

# TRAFFIC IMPACT STUDY

FOR

# STONEBROOK WEST

January 15, 2019

PREPARED FOR:  
Mountain States Property Management

PREPARED BY:



## **YOUR QUESTIONS ANSWERED QUICKLY**

### **Why did you perform this study?**

This Traffic Impact Study evaluates the potential traffic impacts associated with the proposed Stonebrook West project in Sparks, Nevada. This study of potential transportation impacts was undertaken for planning purposes and to determine project roadway sizing, lane configurations, and intersection configurations on Pyramid Highway and at the study intersections. It should be noted that the overall Stonebrook PUD was approved in 2017 and that this study is purposefully focused on providing more detail for the intersection configurations connecting the western portion of the greater Stonebrook project area to the external roadway network.

### **What does the project consist of?**

The project includes approximately 167 acres and would consist of approximately 401 multifamily dwelling units, 434 single family dwelling units, 262,230 square feet of shopping center, 85,000 square feet of discount supermarket, 274,430 square feet of general office, and 91,480 square feet of medical/dental office.

### **How much traffic will the project generate?**

The project is anticipated to generate approximately 25,629 Daily, 1,416 AM peak hour, and 2,241 PM peak hour trips to the external roadway network.

### **Are there any traffic impacts?**

Under 2040 Plus Project conditions, the Pyramid Highway/Smoke Shop Driveway, Pyramid Highway/Robert Banks Boulevard, and Pyramid Highway/David James Boulevard intersections are expected to have individual movements that would operate at LOS F; however, the queues for these movements are not expected to spill back into the through movement lanes on Pyramid Highway. The future operating conditions are expected, documented in the *Pyramid Highway/US 395 Connector* traffic study, and are manageable.

Under 2040 Plus Project conditions, the La Posada Drive/Rockwell Boulevard/Tierra Del Sol Parkway intersection would operate at LOS E.

### **Are any improvements recommended?**

The following recommendations would improve operations to acceptable levels:

- La Posada Drive/Rockwell Boulevard/Tierra Del Sol Parkway – add a northbound right-turn pocket

NDOT District II staff requested that this study provide recommended turn pocket lengths and configurations of the project intersections on Pyramid Highway looking at the corridor as a system. It should be noted that the proposed driveway locations meet NDOT Access Management standards. The recommended configurations are illustrated on the Pyramid Highway Conceptual Lane Configuration plans provided in **Appendix C**.

The project will construct raised median islands/access management features on Pyramid Highway, widening only to the east, from David James Boulevard to the Smoke Shop Driveway/northmost project access (connecting to the existing median island at approximately 1,200 feet south of La Posada Drive). The left edge of the inside (No. 1) southbound travel lane on Pyramid Highway would remain in its current location.

Consideration should be given to reducing the speed limit on Pyramid Highway to 45 mph between David James Blvd and La Posada Drive. With a speed limit of 45 mph, deceleration lengths meeting NDOT Access Management standards would be met for the illustrated turn pocket configurations on Pyramid Highway. The ultimate speed limit decision shall be governed by NDOT and either dictated as a condition of the occupancy permit(s) or implemented by NDOT separate from this project.

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## INTRODUCTION

This report summarizes the results of a Traffic Impact Study completed to assess the potential impacts to the local roadway network associated with the Stonebrook West Master Plan project in Sparks, Nevada. This Traffic Impact Study has been prepared as a supplement to the *Stonebrook Traffic Study* (Solaegui Engineers, Ltd., February 2017) to describe existing traffic conditions, identify potential transportation related impacts, document findings, and determine appropriate intersection configurations and turn pockets lengths for new project connections on Pyramid Highway.

### ***Project Description***

The proposed project is located east of Pyramid Highway and south of La Posada Drive, as shown on **Figure 1**. The project includes approximately 167 acres and would consist of commercial, office, and residential land uses. The project site plan is shown on **Figure 2**.

### ***Study Area and Evaluated Scenarios***

The following intersections are included in the analysis:

- Pyramid Highway/La Posada Drive/Eagle Canyon Road
- Pyramid Highway/Smoke Shop Driveway/North Project Road
- Pyramid Highway/Robert Banks Boulevard/Oppio Ranch Road
- Pyramid Highway/David James Boulevard/Project Driveway
- Pyramid Highway/Dolores Drive/Stonebrook Parkway
- Pyramid Highway/Lazy 5 Parkway
- La Posada Drive/Rockwell Boulevard
- Tierra Del Sol Parkway/North Project Road (*plus project only*)
- Tierra Del Sol Parkway/Oppio Ranch Road (*plus project only*)
- Tierra Del Sol Parkway/Stonebrook Parkway (*plus project only*)

The existing study intersection lane configurations and traffic controls are shown on **Figure 3**, attached.

This study includes analysis of intersections during the weekday AM and PM peak hours as these are the periods of time in which peak traffic is anticipated to occur. The evaluated development scenarios are:

- Existing Conditions (no project)
- Existing Plus Project Conditions (Stonebrook Parkway does not yet connect to Pyramid Highway)
- 2040 Background Conditions (no project)
- 2040 Background Plus Project Conditions (with Stonebrook Parkway connected to Pyramid Hwy)

The 2040 Background conditions scenario reflects the 2040 horizon year which is consistent with the latest version of the Regional Transportation Commission’s (RTC) *2040 Regional Transportation Plan (2040 RTP)*. The 2040 Background conditions analysis also includes improvements to Pyramid Highway consistent with the *Addendum to the Pyramid Highway/US 395 Connector Traffic Report (December 2011), for Arterial Alternatives for Pyramid Highway and US 395 Connector* (Jacobs, June 2017).

## ANALYSIS METHODOLOGY

Level of service (LOS) is a term commonly used by transportation practitioners to measure and describe the operational characteristics of intersections, roadway segments, and other facilities. This term equates seconds of delay per vehicle at intersections to letter grades “A” through “F” with “A” representing optimum conditions and “F” representing breakdown or over capacity flows.

### Intersections

Intersection level of service methodology is established in the *Highway Capacity Manual (HCM) 2010*, published by the Transportation Research Board. The methodology for signalized intersections determines the level of service by comparing the average control delay for the overall intersection to the delay thresholds in **Table 1**. Level of service at unsignalized (side-street stop controlled, all-way stop controlled, and roundabout) intersections is determined by comparing the average control delay for the worst movement/approach to the delay thresholds in **Table 1**.

**Table 1: Level of Service Definition for Intersections**

Level of Service	Brief Description	Average Delay (seconds per vehicle)	
		Signalized Intersections	Unsignalized Intersections
A	Free flow conditions.	< 10	< 10
B	Stable conditions with some affect from other vehicles.	10 to 20	10 to 15
C	Stable conditions with significant affect from other vehicles.	20 to 35	15 to 25
D	High density traffic conditions still with stable flow.	35 to 55	25 to 35
E	At or near capacity flows.	55 to 80	35 to 50
F	Over capacity conditions.	> 80	> 50

Source: Highway Capacity Manual (2010), Chapters 18 through 21

Level of service calculations were performed for the signalized, side street stop, and all way stop controlled study intersections using the Synchro/SimTraffic software package with analysis and results reported in accordance with the current *HCM 2010* methodology. Roundabout intersections were analyzed using SIDRA software with results also reported in accordance with the current *HCM 2010* methodology.

### ***Level of Service Policy***

The 2040 Regional Transportation Plan establishes level of service criteria for regional roadway facilities in the City of Reno, City of Sparks, and Washoe County. The current Level of Service policy is:

*“All regional roadway facilities projected to carry less than 27,000 ADT at the latest RTP horizon – LOS D or better.”*

*“All regional roadway facilities projected to carry 27,000 or more ADT at the latest RTP horizon – LOS E or better.”*

*“All intersections shall be designed to provide a level of service consistent with maintaining the policy level of service of the intersecting corridors”.*

Where intersections are already experiencing level of service beyond the thresholds, conditions should not be exacerbated. In practice, this is commonly interpreted as not increasing average delay per vehicle by more than 5 seconds, or the volume-to-capacity ratio by more than 0.05 for roundabout intersections.

Pyramid Highway south of La Posada is projected to carry more than 27,000 ADT at the latest RTP horizon. La Posada Drive is projected to carry less than 27,000 ADT. The following LOS thresholds were used for the study intersections:

#### LOS E

- Pyramid Highway/La Posada Drive/Eagle Canyon Road
- Pyramid Highway/Smoke Shop Driveway/North Project Road
- Pyramid Highway/Robert Banks Boulevard/Oppio Ranch Road
- Pyramid Highway/David James Boulevard
- Pyramid Highway/Dolores Drive/Stonebrook Parkway
- Pyramid Highway/Lazy 5 Pkwy

#### LOS D

- La Posada Drive/Rockwell Boulevard
- Tierra Del Sol Parkway/North Project Road (*plus project only*)
- Tierra Del Sol Parkway/Oppio Ranch Road (*plus project only*)
- Tierra Del Sol Parkway/Stonebrook Parkway (*plus project only*)

## EXISTING CONDITIONS

### *Roadway Facilities*

A brief description of the key roadways in the study area is provided below.

*Pyramid Highway* (State Route 445) is a north-south state highway that connects Interstate 80 (I-80) in the south to State Route 446 at Pyramid Lake in the north. The segment of Pyramid Highway near the project site is classified in the *2040 RTP* as a High Access Control (HAC) Arterial. The Nevada Department of Transportation classifies the segment of Pyramid Highway near the project site as an "Other Principal Arterial." Pyramid Highway is currently a four-lane roadway with a two-way left-turn lane and/or left-turn pockets at intersections. The posted speed limit adjacent to the project site is 55 mph.

*La Posada Drive/Eagle Canyon Road* is an east-west roadway that intersects Pyramid Highway. West of Pyramid Highway the roadway is named Eagle Canyon Road. East of Pyramid Highway the roadway is called La Posada Drive. Eagle Canyon Road is generally a two-lane roadway that is classified as a Moderate Access Control (MAC) Arterial in the *2040 RTP*. La Posada Drive is a four-lane roadway from Pyramid Highway to just east of Rockwell Boulevard and becomes a two-lane roadway to the east. La Posada Drive is classified as a Moderate Access Control (MAC) Arterial in the *2040 RTP*. The posted speed limits on Eagle Canyon Road and La Posada Drive are 35 mph.

### *Existing Traffic Volumes*

Existing AM (7:00 AM to 9:00 AM) and PM (4:00 PM to 6:00 PM) peak hour intersection turning movement volumes were collected at the study intersection on a mid-week day in June 2018 when Washoe County schools were in regular session. **Figure 4** shows the existing peak hour traffic volumes.

### *Existing Intersection Level of service*

Existing AM and PM peak hour intersection level of service analysis was performed for the signalized and stop controlled intersections using Synchro 9 analysis software. The roundabout intersections were analyzed using SIDRA analysis software. The existing peak hour factors (PHF), ped/bike volumes, and average heavy vehicle percentages from the counts were used in the analysis. **Table 2** shows the existing conditions level of service results and the technical calculations are provided in **Appendix A**.



**Table 2: Existing Intersection Level of Service**

Intersection	Control <sup>1</sup>	Approach/Movement	AM			PM		
			Delay <sup>2</sup>	LOS	v/c Ratio <sup>3</sup>	Delay <sup>2</sup>	LOS	v/c Ratio <sup>3</sup>
Pyramid Hwy/La Posada Dr/Eagle Canyon Rd	Signal	Overall	27.5	C	NA	25.8	C	NA
Pyramid Hwy/Smoke Shop Dwy	Side Street Stop	Eastbound Approach	<b>53.2</b>	<b>F</b>	NA	45.6	E	NA
		Northbound Left	14.1	B	NA	10.3	B	NA
Pyramid Hwy/Robert Banks Blvd	Side Street Stop	Eastbound Approach	19.6	C	NA	16.0	C	NA
		Northbound Left	14.2	B	NA	10.6	B	NA
Pyramid Hwy/David James Blvd	Side Street Stop	Eastbound Approach	19.2	C	NA	14.6	B	NA
		Northbound Left	16.0	C	NA	12.3	B	NA
Pyramid Hwy/Dolores Dr	Side Street Stop	Eastbound Approach	28.1	D	NA	15.8	C	NA
		Northbound Left	17.0	C	NA	11.5	B	NA
Pyramid Hwy/Lazy 5 Pkwy	Signal	Overall	4.1	A	NA	12.1	B	NA
La Posada Dr/Rockwell Blvd	RAB	Northbound Approach	4.1	A	0.01	5.7	A	0.05
		Southbound Approach	7.3	A	0.14	5.1	A	0.08
		Eastbound Approach	4.4	A	0.11	6.0	A	0.29
		Westbound Approach	6.9	A	0.34	5.5	A	0.20

Notes: 1. RAB = roundabout

2. Delay is reported in seconds per vehicle for the overall intersection for signalized intersections, and for the worst approach/movement for side street stop controlled and roundabout intersections.

3. v/c Ratio = volume-to-capacity ratio; reported for roundabout intersections.

**Bold** text indicates unacceptable operations.

Source: Traffic Works, 2018

As shown in the table, the side street (eastbound) approach of the Pyramid Highway/Smoke Shop Driveway intersection currently operates at LOS F during the AM peak hour. This is a result of the heavy southbound traffic volumes on Pyramid Highway during the AM commute time. The remaining study intersections currently operate at acceptable levels of service during the AM and PM peak hours.

## PROJECT CONDITIONS

### *Trip Generation*

Trip generation rates from the *Trip Generation Manual, 10<sup>th</sup> Edition* published by the Institute of Transportation Engineers (ITE) were used to develop trip generation estimates for the proposed project. Reductions in the overall trip generation were calculated for internal capture (trips made between land uses within the project site) and alternative modes of travel (i.e. walking, bicycling, transit, etc.). **Table 3** shows the Daily, AM peak hour, and PM peak hour trip generation estimates. Detailed trip generation calculations are provided in **Appendix B**.

**Table 3: Trip Generation Estimates – Project Buildout**

Land Use (ITE Code)	Size <sup>1</sup>	Trips <sup>2</sup>				
		Daily	AM	AM In/Out	PM	PM In/Out
Multifamily Housing (220)	401 du	2,935	184	42 / 142	225	142 / 83
Single Family Housing (210)	434 du	4,097	321	80 / 241	430	271 / 159
Shopping Center (820)	262.23 ksf	9,899	246	153 / 93	999	480 / 519
Discount Supermarket (854)	85 ksf	7,724	215	125 / 90	712	356 / 356
General Office (710)	274.43 ksf	2,673	318	273 / 45	316	51 / 265
Medical/Dental Office (720)	91.48 ksf	3,183	254	198 / 56	317	89 / 228
<b>Total Trips</b>		<b>30,511</b>	<b>1,538</b>	<b>871 / 667</b>	<b>2,999</b>	<b>1,389 / 1,610</b>
<i>Internal Capture/Alternative Mode Reduction</i>		<i>4,882</i>	<i>122</i>	<i>61 / 61</i>	<i>758</i>	<i>379 / 379</i>
<b>Net New Trips</b>		<b>25,629</b>	<b>1,416</b>	<b>810 / 606</b>	<b>2,241</b>	<b>1,010 / 1,231</b>

Notes: 1. du = dwelling units; ksf = 1,000 square feet

2. Trips were calculated based on standard trip rates in the Institute of Transportation Engineers' Trip Generation Manual, 10<sup>th</sup> Edition. Detailed trip generation calculations are provided in **Appendix B**.

Source: Traffic Works, 2018

As shown in the table, the proposed project is expected to generate approximately 25,629 Daily, 1,416 AM peak hour, and 2,241 PM peak hour trips to the external roadway network.

### **Trip Distribution**

Project trips were distributed to the adjacent roadway network based on existing travel patterns and the locations of complimentary land uses. Project trips are anticipated to be distributed as follows and shown on **Figure 5**:

- 15% to/from the north via Pyramid Highway
- 20% to/from the west via Eagle Canyon Road
- 5% to/from the north via Rockwell Boulevard
- 10% to/from the east via La Posada Drive
- 5% to/from the east via Oppio Ranch Parkway
- 5% to/from the east via Stonebrook Parkway
- 40% to/from the south via Pyramid Highway

### **Project Access**

The project would include multiple access points to the local roadway network. In the near-term (under Existing Plus Project conditions), the project would include three access points on Pyramid Highway (opposite the Smoke Shop Driveway, Robert Banks Boulevard, and David James Boulevard) and one access point on La Posada Drive (at the Rockwell Boulevard roundabout). All three access locations on Pyramid Highway would be side-street stop controlled with right-in/right-out/left-in access only. The access location on La Posada Drive would tie in to the existing roundabout at Rockwell Boulevard as the south leg of the intersection.

Under 2040 Plus Project conditions, it is anticipated that Stonebrook Parkway would connect to Pyramid Highway at Dolores Drive (as is master planned), creating an additional access point for the project on Pyramid Highway. The Pyramid Highway/Stonebrook Parkway/Dolores Drive intersection will be signalized with full access. This additional access location would create additional capacity for the project and allow left-turns to be made directly onto Pyramid Highway from the project site. **Figure 1** shows the proposed access locations.

## EXISTING PLUS PROJECT CONDITIONS

In the near-term (under Existing Plus Project conditions) it is not expected that the entire Stonebrook West project would be constructed. Additionally, the connection to Pyramid Highway at Dolores Drive is not expected to be constructed immediately; therefore, the Existing Plus Project conditions analysis was performed to determine what portion of the project could be constructed without the connection at Dolores Drive and without creating significant impacts.

### *Intersection Level of Service Analysis*

The Existing Plus Project conditions intersection level of service analysis was performed to determine what portion of the project could be built under interim conditions without creating impacts to the external roadway network. Initially, traffic generated by the entire proposed project was added to the existing traffic volumes, however without a connection at Dolores Drive, multiple impacts were found. Several analysis scenarios with less traffic generation were analyzed. It was determined that the following uses within the project site could be constructed without the Stonebrook Parkway connection to Pyramid Highway:

- Multifamily Residential – 401 dwelling units (100%)
- Single Family Residential – 434 dwelling units (100%)
- Shopping Center – 131.12 ksf (approximately 50%)
- Discount Supermarket – 85 ksf (100%)
- General Office – 116.8 ksf (approximately 40%)
- Medical/Dental Office – 38.93 ksf (approximately 40%)

This mix of land uses would generate approximately 18,647 Daily, 1,022 AM peak hour, and 1,560 PM external peak hour trips. Any mix of land uses or quantities that generates an equivalent number of trips could also be constructed. Detailed trip generation calculations are provided in **Appendix B**. The project trips at the study intersections associated with the above mix of uses is shown on **Figure 6**.

**Table 4** shows the Existing Plus Project conditions intersection level of service results at the study intersections with the mix of project land uses shown above. The existing peak hour factors and heavy vehicle percentages were used in the analysis. The side street approaches (eastbound and westbound) of the Pyramid Highway/Smoke Shop Driveway/North Project Road, Pyramid Highway/Robert Banks Boulevard/Oppio Ranch Road, and Pyramid Highway/David James Boulevard intersections would be

restricted to right-in/right-out/left-in access only with construction of the project (i.e. outbound left-turns would not be permitted from the side streets as they are under existing conditions), as shown on the Pyramid Highway Conceptual Lane Configuration plans provided in **Appendix C**. The Existing Plus Project condition intersection lane configurations and controls are shown on **Figure 7**. The Existing Plus Project condition traffic volumes are shown on **Figure 8**. The technical calculations are provided in **Appendix D**.

**Table 4: Existing Plus Project Intersection Level of Service**

Intersection	Control <sup>1</sup>	Approach/ Movement	Existing						Existing Plus Project					
			AM			PM			AM			PM		
			Delay <sup>2</sup>	LOS	v/c Ratio <sup>3</sup>	Delay <sup>2</sup>	LOS	v/c Ratio <sup>3</sup>	Delay <sup>2</sup>	LOS	v/c Ratio <sup>3</sup>	Delay <sup>2</sup>	LOS	v/c Ratio <sup>3</sup>
Pyramid Hwy/ La Posada Dr/ Eagle Canyon Rd	Signal	Overall	27.5	C	NA	25.8	C	NA	34.0	C	NA	39.2	D	NA
		Eastbound Approach	53.2	F	NA	45.6	E	NA	17.6	C	NA	14.3	B	NA
Pyramid Hwy/ Smoke Shop Dwy	Side Street Stop	Westbound Approach	NA						12.8	B	NA	46.5	E	NA
		Northbound Left	14.1	B	NA	10.3	B	NA	36.5	E	NA	18.1	C	NA
		Southbound Left	NA						11.0	B	NA	26.3	D	NA
		Eastbound Approach	19.6	C	NA	16.0	C	NA	20.8	C	NA	14.7	B	NA
Pyramid Hwy/ Robert Banks Blvd	Side Street Stop	Westbound Approach	NA						16.4	C	NA	45.0	E	NA
		Northbound Left	14.2	B	NA	10.6	B	NA	25.4	D	NA	13.6	B	NA
		Southbound Left	NA						11.1	B	NA	33.8	D	NA
		Eastbound Approach	19.2	C	NA	14.6	B	NA	22.6	C	NA	14.8	B	NA
Pyramid Hwy/ David James Blvd	Side Street Stop	Westbound Approach	NA						13.0	B	NA	24.3	C	NA
		Northbound Left	16.0	C	NA	12.3	B	NA	19.1	C	NA	16.0	C	NA
		Southbound Left	NA						10.7	B	NA	27.0	D	NA
		Eastbound Approach	28.1	D	NA	15.8	C	NA	37.8	E	NA	20.1	C	NA
Pyramid Hwy/ Dolores Dr	Side Street Stop	Northbound Left	17.0	C	NA	11.5	B	NA	20.5	C	NA	14.3	B	NA

Intersection	Control <sup>1</sup>	Approach/ Movement	Existing						Existing Plus Project					
			AM			PM			AM			PM		
			Delay <sup>2</sup>	LOS	v/c Ratio <sup>3</sup>	Delay <sup>2</sup>	LOS	v/c Ratio <sup>3</sup>	Delay <sup>2</sup>	LOS	v/c Ratio <sup>3</sup>	Delay <sup>2</sup>	LOS	v/c Ratio <sup>3</sup>
Pyramid Hwy/ Lazy 5 Pkwy	Signal	Overall	4.1	A	NA	12.1	B	NA	5.0	A	NA	28.1	C	NA
La Posada Dr/ Rockwell Blvd	RAB	Northbound Approach	4.1	A	0.01	5.7	A	0.05	7.2	A	0.30	23.9	C	0.77
		Southbound Approach	7.3	A	0.14	5.1	A	0.08	9.6	A	0.21	8.4	A	0.18
		Eastbound Approach	4.4	A	0.11	6.0	A	0.29	5.2	A	0.16	8.3	A	0.40
		Westbound Approach	6.9	A	0.34	5.5	A	0.20	10.0	A	0.45	10.6	B	0.37
		Overall	4.1	A	0.01	5.7	A	0.05	7.2	A	0.30	23.9	C	0.77
Tierra Del Sol Pkwy/North Project Access Rd	Side Street Stop	Eastbound Approach	NA						10.8	B	NA	15.5	B	NA
		Northbound Left	NA						7.5	A	NA	8.0	A	NA
Tierra Del Sol Pkwy/Oppio Ranch Rd	All Way Stop	Overall	NA						9.1	A	NA	11.0	B	NA
		Northbound Approach	NA						3.7	A	0.01	4.9	A	0.03
Tierra Del Sol Pkwy/ Stonebrook Parkway	RAB	Southbound Approach	NA						4.0	A	0.09	6.4	A	0.31
		Eastbound Approach	NA						3.7	A	0.01	4.8	A	0.03
		Westbound Approach	NA						5.7	A	0.26	5.1	A	0.20
		Overall	NA						4.1	A	0.01	5.7	A	0.05

Notes: 1. RAB = roundabout

2. Delay is reported in seconds per vehicle for the overall intersection for signalized and all way stop controlled intersections, and for the worst approach/movement for side street stop controlled and RAB intersections.

3. v/c Ratio = volume-to-capacity ratio; reported for RAB intersections.

**Bold** text indicates unacceptable operations.

Source: Traffic Works, 2018

As shown in the table, the study intersections are expected to operate at acceptable levels of service with the portion of the proposed project listed above under Existing Plus Project conditions. The delay for the eastbound approach of the Pyramid Highway/Smoke Shop Driveway intersection would decrease when left-turns are prohibited from this approach.

## FUTURE YEAR (2040) CONDITIONS

The 2040 analysis estimates operating conditions in the year 2040 (the furthest out RTP horizon year).

### ***Planned Roadway Improvements***

The RTC's 2040 RTP outlines programmed roadway projects of regional significance. The project list is split into three time periods: 2017 – 2021 (first five years of the plan), 2022 – 2026 (second five years of the plan), and 2027 – 2040 (remaining years of the plan). The following roadway improvements are programmed within the project vicinity:

#### RTP Regional Road Improvements (2017-2021)

- Dolores Drive – Existing Dolores Drive west to Lazy 5 Parkway: New 2 lane road
- Wingfield Hills Road – Existing Wingfield Hills Road west to David Allen Parkway: New 4 lane road
- Lazy 5 Parkway – West Sun Valley Arterial to Pyramid Highway: New 2 lane road
- Stonebrook Parkway – La Posada Drive to N/S Connector Road: New 2 lane road

#### RTP Regional Road Improvements (2022-2026)

- Stonebrook Parkway – N/S Connector Road to Pyramid Highway: New 2 lane road
- N/S Connector Road – Stonebrook Parkway to Wingfield Hills Road: New 2 lane road
- Lazy 5 Parkway – West Sun Valley Arterial to Pyramid Highway: Widen from 2 to 4 lanes

#### RTP Regional Road Improvements (2027-2040)

- Pyramid Highway/Sun Valley/US 395 Connector
  - Pyramid Highway – Lazy 5 Parkway to La Posada Drive: Widen 4 lanes to 6 lanes
  - Pyramid Highway – Sunset Springs Lane to Calle De La Plata: Widen 2 lanes to 4 lanes
  - Operational Improvements – La Posada Drive to Calle De La Plata

Additionally, the *Addendum to the Pyramid Highway/US 395 Connector Traffic Report (December 2011), for Arterial Alternatives For Pyramid Highway and US 395 Connector* (Jacobs, June 2017) includes roadway improvements that would be built with the Pyramid Highway/395 Connector project. Alternative 3 is the preferred alternative in that study and the proposed lane configurations associated with Alternative 3 were included at the Pyramid Highway/Eagle Canyon Road/La Posada Drive and Pyramid Highway/Lazy 5 Parkway intersections in this study. The 2040 intersection lane configurations and controls are shown on **Figure 9**.

### **Traffic Volume Forecasts**

2040 background traffic volume forecasts were developed using information from two sources: the *Stonebrook Traffic Study* (Solaegui Engineers, Ltd., February 2017) and the *Addendum to the Pyramid Highway/US 395 Connector Traffic Report (December 2011), for Arterial Alternatives For Pyramid Highway and US 395 Connector* (Jacobs, June 2017). Both of these traffic reports contain future year traffic volume forecasts for Pyramid Highway at the study intersections. The Jacobs report is more current and includes more detail regarding the Pyramid Highway/US 395 Connector and the West Sun Valley Arterial (planned roadways that will affect traffic volumes on Pyramid Highway).

The future year traffic volume forecasts in the Jacobs report include the Stonebrook project area and project roadways. In order to develop background traffic volumes without the Stonebrook West project, the traffic volumes generated by the traffic analysis zones (TAZ's) in the Stonebrook West area were removed for this analysis. The Jacobs report does not include analysis of intersections on La Posada Drive, therefore the *Stonebrook Traffic Study* (which includes analysis of the entire Stonebrook project area) was used to determine future year volumes on this roadway. The Jacobs report and *Stonebrook Traffic Study* analyze future year conditions for the year 2035. In order to develop 2040 traffic volume forecasts, growth rates for Pyramid Highway and La Posada Drive were developed based on the 2035 forecasts and existing traffic volumes and applied to the 2035 through movement traffic volumes on Pyramid Highway and La Posada Drive for an additional five years.

The average traffic volume growth rates for Pyramid Highway are approximately 2.1 percent per year during the AM peak hour and approximately 1.7 percent per year during the PM peak hour. The average growth rates for La Posada Drive are approximately 2.0 percent per year during the AM and PM peak hours. The 2040 Background (No Project) traffic volumes are shown on **Figure 10**.

### **2040 Background (No Project) Intersection Level of Service**

2040 Background AM and PM peak hour intersection level of service analysis was performed for the signalized intersections using Synchro analysis software. The stop controlled intersections were analyzed using SimTraffic microsimulation software because Synchro/HCM calculation methods are inadequate for analyzing three approach lanes on Pyramid Highway toward the subject side streets. The roundabout intersection was analyzed using SIDRA analysis software. The existing peak hour factors or a peak hour factor of 0.92 (whichever was higher) and the existing average heavy vehicle percentages from the counts were used in the analysis. **Table 5** shows the 2040 Background conditions level of service results and the technical calculations are provided in **Appendix E**.

**Table 5: 2040 Background Conditions Intersection Level of Service**

Intersection	Control <sup>1</sup>	Approach/Movement	AM			PM		
			Delay <sup>2</sup>	LOS	v/c Ratio <sup>3</sup>	Delay <sup>2</sup>	LOS	v/c Ratio <sup>3</sup>
Pyramid Hwy/La Posada Dr/Eagle Canyon Rd	Signal							
		Overall	45.1	D	NA	35.0	D	NA
Pyramid Hwy/Smoke Shop Dwy	Side Street Stop							
		Eastbound Right	27.2	D	NA	22.7	C	NA
		Northbound Left	36.4	E	NA	22.8	C	NA
Pyramid Hwy/Robert Banks Blvd	Side Street Stop							
		Eastbound Right	<b>99.5</b>	<b>F</b>	<b>NA</b>	19.8	B	NA
		Northbound Left	<b>50.4</b>	<b>F</b>	<b>NA</b>	29.5	D	NA
Pyramid Hwy/David James Blvd	Side Street Stop							
		Eastbound Right	<b>90.2</b>	<b>F</b>	<b>NA</b>	13.8	B	NA
Pyramid Hwy/Dolores Dr	Signal							
		Overall	36.5	D	NA	28.8	C	NA
Pyramid Hwy/Lazy 5 Pkwy	Signal							
		Overall	61.6	E	NA	47.5	D	NA
La Posada Dr/Rockwell Blvd	RAB							
		Northbound Approach	5.6	A	0.01	6.2	A	0.01
		Southbound Approach	10.1	B	0.29	7.3	A	0.14
		Eastbound Approach	6.7	A	0.31	7.6	A	0.40
		Westbound Approach	8.0	A	0.41	7.8	A	0.39

Notes: 1. RAB = roundabout

2. Delay is reported in seconds per vehicle for the overall intersection for signalized intersections, and for the worst approach/movement for side street stop controlled and RAB intersections.

3. v/c Ratio = volume-to-capacity ratio; reported for RAB intersections.

**Bold** text indicates unacceptable operations.

Source: Traffic Works, 2018

As shown in the table, the side street (eastbound) approaches of the Pyramid Highway/ Robert Banks Boulevard and Pyramid Highway/David James Boulevard intersections are expected to operate at LOS F during the AM peak hour without the project. Side street delay is expected on major arterial roadways and also stated in the *Pyramid Highway/US 395 Connector* traffic study which has very similar results. The remaining study intersections would operate at acceptable levels of service during the AM and PM peak hours based on the 2040 Background conditions traffic volume forecasts and planned roadway improvements.

### **2040 Plus Project Intersection Level of Service**

Under 2040 Plus Project conditions, the entire Stonebrook West project is expected to be constructed. The project trips at the study intersections are shown on **Figure 11**. **Table 6** shows the 2040 Plus Project conditions intersection level of service results at the study intersections. The peak hour factors and heavy vehicle percentages from the 2040 Background Conditions analysis were used in the analysis. The intersection lane configurations and controls are shown on **Figure 12** and the 2040 Plus Project traffic volumes are shown on **Figure 13**. The technical calculations are provided in **Appendix E**.



**Table 6: 2040 Plus Project Intersection Level of Service**

Intersection	Control <sup>1</sup>	Approach/ Movement <sup>2</sup>	2040 Background						2040 Plus Project					
			AM			PM			AM			PM		
			Delay <sup>3</sup>	LOS	v/c Ratio <sup>4</sup>	Delay <sup>3</sup>	LOS	v/c Ratio <sup>4</sup>	Delay <sup>3</sup>	LOS	v/c Ratio <sup>4</sup>	Delay <sup>3</sup>	LOS	v/c Ratio <sup>4</sup>
Pyramid Hwy/ La Posada Dr/ Eagle Canyon Rd	Signal	Overall	45.1	D	NA	35.0	D	NA	57.6	E	NA	50.6	D	NA
		EB Right	27.2	D	NA	22.7	C	NA	35.5	D	NA	<b>67.7</b>	<b>F</b>	<b>NA</b>
Pyramid Hwy/ Smoke Shop Dwy	Side Street Stop	WB Right	NA						11.5	B	NA	48.3	E	NA
		NB Left	36.4	E	NA	22.8	C	NA	<b>52.7</b>	<b>F</b>	<b>NA</b>	40.2	E	NA
		SB Left	NA						23.9	C	NA	<b>82.3</b>	<b>F</b>	<b>NA</b>
		Overall	99.5	<b>F</b>	<b>NA</b>	19.8	B	NA	<b>186.1</b>	<b>F</b>	<b>NA</b>	47.4	E	NA
Pyramid Hwy/ Robert Banks Blvd	Side Street Stop	WB Right	NA						18.5	C	NA	45.1	E	NA
		NB Left	<b>50.4</b>	<b>F</b>	<b>NA</b>	29.5	D	NA	<b>50.5</b>	<b>F</b>	<b>NA</b>	<b>59.0</b>	<b>F</b>	<b>NA</b>
		SB Left	NA						30.6	D	NA	41.7	E	NA
		Overall	90.2	<b>F</b>	<b>NA</b>	13.8	B	NA	<b>95.2</b>	<b>F</b>	<b>NA</b>	42.8	E	NA
Pyramid Hwy/ David James Blvd	Side Street Stop	WB Right	NA						15.4	C	NA	30.3	D	NA
		SB Left	NA						23.7	C	NA	31.5	D	NA
		Overall	36.5	D	NA	28.8	C	NA	59.9	E	NA	79.2	E	NA
Pyramid Hwy/ Dolores Dr	Signal	Overall	61.6	E	NA	47.5	D	NA	68.4	E	NA	62.2	E	NA
Pyramid Hwy/ Lazy 5 Pkwy	Signal	Overall	61.6	E	NA	47.5	D	NA	68.4	E	NA	62.2	E	NA
La Posada Dr/ Rockwell Blvd	RAB	NB Approach	5.6	A	0.01	6.2	A	0.01	10.3	B	0.38	<b>42.3</b>	<b>E</b>	<b>0.91</b>
		SB Approach	10.1	B	0.29	7.3	A	0.14	15.1	C	0.43	12.8	B	0.31
		EB Approach	6.7	A	0.31	7.6	A	0.40	9.7	A	0.43	12.5	B	0.58
		WB Approach	8.0	A	0.41	7.8	A	0.39	12.1	B	0.56	19.2	C	0.67
Tierra Del Sol Pkwy/North Project Access Rd	Side Street Stop	EB Approach	NA						8.4	A	NA	22.6	C	NA
		NB Left	NA						5.6	A	NA	7.2	A	NA
Tierra Del Sol Pkwy/Oppio Ranch Rd	All Way Stop	Overall	NA						7.4	A	NA	16.7	C	NA

Intersection	Control <sup>1</sup>	Approach/ Movement <sup>2</sup>	2040 Background						2040 Plus Project						
			AM			PM			AM			PM			
			Delay <sup>3</sup>	LOS	v/c Ratio <sup>4</sup>	Delay <sup>3</sup>	LOS	v/c Ratio <sup>4</sup>	Delay <sup>3</sup>	LOS	v/c Ratio <sup>4</sup>	Delay <sup>3</sup>	LOS	v/c Ratio <sup>4</sup>	
Tierra Del Sol Pkwy/ Stonebrook Parkway	RAB														
		NB Approach							5.9	A	0.03	7.8	A	0.05	
		SB Approach							8.8	A	0.36	17.2	C	0.73	
		EB Approach							8.2	A	0.38	13.1	B	0.55	
		WB Approach							9.9	A	0.51	8.8	A	0.42	

Notes: 1. RAB = roundabout

2. NB = northbound; SB = southbound; EB = eastbound; WB = westbound

3. Delay is reported in seconds per vehicle for the overall intersection for signalized and all way stop controlled intersections, and for the worst approach/movement for side street stop controlled and RAB intersections.

3. v/c Ratio = volume-to-capacity ratio; reported for RAB intersections.

**Bold** text indicates unacceptable operations.

Source: Traffic Works, 2018

As shown in the table, the Pyramid Highway/Smoke Shop Driveway, Pyramid Highway/Robert Banks Boulevard, and Pyramid Highway/David James Boulevard intersections are expected to have movements that would operate at LOS F under 2040 Plus Project conditions with or without the project. The movements that are expected to operate at LOS F are the eastbound right-turn movements which would not affect operations on the Pyramid Highway mainline. Additionally, the northbound and southbound left-turn movements would operate at LOS F; however, as shown in **Table 7** below, the queues for these movements would be minimal and are not expected to spill back into the through movement lanes on Pyramid Highway. Side street delay is expected on Pyramid Highway as described in the *Pyramid Highway/US 395 Connector* traffic studies and is a manageable condition given that additional signals at David James, Robert Banks, or the Smoke Shop driveway are not be appropriate on Pyramid Highway given the overall context of the highway.

The northbound approach at the La Posada Drive/Rockwell Boulevard/Tierra Del Sol Parkway roundabout is also expected to operate at LOS E during the PM peak hour.

### **Recommended Mitigations**

The following recommendations would improve operations at the La Posada Drive/Rockwell Boulevard/Tierra Del Sol Parkway roundabout to acceptable levels in the 2040 horizon year:

- La Posada Drive/Rockwell Boulevard/Tierra Del Sol Parkway – add a northbound right-turn pocket. The northbound approach to the roundabout would have one shared left-turn/through lane and one right turn lane.

**2040 Plus Project Queue Lengths and Turn Pocket Lengths**

The Nevada Department of Transportation’s (NDOT) *Access Management System and Standards* (November 2017) provides design lengths for left and right-turn deceleration lanes. The length of deceleration lane to be provided is:

$$\text{Minimum Length of Deceleration Lane} = \text{Deceleration Length} + \text{Queue Storage}$$

The “Deceleration Length” is based on the posted speed limit of the roadway as provided in Table 4-20: Minimum Length of Left-Turn or Right-Turn Deceleration Lanes of the *Access Management System and Standards*. The “Deceleration Length” for a roadway with a posted speed limit of 55 mph is 515 feet, and the length decreases to 425 feet at 50 mph and 350 feet at 45 mph. Note that these distances include the taper length. Per discussion with NDOT staff, short, steep tapers are appropriate in this particular context given the existing constraints and desire to create as much storage and deceleration length as possible.

Due to the presence of back to back left turn lanes at existing intersection locations (Dolores Drive, David James Boulevard, Robert Banks Boulevard, Smoke Shop Driveway, and La Posada Drive), to which this project is matching, the full deceleration lengths cannot be met at every location for a 55 mph posted speed. Therefore, consideration should be given to reducing the speed limit for deceleration lengths more consistent with the physically available turn pocket lengths. If the speed limit were reduced to 45 mph between David James Boulevard and La Posada Drive, all deceleration lane length requirements could be satisfied.

**Table 7** shows the recommended queue storage based on the 2040 Plus Project SimTraffic operations analysis and the Minimum Length of Deceleration Lane for the study intersections using a 45 mph posted speed limit.

**Table 7: 2040 Plus Project Queue Lengths and Deceleration Lane Lengths**

Intersection	Approach/Movement	AM			PM			Min. Length of Decel. Lane at 45 mph
		Maximum	Average	95 <sup>th</sup> Percentile	Maximum	Average	95 <sup>th</sup> Percentile	
Pyramid Hwy/ Smoke Shop Dwy	Northbound Left	50	25	50	50	25	<b>50</b>	400
	Northbound Right	25	25	25	50	25	<b>25</b>	375
	Southbound Left	100	50	75	225	100	<b>200</b>	550
Pyramid Hwy/ Robert Banks Blvd	Northbound Left	50	25	50	150	50	<b>125</b>	475
	Northbound Right	50	25	25	25	0	<b>25</b>	375
	Southbound Left	150	50	125	150	50	<b>125</b>	475
Pyramid Hwy/ David James Blvd	Northbound Right	25	25	25	25	0	<b>25</b>	375
	Southbound Left	100	25	75	75	25	<b>75</b>	425

- Notes: 1. RAB = roundabout  
2. Delay is reported in seconds per vehicle for the overall intersection for signalized intersections, and for the worst approach/movement for side street stop controlled and RAB intersections.  
3. v/c Ratio = volume-to-capacity ratio; reported for RAB intersections.  
**Bold** text indicates unacceptable operations.  
Source: Traffic Works, 2018

## CONCLUSIONS AND RECOMMENDATIONS

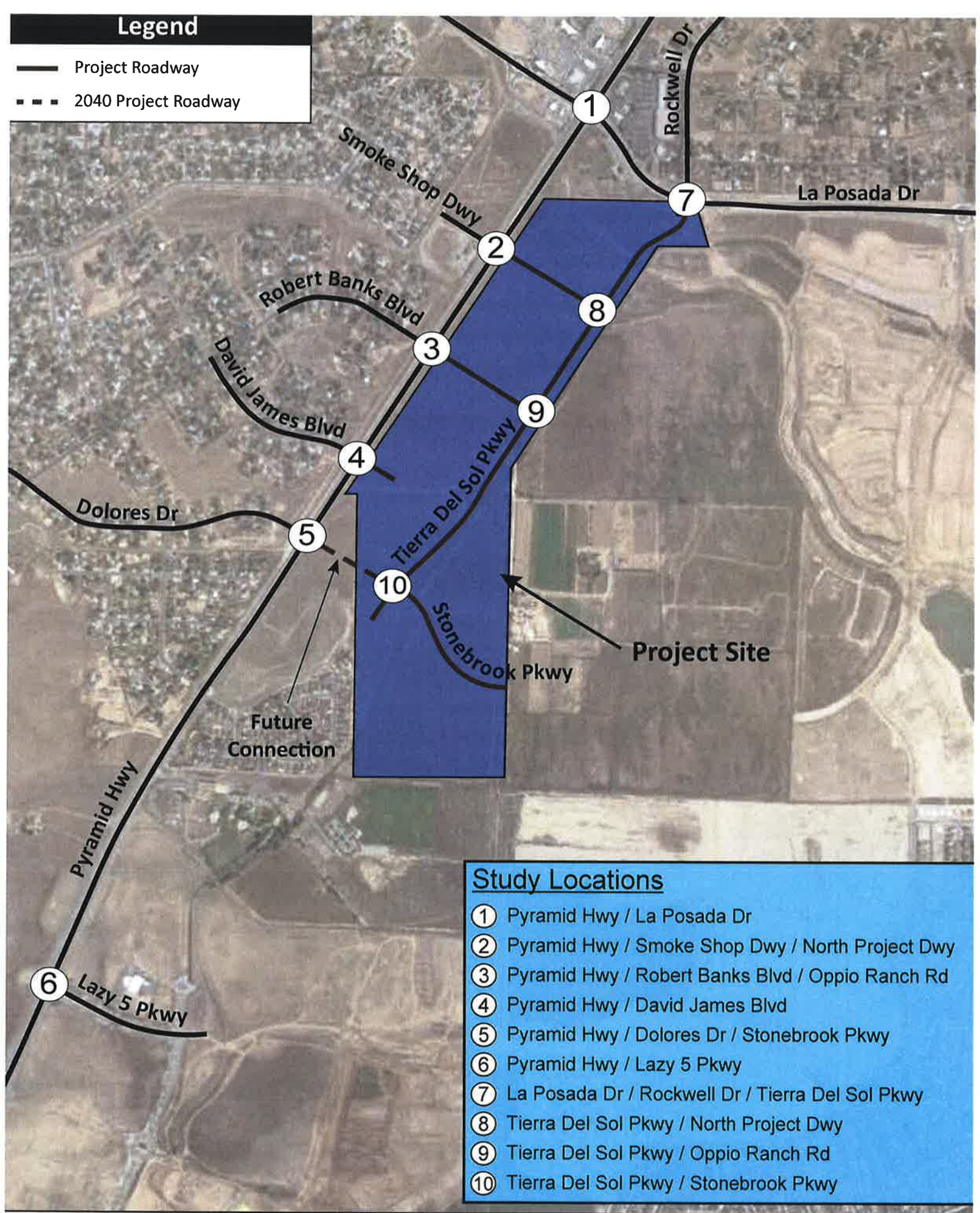
The following is a list of our key findings and recommendations:

- The proposed Stonebrook West project includes approximately 167 acres and would consist of commercial, office, and residential land uses.
- Build-out of the proposed project would generate approximately 25,629 Daily, 1,416 AM peak hour, and 2,241 PM peak hour trips to the external roadway network.
- Under Existing Plus Project conditions, the project connection to Stonebrook Parkway/Dolores Drive is not expected to be constructed. The following land use mix was evaluated and could be constructed without the Stonebrook Parkway connection and without creating significant impacts:
  - Multifamily Residential – 401 dwelling units (100%)
  - Single Family Residential – 434 dwelling units (100%)
  - Shopping Center – 131.12 ksf (approximately 50%)
  - Discount Supermarket – 85 ksf (100%)
  - General Office – 116.8 ksf (approximately 40%)
  - Medical/Dental Office – 38.93 ksf (approximately 40%)
- Any mix of land uses or quantities that generates less than 18,647 Daily, 1,022 AM peak hour, and 1,560 PM external peak hour trips could be constructed without the Stonebrook Parkway connection to Pyramid Highway.
- The northbound approach to the La Posada Drive/Rockwell Boulevard/Tierra Del Sol Parkway roundabout should be constructed with one shared left-turn/through lane and one right turn lane.
- Consideration should be given to reducing the speed limit on Pyramid Highway to 45 miles per hour between David James Boulevard and La Posada Drive with the new access management features and change in roadway character. With this speed limit revision, turn pockets having standard deceleration lengths could be provided at each intersection in the study segment of Pyramid Highway. The ultimate speed limit decision shall be governed by NDOT and either dictated as a condition of the occupancy permit(s) or implemented by NDOT separate from this project.
- The project intersections on Pyramid Highway should be constructed with the configurations shown on the Pyramid Highway Conceptual Lane Configuration plans provided in **Appendix C**.
- The Tierra Del Sol Parkway/North Project Road intersection should be constructed with side street stop control on the eastbound approach, and free northbound and southbound movements. The southbound approach should include a shared through/right-turn lane and the northbound and eastbound approaches should include a left-turn lane and a through lane.


- The Tierra Del Sol Parkway/Oppio Ranch Road intersection should include a left-turn lane and a shared through/right-turn lane on all approaches with all-way stop control.
- The Stonebrook Parkway/Tierra Del Sol Parkway intersection should be constructed as a single-lane roundabout. Stonebrook Parkway is planned to have four lanes between Tierra Del Sol Parkway and Pyramid Highway, and two lanes east of Tierra Del Sol Parkway.

# Legend






- Project Roadway
- - - 2040 Project Roadway

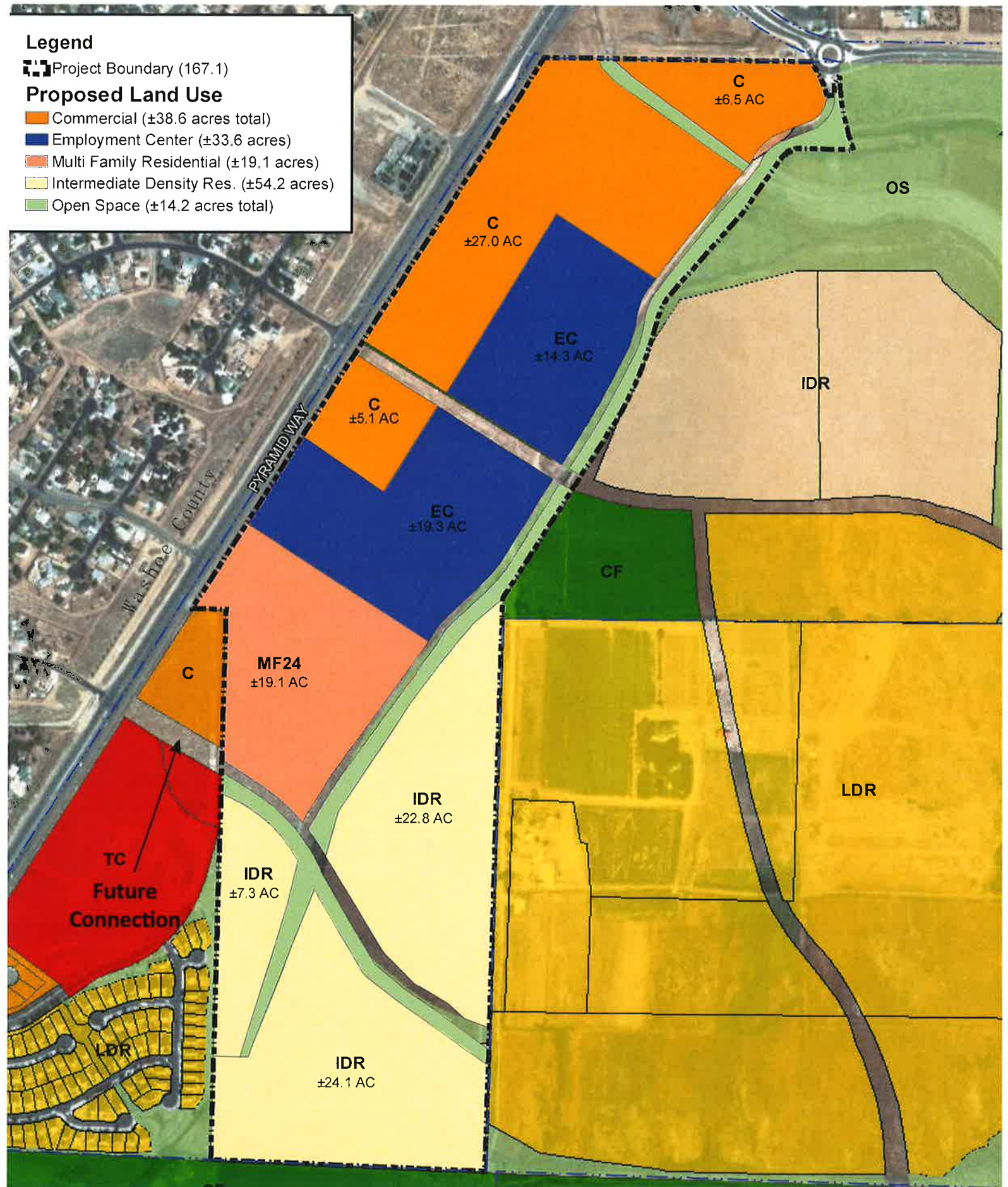


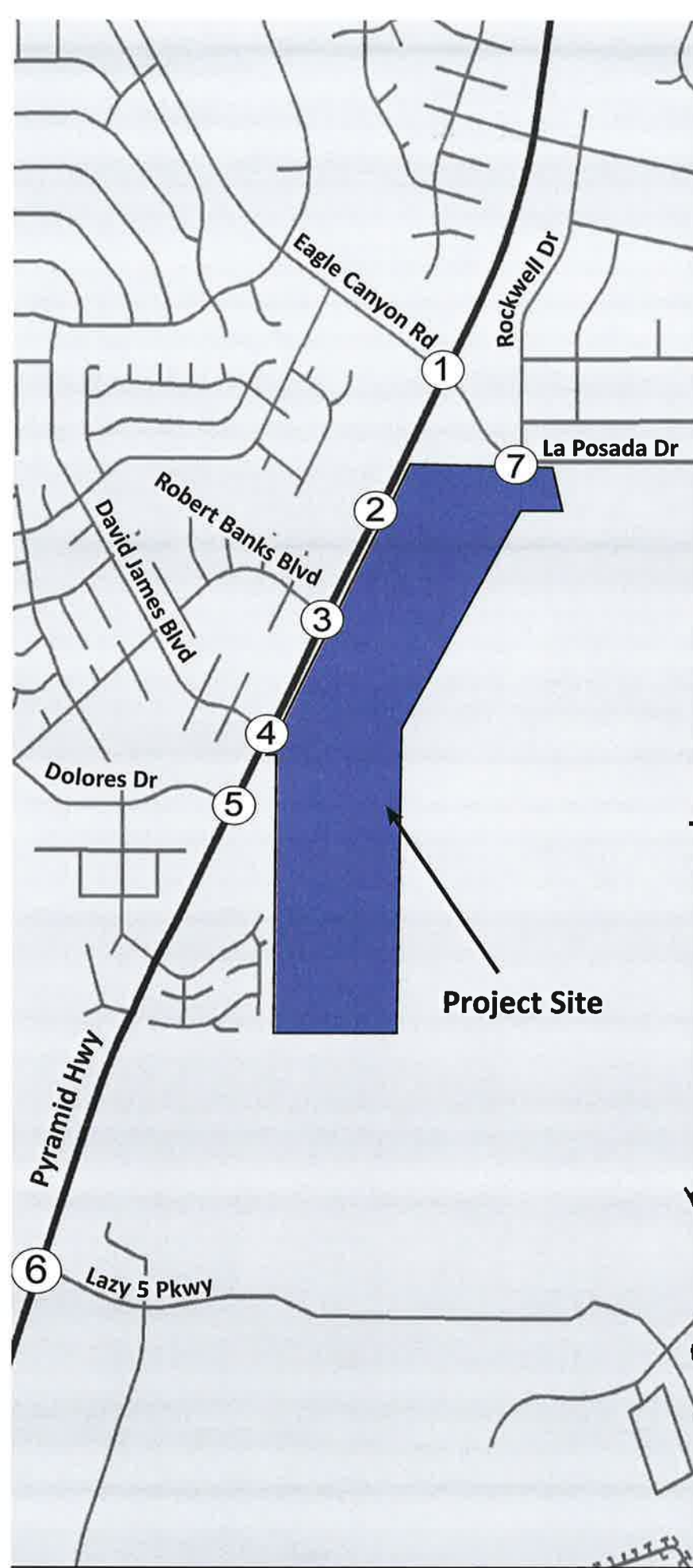
### Legend

 Project Boundary (167.1)

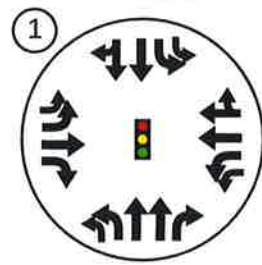
### Proposed Land Use

-  Commercial (±38.6 acres total)
-  Employment Center (±33.6 acres)
-  Multi Family Residential (±19.1 acres)
-  Intermediate Density Res. (±54.2 acres)
-  Open Space (±14.2 acres total)

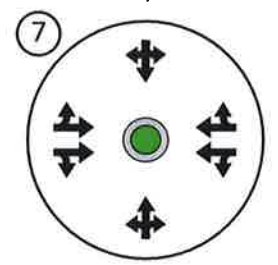




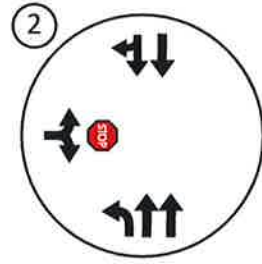
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La Posada Dr



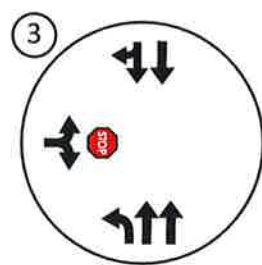
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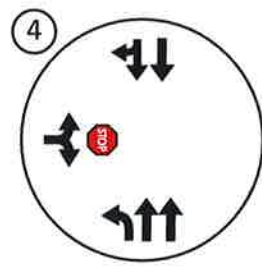
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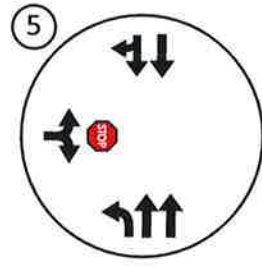
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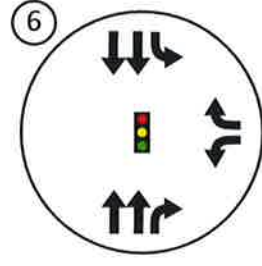
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Pyramid Hwy / Dolores Dr

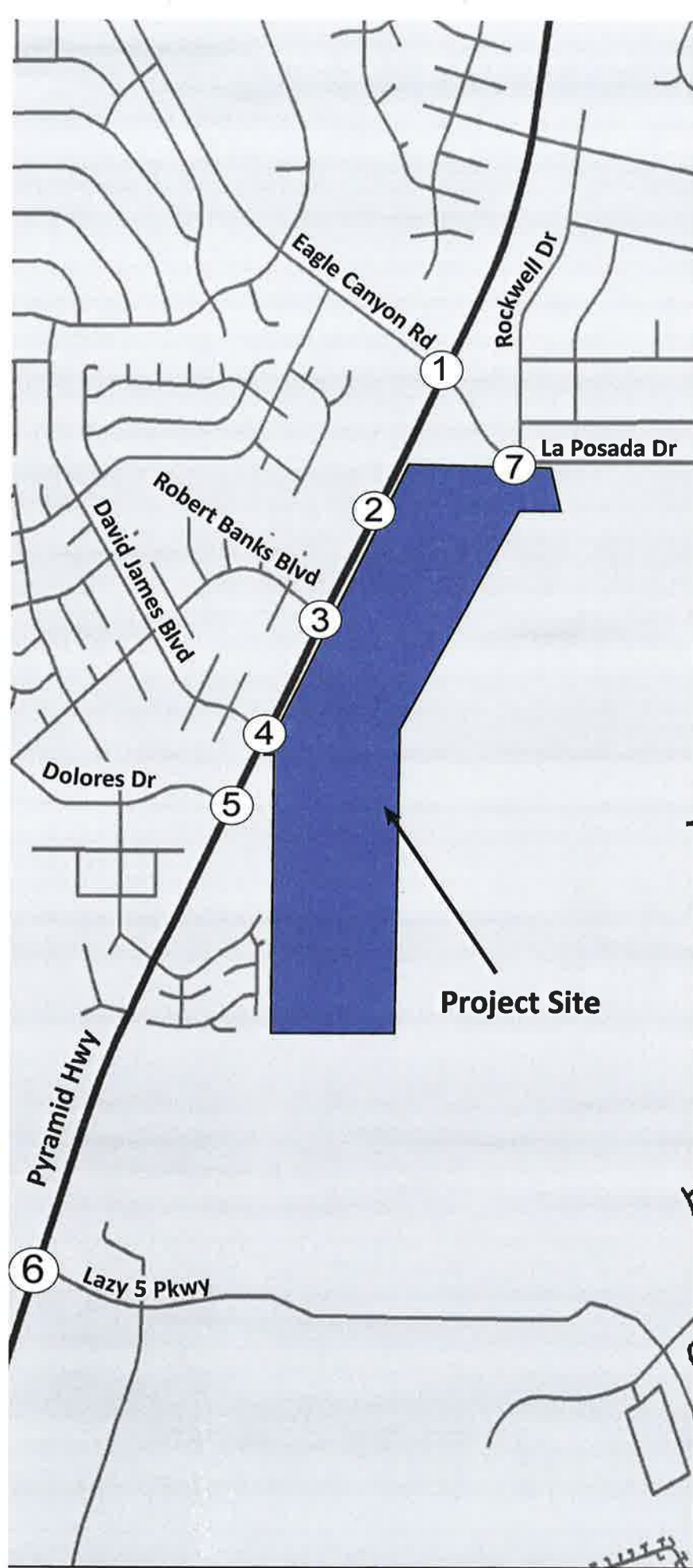


Pyramid Hwy / Lazy 5 Pkwy

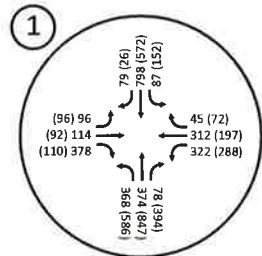


Project Site

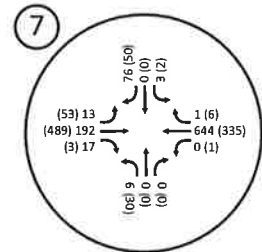




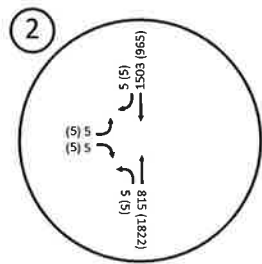
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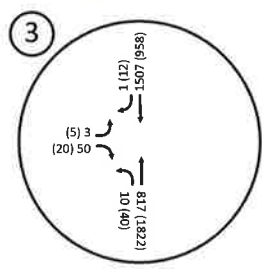
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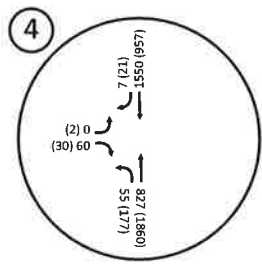
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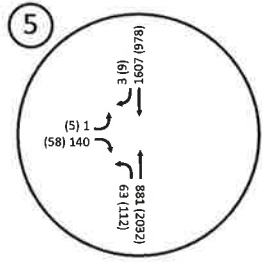
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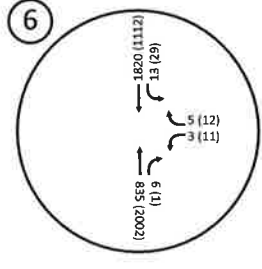
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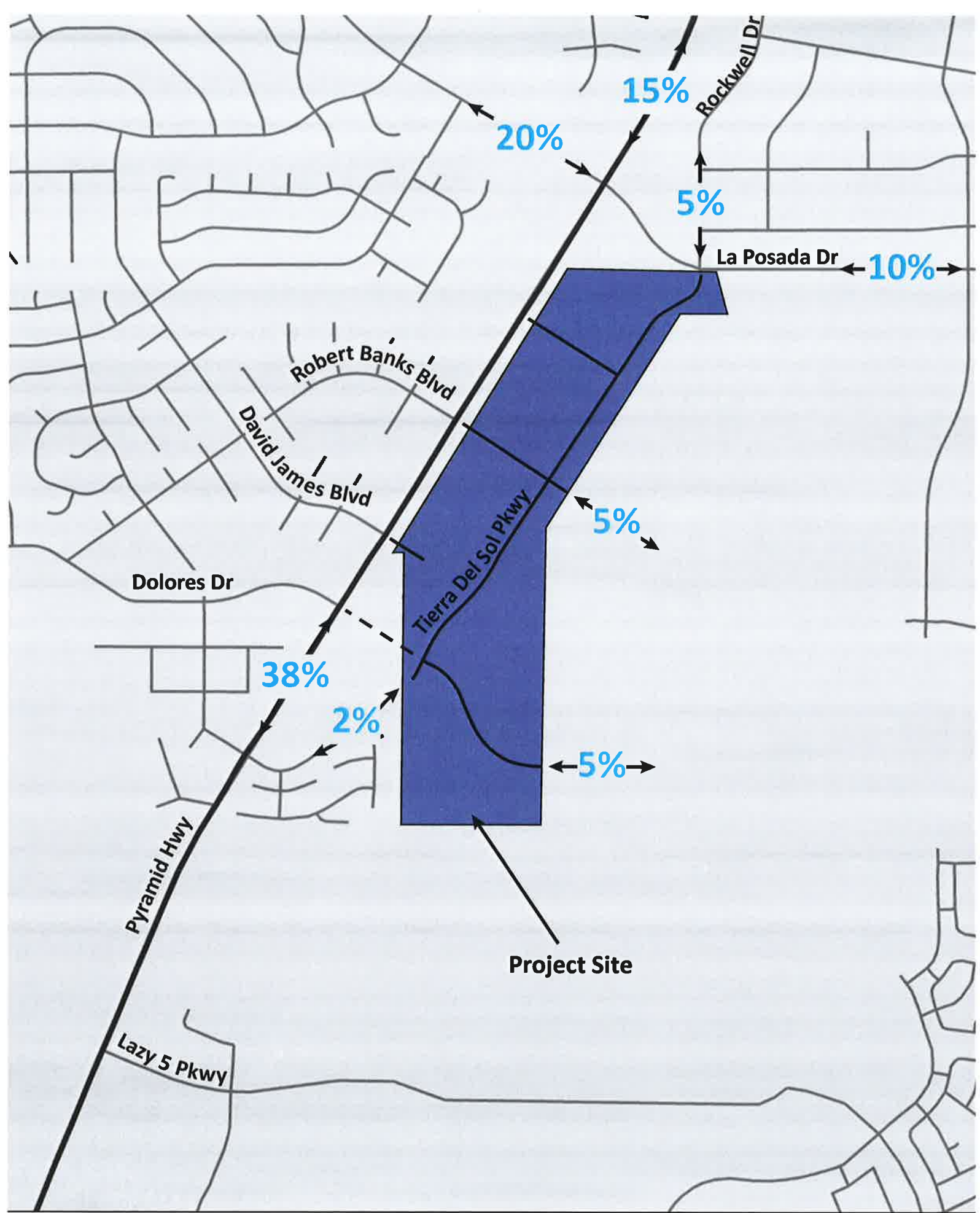
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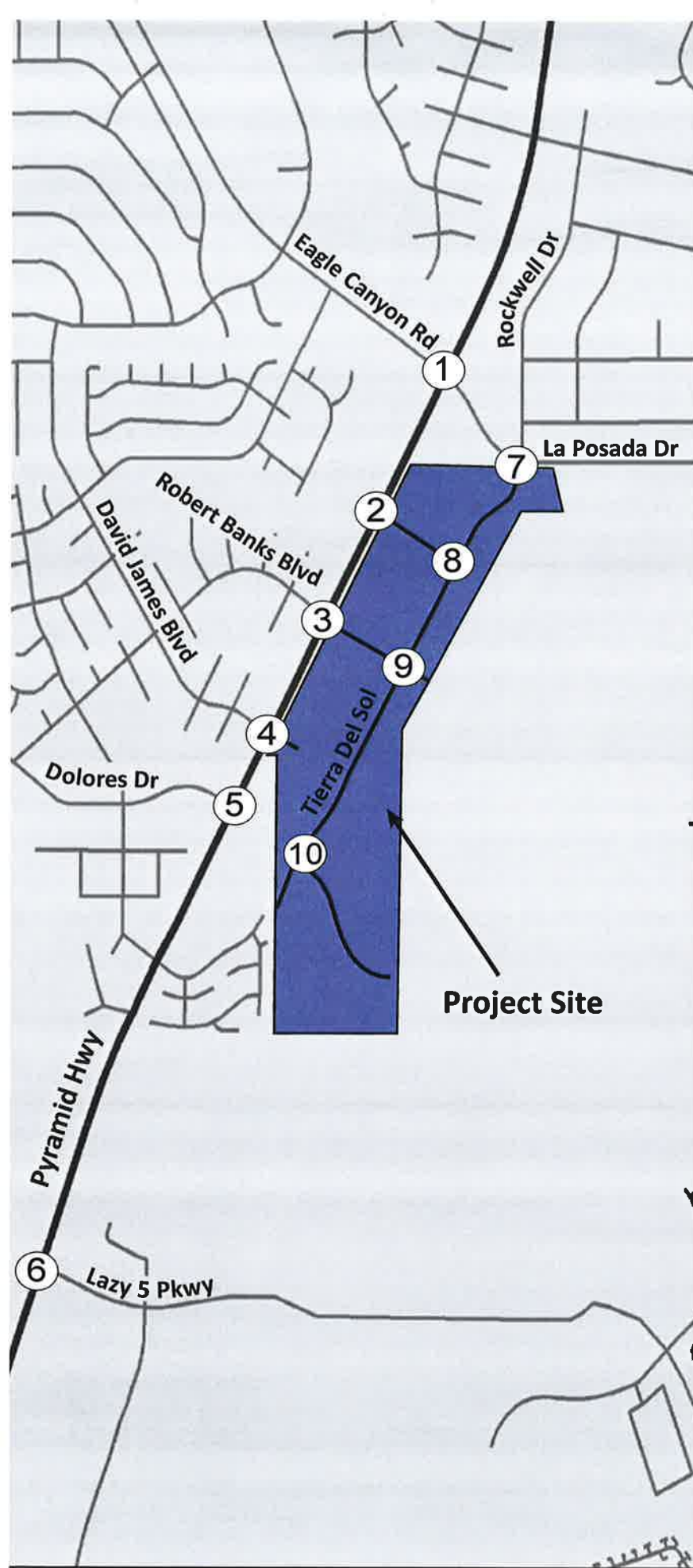


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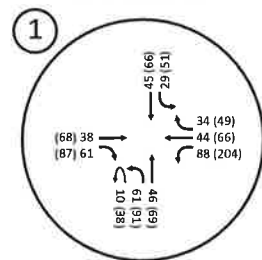


AM Peak Hour Volume (PM Peak Hour Volume)

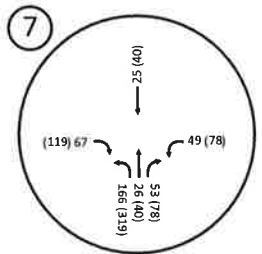




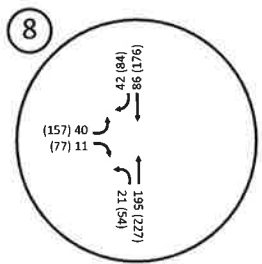
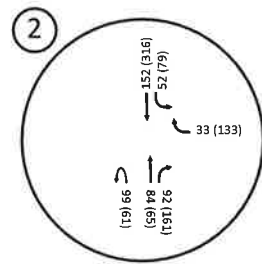
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La Posada Dr



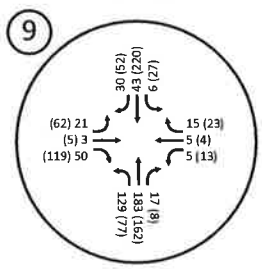
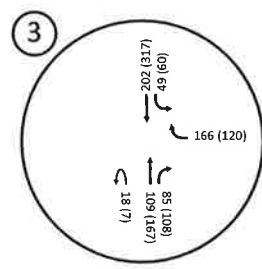
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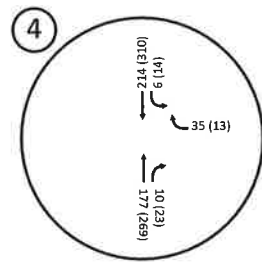
Pyramid Hwy / Smoke Shop Dwy  
Tierra Del Sol / North Project Dwy



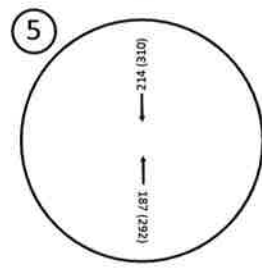
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Tierra Del Sol / Oppio Ranch Rd



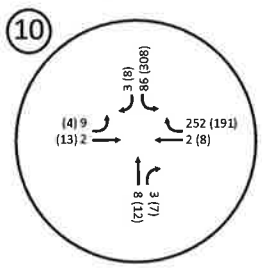
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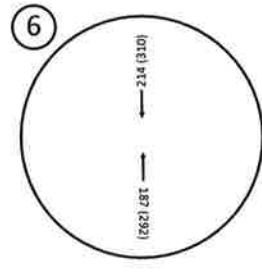
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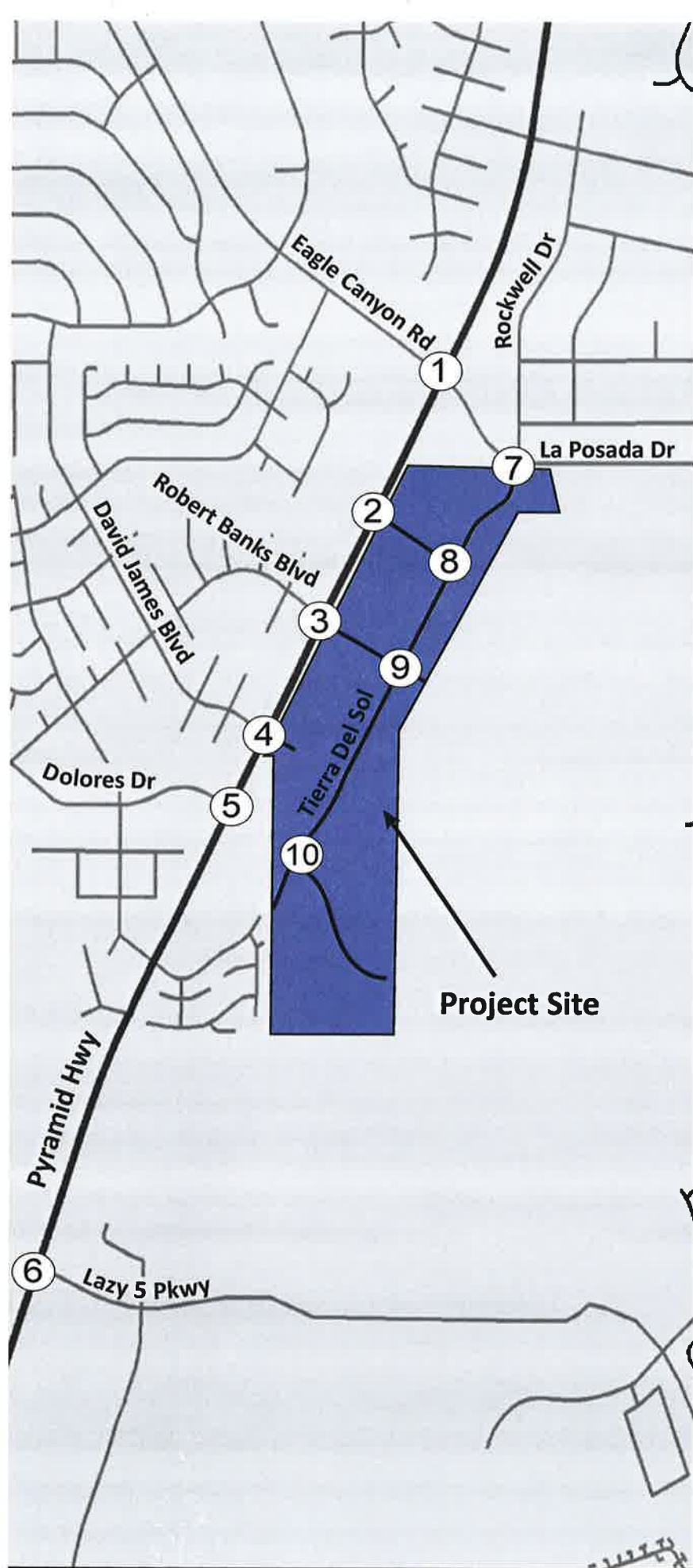
Tierra Del Sol / Stonebrook Pkwy



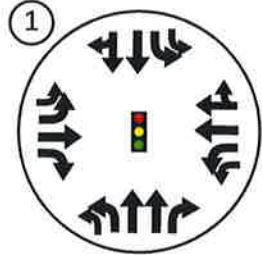
Pyramid Hwy / Lazy 5 Pkwy



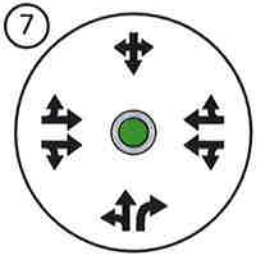
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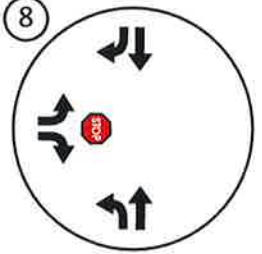
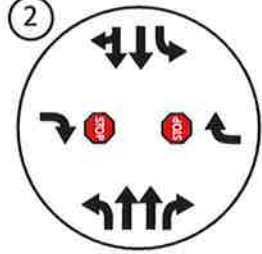
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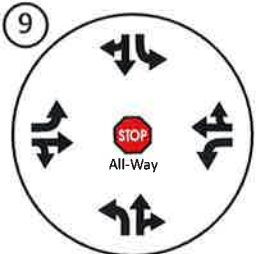
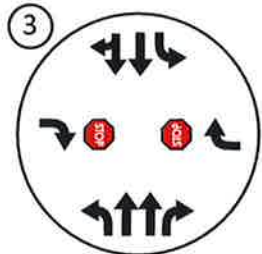
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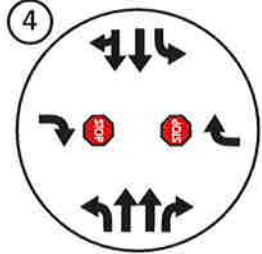
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Tierra Del Sol / North Project Dwy



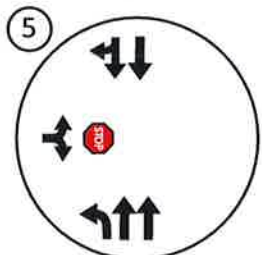
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Tierra Del Sol / Oppio Ranch Rd



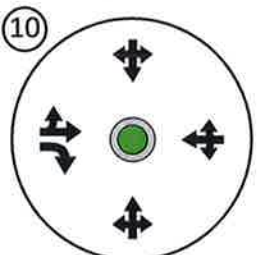
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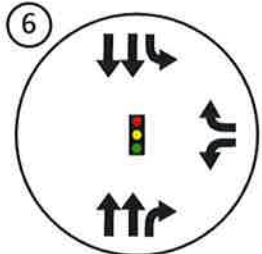
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Tierra Del Sol / Stonebrook Pkwy

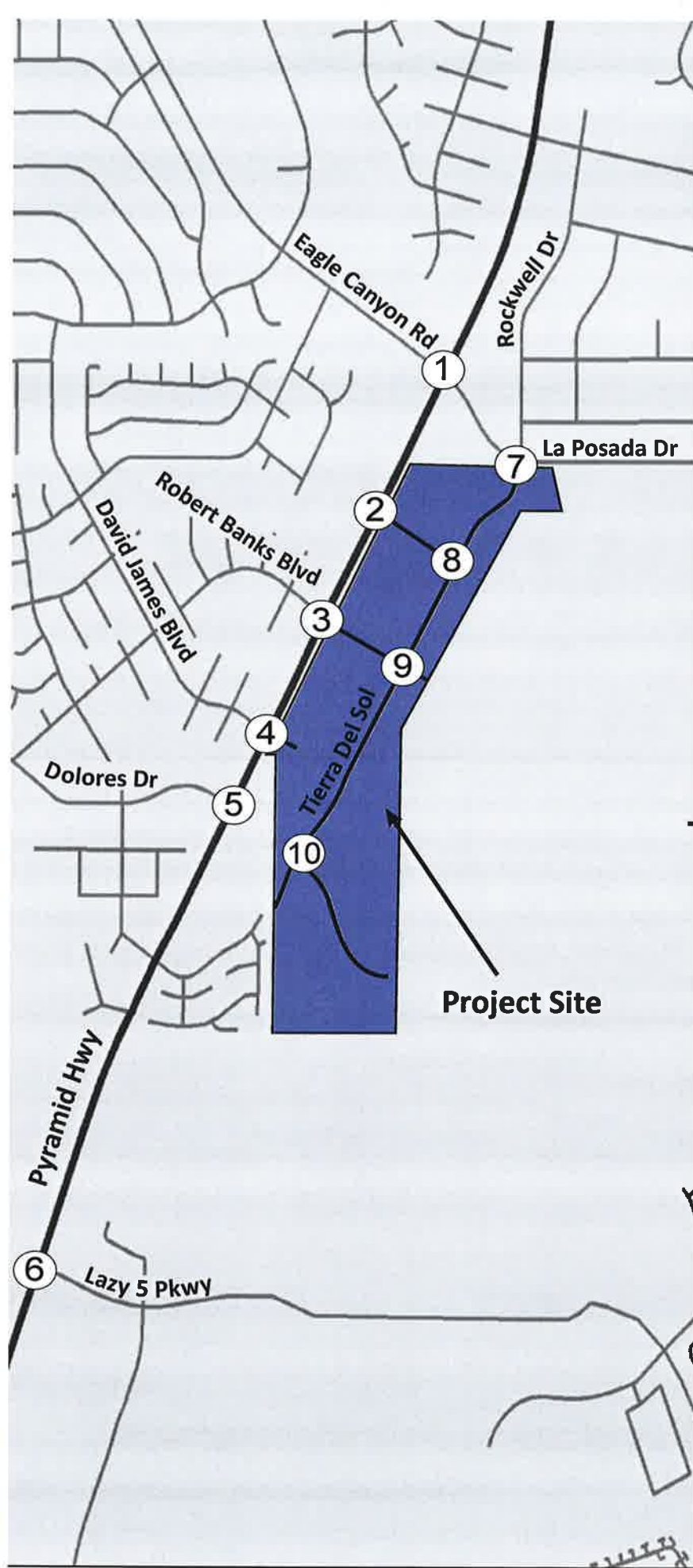


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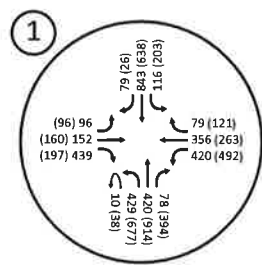


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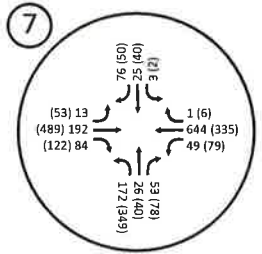
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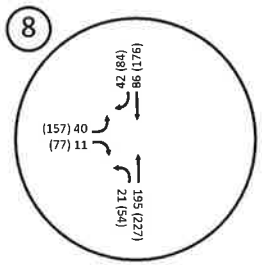
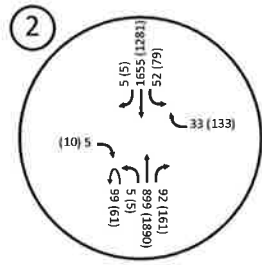
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La Posada Dr



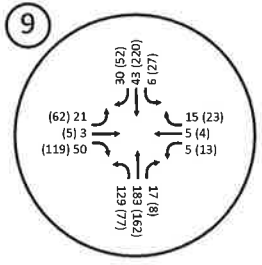
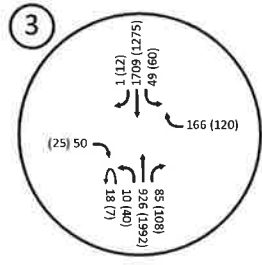
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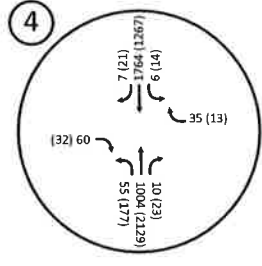
Pyramid Hwy / Smoke Shop Dwy Tierra Del Sol / North Project Dwy



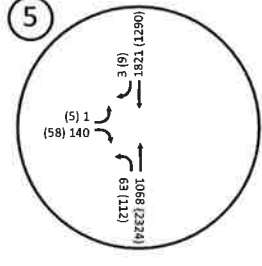
Pyramid Hwy / Robert Banks Blvd Tierra Del Sol / Oppio Ranch Rd



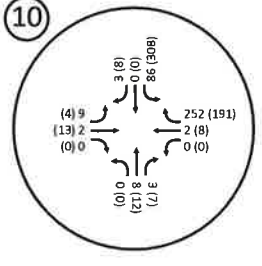
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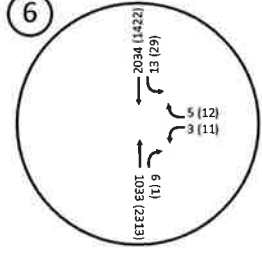
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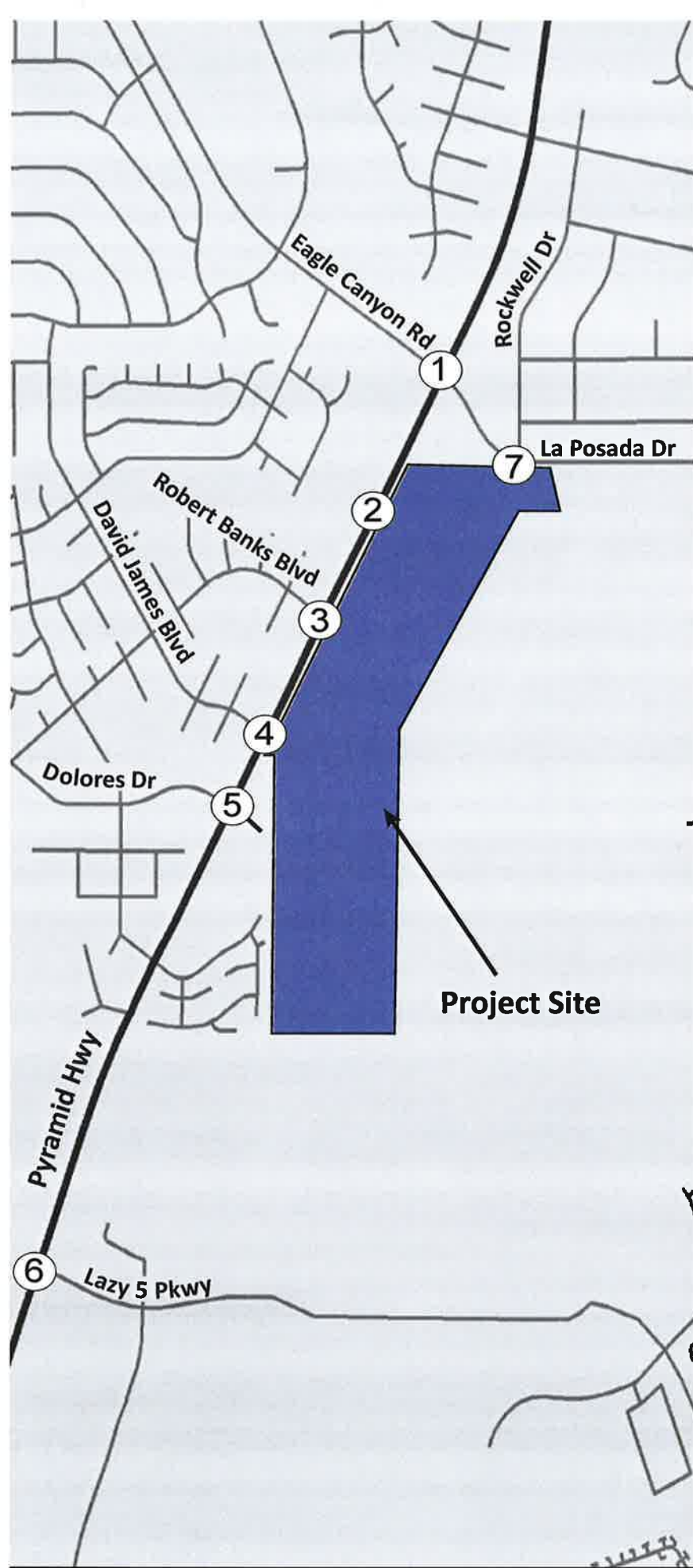
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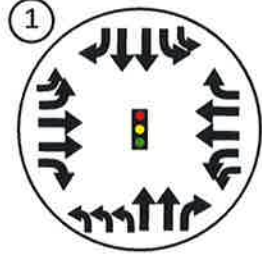
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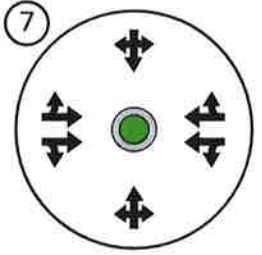
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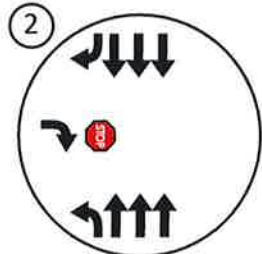
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La Posada Dr



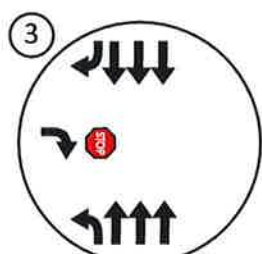
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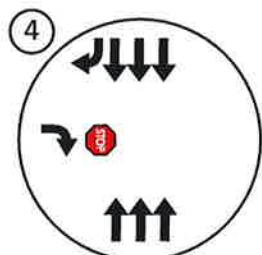
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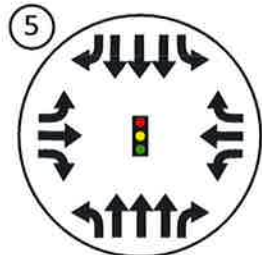
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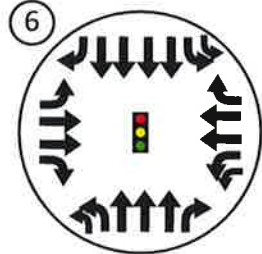
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Pyramid Hwy / Dolores Dr

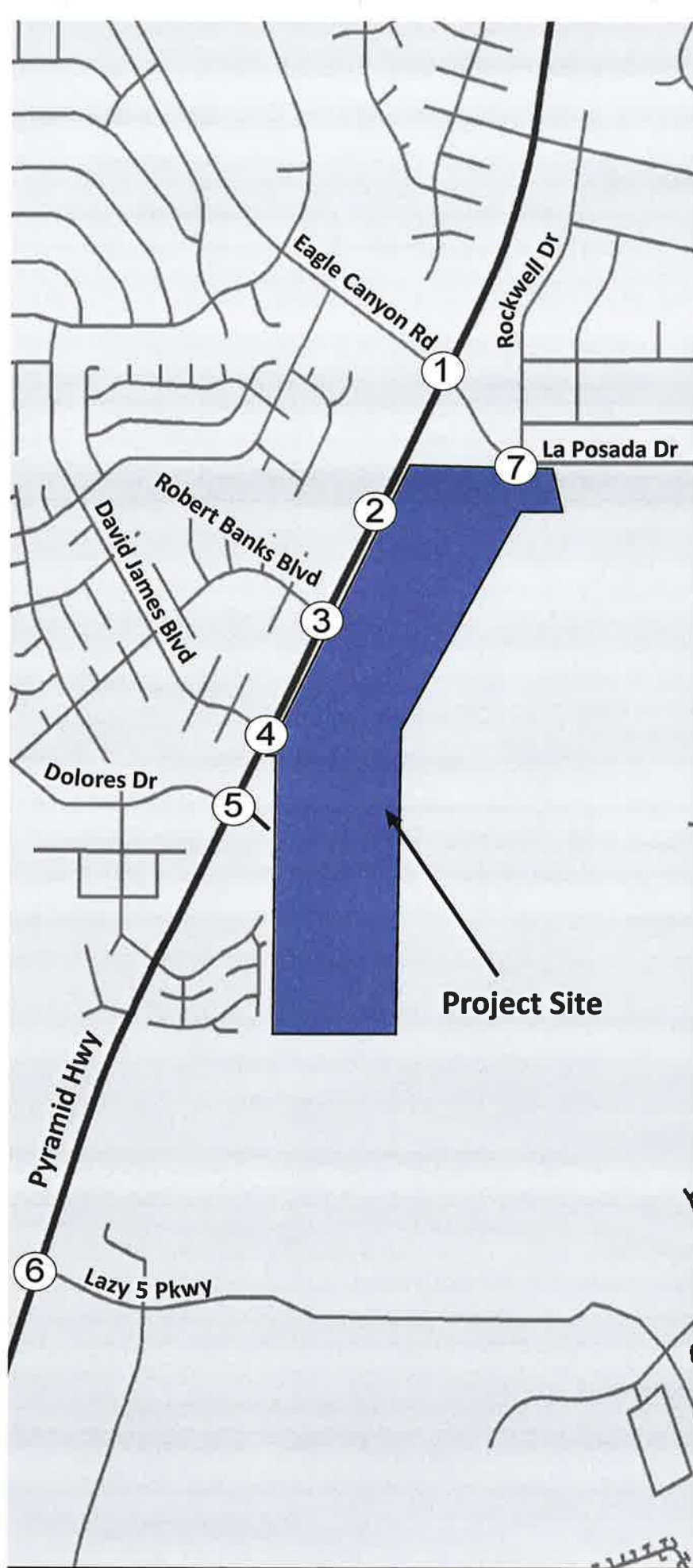


Pyramid Hwy / Lazy 5 Pkwy

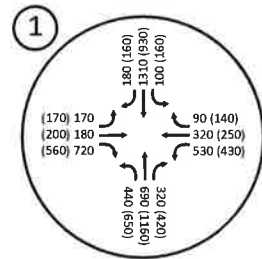


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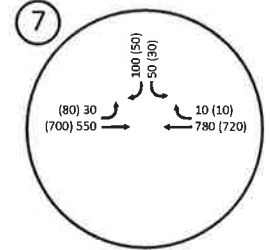
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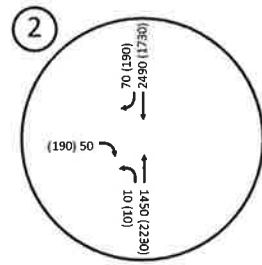
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La Posada Dr



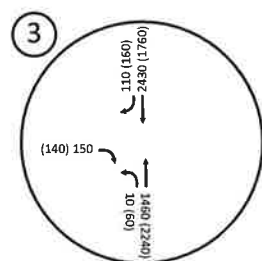
La Posada Dr / Rockwell Dr



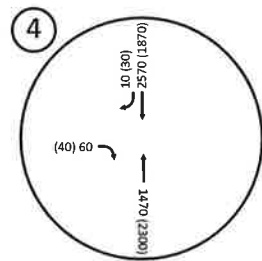
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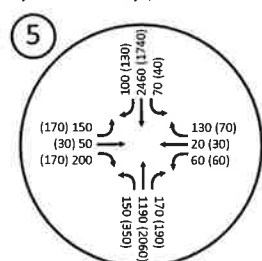
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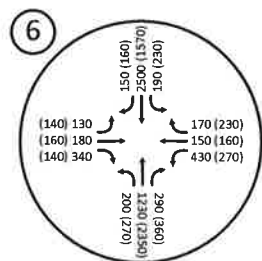
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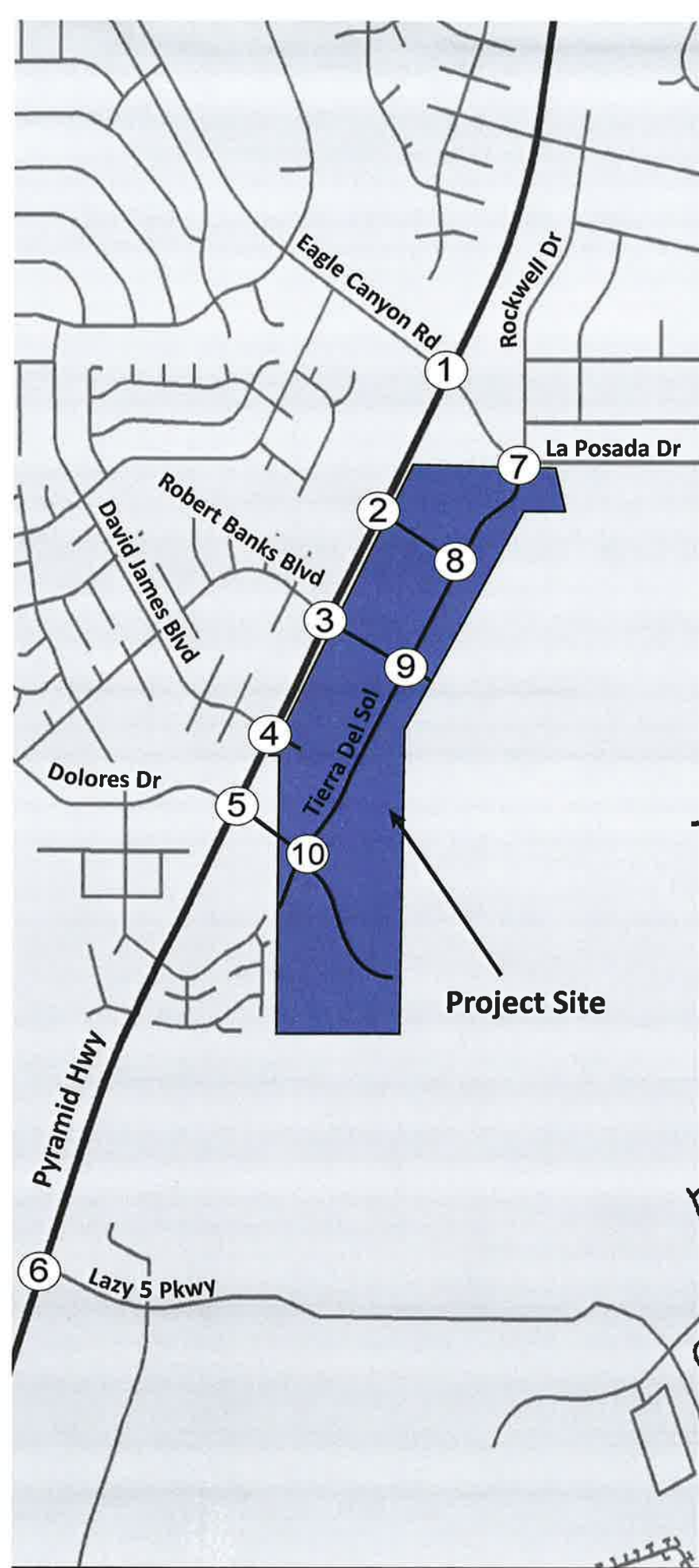
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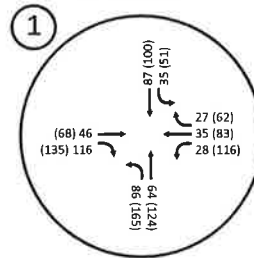
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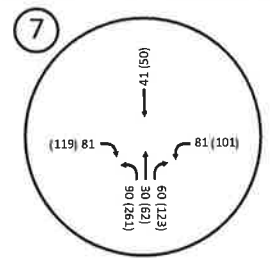
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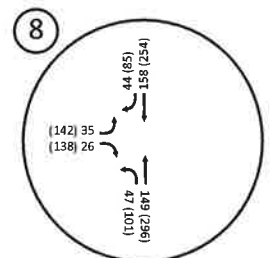
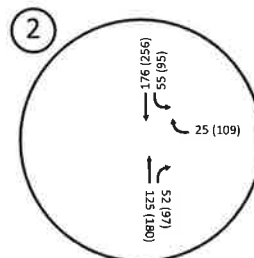
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La Posada Dr



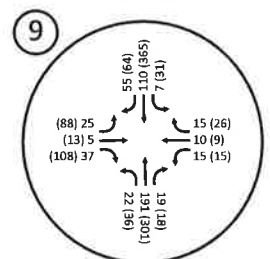
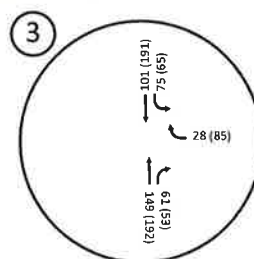
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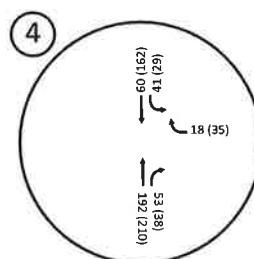
Pyramid Hwy / Smoke Shop Dwy Tierra Del Sol / North Project Dwy



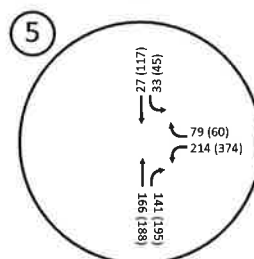
Pyramid Hwy / Robert Banks Blvd Tierra Del Sol / Oppio Ranch Rd



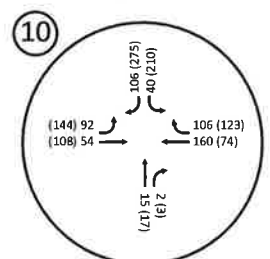
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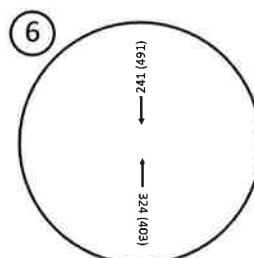
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Tierra Del Sol / Stonebrook Pkwy

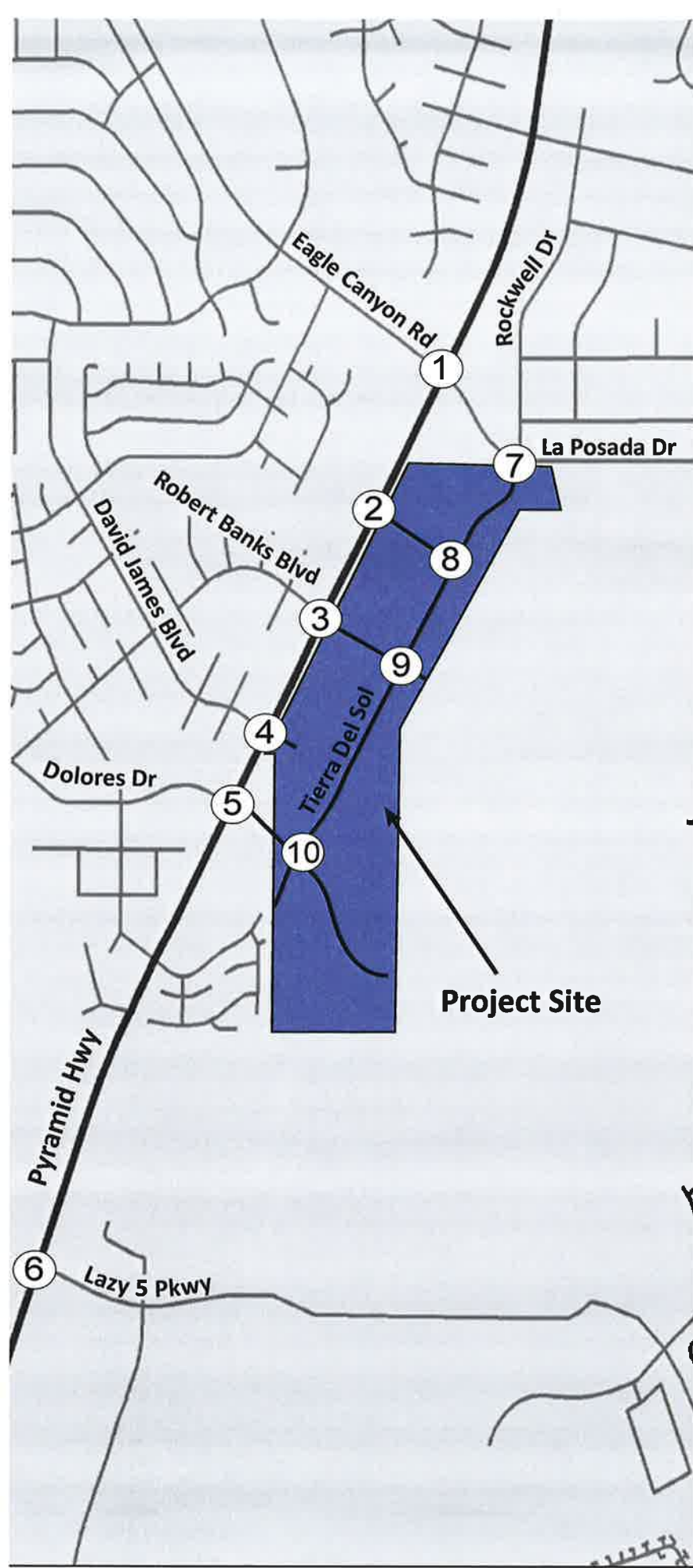


Pyramid Hwy / Lazy 5 Pkwy

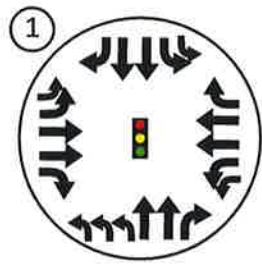


AM Peak Hour Volume (PM Peak Hour Volume)

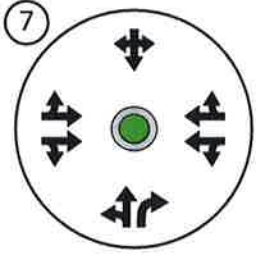




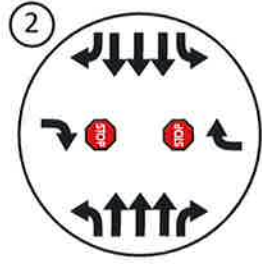
Pyramid Hwy / Eagle Canyon Rd  
La Posada Dr



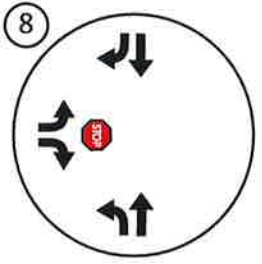
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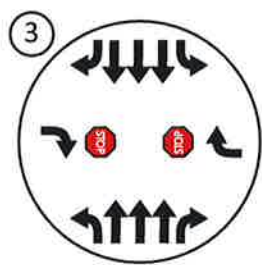
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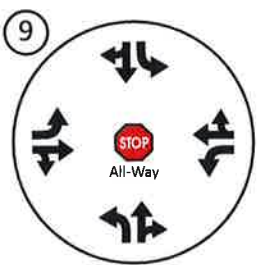
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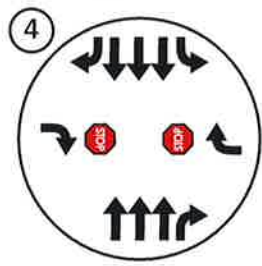
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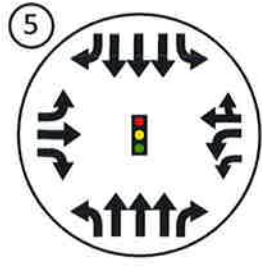
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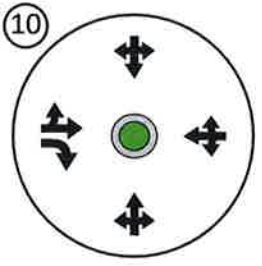
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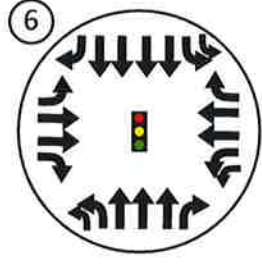
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Tierra Del Sol / Stonebrook Pkwy

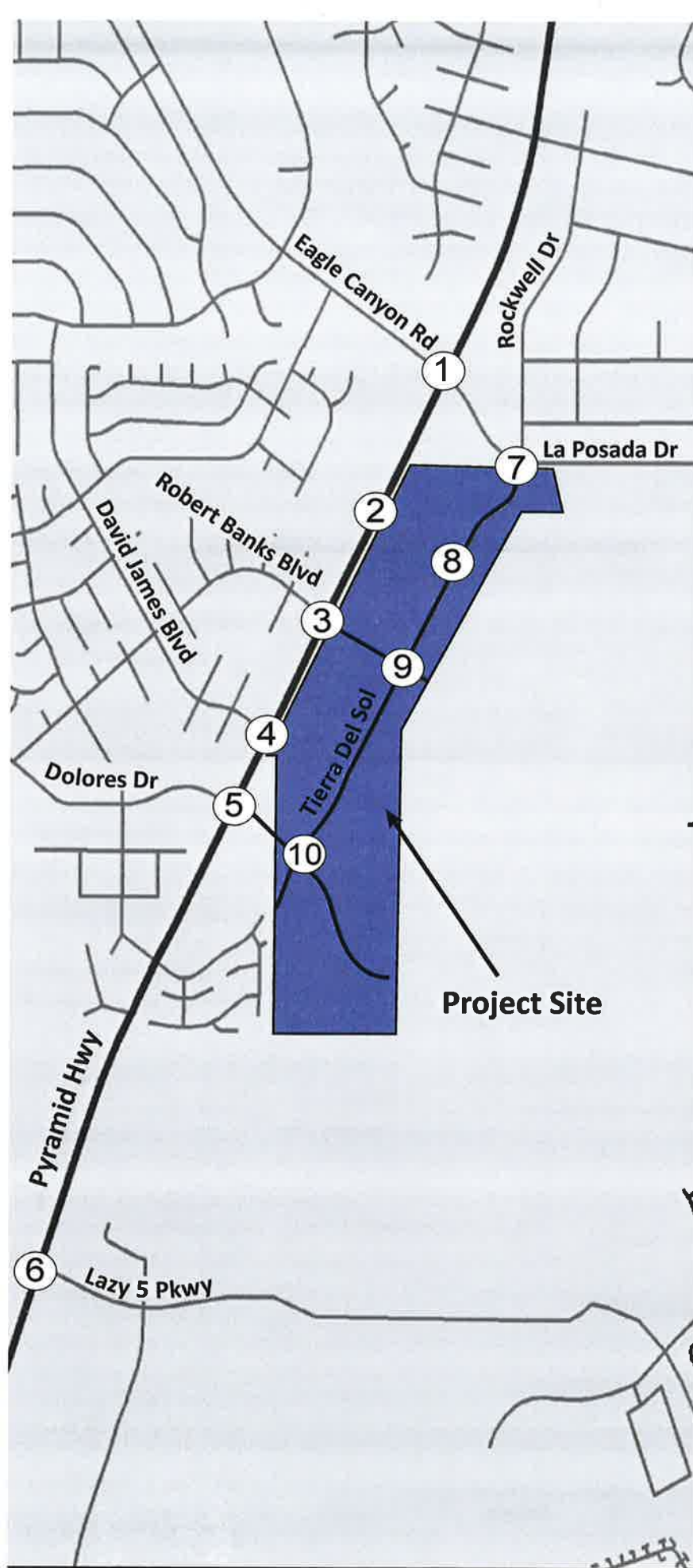


Pyramid Hwy / Lazy 5 Pkwy

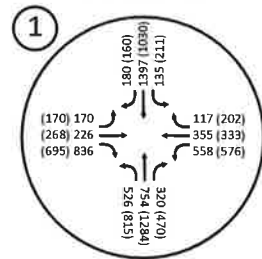


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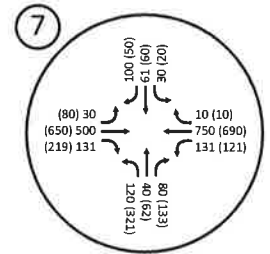
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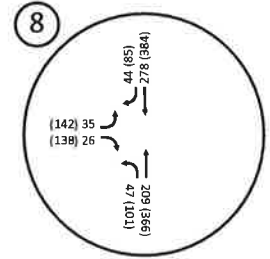
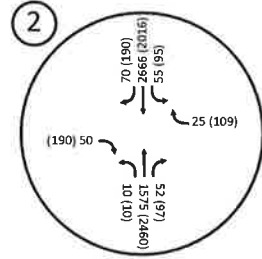
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La Posada Dr



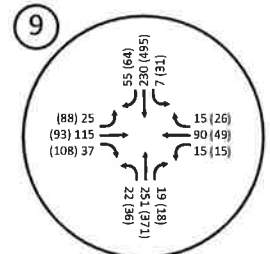
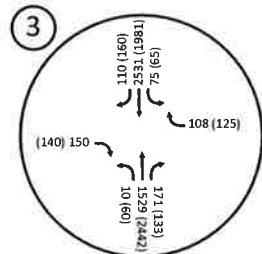
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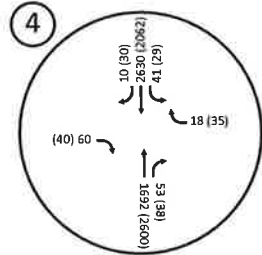
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Tierra Del Sol / North Project Dwy



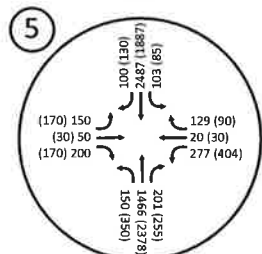
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Tierra Del Sol / Oppio Ranch Rd



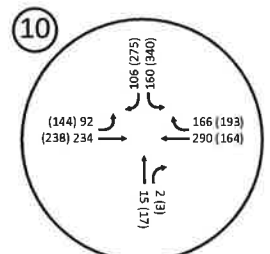
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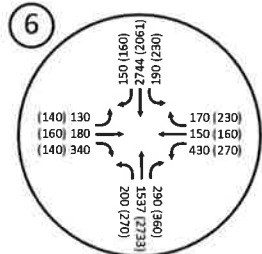
Pyramid Hwy / Dolores Dr



Tierra Del Sol / Stonebrook Pkwy



Pyramid Hwy / Lazy 5 Pkwy



AM Peak Hour Volume (PM Peak Hour Volume)



October 2, 2019

Jon Ericson  
City Engineer  
City of Sparks  
431 Prater Way  
Sparks, NV 89431

## **Gap Analysis - Pyramid Highway at Robert Banks Boulevard**

Dear Mr. Ericson,

This letter provides the results of a gap analysis performed to identify the existing vehicular gaps on Pyramid Highway and to determine the potential capacity for northbound to southbound major street U-turn movements at the Pyramid Highway / Robert Banks Boulevard intersection in Sparks, Nevada. This study follows the methodologies outlined in Chapter 19 of the *Highway Capacity Manual, 2010* (HCM 2010) which is the nationally recognized standard for this type of evaluation.

### ***Existing U-Turn Gaps***

The *Highway Capacity Manual, 2010* (HCM 2010) establishes a base critical headway (minimum gap) in oncoming traffic of 6.4 seconds and a base follow up time of 2.5 seconds (the time between sequential U-turn movements) for a major street U-turn at a side-street STOP controlled intersection. Therefore, a single U-turn could be processed in less than 7 seconds, two U-turns within 9 seconds, three U-turns within 12 seconds and so forth. The total number of existing U-turn gaps on Pyramid Highway was determined by counting the length of each gap equal to or more than 7 seconds in which one or more U-turns could be processed. The traffic flow data was collected on Wednesday, September 18<sup>th</sup>, 2019 during the AM Peak Hour (6:45 to 7:45) with Washoe County School District in session. The number of gaps that were found in southbound traffic on Pyramid Highway at Robert Banks Boulevard are as follows:

- 7 to 9 second gap (1 vehicle): 15
- 9 to 12 second gap (2 vehicles): 21
- 12 to 15 second gap (3 vehicles): 11
- 15 to 18 second gap (4 vehicles): 5
- 18 to 21 second gap (5 vehicles): 3
- 21 to 24 second gap (6 vehicles): 1

In total, there were 56 gaps in southbound Pyramid Highway traffic flows that could enable a total of 131 U-turns during the AM Peak Hour.

**Potential U-Turn Capacity**

U-turn capacity was calculated by subtracting the existing number of left-turns identified in the *Traffic Impact Study for Stonebrook West* (Traffic Works, 2019) from the total potential U-Turns. This method is conservative since left turns from the major street can be processed on gaps less than the 7 second gaps that were counted. **Table 1** shows the AM Peak Hour calculation for remaining U-turn capacity.

**Table 1. AM Peak Hour U-Turn Capacity Calculation**

Start	End	Potential U-Turns
6:45	7:00	42
7:00	7:15	18
7:15	7:30	10
7:30	7:45	61
<b>Total</b>		<b>131</b>
<b>Existing Left Turns</b>		<b>55</b>
<b>Remaining U-Turn Capacity</b>		<b>76</b>

As shown in **Table 1**, subtracting the 55 existing left turns from the 131 potential U-turn gaps results in a remaining capacity of 76 U-turns at the study intersection.

**Conclusion**

The initial phase(s) of the Stonebrook West project are not entirely defined at this time and could consist of single-family units, multi-family housing, commercial uses, or a combination thereof. The Pyramid Highway / Robert Banks Boulevard intersection could process up to 76 new U-turns, therefore, any mix of land uses generating up to 76 U-turns (specifically at Robert Banks) could be built prior to installation of a traffic signal at the Pyramid Highway / Dolores Drive intersection. Project components not creating U-turns at Robert Banks, but further north on Pyramid Highway, are feasible outside this limitation.

Sincerely,  
HEADWAY TRANSPORTATION, LLC

Loren E. Chilson, PE  
Principal





October 2, 2019

Richard Oujevolk, P.E.  
NDOT District II  
310 Galletti Way  
Sparks, NV 89431

### Traffic Signal Warrant Study – Pyramid Highway/Dolores Drive (Stonebrook West)

Dear Mr. Oujevolk,

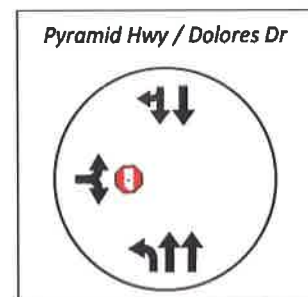
This letter report provides a summary of traffic signal warrant analyses conducted for the Pyramid Highway/Dolores Drive intersection in Sparks, NV. A traffic signal has been planned for this intersection for over a decade and a need for it was described in the *Traffic Impact Study for Stonebrook West* (Traffic Works, January 2019). The following four warrants were analyzed based on guidance in the Federal Highway Administration (FHWA) *Manual on Uniform Traffic Control Devices (MUTCD)*:

- ▶ Warrant 2, Four-Hour Vehicular Volume
- ▶ Warrant 6, Coordinated Signal System
- ▶ Warrant 7, Crash Experience
- ▶ Warrant 8, Roadway Network

### EXISTING INTERSECTION CONDITIONS

The Pyramid Highway/Dolores Drive intersection is currently a three-legged intersection with stop control on the side street (Dolores Drive) approach. The intersection lane configurations include two through lanes in the northbound and southbound directions, a northbound left-turn lane, and a shared left- and right-turn lane on the eastbound approach (Dolores Drive).

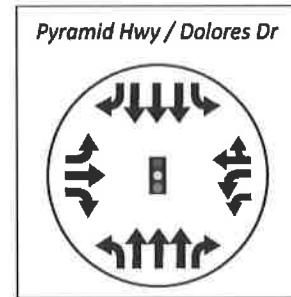
Based on analysis presented in the Stonebrook West traffic study, the Pyramid Highway/Dolores Drive intersection currently operates at LOS D and LOS C during the AM and PM peak hours, respectively.



### PROPOSED INTERSECTION CONDITIONS

The Pyramid Highway/Dolores Drive intersection has been analyzed in multiple studies, most recently the *Addendum to the Pyramid Highway/US 395 Connector Traffic Report (December 2011), for Arterial Alternatives For Pyramid Highway and US 395 Connector* (Jacobs, June 2017). A traffic signal at the Pyramid Highway/Dolores Drive intersection is programmed in the Pyramid Highway improvements and

needed based on Stonebrook West Existing Plus Project and future year traffic volumes. Stonebrook Parkway, a planned arterial roadway that will serve the entire Stonebrook Master Plan area, will connect to Pyramid Highway opposite Dolores Drive. The existing peak hour bi-directional traffic volumes on Pyramid Highway at Dolores Drive are approximately 2,400 to 3,000 vehicles. Once the Stonebrook Parkway connection is built, a signal will be necessary to safely facilitate left-turns across 3,000 conflicting vehicles during the peak hour.



Under future year conditions with Stonebrook Parkway, the signalized Pyramid Highway/Dolores Drive intersection is planned to include three through lanes in each direction on Pyramid Highway, as well as left- and right-turn lanes. The eastbound approach (Dolores Drive) would include separate left, through, and right-turn lanes, and the westbound approach would include two left-turn lanes and a shared through/right-turn lane. As an unsignalized intersection, the side street approaches would operate at deep level of service "F" conditions with more than 500 seconds of delay on the side street in the 2040 timeframe.

The City of Sparks has expressed significant concerns over having Stonebrook Parkway, or other Stonebrook West roadways, connected to Pyramid Highway without a signal due to the introduction of U-turn movements and safety concerns associated with high speed conflicts.

## SIGNAL WARRANT ANALYSIS

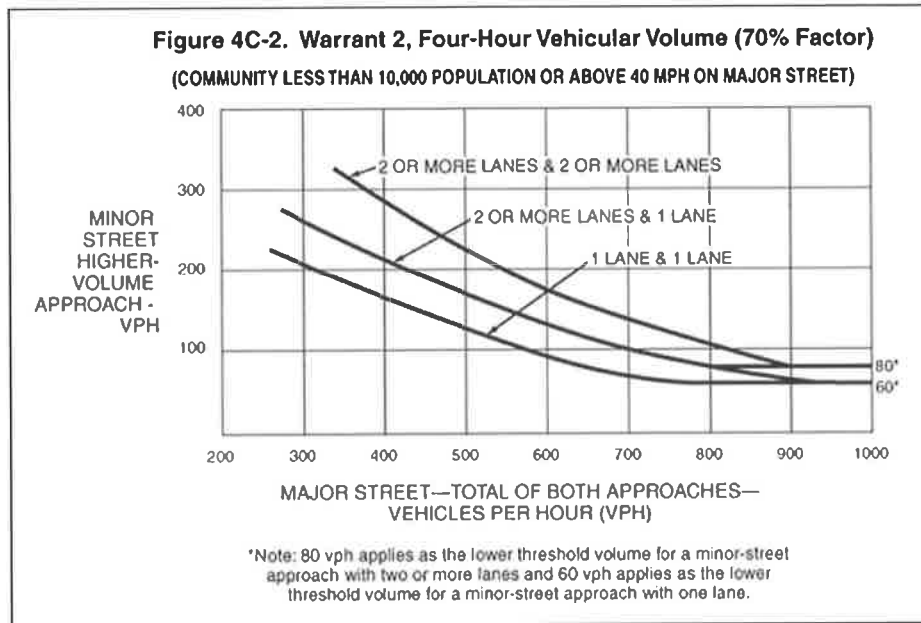
The Federal Highway Administration (FHWA) *Manual on Uniform Traffic Control Devices (MUTCD, updated 2012)* includes eight different traffic signal warrants to investigate the need for a traffic control signal. Four of the signal warrants have been analyzed. Meeting any one of the warrants can be considered adequate justification for a traffic signal installation.

### ***Warrant 2, Four-Hour Vehicular Volume***

#### Criteria

According to the MUTCD, "the need for a traffic control signal shall be considered if an engineering study finds that, for each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) all fall above the applicable curve in **Figure 4C-2** for the existing combination of approach lanes. On the minor street, the higher volume shall not be required to be on the same approach during each of these 4 hours."





Evaluation

Pyramid has a posted speed limit above 40 miles per hour (mph), therefore the 70% Factor warrant was used. Pyramid Highway currently has two lanes in each direction and is planned to be widened to three lanes in each direction. Both Stonebrook Parkway and Dolores Drive are proposed to have multi-lane approaches. Therefore, the “2 OR MORE LANES & 2 OR MORE LANES” curve was used to evaluate the Four-Hour warrant.

The Existing Plus Project AM (7:00 AM to 9:00 AM) and PM (4:00 PM to 6:00 PM) peak hour traffic volumes (which include a portion of the project – 100 percent of the residential and supermarket, 50 percent of the shopping center, and 40 percent of the office) from the *Traffic Impact Study for Stonebrook West* (Traffic Works, January 2019) were used to analyze the Four-Hour warrant. The Stonebrook West volumes for the second AM hour and the second PM hour were determined by assuming 70 percent of the peak hour volumes. **Table 1** shows the left-turn and through movement traffic volumes for the four hours of analysis.

**Table 1: Four-Hour Signal Warrant**

Hour	Major Street Combined (vph)	Highest Minor Street Approach (vph) <sup>1</sup>	Hour Warrant Met?
1 (AM Hour 1)	2,893	225	Yes
2 (AM Hour 2)	2,306	159	Yes
3 (PM Hour 1)	3,454	219	Yes
4 (PM Hour 1)	2,916	155	Yes

Notes: vph = vehicles per hour  
 1. Left-turn and through volumes reported.  
 Source: Headway Transportation, 2019



As shown in the table, all four hours easily meet the criteria for the Four-Hour signal warrant since 80 vehicles per hour on the side street are required. It should be noted the plotted points are significantly off the chart at 3,000 vehicles on the major street. The turning movement volumes for the four peak hours are shown in **Attachment A**.

Warrant Met?

Yes

**Warrant 6, Coordinated Signal System**

Criteria

According to the MUTCD, "the need for a traffic control signal shall be considered if an engineering study finds that one of the criteria is met:

- (a) On a one-way street or a street that has traffic predominantly in one direction, the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning
- (b) On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation."

Evaluation

The Pyramid Highway/Dolores Drive intersection is located between the Pyramid Highway/La Posada Drive and Pyramid Highway/Lazy 5 Parkway signalized intersections with approximately 4,700 feet between each intersection (and approximately 9,400 feet between the existing traffic signals). A signal is already planned at the Pyramid Highway/Dolores Drive intersection without the proposed project and would be coordinated with the two adjacent existing signals. The coordinated signal system on Pyramid Highway, with an intermediate signal at Dolores Drive to reduce the 9,400 feet to approximately 4,700 feet, would provide better progression for traffic on Pyramid Highway, especially as traffic volumes continue increase with future growth. Better progression is needed to create larger gaps in flows on Pyramid Highway so that other side streets can function at reasonable and safe levels.

Warrant Met?

Yes

**Warrant 7, Crash Experience**

Criteria

According to the MUTCD, "the need for a traffic control signal shall be considered if an engineering study finds that all of the following criteria are met:

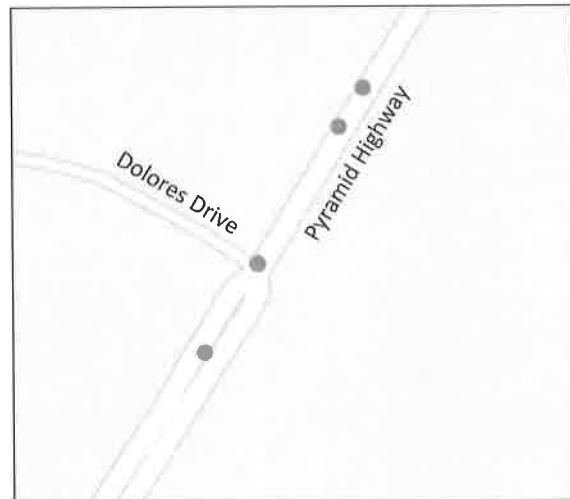




- (a) Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency; and
- (b) Five or more reported crashes, of types susceptible to correction by a traffic control signal, have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for a reportable crash; and
- (c) For each of any 8 hours of an average day, the vehicles per hour (vph) given in both of the 80 percent columns of Condition A in Table 4C-1 (see Section 4C.02), or the vph in both of the 80 percent columns of Condition B in Table 4C-1 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection, or the volume of pedestrian traffic is not less than 80 percent of the requirements specified in the Pedestrian Volume warrant. These major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours.”

#### Evaluation

The Nevada Department of Transportation (NDOT) provides an online database of Traffic Crash Data from 2015 to 2017 (the most recent three years of data available). **Exhibit 1** shows the 3-year crash history at the Pyramid Highway/Dolores Drive intersection. As shown in the exhibit, all of the crashes were “property damage only” crashes. There were no “injury” or “fatal” crashes in the recent 3-year history. There were two crashes at the Pyramid Highway/Dolores Drive intersection, and three crashes near the intersection (approximately 200 to 400 feet away from the intersection). The two crashes at the intersection occurred in May 2016 and October 2017. As the data shows, the “Crash Experience” warrant is not met as there have not been five or more crashes within a 12-month period at the Pyramid Highway/Dolores Drive intersection.



**Exhibit 1: NDOT Crash Data (2015-2017)**

#### Warrant Met?

No



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### ***Warrant 8, Roadway Network***

#### Criteria

According to the MUTCD, “the need for a traffic control signal shall be considered if an engineering study finds that the common intersection of two or more major routes meets one or both of the following criteria:

- (a) The intersection has a total existing, or immediately projected, entering volume of at least 1,000 vehicles per hour during the peak hour of a typical weekday and has 5-year projected traffic volumes, based on an engineering study, that meet one or more of Warrants 1, 2, and 3 during an average weekday; or
- (b) The intersection has a total existing or immediately projected entering volume of at least 1,000 vehicles per hour for each of any 5 hours of a non-normal business day (Saturday or Sunday).

A major route as used in this signal warrant shall have at least one of the following characteristics:

- (a) It is part of the street or highway system that serves as the principal roadway network for through traffic flow.
- (b) It includes rural or suburban highways outside, entering, or traversing a city.
- (c) It appears as a major route on an official plan, such as a major street plan in an urban area traffic and transportation study.”

#### Evaluation

The Pyramid Highway/Dolores Drive intersection has total existing AM and PM peak hour entering volumes of 2,695 and 3,194, respectively. Additionally, the Existing Plus Project volumes meet Warrants 2 (Four-Hour) and 3 (Peak Hour) during an average weekday.

Pyramid Highway is classified by NDOT as an “Other Principal Arterial” and by the Regional Transportation Commission (RTC) as a “High Access Control Arterial” and serves as the primary connection between Reno and Spanish Springs.

Stonebrook Parkway is also planned as a major route serving the entire Stonebrook master planned community and providing a regional level connection to La Posada Drive. A traffic signal has been planned at this location for over a decade and is well documented in the *Pyramid Highway/US 395 Connector Traffic Report*.

#### Warrant Met?

Yes



## ADDITIONAL CONSIDERATIONS

Safety should be considered a key factor in this case given the high speeds and high traffic volumes on Pyramid Highway. Although the "Crash Experience" warrant is not currently met, once Stonebrook Parkway is connected to Pyramid Highway a traffic signal should be installed simply to facilitate turning movements in a safe manner. Side street traffic volumes are expected to materialize very quickly after the Stonebrook projects begin construction, if not immediately, and without a traffic signal it would be very difficult to safely make left-turns onto Pyramid Highway. Note that the project conditions of approval will allow only the first phase of development prior to signal turn-on.

## CONCLUSIONS

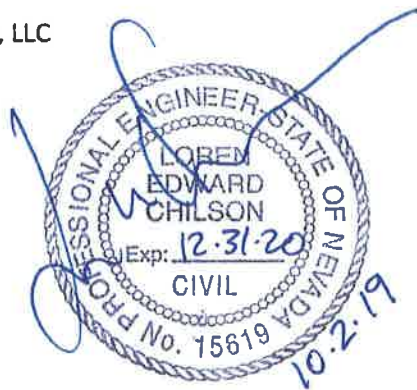
The Pyramid Highway/Dolores Drive intersection meets three of the four traffic signal warrants analyzed:

- ▶ Warrant 2, Four-Hour Vehicular Volume – Met
- ▶ Warrant 6, Coordinated Signal System – Met
- ▶ Warrant 7, Crash Experience – Not Met
- ▶ Warrant 8, Roadway Network – Met

In addition, a traffic signal has been master planned for the Pyramid Highway/Dolores Drive intersection through the Pyramid Highway/US 395 Connector project and prior studies and planning efforts. The initial Stonebrook West project phases will create volumes and demand will materialize before signal turn-on ensuring that there is volume on the side streets and justification for the signal from a driver perspective. Considering all factors, it is appropriate for a traffic signal to be installed within the early phases of the Stonebrook West project.

Please do not hesitate to contact us with questions 775-322-4300.

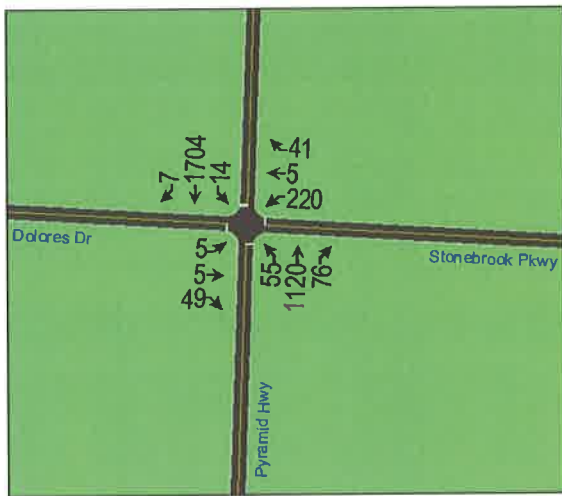
Sincerely,  
Headway Transportation, LLC



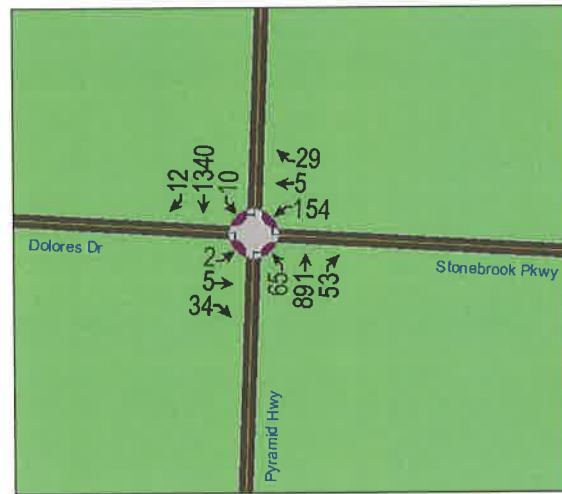
Loren E. Chilson, PE  
Principal

Attachments: A – Four-Hour Warrant Traffic Volumes

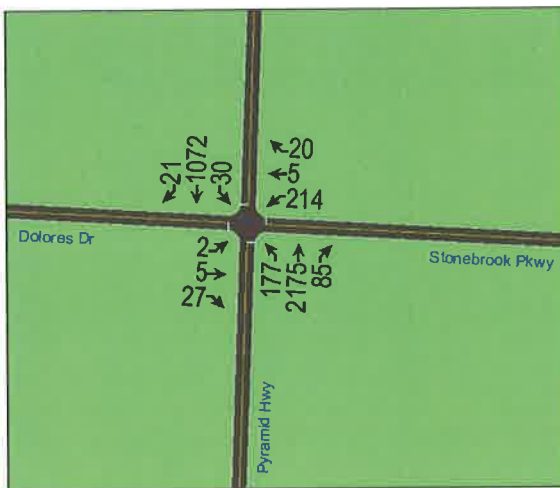




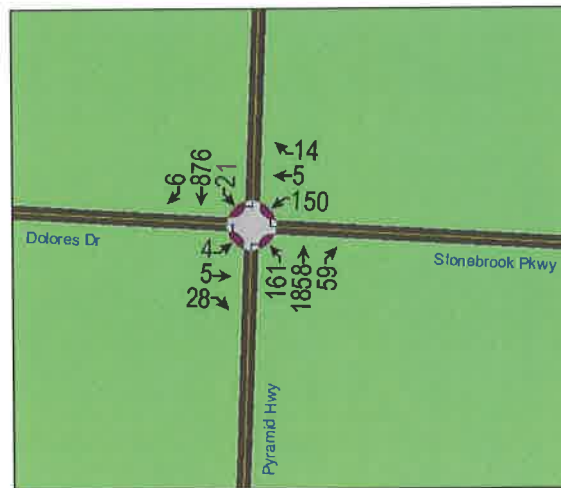
AM Peak Hour Volume - First Hour



AM Peak Hour Volume - Second Hour



PM Peak Hour Volume - First Hour



PM Peak Hour Volume - Second Hour



**Stonebrook West Tentative Map – U-turn Condition**

Discussion:

The regional traffic masterplan contemplates a connection of Stonebrook Parkway to Pyramid Highway at Delores Drive. This intersection will be signalized and provide the primary traffic ingress and egress for Stonebrook West residents. The City of Sparks has led discussions with the affected property owners, NDOT, and Washoe County to facilitate installation of the signal. Those discussions are ongoing.

Prior to installation of the signal there will be three intersection connections made to Pyramid Highway with the Stonebrook West Phase I Backbone improvements along the frontage of the Stonebrook PUD. These improvements will include access control modifications as required by NDOT consisting of a raised median and turn pockets. The controlling traffic movement is southbound traffic from the project which peak in the AM. Left turns from Stonebrook West to southbound Pyramid Highway will not be allowed. Ultimately, this movement will be primarily made at the future signal at Delores Drive. The movement will be made with U-turns made at the new turn pockets prior to completion of the traffic signal. To determine the acceptable number of u-turns that can made during peak AM hours, a gap analysis was prepared. The gap study measured the available time between cars heading south on Pyramid Highway to estimate how many U-turns can be made during the peak AM hour. The results indicated that 76 u-turns can be made at the Robert Banks/Pyramid Highway intersection during the peak AM driving time. Additional U-turns from the project’s development areas located north of Robert Banks could be made at other intersections further north on Pyramid Highway.

The number of estimated u-turns at Robert Banks from Stonebrook West will be determined with each final map and building permit submittal. The City shall keep a running tally to ensure the number does not exceed 76 prior to signal construction. Final maps may record and building permits may be issued until the resulting u-turn estimated from proposed development reaches 76 at Robert Banks. Once the estimated number of u-turns reaches 76, signal construction must commence before subsequent final maps can record or building permits for multi-family and commercial projects can be issued.

U-turns at Robert Banks shall be estimated as follows:

**AM PEAK U-TURNS GENERATED FROM STONEBROOK WEST**

LAND USE	U-TURNS	LAND USE	U-TURNS
Single Family Residential	0.22 u-turns/unit	Medical/Dental Office	0.24 u-turns/1000sf
Mutlifamily	0.14 u-turns/unit	General Office	0.065 u-turns/1000sf
		Retail	0.14 u-turns/1000sf

Proposed Condition:

Prior to recording a final map, applicant shall demonstrate that the number of u-turns at Robert Banks Drive from existing residential, multifamily and commercial projects, and the additional u-turns from the proposed final map does not exceed 76. Prior to recording a final map that results in the 77<sup>th</sup> u-turn at Robert Banks Drive, construction of the signal at Delores Drive shall begin, and the developer agrees that certificates of occupancy shall not be issued until the signal is operational.

The applicant may enter into an offset agreement with RTC for signal and intersection improvements eligible for Regional Road Impact Fee (RRIF) waivers.



**Washoe County School District**

Every Child, By Name And Face, To Graduation

425 East Ninth Street \* P.O. Box 30425 \* Reno, NV 89520-3425  
Phone (775) 348-0200 \* (775) 348-0304 \* www.washoeschools.net

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06-May-19

Ian Crittenden  
City of Sparks, Planning & Community Services  
431 Prater Way  
Sparks, NV 89431

RE: **PCN19-0019/STM19-0003 (Stonebrook Villages West 1& 2)**

Dear Mr. Crittenden,

**Stonebrook Villages West 1 & 2**, which proposes **178** new single-family residential units, will impact Washoe County School District facilities. This project is currently zoned for the following schools:

**Hall Elementary School**

**Hall ES** has **1** portable building (**2** classrooms) in use that provide temporary space for an additional **50** students.

- **Estimated Stonebrook Villages West 1 & 2 impact = 37** new ES students (178 single-family units x **0.206** ES students per unit)
- **Base Capacity = 701**
- **2018-2019 Enrollment = 620**
- **% of Base Capacity = 88%**
  
- **2018-2019 Enrollment including Stonebrook Villages West 1 & 2 = 657**
- **% of Base Capacity including Stonebrook Villages West 1 & 2 = 94%**
  
- The Washoe County School District will be opening John Bohach Elementary School in the Fall of 2020. Bohach Elementary is immediately adjacent to Sky Ranch Middle School and encompasses this development with its enrollment boundary. Students generated by this development will be zoned to attend Bohach Elementary School and Sky Ranch Middle.

### Shaw Middle School

**Shaw MS** has **2** portable buildings (**4** classrooms) in use that provide temporary space for an additional **100** students.

- **Estimated Stonebrook Villages West 1 & 2 impact = 16** new MS students (178 single-family units x **0.088** MS students per unit)
- **Base Capacity = 1,072**
- **2018-2019 Enrollment = 1,017**
- **% of Base Capacity = 95%**
  
- **2018-2019 Enrollment including Stonebrook Villages West 1 & 2 = 1,033**
- **% of Base Capacity including Stonebrook Villages West 1 & 2 = 96%**
  
- The Washoe County School District will be opening Sky Ranch Middle School in the Fall of 2019 and will replace Shaw Middle School as this development's zoned middle school. Shaw and Mendive Middle Schools will receive enrollment relief with the opening of Sky Ranch Middle.

### Spanish Springs High School

**Spanish Springs HS** has **5** portable buildings (**10** classrooms) in use that provide temporary space for an additional **250** students.

- **Estimated Stonebrook Villages West 1 & 2 impact = 17** new HS students (178 single-family units x **0.094** HS students per unit)
- **Base Capacity = 2,160**
- **2018-2019 Enrollment = 2,413**
- **% of Base Capacity = 112%**
  
- **2018-2019 Enrollment including Stonebrook Villages West 1 & 2 = 2,430**
- **% of Base Capacity including Stonebrook Villages West 1 & 2 = 113%**
  
- The Washoe County School District is currently undergoing processes to fully acquire acreage on the Northern portion of the Wildcreek Golf Course for the purposes of building a new high school to provide enrollment relief to Spanish



Springs High School and replace Hug High School's current enrollment boundary. This new high school is anticipated to open Fall of 2022.

Thank you for the opportunity to comment. Please inform of any further questions and/or comments.

***Brett A. Rodela***

Brett A. Rodela, GIS Analyst

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