August 2019 FINAL

TRANSPORTATION FACILITY PLANNING

WAUGH CHAPEL ROAD

Waugh Chapel Road from Maytime Drive to New Market Lane
Project Number H539600 Contract No. H539611

FINAL FUTURE CONDITIONS REPORT

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Executive Summary

Anne Arundel County initiated the Waugh Chapel Road Transportation Facility Planning study with the objective to improve safety, traffic operations, and accessibility for all modes of transportation on Waugh Chapel Road from Waugh Chapel Shopping Center to the existing and planned neighborhoods to the west. The limits of this Waugh Chapel Road study corridor are from Maytime Drive to New Market Lane. The study focuses on a multimodal, context-sensitive approach to identify and recommend improvements to the existing corridor that strike a balance between future vehicular traffic and pedestrian/bicyclists to enhance safety and connectivity for all modes of transportation.

This Future Conditions Report, which builds upon the May 2018 Existing Conditions Report, summarizes preferred alternative concepts and how they can address the purpose and need of the project as well as the process of developing, analyzing, and prioritizing improvement alternatives. The County will use the recommendations of this report to identify potential projects to move forward for implementation based on the County’s priorities and funding opportunities.

The following summarizes the key findings (existing conditions) and recommendations based on the future (2040) conditions analysis for the Waugh Chapel Road study corridor:

- **Key Findings (Existing Conditions)**
  - The roadway segments studied along Waugh Chapel Road operate at level-of-service (LOS) D/E. The peak-hour demand on Waugh Chapel Road is near the capacity for a two-lane facility.
  - During the AM peak hour, the segments east of Symphony Lane operate worse than the western segment, from Maytime Drive to Symphony Lane, due to higher truck traffic and overall traffic volumes.
  - During the PM peak, all segments operate at LOS E in both directions.
  - Results of field observations did not reveal issues with corridor LOS along Waugh Chapel Road. There was very little delay along the corridor during the peak periods, except for an approximate 15-minute period between 7:50 and 8:05 AM at the intersection of Waugh Chapel Road and Symphony Lane. This delay is mostly attributed to the traffic associated with the School of the Incarnation.
  - Existing traffic volumes at the intersection of Silver Way/Macmullen Drive and Waugh Chapel Road do not warrant a traffic signal.
  - There are several gaps in the sidewalk network along Waugh Chapel Road, yet there is demand for sidewalks, as evidenced by pedestrians walking along the shoulder of Waugh Chapel Road.
  - While bicycles can be accommodated on portions of the paved shoulder areas along Waugh Chapel Road east of Macmullen Drive, there are areas without shoulders to the west that do not provide adequate bicycling conditions.
  - Speeding in the corridor, based on 85th-percentile speeds, in conjunction with roadway horizontal alignment may present potential risks to safety at the intersections as well as future proposed pedestrian and bicycle improvements. The 85th percentile speeds range from 41 mph to 45 mph in the westbound direction and 42 mph to 48 mph in the eastbound direction, exceeding the posted speed limit of 35 mph by 6 mph to 13 mph.
  - Reported crashes along the corridor are focused around intersections and driveways. Excluding crashes near MD 3, crashes at the intersection of New Market Lane/Wigeon Way represented more than 35% of the crashes in the corridor and most of the rear-end and angle

crashes. Most of the single-vehicle crashes occurred between Maytime Drive and Silver Way/Macmullen Drive. Roadway horizontal curves and speeding are contributing factors.

- **Recommendations Based on Future (2040) Conditions**
  - **Intersection Preferred Alternatives.** The recommended alternatives improve safety and access to and from Waugh Chapel Road and side streets at the key study area intersections. The improvements address existing issues related to intersection sight distance and operations as well as potential future capacity issues due to anticipated increases in traffic associated with the completion of Summerfield, Chapel Way, and other developments in the vicinity of the corridor, while also accommodating the needs of non-motorized users.
    - Maytime Drive – implement lane use changes and minor signal phasing adjustments
    - Symphony Lane/Silver Way – implement minor signal timing adjustments
    - Silver Way/Macmullen Drive – install a westbound left-turn lane in the short-term while monitoring traffic conditions for long-term improvements which consists of installing a traffic signal or constructing a roundabout
    - Summerfield Road – install a traffic signal
    - New Market Lane/Wigeon Way – revise lane designations and modify pedestrian signal phasing
  - **Multimodal.** The lack of connected sidewalks on Waugh Chapel Road in the study area is a critical gap to address with potential roadway improvements. Dedicated bicycle facilities or shared use paths are needed along Waugh Chapel Road to provide protection for bicyclists and connectivity for the bicycle network linking to the regional trail and transit system. These recommendations are consistent with the county's *2013 Pedestrian and Bicycle Master Plan*.
    - Cross-sections that include sidewalks and bike paths were developed to accommodate non-motorized users.
  - **Network Connectivity.** The continued growth in the western portion of the County, as well as newer developments in the area, including future phases of Waugh Chapel Towne Center, Summerfield, and Two Rivers, will continue to place pressure on Waugh Chapel Road. An additional connection to MD 3 is needed to relieve this pressure in the future.
    - During the course of this study, the possibility of including a connection from Waugh Chapel Shopping Center to Summerfield Road surfaced as a means to provide network connectivity. In August 2018, the County recorded a plat, prepared for Waugh Chapel Towne Centre II – Phase 2A, that includes dedicated public right-of-way (ROW) for Brickhead Road to connect Evergreen Road from the south to the future extension of Summerfield Road to the north.
    - The study team also discussed two other potential future connections:
      - Providing a connection from Brickhead Road to Waugh Chapel Road east of the Reliable Construction plant
      - Extending Evergreen Road to Strawberry Lake Way

Chapter 1 Purpose and Need Statement

Based on the existing conditions and 2040 No-Build analyses (see *Existing Conditions Report, May 2018*), the study team identified the need for developing viable and cost-effective improvements to address traffic operations, safety, multimodal, and network connectivity issues. This chapter discusses the purpose and need, which provides basis for developing, screening, and analyzing alternative improvement concepts.

TRAFFIC OPERATIONS AND SAFETY

The study team identified the need to improve traffic operations and safety in the following areas.

- To improve access for side street traffic at intersections that experience excessive delay and safety issues
- To improve safety for all modes of transportation at the intersections
- To provide LOS D or better for vehicular traffic at study intersections in 2040 by improving operations, without adding through lanes to the Waugh Chapel Road mainline
- To address geometric issues at intersections and in mid-block areas that present safety concerns

MULTIMODAL

The study team identified the following areas in need of multimodal improvements.

- To provide continuous access and improve safety for pedestrians and bicyclists along the length of Waugh Chapel Road
- To improve safety for pedestrians and bicyclists crossing at intersections

NETWORK CONNECTIVITY

The need for improving network connectivity in the study area were identified as follows.

- To identify alternative route(s) that would connect MD 3 with residential and employment centers west of the Waugh Chapel Road study area to relieve potential congestion on Waugh Chapel Road near MD 3 in year 2040
- To provide parallel or off-street multimodal facilities that improve safety for bicyclists and pedestrians when accessing Waugh Chapel Shopping Center

Chapter 2 Future Conditions Alternatives Analysis

Following the purpose and needs statement, the study team started developing future improvement alternatives for the study intersections, multimodal facilities along the corridor, and network connectivity in the study area. The following sections describe the process in which the alternative concepts were developed, screened, and analyzed. The outcomes and findings from the alternative screening and analysis provided the basis for selecting preferred alternatives for the corridor for all roadway users. Forecast traffic volumes for year 2040 were used to develop and evaluate alternatives.

DEVELOPMENT OF PRELIMINARY ALTERNATIVES

Intersection Improvement Concepts

The study team developed up to three types of initial improvement concepts: 1) turn lanes and other small geometric improvements; 2) signal phasing and timing adjustments; and 3) new traffic signal or roundabout. Small geometric and signal operations improvements are generally more cost-effective and easier to implement than intersection redesign projects. However, constructing a new traffic signal or installing a roundabout can provide safety and operational benefits for all road users. From a corridor point of view, both signals and roundabouts offer potential opportunities to slow traffic, thus improving safety along the corridor for vulnerable road users. A roundabout, if designed appropriately, reduces the number of potential conflict points at an intersection and offers safety benefits to all road users, including bicyclists and pedestrians. The development of these intersection improvement alternatives considers ROW constraints to the extent possible, as well as needs for motorists, bicyclists, and pedestrians. Elements considered to develop initial improvement concepts are shown in Table 1 and described in more detail following the table.

Table 1. Initial Improvement Concepts Proposed for Developing Intersection Alternatives

Intersection	Issues	Proposed Initial Improvement Concepts
Maytime Drive	Conflicting left-turning traffic on the side streets	1) Revise pavement markings for the NB approach to delineate a left-turn lane and a shared through/right-turn lane 2) Modify NB/SB signal phasing to allow for protected-permissive left-turn movements 3) Add WB exclusive right-turn lane 4) Revise pavement markings for the EB approach to widen right-turn lane to meet current design standards 5) Construct a roundabout 6) Provide leading pedestrian interval so pedestrians can enter crosswalk before vehicles receive green phase to improve motorist visibility of pedestrians
Symphony Lane	Congestion during morning and afternoon school drop-off and pick-up periods	1) Change NB/SB signal phasing to split phasing 2) Signal timing optimization (e.g. reduce NB/SB green time, and increase EB green time) 3) Restrict right-turn-on-red for EB Waugh Chapel Road during AM peak (7:00 to 9:00 AM) 4) Signalize EB right-turn movement for protected phasing.

Intersection	Issues	Proposed Initial Improvement Concepts
Macmullen Drive/Silver Way	Lack of acceptable gaps for side street traffic turning onto Waugh Chapel Road Difficult for westbound traffic to turn left onto Macmullen Drive Limited intersection sight distance for northbound approach looking east	1) Add WB exclusive left-turn lane 2) Install a traffic signal 3) Construct a roundabout 4) Restrict Silver Way to right-in/right-out 5) Construct a “Continuous Green T” intersection for left turns into and out of Macmullen while restricting other left-turn movements
Summerfield Road	Lack of acceptable gaps for side street traffic turning onto Waugh Chapel Road Difficult for westbound traffic to turn left onto Summerfield Road	1) Provide pavement markings for an exclusive WB left-turn lane and EB exclusive right-turn lane (design plans subsequently submitted by Summerfield developer) 2) Install a traffic signal 3) Construct a roundabout
New Market Lane/Wigeon Way	Peak-period congestion Difficulty for pedestrians crossing due to turning traffic	1) Change EB/WB left-turn phases to protected only 2) Extend WB left-turn lane storage by 200 feet 3) Expand splitter island at easternmost Carrolls Creek entrance to reflect mandatory right-turn lane (per signing) and to eliminate impression of continuous right-turn lane from MD 3 to Wigeon Way. 4) Offset NB/SB approach to remove geometric conflicts between NB/SB left-turns, and change NB/SB signal phase from split phasing to protected left-turn phasing 5) Revise pavement markings for the NB approach to provide two exclusive left-turn lanes and one shared right-turn/through lane, OR two exclusive left-turn lanes, one shared right-turn/through lane, and one exclusive right-turn lane 6) Provide leading pedestrian interval so pedestrians can enter crosswalk before vehicles receive green phase to improve motorist visibility of pedestrians

Maytime Drive and Waugh Chapel Road

This intersection operates at an acceptable LOS under 2040 No-Build conditions; however, the study team considered alternatives that would reduce the number of conflict points and thereby improve safety at the intersection. The proposed concepts included turn lane and signal phasing improvements and a roundabout. The signal phasing and turn lane improvement aims to address conflicts associated with the permissive left-turn movements on the northbound and southbound approaches. A roundabout concept was also developed as a means to reduce turning conflicts and speeds. Although the ROW at this intersection can potentially accommodate a roundabout, the roundabout footprint is large, and the geometry affects the through movement on Waugh Chapel Road. The study team also considered adding a westbound right-turn lane and widening the eastbound right-turn lane (does not meet current design standards). Given the notable school-aged pedestrian use, leading pedestrian interval signal phase is recommended to improve safety in addition to having crossing guard present during off-peak hours.

Symphony Lane and Waugh Chapel Road

This intersection operates at an acceptable LOS in 2040 with optimized signal timing. Although angle crashes were not the predominant reported crash type at this intersection, to address the existing observed conflicts between the heavy westbound left-turn movement and eastbound right-turn movement in the AM peak (heading to School of the Incarnation), the team proposed two options: 1) prohibiting right-turn-on-red during AM peak or 2) adding a protected eastbound right-turn arrow. A SimTraffic queuing analysis was conducted to conclude that both concepts would worsen current queuing conditions, but not to the extent of impacting Maytime Drive intersection.

In addition, during school drop-off and pick-up times, vehicles exiting the neighborhood from the north were observed to have few gaps available to turn left due to the high volumes arriving from the south exiting the school. The study team considered changing the existing northbound/southbound permissive left-turn phasing to split phasing to mitigate conflicts and delays.

Finally, to better accommodate a bike lane with the existing eastbound right-turn lane to Symphony Lane, the study team explored the possibility of removing the eastbound left-turn lane to Silver Way, which is projected to carry low volumes in 2040 (e.g., 4 vph and 18 vph in AM and PM peak hour, respectively). The re-routed traffic could use Maytime Drive intersection without impacting traffic operations.

Macmullen Drive and Waugh Chapel Road

The side streets at this intersection will experience excessive delay in 2040 with the projected growth of traffic on Waugh Chapel Road. The existing sight distance constraint due to the horizontal curve to the east presents an additional challenge to left turns from both Waugh Chapel Road and the side streets without protected traffic control. Three alternatives were sought at this intersection.

A westbound left-turn lane was proposed to prevent left-turning vehicles from blocking westbound through traffic on Waugh Chapel Road. Although the intersection does not warrant a traffic signal based on existing or future traffic volumes (per the Maryland Manual of Uniform Traffic Control Devices (MdMUTCD), a traffic signal would help side street traffic turn onto Waugh Chapel Road and improve operations, as well as potentially slow through traffic; therefore, signalization was considered as an alternative.

To minimize conflicts between turning traffic and through traffic and to slow speeds in the area, the study team also considered a roundabout. Finally, the team investigated the potential to reduce turning movements at the intersection by restricting eastbound left turns at Silver Way and modifying the entrance to a right-turn-in/right-turn-out design. As part of this modification, there also is a potential to shelter the left turns out of Chapel Creek with a median along Waugh Chapel Road, known as a “Continuous Green T.”. The eastbound left-turn volume is very low and, therefore; the re-routed traffic is not expected to have a negative effect on traffic operations at adjacent intersections, such as Symphony Lane and Maytime Drive.

Summerfield Road and Waugh Chapel Road

Summerfield Road is expected to experience excessive delay in 2040 if there are no improvements implemented at the intersection. These delays are primarily due to the lack of acceptable gaps in through traffic on Waugh Chapel Road to allow traffic to turn from the side street. Improvements that can accommodate turning traffic, as well as bicyclists and pedestrians, without compromising traffic operations on Waugh Chapel Road, are desired to accommodate the future demand from the build-out of the Summerfield development. Two alternatives were sought at this intersection: 1) adding a traffic signal and adding turn lanes on Waugh Chapel Road, and 2) installing a single-lane roundabout. The study team explored adding a westbound exclusive left-turn lane and an eastbound right-turn lane on Waugh Chapel Road. In December 2018, the Summerfield Village developer submitted Public Road Plans, that include revising pavement markings on Waugh Chapel Road to include an eastbound right-turn lane and westbound left-turn lane into the development. Coordination will need to be conducted with the developer for them to provide mitigation at full build-out in conjunction with the improvements stemming from this study.

New Market Lane/Wigeon Way and Waugh Chapel Road

This intersection is expected to operate at an acceptable LOS in 2040 under No-Build conditions; however, the New Market Lane approach will operate at LOS E without further improvement. A review of crash data at this intersection showed a history of angle crashes, which could be attributed to the protected-permissive left-turn phasing on Waugh Chapel Road. Currently, the New Market Lane and Wigeon Way approaches are offset and operate with split phasing to accommodate turning traffic from both approaches. The County has received feedback from residents of Carroll’s Creek that pedestrians encounter heavy right-turn traffic from the shopping center in the eastern crosswalk across Waugh Chapel Road, thus making pedestrian access to the shopping center difficult.

The rightmost lane of westbound Waugh Chapel Road is designated as a mandatory right-turn lane prior to the easternmost driveway into Carroll’s Creek and across the frontage of the development to the intersection at Wigeon Way. Although signs indicate that the “Right Lane Must Turn Right,” the current geometric design and marking layout may give motorists the impression that a continuous turn lane exists from MD 3 to the signal at Wigeon Way. As a result, vehicles not desiring to enter Carroll’s Creek merge into the westbound through lane at the traffic signal with Wigeon Way/New Market lane.

To mitigate the operational and pedestrian conflict concerns, two geometric improvements, coupled with pedestrian signal improvements, were explored. Both alternatives include a leading pedestrian interval for the eastern crosswalk and removal of the westbound continuous right-turn lane between Wigeon Way and the easternmost driveway into Carroll’s Creek to mitigate potential safety concerns from the weaving movement.

Bicycle and Pedestrian Alternatives

The County’s 2013 Pedestrian and Bicycle Master Plan identified the Village at Waugh Chapel and Waugh Chapel South as pedestrian/bicycle attractors. It also included the construction of bicycle lanes from Piney Orchard Parkway to MD 3 as a Tier II project and constructing a sidewalk along the south side of the roadway from Maytime Drive to Summerfield Road as a Tier III project. Two different bicycle and pedestrian alternatives were considered for this study: (1) a shared-use path on the south side of Waugh Chapel Road, and (2) dedicated bike lanes on both sides of and a sidewalk on one side of Waugh Chapel Road. Implementation of dedicated bike and pedestrian facilities through any of these measures has been proven to provide improved accessibility and safety for non-motorized road users.

Network Alternatives

Improvements to connectivity of the transportation network can be an effective solution to alleviate traffic congestion on Waugh Chapel Road without adding capacity (widening) to the corridor. The study team considered various potential vehicular connections between Waugh Chapel Towne Center and areas to the west. The study team also explored the idea of a shared-use path connection parallel to Waugh Chapel Road to draw bicycle traffic away from the corridor.

Waugh Chapel Towne Center to Waugh Chapel Road Connections

During the course of the study, the team determined that it would be desirable to provide an alternative for traffic destined to/from Waugh Chapel Towne Center to bypass the easternmost portion of Waugh Chapel Road between Summerfield Road and MD 3. The Waugh Chapel Development Master Sketch Plan shows two connections that would extend to Waugh Chapel Road. One connects to Summerfield Road that purposely was not made as a direct connection to existing Evergreen Road in order to deter through traffic. In August 2018, the County Recorded Plat 361/0037, prepared by Waugh Chapel Towne Centre II – Phase 2A (see Figure 1), that provides the intended connection via Evergreen Road and Brickhead Road to Summerfield Road. The other connection shown in the Waugh Chapel Development Master Sketch Plan extends from Brickhead Road to Waugh Chapel Road, west of the existing power line easement. This connection has not yet moved forward in the development process, and there are no additional details available.

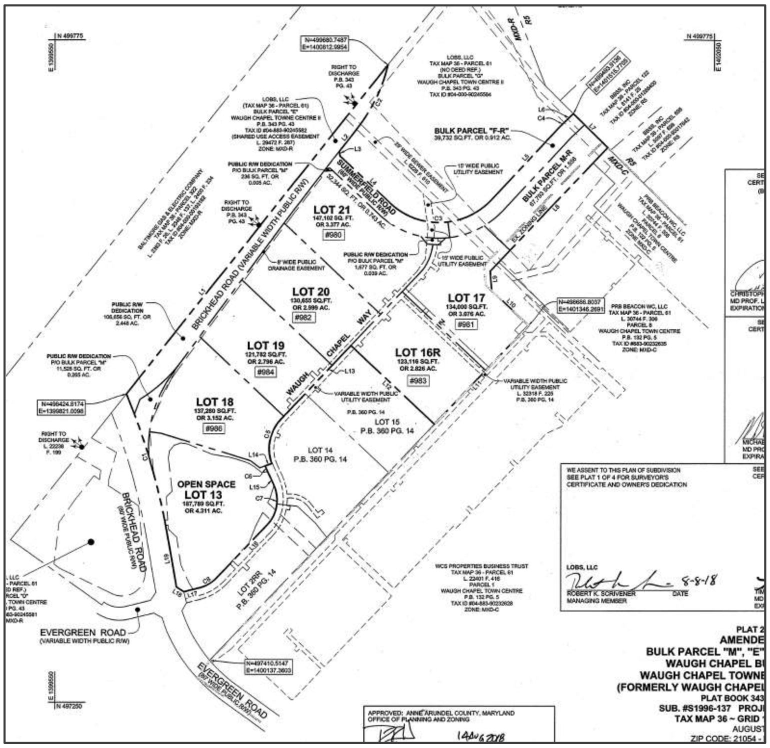

Figure 1. Summerfield Road Connection to Brickhead Road/Evergreen Road (Source: Plat 0361/0037)

Evergreen Road Extension to Strawberry Lake Way

This network alternative proposes a new roadway connection that extends the current Evergreen Road to Strawberry Lake Way following the alignment in Figure 2. West of the Evergreen Road commercial development, the new alignment follows the residential portion of Evergreen Road, divides the Reliable Concrete Plant, and then follows the edge of Odenton Park (GORC) before it ties into Strawberry Lake Way. To mitigate any impacts to POS-acquired park land, the impacted park land would have to be converted. For this to occur, the County's Department of Recreation and Parks (DRP) must determine the appropriateness of such an action and then demonstrate to State authorities that there are no other alternatives available besides impacting park land. As a result, DRP would be more inclined for the connection to be made further to the south on Strawberry Lake Way.

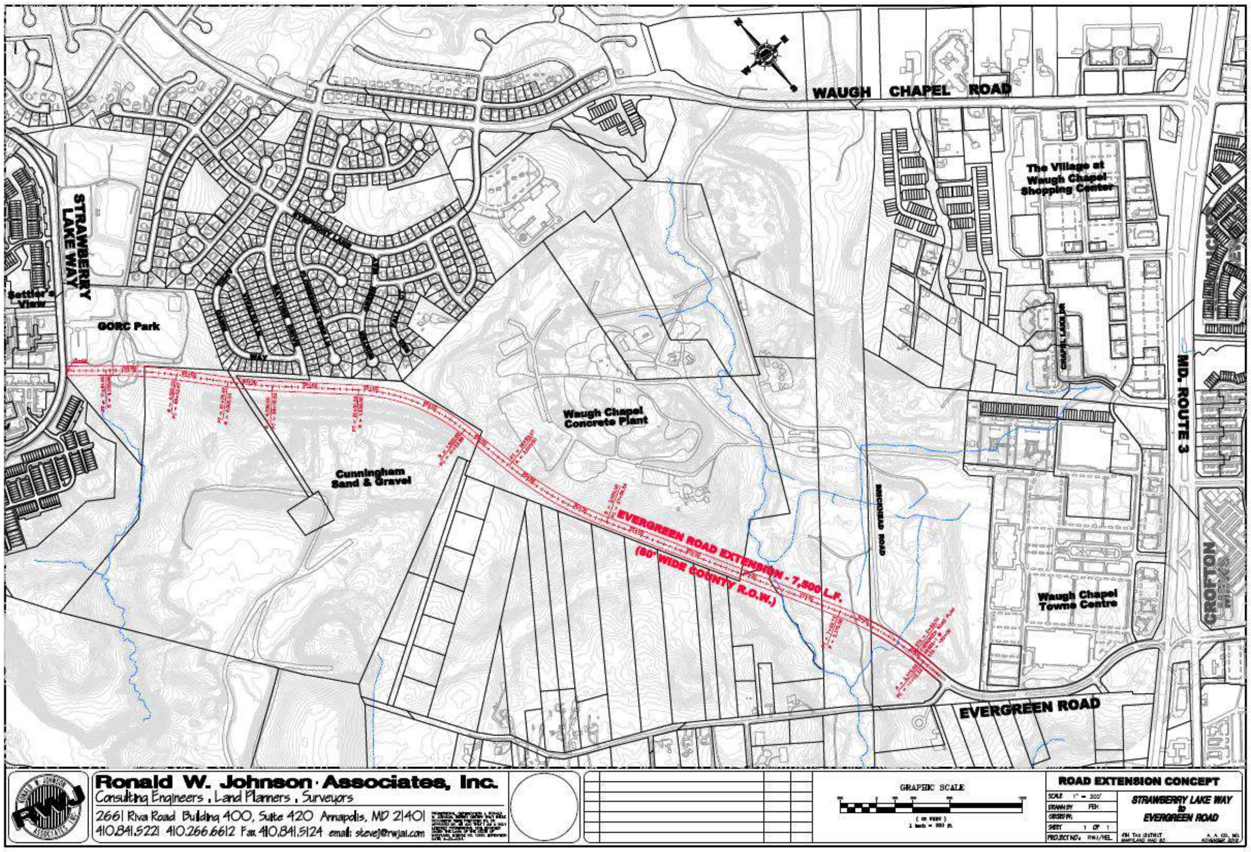

Figure 2. Evergreen Road Extension Concept (Source: Ronald W Johnson Associates, Inc.)

Shared-use Path

A shared-use path also was considered to serve bicyclists and pedestrians following the Evergreen Road Extension alignment that connects to Strawberry Lake Way. This path would be parallel, but not immediately adjacent, to Waugh Chapel Road. The goal would be to encourage bicycle and pedestrian activity on the trail instead of within the Waugh Chapel Road traveled way. This could even further improve safety by encouraging bike use farther from motorized traffic. The study team envisioned that the alternative route could be designed to serve bicyclists and pedestrians as an initial phase, with the potential to serve vehicular traffic in the future, if needed.

ALTERNATIVES SCREENING ANALYSIS

The preliminary improvement concepts were refined and consolidated into two improvement alternatives, Alternative B and C, in addition to Alternative A (No-Build), with the exception of the Waugh Chapel Road / Macmullen Drive intersection, where a third alternative (Alternative D) was developed. A detailed description of each improvement alternative and the anticipated benefit and impact are provided in **Appendix C**. The benefit and impact provided the basis for the screening analysis using the measures of effectiveness and criteria agreed upon by the study team.

Screening Analysis Scoring

The study team developed screening criteria with weighted importance assigned to each measure. These criteria were then used as a tool to assess the relative ability of each alternative to address the issues identified in the purpose and need statement. The screening criteria and importance (weighted by a score of 1 to 3, with 3 being the highest) were:

- Safety for All Users (e.g., bicycle, pedestrian, vehicles) (3)
- Speed management (3)
- Pedestrian/Bicycle access (3)
- Level of stress (bicycle facility) (3)
- Ease of implementation (2)
- Right-of-way and utility relocation (2)
- Ease of access (to/from side streets) (2)
- Level of service (traffic operations) (1)

Table 2 shows a summary of the screening analysis based on the selected criteria. The detailed score calculations for the screening analysis are provided in **Appendix C**.

Table 2: Alternative Study Screening

	Alternatives		Safety for All Users (e.g., bicycle, pedestrian, vehicles)	Speed Management	Pedestrian/ Bicycle Access	Ease of Implementation	R/W & Utility Relocations	Ease of Access to/from Side Streets	Level of Service	Total Score
		Category Weighting	*3*	*3*	*3*	*2*	*2*	*2*	*1*	
Maytime Drive	Alternative A	No Build	1.5	1.5	1.5	2.0	2.0	1.0	0.5	10.0
	Alternative B	Turn lane and signal phasing improvement	3.0	1.5	1.5	2.0	2.0	1.0	0.5	11.5
	Alternative C	Roundabout	3.0	3.0	1.5	0.0	0.0	2.0	0.0	9.5
Symphony Lane/Silver Run	Alternative A	No Build	1.5	1.5	0.0	2.0	2.0	1.0	0.5	8.5
	Alternative B	Signal phasing and timing improvement	3.0	1.5	0.0	2.0	2.0	1.0	1.0	10.5
McMullen Drive/Silver Way	Alternative A	No Build	0.0	0.0	0.0	2.0	2.0	1.0	0.0	5.0
	Alternative B	Traffic signal and turn lanes	3.0	1.5	3.0	1.0	0.0	2.0	1.0	11.5
	Alternative C	Roundabout	3.0	3.0	3.0	0.0	0.0	2.0	1.0	12.0
Summerfield Road	Alternative A	No Build	0.0	0.0	0.0	2.0	2.0	0.0	0.0	4.0
	Alternative B	Traffic signal and turn lanes	3.0	1.5	3.0	1.0	1.0	2.0	1.0	12.5
	Alternative C	Roundabout	3.0	3.0	3.0	0.0	0.0	2.0	0.0	11.0
New Market Lane/Wigeon Way	Alternative A	No Build	0.0	1.5	1.5	2.0	2.0	1.0	0.5	8.5
	Alternative B	Intersection geometric and signal phasing improvement	3.0	1.5	3.0	1.0	2.0	2.0	0.0	12.5
	Alternative C	Intersection geometric and signal phasing improvement	3.0	1.5	3.0	1.0	2.0	2.0	0.5	13.0
New Connections	Alternative A	Evergreen Road - Strawberry Lake Way to Jackson Road	1.5	1.5	1.5	1.0	1.0	1.0	0.5	8.0
	Alternative B	Summerfield Road	1.5	1.5	1.5	1.0	1.0	1.0	0.5	8.0
Multimodal Connections		*Category Weighting*	*3*	*3*	*3*	*2*	*2*	*2*	*3*	
	Alternative A	Shared-Use	3.0	0.0	3.0	0.0	0.0	2.0	3.0	11.0
	Alternative B	On-Road Bike Lane and Sidewalk	3.0	0.0	3.0	1.0	0.0	2.0	1.5	10.5

Intersection concepts carried forward, based on the results of the screening:

Maytime Drive

- Alternative B (provide pavement markings on the northbound approach to provide an exclusive left-turn lane and a shared through/right-turn lane) is easier to implement and offers safety benefits without jeopardizing operations.
- Alternative C (roundabout) has lower score than Alternative B due to its large footprint (impact to built and environmental features), poor LOS, and higher degree of difficulty to implement. It still provides safety benefits by reducing speeds and number of conflict points, and therefore was considered as an intersection alternative.

Symphony Lane

- Alternative B (signal phasing and timing improvements) offers safety and operational benefits without negative impacts to other criteria such as traffic operations, right-of-way and utility, and ease of implementation. Instead of restricting eastbound RTOR, a protected right-turn signal phase, restricting right turns on red while the westbound left-turn phase operates, was considered given the angle crash history increases at the intersection.

Macmullen Drive

- Alternatives B (traffic signal and turn lanes) mitigates the access issues from the side street and mainline left turns. The potential impact to existing build features from constructing a traffic signal is limited to utility relocation during construction.
- Alternative C (roundabout) operates at LOS F during the PM peak with a single lane, which is attributable to the projected high traffic volume in the westbound direction in year 2040; therefore, a two-lane roundabout would be needed and was advanced to the alternative analysis stage.
- Alternative D (Continuous-Green-T) mitigates access issues from the side street while allowing for uninterrupted westbound traffic flow on Waugh Chapel Road, with benefits from restricting left-turn movements into and out of Silver Way. This alternative reduces the number of conflict points at the intersection, but permissible left turns into and out of Chapel Creek Village still need to wait for gaps in through traffic on Waugh Chapel Road.

Summerfield Road

- Alternative B (traffic signal) mitigates the conflict issues from the side street and mainline left turns. The signalized intersection provides sufficient capacity to both mainline and side streets.
- Alternative C (roundabout) operates at LOS F during the PM peak in year 2040 and cannot provide sufficient capacity for westbound travel in the PM peak. It still provides marked safety benefits, and therefore was considered as an intersection alternative.

New Market Lane

- Both alternatives B and C involve improving the geometry and signal phasing at the intersection. Alternative B shows an increase in delay during the Saturday peak, which is attributable to the safety improvements (e.g. leading pedestrian interval, elimination of permissive phase for westbound left-turn etc.).
- Alternative C provides more capacity for the northbound approach (New Market Lane) out of Waugh Chapel shopping center and operates at a LOS comparable to No-Build conditions yet provides additional safety benefits over the No-Build condition.

The concepts that were deemed lower priority or less feasible, based on the screening, include the following:

- Adding a westbound right-turn lane at the Waugh Chapel Road / Maytime Drive intersection. This concept has considerable impact to the natural and built environments. It would be difficult to accommodate potential bicycle and pedestrian facilities within the existing ROW. Operations at this intersection do not justify a right-turn lane.
- Changing the northbound/southbound traffic signal phasing at the Symphony Lane/Silver Way intersection to split phasing. This concept will add notable delay to Waugh Chapel Road during both peak and off-peak periods. Upon review of the traffic volumes and the roadway network, it appears that residents to the north are already using Maytime Drive during peak hours as the primary access point, given the low southbound traffic volumes on Silver Way.
- Restricting right-turn-on-red (RTOR) for eastbound Waugh Chapel Road during the AM peak period at the Symphony Lane/Silver Way intersection. This concept would increase eastbound through and right-turn queues, although queues do not impact Maytime Drive intersection. It also would reduce the efficiency of eastbound traffic turning right with low opposing southbound through volume.

FUTURE TRAFFIC OPERATIONS RESULTS

Future (2040) Intersection Volumes

Intersection turning volumes were developed for 2040 No-Build conditions, as described in the Existing Conditions Report. It was assumed that the network connections previously discussed are excluded from the intersection alternative analysis such that a more conservative (high) traffic forecast is used for the intersection improvement analysis. The 2040 intersection volumes are shown in Figure 3 and Figure 4.

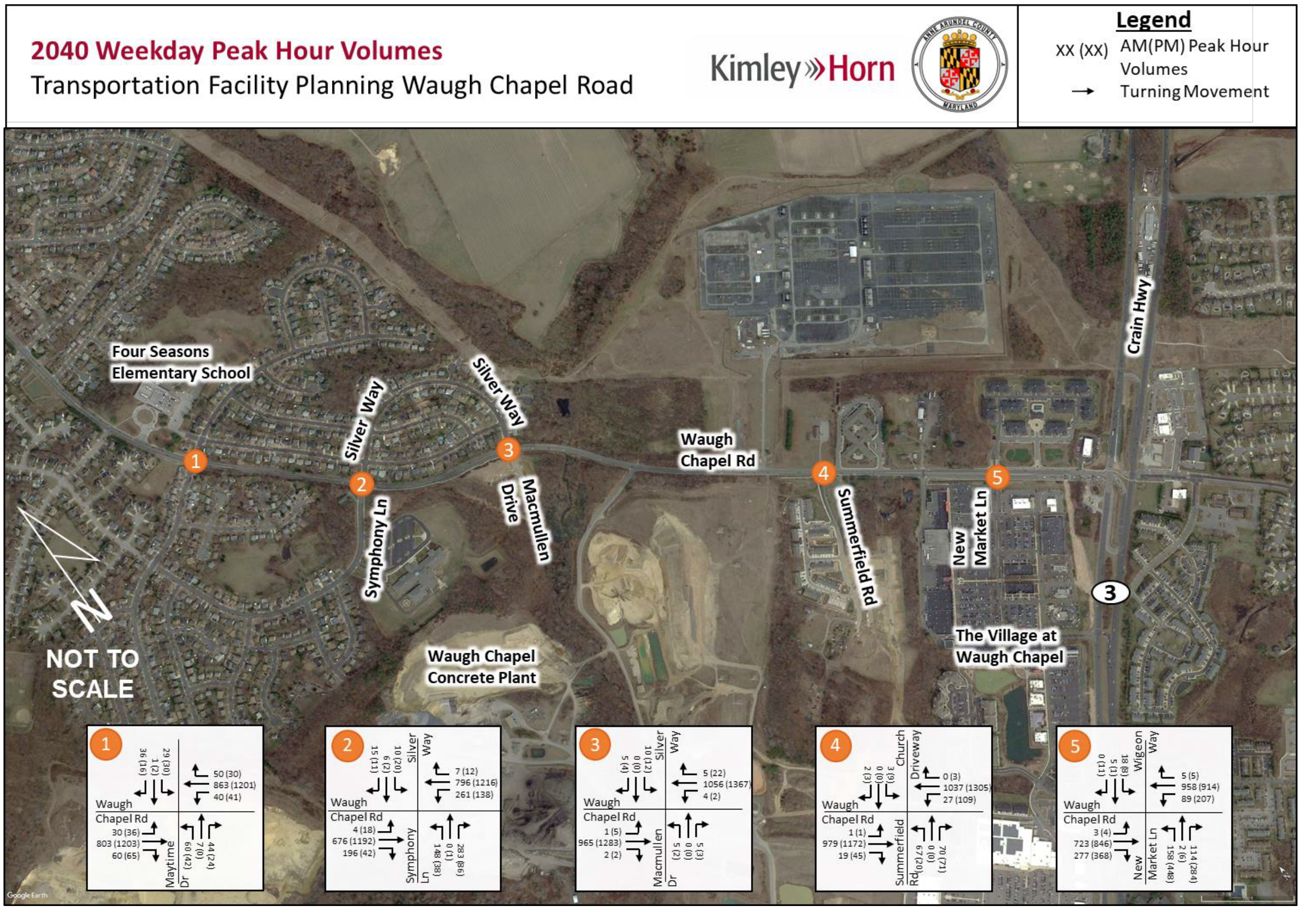

Figure 3. 2040 Weekday AM and PM Peak Hour Intersection Volumes

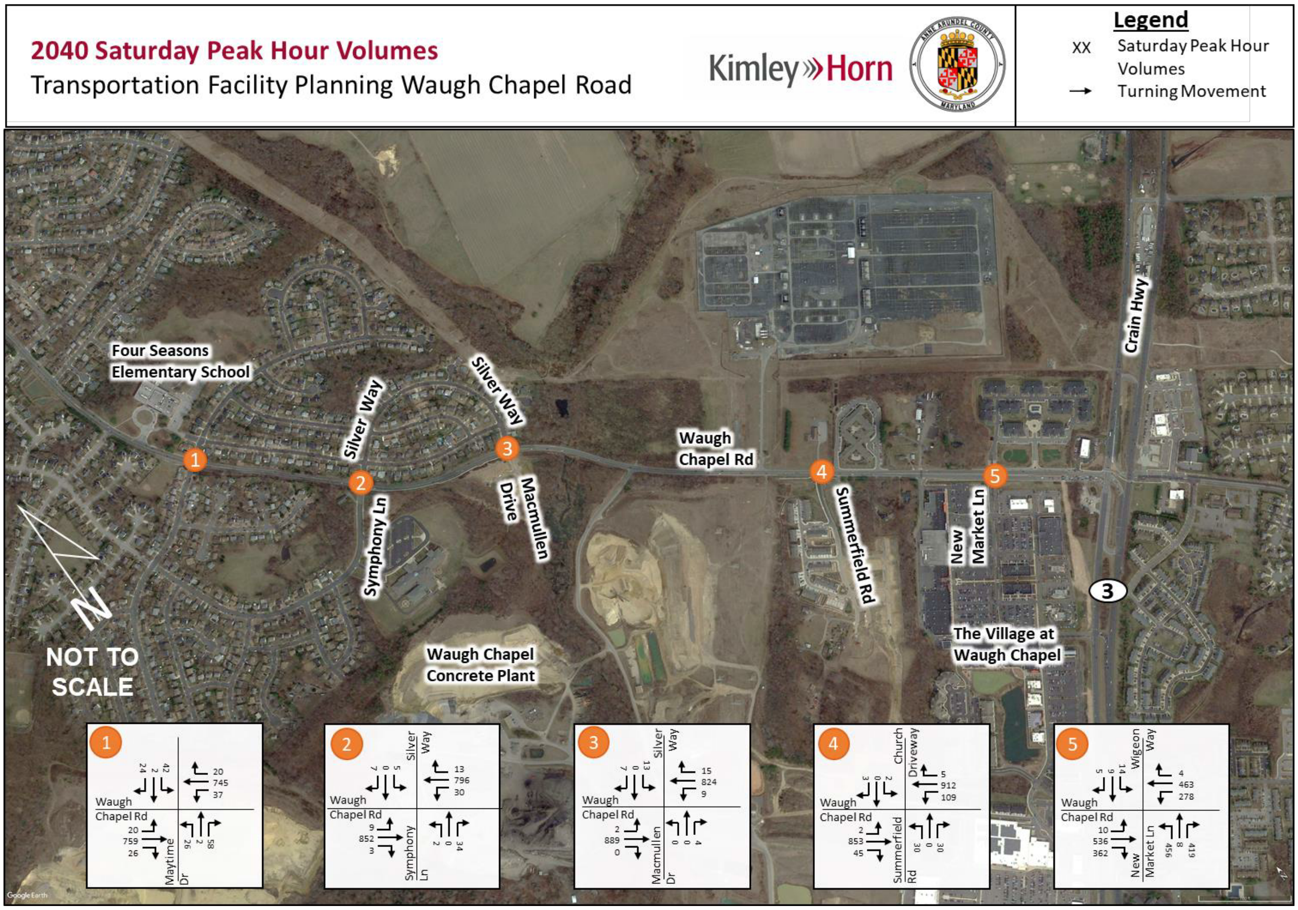

Figure 4. 2040 Saturday Peak Hour Intersection Volumes

Signal Warrant Analysis

A signal warrant analysis was performed using the projected 2040 traffic conditions at the two unsignalized intersections of Waugh Chapel Road at Silver Way / Macmullen Drive and at Summerfield Road. The findings of the signal warrant analysis are summarized as follows.

Silver Way/Macmullen Drive

Year-2040 traffic volumes do not meet the volume warrants for a traffic signal, per the MdMUTCD. This is primarily due to the low volumes on the side streets. However, safety remains a concern at this intersection due to the lack of adequate gaps for left-turn movements. Westbound left-turning traffic blocks the westbound through movement when waiting for gaps to turn, which may be a contributing factor in the occurrence of rear-end crashes at the intersection. As traffic demand grows, this could become more prevalent. As such, a traffic signal is recommended as an alternative to help improve safety and access. The signal warrant analysis worksheet is provided in **Appendix C**.

Summerfield Road

A traffic signal is warranted at this intersection under year-2040 volumes. The projected volumes on the side street upon the completion of the Summerfield community development are sufficiently high that the combination of mainline Waugh Chapel Road and side street volumes meet the minimum criteria for a sufficient number of hours throughout the day per the MdMUTCD. From a safety standpoint, a traffic signal will help mitigate potential left-turn conflicts as both left-turn and through volumes grow in 2040. Coordination will need to be conducted with the Summerfield Village developer so that they provide mitigation at full build-out in conjunction with the improvements stemming from this study.

Traffic Analysis Methodology

Traffic analyses were performed using Synchro© (version 9), a planning-level traffic analysis tool that uses Highway Capacity Manual (HCM) methodologies to calculate operational performance at signalized and unsignalized intersections. Highway Capacity Software© (HCS) was used to analyze operational performance for the two mid-block segments where volume and speed data were collected. The following measures of effectiveness (MOE) were considered for this study:

- Movement/approach/overall intersection delay;
- Movement/approach/overall intersection LOS; and
- 95th-percentile movement/approach queues, based on Synchro HCM outputs
- Roadway segment LOS

HCM defines LOS for signalized and unsignalized intersections as a function of average vehicle delay. LOS may be calculated per movement or per approach for any intersection configuration, but overall intersection LOS is only defined for signalized and all-way stop-controlled intersections. Overall intersection LOS is not reported for two-way stop-controlled intersections. Table 3 summarizes the LOS designations for both signalized and unsignalized intersections based on vehicle delay. The future conditions LOS, delay, and queuing analyses for the AM, PM, and Saturday peak hours are discussed in the following sections.

Table 3: LOS and Delay Thresholds

Level of Service (LOS)	Signalized Delay (seconds)	Unsignalized Delay (seconds)	General Description
A	≤ 10	0-10	Free flow
B	$> 10 - 20$	>10-15	Stable flow (slight delays)
C	$> 20 - 35$	>15-25	Stable flow (acceptable delays)
D	$> 35 - 55$	>25-35	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	$> 55 - 80$	>35-50	Unstable flow (intolerable delay)
F	> 80	>50	Forced flow (congested and queues fail to clear)

In addition to the LOS and delay MOEs, SimTraffic 95th-percentile queues per movement were also evaluated. 95th-percentile queues are particularly useful for traffic operation evaluations, as they represent the maximum queue lengths that are anticipated 95% of the time at each location, which should be accounted for in the design considerations, while removing potentially extreme queuing condition (rare and outlier condition)..

SIDRA (version 7) was used to analyze traffic operations for the proposed roundabout concepts. SIDRA evaluates the traffic operations at each intersection in an isolated environment considering geometric elements, such as lane geometry, center island and roadway radii, advisory speeds, and vehicle volumes and distribution characteristics. The analysis provides a macroscopic evaluation of roundabout operations independent of network conditions upstream or downstream of the roundabout. LOS values are based on the SIDRA standards and methodologies and not HCM.

Intersection Analysis Results

The intersection delay and LOS results for Alternatives B and C for each intersection are summarized in Table 4, along with the No-Build results. Detailed delays, LOS results, and queue lengths by movement and approach are provided in **Appendix C**.

Table 4. 2040 Future Conditions Intersection Delay and LOS

Intersection	No-Build (Alternative A)			Alternative B			Alternative C			Alternative D		
	AM	PM	SAT	AM	PM	SAT	AM	PM	SAT	AM	PM	SAT
	LOS (Delays: seconds/vehicle)											
Waugh Chapel Road/Maytime Drive	B (15.4)	B (17.5)	B (11.6)	Revised markings and signal improvements			Single-lane roundabout					
				B (15.7)	C (34.7)	B (14.7)	C (25.4)	F (113.3)	B (14.9)			
Waugh Chapel Road/Symphony Lane	E (56.2)	C (20.7)	A (5.6)	Signal improvements			-	-	-			
				C (25.5)	B (18.4)	A (6.2)						
Waugh Chapel Road/Macmullen Drive	Excessive delay on side streets	Excessive delay on side streets	Excessive delay on side streets	Revised markings and signal improvements			Two-lane roundabout			Continuous Green-T		
				B (15.3)	D (46.3)	B (10.8)	A (0.1)	A (0.1)	A (0.1)	C (22.7)	F (70.4)	C (17.5)
Waugh Chapel Road/Summerfield Road	Excessive delay on side streets	Excessive delay on side streets	Excessive delay on side streets	Revised markings and signal improvements			Single-lane roundabout					
				B (15.7)	C (34.7)	B (14.7)	A (4.1)	F (54.2)	A (3.8)			
Waugh Chapel Road/New Market Lane	B (15.5)	C (25.4)	C (28.7)	Geometric and signal improvements			Geometric and signal improvements					
				B (17.4)	C (29.8)	D (42.3)	B (16.6)	C (26.4)	C (31.5)			

General note: Roundabout LOS and delay based on SIDRA method not HCM;

Maytime Drive

The alternatives primarily aim to address concerns related to left-turn conflicts since there are no notable traffic operational issues that need to be addressed. Alternative B (provide pavement markings on the northbound approach to provide an exclusive left-turn lane and a shared through/right-turn lane) provides safety benefits without significantly increasing delay. Alternative C (roundabout) provides speed management opportunities but fails to maintain traffic operations at acceptable LOS during PM peak in 2040.

Symphony Lane

The optimized signal timing under Alternative B provides a benefit to traffic operations over the 2040 No-Build condition in 2040 in AM peak. The signal design for a protected right-turn phase functions similarly to allowing right-turn-on-red currently from a capacity point of view while mitigating the potential conflicts between heavy eastbound right turns and westbound left turns in the morning peak.

Macmullen Drive

All three alternatives, Alternative B (traffic signal), Alternative C (two-lane roundabout), and Alternative D (Continuous Green-T), provide improvements over No-Build conditions for the side streets, mitigating access issues for the side streets and mainline left turns. Alternative C (single-lane roundabout) operates at LOS F and results in substantial queuing on westbound Waugh Chapel Road during the PM peak, which is attributable to the projected high demand in the westbound direction. Without additional network connection improvements and subsequent traffic volume diversion from Waugh Chapel Road, a single-lane roundabout will not provide sufficient capacity for the Waugh Chapel Road mainline under year-2040 forecasted volumes. Therefore, a two-lane roundabout was proposed for alternative analysis and comparison. The two-lane roundabout concept has two variations in pavement markings: 1) full striping: two-lane through movements in each direction with one circulating lane and 2) partial striping: two-lane through movements for the westbound direction, one-lane through movement for the eastbound direction, and one circulating lane. Both lane configurations would provide sufficient capacity for mainline through traffic in the AM and PM peak periods. From a design perspective, the desirable configuration would be a a full two-lane roundabout; however, the concept will impact the built and natural environment based on preliminary assessment and the full impact will be assessed in the future effort if project is advanced for development. Under Alternative D (Continuous-Green-T), traffic exiting Chapel Creek Village on Macmullen Drive experiences high delays in the PM peak due to high conflicting eastbound through volumes.

Summerfield Road

Both Alternative B and Alternative C provide marked improvement over No-Build conditions, mitigating access concerns for side-street mainline left-turn traffic. Alternative C (roundabout) operates at LOS F during the PM peak and cannot provide sufficient capacity for westbound travel in PM peak. The signalized intersection provides sufficient capacity on the mainline and overall intersection operations, while the side street (Summerfield Development) would experience high delays (LOS E) during the PM and Saturday peak.

New Market Lane

Alternative B shows an increase in delay during the Saturday peak, which is attributable to the safety improvements (e.g. leading pedestrian interval, elimination of permissive phase for westbound left-turn movement). Alternative C provides more capacity for the northbound approach (New Market Lane) out of

Waugh Chapel shopping center and operates at a LOS comparable to No-Build conditions yet provides additional safety benefits over the No-Build condition.

Roadway Segment Analysis (HCS)

The roadway segment analysis for year-2040 conditions was provided in the Existing Conditions Report and is summarized in Table 3 below. The future traffic forecast for the link volumes assumes the same traffic demand volumes for No-Build and Build alternatives since there is no added lane capacity proposed for Waugh Chapel Road. Network connection alternatives were excluded from the roadway segment analysis at this time due to limitations of the Baltimore Metropolitan Council (BMC) travel demand model related to the Summerfield connection (discussed in the next section) and the disturbance of parkland associated with a future Evergreen connection.

All three segments operate at LOS E in both the AM and PM peaks. The peak-hour demand on Waugh Chapel Road is projected to be heavy for a two-lane roadway.

Table 5: 2040 No-Build HCS Two-Lane Peak Hour LOS Results

Peak Hour	Direction	Segment 1	Segment 2	Segment 3
		Maytime Drive to Symphony Lane	Symphony Lane to Silver Way / Macmullen Drive	Silver Way / Macmullen Drive to Summerfield Road
AM	Eastbound	E	E	E
	Westbound	E	E	E
PM	Eastbound	E	E	E
	Westbound	E	E	E

*Speed data from segments 1 and 3 were used to estimate the segment 2 speeds for the HCS analysis.

NETWORK ALTERNATIVE ANALYSIS

Using the year-2040 BMC regional travel demand model (Version 44C) acquired during the existing conditions phase of this study (See *Existing Conditions Report*, May 2018), the study team added new roadway connections to the BMC model to test diversions from Waugh Chapel Road to alternative network connections. The two network alternative connections evaluated were: 1) Evergreen Road to Strawberry Lake Way and 2) Summerfield Road to Waugh Chapel Shopping Center.

The roadway network changes in the BMC model with the Evergreen Road connection assume the following conditions:

- Evergreen Road provides a connection between Strawberry Lake Way and existing Evergreen Road west of MD 3.
- Evergreen is a two-lane collector road
- Speed limit on Evergreen Road is 25 mph (assumption made to other collectors coded in the BMC model in the study area)

Based on the changes in model daily volumes shown in Figure 5, traffic diversion patterns are summarized as follows.

- The Evergreen Road extension diverts traffic from MD 175 and Patuxent Road / Conway Road in addition to Waugh Chapel Road
- The amount of daily traffic diverted from the three parallel roadway facilities is comparable
    - 2,900 vehicles diverted from MD 175

  - 2,440 vehicles diverted from Waugh Chapel Road (primarily traffic from west of the study area that currently uses Waugh Chapel Road to access MD 3)
  - 2,300 vehicles diverted from Patuxent Road / Conway Road (average)
- The Strawberry Lake Way daily volume increases by 4,000 vehicles north of the Evergreen Road connection and 3,600 vehicles south of the connection
- There is little-to-no induced demand on the new facility

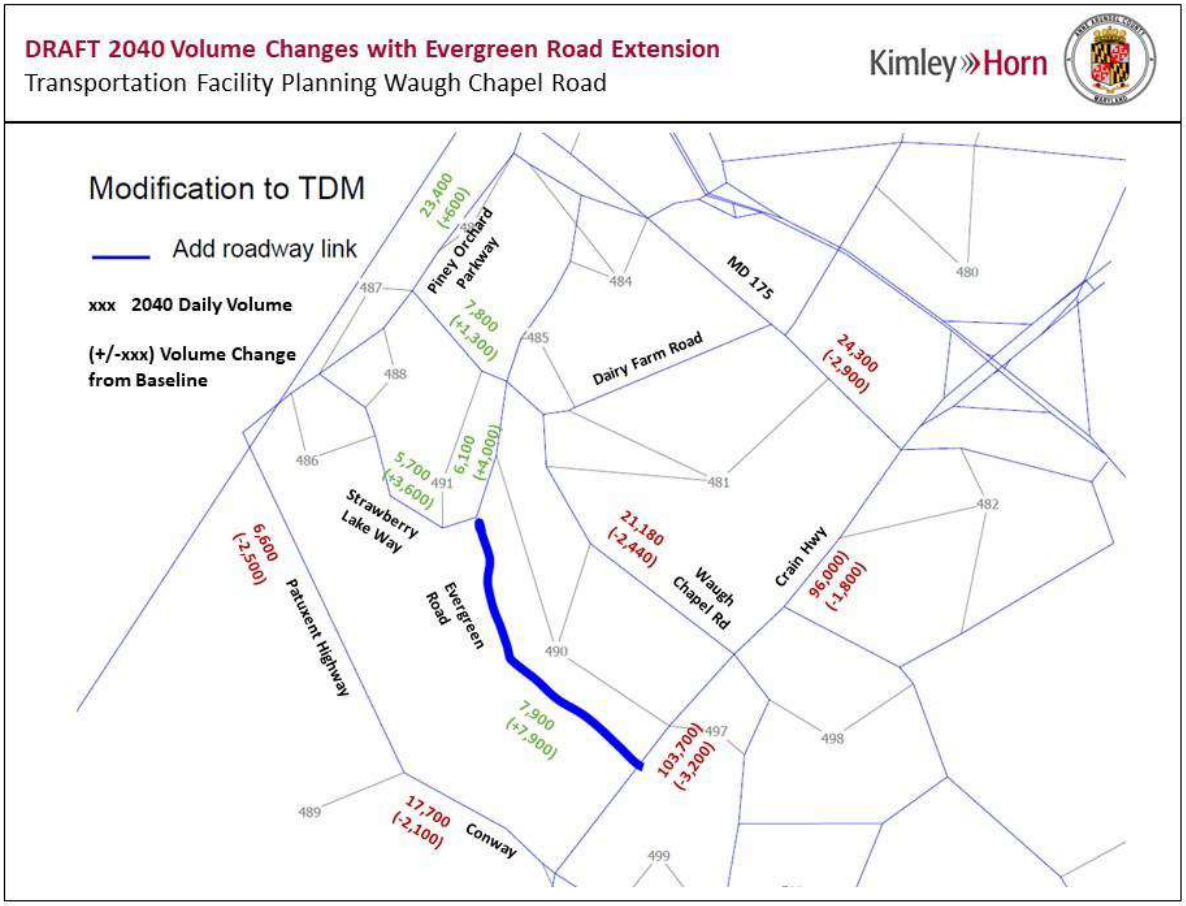

Figure 5. 2040 Daily Volumes - Evergreen Road Extension

The results from the Summerfield Road connection model run show that the BMC model is not able to calculate any volume diversion because of the large traffic analysis zone (TAZ) (#490 shown in Figure 5) used to represent the entire area south of Waugh Chapel Road between Strawberry Lake Way and MD 3. A TAZ represents a geographic boundary of potential future land use. Vehicular trip generation and attraction is developed at the TAZ level and assigned via the centroid connectors that link the TAZ centroid to the adjacent roadway network. Because this area includes future residential and commercial development, further refinement of TAZs and centroid connections, as part of a separate effort, are needed to improve the traffic loading in the model to obtain relevant resulting traffic volumes.

Chapter 3 Preferred Alternatives and Cost Estimate

Several alternatives were screened and evaluated to accommodate future traffic conditions. As described in the previous section, there were various criteria considered, including safety, speed management, pedestrian and bicycle access, ease of implementation, right-of-way impact, and operations. The improvement alternatives advanced from the screening process described in Chapter 2 were presented at a public meeting held at the Waugh Chapel Elementary School. Public comments received from the community members at the meeting and via email are provided in the appendices. After reviewing the results of the screening process, discussions with the County, and public comments, the study resulted in options carried forward for intersection, bicycle and pedestrian improvements, and future connections as described in this chapter.

INTERSECTIONS

The preferred intersection improvements range from installing pavement markings to geometric changes and traffic signalization. The alternatives advanced for further consideration and development are described in this section. Figure 6 through Figure 11 provide high-level conceptual layouts for each preferred alternative, planning level cost estimates, project phasing, and project benefits summaries.

Maytime Drive

Minor improvements at this intersection are intended to help vehicles exiting Maytime Drive turn left onto Waugh Chapel Road by providing a protected left-turn phase. This protected phase will improve the safety of the left-turning movement by eliminating the conflict with through and right-turning vehicles from Maytime Drive. Left-turning vehicles would still be allowed to turn left on the permissive phase after the protected phase. In concert with this change, the northbound approach should be marked to provide a separate left turn lane and a shared through/right turn lane. This lane designation would match the existing southbound approach.

Concept-Level Planning Estimate for Improvements: $35,200

Symphony Lane/Silver Way

Improvements at this intersection are intended to improve safety and reduce delay, particularly during the peak arrival and departure times associated with the School of the Incarnation. The morning arrival time for students coincides with the AM commuting peak hour, causing congestion at this intersection. The heaviest time lasts approximately 15 minutes and residual delay was observed along Waugh Chapel Road, particularly in the eastbound direction between Maytime Drive and Symphony Lane. This is due to the competing demand for green time from westbound left-turning vehicles entering the school, northbound vehicles exiting the school, and eastbound traffic entering the school as well as through traffic on Waugh Chapel Road. Additional traffic growth along Waugh Chapel Road will exacerbate this condition. Improvements at this intersection include adjusting signal timing, as needed, to reflect changes in traffic volumes along Waugh Chapel Road. This could include reducing the amount of green time for the northbound and southbound approaches of Symphony Lane and Silver Way and increasing the amount of time for the eastbound approach. In addition, based on field observations, it is recommended to monitor this intersection for installation of a protected eastbound right turn signal to reduce conflicts and near-misses with westbound left-turning vehicles.

Concept-Level Planning Estimate for Improvements: $31,000

Macmullen Drive/Silver Way

The goal of the recommendations considered at this intersection is to improve safety and access for traffic exiting and entering the side streets, particularly Macmullen Drive. Vegetation along the south side of Waugh Chapel Road limits the sight distance for traffic exiting the southern approach (Chapel Creek Village). Trimming and removing vegetation within the sight lines would be a first step to improvements. Beyond improving sightlines, installing a westbound left turn lane into Macmullen Drive would provide turning vehicles with an area to wait for an appropriate gap to turn left, without blocking the westbound through traffic on Waugh Chapel Road. Following those improvements, monitoring crash history and operations in the area was recommended by the study team to help determine if additional traffic control or geometric improvements are necessary. Three alternatives (see **Appendix D**) were presented during the public meeting:

- Modified continuous green T[1]
- Roundabout
- Traffic signal

The roundabout received the most support during the public comment process, followed by the modified continuous green T and the traffic signal. While there are several benefits to the roundabout, such as slowing traffic and reducing turning movement conflicts, the area required for the roundabout is extensive. To accommodate the through and turning traffic, as well as pedestrians, and the drainage and utilities in the area, it is possible that the two single family homes on the corners of Silver Way would be impacted as well as one of the residential units at Chapel Creek Village. To avoid the possible impacts, the County's desire is to monitor traffic volumes and crash history in this area to determine if a traffic signal is warranted. While the modified continuous green T received public support, some concern was raised relating to the interaction between this intersection and the westbound left turn lane into Symphony Lane. The County may consider this design and operations in the future as a potential interim solution. The preferred alternative concepts for a traffic signal and a roundabout are laid out in the project summary sheets below (Figure 8 and Figure 9).

Concept-Level Planning Estimate for Improvements: $517,100 (traffic signal); $2,214,200 (roundabout)

Summerfield Road

As the Summerfield community continues to develop, as well as the surrounding area, including traffic on Waugh Chapel Road, access into and out of the development will become more difficult. Future traffic volume forecasts indicate that a traffic signal is warranted at this location. In addition, adding a westbound left turn lane will help facilitate traffic operations and allow westbound through traffic to continue on Waugh Chapel Road without maneuvering around turning vehicles. During the first public meeting, residents of Summerfield expressed concern over installing a traffic signal at the entrance and the potential for cut-through traffic. Public comment regarding Summerfield Road at the second public meeting was centered around concerns over connecting Summerfield Road to Waugh Chapel Shopping Center and therefore creating a through street in the development. Monitoring traffic operations, traffic volume, and crash history will help determine the appropriate timing and type of traffic control for this intersection.

Concept-Level Planning Estimate for Improvements: $444,500 (traffic signal)

New Market Lane/Wigeon Way

Improvements at this intersection are intended to ease pedestrian crossing and reduce left turn crash risks, while maintaining reasonable levels of service as traffic volumes grow in the future. Changing the

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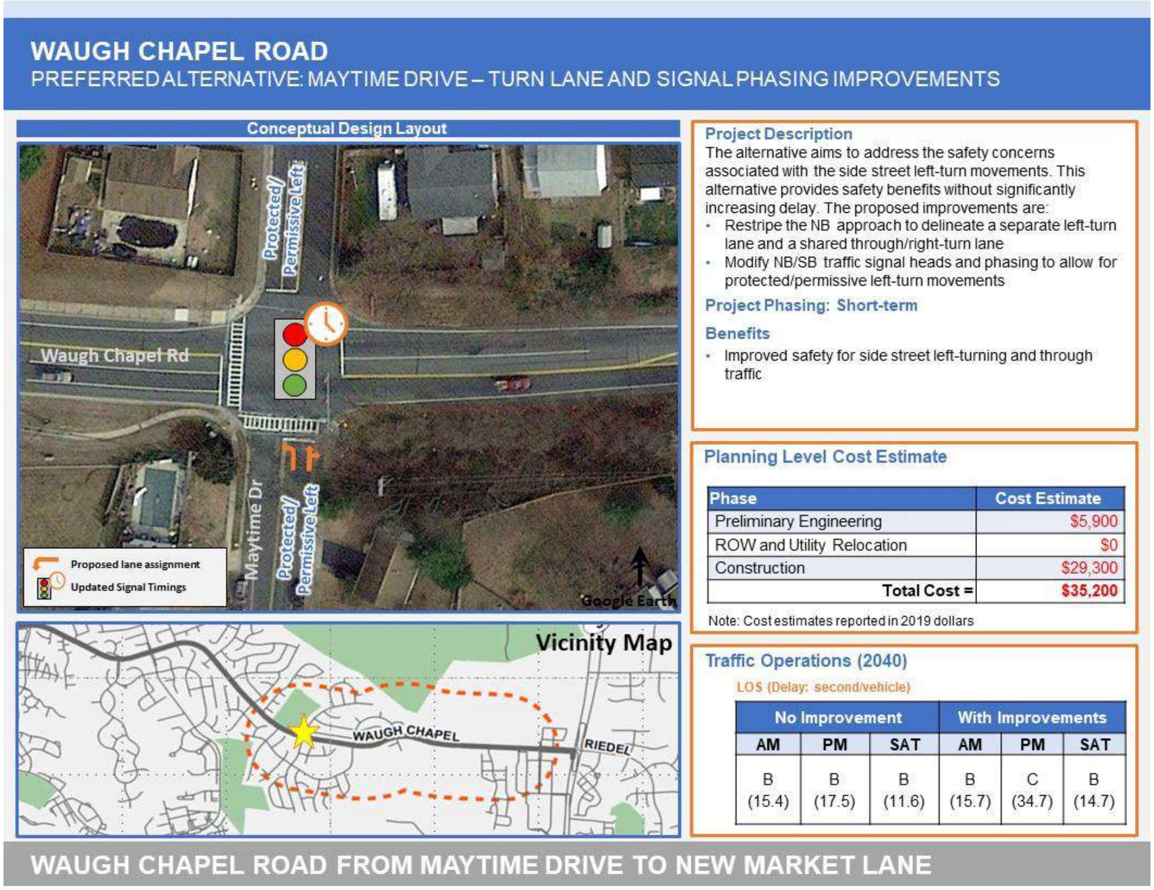
[1] A typical continuous green T intersection consists of a traffic signal that controls the flow of the two opposing movements. The modified continuous green T concept proposes an unsignalized intersection.

eastbound and westbound left turn movements to protected only (eliminating the permissive left turn), improves safety and reduces the likelihood of crashes involving left-turns by providing a stronger traffic control regulation for the movement. As part of this change, the westbound left turn lane would be extended by 200’ to provide additional storage. In addition, consideration should be given to changing the marking and signage along the westbound outside curb lane to a shared through/right turn lane into Wigeon Way. Additional data will be collected in the supplemental analysis to confirm traffic behavior on the outside curb lane (e.g., lane changes, speed etc.). For the northbound approach, widening the approach to accommodate dual left turn lanes, a shared through/right turn lane, and an exclusive right turn lane would enable this approach to run concurrently with the southbound approach, rather than split phase. Protected left turns are also recommended for the northbound and southbound approaches to minimize turning conflicts. Finally, providing a leading pedestrian interval will help pedestrians cross Waugh Chapel Road. This provides a safe crossing for pedestrians accessing the shopping center or getting to the northside of Waugh Chapel Road to connect to pedestrian crossings over MD-3. Additional study of this intersection and interaction with the traffic signal at MD 3 may be necessary to further study operational impacts of these improvements.

Concept-Level Planning Estimate for Improvements: $284,800



WAUGH CHAPEL ROAD
PREFERRED ALTERNATIVE: MAYTIME DRIVE – TURN LANE AND SIGNAL PHASING IMPROVEMENTS

Project Description

The alternative aims to address the safety concerns associated with the side street left-turn movements. This alternative provides safety benefits without significantly increasing delay. The proposed improvements are:

- Restripe the NB approach to delineate a separate left-turn lane and a shared through/right-turn lane
- Modify NB/SB traffic signal heads and phasing to allow for protected/permissive left-turn movements

Project Phasing: Short-term

Benefits

- Improved safety for side street left-turning and through traffic

Planning Level Cost Estimate

Phase	Cost Estimate
Preliminary Engineering	$5,900
ROW and Utility Relocation	$0
Construction	$29,300
Total Cost =	**$35,200**

Note: Cost estimates reported in 2019 dollars

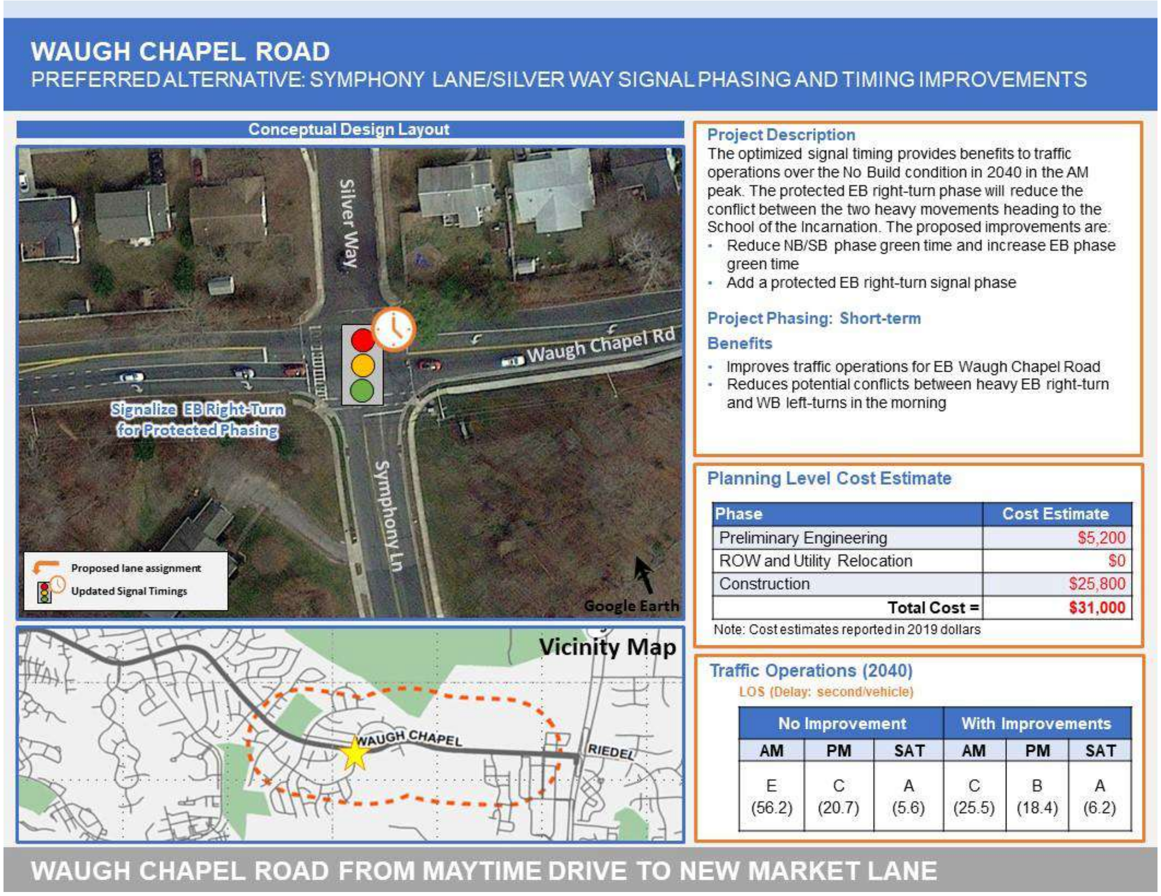
Traffic Operations (2040)

LOS (Delay: second/vehicle)

No Improvement			With Improvements		
AM	PM	SAT	AM	PM	SAT
B (15.4)	B (17.5)	B (11.6)	B (15.7)	C (34.7)	B (14.7)

WAUGH CHAPEL ROAD FROM MAYTIME DRIVE TO NEW MARKET LANE

Figure 6. Project Summery for the Preferred Alternative at Maytime Drive/Waugh Chapel Road Intersection



WAUGH CHAPEL ROAD

PREFERRED ALTERNATIVE: SYMPHONY LANE/SILVER WAY SIGNAL PHASING AND TIMING IMPROVEMENTS

Project Description

The optimized signal timing provides benefits to traffic operations over the No Build condition in 2040 in the AM peak. The protected EB right-turn phase will reduce the conflict between the two heavy movements heading to the School of the Incarnation. The proposed improvements are:

- Reduce NB/SB phase green time and increase EB phase green time
- Add a protected EB right-turn signal phase

Project Phasing: Short-term

Benefits

- Improves traffic operations for EB Waugh Chapel Road
- Reduces potential conflicts between heavy EB right-turn and WB left-turns in the morning

Planning Level Cost Estimate

Phase	Cost Estimate
Preliminary Engineering	$5,200
ROW and Utility Relocation	$0
Construction	$25,800
Total Cost =	**$31,000**

Note: Cost estimates reported in 2019 dollars

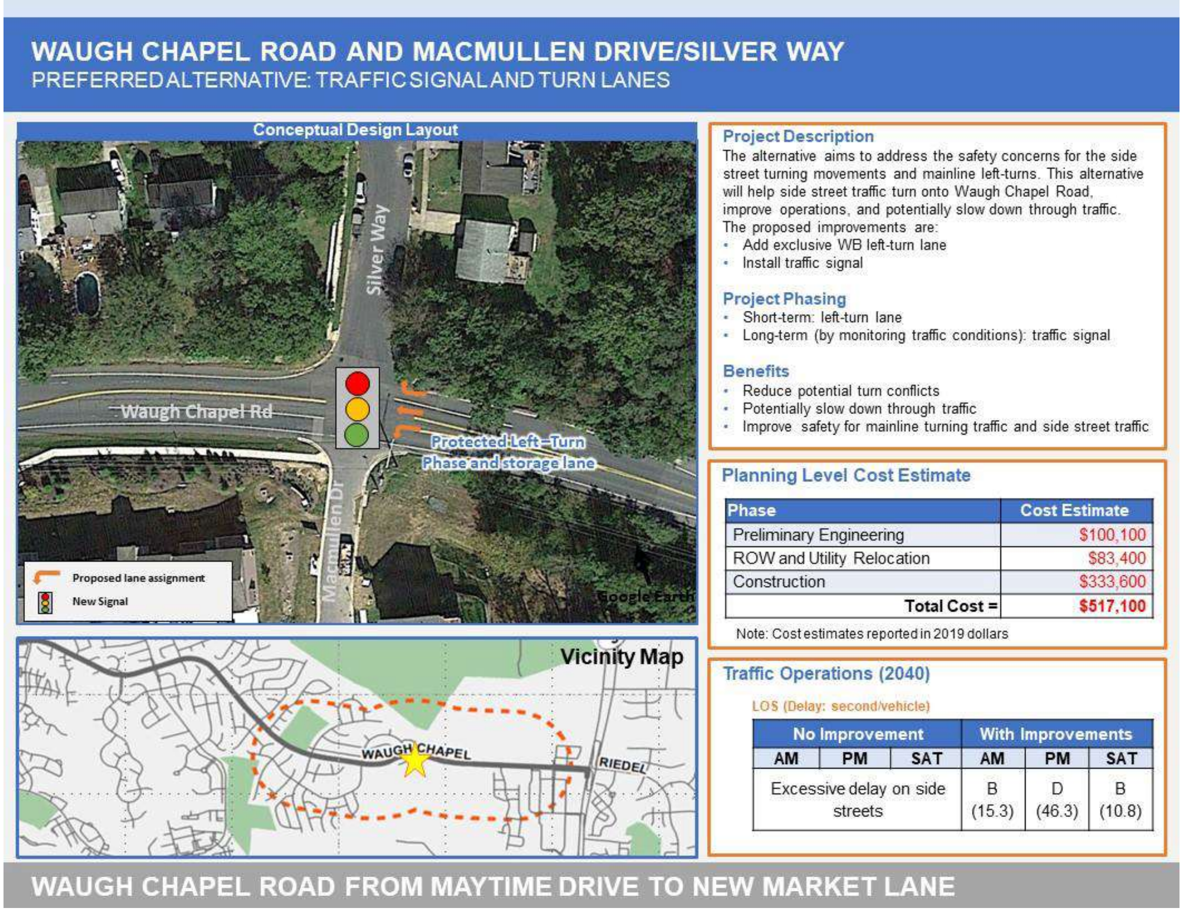
Traffic Operations (2040)

LOS (Delay: second/vehicle)

No Improvement			With Improvements		
AM	PM	SAT	AM	PM	SAT
E (56.2)	C (20.7)	A (5.6)	C (25.5)	B (18.4)	A (6.2)

WAUGH CHAPEL ROAD FROM MAYTIME DRIVE TO NEW MARKET LANE

Figure 7. Project Summery for the Preferred Alternative at Symphony Lane/Waugh Chapel Road Intersection



WAUGH CHAPEL ROAD AND MACMULLEN DRIVE/SILVER WAY

PREFERRED ALTERNATIVE: TRAFFIC SIGNAL AND TURN LANES

Conceptual Design Layout

Project Description

The alternative aims to address the safety concerns for the side street turning movements and mainline left-turns. This alternative will help side street traffic turn onto Waugh Chapel Road, improve operations, and potentially slow down through traffic. The proposed improvements are:

- Add exclusive WB left-turn lane
- Install traffic signal

Project Phasing

- Short-term: left-turn lane
- Long-term (by monitoring traffic conditions): traffic signal

Benefits

- Reduce potential turn conflicts
- Potentially slow down through traffic
- Improve safety for mainline turning traffic and side street traffic

Planning Level Cost Estimate

Phase	Cost Estimate
Preliminary Engineering	$100,100
ROW and Utility Relocation	$83,400
Construction	$333,600
Total Cost =	**$517,100**

Note: Cost estimates reported in 2019 dollars

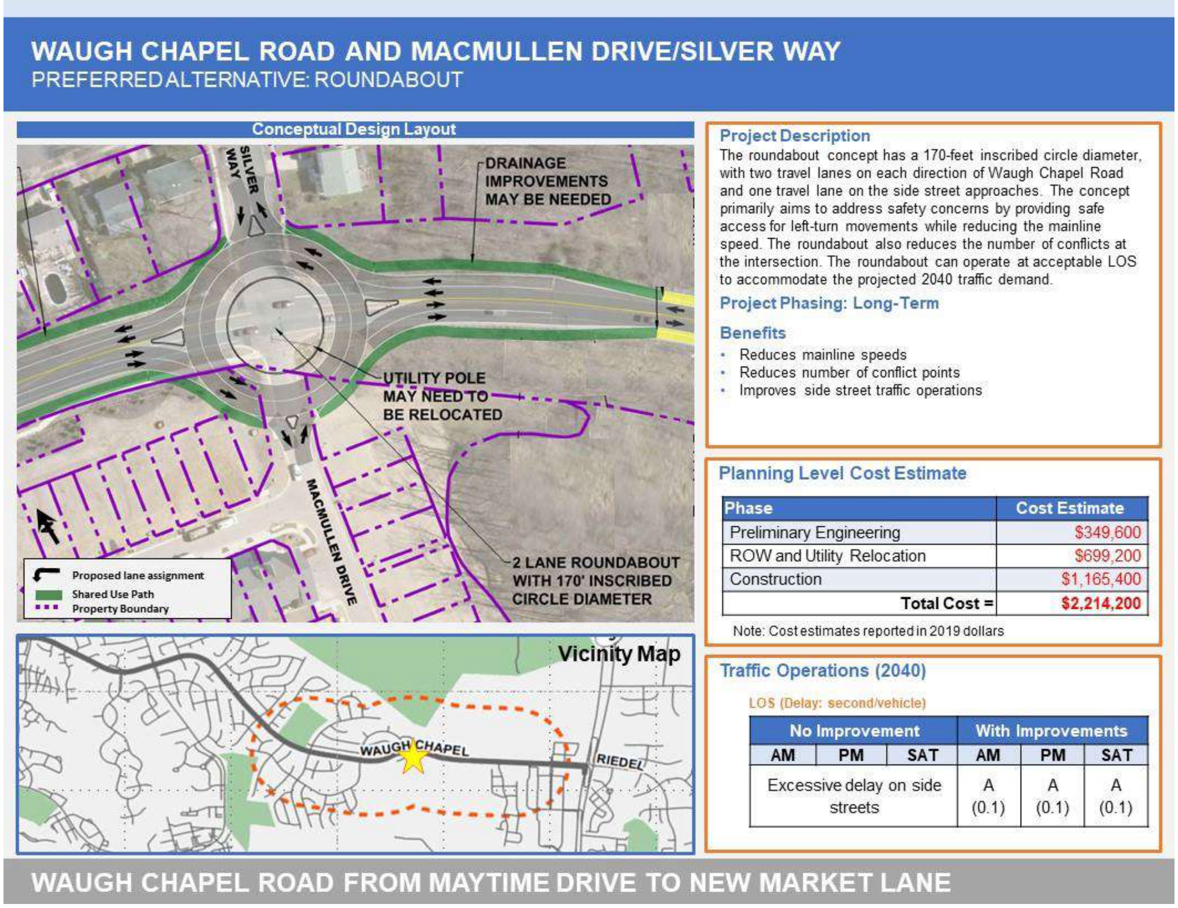
Traffic Operations (2040)

LOS (Delay: second/vehicle)

No Improvement			With Improvements		
AM	PM	SAT	AM	PM	SAT
Excessive delay on side streets			B (15.3)	D (46.3)	B (10.8)

WAUGH CHAPEL ROAD FROM MAYTIME DRIVE TO NEW MARKET LANE

Figure 8. Project Summery for the Preferred Alternative (Signal) at Macmullen Drive/Waugh Chapel Road Intersection



WAUGH CHAPEL ROAD AND MACMULLEN DRIVE/SILVER WAY

PREFERRED ALTERNATIVE: ROUNDABOUT

Conceptual Design Layout

Project Description

The roundabout concept has a 170-feet inscribed circle diameter, with two travel lanes on each direction of Waugh Chapel Road and one travel lane on the side street approaches. The concept primarily aims to address safety concerns by providing safe access for left-turn movements while reducing the mainline speed. The roundabout also reduces the number of conflicts at the intersection. The roundabout can operate at acceptable LOS to accommodate the projected 2040 traffic demand.

Project Phasing: Long-Term

Benefits

- Reduces mainline speeds
- Reduces number of conflict points
- Improves side street traffic operations

Planning Level Cost Estimate

Phase	Cost Estimate
Preliminary Engineering	$349,600
ROW and Utility Relocation	$699,200
Construction	$1,165,400
Total Cost =	**$2,214,200**

Note: Cost estimates reported in 2019 dollars

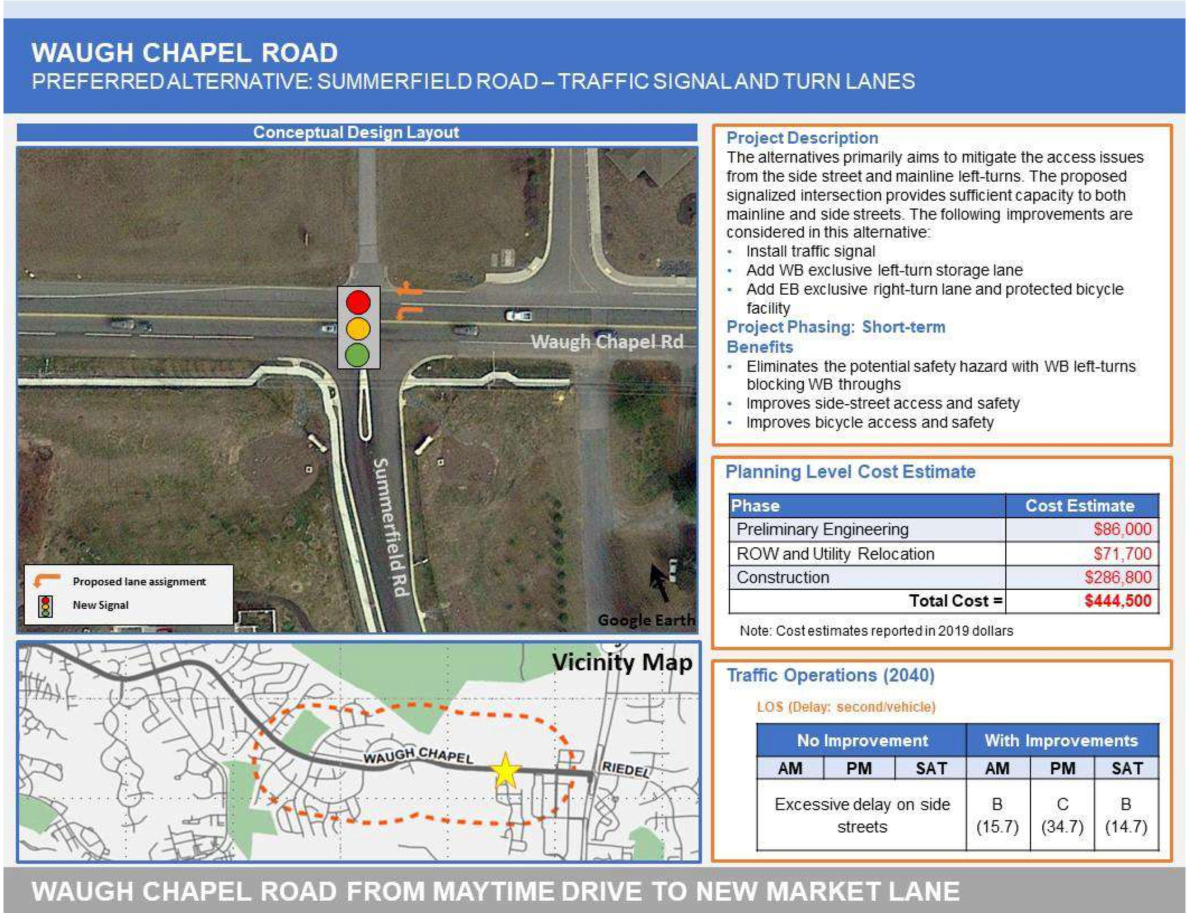
Traffic Operations (2040)

LOS (Delay: second/vehicle)

No Improvement			With Improvements		
AM	PM	SAT	AM	PM	SAT
Excessive delay on side streets			A (0.1)	A (0.1)	A (0.1)

WAUGH CHAPEL ROAD FROM MAYTIME DRIVE TO NEW MARKET LANE

Figure 9. Project Summery for the Preferred Alternative (Roundabout) at Macmullen Drive/Waugh Chapel Road Intersection



WAUGH CHAPEL ROAD

PREFERRED ALTERNATIVE: SUMMERFIELD ROAD – TRAFFIC SIGNAL AND TURN LANES

Conceptual Design Layout

Project Description

The alternatives primarily aims to mitigate the access issues from the side street and mainline left-turns. The proposed signalized intersection provides sufficient capacity to both mainline and side streets. The following improvements are considered in this alternative:

- Install traffic signal
- Add WB exclusive left-turn storage lane
- Add EB exclusive right-turn lane and protected bicycle facility

Project Phasing: Short-term

Benefits

- Eliminates the potential safety hazard with WB left-turns blocking WB throughs
- Improves side-street access and safety
- Improves bicycle access and safety

Planning Level Cost Estimate

Phase	Cost Estimate
Preliminary Engineering	$86,000
ROW and Utility Relocation	$71,700
Construction	$286,800
Total Cost =	**$444,500**

Note: Cost estimates reported in 2019 dollars

Traffic Operations (2040)

LOS (Delay: second/vehicle)

No Improvement			With Improvements		
AM	PM	SAT	AM	PM	SAT
Excessive delay on side streets			B (15.7)	C (34.7)	B (14.7)

WAUGH CHAPEL ROAD FROM MAYTIME DRIVE TO NEW MARKET LANE

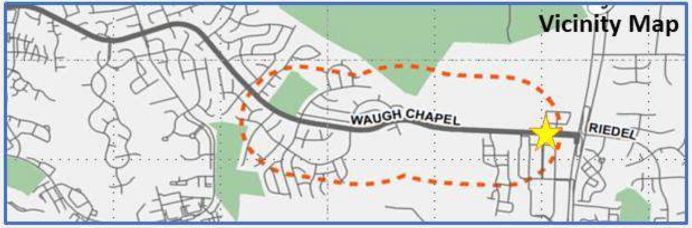
Figure 10. Project Summery for the Preferred Alternative at Summerfield Road/Waugh Chapel Road Intersection

WAUGH CHAPEL ROAD

PREFERRED ALTERNATIVE: NEW MARKET LANE/WIGEON WAY – INTERSECTION GEOMETRIC AND SIGNAL PHASING IMPROVEMENTS

Conceptual Design Layout

Vicinity Map



Project Description

This alternative will help pedestrians cross Waugh Chapel Road safely, improve operational efficiency, and address the safety concerns relating to left turns at the intersection. The proposed improvements are:

- Change EB/WB left-turn phases to protected only
- Extend westbound left-turn lane storage length by 200 feet
- Change WB right-most lane to a shared through/right
- Offset NB/SB approach and restripe NB approach
- Change NB/SB signal to protected left-turn phasing
- Provide leading pedestrian interval

Project Phasing

- Short-term: Change EB/WB phasing to protected only and leading pedestrian interval
- Long-term: All other improvements

Benefits

- Eliminates WB continuous right-turn lane
- Improves pedestrian safety
- Improves operations by eliminating the side street split phasing

Planning Level Cost Estimate

Phase	Cost Estimate
Preliminary Engineering	$41,700
ROW and Utility Relocation	$104,200
Construction	$138,900
Total Cost =	$284,800

Note: Cost estimates reported in 2019 dollars

Traffic Operations (2040)

LOS (Delay: second/vehicle)

No Improvement			With Improvements		
AM	PM	SAT	AM	PM	SAT
B (15.5)	C (25.4)	C (28.7)	B (16.6)	C (26.4)	C (31.5)

WAUGH CHAPEL ROAD FROM MAYTIME DRIVE TO NEW MARKET LANE

Figure 11. Project Summery for the Preferred Alternative at New Market Lane/Wigeon Way/Waugh Chapel Road Intersection

BICYCLE AND PEDESTRIAN CONNECTIONS

The lack of connected sidewalks on Waugh Chapel road in the study area is a critical gap in the transportation network, and the impetus for this study. Several connection options were presented at the public meeting (See **Appendix D**) to give community members the opportunity to provide comments and indicate preferences regarding on-road bicycle lanes and separated shared-use paths, as well as sidewalks. Specific options included:

- Shared-use path, primarily on the south side of Waugh Chapel Road
- Dedicated on-road bike lanes on both sides of Waugh Chapel Road and sidewalk on one side
- Shared-use path connection south of the Waugh Chapel Road corridor to connect Evergreen Road with Strawberry Lake Way (also shown as a potential roadway connection)

Public comments were evenly split between preference for on-road bike lanes and a separated shared-use path. There also was support for the Evergreen Road-Strawberry Lake Way shared-use path.

Sidewalk and Bike-Compatible Shoulder Concept

Due to the need to provide a sidewalk in the study area, as well as the desire to accommodate bicyclists in the corridor, following the public meeting and review of comments, the study team developed a concept that would provide sidewalks and bike-compatible shoulders. This concept, (Figure 12, top graphic) could be implemented as an initial phase (Phase 1), allowing shared-use paths to be considered as a future improvement. This alternative provides flexibility in the design phase to avoid significant utility conflicts and right of way impacts by meandering the sidewalk. Specific elements include:

<u>Maytime to Symphony:</u>

- new 5’ sidewalk on the south side to connect to the existing sidewalk
- existing ditch to be replaced with new drainage network (curb and gutter, structures, pipes, etc.)
- minimum 4’ bike lanes on both sides except at the right turn lane for Symphony where there is a shared bike/turn lane

<u>Symphony to Macmullen:</u>

- existing sidewalk on the south side
- minimum 4’ bike lanes on both sides
- minor pavement widening of 1-2’ may be needed on the north side at the existing guardrail section (survey needed to confirm)

<u>Macmullen to Summerfield:</u>

- new 5’ sidewalk on south side to connect to the existing sidewalk
- existing ditch to be replaced with new drainage network (curb and gutter, structures, pipes, etc.)
- minimum 6’ bike lanes on both sides
- sidewalk pulled closer to the bike lane due to steep grades close to the roadway and to avoid widening the existing culvert
- existing acceleration lane removed to better fit the bike lane and sidewalk

<u>Summerfield to New Market:</u>

- new 5’ sidewalk to connect the existing sidewalk on the south and north side
- drainage network improvements may be necessary for new sidewalk
- minimum 4’ bike lanes on both sides except at right turn lane for New Market where there is a shared bike/turn lane

The concept-level total planning cost estimate for the project is approximately $5.9 million. The detailed breakdown for the cost estimate is provided in Appendix E.

Another potential option could include converting the bike-compatible shoulders to designated bike lanes in the future. That effort would be similar, but could potentially be implemented more quickly, based on the anticipated design effort.

Shared-Use Path and Bike-Compatible Shoulder Concept

Depending upon the community's desires, the shared-use path concept along Waugh Chapel Road (Figure 12, bottom graphic) could be implemented in the following two ways.

- As an alternative to the sidewalk concept, a shared-use path could be implemented independently. The concept-level total planning cost estimate for the projects is approximately $8 million.
- The shared-use path project could be implemented in a phased approach after constructing the sidewalk project. The sidewalk infrastructure can be expanded by 5 feet to become a 10-feet shared-use path. The concept-level total planning cost estimate for the upgrade project is approximately $2.9 million. This brings the total project cost (sidewalk plus shared-use path upgrade) to $8.8 million assuming a 10 percent inflation of construction cost.

Shared-Use Path (Evergreen Road to Strawberry Lake Way)

Furthermore, providing a shared-use path apart from the Waugh Chapel Road right-of-way that would connect from Evergreen Road to Strawberry Lake Way would provide non-motorized connections in this region. Connecting this path to neighborhoods along the corridor would further expand the walking and bicycle network. Coordination with the communities and elected officials will help determine the path forward for facilities that go beyond sidewalks. The concept-level total planning cost estimate for Evergreen to Strawberry Lake Way is approximately $7.8 Million (assumes 60' right-of-way)

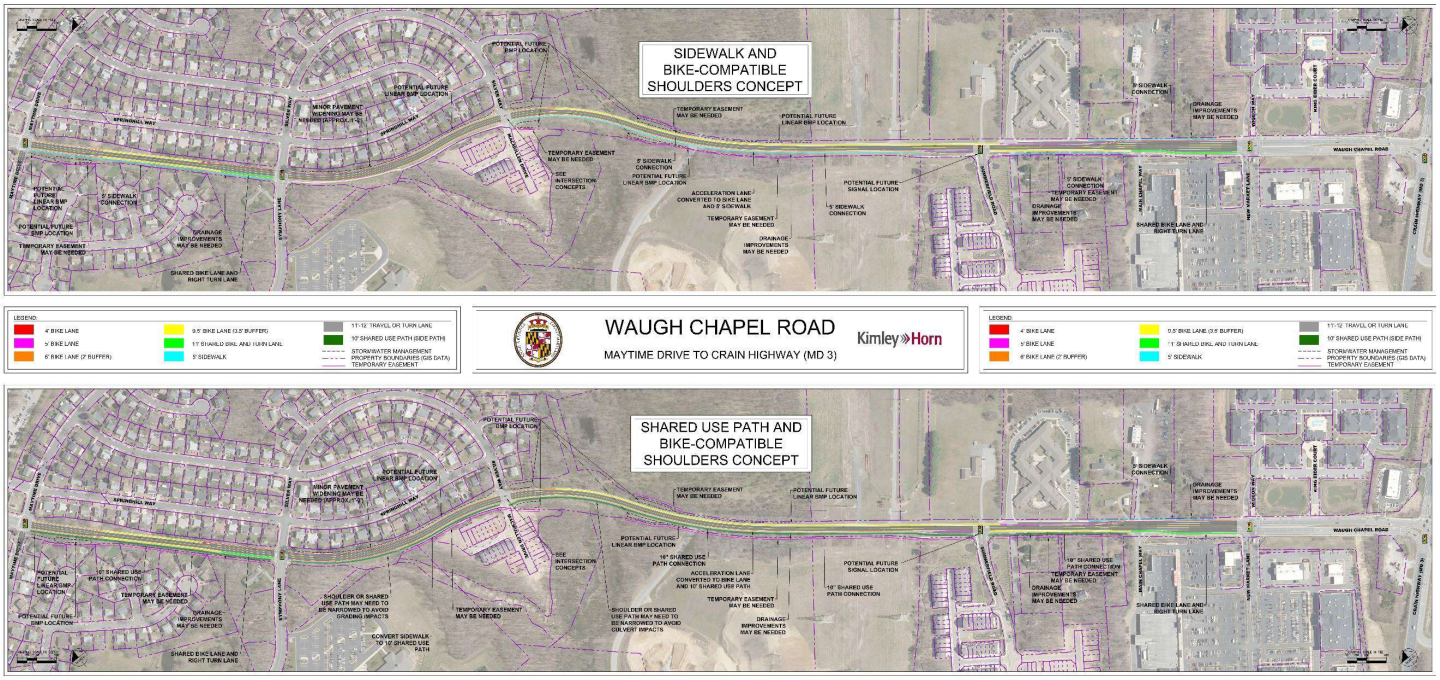


Figure 12. Sidewalk, Bike Lane and Shared Use Path Concepts

NETWORK CONNECTIONS

The continued growth in the western portion of the County, as well as newer developments in the area, including future phases of Waugh Chapel Towne Center, Summerfield, and Two Rivers, will continue to place pressure on Waugh Chapel Road. An additional connection to MD 3 is needed to relieve this pressure in the future.

The public was given the opportunity to view three potential connections identified during this study (see Figure 13):

- Waugh Chapel Towne Centre II-Phase 2(A), also known as the Summerfield Connection
- Waugh Chapel Development Master Sketch Plan, also known as the Brickhead Road connection
- Evergreen Road Extension to Strawberry Lake Way

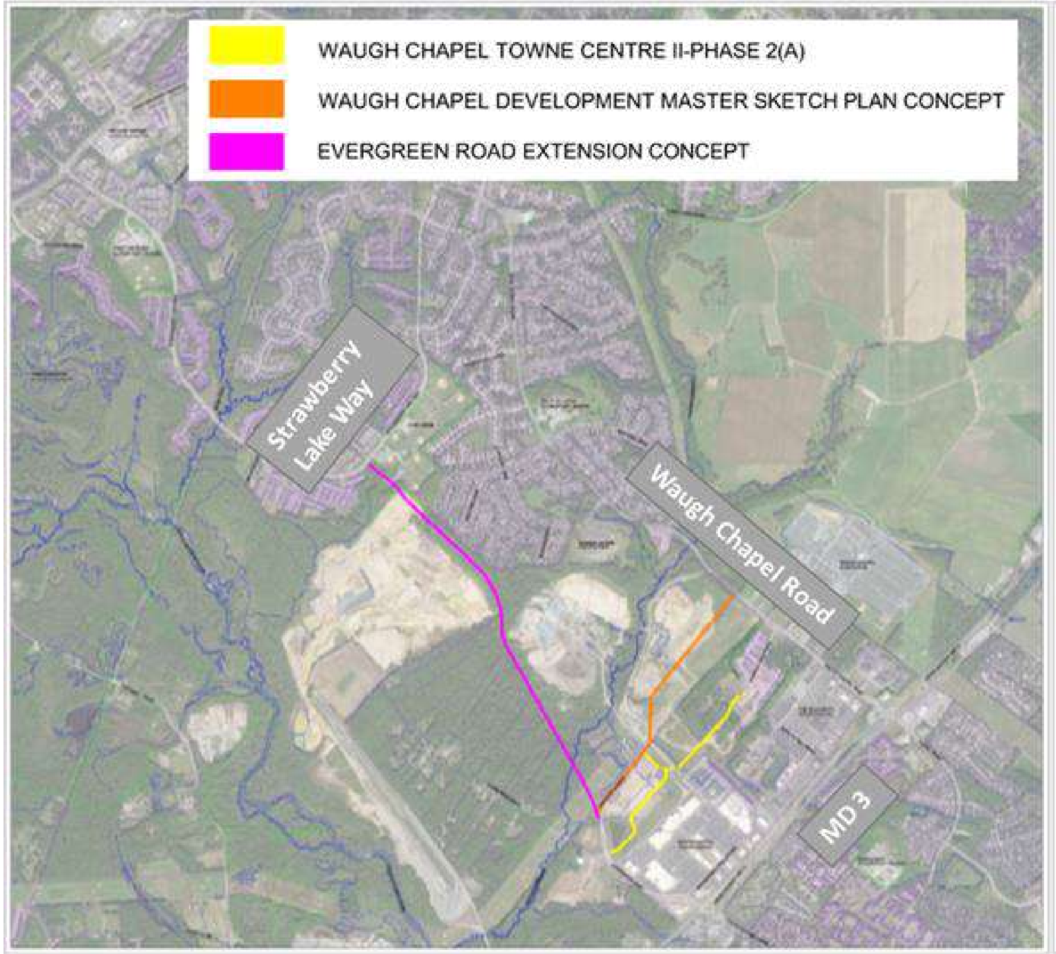


Figure 13. Network Connection Alternatives

The Summerfield Connection, platted in August 2018 as part of the Summerfield Development, serves as an extension of Summerfield Road to Waugh Chapel Shopping Center. Commenters at the public meeting were not in favor of this connection, due to concerns over increased traffic on Summerfield Road and the safety of residents, particularly children, in the community. The Brickhead Road connection, which intersects Waugh Chapel Road to the west of the existing powerline easement, received some support from the public. This connection is shown in the Waugh Chapel Development Master Sketch Plan; however, there are no additional details available. Coordination with the County's Development Division and the developer of Waugh Chapel could lead to advancing this alternative in the future.

The connection from Evergreen Road to Strawberry Lake Way received the most support from the public. Some commenters agreed that a vehicular connection through this area would help alleviate traffic on Waugh Chapel Road, particularly with increasing development in the area. Commenters also suggested that improvements to the intersection of Evergreen Road and MD 3 would be needed to address issues with access to and from northbound MD 3 at this location. Other commenters supported the connection as a non-motorized path. Some commenters expressed concern over the potential environmental impacts of the connection as well as the impact of additional traffic on Strawberry Lake Way.

This study did not include concept-level planning estimates for these connections. The two concepts associated with the Waugh Chapel Towne Center would be developer-led projects. The concept-level planning estimate for the Evergreen Road to Strawberry Lake Way shared-use path could be used as a starting point for obtaining 60' of right-of-way for a potential future roadway connection.

Chapter 4 Next Steps

This study identified several improvements that could take place in the Waugh Chapel Road corridor between New Market Lane and Maytime Drive. Some of those improvements can be implemented in the near-term, while others will require additional study and engineering design to move forward. The following chart shows improvement timeframes.

INTERSECTIONS

Near Term	
Maytime Drive	1) Remark northbound approach to delineate exclusive left-turn lane and shared through/right turn lane 2) Monitor traffic volumes, driver behavior, crash history, pavement quality, TCDs, lighting, etc.
Symphony Lane/Silver Way	1) Monitor traffic volumes, driver behavior, crash history, pavement quality, TCDs, lighting, etc.
Macmullen/Silver Way	1) Remove vegetation to improve sight distance 2) Install westbound left turn lane 3) Monitor traffic volumes, driver behavior, crash history, pavement quality, TCDs, lighting, etc.
Summerfield Road	1) Install westbound left turn lane 2) Monitor traffic volumes, driver behavior, crash history, pavement quality, TCDs, lighting, etc.
New Market Lane	1) Program traffic signal controller to allow for a leading pedestrian phase 2) Begin discussions with Waugh Chapel Shopping Center owner to determine feasibility of northbound approach improvements 3) Monitor traffic volumes, driver behavior, crash history, pavement quality, TCDs, lighting, etc.

Mid Term	
Maytime Drive	1) Modify northbound/southbound signal operation to accommodate protected/permissive left turns
Symphony Lane/Silver Way	1) Install eastbound five-section signal head to accommodate protected/permissive right turn
Macmullen/Silver Way	1) Monitor traffic volumes, driver behavior, crash history, pavement quality, TCDs, lighting, etc. 2) Consider restricting turn movements, modified green T
Summerfield Road	1) Install traffic signal
New Market Lane	1) Convert eastbound/westbound left turns to protected-only left turns and extend westbound left turn storage lane 2) Modify westbound outside curb lane pavement marking or access to clarify required and allowable actions for motorists

Long Term	
Macmullen/Silver Way	1) Monitor traffic volumes, driver behavior, crash history, pavement quality, TCDs, lighting, etc. 2) Design and install traffic signal, or roundabout, as appropriate

BICYCLE AND PEDESTRIAN CONNECTIONS

Filling the gaps in the sidewalk network can be done in phases, working intersection to intersection, and be combined with improvements needed to provide for the bike-compatible shoulder lane. This work can be done based on available funding for such improvements, or as a larger-scale capital improvement project. Alternately, depending upon the community's desire, planning and preliminary engineering work can commence for the shared-use path.

NETWORK CONNECTIONS

The County will need to work with the developer of Waugh Chapel Towne Centre and Summerfield to determine the appropriate course forward for a connection(s) to Waugh Chapel Road in the vicinity of Summerfield Road. The potential connection between Evergreen Road and Strawberry Lake Way can be constructed in phases, with the first phase built as a shared-use path. Additional traffic analysis and outreach will be needed before providing a network connection vehicular access between Evergreen Road and points west. Without such a connection; however, traffic volumes along Waugh Chapel Road are likely to increase to a point that impedes traffic operations, particularly in the commuter and weekend peak hours.

Waugh Chapel Road
Future Conditions
Appendix

Appendix A

EXISTING CONDITIONS REPORT

May 2018

TRANSPORTATION FACILITY PLANNING
WAUGH CHAPEL ROAD

Waugh Chapel Road from Maytime Drive to New Market Lane
Project Number H539600 Contract No. H539611

prepared for:

ANNE ARUNDEL COUNTY MARYLAND

prepared by:

Kimley»Horn

Table of Contents

Executive Summary

Anne Arundel County initiated the Waugh Chapel Road Transportation Facility Planning study with the objective to fill in the gaps in the sidewalk and bicycle facilities that connect Waugh Chapel Shopping Center to the existing and planned neighborhoods to the west. The limits of the Waugh Chapel Road study corridor are from Maytime Drive to New Market Lane. The study will focus on a multimodal, context-sensitive approach to identify and recommend improvements to the existing corridor that strike a balance between future vehicular traffic volumes and pedestrian/bicyclists and to enhance safety and connectivity for all modes of transportation.

This Existing Conditions Report represents the first step in the study process. Following acceptance of this report, the County will initiate Phase II of the study. During Phase II, the team will then work with the County and the community to develop evaluation metrics and begin to develop concepts for improvements to address deficiencies along the study corridor.

The following summarizes the key findings of the existing conditions analysis for the Waugh Chapel Road study corridor:

- The signalized study intersections (Maytime Drive, Symphony Lane/Silver Way, and New Market Lane/Wigeon Way) along Waugh Chapel Road operate within adequate levels of service during peak hours. The two unsignalized intersections (Silver Way/Macmullen Drive and Summerfield Road) operate at LOS F during the AM and PM peak hours and LOS D and F during the Saturday peak hour. The failing level of service is due to the difficulty that the side street vehicles have in finding gaps to enter Waugh Chapel Road. Field observations reveal minimal queues at the unsignalized intersections.
- The roadway segments studied along Waugh Chapel Road operate at LOS D/E. The peak hour demand on Waugh Chapel Road is heavy for a two-lane facility. The segments east of Symphony Lane operate worse than the western segment, Maytime Drive to Symphony Lane, during the AM peak due to higher demand and truck traffic. During PM peak all segments operate at LOS E for both directions. Field observations did not reveal issues with level of service along Waugh Chapel Road. There was very little delay along the corridor during the peak periods, with the exception of an approximately 15-minute period between 7:50 and 8:05 AM in the eastbound direction at the intersection of Waugh Chapel Road and Symphony Lane. This delay is attributed to the traffic associated with the School of the Incarnation.
- Existing traffic volumes at the intersection of Silver Way/Macmullen Drive and Waugh Chapel Road do not warrant a traffic signal.
- Speeding in the corridor, based on the 85th percentile speeds, in conjunction with roadway horizontal alignment may present potential risk to safety at the intersections as well as future proposed pedestrian and bicycle improvements.
- Reported crashes along the corridor are centered around the intersections and driveways. Excluding the crashes near MD 3, crashes at the intersection of New Market Lane/Wigeon Way represented over 35% of the crashes in the corridor and most of the rear-end and angle crashes. Most of the single vehicle crashes occurred between Maytime Drive and Silver Way/ Macmullen Drive. Roadway horizontal curves and speeding are contributing factors.
- The lack of connected sidewalks on Waugh Chapel Road in the study area is a critical gap to address in this study as the roadway is transformed.
- Dedicated bicycle facilities or shared use paths are needed on Waugh Chapel Road to provide protection for bicyclists and connectivity for the bicycle network linking to the regional trail and transit system.

Chapter 1 Project Background

INTRODUCTION

Anne Arundel County initiated this study with the objective to fill in the gaps in the sidewalk and bicycle facilities that connect Waugh Chapel Shopping Center to the existing and planned neighborhoods to the west. This study will focus on a multimodal, context-sensitive approach to identify and recommend improvements to existing multimodal facilities that strike a balance between vehicular traffic and pedestrian/bicyclists and to enhance safety and connectivity for all modes of transportation.

There also have been previous studies that have examined this area from land use, planning and transportation perspectives, including:

- Summerfield Traffic Impact Study, 2014
- 2013 Anne Arundel County Pedestrian and Bicycle Master Plan
- Chapel Creek Village Traffic Impact Study, 2012

This report documents the existing transportation conditions in the study area. The chapters are structured to reflect each of the focus areas of the report.

- Data Collection
- Roadway Geometrics
- Traffic Operations Evaluation
- Multimodal Transportation
- Safety Assessment
- Findings and Conclusions

STUDY AREA

The study area is shown in **Figure 1**. The limits of the Waugh Chapel Road study corridor are from Maytime Drive to New Market Lane. This report documents existing conditions along the Waugh Chapel Road corridor to understand the needs and deficiencies for all roadway users as well as the benefits and effects of any proposed improvements on the transportation network.

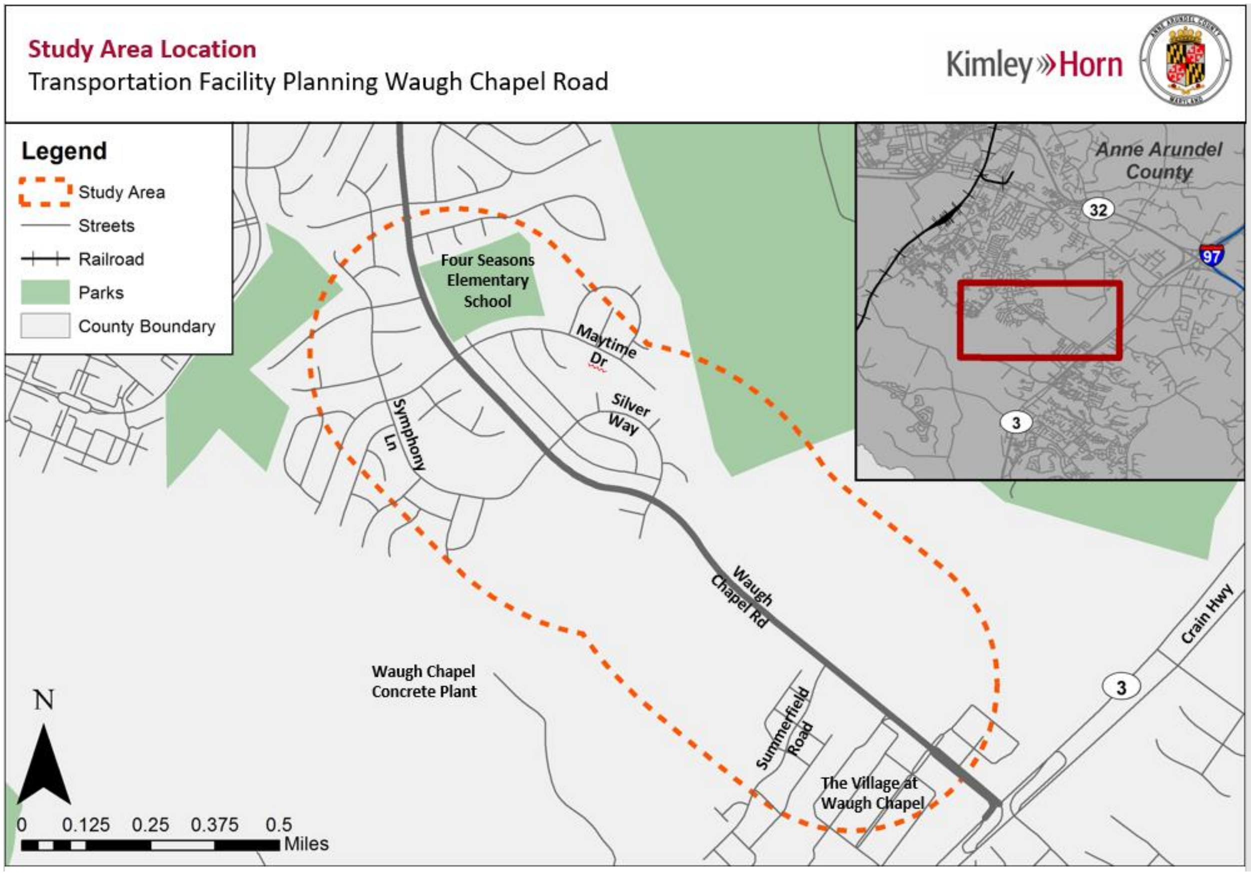


Figure 1: Study Area

STUDY INTERSECTIONS

The study area includes the following five intersections:

1. Maytime Drive and Waugh Chapel Road
2. Silver Way/Symphony Lane and Waugh Chapel Road
3. Silver Way/Macmullen Drive and Waugh Chapel Road
4. Summerfield Road and Waugh Chapel Road
5. New Market Lane/Wigeon Way and Waugh Chapel Road

Figure 2 illustrates the locations of the study intersections and their associated lane designations and intersection traffic control. Eastbound Waugh Chapel Road at Summerfield Road has one shared left-turn/through lane and a “de facto” right-turn lane that is currently marked as a shoulder. For traffic analysis, an effective right-turn lane is assumed for both eastbound and westbound Waugh Chapel Road at Summerfield Road. The New Market Lane/Waugh Chapel Road intersection runs actuated-uncoordinated signal operations and the intersections of Maytime Drive and Symphony Lane/Silver Way with Waugh Chapel Road run coordinated signal operation. The other two intersections are stop-controlled on the side streets.

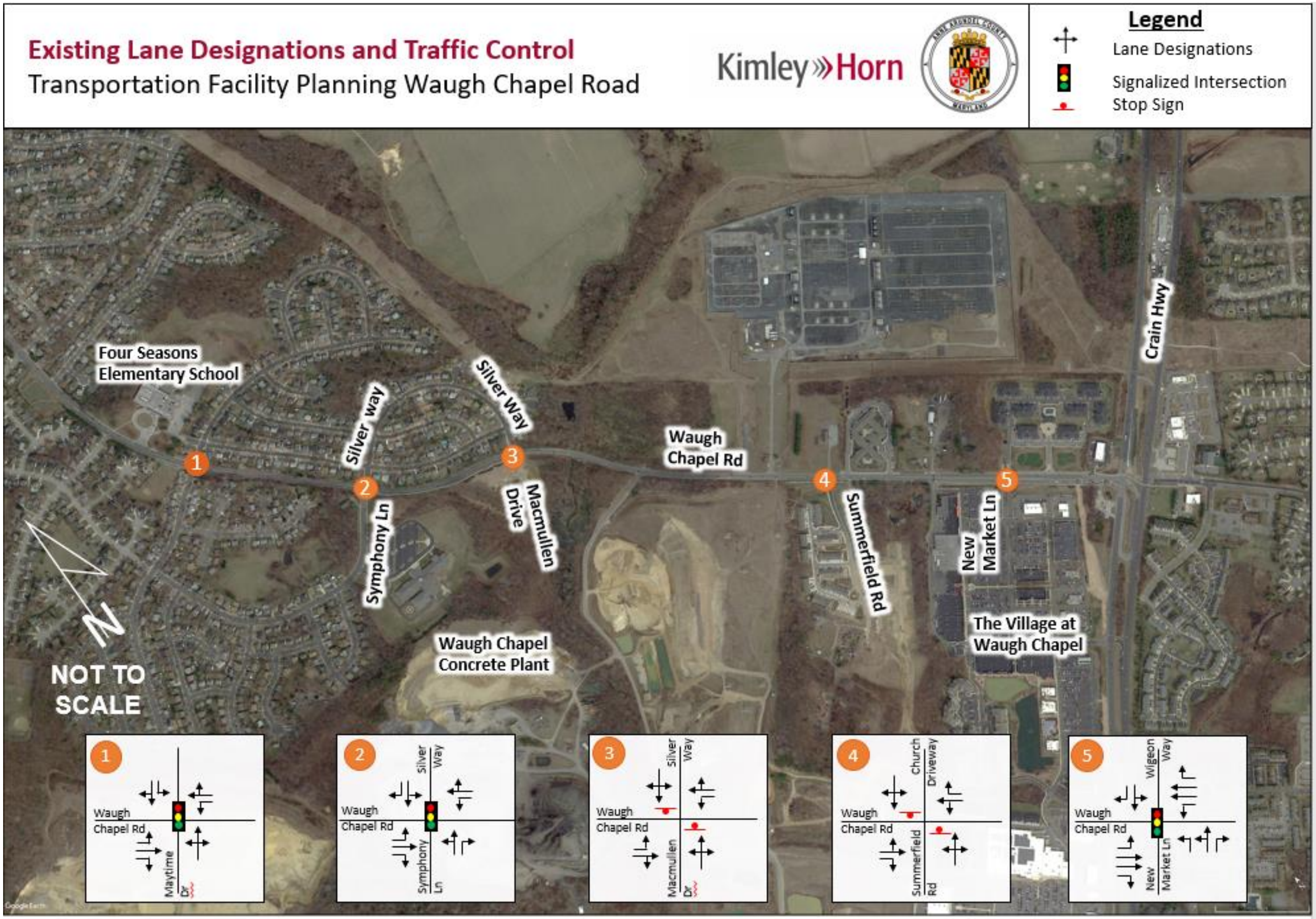


Figure 2. Study Intersection Lane Designation and Traffic Control

COMMUNITY AND DEVELOPMENT

Waugh Chapel Road is in the Odenton Small Area Plan portion of Anne Arundel County. **Figure 3** and **Figure 4** show the types of land uses that are present. The areas located adjacent to Waugh Chapel Road are primarily residential, including low to medium density multifamily dwellings. Small commercial and retail areas are concentrated along the southeast portion of the corridor near the intersection with MD 3 (Crain Highway). Along with residential and commercial uses, there are portions of the surrounding area that are reserved for natural features and industrial uses. The Odenton MARC Train Station is located north of the project site, approximately a 30-minute walk from the western portion of the study area.

Development actives in the corridor include expansion of Summerfield Village off Summerfield Road and Chapel Creek Village off Macmullen Drive, across from Silver Way. Two schools are located within or near the study area, Four Seasons Elementary School west of Maytime Drive and the School of the Incarnation off Symphony Lane.

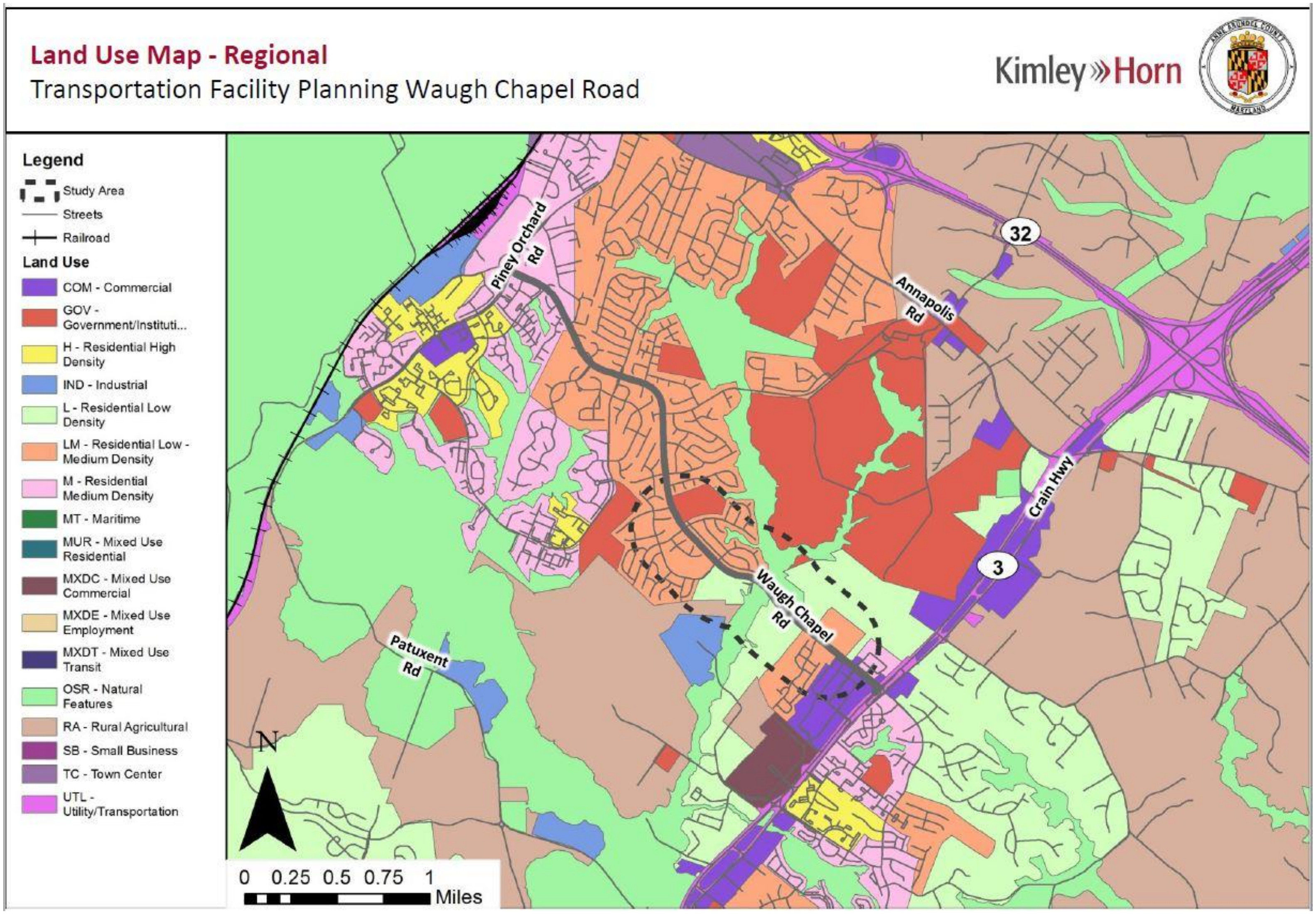


Figure 3. Existing Land Use

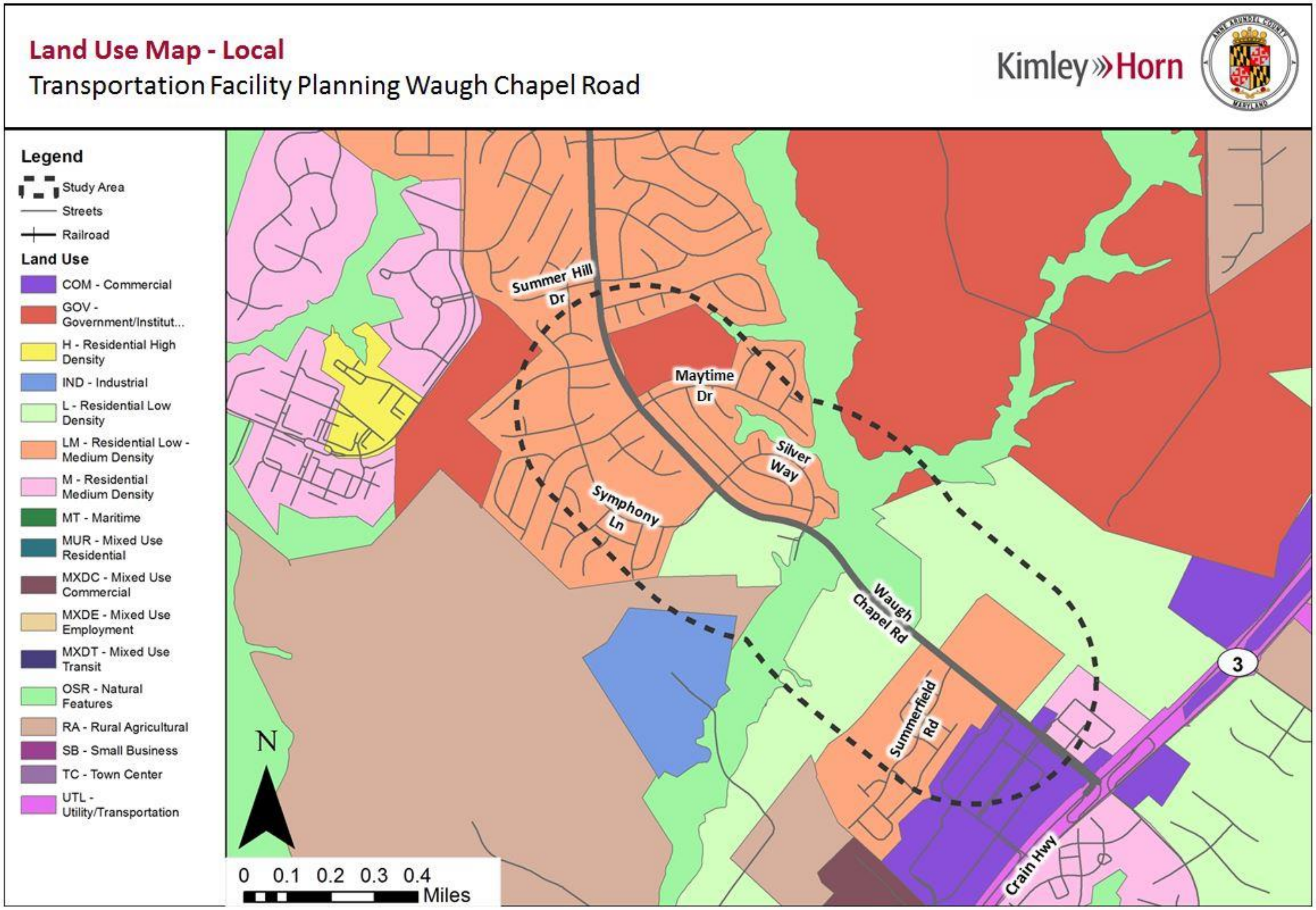


Figure 4. Existing Land Use (Study Corridor)

Chapter 2 Traffic Data Collection

The following is a summary of the data collected.

- Intersection turning movement count (TMC) data, including passenger vehicle, heavy vehicle, pedestrian, and bicycle counts
- 48-hour volume, speed and classification (VSC) data for roadway segments
- Historical volumes
- Roadway geometrics data
- Traffic and queuing observations

INTERSECTION COUNTS AND VOLUME

To conduct an analysis of existing conditions, traffic data was collected in November 2017 along the study corridor. TMCs were collected along Waugh Chapel Road between 6:30 and 8:30 am and between 4:30 and 6:30 pm on November 16, 2017. TMC data also was collected between 10:30 am and 12:30 pm on Saturday, November 18, 2017. A 12-hour intersection count was conducted for the intersection of Silver Way and Waugh Chapel Road.

The overall AM and PM peak hours of the study area were determined by reviewing the individual intersection data. The network AM peak hour was determined to be 7:15 am to 8:15, the network PM peak hour was determined to be 5:30 pm to 6:30 pm, and the Saturday peak hour was determined to be 11:30 AM to 12:30 PM. **Table 1** summarizes the weekday (AM and PM) and Saturday (midday) peak hours, heavy vehicle percentages, and peak hour factors for each intersection. Raw intersection count data is provided in **Appendix A**.

In general, traffic counts were well balanced between intersections except for the segments between Silver Way/Macmullen Drive and Summerfield Road and between Summerfield Road and New Market Lane. The imbalance in volumes is attributable to the Waugh Chapel Concrete Plant and driveways to the shopping center and Waugh Chapel Center. **Figure 5** and **Figure 6** illustrate the existing peak hour traffic volume at the study intersections on a weekday and Saturday, respectively.

Table 1. Existing Intersection Count Summary (Weekday and Saturday)

ID	Intersection Count	Peak Hour		Heavy Vehicle%		Peak Hour Factor	
		AM/ Midday	PM	AM/ Midday	PM	AM/ Midday	PM
	Weekday (11/16/2017)						
1	Waugh Chapel Road and Maytime Drive	7:15 AM	5:15 PM	1.36%	0.63%	0.85	0.95
2	Waugh Chapel Road and Symphony Lane	7:15 AM	5:30 PM	0.96%	0.47%	0.75	0.94
3	Waugh Chapel Road and Silver Way	7:15 AM	5:30 PM	1.22%	0.44%	0.81	0.96
4	Waugh Chapel Road and Summerfield Road	7:15 AM	5:30 PM	4.46%	0.89%	0.82	0.96
5	Waugh Chapel Road and New Market Lane	7:15 AM	5:30 PM	4.43%	0.64%	0.84	0.94
	Saturday (11/18/2017)						
1	Waugh Chapel Road and Maytime Drive	11:30 AM	-	0.90%	-	0.96	-
2	Waugh Chapel Road and Symphony Lane	11:30 AM	-	0.77%	-	0.97	-
3	Waugh Chapel Road and Silver Way	11:30 AM	-	0.91%	-	0.93	-
4	Waugh Chapel Road and Summerfield Road	11:30 AM	-	2.41%	-	0.96	-
5	Waugh Chapel Road and New Market Lane	11:30 AM	-	2.12%	-	0.91	-

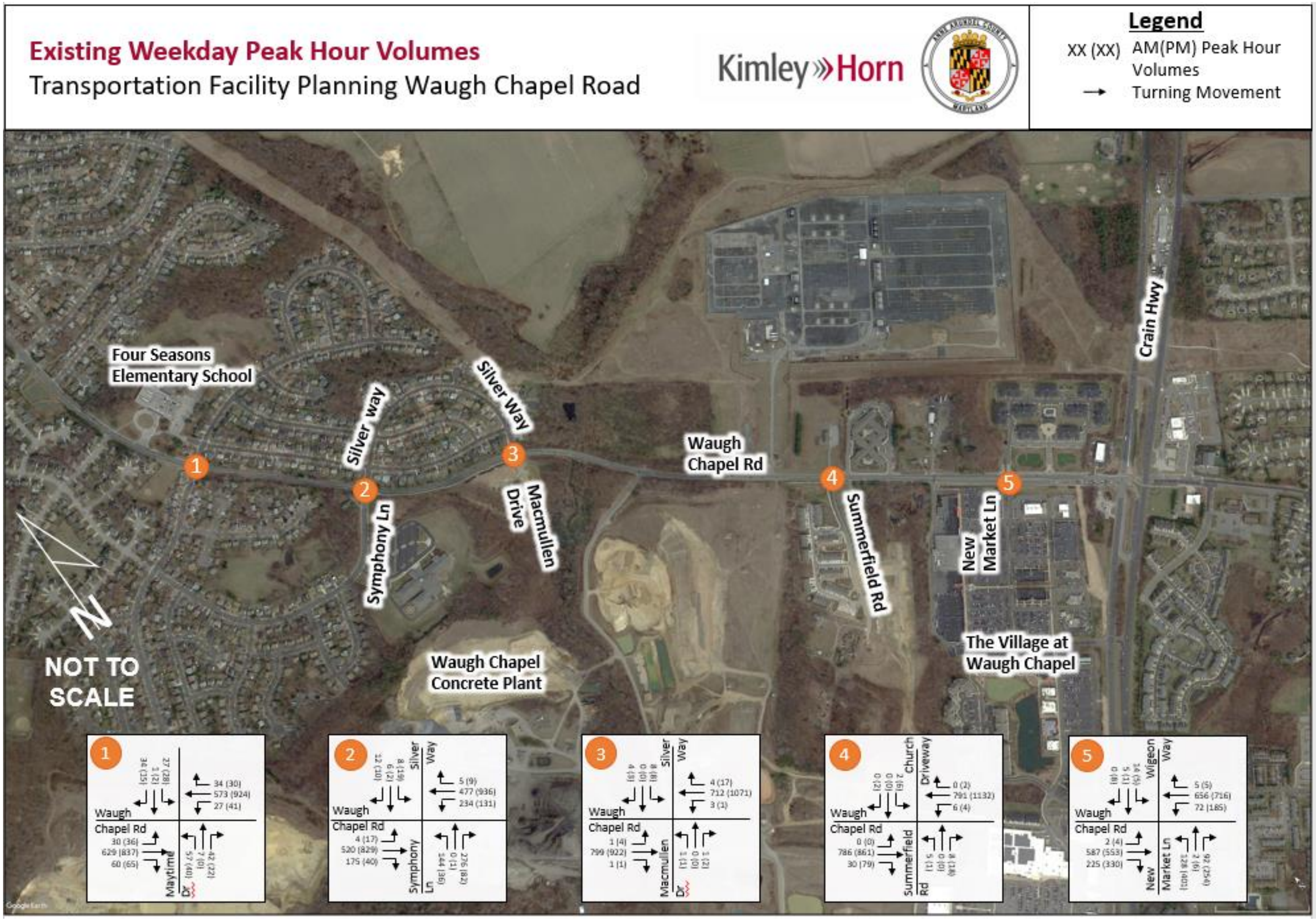


Figure 5. Existing (2017) Weekday Peak Hour Volume

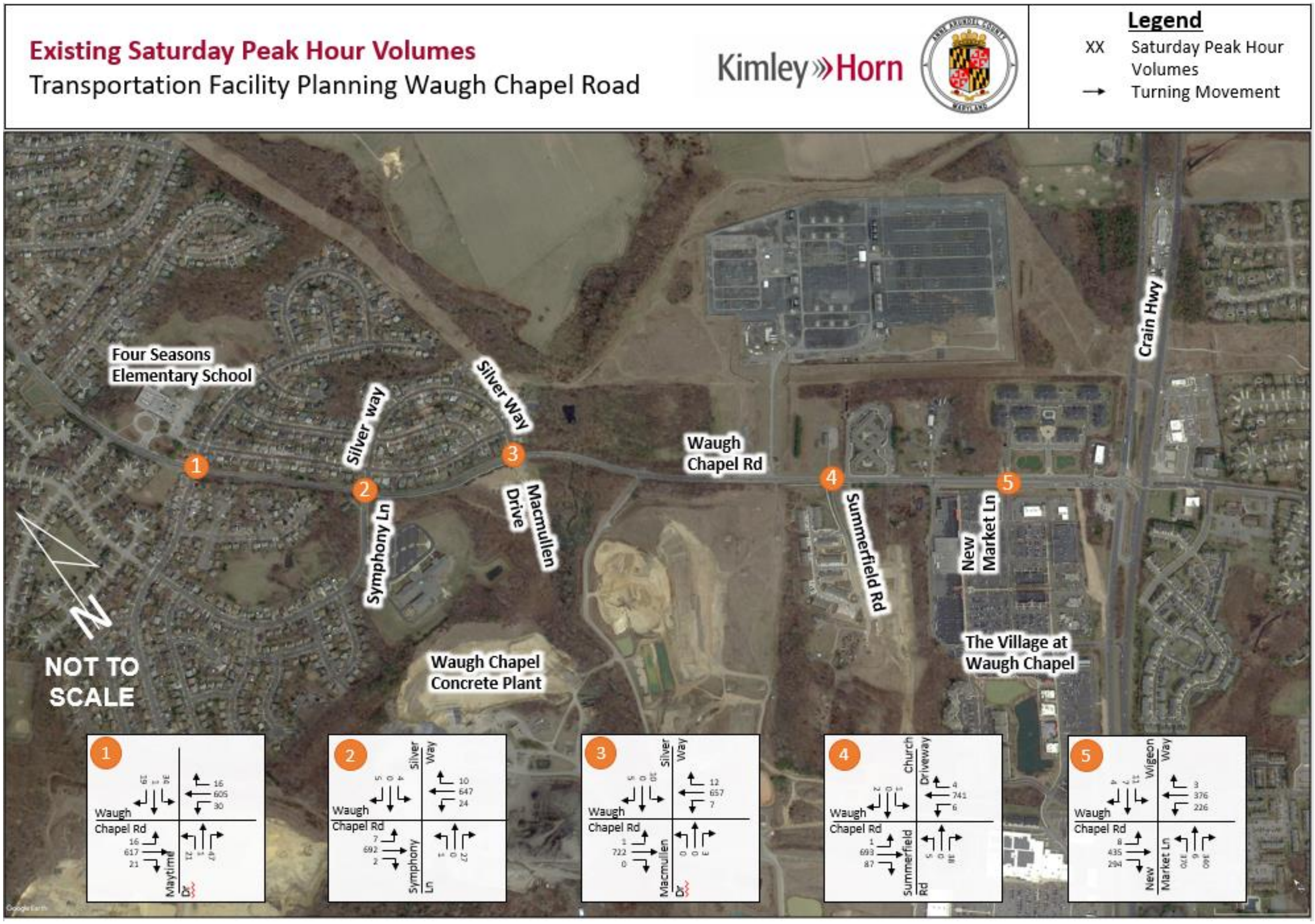


Figure 6. Existing (2017) Saturday Peak Hour Volume

A summary of the weekday and Saturday peak hour volumes is provided below.

Weekday peak hours

- The AM peak hour (7:15 AM to 8:15 AM) and PM peak hour (5:30 PM to 6:30 PM) are consistent throughout the study corridor except for a minor variation at Waugh Chapel Road and Maytime Drive for which the PM peak hour is (5:15 PM to 6:15 PM).
- During the PM peak period volumes are steady for a longer period, from 4 PM to 6:30 PM, while peak AM volumes concentrate within the 60-minute peak hour. The peak hour factors reflect this.
- Heavy vehicle percentage is higher in the AM peak hour than PM peak hour.
- Pedestrian and bicycle volumes are low at the study intersections during the AM and PM peak periods; however, pedestrian activities related to school occur after the AM peak period (6:30 to 8:30 AM), and therefore were not captured in the traffic count data. The highest pedestrian activities occurred at the intersection of Waugh Chapel Road and New Market Lane. There were 3 pedestrians counted during the PM peak period, and none of them were crossing the road during the PM peak hour of 5:30 to 6:30. There were no more than two bicyclists counted at any given intersection during the AM or PM peak period.
- Peak hour volumes are more directional in PM peak hour than in AM peak hour.
- The highest through volume on Waugh Chapel Road was 1,132, traveling westbound at the intersection with Summerfield Road during PM peak; the highest left turn volume from Waugh Chapel Road is the westbound left turn onto Symphony Lane, with a volume of 234 during the AM peak hour; the eastbound right-turn volumes onto New Market Lane are also significant, with 225 and 330 vehicles during AM and PM peak hour, respectively.
- The highest turning volumes from a side street onto Waugh Chapel Road are the left and right turns from New Market Lane with volumes of 401 and 254, respectively during the PM peak hour.

Saturday peak hour

- The mid-day peak hour is from 11:30 AM to 12:30 PM.
- The heavy vehicle percentage is higher than the PM peak while lower than AM peak.
- The mid-day peak hour intersection volumes are comparable to AM peak hour volumes and lower than PM peak hour volumes.
- Pedestrian and bicycle volumes are low at the study intersections; the highest pedestrian activities occurred at the intersections of Waugh Chapel Road and Maytime Drive and Waugh Chapel Road and New Market Lane. These intersections both had two pedestrians counted during the Saturday midday period. There were no more than two bicyclists counted at any given intersection during the Saturday peak period.

ROADWAY SEGMENT VOLUME SPEED AND CLASSIFICATION DATA

48-hour classification and speed data were collected from Wednesday to Thursday (November 15 to 16, 2017) on Waugh Chapel Road between Maytime Drive and Symphony Lane and between Silver Way and Summerfield Road. The average 24-hour volumes and 85th-percentile speeds over the two days are shown in **Figure 7**. The directional 24-hour volumes on Waugh Chapel Road range from approximately 8,600 vehicles to 11,250 vehicles. Comparing to the peak hour volumes, the peak-to-daily ratio (k-factor) is approximately 0.1. The average 85th-percentile speeds on Waugh Chapel Road over the two days are higher between Maytime Drive and Symphony Lane than west of Summerfield Road, potentially due to higher volumes and more truck traffic east of the concrete plant driveway. **Figure 8** and **Figure 9** show the average hourly volumes by time of day for the two segments. Raw classification and speed data is provided in **Appendix A**.

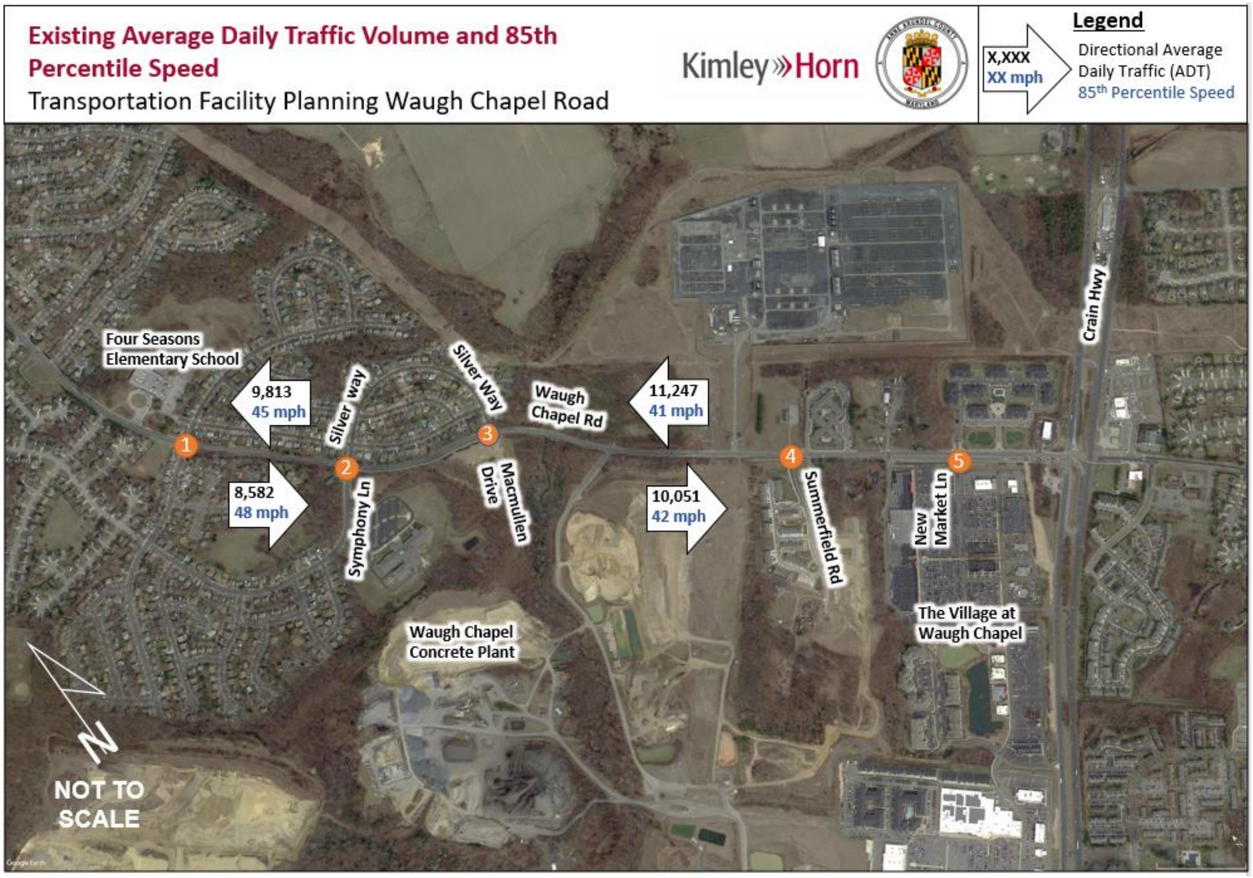


Figure 7. Existing Average Daily Volumes and 85th Percentile Speed

The following is a summary of the classification and speed data.

- PM peak period volumes are higher than AM peak period.
- The speeds are higher in the western segment, potentially due to lower volumes.
- The 85th percentile speeds at both segments in both directions exceed the posted speed limit of 35 mph.
- The percentage of traffic traveling between 50 to 55 mph was 5% of the 24-hour volume for the eastbound direction between Maytime Drive and Symphony Lane while such occurrence at the other segments was only 1% over a 24-hour period.
- 85th percentile speed for eastbound travel between Maytime Drive and Symphony Lane during the AM peak hour was comparable to that over the 24-hour period while for the other segments, the peak hour 85th percentile speeds were lower than the daily 85th-percentile speeds.
- It was noted that the 85th percentile speeds between Maytime Drive and Symphony Lane were significantly higher than the post speed limit of 35 mph.

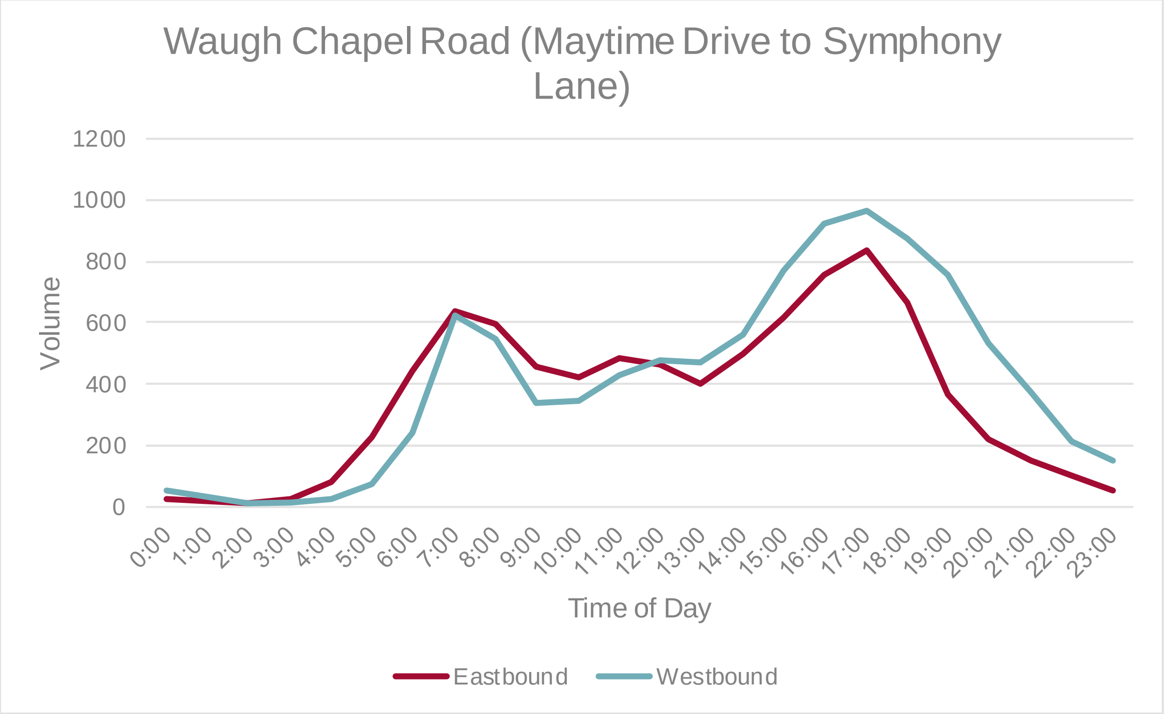


Figure 8. Existing Volume by Time of Day (Waugh Chapel Road, Maytime Drive to Symphony Lane)

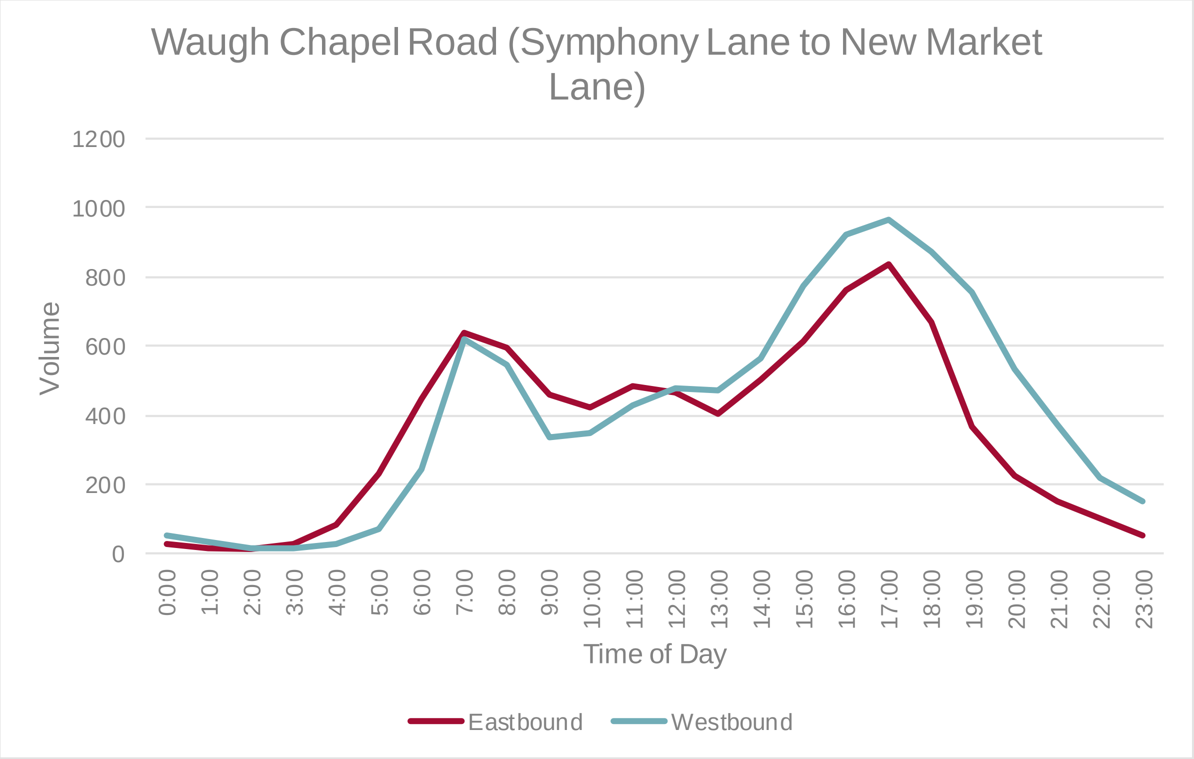


Figure 9. Existing Volume by Time of Day (Waugh Chapel Road, Symphony Lane to New Market Lane)

TRAVEL TIME DATA

Travel time runs were collected on Wednesday, January 10, and Thursday, January 11, 2018. AM travel time runs were performed between 7:30 and 8:30 AM and PM travel time runs were performed between 5:15 and 6:15 PM. The field data contains 4 to 6 runs of data for each segment and time period. **Table 2** shows the resulting averages of the travel times. In general, there was very little delay along the corridor with the exception of an approximately 15-minute period between 7:50 and 8:05 AM in the eastbound direction at the intersection of Waugh Chapel Road and Symphony Lane. This delay is attributed to the traffic associated with the School of the Incarnation. It should be noted that the community has voiced concerns to the County that westbound left-turn queues into the School of the Incarnation sometimes extend to Silver Way/Macmullen Drive. Although this was not observed in the field during AM peak period during any of the field visits, it likely occurs for short periods before school on days where there is an issue with the school drop off procedure at the School of the Incarnation.

Table 2. Travel Time Summary

		Peak Hour Field Travel Time Runs							
		AM				PM			
Route	Distance (miles)	Travel Time [sec]	Delay [sec]	Stops	Average Speed* [mph]	Travel Time [sec]	Delay [sec]	Stops	Average Speed* [mph]
Eastbound	1.2	168	20	2	**26**	142	0	0	**30**
Westbound	1.2	164	0	0	**26**	134	0	0	**32**

*The estimation of average travel speed accounted for delay and stop time at the intersections.

HISTORICAL TRAFFIC DATA

To understand the changes in traffic volumes and patterns over time, annual average daily traffic (AADT) volumes were examined for 2010 through 2016 – the most recent data available. AADTs are determined to provide an estimate of the daily bi-directional volumes at specific locations or along specific roadway corridors. AADT data was obtained from the Maryland State Highway Administration (MSHA) Statewide AADT Points website. A summary of the historical AADT volumes is provided in **Table 3**. The trend of the AADT from 2012 to 2016 is illustrated in **Figure 9**.

Table 3: Historical AADT Data

Road	Annual Average Daily Traffic Volumes (vehicles per day)						
	2010	2011	2012	2013	2014	2015	2016
Waugh Chapel Road	18,441	18,522	17,500	17,541	17,492	17,953	18,870
Piney Orchard Parkway	25,152	24,750	24,551	24,602	24,850	25,501	25,992
Crain Highway (Route 3)	63,191	64,042	67,100	62,251	62,062	65,490	66,731

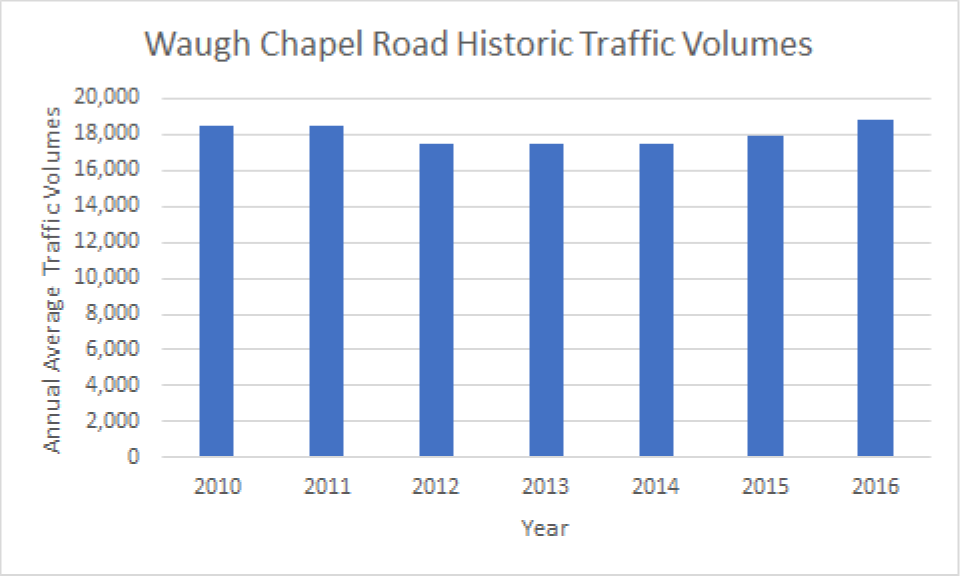


Figure 10. Historical Average Daily Traffic Volumes

The data shows that traffic volumes on Waugh Chapel Road remained steady until 2012 and 2013. The reconstruction of the MD 3/Waugh Chapel Road intersection may have contributed to the volume dip during that time. Traffic volumes began to show growth in 2015 and surpassed 2011 volumes in 2016.

OBSERVATIONS OF TRAFFIC AND SAFETY OPERATIONS

Field observations were conducted January 10 -12, 2018. The field observations were focused on queue lengths and duration, traffic flow, and bicycle and pedestrian activities and facilities. Operational issues, driver behaviors, pedestrian activity, and unsafe activity (e.g. school drop-off or illegal parking) were documented. Information gathered during the field observations was used to validate outputs from traffic analysis software programs used to analyze existing conditions. Notable observations from the site visits are summarized below.

Traffic Operations and Traffic Control Devices

- Operational issues along the corridor were at a minimum.
- Pavement markings along the corridor are inconsistent. There are many approaches that have no pavement marking arrows to designate lane use. The only way to decipher lane use is by the signs on the mast arm, if present.
- Lane use signing at intersections is not present at all intersections throughout the corridor.
- The merge area on westbound Waugh Chapel Road just to the west of the intersection with New Market Lane where the number of through lanes reduces from two lanes to one lane has only one merge arrow. This short merge area, just 450 feet past the intersection, can cause some operational issues along the corridor to drivers unfamiliar with the corridor.

- Speed feedback signs appear to be effective in reducing speeds in the vicinity of the signs, however drivers resume to higher speeds after passing the signs.
- School zone speed limit is the same as the posted speed limit.

Safety Issues

- Speeding
  - The 85th percentile speeds as shown in **Figure 7** show that most vehicles are traveling at speeds greater than 40 mph, including speeds of 45 mph or greater near Maytime Drive. The posted speed limit is 35 mph. This was confirmed when performing field observations. For the most part, while vehicles can traverse the entire corridor without stopping at a traffic signal, turning vehicles and stopping vehicles in queues contribute to the rear-end crashes along with speeding.
  - Westbound vehicles traveling the segment between Summerfield Road and Silver Way/Macmullen Drive often travelled faster than the posted speed limit along a curved horizontal alignment causing the speed feedback sign to flash.
  -
- Parking
  - Four Seasons Elementary School is located just to the west of the intersection of Waugh Chapel Road and Maytime Drive. Just before school starts and right after school ends the wide shoulder west of Maytime Drive is used as a school pick up and drop off zone. As a result, there are young children and their parents walking in this area.

- Heavy Vehicles
  - During the times that Four Seasons Elementary School and the School of the Incarnation are starting and dismissing there were school buses present dropping off and picking up students.
  - During AM peak and mid-day hours, the main source of heavy vehicle traffic observed along the corridor is due to the Waugh Chapel Concrete Plant. This Plant provides ready-mix concrete, sand, gravel, and other construction supplies throughout the east coast, contributing to a fair amount of truck traffic coming in and out of their driveway on Waugh Chapel Road located between Silver Way and Summerfield Road.

Multimodal Activity

- Pedestrians and Bicyclists
  - During peak hour observations, there were only a few pedestrians along the corridor. The pedestrians that were observed walking from one end of the corridor to the other would use the pedestrian facilities that were present when available. However, when they were traversing segments that did not provide pedestrian facilities they walked along the shoulder. Additionally, when there was no shoulder present, they would walk along the roadway. Similarly, there were very few bicyclists, and those riding along the corridor generally used the shoulders where available, and the travel lanes in areas with little-to-no shoulders.

- Transit
    - The County is now running a flex bus service between Crofton-Waugh Chapel-Odenton. Bus stops are at the same places along Waugh Chapel as the prior Regional Transportation Agency (RTA) stops, but residents can call to ask for deviation from the route.

Chapter 3 Roadway Geometrics and Traffic Control Devices

Waugh Chapel Road is classified as a minor arterial and generally has one through lane in the east and westbound directions with exclusive turn lanes at some intersections along the corridor. Roadway geometric and traffic control device data was collected in early January 2018. Observations included the following:

- Travel lane width
- Sidewalk and shoulder width
- Horizontal curve measured by Ball Bank indicator for Waugh Chapel Road east and west of Silver Way/Macmullen Drive
- Sight distance measurements for the intersection of Silver Way/Macmullen Drive and Waugh Chapel Road
- Right-of-Way and Traffic Control Devices

TRAVEL LANE, SHOULDER, AND SIDEWALK WIDTHS

Travel lane, turn lane, and shoulder widths vary throughout the corridor. Through lanes generally measured 11 to 12 feet, while some turn lane widths were as narrow as 7.5 feet. The eastbound approach of Waugh Chapel Road at Maytime Drive has a 7.5 ft right turn lane onto Maytime Drive. Similarly, both the eastbound right turn lane at Symphony Lane and the westbound right turn lane at Silver Way/Macmullen Drive are 9.5 ft. These narrow turn lanes can become an operational issue if drivers slow down to turn but do not fully enter the turn lane, thus partially remaining in the through lanes to make turns. This could potentially cause through traffic delay and rear-end crashes.

Locations with narrow shoulders or no shoulder were also prevalent along the corridor. The locations mentioned above with narrow turning lanes have no shoulder present.

The narrow lanes replaced the shoulder on that side of the roadway for the length of the turn bay. Additionally, there are little to no shoulder present at the following locations:

- Eastbound
  - Just east of Maytime Drive for approximately 25 feet
  - East of Symphony Lane until the eastern terminus of the guardrail, approximately 550 feet (there is a sidewalk in this area)
  - West of Main Chapel Way (where the curb and gutter section begins)
- Westbound
  - Prior to the eastern-most entrance to the senior living center, in the open-section portion of the roadway
  - Approaching Symphony Lane for a distance of approximately 180 feet
  - Leaving Symphony Lane for a distance of approximately 370 feet

HORIZONTAL CURVE MEASUREMENT

The Ball-Bank Indicator Method is based on field driving tests to record angular readings using a ball-bank indicator and a speedometer. The simplicity of the construction and operation of this device has led to its acceptance as a guide to determine advisory speeds for changes in horizontal alignment. However, there are varied criteria for establishing the curve advisory speed based on ball-bank indicator readings. These varied criteria are shown in **Table 3** below.

Table 3. Ball-Bank Indicator Criteria

Curve Speed (mph)	Moyer & Berry 1940	AASHTO	Chowdury & Warren 1991	BAI (99) MUTCD 2003	MdMUTCD 2011	ITE 2010
≤20	14°	14°	20°	16°	16°	16°
25-30	12°	12°	16°		14°	14°
≥35	10°	10°	12°		12°	12°
Truck	-	-			10°	10°

The readings from the ball-bank tests in the field around the horizontal curve surrounding the intersection of Waugh Chapel Road and Silver Way/Macmullen Drive indicated a maximum of 5° traveling westbound and a maximum of 7° traveling eastbound. Both results were not high enough for a speed limit of 35 mph to be of concern. Therefore, the posted speed at this location appears to be appropriate with regard to horizontal curvature.

SIGHT DISTANCE

Figure 11 shows the results of sight-distance measurements at the intersection of Waugh Chapel Road with Silver Way/Macmullen Drive. The average of the daily 85th percentile speed, 45 mph, and the values in Appendix J, Sight Distance at Intersection, of the Anne Arundel County Design Guidelines were used to determine sight-distance adequacy. As shown in **Table A**, sight distances for traffic turning left and right out of Macmullen Drive are not adequate.

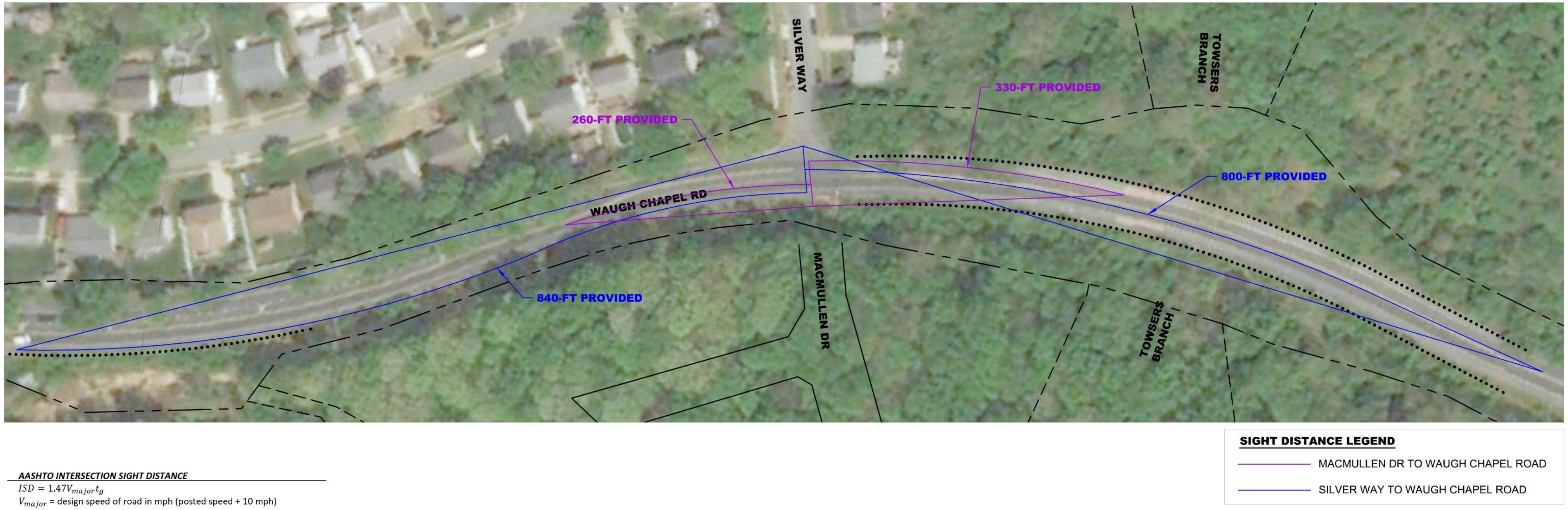
This could be partially due to landscaping planted along the south side of Waugh Chapel Road as part of the Chapel Creek Village residential development currently under construction. **Table B** indicates that sight distances for cross traffic are appropriate for all vehicle types at Sliver Way. Passenger vehicles turning left and right out of Silver Way have adequate sight distance, however single-unit and WB-50 trucks do not.

RIGHT-OF-WAY AND TRAFFIC CONTROL DEVICES

Figure 12 illustrates general right of way along the corridor and includes an inventory of ground mounted signs and approximate guardrail locations. As previously mentioned, there is inconsistent use of Intersection Lane Control signs and arrow pavement markings along the corridor. Examples include:

- Macmullen Drive/Silver Way intersection
    - Westbound Waugh Chapel Road right turn lane – not signed or marked
    - Eastbound Waugh Chapel Road left turn lane – not signed or marked
- Symphony Lane/Silver Way intersection
    - Westbound Waugh Chapel Road left turn lane – advance and intersection lane control signs and left turn arrow pavement markings
    - Eastbound Waugh Chapel Road – advance intersection lane control sign indicating separate left, through, and right turn lanes and pavement marking arrows only for the right turn lane

While neither intersection lane control signs nor turn arrow pavement markings are required by the MdMUTCD, inconsistency in signing and marking practices within a corridor can lead to driver confusion. Consistent use of signs and pavement markings will be addressed in the next phase of this study.



AASHTO INTERSECTION SIGHT DISTANCE

$ISD = 1.47V_{major}t_g$

V_{major} = design speed of road in mph (posted speed + 10 mph)

t_g = time gap in sec (see tables)

Table A - Macmullen Drive Sight Distances

Movement	Vehicle	t_g (sec)	AASHTO Calculated ISD (ft)	AASHTO Required Left ISD (ft)	AA County Required Left ISD (ft)	*Design Required Left ISD (ft)	Provided Left (ft)	Left Met?	AASHTO Calculated ISD (ft)	AASHTO Required Left ISD (ft)	AA County Required Right ISD (ft)	*Design Required Left ISD (ft)	Provided Right	Right Met?
Cross	P	7.0	566.0	570	415	570	260	N	566.0	570	470	570	330	N
	SU	9.2	743.8	750	555	750		N	743.8	750	615	750		N
	WB-50	11.2	905.5	910	755	910		N	905.5	910	820	910		N
Left	P	8.0	646.8	650	490	650	260	N	646.8	650	670	670	330	N
	SU	10.2	824.7	830	705	830		N	824.7	830	995	995		N
	WB-50	12.2	986.4	990	930	990		N	986.4	990	1335	1335		N
Right	P	6.5	525.5	530	640	640	260	N	525.5	530	N/A	N/A	330	N/A
	SU	8.5	687.2	690	940	940		N	687.2	690	N/A	N/A		N/A
	WB-50	10.5	848.9	850	1280	1280		N	848.9	850	N/A	N/A		N/A

Note: AASHTO calculations based on Exhibits 9-54 and 9-57 from "A policy on Geometric Design of Highways and Streets" with V_{major} = 55mph (45mph + 10mph)

Note: AA County calculations based on Appendix J of Anne Arundel County Design Manual Chapter III "Roads and Streets" 45 mp operating speed

*Value is taken as the higher of AASHTO or AA County ISD

Table B - Silver Way Sight Distances

Movement	Vehicle	t_g (sec)	AASHTO Calculated ISD (ft)	AASHTO Required Left ISD (ft)	AA County Required Left ISD (ft)	*Design Required Left ISD (ft)	Provided Left (ft)	Left Met?	AASHTO Calculated ISD (ft)	AASHTO Required Left ISD (ft)	AA County Required Right ISD (ft)	*Design Required Left ISD (ft)	Provided Right	Right Met?
Cross	P	7.0	566.0	570	415	570	800	Y	566.0	570	470	570	840	Y
	SU	9.2	743.8	750	555	750		N	743.8	750	615	750		N
	WB-50	11.2	905.5	910	755	910		N	905.5	910	820	910		N
Left	P	8.0	646.8	650	490	650	800	Y	646.8	650	670	670	840	Y
	SU	10.2	824.7	830	705	830		N	824.7	830	995	995		N
	WB-50	12.2	986.4	990	930	990		N	986.4	990	1335	1335		N
Right	P	6.5	525.5	530	640	640	800	Y	525.5	530	N/A	N/A	840	N/A
	SU	8.5	687.2	690	940	940		N	687.2	690	N/A	N/A		N/A
	WB-50	10.5	848.9	850	1280	1280		N	848.9	850	N/A	N/A		N/A

Note: AASHTO calculations based on Exhibits 9-54 and 9-57 from "A policy on Geometric Design of Highways and Streets" with V_{major} = 55mph (45mph + 10mph)

Note: AA County calculations based on Appendix J of Anne Arundel County Design Manual Chapter III "Roads and Streets" 45 mp operating speed

*Value is taken as the higher of AASHTO or AA County ISD

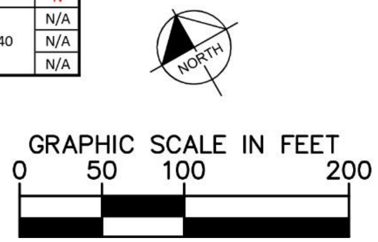


Figure 11. Sight Distance Analysis

Figure 12. Right-of-Way and Signage

Chapter 4 Traffic Operations Evaluation

MEASURES OF EFFECTIVENESS

Traffic analysis was performed using Synchro 9, a macroscopic analysis tool that uses Highway Capacity Manual (HCM) methodologies to calculate operational performance at signalized and unsignalized intersections. Highway Capacity Software (HCS) was used to analyze operational performance for the two mid-block segments where volume and speed data were collected. The following measures of effectiveness (MOE) were considered for this study:

- Movement/approach/overall intersection delay;
- Movement/approach/overall intersection Level of Service (LOS); and
- 95th-percentile movement/approach queues, based on Synchro HCM outputs
- Roadway segment LOS

The Highway Capacity Manual (HCM) defines LOS for signalized and unsignalized intersections as a function of average vehicle control delay. LOS may be calculated per movement or per approach for any intersection configuration, but overall intersection LOS is defined for signalized and all-way stop-controlled intersections only. Overall intersection LOS is not reported for two-way stop-controlled intersections. **Table 4** and **Table 5** summarize the different LOS designations for both signalized and unsignalized intersections, respectively, based on vehicle delay. The existing conditions LOS, delay, and queuing analyses for the AM, PM and Saturday peak hours are discussed in the following sections.

Table 4: LOS and Delay Thresholds, Signalized Intersections

Level of Service (LOS)	Average Control Delay (seconds)	General Description
A	≤ 10	Free flow
B	$> 10 - 20$	Stable flow (slight delays)
C	$> 20 - 35$	Stable flow (acceptable delays)
D	$> 35 - 55$	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	$> 55 - 80$	Unstable flow (intolerable delay)
F	> 80	Forced flow (congested and queues fail to clear)

Table 5: LOS and Delay Thresholds, Unsignalized Intersections

Level of Service (LOS)	Average Control Delay (seconds)
A	$0 - 10$
B	$> 10 - 15$
C	$> 15 - 25$
D	$> 25 - 35$
E	$> 35 - 50$
F	> 50

In addition to the LOS and delay MOEs, 95th-percentile queues per movement also were evaluated. 95th percentile queues are particularly useful for traffic operations evaluation, as they represent the maximum queue lengths that are anticipated for 95% of the time at each location while removing potential outliers that may skew the analysis results.

TRAFFIC OPERATIONAL RESULTS

Synchro Results

The existing conditions overall intersection delay and LOS outputs are summarized in **Table 6**. The existing conditions delay and LOS by movement is provided in Synchro HCM reports in **Appendix B**.

Table 6. Existing (2017) Peak Hour Intersection Delay and LOS

ID	Intersection	Traffic Control	Weekday AM Peak Hour		Weekday PM Peak Hour		Saturday Midday Peak Hour	
			Delay	LOS	Delay	LOS	Delay	LOS
1	Waugh Chapel Road/Maytime Drive	Signalized	13.0	B	9.7	A	9.4	A
2	Waugh Chapel Road/Symphony Lane	Signalized	40.3	D	9.5	A	4.3	A
3	Waugh Chapel Road/Macmullen Drive	Two-way Stop*	68.0	F	377.6	F	43.6	E
4	Waugh Chapel Road/Summerfield Road	Two-way Stop*	61.0	F	129.3	F	27.8	D
5	Waugh Chapel Road/New Market Lane	Signalized	13.7	B	23.3	C	26.2	C

* Worst movement was reported for two-way stop controlled intersection.

As shown in **Table 6** and **Appendix B,** the signalized intersections currently operate at overall LOS C or better except for Waugh Chapel Road and Symphony Lane in AM. The eastbound through movement on Waugh Chapel Road at Symphony Lane operates at LOS F due to heavy opposing left-turn volumes. The rest of mainline through and turning movements on Waugh Chapel Road operate at acceptable LOS during AM and PM peak hours. Side streets experience more delays, particularly at New Market Lane/Wigeon Way, Silver Way/Macmullen Drive, and Symphony Lane, where side streets operate at LOS E/F. New Market Lane has large left-turn and right-turn volumes during PM peak hour. Turning traffic from Silver Way/Macmullen Road must wait a long time for a sufficient gap to turn, although the turning volumes from side streets are low.

The delay on Waugh Chapel Road is primarily attributed to the signalized intersections. The intersection of Symphony Lane and Waugh Chapel Road is a major source of delay during AM peak hour because the heavy eastbound commuting trips (520 vph) are stopped by the westbound left-turn traffic (234 vph) into the School of the Incarnation and the Symphony Lane approach requires additional time to clear the queue of vehicles leaving the school.

During the Saturday peak hour, the New Market Lane approach experiences high delay (LOS E) while Waugh Chapel Road operate at acceptable LOS. This is due to the higher number of vehicles exiting the shopping center throughout the day.

The 95th percentile queue length for each movement at the intersections was reported from SimTraffic and compared with available storage for turn lanes and between adjacent intersections. During AM peak, the eastbound through traffic queue on Waugh Chapel Road at Symphony Lane extends close to the adjacent intersection at Maytime Drive and often blocks the eastbound right-turn lane. The northbound New Market Lane queue extends to the adjacent driveway in the shopping center during PM and Saturday peak hours. A few locations with notable 95th percentile queues are as follows:

AM Peak Hour

- Eastbound through queue on Waugh Chapel Road at Maytime Drive measures at 150 feet
- Eastbound through queue on Waugh Chapel Road at Symphony Lane extends close to Maytime Drive (950 feet)
- Northbound right-turn queue from Symphony Lane to Waugh Chapel Road is at storage capacity

PM Peak Hour

- Eastbound and westbound through queues on Waugh Chapel Road at Maytime Drive measure at 200 feet, blocking turn lanes occasionally
- Northbound left-turn queue extends beyond the adjacent driveway on New Market Lane

Saturday Peak Hour

- Northbound left-turn queue extends beyond the adjacent driveway on New Market Lane

The results of delay/LOS and 95th percentile queues by movement at each intersection are reported in **Appendix B**.

HCS Results

HCS Two-Lane analysis methodology was used to evaluate the performance of the three segments of Waugh Chapel Road. The extents of these evaluation segments are listed below:

- Maytime Drive to Symphony Lane
- Symphony Lane to Silver Way/Macmullen Drive
- Silver Way/Macmullen Drive to Summerfield Road

The existing conditions roadway segment LOS results are provided in **Table 7.** All three segments operate at LOS D/E. The peak hour demand on Waugh Chapel Road is heavy for a two-lane facility. The segments east of Symphony Lane operate worse than the western segment during the AM peak due to higher demand and truck traffic. During PM peak all segments operate at LOS E for both directions.

Table 7: HCS Two-Lane Peak Hour LOS Results

Peak Hour	Direction	Segment 1	Segment 2	Segment 3
		Maytime Drive to Symphony Lane	Symphony Lane to Silver Way/Macmullen Drive	Silver Way/Macmullen Drive to Summerfield Road
AM	Eastbound	D	E	E
	Westbound	D	D	E
PM	Eastbound	E	E	E
	Westbound	E	E	E

*Speed data from segment 1 and 3 was used to estimate the segment 2 speed for the HCS analysis.

The HCS analysis worksheet is provided in **Appendix C.**

SIGNAL WARRANT ANALYSIS

A signal warrant analysis was performed for the intersection of Waugh Chapel Road at Silver Way/Macmullen Drive. All eight criteria were evaluated based on the traffic count and crash data collected and signalization is not currently warranted at this intersection. This is primarily because of the low volumes on the side streets. However, this may change when Chapel Creek Village is fully constructed and occupied. There are several rear-end crashes at the intersection, which may be attributable to the side street movements, although no crashes were reported that directly involved vehicles coming out of side streets. The number of crashes per year at this intersection from 2014 to 2016 does not meet the crash experience warrant. Pedestrian volumes are low and there are no observed school crossing activities at this intersection. The signal warrant analysis worksheet is provided in **Appendix D**.

Chapter 5 Multimodal Transportation

This chapter describes the existing conditions of the study area related to the connectivity and conditions of pedestrian and bicycle facilities and public transportation. The information presented in this chapter is based on a combination of sources including previous studies, Geographic Information Systems (GIS) from Anne Arundel County, and visual observation in the field. The three main previous studies are the 2013 Anne Arundel Pedestrian and Bicycle Master Plan, the 2003 Anne Arundel County Pedestrian and Bicycle Master Plan, and the Summerfield Village Traffic Impact Study. The following sections provide details and maps pertaining to the various modes.

PEDESTRIAN AND BICYCLE FACILITIES

The 2013 Pedestrian and Bicycle Master Plan (PBMP), which was created as an update to the 2003 Pedestrian and Bicycle Master Plan, identifies improvement opportunities that increase the potential for safe trip-making by walking and bicycling. These opportunities include both infrastructure and non-infrastructure improvements that are sorted by a tier ranking system. The following summarizes conditions of bicycle and pedestrian facilities in the study area, as well as proposed improvements suggested in the 2013 Pedestrian and Bicycle Master Plan.

Sidewalks

Policy outlined in the 2013 PBMP stresses the importance of prioritizing sidewalk improvements to ensure that streets have sidewalks on at least one side of the street. As shown in Figure 13, sidewalks are isolated and disconnected on Waugh Chapel Road from Maytime Drive to Main Chapel Way.

While the majority of the local street network in the communities outside the study area have connected sidewalks on either or both sides of the street, this represents a critical gap in the pedestrian network, which presents challenges to pedestrians who desire to walk to the Waugh Chapel Village shopping center.

Major pedestrian attractors in the study area also include Four Seasons Elementary School near Maytime Drive and School of the Incarnation near Symphony Lane.

Constructing sidewalk along the south side of Waugh Chapel Road from Maytime Drive to Summerfield Road was identified as a tier three project in the 2013 PBMP. Pedestrian and bicycle improvements on MD 3 from Waugh Chapel Road to Defense Highway also have been identified as a tier one project.

Bicycle Facilities

This section describes the facilities and condition of biking in the study area. Bicycle facilities in the study area consist of both roadway shoulder with shared lane marking for biking and travel lanes shared by bicycle and motor vehicle. The shared lane is observed at locations such as intersection approaches, where the shoulder becomes right-turn lane, and segments where shoulder is not available. ***Figure 13*** shows the type of bicycle facilities in the study area.

The lack of dedicated, consistent, and continuous bicycle facilities presents challenges to the bicyclists in the study area. The biggest safety concerns are at locations where bicyclists must share the road with vehicular traffic. This occurs in the segment east of the Silver Way intersection as well as all intersection approaches. In addition, the roadway shoulder is truncated by choker islands (east of Silver Way and Waugh Chapel Road intersection) which could potentially force biking on the roadway. Constructing Waugh Chapel Road bicycle lanes from Piney Orchard Parkway to MD 3 was listed as a tier two project in the 2013 PBMP. Waugh Chapel Road was described as a feasible route for bicycle lanes.

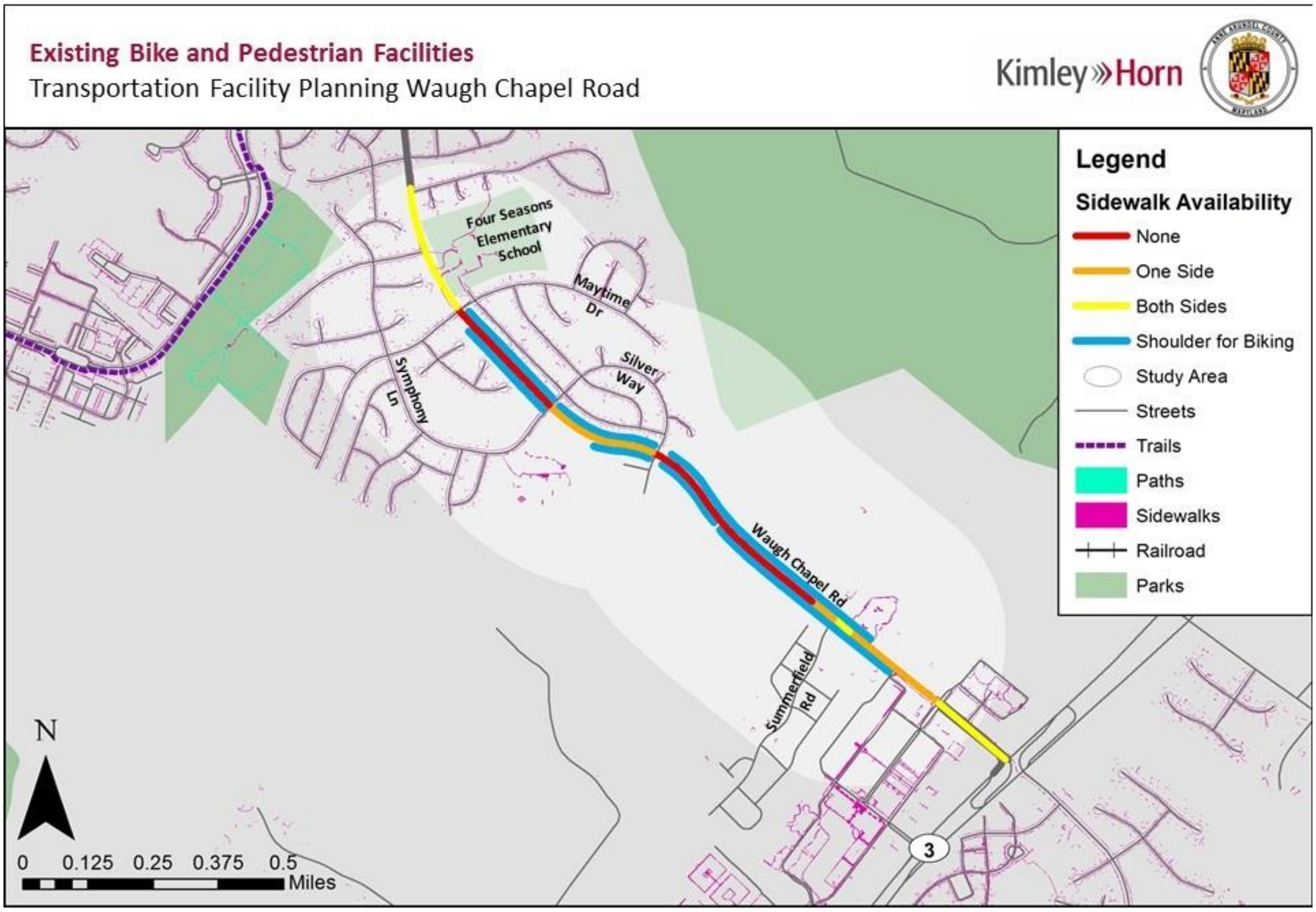


Figure 13. Existing Bike and Pedestrian Facilities

Trails

Washington, Baltimore & Annapolis (WB&A) Trail crosses Waugh Chapel Road at Old Waugh Chapel Road north of the study area. The at-grade crossing is currently unsignalized with a median refugee area. The 2013 PBMP identified WB&A trail access improvement to enhance access to WB&A Trail where Old Waugh Chapel Road bridge crosses the trail.

TRANSIT

Transit and school bus routes

Although there are no fixed-route local or regional bus service in the area, the County is offering a Call and Ride service in this area. Waugh Chapel Road services a few school bus routes.

MARC station

The Odenton MARC train station is located approximately 3 miles from the Maytime Drive intersection, the western terminus of the Waugh Chapel study area. The Odenton station provides daily train service to various locations, including Washington DC’s Union Station and Baltimore’s Penn Station, via the Penn Line. It a popular commuter route, with parking at the Odenton station often beyond capacity.

Chapter 6 Safety Analysis

CRASH DATA

Crash data was used to evaluate safety conditions and crash patterns throughout the study area. This data was obtained from the State Highway Administration of Maryland Department of Transportation. The data includes crashes from January 1, 2014 to August 31, 2017 by mile marker. It is noted that the crash analysis included segments of Waugh Chapel Road from MD 3 to Autumn Gold Drive, just past Four Seasons Elementary School. According to the crash data, MD 3 represents mile marker 0.00 and Autumn Gold Drive represents mile marker 1.50 on Waugh Chapel Road.

COLLISION FREQUENCY AND SEVERITY

Between January 2014 and August 2017, there were 70 total crashes in the study corridor. A summary of the crashes by year and by injury is shown in **Table 8**. There were no fatalities during the study period, but two fatal collisions were reported in the study corridor since 2010. The two fatalities happened on the curved roadway segment near the unsignalized Silver Way intersection (one to the east and the other to the west) during the winter (January and February). Approximately 6% of the crashes involved impaired drivers.

Table 8: Crash Severity by Year

Year	Fatalities	Injuries	No Injuries	Total
2014	0	7	6	13
2015	0	9	18	27
2016	0	8	14	22
2017	0	3	5	8
Total	**0**	**27**	**43**	**70**

Note: 2017 data is partial and unedited.

COLLISION TYPES

Figure 14 and **Figure 15** show crash types that were analyzed. Most of the crashes happened during the weekday (55) compared to the weekend (15). There were no bicycle or pedestrian collisions reported. The most prevalent crash frequencies were near intersections. Mile marker 1.12 near Symphony Lane/Silver Way and Waugh Chapel Road had a total of 5 crashes, and mile marker 0.17 near New Market Lane/Wigeon Way and Waugh Chapel Road had a total of 19 crashes. There were many rear end, head on, and angle crashes near these intersections.

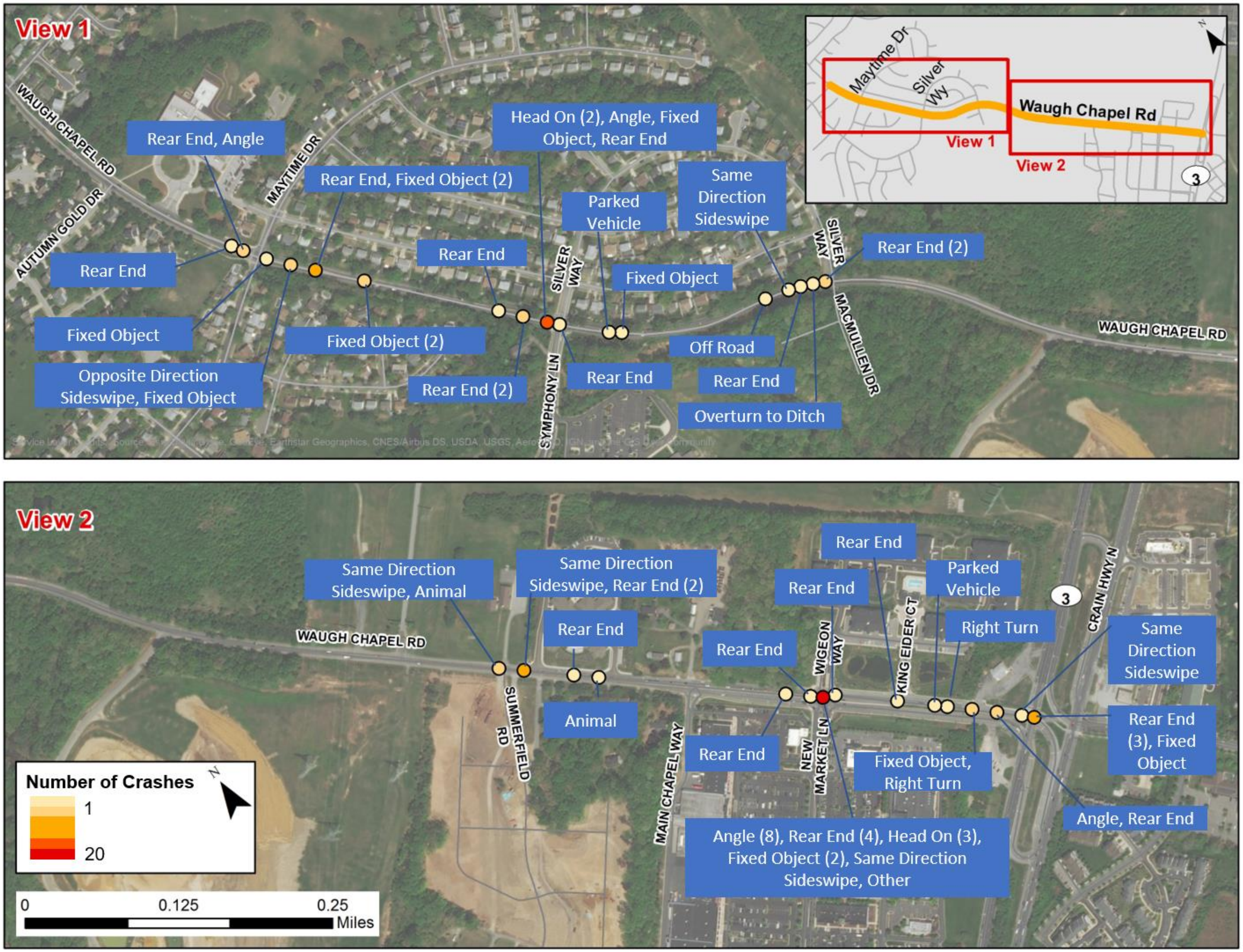


Figure 14. Crash Patterns by Study Intersections

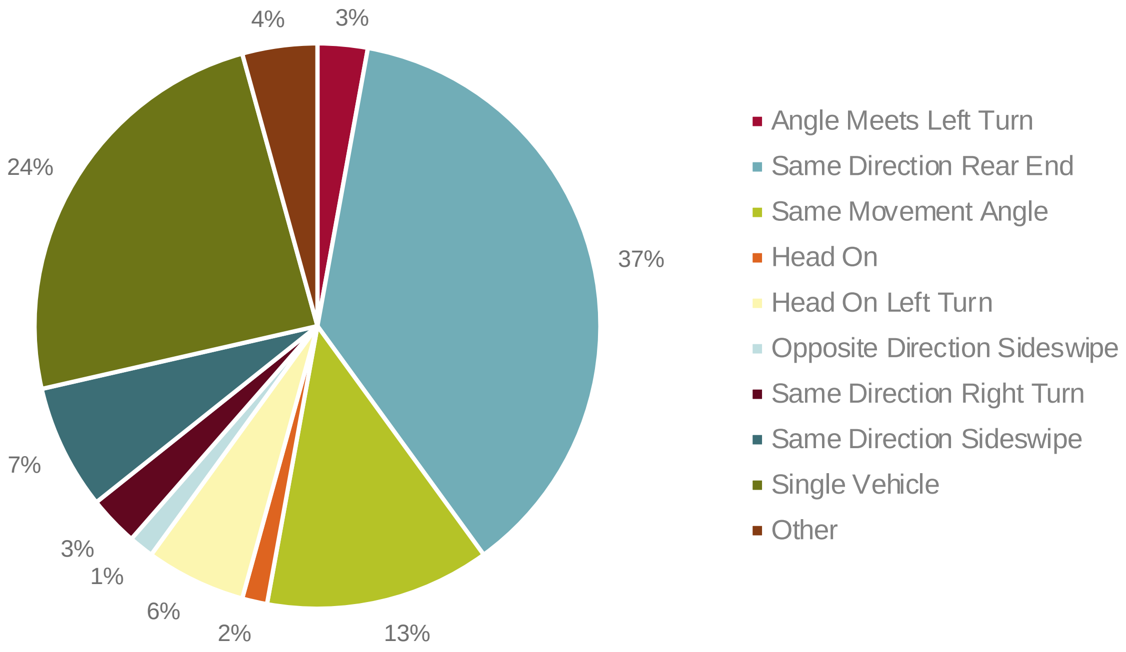


Figure 15: Crash Types

Along the entire study area, rear end, single vehicle, and angle crash types were the most prevalent. Single vehicle accidents consist of those with fixed objects, animals, driving off road, parked vehicles, and other non-collision accidents. These crashes were mainly concentrated around intersections and driveways. **Table 9** summarizes the collision types by intersection. There was a total of 67 crashes that were intersection related out of the 70 total crashes within the study area. Crashes within 250 feet of the intersection or within turning lanes were assumed to be intersection related crashes.

The following summary highlights crash patterns at intersections:

- Majority of the rear end crashes happened at New Market Lane/Wigeon Way (7 crashes), followed by Symphony Lane (5 crashes), and Silver Way/Macmullen Drive (3 crashes). The rear-end crashes at Silver Way/Macmullen Drive are attributable to a combination of factors, including the lack of westbound left-turn lane, speeding, and the horizontal alignment approaching the intersection in the westbound direction on Waugh Chapel Road.
- Most angle crashes occurred at New Market Lane/Wigeon Way (8 crashes). There were also three head on – left turn crashes at this intersection, comprising the five head-on crashes in the corridor (the other two occurred near Symphony Lane). This intersection has heavy left-turn volumes and protected left turn phases are provided for three out of the four movements. Upon further review in the field, a protected left-turn phase may be needed for the southbound approach as well.
- At the intersection of Symphony Lane and Waugh Chapel Road, protected/permissive left-turn phases are provided on Waugh Chapel Road. Review of turn phasing on Waugh Chapel Road and the side streets may be needed to determine how best to accommodate heavy right and left turn volumes on several of the approaches to allow for safe turning maneuvers, particularly in the morning.

- There were 5 single vehicle crashes near Maytime Drive and Waugh Chapel Road. All these collisions were hitting fixed objects near the intersection. This section has a straight alignment and the 85th percentile speeds in this segment exceed the speed limit by more than 10 mph. Speeding may contribute to vehicles running off the road.
- Majority of the single vehicle crashes occurred between Maytime Drive and Silver Way/Macmullen Drive. Roadway horizontal curves and speeding are contributing factors. When developing improvements, this information will be taken into consideration.

Table 9: Intersection Collision Types

Intersection	*Angle Meets Left Turn*	*Same Direction Rear End*	*Same Movement Angle*	*Head On*	*Head On Left Turn*	*Opposite Direction Sideswipe*	*Same Direction Right Turn*	*Same Direction Sideswipe*	*Single Vehicle*	*Other*	*Total*
Maytime Dr	1	3	0	0	0	1	0	0	5	0	**10**
Symphony Ln	0	5	1	1	1	0	0	0	3	0	**11**
Silver Way and Macmullen Dr	0	3	0	0	0	0	0	1	1	0	**5**
Driveway into Waugh Chapel Center - West	0	3	0	0	0	0	0	2	0	1	**6**
Driveway into Waugh Chapel Center - East	0	0	0	0	0	0	0	0	1	0	**1**
New Market Ln/Wigeon Way	1	7	7	0	3	0	0	1	2	1	**22**
King Eider Ct	0	1	0	0	0	0	1	0	0	1	**3**
Crain Hwy (MD 3)	0	4	1	0	0	0	1	1	2	0	**9**
Total	**2**	**26**	**9**	**1**	**4**	**1**	**2**	**5**	**14**	**3**	**67**

For the study area, the following crash trends also were reported during 2014 to 2017:

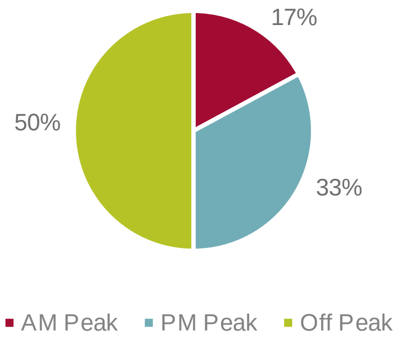


Figure 16: Time Period

- 12 crashes (17%) occurred during the AM peak period and 23 collisions (33%) during the PM peak period. There was an equal amount of crashes that happened during the peak periods as there were during the off-peak period (35 crashes, 50%).

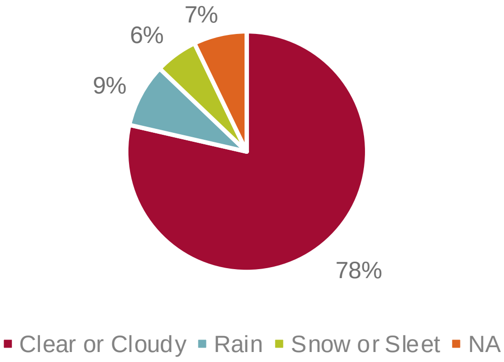


Figure 17: Weather Condition

- 55 crashes (78%) occurred during clear/cloudy weather conditions, 6 (9%) during the rain, 4 (6%) during snow/sleet conditions, and 5 crashes (7%) during unknown conditions. The majority were during clear/cloudy conditions, indicating weather was not a major contributing factor.

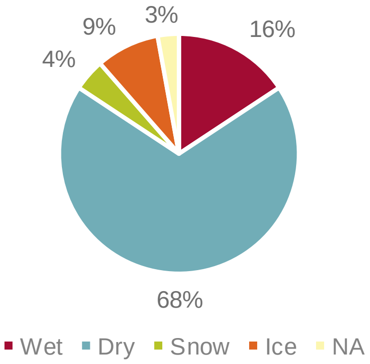


Figure 18: Road Condition

- 48 crashes (68%) occurred during dry road conditions, 11 (16%) during wet road conditions, 6 (9%) during ice conditions, 3 (4%) during snow conditions, and 2 crashes (3%) occurred during other road conditions. This indicates that roadway surface conditions are not contributing factors to crashes.

Chapter 7 Findings and Next Steps

SUMMARY OF FINDINGS

The following summarizes the key findings of the existing conditions analysis for the Waugh Chapel Road study corridor:

- The level of service at the signalized study intersections along Waugh Chapel Road operate within adequate levels of service during peak hours. According to Synchro analysis, the two unsignalized intersections operate at LOS F during the AM and PM peak hours and LOS D and F during the Saturday peak hour. The failing level of service is due to the difficulty that the side street vehicles have in finding gaps to enter Waugh Chapel Road. Field observations reveal minimal queues at the unsignalized intersections.
- The roadway segments studied along Waugh Chapel Road operate at LOS D/E. The peak hour demand on Waugh Chapel Road is heavy for a two-lane facility. The segments east of Symphony Lane operate worse than the western segment, Maytime Drive to Symphony Lane, during the AM peak due to higher demand and truck traffic. During PM peak, all segments operate at LOS E for both directions. Field observations did not reveal issues with level of service along Waugh Chapel Road. There was very little delay along the corridor during the peak periods, with the exception of an approximately 15-minute period between 7:50 and 8:05 AM in the eastbound direction at the intersection of Waugh Chapel Road and Symphony Lane. This delay is attributed to the traffic associated with the School of the Incarnation.
- Under existing conditions, the intersection of Silver Way/Macmullen Drive and Waugh Chapel Road does not warrant a traffic signal.
- Speeding in the corridor, based on the 85th percentile speeds collected, in conjunction with roadway horizontal alignment may present potential risk to safety at the intersections as well as future proposed pedestrian and bicycle improvements.
- Reported crashes along the corridor are centered around the intersections and driveways. Excluding the crashes near MD 3, crashes at the intersection of New Market Lane/Wigeon Way represented over 35% of the crashes in the corridor and most of the rear-end and angle crashes. Most of the single vehicle crashes occurred between Maytime Drive and Silver Way/Macmullen Drive. Roadway horizontal curves and speeding are contributing factors.
- The lack of connected sidewalks on Waugh Chapel Road in the study area is a critical gap to address in this study as the roadway is transformed.
- Dedicated bicycle facilities or shared use paths are needed on Waugh Chapel Road to provide protection for bicyclists and connectivity for the bicycle network linking to the regional trail and transit system.

NEXT STEPS

Following the final existing conditions report, the study team will develop future volumes for the study corridor. The team will then work with the County and the community to develop evaluation metrics and begin to develop concepts for improvements to address deficiencies along the study corridor.

Chapter 8 Future No Build Conditions

This chapter documents the future (2040) No Build traffic volume forecast and traffic operations analysis. The study team chose to use year 2040 as the future analysis year for this study to develop improvement alternatives that could accommodate anticipated traffic growth while serving the multimodal needs on Waugh Chapel Road. The findings from the future No Build analysis will be used to identify traffic operational issues and needs and to provide a basis for developing improvement alternatives. The traffic analyses include assessments of typical weekday AM and PM peak hour and Saturday mid-day peak hour operations for the future year of 2040.

TRAFFIC FORECAST

The study team obtained the Baltimore Metropolitan Council (BMC) regional travel demand model (Version 44C) (hereafter referred to as BMC model) for developing traffic growth rates. The BMC model was used to generate baseline (2016) and future (2040) link traffic volumes. Traffic growth rate(s) for the study corridor and major crossing and parallel roadways were derived from BMC model link volumes. In addition, the land use data associated with the BMC model was reviewed in conjunction with the traffic growth rates by the study team.

The traffic growth rates on Waugh Chapel Road are projected to range from 1% to 2% with higher growth anticipated in the off-peak directions (e.g. westbound in AM and eastbound in PM). Upon examining the land use data, the residential area surrounding the study corridor has minimal growth while the biggest growth in population and employment (approximately 10% annually) is projected to take place in the planned Odenton Town Center near the study area. The traffic forecasts from BMC model are consistent with the projected land use growth.

A brief model validation was conducted to compare the BMC link volumes with daily volumes collected either from the field or from SHA. A screenline was selected to cross Waugh Chapel Road and the parallel east-west roadway MD 175. Traffic count data was not available for Conway Road or Patuxent Road, which were then excluded from the screenline. The BMC model link volumes on Waugh Chapel Road were post-processed by loading more traffic from residential area south of the study corridor to Waugh Chapel Road instead of directly to MD 3 given the large traffic analysis zone (TAZ) and oversimplification of side streets. The screenline volume comparison shows that BMC model volumes were 11% higher than the daily counts, thereby meeting the threshold established in the Federal Highway Administration (FHWA) Model Reasonableness Check. The BMC model was observed to assign more volume to MD 175 when compared to traffic counts, which is likely due to the higher posted speed limit on MD 175 compared to Waugh Chapel Road.

Kimley-Horn presented the traffic growth projection and land use data analysis to the study team. The study team determined that that an average annual growth rate of 1% would most properly represent the anticipated growth on Waugh Chapel Road in the peak direction of travel while off-peak direction of travel would experience more growth (close to 2%). For Saturday mid-day traffic projection, 1% growth rate was proposed for both directions of travel on Waugh Chapel Road. The County approved the proposed growth rate(s) prior to developing future traffic volumes.

Kimley-Horn grew the existing intersection traffic volumes using the approved traffic growth rate and balanced the traffic volumes as needed throughout the study corridor. Trip generation data for Summerfield Village was used to estimate the side street volumes in 2040 because existing counts represent only partially developed and occupied units. The projected 2040 No-Build AM and PM peak hour and Saturday mid-day peak hour traffic volumes for the study area are summarized in Figure 19 and Figure 20, respectively. It was assumed that 2040 traffic demand would change under the build scenario due to proposed new street connections as well as multimodal improvements; however, intersection spot improvements would not trigger traffic demand change in 2040.

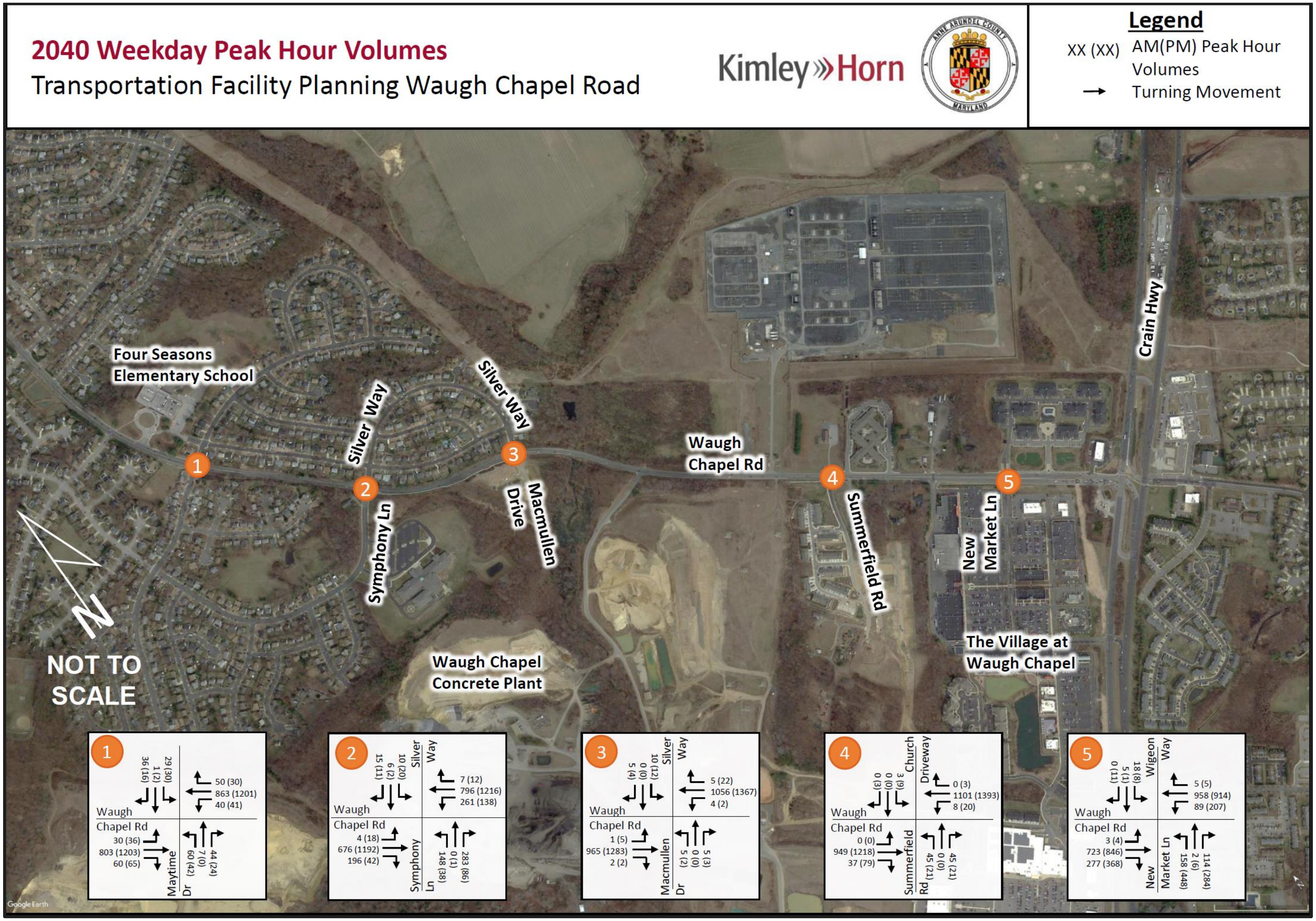


Figure 19. 2040 No Build Weekday Peak Hour Volumes

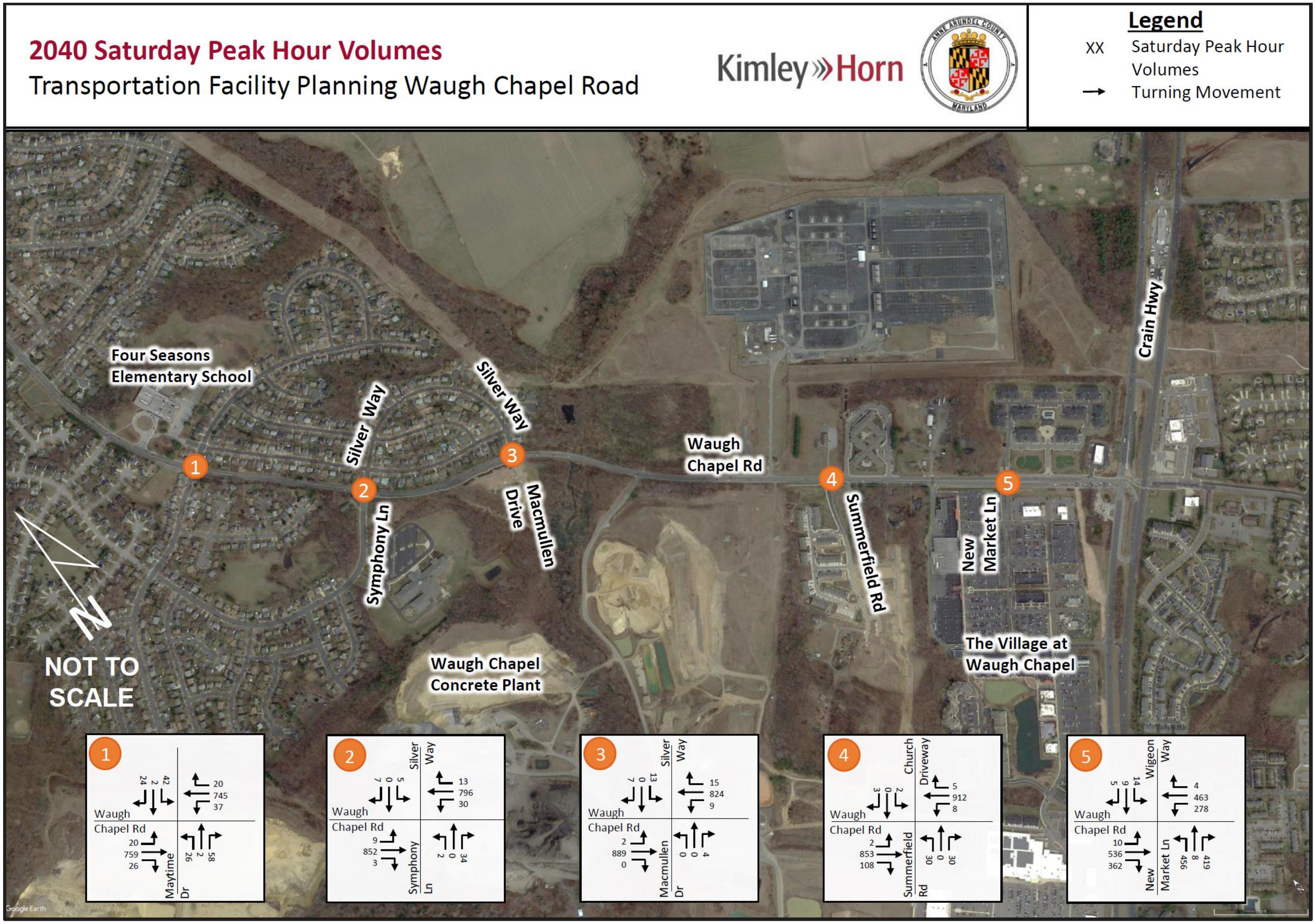


Figure 20. 2040 No Build Saturday Peak Hour Volumes

TRAFFIC OPERATIONAL RESULTS

Synchro Results

The 2040 No Build overall intersection delay and LOS Synchro results are summarized in **Table 6**. The 2040 No Build delay and LOS by movement is provided in Synchro HCM reports in **Appendix B**.

Table 10. 2040 No Build Peak Hour Intersection Delay and LOS

ID	Intersection	Traffic Control	Weekday AM Peak Hour		Weekday PM Peak Hour		Saturday Midday Peak Hour	
			Delay	LOS	Delay	LOS	Delay	LOS
1	Waugh Chapel Road/Maytime Drive	Signalized	15.4	B	17.5	B	11.6	B
2	Waugh Chapel Road/Symphony Lane	Signalized	56.2	E	20.7	C	5.6	A
3	Waugh Chapel Road/Macmullen Drive	Two-way Stop*	512.4	F	**	F	159.8	F
4	Waugh Chapel Road/Summerfield Road	Two-way Stop*	564.7	F	1118.5	F	133.5	F
5	Waugh Chapel Road/New Market Lane	Signalized	15.5	B	25.4	C	28.7	C

* Worst movement was reported for two-way stop controlled intersection.

** Delay exceeds 600 seconds/vehicle.

As shown in **Table 6** and **Appendix B,** the intersection of Symphony Lane and Waugh Chapel Road operates at LOS E during AM peak hour with mainline traffic experiencing high delay in eastbound direction. The other signalized intersections operate at overall LOS B or better. Side streets experience more delays, particularly at New Market Lane/Wigeon Way, and Symphony Lane, where side streets operate at LOS E/F. At unsignalized intersections, turning traffic from Silver Way/Macmullen Road and from Summerfield Road has little gap and must wait an excessive amount of time to turn. Existing conditions are exacerbated in the future. The next phase of the study will develop potential concepts to manage the growth in traffic along the corridor.

During the Saturday peak hour, the New Market Lane approach experiences high delay (LOS E) while Waugh Chapel Road operates at acceptable LOS. This is due to the higher number of vehicles exiting the shopping center throughout the day.

The 95th percentile queue length for each movement at the intersections was reported from SimTraffic and compared with available storage for turn lanes and between adjacent intersections. None of the queues exceeded turn lane storage or extended to adjacent intersections except for northbound New Market Lane during PM and Saturday peak hours. A few locations with notable 95th percentile queues were provided as follow.

AM Peak Hour

- Eastbound through queue on Waugh Chapel Road at Maytime Drive measures close to 900 feet, which extends beyond Four Seasons Elementary School driveway and Autumn Gold Drive
- Eastbound queue on Waugh Chapel Road at Symphony Lane is significant, extending beyond the adjacent intersection of Maytime Drive; the extensive through queue also blocks eastbound right-turn lane, resulting in queue spillover from turn lane
- Westbound through queue at Symphony Lane measures at 400 feet
- Northbound right-turn queue from Symphony Lane to Waugh Chapel Road is at storage capacity

PM Peak Hour

- Eastbound and westbound through queues on Waugh Chapel Road at Maytime Drive measure at 450 feet and 350 feet, respectively
- Eastbound queue at Symphony Lane measures at 625 feet, which blocks the turn lanes
- Westbound queue at Symphony Lane measures at 350 feet
- Northbound left-turn queue extends beyond the adjacent driveway on New Market Lane

Saturday Peak Hour

- Northbound left-turn queue extends beyond the adjacent driveway on New Market Lane

The results of delay/LOS and 95th percentile queues by movement at each intersection are reported in **Appendix B**.

HCS Results

HCS Two-Lane analysis methodology was used to evaluate the performance of the three segments of Waugh Chapel Road. The 2040 No Build roadway segment LOS results are provided in **Table 7.** All three segments operate at LOS E in both AM and PM peak. The peak hour demand on Waugh Chapel Road is projected to be heavy for a two-lane facility.

Table 11: 2040 No Build HCS Two-Lane Peak Hour LOS Results

Peak Hour	Direction	Segment 1	Segment 2	Segment 3
		Maytime Drive to Symphony Lane	Symphony Lane to Silver Way/Macmullen Drive	Silver Way/Macmullen Drive to Summerfield Road
AM	Eastbound	E	E	E
	Westbound	E	E	E
PM	Eastbound	E	E	E
	Westbound	E	E	E

*Speed data from segment 1 and 3 was used to estimate the segment 2 speed for the HCS analysis.

The HCS analysis worksheet is provided in **Appendix C.**

Appendix B

EXISTING CONDITIONS TECHNICAL REPORTS

Appendix B-1

TRAFFIC COUNTS AND SPEED DATA

National Data & Surveying Services

Intersection Turning Movement Count

Location: Maytime Dr & Waugh Chapel Rd
City: Gambrills
Control: Signalized

Project ID: 17-11050-001
Date: 11/16/2017

Total

NS/EW Streets:	Maytime Dr				Maytime Dr				Waugh Chapel Rd				Waugh Chapel Rd				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	1	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:30 AM	11	1	9	0	10	0	10	0	1	111	1	0	0	70	2	0	226
6:45 AM	14	0	9	0	5	0	11	0	1	96	4	0	1	78	0	0	219
7:00 AM	12	1	10	0	7	0	16	0	1	116	5	0	3	154	3	0	328
7:15 AM	20	3	5	0	6	0	7	0	3	107	7	0	5	143	8	0	314
7:30 AM	9	0	10	0	7	0	8	0	8	168	4	0	1	127	9	0	351
7:45 AM	12	3	17	0	6	1	11	0	7	209	20	0	6	141	12	0	445
8:00 AM	16	1	10	0	8	0	8	0	12	145	29	0	15	162	5	0	411
8:15 AM	4	2	3	0	9	1	7	0	11	98	5	0	1	104	15	0	260
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	98	11	73	0	58	2	78	0	44	1050	75	0	32	979	54	0	2554
APPROACH %'s :	53.85%	6.04%	40.11%	0.00%	42.03%	1.45%	56.52%	0.00%	3.76%	89.82%	6.42%	0.00%	3.00%	91.92%	5.07%	0.00%	
PEAK HR :	07:15 AM - 08:15 AM																TOTAL
PEAK HR VOL :	57	7	42	0	27	1	34	0	30	629	60	0	27	573	34	0	1521
PEAK HR FACTOR :	0.713	0.583	0.618	0.000	0.844	0.250	0.773	0.000	0.625	0.752	0.517	0.000	0.450	0.884	0.708	0.000	0.854
		0.828				0.861				0.762				0.871			

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	1	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
4:30 PM	7	1	4	0	6	0	9	0	9	182	15	0	11	233	10	0	487
4:45 PM	5	0	7	0	3	1	6	0	5	201	10	0	4	225	6	0	473
5:00 PM	6	1	1	0	5	1	5	0	8	175	13	0	9	218	10	0	452
5:15 PM	11	0	3	0	5	0	6	0	16	205	15	0	6	204	5	0	476
5:30 PM	10	0	5	0	9	0	7	0	10	200	18	0	6	258	9	0	532
5:45 PM	10	0	8	0	5	2	3	0	12	226	9	0	10	248	5	0	538
6:00 PM	15	0	3	0	6	0	2	0	10	204	22	0	12	219	10	0	503
6:15 PM	5	0	6	0	8	0	3	0	4	207	16	0	13	199	6	0	467
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	69	2	37	0	47	4	41	0	74	1600	118	0	71	1804	61	0	3928
APPROACH %'s :	63.89%	1.85%	34.26%	0.00%	51.09%	4.35%	44.57%	0.00%	4.13%	89.29%	6.58%	0.00%	3.67%	93.18%	3.15%	0.00%	
PEAK HR :	05:15 PM - 06:15 PM																TOTAL
PEAK HR VOL :	46	0	19	0	25	2	18	0	48	835	64	0	34	929	29	0	2049
PEAK HR FACTOR :	0.767	0.000	0.594	0.000	0.694	0.250	0.643	0.000	0.750	0.924	0.727	0.000	0.708	0.900	0.725	0.000	0.952
		0.903				0.703				0.959				0.908			

National Data & Surveying Services

Intersection Turning Movement Count

Location: Maytime Dr & Waugh Chapel Rd
City: Gambrills
Control: Signalized

Project ID: 17-11050-001
Date: 11/16/2017

Cars

NS/EW Streets:	Maytime Dr				Maytime Dr				Waugh Chapel Rd				Waugh Chapel Rd				
	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
AM	0	1	0	0	1	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:30 AM	11	1	9	0	10	0	9	0	1	110	1	0	0	70	2	0	224
6:45 AM	13	0	9	0	5	0	10	0	1	94	4	0	1	75	0	0	212
7:00 AM	12	1	10	0	7	0	16	0	1	115	4	0	3	147	3	0	319
7:15 AM	20	3	5	0	6	0	7	0	3	105	7	0	5	141	8	0	310
7:30 AM	9	0	10	0	7	0	8	0	8	166	4	0	1	127	9	0	349
7:45 AM	10	3	17	0	6	1	10	0	7	207	20	0	5	137	12	0	435
8:00 AM	16	1	10	0	8	0	8	0	12	143	29	0	15	159	5	0	406
8:15 AM	4	2	3	0	9	1	7	0	11	95	5	0	1	97	14	0	249
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	95	11	73	0	58	2	75	0	44	1035	74	0	31	953	53	0	2504
APPROACH %'s :	53.07%	6.15%	40.78%	0.00%	42.96%	1.48%	55.56%	0.00%	3.82%	89.77%	6.42%	0.00%	2.99%	91.90%	5.11%	0.00%	
PEAK HR :	07:15 AM - 08:15 AM																TOTAL
PEAK HR VOL :	55	7	42	0	27	1	33	0	30	621	60	0	26	564	34	0	1500
PEAK HR FACTOR :	0.69	0.583	0.618	0.000	0.844	0.250	0.825	0.000	0.625	0.750	0.517	0.000	0.433	0.887	0.708	0.000	0.862
	0.867				0.897				0.760				0.872				

	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
PM	0	1	0	0	1	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
4:30 PM	7	1	4	0	6	0	8	0	9	178	15	0	11	227	10	0	476
4:45 PM	5	0	7	0	3	1	6	0	5	200	10	0	4	223	6	0	470
5:00 PM	6	1	1	0	5	1	5	0	8	174	13	0	9	215	10	0	448
5:15 PM	11	0	3	0	5	0	6	0	16	203	15	0	6	203	5	0	473
5:30 PM	10	0	5	0	9	0	7	0	10	199	18	0	6	256	9	0	529
5:45 PM	10	0	8	0	5	2	3	0	12	226	9	0	10	244	5	0	534
6:00 PM	15	0	3	0	6	0	2	0	10	202	22	0	12	218	10	0	500
6:15 PM	5	0	6	0	8	0	3	0	4	207	16	0	13	199	6	0	467
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	69	2	37	0	47	4	40	0	74	1589	118	0	71	1785	61	0	3897
APPROACH %'s :	63.89%	1.85%	34.26%	0.00%	51.65%	4.40%	43.96%	0.00%	4.15%	89.22%	6.63%	0.00%	3.70%	93.11%	3.18%	0.00%	
PEAK HR :	05:15 PM - 06:15 PM																TOTAL
PEAK HR VOL :	46	0	19	0	25	2	18	0	48	830	64	0	34	921	29	0	2036
PEAK HR FACTOR :	0.77	0.000	0.594	0.000	0.694	0.250	0.643	0.000	0.750	0.918	0.727	0.000	0.708	0.899	0.725	0.000	0.953
	0.903				0.703				0.953				0.908				

National Data & Surveying Services

Intersection Turning Movement Count

Location: Maytime Dr & Waugh Chapel Rd
City: Gambrills
Control: Signalized

Project ID: 17-11050-001
Date: 11/16/2017

HT

NS/EW Streets:	Maytime Dr				Maytime Dr				Waugh Chapel Rd				Waugh Chapel Rd				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	1	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:30 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2
6:45 AM	1	0	0	0	0	0	1	0	0	2	0	0	0	3	0	0	7
7:00 AM	0	0	0	0	0	0	0	0	0	1	1	0	0	7	0	0	9
7:15 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	4
7:30 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
7:45 AM	2	0	0	0	0	0	1	0	0	2	0	0	1	4	0	0	10
8:00 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	3	0	0	5
8:15 AM	0	0	0	0	0	0	0	0	0	3	0	0	0	7	1	0	11
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	3	0	0	0	0	0	3	0	0	15	1	0	1	26	1	0	50
APPROACH %'s :	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	93.75%	6.25%	0.00%	3.57%	92.86%	3.57%	0.00%	
PEAK HR :	07:15 AM - 08:15 AM																TOTAL
PEAK HR VOL :	2	0	0	0	0	0	1	0	0	8	0	0	1	9	0	0	21
PEAK HR FACTOR :	0.250	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	1.000	0.000	0.000	0.250	0.563	0.000	0.000	0.525
	0.250				0.250				1.000				0.500				

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	1	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
4:30 PM	0	0	0	0	0	0	1	0	0	4	0	0	0	6	0	0	11
4:45 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	3
5:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	3	0	0	4
5:15 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	3
5:30 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	3
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4
6:00 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	3
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	1	0	0	11	0	0	0	19	0	0	31
APPROACH %'s :					0.00%	0.00%	100.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	
PEAK HR :	05:15 PM - 06:15 PM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	5	0	0	0	8	0	0	13
PEAK HR FACTOR :	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.625	0.000	0.000	0.000	0.500	0.000	0.000	0.813
									0.625				0.500				

National Data & Surveying Services

Intersection Turning Movement Count

Location: Maytime Dr & Waugh Chapel Rd
City: Gambrills
Control: Signalized

Project ID: 17-11050-001
Date: 11/16/2017

Bikes

NS/EW Streets:	Maytime Dr				Maytime Dr				Waugh Chapel Rd				Waugh Chapel Rd				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	1	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
APPROACH %'s :																	
PEAK HR :	07:15 AM - 08:15 AM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	1	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
APPROACH %'s :									0.00%	100.00%	0.00%	0.00%					
PEAK HR :	05:15 PM - 06:15 PM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

National Data & Surveying Services
Intersection Turning Movement Count

Location: Maytime Dr & Waugh Chapel Rd
City: Gambrills

Project ID: 17-11050-001
Date: 11/16/2017

Pedestrians (Crosswalks)

NS/EW Streets:	Maytime Dr		Maytime Dr		Waugh Chapel Rd		Waugh Chapel Rd		
AM	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
6:30 AM	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	1	0	1
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	1	0	1
APPROACH %'s :							100.00%	0.00%	
PEAK HR :	**07:15 AM - 08:15 AM**								TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :									

PM	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
4:30 PM	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	1	0	0	0	0	0	1
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	0	0	1	0	0	0	0	0	1
APPROACH %'s :			100.00%	0.00%					
PEAK HR :	**05:15 PM - 06:15 PM**								TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :									

Prepared by National Data & Surveying Services

Maytime Dr & Waugh Chapel Rd

Peak Hour Turning Movement Count

ID: 17-11050-001
City: Gambrills

Day: Thursday
Date: 11/16/2017

	PEAK HOURS	COUNT PERIODS
AM	07:15 AM - 08:15 AM	06:30 AM - 08:30 AM
NOON	NONE	NONE
PM	05:15 PM - 06:15 PM	04:30 PM - 06:30 PM

Maytime Dr

SOUTHBOUND

	↲	↓	↳	U	⇧
AM	34	1	27	0	71
NOON	0	0	0	0	0
PM	18	2	25	0	77
	0	1	1	0	

Waugh Chapel Rd

EASTBOUND

	AM	NOON	PM	
⇦	664	0	993	
U	0	0	0	0
↰	30	0	48	0
→	629	0	835	2
↴	60	0	64	0

WESTBOUND

Waugh Chapel Rd

		PM	NOON	AM
0	↰	29	0	34
2	←	929	0	573
0	↱	34	0	27
0	U	0	0	0
	⇨	879	0	698

CONTROL

Signalized

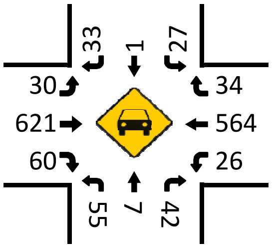
	AM	NOON	PM
TEV	1521	0	2049
PHF	0.85		0.95

	⇩	U	↰	↑	↱
		0	0	1	0
PM	100	0	46	0	19
NOON	0	0	0	0	0
AM	88	0	57	7	42

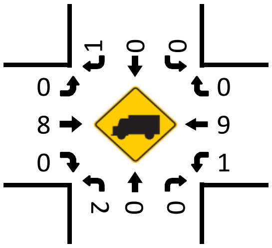
NORTHBOUND

Maytime Dr

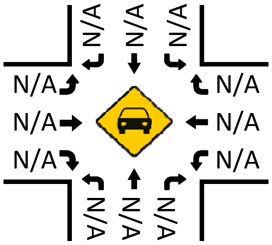
Cars (AM)



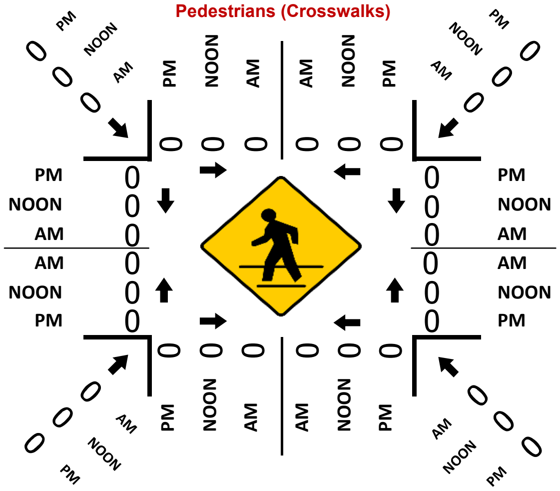
HT (AM)



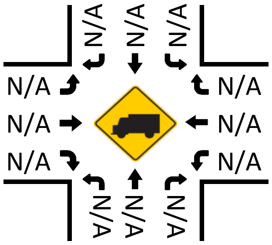
Cars (NOON)



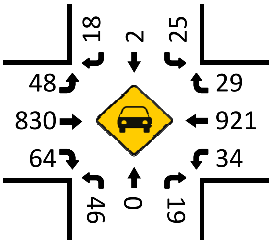
Pedestrians (Crosswalks)



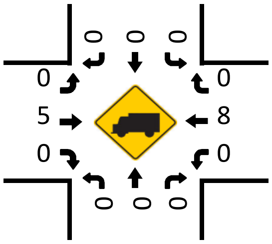
HT (NOON)



Cars (PM)



HT (PM)



National Data & Surveying Services

Intersection Turning Movement Count

Location: Symphony Ln/Silver Way & Waugh Chapel Rd
City: Gambrills
Control: Signalized

Project ID: 17-11050-002
Date: 11/16/2017

Total

NS/EW Streets:	Symphony Ln/Silver Way				Symphony Ln/Silver Way				Waugh Chapel Rd				Waugh Chapel Rd				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	2	0	0	0	1	0	0	0	2	1	0	1	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:30 AM	7	0	12	1	2	0	3	0	1	127	6	0	8	63	1	0	231
6:45 AM	6	0	14	0	2	0	3	0	3	101	3	0	9	75	0	0	216
7:00 AM	7	1	12	0	2	0	3	0	2	126	3	0	15	154	0	0	325
7:15 AM	2	0	13	0	1	0	5	0	2	107	8	0	20	141	0	0	299
7:30 AM	9	0	13	0	3	3	2	0	1	138	47	0	37	132	2	0	387
7:45 AM	58	0	119	0	3	1	3	0	1	136	75	0	115	106	0	0	617
8:00 AM	75	0	131	0	1	2	2	0	0	139	45	0	62	98	3	0	558
8:15 AM	14	0	26	0	2	0	0	0	0	112	2	0	14	107	0	0	277
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	178	1	340	1	16	6	21	0	10	986	189	0	280	876	6	0	2910
APPROACH %'s :	34.23%	0.19%	65.38%	0.19%	37.21%	13.95%	48.84%	0.00%	0.84%	83.21%	15.95%	0.00%	24.10%	75.39%	0.52%	0.00%	
PEAK HR :	07:15 AM - 08:15 AM																TOTAL
PEAK HR VOL :	144	0	276	0	8	6	12	0	4	520	175	0	234	477	5	0	1861
PEAK HR FACTOR :	0.480	0.000	0.527	0.000	0.667	0.500	0.600	0.000	0.500	0.935	0.583	0.000	0.509	0.846	0.417	0.000	
	0.510				0.813				0.824				0.810				0.754

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	2	0	0	0	1	0	0	0	2	1	0	1	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
4:30 PM	11	0	26	0	8	0	6	0	1	183	13	0	17	241	1	0	507
4:45 PM	15	0	21	0	2	0	2	0	1	197	10	0	25	217	5	0	495
5:00 PM	22	0	25	0	1	1	1	0	3	164	13	0	39	214	3	0	486
5:15 PM	10	0	24	0	4	0	3	0	5	206	5	0	14	211	5	0	487
5:30 PM	14	0	20	0	2	0	2	0	7	187	17	0	24	240	1	0	514
5:45 PM	10	0	12	0	7	2	2	0	4	227	9	0	25	259	2	0	559
6:00 PM	6	0	22	0	5	0	3	0	3	203	4	0	20	238	1	0	505
6:15 PM	6	1	28	0	5	0	3	0	3	212	10	0	62	199	5	0	534
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	94	1	178	0	34	3	22	0	27	1579	81	0	226	1819	23	0	4087
APPROACH %'s :	34.43%	0.37%	65.20%	0.00%	57.63%	5.08%	37.29%	0.00%	1.60%	93.60%	4.80%	0.00%	10.93%	87.96%	1.11%	0.00%	
PEAK HR :	05:30 PM - 06:30 PM																TOTAL
PEAK HR VOL :	36	1	82	0	19	2	10	0	17	829	40	0	131	936	9	0	2112
PEAK HR FACTOR :	0.643	0.250	0.732	0.000	0.679	0.250	0.833	0.000	0.607	0.913	0.588	0.000	0.528	0.903	0.450	0.000	
	0.850				0.705				0.923				0.941				0.945

National Data & Surveying Services

Intersection Turning Movement Count

Location: Symphony Ln/Silver Way & Waugh Chapel Rd
City: Gambrills
Control: Signalized

Project ID: 17-11050-002
Date: 11/16/2017

Cars

NS/EW Streets:	Symphony Ln/Silver Way				Symphony Ln/Silver Way				Waugh Chapel Rd				Waugh Chapel Rd				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	2	0	0	0	1	0	0	0	2	1	0	1	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:30 AM	7	0	11	1	2	0	3	0	1	126	6	0	6	63	0	0	226
6:45 AM	5	0	14	0	2	0	3	0	2	100	3	0	7	72	0	0	208
7:00 AM	6	1	12	0	2	0	3	0	2	124	3	0	15	149	0	0	317
7:15 AM	2	0	13	0	1	0	5	0	2	105	8	0	20	139	0	0	295
7:30 AM	9	0	13	0	3	3	2	0	1	136	47	0	37	132	1	0	384
7:45 AM	58	0	119	0	3	1	3	0	1	136	74	0	115	101	0	0	611
8:00 AM	75	0	131	0	1	2	2	0	0	137	45	0	62	95	3	0	553
8:15 AM	14	0	25	0	2	0	0	0	0	109	2	0	14	99	0	0	265
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	176	1	338	1	16	6	21	0	9	973	188	0	276	850	4	0	2859
APPROACH %'s :	34.11%	0.19%	65.50%	0.19%	37.21%	13.95%	48.84%	0.00%	0.77%	83.16%	16.07%	0.00%	24.42%	75.22%	0.35%	0.00%	
PEAK HR :	07:15 AM - 08:15 AM																TOTAL
PEAK HR VOL :	144	0	276	0	8	6	12	0	4	514	174	0	234	467	4	0	1843
PEAK HR FACTOR :	0.48	0.000	0.527	0.000	0.667	0.500	0.600	0.000	0.500	0.938	0.588	0.000	0.509	0.840	0.333	0.000	0.754
	0.510				0.813				0.820				0.816				

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	2	0	0	0	1	0	0	0	2	1	0	1	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
4:30 PM	11	0	26	0	8	0	6	0	1	178	13	0	17	234	1	0	495
4:45 PM	15	0	21	0	2	0	2	0	1	195	10	0	24	215	5	0	490
5:00 PM	21	0	25	0	1	1	1	0	3	163	13	0	39	212	3	0	482
5:15 PM	10	0	24	0	4	0	3	0	5	204	5	0	14	210	5	0	484
5:30 PM	14	0	20	0	2	0	2	0	7	186	17	0	24	238	1	0	511
5:45 PM	10	0	12	0	7	2	2	0	4	227	9	0	25	255	2	0	555
6:00 PM	6	0	22	0	5	0	3	0	3	201	4	0	20	237	1	0	502
6:15 PM	6	1	28	0	5	0	3	0	3	212	10	0	62	199	5	0	534
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	93	1	178	0	34	3	22	0	27	1566	81	0	225	1800	23	0	4053
APPROACH %'s :	34.19%	0.37%	65.44%	0.00%	57.63%	5.08%	37.29%	0.00%	1.61%	93.55%	4.84%	0.00%	10.99%	87.89%	1.12%	0.00%	
PEAK HR :	05:30 PM - 06:30 PM																TOTAL
PEAK HR VOL :	36	1	82	0	19	2	10	0	17	826	40	0	131	929	9	0	2102
PEAK HR FACTOR :	0.64	0.250	0.732	0.000	0.679	0.250	0.833	0.000	0.607	0.910	0.588	0.000	0.528	0.911	0.450	0.000	0.947
	0.850				0.705				0.920				0.948				

National Data & Surveying Services

Intersection Turning Movement Count

Location: Symphony Ln/Silver Way & Waugh Chapel Rd
City: Gambrills
Control: Signalized

Project ID: 17-11050-002
Date: 11/16/2017

HT

NS/EW Streets:	Symphony Ln/Silver Way				Symphony Ln/Silver Way				Waugh Chapel Rd				Waugh Chapel Rd				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	2	0	0	0	1	0	0	0	2	1	0	1	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:30 AM	0	0	1	0	0	0	0	0	0	1	0	0	2	0	1	0	5
6:45 AM	1	0	0	0	0	0	0	0	1	1	0	0	2	3	0	0	8
7:00 AM	1	0	0	0	0	0	0	0	0	2	0	0	0	5	0	0	8
7:15 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	4
7:30 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	3
7:45 AM	0	0	0	0	0	0	0	0	0	0	1	0	0	5	0	0	6
8:00 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	3	0	0	5
8:15 AM	0	0	1	0	0	0	0	0	0	3	0	0	0	8	0	0	12
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	2	0	2	0	0	0	0	0	1	13	1	0	4	26	2	0	51
APPROACH %'s :	50.00%	0.00%	50.00%	0.00%					6.67%	86.67%	6.67%	0.00%	12.50%	81.25%	6.25%	0.00%	
PEAK HR :	07:15 AM - 08:15 AM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	6	1	0	0	10	1	0	18
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.750	0.250	0.000	0.000	0.500	0.250	0.000	0.750
									0.875				0.550				

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	2	0	0	0	1	0	0	0	2	1	0	1	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
4:30 PM	0	0	0	0	0	0	0	0	0	5	0	0	0	7	0	0	12
4:45 PM	0	0	0	0	0	0	0	0	0	2	0	0	1	2	0	0	5
5:00 PM	1	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	4
5:15 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	3
5:30 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	3
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4
6:00 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	3
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	1	0	0	0	0	0	0	0	0	13	0	0	1	19	0	0	34
APPROACH %'s :	100.00%	0.00%	0.00%	0.00%					0.00%	100.00%	0.00%	0.00%	5.00%	95.00%	0.00%	0.00%	
PEAK HR :	05:30 PM - 06:30 PM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	3	0	0	0	7	0	0	10
PEAK HR FACTOR :	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.375	0.000	0.000	0.000	0.438	0.000	0.000	0.625
									0.375				0.438				

National Data & Surveying Services

Intersection Turning Movement Count

Location: Symphony Ln/Silver Way & Waugh Chapel Rd
City: Gambrills
Control: Signalized

Project ID: 17-11050-002
Date: 11/16/2017

Bikes

NS/EW Streets:	Symphony Ln/Silver Way				Symphony Ln/Silver Way				Waugh Chapel Rd				Waugh Chapel Rd				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	2	0	0	0	1	0	0	0	2	1	0	1	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
APPROACH %'s :																	
PEAK HR :	07:15 AM - 08:15 AM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	2	0	0	0	1	0	0	0	2	1	0	1	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
APPROACH %'s :									0.00%	100.00%	0.00%	0.00%					
PEAK HR :	05:30 PM - 06:30 PM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

National Data & Surveying Services
Intersection Turning Movement Count

Location: Symphony Ln/Silver Way & Waugh Chapel Rd
City: Gambrills

Project ID: 17-11050-002
Date: 11/16/2017

Pedestrians (Crosswalks)

NS/EW Streets:	Symphony Ln/Silver Way		Symphony Ln/Silver Way		Waugh Chapel Rd		Waugh Chapel Rd		
AM	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
6:30 AM	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0
APPROACH %'s :									
PEAK HR :	07:15 AM - 08:15 AM								TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :									

PM	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
4:30 PM	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	0	0	0	0	0
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0
APPROACH %'s :									
PEAK HR :	05:30 PM - 06:30 PM								TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :									

Prepared by National Data & Surveying Services

Symphony Ln/Silver Way & Waugh Chapel Rd

Peak Hour Turning Movement Count

ID: 17-11050-002
City: Gambrills

Day: Thursday
Date: 11/16/2017

	PEAK HOURS	COUNT PERIODS
AM	07:15 AM - 08:15 AM	06:30 AM - 08:30 AM
NOON	NONE	NONE
PM	05:30 PM - 06:30 PM	04:30 PM - 06:30 PM

Symphony Ln/Silver Way — SOUTHBOUND

	↲	↓	↳	⮍	⇧
AM	12	6	8	0	9
NOON	0	0	0	0	0
PM	10	2	19	0	27
	0	1	0	0	

Waugh Chapel Rd — EASTBOUND

	AM	NOON	PM	
⇦	633	0	982	
⮌	0	0	0	0
↱	4	0	17	0
→	520	0	829	2
↴	175	0	40	1

Waugh Chapel Rd — WESTBOUND

		PM	NOON	AM
0	↰	9	0	5
1	←	936	0	477
1	↲	131	0	234
0	⮎	0	0	0
	⇨	930	0	804

CONTROL

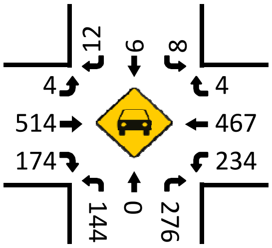
Signalized

	AM	NOON	PM
TEV	1861	0	2112
PHF	0.75		0.94

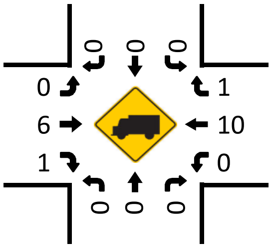
Symphony Ln/Silver Way — NORTHBOUND

	⇩	⮏	↰	↑	↱
		0	0	2	0
PM	173	0	36	1	82
NOON	0	0	0	0	0
AM	415	0	144	0	276

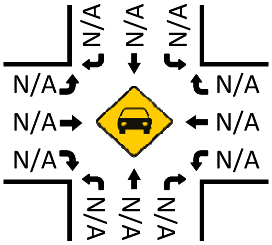
Cars (AM)



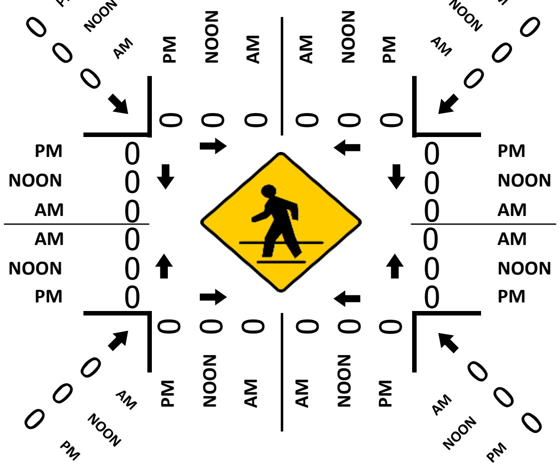
HT (AM)



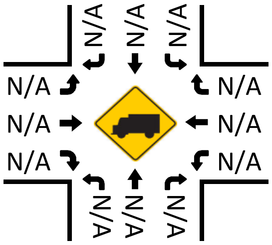
Cars (NOON)



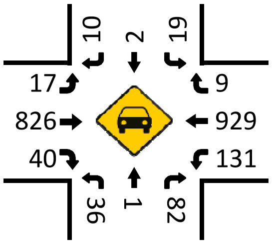
Pedestrians (Crosswalks)



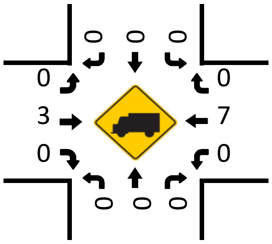
HT (NOON)



Cars (PM)



HT (PM)



National Data & Surveying Services

Intersection Turning Movement Count

Location: Silver Way & Waugh Chapel Rd
City: Gambrills
Control: 1-Way Stop(SB)

Project ID: 17-11050-003
Date: 11/16/2017

Total

NS/EW Streets:	Silver Way				Silver Way				Waugh Chapel Rd				Waugh Chapel Rd				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:00 AM	0	0	1	0	2	0	2	0	0	89	0	0	0	40	0	0	134
6:15 AM	0	0	0	0	2	0	1	0	0	113	0	0	0	43	0	0	159
6:30 AM	0	0	0	0	3	0	0	0	0	136	2	0	2	73	0	0	216
6:45 AM	0	0	0	0	5	0	1	0	0	118	0	0	0	82	0	0	206
7:00 AM	1	0	1	0	6	0	4	0	0	131	1	0	1	167	1	0	313
7:15 AM	0	0	0	0	1	0	0	0	0	128	0	1	3	163	2	0	298
7:30 AM	1	0	0	0	3	0	1	0	1	150	0	0	0	178	0	0	334
7:45 AM	0	0	1	0	2	0	0	0	0	254	1	0	0	223	2	0	483
8:00 AM	0	0	0	0	2	0	3	0	0	267	0	1	0	148	0	0	421
8:15 AM	0	0	0	0	2	0	0	0	1	151	0	0	1	121	2	0	278
8:30 AM	1	0	0	0	7	0	3	0	0	173	0	1	0	132	0	0	317
8:45 AM	0	0	0	0	7	0	1	0	2	159	2	0	0	93	3	0	267
9:00 AM	0	0	1	0	4	0	0	0	1	158	0	0	0	99	0	0	263
9:15 AM	0	1	0	0	5	1	1	0	1	129	0	0	0	82	4	0	224
9:30 AM	0	0	0	0	2	0	0	0	0	121	0	0	0	87	1	0	211
9:45 AM	0	0	1	0	3	0	0	0	0	113	1	0	0	77	4	0	199
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	3	1	5	0	56	1	17	0	6	2390	7	3	7	1808	19	0	4323
APPROACH %'s :	33.33%	11.11%	55.56%	0.00%	75.68%	1.35%	22.97%	0.00%	0.25%	99.33%	0.29%	0.12%	0.38%	98.58%	1.04%	0.00%	
PEAK HR :	07:15 AM - 08:15 AM																TOTAL
PEAK HR VOL :	1	0	1	0	8	0	4	0	1	799	1	2	3	712	4	0	1536
PEAK HR FACTOR :	0.250	0.000	0.250	0.000	0.667	0.000	0.333	0.000	0.250	0.748	0.250	0.500	0.250	0.798	0.500	0.000	0.795
	0.500				0.600				0.749				0.799				

NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:00 AM	0	0	0	0	4	0	0	0	0	85	0	0	1	81	4	0	175
10:15 AM	2	0	0	0	5	0	0	0	0	100	0	0	1	100	0	0	208
10:30 AM	0	0	0	0	3	0	1	0	0	136	0	0	1	85	4	0	230
10:45 AM	1	0	2	0	5	0	0	0	0	149	1	0	0	98	5	0	261
11:00 AM	2	0	1	0	3	0	1	0	0	140	0	0	2	114	1	0	264
11:15 AM	0	0	1	0	2	0	1	0	1	128	0	0	0	121	3	1	258
11:30 AM	1	0	0	0	3	0	0	0	2	121	0	0	4	122	3	0	256
11:45 AM	0	0	1	0	0	0	2	0	1	119	2	0	1	104	0	0	230
12:00 PM	1	0	2	0	3	0	1	0	0	123	0	0	2	125	7	0	264
12:15 PM	0	0	2	0	4	0	0	0	0	122	1	0	1	127	3	0	260
12:30 PM	0	0	0	0	1	0	1	0	0	133	1	0	1	134	2	0	273
12:45 PM	1	1	0	0	4	0	2	0	2	116	0	0	0	132	4	0	262
1:00 PM	0	0	0	0	0	0	0	0	0	101	0	0	0	115	3	0	219
1:15 PM	0	0	0	0	1	0	1	0	0	105	2	0	0	107	2	0	218
1:30 PM	0	0	1	0	0	0	0	0	0	96	0	0	0	120	3	0	220
1:45 PM	0	0	1	0	1	0	1	0	2	113	0	0	1	148	3	0	270
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	8	1	11	0	39	0	11	0	8	1887	7	0	15	1833	47	1	3868
APPROACH %'s :	40.00%	5.00%	55.00%	0.00%	78.00%	0.00%	22.00%	0.00%	0.42%	99.21%	0.37%	0.00%	0.79%	96.68%	2.48%	0.05%	
PEAK HR :	12:00 PM - 01:00 PM																TOTAL
PEAK HR VOL :	2	1	4	0	12	0	4	0	2	494	2	0	4	518	16	0	1059
PEAK HR FACTOR :	0.500	0.250	0.500	0.000	0.750	0.000	0.500	0.000	0.250	0.929	0.500	0.000	0.500	0.966	0.571	0.000	0.970
	0.583				0.667				0.929				0.982				

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
2:00 PM	0	0	1	0	1	0	1	0	0	100	0	0	0	159	4	0	266
2:15 PM	0	0	2	0	1	0	0	0	0	92	0	0	1	159	2	0	257
2:30 PM	0	0	0	0	2	0	1	0	1	113	0	0	1	204	5	0	327
2:45 PM	0	0	0	0	2	0	0	0	0	113	0	0	1	203	8	0	327
3:00 PM	1	0	1	0	1	0	2	0	1	198	1	0	1	153	2	0	361
3:15 PM	0	0	2	0	1	0	1	0	0	202	1	0	0	199	10	0	416
3:30 PM	0	0	2	0	1	0	2	0	1	189	0	0	0	205	5	0	405
3:45 PM	1	0	2	0	3	0	1	0	0	208	0	0	0	196	4	0	415
4:00 PM	0	0	1	0	2	0	1	0	0	165	0	0	0	227	7	0	403
4:15 PM	0	0	0	0	2	0	0	0	1	221	0	0	0	279	10	0	513
4:30 PM	0	0	1	0	0	0	1	0	0	217	1	0	1	259	5	0	485
4:45 PM	0	0	1	0	4	0	0	0	2	219	0	0	0	247	5	0	478
5:00 PM	0	0	2	0	2	0	2	0	3	186	0	1	1	252	4	0	453
5:15 PM	0	1	1	0	0	1	2	0	1	232	1	0	2	228	4	0	473
5:30 PM	0	0	1	0	1	0	0	0	0	210	1	0	0	264	5	0	482
5:45 PM	0	0	0	0	2	0	3	0	0	244	0	0	0	280	1	0	530
6:00 PM	1	0	1	0	2	0	0	0	3	221	0	0	1	263	8	0	500
6:15 PM	0	0	0	0	3	0	0	0	1	247	0	0	0	264	3	0	518
6:30 PM	0	0	0	0	0	0	1	0	1	223	0	0	1	234	6	0	466
6:45 PM	0	0	0	0	6	0	0	0	0	133	0	0	1	220	3	0	363
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	3	1	18	0	36	1	18	0	15	3733	5	1	11	4495	101	0	8438
APPROACH %'s :	13.64%	4.55%	81.82%	0.00%	65.45%	1.82%	32.73%	0.00%	0.40%	99.44%	0.13%	0.03%	0.24%	97.57%	2.19%	0.00%	
PEAK HR :	05:30 PM - 06:30 PM																TOTAL
PEAK HR VOL :	1	0	2	0	8	0	3	0	4	922	1	0	1	1071	17	0	2030
PEAK HR FACTOR :	0.250	0.000	0.500	0.000	0.667	0.000	0.250	0.000	0.333	0.933	0.250	0.000	0.250	0.956	0.531	0.000	0.958
	0.375				0.550				0.934				0.969				

National Data & Surveying Services

Intersection Turning Movement Count

Location: Silver Way & Waugh Chapel Rd
City: Gambrills
Control: 1-Way Stop(SB)

Project ID: 17-11050-003
Date: 11/16/2017

Cars

NS/EW Streets:	Silver Way				Silver Way				Waugh Chapel Rd				Waugh Chapel Rd				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:00 AM	0	0	1	0	2	0	2	0	0	88	0	0	0	40	0	0	133
6:15 AM	0	0	0	0	2	0	1	0	0	112	0	0	0	40	0	0	155
6:30 AM	0	0	0	0	3	0	0	0	0	134	2	0	1	71	0	0	211
6:45 AM	0	0	0	0	5	0	1	0	0	117	0	0	0	77	0	0	200
7:00 AM	0	0	1	0	6	0	4	0	0	130	1	0	1	163	1	0	307
7:15 AM	0	0	0	0	1	0	0	0	0	126	0	1	3	161	2	0	294
7:30 AM	1	0	0	0	3	0	1	0	1	148	0	0	0	177	0	0	331
7:45 AM	0	0	1	0	2	0	0	0	0	253	1	0	0	218	2	0	477
8:00 AM	0	0	0	0	2	0	3	0	0	265	0	1	0	144	0	0	415
8:15 AM	0	0	0	0	2	0	0	0	1	147	0	0	1	114	2	0	267
8:30 AM	1	0	0	0	7	0	3	0	0	165	0	1	0	124	0	0	301
8:45 AM	0	0	0	0	7	0	1	0	2	153	2	0	0	90	2	0	257
9:00 AM	0	0	1	0	4	0	0	0	1	152	0	0	0	97	0	0	255
9:15 AM	0	1	0	0	5	1	1	0	1	125	0	0	0	79	4	0	217
9:30 AM	0	0	0	0	2	0	0	0	0	120	0	0	0	86	1	0	209
9:45 AM	0	0	1	0	3	0	0	0	0	111	1	0	0	76	4	0	196
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	2	1	5	0	56	1	17	0	6	2346	7	3	6	1757	18	0	4225
APPROACH %'s :	25.00%	12.50%	62.50%	0.00%	75.68%	1.35%	22.97%	0.00%	0.25%	99.32%	0.30%	0.13%	0.34%	98.65%	1.01%	0.00%	
PEAK HR :	07:15 AM - 08:15 AM																TOTAL
PEAK HR VOL :	1	0	1	0	8	0	4	0	1	792	1	2	3	700	4	0	1517
PEAK HR FACTOR :	0.25	0.000	0.250	0.000	0.667	0.000	0.333	0.000	0.250	0.747	0.250	0.500	0.250	0.803	0.500	0.000	0.795
	0.500				0.600				0.748				0.803				

NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:00 AM	0	0	0	0	4	0	0	0	0	83	0	0	0	79	4	0	170
10:15 AM	1	0	0	0	5	0	0	0	0	99	0	0	0	98	0	0	203
10:30 AM	0	0	0	0	3	0	1	0	0	135	0	0	1	84	4	0	228
10:45 AM	1	0	1	0	5	0	0	0	0	147	1	0	0	92	5	0	252
11:00 AM	2	0	1	0	3	0	1	0	0	139	0	0	2	111	1	0	260
11:15 AM	0	0	1	0	2	0	1	0	1	125	0	0	0	117	3	1	251
11:30 AM	1	0	0	0	3	0	0	0	1	115	0	0	4	119	3	0	246
11:45 AM	0	0	1	0	0	0	2	0	1	117	2	0	1	103	0	0	227
12:00 PM	1	0	2	0	3	0	1	0	0	121	0	0	1	123	7	0	259
12:15 PM	0	0	0	0	4	0	0	0	0	119	0	0	1	124	3	0	251
12:30 PM	0	0	0	0	1	0	1	0	0	127	1	0	1	134	2	0	267
12:45 PM	1	1	0	0	4	0	2	0	2	113	0	0	0	127	4	0	254
1:00 PM	0	0	0	0	0	0	0	0	0	100	0	0	0	111	3	0	214
1:15 PM	0	0	0	0	1	0	1	0	0	104	2	0	0	106	2	0	216
1:30 PM	0	0	1	0	0	0	0	0	0	95	0	0	0	118	3	0	217
1:45 PM	0	0	1	0	1	0	1	0	2	111	0	0	1	142	3	0	262
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	7	1	8	0	39	0	11	0	7	1850	6	0	12	1788	47	1	3777
APPROACH %'s :	43.75%	6.25%	50.00%	0.00%	78.00%	0.00%	22.00%	0.00%	0.38%	99.30%	0.32%	0.00%	0.65%	96.75%	2.54%	0.05%	
PEAK HR :	12:00 PM - 01:00 PM																TOTAL
PEAK HR VOL :	2	1	2	0	12	0	4	0	2	480	1	0	3	508	16	0	1031
PEAK HR FACTOR :	0.50	0.250	0.250	0.000	0.750	0.000	0.500	0.000	0.250	0.945	0.250	0.000	0.750	0.948	0.571	0.000	0.965
	0.417				0.667				0.943				0.962				

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
2:00 PM	0	0	1	0	1	0	1	0	0	97	0	0	0	154	4	0	258
2:15 PM	0	0	2	0	1	0	0	0	0	92	0	0	1	158	2	0	256
2:30 PM	0	0	0	0	2	0	1	0	1	111	0	0	1	198	5	0	319
2:45 PM	0	0	0	0	2	0	0	0	0	111	0	0	1	200	7	0	321
3:00 PM	1	0	1	0	1	0	2	0	1	197	1	0	1	147	2	0	354
3:15 PM	0	0	2	0	1	0	1	0	0	194	1	0	0	190	10	0	399
3:30 PM	0	0	2	0	1	0	2	0	1	187	0	0	0	199	5	0	397
3:45 PM	1	0	2	0	3	0	1	0	0	200	0	0	0	192	3	0	402
4:00 PM	0	0	1	0	2	0	0	0	0	163	0	0	0	224	7	0	397
4:15 PM	0	0	0	0	2	0	0	0	1	214	0	0	0	277	10	0	504
4:30 PM	0	0	1	0	0	0	1	0	0	213	1	0	1	253	5	0	475
4:45 PM	0	0	1	0	4	0	0	0	2	216	0	0	0	244	5	0	472
5:00 PM	0	0	2	0	2	0	2	0	3	185	0	1	1	250	4	0	450
5:15 PM	0	1	1	0	0	1	2	0	1	230	1	0	2	227	4	0	470
5:30 PM	0	0	1	0	1	0	0	0	0	209	1	0	0	262	5	0	479
5:45 PM	0	0	0	0	2	0	3	0	0	244	0	0	0	277	1	0	527
6:00 PM	1	0	1	0	2	0	0	0	3	219	0	0	1	262	8	0	497
6:15 PM	0	0	0	0	3	0	0	0	1	247	0	0	0	264	3	0	518
6:30 PM	0	0	0	0	0	0	1	0	1	223	0	0	1	234	5	0	465
6:45 PM	0	0	0	0	6	0	0	0	0	133	0	0	1	220	3	0	363
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	3	1	18	0	36	1	17	0	15	3685	5	1	11	4432	98	0	8323
APPROACH %'s :	13.64%	4.55%	81.82%	0.00%	66.67%	1.85%	31.48%	0.00%	0.40%	99.43%	0.13%	0.03%	0.24%	97.60%	2.16%	0.00%	
PEAK HR :	05:30 PM - 06:30 PM																TOTAL
PEAK HR VOL :	1	0	2	0	8	0	3	0	4	919	1	0	1	1065	17	0	2021
PEAK HR FACTOR :	0.25	0.000	0.500	0.000	0.667	0.000	0.250	0.000	0.333	0.930	0.250	0.000	0.250	0.961	0.531	0.000	0.959
	0.375				0.550				0.931				0.974				

National Data & Surveying Services

Intersection Turning Movement Count

Location: Silver Way & Waugh Chapel Rd
City: Gambrills
Control: 1-Way Stop(SB)

Project ID: 17-11050-003
Date: 11/16/2017

HT

NS/EW Streets:	Silver Way				Silver Way				Waugh Chapel Rd				Waugh Chapel Rd				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
6:15 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	3	0	0	4
6:30 AM	0	0	0	0	0	0	0	0	0	2	0	0	1	2	0	0	5
6:45 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	5	0	0	6
7:00 AM	1	0	0	0	0	0	0	0	0	1	0	0	0	4	0	0	6
7:15 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	4
7:30 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	3
7:45 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	5	0	0	6
8:00 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	4	0	0	6
8:15 AM	0	0	0	0	0	0	0	0	0	4	0	0	0	7	0	0	11
8:30 AM	0	0	0	0	0	0	0	0	0	8	0	0	0	8	0	0	16
8:45 AM	0	0	0	0	0	0	0	0	0	6	0	0	0	3	1	0	10
9:00 AM	0	0	0	0	0	0	0	0	0	6	0	0	0	2	0	0	8
9:15 AM	0	0	0	0	0	0	0	0	0	4	0	0	0	3	0	0	7
9:30 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2
9:45 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	3
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	1	0	0	0	0	0	0	0	0	44	0	0	1	51	1	0	98
APPROACH %'s :	100.00%	0.00%	0.00%	0.00%					0.00%	100.00%	0.00%	0.00%	1.89%	96.23%	1.89%	0.00%	
PEAK HR :	07:15 AM - 08:15 AM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	7	0	0	0	12	0	0	19
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.875	0.000	0.000	0.000	0.600	0.000	0.000	0.792
									0.875				0.600				

NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:00 AM	0	0	0	0	0	0	0	0	0	2	0	0	1	2	0	0	5
10:15 AM	1	0	0	0	0	0	0	0	0	1	0	0	1	2	0	0	5
10:30 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2
10:45 AM	0	0	1	0	0	0	0	0	0	2	0	0	0	6	0	0	9
11:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	3	0	0	4
11:15 AM	0	0	0	0	0	0	0	0	0	3	0	0	0	4	0	0	7
11:30 AM	0	0	0	0	0	0	0	0	1	6	0	0	0	3	0	0	10
11:45 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	3
12:00 PM	0	0	0	0	0	0	0	0	0	2	0	0	1	2	0	0	5
12:15 PM	0	0	2	0	0	0	0	0	0	3	1	0	0	3	0	0	9
12:30 PM	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	6
12:45 PM	0	0	0	0	0	0	0	0	0	3	0	0	0	5	0	0	8
1:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	4	0	0	5
1:15 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2
1:30 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	3
1:45 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	6	0	0	8
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	1	0	3	0	0	0	0	0	1	37	1	0	3	45	0	0	91
APPROACH %'s :	25.00%	0.00%	75.00%	0.00%					2.56%	94.87%	2.56%	0.00%	6.25%	93.75%	0.00%	0.00%	
PEAK HR :	12:00 PM - 01:00 PM																TOTAL
PEAK HR VOL :	0	0	2	0	0	0	0	0	0	14	1	0	1	10	0	0	28
PEAK HR FACTOR :	0.00	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.583	0.250	0.000	0.250	0.500	0.000	0.000	0.778
	0.250								0.625				0.550				

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
2:00 PM	0	0	0	0	0	0	0	0	0	3	0	0	0	5	0	0	8
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
2:30 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	6	0	0	8
2:45 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	3	1	0	6
3:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	6	0	0	7
3:15 PM	0	0	0	0	0	0	0	0	0	8	0	0	0	9	0	0	17
3:30 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	6	0	0	8
3:45 PM	0	0	0	0	0	0	0	0	0	8	0	0	0	4	1	0	13
4:00 PM	0	0	0	0	0	0	1	0	0	2	0	0	0	3	0	0	6
4:15 PM	0	0	0	0	0	0	0	0	0	7	0	0	0	2	0	0	9
4:30 PM	0	0	0	0	0	0	0	0	0	4	0	0	0	6	0	0	10
4:45 PM	0	0	0	0	0	0	0	0	0	3	0	0	0	3	0	0	6
5:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	3
5:15 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	3
5:30 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	3
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3
6:00 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	3
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	1	0	0	48	0	0	0	63	3	0	115
APPROACH %'s :					0.00%	0.00%	100.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	95.45%	4.55%	0.00%	
PEAK HR :	05:30 PM - 06:30 PM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	3	0	0	0	6	0	0	9
PEAK HR FACTOR :	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.375	0.000	0.000	0.000	0.500	0.000	0.000	0.750
									0.375				0.500				

National Data & Surveying Services

Intersection Turning Movement Count

Location: Silver Way & Waugh Chapel Rd
City: Gambrills
Control: 1-Way Stop(SB)

Project ID: 17-11050-003
Date: 11/16/2017

Bikes

NS/EW Streets:	Silver Way				Silver Way				Waugh Chapel Rd				Waugh Chapel Rd				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
APPROACH %'s :													0.00%	100.00%	0.00%	0.00%	
PEAK HR :	07:15 AM - 08:15 AM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
APPROACH %'s :																	
PEAK HR :	12:00 PM - 01:00 PM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	2
APPROACH %'s :									0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	
PEAK HR :	05:30 PM - 06:30 PM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

National Data & Surveying Services
Intersection Turning Movement Count

Location: Silver Way & Waugh Chapel Rd
City: Gambrills

Project ID: 17-11050-003
Date: 11/16/2017

Pedestrians (Crosswalks)

NS/EW Streets:	Silver Way		Silver Way		Waugh Chapel Rd		Waugh Chapel Rd		
AM	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
6:00 AM	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0
9:00 AM	0	0	0	0	0	0	0	0	0
9:15 AM	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0
APPROACH %'s :									
PEAK HR :	07:15 AM - 08:15 AM								TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :									

NOON	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
10:00 AM	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	1	0	0	0	0	0	1
11:15 AM	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	1	0	0	0	0	1
12:00 PM	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	1	0	0	0	0	0	1
12:30 PM	0	0	0	1	0	0	0	0	1
12:45 PM	0	0	0	0	0	0	0	0	0
1:00 PM	0	0	0	0	0	0	0	0	0
1:15 PM	0	0	0	0	0	0	0	0	0
1:30 PM	0	0	0	0	0	0	0	0	0
1:45 PM	0	0	0	0	0	0	0	0	0
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	0	0	2	2	0	0	0	0	4
APPROACH %'s :			50.00%	50.00%					
PEAK HR :	12:00 PM - 01:00 PM								TOTAL
PEAK HR VOL :	0	0	1	1	0	0	0	0	2
PEAK HR FACTOR :			0.250	0.250					0.500
			0.500						

PM	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
2:00 PM	0	0	0	0	0	0	0	0	0
2:15 PM	0	0	0	0	0	0	0	0	0
2:30 PM	0	0	0	0	0	0	0	0	0
2:45 PM	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0
3:30 PM	0	1	0	0	0	0	0	0	1
3:45 PM	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	1	0	0	0	0	0	1
4:30 PM	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	1	0	0	0	0	0	1
6:30 PM	0	0	0	0	0	0	0	0	0
6:45 PM	0	0	0	0	0	0	0	0	0
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	0	1	2	0	0	0	0	0	3
APPROACH %'s :	0.00%	100.00%	100.00%	0.00%					
PEAK HR :	05:30 PM - 06:30 PM								TOTAL
PEAK HR VOL :	0	0	1	0	0	0	0	0	1
PEAK HR FACTOR :			0.250						0.250
			0.250						

Prepared by National Data & Surveying Services

Silver Way & Waugh Chapel Rd

Peak Hour Turning Movement Count

ID: 17-11050-003
City: Gambrills

Day: Thursday
Date: 11/16/2017

PEAK HOURS

AM	07:15 AM - 08:15 AM
NOON	12:00 PM - 01:00 PM
PM	05:30 PM - 06:30 PM

COUNT PERIODS

AM	06:00 AM - 10:00 AM
NOON	10:00 AM - 02:00 PM
PM	02:00 PM - 07:00 PM

Silver Way

SOUTHBOUND

	↲	↓	↳	U	⇧
AM	4	0	8	0	5
NOON	4	0	12	0	19
PM	3	0	8	0	21
	0	1	0	0	

Waugh Chapel Rd

EASTBOUND

	AM	NOON	PM	
⇦	719	524	1075	
U	2	0	0	0
↰	1	2	4	0
→	799	494	922	2
↱	1	2	1	0

Waugh Chapel Rd

WESTBOUND

		PM	NOON	AM
0	↰	17	16	4
2	←	1071	518	712
0	↱	1	4	3
0	U	0	0	0
	⇨	932	510	808

CONTROL

1-Way Stop(SB)

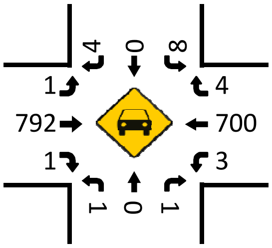
	AM	NOON	PM
TEV	1536	1059	2030
PHF	0.80	0.97	0.96

NORTHBOUND

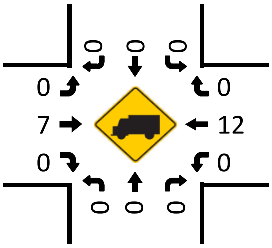
Silver Way

		0	0	1	0
	⇩	U	↰	↑	↱
PM	2	0	1	0	2
NOON	6	0	2	1	4
AM	4	0	1	0	1

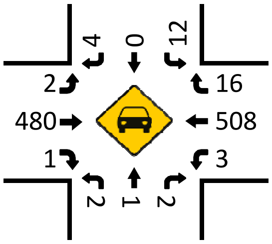
Cars (AM)



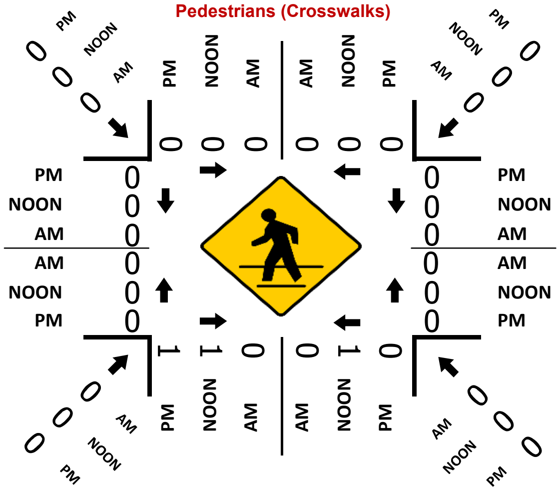
HT (AM)



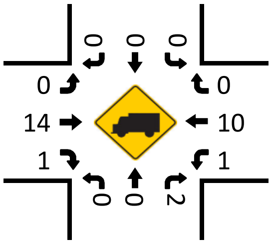
Cars (NOON)



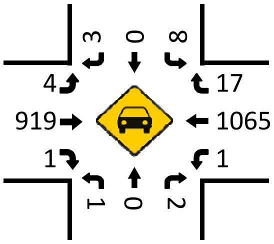
Pedestrians (Crosswalks)



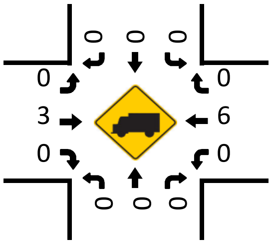
HT (NOON)



Cars (PM)



HT (PM)



National Data & Surveying Services

Intersection Turning Movement Count

Location: Summerfield Rd & Waugh Chapel Rd
City: Gambrills
Control: No Control

Project ID: 17-11050-004
Date: 11/16/2017

Total

NS/EW Streets:	Summerfield Rd				Summerfield Rd				Waugh Chapel Rd				Waugh Chapel Rd				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	0	1	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:30 AM	0	0	2	0	1	0	0	0	0	147	1	0	0	76	0	0	227
6:45 AM	0	0	1	0	0	0	0	0	0	128	6	0	1	87	3	0	226
7:00 AM	0	0	0	0	2	0	0	0	0	137	2	0	0	172	0	0	313
7:15 AM	1	0	1	0	1	0	0	0	0	143	6	0	1	182	0	0	335
7:30 AM	2	0	3	0	0	0	0	0	0	127	7	0	3	180	0	0	322
7:45 AM	0	0	2	0	1	0	0	0	0	246	6	0	1	242	0	0	498
8:00 AM	2	0	2	0	0	0	0	0	0	270	11	0	1	187	0	0	473
8:15 AM	0	0	0	0	0	0	0	0	0	197	9	0	0	115	0	0	321
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	5	0	11	0	5	0	0	0	0	1395	48	0	7	1241	3	0	2715
APPROACH %'s :	31.25%	0.00%	68.75%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	96.67%	3.33%	0.00%	0.56%	99.20%	0.24%	0.00%	
PEAK HR :	07:15 AM - 08:15 AM																TOTAL
PEAK HR VOL :	5	0	8	0	2	0	0	0	0	786	30	0	6	791	0	0	1628
PEAK HR FACTOR :	0.625	0.000	0.667	0.000	0.500	0.000	0.000	0.000	0.000	0.728	0.682	0.000	0.500	0.817	0.000	0.000	0.817
	0.650				0.500				0.726				0.820				

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	0	1	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
4:30 PM	0	0	10	0	2	0	0	0	0	222	13	0	0	254	2	0	503
4:45 PM	0	0	5	0	1	0	0	0	0	206	20	0	0	259	1	0	492
5:00 PM	1	0	9	0	1	0	2	0	1	193	23	0	2	261	1	0	494
5:15 PM	0	0	9	0	2	0	0	0	0	200	26	0	0	263	2	0	502
5:30 PM	0	0	5	0	3	0	1	0	0	191	26	0	1	268	1	0	496
5:45 PM	0	0	4	0	0	0	0	0	0	230	19	0	1	295	0	0	549
6:00 PM	1	0	7	0	2	0	1	0	0	216	13	0	1	271	1	0	513
6:15 PM	0	0	2	0	1	0	0	0	0	224	21	0	1	298	0	0	547
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	2	0	51	0	12	0	4	0	1	1682	161	0	6	2169	8	0	4096
APPROACH %'s :	3.77%	0.00%	96.23%	0.00%	75.00%	0.00%	25.00%	0.00%	0.05%	91.21%	8.73%	0.00%	0.27%	99.36%	0.37%	0.00%	
PEAK HR :	05:30 PM - 06:30 PM																TOTAL
PEAK HR VOL :	1	0	18	0	6	0	2	0	0	861	79	0	4	1132	2	0	2105
PEAK HR FACTOR :	0.250	0.000	0.643	0.000	0.500	0.000	0.500	0.000	0.000	0.936	0.760	0.000	1.000	0.950	0.500	0.000	0.959
	0.594				0.500				0.944				0.952				

National Data & Surveying Services

Intersection Turning Movement Count

Location: Summerfield Rd & Waugh Chapel Rd
City: Gambrills
Control: No Control

Project ID: 17-11050-004
Date: 11/16/2017

Cars

NS/EW Streets:	Summerfield Rd				Summerfield Rd				Waugh Chapel Rd				Waugh Chapel Rd				
	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
AM	0	0	1	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:30 AM	0	0	2	0	0	0	0	0	0	139	1	0	0	69	0	0	211
6:45 AM	0	0	0	0	0	0	0	0	0	123	6	0	1	82	3	0	215
7:00 AM	0	0	0	0	2	0	0	0	0	130	2	0	0	160	0	0	294
7:15 AM	1	0	0	0	1	0	0	0	0	136	6	0	0	175	0	0	319
7:30 AM	2	0	2	0	0	0	0	0	0	122	6	0	2	167	0	0	301
7:45 AM	0	0	1	0	1	0	0	0	0	235	6	0	1	236	0	0	480
8:00 AM	2	0	1	0	0	0	0	0	0	264	11	0	0	174	0	0	452
8:15 AM	0	0	0	0	0	0	0	0	0	188	9	0	0	105	0	0	302
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	5	0	6	0	4	0	0	0	0	1337	47	0	4	1168	3	0	2574
APPROACH %'s :	45.45%	0.00%	54.55%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	96.60%	3.40%	0.00%	0.34%	99.40%	0.26%	0.00%	
PEAK HR :	**07:15 AM - 08:15 AM**																TOTAL
PEAK HR VOL :	5	0	4	0	2	0	0	0	0	757	29	0	3	752	0	0	1552
PEAK HR FACTOR :	0.63	0.000	0.500	0.000	0.500	0.000	0.000	0.000	0.000	0.717	0.659	0.000	0.375	0.797	0.000	0.000	0.808
	0.563				0.500				0.715				0.796				

	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
PM	0	0	1	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
4:30 PM	0	0	10	0	2	0	0	0	0	214	13	0	0	245	0	0	484
4:45 PM	0	0	5	0	1	0	0	0	0	201	20	0	0	256	0	0	483
5:00 PM	1	0	8	0	1	0	2	0	1	192	23	0	2	259	0	0	489
5:15 PM	0	0	9	0	2	0	0	0	0	198	25	0	0	258	2	0	494
5:30 PM	0	0	5	0	3	0	1	0	0	188	26	0	1	266	1	0	491
5:45 PM	0	0	4	0	0	0	0	0	0	229	19	0	1	291	0	0	544
6:00 PM	1	0	7	0	2	0	1	0	0	213	13	0	1	267	1	0	506
6:15 PM	0	0	2	0	1	0	0	0	0	223	21	0	1	297	0	0	545
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	2	0	50	0	12	0	4	0	1	1658	160	0	6	2139	4	0	4036
APPROACH %'s :	3.85%	0.00%	96.15%	0.00%	75.00%	0.00%	25.00%	0.00%	0.05%	91.15%	8.80%	0.00%	0.28%	99.53%	0.19%	0.00%	
PEAK HR :	**05:30 PM - 06:30 PM**																TOTAL
PEAK HR VOL :	1	0	18	0	6	0	2	0	0	853	79	0	4	1121	2	0	2086
PEAK HR FACTOR :	0.25	0.000	0.643	0.000	0.500	0.000	0.500	0.000	0.000	0.931	0.760	0.000	1.000	0.944	0.500	0.000	0.957
	0.594				0.500				0.940				0.945				

Intersection Turning Movement Count

Location: Summerfield Rd & Waugh Chapel Rd
City: Gambrills
Control: No Control

Project ID: 17-11050-004
Date: 11/16/2017

HT

NS/EW Streets:	Summerfield Rd				Summerfield Rd				Waugh Chapel Rd				Waugh Chapel Rd				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	0	1	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:30 AM	0	0	0	0	1	0	0	0	0	8	0	0	0	7	0	0	16
6:45 AM	0	0	1	0	0	0	0	0	0	5	0	0	0	5	0	0	11
7:00 AM	0	0	0	0	0	0	0	0	0	7	0	0	0	12	0	0	19
7:15 AM	0	0	1	0	0	0	0	0	0	7	0	0	1	7	0	0	16
7:30 AM	0	0	1	0	0	0	0	0	0	5	1	0	1	13	0	0	21
7:45 AM	0	0	1	0	0	0	0	0	0	11	0	0	0	6	0	0	18
8:00 AM	0	0	1	0	0	0	0	0	0	6	0	0	1	13	0	0	21
8:15 AM	0	0	0	0	0	0	0	0	0	9	0	0	0	10	0	0	19
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	5	0	1	0	0	0	0	58	1	0	3	73	0	0	141
APPROACH %'s :	0.00%	0.00%	100.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	98.31%	1.69%	0.00%	3.95%	96.05%	0.00%	0.00%	
PEAK HR :	**07:15 AM - 08:15 AM**																TOTAL
PEAK HR VOL :	0	0	4	0	0	0	0	0	0	29	1	0	3	39	0	0	76
PEAK HR FACTOR :	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.659	0.250	0.000	0.750	0.750	0.000	0.000	0.905
	1.000								0.682				0.750				

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	0	1	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
4:30 PM	0	0	0	0	0	0	0	0	0	8	0	0	0	9	2	0	19
4:45 PM	0	0	0	0	0	0	0	0	0	5	0	0	0	3	1	0	9
5:00 PM	0	0	1	0	0	0	0	0	0	1	0	0	0	2	1	0	5
5:15 PM	0	0	0	0	0	0	0	0	0	2	1	0	0	5	0	0	8
5:30 PM	0	0	0	0	0	0	0	0	0	3	0	0	0	2	0	0	5
5:45 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	4	0	0	5
6:00 PM	0	0	0	0	0	0	0	0	0	3	0	0	0	4	0	0	7
6:15 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	1	0	0	0	0	0	0	24	1	0	0	30	4	0	60
APPROACH %'s :	0.00%	0.00%	100.00%	0.00%					0.00%	96.00%	4.00%	0.00%	0.00%	88.24%	11.76%	0.00%	
PEAK HR :	**05:30 PM - 06:30 PM**																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	8	0	0	0	11	0	0	19
PEAK HR FACTOR :	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.667	0.000	0.000	0.000	0.688	0.000	0.000	0.679
									0.667				0.688				

National Data & Surveying Services

Intersection Turning Movement Count

Location: Summerfield Rd & Waugh Chapel Rd
City: Gambrills
Control: No Control

Project ID: 17-11050-004
Date: 11/16/2017

Bikes

NS/EW Streets:	Summerfield Rd				Summerfield Rd				Waugh Chapel Rd				Waugh Chapel Rd				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	0	1	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
APPROACH %'s :																	
PEAK HR :	07:15 AM - 08:15 AM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	0	1	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
5:15 PM	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2
APPROACH %'s :	100.00%	0.00%	0.00%	0.00%					0.00%	100.00%	0.00%	0.00%					
PEAK HR :	05:30 PM - 06:30 PM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

National Data & Surveying Services
Intersection Turning Movement Count

Location: Summerfield Rd & Waugh Chapel Rd
City: Gambrills

Project ID: 17-11050-004
Date: 11/16/2017

Pedestrians (Crosswalks)

NS/EW Streets:	Summerfield Rd		Summerfield Rd		Waugh Chapel Rd		Waugh Chapel Rd		
AM	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
6:30 AM	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0
APPROACH %'s :									
PEAK HR :	**07:15 AM - 08:15 AM**								TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :									

PM	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
4:30 PM	0	0	1	0	0	0	0	1	2
4:45 PM	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	0	0	0	0	0
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	0	0	1	0	0	0	0	1	2
APPROACH %'s :			100.00%	0.00%			0.00%	100.00%	
PEAK HR :	**05:30 PM - 06:30 PM**								TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :									

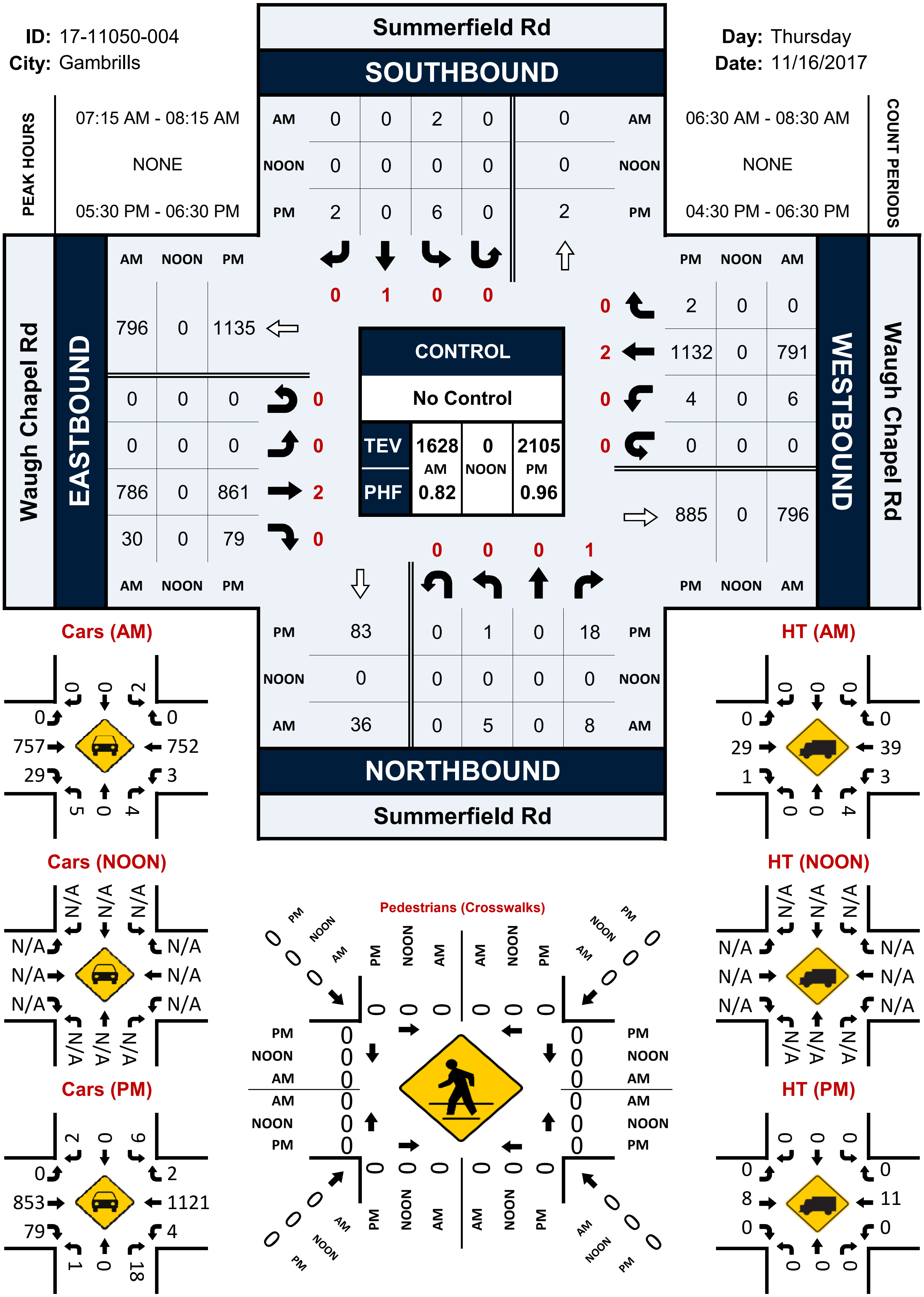
Prepared by National Data & Surveying Services

Summerfield Rd & Waugh Chapel Rd

Peak Hour Turning Movement Count

ID: 17-11050-004
City: Gambrills

Day: Thursday
Date: 11/16/2017



National Data & Surveying Services

Intersection Turning Movement Count

Location: New Market Ln & Waugh Chapel Rd
City: Gambrills
Control: Signalized

Project ID: 17-11050-005
Date: 11/16/2017

Total

NS/EW Streets:	New Market Ln				New Market Ln				Waugh Chapel Rd				Waugh Chapel Rd				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	1.5	1.5	0	0	0	1	0	0	0	3	1	0	0	4	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:30 AM	19	0	6	0	1	1	2	0	0	94	50	0	8	64	0	0	245
6:45 AM	18	1	17	0	5	3	1	0	0	91	38	0	21	77	2	1	275
7:00 AM	35	0	13	0	1	1	2	0	0	104	44	0	18	151	0	0	369
7:15 AM	29	1	18	0	4	1	0	0	0	96	40	0	17	148	1	0	355
7:30 AM	40	0	19	0	1	3	0	0	0	102	47	0	17	159	0	0	388
7:45 AM	25	0	21	0	1	1	0	0	1	191	71	0	15	203	1	0	530
8:00 AM	34	0	34	0	8	0	0	0	1	198	67	0	23	146	3	2	516
8:15 AM	35	1	20	0	2	1	0	0	0	123	54	0	16	88	0	0	340
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	235	3	148	0	23	11	5	0	2	999	411	0	135	1036	7	3	3018
APPROACH %'s :	60.88%	0.78%	38.34%	0.00%	58.97%	28.21%	12.82%	0.00%	0.14%	70.75%	29.11%	0.00%	11.43%	87.72%	0.59%	0.25%	
PEAK HR :	07:15 AM - 08:15 AM																TOTAL
PEAK HR VOL :	128	1	92	0	14	5	0	0	2	587	225	0	72	656	5	2	1789
PEAK HR FACTOR :	0.800	0.250	0.676	0.000	0.438	0.417	0.000	0.000	0.500	0.741	0.792	0.000	0.783	0.808	0.417	0.250	0.844
	0.813				0.594				0.765				0.839				

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	1.5	1.5	0	0	0	1	0	0	0	3	1	0	0	4	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
4:30 PM	109	3	67	0	6	0	0	0	3	139	87	0	43	157	2	0	616
4:45 PM	106	1	75	0	3	1	2	0	3	131	77	0	52	151	0	0	602
5:00 PM	109	2	54	0	3	1	0	0	0	124	76	0	35	160	0	2	566
5:15 PM	102	1	51	0	1	1	2	0	1	139	80	0	33	162	3	1	577
5:30 PM	97	1	63	1	2	0	3	0	3	122	67	0	53	161	1	2	576
5:45 PM	112	3	67	0	0	1	1	0	0	147	100	0	40	186	0	2	659
6:00 PM	94	0	70	0	1	0	1	0	1	140	88	0	48	192	2	3	640
6:15 PM	98	2	54	0	2	0	3	0	0	144	75	0	44	177	2	0	601
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	827	13	501	1	18	4	12	0	11	1086	650	0	348	1346	10	10	4837
APPROACH %'s :	61.62%	0.97%	37.33%	0.07%	52.94%	11.76%	35.29%	0.00%	0.63%	62.16%	37.21%	0.00%	20.30%	78.53%	0.58%	0.58%	
PEAK HR :	05:30 PM - 06:30 PM																TOTAL
PEAK HR VOL :	401	6	254	1	5	1	8	0	4	553	330	0	185	716	5	7	2476
PEAK HR FACTOR :	0.895	0.500	0.907	0.250	0.625	0.250	0.667	0.000	0.333	0.940	0.825	0.000	0.873	0.932	0.625	0.583	0.939
	0.909				0.700				0.898				0.932				

National Data & Surveying Services

Intersection Turning Movement Count

Location: New Market Ln & Waugh Chapel Rd
City: Gambrills
Control: Signalized

Project ID: 17-11050-005
Date: 11/16/2017

Cars

NS/EW Streets:	New Market Ln				New Market Ln				Waugh Chapel Rd				Waugh Chapel Rd				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	1.5	1.5	0	0	0	1	0	0	0	3	1	0	0	4	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:30 AM	19	0	5	0	1	1	2	0	0	86	50	0	8	58	0	0	230
6:45 AM	17	1	17	0	5	3	1	0	0	85	37	0	21	73	2	0	262
7:00 AM	34	0	13	0	1	1	2	0	0	97	44	0	18	139	0	0	349
7:15 AM	29	1	18	0	4	1	0	0	0	85	40	0	15	138	1	0	332
7:30 AM	39	0	16	0	1	3	0	0	0	99	46	0	16	147	0	0	367
7:45 AM	25	0	19	0	1	1	0	0	1	180	70	0	15	196	1	0	509
8:00 AM	32	0	34	0	8	0	0	0	1	193	67	0	23	135	3	2	498
8:15 AM	35	1	20	0	2	1	0	0	0	113	54	0	16	79	0	0	321
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	230	3	142	0	23	11	5	0	2	938	408	0	132	965	7	2	2868
APPROACH %'s :	61.33%	0.80%	37.87%	0.00%	58.97%	28.21%	12.82%	0.00%	0.15%	69.58%	30.27%	0.00%	11.93%	87.25%	0.63%	0.18%	
PEAK HR :	07:15 AM - 08:15 AM																TOTAL
PEAK HR VOL :	125	1	87	0	14	5	0	0	2	557	223	0	69	616	5	2	1706
PEAK HR FACTOR :	0.80	0.250	0.640	0.000	0.438	0.417	0.000	0.000	0.500	0.722	0.796	0.000	0.750	0.786	0.417	0.250	0.838
	0.807				0.594				0.749				0.816				

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	1.5	1.5	0	0	0	1	0	0	0	3	1	0	0	4	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
4:30 PM	108	3	66	0	6	0	0	0	3	132	87	0	43	150	2	0	600
4:45 PM	106	0	75	0	3	1	1	0	3	127	77	0	52	147	0	0	592
5:00 PM	109	2	54	0	3	1	0	0	0	122	76	0	34	157	0	2	560
5:15 PM	101	1	51	0	1	1	2	0	1	137	80	0	33	158	3	1	570
5:30 PM	97	1	63	1	2	0	3	0	3	121	67	0	53	157	1	2	571
5:45 PM	112	3	67	0	0	1	1	0	0	146	100	0	40	184	0	2	656
6:00 PM	93	0	70	0	1	0	1	0	1	137	88	0	48	190	2	3	634
6:15 PM	98	2	54	0	2	0	3	0	0	143	75	0	44	176	2	0	599
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	824	12	500	1	18	4	11	0	11	1065	650	0	347	1319	10	10	4782
APPROACH %'s :	61.63%	0.90%	37.40%	0.07%	54.55%	12.12%	33.33%	0.00%	0.64%	61.70%	37.66%	0.00%	20.58%	78.23%	0.59%	0.59%	
PEAK HR :	05:30 PM - 06:30 PM																TOTAL
PEAK HR VOL :	400	6	254	1	5	1	8	0	4	547	330	0	185	707	5	7	2460
PEAK HR FACTOR :	0.89	0.500	0.907	0.250	0.625	0.250	0.667	0.000	0.333	0.937	0.825	0.000	0.873	0.930	0.625	0.583	0.938
	0.908				0.700				0.895				0.930				

National Data & Surveying Services

Intersection Turning Movement Count

Location: New Market Ln & Waugh Chapel Rd
City: Gambrills
Control: Signalized

Project ID: 17-11050-005
Date: 11/16/2017

HT

NS/EW Streets:	New Market Ln				New Market Ln				Waugh Chapel Rd				Waugh Chapel Rd				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	1.5	1.5	0	0	0	1	0	0	0	3	1	0	0	4	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:30 AM	0	0	1	0	0	0	0	0	0	8	0	0	0	6	0	0	15
6:45 AM	1	0	0	0	0	0	0	0	0	6	1	0	0	4	0	1	13
7:00 AM	1	0	0	0	0	0	0	0	0	7	0	0	0	12	0	0	20
7:15 AM	0	0	0	0	0	0	0	0	0	11	0	0	2	10	0	0	23
7:30 AM	1	0	3	0	0	0	0	0	0	3	1	0	1	12	0	0	21
7:45 AM	0	0	2	0	0	0	0	0	0	11	1	0	0	7	0	0	21
8:00 AM	2	0	0	0	0	0	0	0	0	5	0	0	0	11	0	0	18
8:15 AM	0	0	0	0	0	0	0	0	0	10	0	0	0	9	0	0	19
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	5	0	6	0	0	0	0	0	0	61	3	0	3	71	0	1	150
APPROACH %'s :	45.45%	0.00%	54.55%	0.00%					0.00%	95.31%	4.69%	0.00%	4.00%	94.67%	0.00%	1.33%	
PEAK HR :	07:15 AM - 08:15 AM																TOTAL
PEAK HR VOL :	3	0	5	0	0	0	0	0	0	30	2	0	3	40	0	0	83
PEAK HR FACTOR :	0.375	0.000	0.417	0.000	0.000	0.000	0.000	0.000	0.000	0.682	0.500	0.000	0.375	0.833	0.000	0.000	0.902
	0.500								0.667				0.827				

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	1.5	1.5	0	0	0	1	0	0	0	3	1	0	0	4	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
4:30 PM	1	0	1	0	0	0	0	0	0	7	0	0	0	7	0	0	16
4:45 PM	0	1	0	0	0	0	1	0	0	4	0	0	0	4	0	0	10
5:00 PM	0	0	0	0	0	0	0	0	0	2	0	0	1	3	0	0	6
5:15 PM	1	0	0	0	0	0	0	0	0	2	0	0	0	4	0	0	7
5:30 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	4	0	0	5
5:45 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	3
6:00 PM	1	0	0	0	0	0	0	0	0	3	0	0	0	2	0	0	6
6:15 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	3	1	1	0	0	0	1	0	0	21	0	0	1	27	0	0	55
APPROACH %'s :	60.00%	20.00%	20.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	100.00%	0.00%	0.00%	3.57%	96.43%	0.00%	0.00%	
PEAK HR :	05:30 PM - 06:30 PM																TOTAL
PEAK HR VOL :	1	0	0	0	0	0	0	0	0	6	0	0	0	9	0	0	16
PEAK HR FACTOR :	0.25	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.563	0.000	0.000	0.667
	0.250								0.500				0.563				

National Data & Surveying Services

Intersection Turning Movement Count

Location: New Market Ln & Waugh Chapel Rd
City: Gambrills
Control: Signalized

Project ID: 17-11050-005
Date: 11/16/2017

Bikes

NS/EW Streets:	New Market Ln				New Market Ln				Waugh Chapel Rd				Waugh Chapel Rd				
AM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	1.5	1.5	0	0	0	1	0	0	0	3	1	0	0	4	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
APPROACH %'s :																	
PEAK HR :	07:15 AM - 08:15 AM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

PM	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	1.5	1.5	0	0	0	1	0	0	0	3	1	0	0	4	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
APPROACH %'s :									0.00%	100.00%	0.00%	0.00%					
PEAK HR :	05:30 PM - 06:30 PM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

National Data & Surveying Services
Intersection Turning Movement Count

Location: New Market Ln & Waugh Chapel Rd
City: Gambrills

Project ID: 17-11050-005
Date: 11/16/2017

Pedestrians (Crosswalks)

NS/EW Streets:	New Market Ln		New Market Ln		Waugh Chapel Rd		Waugh Chapel Rd		
AM	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
6:30 AM	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0
APPROACH %'s :									
PEAK HR :	**07:15 AM - 08:15 AM**								TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :									

PM	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
4:30 PM	0	0	1	0	0	0	0	0	1
4:45 PM	0	0	0	0	0	0	0	0	0
5:00 PM	0	1	0	0	0	0	0	1	2
5:15 PM	0	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	0	0	0	0	0
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	0	1	1	0	0	0	0	1	3
APPROACH %'s :	0.00%	100.00%	100.00%	0.00%			0.00%	100.00%	
PEAK HR :	**05:30 PM - 06:30 PM**								TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :									

Prepared by National Data & Surveying Services

New Market Ln & Waugh Chapel Rd

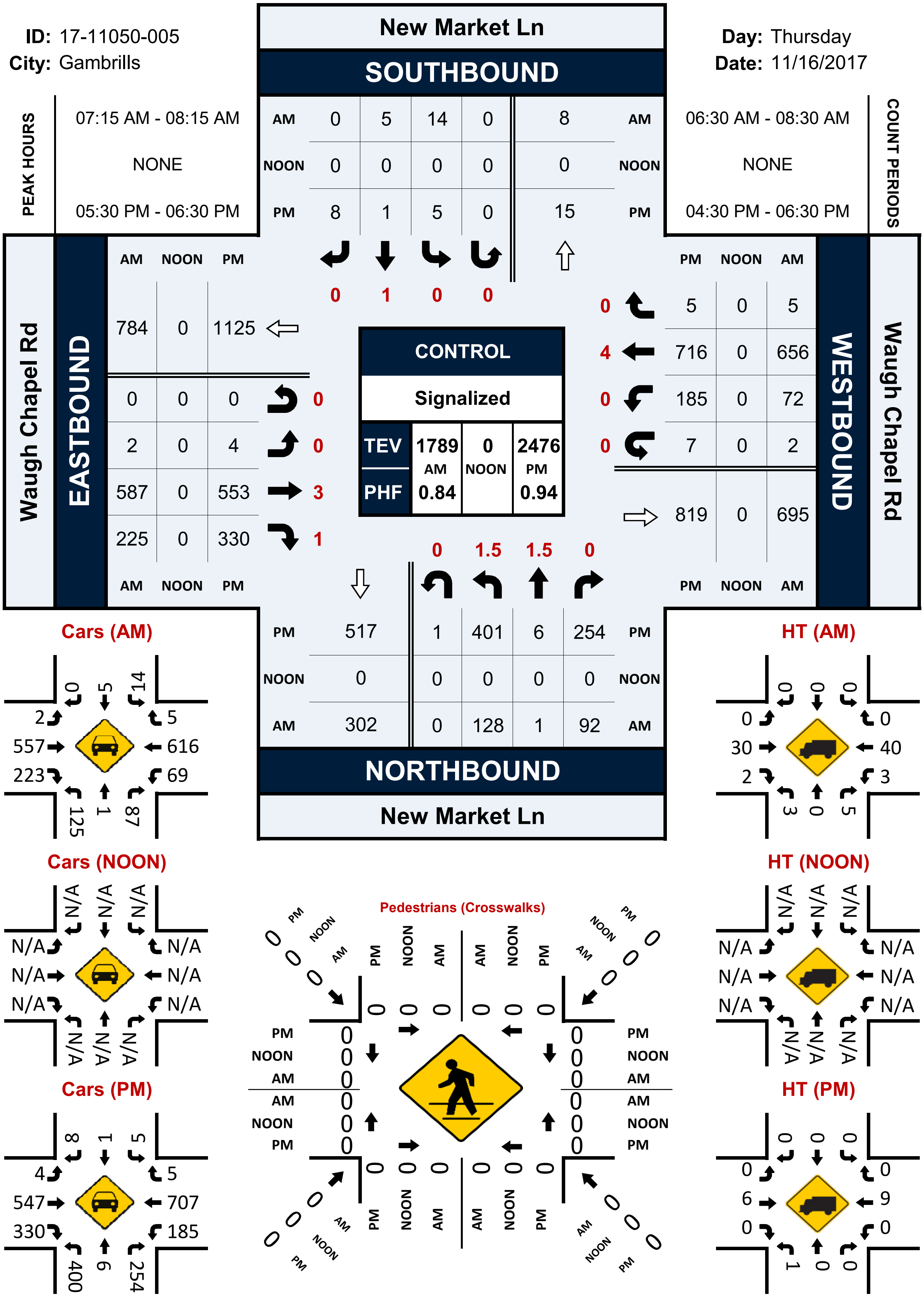
Peak Hour Turning Movement Count

ID: 17-11050-005
City: Gambrills

Day: Thursday
Date: 11/16/2017

PEAK HOURS	
AM	07:15 AM - 08:15 AM
NOON	NONE
PM	05:30 PM - 06:30 PM

COUNT PERIODS	
AM	06:30 AM - 08:30 AM
NOON	NONE
PM	04:30 PM - 06:30 PM



New Market Ln

SOUTHBOUND

	↲	↓	↳	↶	⇧
AM	0	5	14	0	8
NOON	0	0	0	0	0
PM	8	1	5	0	15
	0	1	0	0	

Waugh Chapel Rd

EASTBOUND

	AM	NOON	PM	
⇦	784	0	1125	
↶	0	0	0	0
↰	2	0	4	0
→	587	0	553	3
↴	225	0	330	1

CONTROL

Signalized

	AM	NOON	PM
TEV	1789	0	2476
PHF	0.84		0.94

Waugh Chapel Rd

WESTBOUND

		PM	NOON	AM
0	↰	5	0	5
4	←	716	0	656
0	↙	185	0	72
0	↶	7	0	2
	⇨	819	0	695

NORTHBOUND

New Market Ln

	⇩	↶	↰	↑	↱
		0	1.5	1.5	0
PM	517	1	401	6	254
NOON	0	0	0	0	0
AM	302	0	128	1	92

Cars (AM)

HT (AM)

Cars (NOON)

HT (NOON)

Cars (PM)

HT (PM)

Pedestrians (Crosswalks)

National Data & Surveying Services

Intersection Turning Movement Count

Location: Maytime Dr & Waugh Chapel Rd
City: Gambrills
Control: Signalized

Project ID: 17-11050-001
Date: 2017-11-18

Total

NS/EW Streets:	Maytime Dr				Maytime Dr				Waugh Chapel Rd				Waugh Chapel Rd				
NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	1	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:30 AM	11	1	4	0	5	0	3	0	2	152	5	0	8	122	3	0	316
10:45 AM	5	0	14	0	9	0	4	0	4	153	4	0	9	128	10	0	340
11:00 AM	5	1	9	0	3	0	3	0	3	141	7	0	8	112	3	0	295
11:15 AM	9	0	11	0	8	0	7	0	6	155	5	0	8	122	6	0	337
11:30 AM	6	1	11	0	10	0	2	0	5	158	6	0	8	139	3	0	349
11:45 AM	4	0	14	0	9	1	7	0	4	161	3	0	6	145	5	0	359
12:00 PM	4	0	7	0	7	0	4	0	5	136	2	0	12	167	3	0	347
12:15 PM	7	0	15	0	8	0	6	0	2	162	10	0	4	154	5	0	373
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	51	3	85	0	59	1	36	0	31	1218	42	0	63	1089	38	0	2716
APPROACH %'s :	36.69%	2.16%	61.15%	0.00%	61.46%	1.04%	37.50%	0.00%	2.40%	94.35%	3.25%	0.00%	5.29%	91.51%	3.19%	0.00%	
PEAK HR :	**11:30 AM - 12:30 PM**																TOTAL
PEAK HR VOL :	21	1	47	0	34	1	19	0	16	617	21	0	30	605	16	0	1428
PEAK HR FACTOR :	0.750	0.250	0.783	0.000	0.850	0.250	0.679	0.000	0.800	0.952	0.525	0.000	0.625	0.906	0.800	0.000	0.957
	0.784				0.794				0.940				0.894				

National Data & Surveying Services

Intersection Turning Movement Count

Location: Maytime Dr & Waugh Chapel Rd
City: Gambrills
Control: Signalized

Project ID: 17-11050-001
Date: 2017-11-18

Cars

NS/EW Streets:	Maytime Dr				Maytime Dr				Waugh Chapel Rd				Waugh Chapel Rd				
NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	1	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:30 AM	11	1	4	0	5	0	3	0	2	149	5	0	8	119	3	0	310
10:45 AM	5	0	13	0	9	0	4	0	4	152	4	0	9	125	10	0	335
11:00 AM	5	0	9	0	3	0	3	0	3	141	7	0	8	112	3	0	294
11:15 AM	9	0	11	0	8	0	6	0	6	154	5	0	8	119	6	0	332
11:30 AM	6	1	11	0	9	0	2	0	5	158	6	0	8	138	3	0	347
11:45 AM	4	0	14	0	9	1	7	0	4	160	3	0	6	144	4	0	356
12:00 PM	4	0	7	0	7	0	4	0	5	134	2	0	12	166	3	0	344
12:15 PM	7	0	14	0	8	0	5	0	2	162	8	0	4	153	5	0	368
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	51	2	83	0	58	1	34	0	31	1210	40	0	63	1076	37	0	2686
APPROACH %'s :	37.50%	1.47%	61.03%	0.00%	62.37%	1.08%	36.56%	0.00%	2.42%	94.46%	3.12%	0.00%	5.36%	91.50%	3.15%	0.00%	
PEAK HR :	11:30 AM - 12:30 PM																TOTAL
PEAK HR VOL :	21	1	46	0	33	1	18	0	16	614	19	0	30	601	15	0	1415
PEAK HR FACTOR :	0.75	0.250	0.821	0.000	0.917	0.250	0.643	0.000	0.800	0.948	0.594	0.000	0.625	0.905	0.750	0.000	0.961
	0.810				0.765				0.943				0.892				

National Data & Surveying Services

Intersection Turning Movement Count

Location: Maytime Dr & Waugh Chapel Rd
City: Gambrills
Control: Signalized

Project ID: 17-11050-001
Date: 2017-11-18

HT

NS/EW Streets:	Maytime Dr				Maytime Dr				Waugh Chapel Rd				Waugh Chapel Rd				
NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	1	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:30 AM	0	0	0	0	0	0	0	0	0	3	0	0	0	3	0	0	6
10:45 AM	0	0	1	0	0	0	0	0	0	1	0	0	0	3	0	0	5
11:00 AM	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
11:15 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	3	0	0	5
11:30 AM	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	2
11:45 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	3
12:00 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	3
12:15 PM	0	0	1	0	0	0	1	0	0	0	2	0	0	1	0	0	5
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	1	2	0	1	0	2	0	0	8	2	0	0	13	1	0	30
APPROACH %'s :	0.00%	33.33%	66.67%	0.00%	33.33%	0.00%	66.67%	0.00%	0.00%	80.00%	20.00%	0.00%	0.00%	92.86%	7.14%	0.00%	
PEAK HR :	11:30 AM - 12:30 PM																TOTAL
PEAK HR VOL :	0	0	1	0	1	0	1	0	0	3	2	0	0	4	1	0	13
PEAK HR FACTOR :	0.00	0.000	0.250	0.000	0.250	0.000	0.250	0.000	0.000	0.375	0.250	0.000	0.000	1.000	0.250	0.000	0.650
	0.250				0.500				0.625				0.625				

National Data & Surveying Services

Intersection Turning Movement Count

Location: Maytime Dr & Waugh Chapel Rd
City: Gambrills
Control: Signalized

Project ID: 17-11050-001
Date: 2017-11-18

Bikes

NS/EW Streets:	Maytime Dr				Maytime Dr				Waugh Chapel Rd				Waugh Chapel Rd				
NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	1	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
APPROACH %'s :									0.00%	100.00%	0.00%	0.00%					
PEAK HR :	11:30 AM - 12:30 PM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
PEAK HR FACTOR :	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.250
									0.250								

National Data & Surveying Services
Intersection Turning Movement Count

Location: Maytime Dr & Waugh Chapel Rd
City: Gambrills

Project ID: 17-11050-001
Date: 2017-11-18

Pedestrians (Crosswalks)

NS/EW Streets:	Maytime Dr		Maytime Dr		Waugh Chapel Rd		Waugh Chapel Rd		
NOON	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
10:30 AM	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	1	0	1
11:00 AM	0	0	0	0	0	0	0	1	1
11:15 AM	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	1	1	2
APPROACH %'s :							50.00%	50.00%	
PEAK HR :	11:30 AM - 12:30 PM								TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :									

Prepared by National Data & Surveying Services

Maytime Dr & Waugh Chapel Rd

Peak Hour Turning Movement Count

ID: 17-11050-001
City: Gambrills

Day: Saturday
Date: 11/18/2017

	PEAK HOURS	COUNT PERIODS
AM	NONE	NONE
NOON	11:30 AM - 12:30 PM	10:30 AM - 12:30 PM
PM	NONE	NONE

Maytime Dr
SOUTHBOUND

	↲	↓	↳	U-turn	⇧
AM	0	0	0	0	0
NOON	19	1	34	0	33
PM	0	0	0	0	0
Lanes	0	1	1	0	

Waugh Chapel Rd
EASTBOUND

	AM	NOON	PM	Lanes
⇦	0	645	0	
U-turn	0	0	0	0
↱	0	16	0	0
→	0	617	0	2
↴	0	21	0	0

Waugh Chapel Rd
WESTBOUND

Lanes		PM	NOON	AM
0	↰	0	16	0
2	←	0	605	0
0	↲	0	30	0
0	U-turn	0	0	0
	⇨	0	698	0

CONTROL

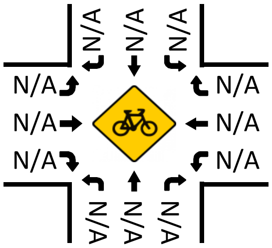
Signalized

	AM	NOON	PM
TEV	0	1428	0
PHF		0.96	

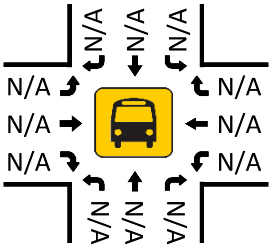
NORTHBOUND
Maytime Dr

	⇩	U-turn	↰	↑	↱
Lanes		0	0	1	0
PM	0	0	0	0	0
NOON	52	0	21	1	47
AM	0	0	0	0	0

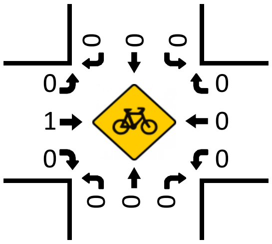
Bikes (AM)



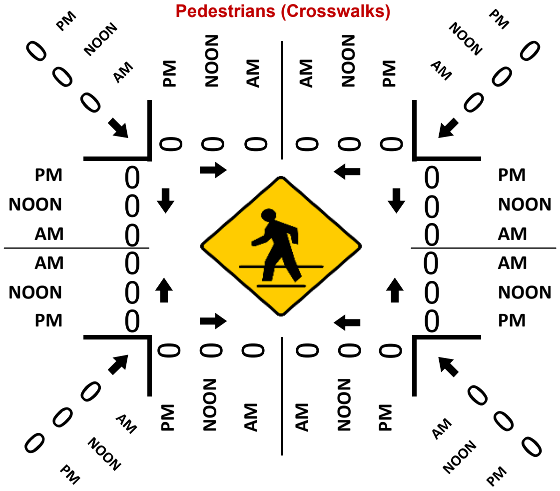
Total Vehicles (AM)



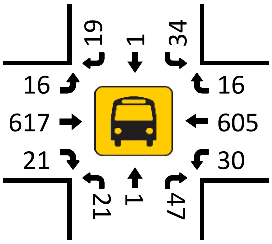
Bikes (NOON)



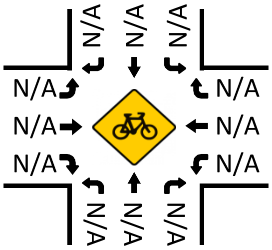
Pedestrians (Crosswalks)



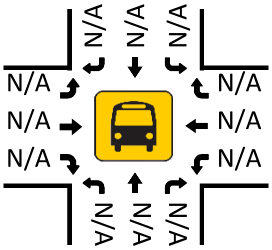
Total Vehicles (NOON)



Bikes (PM)



Total Vehicles (PM)



National Data & Surveying Services

Intersection Turning Movement Count

Location: Symphony Ln/Silver Way & Waugh Chapel Rd
City: Gambrills
Control: Signalized

Project ID: 17-11050-002
Date: 2017-11-18

Total

NS/EW Streets:	Symphony Ln/Silver Way				Symphony Ln/Silver Way				Waugh Chapel Rd				Waugh Chapel Rd				
NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	2	0	0	0	1	0	0	0	2	1	0	1	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:30 AM	0	0	8	0	4	0	3	0	4	158	2	0	6	132	4	0	321
10:45 AM	0	0	10	0	4	0	3	0	2	169	0	0	11	143	4	0	346
11:00 AM	0	0	7	0	3	0	0	0	2	154	3	0	8	123	2	0	302
11:15 AM	0	0	11	0	2	0	3	0	0	173	1	0	6	134	2	0	332
11:30 AM	1	0	7	0	3	0	1	0	2	164	0	0	7	148	1	0	334
11:45 AM	0	0	7	0	0	0	0	0	1	191	1	0	2	158	5	0	365
12:00 PM	0	0	9	0	0	0	2	0	1	159	0	0	8	179	2	0	360
12:15 PM	0	0	4	0	1	0	2	0	3	178	1	0	7	162	2	0	360
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	1	0	63	0	17	0	14	0	15	1346	8	0	55	1179	22	0	2720
APPROACH %'s :	1.56%	0.00%	98.44%	0.00%	54.84%	0.00%	45.16%	0.00%	1.10%	98.32%	0.58%	0.00%	4.38%	93.87%	1.75%	0.00%	
PEAK HR :	**11:30 AM - 12:30 PM**																TOTAL
PEAK HR VOL :	1	0	27	0	4	0	5	0	7	692	2	0	24	647	10	0	1419
PEAK HR FACTOR :	0.250	0.000	0.750	0.000	0.333	0.000	0.625	0.000	0.583	0.906	0.500	0.000	0.750	0.904	0.500	0.000	0.972
		0.778				0.563				0.908				0.901			

National Data & Surveying Services

Intersection Turning Movement Count

Location: Symphony Ln/Silver Way & Waugh Chapel Rd
City: Gambrills
Control: Signalized

Project ID: 17-11050-002
Date: 2017-11-18

Cars

NS/EW Streets:	Symphony Ln/Silver Way				Symphony Ln/Silver Way				Waugh Chapel Rd				Waugh Chapel Rd				
NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	2	0	0	0	1	0	0	0	2	1	0	1	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:30 AM	0	0	8	0	3	0	3	0	4	155	2	0	6	129	4	0	314
10:45 AM	0	0	10	0	4	0	3	0	2	167	0	0	11	140	4	0	341
11:00 AM	0	0	7	0	3	0	0	0	2	154	3	0	8	123	2	0	302
11:15 AM	0	0	11	0	2	0	3	0	0	172	1	0	6	130	2	0	327
11:30 AM	1	0	7	0	3	0	1	0	2	163	0	0	7	147	1	0	332
11:45 AM	0	0	7	0	0	0	0	0	1	189	1	0	2	156	5	0	361
12:00 PM	0	0	9	0	0	0	1	0	1	157	0	0	8	179	2	0	357
12:15 PM	0	0	4	0	1	0	2	0	3	177	1	0	7	161	2	0	358
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	1	0	63	0	16	0	13	0	15	1334	8	0	55	1165	22	0	2692
APPROACH %'s :	1.56%	0.00%	98.44%	0.00%	55.17%	0.00%	44.83%	0.00%	1.11%	98.31%	0.59%	0.00%	4.43%	93.80%	1.77%	0.00%	
PEAK HR :	**11:30 AM - 12:30 PM**																TOTAL
PEAK HR VOL :	1	0	27	0	4	0	4	0	7	686	2	0	24	643	10	0	1408
PEAK HR FACTOR :	0.25	0.000	0.750	0.000	0.333	0.000	0.500	0.000	0.583	0.907	0.500	0.000	0.750	0.898	0.500	0.000	0.975
	0.778				0.500				0.910				0.896				

Intersection Turning Movement Count

Location: Symphony Ln/Silver Way & Waugh Chapel Rd
City: Gambrills
Control: Signalized

Project ID: 17-11050-002
Date: 2017-11-18

HT

NS/EW Streets:	Symphony Ln/Silver Way				Symphony Ln/Silver Way				Waugh Chapel Rd				Waugh Chapel Rd				
NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	2	0	0	0	1	0	0	0	2	1	0	1	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:30 AM	0	0	0	0	1	0	0	0	0	3	0	0	0	3	0	0	7
10:45 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	3	0	0	5
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	4	0	0	5
11:30 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2
11:45 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	4
12:00 PM	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	3
12:15 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	1	0	1	0	0	12	0	0	0	14	0	0	28
APPROACH %'s :					50.00%	0.00%	50.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	
PEAK HR :	11:30 AM - 12:30 PM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	1	0	0	6	0	0	0	4	0	0	11
PEAK HR FACTOR :	0.00	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.750	0.000	0.000	0.000	0.500	0.000	0.000	0.688
					0.250				0.750				0.500				

National Data & Surveying Services

Intersection Turning Movement Count

Location: Symphony Ln/Silver Way & Waugh Chapel Rd
City: Gambrills
Control: Signalized

Project ID: 17-11050-002
Date: 2017-11-18

Bikes

NS/EW Streets:	Symphony Ln/Silver Way				Symphony Ln/Silver Way				Waugh Chapel Rd				Waugh Chapel Rd				
NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	2	0	0	0	1	0	0	0	2	1	0	1	1	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
APPROACH %'s :									0.00%	100.00%	0.00%	0.00%					
PEAK HR :	**11:30 AM - 12:30 PM**																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
PEAK HR FACTOR :	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.250
									0.250								

National Data & Surveying Services
Intersection Turning Movement Count

Location: Symphony Ln/Silver Way & Waugh Chapel Rd
City: Gambrills

Project ID: 17-11050-002
Date: 2017-11-18

Pedestrians (Crosswalks)

NS/EW Streets:	Symphony Ln/Silver Way		Symphony Ln/Silver Way		Waugh Chapel Rd		Waugh Chapel Rd		
NOON	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
10:30 AM	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	1	1
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	1	1
APPROACH %'s :							0.00%	100.00%	
PEAK HR :	**11:30 AM - 12:30 PM**								TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	1	1
PEAK HR FACTOR :								0.250	0.250
							0.250		

Prepared by National Data & Surveying Services

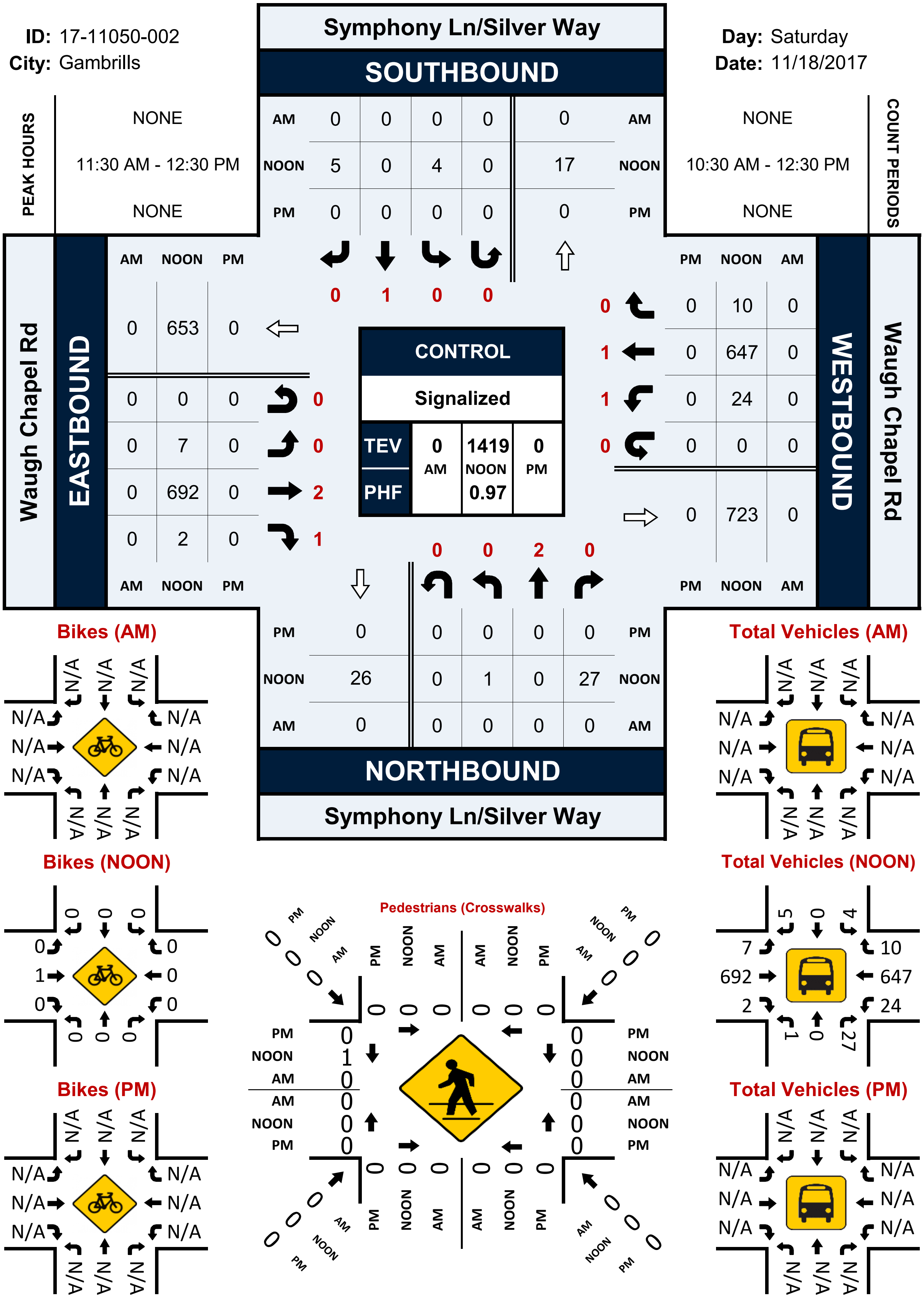
Symphony Ln/Silver Way & Waugh Chapel Rd

Peak Hour Turning Movement Count

ID: 17-11050-002
City: Gambrills

Day: Saturday
Date: 11/18/2017

PEAK HOURS		COUNT PERIODS
NONE	AM	NONE
11:30 AM - 12:30 PM	NOON	10:30 AM - 12:30 PM
NONE	PM	NONE



Symphony Ln/Silver Way

SOUTHBOUND

	↲	↓	↳	↶	⇧
AM	0	0	0	0	0
NOON	5	0	4	0	17
PM	0	0	0	0	0
	0	1	0	0	

Waugh Chapel Rd

EASTBOUND

	AM	NOON	PM	
⇦	0	653	0	
↶	0	0	0	0
↱	0	7	0	0
→	0	692	0	2
↴	0	2	0	1

Waugh Chapel Rd

WESTBOUND

		PM	NOON	AM
0	↰	0	10	0
1	←	0	647	0
1	↲	0	24	0
0	↶	0	0	0
	⇨	0	723	0

CONTROL

Signalized

	AM	NOON	PM
TEV	0	1419	0
PHF		0.97	

NORTHBOUND

Symphony Ln/Silver Way

	⇩	↶	↰	↑	↱
		0	0	2	0
PM	0	0	0	0	0
NOON	26	0	1	0	27
AM	0	0	0	0	0

Bikes (AM)

Bikes (NOON)

Bikes (PM)

Total Vehicles (AM)

Total Vehicles (NOON)

Total Vehicles (PM)

Pedestrians (Crosswalks)

National Data & Surveying Services

Intersection Turning Movement Count

Location: Silver Way & Waugh Chapel Rd
City: Gambrills
Control: 1-Way Stop(SB)

Project ID: 17-11050-003
Date: 2017-11-18

Total

NS/EW Streets:	Silver Way				Silver Way				Waugh Chapel Rd				Waugh Chapel Rd				
NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:30 AM	0	0	4	0	3	0	1	0	0	166	2	0	2	134	4	0	316
10:45 AM	0	0	0	0	5	0	2	0	0	182	0	0	1	156	2	0	348
11:00 AM	0	0	2	0	4	0	0	0	2	166	0	0	2	137	3	0	316
11:15 AM	0	0	1	0	1	0	3	0	1	178	0	0	0	145	4	0	333
11:30 AM	0	0	0	0	2	0	2	0	0	168	0	0	1	149	1	0	323
11:45 AM	0	0	2	0	5	0	0	0	0	203	0	0	2	165	4	0	381
12:00 PM	0	0	1	0	1	0	1	0	0	169	0	0	1	182	4	0	359
12:15 PM	0	0	0	0	2	0	2	0	1	182	0	0	3	161	3	0	354
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	10	0	23	0	11	0	4	1414	2	0	12	1229	25	0	2730
APPROACH %'s :	0.00%	0.00%	100.00%	0.00%	67.65%	0.00%	32.35%	0.00%	0.28%	99.58%	0.14%	0.00%	0.95%	97.08%	1.97%	0.00%	
PEAK HR :	**11:30 AM - 12:30 PM**																TOTAL
PEAK HR VOL :	0	0	3	0	10	0	5	0	1	722	0	0	7	657	12	0	1417
PEAK HR FACTOR :	0.000	0.000	0.375	0.000	0.500	0.000	0.625	0.000	0.250	0.889	0.000	0.000	0.583	0.902	0.750	0.000	0.930
	0.375				0.750				0.890				0.904				

National Data & Surveying Services

Intersection Turning Movement Count

Location: Silver Way & Waugh Chapel Rd
City: Gambrills
Control: 1-Way Stop(SB)

Project ID: 17-11050-003
Date: 2017-11-18

Cars

NS/EW Streets:	Silver Way				Silver Way				Waugh Chapel Rd				Waugh Chapel Rd				
NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:30 AM	0	0	3	0	3	0	1	0	0	163	1	0	2	131	3	0	307
10:45 AM	0	0	0	0	5	0	2	0	0	180	0	0	1	155	2	0	345
11:00 AM	0	0	2	0	4	0	0	0	2	165	0	0	2	135	3	0	313
11:15 AM	0	0	1	0	1	0	3	0	1	178	0	0	0	141	4	0	329
11:30 AM	0	0	0	0	2	0	2	0	0	167	0	0	1	148	1	0	321
11:45 AM	0	0	2	0	5	0	0	0	0	201	0	0	2	163	4	0	377
12:00 PM	0	0	1	0	1	0	1	0	0	167	0	0	1	181	3	0	355
12:15 PM	0	0	0	0	2	0	2	0	1	180	0	0	3	160	3	0	351
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	9	0	23	0	11	0	4	1401	1	0	12	1214	23	0	2698
APPROACH %'s :	0.00%	0.00%	100.00%	0.00%	67.65%	0.00%	32.35%	0.00%	0.28%	99.64%	0.07%	0.00%	0.96%	97.20%	1.84%	0.00%	
PEAK HR :	**11:30 AM - 12:30 PM**																TOTAL
PEAK HR VOL :	0	0	3	0	10	0	5	0	1	715	0	0	7	652	11	0	1404
PEAK HR FACTOR :	0.00	0.000	0.375	0.000	0.500	0.000	0.625	0.000	0.250	0.889	0.000	0.000	0.583	0.901	0.688	0.000	0.931
	0.375				0.750				0.891				0.905				

National Data & Surveying Services

Intersection Turning Movement Count

Location: Silver Way & Waugh Chapel Rd
City: Gambrills
Control: 1-Way Stop(SB)

Project ID: 17-11050-003
Date: 2017-11-18

HT

NS/EW Streets:	Silver Way				Silver Way				Waugh Chapel Rd				Waugh Chapel Rd				
NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:30 AM	0	0	1	0	0	0	0	0	0	3	1	0	0	3	1	0	9
10:45 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	3
11:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	3
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	4
11:30 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2
11:45 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	4
12:00 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	1	1	0	4
12:15 PM	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	3
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	1	0	0	0	0	0	0	13	1	0	0	15	2	0	32
APPROACH %'s :	0.00%	0.00%	100.00%	0.00%					0.00%	92.86%	7.14%	0.00%	0.00%	88.24%	11.76%	0.00%	
PEAK HR :	11:30 AM - 12:30 PM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	7	0	0	0	5	1	0	13
PEAK HR FACTOR :	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.875	0.000	0.000	0.000	0.625	0.250	0.000	0.813
									0.875				0.750				

National Data & Surveying Services

Intersection Turning Movement Count

Location: Silver Way & Waugh Chapel Rd
City: Gambrills
Control: 1-Way Stop(SB)

Project ID: 17-11050-003
Date: 2017-11-18

Bikes

NS/EW Streets:	Silver Way				Silver Way				Waugh Chapel Rd				Waugh Chapel Rd				
NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	1	0	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
APPROACH %'s :									0.00%	100.00%	0.00%	0.00%					
PEAK HR :	**11:30 AM - 12:30 PM**																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
PEAK HR FACTOR :	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.250
									0.250								

National Data & Surveying Services
Intersection Turning Movement Count

Location: Silver Way & Waugh Chapel Rd
City: Gambrills

Project ID: 17-11050-003
Date: 2017-11-18

Pedestrians (Crosswalks)

NS/EW Streets:	Silver Way		Silver Way		Waugh Chapel Rd		Waugh Chapel Rd		
NOON	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
10:30 AM	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0
APPROACH %'s :									
PEAK HR :	**11:30 AM - 12:30 PM**								TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :									

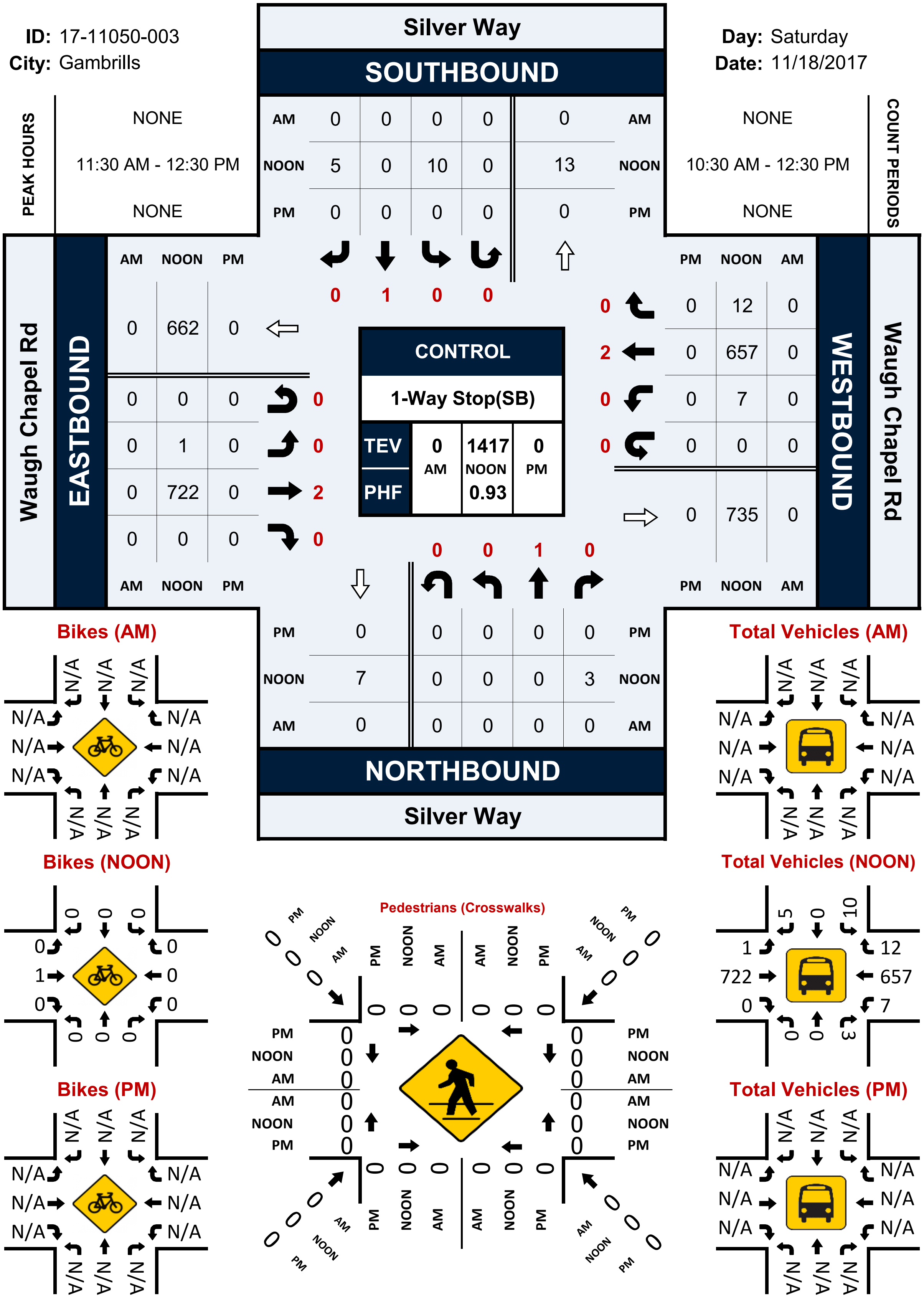
Prepared by National Data & Surveying Services

Silver Way & Waugh Chapel Rd

Peak Hour Turning Movement Count

ID: 17-11050-003
City: Gambrills

Day: Saturday
Date: 11/18/2017



National Data & Surveying Services

Intersection Turning Movement Count

Location: Summerfield Rd & Waugh Chapel Rd
City: Gambrills
Control: No Control

Project ID: 17-11050-004
Date: 2017-11-18

Total

NS/EW Streets:	Summerfield Rd				Summerfield Rd				Waugh Chapel Rd				Waugh Chapel Rd				
NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	0	1	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:30 AM	0	0	8	0	1	0	1	0	0	166	12	0	5	148	2	0	343
10:45 AM	0	0	4	0	1	0	0	0	0	175	22	0	1	179	2	0	384
11:00 AM	3	0	8	0	2	0	0	0	1	163	20	0	0	152	0	0	349
11:15 AM	3	0	6	0	1	0	0	0	0	179	20	0	2	139	2	0	352
11:30 AM	0	0	14	0	0	0	0	0	0	156	20	0	0	170	1	0	361
11:45 AM	0	0	9	0	1	0	0	0	0	199	26	0	1	176	0	0	412
12:00 PM	1	0	5	0	0	0	1	0	1	157	18	0	2	214	1	0	400
12:15 PM	4	0	10	0	0	0	1	0	0	181	23	0	3	181	2	0	405
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	11	0	64	0	6	0	3	0	2	1376	161	0	14	1359	10	0	3006
APPROACH %'s :	14.67%	0.00%	85.33%	0.00%	66.67%	0.00%	33.33%	0.00%	0.13%	89.41%	10.46%	0.00%	1.01%	98.26%	0.72%	0.00%	
PEAK HR :	**11:30 AM - 12:30 PM**																TOTAL
PEAK HR VOL :	5	0	38	0	1	0	2	0	1	693	87	0	6	741	4	0	1578
PEAK HR FACTOR :	0.313	0.000	0.679	0.000	0.250	0.000	0.500	0.000	0.250	0.871	0.837	0.000	0.500	0.866	0.500	0.000	0.958
	0.768				0.750				0.868				0.865				

National Data & Surveying Services

Intersection Turning Movement Count

Location: Summerfield Rd & Waugh Chapel Rd
City: Gambrills
Control: No Control

Project ID: 17-11050-004
Date: 2017-11-18

Cars

NS/EW Streets:	Summerfield Rd				Summerfield Rd				Waugh Chapel Rd				Waugh Chapel Rd				
NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	0	1	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:30 AM	0	0	8	0	1	0	1	0	0	158	12	0	5	143	2	0	330
10:45 AM	0	0	4	0	1	0	0	0	0	173	22	0	1	171	2	0	374
11:00 AM	3	0	8	0	2	0	0	0	1	157	20	0	0	149	0	0	340
11:15 AM	3	0	6	0	1	0	0	0	0	177	20	0	2	133	2	0	344
11:30 AM	0	0	14	0	0	0	0	0	0	155	20	0	0	165	1	0	355
11:45 AM	0	0	8	0	1	0	0	0	0	191	26	0	1	174	0	0	401
12:00 PM	1	0	4	0	0	0	1	0	0	157	17	0	2	209	0	0	391
12:15 PM	4	0	9	0	0	0	1	0	0	175	23	0	3	176	1	0	392
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	11	0	61	0	6	0	3	0	1	1343	160	0	14	1320	8	0	2927
APPROACH %'s :	15.28%	0.00%	84.72%	0.00%	66.67%	0.00%	33.33%	0.00%	0.07%	89.30%	10.64%	0.00%	1.04%	98.36%	0.60%	0.00%	
PEAK HR :	**11:30 AM - 12:30 PM**																TOTAL
PEAK HR VOL :	5	0	35	0	1	0	2	0	0	678	86	0	6	724	2	0	1539
PEAK HR FACTOR :	0.31	0.000	0.625	0.000	0.250	0.000	0.500	0.000	0.000	0.887	0.827	0.000	0.500	0.866	0.500	0.000	0.959
	0.714				0.750				0.880				0.867				

National Data & Surveying Services

Intersection Turning Movement Count

Location: Summerfield Rd & Waugh Chapel Rd
City: Gambrills
Control: No Control

Project ID: 17-11050-004
Date: 2017-11-18

HT

NS/EW Streets:	Summerfield Rd				Summerfield Rd				Waugh Chapel Rd				Waugh Chapel Rd				
NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	0	1	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:30 AM	0	0	0	0	0	0	0	0	0	8	0	0	0	5	0	0	13
10:45 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	8	0	0	10
11:00 AM	0	0	0	0	0	0	0	0	0	6	0	0	0	3	0	0	9
11:15 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	6	0	0	8
11:30 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	5	0	0	6
11:45 AM	0	0	1	0	0	0	0	0	0	8	0	0	0	2	0	0	11
12:00 PM	0	0	1	0	0	0	0	0	1	0	1	0	0	5	1	0	9
12:15 PM	0	0	1	0	0	0	0	0	0	6	0	0	0	5	1	0	13
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	3	0	0	0	0	0	1	33	1	0	0	39	2	0	79
APPROACH %'s :	0.00%	0.00%	100.00%	0.00%					2.86%	94.29%	2.86%	0.00%	0.00%	95.12%	4.88%	0.00%	
PEAK HR :	**11:30 AM - 12:30 PM**																TOTAL
PEAK HR VOL :	0	0	3	0	0	0	0	0	1	15	1	0	0	17	2	0	39
PEAK HR FACTOR :	0.00	0.000	0.750	0.000	0.000	0.000	0.000	0.000	0.250	0.469	0.250	0.000	0.000	0.850	0.500	0.000	0.750
	0.750								0.531				0.792				

National Data & Surveying Services

Intersection Turning Movement Count

Location: Summerfield Rd & Waugh Chapel Rd
City: Gambrills
Control: No Control

Project ID: 17-11050-004
Date: 2017-11-18

Bikes

NS/EW Streets:	Summerfield Rd				Summerfield Rd				Waugh Chapel Rd				Waugh Chapel Rd				
NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	0	0	1	0	0	1	0	0	0	2	0	0	0	2	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2
APPROACH %'s :	100.00%	0.00%	0.00%	0.00%					0.00%	100.00%	0.00%	0.00%					
PEAK HR :	11:30 AM - 12:30 PM																TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
PEAK HR FACTOR :	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.250
									0.250								

National Data & Surveying Services
Intersection Turning Movement Count

Location: Summerfield Rd & Waugh Chapel Rd
City: Gambrills

Project ID: 17-11050-004
Date: 2017-11-18

Pedestrians (Crosswalks)

NS/EW Streets:	Summerfield Rd		Summerfield Rd		Waugh Chapel Rd		Waugh Chapel Rd		
NOON	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
10:30 AM	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	0	0	0	0	0	0	0	0	0
APPROACH %'s :									
PEAK HR :	**11:30 AM - 12:30 PM**								TOTAL
PEAK HR VOL :	0	0	0	0	0	0	0	0	0
PEAK HR FACTOR :									

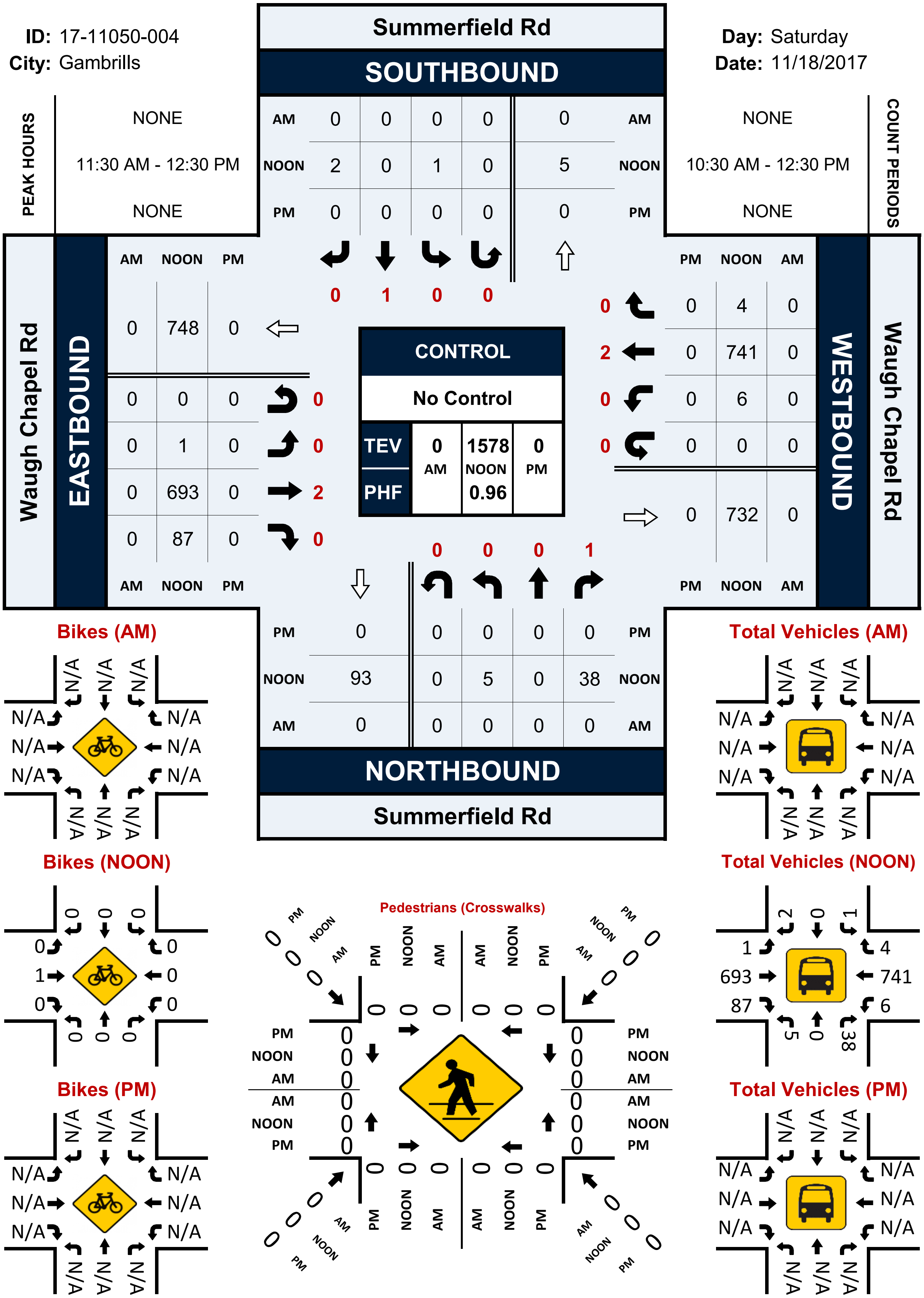
Prepared by National Data & Surveying Services

Summerfield Rd & Waugh Chapel Rd

Peak Hour Turning Movement Count

ID: 17-11050-004
City: Gambrills

Day: Saturday
Date: 11/18/2017



National Data & Surveying Services

Intersection Turning Movement Count

Location: New Market Ln & Waugh Chapel Rd
City: Gambrills
Control: Signalized

Project ID: 17-11050-005
Date: 2017-11-18

Total

NS/EW Streets:	New Market Ln				New Market Ln				Waugh Chapel Rd				Waugh Chapel Rd				
NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	1.5	1.5	0	0	0	1	0	0	0	3	1	0	0	4	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:30 AM	68	3	64	0	6	2	1	1	1	114	65	0	45	83	1	0	454
10:45 AM	74	3	59	1	0	1	2	0	0	105	73	0	77	104	3	1	503
11:00 AM	73	1	63	0	1	1	2	0	1	108	63	0	55	73	0	2	443
11:15 AM	63	1	60	0	5	2	1	0	0	104	79	0	50	86	1	1	453
11:30 AM	89	1	77	0	1	4	0	0	1	103	64	0	56	81	1	2	480
11:45 AM	79	3	77	0	4	1	2	0	4	113	87	0	43	93	0	0	506
12:00 PM	113	1	99	0	5	0	1	0	2	107	68	0	71	104	1	0	572
12:15 PM	89	1	87	0	1	2	1	0	1	112	75	0	56	98	1	0	524
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	648	14	586	1	23	13	10	1	10	866	574	0	453	722	8	6	3935
APPROACH %'s :	51.88%	1.12%	46.92%	0.08%	48.94%	27.66%	21.28%	2.13%	0.69%	59.72%	39.59%	0.00%	38.10%	60.72%	0.67%	0.50%	
PEAK HR :	**11:30 AM - 12:30 PM**																TOTAL
PEAK HR VOL :	370	6	340	0	11	7	4	0	8	435	294	0	226	376	3	2	2082
PEAK HR FACTOR :	0.819	0.500	0.859	0.000	0.550	0.438	0.500	0.000	0.500	0.962	0.845	0.000	0.796	0.904	0.750	0.250	0.910
	0.840				0.786				0.903				0.862				

National Data & Surveying Services

Intersection Turning Movement Count

Location: New Market Ln & Waugh Chapel Rd
City: Gambrills
Control: Signalized

Project ID: 17-11050-005
Date: 2017-11-18

Cars

NS/EW Streets:	New Market Ln				New Market Ln				Waugh Chapel Rd				Waugh Chapel Rd				
NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	1.5	1.5	0	0	0	1	0	0	0	3	1	0	0	4	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:30 AM	67	3	64	0	6	2	1	1	1	106	65	0	44	78	1	0	439
10:45 AM	74	2	59	1	0	1	1	0	0	103	73	0	77	98	3	1	493
11:00 AM	73	1	62	0	1	1	2	0	1	103	63	0	54	70	0	2	433
11:15 AM	63	1	60	0	5	2	1	0	0	103	79	0	50	79	1	1	445
11:30 AM	89	1	75	0	1	4	0	0	1	101	64	0	55	76	1	2	470
11:45 AM	79	3	76	0	4	1	2	0	4	104	87	0	43	91	0	0	494
12:00 PM	113	1	99	0	5	0	1	0	2	106	68	0	70	98	1	0	564
12:15 PM	88	1	86	0	1	2	1	0	1	106	73	0	56	93	1	0	509
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	646	13	581	1	23	13	9	1	10	832	572	0	449	683	8	6	3847
APPROACH %'s :	52.05%	1.05%	46.82%	0.08%	50.00%	28.26%	19.57%	2.17%	0.71%	58.84%	40.45%	0.00%	39.18%	59.60%	0.70%	0.52%	
PEAK HR :	**11:30 AM - 12:30 PM**																TOTAL
PEAK HR VOL :	369	6	336	0	11	7	4	0	8	417	292	0	224	358	3	2	2037
PEAK HR FACTOR :	0.82	0.500	0.848	0.000	0.550	0.438	0.500	0.000	0.500	0.983	0.839	0.000	0.800	0.913	0.750	0.250	0.903
	0.835				0.786				0.919				0.868				

National Data & Surveying Services

Intersection Turning Movement Count

Location: New Market Ln & Waugh Chapel Rd
City: Gambrills
Control: Signalized

Project ID: 17-11050-005
Date: 2017-11-18

HT

NS/EW Streets:	New Market Ln				New Market Ln				Waugh Chapel Rd				Waugh Chapel Rd				
NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	1.5	1.5	0	0	0	1	0	0	0	3	1	0	0	4	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:30 AM	1	0	0	0	0	0	0	0	0	8	0	0	1	5	0	0	15
10:45 AM	0	1	0	0	0	0	1	0	0	2	0	0	0	6	0	0	10
11:00 AM	0	0	1	0	0	0	0	0	0	5	0	0	1	3	0	0	10
11:15 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	7	0	0	8
11:30 AM	0	0	2	0	0	0	0	0	0	2	0	0	1	5	0	0	10
11:45 AM	0	0	1	0	0	0	0	0	0	9	0	0	0	2	0	0	12
12:00 PM	0	0	0	0	0	0	0	0	0	1	0	0	1	6	0	0	8
12:15 PM	1	0	1	0	0	0	0	0	0	6	2	0	0	5	0	0	15
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	2	1	5	0	0	0	1	0	0	34	2	0	4	39	0	0	88
APPROACH %'s :	25.00%	12.50%	62.50%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	94.44%	5.56%	0.00%	9.30%	90.70%	0.00%	0.00%	
PEAK HR :	**11:30 AM - 12:30 PM**																TOTAL
PEAK HR VOL :	1	0	4	0	0	0	0	0	0	18	2	0	2	18	0	0	45
PEAK HR FACTOR :	0.25	0.000	0.500	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.250	0.000	0.500	0.750	0.000	0.000	0.750
	0.625								0.556				0.714				

National Data & Surveying Services

Intersection Turning Movement Count

Location: New Market Ln & Waugh Chapel Rd
City: Gambrills
Control: Signalized

Project ID: 17-11050-005
Date: 2017-11-18

Bikes

NS/EW Streets:	New Market Ln				New Market Ln				Waugh Chapel Rd				Waugh Chapel Rd				
NOON	NORTHBOUND				SOUTHBOUND				EASTBOUND				WESTBOUND				
	1.5	1.5	0	0	0	1	0	0	0	3	1	0	0	4	0	0	
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	NL	NT	NR	NU	SL	ST	SR	SU	EL	ET	ER	EU	WL	WT	WR	WU	TOTAL
TOTAL VOLUMES :	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
APPROACH %'s :	0.00%	0.00%	100.00%	0.00%													
PEAK HR :	11:30 AM - 12:30 PM																TOTAL
PEAK HR VOL :	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
PEAK HR FACTOR :	0.00	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250
	0.250																

National Data & Surveying Services
Intersection Turning Movement Count

Location: New Market Ln & Waugh Chapel Rd
City: Gambrills

Project ID: 17-11050-005
Date: 2017-11-18

Pedestrians (Crosswalks)

NS/EW Streets:	New Market Ln		New Market Ln		Waugh Chapel Rd		Waugh Chapel Rd		
NOON	NORTH LEG		SOUTH LEG		EAST LEG		WEST LEG		
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
10:30 AM	0	0	0	1	0	0	0	0	1
10:45 AM	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	1	0	0	0	0	0	1
12:15 PM	0	0	0	0	0	0	0	0	0
	EB	WB	EB	WB	NB	SB	NB	SB	TOTAL
TOTAL VOLUMES :	0	0	1	1	0	0	0	0	2
APPROACH %'s :			50.00%	50.00%					
PEAK HR :	**11:30 AM - 12:30 PM**								TOTAL
PEAK HR VOL :	0	0	1	0	0	0	0	0	1
PEAK HR FACTOR :			0.250						0.250
			0.250						

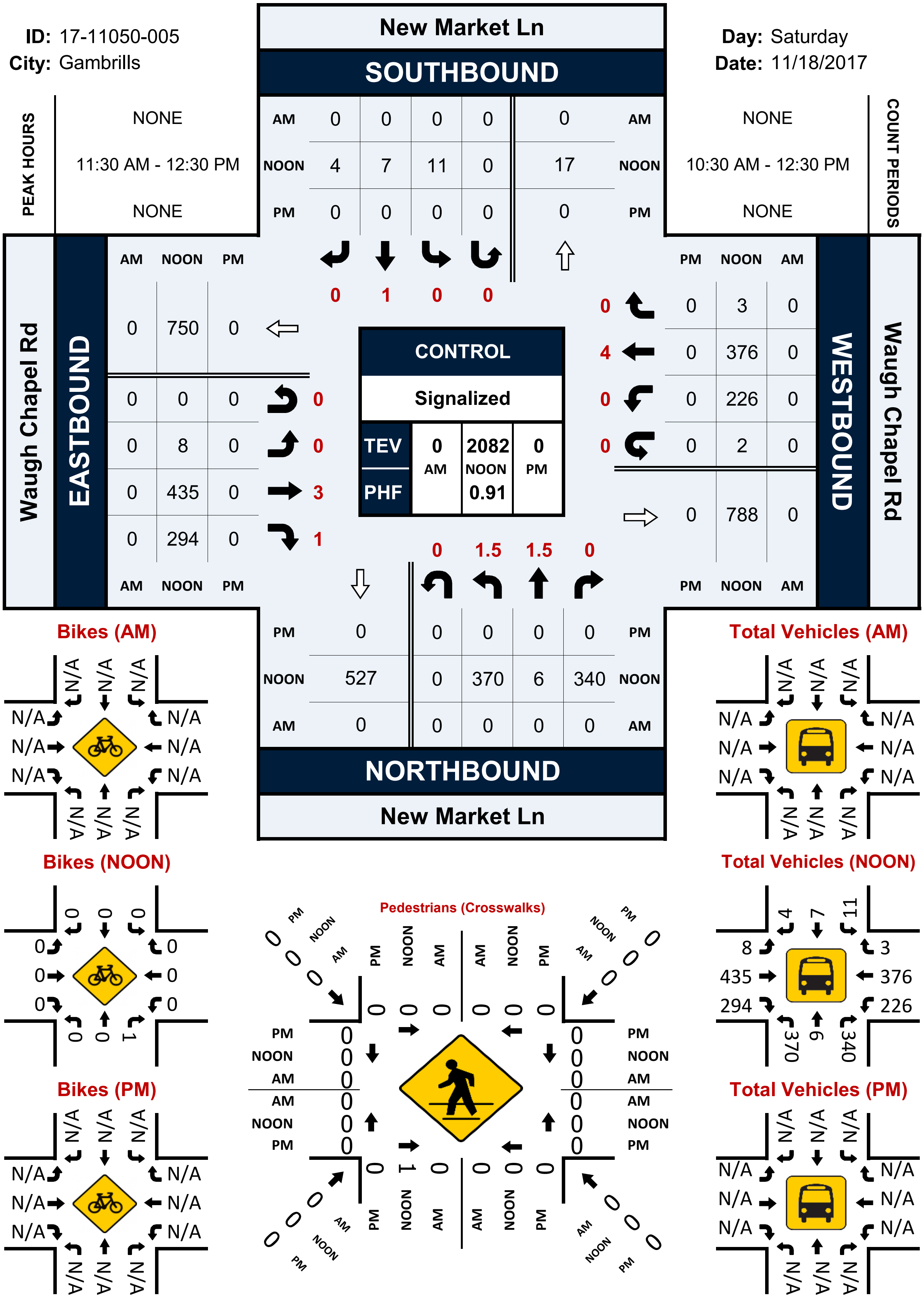
Prepared by National Data & Surveying Services

New Market Ln & Waugh Chapel Rd

Peak Hour Turning Movement Count

ID: 17-11050-005
City: Gambrills

Day: Saturday
Date: 11/18/2017



Block	**Waugh Chapel Road from Maytime Drive to New Market Lane**
Scenario	**AM Peak Hour**
Input by	

Network Peak	
AM	7:15 AM

		Data Collected 11/16/2017	Waugh Chapel Road	RT	34		
60	629	30		TH	1		
RT	TH	LT		LT	27		
Maytime Drive			1	Maytime Drive			
	57	LT	Waugh Chapel Road	LT	TH	RT	
	7	TH		27	573	34	
	42	RT					
1	0%			1	0%		
		Data Collected 11/16/2017	Waugh Chapel Road	RT	12		
175	520	4		TH	6		
RT	TH	LT		LT	8		
Symphony Lane			2	Silver Run Road			
	144	LT	Waugh Chapel Road	LT	TH	RT	
	0	TH		234	477	5	
	276	RT					
-3	0%			-1	0%		
		Data Collected 11/16/2017	Waugh Chapel Road	RT	4		
1	799	1		TH	0		
RT	TH	LT		LT	8		
Silver Way			3	Silver Way			
	1	LT	Waugh Chapel Road	LT	TH	RT	
	0	TH		3	712	4	
	1	RT					
8	1%			-77	-11%		A large number of trucks/cars going to plant
		Data Collected 11/16/2017	Waugh Chapel Road	RT	0		
30	786	0		TH	0		
RT	TH	LT		LT	2		
Summerfield Road			4	Church Driveway			
	5	LT	Waugh Chapel Road	LT	TH	RT	
	0	TH		6	791	0	
	8	RT					
18	2%			8	1%		imbalance due to community center and shopping
		Data Collected 11/16/2017	Waugh Chapel Road	RT	0		
225	587	2		TH	5		
RT	TH	LT		LT	14		
New Market Lane			5	Wigeon Way			
	128	LT	Waugh Chapel Road	LT	TH	RT	
	1	TH		72	656	5	
	92	RT					

Block	**Waugh Chapel Road from Maytime Drive to New Market Lane**
Scenario	**PM Peak Hour**
Input by	

Network Peak	
PM	5:30 PM

		Data Collected 11/16/2017	Waugh Chapel Road	RT	15		
65	837	36		TH	2		
RT	TH	LT		LT	28		
Maytime Drive			1	Maytime Drive			
	40	LT		LT	TH	RT	
	0	TH		41	924	30	
	22	RT	Waugh Chapel Road				
-1	0%			13	1%		
		Data Collected 11/16/2017	Waugh Chapel Road	RT	10		
40	829	17		TH	2		
RT	TH	LT		LT	19		
Symphony Lane			2	Silver Run Road			
	36	LT		LT	TH	RT	
	1	TH		131	936	9	
	82	RT	Waugh Chapel Road				
-3	0%			1	0%		
		Data Collected 11/16/2017	Waugh Chapel Road	RT	3		
1	922	4		TH	0		
RT	TH	LT		LT	8		
Silver Way			3	Silver Way			
	1	LT		LT	TH	RT	
	0	TH		1	1071	17	
	2	RT	Waugh Chapel Road				
8	1%			-46	-4%		A large number of trucks going to plant
		Data Collected 11/16/2017	Waugh Chapel Road	RT	2		
79	861	0		TH	0		
RT	TH	LT		LT	6		
Summerfield Road			4	Church Driveway			
	1	LT		LT	TH	RT	
	0	TH		4	1132	2	
	18	RT	Waugh Chapel Road				
2	0%			20	2%		A large number of trips from shopping center
		Data Collected 11/16/2017	Waugh Chapel Road	RT	8		
330	553	4		TH	1		
RT	TH	LT		LT	5		
New Market Lane			5	Wigeon Way			
	401	LT		LT	TH	RT	
	6	TH		185	716	5	
	254	RT	Waugh Chapel Road				

Date: 11/15/2017
Speed and Hourly Volumes

Speed - Waugh Chapel Road Between Maytime Dr & Symphony Ln

Street Name	Direction	Percentiles					
		15th	50th	Average	85th	95th	ADT
Waugh Chapel Rd	Eastbound	37	43	42	48	51	8489
Waugh Chapel Rd	Westbound	33	39	39	45	49	9704

Speed - Waugh Chapel Road Between Symphony Ln & New Market Ln

Street Name	Direction	Percentiles					
		15th	50th	Average	85th	95th	ADT
Waugh Chapel Rd	Eastbound	31	37	36	42	45	9810
Waugh Chapel Rd	Westbound	27	34	34	41	46	11072

Hourly Volumes

Waugh Chapel Rd Between Maytime Dr & Symphony Lane

Eastbound

Time		Total
0:00	AM	24
1:00		19
2:00		15
3:00		32
4:00		80
5:00		213
6:00		460
7:00		617
8:00		606
9:00		450
10:00		404
11:00		482
12:00	PM	460
13:00		421
14:00		523
15:00		609
16:00		748
17:00		829
18:00		604
19:00		371
20:00		219
21:00		161
22:00		100
23:00		42
		8489

Westbound

Time		Total
0:00	AM	47
1:00		35
2:00		20
3:00		14
4:00		34
5:00		68
6:00		236
7:00		622
8:00		559
9:00		347
10:00		350
11:00		413
12:00	PM	472
13:00		494
14:00		561
15:00		785
16:00		883
17:00		957
18:00		884
19:00		715
20:00		499
21:00		348
22:00		230
23:00		131
		9704

Waugh Chapel Rd Between Symphony Ln & New Market Ln

Eastbound

Time		Total
0:00	AM	27
1:00		30
2:00		19
3:00		30
4:00		91
5:00		237
6:00		510
7:00		680
8:00		825
9:00		544
10:00		485
11:00		574
12:00	PM	559
13:00		485
14:00		538
15:00		869
16:00		778
17:00		889
18:00		650
19:00		403
20:00		239
21:00		172
22:00		119
23:00		57
		9810

Westbound

Time		Total
0:00	AM	55
1:00		50
2:00		25
3:00		15
4:00		32
5:00		95
6:00		285
7:00		758
8:00		538
9:00		434
10:00		432
11:00		511
12:00	PM	578
13:00		573
14:00		809
15:00		823
16:00		948
17:00		1026
18:00		956
19:00		790
20:00		542
21:00		385
22:00		269
23:00		143
		11072

Date: 11/16/2017
Speed and Hourly Volumes

Speed - Waugh Chapel Road Between Maytime Dr & Symphony Ln

Street Name	Direction	Percentiles					
		15th	50th	Average	85th	95th	ADT
Waugh Chapel Rd	Eastbound	37	42	42	48	51	8674
Waugh Chapel Rd	Westbound	33	39	39	44	48	9921

Speed - Waugh Chapel Road Between Symphony Ln & New Market Ln

Street Name	Direction	Percentiles					
		15th	50th	Average	85th	95th	ADT
Waugh Chapel Rd	Eastbound	31	37	36	42	45	10291
Waugh Chapel Rd	Westbound	25	33	33	40	45	11422

Hourly Volumes

Waugh Chapel Rd Between Maytime Dr & Symphony Lane

Eastbound

Time		Total
0:00	AM	32
1:00		16
2:00		10
3:00		24
4:00		81
5:00		245
6:00		431
7:00		658
8:00		584
9:00		465
10:00		439
11:00		485
12:00	PM	469
13:00		386
14:00		482
15:00		622
16:00		770
17:00		844
18:00		730
19:00		362
20:00		229
21:00		143
22:00		104
23:00		63
		8674

Westbound

Time		Total
0:00	AM	58
1:00		32
2:00		11
3:00		15
4:00		24
5:00		76
6:00		246
7:00		621
8:00		533
9:00		329
10:00		345
11:00		445
12:00	PM	488
13:00		447
14:00		565
15:00		762
16:00		959
17:00		974
18:00		862
19:00		794
20:00		568
21:00		400
22:00		202
23:00		165
		9921

Waugh Chapel Rd Between Symphony Ln & New Market Lane

Eastbound

Time		Total
0:00	AM	36
1:00		15
2:00		16
3:00		25
4:00		93
5:00		277
6:00		488
7:00		721
8:00		793
9:00		582
10:00		574
11:00		559
12:00	PM	587
13:00		498
14:00		540
15:00		835
16:00		859
17:00		861
18:00		835
19:00		455
20:00		283
21:00		158
22:00		122
23:00		79
		10291

Westbound

Time		Total
0:00	AM	73
1:00		34
2:00		16
3:00		16
4:00		33
5:00		98
6:00		279
7:00		771
8:00		552
9:00		420
10:00		436
11:00		532
12:00	PM	601
13:00		583
14:00		785
15:00		800
16:00		1007
17:00		1027
18:00		997
19:00		888
20:00		593
21:00		454
22:00		243
23:00		184
		11422

Date: 11/15/2017 and 11/16/2017
Average Speed and Hourly Volumes

Speed - Waugh Chapel Road Between Maytime Dr & Symphony Ln

Street Name	Direction	Percentiles					
		15th	50th	Average	85th	95th	ADT
Waugh Chapel Rd	Eastbound	37	43	42	48	51	8582
Waugh Chapel Rd	Westbound	33	39	39	45	49	9813

Speed - Waugh Chapel Road Between Symphony Ln & New Market Ln

Street Name	Direction	Percentiles					
		15th	50th	Average	85th	95th	ADT
Waugh Chapel Rd	Eastbound	31	37	36	42	45	10051
Waugh Chapel Rd	Westbound	26	34	34	41	46	11247

Hourly Volumes

Waugh Chapel Rd Between Maytime Dr & Symphony Lane

Eastbound

Time	Total
0:00 AM	28
1:00	18
2:00	13
3:00	28
4:00	81
5:00	229
6:00	446
7:00	638
8:00	595
9:00	458
10:00	422
11:00	484
12:00 PM	465
13:00	404
14:00	503
15:00	616
16:00	759
17:00	837
18:00	667
19:00	367
20:00	224
21:00	152
22:00	102
23:00	53
	8582

Westbound

Time	Total
0:00 AM	53
1:00	34
2:00	16
3:00	15
4:00	29
5:00	72
6:00	241
7:00	622
8:00	546
9:00	338
10:00	348
11:00	429
12:00 PM	480
13:00	471
14:00	563
15:00	774
16:00	921
17:00	966
18:00	873
19:00	755
20:00	534
21:00	374
22:00	216
23:00	148
	9813

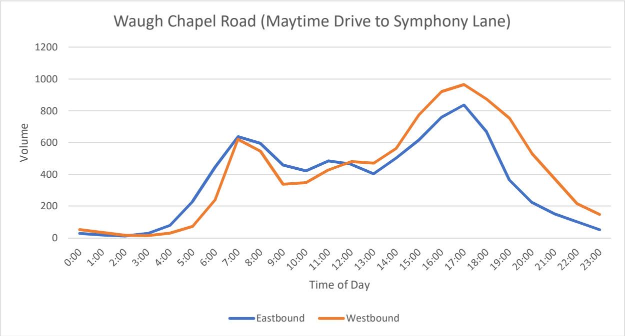
Waugh Chapel Rd Between Symphony Ln & New Market Lane

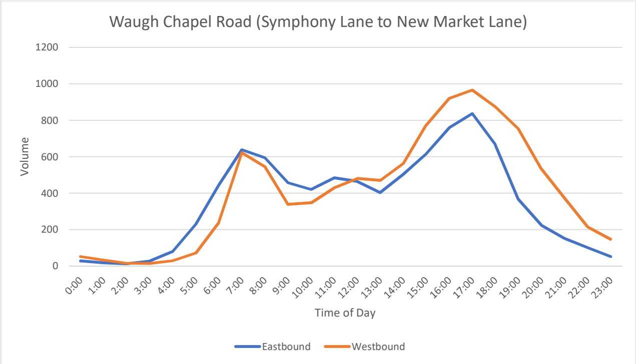
Eastbound

Time	Total
0:00 AM	32
1:00	23
2:00	18
3:00	28
4:00	92
5:00	257
6:00	499
7:00	701
8:00	809
9:00	563
10:00	530
11:00	567
12:00 PM	573
13:00	492
14:00	539
15:00	852
16:00	819
17:00	875
18:00	743
19:00	429
20:00	261
21:00	165
22:00	121
23:00	68
	10051

Westbound

Time	Total
0:00 AM	64
1:00	42
2:00	21
3:00	16
4:00	33
5:00	97
6:00	282
7:00	765
8:00	545
9:00	427
10:00	434
11:00	522
12:00 PM	590
13:00	578
14:00	797
15:00	812
16:00	978
17:00	1027
18:00	977
19:00	839
20:00	568
21:00	420
22:00	256
23:00	164
	11247





Appendix B-2

EXISTING SYNCHRO REPORTS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱			✥		↰	↑↱	
Traffic Volume (vph)	30	629	60	27	573	34	57	7	42	27	1	34
Future Volume (vph)	30	629	60	27	573	34	57	7	42	27	1	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.5	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99			0.95		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.97		0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1770	1847			1717		1770	1591	
Flt Permitted	0.35	1.00	1.00	0.35	1.00			0.81		0.61	1.00	
Satd. Flow (perm)	657	1863	1583	645	1847			1432		1139	1591	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	33	684	65	29	623	37	62	8	46	29	1	37
RTOR Reduction (vph)	0	0	14	0	1	0	0	21	0	0	33	0
Lane Group Flow (vph)	33	684	51	29	659	0	0	95	0	29	5	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6		6	2			4			8		
Actuated Green, G (s)	101.3	97.5	97.5	100.6	96.9			13.8		13.8	13.8	
Effective Green, g (s)	101.3	97.5	97.5	100.6	96.9			13.8		13.8	13.8	
Actuated g/C Ratio	0.78	0.75	0.75	0.78	0.75			0.11		0.11	0.11	
Clearance Time (s)	5.0	5.0	5.0	4.5	5.0			5.0		5.0	5.0	
Vehicle Extension (s)	3.0	5.0	5.0	3.0	5.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	546	1402	1191	533	1382			152		121	169	
v/s Ratio Prot	c0.00	c0.37		0.00	0.36						0.00	
v/s Ratio Perm	0.05		0.03	0.04				c0.07		0.03		
v/c Ratio	0.06	0.49	0.04	0.05	0.48			0.63		0.24	0.03	
Uniform Delay, d1	4.0	6.2	4.1	4.1	6.4			55.4		53.0	51.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.0	1.2	0.1	0.0	1.2			7.9		1.0	0.1	
Delay (s)	4.0	7.5	4.2	4.1	7.6			63.3		54.1	51.9	
Level of Service	A	A	A	A	A			E		D	D	
Approach Delay (s)		7.0			7.4			63.3			52.8	
Approach LOS		A			A			E			D	

Intersection Summary			
HCM 2000 Control Delay	13.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	129.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	54.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

2: Symphony Lane/Silver Way & Waugh Chapel Road

AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱			↰↑	↱		↰↑	↱
Traffic Volume (vph)	4	520	175	234	477	5	144	0	276	8	6	12
Future Volume (vph)	4	520	175	234	477	5	144	0	276	8	6	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00		0.97	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1860			1770	1583		1812	1583
Flt Permitted	0.47	1.00	1.00	0.10	1.00			0.75	1.00		0.88	1.00
Satd. Flow (perm)	876	1863	1583	186	1860			1392	1583		1633	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	565	190	254	518	5	157	0	300	9	7	13
RTOR Reduction (vph)	0	0	107	0	0	0	0	0	35	0	0	9
Lane Group Flow (vph)	4	565	83	254	523	0	0	157	265	0	16	4
Turn Type	Perm	NA	Perm	pm+pt	NA		Perm	NA	pm+ov	Perm	NA	Perm
Protected Phases		6		5	2			8	5		4	
Permitted Phases	6		6	2			8		8	4		4
Actuated Green, G (s)	35.0	35.0	35.0	75.0	75.0			35.0	70.0		35.0	35.0
Effective Green, g (s)	35.0	35.0	35.0	75.0	75.0			35.0	70.0		35.0	35.0
Actuated g/C Ratio	0.29	0.29	0.29	0.62	0.62			0.29	0.58		0.29	0.29
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	255	543	461	578	1162			406	989		476	461
v/s Ratio Prot		c0.30		0.13	c0.28				0.08			
v/s Ratio Perm	0.00		0.05	0.15				c0.11	0.09		0.01	0.00
v/c Ratio	0.02	1.04	0.18	0.44	0.45			0.39	0.27		0.03	0.01
Uniform Delay, d1	30.2	42.5	31.8	20.8	11.7			33.9	12.4		30.4	30.2
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.1	49.6	0.9	2.4	1.3			2.8	0.7		0.1	0.0
Delay (s)	30.4	92.1	32.6	23.2	13.0			36.7	13.0		30.5	30.2
Level of Service	C	F	C	C	B			D	B		C	C
Approach Delay (s)		76.9			16.3			21.2			30.4	
Approach LOS		E			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	40.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	73.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			↰	↱		✣			✣	
Traffic Volume (veh/h)	1	799	7	3	712	4	1	0	1	8	0	4
Future Volume (Veh/h)	1	799	7	3	712	4	1	0	1	8	0	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	868	8	3	774	4	1	0	1	9	0	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		1189										
pX, platoon unblocked				0.72			0.72	0.72	0.72	0.72	0.72	
vC, conflicting volume	778			876			1658	1658	872	1651	1658	774
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	778			633			1720	1720	627	1710	1720	774
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			98	100	100	82	100	99
cM capacity (veh/h)	839			684			50	64	348	51	64	398

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	1	876	777	4	2	13
Volume Left	1	0	3	0	1	9
Volume Right	0	8	0	4	1	4
cSH	839	1700	684	1700	87	70
Volume to Capacity	0.00	0.52	0.00	0.00	0.02	0.19
Queue Length 95th (ft)	0	0	0	0	2	16
Control Delay (s)	9.3	0.0	0.1	0.0	47.2	68.0
Lane LOS	A		A		E	F
Approach Delay (s)	0.0		0.1		47.2	68.0
Approach LOS					E	F

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	59.1%	ICU Level of Service	B
Analysis Period (min)	15		

4: Summerfield Rd/Driveway & Waugh Chapel Rd

AM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰	↱		✥			✥	
Traffic Volume (veh/h)	0	786	30	6	791	0	5	0	8	2	0	0
Future Volume (Veh/h)	0	786	30	6	791	0	5	0	8	2	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	854	33	7	860	0	5	0	9	2	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	860			887			1728	1728	854	1737	1761	860
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	860			887			1728	1728	854	1737	1761	860
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			93	100	97	97	100	100
cM capacity (veh/h)	781			763			69	88	358	66	84	356

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	854	33	867	0	14	2
Volume Left	0	0	7	0	5	2
Volume Right	0	33	0	0	9	0
cSH	781	1700	763	1700	144	66
Volume to Capacity	0.00	0.02	0.01	0.00	0.10	0.03
Queue Length 95th (ft)	0	0	1	0	8	2
Control Delay (s)	0.0	0.0	0.3	0.0	32.8	61.0
Lane LOS			A		D	F
Approach Delay (s)	0.0		0.3		32.8	61.0
Approach LOS					D	F

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	58.6%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰	↰↑	↱		↰↑	↱
Traffic Volume (vph)	2	587	225	72	656	5	128	1	92	14	5	0
Future Volume (vph)	2	587	225	72	656	5	128	1	92	14	5	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0		5.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.95	0.95	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.95	1.00		0.96	
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1681	1686	1583		1795	
Flt Permitted	0.38	1.00	1.00	0.36	1.00	1.00	0.95	0.95	1.00		0.96	
Satd. Flow (perm)	709	3539	1583	675	3539	1583	1681	1686	1583		1795	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	638	245	78	713	5	139	1	100	15	5	0
RTOR Reduction (vph)	0	0	91	0	0	2	0	0	91	0	0	0
Lane Group Flow (vph)	2	638	154	78	713	3	69	71	9	0	20	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases	6		6	2		2			4			3
Actuated Green, G (s)	69.1	68.4	68.4	79.5	73.6	73.6	9.6	9.6	9.6		2.9	
Effective Green, g (s)	69.1	68.4	68.4	79.5	73.6	73.6	9.6	9.6	9.6		2.9	
Actuated g/C Ratio	0.64	0.63	0.63	0.73	0.68	0.68	0.09	0.09	0.09		0.03	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0		5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	457	2224	995	552	2394	1070	148	148	139		47	
v/s Ratio Prot	0.00	0.18		c0.01	c0.20		0.04	c0.04			c0.01	
v/s Ratio Perm	0.00		0.10	0.10		0.00			0.01			
v/c Ratio	0.00	0.29	0.15	0.14	0.30	0.00	0.47	0.48	0.06		0.43	
Uniform Delay, d1	7.3	9.2	8.3	4.5	7.1	5.7	47.2	47.2	45.5		52.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Incremental Delay, d2	0.0	0.3	0.3	0.1	0.3	0.0	2.3	2.4	0.2		6.1	
Delay (s)	7.3	9.5	8.6	4.6	7.4	5.7	49.5	49.7	45.7		58.2	
Level of Service	A	A	A	A	A	A	D	D	D		E	
Approach Delay (s)		9.2			7.2			47.9			58.2	
Approach LOS		A			A			D			E	

Intersection Summary			
HCM 2000 Control Delay	13.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	108.8	Sum of lost time (s)	22.0
Intersection Capacity Utilization	45.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱			✥		↰	↑↱	
Traffic Volume (vph)	36	837	65	41	924	30	40	0	22	28	2	15
Future Volume (vph)	36	837	65	41	924	30	40	0	22	28	2	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00			0.95		1.00	0.87	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.97		0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1770	1854			1718		1770	1614	
Flt Permitted	0.20	1.00	1.00	0.25	1.00			0.79		0.72	1.00	
Satd. Flow (perm)	375	1863	1583	475	1854			1409		1346	1614	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	910	71	45	1004	33	43	0	24	30	2	16
RTOR Reduction (vph)	0	0	12	0	1	0	0	56	0	0	15	0
Lane Group Flow (vph)	39	910	59	45	1036	0	0	11	0	30	3	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6		6	2			4			8		
Actuated Green, G (s)	107.6	102.8	102.8	107.8	102.9			7.3		7.3	7.3	
Effective Green, g (s)	107.6	102.8	102.8	107.8	102.9			7.3		7.3	7.3	
Actuated g/C Ratio	0.83	0.79	0.79	0.83	0.79			0.06		0.06	0.06	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0			5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	361	1473	1251	442	1467			79		75	90	
v/s Ratio Prot	c0.00	0.49		0.00	c0.56						0.00	
v/s Ratio Perm	0.09		0.04	0.08				0.01		c0.02		
v/c Ratio	0.11	0.62	0.05	0.10	0.71			0.14		0.40	0.03	
Uniform Delay, d1	6.1	5.6	3.0	4.1	6.4			58.4		59.2	58.0	
Progression Factor	1.00	1.00	1.00	0.68	0.73			1.00		1.00	1.00	
Incremental Delay, d2	0.1	2.0	0.1	0.1	2.3			0.8		3.5	0.1	
Delay (s)	6.3	7.5	3.0	2.9	7.0			59.2		62.7	58.2	
Level of Service	A	A	A	A	A			E		E	E	
Approach Delay (s)		7.2			6.8			59.2			61.0	
Approach LOS		A			A			E			E	

Intersection Summary			
HCM 2000 Control Delay	9.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: Symphony Lane/Silver Way & Waugh Chapel Road

Existing Conditions
PM Peak

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↱			↰	↱		↰	↱
Traffic Volume (vph)	17	829	40	131	936	9	36	1	82	19	2	10
Future Volume (vph)	17	829	40	131	936	9	36	1	82	19	2	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00		0.96	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1860			1776	1583		1781	1583
Flt Permitted	0.27	1.00	1.00	0.23	1.00			0.71	1.00		0.72	1.00
Satd. Flow (perm)	508	1863	1583	437	1860			1331	1583		1333	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	18	901	43	142	1017	10	39	1	89	21	2	11
RTOR Reduction (vph)	0	0	10	0	0	0	0	0	79	0	0	10
Lane Group Flow (vph)	18	901	33	142	1027	0	0	40	10	0	23	1
Turn Type	Perm	NA	Perm	pm+pt	NA		Perm	NA	pm+ov	Perm	NA	Perm
Protected Phases		6		5	2			8	5		4	
Permitted Phases	6		6	2			8		8	4		4
Actuated Green, G (s)	99.7	99.7	99.7	111.8	111.8			8.2	15.3		8.2	8.2
Effective Green, g (s)	99.7	99.7	99.7	111.8	111.8			8.2	15.3		8.2	8.2
Actuated g/C Ratio	0.77	0.77	0.77	0.86	0.86			0.06	0.12		0.06	0.06
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	389	1428	1214	448	1599			83	247		84	99
v/s Ratio Prot		0.48		0.02	c0.55				0.00			
v/s Ratio Perm	0.04		0.02	0.25				c0.03	0.00		0.02	0.00
v/c Ratio	0.05	0.63	0.03	0.32	0.64			0.48	0.04		0.27	0.01
Uniform Delay, d1	3.7	6.8	3.6	6.0	2.8			58.8	50.9		58.1	57.1
Progression Factor	0.97	0.82	0.81	1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.2	1.8	0.0	0.4	2.0			4.4	0.1		1.8	0.0
Delay (s)	3.7	7.4	3.0	6.4	4.8			63.2	50.9		59.8	57.1
Level of Service	A	A	A	A	A			E	D		E	E
Approach Delay (s)		7.1			5.0			54.7			59.0	
Approach LOS		A			A			D			E	

Intersection Summary			
HCM 2000 Control Delay	9.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	91.9%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

3: Macmullen Drive/Silver Way & Waugh Chapel Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			↰	↱		✥			✥	
Traffic Volume (veh/h)	4	922	1	1	1071	17	1	0	2	8	0	3
Future Volume (Veh/h)	4	922	1	1	1071	17	1	0	2	8	0	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	1002	1	1	1164	18	1	0	2	9	0	3
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		1189										
pX, platoon unblocked				0.70			0.70	0.70	0.70	0.70	0.70	
vC, conflicting volume	1182			1003			2180	2194	1002	2178	2177	1164
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1182			786			2476	2498	785	2474	2472	1164
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			93	100	99	36	100	99
cM capacity (veh/h)	591			580			14	20	273	14	21	237

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	4	1003	1165	18	3	12
Volume Left	4	0	1	0	1	9
Volume Right	0	1	0	18	2	3
cSH	591	1700	580	1700	38	18
Volume to Capacity	0.01	0.59	0.00	0.01	0.08	0.66
Queue Length 95th (ft)	1	0	0	0	6	44
Control Delay (s)	11.1	0.0	0.1	0.0	108.4	377.6
Lane LOS	B		A		F	F
Approach Delay (s)	0.0		0.1		108.4	377.6
Approach LOS					F	F

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	67.2%	ICU Level of Service	C
Analysis Period (min)	15		

4: Summerfield Rd/Driveway & Waugh Chapel Rd

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰	↱		✥			✥	
Traffic Volume (veh/h)	0	861	79	4	1132	2	1	0	18	6	0	2
Future Volume (Veh/h)	0	861	79	4	1132	2	1	0	18	6	0	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	936	86	4	1230	2	1	0	20	7	0	2
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1232			1022			2176	2176	936	2194	2260	1230
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1232			1022			2176	2176	936	2194	2260	1230
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			97	100	94	77	100	99
cM capacity (veh/h)	566			679			33	46	321	30	41	217

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	936	86	1234	2	21	9
Volume Left	0	0	4	0	1	7
Volume Right	0	86	0	2	20	2
cSH	566	1700	679	1700	227	37
Volume to Capacity	0.00	0.05	0.01	0.00	0.09	0.24
Queue Length 95th (ft)	0	0	0	0	8	19
Control Delay (s)	0.0	0.0	0.3	0.0	22.5	129.3
Lane LOS			A		C	F
Approach Delay (s)	0.0		0.3		22.5	129.3
Approach LOS					C	F

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	78.0%	ICU Level of Service	D
Analysis Period (min)	15		

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰	↰	↱		↰	↱
Traffic Volume (vph)	4	553	330	185	716	5	401	6	254	5	1	8
Future Volume (vph)	4	553	330	185	716	5	401	6	254	5	1	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.95	0.95	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.95	1.00		0.96	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1681	1688	1583		1788	1583
Flt Permitted	0.35	1.00	1.00	0.36	1.00	1.00	0.95	0.95	1.00		0.96	1.00
Satd. Flow (perm)	661	3539	1583	664	3539	1583	1681	1688	1583		1788	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	601	359	201	778	5	436	7	276	5	1	9
RTOR Reduction (vph)	0	0	163	0	0	2	0	0	226	0	0	9
Lane Group Flow (vph)	4	601	196	201	778	3	222	221	50	0	6	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases	6		6	2		2			4			3
Actuated Green, G (s)	66.4	65.7	65.7	81.5	74.8	74.8	21.7	21.7	21.7		2.4	2.4
Effective Green, g (s)	66.4	65.7	65.7	81.5	74.8	74.8	21.7	21.7	21.7		2.4	2.4
Actuated g/C Ratio	0.55	0.54	0.54	0.68	0.62	0.62	0.18	0.18	0.18		0.02	0.02
Clearance Time (s)	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	370	1927	862	529	2195	981	302	303	284		35	31
v/s Ratio Prot	0.00	0.17		c0.03	0.22		c0.13	0.13			c0.00	
v/s Ratio Perm	0.01		0.12	c0.23		0.00			0.03			0.00
v/c Ratio	0.01	0.31	0.23	0.38	0.35	0.00	0.74	0.73	0.17		0.17	0.01
Uniform Delay, d1	12.2	15.1	14.3	7.9	11.1	8.7	46.7	46.7	41.9		58.1	57.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.0	0.4	0.6	0.5	0.4	0.0	9.0	8.5	0.3		2.3	0.1
Delay (s)	12.2	15.5	14.9	8.4	11.6	8.7	55.7	55.2	42.2		60.4	58.0
Level of Service	B	B	B	A	B	A	E	E	D		E	E
Approach Delay (s)		15.2			10.9			50.3			59.0	
Approach LOS		B			B			D			E	

Intersection Summary			
HCM 2000 Control Delay	23.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	120.6	Sum of lost time (s)	22.0
Intersection Capacity Utilization	59.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: Maytime Drive & Waugh Chapel Rd

Existing Conditions
Saturday Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↱			✣		↰	↱	
Traffic Volume (vph)	16	617	21	30	605	16	21	1	47	34	1	19
Future Volume (vph)	16	617	21	30	605	16	21	1	47	34	1	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.5	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00			0.91		1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.98		0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1770	1856			1666		1770	1596	
Flt Permitted	0.37	1.00	1.00	0.37	1.00			0.89		0.60	1.00	
Satd. Flow (perm)	690	1863	1583	681	1856			1504		1109	1596	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	17	671	23	33	658	17	23	1	51	37	1	21
RTOR Reduction (vph)	0	0	5	0	0	0	0	48	0	0	20	0
Lane Group Flow (vph)	17	671	18	33	675	0	0	27	0	37	2	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6		6	2			4			8		
Actuated Green, G (s)	105.8	103.4	103.4	107.7	104.1			8.0		8.0	8.0	
Effective Green, g (s)	105.8	103.4	103.4	107.7	104.1			8.0		8.0	8.0	
Actuated g/C Ratio	0.82	0.80	0.80	0.83	0.80			0.06		0.06	0.06	
Clearance Time (s)	5.0	5.0	5.0	4.5	5.0			5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	583	1487	1263	596	1491			92		68	98	
v/s Ratio Prot	0.00	0.36		c0.00	c0.36						0.00	
v/s Ratio Perm	0.02		0.01	0.04				0.02		c0.03		
v/c Ratio	0.03	0.45	0.01	0.06	0.45			0.30		0.54	0.02	
Uniform Delay, d1	2.5	4.1	2.7	2.4	3.9			58.1		59.0	57.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.2	0.0	0.0	1.0			1.8		8.6	0.1	
Delay (s)	2.6	4.3	2.7	2.4	4.9			59.8		67.6	57.2	
Level of Service	A	A	A	A	A			E		E	E	
Approach Delay (s)		4.2			4.8			59.8			63.7	
Approach LOS		A			A			E			E	

Intersection Summary			
HCM 2000 Control Delay	9.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	129.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↱			↰	↱		↰	↱
Traffic Volume (vph)	7	692	2	24	647	10	1	0	27	4	0	5
Future Volume (vph)	7	692	2	24	647	10	1	0	27	4	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00		0.95	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1858			1770	1583		1770	1583
Flt Permitted	0.39	1.00	1.00	0.32	1.00			1.00	1.00		1.00	1.00
Satd. Flow (perm)	733	1863	1583	605	1858			1863	1583		1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	8	752	2	26	703	11	1	0	29	4	0	5
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	28	0	0	5
Lane Group Flow (vph)	8	752	2	26	714	0	0	1	1	0	4	0
Turn Type	Perm	NA	Perm	pm+pt	NA		Perm	NA	pm+ov	Perm	NA	Perm
Protected Phases		6		5	2			8	5		4	
Permitted Phases	6		6	2			8		8	4		4
Actuated Green, G (s)	98.9	98.9	98.9	108.6	108.6			1.4	6.1		1.4	1.4
Effective Green, g (s)	98.9	98.9	98.9	108.6	108.6			1.4	6.1		1.4	1.4
Actuated g/C Ratio	0.82	0.82	0.82	0.90	0.90			0.01	0.05		0.01	0.01
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	604	1535	1304	593	1681			21	146		21	18
v/s Ratio Prot		c0.40		0.00	c0.38				0.00			
v/s Ratio Perm	0.01		0.00	0.04				0.00	0.00		c0.00	0.00
v/c Ratio	0.01	0.49	0.00	0.04	0.42			0.05	0.01		0.19	0.00
Uniform Delay, d1	1.9	3.1	1.9	1.5	0.9			58.6	54.1		58.7	58.6
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.0	1.1	0.0	0.0	0.8			0.9	0.0		4.4	0.1
Delay (s)	1.9	4.2	1.9	1.6	1.7			59.6	54.1		63.1	58.7
Level of Service	A	A	A	A	A			E	D		E	E
Approach Delay (s)		4.2			1.7			54.3			60.7	
Approach LOS		A			A			D			E	

Intersection Summary			
HCM 2000 Control Delay	4.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	55.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
3: Macmullen Drive/Silver Way & Waugh Chapel Road

Existing Conditions
Saturday Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			↰	↱		✥			✥	
Traffic Volume (veh/h)	1	722	0	7	657	12	0	0	3	10	0	5
Future Volume (Veh/h)	1	722	0	7	657	12	0	0	3	10	0	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	785	0	8	714	13	0	0	3	11	0	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		1189										
pX, platoon unblocked				0.86			0.86	0.86	0.86	0.86	0.86	
vC, conflicting volume	727			785			1522	1530	785	1520	1517	714
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	727			664			1526	1535	664	1523	1520	714
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			100	100	99	86	100	99
cM capacity (veh/h)	876			791			81	98	394	81	100	431

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	1	785	722	13	3	16
Volume Left	1	0	8	0	0	11
Volume Right	0	0	0	13	3	5
cSH	876	1700	791	1700	394	109
Volume to Capacity	0.00	0.46	0.01	0.01	0.01	0.15
Queue Length 95th (ft)	0	0	1	0	1	12
Control Delay (s)	9.1	0.0	0.3	0.0	14.2	43.6
Lane LOS	A		A		B	E
Approach Delay (s)	0.0		0.3		14.2	43.6
Approach LOS					B	E

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	54.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰	↱		✣			✣	
Traffic Volume (veh/h)	1	693	87	6	741	4	5	0	38	1	0	2
Future Volume (Veh/h)	1	693	87	6	741	4	5	0	38	1	0	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	753	95	7	805	4	5	0	41	1	0	2
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	809			848			1576	1578	753	1615	1669	805
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	809			848			1576	1578	753	1615	1669	805
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			94	100	90	99	100	99
cM capacity (veh/h)	817			790			88	108	410	75	95	382

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	754	95	812	4	46	3
Volume Left	1	0	7	0	5	1
Volume Right	0	95	0	4	41	2
cSH	817	1700	790	1700	293	161
Volume to Capacity	0.00	0.06	0.01	0.00	0.16	0.02
Queue Length 95th (ft)	0	0	1	0	14	1
Control Delay (s)	0.0	0.0	0.2	0.0	19.6	27.8
Lane LOS	A		A		C	D
Approach Delay (s)	0.0		0.2		19.6	27.8
Approach LOS					C	D

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
5: New Market Lane/Wigeon Way & Waugh Chapel Rd

Existing Conditions
Saturday Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰	↰↑	↱		↰↑	↱
Traffic Volume (vph)	8	435	294	226	376	3	370	6	340	11	7	4
Future Volume (vph)	8	435	294	226	376	3	370	6	340	11	7	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.95	0.95	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.95	1.00		0.97	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1681	1688	1583		1808	1583
Flt Permitted	0.51	1.00	1.00	0.42	1.00	1.00	0.95	0.95	1.00		0.97	1.00
Satd. Flow (perm)	954	3539	1583	783	3539	1583	1681	1688	1583		1808	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	9	473	320	246	409	3	402	7	370	12	8	4
RTOR Reduction (vph)	0	0	148	0	0	1	0	0	306	0	0	4
Lane Group Flow (vph)	9	473	172	246	409	2	205	204	64	0	20	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases	6		6	2		2			4			3
Actuated Green, G (s)	66.5	65.8	65.8	80.8	74.1	74.1	21.1	21.1	21.1		4.3	4.3
Effective Green, g (s)	66.5	65.8	65.8	80.8	74.1	74.1	21.1	21.1	21.1		4.3	4.3
Actuated g/C Ratio	0.54	0.54	0.54	0.66	0.61	0.61	0.17	0.17	0.17		0.04	0.04
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	523	1905	852	590	2145	959	290	291	273		63	55
v/s Ratio Prot	0.00	0.13		c0.03	0.12		c0.12	0.12			c0.01	
v/s Ratio Perm	0.01		0.11	c0.24		0.00			0.04			0.00
v/c Ratio	0.02	0.25	0.20	0.42	0.19	0.00	0.71	0.70	0.23		0.32	0.00
Uniform Delay, d1	12.8	15.0	14.6	8.6	10.7	9.5	47.6	47.6	43.6		57.5	56.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.0	0.3	0.5	0.5	0.2	0.0	7.6	7.4	0.4		2.9	0.0
Delay (s)	12.8	15.3	15.1	9.1	10.9	9.5	55.3	55.0	44.0		60.4	56.9
Level of Service	B	B	B	A	B	A	E	E	D		E	E
Approach Delay (s)		15.2			10.2			49.9			59.8	
Approach LOS		B			B			D			E	

Intersection Summary			
HCM 2000 Control Delay	26.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	122.2	Sum of lost time (s)	22.0
Intersection Capacity Utilization	60.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Intersection: 1: Maytime Drive & Waugh Chapel Rd

Movement	EB	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	T	R	L	TR	LTR	L	TR
Maximum Queue (ft)	112	204	129	46	152	160	63	57
Average Queue (ft)	17	70	9	13	59	65	23	22
95th Queue (ft)	60	159	55	40	130	123	57	48
Link Distance (ft)		666			1254	812		690
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	170		160	180			100	
Storage Blk Time (%)		1	0		0			
Queuing Penalty (veh)		1	0		0			

Intersection: 2: Symphony Lane/Silver Way & Waugh Chapel Road

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	LT	R	LT	R
Maximum Queue (ft)	71	964	265	217	286	226	215	64	31
Average Queue (ft)	5	601	195	100	128	78	90	13	9
95th Queue (ft)	40	947	364	177	251	153	169	44	31
Link Distance (ft)		1254			1110	785		468	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	160		240	930			200		135
Storage Blk Time (%)		62	0			0	1		
Queuing Penalty (veh)		111	1			1	1		

Intersection: 3: Macmullen Drive/Silver Way & Waugh Chapel Road

Movement	EB	WB	NB	SB
Directions Served	L	LT	LTR	LTR
Maximum Queue (ft)	16	27	27	36
Average Queue (ft)	1	1	2	7
95th Queue (ft)	10	11	15	25
Link Distance (ft)		952	302	692
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	160			
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Summerfield Rd/Driveway & Waugh Chapel Rd

Movement	WB	B20	NB	SB
Directions Served	LT	T	LTR	LTR
Maximum Queue (ft)	162	147	31	23
Average Queue (ft)	11	5	8	2
95th Queue (ft)	76	81	27	14
Link Distance (ft)	750	472	982	404
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: New Market Lane/Wigeon Way & Waugh Chapel Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	LT	R	LT
Maximum Queue (ft)	17	200	200	91	124	211	162	14	185	164	98	59
Average Queue (ft)	1	65	66	29	26	83	28	0	92	14	37	17
95th Queue (ft)	11	149	154	69	72	164	103	4	158	80	70	43
Link Distance (ft)		472				772	772	772	420	420	420	308
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	185		320	320	215							
Storage Blk Time (%)		0				0						
Queuing Penalty (veh)		2				0						

Network Summary

Network wide Queuing Penalty: 116

Intersection: 1: Maytime Drive & Waugh Chapel Rd

Movement	EB	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	T	R	L	TR	LTR	L	TR
Maximum Queue (ft)	112	281	94	53	252	122	77	45
Average Queue (ft)	25	87	8	22	91	42	27	13
95th Queue (ft)	70	200	45	50	203	91	65	37
Link Distance (ft)		666			1254	812		690
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	170		160	180			100	
Storage Blk Time (%)		1	0		1		0	
Queuing Penalty (veh)		1	0		1		0	

Intersection: 2: Symphony Lane/Silver Way & Waugh Chapel Road

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	LT	R	LT	R
Maximum Queue (ft)	140	383	113	149	215	71	104	68	38
Average Queue (ft)	17	135	10	50	86	32	42	22	10
95th Queue (ft)	73	274	59	103	199	67	82	55	34
Link Distance (ft)		1254			1110	785		468	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	160		240	930			200		135
Storage Blk Time (%)	0	4							
Queuing Penalty (veh)	0	2							

Intersection: 3: Macmullen Drive/Silver Way & Waugh Chapel Road

Movement	EB	WB	NB	SB
Directions Served	L	LT	LTR	LTR
Maximum Queue (ft)	25	18	27	43
Average Queue (ft)	4	1	3	10
95th Queue (ft)	18	10	16	29
Link Distance (ft)		952	302	692
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	160			
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Summerfield Rd/Driveway & Waugh Chapel Rd

Movement	WB	NB	SB
Directions Served	LT	LTR	LTR
Maximum Queue (ft)	253	33	43
Average Queue (ft)	16	11	7
95th Queue (ft)	105	32	28
Link Distance (ft)	750	982	404
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)	0		
Queuing Penalty (veh)	0		

Intersection: 5: New Market Lane/Wigeon Way & Waugh Chapel Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	LT	R	LT
Maximum Queue (ft)	26	186	206	165	144	289	225	10	328	284	92	24
Average Queue (ft)	4	86	93	58	59	146	77	1	218	155	56	2
95th Queue (ft)	20	154	165	108	117	239	193	8	314	280	86	13
Link Distance (ft)		472				772	772	772	420	420	420	308
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	185		320	320	215							
Storage Blk Time (%)		0			0	1						
Queuing Penalty (veh)		1			0	2						

Intersection: 5: New Market Lane/Wigeon Way & Waugh Chapel Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	20
Average Queue (ft)	4
95th Queue (ft)	18
Link Distance (ft)	308
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 7

Intersection: 1: Maytime Drive & Waugh Chapel Rd

Movement	EB	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	T	R	L	TR	LTR	L	TR
Maximum Queue (ft)	31	157	30	53	254	128	81	44
Average Queue (ft)	7	56	2	14	70	34	29	16
95th Queue (ft)	28	128	16	43	193	79	72	41
Link Distance (ft)		666			1254	812		690
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	170		160	180			100	
Storage Blk Time (%)		0			1		1	
Queuing Penalty (veh)		0			0		0	

Intersection: 2: Symphony Lane/Silver Way & Waugh Chapel Road

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	L	TR	LT	R	LT	R
Maximum Queue (ft)	29	128	31	110	9	52	30	31
Average Queue (ft)	2	14	9	14	0	18	6	5
95th Queue (ft)	12	65	28	65	5	42	24	24
Link Distance (ft)		1254		1110	785		468	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	160		930			200		135
Storage Blk Time (%)		0						
Queuing Penalty (veh)		0						

Intersection: 3: Macmullen Drive/Silver Way & Waugh Chapel Road

Movement	WB	NB	SB
Directions Served	LT	LTR	LTR
Maximum Queue (ft)	134	17	35
Average Queue (ft)	8	2	9
95th Queue (ft)	54	13	28
Link Distance (ft)	952	302	692
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)	0		
Queuing Penalty (veh)	0		

Intersection: 4: Summerfield Rd/Driveway & Waugh Chapel Rd

Movement	EB	WB	NB	SB
Directions Served	LT	LT	LTR	LTR
Maximum Queue (ft)	10	108	46	23
Average Queue (ft)	0	8	19	2
95th Queue (ft)	6	57	38	12
Link Distance (ft)	1422	750	982	404
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: New Market Lane/Wigeon Way & Waugh Chapel Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	LT	R	LT
Maximum Queue (ft)	33	151	153	121	185	198	168	17	348	277	126	60
Average Queue (ft)	5	76	78	54	82	90	27	1	203	141	71	19
95th Queue (ft)	23	133	141	100	142	165	104	6	294	264	106	50
Link Distance (ft)		472				772	772	772	420	420	420	308
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	185		320	320	215							
Storage Blk Time (%)		0			0	0						
Queuing Penalty (veh)		0			0	0						

Intersection: 5: New Market Lane/Wigeon Way & Waugh Chapel Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	20
Average Queue (ft)	3
95th Queue (ft)	13
Link Distance (ft)	308
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 1

Appendix B-2

2040 NO BUILD SYNCHRO REPORTS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↱			✥		↰	↱	
Traffic Volume (vph)	30	803	60	40	863	50	60	7	44	29	1	36
Future Volume (vph)	30	803	60	40	863	50	60	7	44	29	1	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.5	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99			0.95		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.97		0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1770	1848			1717		1770	1590	
Flt Permitted	0.19	1.00	1.00	0.24	1.00			0.81		0.61	1.00	
Satd. Flow (perm)	359	1863	1583	452	1848			1429		1134	1590	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	33	873	65	43	938	54	65	8	48	32	1	39
RTOR Reduction (vph)	0	0	14	0	1	0	0	20	0	0	35	0
Lane Group Flow (vph)	33	873	51	43	991	0	0	101	0	32	5	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6		6	2			4			8		
Actuated Green, G (s)	99.5	95.7	95.7	101.4	96.4			14.3		14.3	14.3	
Effective Green, g (s)	99.5	95.7	95.7	101.4	96.4			14.3		14.3	14.3	
Actuated g/C Ratio	0.77	0.74	0.74	0.78	0.74			0.11		0.11	0.11	
Clearance Time (s)	5.0	5.0	5.0	4.5	5.0			5.0		5.0	5.0	
Vehicle Extension (s)	3.0	5.0	5.0	3.0	5.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	317	1376	1169	404	1375			157		125	175	
v/s Ratio Prot	0.00	0.47		c0.00	c0.54						0.00	
v/s Ratio Perm	0.08		0.03	0.08				c0.07		0.03		
v/c Ratio	0.10	0.63	0.04	0.11	0.72			0.64		0.26	0.03	
Uniform Delay, d1	8.5	8.3	4.6	6.3	9.1			55.1		52.7	51.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.1	2.2	0.1	0.1	3.3			8.6		1.1	0.1	
Delay (s)	8.7	10.5	4.6	6.4	12.4			63.7		53.8	51.5	
Level of Service	A	B	A	A	B			E		D	D	
Approach Delay (s)		10.1			12.2			63.7			52.5	
Approach LOS		B			B			E			D	

Intersection Summary			
HCM 2000 Control Delay	15.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	129.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	69.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱			↰↑	↱		↰↑	↱
Traffic Volume (vph)	4	676	196	261	796	7	148	0	283	10	6	15
Future Volume (vph)	4	676	196	261	796	7	148	0	283	10	6	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00		0.97	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1860			1770	1583		1808	1583
Flt Permitted	0.32	1.00	1.00	0.09	1.00			0.75	1.00		0.86	1.00
Satd. Flow (perm)	595	1863	1583	166	1860			1389	1583		1598	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	735	213	284	865	8	161	0	308	11	7	16
RTOR Reduction (vph)	0	0	92	0	0	0	0	0	26	0	0	11
Lane Group Flow (vph)	4	735	121	284	873	0	0	161	282	0	18	5
Turn Type	Perm	NA	Perm	pm+pt	NA		Perm	NA	pm+ov	Perm	NA	Perm
Protected Phases		6		5	2			8	5		4	
Permitted Phases	6		6	2			8		8	4		4
Actuated Green, G (s)	40.0	40.0	40.0	75.0	75.0			35.0	65.0		35.0	35.0
Effective Green, g (s)	40.0	40.0	40.0	75.0	75.0			35.0	65.0		35.0	35.0
Actuated g/C Ratio	0.33	0.33	0.33	0.62	0.62			0.29	0.54		0.29	0.29
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	198	621	527	504	1162			405	923		466	461
v/s Ratio Prot		c0.39		0.14	c0.47				0.08			
v/s Ratio Perm	0.01		0.08	0.21				c0.12	0.10		0.01	0.00
v/c Ratio	0.02	1.18	0.23	0.56	0.75			0.40	0.31		0.04	0.01
Uniform Delay, d1	26.8	40.0	28.9	26.7	15.9			34.1	15.1		30.4	30.2
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.2	98.3	1.0	4.5	4.5			2.9	0.9		0.2	0.0
Delay (s)	27.0	138.3	29.9	31.2	20.4			37.0	16.0		30.6	30.2
Level of Service	C	F	C	C	C			D	B		C	C
Approach Delay (s)		113.6			23.0			23.2			30.4	
Approach LOS		F			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	56.2	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	90.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
3: Macmullen Drive/Silver Way & Waugh Chapel Road

2040 No Build
03/11/2019

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			↰	↱		✣			✣	
Traffic Volume (veh/h)	1	965	2	4	1056	5	5	0	5	10	0	5
Future Volume (Veh/h)	1	965	2	4	1056	5	5	0	5	10	0	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	1049	2	4	1148	5	5	0	5	11	0	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		1189										
pX, platoon unblocked				0.68			0.68	0.68	0.68	0.68	0.68	
vC, conflicting volume	1153			1051			2213	2213	1050	2212	2209	1148
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1153			837			2553	2553	836	2551	2547	1148
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			57	100	98	7	100	98
cM capacity (veh/h)	606			540			12	18	249	12	18	242

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	1	1051	1152	5	10	16
Volume Left	1	0	4	0	5	11
Volume Right	0	2	0	5	5	5
cSH	606	1700	540	1700	22	17
Volume to Capacity	0.00	0.62	0.01	0.00	0.45	0.95
Queue Length 95th (ft)	0	0	1	0	33	60
Control Delay (s)	11.0	0.0	0.3	0.0	258.9	512.4
Lane LOS	B		A		F	F
Approach Delay (s)	0.0		0.3		258.9	512.4
Approach LOS					F	F

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	68.8%	ICU Level of Service	C
Analysis Period (min)	15		

4: Summerfield Rd/Driveway & Waugh Chapel Rd

03/11/2019

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰	↱		✣			✣	
Traffic Volume (veh/h)	0	949	37	8	1101	0	45	0	45	3	0	0
Future Volume (Veh/h)	0	949	37	8	1101	0	45	0	45	3	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1032	40	9	1197	0	49	0	49	3	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1197			1072			2247	2247	1032	2296	2287	1197
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1197			1072			2247	2247	1032	2296	2287	1197
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			0	100	83	87	100	100
cM capacity (veh/h)	583			650			29	41	283	22	39	226

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	1032	40	1206	0	98	3
Volume Left	0	0	9	0	49	3
Volume Right	0	40	0	0	49	0
cSH	583	1700	650	1700	53	22
Volume to Capacity	0.00	0.02	0.01	0.00	1.84	0.13
Queue Length 95th (ft)	0	0	1	0	237	10
Control Delay (s)	0.0	0.0	0.6	0.0	564.7	189.1
Lane LOS			A		F	F
Approach Delay (s)	0.0		0.6		564.7	189.1
Approach LOS					F	F

Intersection Summary			
Average Delay	23.8		
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰	↰↑	↱		↰↑	↱
Traffic Volume (vph)	3	723	277	89	958	5	158	2	114	18	5	0
Future Volume (vph)	3	723	277	89	958	5	158	2	114	18	5	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0		5.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.95	0.95	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.95	1.00		0.96	
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1681	1687	1583		1791	
Flt Permitted	0.26	1.00	1.00	0.29	1.00	1.00	0.95	0.95	1.00		0.96	
Satd. Flow (perm)	484	3539	1583	536	3539	1583	1681	1687	1583		1791	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	786	301	97	1041	5	172	2	124	20	5	0
RTOR Reduction (vph)	0	0	123	0	0	2	0	0	112	0	0	0
Lane Group Flow (vph)	3	786	178	97	1041	3	88	86	12	0	25	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases	6		6	2		2			4			3
Actuated Green, G (s)	66.3	65.6	65.6	79.3	72.6	72.6	11.0	11.0	11.0		4.4	
Effective Green, g (s)	66.3	65.6	65.6	79.3	72.6	72.6	11.0	11.0	11.0		4.4	
Actuated g/C Ratio	0.60	0.59	0.59	0.72	0.66	0.66	0.10	0.10	0.10		0.04	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0		5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)	298	2097	938	469	2320	1038	167	167	157		71	
v/s Ratio Prot	0.00	0.22		c0.01	c0.29		c0.05	0.05			c0.01	
v/s Ratio Perm	0.01		0.11	0.13		0.00			0.01			
v/c Ratio	0.01	0.37	0.19	0.21	0.45	0.00	0.53	0.51	0.08		0.35	
Uniform Delay, d1	9.0	11.8	10.4	5.7	9.3	6.6	47.4	47.3	45.2		51.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	
Incremental Delay, d2	0.0	0.5	0.5	0.2	0.6	0.0	3.0	2.7	0.2		3.0	
Delay (s)	9.0	12.3	10.8	5.9	9.9	6.6	50.4	50.0	45.5		54.8	
Level of Service	A	B	B	A	A	A	D	D	D		D	
Approach Delay (s)		11.9			9.6			48.2			54.8	
Approach LOS		B			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	15.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	110.7	Sum of lost time (s)	22.0
Intersection Capacity Utilization	55.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱			✥		↰	↑↱	
Traffic Volume (vph)	36	1203	65	41	1201	30	42	0	24	30	2	16
Future Volume (vph)	36	1203	65	41	1201	30	42	0	24	30	2	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00			0.95		1.00	0.87	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.97		0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1770	1856			1717		1770	1613	
Flt Permitted	0.06	1.00	1.00	0.07	1.00			0.80		0.71	1.00	
Satd. Flow (perm)	111	1863	1583	139	1856			1409		1319	1613	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	1308	71	45	1305	33	46	0	26	33	2	17
RTOR Reduction (vph)	0	0	13	0	0	0	0	56	0	0	16	0
Lane Group Flow (vph)	39	1308	58	45	1338	0	0	16	0	33	3	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6		6	2			4			8		
Actuated Green, G (s)	107.3	102.4	102.4	107.5	102.5			7.6		7.6	7.6	
Effective Green, g (s)	107.3	102.4	102.4	107.5	102.5			7.6		7.6	7.6	
Actuated g/C Ratio	0.83	0.79	0.79	0.83	0.79			0.06		0.06	0.06	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0			5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	154	1467	1246	177	1463			82		77	94	
v/s Ratio Prot	0.01	0.70		c0.01	c0.72						0.00	
v/s Ratio Perm	0.20		0.04	0.20				0.01		c0.03		
v/c Ratio	0.25	0.89	0.05	0.25	0.91			0.20		0.43	0.03	
Uniform Delay, d1	25.7	9.8	3.0	22.2	10.4			58.3		59.1	57.7	
Progression Factor	1.00	1.00	1.00	0.71	0.64			1.00		1.00	1.00	
Incremental Delay, d2	0.9	8.6	0.1	0.4	6.6			1.2		3.8	0.1	
Delay (s)	26.5	18.4	3.1	16.2	13.2			59.5		62.9	57.9	
Level of Service	C	B	A	B	B			E		E	E	
Approach Delay (s)		17.9			13.3			59.5			61.1	
Approach LOS		B			B			E			E	

Intersection Summary			
HCM 2000 Control Delay	17.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	83.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: Symphony Lane/Silver Way & Waugh Chapel Road

2040 No Build
03/11/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱			↰↑	↱		↰↑	↱
Traffic Volume (vph)	18	1192	42	138	1216	12	38	1	86	20	2	11
Future Volume (vph)	18	1192	42	138	1216	12	38	1	86	20	2	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00		0.96	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1860			1776	1583		1781	1583
Flt Permitted	0.15	1.00	1.00	0.04	1.00			0.71	1.00		0.71	1.00
Satd. Flow (perm)	276	1863	1583	75	1860			1329	1583		1329	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	20	1296	46	150	1322	13	41	1	93	22	2	12
RTOR Reduction (vph)	0	0	13	0	0	0	0	0	78	0	0	11
Lane Group Flow (vph)	20	1296	33	150	1335	0	0	42	15	0	24	1
Turn Type	Perm	NA	Perm	pm+pt	NA		Perm	NA	pm+ov	Perm	NA	Perm
Protected Phases		6		5	2			8	5		4	
Permitted Phases	6		6	2			8		8	4		4
Actuated Green, G (s)	94.3	94.3	94.3	111.6	111.6			8.4	20.7		8.4	8.4
Effective Green, g (s)	94.3	94.3	94.3	111.6	111.6			8.4	20.7		8.4	8.4
Actuated g/C Ratio	0.73	0.73	0.73	0.86	0.86			0.06	0.16		0.06	0.06
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	200	1351	1148	224	1596			85	312		85	102
v/s Ratio Prot		c0.70		0.06	c0.72				0.00			
v/s Ratio Perm	0.07		0.02	0.51				c0.03	0.00		0.02	0.00
v/c Ratio	0.10	0.96	0.03	0.67	0.84			0.49	0.05		0.28	0.01
Uniform Delay, d1	5.3	16.1	5.0	46.5	4.6			58.7	46.3		57.9	56.9
Progression Factor	1.33	0.85	2.26	1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.5	10.4	0.0	7.4	5.4			4.5	0.1		1.8	0.0
Delay (s)	7.6	24.1	11.3	53.9	10.0			63.2	46.4		59.8	56.9
Level of Service	A	C	B	D	A			E	D		E	E
Approach Delay (s)		23.4			14.4			51.6			58.8	
Approach LOS		C			B			D			E	

Intersection Summary			
HCM 2000 Control Delay	20.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	106.9%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Configurations	↰	↱			↰	↱		✥			✥	
Traffic Volume (veh/h)	5	1283	2	2	1367	22	2	0	3	12	0	4
Future Volume (Veh/h)	5	1283	2	2	1367	22	2	0	3	12	0	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	1395	2	2	1486	24	2	0	3	13	0	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		1189										
pX, platoon unblocked				0.30			0.30	0.30	0.30	0.30	0.30	
vC, conflicting volume	1510			1397			2900	2920	1396	2898	2897	1486
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1510			1160			6127	6193	1156	6120	6117	1486
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			0	100	96	0	100	97
cM capacity (veh/h)	443			182			0	0	72	0	0	153

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	5	1397	1488	24	5	17
Volume Left	5	0	2	0	2	13
Volume Right	0	2	0	24	3	4
cSH	443	1700	182	1700	0	0
Volume to Capacity	0.01	0.82	0.01	0.01	205.88	1343.09
Queue Length 95th (ft)	1	0	1	0	Err	Err
Control Delay (s)	13.2	0.0	2.2	0.0	Err	Err
Lane LOS	B		A		F	F
Approach Delay (s)	0.0		2.2		Err	Err
Approach LOS					F	F

Intersection Summary			
Average Delay	76.1		
Intersection Capacity Utilization	84.3%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰	↱		✥			✥	
Traffic Volume (veh/h)	0	1218	79	20	1393	3	21	0	21	9	0	3
Future Volume (Veh/h)	0	1218	79	20	1393	3	21	0	21	9	0	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1324	86	22	1514	3	23	0	23	10	0	3
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1517			1410			2885	2885	1324	2905	2968	1514
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1517			1410			2885	2885	1324	2905	2968	1514
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			95			0	100	88	0	100	98
cM capacity (veh/h)	440			484			10	15	191	8	14	147

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	1324	86	1536	3	46	13
Volume Left	0	0	22	0	23	10
Volume Right	0	86	0	3	23	3
cSH	440	1700	484	1700	18	11
Volume to Capacity	0.00	0.05	0.05	0.00	2.50	1.21
Queue Length 95th (ft)	0	0	4	0	156	59
Control Delay (s)	0.0	0.0	5.4	0.0	1118.5	821.1
Lane LOS			A		F	F
Approach Delay (s)	0.0		5.4		1118.5	821.1
Approach LOS					F	F

Intersection Summary			
Average Delay	23.4		
Intersection Capacity Utilization	99.3%	ICU Level of Service	F
Analysis Period (min)	15		

5: New Market Lane/Wigeon Way & Waugh Chapel Rd

03/11/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰	↰	↱		↰	↱
Traffic Volume (vph)	4	846	368	207	914	5	448	6	284	8	1	11
Future Volume (vph)	4	846	368	207	914	5	448	6	284	8	1	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.95	0.95	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.95	1.00		0.96	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1681	1688	1583		1783	1583
Flt Permitted	0.26	1.00	1.00	0.22	1.00	1.00	0.95	0.95	1.00		0.96	1.00
Satd. Flow (perm)	482	3539	1583	406	3539	1583	1681	1688	1583		1783	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	920	400	225	993	5	487	7	309	9	1	12
RTOR Reduction (vph)	0	0	189	0	0	2	0	0	237	0	0	12
Lane Group Flow (vph)	4	920	211	225	993	3	248	246	72	0	10	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases	6		6	2		2			4			3
Actuated Green, G (s)	66.3	65.6	65.6	81.7	75.0	75.0	23.7	23.7	23.7		3.8	3.8
Effective Green, g (s)	66.3	65.6	65.6	81.7	75.0	75.0	23.7	23.7	23.7		3.8	3.8
Actuated g/C Ratio	0.53	0.53	0.53	0.66	0.60	0.60	0.19	0.19	0.19		0.03	0.03
Clearance Time (s)	6.0	6.0	6.0	6.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	264	1869	836	367	2137	955	320	322	302		54	48
v/s Ratio Prot	0.00	0.26		c0.04	0.28		c0.15	0.15			c0.01	
v/s Ratio Perm	0.01		0.13	c0.36		0.00			0.05			0.00
v/c Ratio	0.02	0.49	0.25	0.61	0.46	0.00	0.78	0.76	0.24		0.19	0.01
Uniform Delay, d1	13.7	18.7	16.0	11.4	13.5	9.8	47.7	47.6	42.6		58.7	58.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.0	0.9	0.7	3.0	0.7	0.0	11.1	10.3	0.4		1.7	0.1
Delay (s)	13.7	19.6	16.7	14.4	14.3	9.8	58.9	57.9	43.0		60.3	58.4
Level of Service	B	B	B	B	B	A	E	E	D		E	E
Approach Delay (s)		18.7			14.3			52.5			59.3	
Approach LOS		B			B			D			E	

Intersection Summary			
HCM 2000 Control Delay	25.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	124.2	Sum of lost time (s)	22.0
Intersection Capacity Utilization	68.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↱			✣		↰	↱	
Traffic Volume (vph)	20	759	26	37	745	20	26	2	58	42	2	24
Future Volume (vph)	20	759	26	37	745	20	26	2	58	42	2	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.5	5.0			5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00			0.91		1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.99		0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1770	1855			1667		1770	1603	
Flt Permitted	0.29	1.00	1.00	0.28	1.00			0.89		0.54	1.00	
Satd. Flow (perm)	532	1863	1583	524	1855			1504		1002	1603	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	825	28	40	810	22	28	2	63	46	2	26
RTOR Reduction (vph)	0	0	6	0	0	0	0	58	0	0	24	0
Lane Group Flow (vph)	22	825	22	40	832	0	0	35	0	46	4	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6		6	2			4			8		
Actuated Green, G (s)	103.5	99.9	99.9	105.6	100.7			10.2		10.2	10.2	
Effective Green, g (s)	103.5	99.9	99.9	105.6	100.7			10.2		10.2	10.2	
Actuated g/C Ratio	0.80	0.77	0.77	0.82	0.78			0.08		0.08	0.08	
Clearance Time (s)	5.0	5.0	5.0	4.5	5.0			5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	459	1437	1221	474	1442			118		78	126	
v/s Ratio Prot	0.00	0.44		c0.00	c0.45						0.00	
v/s Ratio Perm	0.04		0.01	0.07				0.02		c0.05		
v/c Ratio	0.05	0.57	0.02	0.08	0.58			0.30		0.59	0.03	
Uniform Delay, d1	4.1	6.1	3.4	4.0	5.8			56.3		57.6	55.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.0	0.6	0.0	0.1	1.7			1.4		10.9	0.1	
Delay (s)	4.1	6.6	3.4	4.1	7.5			57.7		68.5	55.2	
Level of Service	A	A	A	A	A			E		E	E	
Approach Delay (s)		6.5			7.3			57.7			63.5	
Approach LOS		A			A			E			E	

Intersection Summary			
HCM 2000 Control Delay	11.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	129.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	60.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

2: Symphony Lane/Silver Way & Waugh Chapel Road

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↱			↰	↱		↰	↱
Traffic Volume (vph)	9	852	3	30	796	13	2	0	34	5	0	7
Future Volume (vph)	9	852	3	30	796	13	2	0	34	5	0	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00		0.95	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1858			1770	1583		1770	1583
Flt Permitted	0.34	1.00	1.00	0.25	1.00			1.00	1.00		1.00	1.00
Satd. Flow (perm)	629	1863	1583	463	1858			1863	1583		1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	926	3	33	865	14	2	0	37	5	0	8
RTOR Reduction (vph)	0	0	1	0	0	0	0	0	35	0	0	8
Lane Group Flow (vph)	10	926	2	33	879	0	0	2	2	0	5	0
Turn Type	Perm	NA	Perm	pm+pt	NA		Perm	NA	pm+ov	Perm	NA	Perm
Protected Phases		6		5	2			8	5		4	
Permitted Phases	6		6	2			8		8	4		4
Actuated Green, G (s)	97.7	97.7	97.7	107.3	107.3			2.7	7.3		2.7	2.7
Effective Green, g (s)	97.7	97.7	97.7	107.3	107.3			2.7	7.3		2.7	2.7
Actuated g/C Ratio	0.81	0.81	0.81	0.89	0.89			0.02	0.06		0.02	0.02
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	512	1516	1288	464	1661			41	162		41	35
v/s Ratio Prot		c0.50		0.00	c0.47				0.00			
v/s Ratio Perm	0.02		0.00	0.06				0.00	0.00		c0.00	0.00
v/c Ratio	0.02	0.61	0.00	0.07	0.53			0.05	0.01		0.12	0.01
Uniform Delay, d1	2.1	4.1	2.1	3.1	1.3			57.4	53.0		57.5	57.3
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.1	1.8	0.0	0.1	1.2			0.5	0.0		1.3	0.1
Delay (s)	2.2	6.0	2.1	3.2	2.5			57.9	53.0		58.8	57.4
Level of Service	A	A	A	A	A			E	D		E	E
Approach Delay (s)		5.9			2.5			53.3			57.9	
Approach LOS		A			A			D			E	

Intersection Summary			
HCM 2000 Control Delay	5.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	64.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
3: Macmullen Drive/Silver Way & Waugh Chapel Road

2040 No Build
03/11/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			↰	↱		✥			✥	
Traffic Volume (veh/h)	2	889	0	9	824	15	0	0	4	13	0	7
Future Volume (Veh/h)	2	889	0	9	824	15	0	0	4	13	0	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	966	0	10	896	16	0	0	4	14	0	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		1189										
pX, platoon unblocked				0.71			0.71	0.71	0.71	0.71	0.71	
vC, conflicting volume	912			966			1894	1902	966	1890	1886	896
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	912			745			2057	2068	745	2051	2046	896
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			98			100	100	99	50	100	98
cM capacity (veh/h)	747			610			28	38	293	28	39	339

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	2	966	906	16	4	22
Volume Left	2	0	10	0	0	14
Volume Right	0	0	0	16	4	8
cSH	747	1700	610	1700	293	42
Volume to Capacity	0.00	0.57	0.02	0.01	0.01	0.52
Queue Length 95th (ft)	0	0	1	0	1	47
Control Delay (s)	9.8	0.0	0.5	0.0	17.5	159.8
Lane LOS	A		A		C	F
Approach Delay (s)	0.0		0.5		17.5	159.8
Approach LOS					C	F

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	65.0%	ICU Level of Service	C
Analysis Period (min)	15		

4: Summerfield Rd/Driveway & Waugh Chapel Rd

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰	↱		✣			✣	
Traffic Volume (veh/h)	2	853	108	8	912	5	30	0	30	2	0	3
Future Volume (Veh/h)	2	853	108	8	912	5	30	0	30	2	0	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	927	117	9	991	5	33	0	33	2	0	3
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	996			1044			1943	1945	927	1973	2057	991
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	996			1044			1943	1945	927	1973	2057	991
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			31	100	90	95	100	99
cM capacity (veh/h)	695			666			48	64	325	41	54	299

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	929	117	1000	5	66	5
Volume Left	2	0	9	0	33	2
Volume Right	0	117	0	5	33	3
cSH	695	1700	666	1700	83	86
Volume to Capacity	0.00	0.07	0.01	0.00	0.79	0.06
Queue Length 95th (ft)	0	0	1	0	100	5
Control Delay (s)	0.1	0.0	0.4	0.0	133.5	49.6
Lane LOS	A		A		F	E
Approach Delay (s)	0.1		0.4		133.5	49.6
Approach LOS					F	E

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	68.5%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰	↰↑	↱		↰↑	↱
Traffic Volume (vph)	10	536	362	278	463	4	456	8	419	14	9	5
Future Volume (vph)	10	536	362	278	463	4	456	8	419	14	9	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.95	0.95	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.95	1.00		0.97	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1681	1688	1583		1808	1583
Flt Permitted	0.47	1.00	1.00	0.36	1.00	1.00	0.95	0.95	1.00		0.97	1.00
Satd. Flow (perm)	870	3539	1583	665	3539	1583	1681	1688	1583		1808	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	583	393	302	503	4	496	9	455	15	10	5
RTOR Reduction (vph)	0	0	189	0	0	2	0	0	303	0	0	5
Lane Group Flow (vph)	11	583	204	302	503	2	253	252	152	0	25	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases	6		6	2		2			4			3
Actuated Green, G (s)	66.1	64.6	64.6	79.7	72.2	72.2	24.3	24.3	24.3		4.6	4.6
Effective Green, g (s)	66.1	64.6	64.6	79.7	72.2	72.2	24.3	24.3	24.3		4.6	4.6
Actuated g/C Ratio	0.53	0.52	0.52	0.64	0.58	0.58	0.20	0.20	0.20		0.04	0.04
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	472	1834	820	506	2050	917	327	329	308		66	58
v/s Ratio Prot	0.00	0.16		c0.04	0.14		c0.15	0.15			c0.01	
v/s Ratio Perm	0.01		0.13	c0.34		0.00			0.10			0.00
v/c Ratio	0.02	0.32	0.25	0.60	0.25	0.00	0.77	0.77	0.49		0.38	0.00
Uniform Delay, d1	13.8	17.3	16.6	10.8	12.8	11.0	47.5	47.5	44.7		58.6	57.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.0	0.5	0.7	1.9	0.3	0.0	10.9	10.2	1.3		3.6	0.0
Delay (s)	13.8	17.8	17.3	12.7	13.1	11.0	58.4	57.6	45.9		62.2	57.8
Level of Service	B	B	B	B	B	B	E	E	D		E	E
Approach Delay (s)		17.5			13.0			52.3			61.5	
Approach LOS		B			B			D			E	

Intersection Summary			
HCM 2000 Control Delay	28.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	124.6	Sum of lost time (s)	22.0
Intersection Capacity Utilization	65.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Intersection: 1: Maytime Drive & Waugh Chapel Rd

Movement	EB	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	T	R	L	TR	LTR	L	TR
Maximum Queue (ft)	194	726	185	59	199	186	81	75
Average Queue (ft)	62	648	100	17	83	77	26	24
95th Queue (ft)	203	885	249	48	176	142	63	58
Link Distance (ft)		666			1254	812		690
Upstream Blk Time (%)		81						
Queuing Penalty (veh)		0						
Storage Bay Dist (ft)	170		160	180			100	
Storage Blk Time (%)	0	76	0		1		0	1
Queuing Penalty (veh)	0	68	1		0		0	0

Intersection: 2: Symphony Lane/Silver Way & Waugh Chapel Road

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	LT	R	LT	R
Maximum Queue (ft)	61	1269	265	212	462	188	197	44	45
Average Queue (ft)	3	1250	204	119	239	89	88	12	10
95th Queue (ft)	35	1325	368	191	396	158	160	35	33
Link Distance (ft)		1254			1110	785		468	
Upstream Blk Time (%)		24							
Queuing Penalty (veh)		207							
Storage Bay Dist (ft)	160		240	930			200		135
Storage Blk Time (%)		68	0			0	0		
Queuing Penalty (veh)		137	1			0	1		

Intersection: 3: Macmullen Drive/Silver Way & Waugh Chapel Road

Movement	EB	WB	NB	SB
Directions Served	L	LT	LTR	LTR
Maximum Queue (ft)	16	300	35	41
Average Queue (ft)	1	15	8	11
95th Queue (ft)	6	127	29	33
Link Distance (ft)		952	302	692
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	160			
Storage Blk Time (%)		1		
Queuing Penalty (veh)		0		

Intersection: 4: Summerfield Rd/Driveway & Waugh Chapel Rd

Movement	WB	B20	NB	SB
Directions Served	LT	T	LTR	LTR
Maximum Queue (ft)	144	183	201	23
Average Queue (ft)	18	6	55	2
95th Queue (ft)	120	101	141	11
Link Distance (ft)	750	472	982	404
Upstream Blk Time (%)		0		
Queuing Penalty (veh)		0		
Storage Bay Dist (ft)				
Storage Blk Time (%)	0			
Queuing Penalty (veh)	0			

Intersection: 5: New Market Lane/Wigeon Way & Waugh Chapel Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	LT	R	LT
Maximum Queue (ft)	26	163	160	80	181	375	289	9	182	166	74	46
Average Queue (ft)	2	71	74	31	38	158	85	0	94	20	38	18
95th Queue (ft)	13	138	149	66	98	288	239	5	163	92	58	42
Link Distance (ft)		472				772	772	772	420	420	420	308
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	185		320	320	215							
Storage Blk Time (%)		0				3						
Queuing Penalty (veh)		0				2						

Network Summary

Network wide Queuing Penalty: 418

Intersection: 1: Maytime Drive & Waugh Chapel Rd

Movement	EB	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	T	R	L	TR	LTR	L	TR
Maximum Queue (ft)	106	540	183	109	447	104	84	51
Average Queue (ft)	28	199	20	31	158	43	27	15
95th Queue (ft)	82	427	100	76	328	87	70	41
Link Distance (ft)		666			1254	812		690
Upstream Blk Time (%)		0						
Queuing Penalty (veh)		0						
Storage Bay Dist (ft)	170		160	180			100	
Storage Blk Time (%)		7	0		4		0	
Queuing Penalty (veh)		7	0		2		0	

Intersection: 2: Symphony Lane/Silver Way & Waugh Chapel Road

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	LT	R	LT	R
Maximum Queue (ft)	185	621	265	188	408	112	131	73	38
Average Queue (ft)	24	386	32	82	163	32	54	21	11
95th Queue (ft)	94	625	161	157	343	77	104	57	37
Link Distance (ft)		1254			1110	785		468	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	160		240	930			200		135
Storage Blk Time (%)		18	0						
Queuing Penalty (veh)		11	0						

Intersection: 3: Macmullen Drive/Silver Way & Waugh Chapel Road

Movement	EB	WB	WB	NB	SB
Directions Served	L	LT	R	LTR	LTR
Maximum Queue (ft)	31	512	6	34	72
Average Queue (ft)	4	39	0	5	19
95th Queue (ft)	21	273	3	23	58
Link Distance (ft)		952		302	692
Upstream Blk Time (%)		0			
Queuing Penalty (veh)		1			
Storage Bay Dist (ft)	160		160		
Storage Blk Time (%)		2			
Queuing Penalty (veh)		0			

Intersection: 4: Summerfield Rd/Driveway & Waugh Chapel Rd

Movement	EB	WB	B20	B20	NB	SB
Directions Served	R	LT	T		LTR	LTR
Maximum Queue (ft)	14	822	438	328	438	132
Average Queue (ft)	0	203	58	21	233	61
95th Queue (ft)	5	650	313	186	442	165
Link Distance (ft)		750	472	472	982	404
Upstream Blk Time (%)		1	1	0		
Queuing Penalty (veh)		20	8	2		
Storage Bay Dist (ft)	230					
Storage Blk Time (%)		5				
Queuing Penalty (veh)		0				

Intersection: 5: New Market Lane/Wigeon Way & Waugh Chapel Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	LT	R	LT
Maximum Queue (ft)	26	272	266	122	239	406	347	14	346	282	129	31
Average Queue (ft)	2	144	151	51	88	188	117	1	247	191	64	6
95th Queue (ft)	14	239	241	94	177	321	270	6	343	294	105	24
Link Distance (ft)		472				772	772	772	420	420	420	308
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	185		320	320	215							
Storage Blk Time (%)		3				5						
Queuing Penalty (veh)		27				9						

Intersection: 5: New Market Lane/Wigeon Way & Waugh Chapel Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	20
Average Queue (ft)	5
95th Queue (ft)	19
Link Distance (ft)	308
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 87

Intersection: 1: Maytime Drive & Waugh Chapel Rd

Movement	EB	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	T	R	L	TR	LTR	L	TR
Maximum Queue (ft)	37	219	26	45	251	121	92	57
Average Queue (ft)	10	90	2	20	80	45	37	21
95th Queue (ft)	33	182	15	47	203	93	78	50
Link Distance (ft)		666			1254	812		690
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	170		160	180			100	
Storage Blk Time (%)		1			1		0	
Queuing Penalty (veh)		0			0		0	

Intersection: 2: Symphony Lane/Silver Way & Waugh Chapel Road

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	L	TR	LT	R	LT	R
Maximum Queue (ft)	29	170	50	137	28	70	30	31
Average Queue (ft)	3	20	13	12	1	19	5	5
95th Queue (ft)	18	90	38	64	11	49	23	24
Link Distance (ft)		1254		1110	785		468	
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	160		930			200		135
Storage Blk Time (%)		0						
Queuing Penalty (veh)		0						

Intersection: 3: Macmullen Drive/Silver Way & Waugh Chapel Road

Movement	EB	WB	NB	SB
Directions Served	L	LT	LTR	LTR
Maximum Queue (ft)	8	207	27	44
Average Queue (ft)	1	15	3	11
95th Queue (ft)	8	94	16	33
Link Distance (ft)		952	302	692
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	160			
Storage Blk Time (%)		0		
Queuing Penalty (veh)		0		

Intersection: 4: Summerfield Rd/Driveway & Waugh Chapel Rd

Movement	EB	WB	B20	NB	SB
Directions Served	LT	LT	T	LTR	LTR
Maximum Queue (ft)	48	79	336	100	23
Average Queue (ft)	2	5	22	33	4
95th Queue (ft)	24	38	192	70	18
Link Distance (ft)	1422	750	472	982	404
Upstream Blk Time (%)			0		
Queuing Penalty (veh)			1		
Storage Bay Dist (ft)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 5: New Market Lane/Wigeon Way & Waugh Chapel Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	SB
Directions Served	L	T	T	R	L	T	T	R	L	LT	R	LT
Maximum Queue (ft)	34	233	217	136	217	282	185	16	418	352	173	59
Average Queue (ft)	6	109	115	60	119	120	39	1	259	205	85	18
95th Queue (ft)	25	180	190	105	207	214	127	5	394	329	145	45
Link Distance (ft)		472				772	772	772	420	420	420	308
Upstream Blk Time (%)									1	0		
Queuing Penalty (veh)									0	0		
Storage Bay Dist (ft)	185		320	320	215							
Storage Blk Time (%)		1			1	0						
Queuing Penalty (veh)		4			2	1						

Intersection: 5: New Market Lane/Wigeon Way & Waugh Chapel Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	20
Average Queue (ft)	4
95th Queue (ft)	17
Link Distance (ft)	308
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 9

Appendix B-3

EXISTING HCS REPORTS

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Phone:                                  Fax:
E-Mail:

_________________Directional Two-Lane Highway Segment Analysis________________

Analyst                 Kimley-Horn
Agency/Co.
Date Performed          1/16/2018
Analysis Time Period    AM Peak
Highway                 Waugh Chapel Road
From/To                 Maytime Dr to Symphony Ln
Jurisdiction            Anne Arundel County
Analysis Year           2017
Description  AM Peak Eastbound Analysis

__________________________________Input Data__________________________________

Highway class  Class 3              Peak hour factor, PHF    0.78
Shoulder width       7.0     ft     % Trucks and buses       1       %
Lane width           12.0    ft     % Trucks crawling        0.0     %
Segment length       0.2     mi     Truck crawl speed        0.0     mi/hr
Terrain type         Level          % Recreational vehicles  0       %
Grade:  Length       -       mi     % No-passing zones       100     %
        Up/down      -       %      Access point density     0       /mi

Analysis direction volume, Vd  680     veh/h
Opposing direction volume, Vo  656     veh/h

____________________________Average Travel Speed______________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.1*                1.1*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adj. factor,(note-5) fHV    0.999               0.999
Grade adj. factor,(note-1) fg             1.00                1.00
Directional flow rate,(note-2) vi         873     pc/h        842     pc/h

Free-Flow Speed from Field Measurement:
Field measured speed,(note-3) S FM             48      mi/h
Observed total demand,(note-3) V               100     veh/h
Estimated Free-Flow Speed:
Base free-flow speed,(note-3) BFFS              -      mi/h
Adj. for lane and shoulder width,(note-3) fLS   -      mi/h
Adj. for access point density,(note-3) fA       -      mi/h

Free-flow speed, FFSd                          48.8    mi/h

Adjustment for no-passing zones, fnp           1.2     mi/h
Average travel speed, ATSd                     34.2    mi/h
Percent Free Flow Speed, PFFS                  70.2    %
```

```
_________________________Percent Time-Spent-Following_________________________

Direction                             Analysis(d)        Opposing (o)
PCE for trucks, ET                        1.0                 1.0
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adjustment factor, fHV      1.000               1.000
Grade adjustment factor,(note-1) fg       1.00                1.00
Directional flow rate,(note-2) vi         872    pc/h         841     pc/h
Base percent time-spent-following,(note-4) BPTSFd  72.4   %
Adjustment for no-passing zones, fnp               23.4
Percent time-spent-following, PTSFd                84.3   %

________________Level of Service and Other Performance Measures_______________

Level of service, LOS                              D
Volume to capacity ratio, v/c                      0.53
Peak 15-min vehicle-miles of travel, VMT15         44      veh-mi
Peak-hour vehicle-miles of travel, VMT60           136     veh-mi
Peak 15-min total travel time, TT15                1.3     veh-h
Capacity from ATS, CdATS                           1700    veh/h
Capacity from PTSF, CdPTSF                         1700    veh/h
Directional Capacity                               1700    veh/h

_____________________________Passing Lane Analysis____________________________

Total length of analysis segment, Lt                         0.2     mi
Length of two-lane highway upstream of the passing lane, Lu  -       mi
Length of passing lane including tapers, Lpl                 -       mi
Average travel speed, ATSd (from above)                      34.2    mi/h
Percent time-spent-following, PTSFd (from above)             84.3
Level of service, LOSd (from above)                          D

___________________Average Travel Speed  with Passing Lane____________________

Downstream length of two-lane highway within effective
    length of passing lane for average travel speed, Lde     -       mi
Length of two-lane highway downstream of effective
    length of the passing lane for average travel speed, Ld  -       mi
Adj. factor for the effect of passing lane
    on average speed, fpl                                    -
Average travel speed including passing lane, ATSpl           -
Percent free flow speed including passing lane, PFFSpl       0.0     %

________________Percent Time-Spent-Following with Passing Lane________________

Downstream length of two-lane highway within effective length
    of passing lane for percent time-spent-following, Lde    -       mi
Length of two-lane highway downstream of effective length of
    the passing lane for percent time-spent-following, Ld    -       mi
Adj. factor for the effect of passing lane
    on percent time-spent-following, fpl                     -
Percent time-spent-following
    including passing lane, PTSFpl                           -       %

______Level of Service and Other Performance Measures with Passing Lane ______

Level of service including passing lane, LOSpl     E
Peak 15-min total travel time, TT15                -       veh-h

__________________________ Bicycle Level of Service __________________________
```

```
Posted speed limit, Sp                                         35
Percent of segment with occupied on-highway parking            0
Pavement rating, P                                             3
Flow rate in outside lane, vOL                                 871.8
Effective width of outside lane, We                            26.00
Effective speed factor, St                                     3.84
Bicycle LOS Score, BLOS                                        2.53
Bicycle LOS                                                    C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain
   is one of the base conditions. For the purpose of grade adjustment, specific
   dewngrade segments are treated as level terrain.
2. If vi (vd or vo ) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a
   specific downgrade.

* These items have been entered or edited to override calculated value
```

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                      HCS7: Two-Lane Highways Release 7.2





Phone:                                  Fax:
E-Mail:

_________________Directional Two-Lane Highway Segment Analysis________________

Analyst                 Kimley-Horn
Agency/Co.
Date Performed          1/16/2018
Analysis Time Period    PM Peak
Highway                 Waugh Chapel Road
From/To                 Maytime Dr to Symphony Ln
Jurisdiction            Anne Arundel County
Analysis Year           2017
Description  PM Peak Eastbound Analysis

__________________________________Input Data__________________________________

Highway class  Class 3              Peak hour factor, PHF    0.93
Shoulder width       7.0     ft     % Trucks and buses       1       %
Lane width           12.0    ft     % Trucks crawling        0.0     %
Segment length       0.2     mi     Truck crawl speed        0.0     mi/hr
Terrain type         Level          % Recreational vehicles  0       %
Grade:  Length       -       mi     % No-passing zones       100     %
        Up/down      -       %      Access point density     0       /mi

Analysis direction volume, Vd  884     veh/h
Opposing direction volume, Vo  975     veh/h

____________________________Average Travel Speed______________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.0*                1.0*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adj. factor,(note-5) fHV    1.000               1.000
Grade adj. factor,(note-1) fg             1.00                1.00
Directional flow rate,(note-2) vi         951     pc/h        1048    pc/h

Free-Flow Speed from Field Measurement:
Field measured speed,(note-3) S FM             48      mi/h
Observed total demand,(note-3) V               100     veh/h
Estimated Free-Flow Speed:
Base free-flow speed,(note-3) BFFS              -      mi/h
Adj. for lane and shoulder width,(note-3) fLS   -      mi/h
Adj. for access point density,(note-3) fA       -      mi/h

Free-flow speed, FFSd                          48.8    mi/h

Adjustment for no-passing zones, fnp           1.1     mi/h
Average travel speed, ATSd                     32.2    mi/h
Percent Free Flow Speed, PFFS                  66.0    %
```

```
_________________________Percent Time-Spent-Following_________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.0                 1.0
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adjustment factor, fHV      1.000               1.000
Grade adjustment factor,(note-1) fg       1.00                1.00
Directional flow rate,(note-2) vi         951    pc/h         1048    pc/h
Base percent time-spent-following,(note-4) BPTSFd  76.8   %
Adjustment for no-passing zones, fnp               18.4
Percent time-spent-following, PTSFd                85.6   %

________________Level of Service and Other Performance Measures_______________

Level of service, LOS                              E
Volume to capacity ratio, v/c                      0.56
Peak 15-min vehicle-miles of travel, VMT15         48      veh-mi
Peak-hour vehicle-miles of travel, VMT60           177     veh-mi
Peak 15-min total travel time, TT15                1.5     veh-h
Capacity from ATS, CdATS                           1700    veh/h
Capacity from PTSF, CdPTSF                         1700    veh/h
Directional Capacity                               1700    veh/h

_____________________________Passing Lane Analysis____________________________

Total length of analysis segment, Lt                         0.2     mi
Length of two-lane highway upstream of the passing lane, Lu  -       mi
Length of passing lane including tapers, Lpl                 -       mi
Average travel speed, ATSd (from above)                      32.2    mi/h
Percent time-spent-following, PTSFd (from above)             85.6
Level of service, LOSd (from above)                          E

___________________Average Travel Speed  with Passing Lane____________________

Downstream length of two-lane highway within effective
    length of passing lane for average travel speed, Lde     -       mi
Length of two-lane highway downstream of effective
    length of the passing lane for average travel speed, Ld  -       mi
Adj. factor for the effect of passing lane
    on average speed, fpl                                    -
Average travel speed including passing lane, ATSpl           -
Percent free flow speed including passing lane, PFFSpl       0.0     %

________________Percent Time-Spent-Following with Passing Lane________________

Downstream length of two-lane highway within effective length
    of passing lane for percent time-spent-following, Lde    -       mi
Length of two-lane highway downstream of effective length of
    the passing lane for percent time-spent-following, Ld    -       mi
Adj. factor for the effect of passing lane
    on percent time-spent-following, fpl                     -
Percent time-spent-following
    including passing lane, PTSFpl                           -       %

______Level of Service and Other Performance Measures with Passing Lane ______

Level of service including passing lane, LOSpl     E
Peak 15-min total travel time, TT15                -       veh-h

__________________________ Bicycle Level of Service __________________________
```

```
Posted speed limit, Sp                                    35
Percent of segment with occupied on-highway parking       0
Pavement rating, P                                        3
Flow rate in outside lane, vOL                            950.5
Effective width of outside lane, We                       26.00
Effective speed factor, St                                3.84
Bicycle LOS Score, BLOS                                   2.58
Bicycle LOS                                               C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain
   is one of the base conditions. For the purpose of grade adjustment, specific
   dewngrade segments are treated as level terrain.
2. If vi (vd or vo ) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a
   specific downgrade.

* These items have been entered or edited to override calculated value
```

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Phone:                                  Fax:
E-Mail:

_________________Directional Two-Lane Highway Segment Analysis________________

Analyst                 Kimley-Horn
Agency/Co.
Date Performed          1/16/2018
Analysis Time Period    AM Peak
Highway                 Waugh Chapel Road
From/To                 Maytime Dr to Symphony Ln
Jurisdiction            Anne Arundel County
Analysis Year           2017
Description  AM Peak Westbound Analysis

__________________________________Input Data__________________________________

Highway class  Class 3              Peak hour factor, PHF    0.87
Shoulder width       7.0     ft     % Trucks and buses       1       %
Lane width           12.0    ft     % Trucks crawling        0.0     %
Segment length       0.2     mi     Truck crawl speed        0.0     mi/hr
Terrain type         Level          % Recreational vehicles  0       %
Grade:  Length       -       mi     % No-passing zones       100     %
        Up/down      -       %      Access point density     0       /mi

Analysis direction volume, Vd  656     veh/h
Opposing direction volume, Vo  680     veh/h

____________________________Average Travel Speed______________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.1*                1.1*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adj. factor,(note-5) fHV    0.999               0.999
Grade adj. factor,(note-1) fg             1.00                1.00
Directional flow rate,(note-2) vi         755     pc/h        782     pc/h

Free-Flow Speed from Field Measurement:
Field measured speed,(note-3) S FM             45      mi/h
Observed total demand,(note-3) V               100     veh/h
Estimated Free-Flow Speed:
Base free-flow speed,(note-3) BFFS              -      mi/h
Adj. for lane and shoulder width,(note-3) fLS   -      mi/h
Adj. for access point density,(note-3) fA       -      mi/h

Free-flow speed, FFSd                          45.8    mi/h

Adjustment for no-passing zones, fnp           1.3     mi/h
Average travel speed, ATSd                     32.6    mi/h
Percent Free Flow Speed, PFFS                  71.2    %
```

```
_________________________Percent Time-Spent-Following_________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.0                 1.0
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adjustment factor, fHV      1.000               1.000
Grade adjustment factor,(note-1) fg       1.00                1.00
Directional flow rate,(note-2) vi         754    pc/h         782     pc/h
Base percent time-spent-following,(note-4) BPTSFd  67.3   %
Adjustment for no-passing zones, fnp               26.3
Percent time-spent-following, PTSFd                80.2   %

________________Level of Service and Other Performance Measures_______________

Level of service, LOS                              D
Volume to capacity ratio, v/c                      0.53
Peak 15-min vehicle-miles of travel, VMT15         38      veh-mi
Peak-hour vehicle-miles of travel, VMT60           131     veh-mi
Peak 15-min total travel time, TT15                1.2     veh-h
Capacity from ATS, CdATS                           1700    veh/h
Capacity from PTSF, CdPTSF                         1700    veh/h
Directional Capacity                               1700    veh/h

_____________________________Passing Lane Analysis____________________________

Total length of analysis segment, Lt                         0.2     mi
Length of two-lane highway upstream of the passing lane, Lu  -       mi
Length of passing lane including tapers, Lpl                 -       mi
Average travel speed, ATSd (from above)                      32.6    mi/h
Percent time-spent-following, PTSFd (from above)             80.2
Level of service, LOSd (from above)                          D

___________________Average Travel Speed  with Passing Lane____________________

Downstream length of two-lane highway within effective
    length of passing lane for average travel speed, Lde     -       mi
Length of two-lane highway downstream of effective
    length of the passing lane for average travel speed, Ld  -       mi
Adj. factor for the effect of passing lane
    on average speed, fpl                                    -
Average travel speed including passing lane, ATSpl          -
Percent free flow speed including passing lane, PFFSpl      0.0     %

________________Percent Time-Spent-Following with Passing Lane________________

Downstream length of two-lane highway within effective length
    of passing lane for percent time-spent-following, Lde    -       mi
Length of two-lane highway downstream of effective length of
    the passing lane for percent time-spent-following, Ld    -       mi
Adj. factor for the effect of passing lane
    on percent time-spent-following, fpl                     -
Percent time-spent-following
    including passing lane, PTSFpl                           -       %

______Level of Service and Other Performance Measures with Passing Lane ______

Level of service including passing lane, LOSpl     E
Peak 15-min total travel time, TT15                -       veh-h

__________________________ Bicycle Level of Service __________________________
```

```
Posted speed limit, Sp                                    35
Percent of segment with occupied on-highway parking       0
Pavement rating, P                                        3
Flow rate in outside lane, vOL                            754.0
Effective width of outside lane, We                       26.00
Effective speed factor, St                                3.84
Bicycle LOS Score, BLOS                                   2.46
Bicycle LOS                                               B

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain
   is one of the base conditions. For the purpose of grade adjustment, specific
   dewngrade segments are treated as level terrain.
2. If vi (vd or vo ) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a
   specific downgrade.

* These items have been entered or edited to override calculated value
```

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                        HCS7: Two-Lane Highways Release 7.2



Phone:                                  Fax:
E-Mail:

_________________Directional Two-Lane Highway Segment Analysis________________

Analyst                 Kimley-Horn
Agency/Co.
Date Performed          1/16/2018
Analysis Time Period    PM Peak
Highway                 Waugh Chapel Road
From/To                 Maytime Dr to Symphony Ln
Jurisdiction            Anne Arundel County
Analysis Year           2017
Description  PM Peak Westbound Analysis

__________________________________Input Data__________________________________

Highway class  Class 3             Peak hour factor, PHF    0.95
Shoulder width       7.0     ft     % Trucks and buses       1       %
Lane width           12.0    ft     % Trucks crawling        0.0     %
Segment length       0.2     mi     Truck crawl speed        0.0     mi/hr
Terrain type         Level          % Recreational vehicles  0       %
Grade:  Length       -       mi     % No-passing zones       100     %
        Up/down      -       %      Access point density     0       /mi

Analysis direction volume, Vd  975     veh/h
Opposing direction volume, Vo  884     veh/h

____________________________Average Travel Speed______________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.0*                1.0*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adj. factor,(note-5) fHV    1.000               1.000
Grade adj. factor,(note-1) fg             1.00                1.00
Directional flow rate,(note-2) vi         1026    pc/h        931     pc/h

Free-Flow Speed from Field Measurement:
Field measured speed,(note-3) S FM             45      mi/h
Observed total demand,(note-3) V               100     veh/h
Estimated Free-Flow Speed:
Base free-flow speed,(note-3) BFFS              -      mi/h
Adj. for lane and shoulder width,(note-3) fLS   -      mi/h
Adj. for access point density,(note-3) fA       -      mi/h

Free-flow speed, FFSd                          45.8    mi/h

Adjustment for no-passing zones, fnp           1.1     mi/h
Average travel speed, ATSd                     29.4    mi/h
Percent Free Flow Speed, PFFS                  64.3    %
```

```
_________________________Percent Time-Spent-Following_________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.0                 1.0
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adjustment factor, fHV      1.000               1.000
Grade adjustment factor,(note-1) fg       1.00                1.00
Directional flow rate,(note-2) vi         1026   pc/h         931     pc/h
Base percent time-spent-following,(note-4) BPTSFd  78.0   %
Adjustment for no-passing zones, fnp               19.1
Percent time-spent-following, PTSFd                88.0   %

________________Level of Service and Other Performance Measures_______________

Level of service, LOS                              E
Volume to capacity ratio, v/c                      0.60
Peak 15-min vehicle-miles of travel, VMT15         51      veh-mi
Peak-hour vehicle-miles of travel, VMT60           195     veh-mi
Peak 15-min total travel time, TT15                1.7     veh-h
Capacity from ATS, CdATS                           1700    veh/h
Capacity from PTSF, CdPTSF                         1700    veh/h
Directional Capacity                               1700    veh/h

_____________________________Passing Lane Analysis____________________________

Total length of analysis segment, Lt                         0.2     mi
Length of two-lane highway upstream of the passing lane, Lu  -       mi
Length of passing lane including tapers, Lpl                 -       mi
Average travel speed, ATSd (from above)                      29.4    mi/h
Percent time-spent-following, PTSFd (from above)             88.0
Level of service, LOSd (from above)                          E

___________________Average Travel Speed  with Passing Lane____________________

Downstream length of two-lane highway within effective
    length of passing lane for average travel speed, Lde     -       mi
Length of two-lane highway downstream of effective
    length of the passing lane for average travel speed, Ld  -       mi
Adj. factor for the effect of passing lane
    on average speed, fpl                                    -
Average travel speed including passing lane, ATSpl           -
Percent free flow speed including passing lane, PFFSpl       0.0     %

________________Percent Time-Spent-Following with Passing Lane________________

Downstream length of two-lane highway within effective length
    of passing lane for percent time-spent-following, Lde    -       mi
Length of two-lane highway downstream of effective length of
    the passing lane for percent time-spent-following, Ld    -       mi
Adj. factor for the effect of passing lane
    on percent time-spent-following, fpl                     -
Percent time-spent-following
    including passing lane, PTSFpl                           -       %

______Level of Service and Other Performance Measures with Passing Lane ______

Level of service including passing lane, LOSpl     E
Peak 15-min total travel time, TT15                -       veh-h

__________________________ Bicycle Level of Service __________________________
```

```
Posted speed limit, Sp                                    35
Percent of segment with occupied on-highway parking       0
Pavement rating, P                                        3
Flow rate in outside lane, vOL                            1026.3
Effective width of outside lane, We                       26.00
Effective speed factor, St                                3.84
Bicycle LOS Score, BLOS                                   2.62
Bicycle LOS                                               C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain
   is one of the base conditions. For the purpose of grade adjustment, specific
   dewngrade segments are treated as level terrain.
2. If vi (vd or vo ) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a
   specific downgrade.

* These items have been entered or edited to override calculated value
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                      HCS7: Two-Lane Highways Release 7.2




Phone:                                  Fax:
E-Mail:

_________________Directional Two-Lane Highway Segment Analysis________________

Analyst                 Kimley-Horn
Agency/Co.
Date Performed          3/08/2018
Analysis Time Period    AM Peak
Highway                 Waugh Chapel Road
From/To                 Symphony Ln to Macmullen Drive
Jurisdiction            Anne Arundel County
Analysis Year           2017
Description  AM Peak Eastbound Analysis

__________________________________Input Data__________________________________

Highway class  Class 3              Peak hour factor, PHF    0.78
Shoulder width       4.0     ft     % Trucks and buses       1       %
Lane width           12.0    ft     % Trucks crawling        0.0     %
Segment length       0.2     mi     Truck crawl speed        0.0     mi/hr
Terrain type         Level          % Recreational vehicles  0       %
Grade:  Length       -       mi     % No-passing zones       100     %
        Up/down      -       %      Access point density     0       /mi

Analysis direction volume, Vd  801     veh/h
Opposing direction volume, Vo  716     veh/h

____________________________Average Travel Speed______________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.1*                1.1*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adj. factor,(note-5) fHV    0.999               0.999
Grade adj. factor,(note-1) fg             1.00                1.00
Directional flow rate,(note-2) vi         1028    pc/h        919     pc/h

Free-Flow Speed from Field Measurement:
Field measured speed,(note-3) S FM             42      mi/h
Observed total demand,(note-3) V               100     veh/h
Estimated Free-Flow Speed:
Base free-flow speed,(note-3) BFFS              -      mi/h
Adj. for lane and shoulder width,(note-3) fLS   -      mi/h
Adj. for access point density,(note-3) fA       -      mi/h

Free-flow speed, FFSd                          42.8    mi/h

Adjustment for no-passing zones, fnp           1.1     mi/h
Average travel speed, ATSd                     26.5    mi/h
Percent Free Flow Speed, PFFS                  62.0    %
```

```
_________________________Percent Time-Spent-Following_________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.0                 1.0
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adjustment factor, fHV      1.000               1.000
Grade adjustment factor,(note-1) fg       1.00                1.00
Directional flow rate,(note-2) vi         1027   pc/h         918     pc/h
Base percent time-spent-following,(note-4) BPTSFd  77.6   %
Adjustment for no-passing zones, fnp               19.3
Percent time-spent-following, PTSFd                87.8   %

________________Level of Service and Other Performance Measures_______________

Level of service, LOS                              E
Volume to capacity ratio, v/c                      0.60
Peak 15-min vehicle-miles of travel, VMT15         56      veh-mi
Peak-hour vehicle-miles of travel, VMT60           176     veh-mi
Peak 15-min total travel time, TT15                2.1     veh-h
Capacity from ATS, CdATS                           1700    veh/h
Capacity from PTSF, CdPTSF                         1700    veh/h
Directional Capacity                               1700    veh/h

_____________________________Passing Lane Analysis____________________________

Total length of analysis segment, Lt                         0.2     mi
Length of two-lane highway upstream of the passing lane, Lu  -       mi
Length of passing lane including tapers, Lpl                 -       mi
Average travel speed, ATSd (from above)                      26.5    mi/h
Percent time-spent-following, PTSFd (from above)             87.8
Level of service, LOSd (from above)                          E

___________________Average Travel Speed  with Passing Lane____________________

Downstream length of two-lane highway within effective
    length of passing lane for average travel speed, Lde     -       mi
Length of two-lane highway downstream of effective
    length of the passing lane for average travel speed, Ld  -       mi
Adj. factor for the effect of passing lane
    on average speed, fpl                                    -
Average travel speed including passing lane, ATSpl           -
Percent free flow speed including passing lane, PFFSpl       0.0     %

________________Percent Time-Spent-Following with Passing Lane________________

Downstream length of two-lane highway within effective length
    of passing lane for percent time-spent-following, Lde    -       mi
Length of two-lane highway downstream of effective length of
    the passing lane for percent time-spent-following, Ld    -       mi
Adj. factor for the effect of passing lane
    on percent time-spent-following, fpl                     -
Percent time-spent-following
    including passing lane, PTSFpl                           -       %

______Level of Service and Other Performance Measures with Passing Lane ______

Level of service including passing lane, LOSpl     E
Peak 15-min total travel time, TT15                -       veh-h

__________________________ Bicycle Level of Service __________________________
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```
Posted speed limit, Sp                                    35
Percent of segment with occupied on-highway parking       0
Pavement rating, P                                        3
Flow rate in outside lane, vOL                            1026.9
Effective width of outside lane, We                       16.00
Effective speed factor, St                                3.84
Bicycle LOS Score, BLOS                                   4.72
Bicycle LOS                                               E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain
   is one of the base conditions. For the purpose of grade adjustment, specific
   dewngrade segments are treated as level terrain.
2. If vi (vd or vo ) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a
   specific downgrade.

* These items have been entered or edited to override calculated value
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Phone:                                   Fax:
E-Mail:

_________________Directional Two-Lane Highway Segment Analysis________________

Analyst                 Kimley-Horn
Agency/Co.
Date Performed          3/08/2018
Analysis Time Period    PM Peak
Highway                 Waugh Chapel Road
From/To                 Symphony Ln to Macmullen Drive
Jurisdiction            Anne Arundel County
Analysis Year           2017
Description  PM Peak Eastbound Analysis

__________________________________Input Data___________________________________

Highway class  Class 3              Peak hour factor, PHF    0.95
Shoulder width       4.0     ft     % Trucks and buses       1       %
Lane width           12.0    ft     % Trucks crawling        0.0     %
Segment length       0.2     mi     Truck crawl speed        0.0     mi/hr
Terrain type         Level          % Recreational vehicles  0       %
Grade:  Length       -       mi     % No-passing zones       100     %
        Up/down      -       %      Access point density     0       /mi

Analysis direction volume, Vd  927     veh/h
Opposing direction volume, Vo  1076    veh/h

____________________________Average Travel Speed______________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.0*                1.0*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adj. factor,(note-5) fHV    1.000               1.000
Grade adj. factor,(note-1) fg             1.00                1.00
Directional flow rate,(note-2) vi         976     pc/h        1133    pc/h

Free-Flow Speed from Field Measurement:
Field measured speed,(note-3) S FM             42      mi/h
Observed total demand,(note-3) V               100     veh/h
Estimated Free-Flow Speed:
Base free-flow speed,(note-3) BFFS              -      mi/h
Adj. for lane and shoulder width,(note-3) fLS   -      mi/h
Adj. for access point density,(note-3) fA       -      mi/h

Free-flow speed, FFSd                          42.8    mi/h

Adjustment for no-passing zones, fnp           1.0     mi/h
Average travel speed, ATSd                     25.4    mi/h
Percent Free Flow Speed, PFFS                  59.3    %
```

```
_________________________Percent Time-Spent-Following_________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.0                 1.0
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adjustment factor, fHV      1.000               1.000
Grade adjustment factor,(note-1) fg       1.00                1.00
Directional flow rate,(note-2) vi         976    pc/h         1133    pc/h
Base percent time-spent-following,(note-4) BPTSFd  78.4   %
Adjustment for no-passing zones, fnp               16.8
Percent time-spent-following, PTSFd                86.2   %

________________Level of Service and Other Performance Measures_______________

Level of service, LOS                              E
Volume to capacity ratio, v/c                      0.57
Peak 15-min vehicle-miles of travel, VMT15         54      veh-mi
Peak-hour vehicle-miles of travel, VMT60           204     veh-mi
Peak 15-min total travel time, TT15                2.1     veh-h
Capacity from ATS, CdATS                           1700    veh/h
Capacity from PTSF, CdPTSF                         1700    veh/h
Directional Capacity                               1700    veh/h

_____________________________Passing Lane Analysis____________________________

Total length of analysis segment, Lt                         0.2     mi
Length of two-lane highway upstream of the passing lane, Lu  -       mi
Length of passing lane including tapers, Lpl                 -       mi
Average travel speed, ATSd (from above)                      25.4    mi/h
Percent time-spent-following, PTSFd (from above)             86.2
Level of service, LOSd (from above)                          E

___________________Average Travel Speed  with Passing Lane____________________

Downstream length of two-lane highway within effective
    length of passing lane for average travel speed, Lde     -       mi
Length of two-lane highway downstream of effective
    length of the passing lane for average travel speed, Ld  -       mi
Adj. factor for the effect of passing lane
    on average speed, fpl                                    -
Average travel speed including passing lane, ATSpl           -
Percent free flow speed including passing lane, PFFSpl       0.0     %

________________Percent Time-Spent-Following with Passing Lane________________

Downstream length of two-lane highway within effective length
    of passing lane for percent time-spent-following, Lde    -       mi
Length of two-lane highway downstream of effective length of
    the passing lane for percent time-spent-following, Ld    -       mi
Adj. factor for the effect of passing lane
    on percent time-spent-following, fpl                     -
Percent time-spent-following
    including passing lane, PTSFpl                           -       %

______Level of Service and Other Performance Measures with Passing Lane ______

Level of service including passing lane, LOSpl     E
Peak 15-min total travel time, TT15                -       veh-h

__________________________ Bicycle Level of Service __________________________
```

```
Posted speed limit, Sp                                    35
Percent of segment with occupied on-highway parking       0
Pavement rating, P                                        3
Flow rate in outside lane, vOL                            975.8
Effective width of outside lane, We                       16.00
Effective speed factor, St                                3.84
Bicycle LOS Score, BLOS                                   4.70
Bicycle LOS                                               E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain
   is one of the base conditions. For the purpose of grade adjustment, specific
   dewngrade segments are treated as level terrain.
2. If vi (vd or vo ) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a
   specific downgrade.

* These items have been entered or edited to override calculated value
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Phone:                                  Fax:
E-Mail:

_________________Directional Two-Lane Highway Segment Analysis________________

Analyst                 Kimley-Horn
Agency/Co.
Date Performed          3/08/2018
Analysis Time Period    AM Peak
Highway                 Waugh Chapel Road
From/To                 Symphony Ln to Macmullen Drive
Jurisdiction            Anne Arundel County
Analysis Year           2017
Description  AM Peak Westbound Analysis

__________________________________Input Data__________________________________

Highway class  Class 3             Peak hour factor, PHF    0.78
Shoulder width       4.0     ft    % Trucks and buses       1       %
Lane width           12.0    ft    % Trucks crawling        0.0     %
Segment length       0.2     mi    Truck crawl speed        0.0     mi/hr
Terrain type         Level         % Recreational vehicles  0       %
Grade:  Length       -       mi    % No-passing zones       100     %
        Up/down      -       %     Access point density     0       /mi

Analysis direction volume, Vd  716     veh/h
Opposing direction volume, Vo  801     veh/h

____________________________Average Travel Speed______________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.1*                1.1*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adj. factor,(note-5) fHV    0.999               0.999
Grade adj. factor,(note-1) fg             1.00                1.00
Directional flow rate,(note-2) vi         919     pc/h        1028    pc/h

Free-Flow Speed from Field Measurement:
Field measured speed,(note-3) S FM             48      mi/h
Observed total demand,(note-3) V               100     veh/h
Estimated Free-Flow Speed:
Base free-flow speed,(note-3) BFFS              -      mi/h
Adj. for lane and shoulder width,(note-3) fLS   -      mi/h
Adj. for access point density,(note-3) fA       -      mi/h

Free-flow speed, FFSd                          48.8    mi/h

Adjustment for no-passing zones, fnp           1.1     mi/h
Average travel speed, ATSd                     32.6    mi/h
Percent Free Flow Speed, PFFS                  66.8    %
```

```
_________________________Percent Time-Spent-Following_________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.0                 1.0
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adjustment factor, fHV      1.000               1.000
Grade adjustment factor,(note-1) fg       1.00                1.00
Directional flow rate,(note-2) vi         918    pc/h         1027    pc/h
Base percent time-spent-following,(note-4) BPTSFd  75.8   %
Adjustment for no-passing zones, fnp               19.3
Percent time-spent-following, PTSFd                84.9   %

________________Level of Service and Other Performance Measures_______________

Level of service, LOS                              D
Volume to capacity ratio, v/c                      0.54
Peak 15-min vehicle-miles of travel, VMT15         50      veh-mi
Peak-hour vehicle-miles of travel, VMT60           158     veh-mi
Peak 15-min total travel time, TT15                1.5     veh-h
Capacity from ATS, CdATS                           1700    veh/h
Capacity from PTSF, CdPTSF                         1700    veh/h
Directional Capacity                               1700    veh/h

_____________________________Passing Lane Analysis____________________________

Total length of analysis segment, Lt                         0.2     mi
Length of two-lane highway upstream of the passing lane, Lu  -       mi
Length of passing lane including tapers, Lpl                 -       mi
Average travel speed, ATSd (from above)                      32.6    mi/h
Percent time-spent-following, PTSFd (from above)             84.9
Level of service, LOSd (from above)                          D

___________________Average Travel Speed  with Passing Lane____________________

Downstream length of two-lane highway within effective
    length of passing lane for average travel speed, Lde     -       mi
Length of two-lane highway downstream of effective
    length of the passing lane for average travel speed, Ld  -       mi
Adj. factor for the effect of passing lane
    on average speed, fpl                                    -
Average travel speed including passing lane, ATSpl           -
Percent free flow speed including passing lane, PFFSpl       0.0     %

________________Percent Time-Spent-Following with Passing Lane________________

Downstream length of two-lane highway within effective length
    of passing lane for percent time-spent-following, Lde    -       mi
Length of two-lane highway downstream of effective length of
    the passing lane for percent time-spent-following, Ld    -       mi
Adj. factor for the effect of passing lane
    on percent time-spent-following, fpl                     -
Percent time-spent-following
    including passing lane, PTSFpl                           -       %

______Level of Service and Other Performance Measures with Passing Lane ______

Level of service including passing lane, LOSpl     E
Peak 15-min total travel time, TT15                -       veh-h

__________________________ Bicycle Level of Service __________________________
```

```
Posted speed limit, Sp                                    35
Percent of segment with occupied on-highway parking       0
Pavement rating, P                                        3
Flow rate in outside lane, vOL                            917.9
Effective width of outside lane, We                       16.00
Effective speed factor, St                                3.84
Bicycle LOS Score, BLOS                                   4.60
Bicycle LOS                                               E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain
   is one of the base conditions. For the purpose of grade adjustment, specific
   dewngrade segments are treated as level terrain.
2. If vi (vd or vo ) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a
   specific downgrade.

* These items have been entered or edited to override calculated value
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Phone:                                  Fax:
E-Mail:

_________________Directional Two-Lane Highway Segment Analysis________________

Analyst                 Kimley-Horn
Agency/Co.
Date Performed          3/08/2018
Analysis Time Period    PM Peak
Highway                 Waugh Chapel Road
From/To                 Symphony Ln to Macmullen Drive
Jurisdiction            Anne Arundel County
Analysis Year           2017
Description  PM Peak Westbound Analysis

__________________________________Input Data__________________________________

Highway class  Class 3             Peak hour factor, PHF    0.95
Shoulder width       4.0     ft    % Trucks and buses       1       %
Lane width           12.0    ft    % Trucks crawling        0.0     %
Segment length       0.2     mi    Truck crawl speed        0.0     mi/hr
Terrain type         Level         % Recreational vehicles  0       %
Grade:  Length       -       mi    % No-passing zones       100     %
        Up/down      -       %     Access point density     0       /mi

Analysis direction volume, Vd  1076    veh/h
Opposing direction volume, Vo  927     veh/h

____________________________Average Travel Speed______________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.0*                1.0*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adj. factor,(note-5) fHV    1.000               1.000
Grade adj. factor,(note-1) fg             1.00                1.00
Directional flow rate,(note-2) vi         1133    pc/h        976     pc/h

Free-Flow Speed from Field Measurement:
Field measured speed,(note-3) S FM               -      mi/h
Observed total demand,(note-3) V                100     veh/h
Estimated Free-Flow Speed:
Base free-flow speed,(note-3) BFFS               -      mi/h
Adj. for lane and shoulder width,(note-3) fLS    -      mi/h
Adj. for access point density,(note-3) fA        -      mi/h

Free-flow speed, FFSd                           45.8    mi/h

Adjustment for no-passing zones, fnp            1.1     mi/h
Average travel speed, ATSd                      28.3    mi/h
Percent Free Flow Speed, PFFS                   61.8    %
```

```
_________________________Percent Time-Spent-Following_________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.0                 1.0
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adjustment factor, fHV      1.000               1.000
Grade adjustment factor,(note-1) fg       1.00                1.00
Directional flow rate,(note-2) vi         1133   pc/h         976     pc/h
Base percent time-spent-following,(note-4) BPTSFd  81.1   %
Adjustment for no-passing zones, fnp               16.8
Percent time-spent-following, PTSFd                90.1   %

________________Level of Service and Other Performance Measures_______________

Level of service, LOS                              E
Volume to capacity ratio, v/c                      0.67
Peak 15-min vehicle-miles of travel, VMT15         62      veh-mi
Peak-hour vehicle-miles of travel, VMT60           237     veh-mi
Peak 15-min total travel time, TT15                2.2     veh-h
Capacity from ATS, CdATS                           1700    veh/h
Capacity from PTSF, CdPTSF                         1700    veh/h
Directional Capacity                               1700    veh/h

_____________________________Passing Lane Analysis____________________________

Total length of analysis segment, Lt                         0.2     mi
Length of two-lane highway upstream of the passing lane, Lu  -       mi
Length of passing lane including tapers, Lpl                 -       mi
Average travel speed, ATSd (from above)                      28.3    mi/h
Percent time-spent-following, PTSFd (from above)             90.1
Level of service, LOSd (from above)                          E

___________________Average Travel Speed  with Passing Lane____________________

Downstream length of two-lane highway within effective
    length of passing lane for average travel speed, Lde     -       mi
Length of two-lane highway downstream of effective
    length of the passing lane for average travel speed, Ld  -       mi
Adj. factor for the effect of passing lane
    on average speed, fpl                                    -
Average travel speed including passing lane, ATSpl           -
Percent free flow speed including passing lane, PFFSpl       0.0     %

________________Percent Time-Spent-Following with Passing Lane________________

Downstream length of two-lane highway within effective length
    of passing lane for percent time-spent-following, Lde    -       mi
Length of two-lane highway downstream of effective length of
    the passing lane for percent time-spent-following, Ld    -       mi
Adj. factor for the effect of passing lane
    on percent time-spent-following, fpl                     -
Percent time-spent-following
    including passing lane, PTSFpl                           -       %

______Level of Service and Other Performance Measures with Passing Lane ______

Level of service including passing lane, LOSpl     E
Peak 15-min total travel time, TT15                -       veh-h

__________________________ Bicycle Level of Service __________________________
```

```
Posted speed limit, Sp                                    35
Percent of segment with occupied on-highway parking       0
Pavement rating, P                                        3
Flow rate in outside lane, vOL                            1132.6
Effective width of outside lane, We                       16.00
Effective speed factor, St                                3.84
Bicycle LOS Score, BLOS                                   4.77
Bicycle LOS                                               E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain
   is one of the base conditions. For the purpose of grade adjustment, specific
   dewngrade segments are treated as level terrain.
2. If vi (vd or vo ) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a
   specific downgrade.

* These items have been entered or edited to override calculated value
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Phone:                                  Fax:
E-Mail:

_________________Directional Two-Lane Highway Segment Analysis________________

Analyst                 Kimley-Horn
Agency/Co.
Date Performed          1/16/2018
Analysis Time Period    AM Peak
Highway                 Waugh Chapel Road
From/To                 Macmullen Dr to Summerfield Rd
Jurisdiction            Anne Arundel County
Analysis Year           2018
Description  AM Peak Eastbound Analysis

__________________________________Input Data__________________________________

Highway class  Class 3             Peak hour factor, PHF    0.82
Shoulder width       5.0     ft    % Trucks and buses       3       %
Lane width           11.0    ft    % Trucks crawling        0.0     %
Segment length       0.5     mi    Truck crawl speed        0.0     mi/hr
Terrain type         Level         % Recreational vehicles  0       %
Grade:  Length       -       mi    % No-passing zones       100     %
        Up/down      -       %     Access point density     2       /mi

Analysis direction volume, Vd  749     veh/h
Opposing direction volume, Vo  710     veh/h

____________________________Average Travel Speed______________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.1*                1.1*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adj. factor,(note-5) fHV    0.997               0.997
Grade adj. factor,(note-1) fg             1.00                1.00
Directional flow rate,(note-2) vi         916     pc/h        868     pc/h

Free-Flow Speed from Field Measurement:
Field measured speed,(note-3) S FM             42      mi/h
Observed total demand,(note-3) V               100     veh/h
Estimated Free-Flow Speed:
Base free-flow speed,(note-3) BFFS              -      mi/h
Adj. for lane and shoulder width,(note-3) fLS   -      mi/h
Adj. for access point density,(note-3) fA       -      mi/h

Free-flow speed, FFSd                          42.8    mi/h

Adjustment for no-passing zones, fnp           1.2     mi/h
Average travel speed, ATSd                     27.8    mi/h
Percent Free Flow Speed, PFFS                  64.9    %
```

```
_________________________Percent Time-Spent-Following_________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.1*                1.0
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adjustment factor, fHV      0.997               1.000
Grade adjustment factor,(note-1) fg       1.00                1.00
Directional flow rate,(note-2) vi         916    pc/h         866     pc/h
Base percent time-spent-following,(note-4) BPTSFd  73.8   %
Adjustment for no-passing zones, fnp               22.2
Percent time-spent-following, PTSFd                85.2   %

________________Level of Service and Other Performance Measures_______________

Level of service, LOS                              E
Volume to capacity ratio, v/c                      0.54
Peak 15-min vehicle-miles of travel, VMT15         114     veh-mi
Peak-hour vehicle-miles of travel, VMT60           375     veh-mi
Peak 15-min total travel time, TT15                4.1     veh-h
Capacity from ATS, CdATS                           1700    veh/h
Capacity from PTSF, CdPTSF                         1700    veh/h
Directional Capacity                               1700    veh/h

_____________________________Passing Lane Analysis____________________________

Total length of analysis segment, Lt                         0.5     mi
Length of two-lane highway upstream of the passing lane, Lu  -       mi
Length of passing lane including tapers, Lpl                 -       mi
Average travel speed, ATSd (from above)                      27.8    mi/h
Percent time-spent-following, PTSFd (from above)             85.2
Level of service, LOSd (from above)                          E

___________________Average Travel Speed  with Passing Lane____________________

Downstream length of two-lane highway within effective
    length of passing lane for average travel speed, Lde     -       mi
Length of two-lane highway downstream of effective
    length of the passing lane for average travel speed, Ld  -       mi
Adj. factor for the effect of passing lane
    on average speed, fpl                                    -
Average travel speed including passing lane, ATSpl           -
Percent free flow speed including passing lane, PFFSpl       0.0     %

________________Percent Time-Spent-Following with Passing Lane________________

Downstream length of two-lane highway within effective length
    of passing lane for percent time-spent-following, Lde    -       mi
Length of two-lane highway downstream of effective length of
    the passing lane for percent time-spent-following, Ld    -       mi
Adj. factor for the effect of passing lane
    on percent time-spent-following, fpl                     -
Percent time-spent-following
    including passing lane, PTSFpl                           -       %

______Level of Service and Other Performance Measures with Passing Lane ______

Level of service including passing lane, LOSpl     E
Peak 15-min total travel time, TT15                -       veh-h

__________________________ Bicycle Level of Service __________________________
```

```
Posted speed limit, Sp                                    35
Percent of segment with occupied on-highway parking       0
Pavement rating, P                                        3
Flow rate in outside lane, vOL                            913.4
Effective width of outside lane, We                       21.00
Effective speed factor, St                                3.84
Bicycle LOS Score, BLOS                                   4.12
Bicycle LOS                                               D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain
   is one of the base conditions. For the purpose of grade adjustment, specific
   dewngrade segments are treated as level terrain.
2. If vi (vd or vo ) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a
   specific downgrade.

* These items have been entered or edited to override calculated value
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Phone:                                  Fax:
E-Mail:

_________________Directional Two-Lane Highway Segment Analysis________________

Analyst                 Kimley-Horn
Agency/Co.
Date Performed          1/16/2018
Analysis Time Period    PM Peak
Highway                 Waugh Chapel Road
From/To                 Macmullen Dr to Summerfield Rd
Jurisdiction            Anne Arundel County
Analysis Year           2018
Description  PM Peak Eastbound Analysis

__________________________________Input Data__________________________________

Highway class  Class 3             Peak hour factor, PHF    0.96
Shoulder width       5.0     ft      % Trucks and buses       1       %
Lane width           11.0    ft      % Trucks crawling        0.0     %
Segment length       0.5     mi      Truck crawl speed        0.0     mi/hr
Terrain type         Level           % Recreational vehicles  0       %
Grade:  Length       -       mi      % No-passing zones       100     %
        Up/down      -       %       Access point density     2       /mi

Analysis direction volume, Vd  831     veh/h
Opposing direction volume, Vo  994     veh/h

____________________________Average Travel Speed______________________________

Direction                            Analysis(d)         Opposing (o)
PCE for trucks, ET                       1.1*                1.0*
PCE for RVs, ER                          1.0                 1.0
Heavy-vehicle adj. factor,(note-5) fHV   0.999               1.000
Grade adj. factor,(note-1) fg            1.00                1.00
Directional flow rate,(note-2) vi        866     pc/h        1035    pc/h

Free-Flow Speed from Field Measurement:
Field measured speed,(note-3) S FM             42      mi/h
Observed total demand,(note-3) V               100     veh/h
Estimated Free-Flow Speed:
Base free-flow speed,(note-3) BFFS              -      mi/h
Adj. for lane and shoulder width,(note-3) fLS   -      mi/h
Adj. for access point density,(note-3) fA       -      mi/h

Free-flow speed, FFSd                          42.8    mi/h

Adjustment for no-passing zones, fnp           1.1     mi/h
Average travel speed, ATSd                     26.9    mi/h
Percent Free Flow Speed, PFFS                  63.0    %
```

```
_________________________Percent Time-Spent-Following_________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.1*                1.0
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adjustment factor, fHV      0.999               1.000
Grade adjustment factor,(note-1) fg       1.00                1.00
Directional flow rate,(note-2) vi         866    pc/h         1035    pc/h
Base percent time-spent-following,(note-4) BPTSFd  74.1   %
Adjustment for no-passing zones, fnp               19.8
Percent time-spent-following, PTSFd                83.1   %

________________Level of Service and Other Performance Measures_______________

Level of service, LOS                              E
Volume to capacity ratio, v/c                      0.53
Peak 15-min vehicle-miles of travel, VMT15         108     veh-mi
Peak-hour vehicle-miles of travel, VMT60           416     veh-mi
Peak 15-min total travel time, TT15                4.0     veh-h
Capacity from ATS, CdATS                           1700    veh/h
Capacity from PTSF, CdPTSF                         1700    veh/h
Directional Capacity                               1700    veh/h

_____________________________Passing Lane Analysis____________________________

Total length of analysis segment, Lt                         0.5     mi
Length of two-lane highway upstream of the passing lane, Lu  -       mi
Length of passing lane including tapers, Lpl                 -       mi
Average travel speed, ATSd (from above)                      26.9    mi/h
Percent time-spent-following, PTSFd (from above)             83.1
Level of service, LOSd (from above)                          E

___________________Average Travel Speed  with Passing Lane____________________

Downstream length of two-lane highway within effective
    length of passing lane for average travel speed, Lde     -       mi
Length of two-lane highway downstream of effective
    length of the passing lane for average travel speed, Ld  -       mi
Adj. factor for the effect of passing lane
    on average speed, fpl                                    -
Average travel speed including passing lane, ATSpl           -
Percent free flow speed including passing lane, PFFSpl       0.0     %

________________Percent Time-Spent-Following with Passing Lane________________

Downstream length of two-lane highway within effective length
    of passing lane for percent time-spent-following, Lde    -       mi
Length of two-lane highway downstream of effective length of
    the passing lane for percent time-spent-following, Ld    -       mi
Adj. factor for the effect of passing lane
    on percent time-spent-following, fpl                     -
Percent time-spent-following
    including passing lane, PTSFpl                           -       %

_____Level of Service and Other Performance Measures with Passing Lane ______

Level of service including passing lane, LOSpl     E
Peak 15-min total travel time, TT15                -       veh-h

__________________________ Bicycle Level of Service __________________________
```

```
Posted speed limit, Sp                                    35
Percent of segment with occupied on-highway parking       0
Pavement rating, P                                        3
Flow rate in outside lane, vOL                            865.6
Effective width of outside lane, We                       21.00
Effective speed factor, St                                3.84
Bicycle LOS Score, BLOS                                   3.72
Bicycle LOS                                               D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain
   is one of the base conditions. For the purpose of grade adjustment, specific
   dewngrade segments are treated as level terrain.
2. If vi (vd or vo ) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a
   specific downgrade.

* These items have been entered or edited to override calculated value
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                      HCS7: Two-Lane Highways Release 7.2







Phone:                                  Fax:
E-Mail:

_________________Directional Two-Lane Highway Segment Analysis________________

Analyst                 Kimley-Horn
Agency/Co.
Date Performed          1/16/2018
Analysis Time Period    AM Peak
Highway                 Waugh Chapel Road
From/To                 Macmullen Dr to Summerfield Rd
Jurisdiction            Anne Arundel County
Analysis Year           2018
Description  AM Peak Westbound Analysis

__________________________________Input Data__________________________________

Highway class  Class 3             Peak hour factor, PHF    0.82
Shoulder width       5.0     ft    % Trucks and buses       3       %
Lane width           11.0    ft    % Trucks crawling        0.0     %
Segment length       0.5     mi    Truck crawl speed        0.0     mi/hr
Terrain type         Level         % Recreational vehicles  0       %
Grade:  Length       -       mi    % No-passing zones       100     %
        Up/down      -       %     Access point density     4       /mi

Analysis direction volume, Vd  710     veh/h
Opposing direction volume, Vo  749     veh/h

____________________________Average Travel Speed______________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.1*                1.1*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adj. factor,(note-5) fHV    0.997               0.997
Grade adj. factor,(note-1) fg             1.00                1.00
Directional flow rate,(note-2) vi         868     pc/h        916     pc/h

Free-Flow Speed from Field Measurement:
Field measured speed,(note-3) S FM               41      mi/h
Observed total demand,(note-3) V                 100     veh/h
Estimated Free-Flow Speed:
Base free-flow speed,(note-3) BFFS                -      mi/h
Adj. for lane and shoulder width,(note-3) fLS     -      mi/h
Adj. for access point density,(note-3) fA         -      mi/h

Free-flow speed, FFSd                            41.8    mi/h

Adjustment for no-passing zones, fnp             1.1     mi/h
Average travel speed, ATSd                       26.8    mi/h
Percent Free Flow Speed, PFFS                    64.1    %
```

```
_________________________Percent Time-Spent-Following_________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.1*                1.1*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adjustment factor, fHV      0.997               0.997
Grade adjustment factor,(note-1) fg       1.00                1.00
Directional flow rate,(note-2) vi         868    pc/h         916     pc/h
Base percent time-spent-following,(note-4) BPTSFd  72.8   %
Adjustment for no-passing zones, fnp               22.1
Percent time-spent-following, PTSFd                83.6   %

________________Level of Service and Other Performance Measures_______________

Level of service, LOS                              E
Volume to capacity ratio, v/c                      0.53
Peak 15-min vehicle-miles of travel, VMT15         108     veh-mi
Peak-hour vehicle-miles of travel, VMT60           355     veh-mi
Peak 15-min total travel time, TT15                4.0     veh-h
Capacity from ATS, CdATS                           1700    veh/h
Capacity from PTSF, CdPTSF                         1700    veh/h
Directional Capacity                               1700    veh/h

_____________________________Passing Lane Analysis____________________________

Total length of analysis segment, Lt                         0.5     mi
Length of two-lane highway upstream of the passing lane, Lu  -       mi
Length of passing lane including tapers, Lpl                 -       mi
Average travel speed, ATSd (from above)                      26.8    mi/h
Percent time-spent-following, PTSFd (from above)             83.6
Level of service, LOSd (from above)                          E

___________________Average Travel Speed  with Passing Lane____________________

Downstream length of two-lane highway within effective
    length of passing lane for average travel speed, Lde     -       mi
Length of two-lane highway downstream of effective
    length of the passing lane for average travel speed, Ld  -       mi
Adj. factor for the effect of passing lane
    on average speed, fpl                                    -
Average travel speed including passing lane, ATSpl           -
Percent free flow speed including passing lane, PFFSpl       0.0     %

________________Percent Time-Spent-Following with Passing Lane________________

Downstream length of two-lane highway within effective length
    of passing lane for percent time-spent-following, Lde    -       mi
Length of two-lane highway downstream of effective length of
    the passing lane for percent time-spent-following, Ld    -       mi
Adj. factor for the effect of passing lane
    on percent time-spent-following, fpl                     -
Percent time-spent-following
    including passing lane, PTSFpl                           -       %

______Level of Service and Other Performance Measures with Passing Lane ______

Level of service including passing lane, LOSpl     E
Peak 15-min total travel time, TT15                -       veh-h

__________________________ Bicycle Level of Service __________________________
```

```
Posted speed limit, Sp                                    35
Percent of segment with occupied on-highway parking       0
Pavement rating, P                                        3
Flow rate in outside lane, vOL                            865.9
Effective width of outside lane, We                       21.00
Effective speed factor, St                                3.84
Bicycle LOS Score, BLOS                                   4.09
Bicycle LOS                                               D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain
   is one of the base conditions. For the purpose of grade adjustment, specific
   dewngrade segments are treated as level terrain.
2. If vi (vd or vo ) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a
   specific downgrade.

* These items have been entered or edited to override calculated value
```

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Phone:                                  Fax:
E-Mail:

_________________Directional Two-Lane Highway Segment Analysis________________

Analyst                 Kimley-Horn
Agency/Co.
Date Performed          1/16/2018
Analysis Time Period    PM Peak
Highway                 Waugh Chapel Road
From/To                 Macmullen Dr to Summerfield Rd
Jurisdiction            Anne Arundel County
Analysis Year           2018
Description  PM Peak Westbound Analysis

__________________________________Input Data__________________________________

Highway class  Class 3              Peak hour factor, PHF    0.96
Shoulder width       5.0     ft     % Trucks and buses       1       %
Lane width           11.0    ft     % Trucks crawling        0.0     %
Segment length       0.5     mi     Truck crawl speed        0.0     mi/hr
Terrain type         Level          % Recreational vehicles  0       %
Grade:  Length       -       mi     % No-passing zones       100     %
        Up/down      -       %      Access point density     4       /mi

Analysis direction volume, Vd  994     veh/h
Opposing direction volume, Vo  831     veh/h

____________________________Average Travel Speed______________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.0*                1.1*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adj. factor,(note-5) fHV    1.000               0.999
Grade adj. factor,(note-1) fg             1.00                1.00
Directional flow rate,(note-2) vi         1035    pc/h        866     pc/h

Free-Flow Speed from Field Measurement:
Field measured speed,(note-3) S FM             41      mi/h
Observed total demand,(note-3) V               100     veh/h
Estimated Free-Flow Speed:
Base free-flow speed,(note-3) BFFS              -      mi/h
Adj. for lane and shoulder width,(note-3) fLS   -      mi/h
Adj. for access point density,(note-3) fA       -      mi/h

Free-flow speed, FFSd                          41.8    mi/h

Adjustment for no-passing zones, fnp           1.2     mi/h
Average travel speed, ATSd                     25.9    mi/h
Percent Free Flow Speed, PFFS                  61.9    %
```

```
_________________________Percent Time-Spent-Following_________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.0                 1.1*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adjustment factor, fHV      1.000               0.999
Grade adjustment factor,(note-1) fg       1.00                1.00
Directional flow rate,(note-2) vi         1035   pc/h         866     pc/h
Base percent time-spent-following,(note-4) BPTSFd  77.3   %
Adjustment for no-passing zones, fnp               19.8
Percent time-spent-following, PTSFd                88.1   %

________________Level of Service and Other Performance Measures_______________

Level of service, LOS                              E
Volume to capacity ratio, v/c                      0.61
Peak 15-min vehicle-miles of travel, VMT15         129     veh-mi
Peak-hour vehicle-miles of travel, VMT60           497     veh-mi
Peak 15-min total travel time, TT15                5.0     veh-h
Capacity from ATS, CdATS                           1700    veh/h
Capacity from PTSF, CdPTSF                         1700    veh/h
Directional Capacity                               1700    veh/h

_____________________________Passing Lane Analysis____________________________

Total length of analysis segment, Lt                         0.5     mi
Length of two-lane highway upstream of the passing lane, Lu  -       mi
Length of passing lane including tapers, Lpl                 -       mi
Average travel speed, ATSd (from above)                      25.9    mi/h
Percent time-spent-following, PTSFd (from above)             88.1
Level of service, LOSd (from above)                          E

___________________Average Travel Speed  with Passing Lane____________________

Downstream length of two-lane highway within effective
    length of passing lane for average travel speed, Lde     -       mi
Length of two-lane highway downstream of effective
    length of the passing lane for average travel speed, Ld  -       mi
Adj. factor for the effect of passing lane
    on average speed, fpl                                    -
Average travel speed including passing lane, ATSpl           -
Percent free flow speed including passing lane, PFFSpl       0.0     %

________________Percent Time-Spent-Following with Passing Lane________________

Downstream length of two-lane highway within effective length
    of passing lane for percent time-spent-following, Lde    -       mi
Length of two-lane highway downstream of effective length of
    the passing lane for percent time-spent-following, Ld    -       mi
Adj. factor for the effect of passing lane
    on percent time-spent-following, fpl                     -
Percent time-spent-following
    including passing lane, PTSFpl                           -       %

______Level of Service and Other Performance Measures with Passing Lane ______

Level of service including passing lane, LOSpl     E
Peak 15-min total travel time, TT15                -       veh-h

__________________________ Bicycle Level of Service __________________________
```

```
Posted speed limit, Sp                                    35
Percent of segment with occupied on-highway parking       0
Pavement rating, P                                        3
Flow rate in outside lane, vOL                            1035.4
Effective width of outside lane, We                       21.00
Effective speed factor, St                                3.84
Bicycle LOS Score, BLOS                                   3.80
Bicycle LOS                                               D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain
   is one of the base conditions. For the purpose of grade adjustment, specific
   dewngrade segments are treated as level terrain.
2. If vi (vd or vo ) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a
   specific downgrade.

* These items have been entered or edited to override calculated value
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Appendix B-3

2040 NO BUILD HCS REPORTS

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Phone:                                  Fax:
E-Mail:

_________________Directional Two-Lane Highway Segment Analysis________________

Analyst                 Kimley-Horn
Agency/Co.
Date Performed          5/9/2018
Analysis Time Period    AM Peak
Highway                 Waugh Chapel Road
From/To                 Maytime Dr to Symphony Ln
Jurisdiction            Anne Arundel County
Analysis Year           2040
Description  No Build AM Peak EB Analysis

__________________________________Input Data__________________________________

Highway class  Class 3              Peak hour factor, PHF    0.78
Shoulder width       7.0     ft     % Trucks and buses       1       %
Lane width           12.0    ft     % Trucks crawling        0.0     %
Segment length       0.2     mi     Truck crawl speed        0.0     mi/hr
Terrain type         Level          % Recreational vehicles  0       %
Grade:  Length       -       mi     % No-passing zones       100     %
        Up/down      -       %      Access point density     0       /mi

Analysis direction volume, Vd  876     veh/h
Opposing direction volume, Vo  959     veh/h

____________________________Average Travel Speed______________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.1*                1.1*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adj. factor,(note-5) fHV    0.999               0.999
Grade adj. factor,(note-1) fg             1.00                1.00
Directional flow rate,(note-2) vi         1124    pc/h        1231    pc/h

Free-Flow Speed from Field Measurement:
Field measured speed,(note-3) S FM             48      mi/h
Observed total demand,(note-3) V               100     veh/h
Estimated Free-Flow Speed:
Base free-flow speed,(note-3) BFFS              -      mi/h
Adj. for lane and shoulder width,(note-3) fLS   -      mi/h
Adj. for access point density,(note-3) fA       -      mi/h

Free-flow speed, FFSd                          48.8    mi/h

Adjustment for no-passing zones, fnp           1.0     mi/h
Average travel speed, ATSd                     29.5    mi/h
Percent Free Flow Speed, PFFS                  60.6    %
```

```
_________________________Percent Time-Spent-Following_________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.0                 1.0
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adjustment factor, fHV      1.000               1.000
Grade adjustment factor,(note-1) fg       1.00                1.00
Directional flow rate,(note-2) vi         1123   pc/h         1229    pc/h
Base percent time-spent-following,(note-4) BPTSFd  83.4   %
Adjustment for no-passing zones, fnp               13.7
Percent time-spent-following, PTSFd                89.9   %

________________Level of Service and Other Performance Measures_______________

Level of service, LOS                              E
Volume to capacity ratio, v/c                      0.66
Peak 15-min vehicle-miles of travel, VMT15         56      veh-mi
Peak-hour vehicle-miles of travel, VMT60           175     veh-mi
Peak 15-min total travel time, TT15                1.9     veh-h
Capacity from ATS, CdATS                           1700    veh/h
Capacity from PTSF, CdPTSF                         1700    veh/h
Directional Capacity                               1700    veh/h

_____________________________Passing Lane Analysis____________________________

Total length of analysis segment, Lt                         0.2     mi
Length of two-lane highway upstream of the passing lane, Lu  -       mi
Length of passing lane including tapers, Lpl                 -       mi
Average travel speed, ATSd (from above)                      29.5    mi/h
Percent time-spent-following, PTSFd (from above)             89.9
Level of service, LOSd (from above)                          E

___________________Average Travel Speed  with Passing Lane____________________

Downstream length of two-lane highway within effective
    length of passing lane for average travel speed, Lde     -       mi
Length of two-lane highway downstream of effective
    length of the passing lane for average travel speed, Ld  -       mi
Adj. factor for the effect of passing lane
    on average speed, fpl                                    -
Average travel speed including passing lane, ATSpl           -
Percent free flow speed including passing lane, PFFSpl       0.0     %

________________Percent Time-Spent-Following with Passing Lane________________

Downstream length of two-lane highway within effective length
    of passing lane for percent time-spent-following, Lde    -       mi
Length of two-lane highway downstream of effective length of
    the passing lane for percent time-spent-following, Ld    -       mi
Adj. factor for the effect of passing lane
    on percent time-spent-following, fpl                     -
Percent time-spent-following
    including passing lane, PTSFpl                           -       %

______Level of Service and Other Performance Measures with Passing Lane ______

Level of service including passing lane, LOSpl     E
Peak 15-min total travel time, TT15                -       veh-h

__________________________ Bicycle Level of Service __________________________
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```
Posted speed limit, Sp                                    35
Percent of segment with occupied on-highway parking       0
Pavement rating, P                                        3
Flow rate in outside lane, vOL                            1123.1
Effective width of outside lane, We                       26.00
Effective speed factor, St                                3.84
Bicycle LOS Score, BLOS                                   2.66
Bicycle LOS                                               C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain
   is one of the base conditions. For the purpose of grade adjustment, specific
   dewngrade segments are treated as level terrain.
2. If vi (vd or vo ) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a
   specific downgrade.

* These items have been entered or edited to override calculated value
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                         HCS7: Two-Lane Highways Release 7.2







Phone:                                  Fax:
E-Mail:

_________________Directional Two-Lane Highway Segment Analysis________________

Analyst                  Kimley-Horn
Agency/Co.
Date Performed           5/9/2018
Analysis Time Period     PM Peak
Highway                  Waugh Chapel Road
From/To                  Maytime Dr to Symphony Ln
Jurisdiction             Anne Arundel County
Analysis Year            2040
Description  No Build PM Peak EB Analysis

__________________________________Input Data__________________________________

Highway class  Class 3              Peak hour factor, PHF    0.93
Shoulder width       7.0     ft     % Trucks and buses       1       %
Lane width           12.0    ft     % Trucks crawling        0.0     %
Segment length       0.2     mi     Truck crawl speed        0.0     mi/hr
Terrain type         Level          % Recreational vehicles  0       %
Grade:  Length       -       mi     % No-passing zones       100     %
        Up/down      -       %      Access point density     0       /mi

Analysis direction volume, Vd  1257    veh/h
Opposing direction volume, Vo  1265    veh/h

____________________________Average Travel Speed______________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.0*                1.0*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adj. factor,(note-5) fHV    1.000               1.000
Grade adj. factor,(note-1) fg             1.00                1.00
Directional flow rate,(note-2) vi         1352    pc/h        1360    pc/h

Free-Flow Speed from Field Measurement:
Field measured speed,(note-3) S FM             48      mi/h
Observed total demand,(note-3) V               100     veh/h
Estimated Free-Flow Speed:
Base free-flow speed,(note-3) BFFS              -      mi/h
Adj. for lane and shoulder width,(note-3) fLS   -      mi/h
Adj. for access point density,(note-3) fA       -      mi/h

Free-flow speed, FFSd                          48.8    mi/h

Adjustment for no-passing zones, fnp           0.8     mi/h
Average travel speed, ATSd                     26.9    mi/h
Percent Free Flow Speed, PFFS                  55.2    %
```

```
_________________________Percent Time-Spent-Following_________________________

Direction                             Analysis(d)          Opposing (o)
PCE for trucks, ET                        1.0                  1.0
PCE for RVs, ER                           1.0                  1.0
Heavy-vehicle adjustment factor, fHV      1.000                1.000
Grade adjustment factor,(note-1) fg       1.00                 1.00
Directional flow rate,(note-2) vi         1352   pc/h          1360    pc/h
Base percent time-spent-following,(note-4) BPTSFd  88.2   %
Adjustment for no-passing zones, fnp               9.5
Percent time-spent-following, PTSFd                92.9   %

________________Level of Service and Other Performance Measures_______________

Level of service, LOS                              E
Volume to capacity ratio, v/c                      0.80
Peak 15-min vehicle-miles of travel, VMT15         68      veh-mi
Peak-hour vehicle-miles of travel, VMT60           251     veh-mi
Peak 15-min total travel time, TT15                2.5     veh-h
Capacity from ATS, CdATS                           1700    veh/h
Capacity from PTSF, CdPTSF                         1700    veh/h
Directional Capacity                               1700    veh/h

_____________________________Passing Lane Analysis____________________________

Total length of analysis segment, Lt                         0.2     mi
Length of two-lane highway upstream of the passing lane, Lu  -       mi
Length of passing lane including tapers, Lpl                 -       mi
Average travel speed, ATSd (from above)                      26.9    mi/h
Percent time-spent-following, PTSFd (from above)             92.9
Level of service, LOSd (from above)                          E

___________________Average Travel Speed  with Passing Lane____________________

Downstream length of two-lane highway within effective
    length of passing lane for average travel speed, Lde     -       mi
Length of two-lane highway downstream of effective
    length of the passing lane for average travel speed, Ld  -       mi
Adj. factor for the effect of passing lane
    on average speed, fpl                                    -
Average travel speed including passing lane, ATSpl           -
Percent free flow speed including passing lane, PFFSpl       0.0     %

________________Percent Time-Spent-Following with Passing Lane________________

Downstream length of two-lane highway within effective length
    of passing lane for percent time-spent-following, Lde    -       mi
Length of two-lane highway downstream of effective length of
    the passing lane for percent time-spent-following, Ld    -       mi
Adj. factor for the effect of passing lane
    on percent time-spent-following, fpl                     -
Percent time-spent-following
    including passing lane, PTSFpl                           -       %

______Level of Service and Other Performance Measures with Passing Lane ______

Level of service including passing lane, LOSpl     E
Peak 15-min total travel time, TT15                -       veh-h

__________________________ Bicycle Level of Service __________________________
```

```
Posted speed limit, Sp                                    35
Percent of segment with occupied on-highway parking       0
Pavement rating, P                                        3
Flow rate in outside lane, vOL                            1351.6
Effective width of outside lane, We                       26.00
Effective speed factor, St                                3.84
Bicycle LOS Score, BLOS                                   2.76
Bicycle LOS                                               C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain
   is one of the base conditions. For the purpose of grade adjustment, specific
   dewngrade segments are treated as level terrain.
2. If vi (vd or vo ) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a
   specific downgrade.

* These items have been entered or edited to override calculated value
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Phone:                                  Fax:
E-Mail:

_________________Directional Two-Lane Highway Segment Analysis________________

Analyst                 Kimley-Horn
Agency/Co.
Date Performed          5/9/2018
Analysis Time Period    AM Peak
Highway                 Waugh Chapel Road
From/To                 Maytime Dr to Symphony Ln
Jurisdiction            Anne Arundel County
Analysis Year           2040
Description  No Build AM Peak WB Analysis

__________________________________Input Data__________________________________

Highway class  Class 3              Peak hour factor, PHF    0.87
Shoulder width       7.0     ft     % Trucks and buses       1       %
Lane width           12.0    ft     % Trucks crawling        0.0     %
Segment length       0.2     mi     Truck crawl speed        0.0     mi/hr
Terrain type         Level          % Recreational vehicles  0       %
Grade:  Length       -       mi     % No-passing zones       100     %
        Up/down      -       %      Access point density     0       /mi

Analysis direction volume, Vd  959     veh/h
Opposing direction volume, Vo  876     veh/h

____________________________Average Travel Speed______________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.1*                1.1*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adj. factor,(note-5) fHV    0.999               0.999
Grade adj. factor,(note-1) fg             1.00                1.00
Directional flow rate,(note-2) vi         1103    pc/h        1008    pc/h

Free-Flow Speed from Field Measurement:
Field measured speed,(note-3) S FM                 45      mi/h
Observed total demand,(note-3) V                   100     veh/h
Estimated Free-Flow Speed:
Base free-flow speed,(note-3) BFFS                  -      mi/h
Adj. for lane and shoulder width,(note-3) fLS       -      mi/h
Adj. for access point density,(note-3) fA           -      mi/h

Free-flow speed, FFSd                              45.8    mi/h

Adjustment for no-passing zones, fnp               1.1     mi/h
Average travel speed, ATSd                         28.3    mi/h
Percent Free Flow Speed, PFFS                      61.8    %
```

```
_________________________Percent Time-Spent-Following_________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.0                 1.0
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adjustment factor, fHV      1.000               1.000
Grade adjustment factor,(note-1) fg       1.00                1.00
Directional flow rate,(note-2) vi         1102   pc/h         1007    pc/h
Base percent time-spent-following,(note-4) BPTSFd  80.4   %
Adjustment for no-passing zones, fnp               17.0
Percent time-spent-following, PTSFd                89.3   %

________________Level of Service and Other Performance Measures_______________

Level of service, LOS                              E
Volume to capacity ratio, v/c                      0.65
Peak 15-min vehicle-miles of travel, VMT15         55      veh-mi
Peak-hour vehicle-miles of travel, VMT60           192     veh-mi
Peak 15-min total travel time, TT15                1.9     veh-h
Capacity from ATS, CdATS                           1700    veh/h
Capacity from PTSF, CdPTSF                         1700    veh/h
Directional Capacity                               1700    veh/h

_____________________________Passing Lane Analysis____________________________

Total length of analysis segment, Lt                         0.2     mi
Length of two-lane highway upstream of the passing lane, Lu  -       mi
Length of passing lane including tapers, Lpl                 -       mi
Average travel speed, ATSd (from above)                      28.3    mi/h
Percent time-spent-following, PTSFd (from above)             89.3
Level of service, LOSd (from above)                          E

___________________Average Travel Speed  with Passing Lane____________________

Downstream length of two-lane highway within effective
    length of passing lane for average travel speed, Lde     -       mi
Length of two-lane highway downstream of effective
    length of the passing lane for average travel speed, Ld  -       mi
Adj. factor for the effect of passing lane
    on average speed, fpl                                    -
Average travel speed including passing lane, ATSpl           -
Percent free flow speed including passing lane, PFFSpl       0.0     %

________________Percent Time-Spent-Following with Passing Lane________________

Downstream length of two-lane highway within effective length
    of passing lane for percent time-spent-following, Lde    -       mi
Length of two-lane highway downstream of effective length of
    the passing lane for percent time-spent-following, Ld    -       mi
Adj. factor for the effect of passing lane
    on percent time-spent-following, fpl                     -
Percent time-spent-following
    including passing lane, PTSFpl                           -       %

______Level of Service and Other Performance Measures with Passing Lane ______

Level of service including passing lane, LOSpl     E
Peak 15-min total travel time, TT15                -       veh-h

__________________________ Bicycle Level of Service __________________________
```

```
Posted speed limit, Sp                                    35
Percent of segment with occupied on-highway parking       0
Pavement rating, P                                        3
Flow rate in outside lane, vOL                            1102.3
Effective width of outside lane, We                       26.00
Effective speed factor, St                                3.84
Bicycle LOS Score, BLOS                                   2.65
Bicycle LOS                                               C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain
   is one of the base conditions. For the purpose of grade adjustment, specific
   dewngrade segments are treated as level terrain.
2. If vi (vd or vo ) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a
   specific downgrade.

* These items have been entered or edited to override calculated value
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Phone:                                  Fax:
E-Mail:

_________________Directional Two-Lane Highway Segment Analysis________________

Analyst                 Kimley-Horn
Agency/Co.
Date Performed          5/9/2018
Analysis Time Period    PM Peak
Highway                 Waugh Chapel Road
From/To                 Maytime Dr to Symphony Ln
Jurisdiction            Anne Arundel County
Analysis Year           2040
Description  No Build PM Peak WB Analysis

__________________________________Input Data__________________________________

Highway class  Class 3             Peak hour factor, PHF    0.95
Shoulder width       7.0     ft     % Trucks and buses       1       %
Lane width           12.0    ft     % Trucks crawling        0.0     %
Segment length       0.2     mi     Truck crawl speed        0.0     mi/hr
Terrain type         Level          % Recreational vehicles  0       %
Grade:  Length       -       mi     % No-passing zones       100     %
        Up/down      -       %      Access point density     0       /mi

Analysis direction volume, Vd  1265    veh/h
Opposing direction volume, Vo  1257    veh/h

____________________________Average Travel Speed______________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.0*                1.0*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adj. factor,(note-5) fHV    1.000               1.000
Grade adj. factor,(note-1) fg             1.00                1.00
Directional flow rate,(note-2) vi         1332    pc/h        1323    pc/h

Free-Flow Speed from Field Measurement:
Field measured speed,(note-3) S FM             45      mi/h
Observed total demand,(note-3) V               100     veh/h
Estimated Free-Flow Speed:
Base free-flow speed,(note-3) BFFS              -      mi/h
Adj. for lane and shoulder width,(note-3) fLS   -      mi/h
Adj. for access point density,(note-3) fA       -      mi/h

Free-flow speed, FFSd                          45.8    mi/h

Adjustment for no-passing zones, fnp           0.8     mi/h
Average travel speed, ATSd                     24.3    mi/h
Percent Free Flow Speed, PFFS                  53.2    %
```

```
_________________________Percent Time-Spent-Following_________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.0                 1.0
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adjustment factor, fHV      1.000               1.000
Grade adjustment factor,(note-1) fg       1.00                1.00
Directional flow rate,(note-2) vi         1332   pc/h         1323    pc/h
Base percent time-spent-following,(note-4) BPTSFd  87.6   %
Adjustment for no-passing zones, fnp               9.9
Percent time-spent-following, PTSFd                92.6   %

________________Level of Service and Other Performance Measures_______________

Level of service, LOS                              E
Volume to capacity ratio, v/c                      0.78
Peak 15-min vehicle-miles of travel, VMT15         67      veh-mi
Peak-hour vehicle-miles of travel, VMT60           253     veh-mi
Peak 15-min total travel time, TT15                2.8     veh-h
Capacity from ATS, CdATS                           1700    veh/h
Capacity from PTSF, CdPTSF                         1700    veh/h
Directional Capacity                               1700    veh/h

_____________________________Passing Lane Analysis____________________________

Total length of analysis segment, Lt                         0.2     mi
Length of two-lane highway upstream of the passing lane, Lu  -       mi
Length of passing lane including tapers, Lpl                 -       mi
Average travel speed, ATSd (from above)                      24.3    mi/h
Percent time-spent-following, PTSFd (from above)             92.6
Level of service, LOSd (from above)                          E

___________________Average Travel Speed  with Passing Lane____________________

Downstream length of two-lane highway within effective
    length of passing lane for average travel speed, Lde     -       mi
Length of two-lane highway downstream of effective
    length of the passing lane for average travel speed, Ld  -       mi
Adj. factor for the effect of passing lane
    on average speed, fpl                                    -
Average travel speed including passing lane, ATSpl           -
Percent free flow speed including passing lane, PFFSpl       0.0     %

________________Percent Time-Spent-Following with Passing Lane________________

Downstream length of two-lane highway within effective length
    of passing lane for percent time-spent-following, Lde    -       mi
Length of two-lane highway downstream of effective length of
    the passing lane for percent time-spent-following, Ld    -       mi
Adj. factor for the effect of passing lane
    on percent time-spent-following, fpl                     -
Percent time-spent-following
    including passing lane, PTSFpl                           -       %

______Level of Service and Other Performance Measures with Passing Lane ______

Level of service including passing lane, LOSpl     E
Peak 15-min total travel time, TT15                -       veh-h

__________________________ Bicycle Level of Service __________________________
```

```
Posted speed limit, Sp                                    35
Percent of segment with occupied on-highway parking       0
Pavement rating, P                                        3
Flow rate in outside lane, vOL                            1331.6
Effective width of outside lane, We                       26.00
Effective speed factor, St                                3.84
Bicycle LOS Score, BLOS                                   2.75
Bicycle LOS                                               C

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain
   is one of the base conditions. For the purpose of grade adjustment, specific
   dewngrade segments are treated as level terrain.
2. If vi (vd or vo ) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a
   specific downgrade.

* These items have been entered or edited to override calculated value
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Phone:                                  Fax:
E-Mail:

_________________Directional Two-Lane Highway Segment Analysis________________

Analyst                 Kimley-Horn
Agency/Co.
Date Performed          5/9/2018
Analysis Time Period    AM Peak
Highway                 Waugh Chapel Road
From/To                 Symphony Ln to Macmullen Drive
Jurisdiction            Anne Arundel County
Analysis Year           2040
Description  No Build AM Peak EB Analysis

__________________________________Input Data__________________________________

Highway class  Class 3              Peak hour factor, PHF    0.78
Shoulder width       4.0     ft     % Trucks and buses       1       %
Lane width           12.0    ft     % Trucks crawling        0.0     %
Segment length       0.2     mi     Truck crawl speed        0.0     mi/hr
Terrain type         Level          % Recreational vehicles  0       %
Grade:  Length       -       mi     % No-passing zones       100     %
        Up/down      -       %      Access point density     0       /mi

Analysis direction volume, Vd  969     veh/h
Opposing direction volume, Vo  1066    veh/h

____________________________Average Travel Speed______________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.1*                1.1*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adj. factor,(note-5) fHV    0.999               0.999
Grade adj. factor,(note-1) fg             1.00                1.00
Directional flow rate,(note-2) vi         1244    pc/h        1368    pc/h

Free-Flow Speed from Field Measurement:
Field measured speed,(note-3) S FM             42      mi/h
Observed total demand,(note-3) V               100     veh/h
Estimated Free-Flow Speed:
Base free-flow speed,(note-3) BFFS              -      mi/h
Adj. for lane and shoulder width,(note-3) fLS   -      mi/h
Adj. for access point density,(note-3) fA       -      mi/h

Free-flow speed, FFSd                          42.8    mi/h

Adjustment for no-passing zones, fnp           0.7     mi/h
Average travel speed, ATSd                     21.8    mi/h
Percent Free Flow Speed, PFFS                  50.9    %
```

```
_________________________Percent Time-Spent-Following_________________________

Direction                             Analysis(d)        Opposing (o)
PCE for trucks, ET                        1.0                 1.0
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adjustment factor, fHV      1.000               1.000
Grade adjustment factor,(note-1) fg       1.00                1.00
Directional flow rate,(note-2) vi         1242   pc/h         1367    pc/h
Base percent time-spent-following,(note-4) BPTSFd  86.4   %
Adjustment for no-passing zones, fnp               10.2
Percent time-spent-following, PTSFd                91.3   %

________________Level of Service and Other Performance Measures_______________

Level of service, LOS                              E
Volume to capacity ratio, v/c                      0.73
Peak 15-min vehicle-miles of travel, VMT15         62      veh-mi
Peak-hour vehicle-miles of travel, VMT60           194     veh-mi
Peak 15-min total travel time, TT15                2.8     veh-h
Capacity from ATS, CdATS                           1700    veh/h
Capacity from PTSF, CdPTSF                         1700    veh/h
Directional Capacity                               1700    veh/h

_____________________________Passing Lane Analysis____________________________

Total length of analysis segment, Lt                         0.2     mi
Length of two-lane highway upstream of the passing lane, Lu  -       mi
Length of passing lane including tapers, Lpl                 -       mi
Average travel speed, ATSd (from above)                      21.8    mi/h
Percent time-spent-following, PTSFd (from above)             91.3
Level of service, LOSd (from above)                          E

___________________Average Travel Speed  with Passing Lane____________________

Downstream length of two-lane highway within effective
    length of passing lane for average travel speed, Lde     -       mi
Length of two-lane highway downstream of effective
    length of the passing lane for average travel speed, Ld  -       mi
Adj. factor for the effect of passing lane
    on average speed, fpl                                    -
Average travel speed including passing lane, ATSpl           -
Percent free flow speed including passing lane, PFFSpl       0.0     %

________________Percent Time-Spent-Following with Passing Lane________________

Downstream length of two-lane highway within effective length
    of passing lane for percent time-spent-following, Lde    -       mi
Length of two-lane highway downstream of effective length of
    the passing lane for percent time-spent-following, Ld    -       mi
Adj. factor for the effect of passing lane
    on percent time-spent-following, fpl                     -
Percent time-spent-following
    including passing lane, PTSFpl                           -       %

______Level of Service and Other Performance Measures with Passing Lane ______

Level of service including passing lane, LOSpl     E
Peak 15-min total travel time, TT15                -       veh-h

__________________________ Bicycle Level of Service __________________________
```

```
Posted speed limit, Sp                                          35
Percent of segment with occupied on-highway parking             0
Pavement rating, P                                              3
Flow rate in outside lane, vOL                                  1242.3
Effective width of outside lane, We                             16.00
Effective speed factor, St                                      3.84
Bicycle LOS Score, BLOS                                         4.81
Bicycle LOS                                                     E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain
   is one of the base conditions. For the purpose of grade adjustment, specific
   dewngrade segments are treated as level terrain.
2. If vi (vd or vo ) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a
   specific downgrade.

* These items have been entered or edited to override calculated value
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Phone:                                  Fax:
E-Mail:

_________________Directional Two-Lane Highway Segment Analysis________________

Analyst                 Kimley-Horn
Agency/Co.
Date Performed          5/9/2018
Analysis Time Period    PM Peak
Highway                 Waugh Chapel Road
From/To                 Symphony Ln to Macmullen Drive
Jurisdiction            Anne Arundel County
Analysis Year           2040
Description  No Build PM Peak EB Analysis

__________________________________Input Data__________________________________

Highway class  Class 3             Peak hour factor, PHF    0.95
Shoulder width       4.0     ft     % Trucks and buses       1       %
Lane width           12.0    ft     % Trucks crawling        0.0     %
Segment length       0.2     mi     Truck crawl speed        0.0     mi/hr
Terrain type         Level          % Recreational vehicles  0       %
Grade:  Length       -       mi     % No-passing zones       100     %
        Up/down      -       %      Access point density     0       /mi

Analysis direction volume, Vd  1298    veh/h
Opposing direction volume, Vo  1373    veh/h

____________________________Average Travel Speed______________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.0*                1.0*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adj. factor,(note-5) fHV    1.000               1.000
Grade adj. factor,(note-1) fg             1.00                1.00
Directional flow rate,(note-2) vi         1366    pc/h        1445    pc/h

Free-Flow Speed from Field Measurement:
Field measured speed,(note-3) S FM             42      mi/h
Observed total demand,(note-3) V               100     veh/h
Estimated Free-Flow Speed:
Base free-flow speed,(note-3) BFFS              -      mi/h
Adj. for lane and shoulder width,(note-3) fLS   -      mi/h
Adj. for access point density,(note-3) fA       -      mi/h

Free-flow speed, FFSd                          42.8    mi/h

Adjustment for no-passing zones, fnp           0.7     mi/h
Average travel speed, ATSd                     20.3    mi/h
Percent Free Flow Speed, PFFS                  47.4    %
```

```
_________________________Percent Time-Spent-Following_________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.0                 1.0
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adjustment factor, fHV      1.000               1.000
Grade adjustment factor,(note-1) fg       1.00                1.00
Directional flow rate,(note-2) vi         1366   pc/h         1445    pc/h
Base percent time-spent-following,(note-4) BPTSFd  88.9   %
Adjustment for no-passing zones, fnp               9.0
Percent time-spent-following, PTSFd                93.3   %

________________Level of Service and Other Performance Measures________________

Level of service, LOS                              E
Volume to capacity ratio, v/c                      0.80
Peak 15-min vehicle-miles of travel, VMT15         68      veh-mi
Peak-hour vehicle-miles of travel, VMT60           260     veh-mi
Peak 15-min total travel time, TT15                3.4     veh-h
Capacity from ATS, CdATS                           1700    veh/h
Capacity from PTSF, CdPTSF                         1700    veh/h
Directional Capacity                               1700    veh/h

_____________________________Passing Lane Analysis____________________________

Total length of analysis segment, Lt                         0.2     mi
Length of two-lane highway upstream of the passing lane, Lu  -       mi
Length of passing lane including tapers, Lpl                 -       mi
Average travel speed, ATSd (from above)                      20.3    mi/h
Percent time-spent-following, PTSFd (from above)             93.3
Level of service, LOSd (from above)                          E

___________________Average Travel Speed  with Passing Lane____________________

Downstream length of two-lane highway within effective
    length of passing lane for average travel speed, Lde     -       mi
Length of two-lane highway downstream of effective
    length of the passing lane for average travel speed, Ld  -       mi
Adj. factor for the effect of passing lane
    on average speed, fpl                                    -
Average travel speed including passing lane, ATSpl           -
Percent free flow speed including passing lane, PFFSpl       0.0     %

________________Percent Time-Spent-Following with Passing Lane________________

Downstream length of two-lane highway within effective length
    of passing lane for percent time-spent-following, Lde    -       mi
Length of two-lane highway downstream of effective length of
    the passing lane for percent time-spent-following, Ld    -       mi
Adj. factor for the effect of passing lane
    on percent time-spent-following, fpl                     -
Percent time-spent-following
    including passing lane, PTSFpl                           -       %

______Level of Service and Other Performance Measures with Passing Lane ______

Level of service including passing lane, LOSpl     E
Peak 15-min total travel time, TT15                -       veh-h

__________________________ Bicycle Level of Service __________________________
```

```
Posted speed limit, Sp                                    35
Percent of segment with occupied on-highway parking       0
Pavement rating, P                                        3
Flow rate in outside lane, vOL                            1366.3
Effective width of outside lane, We                       16.00
Effective speed factor, St                                3.84
Bicycle LOS Score, BLOS                                   4.86
Bicycle LOS                                               E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain
   is one of the base conditions. For the purpose of grade adjustment, specific
   dewngrade segments are treated as level terrain.
2. If vi (vd or vo ) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a
   specific downgrade.

* These items have been entered or edited to override calculated value
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Phone:                                  Fax:
E-Mail:

_________________Directional Two-Lane Highway Segment Analysis________________

Analyst                 Kimley-Horn
Agency/Co.
Date Performed          5/9/2018
Analysis Time Period    AM Peak
Highway                 Waugh Chapel Road
From/To                 Symphony Ln to Macmullen Drive
Jurisdiction            Anne Arundel County
Analysis Year           2040
Description  No Build AM Peak WB Analysis

__________________________________Input Data__________________________________

Highway class  Class 3              Peak hour factor, PHF    0.78
Shoulder width       4.0     ft     % Trucks and buses       1       %
Lane width           12.0    ft     % Trucks crawling        0.0     %
Segment length       0.2     mi     Truck crawl speed        0.0     mi/hr
Terrain type         Level          % Recreational vehicles  0       %
Grade:  Length       -       mi     % No-passing zones       100     %
        Up/down      -       %      Access point density     0       /mi

Analysis direction volume, Vd  1066    veh/h
Opposing direction volume, Vo  969     veh/h

____________________________Average Travel Speed______________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.1*                1.1*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adj. factor,(note-5) fHV    0.999               0.999
Grade adj. factor,(note-1) fg             1.00                1.00
Directional flow rate,(note-2) vi         1368    pc/h        1244    pc/h

Free-Flow Speed from Field Measurement:
Field measured speed,(note-3) S FM             48      mi/h
Observed total demand,(note-3) V               100     veh/h
Estimated Free-Flow Speed:
Base free-flow speed,(note-3) BFFS              -      mi/h
Adj. for lane and shoulder width,(note-3) fLS   -      mi/h
Adj. for access point density,(note-3) fA       -      mi/h

Free-flow speed, FFSd                          48.8    mi/h

Adjustment for no-passing zones, fnp           1.0     mi/h
Average travel speed, ATSd                     27.6    mi/h
Percent Free Flow Speed, PFFS                  56.5    %
```

```
_________________________Percent Time-Spent-Following_________________________

Direction                             Analysis(d)        Opposing (o)
PCE for trucks, ET                        1.0                 1.0
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adjustment factor, fHV      1.000               1.000
Grade adjustment factor,(note-1) fg       1.00                1.00
Directional flow rate,(note-2) vi         1367   pc/h         1242    pc/h
Base percent time-spent-following,(note-4) BPTSFd  87.9   %
Adjustment for no-passing zones, fnp               10.2
Percent time-spent-following, PTSFd                93.2   %

________________Level of Service and Other Performance Measures_______________

Level of service, LOS                              E
Volume to capacity ratio, v/c                      0.80
Peak 15-min vehicle-miles of travel, VMT15         68      veh-mi
Peak-hour vehicle-miles of travel, VMT60           213     veh-mi
Peak 15-min total travel time, TT15                2.5     veh-h
Capacity from ATS, CdATS                           1700    veh/h
Capacity from PTSF, CdPTSF                         1700    veh/h
Directional Capacity                               1700    veh/h

_____________________________Passing Lane Analysis____________________________

Total length of analysis segment, Lt                         0.2     mi
Length of two-lane highway upstream of the passing lane, Lu  -       mi
Length of passing lane including tapers, Lpl                 -       mi
Average travel speed, ATSd (from above)                      27.6    mi/h
Percent time-spent-following, PTSFd (from above)             93.2
Level of service, LOSd (from above)                          E

___________________Average Travel Speed  with Passing Lane____________________

Downstream length of two-lane highway within effective
    length of passing lane for average travel speed, Lde     -       mi
Length of two-lane highway downstream of effective
    length of the passing lane for average travel speed, Ld  -       mi
Adj. factor for the effect of passing lane
    on average speed, fpl                                    -
Average travel speed including passing lane, ATSpl           -
Percent free flow speed including passing lane, PFFSpl       0.0     %

________________Percent Time-Spent-Following with Passing Lane________________

Downstream length of two-lane highway within effective length
    of passing lane for percent time-spent-following, Lde    -       mi
Length of two-lane highway downstream of effective length of
    the passing lane for percent time-spent-following, Ld    -       mi
Adj. factor for the effect of passing lane
    on percent time-spent-following, fpl                     -
Percent time-spent-following
    including passing lane, PTSFpl                           -       %

______Level of Service and Other Performance Measures with Passing Lane ______

Level of service including passing lane, LOSpl     E
Peak 15-min total travel time, TT15                -       veh-h

__________________________ Bicycle Level of Service __________________________
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```
Posted speed limit, Sp                                    35
Percent of segment with occupied on-highway parking       0
Pavement rating, P                                        3
Flow rate in outside lane, vOL                            1366.7
Effective width of outside lane, We                       16.00
Effective speed factor, St                                3.84
Bicycle LOS Score, BLOS                                   4.86
Bicycle LOS                                               E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain
   is one of the base conditions. For the purpose of grade adjustment, specific
   dewngrade segments are treated as level terrain.
2. If vi (vd or vo ) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a
   specific downgrade.

* These items have been entered or edited to override calculated value
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Phone:                                  Fax:
E-Mail:

_________________Directional Two-Lane Highway Segment Analysis________________

Analyst                 Kimley-Horn
Agency/Co.
Date Performed          5/9/2018
Analysis Time Period    PM Peak
Highway                 Waugh Chapel Road
From/To                 Symphony Ln to Macmullen Drive
Jurisdiction            Anne Arundel County
Analysis Year           2040
Description  No Build PM Peak WB Analysis

__________________________________Input Data__________________________________

Highway class  Class 3              Peak hour factor, PHF    0.95
Shoulder width       4.0     ft     % Trucks and buses       1       %
Lane width           12.0    ft     % Trucks crawling        0.0     %
Segment length       0.2     mi     Truck crawl speed        0.0     mi/hr
Terrain type         Level          % Recreational vehicles  0       %
Grade:  Length       -       mi     % No-passing zones       100     %
        Up/down      -       %      Access point density     0       /mi

Analysis direction volume, Vd  1373    veh/h
Opposing direction volume, Vo  1298    veh/h

____________________________Average Travel Speed______________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.0*                1.0*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adj. factor,(note-5) fHV    1.000               1.000
Grade adj. factor,(note-1) fg             1.00                1.00
Directional flow rate,(note-2) vi         1445    pc/h        1366    pc/h

Free-Flow Speed from Field Measurement:
Field measured speed,(note-3) S FM             48      mi/h
Observed total demand,(note-3) V               100     veh/h
Estimated Free-Flow Speed:
Base free-flow speed,(note-3) BFFS              -      mi/h
Adj. for lane and shoulder width,(note-3) fLS   -      mi/h
Adj. for access point density,(note-3) fA       -      mi/h

Free-flow speed, FFSd                          48.8    mi/h

Adjustment for no-passing zones, fnp           0.8     mi/h
Average travel speed, ATSd                     26.1    mi/h
Percent Free Flow Speed, PFFS                  53.6    %
```

```
_________________________Percent Time-Spent-Following_________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.0                 1.0
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adjustment factor, fHV      1.000               1.000
Grade adjustment factor,(note-1) fg       1.00                1.00
Directional flow rate,(note-2) vi         1445   pc/h         1366    pc/h
Base percent time-spent-following,(note-4) BPTSFd  89.5   %
Adjustment for no-passing zones, fnp               9.0
Percent time-spent-following, PTSFd                94.1   %

________________Level of Service and Other Performance Measures_______________

Level of service, LOS                              E
Volume to capacity ratio, v/c                      0.85
Peak 15-min vehicle-miles of travel, VMT15         72      veh-mi
Peak-hour vehicle-miles of travel, VMT60           275     veh-mi
Peak 15-min total travel time, TT15                2.8     veh-h
Capacity from ATS, CdATS                           1700    veh/h
Capacity from PTSF, CdPTSF                         1700    veh/h
Directional Capacity                               1700    veh/h

____________________________Passing Lane Analysis____________________________

Total length of analysis segment, Lt                         0.2     mi
Length of two-lane highway upstream of the passing lane, Lu  -       mi
Length of passing lane including tapers, Lpl                 -       mi
Average travel speed, ATSd (from above)                      26.1    mi/h
Percent time-spent-following, PTSFd (from above)             94.1
Level of service, LOSd (from above)                          E

___________________Average Travel Speed  with Passing Lane____________________

Downstream length of two-lane highway within effective
    length of passing lane for average travel speed, Lde     -       mi
Length of two-lane highway downstream of effective
    length of the passing lane for average travel speed, Ld  -       mi
Adj. factor for the effect of passing lane
    on average speed, fpl                                    -
Average travel speed including passing lane, ATSpl           -
Percent free flow speed including passing lane, PFFSpl       0.0     %

________________Percent Time-Spent-Following with Passing Lane________________

Downstream length of two-lane highway within effective length
    of passing lane for percent time-spent-following, Lde    -       mi
Length of two-lane highway downstream of effective length of
    the passing lane for percent time-spent-following, Ld    -       mi
Adj. factor for the effect of passing lane
    on percent time-spent-following, fpl                     -
Percent time-spent-following
    including passing lane, PTSFpl                           -       %

______Level of Service and Other Performance Measures with Passing Lane ______

Level of service including passing lane, LOSpl     E
Peak 15-min total travel time, TT15                -       veh-h

__________________________ Bicycle Level of Service __________________________
```

```
Posted speed limit, Sp                                    35
Percent of segment with occupied on-highway parking       0
Pavement rating, P                                        3
Flow rate in outside lane, vOL                            1445.3
Effective width of outside lane, We                       16.00
Effective speed factor, St                                3.84
Bicycle LOS Score, BLOS                                   4.89
Bicycle LOS                                               E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain
   is one of the base conditions. For the purpose of grade adjustment, specific
   dewngrade segments are treated as level terrain.
2. If vi (vd or vo ) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a
   specific downgrade.

* These items have been entered or edited to override calculated value
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Phone:                                  Fax:
E-Mail:

_________________Directional Two-Lane Highway Segment Analysis________________

Analyst                 Kimley-Horn
Agency/Co.
Date Performed          5/9/2018
Analysis Time Period    AM Peak
Highway                 Waugh Chapel Road
From/To                 Macmullen Dr to Summerfield Rd
Jurisdiction            Anne Arundel County
Analysis Year           2040
Description  No Build AM Peak EB Analysis

__________________________________Input Data__________________________________

Highway class  Class 3             Peak hour factor, PHF    0.82
Shoulder width       5.0     ft     % Trucks and buses       3       %
Lane width           11.0    ft     % Trucks crawling        0.0     %
Segment length       0.5     mi     Truck crawl speed        0.0     mi/hr
Terrain type         Level          % Recreational vehicles  0       %
Grade:  Length       -       mi     % No-passing zones       100     %
        Up/down      -       %      Access point density     2       /mi

Analysis direction volume, Vd  980     veh/h
Opposing direction volume, Vo  1146    veh/h

____________________________Average Travel Speed______________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.1*                1.1*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adj. factor,(note-5) fHV    0.997               0.997
Grade adj. factor,(note-1) fg             1.00                1.00
Directional flow rate,(note-2) vi         1199    pc/h        1402    pc/h

Free-Flow Speed from Field Measurement:
Field measured speed,(note-3) S FM             42      mi/h
Observed total demand,(note-3) V               100     veh/h
Estimated Free-Flow Speed:
Base free-flow speed,(note-3) BFFS              -      mi/h
Adj. for lane and shoulder width,(note-3) fLS   -      mi/h
Adj. for access point density,(note-3) fA       -      mi/h

Free-flow speed, FFSd                          42.8    mi/h

Adjustment for no-passing zones, fnp           0.7     mi/h
Average travel speed, ATSd                     21.9    mi/h
Percent Free Flow Speed, PFFS                  51.2    %
```

```
_________________________Percent Time-Spent-Following_________________________

Direction                             Analysis(d)        Opposing (o)
PCE for trucks, ET                        1.1*                1.0
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adjustment factor, fHV      0.997               1.000
Grade adjustment factor,(note-1) fg       1.00                1.00
Directional flow rate,(note-2) vi         1199   pc/h         1398    pc/h
Base percent time-spent-following,(note-4) BPTSFd  85.8   %
Adjustment for no-passing zones, fnp               10.3
Percent time-spent-following, PTSFd                90.6   %

________________Level of Service and Other Performance Measures_______________

Level of service, LOS                              E
Volume to capacity ratio, v/c                      0.71
Peak 15-min vehicle-miles of travel, VMT15         149     veh-mi
Peak-hour vehicle-miles of travel, VMT60           490     veh-mi
Peak 15-min total travel time, TT15                6.8     veh-h
Capacity from ATS, CdATS                           1700    veh/h
Capacity from PTSF, CdPTSF                         1700    veh/h
Directional Capacity                               1700    veh/h

_____________________________Passing Lane Analysis____________________________

Total length of analysis segment, Lt                         0.5     mi
Length of two-lane highway upstream of the passing lane, Lu  -       mi
Length of passing lane including tapers, Lpl                 -       mi
Average travel speed, ATSd (from above)                      21.9    mi/h
Percent time-spent-following, PTSFd (from above)             90.6
Level of service, LOSd (from above)                          E

___________________Average Travel Speed  with Passing Lane____________________

Downstream length of two-lane highway within effective
    length of passing lane for average travel speed, Lde     -       mi
Length of two-lane highway downstream of effective
    length of the passing lane for average travel speed, Ld  -       mi
Adj. factor for the effect of passing lane
    on average speed, fpl                                    -
Average travel speed including passing lane, ATSpl           -
Percent free flow speed including passing lane, PFFSpl       0.0     %

________________Percent Time-Spent-Following with Passing Lane________________

Downstream length of two-lane highway within effective length
    of passing lane for percent time-spent-following, Lde    -       mi
Length of two-lane highway downstream of effective length of
    the passing lane for percent time-spent-following, Ld    -       mi
Adj. factor for the effect of passing lane
    on percent time-spent-following, fpl                     -
Percent time-spent-following
    including passing lane, PTSFpl                           -       %

______Level of Service and Other Performance Measures with Passing Lane ______

Level of service including passing lane, LOSpl     E
Peak 15-min total travel time, TT15                -       veh-h

__________________________ Bicycle Level of Service __________________________
```

```
Posted speed limit, Sp                                    35
Percent of segment with occupied on-highway parking       0
Pavement rating, P                                        3
Flow rate in outside lane, vOL                            1195.1
Effective width of outside lane, We                       21.00
Effective speed factor, St                                3.84
Bicycle LOS Score, BLOS                                   4.25
Bicycle LOS                                               D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain
   is one of the base conditions. For the purpose of grade adjustment, specific
   dewngrade segments are treated as level terrain.
2. If vi (vd or vo ) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a
   specific downgrade.

* These items have been entered or edited to override calculated value
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Phone:                                  Fax:
E-Mail:

_________________Directional Two-Lane Highway Segment Analysis________________

Analyst                 Kimley-Horn
Agency/Co.
Date Performed          5/9/2018
Analysis Time Period    PM Peak
Highway                 Waugh Chapel Road
From/To                 Macmullen Dr to Summerfield Rd
Jurisdiction            Anne Arundel County
Analysis Year           2040
Description  No Build PM Peak EB Analysis

__________________________________Input Data__________________________________

Highway class  Class 3              Peak hour factor, PHF    0.96
Shoulder width       5.0     ft     % Trucks and buses       1       %
Lane width           11.0    ft     % Trucks crawling        0.0     %
Segment length       0.5     mi     Truck crawl speed        0.0     mi/hr
Terrain type         Level          % Recreational vehicles  0       %
Grade:  Length       -       mi     % No-passing zones       100     %
        Up/down      -       %      Access point density     2       /mi

Analysis direction volume, Vd  1298    veh/h
Opposing direction volume, Vo  1417    veh/h

____________________________Average Travel Speed______________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.1*                1.0*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adj. factor,(note-5) fHV    0.999               1.000
Grade adj. factor,(note-1) fg             1.00                1.00
Directional flow rate,(note-2) vi         1353    pc/h        1476    pc/h

Free-Flow Speed from Field Measurement:
Field measured speed,(note-3) S FM             42      mi/h
Observed total demand,(note-3) V               100     veh/h
Estimated Free-Flow Speed:
Base free-flow speed,(note-3) BFFS              -      mi/h
Adj. for lane and shoulder width,(note-3) fLS   -      mi/h
Adj. for access point density,(note-3) fA       -      mi/h

Free-flow speed, FFSd                          42.8    mi/h

Adjustment for no-passing zones, fnp           0.7     mi/h
Average travel speed, ATSd                     20.2    mi/h
Percent Free Flow Speed, PFFS                  47.1    %
```

```
_________________________Percent Time-Spent-Following_________________________

Direction                             Analysis(d)        Opposing (o)
PCE for trucks, ET                        1.1*               1.0
PCE for RVs, ER                           1.0                1.0
Heavy-vehicle adjustment factor, fHV      0.999              1.000
Grade adjustment factor,(note-1) fg       1.00               1.00
Directional flow rate,(note-2) vi         1353   pc/h        1476    pc/h
Base percent time-spent-following,(note-4) BPTSFd  88.9   %
Adjustment for no-passing zones, fnp               9.0
Percent time-spent-following, PTSFd                93.2   %

________________Level of Service and Other Performance Measures_______________

Level of service, LOS                              E
Volume to capacity ratio, v/c                      0.80
Peak 15-min vehicle-miles of travel, VMT15         169     veh-mi
Peak-hour vehicle-miles of travel, VMT60           649     veh-mi
Peak 15-min total travel time, TT15                8.4     veh-h
Capacity from ATS, CdATS                           1700    veh/h
Capacity from PTSF, CdPTSF                         1700    veh/h
Directional Capacity                               1700    veh/h

_____________________________Passing Lane Analysis____________________________

Total length of analysis segment, Lt                         0.5     mi
Length of two-lane highway upstream of the passing lane, Lu  -       mi
Length of passing lane including tapers, Lpl                 -       mi
Average travel speed, ATSd (from above)                      20.2    mi/h
Percent time-spent-following, PTSFd (from above)             93.2
Level of service, LOSd (from above)                          E

___________________Average Travel Speed  with Passing Lane____________________

Downstream length of two-lane highway within effective
    length of passing lane for average travel speed, Lde     -       mi
Length of two-lane highway downstream of effective
    length of the passing lane for average travel speed, Ld  -       mi
Adj. factor for the effect of passing lane
    on average speed, fpl                                    -
Average travel speed including passing lane, ATSpl           -
Percent free flow speed including passing lane, PFFSpl       0.0     %

________________Percent Time-Spent-Following with Passing Lane________________

Downstream length of two-lane highway within effective length
    of passing lane for percent time-spent-following, Lde    -       mi
Length of two-lane highway downstream of effective length of
    the passing lane for percent time-spent-following, Ld    -       mi
Adj. factor for the effect of passing lane
    on percent time-spent-following, fpl                     -
Percent time-spent-following
    including passing lane, PTSFpl                           -       %

______Level of Service and Other Performance Measures with Passing Lane ______

Level of service including passing lane, LOSpl     E
Peak 15-min total travel time, TT15                -       veh-h

__________________________ Bicycle Level of Service __________________________
```

```
Posted speed limit, Sp                                    35
Percent of segment with occupied on-highway parking       0
Pavement rating, P                                        3
Flow rate in outside lane, vOL                            1352.1
Effective width of outside lane, We                       21.00
Effective speed factor, St                                3.84
Bicycle LOS Score, BLOS                                   3.93
Bicycle LOS                                               D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain
   is one of the base conditions. For the purpose of grade adjustment, specific
   dewngrade segments are treated as level terrain.
2. If vi (vd or vo ) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a
   specific downgrade.

* These items have been entered or edited to override calculated value
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Phone:                                  Fax:
E-Mail:

_________________Directional Two-Lane Highway Segment Analysis________________

Analyst                 Kimley-Horn
Agency/Co.
Date Performed          5/9/2018
Analysis Time Period    AM Peak
Highway                 Waugh Chapel Road
From/To                 Macmullen Dr to Summerfield Rd
Jurisdiction            Anne Arundel County
Analysis Year           2040
Description  No Build AM Peak WB Analysis

__________________________________Input Data__________________________________

Highway class  Class 3             Peak hour factor, PHF    0.82
Shoulder width       5.0     ft     % Trucks and buses       3       %
Lane width           11.0    ft     % Trucks crawling        0.0     %
Segment length       0.5     mi     Truck crawl speed        0.0     mi/hr
Terrain type         Level          % Recreational vehicles  0       %
Grade:  Length       -       mi     % No-passing zones       100     %
        Up/down      -       %      Access point density     4       /mi

Analysis direction volume, Vd  1146    veh/h
Opposing direction volume, Vo  980     veh/h

____________________________Average Travel Speed______________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.1*                1.1*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adj. factor,(note-5) fHV    0.997               0.997
Grade adj. factor,(note-1) fg             1.00                1.00
Directional flow rate,(note-2) vi         1402    pc/h        1199    pc/h

Free-Flow Speed from Field Measurement:
Field measured speed,(note-3) S FM               41      mi/h
Observed total demand,(note-3) V                 100     veh/h
Estimated Free-Flow Speed:
Base free-flow speed,(note-3) BFFS                -      mi/h
Adj. for lane and shoulder width,(note-3) fLS     -      mi/h
Adj. for access point density,(note-3) fA         -      mi/h

Free-flow speed, FFSd                            41.8    mi/h

Adjustment for no-passing zones, fnp             1.0     mi/h
Average travel speed, ATSd                       20.6    mi/h
Percent Free Flow Speed, PFFS                    49.3    %
```

```
_________________________Percent Time-Spent-Following_________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.1*                1.1*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adjustment factor, fHV      0.997               0.997
Grade adjustment factor,(note-1) fg       1.00                1.00
Directional flow rate,(note-2) vi         1402   pc/h         1199    pc/h
Base percent time-spent-following,(note-4) BPTSFd  88.1   %
Adjustment for no-passing zones, fnp               10.3
Percent time-spent-following, PTSFd                93.7   %

________________Level of Service and Other Performance Measures_______________

Level of service, LOS                              E
Volume to capacity ratio, v/c                      0.82
Peak 15-min vehicle-miles of travel, VMT15         175     veh-mi
Peak-hour vehicle-miles of travel, VMT60           573     veh-mi
Peak 15-min total travel time, TT15                8.5     veh-h
Capacity from ATS, CdATS                           1700    veh/h
Capacity from PTSF, CdPTSF                         1700    veh/h
Directional Capacity                               1700    veh/h

_____________________________Passing Lane Analysis____________________________

Total length of analysis segment, Lt                         0.5     mi
Length of two-lane highway upstream of the passing lane, Lu  -       mi
Length of passing lane including tapers, Lpl                 -       mi
Average travel speed, ATSd (from above)                      20.6    mi/h
Percent time-spent-following, PTSFd (from above)             93.7
Level of service, LOSd (from above)                          E

___________________Average Travel Speed  with Passing Lane____________________

Downstream length of two-lane highway within effective
    length of passing lane for average travel speed, Lde     -       mi
Length of two-lane highway downstream of effective
    length of the passing lane for average travel speed, Ld  -       mi
Adj. factor for the effect of passing lane
    on average speed, fpl                                    -
Average travel speed including passing lane, ATSpl           -
Percent free flow speed including passing lane, PFFSpl       0.0     %

________________Percent Time-Spent-Following with Passing Lane________________

Downstream length of two-lane highway within effective length
    of passing lane for percent time-spent-following, Lde    -       mi
Length of two-lane highway downstream of effective length of
    the passing lane for percent time-spent-following, Ld    -       mi
Adj. factor for the effect of passing lane
    on percent time-spent-following, fpl                     -
Percent time-spent-following
    including passing lane, PTSFpl                           -       %

______Level of Service and Other Performance Measures with Passing Lane ______

Level of service including passing lane, LOSpl     E
Peak 15-min total travel time, TT15                -       veh-h

__________________________ Bicycle Level of Service __________________________
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```
Posted speed limit, Sp                                    35
Percent of segment with occupied on-highway parking       0
Pavement rating, P                                        3
Flow rate in outside lane, vOL                            1397.6
Effective width of outside lane, We                       21.00
Effective speed factor, St                                3.84
Bicycle LOS Score, BLOS                                   4.33
Bicycle LOS                                               D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain
   is one of the base conditions. For the purpose of grade adjustment, specific
   dewngrade segments are treated as level terrain.
2. If vi (vd or vo ) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a
   specific downgrade.

* These items have been entered or edited to override calculated value
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Phone:                                  Fax:
E-Mail:

_________________Directional Two-Lane Highway Segment Analysis________________

Analyst                 Kimley-Horn
Agency/Co.
Date Performed          5/9/2018
Analysis Time Period    PM Peak
Highway                 Waugh Chapel Road
From/To                 Macmullen Dr to Summerfield Rd
Jurisdiction            Anne Arundel County
Analysis Year           2040
Description  No Build PM Peak WB Analysis

__________________________________Input Data__________________________________

Highway class  Class 3             Peak hour factor, PHF    0.96
Shoulder width       5.0     ft     % Trucks and buses       1       %
Lane width           11.0    ft     % Trucks crawling        0.0     %
Segment length       0.5     mi     Truck crawl speed        0.0     mi/hr
Terrain type         Level          % Recreational vehicles  0       %
Grade:  Length       -       mi     % No-passing zones       100     %
        Up/down      -       %      Access point density     4       /mi

Analysis direction volume, Vd  1417    veh/h
Opposing direction volume, Vo  1298    veh/h

____________________________Average Travel Speed______________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.0*                1.1*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adj. factor,(note-5) fHV    1.000               0.999
Grade adj. factor,(note-1) fg             1.00                1.00
Directional flow rate,(note-2) vi         1476    pc/h        1353    pc/h

Free-Flow Speed from Field Measurement:
Field measured speed,(note-3) S FM             41      mi/h
Observed total demand,(note-3) V               100     veh/h
Estimated Free-Flow Speed:
Base free-flow speed,(note-3) BFFS              -      mi/h
Adj. for lane and shoulder width,(note-3) fLS   -      mi/h
Adj. for access point density,(note-3) fA       -      mi/h

Free-flow speed, FFSd                          41.8    mi/h

Adjustment for no-passing zones, fnp           0.8     mi/h
Average travel speed, ATSd                     19.1    mi/h
Percent Free Flow Speed, PFFS                  45.6    %
```

```
_________________________Percent Time-Spent-Following_________________________

Direction                             Analysis(d)         Opposing (o)
PCE for trucks, ET                        1.0                 1.1*
PCE for RVs, ER                           1.0                 1.0
Heavy-vehicle adjustment factor, fHV      1.000               0.999
Grade adjustment factor,(note-1) fg       1.00                1.00
Directional flow rate,(note-2) vi         1476   pc/h         1353    pc/h
Base percent time-spent-following,(note-4) BPTSFd  89.9   %
Adjustment for no-passing zones, fnp               9.0
Percent time-spent-following, PTSFd                94.6   %

________________Level of Service and Other Performance Measures_______________

Level of service, LOS                              E
Volume to capacity ratio, v/c                      0.87
Peak 15-min vehicle-miles of travel, VMT15         185     veh-mi
Peak-hour vehicle-miles of travel, VMT60           709     veh-mi
Peak 15-min total travel time, TT15                9.7     veh-h
Capacity from ATS, CdATS                           1700    veh/h
Capacity from PTSF, CdPTSF                         1700    veh/h
Directional Capacity                               1700    veh/h

_____________________________Passing Lane Analysis____________________________

Total length of analysis segment, Lt                         0.5     mi
Length of two-lane highway upstream of the passing lane, Lu  -       mi
Length of passing lane including tapers, Lpl                 -       mi
Average travel speed, ATSd (from above)                      19.1    mi/h
Percent time-spent-following, PTSFd (from above)             94.6
Level of service, LOSd (from above)                          E

___________________Average Travel Speed  with Passing Lane____________________

Downstream length of two-lane highway within effective
    length of passing lane for average travel speed, Lde     -       mi
Length of two-lane highway downstream of effective
    length of the passing lane for average travel speed, Ld  -       mi
Adj. factor for the effect of passing lane
    on average speed, fpl                                    -
Average travel speed including passing lane, ATSpl           -
Percent free flow speed including passing lane, PFFSpl       0.0     %

________________Percent Time-Spent-Following with Passing Lane________________

Downstream length of two-lane highway within effective length
    of passing lane for percent time-spent-following, Lde    -       mi
Length of two-lane highway downstream of effective length of
    the passing lane for percent time-spent-following, Ld    -       mi
Adj. factor for the effect of passing lane
    on percent time-spent-following, fpl                     -
Percent time-spent-following
    including passing lane, PTSFpl                           -       %

______Level of Service and Other Performance Measures with Passing Lane ______

Level of service including passing lane, LOSpl     E
Peak 15-min total travel time, TT15                -       veh-h

__________________________ Bicycle Level of Service __________________________
```

```
Posted speed limit, Sp                                    35
Percent of segment with occupied on-highway parking       0
Pavement rating, P                                        3
Flow rate in outside lane, vOL                            1476.0
Effective width of outside lane, We                       21.00
Effective speed factor, St                                3.84
Bicycle LOS Score, BLOS                                   3.98
Bicycle LOS                                               D

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain
   is one of the base conditions. For the purpose of grade adjustment, specific
   dewngrade segments are treated as level terrain.
2. If vi (vd or vo ) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a
   specific downgrade.

* These items have been entered or edited to override calculated value
```

Appendix B-4

SIGNAL WARRANTS

Intersection: Waugh Chapel Road and Silver Way/Macmullen Drive

Traffic Signal Warrant

Both Minor-Street approaches have one lane approaches

Warrant 1: Eight-Hour Vehicular Volume

Support:

The minimum vehicular volume, Condition A, is intended for application at locations where a large volume of intersecting traffic is the principal reason to consider installing a traffic signal control

The Interruption of Continuous Traffic, Condition B, is intended for application at locations where Condition A is not satisfied and where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street.

It is intended that Warrant 1 be treated as a single warrant. If Condition A is satisfied, then Warrant 1 is satisfied and analyses of Condition B and the combination of Conditions A and B are not needed. Similarly, if Condition B is satisfied, then Warrant 1 is satisfied and an analysis of the combination of Conditions A and B is not needed.

Standard:

The need for a traffic control signal shall be considered if an engineering study finds that one of the following conditions exist for each of any 8 hours of an average day:

A. The vehicles per hour given in both of the 100 percent columns of Condition A in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection; or
B. The vehicles per hour given in both of the 100 percent columns of Condition B in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection.

In applying each condition the major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of these 8 hours.

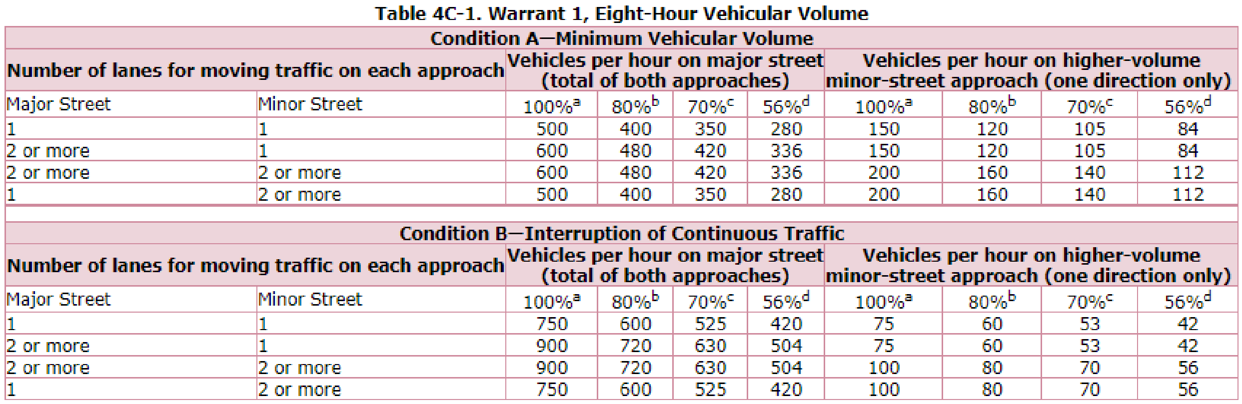


Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A—Minimum Vehicular Volume									
Number of lanes for moving traffic on each approach		**Vehicles per hour on major street (total of both approaches)**				**Vehicles per hour on higher-volume minor-street approach (one direction only)**			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B—Interruption of Continuous Traffic									
Number of lanes for moving traffic on each approach		**Vehicles per hour on major street (total of both approaches)**				**Vehicles per hour on higher-volume minor-street approach (one direction only)**			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

[a] Basic minimum hourly volume

[b]Used for combination of Conditions A and B after adequate trial of other remedial measures
[c]May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000
[d]May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph of in an isolated community with a population of less than 10,000

Conclusion of Warrant 1: The maximum hour minor-street volume, (coming from Silver Way) is 29 vehicles. This minor-street approach volume is too low to meet a, b, c, or d, for either Condition A or B. The major street, Waugh Chapel Road also only has a speed limit of 35 mph. This means c and d do not apply.

Warrant 2: Four-Hour Vehicular Volume

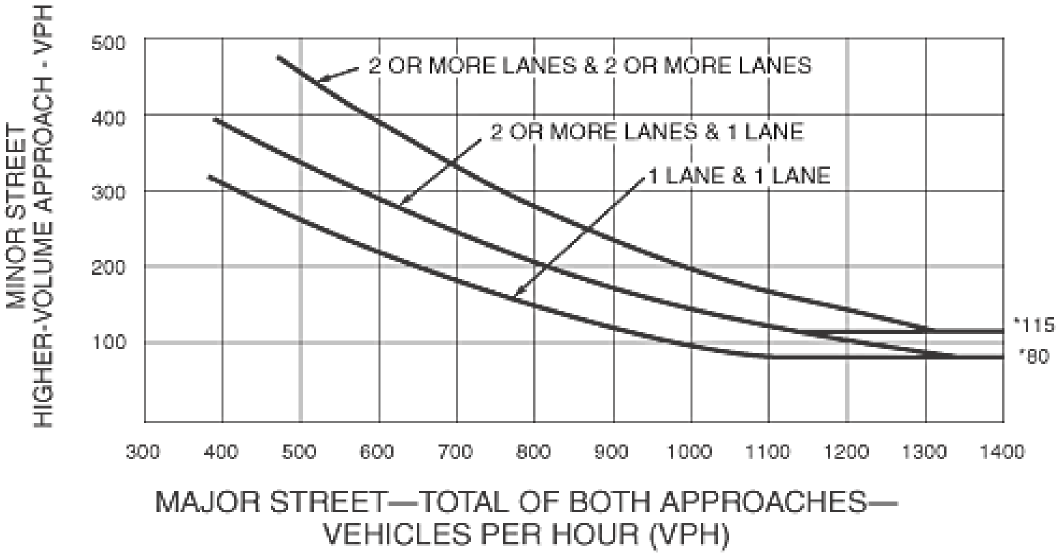
Support:

The Four-Hour Vehicular Volume signal warrant conditions are intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic control signal.

Standard:

The need for a traffic control signal shall be considered if an engineering study finds that, for each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) all fall above the applicable curve in Figure 4C-1 for the existing combination of approach lanes. On the minor street, the higher volume shall not be required to be on the same approach during each of these 4 hours.

Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Conclusion of Warrant 2: As seen in Figure 4C-1, the minimum threshold for a minor-street approach with one lane is 80 vph. Since the highest hour minor-street volume, (coming from Silver Way) is 29 vehicles this option is not valid. Also since the posted speed limit is less than 40 mph, Figure 4C-2 may not be considered in place of Figure 4C-1.

Warrant 3: Peak Hour

Support:

The Peak Hour signal warrant is intended for use at a location where traffic conditions are such that for a minimum of 1 hour of an average day, the minor-street traffic suffers undue delay when entering or crossing the major street.

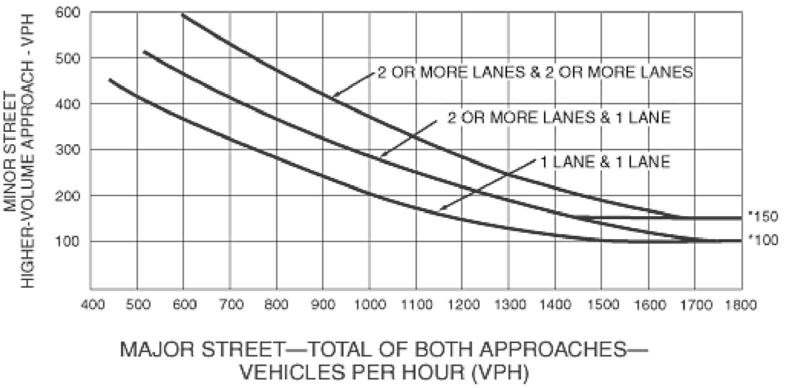
Standard:

The need for a traffic control signal shall be considered if an engineering study finds that the criteria in either of the following two categories are met:

A. If all three of the following conditions exist for the same 1 hour (any four consecutive 15-minute periods) of an average day:
   1. The total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach; and
   2. The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes; and
   3. The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches.

B. The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4C-3 for the existing combination of approach lanes.

Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Conclusion of Warrant 3: As seen in Figure 4C-3, the minimum threshold for a minor-street approach with one lane is 100 vph. Since the highest hour minor-street volume, (coming from Silver Way) is 29 vehicles this option is not valid. Also since the posted speed limit is less than 40 mph, Figure 4C-4 may not be considered in place of Figure 4C-3. Because of this low side street volume Criteria A, number 2 is not met either. Because all numbers must be met for Criteria A to be met, Criteria A is invalid.

Guidance:
If this warrant is the only warrant met and a traffic control signal is justified by an engineering study, the traffic control signal should be traffic-actuated.

However, If this warrant is the only warrant met and a traffic control signal is justified by an engineering study, the traffic control signal may be operated in the flashing mode during the hours that the volume criteria of this warrant are not met.

Warrant 4: Pedestrian Volume

Support:

The Pedestrian Volume signal warrant is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street.

Standard:

The need for a traffic control signal at an intersection or midblock crossing shall be considered if an engineering study finds that one of the following criteria is met:

A. For each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) all fall above the curve in Figure 4C-5; or
B. For 1 hour (any four consecutive 15-minute periods) of an average day, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) falls above the curve in Figure 4C-7.

Conclusion of Warrant 4: The max pedestrian volume during any given hour at this intersection is 1. A count of 1 pedestrian is not an accurate representation of delay for pedestrians during a given hour. This warrant is not valid.

Warrant 5: School Crossing

Support:

The School Crossing signal warrant is intended for application where the fact that schoolchildren cross the major street is the principal reason to consider installing a traffic control signal. For the purposes of this warrant, the word "schoolchildren" includes elementary through high school students.

Standard:

The need for a traffic control signal shall be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream as related to the number and size of groups of schoolchildren at an established school crossing across the major street shows that the number of adequate gaps in the traffic stream during the period when the schoolchildren are using the crossing is less than the number of minutes in the same period (see Section 7A.03) and there are a minimum of 20 schoolchildren during the highest crossing hour.

03 Before a decision is made to install a traffic control signal, consideration shall be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing.

04 The School Crossing signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of traffic.

Conclusion of Warrant 5: The schools Four Seasons Elementary School and The School of the Incarnation have some pedestrians around the intersections of Waugh Chapel Road and Maytime Drive as well as Waugh Chapel Road and Symphony Lane. However, given the counts of pedestrians at the intersection of Waugh Chapel and Silver Way being a max of one during any hour it is concluded these schools do not affect this intersection and therefore, this warrant is not met.

Warrant 6: Coordinated Signal System

Support:

Progressive movement in a coordinated signal system sometimes necessitates installing traffic control signals at intersections where they would not otherwise be needed in order to maintain proper platooning of vehicles.

Standard:

The need for a traffic control signal shall be considered if an engineering study finds that one of the following criteria is met:

A. On a one-way street or a street that has traffic predominantly in one direction, the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning.

B. On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation.

Guidance:

The Coordinated Signal System signal warrant should not be applied where the resultant spacing of traffic control signals would be less than 1,000 feet.

Warrant Conclusion: Along this corridor there is no signal to the east of this intersection until New Market Lane, about 3800 feet to the east along the corridor. To the west about 1200 feet is a signal at the intersection of Waugh Chapel Road and Silver Run Road/Summerfield Road. Based on the field work performed on 1/8/2018 there was no evidence of progression and platooning failing. Therefore based on field observations of how this intersection interacts with adjacent intersections it is determined this warrant is not valid.

Warrant 7: Crash Experience

Support:

The Crash Experience signal warrant conditions are intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal.

Standard:

The need for a traffic control signal shall be considered if an engineering study finds that all of the following criteria are met:

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

Conclusion for Warrant 7: Criterion B is not met based on the crash data from 2014 to 2016. Criteria C is not met because the minor-street volumes are not high enough during any hour within the 8 hour period to meet the 80 percent requirements in Table 4C-1. Since all criteria must be met to call for the need of a traffic signal, this warrant is not valid.

Warrant 8: Roadway Network

Support:

Installing a traffic control signal at some intersections might be justified to encourage concentration and organization of traffic flow on a roadway network.

Standard:

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

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

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

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

Conclusion for Warrant 8: Since Waugh Chapel Road and Silver Way are not considered major routes this warrant is not valid.

Conclusion

Since no warrants are met, mainly due to the low volumes coming from Silver Way and Macmullen Drive, it is determined that there should be no signal placed at the intersection of Waugh Chapel Road and Silver Way/Macmullen Drive.

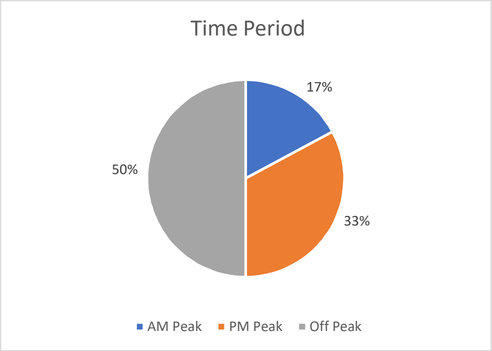
Appendix B-5

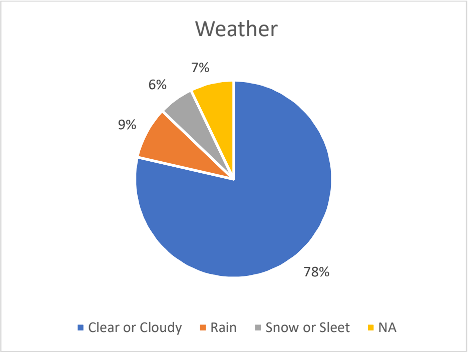
CRASH ANALYSIS

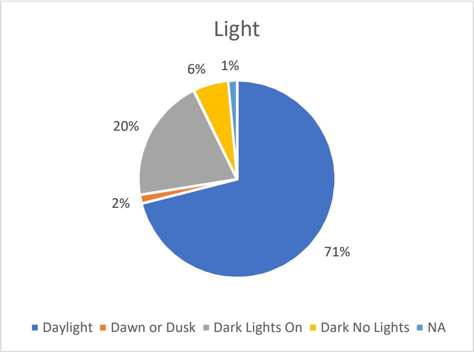
Waugh Chapel Road - Crash Analysis
January 1, 2014 to August 31st, 2017

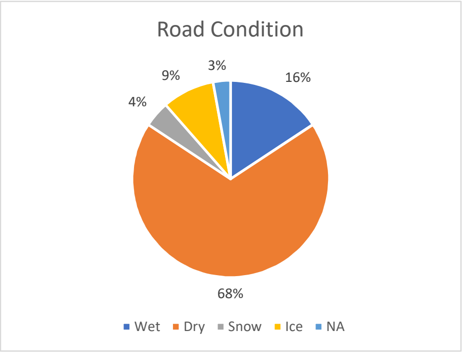
	Day		Time			Severity			Weather				Light				
Year	*Weekday*	*Weekend*	*AM Peak*	*PM Peak*	*Off Peak*	*No Injury*	*Injury*	*Fatal*	*Clear or Cloudy*	*Rain*	*Snow or Sleet*	*NA*	*Daylight*	*Dawn or Dusk*	*Dark Lights On*	*Dark No Lights*	*NA*
2014	12	1	2	6	5	6	7	0	12	1	0	0	10	0	3	0	0
2015	20	7	6	8	13	18	9	0	22	2	3	0	18	0	5	2	1
2016	20	2	3	6	13	14	8	0	16	2	1	3	15	1	5	1	0
2017	3	5	1	3	4	5	3	0	5	1	0	2	6	0	1	1	0
Total	**55**	**15**	**12**	**23**	**35**	**43**	**27**	**0**	**55**	**6**	**4**	**5**	**49**	**1**	**14**	**4**	**1**

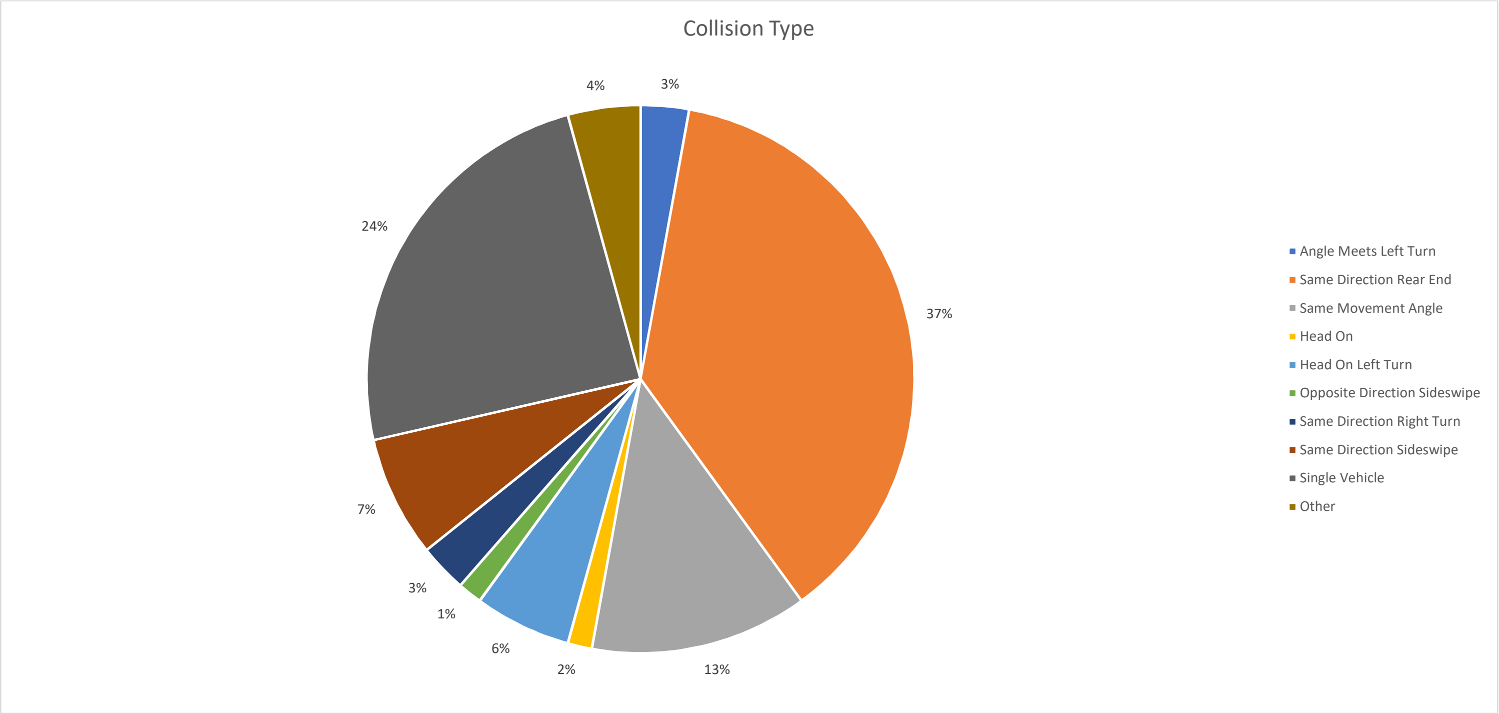
	Surface					Collision									
Year	*Wet*	*Dry*	*Snow*	*Ice*	*NA*	*Angle Meets Left Turn*	*Same Direction Rear End*	*Same Movement Angle*	*Head On*	*Head On Left Turn*	*Opposite Direction Sideswipe*	*Same Direction Right Turn*	*Same Direction Sideswipe*	*Single Vehicle*	*Other*
2014	2	10	0	0	1	0	6	3	0	1	0	0	1	2	0
2015	2	17	2	6	0	1	7	1	0	1	1	2	3	10	1
2016	5	15	1	0	1	0	13	2	1	1	0	0	1	3	1
2017	2	6	0	0	0	1	0	3	0	1	0	0	0	2	1
Total	**11**	**48**	**3**	**6**	**2**	**2**	**26**	**9**	**1**	**4**	**1**	**2**	**5**	**17**	**3**











Appendix C

FUTURE CONDITIONS TECHNICAL REPORTS

Appendix C-1

REFINED INTERSECTION ALTERNATIVES

Appendix A. Refined Intersection Alternatives for Screening Analysis

Intersection	Alternative B			Alternative C		
	Description	Benefit	Impact	Description	Benefit	Impact
Waugh Chapel Road/Maytime Drive	1) Restripe the NB approach to delineate a left-turn lane and a shared through/right-turn storage lane 2) Modify NB/SB phases to allow for protected/permissive left-turn movements	Improved traffic operations and safety for side street turning traffic	None	Single-lane roundabout	1) Reduces mainline speeds 2) Reduces number of conflict points	1) Increased vehicular delay and queuing on Waugh Chapel Road 2) increased intersection footprint
Waugh Chapel Road/Symphony Lane	1) Reduce NB/SB phase green time and increase EB phase green time 2) Signalize EB right turn lane with 5-section signal head to include a right-turn arrow for protected phasing	1) Improves traffic operations for EB Waugh Chapel Road and NB Symphony Lane 2) Eliminates potential conflicts between heavy EB right-turns and WB left-turns in the morning	None	-	-	-
Waugh Chapel Road/Macmullen Drive	1) Add WB exclusive left-turn storage lane 2) Add signal	1) Eliminates the potential safety hazard with WB left-turns blocking WB throughs 2) Improves side-street access and safety by providing dedicated signal phase for side streets 3) Reduces conflicts between mainline left turning vehicles and mainline through vehicles	1) Potential impact to existing built or environmental features 2) Increased intersection footprint	Two-lane roundabout	1) Reduces mainline speeds 2) Reduces number of conflict points 3) Improves side street traffic operations	1) Impact to existing built or environmental features 2) Increased intersection footprint 3) Longer crossing distance for pedestrians and bicyclists over Waugh Chapel Road
Waugh Chapel Road/Summerfield Road	1) Add signal 2) Add WB exclusive left-turn storage lane 3) Add EB exclusive right-turn storage lane	1) Eliminates the potential safety hazard with WB left-turns blocking WB throughs 2) Improves side-street access and safety 3) Improves EB right-turn access	1) Increased mainline delay 2) Increased intersection footprint 3) Potential conflict between EB right-turn and on-road bicycle lane	Single-lane roundabout	1) Speed reduction 2) Reduced number of conflict points 3) Improved side street access and safety	1) Potential impact to existing right of way 2) Increased intersection footprint 3) increased mainline delay and degraded intersection LOS
Waugh Chapel Road/New Market Lane	1) Change EB/WB left-turn phases to protected only 2) Extend westbound left-turn lane storage by 200 feet 3) Stripe out WB right-turn lane between the mid-block access from the Carroll's Creek and Wigeon Way; make WB right-most lane a shared through/right at the intersection; mid-block access would yield 4) Restripe NB approach to two exclusive left-turn lanes, and one shared right-turn/through lane 5) Change NB/SB signal phase from split phasing to protected left-turn phasing (offset SB approach to allow safe movement) 6) Provide leading pedestrian interval to protect pedestrians from NB right-turn	1) Reduces potential conflicts between heavy WB left-turn traffic into the shopping center and EB through traffic 2) Eliminates WB continuous right-turn lane between Wigeon Way and adjacent driveway and related safety concerns 3) Saves space for potential bicycle facility 4) Improves pedestrian safety for residents at Carroll's Creek to access the shopping center 5) Improves side street traffic operations by eliminating the split phasing	1) Increased delay and queuing for WB left-turn movement. 2) Impact to SB approach geometrics	1) Offset NB approach further west to remove geometric conflicts between NB/SB left-turns 2) Restripe NB approach to two exclusive left-turn lanes, one shared right-turn/through lane, and one exclusive right-turn lane 3) Change NB/SB signal phase from split phasing to protected left-turn phasing 4) Provide leading pedestrian interval to protect pedestrians from NB dual right-turn 5) Change EB/WB left-turn phases to protected only 6) Improve access points on WB Waugh Chapel Road and remove WB right-turn lane (same as Alternative B)	1) Improves side street traffic operations by eliminating the split phasing 2) Aligns NB/SB approach for safer left-turn movements 3) Improves pedestrian safety for residents at Carroll's Creek to access the shopping center 4) Reduces potential conflicts between heavy WB left-turn traffic into the shopping center and EB through traffic	Impacts the median on New Market Lane

Intersection	**Alternative D**		
	Description	**Benefit**	**Impact**
Waugh Chapel Road/Macmullen Drive	1) Green-T concept for left-turns out of Chapel Creek Village 2) Add exclusive WB left-turn lane 3) Restrict left-turns in and out of Silver Way	1) Eliminates the potential safety hazard with WB left-turns blocking WB throughs 2) Improves side-street access and safety by reducing number of conflicts 3) Reduces conflicts between left turning vehicles out of Chapel Creek Village and mainline through vehicles	1) Potential impact to existing built or environmental features 2) Increased intersection footprint 3) NB approach (Chapel Creek Village driveway) still experiences high delays in PM peak

Appendix C-2

ALTERNATIVE SCREENING MATRIX

Waugh Chapel Road Alternatives Study Screening Matrix

	Alternatives		Safety	Speed Management	Pedestrian/ Bicycle Access	Ease of Implementation	R/W & Utility Relocations	Ease of Access to/from Side Streets	Level of Service	Total Score
		Category Weighting	*3*	*3*	*3*	*2*	*2*	*2*	*1*	
Maytime Drive	Alternative A	No Build	1.5	1.5	1.5	2.0	2.0	1.0	0.5	10.0
	Alternative B	Turn lane and signal phasing improvement	3.0	1.5	1.5	2.0	2.0	1.0	0.5	11.5
	Alternative C	Roundabout	3.0	3.0	1.5	0.0	0.0	2.0	0.0	9.5
Symphony Lane/Silver Run	Alternative A	No Build	1.5	1.5	0.0	2.0	2.0	1.0	0.5	8.5
	Alternative B	Signal phasing and timing improvement	3.0	1.5	0.0	2.0	2.0	1.0	1.0	10.5
McMullen Drive/Silver Way	Alternative A	No Build	0.0	0.0	0.0	2.0	2.0	1.0	0.0	5.0
	Alternative B	Traffic signal and turn lanes	3.0	1.5	3.0	1.0	0.0	2.0	1.0	11.5
	Alternative C	Roundabout	3.0	3.0	3.0	0.0	0.0	2.0	1.0	12.0
Summerfield	Alternative A	No Build	0.0	0.0	0.0	2.0	2.0	0.0	0.0	4.0
	Alternative B	Traffic signal and turn lanes	3.0	1.5	3.0	1.0	1.0	2.0	1.0	12.5
	Alternative C	Roundabout	3.0	3.0	3.0	0.0	0.0	2.0	0.0	11.0
New Market Lane/Wigeon Way	Alternative A	No Build	0.0	1.5	1.5	2.0	2.0	1.0	0.5	8.5
	Alternative B	Intersection geometric and signal phasing improvement	3.0	1.5	3.0	1.0	2.0	2.0	0.0	12.5
	Alternative C	Intersection geometric and signal phasing improvement	3.0	1.5	3.0	1.0	2.0	2.0	0.5	13.0
New Connections	Alternative A	Evergreen Road - Strawberry Lake Way to Jackson Road	1.5	1.5	1.5	1.0	1.0	1.0	0.5	8.0
	Alternative B	Summerfield Road	1.5	1.5	1.5	1.0	1.0	1.0	0.5	8.0
Multimodal Connections		*Category Weighting*	*3*	*3*	*3*	*2*	*2*	*2*	*3*	
	Alternative A	Shared-Use	3.0	0.0	3.0	0.0	0.0	2.0	3.0	11.0
	Alternative B	On-Road Bike Lane and Sidewalk	3.0	0.0	3.0	1.0	0.0	2.0	1.5	10.5

+	Generally positive effect or better alternative
0	Generally no effect or moderate alternative
-	Generally negative effect or worse alternative

Future Alternative Screening Matrix

		Alternatives	Categories and Weighting														Total Score	Rank
			Pedestrian/ Bicycle Access		Speed Management		Safety		Ease of Implementation		R/W & Utility Relocations		Ease of Access to/from Side Streets		Level of Service			
			3		3		3		2		2		2		1			
			Effect	Score	Effect	Score	Effect	Score	Effect	Score	Effect	Score	Effect	Score	Effect	Score		
Maytime Drive	A	No Build	0	0.5	0	0.5	0	0.5	+	1	+	1	0	0	0	0.5	9.50	2
			1.5		1.5		1.50		2.0		2.0		1.0		0.5			
	B	Turn lane and signal phasing improvement	0	0.5	0	0.5	+	1.0	+	1.0	+	1.0	0	0.5	0	0.5	11.00	1
			1.5		1.5		3.0		2.0		2.0		1.0		0.5			
	C	Single-Lane Roundabout	0	0.5	+	1.0	+	1.0	-	0.0	-	0.0	+	1.0	-	0.0	9.50	2
			1.5		3.0		3.0		0.0		0.0		2.0		0.0			
Symphony Lane/Silver Run	A	No Build	-	0	0	0.5	0	0.5	+	1.0	+	1.0	0	0.5	0	0.5	8.00	2
			0.0		1.5		1.5		2.0		2.0		1.0		0.5			
	B	Signal phasing and timing improvement	-	0.0	0	0.0	+	1.0	+	1.0	+	1.0	0	0.5	+	1.0	9.50	1
			0.0		1.5		3.0		2.0		2.0		1.0		1.0			
Macmullen Drive/Silver Way	A	No Build	-	0.0	-	0.0	-	0.0	+	1.0	+	1.0	0	0.5	-	0.0	5.00	4
			0.0		0.0		0.0		2.0		2.0		1.0		0.0			
	B	Traffic signal and turn lanes	+	1.0	0	0.5	+	1.0	0	0.5	-	0.0	+	1.0	+	1.0	10.50	3
			3.0		1.5		3.0		1.0		0.0		2.0		1.0			
	C	Two-Lane Roundabout	+	1.0	+	1.0	+	1.0	-	0.0	-	0.0	+	1.0	+	1.0	11.00	1
			3.0		3.0		3.0		0.0		0.0		2.0		1.0			
	D	Green-T	0	0.5	0	0.5	+	1.0	+	1.0	+	1.0	0	0.5	+	1.0	11.00	1
			1.5		1.5		3.0		2.0		2.0		1.0		1.0			
Summerfield	A	No Build	-	0.0	-	0.0	-	0.0	+	1.0	+	1.0	-	0.0	-	0.0	4.00	3
			0		0		0		2		2		0		0			
	B	Traffic signal and turn lanes	+	1.0	0	0.5	+	1.0	0	0.5	0	0.5	+	1.0	+	1.0	11.50	1
			3		2		3		1		1		2		1			
	C	Single-Lane Roundabout	+	1.0	+	1.0	+	1.0	-	0.0	-	0.0	+	1.0	-	0.0	11.00	2
			3		3		3		0		0		2		0			
New Market Lane/Wigeon Way	A	No Build	0	0.5	0	0.5	-	0.0	+	1.0	+	1.0	0	0.5	0	0.5	8.00	3
			2		2		0		2		2		1		1			
	B	Intersection geometric and signal phasing improvement	+	1.0	0	0.5	+	1.0	0	0.5	+	1.0	+	1.0	-	0.0	12.50	1
			3		2		3		1		2		2		0			
	C	Intersection geometric and signal phasing improvement	+	1.0	0	0.5	+	1.0	0	0.5	+	1.0	+	1.0	0	0.5	12.50	2
			3		2		3		1		2		2		1			
New Connections	A	Evergreen Road - Strawberry Lake Way to Jackson Road		0.5		0.5		0.5		0.5		0.5	0	0.5		0.5	7.50	
			2		2		2		1		1		1		1			
	B	Summerfield Road		0.5		0.5		0.5		0.5		0.5		0.5		0.5	7.50	
			2		2		2		1		1		1		1			

Effect	Description	Score
+	Generally positive effect or better alternative	1
0	Generally no effect or moderate alternative	0.5
-	Generally negative effect or worse alternative	0

🟩 Category Weighting - determined during
X
🟧 Category Score
=
⬜ Total Category Score with Weighting Applied

Scoring Calculations:
Category Weighting X Category Score = Total Category Score

*High level construction cost estimates

Future Bicycle and Pedestrian Alternative Screening Matrix - DRAFT

	Categories and Weighting										
	Pedestrian/ Bicycle Access		Intersection Safety		Bicycle Level of Stress		Ease of Implementation		R/W & Utility Relocations		Total Score
	3		2		3		2		2		
	Effect	Score	Effect	Score	Effect	Score	Effect	Score	Effect	Score	
Shared-Use Path	+	1	+	1	+	1	-	0	-	0	8.00
	3.0		2.00		3.0		0.0		0.0		
On-Road Bike Lanes	+	1	+	1	0	0.5	0	0.5	-	0	7.50
	3.0		2.00		1.5		1.0		0.0		

Effect	Description	
+	Generally positive effect or better alternative	1
0	Generally no effect or moderate alternative	0.5
-	Generally negative effect or worse alternative	0

Category Weighting - determined during the meetin

X

Category Score

=

Total Category Score with Weighting Applied

<u>Scoring Calculations:</u>

Category Weighting X Category Score = Total Category Score

Appendix C-3

SYNCHRO RESULTS

ALTERNATIVE B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Traffic Volume (vph)	30	803	60	40	863	50	60	7	44	29	1	36
Future Volume (vph)	30	803	60	40	863	50	60	7	44	29	1	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		4.5	5.0		4.5	5.0		4.5	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.87		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1843		1770	1848		1770	1623		1770	1590	
Flt Permitted	0.12	1.00		0.16	1.00		0.80	1.00		1.00	1.00	
Satd. Flow (perm)	229	1843		292	1848		1490	1623		1863	1590	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	33	873	65	43	938	54	65	8	48	32	1	39
RTOR Reduction (vph)	0	2	0	0	2	0	0	45	0	0	38	0
Lane Group Flow (vph)	33	936	0	43	990	0	65	11	0	32	2	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	61.1	58.1		61.2	57.9		11.5	5.0		7.7	3.1	
Effective Green, g (s)	61.1	58.1		61.2	57.9		11.5	5.0		7.7	3.1	
Actuated g/C Ratio	0.68	0.65		0.68	0.64		0.13	0.06		0.09	0.03	
Clearance Time (s)	5.0	5.0		4.5	5.0		4.5	5.0		4.5	5.0	
Vehicle Extension (s)	3.0	5.0		3.0	5.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	206	1189		252	1188		210	90		154	54	
v/s Ratio Prot	0.01	0.51		c0.01	c0.54		c0.02	0.01		0.01	0.00	
v/s Ratio Perm	0.10			0.11			c0.02			0.01		
v/c Ratio	0.16	0.79		0.17	0.83		0.31	0.12		0.21	0.04	
Uniform Delay, d1	11.8	11.5		9.9	12.3		35.5	40.4		38.3	42.0	
Progression Factor	1.00	1.00		0.20	0.44		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	5.3		0.2	5.4		0.8	0.6		0.7	0.3	
Delay (s)	12.2	16.8		2.2	10.8		36.4	41.0		39.0	42.3	
Level of Service	B	B		A	B		D	D		D	D	
Approach Delay (s)		16.6			10.4			38.5			40.9	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	15.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	19.5
Intersection Capacity Utilization	66.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↱			↰	↱		↰	↱
Traffic Volume (vph)	4	676	196	261	796	7	148	0	283	10	6	15
Future Volume (vph)	4	676	196	261	796	7	148	0	283	10	6	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00		0.97	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1860			1770	1583		1808	1583
Flt Permitted	0.34	1.00	1.00	0.09	1.00			0.75	1.00		0.82	1.00
Satd. Flow (perm)	632	1863	1583	169	1860			1389	1583		1525	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	735	213	284	865	8	161	0	308	11	7	16
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	70	0	0	13
Lane Group Flow (vph)	4	735	213	284	873	0	0	161	238	0	18	3
Turn Type	Perm	NA	Perm	pm+pt	NA		Perm	NA	pm+ov	Perm	NA	Perm
Protected Phases		6		5	2			8	5		4	
Permitted Phases	6		6	2			8		8	4		4
Actuated Green, G (s)	39.0	39.0	39.0	65.0	65.0			15.0	36.0		15.0	15.0
Effective Green, g (s)	39.0	39.0	39.0	65.0	65.0			15.0	36.0		15.0	15.0
Actuated g/C Ratio	0.43	0.43	0.43	0.72	0.72			0.17	0.40		0.17	0.17
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	273	807	685	495	1343			231	721		254	263
v/s Ratio Prot		c0.39		0.13	c0.47				0.08			
v/s Ratio Perm	0.01		0.13	0.28				c0.12	0.07		0.01	0.00
v/c Ratio	0.01	0.91	0.31	0.57	0.65			0.70	0.33		0.07	0.01
Uniform Delay, d1	14.5	23.9	16.7	19.8	6.5			35.4	18.7		31.6	31.3
Progression Factor	1.67	1.22	1.39	0.77	1.46			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.1	12.6	0.9	2.0	1.0			16.0	1.2		0.5	0.1
Delay (s)	24.4	41.6	24.1	17.3	10.6			51.4	19.9		32.2	31.4
Level of Service	C	D	C	B	B			D	B		C	C
Approach Delay (s)		37.6			12.2			30.7			31.8	
Approach LOS		D			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	25.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	90.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱			✣			✣	
Traffic Volume (vph)	1	965	2	4	1056	5	5	0	5	10	0	5
Future Volume (vph)	1	965	2	4	1056	5	5	0	5	10	0	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	1.00		1.00	1.00			0.93			0.96	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.97	
Satd. Flow (prot)	1770	1862		1770	1862			1695			1725	
Flt Permitted	0.95	1.00		0.95	1.00			0.91			0.87	
Satd. Flow (perm)	1770	1862		1770	1862			1587			1547	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	1049	2	4	1148	5	5	0	5	11	0	5
RTOR Reduction (vph)	0	0	0	0	0	0	0	8	0	0	13	0
Lane Group Flow (vph)	1	1051	0	4	1153	0	0	2	0	0	3	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)	1.0	61.1		1.0	61.1			14.4			14.4	
Effective Green, g (s)	1.0	61.1		1.0	61.1			14.4			14.4	
Actuated g/C Ratio	0.01	0.68		0.01	0.68			0.16			0.16	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	19	1264		19	1264			253			247	
v/s Ratio Prot	0.00	0.56		c0.00	c0.62							
v/s Ratio Perm								0.00			c0.00	
v/c Ratio	0.05	0.83		0.21	0.91			0.01			0.01	
Uniform Delay, d1	44.0	10.7		44.1	12.2			31.8			31.8	
Progression Factor	1.53	0.37		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.7	3.1		5.5	10.1			0.0			0.1	
Delay (s)	68.3	7.0		49.6	22.3			31.8			31.9	
Level of Service	E	A		D	C			C			C	
Approach Delay (s)		7.1			22.4			31.8			31.9	
Approach LOS		A			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	15.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	67.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣		↰	↱		↰	↱			✣	
Traffic Volume (vph)	1	979	19	27	1037	0	67	0	70	3	0	2
Future Volume (vph)	1	979	19	27	1037	0	67	0	70	3	0	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5		4.5	4.5		4.5	4.5			4.5	
Lane Util. Factor		1.00		1.00	1.00		1.00	1.00			1.00	
Frt		1.00		1.00	1.00		1.00	0.85			0.95	
Flt Protected		1.00		0.95	1.00		0.95	1.00			0.97	
Satd. Flow (prot)		1858		1770	1863		1770	1583			1711	
Flt Permitted		1.00		0.25	1.00		0.75	1.00			0.87	
Satd. Flow (perm)		1857		466	1863		1405	1583			1532	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	1064	21	29	1127	0	73	0	76	3	0	2
RTOR Reduction (vph)	0	0	0	0	0	0	0	69	0	0	5	0
Lane Group Flow (vph)	0	1086	0	29	1127	0	73	7	0	0	0	0
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		6		5	2			4			8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		91.3		99.5	99.5		11.5	11.5			11.5	
Effective Green, g (s)		91.3		99.5	99.5		11.5	11.5			11.5	
Actuated g/C Ratio		0.76		0.83	0.83		0.10	0.10			0.10	
Clearance Time (s)		4.5		4.5	4.5		4.5	4.5			4.5	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0			3.0	
Lane Grp Cap (vph)		1412		426	1544		134	151			146	
v/s Ratio Prot				0.00	c0.61			0.00				
v/s Ratio Perm		c0.58		0.05			c0.05				0.00	
v/c Ratio		0.77		0.07	0.73		0.54	0.05			0.00	
Uniform Delay, d1		8.3		3.0	4.4		51.8	49.3			49.1	
Progression Factor		1.00		0.85	1.56		1.00	1.00			1.00	
Incremental Delay, d2		4.1		0.1	2.9		4.5	0.1			0.0	
Delay (s)		12.3		2.6	9.8		56.2	49.4			49.1	
Level of Service		B		A	A		E	D			D	
Approach Delay (s)		12.3			9.6			52.7			49.1	
Approach LOS		B			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	13.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	67.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↱		↰↰	↱		↰	↱	
Traffic Volume (vph)	3	723	277	89	958	5	158	2	114	18	5	0
Future Volume (vph)	3	723	277	89	958	5	158	2	114	18	5	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.97	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.85		1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	3537		3433	1588		1770	1863	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3539	1583	1770	3537		3433	1588		1770	1863	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	786	301	97	1041	5	172	2	124	20	5	0
RTOR Reduction (vph)	0	0	121	0	0	0	0	112	0	0	0	0
Lane Group Flow (vph)	3	786	180	97	1046	0	172	14	0	20	5	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6									
Actuated Green, G (s)	1.3	71.7	71.7	12.1	82.5		12.8	11.4		2.8	1.4	
Effective Green, g (s)	1.3	71.7	71.7	12.1	82.5		12.8	11.4		2.8	1.4	
Actuated g/C Ratio	0.01	0.60	0.60	0.10	0.69		0.11	0.10		0.02	0.01	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	19	2114	945	178	2431		366	150		41	21	
v/s Ratio Prot	0.00	0.22		c0.05	c0.30		c0.05	c0.01		0.01	0.00	
v/s Ratio Perm			0.11									
v/c Ratio	0.16	0.37	0.19	0.54	0.43		0.47	0.09		0.49	0.24	
Uniform Delay, d1	58.8	12.5	11.0	51.3	8.3		50.4	49.6		57.9	58.8	
Progression Factor	0.91	0.96	1.46	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.7	0.3	0.3	3.4	0.6		1.0	0.3		8.9	5.8	
Delay (s)	56.1	12.3	16.3	54.7	8.9		51.4	49.8		66.7	64.6	
Level of Service	E	B	B	D	A		D	D		E	E	
Approach Delay (s)		13.5			12.8			50.7			66.3	
Approach LOS		B			B			D			E	

Intersection Summary			
HCM 2000 Control Delay	18.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	55.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Traffic Volume (vph)	36	1203	65	41	1201	30	42	0	24	30	2	16
Future Volume (vph)	36	1203	65	41	1201	30	42	0	24	30	2	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		4.5	5.0		4.5	5.0		4.5	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00		1.00	0.85		1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1848		1770	1856		1770	1583		1770	1613	
Flt Permitted	0.04	1.00		0.04	1.00		0.69	1.00		1.00	1.00	
Satd. Flow (perm)	77	1848		78	1856		1285	1583		1863	1613	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	1308	71	45	1305	33	46	0	26	33	2	17
RTOR Reduction (vph)	0	1	0	0	1	0	0	25	0	0	17	0
Lane Group Flow (vph)	39	1378	0	45	1337	0	46	1	0	33	2	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	101.1	96.4		101.0	96.1		13.1	5.8		6.3	2.4	
Effective Green, g (s)	101.1	96.4		101.0	96.1		13.1	5.8		6.3	2.4	
Actuated g/C Ratio	0.78	0.74		0.78	0.74		0.10	0.04		0.05	0.02	
Clearance Time (s)	5.0	5.0		4.5	5.0		4.5	5.0		4.5	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	121	1370		124	1372		156	70		87	29	
v/s Ratio Prot	0.01	c0.75		c0.01	0.72		c0.02	0.00		0.01	0.00	
v/s Ratio Perm	0.24			0.27			c0.01			0.01		
v/c Ratio	0.32	1.01		0.36	0.97		0.29	0.02		0.38	0.08	
Uniform Delay, d1	36.8	16.8		36.8	15.8		54.0	59.4		60.0	62.7	
Progression Factor	1.00	1.00		1.36	0.64		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.5	25.7		1.1	13.6		1.1	0.1		2.8	1.2	
Delay (s)	38.4	42.5		51.2	23.8		55.0	59.5		62.7	63.9	
Level of Service	D	D		D	C		E	E		E	E	
Approach Delay (s)		42.4			24.7			56.6			63.2	
Approach LOS		D			C			E			E	

Intersection Summary			
HCM 2000 Control Delay	34.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	19.5
Intersection Capacity Utilization	84.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

2: Symphony Lane/Silver Way & Waugh Chapel Road

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱			↰↑	↱		↰↑	↱
Traffic Volume (vph)	18	1192	42	138	1216	12	38	1	86	20	2	11
Future Volume (vph)	18	1192	42	138	1216	12	38	1	86	20	2	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00		0.96	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1860			1776	1583		1781	1583
Flt Permitted	0.15	1.00	1.00	0.04	1.00			0.71	1.00		0.71	1.00
Satd. Flow (perm)	274	1863	1583	74	1860			1329	1583		1329	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	20	1296	46	150	1322	13	41	1	93	22	2	12
RTOR Reduction (vph)	0	0	12	0	0	0	0	0	28	0	0	11
Lane Group Flow (vph)	20	1296	34	150	1335	0	0	42	65	0	24	1
Turn Type	Perm	NA	Perm	pm+pt	NA		Perm	NA	pm+ov	Perm	NA	Perm
Protected Phases		6		5	2			8	5		4	
Permitted Phases	6		6	2			8		8	4		4
Actuated Green, G (s)	96.3	96.3	96.3	111.8	111.8			8.2	18.7		8.2	8.2
Effective Green, g (s)	96.3	96.3	96.3	111.8	111.8			8.2	18.7		8.2	8.2
Actuated g/C Ratio	0.74	0.74	0.74	0.86	0.86			0.06	0.14		0.06	0.06
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	202	1380	1172	200	1599			83	288		83	99
v/s Ratio Prot		c0.70		0.06	c0.72				0.02			
v/s Ratio Perm	0.07		0.02	0.59				c0.03	0.02		0.02	0.00
v/c Ratio	0.10	0.94	0.03	0.75	0.83			0.51	0.22		0.29	0.01
Uniform Delay, d1	4.7	14.4	4.5	46.9	4.5			58.9	49.2		58.1	57.1
Progression Factor	1.48	1.14	2.51	0.72	1.66			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.4	6.3	0.0	1.5	0.5			4.8	0.4		1.9	0.0
Delay (s)	7.4	22.7	11.2	35.0	8.0			63.7	49.6		60.0	57.1
Level of Service	A	C	B	D	A			E	D		E	E
Approach Delay (s)		22.1			10.7			54.0			59.1	
Approach LOS		C			B			D			E	

Intersection Summary			
HCM 2000 Control Delay	18.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	106.9%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
3: Macmullen Drive/Silver Way & Waugh Chapel Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱			✥			✥	
Traffic Volume (vph)	5	1283	2	2	1367	22	2	0	3	12	0	4
Future Volume (vph)	5	1283	2	2	1367	22	2	0	3	12	0	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	1.00		1.00	1.00			0.92			0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.98			0.96	
Satd. Flow (prot)	1770	1862		1770	1858			1678			1737	
Flt Permitted	0.95	1.00		0.95	1.00			0.94			0.85	
Satd. Flow (perm)	1770	1862		1770	1858			1617			1533	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	1395	2	2	1486	24	2	0	3	13	0	4
RTOR Reduction (vph)	0	0	0	0	0	0	0	4	0	0	15	0
Lane Group Flow (vph)	5	1397	0	2	1510	0	0	1	0	0	2	0
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	
Protected Phases	1	6		5	2			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	1.4	97.2		1.3	97.1			18.0			18.0	
Effective Green, g (s)	1.4	97.2		1.3	97.1			18.0			18.0	
Actuated g/C Ratio	0.01	0.75		0.01	0.75			0.14			0.14	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	19	1392		17	1387			223			212	
v/s Ratio Prot	c0.00	0.75		0.00	c0.81							
v/s Ratio Perm								0.00			c0.00	
v/c Ratio	0.26	1.00		0.12	1.09			0.00			0.01	
Uniform Delay, d1	63.8	16.4		63.8	16.5			48.3			48.3	
Progression Factor	1.22	0.29		1.00	1.00			1.00			1.00	
Incremental Delay, d2	3.4	17.4		3.1	52.0			0.0			0.1	
Delay (s)	81.2	22.2		66.9	68.5			48.3			48.4	
Level of Service	F	C		E	E			D			D	
Approach Delay (s)		22.4			68.5			48.3			48.4	
Approach LOS		C			E			D			D	

Intersection Summary			
HCM 2000 Control Delay	46.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	84.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥		↰	↑			✥			✥	
Traffic Volume (vph)	1	1172	45	109	1305	3	20	0	71	9	0	3
Future Volume (vph)	1	1172	45	109	1305	3	20	0	71	9	0	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5		4.5	4.5			4.5			4.5	
Lane Util. Factor		1.00		1.00	1.00			1.00			1.00	
Frt		1.00		1.00	1.00			0.90			0.97	
Flt Protected		1.00		0.95	1.00			0.99			0.96	
Satd. Flow (prot)		1853		1770	1862			1649			1738	
Flt Permitted		1.00		0.20	1.00			0.92			0.56	
Satd. Flow (perm)		1853		369	1862			1533			1014	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	1274	49	118	1418	3	22	0	77	10	0	3
RTOR Reduction (vph)	0	1	0	0	0	0	0	72	0	0	12	0
Lane Group Flow (vph)	0	1323	0	118	1421	0	0	27	0	0	1	0
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		6		5	2			4			8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		91.6		102.9	102.9			8.1			8.1	
Effective Green, g (s)		91.6		102.9	102.9			8.1			8.1	
Actuated g/C Ratio		0.76		0.86	0.86			0.07			0.07	
Clearance Time (s)		4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		1414		395	1596			103			68	
v/s Ratio Prot				0.02	c0.76							
v/s Ratio Perm		0.71		0.24				c0.02			0.00	
v/c Ratio		0.94		0.30	0.89			0.26			0.01	
Uniform Delay, d1		11.8		3.4	5.2			53.1			52.2	
Progression Factor		1.00		0.66	1.57			1.00			1.00	
Incremental Delay, d2		12.8		0.4	7.2			1.4			0.1	
Delay (s)		24.6		2.6	15.3			54.5			52.3	
Level of Service		C		A	B			D			D	
Approach Delay (s)		24.6			14.3			54.5			52.3	
Approach LOS		C			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	20.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	102.3%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↱		↰↰	↱		↰	↱	
Traffic Volume (vph)	4	846	368	207	914	5	448	6	284	8	1	11
Future Volume (vph)	4	846	368	207	914	5	448	6	284	8	1	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.97	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.85		1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	3537		3433	1590		1770	1605	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3539	1583	1770	3537		3433	1590		1770	1605	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	920	400	225	993	5	487	7	309	9	1	12
RTOR Reduction (vph)	0	0	223	0	0	0	0	246	0	0	12	0
Lane Group Flow (vph)	4	920	177	225	998	0	487	70	0	9	1	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6									
Actuated Green, G (s)	0.8	53.0	53.0	19.7	72.9		22.1	24.3		1.0	3.2	
Effective Green, g (s)	0.8	53.0	53.0	19.7	72.9		22.1	24.3		1.0	3.2	
Actuated g/C Ratio	0.01	0.44	0.44	0.16	0.61		0.18	0.20		0.01	0.03	
Clearance Time (s)	6.0	6.0	6.0	6.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	11	1563	699	290	2148		632	321		14	42	
v/s Ratio Prot	0.00	c0.26		c0.13	0.28		c0.14	c0.04		0.01	0.00	
v/s Ratio Perm			0.11									
v/c Ratio	0.36	0.59	0.25	0.78	0.46		0.77	0.22		0.64	0.03	
Uniform Delay, d1	59.3	25.3	21.1	48.0	12.9		46.5	39.9		59.3	56.9	
Progression Factor	0.93	0.95	1.34	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	8.5	0.7	0.4	12.2	0.7		5.8	0.3		71.2	0.3	
Delay (s)	63.6	24.6	28.6	60.3	13.6		52.3	40.3		130.5	57.2	
Level of Service	E	C	C	E	B		D	D		F	E	
Approach Delay (s)		25.9			22.2			47.6			87.2	
Approach LOS		C			C			D			F	

Intersection Summary			
HCM 2000 Control Delay	30.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	68.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: Maytime Drive & Waugh Chapel Rd

Alternative B
Timing Plan: Saturday Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Traffic Volume (vph)	20	759	26	37	745	20	26	2	58	42	2	24
Future Volume (vph)	20	759	26	37	745	20	26	2	58	42	2	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		4.5	5.0		4.5	5.0		4.5	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00		1.00	0.85		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1854		1770	1855		1770	1592		1770	1603	
Flt Permitted	0.26	1.00		0.24	1.00		0.72	1.00		0.71	1.00	
Satd. Flow (perm)	482	1854		447	1855		1340	1592		1331	1603	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	825	28	40	810	22	28	2	63	46	2	26
RTOR Reduction (vph)	0	1	0	0	1	0	0	59	0	0	25	0
Lane Group Flow (vph)	22	852	0	40	831	0	28	6	0	46	3	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	96.7	93.0		99.0	93.9		12.6	7.6		12.2	7.4	
Effective Green, g (s)	96.7	93.0		99.0	93.9		12.6	7.6		12.2	7.4	
Actuated g/C Ratio	0.75	0.72		0.76	0.73		0.10	0.06		0.09	0.06	
Clearance Time (s)	5.0	5.0		4.5	5.0		4.5	5.0		4.5	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	396	1331		393	1345		146	93		141	91	
v/s Ratio Prot	0.00	c0.46		c0.00	0.45		0.01	0.00		c0.01	0.00	
v/s Ratio Perm	0.04			0.07			0.01			c0.02		
v/c Ratio	0.06	0.64		0.10	0.62		0.19	0.06		0.33	0.04	
Uniform Delay, d1	6.6	9.5		7.1	8.9		53.6	57.6		54.5	57.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	1.1		0.1	2.1		0.6	0.3		1.4	0.2	
Delay (s)	6.7	10.6		7.2	11.0		54.3	57.9		55.9	57.9	
Level of Service	A	B		A	B		D	E		E	E	
Approach Delay (s)		10.5			10.8			56.8			56.6	
Approach LOS		B			B			E			E	

Intersection Summary			
HCM 2000 Control Delay	14.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	129.5	Sum of lost time (s)	19.5
Intersection Capacity Utilization	58.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
2: Symphony Lane/Silver Way & Waugh Chapel Road

Alternative B
Timing Plan: Saturday Peak

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱			↰↑	↱		↰↑	↱
Traffic Volume (vph)	9	852	3	30	796	13	2	0	34	5	0	7
Future Volume (vph)	9	852	3	30	796	13	2	0	34	5	0	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00		0.95	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1858			1770	1583		1770	1583
Flt Permitted	0.34	1.00	1.00	0.25	1.00			1.00	1.00		1.00	1.00
Satd. Flow (perm)	629	1863	1583	462	1858			1863	1583		1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	926	3	33	865	14	2	0	37	5	0	8
RTOR Reduction (vph)	0	0	1	0	0	0	0	0	36	0	0	8
Lane Group Flow (vph)	10	926	2	33	879	0	0	2	1	0	5	0
Turn Type	Perm	NA	Perm	pm+pt	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		6		5	2			8			4	
Permitted Phases	6		6	2			8		8	4		4
Actuated Green, G (s)	97.5	97.5	97.5	106.1	106.1			3.9	3.9		3.9	3.9
Effective Green, g (s)	97.5	97.5	97.5	106.1	106.1			3.9	3.9		3.9	3.9
Actuated g/C Ratio	0.81	0.81	0.81	0.88	0.88			0.03	0.03		0.03	0.03
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	511	1513	1286	447	1642			60	51		60	51
v/s Ratio Prot		c0.50		0.00	c0.47							
v/s Ratio Perm	0.02		0.00	0.06				0.00	0.00		c0.00	0.00
v/c Ratio	0.02	0.61	0.00	0.07	0.54			0.03	0.02		0.08	0.01
Uniform Delay, d1	2.1	4.2	2.1	3.3	1.5			56.2	56.2		56.3	56.2
Progression Factor	1.00	1.00	1.00	0.91	1.66			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.1	1.9	0.0	0.1	1.0			0.2	0.2		0.6	0.0
Delay (s)	2.2	6.1	2.1	3.1	3.5			56.5	56.4		56.9	56.2
Level of Service	A	A	A	A	A			E	E		E	E
Approach Delay (s)		6.0			3.5			56.4			56.5	
Approach LOS		A			A			E			E	

Intersection Summary			
HCM 2000 Control Delay	6.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	64.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱			✥			✥	
Traffic Volume (vph)	2	889	0	9	824	15	0	0	4	13	0	7
Future Volume (vph)	2	889	0	9	824	15	0	0	4	13	0	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	1.00		1.00	1.00			0.86			0.95	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.97	
Satd. Flow (prot)	1770	1863		1770	1858			1611			1717	
Flt Permitted	0.95	1.00		0.95	1.00			1.00			0.87	
Satd. Flow (perm)	1770	1863		1770	1858			1611			1542	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	966	0	10	896	16	0	0	4	14	0	8
RTOR Reduction (vph)	0	0	0	0	1	0	0	3	0	0	19	0
Lane Group Flow (vph)	2	966	0	10	911	0	0	1	0	0	3	0
Turn Type	Prot	NA		Prot	NA			NA		Perm	NA	
Protected Phases	1	6		5	2			8			4	
Permitted Phases							8			4		
Actuated Green, G (s)	1.2	87.2		1.3	87.3			18.0			18.0	
Effective Green, g (s)	1.2	87.2		1.3	87.3			18.0			18.0	
Actuated g/C Ratio	0.01	0.73		0.01	0.73			0.15			0.15	
Clearance Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	17	1353		19	1351			241			231	
v/s Ratio Prot	0.00	c0.52		c0.01	0.49			0.00				
v/s Ratio Perm											c0.00	
v/c Ratio	0.12	0.71		0.53	0.67			0.00			0.01	
Uniform Delay, d1	58.9	9.3		59.0	8.7			43.4			43.4	
Progression Factor	1.41	0.74		0.98	0.91			1.00			1.00	
Incremental Delay, d2	2.6	2.7		19.7	2.2			0.0			0.1	
Delay (s)	85.5	9.6		77.7	10.2			43.4			43.6	
Level of Service	F	A		E	B			D			D	
Approach Delay (s)		9.7			10.9			43.4			43.6	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	10.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	62.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣		↰	↱			✣			✣	
Traffic Volume (vph)	2	853	45	109	912	5	30	0	30	2	0	3
Future Volume (vph)	2	853	45	109	912	5	30	0	30	2	0	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5		4.5	4.5			4.5			4.5	
Lane Util. Factor		1.00		1.00	1.00			1.00			1.00	
Frt		0.99		1.00	1.00			0.93			0.92	
Flt Protected		1.00		0.95	1.00			0.98			0.98	
Satd. Flow (prot)		1850		1770	1861			1695			1678	
Flt Permitted		1.00		0.28	1.00			0.84			0.88	
Satd. Flow (perm)		1848		529	1861			1458			1508	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2	927	49	118	991	5	33	0	33	2	0	3
RTOR Reduction (vph)	0	1	0	0	0	0	0	52	0	0	5	0
Lane Group Flow (vph)	0	977	0	118	996	0	0	14	0	0	0	0
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		6		5	2			4			8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)		93.7		104.8	104.8			6.2			6.2	
Effective Green, g (s)		93.7		104.8	104.8			6.2			6.2	
Actuated g/C Ratio		0.78		0.87	0.87			0.05			0.05	
Clearance Time (s)		4.5		4.5	4.5			4.5			4.5	
Vehicle Extension (s)		3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)		1442		530	1625			75			77	
v/s Ratio Prot				0.01	c0.54							
v/s Ratio Perm		c0.53		0.18				c0.01			0.00	
v/c Ratio		0.68		0.22	0.61			0.18			0.00	
Uniform Delay, d1		6.1		2.0	2.1			54.5			54.0	
Progression Factor		1.40		1.00	1.00			1.00			1.00	
Incremental Delay, d2		1.9		0.2	1.7			1.2			0.0	
Delay (s)		10.4		2.3	3.8			55.7			54.0	
Level of Service		B		A	A			E			D	
Approach Delay (s)		10.4			3.6			55.7			54.0	
Approach LOS		B			A			E			D	

Intersection Summary			
HCM 2000 Control Delay	8.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.5
Intersection Capacity Utilization	100.1%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

5: New Market Lane/Wigeon Way & Waugh Chapel Rd

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↱		↰↰	↱		↰	↱	
Traffic Volume (vph)	10	536	362	278	463	4	456	8	419	14	9	5
Future Volume (vph)	10	536	362	278	463	4	456	8	419	14	9	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.97	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.85		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	3535		3433	1589		1770	1770	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3539	1583	1770	3535		3433	1589		1770	1770	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	583	393	302	503	4	496	9	455	15	10	5
RTOR Reduction (vph)	0	0	206	0	0	0	0	346	0	0	5	0
Lane Group Flow (vph)	11	583	187	302	507	0	496	118	0	15	10	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases			6									
Actuated Green, G (s)	1.5	61.2	61.2	21.1	80.8		22.7	22.7		1.8	1.8	
Effective Green, g (s)	1.5	61.2	61.2	21.1	80.8		22.7	22.7		1.8	1.8	
Actuated g/C Ratio	0.01	0.48	0.48	0.16	0.63		0.18	0.18		0.01	0.01	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	20	1681	752	289	2217		605	280		24	24	
v/s Ratio Prot	0.01	c0.16		c0.17	0.14		c0.14	c0.07		0.01	0.01	
v/s Ratio Perm			0.12									
v/c Ratio	0.55	0.35	0.25	1.04	0.23		0.82	0.42		0.62	0.42	
Uniform Delay, d1	63.3	21.2	20.1	53.9	10.4		51.1	47.2		63.2	63.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	28.9	0.6	0.8	65.2	0.2		8.5	1.0		41.4	11.4	
Delay (s)	92.2	21.8	20.9	119.0	10.7		59.6	48.2		104.5	74.4	
Level of Service	F	C	C	F	B		E	D		F	E	
Approach Delay (s)		22.2			51.1			54.1			89.5	
Approach LOS		C			D			D			F	

Intersection Summary			
HCM 2000 Control Delay	42.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	128.8	Sum of lost time (s)	24.0
Intersection Capacity Utilization	72.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Appendix C-3

SYNCHRO AND SIDRA RESULTS
ALTERNATIVE C

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↱		↰	↱	
Traffic Volume (vph)	30	803	60	40	863	50	60	7	44	29	1	36
Future Volume (vph)	30	803	60	40	863	50	60	7	44	29	1	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.5	5.0	5.0	4.5	5.0		4.5	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.87		1.00	0.85	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1623		1770	1590	
Flt Permitted	0.15	1.00	1.00	0.19	1.00	1.00	0.80	1.00		1.00	1.00	
Satd. Flow (perm)	286	1863	1583	361	1863	1583	1490	1623		1863	1590	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	33	873	65	43	938	54	65	8	48	32	1	39
RTOR Reduction (vph)	0	0	23	0	0	19	0	45	0	0	38	0
Lane Group Flow (vph)	33	873	42	43	938	35	65	11	0	32	2	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6		6	2		2	4			8		
Actuated Green, G (s)	61.1	58.1	58.1	61.2	57.9	57.9	11.5	5.0		7.7	3.1	
Effective Green, g (s)	61.1	58.1	58.1	61.2	57.9	57.9	11.5	5.0		7.7	3.1	
Actuated g/C Ratio	0.68	0.65	0.65	0.68	0.64	0.64	0.13	0.06		0.09	0.03	
Clearance Time (s)	5.0	5.0	5.0	4.5	5.0	5.0	4.5	5.0		4.5	5.0	
Vehicle Extension (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	243	1202	1021	297	1198	1018	210	90		154	54	
v/s Ratio Prot	0.00	0.47		c0.01	c0.50		c0.02	0.01		0.01	0.00	
v/s Ratio Perm	0.09		0.03	0.09		0.02	c0.02			0.01		
v/c Ratio	0.14	0.73	0.04	0.14	0.78	0.03	0.31	0.12		0.21	0.04	
Uniform Delay, d1	10.1	10.6	5.8	8.4	11.5	5.9	35.5	40.4		38.3	42.0	
Progression Factor	1.00	1.00	1.00	0.72	0.82	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	3.9	0.1	0.2	3.9	0.0	0.8	0.6		0.7	0.3	
Delay (s)	10.3	14.5	5.9	6.2	13.5	5.9	36.4	41.0		39.0	42.3	
Level of Service	B	B	A	A	B	A	D	D		D	D	
Approach Delay (s)		13.8			12.8			38.5			40.9	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	15.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	19.5
Intersection Capacity Utilization	63.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

2: Symphony Lane/Silver Way & Waugh Chapel Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱			↰↑	↱		↰↑	↱
Traffic Volume (vph)	4	676	196	261	796	7	148	0	283	10	6	15
Future Volume (vph)	4	676	196	261	796	7	148	0	283	10	6	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00		0.97	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1860			1770	1583		1808	1583
Flt Permitted	0.34	1.00	1.00	0.09	1.00			0.75	1.00		0.82	1.00
Satd. Flow (perm)	632	1863	1583	169	1860			1389	1583		1525	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	735	213	284	865	8	161	0	308	11	7	16
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	70	0	0	13
Lane Group Flow (vph)	4	735	213	284	873	0	0	161	238	0	18	3
Turn Type	Perm	NA	Perm	pm+pt	NA		Perm	NA	pm+ov	Perm	NA	Perm
Protected Phases		6		5	2			8	5		4	
Permitted Phases	6		6	2			8		8	4		4
Actuated Green, G (s)	39.0	39.0	39.0	65.0	65.0			15.0	36.0		15.0	15.0
Effective Green, g (s)	39.0	39.0	39.0	65.0	65.0			15.0	36.0		15.0	15.0
Actuated g/C Ratio	0.43	0.43	0.43	0.72	0.72			0.17	0.40		0.17	0.17
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	273	807	685	495	1343			231	721		254	263
v/s Ratio Prot		c0.39		0.13	c0.47				0.08			
v/s Ratio Perm	0.01		0.13	0.28				c0.12	0.07		0.01	0.00
v/c Ratio	0.01	0.91	0.31	0.57	0.65			0.70	0.33		0.07	0.01
Uniform Delay, d1	14.5	23.9	16.7	19.8	6.5			35.4	18.7		31.6	31.3
Progression Factor	1.67	1.21	1.39	1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.1	13.3	0.9	4.8	2.4			16.0	1.2		0.5	0.1
Delay (s)	24.4	42.2	24.2	24.6	9.0			51.4	19.9		32.2	31.4
Level of Service	C	D	C	C	A			D	B		C	C
Approach Delay (s)		38.1			12.8			30.7			31.8	
Approach LOS		D			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	25.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	90.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱			✥			✥	
Traffic Volume (veh/h)	1	965	2	4	1056	5	5	0	5	10	0	5
Future Volume (Veh/h)	1	965	2	4	1056	5	5	0	5	10	0	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	1049	2	4	1148	5	5	0	5	11	0	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		1189										
pX, platoon unblocked				0.62			0.62	0.62	0.62	0.62	0.62	
vC, conflicting volume	1153			1051			2213	2213	1050	2214	2212	1150
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1153			770			2659	2659	768	2662	2657	1150
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			44	100	98	0	100	98
cM capacity (veh/h)	606			519			9	14	247	9	14	241

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	1	1051	4	1153	10	16
Volume Left	1	0	4	0	5	11
Volume Right	0	2	0	5	5	5
cSH	606	1700	519	1700	17	13
Volume to Capacity	0.00	0.62	0.01	0.68	0.58	1.26
Queue Length 95th (ft)	0	0	1	0	38	67
Control Delay (s)	11.0	0.0	12.0	0.0	371.2	749.6
Lane LOS	B		B		F	F
Approach Delay (s)	0.0		0.0		371.2	749.6
Approach LOS					F	F

Intersection Summary			
Average Delay	7.1		
Intersection Capacity Utilization	65.9%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰	↱		✥			✥	
Traffic Volume (veh/h)	0	949	37	8	1101	0	45	0	45	3	0	0
Future Volume (Veh/h)	0	949	37	8	1101	0	45	0	45	3	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1032	40	9	1197	0	49	0	49	3	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1197			1072			2247	2247	1032	2296	2287	1197
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1197			1072			2247	2247	1032	2296	2287	1197
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			0	100	83	87	100	100
cM capacity (veh/h)	583			650			29	41	283	22	39	226

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	1032	40	1206	0	98	3
Volume Left	0	0	9	0	49	3
Volume Right	0	40	0	0	49	0
cSH	583	1700	650	1700	53	22
Volume to Capacity	0.00	0.02	0.01	0.00	1.84	0.13
Queue Length 95th (ft)	0	0	1	0	237	10
Control Delay (s)	0.0	0.0	0.6	0.0	564.7	189.1
Lane LOS			A		F	F
Approach Delay (s)	0.0		0.6		564.7	189.1
Approach LOS					F	F

Intersection Summary			
Average Delay	23.8		
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		

5: New Market Lane/Wigeon Way & Waugh Chapel Rd

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↱		↰↰	↱	↱	↰	↱	
Traffic Volume (vph)	3	723	277	89	958	5	158	2	114	18	5	0
Future Volume (vph)	3	723	277	89	958	5	158	2	114	18	5	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.97	0.95	0.95	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.85	0.85	1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	3537		3433	1513	1504	1770	1863	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3539	1583	1770	3537		3433	1513	1504	1770	1863	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	786	301	97	1041	5	172	2	124	20	5	0
RTOR Reduction (vph)	0	0	123	0	0	0	0	55	49	0	0	0
Lane Group Flow (vph)	3	786	178	97	1046	0	172	8	14	20	5	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	pt+ov	Prot	NA	
Protected Phases	1	6		5	2		7	4	4 5	3	8	
Permitted Phases			6									
Actuated Green, G (s)	1.1	64.4	64.4	9.7	73.0		11.8	10.4	25.1	2.6	1.2	
Effective Green, g (s)	1.1	64.4	64.4	9.7	73.0		11.8	10.4	25.1	2.6	1.2	
Actuated g/C Ratio	0.01	0.59	0.59	0.09	0.67		0.11	0.10	0.23	0.02	0.01	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	17	2089	934	157	2366		371	144	346	42	20	
v/s Ratio Prot	0.00	0.22		c0.05	c0.30		c0.05	0.01	0.01	0.01	c0.00	
v/s Ratio Perm			0.11									
v/c Ratio	0.18	0.38	0.19	0.62	0.44		0.46	0.05	0.04	0.48	0.25	
Uniform Delay, d1	53.6	11.8	10.3	47.9	8.5		45.7	44.9	32.7	52.6	53.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.9	0.5	0.5	7.1	0.6		0.9	0.2	0.1	8.3	6.5	
Delay (s)	58.5	12.3	10.8	55.0	9.1		46.6	45.0	32.7	60.9	60.0	
Level of Service	E	B	B	D	A		D	D	C	E	E	
Approach Delay (s)		12.0			13.0			43.3			60.7	
Approach LOS		B			B			D			E	

Intersection Summary			
HCM 2000 Control Delay	16.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	109.1	Sum of lost time (s)	24.0
Intersection Capacity Utilization	55.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: Maytime Drive & Waugh Chapel Rd

Alternative C
Timing Plan: PM Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↱		↰	↱	
Traffic Volume (vph)	36	1203	65	41	1201	30	42	0	24	30	2	16
Future Volume (vph)	36	1203	65	41	1201	30	42	0	24	30	2	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.5	5.0	5.0	4.5	5.0		4.5	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.87	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1583		1770	1613	
Flt Permitted	0.06	1.00	1.00	0.06	1.00	1.00	1.00	1.00		1.00	1.00	
Satd. Flow (perm)	120	1863	1583	120	1863	1583	1863	1583		1863	1613	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	39	1308	71	45	1305	33	46	0	26	33	2	17
RTOR Reduction (vph)	0	0	22	0	0	10	0	25	0	0	17	0
Lane Group Flow (vph)	39	1308	49	45	1305	23	46	1	0	33	2	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6		6	2		2	4			8		
Actuated Green, G (s)	65.5	62.3	62.3	65.4	62.0	62.0	5.3	2.0		5.3	2.0	
Effective Green, g (s)	65.5	62.3	62.3	65.4	62.0	62.0	5.3	2.0		5.3	2.0	
Actuated g/C Ratio	0.73	0.69	0.69	0.73	0.69	0.69	0.06	0.02		0.06	0.02	
Clearance Time (s)	5.0	5.0	5.0	4.5	5.0	5.0	4.5	5.0		4.5	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	146	1289	1095	149	1283	1090	106	35		106	35	
v/s Ratio Prot	0.01	c0.70		c0.01	0.70		c0.02	0.00		0.01	0.00	
v/s Ratio Perm	0.19		0.03	0.21		0.01	c0.01			0.01		
v/c Ratio	0.27	1.01	0.04	0.30	1.02	0.02	0.43	0.02		0.31	0.07	
Uniform Delay, d1	22.7	13.9	4.4	22.6	14.0	4.4	40.9	43.0		40.6	43.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.0	28.8	0.1	1.1	29.5	0.0	2.8	0.2		1.7	0.8	
Delay (s)	23.7	42.6	4.5	23.7	43.5	4.5	43.8	43.2		42.3	43.9	
Level of Service	C	D	A	C	D	A	D	D		D	D	
Approach Delay (s)		40.2			41.9			43.6			42.9	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	41.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	19.5
Intersection Capacity Utilization	80.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱			↰↑	↱		↰↑	↱
Traffic Volume (vph)	18	1192	42	138	1216	12	38	1	86	20	2	11
Future Volume (vph)	18	1192	42	138	1216	12	38	1	86	20	2	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00		0.96	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1860			1776	1583		1781	1583
Flt Permitted	0.15	1.00	1.00	0.04	1.00			0.71	1.00		0.71	1.00
Satd. Flow (perm)	274	1863	1583	74	1860			1329	1583		1329	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	20	1296	46	150	1322	13	41	1	93	22	2	12
RTOR Reduction (vph)	0	0	12	0	0	0	0	0	28	0	0	11
Lane Group Flow (vph)	20	1296	34	150	1335	0	0	42	65	0	24	1
Turn Type	Perm	NA	Perm	pm+pt	NA		Perm	NA	pm+ov	Perm	NA	Perm
Protected Phases		6		5	2			8	5		4	
Permitted Phases	6		6	2			8		8	4		4
Actuated Green, G (s)	96.3	96.3	96.3	111.8	111.8			8.2	18.7		8.2	8.2
Effective Green, g (s)	96.3	96.3	96.3	111.8	111.8			8.2	18.7		8.2	8.2
Actuated g/C Ratio	0.74	0.74	0.74	0.86	0.86			0.06	0.14		0.06	0.06
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	202	1380	1172	200	1599			83	288		83	99
v/s Ratio Prot		c0.70		0.06	c0.72				0.02			
v/s Ratio Perm	0.07		0.02	0.59				c0.03	0.02		0.02	0.00
v/c Ratio	0.10	0.94	0.03	0.75	0.83			0.51	0.22		0.29	0.01
Uniform Delay, d1	4.7	14.4	4.5	46.9	4.5			58.9	49.2		58.1	57.1
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	1.0	13.5	0.0	14.6	5.3			4.8	0.4		1.9	0.0
Delay (s)	5.7	27.8	4.5	61.5	9.8			63.7	49.6		60.0	57.1
Level of Service	A	C	A	E	A			E	D		E	E
Approach Delay (s)		26.7			15.0			54.0			59.1	
Approach LOS		C			B			D			E	

Intersection Summary			
HCM 2000 Control Delay	22.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	106.9%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱			✣			✣	
Traffic Volume (veh/h)	5	1283	2	2	1367	22	2	0	3	12	0	4
Future Volume (Veh/h)	5	1283	2	2	1367	22	2	0	3	12	0	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	1395	2	2	1486	24	2	0	3	13	0	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		1189										
pX, platoon unblocked				0.29			0.29	0.29	0.29	0.29	0.29	
vC, conflicting volume	1510			1397			2900	2920	1396	2910	2909	1498
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1510			1145			6324	6393	1142	6358	6355	1498
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			0	100	96	0	100	97
cM capacity (veh/h)	443			177			0	0	71	0	0	150

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	5	1397	2	1510	5	17
Volume Left	5	0	2	0	2	13
Volume Right	0	2	0	24	3	4
cSH	443	1700	177	1700	0	0
Volume to Capacity	0.01	0.82	0.01	0.89	307.33	2161.84
Queue Length 95th (ft)	1	0	1	0	Err	Err
Control Delay (s)	13.2	0.0	25.6	0.0	Err	Err
Lane LOS	B		D		F	F
Approach Delay (s)	0.0		0.0		Err	Err
Approach LOS					F	F

Intersection Summary			
Average Delay	75.0		
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		

4: Summerfield Rd/Driveway & Waugh Chapel Rd

Timing Plan: PM Peak

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰	↱		✥			✥	
Traffic Volume (veh/h)	0	1218	79	20	1393	3	21	0	21	9	0	3
Future Volume (Veh/h)	0	1218	79	20	1393	3	21	0	21	9	0	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1324	86	22	1514	3	23	0	23	10	0	3
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1517			1410			2885	2885	1324	2905	2968	1514
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1517			1410			2885	2885	1324	2905	2968	1514
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			95			0	100	88	0	100	98
cM capacity (veh/h)	440			484			10	15	191	8	14	147

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	1324	86	1536	3	46	13
Volume Left	0	0	22	0	23	10
Volume Right	0	86	0	3	23	3
cSH	440	1700	484	1700	18	11
Volume to Capacity	0.00	0.05	0.05	0.00	2.50	1.21
Queue Length 95th (ft)	0	0	4	0	156	59
Control Delay (s)	0.0	0.0	5.4	0.0	1118.5	821.1
Lane LOS			A		F	F
Approach Delay (s)	0.0		5.4		1118.5	821.1
Approach LOS					F	F

Intersection Summary			
Average Delay	23.4		
Intersection Capacity Utilization	99.3%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↱		↰↰	↱	↱	↰	↱	
Traffic Volume (vph)	4	846	368	207	914	5	448	6	284	8	1	11
Future Volume (vph)	4	846	368	207	914	5	448	6	284	8	1	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.97	0.95	0.95	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.86	0.85	1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	3537		3433	1516	1504	1770	1605	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3539	1583	1770	3537		3433	1516	1504	1770	1605	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	920	400	225	993	5	487	7	309	9	1	12
RTOR Reduction (vph)	0	0	226	0	0	0	0	124	95	0	12	0
Lane Group Flow (vph)	4	920	174	225	998	0	487	34	63	9	1	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	pt+ov	Prot	NA	
Protected Phases	1	6		5	2		7	4	4 5	3	8	
Permitted Phases			6									
Actuated Green, G (s)	0.6	46.1	46.1	17.9	64.4		19.1	19.1	42.0	0.8	0.8	
Effective Green, g (s)	0.6	46.1	46.1	17.9	64.4		19.1	19.1	42.0	0.8	0.8	
Actuated g/C Ratio	0.01	0.44	0.44	0.17	0.61		0.18	0.18	0.40	0.01	0.01	
Clearance Time (s)	6.0	6.0	6.0	6.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	10	1540	689	299	2150		619	273	596	13	12	
v/s Ratio Prot	0.00	c0.26		c0.13	0.28		c0.14	0.02	c0.04	0.01	0.00	
v/s Ratio Perm			0.11									
v/c Ratio	0.40	0.60	0.25	0.75	0.46		0.79	0.13	0.11	0.69	0.09	
Uniform Delay, d1	52.5	22.8	19.0	41.9	11.3		41.5	36.4	20.1	52.4	52.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	24.2	1.7	0.9	10.2	0.7		6.5	0.2	0.1	96.3	3.3	
Delay (s)	76.7	24.5	19.9	52.1	12.1		48.0	36.6	20.2	148.7	55.5	
Level of Service	E	C	B	D	B		D	D	C	F	E	
Approach Delay (s)		23.3			19.4			40.3			93.6	
Approach LOS		C			B			D			F	

Intersection Summary			
HCM 2000 Control Delay	26.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	105.9	Sum of lost time (s)	24.0
Intersection Capacity Utilization	68.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

1: Maytime Drive & Waugh Chapel Rd

Timing Plan: Saturday Peak

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↱		↰	↱	
Traffic Volume (vph)	20	759	26	37	745	20	26	2	58	42	2	24
Future Volume (vph)	20	759	26	37	745	20	26	2	58	42	2	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.5	5.0	5.0	4.5	5.0		4.5	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.85		1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1592		1770	1603	
Flt Permitted	0.27	1.00	1.00	0.25	1.00	1.00	0.72	1.00		0.71	1.00	
Satd. Flow (perm)	503	1863	1583	473	1863	1583	1340	1592		1331	1603	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	825	28	40	810	22	28	2	63	46	2	26
RTOR Reduction (vph)	0	0	8	0	0	6	0	59	0	0	25	0
Lane Group Flow (vph)	22	825	20	40	810	16	28	6	0	46	3	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6		6	2		2	4			8		
Actuated Green, G (s)	96.7	93.0	93.0	99.0	93.9	93.9	12.6	7.6		12.2	7.4	
Effective Green, g (s)	96.7	93.0	93.0	99.0	93.9	93.9	12.6	7.6		12.2	7.4	
Actuated g/C Ratio	0.75	0.72	0.72	0.76	0.73	0.73	0.10	0.06		0.09	0.06	
Clearance Time (s)	5.0	5.0	5.0	4.5	5.0	5.0	4.5	5.0		4.5	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	411	1337	1136	412	1350	1147	146	93		141	91	
v/s Ratio Prot	0.00	c0.44		c0.00	0.43		0.01	0.00		c0.01	0.00	
v/s Ratio Perm	0.04		0.01	0.07		0.01	0.01			c0.02		
v/c Ratio	0.05	0.62	0.02	0.10	0.60	0.01	0.19	0.06		0.33	0.04	
Uniform Delay, d1	6.4	9.2	5.2	6.6	8.7	4.9	53.6	57.6		54.5	57.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.9	0.0	0.1	2.0	0.0	0.6	0.3		1.4	0.2	
Delay (s)	6.4	10.1	5.2	6.7	10.6	5.0	54.3	57.9		55.9	57.9	
Level of Service	A	B	A	A	B	A	D	E		E	E	
Approach Delay (s)		9.8			10.3			56.8			56.6	
Approach LOS		A			B			E			E	

Intersection Summary			
HCM 2000 Control Delay	14.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	129.5	Sum of lost time (s)	19.5
Intersection Capacity Utilization	57.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

2: Symphony Lane/Silver Way & Waugh Chapel Road

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱			↰↑	↱		↰↑	↱
Traffic Volume (vph)	9	852	3	30	796	13	2	0	34	5	0	7
Future Volume (vph)	9	852	3	30	796	13	2	0	34	5	0	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00		0.95	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1858			1770	1583		1770	1583
Flt Permitted	0.34	1.00	1.00	0.25	1.00			1.00	1.00		1.00	1.00
Satd. Flow (perm)	629	1863	1583	462	1858			1863	1583		1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	926	3	33	865	14	2	0	37	5	0	8
RTOR Reduction (vph)	0	0	1	0	0	0	0	0	36	0	0	8
Lane Group Flow (vph)	10	926	2	33	879	0	0	2	1	0	5	0
Turn Type	Perm	NA	Perm	pm+pt	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		6		5	2			8			4	
Permitted Phases	6		6	2			8		8	4		4
Actuated Green, G (s)	97.5	97.5	97.5	106.1	106.1			3.9	3.9		3.9	3.9
Effective Green, g (s)	97.5	97.5	97.5	106.1	106.1			3.9	3.9		3.9	3.9
Actuated g/C Ratio	0.81	0.81	0.81	0.88	0.88			0.03	0.03		0.03	0.03
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0			5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	511	1513	1286	447	1642			60	51		60	51
v/s Ratio Prot		c0.50		0.00	c0.47							
v/s Ratio Perm	0.02		0.00	0.06				0.00	0.00		c0.00	0.00
v/c Ratio	0.02	0.61	0.00	0.07	0.54			0.03	0.02		0.08	0.01
Uniform Delay, d1	2.1	4.2	2.1	3.3	1.5			56.2	56.2		56.3	56.2
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.1	1.9	0.0	0.1	1.3			0.2	0.2		0.6	0.0
Delay (s)	2.2	6.1	2.1	3.4	2.8			56.5	56.4		56.9	56.2
Level of Service	A	A	A	A	A			E	E		E	E
Approach Delay (s)		6.0			2.8			56.4			56.5	
Approach LOS		A			A			E			E	

Intersection Summary			
HCM 2000 Control Delay	5.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	64.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			↰	↱		✥			✥	
Traffic Volume (veh/h)	2	889	0	9	824	15	0	0	4	13	0	7
Future Volume (Veh/h)	2	889	0	9	824	15	0	0	4	13	0	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	966	0	10	896	16	0	0	4	14	0	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		1189										
pX, platoon unblocked				0.71			0.71	0.71	0.71	0.71	0.71	
vC, conflicting volume	912			966			1894	1902	966	1890	1886	896
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	912			743			2058	2070	743	2053	2047	896
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			98			100	100	99	50	100	98
cM capacity (veh/h)	747			610			28	37	293	28	39	339

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	2	966	906	16	4	22
Volume Left	2	0	10	0	0	14
Volume Right	0	0	0	16	4	8
cSH	747	1700	610	1700	293	42
Volume to Capacity	0.00	0.57	0.02	0.01	0.01	0.52
Queue Length 95th (ft)	0	0	1	0	1	47
Control Delay (s)	9.8	0.0	0.5	0.0	17.5	161.0
Lane LOS	A		A		C	F
Approach Delay (s)	0.0		0.5		17.5	161.0
Approach LOS					C	F

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	65.0%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰	↱		✥			✥	
Traffic Volume (veh/h)	2	853	108	8	912	5	30	0	30	2	0	3
Future Volume (Veh/h)	2	853	108	8	912	5	30	0	30	2	0	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	927	117	9	991	5	33	0	33	2	0	3
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	996			1044			1943	1945	927	1973	2057	991
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	996			1044			1943	1945	927	1973	2057	991
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			31	100	90	95	100	99
cM capacity (veh/h)	695			666			48	64	325	41	54	299

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1
Volume Total	929	117	1000	5	66	5
Volume Left	2	0	9	0	33	2
Volume Right	0	117	0	5	33	3
cSH	695	1700	666	1700	83	86
Volume to Capacity	0.00	0.07	0.01	0.00	0.79	0.06
Queue Length 95th (ft)	0	0	1	0	100	5
Control Delay (s)	0.1	0.0	0.4	0.0	133.5	49.6
Lane LOS	A		A		F	E
Approach Delay (s)	0.1		0.4		133.5	49.6
Approach LOS					F	E

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	68.5%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑↱		↰↰	↑↱	↱	↰	↑↱	
Traffic Volume (vph)	10	536	362	278	463	4	456	8	419	14	9	5
Future Volume (vph)	10	536	362	278	463	4	456	8	419	14	9	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.97	0.95	0.95	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.86	0.85	1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3539	1583	1770	3535		3433	1514	1504	1770	1770	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3539	1583	1770	3535		3433	1514	1504	1770	1770	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	583	393	302	503	4	496	9	455	15	10	5
RTOR Reduction (vph)	0	0	240	0	0	0	0	182	131	0	5	0
Lane Group Flow (vph)	11	583	153	302	507	0	496	50	101	15	10	0
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA	pt+ov	Prot	NA	
Protected Phases	1	6		5	2		7	4	4 5	3	8	
Permitted Phases			6									
Actuated Green, G (s)	0.7	41.2	41.2	21.3	61.8		19.5	19.5	45.8	1.7	1.7	
Effective Green, g (s)	0.7	41.2	41.2	21.3	61.8		19.5	19.5	45.8	1.7	1.7	
Actuated g/C Ratio	0.01	0.39	0.39	0.20	0.58		0.18	0.18	0.43	0.02	0.02	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	11	1379	617	356	2066		633	279	651	28	28	
v/s Ratio Prot	0.01	c0.16		c0.17	0.14		c0.14	0.03	c0.07	0.01	0.01	
v/s Ratio Perm			0.10									
v/c Ratio	1.00	0.42	0.25	0.85	0.25		0.78	0.18	0.15	0.54	0.36	
Uniform Delay, d1	52.5	23.6	21.8	40.6	10.6		41.1	36.4	18.2	51.6	51.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	271.4	1.0	1.0	16.9	0.3		6.3	0.3	0.1	18.3	7.7	
Delay (s)	323.9	24.5	22.7	57.5	10.9		47.4	36.7	18.3	69.9	59.2	
Level of Service	F	C	C	E	B		D	D	B	E	E	
Approach Delay (s)		27.1			28.3			37.8			64.5	
Approach LOS		C			C			D			E	

Intersection Summary			
HCM 2000 Control Delay	31.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	105.7	Sum of lost time (s)	24.0
Intersection Capacity Utilization	65.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

MOVEMENT SUMMARY

Site: 101 [Summerfield Road - Single Lane - AM - 100' diameter]

Waugh Chapel Road/Summerfield Road
Site Category: 2040 AM Build Conditions
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Summerfield Road												
3	L2	67	0.0	0.301	14.5	LOS B	2.0	51.1	0.91	0.94	0.91	22.4
8	T1	1	0.0	0.301	11.0	LOS B	2.0	51.1	0.91	0.94	0.91	22.3
18	R2	70	0.0	0.301	11.2	LOS B	2.0	51.1	0.91	0.94	0.91	22.0
Approach		138	0.0	0.301	12.8	LOS B	2.0	51.1	0.91	0.94	0.91	22.2
East: Waugh Chapel Road												
1	L2	27	0.0	0.897	7.6	LOS A	22.8	570.9	1.00	0.51	1.00	23.6
6	T1	1037	0.0	0.897	4.0	LOS A	22.8	570.9	1.00	0.51	1.00	23.6
16	R2	1	0.0	0.897	4.3	LOS A	22.8	570.9	1.00	0.51	1.00	23.2
Approach		1065	0.0	0.897	4.1	LOS A	22.8	570.9	1.00	0.51	1.00	23.6
North: Driveway												
7	L2	3	0.0	0.021	17.4	LOS C	0.1	3.6	0.97	0.76	0.97	21.7
4	T1	1	0.0	0.021	13.9	LOS B	0.1	3.6	0.97	0.76	0.97	21.7
14	R2	2	0.0	0.021	14.2	LOS B	0.1	3.6	0.97	0.76	0.97	21.3
Approach		6	0.0	0.021	15.8	LOS C	0.1	3.6	0.97	0.76	0.97	21.6
West: Waugh Chapel Road												
5	L2	1	0.0	0.804	6.3	LOS A	16.8	419.3	0.55	0.33	0.55	24.3
2	T1	979	0.0	0.804	2.7	LOS A	16.8	419.3	0.55	0.33	0.55	24.2
12	R2	19	0.0	0.804	3.0	LOS A	16.8	419.3	0.55	0.33	0.55	23.8
Approach		999	0.0	0.804	2.7	LOS A	16.8	419.3	0.55	0.33	0.55	24.2
All Vehicles		2208	0.0	0.897	4.1	LOS A	22.8	570.9	0.79	0.45	0.79	23.8

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
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 6).
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: 101 [Summerfield Road - Single Lane - PM -100' diameter]

Waugh Chapel Road/Summerfield Road
Site Category: 2040 PM Build Conditions
Roundabout

Movement Performance - Vehicles

Mov	Turn	Demand Flows		Deg.	Average	Level of	95% Back of Queue		Prop.	Effective	Aver. No.	Average
ID		Total	HV	Satn	Delay	Service	Vehicles	Distance	Queued	Stop Rate	Cycles	Speed
		veh/h	%	v/c	sec		veh	ft				mph
South: Summerfield Road												
3	L2	20	0.0	0.314	18.0	LOS C	2.3	58.3	1.00	1.00	1.00	21.8
8	T1	1	0.0	0.314	14.5	LOS B	2.3	58.3	1.00	1.00	1.00	21.7
18	R2	71	0.0	0.314	14.7	LOS B	2.3	58.3	1.00	1.00	1.00	21.4
Approach		92	0.0	0.314	15.4	LOS C	2.3	58.3	1.00	1.00	1.00	21.5
East: Waugh Chapel Road												
1	L2	109	0.0	1.128	69.5	LOS F	227.7	5692.9	1.00	0.57	1.31	14.6
6	T1	1305	0.0	1.128	66.0	LOS F	227.7	5692.9	1.00	0.57	1.31	14.5
16	R2	3	0.0	1.128	66.2	LOS F	227.7	5692.9	1.00	0.57	1.31	14.4
Approach		1417	0.0	1.128	66.2	LOS F	227.7	5692.9	1.00	0.57	1.31	14.6
North: Driveway												
7	L2	9	0.0	0.062	23.6	LOS C	0.4	11.2	1.00	0.87	1.00	20.4
4	T1	1	0.0	0.062	20.1	LOS C	0.4	11.2	1.00	0.87	1.00	20.4
14	R2	3	0.0	0.062	20.3	LOS C	0.4	11.2	1.00	0.87	1.00	20.1
Approach		13	0.0	0.062	22.6	LOS C	0.4	11.2	1.00	0.87	1.00	20.3
West: Waugh Chapel Road												
5	L2	1	0.0	1.072	47.0	LOS F	70.5	1761.3	1.00	1.25	1.84	17.1
2	T1	1172	0.0	1.072	43.5	LOS F	70.5	1761.3	1.00	1.25	1.84	17.1
12	R2	45	0.0	1.072	43.8	LOS F	70.5	1761.3	1.00	1.25	1.84	16.8
Approach		1218	0.0	1.072	43.5	LOS E	70.5	1761.3	1.00	1.25	1.84	17.1
All Vehicles		2740	0.0	1.128	54.2	LOS F	227.7	5692.9	1.00	0.89	1.53	15.8

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
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 6).
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: 101 [Summerfield Road - Single Lane - SAT -100' diameter]

Waugh Chapel Road/Summerfield Road
Site Category: 2040 SAT Build Conditions
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Summerfield Road												
3	L2	30	0.0	0.124	11.9	LOS B	0.8	20.5	0.86	0.82	0.86	23.0
8	T1	1	0.0	0.124	8.4	LOS A	0.8	20.5	0.86	0.82	0.86	22.9
18	R2	30	0.0	0.124	8.6	LOS A	0.8	20.5	0.86	0.82	0.86	22.5
Approach		61	0.0	0.124	10.2	LOS B	0.8	20.5	0.86	0.82	0.86	22.7
East: Waugh Chapel Road												
1	L2	109	0.0	0.830	6.4	LOS A	18.9	473.3	0.62	0.36	0.62	24.1
6	T1	912	0.5	0.830	2.9	LOS A	18.9	473.3	0.62	0.36	0.62	24.1
16	R2	5	0.0	0.830	3.1	LOS A	18.9	473.3	0.62	0.36	0.62	23.6
Approach		1026	0.4	0.830	3.2	LOS A	18.9	473.3	0.62	0.36	0.62	24.1
North: Driveway												
7	L2	2	0.0	0.015	14.4	LOS B	0.1	2.4	0.88	0.70	0.88	22.5
4	T1	1	0.0	0.015	10.9	LOS B	0.1	2.4	0.88	0.70	0.88	22.5
14	R2	3	0.0	0.015	11.2	LOS B	0.1	2.4	0.88	0.70	0.88	22.1
Approach		6	0.0	0.015	12.2	LOS B	0.1	2.4	0.88	0.70	0.88	22.3
West: Waugh Chapel Road												
5	L2	2	0.0	0.792	7.5	LOS A	11.5	289.8	0.79	0.53	0.79	23.9
2	T1	853	0.5	0.792	4.0	LOS A	11.5	289.8	0.79	0.53	0.79	23.9
12	R2	45	0.0	0.792	4.2	LOS A	11.5	289.8	0.79	0.53	0.79	23.5
Approach		900	0.5	0.792	4.0	LOS A	11.5	289.8	0.79	0.53	0.79	23.9
All Vehicles		1993	0.4	0.830	3.8	LOS A	18.9	473.3	0.71	0.45	0.71	23.9

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
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 6).
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: 101 [Maytime Drive - Concept 1 - AM - Single Lane]

Waugh Chapel Road/Maytime Drive - Roundabout Concept 1
Site Category: 2040 AM Build Conditions
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Maytime Drive												
3	L2	65	3.0	0.297	14.1	LOS B	2.1	53.3	0.94	0.93	0.94	21.3
8	T1	8	3.0	0.297	14.1	LOS B	2.1	53.3	0.94	0.93	0.94	21.3
18	R2	48	3.0	0.297	14.1	LOS B	2.1	53.3	0.94	0.93	0.94	20.9
Approach		121	3.0	0.297	14.1	LOS B	2.1	53.3	0.94	0.93	0.94	21.2
East: Waugh Chapel Road												
1	L2	43	3.0	0.927	31.6	LOS C	39.0	998.0	1.00	0.91	1.39	18.6
6	T1	938	3.0	0.927	31.6	LOS C	39.0	998.0	1.00	0.91	1.39	18.5
16	R2	54	3.0	0.927	31.6	LOS C	39.0	998.0	1.00	0.91	1.39	18.3
Approach		1036	3.0	0.927	31.6	LOS C	39.0	998.0	1.00	0.91	1.39	18.5
North: Maytime Drive												
7	L2	32	3.0	0.231	16.3	LOS B	1.7	42.3	0.98	0.96	0.98	20.9
4	T1	1	3.0	0.231	16.3	LOS B	1.7	42.3	0.98	0.96	0.98	20.9
14	R2	39	3.0	0.231	16.3	LOS B	1.7	42.3	0.98	0.96	0.98	20.5
Approach		72	3.0	0.231	16.3	LOS B	1.7	42.3	0.98	0.96	0.98	20.7
West: Waugh Chapel Road												
5	L2	33	3.0	0.839	20.9	LOS C	15.4	394.2	0.83	0.44	0.83	20.4
2	T1	873	3.0	0.839	20.9	LOS C	15.4	394.2	0.83	0.44	0.83	20.3
12	R2	65	3.0	0.839	20.9	LOS C	15.4	394.2	0.83	0.44	0.83	20.0
Approach		971	3.0	0.839	20.9	LOS C	15.4	394.2	0.83	0.44	0.83	20.3
All Vehicles		2199	3.0	0.927	25.4	LOS C	39.0	998.0	0.92	0.71	1.10	19.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). 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 6).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Maytime Drive - Concept 1 - PM - Single Lane]

Waugh Chapel Road/Maytime Drive - Roundabout Concept 1
Site Category: 2040 PM Build Conditions
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	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Maytime Drive												
3	L2	46	3.0	0.288	21.4	LOS C	2.1	53.7	1.00	1.00	1.00	19.9
8	T1	1	3.0	0.288	21.4	LOS C	2.1	53.7	1.00	1.00	1.00	19.8
18	R2	26	3.0	0.288	21.4	LOS C	2.1	53.7	1.00	1.00	1.00	19.5
Approach		73	3.0	0.288	21.4	LOS C	2.1	53.7	1.00	1.00	1.00	19.8
East: Waugh Chapel Road												
1	L2	45	3.0	1.199	113.6	LOS F	154.8	3962.6	1.00	1.93	2.75	11.1
6	T1	1305	3.0	1.199	113.6	LOS F	154.8	3962.6	1.00	1.93	2.75	11.1
16	R2	33	3.0	1.199	113.6	LOS F	154.8	3962.6	1.00	1.93	2.75	11.0
Approach		1383	3.0	1.199	113.6	LOS F	154.8	3962.6	1.00	1.93	2.75	11.1
North: Maytime Drive												
7	L2	33	3.0	0.219	20.5	LOS C	1.6	40.5	1.00	0.98	1.00	20.1
4	T1	2	3.0	0.219	20.5	LOS C	1.6	40.5	1.00	0.98	1.00	20.0
14	R2	17	3.0	0.219	20.5	LOS C	1.6	40.5	1.00	0.98	1.00	19.7
Approach		52	3.0	0.219	20.5	LOS C	1.6	40.5	1.00	0.98	1.00	19.9
West: Waugh Chapel Road												
5	L2	39	3.0	1.218	121.1	LOS F	170.5	4365.0	1.00	1.90	2.74	10.7
2	T1	1308	3.0	1.218	121.1	LOS F	170.5	4365.0	1.00	1.90	2.74	10.7
12	R2	71	3.0	1.218	121.1	LOS F	170.5	4365.0	1.00	1.90	2.74	10.6
Approach		1417	3.0	1.218	121.1	LOS F	170.5	4365.0	1.00	1.90	2.74	10.7
All Vehicles		2925	3.0	1.218	113.3	LOS F	170.5	4365.0	1.00	1.88	2.67	11.1

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). 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 6).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Maytime Drive - Concept 1 - SAT - Single Lane]

Waugh Chapel Road/Maytime Drive - Roundabout Concept 1
Site Category: 2040 Saturday Build Conditions
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Maytime Drive												
3	L2	28	3.0	0.200	10.7	LOS B	1.3	33.8	0.88	0.82	0.88	22.2
8	T1	2	3.0	0.200	10.7	LOS B	1.3	33.8	0.88	0.82	0.88	22.1
18	R2	63	3.0	0.200	10.7	LOS B	1.3	33.8	0.88	0.82	0.88	21.7
Approach		93	3.0	0.200	10.7	LOS B	1.3	33.8	0.88	0.82	0.88	21.9
East: Waugh Chapel Road												
1	L2	40	3.0	0.732	14.5	LOS B	10.4	266.3	0.52	0.24	0.52	21.7
6	T1	810	3.0	0.732	14.5	LOS B	10.4	266.3	0.52	0.24	0.52	21.6
16	R2	22	3.0	0.732	14.5	LOS B	10.4	266.3	0.52	0.24	0.52	21.2
Approach		872	3.0	0.732	14.5	LOS B	10.4	266.3	0.52	0.24	0.52	21.6
North: Maytime Drive												
7	L2	46	3.0	0.147	9.1	LOS A	0.9	23.6	0.83	0.76	0.83	22.3
4	T1	2	3.0	0.147	9.1	LOS A	0.9	23.6	0.83	0.76	0.83	22.3
14	R2	26	3.0	0.147	9.1	LOS A	0.9	23.6	0.83	0.76	0.83	21.9
Approach		74	3.0	0.147	9.1	LOS A	0.9	23.6	0.83	0.76	0.83	22.2
West: Waugh Chapel Road												
5	L2	22	3.0	0.764	16.3	LOS B	10.6	271.4	0.68	0.38	0.68	21.3
2	T1	825	3.0	0.764	16.3	LOS B	10.6	271.4	0.68	0.38	0.68	21.2
12	R2	28	3.0	0.764	16.3	LOS B	10.6	271.4	0.68	0.38	0.68	20.9
Approach		875	3.0	0.764	16.3	LOS B	10.6	271.4	0.68	0.38	0.68	21.2
All Vehicles		1914	3.0	0.764	14.9	LOS B	10.6	271.4	0.62	0.35	0.62	21.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). 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 6).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Waugh Chapel Road - Sensitivity Analysis on MacMullen Drive

Intersection	Waugh Chapel Road/Macmullen Drive						
	Volume	AM 2017		AM 2030		AM 2040	
	Approach	*LOS (Delays)*	*Queue (ft)*	*LOS (Delays)*	*Queue (ft)*	*LOS (Delays)*	*Queue (ft)*
WB Two Lanes - EB One Lane	EB	A (0.1)	132.1	A (0.1)	174.5	A (0.2)	206.1
	WB	A (0.0)	34.3	A (0.0)	50.6	A (0.1)	63.9
	SB	A (5.3)	1.2	A (5.8)	1.7	A (6.2)	1.8
	NB	A (6.1)	0.5	A (8.0)	2.3	A (8.9)	2.6
WB Two Lanes - EB Two Lane	EB	A (0.1)	80.6	A (0.1)	44.5	A (0.1)	50.2
	WB	A (0.0)	32.9	A (0.1)	46.7	A (0.1)	58.8
	SB	A (5.3)	1.2	A (5.8)	1.6	A (6.2)	1.8
	NB	A (4.6)	0.4	A (5.0)	1.1	A (5.2)	1.2

Intersection	Waugh Chapel Road/Macmullen Drive						
	Volume	PM 2017		PM 2030		PM 2040	
	Approach	*LOS (Delays)*	*Queue (ft)*	*LOS (Delays)*	*Queue (ft)*	*LOS (Delays)*	*Queue (ft)*
WB Two Lanes - EB One Lane	EB	A (0.1)	189.7	A (0.3)	346.5	A (0.5)	701
	WB	A (0.0)	56.1	A (0.1)	73.4	A (0.1)	88.4
	SB	A (6.3)	1.3	A (7.0)	2	A (7.3)	2.1
	NB	A (7.2)	0.8	B (11.2)	1.9	C (16.1)	3
WB Two Lanes - EB Two Lane	EB	A (0.1)	110.9	A (0.1)	66	A (0.1)	81.9
	WB	A (0.0)	54.7	A (0.1)	69.8	A (0.1)	83.3
	SB	A (6.3)	1.3	A (7.0)	2	A (7.3)	2.1
	NB	A (4.9)	0.5	A (4.9)	0.7	A (5.3)	0.7

MOVEMENT SUMMARY

Site: 101 [2017 MacMullen Drive - Concept 1 - AM - WB Two - EB Two Lane]

Waugh Chapel Road/MacMullen Drive - Roundabout Concept 1
Site Category: 2040 PM Build Conditions
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Maytime Drive												
3	L2	1	0.0	0.004	7.8	LOS A	0.0	0.4	0.54	0.45	0.54	25.5
8	T1	1	0.0	0.004	2.7	LOS A	0.0	0.4	0.54	0.45	0.54	23.7
18	R2	1	0.0	0.004	3.4	LOS A	0.0	0.4	0.54	0.45	0.54	24.1
Approach		3	0.0	0.004	4.6	LOS A	0.0	0.4	0.54	0.45	0.54	24.4
East: Waugh Chapel Road												
1	L2	3	0.0	0.246	5.2	LOS A	1.3	32.8	0.03	0.01	0.03	26.9
6	T1	712	0.5	0.246	0.0	LOS A	1.3	32.9	0.03	0.01	0.03	24.9
16	R2	4	0.0	0.246	1.0	LOS A	1.3	32.9	0.03	0.00	0.03	25.4
Approach		719	0.5	0.246	0.0	LOS A	1.3	32.9	0.03	0.01	0.03	24.9
North: Maytime Drive												
7	L2	8	0.0	0.014	7.1	LOS A	0.0	1.2	0.46	0.54	0.46	25.3
4	T1	1	0.0	0.014	1.9	LOS A	0.0	1.2	0.46	0.54	0.46	23.6
14	R2	4	0.0	0.014	2.7	LOS A	0.0	1.2	0.46	0.54	0.46	24.0
Approach		13	0.0	0.014	5.3	LOS A	0.0	1.2	0.46	0.54	0.46	24.8
West: Waugh Chapel Road												
5	L2	1	0.0	0.458	5.2	LOS A	3.2	80.6	0.10	0.01	0.10	26.7
2	T1	799	0.5	0.458	0.1	LOS A	3.2	80.6	0.10	0.01	0.10	24.8
12	R2	1	0.0	0.118	1.1	LOS A	0.5	13.1	0.08	0.01	0.08	25.3
Approach		801	0.5	0.458	0.1	LOS A	3.2	80.6	0.10	0.01	0.10	24.8
All Vehicles		1536	0.5	0.458	0.1	LOS A	3.2	80.6	0.07	0.01	0.07	24.9

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
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 6).
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: 101 [2017 MacMullen Drive - Concept 1 - AM - WB Two - EB One Lane]

Waugh Chapel Road/MacMullen Drive - Roundabout Concept 1
Site Category: 2040 PM Build Conditions
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Maytime Drive												
3	L2	1	0.0	0.004	9.3	LOS A	0.0	0.5	0.69	0.48	0.69	25.1
8	T1	1	0.0	0.004	4.1	LOS A	0.0	0.5	0.69	0.48	0.69	23.4
18	R2	1	0.0	0.004	4.9	LOS A	0.0	0.5	0.69	0.48	0.69	23.8
Approach		3	0.0	0.004	6.1	LOS A	0.0	0.5	0.69	0.48	0.69	24.1
East: Waugh Chapel Road												
1	L2	3	0.0	0.246	5.2	LOS A	1.4	34.1	0.04	0.01	0.04	26.9
6	T1	712	0.5	0.246	0.0	LOS A	1.4	34.3	0.03	0.01	0.03	24.9
16	R2	4	0.0	0.246	1.0	LOS A	1.4	34.3	0.03	0.00	0.03	25.4
Approach		719	0.5	0.246	0.0	LOS A	1.4	34.3	0.03	0.01	0.03	24.9
North: Maytime Drive												
7	L2	8	0.0	0.014	7.1	LOS A	0.0	1.2	0.46	0.54	0.46	25.3
4	T1	1	0.0	0.014	1.9	LOS A	0.0	1.2	0.46	0.54	0.46	23.6
14	R2	4	0.0	0.014	2.7	LOS A	0.0	1.2	0.46	0.54	0.46	24.0
Approach		13	0.0	0.014	5.3	LOS A	0.0	1.2	0.46	0.54	0.46	24.8
West: Waugh Chapel Road												
5	L2	1	0.0	0.543	5.2	LOS A	5.3	132.1	0.14	0.02	0.14	26.7
2	T1	799	0.5	0.543	0.1	LOS A	5.3	132.1	0.14	0.02	0.14	24.8
12	R2	1	0.0	0.543	0.9	LOS A	5.3	132.1	0.14	0.02	0.14	25.2
Approach		801	0.5	0.543	0.1	LOS A	5.3	132.1	0.14	0.02	0.14	24.8
All Vehicles		1536	0.5	0.543	0.1	LOS A	5.3	132.1	0.09	0.02	0.09	24.8

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
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 6).
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: 101 [2017 MacMullen Drive - Concept 1 - PM - WB Two - EB Two Lane]

Waugh Chapel Road/MacMullen Drive - Roundabout Concept 1
Site Category: 2040 PM Build Conditions
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Maytime Drive												
3	L2	1	0.0	0.005	8.4	LOS A	0.0	0.5	0.58	0.48	0.58	25.4
8	T1	1	0.0	0.005	3.2	LOS A	0.0	0.5	0.58	0.48	0.58	23.7
18	R2	2	0.0	0.005	4.0	LOS A	0.0	0.5	0.58	0.48	0.58	24.1
Approach		4	0.0	0.005	4.9	LOS A	0.0	0.5	0.58	0.48	0.58	24.3
East: Waugh Chapel Road												
1	L2	1	0.0	0.373	5.2	LOS A	2.2	54.7	0.06	0.01	0.06	26.8
6	T1	1071	0.5	0.373	0.0	LOS A	2.2	54.7	0.06	0.01	0.06	24.9
16	R2	17	0.0	0.373	1.0	LOS A	2.2	54.6	0.05	0.01	0.05	25.4
Approach		1089	0.5	0.373	0.0	LOS A	2.2	54.7	0.06	0.01	0.06	24.9
North: Maytime Drive												
7	L2	8	0.0	0.015	7.8	LOS A	0.1	1.3	0.53	0.61	0.53	25.1
4	T1	1	0.0	0.015	2.7	LOS A	0.1	1.3	0.53	0.61	0.53	23.4
14	R2	3	0.0	0.015	3.5	LOS A	0.1	1.3	0.53	0.61	0.53	23.8
Approach		12	0.0	0.015	6.3	LOS A	0.1	1.3	0.53	0.61	0.53	24.6
West: Waugh Chapel Road												
5	L2	4	0.0	0.530	5.2	LOS A	4.4	110.9	0.10	0.01	0.10	26.7
2	T1	922	0.5	0.530	0.1	LOS A	4.4	110.9	0.10	0.01	0.10	24.8
12	R2	1	0.0	0.136	1.1	LOS A	0.6	16.0	0.08	0.01	0.08	25.3
Approach		927	0.5	0.530	0.1	LOS A	4.4	110.9	0.10	0.01	0.10	24.8
All Vehicles		2032	0.5	0.530	0.1	LOS A	4.4	110.9	0.08	0.01	0.08	24.9

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
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 6).
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: 101 [2017 MacMullen Drive - Concept 1 - PM - WB Two - EB One Lane]

Waugh Chapel Road/MacMullen Drive - Roundabout Concept 1
Site Category: 2040 PM Build Conditions
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Maytime Drive												
3	L2	1	0.0	0.005	10.7	LOS B	0.0	0.8	0.76	0.52	0.76	24.8
8	T1	1	0.0	0.005	5.5	LOS A	0.0	0.8	0.76	0.52	0.76	23.2
18	R2	2	0.0	0.005	6.3	LOS A	0.0	0.8	0.76	0.52	0.76	23.6
Approach		4	0.0	0.005	7.2	LOS A	0.0	0.8	0.76	0.52	0.76	23.8
East: Waugh Chapel Road												
1	L2	1	0.0	0.374	5.2	LOS A	2.2	56.1	0.06	0.01	0.06	26.8
6	T1	1071	0.5	0.374	0.0	LOS A	2.2	56.1	0.06	0.01	0.06	24.9
16	R2	17	0.0	0.374	1.0	LOS A	2.2	56.1	0.06	0.01	0.06	25.3
Approach		1089	0.5	0.374	0.0	LOS A	2.2	56.1	0.06	0.01	0.06	24.9
North: Maytime Drive												
7	L2	8	0.0	0.015	7.8	LOS A	0.1	1.3	0.53	0.61	0.53	25.1
4	T1	1	0.0	0.015	2.7	LOS A	0.1	1.3	0.53	0.61	0.53	23.4
14	R2	3	0.0	0.015	3.5	LOS A	0.1	1.3	0.53	0.61	0.53	23.8
Approach		12	0.0	0.015	6.3	LOS A	0.1	1.3	0.53	0.61	0.53	24.6
West: Waugh Chapel Road												
5	L2	4	0.0	0.628	5.2	LOS A	7.6	189.7	0.15	0.02	0.15	26.6
2	T1	922	0.5	0.628	0.1	LOS A	7.6	189.7	0.15	0.02	0.15	24.7
12	R2	1	0.0	0.628	0.9	LOS A	7.6	189.7	0.15	0.02	0.15	25.2
Approach		927	0.5	0.628	0.1	LOS A	7.6	189.7	0.15	0.02	0.15	24.7
All Vehicles		2032	0.5	0.628	0.1	LOS A	7.6	189.7	0.10	0.02	0.10	24.8

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
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 6).
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: 101 [2030 MacMullen Drive - Concept 1 - AM - WB Two - EB Two Lane]

Waugh Chapel Road/MacMullen Drive - Roundabout Concept 1
Site Category: 2040 PM Build Conditions
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Maytime Drive												
3	L2	5	0.0	0.013	7.5	LOS A	0.0	1.1	0.51	0.54	0.51	25.4
8	T1	1	0.0	0.013	2.3	LOS A	0.0	1.1	0.51	0.54	0.51	23.7
18	R2	5	0.0	0.013	3.1	LOS A	0.0	1.1	0.51	0.54	0.51	24.1
Approach		11	0.0	0.013	5.0	LOS A	0.0	1.1	0.51	0.54	0.51	24.6
East: Waugh Chapel Road												
1	L2	4	0.0	0.314	5.2	LOS A	1.9	46.7	0.06	0.01	0.06	26.8
6	T1	907	0.5	0.314	0.0	LOS A	1.9	46.7	0.06	0.01	0.06	24.9
16	R2	5	0.0	0.314	1.0	LOS A	1.9	46.7	0.06	0.01	0.06	25.3
Approach		916	0.5	0.314	0.1	LOS A	1.9	46.7	0.06	0.01	0.06	24.9
North: Maytime Drive												
7	L2	10	0.0	0.019	7.5	LOS A	0.1	1.6	0.51	0.59	0.51	25.2
4	T1	1	0.0	0.019	2.4	LOS A	0.1	1.6	0.51	0.59	0.51	23.5
14	R2	5	0.0	0.019	3.2	LOS A	0.1	1.6	0.51	0.59	0.51	23.9
Approach		16	0.0	0.019	5.8	LOS A	0.1	1.6	0.51	0.59	0.51	24.7
West: Waugh Chapel Road												
5	L2	1	0.0	0.309	5.2	LOS A	1.8	44.5	0.10	0.01	0.10	26.7
2	T1	893	0.5	0.309	0.1	LOS A	1.8	44.5	0.09	0.01	0.09	24.8
12	R2	2	0.0	0.309	1.1	LOS A	1.8	44.5	0.09	0.01	0.09	25.3
Approach		896	0.5	0.309	0.1	LOS A	1.8	44.5	0.09	0.01	0.09	24.8
All Vehicles		1839	0.5	0.314	0.1	LOS A	1.9	46.7	0.08	0.02	0.08	24.9

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
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 6).
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: 101 [2030 MacMullen Drive - Concept 1 - AM - WB Two - EB One Lane]

Waugh Chapel Road/MacMullen Drive - Roundabout Concept 1
Site Category: 2040 PM Build Conditions
Roundabout

Movement Performance - Vehicles

Mov	Turn	Demand Flows		Deg.	Average	Level of	95% Back of Queue		Prop.	Effective	Aver. No.	Average
ID		Total	HV	Satn	Delay	Service	Vehicles	Distance	Queued	Stop Rate	Cycles	Speed
		veh/h	%	v/c	sec		veh	ft				mph
South: Maytime Drive												
3	L2	5	0.0	0.015	10.4	LOS B	0.1	2.3	0.75	0.59	0.75	24.6
8	T1	1	0.0	0.015	5.3	LOS A	0.1	2.3	0.75	0.59	0.75	23.0
18	R2	5	0.0	0.015	6.1	LOS A	0.1	2.3	0.75	0.59	0.75	23.4
Approach		11	0.0	0.015	8.0	LOS A	0.1	2.3	0.75	0.59	0.75	23.9
East: Waugh Chapel Road												
1	L2	1	0.0	0.314	5.2	LOS A	2.0	50.2	0.07	0.01	0.07	26.8
6	T1	907	0.5	0.314	0.0	LOS A	2.0	50.6	0.07	0.01	0.07	24.9
16	R2	5	0.0	0.314	1.0	LOS A	2.0	50.6	0.07	0.01	0.07	25.3
Approach		913	0.5	0.314	0.0	LOS A	2.0	50.6	0.07	0.01	0.07	24.9
North: Maytime Drive												
7	L2	10	0.0	0.019	7.5	LOS A	0.1	1.7	0.51	0.59	0.51	25.2
4	T1	1	0.0	0.019	2.4	LOS A	0.1	1.7	0.51	0.59	0.51	23.5
14	R2	5	0.0	0.019	3.2	LOS A	0.1	1.7	0.51	0.59	0.51	23.9
Approach		16	0.0	0.019	5.8	LOS A	0.1	1.7	0.51	0.59	0.51	24.7
West: Waugh Chapel Road												
5	L2	1	0.0	0.608	5.3	LOS A	7.0	174.5	0.16	0.02	0.16	26.6
2	T1	893	0.5	0.608	0.1	LOS A	7.0	174.5	0.16	0.02	0.16	24.7
12	R2	2	0.0	0.608	0.9	LOS A	7.0	174.5	0.16	0.02	0.16	25.2
Approach		896	0.5	0.608	0.1	LOS A	7.0	174.5	0.16	0.02	0.16	24.7
All Vehicles		1836	0.5	0.608	0.2	LOS A	7.0	174.5	0.12	0.02	0.12	24.8

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
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 6).
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: 101 [2030 MacMullen Drive - Concept 1 - PM - WB Two - EB Two Lane]

Waugh Chapel Road/MacMullen Drive - Roundabout Concept 1
Site Category: 2040 PM Build Conditions
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Maytime Drive												
3	L2	2	0.0	0.008	8.0	LOS A	0.0	0.7	0.55	0.54	0.55	25.4
8	T1	1	0.0	0.008	2.8	LOS A	0.0	0.7	0.55	0.54	0.55	23.7
18	R2	3	0.0	0.008	3.6	LOS A	0.0	0.7	0.55	0.54	0.55	24.1
Approach		6	0.0	0.008	4.9	LOS A	0.0	0.7	0.55	0.54	0.55	24.5
East: Waugh Chapel Road												
1	L2	2	0.0	0.434	5.2	LOS A	2.8	69.8	0.07	0.01	0.07	26.8
6	T1	1239	0.5	0.434	0.0	LOS A	2.8	69.8	0.07	0.01	0.07	24.9
16	R2	22	0.0	0.434	1.0	LOS A	2.8	69.6	0.07	0.01	0.07	25.3
Approach		1263	0.5	0.434	0.1	LOS A	2.8	69.8	0.07	0.01	0.07	24.9
North: Maytime Drive												
7	L2	12	0.0	0.022	8.3	LOS A	0.1	2.0	0.57	0.66	0.57	24.9
4	T1	1	0.0	0.022	3.1	LOS A	0.1	2.0	0.57	0.66	0.57	23.3
14	R2	4	0.0	0.022	3.9	LOS A	0.1	2.0	0.57	0.66	0.57	23.7
Approach		17	0.0	0.022	7.0	LOS A	0.1	2.0	0.57	0.66	0.57	24.5
West: Waugh Chapel Road												
5	L2	5	0.0	0.392	5.2	LOS A	2.6	65.7	0.11	0.02	0.11	26.7
2	T1	1126	0.5	0.392	0.1	LOS A	2.6	66.0	0.11	0.01	0.11	24.8
12	R2	2	0.0	0.392	1.1	LOS A	2.6	66.0	0.11	0.01	0.11	25.3
Approach		1133	0.5	0.392	0.1	LOS A	2.6	66.0	0.11	0.01	0.11	24.8
All Vehicles		2419	0.5	0.434	0.1	LOS A	2.8	69.8	0.09	0.02	0.09	24.8

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
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 6).
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: 101 [2030 MacMullen Drive - Concept 1 - PM - WB Two - EB One Lane]

Waugh Chapel Road/MacMullen Drive - Roundabout Concept 1
Site Category: 2040 PM Build Conditions
Roundabout

Movement Performance - Vehicles

Mov	Turn	Demand Flows		Deg.	Average	Level of	95% Back of Queue		Prop.	Effective	Aver. No.	Average
ID		Total	HV	Satn	Delay	Service	Vehicles	Distance	Queued	Stop Rate	Cycles	Speed
		veh/h	%	v/c	sec		veh	ft				mph
South: Maytime Drive												
3	L2	2	0.0	0.011	14.3	LOS B	0.1	1.9	0.89	0.63	0.89	23.8
8	T1	1	0.0	0.011	9.1	LOS A	0.1	1.9	0.89	0.63	0.89	22.3
18	R2	3	0.0	0.011	9.9	LOS A	0.1	1.9	0.89	0.63	0.89	22.6
Approach		6	0.0	0.011	11.2	LOS B	0.1	1.9	0.89	0.63	0.89	22.9
East: Waugh Chapel Road												
1	L2	2	0.0	0.434	5.2	LOS A	2.9	73.3	0.08	0.01	0.08	26.8
6	T1	1239	0.5	0.434	0.0	LOS A	2.9	73.4	0.08	0.01	0.08	24.9
16	R2	22	0.0	0.434	1.0	LOS A	2.9	73.4	0.07	0.01	0.07	25.3
Approach		1263	0.5	0.434	0.1	LOS A	2.9	73.4	0.08	0.01	0.08	24.9
North: Maytime Drive												
7	L2	12	0.0	0.022	8.3	LOS A	0.1	2.0	0.57	0.66	0.57	24.9
4	T1	1	0.0	0.022	3.1	LOS A	0.1	2.0	0.57	0.66	0.57	23.3
14	R2	4	0.0	0.022	3.9	LOS A	0.1	2.0	0.57	0.66	0.57	23.7
Approach		17	0.0	0.022	7.0	LOS A	0.1	2.0	0.57	0.66	0.57	24.5
West: Waugh Chapel Road												
5	L2	5	0.0	0.771	5.4	LOS A	13.8	346.5	0.28	0.04	0.28	26.4
2	T1	1126	0.5	0.771	0.3	LOS A	13.8	346.5	0.28	0.04	0.28	24.5
12	R2	2	0.0	0.771	1.0	LOS A	13.8	346.5	0.28	0.04	0.28	24.9
Approach		1133	0.5	0.771	0.3	LOS A	13.8	346.5	0.28	0.04	0.28	24.5
All Vehicles		2419	0.5	0.771	0.2	LOS A	13.8	346.5	0.18	0.03	0.18	24.7

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
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 6).
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: 101 [2040 MacMullen Drive - Concept 1 - AM - WB Two - EB One Lane]

Waugh Chapel Road/MacMullen Drive - Roundabout Concept 1
Site Category: 2040 PM Build Conditions
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Maytime Drive												
3	L2	5	0.0	0.016	11.3	LOS B	0.1	2.6	0.79	0.61	0.79	24.4
8	T1	1	0.0	0.016	6.2	LOS A	0.1	2.6	0.79	0.61	0.79	22.8
18	R2	5	0.0	0.016	7.0	LOS A	0.1	2.6	0.79	0.61	0.79	23.2
Approach		11	0.0	0.016	8.9	LOS A	0.1	2.6	0.79	0.61	0.79	23.7
East: Waugh Chapel Road												
1	L2	4	0.0	0.366	5.2	LOS A	2.5	63.8	0.07	0.01	0.07	26.8
6	T1	1056	0.5	0.366	0.0	LOS A	2.6	63.9	0.07	0.01	0.07	24.9
16	R2	5	0.0	0.366	1.0	LOS A	2.6	63.9	0.07	0.01	0.07	25.3
Approach		1065	0.5	0.366	0.1	LOS A	2.6	63.9	0.07	0.01	0.07	24.9
North: Maytime Drive												
7	L2	10	0.0	0.020	7.9	LOS A	0.1	1.8	0.54	0.62	0.54	25.1
4	T1	1	0.0	0.020	2.7	LOS A	0.1	1.8	0.54	0.62	0.54	23.4
14	R2	5	0.0	0.020	3.5	LOS A	0.1	1.8	0.54	0.62	0.54	23.8
Approach		16	0.0	0.020	6.2	LOS A	0.1	1.8	0.54	0.62	0.54	24.6
West: Waugh Chapel Road												
5	L2	1	0.0	0.658	5.3	LOS A	8.2	206.1	0.20	0.03	0.20	26.5
2	T1	965	0.5	0.658	0.2	LOS A	8.2	206.1	0.20	0.03	0.20	24.6
12	R2	2	0.0	0.658	1.0	LOS A	8.2	206.1	0.20	0.03	0.20	25.1
Approach		968	0.5	0.658	0.2	LOS A	8.2	206.1	0.20	0.03	0.20	24.6
All Vehicles		2060	0.5	0.658	0.2	LOS A	8.2	206.1	0.14	0.02	0.14	24.8

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
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 6).
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: 101 [2040 MacMullen Drive - Concept 1 - AM - WB Two - EB Two Lane]

Waugh Chapel Road/MacMullen Drive - Roundabout Concept 1
Site Category: 2040 PM Build Conditions
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total veh/h	HV %	v/c	sec		Vehicles veh	Distance ft				mph
South: Maytime Drive												
3	L2	5	0.0	0.013	7.6	LOS A	0.0	1.2	0.52	0.56	0.52	25.4
8	T1	1	0.0	0.013	2.5	LOS A	0.0	1.2	0.52	0.56	0.52	23.6
18	R2	5	0.0	0.013	3.3	LOS A	0.0	1.2	0.52	0.56	0.52	24.1
Approach		11	0.0	0.013	5.2	LOS A	0.0	1.2	0.52	0.56	0.52	24.6
East: Waugh Chapel Road												
1	L2	4	0.0	0.366	5.2	LOS A	2.3	58.8	0.07	0.01	0.07	26.8
6	T1	1056	0.5	0.366	0.0	LOS A	2.3	58.5	0.07	0.01	0.07	24.9
16	R2	5	0.0	0.366	1.0	LOS A	2.3	58.5	0.07	0.01	0.07	25.3
Approach		1065	0.5	0.366	0.1	LOS A	2.3	58.8	0.07	0.01	0.07	24.9
North: Maytime Drive												
7	L2	10	0.0	0.020	7.9	LOS A	0.1	1.8	0.54	0.62	0.54	25.1
4	T1	1	0.0	0.020	2.7	LOS A	0.1	1.8	0.54	0.62	0.54	23.4
14	R2	5	0.0	0.020	3.5	LOS A	0.1	1.8	0.54	0.62	0.54	23.8
Approach		16	0.0	0.020	6.2	LOS A	0.1	1.8	0.54	0.62	0.54	24.6
West: Waugh Chapel Road												
5	L2	1	0.0	0.334	5.2	LOS A	2.0	50.1	0.10	0.01	0.10	26.7
2	T1	965	0.5	0.334	0.1	LOS A	2.0	50.2	0.10	0.01	0.10	24.8
12	R2	2	0.0	0.334	1.1	LOS A	2.0	50.2	0.10	0.01	0.10	25.3
Approach		968	0.5	0.334	0.1	LOS A	2.0	50.2	0.10	0.01	0.10	24.8
All Vehicles		2060	0.5	0.366	0.1	LOS A	2.3	58.8	0.09	0.02	0.09	24.9

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
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 6).
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: 101 [2040 MacMullen Drive - Concept 1 - PM - WB Two - EB One Lane]

Waugh Chapel Road/MacMullen Drive - Roundabout Concept 1
Site Category: 2040 PM Build Conditions
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Maytime Drive												
3	L2	2	0.0	0.016	19.1	LOS C	0.1	3.0	0.99	0.71	0.99	22.7
8	T1	1	0.0	0.016	14.0	LOS B	0.1	3.0	0.99	0.71	0.99	21.3
18	R2	3	0.0	0.016	14.8	LOS B	0.1	3.0	0.99	0.71	0.99	21.6
Approach		6	0.0	0.016	16.1	LOS C	0.1	3.0	0.99	0.71	0.99	21.9
East: Waugh Chapel Road												
1	L2	2	0.0	0.479	5.2	LOS A	3.5	88.4	0.08	0.01	0.08	26.8
6	T1	1367	0.5	0.479	0.0	LOS A	3.5	87.8	0.08	0.01	0.08	24.8
16	R2	22	0.0	0.479	1.0	LOS A	3.5	87.8	0.08	0.01	0.08	25.3
Approach		1391	0.5	0.479	0.1	LOS A	3.5	88.4	0.08	0.01	0.08	24.9
North: Maytime Drive												
7	L2	12	0.0	0.023	8.6	LOS A	0.1	2.1	0.59	0.68	0.59	24.8
4	T1	1	0.0	0.023	3.5	LOS A	0.1	2.1	0.59	0.68	0.59	23.2
14	R2	4	0.0	0.023	4.3	LOS A	0.1	2.1	0.59	0.68	0.59	23.6
Approach		17	0.0	0.023	7.3	LOS A	0.1	2.1	0.59	0.68	0.59	24.4
West: Waugh Chapel Road												
5	L2	5	0.0	0.878	5.6	LOS A	27.9	701.0	0.46	0.07	0.46	26.0
2	T1	1283	0.5	0.878	0.4	LOS A	27.9	701.0	0.46	0.07	0.46	24.2
12	R2	2	0.0	0.878	1.2	LOS A	27.9	701.0	0.46	0.07	0.46	24.6
Approach		1290	0.5	0.878	0.5	LOS A	27.9	701.0	0.46	0.07	0.46	24.2
All Vehicles		2704	0.5	0.878	0.3	LOS A	27.9	701.0	0.27	0.04	0.27	24.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
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 6).
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: 101 [2040 MacMullen Drive - Concept 1 - PM - WB Two - EB Two Lane]

Waugh Chapel Road/MacMullen Drive - Roundabout Concept 1
Site Category: 2040 PM Build Conditions
Roundabout

Movement Performance - Vehicles

Mov	Turn	Demand Flows		Deg.	Average	Level of	95% Back of Queue		Prop.	Effective	Aver. No.	Average
ID		Total veh/h	HV %	Satn v/c	Delay sec	Service	Vehicles veh	Distance ft	Queued	Stop Rate	Cycles	Speed mph
South: Maytime Drive												
3	L2	2	0.0	0.008	8.4	LOS A	0.0	0.7	0.58	0.56	0.58	25.3
8	T1	1	0.0	0.008	3.2	LOS A	0.0	0.7	0.58	0.56	0.58	23.6
18	R2	3	0.0	0.008	4.0	LOS A	0.0	0.7	0.58	0.56	0.58	24.0
Approach		6	0.0	0.008	5.3	LOS A	0.0	0.7	0.58	0.56	0.58	24.4
East: Waugh Chapel Road												
1	L2	2	0.0	0.478	5.2	LOS A	3.3	83.3	0.08	0.01	0.08	26.8
6	T1	1367	0.5	0.478	0.0	LOS A	3.3	83.3	0.08	0.01	0.08	24.9
16	R2	22	0.0	0.478	1.0	LOS A	3.3	82.3	0.08	0.01	0.08	25.3
Approach		1391	0.5	0.478	0.1	LOS A	3.3	83.3	0.08	0.01	0.08	24.9
North: Maytime Drive												
7	L2	12	0.0	0.023	8.6	LOS A	0.1	2.1	0.59	0.68	0.59	24.8
4	T1	1	0.0	0.023	3.5	LOS A	0.1	2.1	0.59	0.68	0.59	23.2
14	R2	4	0.0	0.023	4.3	LOS A	0.1	2.1	0.59	0.68	0.59	23.6
Approach		17	0.0	0.023	7.3	LOS A	0.1	2.1	0.59	0.68	0.59	24.4
West: Waugh Chapel Road												
5	L2	5	0.0	0.446	5.2	LOS A	3.3	81.6	0.12	0.02	0.12	26.7
2	T1	1283	0.5	0.446	0.1	LOS A	3.3	81.9	0.12	0.01	0.12	24.8
12	R2	2	0.0	0.446	1.1	LOS A	3.3	81.9	0.12	0.01	0.12	25.2
Approach		1290	0.5	0.446	0.1	LOS A	3.3	81.9	0.12	0.01	0.12	24.8
All Vehicles		2704	0.5	0.478	0.1	LOS A	3.3	83.3	0.10	0.02	0.10	24.8

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
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 6).
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.

Appendix C-3

SYNCHRO RESULTS

GREEN-T MACMULLEN DRIVE
ALTERNATIVE D

HCM Unsignalized Intersection Capacity Analysis
3: Macmullen Drive/Silver Way & Waugh Chapel Road

03/18/2019

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↱		↰		↱		✥				↱
Traffic Volume (veh/h)	0	965	2	4	0	5	5	0	5	0	0	5
Future Volume (Veh/h)	0	965	2	4	0	5	5	0	5	0	0	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1049	2	4	0	5	5	0	5	0	0	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		1189										
pX, platoon unblocked				0.62			0.62	0.62	0.62	0.62	0.62	
vC, conflicting volume	5			1051			1063	1063	1050	1063	1059	0
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	5			770			790	790	768	790	783	0
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			97	100	98	100	100	100
cM capacity (veh/h)	1616			519			188	197	247	185	199	1085

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total	1051	4	5	10	5
Volume Left	0	4	0	5	0
Volume Right	2	0	5	5	5
cSH	1700	519	1700	213	1085
Volume to Capacity	0.62	0.01	0.00	0.05	0.00
Queue Length 95th (ft)	0	1	0	4	0
Control Delay (s)	0.0	12.0	0.0	22.7	8.3
Lane LOS		B		C	A
Approach Delay (s)	0.0	5.3		22.7	8.3
Approach LOS				C	A

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	60.9%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Lane Configurations		↱		↰		↱		✥				↱
Traffic Volume (veh/h)	0	1283	2	2	0	22	2	0	3	0	0	4
Future Volume (Veh/h)	0	1283	2	2	0	22	2	0	3	0	0	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1395	2	2	0	24	2	0	3	0	0	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		1189										
pX, platoon unblocked				0.29			0.29	0.29	0.29	0.29	0.29	
vC, conflicting volume	24			1397			1404	1424	1396	1403	1401	0
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	24			1145			1169	1238	1142	1166	1159	0
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			96	100	96	100	100	100
cM capacity (veh/h)	1591			177			49	50	71	47	56	1085

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total	1397	2	24	5	4
Volume Left	0	2	0	2	0
Volume Right	2	0	24	3	4
cSH	1700	177	1700	60	1085
Volume to Capacity	0.82	0.01	0.01	0.08	0.00
Queue Length 95th (ft)	0	1	0	7	0
Control Delay (s)	0.0	25.6	0.0	70.4	8.3
Lane LOS		D		F	A
Approach Delay (s)	0.0	2.0		70.4	8.3
Approach LOS				F	A

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	77.6%	ICU Level of Service	D
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Macmullen Drive/Silver Way & Waugh Chapel Road

03/18/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↱		↰		↱		✣				↱
Traffic Volume (veh/h)	0	889	0	9	0	15	0	0	4	0	0	7
Future Volume (Veh/h)	0	889	0	9	0	15	0	0	4	0	0	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	966	0	10	0	16	0	0	4	0	0	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		1189										
pX, platoon unblocked				0.71			0.71	0.71	0.71	0.71	0.71	
vC, conflicting volume	16			966			994	1002	966	990	986	0
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	16			743			783	794	743	777	771	0
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			98			100	100	99	100	100	99
cM capacity (veh/h)	1602			610			215	222	293	216	229	1085

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total	966	10	16	4	8
Volume Left	0	10	0	0	0
Volume Right	0	0	16	4	8
cSH	1700	610	1700	293	1085
Volume to Capacity	0.57	0.02	0.01	0.01	0.01
Queue Length 95th (ft)	0	1	0	1	1
Control Delay (s)	0.0	11.0	0.0	17.5	8.3
Lane LOS		B		C	A
Approach Delay (s)	0.0	4.2		17.5	8.3
Approach LOS				C	A

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	56.8%	ICU Level of Service	B
Analysis Period (min)	15		

Appendix C- 4

SIGNAL WARRANTS

Intersection: Waugh Chapel Road and Silver Way/Macmullen Drive
Traffic Signal Warrant
Both Minor-Street approaches have one lane approaches

Warrant 1: Eight-Hour Vehicular Volume

Support:
The minimum vehicular volume, Condition A, is intended for application at locations where a large volume of intersecting traffic is the principal reason to consider installing a traffic signal control

The Interruption of Continuous Traffic, Condition B, is intended for application at locations where Condition A is not satisfied and where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street.

It is intended that Warrant 1 be treated as a single warrant. If Condition A is satisfied, then Warrant 1 is satisfied and analyses of Condition B and the combination of Conditions A and B are not needed. Similarly, if Condition B is satisfied, then Warrant 1 is satisfied and an analysis of the combination of Conditions A and B is not needed.

Standard:
The need for a traffic control signal shall be considered if an engineering study finds that one of the following conditions exist for each of any 8 hours of an average day:

A. The vehicles per hour given in both of the 100 percent columns of Condition A in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection; or
B. The vehicles per hour given in both of the 100 percent columns of Condition B in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection.

In applying each condition the major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of these 8 hours.

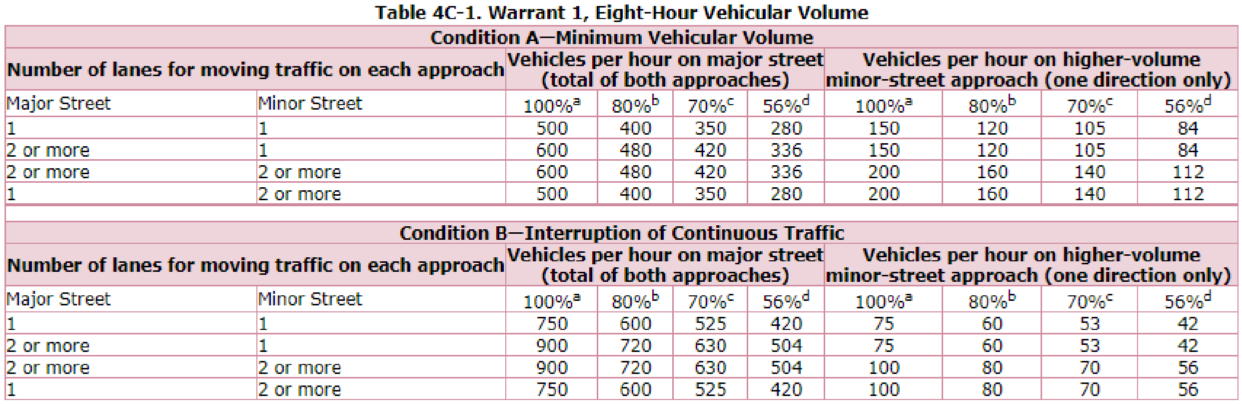


Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		**Vehicles per hour on major street (total of both approaches)**				**Vehicles per hour on higher-volume minor-street approach (one direction only)**			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		**Vehicles per hour on major street (total of both approaches)**				**Vehicles per hour on higher-volume minor-street approach (one direction only)**			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

[a] Basic minimum hourly volume

[b] Used for combination of Conditions A and B after adequate trial of other remedial measures

[c] May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

[d]May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph of in an isolated community with a population of less than 10,000

Conclusion of Warrant 1: The maximum hour minor-street volume, (coming from Silver Way) is 29 vehicles. This minor-street approach volume is too low to meet a, b, c, or d, for either Condition A or B. The major street, Waugh Chapel Road also only has a speed limit of 35 mph. This means c and d do not apply.

Warrant 2: Four-Hour Vehicular Volume

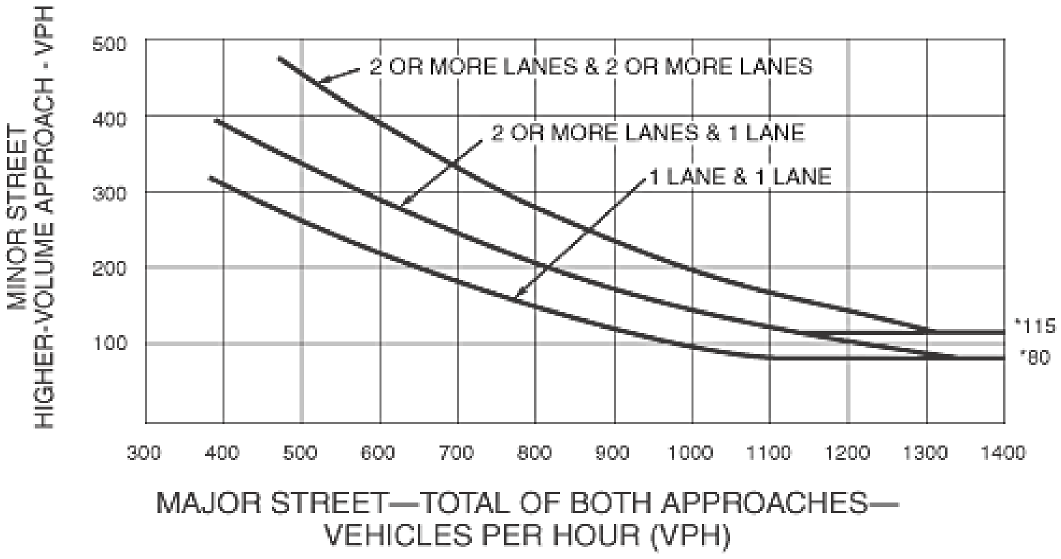
Support:

The Four-Hour Vehicular Volume signal warrant conditions are intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic control signal.

Standard:

The need for a traffic control signal shall be considered if an engineering study finds that, for each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) all fall above the applicable curve in Figure 4C-1 for the existing combination of approach lanes. On the minor street, the higher volume shall not be required to be on the same approach during each of these 4 hours.

Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Conclusion of Warrant 2: As seen in Figure 4C-1, the minimum threshold for a minor-street approach with one lane is 80 vph. Since the highest hour minor-street volume, (coming from Silver Way) is 29 vehicles this option is not valid. Also since the posted speed limit is less than 40 mph, Figure 4C-2 may not be considered in place of Figure 4C-1.

Warrant 3: Peak Hour

Support:

The Peak Hour signal warrant is intended for use at a location where traffic conditions are such that for a minimum of 1 hour of an average day, the minor-street traffic suffers undue delay when entering or crossing the major street.

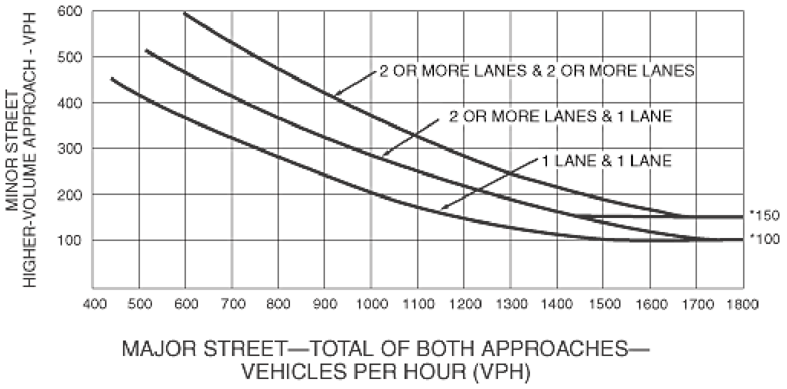
Standard:

The need for a traffic control signal shall be considered if an engineering study finds that the criteria in either of the following two categories are met:

A. If all three of the following conditions exist for the same 1 hour (any four consecutive 15-minute periods) of an average day:
    1. The total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach; and
    2. The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes; and
    3. The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches.

B. The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4C-3 for the existing combination of approach lanes.

Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Conclusion of Warrant 3: As seen in Figure 4C-3, the minimum threshold for a minor-street approach with one lane is 100 vph. Since the highest hour minor-street volume, (coming from Silver Way) is 29 vehicles this option is not valid. Also since the posted speed limit is less than 40 mph, Figure 4C-4 may not be considered in place of Figure 4C-3. Because of this low side street volume Criteria A, number 2 is not met either. Because all numbers must be met for Criteria A to be met, Criteria A is invalid.

Guidance:

If this warrant is the only warrant met and a traffic control signal is justified by an engineering study, the traffic control signal should be traffic-actuated. However, If this warrant is the only warrant met and a traffic control signal is justified by an engineering study, the traffic control signal may be operated in the flashing mode during the hours that the volume criteria of this warrant are not met.

Warrant 4: Pedestrian Volume

Support:

The Pedestrian Volume signal warrant is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street.

Standard:

The need for a traffic control signal at an intersection or midblock crossing shall be considered if an engineering study finds that one of the following criteria is met:

A. For each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) all fall above the curve in Figure 4C-5; or

B. For 1 hour (any four consecutive 15-minute periods) of an average day, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) falls above the curve in Figure 4C-7.

Conclusion of Warrant 4: The max pedestrian volume during any given hour at this intersection is 1. A count of 1 pedestrian is not an accurate representation of delay for pedestrians during a given hour. This warrant is not valid.

Warrant 5: School Crossing

Support:

The School Crossing signal warrant is intended for application where the fact that schoolchildren cross the major street is the principal reason to consider installing a traffic control signal. For the purposes of this warrant, the word "schoolchildren" includes elementary through high school students.

Standard:

The need for a traffic control signal shall be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream as related to the number and size of groups of schoolchildren at an established school crossing across the major street shows that the number of adequate gaps in the traffic stream during the period when the schoolchildren are using the crossing is less than the number of minutes in the same period (see Section 7A.03) and there are a minimum of 20 schoolchildren during the highest crossing hour.

03 Before a decision is made to install a traffic control signal, consideration shall be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing.

04 The School Crossing signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of traffic.

Conclusion of Warrant 5: The schools Four Seasons Elementary School and The School of the Incarnation have some pedestrians around the intersections of Waugh Chapel Road and Maytime Drive as well as Waugh Chapel Road and Symphony Lane. However, given the counts of pedestrians at the intersection of Waugh Chapel and Silver Way being a max of one during any hour it is concluded these schools do not affect this intersection and therefore, this warrant is not met.

Warrant 6: Coordinated Signal System

Support:

Progressive movement in a coordinated signal system sometimes necessitates installing traffic control signals at intersections where they would not otherwise be needed in order to maintain proper platooning of vehicles.

Standard:

The need for a traffic control signal shall be considered if an engineering study finds that one of the following criteria is met:

A. On a one-way street or a street that has traffic predominantly in one direction, the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning.

B. On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation.

Guidance:

The Coordinated Signal System signal warrant should not be applied where the resultant spacing of traffic control signals would be less than 1,000 feet.

Warrant Conclusion: Along this corridor there is no signal to the east of this intersection until New Market Lane, about 3800 feet to the east along the corridor. To the west about 1200 feet is a signal at the intersection of Waugh Chapel Road and Silver Run Road/Summerfield Road. Based on the field work performed on 1/8/2018 there was no evidence of progression and platooning failing. Therefore based on field observations of how this intersection interacts with adjacent intersections it is determined this warrant is not valid.

Warrant 7: Crash Experience

Support:

The Crash Experience signal warrant conditions are intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal.

Standard:

The need for a traffic control signal shall be considered if an engineering study finds that all of the following criteria are met:

A. Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency; and

B. Five or more reported crashes, of types susceptible to correction by a traffic control signal, have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for a reportable crash; and

C. For each of any 8 hours of an average day, the vehicles per hour (vph) given in both of the 80 percent columns of Condition A in Table 4C-1 (see Section 4C.02), or the vph in both of the 80 percent columns of Condition B in Table 4C-1 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection, or the volume of pedestrian traffic is not less than 80 percent of the requirements specified in the Pedestrian Volume warrant. These major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours.

Conclusion for Warrant 7: Criterion B is not met based on the crash data from 2014 to 2016. Criteria C is not met because the minor-street volumes are not high enough during any hour within the 8 hour period to meet the 80 percent requirements in Table 4C-1. Since all criteria must be met to call for the need of a traffic signal, this warrant is not valid.

Warrant 8: Roadway Network

Support:

Installing a traffic control signal at some intersections might be justified to encourage concentration and organization of traffic flow on a roadway network.

Standard:

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

A. The intersection has a total existing, or immediately projected, entering volume of at least 1,000 vehicles per hour during the peak hour of a typical weekday and has 5-year projected traffic volumes, based on an engineering study, that meet one or more of Warrants 1, 2, and 3 during an average weekday; or

B. The intersection has a total existing or immediately projected entering volume of at least 1,000 vehicles per hour for each of any 5 hours of a non-normal business day (Saturday or Sunday).

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

A. It is part of the street or highway system that serves as the principal roadway network for through traffic flow.

B. It includes rural or suburban highways outside, entering, or traversing a city.

C. It appears as a major route on an official plan, such as a major street plan in an urban area traffic and transportation study.

Conclusion for Warrant 8: Since Waugh Chapel Road and Silver Way are not considered major routes this warrant is not valid.

Conclusion

Since no warrants are met, mainly due to the low volumes coming from Silver Way and Macmullen Drive, it is determined that there should be no signal placed at the intersection of Waugh Chapel Road and Silver Way/Macmullen Drive.

Intersection: Waugh Chapel Road and Summerfield Road

Traffic Signal Warrant

Both Minor-Street approaches have one lane approaches

Warrant 1: Eight-Hour Vehicular Volume

Support:

The minimum vehicular volume, Condition A, is intended for application at locations where a large volume of intersecting traffic is the principal reason to consider installing a traffic signal control

The Interruption of Continuous Traffic, Condition B, is intended for application at locations where Condition A is not satisfied and where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street.

It is intended that Warrant 1 be treated as a single warrant. If Condition A is satisfied, then Warrant 1 is satisfied and analyses of Condition B and the combination of Conditions A and B are not needed. Similarly, if Condition B is satisfied, then Warrant 1 is satisfied and an analysis of the combination of Conditions A and B is not needed.

Standard:

The need for a traffic control signal shall be considered if an engineering study finds that one of the following conditions exist for each of any 8 hours of an average day:

A. The vehicles per hour given in both of the 100 percent columns of Condition A in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection; or
B. The vehicles per hour given in both of the 100 percent columns of Condition B in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection.

In applying each condition the major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of these 8 hours.

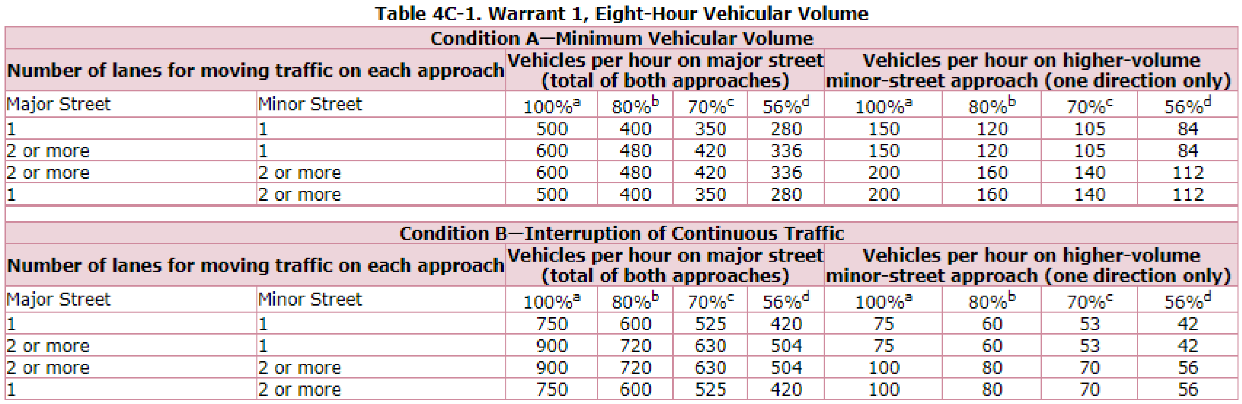


Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		**Vehicles per hour on major street (total of both approaches)**				**Vehicles per hour on higher-volume minor-street approach (one direction only)**			
Major Street	Minor Street	100%^{a}	80%^{b}	70%^{c}	56%^{d}	100%^{a}	80%^{b}	70%^{c}	56%^{d}
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		**Vehicles per hour on major street (total of both approaches)**				**Vehicles per hour on higher-volume minor-street approach (one direction only)**			
Major Street	Minor Street	100%^{a}	80%^{b}	70%^{c}	56%^{d}	100%^{a}	80%^{b}	70%^{c}	56%^{d}
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

^{a}Basic minimum hourly volume

[b] Used for combination of Conditions A and B after adequate trial of other remedial measures

[c] May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

[d] May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph of in an isolated community with a population of less than 10,000

Conclusion of Warrant 1: The maximum minor-street approach volume, coming from Summerfield Road, is 137 vehicles during the 2040 PM peak hour. This minor-street volume criteria meets 'Condition B – Interruption of Continuous Traffic' criteria of 75 as shown on Table 4C-1. Additionally, the maximum hour major-street volume meets the 100% criteria 'a'. Warrant 1 only requires either Condition A or B to be met for the intersection to qualify for a signal warrant, therefore, a signal is warranted.

Warrant 2: Four-Hour Vehicular Volume

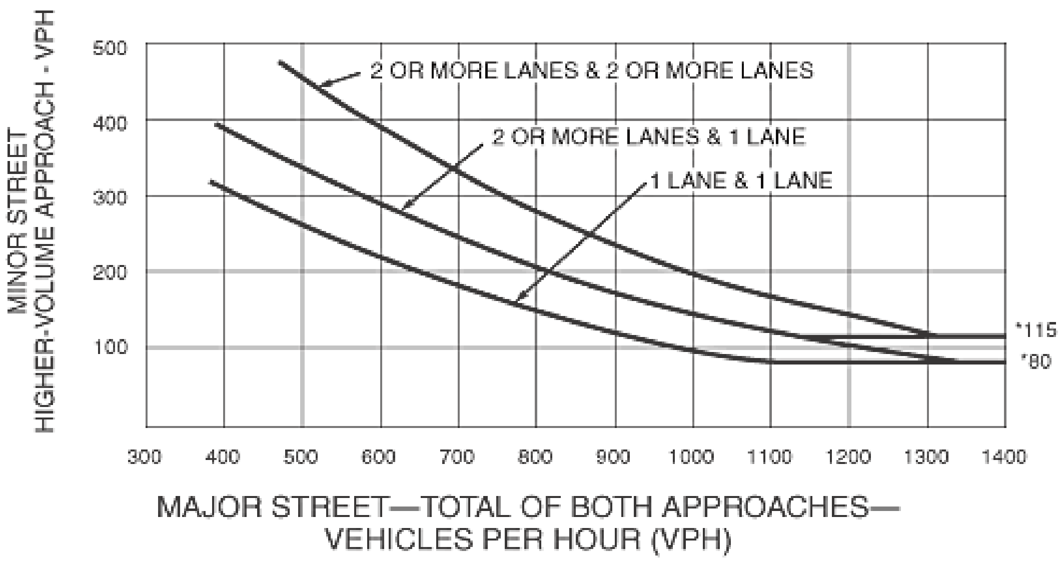
Support:

The Four-Hour Vehicular Volume signal warrant conditions are intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic control signal.

Standard:

The need for a traffic control signal shall be considered if an engineering study finds that, for each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) all fall above the applicable curve in Figure 4C-1 for the existing combination of approach lanes. On the minor street, the higher volume shall not be required to be on the same approach during each of these 4 hours.

Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Conclusion of Warrant 2: As seen in Figure 4C-1, the minimum threshold for a minor-street approach with one lane is 80 vph. Since the highest hour minor-street volume, (coming from Summerfield Road) is 137 vehicles and the total major street volume exceed 2,000 vph, a signal is warranted.

Warrant 3: Peak Hour

Support:

The Peak Hour signal warrant is intended for use at a location where traffic conditions are such that for a minimum of 1 hour of an average day, the minor-street traffic suffers undue delay when entering or crossing the major street.

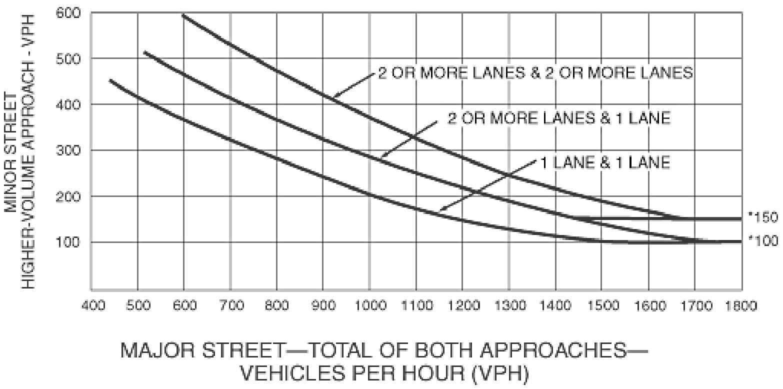
Standard:

The need for a traffic control signal shall be considered if an engineering study finds that the criteria in either of the following two categories are met:

A. If all three of the following conditions exist for the same 1 hour (any four consecutive 15-minute periods) of an average day:
   1. The total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach; and
   2. The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes; and
   3. The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches.

B. The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4C-3 for the existing combination of approach lanes.

Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Conclusion of Warrant 3: As seen in Figure 4C-3, the minimum threshold for a minor-street approach with one lane is 100 vph. Since the highest hour minor-street volume, (coming from Summerfield Road) is 137, the threshold is met. However, the total entering volume serviced during the hour does not equal 800 vehicles per hour, therefore, this warrant is not valid. Also since the posted speed limit is less than 40 mph, Figure 4C-4 may not be considered in place of Figure 4C-3. Because all numbers must be met for Criteria A to be met, Criteria A is invalid.

Guidance:

If this warrant is the only warrant met and a traffic control signal is justified by an engineering study, the traffic control signal should be traffic-actuated. However, if this warrant is the only warrant met and a traffic control signal is justified by an engineering study, the traffic control signal may be operated in the flashing mode during the hours that the volume criteria of this warrant are not met.

Warrant 4: Pedestrian Volume

Support:

The Pedestrian Volume signal warrant is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street.

Standard:

The need for a traffic control signal at an intersection or midblock crossing shall be considered if an engineering study finds that one of the following criteria is met:

A. For each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) all fall above the curve in Figure 4C-5; or

B. For 1 hour (any four consecutive 15-minute periods) of an average day, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) falls above the curve in Figure 4C-7.

Conclusion of Warrant 4: The max pedestrian volume during any given hour at this intersection is two. A count of two pedestrian is not an accurate representation of delay for pedestrians during a given hour. This warrant is not valid.

Warrant 5: School Crossing

Support:

The School Crossing signal warrant is intended for application where the fact that schoolchildren cross the major street is the principal reason to consider installing a traffic control signal. For the purposes of this warrant, the word "schoolchildren" includes elementary through high school students.

Standard:

The need for a traffic control signal shall be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream as related to the number and size of groups of schoolchildren at an established school crossing across the major street shows that the number of adequate gaps in the traffic stream during the period when the schoolchildren are using the crossing is less than the number of minutes in the same period (see Section 7A.03) and there are a minimum of 20 schoolchildren during the highest crossing hour.

03 Before a decision is made to install a traffic control signal, consideration shall be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing.

04 The School Crossing signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of traffic.

Conclusion of Warrant 5: The schools Four Seasons Elementary School and The School of the Incarnation have some pedestrians around the intersections of Waugh Chapel Road and Maytime Drive as well as Waugh Chapel Road and Symphony Lane. However, given the counts of pedestrians at the intersection of Waugh Chapel and Summerfield Road being a max of two during any hour it is concluded these schools do not affect this intersection and therefore, this warrant is not met.

Warrant 6: Coordinated Signal System

Support:

Progressive movement in a coordinated signal system sometimes necessitates installing traffic control signals at intersections where they would not otherwise be needed in order to maintain proper platooning of vehicles.

Standard:

The need for a traffic control signal shall be considered if an engineering study finds that one of the following criteria is met:

A. On a one-way street or a street that has traffic predominantly in one direction, the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning.

B. On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation.

Guidance:

The Coordinated Signal System signal warrant should not be applied where the resultant spacing of traffic control signals would be less than 1,000 feet.

Warrant Conclusion: Along this corridor there is no signal to the east of this intersection until New Market Lane, about 3800 feet to the east along the corridor. To the west about 1200 feet is a signal at the intersection of Waugh Chapel Road and Silver Run Road/Summerfield Road. Based on the field work performed on 1/8/2018 there was no evidence of progression and platooning failing. Therefore based on field observations of how this intersection interacts with adjacent intersections it is determined this warrant is not valid.

Warrant 7: Crash Experience

Support:

The Crash Experience signal warrant conditions are intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal.

Standard:

The need for a traffic control signal shall be considered if an engineering study finds that all of the following criteria are met:

A. Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency; and

B. Five or more reported crashes, of types susceptible to correction by a traffic control signal, have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for a reportable crash; and

C. For each of any 8 hours of an average day, the vehicles per hour (vph) given in both of the 80 percent columns of Condition A in Table 4C-1 (see Section 4C.02), or the vph in both of the 80 percent columns of Condition B in Table 4C-1 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection, or the volume of pedestrian traffic is not less than 80 percent of the requirements specified in the Pedestrian Volume warrant. These major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours.

Conclusion for Warrant 7: All criteria must be met to call for the need of a traffic signal. The study does not have projections of crash data for the year 2040. The existing crash data does not meet the requirements. Therefore, all crash criteria is not met and this warrant is not valid.

Warrant 8: Roadway Network

Support:

Installing a traffic control signal at some intersections might be justified to encourage concentration and organization of traffic flow on a roadway network.

Standard:

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

A. The intersection has a total existing, or immediately projected, entering volume of at least 1,000 vehicles per hour during the peak hour of a typical weekday and has 5-year projected traffic volumes, based on an engineering study, that meet one or more of Warrants 1, 2, and 3 during an average weekday; or

B. The intersection has a total existing or immediately projected entering volume of at least 1,000 vehicles per hour for each of any 5 hours of a non-normal business day (Saturday or Sunday).

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

A. It is part of the street or highway system that serves as the principal roadway network for through traffic flow.

B. It includes rural or suburban highways outside, entering, or traversing a city.

C. It appears as a major route on an official plan, such as a major street plan in an urban area traffic and transportation study.

Conclusion for Warrant 8: Since Waugh Chapel Road and Summerfield Road are not considered major routes this warrant is not valid.

Conclusion

Signal warrants were met for the intersection of Waugh Chapel Road and Summerfield Road for the year 2040 due to high major road traffic and an increase in minor road traffic volumes.

Appendix C-5

BIKE LEVEL OF STRESS

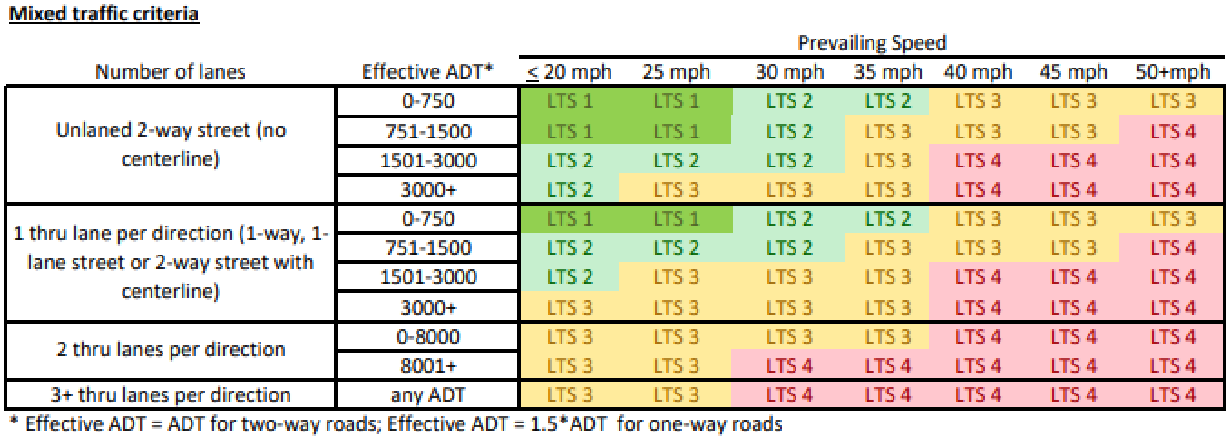
A simple methodology was used in assessing future multimodal accommodations. The Bike Level of Traffic Stress (BLTS or LTS) methodology was developed by the Mineta Transportation Institute in 2012, considering different street elements. This methodology was later updated in 2017 by Northeastern University.

BLTS is scored from one to four (one representing low stress for a bicyclist and four representing high stress for a bicyclist), based on factors such as bicycle facility type, traffic speed, street width, and bike lane width. The combination of these factors contributes to the level of stress that a bicyclist may feel as they travel along a roadway segment. A street with a BLTS score of one provides comfortable and a low stress riding experience for bicyclists of all ages and abilities.

BLTS can be assigned for segments, pocket lanes on intersection approaches, and crossings (unsignalized intersections). Mineta has developed criteria that assign BLTS for each element based on a series of classification tables. Visual inspection of the street (either in person or via satellite mapping is required to assign a classification.

For this study, though Waugh Chapel Road has a posted speed limit of 30 mph, the observed 85th percentile speeds are in the range of 40-45 mph, with higher speed reaching 50 mph in the segment east of Macmullen Drive. Therefore, using the prevailing speeds, travel lane widths, and facility type, the following BLTS were calculated. The proposed shared-use path provides a BLTS score of one, suggesting comfortable and a low stress riding experiences for bicyclists of all ages and abilities. The proposed bike lane and sidewalk alternative provides a BLTS score of three, where riders still experience some discomfort due to proximity to traffic traveling at higher speeds. Nevertheless, if the prevailing speeds in future conditions stay at the speed limit of 30 mph, the BLTS for the bike lanes will be two, which is considered a low stress facility that most riders can tolerate and are comfortable with.

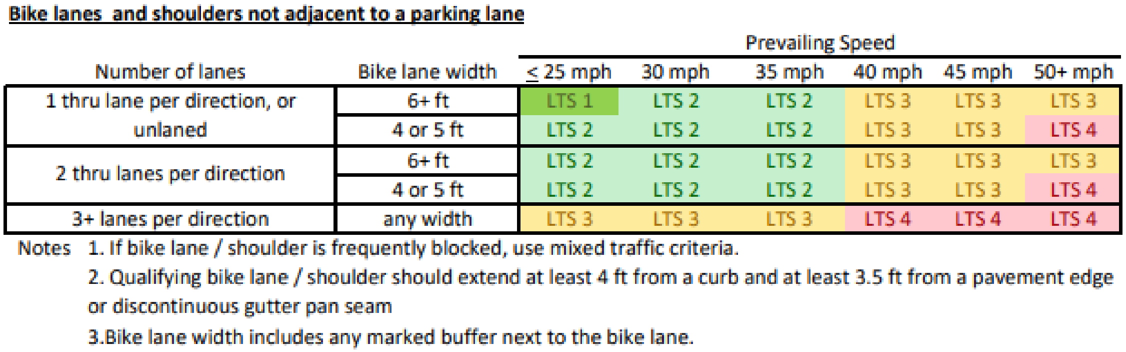
The following page shows the classification tables used to identify the BLTS for the Waugh Chapel Study.



Mixed traffic criteria

Number of lanes	Effective ADT*	Prevailing Speed						
		≤ 20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50+mph
Unlaned 2-way street (no centerline)	0-750	LTS 1	LTS 1	LTS 2	LTS 2	LTS 3	LTS 3	LTS 3
	751-1500	LTS 1	LTS 1	LTS 2	LTS 3	LTS 3	LTS 3	LTS 4
	1501-3000	LTS 2	LTS 2	LTS 2	LTS 3	LTS 4	LTS 4	LTS 4
	3000+	LTS 2	LTS 3	LTS 3	LTS 3	LTS 4	LTS 4	LTS 4
1 thru lane per direction (1-way, 1-lane street or 2-way street with centerline)	0-750	LTS 1	LTS 1	LTS 2	LTS 2	LTS 3	LTS 3	LTS 3
	751-1500	LTS 2	LTS 2	LTS 2	LTS 3	LTS 3	LTS 3	LTS 4
	1501-3000	LTS 2	LTS 3	LTS 3	LTS 3	LTS 4	LTS 4	LTS 4
	3000+	LTS 3	LTS 3	LTS 3	LTS 3	LTS 4	LTS 4	LTS 4
2 thru lanes per direction	0-8000	LTS 3	LTS 3	LTS 3	LTS 3	LTS 4	LTS 4	LTS 4
	8001+	LTS 3	LTS 3	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4
3+ thru lanes per direction	any ADT	LTS 3	LTS 3	LTS 4	LTS 4	LTS 4	LTS 4	LTS 4

* Effective ADT = ADT for two-way roads; Effective ADT = 1.5*ADT for one-way roads



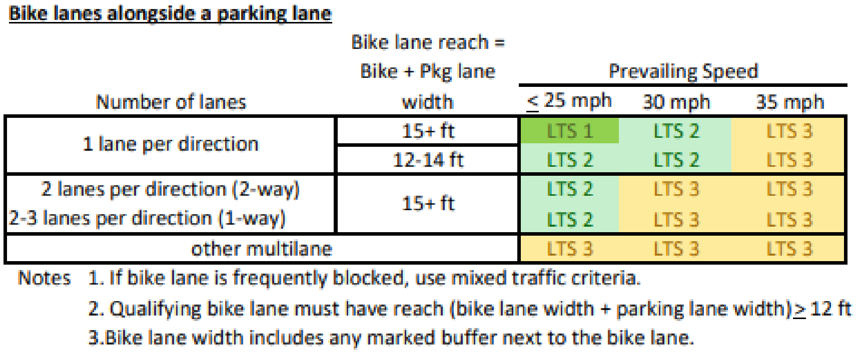
Bike lanes and shoulders not adjacent to a parking lane

Number of lanes	Bike lane width	Prevailing Speed					
		≤ 25 mph	30 mph	35 mph	40 mph	45 mph	50+ mph
1 thru lane per direction, or unlaned	6+ ft	LTS 1	LTS 2	LTS 2	LTS 3	LTS 3	LTS 3
	4 or 5 ft	LTS 2	LTS 2	LTS 2	LTS 3	LTS 3	LTS 4
2 thru lanes per direction	6+ ft	LTS 2	LTS 2	LTS 2	LTS 3	LTS 3	LTS 3
	4 or 5 ft	LTS 2	LTS 2	LTS 2	LTS 3	LTS 3	LTS 4
3+ lanes per direction	any width	LTS 3	LTS 3	LTS 3	LTS 4	LTS 4	LTS 4

Notes 1. If bike lane / shoulder is frequently blocked, use mixed traffic criteria.

2. Qualifying bike lane / shoulder should extend at least 4 ft from a curb and at least 3.5 ft from a pavement edge or discontinuous gutter pan seam

3.Bike lane width includes any marked buffer next to the bike lane.



Bike lanes alongside a parking lane

Number of lanes	Bike lane reach = Bike + Pkg lane width	Prevailing Speed		
		≤ 25 mph	30 mph	35 mph
1 lane per direction	15+ ft	LTS 1	LTS 2	LTS 3
	12-14 ft	LTS 2	LTS 2	LTS 3
2 lanes per direction (2-way)	15+ ft	LTS 2	LTS 3	LTS 3
2-3 lanes per direction (1-way)		LTS 2	LTS 3	LTS 3
other multilane		LTS 3	LTS 3	LTS 3

Notes 1. If bike lane is frequently blocked, use mixed traffic criteria.

2. Qualifying bike lane must have reach (bike lane width + parking lane width) ≥ 12 ft

3.Bike lane width includes any marked buffer next to the bike lane.

Source: http://www.northeastern.edu/peter.furth/criteria-for-level-of-traffic-stress/

Appendix D

PUBLIC MEETING MATERIAL

Anne Arundel County
DPW & YOU
Making a difference, together

July 24, 2018

TRANSPORTATION FACILITY PLANNING
Waugh Chapel Road
Maytime Drive to New Market Lane

Kimley»Horn

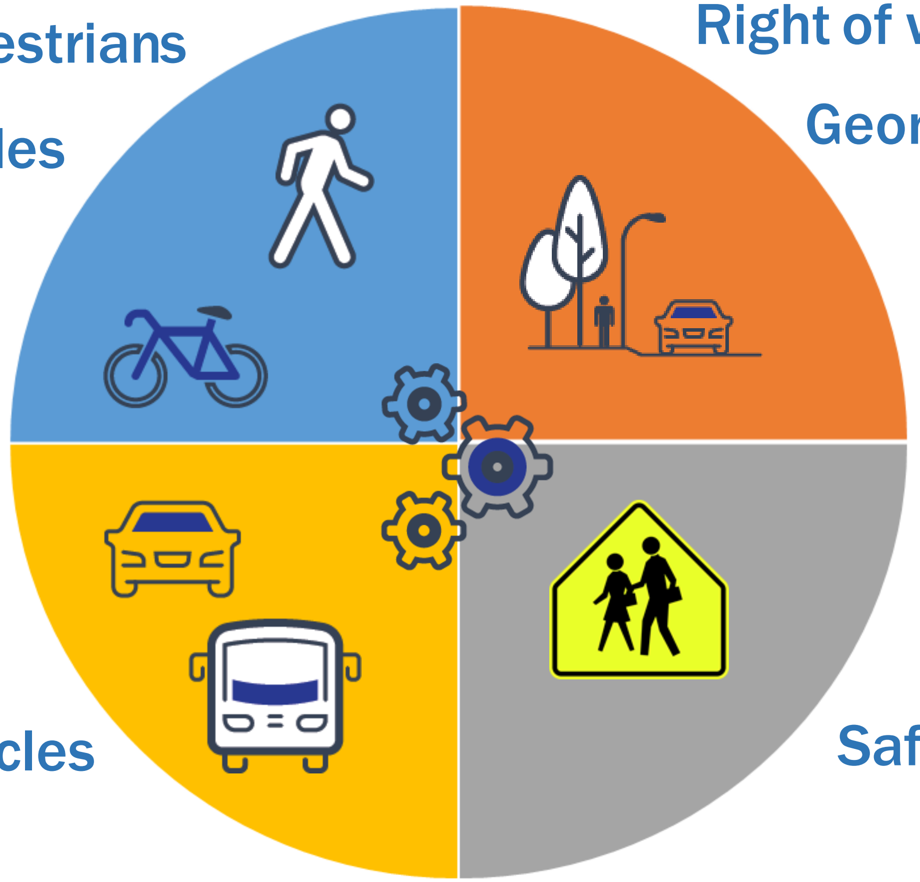
Meeting Agenda

- Purpose of the project
- Overview of work conducted to date
    - Existing conditions
- Discuss public input from online posting
- Future projected traffic volumes and operations
- Next steps

Purpose of Project

- Improve pedestrian and bicycle accessibility
- Enhance safety and connectivity for all modes of transportation
- Limit impacts to natural/built environment and private property

Study Focus Areas



Pedestrians

Bicycles

Right of way

Geometrics

Vehicles

Safety

Existing Conditions Summary

- Generally, a two-lane roadway
- Exclusive turn lanes at some intersections (some narrow turn lanes)
- Varying shoulder width
- Gaps in sidewalk and shoulder
- Deficiencies in roadway geometrics (e.g. sight distance)
- Speeds above posted speed limits

Pedestrian and Bicycle Facilities

Existing Bike and Pedestrian Facilities

Transportation Facility Planning Waugh Chapel Road

Kimley»Horn

Existing Traffic Operations

- Heavy traffic flow (higher in PM than AM)
- EB Waugh Chapel Road at Symphony Lane is congested in AM
- 85th percentile speeds are 41 to 48 mph (35 mph posted speed limit)
- High delay for turning traffic from side streets

Legend

→ = High Delay

Roadway Geometrics

- Gaps in sidewalk and shoulder
- Varying road width (travel lanes, shoulders, sidewalk)
- Horizontal curves
- Restricted sight distance at intersections

Right of Way Constraints

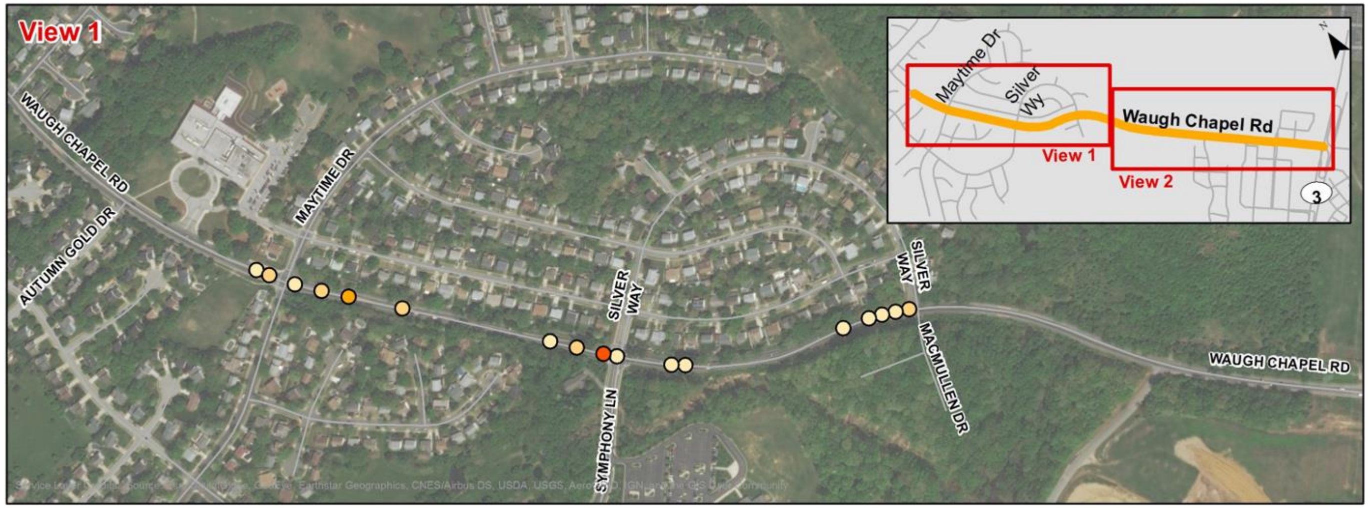
- Overhead utilities on south side through majority of corridor
- Environmentally sensitive locations (e.g. creek, trees)
- Slope
- Challenging areas along the corridor
  - Maytime Drive to Symphony Lane
  - Symphony Lane to Macmullen Drive
  - East of Macmullen Drive (horizontal curve)

Traffic Control Devices

- Signalization
- Signing and pavement markings
- Speed management
    - Speed feedback signs
    - Median island
    - Chokers

Crash Analysis (2014-2017)

- Reported crashes occurred mainly at or near intersections
- Percent of the crashes by type
  - Rear end (37%)
  - Angle/Head On (23%)
  - Sideswipe (11%)



2040 Development and Growth

- Projected annual growth for the surrounding area
  - Population: 0.5%
  - Employment: 1%
- Growth comprised of following developments:
  - Summerfield Phase II
  - Odenton Town Center
  - Waugh Chapel Town Center
  - Two Rivers

2040 Traffic Volumes and Operations

- 1% to 2% annual growth in traffic volumes (not warranting new capacity)
- Stop-controlled side streets movements operate poorly
- Eastbound Waugh Chapel Rd nearing capacity at Symphony Ln in AM peak
- Roadway segments on Waugh Chapel Road near capacity

Public Input - Key Issues

- Improve pedestrian and bicycle infrastructure
- Install turn lanes at several intersections
- Speeding concerns
- Consider two way left turn lane throughout the corridor
- Additional signals
- Through traffic on Waugh Chapel Road

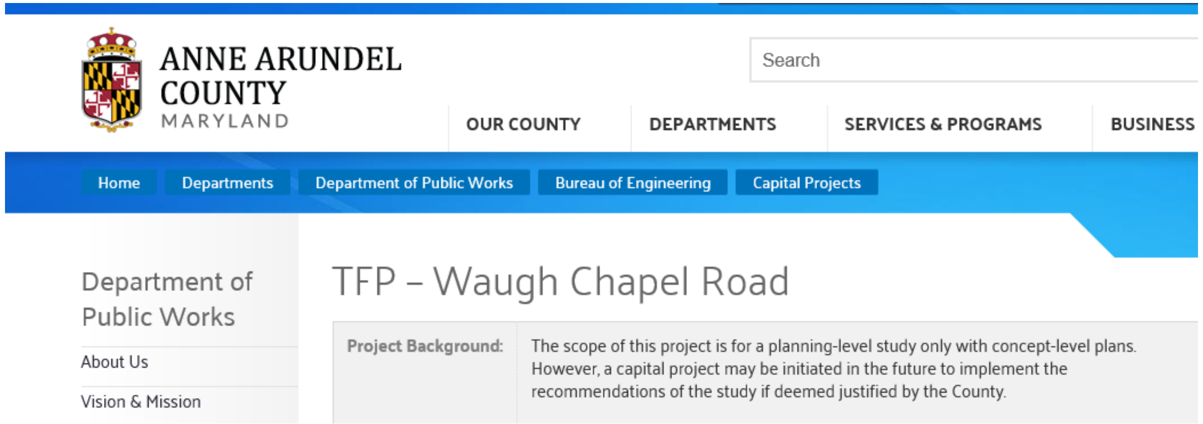
Next Steps

- Now: County’s on-going traffic operations improvements
- This Study:
    - Process input and feedback from you
    - Develop recommended improvement alternatives
    - Analyze future conditions with improvements
    - Prepare final planning-level report and obtain public input
- Future: Seek funding for design and implementation

Public Input

- Project contact

Adam Greenstein, PE, PTOE, ENV SP
pwgree08@aacounty.org
Project website: https://www.aacounty.org/departments/public-works/engineering/Capital_Projects/tfp--waugh-chapel-road



TFP – Waugh Chapel Road

Project Background: The scope of this project is for a planning-level study only with concept-level plans. However, a capital project may be initiated in the future to implement the recommendations of the study if deemed justified by the County.

Bureau of Utility Operations

24-Hour Emergency Water Services: (410) 222-8400
Billing Inquiries: (410) 222-1144

Bureau of Highways

Northern District: (410) 222-6120
Central District: (410) 222-7940
Southern District: (410) 222-1933
Traffic Lights/Signs: (410) 222-1940

Bureau of Waste Management Services

Bulk Trash Service/Curbside Collections: (410) 222-6100

Bureau of Engineering

General Inquiries: (410) 222-7500

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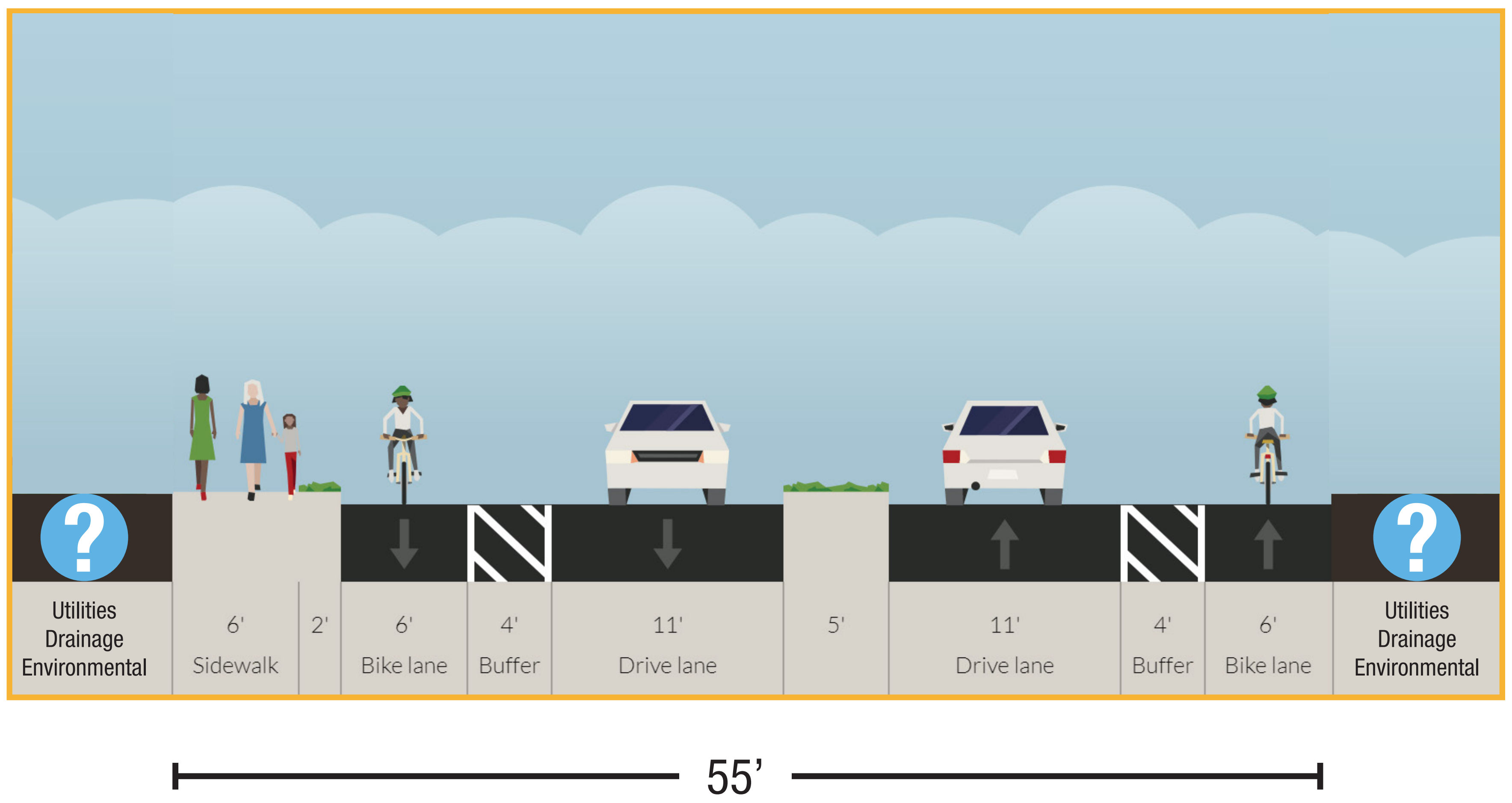
Waugh Chapel Road Existing and Example Mid-Block Cross-Sections

Cross-Section 1: Waugh Chapel Road East of Maytime Drive (Looking West)

Existing

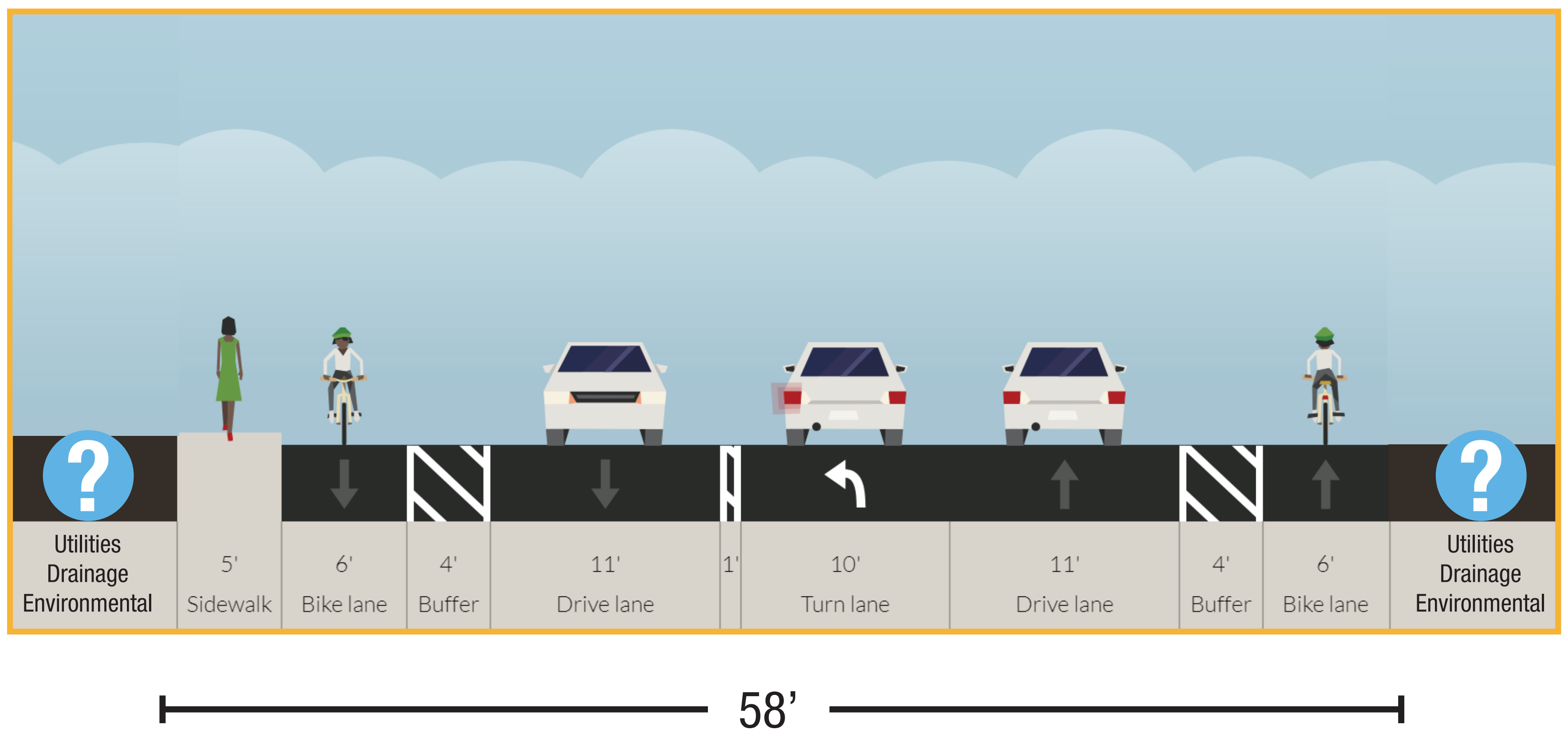
Example Cross-Section



Cross-Section 2: Waugh Chapel Road East of Symphony Lane (Looking West)

Existing

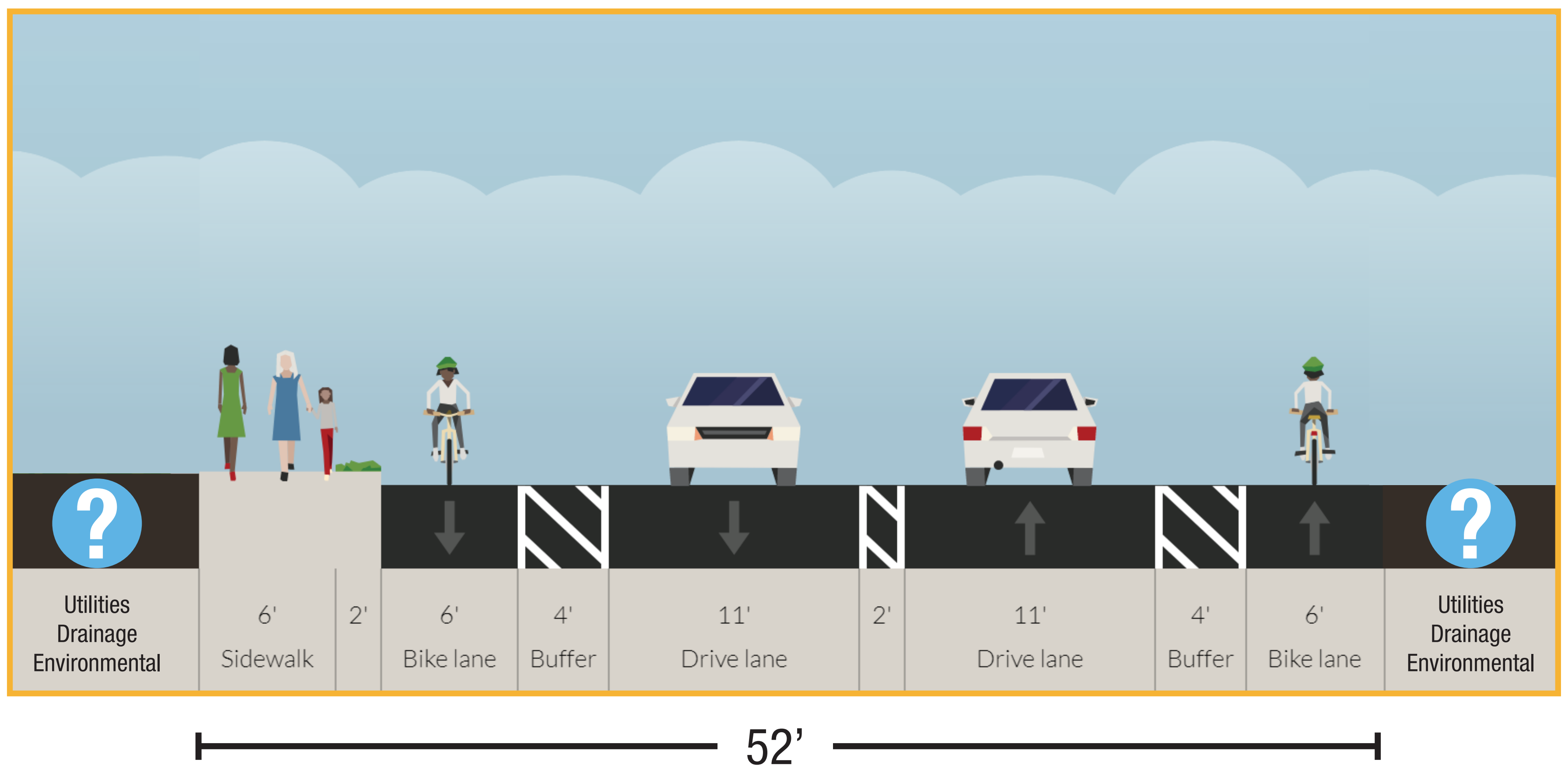
Example Cross-Section



Cross-Section 3: Waugh Chapel Road East of Macmullen Drive (Looking West)

Existing

Example Cross-Section



MEETING SUMMARY

Meeting Subject:	Public Meeting #1
Meeting Date:	July 24, 2018
Meeting Time:	6:30 PM to 8:30 PM
Meeting Location:	Waugh Chapel Elementary School

Attendees

Name	Organization	Email
Public		
David Helmecki	Aide to Andrew Pruski	
Study Team		
Adam Greenstein	Anne Arundel Co.	pwgree08@aacounty.org
Dan Anderson	Anne Arundel Co./DPW Eng	pwande85@aacounty.org
Nestor Flores	Anne Arundel Co.	pwflor11@aacounty.org
Tanya Asman	Anne Arundel Co./OOT	trasma00@aacounty.org
Mark	Anne Arundel Co./Planning	
Dawn Thomas	Anne Arundel Co.	rpthom00@aacounty.org
Kathy Falk	Kimley-Horn	Kathy.falk@kimley-horn.com
Jiaxin Tong	Kimley-Horn	Jiaxin.tong@kimley-horn.com

Summary of Meeting

The purpose of the meeting was to introduce the purpose of the project and provide an overview of work performed to date on Waugh Chapel Road, including existing conditions and public input received to the online posting of the existing conditions report. Thirty-three residents in attended the meeting, including Dave Helmecki, the legislative aide to Andrew Pruski, the Councilman from the 4th District.

Adam Greenstein presented the existing conditions findings and future traffic projections. Nestor Flores then provided an update on the work that is underway and scheduled to be implemented by the County traffic engineering division. The presentation was followed by a Q&A session where the project team collectively addressed the comments and questions from the public. The meeting was concluded with public reviewing the corridor rollout maps and example cross-sections and providing comments. Below is a summary of the discussions and comments received during the public meeting.

1. Discussions during Presentation and Q&A Session
    a. Q: Are number of crashes above state average; how is it compared to other roads? A: We do not have rates to compare with on County roads.
    b. Nester Flores explained on-going and planned work from traffic engineering division and answered questions from the community.

    i. Waugh Chapel Road is designated as a minor arterial; therefore speed bumps and humps cannot be installed. Waugh Chapel Road is used by emergency vehicles serving this portion of the county.
    ii. Nestor meets with neighborhood transportation committee every 2-3 weeks
    iii. Traffic calming focuses on behavior and raises awareness. Concepts can be tested to see how they work, then made into a permanent implementation
    iv. Question: Do you need to widen Waugh Chapel Road at MacMullen to fit a left-turn lane? Answer: Corridor width is ok to accommodate it, will do that analysis before implementing
    v. Enhance trail crossing, pedestrian crossing
    vi. Roundabout to work with right-in-right-out to allow communities to turn left without a signal
    vii. Symphony Lane: apply rumble strip to discourage cut-through traffic
    viii. Future is about what community wants

c. Several residents stated that some of the traffic problems are attributable to development. Builders should allocate funds to help address the issues. Summerfield developer proposes to build a road connection to tie to Waugh Chapel shopping center.
    i. Tanya Asman: impact fee is for traffic mitigation and is part of the development review process; need to provide a grid network so traffic does not go through one road

d. Residents explained that there are 3 routes to connect to MD 3 and all of them are congested.
    i. Patuxent Road has massive development (Two Rivers);
    ii. Route 175 over capacity; narrows to 2 lanes when it intersects Rt 3;
    iii. Waugh Chapel Road

e. 2% annual growth equates to 50% increase by 2040, which will lead to very congested traffic conditions;

f. Residents are totally against widening Waugh Chapel Road. Several have houses that back up against Waugh Chapel Road, some of them have had accidents on their property.

g. Residents suggest lowering the posted speed limit below 35 mph and there used to be no trucks through trucks on the corridor.

h. Bus to take kids to Four Seasons Elementary now because sidewalks are not connected; parents do not want their kids to walk along the corridor

i. Bikers need to be very wary of traffic due to the speeding issues

j. Nester Flores mentioned that capital budget needs to be requested in competing with other projects; roundabout may be analyzed first and then shared with transportation committee;

k. Summerfield is not fully populated yet. Safety issue in terms of near-miss accidents. Community felt it unsafe not having a turning lane; a lot of near misses; The community will have 200 to 300 houses.
    i. Nester: When projects is completed, new marking will be provided; one of options is to provide a left-turn into community; the dilemma is the adult care facility across the street is being handled by others.

l. Lack consistent sidewalk from development to Four Seasons Elementary, which forces people to drive when no sidewalk;

m. Residents do not feel safe; have to drive to Piney Orchard to walk;
    i. Review pavement signing to raise awareness of cycling
n. High % of traffic come from Piney Orchard; Is Evergreen connection going to be built to connect to Piney Orchard directly?
    i. Conway is historical road, any change very limited
o. Left-turn lane into Maytime is sometimes used as accelerating lane to pass people
    i. Nester: that is why we have island; can do enforcement;
p. Two schools in the community right now; can speed cameras be installed as a deterrent? A: The County does not have legislation to allow speed cameras in school zones. That issue would have to be raised through County Council.
q. No bus for School of Incarnation and every kid comes with a car;
r. Traffic signal synchronization technology: use speed camera; upgrade infrastructure to handle speeding; need more traffic officers
s. Is there a reason why Reliable Concrete still uses Waugh Chapel? Trucks still use it as through route. Waugh Chapel should be marked as no (through) trucks.
    i. Extend the merge lane; Reliable has let drivers yield traffic

2. Summary of Public Comments on Rollout Map
    a. Reduce the traffic on Waugh Chapel Road by providing an alternate route for Piney Orchard community
    b. Parents dropping children off at the Four Seasons Elementary School parked in front of the school and pulled out in front of traffic coming down on Waugh Chapel Road
    c. Visibility issues for turning from southbound Maytime Drive to westbound Waugh Chapel Road; overgrown vegetation limits visibility for traffic coming from Silver Way; speeding cars are not seen until last minute
    d. My car was totaled coming of Silver Way left onto Waugh Chapel Road when the driver ran the red light. I did not see the car until I was on Waugh Chapel Road due to overgrown vegetation.
    e. Waugh Chapel Road right-turn onto first Silver Way is scary
    f. A roundabout at Macmullen Drive/Waugh Chapel Road
    g. Right-in-right-out at unsignalized intersections
    h. Sidewalk next to guardrail (east of Symphony Lane) is dangerous
    i. Need a traffic light for Summerfield Road; turning traffic stops on Waugh Chapel Road
    j. Need a sign to identify turns into Summerfield Road
    k. Consider Summerfield Road; Extension to shopping center will add through traffic to Waugh Chapel Road

Anne Arundel County
DPW & YOU
Making a difference, together

April 4, 2019

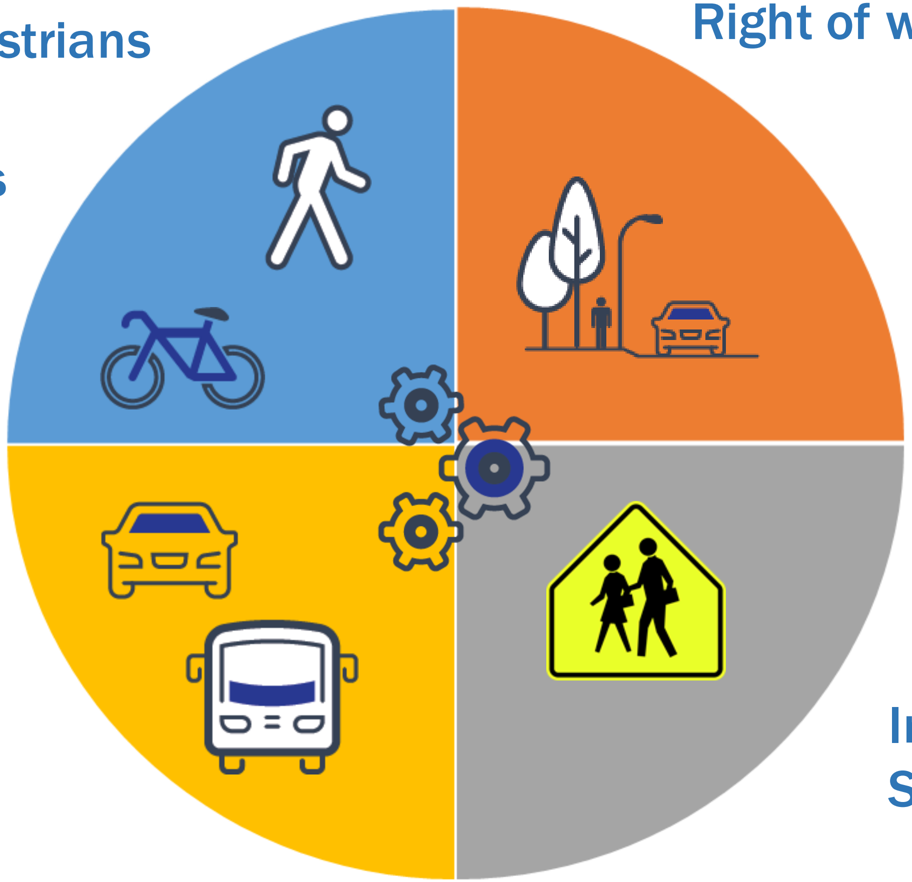
TRANSPORTATION FACILITY PLANNING
Waugh Chapel Road
Maytime Drive to New Market Lane

Kimley»Horn

Purpose of Project

- Enhance safety and connectivity for all modes of transportation
- Improve pedestrian and bicycle accessibility
- Limit impacts to natural/built environment and private property

Study Focus Areas and Performance Metrics



Pedestrians

Bicycles Level of Stress

Right of way Impact

Ease of Implementation

Vehicle Operations

Intersection Safety

Existing Conditions Summary

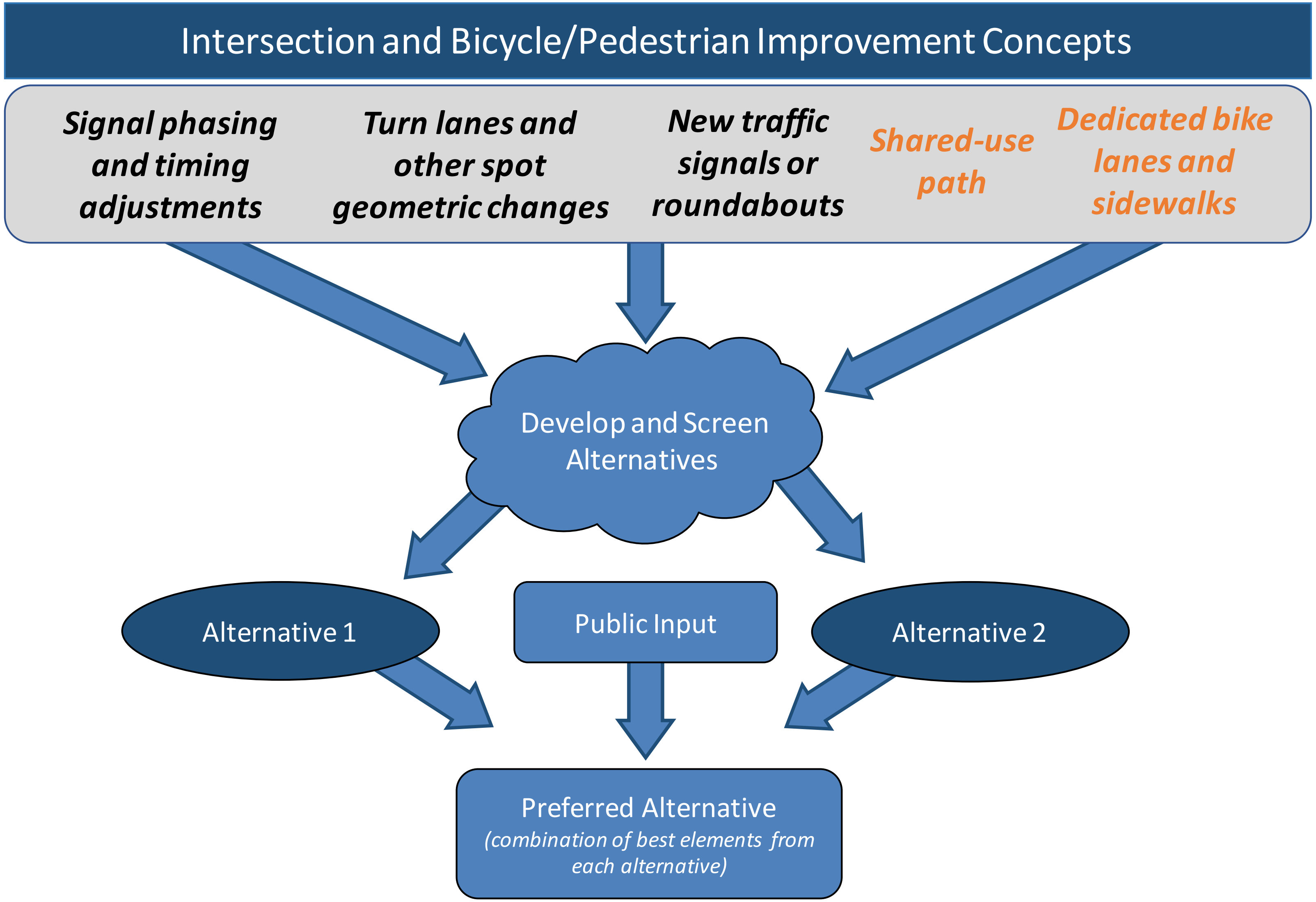
- Generally a two-lane roadway
- Exclusive turn lanes at some intersections (some narrow turn lanes)
- Varying shoulder widths
- Gaps in sidewalks and shoulders
- Deficiencies in roadway geometrics (e.g. sight distance)
- Speeds above posted speed limits

2040 Future No Build Conditions

- Projected future traffic – approx. 20 years out
- Traffic estimated to increase approx. 1-2% per year,
  - Assuming no other connections to MD 3
- Without any improvements:
  - Access onto Waugh Chapel Road will be difficult at:
    - Silver Way / Macmullen Drive
    - Summerfield Road
  - Pedestrians and bicyclists will continue to have inadequate facilities

Alternatives Development & Screening

- Goal - balance needs of vehicular and non-vehicular traffic
- Intersection concepts
- Bicycle and pedestrian improvements
- Network connections



Intersection and Bicycle/Pedestrian Improvement Concepts

Signal phasing and timing adjustments

Turn lanes and other spot geometric changes

New traffic signals or roundabouts

Shared-use path

Dedicated bike lanes and sidewalks

Develop and Screen Alternatives

Alternative 1

Public Input

Alternative 2

Preferred Alternative

(combination of best elements from each alternative)

Evaluating Potential Alternatives

- Highest priorities
  - Safety
  - Speed management
  - Pedestrian/bicycle access
- Medium-level priorities
  - Ease of implementation
  - Right-of-way/utility impacts
  - Ease of access to/from side streets
- Lowest priority
  - Vehicular level-of-service

Screening Criteria and Relative Priority (weighting)

Alternatives	Safety	Speed Management	Pedestrian/ Bicycle Access	Ease of Implementation	R/W & Utility Relocations	Ease of Access to/from Side Streets	Level of Service	Total Score
Category Weighting	*3*	*3*	*3*	*2*	*2*	*2*	*1*	
No Build	1.5	1.5	1.5	2.0	2.0	1.0	0.5	9.5
Turn lane and signal phasing improvement	3.0	1.5	1.5	2.0	2.0	1.0	0.5	11.0
Single-Lane Roundabout	3.0	3.0	1.5	0.0	0.0	2.0	0.0	9.5

Intersection Alternatives Considered

Maytime Drive

- Turn lanes and signal phasing improvements
- Roundabout

Symphony Lane / Silver Way

- Signal phasing and timing improvements

Macmullen Drive / Silver Way

- Traffic signal with turn lanes
- Roundabout
- Continuous Green-T intersection & restricted turns to/from Silver Way

(visit displays to see concepts and talk with study team)

Intersection Alternatives Considered (Continued)

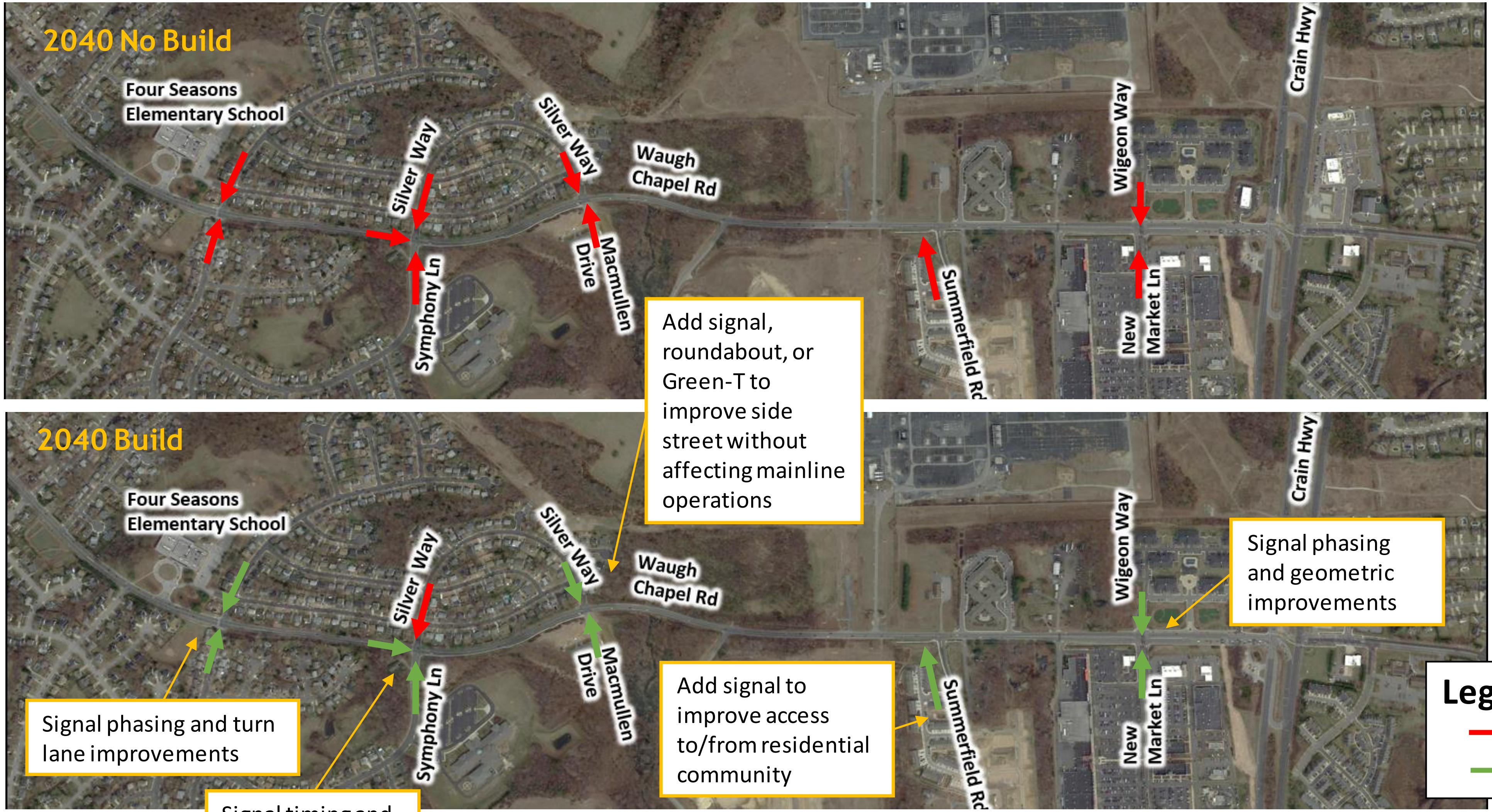
Summerfield Road

- Traffic Signal with turn lanes
- Roundabout

New Market Lane / Wigeon Way

- New Market Lane approach geometric changes
- Potential changes to westbound approach to clarify right turn lane
- Traffic signal phasing and timing adjustments
- Leading pedestrian interval (exclusive time to allow pedestrians to cross)

(visit displays to see concepts and talk with study team)



Add signal, roundabout, or Green-T to improve side street without affecting mainline operations

Signal phasing and geometric improvements

Signal phasing and turn lane improvements

Add signal to improve access to/from residential community

Signal timing and eastbound right-turn signal

Legend

🟥 → = High Delay

🟩 → = Mitigated

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS

Pedestrian and Bicycle Alternatives

- Shared-use path for bicycles and pedestrians, primarily on the south side
- Sidewalk on north side
- Dedicated bike lanes on both sides
- Shared-use-path connection south of the corridor to connect with Strawberry Lake Way (alternative network connection)

(visit displays to see concepts and talk with study team)

Network Connections

Connections to Waugh Chapel Road

- Via Waugh Chapel Towne Centre to Summerfield Road (platted by developer)
- Via Brickhead Road, west of existing power line easement

Evergreen Extension to Strawberry Lake Way

- Via Evergreen Road and Reliable Plant to south of Odenton (GORC) Park
  - Potentially shared-use path in Phase 1, motorist access in Phase 2

(visit displays to see concepts and talk with study team)

Public Input - Alternative Selection

We need your input!

- Preferred intersection alternatives, particularly at…
  - Silver Way / Macmullen Drive
  - New Market Lane / Wigeon Way
- Bicycle lanes, sidewalks, shared-use path
- Potential future network alternatives

Next Steps

- Now: County's on-going traffic operations improvements
- This Study
  - Select preferred alternatives based on today's public input
  - Prioritize and phase potential projects
  - Finalize report
- Future: Seek funding for design and implementation

Public Input

- Project Manager - **Adam Greenstein, PE, PTOE**
  - pwgree08@aacounty.org
- Project website: https://www.aacounty.org/departments/public-works/engineering/Capital_Projects/tfp--waugh-chapel-road

Bureau of Utility Operations

24-Hour Emergency Water Services: (410) 222-8400
Billing Inquiries: (410) 222-1144

Bureau of Highways

Northern District: (410) 222-6120
Central District: (410) 222-7940
Southern District: (410) 222-1933
Traffic Lights/Signs: (410) 222-1940

Bureau of Waste Management Services

Bulk Trash Service/Curbside Collections: (410) 222-6100

Bureau of Engineering

General Inquiries: (410) 222-7500

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ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS

	Waugh Chapel Road Public Meeting 2 - Comments and Issues (Post-its on Scrolls)
	Maytime Drive to Macmullen Drive/Silver Way
Intersection	***Safety*** • Traffic out of Macmullen Drive has more challenges relating to excessive speeds than gaps/volumes for through traffic on Waugh Chapel Road • There is a bus stop on southside of Waugh Chapel Road west of Macmullen Drive ***Signal*** • My name is B Bree Sizlo (HOA President) of neighborhood on Macmullen Drive; based on several inputs from our community, we vote for traffic signal concept - HOA email - Chapelcreek21054@gmail.com • Signal at Macmullen Drive may cause cut through traffic on Springhill Way ***Roundabout*** • Having a roundabout at Macmullen Drive will help manage speeds, stop illegal trucks, and solve side street access issues • Like roundabout concept, but two-lane circles do not work in this area; it did not work at Odenton Town Center ***Green-T*** • Green-T concept need median separation for safety • Green-T concept allows traffic to flow and still be safe and cautious
Segment	• Cars ran off road into ditch north of Waugh Chapel Road (buffer potential) between Symphony Lane and Maytime Drive • Concerns about short distance to end of left-turn queue at Symphony Lane if a Green-T is implemented • Removing traffic calming island east of Macmullen Drive • Vegetation north of Waugh Chapel Road east of Symphony Lane blocks sight line and is a safety hazard, especially when some of the residents avoid Silver Way/Macmullen Drive; crash occurred to SBL traffic out of Symphony Lane • Need mid-block signal warning/flasher east of Symphony Lane
Bicycle and Pedestrian	• Bike path will become a suicide lane for impatient drivers • Agree with shared-use path concept

	Waugh Chapel Road Public Meeting 2 - Comments and Issues (Post-its on Scrolls)
	Alternative Network
Intersection	• Need access from NB MD 3 to Evergreen Road intersection (left-turn movement) if Evergreen Road extension is built
Segment	• Orange route is the preferred connection; Yellow Route is very residential and does not fit the amount of traffic that would be going through Summerfield Road. There are lots of children in the Summerfield community also. Houses are also not set back far enough off the road also. • Summerfield route is dangerous for children in the community • Evergreen Road extension route has environmental impact • Evergreen #1 Brick Head #2 • to Route 32 using Waugh Chapel • Make Evergreen road option have reasonable speed to encourage people from piney orchard to take that option over Waugh Chapel Road • Summerfield option will be too slow and could accommodate less people than the Evergreen option • A connector from Symphony Lane to the proposed Evergreen extension would help to alleviate traffic from the schools • There may be a problem if more traffic is redirected through Piney Orchard to Strawberry Lake Way. Especially if they go through areas where houses and neighborhoods exist • Evergreen road extension is only way to stop the traffic congestion
Bicycle and Pedestrian	• Evergreen Road extension only for bikes and pedestrians • Will these roads have lights and sidewalks? • Add Evergreen/Strawberry connection to alleviate traffic on Waugh Chapel put the bike paths there

Executive Summary

Anne Arundel County initiated the Waugh Chapel Road Transportation Facility Planning study with the objective to improve safety, traffic operations, and accessibility for all modes of transportation on Waugh Chapel Road from Waugh Chapel Shopping Center to the existing and planned neighborhoods to the west. The limits of this Waugh Chapel Road study corridor are from Maytime Drive to New Market Lane. The study focuses on a multimodal, context-sensitive approach to identify and recommend improvements to the existing corridor that strike a balance between future vehicular traffic and pedestrian/bicyclists to enhance safety and connectivity for all modes of transportation.

This Future Conditions Report, which builds upon the May 2018 Existing Conditions Report, summarizes preferred alternative concepts and how they can address the purpose and need of the project as well as the process of developing, analyzing, and prioritizing improvement alternatives. The County will use the recommendations of this report to identify potential projects to move forward for implementation based on the County's priorities and funding opportunities.

The following summarizes the key findings (existing conditions) and recommendations based on the future (2040) conditions analysis for the Waugh Chapel Road study corridor:

- **Key Findings (Existing Conditions)**
  - The roadway segments studied along Waugh Chapel Road operate at level-of-service (LOS) D/E. The peak-hour demand on Waugh Chapel Road is heavy for a two-lane facility.
  - During the AM peak hour, the segments east of Symphony Lane operate worse than the western segment, from Maytime Drive to Symphony Lane, due to higher truck traffic and overall demand.
  - During the PM peak, all segments operate at LOS E in both directions.
  - Results of field observations did not reveal issues with corridor LOS along Waugh Chapel Road. There was very little delay along the corridor during the peak periods, except for an approximate 15-minute period between 7:50 and 8:05 AM at the intersection of Waugh Chapel Road and Symphony Lane. This delay is mostly attributed to the traffic associated with the School of the Incarnation.
  - Existing traffic volumes at the intersection of Silver Way/Macmullen Drive and Waugh Chapel Road do not warrant a traffic signal.
  - There are several gaps in the sidewalk network along Waugh Chapel Road, yet there is demand for sidewalks, as evidenced by pedestrians walking along the shoulder of *Waugh* Chapel Road.

  - While bicycles can be accommodated on portions of the paved shoulder areas along Waugh Chapel Road east of Macmullen Drive, there are areas without shoulders to the west that do not provide adequate bicycling conditions.
  - Speeding in the corridor, based on 85th-percentile speeds, in conjunction with roadway horizontal alignment may present potential risks to safety at the intersections as well as future proposed pedestrian and bicycle improvements.
  - Reported crashes along the corridor are focused around intersections and driveways. Excluding crashes near MD 3, crashes at the intersection of New Market Lane/Wigeon Way represented more than 35% of the crashes in the corridor and most of the rear-end and angle crashes. Most of the single-vehicle crashes occurred between Maytime Drive and Silver Way/Macmullen Drive. Roadway horizontal curves and speeding are contributing factors.

- **Recommendations Based on Future (2040) Conditions**
  - Intersection Preferred Alternatives. The recommended alternatives provide for safe and efficient access to and from Waugh Chapel Road and side streets at the key study area intersections. The improvements address existing issues related to intersection sight distance and operations as well as potential future capacity issues due to anticipated increases in traffic associated with the completion of Summerfield, Chapel Way, and other developments in the vicinity of the corridor, while also accommodating the needs of non-motorized users.
    - Maytime Drive – implement lane use changes and minor signal phasing adjustments
    - Symphony Lane/Silver Way – implement minor signal timing adjustments
    - Silver Way/Macmullen Drive – awaiting public feedback
    - Summerfield Road – install a traffic signal
    - New Market Lane/Wigeon Way – revise lane designations and modify pedestrian signal phasing
  - **Multimodal.** The lack of connected sidewalks on Waugh Chapel Road in the study area is a critical gap to address with potential roadway improvements. Dedicated bicycle facilities or shared use paths are needed along Waugh Chapel Road to provide protection for bicyclists and connectivity for the bicycle network linking to the regional trail and transit system. These recommendations are consistent with the county’s 2013 Pedestrian and Bicycle Master Plan.
    - Cross-sections that include sidewalks and bike paths were developed to accommodate non-motorized users.

- **Network Connectivity**. The continued growth in the western portion of the County, as well as newer developments in the area, including future phases of Waugh Chapel Towne Center, Summerfield, and Two Rivers, will continue to place pressure on Waugh Chapel Road. An additional connection to MD 3 is needed to relieve this pressure in the future.
    - During the course of this study, the possibility of including a connection from Waugh Chapel Shopping Center to Summerfield Road surfaced as a means to provide network connectivity. In August 2018, the County recorded a plat, prepared for Waugh Chapel Towne Centre II – Phase 2A, that includes dedicated public right-of-way (ROW) for Brickhead Road to connect Evergreen Road from the south to the future extension of Summerfield Road to the north.
    - The study team also discussed two other potential future connections:
        - Providing a connection from Brickhead Road to Waugh Chapel Road west of the existing powerline easement
        - Extending Evergreen Road to Strawberry Lake Way

Purpose of Project

Based on the existing conditions and 2040 No-Build analyses, the study team identified the following needs for developing viable and cost-effective improvements for all road users.

- Enhance safety and connectivity for all modes of transportation
- Improve pedestrian and bicycle accessibility
- Limit impacts to natural/built environment and private property

Evaluation Criteria

- **High priority**
  - Safety
  - Speed Management
  - Pedestrian/bicycle access
- **Medium Priority**
  - Ease of implementation
  - Right-of-way and utility
  - Ease of access to/from side streets
- **Low Priority**
  - Vehicular Level of Service

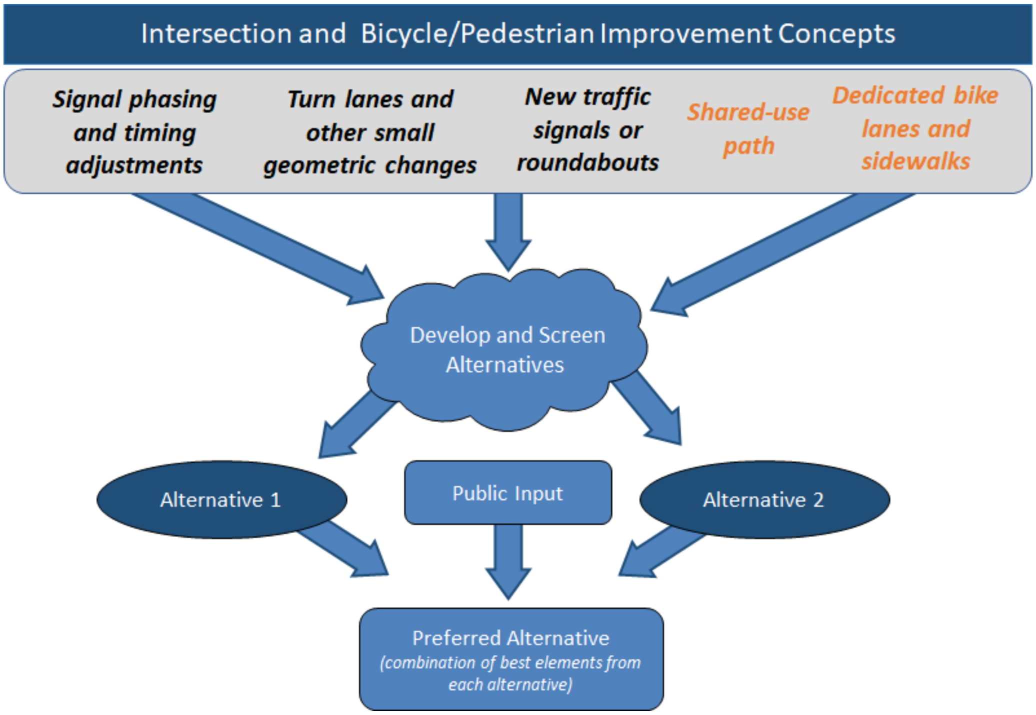


Figure 1. Screening Process for Intersection and Bicycle/Pedestrian Improvements

Intersection Alternatives

Table 1. Alternative Concepts for Study Intersections

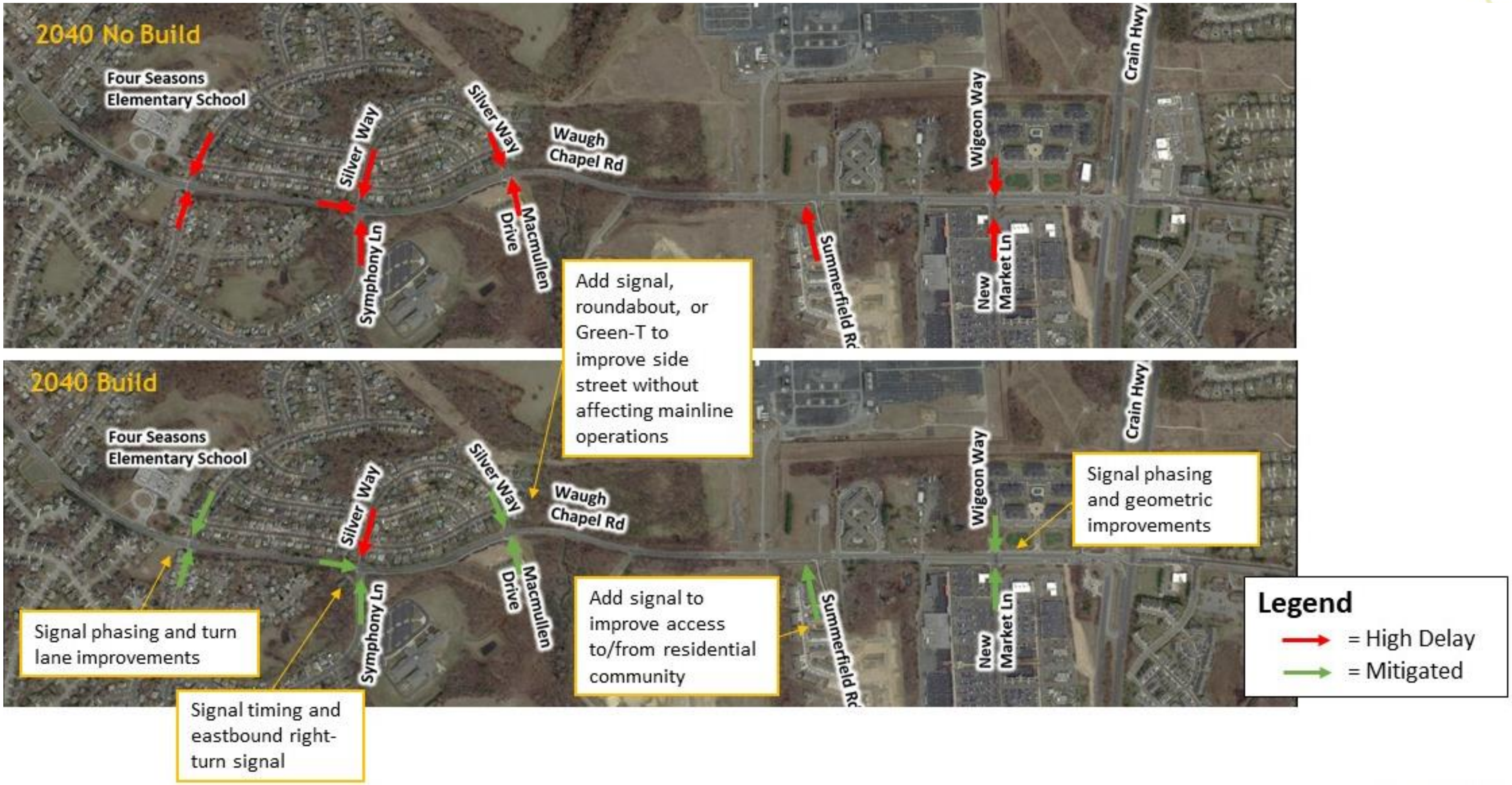
Intersection	Proposed Improvement Concepts
Maytime Drive	▪ Turn lanes and signal phasing improvements ▪ Roundabout
Symphony Lane	▪ Signal phasing and timing improvements
Macmullen Drive/Silver Way	▪ Traffic signal and turn lanes ▪ Roundabout ▪ Continuous-Green-T intersection & restricted turns to/from Silver Way
Summerfield Road	▪ Traffic signal and turn lanes ▪ Roundabout
New Market Lane/Wigeon Way	▪ New Market Lane and westbound Waugh Chapel Road geometric changes ▪ Traffic and pedestrian signal phasing and timing

Table 2. 2040 Future Conditions Intersection Delay and Level of Service (LOS)

Intersection	**No-Build (Alternative A)**			**Alternative B**			**Alternative C**			**Alternative D**		
	AM	**PM**	**SAT**	**AM**	**PM**	**SAT**	**AM**	**PM**	**SAT**	**AM**	**PM**	**SAT**
	LOS (Delay: seconds/vehicle)											
Maytime Drive	B (15.4)	B (17.5)	B (11.6)	**Signal phasing and left turn lane improvements***			**Single-lane roundabout**					
				B (15.7)	C (34.7)	B (14.7)	C (25.4)	F (113.3)	B (14.9)			
Symphony Lane	E (56.2)	C (20.7)	A (5.6)	**Signal improvements***			-	-	-			
				C (25.5)	B (18.4)	A (6.2)						
Silver Way / Macmullen Drive	Excessive delay on side streets	Excessive delay on side streets	Excessive delay on side streets	**Delineate westbound left turn lane; install traffic signal***			**Two-lane roundabout**			**Continuous-Green-T**		
				B (15.3)	D (46.3)	B (10.8)	A (0.1)	A (0.1)	A (0.1)	C (22.7)	F (70.4)	C (17.5)
Summerfield Road	Excessive delay on side streets	Excessive delay on side streets	Excessive delay on side streets	**Turn lanes and install traffic signal ***			**Single-lane roundabout**					
				B (15.7)	C (34.7)	B (14.7)	A (4.1)	F (54.2)	A (3.8)			
New Market Lane / Wigeon Way	B (15.5)	C (25.4)	C (28.7)	**Geometric and signal improvements**			**Geometric and signal improvements***					
				B (17.4)	C (29.8)	D (42.3)	B (16.6)	C (26.4)	C (31.5)			

General note: Roundabout LOS and delay based on SIDRA method not HCM;

*Recommended preferred alternative



Add signal, roundabout, or Green-T to improve side street without affecting mainline operations

Signal phasing and geometric improvements

Signal phasing and turn lane improvements

Add signal to improve access to/from residential community

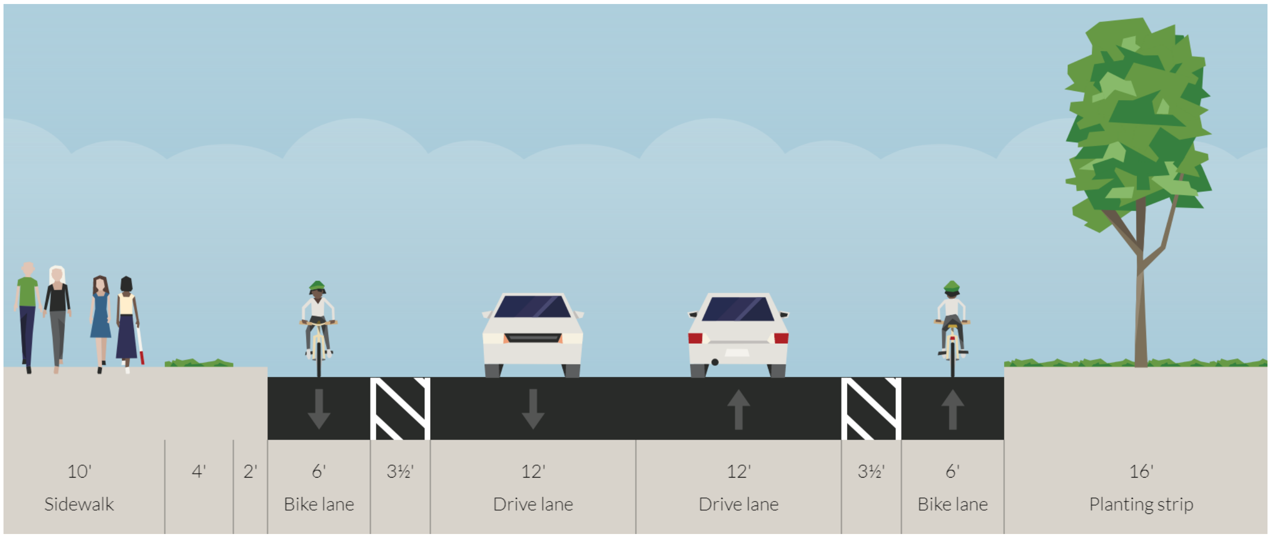
Signal timing and eastbound right-turn signal

Figure 2. 2040 No Build and Build Traffic Operations

Bicycle and Pedestrian Alternatives

- Shared-use path, primarily on the south side
- Dedicated bike lanes on both sides of Waugh Chapel and sidewalk on one side
- Shared-use path connection south to the corridor to connect with Strawberry Lake Way (an alternative network connection)

Figure 3. Potential Bike Lane and Sidewalk Alternative (Between Maytime Drive and Symphony Lane)



Network Alternatives

- **Connections to Waugh Chapel Road**
  - Via Waugh Chapel Towne Centre to Summerfield Road (platted by developer) (Yellow Line)
  - Via Brickhead Road, west of the existing powerline easement (Orange Line)
- **Evergreen Extension to Strawberry Lake Way (Purple Line)**
  - Via Evergreen Road and the Reliable Plant to south of Odenton(GORC) Park
  - Potentially a shared-use path in Phase 1, vehicular travel lanes in Phase 2

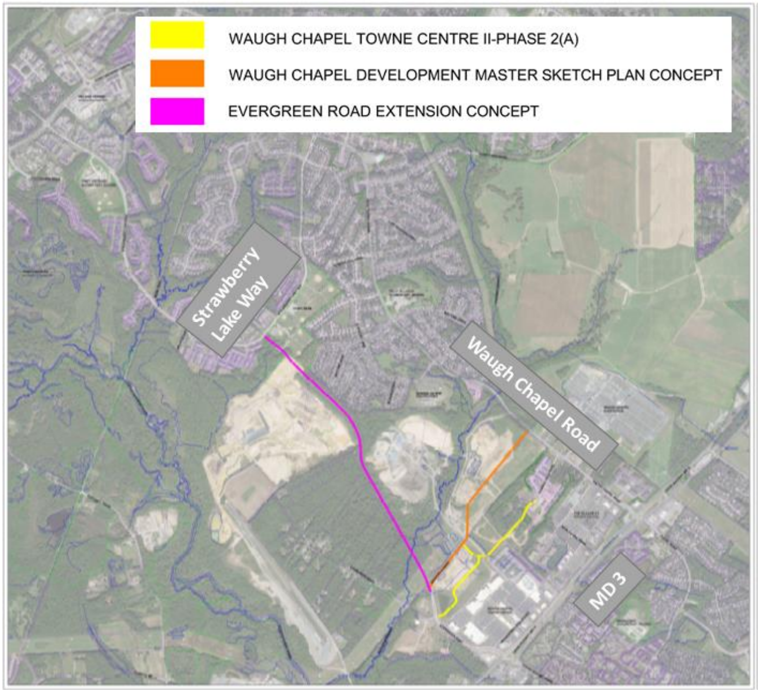


Figure 4. Network Alternatives

ROADWAY SEGMENT ANALYSIS (HCS)

The roadway segment analysis for Existing 2017 and Year 2040 is summarized in Table 3 below. The Year 2040 analysis assumes there are no new network connections in the study area to serve east-west traffic between Odenton/Piney Orchard and MD 3.

Table 3: 2017 and 2040 Two-Lane Peak Hour Level of Service Results

Peak Hour	Direction	Segment 1	Segment 2	Segment 3
		Maytime Drive to Symphony Lane	Symphony Lane to Silver Way / Macmullen Drive	Silver Way / Macmullen Drive to Summerfield Road
AM	Eastbound	D/E	E/E	E/E
	Westbound	D/E	D/E	E/E
PM	Eastbound	E/E	E/E	E/E
	Westbound	E/E	E/E	E/E

Note: 2017 LOS / 2040 LOS; Speed data from segments 1 and 3 were used to estimate the segment 2 speeds for the HCS analysis.

Public Input – Alternative Selection

- Preferred intersection alternatives, particularly at Silver Way/Macmullen Drive and New Market Lane/Wigeon Way
- Bicycle lanes, sidewalks, shared-use path
- Potential future network alternatives

Next Steps

- Now: County's on-going traffic operations improvements
- This Study:
    - Select preferred alternatives based on public input
    - Prioritize and phase projects
    - Finalize report
- Future: Seek funding for design and implementation

Project contact

Adam Greenstein, P.E., P.T.O.E. pwgree08@aacounty.org

Project website:

https://www.aacounty.org/departments/public-works/engineering/Capital_Projects/tfp--waugh-chapel-road

TFP – Waugh Chapel Road

Project Background: The scope of this project is for a planning-level study only with concept-level plans. However, a capital project may be initiated in the future to implement the recommendations of the study if deemed justified by the County.

Appendix E

PLANNING LEVEL COSTS

Project Name:	SHPN - TFP - Waugh Chapel						
Project No:	H539611						
Date:	8/20/2019						
Description:	The summary costs shown below correspond to conceptual improvements along the Waugh Chapel Road corridor. The detailed breakdown of these costs is included in the individual concept tables. This summary table provides the total projected costs of the concepts for comparison and planning purposes. Therefore, the intersection improvements were included with the most conservative options chosen (i.e. roundabout over signalized intersection). Note, the Sidewalk Converted to Shared Use Path and Bike-Compatible Shoulders Concept includes both the cost of the sidewalk (Phase 1) and the conversion to shared use path (Phase 2).						
Fiscal Analysis							
Design							
Phase 100	Description		Sidewalk and Bike-Compatible Shoulders Contract Costs		Shared Use Path and Bike-Compatible Shoulder Contract Costs		Sidewalk Converted to Shared Use Path and Bike-Compatible Shoulders Contract Costs
	Design Contract	*15% of const contract*	$ 485,000.00		$ 640,700.00		$ 699,300.00
	Design Approved C.O.'s						
	Design Pending C.O.'s						
	Misc. Costs (Design)	*Survey*	$ 226,300.00		$ 299,000.00		$ 326,300.00
	Administrative Costs (Labor)	*4% of design contract*	$ 19,400.00		$ 25,600.00		$ 28,000.00
Phase 100 Subtotal			$ 730,700.00		$ 965,300.00		$ 1,053,600.00
Land / Utilities							
Phase 200							
	Maytime Intersection		$ -		$ -		$ -
	Silver/Symphony Intersection		$ -		$ -		$ -
	MacMullen/Silver Intersection	*roundabout concept*	$ 699,200.00		$ 699,200.00		$ 699,200.00
	Summerfield Intersection		$ 71,700.00		$ 71,700.00		$ 71,700.00
	New Market/Wigeon Intersection		$ 104,200.00		$ 104,200.00		$ 104,200.00
	Pedestrian and Bike Improvements		$ 231,700.00		$ 483,600.00		$ 530,200.00
Phase 200 Subtotal			$ 1,106,800.00		$ 1,358,700.00		$ 1,405,300.00
Construction							
Phase 300							
	Maytime Intersection		$ 29,300.00		$ 29,300.00		$ 29,300.00
	Silver/Symphony Intersection		$ 25,800.00		$ 25,800.00		$ 25,800.00
	MacMullen/Silver Intersection	*roundabout concept*	$ 1,165,400.00		$ 1,165,400.00		$ 1,165,400.00
	Summerfield Intersection		$ 286,800.00		$ 286,800.00		$ 286,800.00
	New Market/Wigeon Intersection		$ 138,900.00		$ 138,900.00		$ 138,900.00
	Pedestrian and Bike Improvements		$ 3,233,500.00		$ 4,271,200.00		$ 4,662,300.00
	Construction Approved C.O.'s						
	Construction Pending C.O.'s						
	Inspection Contract	*10% of const contract*	$ 323,400.00		$ 427,100.00		$ 466,300.00
	Inspection Approved C.O.'s						
	Inspection Pending C.O.'s						
Phase 300 Subtotal			$ 5,203,100.00		$ 6,344,500.00		$ 6,774,800.00
Contigency		*30% of above*	$ 2,112,180.00		$ 2,600,550.00		$ 2,770,110.00
	Grand Totals		$ 9,152,780.00		$ 11,269,050.00		$ 12,003,810.00

WAUGH CHAPEL ROAD - SIDEWALK AND BIKE-COMPATIBLE SHOULDERS CONCEPT
PLANNING QUANTITIES AND COSTS

Description: The quantities and costs shown below correspond to the Sidewalk and Bike-Compatible Shoulders Concept. This table provides the costs assuming the project does not include the intersection improvements.

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	TOTAL PRICE	ASSUMPTIONS
CONSTRUCTION ITEMS					
MOBILIZATION	LS	1	$138,180.00	$138,200.00	*5% of construction items*
MAINTENANCE OF TRAFFIC	LS	1	$276,360.00	$276,400.00	*10% of construction items*
CONSTRUCTION SURVEYING	LS	1	$55,272.00	$55,300.00	*2% of construction items*
CLEARING & GRUBBING	LS	1	$50,000.00	$50,000.00	*Price assumes minor clearing and grubbing for the sections where sidewalk is added*
EARTHWORK	CY	3459	$40.00	$138,400.00	*Quantity assumes 20 SF of earthwork for the length of the improvements*
EROSION AND SEDIMENT CONTROL	LF	4670	$11.25	$52,500.00	*Price includes silt fence the length of the improvements and inlet protection every 200 feet*
REMOVAL OF PAVEMENT	CY	119	$50.00	$5,900.00	*Quantity assumes an existing pavement depth of 1 foot*
LANDSCAPING	LF	4670	$30.00	$140,100.00	*Price includes seeding an area 10 feet wide the length of the improvements*
DRAINAGE IMPROVEMENTS	LF	4670	$132.50	$618,800.00	*Price includes pipes the length of improvements and structures every 200 feet*
STORMWATER MANAGEMENT	EA	5	$30,000.00	$150,000.00	*Quantity assumes ~1 small BMP per outfall*
MILL PAVEMENT	SY	32494	$6.00	$195,000.00	*Price includes 2" of mill of the road surface*
ROADWAY PAVEMENT (SURFACE)	TON	3899	$120.00	$467,900.00	*Price assumes asphalt pavement includeing 2" surface*
ROADWAY PAVEMENT (FULL DEPTH)	TON	113	$120.00	$13,600.00	*Price assumes asphalt pavement includeing 2" surface, 6" base, and 8" aggregate*
SIDEWALK PAVEMENT	SF	23350	$15.00	$350,300.00	*Price assumes 5' wide and 5" thick concrete pavement*
CURB AND GUTTER	LF	4160	$30.00	$124,800.00	*Price assumes standard curb and gutter*
HANDRAIL	LF	800	$150.00	$120,000.00	*Price assumes standard handrail at locations where slopes may be steep*
PAVEMENT MARKINGS (LINES)	LF	37945	$5.00	$189,700.00	*Price assumes 5" wide solid pavement markings for all lane divides*
PAVEMENT MARKINGS (SYMBOLS OR MESSAGES)	EA	55	$500.00	$27,500.00	*Quantity includes estimate of bike lane and roadway marking symbols*
SIGNAGE	EA	9	$250.00	$2,300.00	*Quantity assumes 1 new sign every 500 feet of improvements*
LIGHTING	EA	23	$5,000.00	$116,800.00	*Quantity assumes 1 new light pole every 200 feet of improvments*
OTHER ITEMS					
SURVEY	LS	1	$226,300.00	$226,300.00	*7% of construction items*
UTILITY RELOCATIONS	LS	1	$161,700.00	$161,700.00	*5% of construction items*
RIGHT OF WAY OR PERMANENT EASEMENT	SF	1000	$20.00	$20,000.00	*Quantity assumes minor permanent easements may be needed at select locations to avoid utilites*
TEMPORARY EASEMENT	SF	10000	$5.00	$50,000.00	*Quantity assumes minor temporary easments may be needed for slope grading during construction*
ENGINEERING DESIGN	LS	1	$485,000.00	$485,000.00	*15% of construction items*
CONSTRUCTION MANAGEMENT	LS	1	$323,400.00	$323,400.00	*10% of construction items*
ADMINISTRATIVE COSTS	LS	1	$19,400.00	$19,400.00	*4% of engineering design costs*
SUB TOTAL				$4,519,300.00	
CONTINGENCY		30%		$1,355,800.00	
TOTAL				$5,875,100.00	*Price excludes intersection improvements*

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WAUGH CHAPEL ROAD - SHARED USE PATH AND BIKE-COMPATIBLE SHOULDERS CONCEPT
PLANNING QUANTITIES AND COSTS

Description: The quantities and costs shown below correspond to the Shared Use Path and Bike-Compatible Shoulders Concept. This table provides the costs assuming the project does not include the intersection improvements.

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	TOTAL PRICE	ASSUMPTIONS
CONSTRUCTION ITEMS					
MOBILIZATION	LS	1	$182,530.00	$182,500.00	*5% of construction items*
MAINTENANCE OF TRAFFIC	LS	1	$365,060.00	$365,100.00	*10% of construction items*
CONSTRUCTION SURVEYING	LS	1	$73,012.00	$73,000.00	*2% of construction items*
CLEARING & GRUBBING	LS	1	$100,000.00	$100,000.00	*Price assumes clearing and grubbing for the sections where the shared use path is added*
EARTHWORK	CY	6866	$40.00	$274,600.00	*Quantity assumes 30 SF of earthwork for the length of the improvements*
EROSION AND SEDIMENT CONTROL	LF	6179	$11.25	$69,500.00	*Price includes silt fence the length of the improvements and inlet protection every 200 feet*
REMOVAL OF PAVEMENT	CY	5769	$50.00	$288,400.00	*Quantity assumes an existing pavement depth of 1 foot*
LANDSCAPING	LF	6179	$30.00	$185,400.00	*Price includes seeding an area 10 feet wide the length of the improvements*
DRAINAGE IMPROVEMENTS	LF	6179	$132.50	$818,700.00	*Price includes pipes the length of improvements and structures every 200 feet*
STORMWATER MANAGEMENT	EA	5	$30,000.00	$150,000.00	*Quantity assumes ~1 small BMP per outfall*
MILL PAVEMENT	SY	32494	$6.00	$195,000.00	*Price includes 2" of mill and overlay of the road surface*
ROADWAY PAVEMENT (SURFACE)	TON	3899	$120.00	$467,900.00	*Price assumes asphalt pavement includeing 2"*
ROADWAY PAVEMENT (FULL DEPTH)	TON	113	$120.00	$13,600.00	*Price assumes asphalt pavement includeing 2" surface, 6" base, and 8" aggregate*
SHARED USE PATH PAVEMENT	TON	3679	$120.00	$441,500.00	*Price assumes asphalt pavement with 2" of survace and 8" of aggregate and a width of 10'*
SIDWALK PAVEMENT	SF	3300	$8.00	$26,400.00	*Price assumes 5' wide and 5" thick concrete pavement*
CURB AND GUTTER	LF	4160	$30.00	$124,800.00	*Price assumes standard curb and gutter*
HANDRAIL	LF	800	$150.00	$120,000.00	*Price assumes standard handrail at locations where slopes may be steep*
PAVEMENT MARKINGS (LINES)	LF	37945	$5.00	$189,700.00	*Price assumes 5"standard pavement markings for all lane divides*
PAVEMENT MARKINGS (SYMBOLS OR MESSAGES)	EA	55	$500.00	$27,500.00	*Quantity includes estimate of bike lane and roadway marking symbols*
SIGNAGE	EA	12	$250.00	$3,100.00	*Quantity assumes 1 new sign every 500 feet of improvements*
LIGHTING	EA	31	$5,000.00	$154,500.00	*Quantity assumes 1 new light pole every 200 feet of improvments*
OTHER ITEMS					
SURVEY	LS	1	$299,000.00	$299,000.00	*7% of construction items*
UTILITY RELOCATIONS	LS	1	$213,600.00	$213,600.00	*5% of construction items*
RIGHT OF WAY OR PERMANENT EASEMENT	SF	1000	$20.00	$20,000.00	*Quantity assumes minor permanent easements may be needed at select locations to avoid utilites*
TEMPORARY EASEMENT	SF	50000	$5.00	$250,000.00	*Quantity assumes minor temporary easments may be needed for slope grading during construction*
ENGINEERING DESIGN	LS	1	$640,700.00	$640,700.00	*15% of construction items*
CONSTRUCTION MANAGEMENT	LS	1	$427,100.00	$427,100.00	*10% of construction items*
ADMINISTRATIVE COSTS	LS	1	$25,600.00	$25,600.00	*4% of engineering design costs*
SUB TOTAL				$6,147,200.00	
CONTINGENCY		30%		$1,844,200.00	
TOTAL				$7,991,400.00	Price excludes intersection improvements

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WAUGH CHAPEL ROAD - SIDEWALK CONVERTED TO SHARED USE PATH AND BIKE-COMPATIBLE SHOULDERS CONCEPT
PLANNING QUANTITIES AND COSTS

Description: The quantities and costs shown below correspond to the Sidewalk Converted to Shared Use Path and Bike-Compatible Shoulders Concept. The costs include the second phase of work after the sidewalk concept is complete. A future unit price was assumed to be 10% greater than the unit price for the first phase of work to account for price inflation. This table provides the costs assuming the project does not include the intersection improvements.

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	FUTURE UNIT PRICE	TOTAL PRICE	ASSUMPTIONS
CONSTRUCTION ITEMS				10% increase		
MOBILIZATION	LS	1	$60,185.00	$66,203.50	$66,200.00	*5% of construction items*
MAINTENANCE OF TRAFFIC	LS	1	$120,370.00	$132,407.00	$132,400.00	*10% of construction items*
CONSTRUCTION SURVEYING	LS	1	$24,074.00	$26,481.40	$26,500.00	*2% of construction items*
CLEARING & GRUBBING	LS	1	$50,000.00	$55,000.00	$55,000.00	*Price assumes minor clearing and grubbing for the sections where the shared use path is*
EARTHWORK	CY	3406	$40.00	$44.00	$149,900.00	*Quantity assumes the shared use path quantity minus the sidewalk quantity*
EROSION AND SEDIMENT CONTROL	LF	6179	$11.25	$12.38	$76,500.00	*Price includes silt fence the length of the improvements and inlet protection every 200 feet*
LANDSCAPING	LF	6179	$30.00	$33.00	$203,900.00	*Price includes seeding an area 10 feet wide the length of the improvements*
DRAINAGE IMPROVEMENTS	LF	1509	$132.50	$145.75	$219,900.00	*Quantity assumes the shared use path quantity minus the sidewalk quantity*
SIDEWALK PAVEMENT (FOR 10' SHARED USE PATH)	SF	27595	$15.00	$16.50	$455,300.00	*Price assumes 5' wide and 5" thick concrete pavement added to the existing 5' pavement*
SIGNAGE	EA	6	$250.00	$275.00	$1,700.00	*Quantity assumes 1 new sign every 1000 feet of improvements*
LIGHTING	EA	8	$5,000.00	$5,500.00	$41,500.00	*Quantity assumes the shared use path quantity minus the sidewalk quantity*
OTHER ITEMS						
SURVEY	LS	1	$100,000.00	$100,000.00	$100,000.00	*7% of construction items*
UTILITY RELOCATIONS	LS	1	$71,400.00	$78,540.00	$78,500.00	*5% of construction items*
RIGHT OF WAY OR PERMANENT EASEMENT	SF		$20.00	$22.00	$0.00	
TEMPORARY EASEMENT	SF	40000	$5.00	$5.50	$220,000.00	*Quantity assumes the shared use path quantity minus the sidewalk quantity*
ENGINEERING DESIGN	LS	1	$214,300.00	$214,300.00	$214,300.00	*15% of construction items*
CONSTRUCTION MANAGEMENT	LS	1	$142,900.00	$142,900.00	$142,900.00	*10% of construction items*
ADMINISTRATIVE COSTS	LS	1	$8,600.00	$8,600.00	$8,600.00	*4% of engineering design costs*
SUB TOTAL					$2,193,100.00	
CONTINGENCY		30%			$657,900.00	
TOTAL					$2,851,000.00	*Price excludes intersection improvements*

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WAUGH CHAPEL ROAD - STRAWBERRY LAKE SHARED USE PATH CONCEPT
PLANNING QUANTITIES AND COSTS

Description: The quantities and costs shown below correspond to the Strawberry Lake Shared Use Path Concept. This concept includes a 60' wide right of way the length of the project to allow for potential future expansion form a shared use path to a vehicle facility.

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	TOTAL PRICE	ASSUMPTIONS
CONSTRUCTION ITEMS					
MOBILIZATION	LS	1	$126,845.00	$126,800.00	*5% of construction items*
MAINTENANCE OF TRAFFIC	LS	1	$25,369.00	$25,400.00	*1% of construction items*
CONSTRUCTION SURVEYING	LS	1	$50,738.00	$50,700.00	*2% of construction items*
CLEARING & GRUBBING	AC	8	$20,000.00	$167,800.00	*Price assumes 50' wide clearing and gubbing the length of the improvements*
EARTHWORK	CY	13537	$40.00	$541,500.00	*Quantity assumes 50 SF of earthwork for the length of the improvements*
EROSION AND SEDIMENT CONTROL	LF	7310	$11.25	$82,200.00	*Price includes silt fence the length of the improvements and inlet protection every 200 feet*
LANDSCAPING	LF	7310	$60.00	$438,600.00	*Price includes seeding an area 20 feet wide the length of the improvements*
DRAINAGE IMPROVEMENTS	LF	7310	$51.67	$377,700.00	*Price includes ditches the length of improvements and culverts every 300 feet*
STORMWATER MANAGEMENT	EA	5	$30,000.00	$150,000.00	*Quantity assumes ~1 small BMP per outfall*
CULVERT STRUCTURE	EA	1	$300,000.00	$300,000.00	*Price assumes a triple 8' by 8' box culvert with a length of 50 feet*
SHARED USE PATH PAVEMENT	TON	800	$120.00	$96,000.00	*Price assumes asphalt pavement with 2" of survace and 8" of aggregate and a width of 12'*
HANDRAIL	LF	1000	$150.00	$150,000.00	*Price assumes standard handrail at locations where slopes may be steep*
PAVEMENT MARKINGS (LINES)	LF	7310	$5.00	$36,600.00	*Price assumes standard pavement markings for the length of the shared use path*
PAVEMENT MARKINGS (SYMBOLS OR MESSAGES)	EA	20	$500.00	$10,000.00	*Quantity includes estimate of shared use path marking symbols*
SIGNAGE	EA	15	$250.00	$3,700.00	*Quantity assumes 1 new sign every 500 feet of improvements*
LIGHTING	EA	37	$5,000.00	$182,800.00	*Quantity assumes 1 new light pole every 200 feet of improvments*
OTHER ITEMS					
SURVEY	LS	1	$274,000.00	$274,000.00	*10% of construction items*
UTILITY RELOCATIONS	LS	1	$137,000.00	$137,000.00	*5% of construction items*
RIGHT OF WAY OR PERMANENT EASEMENT	SF	438600	$5.00	$2,193,000.00	*Quantity assumes 60' wide the length of the improvements*
TEMPORARY EASEMENT	SF	73100	$1.00	$73,100.00	*Quantity assumes 10' wide the length of the improvements*
ENVIRONMENTAL COSTS	LS	1	$100,000.00	$100,000.00	*Price includes approximate cost for assesment and possible permits which could greatly vary based on the assement results*
ENGINEERING DESIGN	LS	1	$411,000.00	$411,000.00	*15% of construction items*
CONSTRUCTION MANAGEMENT	LS	1	$54,800.00	$54,800.00	*2% of construction items*
SUB TOTAL				$5,982,700.00	
CONTINGENCY		30%		$1,794,800.00	
TOTAL				$7,777,500.00	

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WAUGH CHAPEL ROAD - MAYTIME SIGNAL
PLANNING QUANTITIES AND COSTS

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	TOTAL PRICE	ASSUMPTIONS
PAVEMENT MARKINGS (LINES)	LF	300	$8.00	$2,400	*Price assumes standard pavement markings for all lane divides, stop bars, and crosswalks*
TRAFFIC SIGNAL HEAD	EA	2	$500.00	$1,000	
SIGNAGE	EA	4	$250.00	$1,000	*Quantity assumes upgrading to accessible pedestrian signal (APS)*
OTHER CONSTRUCTION COSTS	LS	1	$20,000.00	$20,000	*Price includes mobilization, maintenance of traffic, and modificaiton of the signal including APS*
CONSTRUCTION COST	LS	1	$24,400.00	$29,300	*20% contingency*
ENGINEERING DESIGN	LS	1	$5,900.00	$5,900	*20% of construction cost, assumes County led engineering and no survey*
RIGHT OF WAY AND UTLTITY RELOCATION	LS	0	$0.00	$0	
TOTAL				$35,200	

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WAUGH CHAPEL ROAD - SYMPHONY SIGNAL
PLANNING QUANTITIES AND COSTS

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	TOTAL PRICE	ASSUMPTIONS
TRAFFIC SIGNAL HEAD	EA	1	$500.00	$500	
SIGNAGE	EA	4	$250.00	$1,000	*Quantity assumes upgrading to accessible pedestrian signal (APS)*
OTHER CONSTRUCTION COSTS	LS	1	$20,000.00	$20,000	*Price includes mobilization, maintenance of traffic, and modificaiton of the signal including APS*
CONSTRUCTION COST	LS	1	$21,500.00	$25,800	*20% contingency*
ENGINEERING DESIGN	LS	1	$5,200.00	$5,200	*20% of construction cost, assumes County led engineering and no survey*
RIGHT OF WAY AND UTLTITY RELOCATION	LS	0	$0.00	$0	
TOTAL				$31,000	

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WAUGH CHAPEL ROAD - MACMULLEN SIGNAL
PLANNING QUANTITIES AND COSTS

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	TOTAL PRICE	ASSUMPTIONS
TRAFFIC SIGNAL MAST ARM	EA	4	$22,000.00	$88,000	*Price based on steel pole with a single 50 foot mast arm*
FOUNDATION	EA	4	$10,000.00	$40,000	*Price based on 5 CY of concrete per foundation at $1,600 per CY*
CONTROLLER AND CABINET	EA	1	$15,000.00	$15,000	*Price based on ground mounted cabinet and other controller items*
DETECTION	EA	4	$10,000.00	$40,000	*Price based on detection for each approach*
CONDUIT	LF	300	$50.00	$15,000	*Quantity based on geometry and layout of the intersection and signal*
CABLE	LF	2320	$5.00	$11,600	*Quantity based on geometry and layout of the intersection and signal*
JUNCTION BOX	EA	6	$1,000.00	$6,000	*Quantity assumes 1 for each corner plus 2 extras as needed*
TRAFFIC SIGNAL HEAD	EA	10	$500.00	$5,000	*Quantity assumes 2 for each side street approach and 3 for the main line approaches*
PEDESTRIAN SIGNAL HEAD	EA	4	$1,000.00	$4,000	*Quantity assumes 2 pedestrian crossings at the intersection*
SIGNAGE	EA	8	$250.00	$2,000	*Quantity assumes 1 street name sign per approach and 4 push button signs*
OTHER CONSTRUCTION COSTS	LS	1	$30,000.00	$30,000	*Price includes mobilization and maintenance of traffic*
CONSTRUCTION COST	LS	1	$256,600.00	$333,600	*30% contingency*
ENGINEERING DESIGN	LS	1	$100,100.00	$100,100	*30% of construction cost, includes survey*
RIGHT OF WAY AND UTLTITY RELOCATION	LS	1	$83,400.00	$83,400	*25% of construction cost*
TOTAL				$517,100	

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WAUGH CHAPEL ROAD - MACMULLEN ROUNDABOUT
PLANNING QUANTITIES AND COSTS

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	TOTAL PRICE	ASSUMPTIONS
ROADWAY PAVEMENT (FULL DEPTH)	TON	3897	$120.00	$467,610	*Price assumes asphalt pavement includeing 2" surface, 6" base, and 8" aggregate*
MOUNTABLE CONCRETE APRON	SF	855	$25.00	$21,372	*Price includes mountable apron 7" concrete pavement with 8" aggregate*
SHARED USE PATH PAVEMENT	TON	186	$120.00	$22,352	*Price assumes asphalt pavement with 2" of survace and 8" of aggregate and a width of 10'*
CURB AND GUTTER	LF	2204	$30.00	$66,120	*Price assumes standard curb and gutter for islands and edge of pavement*
PAVEMENT MARKINGS (LINES)	LF	2484	$8.00	$19,872	*Price includes pavement markings for all lane divides and crosswalks*
PAVEMENT MARKINGS (SYMBOLS OR MESSAGES)	EA	18	$500.00	$9,000	*Quantity assumes 6 in the circle, 8 on the EB and WB approaches, 4 on NB and SB approaches*
SIGNAGE	EA	20	$250.00	$5,000	*Quantity assumes 4 signs per approach and 4 advanced warning signs*
DRAINAGE IMPROVEMENTS	LF	1397	$132.50	$185,103	*Price includes pipes the length of improvements and structures every 200 feet*
OTHER CONSTRUCTION COSTS	LS	1	$100,000.00	$100,000	*Price includes mobilization, maintenance of traffic, demolition, erosion and sediment control, and landscaping*
CONSTRUCTION COST	LS	1	$896,427.73	$1,165,400	*30% contingency*
ENGINEERING DESIGN	LS	1	$349,600.00	$349,600	*30% of construction cost, includes survey*
RIGHT OF WAY AND UTLTITY RELOCATION	LS	1	$699,200.00	$699,200	*60% of construction cost, price includes and estimated 16,000 SF at $20/SF of ROW at the corners ($320,000)*
TOTAL				$2,214,200	

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WAUGH CHAPEL ROAD - SUMMERFIELD SIGNAL
PLANNING QUANTITIES AND COSTS

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	TOTAL PRICE	ASSUMPTIONS
TRAFFIC SIGNAL MAST ARM	EA	3	$22,000.00	$66,000	*Price based on steel pole with a single 50 foot mast arm*
FOUNDATION	EA	3	$10,000.00	$30,000	*Price based on 5 CY of concrete per foundation at $1,600 per CY*
CONTROLLER AND CABINET	EA	1	$15,000.00	$15,000	*Price based on ground mounted cabinet and other controller items*
DETECTION	EA	3	$10,000.00	$30,000	*Price based on detection for each approach*
CONDUIT	LF	210	$50.00	$10,500	*Quantity based on geometry and layout of the intersection and signal*
CABLE	LF	1680	$5.00	$8,400	*Quantity based on geometry and layout of the intersection and signal*
JUNCTION BOX	EA	6	$1,000.00	$6,000	*Quantity assumes 1 for each corner plus 2 extras as needed*
TRAFFIC SIGNAL HEAD	EA	8	$500.00	$4,000	*Quantity assumes 2 for each side street approach and 3 for the main line approaches*
PEDESTRIAN SIGNAL HEAD	EA	4	$1,000.00	$4,000	*Quantity assumes 2 pedestrian crossings at the intersection*
SIGNAGE	EA	7	$250.00	$1,750	*Quantity assumes 1 street name sign per approach and 4 push button signs*
OTHER CONSTRUCTION COSTS	LS	1	$45,000.00	$45,000	*Price includes mobilization, erosion and sediment control, demolition, and maintenance of traffic*
CONSTRUCTION COST	LS	1	$220,650.00	$286,800	*30% contingency*
ENGINEERING DESIGN	LS	1	$86,000.00	$86,000	*30% of construction cost, includes survey*
RIGHT OF WAY AND UTLTITY RELOCATION	LS	1	$71,700.00	$71,700	*25% of construction cost*
TOTAL				$444,500	

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WAUGH CHAPEL ROAD - NEW MARKET SIGNAL
PLANNING QUANTITIES AND COSTS

ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	TOTAL PRICE	ASSUMPTIONS
MILL PAVEMENT	SY	825	$6.00	$4,950	*Price includes 2" of mill and overlay of the road surface*
ROADWAY PAVEMENT (SURFACE)	TON	99	$150.00	$14,850	*Price assumes asphalt pavement includeing 2" surface*
ROADWAY PAVEMENT (FULL DEPTH)	TON	176	$150.00	$26,400	*Price assumes asphalt pavement includeing 2" surface, 6" base, and 8" aggregate*
PAVEMENT MARKINGS (LINES)	LF	300	$8.00	$2,400	*Price assumes standard pavement markings for all lane divides, stop bars, and crosswalks*
PAVEMENT MARKINGS (SYMBOLS OR MESSAGES)	EA	10	$500.00	$5,000	*Quantity assumes symbols and messages will be replaced or added to the northbound approach*
TRAFFIC SIGNAL HEAD	EA	2	$500.00	$1,000	
SIGNAGE	EA	9	$250.00	$2,250	*Quantity assumes upgrading to accessible pedestrian signal (APS) and sign replacement on the mast arm for the new lane configuration*
OTHER CONSTRUCTION COSTS	LS	1	$50,000.00	$50,000	*Price includes mobilization, maintenance of traffic, demolition, erosion and sediment control, and modificaiton of the signal including APS*
CONSTRUCTION COST	LS	1	$106,850.00	$138,900	*30% contingency*
ENGINEERING DESIGN	LS	1	$41,700.00	$41,700	*30% of construction cost, includes survey*
RIGHT OF WAY AND UTLTITY RELOCATION	LS	1	$104,200.00	$104,200	*75% of construction cost*
TOTAL				$284,800	

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Appendix F

POS COVENANTS ON PARCEL 4 OF ODENTON PARK

The attached is a copy of the Board of Public Works item that shows that the property on parcel 4 of Odenton Park was approved for POS funding.

BOARD OF PUBLIC WORKS

February 19, 1975

Secretary's Agenda

Item 4A - Revised
OUTDOOR RECREATION LAND LOAN OF 1969:

Approval is requested to commit to Anne Arundel County $64,010.01 from the Outdoor Recreation Land Loan of 1969. This amount represents 100% of the eligible project costs for the following project:

POS 771-2-57
Odenton Activity Area
Anne Arundel County

Allowable Land Cost for 25.36± acres at $2,401.42/acre	$60,900.01

Appraisals
Maurice C. Ogle - $60,900 ($2,401.42/acre)
Gene E. Floyd - $76,080 ($3,000.00/acre)

Incidentals	$ 3,110.00
Total Allowable Cost	$64,010.01
State Share (100%)	$64,010.01

Fund Source: Program 81.20 Item 73.02

Federal Grant; Not Available

Department of State Planning: Review favorable - January 14, 1975

Control Number: 5-1-M109

Zoning: Agricultural

Location: This project is located on Francis Station Road one mile south of Waugh Chapel Road in the Odenton-Gambrills Area of Anne Arundel County. Property Owner: William Huegg

Board of Public Works Action: The above referenced item was:

[✓ Approved] Disapproved Deferred

With Discussion Without Discussion