Prepared for:

Supplemental Memorandum for Route 28 (Centreville Rd) and Sudley Rd/Prescott Avenue Roundabout Feasibility Report

MANASSAS, VIRGINIA

Prepared by:

May 2022

INTRODUCTION

The City of Manassas is evaluating potential safety and operational improvements at the intersection of Route 28 (Centreville Road) and Sudley Road / Prescott Avenue. **Figure 1** presents the study intersections and existing lane configurations at both locations. RK&K was tasked with performing an analysis for the study intersection to evaluate the feasibility of constructing a roundabout to improve safety and operations at this location, while also providing a gateway entrance feature into the Downtown area.

In June 2019, RK&K prepared a technical report titled "Route 28 (Centreville Rd) and Sudley Rd/Prescott Avenue Roundabout Feasibility Report" (hereby referred to as *2019 Feasibility Report)* documenting the existing operational and safety conditions, alternatives considered for evaluation, future traffic forecasts and results of sensitivity analyses. It is noted that analyses conducted in the *2019 Feasibility Report* were based on February 2018 turning movement counts (TMC). Given the age of TMC data (approximately 4-years old), the City of Manassas tasked RK&K to conduct TMC's and evaluate the multi-lane recommendation from the *2019 Feasibility Report* using new traffic volumes collected in December 2021. The following text serves as a supplemental memorandum to the *2019 Feasibility Report* (See **Attachment-A**) and compares the previously submitted results (with 2018 volumes) with revised multi-lane roundabout analyses using 2021 traffic volumes. Furthermore, two (2) additional concepts with minor lane assignment modifications are also evaluated as part of this effort.

Although the impact of COVID-19 on travel patterns on traffic volumes in Northern Virginia (NoVA) varied during the pandemic, a comparison of 2018 versus 2021 counts for relatively higher volume movements (over 300 vehicles per hour; vph) indicated differences approximately ranging between 10%-15%. **Figure 2** presents the turning movement counts for both years 2018 and 2021. The raw turning movement count data is included in **Attachment B.**

Roundabout Operational Analysis

Roundabout Operations – Existing Conditions

The traffic operations for the multi-lane roundabout evaluated as part of the *2019 Feasibility Report* were analyzed in SIDRA6 (Version 6.0.24.4877). However, version 6 is no longer supported by the SIDRA developers; therefore, a more recent version of SIDRA8 (Version 8.0.7.7948) was used for the analysis. For consistency in comparison of analysis methodologies, the *Original* roundabout design along with corresponding volumes from the *2019 Feasibility Report* was re-analyzed in this supplemental analysis. Furthermore, the *Original* roundabout design's lane assignment is modified along the Prescott Avenue westbound (WB) approach and the resulting modified configurations are referred to as Concept A and Concept B. **Figure 3** presents the *Original*, Concept A, and Concept B designs.

The geometrical improvements associated with each modified concept are as follows:

- Under Concept A, Prescott Avenue WB comprises a shared left-through-right lane and a right-turn lane. As a result, vehicles on the Prescott Avenue WB right-turn lane traveling toward the commercial developments, located on the north of the study intersection (West of Route 28 and North of Sudley Road) can position themselves on the inside lane of Prescott Road WB. This eliminates the downstream lane change that the mentioned vehicles needed to make in the *Original* design. Therefore, the potential risk to pedestrians crossing this departure leg would be reduced.
- Under Concept B, Prescott Avenue WB comprises a shared left-through lane and a shared through-right lane. Consequently, there would be two full-length receiving lanes along Sudley Road . It is noted

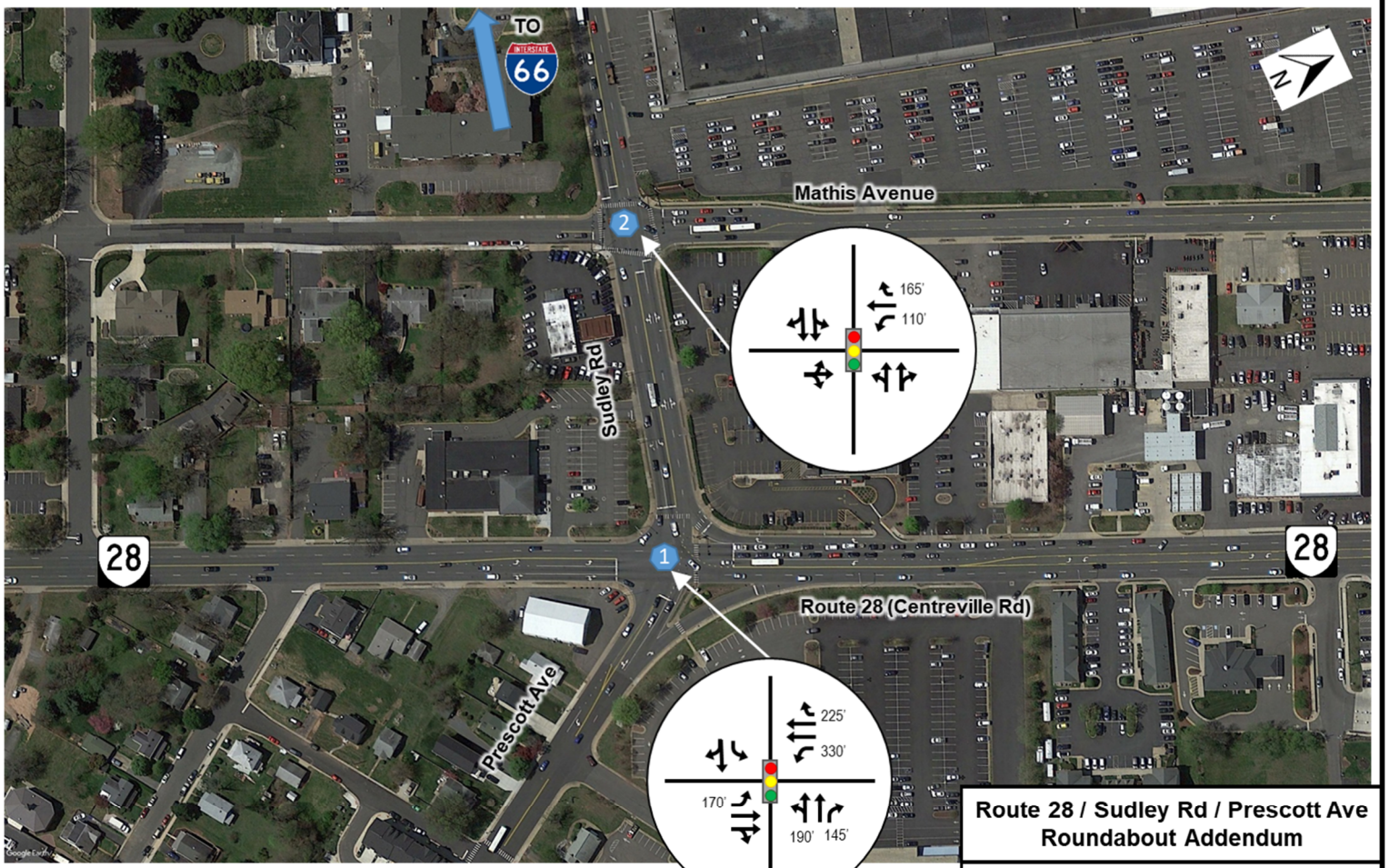
that under the *Original* and Concept A designs, there would be one full-length receiving lane on Sudley Road which would widen to provide a second lane just downstream of the roundabout. Concept B is favored by the City of Manassas as it would provide two full-length receiving lanes on Sudley Road and provide additional storage for queued vehicles at the Mathis Avenue intersection during spikes in traffic demand.

The key measures of effectiveness considered for the analyses included delay (seconds per vehicle), Level of Service (LOS), v/c-ratio, and 95th-percentile queues. A comparison of existing year (2021) results (**Table 1)** indicates that the Concept A and Concept B designs of the multi-lane roundabout operate at LOS B or better during both peak hours. Similarly, all individual movements would operate at LOS B or better during both peak hours. The LOS metrics and v/c-ratios for the Concept A and Concept B designs are similar to or better than the *Original* design, with the highest value of 0.55 during the PM peak hour.

Results indicate that under all three designs, queue lengths are longer during the PM peak hour compared to the AM peak hour. The expected 95th-percentile queues for Concept A and Concept B designs would be reduced compared to the *Original* design, as described for the PM peak hour period below:

- For Prescott Avenue WB, 95th-percentile queues are expected to reduce from approximately 150-feet in *Original* to 100- feet and 55-feet in Concepts A and B, respectively.
- For Route 28 SB, 95th-percentile queues are expected to reduce from approximately 205-feet in *Original* to 120-feet and 85-feet in Concepts A and B, respectively.
- For Sudley Road EB, 95th-percentile queues are anticipated to reduce from approximately 180-feet in *Original* to 65-feet and 60-feet in Concepts A and B, respectively.

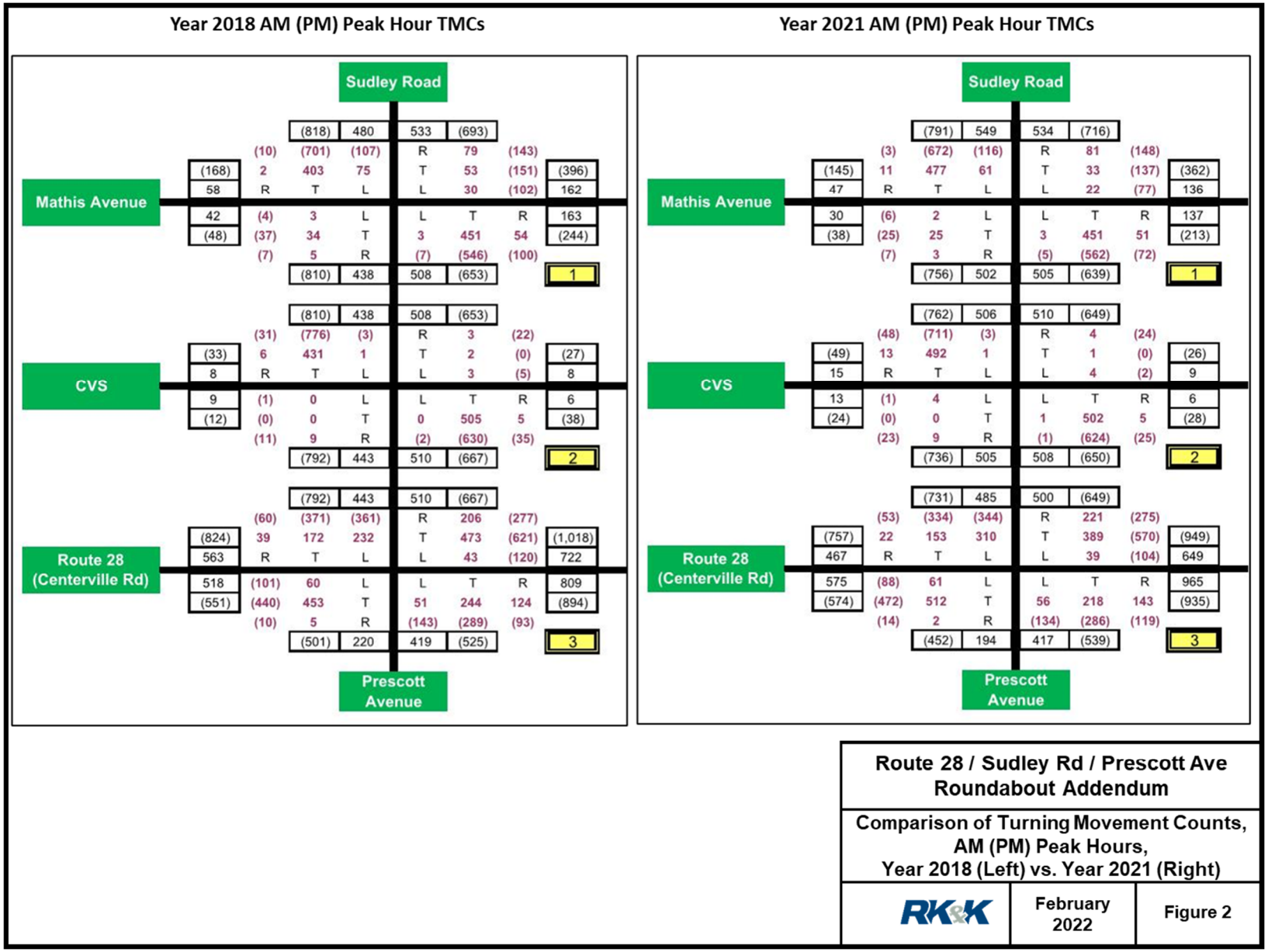
In summary, both Concept A and Concept B designs would operate similarly to or better than the *Original* design.



Route 28 / Sudley Rd / Prescott Ave
Roundabout Addendum

Existing Lane Configurations

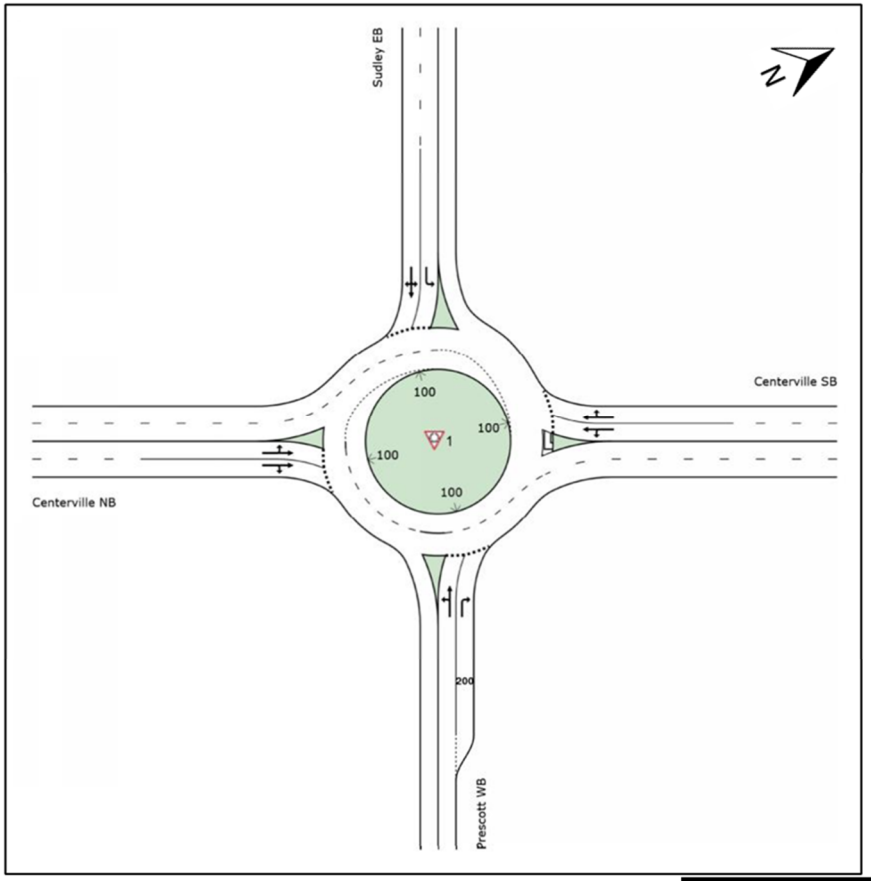
RK&K | February 2022 | Figure 1



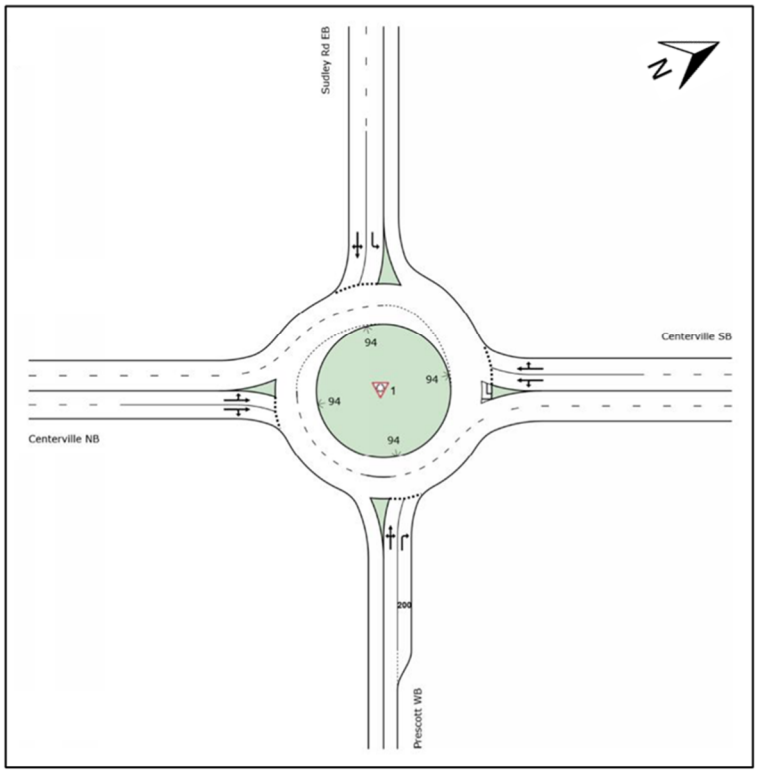
Route 28 / Sudley Rd / Prescott Ave Roundabout Addendum

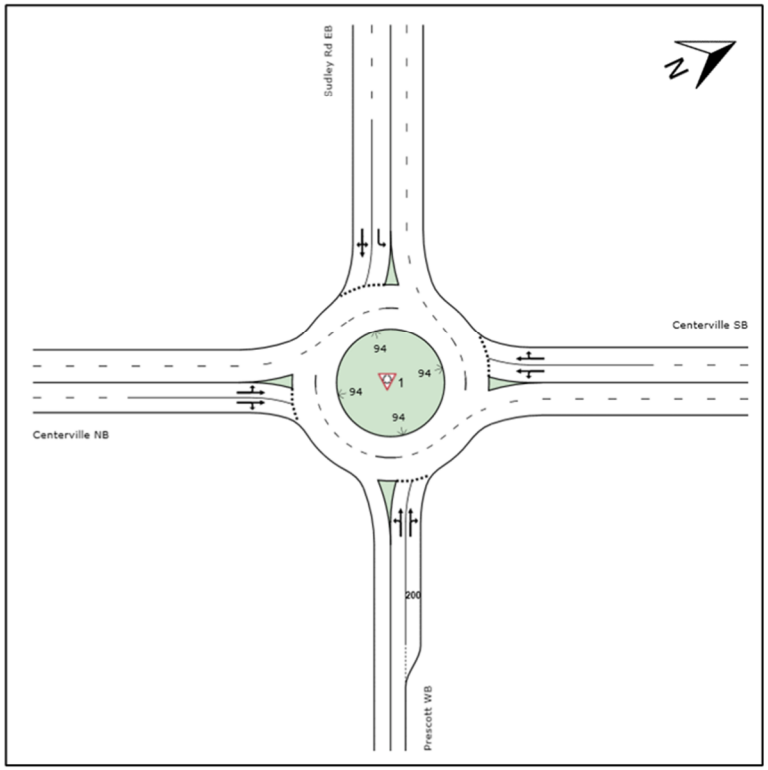
Comparison of Turning Movement Counts, AM (PM) Peak Hours, Year 2018 (Left) vs. Year 2021 (Right)

RK&K	February 2022	Figure 2



Route 28 / Sudley Rd / Prescott Ave Roundabout Addendum		
Comparison of Conceptual Roundabouts, The Original Design		
RK&K	February 2022	Figure 3





Route 28 / Sudley Rd / Prescott Ave Roundabout Addendum		
Comparison of Conceptual Roundabouts, The Modifies Designs, Concept A (Left) & Concept B (Right)		
RK&K	February 2022	Figure 4

Table 1. Comparison of *Original*, Concept A, and Concept B Design Analysis Results

Study Intersection	Movement	AM Peak Hour											
		Original Design				Concept A Design				Concept B Design			
		2018 Volumes	Delay[1]	V/C Ratio	95th Q[2] (Feet)	2021 Volumes	Delay[1]	V/C Ratio	95th Q[2] (Feet)	2021 Volumes	Delay[1]	V/C Ratio	95th Q[2] (Feet)
Centreville Rd (N-S) @Sudley Rd / Prescott Rd (E-W)	WBL	51	14.0	0.42	56	56	9.0	0.35	49	56	9.7	0.29	37
	WBT	244	8.0	0.42	56	218	3.4	0.35	49	218	3.9	0.29	39
	WBR	124	8.9	0.25	26	143	5.5	0.24	29	143	4.4	0.29	39
	WB	*419*	*9.0*	*0.42*	*56*	*417*	*4.8*	*0.35*	*49*	*417*	*4.9*	*0.29*	*39*
	SBL	43	12.7	0.40	72	39	7.4	0.33	56	39	6.7	0.35	46
	SBT	473	6.6	0.40	73	389	2.2	0.33	60	389	1.8	0.35	46
	SBR	206	6.5	0.40	73	221	3.3	0.33	60	221	3.3	0.35	48
	SB	*722*	*6.9*	*0.40*	*73*	*649*	*2.9*	*0.33*	*60*	*649*	*2.6*	*0.35*	*48*
	EBL	232	12.8	0.31	39	310	7.5	0.29	28	310	7.5	0.29	28
	EBT	172	7.1	0.31	39	153	2.3	0.29	28	153	2.1	0.29	28
	EBR	39	7.0	0.31	39	222	3.1	0.29	28	22	3.2	0.29	28
	EB	*443*	*10.1*	*0.31*	*39*	*685*	*5.6*	*0.29*	*29*	*485*	*5.6*	*0.29*	*29*
	NBL	60	12.2	0.33	40	61	7.8	0.33	46	61	7.7	0.32	44
	NBT	453	6.5	0.33	40	512	2.9	0.33	46	512	2.6	0.32	45
	NBR	5	6.6	0.33	40	2	3.7	0.33	46	2	3.3	0.32	45
	NB	*518*	*7.2*	*0.33*	*40*	*575*	*3.4*	*0.33*	*46*	*575*	*3.2*	*0.32*	*45*
	Overall	***2102***	***8.0***	***-***	***-***	***2326***	***4.1***	***0.35***	***60***	***2126***	***3.9***	***0.35***	***48***
		PM Peak Hour											
	Movement	*Original Design*				Concept A Design				Concept B Design			
		2018 Volumes	Delay[1]	V/C Ratio	95th Q[2] (Feet)	2021 Volumes	Delay[1]	V/C Ratio	95th Q[2] (Feet)	2021 Volumes	Delay[1]	V/C Ratio	95th Q[2] (Feet)
	WBL	143	19.2	0.71	148	134	11.0	0.55	102	134	10.3	0.38	55
	WBT	289	13.2	0.71	148	286	5.6	0.55	102	286	4.5	0.38	57
	WBR	93	13.0	0.30	32	119	6.9	0.25	30	119	5.1	0.38	57
	WB	*525*	*14.8*	*0.71*	*148*	*539*	*7.2*	*0.55*	*102*	*539*	*6.1*	*0.38*	*57*
	SBL	120	18.9	0.68	195	104	9.9	0.53	114	104	8.1	0.52	82
	SBT	621	12.5	0.68	204	570	4.3	0.53	119	570	3.1	0.52	83
	SBR	277	12.0	0.68	204	275	4.8	0.53	119	275	3.9	0.52	83
	SB	*1018*	*13.1*	*0.68*	*204*	*949*	*5.0*	*0.53*	*119*	*949*	*3.9*	*0.52*	*83*
	EBL	361	19.5	0.70	140	344	9.2	0.50	64	344	9.2	0.48	60
	EBT	371	15.1	0.78	180	334	3.8	0.50	64	334	3.7	0.48	60
	EBR	60	15.0	0.78	180	53	4.7	0.50	64	53	4.7	0.48	60
	EB	*792*	*17.1*	*0.78*	*180*	*731*	*6.4*	*0.50*	*64*	*731*	*6.3*	*0.48*	*60*
	NBL	101	15.0	0.48	71	88	9.4	0.41	60	88	9.2	0.39	58
	NBT	440	9.2	0.48	71	472	4.4	0.41	62	472	3.9	0.39	59
	NBR	10	9.2	0.48	71	14	5.0	0.41	62	14	4.4	0.39	59
	NB	*551*	*10.3*	*0.48*	*71*	*574*	*5.2*	*0.41*	*62*	*574*	*4.7*	*0.39*	*59*
	Overall	***2886***	***14.0***	***-***	***-***	***2793***	***5.8***	***0.55***	***119***	***2793***	***5.1***	***0.52***	***83***

1. Average delay values highlighted in Green, Yellow, Orange and Red indicated LOS A-C, D, E and F respectively.

Roundabout Operations – Future Conditions

Similar to the work efforts conducted as part of the *2019 Feasibility Report,* sensitivity analyses for the Concept A and Concept B roundabout designs were conducted to estimate additional traffic growth before the proposed design would reach its capacity. The assessed performance measures remain identical to the *2019 Feasibility Report* and are as below:

- The "practical" capacity of a roundabout approach occurs when the v/c-ratio reaches between 0.85 and 0.90.
- The theoretical capacity occurs when the v/c-ratio reaches 1.00 on any approach.
- Also, the Level of Service (LOS) can be used to identify unacceptable operations (LOS F).

The results of the sensitivity analysis indicate that during the PM peak (highest volume hour), the Concept A roundabout configuration could accommodate approximately 30 percent more traffic (consistent growth on all approaches) before any movement or approach would reach the "practical" capacity. Approximately at 35 percent additional growth, the multilane roundabout's Prescott Avenue approach would reach near-theoretical capacity; and at 40 percent the subject approach would fail at LOS D (v/c ratio > 1.00).

Under the Concept B configuration, the sensitivity analysis results indicate that the roundabout could accommodate approximately 35 percent more traffic (consistent growth on all approaches) before any movement or approach would reach the "practical" capacity. Approximately at 40 percent of additional growth, the Sudley Road EB approach is expected to reach near-theoretical capacity, while none of the other roundabout approaches are anticipated to fail.

It is noted that the *2019 Feasibility Report* identified that at 14 percent, the *Original* would reach its capacity. The difference/improvement in expected additional growth is likely attributed to the variation in traffic volumes between the years 2018 and 2021, along with additional lane capacity provided under the Concept A and Concept B designs. **Table 2** summarizes the operational analysis results and **Attachment C** includes analysis worksheets.

Conclusions

The intersection of Route 28 (Centreville Road) and Sudley Road / Prescott Avenue was evaluated in the *2019 Feasibility Report* and a multi-lane roundabout was identified as the preferred concept. However, given the age of the turning movement counts used in the *2019 Feasibility Report,* this supplemental analysis effort was undertaken to re-evaluate the preferred concept along with lane modification improvements. The lane configuration for the Prescott Avenue WB approach is modified under Concept A and Concept B to provide a relatively safer design and maximize the available queue length storage for Sudley Road. In the *Original* design, the mentioned approach consists of a shared left-through and a right-turn lane and is modified to a shared left-through-right and a right-turn lane under Concept A. In Concept B, the Prescott Avenue WB approach would have a shared left-through and shared through-right lanes along with two downstream receiving lanes along Sudley Road.

The intersection and individual movement analysis results for the existing conditions indicate all concepts would operate at LOS B or better during both peak hours. The highest 95th-percentile queues would be shorter (within 100-ft) under Concept A and Concept B designs compared to the *Original* design.

The sensitivity analysis results indicate that during the PM peak hour (highest volume traffic hour):

- Concept A and B would accommodate about 30 percent and 40 percent more traffic than 2021 conditions, respectively, before any movements would reach the "practical" capacity (0.82 < v/c ratio < 0.95).
- Concept A and B would accommodate about 35 percent and 40 percent more traffic than 2021 conditions, respectively, before any movements would reach the near-theoretical capacity (v/c ratio > 0.95).
- At 40 percent additional traffic growth beyond 2021 conditions, Prescott Avenue WB would fail at LOS D (v/c ratio > 1.00) under the Concept A design.

In summary, both the Concept A and Concept B designs are expected to operate favorably at acceptable levels of service under existing conditions and could accommodate at least 30 percent traffic growth before any individual approach/lane group reaches its capacity. In comparison to Concept A, Concept B provides the following benefits:

- Results in shorter expected queue lengths across all the roundabout approaches
- Provides additional queue storage for Sudley Road WB approach at the Mathis Avenue intersection.

Attachments

Attachment A – 2019 Feasibility Report

Attachment B – 2021 Turning Movement Count Data

Attachment C – SIDRA Worksheets

Table 2. Sensitivity Analysis Results for Concept A and Concept B

Study Intersection	Movement	Concept A Design - PM Peak Hour								Concept B Design - PM Peak Hour							
		+14 Percent Additional Growth				*+30 Percent Additional Growth*				*+14 Percent Additional Growth*				*+30 Percent Additional Growth*			
		2021 Volumes	Delay[1]	V/C Ratio	95th Q[2] (Feet)	2021 Volumes	Delay[1]	V/C Ratio	95th Q[2] (Feet)	2021 Volumes	Delay[1]	V/C Ratio	95th Q[2] (Feet)	2021 Volumes	Delay[1]	V/C Ratio	95th Q[2] (Feet)
Centreville Rd (N-S) @Sudley Rd / Prescott Rd (E-W)	WBL	153	14.1	0.68	154	174	24.1	0.88	283	153	12.3	0.48	78	174	16.1	0.62	114
	WBT	326	8.6	0.68	154	372	18.6	0.88	283	326	6.3	0.48	83	372	9.5	0.62	125
	WBR	136	7.9	0.31	39	155	10.0	0.40	53	136	6.7	0.48	83	155	9.8	0.62	125
	WB	*615*	*9.8*	*0.68*	*154*	*701*	*18.1*	*0.88*	*283*	*615*	*7.9*	*0.48*	*83*	*701*	*11.2*	*0.62*	*125*
	SBL	119	13.2	0.66	181	135	23.2	0.85	344	119	9.4	0.63	117	135	11.8	0.76	177
	SBT	650	7.4	0.66	195	741	16.9	0.85	387	650	4.3	0.63	120	741	6.6	0.76	184
	SBR	314	7.7	0.66	195	358	16.6	0.85	387	314	5.0	0.63	120	358	7.1	0.76	184
	SB	*1083*	*8.1*	*0.66*	*195*	*1234*	*17.5*	*0.85*	*387*	*1083*	*5.1*	*0.63*	*120*	*1234*	*7.3*	*0.76*	*184*
	EBL	392	10.9	0.64	98	447	15.4	0.83	168	392	10.8	0.61	91	447	14.9	0.79	156
	EBT	381	5.3	0.64	98	434	9.4	0.83	168	381	5.1	0.61	91	434	8.7	0.79	156
	EBR	60	6.2	0.64	98	69	10.2	0.83	168	60	6.2	0.61	91	69	9.8	0.79	156
	EB	*833*	*8.0*	*0.64*	*98*	*950*	*12.3*	*0.83*	*168*	*833*	*7.9*	*0.61*	*91*	*950*	*11.7*	*0.79*	*156*
	NBL	100	11.3	0.52	88	114	15.2	0.70	136	100	10.9	0.50	83	114	14.3	0.66	127
	NBT	538	6.1	0.52	91	614	9.7	0.70	144	538	5.5	0.50	87	614	8.6	0.66	135
	NBR	16	6.5	0.52	91	18	9.9	0.70	144	16	5.9	0.50	87	18	8.7	0.66	135
	NB	*654*	*6.9*	*0.52*	*91*	*746*	*10.6*	*0.70*	*144*	*654*	*6.4*	*0.50*	*87*	*746*	*9.5*	*0.66*	*135*
	Overall	***3185***	***8.2***	***0.68***	***195***	***3631***	***14.8***	***0.88***	***387***	***3185***	***6.6***	***0.63***	***120***	***3631***	***9.6***	***0.79***	***184***
	Movement	**Concept A Design - PM Peak Hour**								**Concept B Design - PM Peak Hour**							
		+35 Percent Additional Growth				*+40 Percent Additional Growth*				*+35 Percent Additional Growth*				*+40 Percent Additional Growth*			
		2021 Volumes	Delay[1]	V/C Ratio	95th Q[2] (Feet)	2021 Volumes	Delay[1]	V/C Ratio	95th Q[2] (Feet)	2021 Volumes	Delay[1]	V/C Ratio	95th Q[2] (Feet)	2021 Volumes	Delay[1]	V/C Ratio	95th Q[2] (Feet)
	WBL	181	33.0	0.94	384	188	49.1	1.02	557	181	18.0	0.68	129	188	20.5	0.73	148
	WBT	386	27.5	0.94	384	400	43.6	1.02	557	386	11.1	0.68	144	400	13.3	0.73	166
	WBR	161	10.8	0.43	59	167	11.7	0.46	64	161	11.3	0.68	144	167	13.3	0.73	166
	WB	*728*	*25.2*	*0.94*	*384*	*755*	*37.9*	*1.02*	*557*	*728*	*12.9*	*0.68*	*144*	*755*	*15.1*	*0.73*	*166*
	SBL	140	30.7	0.91	446	146	41.8	0.97	585	140	13.1	0.81	206	146	15.1	0.86	245
	SBT	770	24.2	0.91	510	798	35.1	0.97	683	770	7.9	0.81	215	798	9.8	0.86	257
	SBR	371	23.5	0.91	510	385	34.2	0.97	683	371	8.3	0.81	215	385	10.1	0.86	257
	SB	*1281*	*24.7*	*0.91*	*510*	*1329*	*35.6*	*0.97*	*683*	*1281*	*8.6*	*0.81*	*215*	*1329*	*10.4*	*0.86*	*257*
	EBL	464	19.0	0.89	211	482	26.2	0.95	292	464	18.3	0.87	200	482	26.1	0.95	288
	EBT	451	12.6	0.89	211	468	19.3	0.95	292	451	11.8	0.87	200	468	19.0	0.95	288
	EBR	72	13.5	0.89	211	74	20.2	0.95	292	72	12.9	0.87	200	74	20.1	0.95	288
	EB	*987*	*15.7*	*0.89*	*211*	*1024*	*22.7*	*0.95*	*292*	*987*	*14.9*	*0.87*	*200*	*1024*	*22.4*	*0.95*	*288*
	NBL	119	17.6	0.76	159	123	21.6	0.83	194	119	16.4	0.73	149	123	19.8	0.81	194
	NBT	637	11.9	0.76	170	661	15.6	0.83	209	637	10.5	0.73	160	661	13.5	0.81	194
	NBR	19	11.9	0.76	170	20	15.4	0.83	209	19	10.4	0.73	160	20	13.3	0.81	194
	NB	*775*	*12.7*	*0.76*	*170*	*804*	*16.5*	*0.83*	*209*	*775*	*11.4*	*0.73*	*160*	*804*	*14.5*	*0.81*	*194*
	Overall	***3771***	***20.0***	***0.94***	***510***	***3912***	***28.7***	***1.02***	***683***	***3771***	***11.6***	***0.87***	***215***	***3912***	***15.3***	***0.95***	***288***

1. Average delay values highlighted in Green, Yellow, Orange and Red indicated LOS A-C, D, E and F respectively.

ATTACHMENT A – 2019 FEASIBILITY REPORT

Prepared for:

Route 28 (Centreville Rd) and Sudley Rd/Prescott Avenue Roundabout Feasibility Report

MANASSAS, VIRGINIA

Prepared by:

Revised - June 2019

Roundabout Feasibility Report

For

Route 28 (Centreville Rd) at Sudley Rd / Prescott Ave

Manassas, Virginia

Prepared for:
City of Manassas

Prepared by:

RK&K
12600 Fair Lakes Circle, Suite 1100
Fairfax, VA 22033

June 7, 2019

COMMONWEALTH OF VIRGINIA
JEFFREY SCOTT
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Jeffrey S
Kuttesch

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DN: c=US, o=IdenTrust ACES Business Representative, ou=RUMMEL KLEPPER AND KAHL LLP, cn=Jeffrey S Kuttesch, 0.9.2342.19200300.100.1.1=A0109800000014FBCE377BA000079C9
Date: 2019.06.07 10:37:54 -04'00'

RK&K
Richmond, Virginia
TRAFFIC ENGINEER

INTRODUCTION

The City of Manassas is evaluating potential safety and operational improvements at the intersection of Route 28 (Centreville Road) and Sudley Road / Prescott Avenue. RK&K was tasked with performing an analysis for the study intersection to evaluate the feasibility of constructing a roundabout to improve safety and operations at this location, while also providing a gateway entrance feature into the Downtown area.

STUDY AREA

The study area for this feasibility analysis includes the Route 28 (Centreville Rd) / Sudley Rd / Prescott Avenue intersection, as well as the adjacent intersection (at Mathis Ave) to the west along Sudley Rd. The intersection at Mathis Ave is located approximately 440 feet away from the primary study intersection and was included to better understand the overall operations within the Study Area, particularly the potential for queue spillback between intersections.

Route 28 (Centreville Rd) is functionally classified by VDOT and FHWA as an Urban Other Principal Arterial. The speed limit along Centreville Rd is 25 MPH. The 2017 Average Annual Daily Traffic (AADT) volume on the study segment of Centreville Rd is approximately 27,000 vehicles per day (according to published VDOT count data); 3 percent of the daily traffic volume consists of trucks.

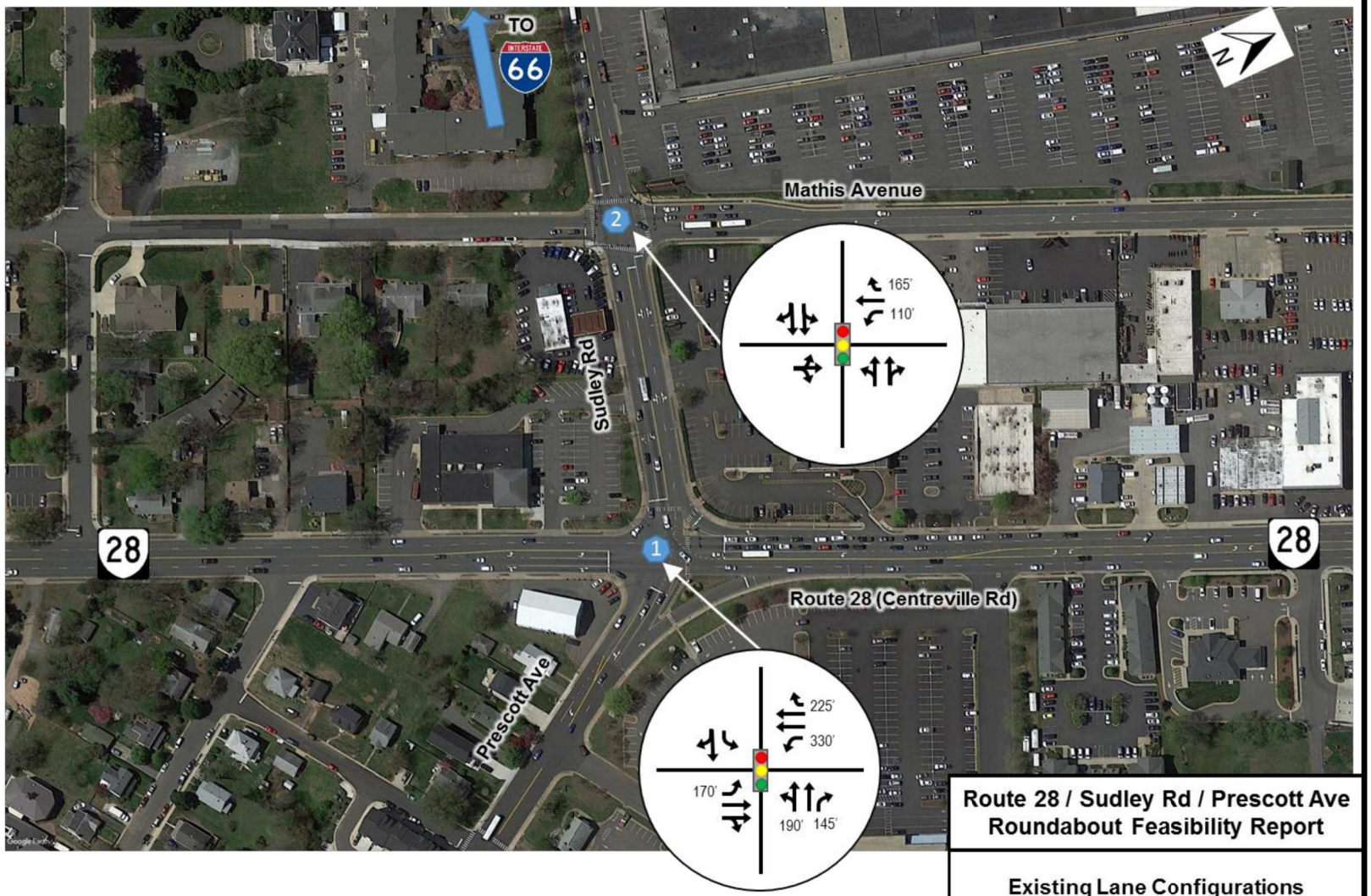
Sudley Rd and Prescott Ave are functionally classified by VDOT and FHWA as Urban Minor Arterials. The speed limit along both routes is 25 MPH. The 2017 AADT volume on Sudley Rd is approximately 20,000 vehicles per day; the 2017 AADT on Prescott Ave is approximately 10,000 vehicles per day. Mathis Avenue is functionally classified as a local road. The speed limit is 25 MPH.

Within the study segment, Centreville Rd is a four-lane roadway (two northbound lanes and two southbound lanes). South of Sudley Rd, the two lanes per direction are separated by double yellow centerlines. North of Sudley Rd, the two lanes per direction are separated by a two-way left-turn lane. Sudley Rd is a four-lane undivided facility within the Study Area, with two eastbound and two westbound lanes. Prescott Ave is a two-lane undivided roadway east of Centreville Rd.

The terrain is generally level through the study area. The intersection at Sudley Rd / Prescott Ave is located within a tangent section of Centreville Rd. The Prescott Ave approach to Centreville Rd is notably skewed. The Sudley Rd approach to Centreville Rd is slightly skewed.

The existing Centreville Rd / Sudley Rd / Prescott Ave intersection is signalized. The northbound and southbound Centreville Rd left-turns operate with protected-permissive phasing. The eastbound (Prescott Ave) and westbound (Sudley Rd) approaches currently operate with split-phasing. The westbound (Prescott Ave) and southbound (Centreville Rd) right-turn movements are currently channelized with stop control.

The existing lane configurations and turn lane storage lengths for the study area intersections are summarized in **Figure 1**.



Route 28 / Sudley Rd / Prescott Ave
Roundabout Feasibility Report

Existing Lane Configurations

RK&K | June 2019 | Figure 1

EXISTING SAFETY PERFORMANCE

Based on data obtained from VDOT's online Crash Analysis Tool (Tableau), a total of 91 crashes resulting in 115 injuries were reported within the study area between January 1, 2012 and December 31, 2017. Crash descriptions were reviewed and several collision types were recategorized to better represent the actual crash events. The location and type of crashes within the study area are summarized in **Figure 2.**

The crashes were grouped by type and severity to identify possible trends. The results are summarized in **Table 1.**

Table 1. Study Area Crash History (January 2012 through December 2017)

Year	A – Severe Injury	B – Moderate Injury	C – Possible Injury	Property Damage Only	Total
Angle	3	1	28	14	46
Rear-End	1	1	19	8	29
Sideswipe Same Direction	0	0	4	5	9
Pedestrian	1	1	0	0	2
Others	1	0	2	2	5
Total	6	3	53	29	91

The results in **Table 1** indicate that angle crashes are the most common type within the Study Area, representing over 50 percent of all reported crashes. The 46 angle crashes include 32 incidents which resulted in 65 injuries. Rear-end crashes were the second most common crash type with 29 total crashes reported in the five-year study period. The 29 rear-end crashes include 21 crashes which resulted in 38 injuries.

At the Centreville Rd / Sudley Rd / Prescott Ave intersection, a total of 18 angle crashes, 16 rear-end crashes, 4 sideswipe same-direction crashes, 1 pedestrian, 1 fixed object off-road and 1 other collision were reported for a total of 41 crashes during the study period. Angle crashes can be common at signalized intersections, especially those locations with permissive or protected-permissive left-turn phasing. Rear-end crashes are also common at signalized intersections. The 18 angle crashes at this intersection resulted in 24 injuries.

A cluster of 10 angle crashes was also reported at the Sudley Rd / Mathis Ave intersection. A cluster of 7 rear-end crashes was observed along the eastbound Sudley Rd approach to Mathis Avenue. The inside lane on this approach functions as a shared left-turn / through lane and that may be contributing to the rear-end crashes in this location if through drivers are not anticipating the need to stop behind left-turning traffic.

The crash types noted for the Centreville Rd / Sudley Rd / Prescott Ave intersection are types which could potentially be mitigated by a modern roundabout. Roundabouts have been shown to reduce fatalities by all crashes by 35 percent and injuries by 76 percent compared to other intersection types, including traffic signals, according to the FHWA's Roundabouts: An Informational Guide (2nd Edition).

Route 28 / Sudley Rd / Prescott Ave
Roundabout Feasibility Report

January 1, 2012 – December 31, 2017
Crash History

RK&K	June 2019	Figure 2

OPERATIONAL ANALYSIS METHODOLOGY

Operational analysis for this report was performed in a manner consistent with the VDOT Traffic Operations and Safety Manual (TOSAM). Analysis for roundabout alternatives were conducted using *SIDRA* (Version 6.0.24.4877). Signalized Intersection analyses were performed using the Highway Capacity Manual (HCM) module contained within *Synchro* (Version 9.2, Build 913, Revision 47), and microsimulation using the companion *SimTraffic* software was used to obtain queuing data. Supplemental microsimulation analysis was conducted with *VISSIM* (Version 9.00-12) to better understand any potential queue spillback between the proposed roundabout and adjacent signalized intersection at Mathis Ave.

For the signalized intersection analysis, existing signal timing plans were obtained from the City of Manassas. Existing lane configurations (with effective storage lengths – full width turn lane + ½ taper length) were coded into Synchro along with the existing volumes. The analysis results include the measures-of-effectiveness (MOE) of approach delay per vehicle, Level of Service (LOS), volume-to-capacity ratio and maximum queue (in feet).

The LOS thresholds for signalized intersections, as defined by the HCM, are presented in ***Table* 2.** For the purposes of comparison, both signalized and roundabout alternatives were assessed using the signalized LOS thresholds. All *SimTraffic* simulation results are processed based on the average of 10 one-hour runs with a preceding 15-minute seeding period for the AM and PM peak hours.

Table 2. LOS Thresholds based on 2010 Highway Capacity Manual

LOS	Delay (seconds per vehicle)
A	≤10
B	10-20
C	20-35
D	35-55
E	55-80
F	≥80

EXISTING TRAFFIC VOLUMES

Turning movement counts for the study intersection were obtained on Wednesday, February 21, 2018. The AM peak hour was determined to fall between 7:30 – 8:30 AM and the PM peak hour occurred between approximately 4:30 – 5:30 PM. The existing AM and PM peak hour volumes are summarized in **Table 3** and **Table 4**. The raw traffic counts are provided in **Appendix A**.

OPERATIONAL ANALYSIS – EXISTING CONDITIONS

The Existing (2018) conditions operational analysis was performed using the existing roadway geometry and the existing traffic volumes. *Synchro* models were developed based on the existing 2018 traffic volumes, field-verified intersection geometry, and signal phasing / timing data provided by the City. The Existing conditions analysis results from *Synchro*/*SimTraffic* (HCM 2010 methodology) include delay, LOS, volume-to-capacity (v/c) ratio, and queue length and are presented in **Table 3** for AM peak hour conditions, **Table 4** for the PM peak hour, and **Table 5** for off-peak conditions. **Appendix B** presents *Synchro*/*SimTraffic* reports.

AM Peak Hour

During the AM peak hour, the intersection currently operates at LOS D overall with approximately 37 seconds of delay per vehicle. Three of the four approaches (westbound, northbound and southbound) currently operate at LOS D. The eastbound (Sudley Rd) approach currently operates at LOS C. Volume to capacity ratios for the various lane groups are all less than 0.70. Queues are moderate during the AM peak with no queue spillback noted along Sudley Rd between Mathis Ave and Centreville Rd.

PM Peak Hour

During the PM peak hour, the intersection currently operates at LOS D with approximately 42 seconds of delay per vehicle. All four approaches to the intersection operate at LOS D, with maximum v/c-ratios between 0.75 and 0.77. Queues are lengthier in the PM peak than in the AM peak. The eastbound Sudley Rd queue at Centreville Rd exceeds the available storage occasionally during the PM peak hour and impacts the Mathis Ave intersection. This occurred approximately 2-3 percent of the time during the PM peak and is consistent with field observations.

Off Peak Conditions

A supplemental analysis of off-peak traffic conditions was also conducted using traffic volumes for the period between 6:30 – 7:30 AM. Total entering volumes for the intersection during this time are approximately 1,600 vehicles, which is 23 percent less than the AM peak hour and 43 percent less than the PM peak hour. During off-peak conditions, the intersection currently operates at LOS C with approximately 26 seconds of delay per vehicle. The maximum v/c-ratio for any lane group at the intersection is 0.56.

Table 3. Existing Conditions - AM Peak Results

Intersection	Movement	Existing Storage Length (ft)	Traffic Volume (vph)	Existing Conditions - Signalized				Roundabout (Multi-Lane)			
				Delay (s)	LOS	V/C Ratio	Max Q (ft)	Delay (s)	LOS	V/C Ratio	95th-Percentile Queue (ft)
Centreville Rd (N/S) at Sudley Rd (EB) / Prescott Ave (WB)	EBL	-	232	21.0	C	0.39	225	12.8	B	0.31	39
	EBT	-	172	19.6	B	0.33	190	7.0	A	0.31	39
	EBR	-	39					7.0	A	0.31	39
	EB	-	*443*	*20.3*	C	-	-	*10.0*	B	0.31	-
	WBL	190	51	45.6	D	0.59	304	13.9	B	0.42	56
	WBT	-	244					8.1	A	0.42	56
	WBR	145	124	40.5	D	0.08	145	8.9	A	0.25	26
	WB	-	*419*	*44.1*	D	-	-	*9.0*	A	0.42	-
	NBL	170	60	31.5	C	0.29	169	12.1	B	0.33	40
	NBT	-	453	42.3	D	0.66	268	6.3	A	0.33	40
	NBR	-	5					6.3	A	0.33	40
	NB	-	*518*	*41.0*	D	-	-	*7.0*	A	0.33	-
	SBL	330	43	31.6	C	0.21	70	12.7	B	0.41	74
	SBT	-	473	44.2	D	0.70	333	6.8	A	0.41	74
	SBR	225	206	36.2	D	0.14	225	6.7	A	0.41	74
	SB	-	*722*	*41.1*	D	-	-	*7.1*	A	0.41	-
	Overall	**-**	**2,102**	**37.3**	**D**	**-**	**-**	**8.1**	**A**	**-**	**-**

Table 4. Existing Conditions - PM Peak Results

Intersection	Movement	Existing Storage Length (ft)	Traffic Volume (vph)	Existing Conditions - Signalized				Roundabout (Multi-Lane)			
				Delay (s)	LOS	V/C Ratio	Max Q (ft)	Delay (s)	LOS	V/C Ratio	95th-Percentile Queue (ft)
Centreville Rd (N/S) at Sudley Rd (EB) / Prescott Ave (WB)	EBL	-	361	32.9	C	0.65	370*	19.7	B	0.71	142
	EBT	-	371	37.1	D	0.75	360*	15.4	B	0.79	183
	EBR	-	60					15.4	B	0.79	183
	EB	-	*792*	*35.2*	D	-	-	*17.4*	B	0.79	-
	WBL	190	143	53.7	D	0.75	451	19.2	B	0.72	148
	WBT	-	289					13.3	B	0.72	148
	WBR	145	93	42.4	D	0.06	145	13.0	B	0.30	32
	WB	-	*525*	*51.6*	D	-	-	*14.9*	B	0.72	-
	NBL	170	101	32.3	C	0.44	169	14.9	B	0.48	70
	NBT	-	440	42.3	D	0.57	272	8.9	A	0.48	70
	NBR	-	10					8.9	A	0.48	70
	NB	-	*551*	*40.5*	D	-	-	*10.0*	B	0.48	-
	SBL	330	120	30.7	C	0.40	329	19.5	B	0.70	205
	SBT	-	621	47.9	D	0.77	349	13.3	B	0.70	213
	SBR	225	277	37.1	D	0.17	224	12.8	B	0.70	213
	SB	-	*1,018*	*43.0*	D	-	-	*13.9*	B	0.70	-
	Overall	**-**	**2,886**	**41.9**	**D**	**-**	**-**	**14.3**	**B**	**-**	**-**

*Queue exceeds available storage to upstream intersection at Mathis Avenue. Blockage time is approximately 2-3 percent of peak hour.

Table 5. Existing Conditions - Off Peak Results

Intersection	Movement	Existing Storage Length (ft)	Traffic Volume (vph)	Existing Conditions - Signalized				Roundabout (Multi-Lane)			
				Delay (s)	LOS	V/C Ratio	Max Q (ft)	Delay (s)	LOS	V/C Ratio	95th-Percentile Queue (ft)
Centreville Rd (N/S) at Sudley Rd (EB) / Prescott Ave (WB)	EBL	-	190	28.9	**C**	0.56	219	11.9	**B**	0.23	27
	EBT	-	147	27.2	**C**	0.45	179	6.1	**A**	0.23	27
	EBR	-	16					6.2	**A**	0.23	27
	EB	-	*353*	*28.1*	**C**	-	-	*9.3*	**A**	-	-
	WBL	190	38	29.2	**C**	0.34	132	12.7	**B**	0.25	27
	WBT	-	136					6.9	**A**	0.25	27
	WBR	145	90	27.5	**C**	0.06	43	7.7	**A**	0.16	16
	WB	-	*264*	*28.6*	**C**	-	-	*8.0*	**A**	-	-
	NBL	170	55	17.5	**B**	0.16	128	11.8	**B**	0.29	35
	NBT	-	414	24.6	**C**	0.50	207	6.1	**A**	0.29	35
	NBR	-	3					6.1	**A**	0.29	35
	NB	-	*472*	*23.8*	**C**	-	-	*6.7*	**A**	-	-
	SBL	330	44	20.3	**C**	0.16	70	11.5	**B**	0.27	43
	SBT	-	311	25.4	**C**	0.42	218	5.6	**A**	0.27	44
	SBR	225	171	23.2	**C**	0.12	90	5.6	**A**	0.27	44
	SB	-	*526*	*24.3*	**C**	-	-	*6.1*	**A**	-	-
	Overall	**-**	**1,615**	**25.7**	**C**	**-**	**-**	**7.3**	**A**	**-**	**-**

ROUNDABOUT CONCEPT

The City of Manassas identified a roundabout as a candidate improvement alternative at the Centreville Rd / Sudley Rd / Prescott Ave intersection. Modern roundabouts are proven safety countermeasures, and particularly effective at reducing the frequency of angle collisions (common at other intersection types) and reducing crash severity due to reduced vehicle speeds. Modern roundabouts can also be a more efficient operational solution than a signalized intersection; the benefits depend on the volume of traffic and the particular movement patterns. Particularly at off-peak times, roundabouts can reduce vehicle stops and delay when compared to signalized intersections. RK&K evaluated the potential feasibility (from a traffic operations standpoint) of constructing a roundabout to replace the existing signalized intersection at Centreville Rd / Sudley Rd / Prescott Ave.

Roundabout Lane Configurations

Following best practices, which aim to minimize the number of approach, exiting, and circulating lanes at a roundabout, an iterative process was used to test different roundabout configurations until a configuration which provided adequate capacity to serve the traffic demand at this location was identified. Existing volumes were used to identify the appropriate lane configurations. *SIDRA* was used to conduct this analysis.

A single-lane roundabout was initially considered, but two approaches would operate at LOS F with v/c-ratios exceeding 1.00 during the AM peak hour and all four approaches would operate at LOS F with v/c-ratios exceeding 1.00 during the PM peak hour.

Building off the single-lane roundabout, additional approach lanes, exit lanes and circulating lanes within the roundabout were added until a configuration was identified which operated satisfactorily (no LOS E of LOS F approaches and all v/c-ratios less than 0.85) for both the AM and PM peak conditions. The final lane configurations include two approach lanes on all four approaches, with single lane exits to Sudley Rd and Prescott Ave and two-lane exits to Centreville Rd (both directions). The proposed roundabout lane configurations are depicted in **Figure 3**.

Roundabout Operations – Existing Conditions

Key measures of effectiveness were extracted from SIDRA for the roundabout configuration depicted in **Figure 3**. These included delay (seconds per vehicle), Level of Service (LOS), v/c-ratio, and 95th-percentile queues. The results are summarized in **Table 3** for the AM peak hour, **Table 4** for the PM peak hour, and **Table 5** for off-peak conditions.

AM Peak Hour: The results in **Table 3** indicate that under existing conditions, the proposed roundabout would operate at LOS A overall during the AM peak, with approximately 8 seconds of delay per vehicle. This represents a substantial reduction in delay (nearly 30 seconds per vehicle) compared to the existing signalized intersection configuration. Three of the four approaches would operate at LOS A, with only the eastbound approach along Sudley Rd operating at LOS B during the AM peak. The v/c-ratios are all projected to be less than 0.42. 95th-percentile queues are expected to be less than 100 feet (approximately 4-5 vehicles) for all approaches.

PM Peak Hour: The results in **Table 4** indicate that under existing conditions, the proposed roundabout would operate at LOS B overall during the PM peak, with approximately 14 seconds of delay per vehicle. Average delay would be reduced by approximately 28 seconds per vehicle compared to the existing

signalized intersection. All four approaches would operate at LOS B (compared to LOS D under existing conditions). The maximum v/c-ratios would range from 0.48 (Centreville Rd northbound approach) to 0.79 (Sudley Rd eastbound approach). The 95th-percentile queues for the roundabout option would range from approximately 75 feet to 175 feet.

Off-Peak Conditions: The results in **Table 5** indicate that the proposed roundabout would operate at LOS A overall, with approximately 7 seconds of delay per vehicle under off-peak conditions. Average delay would be reduced by approximately 18 seconds per vehicle compared to the existing signalized intersection. All four approaches would operate at LOS A and the maximum v/c-ratios would range from 0.22 (Centreville Rd northbound approach) to 0.29 (Sudley Rd eastbound approach). The 95th-percentile queues for the roundabout option would range from approximately 25 feet to 50 feet.

Queue Spillback Assessment: As noted in a previous section, a supplemental analysis was conducted using *VISSIM* to evaluate queue spillback and interaction between the proposed roundabout and the adjacent signalized intersection at Sudley Rd and Mathis Avenue. Roundabouts depend on the free-flow of circulating traffic to operate appropriately. If queues from a downstream area back into a roundabout, that could negatively impact the roundabout operations. In *VISSIM*, the roundabout and signalized intersection can be simulated in a single tool to assess any queue spillback issues. The proposed configuration and adjacent intersection at Mathis Ave were modeled and queues were extracted for the Sudley Rd link connecting the two intersections. The spacing between the stop / yield bars and the upstream edge of the adjacent intersection is approximately 340 feet. The results are summarized in **Table 6**.

Table 6. VISSIM Queuing Summary – Critical Links

Intersection / Approach	Maximum Queue Length (feet)	
	AM	PM
Centreville/Sudley EB	155	405*
Mathis/Sudley WB	180	260

*Exceeds available storage between intersections.

The results indicate that the maximum queue along westbound Sudley Rd approaching Mathis Ave would not exceed the available storage (260-foot queue versus 340-foot storage length) back to the proposed roundabout. The queue along eastbound Sudley Rd approaching Centreville Rd, would occasionally extend back to the upstream intersection at Mathis Ave; this result is similar to the existing signalized intersection configuration where eastbound queues do impact the upstream signal at Mathis Avenue.

Roundabout Operations – Future Conditions

Estimated Traffic Growth: The MWCOG travel demand model was consulted to assess potential future traffic growth rates along the Centreville Rd and Sudley Rd corridors. The MWCOG travel demand model is an accepted tool for evaluating potential future traffic growth rates; the model incorporates future land use projections and future transportation projects contained in the region's Constrained Long-Range Transportation Plan. The potential growth rates within the Study Area were estimated by comparing the 2040 assignments to the 2017 model assignments. **Table 7** summarizes the total growth projected by the COG model, as well as the annualized growth rates, for each roadway.

Table 7. MWCOG Model Study Area Growth Rates

Roadway	Daily		AM Peak Period		PM Peak Period	
	Total Growth	Annualized	Total Growth	Annualized	Total Growth	Annualized
Centreville Rd (Route 28)	42%	1.5%	23%	0.9%	39%	1.4%
Sudley Rd	26%	1.0%	14%	0.6%	18%	0.7%

The projected growth rates from MWCOG range from 1.0 percent to 1.5 percent per year. However, these growth rates may overestimate traffic growth in the Study Area. First, the MWCOG model does not contain many of the other roadway links within the City of Manassas. Without these parallel facilities, future traffic growth in the model may be concentrated along Centreville Road or Sudley Road. Second, the 2016 CLRP does not include the proposed Route 28 Bypass; this proposed project would provide an extension of Godwin Drive to tie back to Route 28 near Bull Run. This proposed project would be expected to reduce through traffic on Centreville Road through the City of Manassas.

Historical traffic data was also reviewed for the past 15 years to assess the recent historical growth along Centreville Road and Sudley Road within the Study Area. The historical Average Annual Daily Traffic (AADT) volumes are summarized in **Table 8**.

Table 8. Historical Growth Trends

Roadway	AADT					Change (2002 to 2017)
	2002	2005	2010	2015	2017	
Centreville Rd (Route 28)	29,000	29,000	27,000	29,000	27,000	-2,000 (-7%)
Sudley Rd	23,000	22,000	20,000	20,000	20,000	-3,000 (-13%)

The data in **Table 8** indicates that there has been a slight decreasing trend in traffic along both Centreville Road and Sudley Road within the Study Area for this report since the early 2000s, with traffic growth essentially unchanged since 2010 on both routes. Based on the available data, traffic growth at the Study intersections is anticipated to be minimal over the coming years, with flat growth or a growth rate of 0.25 percent per year being the most likely outcomes.

Sensitivity Analysis: Given the very low growth projections for traffic within the Study Area, rather than identifying a specific future design year and evaluating traffic conditions for that time period, for the purposes of this analysis, a sensitivity analysis was conducted to evaluate how much additional traffic growth could occur before the proposed roundabout configuration would reach its capacity during the peak hours. Several different performance measures were assessed:

- The "practical" capacity of a roundabout approach occurs when the v/c-ratio reaches between 0.85 and 0.90.
- The theoretical capacity occurs when the v/c-ratio reaches 1.00 on any approach.
- Also, Level of Service (LOS) can be used to identify unacceptable operations.

For this report, each of these three different measures were tested to determine the amount of traffic growth above existing levels which could be accommodated by the proposed roundabout before

operational issues would likely occur. A similar exercise was performed for the existing signalized intersection configuration for theoretical capacity and level of service (signals do not have a practical capacity value). **Table 9** summarizes the results for both the AM and PM peak hours.

Table 9. Traffic Growth Before Operations Begin to Degrade in Peak Hour

Target Performance Measure	Percent Increase in Traffic Volumes		
	AM	PM	Signalized - PM
Practical Capacity – Worst Movement (v/c = 0.85)	52%	6%	n/a
Theoretical Capacity – Worst Movement (v/c = 1.00)	64%	14%	20%
Level of Service (Worst Movement = LOS F)	64%	14%	20%

During the AM peak hour, traffic volumes could increase considerably (50 to 60 percent) before the roundabout capacity is reached on any specific approach.

The results of the sensitivity analysis indicate that during the PM peak (highest volume hour), the proposed roundabout configuration could accommodate approximately 14 percent more traffic (consistent growth on all approaches) before any movement or approach would exceed the theoretical capacity or LOS F is reached. The existing traffic signal configuration could accommodate approximately 20 percent more traffic before reaching capacity or any movement degrades to LOS F.

It should be noted that the highest volume movement along the eastbound Sudley Road approach is the left-turn to northbound Centreville Road. If the eastbound Sudley Road approach experiences substantial delays, traffic could divert to alternate routes to Centreville Road, including Mathis Avenue or Portner Avenue to Liberia Drive. So, while this approach would reach capacity first, operational issues along this approach during peak hours may be mitigated by traffic selecting an alternate route. Further analysis indicates that the southbound Centreville Road and westbound Prescott Avenue approaches would reach their theoretical capacity if traffic during the PM peak hour increased by 20 percent over existing conditions.

Roundabout Safety: As noted in the safety section, a roundabout at the intersection of Centreville Rd / Sudley Rd / Prescott Ave could be expected to reduce crash frequency and crash severity at this location. Angle crashes, due to the elimination of conflicts between crossing movements (left-turns, specifically), would be expected to be reduced. Rear-end crashes would also be expected to be reduced compared to existing conditions, due to decreases in stopped vehicles at the intersection.

Bicycle and Pedestrian Accommodations: Accommodations for pedestrians and bicycles at a multilane roundabout do need to be carefully considered. The proposed design includes sidewalks in all four quadrants connecting to the existing sidewalk network through the Study Area. Marked crosswalks would be provided across all four legs and pedestrian refuge areas would be provided in the median. These refuge areas will enable pedestrians to cross one direction of traffic at a time and then safely wait to find a gap in the other direction of traffic.

For cyclists, they can be accommodated in a variety of ways at a roundabout. Experienced in-road cyclist may prefer to circulate the roundabout like a vehicle, in which case they would claim their lane and then

proceed into and through the roundabout. Other cyclists can be accommodated by providing bicycle ramps from the roadway onto the sidewalk; there they could dismount and traverse the roundabout as a pedestrian before re-entering the roadway downstream of the roundabout.

It should be noted that for visually impaired pedestrians, navigating a multilane roundabout can be challenging since vehicles are constantly flowing (albeit at slower speeds than many traditional intersection types). Enhanced crossing devices, such as pedestrian-actuated beacons, may be necessary to accommodate crossing of multi-lane entries and exits at the proposed roundabout (there are 4 multi-lane entries and 2 multi-lane exits with the proposed lane configurations documented in this report).

Other Considerations: A roundabout at the intersection of Centreville Rd / Sudley Rd / Prescott Ave could provide an opportunity for the City of Manassas to develop a gateway entrance feature, helping to indicate that motorists and visitors are transitioning from the suburban arterial and vehicle oriented commercial stretch of Centreville Rd and entering the downtown area, with its grid of streets and more pedestrian oriented development. Landscaping within the roundabout and on the approaches could provide an aesthetically pleasing welcome to visitors to Manassas.

One challenge for roundabouts, particularly the first roundabout in a jurisdiction, is public acceptance. Residents and commuters may be unfamiliar with roundabouts and uncertain of the potential benefits in terms of operations and safety. This challenge can be addressed through outreach and education efforts, but should be considered as intersection control types are evaluated.

CONCEPTUAL ROUNDABOUT DESIGN

A conceptual roundabout design was developed for the Centreville Rd / Sudley Rd / Prescott Ave intersection. Basic design assumptions (entry lane widths, circulatory roadway widths, inscribed circle diameter) were based on guidance from VDOT's Road Design Manual (latest edition) and FHWA's Roundabouts: An Information Guide (2nd Edition). Roundabout design is an iterative process, with a goal of achieving appropriate entry and circulatory roadway speeds (less than 25 MPH), which requires greater deflection and a smaller footprint, with the need to accommodate larger vehicles, including buses, trucks and fire department vehicles.

At this location, there are also right-of-way constraints in all four quadrants, so minimizing the footprint was also considered to be crucial. Therefore, where appropriate, design values from the lower end of the recommended ranges were selected and utilized in the design. The conceptual design is shown in **Figure 4**, with a larger version included as Appendix C.

Right-of-Way Impacts: The proposed concept would have minor right-of-way impacts in all four quadrants with a total acquisition area of 9,500 SF. Additional temporary construction easements would also be necessary and are included in the cost estimate.

Cost Estimate: A concept-level cost estimate was developed for the roundabout concept for the study intersection. This project level cost estimate includes engineering, right-of-way, utility relocations and adjustments (private and public utilities), and construction (including construction engineering and inspection). In current year dollars, the estimated total project cost is approximately $3.7M.

TRAFFIC SIGNAL OPERATIONS – FUTURE CONDITIONS

To compare the roundabout to the existing signalized configuration, an analysis was conducted for the signalized configuration in the PM peak hour with volumes increased by 14 percent relative to existing conditions (matching when the first roundabout approach – EB Sudley Road – is projected to reach its theoretical capacity). With increased traffic, the overall intersection level of service would remain at LOS D, with an increase in delay of approximately 3 seconds (to 45 seconds) per vehicle compared to existing conditions. The westbound Prescott Avenue left-turn and through movements would operate at LOS E, but all other movements would continue to operate at LOS D or better. **Table 10** compares the overall intersection during the PM peak hour for the roundabout and signalized intersection configurations for the PM peak hour with a 14 percent increase in traffic volumes.

SIGNALIZED INTERSECTION – POTENTIAL IMPROVEMENTS

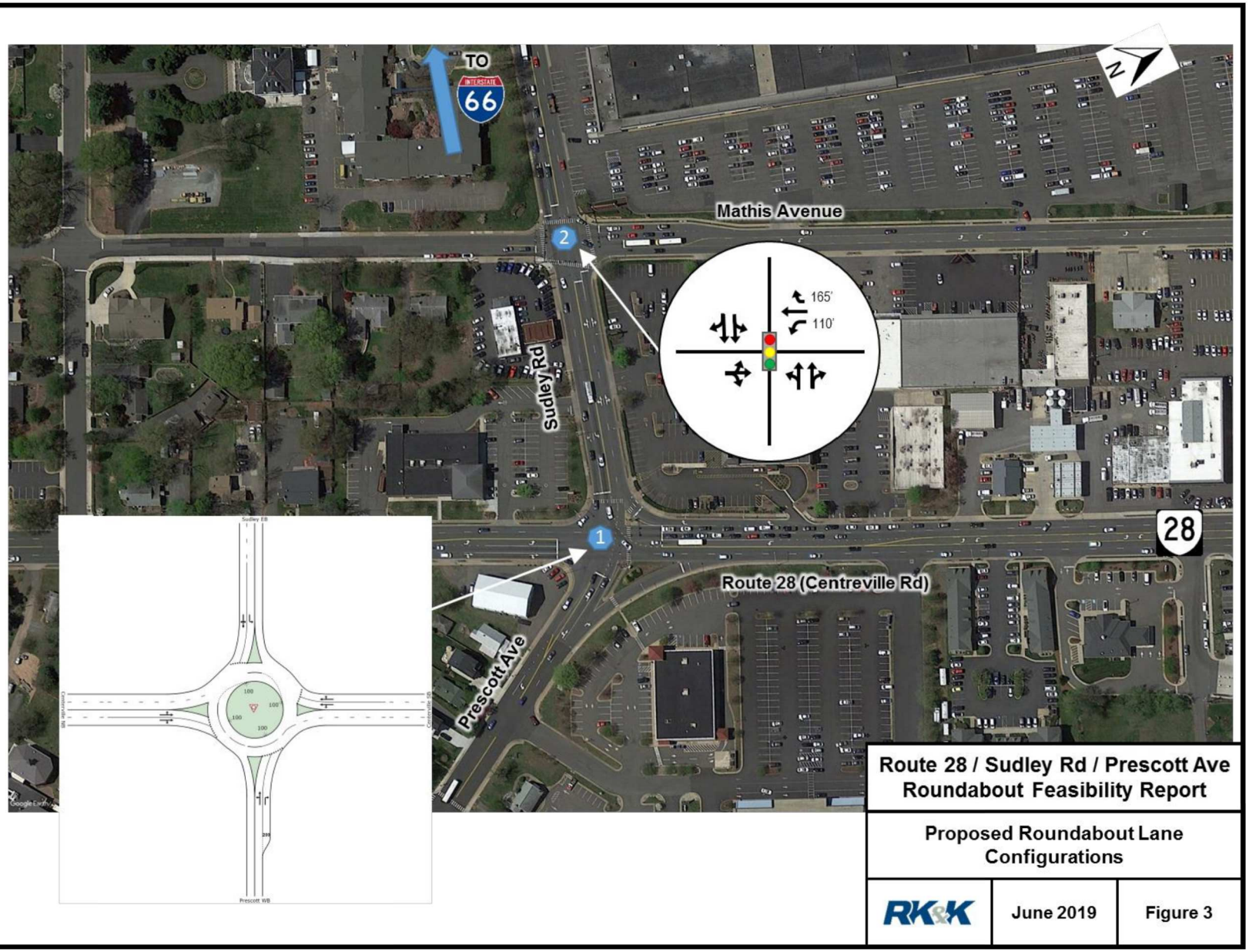
Additionally, to further compare alternatives, the existing signalized intersection configuration was reviewed for improvements to signal phasing and lane configurations. Additional turn lanes were also considered for high-volume movements. Based on this assessment, an improved signalized intersection configuration was evaluated. The potential improvements include an additional dedicated eastbound left-turn lane along Sudley Road (creating dual left-turn lanes on this approach), widening of the northbound Centreville Road approach to accept dual left-turns from Sudley Road, and pedestrian upgrades to accommodate crossings of all four legs (consistent with the pedestrian connectivity proposed with the roundabout option). The proposed improvements are depicted in **Figure 5,** with a larger version included as Appendix D.

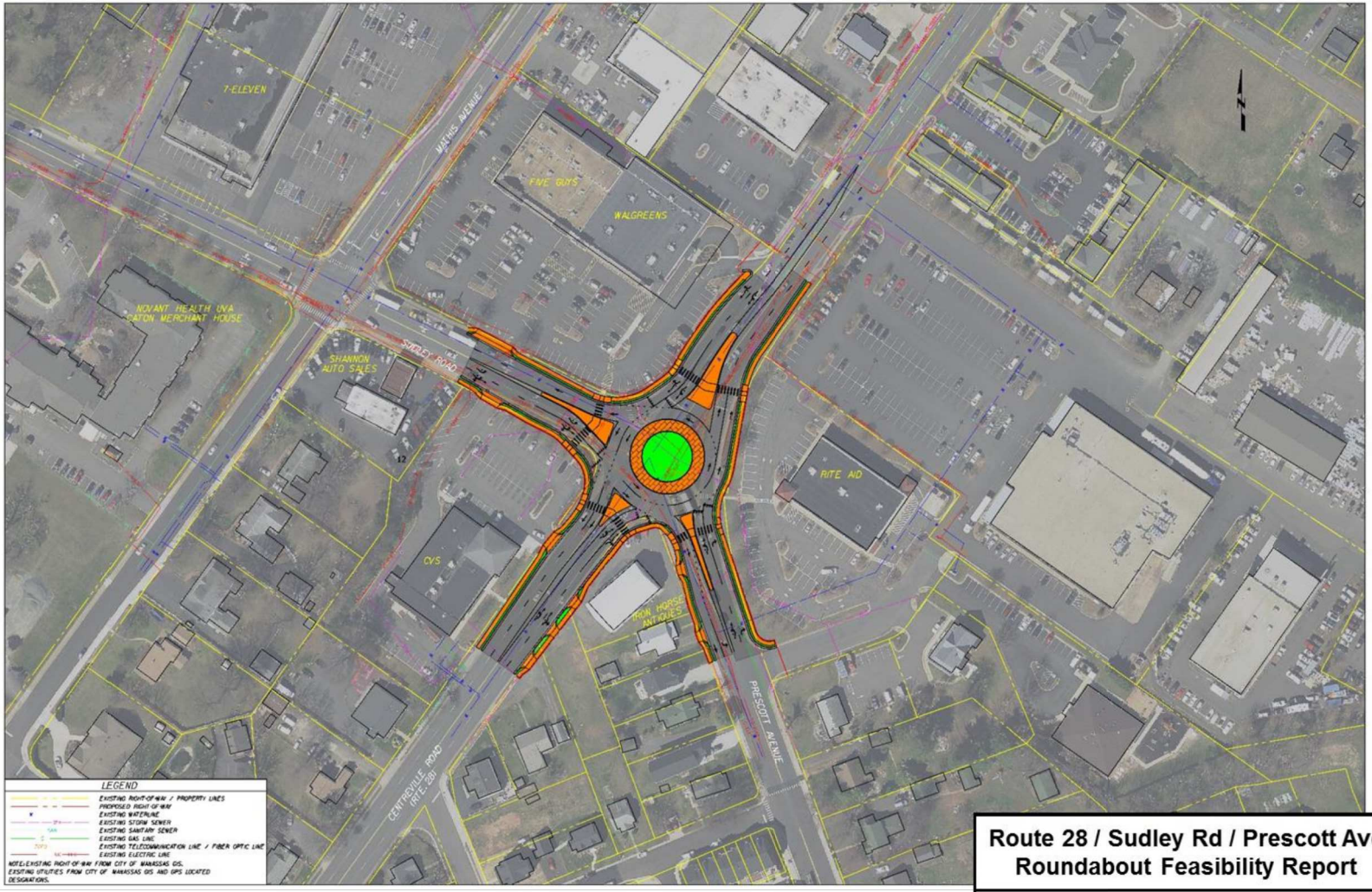
Right-of-Way Impacts: The proposed improved signal concept would have minor right-of-way impacts primarily along the south side of Sudley Road, with total acquisition area of approximately 500 SF. Additional temporary construction easements would also be necessary and are included in the cost estimate.

Cost Estimate: A concept-level cost estimate was developed for the improved signal option for the study intersection. This project level cost estimate includes engineering, right-of-way, utility relocations and adjustments (private and public utilities), and construction (including construction engineering and inspection). In current year dollars, the estimated total project cost is approximately $1.7M.

Operational Analysis: An operational analysis was conducted for the PM peak hour for this improved intersection configuration (assuming the same percent 14 increase in traffic volumes described in the previous section). The results for the improved signal option are summarized in **Table 10.** The improved option provides minor savings in delay compared to the existing configuration and does reduce queue lengths along Sudley Road and the amount of time the queue reaches the upstream intersection at Mathis Avenue.

Safety: An improved signalized intersection would likely result in a marginal safety improvement at this location. The proposed improvements would not mitigate the angle crash (most common crash type at the intersection) but may result in fewer rear-end crashes by reducing queues and delay slightly. Pedestrian safety would likely improve by providing crossings at all four legs of the intersection and reducing pedestrian crossing distances slightly compared to existing conditions.

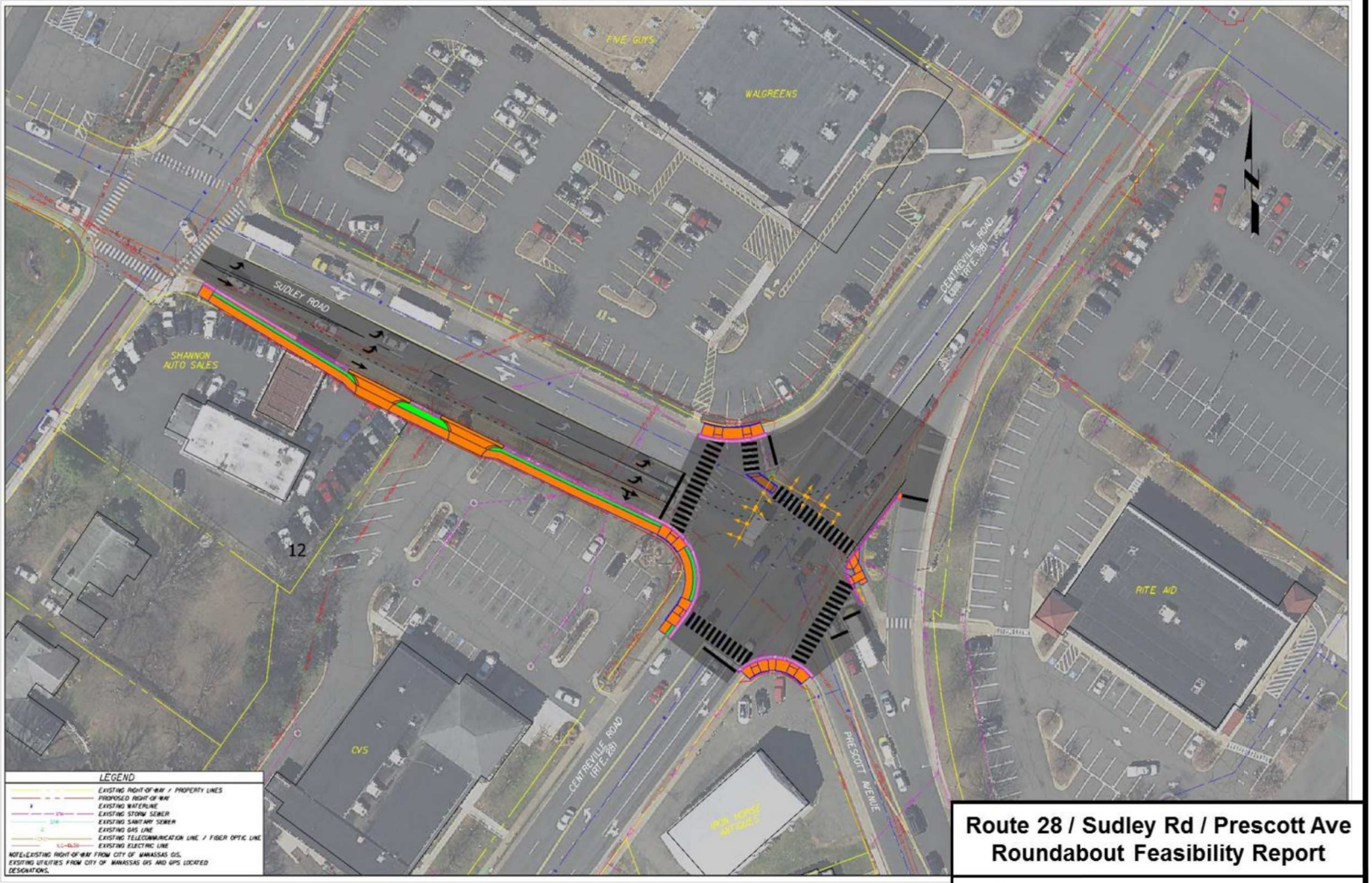

TO
INTERSTATE
66
Mathis Avenue
Sudley Rd
Route 28 (Centreville Rd)
Prescott Ave
28
2
1
165'
110'
Sudley EB
Prescott WB
Route 28 / Sudley Rd / Prescott Ave
Roundabout Feasibility Report
Proposed Roundabout Lane Configurations
RK&K
June 2019
Figure 3



Route 28 / Sudley Rd / Prescott Ave Roundabout Feasibility Report

Conceptual Roundabout Design

RK&K	June 2019	Figure 4



Route 28 / Sudley Rd / Prescott Ave Roundabout Feasibility Report

Conceptual Improved Signalized Intersection Design

RK&K	June 2019	Figure 5

Table 10. Future Conditions (+14% Traffic) - PM Peak Hour Results

Intersection	Movement	Existing Storage Length (ft)	Traffic Volume (vph)	Signalized				Signalized - Improved				Roundabout (Multi-Lane)			
				Delay (s)	LOS	V/C Ratio	Max Q (ft)	Delay (s)	LOS	V/C Ratio	Max Q (ft)	Delay (s)	LOS	V/C Ratio	95th-Percentile Queue (ft)
Centreville Rd (N/S) at Sudley Rd (EB) / Prescott Ave (WB)	EBL**	-	412	37.9	**D**	0.80	368*	20.2	C	0.35	251	35.4	**D**	0.93	292
	EBT	-	423	49.6	**D**	0.92	370*	33.8	C	0.78	366***	43.8	**F**	1.01	474
	EBR	-	68									43.8	**F**	1.01	474
	EB	-	*903*	*44.3*	**D**	-	-	*27.6*	*C*	-	-	*40.0*	**D**	-	
	WBL	190	163	58.3	**E**	0.83	453	61.9	E	0.86	453	31.2	**C**	0.91	292
	WBT	-	329									25.3	**C**	0.91	292
	WBR	145	106	42.0	**D**	0.07	145	42.5	D	0.07	145	15.3	**B**	0.39	43
	WB	-	*599*	*55.4*	**E**	-	-	*58.4*	*E*	-	-	*25.1*	**C**	-	-
	NBL	170	115	32.6	**C**	0.52	169	48.7	D	0.71	169	17.2	**B**	0.62	102
	NBT	-	502	42.6	**D**	0.62	331	47.3	D	0.71	348	11.2	**B**	0.62	104
	NBR	-	11									11.0	**B**	0.62	104
	NB	-	*628*	*40.8*	**D**	-	-	*47.5*	*D*	-	-	*12.3*	**B**	-	-
	SBL	330	137	30.2	**C**	0.47	329	35.3	D	0.58	321	33.5	**C**	0.89	414
	SBT	-	708	51.0	**D**	0.84	436	55.8	E	0.88	429	26.8	**C**	0.89	441
	SBR	225	316	36.5	**D**	0.20	225	37.5	D	0.20	225	25.8	**C**	0.89	441
	SB	-	*1,161*	*44.7*	**D**	-	-	*48.5*	*D*	-	-	*27.3*	**C**	-	-
	Overall	**-**	**3,291**	**45.8**	**D**	**-**	**-**	**44.4**	**D**	**-**	**-**	**27.5**	**C**	**-**	**-**

*Queue exceeds available storage to upstream intersection at Mathis Avenue. Blockage time is approximately 12 percent of peak hour.
**Improved signal option includes 270' of effective storage for the new eastbound left-turn lane along Sudley Road.
***Queue exceeds available storage to upstream intersection at Mathis Avenue. Blockage time sis approximately 5 percent of peak hour.

SUMMARY

A multilane roundabout was evaluated from an operations and safety standpoint for the intersection of Centreville Rd / Sudley Rd / Prescott Ave. The analysis results indicate that a roundabout would operate with reduced delays and queues compared to the existing signalized configuration, based on current traffic volumes. **Table 11** summarizes the results of the analysis for the existing configuration for AM peak hour, PM peak hour, and off-peak conditions. Future PM peak traffic conditions were also analyzed and the results are also shown in **Table 11**. Operations for both a roundabout and a traffic signal would begin to degrade with a 15 to 20 percent increase in traffic volumes; however, traffic volumes along both Centreville Rd and Sudley Rd have been essentially flat over the past 15 years.

Table 11. Traffic Operations Comparison

Target Performance Measure	LOS (Delay)		
	Signalized	Signalized - Improved	Roundabout
AM Peak Hour – Existing	D (37.3)	D (35.7)	A (8.1)
PM Peak Hour – Existing	D (41.9)	D (41.1)	B (14.3)
Off Peak – Existing	C (25.7)	C (24.6)	A (7.3)
PM Peak Hour – Future (Existing Volumes +14%)*	D (45.8)	D (44.4)	C (27.5)**

*Future PM peak hour corresponds to the time when volumes increase 14% compared to existing conditions. The specific year will depend on the rate of traffic growth. For example, with 0.5% annual traffic growth, the future year results would represent existing conditions plus approximately 25 years (2043). With 1.0% annual traffic growth, future year results would represent existing conditions plus approximately 12 years (2030).
**Eastbound Sudley Road approach operates at LOS F.

From a safety perspective, a roundabout would be expected to reduce the frequency and severity of crashes, particularly angle crashes, at the study intersection. Pedestrian accommodations at the proposed roundabout would include new sidewalks in all four quadrants with marked crosswalks and pedestrian refuges to enable pedestrians to cross only one direction of traffic at a time and then wait safely to identify a gap in the other direction of traffic.

In addition to the safety and operational analysis conducted, a conceptual roundabout design was developed to evaluate the potential right-of-way impacts of a roundabout at the intersection of Centreville Rd / Sudley Rd / Prescott Ave, as well as provide an estimate of the anticipated costs of constructing a roundabout at this location. While every effort was made to minimize the design footprint, minor right-of-way impacts are anticipated in all four quadrants of the intersection. The total estimated project cost (including PE, right-of-way, utility relocations, and construction) for a roundabout at this location is approximately $3.7M in current year dollars.

Table 12 provides a summary of the advantages and disadvantages identified with constructing a roundabout at the study intersection of Centreville Rd / Sudley Rd and Prescott Ave.

Table 12. Roundabout Feasibility Summary

Advantages	Disadvantages
• Reduced delays and queues during peak periods and off-peak periods. • Improved safety (reduced potential for angle and rear-end crashes) • Potential gateway entrance feature to downtown • Provides two-stage crossings and refuge areas for pedestrians to cross high-volume streets	• Right-of-way impacts in four quadrants • Nearing capacity during PM peak conditions (signalized configuration has a similar issue as well) • Impacts to private and public utilities requiring relocation/adjustments

Multilane Roundabout - Successful Implementation:
Lastly, concerns were noted by VDOT Northern Virginia District during an initial review of this project regarding the implementation of a multi-lane roundabout in the region due to lack of driver familiarity and previous experience in the District. This is in some contrast to VDOT's official policy that roundabouts are to be considered the preferred alternative when they are found to be feasible at a specific intersection.

At the time of this report, there are approximately 1,334 multi-lane roundabouts across the United States, of which 28 are in Virginia. While multi-lane roundabouts are abundant throughout the country, when this intersection control is introduced to inexperienced or unfamiliar users, there is often a trend of public opposition and/or confusion during the planning stage. This has been addressed by several states through public outreach which contributes to the acceptance of roundabouts and promotes safe behavior for the multi-lane roundabouts. VDOT has a wealth of resources related to roundabouts available on their website including brochures, videos, and an inventory of the 178 roundabouts located throughout the state:

http://www.virginiadot.org/info/innovative_intersections_and_interchanges/roundabout.asp

Several states have found success in reaching all user types of roundabouts, including motorists, bicyclists, truck drivers, emergency medical service providers and pedestrians by providing multiple ways of distribution of information, including paper brochures and educational websites showing the correct operations and safety advantages of multi-lane roundabouts. Common issues found on multi-lane roundabouts when first introduced include:

- Turning from the wrong lane
- Not yielding to all lanes of traffic

To address drivers turning from the wrong lane, there are a variety of approaches available. These include providing information prior to the installation of the roundabouts as well as providing advance lane assignment signs and in pavement arrow markings; both these approaches help encourage correct lane usage. The other common issue relates to how drivers enter the roundabout. Drivers should be educated that the correct action when approaching / entering the roundabout is to wait for an appropriate gap in vehicles in both lanes of the roundabout; they should also understand that drivers in the roundabout continue in their path until their exit. The incorrect actions of drivers not yielding correctly could result in:

- A conflict between entering vehicles and circulating vehicles
- Conflict between entering vehicles and exiting vehicles
- Drivers stopping in the roundabout to yield to entering drivers

To address driver behavior of not yielding to all lanes of traffic, success has shown through been providing educational materials to drivers beforehand. Additionally, to promote correct usage of the multilane roundabout after installation, initial monitoring and having information available via website provides additional resources and feedback for users. Other approaches have been used to reinforce the messages from educational materials. For example, in Washington County, Minnesota, police officers distributed handouts communicating roundabout use and laws to citizens who were pulled over for traffic violations at the roundabout. Ohio DOT's website also has a Frequently Asked Questions page addressing common questions discussing drivers' actions at the roundabout and how to safely act such as:

- Discouraging incorrect driver behavior
- Staying in your lane all the way to the exit
- Appropriate defensive driving

Discouraging incorrect behavior not only includes clarifying the correct way to traverse a roundabout, but also includes not accepting a vehicle in the roundabout "letting you in". The website notes that drivers should stick to their selected lane until they exit the roundabout. This includes waiting if behind a vehicle who incorrectly stops in the circulatory roadway as well as continuing along the lane even if drivers made the wrong lane choice upon entering the roundabout. These actions take patience on the part of other drivers, however changing lanes within the roundabout could cause a collision with another vehicle.

In addition, case studies have been performed reviewing design considerations to reduce the number of crashes that were experienced on multi-lane roundabouts. Strategies to reduce crashes include:

- Using consistent pavement marking line types for circulating and entering drivers
- Minimizing advanced sight distance to promote slower speeds
- Providing overhead lane use signage
- Applying standard pavement marking arrows
- Aligning circulating lane lines to improve entry alignment

The changes at the case studies had decreased driver crashes at the case study locations between 73%-80%. The success of the strategies has led to the construction of additional multi-lane roundabout in those states as safe, operationally efficient intersections. Successful multi-lane roundabouts have been implemented at locations throughout the United States including:

- Prices Fork Road and North Main Street, Blacksburg, VA
- Thimble Shoals Blvd and Town Center Dr, Newport News, VA
- MD 450 and Spa Road, Annapolis, MD
- Kentland Blvd and Main Street, Gaithersburg, MD
- Washington County, MN
- 15th & Reed Market Road, Bend, OH
- 18th & Empire Bend, OH
- Murphy Rd & 3rd Street, Bend, OH

ATTACHMENT B – 2021 TURNING MOVEMENT DATA

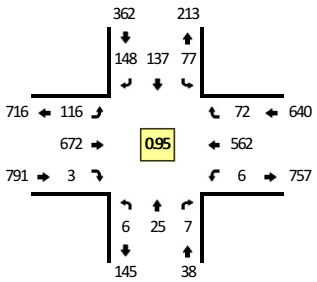
Type of peak hour being reported: Intersection Peak

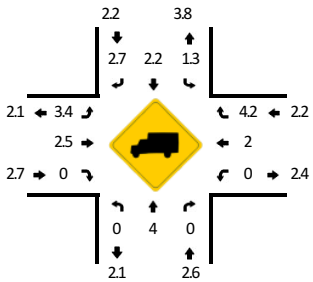
Method for determining peak hour: Total Entering Volume

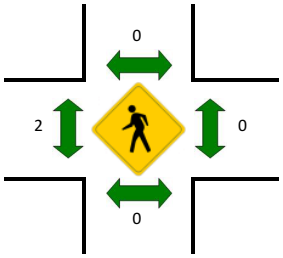
LOCATION: Mathis Ave -- Sudley Rd
CITY/STATE: Manassas, VA

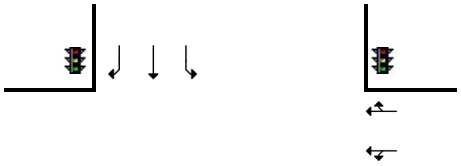
QC JOB #: 15659601
DATE: Wed, Dec 15 2021

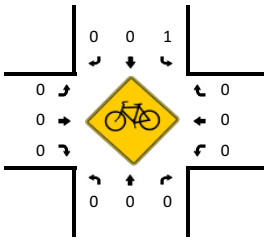
Peak-Hour: 5:00 PM -- 6:00 PM
Peak 15-Min: 5:45 PM -- 6:00 PM

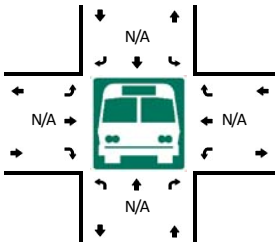


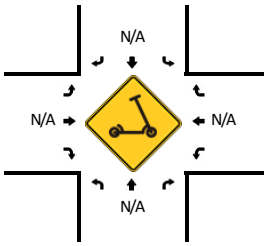












15-Min Count Period Beginning At	Mathis Ave (Northbound)				Mathis Ave (Southbound)				Sudley Rd (Eastbound)				Sudley Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	1	2	2	0	4	5	10	0	16	98	1	0	1	88	11	0	239	
7:15 AM	1	11	0	0	4	10	23	0	12	95	0	0	0	84	14	0	254	
7:30 AM	0	0	0	0	5	8	22	0	31	95	1	0	2	136	14	0	314	
7:45 AM	0	3	3	0	8	17	27	0	27	98	1	0	0	106	10	0	300	1107
8:00 AM	0	7	1	0	3	16	24	0	13	106	1	0	0	84	11	0	266	1134
8:15 AM	1	11	0	0	8	14	26	0	7	93	0	0	1	104	14	0	279	1159
8:30 AM	1	3	1	0	4	8	32	0	16	90	1	0	0	113	11	0	280	1125
8:45 AM	1	3	1	0	4	8	23	0	13	127	2	0	1	124	13	0	320	1145
9:00 AM	1	7	0	0	5	6	19	0	20	130	1	0	1	117	14	0	321	1200
9:15 AM	0	6	1	0	6	13	16	0	11	125	6	0	0	92	13	0	289	1210
9:30 AM	0	9	1	0	7	6	23	0	17	95	2	0	1	118	11	0	290	1220
9:45 AM	2	7	1	0	4	8	26	0	17	102	0	0	1	114	12	0	294	1194
10:00 AM	2	2	2	0	8	11	28	0	21	91	0	0	2	107	15	0	289	1162
10:15 AM	0	5	0	0	12	11	22	0	21	115	1	0	0	87	13	0	287	1160
10:30 AM	1	2	2	0	11	9	28	0	28	100	1	0	1	134	13	0	330	1200
10:45 AM	2	3	6	0	13	10	20	0	13	119	1	0	0	88	13	0	288	1194
11:00 AM	1	2	1	0	13	9	32	0	23	119	2	0	2	116	16	0	336	1241
11:15 AM	1	4	2	0	18	16	28	0	16	115	1	0	0	116	15	0	332	1286
11:30 AM	1	5	2	0	21	15	18	0	27	135	1	0	0	109	19	0	353	1309
11:45 AM	0	9	1	0	16	20	35	0	24	154	2	0	2	124	15	0	402	1423
12:00 PM	1	11	2	0	20	12	25	0	22	124	1	0	1	127	20	0	366	1453
12:15 PM	2	7	1	0	15	16	34	0	22	123	1	0	1	115	17	0	354	1475
12:30 PM	0	5	3	0	13	12	27	0	22	146	0	0	0	143	17	0	388	1510
12:45 PM	0	7	5	0	17	19	26	0	22	119	3	0	1	136	16	0	371	1479
1:00 PM	0	7	1	0	10	12	34	0	23	136	2	0	1	122	23	0	371	1484
1:15 PM	2	4	2	0	22	12	35	0	17	104	4	0	1	134	18	0	355	1485
1:30 PM	1	4	1	0	21	20	29	0	31	135	0	0	1	116	26	0	385	1482
1:45 PM	0	3	1	0	21	14	37	0	25	128	1	0	0	115	21	0	366	1477
2:00 PM	0	7	4	0	17	15	32	0	19	125	1	0	0	127	21	0	368	1474
2:15 PM	1	8	0	0	19	12	32	0	30	143	4	0	1	130	27	0	407	1526
2:30 PM	1	7	2	0	21	23	29	0	13	140	1	0	0	165	21	0	423	1564
2:45 PM	1	5	2	0	19	23	27	0	28	144	3	0	0	148	22	0	422	1620
3:00 PM	1	4	2	0	24	33	25	0	19	172	0	0	2	143	23	0	448	1700
3:15 PM	0	9	2	0	23	31	38	0	25	129	1	0	2	138	19	0	417	1710
3:30 PM	4	9	1	0	13	30	41	0	24	180	0	0	2	144	22	0	470	1757
3:45 PM	1	4	1	0	13	29	34	0	15	168	2	0	3	157	20	0	447	1782
4:00 PM	0	7	0	0	15	34	40	0	33	159	0	0	0	134	27	0	449	1783
4:15 PM	0	5	1	0	19	20	45	0	26	129	2	0	1	145	21	0	414	1780
4:30 PM	2	4	0	0	17	27	38	0	13	153	1	0	2	141	19	0	417	1727

15-Min Count Period Beginning At	Mathis Ave (Northbound)				Mathis Ave (Southbound)				Sudley Rd (Eastbound)				Sudley Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:45 PM	2	9	4	0	21	31	43	0	15	141	2	0	2	134	23	0	427	1707
5:00 PM	3	7	2	0	24	31	46	0	30	152	0	0	0	128	25	0	448	1706
5:15 PM	1	7	2	0	17	46	27	0	35	171	1	0	2	148	13	1	471	1763
5:30 PM	1	8	0	0	21	24	36	0	29	160	2	0	2	129	17	0	429	1775
5:45 PM	1	3	3	0	15	36	39	0	22	189	0	0	1	157	17	0	483	1831
6:00 PM	1	4	2	0	16	23	35	0	18	157	0	0	2	139	19	0	416	1799
6:15 PM	1	3	1	0	21	32	27	0	26	127	1	0	0	127	19	0	385	1713
6:30 PM	2	6	2	0	19	21	24	0	23	129	0	0	1	119	17	0	363	1647
6:45 PM	0	4	0	0	16	30	21	0	18	132	0	0	0	124	8	0	353	1517

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	4	12	12	0	60	144	156	0	88	756	0	0	4	628	68	0	1932
Heavy Trucks	0	0	0		4	4	12		0	12	0		0	16	0		48
Buses																	
Pedestrians		0				0				4				0			4
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 12/24/2021 9:08 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

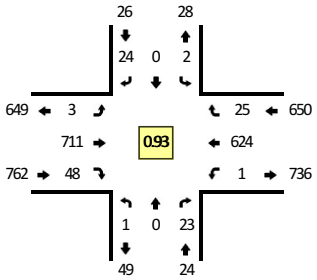
Type of peak hour being reported: Intersection Peak

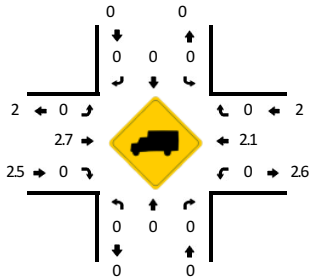
Method for determining peak hour: Total Entering Volume

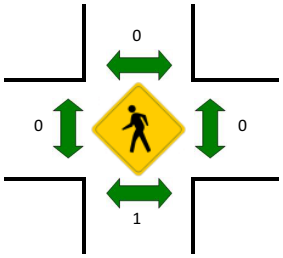
LOCATION: CVS/Shopping Center Dwys -- Sudley Rd
CITY/STATE: Manassas, VA

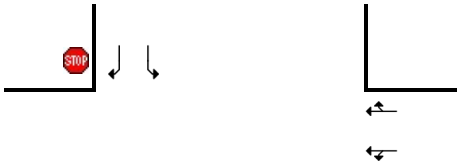
QC JOB #: 15659602
DATE: Wed, Dec 15 2021

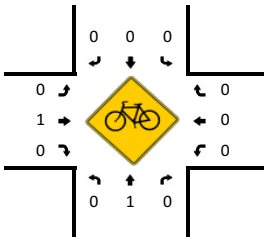
Peak-Hour: 5:15 PM -- 6:15 PM
Peak 15-Min: 5:45 PM -- 6:00 PM

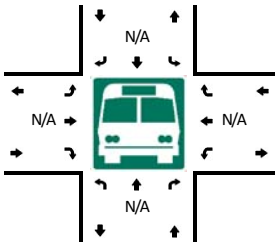


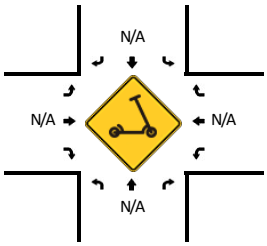












15-Min Count Period Beginning At	CVS/Shopping Center Dwys (Northbound)				CVS/Shopping Center Dwys (Southbound)				Sudley Rd (Eastbound)				Sudley Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	1	0	0	0	0	0	0	0	0	102	3	0	0	104	0	0	210	
7:15 AM	1	0	0	0	0	0	0	0	0	94	5	0	0	100	1	0	201	
7:30 AM	0	0	1	0	0	0	0	0	0	102	1	0	0	146	0	0	250	
7:45 AM	0	0	0	0	1	0	2	0	1	100	4	0	0	119	4	0	231	892
8:00 AM	0	0	2	0	2	0	1	0	0	114	1	0	0	91	1	0	212	894
8:15 AM	0	0	1	0	0	0	1	0	1	91	5	0	0	126	2	0	227	920
8:30 AM	0	0	1	0	0	0	0	0	0	91	9	0	1	120	2	0	224	894
8:45 AM	2	0	3	0	0	0	1	0	0	128	4	0	0	137	0	0	275	938
9:00 AM	1	0	2	0	1	1	1	0	0	132	3	0	0	127	1	0	269	995
9:15 AM	0	0	1	0	1	0	1	0	0	132	4	0	1	106	2	0	248	1016
9:30 AM	1	0	3	0	2	0	1	0	1	100	2	0	0	132	2	0	244	1036
9:45 AM	0	0	0	0	2	1	3	0	0	95	7	0	0	125	5	0	238	999
10:00 AM	0	0	1	0	1	0	3	0	0	100	5	0	1	121	7	0	239	969
10:15 AM	0	0	2	0	1	0	3	0	0	118	5	0	0	102	1	0	232	953
10:30 AM	0	0	3	0	1	1	4	0	1	111	5	0	0	143	7	0	276	985
10:45 AM	0	0	5	0	5	1	1	0	2	123	12	0	0	101	5	0	255	1002
11:00 AM	0	0	4	0	1	0	8	0	3	130	6	0	1	126	3	0	282	1045
11:15 AM	2	0	3	0	2	0	2	0	1	127	10	0	0	136	4	0	287	1100
11:30 AM	2	0	2	0	5	1	2	0	2	148	8	0	0	117	8	0	295	1119
11:45 AM	1	1	0	0	1	0	4	0	0	164	7	0	0	142	2	0	322	1186
12:00 PM	2	0	4	0	3	0	3	0	0	139	9	0	0	140	4	0	304	1208
12:15 PM	0	0	3	0	5	0	1	0	1	125	7	0	0	139	3	0	284	1205
12:30 PM	1	1	0	0	4	0	1	0	1	151	13	0	1	153	9	0	335	1245
12:45 PM	0	0	1	0	0	2	3	0	1	127	7	0	0	156	5	0	302	1225
1:00 PM	0	0	5	0	2	0	3	0	0	149	2	0	0	140	3	0	304	1225
1:15 PM	0	1	2	0	3	0	2	0	1	125	7	0	0	155	3	0	299	1240
1:30 PM	0	0	3	0	2	0	1	0	0	153	5	0	3	140	6	0	313	1218
1:45 PM	2	0	2	0	1	0	1	0	2	140	8	0	0	134	7	0	297	1213
2:00 PM	2	0	2	0	0	0	2	0	0	143	5	0	1	143	8	0	306	1215
2:15 PM	0	1	3	0	5	1	2	0	1	158	4	0	0	162	3	0	340	1256
2:30 PM	0	0	3	0	3	0	4	0	2	159	6	0	0	180	8	0	365	1308
2:45 PM	1	1	3	0	4	1	5	0	3	153	10	0	2	163	3	0	349	1360
3:00 PM	0	0	3	0	0	0	5	0	0	173	16	0	0	159	8	0	364	1418
3:15 PM	1	0	0	0	0	1	5	0	0	153	5	0	0	161	3	0	329	1407
3:30 PM	1	0	4	0	1	0	4	0	2	178	11	0	1	158	7	0	367	1409
3:45 PM	0	0	1	0	1	0	5	0	1	176	5	0	0	175	7	0	371	1431
4:00 PM	0	0	2	0	1	0	2	0	0	171	11	0	0	156	10	0	353	1420
4:15 PM	0	0	4	0	1	2	2	0	2	137	11	0	0	170	6	0	335	1426
4:30 PM	0	0	4	0	1	0	2	0	0	160	8	0	1	157	5	0	338	1397

15-Min Count Period Beginning At	CVS/Shopping Center Dwys (Northbound)				CVS/Shopping Center Dwys (Southbound)				Sudley Rd (Eastbound)				Sudley Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:45 PM	0	0	2	0	1	0	5	0	0	156	7	0	0	161	3	0	335	1361
5:00 PM	0	0	2	0	4	0	2	0	0	171	4	0	0	148	9	0	340	1348
5:15 PM	0	0	3	0	0	0	5	0	0	173	16	0	1	168	3	0	369	1382
5:30 PM	0	0	10	0	1	0	6	0	1	184	9	0	0	131	2	0	344	1388
5:45 PM	1	0	5	0	0	0	7	0	1	180	10	0	0	175	14	0	393	1446
6:00 PM	0	0	5	0	1	0	6	0	1	174	13	0	0	150	6	0	356	1462
6:15 PM	1	0	2	0	2	0	10	0	1	138	10	0	0	146	3	0	313	1406
6:30 PM	0	1	2	0	5	0	3	0	3	141	12	0	0	127	4	0	298	1360
6:45 PM	0	0	5	0	2	0	1	0	0	144	6	0	2	131	1	0	292	1259

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	4	0	20	0	0	0	28	0	4	720	40	0	0	700	56	0	1572
Heavy Trucks	0	0	0		0	0	0		0	12	0		0	20	0		32
Buses																	
Pedestrians		4				0				0				0			4
Bicycles	0	4	0		0	0	0		0	0	0		0	0	0		4
Scooters																	

Comments:

Report generated on 12/24/2021 9:08 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

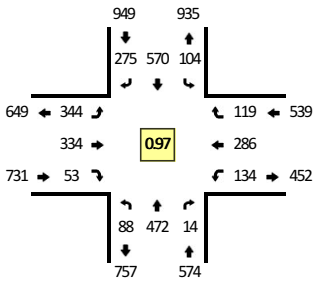
Type of peak hour being reported: Intersection Peak

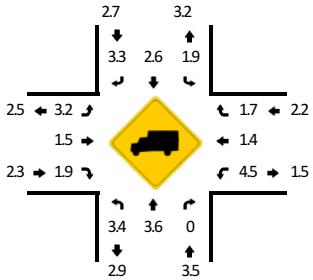
Method for determining peak hour: Total Entering Volume

LOCATION: Centreville Rd -- Sudley Rd/Prescott Ave
CITY/STATE: Manassas, VA

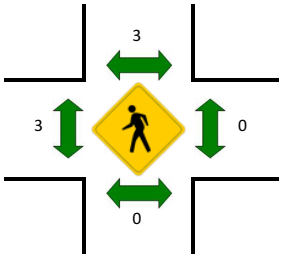
QC JOB #: 15659603
DATE: Wed, Dec 15 2021

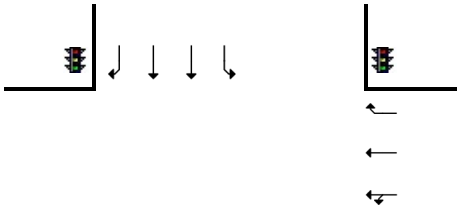
Peak-Hour: 5:00 PM -- 6:00 PM
Peak 15-Min: 5:15 PM -- 5:30 PM

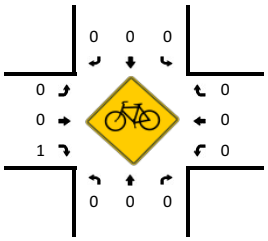


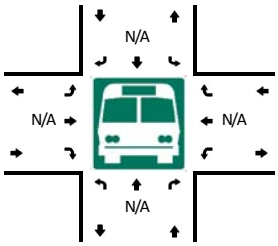


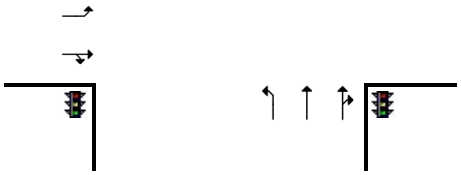
Quality Counts
DATA THAT DRIVES COMMUNITIES

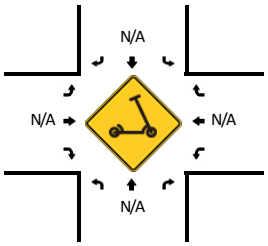












15-Min Count Period Beginning At	Centreville Rd (Northbound)				Centreville Rd (Southbound)				Sudley Rd/Prescott Ave (Eastbound)				Sudley Rd/Prescott Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	10	112	0	0	6	83	46	0	45	53	3	0	12	46	27	0	443	
7:15 AM	15	101	2	0	8	73	35	0	45	38	6	0	10	51	27	0	411	
7:30 AM	21	115	2	0	12	103	70	0	57	41	5	0	12	56	30	0	524	
7:45 AM	19	127	2	0	16	120	52	0	52	35	6	0	12	52	36	0	529	1907
8:00 AM	13	112	4	0	18	95	50	0	57	45	20	0	11	29	30	0	484	1948
8:15 AM	22	134	1	0	17	105	47	0	44	30	13	0	10	59	40	0	522	2059
8:30 AM	15	121	1	0	12	94	54	0	60	31	7	0	14	54	36	0	499	2034
8:45 AM	17	138	0	0	9	112	59	0	69	45	6	0	18	61	41	0	575	2080
9:00 AM	18	113	0	0	10	88	61	0	91	38	5	0	10	49	35	0	518	2114
9:15 AM	11	140	1	0	8	95	47	0	90	39	4	0	14	54	31	0	534	2126
9:30 AM	12	96	2	0	11	81	75	0	64	40	7	0	12	48	36	0	484	2111
9:45 AM	18	97	4	0	10	112	48	0	57	24	6	0	14	62	27	0	479	2015
10:00 AM	10	78	0	0	9	79	58	0	58	42	7	0	9	60	30	0	440	1937
10:15 AM	16	101	2	0	15	95	48	0	62	48	5	0	10	40	26	0	468	1871
10:30 AM	20	82	0	0	8	90	65	0	64	42	13	0	14	64	34	0	496	1883
10:45 AM	17	92	1	0	16	96	57	0	69	47	11	0	12	32	38	0	488	1892
11:00 AM	14	91	2	0	7	82	66	0	80	49	8	0	14	49	24	0	486	1938
11:15 AM	18	93	1	0	16	98	76	0	77	41	10	0	9	48	35	0	522	1992
11:30 AM	22	100	1	0	11	95	49	0	84	57	9	0	11	53	27	0	519	2015
11:45 AM	17	98	3	0	12	108	69	0	80	72	12	0	16	58	27	0	572	2099
12:00 PM	18	68	4	0	17	93	71	0	81	62	10	0	8	55	37	0	524	2137
12:15 PM	20	110	1	0	23	114	70	0	74	45	12	0	19	52	38	0	578	2193
12:30 PM	15	90	5	0	13	94	68	0	87	60	8	0	12	80	30	0	562	2236
12:45 PM	17	93	2	0	16	127	80	0	70	42	10	0	16	63	49	0	585	2249
1:00 PM	21	88	1	0	15	91	56	0	78	71	10	0	14	67	34	0	546	2271
1:15 PM	10	88	1	0	11	117	84	0	75	42	12	0	12	63	28	0	543	2236
1:30 PM	23	91	3	0	23	88	75	0	95	55	13	0	19	51	21	0	557	2231
1:45 PM	21	113	1	0	21	130	69	0	65	62	11	0	20	50	35	0	598	2244
2:00 PM	21	86	4	0	14	117	67	0	91	50	9	0	22	64	31	0	576	2274
2:15 PM	22	107	5	0	11	103	69	0	78	65	15	0	13	75	25	0	588	2319
2:30 PM	19	89	7	0	20	134	88	0	74	85	14	0	19	81	35	0	665	2427
2:45 PM	15	105	6	0	25	158	80	0	84	64	11	0	30	74	22	0	674	2503
3:00 PM	26	108	4	0	25	131	58	0	80	78	14	0	28	82	41	0	675	2602
3:15 PM	21	98	4	0	18	142	68	0	80	67	9	0	25	75	31	0	638	2652
3:30 PM	22	92	3	0	21	132	70	0	88	83	8	0	27	76	40	0	662	2649
3:45 PM	24	104	7	0	25	158	85	0	90	86	4	0	33	72	26	0	714	2689
4:00 PM	30	111	3	0	27	124	62	0	88	83	9	0	32	72	27	0	668	2682
4:15 PM	29	136	3	0	34	169	69	0	68	59	13	0	40	79	28	0	727	2771
4:30 PM	28	104	3	0	26	137	73	0	94	66	5	0	34	61	26	0	657	2766

15-Min Count Period Beginning At	Centreville Rd (Northbound)				Centreville Rd (Southbound)				Sudley Rd/Prescott Ave (Eastbound)				Sudley Rd/Prescott Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:45 PM	21	114	3	0	31	159	71	0	75	73	11	0	31	72	30	0	691	2743
5:00 PM	30	120	2	0	28	141	55	0	81	81	17	0	38	72	35	0	700	2775
5:15 PM	13	129	4	0	28	152	82	0	79	83	12	0	37	78	21	0	718	2766
5:30 PM	20	116	4	0	19	132	67	0	94	91	13	0	28	44	32	0	660	2769
5:45 PM	25	107	4	0	29	145	71	0	90	79	11	0	31	92	31	0	715	2793
6:00 PM	26	106	2	0	28	135	63	0	96	75	10	0	24	67	31	0	663	2756
6:15 PM	21	110	3	0	27	131	67	0	69	55	15	0	20	65	23	0	606	2644
6:30 PM	21	86	1	0	33	143	62	0	76	58	15	0	19	44	28	0	586	2570
6:45 PM	10	89	2	0	20	132	61	0	89	53	11	0	16	64	18	0	565	2420

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	52	516	16	0	112	608	328	0	316	332	48	0	148	312	84	0	2872
Heavy Trucks	0	28	0		4	12	8		0	12	4		4	0	4		76
Buses																	
Pedestrians		0				12				12				0			24
Bicycles	0	0	0		0	0	0		0	0	4		0	0	0		4
Scooters																	

Comments:

Report generated on 12/24/2021 9:08 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

ATTACHMENT C – SIDRA WORKSHEETS

MOVEMENT SUMMARY

Site: 1 [2021_Sudley Centreville - Existing AM - ConceptA 2021 Design]

Existing PM
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Prescott WB												
3	L2	61	9.0	0.354	9.0	LOS A	1.9	48.9	0.71	0.61	0.71	25.1
8	T1	237	2.0	0.354	3.4	LOS A	1.9	48.9	0.71	0.61	0.71	24.6
18	R2	155	3.0	0.243	5.5	LOS A	1.1	29.2	0.68	0.75	0.68	23.9
Approach		453	3.3	0.354	4.8	LOS A	1.9	48.9	0.70	0.66	0.70	24.4
East: Centerville SB												
1	L2	41	3.0	0.332	7.4	LOS A	2.1	55.5	0.61	0.40	0.61	25.3
6	T1	405	6.0	0.332	2.2	LOS A	2.2	59.8	0.60	0.42	0.60	24.9
16	R2	230	17.0	0.332	3.3	LOS A	2.2	59.8	0.60	0.47	0.60	24.3
Approach		676	9.6	0.332	2.9	LOS A	2.2	59.8	0.60	0.44	0.60	24.7
North: Sudley Rd EB												
7	L2	323	11.0	0.289	7.5	LOS A	1.1	28.2	0.43	0.64	0.43	24.6
4	T1	159	4.0	0.289	2.3	LOS A	1.1	28.2	0.40	0.48	0.40	24.8
14	R2	23	5.0	0.289	3.1	LOS A	1.1	28.2	0.40	0.48	0.40	24.1
Approach		505	8.5	0.289	5.6	LOS A	1.1	29.4	0.42	0.58	0.42	24.6
West: Centerville NB												
5	L2	64	3.0	0.327	7.8	LOS A	1.8	45.5	0.60	0.51	0.60	25.1
2	T1	533	3.0	0.327	2.9	LOS A	1.8	46.1	0.60	0.45	0.60	24.7
12	R2	2	0.0	0.327	3.7	LOS A	1.8	46.1	0.59	0.41	0.59	24.1
Approach		599	3.0	0.327	3.4	LOS A	1.8	46.1	0.60	0.46	0.60	24.7
All Vehicles		2233	6.3	0.354	4.1	LOS A	2.2	59.8	0.58	0.52	0.58	24.6

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [2021_Sudley Centreville - Existing PM - ConceptA 2021 Design]

Existing PM
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Prescott WB												
3	L2	138	4.0	0.545	11.0	LOS B	4.0	102.4	0.82	0.96	1.01	24.6
8	T1	295	1.0	0.545	5.6	LOS A	4.0	102.4	0.82	0.96	1.01	24.1
18	R2	123	2.0	0.249	6.9	LOS A	1.2	29.7	0.72	0.78	0.72	23.5
Approach		556	2.0	0.545	7.2	LOS A	4.0	102.4	0.80	0.92	0.95	24.1
East: Centerville SB												
1	L2	108	2.0	0.527	9.9	LOS A	4.4	113.6	0.82	0.82	0.91	24.7
6	T1	594	3.0	0.527	4.3	LOS A	4.6	118.7	0.81	0.77	0.89	24.4
16	R2	286	3.0	0.527	4.8	LOS A	4.6	118.7	0.81	0.70	0.87	24.0
Approach		989	2.9	0.527	5.0	LOS A	4.6	118.7	0.81	0.75	0.88	24.3
North: Sudley Rd EB												
7	L2	358	3.0	0.495	9.2	LOS A	2.5	63.8	0.65	0.88	0.74	24.0
4	T1	348	1.0	0.495	3.8	LOS A	2.5	63.8	0.64	0.61	0.71	24.7
14	R2	55	2.0	0.495	4.7	LOS A	2.5	63.8	0.64	0.61	0.71	24.1
Approach		761	2.0	0.495	6.4	LOS A	2.5	63.8	0.65	0.74	0.73	24.3
West: Centerville NB												
5	L2	92	3.0	0.405	9.4	LOS A	2.3	60.4	0.73	0.77	0.79	24.7
2	T1	492	4.0	0.405	4.4	LOS A	2.4	61.7	0.73	0.69	0.78	24.4
12	R2	15	0.0	0.405	5.0	LOS A	2.4	61.7	0.73	0.63	0.77	23.9
Approach		598	3.7	0.405	5.2	LOS A	2.4	61.7	0.73	0.70	0.78	24.4
All Vehicles		2904	2.7	0.545	5.8	LOS A	4.6	118.7	0.75	0.77	0.83	24.3

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [2021_Sudley Centreville - Existing AM - ConceptB 2021 Design]

Existing PM
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Prescott WB												
3	L2	61	9.0	0.293	9.7	LOS A	1.4	37.2	0.69	0.70	0.69	24.8
8	T1	237	2.0	0.293	3.9	LOS A	1.5	38.9	0.69	0.68	0.69	24.6
18	R2	155	3.0	0.293	4.4	LOS A	1.5	38.9	0.68	0.65	0.68	24.1
Approach		453	3.3	0.293	4.9	LOS A	1.5	38.9	0.69	0.67	0.69	24.5
East: Centerville SB												
1	L2	41	3.0	0.350	6.7	LOS A	1.8	45.9	0.50	0.31	0.50	25.4
6	T1	405	6.0	0.350	1.8	LOS A	1.8	45.9	0.50	0.35	0.50	25.0
16	R2	230	17.0	0.350	3.3	LOS A	1.7	47.8	0.52	0.48	0.52	24.3
Approach		676	9.6	0.350	2.6	LOS A	1.8	47.8	0.51	0.39	0.51	24.8
North: Sudley Rd EB												
7	L2	323	11.0	0.287	7.5	LOS A	1.1	28.0	0.42	0.63	0.42	24.7
4	T1	159	4.0	0.287	2.1	LOS A	1.1	28.0	0.39	0.47	0.39	24.8
14	R2	23	5.0	0.287	3.2	LOS A	1.1	28.0	0.39	0.47	0.39	24.2
Approach		505	8.5	0.287	5.6	LOS A	1.1	29.2	0.41	0.57	0.41	24.7
West: Centerville NB												
5	L2	64	3.0	0.319	7.7	LOS A	1.7	44.4	0.60	0.48	0.60	25.2
2	T1	533	3.0	0.319	2.6	LOS A	1.8	45.1	0.59	0.42	0.59	24.8
12	R2	2	0.0	0.319	3.3	LOS A	1.8	45.1	0.59	0.37	0.59	24.2
Approach		599	3.0	0.319	3.2	LOS A	1.8	45.1	0.59	0.42	0.59	24.8
All Vehicles		2233	6.3	0.350	3.9	LOS A	1.8	47.8	0.55	0.50	0.55	24.7

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [2021_Sudley Centreville - Existing PM - ConceptB 2021 Design]

Existing PM
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Prescott WB												
3	L2	138	4.0	0.381	10.3	LOS B	2.2	55.0	0.76	0.86	0.81	24.4
8	T1	295	1.0	0.381	4.5	LOS A	2.3	57.1	0.76	0.76	0.79	24.4
18	R2	123	2.0	0.381	5.1	LOS A	2.3	57.1	0.76	0.70	0.78	24.0
Approach		556	2.0	0.381	6.1	LOS A	2.3	57.1	0.76	0.77	0.80	24.3
East: Centerville SB												
1	L2	108	2.0	0.520	8.1	LOS A	3.2	82.0	0.66	0.60	0.73	25.0
6	T1	594	3.0	0.520	3.1	LOS A	3.3	83.3	0.65	0.59	0.72	24.7
16	R2	286	3.0	0.520	3.9	LOS A	3.3	83.3	0.65	0.59	0.71	24.2
Approach		989	2.9	0.520	3.9	LOS A	3.3	83.3	0.65	0.59	0.72	24.6
North: Sudley Rd EB												
7	L2	358	3.0	0.481	9.2	LOS A	2.4	60.2	0.63	0.86	0.72	24.1
4	T1	348	1.0	0.481	3.7	LOS A	2.4	60.2	0.62	0.60	0.69	24.8
14	R2	55	2.0	0.481	4.7	LOS A	2.4	60.2	0.62	0.60	0.69	24.2
Approach		761	2.0	0.481	6.3	LOS A	2.4	60.2	0.62	0.72	0.70	24.4
West: Centerville NB												
5	L2	92	3.0	0.392	9.2	LOS A	2.2	57.7	0.73	0.73	0.76	24.8
2	T1	492	4.0	0.392	3.9	LOS A	2.3	59.1	0.72	0.63	0.75	24.5
12	R2	15	0.0	0.392	4.4	LOS A	2.3	59.1	0.72	0.56	0.75	24.0
Approach		598	3.7	0.392	4.7	LOS A	2.3	59.1	0.72	0.64	0.75	24.6
All Vehicles		2904	2.7	0.520	5.1	LOS A	3.3	83.3	0.68	0.67	0.74	24.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [2021_Sudley Centreville - Existing PM - ConceptA 2021 Design+14%]

Existing PM
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Prescott WB												
3	L2	158	4.0	0.684	14.1	LOS B	6.1	153.6	0.91	1.13	1.30	23.8
8	T1	336	1.0	0.684	8.6	LOS A	6.1	153.6	0.91	1.13	1.30	23.3
18	R2	140	2.0	0.312	7.9	LOS A	1.5	38.6	0.77	0.83	0.79	23.3
Approach		634	2.0	0.684	9.8	LOS A	6.1	153.6	0.88	1.06	1.19	23.4
East: Centerville SB												
1	L2	124	2.0	0.660	13.2	LOS B	7.1	180.8	0.93	1.06	1.21	24.0
6	T1	677	3.0	0.660	7.4	LOS A	7.6	195.3	0.94	1.04	1.19	23.8
16	R2	327	3.0	0.660	7.7	LOS A	7.6	195.3	0.94	1.00	1.17	23.5
Approach		1128	2.9	0.660	8.1	LOS A	7.6	195.3	0.94	1.03	1.19	23.7
North: Sudley Rd EB												
7	L2	408	3.0	0.636	10.9	LOS B	3.9	98.3	0.77	0.98	0.95	23.6
4	T1	397	1.0	0.636	5.3	LOS A	3.9	98.3	0.76	0.86	0.93	24.5
14	R2	63	2.0	0.636	6.2	LOS A	3.9	98.3	0.76	0.86	0.93	23.9
Approach		868	2.0	0.636	8.0	LOS A	3.9	98.3	0.77	0.91	0.94	24.0
West: Centerville NB												
5	L2	104	3.0	0.521	11.3	LOS B	3.4	87.7	0.81	0.95	0.98	24.3
2	T1	560	4.0	0.521	6.1	LOS A	3.5	91.0	0.82	0.93	0.98	24.2
12	R2	17	0.0	0.521	6.5	LOS A	3.5	91.0	0.82	0.91	0.97	23.8
Approach		681	3.7	0.521	6.9	LOS A	3.5	91.0	0.82	0.93	0.98	24.2
All Vehicles		3311	2.7	0.684	8.2	LOS A	7.6	195.3	0.86	0.98	1.08	23.8

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [2021_Sudley Centreville - Existing PM - ConceptA 2021 Design+30%]

Existing PM
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Prescott WB												
3	L2	179	4.0	0.875	24.1	LOS C	11.1	283.1	1.00	1.52	2.04	21.5
8	T1	384	1.0	0.875	18.6	LOS B	11.1	283.1	1.00	1.52	2.04	21.2
18	R2	160	2.0	0.399	10.0	LOS A	2.1	53.2	0.81	0.91	0.94	22.8
Approach		723	2.0	0.875	18.1	LOS B	11.1	283.1	0.96	1.38	1.79	21.6
East: Centerville SB												
1	L2	141	2.0	0.846	23.2	LOS C	13.5	343.9	1.00	1.45	1.78	21.7
6	T1	772	3.0	0.846	16.9	LOS B	15.1	386.8	1.00	1.42	1.76	21.6
16	R2	373	3.0	0.846	16.6	LOS B	15.1	386.8	1.00	1.40	1.73	21.5
Approach		1285	2.9	0.846	17.5	LOS B	15.1	386.8	1.00	1.42	1.75	21.6
North: Sudley Rd EB												
7	L2	466	3.0	0.825	15.4	LOS B	6.7	168.4	0.90	1.16	1.34	22.6
4	T1	452	1.0	0.825	9.4	LOS A	6.7	168.4	0.89	1.12	1.32	23.5
14	R2	72	2.0	0.825	10.2	LOS B	6.7	168.4	0.89	1.12	1.32	22.9
Approach		990	2.0	0.825	12.3	LOS B	6.7	168.4	0.90	1.14	1.33	23.0
West: Centerville NB												
5	L2	119	3.0	0.695	15.2	LOS B	5.3	135.9	0.90	1.11	1.28	23.3
2	T1	640	4.0	0.695	9.7	LOS A	5.6	143.7	0.91	1.10	1.27	23.3
12	R2	19	0.0	0.695	9.9	LOS A	5.6	143.7	0.91	1.10	1.27	23.0
Approach		777	3.8	0.695	10.6	LOS B	5.6	143.7	0.91	1.10	1.28	23.3
All Vehicles		3775	2.7	0.875	14.8	LOS B	15.1	386.8	0.95	1.27	1.55	22.3

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [2021_Sudley Centreville - Existing PM - ConceptA 2021 Design+35%]

Existing PM
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Prescott WB												
3	L2	187	4.0	0.943	33.0	LOS C	15.1	383.7	1.00	1.78	2.58	19.9
8	T1	398	1.0	0.943	27.5	LOS C	15.1	383.7	1.00	1.78	2.58	19.6
18	R2	166	2.0	0.429	10.8	LOS B	2.3	58.5	0.83	0.94	0.99	22.6
Approach		751	2.0	0.943	25.2	LOS C	15.1	383.7	0.96	1.60	2.23	20.2
East: Centerville SB												
1	L2	146	2.0	0.909	30.7	LOS C	17.4	445.5	1.00	1.65	2.13	20.2
6	T1	802	3.0	0.909	24.2	LOS C	19.9	510.0	1.00	1.64	2.12	20.2
16	R2	386	3.0	0.909	23.5	LOS C	19.9	510.0	1.00	1.63	2.10	20.1
Approach		1334	2.9	0.909	24.7	LOS C	19.9	510.0	1.00	1.64	2.11	20.2
North: Sudley Rd EB												
7	L2	483	3.0	0.887	19.0	LOS B	8.4	211.3	0.94	1.28	1.60	21.8
4	T1	470	1.0	0.887	12.6	LOS B	8.4	211.3	0.93	1.26	1.57	22.7
14	R2	75	2.0	0.887	13.5	LOS B	8.4	211.3	0.93	1.26	1.57	22.2
Approach		1028	2.0	0.887	15.7	LOS B	8.4	211.3	0.94	1.27	1.59	22.2
West: Centerville NB												
5	L2	124	3.0	0.760	17.6	LOS B	6.2	159.4	0.93	1.19	1.43	22.7
2	T1	664	4.0	0.760	11.9	LOS B	6.6	169.7	0.94	1.18	1.42	22.8
12	R2	20	0.0	0.760	11.9	LOS B	6.6	169.7	0.94	1.18	1.42	22.5
Approach		807	3.7	0.760	12.7	LOS B	6.6	169.7	0.94	1.18	1.42	22.8
All Vehicles		3920	2.7	0.943	20.0	LOS B	19.9	510.0	0.96	1.44	1.85	21.2

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [2021_Sudley Centreville - Existing PM - ConceptA 2021 Design+40%]

Existing PM
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Prescott WB												
3	L2	194	4.0	1.015	49.1	LOS F	21.9	556.7	1.00	2.22	3.48	17.4
8	T1	412	1.0	1.015	43.6	LOS F	21.9	556.7	1.00	2.22	3.48	17.2
18	R2	172	2.0	0.461	11.7	LOS B	2.5	64.3	0.84	0.96	1.04	22.4
Approach		778	2.0	1.015	37.9	LOS D	21.9	556.7	0.96	1.94	2.94	18.2
East: Centerville SB												
1	L2	152	2.0	0.969	41.8	LOS D	22.9	585.1	1.00	1.92	2.63	18.4
6	T1	831	3.0	0.969	35.1	LOS D	26.7	683.0	1.00	1.94	2.63	18.4
16	R2	401	3.0	0.969	34.2	LOS C	26.7	683.0	1.00	1.96	2.62	18.4
Approach		1384	2.9	0.969	35.6	LOS D	26.7	683.0	1.00	1.94	2.63	18.4
North: Sudley Rd EB												
7	L2	502	3.0	0.952	26.2	LOS C	11.6	291.8	0.98	1.50	2.06	20.4
4	T1	488	1.0	0.952	19.3	LOS B	11.6	291.8	0.97	1.51	2.06	21.3
14	R2	77	2.0	0.952	20.2	LOS C	11.6	291.8	0.97	1.51	2.06	20.8
Approach		1067	2.0	0.952	22.7	LOS C	11.6	291.8	0.97	1.50	2.06	20.8
West: Centerville NB												
5	L2	128	3.0	0.834	21.6	LOS C	7.6	194.4	0.96	1.30	1.66	21.9
2	T1	689	4.0	0.834	15.6	LOS B	8.1	208.7	0.97	1.30	1.66	22.0
12	R2	21	0.0	0.834	15.4	LOS B	8.1	208.7	0.97	1.31	1.65	21.7
Approach		838	3.7	0.834	16.5	LOS B	8.1	208.7	0.96	1.30	1.66	22.0
All Vehicles		4067	2.7	1.015	28.7	LOS C	26.7	683.0	0.98	1.70	2.34	19.6

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [2021_Sudley Centreville - Existing PM - ConceptB 2021 Design+14%]

Existing PM
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Prescott WB												
3	L2	158	4.0	0.483	12.3	LOS B	3.0	77.6	0.82	0.97	0.99	23.9
8	T1	336	1.0	0.483	6.3	LOS A	3.3	82.8	0.83	0.94	0.98	24.0
18	R2	140	2.0	0.483	6.7	LOS A	3.3	82.8	0.83	0.92	0.97	23.7
Approach		634	2.0	0.483	7.9	LOS A	3.3	82.8	0.83	0.94	0.98	23.9
East: Centerville SB												
1	L2	124	2.0	0.627	9.4	LOS A	4.6	116.6	0.75	0.80	0.91	24.8
6	T1	677	3.0	0.627	4.3	LOS A	4.7	119.6	0.75	0.79	0.90	24.5
16	R2	327	3.0	0.627	5.0	LOS A	4.7	119.6	0.74	0.78	0.89	24.0
Approach		1128	2.9	0.627	5.1	LOS A	4.7	119.6	0.75	0.79	0.90	24.4
North: Sudley Rd EB												
7	L2	408	3.0	0.608	10.8	LOS B	3.6	90.9	0.74	0.96	0.92	23.7
4	T1	397	1.0	0.608	5.1	LOS A	3.6	90.9	0.73	0.83	0.89	24.6
14	R2	63	2.0	0.608	6.2	LOS A	3.6	90.9	0.73	0.83	0.89	23.9
Approach		868	2.0	0.608	7.9	LOS A	3.6	90.9	0.74	0.89	0.90	24.1
West: Centerville NB												
5	L2	104	3.0	0.501	10.9	LOS B	3.2	83.3	0.81	0.93	0.95	24.4
2	T1	560	4.0	0.501	5.5	LOS A	3.4	86.9	0.81	0.87	0.94	24.3
12	R2	17	0.0	0.501	5.9	LOS A	3.4	86.9	0.81	0.83	0.94	23.9
Approach		681	3.7	0.501	6.4	LOS A	3.4	86.9	0.81	0.87	0.95	24.3
All Vehicles		3311	2.7	0.627	6.6	LOS A	4.7	119.6	0.77	0.86	0.93	24.2

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [2021_Sudley Centreville - Existing PM - ConceptB 2021 Design+30%]

Existing PM
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Prescott WB												
3	L2	179	4.0	0.624	16.1	LOS B	4.5	113.7	0.89	1.10	1.24	23.0
8	T1	384	1.0	0.624	9.5	LOS A	4.9	124.9	0.90	1.09	1.24	23.2
18	R2	160	2.0	0.624	9.8	LOS A	4.9	124.9	0.90	1.08	1.23	23.0
Approach		723	2.0	0.624	11.2	LOS B	4.9	124.9	0.90	1.09	1.24	23.1
East: Centerville SB												
1	L2	141	2.0	0.761	11.8	LOS B	6.9	176.8	0.86	1.07	1.20	24.3
6	T1	772	3.0	0.761	6.6	LOS A	7.2	183.5	0.86	1.06	1.19	24.0
16	R2	373	3.0	0.761	7.1	LOS A	7.2	183.5	0.86	1.05	1.17	23.6
Approach		1285	2.9	0.761	7.3	LOS A	7.2	183.5	0.86	1.06	1.19	23.9
North: Sudley Rd EB												
7	L2	466	3.0	0.792	14.9	LOS B	6.2	156.4	0.88	1.13	1.28	22.8
4	T1	452	1.0	0.792	8.7	LOS A	6.2	156.4	0.87	1.08	1.26	23.7
14	R2	72	2.0	0.792	9.8	LOS A	6.2	156.4	0.87	1.08	1.26	23.1
Approach		990	2.0	0.792	11.7	LOS B	6.2	156.4	0.88	1.10	1.27	23.2
West: Centerville NB												
5	L2	119	3.0	0.664	14.3	LOS B	4.9	127.3	0.89	1.08	1.23	23.6
2	T1	640	4.0	0.664	8.6	LOS A	5.3	135.4	0.90	1.07	1.22	23.6
12	R2	19	0.0	0.664	8.7	LOS A	5.3	135.4	0.90	1.06	1.21	23.3
Approach		777	3.8	0.664	9.5	LOS A	5.3	135.4	0.90	1.07	1.22	23.6
All Vehicles		3775	2.7	0.792	9.6	LOS A	7.2	183.5	0.88	1.08	1.22	23.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [2021_Sudley Centreville - Existing PM - ConceptB 2021 Design+35%]

Existing PM
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Prescott WB												
3	L2	187	4.0	0.678	18.0	LOS B	5.1	129.3	0.91	1.15	1.35	22.5
8	T1	398	1.0	0.678	11.1	LOS B	5.7	143.6	0.92	1.15	1.35	22.9
18	R2	166	2.0	0.678	11.3	LOS B	5.7	143.6	0.93	1.14	1.35	22.7
Approach		751	2.0	0.678	12.9	LOS B	5.7	143.6	0.92	1.15	1.35	22.7
East: Centerville SB												
1	L2	146	2.0	0.808	13.1	LOS B	8.1	206.0	0.90	1.15	1.34	24.0
6	T1	802	3.0	0.808	7.9	LOS A	8.4	214.6	0.90	1.15	1.33	23.7
16	R2	386	3.0	0.808	8.3	LOS A	8.4	214.6	0.90	1.14	1.31	23.3
Approach		1334	2.9	0.808	8.6	LOS A	8.4	214.6	0.90	1.15	1.32	23.6
North: Sudley Rd EB												
7	L2	483	3.0	0.866	18.3	LOS B	7.9	200.1	0.93	1.25	1.54	22.0
4	T1	470	1.0	0.866	11.8	LOS B	7.9	200.1	0.92	1.22	1.51	22.9
14	R2	75	2.0	0.866	12.9	LOS B	7.9	200.1	0.92	1.22	1.51	22.4
Approach		1028	2.0	0.866	14.9	LOS B	7.9	200.1	0.92	1.24	1.52	22.5
West: Centerville NB												
5	L2	124	3.0	0.732	16.4	LOS B	5.8	148.9	0.92	1.15	1.36	23.1
2	T1	664	4.0	0.732	10.5	LOS B	6.2	159.7	0.93	1.15	1.35	23.2
12	R2	20	0.0	0.732	10.4	LOS B	6.2	159.7	0.93	1.14	1.35	22.9
Approach		807	3.7	0.732	11.4	LOS B	6.2	159.7	0.93	1.15	1.36	23.2
All Vehicles		3920	2.7	0.866	11.6	LOS B	8.4	214.6	0.92	1.17	1.39	23.0

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [2021_Sudley Centreville - Existing PM - ConceptB 2021 Design+40%]

Existing PM
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Prescott WB												
3	L2	194	4.0	0.733	20.5	LOS C	5.8	148.2	0.93	1.21	1.49	22.0
8	T1	412	1.0	0.733	13.3	LOS B	6.6	166.5	0.94	1.22	1.49	22.4
18	R2	172	2.0	0.733	13.3	LOS B	6.6	166.5	0.95	1.22	1.49	22.2
Approach		778	2.0	0.733	15.1	LOS B	6.6	166.5	0.94	1.22	1.49	22.2
East: Centerville SB												
1	L2	152	2.0	0.856	15.1	LOS B	9.6	245.5	0.94	1.26	1.53	23.5
6	T1	831	3.0	0.856	9.8	LOS A	10.0	257.0	0.94	1.26	1.52	23.3
16	R2	401	3.0	0.856	10.1	LOS B	10.0	257.0	0.94	1.25	1.50	22.9
Approach		1384	2.9	0.856	10.4	LOS B	10.0	257.0	0.94	1.26	1.51	23.2
North: Sudley Rd EB												
7	L2	502	3.0	0.945	26.1	LOS C	11.4	288.4	0.97	1.49	2.04	20.5
4	T1	488	1.0	0.945	19.0	LOS B	11.4	288.4	0.97	1.49	2.03	21.4
14	R2	77	2.0	0.945	20.1	LOS C	11.4	288.4	0.97	1.49	2.03	20.9
Approach		1067	2.0	0.945	22.4	LOS C	11.4	288.4	0.97	1.49	2.03	20.9
West: Centerville NB												
5	L2	128	3.0	0.806	19.8	LOS B	7.0	179.4	0.95	1.25	1.56	22.3
2	T1	689	4.0	0.806	13.5	LOS B	7.5	194.1	0.96	1.25	1.56	22.5
12	R2	21	0.0	0.806	13.3	LOS B	7.5	194.1	0.96	1.25	1.55	22.2
Approach		838	3.7	0.806	14.5	LOS B	7.5	194.1	0.96	1.25	1.56	22.4
All Vehicles		4067	2.7	0.945	15.3	LOS B	11.4	288.4	0.95	1.31	1.65	22.2

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.