



TRAFFIC IMPACT ANALYSIS

BLACKHAWK

WILMOT ROAD/INTERSTATE 10

29 FEBRUARY 2020



PREPARED FOR
LEGACY COLLATERAL HOLDINGS, LLC
865 SOUTH FRANKWOOD AVENUE
REEDLEY, CALIFORNIA 93654

SOUTHWEST TRAFFIC ENGINEERING, LLC
3838 NORTH CENTRAL AVENUE, SUITE 1810
PHOENIX, AZ 85012
T 602.266.SWTE (7983) F 602.266.1115



Table of Contents

Executive Summary	3
Project Description	6
Study Methodology	6
Existing Conditions	9
Existing Traffic Data	10
Access	13
Trip Generation	15
Trip Distribution & Assignment	15
Existing Traffic Operations	15
Future Roadway Network	20
Future Traffic Operations Without Project	20
Future Traffic Operations With Project	23
Turn Lane Analysis	26
Traffic Signal Warrant Analysis	27
Mitigation	29
Conclusion	31

Table of Figures

Figure 1 – Vicinity Map	7
Figure 2 – Site Plan	8
Figure 3 – Existing Lane Configurations and Traffic Control	11
Figure 4 – Existing Weekday Peak Hour Traffic Volumes	12
Figure 5 – Baseline Access Point and Intersection Configuration Assumptions	14
Figure 6 – Weekday Peak Hour Trip Distribution	16
Figure 7 – Weekday Peak Hour Trip Assignment	17
Figure 8 – 2021 Weekday Peak Hour Traffic Volumes Without Project	21
Figure 9 – 2021 Weekday Peak Hour Traffic Volumes With Project	24
Figure 10 – Proposed Lane Configurations and Traffic Control	34



List of Tables

Table 1 – Project Site Generated Trips	15
Table 2 – Level of Service Criteria – Signalized Intersections	18
Table 3 – Level of Service Criteria – Un-signalized Intersections	18
Table 4 – Existing Weekday Peak Hour Levels of Service	19
Table 5 – 2021 Weekday Peak Hour Levels of Service Without Project	22
Table 6 – 2021 Weekday Peak Hour Levels of Service With Project	25
Table 7 – Turn Lane Warrants	26
Table 8 – Calculated Queue Lengths	27
Table 9 – Traffic Signal Warrant Analysis (Garden Stone Drive/Wilmot Road)	28
Table 10 – Traffic Signal Warrant Analysis (COT Standards)	29
Table 11 – Mitigation Measures	30

Appendix

Traffic Counts

Trip Generation Calculations

Capacity Calculations

Turn Lane Calculations

Traffic Signal Warrant Analysis

ADOT Design Concept Report Wilmot Road/I-10 Interchange Improvements

Prepared By:

Andrew Smigielski, PE, PTOE, PTP

Matthew Reeg, PE, PTOE

Amy Forsythe, EIT



BLACKHAWK WILMOT ROAD/INTERSTATE 10 TRAFFIC IMPACT ANALYSIS

Executive Summary

The purpose of this traffic study is to evaluate the current and future transportation system within the project study area surrounding the site without and with the proposed Blackhawk project.

Existing Traffic Data

The eastbound left/through/right turn lane and westbound left turn lane at the intersection of Diablo Sunrise Road/Wilmot Road currently operate at an inadequate LOS during the weekday AM and/or PM peak hours. These delays are caused by a lack of capacity on Wilmot Road as this roadway only offers one through lane in each direction adjacent to the project site. There are a limited number of acceptable gaps in traffic along Wilmot Road to execute an eastbound/westbound left or right turn maneuver from Diablo Sunrise Road.

All of the remaining study intersections currently operate at an adequate LOS during the weekday peak hours.

Future Traffic Data Without Project

The eastbound and westbound approaches to the intersection of Diablo Sunrise Road/Wilmot Road are expected to continue to operate at an inadequate LOS during the weekday AM and PM peak hours in 2021 without the project.

The remaining study intersections are anticipated to continue to operate at an adequate LOS during the weekday AM and PM peak hours in 2021 without the project.

Future Traffic Data With Project

Eastbound and westbound traffic at the intersection of Diablo Sunrise Road/Wilmot Road are expected to continue to operate at an inadequate LOS during the weekday AM and PM peak hours in 2021 without and with the project.

The eastbound and westbound left turn lanes at the intersection of Garden Stone Drive/Wilmot Road are anticipated to operate at an inadequate LOS during the weekday AM and/or PM peak hours in 2021 with the project.

At the intersection of Shell Driveway/Wilmot Road, the eastbound left/right turn lane experiences delays during the weekday PM peak hour in 2021 with the project.

These delays are a result of the limited capacity on Wilmot Road, which reduces the number of acceptable gaps in traffic to execute turning maneuvers from Diablo Sunrise Road, Garden Stone Drive and Shell Driveway.

The remaining study intersections are anticipated to operate at an adequate LOS during the weekday AM and PM peak hour in 2021 without and with the project.



Turn Lane Analysis

An exclusive southbound right turn lane is warranted at the intersection of Garden Stone Drive/Wilmot Road and should provide a minimum 125 feet of storage. This turn lane would extend beyond the intersection of Shell Driveway/Wilmot Road.

The northbound right turn lane at the intersection of Pistol Ridge Road/Eastbound I-10 Frontage Road will need 75 feet of storage while the southbound approach to the intersection of Pistol Ridge Road/Garden Stone Drive requires 50 feet of queue length to accommodate the anticipated traffic volumes in 2021 with the project.

Traffic Signal Warrant Analysis

The intersection of Garden Stone Drive/Wilmot Road is not anticipated to meet traffic signal warrant #1 or #2 in 2021 with the project using the Manual on Uniform Traffic Control Devices (MUTCD), or City of Tucson (COT), traffic signal warrants.

Mitigation

Eastbound and westbound traffic approaching the intersection of Diablo Sunrise Road/Wilmot Road currently operates at an inadequate LOS during the weekday AM and/or PM peak hour and are anticipated to continue to operate at an inadequate LOS in 2021 without and with the project.

The eastbound and westbound left turn lanes at the intersection of Garden Stone Drive/Wilmot Road and the eastbound left/right turn lane at the Shell Driveway/Wilmot Road are anticipated to operate at an inadequate LOS during the weekday AM and/or PM peak hours in 2021 with the project.

Un-signalized intersections along major streets such as Wilmot Road tend to have their turn movements from intersecting roadway/driveways operate at LOS E or F during the weekday peak hours. Wilmot Road is a key corridor that provides north-south access to Interstate 10 (I-10). As development occurs in the area and traffic volumes grow, Wilmot Road is anticipated to be widened to offer two lanes in each direction separated by a two-way, center left turn lane. The future widening of Wilmot Road to a five-lane cross section is expected to reduce delays at the study intersections; however, it is not expected to mitigate all of the delays at the intersection of Garden Stone Drive/Wilmot Road to acceptable levels. The intersections of Shell Driveway/Wilmot Road and Diablo Sunrise Road/Wilmot Road would be anticipated to operate at an adequate LOS when Wilmot Road offers a five-lane cross section.

Further mitigation measures at the intersection of Garden Stone Drive/Wilmot Road are limited. While the installation of a traffic signal would mitigate the delays, the intersection of Garden Stone Drive/Wilmot Road does not meet typical traffic signal spacing requirements and does not meet traffic signal warrants #1 or #2 based on the MUTCD or COT Access Management Guidelines. In addition, the installation of a traffic signal could negatively impact progression along the major roadway (Wilmot Road).



The warranted southbound right turn lane at the intersection of Garden Stone Drive/Wilmot Road has a calculated storage requirement of 125 feet. This would extend beyond the intersection of Shell Driveway/Wilmot Road, which currently exists 40 feet north of the Garden Stone Drive/Wilmot Road alignment. Consideration should be given to removing the existing south Shell Driveway and constructing a new driveway on the north side of Garden Stone Drive on the west side of the existing gas station site.

Recommendations

It is recommended that the intersection of Garden Stone Drive/Wilmot Road be monitored as development in the area occurs and a traffic signal should only be installed if it meets traffic signal warrants. A southbound right turn lane with a minimum of 125 feet of storage should be constructed at the intersection of Garden Stone Drive/Wilmot Road.

The existing Shell Driveway should be removed and relocated to the north side of Garden Stone Drive, on the west side of the existing gas station site.

A minimum of 100 feet should be provided between Garden Stone Drive and the Eastbound I-10 Frontage Road (curb line to curb line) along Pistol Ridge Road to accommodate the anticipated queue storage lengths between these two intersections. This spacing should be maximized, ideally 660 feet, to provide ample opportunity for drivers to react to one intersection at a time and reduce the potential conflict area between two intersections.

The City of Tucson Major Streets and Routes plan shows Los Reales Road being constructed between Craycroft Road and Wilmot Road. Garden Stone Drive will be constructed along the Los Reales Road alignment. It is recommended that the interim Garden Stone Drive be constructed to provide a three-lane roadway cross section (one lane in each direction and a two-way, center left turn lane) to provide separated eastbound and westbound left turn access to developments along its alignment.



BLACKHAWK WILMOT ROAD/INTERSTATE 10 TRAFFIC IMPACT ANALYSIS

Project Description

Legacy Collateral Holdings, LLC is proposing a new 313 single-family home development on the southwest corner of Wilmot Road/I-10 in Tucson, Arizona. The vicinity of the project is shown in **Figure 1**. The site will be located as shown in **Figure 2**. The project will be served by five proposed access points.

The purpose of this traffic impact analysis is to:

- Evaluate the current and future operational characteristics of the adjacent roadway network surrounding the project site.
- Estimate the traffic generation associated with the project and assign that traffic to the existing roadway system.
- Analyze future traffic operations at four existing intersections and five proposed access points serving the project area.
- Determine the need for auxiliary (left and right turn) lanes at the driveways that will serve the project site.
- Conduct a traffic signal warrant analysis at the intersection of Garden Stone Drive/Wilmot Road.

The author of this report is a registered professional engineer (civil) in the State of Arizona having specific expertise and experience in the preparation of traffic impact analyses.

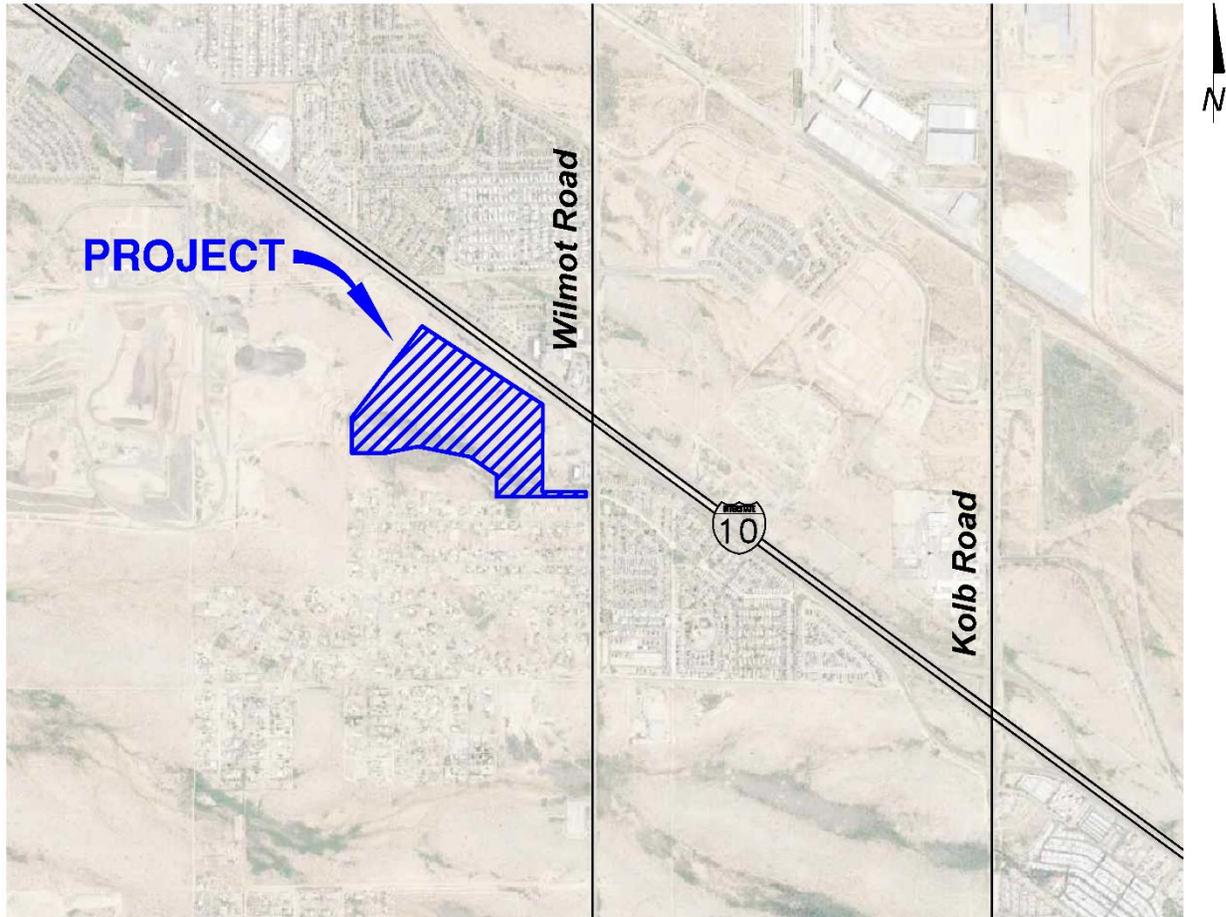
Study Methodology

In order to analyze and evaluate the potential traffic impacts of the proposed development, the following tasks were undertaken:

- Field observation of the proposed site and surrounding area was conducted to evaluate the existing physical and operational characteristics of the adjacent roadway network.
- Site traffic volumes generated by the proposed site were calculated using the *Institute of Transportation Engineers (ITE) Trip Generation Manual, 10th Edition, 2017*.
- Calculated site traffic was distributed based on existing traffic patterns and assigned to the primary roadways within the project study limits.
- Capacity analyses were performed for the existing conditions and opening year (2021) of the project using methodology presented in the *2000 and 2016 Highway Capacity Manual (HCM 2000 and HCM 6)*.
- The need for auxiliary turn lanes at the study driveways was evaluated based on City of Tucson (COT) and ADOT guidelines.
- Traffic signal warrant analyses were completed at the intersection of Garden Stone Drive/Wilmot Road.



Figure 1 – Vicinity Map



LEGEND:

— = Existing Road

 = Project Site



Existing Conditions

The proposed Blackhawk project will be located on undeveloped land on the southwest corner of Wilmot Road/Interstate 10 (I-10) in Tucson, Arizona.

I-10 is an east/west aligned four-lane freeway between Santa Monica, California and Jacksonville, Florida. Throughout central and southern Arizona, I-10 serves as a significant route between Phoenix and Tucson. Eastbound and Westbound I-10 Ramps allow traffic to enter/exit I-10 at Wilmot Road. Eastbound and westbound frontage roads are also provided along I-10 between Wilmot Road and Craycroft Road.

Wilmot Road is a north/south aligned roadway that provides one through lane in each direction separated by a two-way center left turn lane. The posted speed limit on Wilmot Road is 45 miles per hour (mph).

Garden Stone Drive is a two lane local street that serves a residential neighborhood. The roadway does not provide an outlet for through traffic. The posted speed limit on Garden Stone Drive is 25 mph.

Diablo Sunrise Road is a two-lane residential roadway that extends west from Wilmot Road and 'dead ends' after approximately 3,000 feet. The roadway aligns with Sentinal Stone Drive, which extends east from Wilmot Road and serves residential homes. The posted speed limit on these roads is 25 mph.

The intersection of Wilmot Road/I-10 Westbound Ramps forms a four-leg signalized intersection that provides one-way (westbound) access to the I-10 Westbound Frontage Road west of Wilmot Road. The west leg of the intersection extends as the I-10 Frontage Road before an on-ramp to I-10 is provided 1,500 feet west of Wilmot Road. The westbound approach to the intersection makes use of a shared left turn/through lane and an exclusive right turn lane. Northbound traffic at the intersection utilizes an exclusive left turn lane and one through lane. The southbound approach to the intersection is provided with one through lane and an exclusive right turn lane.

Wilmot Road/I-10 Eastbound Ramps form a four-leg signalized intersection that provides access to eastbound I-10 and the I-10 Eastbound Frontage Road. The eastbound approach to the intersection is provided with a shared left turn/through lane and an exclusive right turn lane. Northbound traffic at the intersection makes use of a through lane and a shared through/right turn lane. The southbound approach to the intersection utilizes an exclusive left turn lane and one through lanes.

Shell Driveway is located on the west side of Wilmot Road approximately 40 feet north of Garden Stone Drive. This driveway offers full access to the existing gas station from Wilmot Road. Eastbound vehicles at the intersection of Shell Driveway/Wilmot Road are STOP controlled while northbound and southbound vehicles on Wilmot Road operate under free flow conditions.



The intersection of Garden Stone Drive/Wilmot Road forms a three-leg, un-signalized intersection. The eastbound approach to the intersection is STOP controlled and offers an exclusive left turn lane and right turn lane. Northbound traffic is offered one through lane and an exclusive right turn lane. Southbound vehicles are provided with an exclusive left turn lane and a through lane.

The intersection of Diablo Sunrise Road/Wilmot Road forms a four-leg un-signalized intersection. The eastbound approach to the intersection offers a shared left/through/right turn lane while westbound vehicles are provided with an exclusive left turn and shared through/right turn lane. Northbound vehicles are provided with an exclusive left turn lane, one through lane, and an exclusive right turn lane. Southbound traffic makes use of an exclusive left turn lane and a shared through/right turn lane. Eastbound and westbound vehicles at the intersection are STOP controlled and traffic on Wilmot Road is free flow.

The study intersection locations, lane configurations, and intersection control are shown in **Figure 3**.

Existing Traffic Data

In order to form a basis for analysis of the project impacts, weekday AM and PM peak hour turning movement counts were conducted at the following intersections:

- I-10 Westbound Ramps/Wilmot Road
- I-10 Eastbound Ramps/Wilmot Road
- Garden Stone Drive/ Wilmot Road
- Diablo Sunrise Road/Wilmot Road
- Shell Driveway/Wilmot Road

The weekday turning movement counts were conducted from 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM. All traffic data was collected in December 2019 while school was in session.

Weekday 24-hour intersection approach counts were also conducted at the intersection of Garden Stone Drive/Wilmot Road.

The ADOT Transportation Data Management System (TDMS) was utilized to obtain traffic volume data on the Eastbound I-10 Frontage Road, near the project site. The most recent traffic count data from the ADOT TDMS on the Eastbound I-10 Frontage Road is from June 2017. Due to this, a 2% annual growth rate was applied to these traffic volume counts in an effort to project the 2017 traffic volume data to existing (2020) conditions.

The existing weekday traffic volumes, including the traffic volumes on the Eastbound I-10 Frontage Road from the ADOT TDMS, are shown in **Figure 4**. Complete traffic count data can be found in the Appendix.

Figure 3 – Existing Lane Configurations and Traffic Control

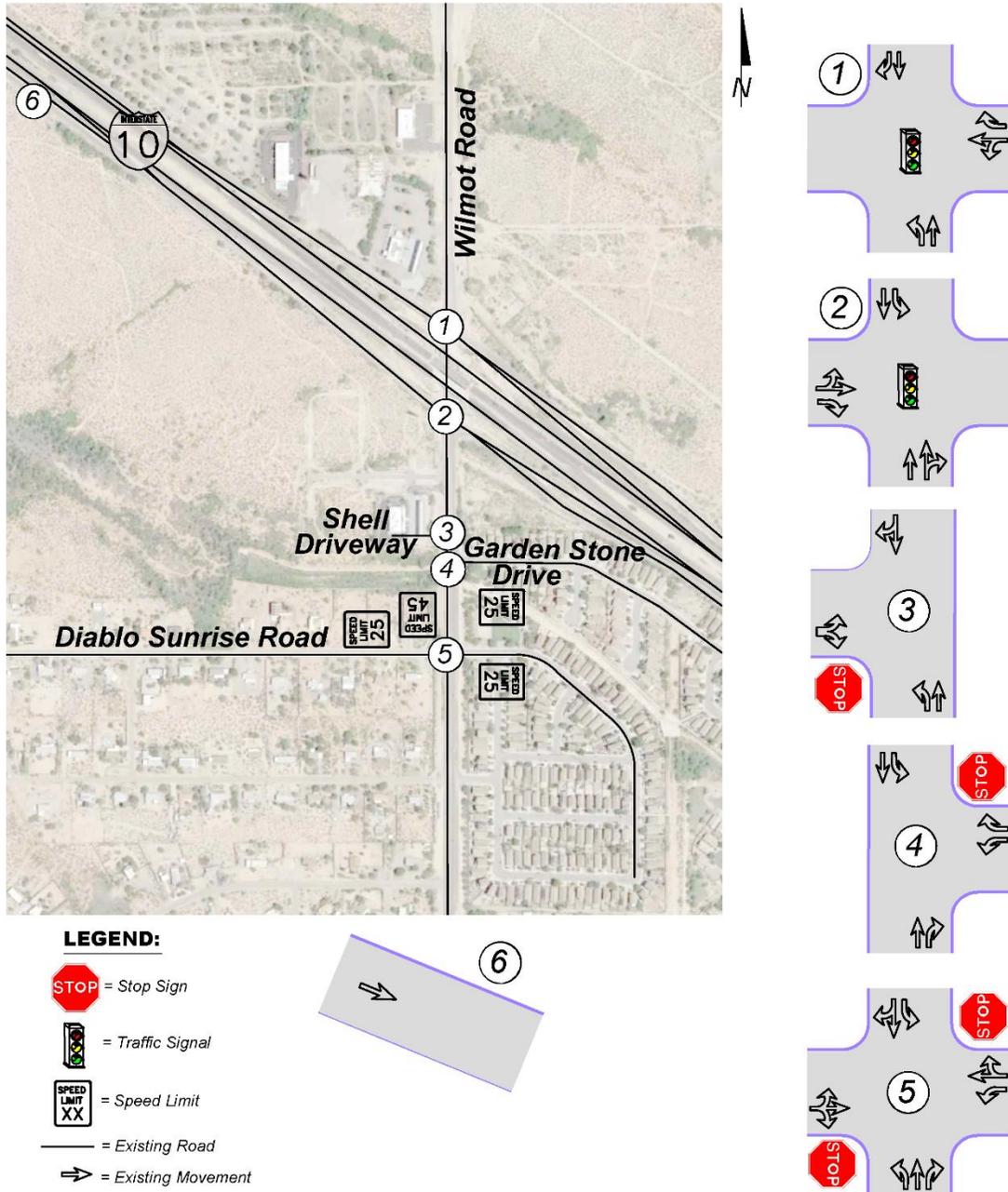
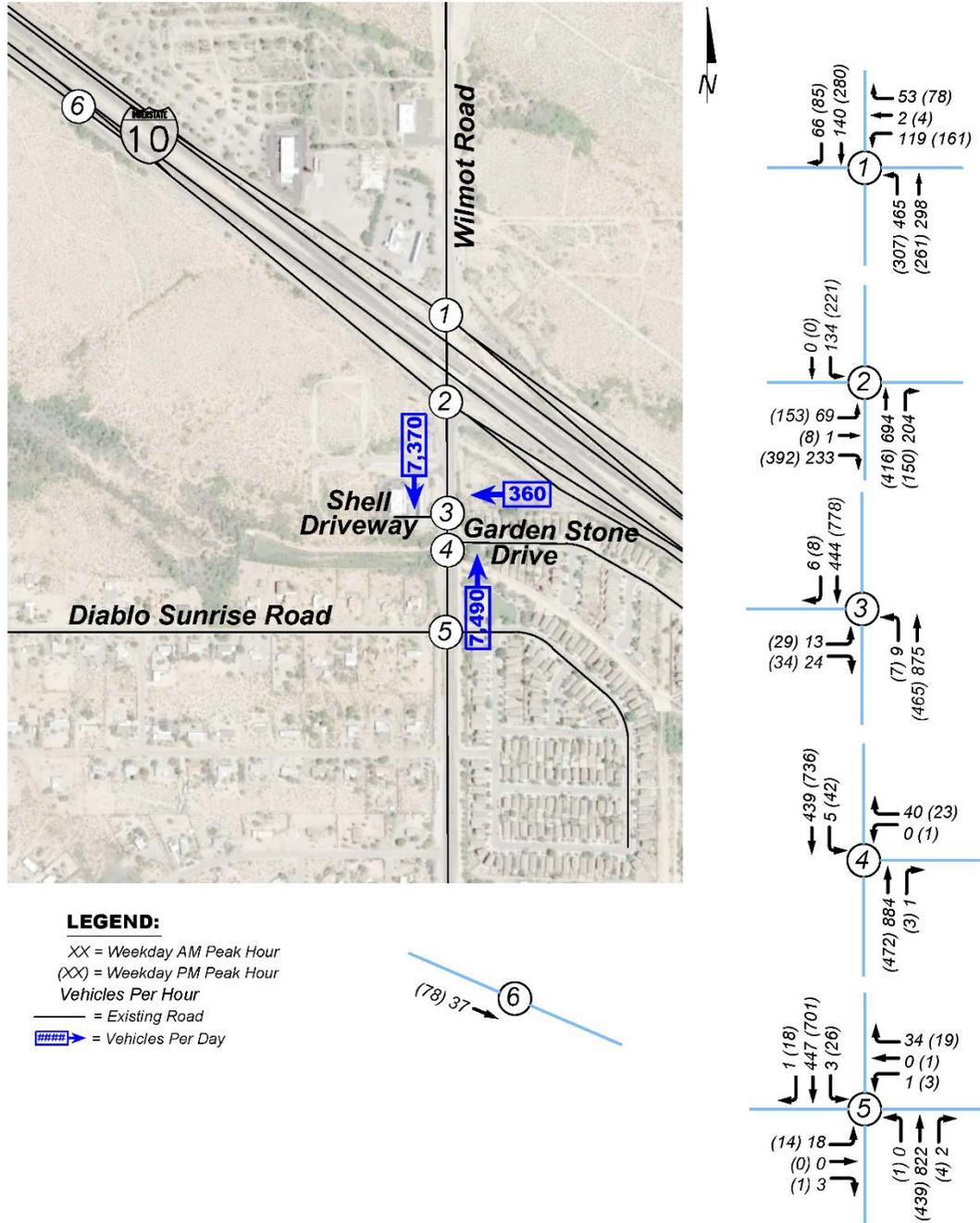




Figure 4 – Existing Weekday Peak Hour Traffic Volumes





Access

Five access points will be constructed along the extension of Garden Stone Drive to serve the project site.

Garden Stone Drive will be constructed as a two-lane roadway that will extend west from Wilmot Road along the existing alignment of Garden Stone Drive. Approximately 600 feet west of Wilmot Road, the Garden Stone Drive extension will curve to the north toward I-10. Prior to reaching I-10, Garden Stone Drive will turn to the northwest and parallel the existing I-10 Eastbound off-ramp at Wilmot Road. The City of Tucson Major Streets and Routes plan shows Los Reales Road being constructed between Craycroft Road and Wilmot Road. It is expected that the Garden Stone Drive extension will be constructed along the Los Reales Road alignment and Los Reales Road will be constructed between the proposed extension of Garden Stone Drive and Craycroft Road. The timing of this connection is not known at this time. This roadway connection to Craycroft Road was not considered in the analysis provided in this report.

The first access point serving the proposed site along Garden Stone Drive will be the intersection of Calle Torim/Garden Stone Drive. This will be a four-leg, un-signalized intersection. All approaches to the intersection will be provided with a shared left turn/through/right turn lane. Eastbound and westbound vehicles approaching the intersection will be STOP controlled while traffic on Garden Stone Drive will be free flow.

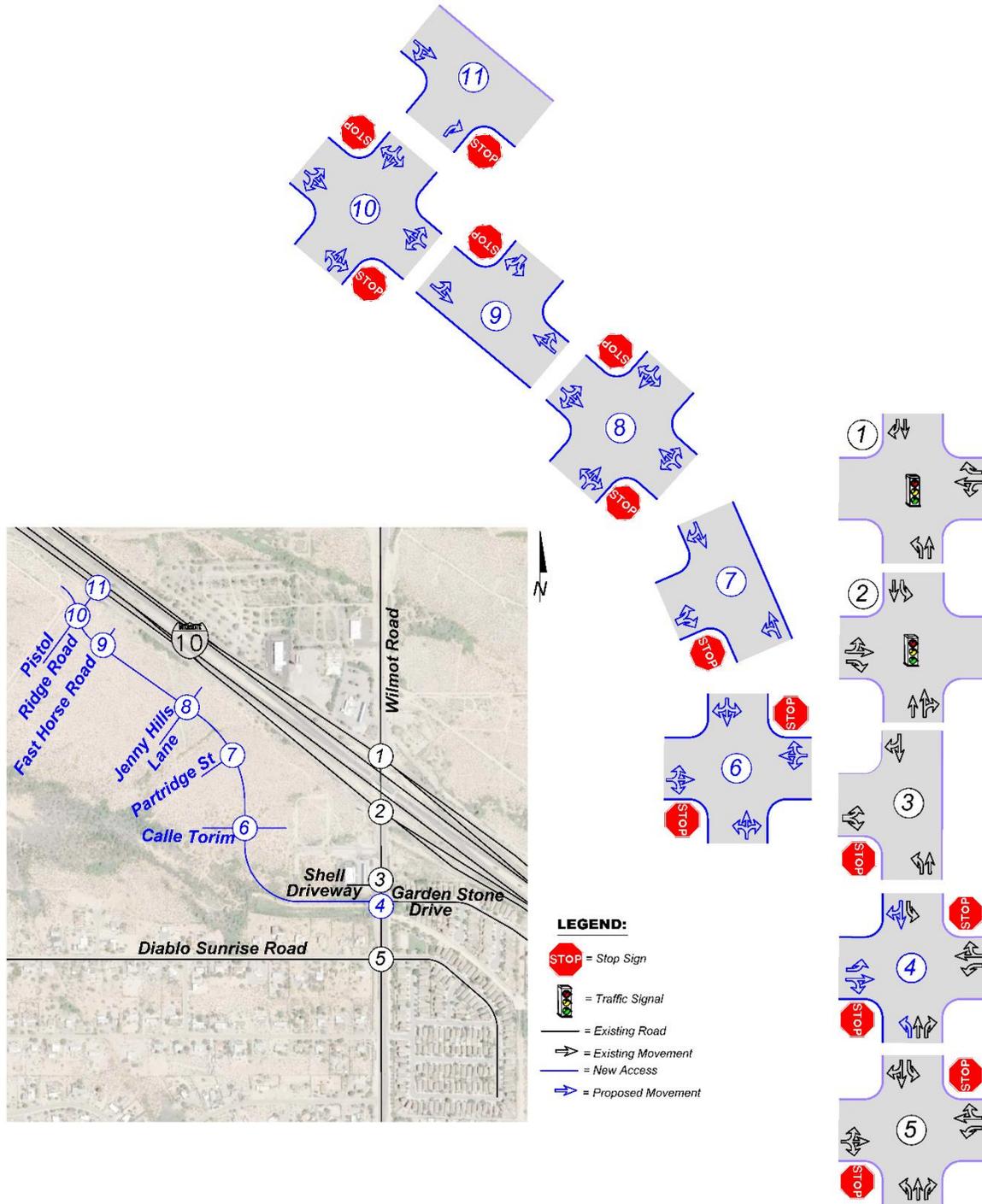
Four additional access points will be constructed along Garden Stone Drive to serve the proposed site. Partridge Street, Jenny Hills Lane, Fast Horse Road, and Pistol Ridge Road will form un-signalized intersections with Garden Stone Drive to provide full access to the Blackhawk development. Partridge Street and Fast Horse Road will form three-leg intersections with Garden Stone Drive; Jenny Hills Lane and Pistol Ridge Road will form four-leg intersections with Garden Stone Drive. Vehicles on Garden Stone Drive will operate under free flow conditions while vehicles approaching this roadway from Partridge Street, Jenny Hills Lane, Fast Horse Road, and Pistol Ridge Road will be STOP controlled.

Pistol Ridge Road will extend north from Garden Stone Drive to form a three-leg, un-signalized intersection with the Eastbound I-10 Frontage Road. Eastbound vehicles travelling along the frontage road will be provided with a shared through/right turn lane. Northbound traffic exiting the site will be offered an exclusive right turn lane.

Figure 5 shows the locations, geometry and spacing for the proposed driveways serving the project site that will serve as a baseline of analysis in the report.



Figure 5 – Baseline Access Point and Intersection Configuration Assumptions





Trip Generation

Trip generation was developed utilizing nationally agreed upon data contained in the Institute of Transportation Engineers (ITE) publication *Trip Generation, 10th Edition*, 2017. The Blackhawk project trip generation was estimated for the construction of a 313-unit single-family housing development based on ITE Land Use Code 210, Single Family Detached Housing (LUC 210). The result is the expected weekday trip generation for the project as shown in **Table 1**. The complete trip generation calculations can be found in the Appendix.

Table 1 – Project Site Generated Trips

Time Period	313 Units Single-Family Housing (LUC 210)
Average Daily, Inbound (vtpd)	1,486
Average Daily, Outbound (vtpd)	1,486
Total Daily	2,972
AM Peak Hour, Inbound (vtph)	57
AM Peak Hour, Outbound (vtph)	171
Total AM Peak	228
PM Peak Hour, Inbound (vtph)	192
PM Peak Hour, Outbound (vtph)	112
Total PM Peak	304

vtpd - vehicle trips per day, vtph - vehicle trips per hour

Trip Distribution & Assignment

Trip distribution for the project was based on existing traffic volume patterns near the proposed site. **Figure 6** shows the weekday trip distribution for the project as a percentage of net new primary trips. **Figure 7** shows the assignment of the new site generated trips to the project intersections within the study area.

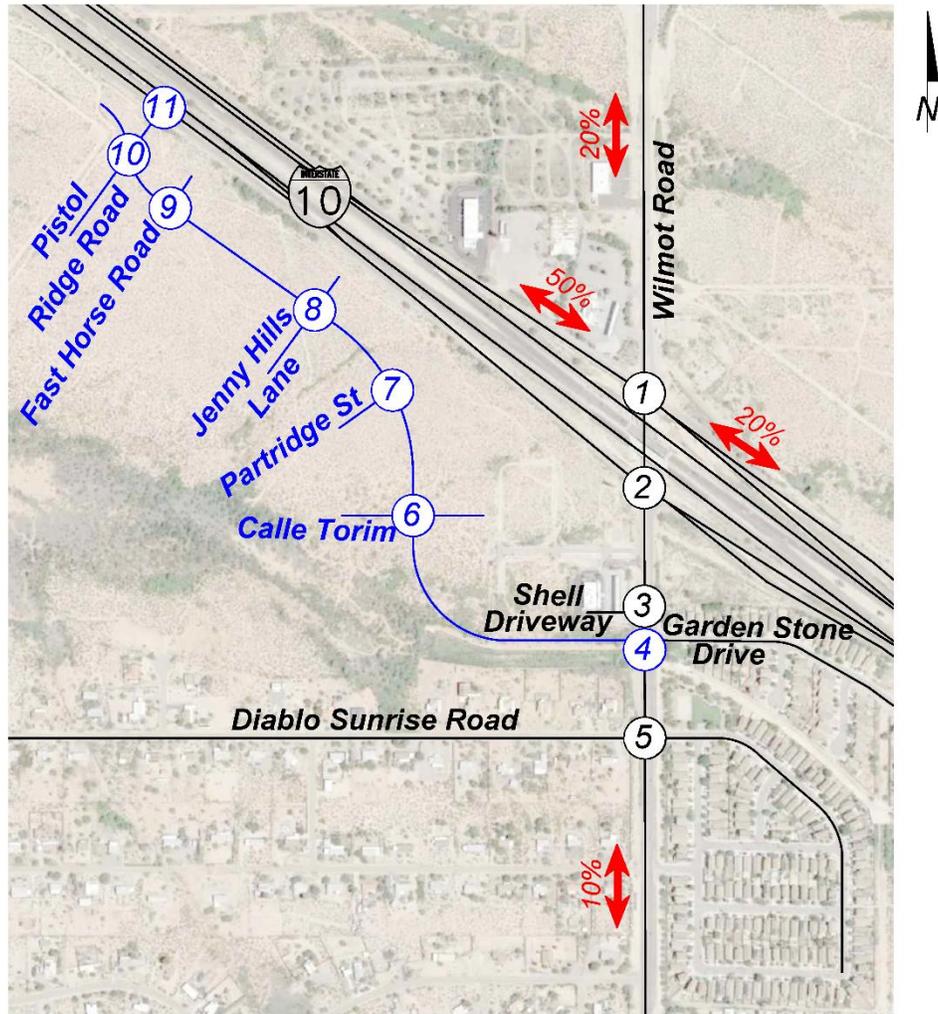
Existing Traffic Operations

Analysis of current intersection operations was conducted for the weekday AM and PM peak hours using the nationally accepted methodology set forth in the *Highway Capacity Manual*, Transportation Research Board, 2000 and 2016 (HCM 2000 and HCM 6). HCM 2000 must be used for ‘clustered’ signalized intersections. The computer software Synchro 10 was utilized to calculate the levels of service for individual movements and approaches.

LOS is a qualitative measure of the traffic operations at an intersection or on a roadway segment. Level of service is ranked from LOS A, which signifies little or no congestion and is the highest rank, to LOS F, which signifies congestion and jam conditions. LOS D is typically considered adequate operation at signalized and un-signalized intersections in developed areas.



Figure 6 – Weekday Peak Hour Trip Distribution

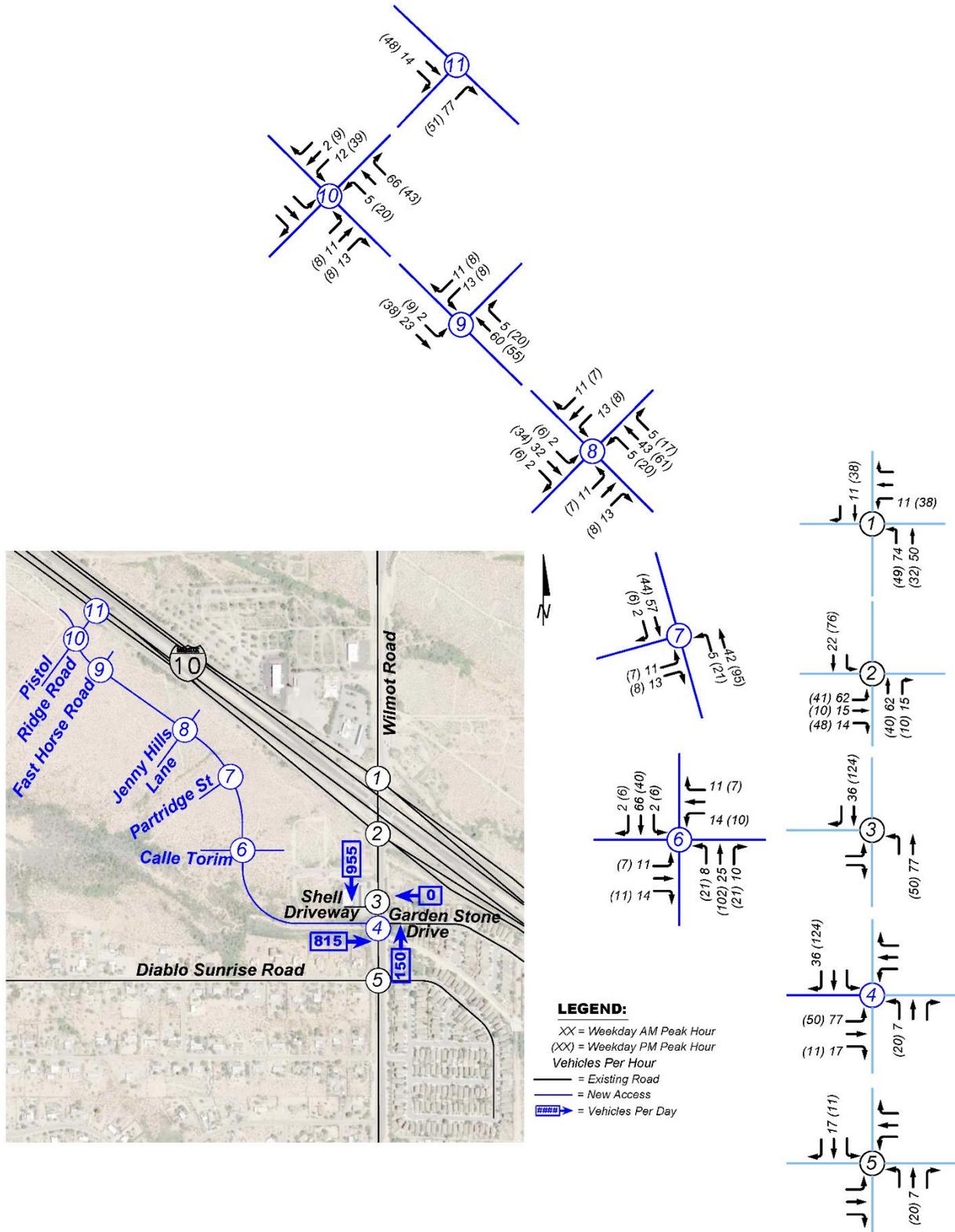


LEGEND:

- = Existing Road
- = New Access
- ↔ XX% = Distribution of Vehicle Trips



Figure 7 – Weekday Peak Hour Trip Assignment





At signalized intersections, level of service is calculated for each movement and then summed in a weighted fashion to yield the LOS for the approach and for the intersections as a whole. Criteria for level of service at signalized intersections are shown in **Table 2**.

Table 2 – Level of Service Criteria – Signalized Intersections

Level-of-Service	Average Total Delay
A	≤ 10.0 seconds/vehicle
B	> 10.0 and ≤ 20.0 seconds/vehicle
C	> 20.0 and ≤ 35.0 seconds/vehicle
D	> 35.0 and ≤ 55.0 seconds/vehicle
E	> 55.0 and ≤ 80.0 seconds/vehicle
F	> 80.0 seconds/vehicle

In calculating the levels of service, assumed signal phasing and timing data was used. Other assumptions included:

- Cycle length – 90 seconds
- Lane widths – 12 feet
- Approach grade – 0%
- Right turn on red allowed

At un-signalized intersections, level of service is predicted/calculated for those movements, which must either stop for or yield to oncoming traffic and is based on average control delay for the particular movement. Control delay is the portion of total delay attributed to traffic control measures such as stop signs and traffic signals. The criteria for level of service at un-signalized intersections are shown in **Table 3**.

Table 3 – Level of Service Criteria – Un-signalized Intersections

Level-of-Service	Delay
A	< 10 seconds/vehicle
B	> 10 and < 15 seconds/vehicle
C	> 15 and < 25 seconds/vehicle
D	> 25 and < 35 seconds/vehicle
E	> 35 and < 50 seconds/vehicle
F	> 50 seconds/vehicle

Table 4 shows the existing levels of service that were calculated for the study intersections. Complete capacity calculations are included in the Appendix.



Table 4 – Existing Weekday Peak Hour Levels of Service

Intersection	AM Peak		PM Peak	
	LOS	Delay	LOS	Delay
Signalized Intersections				
Wilmot Road/I-10 WB Ramps				
Overall Intersection	B	17.3	C	23.2
Westbound Left/Through	D	44.1	D	45.1
Westbound Right	D	40.3	D	39.6
Northbound Left	B	11.9	C	21.5
Northbound Through	A	0.5	A	0.9
Southbound Through	C	32.2	C	28.3
Southbound Right	C	30.0	C	22.9
Wilmot Road/I-10 EB Ramps				
Overall Intersection	C	33.1	C	33.7
Eastbound Left/Through	C	30.7	C	34.1
Eastbound Right	C	31.1	C	33.5
Northbound Through	D	40.1	D	50.9
Northbound Through/Right	D	40.1	D	50.9
Southbound Left	C	20.3	C	20.2
Southbound Through	A	8.7	A	7.3
Unsignalized Intersections				
Shell Driveway/Wilmot Road				
Eastbound Left/Right	C	20.9	D	27.4
Northbound Left	A	8.4	A	8.4
Garden Stone Drive/Wilmot Road				
Westbound Left	A	0.0	D	30.6
Westbound Through/Right	C	19.0	B	11.8
Southbound Left	B	10.2	A	8.6
Diablo Sunrise Road/Wilmot Road				
Eastbound Left/Through/Right	E	45.9	E	37.9
Westbound Left	E	37.2	D	34.1
Westbound Through/Right	C	17.3	B	12.4
Northbound Left	A	0.0	A	9.4
Southbound Left	A	9.9	A	8.5

Delay - seconds per vehicle

As shown in **Table 4**, the eastbound left/through/right turn lane and westbound left turn lane at the intersection of Diablo Sunrise Road/Wilmot Road currently operates at an inadequate LOS during the weekday AM and/or PM peak hours. These delays are caused by a lack of capacity on Wilmot Road as this roadway only offers one through lane in each direction adjacent to the project site. This limits the number of acceptable gaps in traffic along Wilmot Road to execute an eastbound/westbound left or right turn maneuver from Diablo Sunrise Road.

All of the remaining study intersections currently operate at an adequate LOS during the weekday peak hours.



Future Roadway Network

The Arizona Department of Transportation (ADOT) has prepared an Initial Design Concept Report (DCR) to study potential improvements on Interstate 10 from Interstate 19 to Kolb Road. As part of this DCR, improvements have been recommended at the Wilmot Road/I-10 Interchange to accommodate future traffic projections. In addition, the existing eastbound and westbound frontage roads between Wilmot Road and Craycroft Road will be removed. A complete description of the improvements recommended in the DCR near the Wilmot Road/I-10 Interchange can be found in the appendix.

Roadway and intersection improvements identified in the ADOT DCR are expected to be constructed over the next 20 years (or more) and the evaluations conducted in the report are based on a design year 2040 traffic demand model. The Wilmot Road/I-10 Interchange was listed as number 12 of 18 major infrastructure projects in the Project Order of Construction (prioritization) described in the ADOT DCR. In anticipation of these improvements, the proposed site has been adjusted to account for the additional right-of-way ADOT will need in order to complete the future reconstruction efforts at the Wilmot Road/I-10 Interchange. There is the potential for the early elimination of the intersection of Pistol Ridge Road/Eastbound I-10 Frontage Road when the ADOT improvements occur and the Eastbound I-10 Frontage Road is removed.

The City of Tucson Major Streets and Routes plan shows Los Reales Road being constructed between Craycroft Road and Wilmot Road. The Garden Stone Drive extension will be constructed along the Los Reales Road alignment. The timing of the connection of Los Reales Road between the proposed extension of Garden Stone Drive and Craycroft Road is not known at this time.

The Los Reales roadway extension project will allow drivers to access the roadway network west of the proposed site. This can be expected to alleviate traffic demands from the project on Wilmot Road and act in a similar role to the proposed frontage road access by providing a connection between adjacent key roadways.

Due to the uncertainty and long range timing of both the ADOT improvements at the Wilmot Road/I-10 Interchange and the City of Tucson project to extend Los Reales Road, these projects were not considered in the analysis provided in this report.

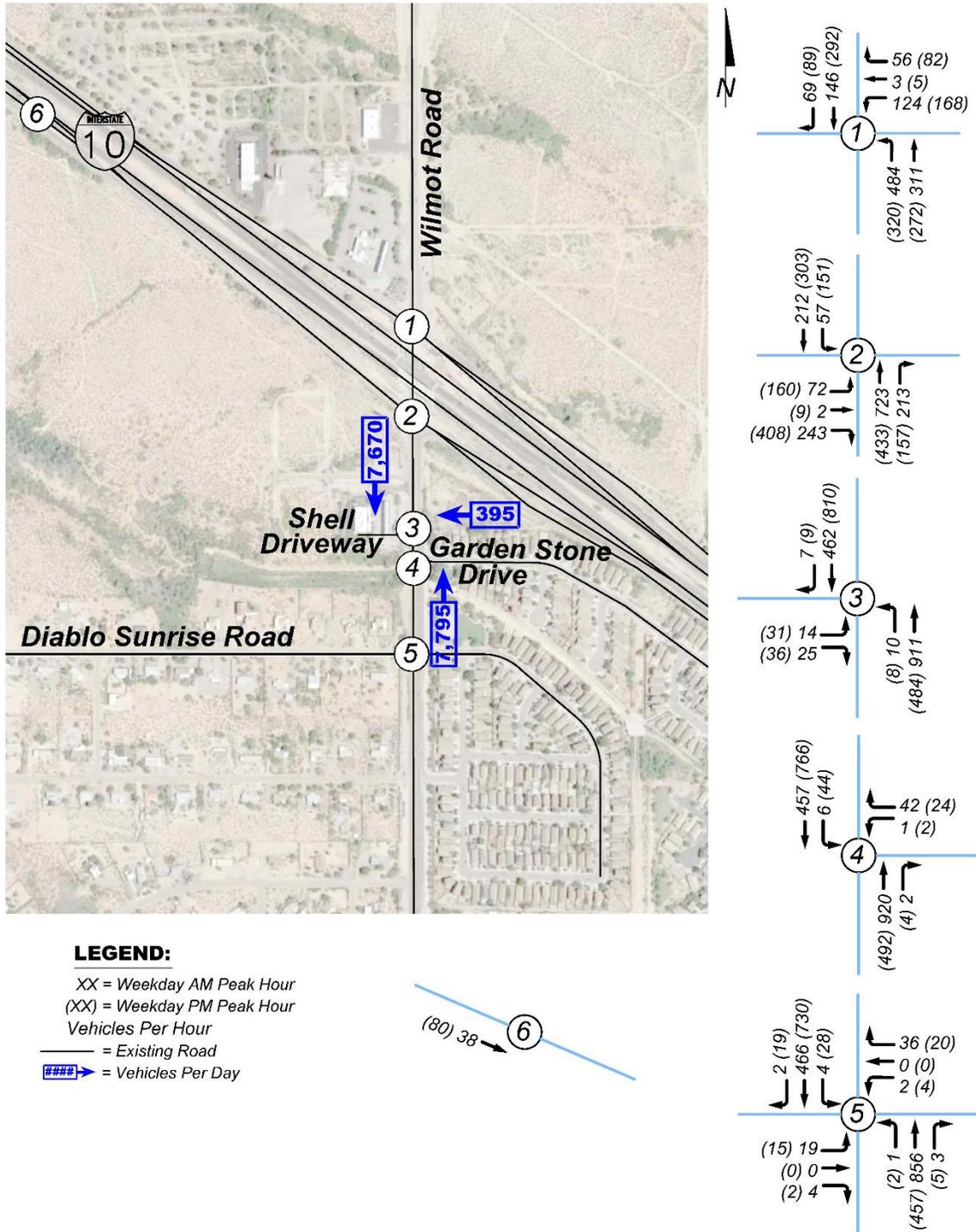
Future Traffic Operations Without Project

In order to assess the impacts of the project on future traffic operations, traffic projections were made for the opening year of 2021.

A review of historical traffic data in the vicinity of the project showed increasing and decreasing traffic volumes in the area. Using a conservative 2% annual compounded growth rate, 2021 weekday peak hour traffic volumes without the project were estimated as shown in **Figure 8**.



Figure 8 – 2021 Weekday Peak Hour Traffic Volumes Without Project





As with the current volumes, levels of service were calculated for each of the intersections in the study area for 2021 without the project. Intersection levels of service for 2021 without the project are shown in **Table 5**. Complete capacity calculations are included in the Appendix.

Table 5 – 2021 Weekday Peak Hour Levels of Service Without Project

Intersection	AM Peak		PM Peak	
	LOS	Delay	LOS	Delay
Signalized Intersections				
Wilmot Road/I-10 WB Ramps				
Overall Intersection	B	17.5	C	23.8
Westbound Left/Through	D	44.1	D	45.7
Westbound Right	D	40.2	D	39.5
Northbound Left	B	11.5	C	22.1
Northbound Through	A	0.5	A	0.9
Southbound Through	C	34.8	C	29.7
Southbound Right	C	31.2	C	23.7
Wilmot Road/I-10 EB Ramps				
Overall Intersection	C	33.1	C	33.9
Eastbound Left/Through	C	31.9	C	35.5
Eastbound Right	C	32.2	C	34.6
Northbound Through	D	39.8	D	50.1
Northbound Through/Right	D	39.8	D	50.1
Southbound Left	C	21.8	C	21.3
Southbound Through	A	7.9	A	6.7
Unsignalized Intersections				
Shell Driveway/Wilmot Road				
Eastbound Left/Right	C	22.7	D	32.5
Northbound Left	A	8.5	A	9.9
Garden Stone Drive/Wilmot Road				
Westbound Left	D	34.1	D	33.4
Westbound Through/Right	C	20.0	B	12.1
Southbound Left	B	10.4	A	8.7
Diablo Sunrise Road/Wilmot Road				
Eastbound Left/Through/Right	F	51.7	E	40.9
Westbound Left	E	41.1	E	37.9
Westbound Through/Right	C	18.1	B	11.6
Northbound Left	A	8.4	A	9.5
Southbound Left	B	10.0	A	8.5

Delay - seconds per vehicle

As shown in **Table 5**, the eastbound and westbound approaches to the intersection of Diablo Sunrise Road/Wilmot Road are expected to continue to operate at an inadequate LOS during the weekday AM and PM peak hours in 2021 without the project.

The remaining study intersections are anticipated to continue to operate at an adequate LOS during the weekday AM and PM peak hour in 2021 without the project.



Future Traffic Operations With Project

In order to assess the impacts of the project on future traffic operations, levels of service were calculated for each project intersection in 2021, with the project.

Weekday peak hour traffic volumes for 2021 without the project were combined with the estimated trips generated by the Blackhawk project to yield weekday peak hour traffic volumes with the project as shown in **Figure 9**.

Weekday intersection levels of service for 2021, with the project, were then calculated as shown in **Table 6**. Complete capacity calculations are included in the Appendix.

As shown in **Table 6**, eastbound and westbound traffic at the intersection of Diablo Sunrise Road/Wilmot Road continue to operate at an inadequate LOS during the weekday AM and PM peak hour in 2021 without and with the project.

The eastbound and westbound left turn lanes at the intersection of Garden Stone Drive/Wilmot Road are anticipated to operate at an inadequate LOS during the weekday AM and/or PM peak hours in 2021 with the project.

At the intersection of Shell Driveway/Wilmot Road, the eastbound left/right turn lane experiences delays during the weekday AM and PM peak hour in 2021 with the project.

These delays are a result of the limited capacity on Wilmot Road, which reduces the number of acceptable gaps to execute turning maneuvers from Diablo Sunrise Road, Garden Stone Drive and Shell Driveway.

The remaining study intersections are anticipated to operate at an adequate LOS during the weekday AM and PM peak hour in 2021 without and with the project.



Figure 9 – 2021 Weekday Peak Hour Traffic Volumes With Project

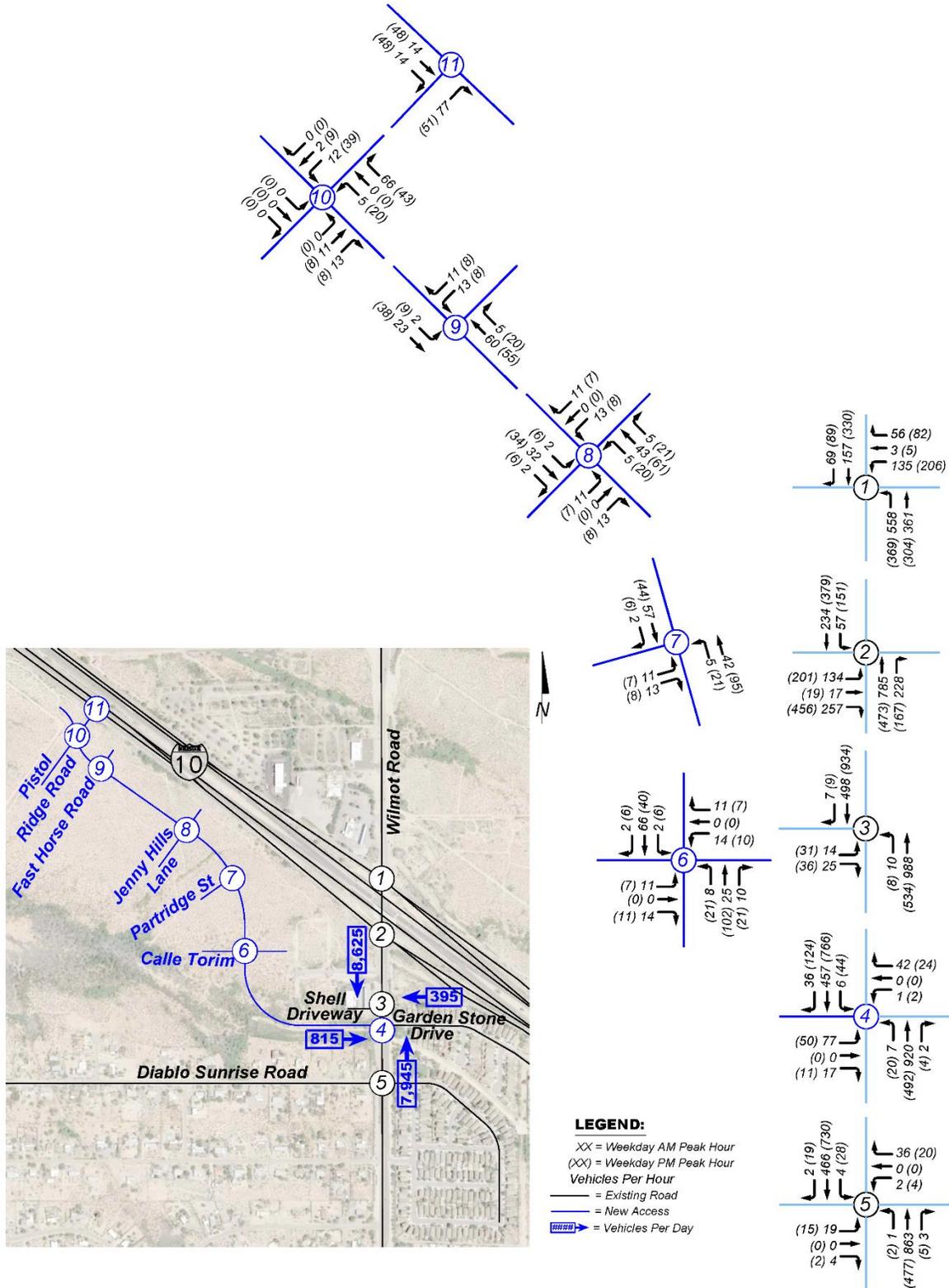




Table 6 – 2021 Weekday Peak Hour Levels of Service With Project

Intersection	2021 Without Project				2021 With Project			
	AM Peak		PM Peak		AM Peak		PM Peak	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Signalized Intersections								
Wilmot Road/I-10 WB Ramps								
Overall Intersection	B	17.5	C	23.8	B	18.4	C	26.2
Westbound Left/Through	D	44.1	D	45.7	D	44.2	D	49.0
Westbound Right	D	40.2	D	39.5	D	39.8	D	39.1
Northbound Left	B	11.5	C	22.1	B	13.1	C	20.7
Northbound Through	A	0.5	A	0.9	A	0.5	A	0.8
Southbound Through	C	34.8	C	29.7	D	40.7	D	37.4
Southbound Right	C	31.2	C	23.7	D	35.3	C	27.6
Wilmot Road/I-10 EB Ramps								
Overall Intersection	C	33.1	C	33.9	C	33.4	C	32.9
Eastbound Left/Through	C	31.9	C	35.5	D	36.1	D	35.4
Eastbound Right	C	32.2	C	34.6	C	34.3	C	34.9
Northbound Through	D	39.8	D	50.1	D	39.9	D	47.3
Northbound Through/Right	D	39.8	D	50.1	D	39.9	D	47.3
Southbound Left	C	21.8	C	21.3	C	23.7	C	27.8
Southbound Through	A	7.9	A	6.7	A	5.1	A	6.1
Unsignalized Intersections								
Shell Driveway/Wilmot Road								
Eastbound Left/Right	C	22.7	D	32.5	D	25.9	E	46.1
Northbound Left	A	8.5	A	9.9	A	8.6	B	10.5
Garden Stone Drive/Wilmot Road								
Eastbound Left	N/A		N/A		F	>120	F	>120
Eastbound Through/Right	N/A		N/A		B	11.8	C	16.4
Westbound Left	D	34.1	D	33.4	E	49.0	F	54.5
Westbound Through/Right	C	20.0	B	12.1	C	20.0	B	12.1
Northbound Left	N/A		N/A		A	8.6	B	10.3
Southbound Left	B	10.4	A	8.7	B	10.4	A	8.7
Diablo Sunrise Road/Wilmot Road								
Eastbound Left/Through/Right	F	51.7	E	40.9	F	52.3	E	39.9
Westbound Left	E	41.1	E	37.9	E	41.4	E	39.1
Westbound Through/Right	C	18.1	B	11.6	C	18.2	B	11.8
Northbound Left	A	8.4	A	9.5	A	8.4	A	9.5
Southbound Left	B	10.0	A	8.5	B	10.1	A	8.6
Calle Torim/Garden Stone Drive								
Eastbound Left/Through/Right	N/A		N/A		A	9.2	A	9.4
Westbound Left/Through/Right	N/A		N/A		A	9.2	B	10
Northbound Left/Through/Right	N/A		N/A		A	7.4	A	7.4
Southbound Left/Through/Right	N/A		N/A		A	7.3	A	7.5
Partridge Street/Garden Stone Drive								
Eastbound Left/Right	N/A		N/A		A	9.0	A	9.3
Northbound Left/Through	N/A		N/A		A	7.4	A	7.4
Jenny Hills Lane/Garden Stone Drive								
Eastbound Left/Through/Right	N/A		N/A		A	7.3	A	7.4
Westbound Left/Through/Right	N/A		N/A		A	7.3	A	7.4
Northbound Left/Through/Right	N/A		N/A		A	9.0	A	9.3
Southbound Left/Through/Right	N/A		N/A		A	9.1	A	9.5
Fast Horse Road/Garden Stone Drive								
Eastbound Left/Through	N/A		N/A		A	7.4	A	7.4
Southbound Left/Right	N/A		N/A		A	9.0	A	9.1
Pistol Ranch Road/Garden Stone Drive								
Eastbound Left/Through/Right	N/A		N/A		A	0.0	A	0
Westbound Left/Through/Right	N/A		N/A		A	7.2	A	7.3
Northbound Left/Through/Right	N/A		N/A		A	9.0	A	9.1
Southbound Left/Through/Right	N/A		N/A		A	9.2	A	9.5
Pistol Ridge Road/I-10 EB Frontage Road								
Northbound Right	N/A		N/A		A	8.7	A	8.7

Delay - seconds per vehicle



Turn Lane Analysis

A key element of this traffic analysis is to determine if left and right turn lanes are required at the intersections serving the project site. Turn lanes at the proposed access points were determined based on City of Tucson’s *Transportation Access Management Guidelines*. The need for an eastbound right turn lane at the intersection of Pistol Ridge Road/Eastbound I-10 Frontage Road was evaluated based on ADOT Traffic Guidelines and Processes (TGP) 245, Turn Lane Warrants. When needed, turn lanes remove the slowing turning traffic from the through traffic stream, improving capacity and reducing rear-end accidents. **Table 7** shows the locations that were evaluated for turn lanes in 2021 with the project.

Table 7 – Turn Lane Warrants

Intersection	Direction	Turn Treatment Analyzed	Turn Treatments Warranted?
Pistol Ridge Road/Eastbound I-10 Frontage Road	Eastbound	Right Turn Lane	No
Pistol Ridge Road/Garden Stone Drive	Westbound	Left Turn Lane	No
Pistol Ridge Road/Garden Stone Drive	Westbound	Right Turn Lane	No
Pistol Ridge Road/Garden Stone Drive	Southbound	Left Turn Lane	No
Fast Horse Road/Garden Stone Drive	Eastbound	Left Turn Lane	No
Fast Horse Road/Garden Stone Drive	Westbound	Right Turn Lane	No
Jenny Hills Lane/Garden Stone Drive	Westbound	Left Turn Lane	No
Jenny Hills Lane/Garden Stone Drive	Westbound	Right Turn Lane	No
Jenny Hills Lane/Garden Stone Drive	Eastbound	Right Turn Lane	No
Jenny Hills Lane/Garden Stone Drive	Eastbound	Left Turn Lane	No
Partridge Street/Garden Stone Drive	Northbound	Left Turn Lane	No
Partridge Street/Garden Stone Drive	Southbound	Right Turn Lane	No
Calle Torim/Garden Stone Drive	Northbound	Left Turn Lane	No
Calle Torim/Garden Stone Drive	Northbound	Right Turn Lane	No
Calle Torim/Garden Stone Drive	Southbound	Left Turn Lane	No
Calle Torim/Garden Stone Drive	Southbound	Right Turn Lane	No
Garden Stone Drive/Wilmot Road	Northbound	Left Turn Lane	Existing
Garden Stone Drive/Wilmot Road	Southbound	Right Turn Lane	Yes

Table 7 shows that an exclusive southbound right turn lane is warranted at the intersection of Garden Stone Drive/Wilmot Road.

Queue storage requirements for the southbound right turn lane at the intersection of Garden Stone Drive/Wilmot Road was calculated using the following methods as recommended in *A Policy of Geometric Design of Highways and Streets* (AASHTO, 2011). Typically, an average vehicle length of 25 feet is assumed.

For un-signalized intersections, storage for vehicles likely to arrive in an average two-minute period within the peak hour should be provided.



$$\text{Vehicles per 2 min. period} = (\text{vehicles/hour}) \div (30 \text{ periods/hour})$$

$$\text{Storage length} = \text{vehicles per 2 min. period} \times 25 \text{ feet}$$

Table 8 shows the calculated queue length for the southbound right turn lane at the intersection of Garden Stone Drive/Wilmot Road. The storage length to for the northbound right turn lane at the intersection of Pistol Ridge Road/Eastbound I-10 Frontage Road and the southbound approach to the intersection of Pistol Ridge Road/Garden Stone Drive were also calculated to determine the minimum distance required between these two intersections to eliminate any potential queue overlap. Complete queue length calculations are available in the Appendix.

Table 8 – Calculated Queue Lengths

Intersection	Approach Storage				Right Turn Storage			
	NB	SB	EB	WB	NB	SB	EB	WB
Garden Stone Drive/Wilmot Road								
Turning Volume (vph)						124		
$S_{\text{calculated}} =$						103		
$S_{\text{rounded}} =$						125		
Pistol Ridge Road/Eastbound I-10 Frontage Road								
Turning Volume (vph)					77			
$S_{\text{calculated}} =$					64			
$S_{\text{rounded}} =$					75			
Pistol Ridge Road/Garden Stone Drive								
Turning Volume (vph)		41						
$S_{\text{calculated}} =$		34						
$S_{\text{rounded}} =$		50						

S - storage in feet, vph - vehicles per hour

As shown in **Table 8**, the warranted southbound right turn lane at the intersection of Garden Stone Drive/Wilmot Road will require a minimum storage length of 125 feet. This will extend into and through the existing location of the Shell Driveway.

The northbound right turn lane at the intersection of Pistol Ridge Road/Eastbound I-10 Frontage Road will need 75 feet of storage while the southbound approach to the intersection of Pistol Ridge Road/Garden Stone Drive requires 50 feet of queue length to accommodate the anticipated traffic volumes in 2021 with the project.

Traffic Signal Warrant Analysis

Traffic Signal Warrant analyses were completed at the intersection of Garden Stone Drive/Wilmot Road for the existing conditions and future study years without and with the project per MCDOT request.



The *Manual on Uniform Traffic Control Devices (MUTCD)*, Federal Highway Administration, 2009, lists 9 warrants that are used to determine if a traffic signal should be considered for installation at an intersection. A traffic signal may be warranted if one or more of the warrants are satisfied. Warrants #1 (Eight Hour Volume) and #2 (Four Hour Vehicular Volume), were used to evaluate the need to signalize the intersections. Based on existing conditions, availability of information, and applicability, the remaining warrants (#3, #4, #5, #6, #7, #8, and #9) do not apply to the given conditions.

Warrant #1 (Eight Hour Volume) is satisfied when for at least eight (8) hours of an average day, specific traffic volume levels are met for both the major and minor streets (Condition A – Minimum Vehicular Volume). The MUTCD states these volumes depend on the vehicles per hour (vph) combined for both approaches of the major street, and for the highest volume approach on the minor street. The values vary depending on the number of approach lanes and the 85th percentile speed of the roadways.

Warrant #1 also applies to operating conditions where the major street traffic levels are sufficiently high that traffic entering or crossing from a minor street suffers excessive delay (Condition B – Interruption of Continuous Traffic). Once again, the warrant is satisfied when for each of any of the same eight (8) hours of an average day, specific traffic volume levels are met for both the major and minor streets.

Warrant #2 (Four Hour Volume) is met when, for any four hours of the average day on both the major and minor streets, the hourly approach volumes are above the plotted curve contained in the MUTCD (see Appendix).

Daily traffic volumes expected to be generated by future development were distributed throughout the 24 hours of a day based on existing daily traffic distributions.

Table 9 shows the results of the warrant analysis. The Appendix contains the complete calculations.

Table 9 – Traffic Signal Warrant Analysis (Garden Stone Drive/Wilmot Road)

Year	Warrant Number									
	1		2	3	4	5	6	7	8	9
	Condition A	Condition B								
Existing	No	No	No	*	*	*	*	*	*	*
Hours Met	0	0	0	*	*	*	*	*	*	*
2021 Without	No	No	No	*	*	*	*	*	*	*
Hours Met	0	0	0	*	*	*	*	*	*	*
2021 With	No	No	No	*	*	*	*	*	*	*
Hours Met	0	1	0	*	*	*	*	*	*	*

* Warrant Does Not Apply

Table 9 shows that the intersection of Garden Stone Drive/Wilmot Road is not anticipated to meet traffic signal warrant #1 or #2 in 2021 with the project using the Manual on Uniform Traffic Control Devices (MUTCD) traffic signal warrants.



It is important to mention that traffic signals should not be installed because one or more of the warrants are satisfied. The MUTCD warrants reflect only the lowest minimum levels on which traffic engineers agree. It also states that, “The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.”

The intersection of Garden Stone Drive/Wilmot Road is located approximately 600 feet south of the existing traffic signal at the intersection of Wilmot Road/I-10 Eastbound Ramps. The City of Tucson’s (COT) *Transportation Access Management Guidelines* states that if a traffic signal being considered does not adhere to their standard half-mile spacing requirement, “the actual or proposed traffic levels shall meet 1.5 times the volume requirements published in the latest edition of the MUTCD for traffic signal warrants.” Due to the proximity of the intersections of Garden Stone Drive/Wilmot Road and Wilmot Road/I-10 Eastbound Ramps, a traffic signal warrant analysis was conducted at the intersection of Garden Stone Drive/Wilmot Road using the stricter COT traffic signal warrants.

Table 10 shows the results of the warrant analysis based on COT standards. The Appendix contains the complete calculations.

Table 10 – Traffic Signal Warrant Analysis (COT Standards)

Year	Warrant Number									
	1		2	3	4	5	6	7	8	9
	Condition A	Condition B								
Existing	No	No	No	*	*	*	*	*	*	*
Hours Met	0	0	0	*	*	*	*	*	*	*
2021 Without	No	No	No	*	*	*	*	*	*	*
Hours Met	0	0	0	*	*	*	*	*	*	*
2021 With	No	No	No	*	*	*	*	*	*	*
Hours Met	0	0	0	*	*	*	*	*	*	*

Table 10 shows that the intersection of Garden Stone Drive/Wilmot Road is not anticipated to meet traffic signal warrant #1 or #2 in 2021 with the project using the stricter COT traffic signal warrants.

Mitigation

Eastbound and westbound traffic approaching the intersection of Diablo Sunrise Road/Wilmot Road currently operates at an inadequate LOS during the weekday AM and/or PM peak hour and are anticipated to continue to operate at an inadequate LOS in 2021 without and with the project.

The eastbound and westbound left turn lanes at the intersection of Garden Stone Drive/Wilmot Road and the eastbound left/right turn lane at the Shell Driveway/Wilmot Road are anticipated to operate at an inadequate LOS during the weekday AM and/or PM peak hours in 2021 with the project.



These delays are a result of the limited capacity on Wilmot Road, which reduces the number of acceptable gaps to execute turning maneuvers from Diablo Sunrise Road, Garden Stone Drive and Shell Driveway.

Un-signalized intersections along major streets such as Wilmot Road tend to have their turn movements from intersecting roadway/driveways operate at LOS E or F during the weekday peak hours. Wilmot Road is a key corridor that provides north-south access to I-10. As development occurs in the area and traffic volumes grow, Wilmot Road is anticipated to be widened to offer two lanes in each direction separated by a two-way, center left turn lane when fully built. The future widening of Wilmot Road to a five-lane cross section is expected to reduce delays at the study intersections; however, it is not expected to mitigate LOS delays at the intersection of Garden Stone Drive/Wilmot Road to acceptable levels.

Further mitigation measures at the intersection of Garden Stone Drive/Wilmot Road are limited. While the installation of a traffic signal would mitigate the delays, the intersection of Garden Stone Drive/Wilmot Road does not meet typical traffic signal spacing requirements and does not meet traffic signal warrants #1 or #2 based on the MUTCD or COT Access Management Guidelines. In addition, the installation of a traffic signal could negatively impact progression along the major roadway (Wilmot Road).

Table 11 shows the corresponding LOS at the intersection of Garden Stone Drive/Wilmot Road with the installation of a southbound right turn lane and Wilmot Road widened to its ultimate roadway cross section based on 2021 traffic volumes with the project. The LOS is also provided for the intersections of Shell Driveway/Wilmot Road and Diablo Sunrise Road/Wilmot Road with a five-lane cross section on Wilmot Road.

Table 11 – Mitigation Measures

Intersection	Mitigation Measure	2021 With Project Without Mitigation				2021 With Project With Mitigation			
		AM Peak		PM Peak		AM Peak		PM Peak	
		LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Unsignalized Intersections									
Garden Stone Drive/Wilmot Road									
Eastbound Left	Wilmot Road Built Out to 5 Lane Cross Section and Install Southbound Right Turn Lane	F	>120	F	>120	E	49.2	F	63.5
Eastbound Through/Right		B	11.9	C	16.8	B	10.0	B	11.4
Westbound Left		E	49.5	F	56.6	E	37.5	D	29.4
Westbound Through/Right		C	20.8	B	13.8	B	12.8	B	10.2
Northbound Left		A	8.6	B	10.6	A	8.6	B	10.4
Southbound Left		B	10.4	A	8.7	B	10.4	A	8.7
Shell Driveway/Wilmot Road									
Eastbound Left/Right	Wilmot Road Built Out to 5 Lane Cross Section	D	29.5	F	56.7	C	16.1	D	28.6
Northbound Left		A	8.7	B	10.8	A	8.6	B	10.5
Diablo Sunrise Road/Wilmot Road									
Eastbound Left/Through/Right	Wilmot Road Built Out to 5 Lane Cross Section	F	54.9	E	43.1	D	25	D	29.0
Westbound Left		E	42.6	E	39.4	D	32.5	C	24.3
Westbound Through/Right		C	18.2	B	11.8	B	12.3	B	10.1
Northbound Left		A	8.5	A	9.6	A	8.5	A	9.5
Southbound Left		B	10.1	A	8.6	B	10.1	A	8.6

Delay - seconds per vehicle



Table 11 shows that the intersection of Garden Stone Drive/Wilmot Road would be expected to have a significant decrease in delay during the weekday AM and PM peak hours in 2021 with the project with the installation of a southbound right turn lane and Wilmot Road widened to its ultimate roadway cross section. The intersections of Shell Driveway/Wilmot Road and Diablo Sunrise Road/Wilmot Road would also be anticipated to operate at an adequate LOS when Wilmot Road offers a five-lane cross section.

Conclusion

When fully completed, the proposed Blackhawk project is predicted to generate an additional 2,972 vehicle trips per day (vtpd) on weekdays to the adjacent street system from the new project site. Fifty percent of these new trips (1,486 vehicle trips) will be into the project and fifty percent will be out of the project.

The eastbound left/through/right turn lane and westbound left turn lane at the intersection of Diablo Sunrise Road/Wilmot Road currently operate at an inadequate LOS during the weekday AM and/or PM peak hours. These delays are caused by a lack of capacity on Wilmot Road as this roadway only offers one through lane in each direction adjacent to the project site. There are a limited number of acceptable gaps in traffic along Wilmot Road to execute an eastbound/westbound left or right turn maneuver from Diablo Sunrise Road.

All of the remaining study intersections currently operate at an adequate LOS during the weekday peak hours.

The eastbound and westbound approaches to the intersection of Diablo Sunrise Road/Wilmot Road are expected to continue to operate at an inadequate LOS during the weekday AM and PM peak hours in 2021 without the project.

The remaining study intersections are anticipated to continue to operate at an adequate LOS during the weekday AM and PM peak hours in 2021 without the project.

Eastbound and westbound traffic at the intersection of Diablo Sunrise Road/Wilmot Road are expected to continue to operate at an inadequate LOS during the weekday AM and PM peak hours in 2021 without and with the project.

The eastbound and westbound left turn lanes at the intersection of Garden Stone Drive/Wilmot Road are anticipated to operate at an inadequate LOS during the weekday AM and/or PM peak hours in 2021 with the project.

At the intersection of Shell Driveway/Wilmot Road, the eastbound left/right turn lane experiences delays during the weekday PM peak hour in 2021 with the project.

The remaining study intersections are anticipated to operate at an adequate LOS during the weekday AM and PM peak hour in 2021 without and with the project.



The intersection of Garden Stone Drive/Wilmot Road is not anticipated to meet traffic signal warrant #1 or #2 in 2021 with the project using the Manual on Uniform Traffic Control Devices (MUTCD), or COT, traffic signal warrants.

Eastbound and westbound traffic approaching the intersection of Diablo Sunrise Road/Wilmot Road currently operates at an inadequate LOS during the weekday AM and/or PM peak hour and are anticipated to continue to operate at an inadequate LOS in 2021 without and with the project.

The eastbound and westbound left turn lanes at the intersection of Garden Stone Drive/Wilmot Road and the eastbound left/right turn lane at the Shell Driveway/Wilmot Road are anticipated to operate at an inadequate LOS during the weekday AM and/or PM peak hours in 2021 with the project.

Un-signalized intersections along major streets such as Wilmot Road tend to have their turn movements from intersecting roadway/driveways operate at LOS E or F during the weekday peak hours. Wilmot Road is a key corridor that provides north-south access to Interstate 10 (I-10). As development occurs in the area and traffic volumes grow, Wilmot Road is anticipated to be widened to offer two lanes in each direction separated by a two-way, center left turn lane. The future widening of Wilmot Road to a five-lane cross section is expected to reduce delays at the study intersections; however, it is not expected to mitigate all of the delays at the intersection of Garden Stone Drive/Wilmot Road to acceptable levels. The intersections of Shell Driveway/Wilmot Road and Diablo Sunrise Road/Wilmot Road would be anticipated to operate at an adequate LOS when Wilmot Road offers a five-lane cross section.

Further mitigation measures at the intersection of Garden Stone Drive/Wilmot Road are limited. While the installation of a traffic signal would mitigate the delays, the intersection of Garden Stone Drive/Wilmot Road does not meet typical traffic signal spacing requirements and does not meet traffic signal warrants #1 or #2 based on the MUTCD or COT Access Management Guidelines. In addition, the installation of a traffic signal could negatively impact progression along the major roadway (Wilmot Road).

The warranted southbound right turn lane at the intersection of Garden Stone Drive/Wilmot Road has a calculated storage requirement of 125 feet. This would extend beyond the intersection of Shell Driveway/Wilmot Road, which currently exists 40 feet north of the Garden Stone Drive/Wilmot Road alignment. Consideration should be given to removing the existing south Shell Driveway and constructing a new driveway on the north side of Garden Stone Drive on the west side of the existing gas station site.

The Arizona Department of Transportation (ADOT) has prepared an Initial Design Concept Report (DCR) to study potential improvements on Interstate 10 from Interstate 19 to Kolb Road. As part of this DCR, improvements have been recommended at the Wilmot Road/I-10 Interchange to accommodate future traffic projections. A complete description of the improvements recommended in the DCR near the Wilmot Road/I-10 Interchange can be found in the appendix.



Roadway and intersection improvements identified in the ADOT DCR are expected to be constructed over the next 20 years (or more) and the evaluations conducted in the report are based on a design year 2040 traffic demand model. In anticipation of these improvements, the proposed site has been adjusted to account for the additional right-of-way ADOT will need in order to complete the future reconstruction efforts at the Wilmot Road/I-10 Interchange. There is the potential for the early elimination of the intersection of Pistol Ridge Road/Eastbound I-10 Frontage Road when the ADOT improvements occur and the Eastbound I-10 Frontage Road is removed.

The City of Tucson Major Streets and Routes plan shows Los Reales Road being constructed between Craycroft Road and Wilmot Road. The Garden Stone Drive extension will be constructed along the Los Reales Road alignment.

The Los Reales roadway extension project will allow drivers to access the roadway network west of the proposed site. This can be expected to alleviate traffic demands from the project on Wilmot Road and act in a similar role to the proposed frontage road access by providing a connection between adjacent key roadways.

Due to the uncertainty and long range timing of both the ADOT improvements at the Wilmot Road/I-10 Interchange and the City of Tucson project to extend Los Reales Road, these project were not considered in the analysis provided in this report.

It is recommended that the intersection of Garden Stone Drive/Wilmot Road be monitored as development in the area occurs and a traffic signal should only be installed if it meets traffic signal warrants. A southbound right turn lane with a minimum of 125 feet of storage should be constructed at the intersection of Garden Stone Drive/Wilmot Road.

The existing Shell Driveway should be removed and relocated to the north side of Garden Stone Drive, on the west side of the existing gas station site.

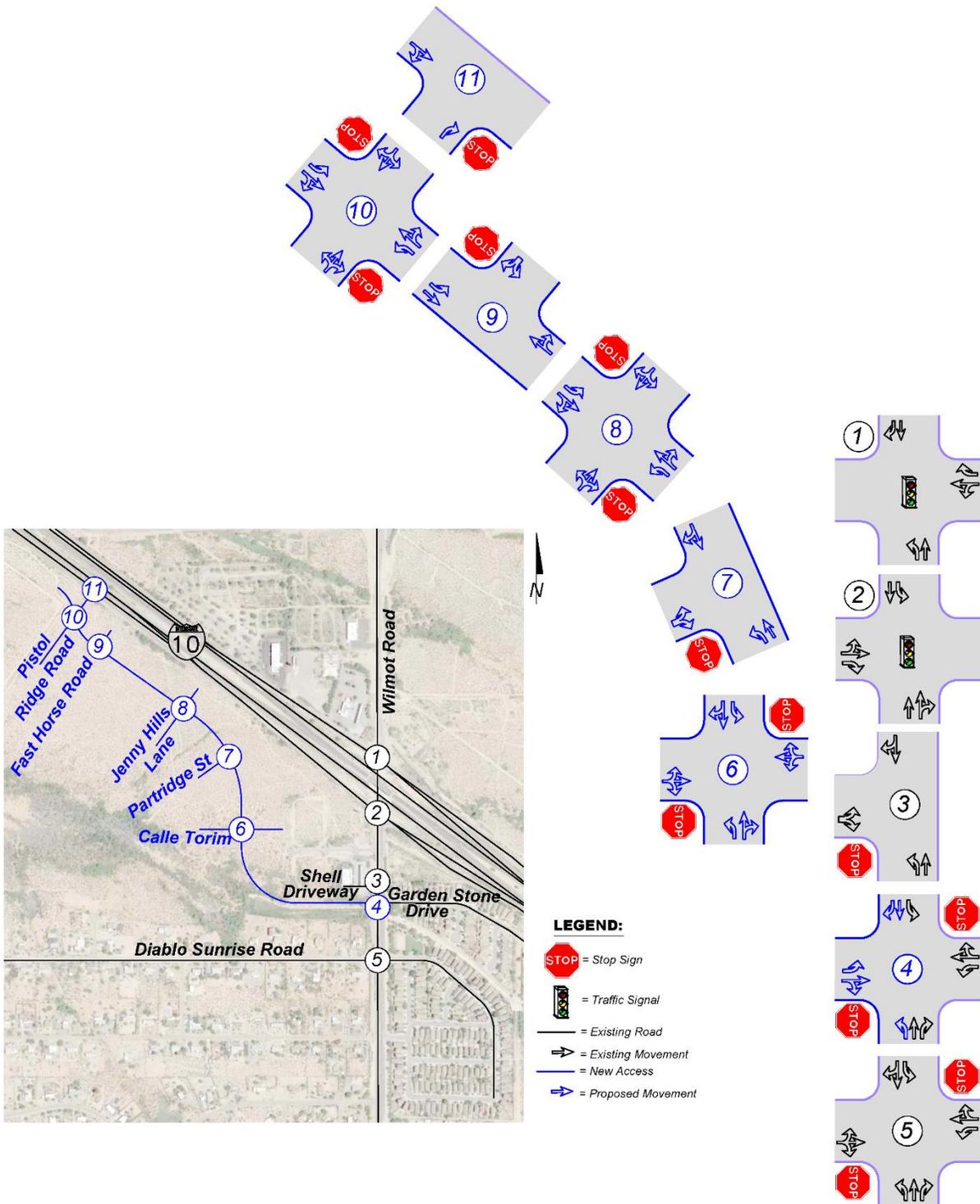
The Garden Stone Drive extension will be constructed along the Los Reales Road alignment. It is recommended that the interim Garden Stone Drive be constructed to provide a three-lane roadway cross section (one lane in each direction and a two-way, center left turn lane) to provide separated eastbound and westbound left turn access to developments along its alignment.

A minimum of 100 feet should be provided between Garden Stone Drive and the Eastbound I-10 Frontage Road (curb line to curb line) along Pistol Ridge Road to accommodate the northbound right turn storage queue at the intersection of Pistol Ridge Road/Eastbound I-10 Frontage Road. This spacing should be maximized, ideally 660 feet, to provide ample opportunity for drivers to react to one intersection at a time and reduce the potential conflict area between two intersections.

Proposed lane configurations and traffic control are shown in **Figure 10**.



Figure 10 – Proposed Lane Configurations and Traffic Control





**BLACKHAWK
WILMOT ROAD/INTERSTATE 10
TRAFFIC IMPACT ANALYSIS**

APPENDIX

Traffic Counts

Trip Generation Calculations

Capacity Calculations

Turn Lane Calculations

Traffic Signal Warrant Analysis

ADOT Design Concept Report Wilmot Road/I-10 Interchange Improvements



**BLACKHAWK
WILMOT ROAD/INTERSTATE 10
TRAFFIC IMPACT ANALYSIS**

APPENDIX

Traffic Counts

Prepared by: Field Data Services of Arizona/Veracity Traffic Group (520) 316-6745

Volumes for: Wednesday, December 11, 2019

City: Tucson

Project #: 19-1633-005

Location: Garden Stone Dr. & Wilmont Rd.

AM Period	NB	SB	EB	WB	PM Period	NB	SB	EB	WB										
00:00	11	15	0	0	12:00	80	85	9	3										
00:15	4	12	0	0	12:15	104	91	15	4										
00:30	4	10	0	1	12:30	70	77	8	9										
00:45	3	22	4	41	1	1	1	2	66	12:45	66	320	101	354	10	42	5	21	737
01:00	4	9	0	0	13:00	74	94	13	5										
01:15	1	15	0	0	13:15	93	20	10	2										
01:30	4	9	1	0	13:30	121	131	9	5										
01:45	2	11	10	43	3	4	1	1	59	13:45	92	380	91	336	11	43	4	16	775
02:00	5	11	0	0	14:00	182	105	12	3										
02:15	2	13	0	0	14:15	149	111	12	3										
02:30	4	3	1	1	14:30	132	104	10	0										
02:45	3	14	10	37	0	1	0	1	53	14:45	105	568	115	435	9	43	1	7	1053
03:00	7	7	2	0	15:00	128	149	17	5										
03:15	8	9	1	0	15:15	120	154	24	5										
03:30	8	10	0	0	15:30	129	166	21	6										
03:45	11	34	14	40	1	4	1	1	79	15:45	144	521	185	654	19	81	8	24	1280
04:00	11	11	2	0	16:00	177	160	23	7										
04:15	22	17	2	2	16:15	135	187	11	6										
04:30	35	24	1	7	16:30	136	170	8	7										
04:45	36	104	43	95	1	6	4	13	218	16:45	102	550	192	709	16	58	7	27	1344
05:00	45	46	2	1	17:00	130	187	19	8										
05:15	76	81	6	3	17:15	115	217	16	3										
05:30	95	126	13	4	17:30	128	190	12	6										
05:45	115	331	116	369	6	27	7	15	742	17:45	103	476	146	740	14	61	6	23	1300
06:00	149	79	8	7	18:00	122	124	13	7										
06:15	175	101	3	5	18:15	105	133	12	6										
06:30	174	148	8	6	18:30	86	113	7	5										
06:45	208	706	152	480	9	28	4	22	1236	18:45	72	385	105	475	5	37	7	25	922
07:00	215	101	5	7	19:00	61	90	10	3										
07:15	225	106	17	14	19:15	39	90	5	2										
07:30	250	126	11	13	19:30	38	80	4	3										
07:45	195	885	117	450	5	38	6	40	1413	19:45	43	181	63	323	5	24	3	11	539
08:00	166	99	5	10	20:00	47	69	6	4										
08:15	138	77	8	7	20:15	41	90	2	5										
08:30	98	63	6	1	20:30	35	68	9	1										
08:45	92	494	70	309	5	24	6	24	851	20:45	30	153	68	295	5	22	1	11	481
09:00	82	59	12	4	21:00	34	83	0	1										
09:15	92	54	5	8	21:15	32	84	6	2										
09:30	91	61	5	5	21:30	12	58	1	7										
09:45	96	361	67	241	6	28	4	21	651	21:45	55	133	44	269	6	13	1	11	426
10:00	79	51	6	1	22:00	88	33	1	1										
10:15	70	54	5	7	22:15	53	33	2	1										
10:30	78	55	2	4	22:30	21	34	0	1										
10:45	72	299	51	211	1	14	1	13	537	22:45	12	174	38	138	1	4	1	4	320
11:00	76	56	2	6	23:00	13	31	1	0										
11:15	81	50	5	4	23:15	12	33	1	2										
11:30	89	51	2	7	23:30	15	26	3	1										
11:45	78	324	60	217	2	11	5	22	574	23:45	25	65	19	109	2	7	1	4	185

Total Vol.	3585	2533	186	175	6479	3906	4837	435	184	9362
-------------------	------	------	-----	-----	-------------	------	------	-----	-----	-------------

GPS Coordinates: 32.112156, -110.857951

					Daily Totals				
					NB	SB	EB	WB	Combined
					7491	7370	621	359	15841

	AM					PM				
Split %	55.3%	39.1%	2.9%	2.7%	40.9%	41.7%	51.7%	4.6%	2.0%	59.1%
Peak Hour	06:45	06:30	06:45	07:15	06:45	15:45	16:45	15:15	15:45	15:30
Volume	898	507	42	43	1463	592	786	87	28	1384
P.H.F.	0.90	0.83	0.62	0.77	0.91	0.84	0.91	0.91	0.88	0.94

Location Info	
Location ID	4429
Type	I-SECTION
Functional Class	-
Located On	I-10 Frontage Rd
Between	AND
Direction	1-WAY
Community	-
MPO_ID	
HPMS ID	
Agency	Arizona Department of Transportation

Count Data Info	
Start Date	6/22/2017
End Date	6/23/2017
Start Time	12:00 PM
End Time	12:00 PM
Direction	
Notes	
Count Source	I-10 EB Frontage Road
File Name	4429 - I-10 EB Frontage Rd W of Exit 269.csv
Weather	
Study	
Owner	davek

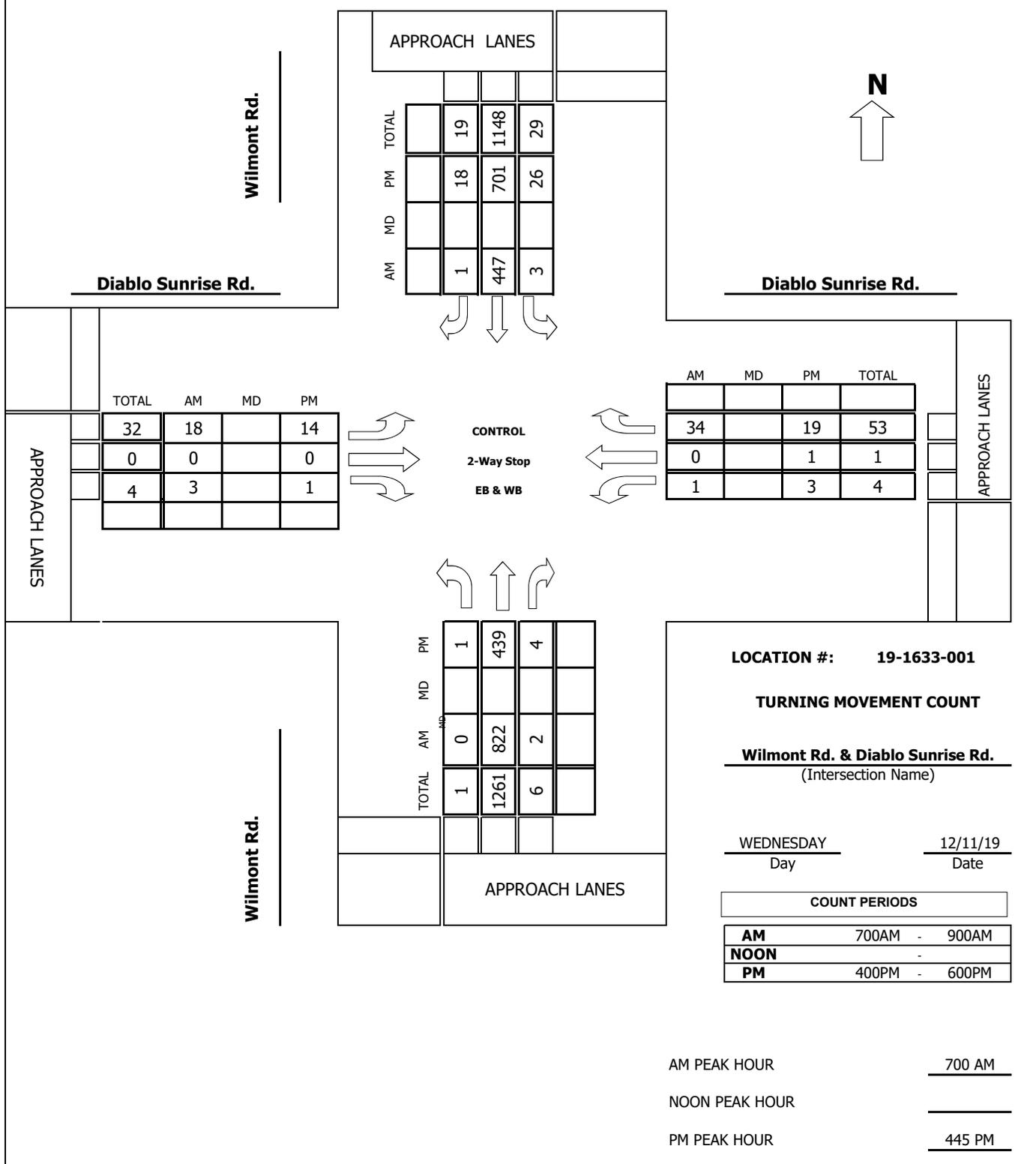
Interval: 15 mins					
Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	2	2	1	2	7
01:00 - 02:00	2	1	0	1	4
02:00 - 03:00	1	0	2	3	6
03:00 - 04:00	3	2	3	4	12
04:00 - 05:00	7	6	7	8	28
05:00 - 06:00	11	15	14	8	48
06:00 - 07:00	6	5	14	9	34
07:00 - 08:00	4	12	10	8	34
08:00 - 09:00	8	7	4	5	24
09:00 - 10:00	4	10	9	10	33
10:00 - 11:00	10	8	13	10	41
11:00 - 12:00	13	19	18	16	66
12:00 - 13:00	10	11	10	21	52
13:00 - 14:00	14	16	10	7	47
14:00 - 15:00	12	12	12	20	56
15:00 - 16:00	6	10	14	15	45
16:00 - 17:00	18	18	21	16	73
17:00 - 18:00	20	11	19	12	62
18:00 - 19:00	12	10	10	19	51
19:00 - 20:00	8	4	6	10	28
20:00 - 21:00	9	12	7	9	37
21:00 - 22:00	3	11	6	8	28
22:00 - 23:00	6	2	5	2	15
23:00 - 24:00	5	2	2	5	14
TOTAL					845

**Intersection Turning Movement
Prepared by:**



Project #: 19-1633-001

TMC SUMMARY OF Wilmont Rd. & Diablo Sunrise Rd.



Intersection Turning Movement Prepared by:



FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745



N-S STREET: **Wilmont Rd.** DATE: **12/11/19** LOCATION: **Tucson**
 E-W STREET: **Diablo Sunrise Rd.** DAY: **WEDNESDAY** PROJECT# **19-1633-001**

LANES:	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
	1	1	1	1	1	0	0	1	0	0	1	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	0	198	0	0	100	1	4	0	2	0	0	8	313
7:15 AM	0	199	1	2	106	0	3	0	0	1	0	12	324
7:30 AM	0	236	0	1	128	0	5	0	1	0	0	9	380
7:45 AM	0	189	1	0	113	0	6	0	0	0	0	5	314
8:00 AM	0	160	0	0	97	0	3	0	0	0	0	4	264
8:15 AM	0	131	0	2	74	1	4	0	0	0	0	6	218
8:30 AM	1	98	1	0	63	0	4	0	1	1	0	3	172
8:45 AM	0	87	0	1	65	0	2	0	0	0	0	4	159
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													
10:45 AM													
11:00 AM													
11:15 AM													
11:30 AM													
11:45 AM													

TOTAL	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
Volumes	1	1298	3	6	746	2	31	0	4	2	0	51	2144
Approach %	0.08	99.69	0.23	0.80	98.94	0.27	88.57	0.00	11.43	3.77	0.00	96.23	
App/Depart	1302	/	1380	754	/	752	35	/	9	53	/	3	

AM Peak Hr Begins at: 700 AM

PEAK

Volumes	0	822	2	3	447	1	18	0	3	1	0	34	1331
Approach %	0.00	99.76	0.24	0.67	99.11	0.22	85.71	0.00	14.29	2.86	0.00	97.14	

PEAK HR.

FACTOR:	0.873	0.874	0.875	0.673	0.876
---------	-------	-------	-------	-------	-------

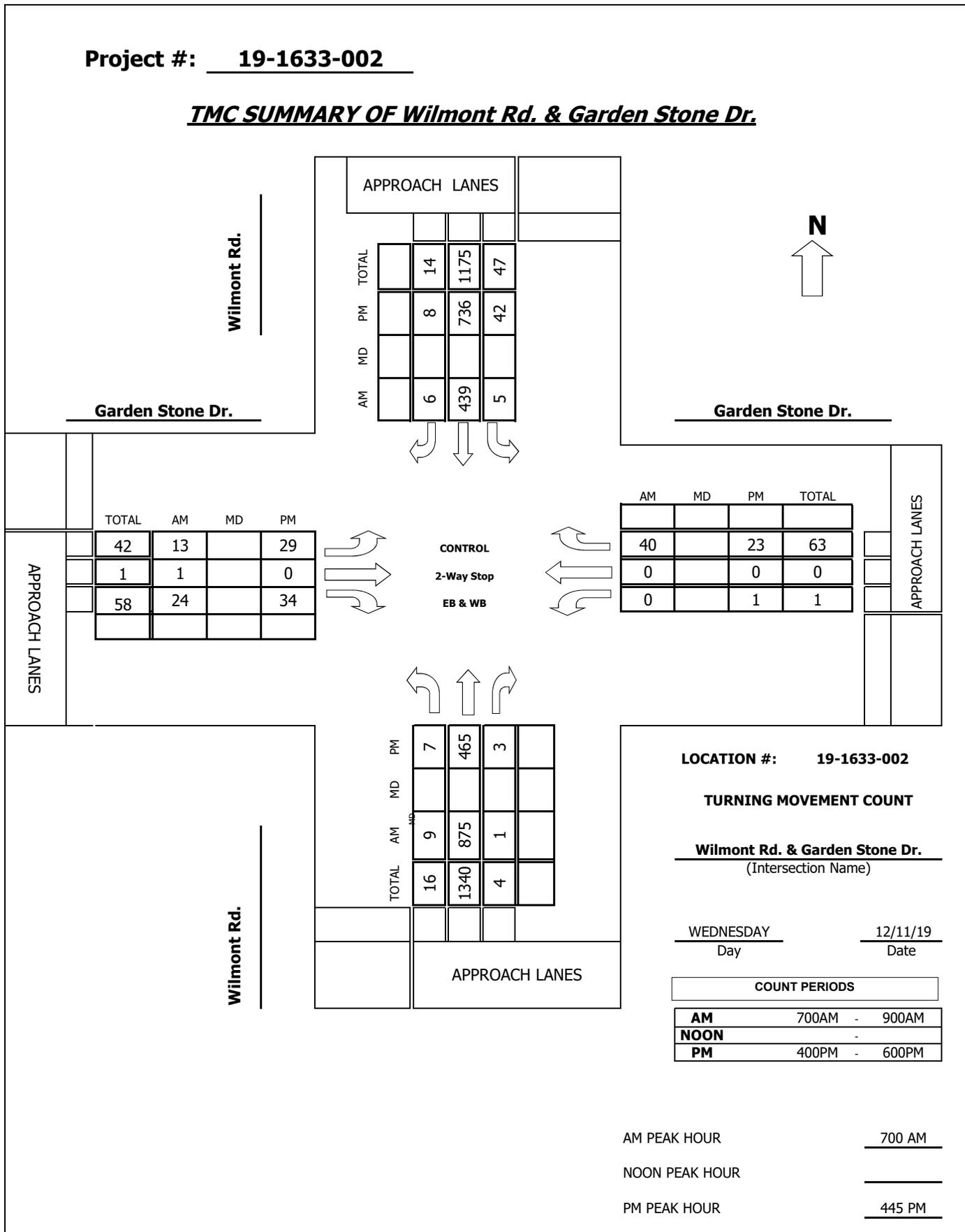
CONTROL: **2-Way Stop (EB & WB)**
 COMMENT 1:
 GPS: **32.110974, -110.857965**

**Intersection Turning Movement
Prepared by:**



Project #: 19-1633-002

TMC SUMMARY OF Wilmont Rd. & Garden Stone Dr.



APPROACH LANES			
	AM	MD	PM
TOTAL	6	439	5
PM	8	736	42
TOTAL	14	1175	47

	TOTAL	AM	MD	PM
APPROACH LANES	42	13		29
	1	1		0
	58	24		34

	AM	MD	PM	TOTAL
APPROACH LANES	40		23	63
	0		0	0
	0		1	1

	TOTAL	AM	MD	PM
APPROACH LANES	16	9		7
	1340	875		465
	4	1		3

LOCATION #: 19-1633-002

TURNING MOVEMENT COUNT

Wilmont Rd. & Garden Stone Dr.
(Intersection Name)

WEDNESDAY
Day

12/11/19
Date

COUNT PERIODS	
AM	700AM - 900AM
NOON	-
PM	400PM - 600PM

AM PEAK HOUR 700 AM
 NOON PEAK HOUR _____
 PM PEAK HOUR 445 PM

Intersection Turning Movement Prepared by:



FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745



N-S STREET: **Wilmont Rd.** DATE: **12/11/19** LOCATION: **Tucson**
 E-W STREET: **Garden Stone Dr.** DAY: **WEDNESDAY** PROJECT# **19-1633-002**

LANES:	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
	0	1	1	1	1	0	0	1	0	0	1	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	0	215	0	1	98	2	2	0	3	0	0	7	328
7:15 AM	5	220	0	0	106	0	6	0	11	0	0	14	362
7:30 AM	2	247	1	0	125	1	3	0	8	0	0	13	400
7:45 AM	2	193	0	4	110	3	2	1	2	0	0	6	323
8:00 AM	1	164	1	6	92	1	4	0	1	0	1	9	280
8:15 AM	3	133	2	1	76	0	4	0	4	0	0	7	230
8:30 AM	2	96	0	1	61	1	3	0	3	0	0	1	168
8:45 AM	1	90	1	2	66	2	4	0	1	1	0	5	173
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													
10:45 AM													
11:00 AM													
11:15 AM													
11:30 AM													
11:45 AM													

TOTAL	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
Volumes	16	1358	5	15	734	10	28	1	33	1	1	62	2264
Approach %	1.16	98.48	0.36	1.98	96.71	1.32	45.16	1.61	53.23	1.56	1.56	96.88	
App/Depart	1379	/	1448	759	/	768	62	/	21	64	/	27	

AM Peak Hr Begins at: 700 AM

PEAK

Volumes	9	875	1	5	439	6	13	1	24	0	0	40	1413
Approach %	1.02	98.87	0.11	1.11	97.56	1.33	34.21	2.63	63.16	0.00	0.00	100.00	

PEAK HR.

FACTOR:	0.885	0.893	0.559	0.714	0.883
---------	-------	-------	-------	-------	-------

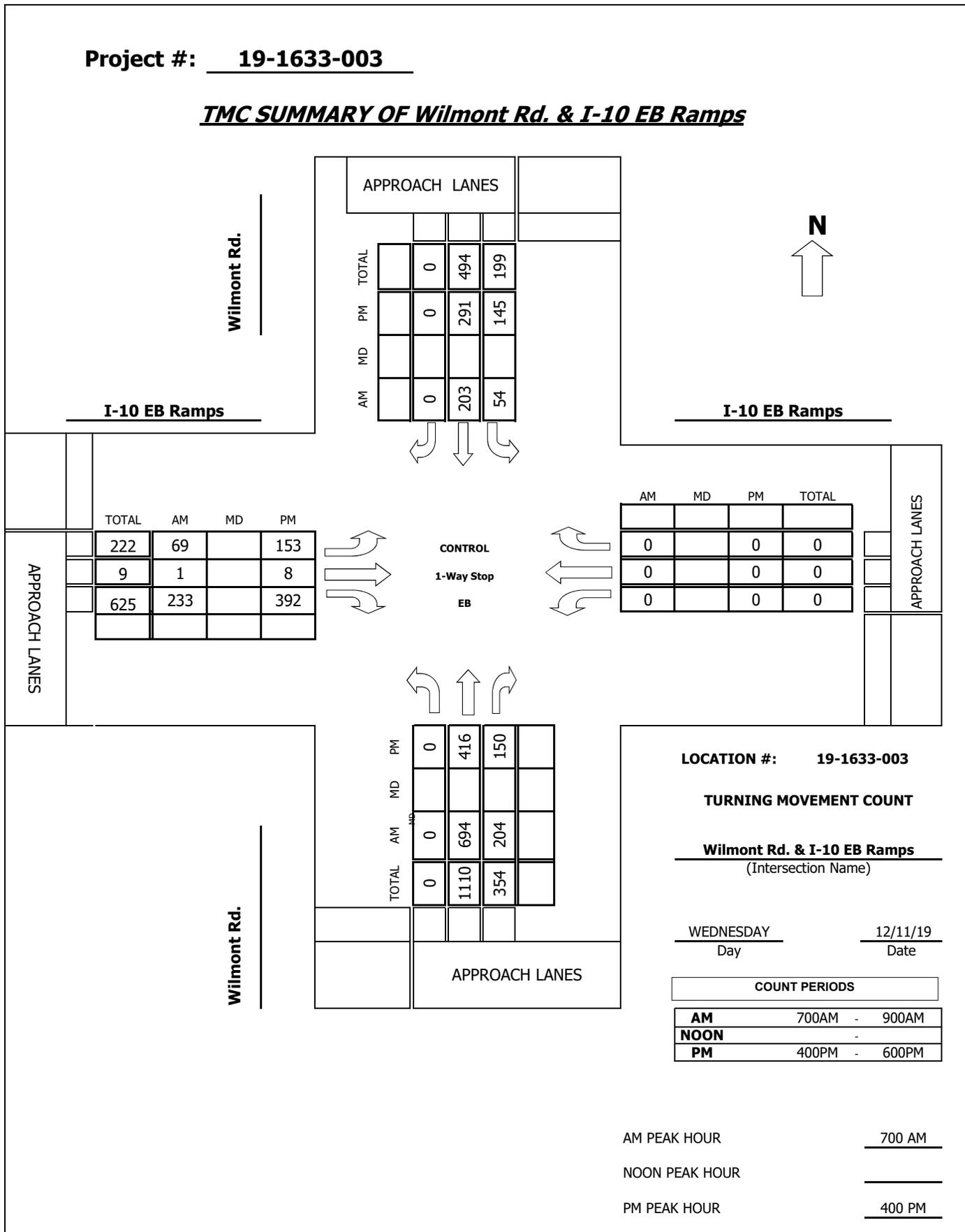
CONTROL: **2-Way Stop (EB & WB)**
 COMMENT 1: **West leg is the driveway to gas station**
 GPS: **32.112156, -110.857951**

**Intersection Turning Movement
Prepared by:**



Project #: 19-1633-003

TMC SUMMARY OF Wilmont Rd. & I-10 EB Ramps



Wilmont Rd.

I-10 EB Ramps

N

I-10 EB Ramps

APPROACH LANES

TOTAL	AM	MD	PM
222	69		153
9	1		8
625	233		392

CONTROL
1-Way Stop
EB

AM	MD	PM	TOTAL
0		0	0
0		0	0
0		0	0

APPROACH LANES

Wilmont Rd.

TOTAL	AM	MD	PM
0			0
1110	694		416
354	204		150

APPROACH LANES

LOCATION #: 19-1633-003

TURNING MOVEMENT COUNT

Wilmont Rd. & I-10 EB Ramps
(Intersection Name)

WEDNESDAY
Day

12/11/19
Date

COUNT PERIODS

AM	700AM - 900AM
NOON	-
PM	400PM - 600PM

AM PEAK HOUR 700 AM

NOON PEAK HOUR

PM PEAK HOUR 400 PM

Intersection Turning Movement Prepared by:



FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745



N-S STREET: **Wilmont Rd.** DATE: **12/11/19** LOCATION: **Tucson**
 E-W STREET: **I-10 EB Ramps** DAY: **WEDNESDAY** PROJECT#: **19-1633-003**

LANES:	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
	0	1	1	1	1	0	0	1	0	0	0	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	0	181	38	16	29	0	24	0	69	0	0	0	357
7:15 AM	0	163	62	11	52	0	10	0	49	0	0	0	347
7:30 AM	0	199	56	11	65	0	20	0	57	0	0	0	408
7:45 AM	0	151	48	16	57	0	15	1	58	0	0	0	346
8:00 AM	0	132	42	5	44	0	17	2	47	0	0	0	289
8:15 AM	0	105	33	8	36	0	16	0	46	0	0	0	244
8:30 AM	0	83	17	7	20	0	28	2	43	0	0	0	200
8:45 AM	0	69	23	12	21	0	12	2	47	0	0	0	186
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													
10:45 AM													
11:00 AM													
11:15 AM													
11:30 AM													
11:45 AM													

TOTAL	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
Volumes	0	1083	319	86	324	0	142	7	416	0	0	0	2377
Approach %	0.00	77.25	22.75	20.98	79.02	0.00	25.13	1.24	73.63	####	####	####	
App/Depart	1402	/	1225	410	/	740	565	/	412	0	/	0	

AM Peak Hr Begins at: 700 AM

PEAK

Volumes	0	694	204	54	203	0	69	1	233	0	0	0	1458
Approach %	0.00	77.28	22.72	21.01	78.99	0.00	22.77	0.33	76.90	####	####	####	

PEAK HR.

FACTOR:	0.880	0.845	0.815	0.000	0.893
---------	-------	-------	-------	-------	-------

CONTROL: **1-Way Stop (EB)**
 COMMENT 1:
 GPS: **32.113950, -110.857985**

Intersection Turning Movement



FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745



N-S STREET: **Wilmont Rd.** DATE: **12/11/19** LOCATION: **Tucson**
 E-W STREET: **I-10 EB Ramps** DAY: **WEDNESDAY** PROJECT#: **19-1633-003**

LANES:	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
	0	1	1	1	1	0	0	1	0	0	0	0	

1:00 PM													
1:15 PM													
1:30 PM													
1:45 PM													
2:00 PM													
2:15 PM													
2:30 PM													
2:45 PM													
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	0	146	38	32	63	0	28	2	84	0	0	0	393
4:15 PM	0	98	40	41	69	0	48	2	109	0	0	0	407
4:30 PM	0	99	38	33	82	0	31	2	86	0	0	0	371
4:45 PM	0	73	34	39	77	0	46	2	113	0	0	0	384
5:00 PM	0	98	33	20	83	0	40	3	103	0	0	0	380
5:15 PM	0	95	30	15	82	0	43	5	119	0	0	0	389
5:30 PM	0	88	41	23	77	0	30	4	104	0	0	0	367
5:45 PM	0	83	26	26	59	0	38	1	82	0	0	0	315
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

TOTAL	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
Volumes	0	780	280	229	592	0	304	21	800	0	0	0	3006
Approach %	0.00	73.58	26.42	27.89	72.11	0.00	27.02	1.87	71.11	####	####	####	
App/Depart	1060	/	1084	821	/	1392	1125	/	530	0	/	0	

PM Peak Hr Begins at: 400 PM

PEAK

Volumes	0	416	150	145	291	0	153	8	392	0	0	0	1555
Approach %	0.00	73.50	26.50	33.26	66.74	0.00	27.67	1.45	70.89	####	####	####	

PEAK HR.

FACTOR:	0.769	0.940	0.859	0.000	0.955
---------	-------	-------	-------	-------	-------

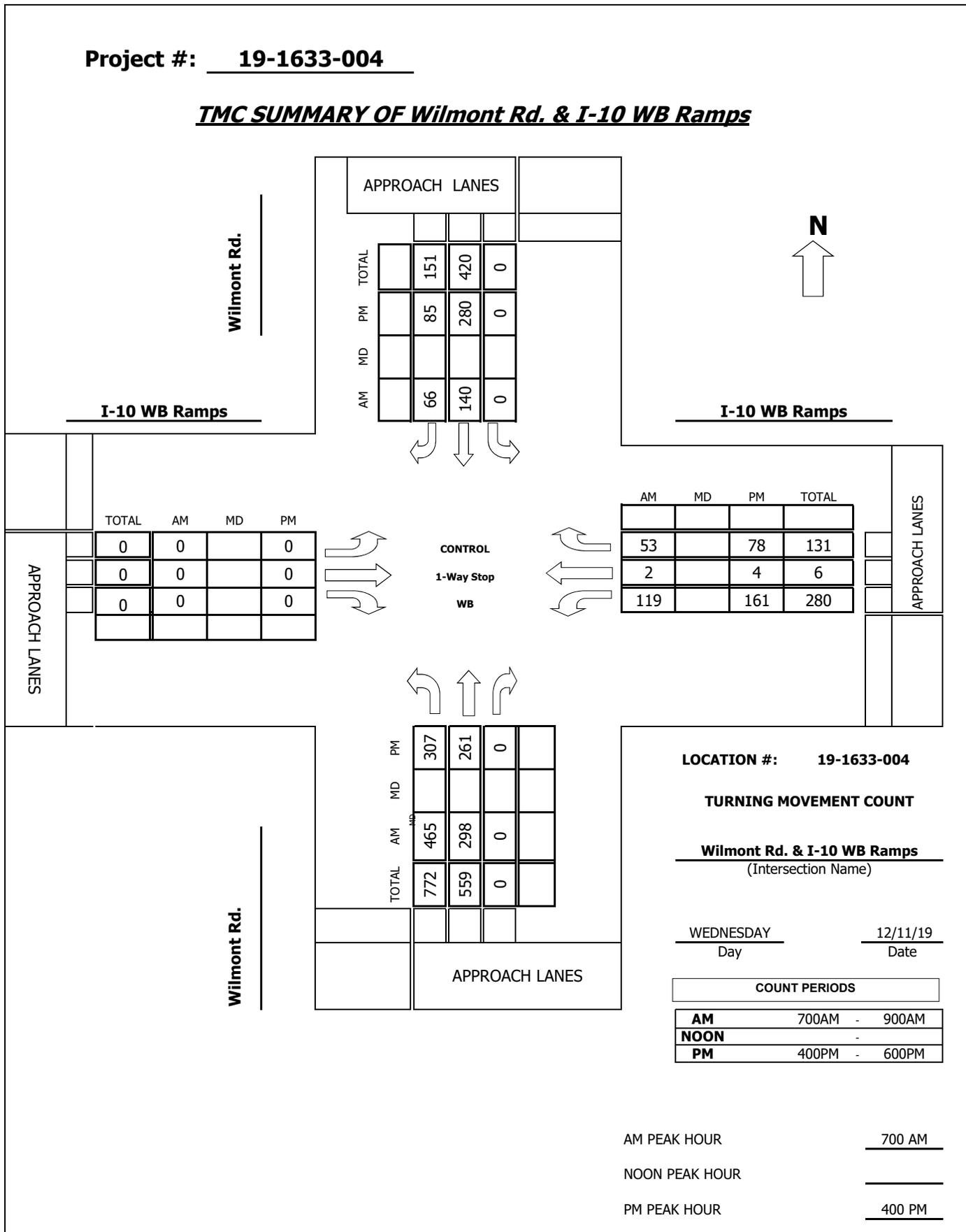
CONTROL: **1-Way Stop (EB)**
 COMMENT 1: **0**
 GPS: **32.113950, -110.857985**

**Intersection Turning Movement
Prepared by:**



Project #: 19-1633-004

TMC SUMMARY OF Wilmont Rd. & I-10 WB Ramps



LOCATION #: 19-1633-004

TURNING MOVEMENT COUNT

Wilmont Rd. & I-10 WB Ramps
(Intersection Name)

WEDNESDAY 12/11/19
Day Date

COUNT PERIODS	
AM	700AM - 900AM
NOON	-
PM	400PM - 600PM

AM PEAK HOUR 700 AM
NOON PEAK HOUR _____
PM PEAK HOUR 400 PM

Intersection Turning Movement Prepared by:



FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745



N-S STREET: **Wilmont Rd.** DATE: **12/11/19** LOCATION: **Tucson**
 E-W STREET: **I-10 WB Ramps** DAY: **WEDNESDAY** PROJECT#: **19-1633-004**

LANES:	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
	1	1	0	0	1	1	0	0	0	0.5	0.5	1	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	129	75	0	0	20	19	0	0	0	27	0	13	283
7:15 AM	98	76	0	0	29	16	0	0	0	32	1	15	267
7:30 AM	135	82	0	0	40	15	0	0	0	37	0	9	318
7:45 AM	103	65	0	0	51	16	0	0	0	23	1	16	275
8:00 AM	87	67	0	0	28	25	0	0	0	24	0	14	245
8:15 AM	74	48	0	0	32	15	0	0	0	14	0	15	198
8:30 AM	62	50	0	0	20	34	0	0	0	8	0	17	191
8:45 AM	49	34	0	0	22	23	0	0	0	12	0	8	148
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													
10:45 AM													
11:00 AM													
11:15 AM													
11:30 AM													
11:45 AM													

TOTAL	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
Volumes	737	497	0	0	242	163	0	0	0	177	2	107	1925
Approach %	59.72	40.28	0.00	0.00	59.75	40.25	####	####	####	61.89	0.70	37.41	
App/Depart	1234	/	604	405	/	419	0	/	0	286	/	902	

AM Peak Hr Begins at: 700 AM

PEAK

Volumes	465	298	0	0	140	66	0	0	0	119	2	53	1143
Approach %	60.94	39.06	0.00	0.00	67.96	32.04	####	####	####	68.39	1.15	30.46	

PEAK HR.

FACTOR:	0.879	0.769	0.000	0.906	0.899
---------	-------	-------	-------	-------	-------

CONTROL: **1-Way Stop (WB)**
 COMMENT 1:
 GPS: **32.115080, -110.857990**

Intersection Turning Movement



FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745



N-S STREET: **Wilmont Rd.** DATE: **12/11/19** LOCATION: **Tucson**
 E-W STREET: **I-10 WB Ramps** DAY: **WEDNESDAY** PROJECT#: **19-1633-004**

LANES:	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
	1	1	0	0	1	1	0	0	0	0.5	0.5	1	

1:00 PM													
1:15 PM													
1:30 PM													
1:45 PM													
2:00 PM													
2:15 PM													
2:30 PM													
2:45 PM													
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	115	54	0	0	52	21	0	0	0	45	1	25	313
4:15 PM	82	66	0	0	67	24	0	0	0	47	0	21	307
4:30 PM	59	72	0	0	76	23	0	0	0	38	1	19	288
4:45 PM	51	69	0	0	85	17	0	0	0	31	2	13	268
5:00 PM	64	75	0	0	66	19	0	0	0	41	1	12	278
5:15 PM	73	66	0	0	55	12	0	0	0	43	0	14	263
5:30 PM	55	65	0	0	67	16	0	0	0	35	0	11	249
5:45 PM	59	63	0	0	52	19	0	0	0	35	1	13	242
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

TOTAL	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
Volumes	558	530	0	0	520	151	0	0	0	315	6	128	2208
Approach %	51.29	48.71	0.00	0.00	77.50	22.50	####	####	####	70.16	1.34	28.51	
App/Depart	1088	/	658	671	/	835	0	/	0	449	/	715	

PM Peak Hr Begins at: 400 PM

PEAK	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
Volumes	307	261	0	0	280	85	0	0	0	161	4	78	1176
Approach %	54.05	45.95	0.00	0.00	76.71	23.29	####	####	####	66.26	1.65	32.10	

PEAK HR. FACTOR:	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
	0.840			0.895			0.000			0.856			0.939

CONTROL: **1-Way Stop (WB)**
 COMMENT 1: **0**
 GPS: **32.115080, -110.857990**



**BLACKHAWK
WILMOT ROAD/INTERSTATE 10
TRAFFIC IMPACT ANALYSIS**

APPENDIX

Trip Generation Calculations

Single Family Detached Housing (LUC 210)

TRIP GENERATION CALCULATIONS ARE BASED ON THE INSTITUTE OF TRANSPORTATION ENGINEERS' TRIP GENERATION, 10TH EDITION.

THE ITE LAND USE CODE IS

Single Family Detached Housing (210), General Urban/Suburban

Weekday

Fitted Curve $LN(T)=0.92 \ln(X) + 2.71$

Where X = 313 Dwelling Units

$$T = 2,972 \text{ VTPD}$$

$$\text{ENTER: } (0.5) * (2972) = 1,486 \text{ VTPD}$$

$$\text{EXIT: } (0.5) * (2972) = 1,486 \text{ VTPD}$$

AM PEAK HOUR (ONE HOUR BETWEEN 7 AND 9 AM)

Fitted Curve $T=0.71(X) + 4.80$

Where X = 313 Dwelling Units

$$T = 228 \text{ VPH}$$

$$\text{ENTER: } (0.25) * (228) = 57 \text{ VPH}$$

$$\text{EXIT: } (0.75) * (228) = 171 \text{ VPH}$$

PM PEAK HOUR (ONE HOUR BETWEEN 4 AND 6 PM)

Fitted Curve $LN(T)=0.96 \ln(X) + 0.2$

Where X = 313 Dwelling Units

$$T = 304 \text{ VPH}$$

$$\text{ENTER: } (0.63) * (304) = 192 \text{ VPH}$$

$$\text{EXIT: } (0.37) * (304) = 112 \text{ VPH}$$

*where, T = trip ends

TRIP GENERATION SUMMARY

WEEKDAY

2,972 VTPD

AM PEAK HOUR (ONE HOUR BETWEEN 7 AND 9 AM)

228 VPH

PM PEAK HOUR (ONE HOUR BETWEEN 4 AND 6 PM)

304 VPH



**BLACKHAWK
WILMOT ROAD/INTERSTATE 10
TRAFFIC IMPACT ANALYSIS**

APPENDIX

Capacity Calculations

HCM Signalized Intersection Capacity Analysis

1: Wilmot Road & WB I-10 Ramps

12/20/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	0	0	0	119	2	53	465	299	0	0	140	66	
Future Volume (vph)	0	0	0	119	2	53	465	299	0	0	140	66	
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)					4.0	4.0	5.0	5.0			5.0	5.0	
Lane Util. Factor					1.00	1.00	1.00	1.00			1.00	1.00	
Frbp, ped/bikes					1.00	0.91	1.00	1.00			1.00	0.91	
Flpb, ped/bikes					1.00	1.00	1.00	1.00			1.00	1.00	
Frt					1.00	0.85	1.00	1.00			1.00	0.85	
Flt Protected					0.95	1.00	0.95	1.00			1.00	1.00	
Satd. Flow (prot)					1775	1435	1770	1863			1863	1435	
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00	
Satd. Flow (perm)					1775	1435	1770	1863			1863	1435	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	
Adj. Flow (vph)	0	0	0	132	2	59	517	332	0	0	156	73	
RTOR Reduction (vph)	0	0	0	0	0	48	0	0	0	0	0	51	
Lane Group Flow (vph)	0	0	0	0	134	11	517	332	0	0	156	22	
Confl. Peds. (#/hr)						20						20	
Turn Type				Perm	NA	Perm	Prot	NA			NA	Perm	
Protected Phases					4 12		1	2 1			2		
Permitted Phases				4 12		4 12						2	
Actuated Green, G (s)					22.1	22.1	47.8	88.9			36.1	36.1	
Effective Green, g (s)					22.1	22.1	47.8	88.9			36.1	36.1	
Actuated g/C Ratio					0.18	0.18	0.40	0.74			0.30	0.30	
Clearance Time (s)							5.0				5.0	5.0	
Vehicle Extension (s)							4.7				4.7	4.7	
Lane Grp Cap (vph)					326	264	705	1380			560	431	
v/s Ratio Prot							c0.29	0.18			c0.08		
v/s Ratio Perm					0.08	0.01						0.02	
v/c Ratio					0.41	0.04	0.73	0.24			0.28	0.05	
Uniform Delay, d1					43.2	40.2	30.7	4.9			32.0	29.8	
Progression Factor					1.00	1.00	0.27	0.08			1.00	1.00	
Incremental Delay, d2					0.8	0.1	3.6	0.1			1.2	0.2	
Delay (s)					44.1	40.3	11.9	0.5			33.2	30.0	
Level of Service					D	D	B	A			C	C	
Approach Delay (s)		0.0			42.9			7.5			32.2		
Approach LOS		A			D			A			C		
Intersection Summary													
HCM 2000 Control Delay			17.3		HCM 2000 Level of Service						B		
HCM 2000 Volume to Capacity ratio			0.53										
Actuated Cycle Length (s)			120.0		Sum of lost time (s)						18.0		
Intersection Capacity Utilization			60.7%		ICU Level of Service						B		
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis

2: Wilmot Road & EB I-10 Ramps

12/20/2019

														
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations														
Traffic Volume (vph)	69	1	233	0	0	0	0	694	204	54	203	0		
Future Volume (vph)	69	1	233	0	0	0	0	694	204	54	203	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Total Lost time (s)		4.0	4.0					4.0		4.0	4.0			
Lane Util. Factor		1.00	1.00					0.95		1.00	1.00			
Frbp, ped/bikes		1.00	0.94					0.98		1.00	1.00			
Flpb, ped/bikes		1.00	1.00					1.00		1.00	1.00			
Frt		1.00	0.85					0.97		1.00	1.00			
Flt Protected		0.95	1.00					1.00		0.95	1.00			
Satd. Flow (prot)		1775	1495					3346		1770	1863			
Flt Permitted		0.95	1.00					1.00		0.95	1.00			
Satd. Flow (perm)		1775	1495					3346		1770	1863			
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90		
Adj. Flow (vph)	77	1	259	0	0	0	0	771	227	60	226	0		
RTOR Reduction (vph)	0	0	181	0	0	0	0	25	0	0	0	0		
Lane Group Flow (vph)	0	78	78	0	0	0	0	973	0	60	226	0		
Confl. Peds. (#/hr)			20						20					
Turn Type	Perm	NA	Perm					NA		Prot	NA			
Protected Phases		8 16						6		5	5 6			
Permitted Phases	8 16		8 16											
Actuated Green, G (s)		36.2	36.2					42.7		29.1	75.8			
Effective Green, g (s)		36.2	36.2					42.7		29.1	75.8			
Actuated g/C Ratio		0.30	0.30					0.36		0.24	0.63			
Clearance Time (s)								4.0		4.0				
Vehicle Extension (s)								4.7		4.7				
Lane Grp Cap (vph)		535	450					1190		429	1176			
v/s Ratio Prot								c0.29		0.03	c0.12			
v/s Ratio Perm		0.04	c0.05											
v/c Ratio		0.15	0.17					0.82		0.14	0.19			
Uniform Delay, d1		30.6	30.9					35.1		35.6	9.3			
Progression Factor		1.00	1.00					1.00		0.56	0.92			
Incremental Delay, d2		0.1	0.2					5.0		0.3	0.1			
Delay (s)		30.7	31.1					40.1		20.3	8.7			
Level of Service		C	C					D		C	A			
Approach Delay (s)		31.0			0.0			40.1			11.1			
Approach LOS		C			A			D			B			
Intersection Summary														
HCM 2000 Control Delay			33.1									HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio			0.46											
Actuated Cycle Length (s)			120.0							18.0				
Intersection Capacity Utilization			60.7%										ICU Level of Service	B
Analysis Period (min)			15											
c	Critical Lane Group													

HCM 6th TWSC
 9: Wilmot Road & Garden Stone Drive

12/23/2019

Intersection						
Int Delay, s/veh	0.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↙	↗	↑	↗	↙	↑
Traffic Vol, veh/h	0	40	884	1	5	439
Future Vol, veh/h	0	40	884	1	5	439
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	0	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	44	982	1	6	488

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1482	982	0	0	983	0
Stage 1	982	-	-	-	-	-
Stage 2	500	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	138	302	-	-	703	-
Stage 1	363	-	-	-	-	-
Stage 2	609	-	-	-	-	-
Platoon blocked, %			-	-		
Mov Cap-1 Maneuver	137	302	-	-	703	-
Mov Cap-2 Maneuver	137	-	-	-	-	-
Stage 1	360	-	-	-	-	-
Stage 2	609	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT
Capacity (veh/h)	-	-	302	703
HCM Lane V/C Ratio	-	-	0.147	0.008
HCM Control Delay (s)	-	-	0	19
HCM Lane LOS	-	-	A	C
HCM 95th %tile Q(veh)	-	-	0.5	0

HCM 6th TWSC
12: Wilmot Road & Diablo Sunrise Road

12/23/2019

Intersection												
Int Delay, s/veh	1.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕		↕	↑	↕	↕	↕	
Traffic Vol, veh/h	18	0	3	1	0	34	0	822	2	3	447	1
Future Vol, veh/h	18	0	3	1	0	34	0	822	2	3	447	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	0	-	-	0	-	0	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	20	0	3	1	0	38	0	913	2	3	497	1

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1437	1419	498	1418	1417	913	498	0	0	915	0	0
Stage 1	504	504	-	913	913	-	-	-	-	-	-	-
Stage 2	933	915	-	505	504	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	111	137	572	114	137	331	1066	-	-	745	-	-
Stage 1	550	541	-	328	352	-	-	-	-	-	-	-
Stage 2	319	352	-	549	541	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	98	136	572	113	136	331	1066	-	-	745	-	-
Mov Cap-2 Maneuver	98	136	-	113	136	-	-	-	-	-	-	-
Stage 1	550	539	-	328	352	-	-	-	-	-	-	-
Stage 2	283	352	-	544	539	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	45.9		17.9		0		0.1	
HCM LOS	E		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1066	-	-	111	113	331	745	-	-
HCM Lane V/C Ratio	-	-	-	0.21	0.01	0.114	0.004	-	-
HCM Control Delay (s)	0	-	-	45.9	37.2	17.3	9.9	-	-
HCM Lane LOS	A	-	-	E	E	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.7	0	0.4	0	-	-

HCM 6th TWSC
15: Wilmot Road & Shell Driveway

12/23/2019

Intersection						
Int Delay, s/veh	0.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	13	24	9	875	444	6
Future Vol, veh/h	13	24	9	875	444	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	14	27	10	972	493	7

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1489	497	500	0	-	0
Stage 1	497	-	-	-	-	-
Stage 2	992	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	136	573	1064	-	-	-
Stage 1	611	-	-	-	-	-
Stage 2	359	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	135	573	1064	-	-	-
Mov Cap-2 Maneuver	135	-	-	-	-	-
Stage 1	606	-	-	-	-	-
Stage 2	359	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	20.9	0.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1064	-	268	-	-
HCM Lane V/C Ratio	0.009	-	0.153	-	-
HCM Control Delay (s)	8.4	-	20.9	-	-
HCM Lane LOS	A	-	C	-	-
HCM 95th %tile Q(veh)	0	-	0.5	-	-

HCM Signalized Intersection Capacity Analysis

1: Wilmot Road & WB I-10 Ramps

12/20/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	0	0	0	161	4	78	307	261	0	0	280	85	
Future Volume (vph)	0	0	0	161	4	78	307	261	0	0	280	85	
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)					4.0	4.0	5.0	5.0			5.0	5.0	
Lane Util. Factor					1.00	1.00	1.00	1.00			1.00	1.00	
Frbp, ped/bikes					1.00	0.91	1.00	1.00			1.00	0.91	
Flpb, ped/bikes					1.00	1.00	1.00	1.00			1.00	1.00	
Frt					1.00	0.85	1.00	1.00			1.00	0.85	
Flt Protected					0.95	1.00	0.95	1.00			1.00	1.00	
Satd. Flow (prot)					1776	1435	1770	1863			1863	1435	
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00	
Satd. Flow (perm)					1776	1435	1770	1863			1863	1435	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	
Adj. Flow (vph)	0	0	0	179	4	87	341	290	0	0	311	94	
RTOR Reduction (vph)	0	0	0	0	0	70	0	0	0	0	0	57	
Lane Group Flow (vph)	0	0	0	0	183	17	341	290	0	0	311	37	
Confl. Peds. (#/hr)						20						20	
Turn Type				Perm	NA	Perm	Prot	NA			NA	Perm	
Protected Phases					4 12		1	2 1			2		
Permitted Phases				4 12		4 12						2	
Actuated Green, G (s)					23.2	23.2	35.6	87.8			47.2	47.2	
Effective Green, g (s)					23.2	23.2	35.6	87.8			47.2	47.2	
Actuated g/C Ratio					0.19	0.19	0.30	0.73			0.39	0.39	
Clearance Time (s)							5.0				5.0	5.0	
Vehicle Extension (s)							4.7				4.7	4.7	
Lane Grp Cap (vph)					343	277	525	1363			732	564	
v/s Ratio Prot							c0.19	0.16			c0.17		
v/s Ratio Perm					0.10	0.01						0.03	
v/c Ratio					0.53	0.06	0.65	0.21			0.42	0.07	
Uniform Delay, d1					43.5	39.5	36.8	5.1			26.5	22.7	
Progression Factor					1.00	1.00	0.50	0.16			1.00	1.00	
Incremental Delay, d2					1.6	0.1	3.1	0.1			1.8	0.2	
Delay (s)					45.1	39.6	21.5	0.9			28.3	22.9	
Level of Service					D	D	C	A			C	C	
Approach Delay (s)		0.0			43.3			12.0			27.1		
Approach LOS		A			D			B			C		
Intersection Summary													
HCM 2000 Control Delay			23.2		HCM 2000 Level of Service						C		
HCM 2000 Volume to Capacity ratio			0.54										
Actuated Cycle Length (s)			120.0		Sum of lost time (s)						18.0		
Intersection Capacity Utilization			54.6%		ICU Level of Service						A		
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis

2: Wilmot Road & EB I-10 Ramps

12/20/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	153	8	392	0	0	0	0	416	150	145	291	0	
Future Volume (vph)	153	8	392	0	0	0	0	416	150	145	291	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		4.0	4.0					4.0		4.0	4.0		
Lane Util. Factor		1.00	1.00					0.95		1.00	1.00		
Frbp, ped/bikes		1.00	0.94					0.98		1.00	1.00		
Flpb, ped/bikes		1.00	1.00					1.00		1.00	1.00		
Frt		1.00	0.85					0.96		1.00	1.00		
Flt Protected		0.95	1.00					1.00		0.95	1.00		
Satd. Flow (prot)		1778	1495					3314		1770	1863		
Flt Permitted		0.95	1.00					1.00		0.95	1.00		
Satd. Flow (perm)		1778	1495					3314		1770	1863		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	
Adj. Flow (vph)	170	9	436	0	0	0	0	462	167	161	323	0	
RTOR Reduction (vph)	0	0	310	0	0	0	0	33	0	0	0	0	
Lane Group Flow (vph)	0	179	126	0	0	0	0	596	0	161	323	0	
Confl. Peds. (#/hr)			20						20				
Turn Type	Perm	NA	Perm					NA		Prot	NA		
Protected Phases		8 16						6		5	5 6		
Permitted Phases	8 16		8 16										
Actuated Green, G (s)		34.7	34.7					27.0		46.3	77.3		
Effective Green, g (s)		34.7	34.7					27.0		46.3	77.3		
Actuated g/C Ratio		0.29	0.29					0.22		0.39	0.64		
Clearance Time (s)								4.0		4.0			
Vehicle Extension (s)								4.7		4.7			
Lane Grp Cap (vph)		514	432					745		682	1200		
v/s Ratio Prot								c0.18		0.09	c0.17		
v/s Ratio Perm		0.10	0.08										
v/c Ratio		0.35	0.29					0.80		0.24	0.27		
Uniform Delay, d1		33.7	33.1					44.0		24.9	9.2		
Progression Factor		1.00	1.00					1.00		0.80	0.77		
Incremental Delay, d2		0.4	0.4					6.9		0.3	0.2		
Delay (s)		34.1	33.5					50.9		20.2	7.3		
Level of Service		C	C					D		C	A		
Approach Delay (s)		33.7			0.0			50.9			11.6		
Approach LOS		C			A			D			B		
Intersection Summary													
HCM 2000 Control Delay			33.7									HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.46										
Actuated Cycle Length (s)			120.0									Sum of lost time (s)	18.0
Intersection Capacity Utilization			54.6%									ICU Level of Service	A
Analysis Period (min)			15										
c	Critical Lane Group												

HCM 6th TWSC
 9: Wilmot Road & Garden Stone Drive

12/23/2019

Intersection						
Int Delay, s/veh	0.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↗	↘	↑
Traffic Vol, veh/h	1	23	465	3	42	736
Future Vol, veh/h	1	23	465	3	42	736
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	0	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	26	517	3	47	818

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1429	517	0	0	520	0
Stage 1	517	-	-	-	-	-
Stage 2	912	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	149	558	-	-	1046	-
Stage 1	598	-	-	-	-	-
Stage 2	392	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	142	558	-	-	1046	-
Mov Cap-2 Maneuver	142	-	-	-	-	-
Stage 1	571	-	-	-	-	-
Stage 2	392	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.6	0	0.5
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	142	558	1046
HCM Lane V/C Ratio	-	-	0.008	0.046	0.045
HCM Control Delay (s)	-	-	30.6	11.8	8.6
HCM Lane LOS	-	-	D	B	A
HCM 95th %tile Q(veh)	-	-	0	0.1	0.1

HCM 6th TWSC
 12: Wilmot Road & Diablo Sunrise Road

12/23/2019

Intersection												
Int Delay, s/veh	0.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↵	↵		↵	↑	↗	↵	↗	
Traffic Vol, veh/h	14	0	1	3	1	19	1	439	4	26	701	18
Future Vol, veh/h	14	0	1	3	1	19	1	439	4	26	701	18
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	0	-	-	0	-	0	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	16	0	1	3	1	21	1	488	4	29	779	20

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1350	1341	789	1338	1347	488	799	0	0	492	0	0
Stage 1	847	847	-	490	490	-	-	-	-	-	-	-
Stage 2	503	494	-	848	857	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	128	152	391	130	151	580	824	-	-	1071	-	-
Stage 1	357	378	-	560	549	-	-	-	-	-	-	-
Stage 2	551	546	-	356	374	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	120	148	391	127	147	580	824	-	-	1071	-	-
Mov Cap-2 Maneuver	120	148	-	127	147	-	-	-	-	-	-	-
Stage 1	357	368	-	559	548	-	-	-	-	-	-	-
Stage 2	529	545	-	345	364	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	37.9		15.2		0		0.3	
HCM LOS	E		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	824	-	-	126	127	506	1071	-	-
HCM Lane V/C Ratio	0.001	-	-	0.132	0.026	0.044	0.027	-	-
HCM Control Delay (s)	9.4	-	-	37.9	34.1	12.4	8.5	-	-
HCM Lane LOS	A	-	-	E	D	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.4	0.1	0.1	0.1	-	-

HCM 6th TWSC
15: Wilmot Road & Shell Driveway

12/23/2019

Intersection						
Int Delay, s/veh	1.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y		Y	↑	↑	
Traffic Vol, veh/h	29	34	9	875	444	6
Future Vol, veh/h	29	34	9	875	444	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	32	38	10	972	493	7

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1489	497	500	0	-	0
Stage 1	497	-	-	-	-	-
Stage 2	992	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	136	573	1064	-	-	-
Stage 1	611	-	-	-	-	-
Stage 2	359	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	135	573	1064	-	-	-
Mov Cap-2 Maneuver	135	-	-	-	-	-
Stage 1	606	-	-	-	-	-
Stage 2	359	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	27.4	0.1	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1064	-	230	-	-
HCM Lane V/C Ratio	0.009	-	0.304	-	-
HCM Control Delay (s)	8.4	-	27.4	-	-
HCM Lane LOS	A	-	D	-	-
HCM 95th %tile Q(veh)	0	-	1.2	-	-

HCM Signalized Intersection Capacity Analysis

1: Wilmot Road & WB I-10 Ramps

12/20/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	0	0	0	124	3	56	484	311	0	0	146	69	
Future Volume (vph)	0	0	0	124	3	56	484	311	0	0	146	69	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)					4.0	4.0	5.0	5.0			5.0	5.0	
Lane Util. Factor					1.00	1.00	1.00	1.00			1.00	1.00	
Frbp, ped/bikes					1.00	0.91	1.00	1.00			1.00	0.91	
Flpb, ped/bikes					1.00	1.00	1.00	1.00			1.00	1.00	
Frt					1.00	0.85	1.00	1.00			1.00	0.85	
Flt Protected					0.95	1.00	0.95	1.00			1.00	1.00	
Satd. Flow (prot)					1776	1435	1770	1863			1863	1435	
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00	
Satd. Flow (perm)					1776	1435	1770	1863			1863	1435	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	
Adj. Flow (vph)	0	0	0	138	3	62	538	346	0	0	162	77	
RTOR Reduction (vph)	0	0	0	0	0	50	0	0	0	0	0	55	
Lane Group Flow (vph)	0	0	0	0	141	12	538	346	0	0	162	22	
Confl. Peds. (#/hr)						20						20	
Turn Type				Perm	NA	Perm	Prot	NA			NA	Perm	
Protected Phases					4 12		1	2 1			2		
Permitted Phases				4 12		4 12						2	
Actuated Green, G (s)					22.3	22.3	49.2	88.7			34.5	34.5	
Effective Green, g (s)					22.3	22.3	49.2	88.7			34.5	34.5	
Actuated g/C Ratio					0.19	0.19	0.41	0.74			0.29	0.29	
Clearance Time (s)							5.0				5.0	5.0	
Vehicle Extension (s)							4.7				4.7	4.7	
Lane Grp Cap (vph)					330	266	725	1377			535	412	
v/s Ratio Prot							c0.30	0.19			c0.09		
v/s Ratio Perm					0.08	0.01						0.02	
v/c Ratio					0.43	0.04	0.74	0.25			0.30	0.05	
Uniform Delay, d1					43.2	40.1	30.0	5.0			33.4	30.9	
Progression Factor					1.00	1.00	0.26	0.08			1.00	1.00	
Incremental Delay, d2					0.9	0.1	3.6	0.1			1.5	0.2	
Delay (s)					44.1	40.2	11.5	0.5			34.8	31.2	
Level of Service					D	D	B	A			C	C	
Approach Delay (s)		0.0			42.9			7.2			33.6		
Approach LOS		A			D			A			C		
Intersection Summary													
HCM 2000 Control Delay			17.5		HCM 2000 Level of Service						B		
HCM 2000 Volume to Capacity ratio			0.55										
Actuated Cycle Length (s)			120.0		Sum of lost time (s)						18.0		
Intersection Capacity Utilization			61.9%		ICU Level of Service						B		
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis

2: Wilmot Road & EB I-10 Ramps

12/20/2019

														
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations														
Traffic Volume (vph)	72	2	243	0	0	0	0	723	213	57	212	0		
Future Volume (vph)	72	2	243	0	0	0	0	723	213	57	212	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Total Lost time (s)		4.0	4.0					4.0		4.0	4.0			
Lane Util. Factor		1.00	1.00					0.95		1.00	1.00			
Frbp, ped/bikes		1.00	0.94					0.98		1.00	1.00			
Flpb, ped/bikes		1.00	1.00					1.00		1.00	1.00			
Frt		1.00	0.85					0.97		1.00	1.00			
Flt Protected		0.95	1.00					1.00		0.95	1.00			
Satd. Flow (prot)		1776	1495					3345		1770	1863			
Flt Permitted		0.95	1.00					1.00		0.95	1.00			
Satd. Flow (perm)		1776	1495					3345		1770	1863			
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90		
Adj. Flow (vph)	80	2	270	0	0	0	0	803	237	63	236	0		
RTOR Reduction (vph)	0	0	192	0	0	0	0	25	0	0	0	0		
Lane Group Flow (vph)	0	82	78	0	0	0	0	1015	0	63	236	0		
Confl. Peds. (#/hr)			20							20				
Turn Type	Perm	NA	Perm					NA		Prot	NA			
Protected Phases		8 16						6		5	5 6			
Permitted Phases	8 16		8 16											
Actuated Green, G (s)		34.7	34.7					44.0		29.3	77.3			
Effective Green, g (s)		34.7	34.7					44.0		29.3	77.3			
Actuated g/C Ratio		0.29	0.29					0.37		0.24	0.64			
Clearance Time (s)								4.0		4.0				
Vehicle Extension (s)								4.7		4.7				
Lane Grp Cap (vph)		513	432					1226		432	1200			
v/s Ratio Prot								c0.30		0.04	c0.13			
v/s Ratio Perm		0.05	c0.05											
v/c Ratio		0.16	0.18					0.83		0.15	0.20			
Uniform Delay, d1		31.8	32.0					34.6		35.5	8.7			
Progression Factor		1.00	1.00					1.00		0.60	0.89			
Incremental Delay, d2		0.1	0.2					5.2		0.3	0.1			
Delay (s)		31.9	32.2					39.8		21.8	7.9			
Level of Service		C	C					D		C	A			
Approach Delay (s)		32.1			0.0			39.8			10.8			
Approach LOS		C			A			D			B			
Intersection Summary														
HCM 2000 Control Delay			33.1									HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio			0.48											
Actuated Cycle Length (s)			120.0								18.0			
Intersection Capacity Utilization			61.9%										ICU Level of Service	B
Analysis Period (min)			15											
c	Critical Lane Group													

HCM 6th TWSC
 9: Wilmot Road & Garden Stone Drive

12/23/2019

Intersection						
Int Delay, s/veh	0.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↗	↘	↑
Traffic Vol, veh/h	1	42	920	2	6	457
Future Vol, veh/h	1	42	920	2	6	457
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	0	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	47	1022	2	7	508

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1544	1022	0	0	1024	0
Stage 1	1022	-	-	-	-	-
Stage 2	522	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	126	287	-	-	678	-
Stage 1	347	-	-	-	-	-
Stage 2	595	-	-	-	-	-
Platoon blocked, %			-	-		
Mov Cap-1 Maneuver	125	287	-	-	678	-
Mov Cap-2 Maneuver	125	-	-	-	-	-
Stage 1	344	-	-	-	-	-
Stage 2	595	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20.3	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	125	287	678
HCM Lane V/C Ratio	-	-	0.009	0.163	0.01
HCM Control Delay (s)	-	-	34.1	20	10.4
HCM Lane LOS	-	-	D	C	B
HCM 95th %tile Q(veh)	-	-	0	0.6	0

HCM 6th TWSC
12: Wilmot Road & Diablo Sunrise Road

12/23/2019

Intersection												
Int Delay, s/veh	1.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕		↕	↑	↕	↕	↕	
Traffic Vol, veh/h	19	0	4	2	0	36	1	856	3	4	466	2
Future Vol, veh/h	19	0	4	2	0	36	1	856	3	4	466	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	0	-	-	0	-	0	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	21	0	4	2	0	40	1	951	3	4	518	2

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1502	1483	519	1482	1481	951	520	0	0	954	0	0
Stage 1	527	527	-	953	953	-	-	-	-	-	-	-
Stage 2	975	956	-	529	528	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	100	125	557	103	125	315	1046	-	-	720	-	-
Stage 1	535	528	-	311	338	-	-	-	-	-	-	-
Stage 2	303	336	-	533	528	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	87	124	557	102	124	315	1046	-	-	720	-	-
Mov Cap-2 Maneuver	87	124	-	102	124	-	-	-	-	-	-	-
Stage 1	534	525	-	311	338	-	-	-	-	-	-	-
Stage 2	264	336	-	526	525	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	51.7		19.3		0		0.1	
HCM LOS	F		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1046	-	-	102	102	315	720	-	-
HCM Lane V/C Ratio	0.001	-	-	0.251	0.022	0.127	0.006	-	-
HCM Control Delay (s)	8.4	-	-	51.7	41.1	18.1	10	-	-
HCM Lane LOS	A	-	-	F	E	C	B	-	-
HCM 95th %tile Q(veh)	0	-	-	0.9	0.1	0.4	0	-	-

HCM 6th TWSC
15: Wilmot Road & Shell Driveway

12/23/2019

Intersection						
Int Delay, s/veh	0.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W		W	↑	↑	
Traffic Vol, veh/h	14	25	10	911	462	7
Future Vol, veh/h	14	25	10	911	462	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	28	11	1012	513	8

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1551	517	521	0	-	0
Stage 1	517	-	-	-	-	-
Stage 2	1034	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	125	558	1045	-	-	-
Stage 1	598	-	-	-	-	-
Stage 2	343	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	124	558	1045	-	-	-
Mov Cap-2 Maneuver	124	-	-	-	-	-
Stage 1	591	-	-	-	-	-
Stage 2	343	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	22.7	0.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1045	-	247	-	-
HCM Lane V/C Ratio	0.011	-	0.175	-	-
HCM Control Delay (s)	8.5	-	22.7	-	-
HCM Lane LOS	A	-	C	-	-
HCM 95th %tile Q(veh)	0	-	0.6	-	-

HCM Signalized Intersection Capacity Analysis

1: Wilmot Road & WB I-10 Ramps

12/20/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	0	0	0	168	5	82	320	272	0	0	292	89	
Future Volume (vph)	0	0	0	168	5	82	320	272	0	0	292	89	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)					4.0	4.0	5.0	5.0			5.0	5.0	
Lane Util. Factor					1.00	1.00	1.00	1.00			1.00	1.00	
Frbp, ped/bikes					1.00	0.91	1.00	1.00			1.00	0.91	
Flpb, ped/bikes					1.00	1.00	1.00	1.00			1.00	1.00	
Frt					1.00	0.85	1.00	1.00			1.00	0.85	
Flt Protected					0.95	1.00	0.95	1.00			1.00	1.00	
Satd. Flow (prot)					1777	1435	1770	1863			1863	1435	
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00	
Satd. Flow (perm)					1777	1435	1770	1863			1863	1435	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	
Adj. Flow (vph)	0	0	0	187	6	91	356	302	0	0	324	99	
RTOR Reduction (vph)	0	0	0	0	0	73	0	0	0	0	0	61	
Lane Group Flow (vph)	0	0	0	0	193	18	356	302	0	0	324	38	
Confl. Peds. (#/hr)						20						20	
Turn Type				Perm	NA	Perm	Prot	NA			NA	Perm	
Protected Phases					4 12		1	2 1			2		
Permitted Phases				4 12		4 12						2	
Actuated Green, G (s)					23.3	23.3	36.7	87.7			46.0	46.0	
Effective Green, g (s)					23.3	23.3	36.7	87.7			46.0	46.0	
Actuated g/C Ratio					0.19	0.19	0.31	0.73			0.38	0.38	
Clearance Time (s)							5.0				5.0	5.0	
Vehicle Extension (s)							4.7				4.7	4.7	
Lane Grp Cap (vph)					345	278	541	1361			714	550	
v/s Ratio Prot							c0.20	0.16			c0.17		
v/s Ratio Perm					0.11	0.01						0.03	
v/c Ratio					0.56	0.06	0.66	0.22			0.45	0.07	
Uniform Delay, d1					43.7	39.4	36.2	5.2			27.6	23.4	
Progression Factor					1.00	1.00	0.53	0.14			1.00	1.00	
Incremental Delay, d2					2.0	0.1	3.1	0.1			2.1	0.2	
Delay (s)					45.7	39.5	22.1	0.9			29.7	23.7	
Level of Service					D	D	C	A			C	C	
Approach Delay (s)		0.0			43.7			12.4			28.3		
Approach LOS		A			D			B			C		
Intersection Summary													
HCM 2000 Control Delay			23.8		HCM 2000 Level of Service						C		
HCM 2000 Volume to Capacity ratio			0.57										
Actuated Cycle Length (s)			120.0		Sum of lost time (s)						18.0		
Intersection Capacity Utilization			56.2%		ICU Level of Service						B		
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis

2: Wilmot Road & EB I-10 Ramps

12/20/2019

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	160	9	408	0	0	0	0	433	157	151	303	0	
Future Volume (vph)	160	9	408	0	0	0	0	433	157	151	303	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		4.0	4.0					4.0		4.0	4.0		
Lane Util. Factor		1.00	1.00					0.95		1.00	1.00		
Frbp, ped/bikes		1.00	0.94					0.98		1.00	1.00		
Flpb, ped/bikes		1.00	1.00					1.00		1.00	1.00		
Frt		1.00	0.85					0.96		1.00	1.00		
Flt Protected		0.95	1.00					1.00		0.95	1.00		
Satd. Flow (prot)		1779	1495					3314		1770	1863		
Flt Permitted		0.95	1.00					1.00		0.95	1.00		
Satd. Flow (perm)		1779	1495					3314		1770	1863		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	
Adj. Flow (vph)	178	10	453	0	0	0	0	481	174	168	337	0	
RTOR Reduction (vph)	0	0	327	0	0	0	0	32	0	0	0	0	
Lane Group Flow (vph)	0	188	126	0	0	0	0	623	0	168	337	0	
Confl. Peds. (#/hr)			20						20				
Turn Type	Perm	NA	Perm					NA		Prot	NA		
Protected Phases		8 16						6		5	5 6		
Permitted Phases	8 16		8 16										
Actuated Green, G (s)		33.3	33.3					28.1		46.6	78.7		
Effective Green, g (s)		33.3	33.3					28.1		46.6	78.7		
Actuated g/C Ratio		0.28	0.28					0.23		0.39	0.66		
Clearance Time (s)								4.0		4.0			
Vehicle Extension (s)								4.7		4.7			
Lane Grp Cap (vph)		493	414					776		687	1221		
v/s Ratio Prot								c0.19		0.09	c0.18		
v/s Ratio Perm		0.11	0.08										
v/c Ratio		0.38	0.30					0.80		0.24	0.28		
Uniform Delay, d1		35.0	34.2					43.3		24.8	8.7		
Progression Factor		1.00	1.00					1.00		0.85	0.75		
Incremental Delay, d2		0.5	0.4					6.7		0.3	0.2		
Delay (s)		35.5	34.6					50.1		21.3	6.7		
Level of Service		D	C					D		C	A		
Approach Delay (s)		34.9			0.0			50.1			11.6		
Approach LOS		C			A			D			B		
Intersection Summary													
HCM 2000 Control Delay			33.9									HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.48										
Actuated Cycle Length (s)			120.0									Sum of lost time (s)	18.0
Intersection Capacity Utilization			56.2%									ICU Level of Service	B
Analysis Period (min)			15										
c Critical Lane Group													

HCM 6th TWSC
 9: Wilmot Road & Garden Stone Drive

12/23/2019

Intersection						
Int Delay, s/veh	0.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖	↗	↑	↗	↖	↑
Traffic Vol, veh/h	2	24	492	4	44	766
Future Vol, veh/h	2	24	492	4	44	766
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	0	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	27	547	4	49	851

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1496	547	0	0	551	0
Stage 1	547	-	-	-	-	-
Stage 2	949	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	135	537	-	-	1019	-
Stage 1	580	-	-	-	-	-
Stage 2	376	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	129	537	-	-	1019	-
Mov Cap-2 Maneuver	129	-	-	-	-	-
Stage 1	552	-	-	-	-	-
Stage 2	376	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.7	0	0.5
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	129	537	1019
HCM Lane V/C Ratio	-	-	0.017	0.05	0.048
HCM Control Delay (s)	-	-	33.4	12.1	8.7
HCM Lane LOS	-	-	D	B	A
HCM 95th %tile Q(veh)	-	-	0.1	0.2	0.2

HCM 6th TWSC
12: Wilmot Road & Diablo Sunrise Road

12/23/2019

Intersection												
Int Delay, s/veh	1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕		↕	↑	↕	↕	↕	↕
Traffic Vol, veh/h	15	0	2	4	0	20	2	457	5	28	730	19
Future Vol, veh/h	15	0	2	4	0	20	2	457	5	28	730	19
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	0	-	-	0	-	0	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	17	0	2	4	0	22	2	508	6	31	811	21

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1410	1402	822	1397	1406	508	832	0	0	514	0	0
Stage 1	884	884	-	512	512	-	-	-	-	-	-	-
Stage 2	526	518	-	885	894	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	116	140	374	118	139	565	801	-	-	1052	-	-
Stage 1	340	363	-	545	536	-	-	-	-	-	-	-
Stage 2	535	533	-	340	360	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	109	136	374	114	135	565	801	-	-	1052	-	-
Mov Cap-2 Maneuver	109	136	-	114	135	-	-	-	-	-	-	-
Stage 1	339	352	-	544	535	-	-	-	-	-	-	-
Stage 2	513	532	-	328	350	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	40.9	16	0	0.3
HCM LOS	E	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	801	-	-	119	114	565	1052	-	-
HCM Lane V/C Ratio	0.003	-	-	0.159	0.039	0.039	0.03	-	-
HCM Control Delay (s)	9.5	-	-	40.9	37.9	11.6	8.5	-	-
HCM Lane LOS	A	-	-	E	E	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.5	0.1	0.1	0.1	-	-

HCM 6th TWSC
15: Wilmot Road & Shell Driveway

12/23/2019

Intersection						
Int Delay, s/veh	1.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	31	36	8	484	810	9
Future Vol, veh/h	31	36	8	484	810	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	34	40	9	538	900	10

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1461	905	910	0	-	0
Stage 1	905	-	-	-	-	-
Stage 2	556	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	142	335	748	-	-	-
Stage 1	395	-	-	-	-	-
Stage 2	574	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	140	335	748	-	-	-
Mov Cap-2 Maneuver	140	-	-	-	-	-
Stage 1	390	-	-	-	-	-
Stage 2	574	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	32.5	0.2	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	748	-	204	-	-
HCM Lane V/C Ratio	0.012	-	0.365	-	-
HCM Control Delay (s)	9.9	-	32.5	-	-
HCM Lane LOS	A	-	D	-	-
HCM 95th %tile Q(veh)	0	-	1.6	-	-

HCM Signalized Intersection Capacity Analysis

1: Wilmot Road & WB I-10 Ramps

02/18/2020

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	0	0	0	135	3	56	558	361	0	0	157	69	
Future Volume (vph)	0	0	0	135	3	56	558	361	0	0	157	69	
Ideal Flow (vphp)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)					4.0	4.0	5.0	5.0			5.0	5.0	
Lane Util. Factor					1.00	1.00	1.00	1.00			1.00	1.00	
Frbp, ped/bikes					1.00	0.91	1.00	1.00			1.00	0.91	
Flpb, ped/bikes					1.00	1.00	1.00	1.00			1.00	1.00	
Frt					1.00	0.85	1.00	1.00			1.00	0.85	
Flt Protected					0.95	1.00	0.95	1.00			1.00	1.00	
Satd. Flow (prot)					1776	1435	1770	1863			1863	1435	
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00	
Satd. Flow (perm)					1776	1435	1770	1863			1863	1435	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	
Adj. Flow (vph)	0	0	0	150	3	62	620	401	0	0	174	77	
RTOR Reduction (vph)	0	0	0	0	0	50	0	0	0	0	0	58	
Lane Group Flow (vph)	0	0	0	0	153	12	620	401	0	0	174	19	
Confl. Peds. (#/hr)						20						20	
Turn Type				Perm	NA	Perm	Prot	NA			NA	Perm	
Protected Phases					4 12		1	2 1			2		
Permitted Phases				4 12		4 12						2	
Actuated Green, G (s)					22.7	22.7	54.4	88.3			28.9	28.9	
Effective Green, g (s)					22.7	22.7	54.4	88.3			28.9	28.9	
Actuated g/C Ratio					0.19	0.19	0.45	0.74			0.24	0.24	
Clearance Time (s)							5.0				5.0	5.0	
Vehicle Extension (s)							4.7				4.7	4.7	
Lane Grp Cap (vph)					335	271	802	1370			448	345	
v/s Ratio Prot							c0.35	0.22			c0.09		
v/s Ratio Perm					0.09	0.01						0.01	
v/c Ratio					0.46	0.04	0.77	0.29			0.39	0.05	
Uniform Delay, d1					43.2	39.8	27.6	5.3			38.1	35.0	
Progression Factor					1.00	1.00	0.34	0.07			1.00	1.00	
Incremental Delay, d2					1.0	0.1	3.8	0.1			2.5	0.3	
Delay (s)					44.2	39.8	13.1	0.5			40.7	35.3	
Level of Service					D	D	B	A			D	D	
Approach Delay (s)		0.0			42.9			8.2			39.0		
Approach LOS		A			D			A			D		
Intersection Summary													
HCM 2000 Control Delay			18.4		HCM 2000 Level of Service						B		
HCM 2000 Volume to Capacity ratio			0.62										
Actuated Cycle Length (s)			120.0		Sum of lost time (s)						18.0		
Intersection Capacity Utilization			66.3%		ICU Level of Service						C		
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis

2: Wilmot Road & EB I-10 Ramps

02/18/2020

														
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations														
Traffic Volume (vph)	134	18	257	0	0	0	0	785	228	57	234	0		
Future Volume (vph)	134	18	257	0	0	0	0	785	228	57	234	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Total Lost time (s)		4.0	4.0					4.0		4.0	4.0			
Lane Util. Factor		1.00	1.00					0.95		1.00	1.00			
Frbp, ped/bikes		1.00	0.91					0.98		1.00	1.00			
Flpb, ped/bikes		1.00	1.00					1.00		1.00	1.00			
Frt		1.00	0.85					0.97		1.00	1.00			
Flt Protected		0.96	1.00					1.00		0.95	1.00			
Satd. Flow (prot)		1784	1435					3348		1770	1863			
Flt Permitted		0.96	1.00					1.00		0.95	1.00			
Satd. Flow (perm)		1784	1435					3348		1770	1863			
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90		
Adj. Flow (vph)	149	20	286	0	0	0	0	872	253	63	260	0		
RTOR Reduction (vph)	0	0	210	0	0	0	0	23	0	0	0	0		
Lane Group Flow (vph)	0	169	76	0	0	0	0	1102	0	63	260	0		
Confl. Peds. (#/hr)			20							20				
Turn Type	Perm	NA	Perm					NA		Prot	NA			
Protected Phases		8 16						6		5	5 6			
Permitted Phases	8 16		8 16											
Actuated Green, G (s)		32.0	32.0					46.3		29.7	80.0			
Effective Green, g (s)		32.0	32.0					46.3		29.7	80.0			
Actuated g/C Ratio		0.27	0.27					0.39		0.25	0.67			
Clearance Time (s)								4.0		4.0				
Vehicle Extension (s)								4.7		4.7				
Lane Grp Cap (vph)		475	382					1291		438	1242			
v/s Ratio Prot								c0.33		0.04	c0.14			
v/s Ratio Perm		0.09	0.05											
v/c Ratio		0.36	0.20					0.85		0.14	0.21			
Uniform Delay, d1		35.6	34.1					33.7		35.2	7.7			
Progression Factor		1.00	1.00					1.00		0.66	0.64			
Incremental Delay, d2		0.5	0.3					6.1		0.3	0.1			
Delay (s)		36.1	34.3					39.9		23.7	5.1			
Level of Service		D	C					D		C	A			
Approach Delay (s)		35.0			0.0			39.9			8.7			
Approach LOS		C			A			D			A			
Intersection Summary														
HCM 2000 Control Delay			33.4									HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio			0.56											
Actuated Cycle Length (s)			120.0								18.0			
Intersection Capacity Utilization			66.3%										ICU Level of Service	C
Analysis Period (min)			15											
c	Critical Lane Group													

HCM 6th TWSC
9: Wilmot Road & Garden Stone Drive

02/18/2020

Intersection												
Int Delay, s/veh	14.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↑	↗	↖	↗	
Traffic Vol, veh/h	77	0	17	1	0	42	7	920	2	6	457	36
Future Vol, veh/h	77	0	17	1	0	42	7	920	2	6	457	36
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	0	-	-	0	-	-	0	-	0	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	86	0	19	1	0	47	8	1022	2	7	508	40

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1605	1582	528	1590	1600	1022	548	0	0	1024	0	0
Stage 1	542	542	-	1038	1038	-	-	-	-	-	-	-
Stage 2	1063	1040	-	552	562	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	~ 85	109	550	87	106	287	1021	-	-	678	-	-
Stage 1	525	520	-	279	308	-	-	-	-	-	-	-
Stage 2	270	307	-	518	510	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	~ 70	107	550	83	104	287	1021	-	-	678	-	-
Mov Cap-2 Maneuver	~ 70	107	-	83	104	-	-	-	-	-	-	-
Stage 1	521	515	-	277	306	-	-	-	-	-	-	-
Stage 2	224	305	-	495	505	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	233.1		20.7		0.1		0.1	
HCM LOS	F		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1021	-	-	70	550	83	287	678	-	-
HCM Lane V/C Ratio	0.008	-	-	1.222	0.034	0.013	0.163	0.01	-	-
HCM Control Delay (s)	8.6	-	-	281.9	11.8	49	20	10.4	-	-
HCM Lane LOS	A	-	-	F	B	E	C	B	-	-
HCM 95th %tile Q(veh)	0	-	-	6.7	0.1	0	0.6	0	-	-

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th TWSC
12: Wilmot Road & Diablo Sunrise Road

02/18/2020

Intersection												
Int Delay, s/veh	1.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕		↕	↑	↕	↕	↕	
Traffic Vol, veh/h	19	0	4	2	0	36	1	863	3	4	466	2
Future Vol, veh/h	19	0	4	2	0	36	1	863	3	4	466	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	0	-	-	0	-	0	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	21	0	4	2	0	40	1	959	3	4	518	2

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1510	1491	519	1490	1489	959	520	0	0	962	0	0
Stage 1	527	527	-	961	961	-	-	-	-	-	-	-
Stage 2	983	964	-	529	528	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	99	124	557	102	124	312	1046	-	-	715	-	-
Stage 1	535	528	-	308	335	-	-	-	-	-	-	-
Stage 2	299	334	-	533	528	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	86	123	557	101	123	312	1046	-	-	715	-	-
Mov Cap-2 Maneuver	86	123	-	101	123	-	-	-	-	-	-	-
Stage 1	534	525	-	308	335	-	-	-	-	-	-	-
Stage 2	260	334	-	526	525	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	52.3		19.4		0		0.1	
HCM LOS	F		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1046	-	-	101	101	312	715	-	-
HCM Lane V/C Ratio	0.001	-	-	0.253	0.022	0.128	0.006	-	-
HCM Control Delay (s)	8.4	-	-	52.3	41.4	18.2	10.1	-	-
HCM Lane LOS	A	-	-	F	E	C	B	-	-
HCM 95th %tile Q(veh)	0	-	-	0.9	0.1	0.4	0	-	-

HCM 6th TWSC
17: Garden Stone Drive & Calle Torim

02/18/2020

Intersection												
Int Delay, s/veh	3.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	11	0	14	14	0	11	8	25	10	2	66	2
Future Vol, veh/h	11	0	14	14	0	11	8	25	10	2	66	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	14	0	18	18	0	14	10	31	13	3	83	3

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	156	155	85	158	150	38	86	0	0	44	0	0
Stage 1	91	91	-	58	58	-	-	-	-	-	-	-
Stage 2	65	64	-	100	92	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	810	737	974	808	742	1034	1510	-	-	1564	-	-
Stage 1	916	820	-	954	847	-	-	-	-	-	-	-
Stage 2	946	842	-	906	819	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	794	730	974	788	735	1034	1510	-	-	1564	-	-
Mov Cap-2 Maneuver	794	730	-	788	735	-	-	-	-	-	-	-
Stage 1	910	818	-	947	841	-	-	-	-	-	-	-
Stage 2	927	836	-	888	817	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB			
HCM Control Delay, s	9.2		9.2		1.4		0.2			
HCM LOS	A		A							

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1510	-	-	886	880	1564	-
HCM Lane V/C Ratio	0.007	-	-	0.035	0.036	0.002	-
HCM Control Delay (s)	7.4	0	-	9.2	9.2	7.3	0
HCM Lane LOS	A	A	-	A	A	A	A
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-

HCM 6th TWSC
 21: Garden Stone Drive & Partridge Street

02/18/2020

Intersection						
Int Delay, s/veh	2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	11	13	5	42	57	2
Future Vol, veh/h	11	13	5	42	57	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	14	16	6	53	71	3

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	138	73	74	0	0
Stage 1	73	-	-	-	-
Stage 2	65	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	855	989	1526	-	-
Stage 1	950	-	-	-	-
Stage 2	958	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	852	989	1526	-	-
Mov Cap-2 Maneuver	852	-	-	-	-
Stage 1	946	-	-	-	-
Stage 2	958	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9	0.8	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1526	-	921	-	-
HCM Lane V/C Ratio	0.004	-	0.033	-	-
HCM Control Delay (s)	7.4	0	9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

HCM 6th TWSC
 24: Garden Stone Drive & Fast Horse Road

02/18/2020

Intersection						
Int Delay, s/veh	2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	2	23	60	5	13	11
Future Vol, veh/h	2	23	60	5	13	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	29	75	6	16	14

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	81	0	-	0	113 78
Stage 1	-	-	-	-	78 -
Stage 2	-	-	-	-	35 -
Critical Hdwy	4.12	-	-	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	2.218	-	-	-	3.518 3.318
Pot Cap-1 Maneuver	1517	-	-	-	884 983
Stage 1	-	-	-	-	945 -
Stage 2	-	-	-	-	987 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1517	-	-	-	882 983
Mov Cap-2 Maneuver	-	-	-	-	882 -
Stage 1	-	-	-	-	943 -
Stage 2	-	-	-	-	987 -

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1517	-	-	-	926
HCM Lane V/C Ratio	0.002	-	-	-	0.032
HCM Control Delay (s)	7.4	0	-	-	9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

HCM 6th TWSC
26: Pistol Ranch Road & Garden Stone Drive

02/18/2020

Intersection												
Int Delay, s/veh	3.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	5	0	66	0	11	13	12	2	0
Future Vol, veh/h	0	0	0	5	0	66	0	11	13	12	2	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	6	0	83	0	14	16	15	3	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	83	0	0	1	0	0	56	96	1	70	55	42
Stage 1	-	-	-	-	-	-	1	1	-	54	54	-
Stage 2	-	-	-	-	-	-	55	95	-	16	1	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1514	-	-	1622	-	-	941	794	1084	922	836	1029
Stage 1	-	-	-	-	-	-	1022	895	-	958	850	-
Stage 2	-	-	-	-	-	-	957	816	-	1004	895	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1514	-	-	1622	-	-	936	791	1084	893	833	1029
Mov Cap-2 Maneuver	-	-	-	-	-	-	936	791	-	893	833	-
Stage 1	-	-	-	-	-	-	1022	895	-	958	847	-
Stage 2	-	-	-	-	-	-	950	813	-	974	895	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.5	9	9.2
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	927	1514	-	-	1622	-	-	884
HCM Lane V/C Ratio	0.032	-	-	-	0.004	-	-	0.02
HCM Control Delay (s)	9	0	-	-	7.2	0	-	9.2
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1

HCM 6th TWSC
28: Wilmot Road & Shell Driveway

02/18/2020

Intersection						
Int Delay, s/veh	0.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W		W	↑	↑	
Traffic Vol, veh/h	14	25	10	988	498	7
Future Vol, veh/h	14	25	10	988	498	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	28	11	1098	553	8

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1677	557	561	0	-	0
Stage 1	557	-	-	-	-	-
Stage 2	1120	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	105	530	1010	-	-	-
Stage 1	574	-	-	-	-	-
Stage 2	312	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	104	530	1010	-	-	-
Mov Cap-2 Maneuver	104	-	-	-	-	-
Stage 1	568	-	-	-	-	-
Stage 2	312	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	25.9	0.1	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1010	-	215	-	-
HCM Lane V/C Ratio	0.011	-	0.202	-	-
HCM Control Delay (s)	8.6	-	25.9	-	-
HCM Lane LOS	A	-	D	-	-
HCM 95th %tile Q(veh)	0	-	0.7	-	-

Intersection						
Int Delay, s/veh	5.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔				↔	
Traffic Vol, veh/h	38	14	0	0	0	77
Future Vol, veh/h	38	14	0	0	0	77
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	16983	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	48	18	0	0	0	96

Major/Minor	Major1		Minor1	
Conflicting Flow All	0	0	-	57
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.318
Pot Cap-1 Maneuver	-	-	0	1009
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	1009
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	NB
HCM Control Delay, s	0	8.9
HCM LOS		A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	1009	-	-
HCM Lane V/C Ratio	0.095	-	-
HCM Control Delay (s)	8.9	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	0.3	-	-

HCM 6th TWSC
 33: Jenny Hills Lane & Garden Stone Drive

02/18/2020

Intersection												
Int Delay, s/veh	3.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	2	32	2	5	43	5	11	0	13	13	0	11
Future Vol, veh/h	2	32	2	5	43	5	11	0	13	13	0	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	40	3	6	54	6	14	0	16	16	0	14

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	60	0	0	43	0	0	124	120	42	125	118	57
Stage 1	-	-	-	-	-	-	48	48	-	69	69	-
Stage 2	-	-	-	-	-	-	76	72	-	56	49	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1544	-	-	1566	-	-	850	770	1029	849	772	1009
Stage 1	-	-	-	-	-	-	965	855	-	941	837	-
Stage 2	-	-	-	-	-	-	933	835	-	956	854	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1544	-	-	1566	-	-	835	765	1029	832	767	1009
Mov Cap-2 Maneuver	-	-	-	-	-	-	835	765	-	832	767	-
Stage 1	-	-	-	-	-	-	963	853	-	939	834	-
Stage 2	-	-	-	-	-	-	917	832	-	939	852	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.4			0.7			9			9.1		
HCM LOS							A			A		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	930	1544	-	-	1566	-	-	905
HCM Lane V/C Ratio	0.032	0.002	-	-	0.004	-	-	0.033
HCM Control Delay (s)	9	7.3	0	-	7.3	0	-	9.1
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1

HCM Signalized Intersection Capacity Analysis

1: Wilmot Road & WB I-10 Ramps

02/18/2020

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	0	0	0	206	5	82	369	304	0	0	330	89	
Future Volume (vph)	0	0	0	206	5	82	369	304	0	0	330	89	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)					4.0	4.0	5.0	5.0			5.0	5.0	
Lane Util. Factor					1.00	1.00	1.00	1.00			1.00	1.00	
Frbp, ped/bikes					1.00	0.91	1.00	1.00			1.00	0.91	
Flpb, ped/bikes					1.00	1.00	1.00	1.00			1.00	1.00	
Frt					1.00	0.85	1.00	1.00			1.00	0.85	
Flt Protected					0.95	1.00	0.95	1.00			1.00	1.00	
Satd. Flow (prot)					1776	1435	1770	1863			1863	1435	
Flt Permitted					0.95	1.00	0.95	1.00			1.00	1.00	
Satd. Flow (perm)					1776	1435	1770	1863			1863	1435	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	
Adj. Flow (vph)	0	0	0	229	6	91	410	338	0	0	367	99	
RTOR Reduction (vph)	0	0	0	0	0	73	0	0	0	0	0	66	
Lane Group Flow (vph)	0	0	0	0	235	18	410	338	0	0	367	33	
Confl. Peds. (#/hr)						20						20	
Turn Type				Perm	NA	Perm	Prot	NA			NA	Perm	
Protected Phases					4 12		1	2 1			2		
Permitted Phases				4 12		4 12						2	
Actuated Green, G (s)					23.9	23.9	42.2	87.1			39.9	39.9	
Effective Green, g (s)					23.9	23.9	42.2	87.1			39.9	39.9	
Actuated g/C Ratio					0.20	0.20	0.35	0.73			0.33	0.33	
Clearance Time (s)							5.0				5.0	5.0	
Vehicle Extension (s)							4.7				4.7	4.7	
Lane Grp Cap (vph)					353	285	622	1352			619	477	
v/s Ratio Prot							c0.23	0.18			c0.20		
v/s Ratio Perm					0.13	0.01						0.02	
v/c Ratio					0.67	0.06	0.66	0.25			0.59	0.07	
Uniform Delay, d1					44.4	39.0	32.8	5.5			33.3	27.4	
Progression Factor					1.00	1.00	0.55	0.12			1.00	1.00	
Incremental Delay, d2					4.7	0.1	2.6	0.1			4.1	0.3	
Delay (s)					49.0	39.1	20.7	0.8			37.4	27.6	
Level of Service					D	D	C	A			D	C	
Approach Delay (s)		0.0			46.3			11.7			35.4		
Approach LOS		A			D			B			D		
Intersection Summary													
HCM 2000 Control Delay			26.2		HCM 2000 Level of Service						C		
HCM 2000 Volume to Capacity ratio			0.66										
Actuated Cycle Length (s)			120.0		Sum of lost time (s)						18.0		
Intersection Capacity Utilization			62.0%		ICU Level of Service						B		
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis

2: Wilmot Road & EB I-10 Ramps

02/18/2020

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	201	19	456	0	0	0	0	473	167	151	379	0	
Future Volume (vph)	201	19	456	0	0	0	0	473	167	151	379	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		4.0	4.0					4.0		4.0	4.0		
Lane Util. Factor		1.00	1.00					0.95		1.00	1.00		
Frbp, ped/bikes		1.00	0.91					0.98		1.00	1.00		
Flpb, ped/bikes		1.00	1.00					1.00		1.00	1.00		
Frt		1.00	0.85					0.96		1.00	1.00		
Flt Protected		0.96	1.00					1.00		0.95	1.00		
Satd. Flow (prot)		1781	1435					3317		1770	1863		
Flt Permitted		0.96	1.00					1.00		0.95	1.00		
Satd. Flow (perm)		1781	1435					3317		1770	1863		
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	
Adj. Flow (vph)	223	21	507	0	0	0	0	526	186	168	421	0	
RTOR Reduction (vph)	0	0	357	0	0	0	0	31	0	0	0	0	
Lane Group Flow (vph)	0	244	150	0	0	0	0	681	0	168	421	0	
Confl. Peds. (#/hr)			20						20				
Turn Type	Perm	NA	Perm					NA		Prot	NA		
Protected Phases		8 16						6		5	5 6		
Permitted Phases	8 16		8 16										
Actuated Green, G (s)		34.1	34.1					31.0		42.9	77.9		
Effective Green, g (s)		34.1	34.1					31.0		42.9	77.9		
Actuated g/C Ratio		0.28	0.28					0.26		0.36	0.65		
Clearance Time (s)								4.0		4.0			
Vehicle Extension (s)								4.7		4.7			
Lane Grp Cap (vph)		506	407					856		632	1209		
v/s Ratio Prot								c0.21		0.09	c0.23		
v/s Ratio Perm		0.14	0.10										
v/c Ratio		0.48	0.37					0.80		0.27	0.35		
Uniform Delay, d1		35.6	34.3					41.5		27.4	9.5		
Progression Factor		1.00	1.00					1.00		1.00	0.61		
Incremental Delay, d2		0.7	0.6					5.8		0.3	0.3		
Delay (s)		36.4	34.9					47.3		27.8	6.1		
Level of Service		D	C					D		C	A		
Approach Delay (s)		35.4			0.0			47.3			12.3		
Approach LOS		D			A			D			B		
Intersection Summary													
HCM 2000 Control Delay			32.9									HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.55										
Actuated Cycle Length (s)			120.0									Sum of lost time (s)	18.0
Intersection Capacity Utilization			62.0%									ICU Level of Service	B
Analysis Period (min)			15										
c	Critical Lane Group												

HCM 6th TWSC
 9: Wilmot Road & Garden Stone Drive

02/18/2020

Intersection												
Int Delay, s/veh	5.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷		↶	↷		↶	↑	↶	↶	↷	
Traffic Vol, veh/h	50	0	11	2	0	24	20	492	4	44	766	124
Future Vol, veh/h	50	0	11	2	0	24	20	492	4	44	766	124
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	0	-	-	0	-	-	0	-	0	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	56	0	12	2	0	27	22	547	4	49	851	138

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1625	1613	920	1615	1678	547	989	0	0	551	0	0
Stage 1	1018	1018	-	591	591	-	-	-	-	-	-	-
Stage 2	607	595	-	1024	1087	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	82	104	328	83	95	537	699	-	-	1019	-	-
Stage 1	286	315	-	493	494	-	-	-	-	-	-	-
Stage 2	483	492	-	284	292	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	73	96	328	75	88	537	699	-	-	1019	-	-
Mov Cap-2 Maneuver	73	96	-	75	88	-	-	-	-	-	-	-
Stage 1	277	300	-	478	479	-	-	-	-	-	-	-
Stage 2	445	477	-	260	278	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	118.7		15.4		0.4		0.4	
HCM LOS	F		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	699	-	-	73	328	75	537	1019	-	-
HCM Lane V/C Ratio	0.032	-	-	0.761	0.037	0.03	0.05	0.048	-	-
HCM Control Delay (s)	10.3	-	-	141.2	16.4	54.5	12.1	8.7	-	-
HCM Lane LOS	B	-	-	F	C	F	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	3.6	0.1	0.1	0.2	0.2	-	-

HCM 6th TWSC
12: Wilmot Road & Diablo Sunrise Road

02/18/2020

Intersection												
Int Delay, s/veh	1.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕		↕	↑	↕	↕	↕	↕
Traffic Vol, veh/h	15	0	4	4	0	20	2	477	5	28	730	19
Future Vol, veh/h	15	0	4	4	0	20	2	477	5	28	730	19
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	0	-	-	0	-	0	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	17	0	4	4	0	22	2	530	6	31	811	21

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1432	1424	822	1420	1428	530	832	0	0	536	0	0
Stage 1	884	884	-	534	534	-	-	-	-	-	-	-
Stage 2	548	540	-	886	894	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	112	136	374	114	135	549	801	-	-	1032	-	-
Stage 1	340	363	-	530	524	-	-	-	-	-	-	-
Stage 2	521	521	-	339	360	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	105	132	374	110	131	549	801	-	-	1032	-	-
Mov Cap-2 Maneuver	105	132	-	110	131	-	-	-	-	-	-	-
Stage 1	339	352	-	529	523	-	-	-	-	-	-	-
Stage 2	499	520	-	325	349	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB				
HCM Control Delay, s	39.9		16.4		0		0.3				
HCM LOS	E		C								

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	801	-	-	124	110	549	1032	-	-
HCM Lane V/C Ratio	0.003	-	-	0.17	0.04	0.04	0.03	-	-
HCM Control Delay (s)	9.5	-	-	39.9	39.1	11.8	8.6	-	-
HCM Lane LOS	A	-	-	E	E	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.6	0.1	0.1	0.1	-	-

HCM 6th TWSC
17: Garden Stone Drive & Calle Torim

02/18/2020

Intersection												
Int Delay, s/veh	2.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	7	0	11	10	0	7	21	102	21	6	40	6
Future Vol, veh/h	7	0	11	10	0	7	21	102	21	6	40	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	9	0	14	13	0	9	26	128	26	8	50	8

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	268	276	54	270	267	141	58	0	0	154	0	0
Stage 1	70	70	-	193	193	-	-	-	-	-	-	-
Stage 2	198	206	-	77	74	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	685	632	1013	683	639	907	1546	-	-	1426	-	-
Stage 1	940	837	-	809	741	-	-	-	-	-	-	-
Stage 2	804	731	-	932	833	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	666	617	1013	661	624	907	1546	-	-	1426	-	-
Mov Cap-2 Maneuver	666	617	-	661	624	-	-	-	-	-	-	-
Stage 1	923	832	-	794	728	-	-	-	-	-	-	-
Stage 2	782	718	-	914	828	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	9.4		10		1.1		0.9	
HCM LOS	A		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1546	-	-	842	744	1426	-
HCM Lane V/C Ratio	0.017	-	-	0.027	0.029	0.005	-
HCM Control Delay (s)	7.4	0	-	9.4	10	7.5	0
HCM Lane LOS	A	A	-	A	B	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	0.1	0	-

HCM 6th TWSC
 21: Garden Stone Drive & Partridge Street

02/18/2020

Intersection						
Int Delay, s/veh	1.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		T
Traffic Vol, veh/h	7	8	21	102	44	6
Future Vol, veh/h	7	8	21	102	44	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	9	10	26	128	55	8

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	239	59	63	0	0
Stage 1	59	-	-	-	-
Stage 2	180	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-
Pot Cap-1 Maneuver	749	1007	1540	-	-
Stage 1	964	-	-	-	-
Stage 2	851	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	736	1007	1540	-	-
Mov Cap-2 Maneuver	736	-	-	-	-
Stage 1	947	-	-	-	-
Stage 2	851	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.3	1.3	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1540	-	859	-	-
HCM Lane V/C Ratio	0.017	-	0.022	-	-
HCM Control Delay (s)	7.4	0	9.3	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.1	-	-

HCM 6th TWSC
 24: Garden Stone Drive & Fast Horse Road

02/18/2020

Intersection						
Int Delay, s/veh	1.5					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↷		↶	
Traffic Vol, veh/h	9	38	55	20	8	8
Future Vol, veh/h	9	38	55	20	8	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	48	69	25	10	10

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	94	0	-	0	152 82
Stage 1	-	-	-	-	82 -
Stage 2	-	-	-	-	70 -
Critical Hdwy	4.12	-	-	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	2.218	-	-	-	3.518 3.318
Pot Cap-1 Maneuver	1500	-	-	-	840 978
Stage 1	-	-	-	-	941 -
Stage 2	-	-	-	-	953 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1500	-	-	-	833 978
Mov Cap-2 Maneuver	-	-	-	-	833 -
Stage 1	-	-	-	-	933 -
Stage 2	-	-	-	-	953 -

Approach	EB	WB	SB
HCM Control Delay, s	1.4	0	9.1
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1500	-	-	-	900
HCM Lane V/C Ratio	0.008	-	-	-	0.022
HCM Control Delay (s)	7.4	0	-	-	9.1
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

HCM 6th TWSC
 26: Pistol Ranch Road & Garden Stone Drive

02/18/2020

Intersection												
Int Delay, s/veh	5.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	0	0	20	0	43	0	8	8	39	9	0
Future Vol, veh/h	0	0	0	20	0	43	0	8	8	39	9	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	25	0	54	0	10	10	49	11	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	54	0	0	1	0	0	84	105	1	88	78	27
Stage 1	-	-	-	-	-	-	1	1	-	77	77	-
Stage 2	-	-	-	-	-	-	83	104	-	11	1	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1551	-	-	1622	-	-	903	785	1084	897	812	1048
Stage 1	-	-	-	-	-	-	1022	895	-	932	831	-
Stage 2	-	-	-	-	-	-	925	809	-	1010	895	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1551	-	-	1622	-	-	882	772	1084	869	799	1048
Mov Cap-2 Maneuver	-	-	-	-	-	-	882	772	-	869	799	-
Stage 1	-	-	-	-	-	-	1022	895	-	932	818	-
Stage 2	-	-	-	-	-	-	898	796	-	990	895	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			2.3			9.1			9.5		
HCM LOS							A			A		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	902	1551	-	-	1622	-	-	855
HCM Lane V/C Ratio	0.022	-	-	-	0.015	-	-	0.07
HCM Control Delay (s)	9.1	0	-	-	7.3	0	-	9.5
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.2

HCM 6th TWSC
28: Wilmot Road & Shell Driveway

02/18/2020

Intersection						
Int Delay, s/veh	2.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	31	36	8	534	934	9
Future Vol, veh/h	31	36	8	534	934	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	34	40	9	593	1038	10

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1654	1043	1048	0	-	0
Stage 1	1043	-	-	-	-	-
Stage 2	611	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	108	279	664	-	-	-
Stage 1	339	-	-	-	-	-
Stage 2	542	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	106	279	664	-	-	-
Mov Cap-2 Maneuver	106	-	-	-	-	-
Stage 1	334	-	-	-	-	-
Stage 2	542	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	46.1	0.2	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	664	-	159	-	-
HCM Lane V/C Ratio	0.013	-	0.468	-	-
HCM Control Delay (s)	10.5	-	46.1	-	-
HCM Lane LOS	B	-	E	-	-
HCM 95th %tile Q(veh)	0	-	2.2	-	-

HCM 6th TWSC
 32: Pistol Ranch Road & I-10 Eastbound Frontage Road

02/18/2020

Intersection						
Int Delay, s/veh	2.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	T				T	
Traffic Vol, veh/h	80	48	0	0	0	51
Future Vol, veh/h	80	48	0	0	0	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	16983	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	100	60	0	0	0	64

Major/Minor	Major1		Minor1	
Conflicting Flow All	0	0	-	130
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.22
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.318
Pot Cap-1 Maneuver	-	-	0	920
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	920
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	NB
HCM Control Delay, s	0	9.2
HCM LOS		A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	920	-	-
HCM Lane V/C Ratio	0.069	-	-
HCM Control Delay (s)	9.2	-	-
HCM Lane LOS	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-

HCM 6th TWSC
 33: Jenny Hills Lane & Garden Stone Drive

02/18/2020

Intersection												
Int Delay, s/veh	2.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	6	34	6	20	61	21	7	0	8	8	0	7
Future Vol, veh/h	6	34	6	20	61	21	7	0	8	8	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	8	43	8	25	76	26	9	0	10	10	0	9

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	102	0	0	51	0	0	207	215	47	207	206	89
Stage 1	-	-	-	-	-	-	63	63	-	139	139	-
Stage 2	-	-	-	-	-	-	144	152	-	68	67	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1490	-	-	1555	-	-	751	683	1022	751	691	969
Stage 1	-	-	-	-	-	-	948	842	-	864	782	-
Stage 2	-	-	-	-	-	-	859	772	-	942	839	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1490	-	-	1555	-	-	731	667	1022	731	675	969
Mov Cap-2 Maneuver	-	-	-	-	-	-	731	667	-	731	675	-
Stage 1	-	-	-	-	-	-	942	837	-	859	769	-
Stage 2	-	-	-	-	-	-	837	759	-	927	834	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	1			1.4			9.3			9.5		
HCM LOS							A			A		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	862	1490	-	-	1555	-	-	826
HCM Lane V/C Ratio	0.022	0.005	-	-	0.016	-	-	0.023
HCM Control Delay (s)	9.3	7.4	0	-	7.4	0	-	9.5
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1

HCM 6th TWSC
 9: Wilmot Road & Garden Stone Drive

02/18/2020

Intersection												
Int Delay, s/veh	3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↵	↵		↵	↵		↵	↑↑	↵	↵	↑↑	↵
Traffic Vol, veh/h	77	0	17	1	0	42	7	920	2	6	457	36
Future Vol, veh/h	77	0	17	1	0	42	7	920	2	6	457	36
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	0	-	-	0	-	-	0	-	0	0	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	86	0	19	1	0	47	8	1022	2	7	508	40

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1049	1562	254	1306	1600	511	548	0	0	1024	0	0
Stage 1	522	522	-	1038	1038	-	-	-	-	-	-	-
Stage 2	527	1040	-	268	562	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	182	111	745	117	105	508	1018	-	-	674	-	-
Stage 1	506	529	-	247	306	-	-	-	-	-	-	-
Stage 2	502	306	-	714	508	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	163	109	745	112	103	508	1018	-	-	674	-	-
Mov Cap-2 Maneuver	163	109	-	112	103	-	-	-	-	-	-	-
Stage 1	502	524	-	245	304	-	-	-	-	-	-	-
Stage 2	452	304	-	689	503	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	42.1		13.4		0.1		0.1	
HCM LOS	E		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1018	-	-	163	745	112	508	674	-	-
HCM Lane V/C Ratio	0.008	-	-	0.525	0.025	0.01	0.092	0.01	-	-
HCM Control Delay (s)	8.6	-	-	49.2	10	37.5	12.8	10.4	-	-
HCM Lane LOS	A	-	-	E	B	E	B	B	-	-
HCM 95th %tile Q(veh)	0	-	-	2.6	0.1	0	0.3	0	-	-

HCM 6th TWSC
12: Wilmot Road & Diablo Sunrise Road

02/18/2020

Intersection												
Int Delay, s/veh	0.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕		↕	↕	↕	↕	↕	↕
Traffic Vol, veh/h	19	0	4	2	0	36	1	863	3	4	466	2
Future Vol, veh/h	19	0	4	2	0	36	1	863	3	4	466	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	0	-	-	0	-	0	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	21	0	4	2	0	40	1	959	3	4	518	2

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1009	1491	260	1228	1489	480	520	0	0	962	0	0
Stage 1	527	527	-	961	961	-	-	-	-	-	-	-
Stage 2	482	964	-	267	528	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	194	123	739	134	123	532	1042	-	-	711	-	-
Stage 1	502	527	-	275	333	-	-	-	-	-	-	-
Stage 2	534	332	-	715	526	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	178	122	739	133	122	532	1042	-	-	711	-	-
Mov Cap-2 Maneuver	178	122	-	133	122	-	-	-	-	-	-	-
Stage 1	501	524	-	275	333	-	-	-	-	-	-	-
Stage 2	493	332	-	707	523	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	25	13.4	0	0.1
HCM LOS	D	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1042	-	-	205	133	532	711	-	-
HCM Lane V/C Ratio	0.001	-	-	0.125	0.017	0.075	0.006	-	-
HCM Control Delay (s)	8.5	-	-	25	32.5	12.3	10.1	-	-
HCM Lane LOS	A	-	-	D	D	B	B	-	-
HCM 95th %tile Q(veh)	0	-	-	0.4	0.1	0.2	0	-	-

HCM 6th TWSC
28: Wilmot Road & Shell Driveway

02/18/2020

Intersection						
Int Delay, s/veh	0.5					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔		↔	↑↑	↑↑	
Traffic Vol, veh/h	14	25	10	988	498	7
Future Vol, veh/h	14	25	10	988	498	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	28	11	1098	553	8

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1128	281	561	0	-	0
Stage 1	557	-	-	-	-	-
Stage 2	571	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	198	716	1006	-	-	-
Stage 1	537	-	-	-	-	-
Stage 2	529	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	196	716	1006	-	-	-
Mov Cap-2 Maneuver	196	-	-	-	-	-
Stage 1	531	-	-	-	-	-
Stage 2	529	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	16.1	0.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1006	-	367	-	-
HCM Lane V/C Ratio	0.011	-	0.118	-	-
HCM Control Delay (s)	8.6	-	16.1	-	-
HCM Lane LOS	A	-	C	-	-
HCM 95th %tile Q(veh)	0	-	0.4	-	-

HCM 6th TWSC
9: Wilmot Road & Garden Stone Drive

02/18/2020

Intersection												
Int Delay, s/veh	2.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↵	↵		↵	↵		↵	↕↕	↵	↵	↕↕	↵
Traffic Vol, veh/h	50	0	11	2	0	24	20	492	4	44	766	124
Future Vol, veh/h	50	0	11	2	0	24	20	492	4	44	766	124
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	0	-	-	0	-	-	0	-	0	0	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	56	0	12	2	0	27	22	547	4	49	851	138

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1267	1544	426	1115	1678	274	989	0	0	551	0	0
Stage 1	949	949	-	591	591	-	-	-	-	-	-	-
Stage 2	318	595	-	524	1087	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	126	114	577	163	94	724	695	-	-	1015	-	-
Stage 1	280	337	-	460	493	-	-	-	-	-	-	-
Stage 2	668	491	-	504	290	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	114	105	577	150	87	724	695	-	-	1015	-	-
Mov Cap-2 Maneuver	114	105	-	150	87	-	-	-	-	-	-	-
Stage 1	271	321	-	445	477	-	-	-	-	-	-	-
Stage 2	623	475	-	470	276	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	54.1		11.7		0.4		0.4	
HCM LOS	F		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	695	-	-	114	577	150	724	1015	-	-
HCM Lane V/C Ratio	0.032	-	-	0.487	0.021	0.015	0.037	0.048	-	-
HCM Control Delay (s)	10.4	-	-	63.5	11.4	29.4	10.2	8.7	-	-
HCM Lane LOS	B	-	-	F	B	D	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	2.2	0.1	0	0.1	0.2	-	-

HCM 6th TWSC
12: Wilmot Road & Diablo Sunrise Road

02/18/2020

Intersection												
Int Delay, s/veh	0.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕		↕	↕	↕	↕	↕	↕
Traffic Vol, veh/h	15	0	4	4	0	20	2	477	5	28	730	19
Future Vol, veh/h	15	0	4	4	0	20	2	477	5	28	730	19
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	0	-	-	0	-	0	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	17	0	4	4	0	22	2	530	6	31	811	21

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1153	1424	416	1002	1428	265	832	0	0	536	0	0
Stage 1	884	884	-	534	534	-	-	-	-	-	-	-
Stage 2	269	540	-	468	894	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	152	135	585	197	134	733	796	-	-	1028	-	-
Stage 1	307	362	-	498	523	-	-	-	-	-	-	-
Stage 2	713	519	-	545	358	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	144	131	585	191	130	733	796	-	-	1028	-	-
Mov Cap-2 Maneuver	144	131	-	191	130	-	-	-	-	-	-	-
Stage 1	306	351	-	497	521	-	-	-	-	-	-	-
Stage 2	690	517	-	525	347	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	29	12.5	0	0.3
HCM LOS	D	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	796	-	-	171	191	733	1028	-	-
HCM Lane V/C Ratio	0.003	-	-	0.123	0.023	0.03	0.03	-	-
HCM Control Delay (s)	9.5	-	-	29	24.3	10.1	8.6	-	-
HCM Lane LOS	A	-	-	D	C	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.4	0.1	0.1	0.1	-	-

HCM 6th TWSC
28: Wilmot Road & Shell Driveway

02/18/2020

Intersection						
Int Delay, s/veh	1.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	31	36	8	534	934	9
Future Vol, veh/h	31	36	8	534	934	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	34	40	9	593	1038	10

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1358	524	1048	0	-	0
Stage 1	1043	-	-	-	-	-
Stage 2	315	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	140	498	660	-	-	-
Stage 1	300	-	-	-	-	-
Stage 2	713	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	138	498	660	-	-	-
Mov Cap-2 Maneuver	138	-	-	-	-	-
Stage 1	296	-	-	-	-	-
Stage 2	713	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	28.6	0.2	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	660	-	226	-	-
HCM Lane V/C Ratio	0.013	-	0.329	-	-
HCM Control Delay (s)	10.5	-	28.6	-	-
HCM Lane LOS	B	-	D	-	-
HCM 95th %tile Q(veh)	0	-	1.4	-	-



**BLACKHAWK
WILMOT ROAD/INTERSTATE 10
TRAFFIC IMPACT ANALYSIS**

APPENDIX

Turn Lane Calculations

Un-Signalized Intersection (Right Turn Lane)

Location: Garden Stone Drive/Wilmot Road

Approach/Leg: Southbound

2021 With Project

V = vehicles per hour

PM Peak Hour

V = 124 vph

S = Storage = (V *2 min* 25 ft/veh)/60 min/hr

$$S \text{ (ft)} = \frac{124 \text{ vph} * (2 \text{ min}) * (25 \text{ ft/veh})}{(60 \text{ min/hr})} = 103 \text{ feet}$$

Minimum Recommended Storage: 125 feet

Un-Signalized Intersection (Right Turn Lane)

Location: Pistol Ridge Road/Eastbound I-10 Frontage Road

Approach/Leg: Northbound

2021 With Project

V = vehicles per hour

AM Peak Hour

V = 77 vph

S = Storage = (V *2 min* 25 ft/veh)/60 min/hr

$$S \text{ (ft)} = \frac{77 \text{ vph} * (2 \text{ min}) * (25 \text{ ft/veh})}{(60 \text{ min/hr})} = 64 \text{ feet}$$

Minimum Recommended Storage: 75 feet

Un-Signalized Intersection (Left/Through Lane)

Location: Pistol Ridge Road/Garden Stone Drive

Approach/Leg: Southbound

2021 With Project

V = vehicles per hour

PM Peak Hour

V = 41 vph

S = Storage = (V *2 min* 25 ft/veh)/60 min/hr

$$S \text{ (ft)} = \frac{41 \text{ vph} * (2 \text{ min}) * (25 \text{ ft/veh})}{(60 \text{ min/hr})} = 34 \text{ feet}$$

Minimum Recommended Storage: 50 feet



**BLACKHAWK
WILMOT ROAD/INTERSTATE 10
TRAFFIC IMPACT ANALYSIS**

APPENDIX

Traffic Signal Warrant Analysis

General Description of Intersection

Project Number: 19173

Existing

Name of Major Roadway: Wilmot Road

Direction: N/S

of NB Lanes: 2

of SB Lanes: 2

85th percentile speed: 45 mph

Control #:

Section #:

Route #:

Name of Minor Roadway: Garden Stone Drive

Direction: E/W

of EB Lanes: 2

of WB Lanes: 1

85th percentile speed: 45 mph

Control #:

Section #:

Route #:

City: Tucson

Population: 535,000

County:

District:

Data Source: 24-hour approach

Date of Survey: 12/11/2019 (press Ctrl + ;)

Day of Week: Wednesday

Weather: Sunny

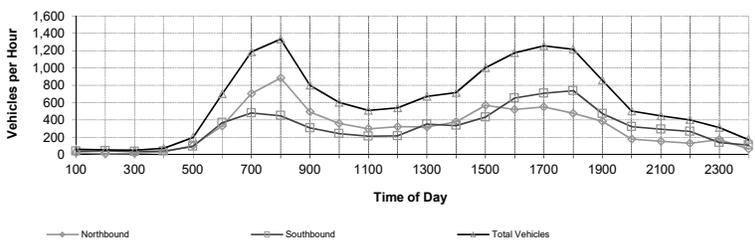
Surface Conditions: Dry

Smooth

Enter Traffic Volumes:

Automated Traffic Counts

Street: **Wilmot Road**
 Location: **Garden Stone Drive**
 City/State: **Tucson , AZ**
 Project #: **19173**
 Date: **12/11/2019**
 Day of Week: **Wednesday**
 Data Source: **24-hour approach**



24-Hour Volume: **14,861**

Time	Northbound		Southbound	
	Vehicles	Peds	Vehicles	Peds
12:00 AM				
12:15 AM				
12:30 AM				
12:45 AM				
1:00 AM	22		41	
1:15 AM				
1:30 AM				
1:45 AM				
2:00 AM	11		43	
2:15 AM				
2:30 AM				
2:45 AM				
3:00 AM	14		37	
3:15 AM				
3:30 AM				
3:45 AM				
4:00 AM	34		40	
4:15 AM				
4:30 AM				
4:45 AM				
5:00 AM	104		95	
5:15 AM				
5:30 AM				
5:45 AM				
6:00 AM	331		369	
6:15 AM				
6:30 AM				
6:45 AM				
7:00 AM	706		480	
7:15 AM				
7:30 AM				
7:45 AM				
8:00 AM	885		450	
8:15 AM				
8:30 AM				
8:45 AM				
9:00 AM	494		309	
9:15 AM				
9:30 AM				
9:45 AM				
10:00 AM	361		241	
10:15 AM				
10:30 AM				
10:45 AM				
11:00 AM	299		211	
11:15 AM				
11:30 AM				
11:45 AM				
12:00 PM	324		217	

Time	Northbound		Southbound	
	Vehicles	Peds	Vehicles	Peds
12:00 PM				
12:15 PM				
12:30 PM				
12:45 PM				
1:00 PM	320		354	
1:15 PM				
1:30 PM				
1:45 PM				
2:00 PM	380		336	
2:15 PM				
2:30 PM				
2:45 PM				
3:00 PM	568		435	
3:15 PM				
3:30 PM				
3:45 PM				
4:00 PM	521		654	
4:15 PM				
4:30 PM				
4:45 PM				
5:00 PM	550		709	
5:15 PM				
5:30 PM				
5:45 PM				
6:00 PM	476		740	
6:15 PM				
6:30 PM				
6:45 PM				
7:00 PM	385		475	
7:15 PM				
7:30 PM				
7:45 PM				
8:00 PM	181		323	
8:15 PM				
8:30 PM				
8:45 PM				
9:00 PM	153		295	
9:15 PM				
9:30 PM				
9:45 PM				
10:00 PM	133		269	
10:15 PM				
10:30 PM				
10:45 PM				
11:00 PM	174		138	
11:15 PM				
11:30 PM				
11:45 PM				
12:00 AM	65		109	

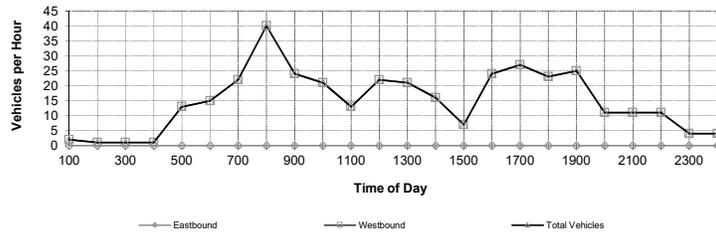
Equipment ID#: _____ 24-Hour Volume **14,861**

Automated Traffic Counts

Street: **Garden Stone Drive**
 Location: **Wilmot Road**

City/State: **Tucson , AZ**
 Project #:

Date: **12/11/2019**
 Day of Week: **Wednesday**
 Data Source: **24-hour approach**



24-Hour Volume: 359

Time	Eastbound		Westbound	
	Vehicles	Peds	Vehicles	Peds
12:00 AM				
12:15 AM				
12:30 AM				
12:45 AM				
1:00 AM	0		2	
1:15 AM				
1:30 AM				
1:45 AM				
2:00 AM	0		1	
2:15 AM				
2:30 AM				
2:45 AM				
3:00 AM	0		1	
3:15 AM				
3:30 AM				
3:45 AM				
4:00 AM	0		1	
4:15 AM				
4:30 AM				
4:45 AM				
5:00 AM	0		13	
5:15 AM				
5:30 AM				
5:45 AM				
6:00 AM	0		15	
6:15 AM				
6:30 AM				
6:45 AM				
7:00 AM	0		22	
7:15 AM				
7:30 AM				
7:45 AM				
8:00 AM	0		40	
8:15 AM				
8:30 AM				
8:45 AM				
9:00 AM	0		24	
9:15 AM				
9:30 AM				
9:45 AM				
10:00 AM	0		21	
10:15 AM				
10:30 AM				
10:45 AM				
11:00 AM	0		13	
11:15 AM				
11:30 AM				
11:45 AM				
12:00 PM	0		22	

Time	Eastbound		Westbound	
	Vehicles	Peds	Vehicles	Peds
12:00 PM				
12:59 PM				
12:30 PM				
12:45 PM				
1:00 PM	0		21	
1:59 PM				
1:30 PM				
1:45 PM				
2:00 PM	0		16	
2:59 PM				
2:30 PM				
2:45 PM				
3:00 PM	0		7	
3:59 PM				
3:30 PM				
3:45 PM				
4:00 PM	0		24	
4:59 PM				
4:30 PM				
12:00 AM				
5:00 PM	0		27	
5:59 PM				
5:30 PM				
5:45 PM				
6:00 PM	0		23	
6:59 PM				
6:30 PM				
6:45 PM				
7:00 PM	0		25	
7:59 PM				
7:30 PM				
7:45 PM				
8:00 PM	0		11	
8:59 PM				
8:30 PM				
8:45 PM				
9:00 PM	0		11	
9:59 PM				
9:30 PM				
9:45 PM				
10:00 PM	0		11	
10:59 PM				
10:30 PM				
10:45 PM				
11:00 PM	0		4	
11:59 PM				
11:30 PM				
11:45 PM				
12:00 AM	0		4	

Equipment ID#:

0	359
24-Hour Volume	
359	

TRAFFIC SURVEY - COUNT ANALYSIS
2009 MUTCD WARRANTS

Existing

Northern Avenue _____		District No.: _____	
1	City: Tucson	Population: 535,000	Survey Date: 12/11/2019
	Route #	Name	Control Section 85% Speed
Major	_____	Wilmot Road	- _____ 45
Minor	_____	Garden Stone Drive	- _____ 45
Cotton Lane _____			

1
2 **Condition A**

#	Number of Lanes		Major Street		Minor Street		
			Both Approaches Required		High Volume Approach Required		
	Major	Street	Minor Street	Urban	Rural*	Urban	Rural*
	1		1	500	350	150	105
Peoria	2 or more		1	600	420	150	105
#	2 or more		2 or more	600	420	200	140
	1		2 or more	500	350	200	140

*Criteria when the 85th percentile speed is greater than 40 mph or when the population is less than 10,000

#	Warrant 1		Criteria				
	Time		Volume		Major	Minor	Both Meet
	Begin	End	Major	Minor	>= 420	>= 140	
	12:00 AM	1:00 AM	63	2	N	N	N
	1:00 AM	2:00 AM	54	1	N	N	N
	2:00 AM	3:00 AM	51	1	N	N	N
	3:00 AM	4:00 AM	74	1	N	N	N
	4:00 AM	5:00 AM	199	13	N	N	N
	5:00 AM	6:00 AM	700	15	Y	N	N
	6:00 AM	7:00 AM	1186	22	Y	N	N
	7:00 AM	8:00 AM	1335	40	Y	N	N
	8:00 AM	9:00 AM	803	24	Y	N	N
	9:00 AM	10:00 AM	602	21	Y	N	N
	10:00 AM	11:00 AM	510	13	Y	N	N
	11:00 AM	12:00 PM	541	22	Y	N	N
	12:00 PM	1:00 PM	674	21	Y	N	N
	1:00 PM	2:00 PM	716	16	Y	N	N
	2:00 PM	3:00 PM	1003	7	Y	N	N
	3:00 PM	4:00 PM	1175	24	Y	N	N
	4:00 PM	5:00 PM	1259	27	Y	N	N
	5:00 PM	6:00 PM	1216	23	Y	N	N
	6:00 PM	7:00 PM	860	25	Y	N	N
	7:00 PM	8:00 PM	504	11	Y	N	N
	8:00 PM	9:00 PM	448	11	Y	N	N
	9:00 PM	10:00 PM	402	11	N	N	N
	10:00 PM	11:00 PM	312	4	N	N	N
	11:00 PM	12:00 AM	174	4	N	N	N

Total number of hours, both the major(both approaches) and minor(high volume approach) met: 0

Condition A is not satisfied Hours Required: 8
Warrant 1 not satisfied.

Warrant 1: Eight- Hour Volumes

Condition B

Number of Lanes		Major Street Both Approaches Required		Minor Street High Volume Approach Required		
Major	Street	Minor Street	Urban	Rural*	Urban	Rural*
1		1	750	525	75	53
2 or more		1	900	630	75	53
2 or more		2 or more	900	630	100	70
1		2 or more	750	525	100	70

*Criteria when the 85th percentile speed is greater than 40 mph or when the population is less than 10,000

Warrant 2						
Time		Volume		Criteria		
Begin	End	Major	Minor	Major ≥ 630	Minor ≥ 70	Both Meet
12:00 AM	1:00 AM	63	2	N	N	N
1:00 AM	2:00 AM	54	1	N	N	N
2:00 AM	3:00 AM	51	1	N	N	N
3:00 AM	4:00 AM	74	1	N	N	N
4:00 AM	5:00 AM	199	13	N	N	N
5:00 AM	6:00 AM	700	15	Y	N	N
6:00 AM	7:00 AM	1186	22	Y	N	N
7:00 AM	8:00 AM	1335	40	Y	N	N
8:00 AM	9:00 AM	803	24	Y	N	N
9:00 AM	10:00 AM	602	21	N	N	N
10:00 AM	11:00 AM	510	13	N	N	N
11:00 AM	12:00 PM	541	22	N	N	N
12:00 PM	1:00 PM	674	21	Y	N	N
1:00 PM	2:00 PM	716	16	Y	N	N
2:00 PM	3:00 PM	1003	7	Y	N	N
3:00 PM	4:00 PM	1175	24	Y	N	N
4:00 PM	5:00 PM	1259	27	Y	N	N
5:00 PM	6:00 PM	1216	23	Y	N	N
6:00 PM	7:00 PM	860	25	Y	N	N
7:00 PM	8:00 PM	504	11	N	N	N
8:00 PM	9:00 PM	448	11	N	N	N
9:00 PM	10:00 PM	402	11	N	N	N
10:00 PM	11:00 PM	312	4	N	N	N
11:00 PM	12:00 AM	174	4	N	N	N

Total number of hours, both the major(both approaches) and minor(high volume approach) met: 0
 Hours Required: 8

Condition B is not satisfied

Warrant 1 not satisfied.

Warrant 2: Four Hour Vehicular Volumes

This warrant is similar to Warrant 1A, except that the required traffic volumes must be present for at least four hours of an average day. The traffic volumes required are based on curves (Figure 4C-2) shown in the MUTCD.

* **The required traffic volumes for Warrant 2 do not meet for any one hour.**

Warrant 2 is not satisfied

Warrant 3, Condition A- Peak Hour Delay

This warrant is intended for application where traffic conditions will cause undue delay to traffic entering or crossing the major street. The peak hour delay warrant is satisfied when the following conditions exist for one hour (any four consecutive 15-minute periods) of an average weekday:

- (1) The total delay by the traffic on a side street controlled by a stop sign equals or exceeds four vehicle-hours for a one-lane approach and five vehicle-hours for a two-lane approach, **and**
- (2) the volume on the side street (one direction) equals or exceeds 100 vph for one moving lane of traffic and 150 vph for two moving lanes, **and**
- (3) the total traffic volume serviced during 1 hour equals or exceeds 800 vph for an intersection with four (or more) approaches or 650 vph for three approaches.

*Part 1 - N/A

*Part 2 - N/A

*Part 3 - N/A

Warrant 3, Condition B - Peak Hour Volume

This warrant applies to traffic entering from the minor street which encounters undue delay crossing the main street. This warrant is satisfied when the main street and side street traffic volumes satisfy the curves shown in Figure 4C-4 of the TMUTCD.

Warrant 3 is N/A.

Warrant 4: Pedestrian Volume

Required*	Existing
100 or more for each of any four hours	_____
OR	
190 or more during any one hour	_____

* For predominant pedestrian crossing speeds less than 3.5 ft/sec, the pedestrian volume may be reduced as much as 50 percent.

Gap Requirements

YES	NO	Is the nearest signal located more than 300 feet away?
YES	NO	For traffic flow which is not platooned, are there less than 60 gaps per hour of adequate length for the pedestrians to cross the street?

Warrant 4 is N/A.

Warrant 5: School Crossing

YES	NO	Is the number of adequate gaps in traffic stream during the period when the children are using the crossing less than the number of minutes in the same period?
-----	----	---

Warrant 5 is N/A.

Warrant 6: Coordinate Systems

YES	NO	Are the adjacent signals in a signal system?
YES	NO	Would the resultant spacing be 1000 feet or more?

Warrant 6 is N/A.

Warrant 7: Crash Experience

YES	NO	Is 80% or more of one of Warrants #1, #2, or #3 met?
YES	NO	Have there been more than five accidents susceptible to correction by a traffic signal in 12 months?

Warrant 7 is N/A.

Warrant 8: Roadway Network

YES	NO	Does the major street having an existing or immediately projected entering volume of > 1000 vehicles per hour of a typical weekday?
YES	NO	Do 5-year projected traffic volumes meet Warrants 1, 2, or 3?
YES	NO	Is there an entering traffic volume of at least 1000 vehicles per hour for each of any 5 hours on a Saturday or Sunday?

Warrant 8 is N/A.

Summary:

Warrants satisfied: none

Warrants not satisfied: 1, 2

Warrants not applicable: 3, 4, 5, 6, 7, 8

Warrants not included in study: none

Warrant 2 - Four Hour Vehicular Volumes

85th % speed: 1
 Population: 1

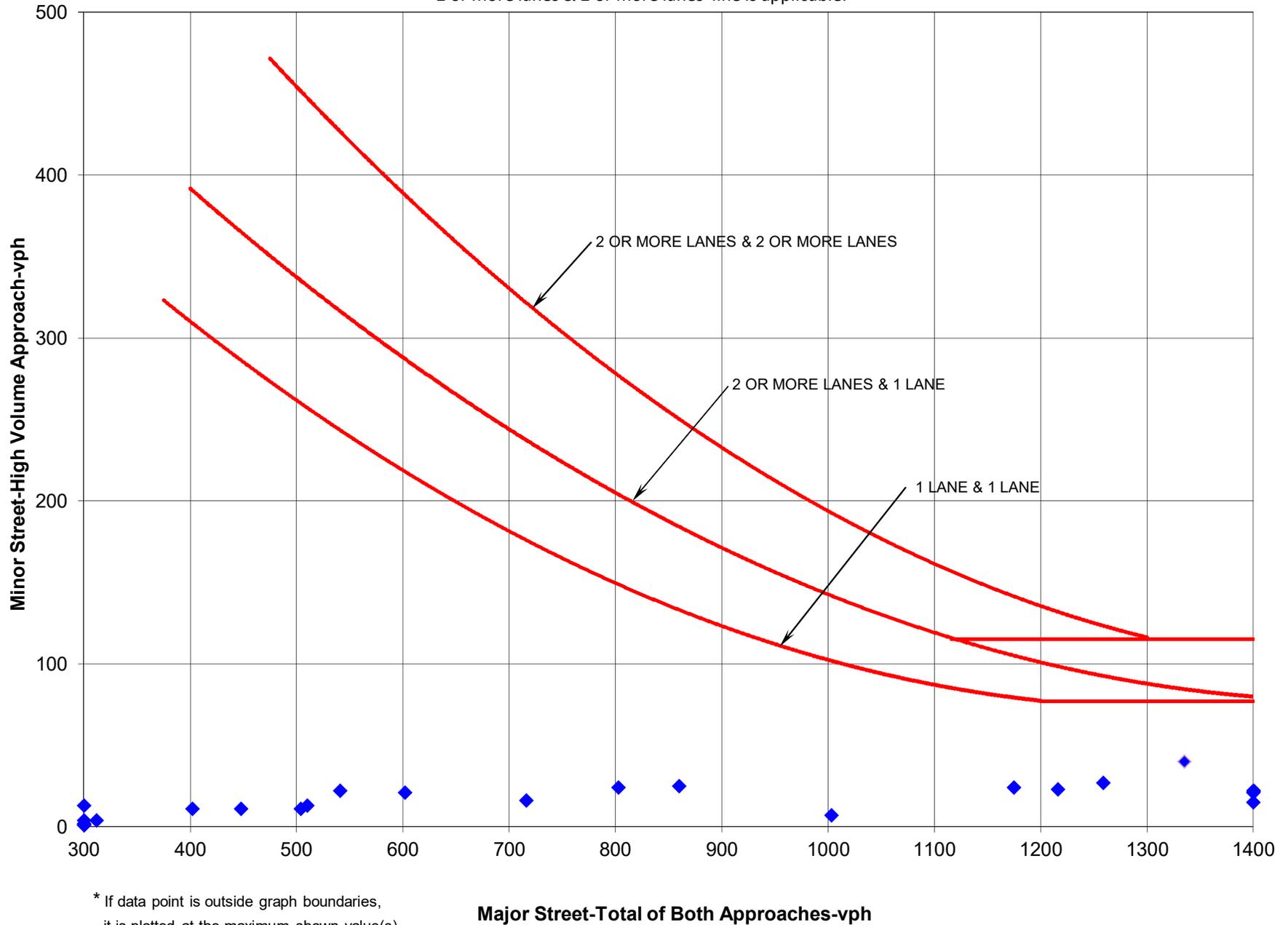
Major Street Lanes: 2
 Minor Street Lanes: 2

Use Figure: 4C-1 2&2
 Cotton Lane

Rank	Major Street 1	Minor Street Volume	Figure 4C-1			Figure 4C-2		
			1&1	2&1	2&2	1&1	2&1	2&2
1	2	4	-	-	N	-	-	-
2	45	2	-	-	N	-	-	-
3	54	1	-	-	N	-	-	-
4	51	1	-	-	N	-	-	-
5	74	1	-	-	N	-	-	-
6	199	13	-	-	N	-	-	-
7	Peoria	15	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
8	17000	22	-	-	N	-	-	-
9	1335	40	-	-	N	-	-	-
10	803	24	-	-	N	-	-	-
11	602	21	-	-	N	-	-	-
12	510	13	-	-	N	-	-	-
13	541	22	-	-	N	-	-	-
14	12/2/2019	21	-	-	N	-	-	-
15	716	16	-	-	N	-	-	-
16	1003	7	-	-	N	-	-	-
17	1175	24	-	-	N	-	-	-
18	1259	27	-	-	N	-	-	-
19	1216	23	-	-	N	-	-	-
20	860	25	-	-	N	-	-	-
21	504	11	-	-	N	-	-	-
22	448	11	-	-	N	-	-	-
23	402	11	-	-	N	-	-	-
24	312	4	-	-	N	-	-	-
			0	0	0	0	0	0
Warrant 2 is not satisfied.			N	N	N	N	N	N

Warrant 2
Figure 4C-1 Four Hour Volume Warrant

'2 or more lanes & 2 or more lanes' line is applicable.



* If data point is outside graph boundaries,
it is plotted at the maximum shown value(s).

General Description of Intersection

Project Number: 19173

2021 Without

Name of Major Roadway: Wilmot Road

Direction: N/S

of NB Lanes: 2

of SB Lanes: 2

85th percentile speed: 45 mph

Control #:

Section #:

Route #:

Name of Minor Roadway: Garden Stone Drive

Direction: E/W

of EB Lanes: 2

of WB Lanes: 1

85th percentile speed: 45 mph

Control #:

Section #:

Route #:

City: Tucson

Population: 535,000

County:

District:

Data Source: 24-hour approach

Date of Survey: 12/11/2019 (press Ctrl + ;)

Day of Week: Wednesday

Weather: Sunny

Surface Conditions: Dry

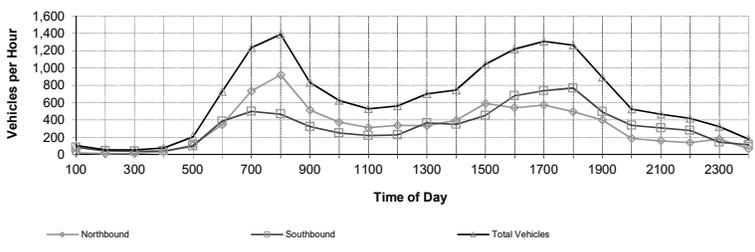
Smooth

Enter Traffic Volumes:

Automated Traffic Counts

Street: Wilmot Road
Location: Garden Stone Drive

City/State: Tucson , AZ
Project #: 19173
Date: 12/11/2019
Day of Week: Wednesday
Data Source: 24-hour approach



24-Hour Volume: 15,502

Time	Northbound		Southbound	
	Vehicles	Peds	Vehicles	Peds
12:00 AM				
12:15 AM				
12:30 AM				
12:45 AM				
1:00 AM	23		84	
1:15 AM				
1:30 AM				
1:45 AM				
2:00 AM	11		45	
2:15 AM				
2:30 AM				
2:45 AM				
3:00 AM	15		38	
3:15 AM				
3:30 AM				
3:45 AM				
4:00 AM	35		42	
4:15 AM				
4:30 AM				
4:45 AM				
5:00 AM	108		99	
5:15 AM				
5:30 AM				
5:45 AM				
6:00 AM	344		384	
6:15 AM				
6:30 AM				
6:45 AM				
7:00 AM	735		499	
7:15 AM				
7:30 AM				
7:45 AM				
8:00 AM	921		468	
8:15 AM				
8:30 AM				
8:45 AM				
9:00 AM	514		321	
9:15 AM				
9:30 AM				
9:45 AM				
10:00 AM	376		251	
10:15 AM				
10:30 AM				
10:45 AM				
11:00 AM	311		220	
11:15 AM				
11:30 AM				
11:45 AM				
12:00 PM	337		226	

Time	Northbound		Southbound	
	Vehicles	Peds	Vehicles	Peds
12:00 PM				
12:15 PM				
12:30 PM				
12:45 PM				
1:00 PM	333		368	
1:15 PM				
1:30 PM				
1:45 PM				
2:00 PM	395		350	
2:15 PM				
2:30 PM				
2:45 PM				
3:00 PM	591		453	
3:15 PM				
3:30 PM				
3:45 PM				
4:00 PM	542		680	
4:15 PM				
4:30 PM				
4:45 PM				
5:00 PM	572		738	
5:15 PM				
5:30 PM				
5:45 PM				
6:00 PM	495		770	
6:15 PM				
6:30 PM				
6:45 PM				
7:00 PM	401		494	
7:15 PM				
7:30 PM				
7:45 PM				
8:00 PM	188		336	
8:15 PM				
8:30 PM				
8:45 PM				
9:00 PM	159		307	
9:15 PM				
9:30 PM				
9:45 PM				
10:00 PM	138		280	
10:15 PM				
10:30 PM				
10:45 PM				
11:00 PM	181		144	
11:15 PM				
11:30 PM				
11:45 PM				
12:00 AM	68		113	

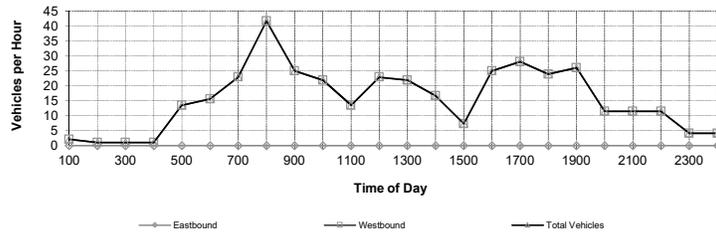
Equipment ID#:		7,794	7,709
		24-Hour Volume	15,502

Automated Traffic Counts

Street: **Garden Stone Drive**
 Location: **Wilmot Road**

City/State: **Tucson , AZ**
 Project #:

Date: **12/11/2019**
 Day of Week: **Wednesday**
 Data Source: **24-hour approach**



24-Hour Volume: 374

Time	Eastbound		Westbound	
	Vehicles	Peds	Vehicles	Peds
12:00 AM				
12:15 AM				
12:30 AM				
12:45 AM				
1:00 AM	0		2	
1:15 AM				
1:30 AM				
1:45 AM				
2:00 AM	0		1	
2:15 AM				
2:30 AM				
2:45 AM				
3:00 AM	0		1	
3:15 AM				
3:30 AM				
3:45 AM				
4:00 AM	0		1	
4:15 AM				
4:30 AM				
4:45 AM				
5:00 AM	0		14	
5:15 AM				
5:30 AM				
5:45 AM				
6:00 AM	0		16	
6:15 AM				
6:30 AM				
6:45 AM				
7:00 AM	0		23	
7:15 AM				
7:30 AM				
7:45 AM				
8:00 AM	0		42	
8:15 AM				
8:30 AM				
8:45 AM				
9:00 AM	0		25	
9:15 AM				
9:30 AM				
9:45 AM				
10:00 AM	0		22	
10:15 AM				
10:30 AM				
10:45 AM				
11:00 AM	0		14	
11:15 AM				
11:30 AM				
11:45 AM				
12:00 PM	0		23	

Time	Eastbound		Westbound	
	Vehicles	Peds	Vehicles	Peds
12:00 PM				
12:59 PM				
12:30 PM				
12:45 PM				
1:00 PM	0		22	
1:59 PM				
1:30 PM				
1:45 PM				
2:00 PM	0		17	
2:59 PM				
2:30 PM				
2:45 PM				
3:00 PM	0		7	
3:59 PM				
3:30 PM				
3:45 PM				
4:00 PM	0		25	
4:59 PM				
4:30 PM				
12:00 AM				
5:00 PM	0		28	
5:59 PM				
5:30 PM				
5:45 PM				
6:00 PM	0		24	
6:59 PM				
6:30 PM				
6:45 PM				
7:00 PM	0		26	
7:59 PM				
7:30 PM				
7:45 PM				
8:00 PM	0		11	
8:59 PM				
8:30 PM				
8:45 PM				
9:00 PM	0		11	
9:59 PM				
9:30 PM				
9:45 PM				
10:00 PM	0		11	
10:59 PM				
10:30 PM				
10:45 PM				
11:00 PM	0		4	
11:59 PM				
11:30 PM				
11:45 PM				
12:00 AM	0		4	

Equipment ID#:

0	374
24-Hour Volume	374

TRAFFIC SURVEY - COUNT ANALYSIS
2009 MUTCD WARRANTS

2021 Without

Northern Avenue		District No.:	
1	City: Tucson	Population: 535,000	Survey Date: 12/11/2019
	Route #	Name	Control Section 85% Speed
Major		Wilmot Road	- 45
Minor		Garden Stone Drive	- 45
Cotton Lane			

1
2 **Condition A**

#	Number of Lanes		Major Street Both Approaches Required		Minor Street High Volume Approach Required		
	Major	Street	Minor Street	Urban	Rural*	Urban	Rural*
		1		1	500	350	150
Peoria	2 or more		1	600	420	150	105
#	2 or more		2 or more	600	420	200	140
	1		2 or more	500	350	200	140

*Criteria when the 85th percentile speed is greater than 40 mph or when the population is less than 10,000

#	Warrant 1		Criteria				
	Time		Volume		Major	Minor	Both Meet
	Begin	End	Major	Minor	>= 420	>= 140	
	12:00 AM	1:00 AM	106.5452	2.0808	N	N	N
	1:00 AM	2:00 AM	56.1816	1.0404	N	N	N
	2:00 AM	3:00 AM	53.0604	1.0404	N	N	N
	3:00 AM	4:00 AM	76.9896	1.0404	N	N	N
	4:00 AM	5:00 AM	207.0396	13.5252	N	N	N
	5:00 AM	6:00 AM	728.28	15.606	Y	N	N
	6:00 AM	7:00 AM	1233.914	22.8888	Y	N	N
	7:00 AM	8:00 AM	1388.934	41.616	Y	N	N
	8:00 AM	9:00 AM	835.4412	24.9696	Y	N	N
	9:00 AM	10:00 AM	626.3208	21.8484	Y	N	N
	10:00 AM	11:00 AM	530.604	13.5252	Y	N	N
	11:00 AM	12:00 PM	562.8564	22.8888	Y	N	N
	12:00 PM	1:00 PM	701.2296	21.8484	Y	N	N
	1:00 PM	2:00 PM	744.9264	16.6464	Y	N	N
	2:00 PM	3:00 PM	1043.521	7.2828	Y	N	N
	3:00 PM	4:00 PM	1222.47	24.9696	Y	N	N
	4:00 PM	5:00 PM	1309.864	28.0908	Y	N	N
	5:00 PM	6:00 PM	1265.126	23.9292	Y	N	N
	6:00 PM	7:00 PM	894.744	26.01	Y	N	N
	7:00 PM	8:00 PM	524.3616	11.4444	Y	N	N
	8:00 PM	9:00 PM	466.0992	11.4444	Y	N	N
	9:00 PM	10:00 PM	418.2408	11.4444	N	N	N
	10:00 PM	11:00 PM	324.6048	4.1616	N	N	N
	11:00 PM	12:00 AM	181.0296	4.1616	N	N	N

Total number of hours, both the major(both approaches) and minor(high volume approach) met: 0

Condition A is not satisfied
Warrant 1 not satisfied.

Hours Required: 8

Warrant 1: Eight- Hour Volumes

Condition B

Number of Lanes		Major Street Both Approaches Required		Minor Street High Volume Approach Required		
Major	Street	Minor Street	Urban	Rural*	Urban	Rural*
1		1	750	525	75	53
2 or more		1	900	630	75	53
2 or more		2 or more	900	630	100	70
1		2 or more	750	525	100	70

*Criteria when the 85th percentile speed is greater than 40 mph or when the population is less than 10,000

Warrant 2						
Time		Volume		Criteria		
Begin	End	Major	Minor	Major ≥ 630	Minor ≥ 70	Both Meet
12:00 AM	1:00 AM	106.5452	2.0808	N	N	N
1:00 AM	2:00 AM	56.1816	1.0404	N	N	N
2:00 AM	3:00 AM	53.0604	1.0404	N	N	N
3:00 AM	4:00 AM	76.9896	1.0404	N	N	N
4:00 AM	5:00 AM	207.0396	13.5252	N	N	N
5:00 AM	6:00 AM	728.28	15.606	Y	N	N
6:00 AM	7:00 AM	1233.914	22.8888	Y	N	N
7:00 AM	8:00 AM	1388.934	41.616	Y	N	N
8:00 AM	9:00 AM	835.4412	24.9696	Y	N	N
9:00 AM	10:00 AM	626.3208	21.8484	N	N	N
10:00 AM	11:00 AM	530.604	13.5252	N	N	N
11:00 AM	12:00 PM	562.8564	22.8888	N	N	N
12:00 PM	1:00 PM	701.2296	21.8484	Y	N	N
1:00 PM	2:00 PM	744.9264	16.6464	Y	N	N
2:00 PM	3:00 PM	1043.521	7.2828	Y	N	N
3:00 PM	4:00 PM	1222.47	24.9696	Y	N	N
4:00 PM	5:00 PM	1309.864	28.0908	Y	N	N
5:00 PM	6:00 PM	1265.126	23.9292	Y	N	N
6:00 PM	7:00 PM	894.744	26.01	Y	N	N
7:00 PM	8:00 PM	524.3616	11.4444	N	N	N
8:00 PM	9:00 PM	466.0992	11.4444	N	N	N
9:00 PM	10:00 PM	418.2408	11.4444	N	N	N
10:00 PM	11:00 PM	324.6048	4.1616	N	N	N
11:00 PM	12:00 AM	181.0296	4.1616	N	N	N

Total number of hours, both the major(both approaches) and minor(high volume approach) met: 0
 Hours Required: 8

Condition B is not satisfied

Warrant 1 not satisfied.

Warrant 2: Four Hour Vehicular Volumes

This warrant is similar to Warrant 1A, except that the required traffic volumes must be present for at least four hours of an average day. The traffic volumes required are based on curves (Figure 4C-2) shown in the MUTCD.

* **The required traffic volumes for Warrant 2 do not meet for any one hour.**

Warrant 2 is not satisfied

Warrant 3, Condition A- Peak Hour Delay

This warrant is intended for application where traffic conditions will cause undue delay to traffic entering or crossing the major street. The peak hour delay warrant is satisfied when the following conditions exist for one hour (any four consecutive 15-minute periods) of an average weekday:

- (1) The total delay by the traffic on a side street controlled by a stop sign equals or exceeds four vehicle-hours for a one-lane approach and five vehicle-hours for a two-lane approach, **and**
- (2) the volume on the side street (one direction) equals or exceeds 100 vph for one moving lane of traffic and 150 vph for two moving lanes, **and**
- (3) the total traffic volume serviced during 1 hour equals or exceeds 800 vph for an intersection with four (or more) approaches or 650 vph for three approaches.

*Part 1 - N/A

*Part 2 - N/A

*Part 3 - N/A

Warrant 3, Condition B - Peak Hour Volume

This warrant applies to traffic entering from the minor street which encounters undue delay crossing the main street. This is satisfied when the main street and side street traffic volumes satisfy the curves shown in Figure 4C-4 of the TMUTCD.

Warrant 3 is N/A.

Warrant 4: Pedestrian Volume

Required*	Existing
100 or more for each of any four hours	_____
OR	
190 or more during any one hour	_____

* For predominant pedestrian crossing speeds less than 3.5 ft/sec, the pedestrian volume may be reduced as much as 50 percent.

Gap Requirements

YES	NO	Is the nearest signal located more than 300 feet away?
YES	NO	For traffic flow which is not platooned, are there less than 60 gaps per hour of adequate length for the pedestrians to cross the street?

Warrant 4 is N/A.

Warrant 5: School Crossing

YES	NO	Is the number of adequate gaps in traffic stream during the period when the children are using the crossing less than the number of minutes in the same period?
-----	----	---

Warrant 5 is N/A.

Warrant 6: Coordinate Systems

YES	NO	Are the adjacent signals in a signal system?
YES	NO	Would the resultant spacing be 1000 feet or more?

Warrant 6 is N/A.

Warrant 7: Crash Experience

YES	NO	Is 80% or more of one of Warrants #1, #2, or #3 met?
YES	NO	Have there been more than five accidents susceptible to correction by a traffic signal in 12 months?

Warrant 7 is N/A.

Warrant 8: Roadway Network

YES	NO	Does the major street having an existing or immediately projected entering volume of > 1000 vehicles per hour of a typical weekday?
YES	NO	Do 5-year projected traffic volumes meet Warrants 1, 2, or 3?
YES	NO	Is there an entering traffic volume of at least 1000 vehicles per hour for each of any 5 hours on a Saturday or Sunday?

Warrant 8 is N/A.

Summary:

Warrants satisfied: none

Warrants not satisfied: 1, 2

Warrants not applicable: 3, 4, 5, 6, 7, 8

Warrants not included in study: none

Warrant 2 - Four Hour Vehicular Volumes

85th % speed: 1
 Population: 1

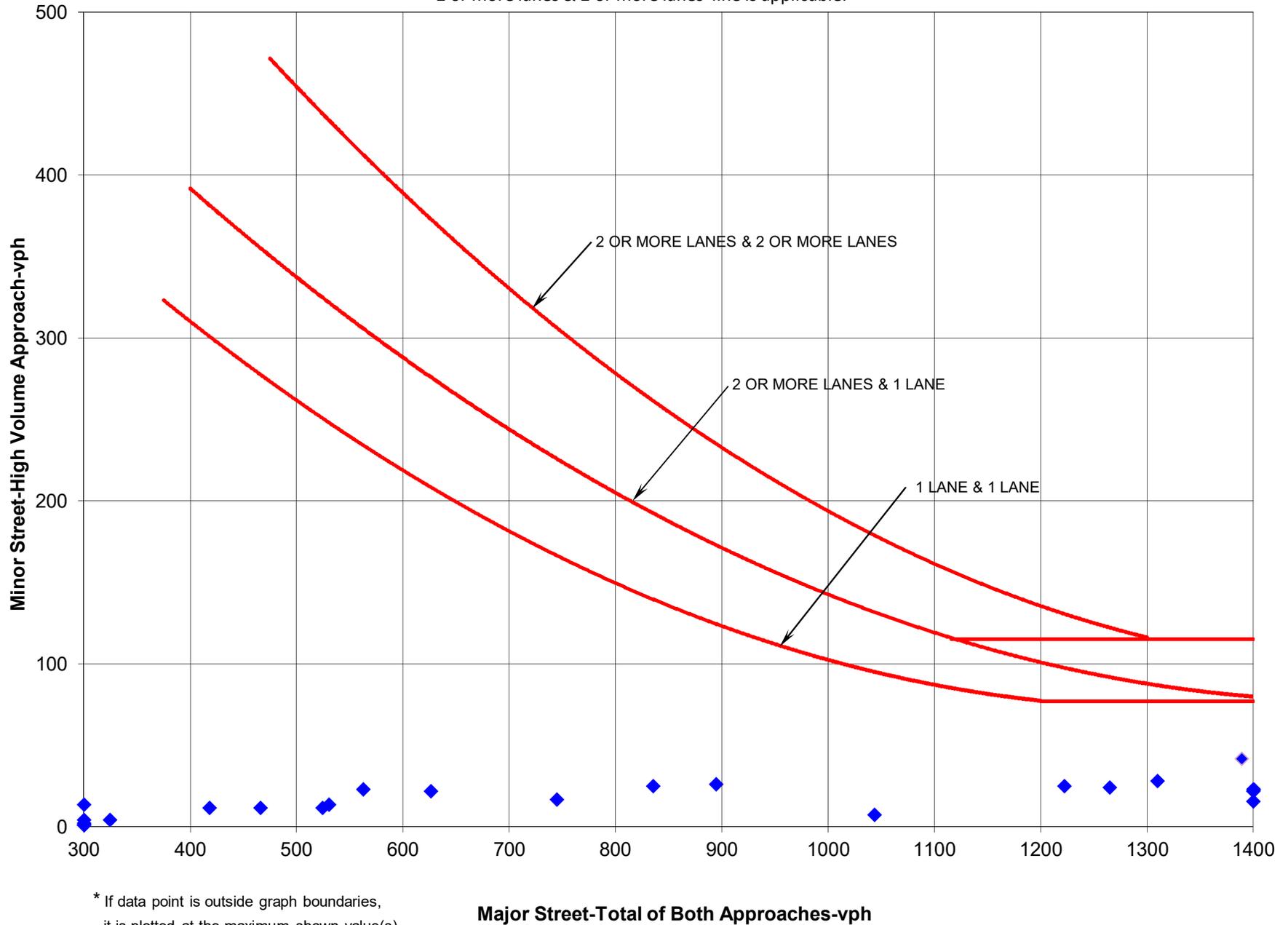
Major Street Lanes: 2
 Minor Street Lanes: 2

Use Figure: 4C-1 2&2
 Cotton Lane

Rank	Major Street 1	Minor Street Volume	Figure 4C-1			Figure 4C-2		
			1&1	2&1	2&2	1&1	2&1	2&2
1	2	4.1616	-	-	N	-	-	-
2	45	2.0808	-	-	N	-	-	-
3	56.1816	1.0404	-	-	N	-	-	-
4	53.0604	1.0404	-	-	N	-	-	-
5	76.9896	1.0404	-	-	N	-	-	-
6	207.0396	13.5252	-	-	N	-	-	-
7	Peoria	15.606	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
8	170000	22.8888	-	-	N	-	-	-
9	1388.934	41.616	-	-	N	-	-	-
10	835.4412	24.9696	-	-	N	-	-	-
11	626.3208	21.8484	-	-	N	-	-	-
12	530.604	13.5252	-	-	N	-	-	-
13	562.8564	22.8888	-	-	N	-	-	-
14	12/2/2019	21.8484	-	-	N	-	-	-
15	744.9264	16.6464	-	-	N	-	-	-
16	1043.5212	7.2828	-	-	N	-	-	-
17	1222.47	24.9696	-	-	N	-	-	-
18	1309.8636	28.0908	-	-	N	-	-	-
19	1265.1264	23.9292	-	-	N	-	-	-
20	894.744	26.01	-	-	N	-	-	-
21	524.3616	11.4444	-	-	N	-	-	-
22	466.0992	11.4444	-	-	N	-	-	-
23	418.2408	11.4444	-	-	N	-	-	-
24	324.6048	4.1616	-	-	N	-	-	-
			0	0	0	0	0	0
Warrant 2 is not satisfied.			N	N	N	N	N	N

Warrant 2
Figure 4C-1 Four Hour Volume Warrant

'2 or more lanes & 2 or more lanes' line is applicable.



General Description of Intersection

Project Number: 19173

2021 With

Name of Major Roadway: Wilmot Road

Direction: N/S

of NB Lanes: 2

of SB Lanes: 2

85th percentile speed: 45 mph

Control #:

Section #:

Route #:

Name of Minor Roadway: Garden Stone Drive

Direction: E/W

of EB Lanes: 2

of WB Lanes: 1

85th percentile speed: 45 mph

Control #:

Section #:

Route #:

City: Tucson

Population: 535,000

County:

District:

Data Source: 24-hour approach

Date of Survey: 12/11/2019 (press Ctrl + ;)

Day of Week: Wednesday

Weather: Sunny

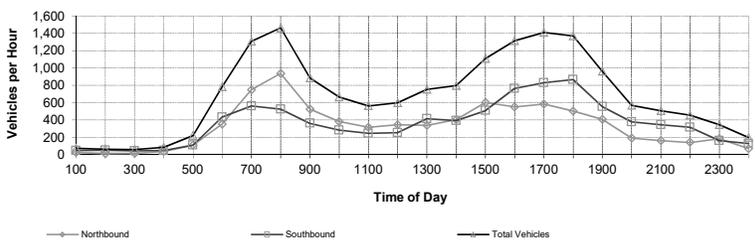
Surface Conditions: Dry

Smooth

Enter Traffic Volumes:

Automated Traffic Counts

Street: **Wilmot Road**
 Location: **Garden Stone Drive**
 City/State: **Tucson , AZ**
 Project #: **19173**
 Date: **12/11/2019**
 Day of Week: **Wednesday**
 Data Source: **24-hour approach**



24-Hour Volume: **16,565**

Time	Northbound		Southbound	
	Vehicles	Peds	Vehicles	Peds
12:00 AM				
12:15 AM				
12:30 AM				
12:45 AM				
1:00 AM	23		48	
1:15 AM				
1:30 AM				
1:45 AM				
2:00 AM	12		50	
2:15 AM				
2:30 AM				
2:45 AM				
3:00 AM	15		43	
3:15 AM				
3:30 AM				
3:45 AM				
4:00 AM	36		47	
4:15 AM				
4:30 AM				
4:45 AM				
5:00 AM	110		111	
5:15 AM				
5:30 AM				
5:45 AM				
6:00 AM	351		432	
6:15 AM				
6:30 AM				
6:45 AM				
7:00 AM	749		562	
7:15 AM				
7:30 AM				
7:45 AM				
8:00 AM	938		526	
8:15 AM				
8:30 AM				
8:45 AM				
9:00 AM	524		362	
9:15 AM				
9:30 AM				
9:45 AM				
10:00 AM	383		282	
10:15 AM				
10:30 AM				
10:45 AM				
11:00 AM	317		247	
11:15 AM				
11:30 AM				
11:45 AM				
12:00 PM	344		254	

Time	Northbound		Southbound	
	Vehicles	Peds	Vehicles	Peds
12:00 PM				
12:15 PM				
12:30 PM				
12:45 PM				
1:00 PM	339		414	
1:15 PM				
1:30 PM				
1:45 PM				
2:00 PM	403		393	
2:15 PM				
2:30 PM				
2:45 PM				
3:00 PM	602		509	
3:15 PM				
3:30 PM				
3:45 PM				
4:00 PM	552		765	
4:15 PM				
4:30 PM				
4:45 PM				
5:00 PM	583		830	
5:15 PM				
5:30 PM				
5:45 PM				
6:00 PM	505		866	
6:15 PM				
6:30 PM				
6:45 PM				
7:00 PM	408		556	
7:15 PM				
7:30 PM				
7:45 PM				
8:00 PM	192		378	
8:15 PM				
8:30 PM				
8:45 PM				
9:00 PM	162		345	
9:15 PM				
9:30 PM				
9:45 PM				
10:00 PM	141		315	
10:15 PM				
10:30 PM				
10:45 PM				
11:00 PM	184		161	
11:15 PM				
11:30 PM				
11:45 PM				
12:00 AM	69		128	

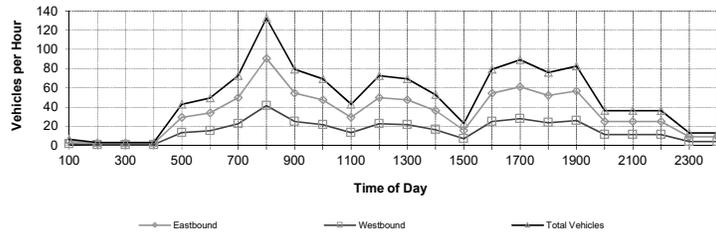
Equipment ID#:		7,943	8,623
		24-Hour Volume	
			16,565

Automated Traffic Counts

Street: **Garden Stone Drive**
 Location: **Wilmot Road**

City/State: **Tucson , AZ**
 Project #:

Date: **12/11/2019**
 Day of Week: **Wednesday**
 Data Source: **24-hour approach**



24-Hour Volume: **1,188**

Time	Eastbound		Westbound	
	Vehicles	Peds	Vehicles	Peds
12:00 AM				
12:15 AM				
12:30 AM				
12:45 AM				
1:00 AM	5		2	
1:15 AM				
1:30 AM				
1:45 AM				
2:00 AM	2		1	
2:15 AM				
2:30 AM				
2:45 AM				
3:00 AM	2		1	
3:15 AM				
3:30 AM				
3:45 AM				
4:00 AM	2		1	
4:15 AM				
4:30 AM				
4:45 AM				
5:00 AM	29		14	
5:15 AM				
5:30 AM				
5:45 AM				
6:00 AM	34		16	
6:15 AM				
6:30 AM				
6:45 AM				
7:00 AM	50		23	
7:15 AM				
7:30 AM				
7:45 AM				
8:00 AM	91		42	
8:15 AM				
8:30 AM				
8:45 AM				
9:00 AM	54		25	
9:15 AM				
9:30 AM				
9:45 AM				
10:00 AM	48		22	
10:15 AM				
10:30 AM				
10:45 AM				
11:00 AM	29		14	
11:15 AM				
11:30 AM				
11:45 AM				
12:00 PM	50		23	

Time	Eastbound		Westbound	
	Vehicles	Peds	Vehicles	Peds
12:00 PM				
12:59 PM				
12:30 PM				
12:45 PM				
1:00 PM	48		22	
1:59 PM				
1:30 PM				
1:45 PM				
2:00 PM	36		17	
2:59 PM				
2:30 PM				
2:45 PM				
3:00 PM	16		7	
3:59 PM				
3:30 PM				
3:45 PM				
4:00 PM	54		25	
4:59 PM				
4:30 PM				
12:00 AM				
5:00 PM	61		28	
5:59 PM				
5:30 PM				
5:45 PM				
6:00 PM	52		24	
6:59 PM				
6:30 PM				
6:45 PM				
7:00 PM	57		26	
7:59 PM				
7:30 PM				
7:45 PM				
8:00 PM	25		11	
8:59 PM				
8:30 PM				
8:45 PM				
9:00 PM	25		11	
9:59 PM				
9:30 PM				
9:45 PM				
10:00 PM	25		11	
10:59 PM				
10:30 PM				
10:45 PM				
11:00 PM	9		4	
11:59 PM				
11:30 PM				
11:45 PM				
12:00 AM	9		4	

Equipment ID#:

814	374
24-Hour Volume	1,188

TRAFFIC SURVEY - COUNT ANALYSIS
2009 MUTCD WARRANTS

2021 With

	Northern Avenue _____		District No.: _____
1	City: <u>Tucson</u>	Population: <u>535,000</u>	Survey Date: <u>12/11/2019</u>
	Route #	Name	Control
	Major	<u>Wilmot Road</u>	-
	Minor	<u>Garden Stone Drive</u>	-
	<u>Cotton Lane</u>		
			85% Speed
			<u>45</u>
			<u>45</u>

1
2 **Condition A**

#	Number of Lanes		Major Street		Minor Street		
			Both Approaches		High Volume Approach		
	Major	Street	Minor Street	Urban	Rural*	Urban	Rural*
	1		1	500	350	150	105
Peoria	2 or more		1	600	420	150	105
#	2 or more		2 or more	600	420	200	140
	1		2 or more	500	350	200	140

*Criteria when the 85th percentile speed is greater than 40 mph or when the population is less than 10,000

#	Warrant 1		Criteria				
	Time		Volume		Major	Minor	Both Meet
	Begin	End	Major	Minor	>= 420	>= 140	
	12:00 AM	1:00 AM	71.29555	4.5348189	N	N	N
	1:00 AM	2:00 AM	61.97231	2.2674095	N	N	N
	2:00 AM	3:00 AM	58.1333	2.2674095	N	N	N
	3:00 AM	4:00 AM	82.84905	2.2674095	N	N	N
	4:00 AM	5:00 AM	221.4183	29.476323	N	N	N
	5:00 AM	6:00 AM	782.6786	34.011142	Y	N	N
	6:00 AM	7:00 AM	1310.155	49.883008	Y	N	N
	7:00 AM	8:00 AM	1464.848	90.696379	Y	N	N
	8:00 AM	9:00 AM	885.3072	54.417827	Y	N	N
	9:00 AM	10:00 AM	664.7299	47.615599	Y	N	N
	10:00 AM	11:00 AM	563.8925	29.476323	Y	N	N
	11:00 AM	12:00 PM	597.4197	49.883008	Y	N	N
	12:00 PM	1:00 PM	753.4657	47.615599	Y	N	N
	1:00 PM	2:00 PM	796.0235	36.278552	Y	N	N
	2:00 PM	3:00 PM	1111.186	15.871866	Y	N	N
	3:00 PM	4:00 PM	1317.578	54.417827	Y	N	N
	4:00 PM	5:00 PM	1412.675	61.220056	Y	N	N
	5:00 PM	6:00 PM	1370.483	52.150418	Y	N	N
	6:00 PM	7:00 PM	963.9521	56.685237	Y	N	N
	7:00 PM	8:00 PM	569.8159	24.941504	Y	N	N
	8:00 PM	9:00 PM	507.3684	24.941504	Y	N	N
	9:00 PM	10:00 PM	455.7431	24.941504	Y	N	N
	10:00 PM	11:00 PM	345.9477	9.0696379	N	N	N
	11:00 PM	12:00 AM	196.4466	9.0696379	N	N	N

Total number of hours, both the major(both approaches) and minor(high volume approach) met: 0

Condition A is not satisfied Hours Required: 8
Warrant 1 not satisfied.

Warrant 1: Eight- Hour Volumes

Condition B

Number of Lanes		Major Street Both Approaches Required		Minor Street High Volume Approach Required		
Major	Street	Minor Street	Urban	Rural*	Urban	Rural*
1		1	750	525	75	53
2 or more		1	900	630	75	53
2 or more		2 or more	900	630	100	70
1		2 or more	750	525	100	70

*Criteria when the 85th percentile speed is greater than 40 mph or when the population is less than 10,000

Warrant 2						
Time		Volume		Criteria		
Begin	End	Major	Minor	Major ≥ 630	Minor ≥ 70	Both Meet
12:00 AM	1:00 AM	71.29555	4.5348189	N	N	N
1:00 AM	2:00 AM	61.97231	2.2674095	N	N	N
2:00 AM	3:00 AM	58.1333	2.2674095	N	N	N
3:00 AM	4:00 AM	82.84905	2.2674095	N	N	N
4:00 AM	5:00 AM	221.4183	29.476323	N	N	N
5:00 AM	6:00 AM	782.6786	34.011142	Y	N	N
6:00 AM	7:00 AM	1310.155	49.883008	Y	N	N
7:00 AM	8:00 AM	1464.848	90.696379	Y	Y	Y
8:00 AM	9:00 AM	885.3072	54.417827	Y	N	N
9:00 AM	10:00 AM	664.7299	47.615599	Y	N	N
10:00 AM	11:00 AM	563.8925	29.476323	N	N	N
11:00 AM	12:00 PM	597.4197	49.883008	N	N	N
12:00 PM	1:00 PM	753.4657	47.615599	Y	N	N
1:00 PM	2:00 PM	796.0235	36.278552	Y	N	N
2:00 PM	3:00 PM	1111.186	15.871866	Y	N	N
3:00 PM	4:00 PM	1317.578	54.417827	Y	N	N
4:00 PM	5:00 PM	1412.675	61.220056	Y	N	N
5:00 PM	6:00 PM	1370.483	52.150418	Y	N	N
6:00 PM	7:00 PM	963.9521	56.685237	Y	N	N
7:00 PM	8:00 PM	569.8159	24.941504	N	N	N
8:00 PM	9:00 PM	507.3684	24.941504	N	N	N
9:00 PM	10:00 PM	455.7431	24.941504	N	N	N
10:00 PM	11:00 PM	345.9477	9.0696379	N	N	N
11:00 PM	12:00 AM	196.4466	9.0696379	N	N	N

Total number of hours, both the major(both approaches) and minor(high volume approach) met: 1
 Hours Required: 8

Condition B is not satisfied

Warrant 1 not satisfied.

Warrant 2: Four Hour Vehicular Volumes

This warrant is similar to Warrant 1A, except that the required traffic volumes must be present for at least four hours of an average day. The traffic volumes required are based on curves (Figure 4C-2) shown in the MUTCD.

* The required traffic volumes for Warrant 2 do not meet for any one hour.

Warrant 2 is not satisfied

Warrant 3, Condition A- Peak Hour Delay

This warrant is intended for application where traffic conditions will cause undue delay to traffic entering or crossing the major street. The peak hour delay warrant is satisfied when the following conditions exist for one hour (any four consecutive 15-minute periods) of an average weekday:

- (1) The total delay by the traffic on a side street controlled by a stop sign equals or exceeds four vehicle-hours for a one-lane approach and five vehicle-hours for a two-lane approach, **and**
- (2) the volume on the side street (one direction) equals or exceeds 100 vph for one moving lane of traffic and 150 vph for two moving lanes, **and**
- (3) the total traffic volume serviced during 1 hour equals or exceeds 800 vph for an intersection with four (or more) approaches or 650 vph for three approaches.

*Part 1 - N/A

*Part 2 - N/A

*Part 3 - N/A

Warrant 3, Condition B - Peak Hour Volume

This warrant applies to traffic entering from the minor street which encounters undue delay crossing the main street. This warrant is satisfied when the main street and side street traffic volumes satisfy the curves shown in Figure 4C-4 of the TMUTCD.

Warrant 3 is N/A.

Warrant 4: Pedestrian Volume

Required*	Existing
100 or more for each of any four hours	_____
OR	
190 or more during any one hour	_____

* For predominant pedestrian crossing speeds less than 3.5 ft/sec, the pedestrian volume may be reduced as much as 50 percent.

Gap Requirements

YES	NO	Is the nearest signal located more than 300 feet away?
YES	NO	For traffic flow which is not platooned, are there less than 60 gaps per hour of adequate length for the pedestrians to cross the street?

Warrant 4 is N/A.

Warrant 5: School Crossing

YES	NO	Is the number of adequate gaps in traffic stream during the period when the children are using the crossing less than the number of minutes in the same period?
-----	----	---

Warrant 5 is N/A.

Warrant 6: Coordinate Systems

YES	NO	Are the adjacent signals in a signal system?
YES	NO	Would the resultant spacing be 1000 feet or more?

Warrant 6 is N/A.

Warrant 7: Crash Experience

YES	NO	Is 80% or more of one of Warrants #1, #2, or #3 met?
YES	NO	Have there been more than five accidents susceptible to correction by a traffic signal in 12 months?

Warrant 7 is N/A.

Warrant 8: Roadway Network

YES	NO	Does the major street having an existing or immediately projected entering volume of > 1000 vehicles per hour of a typical weekday?
YES	NO	Do 5-year projected traffic volumes meet Warrants 1, 2, or 3?
YES	NO	Is there an entering traffic volume of at least 1000 vehicles per hour for each of any 5 hours on a Saturday or Sunday?

Warrant 8 is N/A.

Summary:

Warrants satisfied: none

Warrants not satisfied: 1, 2

Warrants not applicable: 3, 4, 5, 6, 7, 8

Warrants not included in study: none

Warrant 2 - Four Hour Vehicular Volumes

85th % speed: 1
Population: 1

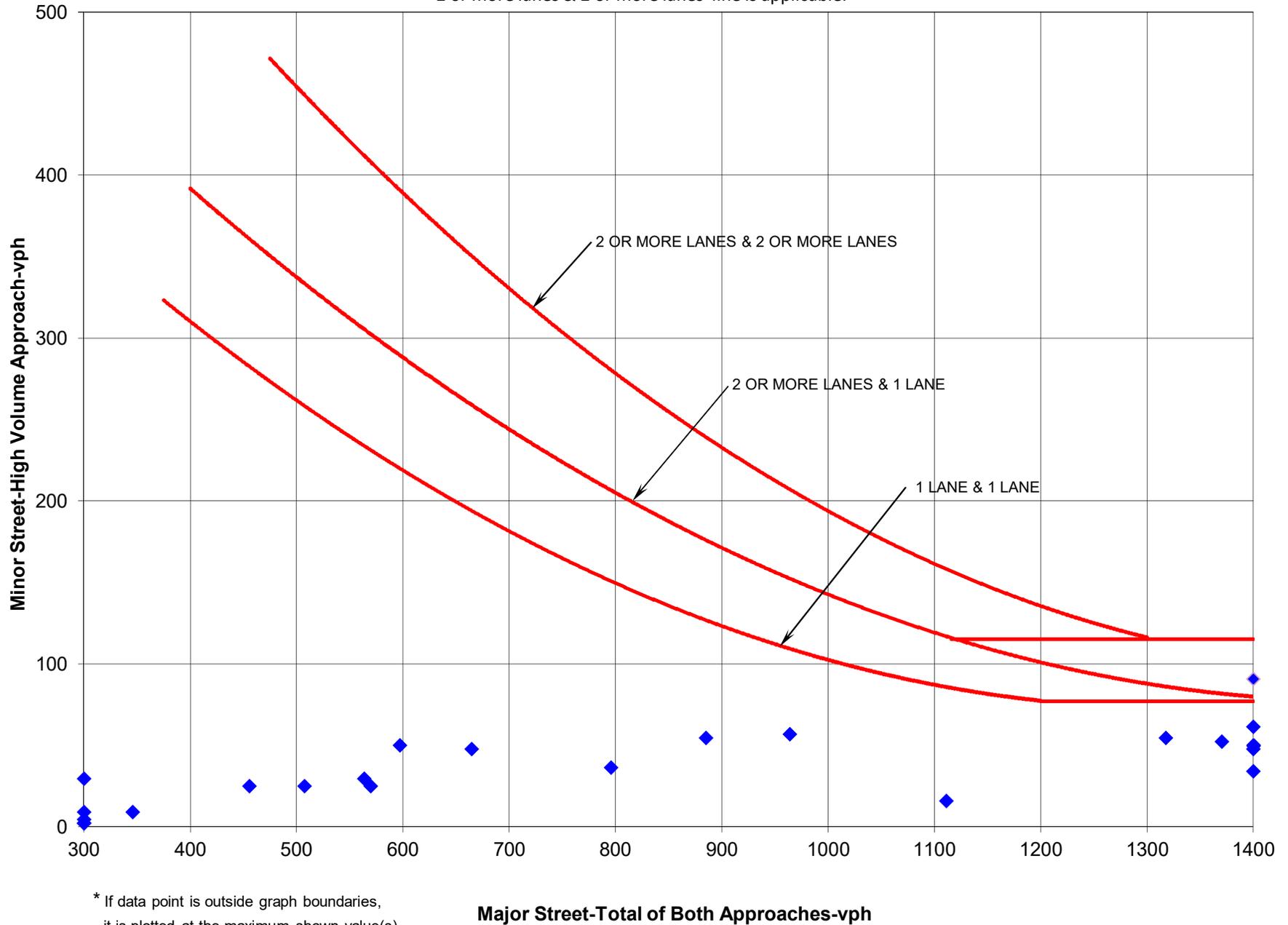
Major Street Lanes: 2
Minor Street Lanes: 2

Use Figure: 4C-1 2&2
Cotton Lane

Rank	Major Street 1	Minor Street Volume	Figure 4C-1			Figure 4C-2		
			1&1	2&1	2&2	1&1	2&1	2&2
1	2	9.06963788	-	-	N	-	-	-
2	45	4.53481894	-	-	N	-	-	-
3	61.97230905	2.26740947	-	-	N	-	-	-
4	58.1333044	2.26740947	-	-	N	-	-	-
5	82.84905323	2.26740947	-	-	N	-	-	-
6	221.4182564	29.4763231	-	-	N	-	-	-
7	Peoria	34.0111421	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
8	170000	49.8830084	-	-	N	-	-	-
9	1464.847843	90.6963788	-	-	N	-	-	-
10	885.3071516	54.4178273	-	-	N	-	-	-
11	664.7299128	47.6155989	-	-	N	-	-	-
12	563.8925184	29.4763231	-	-	N	-	-	-
13	597.419658	49.8830084	-	-	N	-	-	-
14	12/2/2019	47.6155989	-	-	N	-	-	-
15	796.0234737	36.2785515	-	-	N	-	-	-
16	1111.186053	15.8718663	-	-	N	-	-	-
17	1317.577881	54.4178273	-	-	N	-	-	-
18	1412.675172	61.2200557	-	-	N	-	-	-
19	1370.483033	52.1504178	-	-	N	-	-	-
20	963.9520596	56.6852368	-	-	N	-	-	-
21	569.8159253	24.9415042	-	-	N	-	-	-
22	507.3683678	24.9415042	-	-	N	-	-	-
23	455.7430933	24.9415042	-	-	N	-	-	-
24	345.947707	9.06963788	-	-	N	-	-	-
			0	0	0	0	0	0
Warrant 2 is not satisfied.			N	N	N	N	N	N

Warrant 2
Figure 4C-1 Four Hour Volume Warrant

'2 or more lanes & 2 or more lanes' line is applicable.



* If data point is outside graph boundaries,
it is plotted at the maximum shown value(s).



**BLACKHAWK
WILMOT ROAD/INTERSTATE 10
TRAFFIC IMPACT ANALYSIS**

APPENDIX

ADOT Design Concept Report Wilmot Road/I-10 Interchange Improvements

I-10 (Wilmot Road TI) (MP 268.83 to MP 269.93)

Project Need

This project is the third project to be constructed after the extension of SR 210 to I-10 at the system interchange at Alvernon Way. It is needed to accommodate the increase in traffic demand generated by the extension of SR 210. See **Figure 7.12**.

Project Features

I-10 is reconstructed with three general purpose lanes in each direction and replaces I-10 overpass structures at Wilmot Road. Due to the need for new structures, the I-10 profile will be higher than the existing profile. The project leaves an open median for future addition of general purpose lanes. It also reconstructs the crossroad and the interchange ramps.

Construction Phasing

Reconstruction of I-10 and the construction of the new overpass structures will require phased construction to maintain two lanes of traffic open in each direction on I-10 during construction. The overpass structures will be full width across I-10, allowing for temporarily shifting traffic into the median. At the east end of the project, tapers will be needed.

The first phase constructs temporary pavements in the median during construction of the median portions of the bridges over Wilmot Road. Subsequent phases will construct the remainder of the new improvements.

I-10 structure replacement over Wilmot Road will be performed using the same phased construction for mainline I-10 reconstruction.

Reconstruction of Wilmot Road will be performed via half-width construction phasing.

Construction Detours

Reconstruction of I-10 will not require detours, just shifts in traffic within the I-10 corridor.

A detour for Wilmot Road will not be required. Wilmot Road is isolated from other major streets, especially south of I-10. There are not any viable detour routes via the local street system. While construction of the east ramps would normally require temporary closures with detours, the lack of detour routes via local streets dictates that these ramps must be reconstructed under traffic via phased construction techniques. See **Figure 7.12**.

Figure 7.12 Wilmot Road TI

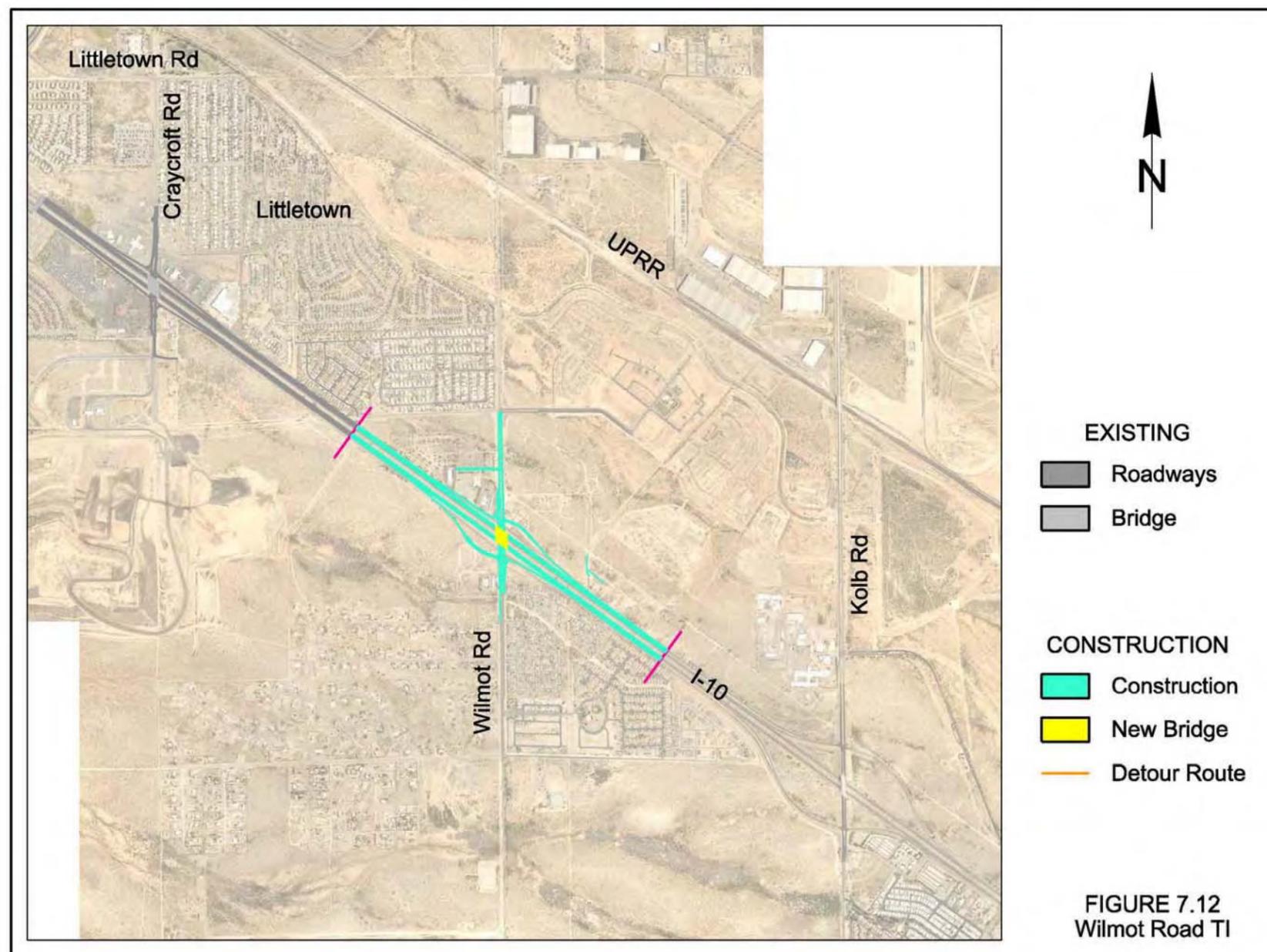


FIGURE 7.12
Wilmot Road TI