Exterior Building Color & Material Samples

Color Drawdowns

Archaeological Resources

Airport Vicinity Development Checklist

Parking Study

Trip Generation Comparison

Parking Master Plan

CASE FILE
QS 21.44
22-ZN-2016

HUBBARD ENGINEERING

COTTONWOODS RESORT & SUITES
SEWER SYSTEM ASSESSMENT
August 2016

Project Description:

The existing site was developed with a one-story building serving as the Cottonwoods Resort lobby and a restaurant. The building that once served as the lobby and restaurant was recently demolished however, the existing sewer service lines remain in place. There is currently an 8-inch sewer main in Rose Lane that discharges to another 8-inch sewer in Scottsdale Road at a slope of 0.33%, which serves the Cottonwoods Resort, Alamos, the Marriot, and the Borgata. This sewer system assessment evaluates the future demand for development of the existing Cottonwoods Resort lobby and restaurant property.

Site Information:

APN#:	174-65-012G
Site Address:	6160 N Scottsdale Rd Paradise Valley, AZ 85253
Site Area:	115,782 sq. ft. (2.6 acres)

Accepted w/Comments

City of Scottsdale
Water Resources Administration
9379 E. San Salvador
Scottsdale, AZ 85258

Doug Mann 9.7.16

Sewer Demand Calculations:

To determine the unit wastewater loads, the following references were used:

- City of Scottsdale Digital Zoning Map
- Table 8-22: "Unit Daily Design Flow For Sewer – Per Land Use" in the Town of Gilbert Public Works And Engineering Standards 2015.
- Table 8-23: "Wastewater Flow Peaking Factor" in the Town of Gilbert Public Works And Engineering Standards 2015.
- ADEQ Bulletin No. 11

for C-1 502/822/1173 gpad
weighted Avg = 553 gpad

In accordance with the City of Scottsdale Zoning Map, the subject property is currently located within the Zone R-R4, Resort/Townhouse Residential District. The property is in the process of being re-zoned to Zone C-1, Neighborhood Commercial. There currently is not a plan in place for the development of the subject property, so assumptions were made to determine future sewer flows based on acreage of the site and zoning designation. Since the City of Scottsdale does not have a sewer demand for gallons per acre per day, a sewer demand from the Town of Gilbert Public Works and Engineering Standards was used. Utilizing this information, it can be determined from Table 8-22 of the Town of Gilbert Public Works and Engineering Standards 2015 manual that the design unit wastewater load for property zoned with a commercial land use is 707 gallons per acre per day.

OK

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22-ZN-2016

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The existing Average Daily Flow is:

Total Average Daily Flow = (707 gal. per acre per day) x (2.6 acres) = 1,838 gal/day (1.28 gal/min)

A peaking factor of 2.9 was determined per Town of Gilbert Design Standards & Policies Manual.

COS 2.3 ✓ High/Low gpd/d 1173/502 = 2.3

Total Peak Factor = (2.9) x (1,838 gal/day) = 5,331 gal/day (3.70 gal/min)

Pipe Velocity and Capacity Calculations:

65 gpm (from resort report) + 4 gpm (this report) ✓ 69 gpm

Sewer Size (D):	8	inches	
Mannings n-value (n):	0.013		
Slope (S):	0.0033	ft./ft.	
Hydraulic Radius (R):	0.167	ft.	R=D/4 (full pipe)
Manning Equation:	$V=(k/n) \times (R)^{2/3} \times (S)^{1/2}$		k = 1.486
Velocity (V), full pipe:	2.0	ft./sec	Min. = 2.0 ft./sec Per ADEQ Bulletin No. 11 Max. = 10.0 ft./sec
Pipe Capacity:	**0.69**	**cfs**	**Q = V x A**
	448,629	**gal/day**	**OK**

@ d/D = 0.65 = 236 gpm ✓

***Note:** Upon final development of the subject property, a new sewer design report shall be prepared and submitted in accordance with City of Scottsdale design guidelines and requirements.*

Registered Professional Engineer (Civil) CERTIFICATE NO. 41972 BRENT R. STEFFENHAGEN Date Signed 8/12/16 ARIZONA, U.S.A. Expires 3/31/2017

X 3833

1201 S. Alma School Rd., Suite 12000 Mesa, Arizona 85210 www.hubbardengineering.com phone 480 892 3313 fax 480 892 7051

SWC Scottsdale Road & Rose Lane
Scottsdale, Arizona

Traffic Impact Analysis – FIRST REVISION

May 2017

Prepared for:
PV HOTEL VENTURE, SPE LLC

For Submittal to:
CITY OF SCOTTSDALE

EPS Group Project Number: 16-228

Prepared by: Eric R. Maceyko, P.E., PTOE
Bryan A. Martin, P.E.

Expires:6/30/2017

ACCEPTED
CITY OF SCOTTSDALE
TRANSPORTATION DEPARTMENT

DATE: June 20, 2017

REVIEWER: Abn Ruck

EPS GROUP

EPS Group, Inc. • 2045-South Vineyard Avenue, Suite 101 • Mesa, AZ 85210
Tel (480) 503-2250 • Fax (480) 503-2258
www.epsgroupinc.com

22-ZN-2016
5/31/2017

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Executive Summary

Introduction

PV Hotel Venture, SPE LLC is proposing a new restaurant development on the southwest corner of Scottsdale Road and Rose Lane in Scottsdale, Arizona. The proposed development encompasses an existing parcel of land on approximately 2.7 acres that previously contained an 8,000 square foot building with 2,000 square feet of patio space. This previous building contained hotel lobby and restaurant uses and was recently demolished.

The existing parcel is being planned for redevelopment to contain either one (1) single-story restaurant pad or two (2) separate two-story restaurant pads, with either option providing a total of 9,000 square feet of indoor building area and 3,000 square feet of outdoor patio area.

Results

The proposed development is anticipated to generate the following weekday traffic volumes.

Time Period	Day			AM Peak Hour			PM Peak Hour		
	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
Weekday	572	572	1,144	54	50	104	59	41	100

Recommendations without Proposed Development

The existing Scottsdale Road / Rose Lane intersection is operating at a level-of-service "B" during both peak hours with some individual movements operating at level-of-service "D" or "E". All instances of level-of-service "D" or "E" occurred on Rose Lane. These levels-of-service are anticipated to continue for ambient 2018 traffic conditions with minor additional delay.

It is also recommended to provide new lane striping on the eastbound Rose Lane approach at its intersection with Scottsdale Road to improve visibility of lane separation.

Recommendations with Proposed Development

All intersections are anticipated to operate at a level-of-service "B" or better under the 2018 with proposed site traffic conditions. The Scottsdale Road / Rose Lane intersection is anticipated to continue to have some individual movements operating at level-of-service "D" or "E". All instances of level-of-service "D" or "E" occurred on Rose Lane.

It is recommended to implement a revised lane configuration on the eastbound and westbound Rose Lane approaches consisting of separate left-turn and shared through / right-turn lanes.

No significant change in intersection level-of-service is anticipated with the addition of the proposed site traffic.

No additional turn lanes are warranted or recommended.

Introduction

PV Hotel Venture, SPE LLC is proposing a new restaurant development on the southwest corner of Scottsdale Road and Rose Lane in Scottsdale, Arizona. The proposed development encompasses an existing parcel of land on approximately 2.7 acres that previously contained an 8,000 square foot building with 2,000 square feet of patio space. This previous building contained hotel lobby and restaurant uses and was recently demolished.

The existing parcel is being planned for redevelopment to contain either one (1) single-story restaurant pad or two (2) separate two-story restaurant pads, with either option providing a total of 9,000 square feet of indoor building area and 3,000 square feet of outdoor patio area.

Scope of Study

There are eight (8) purposes for this analysis:

- Evaluate existing traffic conditions
- Estimate future ambient 2018 traffic volumes
- Evaluate ambient 2018 traffic conditions
- Estimate new traffic generated by proposed development
- Assign and distribute new traffic to surrounding street system
- Determine need for auxiliary lanes at all study intersections
- Evaluate operation of adjacent streets and intersections with proposed development
- Determine need for modified traffic control at all study intersections

Proposed Development

The site is located on the southwest corner of Scottsdale Road and Rose Lane. **Figure 1** provides a vicinity map proximate to the proposed site. **Figure 2** provides an initial site plan for the proposed development representing the two-building option.

The primary road used to access the site is Rose Lane which connects to Scottsdale Road. Rose Lane does not provide through access east or west of Scottsdale Road. Scottsdale Road is the main arterial providing regional access. The existing site has two full access driveways on Rose Lane west of Scottsdale Road, both of which are planned to be utilized by the proposed development. The driveways are labeled as Access A and Access B for the purposes of this analysis.

Figure 1: Vicinity Map

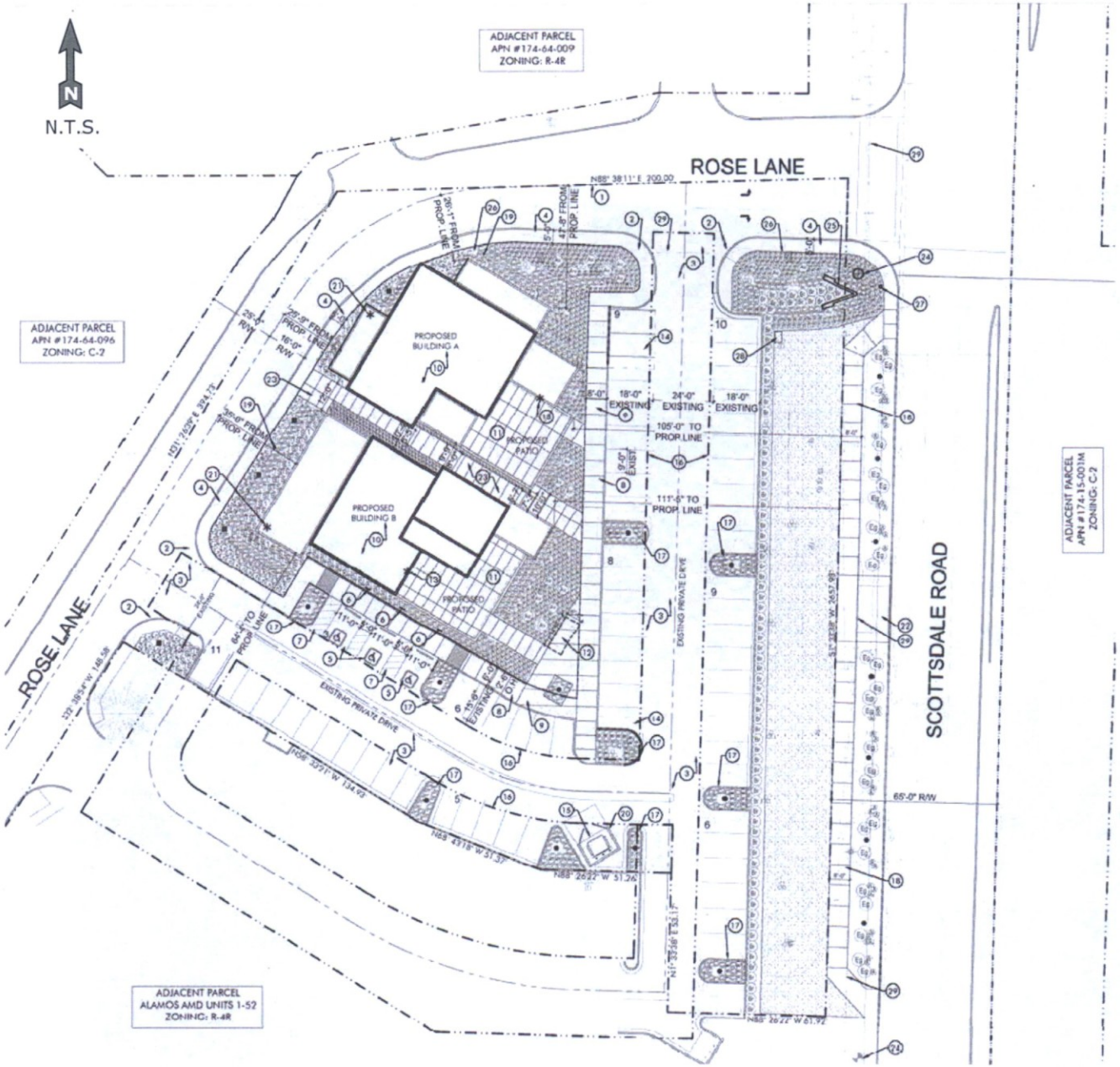


Figure 2: Proposed Development Site Plan

Surrounding Land Use and Transportation System

The proposed development is served primarily by Scottsdale Road and is located adjacent to various residential and mixed-use commercial and office properties. The site is located approximately one-quarter mile south of Lincoln Drive and north of McDonald Drive. Lincoln Drive provides additional west regional access and McDonald Drive provides additional east and west regional access. The Loop 101 freeway is located approximately 2 miles to the east of the proposed development with an interchange at McDonald Drive.

Scottsdale Road is a north-south Major Arterial Road that currently provides three lanes in each direction adjacent to the site with a posted speed limit of 45 mph. Rose Lane is an east-west local road west of Scottsdale Road adjacent to the site providing one lane in each direction with a posted speed limit of 25 mph. The alignment curves to the southwest and terminates shortly west of the proposed development.

Study Intersections

The existing Scottsdale Road / Rose Lane intersection will be analyzed for existing and ambient 2018 conditions for both weekday morning and evening peak hour conditions.

The following additional intersections will only be analyzed for 2018 with the proposed development conditions:

Access A and Rose Lane
Rose Lane and Access B

Figure 3 depicts the existing lane configurations at the study intersections.

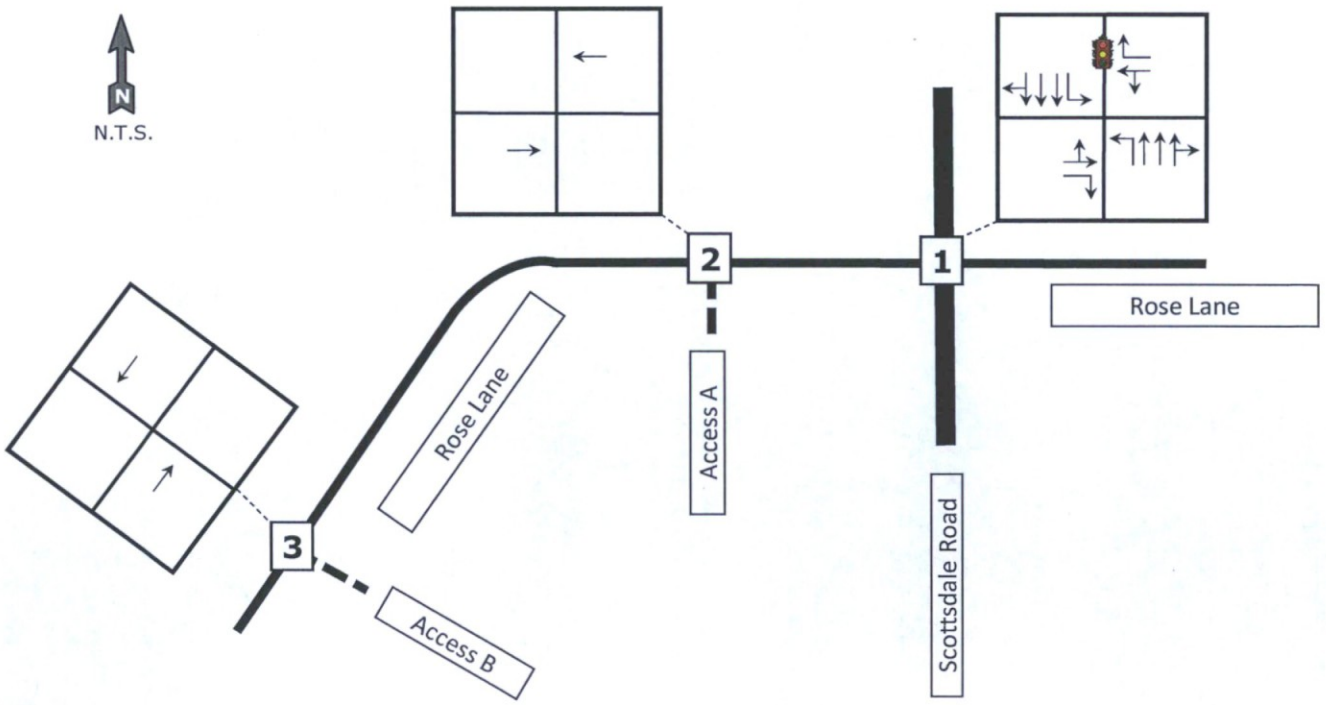


Figure 3: Existing Lane Configurations and Traffic Control

Existing Traffic Counts

Approach and departure traffic volumes were collected on Thursday, 28 July 2016 for 24 hours in 15-minute intervals on the following road segments:

- Scottsdale Road, north of Rose Lane
- Scottsdale Road, south Rose Lane
- Rose Lane, east of Scottsdale Road
- Rose Lane, west of Scottsdale Road

Four-hour turning movement traffic counts were also obtained at the Scottsdale Road / Rose Lane intersection on Thursday, 28 July 2016 from 7:00 AM to 9:00 AM, and from 4:00 PM to 6:00 PM. Since July is historically a low traffic volume month, the counts were increased by a monthly adjustment factor. The monthly adjustment factor for July, as provided by the City of Scottsdale, is 1.08. **Figure 4** depicts the adjusted existing weekday traffic volumes. **Figure 5** and **Figure 6** respectively depict the adjusted existing weekday morning and evening peak hour traffic volumes.

The existing traffic volumes are provided in **Appendix A** to this report. Also included in **Appendix A** are tables providing the hourly counts by time of day, and graphs plotting the hourly traffic counts. **Appendix A.1** contains the approach and departure volumes. Also included in this appendix are tables determining the maximum morning and evening hourly volumes and peak hour factors as determined from the approach counts, and graphs plotting the hourly traffic counts. **Appendix A.2** contains the turning movement counts.

Historical traffic data on Scottsdale Road between Lincoln Drive and McDonald Drive is provided by the City of Scottsdale. The volumes were reviewed to determine an appropriate average annual growth rate to obtain predicted 2018 traffic volumes. The City provides historic traffic count data every other year from 1998 to 2014. The current adjusted 2016 traffic volumes collected on Scottsdale Road are also included.

Table 1 provides the historic traffic volumes by year.

Table 1: Historic Traffic Volumes Summary

AVERAGE DAILY TRAFFIC VOLUMES		
YEARS	**SCOTTSDALE ROAD**	**% CHANGE**
1998	70,500	-
2000	70,300	0%
2002	50,200	-14%
2004	51,400	1%
2006	47,700	-4%
2008	43,900	-4%
2010	42,400	-2%
2012	43,200	1%
2014	40,700	-3%
2016	43,383	3%
AVERAGE ANNUAL GROWTH		**-2%**

As can be seen in **Table 1**, growth has been inconsistent with some years reporting increases and other years reporting decreases in traffic volume. Therefore, it was determined that a conservative nominal annual growth rate of 2%, applied linearly to all existing traffic volumes, was appropriate to estimate ambient 2018 traffic volumes. **Figure 7** depicts the ambient 2018 weekday traffic volumes. **Figure 8** and **Figure 9** respectively depict the ambient 2018 weekday morning and evening peak hour traffic volumes.

The existing Cottonwoods Resort, located west of the proposed development with primary access on Rose Lane, is currently undergoing redevelopment. As part of the planning for the redevelopment the C*ottonwoods Resort Traffic and Parking Impact Analysis*, was prepared by Kimley-Horn & Associates in February 2014. Included in this report are the anticipated morning and evening peak hour traffic volumes anticipated with the new development. These traffic volumes were added to the estimated ambient 2018 traffic volumes and are included in **Figure 8** and **Figure 9**. **Appendix B** contains the pertinent excerpts from the previous report.

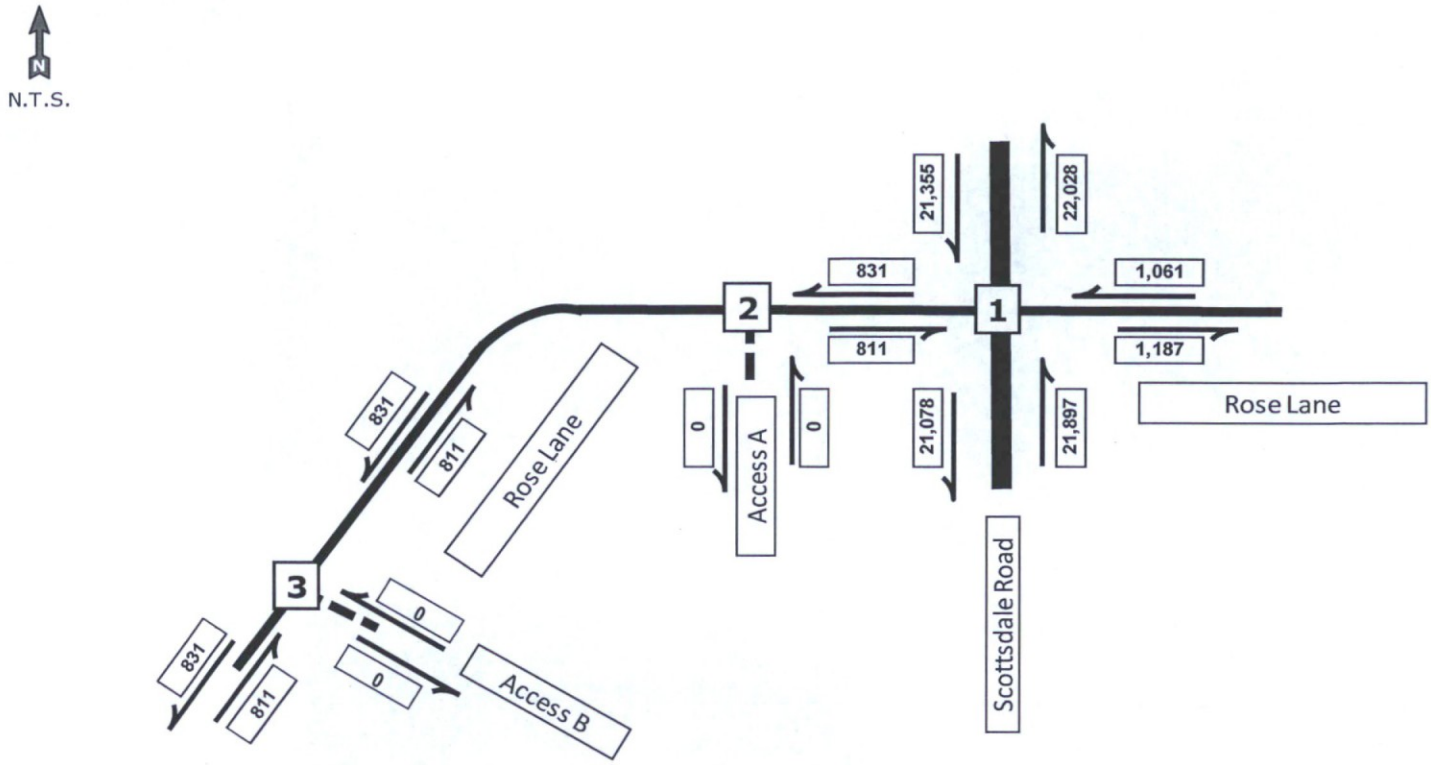


Figure 4: Existing Traffic Volumes – Day

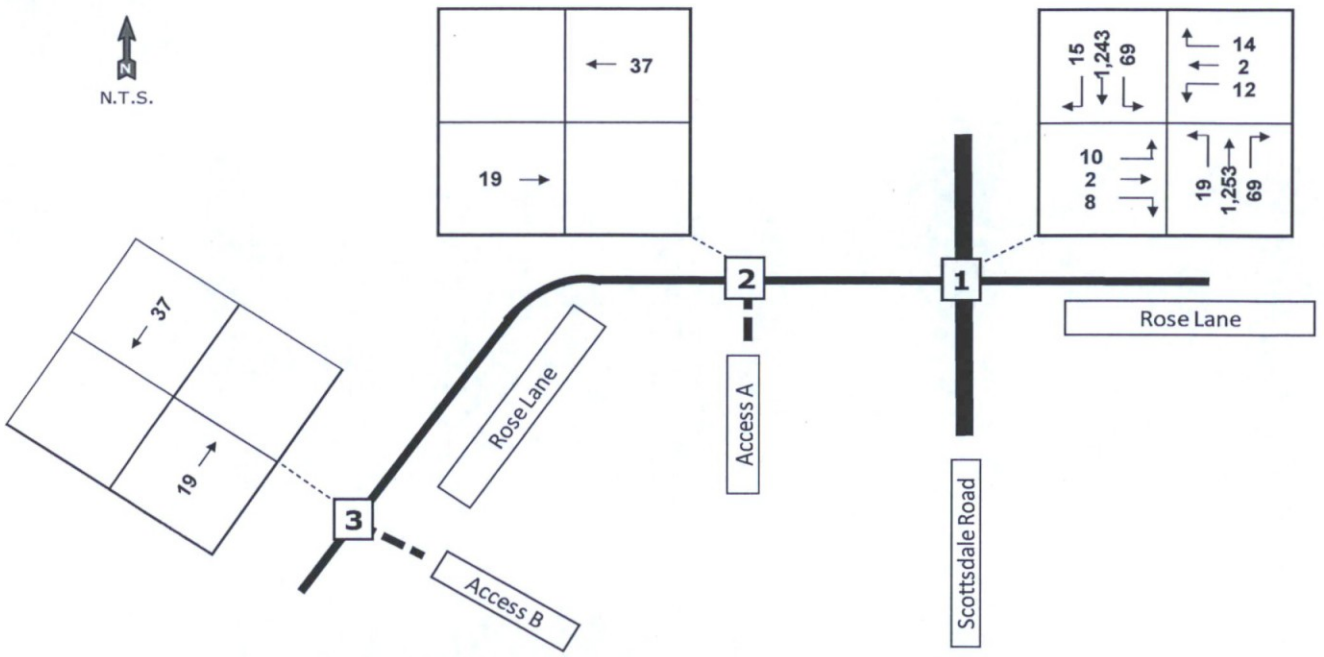


Figure 5: Existing Traffic Volumes – AM Peak Hour

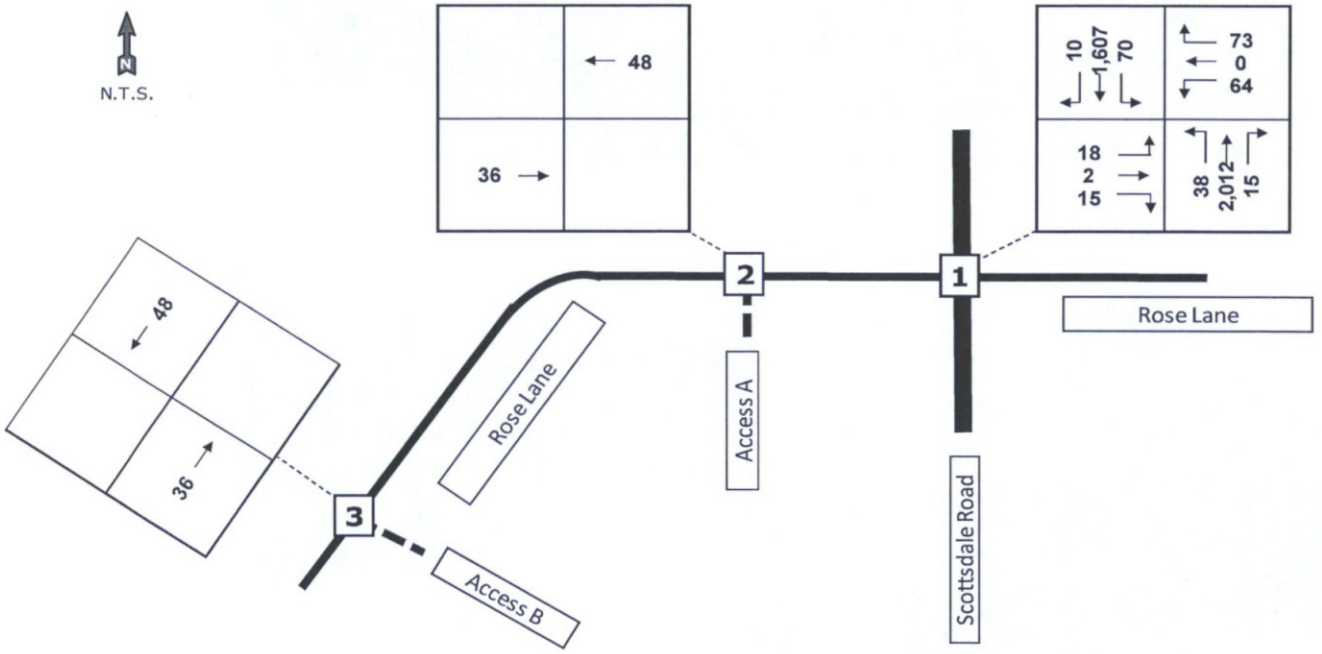


Figure 6: Existing Traffic Volumes – PM Peak Hour

N.T.S.

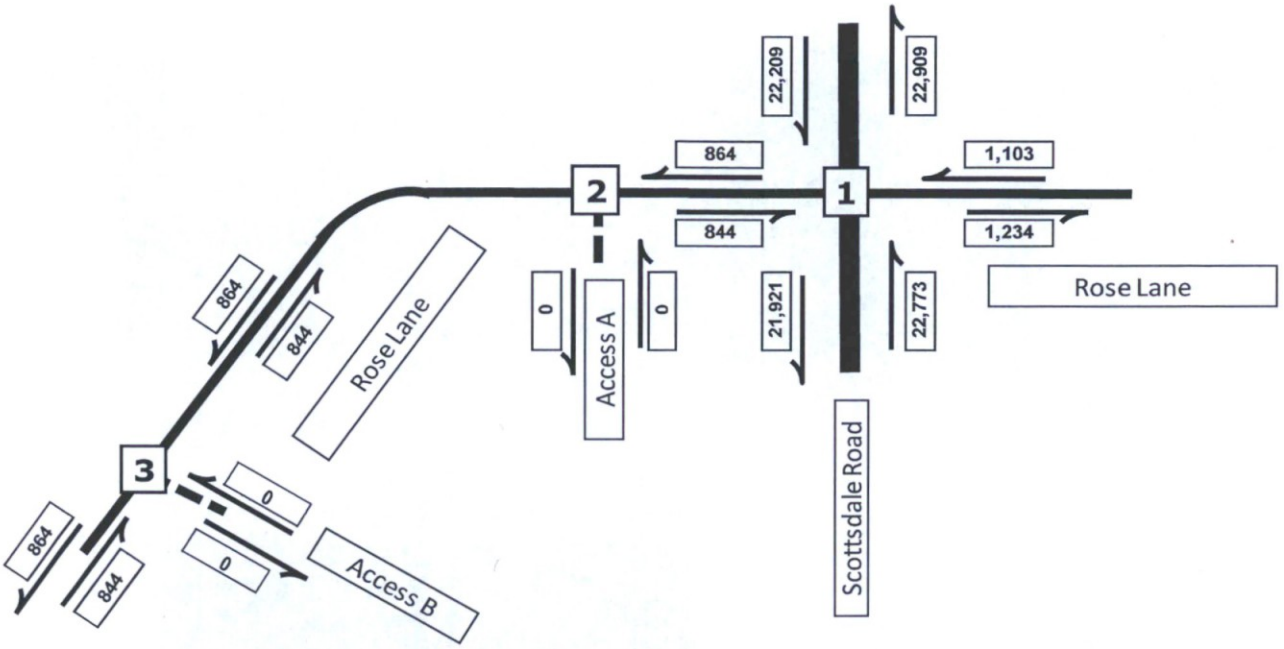


Figure 7: Ambient 2018 Traffic Volumes – Day

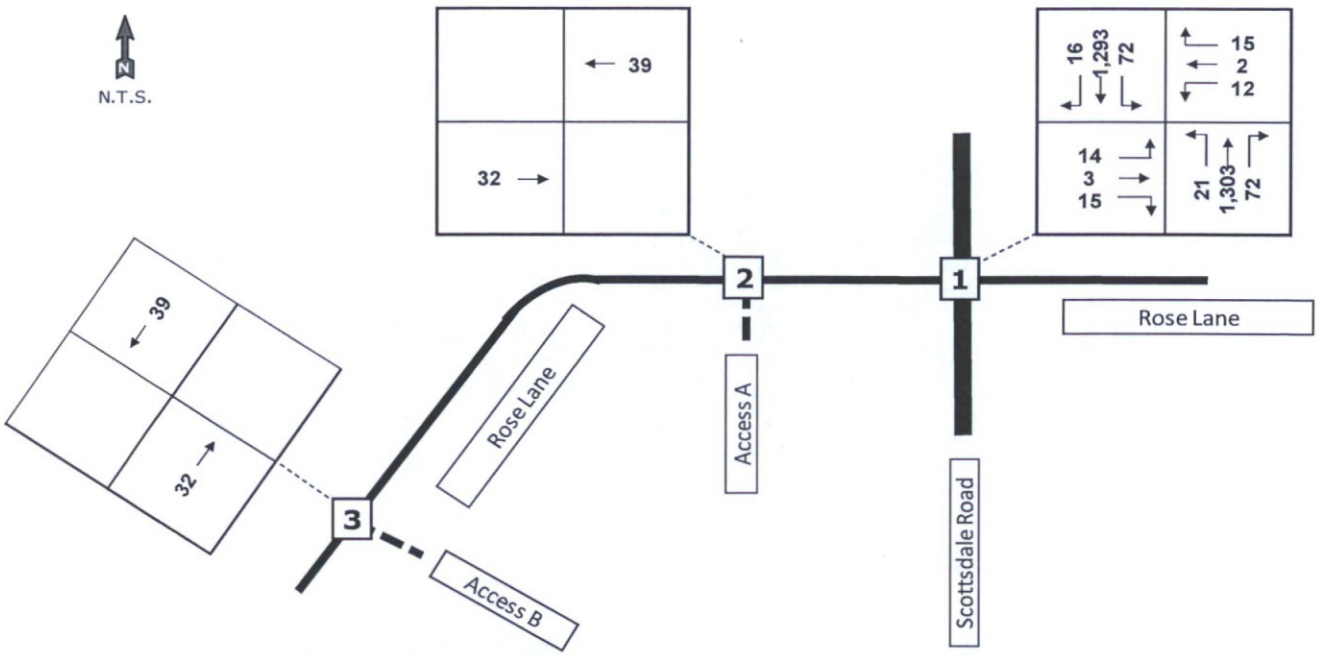


Figure 8: Ambient 2018 Traffic Volumes – AM Peak Hour

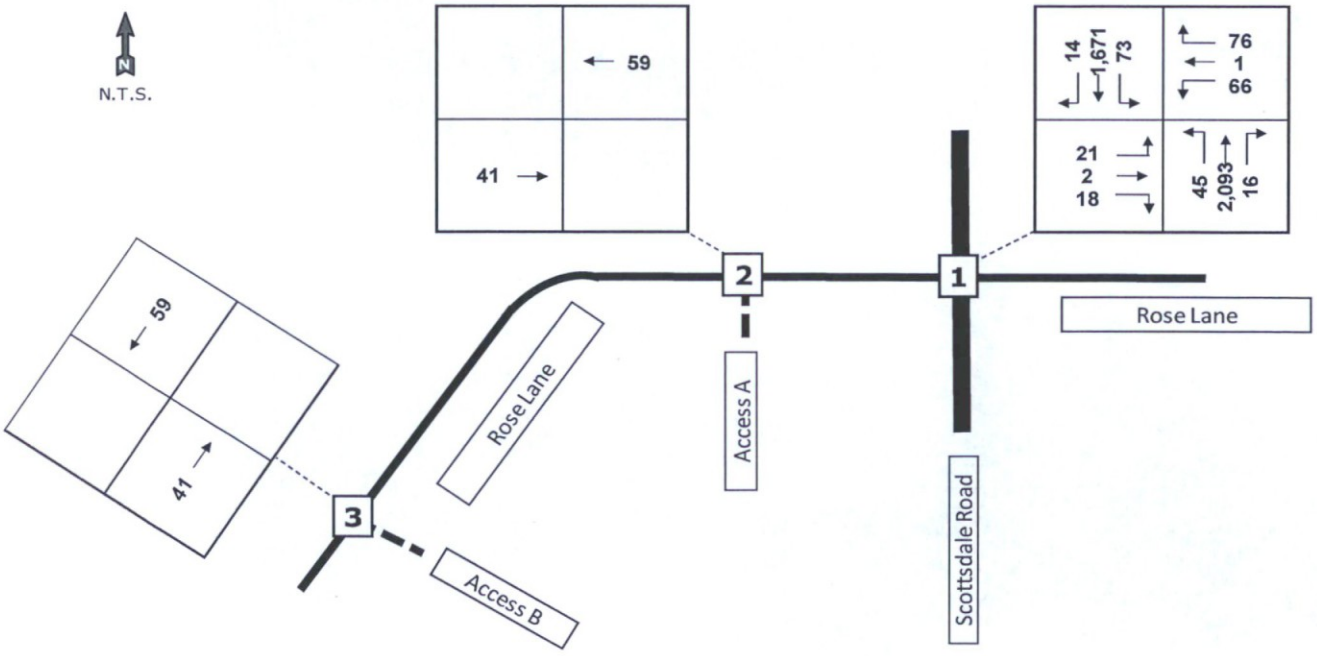


Figure 9: Ambient 2018 Traffic Volumes – PM Peak Hour

Level-of-Service Analysis without Site

The ability of a transportation system to transmit the transportation demand is characterized as its level-of-service (LOS). Level-of-service is a rating system from "A", representing the best operation with the least delay, to "F", representing the worst operation with the greatest delay. Typically, level-of-service "D" is considered the minimum acceptable operation. The appropriate reference for level-of-service operation is the *Highway Capacity Manual*, published by the Transportation Research Board in 2010.

This manual considers the average delay per vehicle as the measure to determine the level-of-service for both signalized and unsignalized intersections. For signalized intersections and for multi-way stop intersections, the delay and level-of-service are calculated for the intersection, each approach, and each turning movement. For unsignalized intersections the level-of-service is defined for each minor movement for two-way stop controls, and is not defined for the major street approaches or for the entire intersection. **Figure 10** provides a diagram and **Table 2** lists the level-of-service criteria for both signalized and unsignalized intersections as stated in the *Highway Capacity Manual*.

Figure 10: Level-of-Service Criteria for Intersections

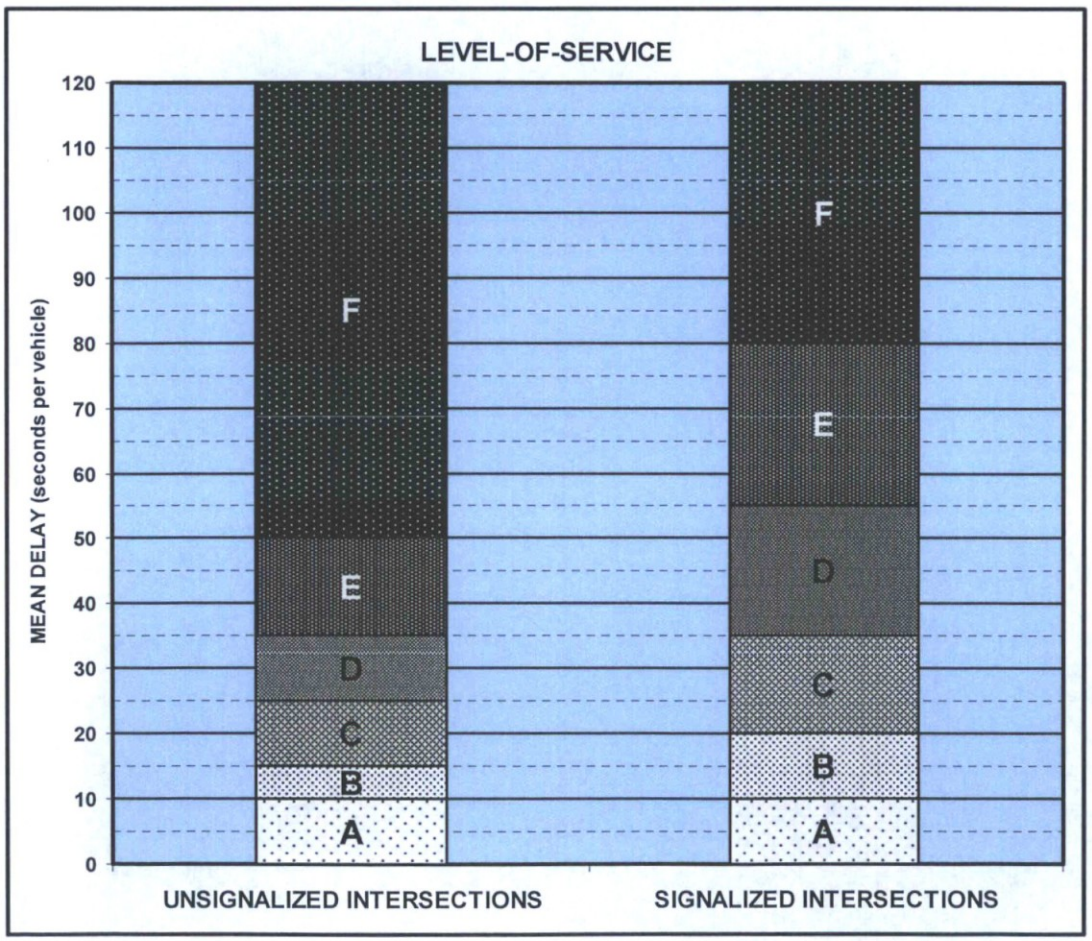


Table 2: Level-of-Service Criteria for Intersections

LEVEL-OF-SERVICE	AVERAGE DELAY (seconds per vehicle)	
	UNSIGNALIZED	SIGNALIZED
A	≤ 10	≤ 10
B	> 10 to 15	> 10 to 20
C	> 15 to 25	> 20 to 35
D	> 25 to 35	> 35 to 55
E	> 35 to 50	> 55 to 80
F	> 50	> 80

Synchro software was utilized to calculate the average delay and level-of-service. The input and output for these analyses are provided as **Appendix C** to this report. **Appendix C.1** provides the results for existing traffic volumes, and **Appendix C.2** provides the results for ambient 2018 traffic volumes. **Figure 11** and **Figure 12** respectively provide the weekday morning and evening peak hour existing level-of-service for the study intersection. **Figure 13** and **Figure 14** respectively provide the weekday morning and evening peak hour ambient 2018 level-of-service for the study intersection.

The existing traffic signal timing plans for the Scottsdale Road / Rose Lane intersection were utilized in the analysis. A copy of these plans is provided in **Appendix D**. The existing Scottsdale Road / Rose Lane intersection is operating at a level-of-service "B" during both peak hours with some individual movements operating at level-of-service "D" or "E". All instances of level-of-service "D" or "E" occurred on Rose Lane. These levels-of-service are anticipated to continue for ambient 2018 traffic conditions with minor additional delay.

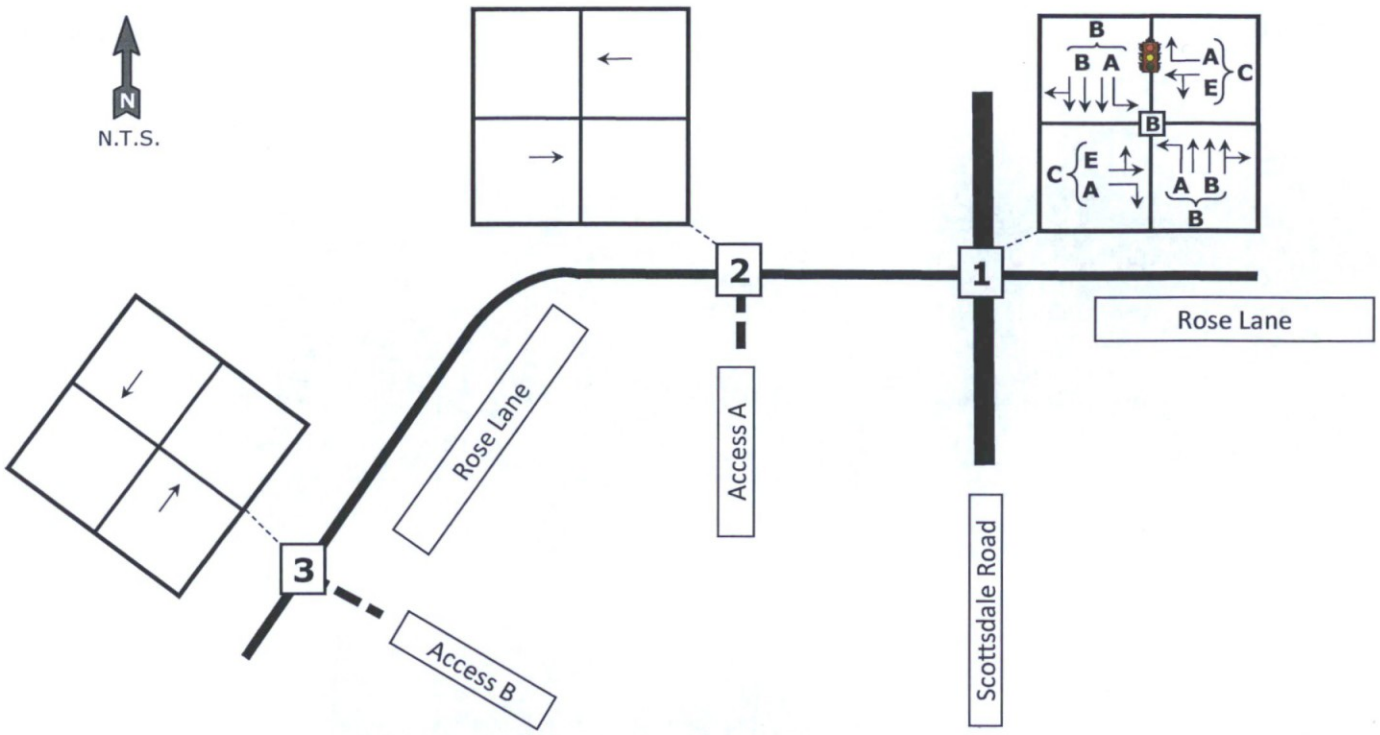


Figure 11: Existing Level-of-Service – AM Peak Hour

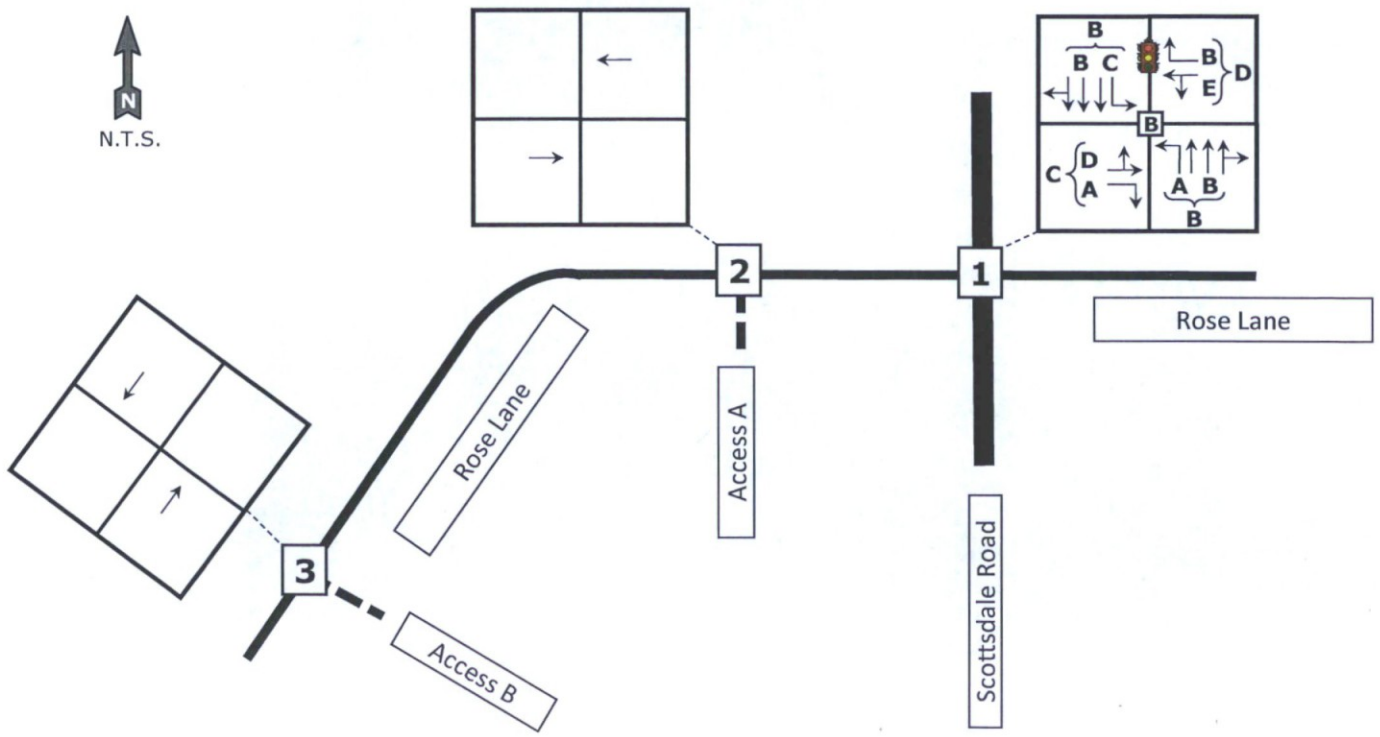


Figure 12: Existing Level-of-Service – PM Peak Hour

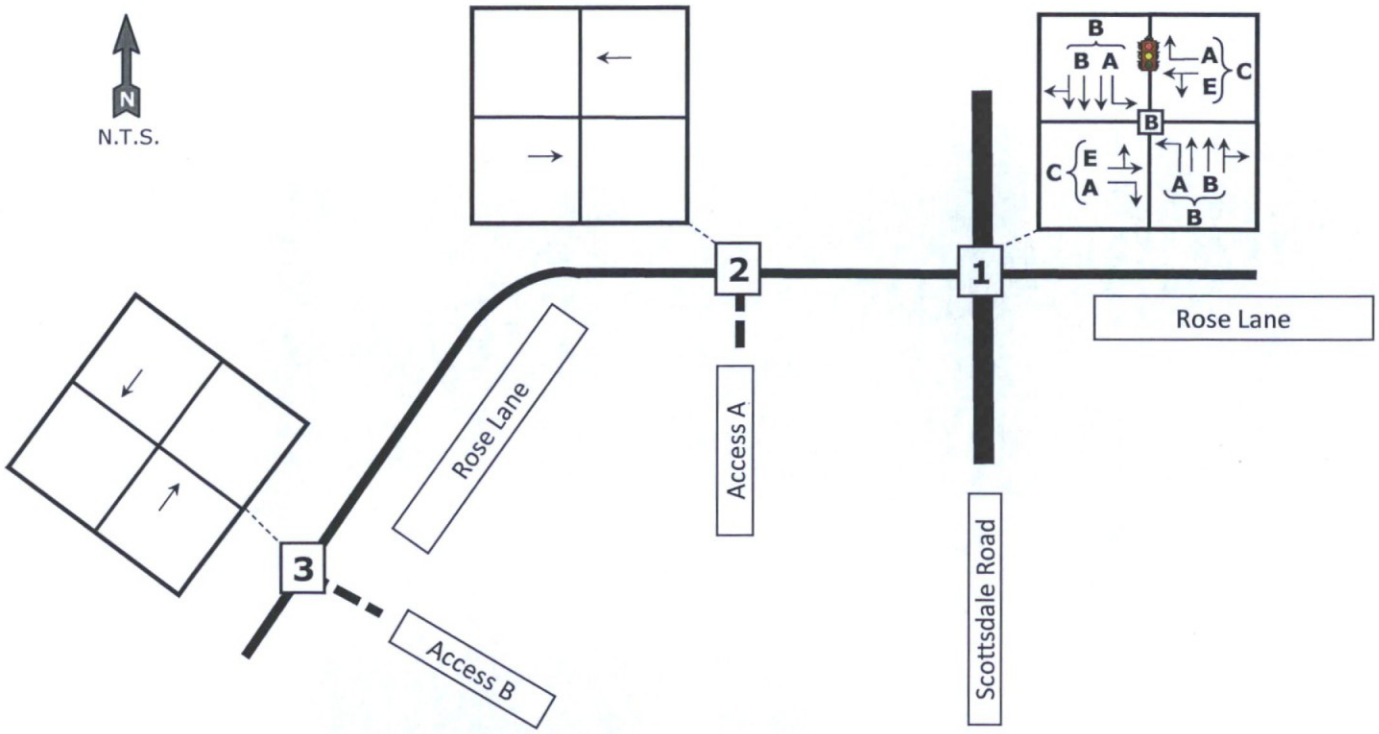


Figure 13: Ambient 2018 Level-of-Service – AM Peak Hour

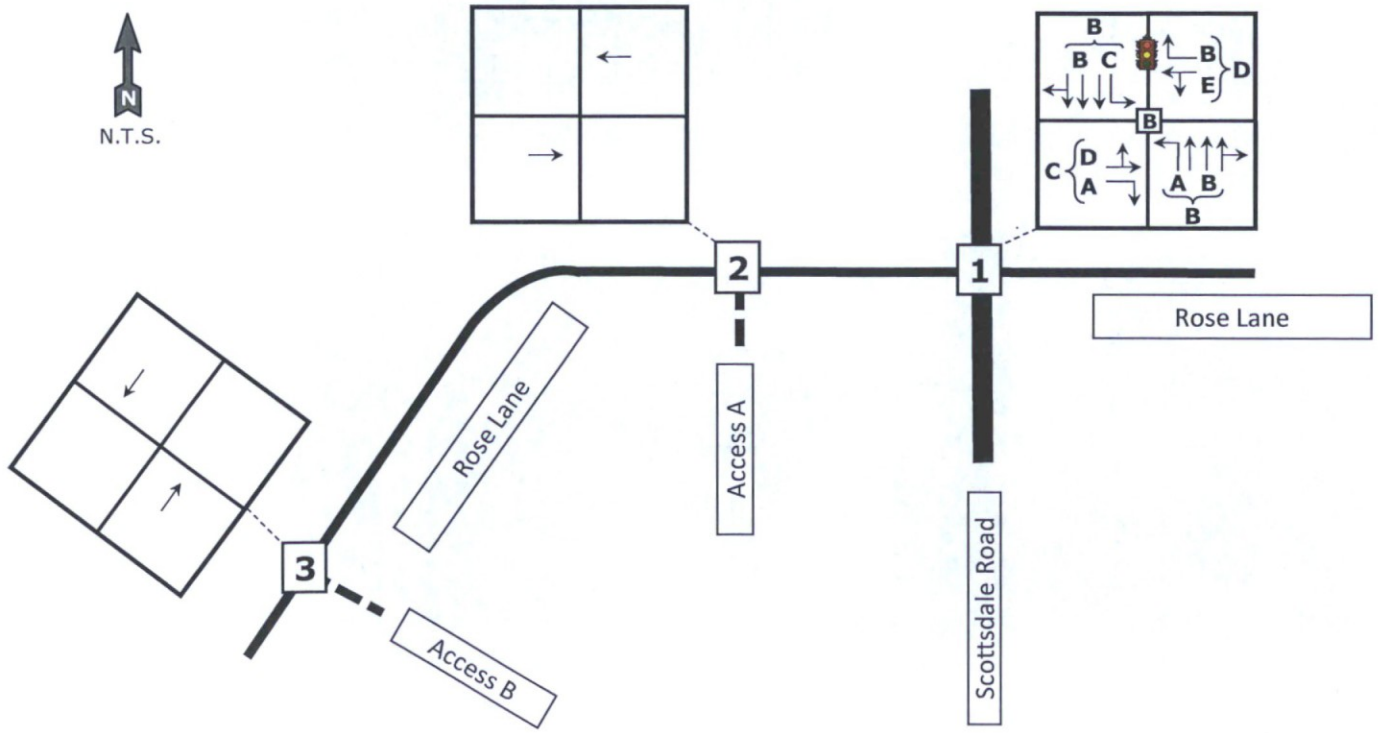


Figure 14: Ambient 2018 Level-of-Service – PM Peak Hour

Proposed Site – Trip Generation

The estimated trip generation for the proposed development was determined through the procedures and data contained within the Institute of Transportation Engineers (ITE) Trip Generation, 9th Edition, published in 2012. This document provides traffic volume data from existing developments throughout North America that can be utilized to estimate vehicle trips that might be generated from proposed developments. The traffic data are provided for 172 different categories. The estimated traffic volume is dependent upon independent variables defined by the characteristics and size of each land use category.

There is considerable data for restaurant developments. The exact nature of the restaurants is currently unknown. Therefore, ITE Land Use Code 931 – Quality Restaurant, and ITE Land Use Code 932 – High Turnover (Sit-Down) Restaurant were utilized for the trip generation analysis. The largest trip generation values from both land use codes were utilized. The independent variable available to predict trips for this land use category is 1,000 Square Feet of Gross Floor Area. It should be noted that ITE specifies that outdoor seating area is not included in the gross floor area for the purposes of calculating trip generation.

The trip generation calculation results for the proposed development are summarized in **Table 3**.

Table 3: Proposed Development Trip Generation Summary

Time Period	Day			AM Peak Hour			PM Peak Hour		
	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
Weekday	572	572	1,144	54	50	104	59	41	100

The same methodology was utilized to determine the estimated trip generation for the previous site. The operation of the previous restaurant use was most similar to the description contained in ITE Land Use Code 931 – Quality Restaurant. Therefore, the data from this land use was utilized for the trip generation analysis. The independent variable available to predict trips for this land use category is 1,000 Square Feet of Gross Floor Area. As previously noted, ITE specifies that outdoor seating area is not included in the gross floor area for the purposes of calculating trip generation.

The trip generation calculation results for the previous development are summarized in **Table 4**.

Table 4: Previous Development Trip Generation Summary

Time Period	Day			AM Peak Hour			PM Peak Hour		
	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
Weekday	360	360	720	3	3	6	40	20	60

Table 5 summarizes the two (2) trip generation calculations and compares the differences between the trip generation calculations for the previous development and the proposed development. The proposed development is estimated to generate less daily and evening peak hour trips and more morning peak hour trips than the previously approved development.

Table 5: Trip Generation Comparison Summary

TIME PERIOD	PREVIOUS	PROPOSED	COMPARISON
WEEKDAY			
Day	720	1,144	424
AM Peak Hour	6	104	98
PM Peak Hour	60	100	40

Appendix E contains the complete trip generation calculations.

Proposed Site – Trip Distribution

The final determination related to site traffic is the direction the generated traffic utilizes to enter and exit the site. The existing traffic count data and the Maricopa County Association of Governments (MAG) 2020 population estimates were utilized to determine the likely aggregate direction of travel for a radius of 5 miles. **Table 6** provides the anticipated aggregate trip distribution for the proposed development.

Table 6: Trip Distribution

DIRECTION OF TRAVEL	% OF TRIPS
Scottsdale Road, North	50%
Scottsdale Road, South	45%
Rose Lane, West	5%

The anticipated site traffic generated by the proposed development was assigned to the adjacent roadway network according to the trip distribution and site layout. **Figure 15** provides the site weekday traffic volumes. **Figure 16** and **Figure 17** respectively provide the site weekday morning and evening peak hour turning movement volumes. **Figure 18** provides the total of the ambient 2018 and proposed site weekday traffic volumes. **Figure 19** and **Figure 20** respectively provide the total of the ambient 2018 and proposed site weekday morning and evening peak hour turning movement volumes.

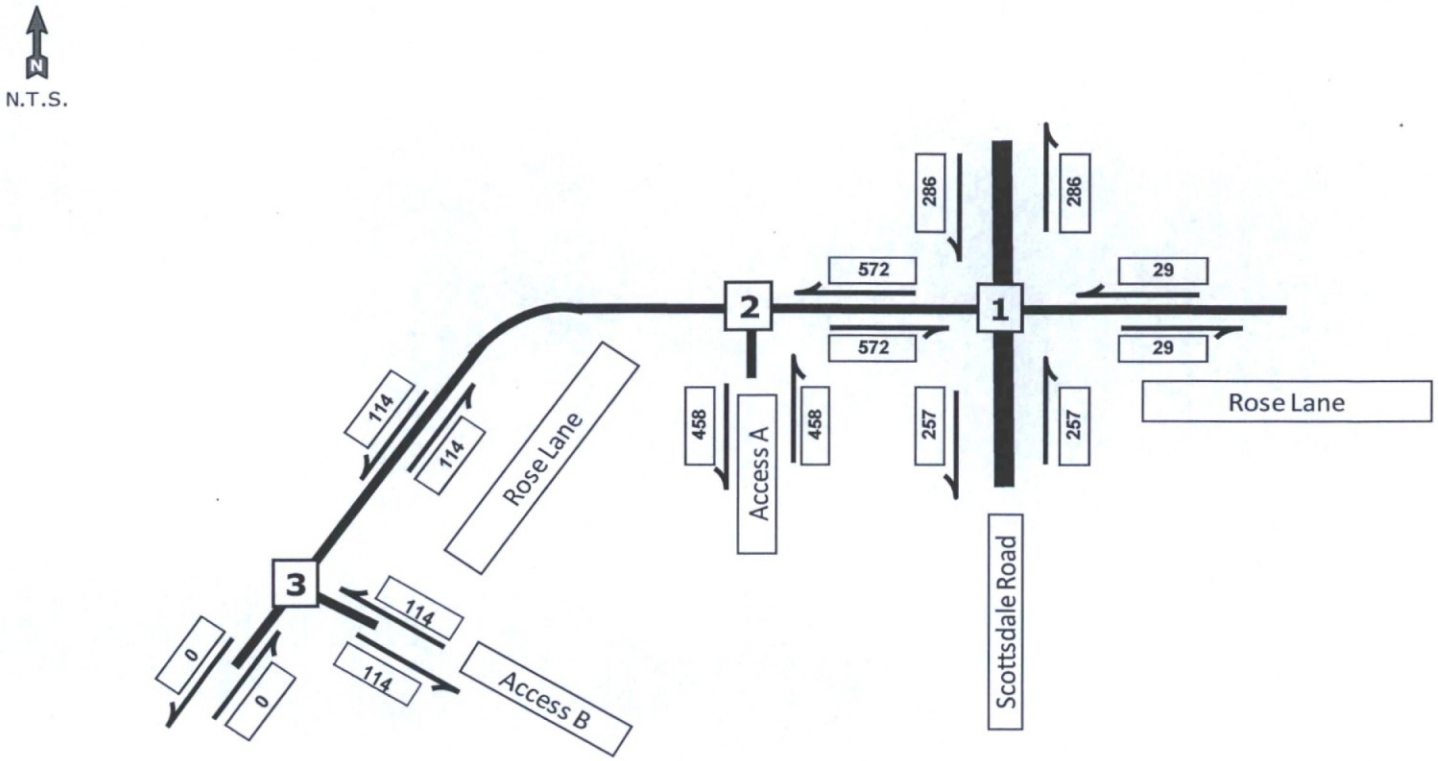


Figure 15: Site Traffic Volumes – Day

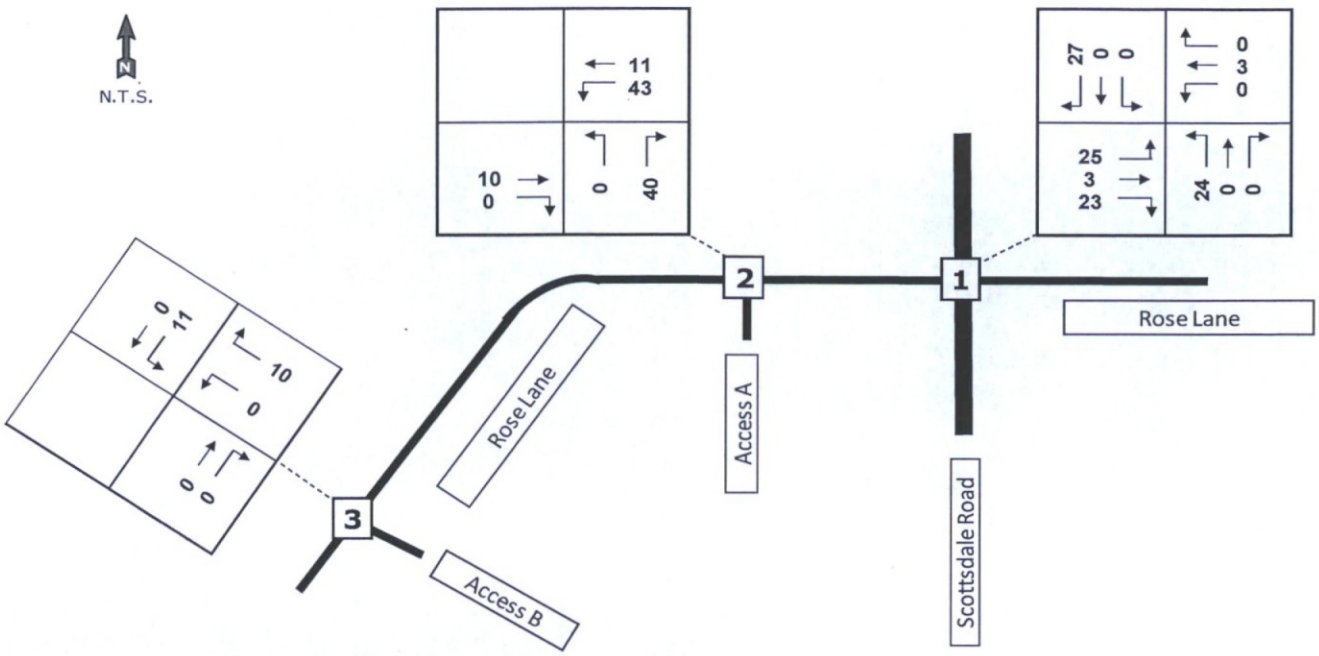


Figure 16: Site Traffic Volumes – AM Peak Hour

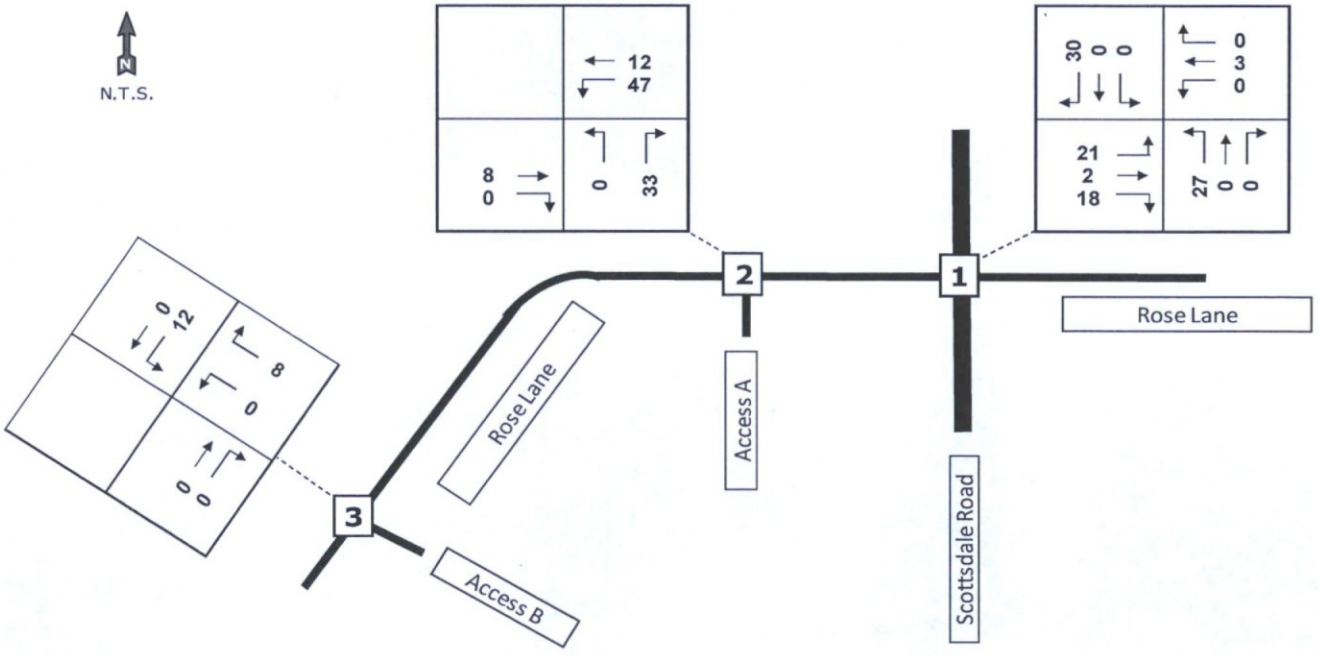


Figure 17: Site Traffic Volumes – PM Peak Hour

N.T.S.

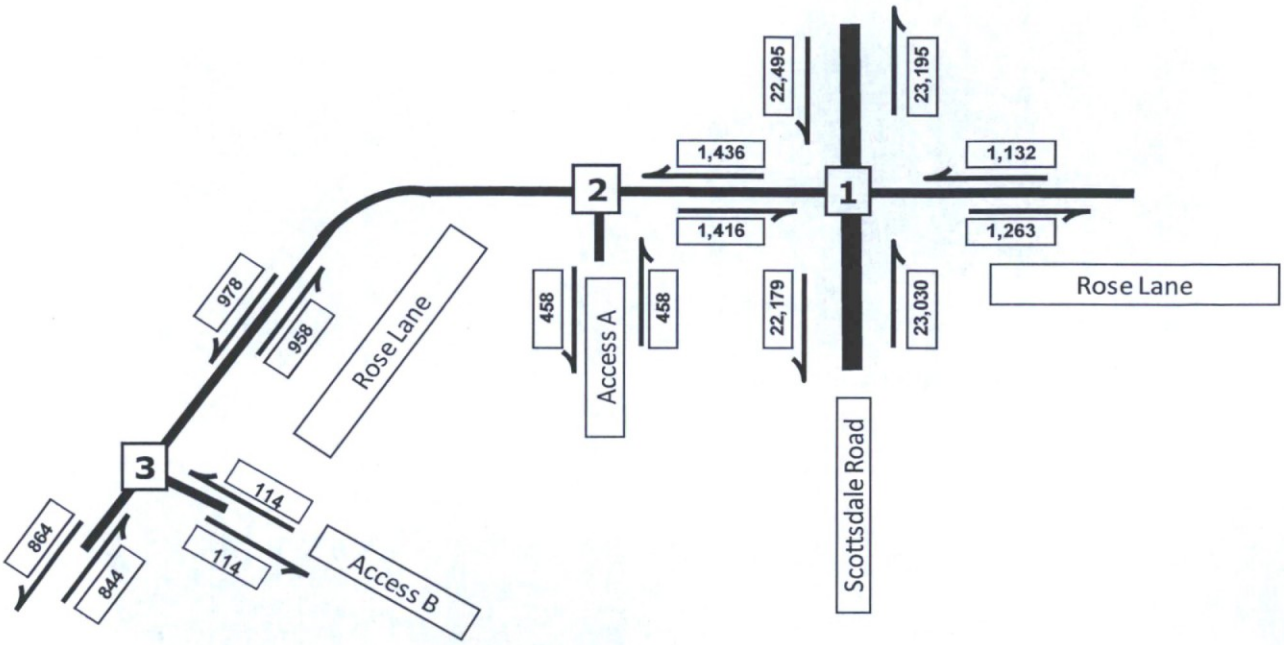


Figure 18: 2018 with Site Traffic Volumes – Day

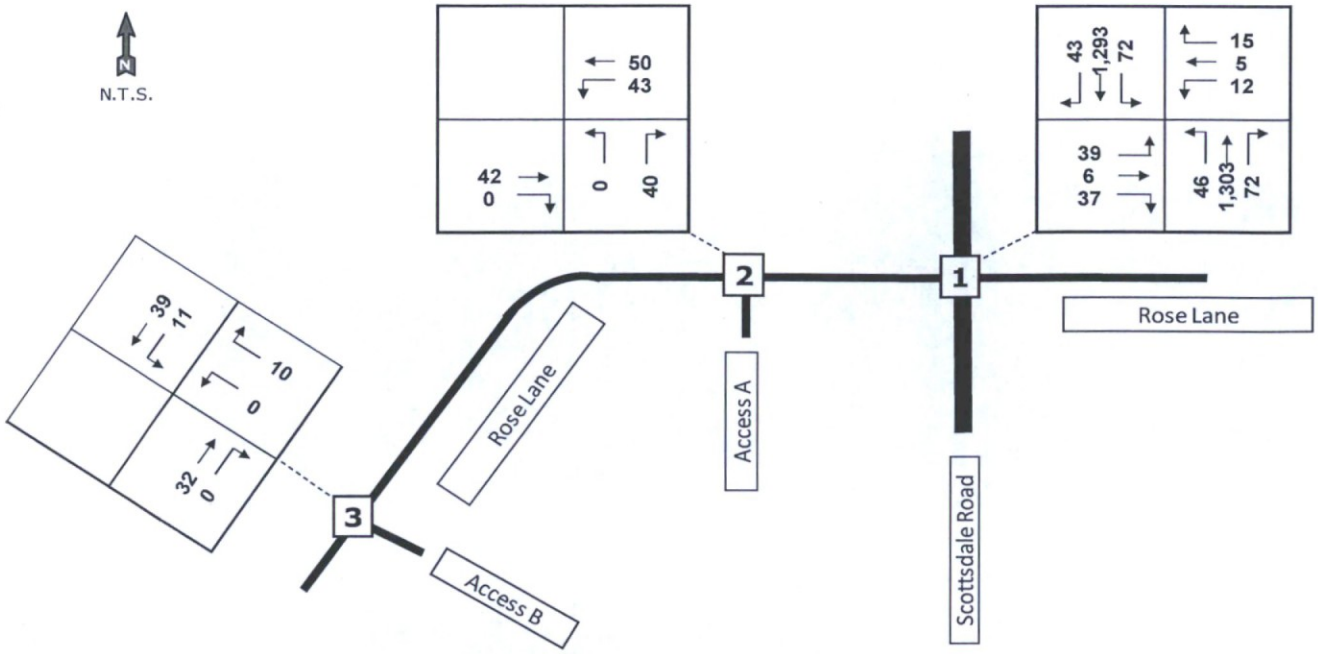


Figure 19: 2018 with Site Traffic Volumes – AM Peak Hour

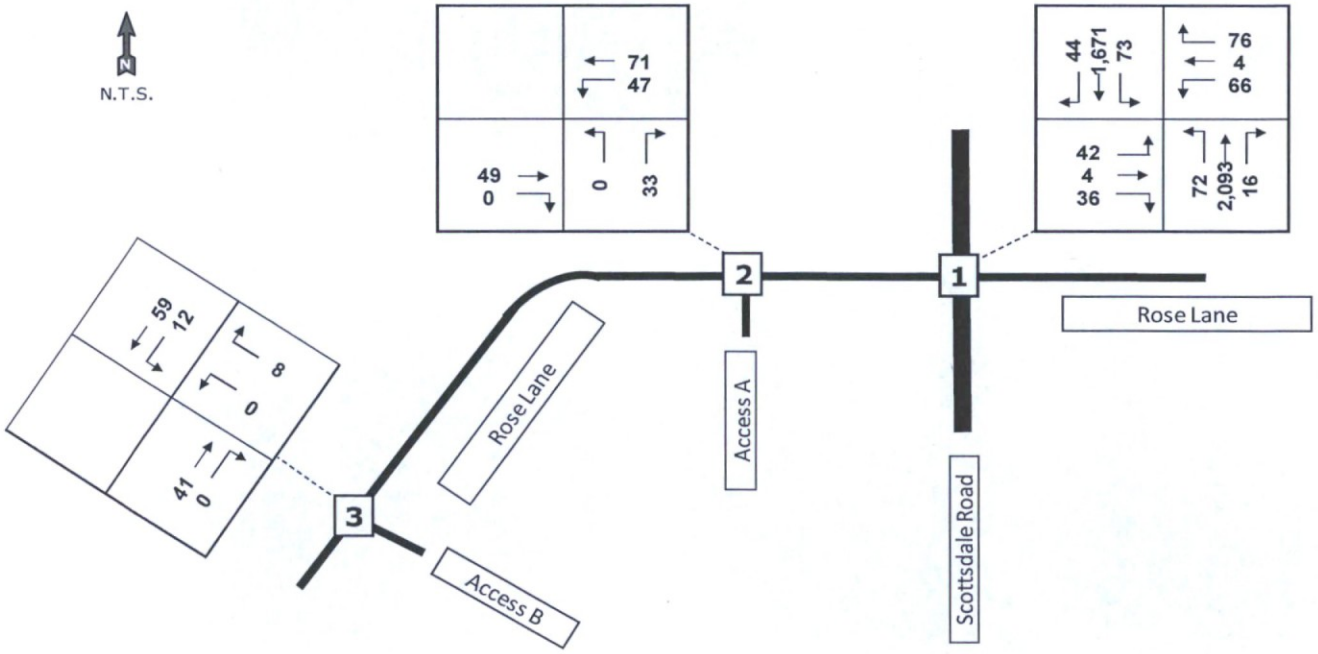


Figure 20: 2018 with Site Traffic Volumes – PM Peak Hour

Level-of-Service Analysis with Site

The level-of-service for the 2018 with site traffic volumes was analyzed for the study intersections and site accesses. Synchro software was utilized to calculate the average delay and level-of-service. All intersections are anticipated to operate at a level-of-service "B" or better under the 2018 with proposed site traffic conditions. The Scottsdale Road / Rose Lane intersection is anticipated to continue to have some individual movements operating at level-of-service "D" or "E". All instances of level-of-service "D" or "E" occurred on Rose Lane.

The average increase in intersection delay with the addition of the proposed site traffic is below:

- Scottsdale Road / Rose Lane
  - Morning Peak Hour: + 0.7 seconds
  - Evening Peak Hour: + 0.6 seconds

No significant change in intersection level-of-service is anticipated with the addition of the proposed site traffic.

Discussions with City staff yielded a request for the inclusion of alternate Rose Lane intersection lane configuration analyses. Two (2) alternate configurations were considered for the eastbound and westbound Rose Lane approaches:

- Alternative 1 – separate left-turn, through, and right-turn lanes
- Alternative 2 – separate left-turn and shared through / right-turn lanes

Figure 21 and **Figure 22** respectively provide the schematic revised striping layouts with the approximate roadway widths available. Synchro software was also utilized to calculate the average increase in intersection delay with the addition of the proposed site traffic for these two alternative lane configurations. The following results were obtained:

- Scottsdale Road / Rose Lane (Alternative 1)
  - Morning Peak Hour: + 0.5 seconds
  - Evening Peak Hour: + 0.2 seconds

- Scottsdale Road / Rose Lane (Alternative 2)
  - Morning Peak Hour: + 0.8 seconds
  - Evening Peak Hour: + 0.4 seconds

The results of all three analyses yielded only slight differences in intersection level-of-service or average delay. Therefore, it is recommended to implement the Alternative 2 lane configurations as this provides a slightly better overall average delay than the existing configuration, requires only striping modifications, and eliminates the eastbound and westbound through traffic deflection that occurs within the intersection under the existing or Alternative 1 configurations.

The input and output for all three analyses are provided as **Appendix F** to this report. **Figure 23** and **Figure 24** respectively provide the 2018 with site traffic weekday morning and evening peak hour level-of-service for the study intersections utilizing the recommended Alternative 2 lane configurations.

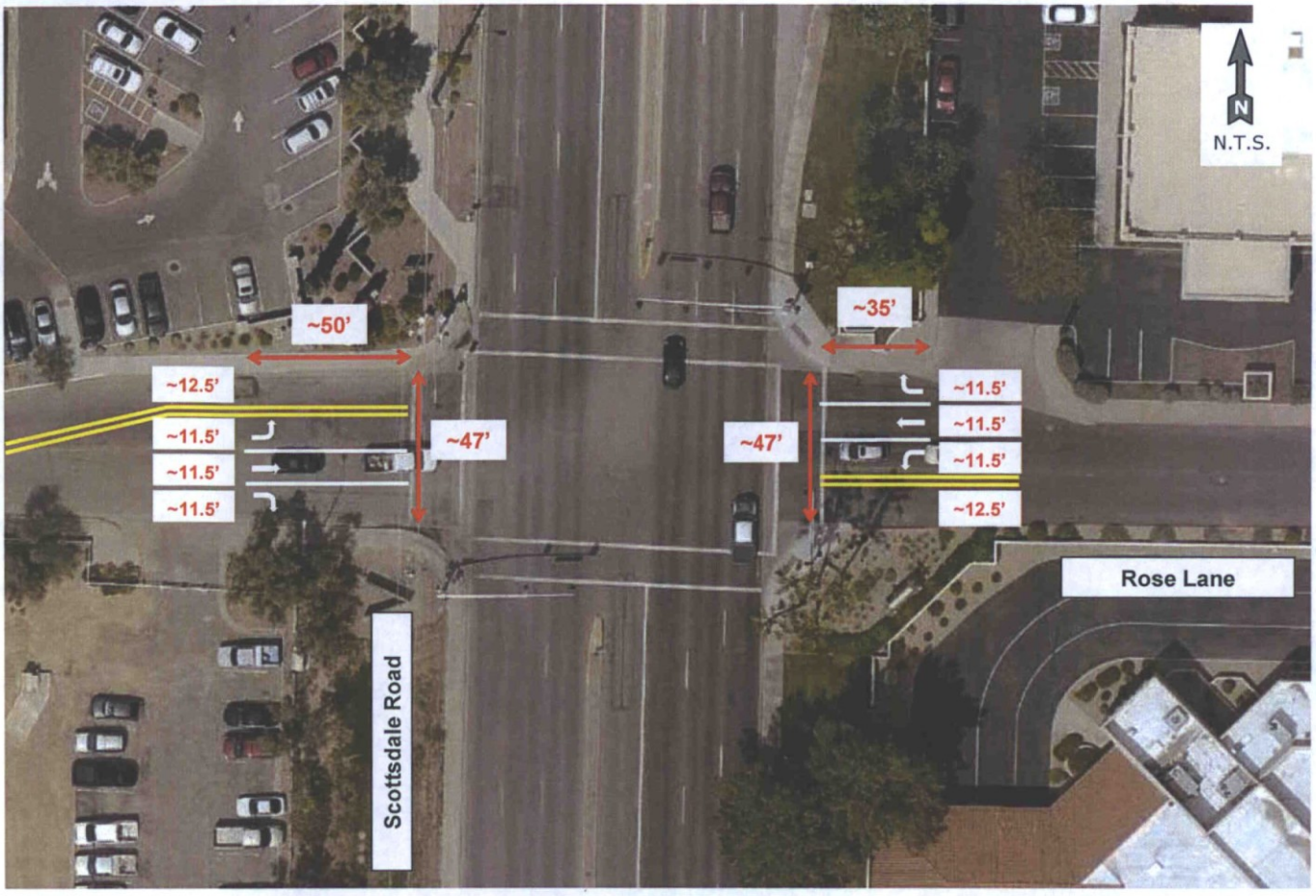


Figure 21: Rose Lane Alternate Lane Configuration – Alternative 1

Figure 22: Rose Lane Alternate Lane Configuration – Alternative 2

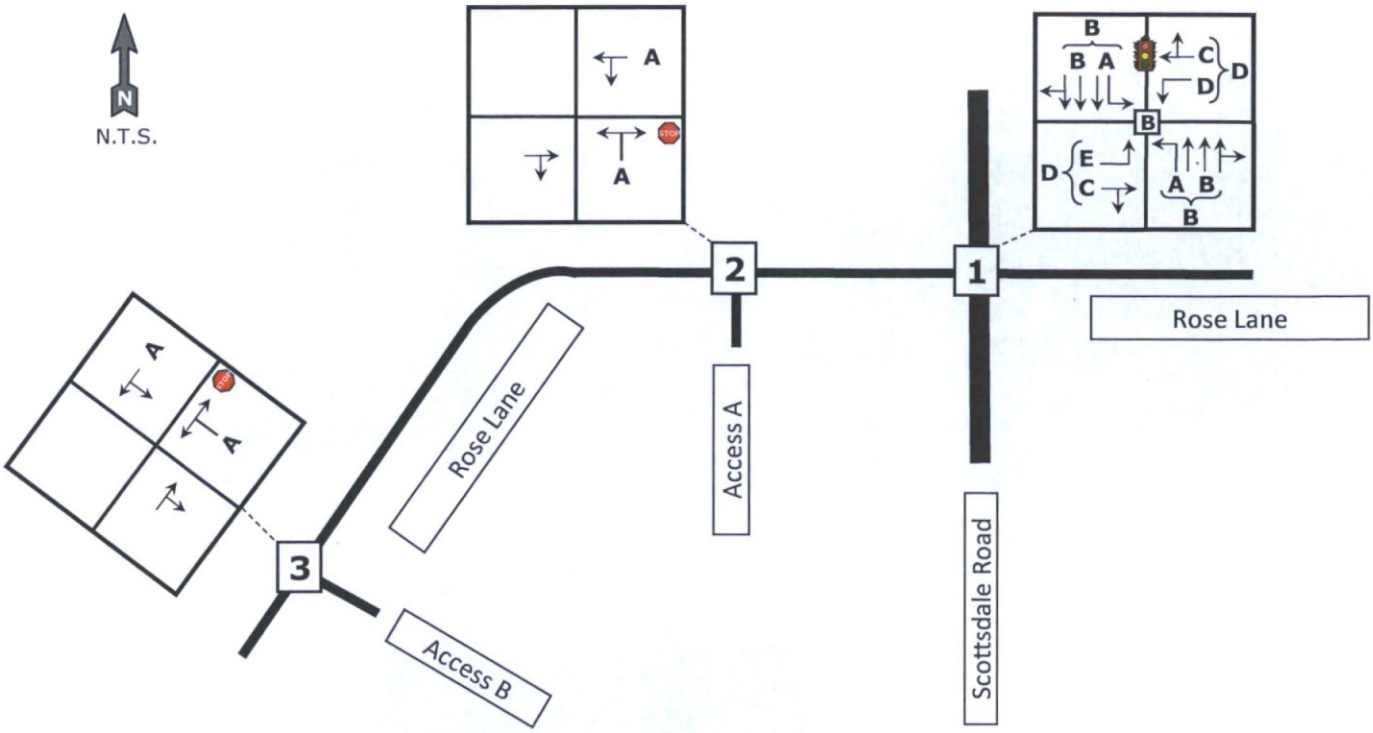


Figure 23: 2018 with Site Levels-of-Service – AM Peak Hour

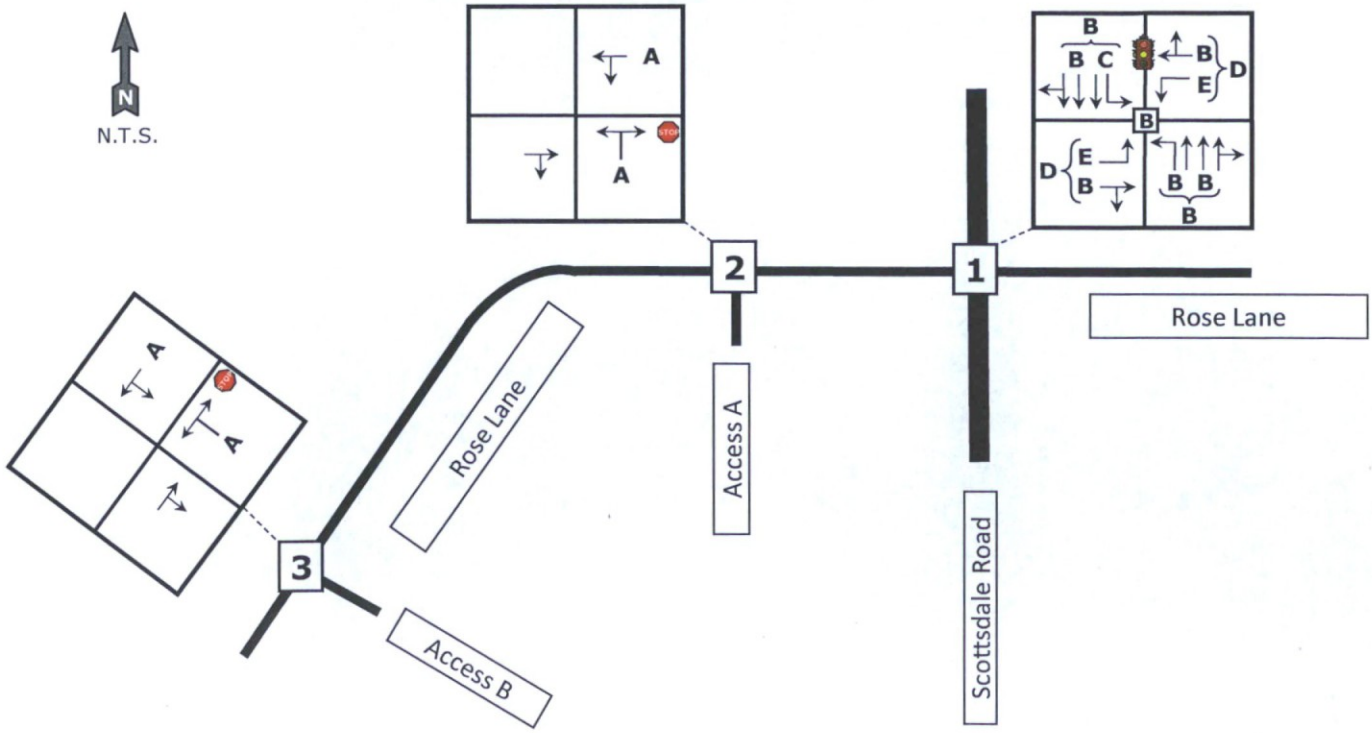


Figure 24: 2018 with Site Levels-of-Service – PM Peak Hour

Turn Lane Analysis

The current edition of the *City of Scottsdale Design Standards & Policies Manual* contains criteria regarding the need for deceleration lanes. Per the manual, the following criteria are provided:

"Deceleration lanes are required at all new driveways on major arterials and at new commercial/retail driveways on minor arterials. Deceleration lanes for driveways may also be required on collector streets and for non-commercial/retail driveways on minor arterials. The lane length should be based on the distance needed to allow the vehicle to exit the through lane and slow to a 15 mph travel speed. To determine the need for a deceleration lane on streets classified as a minor arterial or collector, see the following criteria:

- At least 5,000 vehicles per day are expected to use the street;
- The 85th percentile traffic speed on the street is at least 35 mph; or 45 mph for a 2 lane (1 lane each direction) roadway;
- At least 30 vehicles will make right turns into the driveway during a 1-hour period."

It was determined that a right-turn deceleration lane is not warranted at any of the site access intersections as neither access meets the above criteria. Additionally, right-turn lanes would have been included at intersections where necessary to provide level-of-service "D" or better. There were no circumstances where this criterion was satisfied.

Synchro also calculates the 95th percentile queue lengths. **Table 7** provides the maximum 95th percentile queue lengths for left-turn and right-turn lanes for the ambient 2018 and 2018 with proposed site traffic conditions during the weekday peak morning and evening hours.

Table 7: 95th Percentile Queue Length Calculations

MOVEMENT	EXISTING TURN-LANE STORAGE	AMBIENT 2018 AM PEAK	AMBIENT 2018 PM PEAK	2018 WITH SITE AM PEAK	2018 WITH SITE PM PEAK
1 - SCOTTSDALE ROAD and ROSE LANE					
NORTHBOUND					
Northbound Left	**165'**	**6'**	**16'**	**12'**	**24'**
SOUTHBOUND					
Southbound Left	**170'**	**15'**	**62'**	**18'**	**63'**
EASTBOUND					
Eastbound Right (Left)	**50'**	**0'**	**0'**	**(70')**	**(71')**
WESTBOUND					
Westbound Right (Left)	**35'**	**0'**	**46'**	**(30')**	**(100')**

The calculated 95th percentile queue lengths generally lie within the turn-lane storage length available where turn lanes already exist. Some excessive queuing is anticipated for the eastbound and westbound turn lanes at the Scottsdale Road / Rose Lane intersection during ambient 2018 and 2018 with proposed site traffic conditions. This condition is primarily due to the minimal turn lane storage length provided or available on the Rose Lane approaches. It was observed that the excess queue did not impede overall intersection operation.

It was also noted that the existing eastbound Rose Lane approach at its intersection with Scottsdale Road does currently provide a dedicated through / left-turn lane and dedicated right-turn lane. However, due to the poor condition of the striping this separation may be difficult for drivers to discern and may contribute to instances of excess queuing. It is recommended to refresh the striping to maintain adequate separation of turn movements.

Collision Analysis

Collision experience from 2013 through 2015 was provided by the City of Scottsdale for the intersection of Scottsdale Road / Rose Lane and for the Scottsdale Road segment immediately north and south of Rose Lane. A copy of the data is provided as **Appendix G**.

At the Scottsdale Road / Rose Lane intersection there were a total of 12 collisions from 2013 to 2015. There were a total of 4 sideswipe (same direction) collisions, 3 rear-end collisions, 3 left-turn collisions, 1 angle collision, and 1 head-on collision. There were no fatal collisions and 1 incapacitating injury collision. All collisions, with one exception, involved vehicles traveling northbound and / or southbound on Scottsdale Road. The one exception involved a vehicle traveling westbound on Rose Lane. The Year 2015 contained the most reported collisions with a total of 6 collisions. There were not a significant number of crashes at this intersection nor was there a discernable pattern in the collision manner or direction of travel.

For the Scottsdale Road segment north and south of Rose Lane there were a total of 9 collisions from 2013 to 2015. There were 7 rear-end collisions, and 2 sideswipe (same direction) collisions. There were no fatal collisions and 2 incapacitating injury collisions, one of which involved alcohol. There were not a significant number of crashes on this road segment nor was there a discernable pattern in the collision manner or direction of travel.

Recommendations without Proposed Development

The existing Scottsdale Road / Rose Lane intersection is operating at a level-of-service "B" during both peak hours with some individual movements operating at level-of-service "D" or "E". All instances of level-of-service "D" or "E" occurred on Rose Lane. These levels-of-service are anticipated to continue for ambient 2018 traffic conditions with minor additional delay.

It is also recommended to provide new lane striping on the eastbound Rose Lane approach at its intersection with Scottsdale Road to improve visibility of lane separation.

Recommendations with Proposed Development

All intersections are anticipated to operate at a level-of-service "B" or better under the 2018 with proposed site traffic conditions. The Scottsdale Road / Rose Lane intersection is anticipated to continue to have some individual movements operating at level-of-service "D" or "E". All instances of level-of-service "D" or "E" occurred on Rose Lane.

It is recommended to implement a revised lane configuration on the eastbound and westbound Rose Lane approaches consisting of separate left-turn and shared through / right-turn lanes.

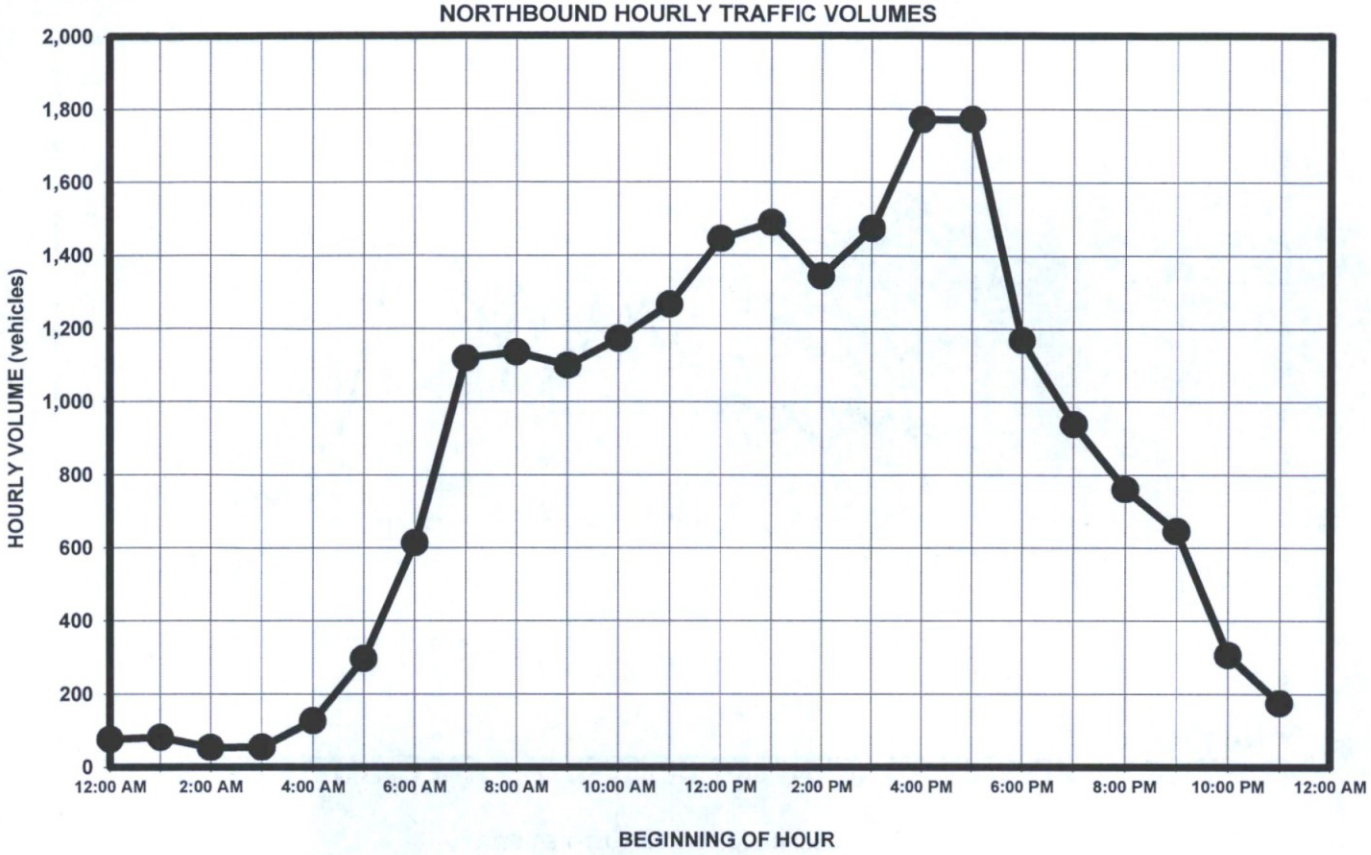
No significant change in intersection level-of-service is anticipated with the addition of the proposed site traffic.

No additional turn lanes are warranted or recommended.

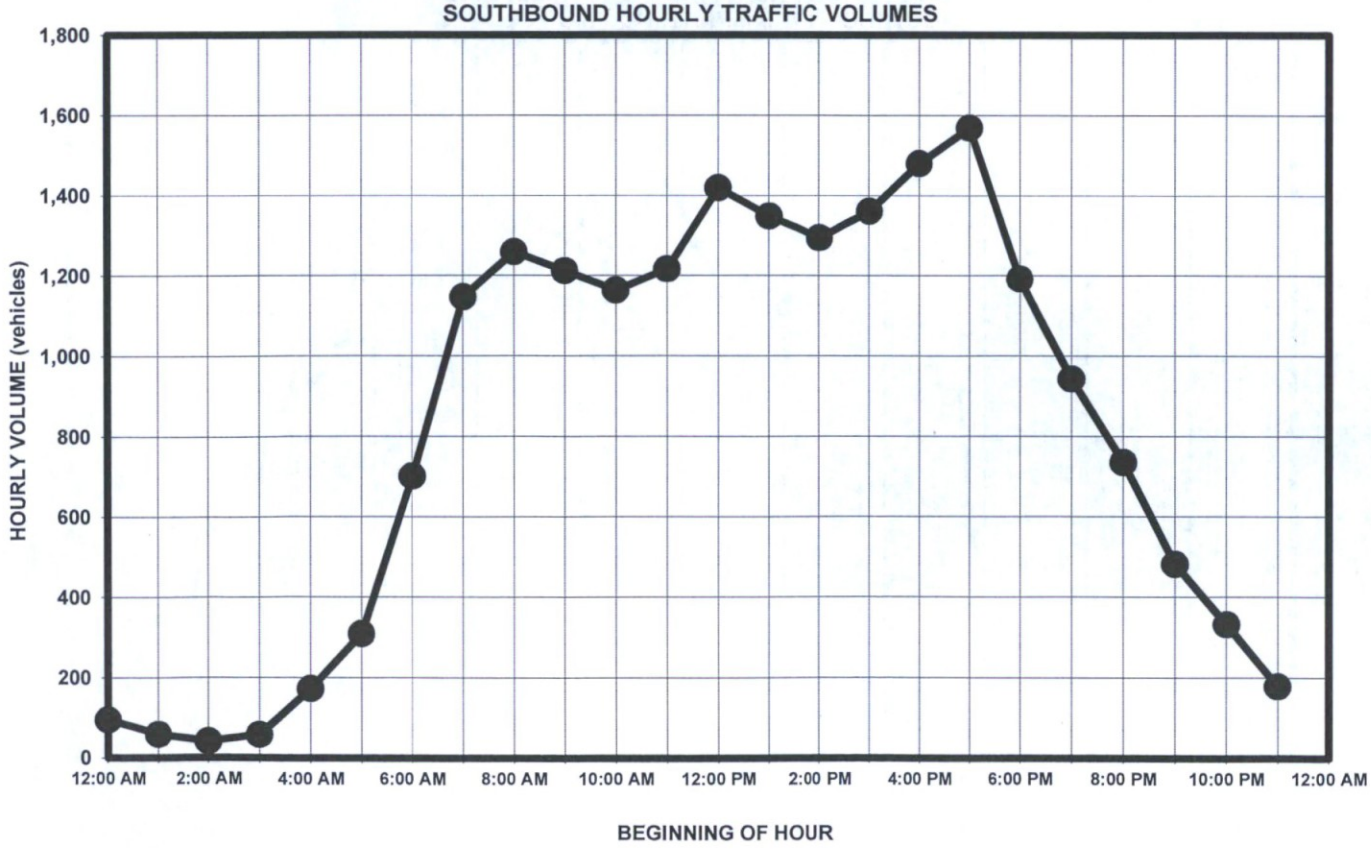
APPENDIX A
EXISTING TRAFFIC COUNTS

APPENDIX A.1
APPROACH AND DEPARTURE

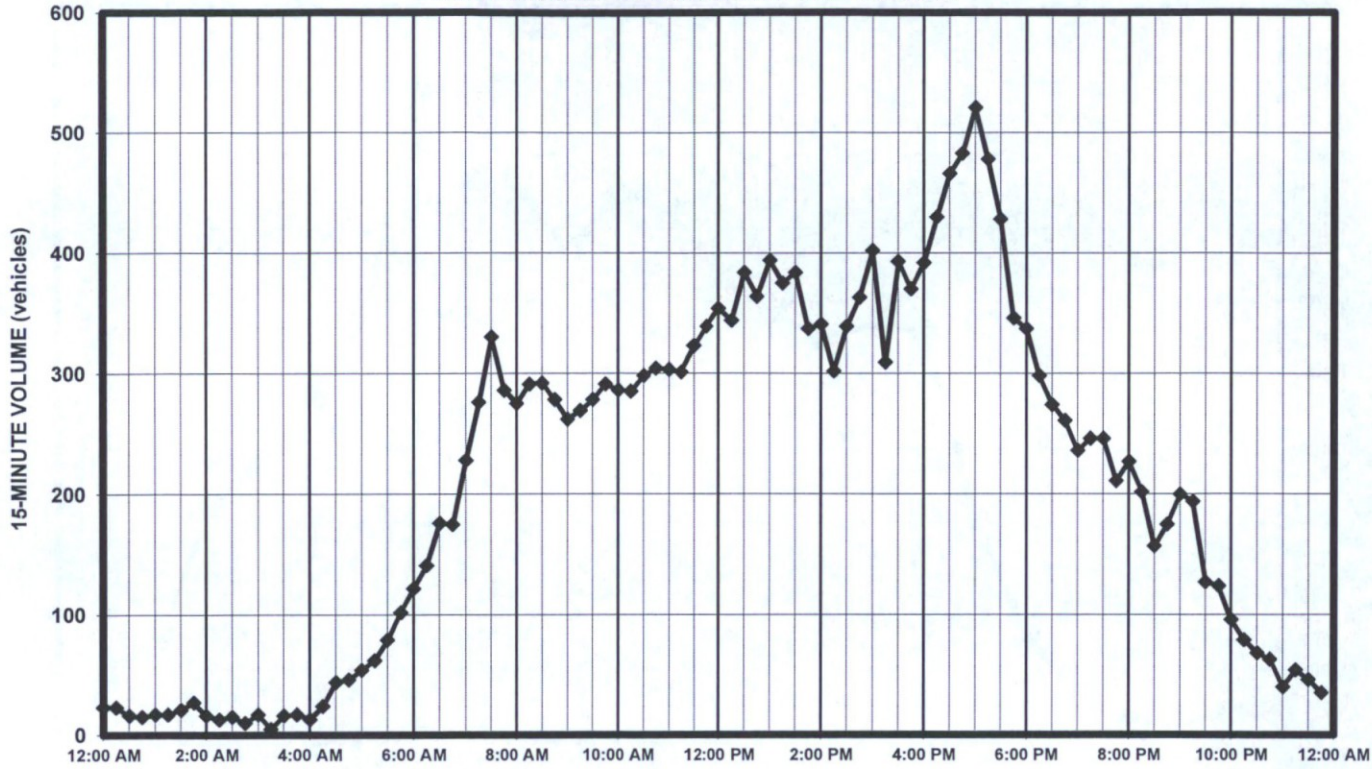
SWC SCOTTSDALE ROAD & ROSE LANE
SCOTTSDALE ROAD, NORTH OF ROSE LANE
NORTHBOUND HOURLY TRAFFIC VOLUMES



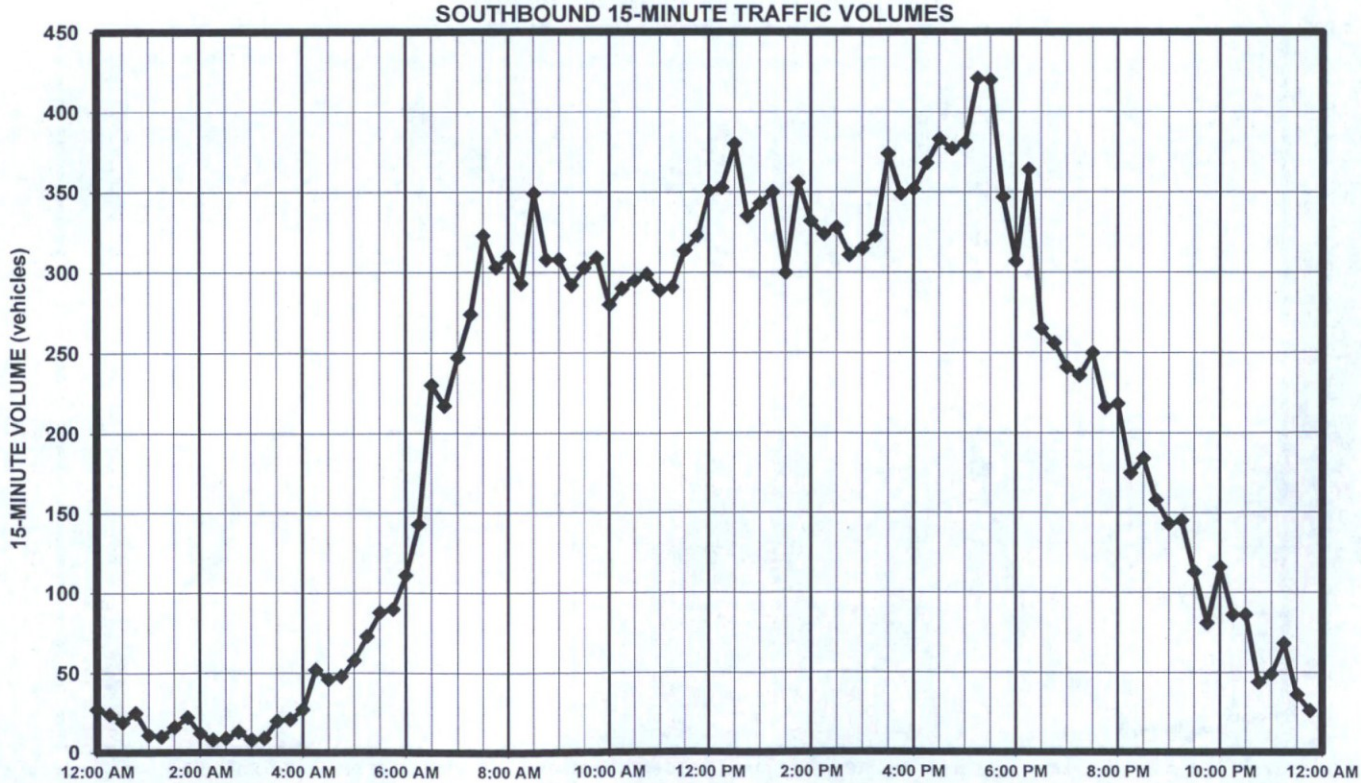
SWC SCOTTSDALE ROAD & ROSE LANE
SCOTTSDALE ROAD, NORTH OF ROSE LANE
SOUTHBOUND HOURLY TRAFFIC VOLUMES



SWC SCOTTSDALE ROAD & ROSE LANE
SCOTTSDALE ROAD, NORTH OF ROSE LANE
NORTHBOUND 15-MINUTE TRAFFIC VOLUMES



SWC SCOTTSDALE ROAD & ROSE LANE
SCOTTSDALE ROAD, NORTH OF ROSE LANE
SOUTHBOUND 15-MINUTE TRAFFIC VOLUMES



SWC SCOTTSDALE ROAD & ROSE LANE

SCOTTSDALE ROAD, NORTH OF ROSE LANE

APPROACH AND DEPARTURE

BEGIN	NORTHBOUND		SOUTHBOUND		BOTH	
PERIOD	15 MINUTES	60 MINUTES	15 MINUTES	60 MINUTES	15 MINUTES	60 MINUTES
12:00 AM	23	**77**	27	**95**	50	**172**
12:15 AM	23	71	24	79	47	150
12:30 AM	16	65	19	65	35	130
12:45 AM	15	70	25	62	40	132
1:00 AM	17	**82**	11	**59**	28	**141**
1:15 AM	17	81	10	60	27	141
1:30 AM	21	77	16	58	37	135
1:45 AM	27	71	22	51	49	122
2:00 AM	16	**54**	12	**42**	28	**96**
2:15 AM	13	55	8	38	21	93
2:30 AM	15	47	9	39	24	86
2:45 AM	10	48	13	50	23	98
3:00 AM	17	**55**	8	**58**	25	**113**
3:15 AM	5	51	9	77	14	128
3:30 AM	16	70	20	120	36	190
3:45 AM	17	98	21	146	38	244
4:00 AM	13	**127**	27	**173**	40	**300**
4:15 AM	24	168	52	204	76	372
4:30 AM	44	206	46	225	90	431
4:45 AM	46	241	48	267	94	508
5:00 AM	54	**297**	58	**309**	112	**606**
5:15 AM	62	365	73	362	135	727
5:30 AM	79	444	88	432	167	876
5:45 AM	102	541	90	574	192	1,115
6:00 AM	122	**614**	111	**701**	233	**1,315**
6:15 AM	141	720	143	837	284	1,557
6:30 AM	176	855	230	968	406	1,823
6:45 AM	175	1,009	217	1,061	392	2,070
7:00 AM	228	**1,120**	247	**1,147**	475	**2,267**
7:15 AM	276	1,167	274	1,210	550	2,377
7:30 AM	330	1,182	323	1,229	653	2,411
7:45 AM	286	1,144	303	1,255	589	2,399
8:00 AM	275	**1,136**	310	**1,260**	585	**2,396**
8:15 AM	291	1,123	293	1,258	584	2,381
8:30 AM	292	1,101	349	1,257	641	2,358
8:45 AM	278	1,087	308	1,211	586	2,298
9:00 AM	262	**1,100**	308	**1,212**	570	**2,312**
9:15 AM	269	1,124	292	1,184	561	2,308
9:30 AM	278	1,140	303	1,182	581	2,322
9:45 AM	291	1,160	309	1,174	600	2,334
10:00 AM	286	**1,173**	280	**1,164**	566	**2,337**
10:15 AM	285	1,190	290	1,173	575	2,363
10:30 AM	298	1,206	295	1,174	593	2,380
10:45 AM	304	1,231	299	1,193	603	2,424
11:00 AM	303	**1,266**	289	**1,217**	592	**2,483**
11:15 AM	301	1,317	291	1,279	592	2,596
11:30 AM	323	1,360	314	1,341	637	2,701
11:45 AM	339	1,421	323	1,407	662	2,828
MAXIMUM	**384**	**1,421**	**380**	**1,407**	**764**	**2,828**
PHF and TIME	**0.93**	**11:45 AM**	**0.93**	**11:45 AM**	**0.93**	**11:45 AM**

EPS GROUP

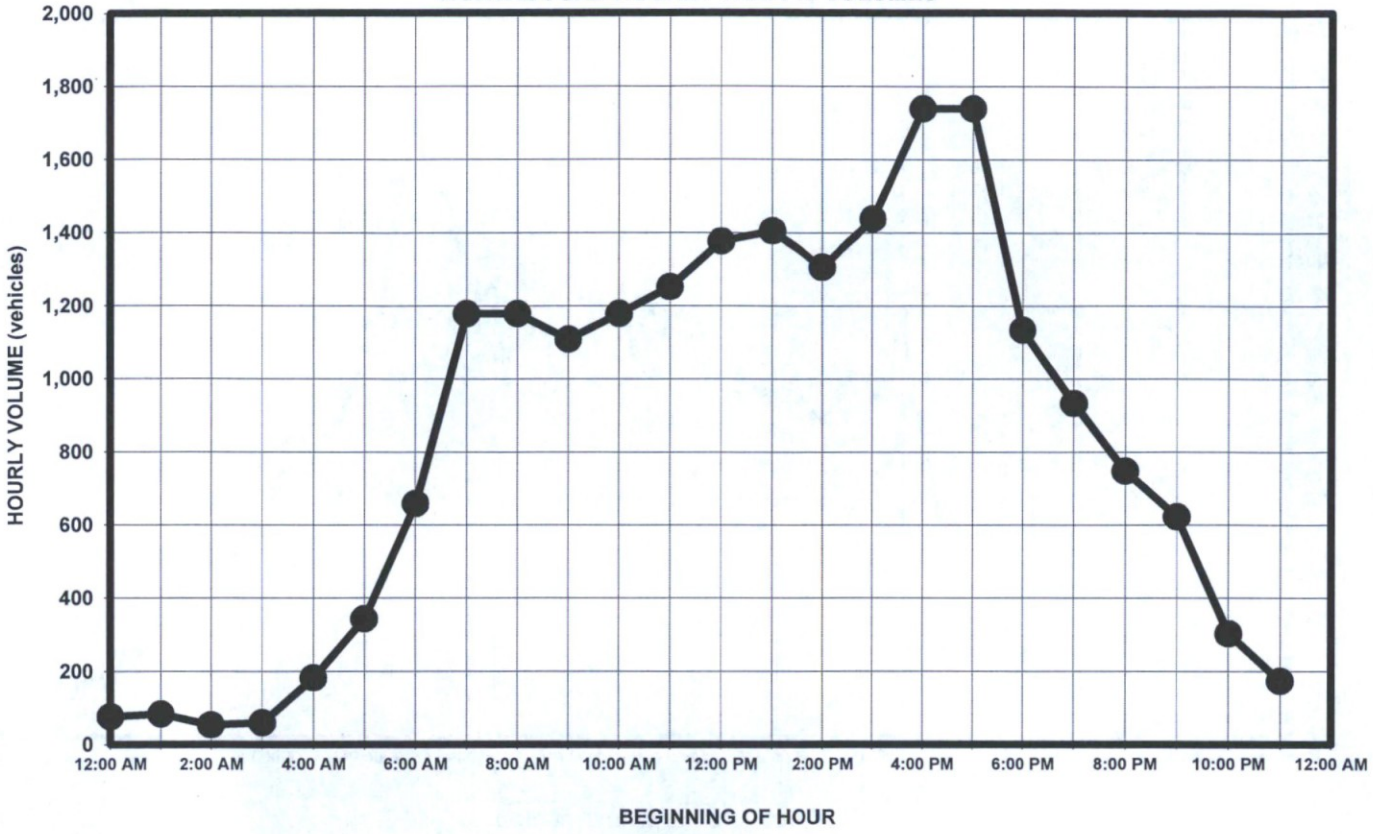
SWC SCOTTSDALE ROAD & ROSE LANE
SCOTTSDALE ROAD, NORTH OF ROSE LANE
APPROACH AND DEPARTURE

BEGIN	NORTHBOUND		SOUTHBOUND		BOTH	
PERIOD	15 MINUTES	60 MINUTES	15 MINUTES	60 MINUTES	15 MINUTES	60 MINUTES
12:00 PM	354	**1,446**	351	**1,419**	705	**2,865**
12:15 PM	344	1,486	353	1,411	697	2,897
12:30 PM	384	1,517	380	1,408	764	2,925
12:45 PM	364	1,517	335	1,328	699	2,845
1:00 PM	394	**1,490**	343	**1,349**	737	**2,839**
1:15 PM	375	1,437	350	1,338	725	2,775
1:30 PM	384	1,364	300	1,312	684	2,676
1:45 PM	337	1,319	356	1,340	693	2,659
2:00 PM	341	**1,345**	332	**1,295**	673	**2,640**
2:15 PM	302	1,406	324	1,278	626	2,684
2:30 PM	339	1,413	328	1,277	667	2,690
2:45 PM	363	1,467	311	1,323	674	2,790
3:00 PM	402	**1,474**	315	**1,361**	717	**2,835**
3:15 PM	309	1,464	323	1,398	632	2,862
3:30 PM	393	1,585	374	1,443	767	3,028
3:45 PM	370	1,658	349	1,452	719	3,110
4:00 PM	392	**1,771**	352	**1,480**	744	**3,251**
4:15 PM	430	1,900	368	1,509	798	3,409
4:30 PM	466	1,948	383	1,562	849	3,510
4:45 PM	483	1,910	377	1,599	860	3,509
5:00 PM	521	**1,773**	381	**1,569**	902	**3,342**
5:15 PM	478	1,589	421	1,495	899	3,084
5:30 PM	428	1,409	420	1,438	848	2,847
5:45 PM	346	1,255	347	1,283	693	2,538
6:00 PM	337	**1,170**	307	**1,192**	644	**2,362**
6:15 PM	298	1,069	364	1,126	662	2,195
6:30 PM	274	1,017	265	998	539	2,015
6:45 PM	261	989	256	983	517	1,972
7:00 PM	236	**939**	241	**943**	477	**1,882**
7:15 PM	246	930	236	920	482	1,850
7:30 PM	246	886	250	859	496	1,745
7:45 PM	211	797	216	793	427	1,590
8:00 PM	227	**761**	218	**735**	445	**1,496**
8:15 PM	202	734	175	660	377	1,394
8:30 PM	157	726	184	630	341	1,356
8:45 PM	175	696	158	559	333	1,255
9:00 PM	200	**645**	143	**482**	343	**1,127**
9:15 PM	194	541	145	455	339	996
9:30 PM	127	426	113	396	240	822
9:45 PM	124	367	81	369	205	736
10:00 PM	96	**306**	116	**332**	212	**638**
10:15 PM	79	250	86	265	165	515
10:30 PM	68	225	86	247	154	472
10:45 PM	63	203	44	197	107	400
11:00 PM	40	**175**	49	**179**	89	**354**
11:15 PM	54	-	68	-	122	-
11:30 PM	46	-	36	-	82	-
11:45 PM	35	-	26	-	61	-
MAXIMUM	**521**	**1,948**	**421**	**1,599**	**902**	**3,510**
PHF and TIME	**0.93**	**4:30 PM**	**0.95**	**4:45 PM**	**0.97**	**4:30 PM**

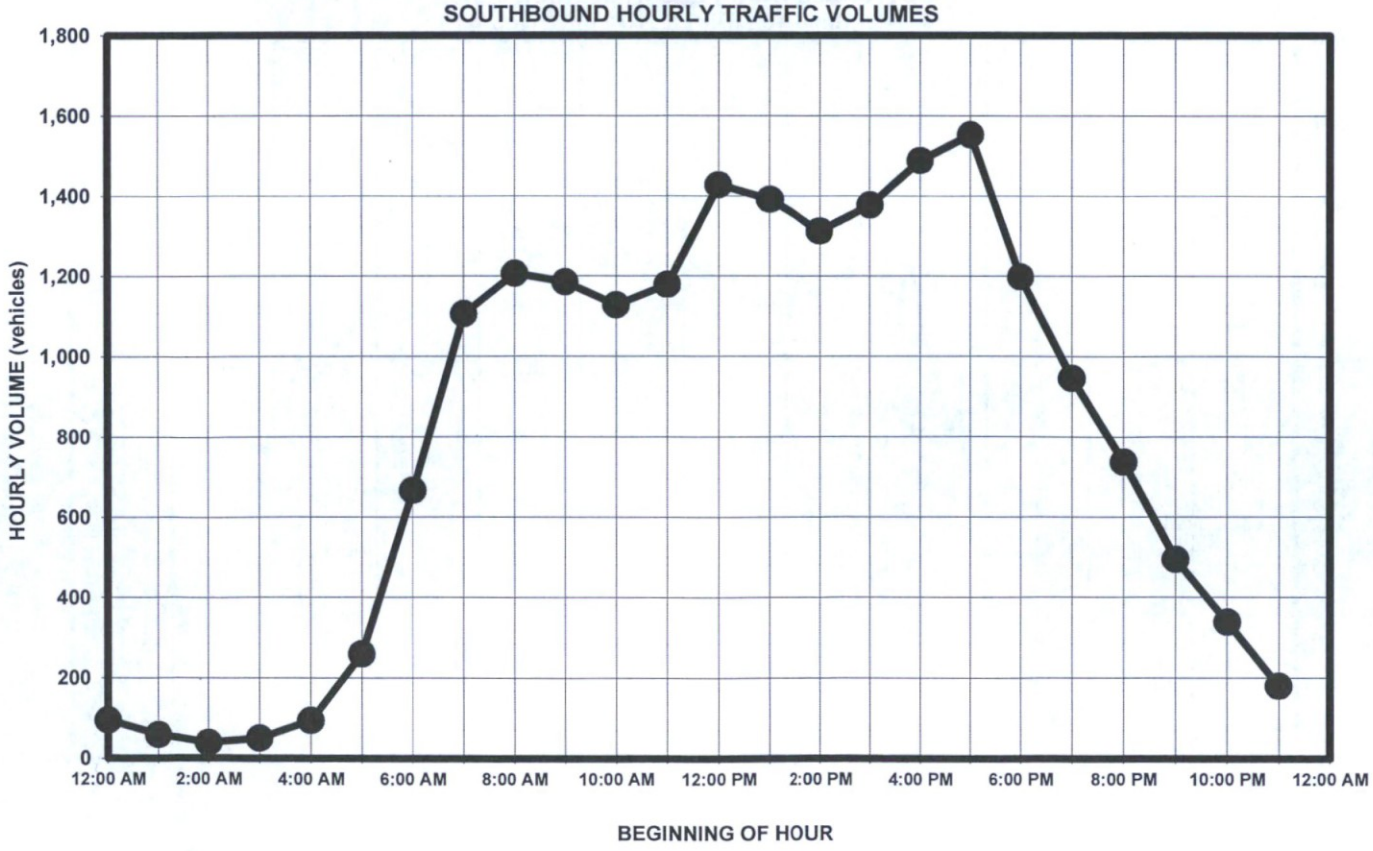
	NORTHBOUND		SOUTHBOUND		BOTH
DAILY TOTAL VOLUME	**20,396**		**19,773**		**40,169**

EPS GROUP

SWC SCOTTSDALE ROAD & ROSE LANE
SCOTTSDALE ROAD, SOUTH OF ROSE LANE
NORTHBOUND HOURLY TRAFFIC VOLUMES

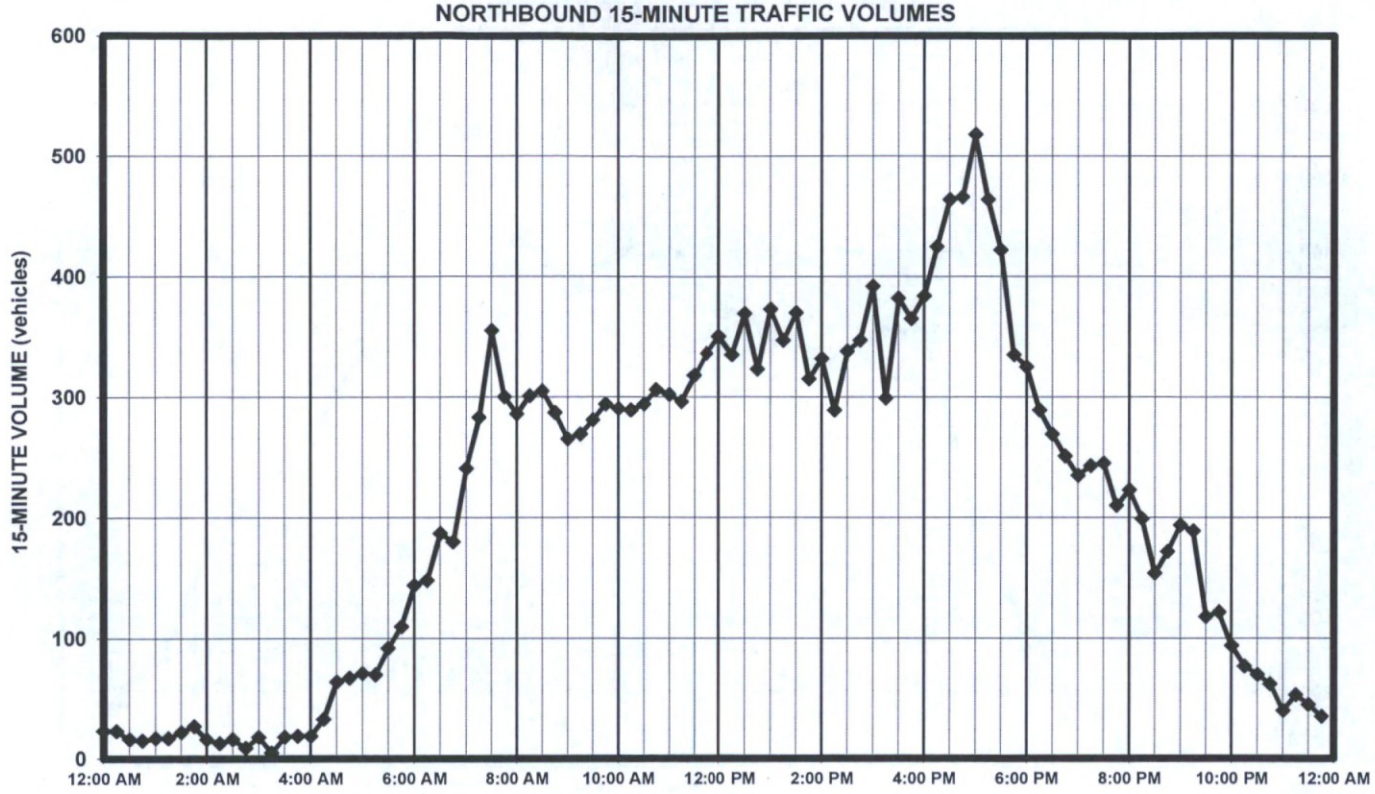


SWC SCOTTSDALE ROAD & ROSE LANE
SCOTTSDALE ROAD, SOUTH OF ROSE LANE
SOUTHBOUND HOURLY TRAFFIC VOLUMES

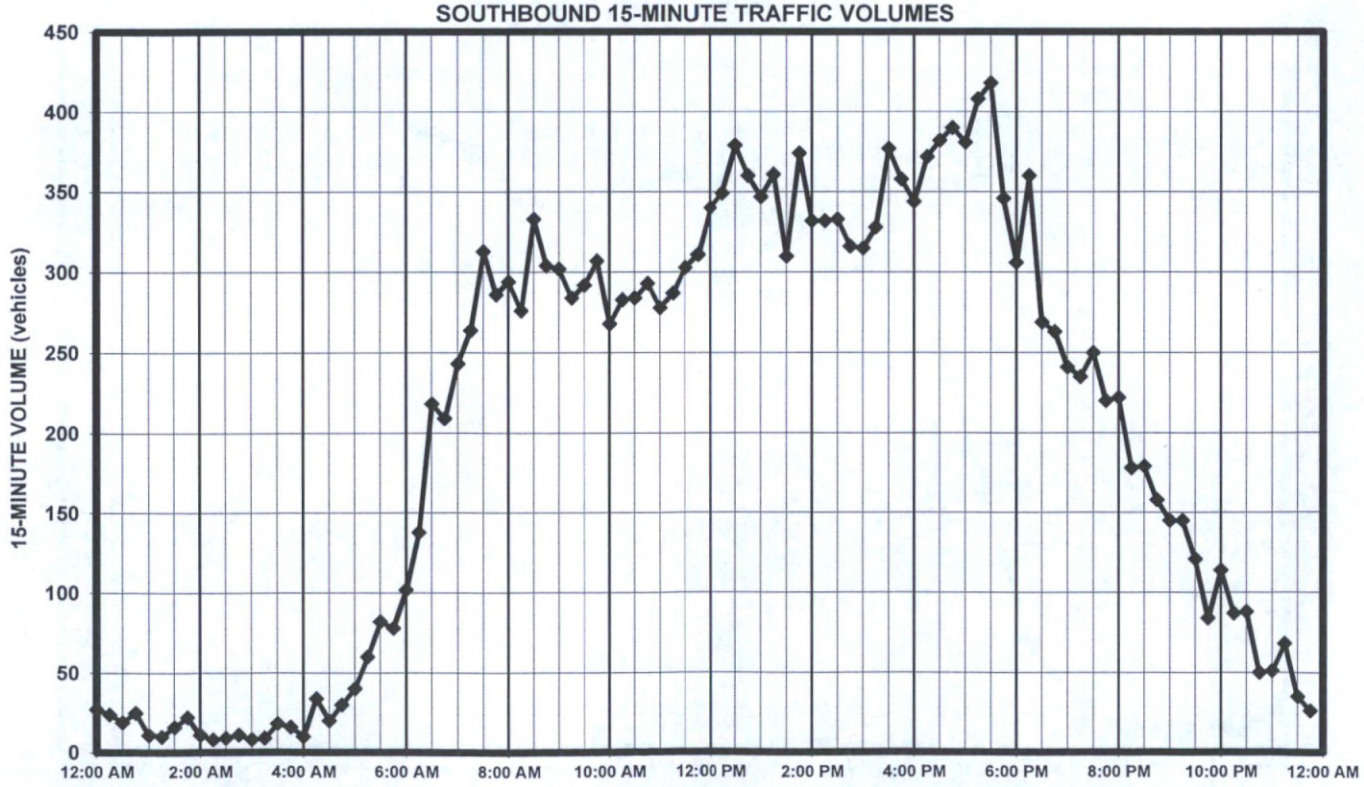


EPS GROUP

SWC SCOTTSDALE ROAD & ROSE LANE
SCOTTSDALE ROAD, SOUTH OF ROSE LANE
NORTHBOUND 15-MINUTE TRAFFIC VOLUMES



SWC SCOTTSDALE ROAD & ROSE LANE
SCOTTSDALE ROAD, SOUTH OF ROSE LANE
SOUTHBOUND 15-MINUTE TRAFFIC VOLUMES



SWC SCOTTSDALE ROAD & ROSE LANE

SCOTTSDALE ROAD, SOUTH OF ROSE LANE

APPROACH AND DEPARTURE

BEGIN	NORTHBOUND		SOUTHBOUND		BOTH	
PERIOD	15 MINUTES	60 MINUTES	15 MINUTES	60 MINUTES	15 MINUTES	60 MINUTES
12:00 AM	23	**77**	27	**95**	50	**172**
12:15 AM	23	71	24	79	47	150
12:30 AM	16	65	19	65	35	130
12:45 AM	15	71	25	62	40	133
1:00 AM	17	**83**	11	**59**	28	**142**
1:15 AM	17	82	10	59	27	141
1:30 AM	22	78	16	57	38	135
1:45 AM	27	72	22	50	49	122
2:00 AM	16	**54**	11	**39**	27	**93**
2:15 AM	13	56	8	36	21	92
2:30 AM	16	48	9	37	25	85
2:45 AM	9	50	11	46	20	96
3:00 AM	18	**60**	8	**51**	26	**111**
3:15 AM	5	61	9	53	14	114
3:30 AM	18	89	18	78	36	167
3:45 AM	19	135	16	80	35	215
4:00 AM	19	**183**	10	**94**	29	**277**
4:15 AM	33	235	34	124	67	359
4:30 AM	64	272	20	150	84	422
4:45 AM	67	300	30	212	97	512
5:00 AM	71	**343**	40	**260**	111	**603**
5:15 AM	70	416	60	322	130	738
5:30 AM	92	494	82	400	174	894
5:45 AM	110	589	78	536	188	1,125
6:00 AM	144	**659**	102	**667**	246	**1,326**
6:15 AM	148	756	138	808	286	1,564
6:30 AM	187	891	218	934	405	1,825
6:45 AM	180	1,059	209	1,029	389	2,088
7:00 AM	241	**1,179**	243	**1,106**	484	**2,285**
7:15 AM	283	1,224	264	1,157	547	2,381
7:30 AM	355	1,242	313	1,169	668	2,411
7:45 AM	300	1,192	286	1,189	586	2,381
8:00 AM	286	**1,179**	294	**1,207**	580	**2,386**
8:15 AM	301	1,158	276	1,215	577	2,373
8:30 AM	305	1,126	333	1,223	638	2,349
8:45 AM	287	1,102	304	1,182	591	2,284
9:00 AM	265	**1,109**	302	**1,185**	567	**2,294**
9:15 AM	269	1,134	284	1,151	553	2,285
9:30 AM	281	1,154	292	1,150	573	2,304
9:45 AM	294	1,167	307	1,142	601	2,309
10:00 AM	290	**1,179**	268	**1,128**	558	**2,307**
10:15 AM	289	1,191	283	1,138	572	2,329
10:30 AM	294	1,198	284	1,142	578	2,340
10:45 AM	306	1,222	293	1,161	599	2,383
11:00 AM	302	**1,252**	278	**1,179**	580	**2,431**
11:15 AM	296	1,300	287	1,241	583	2,541
11:30 AM	318	1,339	303	1,303	621	2,642
11:45 AM	336	1,390	311	1,379	647	2,769
MAXIMUM	**369**	**1,390**	**379**	**1,379**	**748**	**2,769**
PHF and TIME	**0.94**	**11:45 AM**	**0.91**	**11:45 AM**	**0.93**	**11:45 AM**

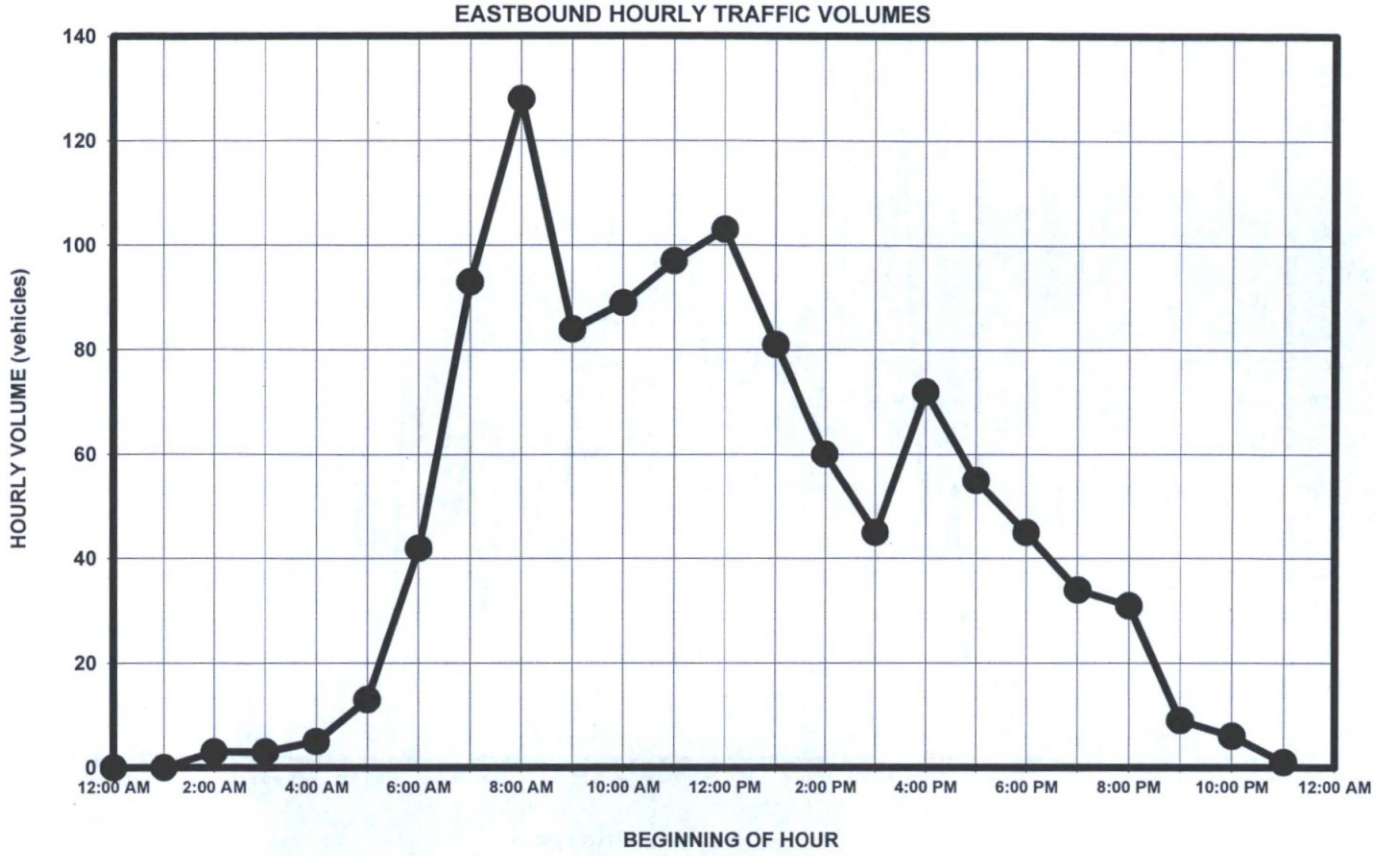
EPS GROUP

SWC SCOTTSDALE ROAD & ROSE LANE
SCOTTSDALE ROAD, SOUTH OF ROSE LANE
APPROACH AND DEPARTURE

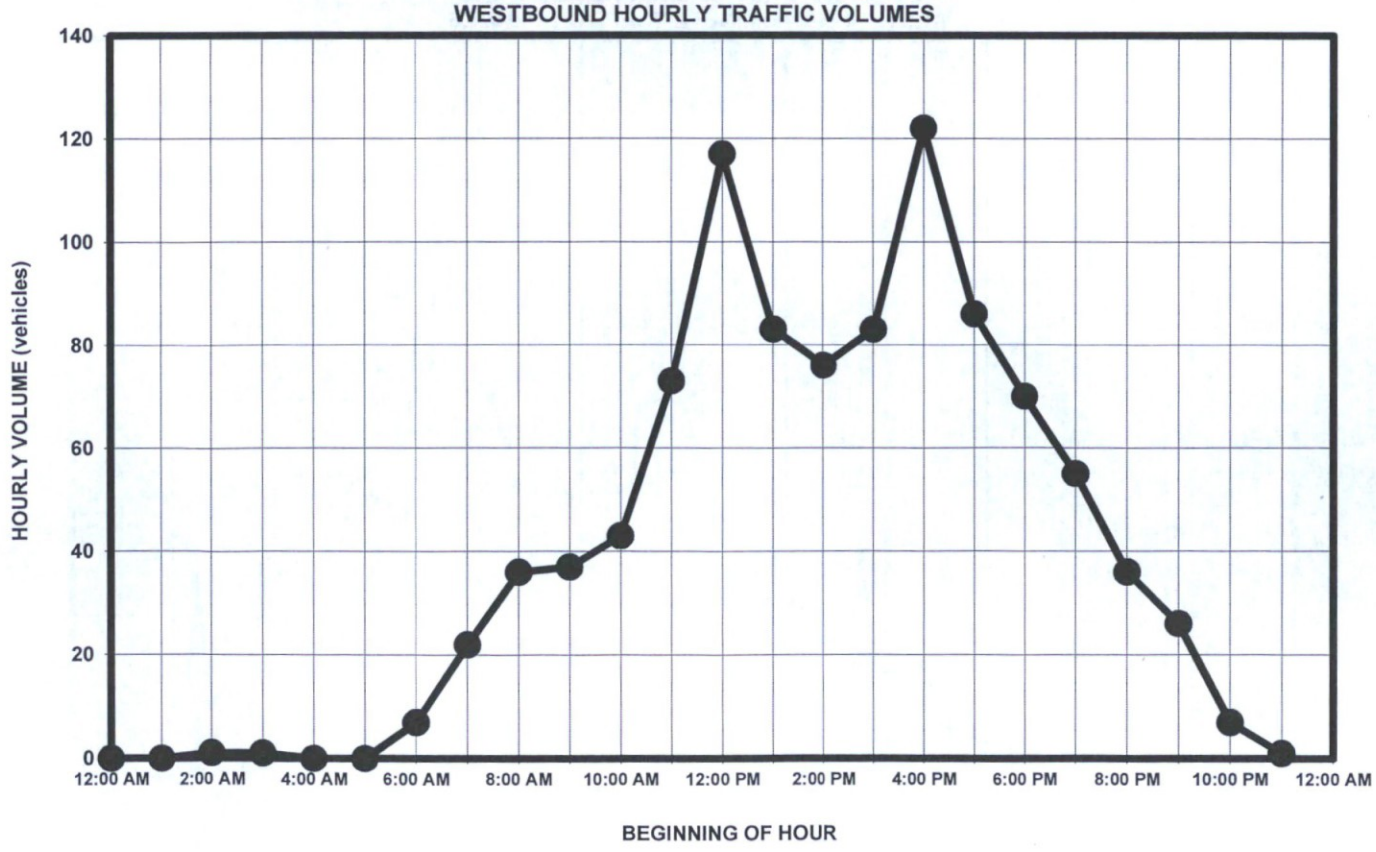
BEGIN	NORTHBOUND		SOUTHBOUND		BOTH	
PERIOD	15 MINUTES	60 MINUTES	15 MINUTES	60 MINUTES	15 MINUTES	60 MINUTES
12:00 PM	350	**1,377**	340	**1,428**	690	**2,805**
12:15 PM	335	1,400	349	1,435	684	2,835
12:30 PM	369	1,412	379	1,447	748	2,859
12:45 PM	323	1,413	360	1,378	683	2,791
1:00 PM	373	**1,405**	347	**1,392**	720	**2,797**
1:15 PM	347	1,364	361	1,377	708	2,741
1:30 PM	370	1,306	310	1,348	680	2,654
1:45 PM	315	1,274	374	1,371	689	2,645
2:00 PM	332	**1,306**	332	**1,313**	664	**2,619**
2:15 PM	289	1,366	332	1,296	621	2,662
2:30 PM	338	1,376	333	1,292	671	2,668
2:45 PM	347	1,420	316	1,336	663	2,756
3:00 PM	392	**1,438**	315	**1,378**	707	**2,816**
3:15 PM	299	1,430	328	1,407	627	2,837
3:30 PM	382	1,556	377	1,451	759	3,007
3:45 PM	365	1,638	358	1,456	723	3,094
4:00 PM	384	**1,739**	344	**1,488**	728	**3,227**
4:15 PM	425	1,873	372	1,525	797	3,398
4:30 PM	464	1,912	382	1,561	846	3,473
4:45 PM	466	1,870	390	1,597	856	3,467
5:00 PM	518	**1,739**	381	**1,553**	899	**3,292**
5:15 PM	464	1,546	408	1,478	872	3,024
5:30 PM	422	1,371	418	1,430	840	2,801
5:45 PM	335	1,218	346	1,281	681	2,499
6:00 PM	325	**1,134**	306	**1,198**	631	**2,332**
6:15 PM	289	1,044	360	1,133	649	2,177
6:30 PM	269	998	269	1,008	538	2,006
6:45 PM	251	974	263	989	514	1,963
7:00 PM	235	**933**	241	**946**	476	**1,879**
7:15 PM	243	921	235	927	478	1,848
7:30 PM	245	877	250	870	495	1,747
7:45 PM	210	786	220	799	430	1,585
8:00 PM	223	**748**	222	**737**	445	**1,485**
8:15 PM	199	719	178	660	377	1,379
8:30 PM	154	709	179	627	333	1,336
8:45 PM	172	673	158	569	330	1,242
9:00 PM	194	**623**	145	**495**	339	**1,118**
9:15 PM	189	523	145	464	334	987
9:30 PM	118	411	121	406	239	817
9:45 PM	122	363	84	373	206	736
10:00 PM	94	**303**	114	**339**	208	**642**
10:15 PM	77	249	87	276	164	525
10:30 PM	70	225	88	257	158	482
10:45 PM	62	200	50	204	112	404
11:00 PM	40	**173**	51	**180**	91	**353**
11:15 PM	53	-	68	-	121	-
11:30 PM	45	-	35	-	80	-
11:45 PM	35	-	26	-	61	-
MAXIMUM	**518**	**1,912**	**418**	**1,597**	**899**	**3,473**
PHF and TIME	**0.92**	**4:30 PM**	**0.96**	**4:45 PM**	**0.97**	**4:30 PM**

	NORTHBOUND		SOUTHBOUND		BOTH
DAILY TOTAL VOLUME	**20,275**		**19,517**		**39,792**

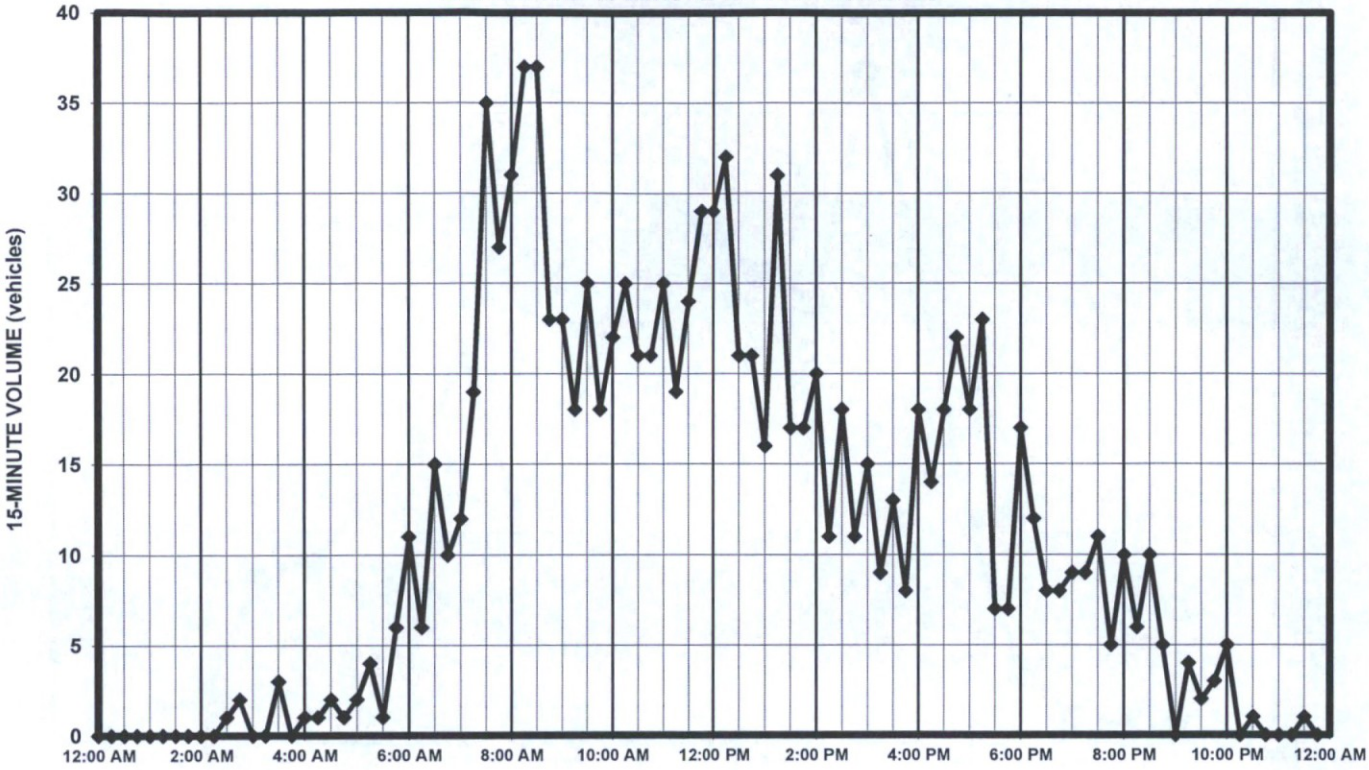
SWC SCOTTSDALE ROAD & ROSE LANE
ROSE LANE, EAST OF SCOTTSDALE ROAD
EASTBOUND HOURLY TRAFFIC VOLUMES



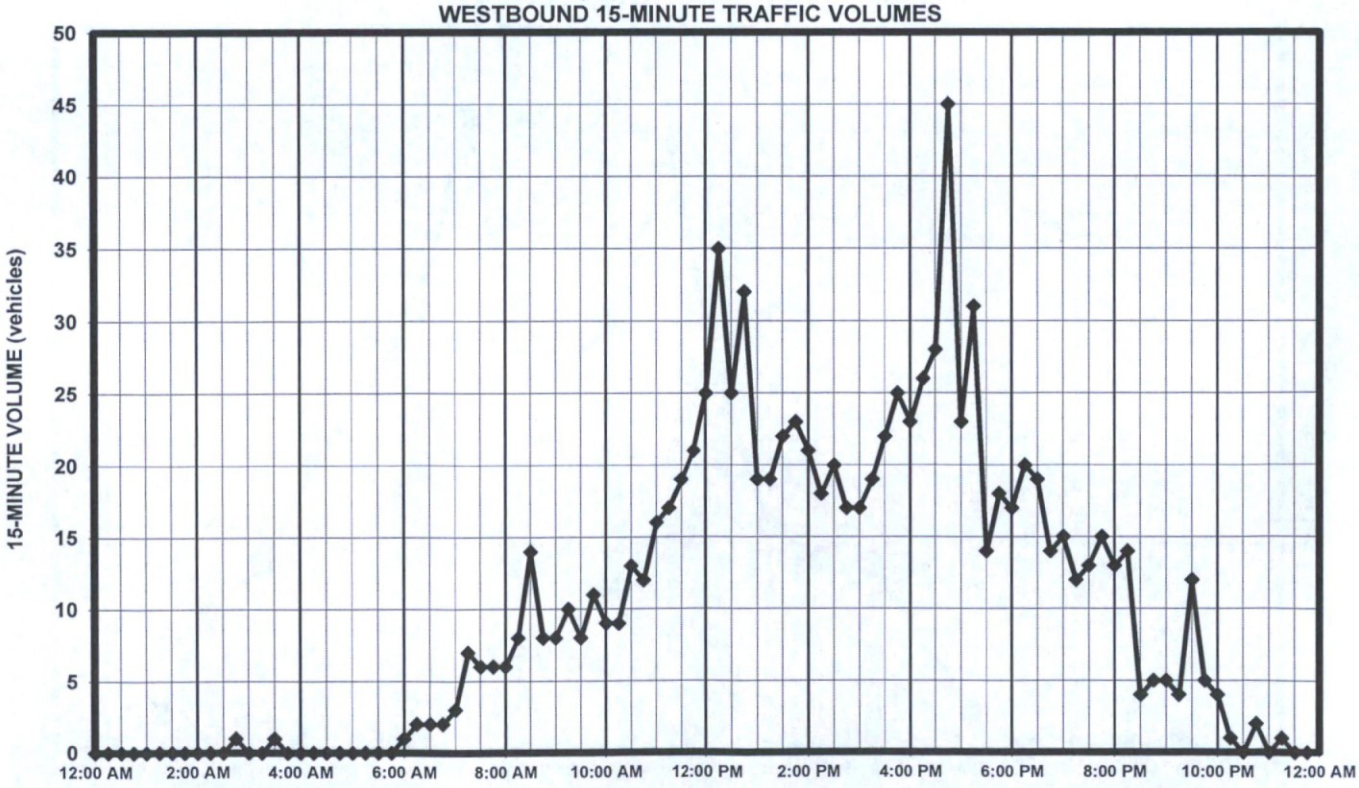
SWC SCOTTSDALE ROAD & ROSE LANE
ROSE LANE, EAST OF SCOTTSDALE ROAD
WESTBOUND HOURLY TRAFFIC VOLUMES



SWC SCOTTSDALE ROAD & ROSE LANE
ROSE LANE, EAST OF SCOTTSDALE ROAD
EASTBOUND 15-MINUTE TRAFFIC VOLUMES



SWC SCOTTSDALE ROAD & ROSE LANE
ROSE LANE, EAST OF SCOTTSDALE ROAD
WESTBOUND 15-MINUTE TRAFFIC VOLUMES



SWC SCOTTSDALE ROAD & ROSE LANE

ROSE LANE, EAST OF SCOTTSDALE ROAD

APPROACH AND DEPARTURE

BEGIN	EASTBOUND		WESTBOUND		BOTH	
PERIOD	15 MINUTES	60 MINUTES	15 MINUTES	60 MINUTES	15 MINUTES	60 MINUTES
12:00 AM	0	**0**	0	**0**	0	**0**
12:15 AM	0	0	0	0	0	0
12:30 AM	0	0	0	0	0	0
12:45 AM	0	0	0	0	0	0
1:00 AM	0	**0**	0	**0**	0	**0**
1:15 AM	0	0	0	0	0	0
1:30 AM	0	0	0	0	0	0
1:45 AM	0	1	0	0	0	1
2:00 AM	0	**3**	0	**1**	0	**4**
2:15 AM	0	3	0	1	0	4
2:30 AM	1	3	0	1	1	4
2:45 AM	2	5	1	2	3	7
3:00 AM	0	**3**	0	**1**	0	**4**
3:15 AM	0	4	0	1	0	5
3:30 AM	3	5	1	1	4	6
3:45 AM	0	4	0	0	0	4
4:00 AM	1	**5**	0	**0**	1	**5**
4:15 AM	1	6	0	0	1	6
4:30 AM	2	9	0	0	2	9
4:45 AM	1	8	0	0	1	8
5:00 AM	2	**13**	0	**0**	2	**13**
5:15 AM	4	22	0	1	4	23
5:30 AM	1	24	0	3	1	27
5:45 AM	6	38	0	5	6	43
6:00 AM	11	**42**	1	**7**	12	**49**
6:15 AM	6	43	2	9	8	52
6:30 AM	15	56	2	14	17	70
6:45 AM	10	76	2	18	12	94
7:00 AM	12	**93**	3	**22**	15	**115**
7:15 AM	19	112	7	25	26	137
7:30 AM	35	130	6	26	41	156
7:45 AM	27	132	6	34	33	166
8:00 AM	31	**128**	6	**36**	37	**164**
8:15 AM	37	120	8	38	45	158
8:30 AM	37	101	14	40	51	141
8:45 AM	23	89	8	34	31	123
9:00 AM	23	**84**	8	**37**	31	**121**
9:15 AM	18	83	10	38	28	121
9:30 AM	25	90	8	37	33	127
9:45 AM	18	86	11	42	29	128
10:00 AM	22	**89**	9	**43**	31	**132**
10:15 AM	25	92	9	50	34	142
10:30 AM	21	86	13	58	34	144
10:45 AM	21	89	12	64	33	153
11:00 AM	25	**97**	16	**73**	41	**170**
11:15 AM	19	101	17	82	36	183
11:30 AM	24	114	19	100	43	214
11:45 AM	29	111	21	106	50	217
MAXIMUM	**37**	**132**	**35**	**106**	**67**	**217**
PHF and TIME	**0.89**	**7:45 AM**	**0.76**	**11:45 AM**	**0.81**	**11:45 AM**

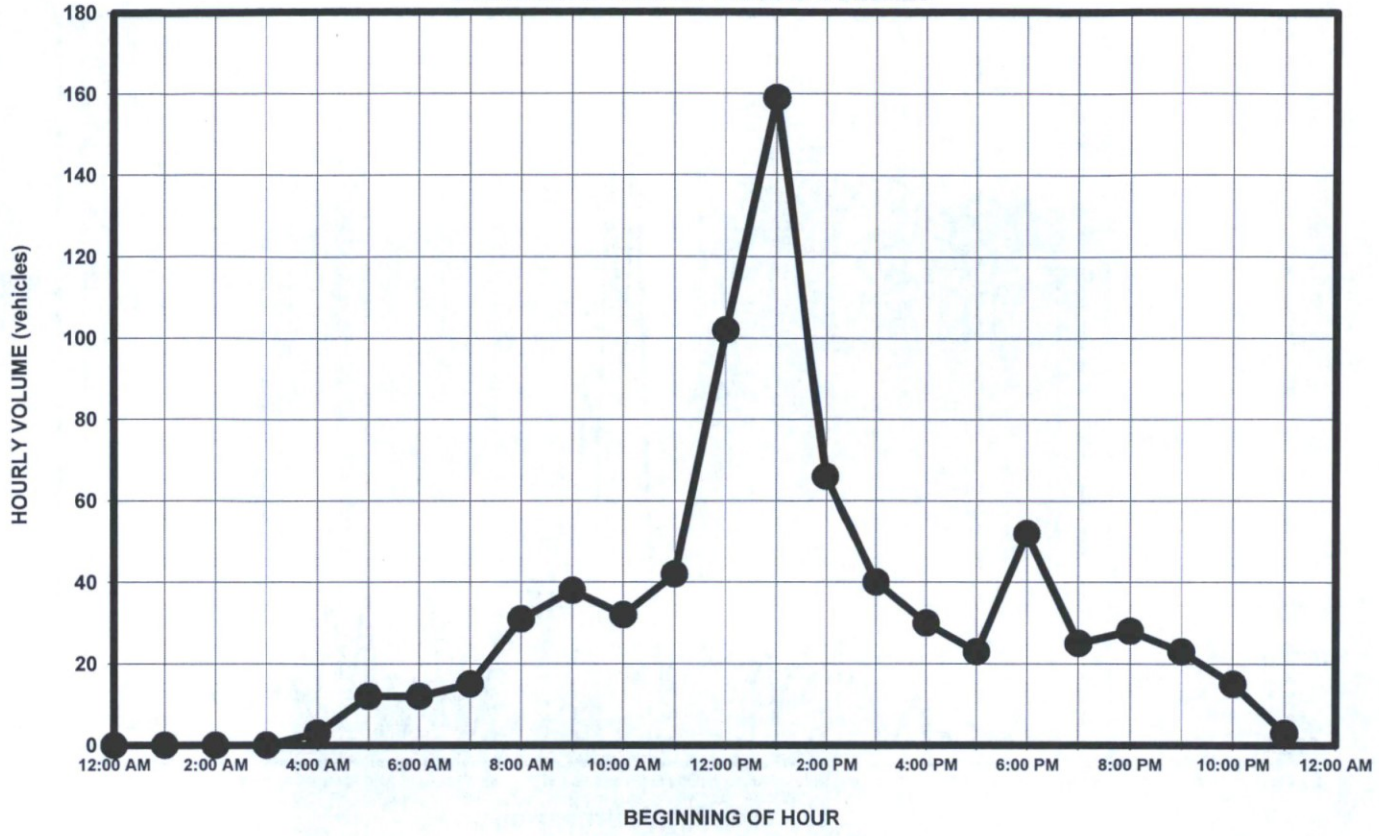
EPS GROUP

SWC SCOTTSDALE ROAD & ROSE LANE
ROSE LANE, EAST OF SCOTTSDALE ROAD
APPROACH AND DEPARTURE

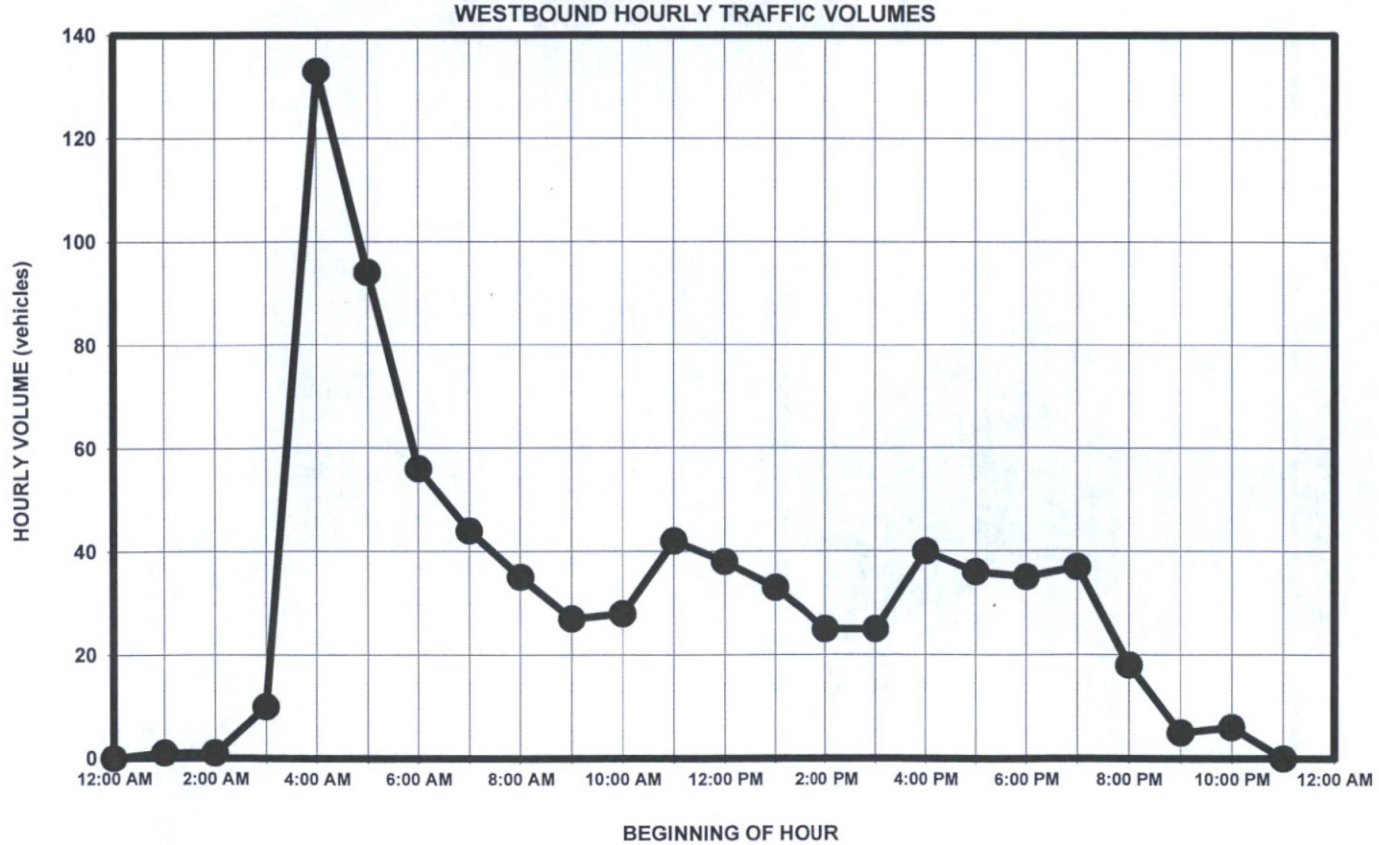
BEGIN	EASTBOUND		WESTBOUND		BOTH	
PERIOD	15 MINUTES	60 MINUTES	15 MINUTES	60 MINUTES	15 MINUTES	60 MINUTES
12:00 PM	29	**103**	25	**117**	54	**220**
12:15 PM	32	90	35	111	67	201
12:30 PM	21	89	25	95	46	184
12:45 PM	21	85	32	92	53	177
1:00 PM	16	**81**	19	**83**	35	**164**
1:15 PM	31	85	19	85	50	170
1:30 PM	17	65	22	84	39	149
1:45 PM	17	66	23	82	40	148
2:00 PM	20	**60**	21	**76**	41	**136**
2:15 PM	11	55	18	72	29	127
2:30 PM	18	53	20	73	38	126
2:45 PM	11	48	17	75	28	123
3:00 PM	15	**45**	17	**83**	32	**128**
3:15 PM	9	48	19	89	28	137
3:30 PM	13	53	22	96	35	149
3:45 PM	8	58	25	102	33	160
4:00 PM	18	**72**	23	**122**	41	**194**
4:15 PM	14	72	26	122	40	194
4:30 PM	18	81	28	127	46	208
4:45 PM	22	70	45	113	67	183
5:00 PM	18	**55**	23	**86**	41	**141**
5:15 PM	23	54	31	80	54	134
5:30 PM	7	43	14	69	21	112
5:45 PM	7	44	18	74	25	118
6:00 PM	17	**45**	17	**70**	34	**115**
6:15 PM	12	37	20	68	32	105
6:30 PM	8	34	19	60	27	94
6:45 PM	8	37	14	54	22	91
7:00 PM	9	**34**	15	**55**	24	**89**
7:15 PM	9	35	12	53	21	88
7:30 PM	11	32	13	55	24	87
7:45 PM	5	31	15	46	20	77
8:00 PM	10	**31**	13	**36**	23	**67**
8:15 PM	6	21	14	28	20	49
8:30 PM	10	19	4	18	14	37
8:45 PM	5	11	5	26	10	37
9:00 PM	0	**9**	5	**26**	5	**35**
9:15 PM	4	14	4	25	8	39
9:30 PM	2	10	12	22	14	32
9:45 PM	3	9	5	10	8	19
10:00 PM	5	**6**	4	**7**	9	**13**
10:15 PM	0	1	1	3	1	4
10:30 PM	1	1	0	3	1	4
10:45 PM	0	1	2	3	2	4
11:00 PM	0	**1**	0	**1**	0	**2**
11:15 PM	0	-	1	-	1	-
11:30 PM	1	-	0	-	1	-
11:45 PM	0	-	0	-	0	-
MAXIMUM	**32**	**103**	**45**	**127**	**67**	**220**
PHF and TIME	**0.80**	**12:00 PM**	**0.71**	**4:30 PM**	**0.82**	**12:00 PM**

	EASTBOUND		WESTBOUND		BOTH
DAILY TOTAL VOLUME	**1,099**		**982**		**2,081**

SWC SCOTTSDALE ROAD & ROSE LANE
ROSE LANE, WEST OF SCOTTSDALE ROAD
EASTBOUND HOURLY TRAFFIC VOLUMES

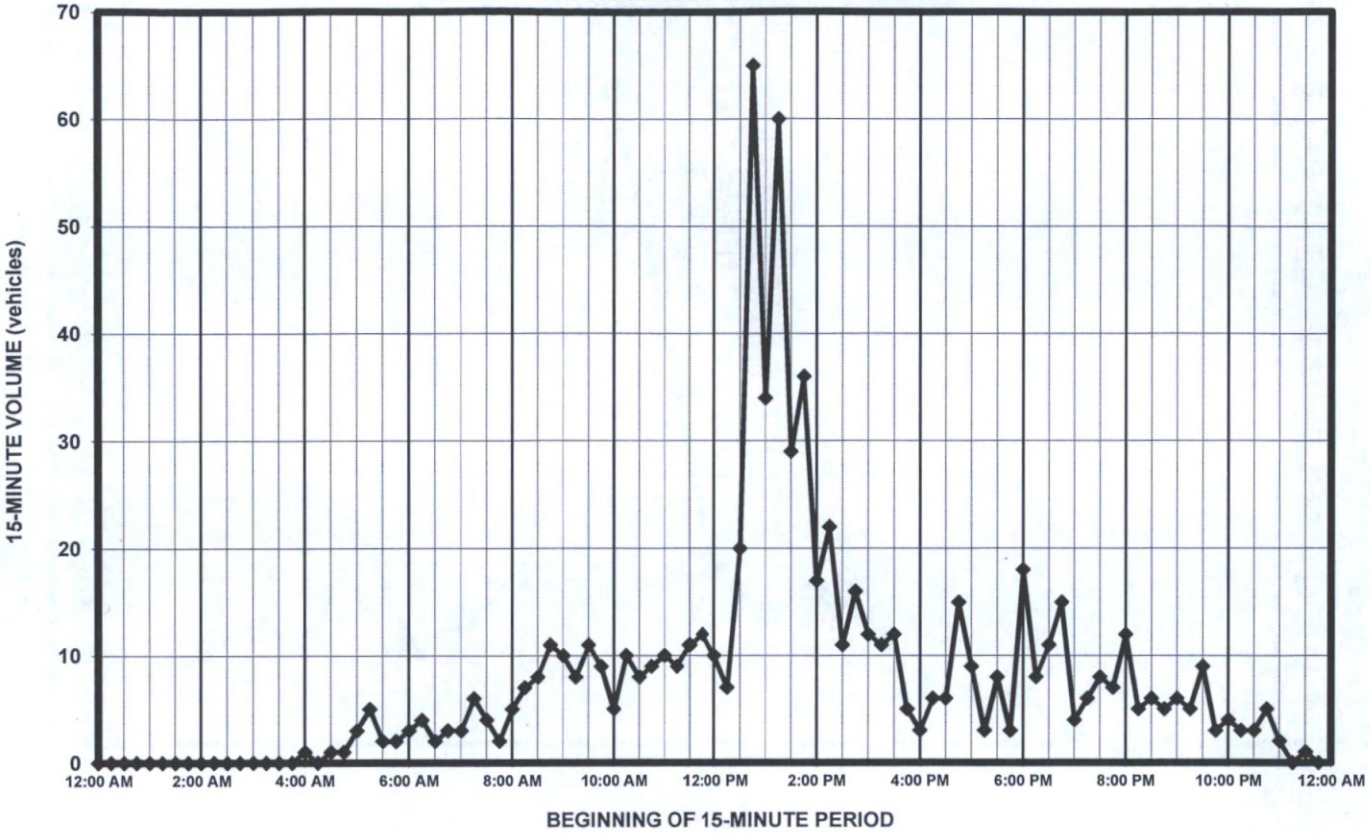


SWC SCOTTSDALE ROAD & ROSE LANE
ROSE LANE, WEST OF SCOTTSDALE ROAD
WESTBOUND HOURLY TRAFFIC VOLUMES

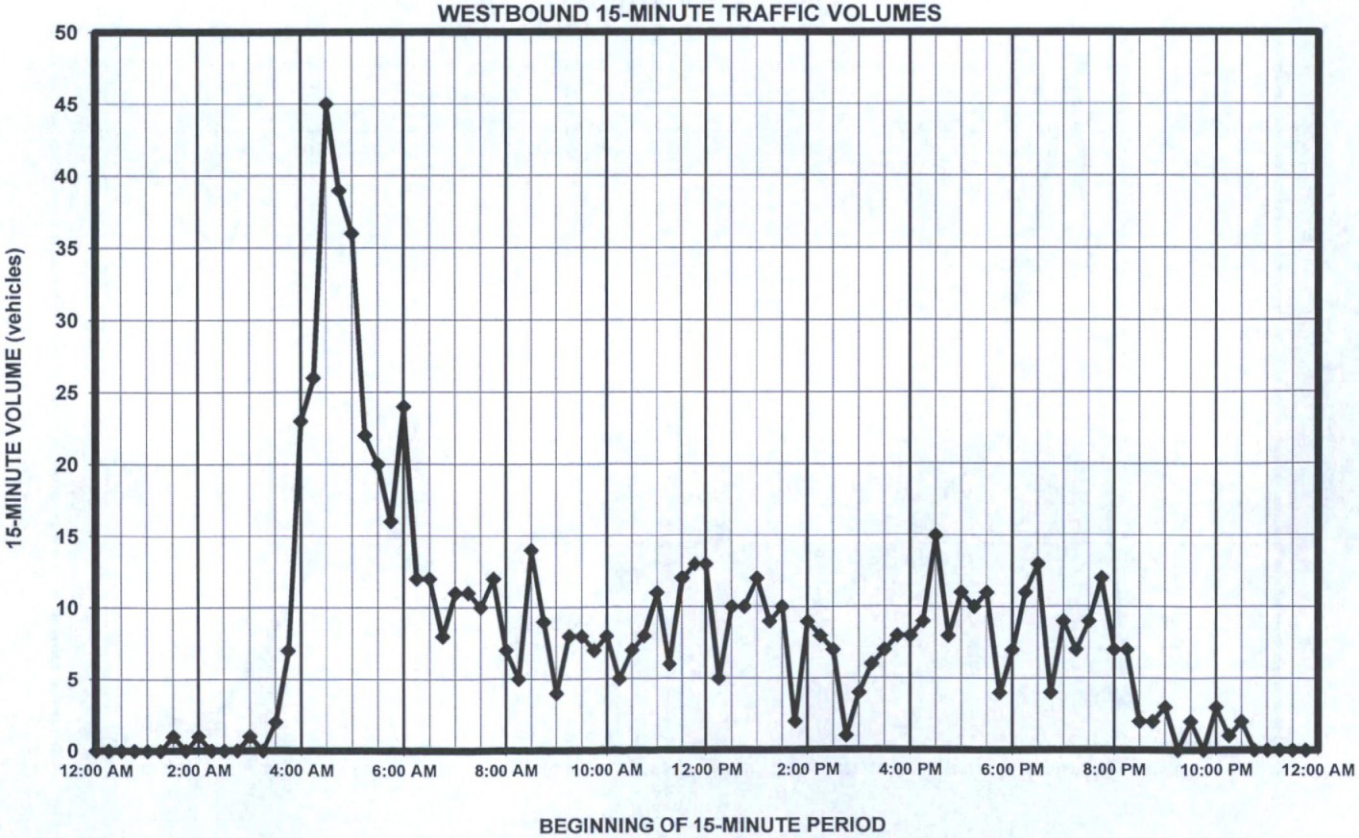


EPS GROUP

SWC SCOTTSDALE ROAD & ROSE LANE
ROSE LANE, WEST OF SCOTTSDALE ROAD
EASTBOUND 15-MINUTE TRAFFIC VOLUMES



SWC SCOTTSDALE ROAD & ROSE LANE
ROSE LANE, WEST OF SCOTTSDALE ROAD
WESTBOUND 15-MINUTE TRAFFIC VOLUMES



SWC SCOTTSDALE ROAD & ROSE LANE

ROSE LANE, WEST OF SCOTTSDALE ROAD

APPROACH AND DEPARTURE

BEGIN	EASTBOUND		WESTBOUND		BOTH	
PERIOD	15 MINUTES	60 MINUTES	15 MINUTES	60 MINUTES	15 MINUTES	60 MINUTES
12:00 AM	0	**0**	0	**0**	0	**0**
12:15 AM	0	0	0	0	0	0
12:30 AM	0	0	0	0	0	0
12:45 AM	0	0	0	1	0	1
1:00 AM	0	**0**	0	**1**	0	**1**
1:15 AM	0	0	0	2	0	2
1:30 AM	0	0	1	2	1	2
1:45 AM	0	0	0	1	0	1
2:00 AM	0	**0**	1	**1**	1	**1**
2:15 AM	0	0	0	1	0	1
2:30 AM	0	0	0	1	0	1
2:45 AM	0	0	0	3	0	3
3:00 AM	0	**0**	1	**10**	1	**10**
3:15 AM	0	1	0	32	0	33
3:30 AM	0	1	2	58	2	59
3:45 AM	0	2	7	101	7	103
4:00 AM	1	**3**	23	**133**	24	**136**
4:15 AM	0	5	26	146	26	151
4:30 AM	1	10	45	142	46	152
4:45 AM	1	11	39	117	40	128
5:00 AM	3	**12**	36	**94**	39	**106**
5:15 AM	5	12	22	82	27	94
5:30 AM	2	11	20	72	22	83
5:45 AM	2	11	16	64	18	75
6:00 AM	3	**12**	24	**56**	27	**68**
6:15 AM	4	12	12	43	16	55
6:30 AM	2	14	12	42	14	56
6:45 AM	3	16	8	40	11	56
7:00 AM	3	**15**	11	**44**	14	**59**
7:15 AM	6	17	11	40	17	57
7:30 AM	4	18	10	34	14	52
7:45 AM	2	22	12	38	14	60
8:00 AM	5	**31**	7	**35**	12	**66**
8:15 AM	7	36	5	32	12	68
8:30 AM	8	37	14	35	22	72
8:45 AM	11	40	9	29	20	69
9:00 AM	10	**38**	4	**27**	14	**65**
9:15 AM	8	33	8	31	16	64
9:30 AM	11	35	8	28	19	63
9:45 AM	9	32	7	27	16	59
10:00 AM	5	**32**	8	**28**	13	**60**
10:15 AM	10	37	5	31	15	68
10:30 AM	8	36	7	32	15	68
10:45 AM	9	39	8	37	17	76
11:00 AM	10	**42**	11	**42**	21	**84**
11:15 AM	9	42	6	44	15	86
11:30 AM	11	40	12	43	23	83
11:45 AM	12	49	13	41	25	90
MAXIMUM	**20**	**49**	**45**	**146**	**46**	**152**
PHF and TIME	**0.61**	**11:45 AM**	**0.81**	**4:15 AM**	**0.83**	**4:30 AM**

EPS GROUP

SWC SCOTTSDALE ROAD & ROSE LANE
ROSE LANE, WEST OF SCOTTSDALE ROAD
APPROACH AND DEPARTURE

BEGIN	EASTBOUND		WESTBOUND		BOTH	
PERIOD	15 MINUTES	60 MINUTES	15 MINUTES	60 MINUTES	15 MINUTES	60 MINUTES
12:00 PM	10	**102**	13	**38**	23	**140**
12:15 PM	7	126	5	37	12	163
12:30 PM	20	179	10	41	30	220
12:45 PM	65	188	10	41	75	229
1:00 PM	34	**159**	12	**33**	46	**192**
1:15 PM	60	142	9	30	69	172
1:30 PM	29	104	10	29	39	133
1:45 PM	36	86	2	26	38	112
2:00 PM	17	**66**	9	**25**	26	**91**
2:15 PM	22	61	8	20	30	81
2:30 PM	11	50	7	18	18	68
2:45 PM	16	51	1	18	17	69
3:00 PM	12	**40**	4	**25**	16	**65**
3:15 PM	11	31	6	29	17	60
3:30 PM	12	26	7	32	19	58
3:45 PM	5	20	8	40	13	60
4:00 PM	3	**30**	8	**40**	11	**70**
4:15 PM	6	36	9	43	15	79
4:30 PM	6	33	15	44	21	77
4:45 PM	15	35	8	40	23	75
5:00 PM	9	**23**	11	**36**	20	**59**
5:15 PM	3	32	10	32	13	64
5:30 PM	8	37	11	33	19	70
5:45 PM	3	40	4	35	7	75
6:00 PM	18	**52**	7	**35**	25	**87**
6:15 PM	8	38	11	37	19	75
6:30 PM	11	36	13	33	24	69
6:45 PM	15	33	4	29	19	62
7:00 PM	4	**25**	9	**37**	13	**62**
7:15 PM	6	33	7	35	13	68
7:30 PM	8	32	9	35	17	67
7:45 PM	7	30	12	28	19	58
8:00 PM	12	**28**	7	**18**	19	**46**
8:15 PM	5	22	7	14	12	36
8:30 PM	6	22	2	7	8	29
8:45 PM	5	25	2	7	7	32
9:00 PM	6	**23**	3	**5**	9	**28**
9:15 PM	5	21	0	5	5	26
9:30 PM	9	19	2	6	11	25
9:45 PM	3	13	0	6	3	19
10:00 PM	4	**15**	3	**6**	7	**21**
10:15 PM	3	13	1	3	4	16
10:30 PM	3	10	2	2	5	12
10:45 PM	5	8	0	0	5	8
11:00 PM	2	**3**	0	**0**	2	**3**
11:15 PM	0	-	0	-	0	-
11:30 PM	1	-	0	-	1	-
11:45 PM	0	-	0	-	0	-
MAXIMUM	**65**	**188**	**15**	**44**	**75**	**229**
PHF and TIME	**0.72**	**12:45 PM**	**0.73**	**4:30 PM**	**0.76**	**12:45 PM**

	EASTBOUND		WESTBOUND		BOTH
DAILY TOTAL VOLUME	**751**		**769**		**1,520**

APPENDIX A.2
TURNING MOVEMENTS

EPS GROUP

EPS GROUP

SWC SCOTTSDALE ROAD & ROSE LANE

SCOTTSDALE ROAD and ROSE LANE

EXISTING 4-HOUR TURNING MOVEMENT COUNTS

BEGIN	SCOTTSDALE ROAD FROM NORTH				ROSE LANE FROM EAST				SCOTTSDALE ROAD FROM SOUTH				ROSE LANE FROM WEST				ALL	60 MIN.
TIME	LEFT	THRU	RIGHT	TOTAL	LEFT	THRU	RIGHT	TOTAL	LEFT	THRU	RIGHT	TOTAL	LEFT	THRU	RIGHT	TOTAL	TOTAL	TOTAL
7:00 AM	5	239	3	247	1	0	2	3	8	226	7	241	0	0	3	3	494	2,363
7:15 AM	11	257	6	274	1	0	6	7	5	270	8	283	0	0	6	6	570	2,476
7:30 AM	**11**	**308**	**4**	**323**	**1**	**0**	**5**	**6**	**6**	**325**	**24**	**355**	**0**	**0**	**4**	**4**	**688**	**2,515**
7:45 AM	15	283	5	303	3	1	2	6	6	282	12	300	2	0	0	2	611	2,503
8:00 AM	19	289	2	310	4	1	1	6	4	271	11	286	3	1	1	5	607	2,506
8:15 AM	19	271	3	293	3	0	5	8	2	282	17	301	4	1	2	7	609	
8:30 AM	19	324	6	349	5	0	9	14	8	280	17	305	3	1	4	8	676	
8:45 AM	13	292	3	308	5	0	3	8	6	272	9	287	3	1	7	11	614	MAX
AM PEAK	64	1,151	14	1,229	11	2	13	26	18	1,160	64	1,242	9	2	7	18	2,515	**2,515**
PHF	0.84	0.93	0.70	0.95	0.69	0.50	0.65	0.81	0.75	0.89	0.67	0.87	0.56	0.50	0.44	0.64	0.91	
4:00 PM	14	335	3	352	7	0	16	23	5	375	4	384	1	0	2	3	762	3,371
4:15 PM	6	359	3	368	13	0	13	26	6	412	7	425	5	1	0	6	825	3,540
4:30 PM	**12**	**367**	**4**	**383**	**11**	**0**	**17**	**28**	**11**	**447**	**6**	**464**	**2**	**0**	**4**	**6**	881	**3,634**
4:45 PM	16	359	2	377	26	0	19	45	6	456	4	466	8	2	5	15	903	3,617
5:00 PM	16	364	1	381	13	0	10	23	10	506	2	518	5	0	4	9	**931**	3,417
5:15 PM	21	398	2	421	9	0	22	31	8	454	2	464	2	0	1	3	919	
5:30 PM	7	411	2	420	5	0	9	14	9	413	0	422	6	0	2	8	864	
5:45 PM	7	337	3	347	7	0	11	18	1	334	0	335	1	0	2	3	703	MAX
PM PEAK	65	1,488	9	1,562	59	0	68	127	35	1,863	14	1,912	17	2	14	33	3,634	**3,634**
PHF	0.77	0.93	0.56	0.93	0.57	0.00	0.77	0.71	0.80	0.92	0.58	0.92	0.53	0.25	0.70	0.55	0.98	

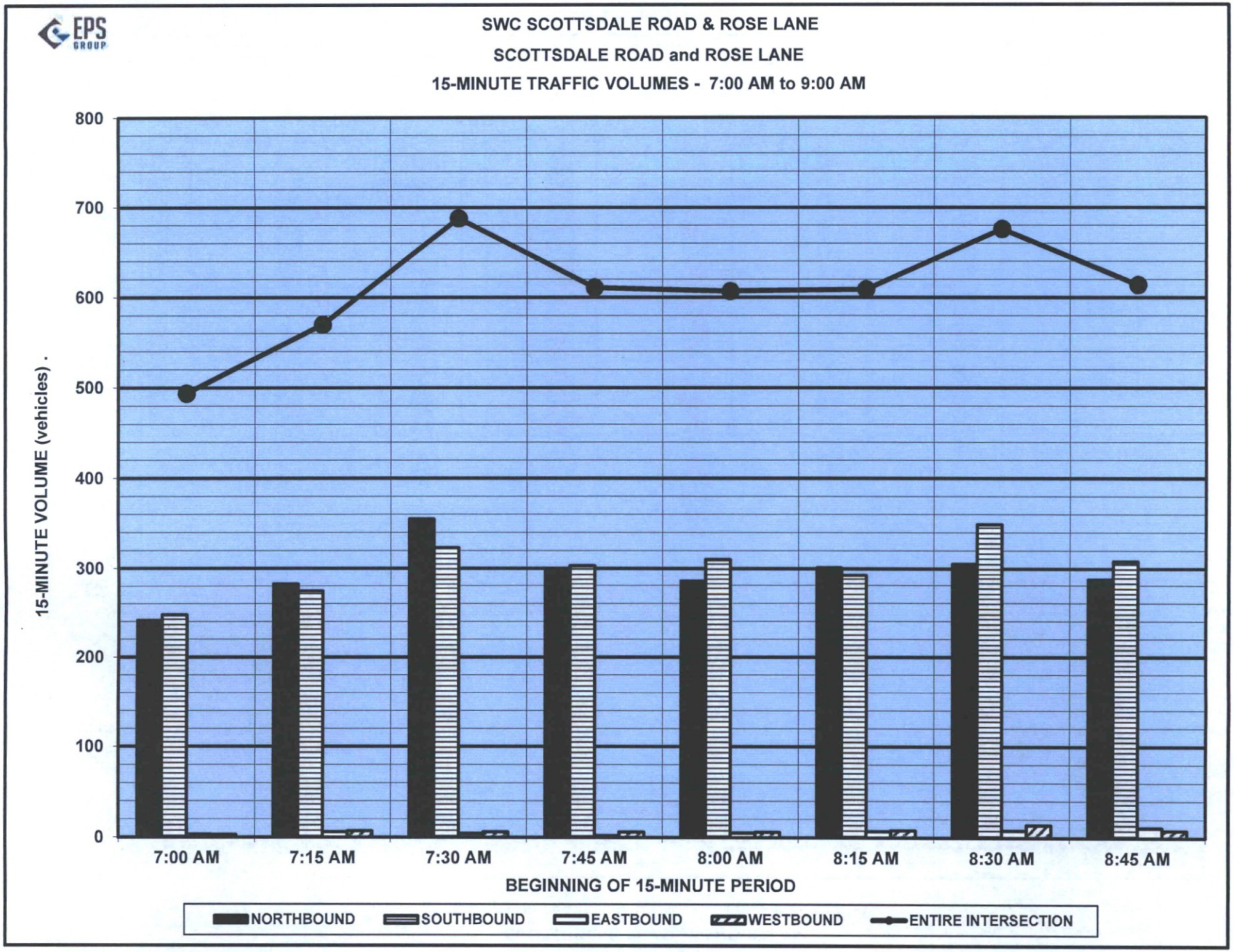
SWC SCOTTSDALE ROAD & ROSE LANE
SCOTTSDALE ROAD and ROSE LANE

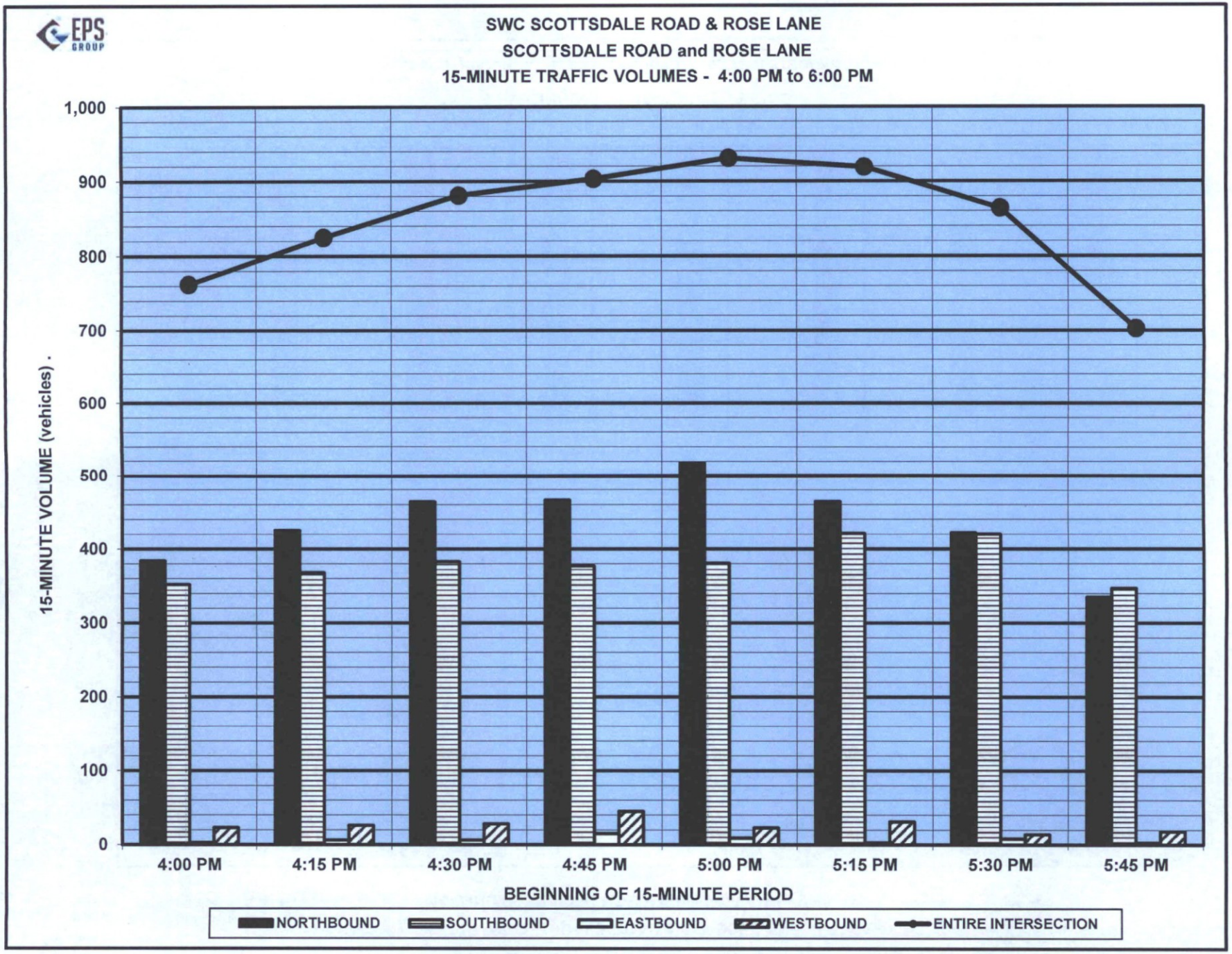
BEGIN TIME	SCOTTSDALE ROAD FROM NORTH				ROSE LANE FROM EAST				SCOTTSDALE ROAD FROM SOUTH				ROSE LANE FROM WEST				ALL TOTAL	60 MIN. TOTAL
	LEFT	THRU	RIGHT	TOTAL	LEFT	THRU	RIGHT	TOTAL	LEFT	THRU	RIGHT	TOTAL	LEFT	THRU	RIGHT	TOTAL		
APPROACH VOLUMES																		
7:00 AM	42	1,087	18	1,147	6	1	15	22	25	1,103	51	1,179	2	0	13	15		2,363
8:00 AM	70	1,176	14	1,260	17	1	18	36	20	1,105	54	1,179	13	4	14	31		2,506
4:00 PM	48	1,420	12	1,480	57	0	65	122	28	1,690	21	1,739	16	3	11	30		3,371
5:00 PM	51	1,510	8	1,569	34	0	52	86	28	1,707	4	1,739	14	0	9	23		3,417
AM TOTAL	112	2,263	32	2,407	23	2	33	58	45	2,208	105	2,358	15	4	27	46		4,869
AM %	5%	94%	1%	100%	40%	3%	57%	100%	2%	94%	4%	100%	33%	9%	59%	100%		
PM TOTAL	99	2,930	20	3,049	91	0	117	208	56	3,397	25	3,478	30	3	20	53		6,788
PM %	3%	96%	1%	100%	44%	0%	56%	100%	2%	98%	1%	100%	57%	6%	38%	100%		
ALL TOTAL	211	5,193	52	5,456	114	2	150	266	101	5,605	130	5,836	45	7	47	99		11,657
ALL %	4%	95%	1%	100%	43%	1%	56%	100%	2%	96%	2%	100%	45%	7%	47%	100%		
AM TOTAL	**49%**				**1%**				**48%**				**1%**					**100%**
PM TOTAL	**45%**				**3%**				**51%**				**1%**					**100%**
ALL TOTAL	**47%**				**2%**				**50%**				**1%**					**100%**

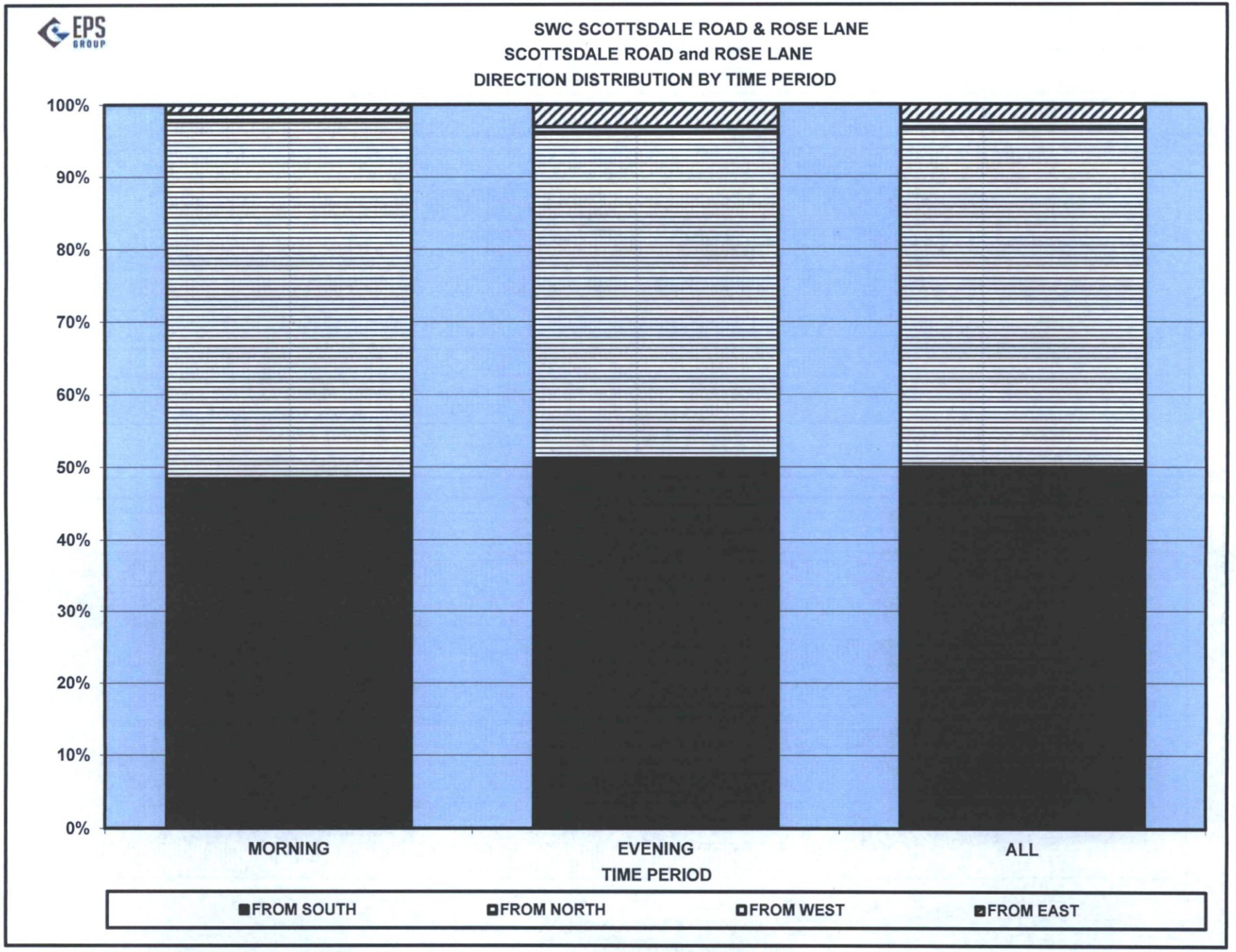
DEPARTURE VOLUMES

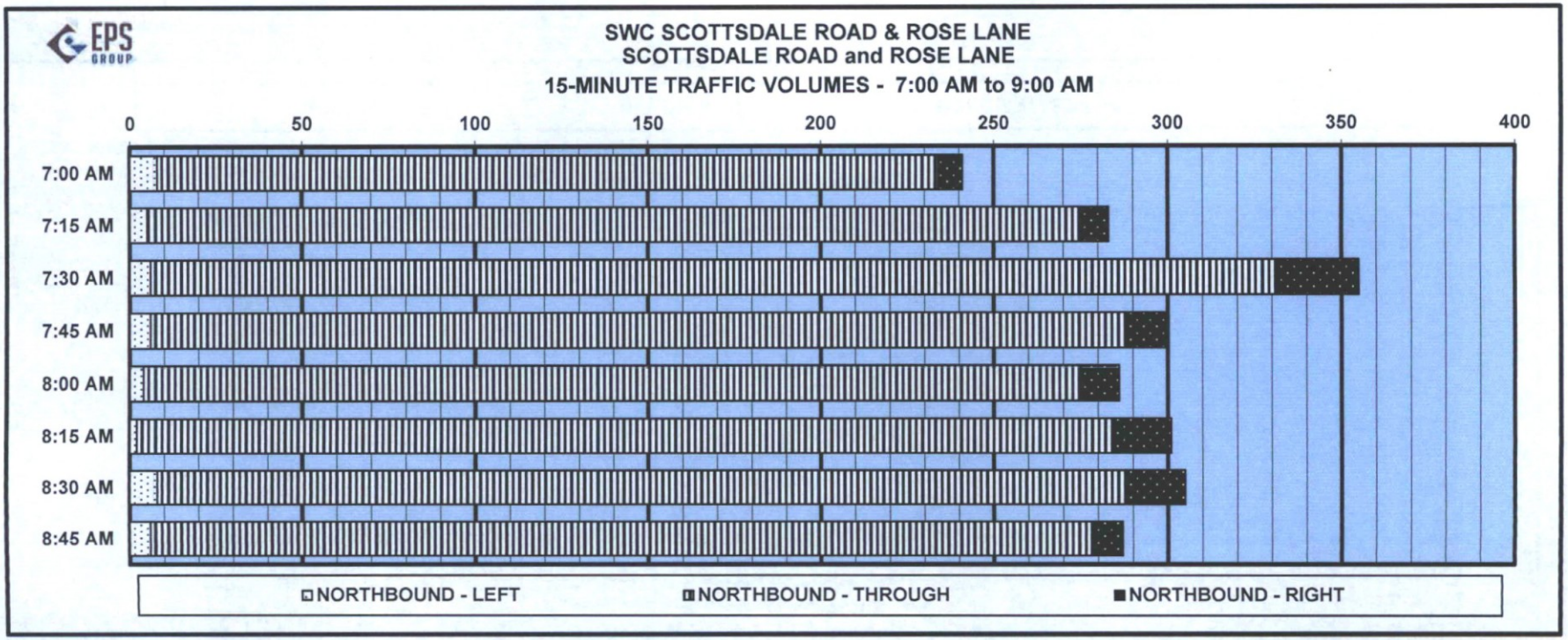
TIME	SCOTTSDALE ROAD TO NORTH				ROSE LANE TO EAST				SCOTTSDALE ROAD TO SOUTH				ROSE LANE TO WEST				ALL TOTAL	60 MIN. TOTAL
	EB LEFT	NB THRU	WB RIGHT	TOTAL	SB LEFT	EB THRU	NB RIGHT	TOTAL	WB LEFT	SB THRU	EB RIGHT	TOTAL	NB LEFT	WB THRU	SB RIGHT	TOTAL		
AM TOTAL	15	2,208	33	2,256	112	4	105	221	23	2,263	27	2,313	45	2	32	79		4,869
AM %	1%	98%	1%	100%	51%	2%	48%	100%	1%	98%	1%	100%	57%	3%	41%	100%		
PM TOTAL	30	3,397	117	3,544	99	3	25	127	91	2,930	20	3,041	56	0	20	76		6,788
PM %	1%	96%	3%	100%	78%	2%	20%	100%	3%	96%	1%	100%	74%	0%	26%	100%		
ALL TOTAL	45	5,605	150	5,800	211	7	130	348	114	5,193	47	5,354	101	2	52	155		11,657
TOTAL %	1%	97%	3%	100%	61%	2%	37%	100%	2%	97%	1%	100%	65%	1%	34%	100%		
AM TOTAL	**46%**				**5%**				**48%**				**2%**					**100%**
PM TOTAL	**52%**				**2%**				**45%**				**1%**					**100%**
ALL TOTAL	**50%**				**3%**				**46%**				**1%**					**100%**

EPS GROUP

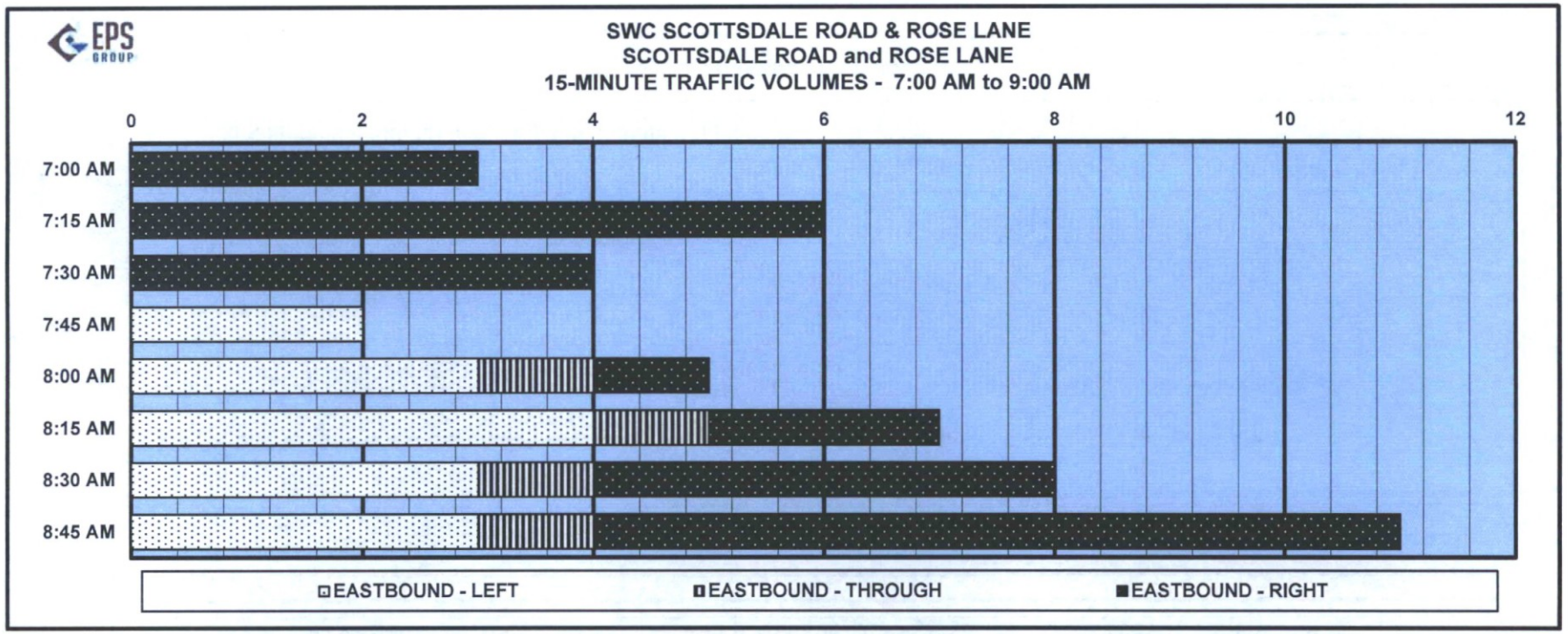

SWC SCOTTSDALE ROAD & ROSE LANE
SCOTTSDALE ROAD and ROSE LANE
15-MINUTE TRAFFIC VOLUMES - 7:00 AM to 9:00 AM
15-MINUTE VOLUME (vehicles)
800
700
600
500
400
300
200
100
0
7:00 AM
7:15 AM
7:30 AM
7:45 AM
8:00 AM
8:15 AM
8:30 AM
8:45 AM
BEGINNING OF 15-MINUTE PERIOD
NORTHBOUND
SOUTHBOUND
EASTBOUND
WESTBOUND
ENTIRE INTERSECTION

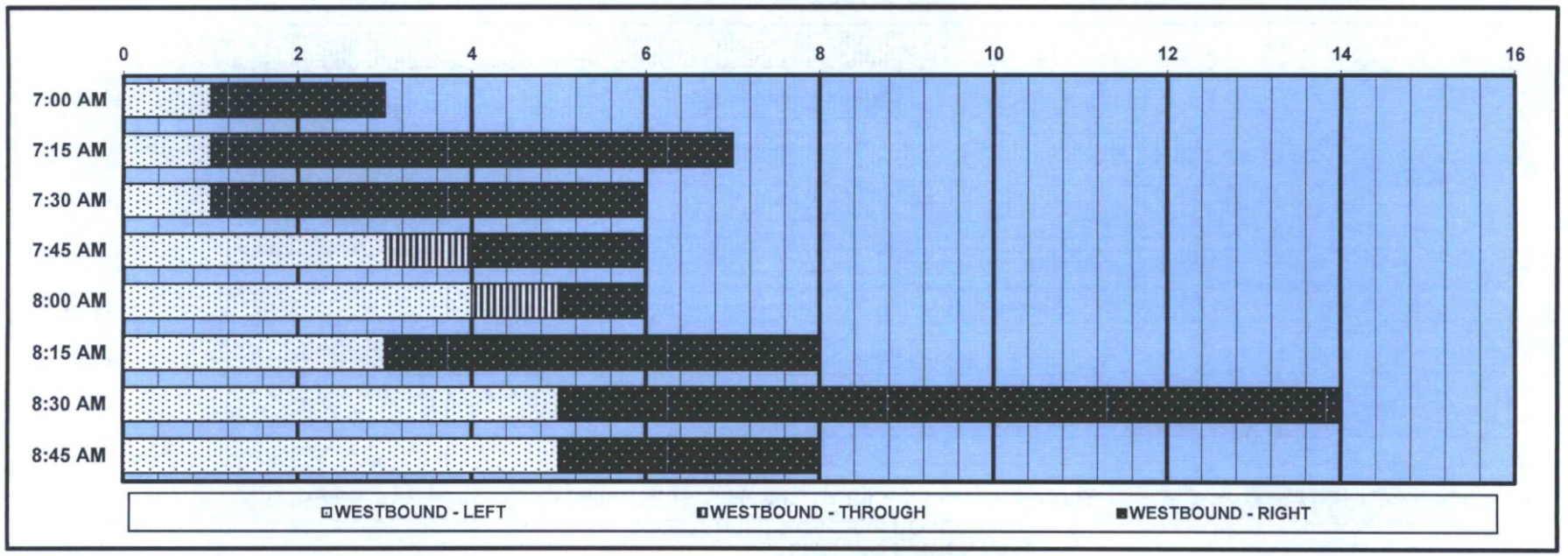

SWC SCOTTSDALE ROAD & ROSE LANE
SCOTTSDALE ROAD and ROSE LANE
15-MINUTE TRAFFIC VOLUMES - 4:00 PM to 6:00 PM
15-MINUTE VOLUME (vehicles)
1,000
900
800
700
600
500
400
300
200
100
0
4:00 PM
4:15 PM
4:30 PM
4:45 PM
5:00 PM
5:15 PM
5:30 PM
5:45 PM
BEGINNING OF 15-MINUTE PERIOD
NORTHBOUND
SOUTHBOUND
EASTBOUND
WESTBOUND
ENTIRE INTERSECTION

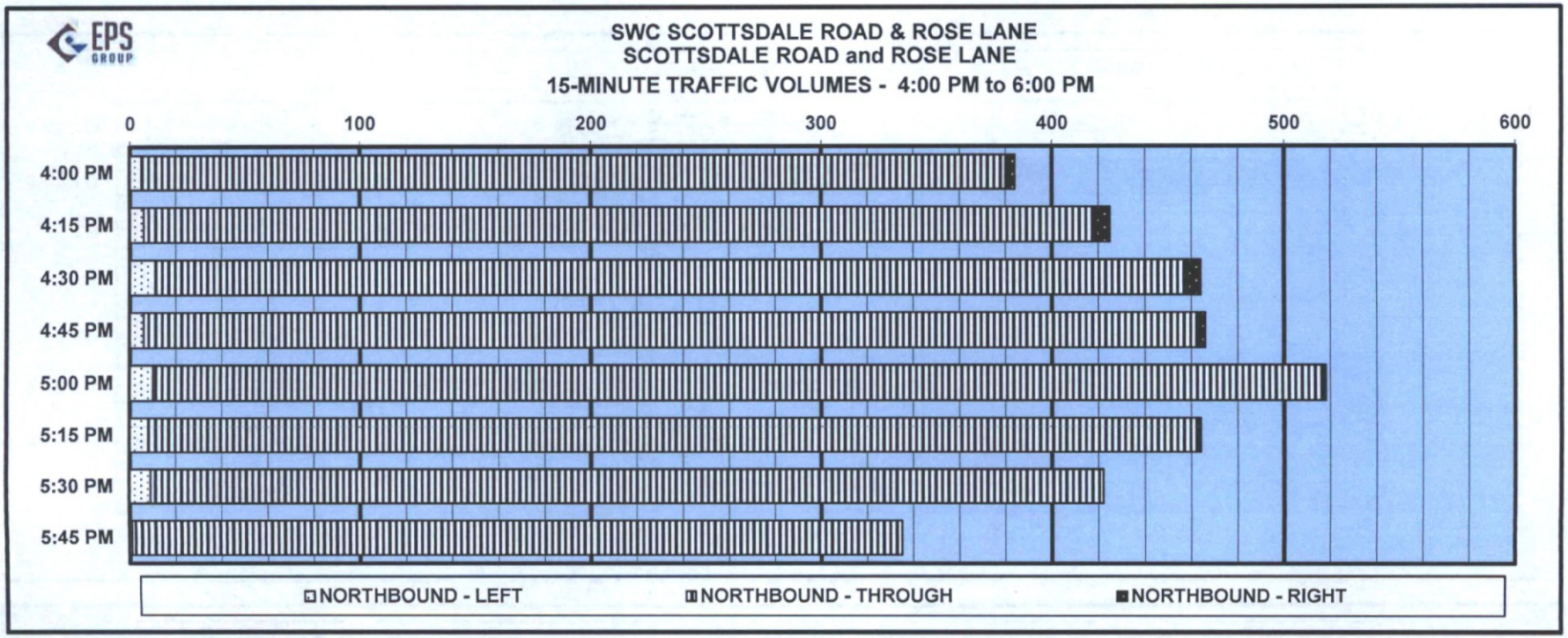

SWC SCOTTSDALE ROAD & ROSE LANE
SCOTTSDALE ROAD and ROSE LANE
DIRECTION DISTRIBUTION BY TIME PERIOD
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
MORNING
EVENING
ALL
TIME PERIOD
FROM SOUTH
FROM NORTH
FROM WEST
FROM EAST

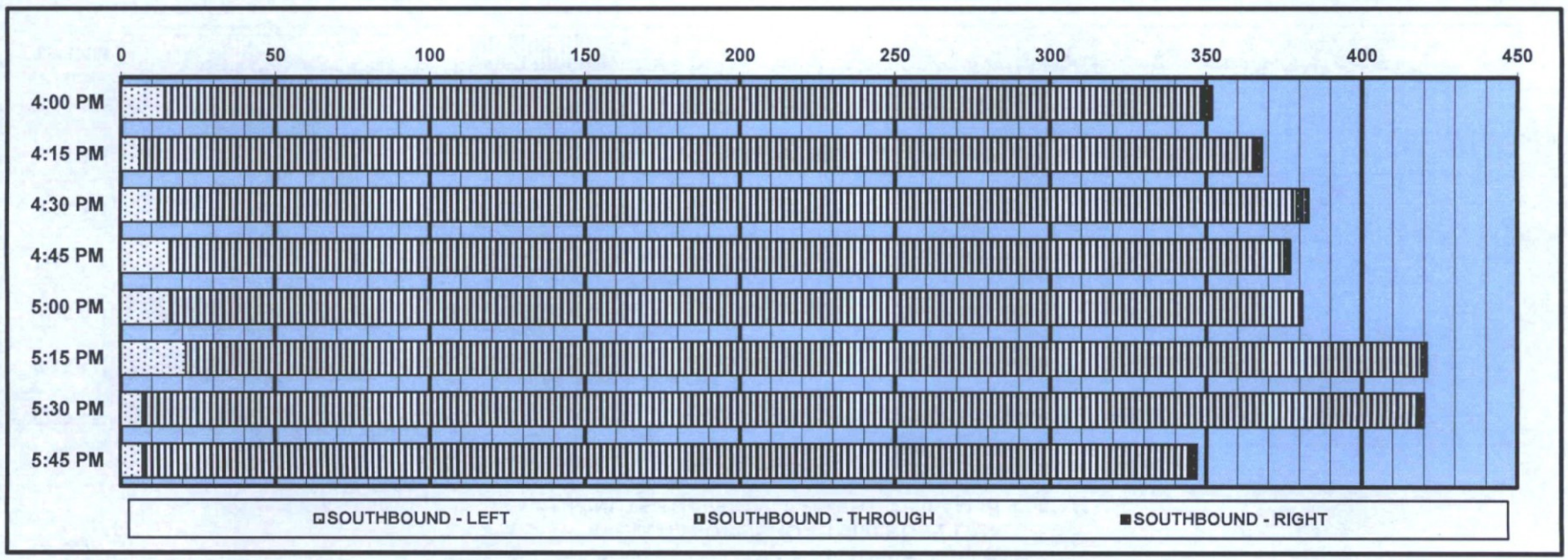

SWC SCOTTSDALE ROAD & ROSE LANE
SCOTTSDALE ROAD and ROSE LANE
15-MINUTE TRAFFIC VOLUMES - 7:00 AM to 9:00 AM
0
50
100
150
200
250
300
350
400
7:00 AM
7:15 AM
7:30 AM
7:45 AM
8:00 AM
8:15 AM
8:30 AM
8:45 AM
NORTHBOUND - LEFT
NORTHBOUND - THROUGH
NORTHBOUND - RIGHT

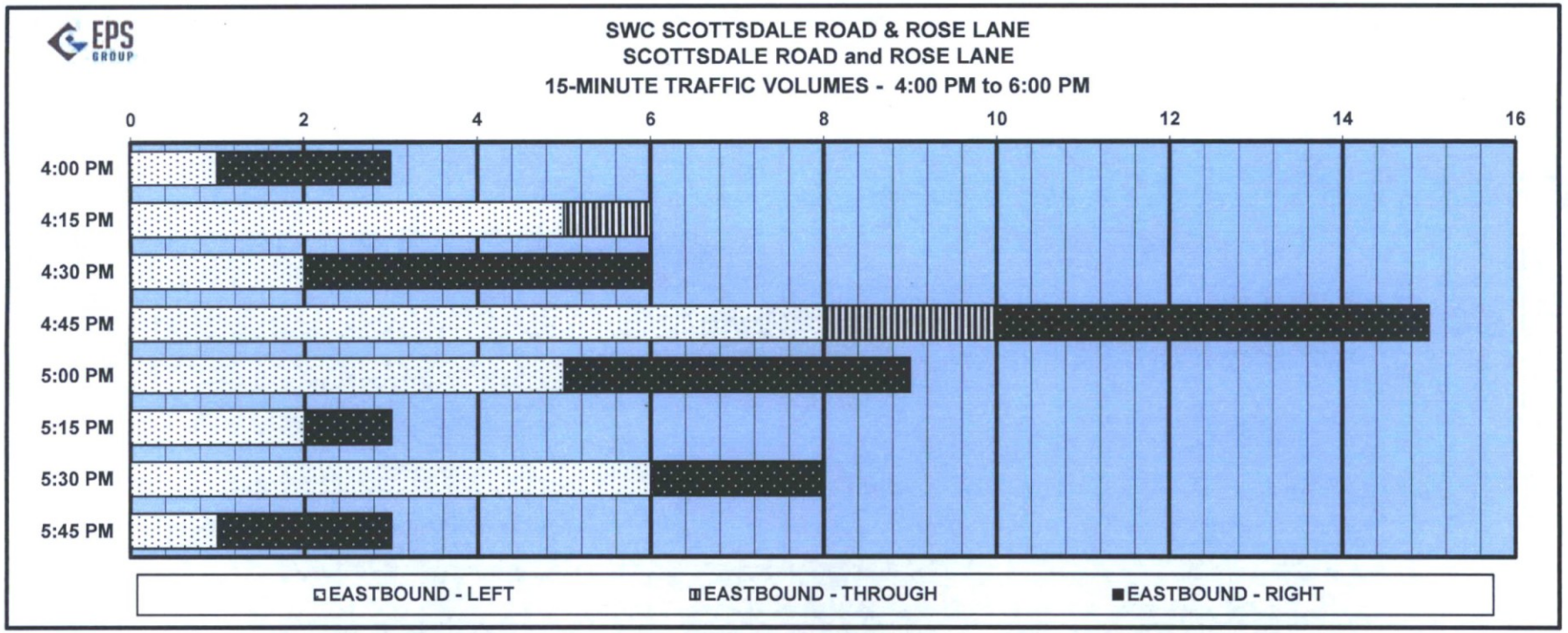

0
50
100
150
200
250
300
350
400
7:00 AM
7:15 AM
7:30 AM
7:45 AM
8:00 AM
8:15 AM
8:30 AM
8:45 AM
SOUTHBOUND - LEFT
SOUTHBOUND - THROUGH
SOUTHBOUND - RIGHT

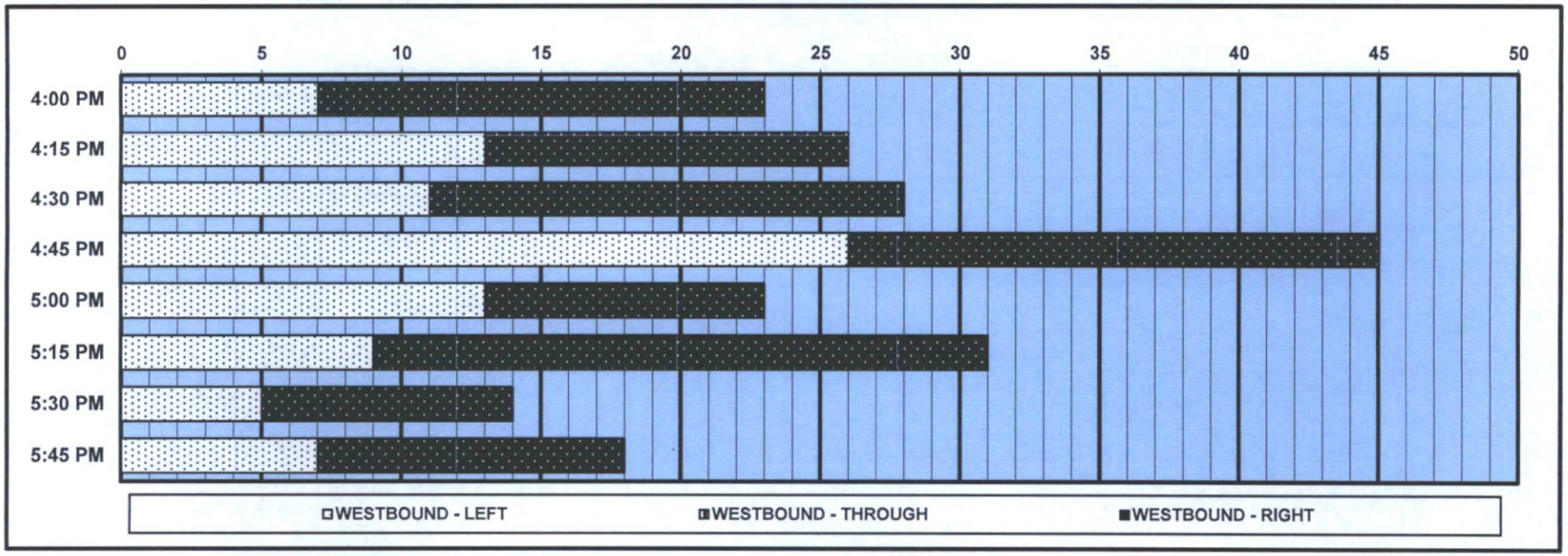

SWC SCOTTSDALE ROAD & ROSE LANE
SCOTTSDALE ROAD and ROSE LANE
15-MINUTE TRAFFIC VOLUMES - 7:00 AM to 9:00 AM
0
2
4
6
8
10
12
7:00 AM
7:15 AM
7:30 AM
7:45 AM
8:00 AM
8:15 AM
8:30 AM
8:45 AM
EASTBOUND - LEFT
EASTBOUND - THROUGH
EASTBOUND - RIGHT


0
2
4
6
8
10
12
14
16
7:00 AM
7:15 AM
7:30 AM
7:45 AM
8:00 AM
8:15 AM
8:30 AM
8:45 AM
WESTBOUND - LEFT
WESTBOUND - THROUGH
WESTBOUND - RIGHT


SWC SCOTTSDALE ROAD & ROSE LANE
SCOTTSDALE ROAD and ROSE LANE
15-MINUTE TRAFFIC VOLUMES - 4:00 PM to 6:00 PM
0
100
200
300
400
500
600
4:00 PM
4:15 PM
4:30 PM
4:45 PM
5:00 PM
5:15 PM
5:30 PM
5:45 PM
NORTHBOUND - LEFT
NORTHBOUND - THROUGH
NORTHBOUND - RIGHT

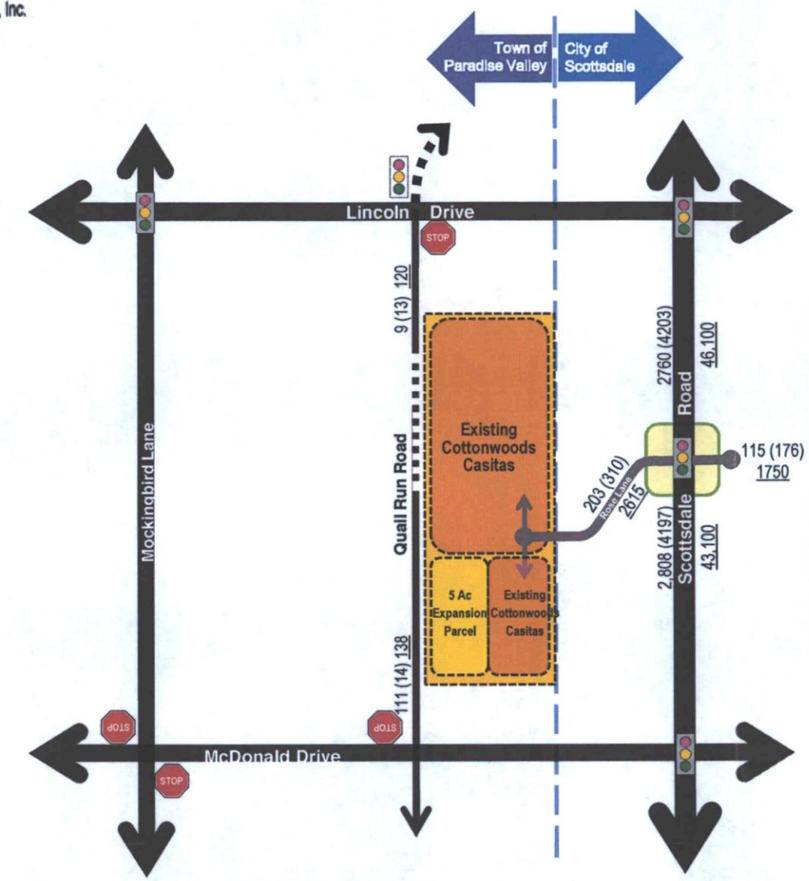

0
50
100
150
200
250
300
350
400
450
4:00 PM
4:15 PM
4:30 PM
4:45 PM
5:00 PM
5:15 PM
5:30 PM
5:45 PM
SOUTHBOUND - LEFT
SOUTHBOUND - THROUGH
SOUTHBOUND - RIGHT

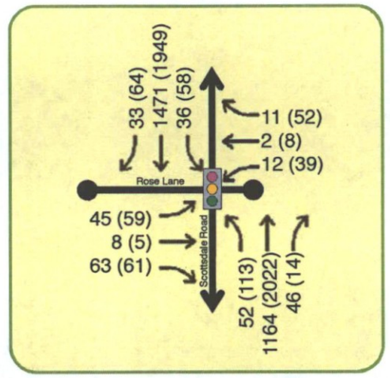

SWC SCOTTSDALE ROAD & ROSE LANE
SCOTTSDALE ROAD and ROSE LANE
15-MINUTE TRAFFIC VOLUMES - 4:00 PM to 6:00 PM
0
2
4
6
8
10
12
14
16
4:00 PM
4:15 PM
4:30 PM
4:45 PM
5:00 PM
5:15 PM
5:30 PM
5:45 PM
EASTBOUND - LEFT
EASTBOUND - THROUGH
EASTBOUND - RIGHT


0
5
10
15
20
25
30
35
40
45
50
4:00 PM
4:15 PM
4:30 PM
4:45 PM
5:00 PM
5:15 PM
5:30 PM
5:45 PM
WESTBOUND - LEFT
WESTBOUND - THROUGH
WESTBOUND - RIGHT

APPENDIX B
PERTINENT EXCERPTS FROM PREVIOUS REPORT

Kimley-Horn and Associates, Inc.





2016 Traffic Volumes
(without SUP Amendment Approval)

(##)

AM Peak Hour Volume | (PM) Peak Hour Volume | Total Daily Volume

Not to Scale

TRAFFIC CONTROL LEGEND

- Signalized Intersection (Existing)
- Signalized Intersection (Recognized Future)
- Stop Sign Controlled Approach

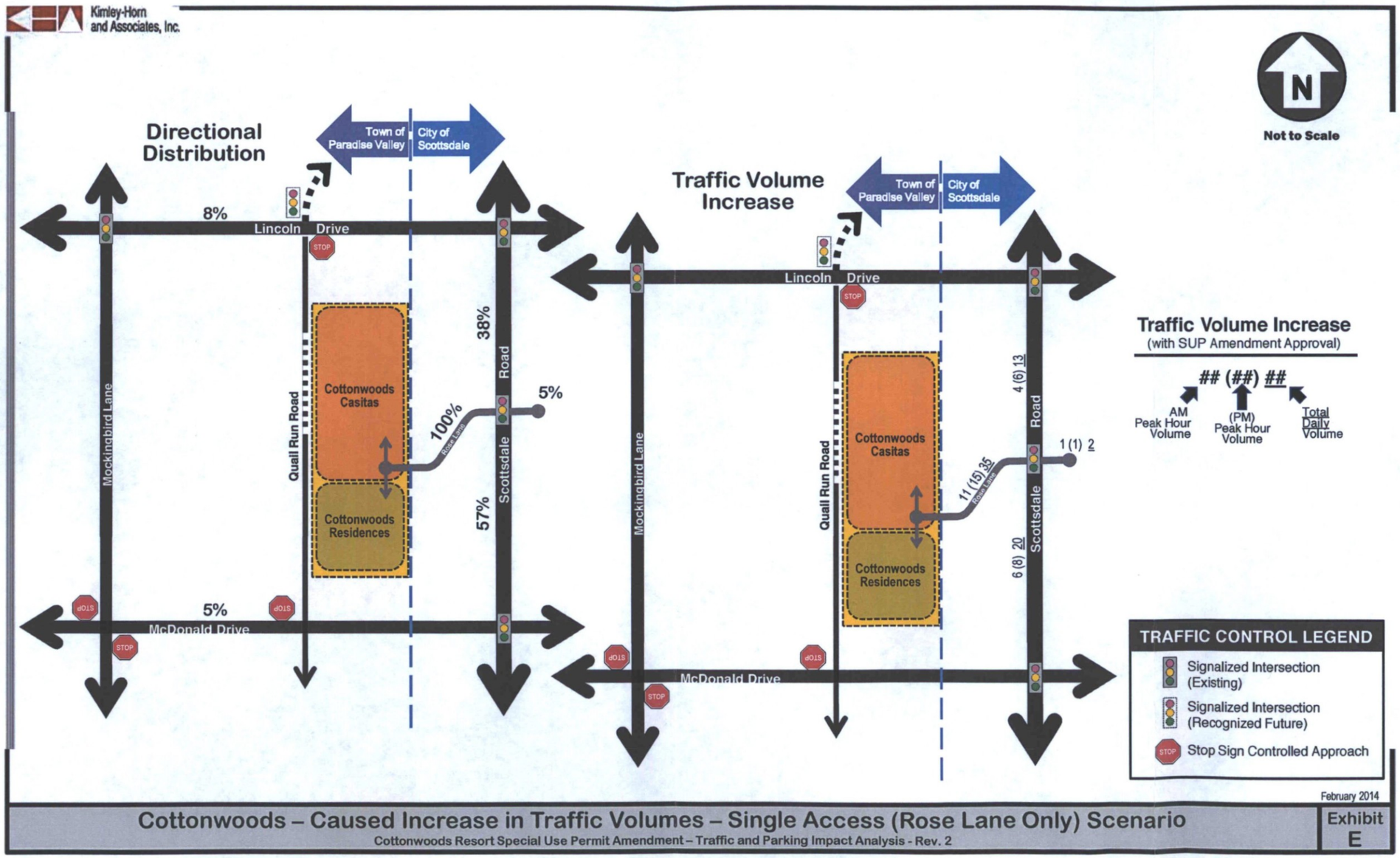
February 2014

Future (2016) Traffic Volumes Without Cottonwoods Redevelopment

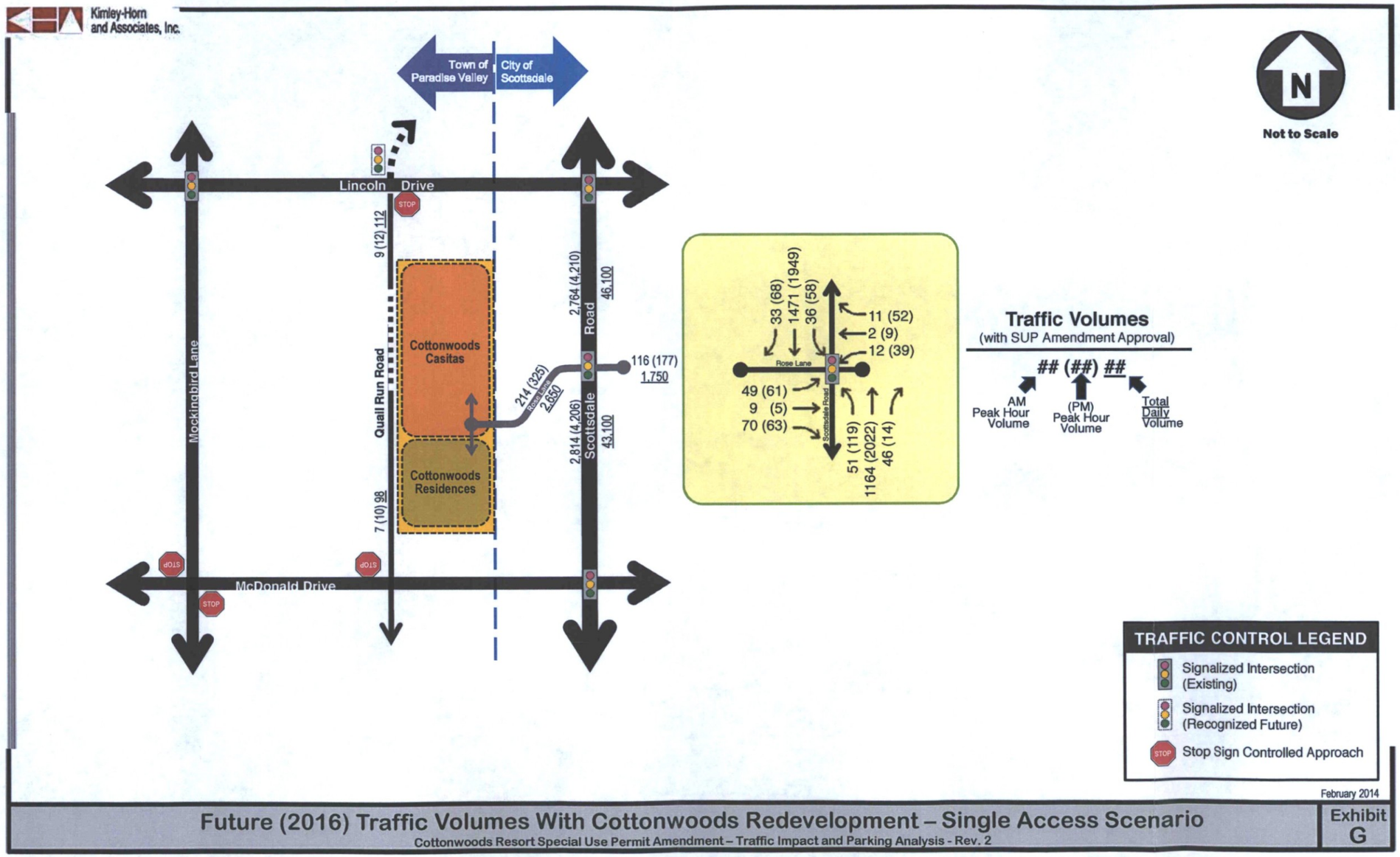
Cottonwoods Resort Special Use Permit Amendment – Traffic Impact and Parking Analysis - Rev. 2

Exhibit D

TRAFFIC


Kimley-Horn and Associates, Inc.
N
Not to Scale
Directional Distribution
Town of Paradise Valley
City of Scottsdale
8%
Lincoln Drive
STOP
38%
Road
5%
Scottsdale
57%
100%
Rose Lane
Cottonwoods Casitas
Cottonwoods Residences
Quail Run Road
Mockingbird Lane
5%
McDonald Drive
Traffic Volume Increase
4 (6) 13
1 (1) 2
11 (15) 35
6 (8) 20
Traffic Volume Increase
(with SUP Amendment Approval)
(##)
AM Peak Hour Volume
(PM) Peak Hour Volume
Total Daily Volume
TRAFFIC CONTROL LEGEND
Signalized Intersection (Existing)
Signalized Intersection (Recognized Future)
Stop Sign Controlled Approach
February 2014
Cottonwoods – Caused Increase in Traffic Volumes – Single Access (Rose Lane Only) Scenario
Cottonwoods Resort Special Use Permit Amendment – Traffic and Parking Impact Analysis - Rev. 2
Exhibit E

TRAFFIC


Kimley-Horn and Associates, Inc.
Town of Paradise Valley
City of Scottsdale
N
Not to Scale
Lincoln Drive
STOP
Mockingbird Lane
Quail Run Road
Scottsdale Road
Cottonwoods Casitas
Cottonwoods Residences
McDonald Drive
9 (12) 112
7 (10) 98
2,764 (4,210)
46,100
2,814 (4,206)
43,100
116 (177)
1,750
214 (325)
2,650
Rose Lane
33 (68)
1471 (1949)
36 (58)
11 (52)
2 (9)
12 (39)
49 (61)
9 (5)
70 (63)
51 (119)
1164 (2022)
46 (14)
Traffic Volumes
(with SUP Amendment Approval)
(##)
AM Peak Hour Volume
(PM) Peak Hour Volume
Total Daily Volume
TRAFFIC CONTROL LEGEND
Signalized Intersection (Existing)
Signalized Intersection (Recognized Future)
Stop Sign Controlled Approach
February 2014
Future (2016) Traffic Volumes With Cottonwoods Redevelopment – Single Access Scenario
Cottonwoods Resort Special Use Permit Amendment – Traffic Impact and Parking Analysis - Rev. 2
Exhibit G

February 25, 2014

Suite 300
7740 N. 16th Street
Phoenix, Arizona
85020

Mr. James Shano, P.E.
Public Works Director
Town of Paradise Valley
6401 E. McDonald Drive
Paradise Valley, AZ 85253

Re: Cottonwoods Resort - Paradise Valley, Arizona
Special Use Permit (SUP) Amendment
Traffic and Parking Impact Analysis – Revision No. 2

Dear Mr. Shano:

This letter discusses the anticipated traffic and parking impacts of updated redevelopment plans for the Cottonwoods Resort, and a resort-adjacent vacant 5.0 acre residential parcel. The Cottonwoods Resort is operating under an existing Special Use Permit (SUP) that covers 22.5 acres (the main resort site) located south of Lincoln Drive; west of Scottsdale Road; north of McDonald Drive; and east of Quail Run Road. Cottonwoods (the applicant) is proposing to expand the existing SUP coverage area by 5.0 acres, through an amendment to the existing SUP. The 5.0-acre "expansion" parcel the applicant is proposing to add to the SUP coverage area is located on the east side of Quail Run Road; approximately 320 feet north of McDonald Drive.

Overview

There are currently 22.5 acres within the existing SUP coverage area. Previously considered redevelopment plans for the Cottonwoods Resort proposed three (3) traffic impacting changes to the SUP: (1) an increase in the size of the SUP coverage (land) area; (2) a change in the composition of dwelling units within the SUP coverage area; and (3) an increase in the number of dwelling units allowed within the SUP coverage area. Currently proposed changes to the SUP include an increase in land area and dwelling unit composition; but no longer include an increase in the allowable number of dwelling units.

A Vicinity Map and Context Plan identifying the main resort site and proposed expansion parcel, respectively; is presented in **Exhibit A.** A conceptual site plan for the entire 27.5 acres is presented in **Exhibit B**. Also attached to this letter are five additional exhibits **(Exhibits C through G)** displaying traffic impact information in a graphic format; and three pages of tables **(Tables 1 through 13)** that summarize the quantitative

TEL 602 944 5500
FAX 602 944 7423

information and opinions discussed below.

Executive Summary

The information provided with this letter demonstrates the following:

- Cottonwoods redevelopment will add fewer than 20 trips to Rose Lane during either peak hour. Rose Lane and the Scottsdale/Rose intersection have enough capacity remaining to accommodate all of this trip generation, as well as all of the traffic anticipated to come from the recently approved "commercial to residential" land use conversion of the rear portion of the Borgata property, which is located adjacent to the Cottonwoods property.
- Daily traffic volumes on Rose Lane will be lower, after the Cottonwoods and Borgata sites have been redeveloped than it would have been if the Borgata site remained commercial.
- Peak hour level of service at the Scottsdale/Rose intersection is expected to remain in the acceptable level of service (LOS) range ("D" or better) after Cottonwoods is completely redeveloped, without any traffic impact mitigation on Rose Lane, and regardless of whether or not any access to the Cottonwoods is provided on Quail Run Road.
- Approval of the Cottonwoods application will add no traffic to Quail Run Road, except during emergencies, as required by the Town. In fact, by adding the 5.0-acre expansion parcel to the existing SUP, approval of the SUP amendment will actually reroute to Rose Lane (City of Scottsdale) traffic that would otherwise be using Quail Run Road.
- Even if Cottonwoods residential (and not resort) access was to be provided along Quail Run Road (later referred to as the "dual access scenario"), the amount of Cottonwoods traffic that would use Quail Run would be minimal (approximately 39 vehicles per day, and fewer than 5 vehicles during either peak hour).
- The proposed redevelopment of the Cottonwoods property should not be the basis for determining when or how to close the existing "gap" in Quail Run Road because, regardless of which the above cited access scenarios is implemented, the amount of traffic this project would add to Quail Run Road would be minimal.
- The determination as to how and when to complete the rest of Quail Run Road between Lincoln and McDonald, should not occur without the following:
    - Specific consideration of the potential future use of the eight acres of undeveloped Sunchase property located to the west of the Cottonwoods site;
    - support of an alignment from existing owners of property along this segment of Quail Run Road; and

Kimley-Horn and Associates, Inc.

N

Not to Scale

February 2014

Conceptual Site Plan

Cottonwoods Resort Special Use Permit Amendment – Traffic and Parking Impact Analysis - Rev. 2

Exhibit B

APPENDIX C
LEVEL-OF-SERVICE ANALYSIS WITHOUT SITE

Existing AM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	2	8	12	2	14	19	1253	69	69	1243	15
Future Volume (vph)	10	2	8	12	2	14	19	1253	69	69	1243	15
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Frt			0.850			0.850		0.992			0.998	
Flt Protected		0.959			0.958		0.950			0.950		
Satd. Flow (prot)	0	1786	1583	0	1785	1583	1770	5045	0	1770	5075	0
Flt Permitted		0.803			0.812		0.152			0.138		
Satd. Flow (perm)	0	1496	1583	0	1513	1583	283	5045	0	257	5075	0
Satd. Flow (RTOR)			64			64		17			3	
Adj. Flow (vph)	11	2	9	13	2	16	21	1392	77	77	1381	17
Lane Group Flow (vph)	0	13	9	0	15	16	21	1469	0	77	1398	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		3			3		2	1		2	1	
Permitted Phases	3		3	3		3	1			1		
Total Split (s)	18.0	18.0	18.0	18.0	18.0	18.0	12.0	90.0		12.0	90.0	
Total Lost Time (s)		6.0	6.0		6.0	6.0	4.0	6.0		4.0	6.0	
Act Effct Green (s)		6.9	6.9		6.9	6.9	103.8	75.0		103.8	75.0	
Actuated g/C Ratio		0.06	0.06		0.06	0.06	0.86	0.62		0.86	0.62	
v/c Ratio		0.15	0.06		0.17	0.11	0.04	0.46		0.14	0.44	
Control Delay		56.9	0.8		57.6	1.4	1.7	12.0		2.7	11.9	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		56.9	0.8		57.6	1.4	1.7	12.0		2.7	11.9	
LOS		E	A		E	A	A	B		A	B	
Approach Delay		33.9			28.6			11.9			11.4	
Approach LOS		C			C			B			B	
Queue Length 50th (ft)		10	0		11	0	2	189		6	179	
Queue Length 95th (ft)		31	0		34	0	5	163		14	154	
Internal Link Dist (ft)		57			222			269			300	
Turn Bay Length (ft)			50			35	165			170		
Base Capacity (vph)		149	215		151	215	576	3586		559	3604	
Starvation Cap Reductn		0	0		0	0	0	0		0	0	
Spillback Cap Reductn		0	0		0	0	0	0		0	0	
Storage Cap Reductn		0	0		0	0	0	0		0	0	
Reduced v/c Ratio		0.09	0.04		0.10	0.07	0.04	0.41		0.14	0.39	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBSBL and 6:, Start of Green, Master Intersection
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.46
Intersection Signal Delay: 12.0 — Intersection LOS: B
Intersection Capacity Utilization 50.3% — ICU Level of Service A
Analysis Period (min) 15

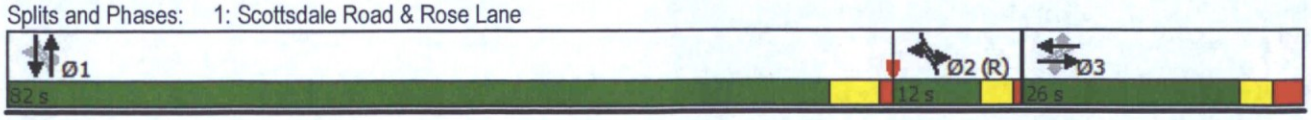
Splits and Phases: 1: Scottsdale Road & Rose Lane

Existing PM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	2	15	64	0	73	38	2012	15	70	1607	10
Future Volume (vph)	18	2	15	64	0	73	38	2012	15	70	1607	10
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Frt			0.850			0.850		0.999			0.999	
Flt Protected		0.957			0.950		0.950			0.950		
Satd. Flow (prot)	0	1783	1583	0	1770	1583	1770	5080	0	1770	5080	0
Flt Permitted		0.695			0.743		0.094			0.049		
Satd. Flow (perm)	0	1295	1583	0	1384	1583	175	5080	0	91	5080	0
Satd. Flow (RTOR)			64			81		2			1	
Adj. Flow (vph)	20	2	17	71	0	81	42	2236	17	78	1786	11
Lane Group Flow (vph)	0	22	17	0	71	81	42	2253	0	78	1797	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		3			3		2	1		2	1	
Permitted Phases	3		3	3		3	1			1		
Total Split (s)	26.0	26.0	26.0	26.0	26.0	26.0	12.0	82.0		12.0	82.0	
Total Lost Time (s)		6.0	6.0		6.0	6.0	4.0	6.0		4.0	6.0	
Act Effct Green (s)		11.5	11.5		11.5	11.5	94.5	81.3		94.5	81.3	
Actuated g/C Ratio		0.10	0.10		0.10	0.10	0.79	0.68		0.79	0.68	
v/c Ratio		0.18	0.08		0.54	0.36	0.15	0.65		0.34	0.52	
Control Delay		51.2	0.7		65.6	14.8	5.3	12.4		25.5	10.3	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		51.2	0.7		65.6	14.8	5.3	12.4		25.5	10.3	
LOS		D	A		E	B	A	B		C	B	
Approach Delay		29.2			38.5			12.2			11.0	
Approach LOS		C			D			B			B	
Queue Length 50th (ft)		16	0		53	0	5	304		9	208	
Queue Length 95th (ft)		41	0		99	46	14	403		58	280	
Internal Link Dist (ft)		57			222			269			300	
Turn Bay Length (ft)			50			35	165			170		
Base Capacity (vph)		215	317		230	331	287	3441		228	3441	
Starvation Cap Reductn		0	0		0	0	0	0		0	0	
Spillback Cap Reductn		0	0		0	0	0	0		0	0	
Storage Cap Reductn		0	0		0	0	0	0		0	0	
Reduced v/c Ratio		0.10	0.05		0.31	0.24	0.15	0.65		0.34	0.52	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBSBL and 6:, Start of Green, Master Intersection	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.65	
Intersection Signal Delay: 12.8	Intersection LOS: B
Intersection Capacity Utilization 66.6%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: Scottsdale Road & Rose Lane



APPENDIX C.2
AMBIENT 2018

EPS GROUP

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	3	15	12	2	15	21	1303	72	72	1293	16
Future Volume (vph)	14	3	15	12	2	15	21	1303	72	72	1293	16
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Frt			0.850			0.850		0.992			0.998	
Flt Protected		0.960			0.958		0.950			0.950		
Satd. Flow (prot)	0	1788	1583	0	1785	1583	1770	5045	0	1770	5075	0
Flt Permitted		0.752			0.762		0.144			0.131		
Satd. Flow (perm)	0	1401	1583	0	1419	1583	268	5045	0	244	5075	0
Satd. Flow (RTOR)			64			64		17			3	
Adj. Flow (vph)	16	3	17	13	2	17	23	1448	80	80	1437	18
Lane Group Flow (vph)	0	19	17	0	15	17	23	1528	0	80	1455	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		3			3		2	1		2	1	
Permitted Phases	3		3	3		3	1			1		
Total Split (s)	18.0	18.0	18.0	18.0	18.0	18.0	12.0	90.0		12.0	90.0	
Total Lost Time (s)		6.0	6.0		6.0	6.0	4.0	6.0		4.0	6.0	
Act Effct Green (s)		7.2	7.2		7.2	7.2	103.5	77.8		103.5	77.8	
Actuated g/C Ratio		0.06	0.06		0.06	0.06	0.86	0.65		0.86	0.65	
v/c Ratio		0.23	0.11		0.18	0.11	0.04	0.47		0.16	0.44	
Control Delay		59.4	1.4		57.4	1.4	1.9	10.8		3.1	10.6	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		59.4	1.4		57.4	1.4	1.9	10.8		3.1	10.6	
LOS		E	A		E	A	A	B		A	B	
Approach Delay		32.0			27.7			10.7			10.2	
Approach LOS		C			C			B			B	
Queue Length 50th (ft)		14	0		11	0	2	168		6	158	
Queue Length 95th (ft)		39	0		34	0	6	176		15	166	
Internal Link Dist (ft)		57			222			269			300	
Turn Bay Length (ft)			50			35	165			170		
Base Capacity (vph)		140	215		141	215	527	3581		511	3599	
Starvation Cap Reductn		0	0		0	0	0	0		0	0	
Spillback Cap Reductn		0	0		0	0	0	0		0	0	
Storage Cap Reductn		0	0		0	0	0	0		0	0	
Reduced v/c Ratio		0.14	0.08		0.11	0.08	0.04	0.43		0.16	0.40	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBSBL and 6:, Start of Green, Master Intersection	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.47	
Intersection Signal Delay: 10.9	Intersection LOS: B
Intersection Capacity Utilization 51.7%	ICU Level of Service A
Analysis Period (min) 15	

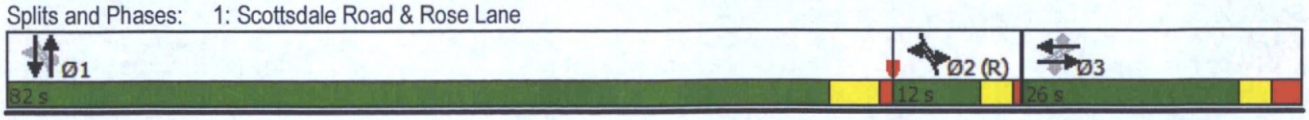
Splits and Phases: 1: Scottsdale Road & Rose Lane

2018 PM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	21	2	18	66	1	76	45	2093	16	73	1671	14
Future Volume (vph)	21	2	18	66	1	76	45	2093	16	73	1671	14
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Frt			0.850			0.850		0.999			0.999	
Flt Protected		0.956			0.953		0.950			0.950		
Satd. Flow (prot)	0	1781	1583	0	1775	1583	1770	5080	0	1770	5080	0
Flt Permitted		0.690			0.711		0.085			0.049		
Satd. Flow (perm)	0	1285	1583	0	1324	1583	158	5080	0	91	5080	0
Satd. Flow (RTOR)			64			84		2			2	
Adj. Flow (vph)	23	2	20	73	1	84	50	2326	18	81	1857	16
Lane Group Flow (vph)	0	25	20	0	74	84	50	2344	0	81	1873	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		3			3		2	1		2	1	
Permitted Phases	3		3	3		3	1			1		
Total Split (s)	26.0	26.0	26.0	26.0	26.0	26.0	12.0	82.0		12.0	82.0	
Total Lost Time (s)		6.0	6.0		6.0	6.0	4.0	6.0		4.0	6.0	
Act Effct Green (s)		12.0	12.0		12.0	12.0	94.0	81.4		94.0	81.4	
Actuated g/C Ratio		0.10	0.10		0.10	0.10	0.78	0.68		0.78	0.68	
v/c Ratio		0.20	0.09		0.56	0.36	0.19	0.68		0.37	0.54	
Control Delay		51.1	0.8		66.6	14.2	7.1	12.9		27.3	10.6	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		51.1	0.8		66.6	14.2	7.1	12.9		27.3	10.6	
LOS		D	A		E	B	A	B		C	B	
Approach Delay		28.8			38.8			12.8			11.3	
Approach LOS		C			D			B			B	
Queue Length 50th (ft)		18	0		56	0	6	332		9	226	
Queue Length 95th (ft)		44	0		103	46	16	443		62	305	
Internal Link Dist (ft)		57			222			269			300	
Turn Bay Length (ft)			50			35	165			170		
Base Capacity (vph)		214	317		220	333	266	3445		219	3445	
Starvation Cap Reductn		0	0		0	0	0	0		0	0	
Spillback Cap Reductn		0	0		0	0	0	0		0	0	
Storage Cap Reductn		0	0		0	0	0	0		0	0	
Reduced v/c Ratio		0.12	0.06		0.34	0.25	0.19	0.68		0.37	0.54	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBSBL and 6:, Start of Green, Master Intersection	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.68	
Intersection Signal Delay: 13.2	Intersection LOS: B
Intersection Capacity Utilization 68.5%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: Scottsdale Road & Rose Lane



APPENDIX D
TRAFFIC SIGNAL TIMING PLANS

SCOTTSDALE RD. & ROSE LN.

FIELD DATA - CLEARANCES

N/S STREET | E/W STREET

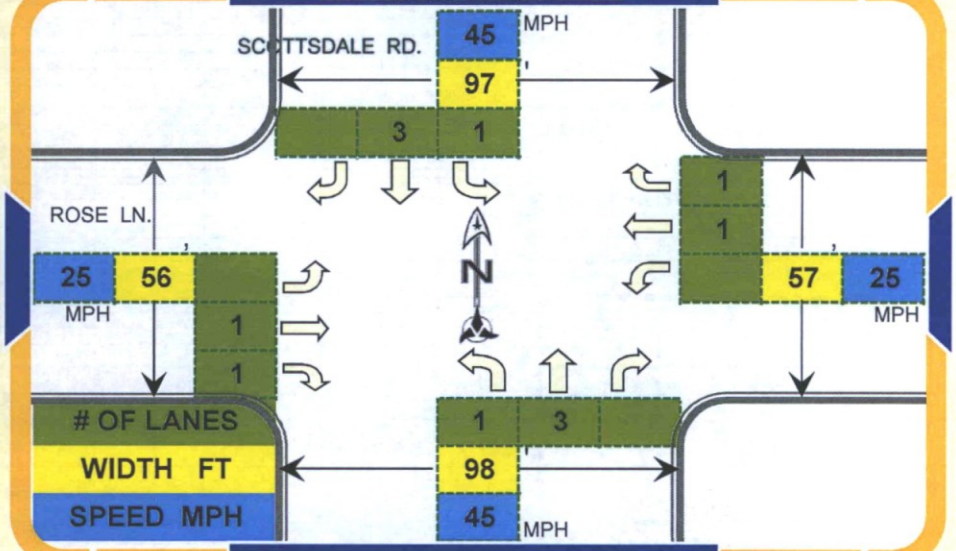
DATE MEASURED	SYSTEM #	SECTION #	PED SPEED	VEH LENGTH	REACT TIME	ACCEL.
11/17/2010	79	722	3.5	18	1	10

BASIC TIME | SEQUENCE | PATTERNS | HISTORY

INTERSECTION GEOMETRICS

AERIAL PHOTO

MEASUREMENTS



CALCULATIONS

INTERVAL	FORMULAS	N/S	E/W	N/S	E/W	EXCESS TIME>	N/S	E/W	TOTALS	
F.D.W.	= (Width-6)/PedSpeed-(AllRed+Yellow)	9.14	20.29	10	21		0.86	0.71	1.58	
YELLOW	= ReactionTime+(Speed/(2*Accel))	4.30	2.83	4.7	2.8		0.40	-0.03	0.37	
ALL-RED	= (Width+LenghVehicle)/Speed	1.14	3.16	1.3	3.2		0.16	0.04	0.20	2.14

CALC | ROUNDED - UP

SCOTTSDALE RD. & ROSE LN.

BASIC TIMING PLANS

CITY OF SCOTTSDALE

RECOMMENDED CLEARANCES

	N/S	E/W	LEFT TURN
F.D.W.	10	21	STANDARD
YELLOW	4.7	2.8	3.0
ALL-RED	1.3	3.2	1.0

DATE DESIGNED: 11/17/2010

SYSTEM # 79 | SECTION # 722

COMMUNICATIONS I.P. ADDRESS
MM-1-5-1 172.17. 10.79

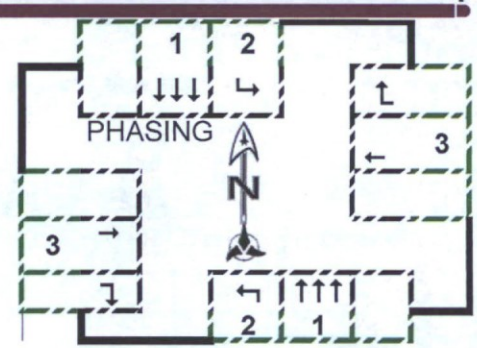
TIMING #1 CLEARANCE | TIMING #2 SEQUENCE | TIMING #3 PATTERNS | TIMING #4 HISTORY

MM-2-1
TIMING PLAN #1

GREENS | PEDESTRIAN | MAXIMUMS | REDS | VOL DENSITY | MM-2-8 RECALLS

PHASE	1	2	3
MOVEMENT	NST	NSL	EWT
NOTES			
MIN GRN	10	4	5
BK MGRN			
CS MGRN			
DLY GRN			
WALK	20		9
WALK2			
WLK MAX			
PED CLR/FDW	10		21
PD CLR2			
PC MAX			
PED CO			
VEH EXT		1	2
VH EXT2			
MAX 1	85	20	30
MAX 2	95	25	35
MAX 3			
DYM MAX			
DYM STP			
YELLOW	4.7	3	3
RED CLR	1.3	1	3
RED MAX			
RED RVT	2		2
ACT B4			
SEC/ACT			
MAX INT			
TIME B4			
CARS WT			
STPTDUC			
TTREDUC			
MIN GAP			
LOCK DET			
VEH RECALL			
PED RECALL	X		
MAX RECALL			
SOFT RECALL			
NO REST			
ADD INIT CAL			

9 10 11 12 13 14 15 16



1	2	3	4	5	6	7	8
84	17	27	0	0	0	0	0
92	22	35	0	0	0	0	0

SPLIT PLAN MAXIMUMS

NOTES

SCOTTSDALE RD. & ROSE LN.

COORDINATOR PATTERNS

CITY OF SCOTTSDALE

CLEARANCES

	PH1	2	3	4	5	6	7	8
FDW	10	0	21	0	0	0	0	0
YELLOW	4.7	3.0	3.0	0.0	0.0	0.0	0.0	0.0
ALL RED	1.3	1.0	3.0	0.0	0.0	0.0	0.0	0.0

SYSTEM # 79

SECTION # 722

MORNING | EVENING | N/S EX

MID-DAY | MIDNIGHT | E/W EX

CLEARANCE | BASIC TIME | SEQUENCE | HISTORY

MM-3-3 MORNING SPLIT PATTERNS

TIMING PLAN # 1

SEQUENCE # 1

ACTION PLAN #

MOVEMENTS NST NSL EWT

SEQUENCE

R1: 1 ↕ | 2 ↪ | 3 ↔

R2

E/W: WALK & GREEN | FDW & GREEN | GREEN w/o WALK | LEFT

N/S

MM-3-2 AVAILABLE COORDINATOR PATTERN #s

PROGRESSION VALUES

HYPERLINKS TO MORNING TIME-SPACE DIAGRAMS

DIR CODE	COORD DIR	B.O.G. OFFSET
1	NB	65
2	SB	70
3	NS	5
4	EB	100
5	WB	100
6	EW	100

PLAN # 1

DATE EFFECTIVE 11/20/2006

OPERATIVE TIMES 0630-0900

	RING 1				RING 2				TARGET
PHASE	1	2	3	4	5	6	7	8	
SPLIT	90	12	18						120
COORD	X								ACTUAL CYCLE
RECALLS (V, P, Mx)	P								
GREEN	84	8	12	0	0	0	0	0	RING 1 / RING 2

120

AVAILABLE COORDINATOR PATTERN #s: 1 1 | 1 2 | 1 3 | 1 4 | 1 5 | 1 6

PLAN # 2

DATE EFFECTIVE 3/30/2009

OPERATIVE TIMES

	RING 1				RING 2				TARGET
PHASE	1	2	3	4	5	6	7	8	
SPLIT	78	21	21						120
COORD	X								ACTUAL CYCLE
RECALLS (V, P, Mx)	P								
GREEN	72	17	15	0	0	0	0	0	RING 1 / RING 2

120

AVAILABLE COORDINATOR PATTERN #s: 2 1 | 2 2 | 2 3 | 2 4 | 2 5 | 2 6

PLAN # 3

DATE EFFECTIVE 3/30/2009

OPERATIVE TIMES

	RING 1				RING 2				TARGET
PHASE	1	2	3	4	5	6	7	8	
SPLIT	73	14	33						120
COORD	X								ACTUAL CYCLE
RECALLS (V, P, Mx)	P								
GREEN	67	10	27	0	0	0	0	0	RING 1 / RING 2

120

AVAILABLE COORDINATOR PATTERN #s: 3 1 | 3 2 | 3 3 | 3 4 | 3 5 | 3 6

SCOTTSDALE RD. & ROSE LN.

COORDINATOR PATTERNS

CITY OF SCOTTSDALE

CLEARANCES

	PH1	2	3	4	5	6	7	8
FDW	10	0	21	0	0	0	0	0
YELLOW	4.7	3.0	3.0	0.0	0.0	0.0	0.0	0.0
ALL RED	1.3	1.0	3.0	0.0	0.0	0.0	0.0	0.0

SYSTEM # 79

SECTION # 722

MORNING | EVENING | N/S EX | MID-DAY | MIDNIGHT | E/W EX

CLEARANCE | BASIC TIME | SEQUENCE | HISTORY

MM-3-3 EVENING SPLIT PATTERNS

TIMING PLAN 1
SEQUENCE 1
ACTION PLAN

SEQUENCE

R1: 1 ↕ | 2 ↔ | 3 ↔
R2

MOVEMENTS NST NSL EWT

E/W: WALK & GREEN; FDW & GREEN; GREEN w/o WALK; LEFT

N/S

MM-3-2 AVAILABLE COORDINATOR PATTERN #s

PROGRESSION VALUES

HYPERLINKS TO EVENING TIME-SPACE DIAGRAMS

PLAN # 7

DATE EFFECTIVE 11/20/2006

OPERATIVE TIMES 1530-1830

	RING 1				RING 2				TARGET
PHASE	1	2	3	4	5	6	7	8	
SPLIT	82	12	26						120
COORD	X								ACTUAL CYCLE
RECALLS (V, P, Mx)	P								
GREEN	76	8	20	0	0	0	0	0	RING 1 / RING 2

120

MM-3-2: 7 1, 7 2, 7 3, 7 4, 7 5, 7 6

PLAN # 8

DATE EFFECTIVE

OPERATIVE TIMES

	RING 1				RING 2				TARGET
PHASE	1	2	3	4	5	6	7	8	
SPLIT	78	21	21						120
COORD	X								ACTUAL CYCLE
RECALLS (V, P, Mx)	P								
GREEN	72	17	15	0	0	0	0	0	RING 1 / RING 2

120

MM-3-2: 8 1, 8 2, 8 3, 8 4, 8 5, 8 6

PLAN # 9

DATE EFFECTIVE

OPERATIVE TIMES

	RING 1				RING 2				TARGET
PHASE	1	2	3	4	5	6	7	8	
SPLIT	73	14	33						120
COORD	X								ACTUAL CYCLE
RECALLS (V, P, Mx)	P								
GREEN	67	10	27	0	0	0	0	0	RING 1 / RING 2

120

MM-3-2: 9 1, 9 2, 9 3, 9 4, 9 5, 9 6

PROGRESSION VALUES

DIR CODE	COORD DIR	B.O.G. OFFSET
1	NB	65
2	SB	70
3	NS	5
4	EB	100
5	WB	100
6	EW	100

APPENDIX E
TRIP GENERATION

EPS GROUP

PROJECT	SWC SCOTTSDALE ROAD & ROSE LANE			
PARCEL	RESTAURANT			
ITE LAND USE CATEGORY AND CODE	QUALITY RESTAURANT - 931			
INDEPENDENT VARIABLE	1,000 SQUARE FEET			
SIZE	9.000			
		TRIPS		
		ENTERING	EXITING	TOTAL
***WEEKDAY* DAILY**		50%	50%	
NUMBER OF STUDIES	15			
AVERAGE SIZE	9			
MINIMUM RATE	33.41	151	150	301
AVERAGE RATE	89.95	405	405	810
MAXIMUM RATE	139.80	629	629	1,258
STANDARD DEVIATION	36.81			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**405**	**405**	**810**
AM PEAK HOUR ADJACENT STREET		50%	50%	
NUMBER OF STUDIES	11			
AVERAGE SIZE	9			
MINIMUM RATE	0.25	1	1	2
AVERAGE RATE	0.81	4	3	7
MAXIMUM RATE	1.60	7	7	14
STANDARD DEVIATION	0.93			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**4**	**3**	**7**
AM PEAK HOUR GENERATOR		82%	18%	
NUMBER OF STUDIES	14			
AVERAGE SIZE	9			
MINIMUM RATE	0.87	7	1	8
AVERAGE RATE	5.57	41	9	50
MAXIMUM RATE	10.37	76	17	93
STANDARD DEVIATION	3.79			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**41**	**9**	**50**
PM PEAK HOUR ADJACENT STREET		67%	33%	
NUMBER OF STUDIES	24			
AVERAGE SIZE	9			
MINIMUM RATE	2.42	15	7	22
AVERAGE RATE	7.49	45	22	67
MAXIMUM RATE	18.64	113	55	168
STANDARD DEVIATION	4.89			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**45**	**22**	**67**
PM PEAK HOUR GENERATOR		62%	38%	
NUMBER OF STUDIES	16			
AVERAGE SIZE	9			
MINIMUM RATE	3.24	18	11	29
AVERAGE RATE	9.02	50	31	81
MAXIMUM RATE	15.89	89	54	143
STANDARD DEVIATION	4.55			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**50**	**31**	**81**

EPS GROUP

PROJECT	SWC SCOTTSDALE ROAD & ROSE LANE			
PARCEL	RESTAURANT			
ITE LAND USE CATEGORY AND CODE	QUALITY RESTAURANT - 931			
INDEPENDENT VARIABLE	1,000 SQUARE FEET			
SIZE	9.000			
		TRIPS		
	RATE	ENTERING	EXITING	SUM
***SATURDAY* DAILY**		50%	50%	
NUMBER OF STUDIES	11			
AVERAGE SIZE	9			
MINIMUM RATE	53.63	242	241	483
AVERAGE RATE	94.36	425	424	849
MAXIMUM RATE	156.67	705	705	1,410
STANDARD DEVIATION	34.42			
EQUATION: LN (T) = 1.04 * LN(X) + 4.41	R^2 = 0.54	54	53	107
LARGEST OF AVERAGE OR EQUATION		**425**	**424**	**849**
PEAK HOUR GENERATOR		59%	41%	
NUMBER OF STUDIES	11			
AVERAGE SIZE	9			
MINIMUM RATE	5.75	31	21	52
AVERAGE RATE	10.82	57	40	97
MAXIMUM RATE	15.28	81	57	138
STANDARD DEVIATION	4.38			
EQUATION: T = 10.87 * (X) - 0.46	R^2 = 0.64	11	7	18
LARGEST OF AVERAGE OR EQUATION		**57**	**40**	**97**
***SUNDAY* DAILY**		50%	50%	
NUMBER OF STUDIES	11			
AVERAGE SIZE	9			
MINIMUM RATE	34.09	154	153	307
AVERAGE RATE	72.16	325	324	649
MAXIMUM RATE	137.78	620	620	1,240
STANDARD DEVIATION	32.35			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**325**	**324**	**649**
PEAK HOUR GENERATOR		63%	37%	
NUMBER OF STUDIES	10			
AVERAGE SIZE	9			
MINIMUM RATE	4.56	26	15	41
AVERAGE RATE	8.38	47	28	75
MAXIMUM RATE	12.07	69	40	109
STANDARD DEVIATION	3.88			
EQUATION: LN (T) = 0.94 * LN(X) + 2.21	R^2 = 0.55	6	4	10
LARGEST OF AVERAGE OR EQUATION		**47**	**28**	**75**

EPS GROUP

PROJECT	SWC SCOTTSDALE ROAD & ROSE LANE			
PARCEL	RESTAURANT			
ITE LAND USE CATEGORY AND CODE	HIGH TURNOVER (SIT-DOWN) RESTAURANT - 932			
INDEPENDENT VARIABLE	1,000 SQUARE FEET			
SIZE	9.000			
		TRIPS		
		ENTERING	EXITING	TOTAL
***WEEKDAY* DAILY**		50%	50%	
NUMBER OF STUDIES	14			
AVERAGE SIZE	7			
MINIMUM RATE	73.51	331	331	662
AVERAGE RATE	127.15	572	572	1,144
MAXIMUM RATE	246.00	1,107	1,107	2,214
STANDARD DEVIATION	41.77			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**572**	**572**	**1,144**
AM PEAK HOUR ADJACENT STREET		52%	48%	
NUMBER OF STUDIES	18			
AVERAGE SIZE	6			
MINIMUM RATE	2.83	13	12	25
AVERAGE RATE	11.52	54	50	104
MAXIMUM RATE	25.60	120	110	230
STANDARD DEVIATION	6.75			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**54**	**50**	**104**
AM PEAK HOUR GENERATOR		52%	48%	
NUMBER OF STUDIES	21			
AVERAGE SIZE	7			
MINIMUM RATE	3.00	14	13	27
AVERAGE RATE	13.53	63	59	122
MAXIMUM RATE	54.09	253	234	487
STANDARD DEVIATION	10.05			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**63**	**59**	**122**
PM PEAK HOUR ADJACENT STREET		59%	41%	
NUMBER OF STUDIES	46			
AVERAGE SIZE	6			
MINIMUM RATE	2.80	15	10	25
AVERAGE RATE	11.15	59	41	100
MAXIMUM RATE	62.00	329	229	558
STANDARD DEVIATION	9.13			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**59**	**41**	**100**
PM PEAK HOUR GENERATOR		54%	46%	
NUMBER OF STUDIES	31			
AVERAGE SIZE	5			
MINIMUM RATE	5.60	27	23	50
AVERAGE RATE	18.49	90	76	166
MAXIMUM RATE	69.20	336	287	623
STANDARD DEVIATION	13.32			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**90**	**76**	**166**

EPS GROUP

PROJECT	SWC SCOTTSDALE ROAD & ROSE LANE			
PARCEL	RESTAURANT			
ITE LAND USE CATEGORY AND CODE	HIGH TURNOVER (SIT-DOWN) RESTAURANT - 932			
INDEPENDENT VARIABLE	1,000 SQUARE FEET			
SIZE	9.000			
		TRIPS		
	RATE	ENTERING	EXITING	SUM
***SATURDAY* DAILY**		50%	50%	
NUMBER OF STUDIES	2			
AVERAGE SIZE	5			
MINIMUM RATE	144.60	651	650	1,301
AVERAGE RATE	158.37	713	712	1,425
MAXIMUM RATE	172.71	777	777	1,554
STANDARD DEVIATION	NA			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**713**	**712**	**1,425**
PEAK HOUR GENERATOR		53%	47%	
NUMBER OF STUDIES	8			
AVERAGE SIZE	4			
MINIMUM RATE	4.44	21	19	40
AVERAGE RATE	14.07	67	60	127
MAXIMUM RATE	50.40	241	213	454
STANDARD DEVIATION	12.19			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**67**	**60**	**127**
***SUNDAY* DAILY**		50%	50%	
NUMBER OF STUDIES	2			
AVERAGE SIZE	5			
MINIMUM RATE	119.38	537	537	1,074
AVERAGE RATE	131.84	594	593	1,187
MAXIMUM RATE	143.80	647	647	1,294
STANDARD DEVIATION	NA			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**594**	**593**	**1,187**
PEAK HOUR GENERATOR		55%	45%	
NUMBER OF STUDIES	3			
AVERAGE SIZE	4			
MINIMUM RATE	9.79	48	40	88
AVERAGE RATE	18.46	91	75	166
MAXIMUM RATE	43.20	214	175	389
STANDARD DEVIATION	13.74			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**91**	**75**	**166**

EPS GROUP

PROJECT	SWC SCOTTSDALE ROAD & ROSE LANE			
PARCEL	RESTAURANT - PREVIOUS USE			
ITE LAND USE CATEGORY AND CODE	QUALITY RESTAURANT - 931			
INDEPENDENT VARIABLE	1,000 SQUARE FEET			
SIZE	8.000			
		TRIPS		
		ENTERING	EXITING	TOTAL
***WEEKDAY* DAILY**		50%	50%	
NUMBER OF STUDIES	15			
AVERAGE SIZE	9			
MINIMUM RATE	33.41	134	133	267
AVERAGE RATE	89.95	360	360	720
MAXIMUM RATE	139.80	559	559	1,118
STANDARD DEVIATION	36.81			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**360**	**360**	**720**
AM PEAK HOUR ADJACENT STREET		50%	50%	
NUMBER OF STUDIES	11			
AVERAGE SIZE	9			
MINIMUM RATE	0.25	1	1	2
AVERAGE RATE	0.81	3	3	6
MAXIMUM RATE	1.60	7	6	13
STANDARD DEVIATION	0.93			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**3**	**3**	**6**
AM PEAK HOUR GENERATOR		82%	18%	
NUMBER OF STUDIES	14			
AVERAGE SIZE	9			
MINIMUM RATE	0.87	6	1	7
AVERAGE RATE	5.57	37	8	45
MAXIMUM RATE	10.37	68	15	83
STANDARD DEVIATION	3.79			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**37**	**8**	**45**
PM PEAK HOUR ADJACENT STREET		67%	33%	
NUMBER OF STUDIES	24			
AVERAGE SIZE	9			
MINIMUM RATE	2.42	13	6	19
AVERAGE RATE	7.49	40	20	60
MAXIMUM RATE	18.64	100	49	149
STANDARD DEVIATION	4.89			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**40**	**20**	**60**
PM PEAK HOUR GENERATOR		62%	38%	
NUMBER OF STUDIES	16			
AVERAGE SIZE	9			
MINIMUM RATE	3.24	16	10	26
AVERAGE RATE	9.02	45	27	72
MAXIMUM RATE	15.89	79	48	127
STANDARD DEVIATION	4.55			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**45**	**27**	**72**

EPS GROUP

PROJECT	SWC SCOTTSDALE ROAD & ROSE LANE			
PARCEL	RESTAURANT - PREVIOUS USE			
ITE LAND USE CATEGORY AND CODE	QUALITY RESTAURANT - 931			
INDEPENDENT VARIABLE	1,000 SQUARE FEET			
SIZE	8.000			
		TRIPS		
	RATE	ENTERING	EXITING	SUM
***SATURDAY* DAILY**		50%	50%	
NUMBER OF STUDIES	11			
AVERAGE SIZE	9			
MINIMUM RATE	53.63	215	214	429
AVERAGE RATE	94.36	378	377	755
MAXIMUM RATE	156.67	627	626	1,253
STANDARD DEVIATION	34.42			
EQUATION: LN (T) = 1.04 * LN(X) + 4.41	R^2 = 0.54	48	48	96
LARGEST OF AVERAGE OR EQUATION		**378**	**377**	**755**
PEAK HOUR GENERATOR		59%	41%	
NUMBER OF STUDIES	11			
AVERAGE SIZE	9			
MINIMUM RATE	5.75	27	19	46
AVERAGE RATE	10.82	51	36	87
MAXIMUM RATE	15.28	72	50	122
STANDARD DEVIATION	4.38			
EQUATION: T = 10.87 * (X) - 0.46	R^2 = 0.64	10	7	17
LARGEST OF AVERAGE OR EQUATION		**51**	**36**	**87**
***SUNDAY* DAILY**		50%	50%	
NUMBER OF STUDIES	11			
AVERAGE SIZE	9			
MINIMUM RATE	34.09	137	136	273
AVERAGE RATE	72.16	289	288	577
MAXIMUM RATE	137.78	551	551	1,102
STANDARD DEVIATION	32.35			
EQUATION: NOT PROVIDED	NA	NA	NA	NA
LARGEST OF AVERAGE OR EQUATION		**289**	**288**	**577**
PEAK HOUR GENERATOR		63%	37%	
NUMBER OF STUDIES	10			
AVERAGE SIZE	9			
MINIMUM RATE	4.56	23	13	36
AVERAGE RATE	8.38	42	25	67
MAXIMUM RATE	12.07	61	36	97
STANDARD DEVIATION	3.88			
EQUATION: LN (T) = 0.94 * LN(X) + 2.21	R^2 = 0.55	6	3	9
LARGEST OF AVERAGE OR EQUATION		**42**	**25**	**67**

EPS GROUP

APPENDIX F
LEVEL-OF-SERVICE ANALYSIS WITH SITE

EPS GROUP

2018 with Site AM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	39	6	37	12	5	15	46	1303	72	72	1293	43
Future Volume (vph)	39	6	37	12	5	15	46	1303	72	72	1293	43
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Frt			0.850			0.850		0.992			0.995	
Flt Protected		0.959			0.967		0.950			0.950		
Satd. Flow (prot)	0	1786	1583	0	1801	1583	1770	5045	0	1770	5060	0
Flt Permitted		0.742			0.764		0.138			0.131		
Satd. Flow (perm)	0	1382	1583	0	1423	1583	257	5045	0	244	5060	0
Satd. Flow (RTOR)			64			64		17			10	
Adj. Flow (vph)	43	7	41	13	6	17	51	1448	80	80	1437	48
Lane Group Flow (vph)	0	50	41	0	19	17	51	1528	0	80	1485	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		3			3		2	1		2	1	
Permitted Phases	3		3	3		3	1			1		
Total Split (s)	18.0	18.0	18.0	18.0	18.0	18.0	12.0	90.0		12.0	90.0	
Total Lost Time (s)		6.0	6.0		6.0	6.0	4.0	6.0		4.0	6.0	
Act Effct Green (s)		9.3	9.3		9.3	9.3	99.0	77.5		99.0	77.5	
Actuated g/C Ratio		0.08	0.08		0.08	0.08	0.82	0.65		0.82	0.65	
v/c Ratio		0.47	0.23		0.17	0.09	0.11	0.47		0.18	0.45	
Control Delay		66.3	8.1		54.0	1.0	3.2	11.0		4.3	10.9	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		66.3	8.1		54.0	1.0	3.2	11.0		4.3	10.9	
LOS		E	A		D	A	A	B		A	B	
Approach Delay		40.1			29.0			10.7			10.5	
Approach LOS		D			C			B			B	
Queue Length 50th (ft)		38	0		14	0	5	161		8	156	
Queue Length 95th (ft)		79	18		38	0	12	191		18	185	
Internal Link Dist (ft)		57			222			269			300	
Turn Bay Length (ft)			50			35	165			170		
Base Capacity (vph)		138	215		142	215	458	3546		449	3555	
Starvation Cap Reductn		0	0		0	0	0	0		0	0	
Spillback Cap Reductn		0	0		0	0	0	0		0	0	
Storage Cap Reductn		0	0		0	0	0	0		0	0	
Reduced v/c Ratio		0.36	0.19		0.13	0.08	0.11	0.43		0.18	0.42	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBSBL and 6:, Start of Green, Master Intersection	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.47	
Intersection Signal Delay: 11.7	Intersection LOS: B
Intersection Capacity Utilization 53.2%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: Scottsdale Road & Rose Lane

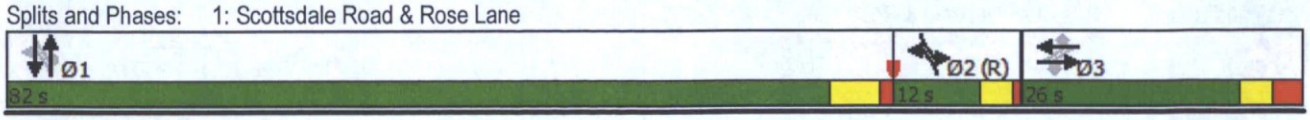
2018 with Site PM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	42	4	36	66	4	76	72	2093	16	73	1671	44
Future Volume (vph)	42	4	36	66	4	76	72	2093	16	73	1671	44
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Frt			0.850			0.850		0.999			0.996	
Flt Protected		0.956			0.955		0.950			0.950		
Satd. Flow (prot)	0	1781	1583	0	1779	1583	1770	5080	0	1770	5065	0
Flt Permitted		0.688			0.700		0.081			0.049		
Satd. Flow (perm)	0	1282	1583	0	1304	1583	151	5080	0	91	5065	0
Satd. Flow (RTOR)			64			84		2			6	
Adj. Flow (vph)	47	4	40	73	4	84	80	2326	18	81	1857	49
Lane Group Flow (vph)	0	51	40	0	77	84	80	2344	0	81	1906	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		3			3		2	1		2	1	
Permitted Phases	3		3	3		3	1			1		
Total Split (s)	26.0	26.0	26.0	26.0	26.0	26.0	12.0	82.0		12.0	82.0	
Total Lost Time (s)		6.0	6.0		6.0	6.0	4.0	6.0		4.0	6.0	
Act Effct Green (s)		12.5	12.5		12.5	12.5	93.5	81.0		93.5	81.0	
Actuated g/C Ratio		0.10	0.10		0.10	0.10	0.78	0.68		0.78	0.68	
v/c Ratio		0.38	0.18		0.57	0.35	0.31	0.68		0.37	0.56	
Control Delay		56.6	6.0		66.1	13.7	14.6	13.2		27.9	11.0	
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		56.6	6.0		66.1	13.7	14.6	13.2		27.9	11.0	
LOS		E	A		E	B	B	B		C	B	
Approach Delay		34.4			38.7			13.3			11.7	
Approach LOS		C			D			B			B	
Queue Length 50th (ft)		38	0		58	0	10	336		10	235	
Queue Length 95th (ft)		75	15		104	46	25	462		63	326	
Internal Link Dist (ft)		57			222			269			300	
Turn Bay Length (ft)			50			35	165			170		
Base Capacity (vph)		213	317		217	333	259	3427		217	3419	
Starvation Cap Reductn		0	0		0	0	0	0		0	0	
Spillback Cap Reductn		0	0		0	0	0	0		0	0	
Storage Cap Reductn		0	0		0	0	0	0		0	0	
Reduced v/c Ratio		0.24	0.13		0.35	0.25	0.31	0.68		0.37	0.56	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBSBL and 6:, Start of Green, Master Intersection
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.68
Intersection Signal Delay: 13.9 — Intersection LOS: B
Intersection Capacity Utilization 68.7% — ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 1: Scottsdale Road & Rose Lane



Intersection	
Int Delay, s/veh	3.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	42	0	43	50	0	40
Future Vol, veh/h	42	0	43	50	0	40
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	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	47	0	48	56	0	44

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	47	0	198	47
Stage 1	-	-	-	-	47	-
Stage 2	-	-	-	-	151	-
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	-	-	1560	-	791	1022
Stage 1	-	-	-	-	975	-
Stage 2	-	-	-	-	877	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1560	-	766	1022
Mov Cap-2 Maneuver	-	-	-	-	766	-
Stage 1	-	-	-	-	975	-
Stage 2	-	-	-	-	849	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.4	8.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1022	-	-	1560	-
HCM Lane V/C Ratio	0.043	-	-	0.031	-
HCM Control Delay (s)	8.7	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Intersection	
Int Delay, s/veh	3.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	49	0	47	71	0	33
Future Vol, veh/h	49	0	47	71	0	33
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	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	54	0	52	79	0	37

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	54	0	237	54
Stage 1	-	-	-	-	54	-
Stage 2	-	-	-	-	183	-
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	-	-	1551	-	751	1013
Stage 1	-	-	-	-	969	-
Stage 2	-	-	-	-	848	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1551	-	725	1013
Mov Cap-2 Maneuver	-	-	-	-	725	-
Stage 1	-	-	-	-	969	-
Stage 2	-	-	-	-	818	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.9	8.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1013	-	-	1551	-
HCM Lane V/C Ratio	0.036	-	-	0.034	-
HCM Control Delay (s)	8.7	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Intersection	
Int Delay, s/veh	1.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	10	32	0	11	39
Future Vol, veh/h	0	10	32	0	11	39
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	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	11	36	0	12	43

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	104	36	0	0	36	0
Stage 1	36	-	-	-	-	-
Stage 2	68	-	-	-	-	-
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	894	1037	-	-	1575	-
Stage 1	986	-	-	-	-	-
Stage 2	955	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	887	1037	-	-	1575	-
Mov Cap-2 Maneuver	887	-	-	-	-	-
Stage 1	986	-	-	-	-	-
Stage 2	947	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.5	0	1.6
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1037	1575	-
HCM Lane V/C Ratio	-	-	0.011	0.008	-
HCM Control Delay (s)	-	-	8.5	7.3	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	8	41	0	12	59
Future Vol, veh/h	0	8	41	0	12	59
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	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	9	46	0	13	66

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	138	46	0	0	46	0
Stage 1	46	-	-	-	-	-
Stage 2	92	-	-	-	-	-
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	1023	-	-	1562	-
Stage 1	976	-	-	-	-	-
Stage 2	932	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	847	1023	-	-	1562	-
Mov Cap-2 Maneuver	847	-	-	-	-	-
Stage 1	976	-	-	-	-	-
Stage 2	924	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.6	0	1.2
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1023	1562	-
HCM Lane V/C Ratio	-	-	0.009	0.009	-
HCM Control Delay (s)	-	-	8.6	7.3	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

2018 with Site AM - Alternative #1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	39	6	37	12	5	15	46	1303	72	72	1293	43
Future Volume (vph)	39	6	37	12	5	15	46	1303	72	72	1293	43
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Frt			0.850			0.850		0.992			0.995	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	5045	0	1770	5060	0
Flt Permitted	0.754			0.753			0.138			0.131		
Satd. Flow (perm)	1405	1863	1583	1403	1863	1583	257	5045	0	244	5060	0
Satd. Flow (RTOR)			64			64		17			10	
Adj. Flow (vph)	43	7	41	13	6	17	51	1448	80	80	1437	48
Lane Group Flow (vph)	43	7	41	13	6	17	51	1528	0	80	1485	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		3			3		2	1		2	1	
Permitted Phases	3		3	3		3	1			1		
Total Split (s)	18.0	18.0	18.0	18.0	18.0	18.0	12.0	90.0		12.0	90.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	4.0	6.0		4.0	6.0	
Act Effct Green (s)	8.9	8.9	8.9	8.9	8.9	8.9	99.4	77.6		99.4	77.6	
Actuated g/C Ratio	0.07	0.07	0.07	0.07	0.07	0.07	0.83	0.65		0.83	0.65	
v/c Ratio	0.41	0.05	0.23	0.12	0.04	0.10	0.11	0.47		0.18	0.45	
Control Delay	64.1	50.7	8.3	53.1	50.4	1.1	3.1	10.9		4.2	10.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	64.1	50.7	8.3	53.1	50.4	1.1	3.1	10.9		4.2	10.8	
LOS	E	D	A	D	D	A	A	B		A	B	
Approach Delay		37.9			28.1			10.7			10.5	
Approach LOS		D			C			B			B	
Queue Length 50th (ft)	32	5	0	10	4	0	5	161		8	156	
Queue Length 95th (ft)	70	20	18	30	18	0	12	191		18	185	
Internal Link Dist (ft)		57			222			269			300	
Turn Bay Length (ft)			50			35	165			170		
Base Capacity (vph)	140	186	215	140	186	215	462	3553		453	3562	
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio	0.31	0.04	0.19	0.09	0.03	0.08	0.11	0.43		0.18	0.42	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBSBL and 6:, Start of Green, Master Intersection
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.47
Intersection Signal Delay: 11.5 — Intersection LOS: B
Intersection Capacity Utilization 52.9% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 1: Scottsdale Road & Rose Lane

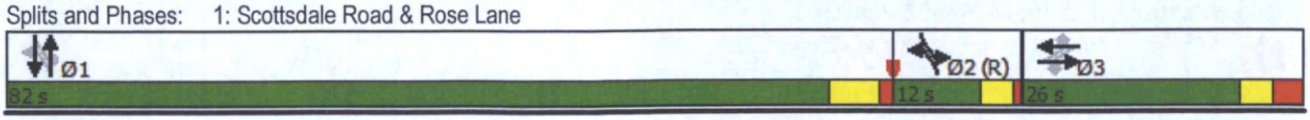
2018 with Site PM - Alternative #1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	42	4	36	66	4	76	72	2093	16	73	1671	44
Future Volume (vph)	42	4	36	66	4	76	72	2093	16	73	1671	44
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Frt			0.850			0.850		0.999			0.996	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	5080	0	1770	5065	0
Flt Permitted	0.755			0.755			0.081			0.049		
Satd. Flow (perm)	1406	1863	1583	1406	1863	1583	151	5080	0	91	5065	0
Satd. Flow (RTOR)			64			84		2			6	
Adj. Flow (vph)	47	4	40	73	4	84	80	2326	18	81	1857	49
Lane Group Flow (vph)	47	4	40	73	4	84	80	2344	0	81	1906	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		3			3		2	1		2	1	
Permitted Phases	3		3	3		3	1			1		
Total Split (s)	26.0	26.0	26.0	26.0	26.0	26.0	12.0	82.0		12.0	82.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	4.0	6.0		4.0	6.0	
Act Effct Green (s)	11.7	11.7	11.7	11.7	11.7	11.7	94.3	81.5		94.3	81.5	
Actuated g/C Ratio	0.10	0.10	0.10	0.10	0.10	0.10	0.79	0.68		0.79	0.68	
v/c Ratio	0.34	0.02	0.19	0.53	0.02	0.37	0.30	0.68		0.36	0.55	
Control Delay	55.7	46.0	6.3	64.4	46.0	14.4	13.8	12.8		27.1	10.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	55.7	46.0	6.3	64.4	46.0	14.4	13.8	12.8		27.1	10.7	
LOS	E	D	A	E	D	B	B	B		C	B	
Approach Delay		33.5			37.8			12.9			11.4	
Approach LOS		C			D			B			B	
Queue Length 50th (ft)	35	3	0	55	3	0	9	327		9	229	
Queue Length 95th (ft)	71	14	16	100	14	46	24	445		62	315	
Internal Link Dist (ft)		57			222			269			300	
Turn Bay Length (ft)			50			35	165			170		
Base Capacity (vph)	234	310	317	234	310	333	264	3449		222	3441	
Starvation Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio	0.20	0.01	0.13	0.31	0.01	0.25	0.30	0.68		0.36	0.55	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBSBL and 6:, Start of Green, Master Intersection
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.68
Intersection Signal Delay: 13.5 — Intersection LOS: B
Intersection Capacity Utilization 68.5% — ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 1: Scottsdale Road & Rose Lane



Intersection	
Int Delay, s/veh	3.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	42	0	43	50	0	40
Future Vol, veh/h	42	0	43	50	0	40
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	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	47	0	48	56	0	44

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	47	0	198	47
Stage 1	-	-	-	-	47	-
Stage 2	-	-	-	-	151	-
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	-	-	1560	-	791	1022
Stage 1	-	-	-	-	975	-
Stage 2	-	-	-	-	877	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1560	-	766	1022
Mov Cap-2 Maneuver	-	-	-	-	766	-
Stage 1	-	-	-	-	975	-
Stage 2	-	-	-	-	849	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.4	8.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1022	-	-	1560	-
HCM Lane V/C Ratio	0.043	-	-	0.031	-
HCM Control Delay (s)	8.7	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Intersection	
Int Delay, s/veh	3.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	49	0	47	71	0	33
Future Vol, veh/h	49	0	47	71	0	33
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	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	54	0	52	79	0	37

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	54	0	237	54
Stage 1	-	-	-	-	54	-
Stage 2	-	-	-	-	183	-
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	-	-	1551	-	751	1013
Stage 1	-	-	-	-	969	-
Stage 2	-	-	-	-	848	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1551	-	725	1013
Mov Cap-2 Maneuver	-	-	-	-	725	-
Stage 1	-	-	-	-	969	-
Stage 2	-	-	-	-	818	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.9	8.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1013	-	-	1551	-
HCM Lane V/C Ratio	0.036	-	-	0.034	-
HCM Control Delay (s)	8.7	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Intersection	
Int Delay, s/veh	1.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	10	32	0	11	39
Future Vol, veh/h	0	10	32	0	11	39
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	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	11	36	0	12	43

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	104	36	0	0	36	0
Stage 1	36	-	-	-	-	-
Stage 2	68	-	-	-	-	-
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	894	1037	-	-	1575	-
Stage 1	986	-	-	-	-	-
Stage 2	955	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	887	1037	-	-	1575	-
Mov Cap-2 Maneuver	887	-	-	-	-	-
Stage 1	986	-	-	-	-	-
Stage 2	947	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.5	0	1.6
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1037	1575	-
HCM Lane V/C Ratio	-	-	0.011	0.008	-
HCM Control Delay (s)	-	-	8.5	7.3	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	8	41	0	12	59
Future Vol, veh/h	0	8	41	0	12	59
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	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	9	46	0	13	66

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	138	46	0	0	46	0
Stage 1	46	-	-	-	-	-
Stage 2	92	-	-	-	-	-
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	1023	-	-	1562	-
Stage 1	976	-	-	-	-	-
Stage 2	932	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	847	1023	-	-	1562	-
Mov Cap-2 Maneuver	847	-	-	-	-	-
Stage 1	976	-	-	-	-	-
Stage 2	924	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.6	0	1.2
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1023	1562	-
HCM Lane V/C Ratio	-	-	0.009	0.009	-
HCM Control Delay (s)	-	-	8.6	7.3	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

2018 with Site AM - Alternative #2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	39	6	37	12	5	15	46	1303	72	72	1293	43
Future Volume (vph)	39	6	37	12	5	15	46	1303	72	72	1293	43
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Frt		0.872			0.889			0.992			0.995	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1624	0	1770	1656	0	1770	5045	0	1770	5060	0
Flt Permitted	0.742			0.726			0.138			0.131		
Satd. Flow (perm)	1382	1624	0	1352	1656	0	257	5045	0	244	5060	0
Satd. Flow (RTOR)		41			17			17			10	
Adj. Flow (vph)	43	7	41	13	6	17	51	1448	80	80	1437	48
Lane Group Flow (vph)	43	48	0	13	23	0	51	1528	0	80	1485	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		3			3		2	1		2	1	
Permitted Phases	3			3			1			1		
Total Split (s)	18.0	18.0		18.0	18.0		12.0	90.0		12.0	90.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Act Effct Green (s)	9.0	9.0		9.0	9.0		99.3	77.6		99.3	77.6	
Actuated g/C Ratio	0.08	0.08		0.08	0.08		0.83	0.65		0.83	0.65	
v/c Ratio	0.42	0.30		0.13	0.17		0.11	0.47		0.18	0.45	
Control Delay	64.4	23.7		53.2	28.8		3.1	10.9		4.2	10.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	64.4	23.7		53.2	28.8		3.1	10.9		4.2	10.8	
LOS	E	C		D	C		A	B		A	B	
Approach Delay		42.9			37.6			10.7			10.5	
Approach LOS		D			D			B			B	
Queue Length 50th (ft)	32	5		10	4		5	161		8	156	
Queue Length 95th (ft)	70	43		30	31		12	191		18	185	
Internal Link Dist (ft)		57			222			269			300	
Turn Bay Length (ft)							165			170		
Base Capacity (vph)	138	199		135	180		461	3552		453	3561	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.31	0.24		0.10	0.13		0.11	0.43		0.18	0.42	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBSBL and 6:, Start of Green, Master Intersection	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.47	
Intersection Signal Delay: 11.8	Intersection LOS: B
Intersection Capacity Utilization 52.9%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: Scottsdale Road & Rose Lane

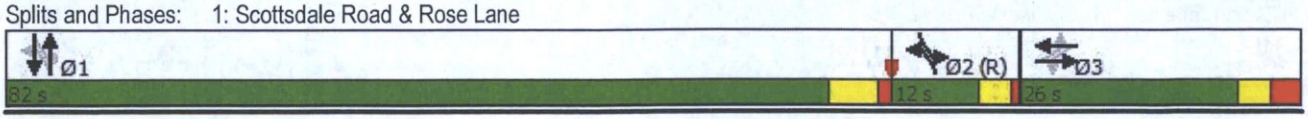
2018 with Site PM - Alternative #2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	42	4	36	66	4	76	72	2093	16	73	1671	44
Future Volume (vph)	42	4	36	66	4	76	72	2093	16	73	1671	44
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Frt		0.864			0.857			0.999			0.996	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1609	0	1770	1596	0	1770	5080	0	1770	5065	0
Flt Permitted	0.700			0.728			0.081			0.049		
Satd. Flow (perm)	1304	1609	0	1356	1596	0	151	5080	0	91	5065	0
Satd. Flow (RTOR)		40			84			2			6	
Adj. Flow (vph)	47	4	40	73	4	84	80	2326	18	81	1857	49
Lane Group Flow (vph)	47	44	0	73	88	0	80	2344	0	81	1906	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		3			3		2	1		2	1	
Permitted Phases	3			3			1			1		
Total Split (s)	26.0	26.0		26.0	26.0		12.0	82.0		12.0	82.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		4.0	6.0		4.0	6.0	
Act Effct Green (s)	12.0	12.0		12.0	12.0		94.0	81.3		94.0	81.3	
Actuated g/C Ratio	0.10	0.10		0.10	0.10		0.78	0.68		0.78	0.68	
v/c Ratio	0.36	0.22		0.54	0.38		0.31	0.68		0.37	0.56	
Control Delay	56.6	18.7		65.0	15.6		14.1	13.0		27.3	10.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	56.6	18.7		65.0	15.6		14.1	13.0		27.3	10.8	
LOS	E	B		E	B		B	B		C	B	
Approach Delay		38.3			38.0			13.0			11.5	
Approach LOS		D			D			B			B	
Queue Length 50th (ft)	35	3		55	3		9	329		9	231	
Queue Length 95th (ft)	71	37		100	50		24	450		62	318	
Internal Link Dist (ft)		57			222			269			300	
Turn Bay Length (ft)							165			170		
Base Capacity (vph)	217	301		226	336		262	3443		221	3434	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.22	0.15		0.32	0.26		0.31	0.68		0.37	0.56	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBSBL and 6:, Start of Green, Master Intersection
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.68
Intersection Signal Delay: 13.7 — Intersection LOS: B
Intersection Capacity Utilization 68.5% — ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 1: Scottsdale Road & Rose Lane



Intersection	
Int Delay, s/veh	3.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	42	0	43	50	0	40
Future Vol, veh/h	42	0	43	50	0	40
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	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	47	0	48	56	0	44

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	47	0	198	47
Stage 1	-	-	-	-	47	-
Stage 2	-	-	-	-	151	-
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	-	-	1560	-	791	1022
Stage 1	-	-	-	-	975	-
Stage 2	-	-	-	-	877	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1560	-	766	1022
Mov Cap-2 Maneuver	-	-	-	-	766	-
Stage 1	-	-	-	-	975	-
Stage 2	-	-	-	-	849	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.4	8.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1022	-	-	1560	-
HCM Lane V/C Ratio	0.043	-	-	0.031	-
HCM Control Delay (s)	8.7	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Intersection	
Int Delay, s/veh	3.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	49	0	47	71	0	33
Future Vol, veh/h	49	0	47	71	0	33
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	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	54	0	52	79	0	37

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	54	0	237	54
Stage 1	-	-	-	-	54	-
Stage 2	-	-	-	-	183	-
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	-	-	1551	-	751	1013
Stage 1	-	-	-	-	969	-
Stage 2	-	-	-	-	848	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1551	-	725	1013
Mov Cap-2 Maneuver	-	-	-	-	725	-
Stage 1	-	-	-	-	969	-
Stage 2	-	-	-	-	818	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.9	8.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1013	-	-	1551	-
HCM Lane V/C Ratio	0.036	-	-	0.034	-
HCM Control Delay (s)	8.7	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Intersection	
Int Delay, s/veh	1.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	10	32	0	11	39
Future Vol, veh/h	0	10	32	0	11	39
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	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	11	36	0	12	43

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	104	36	0	0	36	0
Stage 1	36	-	-	-	-	-
Stage 2	68	-	-	-	-	-
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	894	1037	-	-	1575	-
Stage 1	986	-	-	-	-	-
Stage 2	955	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	887	1037	-	-	1575	-
Mov Cap-2 Maneuver	887	-	-	-	-	-
Stage 1	986	-	-	-	-	-
Stage 2	947	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.5	0	1.6
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1037	1575	-
HCM Lane V/C Ratio	-	-	0.011	0.008	-
HCM Control Delay (s)	-	-	8.5	7.3	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

Intersection	
Int Delay, s/veh	1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	8	41	0	12	59
Future Vol, veh/h	0	8	41	0	12	59
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	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	9	46	0	13	66

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	138	46	0	0	46	0
Stage 1	46	-	-	-	-	-
Stage 2	92	-	-	-	-	-
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	1023	-	-	1562	-
Stage 1	976	-	-	-	-	-
Stage 2	932	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	847	1023	-	-	1562	-
Mov Cap-2 Maneuver	847	-	-	-	-	-
Stage 1	976	-	-	-	-	-
Stage 2	924	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.6	0	1.2
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1023	1562	-
HCM Lane V/C Ratio	-	-	0.009	0.009	-
HCM Control Delay (s)	-	-	8.6	7.3	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

APPENDIX G
HISTORIC COLLISION DATA

EPS GROUP

CITY OF SCOTTSDALE '13 -'14 COLLISION SUMMARY

REPORT #	DATE YYMMDD	TIME HHMM	NORTH / SOUTH ST.	TYPE	EAST WEST ST.	TYPE	DIR FROM	DIST FROM	INJ. SEV. #1	INJ. SEV. #2	PHYS. COND. #1	PHYS. COND. #2	VIOLATION #1	VIOLATION #2	ACTION #1	ACTION #2	TRAV. DIR. #1	TRAV. DIR. #2	MANNER OF COLLISION	COMMENTS
14-21436	141005	1514	SCOTTSDALE	RD	ROSE	LN	AT		1	3	0	0	99	99	4	1	WB	NB	3	
14-18257	140824	1356	SCOTTSDALE	RD	ROSE	LN	AT		1	1	0	0	2	1	1	3	SB	SB	4	
14-15723	140721	1100	SCOTTSDALE	RD	ROSE	LN	N	50	1	1	0	0	2	1	1	3	SB	SB	4	
14-14627	140705	1044	SCOTTSDALE	RD	ROSE	LN	AT		1	1	0	0	12	1	8	1	SB	SB	6	
13-26293	131114	1806	SCOTTSDALE	RD	ROSE	LN	AT		3	3	97	0	97	1	4	1	SB	NB	3	
13-01811	130124	1920	SCOTTSDALE	RD	ROSE	LN	AT		1	1	0	0	6	1	5	1	NB	NB	2	

KEY

INJURY SEVERITY: 1=NO INJURY, 2=POSSIBLE INJURY, 3=NON-INCAPACITATING INJURY, 4=INCAPACITATING INJURY, 5=FATAL INJURY, 99=NOT REPORTED / UNKNOWN

PHYSICAL CONDITION: 0=NO APPARENT INFLUENCE, 1=ILLNESS, 2=PHYSICAL IMPAIRMENT, 3=FELL ASLEEP / FATIGUED 4=ALCOHOL, 5=DRUGS, 6=MEDICATIONS, A=NO TEST GIVEN, B=TEST GIVEN, C=TEST REFUSED, D=TESTING UNKNOWN, 97=OTHER, 99=UNKNOWN

VIOLATION: 1=NO IMPROPER ACTION, 2=SPEED TOO FAST FOR CONDITIONS, 3=EXCEEDED LAWFUL SPEED 4=FOLLOWED TOO CLOSELY. 5=RAN STOP SIGN, 6=DISREGAREDED TRAFFIC SIGNAL7=MADE IMPROPER TURN, 8=DROVE/RODE IN OPPOSING TRAFFIC LANE, 9=KNOWINGLY OPERATED WITH FAULTY / MISSING EQUIPMENT, 10=REQUIRED MOTORCYCLE SAFETY EQUIPMENT NOT USED, 11=PASSED IN NO PASSING ZONE, 12=UNSAFE LANE CHANGE, 13=FAILED TO KEEP IN PROPER LANE, 14=DISREGARDED PAVEMENT MARKINGS, 15=OTHER UNSAFE PASSING, 16=INATTENTION/DISTRACTION, 17=DID NOT USE CROSSWALK, 18=WALKED ON WRONG SIDE OF ROAD, 19=ELECTRONIC COMMUNICATIONS DEVICE, 20=FAILED TO YIELD RIGHT OF WAY (added August 2014), 97=OTHER, 99 UNKNOWN

ACTION: 1=GOING STRAIGHT AHEAD, 2=SLOWING IN TRAFFICWAY, 3=STOPPED IN TRAFFICWAY, 4=MAKING LEFT TURN, 5=MAKING RIGHT TURN, 6=MAKING U-TURN, 7=OVERTAKING/PASSING, 8=CHANGING LANES, 9=NEGOTIATING A CURVE, 10=BACKING, 11=AVOIDING VEH/OBJ/PED/CYCLIST/ANIMAL, 12=ENTERING PARKING POSITION, 13=LEAVING PARKING POSITION, 14=PROPERLY PARKED, 15=IMPROPERLY PARKED, 16=DRIVERLESS MOVING VEHICLE, 17=CROSING ROAD, 18=WALKING WITH TRAFFIC, 19=WALKING AGAINST TRAFFIC, 20=STANDING, 21=LYING, 22=GETTING ON OR OFF VEHICLE, 23=WORKING ON/PUSHING VEHICLE, 24=WORKING ON ROAD, 97=OTHER, 99=UKNOWN

MANNER OF COLLISION: 1=SINGLE VEHICLE, 2=ANGLE (front to side, other than left turn), 3=LEFT TURN, 4=REAR END (front to rear), 5=HEAD-ON (front to front, other than left turn), 6=SIDESWIPE (same direction), 7=SIDESWIPE (opposite direction), 8=REAR-TO-SIDE, 9=REAR TO REAR, 97=OTHER, 99=UNKNOWN

TOTAL **6**

CITY OF SCOTTSDALE '15 -'16 COLLISION SUMMARY

REPORT #	DATE YYMMDD	TIME HHMM	NORTH / SOUTH ST.	TYPE	EAST WEST ST.	TYPE	DIR FROM	DIST FROM	INJ. SEV. #1	INJ. SEV. #2	PHYS. COND. #1	PHYS. COND. #2	VIOLATION #1	VIOLATION #2	ACTION #1	ACTION #2	TRAV. DIR. #1	TRAV. DIR. #2	MANNER OF COLLISION	COMMENTS
15-27479	151215	1850	SCOTTSDALE	RD	ROSE	LN	AT		1	1	0	0		1	1	2	SB	SB	4	
15-23337	151026	1232	SCOTTSDALE	RD	ROSE	LN	AT		99	1	99	0	13	1	7	1	NB	NB	6	HIT AND RUN
15-21810	151006	1909	SCOTTSDALE	RD	ROSE	AV	AT		1	1	4	0	12	1	8	1	SB	SB	6	DUI
15-18347	150821	2105	SCOTTSDALE	RD	ROSE	AV	AT		99	1	99	0	15	1	5	5	NB	NB	6	HIT AND RUN
15-06554	150320	1312	SCOTTSDALE	RD	ROSE	LN	AT		4	2	0	0	20	1	4	1	SB	NB	5	
15-03412	150209	1453	SCOTTSDALE	RD	ROSE	LN	AT		2	3	0	0	7	1	4	1	SB	NB	3	MULTI VEH 3

KEY

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PHYSICAL CONDITION: 0=NO APPARENT INFLUENCE, 1=ILLNESS, 2=PHYSICAL IMPAIRMENT, 3=FELL ASLEEP / FATIGUED 4=ALCOHOL, 5=DRUGS, 6=MEDICATIONS, A=NO TEST GIVEN, B=TEST GIVEN, C=TEST REFUSED, D=TESTING UNKNOWN, 97=OTHER, 99=UNKNOWN

VIOLATION: 1=NO IMPROPER ACTION, 2=SPEED TOO FAST FOR CONDITIONS, 3=EXCEEDED LAWFUL SPEED 4=FOLLOWED TOO CLOSELY. 5=RAN STOP SIGN, 6=DISREGAREDED TRAFFIC SIGNAL7=MADE IMPROPER TURN, 8=DROVE/RODE IN OPPOSING TRAFFIC LANE, 9=KNOWINGLY OPERATED WITH FAULTY / MISSING EQUIPMENT, 10=REQUIRED MOTORCYCLE SAFETY EQUIPMENT NOT USED, 11=PASSED IN NO PASSING ZONE, 12=UNSAFE LANE CHANGE, 13=FAILED TO KEEP IN PROPER LANE, 14=DISREGARDED PAVEMENT MARKINGS, 15=OTHER UNSAFE PASSING, 16=INATTENTION/DISTRACTION, 17=DID NOT USE CROSSWALK, 18=WALKED ON WRONG SIDE OF ROAD, 19=ELECTRONIC COMMUNICATIONS DEVICE, 20=FAILED TO YIELD RIGHT OF WAY (added August 2014), 97=OTHER, 99 UNKNOWN

ACTION: 1=GOING STRAIGHT AHEAD, 2=SLOWING IN TRAFFICWAY, 3=STOPPED IN TRAFFICWAY, 4=MAKING LEFT TURN, 5=MAKING RIGHT TURN, 6=MAKING U-TURN, 7=OVERTAKING/PASSING, 8=CHANGING LANES, 9=NEGOTIATING A CURVE, 10=BACKING, 11=AVOIDING VEH/OBJ/PED/CYCLIST/ANIMAL, 12=ENTERING PARKING POSITION, 13=LEAVING PARKING POSITION, 14=PROPERLY PARKED, 15=IMPROPERLY PARKED, 16=DRIVERLESS MOVING VEHICLE, 17=CROSING ROAD, 18=WALKING WITH TRAFFIC, 19=WALKING AGAINST TRAFFIC, 20=STANDING, 21=LYING, 22=GETTING ON OR OFF VEHICLE, 23=WORKING ON/PUSHING VEHICLE, 24=WORKING ON ROAD, 97=OTHER, 99=UKNOWN

MANNER OF COLLISION: 1=SINGLE VEHICLE, 2=ANGLE (front to side, other than left turn), 3=LEFT TURN, 4=REAR END (front to rear), 5=HEAD-ON (front to front, other than left turn), 6=SIDESWIPE (same direction), 7=SIDESWIPE (opposite direction), 8=REAR-TO-SIDE, 9=REAR TO REAR, 97=OTHER, 99=UNKNOWN

TOTAL **6**

CITY OF SCOTTSDALE '13 -'14 COLLISION SUMMARY

REPORT #	DATE YYMMDD	TIME HHMM	NORTH / SOUTH ST.	TYPE	EAST WEST ST.	TYPE	DIR FROM	DIST FROM	INJ. SEV. #1	INJ. SEV. #2	PHYS. COND. #1	PHYS. COND. #2	VIOLATION #1	VIOLATION #2	ACTION #1	ACTION #2	TRAV. DIR. #1	TRAV. DIR. #2	MANNER OF COLLISION	COMMENTS
14-05683	140311	1745	SCOTTSDALE	RD	ROSE	LN	S	300	1	1	0	0	2	1	2	3	SB	SB	4	
14-01919	140124	1231	SCOTTSDALE	RD	ROSE	LN	S	470	1	3	0	0	2	1	1	3	NB	NB	4	MULTI VEH 3
14-01918	140124	1304	SCOTTSDALE	RD	ROSE	LN	S	486		1	0	0	1	1	1	3	NB	NB	4	
13-28137	131207	1201	SCOTTSDALE	RD	ROSE	LN	N	277	1	3	0	0	97	1	8	1	SB	SB	6	
13-10788	130508	1805	SCOTTSDALE	RD	ROSE	LN	N	647	1	1	0	0	12	1	8	1	SB	SB	6	
13-02496	130201	1800	SCOTTSDALE	RD	ROSE	LN	S	200	1	1	0	0	2	1	1	1	NB	NB	4	MULTI VEH 3
13-00242	130104	0305	SCOTTSDALE	RD	ROSE	LN	S	350	1	4	4	0	2	1	1	97	NB	NB	4	PEDICAB

KEY

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VIOLATION: 1=NO IMPROPER ACTION, 2=SPEED TOO FAST FOR CONDITIONS, 3=EXCEEDED LAWFUL SPEED 4=FOLLOWED TOO CLOSELY. 5=RAN STOP SIGN, 6=DISREGAREDED TRAFFIC SIGNAL7=MADE IMPROPER TURN, 8=DROVE/RODE IN OPPOSING TRAFFIC LANE, 9=KNOWINGLY OPERATED WITH FAULTY / MISSING EQUIPMENT, 10=REQUIRED MOTORCYCLE SAFETY EQUIPMENT NOT USED, 11=PASSED IN NO PASSING ZONE, 12=UNSAFE LANE CHANGE, 13=FAILED TO KEEP IN PROPER LANE, 14=DISREGARDED PAVEMENT MARKINGS, 15=OTHER UNSAFE PASSING, 16=INATTENTION/DISTRACTION, 17=DID NOT USE CROSSWALK, 18=WALKED ON WRONG SIDE OF ROAD, 19=ELECTRONIC COMMUNICATIONS DEVICE, 20=FAILED TO YIELD RIGHT OF WAY (added August 2014), 97=OTHER, 99 UNKNOWN

ACTION: 1=GOING STRAIGHT AHEAD, 2=SLOWING IN TRAFFICWAY, 3=STOPPED IN TRAFFICWAY, 4=MAKING LEFT TURN, 5=MAKING RIGHT TURN, 6=MAKING U-TURN, 7=OVERTAKING/PASSING, 8=CHANGING LANES, 9=NEGOTIATING A CURVE, 10=BACKING, 11=AVOIDING VEH/OBJ/PED/CYCLIST/ANIMAL, 12=ENTERING PARKING POSITION, 13=LEAVING PARKING POSITION, 14=PROPERLY PARKED, 15=IMPROPERLY PARKED, 16=DRIVERLESS MOVING VEHICLE, 17=CROSING ROAD, 18=WALKING WITH TRAFFIC, 19=WALKING AGAINST TRAFFIC, 20=STANDING, 21=LYING, 22=GETTING ON OR OFF VEHICLE, 23=WORKING ON/PUSHING VEHICLE, 24=WORKING ON ROAD, 97=OTHER, 99=UKNOWN

MANNER OF COLLISION: 1=SINGLE VEHICLE, 2=ANGLE (front to side, other than left turn), 3=LEFT TURN, 4=REAR END (front to rear), 5=HEAD-ON (front to front, other than left turn), 6=SIDESWIPE (same direction), 7=SIDESWIPE (opposite direction), 8=REAR-TO-SIDE, 9=REAR TO REAR, 97=OTHER, 99=UNKNOWN

TOTAL **7**

CITY OF SCOTTSDALE '15 -'16 COLLISION SUMMARY

REPORT #	DATE YYMMDD	TIME HHMM	NORTH / SOUTH ST.	TYPE	EAST WEST ST.	TYPE	DIR FROM	DIST FROM	INJ. SEV. #1	INJ. SEV. #2	PHYS. COND. #1	PHYS. COND. #2	VIOLATION #1	VIOLATION #2	ACTION #1	ACTION #2	TRAV. DIR. #1	TRAV. DIR. #2	MANNER OF COLLISION	COMMENTS
15-19136	150901	1404	SCOTTSDALE	RD	ROSE	LN	N	250	1	2	0	0	2	1	1	3	SB	SB	4	
15-08319	150410	1900	SCOTTSDALE	RD	ROSE	LN	N	240	99	1	99	0	99	1	1	3	SB	SB	4	HITA ND RUN

KEY

INJURY SEVERITY: 1=NO INJURY, 2=POSSIBLE INJURY, 3=NON-INCAPACITATING INJURY, 4=INCAPACITATING INJURY, 5=FATAL INJURY, 99=NOT REPORTED / UNKNOWN

PHYSICAL CONDITION: 0=NO APPARENT INFLUENCE, 1=ILLNESS, 2=PHYSICAL IMPAIRMENT, 3=FELL ASLEEP / FATIGUED 4=ALCOHOL, 5=DRUGS, 6=MEDICATIONS, A=NO TEST GIVEN, B=TEST GIVEN, C=TEST REFUSED, D=TESTING UNKNOWN, 97=OTHER, 99=UNKNOWN

VIOLATION: 1=NO IMPROPER ACTION, 2=SPEED TOO FAST FOR CONDITIONS, 3=EXCEEDED LAWFUL SPEED 4=FOLLOWED TOO CLOSELY. 5=RAN STOP SIGN, 6=DISREGAREDED TRAFFIC SIGNAL7=MADE IMPROPER TURN, 8=DROVE/RODE IN OPPOSING TRAFFIC LANE, 9=KNOWINGLY OPERATED WITH FAULTY / MISSING EQUIPMENT, 10=REQUIRED MOTORCYCLE SAFETY EQUIPMENT NOT USED, 11=PASSED IN NO PASSING ZONE, 12=UNSAFE LANE CHANGE, 13=FAILED TO KEEP IN PROPER LANE, 14=DISREGARDED PAVEMENT MARKINGS, 15=OTHER UNSAFE PASSING, 16=INATTENTION/DISTRACTION, 17=DID NOT USE CROSSWALK, 18=WALKED ON WRONG SIDE OF ROAD, 19=ELECTRONIC COMMUNICATIONS DEVICE, 20=FAILED TO YIELD RIGHT OF WAY (added August 2014), 97=OTHER, 99 UNKNOWN

ACTION: 1=GOING STRAIGHT AHEAD, 2=SLOWING IN TRAFFICWAY, 3=STOPPED IN TRAFFICWAY, 4=MAKING LEFT TURN, 5=MAKING RIGHT TURN, 6=MAKING U-TURN, 7=OVERTAKING/PASSING, 8=CHANGING LANES, 9=NEGOTIATING A CURVE, 10=BACKING, 11=AVOIDING VEH/OBJ/PED/CYCLIST/ANIMAL, 12=ENTERING PARKING POSITION, 13=LEAVING PARKING POSITION, 14=PROPERLY PARKED, 15=IMPROPERLY PARKED, 16=DRIVERLESS MOVING VEHICLE, 17=CROSING ROAD, 18=WALKING WITH TRAFFIC, 19=WALKING AGAINST TRAFFIC, 20=STANDING, 21=LYING, 22=GETTING ON OR OFF VEHICLE, 23=WORKING ON/PUSHING VEHICLE, 24=WORKING ON ROAD, 97=OTHER, 99=UKNOWN

MANNER OF COLLISION: 1=SINGLE VEHICLE, 2=ANGLE (front to side, other than left turn), 3=LEFT TURN, 4=REAR END (front to rear), 5=HEAD-ON (front to front, other than left turn), 6=SIDESWIPE (same direction), 7=SIDESWIPE (opposite direction), 8=REAR-TO-SIDE, 9=REAR TO REAR, 97=OTHER, 99=UNKNOWN

TOTAL **2**

APPENDIX C.1
EXISTING

EPS GROUP

CASE FILE

COTTONWOODS RESORT & SUITES
MARICOPA, ARIZONA

LOCATED AT 6160 N SCOTTSDALE RD
PARADISE VALLEY, ARIZONA 85253

MASTER DRAINAGE REPORT

AUGUST 2017
Project No.: 16143

PREPARED FOR:
PV HOTEL VENTURES SPE, LLC
4858 E. BASELINE RD., SUITE 101
MESA, AZ 85206

PREPARED BY:
HUBBARD ENGINEERING
1201 S. ALMA SCHOOL RD., SUITE 12000
MESA, ARIZONA 85210
(480) 892-3313
BRENT STEFFENHAGEN, PE

HUBBARD ENGINEERING

Plan # _____
Case # 22-ZN-2016
Q-S # _____
☒ Accepted
☐ Corrections
A. MEÑEZ 9/12/17
Reviewed By Date

22-ZN-2016
08/24/2017

9-GP-2016
08/24/2017

Appendix 4-1C

WARNING & DISCLAIMER OF LIABILITY

The Drainage and Floodplain Regulations and Ordinances of the City of Scottsdale are intended to "minimize the occurrence of losses, hazards and conditions adversely affecting the public health, safety and general welfare which might result from flooding caused by the surface runoff of rainfall" (Scottsdale Revised Code §37-16).

As defined in S.R.C. §37-17, a flood plain or "*Special flood hazard* area means an area having flood and/or flood related erosion hazards as shown on a FHBM or FIRM as zone A, AO, A1-30, AE, A99, AH, or E, and those areas identified as such by the floodplain administrator, delineated in accordance with subsection 37-18(b) and adopted by the floodplain board." It is possible that a property could be inundated by greater frequency flood events or by a flood greater in magnitude than a 100-year flood. Additionally, much of the Scottsdale area is a dynamic flood area; that is, the floodplains may shift from one location to another, over time, due to natural processes.

WARNING AND DISCLAIMER OF LIABILITY PURSUANT TO S.R.C §37-22

"The degree of flood protection provided by the requirements in this article is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Floods larger than the base flood can and will occur on rare occasions. Floodwater heights may be increased by man-made or natural causes. This article (Chapter 37, Article II) shall not create liability on the part of the city, any officer or employee thereof, or the federal government for any flood damages that result from reliance on this article or any administrative decision lawfully made thereunder."

Compliance with Drainage and Floodplain Regulations and Ordinances does not insure complete protection from flooding. The Floodplain Regulations and Ordinances meet established local and federal standards for floodplain management, but neither this review nor the Regulations and Ordinances take into account such flood related problems as natural erosion, streambed meander or man-made obstructions and diversions, all of which may have an adverse affect in the event of a flood. You are advised to consult your own engineer or other expert regarding these considerations.

I have read and understand the above. If I am an agent for an owner I have made the owner aware of and explained this disclaimer.

Plan Check No.	Gary A. Stoyanoff	8/18/17	AUTHORIZED SIGNATURE
	Owner or Agent	Date	

TABLE OF CONTENTS

FIGURES

APPENDICES

EXHIBITS

1. INTRODUCTION AND SCOPE OF WORK

This report presents the results of a *Master Drainage Study* conducted by Hubbard Engineering at the request of Delawie ("client"), for Cottonwoods Resort & Suites ("site"). The purpose of this report is to provide a hydrologic and hydraulic evaluation for the site so that the site can be rezoned. This report addresses on-site conditions as well as storm water runoff retention.

1.1 Site Description

The site is located in Section 10 of Township 2N, Range 4E of the Gila and Salt River Base and Meridian, Maricopa County, Arizona. The location of the site is shown on the site *Vicinity Map*, **FIGURE 1**, on the next page.

1.2 Project Description

The site was previously developed with an existing building with water service connections, sewer service connections, asphalt paved parking lot, concrete sidewalk, concrete curb, block site wall, landscape areas and a surface retention basin that has grass for ground cover. The adjacent half streets to the site are fully developed. The existing building on the site was demoed however, the existing paved parking lot remains along with the existing surface retention basin along Scottsdale Road. There are no offsite flows onto the existing site.

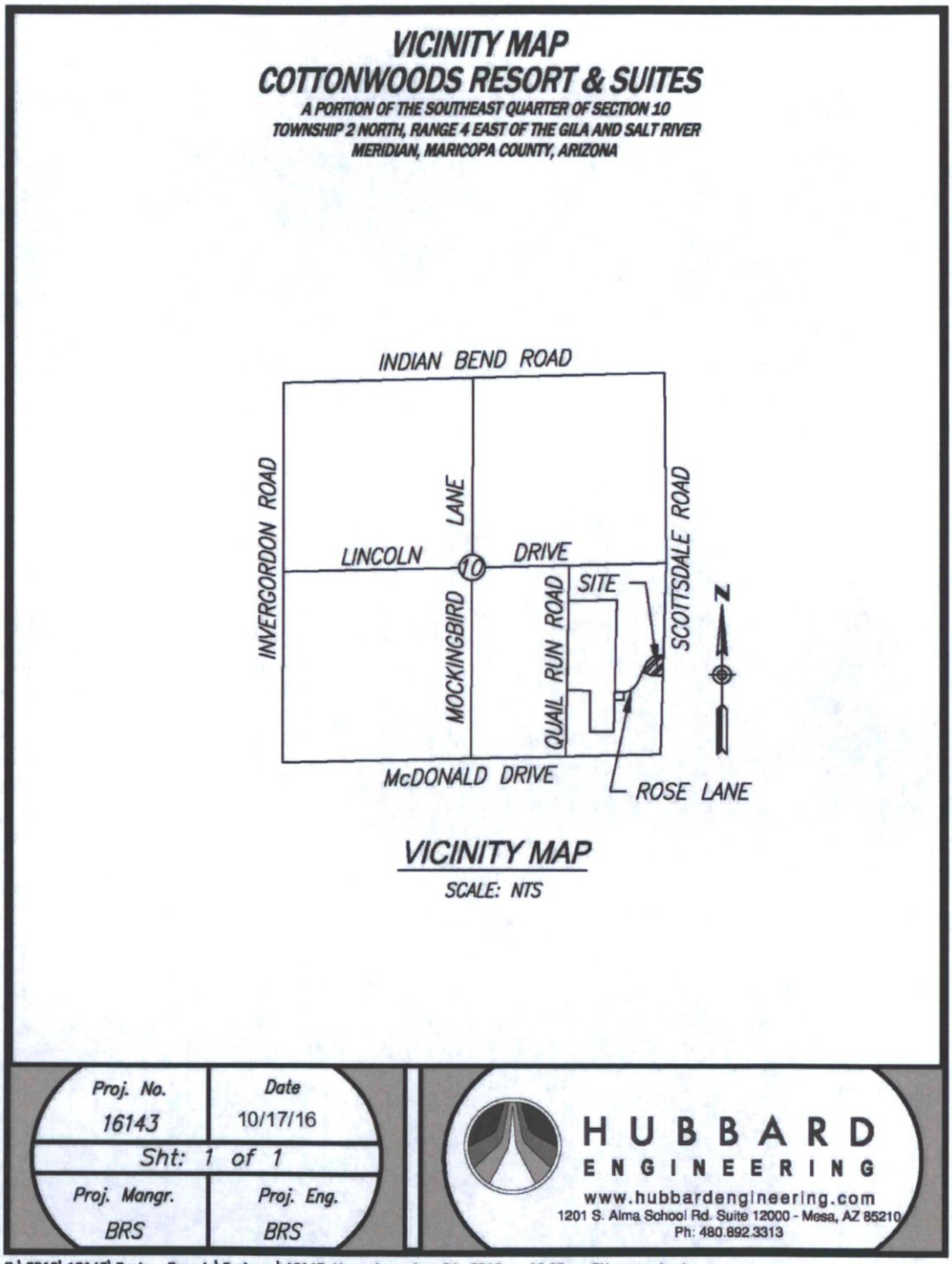


Figure 1 – Vicinity Map

1.3 Design Criteria

The criteria used in the drainage design and analysis of the site was established using the guidelines as described in the following:

- *Design Standards & Policies Manual Chapter 4 Grading and Drainage, City of Scottsdale, Dated January, 2010.* (Reference 1).
- *Drainage Design Manual for Maricopa County, Arizona, Volume I, Hydrology* (Reference 2).
- *Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics* (Reference 3).

2. DESCRIPTION OF EXIST. DRAINAGE COND. & CHARACTERISTICS

2.1 Onsite Drainage

As previously mentioned, the site was previously developed with an existing building with water service connections, sewer service connections, asphalt paved parking lot, concrete sidewalk, concrete curb, block site wall, desert landscape areas and a surface retention basin that has grass for ground cover. The adjacent half streets are fully developed. The existing building on the site was recently demoed however, the existing paved parking lot remains along with the existing surface retention basin along N. Scottsdale Road.

A pre-vs-post drainage analysis was done on the existing site. The analysis represents the previous site condition with the building and the post (future) site conditions with future buildings locations and proposed ground cover. The future conceptual site layout is very similar to pre-project site layout. All ground cover areas will stay the same as the pre site conditions. The existing site has one drainage area DA-A which is shown in **Exhibit 4**. DA-A drains to the existing retention basin along Scottsdale Rd via sheet flow. The demolition of the existing building included the concrete slab of the building. A C-value of 0.95 was used for impervious areas and a C-value of 0.30 was used for grass areas. See **Exhibits 2 & 6** for pre-vs-post ground cover delineation areas. See **Section 2.5** for additional information on pre-vs-post drainage analysis. See **Exhibit 1** for Aerial Site Map, **Exhibit 5** for existing site topography.

In accordance with the requirements of the City of Scottsdale Design Standards & Policies Manual, the subject property will be required to retain the 100-year, 2-hour runoff volume, which is determined by utilizing the following formula:

$$V = C * (P/12) * A$$

where,

V = Storage volume (acre-feet)

C = Watershed runoff coefficient

P = 100-year, 2-hour precipitation (inches)

A = Drainage area (acres)

According to the City of Scottsdale Design Standards & Policies Manual, the 100-year, 2-hour depth is 2.2 inches for the site area. See **Appendix B** for NOAA rainfall data.

A "weighted" C-value is determined for each drainage area by utilizing the formula:

$$Cw = \frac{A_1*C_1 + A_2*C_2 + A_3*C_3 \ldots A_n*C_n}{A_1 + A_2 + A_3 \ldots A_n}$$

where,

A_i = Area in the i_{th} sub-area (acres)

C_i = Runoff coefficient in the i_{th} sub-area

As identified in Figure 4.1-4 of the City of Scottsdale Design Standards & Policies Manual, the following "C" values will be used in the retention calculations:

Land Use Category	100-year max. "C" value
Pavement and Rooftops (Impervious Areas)	0.95
Landscape (no impervious weed barrier)	0.45
Lawns, golf course & parks (grassed areas)	0.30

The volume provided in the proposed retention basins is calculated by using the prismoidal formula:

$$V = d/3 * (A_1 + A_2 + (A_1 * A_2)^{0.5})$$

where,

V = Storage volume (cu.ft.)

d = Depth (ft)

A_1 = Area of upper contour (sq.ft.)

A_2 = Area of lower contour (sq.ft.)

The volume of the existing retention basin was determined by using the prismoidal formula. See **Table 1** below for the existing retention basin volume.

Table 1: Existing Basin Volume

EXISTING RETENTION BASIN							
Drainage Area	HW Elevation (ft)	HW Area ft^2	Bottom Elevation (ft)	Bottom ft^2	H ft	Volume Provided ft^3	Drainage Areas contributing to Basins
RB1	1302.25	14,000.00	1300.25	680.00	2	11,844	DA-A
					Total ->	**11,844**	

14,000.00 <= Total Area @ H.W.'s

Volume Provided = $H/3*(A_{H.W.} + A_{BOTTOM} + (A_{H.W.} * A_{BOTTOM})^{0.5})$

In accordance with the City of Scottsdale Drainage Ordinance, retention basins are required to be drained within a 36-hour period after the storm event.

There is an existing drywell located in the existing retention basin that currently assists in the dissipation of the water to drain within the required 36-hours. See **Exhibit 2 & 6** for drywell location. When the property is developed in the future a Final Drainage Report will need to be submitted along with the Improvement Plans to verify that the proposed site will not require additional storage than what is currently provided by the existing basin and if additional drywell or drywells need to be added to drain the water within the required 36-hours.

Drainage calculations can be found at the end of this drainage study.

2.2 Existing Off-Site Conditions Characteristics

There are no existing offsite flows that inundate the existing site.

2.3 Flood Zone Information

The Maricopa County, Arizona and Incorporated Areas Flood Insurance Rate Map *(F.I.R.M.)* number 04013C1770L panel number 1770 of 4425, dated October 16, 2013 indicates that the project falls within Zone X. A Copy of the FEMA Firmette map can be found in **FIGURE 2**.

Zone X is defined by the Federal Emergency Management Agency (FEMA) as:

"Areas determined to be outside the 0.2% annual chance floodplain."

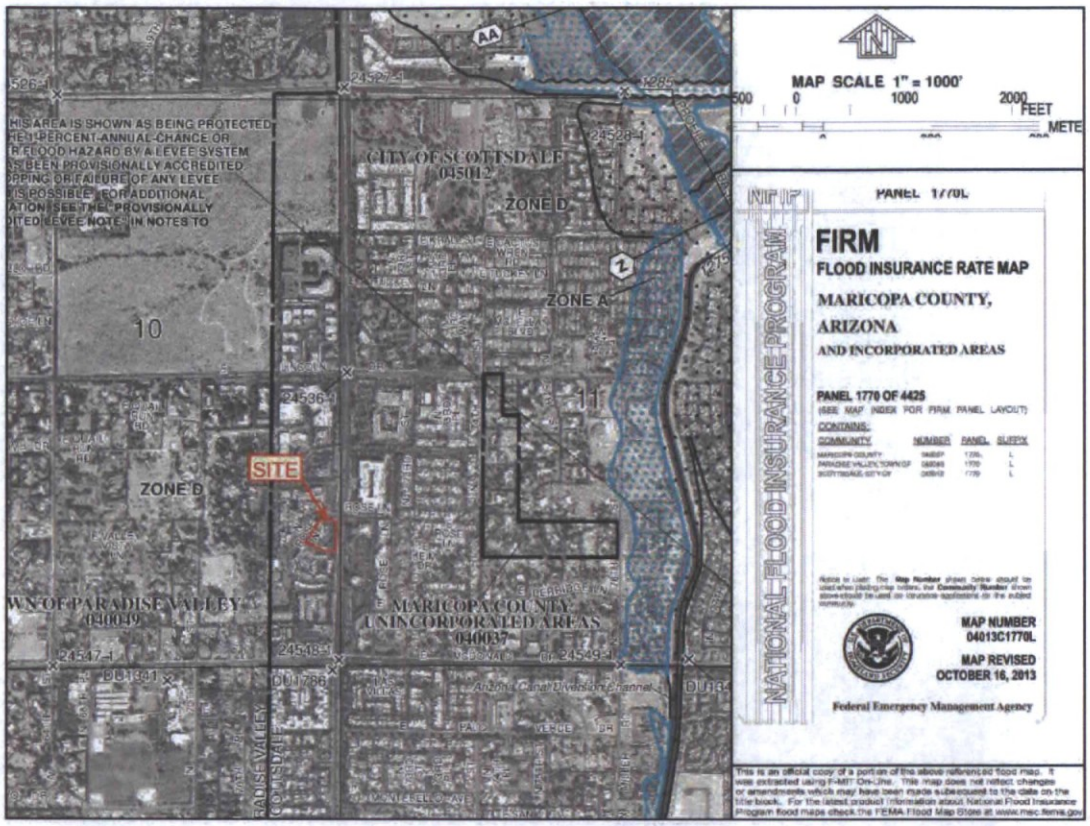


Figure 2 – FIRM

2.4 Pre- and Post-Project Topography

The pre and post project topography will be very similar since they will maintain the same drainage scheme and drain to the same existing basin. See **Exhibit 5 & 6** for existing site topography map and the preliminary grading plan.

2.5 Pre- and Post-Project Stormwater Runoff

The entire drainage area DA-A shown in **Exhibit 4** will drain to the existing retention basin RB-1 located along Scottsdale Road. The site was determined to have one drainage area and **Exhibit 4** is labeled accordingly. The runoff from DA-A will drain to RB-1 via sheet flow. The existing basin RB-1 is 2 feet in depth and has a capacity of approximately 11,844 cubic feet. For the pre-condition drainage analysis, it was determined that the required volume that the retention basin must provide per City of Scottsdale's *Design Standards and Policies Manual* (Reference 1) was 7,646 cubic feet. The post-condition drainage analysis determined that the required volume the retention basin must also provide the same as the pre-condition 7,646 cubic feet of water. The sidewalk adjacent to N. Scottsdale Road will be realigned to the

west and take away a portion of the volume being provided by the existing RB-1. The existing retention will need to be regraded as shown in the preliminary grading plans. The proposed basin is designed to provide 7,656 cubic feet of storage. See **Appendix A** for retention calculations. The proposed basin volume being provided will be adequate for the proposed post site conditions. The existing basin also has an existing drywell incorporated in the bottom of the basin. With the existing RB-1 being reduced in size the existing drywell will need a catch basin or an interceptor located at the bottom of the new retention basin, so that the basin drains within the permitted time of 36 hours. See **Appendix A** pre vs post calculations.

3. SPECIAL CONDITIONS

3.1 Section 404 & 401

The site is not delineated as a 404 & 401 jurisdiction.

3.2 AZPDES

When the future site is regraded an AZPDES permit will be required for improvements since the land disturbed will be more than one acre. An NOI will be submitted to ADEQ prior to and an approved NOI Certification with an AZCON number. The approved AZCON will be provided to the City at the time of the final plan review.

3.3 ESL

The site does not qualify as an Environmentally Sensitive Land on the City of Scottsdale Environmentally Sensitive Land Inventories.

4. DATA ANALYSIS METHODS

4.1 Peak Flows and Stormwater Storage

Storage for the 100-year, 2-hour and peak flow for the 100-year storm was determined by rational method per COS Requirements. See the associated Appendices for the references and parameters that were used to calculate the storm water required retention.

5. SUMMARY AND CONCLUSION

- The project is bound by N. Scottsdale Rd to the east, Rose Ln. to the west and north and by condos on the south side.
- Any future development on the site must abide by the City of Scottsdale's Design Standards & Policies Manual.
- The proposed surface retention basin will provide adequate storage volume for the proposed post site condition per City of Scottsdale's Design Standards & Policies Manual.
- The site will covey the 100-yr storm event via surface flow into the existing retention basin along N. Scottsdale Road.
- The post conceptual site will have the same drainage area and drainage scheme.
- Subject site is currently located in Flood Plain Zone X per FEMA No. 04013C1770L.

6. REFERENCES

1. *Design Standards & Policies Manual Chapter 4 Grading and Drainage, City of Scottsdale, Dated January, 2010.*
2. *Drainage Design Manual For Maricopa County, Arizona, Volume I, Hydrology*, Flood Control District Of Maricopa County, February 2013.
3. *Drainage Design Manual For Maricopa County, Arizona, Volume II, Hydraulics*, Flood Control District Of Maricopa County, January 2013. *Flood Insurance Rate Map (F.I.R.M.) Maricopa County, Arizona and Incorporated areas, Panel 1770 of 4425*

7. LIMITATIONS

This report is focused on providing practical design information, evaluation, and calculations for statistical flood events up to and including the 100-year frequency flood. The procedures used herein are derived from, and performed with, currently accepted engineering methodologies and practices. Additionally, the criteria for this evaluation is designed to conform to currently applicable ordinances, regulations and policies effected by the appropriate jurisdictional regulatory authorities for the site.

The analysis presented herein focuses on developing design estimates of storm water runoff resulting from a statistical evaluation of storm events of particular duration and frequency up to and including a 100-year frequency event. A storm event exceeding the 100-year frequency event may cause or create the risk of greater flood impact than is addressed and presented herein. However, the scope of this assessment does not include evaluation of storm water runoff resulting from storm events exceeding the 100-year frequency event. Hubbard Engineering assumes no responsibility for actual flood damage, increased risks of flood damage, or increased construction or development cost resulting from or related to any such events. Nor shall Hubbard Engineering be responsible for any changes in, or additions to, regulatory requirements which may result from, or be related to, any such events or changes in hydrologic or hydraulic conditions within the watershed.

In performing the services contained herein, Hubbard Engineering has received or will receive information prepared or compiled by others. Hubbard Engineering, as engineering professionals, are not required to verify the information, but may rely on the information unless actual knowledge concerning the validity of the information is known or is obvious to the professional. Therefore, Hubbard Engineering is entitled to rely upon the accuracy and completeness of this information without independent evaluation or verification.

Appendix A
Retention Calculations
Cottonwoods Resort & Suites

HYDRAULIC CALCULATION SHEET
POST Composite "C" Calculation
Hubbard Engineering
Project No. 16143

Project Name: Cottonwoods Resort | **Prepared By:** BAH | **Date:** 08/22/17
Project No: 16143 | **Checked By:** | **Date:**

Purpose: Calculate a weighted "C" Value for a drainage area.

Methodology: The weighted "C" value is determined by summing the products of each surface "C" value times the suface area, and dividing by the sum of all of the surface areas.

References: 1. Scottsdale Drainage Design Policy

Calculation: $Cw = (C_{0.95}*A_{0.95} + C_{0.45}*A_{0.45})/A_{TOTAL}$

Surface	C	Area (Sq. Ft.)	C x Area
Landscape	0.45	10,423	4,690
Grassed Areas	0.30	7,200	2,160
Impervious	0.95	36,537	34,710
Total	N/A	54,160	41,561

"Cw"= 0.77	Weighted Runoff Coefficient

Weighted "C"

HYDRAULIC CALCULATION SHEET
Post Retention Calculations
Hubbard Engineering
Project No. 16143

Project Name: Cottonwoods Resort
Project No.: 16143

Prepared by: BAH
Revised By:

Date: 08/22/17
Date:

Purpose: Evaluate the required and provided retention volumes in order to assess conformance to project criteria.

Methodology: Calculate the volume of stormwater required to be retained using City of Scottsdale criteria. Calculate the estimated volume of stormwater retained using retention basin geometry.

Criteria: Retain the calculated stormwater run-off for the 100-YEAR 2-HOUR duration storm event.

References:
1. Scottsdale Drainage Design Policy
2. Drainage Design Manual for Maricopa County, Arizona, Volume II: Hydraulics, August 2013.

Calculations: Volume Required = $C_{Composite}$ *D/12* A [ft^3] (Reference 1)

D = 2.2	[in]	(Reference 1)
C = 0.95	(Paved Parking)	(Reference 1)
C = 0.30	(Grassed Areas)	(Reference 1)
C = 0.45	(Desert Landscape)	

Composite C= (C1*A1 + C2*A2... +....)/(A1+A2+....)

Volume Required = Composite C*P/12*A

Results:

Identifiers	CALCULATE RETENTION VOLUME REQUIRED		Volume Required	
Contributory Area ID	Area [acres]	C Post	[acre-ft]	[ft^3]
DA-A	1.24	0.77	0.18	7,646
Total Area:	**1.24**	**TOTAL VOLUME REQUIRED:**	**0.18**	**7,646**

HYDRAULIC CALCULATION SHEET
Pre Composite "C" Calculation
Hubbard Engineering
Project No. 16143

Project Name: Cottonwoods Resort
Project No: 16143

Prepared By: BAH
Checked By:

Date: 08/22/17
Date:

Purpose: Calculate a weighted "C" Value for a drainage area.

Methodology: The weighted "C" value is determined by summing the products of each surface "C" value times the suface area, and dividing by the sum of all of the surface areas.

References: 1. Scottsdale Drainage Design Policy

Calculation: $Cw = (C_{0.95}*A_{0.95} + C_{0.45}*A_{0.45})/A_{TOTAL}$

Surface	C	Area (Sq. Ft.)	C x Area
Grassed Areas	0.30	9,904	2971.20
Landscape	0.45	6,743	3034.35
Impervious	0.95	37,513	35637.35
Total	N/A	54,160	41642.90

"Cw"= 0.77	Weighted Runoff Coefficient

Weighted "C"

HYDRAULIC CALCULATION SHEET
Pre Retention Calculations
Hubbard Engineering
Project No. 16143

Project Name: Cottonwoods Resort
Project No.: 16143

Prepared by: BAH
Revised By:

Date: 08/22/17
Date:

Purpose: Evaluate the required and provided retention volumes in order to assess conformance to project criteria.

Methodology: Calculate the volume of stormwater required to be retained using City of Scottsdale criteria. Calculate the estimated volume of stormwater retained using retention basin geometry.

Criteria: Retain the calculated stormwater run-off for the 100-YEAR 2-HOUR duration storm event.

References:
1. Scottsdale Drainage Design Policy
2. Drainage Design Manual for Maricopa County, Arizona, Volume II: Hydraulics, August 2013.

Calculations: Volume Required = $C_{Composite}$ *D/12* A [ft^3] (Reference 1)

D = 2.2	[in]	(Reference 1)
C = 0.95	(Paved Parking)	(Reference 1)
C = 0.30	(Grassed Areas)	(Reference 1)
C = 0.45	(Desert Landscape)	

Composite C= (C1*A1 + C2*A2...+....)/(A1+A2+....)

Volume Required = Composite C*P/12*A

Results:

Identifiers	CALCULATE RETENTION VOLUME REQUIRED		Volume Required	
Contributory Area ID	Area [acres]	C PRE	[acre-ft]	[ft^3]
DA-A	1.24	0.77	0.18	7,646
Total Area:	**1.24**	**TOTAL VOLUME REQUIRED:**	**0.18**	**7,646**

HYDRAULIC CALCULATION SHEET

Retention Provided

Hubbard Engineering

Project No. 16143

Project Name: Cottonwoods Resort
Project No.: 16143

Prepared By: BAH
Revised By:

Date: 08/22/17
Date:

RETENTION BASINS					
Drainage Area	HW Area ft^2	Bottom ft^2	H ft	Volume Provided ft^3	Drainage Areas contributing to Basins
RB1	5,833.00	3,622.55	1	4,684	DA-A
	3,622.55	1,511.50	1	2,491	
	1,511.50	500.00	0.5	480	
			Total ->	**7,656**	

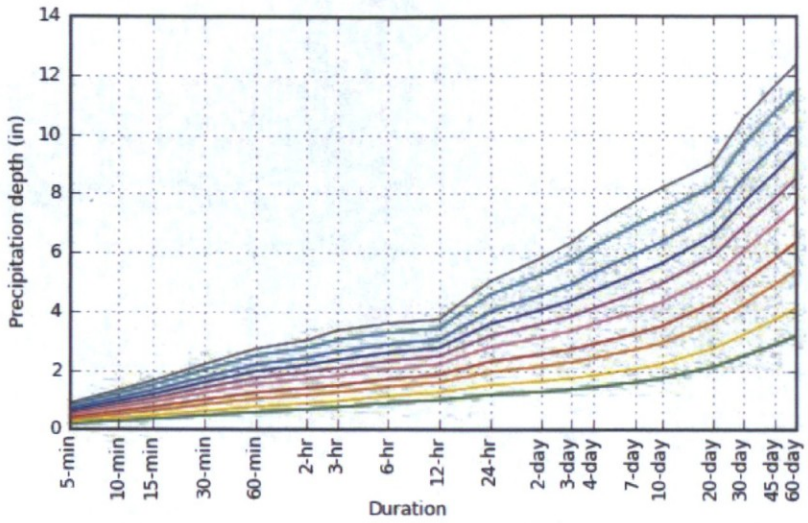
10,967.05 <= Total Area @ H.W.'s

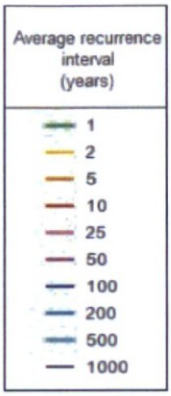
Volume Provided = $H/3*(A_{H.W.} + A_{BOTTOM} + (A_{H.W.} * A_{BOTTOM})^{0.5})$

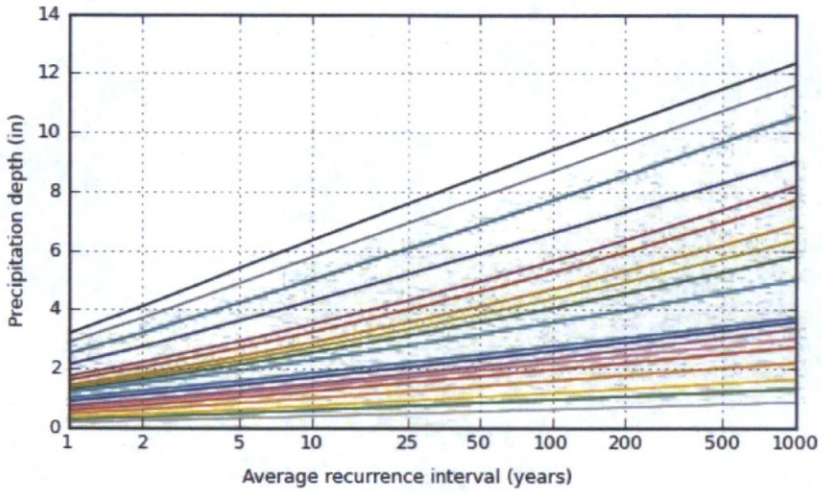
Appendix B
Rainfall Data
Cottonwoods Resort & Suites

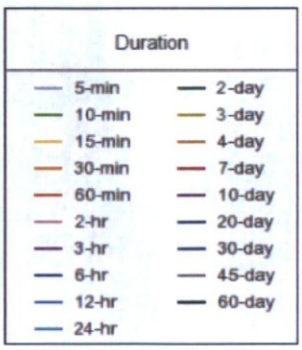
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 33.5274°, Longitude: -111.9264°









NOAA Atlas 14, Volume 1, Version 5

Created (GMT): Thu Oct 13 22:13:01 2016

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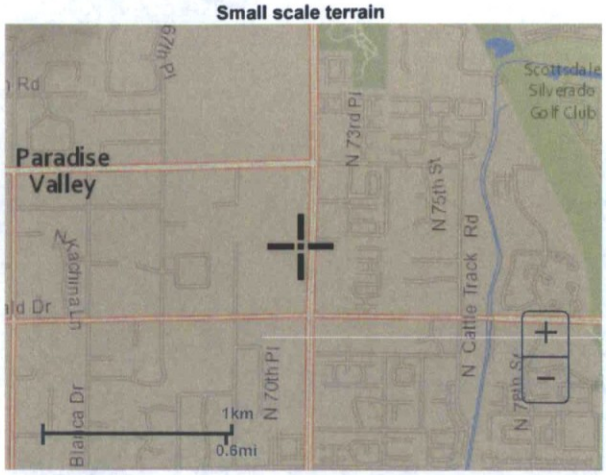
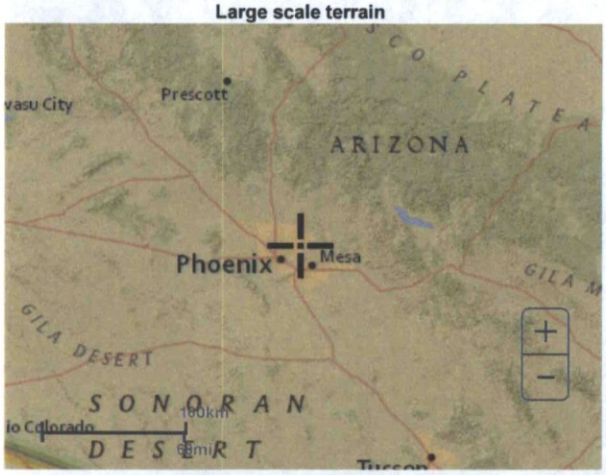
Maps & aerials

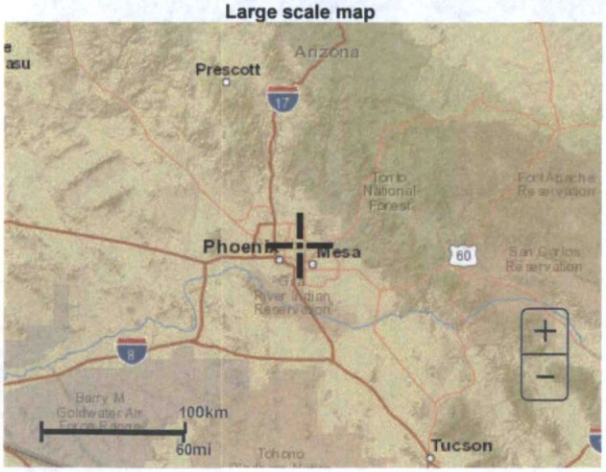
Small scale terrain



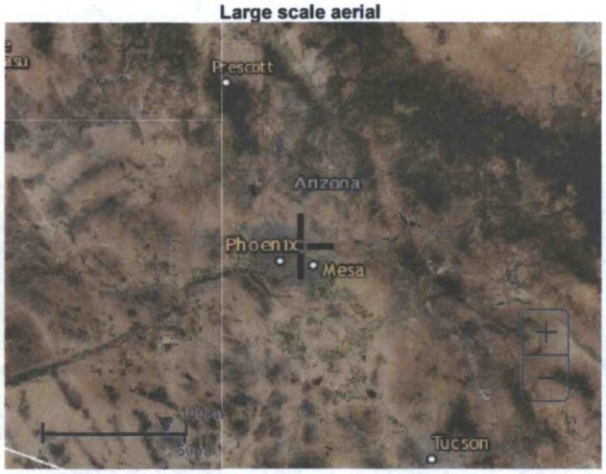
Large scale terrain



Large scale map



Large scale aerial



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National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

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Suite 12000
Mesa, AZ 85210
Ph: 480.892.3313
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AERIAL SITE MAP

COTTONWOODS RESORT & SUITES

A PORTION OF THE SOUTHEAST QUARTER OF SECTION 10
TOWNSHIP 2 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER
MERIDIAN, MARICOPA COUNTY, ARIZONA

Project No.	Date
16143	10/13/16

22-ZN-2016
08/24/2017

9-GP-2016
08/24/2017

Exhibit 1

LEGEND

GROUND COVER DELINEATION

DRAINAGE AREA

DRAINAGE AREA ID **DA-A**

GROUND COVER TYPE "IMPERVIOUS"

GROUND COVER TYPE "GRASS"

GROUND COVER TYPE "LANDSCAPE"

Surface	C	Area (Sq. Ft.)	C x Area
Grassed Areas	0.30	9,904	2971.20
Landscape	0.45	6,743	3034.35
Impervious	0.95	37,513	35637.35
Total	N/A	54,160	41642.90

"Cw"= 0.77 Weighted Runoff Coefficient

Retention Volumes

Vrpre=7,646 C.F.

Vp=11,844 C.F.

N

50 0 50 100

scale feet

Proj. No.	Date
16143	08/22/17
Sht: 1 of 1	

PRE-DEVELOPMENT AERIAL GROUND COVER MAP
EXHIBIT 2

A PORTION OF THE SOUTHEAST QUARTER OF SECTION 10 TOWNSHIP 2 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER MERIDIAN, MARICOPA COUNTY, ARIZONA

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LEGEND

GROUND COVER DELINEATION

DRAINAGE AREA

DRAINAGE AREA ID **DA-A**

GROUND COVER TYPE "DESERT LANDSCAPE"

GROUND COVER TYPE "IMPERVIOUS"

GROUND COVER TYPE "GRASS"

Surface	C	Area (Sq. Ft.)	C x Area
Landscape	0.45	10,423	4,690
Grassed Areas	0.30	7,200	2,160
Impervious	0.95	36,537	34,710
Total	N/A	54,160	41,561

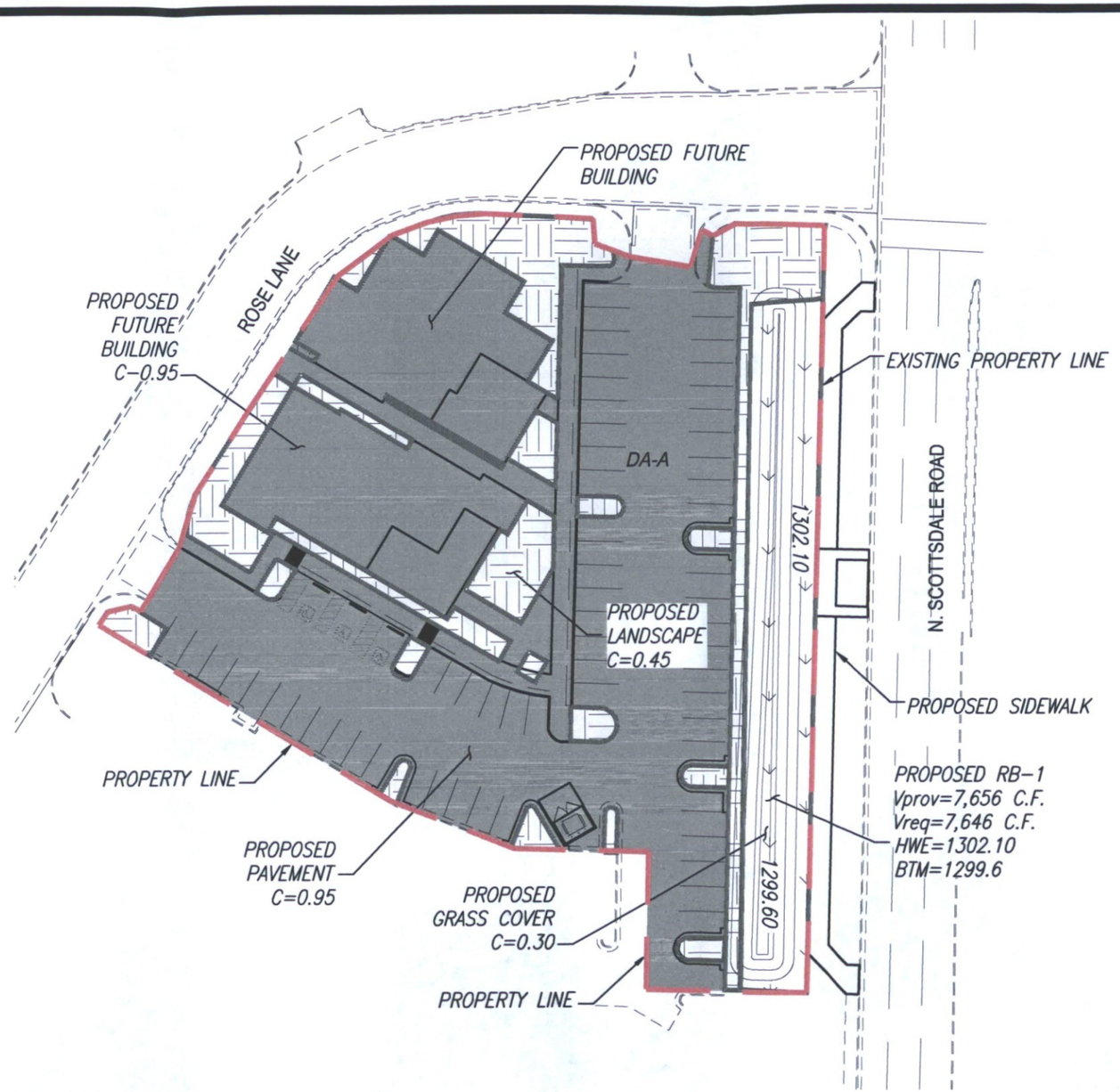
"Cw"= 0.77 Weighted Runoff Coefficient

Retention Volumes

Vrpre=7,646 C.F.

Vrpost=7,646 C.F.

Vp=7,656 C.F.



N

50 0 50 100

scale feet

Proj. No.	Date
16143	08/22/17
Sht: 1 of 1	

POST DEVELOPMENT AERIAL GROUND COVER MAP

EXHIBIT 3

A PORTION OF THE SOUTHEAST QUARTER OF SECTION 10 TOWNSHIP 2 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER MERIDIAN, MARICOPA COUNTY, ARIZONA

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LEGEND

EXISTING MAJOR CONTOUR
EXISTING MINOR CONTOUR
DRAINAGE AREA

EXISTING GRADES — TC=20.50 G=20.00

PAVEMENT EXISTING — PE=123

DRAINAGE AREA ID — DA-A

EXISTING RETENTION BASIN							
Drainage Area	HW Elevation (ft)	HW Area ft²	Bottom Elevation (ft)	Bottom ft²	H ft	Volume Provided ft³	Drainage Areas contributing to Basins
RB1	1302.25	14,000.00	1300.25	680.00	2	11,844	DA-A
					Total ->	11,844	

14,000.00 <= Total Area @ H.W.'s

Volume Provided = $H/3*(A_{H.W.} + A_{BOTTOM} + (A_{H.W.} * A_{BOTTOM})^{0.5})$

EXISTING PROPERTY LINE

ROSE LANE

N. SCOTTSDALE ROAD

EXISTING PROPERTY

DA-A
Vrpre=7,646 C.F.
Vrpost=7,646 C.F.
Vp=11,844 C.F.

COMPACTED SOIL

GRASS COVER

EXISTING DRYWELL
RIM=1299.71

EXISTING PAVEMENT

EXISTING RB-1
DEPTH 2'

PROPERTY LINE

1305 1304 1303 1302 1301 1306

N

scale 20 0 20 40 feet

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EXISTING SITE DRAINAGE MAP

COTTONWOODS RESORT & SUITES

A PORTION OF THE SOUTHEAST QUARTER OF SECTION 10
TOWNSHIP 2 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER
MERIDIAN, MARICOPA COUNTY, ARIZONA

Project No.	Date
16143	08/22/17

Exhibit 4

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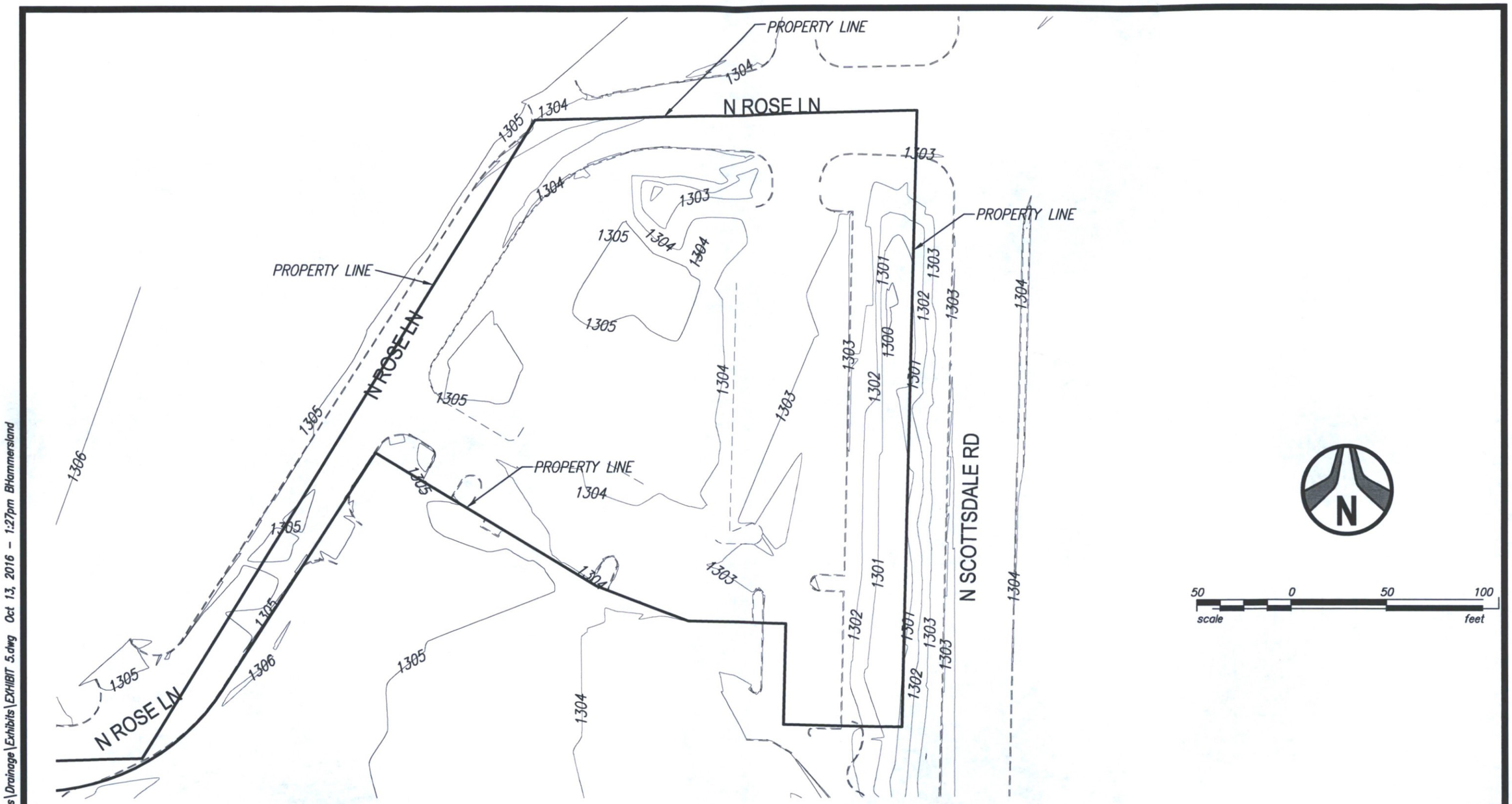

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Proj. No.	Date
16143	10/13/2016
Sht: 1 of 1	

EXISTING TOPOGRAPHY

EXHIBIT 5

A PORTION OF THE SOUTHEAST QUARTER OF SECTION 10
TOWNSHIP 2 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER
MERIDIAN, MARICOPA COUNTY, ARIZONA

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CONSTRUCTION NOTES

1. EXISTING CONCRETE VALLEY GUTTER TO REMAIN.
2. EXISTING CURB AND GUTTER TO REMAIN.
3. PROPOSED CONCRETE SINGLE CURB.
4. PROPOSED CURB OPENING. ELEVATION AS NOTED.
5. EXISTING CURB AND GUTTER TO BE REMOVED.
6. PROPOSED ASPHALT PAVEMENT.
7. PROPOSED CONCRETE SIDEWALK.
8. PROPOSED SIDEWALK RAMP.
9. EXISTING CURB OPENING TO REMAIN. ELEVATION AS NOTED.
10. PROPOSED CONCRETE CURB AND GUTTER.

LEGEND

PROPOSED	DESCRIPTION	EXISTING
	MAJOR CONTOUR	
	MINOR CONTOUR	
	LOT LINE	
FO	FIBER OPTIC LINE	FO
OHC	OVERHEAD COMM LINE	OHC
UGC	UNDERGROUND COMM LINE	UGC
OHE	OVERHEAD ELECTRIC LINE	OHE
UGE	UNDERGROUND ELECTRIC LINE	UGE
GAS	NATURAL GAS LINE	GAS
S	SEWER LINE (FLOW DIR SHOWN)	S
	SEWER SERVICE LINE	
	STORM DRAIN	
W	WATER MAIN	W
	WATER SERVICE LINE	
X	FENCE	X
	CONC CURB (AND GUTTER)	
SS	SANITARY 4' MANHOLE	SS
	SANITARY CLEAN-OUT	
SD	STORM DRAIN MANHOLE	SD
	CURB INLET	
	CATCH BASIN	
	FIRE HYDRANT	
	WATER VALVE	
WM	WATER METER	WM
	BACKFLOW PREVENTOR	

OWNER
PV HOTEL VENTURE SPE LLC
6060 N. SCOTTSDALE ROAD
SCOTTSDALE, AZ 85253

ARCHITECT
PHX ARCHITECTURE
15990 N. GREENWAY-HAYDEN LOOP
SUITE C100
SCOTTSDALE, AZ 85260
PHONE: 480-477-1111
CONTACT: ANDREA LUCARELLI

CIVIL ENGINEER
HUBBARD ENGINEERING
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CONTACT: BRENT STEFFENHAGEN, P.E.

SURVEY
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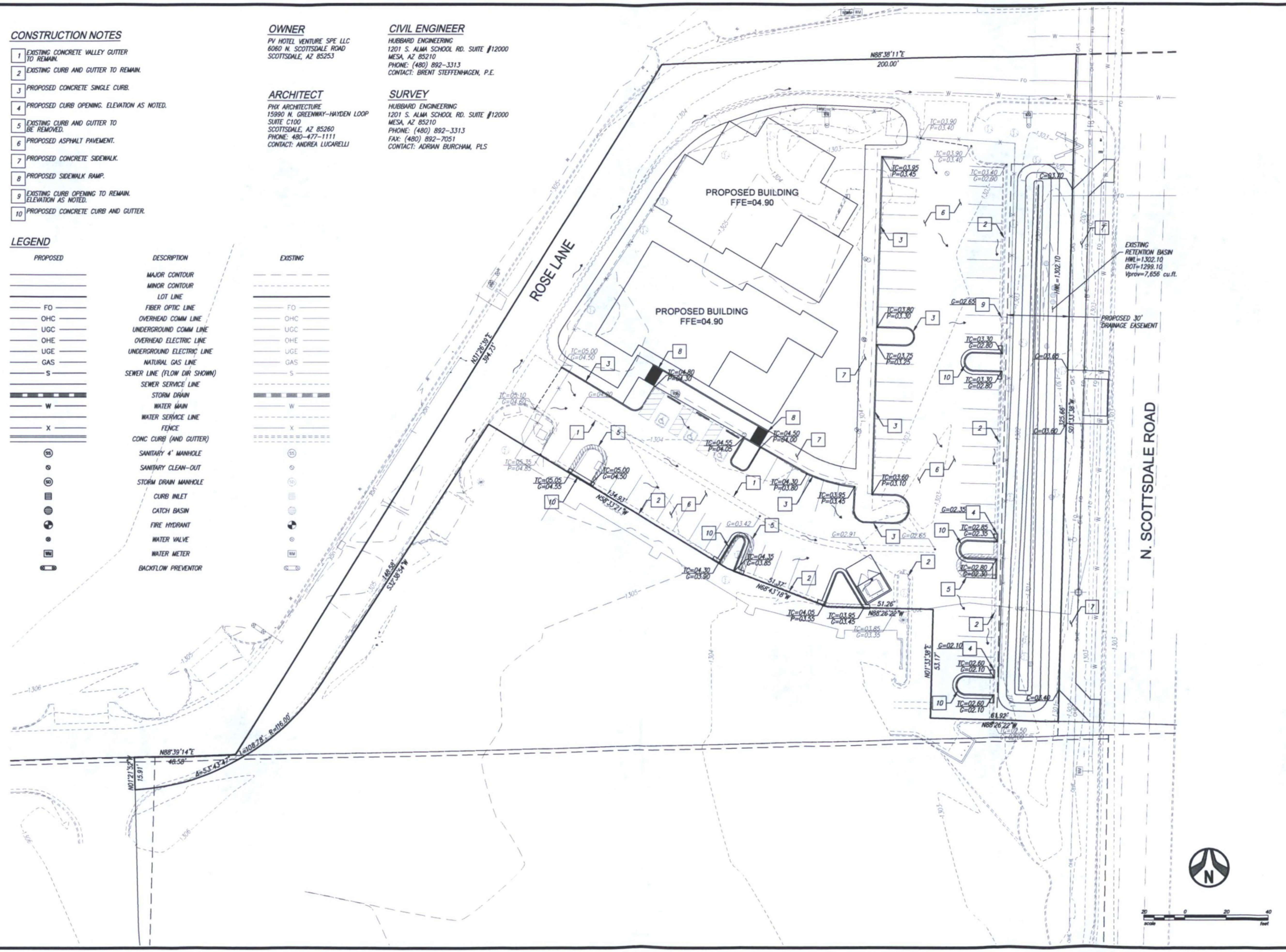
PHONE: (480) 892-3313
FAX: (480) 892-7051
CONTACT: ADRIAN BURCHAM, PLS



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PRELIMINARY GRADING PLAN
COTTONWOODS RESORT & SUITES
A PORTION OF THE SOUTHEAST QUARTER OF SECTION 10
TOWNSHIP 2 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER
MERIDIAN, MARICOPA COUNTY, ARIZONA

Project No. 16143	Date 08/22/17
Project Mgr. BRS	Project Eng. BRS

NOT FOR CONSTRUCTION
PRELIMINARY
OR RECORDING
BID AT RISK

811
Call before you dig.
1.800.STAKE.IT
602.263.1100

SHT: 01 OF 01
EXHIBIT 6

1st Submittal **Resubmittal** (← circle one)

Development Application: PC/CC, CC and DRB (← circle one)

Coordinator: Greg B **Date of application submittal:** 5-31-17 **Preapp #:** 22-ZN-16

Case #:

Date Plans Were Routed: _____ **Staff that Routed Plans:** _____

Please check the appropriate box of the Type(s) of Application(s)		
Planning Commission and City Council	**Development Review**	Other
☐ General Plan Amendment (GP)	☐ Development Review (Major) (DR)	☐ Annexation/De-annexation (AN)
☐ Text Amendment (TA)	☐ Subdivisions (Major) (PP)	☐ In-Lieu Parking (IP) (More than 5 spaces
☒ Rezoning (ZN)	☐ Historic Property (HP)	☐ Hardship Exemption (HE)
☐ Conditional Use Permit (UP)	**Board of Adjustment**	Other Application Type Not Listed
☐ In-fill Incentive (II)	☐ Variance (BA)	☐
☐ Abandonment (AB)	☐ Zoning or DS&PM Appeal	☐

	PC/CC Track - Not including major General Plan Amendment		DRB Track		BofA Track	White	Other

Coordinator, please complete the following:

1. Is this a resubmittal: Yes or No *(circle one)*
   Yes, this is a resubmittal. Indicate the Review Track that the application was *resubmitted* on: _____
2. Review Team. Please indicate below, who and what are to be routed.
3. Review Due Date. Please indicate the Comments Due Date below for the Review Track that the application was submitted on.

Comments Due Date: _____ / **Review Team**	Response Memo Letter	Narrative	Site Plan	G & D Plan	Drainage Report	Trip gen, Traffic Study, TIMA	Water and/or Wastewater Basis of Design	Archaeological Report	Others	Add other item(s) below
Design Review - Steve Venker	☑	☑	☑	☐				☐ qty 1	☑	B+W elevations landscape
Engineering Group – ~~Eliana Hayes~~ David G.	☑	☐	☑	☐					☐	
Transportation Engineering - Phil Kercher	☑	☐ qty 2	☑ qty 2	☐		☑ qty 2			☐	
Transportation Planning – Greg Davies	☐	☐	☐	☐					☐	
Water Resources – Chris Hassert	☐	☐	☐	☐			☐ qty 2		☐	
Fire Group – Ricky King	☑	☐	☑ qty 2	☐					☐	
Drainage – ~~Richard Anderson~~ Mohammad	☐	☐	☐	☑	☑ qty 2				☐	
GIS - (Street Names, PP Cases) - Tanya H.	☐	☐	☐	☐					☐	
Airport - Sarah Ferrara	☐	☐	☐	☐					☐	
Maps – (PP Cases) – Greg Williams	☐	☐	☐	☐					☐	
Land Survey – (PP, Dedications) – Dwayne H.	☐	☐	☐	☐					☐	
Historic Preserv. or Archaeological – Steve V.	☐	☐	☐	☐				☐	☐	
Long Range Planning – Taylor R.	☐	☑	☑							
Other:	☐	☐	☐	☐					☐	

22-ZN-2016
5/31/2017

Case Review – Rose Lane Commercial Parcel (Cottonwoods Resorts and Suites)

PROJECT NAME: ROSE LANE COMMERCIAL PARCEL
LOCATION: SOUTHEAST CORNER OF SCOTTSDALE ROAD AND ROSE LANE
CASE NUMBER: 22-ZN-2016

Review comments for case drainage report by Hubbard Engineering sealed May 24, 2017. The date of our review is June 20, 2017. Our review comments are as follows:

1. The ground cover delineation for the pre-developed condition appears to designate some landscaped areas as impervious. This may overestimate pre-developed flow and under-estimate impacts during post-developed conditions. Delineate these landscaped areas and take this account when calculating the weighted runoff coefficient. [*Reference: COS DSPM: Section 4-1.806*]

2. Submit a preliminary grading and drainage plan on a folded 24"x36" sheet showing existing topo, proposed contours or finished grade elevations, and arrows indicating drainage patterns. Label the existing basin and indicate the proposed drainage easement for the basin. [*Reference: COS DSPM: Section 4-1.804*]

3. For redevelopment projects, the current policy is to preserve any existing stormwater storage and meet first flush treatment for the re-developed area. The proposed drainage concept for this project is acceptable if the Engineer can demonstrate that the existing basin has enough storage to accommodate both (a) the 100-year, 2-hour volume per NOAA Atlas 14 rainfall and (b) first flush (0.5 inch) [*Reference: COS Ordinance: Section 37-1.804*]

4. The area of disturbance during construction of this project will exceed 1 acre. Any disturbed area over 1 acre requires a Notice of Intent (NOI) Certification from the ADEQ prior to construction. Please add a section in the report stating that an NOI will be submitted to ADEQ and an approved NOI Certification from ADEQ with an AZCON number will be provided to the City during the improvement plans submittal. [*Reference: COS DS&PM: Section 4-1.300*]

5. Each drainage report should include a completed Warning and Disclaimer of Liability. [*Reference: COS DSPM: Section 4-1A*]

Alex Meñez, P.E., CFM
Sr. Stormwater Engineer
Stormwater Management
City of Scottsdale
Phone: 480-312-7278

TABLE OF CONTENTS

FIGURES

APPENDICES

EXHIBITS

1. INTRODUCTION AND SCOPE OF WORK

This report presents the results of a *Master Drainage Study* conducted by Hubbard Engineering at the request of Delawie ("client"), for Cottonwoods Resort & Suites ("site"). The purpose of this report is to provide a hydrologic and hydraulic evaluation for the site so that the site can be rezoned. This report addresses on-site conditions as well as storm water runoff retention.

1.1 Site Description

The site is located in Section 10 of Township 2N, Range 4E of the Gila and Salt River Base and Meridian, Maricopa County, Arizona. The location of the site is shown on the site *Vicinity Map*, **FIGURE 1**, on the next page.

1.2 Project Description

The site was previously developed with an existing building with water service connections, sewer service connections, asphalt paved parking lot, concrete sidewalk, concrete curb, block site wall, landscape areas and a surface retention basin that has grass for ground cover. The adjacent half streets to the site are fully developed. The existing building on the site was demoed however, the existing paved parking lot remains along with the existing surface retention basin along Scottsdale Road. There are no offsite flows onto the existing site.

COTTONWOODS RESORT & SUITES
MARICOPA, ARIZONA

LOCATED AT 6160 N SCOTTSDALE RD
PARADISE VALLEY, ARIZONA 85253

MASTER DRAINAGE REPORT

MAY 2017
Project No.: 16143

PREPARED FOR:
PV HOTEL VENTURES SPE, LLC
4858 E. BASELINE RD., SUITE 101
MESA, AZ 85206

PREPARED BY:
HUBBARD ENGINEERING
1201 S. ALMA SCHOOL RD., SUITE 12000
MESA, ARIZONA 85210
(480) 892-3313
BRENT STEFFENHAGEN, PE

HUBBARD ENGINEERING

Plat #
Case # 22-ZN-2016
D-S #

☐ Accepted
☑ Corrections

Alex Muñoz 6/20/17
Reviewed By Date

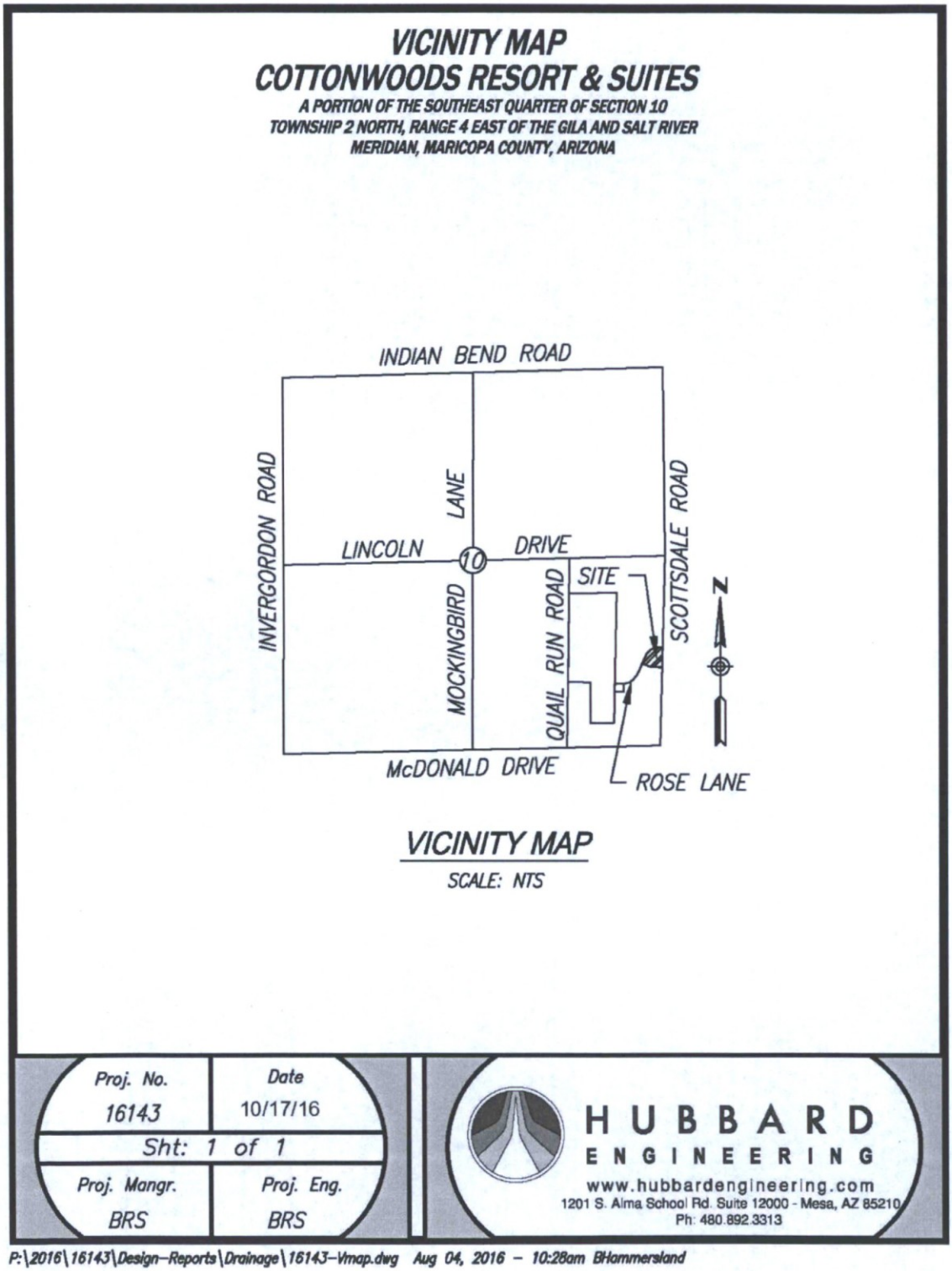

Figure 1 – Vicinity Map

1.3 Design Criteria

The criteria used in the drainage design and analysis of the site was established using the guidelines as described in the following:

- *Design Standards & Policies Manual Chapter 4 Grading and Drainage, City of Scottsdale, Dated January, 2010.* (Reference 1).
- *Drainage Design Manual for Maricopa County, Arizona, Volume I, Hydrology* (Reference 2).
- *Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics* (Reference 3).

2. DESCRIPTION OF EXIST. DRAINAGE COND. & CHARACTERISTICS

2.1 Onsite Drainage

As previously mentioned, the site was previously developed with an existing building with water service connections, sewer service connections, asphalt paved parking lot, concrete sidewalk, concrete curb, block site wall, desert landscape areas and a surface retention basin that has grass for ground cover. The adjacent half streets are fully developed. The existing building on the site was recently demoed however, the existing paved parking lot remains along with the existing surface retention basin along N. Scottsdale Road.

A pre-vs-post drainage analysis was done on the existing site representing the previous site condition with the building and the post (future) site conditions with future buildings locations and proposed ground cover. The future conceptual site layout is very similar to pre-project site layout. All ground cover areas will stay the same as the pre site conditions. The existing site has one drainage area DA-A which is shown in **Exhibit 4**. DA-A drains to the existing retention basin along Scottsdale Rd via sheet flow. The demolition of the existing building included the concrete slab of the building therefore the impervious area of the demoed building. A C-value of 0.95 was used for impervious areas and a C-value of 0.30 was used for grass areas. See **Exhibits 2 & 6** for pre-vs-post ground cover delineation areas. See **Section 2.5** for additional information on pre-vs-post drainage analysis. See **Exhibit 1** for Aerial Site Map, **Exhibit 5** for existing site topography.

In accordance with the requirements of the City of Scottsdale Design Standards & Policies Manual, the subject property will be required to retain the 100-year, 2-hour runoff volume, which is determined by utilizing the following formula:

$$V = C * (P/12) * A$$

where,

V = Storage volume (acre-feet)

C = Watershed runoff coefficient

P = 100-year, 2-hour precipitation (inches)

A = Drainage area (acres)

According to the City of Scottsdale Design Standards & Policies Manual, the 100-year, 2-hour depth is 2.2 inches for the site area. See **Appendix B** for NOAA rainfall data.

A "weighted" C-value is determined for each drainage area by utilizing the formula:

$$Cw = \frac{A_1*C_1 + A_2*C_2 + A_3*C_3 \ldots A_n*C_n}{A_1 + A_2 + A_3 \ldots A_n}$$

where,

A_i = Area in the i_{th} sub-area (acres)

C_i = Runoff coefficient in the i_{th} sub-area

As identified in Figure 4.1-4 of the City of Scottsdale Design Standards & Policies Manual, the following "C" values will be used in the retention calculations:

Land Use Category	100-year max. "C" value
Pavement and Rooftops (Impervious Areas)	0.95
Lawns, golf course & parks (grassed areas)	0.30

The volume provided in the proposed retention basins is calculated by using the prismoidal formula:

$$V = d/3 * (A_1 + A_2 + (A_1 * A_2)^{0.5})$$

where,

V = Storage volume (cu.ft.)

d = Depth (ft)

A_1 = Area of upper contour (sq.ft.)

A_2 = Area of lower contour (sq.ft.)

The volume of the existing retention basin was determined by using the prismoidal formula. See **Table 1** below for the existing retention basin volume.

Table 1: Existing Basin Volume

EXISTING RETENTION BASIN							
Drainage Area	HW Elevation (ft)	HW Area ft^2	Bottom Elevation (ft)	Bottom ft^2	H ft	Volume Provided ft^3	Drainage Areas contributing to Basins
RB1	1302.25	14,000.00	1300.25	680.00	2	11,844	DA-A
					Total ->	**11,844**	

14,000.00 <= Total Area @ H.W.'s

Volume Provided = $H/3*(A_{H.W.} + A_{BOTTOM} + (A_{H.W.} * A_{BOTTOM})^{0.5})$

In accordance with the City of Scottsdale Drainage Ordinance, retention basins are required to be drained within a 36-hour period after the storm event.

There is an existing drywell located in the existing retention basin that currently assists in the dissipation of the water to drain within the required 36-hours. See **Exhibit 2 & 6** for drywell location. When the property is developed in the future a Final Drainage Report will need to be submitted along with the Improvement Plans to verify that the proposed site will not require additional storage than what is currently provided by the existing basin and if additional drywell or drywells need to be added to drain the water within the required 36-hours.

Drainage calculations can be found at the end of this drainage study.

2.2 Existing Off-Site Conditions Characteristics

There are no existing offsite flows that inundate the existing site.

2.3 Flood Zone Information

The Maricopa County, Arizona and Incorporated Areas Flood Insurance Rate Map (*F.I.R.M.)* number 04013C1770L panel number 1770 of 4425, dated October 16, 2013 indicates that the project falls within Zone X. A Copy of the FEMA Firmette map can be found in **FIGURE 2**.

Zone X is defined by the Federal Emergency Management Agency (FEMA) as:

> "Areas determined to be outside the 0.2% annual chance floodplain."

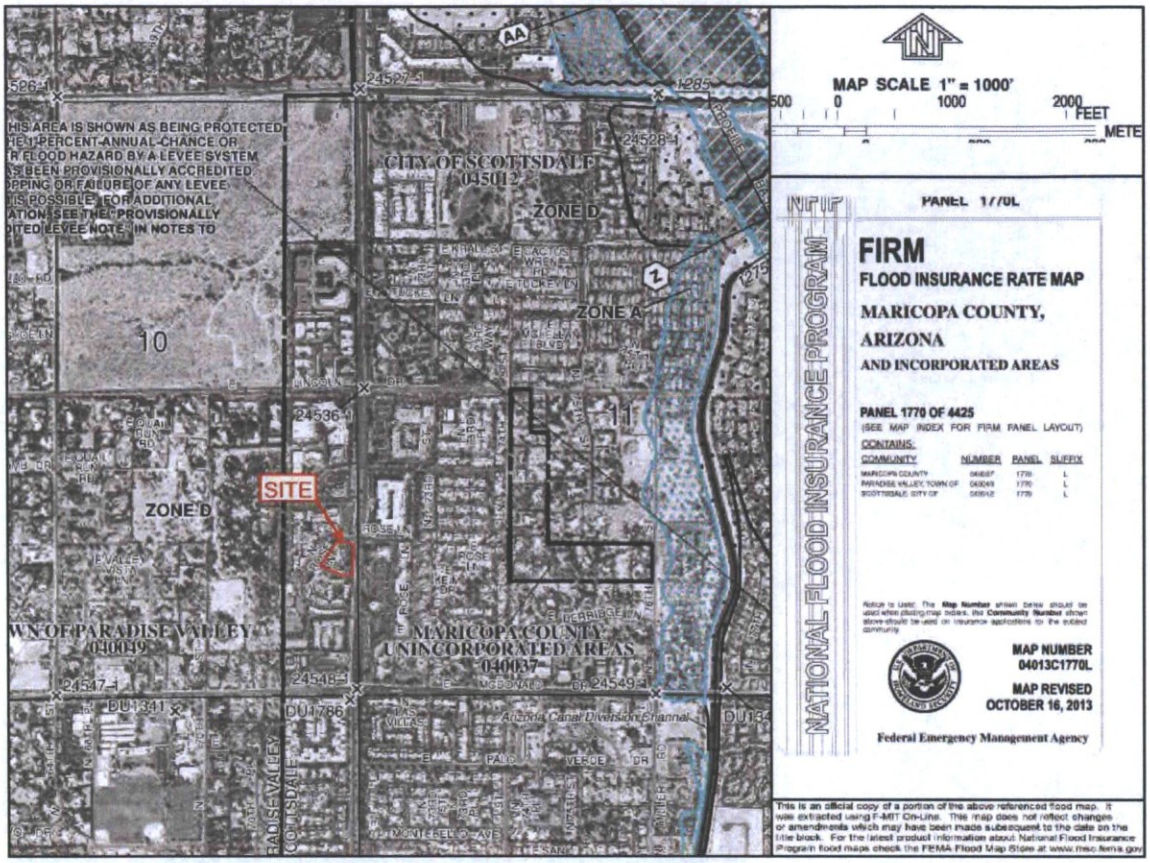

Figure 2 – FIRM

2.4 Pre- and Post-Project Topography

The pre and post project topography will be very similar since they will maintain the same drainage scheme and drain to the same existing basin. See **Exhibit 5 & 6** for existing site topography map and conceptual grading plan.

2.5 Pre- and Post-Project Stormwater Runoff

The entire drainage area DA-A shown in **Exhibit 4** will drain to the existing retention basin RB-1 located along Scottsdale Road. The site was determined to have one drainage area and **Exhibit 4** is labeled accordingly. The runoff from DA-A will drain to RB-1 via sheet flow. The existing basin RB-1 is 2 feet in depth and has a capacity of approximately 11,844 cubic feet. For the pre-condition drainage analysis, it was determined that the required volume that the retention basin must provide per City of Scottsdale's *Design Standards and Policies Manual* (Reference 1) was 8,241 cubic feet. The post-condition drainage analysis determined that the required volume the retention basin must also provide the same as the pre-condition 8,241 cubic feet of water. Therefore, the existing retention basin has adequate volume for the

current site condition. The existing basin also has an existing drywell incorporated in the bottom of the basin so that the basin drains within the permitted time of 36 hours. See **Appendix A** pre vs post calculations.

3. SPECIAL CONDIDTIONS

3.1 Section 404 & 401

The site is not delineated as a 404 & 401 jurisdiction.

3.2 AZPDES

If in the future the site regraded an AZPDES permit maybe required if the land disturbed is more than one acre.

3.3 ESL

The site does not qualify as an Environmentally Sensitive Land on the City of Scottsdale Environmentally Sensitive Land Inventories.

4. DATA ANALYSIS METHODS

4.1 Peak Flows and Stormwater Storage

Storage for the 100-year, 2-hour and peak flow for the 100-year storm was determined by rational method per COS Requirements. See the associated Appendices for the references and parameters that were used to calculate the storm water required retention.

5. SUMMARY AND CONCLUSION

- The project is bound by N. Scottsdale Rd to the east, Rose Ln. to the west and north and by condos on the south side.
- Any future development on the site must abide by the City of Scottsdale's Design Standards & Policies Manual.
- The pre vs post analysis determined that the existing retention basin provides the adequate volume for the current site conditions.
- The site will covey the 100-yr storm event via surface flow into the existing retention basin along N. Scottsdale Road.
- The post conceptual site will have the same drainage area and drainage scheme. It will also have the same ground cover areas as the pre-project condition.
- Subject site is currently located in Flood Plain Zone X per FEMA No. 04013C1770L.

6. REFERENCES

1. *Design Standards & Policies Manual Chapter 4 Grading and Drainage, City of Scottsdale, Dated January, 2010.*
2. *Drainage Design Manual For Maricopa County, Arizona, Volume I, Hydrology*, Flood Control District Of Maricopa County, February 2013.
3. *Drainage Design Manual For Maricopa County, Arizona, Volume II, Hydraulics*, Flood Control District Of Maricopa County, January 2013. *Flood Insurance Rate Map (F.I.R.M.) Maricopa County, Arizona and Incorporated areas, Panel 1770 of 4425*

7. LIMITATIONS

This report is focused on providing practical design information, evaluation, and calculations for statistical flood events up to and including the 100-year frequency flood. The procedures used herein are derived from, and performed with, currently accepted engineering methodologies and practices. Additionally, the criteria for this evaluation is designed to conform to currently applicable ordinances, regulations and policies effected by the appropriate jurisdictional regulatory authorities for the site.

The analysis presented herein focuses on developing design estimates of storm water runoff resulting from a statistical evaluation of storm events of particular duration and frequency up to and including a 100-year frequency event. A storm event exceeding the 100-year frequency event may cause or create the risk of greater flood impact than is addressed and presented herein. However, the scope of this assessment does not include evaluation of storm water runoff resulting from storm events exceeding the 100-year frequency event. Hubbard Engineering assumes no responsibility for actual flood damage, increased risks of flood damage, or increased construction or development cost resulting from or related to any such events. Nor shall Hubbard Engineering be responsible for any changes in, or additions to, regulatory requirements which may result from, or be related to, any such events or changes in hydrologic or hydraulic conditions within the watershed.

In performing the services contained herein, Hubbard Engineering has received or will receive information prepared or compiled by others. Hubbard Engineering, as engineering professionals, are not required to verify the information, but may rely on the information unless actual knowledge concerning the validity of the information is known or is obvious to the professional. Therefore, Hubbard Engineering is entitled to rely upon the accuracy and completeness of this information without independent evaluation or verification.

Appendix A
Retention Calculations
Cottonwoods Resort & Suites

HYDRAULIC CALCULATION SHEET
POST Composite "C" Calculation
Hubbard Engineering
Project No. 16143

Project Name: Cottonwoods Resort
Project No: 16143

Prepared By: BAH
Checked By:

Date: 05/23/17
Date:

Purpose: Calculate a weighted "C" Value for a drainage area.

Methodology: The weighted "C" value is determined by summing the products of each surface "C" value times the suface area, and dividing by the sum of all of the surface areas.

References: 1. Scottsdale Drainage Design Policy

Calculation: $Cw = (C_{0.95}*A_{0.95} + C_{0.45}*A_{0.45})/A_{TOTAL}$

Surface	C	Area (Sq. Ft.)	C x Area
Hardscape	0.95	19,463	18,490
Grassed Areas	0.30	9,904	2,971
Impervious	0.95	24,793	23,553
Total	N/A	54,160	45,014
		1.243342516	1.03338843

"Cw"= 0.83	Weighted Runoff Coefficient

HYDRAULIC CALCULATION SHEET
Post Retention Calculations
Hubbard Engineering
Project No. 16143

Project Name: Cottonwoods Resort
Project No.: 16143

Prepared by: BAH
Revised By:

Date: 05/23/17
Date:

Purpose: Evaluate the required and provided retention volumes in order to assess conformance to project criteria.

Methodology: Calculate the volume of stormwater required to be retained using City of Scottsdale criteria. Calculate the estimated volume of stormwater retained using retention basin geometry.

Criteria: Retain the calculated stormwater run-off for the 100-YEAR 2-HOUR duration storm event.

References: 1. Scottsdale Drainage Design Policy
2. Drainage Design Manual for Maricopa County, Arizona, Volume II: Hydraulics, August 2013.

Calculations: Volume Required = $C_{Composite}$ *D/12* A [ft^3] (Reference 1)

D = 2.2	[in]	(Reference 1)
C = 0.95	(Paved Parking)	(Reference 1)
C = 0.30	(Grassed Areas)	(Reference 1)

Composite C= (C1*A1 + C2*A2…+….)/(A1+A2+….)

Volume Required = Composite C*P/12*A

Results:

Identifiers	CALCULATE RETENTION VOLUME REQUIRED		Volume Required	
Contributory Area ID	Area [acres]	C Post	[acre-ft]	[ft^3]
DA-A	1.24	0.83	0.19	8,241
Total Area:	**1.24**	**TOTAL VOLUME REQUIRED:**	**0.19**	**8,241**

HYDRAULIC CALCULATION SHEET
Pre Composite "C" Calculation
Hubbard Engineering
Project No. 16143

Project Name: Cottonwoods Resort
Project No: 16143

Prepared By: BAH
Checked By:

Date: 10/13/16
Date:

Purpose: Calculate a weighted "C" Value for a drainage area.

Methodology: The weighted "C" value is determined by summing the products of each surface "C" value times the suface area, and dividing by the sum of all of the surface areas.

References: 1. Scottsdale Drainage Design Policy

Calculation: $Cw = (C_{0.95}*A_{0.95} + C_{0.45}*A_{0.45})/A_{TOTAL}$

Surface	C	Area (Sq. Ft.)	C x Area
Grassed Areas	0.30	9,904.00	2971.20
Impervious	0.95	44,256.00	42043.20
Total	N/A	54160.00	45014.40

1.243342516 1.03338843

Weighted "C"

HYDRAULIC CALCULATION SHEET
Pre Retention Calculations
Hubbard Engineering
Project No. 16143

Project Name: Cottonwoods Resort
Project No.: 16143

Prepared by: BAH
Revised By:

Date: 10/13/16
Date:

Purpose: Evaluate the required and provided retention volumes in order to assess conformance to project criteria.

Methodology: Calculate the volume of stormwater required to be retained using City of Scottsdale criteria. Calculate the estimated volume of stormwater retained using retention basin geometry.

Criteria: Retain the calculated stormwater run-off for the 100-YEAR 2-HOUR duration storm event.

References:
1. Scottsdale Drainage Design Policy
2. Drainage Design Manual for Maricopa County, Arizona, Volume II: Hydraulics, August 2013.

Calculations: Volume Required = $C_{Composite}$ *D/12* A [ft^3] (Reference 1)

D = 2.2	[in]	(Reference 1)
C = 0.95	(Paved Parking)	(Reference 1)
C = 0.30	(Grassed Areas)	(Reference 1)

Composite C= (C1*A1 + C2*A2…+….)/(A1+A2+….)

Volume Required = Composite C*P/12*A

Results:

Identifiers	CALCULATE RETENTION VOLUME REQUIRED		Volume Required	
Contributory Area ID	Area [acres]	C PRE	[acre-ft]	[ft^3]
DA-A	1.24	0.83	0.19	8,241
Total Area:	**1.24**	**TOTAL VOLUME REQUIRED:**	**0.19**	**8,241**

HYDRAULIC CALCULATION SHEET

Retention Provided

Hubbard Engineering

Project No. 16143

Project Name: Cottonwoods Resort
Project No.: 16143

Prepared By: BAH
Revised By:

Date: 10/13/16
Date:

RETENTION BASINS					
Drainage Area	HW Area ft^2	Bottom ft^2	H ft	Volume Provided ft^3	Drainage Areas contributing to Basins
RB1	14,000.00	680.00	2	11,844	DA-A
			Total ->	**11,844**	

14,000.00 <= Total Area @ H.W.'s

Volume Provided = $H/3*(A_{H.W.} + A_{BOTTOM} + (A_{H.W.} * A_{BOTTOM})^{0.5})$

Appendix B
Rainfall Data
Cottonwoods Resort & Suites

NOAA Atlas 14, Volume 1, Version 5
Location name: Scottsdale, Arizona, USA*
Latitude: 33.5274°, Longitude: -111.9264°
Elevation: 1300.55 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.185 (0.155-0.226)	0.242 (0.203-0.296)	0.329 (0.274-0.401)	0.395 (0.327-0.480)	0.485 (0.395-0.586)	0.554 (0.446-0.666)	0.625 (0.494-0.749)	0.697 (0.541-0.834)	0.794 (0.600-0.951)	0.868 (0.643-1.04)
10-min	0.282 (0.236-0.345)	0.369 (0.310-0.451)	0.500 (0.417-0.610)	0.602 (0.498-0.730)	0.738 (0.602-0.892)	0.844 (0.679-1.01)	0.951 (0.752-1.14)	1.06 (0.824-1.27)	1.21 (0.914-1.45)	1.32 (0.979-1.59)
15-min	0.350 (0.292-0.428)	0.457 (0.384-0.559)	0.620 (0.517-0.756)	0.746 (0.618-0.906)	0.915 (0.746-1.11)	1.05 (0.841-1.26)	1.18 (0.932-1.41)	1.32 (1.02-1.57)	1.50 (1.13-1.80)	1.64 (1.21-1.97)
30-min	0.471 (0.393-0.576)	0.616 (0.517-0.753)	0.836 (0.696-1.02)	1.00 (0.832-1.22)	1.23 (1.00-1.49)	1.41 (1.13-1.69)	1.59 (1.25-1.90)	1.77 (1.38-2.12)	2.02 (1.53-2.42)	2.20 (1.63-2.65)
60-min	0.583 (0.487-0.713)	0.762 (0.640-0.932)	1.03 (0.861-1.26)	1.24 (1.03-1.51)	1.53 (1.24-1.84)	1.74 (1.40-2.10)	1.97 (1.55-2.36)	2.19 (1.70-2.62)	2.50 (1.89-2.99)	2.73 (2.02-3.28)
2-hr	0.677 (0.575-0.810)	0.877 (0.744-1.05)	1.17 (0.990-1.40)	1.40 (1.17-1.67)	1.71 (1.41-2.02)	1.94 (1.58-2.29)	2.19 (1.75-2.58)	2.43 (1.92-2.86)	2.76 (2.13-3.26)	3.02 (2.27-3.58)
3-hr	0.743 (0.628-0.899)	0.952 (0.809-1.16)	1.25 (1.05-1.51)	1.49 (1.24-1.79)	1.82 (1.50-2.17)	2.08 (1.69-2.47)	2.35 (1.88-2.80)	2.64 (2.07-3.13)	3.03 (2.31-3.61)	3.35 (2.49-3.99)
6-hr	0.894 (0.772-1.06)	1.13 (0.979-1.34)	1.45 (1.25-1.71)	1.70 (1.45-2.00)	2.05 (1.72-2.39)	2.32 (1.92-2.69)	2.60 (2.12-3.02)	2.89 (2.31-3.36)	3.28 (2.56-3.82)	3.59 (2.74-4.19)
12-hr	0.997 (0.869-1.16)	1.26 (1.10-1.47)	1.59 (1.38-1.85)	1.86 (1.60-2.15)	2.21 (1.88-2.55)	2.48 (2.09-2.86)	2.77 (2.29-3.19)	3.05 (2.49-3.52)	3.43 (2.74-3.97)	3.73 (2.92-4.35)
24-hr	1.18 (1.04-1.36)	1.50 (1.33-1.73)	1.95 (1.71-2.23)	2.30 (2.02-2.63)	2.79 (2.43-3.19)	3.17 (2.74-3.62)	3.57 (3.07-4.08)	3.99 (3.40-4.55)	4.57 (3.84-5.21)	5.02 (4.18-5.74)
2-day	1.28 (1.13-1.46)	1.63 (1.44-1.87)	2.14 (1.89-2.45)	2.55 (2.24-2.91)	3.12 (2.72-3.56)	3.58 (3.10-4.08)	4.05 (3.49-4.63)	4.55 (3.89-5.20)	5.25 (4.44-6.01)	5.81 (4.86-6.66)
3-day	1.36 (1.20-1.55)	1.73 (1.53-1.98)	2.28 (2.01-2.60)	2.72 (2.39-3.10)	3.34 (2.92-3.81)	3.84 (3.33-4.37)	4.37 (3.76-4.98)	4.93 (4.21-5.62)	5.72 (4.82-6.51)	6.35 (5.30-7.25)
4-day	1.43 (1.26-1.64)	1.83 (1.62-2.09)	2.42 (2.13-2.75)	2.89 (2.54-3.29)	3.57 (3.11-4.05)	4.11 (3.56-4.67)	4.69 (4.04-5.32)	5.31 (4.52-6.04)	6.18 (5.20-7.02)	6.89 (5.74-7.84)
7-day	1.60 (1.41-1.83)	2.05 (1.80-2.34)	2.71 (2.38-3.09)	3.24 (2.84-3.70)	4.00 (3.48-4.56)	4.61 (3.98-5.24)	5.26 (4.51-5.98)	5.95 (5.06-6.78)	6.93 (5.81-7.89)	7.71 (6.41-8.80)
10-day	1.73 (1.53-1.98)	2.22 (1.96-2.53)	2.93 (2.58-3.33)	3.51 (3.07-3.98)	4.31 (3.76-4.88)	4.95 (4.29-5.60)	5.64 (4.85-6.38)	6.36 (5.43-7.21)	7.37 (6.22-8.35)	8.18 (6.84-9.29)
20-day	2.14 (1.89-2.42)	2.75 (2.43-3.11)	3.63 (3.21-4.10)	4.30 (3.79-4.85)	5.20 (4.56-5.87)	5.89 (5.15-6.65)	6.60 (5.74-7.45)	7.32 (6.33-8.27)	8.28 (7.10-9.38)	9.03 (7.68-10.2)
30-day	2.50 (2.20-2.83)	3.22 (2.84-3.64)	4.24 (3.74-4.79)	5.02 (4.41-5.66)	6.07 (5.31-6.84)	6.87 (5.99-7.74)	7.70 (6.68-8.66)	8.54 (7.37-9.60)	9.67 (8.29-10.9)	10.5 (8.96-11.9)
45-day	2.88 (2.56-3.26)	3.72 (3.30-4.19)	4.90 (4.34-5.52)	5.78 (5.10-6.51)	6.93 (6.10-7.80)	7.80 (6.85-8.78)	8.69 (7.58-9.78)	9.57 (8.32-10.8)	10.7 (9.26-12.1)	11.6 (9.96-13.1)
60-day	3.18 (2.83-3.58)	4.11 (3.66-4.62)	5.41 (4.81-6.07)	6.36 (5.63-7.14)	7.59 (6.71-8.51)	8.50 (7.48-9.53)	9.41 (8.25-10.6)	10.3 (9.00-11.6)	11.5 (9.97-12.9)	12.4 (10.7-14.0)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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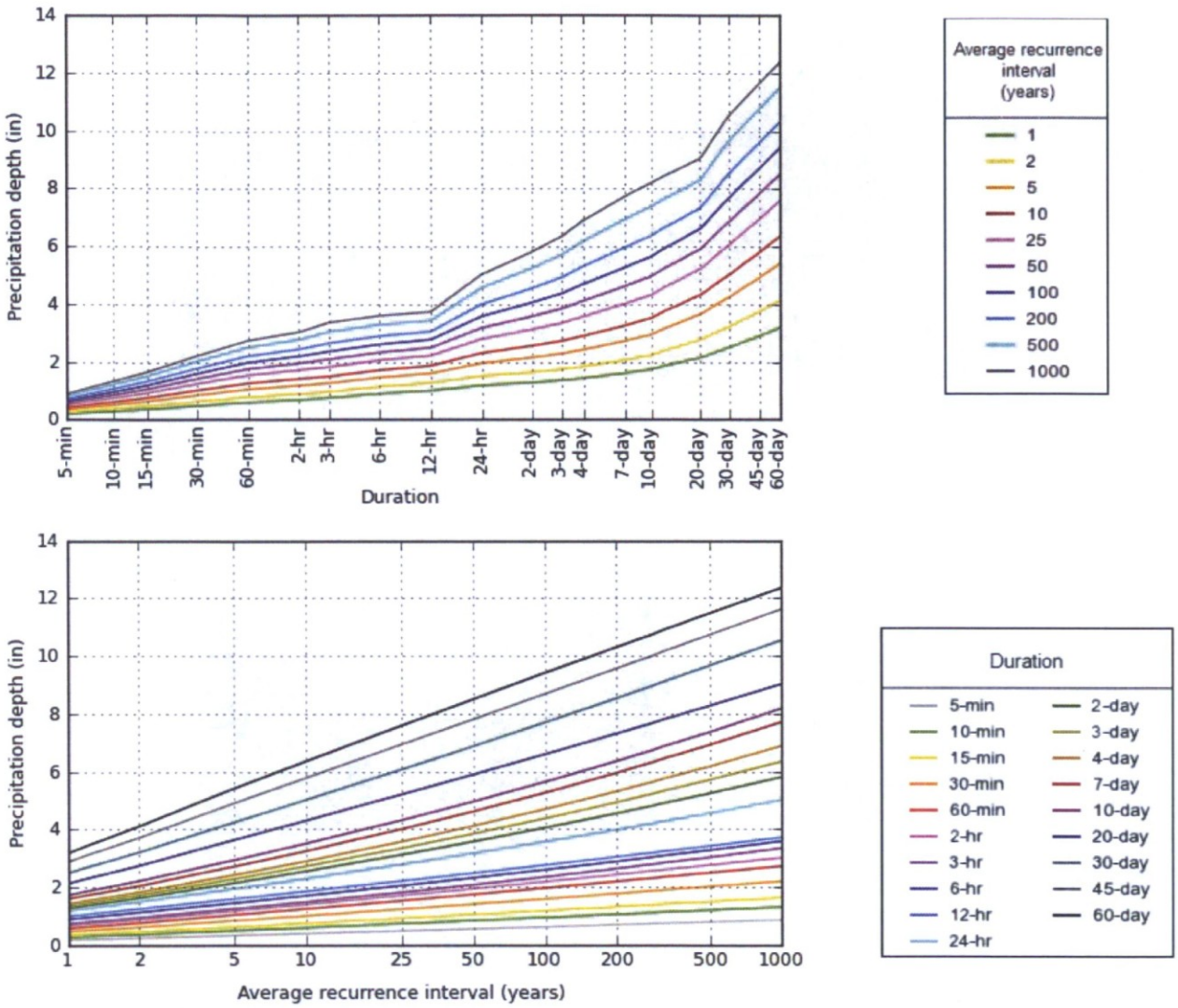
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 33.5274°, Longitude: -111.9264°



NOAA Atlas 14, Volume 1, Version 5

Created (GMT): Thu Oct 13 22:13:01 2016

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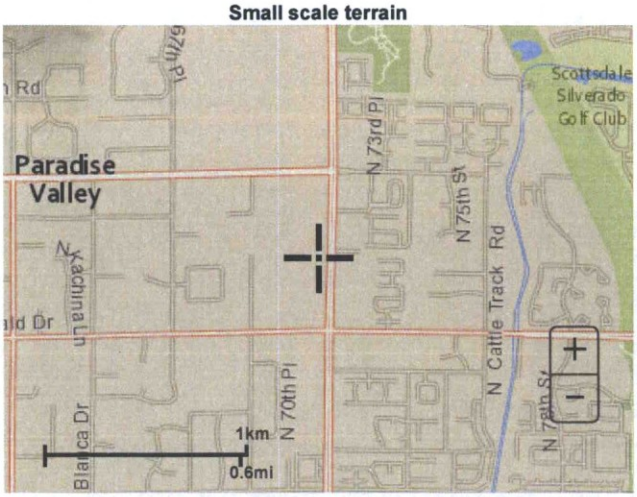
Maps & aerials

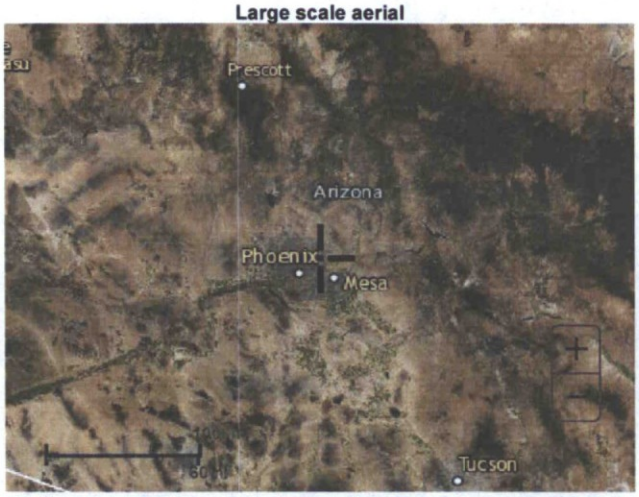
Small scale terrain



Large scale terrain

Large scale map

Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

LEGEND

EXISTING MAJOR CONTOUR
EXISTING MINOR CONTOUR
DRAINAGE AREA

EXISTING GRADES — TC=20.50 G=20.00

PAVEMENT EXISTING — PE=173

DRAINAGE AREA ID — DA-A

EXISTING RETENTION BASIN							
Drainage Area	HW Elevation (ft)	HW Area ft²	Bottom Elevation (ft)	Bottom ft²	H ft	Volume Provided ft³	Drainage Areas contributing to Basins
RB1	1302.25	14,000.00	1300.25	680.00	2	11,844	DA-A
					Total ->	11,844	

14,000.00 <= Total Area @ H.W.'s

Volume Provided = $H/3*(A_{H.W.} + A_{BOTTOM} + (A_{H.W.} * A_{BOTTOM})^{0.5})$

DA-A
Vrpre=8,241 C.F.
Vrpost=8,241 C.F.
Vp=11,844 C.F.

EXISTING PROPERTY LINE
ROSE LANE
N. SCOTTSDALE ROAD
COMPACTED SOIL
EXISTING PAVEMENT
EXISTING RB-1
DEPTH 2'
EXISTING DRYWELL
RIM=1299.71
GRASS COVER
EXISTING PROPERTY
PROPERTY LINE

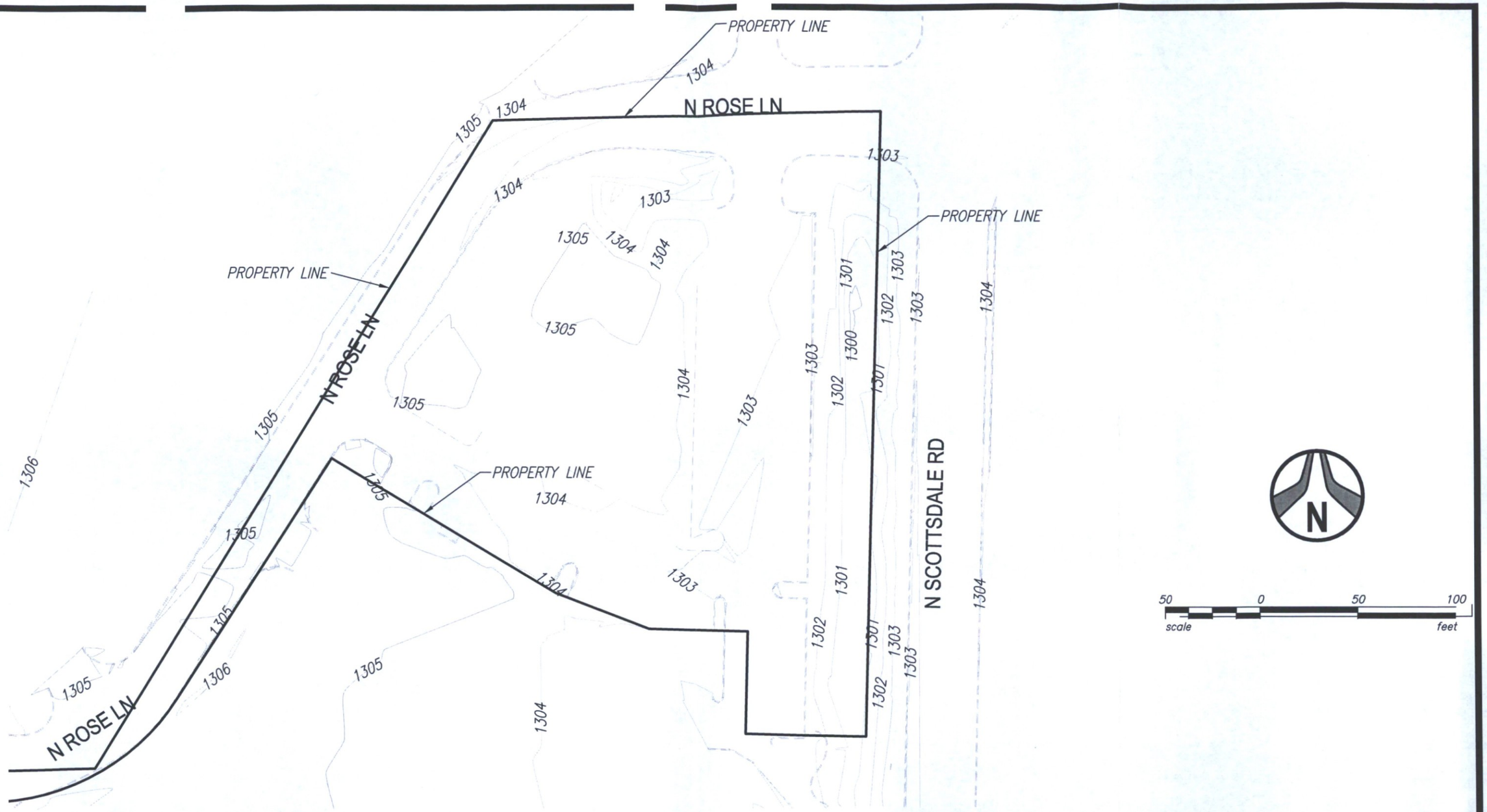
HUBBARD ENGINEERING
1201 S. Alma School Rd.
Suite 12000
Mesa, AZ 85210
Ph: 480.892.3313
www.hubbardengineering.com

EXISTING SITE DRAINAGE MAP
COTTONWOODS RESORT & SUITES
A PORTION OF THE SOUTHEAST QUARTER OF SECTION 10
TOWNSHIP 1 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER
MERIDIAN, MARICOPA COUNTY, ARIZONA

Date 05/23/17
Project No. 16143

Exhibit 4

P:\2016\16143\Design-Reports\Drainage\Exhibits\EXHIBIT 4.dwg May 23, 2017 - 8:11pm Bhammerstad



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Proj. No.	Date
16143	10/13/2016
Sht: 1 of 1	

EXISTING TOPOGRAPHY

EXHIBIT 5

A PORTION OF THE SOUTHEAST QUARTER OF SECTION 10
TOWNSHIP 2 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER
MERIDIAN, MARICOPA COUNTY, ARIZONA

HUBBARD ENGINEERING
1201 S. Alma School Rd.
Suite 12000
Mesa, AZ 85210
Ph: 480.892.3313
www.hubbardengineering.com

LEGEND

GROUND COVER DELINEATION

DRAINAGE AREA

DRAINAGE AREA ID **DA-A**

GROUND COVER TYPE "BUIDLINGS & HARDSCAPE"

GROUND COVER TYPE "PAVEMENT"

GROUND COVER TYPE "GRASS"

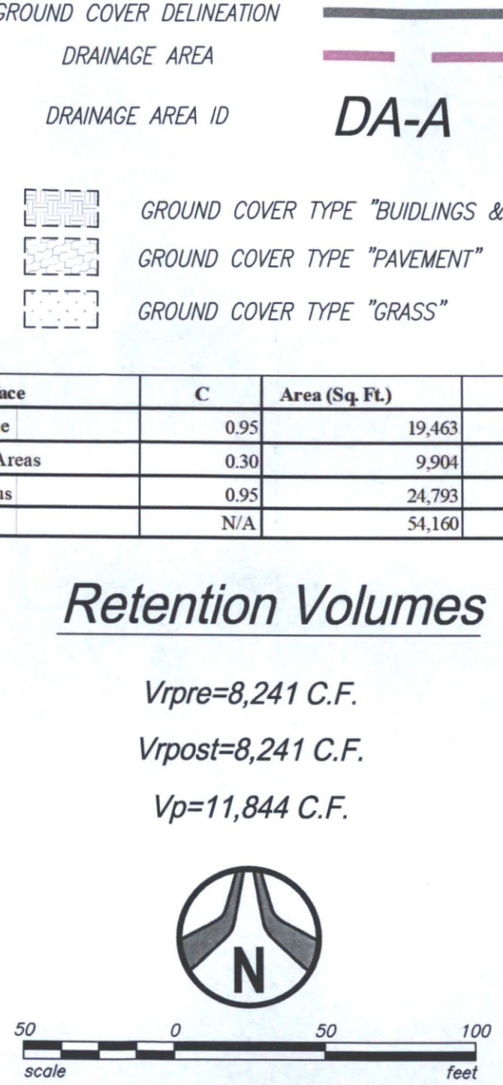
Surface	C	Area (Sq. Ft.)	C x Area
Hardscape	0.95	19,463	18,490
Grassed Areas	0.30	9,904	2,971
Impervious	0.95	24,793	23,553
Total	N/A	54,160	45,014

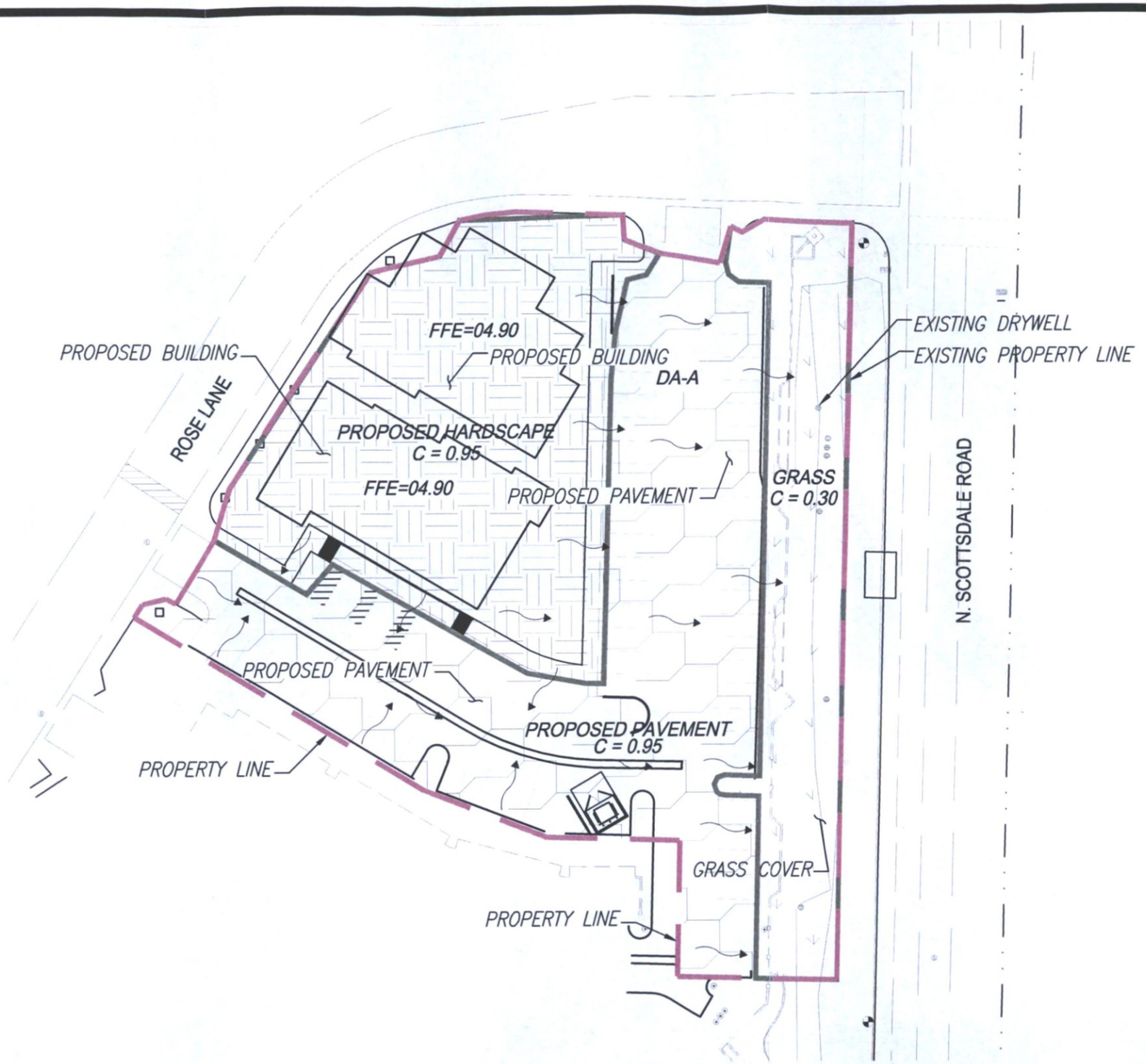
Retention Volumes

Vrpre=8,241 C.F.

Vrpost=8,241 C.F.

Vp=11,844 C.F.





Proj. No.	Date
16143	05/23/17
Sht: 1 of 1	

CONCEPTUAL GRADING PLAN

EXHIBIT 6

A PORTION OF THE SOUTHEAST QUARTER OF SECTION 10
TOWNSHIP 2 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER
MERIDIAN, MARICOPA COUNTY, ARIZONA

HUBBARD ENGINEERING
1201 S. Alma School Rd.
Suite 12000
Mesa, AZ 85210
Ph: 480.892.3313
www.hubbardengineering.com

LEGEND

GROUND COVER DELINEATION

DRAINAGE AREA

DRAINAGE AREA ID **DA-A**

GROUND COVER TYPE "BUIDLINGS & HARDSCAPE"

GROUND COVER TYPE "PAVEMENT"

GROUND COVER TYPE "GRASS"

Surface	C	Area (Sq. Ft.)	C x Area
Hardscape	0.95	19,463	18,490
Grassed Areas	0.30	9,904	2,971
Impervious	0.95	24,793	23,553
Total	N/A	54,160	45,014

Retention Volumes

Vrpre=8,241 C.F.

Vrpost=8,241 C.F.

Vp=11,844 C.F.

N

50 0 50 100

scale feet

Proj. No.	Date
16143	05/23/17
Sht: 1 of 1	

POST DEVELOPMENT AERIAL GROUND COVER MAP

EXHIBIT 3

A PORTION OF THE SOUTHEAST QUARTER OF SECTION 10
TOWNSHIP 2 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER
MERIDIAN, MARICOPA COUNTY, ARIZONA

HUBBARD ENGINEERING
1201 S. Alma School Rd.
Suite 12000
Mesa, AZ 85210
Ph: 480.892.3313
www.hubbardengineering.com

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Exhibit 1		Project No. 16143	Date 10/13/16

AERIAL SITE MAP
COTTONWOODS RESORT & SUITES
A PORTION OF THE SOUTHEAST QUARTER OF SECTION 10
TOWNSHIP 2 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER
MERIDIAN, MARICOPA COUNTY, ARIZONA

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LEGEND

GROUND COVER DELINEATION

DRAINAGE AREA

DRAINAGE AREA ID **DA-A**

GROUND COVER TYPE "PAVEMENT"

GROUND COVER TYPE "GRASS"

GROUND COVER TYPE "IMPERVIOUS"

Surface	C	Area (Sq. Ft.)	C x Area
Grassed Areas	0.30	9,904.00	2971.20
Impervious	0.95	44,256.00	42043.20
Total	N/A	54160.00	45014.40

Retention Volumes

Vrpre=8,241 C.F.

Vp=11,844 C.F.

N

50 0 50 100

scale feet

Proj. No.	Date
16143	05/23/17
Sht: 1 of 1	

PRE-DEVELOPMENT AERIAL GROUND COVER MAP

EXHIBIT 2

A PORTION OF THE SOUTHEAST QUARTER OF SECTION 10
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MERIDIAN, MARICOPA COUNTY, ARIZONA

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