SR 1305 (Wayside Rd) Widening/SR 1418 (Lindsay Rd) Widening

Hoke County

STIP Project No. U-5753/U-5858

WBS No. 51078.1.1 /46385 .1.1

# Traffic Operations Analysis Technical Memorandum


Prepared For:

North Carolina Department of Transportation

Transportation Mobility and Safety Unit

Prepared By:

Patriot Transportation Engineering, PLLC

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# EXECUTIVE SUMMARY

The North Carolina Department of Transportation (NCDOT) proposes to construct State Transportation Improvement Program (STIP) Project Number U-5753/U-5858; SR 1305 (Wayside Rd) Widening/SR 1418 (Lindsay Rd) Widening in Hoke County. Project U-5753/U-5858 is defined as the widening of SR 1305 (Wayside Rd) and SR 1418 (Lindsay Rd). SR 1305 (Wayside Rd) is a two-lane facility with an AADT of 13,000 vpd and SR 1418 (Lindsay Rd) is a two-lane facility with an AADT of 8,400 vpd.

The purpose of this technical memorandum is to analyze the traffic operations for the proposed alternatives for U-5753/U-5858. The study includes the analysis for both the 2017 No-Build and Build Scenarios and 2040 Scenarios for both the No-Build and Build Scenarios. The analysis utilizes microscopic simulation of each of the scenarios in TransModeler, including the development of a visually validated base year model.

Two proposed build alternatives were analyzed:

- Alternative 1 – Realign Wayside Rd and Lindsay Rd to a reverse superstreet intersection with US 401
- Alternative 2 – Realign Wayside Rd and Lindsay Rd with a grade separated quadrant interchange at US 401

The results of each scenario are included in the following sections.

**2017 Base Year No-Build Scenario**

The analysis of the existing conditions within the study area shows that the traffic is operating at an acceptable level overall. At the overall intersection level all of the unsignalized intersections are operating at $LOS_S$ C or better. At the overall intersection level all of the signalized intersections are operating at $LOS_S$ C or better except for the intersection of Wayside Rd and Plank Rd which is operating at $LOS_S$ F in the AM peak period and $LOS_S$ E in the PM peak period.

Additionally, an analysis of the queue lengths found that the system is not adequately processing traffic such that queued traffic is affecting the operations of adjacent locations. The intersection of Wayside Rd at Plank Rd has queues longer than 1,000 feet on each approach in at least one peak period.

**2040 Future Year No-Build Scenario**

The 2040 No-Build analysis shows what the traffic operations in the study area are anticipated to be if the proposed project is not constructed. STIP Project U-5707 (Gillis Hill Road Extension) was assumed to be completed in 2040 and was included in all 2040 Future Year analyses. Without the proposed project, the analysis of the signalized intersections shows all signals are operating at an overall $LOS_S$ D or better except for SR 1305 (Wayside Rd) at Plank Rd. Based on a review of the unsignalized intersections, five intersections have movements that are operating at $LOS_S$ E or worse in one or both of the peak periods.

Additionally, an analysis of the queue lengths found that the system is not adequately processing traffic such that queued traffic is affecting the operations of adjacent locations. The intersection of Wayside Rd at Plank Rd has queues longer than 1,000 feet on each approach in at least one peak period. The intersections of Wayside Rd at Brock Rd and Lindsay Rd at Stony Point Rd both have queues over 1000 feet on at least one approach during the AM or PM peak period.

**2040 Future Year Build Scenario – Alternative 1**

The Build Alternative 1 proposed improvements included widening Wayside Rd to a four-lane divided facility, improving the Wayside Rd at Plank Rd intersection, installing a signal and turn lanes at Brock Rd, realigning Wayside Rd and Lindsay Rd to intersect US 401 at one signalized reverse superstreet intersection with restricted movements for the eastbound and westbound left-turn movements and the northbound and southbound through movements.

The restricted movements would use the adjacent signalized U-turn intersections. Improvements along Lindsay Rd include installing a signal and turn lanes at the intersection of Lindsay Rd and Stony Point Rd, and a roundabout at the intersection of Lindsay Rd and Galatia Church Rd.

The overall intersection $LOS_S$ for the signalized intersections in the 2040 Future Year Build Alternative 1 scenario shows that all the study intersections are operating at $LOS_S$ D or better in both the AM and PM peak periods.

Based on a review of the unsignalized intersections, one intersection, Lindsay Rd at Gillis Hill Rd, has two movements that are operating at $LOS_S$ E or worse in both of the peak periods. A review of the queue data showed that the system is adequately processing traffic such that queued traffic is not affecting the operations of adjacent locations.

**2040 Future Year Build Scenario – Alternative 2**

The Build Alternative 2 proposed improvements include widening Wayside Rd to a four-lane divided facility, improving the Wayside Rd at Plank Rd intersection, installing a signal and turn lanes at Brock Rd, realigning Wayside Rd and Lindsay Rd to be a grade separated interchange with quadrant ramps connecting to US 401. Improvements along Lindsay Rd include installing a signal and turn lanes at the intersection of Lindsay Rd and Stony Point Rd, and a roundabout at the intersection of Lindsay Rd and Galatia Church Rd.

The overall intersection $LOS_S$ for the signalized intersections in the 2040 Future Year Build Alternative 2 scenario shows that all the study intersections are operating at $LOS_S$ D or better in both the AM and PM peak periods. Based on a review of the unsignalized intersections, one intersection, Lindsay Rd at Gillis Hill Rd, has two movements that are operating at $LOS_S$ E or worse in both of the peak periods. A review of the queue data showed that the system is adequately processing traffic such that queued traffic is not affecting the operations of adjacent locations. None of the intersections in the study area had queuing issues.

**2017 Base Year Build Scenario**

The Base Year Build Alternative proposed improvements are the same improvements included in Alternative 2.

The overall intersection $LOS_S$ for the unsignalized intersections in the 2017 Base Year Build Alternative 2 scenario shows that all the study intersections are operating at $LOS_S$ D or better in both the AM and PM peak periods. Based on a review of the unsignalized intersections, all movements are operating at $LOS_S$ D or better in both the AM an PM peak periods. A review of the queue data showed that the system is adequately processing traffic such that queued traffic is not affecting the operations of adjacent locations. None of the intersections in the study area had queuing issues.

**Recommendation**

Based on the results of the analysis, Alternatives 1 and 2 are both acceptable alternatives. Alternatives 1 and 2 have very similar overall operations from a traffic standpoint, with only minimal differences in level of service. Both alternatives show improvements in delay and queue length along the Wayside Rd and Lindsay Rd corridors when compared to the No-Build scenario. Alternative 2 was chosen as the preferred alternative and the Base Year Build analysis shows improvements in traffic operations along the Wayside Rd and Lindsay Rd corridors.

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# 1. PROJECT BACKGROUND

Under a contract with the North Carolina Department of Transportation (NCDOT), Dewberry Engineers, Inc. (Dewberry) has been requested to assist NCDOT in the development of the planning and design of State Transportation Improvement Program (STIP) Project Number U-5753/U-5858; SR 1305 (Wayside Rd) Widening/SR 1418 (Lindsay Rd) Widening in Hoke County. Patriot Transportation Engineering, PLLC (Patriot), as a subconsultant to Dewberry, has been contracted to develop the traffic operations analysis for the subject project.

## 1.1 PURPOSE OF TECHNICAL MEMORANDUM

The purpose of this technical memorandum is to analyze the traffic operations for the proposed alternatives for U-5753/U-5858. The study includes the analysis for the 2017 No-Build Scenario and 2040 Scenarios for both the No-Build and Build Scenarios. The study also includes the analysis for the 2017 Build Scenario of the preferred alternative. The analysis utilizes microscopic simulation of each of the scenarios in TransModeler (Version 4, Build 6275), including the development of a visually validated base year model.

## 1.2 PROJECT DESCRIPTION

Projects U-5753/U-5858 are defined as the widening of SR 1305 (Wayside Rd) and SR 1418 (Lindsay Rd). SR 1305 (Wayside Rd) is a two-lane facility with an AADT of 13,000 vpd and SR 1418 (Lindsay Rd) is a two-lane facility with an AADT of 8,400 vpd. The Project Study Area is shown in Figure 1-1.

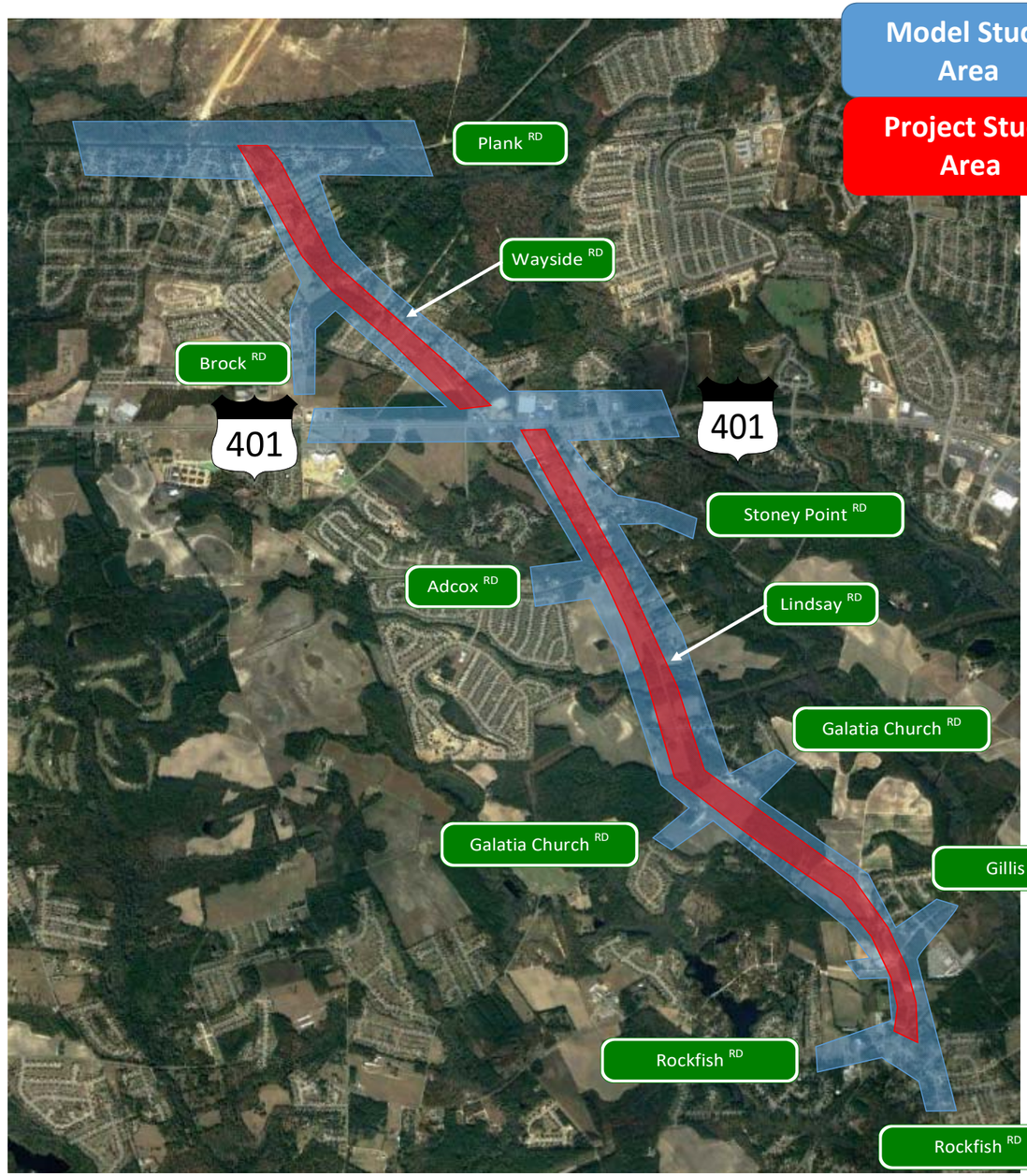
The analysis of the proposed project includes the evaluation of five alternatives that were screened in order to find the best options at the SR 1305 and SR 1418 at US 401 intersections. The Build Alternative analysis was based on the two alternatives that had the best operations.

- Alternative 1 – Realign Wayside Rd and Lindsay Rd to a reverse superstreet intersection with US 401
- Alternative 2 – Realign Wayside Rd and Lindsay Rd with a grade separated quadrant interchange at US 401

A detailed description of the build analyses are included in Section 8.


**U-5753 Project Study Area**


**U-5858 Project Study Area**




**Model Study Area**

**Project Study Area**

N

**STIP Project No. U-5753/U-5858**

**SR 1305 and SR 1418 Widening**

**Hoke County**

**Figure 1-1**

**Project Study Area**

**Simulation Model Study Area**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# 2. DESCRIPTION OF SCENARIOS ANALYZED

The scenarios that require analysis as a part of this study include analysis of both existing and future conditions, both with and without the project. The following scenarios were evaluated in the microscopic simulation of the traffic operations.

## 2.1 2017 BASE YEAR NO-BUILD CONDITIONS

The Base Year No-Build analysis is based on the current traffic volumes and the existing configuration of the transportation network within the project study area. This analysis provides a baseline for comparison against future scenarios. The 2017 Base Year No-Build Model includes visual validation, which is the process of comparing the overall model-predicted traffic performance against field observations of traffic performance and modifying parameters to better emulate the observed conditions. The objective of visual validation is to obtain a reasonable match between model performance estimates and the field observations during the base year period and then utilize the parameters developed in the validated model to evaluate alternative scenarios including future years and/or design variations.

## 2.2 2040 FUTURE YEAR NO-BUILD SCENARIO

This scenario evaluated what the traffic operations will be in the vicinity of the proposed project in the design year 2040 if the proposed project is not constructed. The 2040 scenarios assume that all improvements in the Fayetteville Area Metropolitan Planning Organization (FAMPO) *Metropolitan Transportation Plan (MTP)* are included in the analysis. For the study area included in this analysis, the following projects are included in the future year analysis:

- STIP Project U-5707 – Gillis Hill Road Extension

## 2.3 2040 FUTURE YEAR BUILD SCENARIOS

This scenario evaluated what the traffic operations will be in the vicinity of the proposed project in the design year 2040 if the proposed project is constructed. The 2040 scenarios assume that all improvements within the model study area (listed in Section 2.2) are included in the analysis. The 2040 Future Year Build analysis includes the following Build Alternatives:

- Alternative 1 – Realign Wayside Rd and Lindsay Rd to a reverse superstreet intersection with US 401
- Alternative 2 – Realign Wayside Rd and Lindsay Rd with a grade separated quadrant interchange at US 401

## 2.4 2017 BASE YEAR BUILD SCENARIO

This scenario evaluated what the traffic operations would be in the vicinity of the proposed project in the base year 2017 if the proposed project is constructed. The 2017 scenario assumes that all improvements within the model study area (listed in Section 2.2) are included in the analysis. The 2017 Base Year Build analysis includes the following Build Alternative:

- Preferred Alternative (Alternative 2) – Realign Wayside Rd and Lindsay Rd with a grade separated quadrant interchange at US 401

## 3. METHODOLOGY

The use of microscopic simulation was completed using TransModeler software (version 4.0 Build 6275). TransModeler is a microscopic, behavior-based multi-purpose traffic simulation program that has emerged as one of the leading simulation software programs. For many engineering disciplines, simulation has become an indispensable instrument for the optimization of complex technical systems. This is also true for transportation planning and traffic engineering. The microscopic simulation model was developed for the build and no-build alternatives for the project and was based on a visually validated base model for the area.

The methodology for microscopic simulation begins with a base model developed from data collected for the transportation network. The base model is then validated against the observations made in the field to arrive at a validated base model. Once the base model is validated the future year build alternatives can be developed and their results compared. Each scenario model was created in accordance with the *NCDOT Congestion Management Simulation Guidelines* (Effective October 1, 2016).

## 4. MEASURES OF EFFECTIVENESS

Measures of Effectiveness (MOE) are system performance statistics that best characterize the degree to which a particular alternative meets the project objectives. The MOEs for microscopic simulation can be abundant due to the nature of the type of analysis. On an overall network level, MOEs such as vehicle hours traveled (VHT), vehicle miles traveled (VMT), average system speed, average system delay, and number of stops can provide overall indications of the operations of a network. The primary MOEs for freeway facilities are typically average speed, density and Level of Service for individual segments within the network. For arterial corridors, the primary MOEs are control delay, Level of Service and queue lengths.

For this analysis it was determined that the use of intersection level MOEs, such as control delay and level of service at each intersection, would be used as the primary method of comparison for alternatives. The queue lengths also played a substantial role in the evaluation and includes both the average and maximum queue length for each lane group and the average and maximum queue length for each approach to the intersection.

The following MOEs were developed, based on NCDOT Simulation Guidelines, for each scenario being analyzed:

- Intersection MOEs
    - Delay and LOS by Intersection for signalized intersections
    - Delay and LOS by Lane Group for signalized intersections and stop-controlled intersections
    - 95$^{th}$ percentile Queue Length by Lane Group for all intersections
    - Maximum Spillback Queue by Approach for all intersections

## 5. TRAFFIC VOLUME DEVELOPMENT

Traffic demand is one of the most important elements of a simulation project. Defining traffic demand in TransModeler includes not only the volumes of vehicle trips to be simulated, but also the paths vehicles choose to travel to reach their assigned destination. Traffic demand can be specified through a variety of methods, such as defining link volumes and turning movements, origin-destination trip tables, or a specific set of vehicle paths.

The primary sources of volume data for this study were the *Traffic Forecast Report for U-5753* (NCDOT; March 2017) and *Traffic Forecast Report for U-5858* (NCDOT; April 2017). The traffic forecast included four scenarios: the 2017 Base Year No-Build and Build and the 2040 Future Year No-Build and Build. A copy of the traffic forecast diagrams is included in Appendix A.

## 5.1 ORIGIN-DESTINATION MATRIX DEVELOPMENT

For a network of this size and the level of detail for the design options, it was determined that utilizing an Origin-Destination (O-D) matrix would be the best method to define how the actual volumes are loaded onto the network. Trip matrices have two components. The first component is an O-D matrix that lists the number of trips between each O-D pair. The second component is a set of Trip Matrix Settings which govern the specifics of how each of the trips between each O-D pair should be simulated. The trip matrix settings are saved as part of the standard matrix file. Both components are necessary in order to use a Trip Matrix as a simulation input.

O-D matrices can be created by various ways. They can be forecasts of O-D demand from a planning model or subarea analysis, they may be derived from observed volumes and/or turning movement counts, or they may be based on engineering judgment. For this study it was determined that the volumes would be developed by utilizing a manual Origin-Destination Matrix Estimation (ODME) procedure that distributes trips between origins and destinations proportionally to the magnitude of volume on each origin or destination. The following steps were utilized in developing the traffic volumes for this study:

- The traffic forecast volumes were entered into the Intersection Analysis Utility (IAU) and peak hour volumes were generated.
- The peak hour volumes were entered into the manual ODME spreadsheet
- The manual ODME spreadsheet was developed to allocate O-D trips along corridors and was adapted for this project to develop a corridor O-D matrix for the SR 1305 (Wayside Rd) / SR 1418 (Lindsay Rd) corridor.

At the completion of the O-D matrix development process, the demand volumes for the AM and PM peaks were established. However, the matrices only included the total number of trips occurring between each O-D pair and were not broken down by vehicle type. TransModeler defines the percentage of vehicle types as each trip is generated at an origin based on a distribution provided in the model. Each external node was classified based on the truck percentage of the entering link from the traffic forecast in order to create the vehicle class distribution for each external node.

## 5.2 ORIGIN-DESTINATION MATRIX SETTINGS

A variety of other parameters describe how trips are to be generated from the matrix. These settings are defined in the trip matrix settings. The Trip Matrix Setup and matrix curves used the basic parameters described in the NCDOT Simulation Guidelines.

## 5.3 VEHICLE ROUTING

One of the more important tasks of a traffic simulation model is to ensure that the paths that vehicles follow through the network reflect those that drivers actually choose and that the distribution of vehicles, both in spacing throughout the network and over time throughout the simulation period, result in realistic congestion patterns. The Routing settings are project settings that are used as inputs to the route choice model. In TransModeler, a path is selected for each individual vehicle. Because of varying perceptions and behaviors, drivers traveling between the same origin-destination pair likely may not always follow the same path. Furthermore, drivers do not necessarily choose the minimum cost path. Route choice is one of the most complex of driver behaviors and one of the most critical in traffic modeling.

The models for this study did not include the use of the TransModeler features for both historic travel times along each link and the turning delay at each node that is generated through the dynamic traffic assignment process as there were very limited alternative routes available within the simulation network.

### 5.4 VISUAL VALIDATION

The objective of visual validation is to obtain a reasonable match between model performance estimates and the field observations during the base year period and then utilize the parameters developed in the validated model to evaluate alternative scenarios including future years and/or design variations. The model was run and the animation was compared to information observed in the field and deemed visually validated.

## 6. 2017 BASE YEAR NO-BUILD ANALYSIS

### 6.1 MODEL GEOMETRY

The basis for developing the geometric data was aerial photographs and contour data. Aerial photography from NCOneMap (Hoke County, 2017 imagery; http://nconemap.org/) was used as a background to digitize the network into the simulation model. The three-dimensional attributes and grades were determined based on contour data from the NCDOT GIS Unit (Elevation Data at 20-foot Grid, Hoke County).

The limits of the model network, shown in Figure 1-1, include SR 1305 (Wayside Rd) from Plank Rd to US 401 and SR 1418 (Lindsay Rd) from US 401 to Rockfish Rd.

### 6.2 MODEL PARAMETERS

Every microscopic simulation package has its own unique methodology for coding the model. Most models include a default set of parameters that define how the model operates and is based on data taken from locations outside of North Carolina. The initial model development included the use of the NCDOT default parameters file for TransModeler (dated September 2016). The process of visual validation reviews and refines these model parameters to better replicate the conditions observed in the field. This project required no changes to the default parameters file.

### 6.3 VOLUME DATA AND VEHICLE ROUTING

Traffic demand and vehicle routing inputs were defined in the model as described in Section 5. The volumes for the 2017 Base Year No-Build analysis are included in Figure 6-1. The O-D matrices for the 2017 Base Year No-Build analysis are included in Appendix B.

## 6.4 INTERSECTIONS

Traffic control devices of varying designs and purposes are used in transportation systems to manage rights of way, guide traffic, and mitigate congestion. These devices vary widely from the common stop sign to changeable message signs conveying dynamic traveler information. TransModeler simulates a broad range of devices as well as the behavioral responses of drivers to those devices. Some of the more common types of traffic control devices are those used for intersection control, where conflicting traffic streams must share the same rights of way. The intersection control editing tools in TransModeler are used to create stop signs, yield signs, and traffic signals.

The geometric layout for the signalized intersections were coded in the network according to the signal design plans collected for this study and included in Appendix C. For each signal, the signal detectors were coded based on the NCDOT Simulation Guidelines. The signal phases and attributes (including minimum/maximum green times, recall mode, and actuated signal parameters) were then coded based on the respective signal plans. Next, the Ring and Barrier Table was coded in TransModeler based on the Phasing Diagram shown on the signal control plan.

The initial signal timings entered into TransModeler (prior to being optimized) were developed based on two sources of information. For isolated (non-coordinated) signals or for free running timings for off peak periods, the timings provided in the signal design plan were utilized. For any signal within the study area that is part of coordinated traffic signal systems initial splits by adding the minimum green, yellow and all red were utilized.

At the signalized intersections of US 401 at SR 1305 (Wayside Rd) and US 401 at SR 1418 (Lindsay Rd), the existing configuration includes a flared right turn lane with a stop sign for the driveway movement. It was decided that this movement would be included in the signal and modeled with the right turn on flashing red to better emulate the operations.

### 6.4.1 SIGNAL OPTIMIZATION

The signal at SR 1305 (Wayside Rd) and Plank Rd was optimized using Webster's Equation based off of the turning movement counts for the intersection. It was optimized in 10 second increments with a minimum cycle length of 120 seconds and a maximum cycle length of 180 seconds.

The signals along the US 401 corridors were optimized utilizing the simulation-based signal optimization feature in TransModeler. The signals were optimized for 30 minutes of the peak hour with a five-minute warmup period based on the NCDOT Congestion Management Simulation Guidelines. Each corridor was optimized in 10 second increments with a minimum cycle length of 90 seconds and a maximum cycle length of 180 seconds. The default Performance Index MOE Weights were set based on the NCDOT Congestion Management Simulation Guidelines. Once the optimized signal timings were developed the simulation was run and the timings were fine-tuned by the analyst on an as-needed basis.

## 6.5 OUTPUTS AND MEASURES OF EFFECTIVENESS

After running a simulation, the next step is to use the output statistics in order to analyze traffic conditions in the network. The development of selection sets in TransModeler included defining the nodes for delay and queue output and links for the queue length. For the purposes of the 2017 Base Year Model, the MOEs detailed in Section 4 were extracted from the model and summarized in Section 6.7.

## 6.6 SIMULATION AND RUN CONTROLS

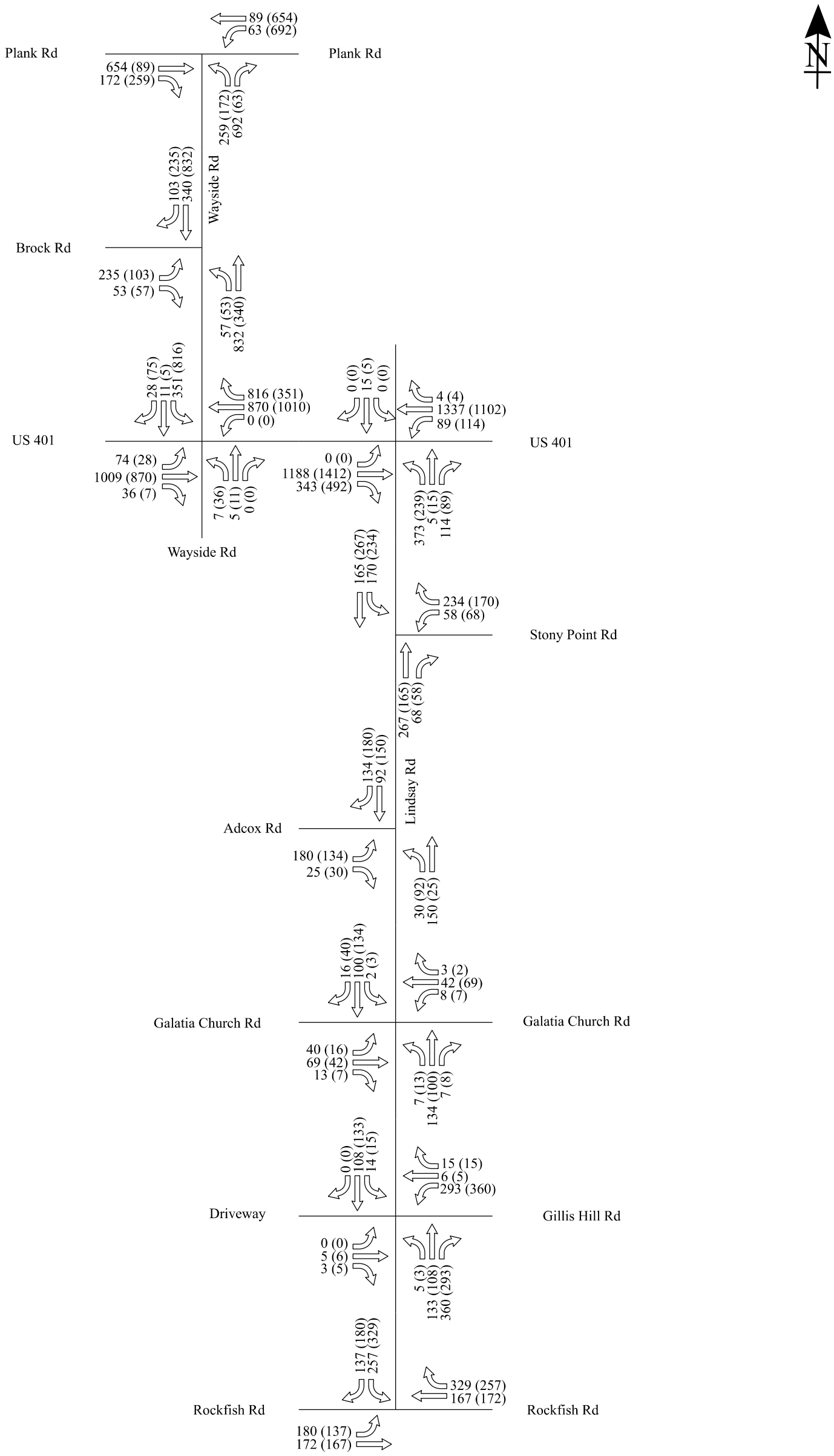
All simulation software contains run control parameters to enable the modeler to customize the software operation for their specific modeling needs. Multiple repetitions of the same model are required because microscopic simulation results will vary depending on the random number seed used in each run. The random number seed is an input that

TransModeler uses to select a sequence of random numbers, which are utilized in the model to make numerous decisions throughout the simulation run. The outcomes of all of these decisions will affect the simulation results. The results of each run are usually close to the average of all of the runs; however, each run will be different from the other.

The number of repetitions required for the base model is typically based on a statistical evaluation of the results based on a desired range and confidence interval. After a review of the output data, it was determined that ten simulation runs would be adequate for this project.

## 6.7 2017 BASE YEAR NO-BUILD MODEL RESULTS

The output data was extracted from the TransModeler model via the Output Manager using the Delay, Queue and Queue Spillback reports. The outputs were collected in accordance with the MOEs defined in Section 4 and are summarized in the following sections.




PATRIOT TRANSPORTATION ENGINEERING, PLLC

STIP U-5753/U-5858
2017 Base Year No-Build
Figure 6-1

AM (PM) Turning Movement Volumes

### 6.7.1 INTERSECTION RESULTS

The results of the intersection analysis are included in Table 6-1 and Figure 6-2. The overall intersection $LOS_S$ for all signalized intersections in the 2017 Base Year No-Build scenario shows that all signals are operating at $LOS_S$ C or better except for SR 1305 (Wayside Rd) at Plank Rd. During the AM peak period 2 of 3 intersections are operating at $LOS_S$ B and 1 of 3 intersections is operating at $LOS_S$ F. During the PM peak period 1 of 3 intersections is operating at $LOS_S$ B, 1 of 3 intersections is operating at $LOS_S$ C, and 1 of 3 intersections is operating at $LOS_S$ E.

Based on a review of the intersection operations at the lane group level, the following movements operate at $LOS_S$ E or F in the 2017 Base Year No-Build scenario:

- Wayside Rd at Plank Rd, westbound left operates at $LOS_S$ F during the AM and PM Peaks
- Wayside Rd at Plank Rd, westbound through operates at $LOS_S$ E during the PM Peak
- Wayside Rd at Plank Rd, northbound left operates at $LOS_S$ F during the AM and PM Peaks
- Wayside Rd at Plank Rd, northbound right operates at $LOS_S$ F during the AM Peak
- Wayside Rd at Plank Rd, eastbound through/right operates at $LOS_S$ F during the AM Peak
- US 401 at Lindsay Rd, northbound left/through/right operates at $LOS_S$ E during the PM Peak

Based on a review of the unsignalized intersections, three intersections have movements that are operating at $LOS_S$ F in one or both of the peak periods. The poorest operations were at the intersection of Wayside Road and Brock Road, which operated at $LOS_S$ F for the eastbound left/through movement during both the AM and PM peak periods.

A review of the queue data showed that the system is not adequately processing traffic such that queued traffic is affecting the operations of adjacent locations. The maximum queue lengths for traffic in areas of poor operation included in the study is shown as follows:

- Wayside Rd at Plank Rd, westbound approach has a maximum queue length of 184 feet (AM) and 1704 feet (PM)
- Wayside Rd at Plank Rd, northbound approach has a maximum queue length of 2084 feet (AM) and 532 feet (PM)
- Wayside Rd at Plank Rd, eastbound approach has a maximum queue length of 1842 feet (AM) and 297 feet (PM)
- Wayside Rd at Brock Rd, eastbound approach has a maximum queue length of 3401 feet (AM) and 2129 feet (PM)
- Lindsay Rd at Gillis Hill Rd, westbound approach has a maximum queue length of 129 feet (AM) and 1452 feet (PM)
- Lindsay Rd at Rockfish Rd, southbound approach has a maximum queue length of 1741 feet (AM) and 2920 feet (PM)

The analysis of the existing conditions within the study area shows that the traffic is operating at an acceptable level overall for most of the study area. There are two movements at unsignalized intersections operating at $LOS_S$ E or worse for both peak periods.

## Table 6-1: 2017 Base Year No-Build Intersection Measures of Effectiveness

### Signalized Intersections

| Intersection No. | Intersection | Approach | Lane Group | Delay[1] (s) | | Level of Service[2] | | 95th % Queue (ft)/Spillback Rate | | Maximum Queue Length (ft) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | AM | PM | AM | PM | AM | PM | AM | PM |
| 1 | SR 1305 (Wayside Rd) at Plank Rd | **Overall** | | **130.0** | **69.2** | **F** | **E** | | | | |
| | | Plank Rd WB | L | 103.9 | 87.2 | F | F | 130 (0%) | 772 (0%) | 184 | 1704 |
| | | | T | 26.2 | 69.8 | C | E | 56 (0%) | 218 (0%) | | |
| | | SR 1305 (Wayside Rd) NB | L | 146.1 | 126.5 | F | F | 413 (0%) | 437 (0%) | 2084 | 532 |
| | | | R | 140.3 | 51.9 | F | D | 1749 (0%) | 76 (0%) | | |
| | | Plank Rd EB | TR | 148.8 | 29.4 | F | C | 1686 (0%) | 184 (0%) | 1842 | 297 |
| 3 | SR 1305 (Wayside Rd) at US 401 | **Overall** | | **10.3** | **25.1** | **B** | **C** | | | | |
| | | SR 1305 (Wayside Rd) SB | L | 50.9 | 50.5 | D | D | 180 (0%) | 278 (0%) | 349 | 891 |
| | | | LT | 52.2 | 52.5 | D | D | 247 (0%) | 522 (0%) | | |
| | | | R | 51.5 | 52.2 | D | D | 52 (0%) | 61 (0%) | | |
| | | US 401 WB | T | 5.5 | 20.7 | A | C | 153 (0%) | 371 (0%) | 259 | 556 |
| | | | R | 1.3 | 6.7 | A | A | 0 (0%) | 0 (0%) | | |
| | | Gas Station Driveway NB | R | 16.3 | 23.1 | B | C | 33 (0%) | 56 (0%) | 0 | 82 |
| | | US 401 EB | T | 6.6 | 16.4 | A | B | 172 (0%) | 215 (0%) | 282 | 396 |
| | | | TR | 7.2 | 16.9 | A | B | 184 (0%) | 277 (0%) | | |
| 4 | US 401 at SR 1418 (Lindsay Rd) | **Overall** | | **17.4** | **11.9** | **B** | **B** | | | | |
| | | Storage Unit Driveway SB | R | 24.0 | 22.4 | C | C | 38 (0%) | 29 (0%) | 0 | 0 |
| | | US 401 WB | T | 12.8 | 7.5 | B | A | 231 (0%) | 205 (0%) | 421 | 327 |
| | | | R | 19.3 | 10.6 | B | B | 21 (0%) | 21 (0%) | | |
| | | SR 1418 (Lindsay Rd) NB | L | 40.9 | 50.7 | D | D | 179 (0%) | 162 (0%) | 374 | 331 |
| | | | LTR | 48.1 | 60.8 | D | E | 255 (0%) | 220 (0%) | | |
| | | US 401 EB | T | 12.9 | 6.6 | B | A | 265 (0%) | 254 (0%) | 491 | 416 |
| | | | R | 13.5 | 7.5 | B | A | 289 (0%) | 129 (0%) | | |

### Unsignalized Intersections[3]

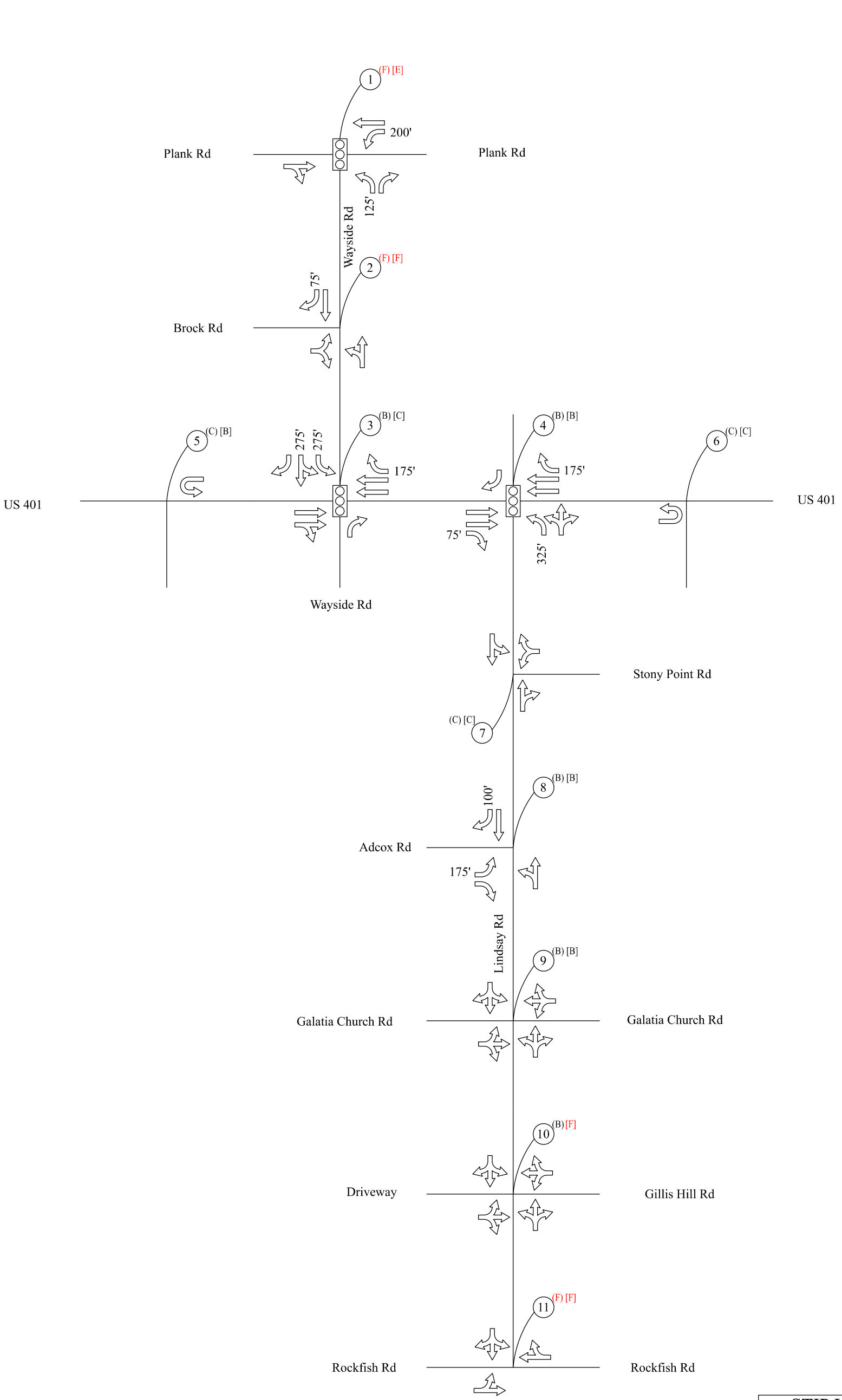
| Intersection No. | Intersection | Approach | Lane | Delay[1] (s) | | Level of Service[2] | | 95th % Queue (ft)/Spillback Rate | | Maximum Queue Length (ft) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | AM | PM | AM | PM | AM | PM | AM | PM |
| 2 | SR 1305 (Wayside Rd) at Brock Rd | SR 1305 (Wayside Rd) SB | T | 0.7 | 1.6 | A | A | 0 (0%) | 0 (0%) | 0 | 0 |
| | | | R | 2.5 | 3.3 | A | A | 0 (0%) | 0 (0%) | | |
| | | SR 1305 (Wayside Rd) NB | LT | 6.4 | 33.8 | A | D | 363 (0%) | 523 (0%) | 463 | 634 |
| | | Brock Rd EB | LR | 956.2 | 673.2 | F | F | 2950 (1%) | 1995 (0%) | 3401 | 2129 |
| 5 | US 401 EB at U-Turn | US 401 U-Turn SB | L | 16.3 | 14.8 | C | B | 57 (0%) | 96 (0%) | 99 | 107 |
| | | US 401 EB | T | 0.2 | 0.2 | A | A | 0 (0%) | 7 (0%) | 0 | 0 |
| 6 | US 401 WB at U-Turn | US 401 WB | T | 0.2 | 0.2 | A | A | 0 (0%) | 0 (0%) | 0 | 0 |
| | | US 401 U-Turn NB | L | 25.0 | 18.3 | C | C | 87 (0%) | 72 (0%) | 115 | 94 |
| 7 | SR 1418 (Lindsay Rd) at SR 1419 (Stony Point Rd) | SR 1418 (Lindsay Rd) SB | LT | 9.7 | 6.6 | A | A | 184 (0%) | 152 (0%) | 358 | 311 |
| | | SR 1419 (Stony Point Rd) WB | LR | 21.7 | 18.5 | C | C | 177 (0%) | 124 (0%) | 265 | 204 |
| | | SR 1418 (Lindsay Rd) NB | TR | 1.2 | 1.1 | A | A | 10 (0%) | 0 (0%) | 0 | 0 |
| 8 | SR 1418 (Lindsay Rd) at SR 1417 (Adcox Rd) | SR 1418 (Lindsay Rd) SB | T | 0.8 | 0.6 | A | A | 0 (0%) | 0 (0%) | 0 | 0 |
| | | | R | 0.9 | 0.7 | A | A | 0 (0%) | 0 (0%) | | |
| | | SR 1418 (Lindsay Rd) NB | LT | 1.0 | 1.1 | A | A | 41 (0%) | 24 (0%) | 0 | 0 |
| | | SR 1417 (Adcox Rd) EB | L | 12.5 | 11.8 | B | B | 64 (0%) | 64 (0%) | 116 | 104 |
| | | | R | 9.9 | 10.2 | A | B | 32 (0%) | 32 (0%) | | |
| 9 | SR 1418 (Lindsay Rd) at SR 1415 (Galatia Church Rd) | SR 1418 (Lindsay Rd) SB | LTR | 13.0 | 12.6 | B | B | 72 (0%) | 96 (0%) | 107 | 113 |
| | | SR 1415 (Galatia Church Rd) WB | LTR | 11.1 | 11.2 | B | B | 36 (0%) | 48 (0%) | 27 | 38 |
| | | SR 1418 (Lindsay Rd) NB | LTR | 12.6 | 12.1 | B | B | 64 (0%) | 62 (0%) | 111 | 101 |
| | | SR 1415 (Galatia Church Rd) EB | LTR | 11.4 | 11.3 | B | B | 44 (0%) | 48 (0%) | 78 | 33 |
| 10 | SR 1418 (Lindsay Rd) at SR 1420 (Gillis Hill Rd) | SR 1418 (Lindsay Rd) SB | LTR | 2.6 | 6.6 | A | A | 42 (0%) | 103 (0%) | 101 | 102 |
| | | SR 1420 (Gillis Hill Rd) WB | LTR | 12.7 | 145.3 | B | F | 72 (0%) | 1161 (0%) | 129 | 1452 |
| | | SR 1418 (Lindsay Rd) NB | LTR | 0.7 | 0.7 | A | A | 0 (0%) | 52 (0%) | 0 | 0 |
| | | Driveway EB | LTR | 9.2 | 15.1 | A | C | 30 (0%) | 39 (0%) | 0 | 25 |
| 11 | SR 1418 (Lindsay Rd) at SR 1406 (Rockfish Rd) | SR 1418 (Lindsay Rd) SB | LR | 306.6 | 258.6 | F | F | 1138 (1%) | 1034 (2%) | 1741 | 2920 |
| | | SR 1406 (Rockfish Rd) WB | TR | 2.3 | 1.8 | A | A | 17 (0%) | 19 (0%) | 37 | 0 |
| | | SR 1406 (Rockfish Rd) EB | LT | 12.3 | 6.5 | B | A | 122 (0%) | 86 (0%) | 199 | 133 |

Notes:

1 Delay shown is the 95th percentile worst case control delay for the full 60-minute simulation period as derived from the 10 random seed simulations

2 Level of Service shown is Simulation based and calculated in a manner that is consistent with the HCM 2010 Methodologies

3 Results for unsignalized intersections include only the movements that have conflicting flow and thus have the potential to incur control delay

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Worst movement shown at unsignalized intersections.

STIP U-5753/U-5858
2017 Base Year No-Build
Figure 6-2

| | |
|---|---|
| ⇦ | Existing Laneage |
| ▯ | Existing Signal |
| (#) | Intersection Number |
| (AM) [PM] | Intersection LOS (E/F in Red) |
| XXX' | Storage Length |

# 7. 2040 FUTURE YEAR NO-BUILD ANALYSIS

Based on the requirements of the National Environmental Policy Act (NEPA), the Future Year No-Build alternative must be given full consideration and is often used as a means of comparison for the build alternatives. Therefore, the next step was to utilize the validated base model to determine how the transportation network within the study area will operate in the future.

## 7.1 MODEL PARAMETERS

All of the driver behaviors and parameters established while validating the base year model were reviewed and it was determined that they would be carried forward to the future year network.

## 7.2 VOLUME DATA

The development of the volume data for the 2040 No-Build model was described in Section 5. The volumes for the 2040 Future Year No-Build analysis are included in Figure 7-1. The O-D matrices for the 2040 Future Year No-Build analysis are included in Appendix B. The vehicle loading and matrix setting were identical to those used in the 2017 Base Year No-Build model with the vehicles being loaded onto the network based the NCDOT Simulation Guidelines.

## 7.3 DESIGN ASSUMPTIONS/MODEL NETWORK

The 2040 scenarios assume that all improvements in the Fayetteville Area Metropolitan Planning Organization (FAMPO) *Metropolitan Transportation Plan (MTP)* are included in the analysis. For the study area included in this analysis, the following projects were assumed to be completed.

- STIP Project U-5707 – Gillis Hill Road Extension, SR 1406 (Rockfish Road) to SR 1418 (Lindsay Rd)

## 7.4 SIGNAL TIMINGS AND OPERATIONS

The next step in developing the 2040 No-Build model was to re-optimize the signals for the new traffic volumes. The signal optimization was done in the same manner as for the 2017 Base Year No-Build model described in Section 6.4.1. A new signalized intersection was added based on STIP Project U-5707 at Gillis Hill Road Extension and Rockfish Rd. The signalized intersection was coded based on the NCDOT Congestion Management Simulation Guidelines.

## 7.5 VISUAL VALIDATION OF MODEL

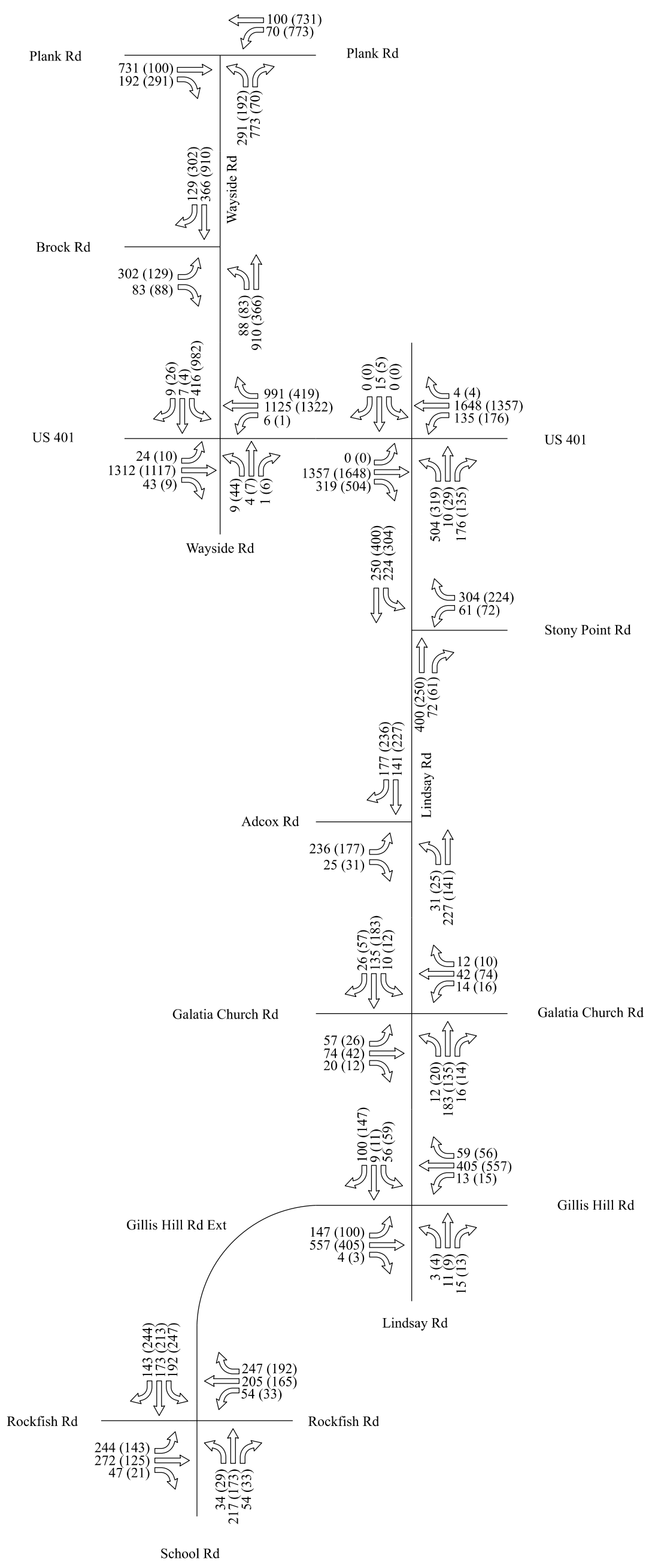
Quality control was performed for the 2040 No-Build model to ensure it was developed in a manner consistent with the current guidelines and best practices being utilized for TransModeler. The model was then visually validated by observing the model animations in the same manner that was described in Section 5. Following the conclusion of the model review process it was determined that 2040 No-Build model was visually valid and ready for developing detailed MOEs.

## 7.6 MEASURES OF EFFECTIVENESS

The MOEs extracted for the 2040 No-Build scenario are identical to those utilized for the 2017 Base Year No-Build model and are discussed in detail in Section 4.

## 7.7 SIMULATION RUN CONTROL

The simulation model run controls for the future year no-build model were identical to those included in Section 6.6 for the 2017 Base Year No-Build model.

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STIP U-5753/U-5858
2040 Future Year No-Build
Figure 7-1

AM (PM) Turning Movement Volumes

## 7.8 2040 FUTURE YEAR NO-BUILD MODEL RESULTS

The output data was extracted from the TransModeler model via the Output Manager using the Delay, Queue and Queue Spillback reports. The outputs were collected in accordance with the MOEs defined in Section 4 and are summarized in the following sections.

### 7.8.1 INTERSECTION RESULTS

The results of the intersection analysis are included in Table 7-1 and Figure 7-2. The overall intersection $LOS_S$ for all signalized intersections in the 2017 Base Year No-Build scenario shows that all signals are operating at $LOS_S$ D or better except for SR 1305 (Wayside Rd) at Plank Rd. During the AM peak period 1 of 4 intersections is operating at $LOS_S$ A, 1 of 4 intersections is operating at $LOS_S$ B, 1 of 4 intersections is operating at $LOS_S$ D, and 1 of 4 intersections is operating at $LOS_S$ F. During the PM peak period 2 of 4 intersections is operating at $LOS_S$ B, 1 of 4 intersections is operating at $LOS_S$ C, and 1 of 4 intersections is operating at $LOS_S$ F.

Based on a review of the intersection operations at the lane group level, the following movements operate at $LOS_S$ E or F in the 2017 Base Year No-Build scenario:

- Wayside Rd at Plank Rd, westbound left operates at $LOS_S$ F during the AM and PM Peaks
- Wayside Rd at Plank Rd, westbound through operates at $LOS_S$ F during the AM and PM Peaks
- Wayside Rd at Plank Rd, northbound left operates at $LOS_S$ F during the AM and PM Peaks
- Wayside Rd at Plank Rd, northbound right operates at $LOS_S$ F during the AM Peak
- Wayside Rd at Plank Rd, eastbound through/right operates at $LOS_S$ F during the AM Peak
- Gillis Hill Rd Extension, westbound left operates at $LOS_S$ E during the AM and PM Peaks
- Gillis Hill Rd Extension, northbound left operates at $LOS_S$ E during the AM and PM Peaks

Based on a review of the unsignalized intersections, five intersections have movements that are operating at $LOS_S$ E or worse in one or both of the peak periods. The poorest operations were at the intersection of Wayside Road and Brock Road, which operated at $LOS_S$ F for the eastbound left/through movement during both the AM and PM peak periods.

A review of the queue data showed that the system is not adequately processing traffic such that queued traffic is affecting the operations of adjacent locations. The maximum queue lengths for traffic in areas of poor operation included in the study is shown as follows:

- Wayside Rd at Plank Rd, westbound approach has a maximum queue length of 234 feet (AM) and 2491 feet (PM)
- Wayside Rd at Plank Rd, northbound approach has a maximum queue length of 2698 feet (AM) and 510 feet (PM)
- Wayside Rd at Plank Rd, eastbound approach has a maximum queue length of 2736 feet (AM) and 345 feet (PM)
- Wayside Rd at Brock Rd, northbound approach has a maximum queue length of 926 feet (AM) and 2665 feet (PM)
- Wayside Rd at Brock Rd, eastbound approach has a maximum queue length of 3332 feet (AM) and 3340 feet (PM)
- Lindsay Rd at Stony Point Rd, westbound approach has a maximum queue length of 1126 feet (AM) and 606 feet (PM)

The analysis of the existing conditions within the study area shows that the traffic is operating at an acceptable level overall for most of the study area. There are three movements at unsignalized intersections operating at $LOS_S$ E or worse for both peak periods.

**Table 7-1: 2040 Future Year No-Build Intersection Measures of Effectiveness**

**Signalized Intersections**

| Intersection No. | Intersection | Approach | Lane Group | Delay[1] (s) | | Level of Service[2] | | 95th % Queue (ft)/Spillback Rate | | Maximum Queue Length (ft) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | AM | PM | AM | PM | AM | PM | AM | PM |
| 1 | SR 1305 (Wayside Rd) at Plank Rd | **Overall** | | **168.6** | **91.5** | **F** | **F** | | | | |
| | | Plank Rd WB | L | 151.6 | 124.7 | F | F | 193 (0%) | 947 (0%) | 234 | 2491 |
| | | | T | 21.6 | 102.3 | C | F | 61 (0%) | 319 (0%) | | |
| | | SR 1305 (Wayside Rd) NB | L | 172.1 | 107.2 | F | F | 436 (0%) | 407 (0%) | 2698 | 510 |
| | | | R | 164.8 | 42.8 | F | D | 1966 (0%) | 55 (0%) | | |
| | | Plank Rd EB | TR | 200.6 | 34.0 | F | C | 2165 (0%) | 250 (0%) | 2736 | 345 |
| 3 | SR 1305 (Wayside Rd) at US 401 | **Overall** | | **9.4** | **18.9** | **A** | **B** | | | | |
| | | SR 1305 (Wayside Rd) SB | L | 32.7 | 31.9 | C | C | 159 (0%) | 235 (0%) | 340 | 543 |
| | | | LT | 36.1 | 34.1 | D | C | 213 (0%) | 396 (0%) | | |
| | | | R | 49.1 | 34.9 | D | C | 32 (0%) | 42 (0%) | | |
| | | US 401 WB | T | 8.4 | 18.4 | A | B | 222 (0%) | 312 (0%) | 320 | 550 |
| | | | R | 2.6 | 7.1 | A | A | 0 (0%) | 0 (0%) | | |
| | | Gas Station Driveway NB | R | 18.9 | 25.3 | B | C | 33 (0%) | 54 (0%) | 0 | 73 |
| | | US 401 EB | T | 7.5 | 14.1 | A | B | 162 (0%) | 181 (0%) | 343 | 394 |
| | | | TR | 8.9 | 17.1 | A | B | 211 (0%) | 258 (0%) | | |
| 4 | US 401 at SR 1418 (Lindsay Rd) | **Overall** | | **19.7** | **15.0** | **B** | **B** | | | | |
| | | Storage Unit Driveway SB | R | 32.5 | 25.2 | C | C | 60 (0%) | 24 (0%) | 95 | 0 |
| | | US 401 WB | T | 20.0 | 11.4 | C | B | 291 (0%) | 218 (0%) | 530 | 394 |
| | | | R | 0.0 | 0.0 | A | A | 0 (0%) | 0 (0%) | | |
| | | SR 1418 (Lindsay Rd) NB | L | 26.1 | 28.3 | C | C | 148 (0%) | 142 (0%) | 311 | 285 |
| | | | LTR | 31.6 | 33.9 | C | C | 235 (0%) | 196 (0%) | | |
| | | US 401 EB | T | 16.6 | 13.6 | B | B | 263 (0%) | 310 (0%) | 478 | 523 |
| | | | R | 17.3 | 15.5 | B | B | 247 (0%) | 350 (0%) | | |
| 11 | Gillis Hill Rd Ext at Rockfish Rd | **Overall** | | **35.4** | **31.7** | **D** | **C** | | | | |
| | | Gillis Hill Rd Ext SB | LT | 53.1 | 50.5 | D | D | 90 (0%) | 108 (0%) | 191 | 181 |
| | | | T | 23.2 | 15.9 | C | B | 134 (0%) | 103 (0%) | | |
| | | | R | 10.4 | 8.1 | B | A | 89 (0%) | 85 (0%) | | |
| | | Rockfish Rd WB | L | 67.8 | 70.4 | E | E | 50 (0%) | 54 (0%) | 236 | 175 |
| | | | T | 45.8 | 49.1 | D | D | 160 (0%) | 129 (0%) | | |
| | | | R | 33.7 | 31.9 | C | C | 166 (0%) | 123 (0%) | | |
| | | School Rd NB | L | 63.5 | 73.5 | E | E | 45 (0%) | 38 (0%) | 186 | 170 |
| | | | T | 25.5 | 22.5 | C | C | 144 (0%) | 112 (0%) | | |
| | | | R | 19.7 | 23.0 | B | C | 34 (0%) | 25 (0%) | | |
| | | Rockfish Rd EB | L | 50.6 | 53.2 | D | D | 178 (0%) | 117 (0%) | 249 | 167 |
| | | | T | 41.2 | 40.9 | D | D | 196 (0%) | 97 (0%) | | |
| | | | R | 30.6 | 37.0 | C | D | 47 (0%) | 37 (0%) | | |

**Unsignalized Intersections[3]**

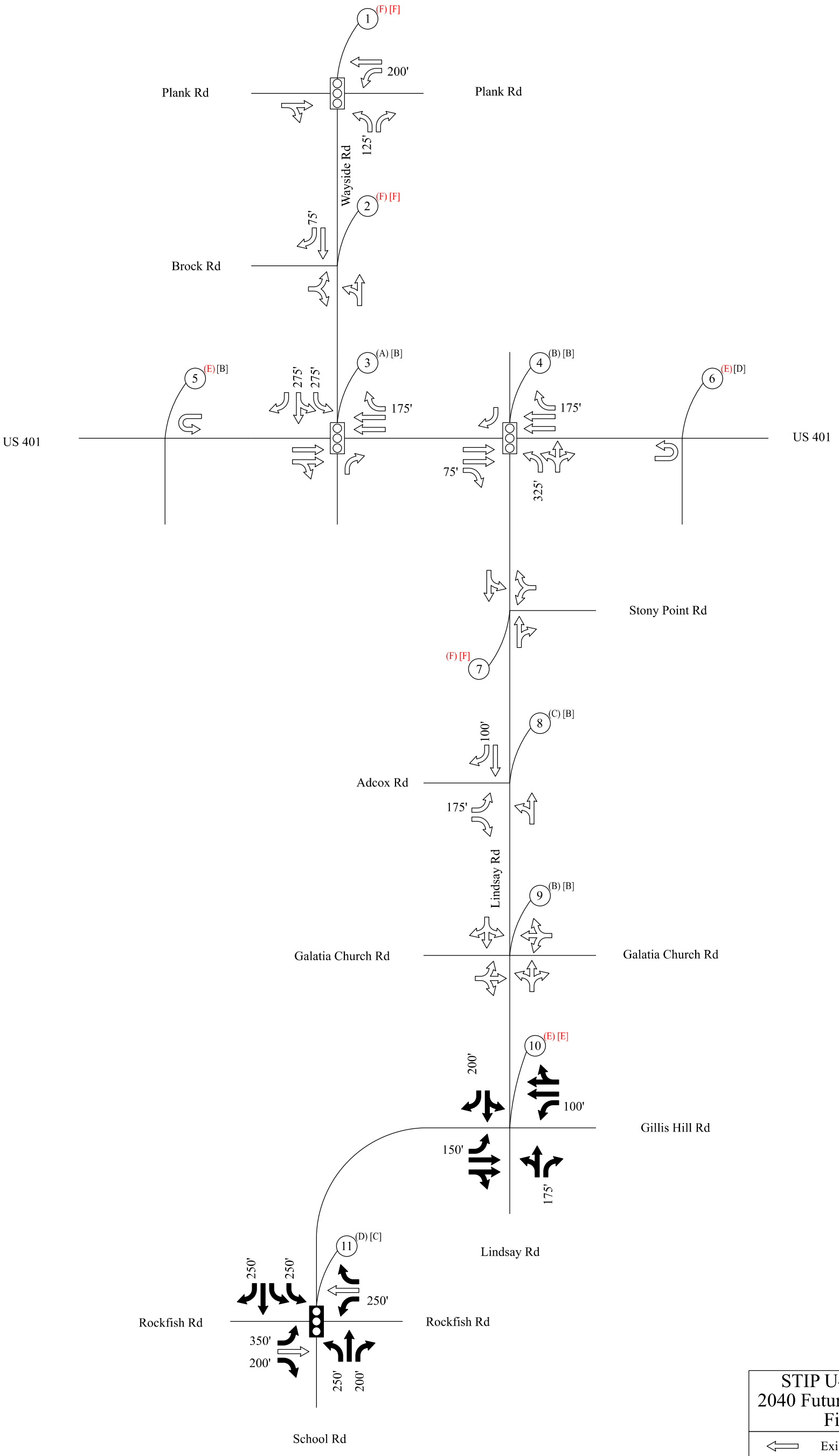
| Intersection No. | Intersection | Approach | Lane | Delay[1] (s) | | Level of Service[2] | | 95th % Queue (ft)/Spillback Rate | | Maximum Queue Length (ft) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | AM | PM | AM | PM | AM | PM | AM | PM |
| 2 | SR 1305 (Wayside Rd) at Brock Rd | SR 1305 (Wayside Rd) SB | T | 0.6 | 1.7 | A | A | 9 (0%) | 0 (0%) | 0 | 0 |
| | | | R | 2.5 | 3.7 | A | A | 0 (0%) | 0 (0%) | | |
| | | SR 1305 (Wayside Rd) NB | LT | 17.7 | 263.7 | C | F | 529 (0%) | 1740 (0%) | 926 | 2665 |
| | | Brock Rd EB | LR | 1257.5 | 1189.5 | F | F | 3314 (30%) | 3332 (11%) | 3332 | 3340 |
| 5 | US 401 EB at U-Turn | US 401 U-Turn SB | L | 40.2 | 24.6 | E | C | 171 (0%) | 133 (0%) | 197 | 163 |
| | | US 401 EB | T | 0.4 | 0.4 | A | A | 0 (0%) | 0 (0%) | 0 | 0 |
| 6 | US 401 WB at U-Turn | US 401 WB | T | 0.1 | 0.2 | A | A | 0 (0%) | 0 (0%) | 0 | 0 |
| | | US 401 U-Turn NB | L | 48.0 | 32.1 | E | D | 92 (0%) | 82 (0%) | 113 | 97 |
| 7 | SR 1418 (Lindsay Rd) at SR 1419 (Stony Point Rd) | SR 1418 (Lindsay Rd) SB | LT | 16.1 | 11.1 | C | B | 273 (0%) | 222 (0%) | 493 | 405 |
| | | SR 1419 (Stony Point Rd) WB | LR | 163.9 | 71.4 | F | F | 852 (0%) | 429 (0%) | 1126 | 606 |
| | | SR 1418 (Lindsay Rd) NB | TR | 1.3 | 1.3 | A | A | 0 (0%) | 0 (0%) | 0 | 0 |
| 8 | SR 1418 (Lindsay Rd) at SR 1417 (Adcox Rd) | SR 1418 (Lindsay Rd) SB | T | 0.8 | 0.8 | A | A | 0 (0%) | 0 (0%) | 0 | 0 |
| | | | R | 1.0 | 1.0 | A | A | 0 (0%) | 0 (0%) | | |
| | | SR 1418 (Lindsay Rd) NB | LT | 1.2 | 1.2 | A | A | 123 (0%) | 43 (0%) | 144 | 67 |
| | | SR 1417 (Adcox Rd) EB | L | 15.2 | 14.1 | C | B | 85 (0%) | 77 (0%) | 115 | 124 |
| | | | R | 10.5 | 10.7 | B | B | 26 (0%) | 35 (0%) | | |
| 9 | SR 1418 (Lindsay Rd) at SR 1415 (Galatia Church Rd) | SR 1418 (Lindsay Rd) SB | LTR | 14.2 | 14.3 | B | B | 72 (0%) | 99 (0%) | 122 | 175 |
| | | SR 1415 (Galatia Church Rd) WB | LTR | 11.8 | 11.6 | B | B | 44 (0%) | 50 (0%) | 0 | 63 |
| | | SR 1418 (Lindsay Rd) NB | LTR | 14.0 | 12.9 | B | B | 84 (0%) | 60 (0%) | 163 | 157 |
| | | SR 1415 (Galatia Church Rd) EB | LTR | 12.1 | 11.6 | B | B | 51 (0%) | 35 (0%) | 88 | 54 |
| 10 | SR 1418 (Lindsay Rd) at SR 1420 (Gillis Hill Rd) | SR 1418 (Lindsay Rd) SB | LT | 32.9 | 36.3 | D | E | 82 (0%) | 109 (0%) | 104 | 129 |
| | | | R | 13.0 | 14.2 | B | B | 62 (0%) | 66 (0%) | | |
| | | SR 1420 (Gillis Hill Rd) WB | L | 6.1 | 3.9 | A | A | 19 (0%) | 19 (0%) | 0 | 0 |
| | | SR 1418 (Lindsay Rd) NB | LT | 36.0 | 36.8 | E | E | 41 (0%) | 37 (0%) | 41 | 41 |
| | | | R | 13.2 | 14.1 | B | B | 24 (0%) | 32 (0%) | | |
| | | Driveway EB | LT | 6.1 | 8.0 | A | A | 92 (0%) | 79 (0%) | 79 | 116 |

Notes:

1 Delay shown is the 95th percentile worst case control delay for the full 60-minute simulation period as derived from the 10 random seed simulations

2 Level of Service shown is Simulation based and calculated in a manner that is consistent with the HCM 2010 Methodologies

3 Results for unsignalized intersections include only the movements that have conflicting flow and thus have the potential to incur control delay




STIP U-5753/U-5858
2040 Future Year No-Build
Figure 7-2

Existing Laneage
Laneage Built By U-5707
Existing Signal
Signal Proposed By U-5707
(#) Intersection Number
(AM) [PM] Intersection LOS (E/F in Red)
XXX' Storage Length

Worst movement shown at unsignalized intersections.

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# 8. 2040 FUTURE YEAR BUILD ANALYSIS

This section presents a summary of the model development and results for the 2040 Build scenario and includes two alternatives. Five build alternatives were screened, and only two were carried forward. The results of the other three build alternatives are included in Appendix D. The following alternatives were analyzed in the build alternative screening:

- Widen Wayside Rd – Widen Wayside Rd to a four-lane divided facility with no other improvements on US 401 or Lindsay Rd.

- Realign Wayside Rd and Lindsay Rd to a single signalized intersection with US 401 – Widen Wayside Rd to a four-lane divided facility. Realign both Wayside Rd and Lindsay Rd to intersect US 401 at one intersection with an eight-phase signal control.

- Realign Wayside Rd and Lindsay Rd to a superstreet intersection with US 401 – Widen Wayside Rd to a four-lane divided facility. Realign both Wayside Rd and Lindsay Rd to one intersection with US 401 that is a superstreet intersection with U-turns for northbound and southbound through and left-turn movements.

- Realign Wayside Rd and Lindsay Rd to a reverse superstreet intersection with US 401 – Widen Wayside Rd to a four-lane divided facility. Realign both Wayside Rd and Lindsay Rd to one intersection with US 401 that is a reverse superstreet intersection with U-turns for northbound and southbound through movements and eastbound and westbound left-turn movements.

- Realign Wayside Rd and Lindsay Rd to a grade separated quadrant interchange with US 401 – Widen Wayside Rd to a four-lane divided facility. Realign both Wayside Rd and Lindsay Rd

Based on initial analysis of all five alternatives, the reverse superstreet intersection and quadrant interchange had the best operations. Both alternatives that were carried forward also include improvements at the intersection of Wayside Rd and Plank Rd, signalizing the intersection of Wayside Rd and Brock Rd, signalizing the intersection of Lindsay Rd and Stony Point Rd, and a roundabout at the intersection of Lindsay Rd and Galatia Church Rd. The following two alternatives were evaluated, and results included in this section:

- Alternative 1 – Realign Wayside Rd and Lindsay Rd to a reverse superstreet intersection with US 401

- Alternative 2 – Realign Wayside Rd and Lindsay Rd with a grade separated quadrant interchange at US 401

## 8.1 MODEL PARAMETERS

All of the driver behaviors and parameters established for the base year model were reviewed and it was determined that they would be carried forward to the future year network.

## 8.2 VOLUME DATA

The development of the volume data for the 2040 build model was described in Section 5 and is the same for both alternatives. The O-D matrices for the 2040 Future Year Build analyses are based on the turning movements shown in Figure 8-1 and Figure 8-2 and are included in Appendix B. The vehicle loading and matrix settings were identical to those used in the 2017 Base Year No-Build and 2040 Future Year No-Build models with the vehicles being loaded onto the network based on the NCDOT Simulation Guidelines.

## 8.3 MODEL NETWORK

The 2040 scenarios assume that all improvements in the Fayetteville Area Metropolitan Planning Organization (FAMPO) *Metropolitan Transportation Plan (MTP)* are included in the analysis. For the study area included in this analysis, the following projects were assumed to be completed.

- STIP Project U-5707 – Gillis Hill Road Extension, SR 1406 (Rockfish Road) to SR 1418 (Lindsay Rd)

## 8.4 SIGNAL TIMINGS AND OPERATIONS

The signal optimization was done in the same manner as for the No-Build models described in Section 6.4.1. Based on operations and peak hour warrants, new signals were added at the intersections Wayside Rd at Brock Rd and Lindsay Rd at Stony Point Rd.

Alternative 1 used the corridor optimization tool to optimize the signals on Wayside Rd at Plank Rd and Brock Rd as one corridor and the signals on US 401 as second corridor. The signal at Lindsay Rd and Stony Point Rd was optimized as an isolated signal.

Alternative 2 used the corridor optimization tool to optimize all the signals along Wayside Rd and Lindsay Rd as one corridor. The quadrant intersections on US 401 were optimized as isolated signals using the same cycle length as the coordinated Wayside/Lindsay corridor then visually coordinated with the intersection on Wayside Rd and Lindsay Rd.

## 8.5 VISUAL VALIDATION OF MODEL

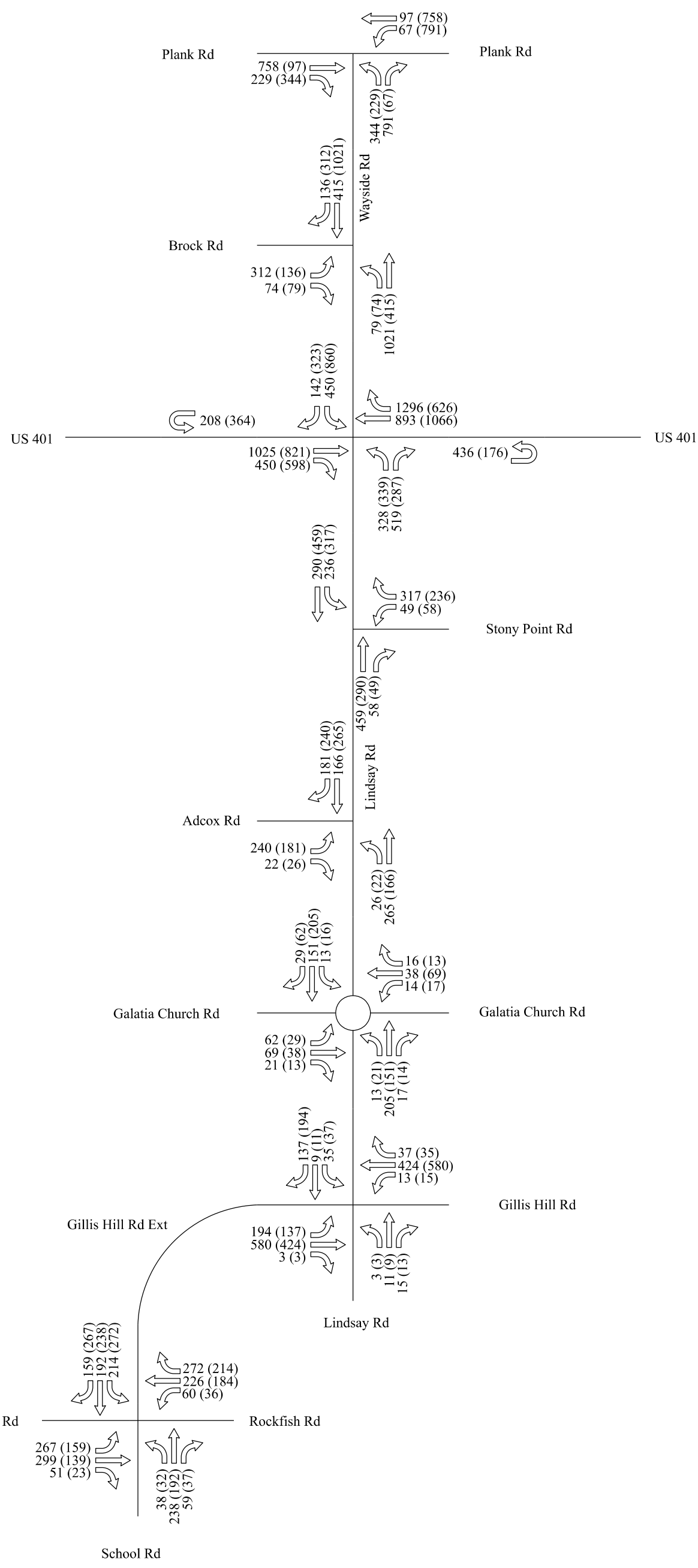
Quality control was performed for the 2040 Build models to ensure it was developed in a manner consistent with the current guidelines and best practices being utilized for TransModeler. The model was then visually validated by observing the model animations in the same manner that was described in Section 5. Following the conclusion of the model review process it was determined that the 2040 Build models were visually valid and ready for developing detailed MOEs.

## 8.6 MEASURES OF EFFECTIVENESS

The MOEs extracted for the 2040 Build scenario are identical to those utilized for the 2017 Base Year No-Build and 2040 Future Year No-Build models and are discussed in detail in Section 4.

## 8.7 SIMULATION RUN CONTROL

The simulation model runs controls for the future year build models were identical to those included in Section 6.6 for the 2017 Base Year No-Build model.

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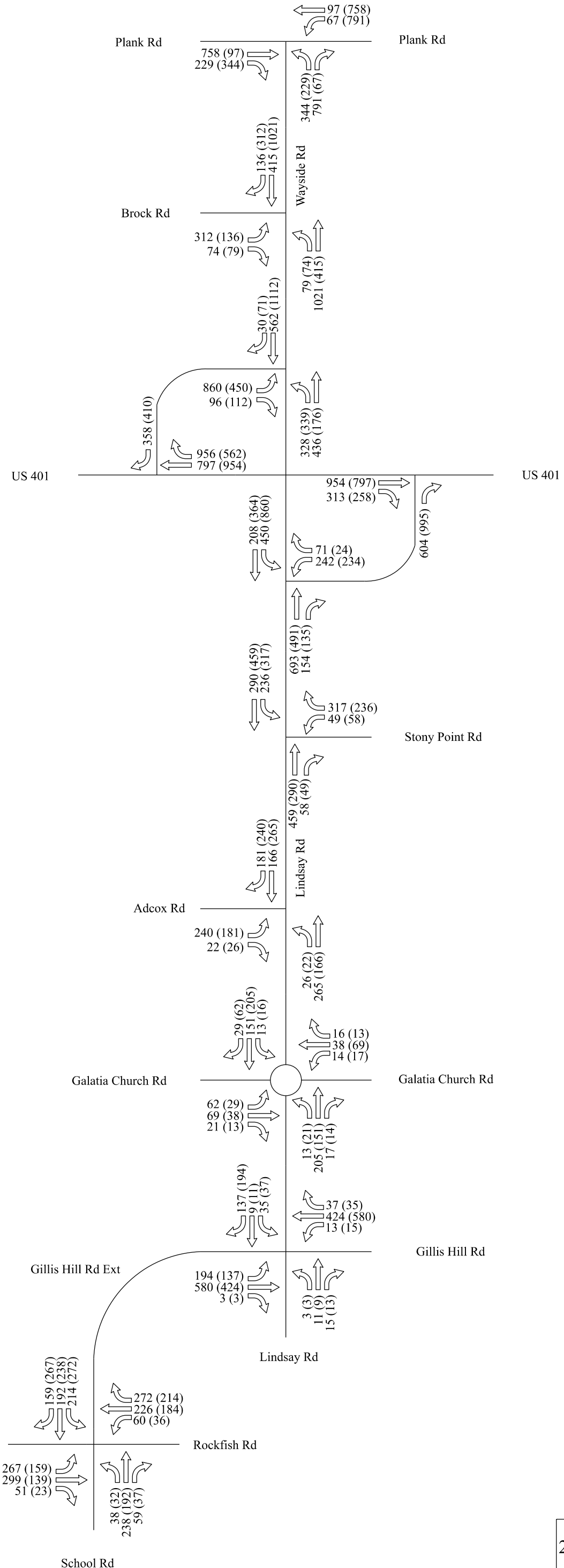
STIP U-5753/U-5858
2040 Future Year Build Alt 1
Figure 8-1

AM (PM) Turning Movement Volumes

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STIP U-5753/U-5858
2040 Future Year Build Alt 2
Figure 8-2

AM (PM) Turning Movement Volumes

## 8.8 2040 FUTURE YEAR ALTERNATIVE 1 BUILD MODEL RESULTS

Alternative 1 improvements include widening Wayside Rd to a four-lane divide facility and installing a signal and turn lanes at Brock Rd, realigning Wayside Rd and Lindsay Rd to intersect US 401 at one signalized reverse superstreet intersection with restricted movements for the eastbound and westbound left-turn movements and the northbound and southbound through movements. The restricted movements would use the adjacent signalized U-turn intersections. Improvements along Lindsay Rd include installing a signal and turn lanes at the intersection of Lindsay Rd and Stony Point Rd, and a roundabout at the intersection of Lindsay Rd and Galatia Church Rd.

The output data was extracted from the TransModeler model via the Output Manager using the Delay, Queue and Queue Spillback reports. The outputs were collected in accordance with the MOEs defined in Section 4 and are summarized in the following sections.

### 8.8.1 INTERSECTION RESULTS – ALTERNATIVE 1

The results of the intersection analysis along the study area are included in )

US 401 at Wayside Rd/Lindsay Rd, westbound approach 554 feet (AM)

- US 401 at Wayside Rd/Lindsay Rd, eastbound approach 764 feet (AM)

Table 8-1 and Figure 8-3. The overall intersection $LOS_S$ for the signalized intersections in the 2040 Future Year Build Alternative 1 scenario shows that all the study intersections are operating at $LOS_S$ D or better in both the AM and PM peak periods. During the AM peak period 4 of 7 intersections are operating at $LOS_S$ B, 1 of 7 intersections are operating at $LOS_S$ C, and 2 of 7 intersections are operating at $LOS_S$ D. During the PM peak period 1 of 7 intersections is operating at $LOS_S$ A, 3 of 7 intersections is operating at $LOS_S$ B, and 3 of 7 intersections is operating at $LOS_S$ C.

Based on a review of the intersection operations at the lane group level, the following movements operate at $LOS_S$ E or F in the 2040 Future Year Build Alternative 1 scenario:

- Wayside Rd at Plank Rd, westbound left operates at $LOS_S$ E during the AM Peak
- Wayside Rd at Brock Rd, northbound left operates at $LOS_S$ E during the AM Peak
- US 401 at Wayside Rd/Lindsay Rd, northbound left operates at $LOS_S$ E during the AM Peak
- Gillis Hill Rd Extension, westbound left operates at $LOS_S$ E during the AM and PM Peaks
- Gillis Hill Rd Extension, northbound left operates at $LOS_S$ E during the AM and PM Peaks

Based on a review of the unsignalized intersections, one intersection, Lindsay Rd at Gillis Hill Rd, has two movements that are operating at $LOS_S$ E or worse in both of the peak periods.

A review of the queue data showed improvements from the 2040 Future Year No-Build model, with no queue lengths spanning more than 900 feet. There are several locations still showing queuing, but none that are affecting the operations of adjacent locations. The following locations are showing the longest maximum queue lengths in the 2040 Future Year Build Alternative 1 model:

- Wayside Rd at Plank Rd, westbound approach has a maximum queue length of 551 feet (PM)
- Wayside Rd at Plank Rd, eastbound approach has a maximum queue length of 710 feet (AM)
- Wayside Rd at Plank Rd, northbound approach has a maximum queue length of 805 feet (AM)
- US 401 at Wayside Rd/Lindsay Rd, westbound approach 554 feet (AM)
- US 401 at Wayside Rd/Lindsay Rd, eastbound approach 764 feet (AM)

## Table 8-1: 2040 Future Year Build Alternative 1 Intersection Measures of Effectiveness

### Signalized Intersections

| Intersection No. | Intersection | Approach | Lane Group | Delay[1] (s) AM | Delay[1] (s) PM | Level of Service[2] AM | Level of Service[2] PM | 95th % Queue (ft)/Spillback Rate AM | 95th % Queue (ft)/Spillback Rate PM | Maximum Queue Length (ft) AM | Maximum Queue Length (ft) PM |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | SR 1305 (Wayside Rd) at Plank Rd | **Overall** | | **36.6** | **30.0** | **D** | **C** | | | | |
| | | Plank Rd WB | L | 60.6 | 44.0 | E | D | 62 (0%) | 293 (0%) | 104 | 551 |
| | | | T | 15.9 | 13.6 | B | B | 56 (0%) | 141 (0%) | | |
| | | SR 1305 (Wayside Rd) NB | L | 29.1 | 37.4 | C | D | 230 (0%) | 182 (0%) | 805 | 253 |
| | | | R | 47.8 | 12.6 | D | B | 603 (0%) | 62 (0%) | | |
| | | Plank Rd EB | T | 42.2 | 24.7 | D | C | 460 (0%) | 53 (0%) | 710 | 304 |
| | | | R | 12.9 | 30.2 | B | C | 93 (0%) | 200 (0%) | | |
| 2 | SR 1305 (Wayside Rd) at Brock Rd | **Overall** | | **18.6** | **10.1** | **B** | **B** | | | | |
| | | SR 1305 (Wayside Rd) SB | T | 14.8 | 7.2 | B | A | 138 (0%) | 143 (0%) | 205 | 207 |
| | | | R | 6.0 | 5.2 | A | A | 47 (0%) | 81 (0%) | | |
| | | SR 1305 (Wayside Rd) NB | L | 60.4 | 40.2 | E | D | 114 (0%) | 90 (0%) | 302 | 123 |
| | | | R | 7.6 | 2.6 | A | A | 183 (0%) | 52 (0%) | | |
| | | Brock Rd EB | L | 54.0 | 40.7 | D | D | 247 (0%) | 102 (0%) | 378 | 142 |
| | | | T | 50.6 | 39.9 | D | D | 101 (0%) | 97 (0%) | | |
| 12 | US 401 at SR 1305 (Wayside Rd) / SR 1418 (Lindsay Rd) | **Overall** | | **29.4** | **25.1** | **C** | **C** | | | | |
| | | SR 1305 (Wayside Rd) SB | L | 48.0 | 38.9 | D | D | 193 (0%) | 252 (0%) | 285 | 433 |
| | | | R | 45.4 | 42.3 | D | D | 206 (0%) | 285 (0%) | | |
| | | US 401 WB | T | 27.0 | 29.7 | C | C | 330 (0%) | 286 (0%) | 554 | 452 |
| | | | R | 12.0 | 4.9 | B | A | 262 (0%) | 53 (0%) | | |
| | | SR 1418 (Lindsay Rd) NB | L | 60.5 | 43.1 | E | D | 297 (0%) | 214 (0%) | 331 | 314 |
| | | | R | 45.0 | 31.4 | D | C | 229 (0%) | 125 (0%) | | |
| | | US 401 EB | T | 42.5 | 30.2 | D | C | 435 (0%) | 243 (0%) | 764 | 362 |
| | | | R | 9.2 | 5.7 | A | A | 31 (0%) | 69 (0%) | | |
| 11 | Gillis Hill Rd Ext at Rockfish Rd | **Overall** | | **36.3** | **32.3** | **D** | **C** | | | | |
| | | Gillis Hill Rd Ext SB | LT | 53.0 | 48.9 | D | D | 110 (0%) | 121 (0%) | 234 | 191 |
| | | | T | 28.6 | 18.5 | C | B | 170 (0%) | 128 (0%) | | |
| | | | R | 12.7 | 9.2 | B | A | 90 (0%) | 112 (0%) | | |
| | | Rockfish Rd WB | L | 67.5 | 79.6 | E | E | 48 (0%) | 51 (0%) | 268 | 206 |
| | | | T | 45.1 | 48.1 | D | D | 189 (0%) | 136 (0%) | | |
| | | | R | 33.8 | 30.8 | C | C | 185 (0%) | 140 (0%) | | |
| | | School Rd NB | L | 71.7 | 77.3 | E | E | 54 (0%) | 64 (0%) | 235 | 202 |
| | | | T | 30.4 | 25.0 | C | C | 184 (0%) | 143 (0%) | | |
| | | | R | 23.8 | 22.9 | C | C | 39 (0%) | 31 (0%) | | |
| | | Rockfish Rd EB | L | 50.0 | 53.9 | D | D | 198 (0%) | 135 (0%) | 292 | 187 |
| | | | T | 39.1 | 40.4 | D | D | 217 (0%) | 97 (0%) | | |
| | | | R | 32.5 | 40.5 | C | D | 39 (0%) | 35 (0%) | | |
| 5 | US 401 EB at U-Turn | **Overall** | | **11.7** | **19.0** | **B** | **B** | | | | |
| | | US 401 U-Turn SB | U | 44.6 | 49.7 | D | D | 126 (0%) | 197 (2%) | 227 | 254 |
| | | US 401 EB | T | 4.4 | 5.6 | A | A | 132 (0%) | 120 (0%) | 231 | 195 |
| 6 | US 401 WB at U-Turn | **Overall** | | **14.0** | **7.6** | **B** | **A** | | | | |
| | | US 401 WB | T | 6.8 | 2.9 | A | A | 178 (0%) | 92 (0%) | 372 | 192 |
| | | US 401 U-Turn NB | U | 42.4 | 37.5 | D | D | 220 (0%) | 102 (0%) | 313 | 181 |
| 7 | SR 1418 (Lindsay Rd) at SR 1419 (Stony Point Rd) | **Overall** | | **18.1** | **15.9** | **B** | **B** | | | | |
| | | SR 1418 (Lindsay Rd) SB | L | 38.9 | 30.6 | D | C | 205 (0%) | 186 (0%) | 267 | 280 |
| | | | T | 6.5 | 3.8 | A | A | 102 (0%) | 57 (0%) | | |
| | | SR 1419 (Stony Point Rd) WB | L | 35.5 | 35.0 | D | C | 50 (0%) | 64 (0%) | 172 | 162 |
| | | | R | 17.8 | 16.0 | B | B | 149 (0%) | 142 (0%) | | |
| | | SR 1418 (Lindsay Rd) NB | TR | 16.6 | 18.9 | B | B | 122 (0%) | 100 (0%) | 213 | 149 |

### Unsignalized Intersections[3]

| Intersection No. | Intersection | Approach | Lane | Delay[1] (s) AM | Delay[1] (s) PM | Level of Service[2] AM | Level of Service[2] PM | 95th % Queue (ft)/Spillback Rate AM | 95th % Queue (ft)/Spillback Rate PM | Maximum Queue Length (ft) AM | Maximum Queue Length (ft) PM |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | SR 1418 (Lindsay Rd) at SR 1417 (Adcox Rd) | SR 1418 (Lindsay Rd) SB | T | 0.6 | 0.5 | A | A | 0 (0%) | 0 (0%) | 0 | 0 |
| | | | R | 0.4 | 0.4 | A | A | 0 (0%) | 0 (0%) | | |
| | | SR 1418 (Lindsay Rd) NB | L | 7.2 | 11.5 | A | B | 9 (0%) | 4 (0%) | 0 | 0 |
| | | | T | 0.3 | 0.3 | A | A | 0 (0%) | 0 (0%) | | |
| | | SR 1417 (Adcox Rd) EB | L | 15.8 | 15.7 | C | C | 99 (0%) | 91 (0%) | 138 | 97 |
| | | | R | 10.6 | 11.3 | B | B | 26 (0%) | 26 (0%) | | |
| 10 | SR 1418 (Lindsay Rd) at SR 1420 (Gillis Hill Rd) | SR 1418 (Lindsay Rd) SB | LT | 40.4 | 49.2 | E | E | 83 (0%) | 90 (0%) | 152 | 148 |
| | | | R | 13.9 | 18.4 | B | C | 88 (0%) | 117 (0%) | | |
| | | SR 1420 (Gillis Hill Rd) WB | L | 7.3 | 5.5 | A | A | 19 (0%) | 18 (0%) | 0 | 0 |
| | | SR 1418 (Lindsay Rd) NB | LT | 43.4 | 44.8 | E | E | 56 (0%) | 40 (0%) | 62 | 28 |
| | | | R | 12.6 | 15.3 | B | C | 32 (0%) | 30 (0%) | | |
| | | SR 1420 (Gillis Hill Rd) EB | L | 6.0 | 7.6 | A | A | 56 (0%) | 52 (0%) | 103 | 109 |

### Roundabouts

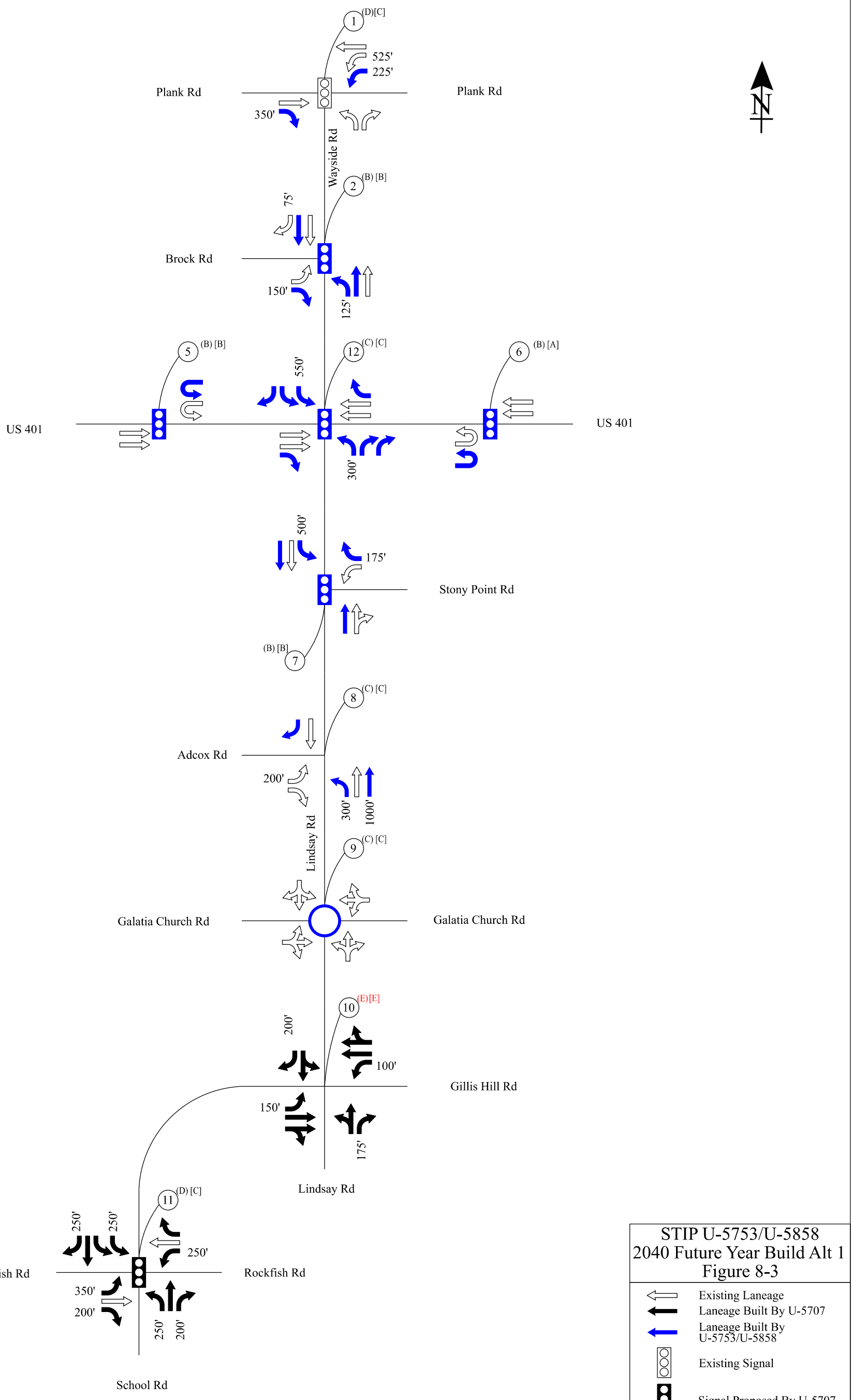
| Intersection No. | Intersection | Approach | Lane | Delay[1] (s) AM | Delay[1] (s) PM | Level of Service[2] AM | Level of Service[2] PM | 95th % Queue (ft)/Spillback Rate AM | 95th % Queue (ft)/Spillback Rate PM | Maximum Queue Length (ft) AM | Maximum Queue Length (ft) PM |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | SR 1418 (Lindsay Rd) at SR 1415 (Galatia Church Rd) | SR 1418 (Lindsay Rd) SB | LTR | 15.5 | 16.5 | C | C | 69 (0%) | 112 (0%) | 27 | 112 |
| | | SR 1415 (Galatia Church Rd) WB | LTR | 15.4 | 14.9 | C | B | 33 (0%) | 34 (0%) | 0 | 22 |
| | | SR 1418 (Lindsay Rd) NB | LTR | 14.8 | 14.2 | B | B | 94 (0%) | 23 (0%) | 75 | 0 |
| | | SR 1415 (Galatia Church Rd) EB | LTR | 15.3 | 15.6 | C | C | 57 (0%) | 46 (0%) | 51 | 65 |

Notes:

1 Delay shown is the 95th percentile worst case control delay for the full 60-minute simulation period as derived from the 10 random seed simulations

2 Level of Service shown is Simulation based and calculated in a manner that is consistent with the HCM 2010 Methodologies

3 Results for unsignalized intersections include only the movements that have conflicting flow and thus have the potential to incur control delay


1
(D)[C]
525'
225'
Plank Rd
Plank Rd
350'
Wayside Rd
2
(B) [B]
75'
Brock Rd
150'
125'
5
(B) [B]
12
(C) [C]
550'
6
(B) [A]
US 401
US 401
300'
500'
175'
Stony Point Rd
7
(B) [B]
8
(C) [C]
Adcox Rd
200'
300'
1000'
Lindsay Rd
9
(C) [C]
Galatia Church Rd
Galatia Church Rd
10
(E)[E]
200'
100'
Gillis Hill Rd
150'
175'
Lindsay Rd
11
(D) [C]
250'
250'
250'
Rockfish Rd
Rockfish Rd
350'
200'
250'
200'
School Rd
N
STIP U-5753/U-5858
2040 Future Year Build Alt 1
Figure 8-3
Existing Laneage
Laneage Built By U-5707
Laneage Built By U-5753/U-5858
Existing Signal
Signal Proposed By U-5707
Signal Proposed By U-5753/U-5858
Roundabout Proposed By U-5753/U-5858
# Intersection Number
(AM) [PM] Intersection LOS (E/F in Red)
XXX' Storage Length
Worst movement shown at unsignalized intersections.
PATRIOT
TRANSPORTATION
ENGINEERING, PLLC

## 8.9 2040 FUTURE YEAR ALTERNATIVE 2 BUILD MODEL RESULTS

Alternative 2 improvements include widening Wayside Rd to a four-lane divide facility and installing a signal and turn lanes at Brock Rd, realigning Wayside Rd and Lindsay Rd to be a grade separated interchange with quadrant ramps connecting to US 401. Improvements along Lindsay Rd include installing a signal and turn lanes at the intersection of Lindsay Rd and Stony Point Rd, and a roundabout at the intersection of Lindsay Rd and Galatia Church Rd.

The output data was extracted from the TransModeler model via the Output Manager using the Delay, Queue and Queue Spillback reports. The outputs were collected in accordance with the MOEs defined in Section 4 and are summarized in the following sections.

### 8.9.1 INTERSECTION RESULTS – ALTERNATIVE 2

The results of the intersection analysis along the study area are included in Table 8-2 and Figure 8-4. The overall intersection $LOS_S$ for the signalized intersections in the 2040 Future Year Build Alternative 2 scenario shows that all the study intersections are operating at $LOS_S$ D or better in both the AM and PM peak periods. During the AM peak period 1 of 8 intersections is operating at $LOS_S$ A, 3 of 8 intersections are operating at $LOS_S$ B, 2 of 8 intersections are operating at $LOS_S$ C, and 2 of 8 intersections are operating at $LOS_S$ D. During the PM peak period 1 of 8 intersections is operating at $LOS_S$ A, 3 of 8 intersections is operating at $LOS_S$ B, and 4 of 8 intersections is operating at $LOS_S$ C.

Based on a review of the intersection operations at the lane group level, the following movements operate at $LOS_S$ E or F in the 2040 Future Year Build Alternative 2 scenario:

- Wayside Rd at Plank Rd, eastbound through operates at $LOS_S$ E during the AM Peak
- Wayside Rd at US 401 Quadrant, northbound left operates at $LOS_S$ E during the AM and PM Peaks
- Gillis Hill Rd Extension, westbound left operates at $LOS_S$ E during the AM and PM Peaks
- Gillis Hill Rd Extension, northbound left operates at $LOS_S$ E during the AM and PM Peaks

Based on a review of the unsignalized intersections, three intersections have movements that are operating at $LOS_S$ E or worse in both of the peak periods. The US 401 EB and WB U-turns have a movement that operates at $LOS_S$ E in the AM and PM peak periods. Lindsay Rd at Gillis Hill Rd has two movements that operate at $LOS_S$ E in the AM and PM peak periods.

A review of the queue data showed improvements from the 2040 Future Year No-Build model, with no queue lengths spanning more than 1100 feet. There are several locations still showing queuing, but none that are affecting the operations of adjacent locations. The following locations are showing the longest maximum queue lengths in the 2040 Future Year Build Alternative 2 model:

- Wayside Rd at Plank Rd, westbound approach has a maximum queue length of 532 feet (PM)
- Wayside Rd at Plank Rd, eastbound approach has a maximum queue length of 1008 feet (AM)
- Wayside Rd at Plank Rd, northbound approach has a maximum queue length of 854 feet (AM)

## Table 8-2: 2040 Future Year Build Alternative 2 Intersection Measures of Effectiveness

### Signalized Intersections

| Intersection No. | Intersection | Approach | Lane Group | Delay[1] (s) | | Level of Service[2] | | 95th % Queue (ft)/Spillback Rate | | Maximum Queue Length (ft) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | AM | PM | AM | PM | AM | PM | AM | PM |
| 1 | SR 1305 (Wayside Rd) at Plank Rd | **Overall** | | **42.8** | **27.8** | **D** | **C** | | | | |
| | | Plank Rd WB | L | 44.5 | 40.2 | D | D | 62 (0%) | 239 (0%) | 80 | 532 |
| | | | T | 12.8 | 11.6 | B | B | 38 (0%) | 149 (0%) | | |
| | | SR 1305 (Wayside Rd) NB | L | 26.9 | 33.7 | C | C | 213 (0%) | 221 (0%) | 854 | 258 |
| | | | R | 51.0 | 19.1 | D | B | 761 (0%) | 62 (0%) | | |
| | | Plank Rd EB | T | 68.4 | 24.7 | E | C | 745 (0%) | 49 (0%) | 1008 | 318 |
| | | | R | 33.0 | 29.5 | C | C | 60 (0%) | 198 (0%) | | |
| 3 | US 401 at SR 1305 (Wayside Rd) Quadrant Ramp | **Overall** | | **9.3** | **9.0** | **A** | **A** | | | | |
| | | SR 1305 (Wayside Rd) SB | R | 41.9 | 30.6 | D | C | 191 (0%) | 235 (0%) | 274 | 366 |
| | | US 401 WB | T | 6.4 | 5.9 | A | A | 107 (0%) | 119 (0%) | 162 | 186 |
| | | | R | 0.7 | 0.7 | A | A | 0 (0%) | 0 (0%) | | |
| 4 | US 401 at SR 1418 (Lindsay Rd) Quadrant Ramp | **Overall** | | **10.1** | **19.5** | **B** | **B** | | | | |
| | | SR 1418 (Lindsay Rd) NB | R | 17.5 | 30.3 | B | C | 256 (0%) | 353 (0%) | 376 | 617 |
| | | US 401 EB | T | 10.8 | 15.2 | B | B | 141 (0%) | 180 (0%) | 235 | 256 |
| | | | R | 0.8 | 0.9 | A | A | 0 (0%) | 0 (0%) | | |
| 11 | Gillis Hill Rd Ext at Rockfish Rd | **Overall** | | **36.3** | **32.5** | **D** | **C** | | | | |
| | | Gillis Hill Rd Ext SB | LT | 54.7 | 49.6 | D | D | 100 (0%) | 133 (0%) | 204 | 211 |
| | | | T | 27.1 | 19.5 | C | B | 150 (0%) | 141 (0%) | | |
| | | | R | 12.5 | 9.3 | B | A | 79 (0%) | 107 (0%) | | |
| | | Rockfish Rd WB | L | 67.0 | 77.9 | E | E | 58 (0%) | 50 (0%) | 266 | 204 |
| | | | T | 45.8 | 47.9 | D | D | 187 (0%) | 145 (0%) | | |
| | | | R | 33.2 | 31.1 | C | C | 189 (0%) | 156 (0%) | | |
| | | School Rd NB | L | 73.0 | 78.2 | E | E | 52 (0%) | 51 (0%) | 226 | 186 |
| | | | T | 30.4 | 24.9 | C | C | 177 (0%) | 132 (0%) | | |
| | | | R | 25.6 | 25.4 | C | C | 26 (0%) | 36 (0%) | | |
| | | Rockfish Rd EB | L | 50.7 | 52.3 | D | D | 199 (0%) | 128 (0%) | 289 | 197 |
| | | | T | 39.1 | 39.6 | D | D | 210 (0%) | 99 (0%) | | |
| | | | R | 31.9 | 46.7 | C | D | 46 (0%) | 43 (0%) | | |
| 2 | SR 1305 (Wayside Rd) at Brock Rd | **Overall** | | **12.3** | **12.4** | **B** | **B** | | | | |
| | | SR 1305 (Wayside Rd) SB | T | 13.2 | 10.9 | B | B | 105 (0%) | 210 (0%) | 154 | 288 |
| | | | R | 6.0 | 8.7 | A | A | 50 (0%) | 81 (0%) | | |
| | | SR 1305 (Wayside Rd) NB | L | 37.5 | 49.4 | D | D | 88 (0%) | 102 (0%) | 174 | 123 |
| | | | T | 5.3 | 3.4 | A | A | 115 (0%) | 37 (0%) | | |
| | | Brock Rd EB | L | 35.6 | 40.9 | D | D | 154 (0%) | 83 (0%) | 234 | 121 |
| | | | R | 21.7 | 24.6 | C | C | 74 (0%) | 80 (0%) | | |
| 12 | SR 1305 (Wayside Rd) at US 401 Quadrant Ramp | **Overall** | | **28.4** | **25.3** | **C** | **C** | | | | |
| | | SR 1305 (Wayside Rd) SB | T | 35.4 | 16.8 | D | B | 213 (0%) | 204 (0%) | 258 | 384 |
| | | | R | 12.6 | 6.4 | B | A | 48 (0%) | 30 (0%) | | |
| | | SR 1305 (Wayside Rd) NB | L | 55.8 | 60.3 | E | E | 261 (0%) | 284 (0%) | 321 | 522 |
| | | | T | 6.4 | 2.1 | A | A | 64 (0%) | 25 (0%) | | |
| | | US 401 Quadrant EB | L | 27.4 | 35.6 | C | D | 203 (0%) | 128 (0%) | 306 | 193 |
| | | | R | 27.1 | 40.3 | C | D | 103 (0%) | 131 (0%) | | |
| 13 | SR 1418 (Lindsay Rd) at US 401 Quadrant Ramp | **Overall** | | **24.2** | **28.3** | **C** | **C** | | | | |
| | | SR 1418 (Lindsay Rd) SB | L | 43.1 | 46.9 | D | D | 202 (0%) | 359 (0%) | 385 | 450 |
| | | | T | 2.4 | 7.3 | A | A | 58 (0%) | 78 (0%) | | |
| | | US 401 Quadrant WB | L | 35.6 | 35.9 | D | D | 200 (0%) | 200 (0%) | 293 | 276 |
| | | | R | 21.5 | 14.3 | C | B | 79 (0%) | 57 (0%) | | |
| | | SR 1418 (Lindsay Rd) NB | T | 22.7 | 22.6 | C | C | 187 (0%) | 126 (0%) | 251 | 224 |
| | | | R | 5.3 | 11.4 | A | B | 64 (0%) | 65 (0%) | | |
| 7 | SR 1418 (Lindsay Rd) at SR 1419 (Stony Point Rd) | **Overall** | | **16.3** | **18.0** | **B** | **B** | | | | |
| | | SR 1418 (Lindsay Rd) SB | L | 32.3 | 40.0 | C | D | 168 (0%) | 168 (0%) | 272 | 311 |
| | | | T | 4.1 | 5.0 | A | A | 67 (0%) | 67 (0%) | | |
| | | SR 1419 (Stony Point Rd) WB | L | 35.5 | 38.1 | D | D | 44 (0%) | 63 (0%) | 177 | 165 |
| | | | R | 18.5 | 16.2 | B | B | 165 (0%) | 126 (0%) | | |
| | | SR 1418 (Lindsay Rd) NB | TR | 16.4 | 18.8 | B | B | 138 (0%) | 103 (0%) | 180 | 146 |

## Unsignalized Intersections[3]

| Intersection No. | Intersection | Approach | Lane | Delay[1] (s) | | Level of Service[2] | | 95th % Queue (ft)/Spillback Rate | | Maximum Queue Length (ft) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | AM | PM | AM | PM | AM | PM | AM | PM |
| 5 | US 401 EB at U-Turn | US 401 U-Turn SB | L | 44.7 | 36.1 | E | E | 90 (0%) | 45 (0%) | 75 | 0 |
| | | US 401 EB | T | 0.1 | 0.0 | A | A | 0 (0%) | 0 (0%) | 0 | 0 |
| 6 | US 401 WB at U-Turn | US 401 WB | T | 0.1 | 0.2 | A | A | 0 (0%) | 0 (0%) | 0 | 0 |
| | | US 401 U-Turn NB | L | 40.8 | 39.4 | E | E | 44 (0%) | 90 (0%) | 44 | 113 |
| 8 | SR 1418 (Lindsay Rd) at SR 1417 (Adcox Rd) | SR 1418 (Lindsay Rd) SB | T | 0.6 | 0.5 | A | A | 0 (0%) | 0 (0%) | 0 | 0 |
| | | | R | 0.4 | 0.3 | A | A | 0 (0%) | 0 (0%) | | |
| | | SR 1418 (Lindsay Rd) NB | L | 7.6 | 9.0 | A | A | 0 (0%) | 0 (0%) | 0 | 0 |
| | | | T | 0.3 | 0.2 | A | A | 0 (0%) | 0 (0%) | | |
| | | SR 1417 (Adcox Rd) EB | L | 16.5 | 16.5 | C | C | 85 (0%) | 74 (0%) | 146 | 109 |
| | | | R | 11.5 | 10.8 | B | B | 31 (0%) | 28 (0%) | | |
| 10 | SR 1418 (Lindsay Rd) at SR 1420 (Gillis Hill Rd) | SR 1418 (Lindsay Rd) SB | LT | 40.0 | 37.6 | E | E | 72 (0%) | 62 (0%) | 105 | 133 |
| | | | R | 14.3 | 17.3 | B | C | 74 (0%) | 112 (0%) | | |
| | | SR 1420 (Gillis Hill Rd) WB | L | 7.3 | 5.1 | A | A | 22 (0%) | 14 (0%) | 0 | 0 |
| | | SR 1418 (Lindsay Rd) NB | LT | 35.4 | 46.7 | E | E | 33 (0%) | 58 (0%) | 31 | 41 |
| | | | R | 14.1 | 12.4 | B | B | 28 (0%) | 27 (0%) | | |
| | | SR 1420 (Gillis Hill Rd) EB | L | 6.1 | 7.2 | A | A | 59 (0%) | 59 (0%) | 96 | 70 |

## Roundabouts

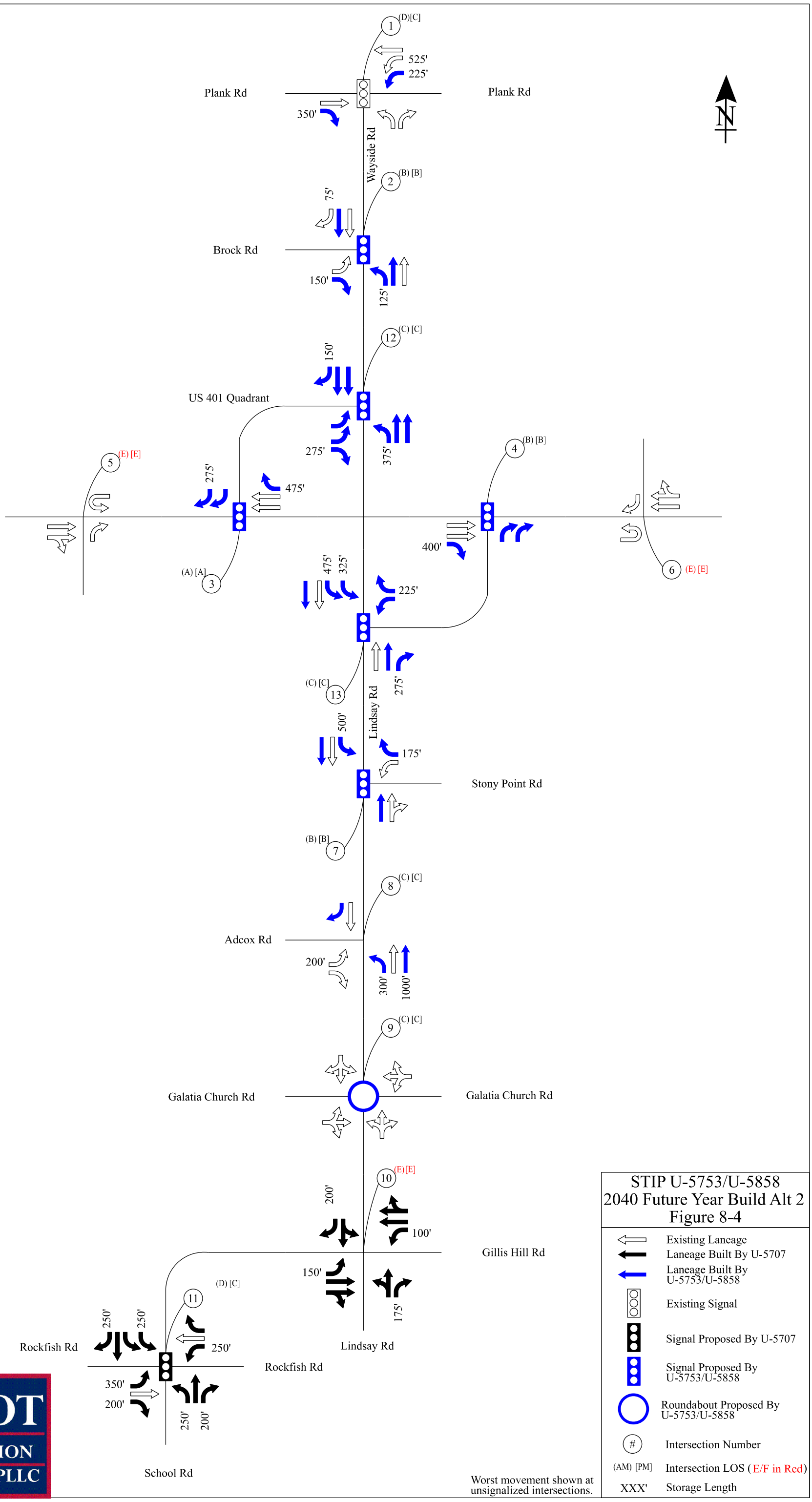
| Intersection No. | Intersection | Approach | Lane | Delay[1] (s) | | Level of Service[2] | | 95th % Queue (ft)/Spillback Rate | | Maximum Queue Length (ft) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | AM | PM | AM | PM | AM | PM | AM | PM |
| 9 | SR 1418 (Lindsay Rd) at SR 1415 (Galatia Church Rd) | SR 1418 (Lindsay Rd) SB | LTR | 15.4 | 15.8 | C | C | 58 (0%) | 58 (0%) | 46 | 67 |
| | | SR 1415 (Galatia Church Rd) WB | LTR | 15.7 | 15.1 | C | C | 25 (0%) | 25 (0%) | 0 | 23 |
| | | SR 1418 (Lindsay Rd) NB | LTR | 14.7 | 14.2 | B | B | 84 (0%) | 84 (0%) | 37 | 0 |
| | | SR 1415 (Galatia Church Rd) EB | LTR | 15.2 | 15.8 | C | C | 35 (0%) | 35 (0%) | 38 | 23 |

Notes:

1 Delay shown is the 95th percentile worst case control delay for the full 60-minute simulation period as derived from the 10 random seed simulations

2 Level of Service shown is Simulation based and calculated in a manner that is consistent with the HCM 2010 Methodologies

3 Results for unsignalized intersections include only the movements that have conflicting flow and thus have the potential to incur control delay

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# 9. 2017 BASE YEAR BUILD ANALYSIS

This section presents a summary of the model development and results for the 2017 Base Year Build scenario and includes one preferred alternative. After reviewing the 2040 Build Scenarios, Alternative 2 (Quadrant Interchange) was selected as the preferred alternative. The following alternative was evaluated, and results are included in this section:

- Alternative 2 – Realign Wayside Rd and Lindsay Rd with a grade separated quadrant interchange at US 401

## 9.1 MODEL PARAMETERS

All of the driver behaviors and parameters established for the base year model were reviewed and it was determined that they would be carried forward to the future year network.

## 9.2 VOLUME DATA

The development of the volume data for the 2017 build model was described in Section 5 and is the same for both alternatives. The O-D matrices for the 2017 Base Year Build analysis are based on the turning movements shown in Figure 9-1 and are included in Appendix B. The vehicle loading and matrix settings were identical to those used in the 2017 Base Year No-Build and 2040 Future Year No-Build models with the vehicles being loaded onto the network based on the NCDOT Simulation Guidelines.

## 9.3 MODEL NETWORK

The 2017 build scenario assumes that all improvements in the Fayetteville Area Metropolitan Planning Organization (FAMPO) *Metropolitan Transportation Plan (MTP)* are included in the analysis. For the study area included in this analysis, the following projects were assumed to be completed.

- STIP Project U-5707 – Gillis Hill Road Extension, SR 1406 (Rockfish Road) to SR 1418 (Lindsay Rd)

## 9.4 SIGNAL TIMINGS AND OPERATIONS

The signal optimization was done in the same manner as for the No-Build models described in Section 6.4.1. Based on operations and peak hour warrants, new signals were added at the intersections Wayside Rd at Brock Rd and Lindsay Rd at Stony Point Rd.

The preferred alternative used the corridor optimization tool to optimize all the signals along Wayside Rd and Lindsay Rd as one corridor. The quadrant intersections on US 401 were optimized as isolated signals then visually coordinated with the intersection on Wayside Rd and Lindsay Rd.

## 9.5 VISUAL VALIDATION OF MODEL

Quality control was performed for the 2017 Build model to ensure it was developed in a manner consistent with the current guidelines and best practices being utilized for TransModeler. The model was then visually validated by observing the model animations in the same manner that was described in Section 5. Following the conclusion of the model review process it was determined that the 2017 Build model was visually valid and ready for developing detailed MOEs.

## 9.6 MEASURES OF EFFECTIVENESS

The MOEs extracted for the 2017 Build scenario are identical to those utilized for the 2017 Base Year No-Build and 2040 Future Year No-Build models and are discussed in detail in Section 4.

## 9.7 SIMULATION RUN CONTROL

The simulation model runs controls for the future year build models were identical to those included in Section 6.6 for the 2017 Base Year No-Build model.

## 9.8 2017 BASE YEAR BUILD MODEL RESULTS

The preferred alternative (Alternative 2) improvements include widening Wayside Rd to a four-lane divide facility and installing a signal and turn lanes at Brock Rd, realigning Wayside Rd and Lindsay Rd to be a grade separated interchange with quadrant ramps connecting to US 401. Improvements along Lindsay Rd include installing a signal and turn lanes at the intersection of Lindsay Rd and Stony Point Rd, and a roundabout at the intersection of Lindsay Rd and Galatia Church Rd.

The output data was extracted from the TransModeler model via the Output Manager using the Delay, Queue and Queue Spillback reports. The outputs were collected in accordance with the MOEs defined in Section 4 and are summarized in the following sections.

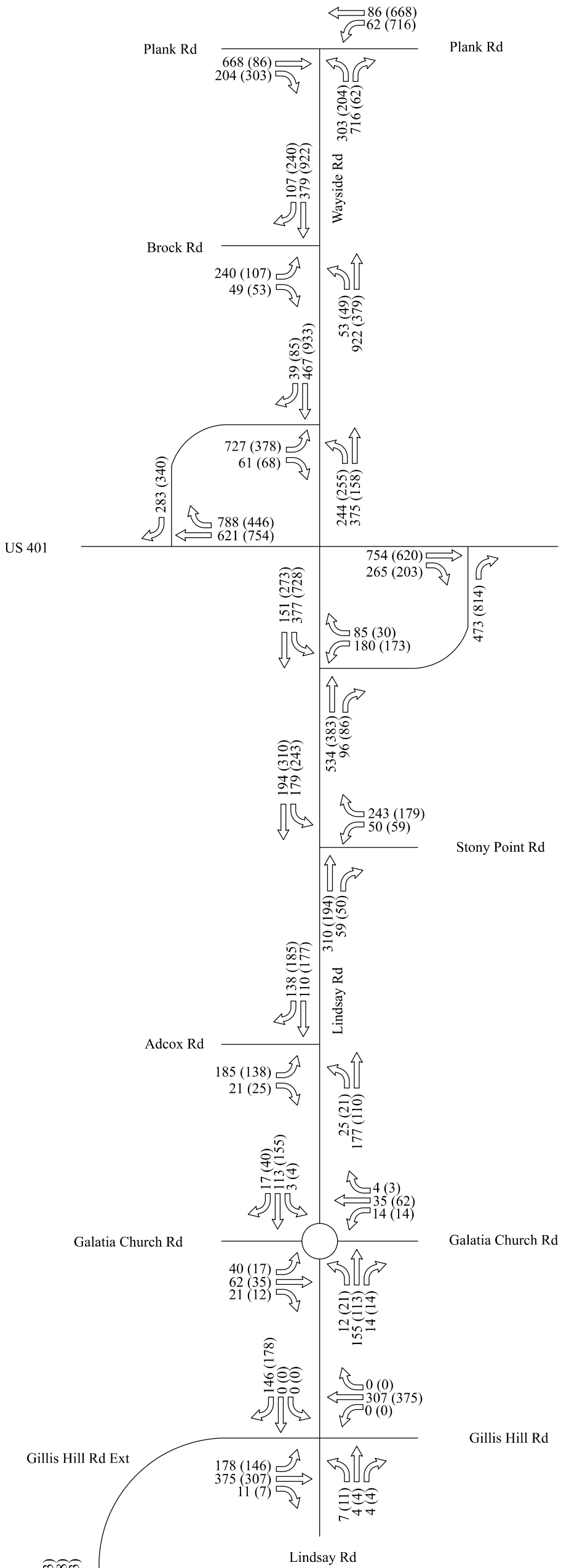
### 9.8.1 INTERSECTION RESULTS

The results of the intersection analysis along the study area are included in **Error! Reference source not found.** and Figure 9-2. The overall intersection $LOS_S$ for the signalized intersections in the 2017 Base Year Build scenario shows that all the study intersections are operating at $LOS_S$ C or better in both the AM and PM peak periods. During the AM peak period 1 of 7 intersections is operating at $LOS_S$ A, 2 of 7 intersections are operating at $LOS_S$ B, and 5 of 7 intersections are operating at $LOS_S$ C. During the PM peak period 2 of 7 intersections are operating at $LOS_S$ A, 1 of 7 intersections is operating at $LOS_S$ B, and 5 of 7 intersections is operating at $LOS_S$ C.

Based on a review of the intersection operations at the lane group level, the following movements operate at $LOS_S$ E or F in the 2017 Base Year Build scenario:

- Wayside Rd at Plank Rd, westbound left operates at $LOS_S$ E during the AM Peak
- Gillis Hill Rd Extension at Rockfish Rd, westbound left operates at $LOS_S$ F during the AM and PM Peaks
- Gillis Hill Rd Extension at Rockfish Rd, northbound left operates at $LOS_S$ F during the AM and PM Peaks
- Gillis Hill Rd Extension at Rockfish Rd, northbound right operates at $LOS_S$ E during the AM Peak
- Wayside Rd at Brock Rd, northbound left operates at $LOS_S$ E during the AM Peak and PM Peaks
- Wayside Rd at US 401 Quadrant Ramp, northbound left operates at $LOS_S$ E during the AM Peak
- Lindsay Rd at Stony Point Rd, southbound left operates at $LOS_S$ E during the AM Peak

Based on a review of the unsignalized intersections, all movements are operating at $LOS_S$ D or better in both the AM and PM peak periods.

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STIP U-5753/U-5858
2017 Base Year Build Alt 2
Figure 9-1

AM (PM) Turning Movement Volumes

A review of the queue data showed improvements from the 2017 Base Year No-Build model, with no queue lengths spanning longer than 1000 feet. There are several locations still showing queuing, but none that are affecting the operations of adjacent locations. The following locations are showing the longest maximum queue lengths in the 2017 Base Year Build model:

- Wayside Rd at Plank Rd, westbound approach has a maximum queue length of 341 feet (PM)
- Wayside Rd at Plank Rd, eastbound approach has a maximum queue length of 841 feet (AM)
- Wayside Rd at Plank Rd, northbound approach has a maximum queue length of 686 feet (AM)
- Lindsay Rd at US 401 Quadrant Ramp, southbound approach 442 feet (PM)

## Table 9-1: 2017 Base Year Build Intersection Measures of Effectiveness

### Signalized Intersections

| Intersection No. | Intersection | Approach | Lane Group | Delay[1] (s) | | Level of Service[2] | | 95th % Queue (ft)/Spillback Rate | | Maximum Queue Length (ft) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | AM | PM | AM | PM | AM | PM | AM | PM |
| 1 | SR 1305 (Wayside Rd) at Plank Rd | **Overall** | | **30.8** | **22.9** | **C** | **C** | | | | |
| | | Plank Rd WB | L | 57.1 | 31.9 | E | C | 53 (0%) | 213 (0%) | 95 | 341 |
| | | | T | 19.7 | 7.1 | B | A | 56 (0%) | 111 (0%) | | |
| | | SR 1305 (Wayside Rd) NB | L | 20.9 | 32.9 | C | C | 185 (0%) | 195 (0%) | 686 | 291 |
| | | | R | 25.7 | 19.7 | C | B | 475 (0%) | 60 (0%) | | |
| | | Plank Rd EB | T | 50.6 | 22.4 | D | C | 573 (0%) | 55 (0%) | 841 | 258 |
| | | | R | 15.6 | 27.5 | B | C | 75 (0%) | 167 (0%) | | |
| 3 | US 401 at SR 1305 (Wayside Rd) Quadrant Ramp | **Overall** | | **8.9** | **6.8** | **A** | **A** | | | | |
| | | SR 1305 (Wayside Rd) SB | R | 45.1 | 20.3 | D | C | 162 (0%) | 103 (0%) | 213 | 209 |
| | | US 401 WB | T | 4.7 | 5.3 | A | A | 78 (0%) | 93 (0%) | 117 | 166 |
| | | | R | 0.5 | 0.5 | A | A | 0 (0%) | 0 (0%) | | |
| 4 | US 401 at SR 1418 (Lindsay Rd) Quadrant Ramp | **Overall** | | **16.3** | **25.0** | **B** | **C** | | | | |
| | | SR 1418 (Lindsay Rd) NB | R | 44.9 | 44.9 | D | D | 228 (0%) | 405 (0%) | 275 | 483 |
| | | US 401 EB | T | 6.4 | 11.3 | A | B | 115 (0%) | 117 (0%) | 150 | 203 |
| | | | R | 0.5 | 0.5 | A | A | 0 (0%) | 0 (0%) | | |
| 11 | Gillis Hill Rd Ext at Rockfish Rd | **Overall** | | **32.0** | **30.0** | **C** | **C** | | | | |
| | | Gillis Hill Rd Ext SB | LT | 49.1 | 51.7 | D | D | 95 (0%) | 103 (0%) | 166 | 149 |
| | | | T | 19.0 | 16.2 | B | B | 106 (0%) | 108 (0%) | | |
| | | | R | 10.0 | 8.1 | A | A | 107 (0%) | 86 (0%) | | |
| | | Rockfish Rd WB | L | 92.7 | 104.8 | F | F | 23 (0%) | 28 (0%) | 334 | 276 |
| | | | T | 38.6 | 42.1 | D | D | 114 (0%) | 116 (0%) | | |
| | | | R | 30.6 | 29.9 | C | C | 242 (0%) | 195 (0%) | | |
| | | School Rd NB | L | 86.8 | 99.3 | F | F | 25 (0%) | 24 (0%) | 18 | 10 |
| | | | T | 42.5 | 37.6 | D | D | 25 (0%) | 24 (0%) | | |
| | | | R | 67.3 | 53.3 | E | D | 20 (0%) | 18 (0%) | | |
| | | Rockfish Rd EB | L | 53.2 | 54.9 | D | D | 158 (0%) | 143 (0%) | 236 | 194 |
| | | | T | 25.1 | 28.3 | C | C | 94 (0%) | 99 (0%) | | |
| | | | R | 40.5 | 43.3 | D | D | 26 (0%) | 24 (0%) | | |
| 2 | SR 1305 (Wayside Rd) at Brock Rd | **Overall** | | **16.1** | **9.3** | **B** | **A** | | | | |
| | | SR 1305 (Wayside Rd) SB | T | 12.3 | 4.6 | B | A | 124 (0%) | 123 (0%) | 155 | 176 |
| | | | R | 4.8 | 2.9 | A | A | 56 (0%) | 58 (0%) | | |
| | | SR 1305 (Wayside Rd) NB | L | 59.6 | 62.8 | E | E | 90 (0%) | 83 (0%) | 244 | 136 |
| | | | T | 9.6 | 6.3 | A | A | 207 (0%) | 76 (0%) | | |
| | | Brock Rd EB | L | 46.4 | 42.1 | D | D | 158 (0%) | 74 (0%) | 207 | 102 |
| | | | R | 31.7 | 30.1 | C | C | 72 (0%) | 66 (0%) | | |
| 12 | SR 1305 (Wayside Rd) at US 401 Quadrant Ramp | **Overall** | | **27.9** | **22.5** | **C** | **C** | | | | |
| | | SR 1305 (Wayside Rd) SB | T | 15.6 | 17.0 | B | B | 104 (0%) | 255 (0%) | 171 | 348 |
| | | | R | 4.4 | 6.3 | A | A | 31 (0%) | 40 (0%) | | |
| | | SR 1305 (Wayside Rd) NB | L | 67.9 | 46.0 | E | D | 250 (0%) | 224 (0%) | 303 | 396 |
| | | | T | 5.9 | 4.6 | A | A | 67 (0%) | 48 (0%) | | |
| | | US 401 Quadrant EB | L | 37.8 | 35.1 | D | D | 218 (0%) | 118 (0%) | 291 | 193 |
| | | | R | 37.0 | 37.1 | D | D | 94 (0%) | 88 (0%) | | |
| 13 | SR 1418 (Lindsay Rd) at US 401 Quadrant Ramp | **Overall** | | **24.4** | **28.8** | **C** | **C** | | | | |
| | | SR 1418 (Lindsay Rd) SB | L | 36.8 | 46.9 | D | D | 198 (0%) | 323 (0%) | 254 | 442 |
| | | | T | 7.0 | 6.6 | A | A | 70 (0%) | 69 (0%) | | |
| | | US 401 Quadrant WB | L | 45.8 | 35.6 | D | D | 189 (0%) | 152 (0%) | 261 | 210 |
| | | | R | 26.0 | 15.0 | C | B | 86 (0%) | 47 (0%) | | |
| | | SR 1418 (Lindsay Rd) NB | T | 17.9 | 19.9 | B | B | 127 (0%) | 95 (0%) | 169 | 190 |
| | | | R | 5.8 | 9.7 | A | A | 60 (0%) | 54 (0%) | | |
| 7 | SR 1418 (Lindsay Rd) at SR 1419 (Stony Point Rd) | **Overall** | | **23.8** | **19.3** | **C** | **B** | | | | |
| | | SR 1418 (Lindsay Rd) SB | L | 68.6 | 44.5 | E | D | 204 (0%) | 177 (0%) | 251 | 239 |
| | | | T | 1.0 | 4.2 | A | A | 22 (0%) | 60 (0%) | | |
| | | SR 1419 (Stony Point Rd) WB | L | 46.7 | 40.5 | D | D | 53 (0%) | 67 (0%) | 177 | 161 |
| | | | R | 26.8 | 18.2 | C | B | 158 (0%) | 111 (0%) | | |
| | | SR 1418 (Lindsay Rd) NB | TR | 14.1 | 17.1 | B | B | 106 (0%) | 89 (0%) | 150 | 135 |

## Unsignalized Intersections[3]

| Intersection No. | Intersection | Approach | Lane | Delay[1] (s) | | Level of Service[2] | | 95th % Queue (ft)/Spillback Rate | | Maximum Queue Length (ft) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | AM | PM | AM | PM | AM | PM | AM | PM |
| 5 | US 401 EB at U-Turn | US 401 U-Turn SB | L | 23.7 | 21.2 | C | C | 48 (0%) | 26 (0%) | 0 | 0 |
| | | US 401 EB | T | 0.0 | 0.0 | A | A | 0 (0%) | 0 (0%) | 0 | 0 |
| 6 | US 401 WB at U-Turn | US 401 WB | T | 0.0 | 0.2 | A | A | 0 (0%) | 0 (0%) | 0 | 0 |
| | | US 401 U-Turn NB | L | 29.5 | 32.7 | D | D | 24 (0%) | 82 (0%) | 28 | 101 |
| 8 | SR 1418 (Lindsay Rd) at SR 1417 (Adcox Rd) | SR 1418 (Lindsay Rd) SB | T | 0.4 | 0.4 | A | A | 0 (0%) | 0 (0%) | 0 | 0 |
| | | | R | 0.4 | 0.3 | A | A | 0 (0%) | 0 (0%) | | |
| | | SR 1418 (Lindsay Rd) NB | L | 6.8 | 7.8 | A | A | 0 (0%) | 0 (0%) | 0 | 0 |
| | | | T | 0.3 | 0.2 | A | A | 0 (0%) | 0 (0%) | | |
| | | SR 1417 (Adcox Rd) EB | L | 13.4 | 13.3 | B | B | 79 (0%) | 68 (0%) | 115 | 92 |
| | | | R | 10.1 | 9.8 | B | A | 23 (0%) | 30 (0%) | | |
| 10 | SR 1418 (Lindsay Rd) at SR 1420 (Gillis Hill Rd) | SR 1418 (Lindsay Rd) SB | LT | 0.0 | 0.0 | A | A | 0 (0%) | 0 (0%) | 110 | 149 |
| | | | R | 14.4 | 14.6 | B | B | 99 (0%) | 111 (0%) | | |
| | | SR 1420 (Gillis Hill Rd) WB | L | 0.0 | 0.0 | A | A | 0 (0%) | 0 (0%) | 0 | 0 |
| | | SR 1418 (Lindsay Rd) NB | LT | 30.7 | 26.5 | D | D | 43 (0%) | 49 (0%) | 31 | 25 |
| | | | R | 13.1 | 12.0 | B | B | 23 (0%) | 16 (0%) | | |
| | | SR 1420 (Gillis Hill Rd) EB | L | 4.0 | 4.8 | A | A | 121 (0%) | 84 (0%) | 30 | 46 |

## Roundabouts

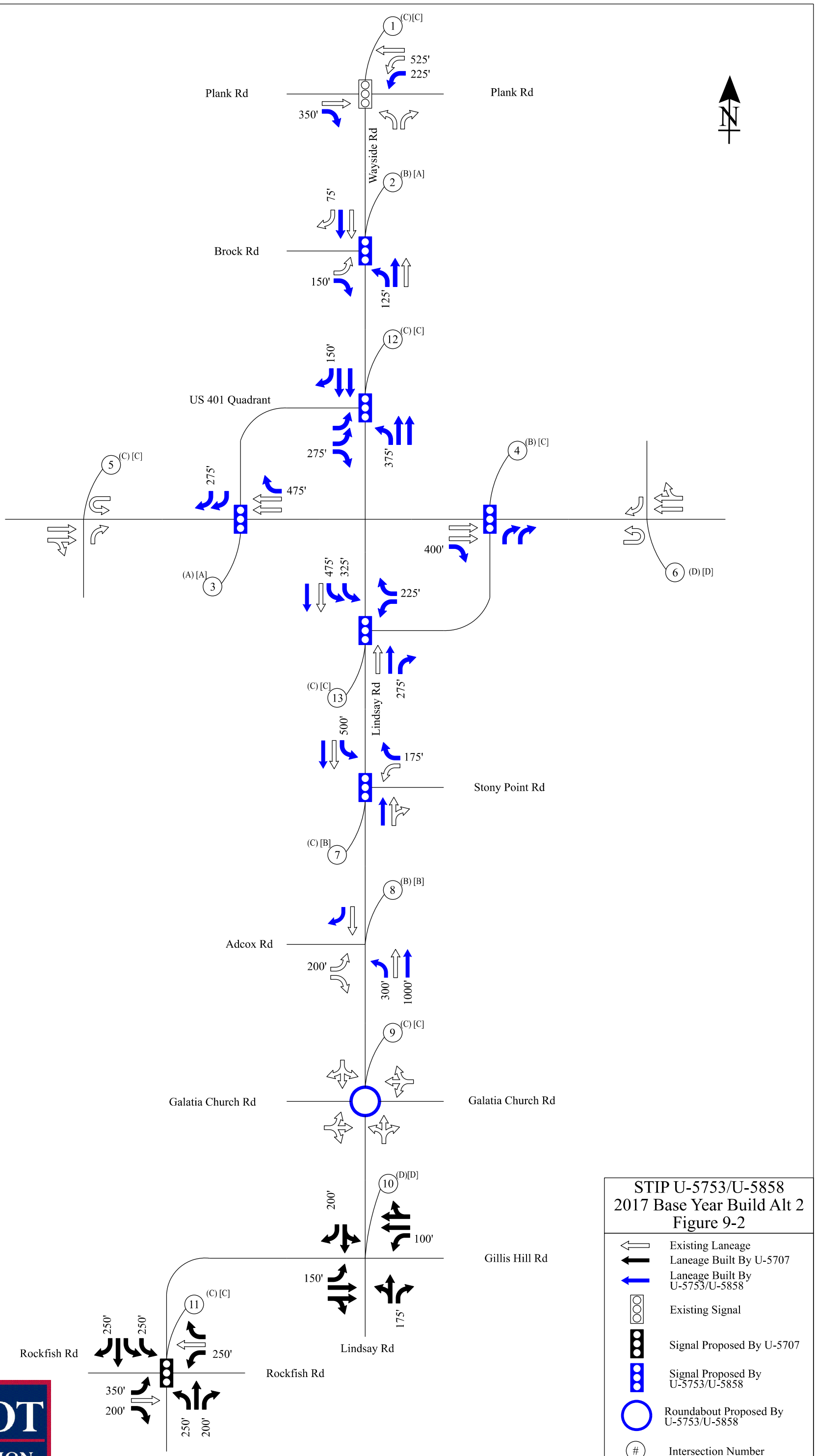
| Intersection No. | Intersection | Approach | Lane | Delay[1] (s) | | Level of Service[2] | | 95th % Queue (ft)/Spillback Rate | | Maximum Queue Length (ft) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | AM | PM | AM | PM | AM | PM | AM | PM |
| 9 | SR 1418 (Lindsay Rd) at SR 1415 (Galatia Church Rd) | SR 1418 (Lindsay Rd) SB | LTR | 15.1 | 15.3 | C | C | 27 (0%) | 55 (0%) | 22 | 50 |
| | | SR 1415 (Galatia Church Rd) WB | LTR | 15.2 | 14.9 | C | B | 29 (0%) | 32 (0%) | 0 | 0 |
| | | SR 1418 (Lindsay Rd) NB | LTR | 14.7 | 14.3 | B | B | 79 (0%) | 27 (0%) | 0 | 0 |
| | | SR 1415 (Galatia Church Rd) EB | LTR | 14.8 | 14.9 | B | B | 52 (0%) | 42 (0%) | 0 | 0 |

Notes:

1 Delay shown is the 95th percentile worst case control delay for the full 60-minute simulation period as derived from the 10 random seed simulations

2 Level of Service shown is Simulation based and calculated in a manner that is consistent with the HCM 2010 Methodologies

3 Results for unsignalized intersections include only the movements that have conflicting flow and thus have the potential to incur control delay


Plank Rd
Plank Rd
Wayside Rd
Brock Rd
US 401 Quadrant
Lindsay Rd
Stony Point Rd
Adcox Rd
Galatia Church Rd
Galatia Church Rd
Gillis Hill Rd
Lindsay Rd
Rockfish Rd
Rockfish Rd
School Rd
(C)[C]
525'
225'
350'
(B) [A]
75'
150'
125'
(C) [C]
150'
275'
375'
(C) [C]
275'
475'
(B) [C]
400'
(A) [A]
475'
325'
225'
(C) [C]
275'
500'
175'
(C) [B]
(B) [B]
200'
300'
1000'
(C) [C]
(D)[D]
200'
100'
150'
175'
(C) [C]
250'
250'
250'
350'
200'
250'
200'
N
STIP U-5753/U-5858
2017 Base Year Build Alt 2
Figure 9-2
Existing Laneage
Laneage Built By U-5707
Laneage Built By U-5753/U-5858
Existing Signal
Signal Proposed By U-5707
Signal Proposed By U-5753/U-5858
Roundabout Proposed By U-5753/U-5858
# Intersection Number
(AM) [PM] Intersection LOS ( E/F in Red)
XXX' Storage Length
Worst movement shown at unsignalized intersections.
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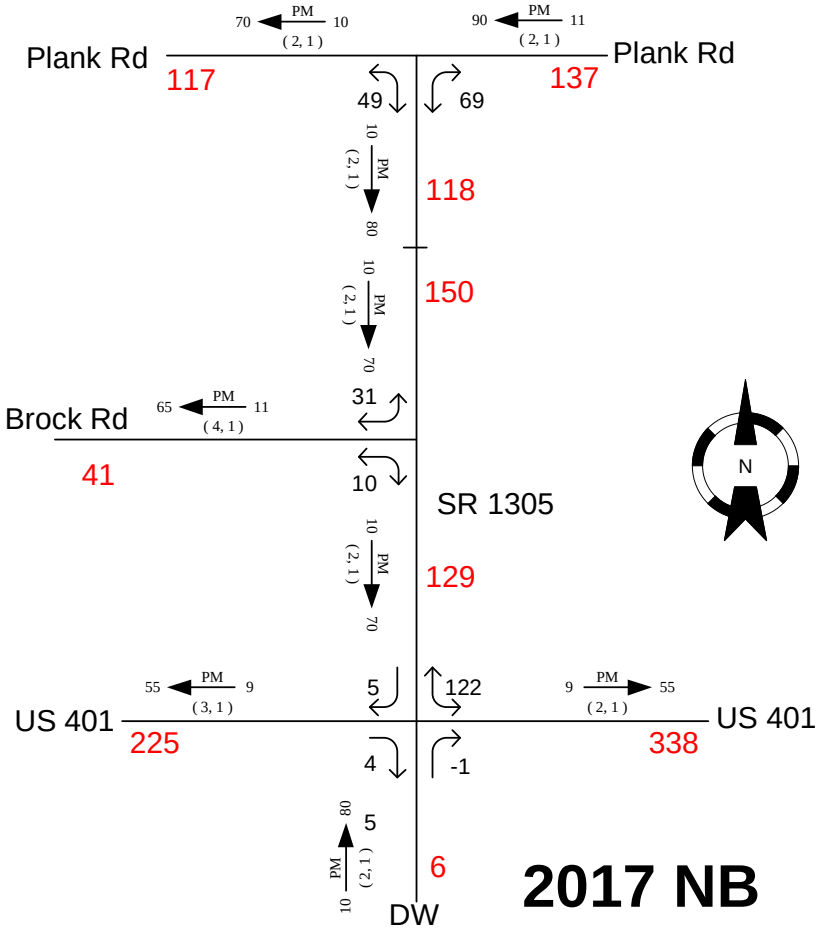
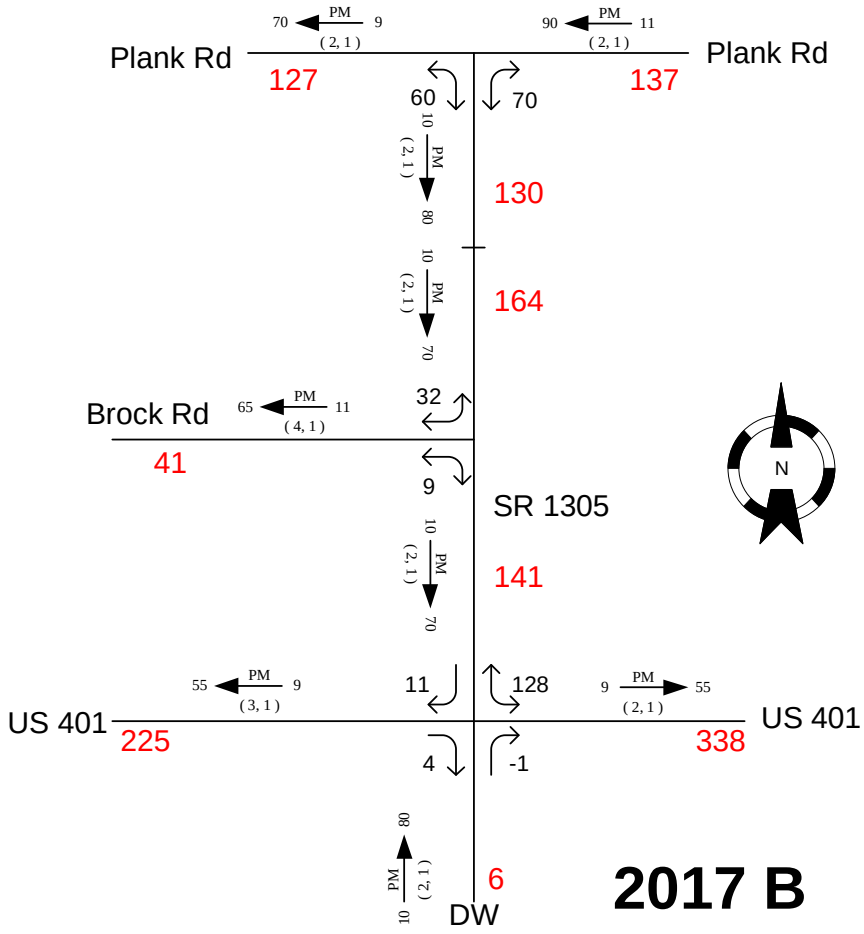
# 10. CONCLUSIONS AND RECOMMENDATIONS

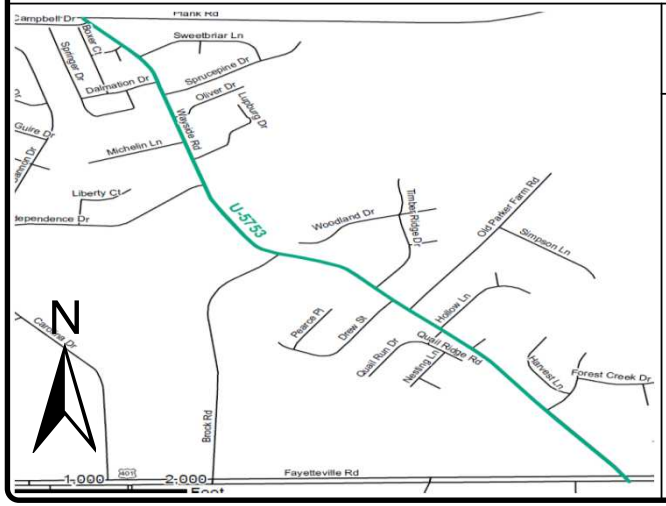
Based on the results of the analysis, Alternatives 1 and 2 are both acceptable alternatives. Alternatives 1 and 2 have very similar overall operations from a traffic standpoint, with only minimal differences in level of service. Both alternatives show improvements in delay and queue length along the Wayside Rd and Lindsay Rd corridors when compared to the No-Build scenario. Alternative 2 was chosen as the preferred alternative and the Base Year Build analysis shows improvements in traffic operations along the Wayside Rd and Lindsay Rd corridors.

# APPENDIX A:

# TRAFFIC FORECAST




# No-Build / Build

AVERAGE ANNUAL DAILY TRAFFIC

**SHEET 1 OF 2**

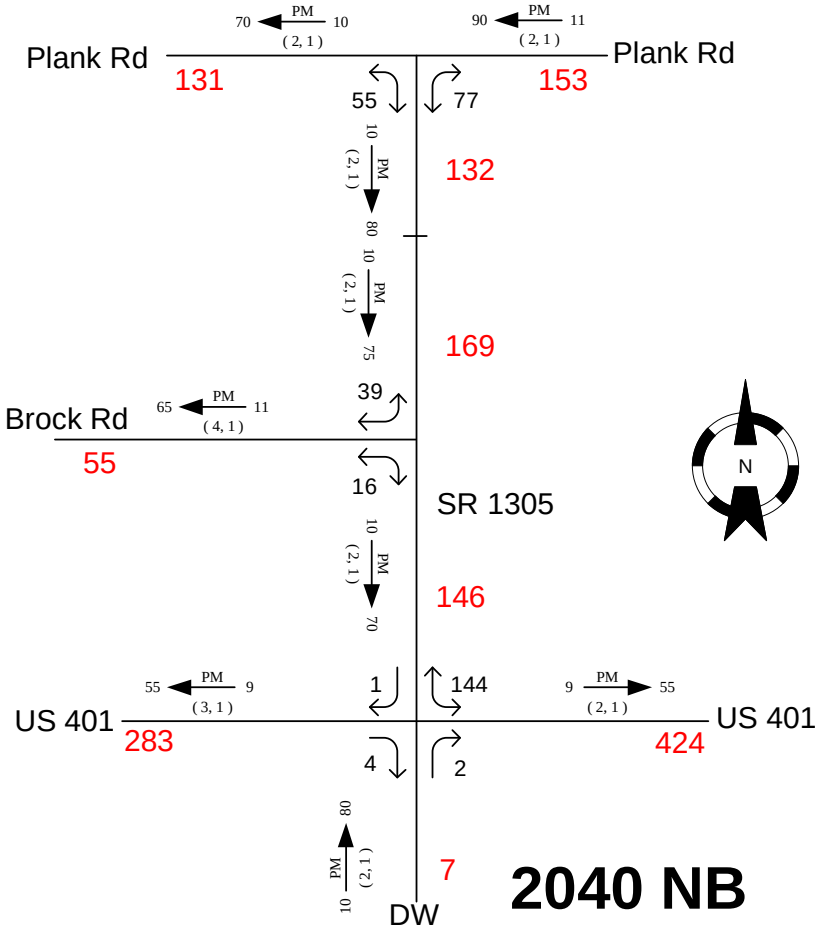
## L E G E N D

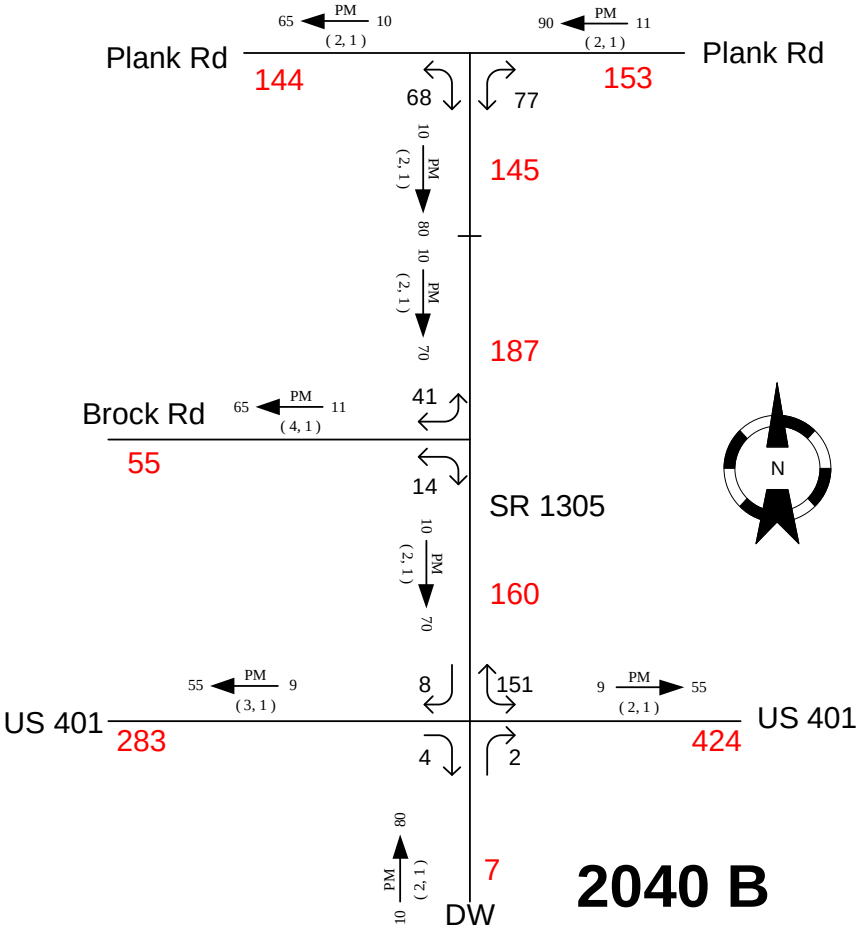
K PM (d, t) D

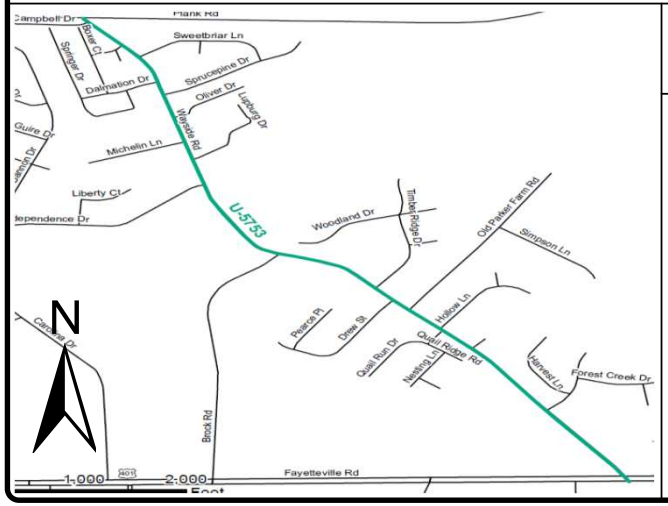
| | |
|---|---|
| ### No. of Vehicles Per Day (VPD) in 100s | K Design Hour Factor(%) |
| 1- Less than 50 VPD | PM PM Peak Period |
| | D Peak Hour Directional Split (%) |
| X Movement Prohibited | → Indicates Direction of D |

(d,t) Duals, TT-STs (%)

| | |
|---|---|
| **TIP: U-5753** | **WBS:** 51078.1.1 |
| **COUNTY: Hoke** | **DIVISION: 8** |
| **DATE:** 03-15-2017 | |
| **PREPARED BY:** Chris McKoy | |
| **LOCATION: SR1305-Wayside Road** | |
| **PROJECT:** Widen SR 1305 to 4 lanes from Plank Rd to US 401 (Fayetteville Rd) | |




# No-Build / Build

AVERAGE ANNUAL DAILY TRAFFIC

**SHEET 2 OF 2**

## L E G E N D

PM
K → D
( d, t )

### Number of Vehicles Per Day (VPD) in 100s

1- Less than 50 VPD

X Movement Prohibited

(d,t) Duals, TT-STs (%)

K Design Hour Factor(%)

PM PM Peak Period

D Peak Hour Directional Split (%)

→ Indicates Direction of D

**TIP: U-5753** | **WBS:** 51078.1.1

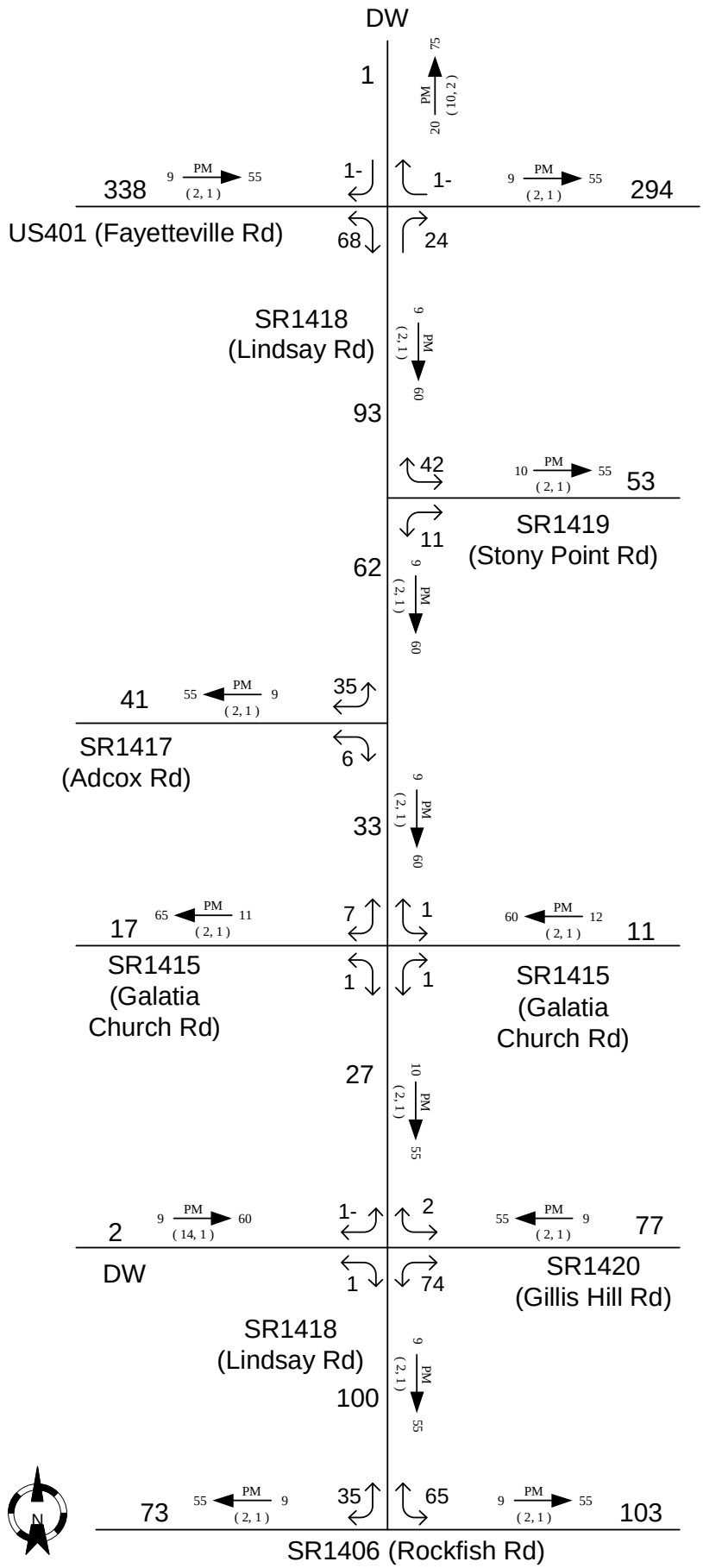
**COUNTY: Hoke** | **DIVISION: 8**

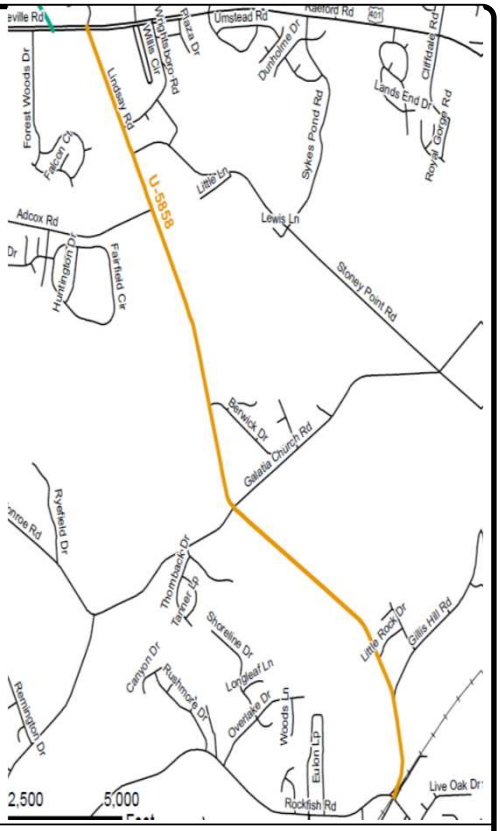
**DATE:** 03-15-2017

**PREPARED BY:** Chris McKoy

**LOCATION: SR1305-Wayside Road**

**PROJECT:** Widen SR 1305 to 4 lanes from Plank Rd to US 401 (Fayetteville Rd)




# 2017 AADT

## No Build

## Sheet 1 of 4

### L E G E N D

K PM D
( d, t )

| | |
|---|---|
| ### | No. of Vehicles Per Day (VPD) in 100s |
| 1- | Less than 50 VPD |
| X | Movement Prohibited |
| ------- | Roadway |
| K | Design Hourly Factor |
| PM | PM Peak Period |
| D | Peak Hour Directional Split |
| → | Indicates Direction of D |
| (d,t) | Duals, TT-STs (%) |

**TIP:** U-5858 | **WBS:** **46385**.1.1

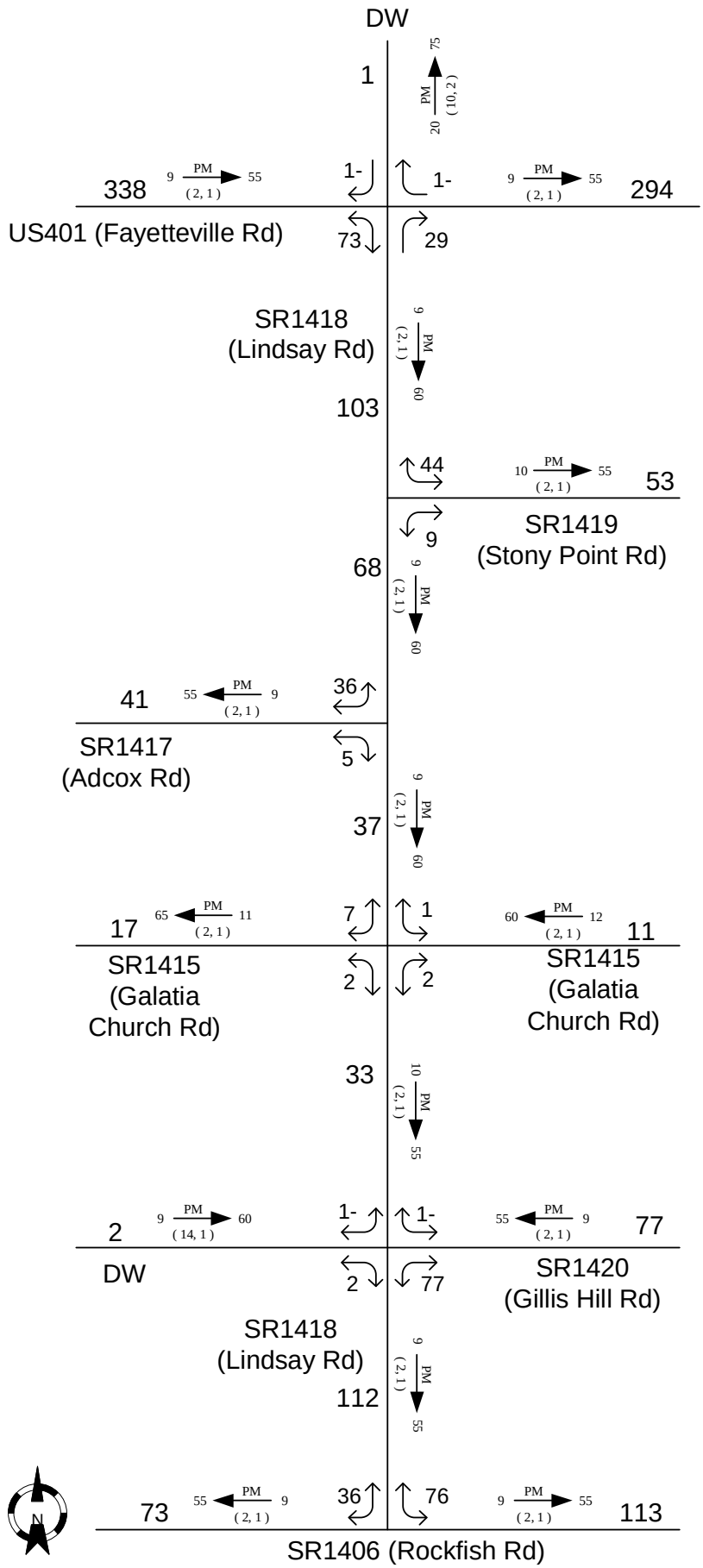
**COUNTY:** **Hoke** | **DIVISION:** **8**

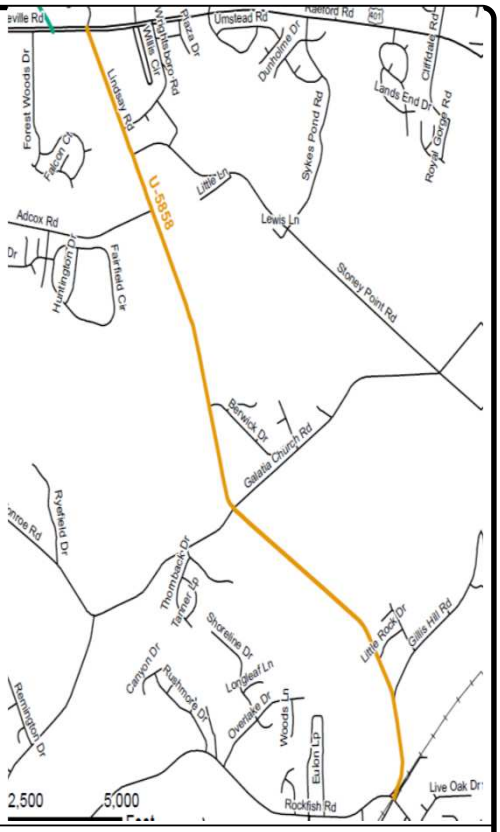
**DATE:** 4-4-2017

**PREPARED BY:** Chris McKoy

**LOCATION:** **SR 1418 (Lindsay Rd)**

**PROJECT:** Widen SR1418 to 4 lanes from SR 1406 to US 401




# 2017 AADT

## Build

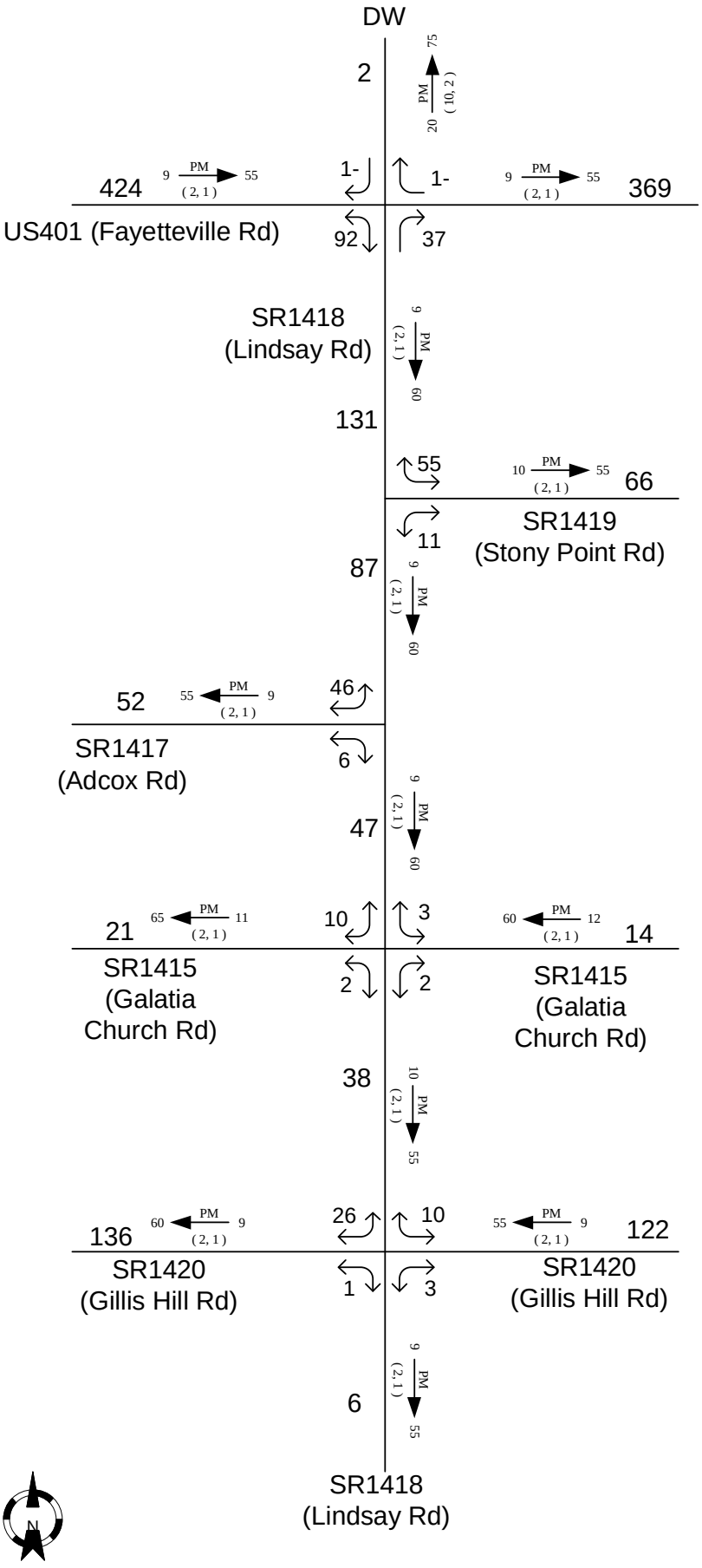
## Sheet 2 of 4

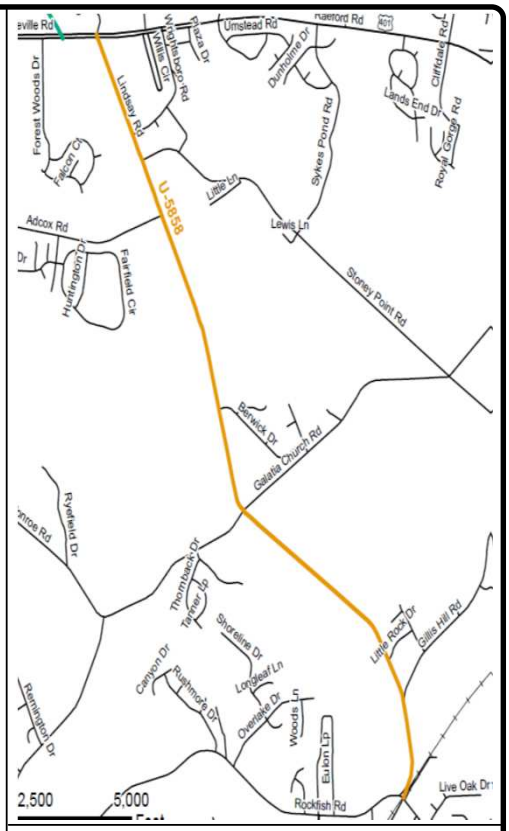
### L E G E N D

K PM (d, t) D

| | |
|---|---|
| ### | No. of Vehicles Per Day (VPD) in 100s |
| 1- | Less than 50 VPD |
| X | Movement Prohibited |
| ------- | Roadway |
| K | Design Hourly Factor |
| PM | PM Peak Period |
| D | Peak Hour Directional Split |
| → | Indicates Direction of D |
| (d,t) | Duals, TT-STs (%) |

| | |
|---|---|
| **TIP:** U-5858 | **WBS: 46385**.1.1 |
| **COUNTY: Hoke** | **DIVISION: 8** |
| **DATE:** 4-4-2017 | |
| **PREPARED BY:** Chris McKoy | |
| **LOCATION: SR 1418 (Lindsay Rd)** | |
| **PROJECT:** Widen SR1418 to 4 lanes from SR 1406 to US 401 | |




# 2040 AADT

## No Build

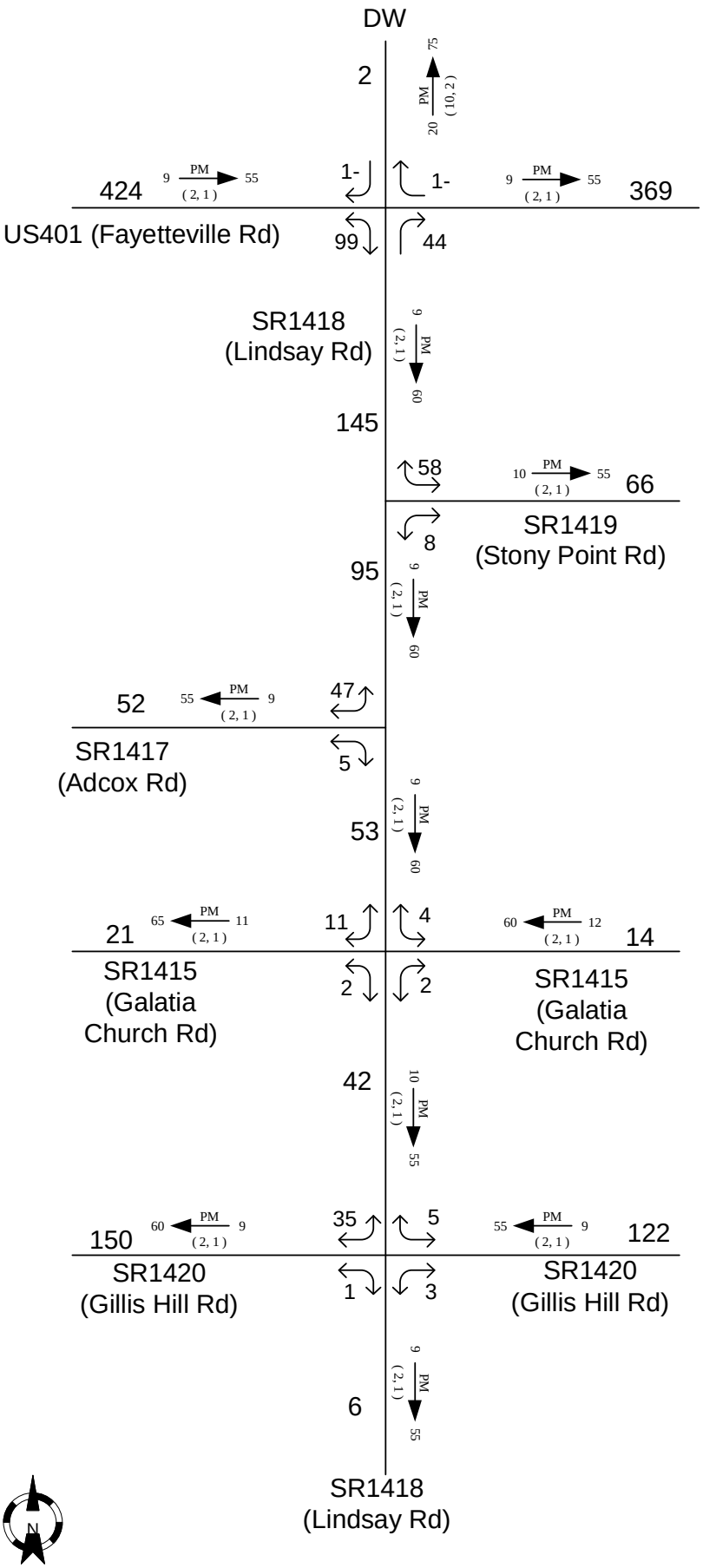
## Sheet 3 of 4

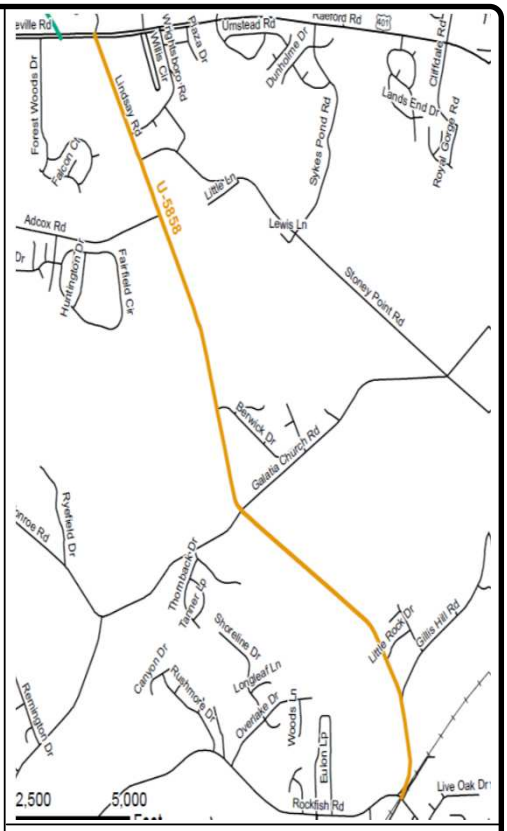
### L E G E N D

K PM ( d, t ) D

| | |
|---|---|
| ### | No. of Vehicles Per Day (VPD) in 100s |
| 1- | Less than 50 VPD |
| X | Movement Prohibited |
| ------- | Roadway |
| K | Design Hourly Factor |
| PM | PM Peak Period |
| D | Peak Hour Directional Split |
| → | Indicates Direction of D |
| (d,t) | Duals, TT-STs (%) |

| | |
|---|---|
| **TIP:** U-5858 | **WBS:** **46385**.1.1 |
| **COUNTY:** **Hoke** | **DIVISION:** **8** |
| **DATE:** 4-4-2017 | |
| **PREPARED BY:** Chris McKoy | |
| **LOCATION:** **SR 1418 (Lindsay Rd)** | |
| **PROJECT:** Widen SR1418 to 4 lanes from SR 1406 to US 401 | |




# 2040 AADT

## Build

## Sheet 4 of 4

### L E G E N D

K PM (d, t) D

| | |
|---|---|
| ### | No. of Vehicles Per Day (VPD) in 100s |
| 1- | Less than 50 VPD |
| X | Movement Prohibited |
| ------- | Roadway |
| K | Design Hourly Factor |
| PM | PM Peak Period |
| D | Peak Hour Directional Split |
| → | Indicates Direction of D |
| (d,t) | Duals, TT-STs (%) |

**TIP:** U-5858 | **WBS:** **46385**.1.1

**COUNTY:** **Hoke** | **DIVISION:** **8**

**DATE:** 4-4-2017

**PREPARED BY:** Chris McKoy

**LOCATION:** **SR 1418 (Lindsay Rd)**

**PROJECT:** Widen SR1418 to 4 lanes from SR 1406 to US 401

# APPENDIX B:

# INTERSECTION ANALYSIS UTILITY OUTPUT

# AND

# ORIGIN-DESTINATION MATRICES

# 2017 Base Year No-Build

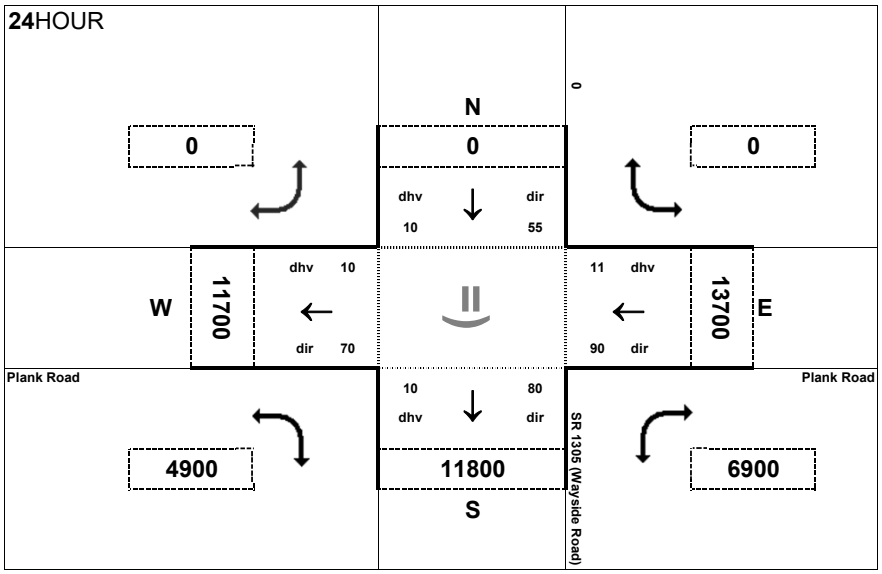
# Intersection Analysis Utility Output

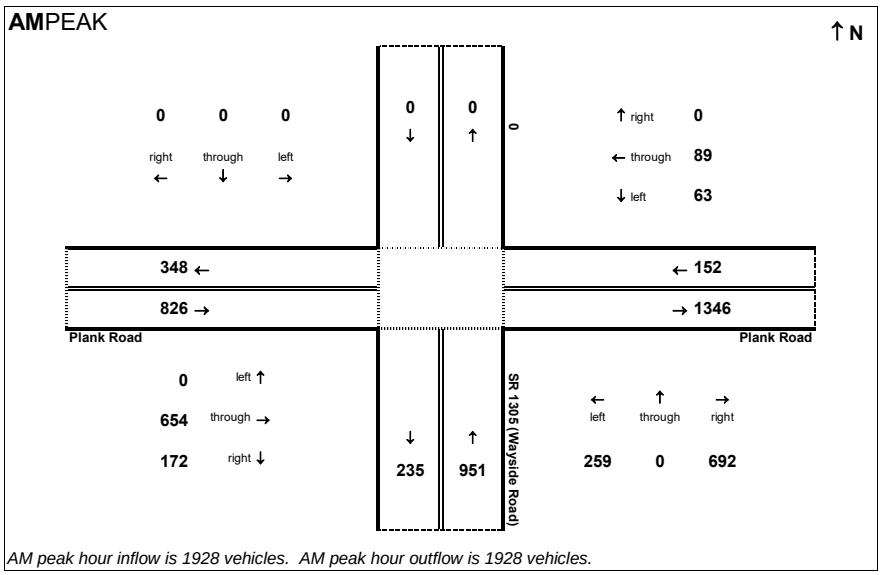
**Peak Hour Volume Breakouts Report:**
Intersection of SR 1305 (Wayside Road) and Plank Road

**Traffic Forecast Release Date:**
March-17

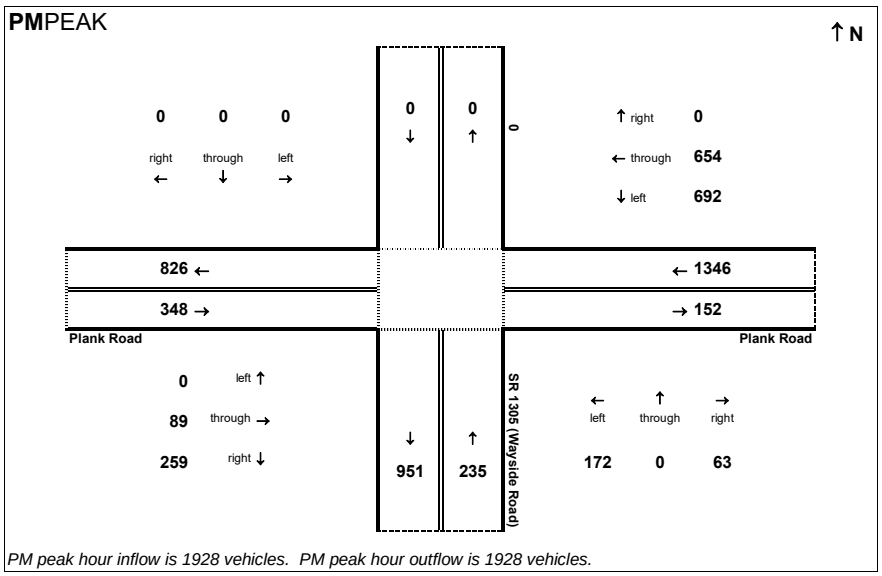
**Traffic Data Year:**
2017 No Build

**Project:**
U-5753

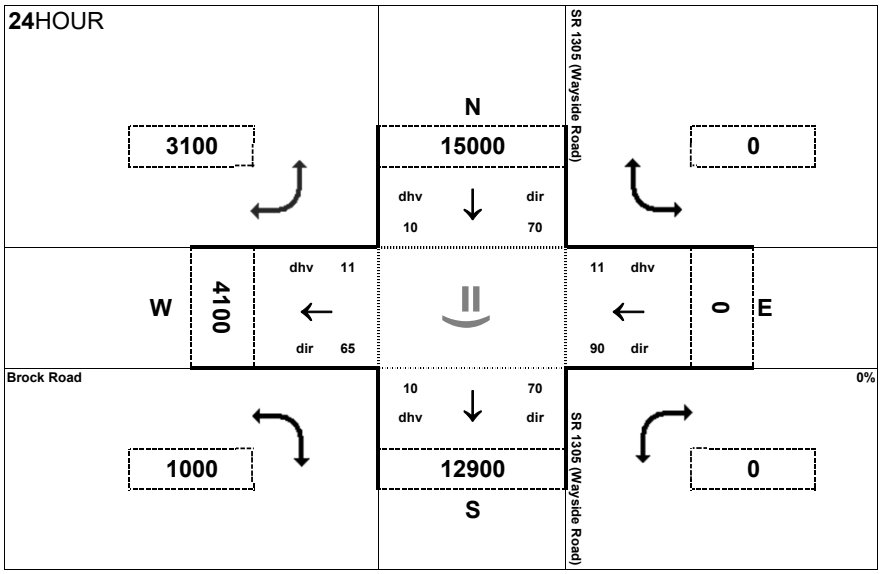


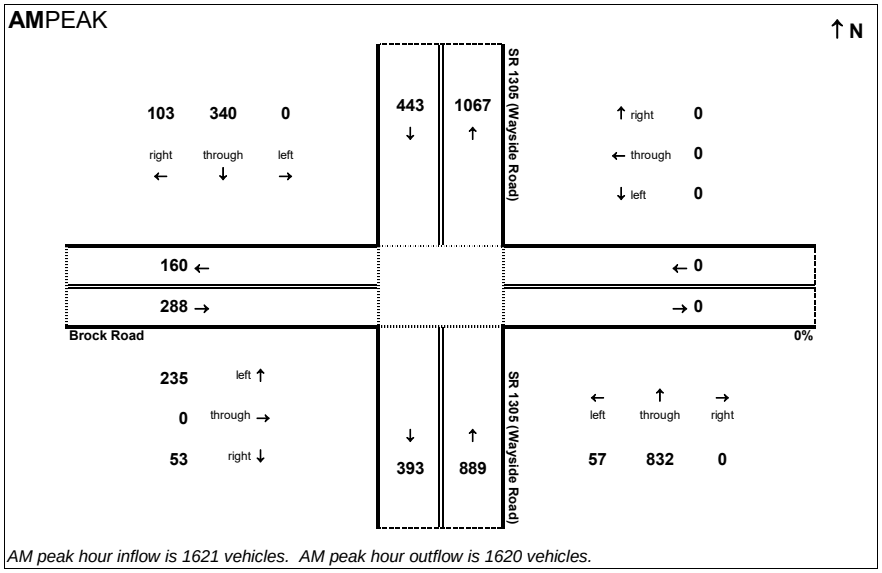




*AM peak hour inflow is 1928 vehicles. AM peak hour outflow is 1928 vehicles.*

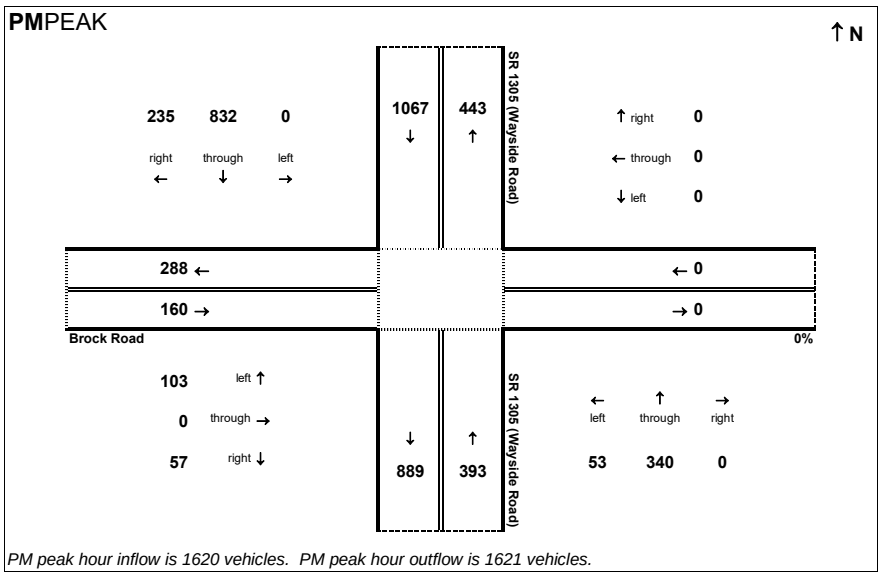



*PM peak hour inflow is 1928 vehicles. PM peak hour outflow is 1928 vehicles.*




*AM peak hour inflow is 1621 vehicles. AM peak hour outflow is 1620 vehicles.*



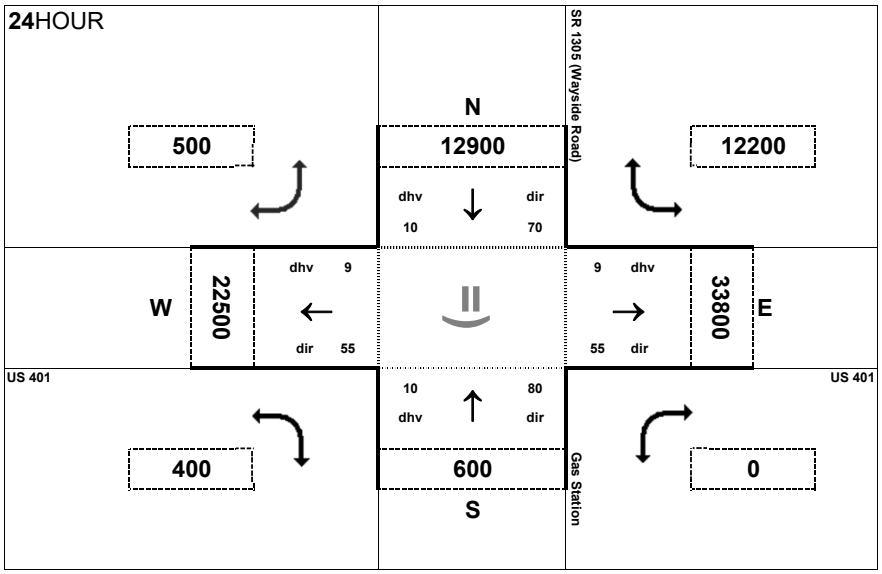

*PM peak hour inflow is 1620 vehicles. PM peak hour outflow is 1621 vehicles.*

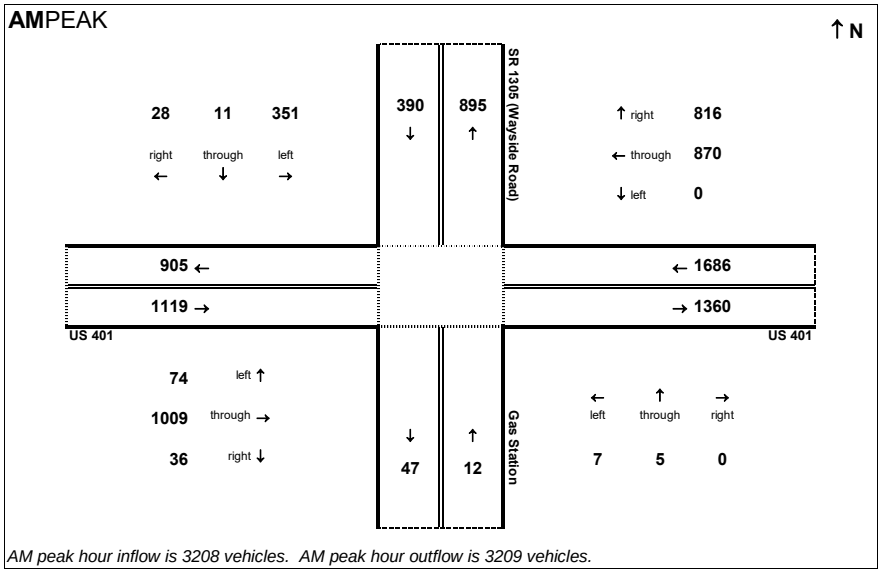
**Peak Hour Volume Breakouts Report:**
Intersection of SR 1305 (Wayside Road) and Brock Road

**Traffic Forecast Release Date:**
March-17

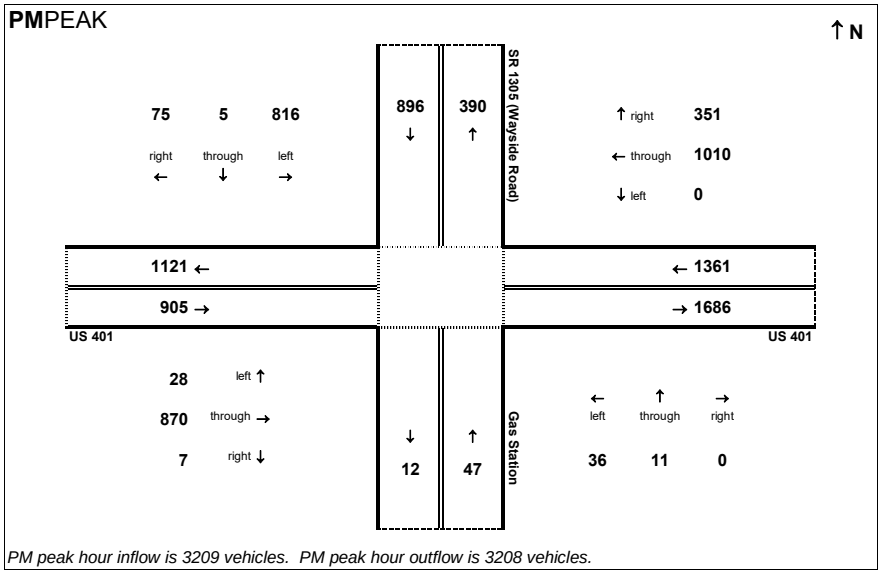
**Traffic Data Year:**
2017 No Build

**Project:**
U-5753




*AM peak hour inflow is 3208 vehicles. AM peak hour outflow is 3209 vehicles.*




*PM peak hour inflow is 3209 vehicles. PM peak hour outflow is 3208 vehicles.*

**Peak Hour Volume Breakouts Report:**
Intersection of SR 1305 (Wayside Road) and US 401

**Traffic Forecast Release Date:**
March-17

**Traffic Data Year:**
2017 No Build

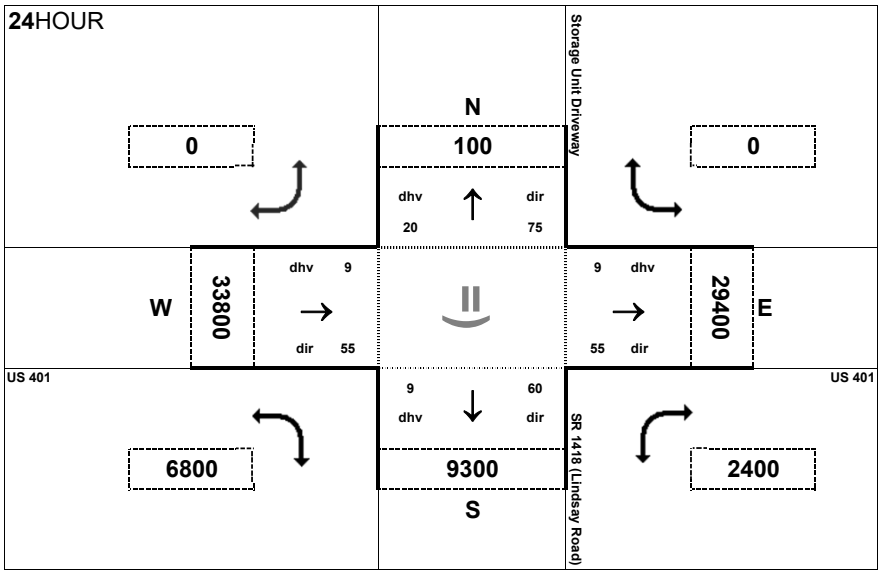
**Project:**
U-5753

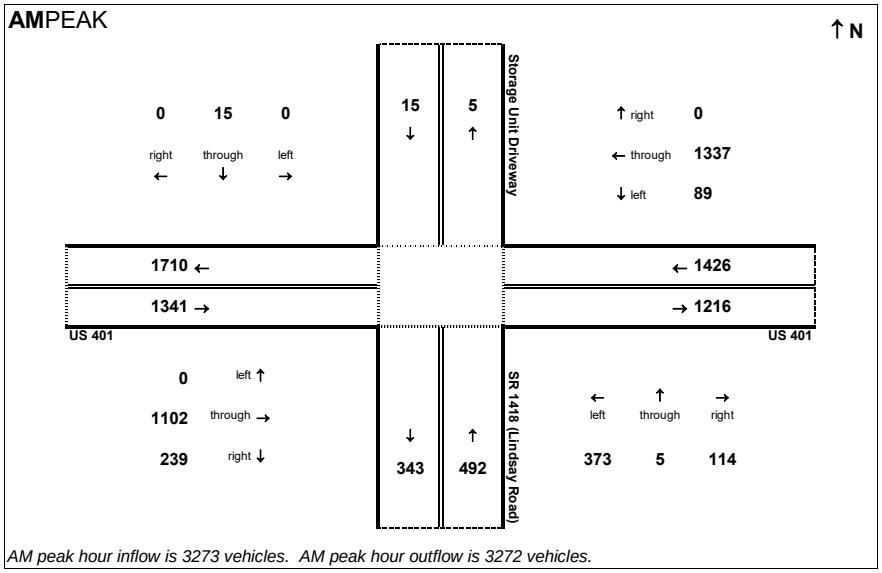
**Peak Hour Volume Breakouts Report:**
Intersection of SR 1418 (Lindsay Road) and US 401

**Traffic Forecast Release Date:**
April-17

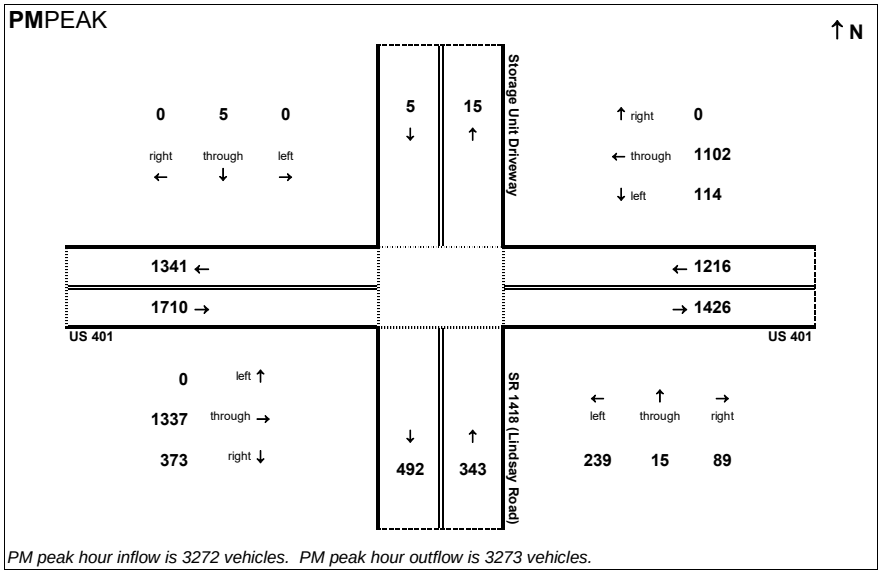
**Traffic Data Year:**
2017 No Build

**Project:**
U-5858

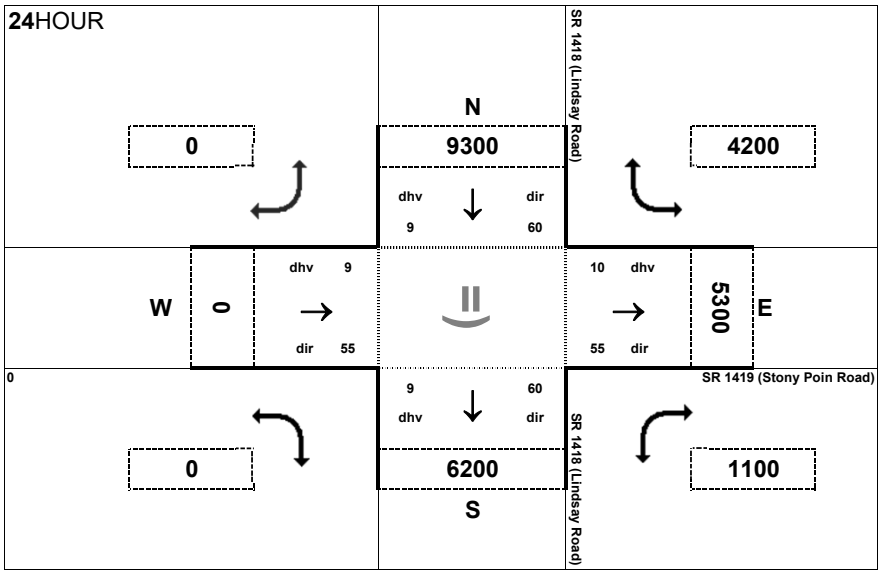



*AM peak hour inflow is 3273 vehicles. AM peak hour outflow is 3272 vehicles.*




*PM peak hour inflow is 3272 vehicles. PM peak hour outflow is 3273 vehicles.*

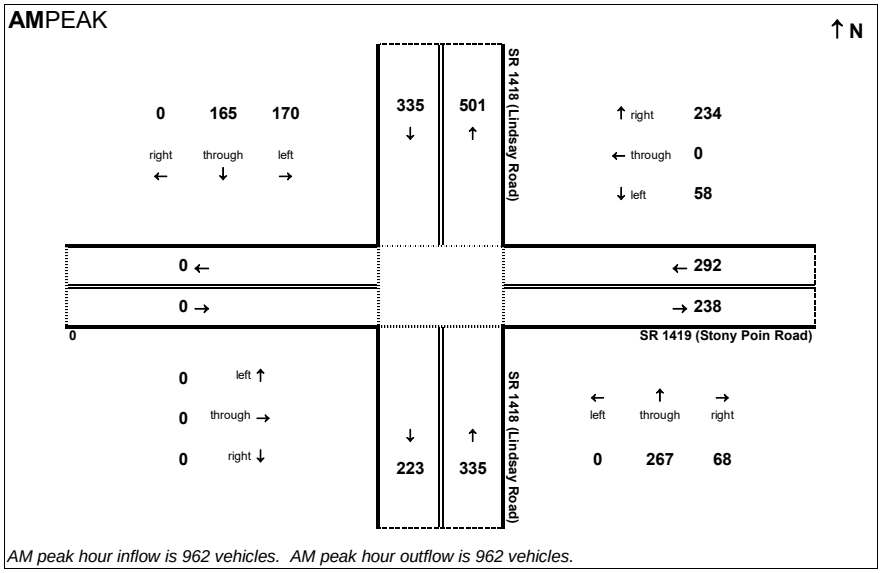



**Peak Hour Volume Breakouts Report:**
Intersection of SR 1418 (Lindsay Road) and SR 1419 (Stony Point Road)

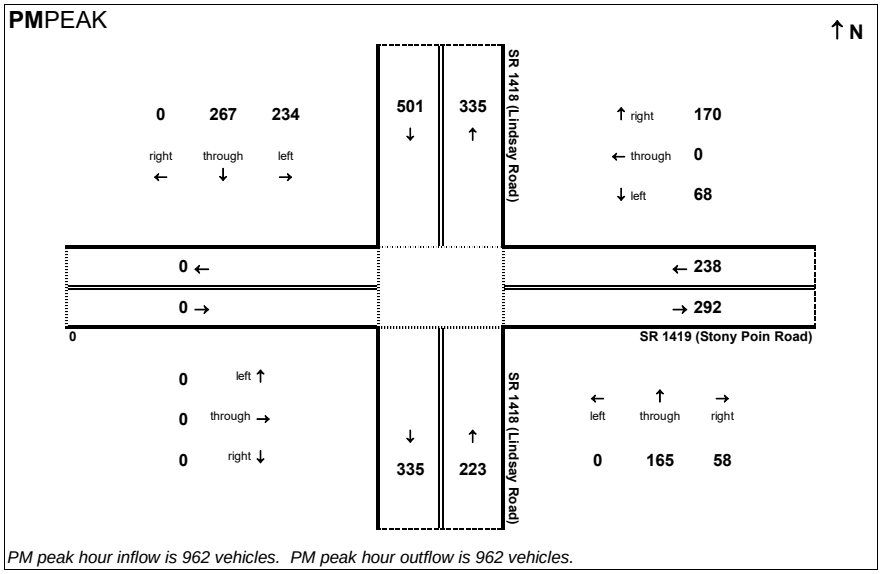
**Traffic Forecast Release Date:**
April-17

**Traffic Data Year:**
2017 No Build

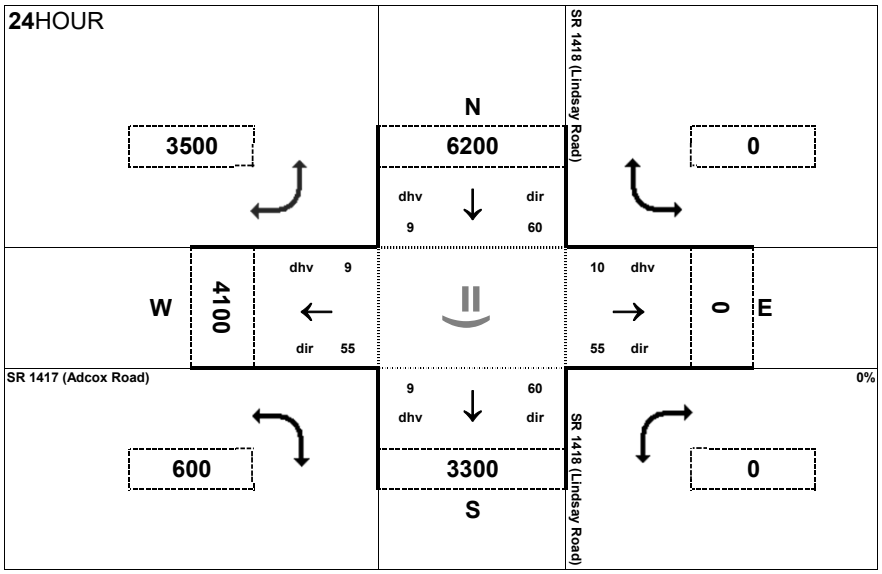
**Project:**
U-5858

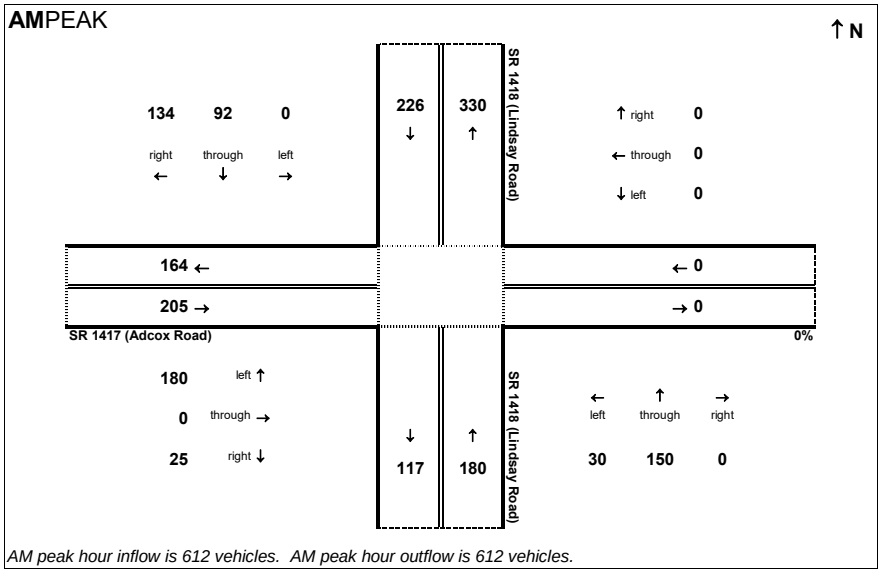



*AM peak hour inflow is 962 vehicles. AM peak hour outflow is 962 vehicles.*

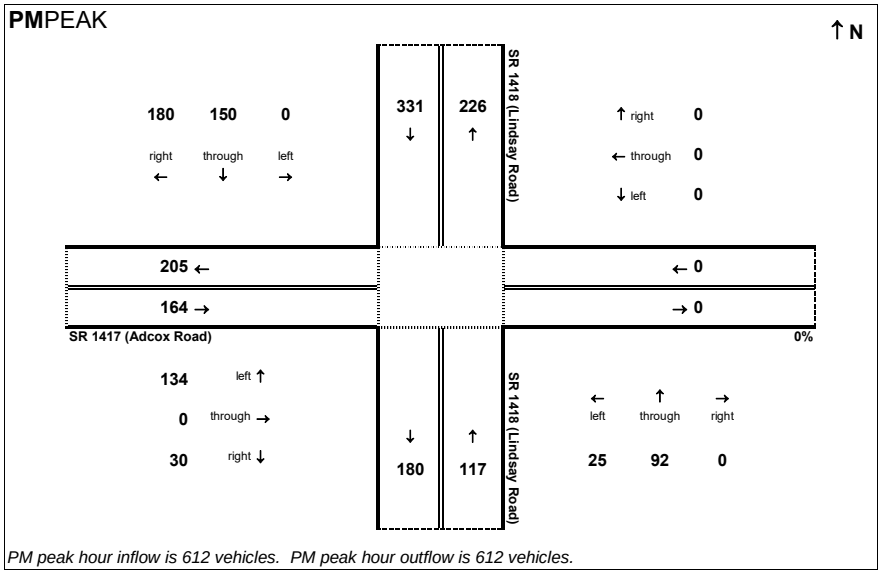



*PM peak hour inflow is 962 vehicles. PM peak hour outflow is 962 vehicles.*




*AM peak hour inflow is 612 vehicles. AM peak hour outflow is 612 vehicles.*



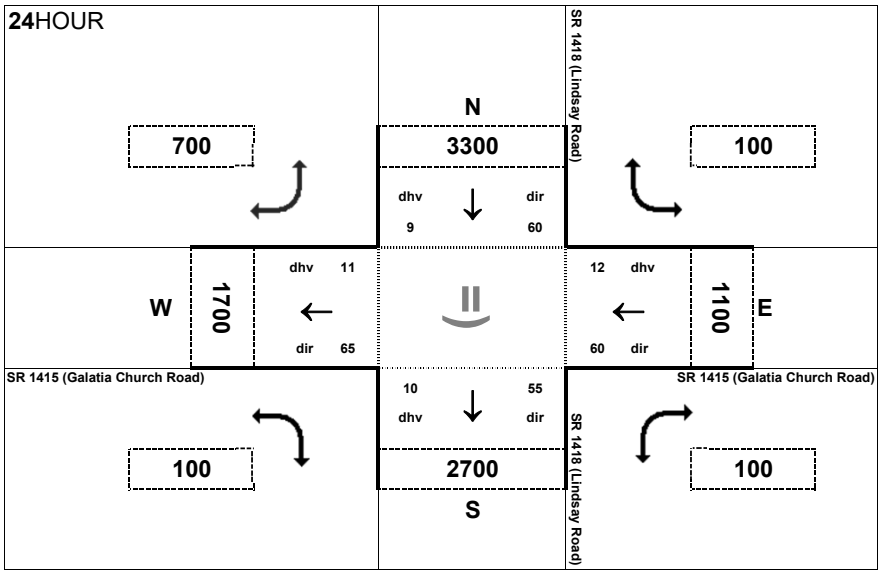

*PM peak hour inflow is 612 vehicles. PM peak hour outflow is 612 vehicles.*

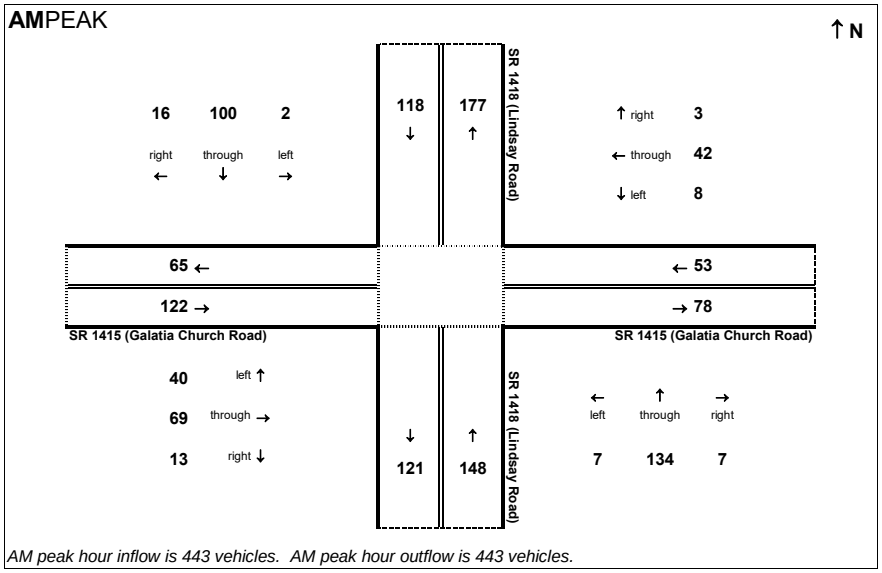
**Peak Hour Volume Breakouts Report:**
Intersection of SR 1418 (Lindsay Road) and SR 1417 (Adcox Road)

**Traffic Forecast Release Date:**
April-17

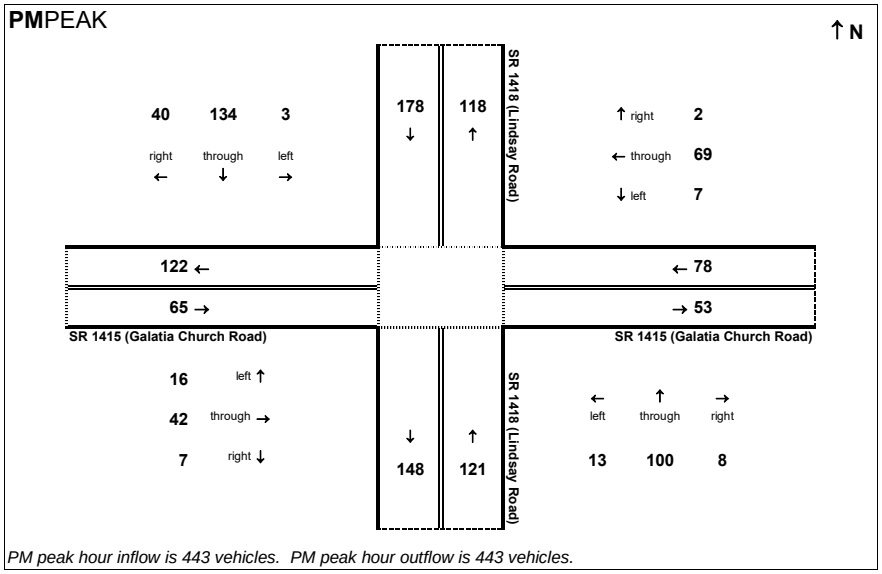
**Traffic Data Year:**
2017 No Build

**Project:**
U-5858




*AM peak hour inflow is 443 vehicles. AM peak hour outflow is 443 vehicles.*



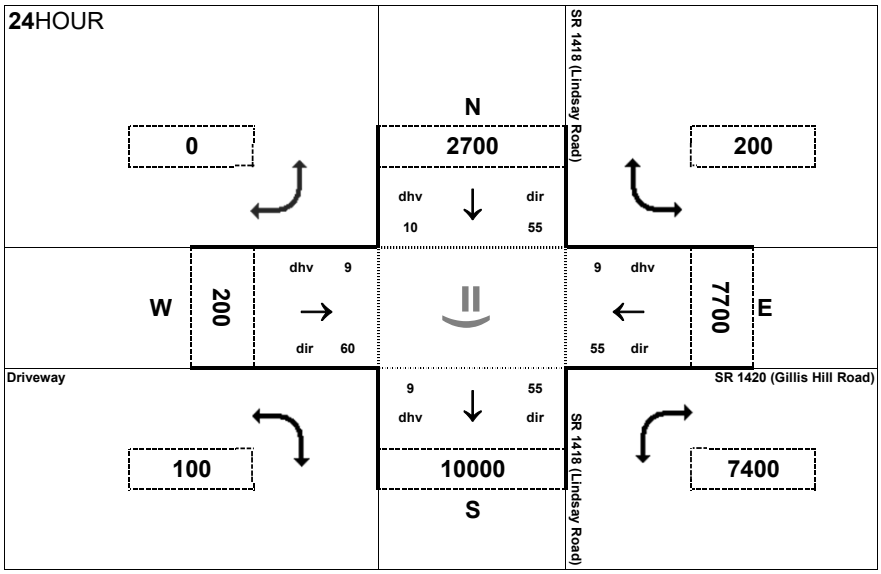

*PM peak hour inflow is 443 vehicles. PM peak hour outflow is 443 vehicles.*

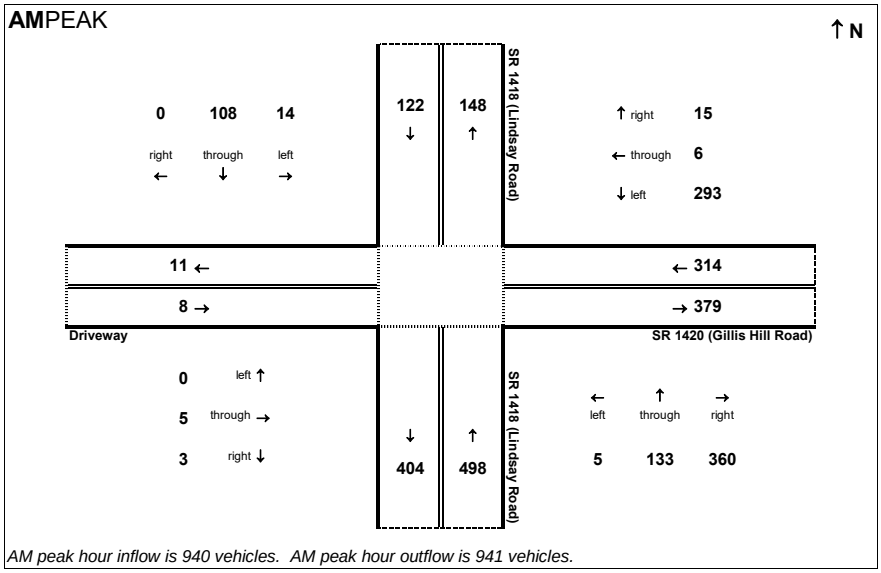
**Peak Hour Volume Breakouts Report:**
Intersection of SR 1418 (Lindsay Road) and SR 1415 (Galatia Church Road)

**Traffic Forecast Release Date:**
April-17

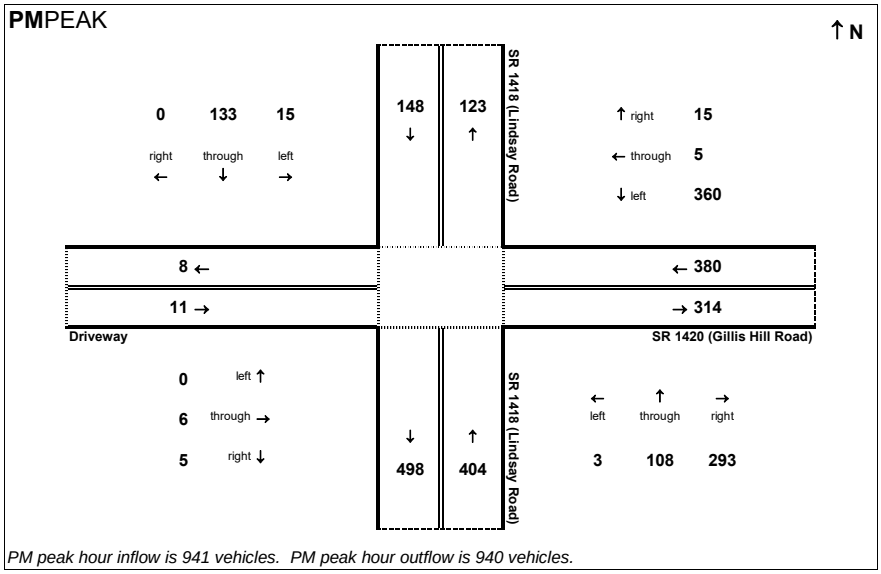
**Traffic Data Year:**
2017 No Build

**Project:**
U-5858




*AM peak hour inflow is 940 vehicles. AM peak hour outflow is 941 vehicles.*



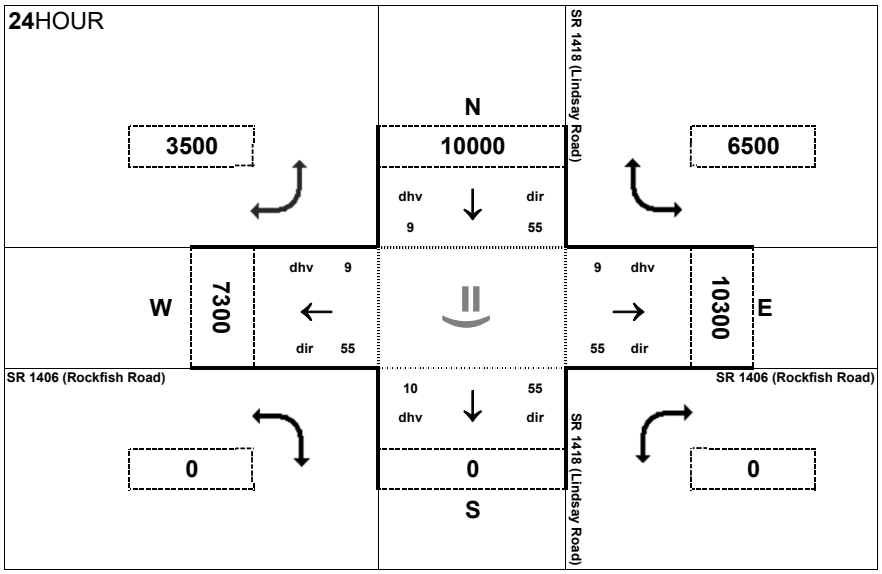

*PM peak hour inflow is 941 vehicles. PM peak hour outflow is 940 vehicles.*

**Peak Hour Volume Breakouts Report:**
Intersection of SR 1418 (Lindsay Road) and SR 1420 (Gillis Hill Road)

**Traffic Forecast Release Date:**
April-17

**Traffic Data Year:**
2017 No Build

**Project:**
U-5858

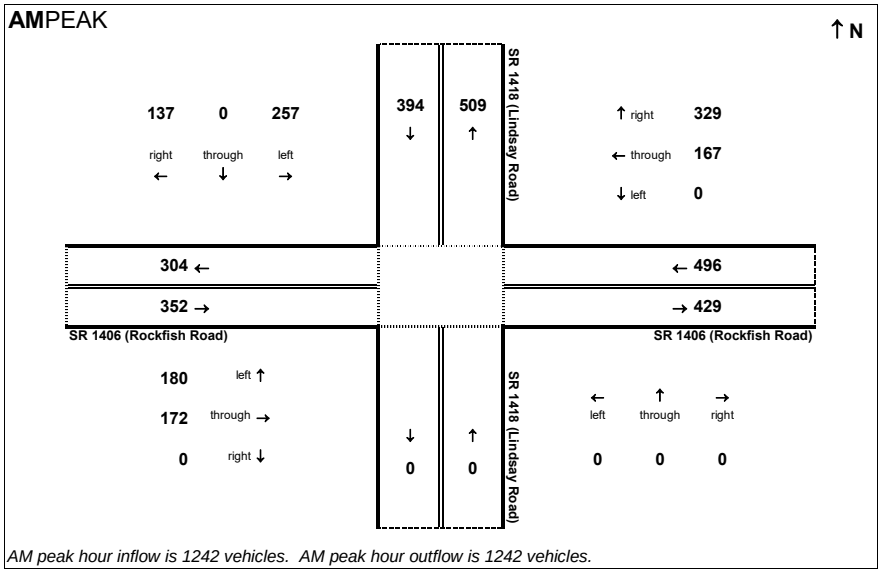



**Peak Hour Volume Breakouts Report:**
Intersection of SR 1418 (Lindsay Road) and SR 1415 (Galatia Church Road)

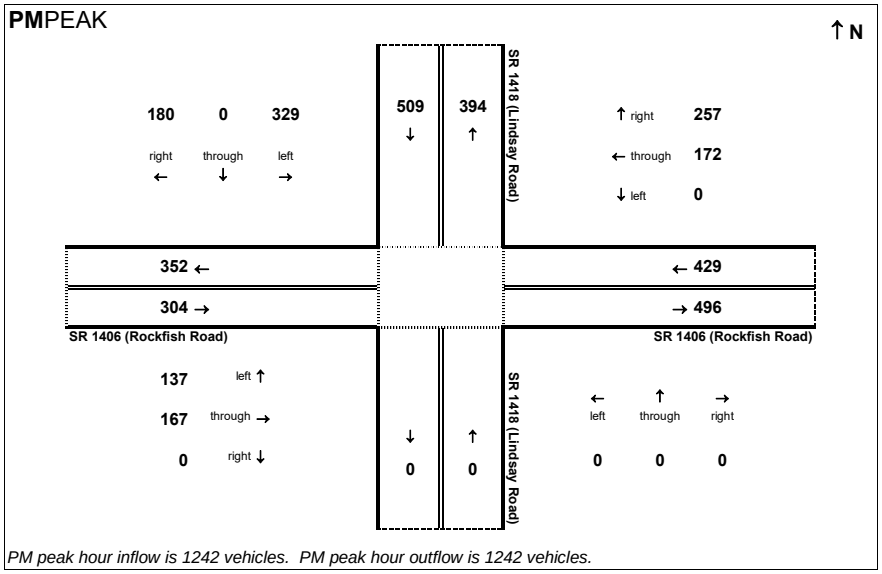
**Traffic Forecast Release Date:**
April-17

**Traffic Data Year:**
2017 No Build

**Project:**
U-5858




*AM peak hour inflow is 1242 vehicles. AM peak hour outflow is 1242 vehicles.*




*PM peak hour inflow is 1242 vehicles. PM peak hour outflow is 1242 vehicles.*

# 2017 Base Year No-Build

# Origin-Destination Matrices

# 2017 Base Year No-Build AM Peak O-D Matrix

| | 1 | 3 | 5 | 6 | 8 | 9 | 10 | 11 | 13 | 14 | 16 | 17 | 20 | 21 | 23 | 36 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 596 | 0 | 35 | 7 | 3 | 0 | 137 | 20 | 13 | 2 | 0 | 0 | 1 | 5 | 3 | 822 |
| 3 | 73 | 0 | 0 | 13 | 3 | 1 | 0 | 46 | 7 | 4 | 1 | 0 | 0 | 0 | 2 | 1 | 151 |
| 4 | 0 | 0 | 0 | 32 | 6 | 3 | 0 | 126 | 19 | 12 | 1 | 0 | 0 | 1 | 5 | 3 | 208 |
| 6 | 49 | 136 | 21 | 0 | 3 | 2 | 0 | 57 | 9 | 6 | 1 | 0 | 0 | 0 | 2 | 1 | 287 |
| 8 | 11 | 30 | 5 | 4 | 0 | 39 | 0 | 779 | 113 | 75 | 9 | 1 | 0 | 4 | 29 | 16 | 1115 |
| 9 | 1 | 3 | 1 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 4 | 1 | 0 | 0 | 0 | 2 | 1 | 14 |
| 11 | 158 | 431 | 66 | 56 | 647 | 0 | 5 | 0 | 27 | 18 | 2 | 0 | 0 | 1 | 7 | 4 | 1422 |
| 13 | 26 | 70 | 11 | 10 | 105 | 0 | 2 | 34 | 0 | 18 | 3 | 0 | 0 | 1 | 6 | 4 | 290 |
| 14 | 17 | 48 | 8 | 6 | 71 | 0 | 1 | 23 | 20 | 0 | 2 | 0 | 0 | 1 | 5 | 3 | 205 |
| 16 | 4 | 10 | 1 | 1 | 14 | 0 | 0 | 5 | 5 | 3 | 0 | 70 | 0 | 1 | 5 | 3 | 122 |
| 17 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 40 | 0 | 0 | 1 | 4 | 2 | 52 |
| 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 3 | 2 | 9 |
| 21 | 1 | 2 | 0 | 0 | 3 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 5 | 0 | 190 | 107 | 311 |
| 23 | 8 | 18 | 3 | 2 | 28 | 0 | 1 | 9 | 8 | 6 | 3 | 4 | 4 | 240 | 0 | 158 | 492 |
| 36 | 4 | 10 | 2 | 1 | 15 | 0 | 0 | 5 | 4 | 3 | 2 | 2 | 2 | 130 | 168 | 0 | 348 |
| Total | 352 | 1355 | 118 | 160 | 910 | 48 | 9 | 1223 | 240 | 164 | 67 | 77 | 11 | 385 | 433 | 308 | 5860 |

# 2017 Base Year No-Build PM Peak O-D Matrix

| | 1 | 3 | 5 | 6 | 8 | 9 | 10 | 11 | 13 | 14 | 16 | 17 | 20 | 21 | 23 | 36 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 73 | 0 | 49 | 11 | 1 | 0 | 158 | 26 | 17 | 4 | 0 | 0 | 1 | 7 | 4 | 351 |
| 3 | 596 | 0 | 0 | 136 | 30 | 3 | 0 | 431 | 70 | 48 | 10 | 1 | 0 | 2 | 18 | 10 | 1355 |
| 4 | 0 | 0 | 0 | 21 | 5 | 1 | 0 | 66 | 11 | 8 | 1 | 0 | 0 | 0 | 3 | 2 | 118 |
| 6 | 35 | 13 | 32 | 0 | 4 | 0 | 0 | 56 | 10 | 6 | 1 | 0 | 0 | 0 | 2 | 1 | 160 |
| 8 | 7 | 3 | 6 | 3 | 0 | 7 | 0 | 647 | 105 | 71 | 14 | 1 | 0 | 3 | 28 | 15 | 910 |
| 9 | 3 | 1 | 3 | 2 | 39 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 48 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 5 |
| 11 | 136 | 46 | 126 | 57 | 779 | 0 | 6 | 0 | 34 | 23 | 5 | 1 | 0 | 1 | 9 | 5 | 1228 |
| 13 | 20 | 7 | 19 | 9 | 113 | 0 | 5 | 27 | 0 | 20 | 5 | 1 | 0 | 1 | 8 | 4 | 239 |
| 14 | 13 | 4 | 12 | 6 | 75 | 0 | 4 | 18 | 18 | 0 | 3 | 1 | 0 | 1 | 6 | 3 | 164 |
| 16 | 2 | 1 | 1 | 1 | 9 | 0 | 1 | 2 | 3 | 2 | 0 | 40 | 0 | 0 | 3 | 2 | 67 |
| 17 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 70 | 0 | 0 | 0 | 4 | 2 | 77 |
| 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 4 | 2 | 11 |
| 21 | 1 | 0 | 1 | 0 | 4 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 4 | 0 | 240 | 130 | 385 |
| 23 | 5 | 2 | 5 | 2 | 29 | 0 | 2 | 7 | 6 | 5 | 5 | 4 | 3 | 190 | 0 | 168 | 433 |
| 36 | 3 | 1 | 3 | 1 | 16 | 0 | 1 | 4 | 4 | 3 | 3 | 2 | 2 | 107 | 158 | 0 | 308 |
| Total | 821 | 151 | 208 | 287 | 1115 | 12 | 19 | 1417 | 291 | 205 | 122 | 52 | 9 | 311 | 491 | 348 | 5859 |

# 2040 Future Year No-Build

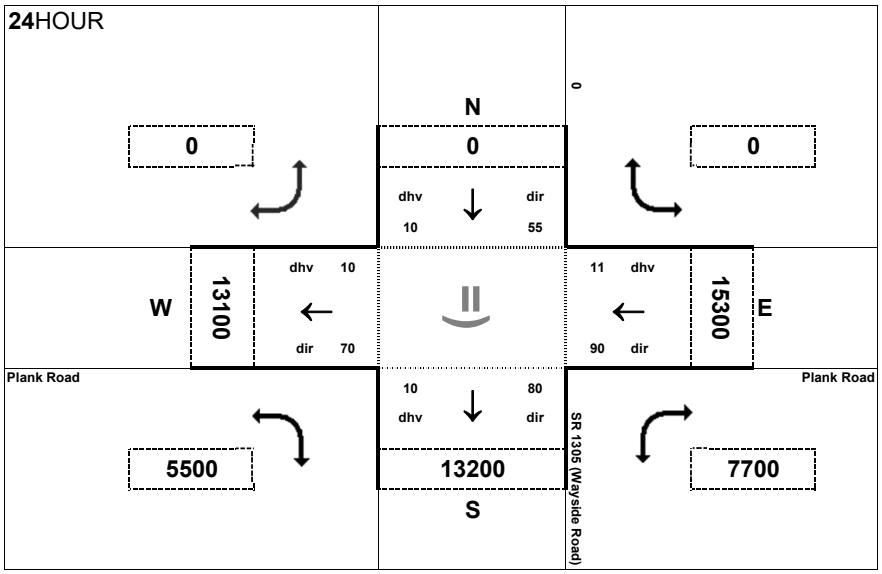
# Intersection Analysis Utility Output

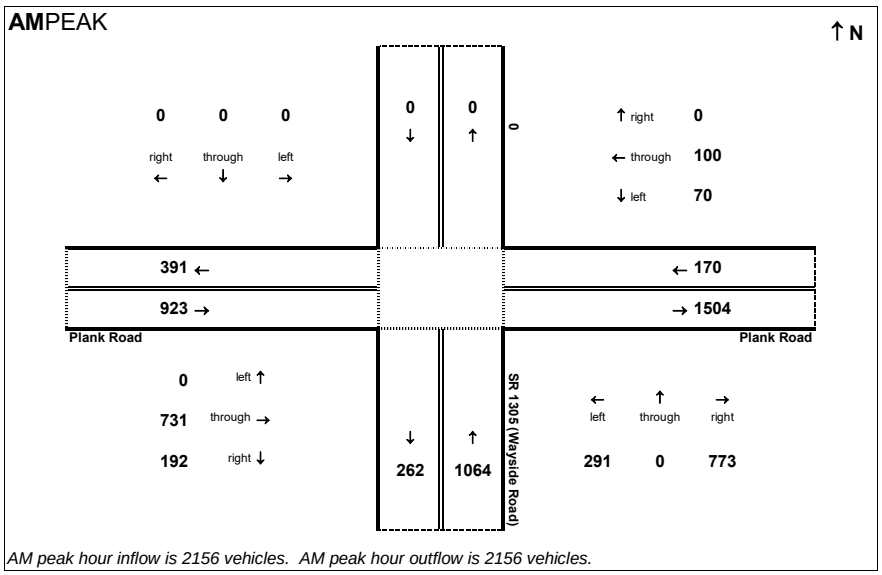
**Peak Hour Volume Breakouts Report:**
Intersection of SR 1305 (Wayside Road) and Plank Road

**Traffic Forecast Release Date:**
March-17

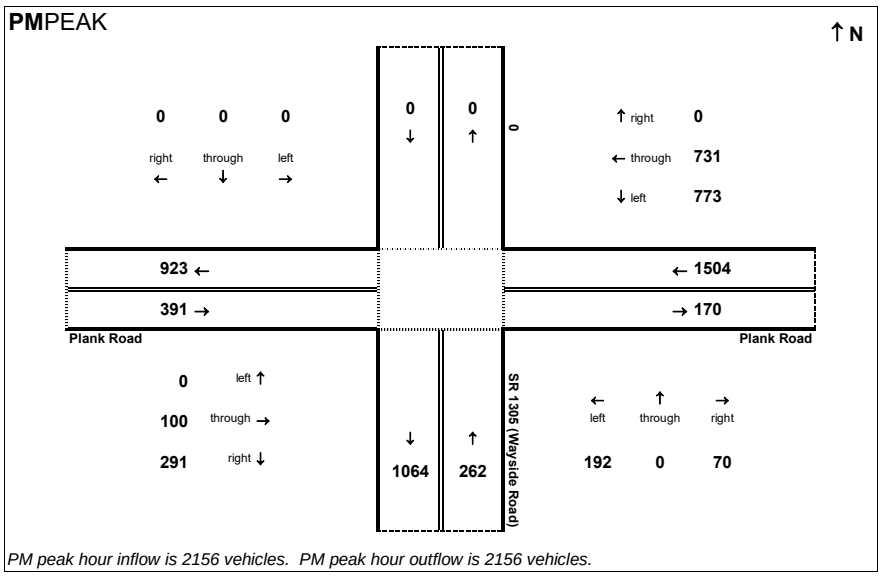
**Traffic Data Year:**
2040 No Build

**Project:**
U-5753

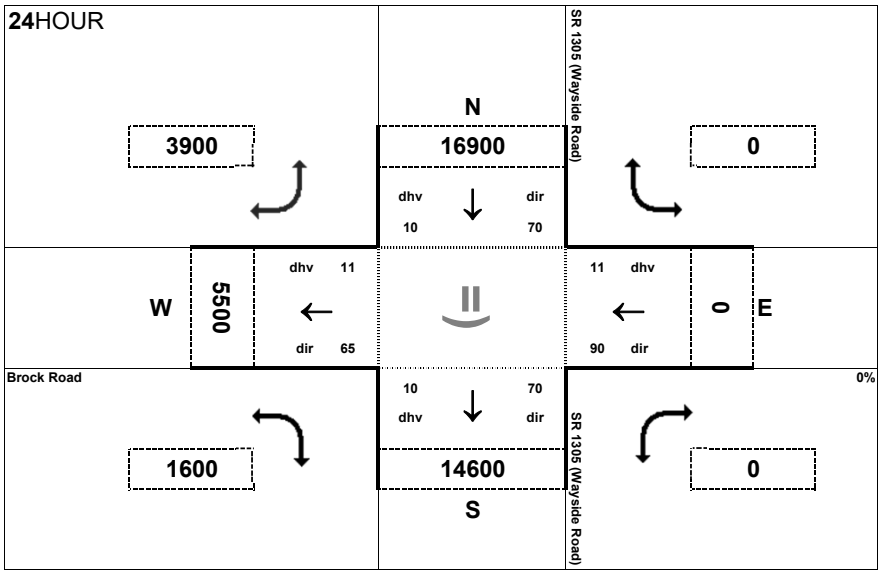


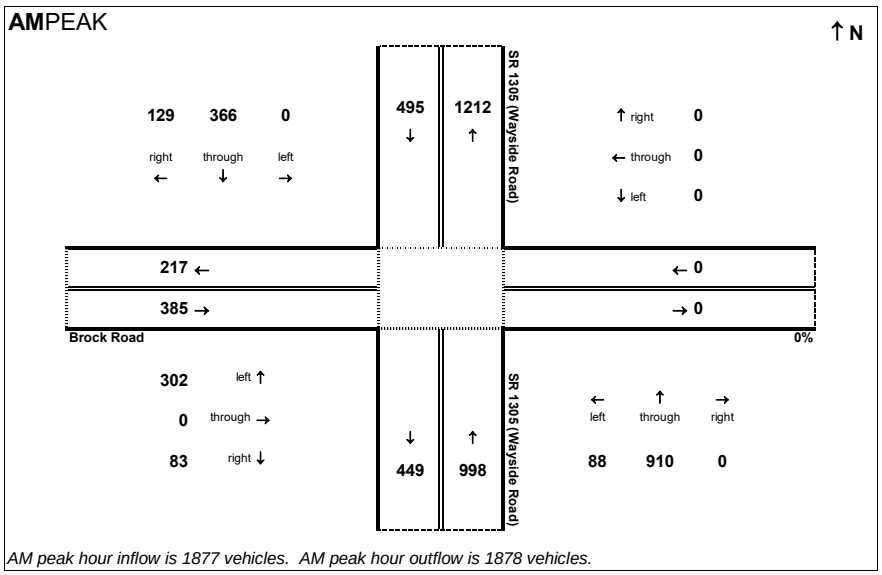




*AM peak hour inflow is 2156 vehicles. AM peak hour outflow is 2156 vehicles.*

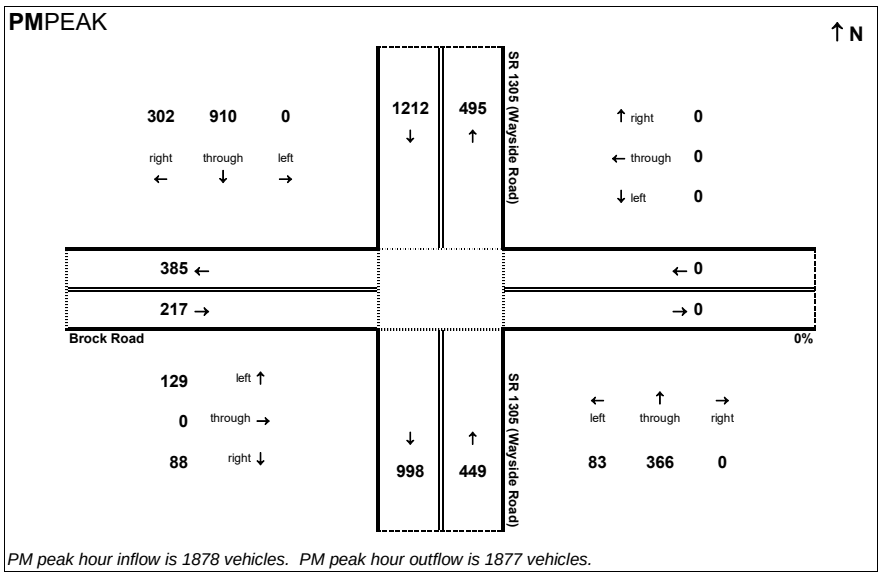



*PM peak hour inflow is 2156 vehicles. PM peak hour outflow is 2156 vehicles.*




*AM peak hour inflow is 1877 vehicles. AM peak hour outflow is 1878 vehicles.*



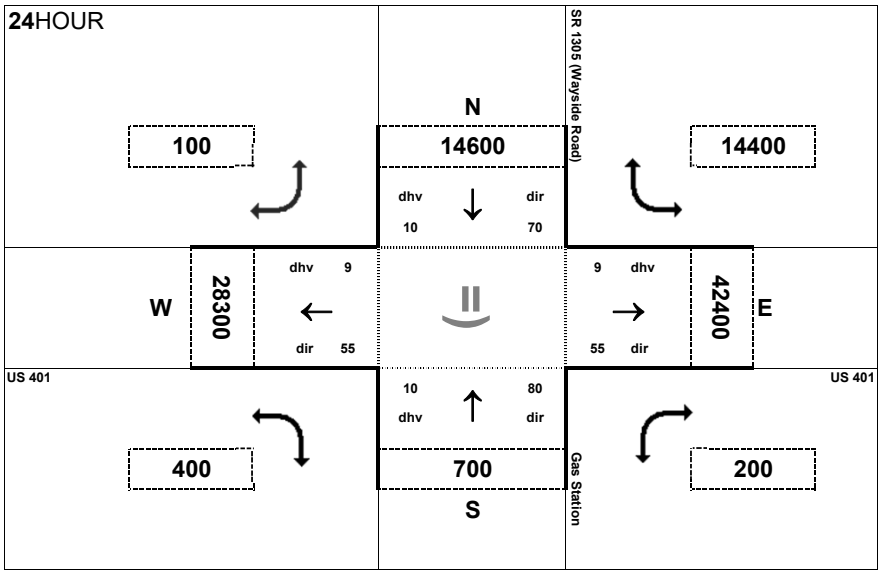

*PM peak hour inflow is 1878 vehicles. PM peak hour outflow is 1877 vehicles.*

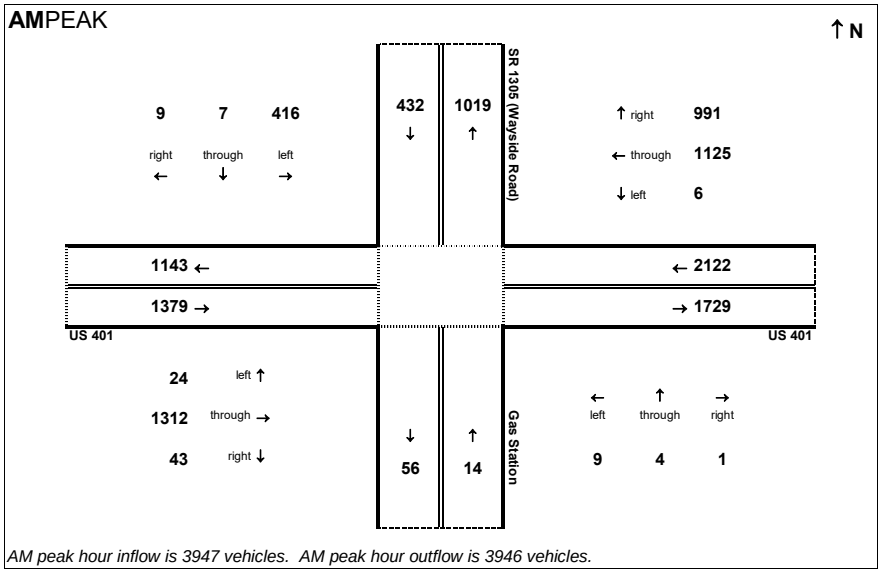
**Peak Hour Volume Breakouts Report:**
Intersection of SR 1305 (Wayside Road) and Brock Road

**Traffic Forecast Release Date:**
March-17

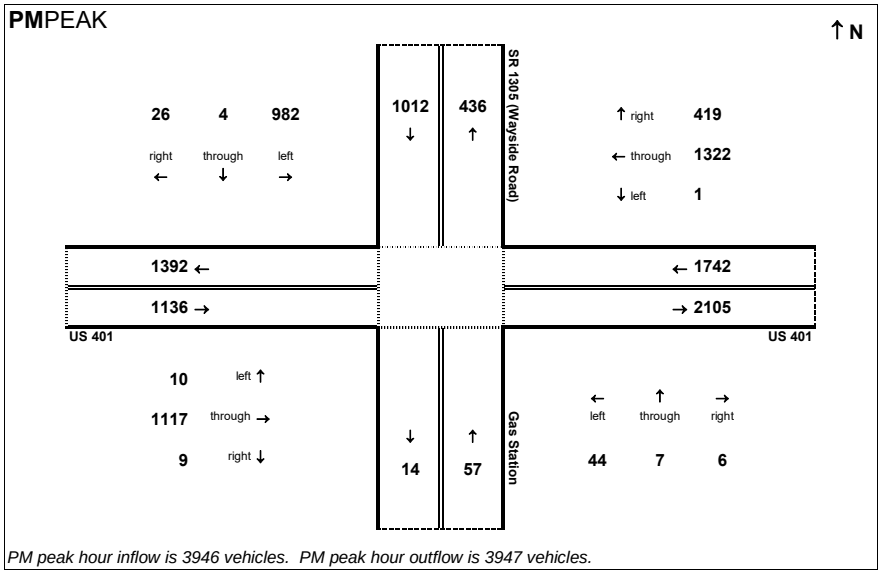
**Traffic Data Year:**
2040 No Build

**Project:**
U-5753




*AM peak hour inflow is 3947 vehicles. AM peak hour outflow is 3946 vehicles.*




*PM peak hour inflow is 3946 vehicles. PM peak hour outflow is 3947 vehicles.*

**Peak Hour Volume Breakouts Report:**
Intersection of SR 1305 (Wayside Road) and US 401

**Traffic Forecast Release Date:**
March-17

**Traffic Data Year:**
2040 No Build

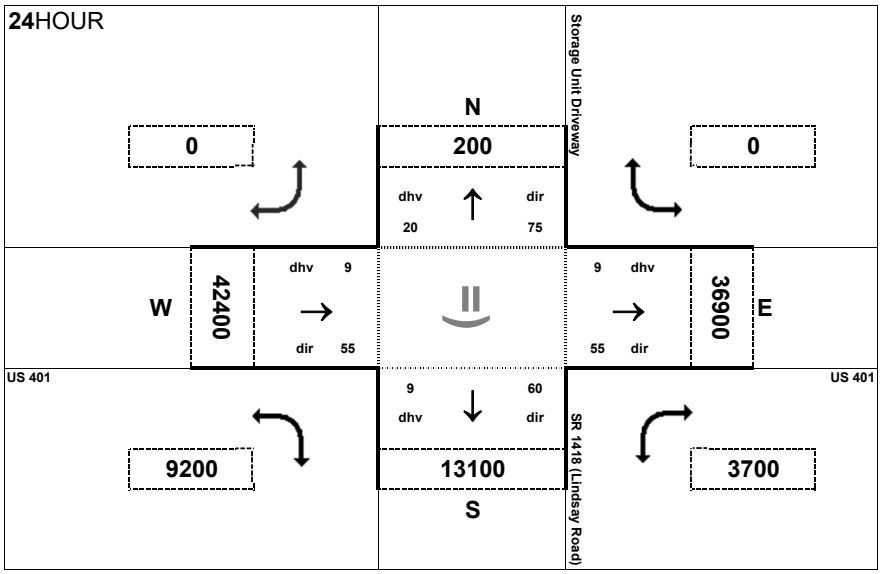
**Project:**
U-5753

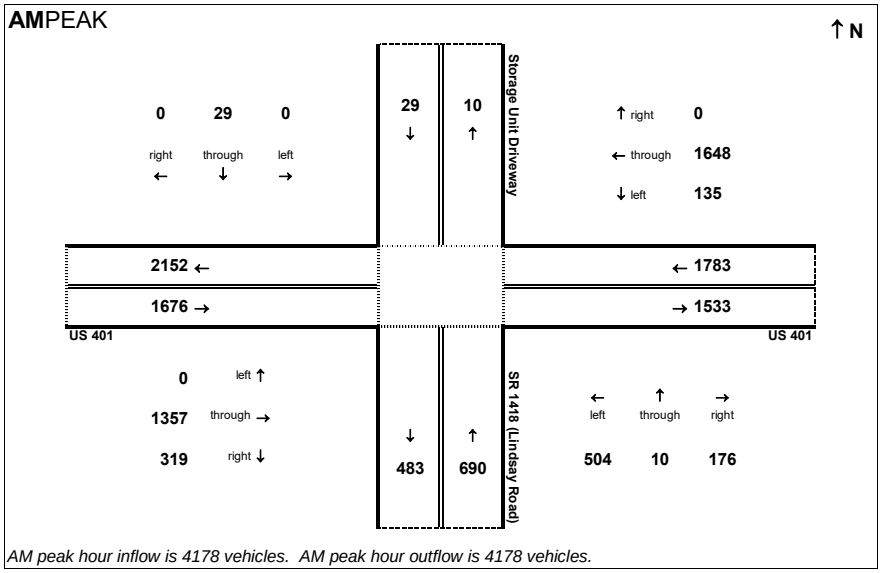
**Peak Hour Volume Breakouts Report:**
Intersection of SR 1418 (Lindsay Road) and US 401

**Traffic Forecast Release Date:**
April-17

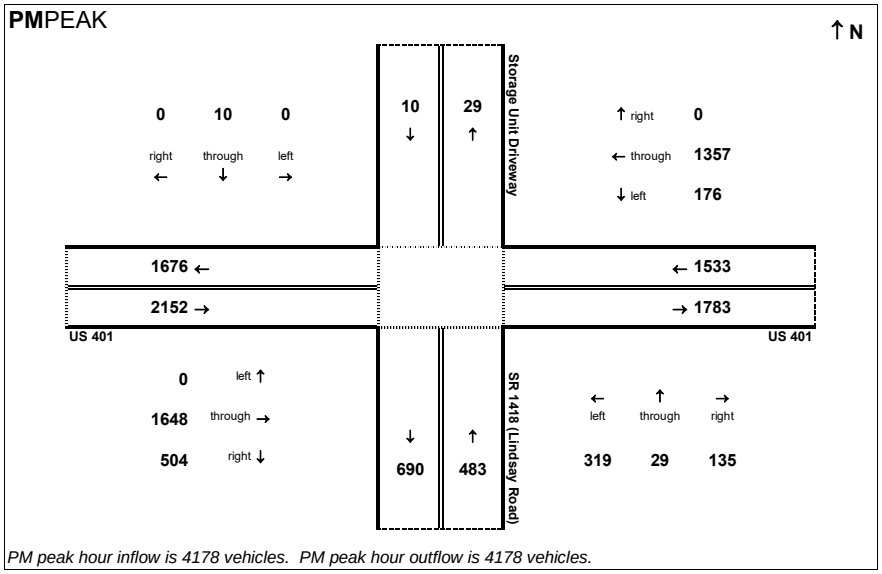
**Traffic Data Year:**
2040 No Build

**Project:**
U-5858

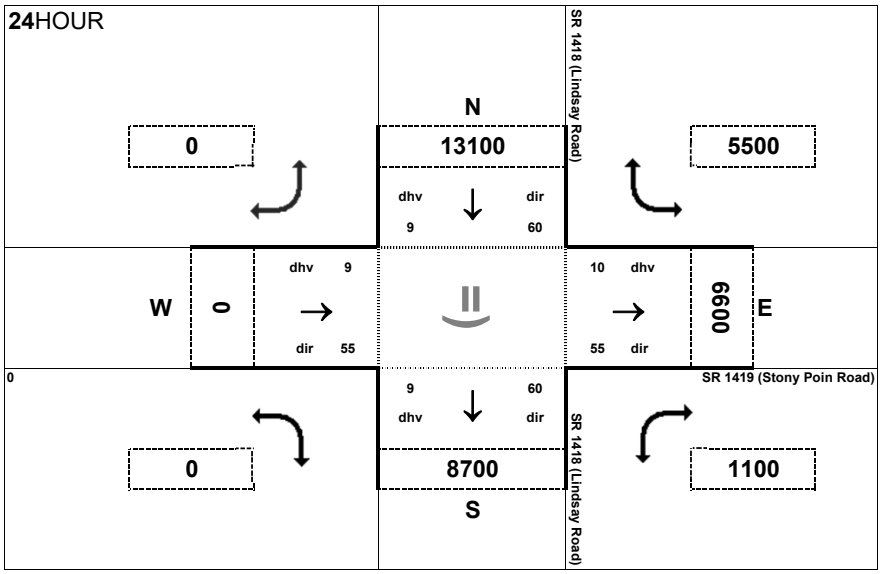


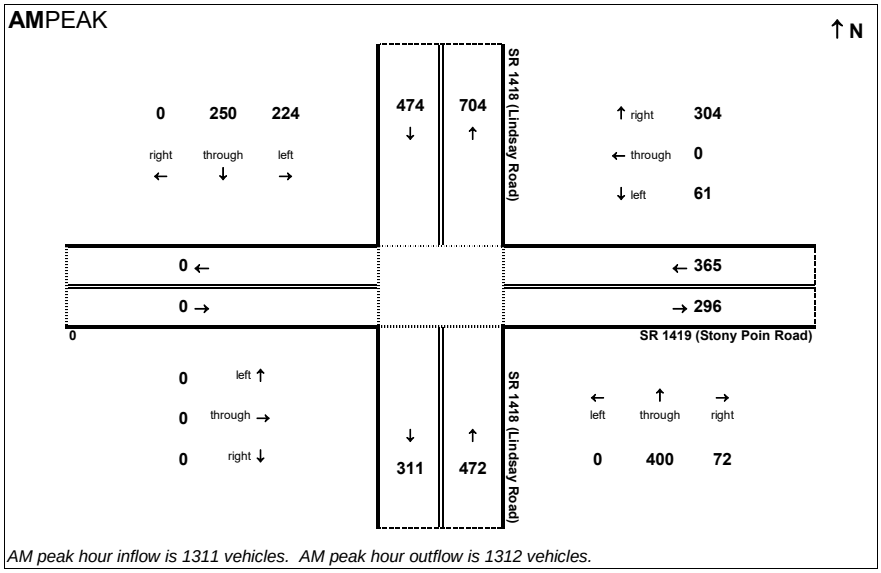




*AM peak hour inflow is 4178 vehicles. AM peak hour outflow is 4178 vehicles.*

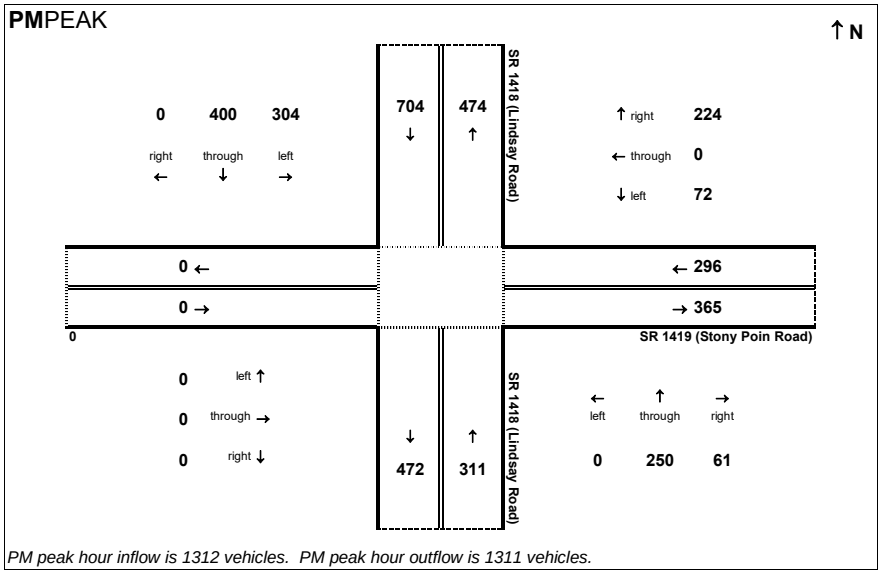



*PM peak hour inflow is 4178 vehicles. PM peak hour outflow is 4178 vehicles.*




*AM peak hour inflow is 1311 vehicles. AM peak hour outflow is 1312 vehicles.*



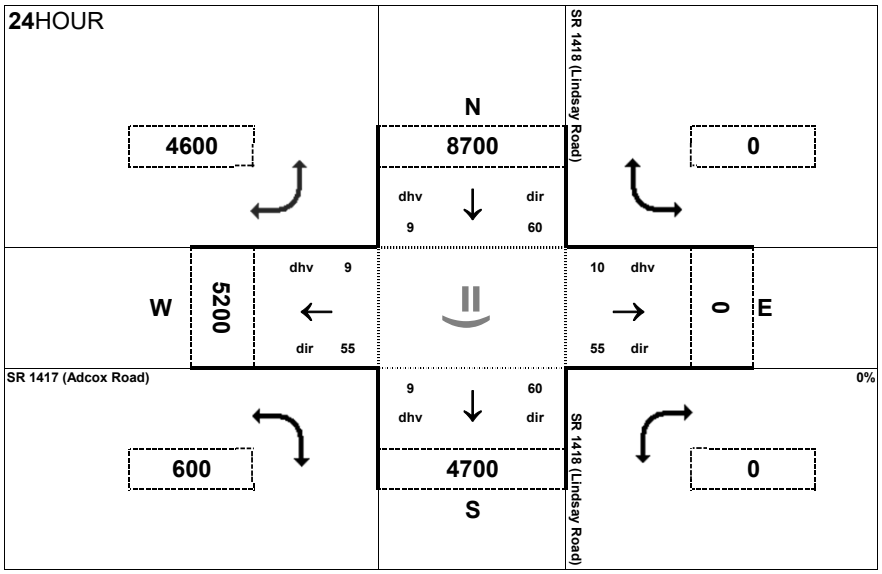

*PM peak hour inflow is 1312 vehicles. PM peak hour outflow is 1311 vehicles.*

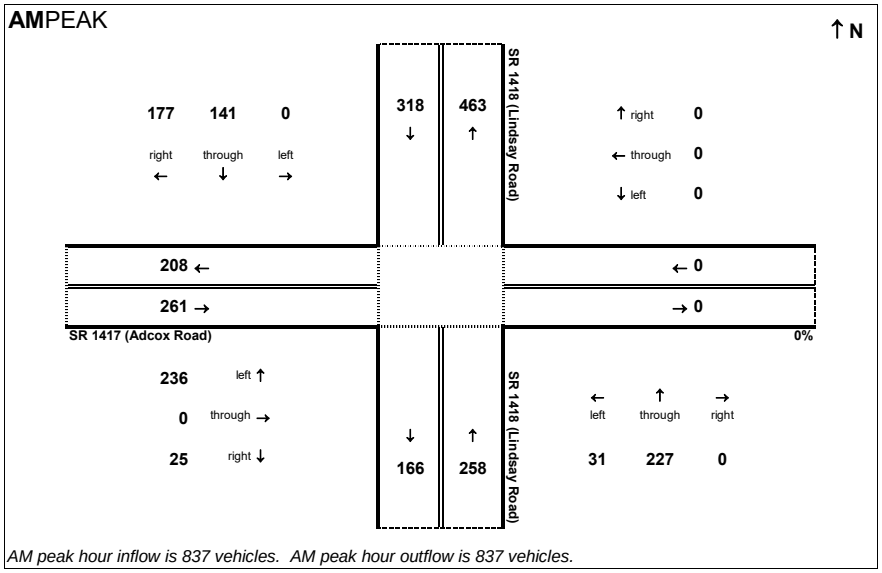
**Peak Hour Volume Breakouts Report:**
Intersection of SR 1418 (Lindsay Road) and SR 1419 (Stony Point Road)

**Traffic Forecast Release Date:**
April-17

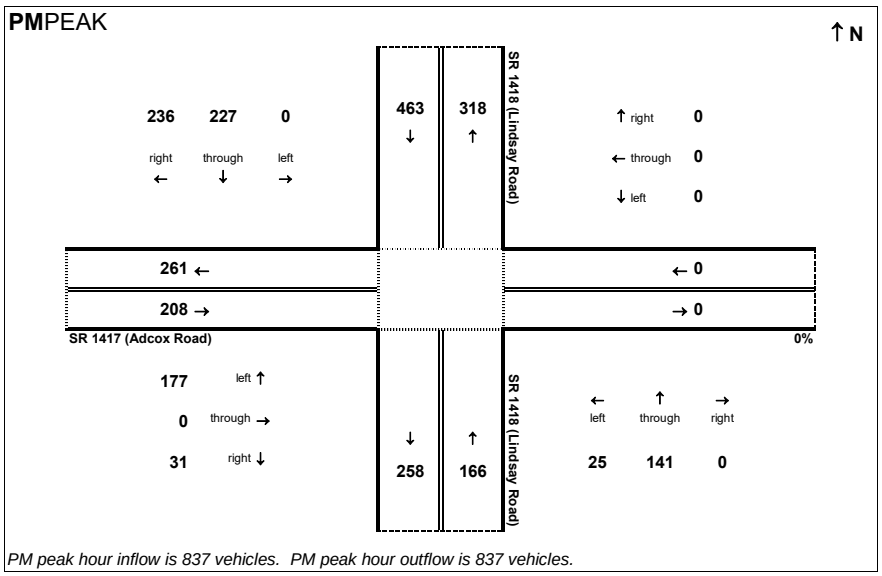
**Traffic Data Year:**
2040 No Build

**Project:**
U-5858




*AM peak hour inflow is 837 vehicles. AM peak hour outflow is 837 vehicles.*



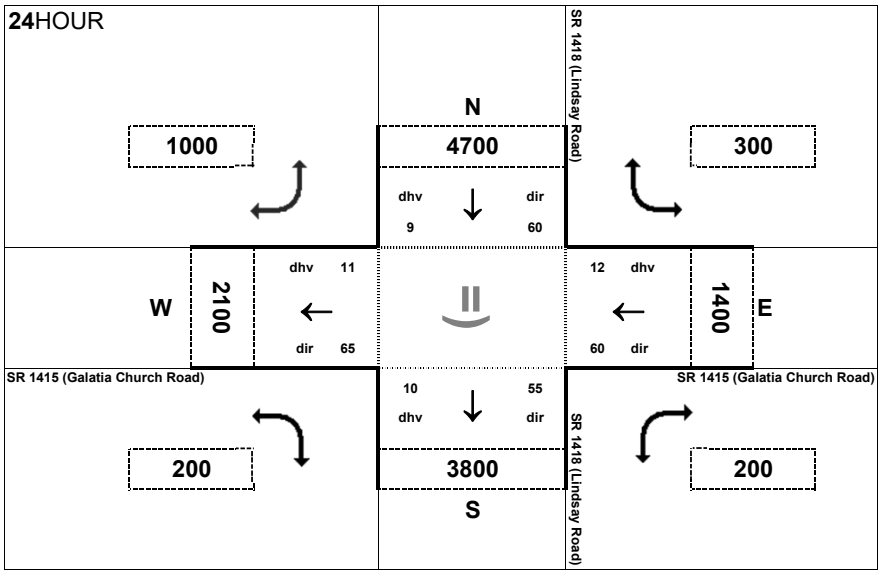

*PM peak hour inflow is 837 vehicles. PM peak hour outflow is 837 vehicles.*

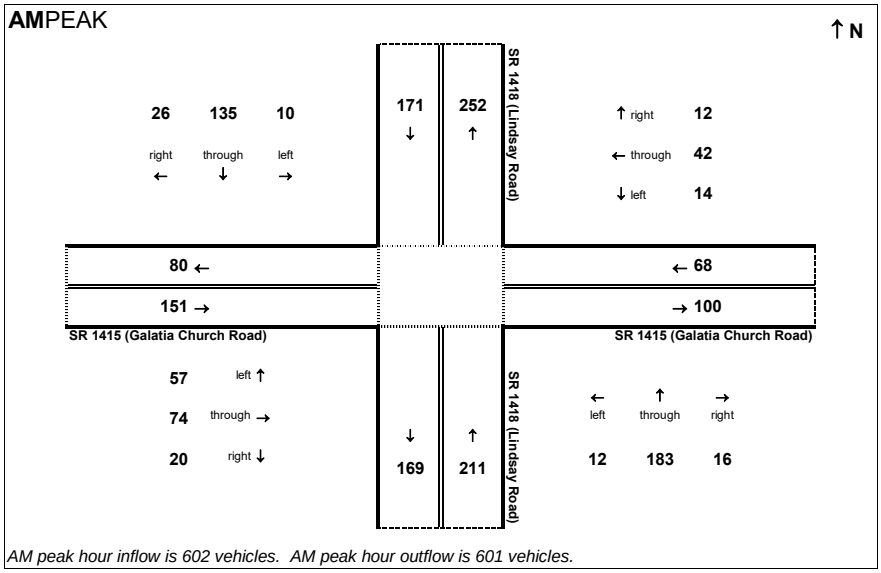
**Peak Hour Volume Breakouts Report:**
Intersection of SR 1418 (Lindsay Road) and SR 1417 (Adcox Road)

**Traffic Forecast Release Date:**
April-17

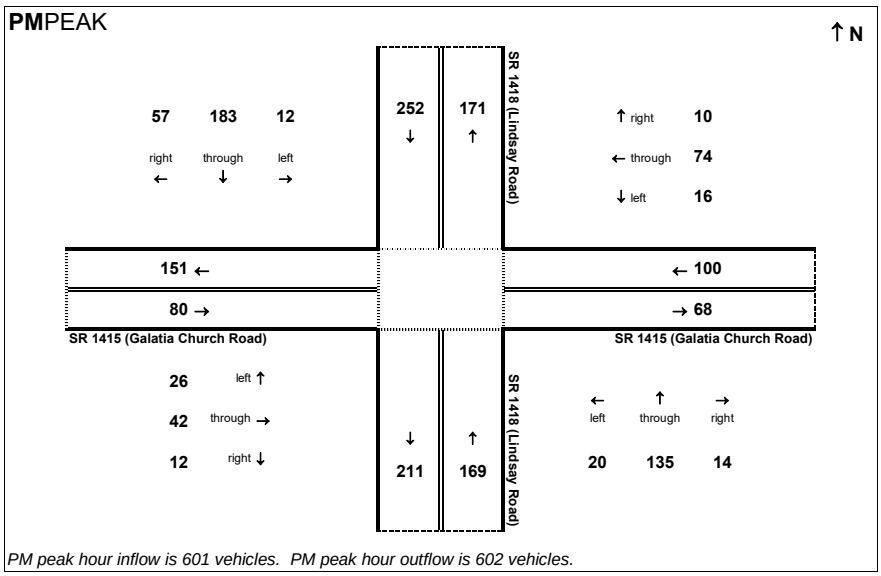
**Traffic Data Year:**
2040 No Build

**Project:**
U-5858




*AM peak hour inflow is 602 vehicles. AM peak hour outflow is 601 vehicles.*



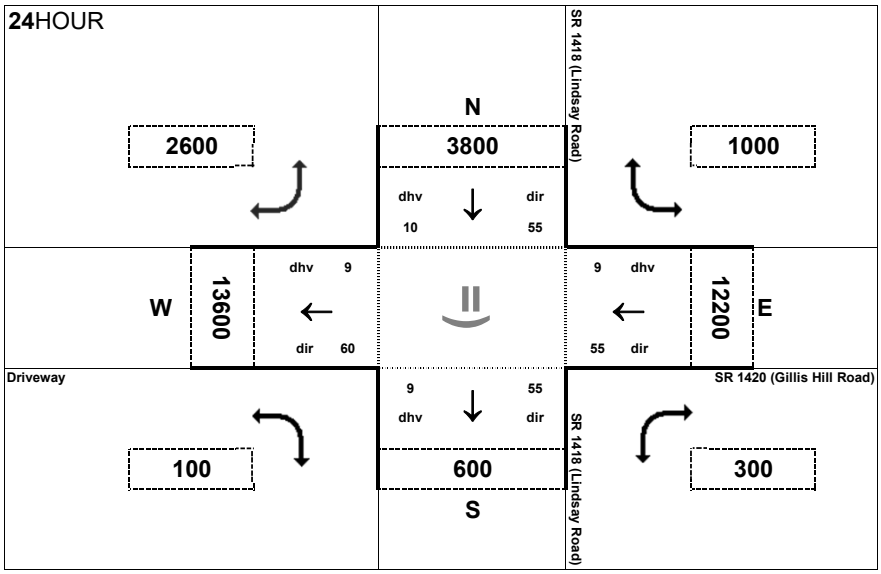

*PM peak hour inflow is 601 vehicles. PM peak hour outflow is 602 vehicles.*

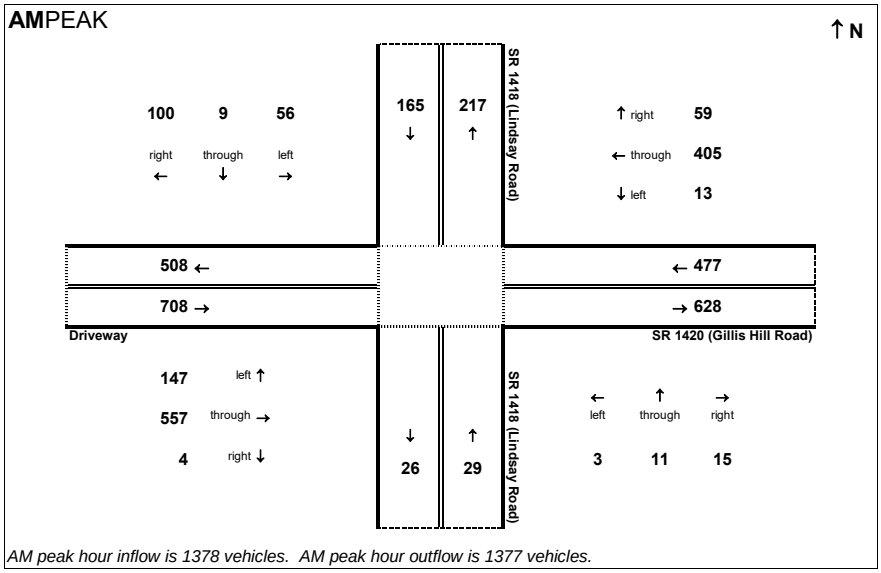
**Peak Hour Volume Breakouts Report:**
Intersection of SR 1418 (Lindsay Road) and SR 1415 (Galatia Church Road)

**Traffic Forecast Release Date:**
April-17

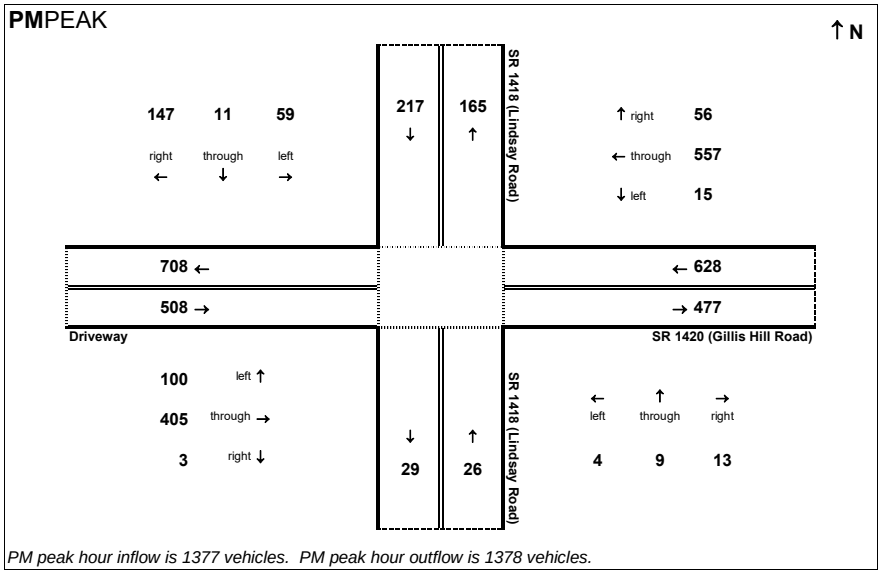
**Traffic Data Year:**
2040 No Build

**Project:**
U-5858




*AM peak hour inflow is 1378 vehicles. AM peak hour outflow is 1377 vehicles.*




*PM peak hour inflow is 1377 vehicles. PM peak hour outflow is 1378 vehicles.*

**Peak Hour Volume Breakouts Report:**
Intersection of SR 1418 (Lindsay Road) and SR 1420 (Gillis Hill Road)

**Traffic Forecast Release Date:**
April-17

**Traffic Data Year:**
2040 No Build

**Project:**
U-5858

# 2040 Future Year No-Build

# Origin-Destination Matrices

# 2040 Future Year No-Build AM Peak O-D Matrix

| | 1 | 3 | 5 | 6 | 8 | 9 | 10 | 11 | 13 | 14 | 16 | 17 | 20 | 21 | 22 | 23 | 36 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 662 | 0 | 42 | 2 | 2 | 0 | 155 | 23 | 15 | 2 | 1 | 1 | 3 | 2 | 2 | 3 | 915 |
| 3 | 82 | 0 | 0 | 14 | 1 | 1 | 0 | 53 | 8 | 5 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 169 |
| 4 | 0 | 0 | 0 | 38 | 2 | 2 | 0 | 142 | 20 | 14 | 2 | 1 | 1 | 3 | 2 | 2 | 3 | 232 |
| 6 | 61 | 165 | 29 | 0 | 1 | 1 | 0 | 91 | 14 | 10 | 1 | 0 | 0 | 2 | 1 | 1 | 2 | 379 |
| 8 | 3 | 9 | 1 | 2 | 0 | 43 | 0 | 980 | 142 | 97 | 14 | 7 | 4 | 21 | 10 | 14 | 18 | 1365 |
| 9 | 1 | 2 | 0 | 0 | 10 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 8 | 1 | 2 | 0 | 2 | 1 | 1 | 2 | 28 |
| 11 | 179 | 492 | 85 | 89 | 821 | 5 | 0 | 0 | 40 | 28 | 4 | 2 | 1 | 6 | 3 | 4 | 5 | 1764 |
| 13 | 29 | 80 | 14 | 15 | 133 | 1 | 4 | 52 | 0 | 17 | 3 | 1 | 1 | 4 | 2 | 3 | 3 | 362 |
| 14 | 21 | 55 | 10 | 10 | 92 | 1 | 2 | 36 | 20 | 0 | 2 | 1 | 0 | 2 | 1 | 2 | 2 | 257 |
| 16 | 5 | 13 | 2 | 2 | 22 | 0 | 1 | 9 | 5 | 3 | 0 | 72 | 1 | 5 | 2 | 3 | 4 | 149 |
| 17 | 1 | 3 | 1 | 0 | 6 | 0 | 0 | 2 | 1 | 1 | 40 | 0 | 1 | 4 | 2 | 3 | 3 | 68 |
| 20 | 1 | 2 | 0 | 0 | 3 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 15 | 1 | 1 | 1 | 28 |
| 21 | 6 | 10 | 2 | 2 | 16 | 0 | 1 | 7 | 4 | 3 | 2 | 4 | 13 | 0 | 104 | 143 | 161 | 478 |
| 22 | 5 | 9 | 2 | 2 | 14 | 0 | 0 | 6 | 3 | 2 | 2 | 3 | 1 | 181 | 0 | 300 | 33 | 563 |
| 23 | 6 | 9 | 2 | 2 | 15 | 0 | 0 | 6 | 3 | 2 | 2 | 3 | 1 | 188 | 227 | 0 | 38 | 504 |
| 36 | 6 | 9 | 2 | 2 | 15 | 0 | 0 | 6 | 3 | 2 | 2 | 3 | 2 | 191 | 23 | 38 | 0 | 304 |
| Total | 406 | 1520 | 150 | 220 | 1153 | 56 | 8 | 1547 | 298 | 208 | 78 | 101 | 27 | 628 | 382 | 518 | 279 | 7579 |

# 2040 Future Year No-Build PM Peak O-D Matrix

| | 1 | 3 | 5 | 6 | 8 | 9 | 10 | 11 | 13 | 14 | 16 | 17 | 20 | 21 | 22 | 23 | 36 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 82 | 0 | 61 | 4 | 1 | 0 | 179 | 29 | 21 | 5 | 1 | 1 | 4 | 3 | 4 | 3 | 398 |
| 3 | 662 | 0 | 0 | 166 | 9 | 2 | 0 | 493 | 80 | 55 | 13 | 3 | 2 | 11 | 9 | 10 | 7 | 1522 |
| 4 | 0 | 0 | 0 | 29 | 1 | 0 | 0 | 86 | 14 | 10 | 2 | 1 | 0 | 2 | 2 | 2 | 1 | 150 |
| 6 | 41 | 14 | 39 | 0 | 2 | 0 | 0 | 89 | 15 | 10 | 2 | 0 | 0 | 2 | 2 | 2 | 2 | 220 |
| 8 | 2 | 1 | 2 | 1 | 0 | 10 | 0 | 818 | 132 | 92 | 22 | 5 | 3 | 18 | 16 | 16 | 12 | 1150 |
| 9 | 2 | 1 | 2 | 1 | 44 | 0 | 0 | 5 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 9 |
| 11 | 154 | 53 | 141 | 91 | 985 | 1 | 0 | 0 | 53 | 36 | 9 | 2 | 1 | 7 | 6 | 7 | 5 | 1551 |
| 13 | 22 | 8 | 20 | 14 | 143 | 0 | 11 | 40 | 0 | 20 | 5 | 1 | 1 | 4 | 3 | 4 | 3 | 299 |
| 14 | 15 | 5 | 14 | 10 | 98 | 0 | 8 | 28 | 17 | 0 | 3 | 1 | 1 | 3 | 2 | 3 | 2 | 210 |
| 16 | 2 | 1 | 2 | 1 | 14 | 0 | 1 | 4 | 3 | 2 | 0 | 41 | 0 | 2 | 2 | 2 | 2 | 79 |
| 17 | 1 | 0 | 1 | 0 | 7 | 0 | 2 | 2 | 1 | 1 | 72 | 0 | 1 | 4 | 3 | 4 | 3 | 102 |
| 20 | 0 | 0 | 1 | 0 | 4 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 13 | 1 | 1 | 1 | 25 |
| 21 | 1 | 1 | 3 | 2 | 22 | 0 | 2 | 6 | 4 | 3 | 5 | 4 | 15 | 0 | 186 | 191 | 184 | 629 |
| 22 | 1 | 1 | 2 | 1 | 11 | 0 | 1 | 3 | 2 | 2 | 3 | 2 | 1 | 109 | 0 | 137 | 14 | 290 |
| 23 | 1 | 1 | 2 | 2 | 15 | 0 | 1 | 4 | 3 | 2 | 3 | 3 | 1 | 147 | 181 | 0 | 23 | 389 |
| 36 | 1 | 1 | 2 | 2 | 15 | 0 | 1 | 4 | 3 | 2 | 3 | 3 | 1 | 152 | 21 | 24 | 0 | 235 |
| Total | 905 | 169 | 231 | 381 | 1374 | 14 | 27 | 1762 | 362 | 259 | 149 | 68 | 28 | 479 | 437 | 408 | 262 | 7315 |

# 2040 Future Year Build

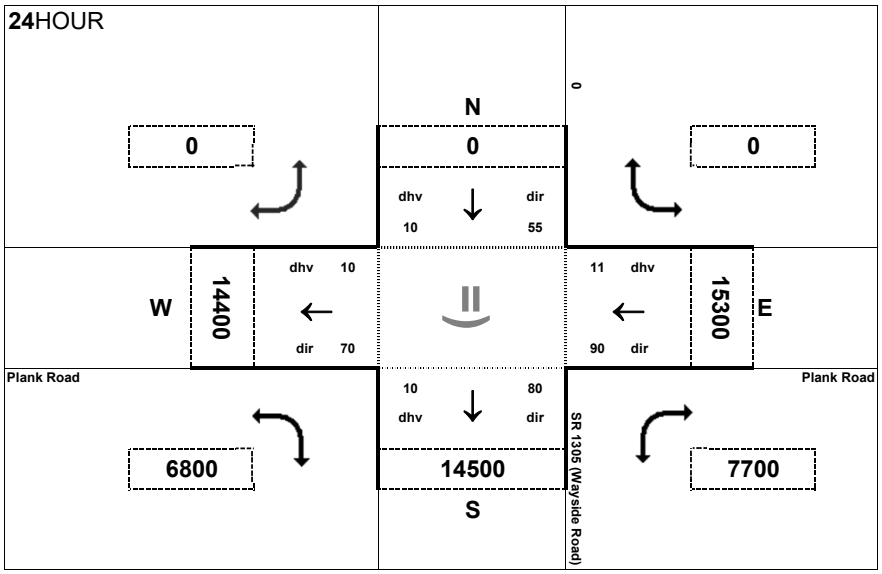
# Intersection Analysis Utility Output

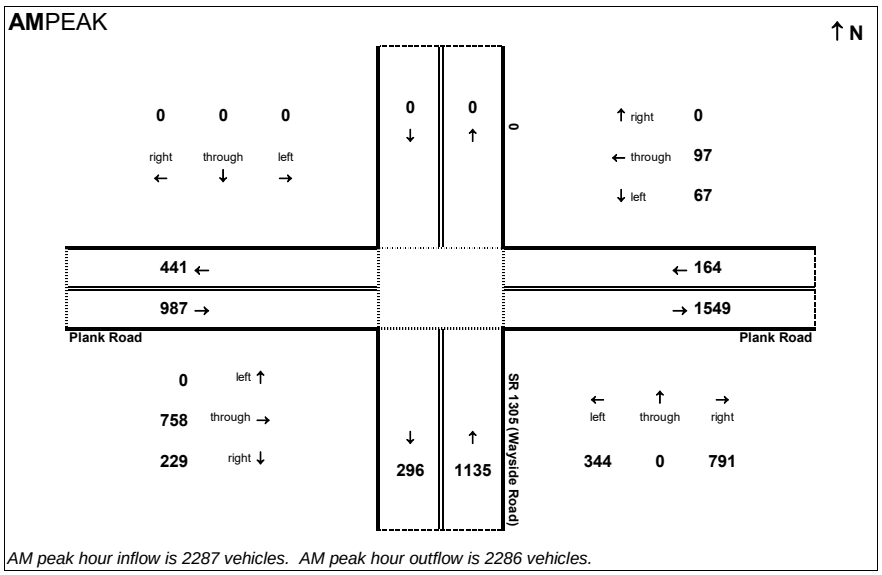
**Peak Hour Volume Breakouts Report:**
Intersection of SR 1305 (Wayside Road) and Plank Road

**Traffic Forecast Release Date:**
March-17

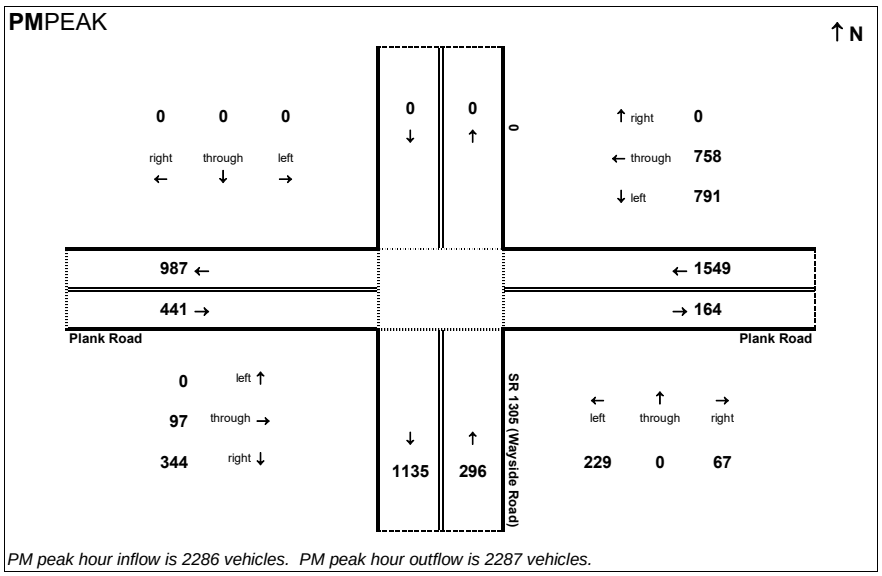
**Traffic Data Year:**
2040 Build

**Project:**
U-5753

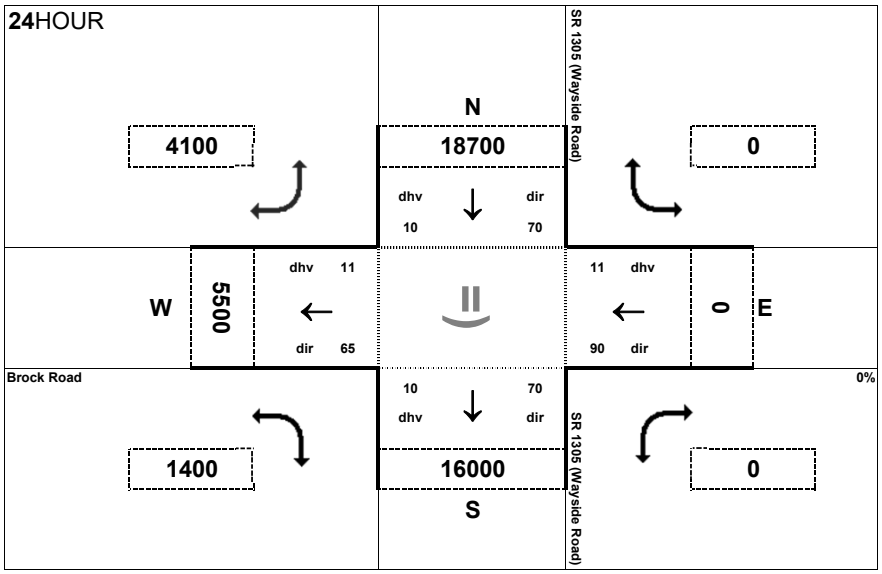


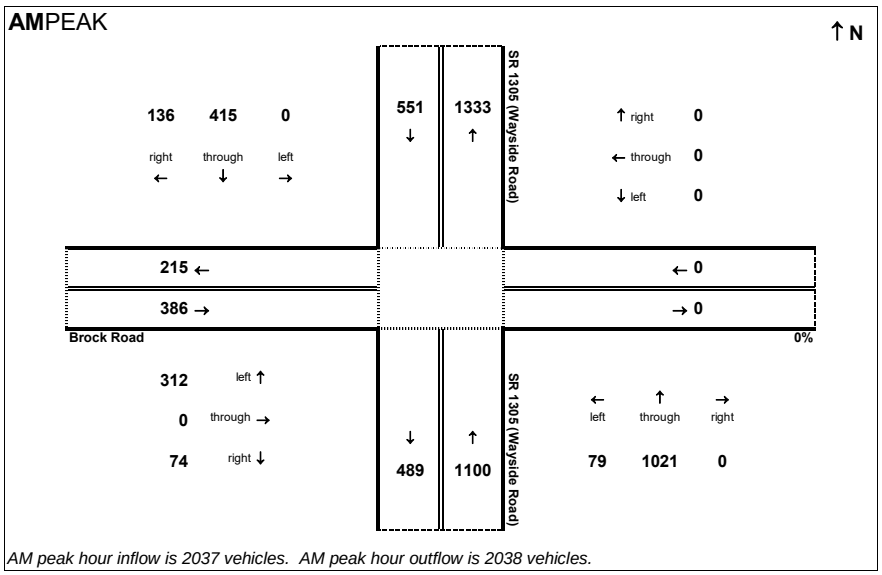




*AM peak hour inflow is 2287 vehicles. AM peak hour outflow is 2286 vehicles.*

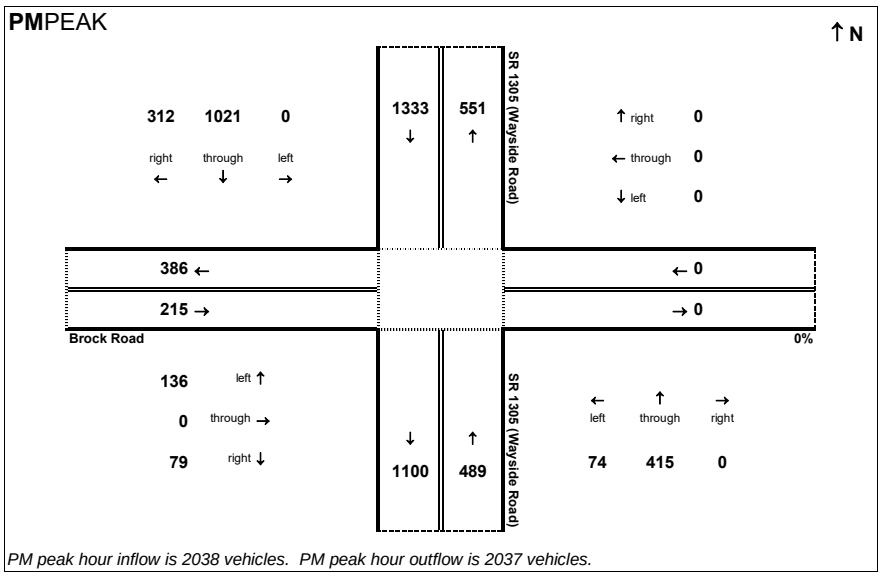



*PM peak hour inflow is 2286 vehicles. PM peak hour outflow is 2287 vehicles.*




*AM peak hour inflow is 2037 vehicles. AM peak hour outflow is 2038 vehicles.*



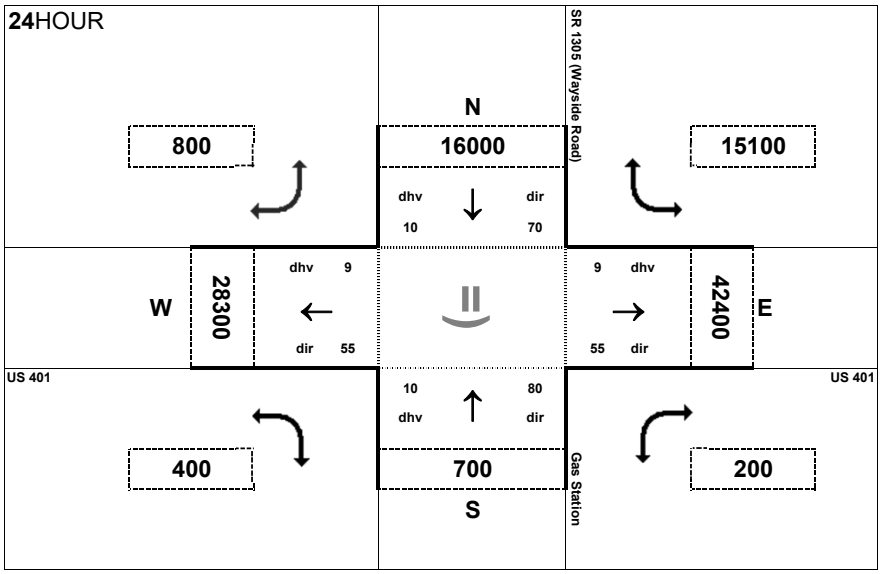

*PM peak hour inflow is 2038 vehicles. PM peak hour outflow is 2037 vehicles.*

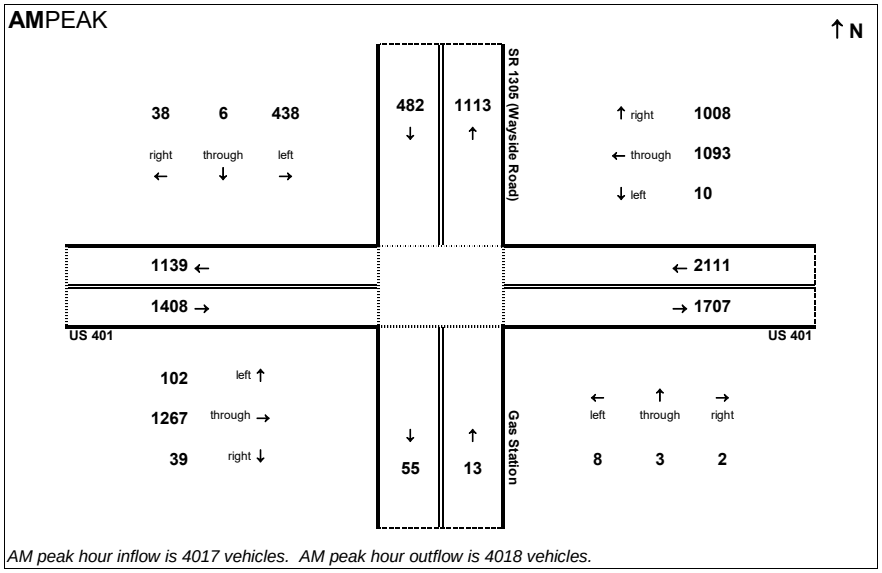
**Peak Hour Volume Breakouts Report:**
Intersection of SR 1305 (Wayside Road) and Brock Road

**Traffic Forecast Release Date:**
March-17

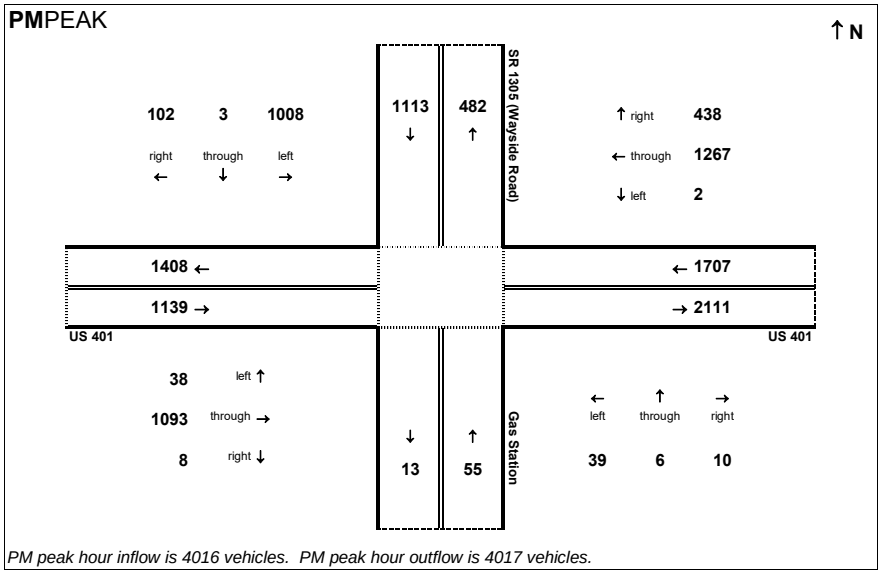
**Traffic Data Year:**
2040 Build

**Project:**
U-5753




*AM peak hour inflow is 4017 vehicles. AM peak hour outflow is 4018 vehicles.*



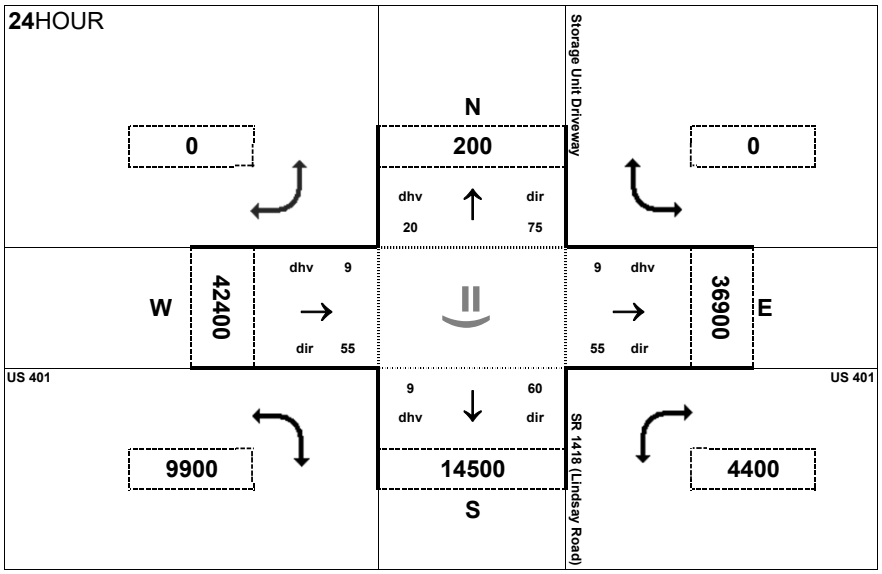

*PM peak hour inflow is 4016 vehicles. PM peak hour outflow is 4017 vehicles.*

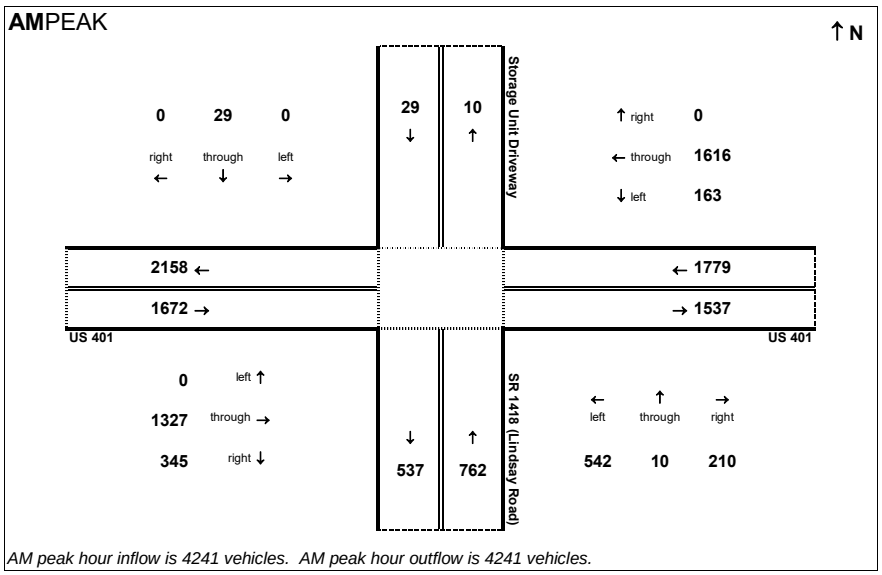
**Peak Hour Volume Breakouts Report:**
Intersection of SR 1305 (Wayside Road) and US 401

**Traffic Forecast Release Date:**
March-17

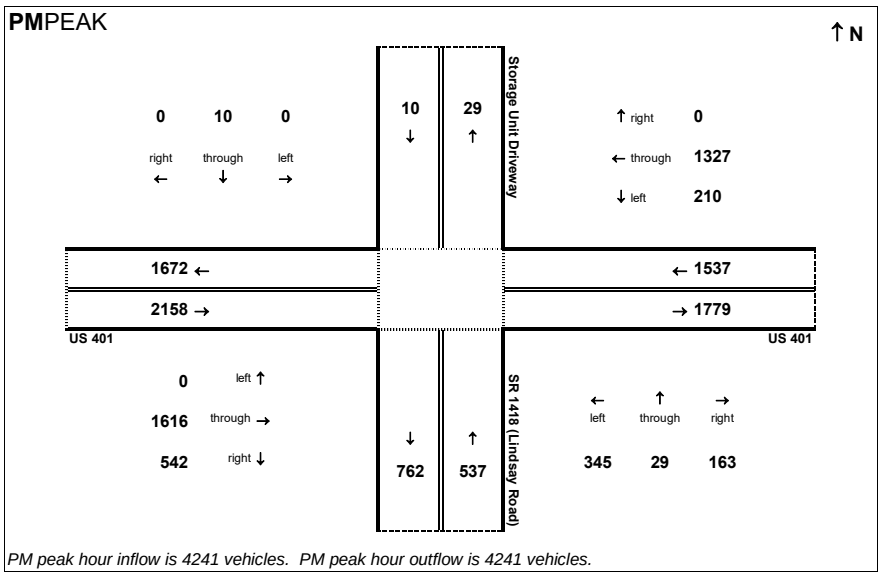
**Traffic Data Year:**
2040 Build

**Project:**
U-5753




*AM peak hour inflow is 4241 vehicles. AM peak hour outflow is 4241 vehicles.*



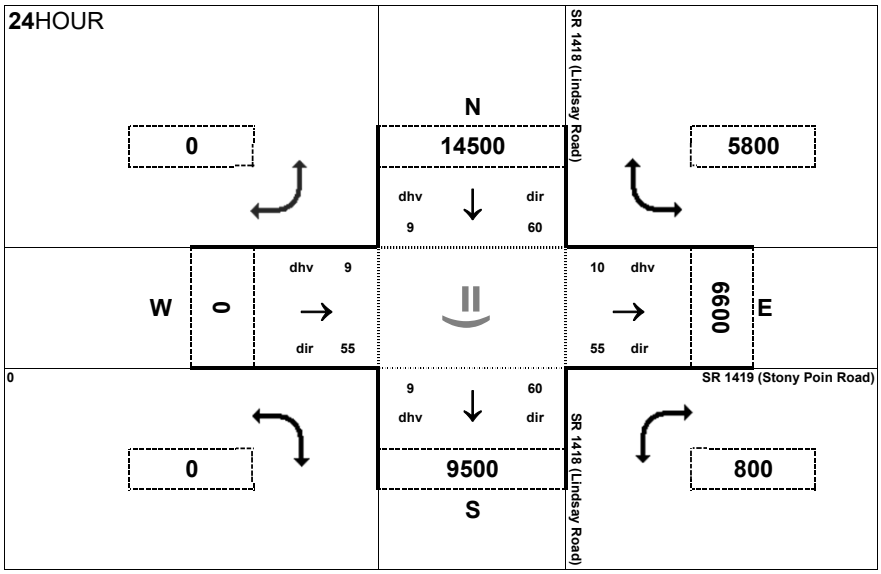

*PM peak hour inflow is 4241 vehicles. PM peak hour outflow is 4241 vehicles.*

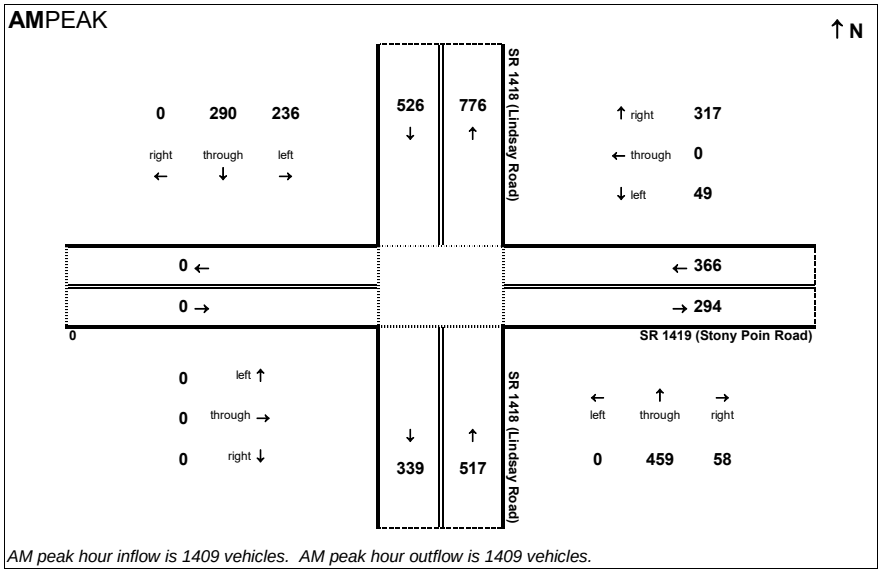
**Peak Hour Volume Breakouts Report:**
Intersection of SR 1418 (Lindsay Road) and US 401

**Traffic Forecast Release Date:**
April-17

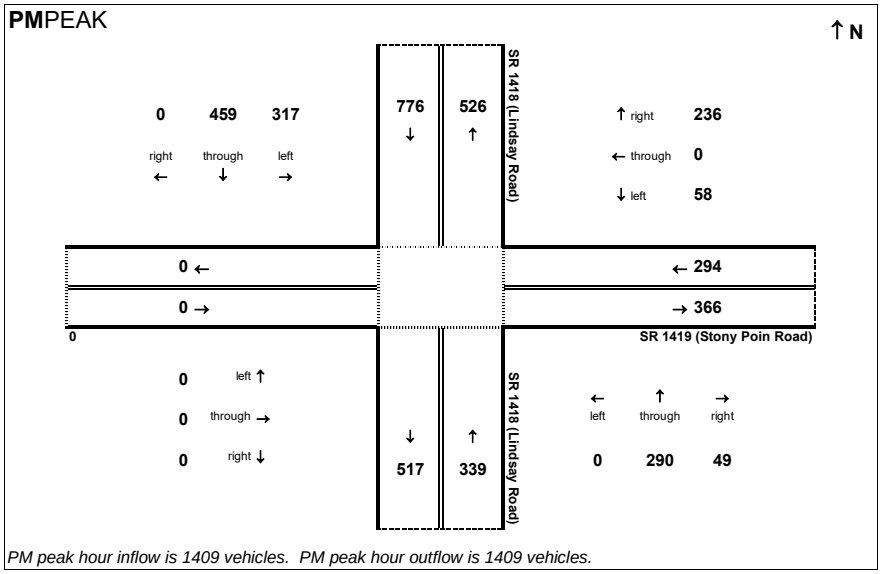
**Traffic Data Year:**
2040 Build

**Project:**
U-5858




*AM peak hour inflow is 1409 vehicles. AM peak hour outflow is 1409 vehicles.*



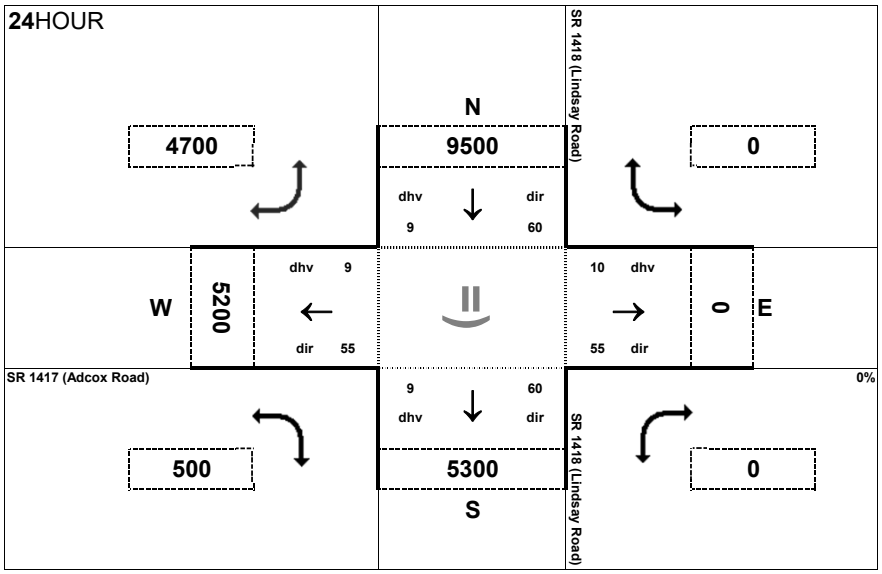

*PM peak hour inflow is 1409 vehicles. PM peak hour outflow is 1409 vehicles.*

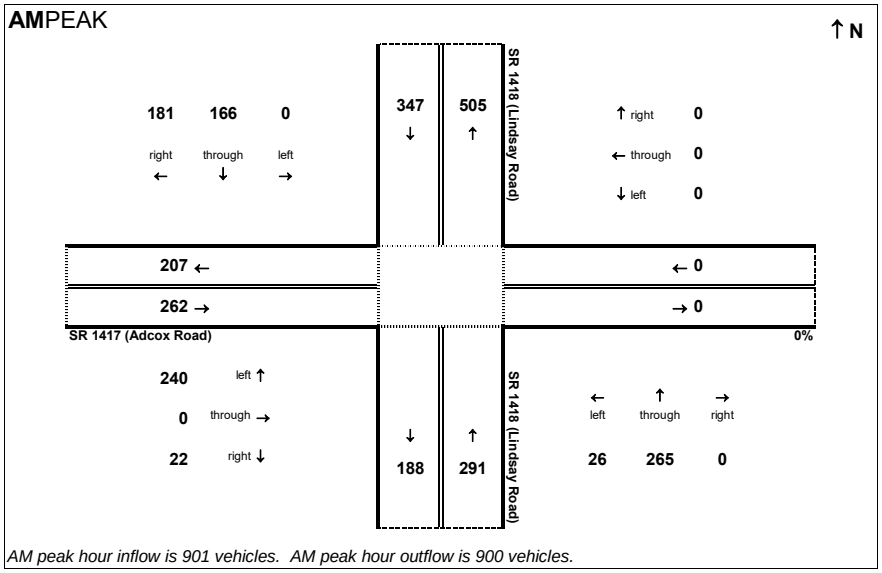
**Peak Hour Volume Breakouts Report:**
Intersection of SR 1418 (Lindsay Road) and SR 1419 (Stony Point Road)

**Traffic Forecast Release Date:**
April-17

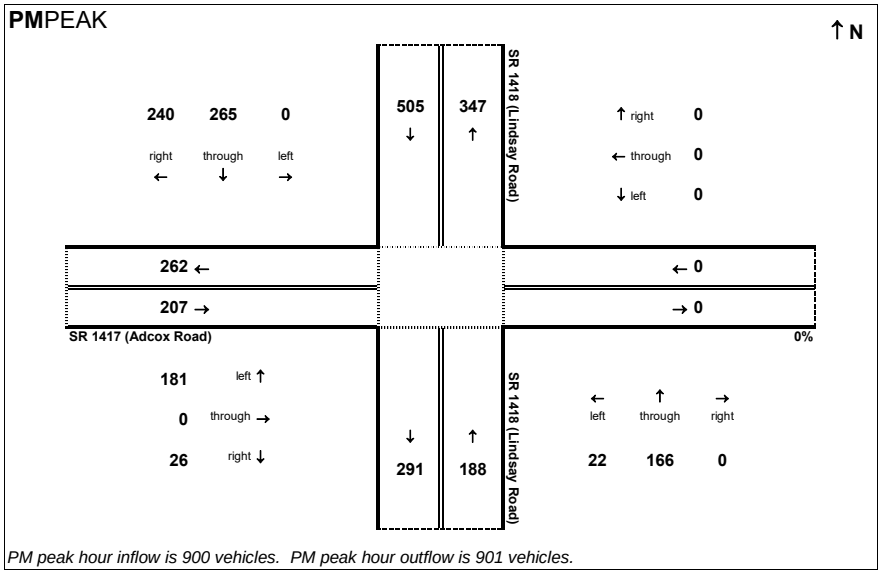
**Traffic Data Year:**
2040 Build

**Project:**
U-5858




*AM peak hour inflow is 901 vehicles. AM peak hour outflow is 900 vehicles.*



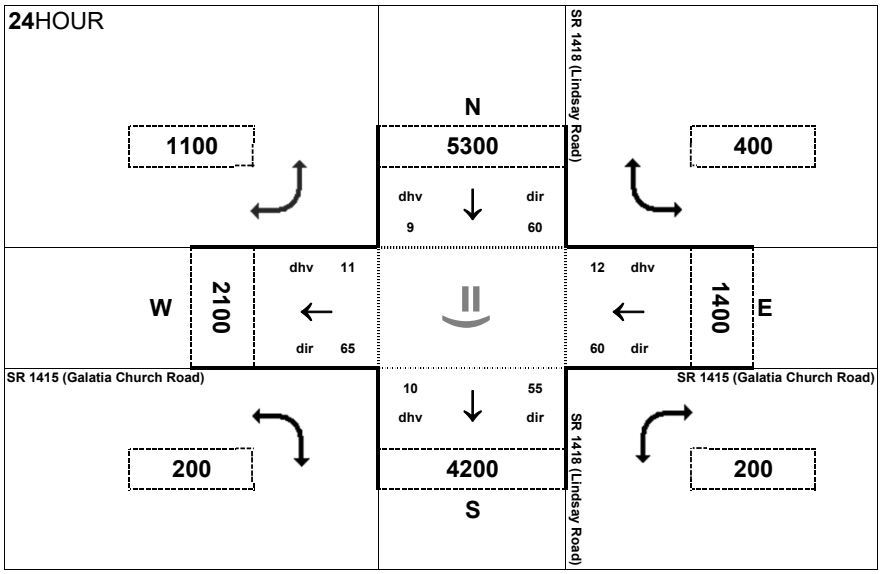

*PM peak hour inflow is 900 vehicles. PM peak hour outflow is 901 vehicles.*

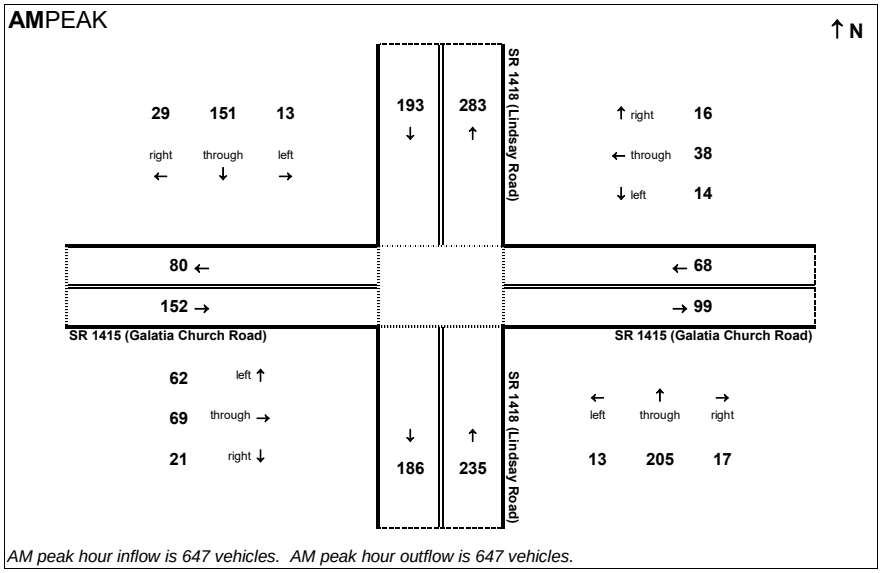
**Peak Hour Volume Breakouts Report:**
Intersection of SR 1418 (Lindsay Road) and SR 1417 (Adcox Road)

**Traffic Forecast Release Date:**
April-17

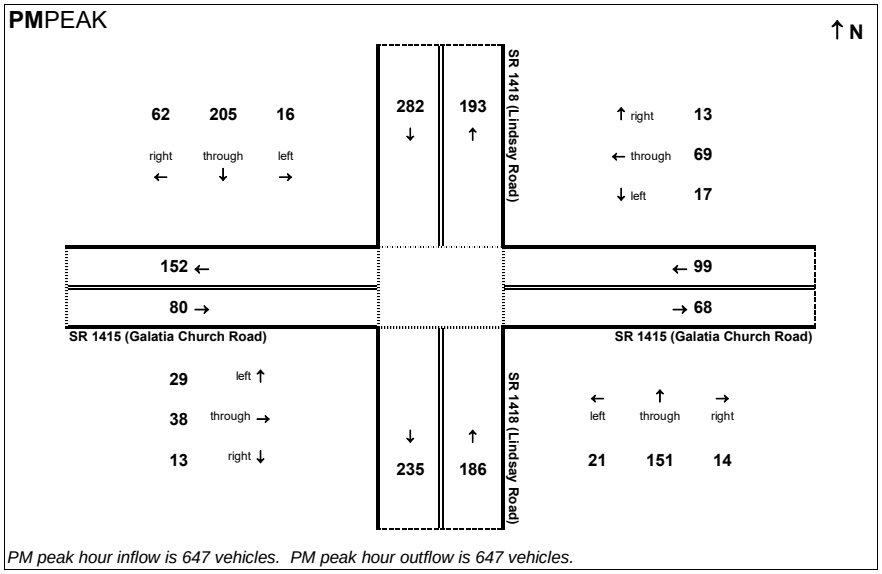
**Traffic Data Year:**
2040 Build

**Project:**
U-5858




*AM peak hour inflow is 647 vehicles. AM peak hour outflow is 647 vehicles.*



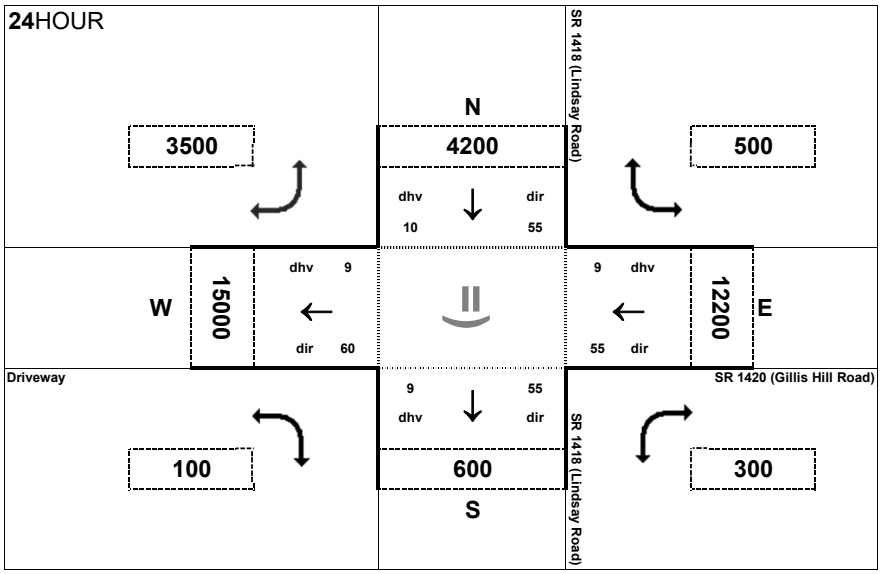

*PM peak hour inflow is 647 vehicles. PM peak hour outflow is 647 vehicles.*

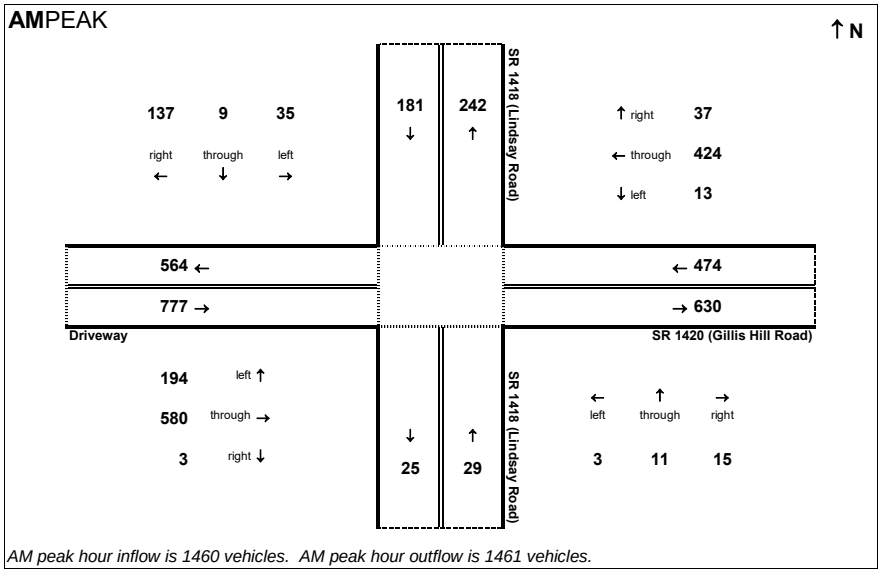
**Peak Hour Volume Breakouts Report:**
Intersection of SR 1418 (Lindsay Road) and SR 1415 (Galatia Church Road)

**Traffic Forecast Release Date:**
April-17

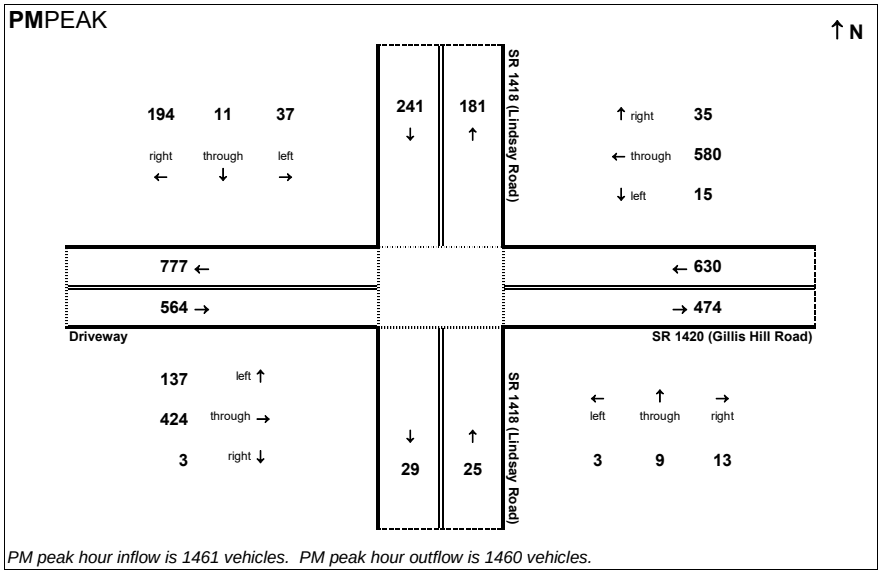
**Traffic Data Year:**
2040 Build

**Project:**
U-5858




*AM peak hour inflow is 1460 vehicles. AM peak hour outflow is 1461 vehicles.*




*PM peak hour inflow is 1461 vehicles. PM peak hour outflow is 1460 vehicles.*

**Peak Hour Volume Breakouts Report:**
Intersection of SR 1418 (Lindsay Road) and SR 1420 (Gillis Hill Road)

**Traffic Forecast Release Date:**
April-17

**Traffic Data Year:**
2040 Build

**Project:**
U-5858

# 2040 Future Year Build

# Origin-Destination Matrices

# 2040 Future Year Build AM Peak O-D Matrix

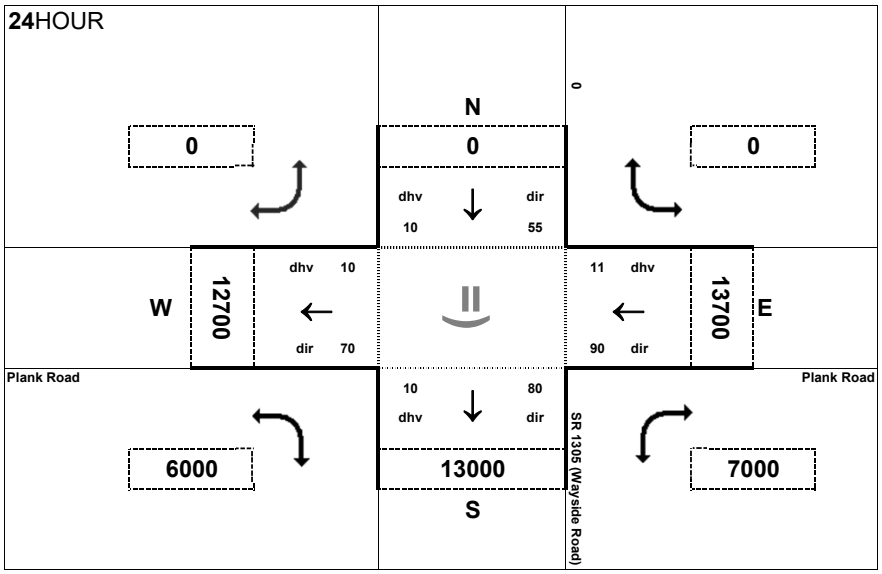
| | 1 | 3 | 5 | 6 | 8 | 9 | 10 | 11 | 13 | 14 | 16 | 17 | 20 | 21 | 22 | 23 | 36 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 685 | 0 | 48 | 9 | 2 | 0 | 174 | 26 | 18 | 3 | 1 | 1 | 2 | 2 | 3 | 4 | 978 |
| 3 | 79 | 0 | 0 | 14 | 3 | 1 | 0 | 49 | 8 | 5 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 164 |
| 4 | 0 | 0 | 0 | 41 | 8 | 2 | 0 | 149 | 22 | 15 | 2 | 2 | 1 | 2 | 2 | 3 | 4 | 253 |
| 6 | 68 | 165 | 38 | 0 | 4 | 1 | 0 | 78 | 12 | 9 | 1 | 0 | 0 | 1 | 1 | 2 | 2 | 382 |
| 8 | 16 | 37 | 9 | 6 | 0 | 38 | 0 | 953 | 141 | 97 | 16 | 9 | 4 | 13 | 14 | 20 | 25 | 1398 |
| 9 | 1 | 2 | 0 | 0 | 9 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 8 | 1 | 2 | 0 | 1 | 1 | 2 | 2 | 28 |
| 11 | 198 | 477 | 109 | 76 | 789 | 8 | 0 | 0 | 45 | 31 | 5 | 2 | 1 | 4 | 5 | 6 | 8 | 1764 |
| 13 | 33 | 79 | 18 | 13 | 131 | 1 | 4 | 58 | 0 | 12 | 3 | 1 | 0 | 2 | 2 | 3 | 3 | 363 |
| 14 | 23 | 55 | 13 | 9 | 92 | 1 | 2 | 40 | 14 | 0 | 2 | 1 | 0 | 1 | 2 | 2 | 3 | 260 |
| 16 | 6 | 14 | 3 | 2 | 23 | 0 | 1 | 11 | 4 | 3 | 0 | 66 | 1 | 3 | 3 | 4 | 5 | 149 |
| 17 | 2 | 4 | 1 | 0 | 7 | 0 | 0 | 4 | 1 | 1 | 36 | 0 | 1 | 2 | 2 | 3 | 4 | 68 |
| 20 | 1 | 2 | 0 | 0 | 3 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 15 | 1 | 1 | 1 | 27 |
| 21 | 4 | 6 | 1 | 1 | 10 | 0 | 0 | 4 | 2 | 1 | 1 | 2 | 13 | 0 | 109 | 148 | 169 | 471 |
| 22 | 8 | 11 | 3 | 2 | 19 | 0 | 1 | 8 | 3 | 2 | 3 | 4 | 1 | 186 | 0 | 328 | 36 | 615 |
| 23 | 8 | 12 | 3 | 2 | 20 | 0 | 1 | 9 | 3 | 2 | 3 | 4 | 1 | 194 | 251 | 0 | 44 | 557 |
| 36 | 8 | 13 | 3 | 2 | 21 | 0 | 1 | 9 | 3 | 2 | 3 | 4 | 1 | 207 | 27 | 28 | 0 | 332 |
| Total | 455 | 1562 | 201 | 216 | 1148 | 54 | 10 | 1548 | 296 | 206 | 80 | 99 | 25 | 634 | 423 | 554 | 311 | 7822 |

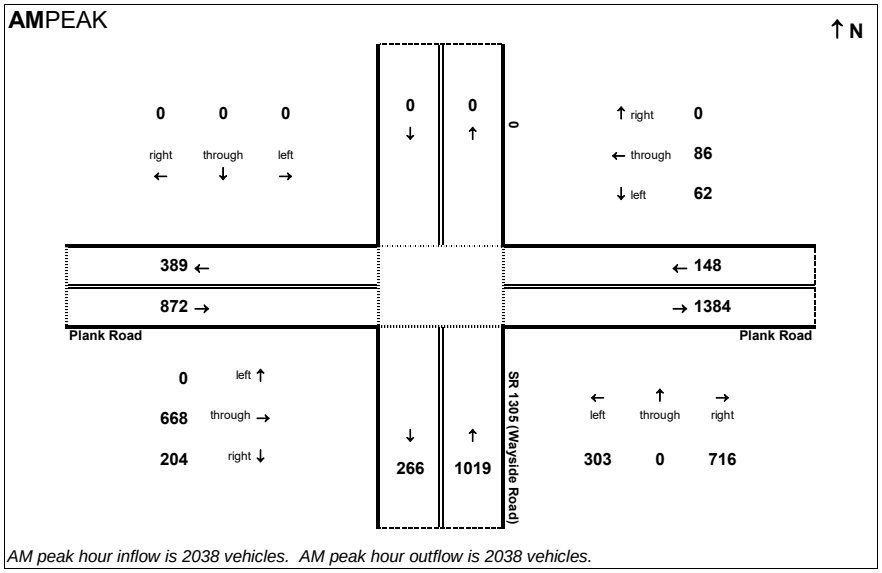
# 2040 Future Year Build PM Peak O-D Matrix

| | 1 | 3 | 5 | 6 | 8 | 9 | 10 | 11 | 13 | 14 | 16 | 17 | 20 | 21 | 22 | 23 | 36 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 79 | 0 | 68 | 16 | 1 | 0 | 198 | 33 | 23 | 6 | 2 | 1 | 3 | 5 | 5 | 4 | 444 |
| 3 | 685 | 0 | 0 | 165 | 37 | 2 | 0 | 477 | 79 | 55 | 14 | 4 | 2 | 6 | 12 | 13 | 10 | 1561 |
| 4 | 0 | 0 | 0 | 38 | 9 | 0 | 0 | 109 | 18 | 13 | 3 | 1 | 0 | 1 | 3 | 3 | 2 | 200 |
| 6 | 48 | 14 | 41 | 0 | 6 | 0 | 0 | 76 | 13 | 9 | 2 | 0 | 0 | 1 | 2 | 2 | 2 | 216 |
| 8 | 9 | 3 | 8 | 4 | 0 | 9 | 0 | 789 | 131 | 92 | 23 | 7 | 3 | 11 | 20 | 21 | 17 | 1147 |
| 9 | 2 | 1 | 2 | 1 | 38 | 0 | 0 | 8 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 54 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 9 |
| 11 | 174 | 49 | 149 | 78 | 953 | 1 | 0 | 0 | 58 | 40 | 11 | 4 | 2 | 5 | 9 | 9 | 7 | 1549 |
| 13 | 26 | 8 | 22 | 12 | 141 | 0 | 11 | 45 | 0 | 14 | 4 | 1 | 1 | 2 | 3 | 4 | 3 | 297 |
| 14 | 18 | 5 | 15 | 9 | 97 | 0 | 8 | 31 | 12 | 0 | 3 | 1 | 0 | 1 | 2 | 2 | 2 | 206 |
| 16 | 3 | 1 | 2 | 1 | 16 | 0 | 1 | 5 | 3 | 2 | 0 | 36 | 0 | 1 | 3 | 3 | 2 | 79 |
| 17 | 1 | 0 | 2 | 0 | 9 | 0 | 2 | 2 | 1 | 1 | 66 | 0 | 1 | 2 | 4 | 4 | 3 | 98 |
| 20 | 0 | 0 | 1 | 0 | 4 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 13 | 1 | 1 | 1 | 24 |
| 21 | 1 | 1 | 2 | 1 | 14 | 0 | 1 | 4 | 2 | 1 | 3 | 2 | 15 | 0 | 192 | 200 | 190 | 629 |
| 22 | 1 | 1 | 2 | 1 | 15 | 0 | 1 | 5 | 2 | 2 | 3 | 2 | 1 | 114 | 0 | 136 | 16 | 302 |
| 23 | 2 | 1 | 3 | 2 | 21 | 0 | 2 | 7 | 3 | 2 | 4 | 3 | 1 | 154 | 203 | 0 | 25 | 433 |
| 36 | 2 | 1 | 3 | 2 | 22 | 0 | 2 | 7 | 3 | 2 | 5 | 3 | 1 | 158 | 23 | 26 | 0 | 260 |
| Total | 972 | 164 | 252 | 382 | 1398 | 13 | 28 | 1764 | 363 | 259 | 149 | 67 | 28 | 472 | 483 | 430 | 284 | 7508 |

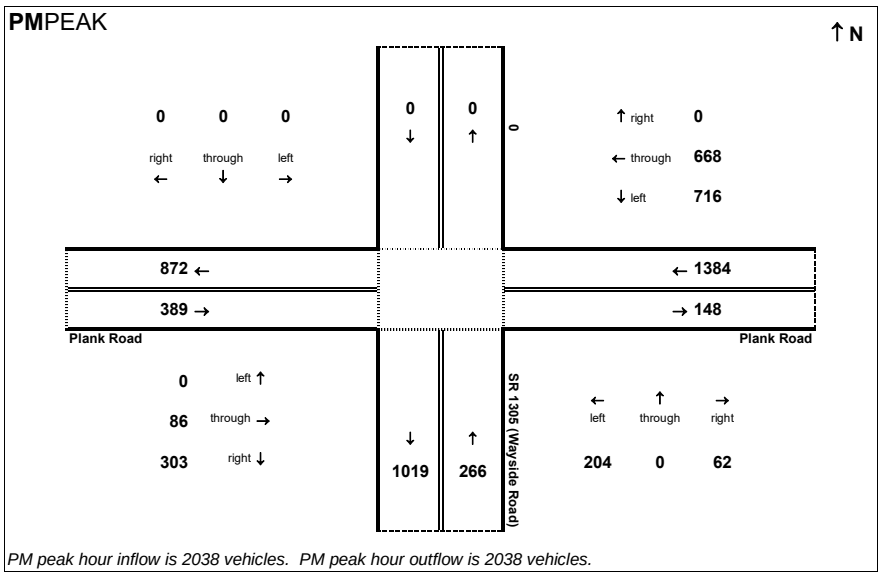
# 2017 BASE YEAR BUILD

# INTERSECTION ANALYSIS UTILITY OUTPUT




*AM peak hour inflow is 2038 vehicles. AM peak hour outflow is 2038 vehicles.*



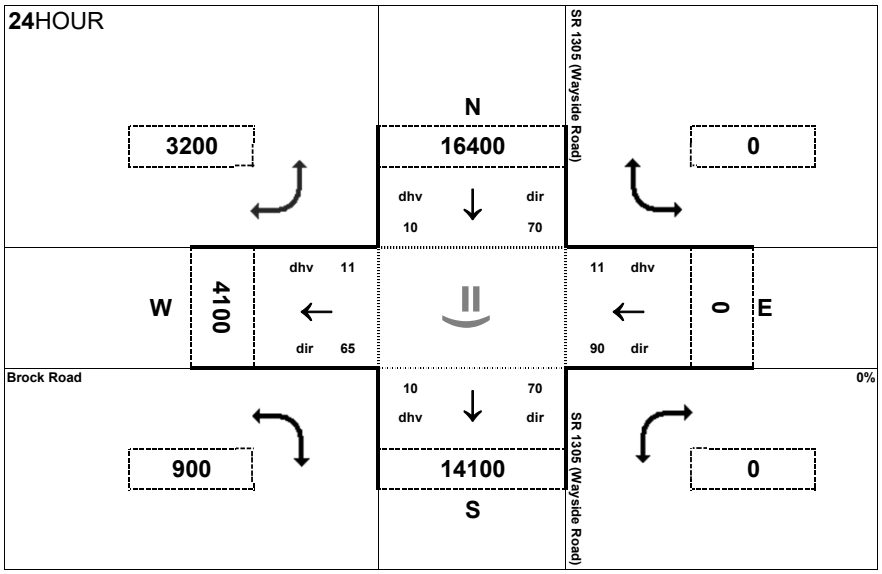

*PM peak hour inflow is 2038 vehicles. PM peak hour outflow is 2038 vehicles.*

**Peak Hour Volume Breakouts Report:**
Intersection of SR 1305 (Wayside Road) and Plank Road

**Traffic Forecast Release Date:**
March-17

**Traffic Data Year:**
2017 Build

**Project:**
U-5753

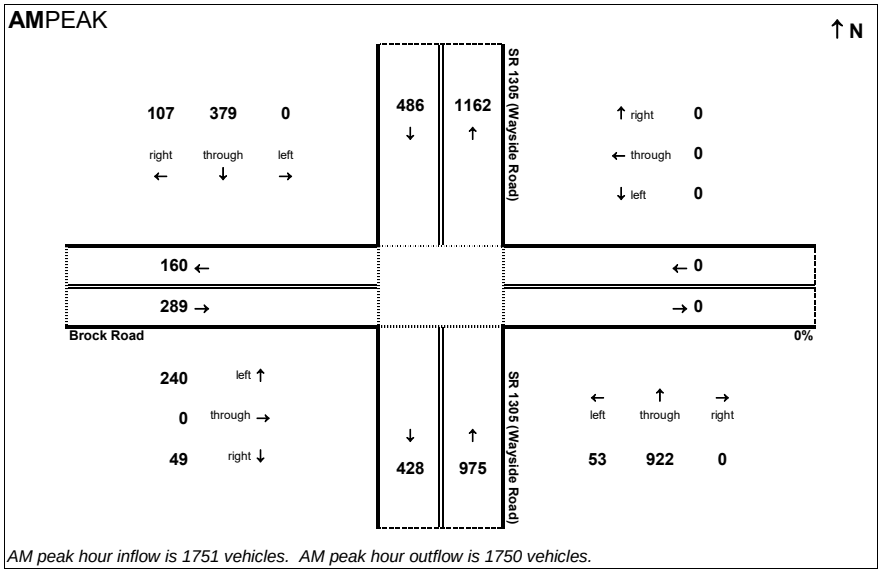



**Peak Hour Volume Breakouts Report:**
Intersection of SR 1305 (Wayside Road) and Brock Road

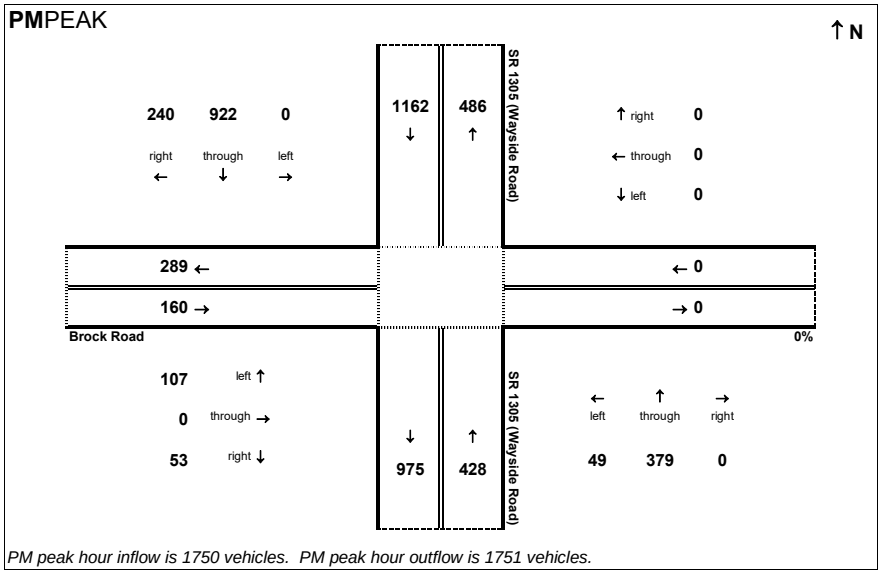
**Traffic Forecast Release Date:**
March-17

**Traffic Data Year:**
2017 Build

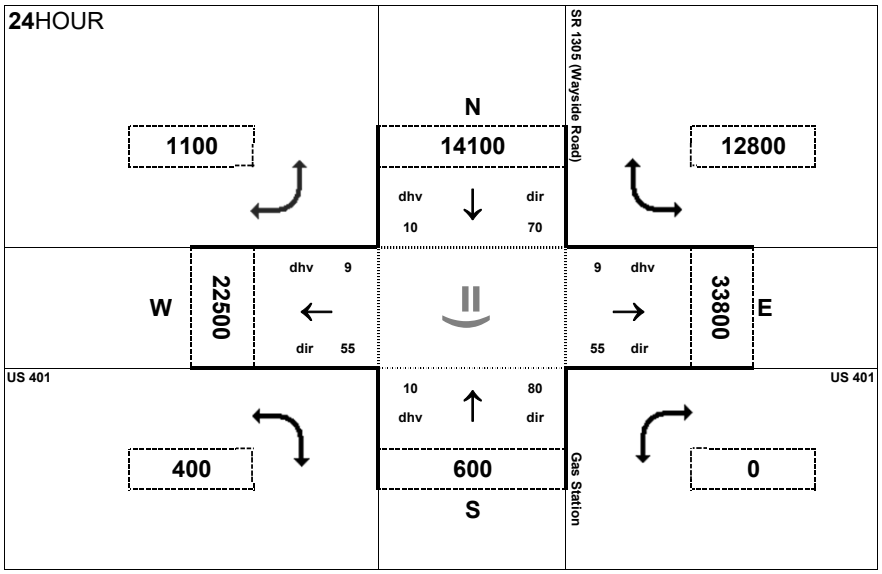
**Project:**
U-5753

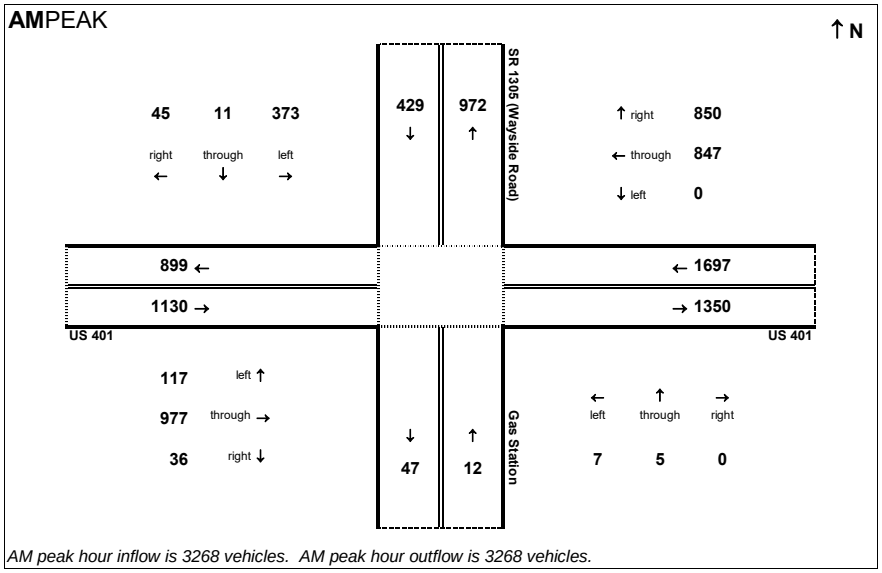



*AM peak hour inflow is 1751 vehicles. AM peak hour outflow is 1750 vehicles.*

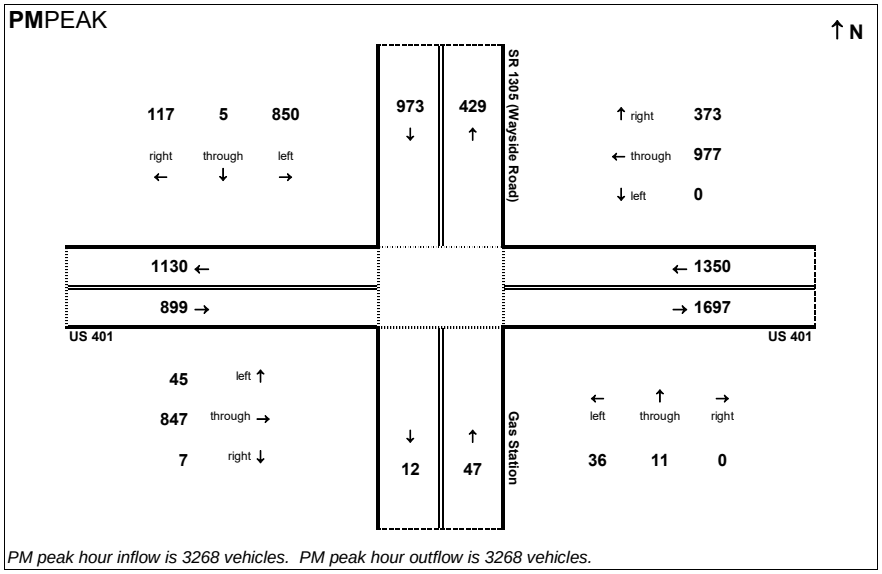



*PM peak hour inflow is 1750 vehicles. PM peak hour outflow is 1751 vehicles.*




*AM peak hour inflow is 3268 vehicles. AM peak hour outflow is 3268 vehicles.*




*PM peak hour inflow is 3268 vehicles. PM peak hour outflow is 3268 vehicles.*

**Peak Hour Volume Breakouts Report:**
Intersection of SR 1305 (Wayside Road) and US 401

**Traffic Forecast Release Date:**
March-17

**Traffic Data Year:**
2017 Build

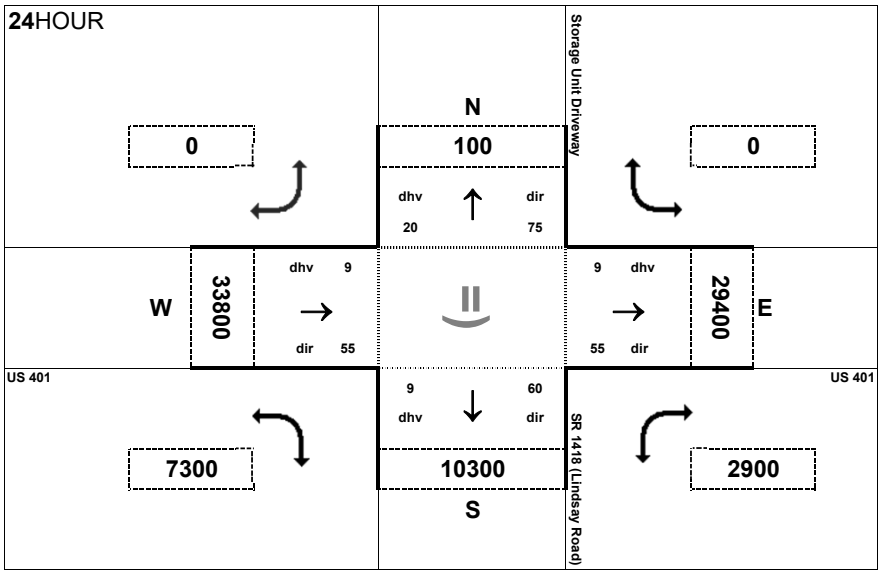
**Project:**
U-5753

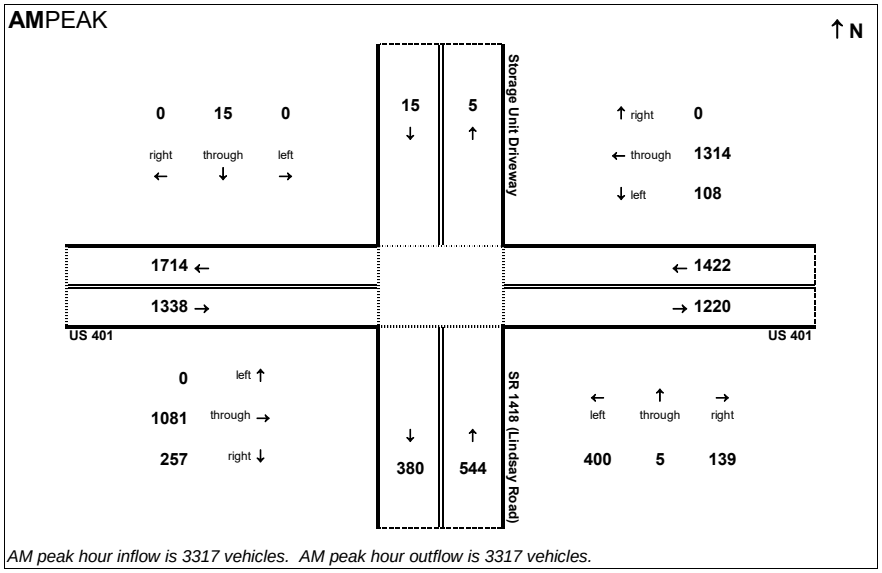
**Peak Hour Volume Breakouts Report:**
Intersection of SR 1418 (Lindsay Road) and US 401

**Traffic Forecast Release Date:**
April-17

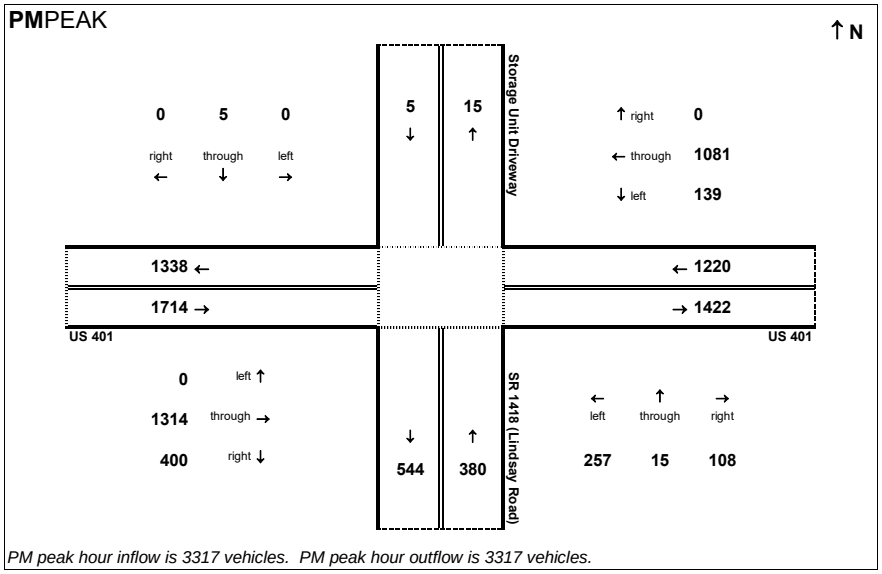
**Traffic Data Year:**
2017 Build

**Project:**
U-5858

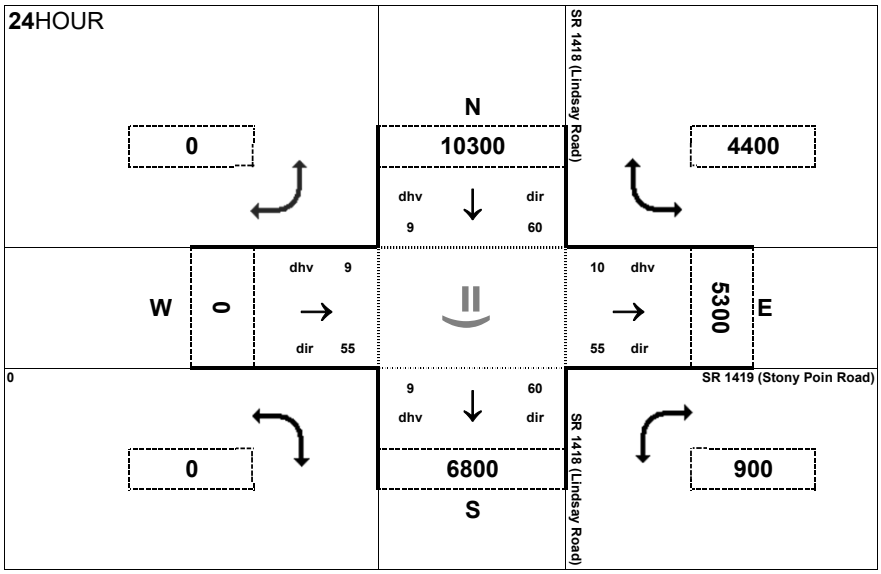


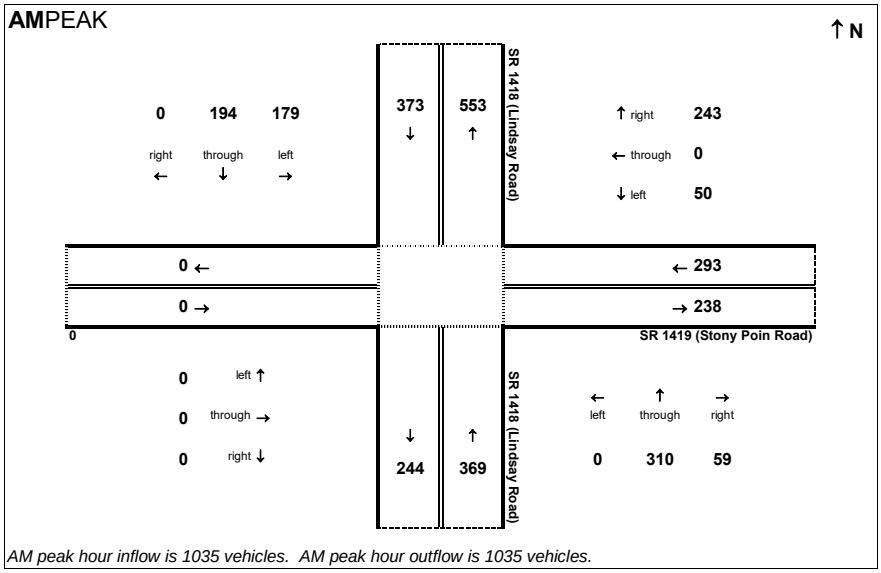




*AM peak hour inflow is 3317 vehicles. AM peak hour outflow is 3317 vehicles.*

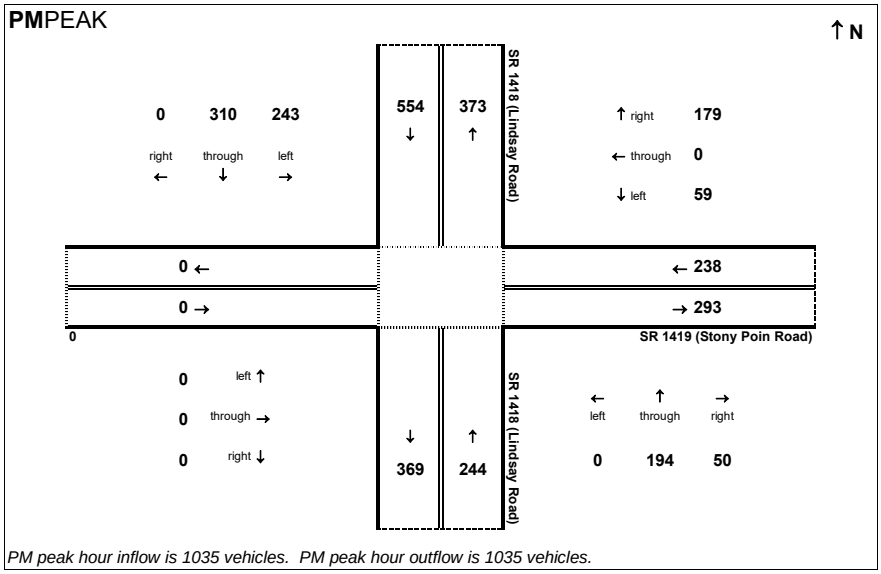



*PM peak hour inflow is 3317 vehicles. PM peak hour outflow is 3317 vehicles.*




*AM peak hour inflow is 1035 vehicles. AM peak hour outflow is 1035 vehicles.*



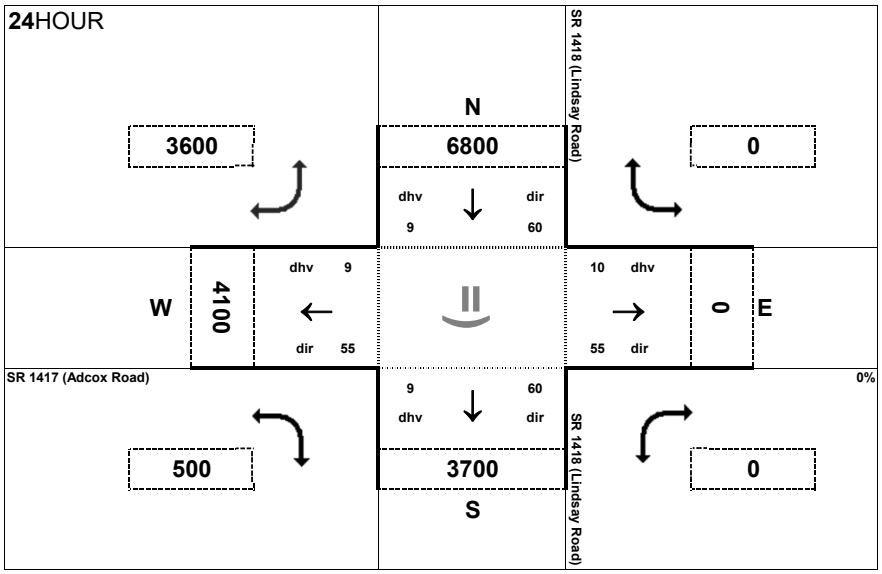

*PM peak hour inflow is 1035 vehicles. PM peak hour outflow is 1035 vehicles.*

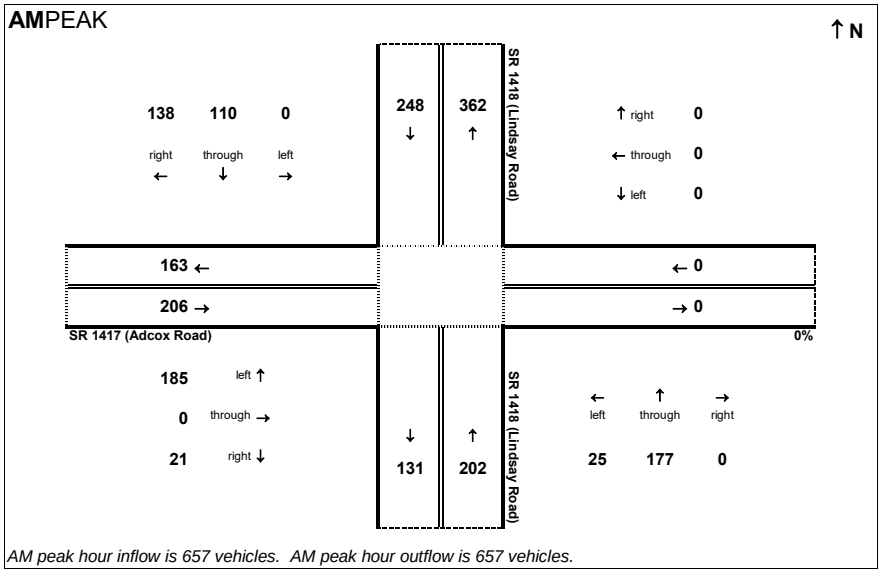
**Peak Hour Volume Breakouts Report:**
Intersection of SR 1418 (Lindsay Road) and SR 1419 (Stony Point Road)

**Traffic Forecast Release Date:**
April-17

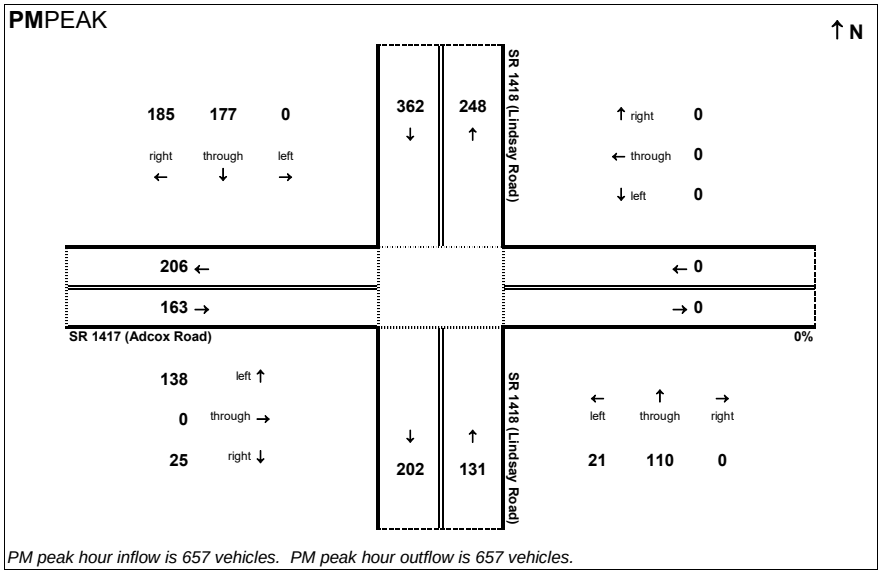
**Traffic Data Year:**
2017 Build

**Project:**
U-5858




*AM peak hour inflow is 657 vehicles. AM peak hour outflow is 657 vehicles.*



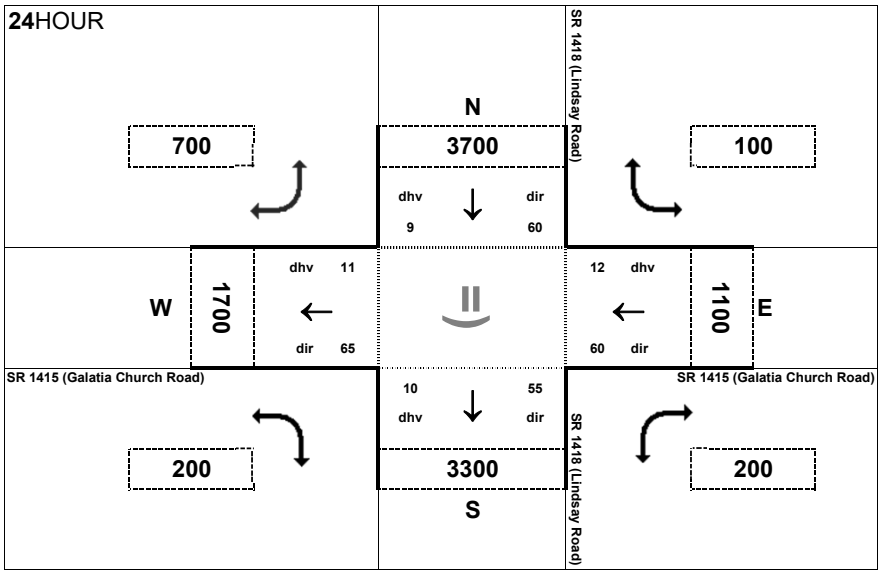

*PM peak hour inflow is 657 vehicles. PM peak hour outflow is 657 vehicles.*

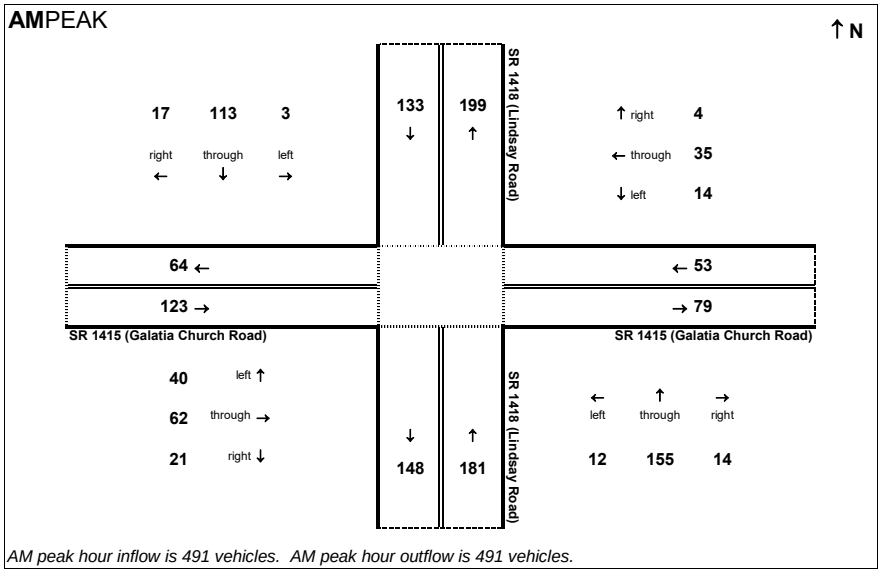
**Peak Hour Volume Breakouts Report:**
Intersection of SR 1418 (Lindsay Road) and SR 1417 (Adcox Road)

**Traffic Forecast Release Date:**
April-17

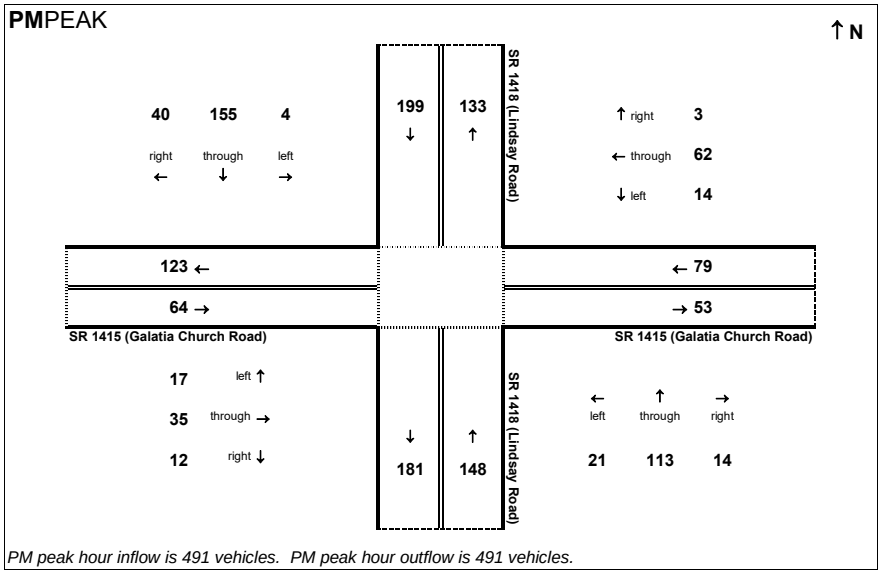
**Traffic Data Year:**
2017 Build

**Project:**
U-5858




*AM peak hour inflow is 491 vehicles. AM peak hour outflow is 491 vehicles.*



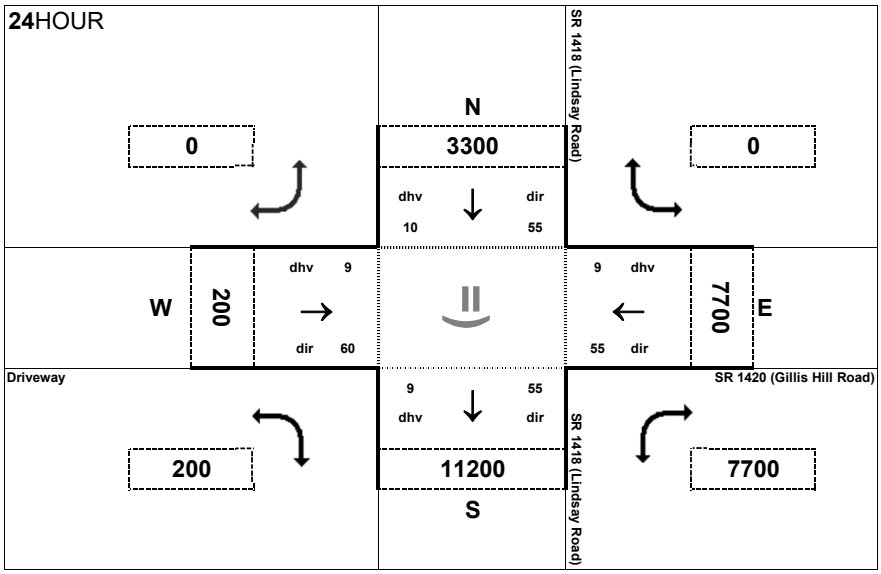

*PM peak hour inflow is 491 vehicles. PM peak hour outflow is 491 vehicles.*

**Peak Hour Volume Breakouts Report:**
Intersection of SR 1418 (Lindsay Road) and SR 1415 (Galatia Church Road)

**Traffic Forecast Release Date:**
April-17

**Traffic Data Year:**
2017 Build

**Project:**
U-5858

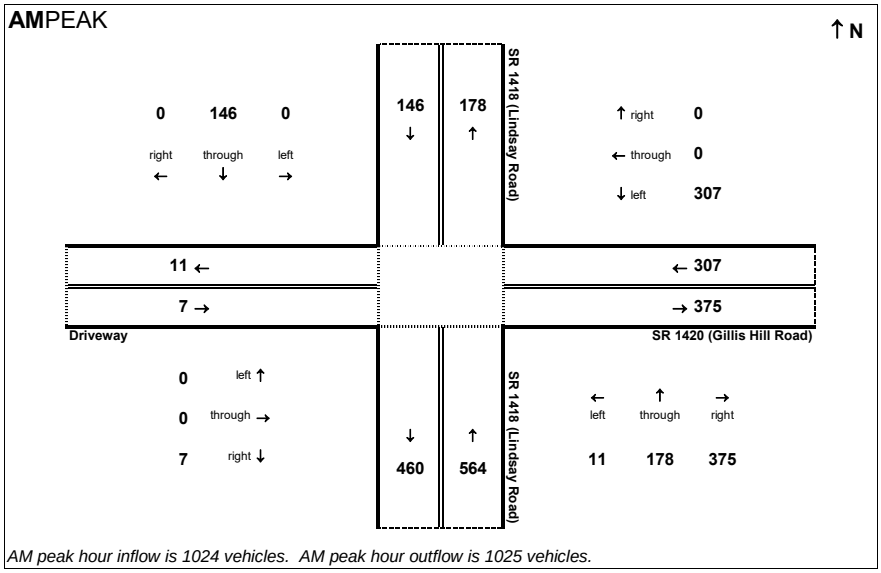



**Peak Hour Volume Breakouts Report:**
Intersection of SR 1418 (Lindsay Road) and SR 1420 (Gillis Hill Road)

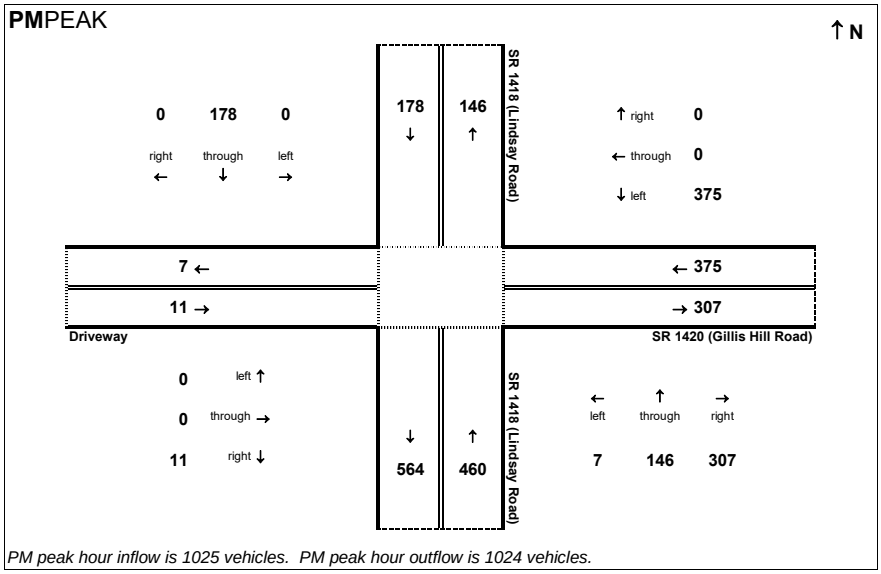
**Traffic Forecast Release Date:**
April-17

**Traffic Data Year:**
2017 Build

**Project:**
U-5858




*AM peak hour inflow is 1024 vehicles. AM peak hour outflow is 1025 vehicles.*



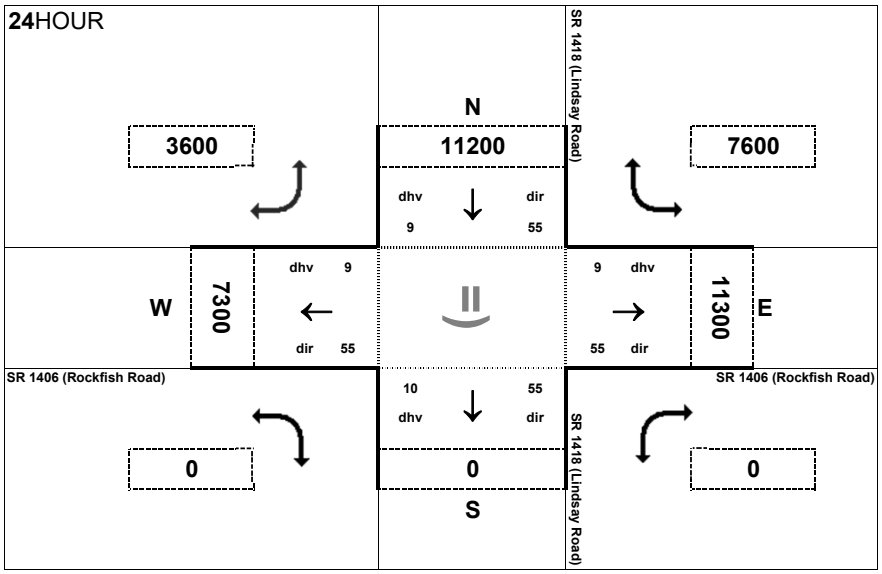

*PM peak hour inflow is 1025 vehicles. PM peak hour outflow is 1024 vehicles.*

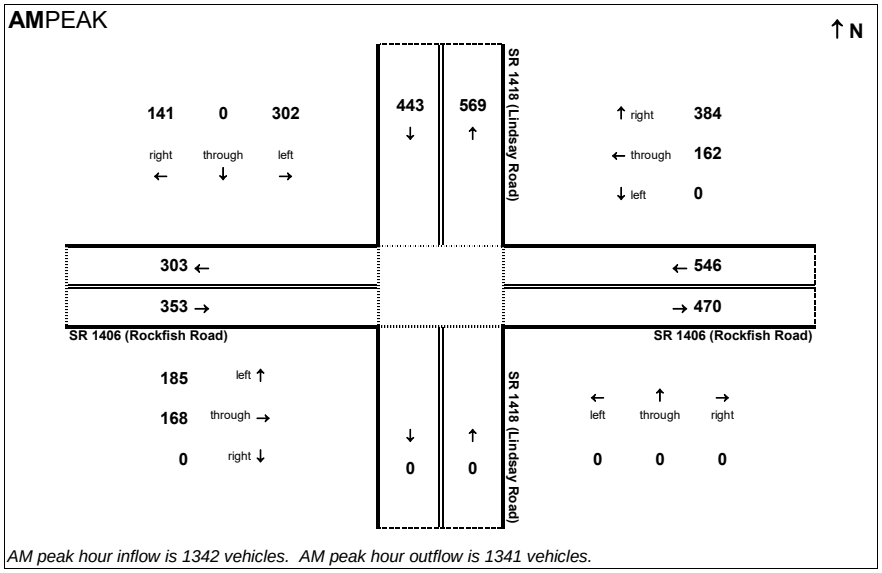
**Peak Hour Volume Breakouts Report:**
Intersection of SR 1418 (Lindsay Road) and SR 1415 (Galatia Church Road)

**Traffic Forecast Release Date:**
April-17

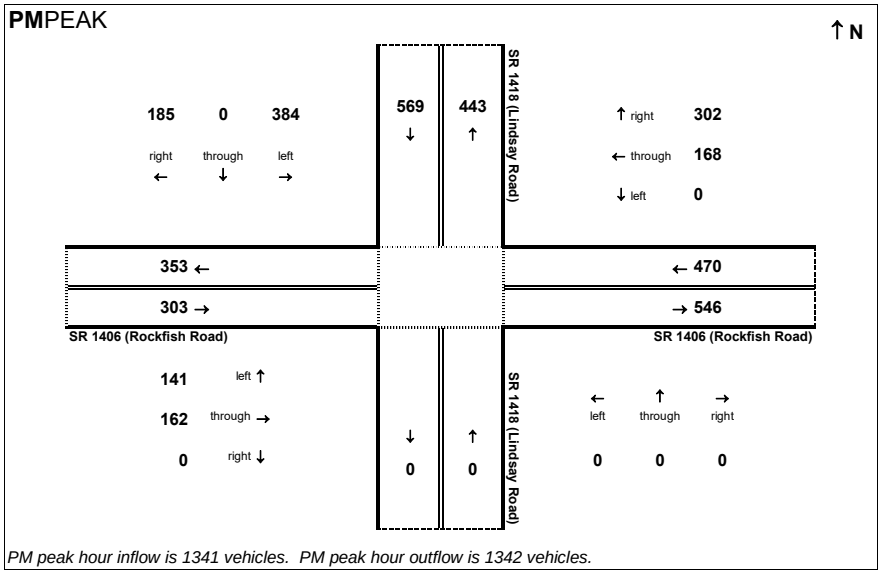
**Traffic Data Year:**
2017 Build

**Project:**
U-5858




*AM peak hour inflow is 1342 vehicles. AM peak hour outflow is 1341 vehicles.*




*PM peak hour inflow is 1341 vehicles. PM peak hour outflow is 1342 vehicles.*

# 2017 Base Year Build

# Origin-Destination Matrices

# 2017 Build AM Peak O-D Matrix

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 20 | 21 | 22 | 23 | 36 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 610 | 0 | 0 | 40 | 0 | 12 | 3 | 0 | 153 | 0 | 23 | 16 | 0 | 2 | 0 | 0 | 0 | 3 | 5 | 4 | 871 |
| 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 72 | 0 | 0 | 0 | 0 | 12 | 0 | 4 | 1 | 0 | 44 | 0 | 7 | 4 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 148 |
| 4 | 0 | 0 | 0 | 0 | 0 | 33 | 0 | 11 | 3 | 0 | 130 | 0 | 19 | 13 | 0 | 1 | 0 | 0 | 0 | 3 | 4 | 3 | 220 |
| 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | 56 | 0 | 135 | 0 | 25 | 0 | 0 | 4 | 1 | 0 | 50 | 0 | 8 | 5 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 288 |
| 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | 19 | 0 | 47 | 0 | 9 | 5 | 0 | 0 | 39 | 0 | 754 | 0 | 112 | 75 | 0 | 10 | 2 | 0 | 0 | 15 | 21 | 20 | 1128 |
| 9 | 1 | 0 | 3 | 0 | 1 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 4 | 0 | 1 | 0 | 0 | 0 | 1 | 2 | 1 | 15 |
| 11 | 173 | 0 | 426 | 0 | 78 | 50 | 0 | 621 | 0 | 0 | 0 | 0 | 31 | 21 | 0 | 3 | 1 | 0 | 0 | 4 | 6 | 5 | 1419 |
| 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 | 29 | 0 | 71 | 0 | 13 | 8 | 0 | 103 | 0 | 3 | 39 | 0 | 0 | 14 | 0 | 2 | 1 | 0 | 0 | 3 | 4 | 3 | 293 |
| 14 | 20 | 0 | 48 | 0 | 9 | 6 | 0 | 70 | 0 | 1 | 26 | 0 | 16 | 0 | 0 | 2 | 0 | 0 | 0 | 2 | 3 | 3 | 206 |
| 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16 | 4 | 0 | 11 | 0 | 2 | 1 | 0 | 15 | 0 | 0 | 6 | 0 | 4 | 3 | 0 | 0 | 62 | 0 | 0 | 4 | 6 | 6 | 124 |
| 17 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 33 | 0 | 0 | 0 | 3 | 5 | 4 | 52 |
| 20 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | 3 | 2 | 13 |
| 21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 86 | 116 | 103 | 305 |
| 22 | 6 | 0 | 11 | 0 | 2 | 2 | 0 | 17 | 0 | 0 | 6 | 0 | 4 | 2 | 0 | 3 | 4 | 4 | 120 | 0 | 172 | 3 | 356 |
| 23 | 12 | 0 | 23 | 0 | 5 | 3 | 0 | 35 | 0 | 1 | 13 | 0 | 8 | 5 | 0 | 6 | 8 | 7 | 251 | 167 | 0 | 3 | 547 |
| 36 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 2 | 2 | 0 | 12 |
| Total | 393 | 0 | 1388 | 0 | 144 | 160 | 0 | 903 | 47 | 5 | 1222 | 0 | 239 | 163 | 0 | 65 | 78 | 11 | 381 | 297 | 351 | 162 | 6009 |

# 2017 Build PM Peak O-D Matrix

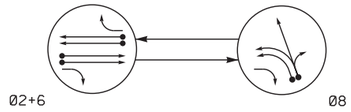
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 20 | 21 | 22 | 23 | 36 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 72 | 0 | 0 | 56 | 0 | 19 | 1 | 0 | 174 | 0 | 29 | 20 | 0 | 4 | 1 | 0 | 0 | 5 | 5 | 5 | 391 |
| 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 610 | 0 | 0 | 0 | 0 | 135 | 0 | 47 | 3 | 0 | 426 | 0 | 71 | 48 | 0 | 11 | 1 | 0 | 0 | 12 | 12 | 13 | 1389 |
| 4 | 0 | 0 | 0 | 0 | 0 | 25 | 0 | 9 | 1 | 0 | 78 | 0 | 13 | 9 | 0 | 2 | 0 | 0 | 0 | 2 | 2 | 2 | 143 |
| 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | 40 | 0 | 12 | 0 | 33 | 0 | 0 | 5 | 0 | 0 | 50 | 0 | 8 | 6 | 0 | 1 | 0 | 0 | 0 | 2 | 2 | 2 | 161 |
| 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | 11 | 0 | 4 | 0 | 11 | 4 | 0 | 0 | 7 | 0 | 620 | 0 | 103 | 70 | 0 | 15 | 2 | 0 | 0 | 17 | 17 | 19 | 900 |
| 9 | 3 | 0 | 1 | 0 | 3 | 1 | 0 | 39 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 47 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 11 | 154 | 0 | 44 | 0 | 130 | 50 | 0 | 754 | 0 | 0 | 0 | 0 | 39 | 26 | 0 | 6 | 1 | 0 | 0 | 6 | 6 | 7 | 1223 |
| 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 | 23 | 0 | 7 | 0 | 19 | 8 | 0 | 112 | 0 | 6 | 31 | 0 | 0 | 16 | 0 | 4 | 1 | 0 | 0 | 4 | 4 | 4 | 239 |
| 14 | 16 | 0 | 4 | 0 | 13 | 5 | 0 | 75 | 0 | 4 | 21 | 0 | 14 | 0 | 0 | 3 | 1 | 0 | 0 | 3 | 3 | 3 | 165 |
| 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16 | 2 | 0 | 1 | 0 | 1 | 1 | 0 | 10 | 0 | 1 | 3 | 0 | 2 | 2 | 0 | 0 | 33 | 0 | 0 | 3 | 3 | 3 | 65 |
| 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 62 | 0 | 0 | 0 | 4 | 4 | 5 | 79 |
| 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 4 | 4 | 18 |
| 21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 122 | 122 | 133 | 377 |
| 22 | 4 | 0 | 1 | 0 | 3 | 1 | 0 | 17 | 0 | 1 | 5 | 0 | 3 | 2 | 0 | 5 | 4 | 2 | 96 | 0 | 162 | 3 | 309 |
| 23 | 8 | 0 | 2 | 0 | 7 | 2 | 0 | 36 | 0 | 3 | 10 | 0 | 7 | 5 | 0 | 10 | 8 | 5 | 204 | 168 | 0 | 3 | 478 |
| 36 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 2 | 1 | 0 | 10 |
| Total | 871 | 0 | 148 | 0 | 220 | 288 | 0 | 1128 | 12 | 15 | 1419 | 0 | 293 | 205 | 0 | 123 | 52 | 7 | 310 | 354 | 347 | 206 | 5998 |

# APPENDIX C:

# SIGNAL DESIGN PLANS

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| W-5208J | Sig. 3 |

## PHASING DIAGRAM



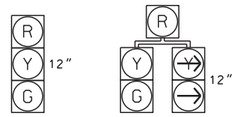

PHASING DIAGRAM DETECTION LEGEND

- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

| TABLE OF OPERATION | | | |
|---|---|---|---|
| SIGNAL FACE | PHASE 02+6 | PHASE 08 | FLASH |
| 22 | G | R | Y |
| 23 | G | R | Y |
| 62, 63 | G | R | Y |
| 81, 82 | R | G | R |

## SIGNAL FACE I.D.

All Heads L.E.D.

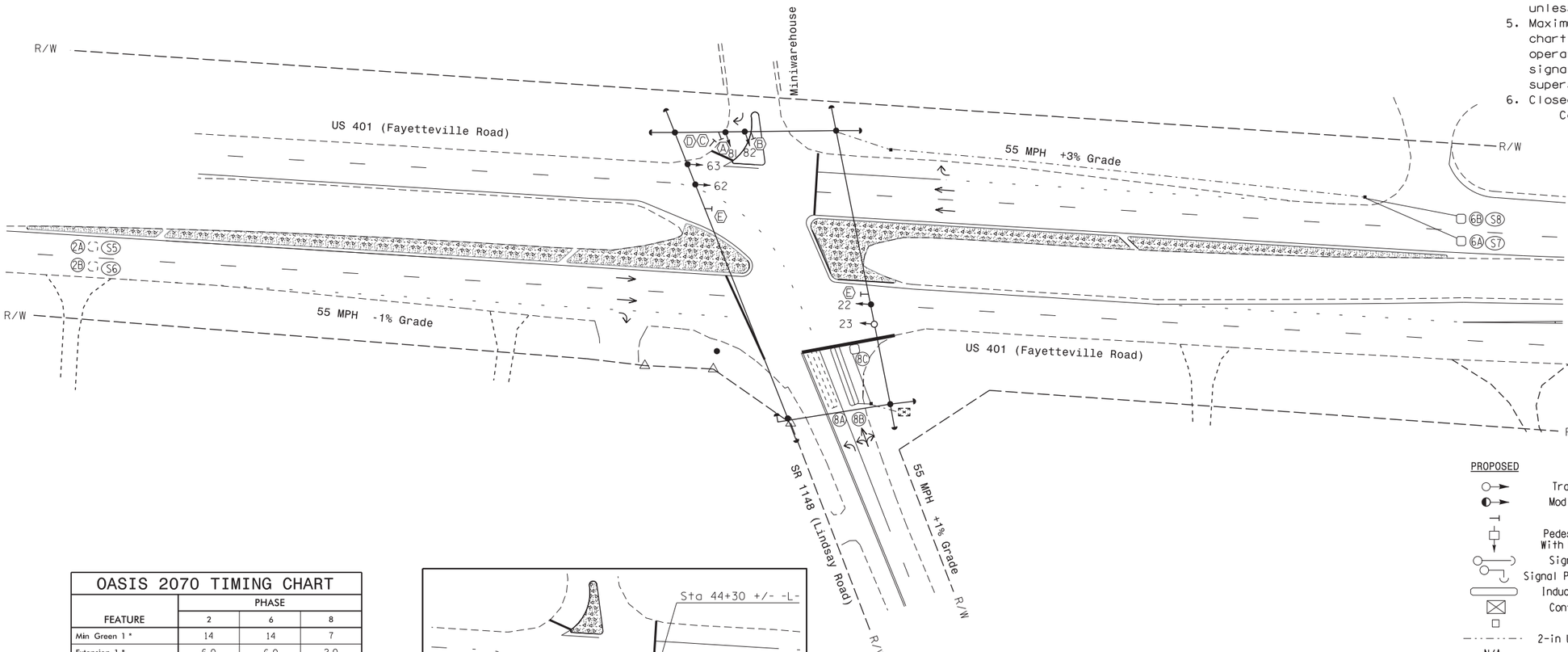



| OASIS 2070 LOOP & DETECTOR INSTALLATION CHART | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| INDUCTIVE LOOPS | | | | | DETECTOR PROGRAMMING | | | | | | | |
| LOOP | SIZE (FT) | DISTANCE FROM STOPBAR (FT) | TURNS | NEW LOOP | PHASE | CALLING | EXTENSION | FULL TIME DELAY | STRETCH TIME | DELAY TIME | SYSTEM LOOP | NEW CARD |
| 2A/S5 | 6X6 | 420 | EXISTING | - | 2 | Y | Y | - | - | - | Y | - |
| 2B/S6 | 6X6 | 420 | EXISTING | - | 2 | Y | Y | - | - | - | Y | - |
| 6A/S7 | 6X6 | 420 | 6 | Y | 6 | Y | Y | - | - | - | Y | - |
| 6B/S8 | 6X6 | 420 | 6 | Y | 6 | Y | Y | - | - | - | Y | - |
| 8A | 6X40 | 0 | 2-4-2 | - | 8 | Y | Y | - | - | - | - | Y |
| 8B | 6X40 | 0 | 2-4-2 | Y | 8 | Y | Y | - | - | 10 | - | Y |
| 8C | 6X6 | 0 | 6 | Y | 8 | Y | Y | - | - | 15 | - | Y |

2 Phase
Fully Actuated
US 401 (Fayetteville Road) CLS

## NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Pavement markings are existing unless otherwise shown.
5. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
6. Closed loop system data:
   Controller Asset #: 0444.



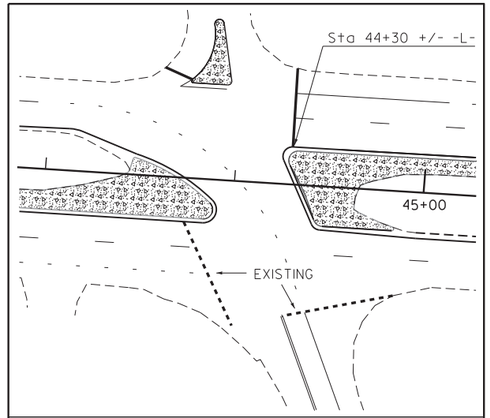

## LEGEND

| PROPOSED | | EXISTING |
|---|---|---|
| | Traffic Signal Head | |
| | Modified Signal Head | N/A |
| | Sign | |
| | Pedestrian Signal Head With Push Button & Sign | |
| | Signal Pole with Guy | |
| | Signal Pole with Sidewalk Guy | |
| | Inductive Loop Detector | |
| | Controller & Cabinet | |
| | Junction Box | |
| | 2-in Underground Conduit | |
| N/A | Right of Way | |
| | Directional Arrow | |
| A | Left Arrow "ONLY" Sign (R3-5L) | A |
| B | Dual Turn and Through Arrows Sign (R3-19) | B |
| C | "STOP" Sign (R1-1) | C |
| D | Right Arrow "ONLY" Sign (R3-5R) | D |
| E | No U-Turn/Left Turn Sign | E |

This plan supersedes the plan signed and sealed on 2/14/14.

| OASIS 2070 TIMING CHART | | | |
|---|---|---|---|
| | PHASE | | |
| FEATURE | 2 | 6 | 8 |
| Min Green 1 * | 14 | 14 | 7 |
| Extension 1 * | 6.0 | 6.0 | 2.0 |
| Max Green 1 * | 90 | 90 | 15 |
| Yellow Clearance | 5.3 | 4.9 | 3.5 |
| Red Clearance | 1.0 | 1.0 | 3.4 |
| Red Revert | 2.0 | 2.0 | 2.0 |
| Walk 1 * | - | - | - |
| Don't Walk 1 | - | - | - |
| Seconds Per Actuation * | 1.5 | 1.5 | - |
| Max Variable Initial * | 46 | 46 | - |
| Time Before Reduction * | 15 | 15 | - |
| Time To Reduce * | 30 | 30 | - |
| Minimum Gap | 3.4 | 3.4 | - |
| Recall Mode | MIN RECALL | MIN RECALL | - |
| Vehicle Call Memory | YELLOW | YELLOW | - |
| Dual Entry | - | - | - |
| Simultaneous Gap | ON | ON | ON |

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.




Proposed Stopbar Locations

Signal Upgrade

Prepared In the Offices of:
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy.Garner,NC 27529

US 401 (Fayetteville Road)
at
SR 1418 (Lindsay Road)

Division 8 | Hoke County | East of Raeford

PLAN DATE: September 2015 | REVIEWED BY:
PREPARED BY: C.E. Carter | REVIEWED BY:

SCALE 0 40 1"=40'

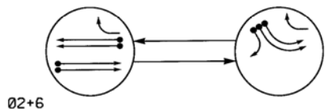
| REVISIONS | INIT. | DATE |
|---|---|---|
| | | |

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT L. ZIEMBA
DocuSigned by: Robert L Ziemba
15
SIG. INVENTORY NO. 08-0444

16-SEP-2015 09:04
S:\MTS&SU\TIS Signals\Signal Design Section\Central Region\Div 8\W8-5208J\W080444_sig_dsn_20150916.dgn
rziemba

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| W-5208J | Sig. \ |

## PHASING DIAGRAM




PHASING DIAGRAM DETECTION LEGEND

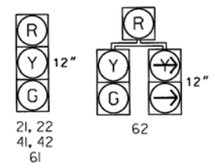
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

| TABLE OF OPERATION | | | |
|---|---|---|---|
| SIGNAL FACE | PHASE Ø2+6 | PHASE Ø4 | FLASH |
| 21, 22 | G | R | Y |
| 41, 42 | R | G | R |
| 61 | G | R | Y |
| 62 | G | R | Y |

| OASIS 2070 LOOP & DETECTOR INSTALLATION CHART | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| INDUCTIVE LOOPS | | | | | DETECTOR PROGRAMMING | | | | | | | |
| LOOP | SIZE (FT) | DISTANCE FROM STOPBAR (FT) | TURNS | NEW LOOP | PHASE | CALLING | EXTENSION | FULL TIME DELAY | STRETCH TIME | DELAY TIME | SYSTEM LOOP | NEW CARD |
| 2A/S9 | 6X6 | 420 | 6 | Y | 2 | Y | Y | - | - | - | Y | - |
| 2B/S10 | 6X6 | 420 | 6 | Y | 2 | Y | Y | - | - | - | Y | - |
| 4A | 6X40 | 0 | 2-4-2 | Y | 4 | Y | Y | - | - | - | - | - |
| 4B | 6X40 | 0 | 2-4-2 | Y | 4 | Y | Y | - | - | - | - | - |
| 4C | 6X40 | 0 | 2-4-2 | Y | 4 | Y | Y | - | - | 15 | - | - |
| 4D | 6X6 | 0 | 4 | Y | 4 | Y | Y | - | - | 15 | - | - |
| 6A/S11 | 6X6 | 420 | 6 | Y | 6 | Y | Y | - | - | - | Y | - |
| 6B/S12 | 6X6 | 420 | 6 | Y | 6 | Y | Y | - | - | - | Y | - |

## SIGNAL FACE I.D.

All Heads L.E.D.



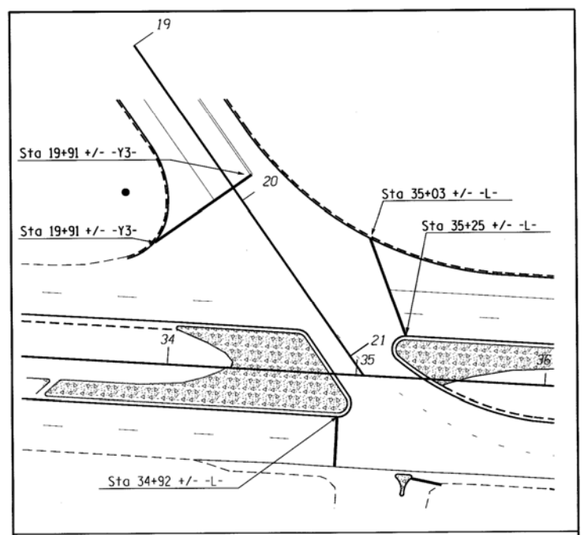




## OASIS 2070L TIMING CHART

| FEATURE | PHASE 2 | PHASE 4 | PHASE 6 |
|---|---|---|---|
| Min Green 1 * | 14 | 7 | 14 |
| Extension 1 * | 6.0 | 2.0 | 6.0 |
| Max Green 1 * | 45 | 25 | 45 |
| Yellow Clearance | 5.2 | 3.6 | 5.1 |
| Red Clearance | 1.0 | 3.7 | 1.0 |
| Red Revert | 2.0 | 2.0 | 2.0 |
| Walk 1 * | - | - | - |
| Don't Walk 1 | - | - | - |
| Seconds Per Actuation * | 1.5 | - | 1.5 |
| Max Variable Initial * | 46 | - | 46 |
| Time Before Reduction * | 15 | - | 15 |
| Time To Reduce * | 30 | - | 30 |
| Minimum Gap | 3.4 | - | 3.4 |
| Recall Mode | MIN RECALL | - | MIN RECALL |
| Vehicle Call Memory | YELLOW | - | YELLOW |
| Dual Entry | - | - | - |
| Simultaneous Gap | ON | ON | ON |

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.




Proposed Stopbar Locations

2 Phase
Fully Actuated
US 401 (Fayetteville Road) CLS

## NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2012 and "Standard Specifications for Roads and Structures" dated January 2012.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Reposition existing signal head number 42.
4. Renumber existing loops, signal heads, and phases as shown.
5. Set all detector units to presence mode.
6. Pavement markings are existing unless otherwise shown.
7. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
8. Closed loop system data:
   Controller Asset #: 0264.

## LEGEND

| PROPOSED | | EXISTING |
|---|---|---|
| | Traffic Signal Head | |
| | Modified Signal Head | N/A |
| | Sign | |
| | Pedestrian Signal Head With Push Button & Sign | |
| | Signal Pole with Guy | |
| | Signal Pole with Sidewalk Guy | |
| | Inductive Loop Detector | |
| | Controller & Cabinet | |
| | Junction Box | |
| | 2-in Underground Conduit | |
| N/A | Right of Way | |
| | Directional Arrow | |
| (A) | Left Arrow "ONLY" Sign (R3-5L) | (A) |
| (B) | Right Arrow "ONLY" Sign (R3-5R) | (B) |
| (C) | "STOP" Sign (R1-1) | (C) |
| (D) | No Left Turn/U-Turn Sign (R3-18) | (D) |

Signal Upgrade

Prepared in the Offices of:
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy.Garner,NC 27529

US 401 (Fayetteville Road)
at
SR 1305 (Wayside Road)

Division 8 Hoke County E. of Raeford

PLAN DATE: December 2013 REVIEWED BY:
PREPARED BY: C.E. Carter REVIEWED BY:

| REVISIONS | INIT. | DATE |
|---|---|---|
| | | |

SCALE 0 40 1"=40'

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 026486 ENGINEER ROBERT J. ZIEMBA
SIGNATURE 2/14/14 DATE
SIG. INVENTORY NO. 08-0264

14-FEB-2014,14:17
S:\TEAMS\Traffic Signals\Signal Design Section\Central Region\Div 8\W-5208J#080264-sig-dsn_20140214.dgn

# APPENDIX D:

## BUILD ALTERNATIVES SCREENING

## TABLE D-1: 2040 FUTURE YEAR BUILD WIDEN WAYSIDE RD INTERSECTION MEASURES OF EFFECTIVENESS

### Signalized Intersections

| Intersection No. | Intersection | Approach | Lane Group | Delay[1] (s) AM | Delay[1] (s) PM | Level of Service[2] AM | Level of Service[2] PM | 95th % Queue (ft)/Spillback Rate AM | 95th % Queue (ft)/Spillback Rate PM | Maximum Queue Length (ft) AM | Maximum Queue Length (ft) PM |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | SR 1305 (Wayside Rd) at Plank Rd | **Overall** | | **85.1** | **25.5** | F | C | | | | |
| | | Plank Rd WB | L | 54.8 | 35.8 | D | D | 56 (0%) | 238 (0%) | 106 | 468 |
| | | | T | 21.5 | 9.6 | C | A | 49 (0%) | 139 (0%) | | |
| | | SR 1305 (Wayside Rd) NB | L | 23.2 | 34.5 | C | C | 232 (0%) | 170 (0%) | 711 | 265 |
| | | | R | 31.5 | 9.7 | C | A | 506 (0%) | 55 (0%) | | |
| | | Plank Rd EB | T | 182.0 | 27.0 | F | C | 1207 (0%) | 55 (0%) | 2848 | 300 |
| | | | R | 137.3 | 31.9 | F | C | 67 (0%) | 201 (0%) | | |
| 3 | SR 1305 (Wayside Rd) at US 401 | **Overall** | | **10.4** | **46.5** | B | D | | | | |
| | | SR 1305 (Wayside Rd) SB | L | 25.8 | 51.7 | C | D | 155 (0%) | 263 (0%) | 354 | 1113 |
| | | | LT | 26.0 | 52.2 | C | D | 175 (0%) | 712 (0%) | | |
| | | | R | 27.9 | 19.7 | C | B | 52 (0%) | 60 (0%) | | |
| | | US 401 WB | T | 9.1 | 35.0 | A | D | 219 (0%) | 457 (0%) | 378 | 775 |
| | | | R | 3.1 | 15.4 | A | B | 0 (0%) | 0 (0%) | | |
| | | Gas Station Driveway NB | R | 33.4 | 246.8 | C | F | 58 (0%) | 227 (5%) | 48 | 248 |
| | | US 401 EB | T | 10.9 | 64.8 | B | E | 241 (0%) | 790 (0%) | 428 | 1418 |
| | | | TR | 13.2 | 87.6 | B | F | 277 (0%) | 857 (1%) | | |
| 4 | US 401 at SR 1418 (Lindsay Rd) | **Overall** | | **26.2** | **27.0** | C | C | | | | |
| | | Storage Unit Driveway SB | R | 39.3 | 22.4 | D | C | 57 (0%) | 45 (0%) | 83 | 0 |
| | | US 401 WB | T | 27.4 | 18.9 | C | B | 412 (0%) | 311 (0%) | 584 | 531 |
| | | | R | 0.0 | 0.0 | A | A | 0 (0%) | 0 (0%) | | |
| | | SR 1418 (Lindsay Rd) NB | L | 31.5 | 28.3 | C | C | 201 (0%) | 144 (0%) | 453 | 295 |
| | | | LTR | 38.3 | 33.5 | D | C | 274 (0%) | 229 (0%) | | |
| | | US 401 EB | T | 22.4 | 31.8 | C | C | 392 (0%) | 554 (0%) | 502 | 765 |
| | | | R | 24.0 | 34.3 | C | C | 441 (0%) | 621 (0%) | | |
| 11 | Gillis Hill Rd Ext at Rockfish Rd | **Overall** | | **36.4** | **32.7** | D | C | | | | |
| | | Gillis Hill Rd Ext SB | LT | 52.6 | 49.9 | D | D | 108 (0%) | 127 (0%) | 226 | 178 |
| | | | T | 27.2 | 19.1 | C | B | 151 (0%) | 134 (0%) | | |
| | | | R | 12.5 | 8.8 | B | A | 72 (0%) | 104 (0%) | | |
| | | Rockfish Rd WB | L | 67.2 | 73.5 | E | E | 49 (0%) | 49 (0%) | 247 | 208 |
| | | | T | 45.4 | 48.6 | D | D | 180 (0%) | 154 (0%) | | |
| | | | R | 33.4 | 32.0 | C | C | 178 (0%) | 143 (0%) | | |
| | | School Rd NB | L | 72.9 | 74.8 | E | E | 48 (0%) | 47 (0%) | 228 | 188 |
| | | | T | 30.9 | 25.9 | C | C | 186 (0%) | 137 (0%) | | |
| | | | R | 21.1 | 22.7 | C | C | 35 (0%) | 25 (0%) | | |
| | | Rockfish Rd EB | L | 50.6 | 54.6 | D | D | 208 (0%) | 135 (0%) | 336 | 182 |
| | | | T | 38.9 | 37.8 | D | D | 214 (0%) | 95 (0%) | | |
| | | | R | 32.5 | 42.1 | C | D | 50 (0%) | 23 (0%) | | |
| 2 | SR 1305 (Wayside Rd) at Brock Rd | **Overall** | | **18.9** | **9.4** | B | A | | | | |
| | | SR 1305 (Wayside Rd) SB | T | 19.0 | 5.6 | B | A | 141 (0%) | 100 (0%) | 213 | 198 |
| | | | R | 7.7 | 4.5 | A | A | 43 (0%) | 51 (0%) | | |
| | | SR 1305 (Wayside Rd) NB | LR | 42.0 | 38.8 | D | D | 268 (0%) | 159 (0%) | 395 | 219 |
| | | Brock Rd EB | L | 49.5 | 42.1 | D | D | 101 (0%) | 97 (0%) | 339 | 136 |
| | | | T | 10.1 | 5.0 | B | A | 193 (0%) | 68 (0%) | | |

### Unsignalized Intersections[3]

| Intersection No. | Intersection | Approach | Lane | Delay[1] (s) AM | Delay[1] (s) PM | Level of Service[2] AM | Level of Service[2] PM | 95th % Queue (ft)/Spillback Rate AM | 95th % Queue (ft)/Spillback Rate PM | Maximum Queue Length (ft) AM | Maximum Queue Length (ft) PM |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | US 401 EB at U-Turn | US 401 U-Turn SB | L | 71.8 | 65.7 | F | F | 232 (1%) | 234 (3%) | 296 | 592 |
| | | US 401 EB | T | 0.4 | 2.4 | A | A | 0 (0%) | 100 (0%) | 0 | 178 |
| 6 | US 401 WB at U-Turn | US 401 WB | T | 0.5 | 0.3 | A | A | 12 (0%) | 0 (0%) | 0 | 0 |
| | | US 401 U-Turn NB | L | 59.2 | 36.7 | F | E | 156 (0%) | 110 (0%) | 201 | 137 |
| 7 | SR 1418 (Lindsay Rd) at SR 1419 (Stony Point Rd) | SR 1418 (Lindsay Rd) SB | LT | 23.7 | 15.7 | C | C | 395 (0%) | 288 (0%) | 589 | 521 |
| | | SR 1419 (Stony Point Rd) WB | LR | 465.1 | 105.7 | F | F | 1606 (0%) | 516 (0%) | 2040 | 668 |
| | | SR 1418 (Lindsay Rd) NB | TR | 1.4 | 1.2 | A | A | 27 (0%) | 0 (0%) | 0 | 0 |
| 8 | SR 1418 (Lindsay Rd) at SR 1417 (Adcox Rd) | SR 1418 (Lindsay Rd) SB | T | 1.1 | 0.8 | A | A | 0 (0%) | 0 (0%) | 0 | 0 |
| | | | R | 1.3 | 1.1 | A | A | 0 (0%) | 0 (0%) | | |
| | | SR 1418 (Lindsay Rd) NB | LT | 0.8 | 1.0 | A | A | 20 (0%) | 81 (0%) | 0 | 68 |
| | | SR 1417 (Adcox Rd) EB | L | 16.4 | 14.9 | C | B | 87 (0%) | 66 (0%) | 161 | 117 |
| | | | R | 11.7 | 11.3 | B | B | 31 (0%) | 23 (0%) | | |
| 9 | SR 1418 (Lindsay Rd) at SR 1415 (Galatia Church Rd) | SR 1418 (Lindsay Rd) SB | LTR | 16.6 | 16.3 | C | C | 110 (0%) | 109 (0%) | 193 | 191 |
| | | SR 1415 (Galatia Church Rd) WB | LTR | 12.3 | 12.5 | B | B | 37 (0%) | 45 (0%) | 74 | 87 |
| | | SR 1418 (Lindsay Rd) NB | LTR | 14.7 | 13.1 | B | B | 87 (0%) | 57 (0%) | 148 | 130 |
| | | SR 1415 (Galatia Church Rd) EB | LTR | 13.1 | 12.1 | B | B | 59 (0%) | 34 (0%) | 116 | 31 |
| 10 | SR 1418 (Lindsay Rd) at SR 1420 (Gillis Hill Rd) | SR 1418 (Lindsay Rd) SB | LT | 38.4 | 39.1 | E | E | 61 (0%) | 61 (0%) | 116 | 135 |
| | | | R | 13.7 | 15.1 | B | C | 83 (0%) | 66 (0%) | | |
| | | SR 1420 (Gillis Hill Rd) WB | L | 5.9 | 5.1 | A | A | 22 (0%) | 18 (0%) | 0 | 0 |
| | | SR 1418 (Lindsay Rd) NB | LT | 42.0 | 50.0 | E | E | 38 (0%) | 43 (0%) | 48 | 55 |
| | | | R | 16.9 | 14.8 | C | B | 42 (0%) | 30 (0%) | | |
| | | SR 1420 (Gillis Hill Rd) EB | L | 5.9 | 7.5 | A | A | 65 (0%) | 71 (0%) | 108 | 91 |
| | | | TR | 0.2 | 0.2 | A | A | 0 (0%) | 0 (0%) | | |

Notes:

1 Delay shown is the 95th percentile worst case control delay for the full 60-minute simulation period as derived from the 10 random seed simulations

2 Level of Service shown is Simulation based and calculated in a manner that is consistent with the HCM 2010 Methodologies

3 Results for unsignalized intersections include only the movements that have conflicting flow and thus have the potential to incur control delay

## TABLE D-2: 2040 FUTURE YEAR BUILD REALIGN WAYSIDE RD AND LINDSAY RD WITH 8-PHASE SIGNAL AT US 401 INTERSECTION MEASURES OF EFFECTIVENESS

### Signalized Intersections

| Intersection No. | Intersection | Approach | Lane Group | Delay[1] (s) | | Level of Service[2] | | 95th % Queue (ft)/Spillback Rate | | Maximum Queue Length (ft) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | AM | PM | AM | PM | AM | PM | AM | PM |
| 1 | SR 1305 (Wayside Rd) at Plank Rd | **Overall** | | **75.6** | **34.6** | **E** | **C** | | | | |
| | | Plank Rd WB | L | 68.0 | 50.7 | E | D | 61 (0%) | 279 (0%) | 102 | 633 |
| | | | T | 23.7 | 19.2 | C | B | 52 (0%) | 149 (0%) | | |
| | | SR 1305 (Wayside Rd) NB | L | 25.7 | 37.4 | C | D | 274 (0%) | 202 (0%) | 778 | 268 |
| | | | R | 33.7 | 12.3 | C | B | 539 (0%) | 72 (0%) | | |
| | | Plank Rd EB | T | 153.6 | 28.8 | F | C | 1309 (0%) | 49 (0%) | 2286 | 323 |
| | | | R | 109.2 | 33.6 | F | C | 66 (0%) | 213 (0%) | | |
| 2 | SR 1305 (Wayside Rd) at Brock Rd | **Overall** | | **20.8** | **10.5** | **C** | **B** | | | | |
| | | SR 1305 (Wayside Rd) SB | T | 17.2 | 5.4 | B | A | 142 (0%) | 104 (0%) | 209 | 191 |
| | | | R | 6.7 | 4.3 | A | A | 43 (0%) | 53 (0%) | | |
| | | SR 1305 (Wayside Rd) NB | LR | 49.9 | 42.3 | D | D | 301 (0%) | 167 (0%) | 416 | 239 |
| | | Brock Rd EB | L | 60.7 | 48.2 | E | D | 118 (0%) | 100 (0%) | 368 | 140 |
| | | | T | 11.9 | 5.4 | B | A | 247 (0%) | 79 (0%) | | |
| 12 | US 401 at SR 1305 (Wayside Rd) / SR 1418 (Lindsay Rd) | **Overall** | | **66.3** | **60.3** | **E** | **E** | | | | |
| | | SR 1305 (Wayside Rd) SB | L | 108.5 | 61.9 | F | E | 336 (0%) | 403 (0%) | 921 | 1079 |
| | | | TR | 397.8 | 202.1 | F | F | 871 (0%) | 1030 (0%) | | |
| | | US 401 WB | L | 92.2 | 90.1 | F | F | 192 (0%) | 213 (0%) | 549 | 578 |
| | | | T | 24.4 | 44.8 | C | D | 248 (0%) | 358 (0%) | | |
| | | | R | 19.8 | 17.1 | B | B | 404 (0%) | 208 (0%) | | |
| | | SR 1418 (Lindsay Rd) NB | L | 131.9 | 67.8 | F | E | 601 (0%) | 368 (0%) | 1043 | 502 |
| | | | T | 144.0 | 64.4 | F | E | 332 (0%) | 128 (0%) | | |
| | | | TR | 156.3 | 72.6 | F | E | 673 (0%) | 217 (0%) | | |
| | | US 401 EB | L | 105.3 | 79.8 | F | E | 129 (0%) | 84 (0%) | 416 | 512 |
| | | | T | 30.6 | 44.3 | C | D | 319 (0%) | 310 (0%) | | |
| | | | R | 14.0 | 23.5 | B | C | 163 (0%) | 195 (0%) | | |
| 11 | Gillis Hill Rd Ext at Rockfish Rd | **Overall** | | **36.4** | **32.1** | **D** | **C** | | | | |
| | | Gillis Hill Rd Ext SB | LT | 56.0 | 48.8 | E | D | 96 (0%) | 132 (0%) | 191 | 221 |
| | | | T | 26.8 | 19.5 | C | B | 156 (0%) | 127 (0%) | | |
| | | | R | 13.2 | 9.3 | B | A | 104 (0%) | 99 (0%) | | |
| | | Rockfish Rd WB | L | 64.6 | 66.8 | E | E | 51 (0%) | 58 (0%) | 250 | 200 |
| | | | T | 44.6 | 48.0 | D | D | 179 (0%) | 159 (0%) | | |
| | | | R | 33.3 | 31.7 | C | C | 178 (0%) | 134 (0%) | | |
| | | School Rd NB | L | 65.2 | 73.7 | E | E | 54 (0%) | 53 (0%) | 231 | 178 |
| | | | T | 29.6 | 24.6 | C | C | 170 (0%) | 126 (0%) | | |
| | | | R | 22.7 | 22.5 | C | C | 29 (0%) | 47 (0%) | | |
| | | Rockfish Rd EB | L | 50.0 | 51.9 | D | D | 203 (0%) | 138 (0%) | 273 | 184 |
| | | | T | 39.0 | 39.4 | D | D | 213 (0%) | 98 (0%) | | |
| | | | R | 29.5 | 41.7 | C | D | 41 (0%) | 37 (0%) | | |

### Unsignalized Intersections[3]

| Intersection No. | Intersection | Approach | Lane | Delay[1] (s) | | Level of Service[2] | | 95th % Queue (ft)/Spillback Rate | | Maximum Queue Length (ft) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | AM | PM | AM | PM | AM | PM | AM | PM |
| 5 | US 401 EB at U-Turn | US 401 U-Turn SB | L | 21.8 | 22.4 | C | C | 48 (0%) | 29 (0%) | 22 | 33 |
| | | US 401 EB | T | 0.1 | 0.0 | A | A | 0 (0%) | 0 (0%) | 0 | 0 |
| 6 | US 401 WB at U-Turn | US 401 WB | T | 0.1 | 0.2 | A | A | 0 (0%) | 0 (0%) | 0 | 0 |
| | | US 401 U-Turn NB | L | 42.7 | 33.9 | E | D | 90 (0%) | 100 (0%) | 87 | 110 |
| 7 | SR 1418 (Lindsay Rd) at SR 1419 (Stony Point Rd) | SR 1418 (Lindsay Rd) SB | LT | 19.0 | 15.4 | C | C | 288 (0%) | 329 (0%) | 559 | 659 |
| | | SR 1419 (Stony Point Rd) WB | LR | 390.4 | 205.0 | F | F | 1617 (0%) | 847 (0%) | 1927 | 1156 |
| | | SR 1418 (Lindsay Rd) NB | TR | 1.4 | 1.3 | A | A | 0 (0%) | 0 (0%) | 0 | 0 |
| 8 | SR 1418 (Lindsay Rd) at SR 1417 (Adcox Rd) | SR 1418 (Lindsay Rd) SB | T | 1.0 | 0.9 | A | A | 0 (0%) | 0 (0%) | 0 | 0 |
| | | | R | 1.1 | 1.2 | A | A | 0 (0%) | 0 (0%) | | |
| | | SR 1418 (Lindsay Rd) NB | LT | 0.9 | 1.7 | A | A | 70 (0%) | 40 (0%) | 93 | 85 |
| | | SR 1417 (Adcox Rd) EB | L | 16.9 | 15.2 | C | C | 97 (0%) | 79 (0%) | 137 | 114 |
| | | | R | 11.1 | 11.9 | B | B | 24 (0%) | 30 (0%) | | |
| 9 | SR 1418 (Lindsay Rd) at SR 1415 (Galatia Church Rd) | SR 1418 (Lindsay Rd) SB | LTR | 14.4 | 16.0 | B | C | 87 (0%) | 102 (0%) | 130 | 170 |
| | | SR 1415 (Galatia Church Rd) WB | LTR | 12.9 | 12.8 | B | B | 41 (0%) | 49 (0%) | 37 | 71 |
| | | SR 1418 (Lindsay Rd) NB | LTR | 15.0 | 13.2 | B | B | 96 (0%) | 83 (0%) | 167 | 125 |
| | | SR 1415 (Galatia Church Rd) EB | LTR | 12.9 | 12.6 | B | B | 59 (0%) | 46 (0%) | 108 | 69 |
| 10 | SR 1418 (Lindsay Rd) at SR 1420 (Gillis Hill Rd) | SR 1418 (Lindsay Rd) SB | LT | 40.4 | 38.3 | E | E | 93 (0%) | 81 (0%) | 124 | 160 |
| | | | R | 13.4 | 15.1 | B | C | 66 (0%) | 79 (0%) | | |
| | | SR 1420 (Gillis Hill Rd) WB | L | 7.2 | 4.3 | A | A | 23 (0%) | 14 (0%) | 0 | 0 |
| | | SR 1418 (Lindsay Rd) NB | LT | 41.8 | 46.3 | E | E | 47 (0%) | 39 (0%) | 30 | 35 |
| | | | R | 15.7 | 14.0 | C | B | 35 (0%) | 26 (0%) | | |
| | | Driveway EB | LT | 6.0 | 8.1 | A | A | 77 (0%) | 71 (0%) | 114 | 89 |

Notes:

1 Delay shown is the 95th percentile worst case control delay for the full 60-minute simulation period as derived from the 10 random seed simulations

2 Level of Service shown is Simulation based and calculated in a manner that is consistent with the HCM 2010 Methodologies

3 Results for unsignalized intersections include only the movements that have conflicting flow and thus have the potential to incur control delay

## TABLE D-3: 2040 FUTURE YEAR BUILD REALIGN WAYSIDE RD AND LINDSAY RD TO A SUPERSTREET INTERSECTION WITH US 401 INTERSECTION MEASURES OF EFFECTIVENESS

### Signalized Intersections

| Intersection No. | Intersection | Approach | Lane Group | Delay[1] (s) AM | Delay[1] (s) PM | Level of Service[2] AM | Level of Service[2] PM | 95th % Queue (ft)/Spillback Rate AM | 95th % Queue (ft)/Spillback Rate PM | Maximum Queue Length (ft) AM | Maximum Queue Length (ft) PM |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | SR 1305 (Wayside Rd) at Plank Rd | **Overall** | | **41.7** | **35.4** | **D** | **D** | | | | |
| | | Plank Rd WB | L | 59.1 | 49.5 | E | D | 61 (0%) | 338 (0%) | 109 | 824 |
| | | | T | 19.5 | 18.6 | B | B | 59 (0%) | 172 (0%) | | |
| | | SR 1305 (Wayside Rd) NB | L | 29.5 | 41.7 | C | D | 259 (0%) | 230 (0%) | 679 | 273 |
| | | | R | 39.0 | 12.9 | D | B | 573 (0%) | 63 (0%) | | |
| | | Plank Rd EB | T | 62.0 | 29.8 | E | C | 782 (0%) | 54 (0%) | 1021 | 350 |
| | | | R | 26.4 | 38.1 | C | D | 76 (0%) | 235 (0%) | | |
| 2 | SR 1305 (Wayside Rd) at Brock Rd | **Overall** | | **18.4** | **15.1** | **B** | **B** | | | | |
| | | SR 1305 (Wayside Rd) SB | T | 17.8 | 12.3 | B | B | 150 (0%) | 238 (0%) | 219 | 437 |
| | | | R | 6.2 | 11.0 | A | B | 58 (0%) | 57 (0%) | | |
| | | SR 1305 (Wayside Rd) NB | LR | 45.2 | 47.6 | D | D | 281 (0%) | 167 (0%) | 462 | 245 |
| | | Brock Rd EB | L | 50.0 | 50.0 | D | D | 105 (0%) | 108 (0%) | 316 | 138 |
| | | | T | 9.1 | 5.0 | A | A | 184 (0%) | 106 (0%) | | |
| 12 | US 401 at SR 1305 (Wayside Rd) | **Overall** | | **73.8** | **31.1** | **E** | **C** | | | | |
| | | SR 1305 (Wayside Rd) SB | L | 185.8 | 35.5 | F | D | 759 (0%) | 465 (0%) | 874 | 594 |
| | | US 401 WB | T | 34.5 | 29.7 | C | C | 152 (0%) | 295 (0%) | 1009 | 373 |
| | | | R | 65.8 | 28.2 | E | C | 612 (0%) | 234 (0%) | | |
| | | US 401 EB | L | 23.5 | 18.5 | C | B | 92 (0%) | 61 (0%) | 134 | 61 |
| 13 | US 401 at SR 1418 (Lindsay Rd) | **Overall** | | **18.9** | **19.2** | **B** | **B** | | | | |
| | | US 401 WB | L | 18.1 | 22.2 | B | C | 86 (0%) | 98 (0%) | 138 | 134 |
| | | SR 1418 (Lindsay Rd) NB | L | 23.5 | 29.0 | C | C | 220 (0%) | 205 (0%) | 288 | 273 |
| | | US 401 EB | T | 16.8 | 15.7 | B | B | 183 (0%) | 198 (0%) | 321 | 311 |
| | | | R | 20.3 | 19.7 | C | B | 169 (0%) | 158 (0%) | | |
| 11 | Gillis Hill Rd Ext at Rockfish Rd | **Overall** | | **36.3** | **32.1** | **D** | **C** | | | | |
| | | Gillis Hill Rd Ext SB | LT | 55.7 | 48.1 | E | D | 100 (0%) | 122 (0%) | 209 | 212 |
| | | | T | 27.2 | 18.4 | C | B | 149 (0%) | 123 (0%) | | |
| | | | R | 11.6 | 9.0 | B | A | 86 (0%) | 105 (0%) | | |
| | | Rockfish Rd WB | L | 60.8 | 77.5 | E | E | 52 (0%) | 48 (0%) | 259 | 235 |
| | | | T | 45.0 | 48.1 | D | D | 180 (0%) | 152 (0%) | | |
| | | | R | 33.2 | 31.1 | C | C | 186 (0%) | 141 (0%) | | |
| | | School Rd NB | L | 72.5 | 73.3 | E | E | 50 (0%) | 55 (0%) | 232 | 181 |
| | | | T | 29.1 | 24.9 | C | C | 170 (0%) | 126 (0%) | | |
| | | | R | 20.7 | 24.6 | C | C | 25 (0%) | 39 (0%) | | |
| | | Rockfish Rd EB | L | 50.3 | 54.2 | D | D | 196 (0%) | 131 (0%) | 272 | 219 |
| | | | T | 38.3 | 39.0 | D | D | 201 (0%) | 100 (0%) | | |
| | | | R | 31.6 | 37.8 | C | D | 45 (0%) | 30 (0%) | | |
| 5 | US 401 EB at U-Turn | **Overall** | | **13.1** | **18.3** | **B** | **B** | | | | |
| | | US 401 U-Turn SB | U | 25.6 | 22.5 | C | C | 185 (2%) | 247 (21%) | 349 | 1021 |
| | | US 401 EB | T | 7.8 | 14.8 | A | B | 132 (0%) | 172 (0%) | 239 | 264 |
| 6 | US 401 WB at U-Turn | **Overall** | | **27.3** | **13.2** | **C** | **B** | | | | |
| | | US 401 WB | T | 25.6 | 7.4 | C | A | 414 (0%) | 138 (0%) | 889 | 281 |
| | | US 401 U-Turn NB | U | 33.3 | 30.0 | C | C | 201 (0%) | 190 (0%) | 323 | 282 |

### Unsignalized Intersections[3]

| Intersection No. | Intersection | Approach | Lane | Delay[1] (s) AM | Delay[1] (s) PM | Level of Service[2] AM | Level of Service[2] PM | 95th % Queue (ft)/Spillback Rate AM | 95th % Queue (ft)/Spillback Rate PM | Maximum Queue Length (ft) AM | Maximum Queue Length (ft) PM |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | SR 1418 (Lindsay Rd) at SR 1419 (Stony Point Rd) | SR 1418 (Lindsay Rd) SB | LT | 17.9 | 14.1 | C | B | 283 (0%) | 265 (0%) | 451 | 548 |
| | | SR 1419 (Stony Point Rd) WB | LR | 402.2 | 204.3 | F | F | 1500 (0%) | 828 (0%) | 2004 | 1026 |
| | | SR 1418 (Lindsay Rd) NB | TR | 1.4 | 1.3 | A | A | 10 (0%) | 0 (0%) | 0 | 0 |
| 8 | SR 1418 (Lindsay Rd) at SR 1417 (Adcox Rd) | SR 1418 (Lindsay Rd) SB | T | 1.0 | 0.9 | A | A | 0 (0%) | 0 (0%) | 0 | 0 |
| | | | R | 1.1 | 1.2 | A | A | 0 (0%) | 0 (0%) | | |
| | | SR 1418 (Lindsay Rd) NB | LT | 1.1 | 1.3 | A | A | 87 (0%) | 66 (0%) | 60 | 0 |
| | | SR 1417 (Adcox Rd) EB | L | 17.7 | 15.3 | C | C | 113 (0%) | 85 (0%) | 144 | 114 |
| | | | R | 14.2 | 11.1 | B | B | 45 (0%) | 30 (0%) | | |
| 9 | SR 1418 (Lindsay Rd) at SR 1415 (Galatia Church Rd) | SR 1418 (Lindsay Rd) SB | LTR | 14.8 | 16.1 | B | C | 82 (0%) | 135 (0%) | 166 | 164 |
| | | SR 1415 (Galatia Church Rd) WB | LTR | 12.3 | 12.7 | B | B | 37 (0%) | 51 (0%) | 27 | 91 |
| | | SR 1418 (Lindsay Rd) NB | LTR | 15.5 | 13.9 | C | B | 99 (0%) | 88 (0%) | 166 | 145 |
| | | SR 1415 (Galatia Church Rd) EB | LTR | 13.0 | 12.4 | B | B | 63 (0%) | 47 (0%) | 116 | 40 |
| 10 | SR 1418 (Lindsay Rd) at SR 1420 (Gillis Hill Rd) | SR 1418 (Lindsay Rd) SB | LT | 39.2 | 56.1 | E | F | 74 (0%) | 104 (0%) | 92 | 129 |
| | | | R | 13.4 | 16.0 | B | C | 86 (0%) | 86 (0%) | | |
| | | SR 1420 (Gillis Hill Rd) WB | L | 7.6 | 6.0 | A | A | 25 (0%) | 13 (0%) | 0 | 0 |
| | | SR 1418 (Lindsay Rd) NB | LT | 44.8 | 59.6 | E | F | 33 (0%) | 64 (0%) | 58 | 53 |
| | | | R | 13.6 | 12.6 | B | B | 26 (0%) | 28 (0%) | | |
| | | Driveway EB | LT | 6.2 | 8.2 | A | A | 79 (0%) | 81 (0%) | 107 | 104 |

Notes:

1 Delay shown is the 95th percentile worst case control delay for the full 60-minute simulation period as derived from the 10 random seed simulations

2 Level of Service shown is Simulation based and calculated in a manner that is consistent with the HCM 2010 Methodologies

3 Results for unsignalized intersections include only the movements that have conflicting flow and thus have the potential to incur control delay

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