

SOUTHWEST TRAFFIC
ENGINEERING, LLC

TRAFFIC IMPACT ANALYSIS

HOPEWELL REEMS

ORANGEWOOD AVENUE/REEMS ROAD

29 APRIL 2021



PREPARED FOR
HOPEWELL DEVELOPMENT
410, 2020 4TH STREET SW
CALGARY, ALBERTA T2S 1W3
CANADA

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



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Prepared By:

Andrew Smigielski, PE, PTOE, PTP
Austin Kennedy, EIT



HOPEWELL REEMS ORANGEWOOD AVENUE/REEMS ROAD TRAFFIC IMPACT ANALYSIS

Executive Summary

The purpose of this traffic study is to evaluate the current and future transportation system within the project study area surrounding the site without and with the proposed Hopewell Reems industrial park. Hopewell Reems will be constructed in two phases. The first phase proposed to complete two light industrial buildings totaling 556, 669 square feet by the year 2022. The second phase of the project, which is dependent on changing future market conditions, is assumed to construct three additional light industrial buildings totaling 1,014,860 square feet by the study horizon year of 2027.

Existing Traffic Data

All of the existing study intersections currently operate at an adequate level of service (LOS) during the weekday AM and PM peak hours.

Future Traffic Data Without Project

The study intersections are anticipated to continue operating at an adequate LOS in 2022 and 2027 without traffic from the project.

Future Traffic Data With Project

All of the study intersections are expected to operate at an adequate LOS in 2022 and 2027 without and with traffic from the project.

Turn Lane Analysis

The left turn movements into the project site from Reems Road, Northern Avenue, and Alsup Road can be accommodated within the proposed two-way center left turn lanes on Reems Road, Northern Avenue, and Alsup Road.

An eastbound right turn lane is warranted at West Access/Northern Avenue.

The warranted southbound left turn lanes at North Building 5 Access/Alsup Road, Middle Building 5 Access/Alsup Road, and South Building 5 Access/Alsup Road are expected to have a minimum queue length of 50 feet.

In addition, the warranted eastbound right turn lane at West Access/Northern Avenue is also expected to have a minimum queue length of 50 feet.

The warranted left and right turn lanes should be constructed to provide 160 feet of storage per the Maricopa County Department of Transportation (MCDOT) *Roadway Design Manual*.



Crash Analysis

Crash history for all of the existing study intersections was obtained from the Arizona Department of Transportation (ADOT) from 1 January 2017 to 31 December 2019. No collisions were reported near the intersections of Reems Road/Northern Avenue, Orangewood Avenue/Reems Road, or Alsup Road/Northern Avenue during the three-year study period.

Eleven crashes were reported at the intersections of Northern Parkway Ramps/Reems Road with four injuries and no fatalities during the three-year study period. The most common crash type was single vehicle (eight crashes, 72% of total) followed by angle (one crash, 9% of total) and left turn (one crash, 9% of total). The observed crash patterns at this intersection could be the result of multiple lane transitions on Reems Road near the Northern Parkway Ramps that shifts cars from two-lanes, out to five lanes, and then back down to a two-lane roadway within a quarter of a mile.

Recommendations

Reems Road and Northern Avenue are expected to be five-lane major arterials when built to their ultimate pavement cross-section. Hopewell Reems is anticipated to construct half-street improvements on the west side of Reems Road and the south side of Northern Avenue along the project frontage prior to the opening year. It is recommended that the interim pavement be striped to provide one through lane for each direction of travel with a two-way center left turn lane. Additional pavement should be ‘striped out’ for future improvements to tie into as development occurs in the area.

While Alsup Road will be widened to a three-lane pavement cross-section along the project frontage, there is not adequate space to transition the roadway from two lanes, out to three lanes, and then back down to two lanes. It is recommended for the Hopewell Reems project to provide one through lane for each direction of travel on Alsup Road during the interim condition and to ‘stripe out’ additional pavement to tie into future roadway improvements north and south of the project frontage.

The warranted eastbound right turn lane at West Access/Northern Avenue should be constructed to provide 160 feet of storage to meet MCDOT guidelines.



HOPEWELL REEMS ORANGEWOOD AVENUE/REEMS ROAD TRAFFIC IMPACT ANALYSIS

Project Description

Hopewell Development is proposing a new light industrial development on the northwest corner of Oranewood Avenue/Reems Road in Glendale, Arizona. The vicinity of the project is shown in **Figure 1**. The site will be located as shown in **Figure 2**. Hopewell Reems will be constructed in two phases. The first phase will have two buildings providing a total of 536,669 square feet of light industrial space with an expected opening year of 2022. The development of the second phase will depend on changing future market conditions. However, for the purposes of this report, it is assumed that three more buildings will be constructed by 2027 with a total size of 1,014,860 square feet. The first phase of the site will be served by three ‘full’ access points on Reems Road. Phase 2 of the project is anticipated to have one additional ‘full’ access point on Reems Road, two ‘full’ access points on Northern Avenue, and three ‘full’ access points on Alsup Road.

The purpose of this traffic impact analysis is to:

- Evaluate the current and future operational characteristics of the adjacent roadway network surrounding the project site.
- Estimate the traffic generation associated with the project and assign that traffic to the existing roadway system.
- Analyze future traffic operations at four existing intersections and nine proposed driveways serving the project area.
- Determine the need for auxiliary (left and right turn) lanes at the driveways that will serve the project site.

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

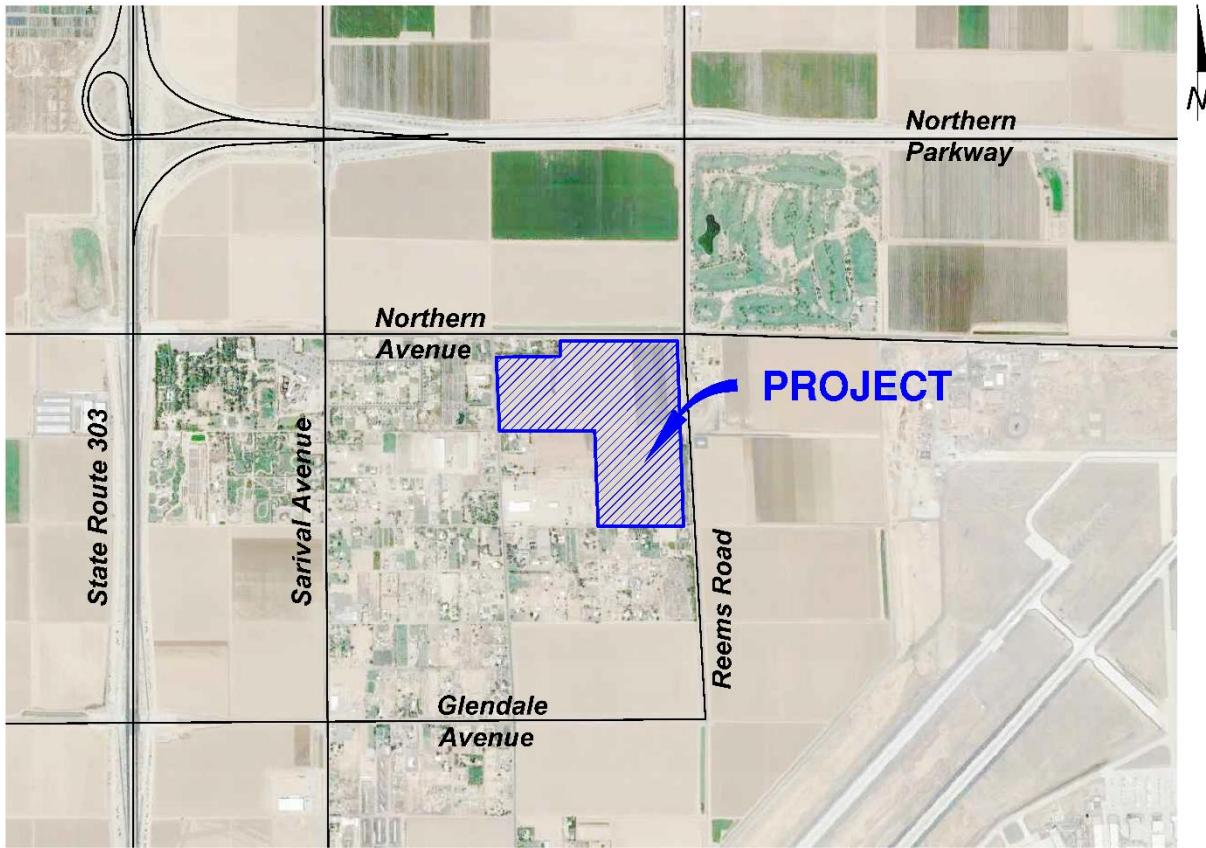
Study Methodology

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

- Field observation of the proposed site and surrounding area was conducted to evaluate the existing physical and operational characteristics of the adjacent roadway network.
- Site traffic volumes generated by the proposed site were calculated using the *Institute of Transportation Engineers (ITE) Trip Generation Manual, 10th Edition, 2017*.
- Calculated site traffic was distributed based on existing traffic patterns and assigned to the primary roadways within the project study limits.
- Capacity analyses were performed for the existing conditions and future conditions without and with the project based on an opening year of 2022 and a horizon year of 2027 using methodology presented in the 2016 Highway Capacity Manual (HCM 6).
- The need for auxiliary turn lanes at the study driveways were evaluated based on MCDOT guidelines.



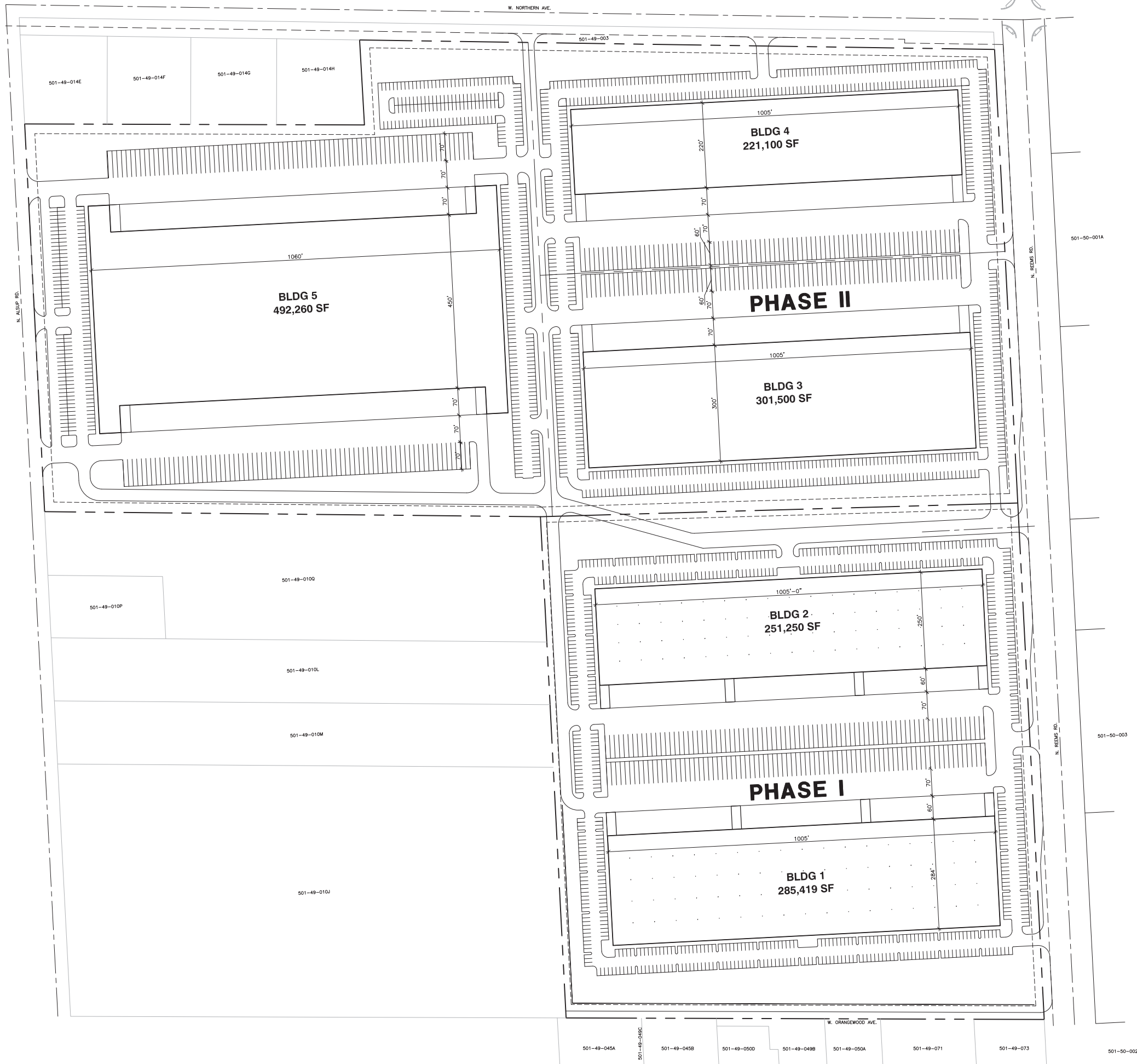
Figure 1 – Vicinity Map



LEGEND:

— EXISTING ROAD

 PROJECT SITE



PHASE I - SITE DATA

TOTAL LOT SIZE	1,637,167 SF (37.58 ACRES)
TOTAL BUILDING AREA	536,669 SF
TOTAL LOT COVERAGE	32.7%
TOTAL PARKING PROVIDED	683

BUILDING 1

LOT SIZE	861,287 SF
BUILDING AREA	285,419 SF
TOTAL COVERAGE	33.1%
PARKING PROVIDED	347 SPACES
PARKING RATIO	1.22:1,000

BUILDING 2

LOT SIZE	775,880 SF
BUILDING AREA	251,250 SF
TOTAL COVERAGE	32.4%
PARKING PROVIDED	336 SPACES
PARKING RATIO	1.34:1,000

PHASE II - SITE DATA

TOTAL LOT SIZE	2,880,526 SF (66.1 ACRES)
TOTAL BUILDING AREA	1,014,860 SF
TOTAL LOT COVERAGE	35.2 %
TOTAL PARKING EST.	1,173 SPACES

BUILDING 3

LOT SIZE	682,177 SF
BUILDING AREA	301,500 SF
TOTAL COVERAGE	44.2 %
PARKING EST.	382 SPACES
PARKING RATIO	1.27:1,000

BUILDING 4

LOT SIZE	772,419 SF
BUILDING AREA	221,100 SF
TOTAL COVERAGE	28.6 %
PARKING EST.	345 SPACES
PARKING RATIO	1.56:1,000

BUILDING 5

LOT SIZE	1,425,946 SF
BUILDING AREA	492,260 SF
TOTAL COVERAGE	34.5 %
PARKING EST.	450 SPACES
PARKING RATIO	0.91:1,000

1 SITE PLAN - OPTION 3

SCALE 0 100 200 300 400 1:100

HOPEWELL DEVELOPMENT
 N. REEMS RD. & W. ORANGEWOOD AVE.
 DEUTSCH PROJECT #: 20206.00 04/07/2021





Existing Conditions

Hopewell Reems will be located on undeveloped land on the northwest corner of Orangewood Avenue/Reems Road in Glendale, Arizona. Luke Air Force Base is located southeast of the project site.

Northern Parkway is an east/west aligned, access-controlled freeway between State Route 303 and Dysart Road. The pavement transitions northeast/southeast to align with Northern Avenue between Litchfield Road and Dysart Road. Two through lanes are provided for each direction of travel separated by a wide dirt median. The posted speed limit on Northern Parkway near the project site is 55 mile per hour (mph). Eastbound and Westbound Northern Parkway on/off-ramps provide access to/from Reems Road approximately one mile north of the project site.

Northern Avenue is an east/west aligned principal arterial roadway providing one through lane for each direction of travel. The alignment of Northern Parkway precludes through traffic on Northern Avenue between Litchfield Road and Dysart Road. Overhead utilities parallel the south side of Northern Avenue and the posted speed limit is 45 mph.

Reems Road is a north/south aligned principal arterial roadway between United States Route 60 and Luke Air Force Base. The pavement provides one through lane for each direction of travel near the project site and the posted speed limit is 45 mph. While MCDOT considers this roadway a principal arterial in their *Major Streets and Routes Plan* (June 2011), Reems Road ends at Glendale Avenue due to Luke Air Force Base and is expected to operate more similar to a minor arterial or major collector near the project site.

Alsup Road is a north/south aligned major collector roadway bordering the west side of the project's second phase. One through lane is provided for each direction of travel and the posted speed limit on Alsup Road is 45 mph in the vicinity of the project. Overhead utilities parallel the east side of the roadway.

Orangewood Avenue is an east/west aligned local road providing access to homes between Alsup and Reems Road. The roadway is unpaved and wide enough to allow one through lane for each direction of travel. There is no posted speed limit on Orangewood Avenue.

Eastbound and Westbound Northern Parkway Ramps/Reems Road are coordinated, four-leg, signalized intersections that allow access to/from Northern Parkway. The northbound left turn movements at Westbound Northern Parkway Ramps/Reems Road make use of protected/permitted left turn phasing. Southbound left turns at Eastbound Northern Parkway Ramps/Reems Road utilize protected-only left turn phasing. Pedestrian ramps and crosswalks are available on all legs of the intersections except the south leg of Westbound Northern Parkway Ramps/Reems Road and the north leg of Eastbound Northern Parkway Ramps/Reems Road.



Reems Road/Northern Avenue is a four-leg signalized intersection. All four approaches to the intersection are provided with a left turn lane (permitted only left turn phasing) and a shared through/right turn lane. Pedestrian ramps and crosswalks are available on each leg of the intersection.

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

Existing Traffic Data

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

- Eastbound Northern Parkway Ramps/Reems Road
- Westbound Northern Parkway Ramps/Reems Road
- Northern Avenue/Reems Road
- Oranewood Avenue/Reems Road

The weekday turning movement counts were conducted from 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM. All traffic counts were collected in March 2021 while school was in session. The results of the traffic counts are shown in **Figure 4**. Complete traffic count data can be found in the Appendix.

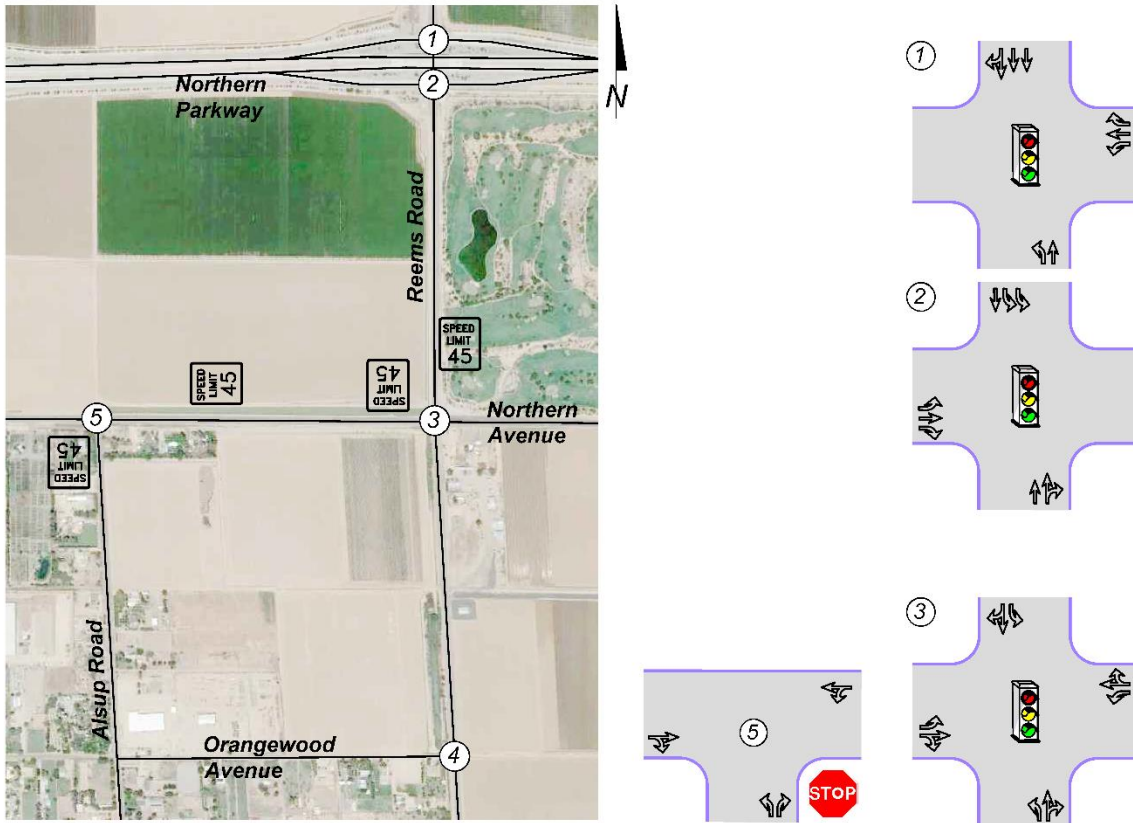
Alsup Road is a two-lane road spanning approximately two miles between Northern Avenue and Luke Air Force Base. The roadway currently serves low density homes and agricultural land uses. Specific traffic counts were not taken on Alsup Road as the roadway is not anticipated to have significant peak hour traffic volumes. In addition, traffic associated with full buildout of the Hopewell Reems site is expected to outweigh any existing traffic on Alsup Road.

The Maricopa Association of Governments (MAG) is collecting and analyzing traffic volume data within Maricopa County as it relates to the impacts of COVID-19. The basis of their analysis assumes that the average weekday traffic volumes in the first week of March 2020 were ‘normal’ traffic conditions, defined as 100%. Based on this assumption, MAG has identified the following key trends:

- The lowest number of vehicles on the regional freeways and arterial roads was observed during the 2nd week of April 2020 as 63% of the ‘normal’ traffic volumes.
- The number of vehicles on regional freeways and arterial roads increased to 87% of ‘normal’ traffic volumes during the third week of June 2020.
- Traffic volumes decreased to below 80% of ‘normal’ in July 2020, and gradually increased to 100% in the first week of March 2021.

MAG data shows ‘normal’ traffic has returned to freeways and principal arterials within Maricopa County. As such, no specific COVID 19 adjustments were applied to the traffic data collected for this analysis.

Figure 3 – Existing Lane Configurations and Traffic Control

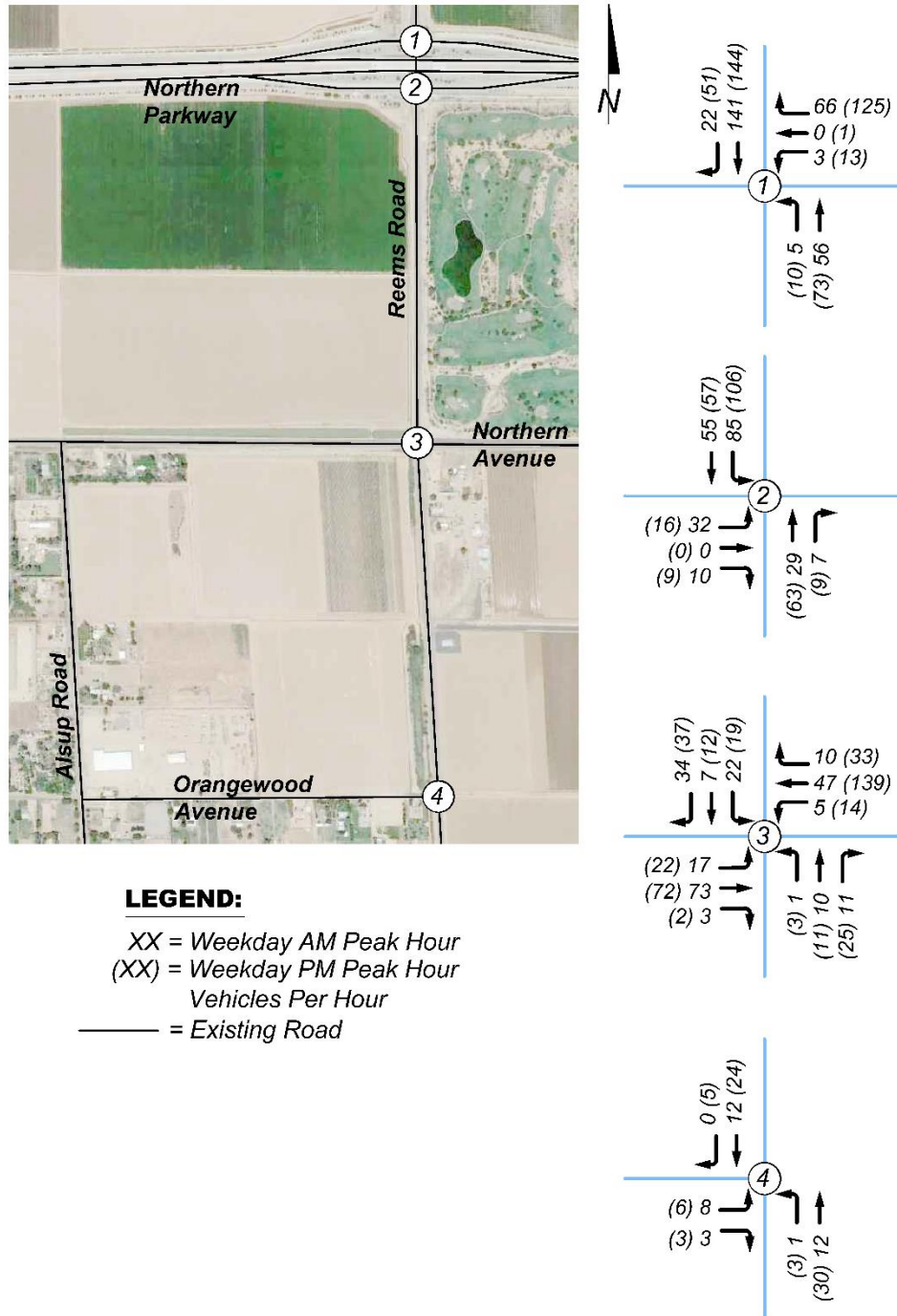


LEGEND:

- = Speed Limit
- = Existing Road
- = Existing Movement
- = Traffic Signal
- = Stop Sign



Figure 4 – Existing Weekday Peak Hour Traffic Volumes





Access

Access to Hopewell Reems will be provided by three ‘full’ access points on Reems Road north of Orangewood Avenue. Eastbound traffic exiting the site will be STOP controlled while northbound and southbound traffic on Reems Road will remain free flow.

Phase 1 – 2022

Half-street improvements will be completed on the west side of Reems Road along the Hopewell Reems frontage as a part of the project. When completed Reems Road is assumed to provide two through lanes for each direction of travel separated by a two-way center left turn lane. Hopewell Reems will construct two southbound through lanes and a two-way center left turn lane as a part of the project. Due to limited space for lane transitions through the project frontage, the outermost southbound through lane will be ‘striped out’ for future Reems Road improvements to tie into.

South Access, South Middle Access, and North Middle Access will be constructed on the west side of Reems Road located approximately 200 feet, 725 feet, and 1,275 feet north of Orangewood Avenue, respectively. Eastbound exiting the site from each of these access points will be provided with a left turn lane and a right turn lane. Northbound traffic on Reems Road will make use of proposed two-way center left lane and a through lane at each of these access points. Southbound traffic on Reems Road will have a shared through/right turn lane.

Figure 5 shows the locations, geometry and spacing for the phase 1 (2022) proposed access points serving the project site that will serve as a baseline of analysis in the report.

Phase 2 – 2027

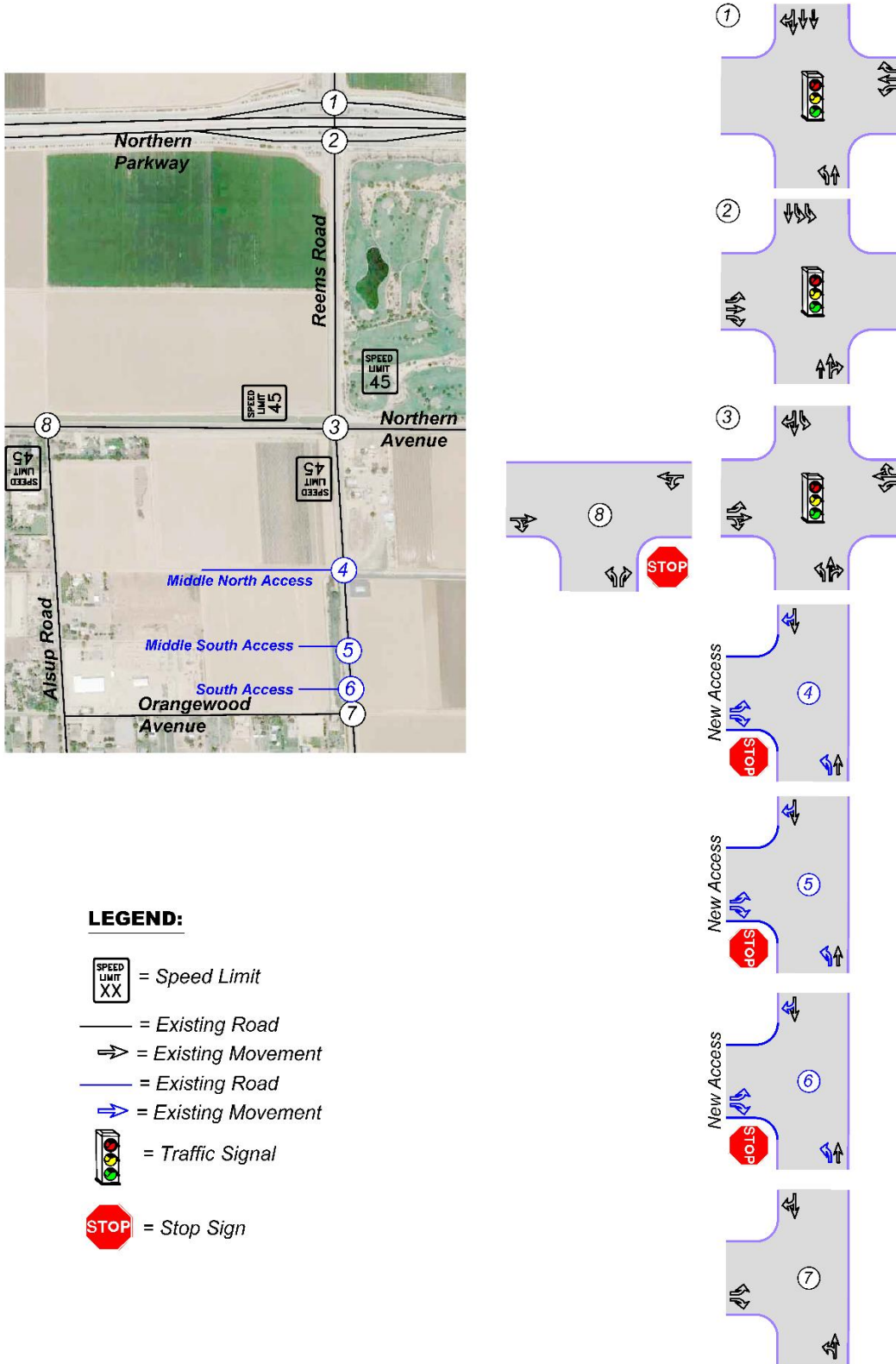
The south side of Northern Avenue will also be completed as a part of Phase 2 of the project prior to the anticipated 2027 full buildout. When completed, Northern Avenue is anticipated to have two through lanes in each direction of travel separated by a two-way center left turn lane. Phase 2 of the Hopewell Reems project will construct two eastbound through lanes and a two-way left turn lane; however, due to limited space for lane transitions within the project frontage, the outermost eastbound through lane will be ‘striped out’ for future use when Northern Avenue is widened east and west of the project site.

Alsop Road will also be improved to a three-lane pavement cross-section within the project frontage as a part of Hopewell Reems phase 2. Alsop Road will be widened to provide one through lane for each direction of travel separated by a two-way center left turn lane.

Phase 2 of the project will construct one additional ‘full’ access point on Reems Road, two ‘full’ access points on Northern Avenue, and three ‘full’ access points on Alsop Road.



Figure 5 – Phase 1 (2022) Baseline Study Configuration and Traffic Control





North Access will be located on the west side of Reems Road approximately 575 feet south of Northern Avenue. Eastbound traffic exiting the site will be STOP controlled and provided with a left turn lane and a right turn lane. Northbound traffic on Reems Road will make use of the two-way center left turn lane and a through lane. The southbound approach to the intersection will have a shared through/right turn lane.

East Access and West Access will be located on the south side of Northern Avenue approximately 675 and 1,300 feet west of Reems Road, respectively. The eastbound approach to these access points will have a shared through/right turn lane. The westbound approaches to these intersections will make use of the two-way center left turn lane and a through lane. Northbound vehicles exiting the site from either access point will be STOP controlled and provided with a left turn lane and a right turn lane.

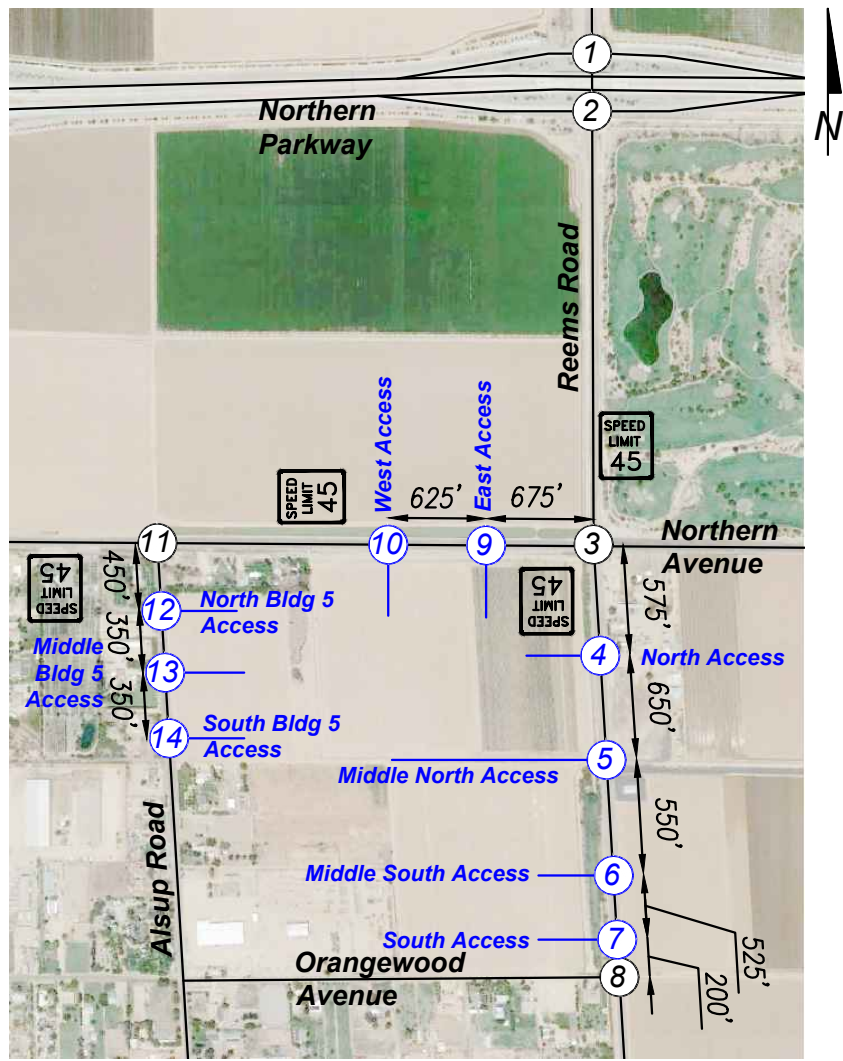
North Building 5 Access, Middle Building 5 Access, and South Building 5 Access will all be constructed on the east side of Alsup Road approximately 450, 800, and 1,150 feet south of Northern Avenue, respectively. Westbound vehicles exiting the site from any of these access points will be STOP controlled and make use of a left turn lane and a right turn lane. The northbound approaches to these intersections will have a shared through/right turn lane. Southbound traffic at each of these intersections will utilize a shared left turn/through lane.

Through traffic on Reems Road, Northern Avenue, and Alsup Road will remain free flow.

Figure 6 shows the locations, geometry and spacing for the phase 2 (2027) proposed access points serving the project site that will serve as a baseline of analysis in the report.

Trip Generation

Trip generation was developed utilizing nationally agreed upon data contained in the Institute of Transportation Engineers (ITE) publication *Trip Generation, 10th Edition, 2017*. Hopewell Reems will be constructed in two phases. The first phase will have two buildings providing a total of 536,669 square feet of light industrial space with an expected opening year of 2022. The development of the second phase will depend on changing future market conditions. However, for the purposes of this report, it is assumed that three more buildings will be constructed by 2027 with a total size of 1,014,860 square feet. The Hopewell Reems trip generation was estimated for both phases of the project based on ITE Land Use Code 130 (LUC 130), Industrial Park. The result is the expected weekday trip generation for phase 1 and full buildout of the project, as shown in **Tables 1** and **2**. The complete trip generation calculations can be found in the Appendix.



LEGEND:

- = Speed Limit
- = Existing Road
- = Existing Movement
- = Existing Road
- = Traffic Signal
- = Stop Sign

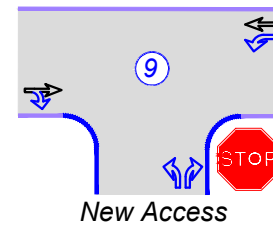
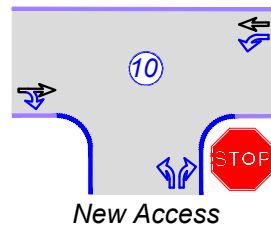
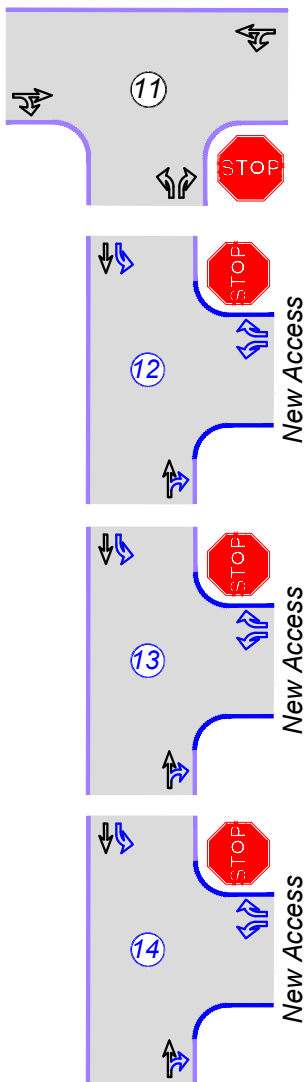
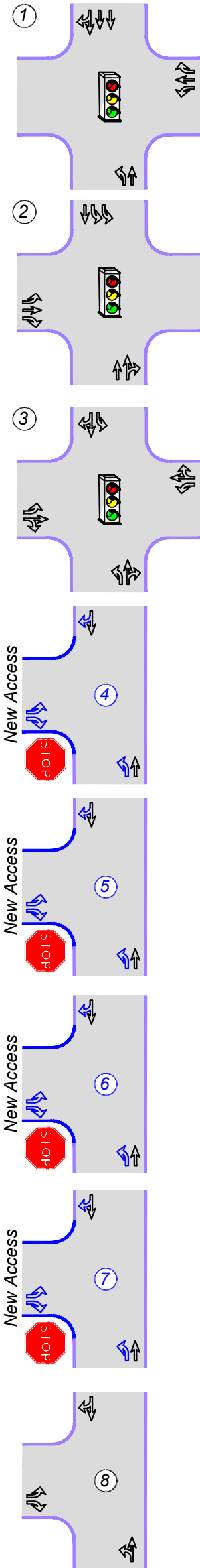


Figure 6 - Full Buildout (2027) Baseline Study Configuration and Traffic Control



Table 1 – Phase 1 (2022) Site Generated Trips

Time Period	536,669 sq. ft. Industrial Park
Average Daily, Inbound (vtpd)	905
Average Daily, Outbound (vtpd)	905
Total Daily	1,810
AM Peak Hour, Inbound (vtph)	174
AM Peak Hour, Outbound (vtph)	41
Total AM Peak	215
PM Peak Hour, Inbound (vtph)	45
PM Peak Hour, Outbound (vtph)	170
Total PM Peak	215

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

Table 2 – Full Buildout (2027) Site Generated Trips

Time Period	PHASE 1 536,669 sq. ft. Industrial Park	PHASE 2 1,014,860 sq. ft. Industrial Park	Total
Average Daily, Inbound (vtpd)	905	1,711	2,616
Average Daily, Outbound (vtpd)	905	1,711	2,616
Total Daily	1,810	3,422	5,232
AM Peak Hour, Inbound (vtph)	174	329	503
AM Peak Hour, Outbound (vtph)	41	77	118
Total AM Peak	215	406	621
PM Peak Hour, Inbound (vtph)	45	85	130
PM Peak Hour, Outbound (vtph)	170	321	491
Total PM Peak	215	406	621

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

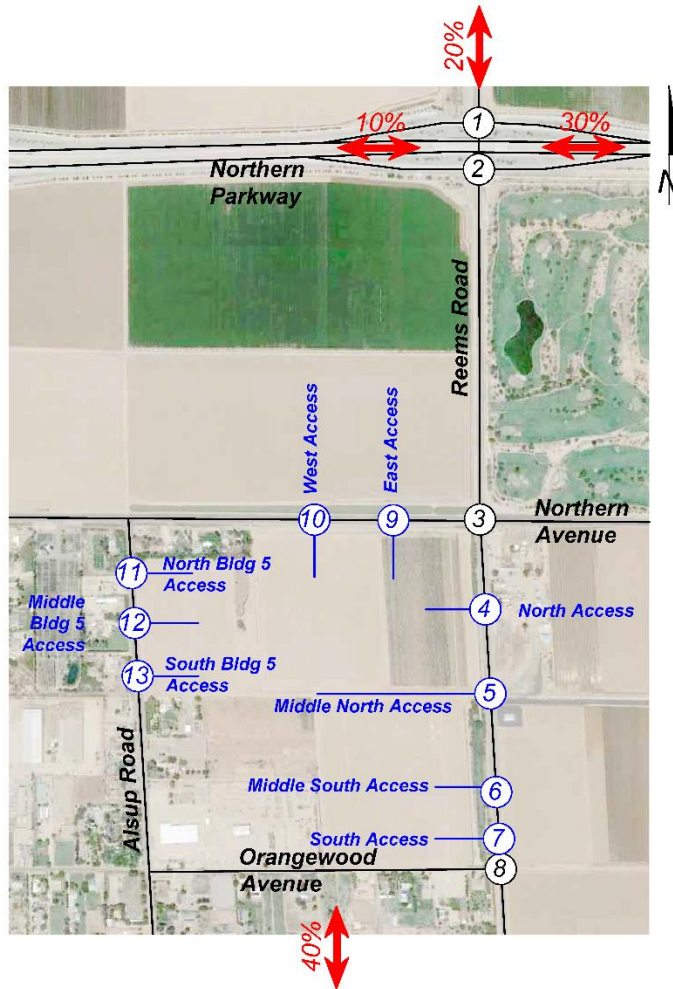
Trip Distribution & Assignment

Trip distribution for the project was based on existing traffic volume patterns near the proposed site. **Figure 7** shows the weekday trip distribution for the project as a percentage of net new primary trips.

Figures 8 and 9 show the assignment of the Phase 1 (2022) and full buildout (2027) new site generated trips to the project intersections within the study area.



Figure 7 – Weekday Peak Hour Trip Distribution

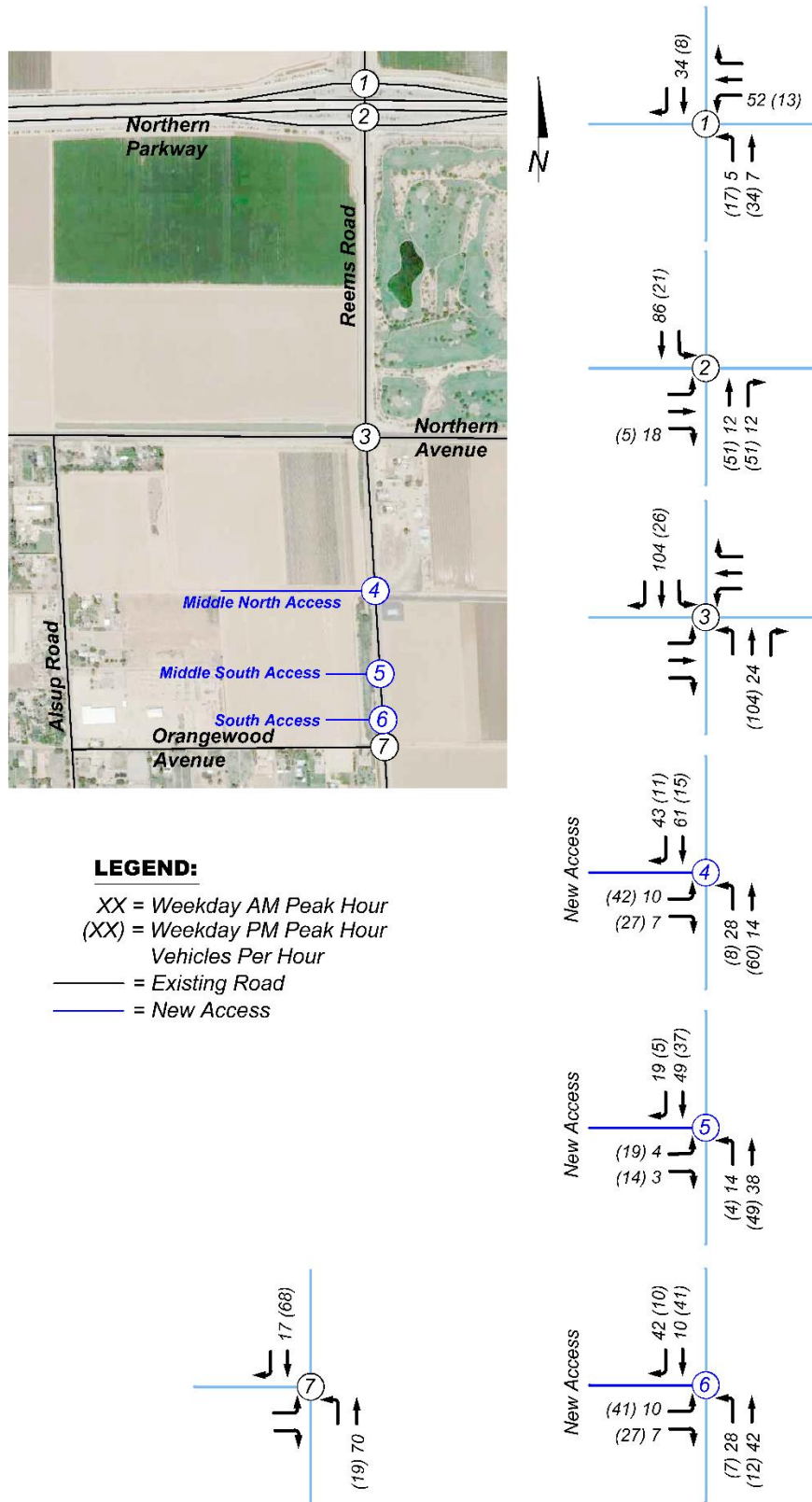


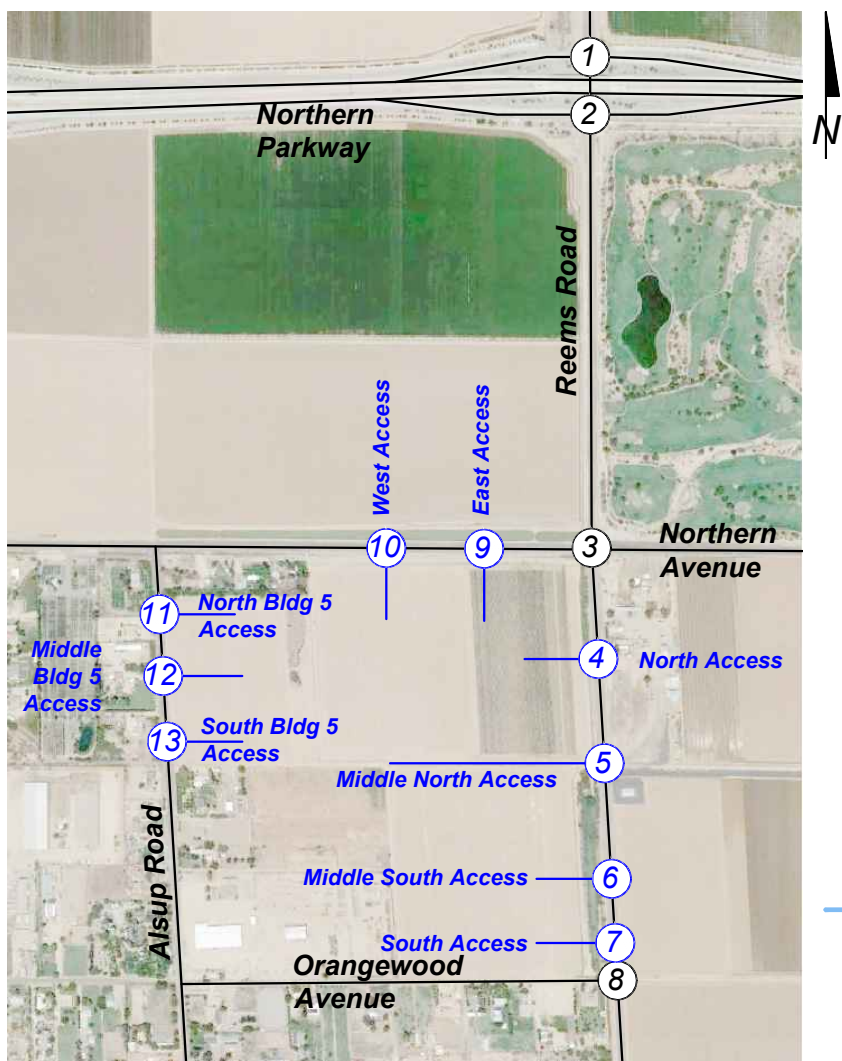
LEGEND:

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



Figure 8 – Phase 1 (2022) Weekday Peak Hour Trip Assignment





LEGEND:

- XX = Weekday AM Peak Hour
- (XX) = Weekday PM Peak Hour
- Vehicles Per Hour
- = Existing Road
- = New Access

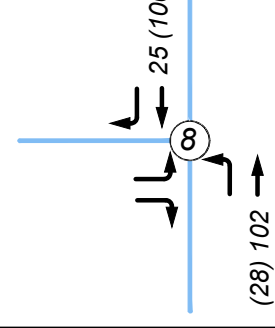
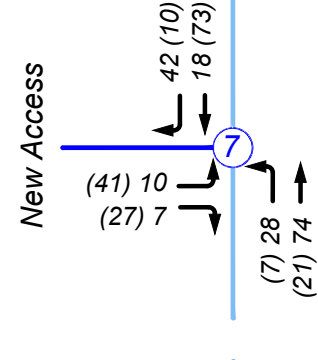
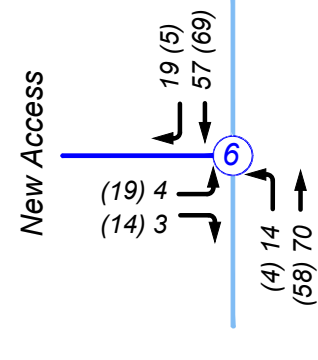
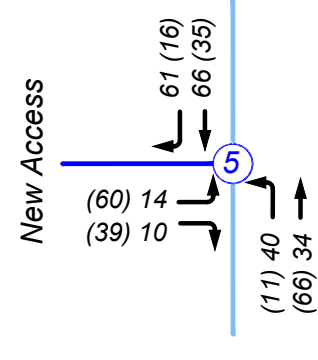
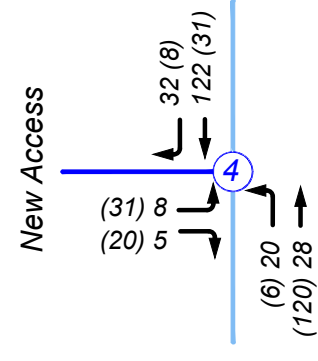
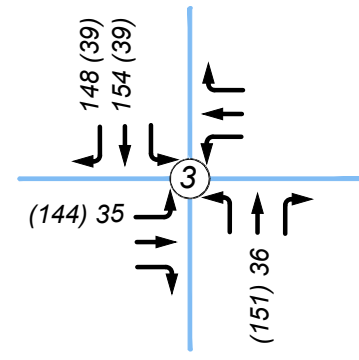
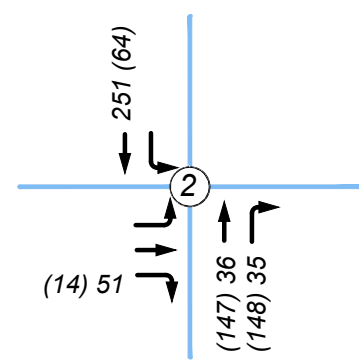
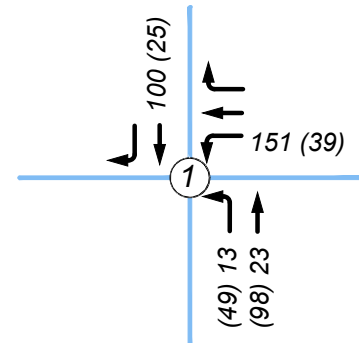
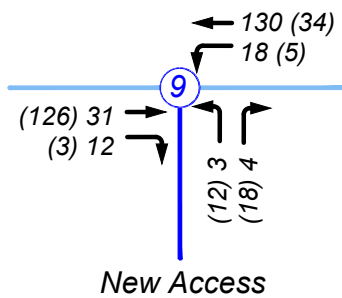
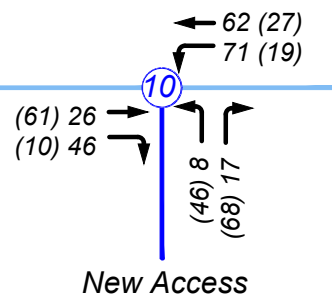
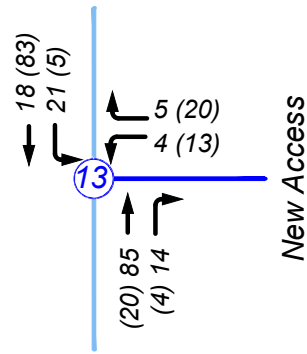
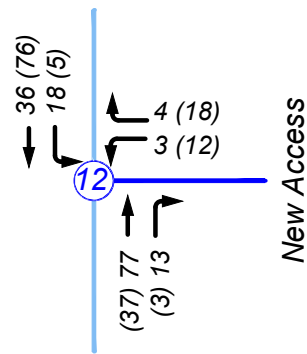
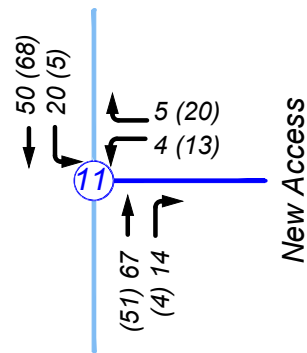


Figure 9 - Full Buildout (2027) Weekday Peak Hour Trip Assignment



Existing Traffic Operations

Analysis of current intersection operations at Westbound Northern Parkway Ramps/Reems Road and Eastbound Northern Parkway Ramps/Reems Road was conducted for the weekday AM and PM peak hours using the nationally accepted methodology set forth in the *Highway Capacity Manual*, Transportation Research Board, 2000 (HCM 2000). More recent versions of HCM cannot be used to analyze these ‘clustered’ signalized intersection less than 350 feet apart. The most recent version of the *Highway Capacity Manual*, HCM 6, was used to analyze the remaining study intersections. The computer software Synchro 10 was utilized to calculate the levels of service for individual movements and approaches for both HCM 2000 and HCM 6.

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

At signalized intersections, level of service is calculated for each movement and then summed in a weighted fashion to yield the LOS for the approach and for the intersections as a whole. Criteria for level of service at signalized intersections are shown in **Table 3**.

Table 3 - Level of Service Criteria – Signalized Intersections

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

In calculating the levels of service, assumed signal timings were used at Westbound Northern Parkway Ramps/Reems Road, Eastbound Northbound Parkway Ramps/Reems Road, and Reems Road/Northern Avenue. These assumptions are as follows:

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

At un-signalized intersections, level of service is predicted/calculated for those movements, which must either stop for or yield to oncoming traffic and is based on average control delay for the particular movement. Control delay is the portion of total delay attributed to traffic control measures such as stop signs and traffic signals. The criteria for level of service at un-signalized intersections are shown in **Table 4**.



Table 4 – Level of Service Criteria – Un-signalized Intersections

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

Table 5 shows the existing levels of service that were calculated for the study intersections. Complete capacity calculations are included in the Appendix.

Table 5 – Existing Weekday Peak Hour Levels of Service

Intersection	AMPeak		PMPeak	
	LOS	Delay	LOS	Delay
Signalized Intersections				
Westbound Northern Parkway Ramps/Reems Road				
Overall Intersection	B	12.9	B	16.5
Westbound Left	D	40.8	D	39.3
Westbound Through	A	0.0	D	38.5
Westbound Right	D	40.9	D	39.2
Northbound Left	C	27.8	D	48.2
Northbound Through	A	1.0	A	0.8
Southbound Through	A	4.7	A	5.4
Southbound Through/Right	A	4.7	A	5.4
Eastbound Northern Parkway Ramps/Reems Road				
Overall Intersection	C	27.5	C	22.4
Eastbound Left	D	43.8	D	42.9
Eastbound Through	A	0.0	A	0.0
Eastbound Right	D	39.9	D	40.8
Northbound Through	A	6.8	A	7.8
Northbound Through/Right	A	6.8	A	7.8
Southbound Left	D	46.3	D	39.2
Southbound Through	A	0.3	A	0.7
Reems Road/Northern Avenue				
Overall Intersection	B	15.7	B	16.8
Eastbound Left	C	22.4	C	24.4
Eastbound Through/Right	C	23.9	B	19.7
Westbound Left	C	22.6	C	20.6
Westbound Through/Right	C	22.6	C	23.1
Northbound Left	A	2.1	A	3.6
Northbound Through/Right	A	2.0	A	3.5
Southbound Left	A	2.1	A	3.6
Southbound Through/Right	A	2.1	A	3.6
Un-Signalized Intersections				
Orangewood Avenue/Reems Road				
Eastbound Left	A	8.8	A	9.0
Eastbound Right	A	8.5	A	8.5
Northbound Left/Through	A	7.3	A	7.4

Delay - seconds per vehicle

As shown in **Table 5**, all of the existing study intersections currently operate at an adequate LOS during the weekday peak hours.



Future Traffic Operations Without Project

In order to assess the impacts of the project on future traffic operations, traffic projections were made for the opening year of 2022 and the horizon year of 2027. A review of Maricopa County historical traffic data in the vicinity of the project showed increasing and decreasing traffic volumes in the area. A 10% annual compounded traffic growth rate was used to estimate the future 2022 and 2027 weekday peak hour traffic volumes without the project, as shown in **Figures 10** and **11**.

As with the current volumes, levels of service were calculated for each of the intersections in the study area for 2022 and 2027 without the project. Intersection levels of service for 2022 and 2027 without the project are shown in **Tables 6** and **7**. Complete capacity calculations are included in the Appendix.

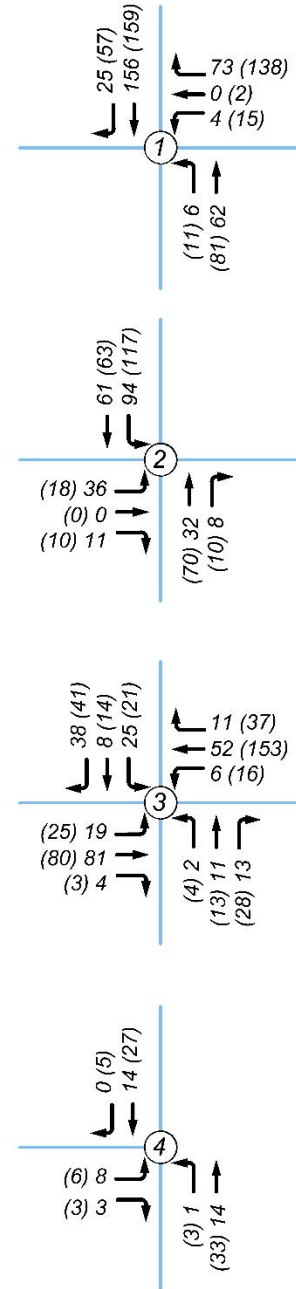
Table 6 – 2022 Weekday Peak Hour Levels of Service Without Project

Intersection	AM Peak		PM Peak	
	LOS	Delay	LOS	Delay
Signalized Intersections				
Westbound Northern Parkway Ramps/Reems Road				
Overall Intersection	B	13.0	B	16.8
Westbound Left	D	40.7	D	39.0
Westbound Through	A	0.0	D	38.2
Westbound Right	D	40.8	D	38.8
Northbound Left	C	28.4	D	49.1
Northbound Through	A	1.0	A	0.8
Southbound Through	A	4.7	A	5.6
Southbound Through/Right	A	4.7	A	5.6
Eastbound Northern Parkway Ramps/Reems Road				
Overall Intersection	C	26.7	C	22.3
Eastbound Left	D	44.0	D	42.9
Eastbound Through	A	0.0	A	0.0
Eastbound Right	D	39.7	D	40.6
Northbound Through	A	7.9	A	8.0
Northbound Through/Right	A	7.9	A	8.0
Southbound Left	D	43.4	D	38.9
Southbound Through	A	0.4	A	0.8
Reems Road/Northern Avenue				
Overall Intersection	B	15.4	B	16.9
Eastbound Left	C	22.5	C	24.8
Eastbound Through/Right	C	23.4	B	19.4
Westbound Left	C	22.6	C	20.5
Westbound Through/Right	C	22.4	C	23.0
Northbound Left	A	2.2	A	4.0
Northbound Through/Right	A	2.2	A	3.8
Southbound Left	A	2.3	A	4.0
Southbound Through/Right	A	2.2	A	3.9
Un-Signalized Intersections				
Orangewood Avenue/Reems Road				
Eastbound Left	A	8.8	A	9.1
Eastbound Right	A	8.5	A	8.6
Northbound Left/Through	A	7.3	A	7.4

Delay - seconds per vehicle



Figure 10 – 2022 Weekday Peak Hour Traffic Volumes Without Project



LEGEND:

- XX = Weekday AM Peak Hour
- (XX) = Weekday PM Peak Hour
- Vehicles Per Hour
- = Existing Road



Figure 11 – 2027 Weekday Peak Hour Traffic Volumes Without Project

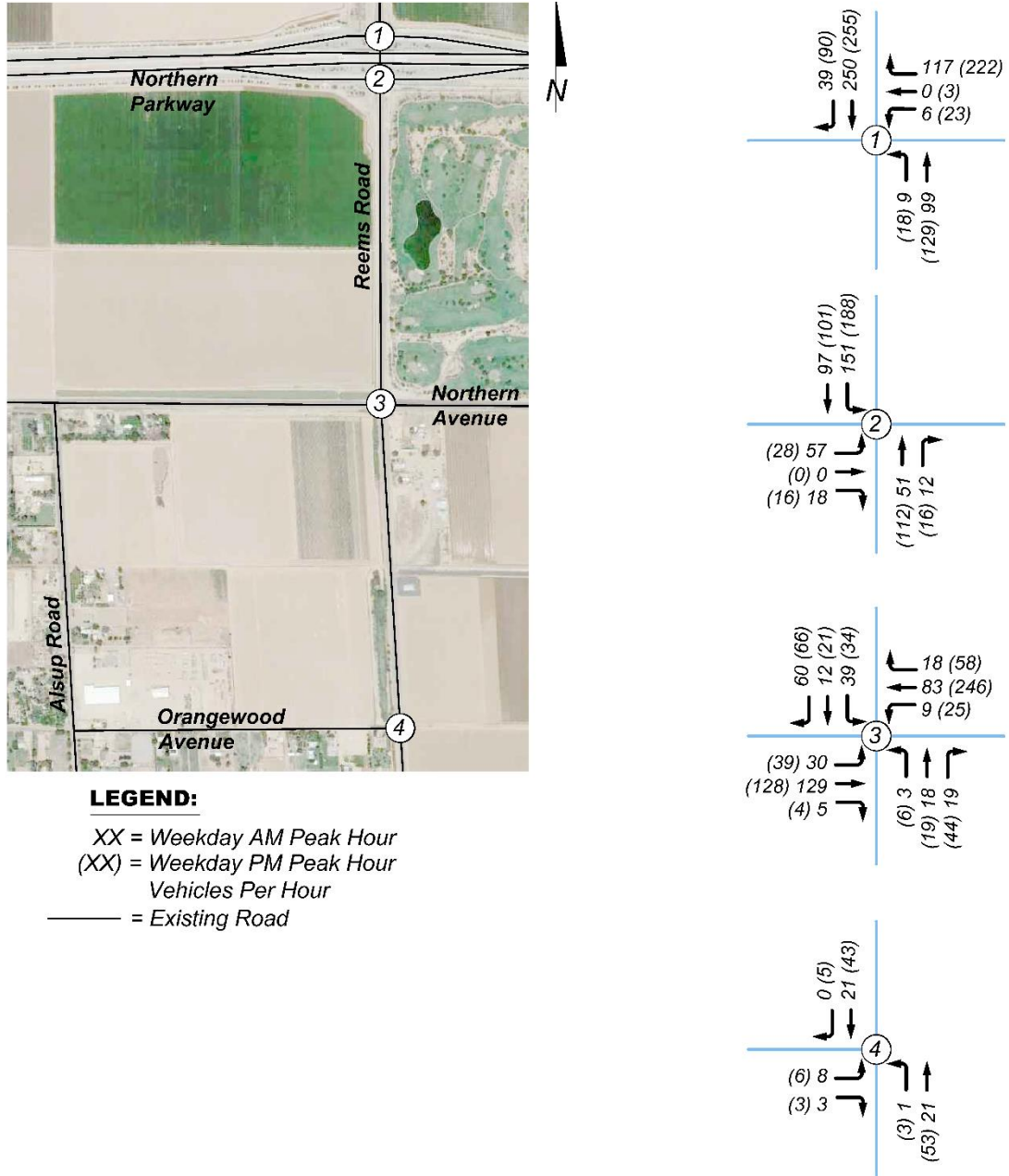




Table 7 – 2027 Weekday Peak Hour Levels of Service Without Project

Intersection	AM Peak		PM Peak	
	LOS	Delay	LOS	Delay
Signalized Intersections				
Westbound Northern Parkway Ramps/Reems Road				
Overall Intersection	B	13.3	B	17.5
Westbound Left	D	39.5	D	38.1
Westbound Through	A	0.0	D	37.0
Westbound Right	D	39.8	D	38.1
Northbound Left	C	27.1	D	47.6
Northbound Through	A	0.8	A	1.0
Southbound Through	A	5.7	A	7.3
Southbound Through/Right	A	5.7	A	7.3
Eastbound Northern Parkway Ramps/Reems Road				
Overall Intersection	C	23.2	C	24.3
Eastbound Left	D	41.4	D	43.5
Eastbound Through	A	0.0	A	0.0
Eastbound Right	D	37.4	D	43.5
Northbound Through	A	9.8	D	40.1
Northbound Through/Right	A	9.8	A	9.1
Southbound Left	D	34.6	D	43.4
Southbound Through	A	0.7	A	0.9
Reems Road/Northern Avenue				
Overall Intersection	B	15.4	B	17.2
Eastbound Left	C	22.9	C	27.5
Eastbound Through/Right	C	23.0	B	17.7
Westbound Left	C	23.2	B	19.7
Westbound Through/Right	C	21.7	C	22.3
Northbound Left	A	3.1	A	6.9
Northbound Through/Right	A	2.9	A	6.4
Southbound Left	A	3.1	A	6.9
Southbound Through/Right	A	3.1	A	6.6
Un-Signalized Intersections				
Orangewood Avenue/Reems Road				
Eastbound Left	A	8.9	A	9.3
Eastbound Right	A	8.5	A	8.7
Northbound Left/Through	A	7.3	A	7.4

Delay - seconds per vehicle

As shown in **Tables 6** and **7**, all of the study intersections are anticipated to continue operating at an adequate LOS in 2022 and 2027 without traffic from the project.



Future Traffic Operations With Project

In order to assess the impacts of the project on future traffic operations, levels of service were calculated for each project intersection in 2022 and 2027 with the corresponding phase of the project. Weekday peak hour traffic volumes for 2022 and 2027 without the project were combined with the estimated trips generated by the project to yield weekday peak hour traffic volumes with the project. The weekday peak hour traffic volumes with the project in 2022 and 2027 are shown in **Figures 12** and **13**.

Weekday intersection levels of service for 2022 and 2027, with the project, were then calculated as shown in **Tables 8** and **9**. Complete capacity calculations are included in the Appendix.

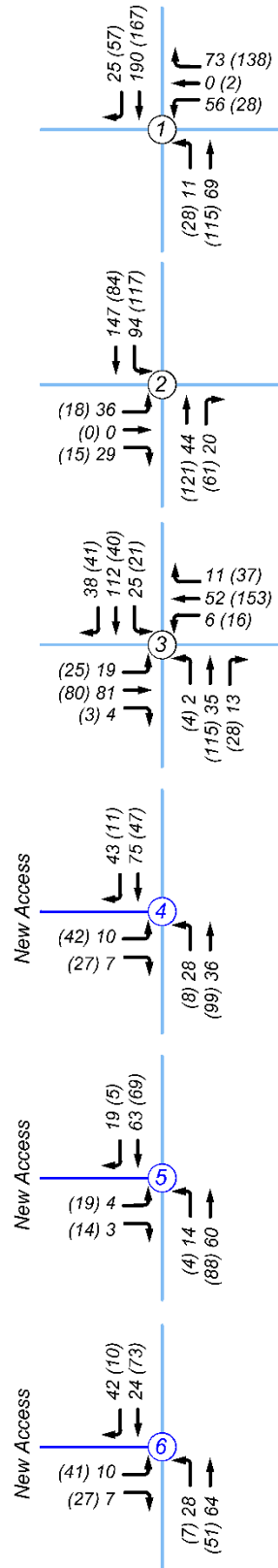
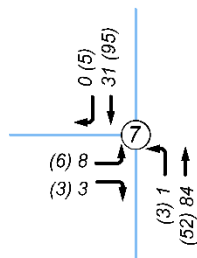
As shown in **Tables 8** and **9**, all of the study intersections are anticipated to operate at an adequate LOS in 2022 and 2027 without and with traffic from the project.

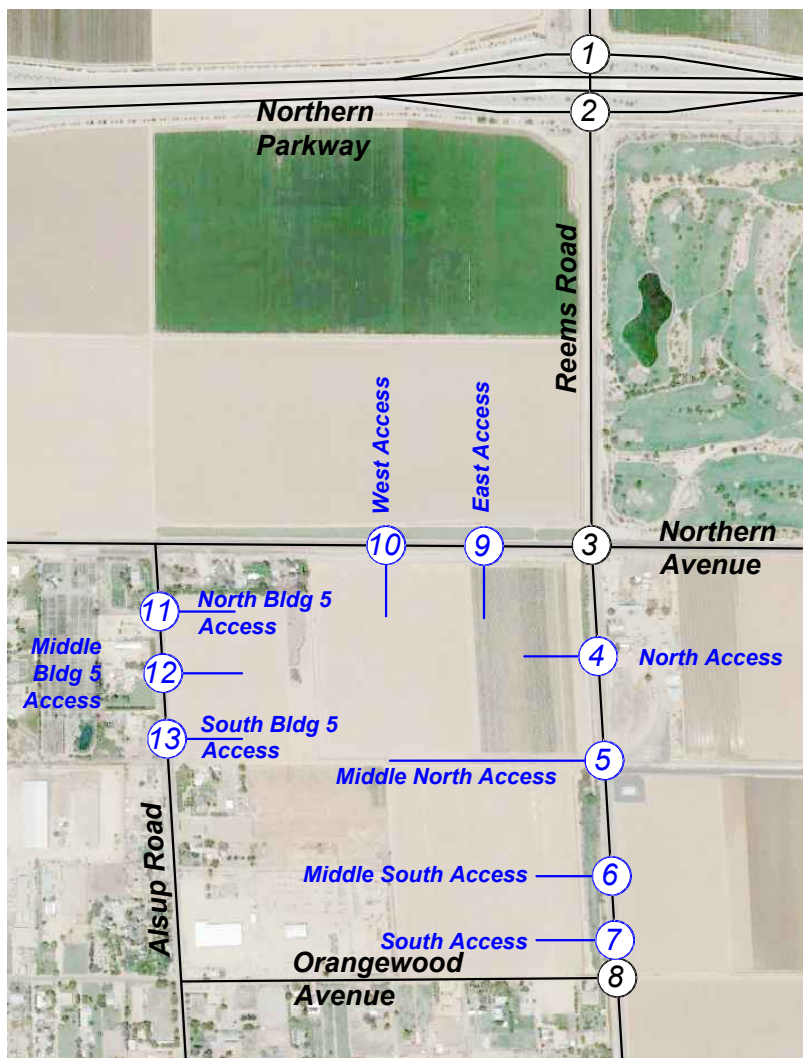


Figure 12 – 2022 Weekday Peak Hour Traffic Volumes With Project



LEGEND:
 XX = Weekday AM Peak Hour
 (XX) = Weekday PM Peak Hour
 Vehicles Per Hour
 — = Existing Road
 — = New Access





LEGEND:

- XX = Weekday AM Peak Hour
- (XX) = Weekday PM Peak Hour
- Vehicles Per Hour
- = Existing Road
- = New Access

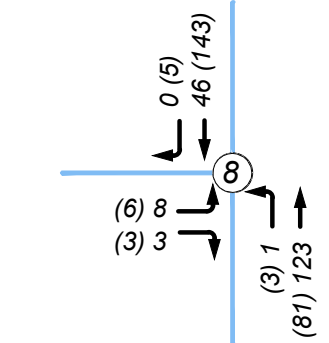
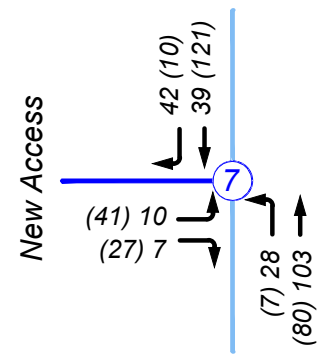
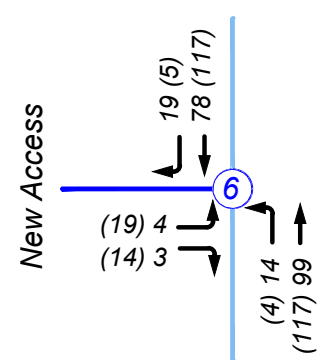
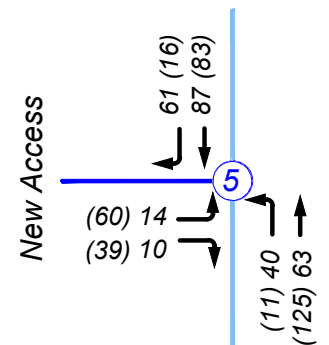
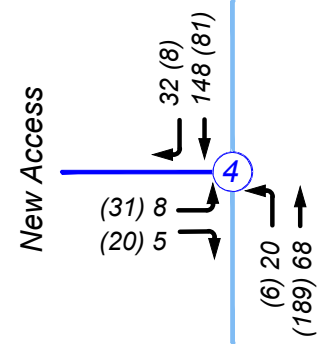
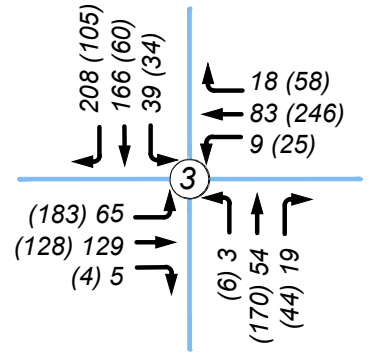
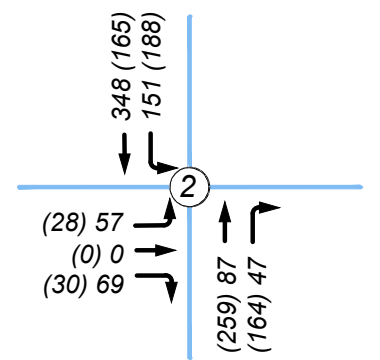
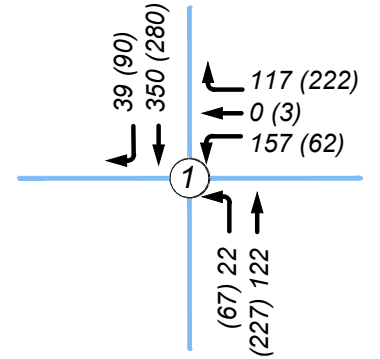
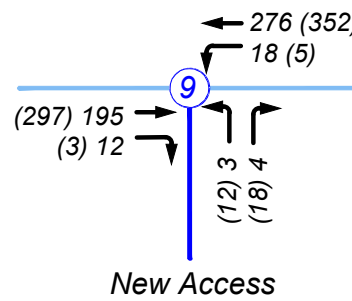
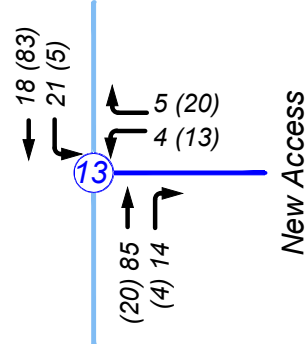
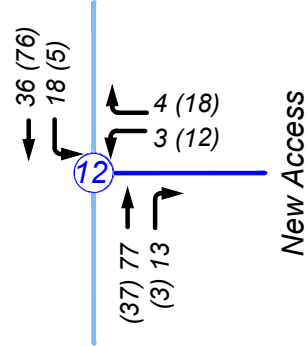
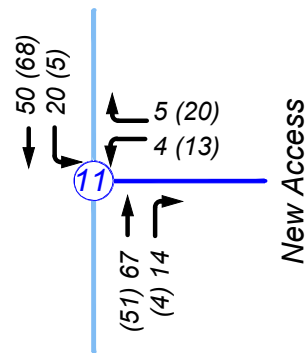


Figure 13 - 2027 Weekday Peak Hour Traffic Volumes With Project



Table 8 – 2022 Weekday Peak Hour Levels of Service With Project

Intersection	2022 Without Project				2022 With Project			
	AM Peak		PM Peak		AM Peak		PM Peak	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Signalized Intersections								
Westbound Northern Parkway Ramps/Reems Road								
Overall Intersection	B	13.0	B	16.8	B	16.3	B	17.7
Westbound Left	D	40.7	D	39.0	D	41.4	D	39.4
Westbound Through	A	0.0	D	38.2	A	0.0	D	37.8
Westbound Right	D	40.8	D	38.8	D	37.7	D	38.4
Northbound Left	C	28.4	D	49.1	D	37.6	D	46.7
Northbound Through	A	1.0	A	0.8	A	2.4	A	0.9
Southbound Through	A	4.7	A	5.6	A	6.0	A	7.2
Southbound Through/Right	A	4.7	A	5.6	A	6.0	A	7.2
Eastbound Northern Parkway Ramps/Reems Road								
Overall Intersection	C	26.7	C	22.3	B	18.2	C	20.1
Eastbound Left	D	44.0	D	42.9	D	41.4	D	42.9
Eastbound Through	A	0.0	A	0.0	A	0.0	A	0.0
Eastbound Right	D	39.7	D	40.6	D	38.6	A	40.6
Northbound Through	A	7.9	A	8.0	A	8.5	A	8.3
Northbound Through/Right	A	7.9	A	8.0	A	8.5	A	8.6
Southbound Left	D	43.4	D	38.9	C	33.7	D	45.1
Southbound Through	A	0.4	A	0.8	A	1.9	A	1.1
Reems Road/Northern Avenue								
Overall Intersection	B	15.4	B	16.9	B	11.4	B	14.1
Eastbound Left	C	22.5	C	24.8	C	22.5	C	24.8
Eastbound Through/Right	C	23.4	B	19.4	C	23.4	B	19.4
Westbound Left	C	22.6	C	20.5	C	22.6	C	20.5
Westbound Through/Right	C	22.4	C	23.0	C	22.4	C	23.0
Northbound Left	A	2.2	A	4.0	A	2.6	A	4.1
Northbound Through/Right	A	2.2	A	3.8	C	2.2	A	4.3
Southbound Left	A	2.3	A	4.0	C	2.3	A	4.6
Southbound Through/Right	A	2.2	A	3.9	C	2.6	A	4.0
Un-Signalized Intersections								
Orangewood Avenue/Reems Road								
Eastbound Left	A	8.8	A	9.1	A	9.5	A	9.7
Eastbound Right	A	8.5	A	8.6	A	8.6	A	8.9
Northbound Left/Through	A	7.3	A	7.4	A	7.4	A	7.5
North Middle Access/Reems Road								
Eastbound Left					B	10.1	B	10.1
Eastbound Right	N/A		N/A		A	9.0	A	8.8
Northbound Left					A	7.7	A	7.5
South Middle Access/Reems Road								
Eastbound Left					A	9.8	A	9.9
Eastbound Right	N/A		N/A		A	8.8	A	8.9
Northbound Left					A	7.5	A	7.5
South Access/Reems Road								
Eastbound Left					A	9.9	B	10.0
Eastbound Right	N/A		N/A		A	8.7	A	9.0
Northbound Left					A	7.5	A	7.5

Delay - seconds per vehicle



Table 9 – 2027 Weekday Peak Hour Levels of Service With Project

Intersection	2027 Without Project				2027 With Project			
	AM Peak		PM Peak		AM Peak		PM Peak	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Signalized Intersections								
Westbound Northern Parkway Ramps/Reems Road								
Overall Intersection	B	13.3	B	17.5	B	19.6	B	19.0
Westbound Left	D	39.5	D	38.1	D	40.6	D	38.8
Westbound Through	A	0.0	D	37.0	A	0.0	D	35.6
Westbound Right	D	39.8	D	38.1	C	31.6	D	36.7
Northbound Left	C	27.1	D	47.6	D	43.6	D	51.0
Northbound Through	A	0.8	A	1.0	A	4.5	A	1.3
Southbound Through	A	5.7	A	7.3	B	10.8	A	9.5
Southbound Through/Right	A	5.7	A	7.3	B	10.8	A	9.5
Eastbound Northern Parkway Ramps/Reems Road								
Overall Intersection	C	23.2	C	24.3	B	18.9	B	18.6
Eastbound Left	D	41.4	D	43.5	D	41.4	D	41.1
Eastbound Through	A	0.0	A	0.0	A	0.0	A	0.0
Eastbound Right	D	37.4	D	43.5	D	37.6	D	39.0
Northbound Through	A	9.8	D	40.1	B	10.3	B	11.0
Northbound Through/Right	A	9.8	A	9.1	B	10.3	B	11.0
Southbound Left	D	34.6	D	43.4	D	43.2	D	43.5
Southbound Through	A	0.7	A	0.9	A	3.2	A	1.8
Reems Road/Northern Avenue								
Overall Intersection	B	15.4	B	17.2	B	11.6	B	17.5
Eastbound Left	C	22.9	C	27.5	C	23.2	C	28.8
Eastbound Through/Right	C	23.0	B	17.7	C	21.2	B	14.3
Westbound Left	C	23.2	B	19.7	C	22.3	B	16.1
Westbound Through/Right	C	21.7	C	22.3	C	20.4	B	17.0
Northbound Left	A	3.1	A	6.9	A	6.4	B	14.6
Northbound Through/Right	A	2.9	A	6.4	A	3.6	B	14.1
Southbound Left	A	3.1	A	6.9	A	4.0	B	16.3
Southbound Through/Right	A	3.1	A	6.6	A	5.8	B	13.6
Un-Signalized Intersections								
Orangewood Avenue/Reems Road								
Eastbound Left	A	8.9	A	9.3	A	9.8	B	10.1
Eastbound Right	A	8.5	A	8.7	A	8.7	A	9.2
Northbound Left/Through	A	7.3	A	7.4	A	7.4	A	7.7
North Access/Reems Road								
Eastbound Left					B	10.4	B	10.7
Eastbound Right	N/A		N/A		A	9.4	A	9.0
Northbound Left					A	7.8	A	7.5
North Middle Access/Reems Road								
Eastbound Left					B	10.5	B	10.7
Eastbound Right	N/A		N/A		A	9.1	A	9.1
Northbound Left					A	7.8	A	7.6
South Middle Access/Reems Road								
Eastbound Left					B	10.0	B	10.3
Eastbound Right	N/A		N/A		A	8.9	A	9.1
Northbound Left					A	7.6	A	7.6
South Access/Reems Road								
Eastbound Left					B	10.2	B	10.4
Eastbound Right	N/A		N/A		A	8.8	A	9.3
Northbound Left					A	7.6	A	7.6
East Access/Northern Avenue								
Westbound Left					A	7.9	A	8.1
Northbound Left	N/A		N/A		B	11.9	B	12.8
Northbound Right					A	9.6	B	10.5
West Access/Northern Avenue								
Westbound Left					A	8.1	A	8.0
Northbound Left	N/A		N/A		B	14.8	C	16.1
Northbound Right					A	9.8	B	10.5
North Building 5 Access/Alsup Road								
Westbound Left					A	9.8	A	9.7
Westbound Right	N/A		N/A		A	8.8	A	8.8
Southbound Left/Through					A	7.5	A	7.4
Middle Building 5 Access/Alsup Road								
Westbound Left					A	9.7	A	9.6
Westbound Right	N/A		N/A		A	8.9	A	8.7
Southbound Left/Through					A	7.5	A	7.4
South Building 5 Access/Alsup Road								
Westbound Left					A	9.7	A	9.6
Westbound Right	N/A		N/A		A	8.9	A	8.6
Southbound Left/Through					A	7.6	A	7.4

Delay - seconds per vehicle



Turn Lane Analysis

A key element of this traffic statement is to determine if right or left turn lanes are required at the intersections providing direct access to the proposed project site. City of Glendale's *2015 Engineering Design & Construction Standards* (March 2014) only states that auxiliary turn lanes "may be required, as determined by the Transportation Engineer," and does not provide specific warrants for the inclusion of left or right turn lanes at project driveways. However, the City of Glendale also utilizes the turn lane warrants provided in MCDOT's *Roadway Design Manual* (February 2020) was used to determine the need for turn lanes at the proposed access points. It should be noted that the left turn movements into the project site from Reems Road, Northern Avenue, and Alsup Road can be accommodated within the proposed two-way center left turn lanes on Reems Road, Northern Avenue, and Alsup Road.

Per MCDOT's *Roadway Design Manual*, a driveway right turn deceleration lane is required when either of the following are met:

- The outside lane has an expected volume of 250 vehicles per hour (vph) or greater and the right turn volume is greater than 55 vph.
- Any three of the below criteria are met:
 - a. At least 5,000 vehicles per day are using or are expected to be using the adjacent street.
 - b. The roadway's posted speed limit is greater than 35 mph.
 - c. At least 1,000 vehicles per day are using or are expected to use the driveway.
 - d. At least 30 vehicles are expected to make right-turns into the driveway within a one-hour period.

When needed, turn lanes remove the slowing turning traffic from the through traffic stream, improving capacity. **Table 10** show the locations that were evaluated for right turn lanes based on traffic volumes in 2027 with the project.

As shown in **Table 10**, an eastbound right turn lane is warranted at West Access/Northern Avenue.

Queue lengths were calculated at the site driveways and at the adjacent intersections of Northern Parkway Ramps/Reems Road and Reems Road/Northern Avenue to determine if any queue overlap is expected to occur using the following methods as recommended in *A Policy of Geometric Design of Highways and Streets* (AASHTO Green Book, 2018).

For signalized intersections, storage for vehicles should be based on one and a half to two times the number of vehicles that would store per cycle.

$$\begin{aligned}\text{Vehicles per cycle} &= 2 \times (\text{vehicles/hour})/\text{cycles/hour} \\ \text{Storage length} &= \text{vehicles per hour/cycle} \times 25 \text{ feet}\end{aligned}$$



Table 10 – Right Turn Lane Warrants

Intersection	Direction	Right Turn Lane Warrant Criteria								Turn Lane Warranted?
		Speed Limit (mph)	Number of Through Lanes	Mainline Daily Traffic (vpd)*	Driveway Daily Traffic (vpd)	Peak Hour	Volume Advancing (vph)	Outside Lane vph per lane (vph/l)	Turning Volume (vph)	
North Access/Reems Road	Southbound	45	1	<5,000	560	AM	148	180	32	No
						PM	81	89	8	
North Middle Access/Reems Road	Southbound	45	1	<5,000	1,050	AM	87	93	6	No
						PM	83	99	16	
South Middle Access/Reems Road	Southbound	45	1	<5,000	350	AM	78	97	19	No
						PM	117	122	5	
South Access/Reems Road	Southbound	45	1	<5,000	720	AM	39	81	42	No
						PM	121	131	10	
East Access/Northern Avenue	Eastbound	45	1	<5,000	320	AM	195	207	12	No
						PM	297	300	3	
West Access/Northern Avenue	Eastbound	45	1	<5,000	1,210	AM	190	236	46	Yes
						PM	232	242	10	
North Building 5 Access/Alsup Road	Northbound	45	1	<5,000	350	AM	67	81	14	No
						PM	51	55	4	
Middle Building 5 Access/Alsup Road	Northbound	45	1	<5,000	320	AM	77	90	13	No
						PM	37	40	3	
South Building 5 Access/Alsup Road	Northbound	45	1	<5,000	350	AM	85	99	14	No
						PM	20	24	4	

*mainline daily traffic assumed based on weekday peak hour traffic volumes and an assumed 10% K factor

For un-signalized intersections, storage for vehicles likely to arrive in an average two-minute period within the peak hour should be provided based on the following equations. *Table 9-22* within the 2018 AASHTO Green Book tabularizes these equations based on 85th percentile critical gap acceptance and typical driver behaviors.

$$c = \frac{V_0 e^{-\frac{V_0 t_c}{3600}}}{1 - e^{-\frac{V_0 t_f}{3600}}}$$

Where:

c = left-turn capacity, vehicles per hour

V₀ = major-road volume conflicting with the minor movement, assumed to be equal to one-half of the two-way major-road volume, vehicles per hour

t_c = critical gap, seconds

t_f = follow-up gap, seconds



$$SL = \left\{ \frac{\ln[P(n > N)]}{\ln\left[\frac{v}{c}\right]} - 1 \right\} \times VL$$

Where:

SL = storage length, feet

P(n>N) = probability of turn-lane overflow

v = left-turn vehicle volume, vehicles per hour

c = left-turn capacity, vehicles per hour

VL = average length per vehicle, feet

Table 11 shows the calculated queue lengths for the warranted turn lanes at the study intersections based on 2027 weekday peak hour traffic volumes with traffic from the project. Queue lengths were also calculated at adjacent intersections to determine if any queue overlap is expected to occur. The computed values are typically rounded to the nearest 25 feet. Complete queue length calculations are available in the Appendix.

As shown in **Table 11**, the warranted southbound left turn lanes at North Building 5 Access/Alsup Road, Middle Building 5 Access/Alsup Road, and South Building 5 Access/Alsup Road are expected to have a minimum queue length of 50 feet.

In addition, the warranted eastbound right turn lane at West Access/Northern Avenue is also expected to have a minimum queue length of 50 feet.

The warranted left and right turn lanes should be constructed to provide 160 feet of storage per the MCDOT *Roadway Design Manual*.

No queue overlap is anticipated to occur between the project driveways and the nearby study intersections.



Table 11 – Calculated Queue Lengths

Intersection	Left Turn Storage				Right Turn Storage			
	NB	SB	EB	WB	NB	SB	EB	WB
Westbound Northern Parkway Ramps/Reems Road								
Turning Volume (vph)	67							
S _{calculated} =	84							
S _{rounded} =	100							
Eastbound Northern Parkway Ramps/Reems Road								
Turning Volume (vph)					164			
S _{calculated} =					205			
S _{rounded} =					225			
Reems Road/Northern Avenue								
Turning Volume (vph)	6		183					
S _{calculated} =	8		229					
S _{rounded} =	25		250					
North Access/Reems Road								
Turning Volume (vph)	20							
S _{calculated} =	50							
S _{rounded} =	50							
North Middle Access/Reems Road								
Turning Volume (vph)	40							
S _{calculated} =	50							
S _{rounded} =	50							
South Middle Access/Reems Road								
Turning Volume (vph)	97							
S _{calculated} =	50							
S _{rounded} =	50							
South Access/Reems Road								
Turning Volume (vph)	28							
S _{calculated} =	50							
S _{rounded} =	50							
East Access/Northern Avenue								
Turning Volume (vph)				18				
S _{calculated} =				50				
S _{rounded} =				50				
West Access/Northern Avenue								
Turning Volume (vph)				71			46	
S _{calculated} =				50			50	
S _{rounded} =				50			50	
North Building 5 Access/Alsup Road								
Turning Volume (vph)		20						
S _{calculated} =		50						
S _{rounded} =		50						
Middle Building 5 Access/Alsup Road								
Turning Volume (vph)		18						
S _{calculated} =		50						
S _{rounded} =		50						
South Building 5 Access/Alsup Road								
Turning Volume (vph)		21						
S _{calculated} =		50						
S _{rounded} =		50						

S - storage in feet, vph - vehicles per hour



Crash Analysis

Crash history for all of the existing study intersections was obtained from ADOT from 1 January 2017 to 31 December 2019. The results of the crash analysis at the five existing study intersections are shown in **Table 12**. No collisions were reported near the intersections of Reems Road/Northern Avenue, Orangewood Avenue/Reems Road, or Alsop Road/Northern Avenue during the three-year study period. An expanded summary of the crash data can be found in the Appendix.

Table 12 – Crash Analysis at Northern Parkway Ramps/Reems Road

Year	Crash Type							Fatal	Injury	Crash Totals
	Angle	Left Turn	Rear-End	Sideswipe	Single Vehicle	Head On	Other			
2017	0	0	0	0	0	0	0	0	0	0
2018	0	1	0	0	2	0	1	0	1	4
2019	1	0	0	0	6	0	0	0	3	7
3-Year Total	1	1	0	0	8	0	1	0	4	11

Table 12 shows there were eleven reported crashes with four injuries and no fatalities at the intersection of Northern Parkway Ramps/Reems Road during the three-year study period. The most common crash type was single vehicle (eight crashes, 72% of total) followed by angle (one crash, 9% of total) and left turn (one crash, 9% of total). The observed crash patterns at this intersection could be the result of multiple lane transitions on Reems Road near the Northern Parkway Ramps that shifts cars from a two-lanes, out to five lanes, and then back down to a two-lane roadway within a quarter of a mile.

It should be noted that this crash summary only includes crashes where a police officer was contacted and wrote a report, otherwise, there is no record of the incident. It is possible that other minor crashes occurred in the area where the Police Department was not contacted, and no official record of these crashes exists.

Conclusion

When fully completed, the proposed Hopewell Reems project is predicted to generate an additional 5,232 vehicle trips per day (vtpd) on weekdays to the adjacent street system from the new project site. Fifty percent of these new trips (2,616 vehicle trips) will be into the project and fifty percent will be out of the project.

All of the existing study intersections currently operate at an adequate LOS during the weekday AM and PM peak hours.

The study intersections are anticipated to continue operating at an adequate LOS in 2022 and 2027 without traffic from the project.



All of the study intersections are expected to operate at an adequate LOS in 2022 and 2027 without and with traffic from the project.

The left turn movements into the project site from Reems Road, Northern Avenue, and Alsup Road can be accommodated within the proposed two-way center left turn lanes on Reems Road, Northern Avenue, and Alsup Road.

Southbound left turn lanes are warranted at the access points on Alsup Road (North Building 5 Access, Middle Building 5 Access, and South Building 5 Access).

An eastbound right turn lane is warranted at West Access/Northern Avenue.

The warranted southbound left turn lanes at North Building 5 Access/Alsup Road, Middle Building 5 Access/Alsup Road, and South Building 5 Access/Alsup Road are expected to have a minimum queue length of 50 feet.

In addition, the warranted eastbound right turn lane at West Access/Northern Avenue is also expected to have a minimum queue length of 50 feet.

The warranted left and right turn lanes should be constructed to provide 160 feet of storage per the Maricopa County Department of Transportation (MCDOT) *Roadway Design Manual*.

Crash history for all of the existing study intersections was obtained from ADOT from 1 January 2017 to 31 December 2019. No collisions were reported near the intersections of Reems Road/Northern Avenue, Orangewood Avenue/Reems Road, or Alsup Road/Northern Avenue during the three-year study period.

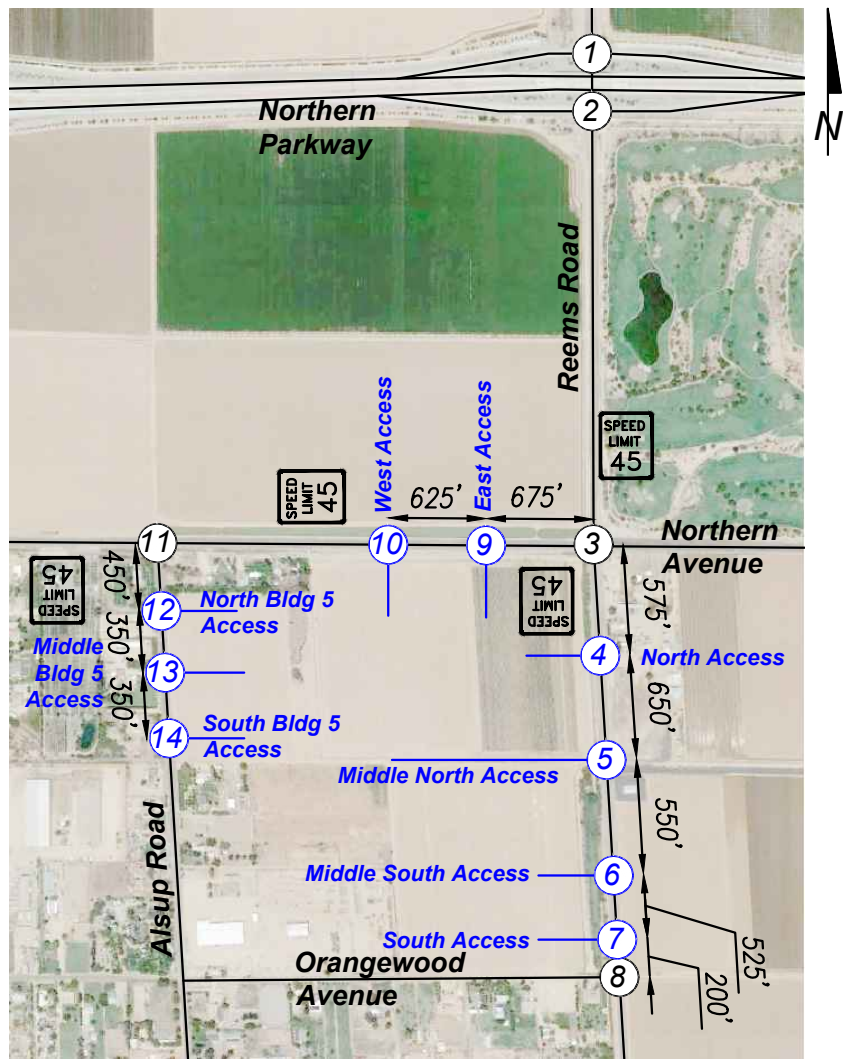
Eleven crashes were reported at the intersections of Northern Parkway Ramps/Reems Road with four injuries and no fatalities during the three-year study period. The most common crash type was single vehicle (eight crashes, 72% of total) followed by angle (one crash, 9% of total) and left turn (one crash, 9% of total). The observed crash patterns at this intersection could be the result of multiple lane transitions on Reems Road near the Northern Parkway Ramps that shifts cars from two-lanes, out to five lanes, and then back down to a two-lane roadway within a quarter of a mile.

Reems Road and Northern Avenue are expected to be five-lane major arterials when built to their ultimate pavement cross-section. Hopewell Reems is anticipated to construct half-street improvements on the west side of Reems Road and the south side of Northern Avenue along the project frontage prior to the opening year. It is recommended that the interim pavement be striped to provide one through lane for each direction of travel with a two-way center left turn lane. Additional pavement should be 'striped out' for future improvements to tie into as development occurs in the area.



While Alsup Road will be widened to a three-lane pavement cross-section along the project frontage, there is not adequate space to transition the roadway from two lanes, out to three lanes, and then back down to two lanes. It is recommended for the Hopewell Reems project to provide one through lane for each direction of travel on Alsup Road during the interim condition and to 'stripe out' additional pavement to tie into future roadway improvements north and south of the project frontage.

Proposed lane configurations and traffic control are shown in **Figure 14**.



LEGEND:

- = Speed Limit
- = Existing Road
- = Existing Movement
- = Existing Road
- = Existing Movement
- = Traffic Signal
- = Stop Sign

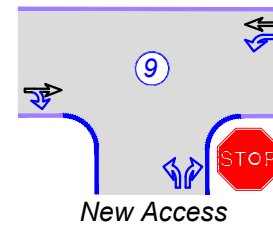
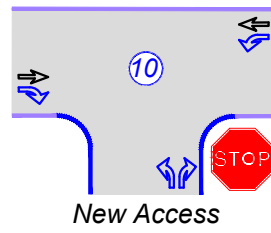
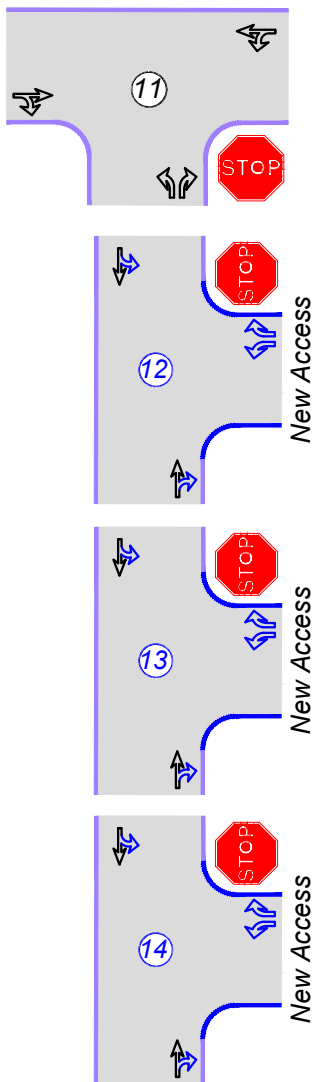
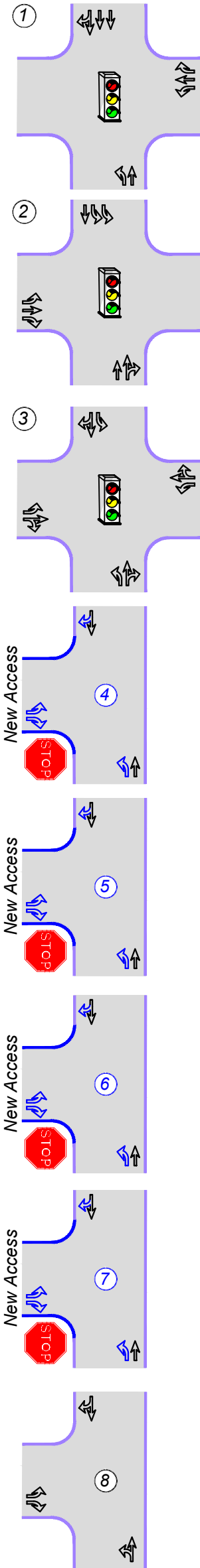


Figure 14 - Proposed Lane Configurations and Traffic Control



**HOPEWELL REEMS
ORANGEWOOD AVENUE/REEMS ROAD
TRAFFIC IMPACT ANALYSIS**

APPENDIX

Traffic Counts

Trip Generation Calculations

Capacity Calculations

Turn Lane Calculations

Crash Data



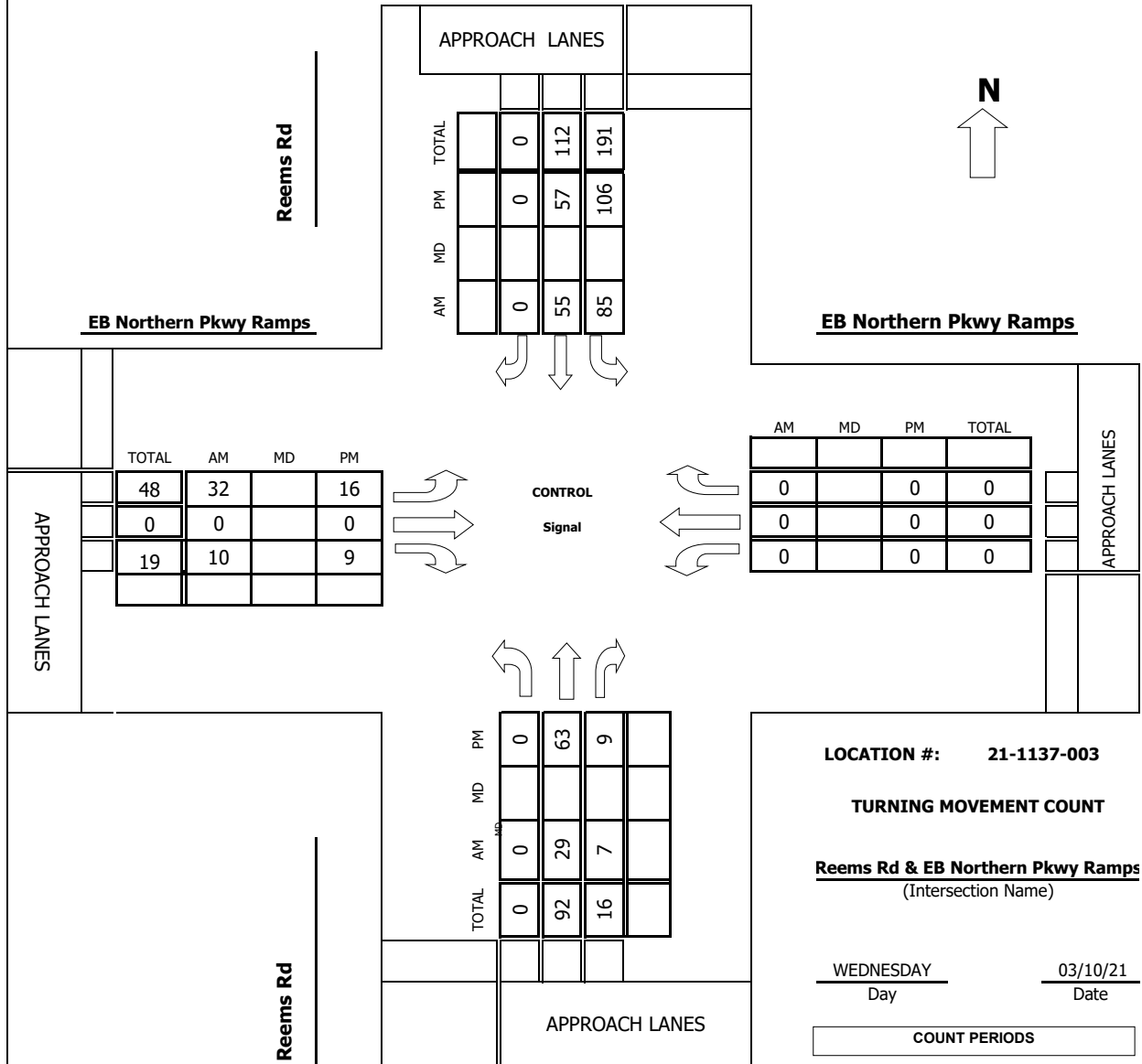
**HOPEWELL REEMS
ORANGEWOOD AVENUE/REEMS ROAD
TRAFFIC IMPACT ANALYSIS**

APPENDIX

Traffic Counts

Project #: 21-1137-003

TMC SUMMARY OF Reems Rd & EB Northern Pkwy Ramps



Reems Rd

EB Northern Pkwy Ramps

TOTAL	AM	MD	PM
48	32		16
0	0		0
19	10		9

APPROACH LANES

	AM	MD	PM	TOTAL
0	55	85		140
0	57	106		163
0	112	191		303

EB Northern Pkwy Ramps

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

APPROACH LANES

APPROACH LANES

Reems Rd

TOTAL	AM	MD	PM
0	92	16	
0	29	7	
0	63	9	

APPROACH LANES

LOCATION #: 21-1137-003

TURNING MOVEMENT COUNT

Reems Rd & EB Northern Pkwy Ramps
 (Intersection Name)

WEDNESDAY 03/10/21
 Day Date

COUNT PERIODS

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

AM PEAK HOUR 800 AM
 NOON PEAK HOUR _____
 PM PEAK HOUR 415 PM

Intersection Turning Movement Prepared by:



FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745



N-S STREET: **Reems Rd** DATE: **03/10/21** LOCATION: **Glendale**
 E-W STREET: **EB Northern Pkwy Ramps** DAY: **WEDNESDAY** PROJECT# **21-1137-003**

LANES:	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
	0	2	0	1	1	0	1	1	1	0	0	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	0	5	0	24	12	0	13	0	2	0	0	0	56
7:15 AM	0	3	0	24	11	0	8	0	2	0	0	0	48
7:30 AM	0	10	0	30	8	0	10	0	2	0	0	0	60
7:45 AM	0	7	1	19	6	0	10	0	2	0	0	0	45
8:00 AM	0	10	2	31	12	0	7	0	3	0	0	0	65
8:15 AM	0	5	2	22	13	0	4	0	1	0	0	0	47
8:30 AM	0	6	3	13	24	0	11	0	4	0	0	0	61
8:45 AM	0	8	0	19	6	0	10	0	2	0	0	0	45
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													
10:45 AM													
11:00 AM													
11:15 AM													
11:30 AM													
11:45 AM													

TOTAL	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
Volumes	0	54	8	182	92	0	73	0	18	0	0	0	427
Approach %	0.00	87.10	12.90	66.42	33.58	0.00	80.22	0.00	19.78	####	####	####	
App/Depart	62	/	127	274	/	110	91	/	190	0	/	0	

AM Peak Hr Begins at: 800 AM

PEAK

Volumes	0	29	7	85	55	0	32	0	10	0	0	0	218
Approach %	0.00	80.56	19.44	60.71	39.29	0.00	76.19	0.00	23.81	####	####	####	

PEAK HR.

FACTOR:	0.750	0.814	0.700	0.000	0.838
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CONTROL: **Signal**
 COMMENT 1:
 GPS: **33.558803, -112.393599**

Intersection Turning Movement



FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745



N-S STREET: Reems Rd DATE: 03/10/21 LOCATION: Glendale
0
E-W STREET: EB Northern Pkwy Ramps DAY: WEDNESDAY PROJECT# 21-1137-003

LANES:	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
	0	2	0	1	1	0	1	1	1	0	0	0	
1:00 PM													
1:15 PM													
1:30 PM													
1:45 PM													
2:00 PM													
2:15 PM													
2:30 PM													
2:45 PM													
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	0	10	0	22	9	0	10	1	3	0	0	0	55
4:15 PM	0	22	1	25	26	0	7	0	0	0	0	0	81
4:30 PM	0	11	4	36	14	0	4	0	3	0	0	0	72
4:45 PM	0	18	2	18	8	0	2	0	4	0	0	0	52
5:00 PM	0	12	2	27	9	0	3	0	2	0	0	0	55
5:15 PM	0	9	5	17	17	0	7	0	3	0	0	0	58
5:30 PM	0	20	1	23	5	0	5	0	2	0	0	0	56
5:45 PM	0	12	2	14	5	0	1	0	3	0	0	0	37
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

TOTAL	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
Volumes	0	114	17	182	93	0	39	1	20	0	0	0	466
Approach %	0.00	87.02	12.98	66.18	33.82	0.00	65.00	1.67	33.33	####	####	####	
App/Depart	131	/	153	275	/	113	60	/	200	0	/	0	

PM Peak Hr Begins at: 415 PM

PEAK

Volumes	0	63	9	106	57	0	16	0	9	0	0	0	260
Approach %	0.00	87.50	12.50	65.03	34.97	0.00	64.00	0.00	36.00	####	####	####	

PEAK HR. FACTOR:

	0.783	0.799	0.893	0.000	0.802
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CONTROL: Signal
COMMENT 1: 0
GPS: 33.558803, -112.393599

Intersection Turning Movement Prepared by:



FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745



N-S STREET: **Reems Rd** DATE: **03/10/21** LOCATION: **Glendale**
 E-W STREET: **WB Northern Pkwy Ramps** DAY: **WEDNESDAY** PROJECT# **21-1137-004**

LANES:	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
	1	1	0	0	2	1	0	0	0	1	1	1	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	0	17	0	0	35	5	0	0	0	0	0	17	74
7:15 AM	1	12	0	0	34	1	0	0	0	2	1	9	60
7:30 AM	3	16	0	0	38	6	0	0	0	2	0	24	89
7:45 AM	1	14	0	0	24	3	0	0	0	1	0	20	63
8:00 AM	0	18	0	0	43	7	0	0	0	0	0	9	77
8:15 AM	1	8	0	0	36	6	0	0	0	0	0	13	64
8:30 AM	2	14	0	0	36	5	0	0	0	2	0	7	66
8:45 AM	2	17	0	0	25	2	0	0	0	1	0	10	57
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													
10:45 AM													
11:00 AM													
11:15 AM													
11:30 AM													
11:45 AM													

TOTAL	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
Volumes	10	116	0	0	271	35	0	0	0	8	1	109	550
Approach %	7.94	92.06	0.00	0.00	88.56	11.44	####	####	####	6.78	0.85	92.37	
App/Depart	126	/	225	306	/	279	0	/	0	118	/	46	

AM Peak Hr Begins at: 730 AM

PEAK

Volumes	5	56	0	0	141	22	0	0	0	3	0	66	293
Approach %	8.20	91.80	0.00	0.00	86.50	13.50	####	####	####	4.35	0.00	95.65	

PEAK HR.

FACTOR:	0.803	0.815	0.000	0.663	0.823
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CONTROL: **Signal**
 COMMENT 1:
 GPS: **33.559717, -112.393585**

Intersection Turning Movement



FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745



N-S STREET: Reems Rd DATE: 03/10/21 LOCATION: Glendale
0
 E-W STREET: WB Northern Pkwy Ramps DAY: WEDNESDAY PROJECT# 21-1137-004

LANES:	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
	1	1	0	0	2	1	0	0	0	1	1	1	

1:00 PM													
1:15 PM													
1:30 PM													
1:45 PM													
2:00 PM													
2:15 PM													
2:30 PM													
2:45 PM													
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	2	17	0	0	30	14	0	0	0	3	0	28	94
4:15 PM	5	25	0	0	46	14	0	0	0	5	1	28	124
4:30 PM	1	14	0	0	44	13	0	0	0	3	0	36	111
4:45 PM	2	17	0	0	24	10	0	0	0	2	0	33	88
5:00 PM	2	13	0	0	30	8	0	0	0	6	0	33	92
5:15 PM	1	16	0	0	32	6	0	0	0	1	0	29	85
5:30 PM	7	18	0	0	26	19	0	0	0	1	0	23	94
5:45 PM	1	13	0	0	16	10	0	0	0	3	0	23	66
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

TOTAL	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
Volumes	21	133	0	0	248	94	0	0	0	24	1	233	754
Approach %	13.64	86.36	0.00	0.00	72.51	27.49	####	####	####	9.30	0.39	90.31	
App/Depart	154	/	366	342	/	272	0	/	0	258	/	116	

PM Peak Hr Begins at: 400 PM

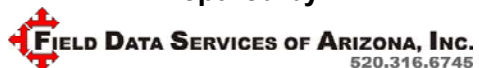
PEAK	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
Volumes	10	73	0	0	144	51	0	0	0	13	1	125	417
Approach %	12.05	87.95	0.00	0.00	73.85	26.15	####	####	####	9.35	0.72	89.93	

PEAK HR. FACTOR:	0.692	0.813	0.000	0.891	0.841
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CONTROL: Signal
 COMMENT 1: 0
 GPS: 33.559717, -112.393585

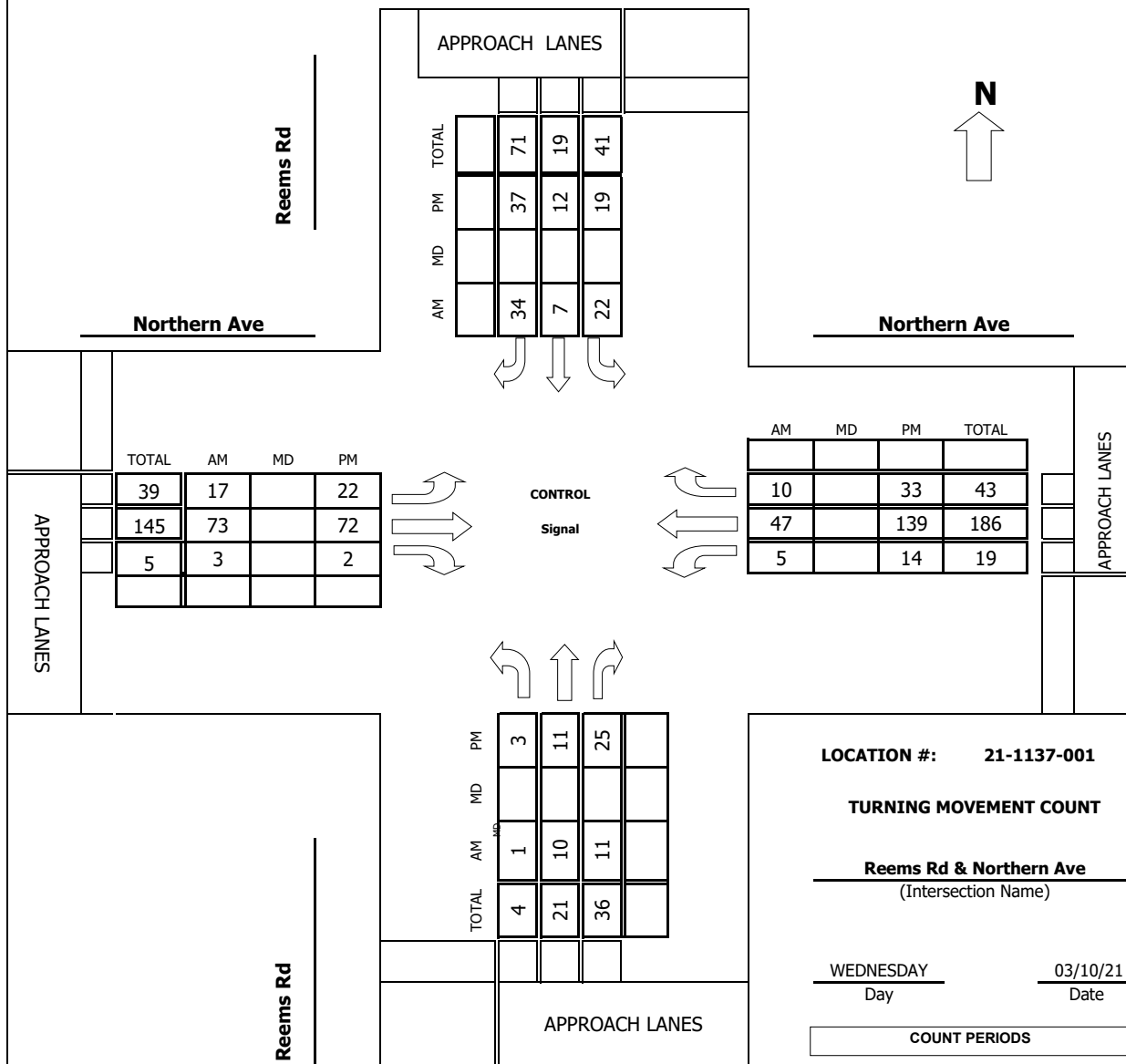
Intersection Turning Movement

Prepared by:



Project #: 21-1137-001

TMC SUMMARY OF Reems Rd & Northern Ave



LOCATION #: **21-1137-001**

TURNING MOVEMENT COUNT

Reems Rd & Northern Ave
(Intersection Name)

WEDNESDAY 03/10/21
Day Date

COUNT PERIODS

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

AM PEAK HOUR 745 AM

NOON PEAK HOUR _____

PM PEAK HOUR 400 PM

Intersection Turning Movement Prepared by:



FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745



N-S STREET: **Reems Rd** DATE: **03/10/21** LOCATION: **Glendale**
 E-W STREET: **Northern Ave** DAY: **WEDNESDAY** PROJECT# **21-1137-001**

LANES:	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
	1	1	0	1	1	0	1	1	0	1	1	0	
6:00 AM													
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	0	1	0	12	0	2	1	33	0	0	8	3	60
7:15 AM	0	1	4	8	0	2	2	25	0	0	4	4	50
7:30 AM	0	1	2	8	1	1	2	18	0	1	3	2	39
7:45 AM	0	2	3	2	1	3	8	15	1	1	10	5	51
8:00 AM	0	2	1	9	3	4	2	17	1	1	12	2	54
8:15 AM	0	3	2	4	1	6	6	14	1	1	10	0	48
8:30 AM	1	3	5	7	2	21	1	27	0	2	15	3	87
8:45 AM	0	3	2	3	1	6	0	14	0	4	12	2	47
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													
10:45 AM													
11:00 AM													
11:15 AM													
11:30 AM													
11:45 AM													

TOTAL	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
Volumes	1	16	19	53	9	45	22	163	3	10	74	21	436
Approach %	2.78	44.44	52.78	49.53	8.41	42.06	11.70	86.70	1.60	9.52	70.48	20.00	
App/Depart	36	/	59	107	/	22	188	/	235	105	/	120	

AM Peak Hr Begins at: 745 AM

PEAK

Volumes	1	10	11	22	7	34	17	73	3	5	47	10	240
Approach %	4.55	45.45	50.00	34.92	11.11	53.97	18.28	78.49	3.23	8.06	75.81	16.13	

PEAK HR.

FACTOR:	0.611	0.525	0.830	0.775	0.690
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CONTROL: **Signal**
 COMMENT 1:
 GPS: **33.551647, -112.393541**

Intersection Turning Movement



FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745



N-S STREET: **Reems Rd** DATE: **03/10/21** LOCATION: **Glendale**
 E-W STREET: **Northern Ave** DAY: **WEDNESDAY** PROJECT#: **21-1137-001**

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

1:00 PM													
1:15 PM													
1:30 PM													
1:45 PM													
2:00 PM													
2:15 PM													
2:30 PM													
2:45 PM													
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	1	0	10	3	4	9	2	19	0	4	42	9	103
4:15 PM	0	4	4	11	4	10	3	12	2	3	37	14	104
4:30 PM	1	7	3	4	1	10	8	20	0	1	43	4	102
4:45 PM	1	0	8	1	3	8	9	21	0	6	17	6	80
5:00 PM	2	3	1	2	2	10	8	18	2	3	32	7	90
5:15 PM	1	1	5	6	3	7	2	13	1	7	18	8	72
5:30 PM	0	3	3	3	0	4	11	15	0	3	38	9	89
5:45 PM	0	2	4	2	1	5	3	17	1	2	10	5	52
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

TOTAL	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
Volumes	6	20	38	32	18	63	46	135	6	29	237	62	692
Approach %	9.38	31.25	59.38	28.32	15.93	55.75	24.60	72.19	3.21	8.84	72.26	18.90	
App/Depart	64	/	128	113	/	53	187	/	205	328	/	306	

PM Peak Hr Begins at: 400 PM

PEAK

Volumes	3	11	25	19	12	37	22	72	2	14	139	33	389
Approach %	7.69	28.21	64.10	27.94	17.65	54.41	22.92	75.00	2.08	7.53	74.73	17.74	

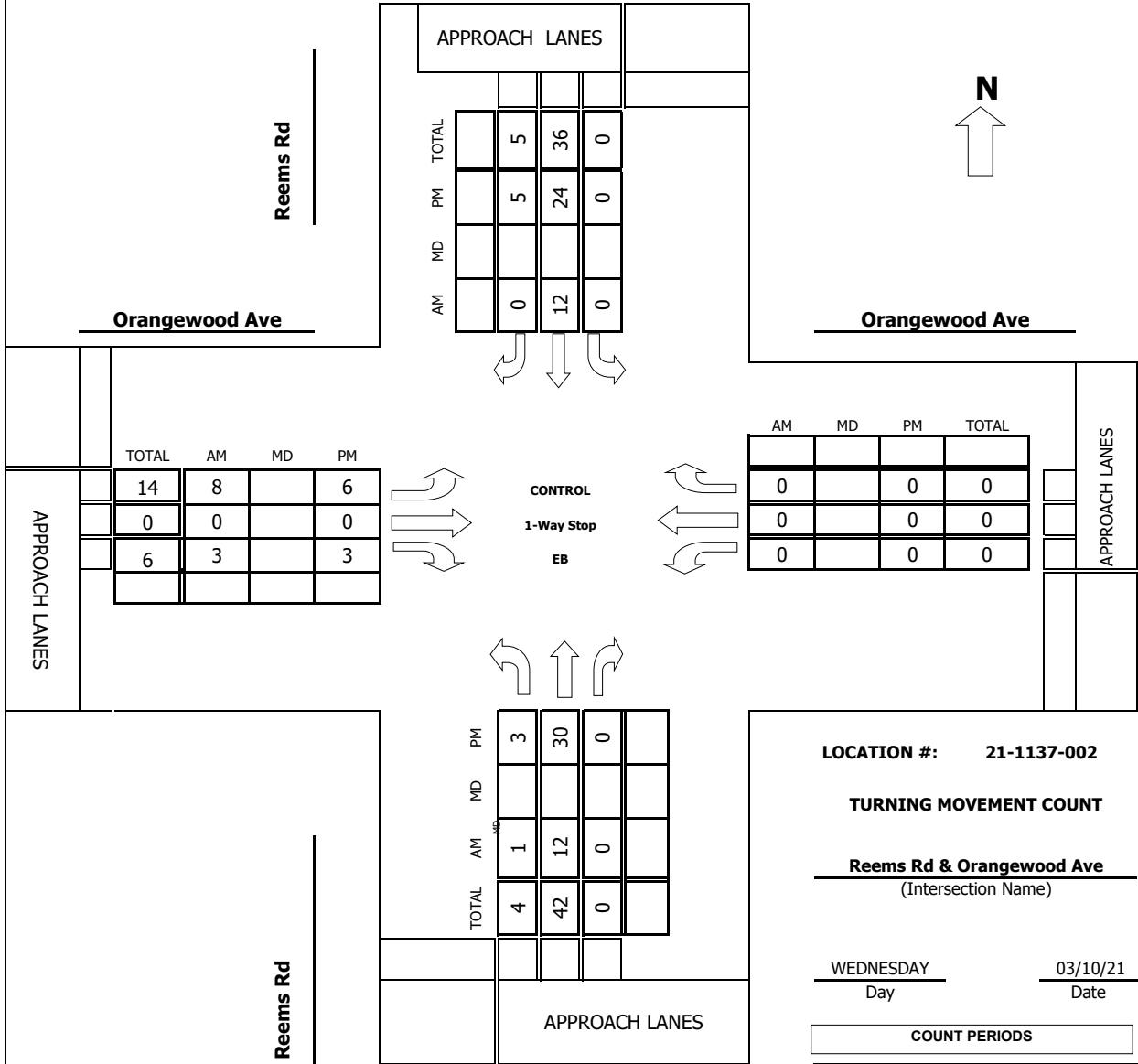
PEAK HR.

FACTOR:	0.886	0.680	0.800	0.845	0.935
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CONTROL: **Signal**
 COMMENT 1: **0**
 GPS: **33.551647, -112.393541**

Project #: 21-1137-002

TMC SUMMARY OF Reems Rd & Orangewood Ave



Reems Rd

Orangewood Ave

TOTAL	AM	MD	PM
14	8		6
0	0		0
6	3		3

APPROACH LANES

AM	MD	PM	TOTAL
0		5	5
12		24	36
0		0	0

Orangewood Ave

N

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

APPROACH LANES

TOTAL	AM	MD	PM
14	8		6
0	0		0
6	3		3

TOTAL	AM	MD	PM
4	1		3
42	12		30
0	0		0

APPROACH LANES

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

Reems Rd

TOTAL	AM	MD	PM
4	1		3
42	12		30
0	0		0

APPROACH LANES

LOCATION #: 21-1137-002

TURNING MOVEMENT COUNT

Reems Rd & Orangewood Ave
(Intersection Name)

WEDNESDAY 03/10/21
Day Date

COUNT PERIODS

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

AM PEAK HOUR 800 AM
 NOON PEAK HOUR _____
 PM PEAK HOUR 400 PM

Intersection Turning Movement Prepared by:



FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745



N-S STREET: **Reems Rd** DATE: **03/10/21** LOCATION: **Glendale**
 E-W STREET: **Orangewood Ave** DAY: **WEDNESDAY** PROJECT# **21-1137-002**

LANES:	NORTHBOUND			SOUTHBOUND			EASTBOUND			WESTBOUND			TOTAL
	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
6:00 AM	0	1	0	0	1	0	0	1	0	0	0	0	2
6:15 AM													
6:30 AM													
6:45 AM													
7:00 AM	0	1	0	0	1	0	0	0	0	0	0	0	2
7:15 AM	0	2	0	0	0	0	2	0	0	0	0	0	4
7:30 AM	0	2	0	0	1	0	1	0	1	0	0	0	5
7:45 AM	0	4	0	0	3	1	1	0	0	0	0	0	9
8:00 AM	0	3	0	0	3	0	1	0	2	0	0	0	9
8:15 AM	1	4	0	0	3	0	2	0	0	0	0	0	10
8:30 AM	0	3	0	0	2	0	3	0	0	0	0	0	8
8:45 AM	0	2	0	0	4	0	2	0	1	0	0	0	9
9:00 AM													
9:15 AM													
9:30 AM													
9:45 AM													
10:00 AM													
10:15 AM													
10:30 AM													
10:45 AM													
11:00 AM													
11:15 AM													
11:30 AM													
11:45 AM													

TOTAL	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
Volumes	1	21	0	0	17	1	12	0	4	0	0	0	56
Approach %	4.55	95.45	0.00	0.00	94.44	5.56	75.00	0.00	25.00	####	####	####	
App/Depart	22	/	33	18	/	21	16	/	0	0	/	2	

AM Peak Hr Begins at: 800 AM

PEAK

Volumes	1	12	0	0	12	0	8	0	3	0	0	0	36
Approach %	7.69	92.31	0.00	0.00	100.00	0.00	72.73	0.00	27.27	####	####	####	

PEAK HR.

FACTOR:	0.650	0.750	0.917	0.000	0.900
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CONTROL: **1-Way Stop (EB)**
 COMMENT 1:
 GPS: **33.544446, -112.393041**

Intersection Turning Movement



FIELD DATA SERVICES OF ARIZONA, INC.
520.316.6745



N-S STREET: **Reems Rd** DATE: **03/10/21** LOCATION: **Glendale**
 E-W STREET: **Orangewood Ave** DAY: **WEDNESDAY** PROJECT#: **21-1137-002**

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

1:00 PM													
1:15 PM													
1:30 PM													
1:45 PM													
2:00 PM													
2:15 PM													
2:30 PM													
2:45 PM													
3:00 PM													
3:15 PM													
3:30 PM													
3:45 PM													
4:00 PM	1	7	0	0	6	1	2	0	0	0	0	0	17
4:15 PM	0	8	0	0	5	2	1	0	1	0	0	0	17
4:30 PM	2	8	0	0	8	1	0	0	2	0	0	0	21
4:45 PM	0	7	0	0	5	1	3	0	0	0	0	0	16
5:00 PM	1	4	0	0	6	0	0	0	1	0	0	0	12
5:15 PM	1	6	0	0	6	2	1	0	1	0	0	0	17
5:30 PM	0	5	0	0	4	0	0	0	0	0	0	0	9
5:45 PM	0	4	0	0	3	1	0	0	0	0	0	0	8
6:00 PM													
6:15 PM													
6:30 PM													
6:45 PM													

TOTAL	NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	TOTAL
Volumes	5	49	0	0	43	8	7	0	5	0	0	0	117
Approach %	9.26	90.74	0.00	0.00	84.31	15.69	58.33	0.00	41.67	####	####	####	
App/Depart	54	/	56	51	/	48	12	/	0	0	/	13	

PM Peak Hr Begins at: 400 PM

PEAK

Volumes	3	30	0	0	24	5	6	0	3	0	0	0	71
Approach %	9.09	90.91	0.00	0.00	82.76	17.24	66.67	0.00	33.33	####	####	####	

PEAK HR.

FACTOR:	0.825	0.806	0.750	0.000	0.845
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CONTROL: **1-Way Stop (EB)**
 COMMENT 1: **0**
 GPS: **33.544446, -112.393041**



**HOPEWELL REEMS
ORANGEWOOD AVENUE/REEMS ROAD
TRAFFIC IMPACT ANALYSIS**

APPENDIX

Trip Generation Calculations

Industrial Park

Phase 1

LAND USE: 536,669 Square Feet Industrial Park

TRIP GENERATION CALCULATIONS ARE BASED ON THE INSTITUTE OF TRANSPORTATION ENGINEERS' TRIP GENERATION, 10TH EDITION. THE ITE LAND USE CODE IS Industrial Park (130), General Urban/Suburban

Weekday

Average Rate = 3.37 Trips per 1000 Square Feet (sqft)

$3.37 \text{ Trips} \times 536669 \text{ sqft} / 1000$

T = 1,810 VTPD

ENTER: $(0.5) \times (1810) =$ **905 VTPD**

EXIT: $(0.5) \times (1810) =$ **905 VTPD**

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

Average Rate = 0.4 Trips per 1000 Square Feet (sqft)

$T = 0.4 \text{ Trips} \times 536669 \text{ sqft} / 1000$

T = 215 VPH

ENTER: $(0.81) \times (215) =$ **174 VPH**

EXIT: $(0.19) \times (215) =$ **41 VPH**

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

Average Rate = 0.4 Trips per 1000 Square Feet (sqft)

$T = 0.4 \text{ Trips} \times 536669 \text{ sqft} / 1000$

T = 215 VPH

ENTER: $(0.21) \times (215) =$ **45 VPH**

EXIT: $(0.79) \times (215) =$ **170 VPH**

*where, T = trip ends

TRIP GENERATION SUMMARY

WEEKDAY

1,810 VTPD

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

215 VPH

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

215 VPH

Industrial Park

Phase 2

LAND USE: 1,014,860 Square Feet Industrial Park

TRIP GENERATION CALCULATIONS ARE BASED ON THE INSTITUTE OF TRANSPORTATION ENGINEERS' TRIP GENERATION, 10TH EDITION. THE ITE LAND USE CODE IS Industrial Park (130), General Urban/Suburban

Weekday

Average Rate = 3.37 Trips per 1000 Square Feet (sqft)

$3.37 \text{ Trips} \times 1014860 \text{ sqft} / 1000$

T = 3,422 VTPD

ENTER: $(0.5) \times (3422) = 1,711 \text{ VTPD}$

EXIT: $(0.5) \times (3422) = 1,711 \text{ VTPD}$

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

Average Rate = 0.4 Trips per 1000 Square Feet (sqft)

$T = 0.4 \text{ Trips} \times 1014860 \text{ sqft} / 1000$

T = 406 VPH

ENTER: $(0.81) \times (406) = 329 \text{ VPH}$

EXIT: $(0.19) \times (406) = 77 \text{ VPH}$

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

Average Rate = 0.4 Trips per 1000 Square Feet (sqft)

$T = 0.4 \text{ Trips} \times 1014860 \text{ sqft} / 1000$

T = 406 VPH

ENTER: $(0.21) \times (406) = 85 \text{ VPH}$

EXIT: $(0.79) \times (406) = 321 \text{ VPH}$

*where, T = trip ends

TRIP GENERATION SUMMARY

WEEKDAY

3,422 VTPD

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

406 VPH

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

406 VPH



**HOPEWELL REEMS
ORANGEWOOD AVENUE/REEMS ROAD
TRAFFIC IMPACT ANALYSIS**

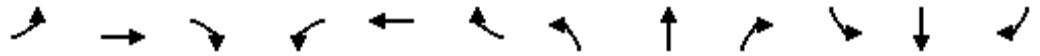
APPENDIX

Capacity Calculations

HCM Signalized Intersection Capacity Analysis

1: Reems Road & Westbound Northern Parkway Ramps

04/02/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↑	↗	↙	↑			↑↑↑	
Traffic Volume (vph)	0	0	0	3	0	66	5	56	0	0	141	22
Future Volume (vph)	0	0	0	3	0	66	5	56	0	0	141	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.5		4.5	4.5	4.5			4.5	
Lane Util. Factor				1.00		1.00	1.00	1.00			0.91	
Frt				1.00		0.85	1.00	1.00			0.98	
Flt Protected				0.95		1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1641		1468	1641	1727			4618	
Flt Permitted				0.95		1.00	0.95	1.00			1.00	
Satd. Flow (perm)				1641		1468	1641	1727			4618	
Peak-hour factor, PHF	0.90	0.90	0.90	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	0	0	0	4	0	82	6	70	0	0	176	28
RTOR Reduction (vph)	0	0	0	0	0	79	0	0	0	0	9	0
Lane Group Flow (vph)	0	0	0	4	0	4	6	70	0	0	195	0
Turn Type				Split		Perm	Prot	NA			NA	
Protected Phases				8	8		1 7	5 6 7			2	
Permitted Phases						8						
Actuated Green, G (s)				4.7		4.7	5.5	76.3			61.8	
Effective Green, g (s)				4.7		4.7	5.5	76.3			61.8	
Actuated g/C Ratio				0.05		0.05	0.06	0.85			0.69	
Clearance Time (s)				4.5		4.5					4.5	
Vehicle Extension (s)				3.0		3.0					3.0	
Lane Grp Cap (vph)				85		76	100	1464			3171	
v/s Ratio Prot				0.00			0.00	c0.04			c0.04	
v/s Ratio Perm						c0.00						
v/c Ratio				0.05		0.06	0.06	0.05			0.06	
Uniform Delay, d1				40.5		40.5	39.8	1.1			4.6	
Progression Factor				1.00		1.00	0.69	0.94			1.00	
Incremental Delay, d2				0.2		0.3	0.3	0.0			0.0	
Delay (s)				40.8		40.9	27.8	1.0			4.7	
Level of Service				D		D	C	A			A	
Approach Delay (s)		0.0			40.9			3.2			4.7	
Approach LOS		A			D			A			A	
Intersection Summary												
HCM 2000 Control Delay			12.9									B
HCM 2000 Volume to Capacity ratio			0.06									
Actuated Cycle Length (s)			90.0							18.0		
Intersection Capacity Utilization			23.8%									A
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: Reems Road & Eastbound Northern Parkway Ramps

04/02/2021



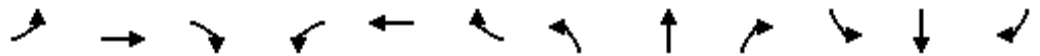
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	32	0	10	0	0	0	0	29	7	85	55	0	
Future Volume (vph)	32	0	10	0	0	0	0	29	7	85	55	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.5		4.5					4.5		4.5	4.5		
Lane Util. Factor	1.00		1.00					0.95		0.97	1.00		
Frt	1.00		0.85					0.97		1.00	1.00		
Flt Protected	0.95		1.00					1.00		0.95	1.00		
Satd. Flow (prot)	1641		1468					3183		3183	1727		
Flt Permitted	0.95		1.00					1.00		0.95	1.00		
Satd. Flow (perm)	1641		1468					3183		3183	1727		
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	
Adj. Flow (vph)	40	0	12	0	0	0	0	36	9	106	69	0	
RTOR Reduction (vph)	0	0	12	0	0	0	0	3	0	0	0	0	
Lane Group Flow (vph)	40	0	1	0	0	0	0	42	0	106	69	0	
Turn Type	Split		Perm					NA		Prot	NA		
Protected Phases	4	4						6		3 5	1 2 3		
Permitted Phases			4										
Actuated Green, G (s)	5.3		5.3					55.4		11.3	75.7		
Effective Green, g (s)	5.3		5.3					55.4		11.3	75.7		
Actuated g/C Ratio	0.06		0.06					0.62		0.13	0.84		
Clearance Time (s)	4.5		4.5					4.5					
Vehicle Extension (s)	3.0		3.0					3.0					
Lane Grp Cap (vph)	96		86					1959		399	1452		
v/s Ratio Prot	c0.02							0.01		c0.03	c0.04		
v/s Ratio Perm			0.00										
v/c Ratio	0.42		0.01					0.02		0.27	0.05		
Uniform Delay, d1	40.9		39.9					6.7		35.6	1.2		
Progression Factor	1.00		1.00					1.00		1.29	0.26		
Incremental Delay, d2	2.9		0.0					0.0		0.4	0.0		
Delay (s)	43.8		39.9					6.8		46.3	0.3		
Level of Service	D		D					A		D	A		
Approach Delay (s)		42.8			0.0			6.8			28.2		
Approach LOS		D			A			A			C		
Intersection Summary													
HCM 2000 Control Delay			27.5									HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.11										
Actuated Cycle Length (s)			90.0									Sum of lost time (s)	18.0
Intersection Capacity Utilization			23.8%									ICU Level of Service	A
Analysis Period (min)			15										

c Critical Lane Group

HCM 6th Signalized Intersection Summary

9: Reems Road & Northern Avenue

04/02/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Traffic Volume (veh/h)	17	73	3	5	47	10	1	10	11	22	7	34
Future Volume (veh/h)	17	73	3	5	47	10	1	10	11	22	7	34
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752
Adj Flow Rate, veh/h	21	91	4	6	59	12	1	12	14	28	9	42
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	10	10	10	10	10	10	10	10	10	10	10	10
Cap, veh/h	220	165	7	203	140	29	1045	530	618	1072	193	903
Arrive On Green	0.10	0.10	0.10	0.10	0.10	0.10	0.72	0.72	0.72	0.72	0.72	0.72
Sat Flow, veh/h	1245	1665	73	1218	1413	287	1268	737	860	1297	269	1256
Grp Volume(v), veh/h	21	0	95	6	0	71	1	0	26	28	0	51
Grp Sat Flow(s),veh/h/ln	1245	0	1739	1218	0	1700	1268	0	1597	1297	0	1526
Q Serve(g_s), s	0.8	0.0	2.6	0.2	0.0	1.9	0.0	0.0	0.2	0.3	0.0	0.5
Cycle Q Clear(g_c), s	2.7	0.0	2.6	2.8	0.0	1.9	0.5	0.0	0.2	0.5	0.0	0.5
Prop In Lane	1.00		0.04	1.00		0.17	1.00		0.54	1.00		0.82
Lane Grp Cap(c), veh/h	220	0	172	203	0	169	1045	0	1148	1072	0	1096
V/C Ratio(X)	0.10	0.00	0.55	0.03	0.00	0.42	0.00	0.00	0.02	0.03	0.00	0.05
Avail Cap(c_a), veh/h	1244	0	1601	1204	0	1566	1045	0	1148	1072	0	1096
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	22.2	0.0	21.2	22.5	0.0	20.9	2.1	0.0	2.0	2.1	0.0	2.0
Incr Delay (d2), s/veh	0.2	0.0	2.7	0.1	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	1.0	0.1	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.4	0.0	23.9	22.6	0.0	22.6	2.1	0.0	2.0	2.1	0.0	2.1
LnGrp LOS	C	A	C	C	A	C	A	A	A	A	A	A
Approach Vol, veh/h		116			77			27				79
Approach Delay, s/veh		23.7			22.6			2.0				2.1
Approach LOS		C			C			A				A
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		40.0		9.4		40.0		9.4				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		35.5		45.5		35.5		45.5				
Max Q Clear Time (g_c+I1), s		2.5		4.7		2.5		4.8				
Green Ext Time (p_c), s		0.1		0.5		0.3		0.4				
Intersection Summary												
HCM 6th Ctrl Delay				15.7								
HCM 6th LOS				B								

HCM 6th TWSC
12: Reems Road & Orangewood Avenue

04/02/2021

Intersection						
Int Delay, s/veh	2.9					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	8	3	1	12	12	0
Future Vol, veh/h	8	3	1	12	12	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	10	4	1	15	15	0

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	32	15	15	0	-	0
Stage 1	15	-	-	-	-	-
Stage 2	17	-	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-	-
Pot Cap-1 Maneuver	962	1042	1552	-	-	-
Stage 1	987	-	-	-	-	-
Stage 2	985	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	961	1042	1552	-	-	-
Mov Cap-2 Maneuver	961	-	-	-	-	-
Stage 1	986	-	-	-	-	-
Stage 2	985	-	-	-	-	-

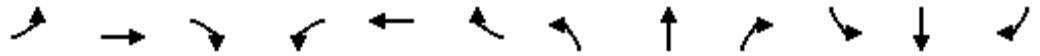
Approach	EB	NB	SB
HCM Control Delay, s	8.7	0.6	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1552	-	961	1042	-	-
HCM Lane V/C Ratio	0.001	-	0.01	0.004	-	-
HCM Control Delay (s)	7.3	0	8.8	8.5	-	-
HCM Lane LOS	A	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	0	-	-

HCM Signalized Intersection Capacity Analysis

1: Reems Road & Westbound Northern Parkway Ramps

04/02/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↖	↗	↖	↖	↗			↖↗↘	
Traffic Volume (vph)	0	0	0	13	1	125	10	73	0	0	144	51
Future Volume (vph)	0	0	0	13	1	125	10	73	0	0	144	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.5	4.5	4.5	4.5	4.5			4.5	
Lane Util. Factor				1.00	1.00	1.00	1.00	1.00			0.91	
Frt				1.00	1.00	0.85	1.00	1.00			0.96	
Flt Protected				0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1641	1727	1468	1641	1727			4530	
Flt Permitted				0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (perm)				1641	1727	1468	1641	1727			4530	
Peak-hour factor, PHF	0.90	0.90	0.90	0.80	0.80	0.85	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	0	0	0	16	1	147	12	91	0	0	180	64
RTOR Reduction (vph)	0	0	0	0	0	136	0	0	0	0	22	0
Lane Group Flow (vph)	0	0	0	16	1	11	13	91	0	0	222	0
Turn Type				Split	NA	Perm	Prot	NA			NA	
Protected Phases				8	8		1 7	5 6 7			2	
Permitted Phases						8						
Actuated Green, G (s)				6.8	6.8	6.8	5.6	74.2			59.6	
Effective Green, g (s)				6.8	6.8	6.8	5.6	74.2			59.6	
Actuated g/C Ratio				0.08	0.08	0.08	0.06	0.82			0.66	
Clearance Time (s)				4.5	4.5	4.5					4.5	
Vehicle Extension (s)				3.0	3.0	3.0					3.0	
Lane Grp Cap (vph)				123	130	110	102	1423			2999	
v/s Ratio Prot				c0.01	0.00		c0.01	c0.05			c0.05	
v/s Ratio Perm						0.01						
v/c Ratio				0.13	0.01	0.10	0.13	0.06			0.07	
Uniform Delay, d1				38.8	38.5	38.8	39.9	1.5			5.4	
Progression Factor				1.00	1.00	1.00	1.19	0.54			1.00	
Incremental Delay, d2				0.5	0.0	0.4	0.6	0.0			0.0	
Delay (s)				39.3	38.5	39.2	48.2	0.8			5.4	
Level of Service				D	D	D	D	A			A	
Approach Delay (s)		0.0			39.2			6.7			5.4	
Approach LOS		A			D			A			A	

Intersection Summary

HCM 2000 Control Delay	16.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.08		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	23.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: Reems Road & Eastbound Northern Parkway Ramps

04/02/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	↘	↑	↗					↑↔		↗↘	↑		
Traffic Volume (vph)	16	0	9	0	0	0	0	63	9	106	57	0	
Future Volume (vph)	16	0	9	0	0	0	0	63	9	106	57	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.5		4.5					4.5		4.5	4.5		
Lane Util. Factor	1.00		1.00					0.95		0.97	1.00		
Frt	1.00		0.85					0.98		1.00	1.00		
Flt Protected	0.95		1.00					1.00		0.95	1.00		
Satd. Flow (prot)	1641		1468					3222		3183	1727		
Flt Permitted	0.95		1.00					1.00		0.95	1.00		
Satd. Flow (perm)	1641		1468					3222		3183	1727		
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	
Adj. Flow (vph)	20	0	11	0	0	0	0	79	11	132	71	0	
RTOR Reduction (vph)	0	0	10	0	0	0	0	4	0	0	0	0	
Lane Group Flow (vph)	20	0	1	0	0	0	0	86	0	133	71	0	
Turn Type	Split		Perm					NA		Prot	NA		
Protected Phases	4	4						6		3 5	1 2 3		
Permitted Phases			4										
Actuated Green, G (s)	4.4		4.4					53.2		14.4	76.6		
Effective Green, g (s)	4.4		4.4					53.2		14.4	76.6		
Actuated g/C Ratio	0.05		0.05					0.59		0.16	0.85		
Clearance Time (s)	4.5		4.5					4.5					
Vehicle Extension (s)	3.0		3.0					3.0					
Lane Grp Cap (vph)	80		71					1904		509	1469		
v/s Ratio Prot	c0.01							0.03		c0.04	c0.04		
v/s Ratio Perm			0.00										
v/c Ratio	0.25		0.01					0.04		0.26	0.05		
Uniform Delay, d1	41.2		40.7					7.7		33.1	1.0		
Progression Factor	1.00		1.00					1.00		1.17	0.69		
Incremental Delay, d2	1.6		0.0					0.0		0.3	0.0		
Delay (s)	42.9		40.8					7.8		39.2	0.7		
Level of Service	D		D					A		D	A		
Approach Delay (s)		42.1			0.0			7.8			25.8		
Approach LOS		D			A			A			C		
Intersection Summary													
HCM 2000 Control Delay			22.4									HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.11										
Actuated Cycle Length (s)			90.0									Sum of lost time (s)	18.0
Intersection Capacity Utilization			23.8%									ICU Level of Service	A
Analysis Period (min)			15										

c Critical Lane Group

HCM 6th Signalized Intersection Summary

9: Reems Road & Northern Avenue

04/02/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	22	72	2	14	139	33	3	11	25	19	15	37
Future Volume (veh/h)	22	72	2	14	139	33	3	11	25	19	15	37
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752
Adj Flow Rate, veh/h	28	90	2	18	164	41	4	14	31	24	19	46
Peak Hour Factor	0.80	0.80	0.80	0.80	0.85	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	10	10	10	10	10	10	10	10	10	10	10	10
Cap, veh/h	209	312	7	300	247	62	929	316	700	950	296	717
Arrive On Green	0.18	0.18	0.18	0.18	0.18	0.18	0.65	0.65	0.65	0.65	0.65	0.65
Sat Flow, veh/h	1102	1707	38	1222	1353	338	1252	485	1074	1275	454	1100
Grp Volume(v), veh/h	28	0	92	18	0	205	4	0	45	24	0	65
Grp Sat Flow(s),veh/h/ln	1102	0	1745	1222	0	1691	1252	0	1559	1275	0	1554
Q Serve(g_s), s	1.3	0.0	2.5	0.7	0.0	6.1	0.1	0.0	0.6	0.4	0.0	0.8
Cycle Q Clear(g_c), s	7.5	0.0	2.5	3.2	0.0	6.1	0.9	0.0	0.6	0.9	0.0	0.8
Prop In Lane	1.00		0.02	1.00		0.20	1.00		0.69	1.00		0.71
Lane Grp Cap(c), veh/h	209	0	319	300	0	309	929	0	1016	950	0	1013
V/C Ratio(X)	0.13	0.00	0.29	0.06	0.00	0.66	0.00	0.00	0.04	0.03	0.00	0.06
Avail Cap(c_a), veh/h	929	0	1458	1097	0	1413	929	0	1016	950	0	1013
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	24.2	0.0	19.2	20.6	0.0	20.7	3.6	0.0	3.4	3.6	0.0	3.4
Incr Delay (d2), s/veh	0.3	0.0	0.5	0.1	0.0	2.4	0.0	0.0	0.1	0.0	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.9	0.2	0.0	2.3	0.0	0.0	0.1	0.1	0.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.4	0.0	19.7	20.6	0.0	23.1	3.6	0.0	3.5	3.6	0.0	3.6
LnGrp LOS	C	A	B	C	A	C	A	A	A	A	A	A
Approach Vol, veh/h		120			223			49				89
Approach Delay, s/veh		20.8			22.9			3.5				3.6
Approach LOS		C			C			A				A
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		40.0		14.5		40.0		14.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		35.5		45.5		35.5		45.5				
Max Q Clear Time (g_c+I1), s		2.9		9.5		2.9		8.1				
Green Ext Time (p_c), s		0.2		0.6		0.4		1.2				
Intersection Summary												
HCM 6th Ctrl Delay				16.8								
HCM 6th LOS				B								

HCM 6th TWSC
12: Reems Road & Orangewood Avenue

04/02/2021

Intersection						
Int Delay, s/veh	1.4					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	3	3	30	24	5
Future Vol, veh/h	6	3	3	30	24	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	8	4	4	38	30	6

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	79	33	36	0	0
Stage 1	33	-	-	-	-
Stage 2	46	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-
Pot Cap-1 Maneuver	904	1018	1525	-	-
Stage 1	969	-	-	-	-
Stage 2	956	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	901	1018	1525	-	-
Mov Cap-2 Maneuver	901	-	-	-	-
Stage 1	966	-	-	-	-
Stage 2	956	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	8.8	0.7	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1525	-	901	1018	-	-
HCM Lane V/C Ratio	0.002	-	0.008	0.004	-	-
HCM Control Delay (s)	7.4	0	9	8.5	-	-
HCM Lane LOS	A	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	0	-	-

HCM Signalized Intersection Capacity Analysis

1: Reems Road & Westbound Northern Parkway Ramps

04/02/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↕	↗	↙	↕			↕↗↘	
Traffic Volume (vph)	0	0	0	4	0	73	6	62	0	0	153	25
Future Volume (vph)	0	0	0	4	0	73	6	62	0	0	153	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.5		4.5	4.5	4.5			4.5	
Lane Util. Factor				1.00		1.00	1.00	1.00			0.91	
Frt				1.00		0.85	1.00	1.00			0.98	
Flt Protected				0.95		1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1641		1468	1641	1727			4617	
Flt Permitted				0.95		1.00	0.95	1.00			1.00	
Satd. Flow (perm)				1641		1468	1641	1727			4617	
Peak-hour factor, PHF	0.90	0.90	0.90	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	0	0	0	5	0	91	8	78	0	0	191	31
RTOR Reduction (vph)	0	0	0	0	0	86	0	0	0	0	10	0
Lane Group Flow (vph)	0	0	0	5	0	5	8	78	0	0	212	0
Turn Type				Split		Perm	Prot	NA			NA	
Protected Phases				8	8		1 7	5 6 7			2	
Permitted Phases						8						
Actuated Green, G (s)				4.8		4.8	5.6	76.2			61.6	
Effective Green, g (s)				4.8		4.8	5.6	76.2			61.6	
Actuated g/C Ratio				0.05		0.05	0.06	0.85			0.68	
Clearance Time (s)				4.5		4.5					4.5	
Vehicle Extension (s)				3.0		3.0					3.0	
Lane Grp Cap (vph)				87		78	102	1462			3160	
v/s Ratio Prot				0.00			0.00	c0.05			c0.05	
v/s Ratio Perm						c0.00						
v/c Ratio				0.06		0.06	0.08	0.05			0.07	
Uniform Delay, d1				40.5		40.5	39.8	1.1			4.7	
Progression Factor				1.00		1.00	0.71	0.87			1.00	
Incremental Delay, d2				0.3		0.3	0.3	0.0			0.0	
Delay (s)				40.7		40.8	28.4	1.0			4.7	
Level of Service				D		D	C	A			A	
Approach Delay (s)		0.0			40.8			3.5			4.7	
Approach LOS		A			D			A			A	
Intersection Summary												
HCM 2000 Control Delay			13.0								B	
HCM 2000 Volume to Capacity ratio			0.07									
Actuated Cycle Length (s)			90.0						18.0			
Intersection Capacity Utilization			23.8%								A	
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: Reems Road & Eastbound Northern Parkway Ramps

04/02/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	0	11	0	0	0	0	32	8	94	61	0
Future Volume (vph)	36	0	11	0	0	0	0	32	8	94	61	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5		4.5					4.5		4.5	4.5	
Lane Util. Factor	1.00		1.00					0.95		0.97	1.00	
Frt	1.00		0.85					0.97		1.00	1.00	
Flt Protected	0.95		1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1641		1468					3183		3183	1727	
Flt Permitted	0.95		1.00					1.00		0.95	1.00	
Satd. Flow (perm)	1641		1468					3183		3183	1727	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	45	0	14	0	0	0	0	40	10	118	76	0
RTOR Reduction (vph)	0	0	13	0	0	0	0	4	0	0	0	0
Lane Group Flow (vph)	45	0	1	0	0	0	0	46	0	118	76	0
Turn Type	Split		Perm					NA		Prot	NA	
Protected Phases	4	4						6		3 5	1 2 3	
Permitted Phases			4									
Actuated Green, G (s)	5.5		5.5					52.6		13.9	75.5	
Effective Green, g (s)	5.5		5.5					52.6		13.9	75.5	
Actuated g/C Ratio	0.06		0.06					0.58		0.15	0.84	
Clearance Time (s)	4.5		4.5					4.5				
Vehicle Extension (s)	3.0		3.0					3.0				
Lane Grp Cap (vph)	100		89					1860		491	1448	
v/s Ratio Prot	c0.03							0.01		c0.04	c0.04	
v/s Ratio Perm			0.00									
v/c Ratio	0.45		0.01					0.02		0.24	0.05	
Uniform Delay, d1	40.8		39.7					7.9		33.4	1.2	
Progression Factor	1.00		1.00					1.00		1.29	0.30	
Incremental Delay, d2	3.2		0.0					0.0		0.3	0.0	
Delay (s)	44.0		39.7					7.9		43.4	0.4	
Level of Service	D		D					A		D	A	
Approach Delay (s)		43.0			0.0			7.9			26.6	
Approach LOS		D			A			A			C	

Intersection Summary

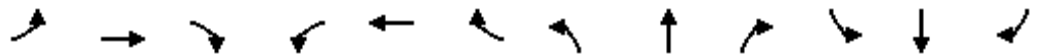
HCM 2000 Control Delay	26.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.12		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	23.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary

9: Reems Road & Northern Avenue

04/02/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷		↶	↷		↶	↷		↶	↷	
Traffic Volume (veh/h)	19	81	4	6	52	11	2	11	13	25	8	38
Future Volume (veh/h)	19	81	4	6	52	11	2	11	13	25	8	38
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752
Adj Flow Rate, veh/h	24	95	5	8	65	14	2	14	16	31	10	48
Peak Hour Factor	0.80	0.85	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	10	10	10	10	10	10	10	10	10	10	10	10
Cap, veh/h	224	178	9	209	150	32	1027	531	607	1057	187	898
Arrive On Green	0.11	0.11	0.11	0.11	0.11	0.11	0.71	0.71	0.71	0.71	0.71	0.71
Sat Flow, veh/h	1236	1649	87	1213	1397	301	1260	746	852	1292	263	1262
Grp Volume(v), veh/h	24	0	100	8	0	79	2	0	30	31	0	58
Grp Sat Flow(s),veh/h/ln	1236	0	1736	1213	0	1698	1260	0	1598	1292	0	1525
Q Serve(g_s), s	0.9	0.0	2.7	0.3	0.0	2.2	0.0	0.0	0.3	0.4	0.0	0.6
Cycle Q Clear(g_c), s	3.1	0.0	2.7	3.0	0.0	2.2	0.6	0.0	0.3	0.6	0.0	0.6
Prop In Lane	1.00		0.05	1.00		0.18	1.00		0.53	1.00		0.83
Lane Grp Cap(c), veh/h	224	0	187	209	0	183	1027	0	1138	1057	0	1085
V/C Ratio(X)	0.11	0.00	0.54	0.04	0.00	0.43	0.00	0.00	0.03	0.03	0.00	0.05
Avail Cap(c_a), veh/h	1218	0	1584	1185	0	1549	1027	0	1138	1057	0	1085
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	22.3	0.0	21.1	22.5	0.0	20.8	2.2	0.0	2.1	2.2	0.0	2.2
Incr Delay (d2), s/veh	0.2	0.0	2.4	0.1	0.0	1.6	0.0	0.0	0.0	0.1	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	1.1	0.1	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.5	0.0	23.4	22.6	0.0	22.4	2.2	0.0	2.2	2.3	0.0	2.2
LnGrp LOS	C	A	C	C	A	C	A	A	A	A	A	A
Approach Vol, veh/h		124			87			32				89
Approach Delay, s/veh		23.3			22.4			2.2				2.2
Approach LOS		C			C			A				A
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		40.0		9.9		40.0		9.9				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		35.5		45.5		35.5		45.5				
Max Q Clear Time (g_c+I1), s		2.6		5.1		2.6		5.0				
Green Ext Time (p_c), s		0.1		0.6		0.4		0.4				
Intersection Summary												
HCM 6th Ctrl Delay				15.4								
HCM 6th LOS				B								

HCM 6th TWSC
12: Reems Road & Orangewood Avenue

04/02/2021

Intersection						
Int Delay, s/veh	2.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	8	3	1	14	14	0
Future Vol, veh/h	8	3	1	14	14	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	10	4	1	18	18	0

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	38	18	18	0	0
Stage 1	18	-	-	-	-
Stage 2	20	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-
Pot Cap-1 Maneuver	954	1038	1548	-	-
Stage 1	984	-	-	-	-
Stage 2	982	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	953	1038	1548	-	-
Mov Cap-2 Maneuver	953	-	-	-	-
Stage 1	983	-	-	-	-
Stage 2	982	-	-	-	-

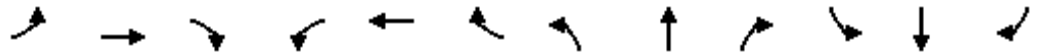
Approach	EB	NB	SB
HCM Control Delay, s	8.7	0.5	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1548	-	953	1038	-	-
HCM Lane V/C Ratio	0.001	-	0.01	0.004	-	-
HCM Control Delay (s)	7.3	0	8.8	8.5	-	-
HCM Lane LOS	A	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	0	-	-

HCM Signalized Intersection Capacity Analysis

1: Reems Road & Westbound Northern Parkway Ramps

04/02/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations				↙	↕	↗	↙	↕			↕↗↘		
Traffic Volume (vph)	0	0	0	15	2	138	11	81	0	0	159	57	
Future Volume (vph)	0	0	0	15	2	138	11	81	0	0	159	57	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)				4.5	4.5	4.5	4.5	4.5			4.5		
Lane Util. Factor				1.00	1.00	1.00	1.00	1.00			0.91		
Frt				1.00	1.00	0.85	1.00	1.00			0.96		
Flt Protected				0.95	1.00	1.00	0.95	1.00			1.00		
Satd. Flow (prot)				1641	1727	1468	1641	1727			4537		
Flt Permitted				0.95	1.00	1.00	0.95	1.00			1.00		
Satd. Flow (perm)				1641	1727	1468	1641	1727			4537		
Peak-hour factor, PHF	0.90	0.90	0.90	0.80	0.80	0.85	0.80	0.85	0.80	0.80	0.80	0.85	
Adj. Flow (vph)	0	0	0	19	2	162	14	95	0	0	199	67	
RTOR Reduction (vph)	0	0	0	0	0	149	0	0	0	0	23	0	
Lane Group Flow (vph)	0	0	0	19	3	13	14	95	0	0	243	0	
Turn Type				Split	NA	Perm	Prot	NA			NA		
Protected Phases				8	8		1 7	5 6 7			2		
Permitted Phases						8							
Actuated Green, G (s)				7.2	7.2	7.2	5.6	73.8			59.2		
Effective Green, g (s)				7.2	7.2	7.2	5.6	73.8			59.2		
Actuated g/C Ratio				0.08	0.08	0.08	0.06	0.82			0.66		
Clearance Time (s)				4.5	4.5	4.5					4.5		
Vehicle Extension (s)				3.0	3.0	3.0					3.0		
Lane Grp Cap (vph)				131	138	117	102	1416			2984		
v/s Ratio Prot				c0.01	0.00		c0.01	c0.06			c0.05		
v/s Ratio Perm						0.01							
v/c Ratio				0.15	0.02	0.11	0.14	0.07			0.08		
Uniform Delay, d1				38.5	38.2	38.4	39.9	1.5			5.6		
Progression Factor				1.00	1.00	1.00	1.21	0.53			1.00		
Incremental Delay, d2				0.5	0.1	0.4	0.6	0.0			0.1		
Delay (s)				39.0	38.2	38.8	49.1	0.8			5.6		
Level of Service				D	D	D	D	A			A		
Approach Delay (s)		0.0			38.9			7.0			5.6		
Approach LOS		A			D			A			A		
Intersection Summary													
HCM 2000 Control Delay			16.8									HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.09										
Actuated Cycle Length (s)			90.0									Sum of lost time (s)	18.0
Intersection Capacity Utilization			23.9%									ICU Level of Service	A
Analysis Period (min)			15										

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: Reems Road & Eastbound Northern Parkway Ramps

04/02/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑	↗					↑↔		↗↘	↑	
Traffic Volume (vph)	18	0	10	0	0	0	0	70	10	117	63	0
Future Volume (vph)	18	0	10	0	0	0	0	70	10	117	63	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5		4.5					4.5		4.5	4.5	
Lane Util. Factor	1.00		1.00					0.95		0.97	1.00	
Frt	1.00		0.85					0.98		1.00	1.00	
Flt Protected	0.95		1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1641		1468					3218		3183	1727	
Flt Permitted	0.95		1.00					1.00		0.95	1.00	
Satd. Flow (perm)	1641		1468					3218		3183	1727	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	22	0	12	0	0	0	0	88	12	146	79	0
RTOR Reduction (vph)	0	0	12	0	0	0	0	5	0	0	0	0
Lane Group Flow (vph)	23	0	1	0	0	0	0	96	0	146	79	0
Turn Type	Split		Perm					NA		Prot	NA	
Protected Phases	4	4						6		3 5	1 2 3	
Permitted Phases			4									
Actuated Green, G (s)	4.6		4.6					52.8		14.6	76.4	
Effective Green, g (s)	4.6		4.6					52.8		14.6	76.4	
Actuated g/C Ratio	0.05		0.05					0.59		0.16	0.85	
Clearance Time (s)	4.5		4.5					4.5				
Vehicle Extension (s)	3.0		3.0					3.0				
Lane Grp Cap (vph)	83		75					1887		516	1466	
v/s Ratio Prot	c0.01							0.03		c0.05	c0.05	
v/s Ratio Perm			0.00									
v/c Ratio	0.28		0.01					0.05		0.28	0.05	
Uniform Delay, d1	41.1		40.5					7.9		33.1	1.1	
Progression Factor	1.00		1.00					1.00		1.17	0.70	
Incremental Delay, d2	1.8		0.0					0.1		0.3	0.0	
Delay (s)	42.9		40.6					8.0		38.9	0.8	
Level of Service	D		D					A		D	A	
Approach Delay (s)		42.1			0.0			8.0			25.5	
Approach LOS		D			A			A			C	

Intersection Summary

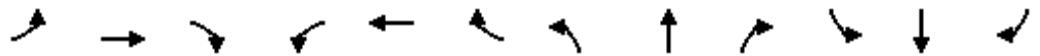
HCM 2000 Control Delay	22.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.12		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	23.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary

9: Reems Road & Northern Avenue

04/02/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Traffic Volume (veh/h)	25	80	3	16	153	37	4	13	28	21	14	41
Future Volume (veh/h)	25	80	3	16	153	37	4	13	28	21	14	41
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752
Adj Flow Rate, veh/h	31	94	4	20	180	46	5	16	35	26	18	51
Peak Hour Factor	0.80	0.85	0.80	0.80	0.85	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	10	10	10	10	10	10	10	10	10	10	10	10
Cap, veh/h	209	329	14	312	266	68	907	313	685	926	258	732
Arrive On Green	0.20	0.20	0.20	0.20	0.20	0.20	0.64	0.64	0.64	0.64	0.64	0.64
Sat Flow, veh/h	1082	1668	71	1215	1346	344	1247	489	1070	1268	403	1143
Grp Volume(v), veh/h	31	0	98	20	0	226	5	0	51	26	0	69
Grp Sat Flow(s),veh/h/ln	1082	0	1739	1215	0	1690	1247	0	1559	1268	0	1546
Q Serve(g_s), s	1.5	0.0	2.7	0.8	0.0	6.9	0.1	0.0	0.7	0.4	0.0	0.9
Cycle Q Clear(g_c), s	8.4	0.0	2.7	3.4	0.0	6.9	1.0	0.0	0.7	1.1	0.0	0.9
Prop In Lane	1.00		0.04	1.00		0.20	1.00		0.69	1.00		0.74
Lane Grp Cap(c), veh/h	209	0	343	312	0	334	907	0	998	926	0	990
V/C Ratio(X)	0.15	0.00	0.29	0.06	0.00	0.68	0.01	0.00	0.05	0.03	0.00	0.07
Avail Cap(c_a), veh/h	883	0	1427	1069	0	1387	907	0	998	926	0	990
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	24.5	0.0	18.9	20.4	0.0	20.6	3.9	0.0	3.7	3.9	0.0	3.8
Incr Delay (d2), s/veh	0.3	0.0	0.5	0.1	0.0	2.4	0.0	0.0	0.1	0.1	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	1.0	0.2	0.0	2.5	0.0	0.0	0.1	0.1	0.0	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.8	0.0	19.4	20.5	0.0	23.0	4.0	0.0	3.8	4.0	0.0	3.9
LnGrp LOS	C	A	B	C	A	C	A	A	A	A	A	A
Approach Vol, veh/h		129			246			56				95
Approach Delay, s/veh		20.7			22.8			3.8				3.9
Approach LOS		C			C			A				A
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		40.0		15.5		40.0		15.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		35.5		45.5		35.5		45.5				
Max Q Clear Time (g_c+I1), s		3.0		10.4		3.1		8.9				
Green Ext Time (p_c), s		0.2		0.6		0.4		1.3				
Intersection Summary												
HCM 6th Ctrl Delay				16.9								
HCM 6th LOS				B								

HCM 6th TWSC
 12: Reems Road & Orangewood Avenue

04/02/2021

Intersection						
Int Delay, s/veh	1.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	3	3	33	27	5
Future Vol, veh/h	6	3	3	33	27	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	8	4	4	41	34	6

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	86	37	40	0	0
Stage 1	37	-	-	-	-
Stage 2	49	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-
Pot Cap-1 Maneuver	896	1013	1520	-	-
Stage 1	965	-	-	-	-
Stage 2	953	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	893	1013	1520	-	-
Mov Cap-2 Maneuver	893	-	-	-	-
Stage 1	962	-	-	-	-
Stage 2	953	-	-	-	-

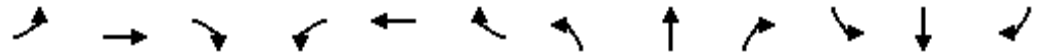
Approach	EB	NB	SB
HCM Control Delay, s	8.9	0.6	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1520	-	893	1013	-	-
HCM Lane V/C Ratio	0.002	-	0.008	0.004	-	-
HCM Control Delay (s)	7.4	0	9.1	8.6	-	-
HCM Lane LOS	A	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	0	-	-

HCM Signalized Intersection Capacity Analysis

1: Reems Road & Westbound Northern Parkway Ramps

04/16/2021



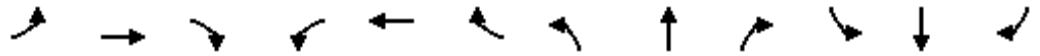
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↑	↗	↙	↑			↑↑↑	
Traffic Volume (vph)	0	0	0	6	0	117	9	99	0	0	250	39
Future Volume (vph)	0	0	0	6	0	117	9	99	0	0	250	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.5		4.5	4.5	4.5			4.5	
Lane Util. Factor				1.00		1.00	1.00	1.00			0.91	
Frt				1.00		0.85	1.00	1.00			0.98	
Flt Protected				0.95		1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1641		1468	1641	1727			4614	
Flt Permitted				0.95		1.00	0.95	1.00			1.00	
Satd. Flow (perm)				1641		1468	1641	1727			4614	
Peak-hour factor, PHF	0.90	0.90	0.90	0.80	0.80	0.85	0.80	0.85	0.80	0.80	0.85	0.80
Adj. Flow (vph)	0	0	0	8	0	138	11	116	0	0	294	49
RTOR Reduction (vph)	0	0	0	0	0	129	0	0	0	0	13	0
Lane Group Flow (vph)	0	0	0	8	0	9	11	116	0	0	330	0
Turn Type				Split		Perm	Prot	NA			NA	
Protected Phases				8	8		1 7	5 6 7			2	
Permitted Phases						8						
Actuated Green, G (s)				6.1		6.1	6.7	74.9			59.2	
Effective Green, g (s)				6.1		6.1	6.7	74.9			59.2	
Actuated g/C Ratio				0.07		0.07	0.07	0.83			0.66	
Clearance Time (s)				4.5		4.5					4.5	
Vehicle Extension (s)				3.0		3.0					3.0	
Lane Grp Cap (vph)				111		99	122	1437			3034	
v/s Ratio Prot				0.00			0.01	c0.07			c0.07	
v/s Ratio Perm						c0.01						
v/c Ratio				0.07		0.09	0.09	0.08			0.11	
Uniform Delay, d1				39.3		39.4	38.8	1.4			5.7	
Progression Factor				1.00		1.00	0.69	0.53			1.00	
Incremental Delay, d2				0.3		0.4	0.3	0.0			0.1	
Delay (s)				39.6		39.8	27.1	0.8			5.7	
Level of Service				D		D	C	A			A	
Approach Delay (s)		0.0			39.8			3.0			5.7	
Approach LOS		A			D			A			A	
Intersection Summary												
HCM 2000 Control Delay			13.3									B
HCM 2000 Volume to Capacity ratio			0.11									
Actuated Cycle Length (s)			90.0								18.0	
Intersection Capacity Utilization			25.3%									A
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: Reems Road & Eastbound Northern Parkway Ramps

04/16/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	57	0	18	0	0	0	0	51	12	151	97	0
Future Volume (vph)	57	0	18	0	0	0	0	51	12	151	97	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5		4.5					4.5		4.5	4.5	
Lane Util. Factor	1.00		1.00					0.95		0.97	1.00	
Frt	1.00		0.85					0.97		1.00	1.00	
Flt Protected	0.95		1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1641		1468					3188		3183	1727	
Flt Permitted	0.95		1.00					1.00		0.95	1.00	
Satd. Flow (perm)	1641		1468					3188		3183	1727	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.85	0.85	0.80
Adj. Flow (vph)	71	0	22	0	0	0	0	64	15	178	114	0
RTOR Reduction (vph)	0	0	21	0	0	0	0	7	0	0	0	0
Lane Group Flow (vph)	71	0	2	0	0	0	0	72	0	178	114	0
Turn Type	Split		Perm					NA		Prot	NA	
Protected Phases	4	4						6		3 5	1 2 3	
Permitted Phases			4									
Actuated Green, G (s)	8.1		8.1					48.5		15.4	72.9	
Effective Green, g (s)	8.1		8.1					48.5		15.4	72.9	
Actuated g/C Ratio	0.09		0.09					0.54		0.17	0.81	
Clearance Time (s)	4.5		4.5					4.5				
Vehicle Extension (s)	3.0		3.0					3.0				
Lane Grp Cap (vph)	147		132					1717		544	1398	
v/s Ratio Prot	c0.04							0.02		c0.06	c0.07	
v/s Ratio Perm			0.00									
v/c Ratio	0.48		0.02					0.04		0.33	0.08	
Uniform Delay, d1	39.0		37.3					9.8		32.8	1.7	
Progression Factor	1.00		1.00					1.00		1.04	0.38	
Incremental Delay, d2	2.5		0.0					0.0		0.4	0.0	
Delay (s)	41.4		37.4					9.8		34.6	0.7	
Level of Service	D		D					A		C	A	
Approach Delay (s)		40.4			0.0			9.8			21.3	
Approach LOS		D			A			A			C	

Intersection Summary

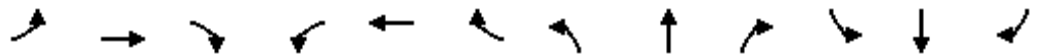
HCM 2000 Control Delay	23.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.18		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	25.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary

9: Reems Road & Northern Avenue

04/16/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷		↶	↷		↶	↷		↶	↷	
Traffic Volume (veh/h)	30	129	5	9	83	18	3	18	19	39	12	60
Future Volume (veh/h)	30	129	5	9	83	18	3	18	19	39	12	60
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752
Adj Flow Rate, veh/h	38	152	6	11	98	22	4	22	24	49	15	75
Peak Hour Factor	0.80	0.85	0.80	0.80	0.85	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	10	10	10	10	10	10	10	10	10	10	10	10
Cap, veh/h	239	251	10	213	208	47	943	519	566	989	172	861
Arrive On Green	0.15	0.15	0.15	0.15	0.15	0.15	0.68	0.68	0.68	0.68	0.68	0.68
Sat Flow, veh/h	1191	1674	66	1151	1385	311	1224	766	836	1274	254	1269
Grp Volume(v), veh/h	38	0	158	11	0	120	4	0	46	49	0	90
Grp Sat Flow(s),veh/h/ln	1191	0	1740	1151	0	1696	1224	0	1601	1274	0	1523
Q Serve(g_s), s	1.6	0.0	4.4	0.5	0.0	3.4	0.1	0.0	0.5	0.7	0.0	1.1
Cycle Q Clear(g_c), s	5.0	0.0	4.4	4.9	0.0	3.4	1.1	0.0	0.5	1.2	0.0	1.1
Prop In Lane	1.00		0.04	1.00		0.18	1.00		0.52	1.00		0.83
Lane Grp Cap(c), veh/h	239	0	261	213	0	255	943	0	1086	989	0	1033
V/C Ratio(X)	0.16	0.00	0.60	0.05	0.00	0.47	0.00	0.00	0.04	0.05	0.00	0.09
Avail Cap(c_a), veh/h	1095	0	1512	1040	0	1474	943	0	1086	989	0	1033
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	22.6	0.0	20.8	23.1	0.0	20.3	3.1	0.0	2.8	3.0	0.0	2.9
Incr Delay (d2), s/veh	0.3	0.0	2.3	0.1	0.0	1.4	0.0	0.0	0.1	0.1	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	1.7	0.1	0.0	1.2	0.0	0.0	0.1	0.1	0.0	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.9	0.0	23.0	23.2	0.0	21.7	3.1	0.0	2.9	3.1	0.0	3.1
LnGrp LOS	C	A	C	C	A	C	A	A	A	A	A	A
Approach Vol, veh/h		196			131			50				139
Approach Delay, s/veh		23.0			21.8			2.9				3.1
Approach LOS		C			C			A				A
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		40.0		12.4		40.0		12.4				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		35.5		45.5		35.5		45.5				
Max Q Clear Time (g_c+I1), s		3.1		7.0		3.2		6.9				
Green Ext Time (p_c), s		0.2		1.0		0.6		0.7				
Intersection Summary												
HCM 6th Ctrl Delay				15.4								
HCM 6th LOS				B								

HCM 6th TWSC
12: Reems Road & Orangewood Avenue

04/16/2021

Intersection						
Int Delay, s/veh	1.9					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	8	3	1	21	21	0
Future Vol, veh/h	8	3	1	21	21	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	10	4	1	26	26	0

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	54	26	26	0	-	0
Stage 1	26	-	-	-	-	-
Stage 2	28	-	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-	-
Pot Cap-1 Maneuver	934	1027	1538	-	-	-
Stage 1	976	-	-	-	-	-
Stage 2	974	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	933	1027	1538	-	-	-
Mov Cap-2 Maneuver	933	-	-	-	-	-
Stage 1	975	-	-	-	-	-
Stage 2	974	-	-	-	-	-

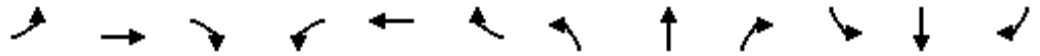
Approach	EB	NB	SB
HCM Control Delay, s	8.8	0.3	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1538	-	933	1027	-	-
HCM Lane V/C Ratio	0.001	-	0.011	0.004	-	-
HCM Control Delay (s)	7.3	0	8.9	8.5	-	-
HCM Lane LOS	A	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	0	-	-

HCM Signalized Intersection Capacity Analysis

1: Reems Road & Westbound Northern Parkway Ramps

04/16/2021

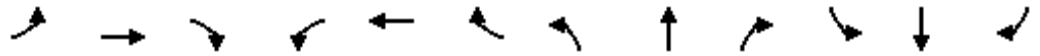


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↑	↗	↙	↑			↑↑↑	
Traffic Volume (vph)	0	0	0	23	3	222	18	129	0	0	255	90
Future Volume (vph)	0	0	0	23	3	222	18	129	0	0	255	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.5	4.5	4.5	4.5	4.5			4.5	
Lane Util. Factor				1.00	1.00	1.00	1.00	1.00			0.91	
Frt				1.00	1.00	0.85	1.00	1.00			0.96	
Flt Protected				0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1641	1727	1468	1641	1727			4522	
Flt Permitted				0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (perm)				1641	1727	1468	1641	1727			4522	
Peak-hour factor, PHF	0.90	0.90	0.90	0.80	0.80	0.85	0.80	0.85	0.80	0.80	0.85	0.80
Adj. Flow (vph)	0	0	0	29	4	261	22	152	0	0	300	112
RTOR Reduction (vph)	0	0	0	0	0	236	0	0	0	0	43	0
Lane Group Flow (vph)	0	0	0	29	4	25	23	152	0	0	370	0
Turn Type				Split	NA	Perm	Prot	NA			NA	
Protected Phases				8	8		1 7	5 6 7			2	
Permitted Phases						8						
Actuated Green, G (s)				8.6	8.6	8.6	8.0	72.4			55.4	
Effective Green, g (s)				8.6	8.6	8.6	8.0	72.4			55.4	
Actuated g/C Ratio				0.10	0.10	0.10	0.09	0.80			0.62	
Clearance Time (s)				4.5	4.5	4.5					4.5	
Vehicle Extension (s)				3.0	3.0	3.0					3.0	
Lane Grp Cap (vph)				156	165	140	145	1389			2783	
v/s Ratio Prot				c0.02	0.00		0.01	c0.09			c0.08	
v/s Ratio Perm						0.02						
v/c Ratio				0.19	0.02	0.18	0.16	0.11			0.13	
Uniform Delay, d1				37.5	36.9	37.4	37.9	1.9			7.2	
Progression Factor				1.00	1.00	1.00	1.24	0.52			1.00	
Incremental Delay, d2				0.6	0.1	0.6	0.5	0.0			0.1	
Delay (s)				38.1	37.0	38.1	47.6	1.0			7.3	
Level of Service				D	D	D	D	A			A	
Approach Delay (s)		0.0			38.0			7.1			7.3	
Approach LOS		A			D			A			A	
Intersection Summary												
HCM 2000 Control Delay			17.5	HCM 2000 Level of Service				B				
HCM 2000 Volume to Capacity ratio			0.14									
Actuated Cycle Length (s)			90.0	Sum of lost time (s)				18.0				
Intersection Capacity Utilization			28.0%	ICU Level of Service				A				
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Reems Road & Eastbound Northern Parkway Ramps

04/16/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	0	16	0	0	0	0	112	16	188	101	0
Future Volume (vph)	28	0	16	0	0	0	0	112	16	188	101	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5		4.5					4.5		4.5	4.5	
Lane Util. Factor	1.00		1.00					0.95		0.97	1.00	
Frt	1.00		0.85					0.98		1.00	1.00	
Flt Protected	0.95		1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1641		1468					3220		3183	1727	
Flt Permitted	0.95		1.00					1.00		0.95	1.00	
Satd. Flow (perm)	1641		1468					3220		3183	1727	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.85	0.85	0.80
Adj. Flow (vph)	35	0	20	0	0	0	0	140	20	221	119	0
RTOR Reduction (vph)	0	0	19	0	0	0	0	9	0	0	0	0
Lane Group Flow (vph)	35	0	1	0	0	0	0	151	0	221	119	0
Turn Type	Split		Perm					NA		Prot	NA	
Protected Phases	4	4						6		3 5	1 2 3	
Permitted Phases			4									
Actuated Green, G (s)	5.1		5.1					50.7		16.2	75.9	
Effective Green, g (s)	5.1		5.1					50.7		16.2	75.9	
Actuated g/C Ratio	0.06		0.06					0.56		0.18	0.84	
Clearance Time (s)	4.5		4.5					4.5				
Vehicle Extension (s)	3.0		3.0					3.0				
Lane Grp Cap (vph)	92		83					1813		572	1456	
v/s Ratio Prot	c0.02							0.05		c0.07	c0.07	
v/s Ratio Perm			0.00									
v/c Ratio	0.38		0.01					0.08		0.39	0.08	
Uniform Delay, d1	40.9		40.1					9.0		32.5	1.2	
Progression Factor	1.00		1.00					1.00		1.32	0.73	
Incremental Delay, d2	2.6		0.1					0.1		0.4	0.0	
Delay (s)	43.5		40.1					9.1		43.4	0.9	
Level of Service	D		D					A		D	A	
Approach Delay (s)		42.3			0.0			9.1			28.5	
Approach LOS		D			A			A			C	

Intersection Summary

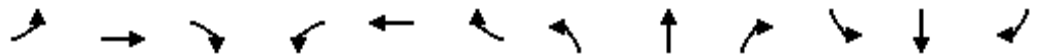
HCM 2000 Control Delay	24.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.18		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	28.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary

9: Reems Road & Northern Avenue

04/16/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷		↶	↷		↶	↷		↶	↷	
Traffic Volume (veh/h)	39	128	4	25	246	58	6	19	44	34	21	66
Future Volume (veh/h)	39	128	4	25	246	58	6	19	44	34	21	66
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752
Adj Flow Rate, veh/h	49	151	5	31	289	72	8	24	55	42	26	82
Peak Hour Factor	0.80	0.85	0.80	0.80	0.85	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	10	10	10	10	10	10	10	10	10	10	10	10
Cap, veh/h	208	488	16	368	392	98	758	268	614	787	210	663
Arrive On Green	0.29	0.29	0.29	0.29	0.29	0.29	0.57	0.57	0.57	0.57	0.57	0.57
Sat Flow, veh/h	956	1686	56	1153	1354	337	1204	473	1084	1236	371	1170
Grp Volume(v), veh/h	49	0	156	31	0	361	8	0	79	42	0	108
Grp Sat Flow(s),veh/h/ln	956	0	1742	1153	0	1691	1204	0	1557	1236	0	1541
Q Serve(g_s), s	3.1	0.0	4.4	1.4	0.0	12.1	0.2	0.0	1.5	1.0	0.0	2.0
Cycle Q Clear(g_c), s	15.1	0.0	4.4	5.7	0.0	12.1	2.2	0.0	1.5	2.5	0.0	2.0
Prop In Lane	1.00		0.03	1.00		0.20	1.00		0.70	1.00		0.76
Lane Grp Cap(c), veh/h	208	0	505	368	0	490	758	0	882	787	0	873
V/C Ratio(X)	0.24	0.00	0.31	0.08	0.00	0.74	0.01	0.00	0.09	0.05	0.00	0.12
Avail Cap(c_a), veh/h	625	0	1265	872	0	1228	758	0	882	787	0	873
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	26.9	0.0	17.4	19.6	0.0	20.1	6.8	0.0	6.2	6.8	0.0	6.3
Incr Delay (d2), s/veh	0.6	0.0	0.3	0.1	0.0	2.2	0.0	0.0	0.2	0.1	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	1.6	0.3	0.0	4.3	0.0	0.0	0.4	0.2	0.0	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.5	0.0	17.7	19.7	0.0	22.3	6.9	0.0	6.4	6.9	0.0	6.6
LnGrp LOS	C	A	B	B	A	C	A	A	A	A	A	A
Approach Vol, veh/h		205			392			87				150
Approach Delay, s/veh		20.0			22.1			6.4				6.7
Approach LOS		C			C			A				A
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		40.0		22.6		40.0		22.6				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		35.5		45.5		35.5		45.5				
Max Q Clear Time (g_c+I1), s		4.2		17.1		4.5		14.1				
Green Ext Time (p_c), s		0.4		1.0		0.7		2.2				
Intersection Summary												
HCM 6th Ctrl Delay				17.2								
HCM 6th LOS				B								

HCM 6th TWSC
12: Reems Road & Orangewood Avenue

04/16/2021

Intersection						
Int Delay, s/veh	0.9					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	3	3	53	43	5
Future Vol, veh/h	6	3	3	53	43	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	8	4	4	66	54	6

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	131	57	60	0	0
Stage 1	57	-	-	-	-
Stage 2	74	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-
Pot Cap-1 Maneuver	844	987	1494	-	-
Stage 1	946	-	-	-	-
Stage 2	929	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	841	987	1494	-	-
Mov Cap-2 Maneuver	841	-	-	-	-
Stage 1	943	-	-	-	-
Stage 2	929	-	-	-	-

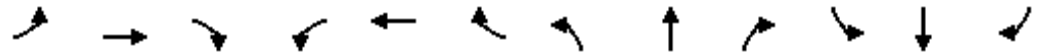
Approach	EB	NB	SB
HCM Control Delay, s	9.1	0.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1494	-	841	987	-	-
HCM Lane V/C Ratio	0.003	-	0.009	0.004	-	-
HCM Control Delay (s)	7.4	0	9.3	8.7	-	-
HCM Lane LOS	A	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	0	-	-

HCM Signalized Intersection Capacity Analysis

1: Reems Road & Westbound Northern Parkway Ramps

04/14/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↑	↗	↙	↑			↑↑↑	
Traffic Volume (vph)	0	0	0	56	0	73	11	69	0	0	190	25
Future Volume (vph)	0	0	0	56	0	73	11	69	0	0	190	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.5		4.5	4.5	4.5			4.5	
Lane Util. Factor				1.00		1.00	1.00	1.00			0.91	
Frt				1.00		0.85	1.00	1.00			0.98	
Flt Protected				0.95		1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1641		1468	1641	1727			4634	
Flt Permitted				0.95		1.00	0.95	1.00			1.00	
Satd. Flow (perm)				1641		1468	1641	1727			4634	
Peak-hour factor, PHF	0.90	0.90	0.90	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	0	0	0	70	0	91	14	86	0	0	238	31
RTOR Reduction (vph)	0	0	0	0	0	83	0	0	0	0	10	0
Lane Group Flow (vph)	0	0	0	70	0	8	14	86	0	0	259	0
Turn Type				Split		Perm	Prot	NA			NA	
Protected Phases				8	8		1 7	5 6 7			2	
Permitted Phases						8						
Actuated Green, G (s)				8.1		8.1	5.6	72.9			58.3	
Effective Green, g (s)				8.1		8.1	5.6	72.9			58.3	
Actuated g/C Ratio				0.09		0.09	0.06	0.81			0.65	
Clearance Time (s)				4.5		4.5					4.5	
Vehicle Extension (s)				3.0		3.0					3.0	
Lane Grp Cap (vph)				147		132	102	1398			3001	
v/s Ratio Prot				c0.04			c0.01	c0.05			c0.06	
v/s Ratio Perm						0.01						
v/c Ratio				0.48		0.06	0.14	0.06			0.09	
Uniform Delay, d1				38.9		37.5	39.9	1.7			5.9	
Progression Factor				1.00		1.00	0.93	1.40			1.00	
Incremental Delay, d2				2.4		0.2	0.6	0.0			0.1	
Delay (s)				41.4		37.7	37.6	2.4			6.0	
Level of Service				D		D	D	A			A	
Approach Delay (s)		0.0			39.3			7.3			6.0	
Approach LOS		A			D			A			A	
Intersection Summary												
HCM 2000 Control Delay			16.3									B
HCM 2000 Volume to Capacity ratio			0.13									
Actuated Cycle Length (s)			90.0								18.0	
Intersection Capacity Utilization			23.8%									A
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: Reems Road & Eastbound Northern Parkway Ramps

04/14/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	36	0	29	0	0	0	0	44	20	94	147	0
Future Volume (vph)	36	0	29	0	0	0	0	44	20	94	147	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5		4.5					4.5		4.5	4.5	
Lane Util. Factor	1.00		1.00					0.95		0.97	1.00	
Frt	1.00		0.85					0.95		1.00	1.00	
Flt Protected	0.95		1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1641		1468					3128		3183	1727	
Flt Permitted	0.95		1.00					1.00		0.95	1.00	
Satd. Flow (perm)	1641		1468					3128		3183	1727	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.85	0.80
Adj. Flow (vph)	45	0	36	0	0	0	0	55	25	118	173	0
RTOR Reduction (vph)	0	0	33	0	0	0	0	11	0	0	0	0
Lane Group Flow (vph)	45	0	3	0	0	0	0	69	0	118	173	0
Turn Type	Split		Perm					NA		Prot	NA	
Protected Phases	4	4						6		3 5	1 2 3	
Permitted Phases			4									
Actuated Green, G (s)	6.8		6.8					51.3		13.9	74.2	
Effective Green, g (s)	6.8		6.8					51.3		13.9	74.2	
Actuated g/C Ratio	0.08		0.08					0.57		0.15	0.82	
Clearance Time (s)	4.5		4.5					4.5				
Vehicle Extension (s)	3.0		3.0					3.0				
Lane Grp Cap (vph)	123		110					1782		491	1423	
v/s Ratio Prot	c0.03							0.02		c0.04	c0.10	
v/s Ratio Perm			0.00									
v/c Ratio	0.37		0.02					0.04		0.24	0.12	
Uniform Delay, d1	39.6		38.5					8.5		33.4	1.5	
Progression Factor	1.00		1.00					1.00		1.00	1.19	
Incremental Delay, d2	1.8		0.1					0.0		0.3	0.0	
Delay (s)	41.4		38.6					8.5		33.7	1.9	
Level of Service	D		D					A		C	A	
Approach Delay (s)		40.2			0.0			8.5			14.8	
Approach LOS		D			A			A			B	

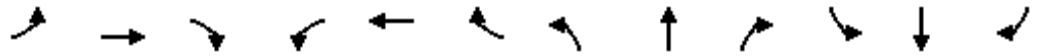
Intersection Summary

HCM 2000 Control Delay	18.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.17		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	23.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
 9: Reems Road & Northern Avenue

04/14/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Traffic Volume (veh/h)	19	81	4	6	52	11	2	35	13	25	112	38
Future Volume (veh/h)	19	81	4	6	52	11	2	35	13	25	112	38
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752
Adj Flow Rate, veh/h	24	95	5	8	65	14	2	44	16	31	132	48
Peak Hour Factor	0.80	0.85	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.85	0.80
Percent Heavy Veh, %	10	10	10	10	10	10	10	10	10	10	10	10
Cap, veh/h	224	178	9	209	150	32	908	873	317	1026	873	317
Arrive On Green	0.11	0.11	0.11	0.11	0.11	0.11	0.71	0.71	0.71	0.71	0.71	0.71
Sat Flow, veh/h	1236	1649	87	1213	1397	301	1128	1226	446	1258	1226	446
Grp Volume(v), veh/h	24	0	100	8	0	79	2	0	60	31	0	180
Grp Sat Flow(s),veh/h/ln	1236	0	1736	1213	0	1698	1128	0	1672	1258	0	1672
Q Serve(g_s), s	0.9	0.0	2.7	0.3	0.0	2.2	0.0	0.0	0.5	0.4	0.0	1.7
Cycle Q Clear(g_c), s	3.1	0.0	2.7	3.0	0.0	2.2	1.8	0.0	0.5	0.9	0.0	1.7
Prop In Lane	1.00		0.05	1.00		0.18	1.00		0.27	1.00		0.27
Lane Grp Cap(c), veh/h	224	0	187	209	0	183	908	0	1190	1026	0	1190
V/C Ratio(X)	0.11	0.00	0.54	0.04	0.00	0.43	0.00	0.00	0.05	0.03	0.00	0.15
Avail Cap(c_a), veh/h	1218	0	1584	1185	0	1549	908	0	1190	1026	0	1190
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	22.3	0.0	21.1	22.5	0.0	20.8	2.6	0.0	2.1	2.3	0.0	2.3
Incr Delay (d2), s/veh	0.2	0.0	2.4	0.1	0.0	1.6	0.0	0.0	0.1	0.1	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	1.1	0.1	0.0	0.8	0.0	0.0	0.1	0.0	0.0	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.5	0.0	23.4	22.6	0.0	22.4	2.6	0.0	2.2	2.3	0.0	2.6
LnGrp LOS	C	A	C	C	A	C	A	A	A	A	A	A
Approach Vol, veh/h		124			87			62			211	
Approach Delay, s/veh		23.3			22.4			2.2			2.6	
Approach LOS		C			C			A			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		40.0		9.9		40.0		9.9				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		35.5		45.5		35.5		45.5				
Max Q Clear Time (g_c+I1), s		3.8		5.1		3.7		5.0				
Green Ext Time (p_c), s		0.3		0.6		1.1		0.4				
Intersection Summary												
HCM 6th Ctrl Delay				11.4								
HCM 6th LOS				B								

HCM 6th TWSC
12: Reems Road & Orangewood Avenue

04/14/2021

Intersection						
Int Delay, s/veh	0.9					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	8	3	1	84	31	0
Future Vol, veh/h	8	3	1	84	31	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	85	80	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	10	4	1	99	39	0

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	140	39	39	0	-	0
Stage 1	39	-	-	-	-	-
Stage 2	101	-	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-	-
Pot Cap-1 Maneuver	834	1010	1521	-	-	-
Stage 1	963	-	-	-	-	-
Stage 2	903	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	833	1010	1521	-	-	-
Mov Cap-2 Maneuver	802	-	-	-	-	-
Stage 1	962	-	-	-	-	-
Stage 2	903	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.3	0.1	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1521	-	802	1010	-	-
HCM Lane V/C Ratio	0.001	-	0.012	0.004	-	-
HCM Control Delay (s)	7.4	0	9.5	8.6	-	-
HCM Lane LOS	A	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	0	-	-

HCM 6th TWSC
14: Reems Road & North Access

04/14/2021

Intersection						
Int Delay, s/veh	1.9					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↶	↷	↶	↶	↷	↷
Traffic Vol, veh/h	10	7	28	36	75	43
Future Vol, veh/h	10	7	28	36	75	43
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	80	85	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	13	9	35	45	88	54

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	230	115	142	0	0
Stage 1	115	-	-	-	-
Stage 2	115	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-
Pot Cap-1 Maneuver	741	916	1393	-	-
Stage 1	890	-	-	-	-
Stage 2	890	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	722	916	1393	-	-
Mov Cap-2 Maneuver	722	-	-	-	-
Stage 1	868	-	-	-	-
Stage 2	890	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.6	3.3	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1393	-	722	916	-	-
HCM Lane V/C Ratio	0.025	-	0.017	0.01	-	-
HCM Control Delay (s)	7.7	-	10.1	9	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.1	0	-	-

HCM 6th TWSC
16: Reems Road & Middle Access

04/14/2021

Intersection						
Int Delay, s/veh	1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	4	3	14	60	63	19
Future Vol, veh/h	4	3	14	60	63	19
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	5	4	18	75	79	24

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	202	91	103	0	0
Stage 1	91	-	-	-	-
Stage 2	111	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-
Pot Cap-1 Maneuver	769	945	1440	-	-
Stage 1	913	-	-	-	-
Stage 2	894	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	760	945	1440	-	-
Mov Cap-2 Maneuver	757	-	-	-	-
Stage 1	902	-	-	-	-
Stage 2	894	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.4	1.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1440	-	757	945	-	-
HCM Lane V/C Ratio	0.012	-	0.007	0.004	-	-
HCM Control Delay (s)	7.5	-	9.8	8.8	-	-
HCM Lane LOS	A	-	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	0	-	-

HCM 6th TWSC
18: Reems Road & South Access

04/14/2021

Intersection						
Int Delay, s/veh	2.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	10	7	28	64	24	42
Future Vol, veh/h	10	7	28	64	24	42
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	13	9	35	80	30	53

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	207	57	83	0	0
Stage 1	57	-	-	-	-
Stage 2	150	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-
Pot Cap-1 Maneuver	764	987	1465	-	-
Stage 1	946	-	-	-	-
Stage 2	859	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	746	987	1465	-	-
Mov Cap-2 Maneuver	744	-	-	-	-
Stage 1	923	-	-	-	-
Stage 2	859	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.4	2.3	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1465	-	744	987	-	-
HCM Lane V/C Ratio	0.024	-	0.017	0.009	-	-
HCM Control Delay (s)	7.5	-	9.9	8.7	-	-
HCM Lane LOS	A	-	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.1	0	-	-

HCM Signalized Intersection Capacity Analysis

1: Reems Road & Westbound Northern Parkway Ramps

04/14/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↑	↗	↙	↑			↑↑↑	
Traffic Volume (vph)	0	0	0	28	2	138	28	115	0	0	167	57
Future Volume (vph)	0	0	0	28	2	138	28	115	0	0	167	57
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.5	4.5	4.5	4.5	4.5			4.5	
Lane Util. Factor				1.00	1.00	1.00	1.00	1.00			0.91	
Frt				1.00	1.00	0.85	1.00	1.00			0.96	
Flt Protected				0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1641	1727	1468	1641	1727			4536	
Flt Permitted				0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (perm)				1641	1727	1468	1641	1727			4536	
Peak-hour factor, PHF	0.90	0.90	0.90	0.80	0.80	0.85	0.80	0.85	0.80	0.80	0.80	0.80
Adj. Flow (vph)	0	0	0	35	2	162	35	135	0	0	209	71
RTOR Reduction (vph)	0	0	0	0	0	148	0	0	0	0	28	0
Lane Group Flow (vph)	0	0	0	35	3	14	35	135	0	0	252	0
Turn Type				Split	NA	Perm	Prot	NA			NA	
Protected Phases				8	8		1 7	5 6 7			2	
Permitted Phases						8						
Actuated Green, G (s)				7.7	7.7	7.7	9.2	73.3			55.1	
Effective Green, g (s)				7.7	7.7	7.7	9.2	73.3			55.1	
Actuated g/C Ratio				0.09	0.09	0.09	0.10	0.81			0.61	
Clearance Time (s)				4.5	4.5	4.5					4.5	
Vehicle Extension (s)				3.0	3.0	3.0					3.0	
Lane Grp Cap (vph)				140	147	125	167	1406			2777	
v/s Ratio Prot				c0.02	0.00		c0.02	c0.08			0.06	
v/s Ratio Perm						0.01						
v/c Ratio				0.25	0.02	0.11	0.21	0.10			0.09	
Uniform Delay, d1				38.5	37.7	38.0	37.1	1.7			7.2	
Progression Factor				1.00	1.00	1.00	1.24	0.52			1.00	
Incremental Delay, d2				0.9	0.1	0.4	0.6	0.0			0.1	
Delay (s)				39.4	37.8	38.4	46.7	0.9			7.2	
Level of Service				D	D	D	D	A			A	
Approach Delay (s)		0.0			38.6			10.3			7.2	
Approach LOS		A			D			B			A	
Intersection Summary												
HCM 2000 Control Delay			17.7	HCM 2000 Level of Service				B				
HCM 2000 Volume to Capacity ratio			0.13									
Actuated Cycle Length (s)			90.0	Sum of lost time (s)				18.0				
Intersection Capacity Utilization			24.9%	ICU Level of Service				A				
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis

2: Reems Road & Eastbound Northern Parkway Ramps

04/14/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	0	15	0	0	0	0	121	61	117	84	0
Future Volume (vph)	18	0	15	0	0	0	0	121	61	117	84	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5		4.5					4.5		4.5	4.5	
Lane Util. Factor	1.00		1.00					0.95		0.97	1.00	
Frt	1.00		0.85					0.95		1.00	1.00	
Flt Protected	0.95		1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1641		1468					3117		3183	1727	
Flt Permitted	0.95		1.00					1.00		0.95	1.00	
Satd. Flow (perm)	1641		1468					3117		3183	1727	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.85	0.80
Adj. Flow (vph)	22	0	19	0	0	0	0	151	76	146	99	0
RTOR Reduction (vph)	0	0	18	0	0	0	0	31	0	0	0	0
Lane Group Flow (vph)	23	0	1	0	0	0	0	196	0	146	99	0
Turn Type	Split		Perm					NA		Prot	NA	
Protected Phases	4	4						6		3 5	1 2 3	
Permitted Phases			4									
Actuated Green, G (s)	4.6		4.6					52.8		14.6	76.4	
Effective Green, g (s)	4.6		4.6					52.8		14.6	76.4	
Actuated g/C Ratio	0.05		0.05					0.59		0.16	0.85	
Clearance Time (s)	4.5		4.5					4.5				
Vehicle Extension (s)	3.0		3.0					3.0				
Lane Grp Cap (vph)	83		75					1828		516	1466	
v/s Ratio Prot	c0.01							c0.06		c0.05	0.06	
v/s Ratio Perm			0.00									
v/c Ratio	0.28		0.01					0.11		0.28	0.07	
Uniform Delay, d1	41.1		40.5					8.2		33.1	1.1	
Progression Factor	1.00		1.00					1.00		1.35	0.99	
Incremental Delay, d2	1.8		0.1					0.1		0.3	0.0	
Delay (s)	42.9		40.6					8.3		45.1	1.1	
Level of Service	D		D					A		D	A	
Approach Delay (s)		41.9			0.0			8.3			27.3	
Approach LOS		D			A			A			C	

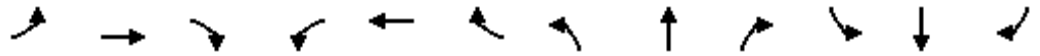
Intersection Summary

HCM 2000 Control Delay	20.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.15		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	24.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary
 9: Reems Road & Northern Avenue

04/14/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Traffic Volume (veh/h)	25	80	3	16	153	37	4	115	28	21	40	41
Future Volume (veh/h)	25	80	3	16	153	37	4	115	28	21	40	41
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752
Adj Flow Rate, veh/h	31	94	4	20	180	46	5	135	35	26	50	51
Peak Hour Factor	0.80	0.85	0.80	0.80	0.85	0.80	0.80	0.85	0.80	0.80	0.80	0.80
Percent Heavy Veh, %	10	10	10	10	10	10	10	10	10	10	10	10
Cap, veh/h	209	329	14	312	266	68	876	859	223	813	509	519
Arrive On Green	0.20	0.20	0.20	0.20	0.20	0.20	0.64	0.64	0.64	0.64	0.64	0.64
Sat Flow, veh/h	1082	1668	71	1215	1346	344	1212	1341	348	1138	795	811
Grp Volume(v), veh/h	31	0	98	20	0	226	5	0	170	26	0	101
Grp Sat Flow(s),veh/h/ln	1082	0	1739	1215	0	1690	1212	0	1689	1138	0	1606
Q Serve(g_s), s	1.5	0.0	2.7	0.8	0.0	6.9	0.1	0.0	2.2	0.5	0.0	1.3
Cycle Q Clear(g_c), s	8.4	0.0	2.7	3.4	0.0	6.9	1.4	0.0	2.2	2.8	0.0	1.3
Prop In Lane	1.00		0.04	1.00		0.20	1.00		0.21	1.00		0.50
Lane Grp Cap(c), veh/h	209	0	343	312	0	334	876	0	1081	813	0	1028
V/C Ratio(X)	0.15	0.00	0.29	0.06	0.00	0.68	0.01	0.00	0.16	0.03	0.00	0.10
Avail Cap(c_a), veh/h	883	0	1427	1069	0	1387	876	0	1081	813	0	1028
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	24.5	0.0	18.9	20.4	0.0	20.6	4.1	0.0	4.0	4.5	0.0	3.8
Incr Delay (d2), s/veh	0.3	0.0	0.5	0.1	0.0	2.4	0.0	0.0	0.3	0.1	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	1.0	0.2	0.0	2.5	0.0	0.0	0.5	0.1	0.0	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.8	0.0	19.4	20.5	0.0	23.0	4.1	0.0	4.3	4.6	0.0	4.0
LnGrp LOS	C	A	B	C	A	C	A	A	A	A	A	A
Approach Vol, veh/h		129			246			175				127
Approach Delay, s/veh		20.7			22.8			4.3				4.1
Approach LOS		C			C			A				A
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		40.0		15.5		40.0		15.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		35.5		45.5		35.5		45.5				
Max Q Clear Time (g_c+I1), s		4.2		10.4		4.8		8.9				
Green Ext Time (p_c), s		0.9		0.6		0.6		1.3				
Intersection Summary												
HCM 6th Ctrl Delay				14.1								
HCM 6th LOS				B								

HCM 6th TWSC
 12: Reems Road & Orangewood Avenue

04/14/2021

Intersection						
Int Delay, s/veh	0.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	3	3	52	95	5
Future Vol, veh/h	6	3	3	52	95	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	80	85	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	8	4	4	65	112	6

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	188	115	118	0	-	0
Stage 1	115	-	-	-	-	-
Stage 2	73	-	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-	-
Pot Cap-1 Maneuver	783	916	1422	-	-	-
Stage 1	890	-	-	-	-	-
Stage 2	930	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	781	916	1422	-	-	-
Mov Cap-2 Maneuver	769	-	-	-	-	-
Stage 1	887	-	-	-	-	-
Stage 2	930	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.4	0.4	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1422	-	769	916	-	-
HCM Lane V/C Ratio	0.003	-	0.01	0.004	-	-
HCM Control Delay (s)	7.5	0	9.7	8.9	-	-
HCM Lane LOS	A	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	0	-	-

HCM 6th TWSC
14: Reems Road & North Access

04/14/2021

Intersection						
Int Delay, s/veh	3.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	42	27	8	99	47	11
Future Vol, veh/h	42	27	8	99	47	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	85	80	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	53	34	10	116	59	14

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	202	66	73	0	0
Stage 1	66	-	-	-	-
Stage 2	136	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-
Pot Cap-1 Maneuver	769	976	1477	-	-
Stage 1	937	-	-	-	-
Stage 2	871	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	764	976	1477	-	-
Mov Cap-2 Maneuver	764	-	-	-	-
Stage 1	930	-	-	-	-
Stage 2	871	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.6	0.6	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1477	-	764	976	-	-
HCM Lane V/C Ratio	0.007	-	0.069	0.035	-	-
HCM Control Delay (s)	7.5	-	10.1	8.8	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.2	0.1	-	-

HCM 6th TWSC
16: Reems Road & Middle Access

04/14/2021

Intersection						
Int Delay, s/veh	1.8					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	19	14	4	88	69	5
Future Vol, veh/h	19	14	4	88	69	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	85	80	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	24	18	5	104	86	6

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	203	89	92	0	0
Stage 1	89	-	-	-	-
Stage 2	114	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-
Pot Cap-1 Maneuver	768	947	1454	-	-
Stage 1	915	-	-	-	-
Stage 2	891	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	766	947	1454	-	-
Mov Cap-2 Maneuver	761	-	-	-	-
Stage 1	912	-	-	-	-
Stage 2	891	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.5	0.3	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1454	-	761	947	-	-
HCM Lane V/C Ratio	0.003	-	0.031	0.018	-	-
HCM Control Delay (s)	7.5	-	9.9	8.9	-	-
HCM Lane LOS	A	-	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	0.1	-	-

HCM 6th TWSC
18: Reems Road & South Access

04/14/2021

Intersection						
Int Delay, s/veh	3.4					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↶	↷	↶	↷	↷	↷
Traffic Vol, veh/h	41	27	7	51	69	10
Future Vol, veh/h	41	27	7	51	69	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	51	34	9	64	86	13

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	175	93	99	0	0
Stage 1	93	-	-	-	-
Stage 2	82	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-
Pot Cap-1 Maneuver	797	943	1445	-	-
Stage 1	911	-	-	-	-
Stage 2	921	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	792	943	1445	-	-
Mov Cap-2 Maneuver	778	-	-	-	-
Stage 1	906	-	-	-	-
Stage 2	921	-	-	-	-





















Approach	EB	NB	SB
HCM Control Delay, s	9.6	0.9	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1445	-	778	943	-	-
HCM Lane V/C Ratio	0.006	-	0.066	0.036	-	-
HCM Control Delay (s)	7.5	-	10	9	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.2	0.1	-	-

HCM Signalized Intersection Capacity Analysis

1: Reems Road & Westbound Northern Parkway Ramps

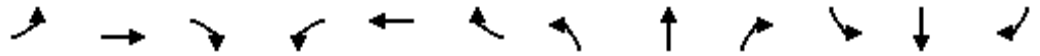
04/16/2021

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	0	0	0	157	0	117	22	122	0	0	350	39	
Future Volume (vph)	0	0	0	157	0	117	22	122	0	0	350	39	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)				4.5		4.5	4.5	4.5			4.5		
Lane Util. Factor				1.00		1.00	1.00	1.00			0.91		
Frt				1.00		0.85	1.00	1.00			0.98		
Flt Protected				0.95		1.00	0.95	1.00			1.00		
Satd. Flow (prot)				1641		1468	1641	1727			4640		
Flt Permitted				0.95		1.00	0.95	1.00			1.00		
Satd. Flow (perm)				1641		1468	1641	1727			4640		
Peak-hour factor, PHF	0.90	0.90	0.90	0.85	0.80	0.85	0.80	0.85	0.80	0.80	0.85	0.80	
Adj. Flow (vph)	0	0	0	185	0	138	28	144	0	0	412	49	
RTOR Reduction (vph)	0	0	0	0	0	114	0	0	0	0	12	0	
Lane Group Flow (vph)	0	0	0	185	0	24	28	144	0	0	449	0	
Turn Type				Split		Perm	Prot	NA			NA		
Protected Phases				8	8		1 7	5 6 7			2		
Permitted Phases						8							
Actuated Green, G (s)				15.4		15.4	8.1	65.6			48.5		
Effective Green, g (s)				15.4		15.4	8.1	65.6			48.5		
Actuated g/C Ratio				0.17		0.17	0.09	0.73			0.54		
Clearance Time (s)				4.5		4.5					4.5		
Vehicle Extension (s)				3.0		3.0					3.0		
Lane Grp Cap (vph)				280		251	147	1258			2500		
v/s Ratio Prot				c0.11			c0.02	c0.08			c0.10		
v/s Ratio Perm						0.02							
v/c Ratio				0.66		0.09	0.19	0.11			0.18		
Uniform Delay, d1				34.9		31.4	37.9	3.6			10.6		
Progression Factor				1.00		1.00	1.13	1.23			1.00		
Incremental Delay, d2				5.7		0.2	0.6	0.0			0.2		
Delay (s)				40.6		31.6	43.6	4.5			10.8		
Level of Service				D		C	D	A			B		
Approach Delay (s)		0.0			36.8			10.9			10.8		
Approach LOS		A			D			B			B		
Intersection Summary													
HCM 2000 Control Delay			19.6									HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.28										
Actuated Cycle Length (s)			90.0									Sum of lost time (s)	18.0
Intersection Capacity Utilization			31.7%									ICU Level of Service	A
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis

2: Reems Road & Eastbound Northern Parkway Ramps

04/16/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	57	0	69	0	0	0	0	87	47	151	348	0
Future Volume (vph)	57	0	69	0	0	0	0	87	47	151	348	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5		4.5					4.5		4.5	4.5	
Lane Util. Factor	1.00		1.00					0.95		0.97	1.00	
Frt	1.00		0.85					0.95		1.00	1.00	
Flt Protected	0.95		1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1641		1468					3109		3183	1727	
Flt Permitted	0.95		1.00					1.00		0.95	1.00	
Satd. Flow (perm)	1641		1468					3109		3183	1727	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.85	0.90	0.80
Adj. Flow (vph)	71	0	86	0	0	0	0	109	59	178	387	0
RTOR Reduction (vph)	0	0	78	0	0	0	0	27	0	0	0	0
Lane Group Flow (vph)	71	0	8	0	0	0	0	141	0	178	387	0
Turn Type	Split		Perm					NA		Prot	NA	
Protected Phases	4	4						6		3 5	1 2 3	
Permitted Phases			4									
Actuated Green, G (s)	8.1		8.1					48.1		15.8	72.9	
Effective Green, g (s)	8.1		8.1					48.1		15.8	72.9	
Actuated g/C Ratio	0.09		0.09					0.53		0.18	0.81	
Clearance Time (s)	4.5		4.5					4.5				
Vehicle Extension (s)	3.0		3.0					3.0				
Lane Grp Cap (vph)	147		132					1661		558	1398	
v/s Ratio Prot	c0.04							0.05		0.06	c0.22	
v/s Ratio Perm			0.01									
v/c Ratio	0.48		0.06					0.08		0.32	0.28	
Uniform Delay, d1	39.0		37.5					10.2		32.4	2.1	
Progression Factor	1.00		1.00					1.00		1.32	1.49	
Incremental Delay, d2	2.5		0.2					0.1		0.3	0.1	
Delay (s)	41.4		37.6					10.3		43.2	3.2	
Level of Service	D		D					B		D	A	
Approach Delay (s)		39.4			0.0			10.3			15.8	
Approach LOS		D			A			B			B	

Intersection Summary

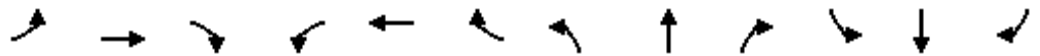
HCM 2000 Control Delay	18.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	31.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary

9: Reems Road & Northern Avenue

04/16/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	65	129	5	9	83	18	3	54	19	39	166	208
Future Volume (veh/h)	65	129	5	9	83	18	3	54	19	39	166	208
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752
Adj Flow Rate, veh/h	81	152	6	11	98	22	4	68	24	49	195	245
Peak Hour Factor	0.80	0.85	0.80	0.80	0.85	0.80	0.80	0.80	0.80	0.80	0.85	0.85
Percent Heavy Veh, %	10	10	10	10	10	10	10	10	10	10	10	10
Cap, veh/h	276	306	12	249	253	57	593	806	285	904	460	578
Arrive On Green	0.18	0.18	0.18	0.18	0.18	0.18	0.65	0.65	0.65	0.65	0.65	0.65
Sat Flow, veh/h	1191	1674	66	1151	1385	311	889	1237	436	1222	706	887
Grp Volume(v), veh/h	81	0	158	11	0	120	4	0	92	49	0	440
Grp Sat Flow(s),veh/h/ln	1191	0	1740	1151	0	1696	889	0	1673	1222	0	1592
Q Serve(g_s), s	3.5	0.0	4.4	0.5	0.0	3.4	0.1	0.0	1.1	0.8	0.0	7.2
Cycle Q Clear(g_c), s	6.9	0.0	4.4	4.9	0.0	3.4	7.4	0.0	1.1	1.9	0.0	7.2
Prop In Lane	1.00		0.04	1.00		0.18	1.00		0.26	1.00		0.56
Lane Grp Cap(c), veh/h	276	0	318	249	0	310	593	0	1091	904	0	1038
V/C Ratio(X)	0.29	0.00	0.50	0.04	0.00	0.39	0.01	0.00	0.08	0.05	0.00	0.42
Avail Cap(c_a), veh/h	1053	0	1454	1000	0	1417	593	0	1091	904	0	1038
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	22.6	0.0	20.0	22.2	0.0	19.6	6.3	0.0	3.5	3.9	0.0	4.6
Incr Delay (d2), s/veh	0.6	0.0	1.2	0.1	0.0	0.8	0.0	0.0	0.2	0.1	0.0	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	0.0	1.6	0.1	0.0	1.2	0.0	0.0	0.2	0.1	0.0	1.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.2	0.0	21.2	22.3	0.0	20.4	6.4	0.0	3.6	4.0	0.0	5.8
LnGrp LOS	C	A	C	C	A	C	A	A	A	A	A	A
Approach Vol, veh/h		239			131			96				489
Approach Delay, s/veh		21.9			20.5			3.8				5.6
Approach LOS		C			C			A				A
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		40.0		14.5		40.0		14.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		35.5		45.5		35.5		45.5				
Max Q Clear Time (g_c+I1), s		9.4		8.9		9.2		6.9				
Green Ext Time (p_c), s		0.4		1.1		2.9		0.7				
Intersection Summary												
HCM 6th Ctrl Delay				11.6								
HCM 6th LOS				B								

HCM 6th TWSC
12: Reems Road & Orangewood Avenue

04/16/2021

Intersection						
Int Delay, s/veh	0.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	8	3	1	123	46	0
Future Vol, veh/h	8	3	1	123	46	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	85	80	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	10	4	1	145	58	0

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	205	58	58	0	-	0
Stage 1	58	-	-	-	-	-
Stage 2	147	-	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-	-
Pot Cap-1 Maneuver	766	986	1496	-	-	-
Stage 1	945	-	-	-	-	-
Stage 2	861	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	765	986	1496	-	-	-
Mov Cap-2 Maneuver	755	-	-	-	-	-
Stage 1	944	-	-	-	-	-
Stage 2	861	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.5	0.1	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1496	-	755	986	-	-
HCM Lane V/C Ratio	0.001	-	0.013	0.004	-	-
HCM Control Delay (s)	7.4	0	9.8	8.7	-	-
HCM Lane LOS	A	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0	0	-	-

HCM 6th TWSC
 14: Reems Road & North Middle Access

04/16/2021

Intersection						
Int Delay, s/veh	2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↙	↗	↙	↑	↗	
Traffic Vol, veh/h	14	10	40	63	87	61
Future Vol, veh/h	14	10	40	63	87	61
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	80	85	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	18	13	50	79	102	76

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	319	140	178	0	-	0
Stage 1	140	-	-	-	-	-
Stage 2	179	-	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-	-
Pot Cap-1 Maneuver	658	887	1351	-	-	-
Stage 1	868	-	-	-	-	-
Stage 2	833	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	634	887	1351	-	-	-
Mov Cap-2 Maneuver	670	-	-	-	-	-
Stage 1	836	-	-	-	-	-
Stage 2	833	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.9	3	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1351	-	670	887	-	-
HCM Lane V/C Ratio	0.037	-	0.026	0.014	-	-
HCM Control Delay (s)	7.8	-	10.5	9.1	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.1	0	-	-

HCM 6th TWSC
 16: Reems Road & South Middle Access

04/16/2021

Intersection						
Int Delay, s/veh	0.8					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↶	↷	↶	↶	↷	
Traffic Vol, veh/h	4	3	14	99	78	19
Future Vol, veh/h	4	3	14	99	78	19
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	85	85	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	5	4	18	116	92	24

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	256	104	116	0	-	0
Stage 1	104	-	-	-	-	-
Stage 2	152	-	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-	-
Pot Cap-1 Maneuver	716	929	1424	-	-	-
Stage 1	901	-	-	-	-	-
Stage 2	857	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	707	929	1424	-	-	-
Mov Cap-2 Maneuver	720	-	-	-	-	-
Stage 1	889	-	-	-	-	-
Stage 2	857	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.5	1	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1424	-	720	929	-	-
HCM Lane V/C Ratio	0.012	-	0.007	0.004	-	-
HCM Control Delay (s)	7.6	-	10	8.9	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0	0	-	-

HCM 6th TWSC
18: Reems Road & South Access

04/16/2021

Intersection						
Int Delay, s/veh	1.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	10	7	28	103	39	42
Future Vol, veh/h	10	7	28	103	39	42
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	85	80	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	13	9	35	121	49	53

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	267	76	102	0	0
Stage 1	76	-	-	-	-
Stage 2	191	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-
Pot Cap-1 Maneuver	705	963	1441	-	-
Stage 1	927	-	-	-	-
Stage 2	823	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	688	963	1441	-	-
Mov Cap-2 Maneuver	704	-	-	-	-
Stage 1	905	-	-	-	-
Stage 2	823	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.6	1.7	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1441	-	704	963	-	-
HCM Lane V/C Ratio	0.024	-	0.018	0.009	-	-
HCM Control Delay (s)	7.6	-	10.2	8.8	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.1	0	-	-

HCM 6th TWSC
 21: Alsup Road & North Building 5 Access

04/16/2021

Intersection						
Int Delay, s/veh	1.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖	↗	↖		↖	↗
Traffic Vol, veh/h	4	5	67	14	20	50
Future Vol, veh/h	4	5	67	14	20	50
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	5	6	84	18	25	63

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	206	93	0	0	102	0
Stage 1	93	-	-	-	-	-
Stage 2	113	-	-	-	-	-
Critical Hdwy	6.5	6.3	-	-	4.2	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	-	-	2.29	-
Pot Cap-1 Maneuver	765	943	-	-	1441	-
Stage 1	911	-	-	-	-	-
Stage 2	892	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	752	943	-	-	1441	-
Mov Cap-2 Maneuver	750	-	-	-	-	-
Stage 1	911	-	-	-	-	-
Stage 2	877	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.2	0	2.2
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	750	943	1441
HCM Lane V/C Ratio	-	-	0.007	0.007	0.017
HCM Control Delay (s)	-	-	9.8	8.8	7.5
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	0	0.1

HCM 6th TWSC
23: West Access & Northern Avenue

04/16/2021

Intersection						
Int Delay, s/veh	1.7					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	190	46	71	208	8	17
Future Vol, veh/h	190	46	71	208	8	17
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	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	80	80	85	80	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	224	58	89	245	10	21

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	282	0	676 253
Stage 1	-	-	-	-	253 -
Stage 2	-	-	-	-	423 -
Critical Hdwy	-	-	4.2	-	6.5 6.3
Critical Hdwy Stg 1	-	-	-	-	5.5 -
Critical Hdwy Stg 2	-	-	-	-	5.5 -
Follow-up Hdwy	-	-	2.29	-	3.59 3.39
Pot Cap-1 Maneuver	-	-	1236	-	407 767
Stage 1	-	-	-	-	771 -
Stage 2	-	-	-	-	644 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1236	-	378 767
Mov Cap-2 Maneuver	-	-	-	-	378 -
Stage 1	-	-	-	-	771 -
Stage 2	-	-	-	-	598 -

Approach	EB	WB	NB
HCM Control Delay, s	0	2.2	11.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	378	767	-	-	1236	-
HCM Lane V/C Ratio	0.026	0.028	-	-	0.072	-
HCM Control Delay (s)	14.8	9.8	-	-	8.1	-
HCM Lane LOS	B	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0.2	-

HCM 6th TWSC
 25: Alsup Road & Middle Building 5 Access

04/16/2021

Intersection						
Int Delay, s/veh	1.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖	↗	↖		↖	↗
Traffic Vol, veh/h	3	4	77	13	18	36
Future Vol, veh/h	3	4	77	13	18	36
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	80	80	85	80	80	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	4	5	91	16	23	45

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	190	99	0	0	107	0
Stage 1	99	-	-	-	-	-
Stage 2	91	-	-	-	-	-
Critical Hdwy	6.5	6.3	-	-	4.2	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	-	-	2.29	-
Pot Cap-1 Maneuver	781	935	-	-	1435	-
Stage 1	905	-	-	-	-	-
Stage 2	913	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	769	935	-	-	1435	-
Mov Cap-2 Maneuver	762	-	-	-	-	-
Stage 1	905	-	-	-	-	-
Stage 2	898	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.2	0	2.5
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	762	935	1435
HCM Lane V/C Ratio	-	-	0.005	0.005	0.016
HCM Control Delay (s)	-	-	9.7	8.9	7.5
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	0	0

HCM 6th TWSC
26: East Access & Northern Avenue

04/16/2021

Intersection						
Int Delay, s/veh	0.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔		↔	↑	↔	↔
Traffic Vol, veh/h	195	12	18	276	3	4
Future Vol, veh/h	195	12	18	276	3	4
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	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	80	80	85	80	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	229	15	23	325	4	5

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	244	0	608 237
Stage 1	-	-	-	-	237 -
Stage 2	-	-	-	-	371 -
Critical Hdwy	-	-	4.2	-	6.5 6.3
Critical Hdwy Stg 1	-	-	-	-	5.5 -
Critical Hdwy Stg 2	-	-	-	-	5.5 -
Follow-up Hdwy	-	-	2.29	-	3.59 3.39
Pot Cap-1 Maneuver	-	-	1277	-	446 783
Stage 1	-	-	-	-	784 -
Stage 2	-	-	-	-	681 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1277	-	438 783
Mov Cap-2 Maneuver	-	-	-	-	526 -
Stage 1	-	-	-	-	784 -
Stage 2	-	-	-	-	669 -

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	10.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	526	783	-	-	1277	-
HCM Lane V/C Ratio	0.007	0.006	-	-	0.018	-
HCM Control Delay (s)	11.9	9.6	-	-	7.9	-
HCM Lane LOS	B	A	-	-	A	-
HCM 95th %tile Q(veh)	0	0	-	-	0.1	-

HCM 6th TWSC
 28: Alsup Road & South Building 5 Driveway

04/16/2021

Intersection						
Int Delay, s/veh	1.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↙	↗	↖		↙	↗
Traffic Vol, veh/h	4	5	85	14	21	18
Future Vol, veh/h	4	5	85	14	21	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	80	80	85	80	80	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	5	6	100	18	26	23

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	184	109	0	0	118
Stage 1	109	-	-	-	-
Stage 2	75	-	-	-	-
Critical Hdwy	6.5	6.3	-	-	4.2
Critical Hdwy Stg 1	5.5	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-
Follow-up Hdwy	3.59	3.39	-	-	2.29
Pot Cap-1 Maneuver	787	923	-	-	1422
Stage 1	896	-	-	-	-
Stage 2	928	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	773	923	-	-	1422
Mov Cap-2 Maneuver	765	-	-	-	-
Stage 1	896	-	-	-	-
Stage 2	911	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.3	0	4.1
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	765	923	1422
HCM Lane V/C Ratio	-	-	0.007	0.007	0.018
HCM Control Delay (s)	-	-	9.7	8.9	7.6
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	0	0.1

HCM 6th TWSC
31: Reems Road & North Access

04/16/2021

Intersection						
Int Delay, s/veh	1.1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	8	5	20	68	148	32
Future Vol, veh/h	8	5	20	68	148	32
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	80	85	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	10	6	25	85	174	40

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	329	194	214	0	0
Stage 1	194	-	-	-	-
Stage 2	135	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-
Pot Cap-1 Maneuver	649	827	1310	-	-
Stage 1	820	-	-	-	-
Stage 2	872	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	637	827	1310	-	-
Mov Cap-2 Maneuver	671	-	-	-	-
Stage 1	804	-	-	-	-
Stage 2	872	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10	1.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1310	-	671	827	-	-
HCM Lane V/C Ratio	0.019	-	0.015	0.008	-	-
HCM Control Delay (s)	7.8	-	10.4	9.4	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0	0	-	-

HCM Signalized Intersection Capacity Analysis

1: Reems Road & Westbound Northern Parkway Ramps

04/16/2021



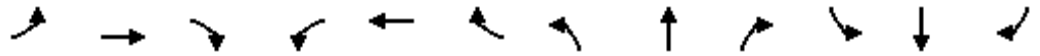
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↙	↑	↗	↙	↑			↑↑↑	
Traffic Volume (vph)	0	0	0	62	3	222	67	227	0	0	280	90
Future Volume (vph)	0	0	0	62	3	222	67	227	0	0	280	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.5	4.5	4.5	4.5	4.5			4.5	
Lane Util. Factor				1.00	1.00	1.00	1.00	1.00			0.91	
Frt				1.00	1.00	0.85	1.00	1.00			0.96	
Flt Protected				0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)				1641	1727	1468	1641	1727			4543	
Flt Permitted				0.95	1.00	1.00	0.95	1.00			1.00	
Satd. Flow (perm)				1641	1727	1468	1641	1727			4543	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.85	0.80	0.85	0.80	0.80	0.85	0.85
Adj. Flow (vph)	0	0	0	78	4	261	84	267	0	0	329	106
RTOR Reduction (vph)	0	0	0	0	0	232	0	0	0	0	43	0
Lane Group Flow (vph)	0	0	0	78	4	29	84	267	0	0	392	0
Turn Type				Split	NA	Perm	Prot	NA			NA	
Protected Phases				8	8		1 7	5 6 7			2	
Permitted Phases						8						
Actuated Green, G (s)				10.1	10.1	10.1	11.1	70.9			50.8	
Effective Green, g (s)				10.1	10.1	10.1	11.1	70.9			50.8	
Actuated g/C Ratio				0.11	0.11	0.11	0.12	0.79			0.56	
Clearance Time (s)				4.5	4.5	4.5					4.5	
Vehicle Extension (s)				3.0	3.0	3.0					3.0	
Lane Grp Cap (vph)				184	193	164	202	1360			2564	
v/s Ratio Prot				c0.05	0.00		c0.05	c0.15			0.09	
v/s Ratio Perm						0.02						
v/c Ratio				0.42	0.02	0.18	0.42	0.20			0.15	
Uniform Delay, d1				37.2	35.5	36.2	36.5	2.4			9.3	
Progression Factor				1.00	1.00	1.00	1.36	0.50			1.00	
Incremental Delay, d2				1.6	0.0	0.5	1.4	0.1			0.1	
Delay (s)				38.8	35.6	36.7	51.0	1.3			9.5	
Level of Service				D	D	D	D	A			A	
Approach Delay (s)		0.0			37.2			13.2			9.5	
Approach LOS		A			D			B			A	
Intersection Summary												
HCM 2000 Control Delay			19.0								HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.27									
Actuated Cycle Length (s)			90.0								Sum of lost time (s)	18.0
Intersection Capacity Utilization			33.2%								ICU Level of Service	A
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: Reems Road & Eastbound Northern Parkway Ramps

04/16/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	0	30	0	0	0	0	259	164	188	165	0
Future Volume (vph)	28	0	30	0	0	0	0	259	164	188	165	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5		4.5					4.5		4.5	4.5	
Lane Util. Factor	1.00		1.00					0.95		0.97	1.00	
Frt	1.00		0.85					0.94		1.00	1.00	
Flt Protected	0.95		1.00					1.00		0.95	1.00	
Satd. Flow (prot)	1641		1468					3091		3183	1727	
Flt Permitted	0.95		1.00					1.00		0.95	1.00	
Satd. Flow (perm)	1641		1468					3091		3183	1727	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.85	0.85	0.85	0.85	0.80
Adj. Flow (vph)	35	0	38	0	0	0	0	305	193	221	194	0
RTOR Reduction (vph)	0	0	35	0	0	0	0	84	0	0	0	0
Lane Group Flow (vph)	35	0	3	0	0	0	0	414	0	221	194	0
Turn Type	Split		Perm					NA		Prot	NA	
Protected Phases	4	4						6		3 5	1 2 3	
Permitted Phases			4									
Actuated Green, G (s)	6.4		6.4					49.3		16.3	74.6	
Effective Green, g (s)	6.4		6.4					49.3		16.3	74.6	
Actuated g/C Ratio	0.07		0.07					0.55		0.18	0.83	
Clearance Time (s)	4.5		4.5					4.5				
Vehicle Extension (s)	3.0		3.0					3.0				
Lane Grp Cap (vph)	116		104					1693		576	1431	
v/s Ratio Prot	c0.02							c0.13		c0.07	0.11	
v/s Ratio Perm			0.00									
v/c Ratio	0.30		0.03					0.24		0.38	0.14	
Uniform Delay, d1	39.7		38.9					10.6		32.4	1.5	
Progression Factor	1.00		1.00					1.00		1.33	1.21	
Incremental Delay, d2	1.5		0.1					0.3		0.4	0.0	
Delay (s)	41.1		39.0					11.0		43.5	1.8	
Level of Service	D		D					B		D	A	
Approach Delay (s)		40.0			0.0			11.0			24.0	
Approach LOS		D			A			B			C	

Intersection Summary

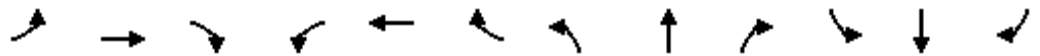
HCM 2000 Control Delay	18.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	33.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM 6th Signalized Intersection Summary

9: Reems Road & Northern Avenue

04/16/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	→	↱	↰	→	↱	↰	→	↱	↰	→	↱
Traffic Volume (veh/h)	183	128	4	25	246	58	6	170	44	34	60	105
Future Volume (veh/h)	183	128	4	25	246	58	6	170	44	34	60	105
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752	1752
Adj Flow Rate, veh/h	215	151	5	31	289	72	8	200	55	42	75	124
Peak Hour Factor	0.85	0.85	0.80	0.80	0.85	0.80	0.80	0.85	0.80	0.80	0.80	0.85
Percent Heavy Veh, %	10	10	10	10	10	10	10	10	10	10	10	10
Cap, veh/h	344	707	23	511	568	141	522	613	169	481	275	455
Arrive On Green	0.42	0.42	0.42	0.42	0.42	0.42	0.46	0.46	0.46	0.46	0.46	0.46
Sat Flow, veh/h	956	1686	56	1153	1354	337	1108	1323	364	1053	594	981
Grp Volume(v), veh/h	215	0	156	31	0	361	8	0	255	42	0	199
Grp Sat Flow(s),veh/h/ln	956	0	1742	1153	0	1691	1108	0	1686	1053	0	1575
Q Serve(g_s), s	16.4	0.0	4.4	1.4	0.0	12.1	0.3	0.0	7.3	2.0	0.0	5.9
Cycle Q Clear(g_c), s	28.5	0.0	4.4	5.7	0.0	12.1	6.3	0.0	7.3	9.3	0.0	5.9
Prop In Lane	1.00		0.03	1.00		0.20	1.00		0.22	1.00		0.62
Lane Grp Cap(c), veh/h	344	0	730	511	0	709	522	0	781	481	0	730
V/C Ratio(X)	0.62	0.00	0.21	0.06	0.00	0.51	0.02	0.00	0.33	0.09	0.00	0.27
Avail Cap(c_a), veh/h	511	0	1034	713	0	1004	522	0	781	481	0	730
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	27.0	0.0	14.2	16.0	0.0	16.4	14.6	0.0	13.0	16.0	0.0	12.6
Incr Delay (d2), s/veh	1.9	0.0	0.1	0.0	0.0	0.6	0.1	0.0	1.1	0.4	0.0	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.5	0.0	1.5	0.3	0.0	4.1	0.1	0.0	2.6	0.5	0.0	2.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.8	0.0	14.3	16.1	0.0	17.0	14.6	0.0	14.1	16.3	0.0	13.6
LnGrp LOS	C	A	B	B	A	B	B	A	B	B	A	B
Approach Vol, veh/h		371			392			263			241	
Approach Delay, s/veh		22.7			16.9			14.1			14.0	
Approach LOS		C			B			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		40.0		36.6		40.0		36.6				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		35.5		45.5		35.5		45.5				
Max Q Clear Time (g_c+I1), s		9.3		30.5		11.3		14.1				
Green Ext Time (p_c), s		1.4		1.6		1.2		2.2				
Intersection Summary												
HCM 6th Ctrl Delay				17.5								
HCM 6th LOS				B								

HCM 6th TWSC
12: Reems Road & Orangewood Avenue

04/16/2021

Intersection						
Int Delay, s/veh	0.5					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↶	↷		↶	↷	
Traffic Vol, veh/h	6	3	3	81	143	5
Future Vol, veh/h	6	3	3	81	143	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	85	85	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	8	4	4	95	168	6

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	274	171	174	0	-	0
Stage 1	171	-	-	-	-	-
Stage 2	103	-	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-	-
Pot Cap-1 Maneuver	699	852	1356	-	-	-
Stage 1	840	-	-	-	-	-
Stage 2	902	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	697	852	1356	-	-	-
Mov Cap-2 Maneuver	712	-	-	-	-	-
Stage 1	837	-	-	-	-	-
Stage 2	902	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.8	0.3	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1356	-	712	852	-	-
HCM Lane V/C Ratio	0.003	-	0.011	0.004	-	-
HCM Control Delay (s)	7.7	0	10.1	9.2	-	-
HCM Lane LOS	A	A	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0	0	-	-

HCM 6th TWSC
 14: Reems Road & North Middle Access

04/16/2021

Intersection						
Int Delay, s/veh	3.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↶	↷	↶	↶	↷	↷
Traffic Vol, veh/h	60	39	11	125	83	16
Future Vol, veh/h	60	39	11	125	83	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	85	85	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	75	49	14	147	98	20

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	283	108	118	0	-	0
Stage 1	108	-	-	-	-	-
Stage 2	175	-	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-	-
Pot Cap-1 Maneuver	690	925	1422	-	-	-
Stage 1	897	-	-	-	-	-
Stage 2	836	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	683	925	1422	-	-	-
Mov Cap-2 Maneuver	703	-	-	-	-	-
Stage 1	888	-	-	-	-	-
Stage 2	836	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.1	0.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1422	-	703	925	-	-
HCM Lane V/C Ratio	0.01	-	0.107	0.053	-	-
HCM Control Delay (s)	7.6	-	10.7	9.1	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.4	0.2	-	-

HCM 6th TWSC
 16: Reems Road & South Middle Access

04/16/2021

Intersection						
Int Delay, s/veh	1.4					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	19	14	4	117	117	5
Future Vol, veh/h	19	14	4	117	117	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	85	85	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	24	18	5	138	138	6

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	289	141	144	0	0
Stage 1	141	-	-	-	-
Stage 2	148	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-
Pot Cap-1 Maneuver	685	886	1391	-	-
Stage 1	867	-	-	-	-
Stage 2	860	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	682	886	1391	-	-
Mov Cap-2 Maneuver	705	-	-	-	-
Stage 1	864	-	-	-	-
Stage 2	860	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.8	0.3	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1391	-	705	886	-	-
HCM Lane V/C Ratio	0.004	-	0.034	0.02	-	-
HCM Control Delay (s)	7.6	-	10.3	9.1	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	0.1	-	-

HCM 6th TWSC
18: Reems Road & South Access

04/16/2021

Intersection						
Int Delay, s/veh	2.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	41	27	7	80	121	10
Future Vol, veh/h	41	27	7	80	121	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	85	85	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	51	34	9	94	142	13

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	261	149	155	0	-	0
Stage 1	149	-	-	-	-	-
Stage 2	112	-	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-	-
Pot Cap-1 Maneuver	711	877	1378	-	-	-
Stage 1	859	-	-	-	-	-
Stage 2	893	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	706	877	1378	-	-	-
Mov Cap-2 Maneuver	720	-	-	-	-	-
Stage 1	853	-	-	-	-	-
Stage 2	893	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10	0.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1378	-	720	877	-	-
HCM Lane V/C Ratio	0.006	-	0.071	0.038	-	-
HCM Control Delay (s)	7.6	-	10.4	9.3	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.2	0.1	-	-

HCM 6th TWSC
 21: Alsup Road & North Building 5 Access

04/16/2021

Intersection						
Int Delay, s/veh	2.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↖		↘	↗
Traffic Vol, veh/h	13	20	51	4	5	68
Future Vol, veh/h	13	20	51	4	5	68
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	16	25	64	5	6	85

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	164	67	0	0	69	0
Stage 1	67	-	-	-	-	-
Stage 2	97	-	-	-	-	-
Critical Hdwy	6.5	6.3	-	-	4.2	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	-	-	2.29	-
Pot Cap-1 Maneuver	808	975	-	-	1483	-
Stage 1	936	-	-	-	-	-
Stage 2	907	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	805	975	-	-	1483	-
Mov Cap-2 Maneuver	786	-	-	-	-	-
Stage 1	936	-	-	-	-	-
Stage 2	903	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	786	975	1483
HCM Lane V/C Ratio	-	-	0.021	0.026	0.004
HCM Control Delay (s)	-	-	9.7	8.8	7.4
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0.1	0

HCM 6th TWSC
23: West Access & Northern Avenue

04/16/2021

Intersection						
Int Delay, s/veh	2.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	232	10	19	345	46	68
Future Vol, veh/h	232	10	19	345	46	68
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	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	80	80	90	80	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	273	13	24	383	58	85

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	286	0	711 280
Stage 1	-	-	-	-	280 -
Stage 2	-	-	-	-	431 -
Critical Hdwy	-	-	4.2	-	6.5 6.3
Critical Hdwy Stg 1	-	-	-	-	5.5 -
Critical Hdwy Stg 2	-	-	-	-	5.5 -
Follow-up Hdwy	-	-	2.29	-	3.59 3.39
Pot Cap-1 Maneuver	-	-	1232	-	388 740
Stage 1	-	-	-	-	749 -
Stage 2	-	-	-	-	639 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1232	-	381 740
Mov Cap-2 Maneuver	-	-	-	-	381 -
Stage 1	-	-	-	-	749 -
Stage 2	-	-	-	-	627 -

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	12.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	381	740	-	-	1232	-
HCM Lane V/C Ratio	0.151	0.115	-	-	0.019	-
HCM Control Delay (s)	16.1	10.5	-	-	8	-
HCM Lane LOS	C	B	-	-	A	-
HCM 95th %tile Q(veh)	0.5	0.4	-	-	0.1	-

HCM 6th TWSC
 25: Alsup Road & Middle Building 5 Access

04/16/2021

Intersection						
Int Delay, s/veh	2.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↙	↗	↖		↙	↗
Traffic Vol, veh/h	12	18	37	3	5	76
Future Vol, veh/h	12	18	37	3	5	76
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	80	80	80	80	80	85
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	15	23	46	4	6	89

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	149	48	0	0	50	0
Stage 1	48	-	-	-	-	-
Stage 2	101	-	-	-	-	-
Critical Hdwy	6.5	6.3	-	-	4.2	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	-	-	2.29	-
Pot Cap-1 Maneuver	825	999	-	-	1507	-
Stage 1	954	-	-	-	-	-
Stage 2	903	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	822	999	-	-	1507	-
Mov Cap-2 Maneuver	795	-	-	-	-	-
Stage 1	954	-	-	-	-	-
Stage 2	899	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.1	0	0.5
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT	
Capacity (veh/h)	-	-	795	999	1507	-
HCM Lane V/C Ratio	-	-	0.019	0.023	0.004	-
HCM Control Delay (s)	-	-	9.6	8.7	7.4	-
HCM Lane LOS	-	-	A	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0.1	0	-

HCM 6th TWSC
26: East Access & Northern Avenue

04/16/2021

Intersection						
Int Delay, s/veh	0.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↶		↷	↶	↷	↷
Traffic Vol, veh/h	297	3	5	352	12	18
Future Vol, veh/h	297	3	5	352	12	18
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	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	80	80	90	80	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	349	4	6	391	15	23

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	353	0	754
Stage 1	-	-	-	-	351
Stage 2	-	-	-	-	403
Critical Hdwy	-	-	4.2	-	6.5
Critical Hdwy Stg 1	-	-	-	-	5.5
Critical Hdwy Stg 2	-	-	-	-	5.5
Follow-up Hdwy	-	-	2.29	-	3.59
Pot Cap-1 Maneuver	-	-	1163	-	366
Stage 1	-	-	-	-	695
Stage 2	-	-	-	-	658
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1163	-	364
Mov Cap-2 Maneuver	-	-	-	-	474
Stage 1	-	-	-	-	695
Stage 2	-	-	-	-	655

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	11.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	474	675	-	-	1163	-
HCM Lane V/C Ratio	0.032	0.033	-	-	0.005	-
HCM Control Delay (s)	12.8	10.5	-	-	8.1	-
HCM Lane LOS	B	B	-	-	A	-
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0	-

HCM 6th TWSC
28: Alsup Road & South Building 5 Driveway

04/16/2021

Intersection						
Int Delay, s/veh	2.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	13	20	20	4	5	83
Future Vol, veh/h	13	20	20	4	5	83
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	80	80	80	80	80	85
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	16	25	25	5	6	98

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	138	28	0	0	30	0
Stage 1	28	-	-	-	-	-
Stage 2	110	-	-	-	-	-
Critical Hdwy	6.5	6.3	-	-	4.2	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	-	-	2.29	-
Pot Cap-1 Maneuver	837	1025	-	-	1533	-
Stage 1	974	-	-	-	-	-
Stage 2	895	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	834	1025	-	-	1533	-
Mov Cap-2 Maneuver	798	-	-	-	-	-
Stage 1	974	-	-	-	-	-
Stage 2	891	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9	0	0.4
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	798	1025	1533	-
HCM Lane V/C Ratio	-	-	0.02	0.024	0.004	-
HCM Control Delay (s)	-	-	9.6	8.6	7.4	-
HCM Lane LOS	-	-	A	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	0.1	0	-

HCM 6th TWSC
31: Reems Road & North Access

04/16/2021

Intersection						
Int Delay, s/veh	1.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↖	↗	↖	↑	↗	
Traffic Vol, veh/h	31	20	6	189	81	8
Future Vol, veh/h	31	20	6	189	81	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	85	85	80
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	39	25	8	222	95	10

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	338	100	105	0	-	0
Stage 1	100	-	-	-	-	-
Stage 2	238	-	-	-	-	-
Critical Hdwy	6.5	6.3	4.2	-	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.29	-	-	-
Pot Cap-1 Maneuver	642	934	1438	-	-	-
Stage 1	904	-	-	-	-	-
Stage 2	783	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	638	934	1438	-	-	-
Mov Cap-2 Maneuver	667	-	-	-	-	-
Stage 1	899	-	-	-	-	-
Stage 2	783	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10	0.2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1438	-	667	934	-	-
HCM Lane V/C Ratio	0.005	-	0.058	0.027	-	-
HCM Control Delay (s)	7.5	-	10.7	9	-	-
HCM Lane LOS	A	-	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.2	0.1	-	-



**HOPEWELL REEMS
ORANGEWOOD AVENUE/REEMS ROAD
TRAFFIC IMPACT ANALYSIS**

APPENDIX

Turn Lane Calculations

Signalized Intersection

(Left Turn Lane)

Location: Westbound Northern Parkway Ramps/Reems Road**Approach/Leg:** Northbound**2025 With Project**

V = vehicles per hour

Cycle Length =

90 sec

PM Peak Hour

V = 67 vph

Vehicles/cycle = 2 x (vehicles/hour)/cycles/hour

Storage length = (vehicles/cycle x 25 feet)

$$S \text{ (ft)} = \frac{67 \text{ vph} \times (2) \times (25 \text{ ft/veh}) \times (90 \text{ sec/cycle})}{(3600 \text{ sec/hr})} = 84 \text{ feet}$$

Minimum Recommended Storage:

100 feet

Signalized Intersection

(Right Turn Lane)

Location: Eastbound Northern Parkway Ramps/Reems Road**Approach/Leg:** Northbound**2025 With Project**

V = vehicles per hour

Cycle Length =

90 sec

PM Peak Hour

V = 164 vph

Vehicles/cycle = 2 x (vehicles/hour)/cycles/hour

Storage length = (vehicles/cycle x 25 feet)

$$S \text{ (ft)} = \frac{164 \text{ vph} \times (2) \times (25 \text{ ft/veh}) \times (90 \text{ sec/cycle})}{(3600 \text{ sec/hr})} = 205 \text{ feet}$$

Minimum Recommended Storage:

225 feet

Signalized Intersection

(Left Turn lane)

Location:

Reems Road/Northern Avenue

Approach/Leg:

Northbound

2025 With Project

V = vehicles per hour

Cycle Length =

90 sec

AM Peak Hour

V = 6 vph

Vehicles/cycle = 2 x (vehicles/hour)/cycles/hour

Storage length = (vehicles/cycle x 25 feet)

$$S \text{ (ft)} = \frac{6 \text{ vph} \times (2) \times (25 \text{ ft/veh}) \times (90 \text{ sec/cycle})}{(3600 \text{ sec/hr})} = 8 \text{ feet}$$

Minimum Recommended Storage: 25 feet

Signalized Intersection

(Left Turn lane)

Location:

Reems Road/Northern Avenue

Approach/Leg:

Eastbound

2025 With Project

V = vehicles per hour

Cycle Length =

90 sec

AM Peak Hour

V = 183 vph

Vehicles/cycle = 2 x (vehicles/hour)/cycles/hour

Storage length = (vehicles/cycle x 25 feet)

$$S \text{ (ft)} = \frac{183 \text{ vph} \times (2) \times (25 \text{ ft/veh}) \times (90 \text{ sec/cycle})}{(3600 \text{ sec/hr})} = 229 \text{ feet}$$

Minimum Recommended Storage: 250 feet

Un-Signalized Intersection

(Left Turn Lane)

Location: North Access/Reems Road**Approach/Leg:** Northbound**2025 With Project**

V = vehicles per hour

AM Peak Hour

Turning Volume = 20 vph

Opposing Volume = 180 vph

Based on AASHTO Policy on Geometric Design of Highways and Streets (2018)

Table 9-22. Calculated Storage Lengths to Accommodate the 85th Percentile Critical Gap

Storage = 50 feet

Minimum Recommended Storage:

50 feet

Un-Signalized Intersection

(Left Turn Lane)

Location: North Middle Access/Reems Road**Approach/Leg:** Northbound**2025 With Project**

V = vehicles per hour

AM Peak Hour

Turning Volume = 40 vph

Opposing Volume = 148 vph

Based on AASHTO Policy on Geometric Design of Highways and Streets (2018)

Table 9-22. Calculated Storage Lengths to Accommodate the 85th Percentile Critical Gap

Storage = 50 feet

Minimum Recommended Storage:

50 feet

Un-Signalized Intersection

(Left Turn Lane)

Location: South Middle Access/Reems Road**Approach/Leg:** Northbound**2025 With Project**

V = vehicles per hour

AM Peak Hour

Turning Volume = 97 vph

Opposing Volume = 94 vph

Based on AASHTO Policy on Geometric Design of Highways and Streets (2018)

Table 9-22. Calculated Storage Lengths to Accommodate the 85th Percentile Critical Gap

Storage = 50 feet

Minimum Recommended Storage:

50 feet

Un-Signalized Intersection

(Left Turn Lane)

Location: South Access/Reems Road

Approach/Leg: Northbound

2025 With Project

V = vehicles per hour

AM Peak Hour

Turning Volume = 28 vph

Opposing Volume = 81 vph

Based on AASHTO Policy on Geometric Design of Highways and Streets (2018)

Table 9-22. Calculated Storage Lengths to Accommodate the 85th Percentile Critical Gap

Storage = 50 feet

Minimum Recommended Storage:

50 feet

Un-Signalized Intersection

(Left Turn Lane)

Location: East Access/Northern Avenue

Approach/Leg: Westbound

2025 With Project

V = vehicles per hour

AM Peak Hour

Turning Volume = 18 vph

Opposing Volume = 207 vph

Based on AASHTO Policy on Geometric Design of Highways and Streets (2018)

Table 9-22. Calculated Storage Lengths to Accommodate the 85th Percentile Critical Gap

Storage = 50 feet

Minimum Recommended Storage:

50 feet

Un-Signalized Intersection

(Right Turn Lane)

Location: West Access/Northern Avenue

Approach/Leg: Eastbound

2025 With Project

V = vehicles per hour

AM Peak Hour

Turning Volume = 46 vph

Opposing Volume = 0 vph

Based on AASHTO Policy on Geometric Design of Highways and Streets (2018)

Table 9-22. Calculated Storage Lengths to Accommodate the 85th Percentile Critical Gap

Storage = 50 feet

Minimum Recommended Storage:

50 feet

Un-Signalized Intersection

(Left Turn Lane)

Location: West Access/Northern Avenue

Approach/Leg: Westbound

2025 With Project

V = vehicles per hour

AM Peak Hour

Turning Volume = 71 vph

Opposing Volume = 236 vph

Based on AASHTO Policy on Geometric Design of Highways and Streets (2018)

Table 9-22. Calculated Storage Lengths to Accommodate the 85th Percentile Critical Gap

Storage = 50 feet

Minimum Recommended Storage:

50 feet

Un-Signalized Intersection

(Left Turn Lane)

Location: North Building 5 Access/Alsup Road**Approach/Leg:** Southbound**2025 With Project**

V = vehicles per hour

AM Peak Hour

Turning Volume = 20 vph

Opposing Volume = 81 vph

Based on AASHTO Policy on Geometric Design of Highways and Streets (2018)

Table 9-22. Calculated Storage Lengths to Accommodate the 85th Percentile Critical Gap

Storage = 50 feet

Minimum Recommended Storage:

50 feet

Un-Signalized Intersection

(Left Turn Lane)

Location: Middle Building 5 Driveway/Alsup Road**Approach/Leg:** Southbound**2025 With Project**

V = vehicles per hour

AM Peak Hour

Turning Volume = 18 vph

Opposing Volume = 90 vph

Based on AASHTO Policy on Geometric Design of Highways and Streets (2018)

Table 9-22. Calculated Storage Lengths to Accommodate the 85th Percentile Critical Gap

Storage = 50 feet

Minimum Recommended Storage:

50 feet

Un-Signalized Intersection

(Left Turn Lane)

Location: South Building 5 Access/Alsup Road**Approach/Leg:** Southbound**2025 With Project**

V = vehicles per hour

AM Peak Hour

Turning Volume = 21 vph

Opposing Volume = 98 vph

Based on AASHTO Policy on Geometric Design of Highways and Streets (2018)

Table 9-22. Calculated Storage Lengths to Accommodate the 85th Percentile Critical Gap

Storage = 50 feet

Minimum Recommended Storage:

50 feet



**HOPEWELL REEMS
ORANGEWOOD AVENUE/REEMS ROAD
TRAFFIC IMPACT ANALYSIS**

APPENDIX

Crash Data

Northern Parkway/Reems Road Crash Data

2017-2019

IncidentID	IncidentDate	CollisionManner	TotalInjuries	TotalFatalities	InjurySeverity	Onroad	CrossingFeature	Offset
3400955	8/14/2018 0:00	3	0	0	1 07	REEMS	Northern Pkwy	0
3322854	1/26/2018 0:00	1	1	0	2 07	NORTHERN	Reems Rd	0
3328065	2/5/2018 0:00	97	0	0	1 07	NORTHERN	Reems Rd	200
3448807	12/15/2018 0:00	1	0	0	1 07	NORTHERN	Reems Rd	-30
3463816	1/25/2019 0:00	2	0	0	1 07	REEMS	Northern Pkwy	800
3466640	2/1/2019 0:00	1	1	0	3 07	REEMS	Northern Pkwy Non	50
3492569	4/5/2019 0:00	1	0	0	1 07	REEMS	Northern Pkwy	100
3550933	8/25/2019 0:00	1	0	0	1 07	REEMS	Northern Pkwy Non	0
3523181	6/16/2019 0:00	1	1	0	3 07	NORTHERN	Reems Rd	500
3524738	6/16/2019 0:00	1	1	0	3 07	NORTHERN	Reems Rd	500
3529787	6/29/2019 0:00	1	0	0	1 07	NORTHERN	Reems Rd	-29

LEGEND

CollisionManner

- 1 SINGLE_VEHICLE
- 2 ANGLE (front to side)(other than left turn)
- 3 LEFT_TURN
- 4 REAR_END
- 5 HEAD_ON
- 6 SIDESWIPE_SAME_DIRECTION
- 7 SIDESWIPE_OPPOSITE_DIRECTION
- 8 REAR_TO_SIDE
- 9 REAR_TO_REAR
- 10 U_TURN
- 97 OTHER
- 99 UNKNOWN

InjurySeverity

- 1 NO_INJURY
- 2 POSSIBLE_INJURY
- 3 SUSPECTED_MINOR_INJURY
- 4 SUSPECTED_SERIOUS_INJURY
- 5 FATAL
- 99 UNKNOWN