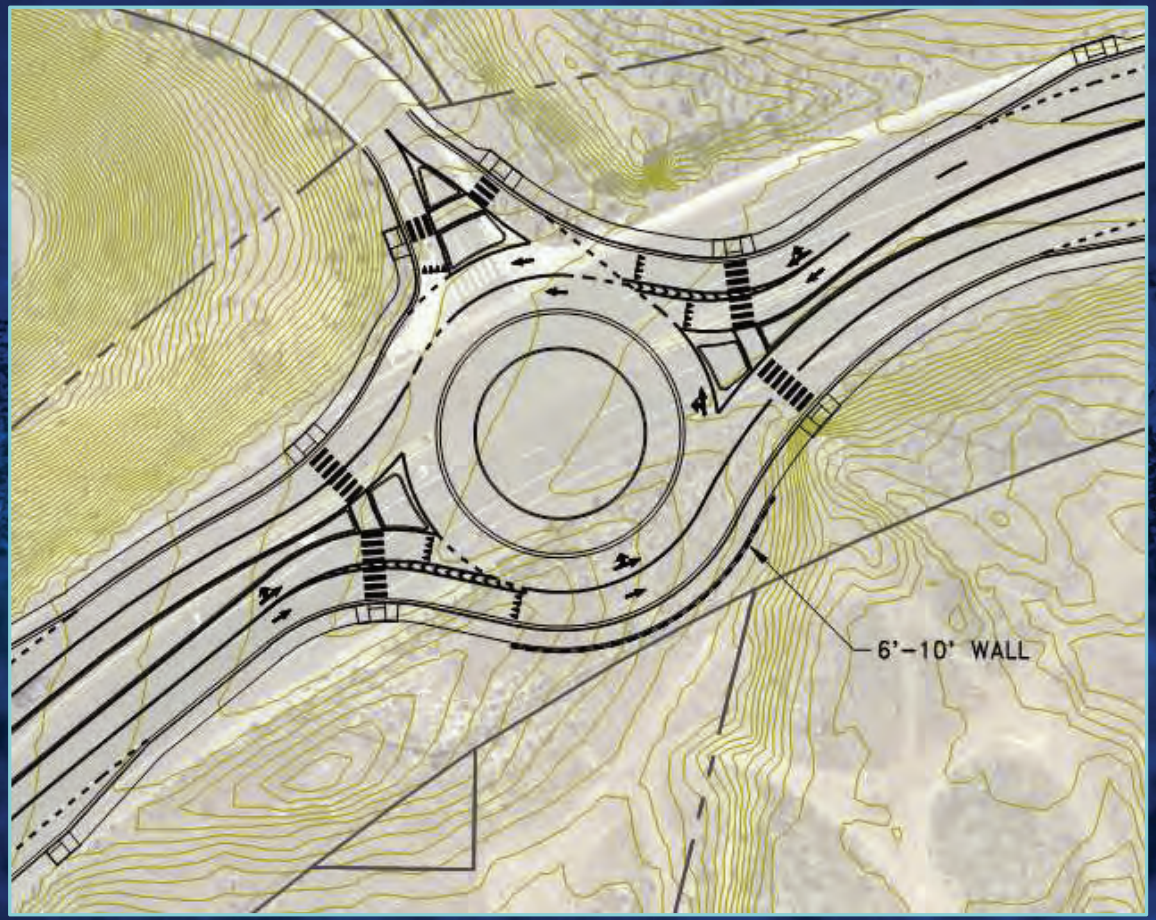
Pros

- Can be made to work

Cons

- Tight right-of-way location
- May require corner clips
- Requires 10'-15' retaining wall
- Visually impactful
- Well west of segment mid point, minimizing speed reduction

Center Segment RAB – Victory Lane



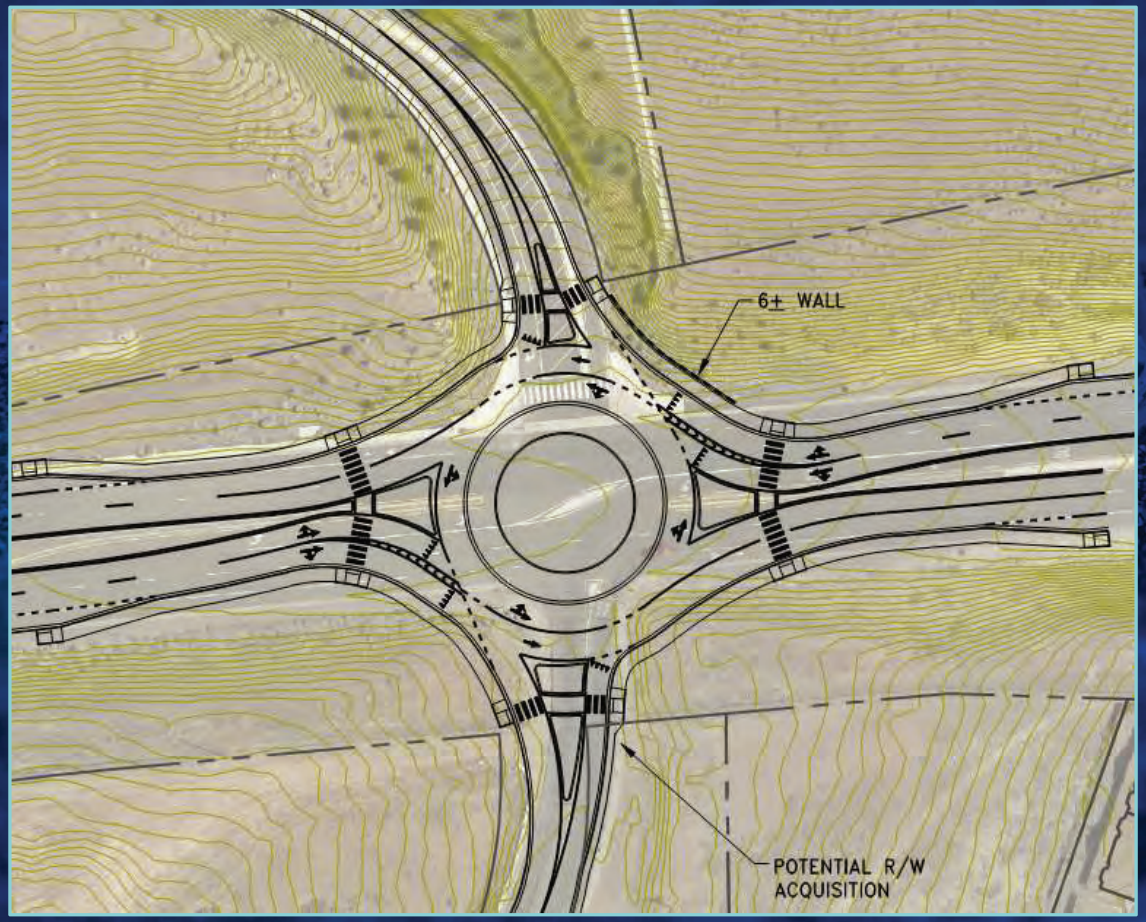
Pros

- Centered in segment, maximizing speed reduction
- Can be constructed in right-of-way

Cons

- Requires 6'-10' retaining wall
- Serves no other traffic operational need besides speed reduction

Center Segment RAB – Keystone Ave



Pros

- Centered in segment, maximizing speed reduction
- Alleviates worm island issues
- Returns full movements from Keystone and Leadership
- Operates at LOS A under current conditions

Cons

- Requires 6’ retaining wall
- May require minor right-of-way acquisition

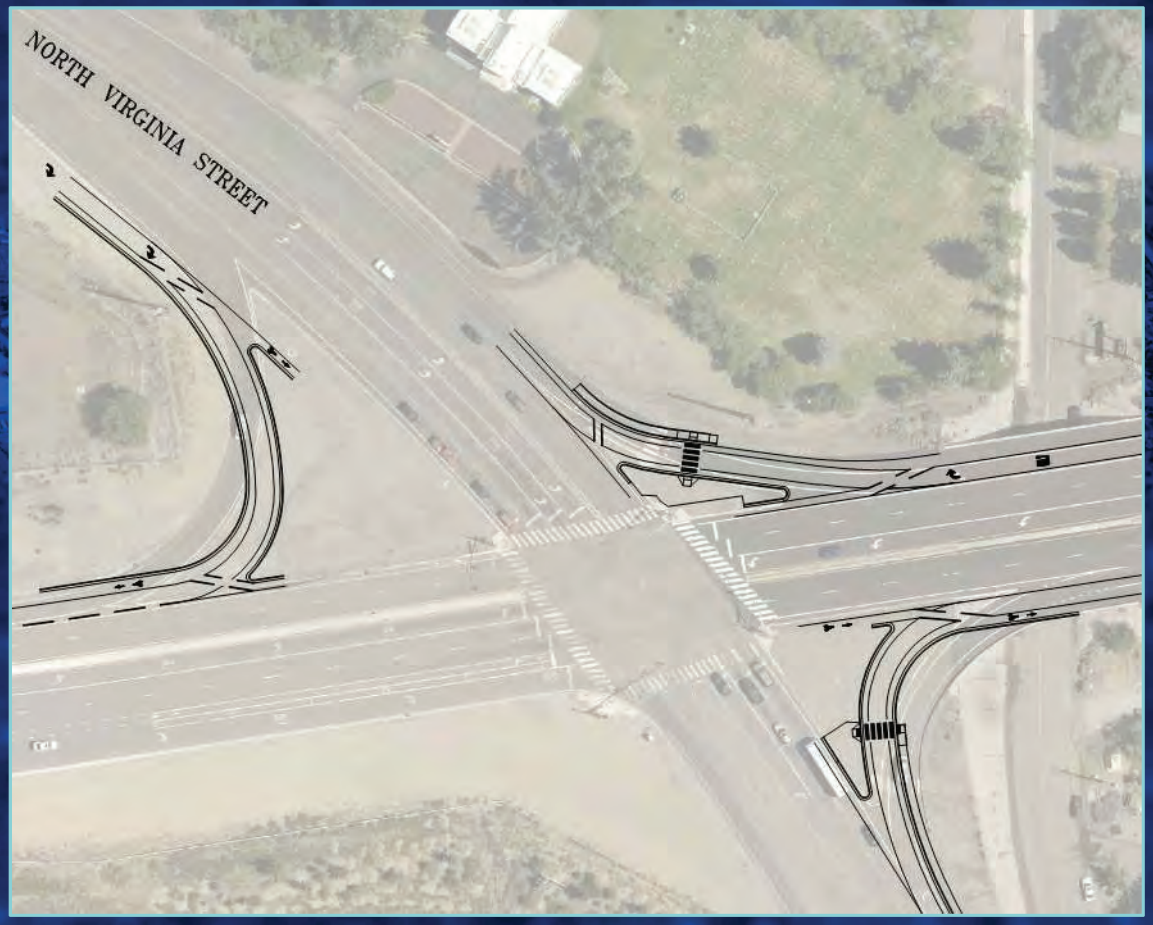
Virginia Street Right Turn Lanes

Pros

- Can reduce right turning speeds for 2/4 movements
- Easily constructible

Cons

- Until there is sidewalk on McCarran, the benefit is limited

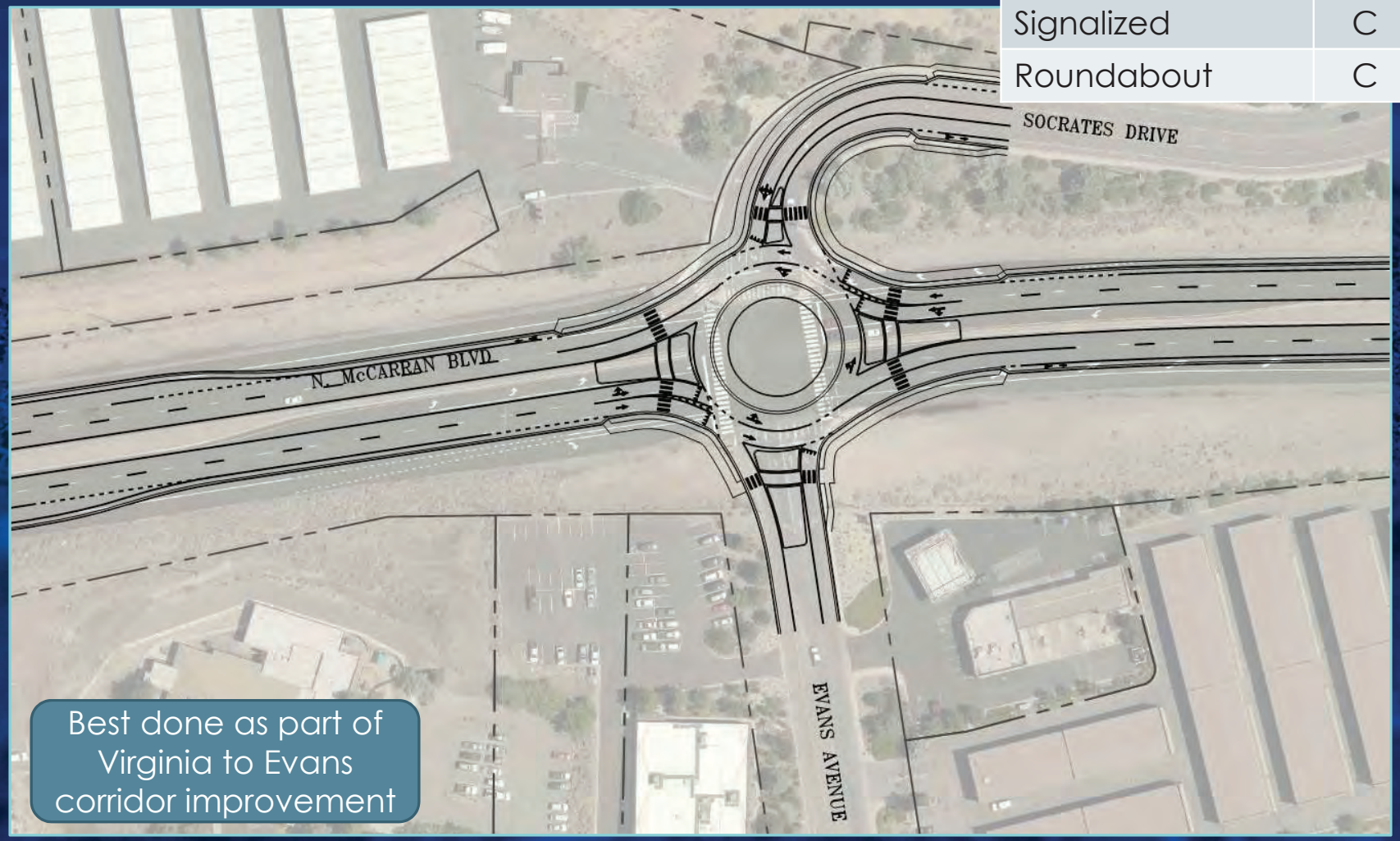


Evans Avenue – Eliminate 3rd EB Through Lane



Evans Avenue – Roundabout

Evans Intersection	AM	PM
Signalized	C	D
Roundabout	C	E*



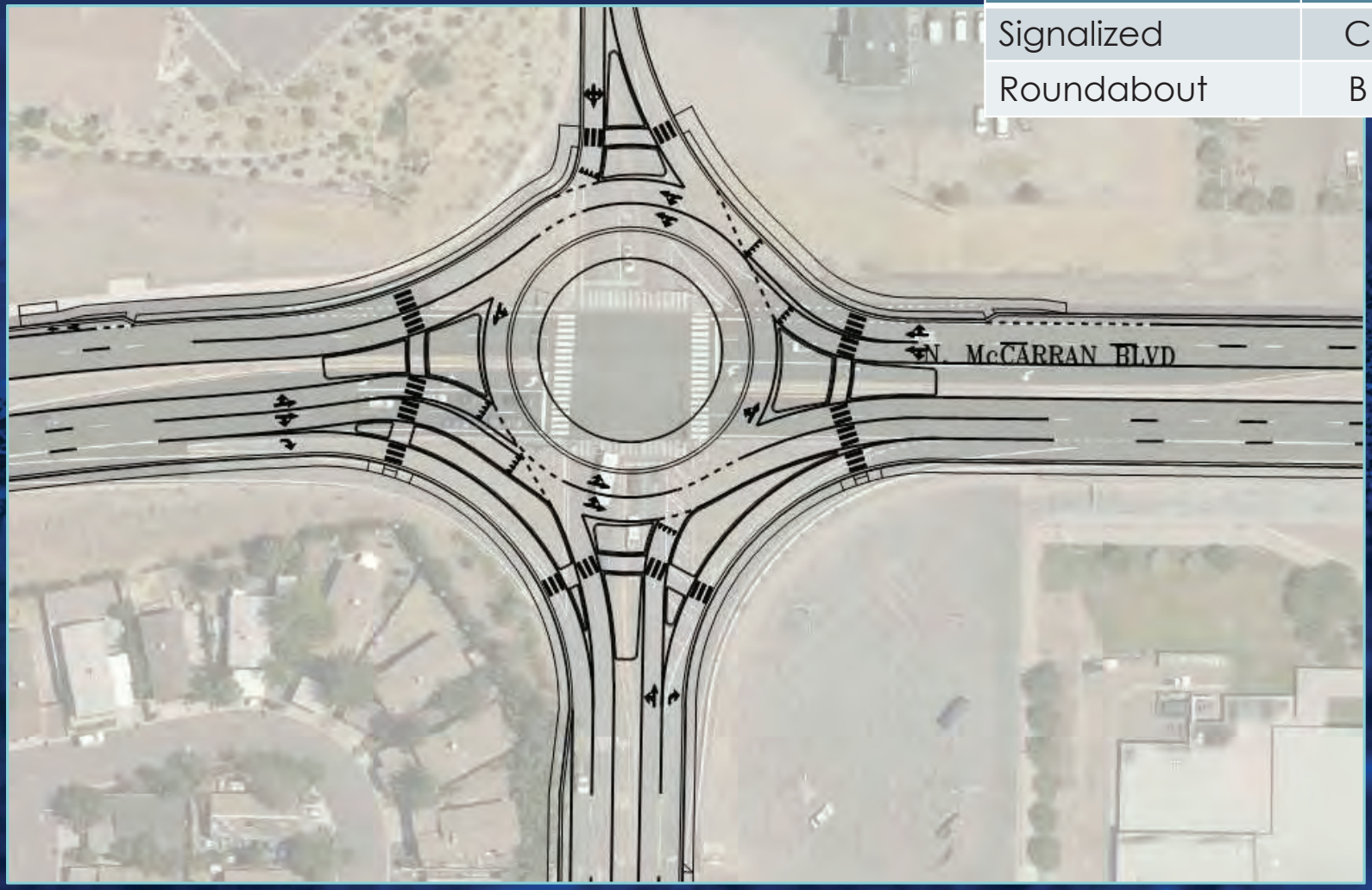
Best done as part of Virginia to Evans corridor improvement

Sutro Street – Right Turn Lanes



Sutro Street – Roundabout

Sutro Intersection	AM	PM
Signalized	C	D
Roundabout	B	C



Other Spot Improvement Alternatives

- Reduce speed limit to 45 mph
- Add lighting: Sky Mountain to I-80, and Victory Lane
- Rip rap sidewalk slopes: Sky Mountain through I-80
- Restripe cattrack for EB left at Mae Anne Ave.
- Leading pedestrian interval (LPI) at Mae Anne Ave., 7th St., Evans Ave. and Sutro St.
- Extend worm islands at Keystone Ave.

Other Spot Improvement Alternatives

- Speed feedback sign in center segment
- Add green paint to bike lane transitions across turn lanes
- Extend queue lengths at needed locations
- Signal optimization

Schedule


Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Existing Conditions
Develop Recommendations
TAC Meetings
Public Meetings
Agency Updates
Report Preparation
Intro & Crash Summary
RSA & Alternative Analysis
Final SMP

Contacts

NDOT
Lori Campbell
lcampbell@dot.state.nv.us
775-888-7462

Wood Rodgers
Bryan Gant
bgant@woodrodgers.com
775-225-3184

TAC MEETING #3
SIGN IN SHEET



Name	Organization	Email
Bryan Gent	Wood Rodgers	BGent@WoodRodgers.com
Jamie Barino	NDOT Bike/Ped	jbarino@dot.nv.gov
Rebecca Kapuler	RTC Washoe	rkapuler@rtcwashoe.com
David Hutchins	City of Reno	hutchinsond@reno.gov
Richard Ouijevolk "OJ"	NDOT D2	rouijevolk@dot.nv.gov
STEPHEN HUGHEY	WOOD RODGERS	SHUGHEY@WOODRODGERS.COM
Jeff Hale	WR	
Shaun Wang	NDOT Traffic Safety	xwang@dot.nv.gov
TOM DIANI	RENO FIRE DEPT	DIANIT@RENO.GOV
SAM AHIAMADI	NDOT Traffic Operations	sahiamadi@dot.nv.gov
JON KING	UNR	JBKING@UNR.EDU
Julie Masterpool	RTC	jmasterpool@rtcwashoe.com
Loki Campbell	NDOT - Safety	
Bryan Harrower	Washoe County Parks	bharrower@washoecounty.us

February 13, 2019

Appendix M
Public Meeting

North McCarran Blvd. Safety Management Plan
Public Open House

WELCOME!

May 1, 2019

The Nevada Department of Transportation (NDOT) is considering safety enhancements along North McCarran Boulevard in Washoe County, NV. The North McCarran Boulevard Safety Management Plan (SMP) is a transportation planning effort that focuses on improving traffic safety for all road users. The SMP process is consistent with the Nevada Strategic Highway Safety Plan's goals of reducing the number and severity of roadway crashes in the state. The North McCarran Boulevard SMP study area extends approximately 6.5 miles along North McCarran Boulevard from Summit Ridge Drive, north and east to US 395. This corridor experiences significant crash activity with four of the 14 intersections exceeding statewide averages for similar facilities.

At this open house, NDOT is offering two sessions for your convience. The first session is offered from 11:30 a.m. - 1 p.m. and the second session from 5 p.m. - 6:30 p.m. Interactive stations are available for you to view and discuss with NDOT representatives.

During this meeting, and through **Friday, May 17, 2019,** your comments are welcome regarding this plan.

WAYS TO GIVE US YOUR COMMENTS:

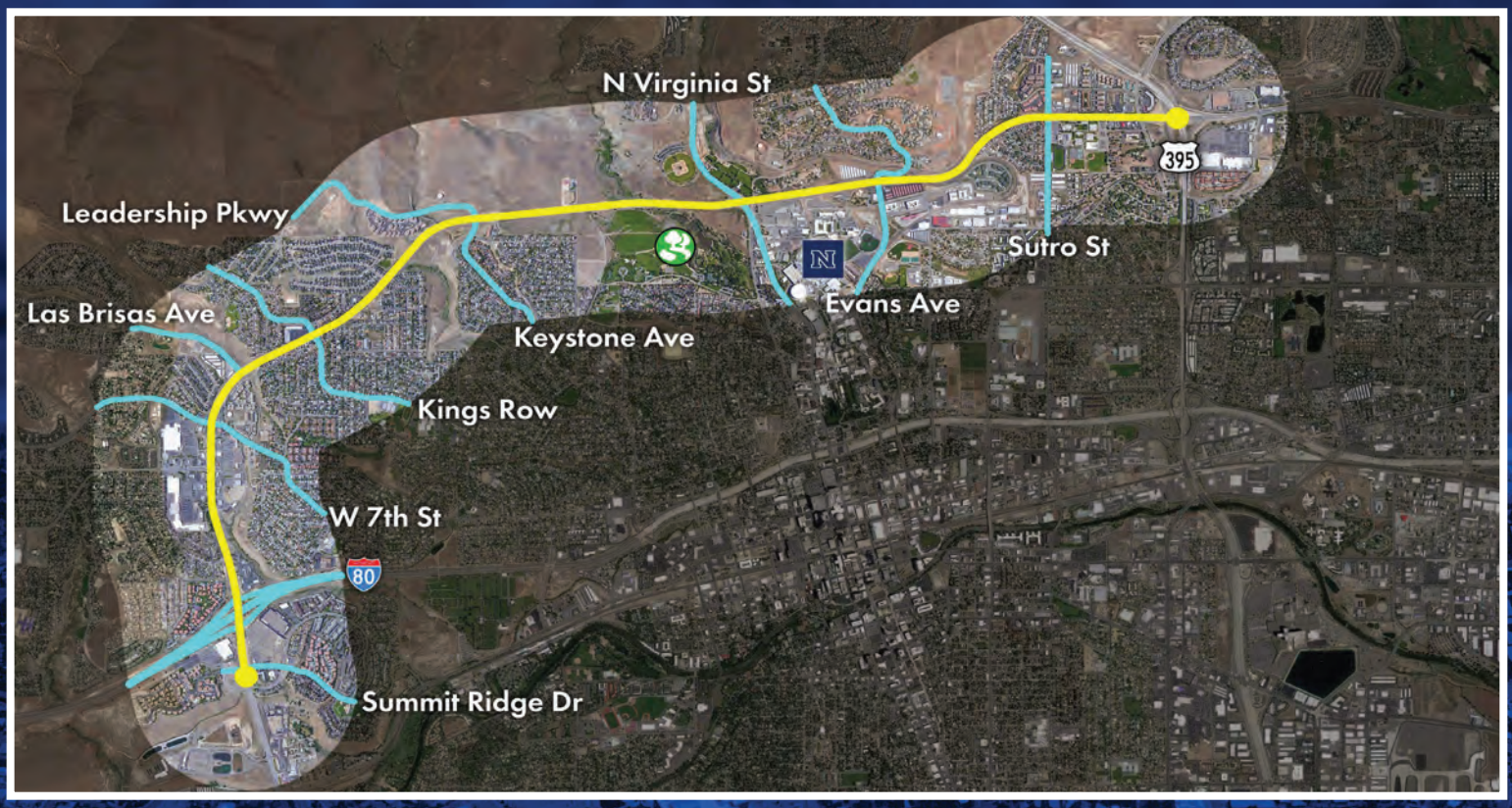
- **TODAY (IN WRITING):** You may fill out the comment form attached to this handout and deposit it in the comment box or give the completed form to one of our representatives.
- **BY MAIL:** You may write a letter or mail your completed comment form which will become part of the official public record. Mail your comments to: Lori Campbell, NDOT, 1263 South Stewart Street, Carson City, NV, 89712.
- **BY EMAIL:** Email your comments to **lcampbell@dot.nv.gov.** Please reference North McCarran Blvd. SMP in the subject line.

Thank you for attending this open house and for providing your comments.

Sincerely,

Lori Campbell
Traffic Safety Manager
Nevada Department of Transportation

NORTH MCCARRAN BOULEVARD SAFETY MANAGEMENT PLAN FACT SHEET



BACKGROUND

The North McCarran Boulevard Safety Management Plan (SMP) is a transportation planning effort that focuses on improving traffic safety for all road users. The SMP process is consistent with the Nevada Strategic Highway Safety Plan's goals of reducing the number and severity of roadway crashes in the state. The North McCarran Boulevard SMP study area extends approximately 6.5 miles along North McCarran Boulevard from Summit Ridge Drive, north and east to US 395. This corridor experiences significant crash activity with four of the 14 intersections exceeding statewide averages for similar facilities.

WHAT IS BEING CONSIDERED?

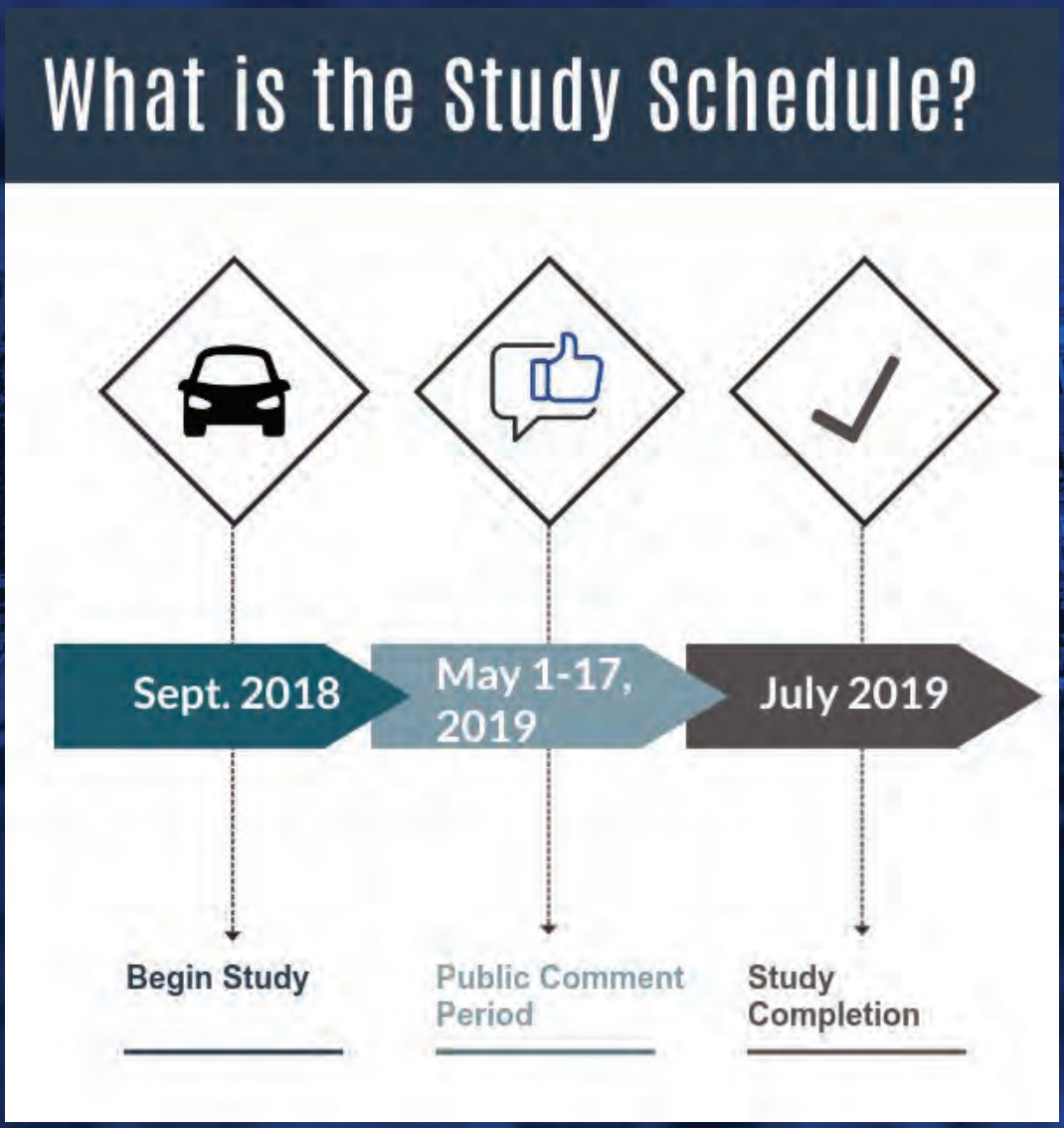
The study team has identified several alternatives that can be considered to improve safety for all travelers in the corridor. Examples of alternatives include changes to the roadway configuration, intersection improvements and reconfigurations, operational enhancements, and improvements at select locations.

WHAT ARE THE BENEFITS?

Each of the alternatives being considered would reduce the potential for crashes, improving overall safety. While issues such as access, traffic performance, adjacent land uses, etc. are taken into consideration, decreasing the potential for crashes is the main focus of this SMP.

WHERE CAN I SEE THE ALTERNATIVES BEING CONSIDERED?

NDOT has prepared an interactive website to illustrate the concepts under study, as well as the potential benefits. The website is www.nevadadot.com/safety/safety-management-plans-smp. It can also help you stay informed and provide your comments on this SMP.



For more information, questions, or to submit comments, please contact:

Lori Campbell
1263 S. Stewart Street
Carson City, NV 89712

775-888-7462
lcampbell@dot.nv.gov
www.Nevadadot.com

Nevada Department of Transportation
North McCarran Boulevard Safety Management Plan
5/1/2019
Rancho San Rafael Park – Ranch House, 1595 N. Sierra St., Reno

Please Sign In / Por Favor Registrarse

	Name / Nombre Representing / Organización	Address / Dirección City State Zip / Ciudad, Estado, Codigo Postal	Phone / Teléfono E-mail / Electrónico	How did you hear about this meeting? ¿Cómo se entero de esta reunión?
1.	JULIE MAXEY, Nevada Department of Transportation	1263 S. Stewart St., Carson City, NV 89712	775-888-7171, jmaxey@dot.nv.gov	News advertisement
2.	MAC ROSSI	260 DIAMOND RIDGE, RENO	408-410-3062	NAB 5
3.	BARB FENNE	10200 FIRETHORN AVE. RENO	775 997-4575	NAB 5
4.	Jane Westa			
5.	Mark Sheldon	3035 Andrea St. Reno	775-240-0501	
6.	Berry Hall	1990 Ives Avenue	408-316-9397	Next door.
7.	Pierre Monsset-Jones	2095 Lassen Dr	747-4090	NAB 5
8.	Thomas Martin & DIANA KAMPS	3190 Coronado Way	775-560-0320	News Cast
9.	Roland MS	1777 Quail Reno Rd		News
10.	Rebecca Kapuler	RTC Washoe		
11.	Heather Manzo	City of Reno - Planning	775 334-2668	
12.	Troy Miller	UNR	775 784 6546	Email -
13.	Bill Macaulay	60 Greenstone Cir. Reno 89512	3234220	
14.	Derek Wilson	Rubicon Design Group	527-6710	dwilson@rubicondesigngroup.com
15.	Karen Downs	Manhard Consulting	321-6538	kdowns@manhard.com
16.	Paco Lachoy	Reno Senior Citizen Advisory Comm	775-322-7866	pacolachoy@yahoo.com

NOTICE: THE INFORMATION YOU PROVIDE BECOMES A PUBLIC RECORD SUBJECT TO DISCLOSURE (NRS 239.0107)
AVISO: LA INFORMACIÓN QUE PROPORCIONE SE CONVIERTE EN UN REGISTRO PÚBLICO SUJETO A LA DIVULGACIÓN (NRS 239.0107)

Nevada Department of Transportation
North McCarran Boulevard Safety Management Plan
5/1/2019
Rancho San Rafael Park – Ranch House, 1595 N. Sierra St., Reno

Please Sign In / Por Favor Registrarse

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1.	JULIE MAXEY, Nevada Department of Transportation	1263 S. Stewart St., Carson City, NV 89712	775-888-7171, jmaxey@dot.nv.gov	News advertisement
2.	Pat Fager	1420 Wessex Circle Reno 89503	775-771947 pafager@yahoo.com	
3.	Leah Sandels	1880 Coleman Dr.	leah.sanders14@gmail.com	Nextdoor Blog
4.	KURT DIETRICH, COR	PO BOX 1900 RENO, NV 89505	DIETRICHK@RENO.GOV	
5.	DONNA CLONTZ	PO Box 33244 Reno 89533	donnahorm1@yahoo.com	email
6.	Amy Cummings	RTC	acummings@rtcwashoe.com	
7.	MIKE GALLOTTO	98 HAMPSHIRE DR. RENO 89503	MIKEG@SSPBIKES.COM	Email
8.	Carol Burns	15 Columbine Ct SV	775-673-5256	
9.	Patrick Smith	3241 Green River Dr Reno, NV 89503	PatrickS@Nevada.UNR.edu	Email
10.				
11.				
12.				
13.				
14.				
15.				
16.				

NOTICE: THE INFORMATION YOU PROVIDE BECOMES A PUBLIC RECORD SUBJECT TO DISCLOSURE (NRS 239.0107)
AVISO: LA INFORMACIÓN QUE PROPORCIONE SE CONVIERTE EN UN REGISTRO PÚBLICO SUJETO A LA DIVULGACIÓN (NRS 239.0107)

Nevada Department of Transportation
North McCarran Boulevard Safety Management Plan
5/1/2019
Rancho San Rafael Park – Ranch House, 1595 N. Sierra St., Reno

Please Sign In / Por Favor Registrarse

	Name / Nombre Representing / Organización	Address / Dirección City State Zip / Ciudad, Estado, Codigo Postal	Phone / Teléfono E-mail / Electrónico	How did you hear about this meeting? ¿Cómo se enteró de esta reunión?
1.	JULIE MAXEY, Nevada Department of Transportation	1263 S. Stewart St., Carson City, NV 89712	775-888-7171, jmaxey@dot.nv.gov	News advertisement
2.	Alex C. Woodley	City of Reno	334-4636 woodleya@reno.gov	
3.	Marjorie Randall	3948 Glenview Ter	775-250-7761	Nextdoor.com
4.	LJ JOHNSON	1675 Sky Mountain Dr #524 Reno 89523	775-342-8434	Facebook/Instagram.
5.	Melanie Scott	2030 Ives Ave 89503	775.746-1667	email/NextDoor
6.	Loren Chilson	Headway Transportation		lchilson@headwaytransportation.com
7.	Kate Berry	1770 O'Farrell St Reno 8958	—	Kberrya@gmail.com
8.	Lisa Lien	1975 Peavine Rd Reno 8450		
9.				
10.				
11.				
12.				
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16.				

NOTICE: THE INFORMATION YOU PROVIDE BECOMES A PUBLIC RECORD SUBJECT TO DISCLOSURE (NRS 239.0107)
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North McCarran Boulevard Safety Management Plan
5/1/2019
Rancho San Rafael Park – Ranch House, 1595 N. Sierra St., Reno

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	Name / Nombre Representing / Organización	Address / Dirección City State Zip / Ciudad, Estado, Codigo Postal	Phone / Teléfono E-mail / Electrónico	How did you hear about this meeting? ¿Cómo se entero de esta reunión?
1.	JULIE MAXEY, Nevada Department of Transportation	1263 S. Stewart St., Carson City, NV 89712	775-888-7171, jmaxey@dot.nv.gov	News advertisement
2.	Jim Cox	1915 Pembroke Rd, Reno, NV	JIMACOX@SBCGLOBAL.NET	[illegible]
3.	Kim Eldredge	7230 Elder, Rio Linda CA 95673		V2
4.	Brenda Eldredge	3570 W Country Club Sac. CA 95821	916) 801-7728	V2
5.	Wade Eldredge	7230 Elder St Rio Linda CA 95673	WSkyeld@gmail.com	V2
6.	IRENE Eldredge	9602 Cole Dr. MORADA, CA 95212	209/602-7889	V2
7.	IRV Eldredge	9602 Cole Dr. MORADA CA 95212	209/602-7889	V2
8.	Sam Alvarenga	222 River Rock Dr NV 89501	347 306 2301	
9.	Mark Clean	449 Trout Ct. Reno 89519	775-324-3100	RCS
10.	Sondra Rosenberg	1870 California Ave, Reno 89509	775-443-5869	
11.	Tess Opferman	2230 Watt St. Reno, 89509	775-880-334-2255	
12.	Helena Farrar	1664 N. Virginia St. MS058 89557	hfarrar@unr.edu	email
13.	John Hung	2030 Ives Ave	775.379.0754	
14.	Alan Chvilicek	2375 Vista Ave	775-527-3731	email
15.	FORREST BIETZ	692 Citadel Way Reno 89503	7758130864 fwbietz@yahoo.com	email
16.	Sue Ward	6389 Moon Ridge Terr Reno 89523		Newspaper, Citizen

NOTICE: THE INFORMATION YOU PROVIDE BECOMES A PUBLIC RECORD SUBJECT TO DISCLOSURE (NRS 239.0107)
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Nevada Department of Transportation
North McCarran Boulevard Safety Management Plan
5/1/2019
Rancho San Rafael Park – Ranch House, 1595 N. Sierra St., Reno

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	Name / Nombre Representing / Organización	Address / Dirección City State Zip / Ciudad, Estado, Codigo Postal	Phone / Teléfono E-mail / Electrónico	How did you hear about this meeting? ¿Cómo se entero de esta reunión?
1.	JULIE MAXEY, Nevada Department of Transportation	1263 S. Stewart St., Carson City, NV 89712	775-888-7171, jmaxey@dot.nv.gov	News advertisement
2.	Jack Mayes	5280 Tenaya Creek 89506		
3.	Richard M. Ojevolk	310 Galletti Way, Sparks NV. 89701	775 834-8304 [illegible]	
4.	John Flansberg	1 East First, Reno, NV 89512	775-657-4570, flansberg[illegible]gov	
5.	Joy Bridgeman	2245 Ellendale Rd Reno NV 89503	775-746-1717	
6.	Ethnea Mousset-Jones	2095 Lassen Dr. Reno NV 89503	775-747-4090	
7.	Rebecca Venis	1220 Hugh Chaparral Dr. 89524	775-348-3909	
8.	Michael Collins	1830 Brisbane Ave Reno 89503	503-550-6115	
9.	Terry Barker	1975 Peavine Rd. Reno 89503		
10.	Lynn Reynolds	1900 Peavine Rd Rno 89503	775 402 2907	
11.				
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COMMENT FORM

N. McCarran Blvd. Safety Management Plan
Public Open House
Wednesday, May 1, 2019

▪ ***Please Print Clearly*** ▪

Date:	5-1-19
Name:	John Hervey
Address:	2030 Ives Ave
City: Reno	State: NV ZIP Code: 89503
Phone (Day): 775.379.0754	Phone (Evening): Same
E-mail Address:	jhervey63@gmail.com
Would you like NDOT staff to call you to discuss your comment or question?	☐ YES ☐ NO
Discussed Keystone/McCarran w/ staff	
Comment/Question:	

Subsequent to talking w/ staff concerning the ~~Keystone~~ / McCarran intersection I strongly recommend the round a ~~bout~~ not only for safety ~~of~~ turning but a/so for speed mitigation. I have witnessed 4 ~~FAT~~ wreaks in the past 2 years and many illegal turns onto McCarran ~~from~~ Keystone and Leadership.

Comments will be accepted through 5 p.m., Friday May 17, 2019.
Please mail to:
Lori Campbell, NDOT Traffic Safety, 1263 S. Stewart St., Carson City, NV 89712
Or email your comments to lcampbell@dot.nv.gov

Thank you for your time and interest

COMMENT FORM

N. McCarran Blvd. Safety Management Plan
Public Open House
Wednesday, May 1, 2019

▪ ***Please Print Clearly*** ▪

Date:	5/1/19
Name:	Brenda Eldredge
Address:	3570 W Country Club Ln
City:	Sacramento
State:	CA
ZIP Code:	95821
Phone (Day):	916) 801-7728
Phone (Evening):	916) 801-7728
E-mail Address:	Littlesisbeeyahoo.com
Would you like NDOT staff to call you to discuss your comment or question?	☒ YES ☐ NO

Comment/Question:

Area of Concern: North McCarran + Socrates/Evans

Not enough walking time for pedestrians - Speed TOO FAST

No Safe Median in Crosswalk for Pedestrian - Speed TOO FAST

Speed too Fast on N. McCarran! No ~~Gras~~ Sidewalk next to UNR

Suggestions:

Input Sidewalk on UNR (Next to Intersection)

Install lead Pedestrian timers

Add Median/Pedestrian Crossing Island

Install Round about to SLOW DOWN TRAFFIC!

Comments will be accepted through 5 p.m., Friday May 17, 2019.
Please mail to:
Lori Campbell, NDOT Traffic Safety, 1263 S. Stewart St., Carson City, NV 89712
Or email your comments to lcampbell@dot.nv.gov

Thank you for your time and interest

COMMENT FORM

N. McCarran Blvd. Safety Management Plan
Public Open House
Wednesday, May 1, 2019

▪ *Please Print Clearly* ▪

Date:	5-1-19
Name:	Kim Eldredge
Address:	7230 ELDER ST
City: Rio Linda	State: CA ZIP Code: 95673
Phone (Day): (916) 834-4647	Phone (Evening):
E-mail Address:	kim.eldredge@yolocounty.org
Would you like NDOT staff to call you to discuss your comment or question?	☒ YES ☐ NO

Comment/Question:

AREA OF CONCERN (N McCARRAN & SOCRATES CROSS)
- NOT ENOUGH WALKING TIME for Ped to cross the roadway SAFELY
- NO CROSSWALK AT INTERSECTION
- NO SAFE MEDIAN IN CROSSWALK FOR PED
- NO SIGNAGE AT or APPROACHING INTERSECTION OF Ped CROSSING
- POOR LIGHTING AT APPROACHING INTERSECTION
- HIGH SPEED 45 TO 50 mph

OVER ↓

Comments will be accepted through 5 p.m., Friday May 17, 2019.
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Lori Campbell, NDOT Traffic Safety, 1263 S. Stewart St., Carson City, NV 89712
Or email your comments to lcampbell@dot.nv.gov

Thank you for your time and interest

Consider

- Roundabout to reduce speed
- lower speed
- incr lighting
- Reflective paint on rumble strips
- Ped warning signs
- ped Hybrid Beacon
- Lead ped intervals
- cameras
- pedestrian safety zone
- pedestrian Refuge Island

COMMENT FORM

N. McCarran Blvd. Safety Management Plan
Public Open House
Wednesday, May 1, 2019

▪ ***Please Print Clearly*** ▪

			Date:	May 1, 2019	
Name:	Kate Berry				
Address:	1770 O'Farrell Street				
City:	Reno	State:	NV	ZIP Code:	89503
Phone (Day):		Phone (Evening):			
E-mail Address:	Kberry a Gg mail. com				
Would you like NDOT staff to call you to discuss your comment or question?		☐ YES	☐ NO		
Comment/Question:	Please consider adding a traffic light at the McCarran - Keystone intersection.				

Comments will be accepted through 5 p.m., Friday May 17, 2019.
Please mail to:
Lori Campbell, NDOT Traffic Safety, 1263 S. Stewart St., Carson City, NV 89712
Or email your comments to lcampbell@dot.nv.gov

Thank you for your time and interest

COMMENT FORM

N. McCarran Blvd. Safety Management Plan
Public Open House
Wednesday, May 1, 2019

▪ ***Please Print Clearly*** ▪

Date:	5/1/19
Name:	Joyce Bridgeman
Address:	2245 Ellendale Rd
City: Reno,	State: NV ZIP Code: 89503
Phone (Day):	775 224-1533
Phone (Evening):	775 746-1317
E-mail Address:	joybridge3@yahoo.com
Would you like NDOT staff to call you to discuss your comment or question?	☐ YES ☑ NO

Comment/Question:

I would really like to see a light at Keystone we can't go left but I've seen people make a dash for it - maybe a letter carrier at least.
A light would be best and allow a crosswalk for hikers & Biker to get across. Since people are accelerating to get up the hill & may be Tempted to Run the light - maybe those yellow warning signals would be very helpful & safe. I like the lights they have on Pyramid so you are warned that the light is going to change

Comments will be accepted through 5 p.m., Friday May 17, 2019.

Please mail to:
Lori Campbell, NDOT Traffic Safety, 1263 S. Stewart St., Carson City, NV 89712
Or email your comments to lcampbell@dot.nv.gov

Thank you for your time and interest

COMMENT FORM

N. McCarran Blvd. Safety Management Plan
Public Open House
Wednesday, May 1, 2019

▪ ***Please Print Clearly*** ▪

			Date:	5/1/19	
Name:	MARJORIE RANDALL				
Address:	3948 Glenview Ter				
City:	Reno	State:	NV	ZIP Code:	89503
Phone (Day):	775-250-7761	Phone (Evening):			
E-mail Address:	mrand88@gmail.com				
Would you like NDOT staff to call you to discuss your comment or question?		☐ YES	☒ NO		
Comment/Question:	My biggest concern in this corridor is the on ramp from North McCarran onto southbound I-580. Not only was the merge lane shortened but there is now a wall blocking visibility of oncoming cars. Any driver trying to merge onto 580 is at great risk of collision.				

Comments will be accepted through 5 p.m., Friday May 17, 2019.
Please mail to:
Lori Campbell, NDOT Traffic Safety, 1263 S. Stewart St., Carson City, NV 89712
Or email your comments to lcampbell@dot.nv.gov

Thank you for your time and interest

COMMENT FORM

N. McCarran Blvd. Safety Management Plan
Public Open House
Wednesday, May 1, 2019

▪ ***Please Print Clearly*** ▪

				Date:	5-1-2019
Name:	Michael Collins				
Address:	1830 Brisbane Avenue				
City:	Reno	State:	NV	ZIP Code:	89503
Phone (Day):	503-550-6115	Phone (Evening):			
E-mail Address:	michael.smokey.collins@gmail.com				
Would you like NDOT staff to call you to discuss your comment or question?		☑ YES	☐ NO		

Comment/Question:

Keystone → N Virginia for an occasional bike user, I would prefer the buffered bike lane option, because I would be cruising at speed for a long period of time. I would be concerned when passing peds on an MUP.

Due to illegal left turns from Keystone to McCarran, I think that intersection is ideally suited to a roundabout.

Comments will be accepted through 5 p.m., Friday May 17, 2019.
Please mail to:
Lori Campbell, NDOT Traffic Safety, 1263 S. Stewart St., Carson City, NV 89712
Or email your comments to lcampbell@dot.nv.gov

Thank you for your time and interest

COMMENT FORM

N. McCarran Blvd. Safety Management Plan
Public Open House
Wednesday, May 1, 2019

▪ *Please Print Clearly* ▪

Date:	5-1-19
Name:	Alan Olive
Address:	2385 Vista.
City:	State: ZIP Code:
Phone (Day):	775-356-4001 Phone (Evening):
E-mail Address:	alan.olive@uhsinc.com
Would you like NDOT staff to call you to discuss your comment or question?	☐ YES ☐ NO
Comment/Question:	We have been approved to build a free standing Emergency Room at Moana & McCarran. We welcome to participate in discussion & planning to support the community. Thank you.

Comments will be accepted through 5 p.m., Friday May 17, 2019.
Please mail to:
Lori Campbell, NDOT Traffic Safety, 1263 S. Stewart St., Carson City, NV 89712
Or email your comments to lcampbell@dot.nv.gov

Thank you for your time and interest

COMMENT FORM

N. McCarran Blvd. Safety Management Plan
Public Open House
Wednesday, May 1, 2019

▪ ***Please Print Clearly*** ▪

Date:	5-1-2019
Name:	Lisa Hill
Address:	1975 Peavine Rd
City: Reno	State: NV ZIP Code: 89503
Phone (Day): 775 848-8579	Phone (Evening):
E-mail Address:	Keystoneneighbor@yahoo.com
Would you like NDOT staff to call you to discuss your comment or question?	☒ YES ☐ NO

Comment/Question:

Slow traffic speeds down to 45mph
Separate bike & ped lanes along roadway (Separate)
Provide safe crossings for ped & bikes crossing
north south in area of Rancho San Rafael
(like Round about w/ Hawk ped/walker activation and
or traffic light)
Banana turn & worm turn are patently unsafe
(near Keystone)
There is poor visability going west up hill prior to
Keystone need extra care w/ signals here

Comments will be accepted through 5 p.m., Friday May 17, 2019.
Please mail to:
Lori Campbell, NDOT Traffic Safety, 1263 S. Stewart St., Carson City, NV 89712
Or email your comments to lcampbell@dot.nv.gov

Thank you for your time and interest

COMMENT FORM

N. McCarran Blvd. Safety Management Plan
Public Open House
Wednesday, May 1, 2019

▪ ***Please Print Clearly*** ▪

			Date:	5-1-2019	
Name:	Patrick Smith				
Address:	3241 Green River Dr.				
City:	Reno	State:	NV	ZIP Code:	89503
Phone (Day):	(775) 297-6605	Phone (Evening):			
E-mail Address:	PatrickS@Nevada.UNR.edu				
Would you like NDOT staff to call you to discuss your comment or question?		☐ YES	☒ NO		

Comment/Question:

I support the roundabout options at Keystone and Las Brisas high priority and the one at Sky Country as moderate priority. In the Las Brisas → Keystone Corridor I also support the multi-use path option over the buffered bike lane option.

Comments will be accepted through 5 p.m., Friday May 17, 2019.
Please mail to:
Lori Campbell, NDOT Traffic Safety, 1263 S. Stewart St., Carson City, NV 89712
Or email your comments to lcampbell@dot.nv.gov

Thank you for your time and interest

COMMENT FORM

N. McCarran Blvd. Safety Management Plan
Public Open House
Wednesday, May 1, 2019

▪ ***Please Print Clearly*** ▪

				Date:	5-1-19
Name:	MIKE GALLOTTO.				
Address:	918 HAMPSHIRE DR.				
City:	RENO	State:	NV	ZIP Code:	89503.
Phone (Day):	775-544-1996.	Phone (Evening):	SAME -		
E-mail Address:	MIKE@GSRBIKES.COM				
Would you like NDOT staff to call you to discuss your comment or question?		☑ YES (OR)	☐ NO		

Comment/Question:

I'M AFFILIATED WITH THE 6 ACRE DEVELOPMENT ON THE SOUTH SIDE OF MCCARRAN - IN THE KEYSTONE BRAIN, SO I'VE BEEN INTERESTED IN THIS. I'M ALL FOR A ROUNDABOUT AT KEYSTONE AND A ROUNDABOUT AT LAS BRISAS, LOWER THE SPEED FROM 7M TO JUST PAST KEYSTONE & USE THE KEYSTONE CANYON BIKE TRAILS. ALMOST EVERY DAY.

Comments will be accepted through 5 p.m., Friday May 17, 2019.
Please mail to:
Lori Campbell, NDOT Traffic Safety, 1263 S. Stewart St., Carson City, NV 89712
Or email your comments to lcampbell@dot.nv.gov

Thank you for your time and interest

COMMENT FORM

N. McCarran Blvd. Safety Management Plan
Public Open House
Wednesday, May 1, 2019

▪ ***Please Print Clearly*** ▪

Date:	5/1/2019
Name:	Pat Fagen
Address:	1420 Wessex Circle
City:	Reno
State:	
ZIP Code:	89503
Phone (Day):	775 771 1947
Phone (Evening):	
E-mail Address:	Pafager@yahoo.com
Would you like NDOT staff to call you to discuss your comment or question?	☑ YES ☐ NO
Comment/Question:	Re Keystone: Needs pedestrian access to cross Mc Carran. Need to Be able to make Left hand turn from Keystone to N McCarran heading west. Want a light at Keystone & McCarran Re: Kings Row & McCarran Poor visibility for Kids crossing McCarran from Kings Row schools. ~~Right hand turns~~ ~~Are~~ cars making Right hand turns have almost hit Kids

Comments will be accepted through 5 p.m., Friday May 17, 2019.
Please mail to:
Lori Campbell, NDOT Traffic Safety, 1263 S. Stewart St., Carson City, NV 89712
Or email your comments to lcampbell@dot.nv.gov

Thank you for your time and interest

COMMENT FORM

N. McCarran Blvd. Safety Management Plan
Public Open House
Wednesday, May 1, 2019

▪ ***Please Print Clearly*** ▪

			Date:	5-1-2019	
Name:	Leah Sanders				
Address:	1880 Coleman Dr				
City:	Reno	State:	NV	ZIP Code:	89503
Phone (Day):		Phone (Evening):			
E-mail Address:	leah.sanders14@gmail.com				
Would you like NDOT staff to call you to discuss your comment or question?		☐ YES	☒ NO		
Comment/Question:	Roundabout at Keystone is a great solution. Thanks A stoplight is not OK				

Comments will be accepted through 5 p.m., Friday May 17, 2019.
Please mail to:
Lori Campbell, NDOT Traffic Safety, 1263 S. Stewart St., Carson City, NV 89712
Or email your comments to lcampbell@dot.nv.gov

Thank you for your time and interest

COMMENT FORM

N. McCarran Blvd. Safety Management Plan
Public Open House
Wednesday, May 1, 2019

▪ ***Please Print Clearly*** ▪

			Date:	5/1/19	
Name: Bill Macaulay					
Address: 66 Greenstone Cir					
City: Reno	State: NV	NV	ZIP Code:	89512	
Phone (Day): 3234220		Phone (Evening):			
E-mail Address: billemail@charter.net					
Would you like NDOT staff to call you to discuss your comment or question?		☐ YES	☐ NO		
Comment/Question:					

Development is planned on Comstock Drive which will add several hundred vehicles per day to Comstock + N. Virginia. Developer hopes to alter that intersection. Heads up for any confict with your project.

Comments will be accepted through 5 p.m., Friday May 17, 2019.
Please mail to:
Lori Campbell, NDOT Traffic Safety, 1263 S. Stewart St., Carson City, NV 89712
Or email your comments to lcampbell@dot.nv.gov

Thank you for your time and interest

COMMENT FORM

N. McCarran Blvd. Safety Management Plan
Public Open House
Wednesday, May 1, 2019

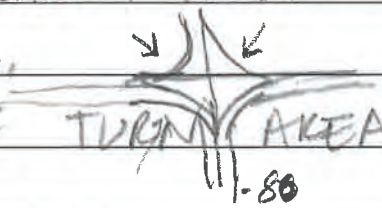
▪ ***Please Print Clearly*** ▪

Date:	4/1/19
Name:	BARBARA FENNE
Address:	10200 FIRETHORN CIRCLE
City:	RENO
State:	NV
ZIP Code:	89523
Phone (Day):	775-997-4574
Phone (Evening):	SAME
E-mail Address:	bfenne@aol.com
Would you like NDOT staff to call you to discuss your comment or question?	☑ YES ☐ NO

Comment/Question:

I LIVE IN MOGUL & USE MCCARRAN OFTEN

BOTTLE NECKS GOING ONTO I-80 RAMPS BOTH EAST & WEST. MAKE LONGER DESIGNATED TURN LANES,



ROUND OFF TURN AREAS AT MCCARREN

POST MORE SPEED LIMIT SIGNS ON MCCARREN FROM GREENSBORO TO HWY 395 AREA

PUT IN WARNING COUNT-DOWN LIGHT COMING DOWN MCCARREN TO PLUMB/CAUGHLIN RANCH. SHOWING HOW LONG TILL LIGHT TURNS GREEN/RED

Comments will be accepted through 5 p.m., Friday May 17, 2019.
Please mail to:
Lori Campbell, NDOT Traffic Safety, 1263 S. Stewart St., Carson City, NV 89712
Or email your comments to lcampbell@dot.nv.gov

Thank you for your time and interest

THANK YOU

- SUPPLY CLIPBOARDS TO WRITE ON AT MTGS.

COMMENT FORM

N. McCarran Blvd. Safety Management Plan
Public Open House
Wednesday, May 1, 2019

▪ ***Please Print Clearly*** ▪

Date:	5/1/19
Name:	Donna Clontz
Address:	PO Box 33244
City: Reno	State: NV ZIP Code: 89533
Phone (Day): 775-240-2745	Phone (Evening):
E-mail Address:	donnanorm1@yahoo.com
Would you like NDOT staff to call you to discuss your comment or question?	☐ YES ☒ NO

Comment/Question:

Need longer left turn lanes on SB N. McCarran for I-80 left turn onramp before the bridge; & under the bridge

Better synch of signal lights ~~SB~~ along entire McCarran ring. — Stopping at every signal is wasteful of time/gas/air quality

Comments will be accepted through 5 p.m., Friday May 17, 2019.
Please mail to:
Lori Campbell, NDOT Traffic Safety, 1263 S. Stewart St., Carson City, NV 89712
Or email your comments to lcampbell@dot.nv.gov

Thank you for your time and interest

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N. McCarran Blvd. Safety Management Plan
Public Open House
Wednesday, May 1, 2019

▪ ***Please Print Clearly*** ▪

				Date:	5/1/2019
Name:	RICHARD McCoy				
Address:	1777 QUAIL Run Rd				
City:	RENO	State:	NV	ZIP Code:	89523
Phone (Day):	775 746 0641	Phone (Evening):			
E-mail Address:					
Would you like NDOT staff to call you to discuss your comment or question?		☐ YES	☐ NO		
	IF THEY WANT				
Comment/Question:					

YOUR 1+ mile 3 LANE widening HAS CREATED A MESS. AT Siena Highland / McCARRAN people HAVE to CROSS 3 LANES TO MAKE A left TURN on TO I-80 ABOUT .2 of mile People LEAVING Shopping center HAVE to CROSS AT least 3 LANES TO MAKE a Right on to I-80 West. Supprised NO one Killed yet

AN NDOT DID Before WAS open up McCARRAN for ABOUT 1+ mile THEN everyone HAS to BE merged + Get IN RIGHT LANE TO GO FORWARD

Comments will be accepted through 5 p.m., Friday May 17, 2019.
Please mail to:
Lori Campbell, NDOT Traffic Safety, 1263 S. Stewart St., Carson City, NV 89712
Or email your comments to lcampbell@dot.nv.gov

Thank you for your time and interest

OH CAN'T

COMMENT FORM

N. McCarran Blvd. Safety Management Plan
Public Open House
Wednesday, May 1, 2019

▪ ***Please Print Clearly*** ▪

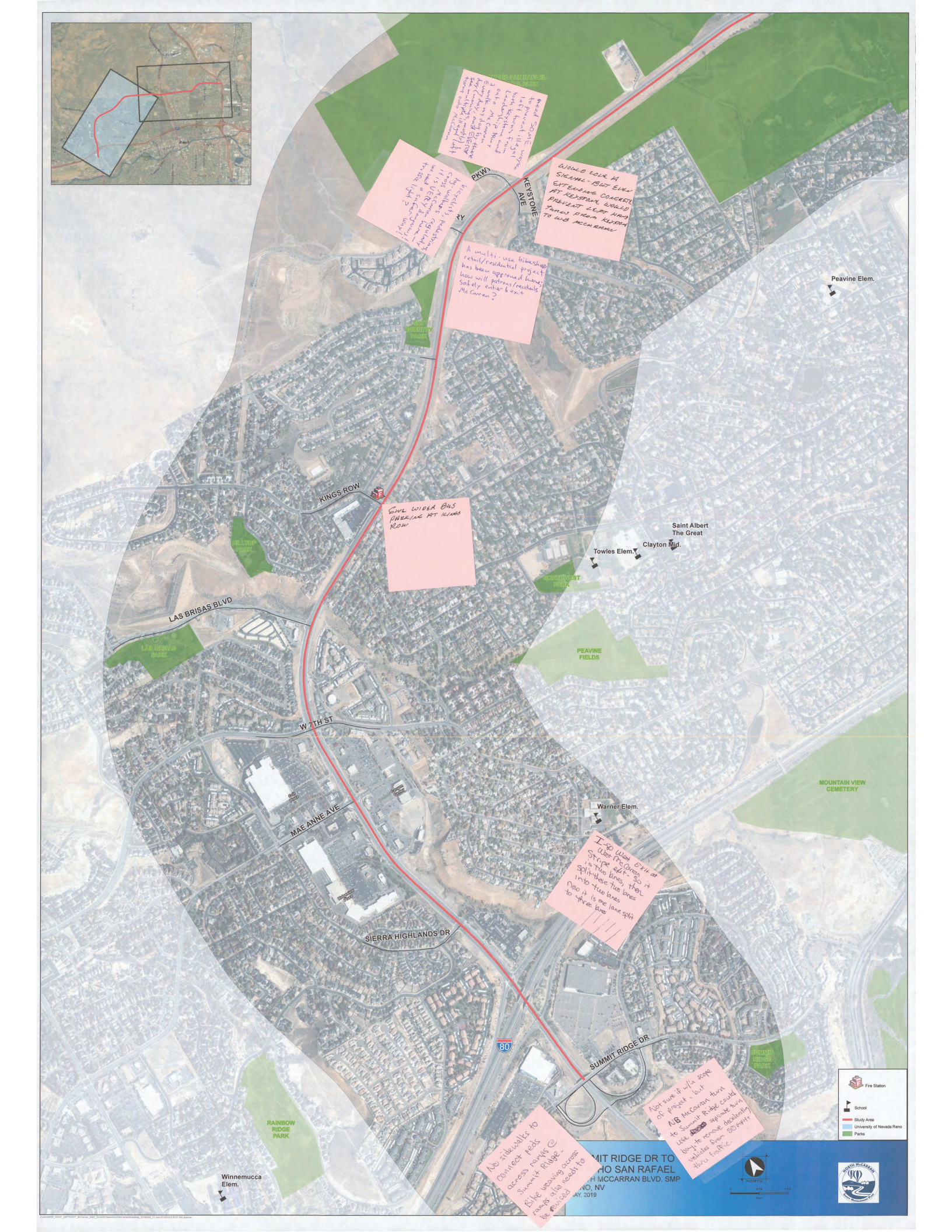
			Date:	May 1st 2019	
Name:	PIERRE MOUSSET-JONES				
Address:	2095 LASSEN DR				
City:	RENO	State:	NV	ZIP Code:	89503
Phone (Day):	747-4090	Phone (Evening):	SAME		
E-mail Address:	MOUSSET @ UNR.EDU				
Would you like NDOT staff to call you to discuss your comment or question?	☒ YES ☐ NO				
Comment/Question:					

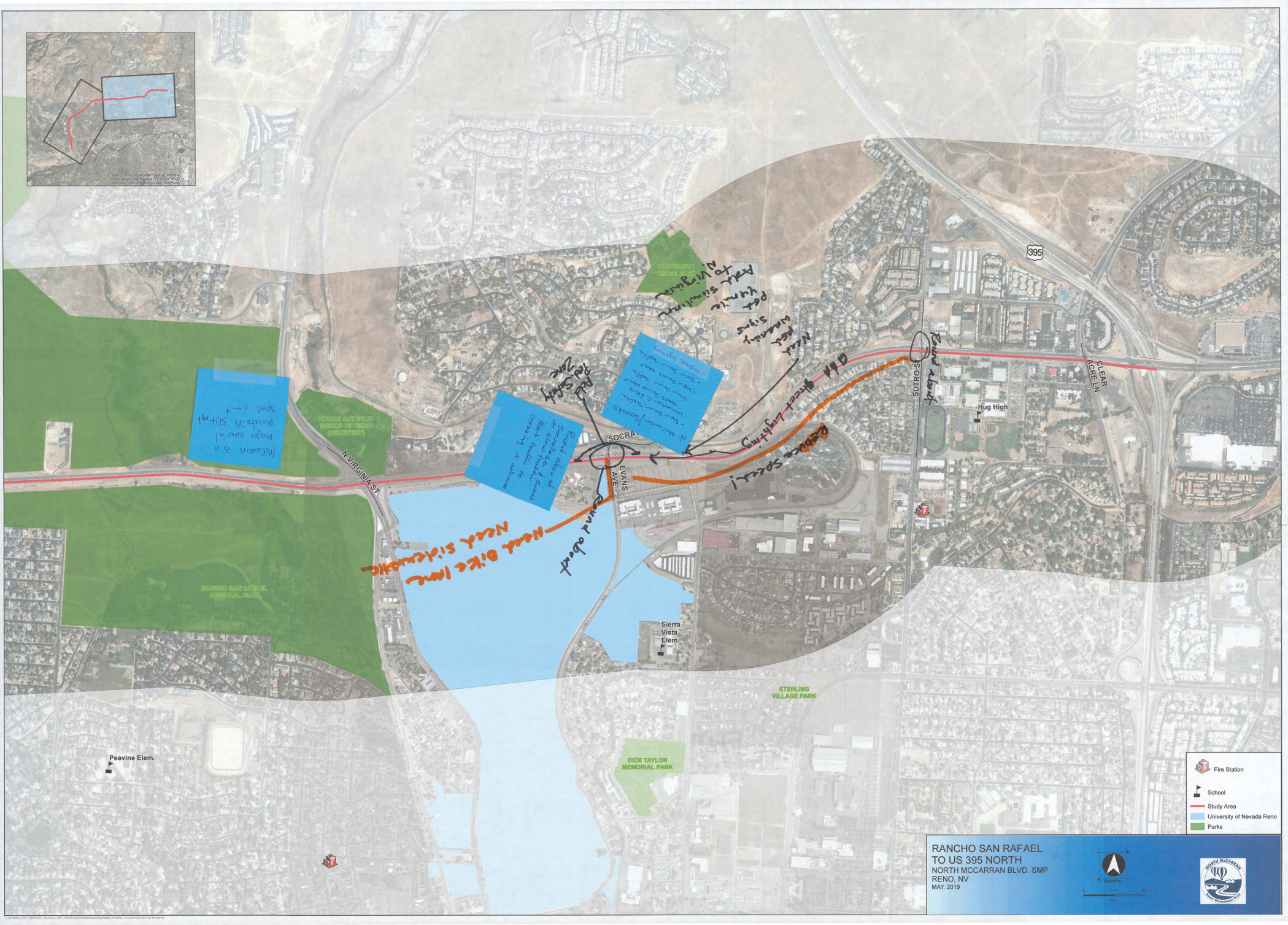
THE KEYSTONE / McCARRAN intersection is very dangerous, difficult to turn in one direction, have to go into outer lane and slow down. Traffic moving at high speed in both directions. Difficult to turn into Keystone going East, very difficult to cross by walking or bicycle. More building around Keystone Canyon trailhead more traffic. More people using trailhead. It is ABSOLUTELY NECESSARY to either have a TRAFFIC LIGHT OR ROUNDABOUT AT THE KEYSTONE / MCCARRAN intersection.

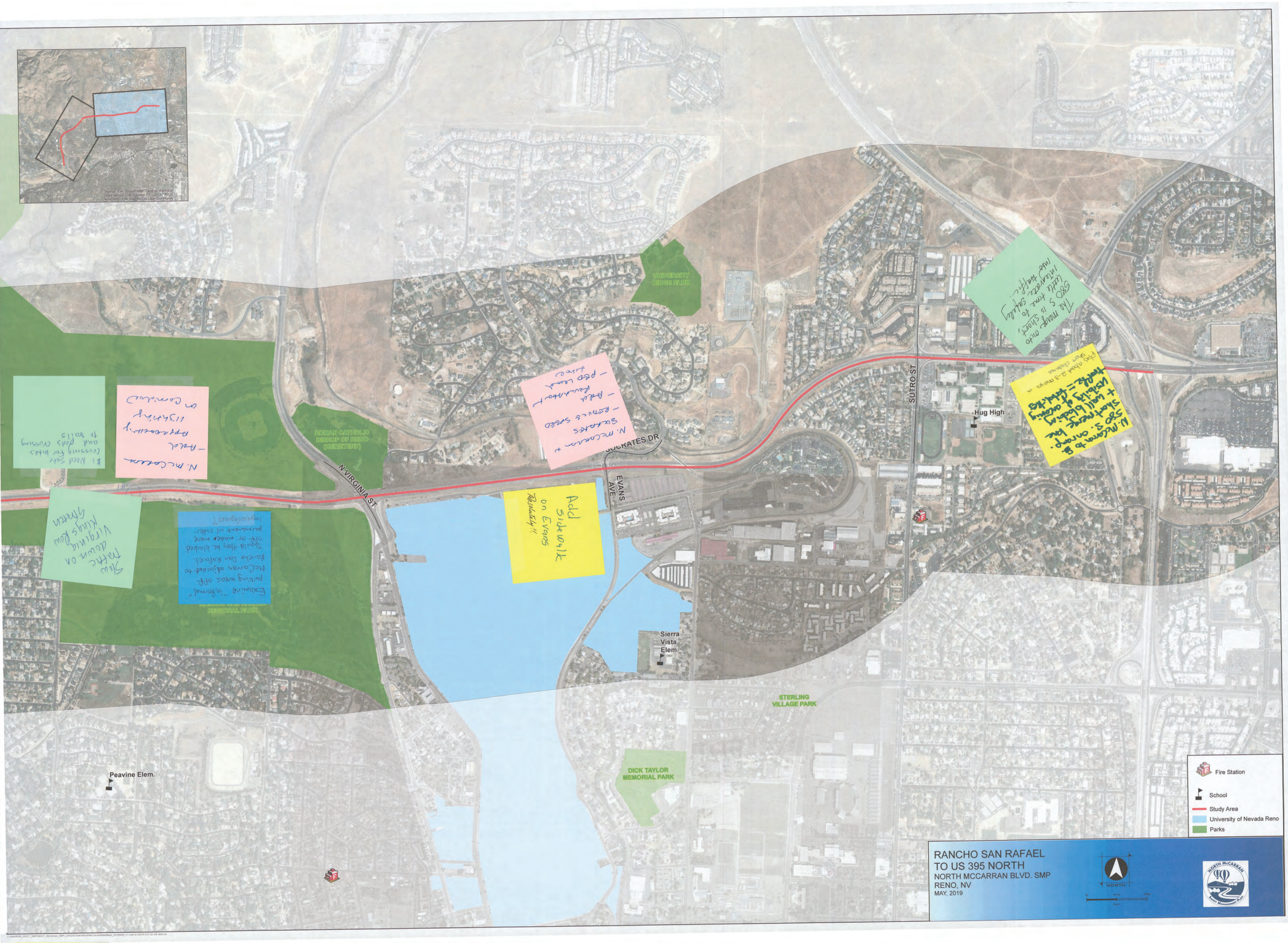
Comments will be accepted through 5 p.m., Friday May 17, 2019.
Please mail to:
Lori Campbell, NDOT Traffic Safety, 1263 S. Stewart St., Carson City, NV 89712
Or email your comments to lcampbell@dot.nv.gov

Thank you for your time and interest


KEYSTONE AVE
KINGS ROW
LAS BRISAS
W 7TH ST
MAE ANNE AVE
SIERRA HIGHLANDS DR
SUMMIT RIDGE DR
Peavine Elem.
Saint Albert The Great
Clayton Mid.
Towles Elem.
Warner Elem.
Winnemucca Elem.
PEAVINE FIELDS
MOUNTAIN VIEW CEMETERY
RAINBOW RIDGE PARK
SUMMIT RIDGE PARK
SKY COUNTRY PARK
LAS BRISAS PARK
NORTHWEST PARK
Fire Station
School
Study Area
University of Nevada Reno
Parks
SUMMIT RIDGE DR TO RANCHO SAN RAFAEL
NORTH MCCARRAN BLVD. SMP
RENO, NV
MAY, 2019
NORTH


KEYSTONE AVE
PKWY
KINGS ROW
LAS BRISAS BLVD
W 7TH ST
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80
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RAINBOW RIDGE PARK
SUMMIT RIDGE PARK
NORTHWEST PARK
HILLTOP PARK
LAS BRISAS PARK
SKY COUNTRY PARK
Fire Station
School
Study Area
University of Nevada Reno
Parks
NORTH
MIT RIDGE DR TO
HO SAN RAFAEL
H MCCARRAN BLVD. SMP
NO, NV
AY, 2019


RANCHO SAN RAFAEL REGIONAL PARK
ROMAN CATHOLIC BISHOP OF RENO (CEMETERY)
UNIVERSITY RIDGE PARK
STERLING VILLAGE PARK
DICK TAYLOR MEMORIAL PARK
N VIRGINIA ST
EVANS AVE
SUTRO ST
CLEAR ACRE LN
395
Hug High
Sierra Vista Elem.
Peavine Elem.
Fire Station
School
Study Area
University of Nevada Reno
Parks
RANCHO SAN RAFAEL
TO US 395 NORTH
NORTH MCCARRAN BLVD. SMP
RENO, NV
MAY, 2019
NORTH


UNIVERSITY RIDGE PARK
ROMAN CATHOLIC BISHOP OF RENO (CEMETERY)
N VIRGINIA ST
SOCRATES DR
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MAY, 2019
NORTH

NORTH McCARRAN
SAFETY MANAGEMENT PLAN



NEVADA DOT
SAFE AND CONNECTED

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