Modifying Traffic Distribution Patterns via Pavement Marking Enhancements and Lane Channelization on the State Street Corridor in New Albany, Indiana

Phase 1: Simulation of the State Street Corridor

in conjunction with

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Executive Summary

Phase 1 of this study found that, by adjusting the lane flow distribution northbound on the State Street corridor in New Albany, IN, delay could be reduced by 64% and the average queue length on the northbound approach of State St approaching Daisy Ln can be reduced by 88%. The study utilized cellular data and a Vissim traffic microsimulation model to achieve these results. The City of New Albany is moving forward with efforts to influence lane position behavior through signage and pavement markings to achieve the modeled results on the State St corridor. Phase 2 of this study will test the real effects of these efforts in a before-after framework.

Table 1. Projected impacts of adjusting lane flow distribution on the State Street Corridor

	Current	Projected	Percent Difference	Significant ($\alpha = 0.05$)
Average Queue (m)	320.6	39.0	-88%	Yes
Average Maximum Queue (m)	506.2	176.9	-65%	Yes
Queue Stops	2649.0	778.0	-71%	Yes
Average Travel Time (s)	389.5	171.4	-56%	Yes
Average Delay (s)	259.6	92.5	-64%	Yes

Table of Contents

Executive Summary ..... *ii*

LIST OF TABLES ..... *iv*

LIST OF FIGURES ..... *v*

INTRODUCTION *1*

LITERATURE REVIEW *1*

Driving Behavior 1

Simulation 2

STUDY CORRIDOR *3*

METHODOLOGY *7*

Model Development 7

Model Calibration 9

Current and Projected Condition Analysis 12

RESULTS *13*

Queue Lengths 13

Travel Time 17

Delay 20

Lane Flow Distribution 23

DISCUSSION *26*

General Discussion 26

Recommendations and Future Research 26

CONCLUSION *1*

REFERENCES *2*

APPENDICES *5*

Appendix A: Queue Data 5

Appendix B: Travel Time Data 10

Appendix C: Delay Data 15

Appendix D: Vehicle Distribution Data 20

Appendix E: Traffic Signal Timings 25

LIST OF TABLES

TABLE 1: ANOVA SINGLE FACTOR NB QUEUE LENGTH AVERAGE (M).....14
TABLE 2: ANOVA SINGLE FACTOR SB QUEUE LENGTH AVERAGE (M).....16
TABLE 3: ANOVA SINGLE FACTOR NB MAXIMUM QUEUE LENGTHS (M).....16
TABLE 4: ANOVA SINGLE FACTOR NB QUEUE STOPS 17
TABLE 5: ANOVA SINGLE FACTOR NB TRAVEL TIME (S).....18
TABLE 6: ANOVA SINGLE FACTOR NB TRAVEL TIME (S).....20
TABLE 7: ANOVA SINGLE FACTOR NB DELAY (S) 21
TABLE 8: ANOVA SINGLE FACTOR SB STOP DELAY (S).....23
TABLE 9: ANOVA SINGLE FACTOR NB RIGHT LANE VEHICLE COUNT.....24
TABLE 10: ANOVA SINGLE FACTOR PERCENTAGE OF VEHICLES IN THE RIGHT LANE.....25

LIST OF FIGURES

FIGURE 1: STUDY PORTION OF STATE STREET CORRIDOR AERIAL VIEW 4
FIGURE 2: STATE STREET AERIAL SHOWING EXISTING QUEUING 5
FIGURE 3: PICTURE OF STATE STREET CORRIDOR LOOKING NORTH NEAR THE KROGER ENTRANCE 6
FIGURE 4: PICTURE OF STATE STREET CORRIDOR LOOKING NORTH NEAR THE HOME DEPOT ENTRANCE 6
FIGURE 5: VISSIM MODEL OF THE STATE STREET CORRIDOR 7
FIGURE 6: STATE AND DAISY INTERSECTION 8
FIGURE 7: STATE STREET AND CAPTAIN FRANK INTERSECTION 9
FIGURE 8: STATE STREET AND DAISY LANE VISSIM SIGNAL CONTROLLER INPUTS 10
FIGURE 9: CURRENT MODEL SHOWING EXISTING QUEUING 11
FIGURE 10: PROPOSED MODEL SHOWING PROJECTED QUEUING 12
FIGURE 11: COMPARATIVE HISTOGRAM OF CURRENT & PROJECTED NB AVERAGE QUEUE LENGTH (M) 14
FIGURE 12: COMPARATIVE HISTOGRAM OF CURRENT & PROJECTED SB AVERAGE QUEUE LENGTH (M) 15
FIGURE 13: COMPARATIVE HISTOGRAM OF CURRENT & PROJECTED NB AVERAGE TRAVEL TIME (S) 18
FIGURE 14: COMPARATIVE HISTOGRAM OF CURRENT & PROJECTED SB AVERAGE TRAVEL TIME (S) 19
FIGURE 15: COMPARATIVE HISTOGRAM OF CURRENT & PROJECTED NB AVERAGE DELAY (S) 21
FIGURE 16: COMPARATIVE HISTOGRAM OF CURRENT & PROJECTED SB AVERAGE DELAY (S) 22
FIGURE 17: COMPARISON OF CURRENT & PROJECTED LANE FLOW DISTRIBUTIONS 24
FIGURE 18: STATE STREET STRIPING MODIFICATIONS SHEET 1 26
FIGURE 19: STATE STREET STRIPING MODIFICATIONS SHEET 2 27
FIGURE 20: STATE STREET STRIPING MODIFICATIONS SHEET 3 27
FIGURE 21: STATE STREET STRIPING MODIFICATIONS SHEET 4 28
FIGURE 22: STATE STREET STRIPING MODIFICATIONS SHEET 5 28
FIGURE 23: STATE STREET STRIPING MODIFICATIONS SHEET 6 29
FIGURE 24: EXAMPLE OF OVERHEAD SIGNAGE 29

INTRODUCTION

State Street, moving northbound from Green Valley Rd approaching I-265 has recurrent congestion due to high traffic volumes combined with unusual road geometry. Particularly, the corridor experiences high delay and long queue lengths at several northbound approaches to intersections as the lane flow distribution is highly unbalanced with access to I-265 in both directions on the right lane. The objective of this study is to explore approaches to balancing the lane flow distribution through pavement markings and signage on the corridor.

The objective of Phase 1 of this study is to evaluate lane flow distribution before and after implementing new route markings and signs to utilize existing lanes better moving northbound on State St in New Albany, IN. To accomplish this objective data was collected on the State St corridor. Using this data, a Vissim traffic microsimulation model was built of the corridor under two conditions, the current base case, and the projected case with signage and marking to influence lane flow distribution. Results compared the two cases and found that the improved lane flow distribution has the potential to greatly improve key traffic engineering metrics including travel time, queue length, and total delay. Based on these findings suggested signage and pavement markings on the corridor were proposed. Phase 2 will evaluate the true impact of the changes post-construction.

LITERATURE REVIEW

Driving Behavior

An analysis of the lane flow distribution and the effects of various treatments are the primary focus of this study. In looking at lane flow distribution, we must look at the lane-changing process; it is a highly complex process because of the overlap of the strategy, tactical, and operational behaviors (Li & Sun, 2017). Studies have analyzed the effectiveness of traffic control devices in affecting driver behavior and show signs affected passenger car behavior (Bai et al., 2010). In contrast, other studies have reviewed the overuse of signs and the effect on mental workload (Yang et al., 2020). With signs, the goal is to achieve clarity of the meaning to provoke fewer mistakes in the decision task (Vilchez, 2018) and to minimize the time the subjects take to recognize the sign to reduce the likelihood of committing an error in discarding the sign's message (Vilchez, 2019).

For the corridor, overhead sign locations, other than on the signal strain wires, do not exist; therefore, this study reviewed previous research about co-location of road signs. The research established that co-location did not negatively affect driving performance and had minimal impact on a driver's ability to respond appropriately to an emergency event; however, the mental workload was higher when signs were triply co-located (Filtness et al., 2017). Further studies show vertical traffic signs are looked at infrequently (Costa et al., 2014).

Since road surface markings are placed on the surface immediately in the driver's line of sight, they are more effective in influencing driver behavior, considering drivers fix their eyes mainly on the center of the road (Costa et al., 2014). Pavement markings can communicate information to road users like no other traffic control device. They provide constant messages to roadway users related to alignment, vehicle positioning, and other critical driving-related tasks (Carlson et al., 2009). Drivers principally focus on the center area of the road, and during various experiment conditions, all drivers' percent focusing on the center of the road exceeded 60% (Yuan et al., 2011).

When implementing traffic control devices in a simulation study, a study determined that treatments positively affected driver behavior (Babić & Brijs, 2021). This impact continued when implemented in the field, with results indicating pavement markings had positive effects on drivers' behaviors at signalized intersections. In particular, signs affected traffic volume on lane-changing behaviors in simulations, and the recommendation is to install signs 500 m upstream from the required changed condition (Hang et al., 2018). Additional studies show pavement markings affect drivers' behaviors—particularly with respect to lateral position on a roadway. (Akbari & Haghighi, 2020; Ariën et al., 2017; Daniels et al., 2010; Godley, 1999; Hussain et al., 2021; Van Driel et al., 2004).

Simulation

Microsimulation methods are used productively in the field of modeling vehicular flows on urban road networks. These methods provide the fundamental cornerstone for investigating traffic flow characteristics (Bandi & George, 2020). For the average queue length estimated by various traffic microsimulation programs, VISSIM has closer simulation results to the actual situation (Sun et al., 2013). The primary benefit of VISSIM is that it achieves a high level of detail and flexibility in modeling roadway design, vehicle performance, and drivers' behavior. VISSIM uses a psychophysical car-following basis for longitudinal vehicle movement and a rule-based algorithm for lateral movement (Huang et al., 2013). Given the plethora of benefits of using VISSIM in the literature reviewed, this study performed the modeling within the VISSIM modeling package.

Large datasets of trajectory information are required to develop new lane-changing models and improve the accuracy of the current lane-changing models

(Moridpour et al., 2010). Many studies use aggregate data, which do not describe individual drivers or vehicle behavior, due to difficulties obtaining more granular data (Hollander & Liu, 2008). In the calibration process, parameters are adjusted so the model outputs are similar to observed data. Appropriate adaptation of the input data to generate results as close as possible to the field data is the first state of calibration (Karakikes et al., 2017).

Lane utilization, a macroscopic characteristic, helps reflect traffic capacity, discharge capacity, the degree of congestion, and the running state of vehicles. The definition of lane utilization is the number of vehicles on the lane divided by the number of vehicles on all lanes (Lv et al., 2013). The calibrated models are evaluated with a new set of field data under untried conditions, including the input volumes, traffic composition, and other required data (Siddharth & Ramadurai, 2013). Furthermore, lane flow distribution (LFD) is an effective calibration and validation method for models (Duret et al., 2012).

STUDY CORRIDOR

The study segment of the State Street corridor is a four-lane, urban section with left-turn lanes at select locations. In 2020, the Indiana Department of Transportation (INDOT) performed traffic counts showing a 27,469 AADT; however, INDOT noted the counts were likely lower than usual because of the COVID-19 pandemic (*Traffic Count Database System (TCDS)*, n.d.). There are two interstate ingress ramps along the corridor, two interstate egress ramps, seven signalized intersections, three unsignalized side streets, and 12 commercial entrances on the northbound side of the street and 15 commercial entrances along on the southbound side of the road.

Figure 1: Study Portion of State Street Corridor Aerial View

During midday and PM peak hours, traffic moving in the northbound direction can queue 0.7 of the 0.8-mile segment. Observationally, majority of northbound traffic attempts to establish position in the right lane to gain access to the interstate ramps which are, both on the right side of the street. The previously mentioned position-establishing creates a situation in which the left lane becomes a de facto passing lane rather than conveying traffic in conjunction with the right lane. Further exacerbating the queuing along the corridor, as northbound traffic attempts to access the westbound I-265 ramp, traffic queues along State Street, thereby severing traffic from the I-265 eastbound ramp. Given this condition, the City of New Albany has requested methods to improve traffic flow on the commercial corridor. The simulation and the results of this study will focus on northbound traffic since it is the condition causing the most concern for the City of New Albany.

Figure 2: State Street Aerial Showing Existing Queuing

For the corridor, overhead sign locations, other than on signal strain wires, do not exist as is visible in Figures 3 and 4; therefore, this study reviewed previous research about co-location of road signs. The research established that co-location did not negatively affect driving performance and had minimal impact on a driver's ability to respond appropriately to an emergency event (Filtness et al., 2017). Further studies show vertical traffic signs are looked at infrequently (Costa et al., 2014).

Also apparent in Figures 3 and 4, the lane flow distribution for NB traffic along the State Street corridor is not evenly distributed among the lanes. This uneven distribution causes issues with queuing, longer travel times, and additional delay for the corridor, as reported by the City of New Albany.

Figure 3: Picture of State Street Corridor Looking North near the Kroger Entrance

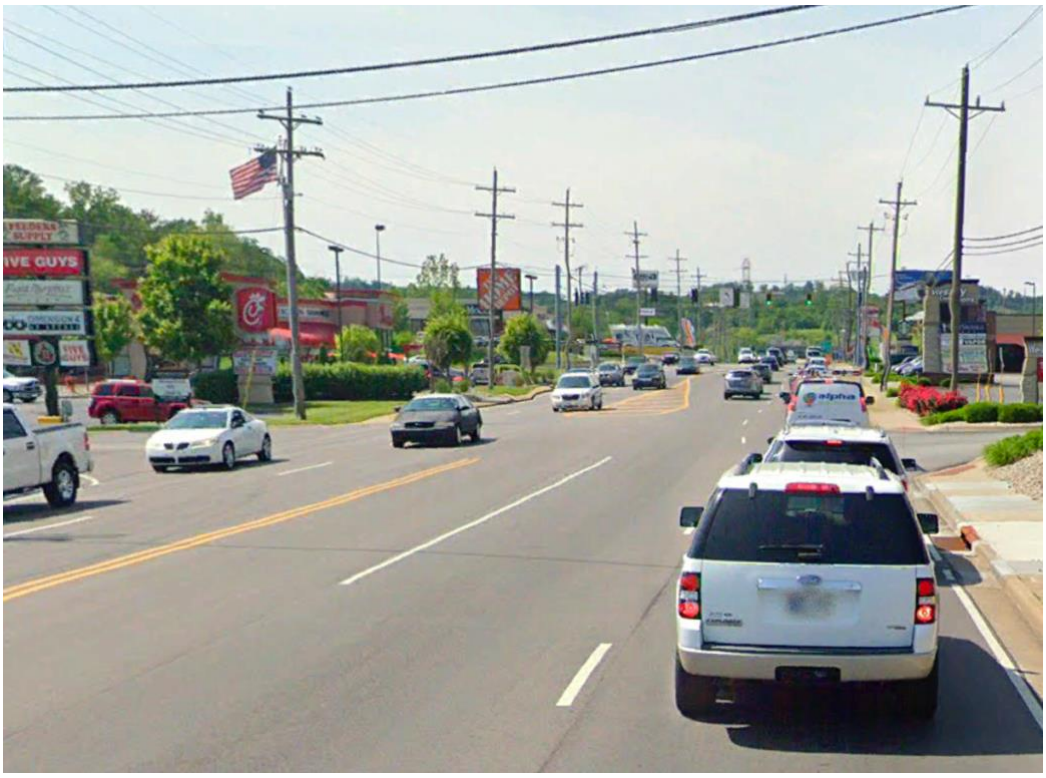
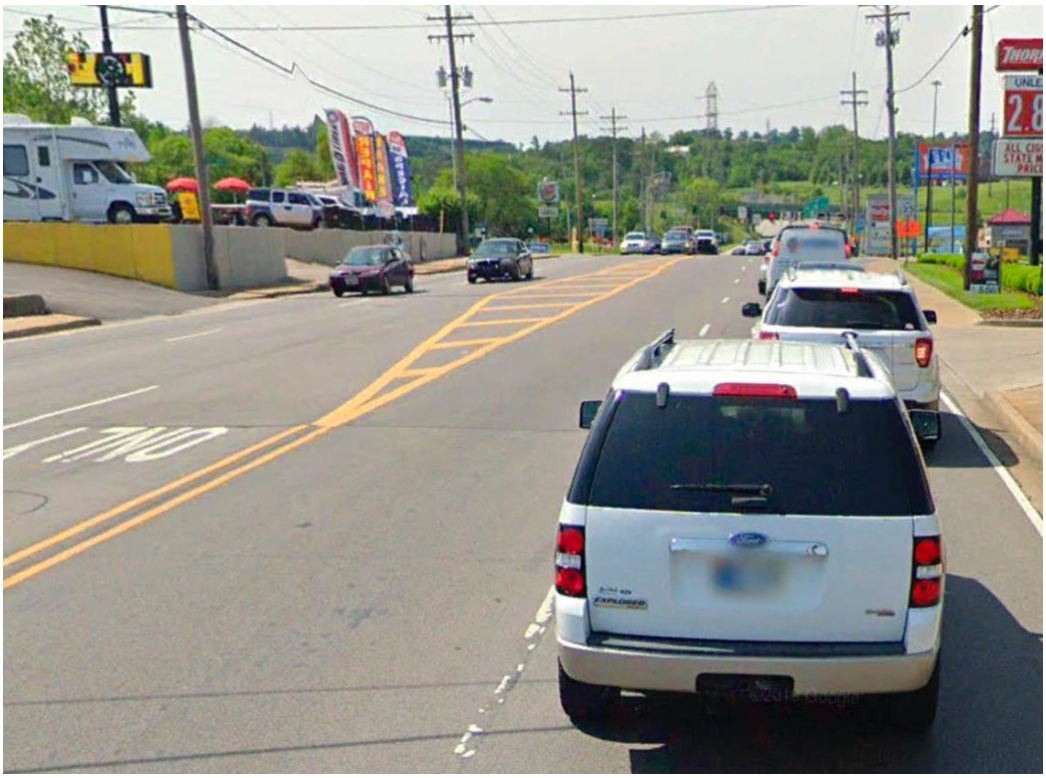


Figure 4: Picture of State Street Corridor Looking North near the Home Depot Entrance



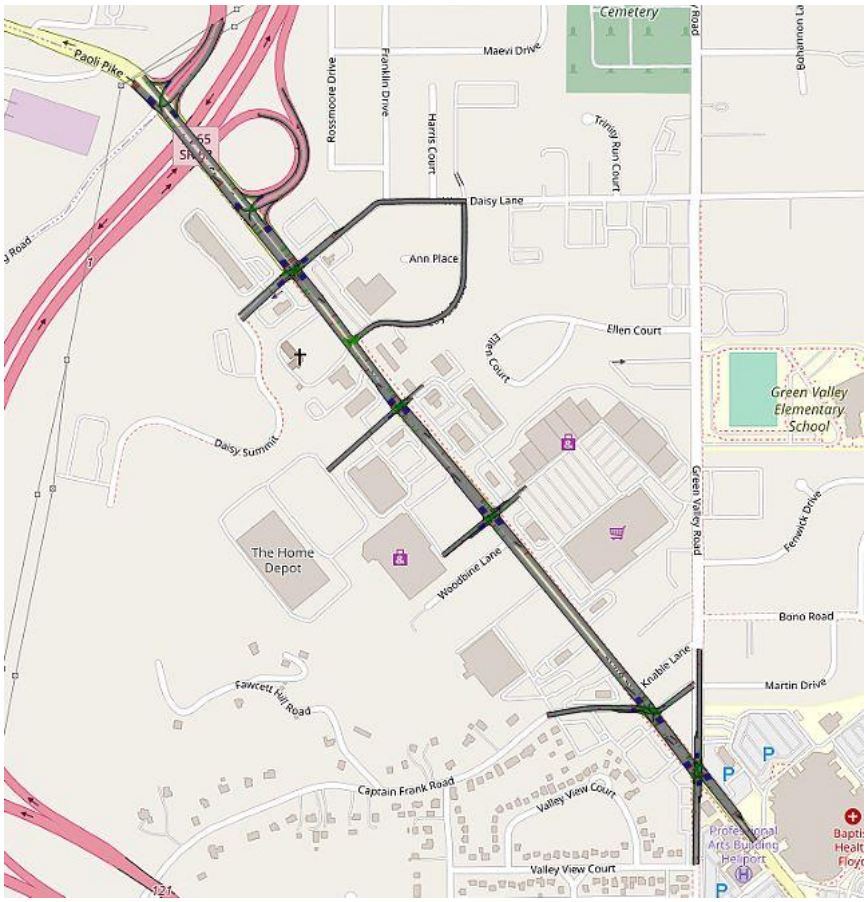
METHODOLOGY

Model Development

The physical features of the State Street corridor were modeled in Vissim using satellite imagery. Seven signalized intersections and one stop-controlled intersection were included in the model. Timings and turning movement counts were collected by the city and integrated into the model.

Field observations established the signal configuration for the simulation, and Google Street View provided confirmation. Priority rules, conflict areas, and speed decisions were all established based on field observations and applicable traffic laws; the model established reduced speed areas within turning movements to more accurately depict speed reductions that would occur during turns. The data as mentioned above established the signalized corridor within Vissim, which matched the actual signalized corridor based on field observations.

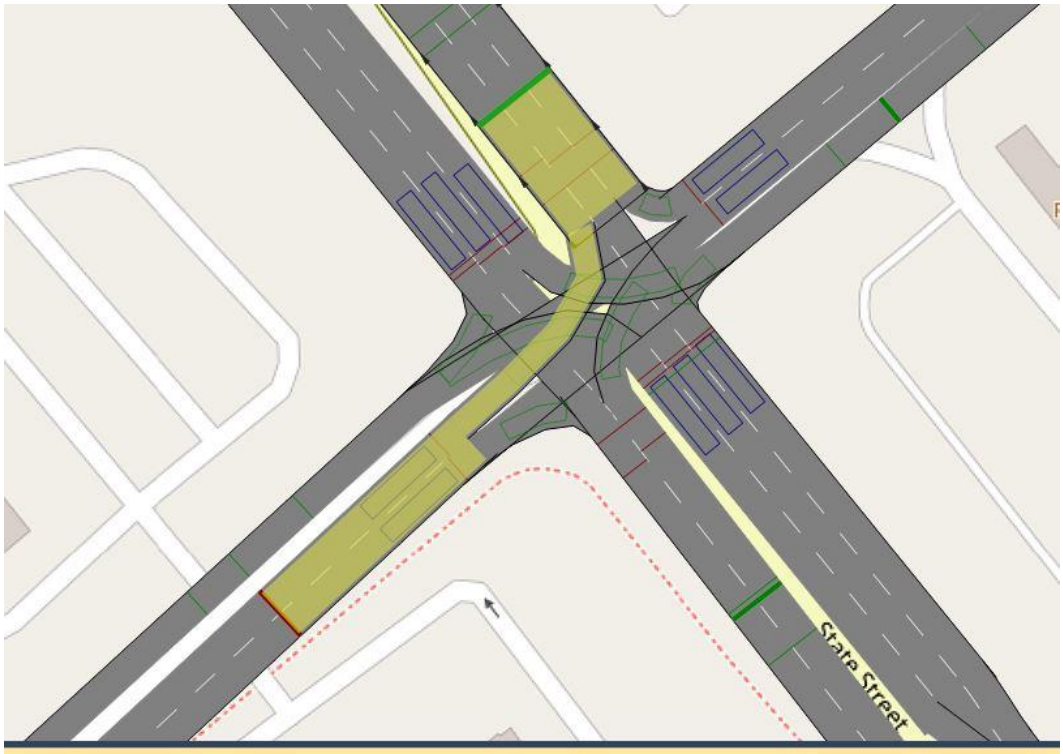
Figure 5: VISSIM Model of the State Street Corridor



The onus of this study was to determine the effects of lane flow distribution in the NB lanes of State Street with the ultimate goal of reducing travel time, delay, and queue lengths for NB traffic. Given the proximity of the interstate ramps to the intersection at Daisy Lane, the study focuses on the effects of queuing and vehicle distribution of NB traffic near the Daisy Lane intersection.

The model for the State Street corridor had queue counters for the NB and SB directions for the intersection of State Street and Daisy Lane, which can be seen directly behind the stop bars in Figure 6. The queue counter for the NB traffic was to determine the difference in the queue in the current condition and the projected condition; however, the counters in the SB direction were primarily used as a control.

Figure 6: State and Daisy Intersection

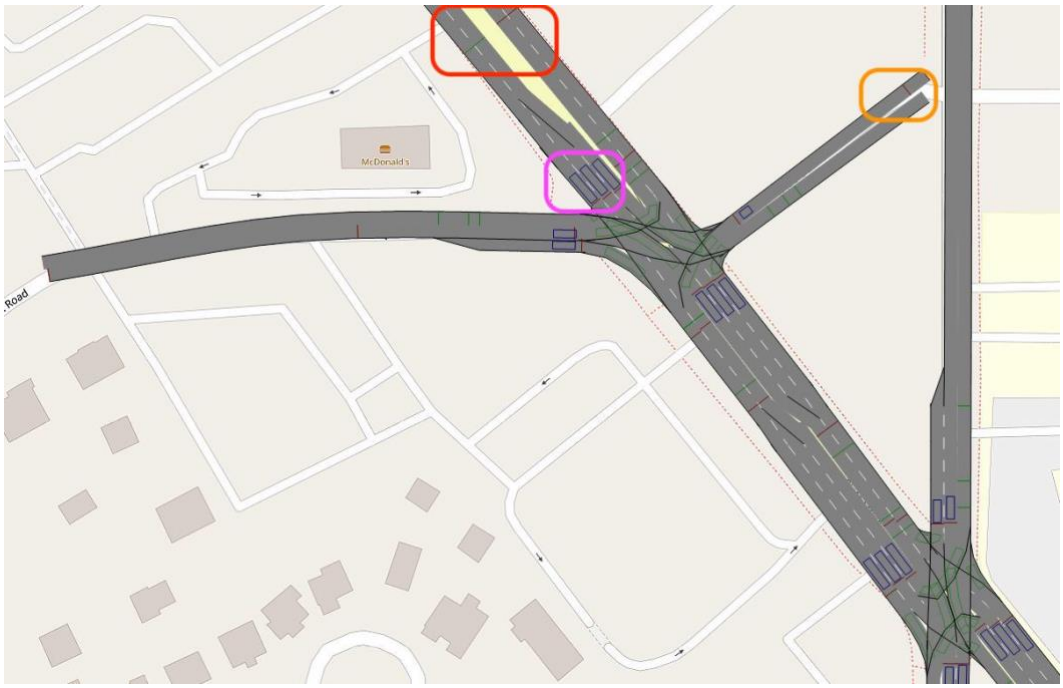


Count: 3	VehRoutDec	No	Name	DestLink	DestPos	RelFlow(0)
1	20	1		32: State St NB	17.766	46.700
2	20	2		6: Daisy Ln EB	26.621	28.300
3	20	3		34: State Street SB	32.253	25.000

Vehicle travel time collection points were placed in the NB and SB direction at matching locations south of the Daisy Lane intersection and north of the Captain Frank intersection, and the distance was confirmed to be the same in each direction for

comparison purposes. The travel time collection points north of the Captain Frank intersection are shown in the red rectangle in Figure 7. The vehicle travel times for the NB traffic were to determine the difference in travel times in the current condition and the projected condition; however, the travel times in the SB direction were primarily used as a control and model validation. The travel time measurement points were used to establish delay within the corridor as well. Also shown in Figure 7 is the signal detection as denoted within a fuchsia rectangle and one set of traffic volume inputs denoted within the orange rectangle.

Figure 7: State Street and Captain Frank Intersection

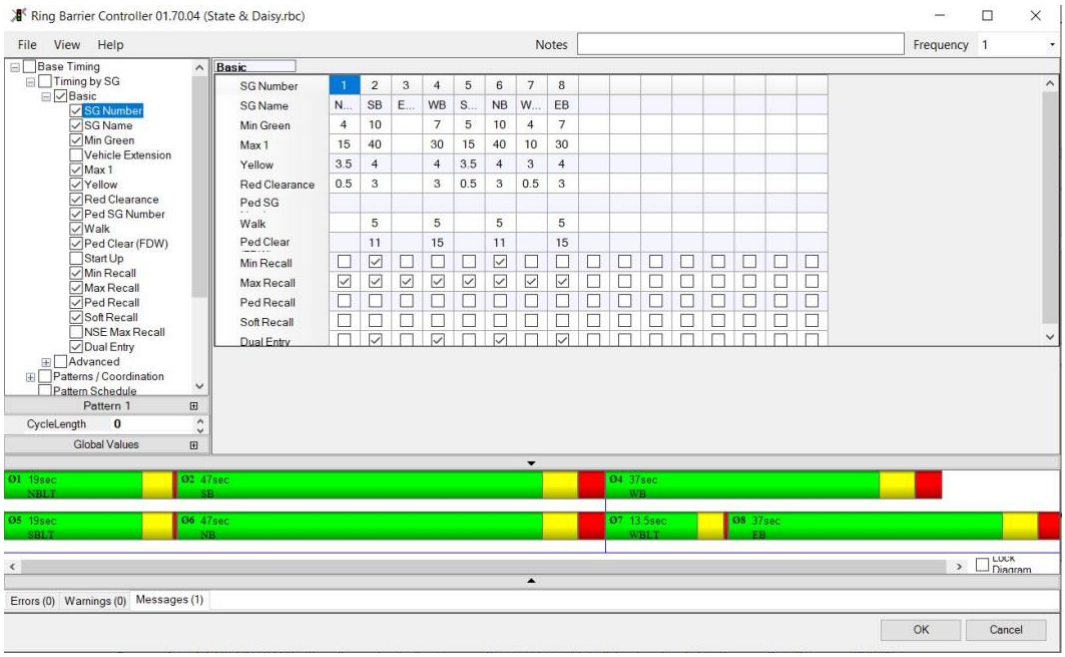


Data collection points were placed in each of the NB lanes near the intersection at Coyle Drive, used to determine the number of vehicles in each lane. This data was used to determine the lane flow distribution in the current and projected model simulations.

Model Calibration

The City of New Albany provided signal timings for the five signalized intersections within their jurisdiction, and INDOT provided signal timings for the two signalized intersections at the interstate ramps, which can be found in Appendix E: Traffic Signal Timings. These signal timings were used to create the signal controllers for each signalized intersection within the model. See Figure 8 for an example of a signal controller input within VISSIM.

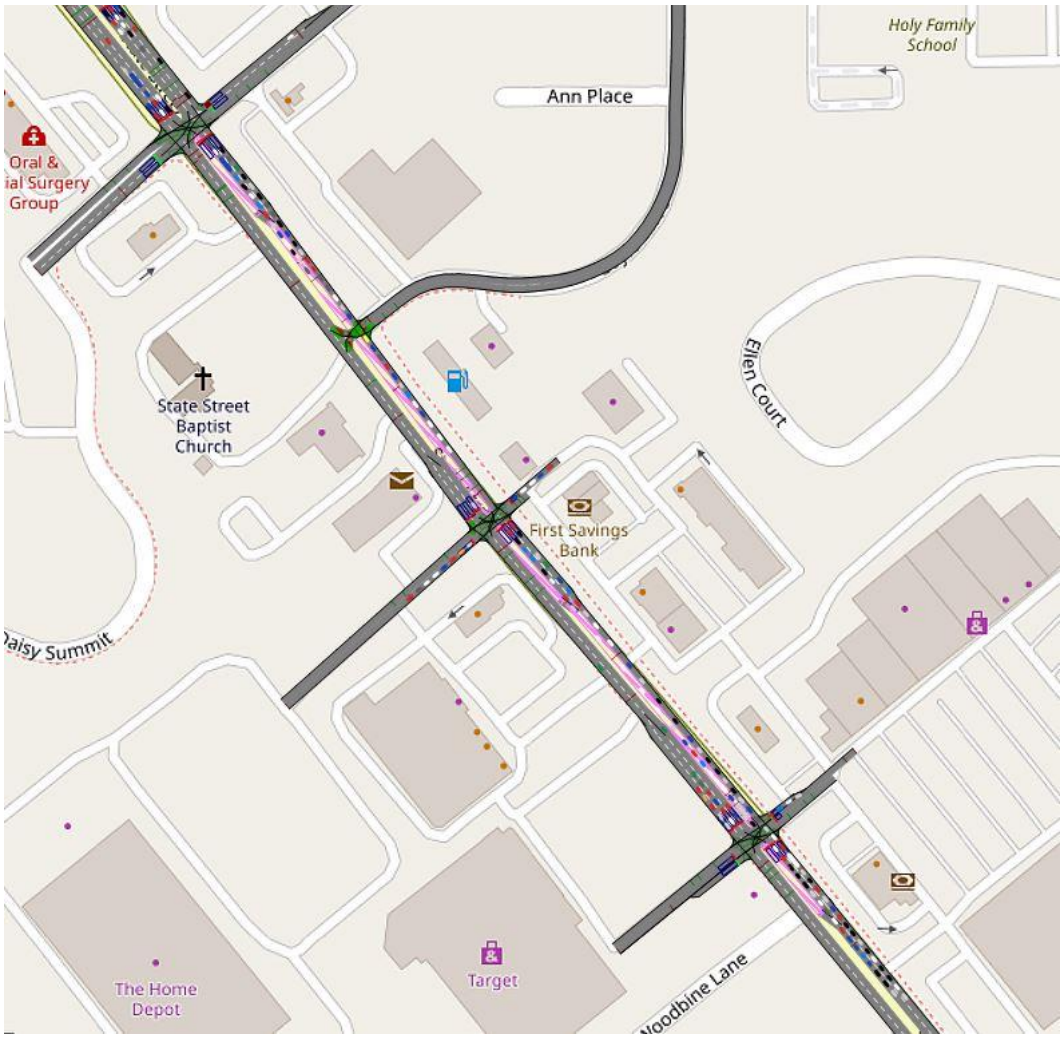
Figure 8: State Street and Daisy Lane VISSIM Signal Controller Inputs



To establish the baseline traffic counts and turning movements for the State Street corridor, the author contacted the Kentuckiana Regional Planning and Development Agency (KIPDA). KIPDA staff provided AADT and turning movements along the State Street corridor from 2019 to allow for pre-COVID-19 traffic volumes for the simulation, from a cellphone-based on-demand traffic pattern information service, Streetlight. The provided data was from the average daily origin-destination volumes for multiple days and times; however, for this study, the focus was on Tuesday through Thursday to produce the most accurate representation of a typical weekday volume. This data was further filtered to volumes from a four-hour peak window of 3 PM to 7 PM, which was the highest resolution the service could provide. Subsequently, the peak hour volume was calculated from the four-hour peak volumes and compared against an existing traffic study for the corridor to determine the accuracy of the data.

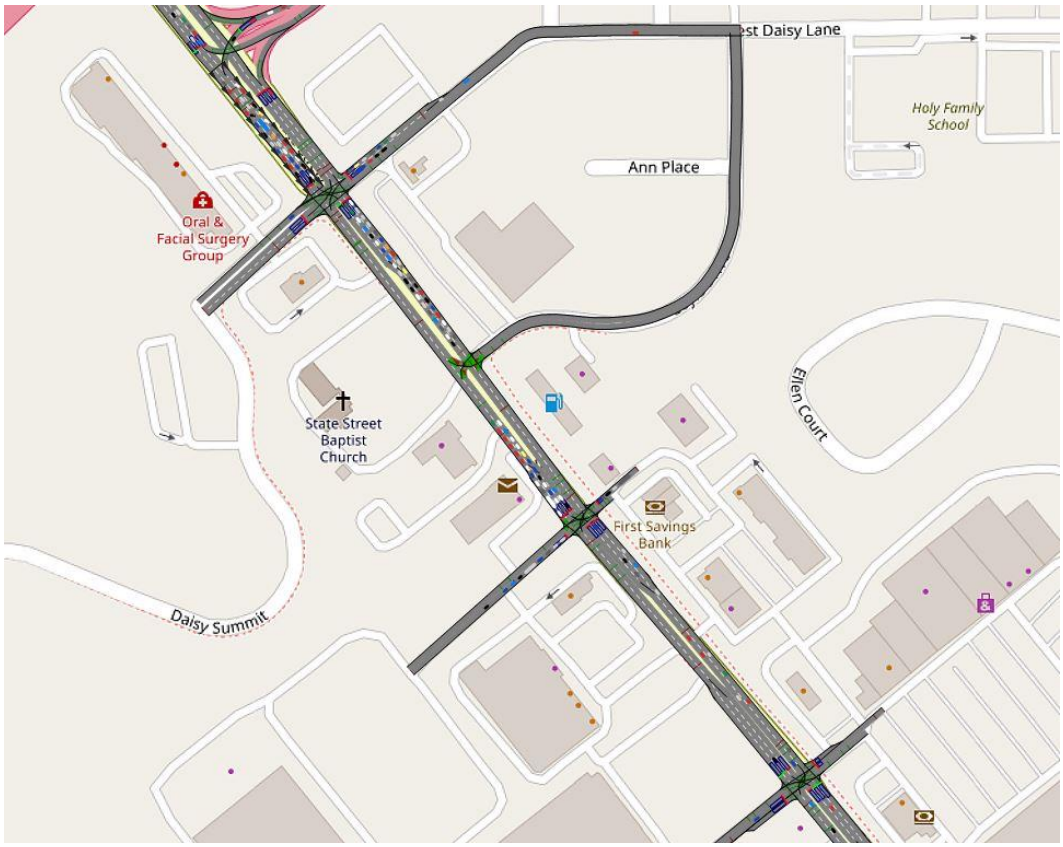
For each signalized intersection, the turning movement was established with vehicle routing that ensured the appropriate proportion of traffic was turning in each direction; this can be seen in Figure 6, shown with the yellow routing for the left-turn movement from Daisy Summit onto State St. When the traffic counts and turning movements were entered into the Vissim model with the existing signal timings for the corridor, it was not easy to achieve the existing condition because the simulation assumed the driving behavior was logical. Since much of the traffic along the corridor tends to establish position in the right lane, and the left lane becomes a de facto overtaking lane, the left lane was implemented as an overtaking lane to achieve the lane flow distribution in the model that exists along the corridor. Upon implementing this feature, the model consistently produced queues and a lane flow distribution, as observed in the field.

Figure 9: Current Model Showing Existing Queuing



The version of the Vissim simulation without implementing the overtaking lane showed the corridor had adequate capacity to accommodate the number of vehicles currently using the street. As such, it was used to show the projected lane flow distribution. If the signs and route markers achieve the desired effect, queues, travel times, and delays will be reduced in a statistically significant manner. Furthermore, the lane flow distribution will nearly equalize, which better utilizes the lanes that are present.

Figure 10: Proposed Model Showing Projected Queuing



Current and Projected Condition Analysis

Each simulation began with an initial 10-minute warm-up period and then began gathering data for 60-minutes on queue lengths, travel time, delay, and vehicle counts in each northbound lane, which helped determine the lane flow distribution. The simulation ran through 70 iterations of the existing condition and 70 iterations of the projected corridor after the modifications in signage and new route markers. The primary difference between the two simulation scenarios is that the current simulation uses the left lane on State Street primarily as a passing lane rather than regular traffic conveyance. The projected model uses the Vissim's standard lane distribution procedures to allocate vehicles among the existing lanes.

For each parameter of the analysis, a comparative histogram was developed to show the distribution of outputs. This comparative histogram provided the opportunity to determine if each data set was normally distributed or skewed in any meaningful manner. Furthermore, it allows for comparing the current and projected data distribution on the same graph, which produces an easy method of viewing the effect the modifications had on the simulation outcomes.

This study utilizes ANOVA methods for data analysis of current and projected conditions and the differences thereof. The probability of obtaining the observed results of a particular test is the probability value (p-value). For this study, assuming the null hypothesis (H_0) that there is no difference between the current and projected condition is correct, the p-value means the probability that the test statistic equals the observed value predicted by the alternative hypothesis (H_1) that there is a difference between the current and projected condition. An option for rejecting H_0 is using the p-value for comparing the results with the significance level; the significance level is the probability of rejecting the null hypothesis when it is true. In this study, an α of 0.05 is used and implies a 5% danger of inferring a difference exists while there is no statistical difference. Therefore, a p-value less than the α implies evidence to support H_1, and the result is statistically significant (Alassaf & Qamar, 2021; Wasserstein & Lazar, 2016).

A one-way ANOVA uses a feature selection (FS) filter to measure the impact of a feature on a target class. One-way ANOVA calculates a score for all features as a univariate method and then selects the highest scores (Elssied et al., 2014). If a difference between groups based on variance exists, a feature affects the target group, which is the average of the squared differences from the mean. This condition leads to rejecting H_0, which states that all means of groups are equivalent, and accepting H_1. Determining pertinent features using ANOVA requires deciding the threshold at which each feature is evaluated individually in correlation with the groups.

As a result of the ANOVA, each feature will have an F-value and a p-value to help determine statistical significance. An F-value higher than the F-critical value means a feature that impacts the group and will be considered relevant. Furthermore, a p-value lower than the initial α—0.05 for this study—will be recognized as statistically significant. Previous studies have used the p-value to determine the critical features of the target classes (Arowolo et al., 2016; Elssied et al., 2014).

RESULTS

Queue Lengths

Each simulation began with an initial 10-minute warm-up period and then began gathering data for 60-minutes on queue lengths, travel time, delay, and vehicle counts in each northbound lane, which helped determine the lane flow distribution. The simulation ran through 70 iterations of the existing condition and 70 iterations of the projected corridor after the modifications in signage and new route markers.

The model outputs for NB average queue lengths (meters) from the current condition and the projected condition are available in Appendix A: Queue Data. Figure 11 displays the frequency of the average queue length (meters) in a comparative histogram. An ANOVA single factor test was used to determine the statistical significance of the changes; see Table 1 for the analysis results. The H_0 for this test was

there was no difference between the current and projected condition, and the H_1 that there is a difference between the current and projected condition; an α of 0.05 is used. The F-critical for all criteria was approximately 3.9, and the F-value between the groups for this measure was over 949.9. In conjunction with a p-value of approximately 9.69E-64, this result showed the modifications produced a statistically significant change to the NB direction with an average queue length reduction of 88 percent.

Figure 11: Comparative Histogram of Current & Projected NB Average Queue Length (m)

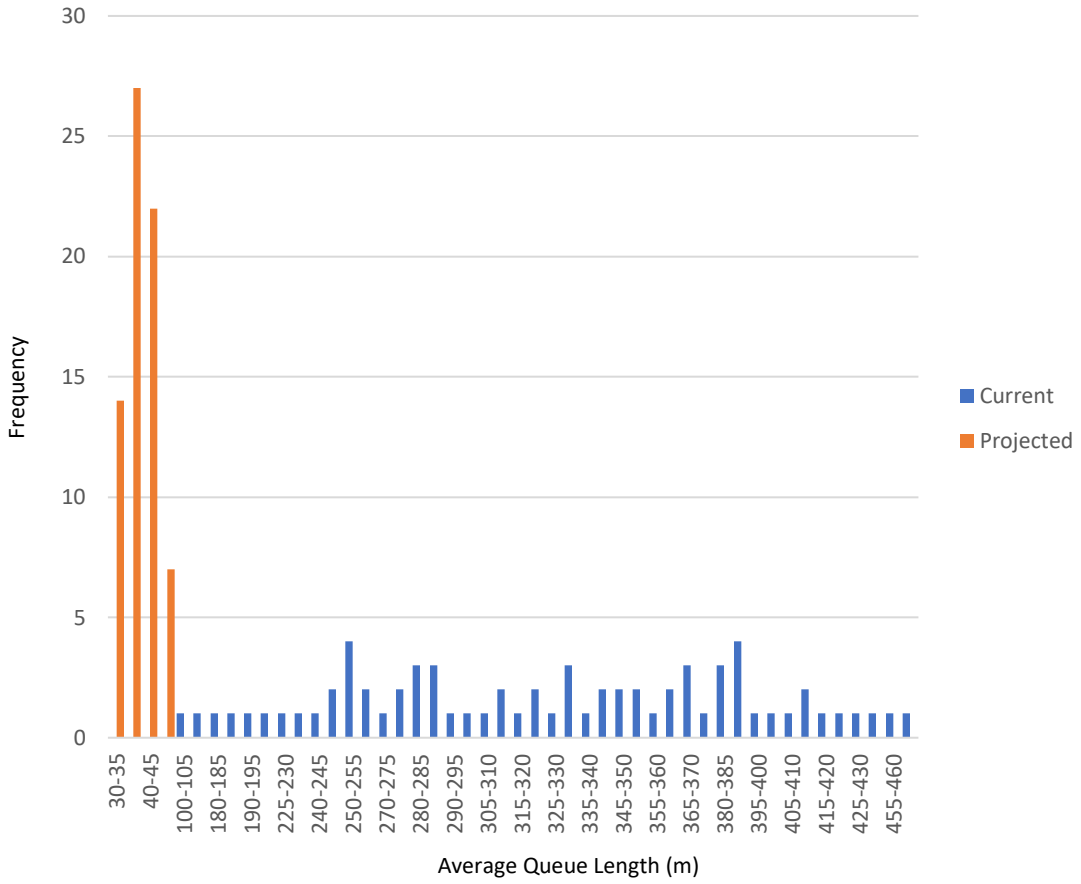


Table 1: ANOVA Single Factor NB Queue Length Average (m)

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Current NB Queue Length Average (m)	70	22439.02	320.56	5822.94
Projected NB Queue Length Average (m)	70	2730.63	39.01	18.38

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	2774433.11	1	2774433.12	949.93	9.69E-64	3.91
Within Groups	403051.25	138	2920.66			
Total	3177484.37	139				

The model output distributions for the SB queue lengths (meters) from the current condition and the projected condition are shown in Figure 12. The SB queue length outputs were compared using an ANOVA single factor test to determine the statistical significance of the changes; see Table 2 for the analysis results. The H_0 for this test was there was no difference between the current and projected condition, and the H_1 that there is a difference between the current and projected condition; an α of 0.05 is used. The F-critical was approximately 3.9, and the F-value between the groups was approximately 0.18. In conjunction with the p-value of approximately 0.67, this result showed that the modifications did not produce a statistically significant change for the SB direction.

Figure 12: Comparative Histogram of Current & Projected SB Average Queue Length (m)

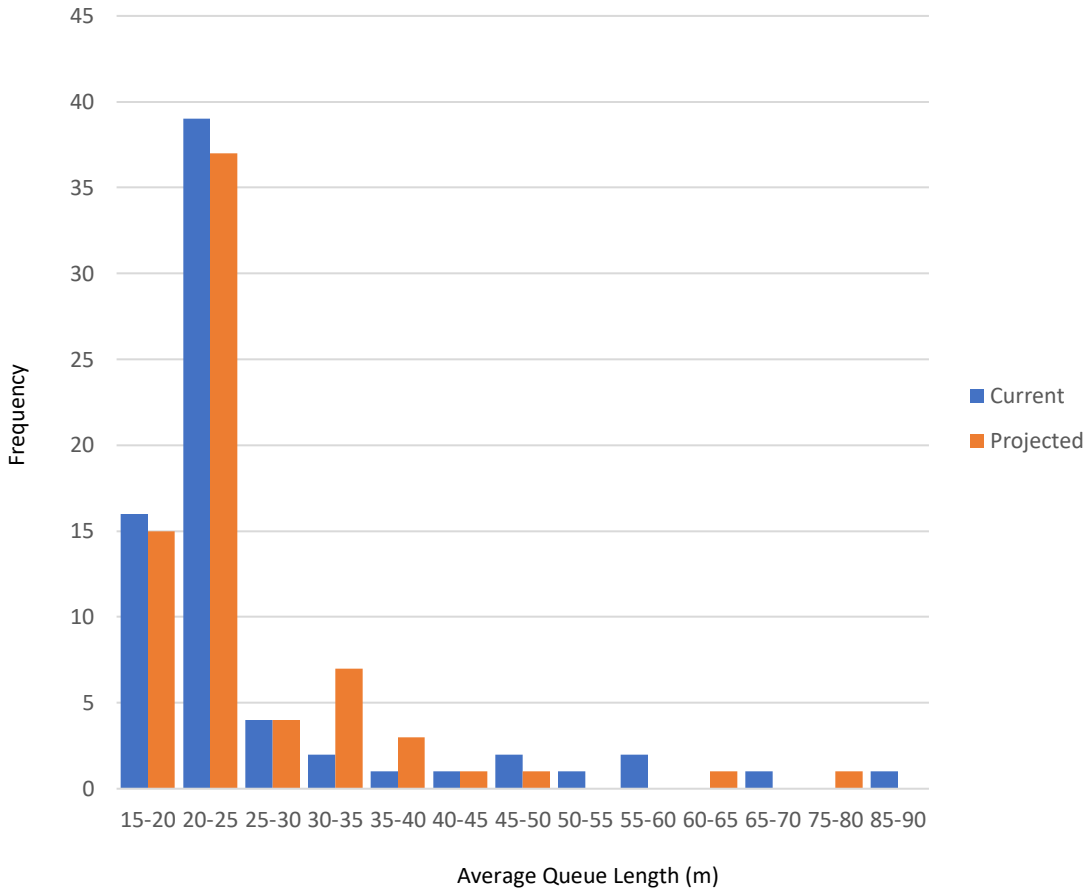


Table 2: ***ANOVA Single Factor SB Queue Length Average (m)***

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Current SB Queue Length Average (m)	70	1815.89	25.94	160.67
Projected SB Queue Length Average (m)	70	1759.02	25.13	94.56

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	23.10	1	23.10	0.18	0.67	3.91
Within Groups	17611.27	138	127.62			
Total	17634.37	139				

Furthermore, the maximum queue lengths were reduced by 65 percent, and the average number of queue stops was reduced by 71 percent. Both measures were tested with a single factor ANOVA and shown to be statistically significant. See Tables 3 and 4 for the results of the ANOVA.

Table 3: ***ANOVA Single Factor NB Maximum Queue Lengths (m)***

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Current NB Queue Length Maximum (m)	70	35435.57	506.22	28.71
Projected NB Queue Length Maximum (m)	70	12384.15	176.92	453.91

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	3795485.46	1	3795485.46	15728.74	4.48E-144	3.91
Within Groups	33300.63	138	241.31			
Total	3828786.08	139				

Table 4: ***ANOVA Single Factor NB Queue Stops***

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Current NB Queue Stops	70	185475	2649.64	355668.29
Projected NB Queue Stops	70	54468	778.11	3737.35

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	122591671.8	1	122591671.8	682.19	2.90E-55	3.91
Within Groups	24798989.16	138	179702.82			
Total	147390660.9	139				

Travel Time

The VISSIM model for the State Street corridor measured travel time for NB and SB traffic with equal distances. The model outputs for the NB travel times (seconds) from the current condition and the projected condition can be found in Appendix B: Travel Time Data. Figure 13 compares the average travel time (seconds) for both conditions in a comparative histogram. An ANOVA single factor test was used to determine the statistical significance of the changes; see Table 5 for the analysis results. The H_0 for this test was there was no difference between the current and projected condition, and the H_1 that there is a difference between the current and projected condition; an α of 0.05 is used. Since the F-critical for all criteria is 3.9 and the F-value between the groups for travel time was over 373.3, in conjunction with a p-value of approximately 4.48E-41, this result showed the modifications produced a statistically significant change to the NB direction with an average travel time reduction of approximately 56 percent.

Figure 13: Comparative Histogram of Current & Projected NB Average Travel Time (s)

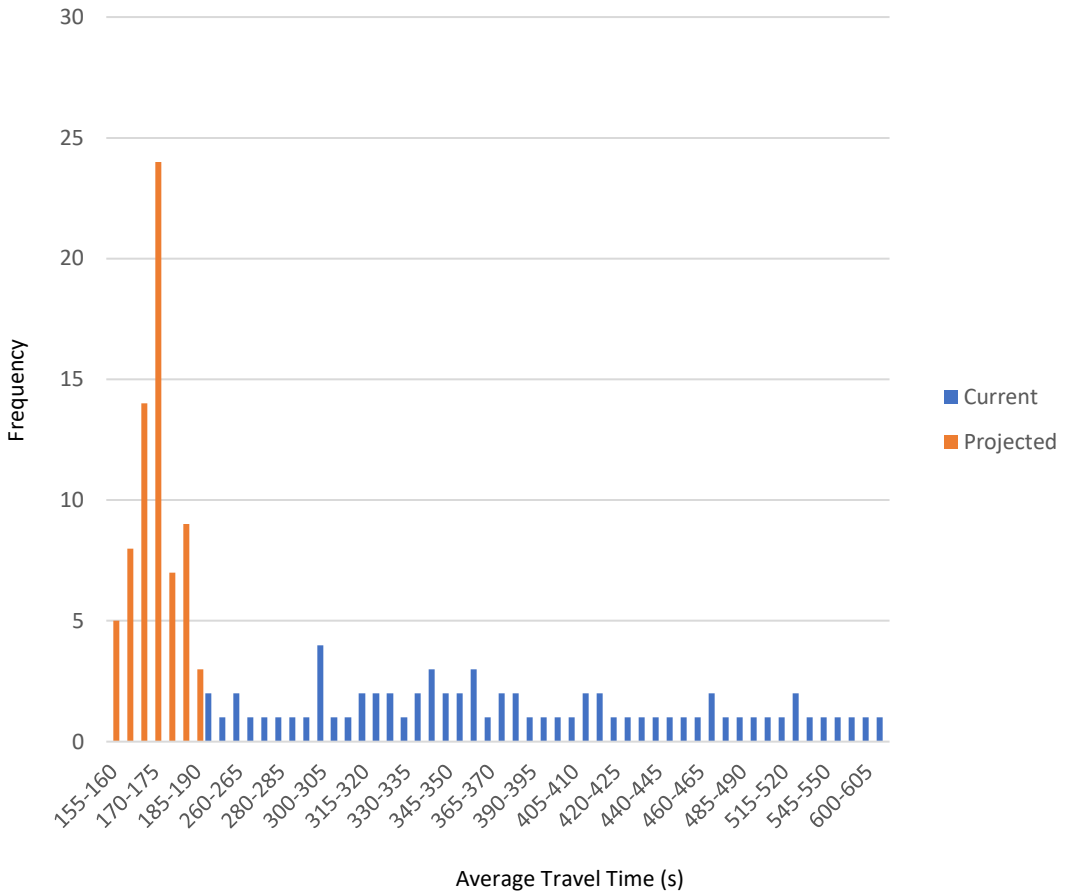


Table 5: ***ANOVA Single Factor NB Travel Time (s)***

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Current NB Travel Time (s)	70	27262.96	389.47	8864.72
Projected NB Travel Time (s)	70	11996.94	171.38	53.81

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1664652.62	1	1664652.62	373.30	4.48E-41	3.91
Within Groups	615378.95	138	4459.27			
Total	2280031.57	139				

The model output distributions for the SB travel times (seconds) from the current condition and the projected condition are shown in Figure 14. The SB travel time outputs were compared using an ANOVA single factor test to determine the statistical significance of the changes; see Table 6 for the analysis results. The H_0 for this test was there was no difference between the current and projected condition, and the H_1 that there is a difference between the current and projected condition; an α of 0.05 is used. The F-critical was approximately 3.9, and the F-value between the groups was approximately 0.02. In conjunction with the p-value of approximately 0.90, this result showed that the modifications did not produce a statistically significant change for the SB direction.

Figure 14: Comparative Histogram of Current & Projected SB Average Travel Time (s)

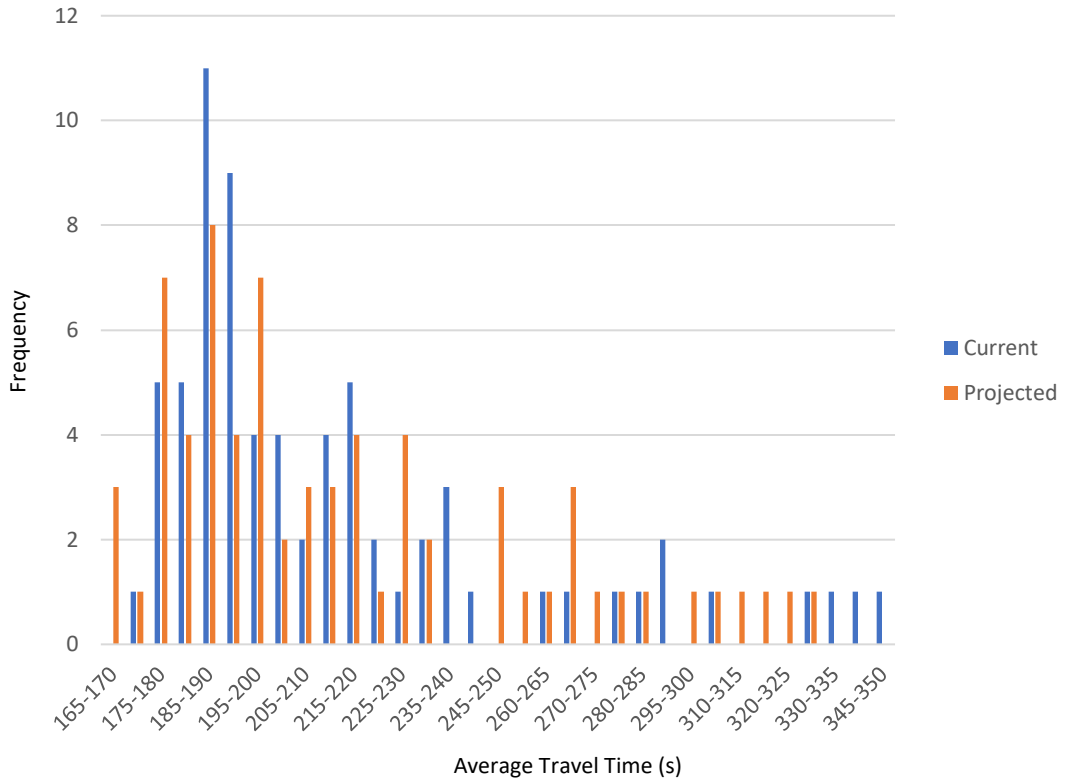


Table 6: ANOVA Single Factor SB Travel Time (s)

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Current SB Travel Time (s)	70	15139.47	216.28	1776.78
Projected SB Travel Time (s)	70	15201.73	217.17	1746.90

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	27.69	1	27.69	0.016	0.90	3.91
Within Groups	243133.53	138	1761.84			
Total	243161.22	139				

Delay

The VISSIM model for the State Street corridor measured stop delay for NB and SB traffic. The model outputs for the NB stop delay (seconds) from the current condition and the projected condition can be viewed in Appendix C: Delay Data. Figure 15 compares the average stop delay (seconds) for both conditions in a comparative histogram. An ANOVA single factor test was used to determine the statistical significance of the changes; see Table 7 for the analysis results. The H_0 for this test was there was no difference between the current and projected condition, and the H_1 that there is a difference between the current and projected condition; an α of 0.05 is used. Since the F-critical for all criteria is 3.9, and the F-value between the groups for stop delay was over 364.6, in conjunction with a p-value of approximately 1.47E-40, it showed the modifications produced a statistically significant change to the NB direction with an average stop delay reduction of approximately 64 percent.

Figure 15: Comparative Histogram of Current & Projected NB Average Delay (s)

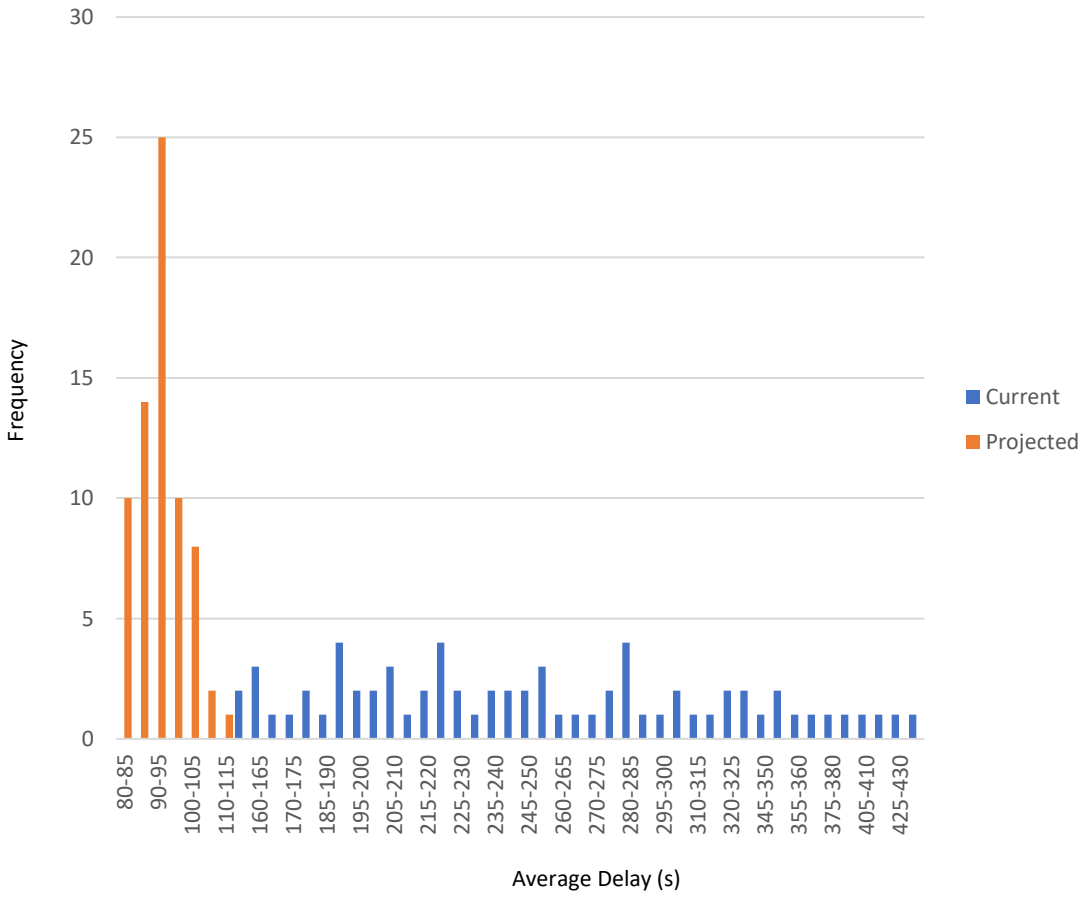


Table 7: ***ANOVA Single Factor NB Delay (s)***

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Current NB Stop Delay (s)	70	18174.64	259.64	5318.24
Projected NB Stop Delay (s)	70	6475.81	92.51	44.24

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	977590.17	1	977590.17	364.60	1.47E-40	3.91
Within Groups	370010.88	138	2681.24			
Total	1347601.05	139				

The model outputs for SB stop delay (seconds) from the current condition and the projected condition with the distribution shown in Figure 16. The SB delay outputs were compared using an ANOVA single factor test to determine the statistical

significance of the changes; see Table 8 for the analysis results. The H_0 for this test was there was no difference between the current and projected condition, and the H_1 that there is a difference between the current and projected condition; an α of 0.05 is used. The F-critical was approximately 3.9, and the F-value between the groups was approximately 0.05. In conjunction with the p-value of approximately 0.82, this result showed that the modifications did not produce a statistically significant change for the SB direction.

Figure 16: Comparative Histogram of Current & Projected SB Average Delay (s)

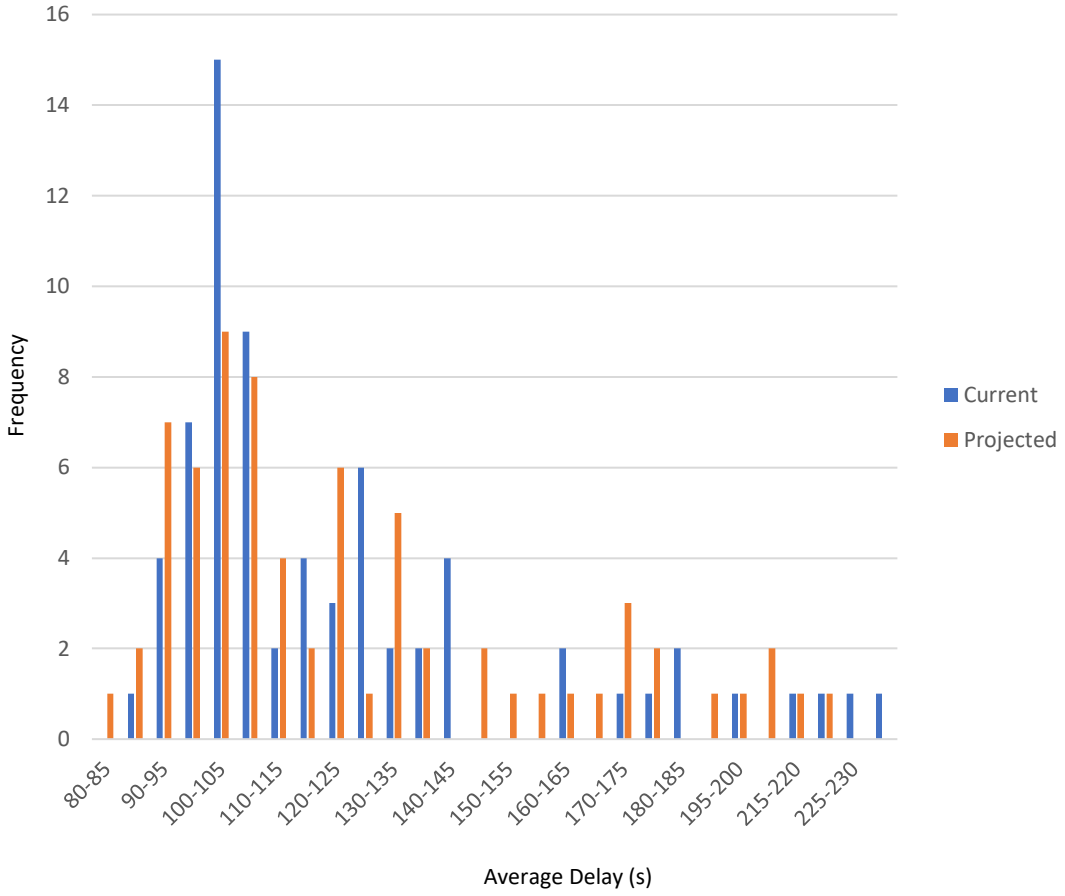


Table 8: ***ANOVA Single Factor SB Stop Delay (s)***

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Current SB Stop Delay (s)	70	8714.28	124.49	1214.85
Projected SB Stop Delay (s)	70	8806.82	125.81	1216.07

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	61.17	1	61.17	0.05	0.82	3.91
Within Groups	167733.34	138	1215.46			
Total	167794.51	139				

Lane Flow Distribution

The VISSIM model for the State Street corridor measured the number of vehicles in each NB lane near Coyle Drive. The model outputs for the NB vehicle counts and the subsequent calculation for lane flow distribution from the current condition and the projected condition are available in Appendix D: Vehicle Distribution Data. Figure 17 shows the distribution comparison of the outputs mentioned above, which were compared using an ANOVA single factor test to determine the statistical significance of the changes. See Table 8 for the analysis results for vehicle counts and Table 9 for the results of the lane flow distribution.

Equation 1: Lane Flow Distribution

$$\boldsymbol{Lane\ Flow\ Distribution} = \frac{NL}{NT} \times 100$$

Where:

NL = Number of vehicles in the study lane
NT = Number of vehicles in all lanes in that direction

The H_0 for this test was there was no difference between the current and projected condition, and the H_1 that there is a difference between the current and projected condition; an α of 0.05 is used. Since the F-critical for all criteria is 3.9, and the F-value between the groups for the right lane vehicle count was over 1,935, it showed, in conjunction with a p-value of approximately 4.43E-83, the modifications produced a statistically significant change to the NB direction right lane vehicle counts. Furthermore, the F-critical for all criteria is 3.9, and the F-value between the groups for the percentage of overall vehicles in the right lane was over 5,302. In conjunction with a p-value of approximately 5.37E-112, this result showed that the modifications produced a statistically significant change to the percentage of overall NB vehicles in the right lane.

Table 9: ANOVA Single Factor NB Right Lane Vehicle Count

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Current Right Lane Vehicle Count	70	44997	642.81	1372.82
Projected Right Lane Vehicle Count	70	29996	428.51	288.17

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1607357.15	1	1607357.15	1935.42	4.43E-83	3.91
Within Groups	114608.07	138	830.49			
Total	1721965.22	139				

Figure 17: Comparison of Current & Projected Lane Flow Distributions

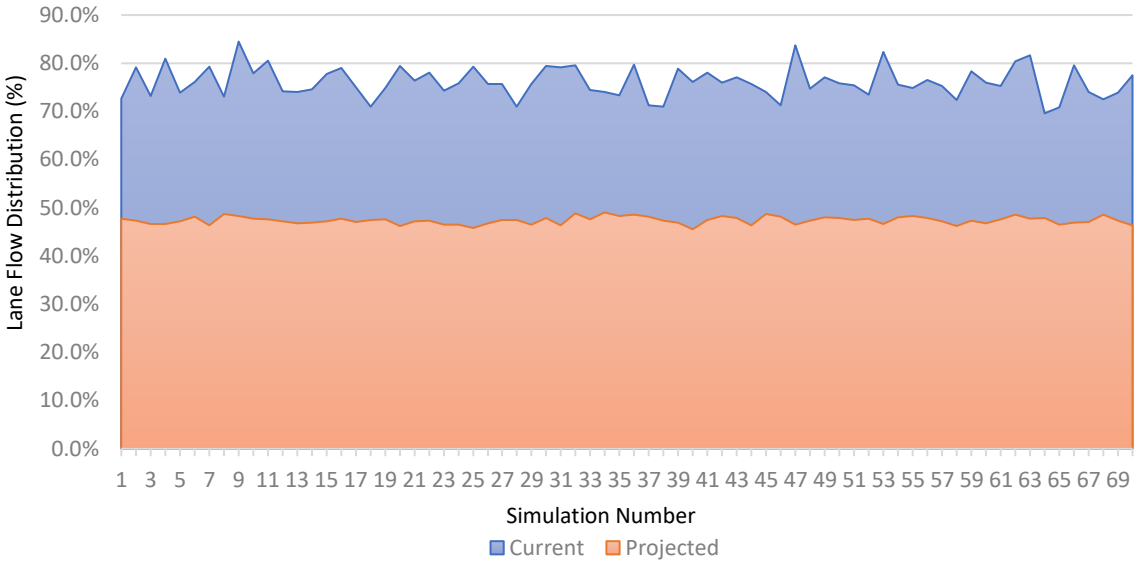


***Table 10:* ANOVA Single Factor Percentage of Vehicles in the Right Lane**

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Current Percentage of Vehicles in the Right Lane	70	5327.90%	76.11%	0.10%
Projected Percentage of Vehicles in the Right Lane	70	3316.09%	47.37%	0.01%

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	2.89	1	2.89	5302.37	5.37E-112	3.91
Within Groups	0.08	138	0.00			
Total	2.97	139				

DISCUSSION

General Discussion

From the outset, the purpose of this study was to evaluate measures that could improve the queuing, travel times, and delays associated with traveling on the State Street corridor; however, the primary cause of these issues appears to be an uneven lane flow distribution. Consequently, this uneven lane flow distribution causes vehicles to queue, which creates longer travel times and increases delay.

During midday and PM peak hours, traffic moving in the northbound direction can queue 0.7 miles of the 0.8-mile segment. The majority of northbound traffic attempts to establish position in the right lane to gain access to the interstate ramps, both on the right side of the street. The previously mentioned position-establishing creates a situation in which the left lane becomes a de facto passing lane rather than conveying traffic in conjunction with the right lane. Further exacerbating the queuing along the corridor, as northbound traffic attempts to access the westbound I-265 ramp, traffic queues along State Street, thereby severing traffic from the I-265 eastbound ramp.

The City of New Albany has requested methods to improve traffic flow so the State St commercial corridor can further flourish. The simulation and the results of this study focused on the northbound traffic since it is the condition causing the most concern for the City. It was determined that overhead signs and route markings could affect driver behavior to improve the lane flow distribution.

The Vissim simulation showed the corridor had adequate capacity to convey the number of vehicles currently using the street. If the signs and route markers achieve the desired effect, queues, travel times, and delays will be reduced in a statistically significant manner. Furthermore, the lane flow distribution will nearly equalize, which better utilizes the lanes that are present.

Recommendations and Future Research

Based on the simulation results and the statistical significance thereof, it is the recommendation to the City of New Albany to install overall head signs and route markers along the State Street corridor to achieve better lane flow distribution. Given the existing literature, the new route markers and overhead signs should be installed at least 500 meters from the critical intersection (Huang et al., 2013), in this case Daisy Lane.

The City of New Albany has already produced plans and specifications for the recommended modifications; see Figures 18 through 24 for plan documents. The anticipated timeframe for the project is to bid the modifications in June 2021, with construction/installation slated to occur late summer of 2021. Once the new pavement markings and signs have been installed and traffic has normalized, Phase II of this study will evaluate the simulation findings against empirical data collected in lane flow distribution, queues, travel times, and delay.

Additionally, if the entirety of the desired outcome is not obtained, potential further modification to the corridor may require the I-265 WB traffic to utilize the left lane to obtain the desired lane flow distribution, thereby improved queuing, travel times, and delay. Evaluating the pre-improvement and post-improvement conditions of the modification above could yield further research.

Figure 18: State Street Striping Modifications Sheet 1

Figure 19: State Street Striping Modifications Sheet 2

Figure 20: State Street Striping Modifications Sheet 3

Figure 21: State Street Striping Modifications Sheet 4

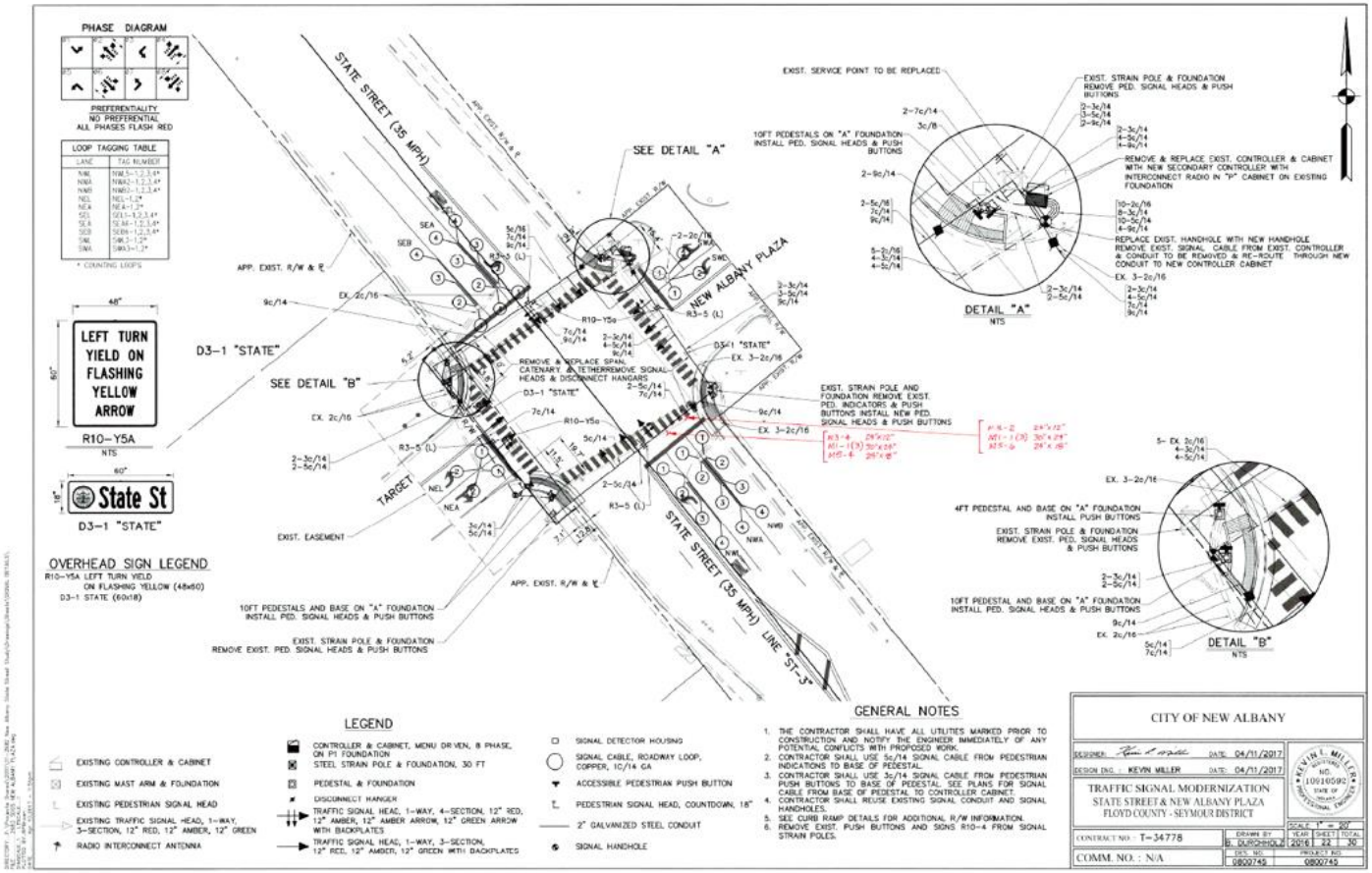


Figure 22: State Street Striping Modifications Sheet 5

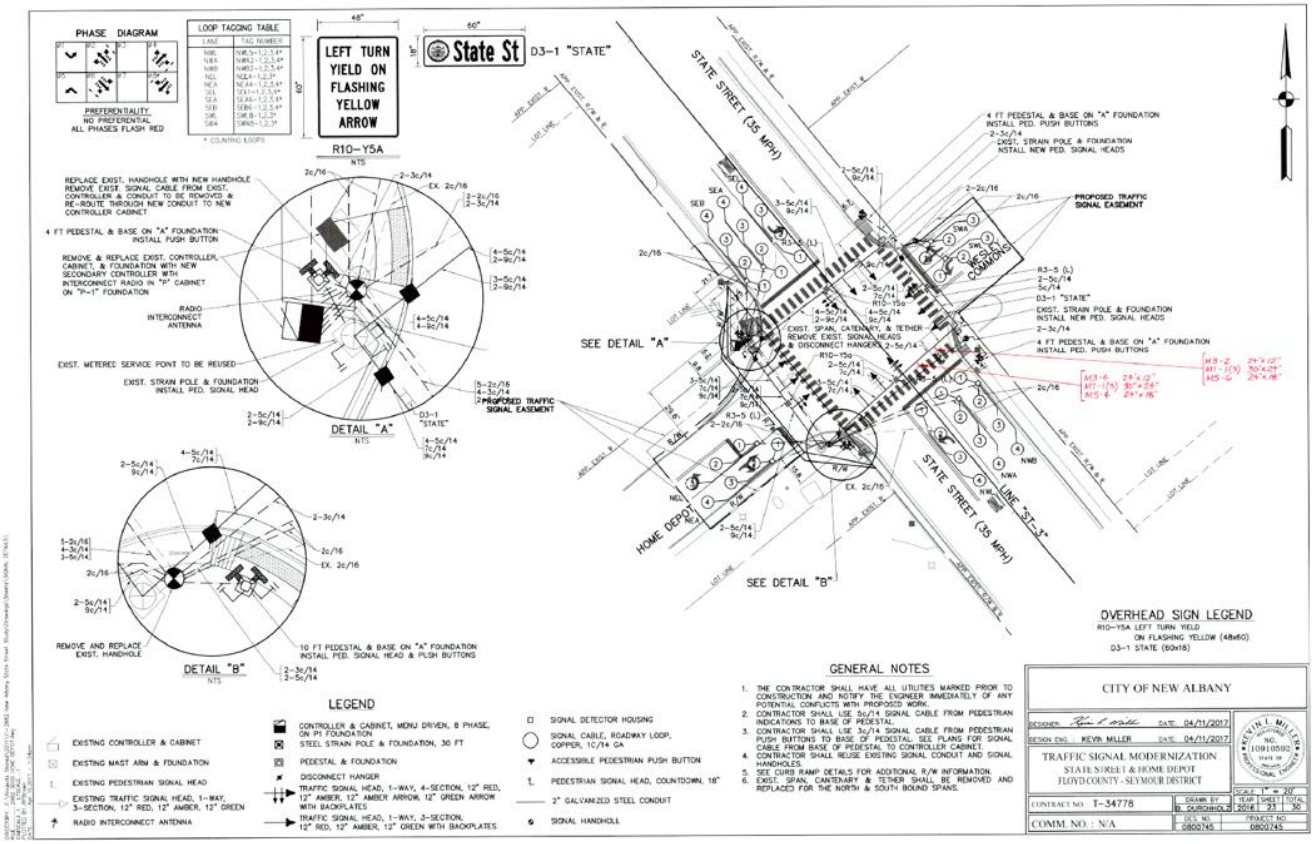


Figure 23: State Street Striping Modifications Sheet 6

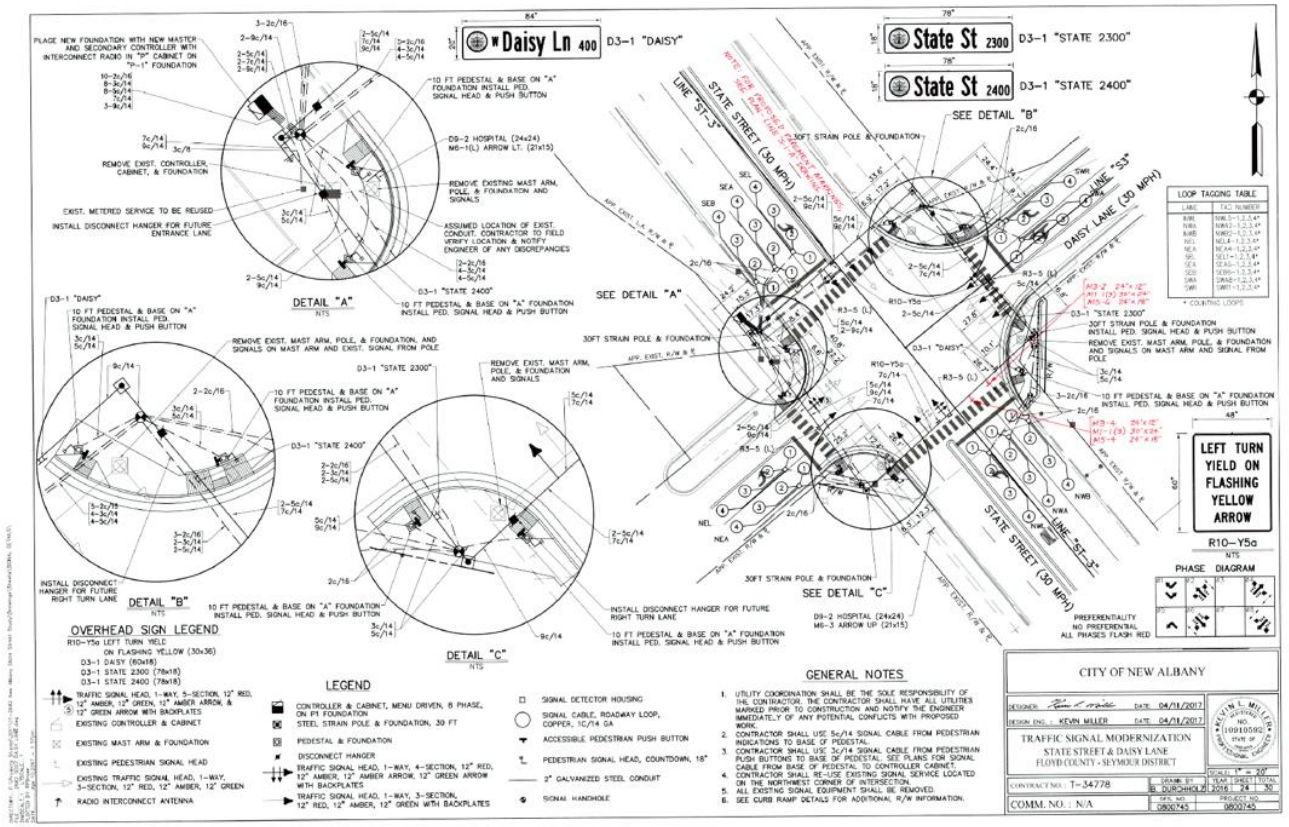
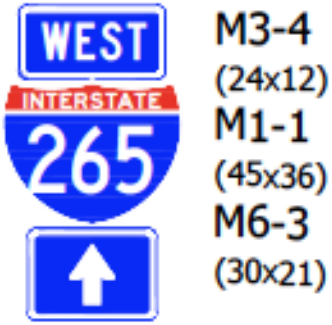


Figure 24: Example of Overhead Signage



CONCLUSION

While urban arterials may not effectively utilize available lanes to move vehicles efficiently, this study evaluated lane flow distribution before and after implementing new route markings and overhead signs to utilize existing lanes better and show the modifications affected the lane flow distribution in the VISSIM simulation. The simulation indicated the existing condition had average queue lengths of 320.6 meters, average travel times of 389.5 seconds, an average stop delay of 259.6 seconds, and an average lane flow distribution in the right lane of 76.1%.

The projected simulation showed average queue lengths were reduced to 39.0 meters, average travel times reduced to 171.4 seconds, average stop delay was reduced to 92.5 seconds, and the average lane flow distribution in the right lane was 47.4%. The VISSIM simulation of the proposed State Street corridor yielded statistically significant improvements in each of the abovementioned measures.

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APPENDICES

Appendix A: Queue Data

Current Queue (Location: 1 NB, 4 SB)

Simulation	Location	Q Length Average (m)	Q Length Max (m)	Q Stops
1	1	392.06	510.04	3348
2	1	218.19	504.69	1986
3	1	413.17	510.16	3356
4	1	194.04	504.37	1554
5	1	304.63	510.15	2907
6	1	332.24	504.75	2699
7	1	358.16	504.62	2480
8	1	345.21	510.05	2767
9	1	253.04	510.15	1995
10	1	325.91	504.62	2441
11	1	354.32	510.1	2585
12	1	381.04	508.25	3262
13	1	235.98	503.85	2074
14	1	316.66	509.24	2764
15	1	366.14	508.82	2844
16	1	341.58	504.75	2859
17	1	305.88	504.64	2712
18	1	436.42	510.06	3656
19	1	250.64	503.9	2130
20	1	289.33	510.2	2571
21	1	330.09	510.18	2906
22	1	254.88	503.76	1959
23	1	283.42	504.74	2587
24	1	390.18	504.61	3023
25	1	246.35	504.74	1879
26	1	310.91	504.53	2589
27	1	332.68	504.88	2690
28	1	409.52	504.76	3548
29	1	422.65	509.99	3436
30	1	464.76	510.19	3315
31	1	185.72	493.68	1680
32	1	321.66	509.99	2445
33	1	345.49	504.63	2595
34	1	291.53	504.68	2515
35	1	280.81	497.74	2326
36	1	267.43	505.59	2146
37	1	313.8	504.63	2742
38	1	384.89	504.73	3434
39	1	240.41	504.69	1980
40	1	364.31	504.74	2613

Proposed Queue (Location: 1 NB, 4 SB)

Simulation	Location	Q Length Average (m)	Q Length Max (m)	Q Stops
1	1	43.79	171.06	862
2	1	42.13	225.62	803
3	1	37.66	161.42	761
4	1	35.26	170.25	687
5	1	38.76	170.04	772
6	1	41.63	196.75	819
7	1	36.45	188.12	729
8	1	46.19	190.44	834
9	1	36.52	183.18	729
10	1	35.08	164.13	732
11	1	38.75	158.37	808
12	1	34.02	144.24	701
13	1	36.8	168.86	753
14	1	38.99	181.78	727
15	1	36.71	159.36	765
16	1	39.37	162.41	778
17	1	38.21	202.49	740
18	1	41.21	175.6	832
19	1	40.23	173.65	827
20	1	44.02	182.51	830
21	1	38.3	182.12	807
22	1	38.46	170.02	759
23	1	41.43	227.68	789
24	1	34.57	189.93	690
25	1	36.13	156	751
26	1	35.13	163.49	740
27	1	45.62	220.05	843
28	1	30.86	151.56	663
29	1	39.14	163.47	802
30	1	42.48	191.2	830
31	1	34.56	158.63	741
32	1	45.47	180.35	896
33	1	30.79	131.71	630
34	1	36.9	157.58	739
35	1	33.65	144.23	727
36	1	40.96	162.73	819
37	1	38.89	189.75	780
38	1	42.43	175.3	864
39	1	40.47	171.53	790
40	1	41.23	187.48	810

41	1	227.92	504.58	1783	41	1	34.38	151.57	738
42	1	342.32	510.21	2681	42	1	39.42	185.32	779
43	1	284.46	509.99	2569	43	1	45.66	215.06	803
44	1	391.08	504.62	2802	44	1	35.85	175.37	710
45	1	393.25	504.55	3094	45	1	34.61	158.55	736
46	1	457.66	510.2	3618	46	1	39.17	163.92	783
47	1	107.13	471.93	1171	47	1	32.21	187.57	698
48	1	252.82	510.12	2421	48	1	40.54	220.81	804
49	1	274.84	504.72	2035	49	1	32.89	144.76	715
50	1	248.71	504.63	2082	50	1	30.28	131.59	637
51	1	416.92	510.17	3428	51	1	42.73	201.16	781
52	1	353.39	510.13	3011	52	1	37.43	208.12	771
53	1	375.36	508.02	2856	53	1	33.48	173.09	682
54	1	368.46	510.18	3005	54	1	48.53	195.44	923
55	1	403.88	510.21	3361	55	1	46.87	173.3	872
56	1	279.86	510.18	2435	56	1	41.11	176.51	783
57	1	380.27	506.62	3263	57	1	42.16	182.31	817
58	1	367.33	510.18	2760	58	1	37.62	156.44	796
59	1	337.02	507.38	2514	59	1	44.33	189.26	864
60	1	396.47	510.19	3430	60	1	40.8	175.35	807
61	1	285.97	504.76	2247	61	1	39.86	201.89	832
62	1	266.58	510.13	2351	62	1	44.63	177.88	855
63	1	102.79	504.74	1162	63	1	42.73	177.67	817
64	1	429.02	509.99	3831	64	1	42.89	190.62	849
65	1	413.81	504.75	3624	65	1	34.43	151.27	749
66	1	183.13	498.27	1643	66	1	36.43	163.92	747
67	1	275.28	510.2	2521	67	1	44.32	198	841
68	1	360.39	505.76	3265	68	1	45.72	214.43	866
69	1	286.35	508.57	2357	69	1	32.62	156.04	684
70	1	320.42	504.7	2757	70	1	37.68	181.84	770
1	4	21.87	96.6	750	1	4	36.74	271.64	926
2	4	22.38	88.54	736	2	4	32.89	158.81	775
3	4	20.45	91.29	694	3	4	20.62	82.6	724
4	4	20.2	71.34	655	4	4	19.83	81.79	670
5	4	29.29	167.33	862	5	4	35.45	141.17	971
6	4	36.15	179.71	967	6	4	32.58	188.11	941
7	4	50.2	205.58	1184	7	4	21.98	91.13	757
8	4	21.86	85.03	726	8	4	20.54	77.24	710
9	4	25.04	200.39	751	9	4	21.09	79.78	708
10	4	24.72	87.21	812	10	4	30.32	168.71	838
11	4	20.96	81.51	698	11	4	21.59	81.51	720
12	4	22.31	76.26	764	12	4	27.17	100.75	861

13	4	24.6	119.55	793	13	4	28.01	89.66	879
14	4	23.04	82.28	767	14	4	23.53	86.57	765
15	4	22.51	89.48	749	15	4	24.96	95.64	780
16	4	87.41	333.21	1440	16	4	20.94	73.3	730
17	4	19.06	69.56	684	17	4	18.41	73.59	662
18	4	20.3	73.3	730	18	4	19.68	76.2	714
19	4	18.81	70.46	628	19	4	20.41	89.36	668
20	4	21.81	79.93	733	20	4	20.18	79.93	689
21	4	20.4	79.29	675	21	4	31.3	174.29	861
22	4	21.23	74.21	700	22	4	19.59	71.34	680
23	4	21.35	68.96	702	23	4	78.34	337.64	1586
24	4	19.53	69.78	655	24	4	19.26	69.41	653
25	4	19.32	76.91	659	25	4	18.46	76.91	646
26	4	20.52	93.58	692	26	4	19.47	93.58	657
27	4	24.08	83.86	788	27	4	23.83	93.24	780
28	4	20.3	75.96	700	28	4	21.34	75.9	720
29	4	21.2	83.7	707	29	4	21.18	79.17	720
30	4	19.55	75.57	678	30	4	19.21	66.33	668
31	4	30.86	151.94	883	31	4	30.53	146.84	928
32	4	21.2	81.45	731	32	4	23.3	90.57	769
33	4	20.68	89.33	688	33	4	21.81	88.2	737
34	4	20.1	75.43	661	34	4	20.99	84.58	705
35	4	17.71	67.44	625	35	4	23.54	96.02	732
36	4	34.86	206.94	819	36	4	21.29	87.11	737
37	4	19.67	92.18	724	37	4	19.25	81.97	705
38	4	20.02	81.63	671	38	4	20.53	81.63	692
39	4	20.56	88.36	698	39	4	18.28	84.49	656
40	4	20.71	88.22	732	40	4	24.16	87.83	787
41	4	21.38	106.11	697	41	4	20.72	77.26	732
42	4	56.32	267.25	1328	42	4	22.49	89.37	755
43	4	59.66	266.99	1102	43	4	24.86	99.93	818
44	4	21.03	77.07	724	44	4	21.75	82.15	742
45	4	42.57	251.93	992	45	4	35.7	256.37	904
46	4	19.67	70.14	672	46	4	20.13	75.81	692
47	4	21.02	82.32	684	47	4	21.01	82.32	688
48	4	22.29	96.16	754	48	4	20.23	68.44	661
49	4	19.85	91.74	703	49	4	19.84	91.74	699
50	4	22.8	85.2	756	50	4	24.25	141.35	772
51	4	22.61	90.27	736	51	4	23.37	159.51	761
52	4	19.03	80.17	646	52	4	20.67	105.54	693
53	4	20.61	93.86	709	53	4	21.33	88.97	723
54	4	47.79	224.62	1180	54	4	40.12	255.25	1011
55	4	21.17	75.39	699	55	4	19.67	78.02	666

56	4	19.29	69.37	642	56	4	19.33	73.31	654
57	4	20.32	74.69	701	57	4	20.69	89	731
58	4	18.98	83.42	658	58	4	20.41	84.41	696
59	4	28.25	178.01	747	59	4	24.99	171.32	712
60	4	20.64	70.07	703	60	4	30.53	149.2	867
61	4	19.6	75.42	674	61	4	20.15	75.42	701
62	4	19.2	66.31	666	62	4	19.53	66.9	673
63	4	23.59	85.75	824	63	4	28.22	151.71	908
64	4	66.43	296.34	1359	64	4	30.4	166.53	908
65	4	20.9	69.11	664	65	4	20.34	69.11	664
66	4	19.93	81.03	687	66	4	48.92	251.49	1021
67	4	18.45	86.36	642	67	4	18.45	84.02	635
68	4	25.78	161.88	715	68	4	26.79	161.88	738
69	4	48.21	212.81	1141	69	4	60.25	243.51	1402
70	4	21.7	85.64	728	70	4	21.3	85.01	701

Appendix B: Travel Time Data

Current Travel Time (1 NB, 2 SB)		
Simulation	*Direction*	*Travel Time (s)*
1	1	475.22
2	1	317.7
3	1	576.55
4	1	262.02
5	1	426.87
6	1	412.13
7	1	324.48
8	1	375.95
9	1	476.87
10	1	302.59
11	1	418.38
12	1	441.41
13	1	302.11
14	1	409.99
15	1	347.57
16	1	452.68
17	1	368.71
18	1	459.53
19	1	322.73
20	1	523.99
21	1	647
22	1	278.35
23	1	312.03
24	1	363.26
25	1	284.61
26	1	331.62
27	1	344.07
28	1	488.55
29	1	484.15
30	1	544.83
31	1	259.55
32	1	363.85
33	1	303.07
34	1	335.86
35	1	303.18
36	1	376.88
37	1	344.09
38	1	515.67
39	1	287.05

Projected Travel Time (1 NB, 2 SB)		
Simulation	*Direction*	*Travel time (s)*
1	1	171.45
2	1	171.49
3	1	174.56
4	1	161.47
5	1	174.25
6	1	171.81
7	1	171.37
8	1	180.91
9	1	173.27
10	1	167.26
11	1	171.88
12	1	177.72
13	1	169.08
14	1	185.37
15	1	165.28
16	1	171.39
17	1	167.98
18	1	174.37
19	1	166.89
20	1	187.53
21	1	170.9
22	1	169.21
23	1	166.58
24	1	158.15
25	1	164.33
26	1	161.9
27	1	173.49
28	1	171.78
29	1	170.38
30	1	180.09
31	1	164.49
32	1	182.5
33	1	158.83
34	1	180.02
35	1	167.72
36	1	169.7
37	1	171.14
38	1	166.88
39	1	175.2

40	1	307.23
41	1	296.85
42	1	358.66
43	1	399.8
44	1	338.69
45	1	460.32
46	1	603.63
47	1	249.78
48	1	328.98
49	1	260.29
50	1	341.06
51	1	509.56
52	1	416.63
53	1	381.15
54	1	392.11
55	1	500.92
56	1	411.05
57	1	381.03
58	1	325.64
59	1	364.48
60	1	588.75
61	1	317.58
62	1	439.24
63	1	249.17
64	1	546.04
65	1	524.2
66	1	271.63
67	1	348.47
68	1	422.77
69	1	357.86
70	1	404.24
1	2	202.42
2	2	205.58
3	2	236.8
4	2	218.32
5	2	214.99
6	2	217.28
7	2	301.84
8	2	191.11
9	2	189.63
10	2	287.68
11	2	193.3

40	1	170.49
41	1	172.01
42	1	165.13
43	1	178.39
44	1	170.42
45	1	177.71
46	1	180.13
47	1	159.91
48	1	171.11
49	1	160.09
50	1	160.12
51	1	175.33
52	1	158.72
53	1	170.31
54	1	183.92
55	1	177.73
56	1	183.06
57	1	169.21
58	1	170.4
59	1	170.28
60	1	173.51
61	1	180.47
62	1	167.01
63	1	181.34
64	1	167.62
65	1	161.29
66	1	159.11
67	1	172.92
68	1	177.42
69	1	163.34
70	1	189.82
1	2	200.77
2	2	213.1
3	2	261.73
4	2	213.71
5	2	276.6
6	2	198.53
7	2	245.77
8	2	168.38
9	2	234.98
10	2	212.26
11	2	198.5

12	2	238.14	12	2	282.14
13	2	232.79	13	2	324.11
14	2	203.42	14	2	206.74
15	2	200.68	15	2	269.39
16	2	339.73	16	2	215.15
17	2	179.48	17	2	177.03
18	2	282.47	18	2	199.45
19	2	174.28	19	2	176.43
20	2	287.58	20	2	185.72
21	2	190.6	21	2	232
22	2	233.15	22	2	225.65
23	2	223.28	23	2	325.79
24	2	209.13	24	2	190.58
25	2	186.92	25	2	202.34
26	2	196.53	26	2	197.5
27	2	218.49	27	2	193.54
28	2	218.93	28	2	197.64
29	2	188.19	29	2	187.52
30	2	184.97	30	2	216.84
31	2	276.57	31	2	247.21
32	2	198.89	32	2	256.8
33	2	213.12	33	2	207.36
34	2	211.18	34	2	227.7
35	2	192.96	35	2	225.61
36	2	203.87	36	2	187.98
37	2	175.32	37	2	165.16
38	2	184.3	38	2	169.49
39	2	177.48	39	2	185.53
40	2	217.43	40	2	228.15
41	2	192.75	41	2	191.45
42	2	333.22	42	2	220.72
43	2	189.75	43	2	207.36
44	2	186.41	44	2	174.74
45	2	236.85	45	2	268.68
46	2	190.34	46	2	177.14
47	2	242.29	47	2	216.59
48	2	190.65	48	2	182.43
49	2	186.24	49	2	184.18
50	2	199.24	50	2	190.16
51	2	175.25	51	2	196.35
52	2	227.55	52	2	215.04
53	2	199.41	53	2	184.82
54	2	347.29	54	2	295.81

55	2	182.58
56	2	211.17
57	2	178.82
58	2	188.96
59	2	189.2
60	2	222.48
61	2	189.08
62	2	190.13
63	2	181.51
64	2	326.98
65	2	186.73
66	2	263.16
67	2	189.9
68	2	181.7
69	2	266.5
70	2	194.5

55	2	178
56	2	184.4
57	2	177.7
58	2	185.97
59	2	196.47
60	2	304.31
61	2	186.57
62	2	175.46
63	2	267.84
64	2	272.9
65	2	187.36
66	2	314.25
67	2	189.76
68	2	179.04
69	2	317
70	2	248.35

Appendix C: Delay Data

Current Delay (Direction 1 NB, 2 SB)

Simulation	*Direction*	*Stop Delay (s)*	*Stops*	*Vehicle Delay (s)*
1	1	323.3	9.12	422.09
2	1	203.37	5.17	263.98
3	1	405.19	11.29	523.4
4	1	160.51	3.93	208.66
5	1	289.81	7.63	373.57
6	1	279.19	7.08	358.65
7	1	206.65	5.67	271
8	1	251.11	6.1	322.83
9	1	324.89	9.88	423.27
10	1	194.47	4.53	248.91
11	1	281.38	7.7	364.8
12	1	305.51	7.7	388.03
13	1	192.25	4.83	248.74
14	1	275.51	6.88	356.92
15	1	225.46	6.34	294.36
16	1	307.12	8.45	399.39
17	1	247.65	5.96	315.3
18	1	311	8.38	406.46
19	1	207.06	5.01	269.69
20	1	359.64	10.76	470.29
21	1	460.14	12.98	593.83
22	1	174.93	4.2	224.47
23	1	196.98	5.5	258.57
24	1	238.25	6.03	309.9
25	1	176.77	4.65	231.13
26	1	216.53	5.53	278.17
27	1	226.91	5.37	290.58
28	1	337.93	8.95	435.57
29	1	335.04	8.75	431.04
30	1	380.47	10.66	491.32
31	1	160.35	3.97	205.91
32	1	240.93	6.19	310.4
33	1	190.77	4.96	249.87
34	1	217.99	5.28	282.49
35	1	192.66	5.02	249.67
36	1	248.33	6.6	323.47
37	1	223.2	5.5	290.97
38	1	350.93	10.83	462.62
39	1	178.51	4.61	233.39
40	1	196.29	4.63	253.96

Projected Delay (Direction 1 NB, 2 SB)

Simulation	*Direction*	*Stop Delay (s)*	*Stops (s)*	*Vehicle Delay (s)*
1	1	93.63	2.08	115.5
2	1	92.13	2.26	115.16
3	1	96.39	2.11	118.51
4	1	83.39	2.12	105.67
5	1	95.89	2.19	118.23
6	1	93.86	2.12	115.49
7	1	92.34	2.26	115.13
8	1	101.15	2.31	124.98
9	1	94.4	2.24	117
10	1	89.3	2.21	111.07
11	1	92.72	2.22	115.64
12	1	99.59	2.11	121.6
13	1	89.89	2.24	113.15
14	1	105.1	2.35	129.33
15	1	85.81	2.25	109.26
16	1	92.34	2.21	115.32
17	1	90.08	2.19	111.89
18	1	94.47	2.29	118.15
19	1	87.82	2.29	110.94
20	1	107.38	2.38	131.19
21	1	93.24	2.12	114.77
22	1	89.59	2.27	113
23	1	88.23	2.2	110.57
24	1	80.7	2.08	101.94
25	1	86.66	2.06	108.18
26	1	83.69	2.14	105.74
27	1	93.42	2.31	117.19
28	1	93.03	2.15	115.49
29	1	91.56	2.26	114.38
30	1	99.79	2.33	123.77
31	1	86.11	2.12	108.51
32	1	102.57	2.28	126.26
33	1	81.45	1.96	102.84
34	1	100.71	2.26	123.86
35	1	88.89	2.25	111.62
36	1	91.02	2.23	113.62
37	1	91.83	2.3	115.21
38	1	87.91	2.26	110.83
39	1	95.1	2.34	118.95
40	1	91.53	2.34	114.4

41	1	187.98	4.93	243.32
42	1	235.1	5.91	305.24
43	1	266.56	6.91	346.45
44	1	220.45	5.42	285.56
45	1	319.45	8.16	407.27
46	1	427.5	12.31	550.71
47	1	150.9	3.93	196.01
48	1	213.31	5.38	275.29
49	1	160.08	4.06	206.7
50	1	224.35	5.52	287.81
51	1	353.44	10.01	456.48
52	1	281.81	7.56	363.68
53	1	254.28	6.75	327.51
54	1	262.72	6.32	338.88
55	1	345.86	9.61	447.82
56	1	281.25	7.21	357.43
57	1	252.84	6.4	327.81
58	1	208.78	5.19	272.11
59	1	240.99	6.36	311.11
60	1	414.07	11.67	535.85
61	1	204.51	4.94	264.31
62	1	297.64	7.94	386.03
63	1	151.98	3.8	195.49
64	1	379.92	10.34	493
65	1	360.16	10.33	471.27
66	1	167.03	4.46	217.88
67	1	224.34	5.74	295.05
68	1	283.76	7.27	369.79
69	1	234.14	6.23	304.52
70	1	274.46	6.65	351.09
1	2	112.76	3.23	145.95
2	2	117.01	3.16	149.15
3	2	140.27	4.11	180.47
4	2	126.73	3.66	161.88
5	2	122.97	3.76	159.16
6	2	125.58	3.47	160.86
7	2	195.08	5.6	245.78
8	2	103.69	3.13	134.84
9	2	100.28	3.28	133.53
10	2	179.86	5.93	231.68
11	2	107.38	2.99	136.93
12	2	141.18	4.07	181.99

41	1	93.6	2.2	115.98
42	1	86.53	2.18	108.95
43	1	98.36	2.29	122.2
44	1	92.96	2.13	114.33
45	1	97.94	2.28	121.72
46	1	100.05	2.26	124.11
47	1	82.16	2.17	103.97
48	1	92.36	2.16	114.85
49	1	83.33	2.01	103.92
50	1	83.17	2.04	104.12
51	1	95.7	2.3	119.38
52	1	81.78	2.08	102.88
53	1	92.62	2.1	114.33
54	1	103.8	2.4	127.81
55	1	97.16	2.43	121.59
56	1	103.03	2.31	126.98
57	1	90.08	2.28	113
58	1	91.79	2.2	114.13
59	1	90.24	2.35	114.25
60	1	94.13	2.24	117.4
61	1	100.67	2.34	124.33
62	1	88.5	2.24	111.04
63	1	101.3	2.42	125.42
64	1	89.17	2.17	111.6
65	1	83.88	2.11	105.26
66	1	80.99	2.16	103.05
67	1	93.34	2.29	116.83
68	1	96.4	2.5	121.45
69	1	85.05	2.09	107.35
70	1	111.01	2.31	133.76
1	2	113.43	3.13	144.53
2	2	122.84	3.38	156.83
3	2	161.22	4.7	205.54
4	2	122.57	3.66	157.54
5	2	176.1	4.98	220.75
6	2	110.59	3.16	142.24
7	2	146.78	4.38	189.83
8	2	85.21	2.47	112.08
9	2	139.31	4.1	178.76
10	2	120.91	3.45	156.01
11	2	109.62	3.22	142.09
12	2	178.75	5.22	226.08

13	2	136.54	4.24	176.82	13	2	216.68	5.76	268.24
14	2	114.65	3.17	147.04	14	2	114.38	3.59	150.52
15	2	109.58	3.44	144.5	15	2	172.95	4.24	213.43
16	2	229.9	6.11	283.22	16	2	123.26	3.53	158.85
17	2	95.85	2.61	123.38	17	2	91.22	2.9	120.97
18	2	180.57	4.85	226.32	18	2	108.85	3.25	143.32
19	2	90.22	2.6	117.64	19	2	92.77	2.65	120.11
20	2	182.31	5.14	231.34	20	2	99.49	2.92	129.3
21	2	103.55	2.98	134.13	21	2	139.87	4.13	175.9
22	2	138.89	3.96	176.72	22	2	134.08	3.54	169.4
23	2	130.16	3.73	167.14	23	2	221.57	5.43	269.73
24	2	118.94	3.38	152.92	24	2	107.11	2.55	134.35
25	2	100.12	2.99	130.44	25	2	113.35	3.19	145.97
26	2	108.54	3.09	140.23	26	2	109.06	3.06	141.11
27	2	127.24	3.63	162.46	27	2	106.93	3.02	137.57
28	2	122.69	4.1	162.75	28	2	108.81	3.12	141.34
29	2	101.53	2.95	131.92	29	2	100.79	3.04	131.31
30	2	99.13	2.84	128.54	30	2	127.34	3.49	160.53
31	2	174.36	4.93	220.51	31	2	148.19	4.49	191
32	2	108.88	3.31	142.62	32	2	157.13	4.68	200.6
33	2	125.3	3.07	156.78	33	2	117.64	3.29	150.83
34	2	118.56	3.8	154.87	34	2	132.7	3.93	171.56
35	2	105.11	3.01	136.68	35	2	132.18	3.69	169.39
36	2	115.54	3.28	147.64	36	2	100.8	2.99	131.65
37	2	90.2	2.79	119.17	37	2	82.12	2.57	109.08
38	2	98.33	2.82	128.17	38	2	86.67	2.52	113.27
39	2	92.22	2.87	121.25	39	2	100.57	2.8	129.36
40	2	127.09	3.46	161.01	40	2	133.59	3.8	171.58
41	2	107.69	2.89	136.62	41	2	104.21	3.14	135.24
42	2	220.27	6.37	277.08	42	2	131.37	3.39	164.47
43	2	100.86	3.28	133.21	43	2	117.34	3.26	151.04
44	2	100.28	2.82	130.31	44	2	90.81	2.63	118.37
45	2	140.38	4.27	180.63	45	2	169.84	4.62	212.22
46	2	102.41	2.97	133.97	46	2	92.85	2.71	120.85
47	2	143.69	4.6	185.88	47	2	123.8	3.72	160.13
48	2	101.7	3.12	134.23	48	2	96.79	2.89	126.15
49	2	98.54	2.99	129.94	49	2	99.06	2.7	127.93
50	2	109.74	3.21	142.93	50	2	101.77	2.88	133.97
51	2	88.72	2.92	119.07	51	2	109.82	2.98	140.17
52	2	134.17	3.73	171.36	52	2	122.24	3.52	158.71
53	2	109.86	3.21	143.34	53	2	100.22	2.67	128.65
54	2	234.72	6.49	291.17	54	2	190.28	5.36	239.61

55	2	99.06	2.64	126.3
56	2	120.04	3.5	154.96
57	2	94.32	2.77	122.55
58	2	102.72	2.91	132.65
59	2	102.67	2.84	132.81
60	2	129.64	3.75	166.26
61	2	100.86	3.17	133.18
62	2	103.78	2.93	133.93
63	2	97.08	2.64	125.07
64	2	218.03	5.73	271.03
65	2	100.12	3.01	130.49
66	2	161.25	4.93	206.96
67	2	101.43	3.06	133.73
68	2	98.04	2.52	124.81
69	2	163.48	4.94	210.25
70	2	109.94	2.72	138.43

55	2	93.29	2.69	121.64
56	2	97.6	2.99	128.08
57	2	92.78	2.77	121.59
58	2	100.3	2.95	129.74
59	2	109.58	2.91	140.32
60	2	196.5	5.55	248.23
61	2	99.84	3.02	130.48
62	2	90.34	2.83	119.17
63	2	171.21	4.05	211.89
64	2	171.61	4.8	216.66
65	2	102.18	2.89	131.36
66	2	207.12	5.92	257.97
67	2	102.98	2.98	133.47
68	2	96.35	2.49	122.28
69	2	205.6	6.62	260.61
70	2	151.71	4.19	192.3

Appendix D: Vehicle Distribution Data

Current Vehicle Distribution (Lane 1 Right, 2 Left)

Simulation	*Lane*	*Vehicles*	*Lane Utilization*
1	1	610	72.6%
2	1	683	79.1%
3	1	588	73.1%
4	1	700	80.9%
5	1	612	73.9%
6	1	638	76.0%
7	1	691	79.2%
8	1	633	73.0%
9	1	681	84.5%
10	1	685	77.9%
11	1	686	80.5%
12	1	614	74.2%
13	1	610	74.0%
14	1	641	74.5%
15	1	646	77.7%
16	1	665	79.0%
17	1	611	75.0%
18	1	608	70.9%
19	1	680	74.9%
20	1	626	79.4%
21	1	596	76.3%
22	1	677	78.0%
23	1	591	74.2%
24	1	629	75.8%
25	1	686	79.3%
26	1	624	75.7%
27	1	678	75.7%
28	1	573	71.0%
29	1	633	75.6%
30	1	645	79.4%
31	1	693	79.1%
32	1	703	79.5%
33	1	644	74.5%
34	1	643	74.0%
35	1	611	73.3%
36	1	694	79.8%
37	1	606	71.3%
38	1	602	71.0%
39	1	693	78.9%
40	1	671	76.1%

Projected Vehicle Distribution (Lane 1 Right, 2 Left)

Simulation	*Lane*	*Vehicles*	*Lane Utilization*
1	1	453	47.7%
2	1	431	47.3%
3	1	439	46.6%
4	1	399	46.6%
5	1	426	47.2%
6	1	440	48.1%
7	1	414	46.3%
8	1	450	48.7%
9	1	421	48.2%
10	1	435	47.7%
11	1	442	47.5%
12	1	417	47.2%
13	1	399	46.7%
14	1	426	46.9%
15	1	417	47.2%
16	1	435	47.7%
17	1	407	47.0%
18	1	437	47.5%
19	1	436	47.6%
20	1	417	46.2%
21	1	433	47.2%
22	1	421	47.3%
23	1	409	46.5%
24	1	397	46.4%
25	1	410	45.9%
26	1	416	46.8%
27	1	446	47.5%
28	1	428	47.5%
29	1	437	46.5%
30	1	427	47.9%
31	1	411	46.3%
32	1	469	48.8%
33	1	418	47.6%
34	1	453	49.0%
35	1	420	48.2%
36	1	456	48.6%
37	1	422	48.1%
38	1	445	47.3%
39	1	422	46.9%
40	1	408	45.5%

41	1	677	78.0%
42	1	629	76.0%
43	1	620	77.0%
44	1	658	75.7%
45	1	634	74.1%
46	1	576	71.2%
47	1	687	83.8%
48	1	637	74.8%
49	1	690	77.1%
50	1	631	75.8%
51	1	622	75.4%
52	1	616	73.4%
53	1	667	82.3%
54	1	667	75.5%
55	1	636	74.9%
56	1	614	76.6%
57	1	647	75.3%
58	1	642	72.4%
59	1	679	78.3%
60	1	602	75.9%
61	1	677	75.3%
62	1	678	80.3%
63	1	711	81.6%
64	1	567	69.7%
65	1	577	70.8%
66	1	691	79.5%
67	1	631	74.1%
68	1	604	72.5%
69	1	602	73.9%
70	1	628	77.4%
1	2	230	27.4%
2	2	180	20.9%
3	2	216	26.9%
4	2	165	19.1%
5	2	216	26.1%
6	2	201	24.0%
7	2	181	20.8%
8	2	234	27.0%
9	2	125	15.5%
10	2	194	22.1%
11	2	166	19.5%
12	2	214	25.8%

41	1	415	47.5%
42	1	424	48.3%
43	1	423	47.9%
44	1	409	46.3%
45	1	449	48.7%
46	1	436	48.1%
47	1	390	46.5%
48	1	435	47.3%
49	1	431	48.0%
50	1	404	47.8%
51	1	431	47.5%
52	1	438	47.8%
53	1	412	46.7%
54	1	470	48.1%
55	1	445	48.3%
56	1	436	47.8%
57	1	429	47.1%
58	1	418	46.2%
59	1	451	47.3%
60	1	434	46.8%
61	1	441	47.6%
62	1	444	48.6%
63	1	433	47.7%
64	1	459	47.9%
65	1	420	46.5%
66	1	413	46.9%
67	1	430	47.1%
68	1	444	48.6%
69	1	407	47.3%
70	1	436	46.3%
1	2	497	52.3%
2	2	481	52.7%
3	2	503	53.4%
4	2	458	53.4%
5	2	477	52.8%
6	2	475	51.9%
7	2	480	53.7%
8	2	474	51.3%
9	2	452	51.8%
10	2	476	52.3%
11	2	488	52.5%
12	2	467	52.8%

13	2	214	26.0%	13	2	455	53.3%
14	2	219	25.5%	14	2	483	53.1%
15	2	185	22.3%	15	2	467	52.8%
16	2	177	21.0%	16	2	476	52.3%
17	2	204	25.0%	17	2	459	53.0%
18	2	249	29.1%	18	2	483	52.5%
19	2	228	25.1%	19	2	480	52.4%
20	2	162	20.6%	20	2	485	53.8%
21	2	185	23.7%	21	2	484	52.8%
22	2	191	22.0%	22	2	469	52.7%
23	2	205	25.8%	23	2	471	53.5%
24	2	201	24.2%	24	2	458	53.6%
25	2	179	20.7%	25	2	484	54.1%
26	2	200	24.3%	26	2	473	53.2%
27	2	218	24.3%	27	2	493	52.5%
28	2	234	29.0%	28	2	474	52.5%
29	2	204	24.4%	29	2	503	53.5%
30	2	167	20.6%	30	2	464	52.1%
31	2	183	20.9%	31	2	476	53.7%
32	2	181	20.5%	32	2	492	51.2%
33	2	221	25.5%	33	2	461	52.4%
34	2	226	26.0%	34	2	471	51.0%
35	2	222	26.7%	35	2	451	51.8%
36	2	176	20.2%	36	2	483	51.4%
37	2	244	28.7%	37	2	455	51.9%
38	2	246	29.0%	38	2	496	52.7%
39	2	185	21.1%	39	2	478	53.1%
40	2	211	23.9%	40	2	488	54.5%
41	2	191	22.0%	41	2	459	52.5%
42	2	199	24.0%	42	2	453	51.7%
43	2	185	23.0%	43	2	460	52.1%
44	2	211	24.3%	44	2	474	53.7%
45	2	222	25.9%	45	2	473	51.3%
46	2	233	28.8%	46	2	470	51.9%
47	2	133	16.2%	47	2	449	53.5%
48	2	215	25.2%	48	2	484	52.7%
49	2	205	22.9%	49	2	466	52.0%
50	2	201	24.2%	50	2	441	52.2%
51	2	203	24.6%	51	2	476	52.5%
52	2	223	26.6%	52	2	479	52.2%
53	2	143	17.7%	53	2	471	53.3%
54	2	216	24.5%	54	2	508	51.9%
55	2	213	25.1%	55	2	477	51.7%

56	2	188	23.4%
57	2	212	24.7%
58	2	245	27.6%
59	2	188	21.7%
60	2	191	24.1%
61	2	222	24.7%
62	2	166	19.7%
63	2	160	18.4%
64	2	247	30.3%
65	2	238	29.2%
66	2	178	20.5%
67	2	221	25.9%
68	2	229	27.5%
69	2	213	26.1%
70	2	183	22.6%

56	2	476	52.2%
57	2	481	52.9%
58	2	487	53.8%
59	2	502	52.7%
60	2	494	53.2%
61	2	486	52.4%
62	2	470	51.4%
63	2	475	52.3%
64	2	500	52.1%
65	2	483	53.5%
66	2	468	53.1%
67	2	483	52.9%
68	2	470	51.4%
69	2	453	52.7%
70	2	506	53.7%

Appendix E: Traffic Signal Timings

New Albany, Indiana - Actuated Signal Timing Record

State: _____ City: x County: _____
Area: _____

INTERSECTION: State St & Daisy Ln **INTERSECTION CODE**

DATE SET: 11/8/18

CONTROLLER TYPE: Cobalt **TIME:** 4p

SET BY: M Lindely / VS Eng

PHASE MOVEMENT/INTERVAL	1	2	3	4	5	6	7	8
	NBLT	SB		WB	SBLT	NB		EB
MIN. GREEN	4	10		7	5	10		7
WALK		5		5		5		5
PED CLEAR		11		15		11		15
PASSAGE	3.0	3.0		3.0	3.0	3.0		3.0
MAX I	15	40		30	15	40		30
MAX II	15	40		30	15	40		30
MAX III								
MAX EXT.								
AMBER	3.5	4.0		4.0	3.5	4.0		4.0
RED CLEAR	0.5	3.0		3.0	0.5	3.0		3.0
SECONDS PER ACT								
MAX. VAR. INITIAL								
BEFORE REDUCTION								
TIME TO REDUCE								
MIN. GAP	3.0	3.0		3.0	3.0	3.0		3.0
MEMORY								
VEH RECALL		x				x		
SOFT RECALL								
PED RECALL								
DUAL ENTRY		x		x		x		x
CNA I								
THIS FLASHES		R		R		R		R

NOTES:

		Phase 1	2	3	4	5	6	7	8
Cy1/Sp1/Of1	CY 100 Of 90	8	62	0	30	25	46	0	29
Cy2/Sp1/Of1	Cy 90 Of 75	8	53	0	29	24	36	0	30

NIC (CY/SP/OF) 600 2/1/1
1300 1/1/1

New Albany, Indiana - Actuated Signal Timing Record

State: _____ City: x County: _____
Area: _____

INTERSECTION: State St & Home Depot

INTERSECTION CODE

DATE SET: 11/8/18

CONTROLLER TYPE: Cobalt

TIME: 3:45p

SET BY: M Lindely / VS Eng

PHASE MOVEMENT/INTERVAL	1	2	3	4	5	6	7	8
	NBLT	SB		WB	SBLT	NB		EB
MIN. GREEN	5	20		8	5	20		8
WALK		5		5		5		5
PED CLEAR		11		15		11		15
PASSAGE	2.0	5.0		2.0	2.0	5.0		2.0
MAX I	25	50		30	25	50		30
MAX II	25	50		30	25	50		30
MAX III								
MAX EXT.								
AMBER	3.0	4.0		3.2	3.0	4.0		3.2
RED CLEAR	3.0	3.0		3.0	3.0	3.0		3.0
SECONDS PER ACT		2.0				2.0		
MAX. VAR. INITIAL								
BEFORE REDUCTION								
TIME TO REDUCE								
MIN. GAP	1.5	1.5		1.5	1.5	1.5		1.5
MEMORY		x				x		
VEH RECALL		x				x		
SOFT RECALL								
PED RECALL								
DUAL ENTRY				x				x
CNA I								
THIS FLASHES		R		R		R		R

NOTES:

		Phase 1	2	3	4	5	6	7	8
Cy1/Sp1/Of1	CY 100 Of 86	12	49	0	39	11	50	0	39
Cy2/Sp1/Of1	Cy 90 Of 85	14	44	0	32	14	44	0	32

NIC (CY/SP/OF) Mon-Sat 600 2/1/1 Sun 600 2/1/1
1300 1/1/1 1300 1/1/1

2300 CKT 13 OFF FREE 2300 CKT 13 OFF FREE

New Albany, Indiana - Actuated Signal Timing Record

State: _____ City: x County: _____
Area: _____

INTERSECTION: State St & Target — **INTERSECTION CODE**

DATE SET: 11/8/18

CONTROLLER TYPE: Cobalt — **TIME:** 3:30p

SET BY: M Lindely / VS Eng

PHASE MOVEMENT/INTERVAL	1	2	3	4	5	6	7	8
	NBLT	SB	WBLT	EB	SBLT	NB	EBLT	WB
MIN. GREEN	7	10	7	6	7	10	5	6
WALK		5		5		5		5
PED CLEAR		15		18		15		18
PASSAGE	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
MAX I	20	40	20	30	20	40	20	30
MAX II	30	40	30	30	30	40	30	30
MAX III								
MAX EXT.								
AMBER	3.0	4.0	3.0	3.0	4.0	4.0	3.0	3.0
RED CLEAR	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
SECONDS PER ACT								
MAX. VAR. INITIAL								
BEFORE REDUCTION								
TIME TO REDUCE								
MIN. GAP	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
MEMORY								
VEH RECALL		x				x		
SOFT RECALL		x				x		
PED RECALL								
DUAL ENTRY		x		x		x		x
CNA I								
THIS FLASHES		R		R		R		R

NOTES:

		Phase 1	2	3	4	5	6	7	8
Cy1/Sp1/Of1	CY 100 Of 86	17	41	13	29	17	41	13	29
Cy2/Sp1/Of1	Cy 90 Of 19	13	37	13	27	15	33	13	29

NIC (CY/SP/OF) 600 2/1/1
1300 1/1/1

New Albany, Indiana - Actuated Signal Timing Record

State: _____ City: x County: _____
Area: _____

INTERSECTION: State St & Capt. Frank — **INTERSECTION CODE**

DATE SET: 11/8/18

CONTROLLER TYPE: Cobalt

TIME: 3:15p

SET BY: M Lindely / VS Eng

PHASE MOVEMENT/INTERVAL	1	2	3	4	5	6	7	8
	NBLT	SB		EB/WB	SBLT	NB		
MIN. GREEN	2	22		13	2	22		13
WALK		5		5		5		5
PED CLEAR		16		17		16		17
PASSAGE	2.0	4.0		4.0	2.0	4.0		4.0
MAX I	20	20		30	20	20		30
MAX II	30	30		30	30	30		30
MAX III								
MAX EXT.								
AMBER	4.0	4.0		4.0	4.0	4.0		4.0
RED CLEAR	3.0	3.0		3.0	3.0	3.0		3.0
SECONDS PER ACT								
MAX. VAR. INITIAL								
BEFORE REDUCTION								
TIME TO REDUCE								
MIN. GAP								
MEMORY								
VEH RECALL		x				x		
SOFT RECALL								
PED RECALL		x		x		x		x
DUAL ENTRY		x		x		x		x
CNA I								
THIS FLASHES		R		R		R		R

NOTES:

		Phase 1	2	3	4	5	6	7	8
Cy1/Sp1/Of1	CY 100 Of 18	9	50	0	41	9	50	0	41
Cy2/Sp1/Of1	Cy 90 Of 28	18	39	0	33	9	48	0	37

NIC (CY/SP/OF) 600 2/1/1
1300 1/1/1

I-265 EB Ramp & State St

Plan 2

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Direction																
Min Green	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
BK Min Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CS Min Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Delay Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Walk	0	10	0	10	0	10	0	10	0	10	0	10	0	10	0	10
Walk 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Walk Max	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ped Clear	0	16	0	16	0	16	0	16	0	16	0	16	0	16	0	16
Ped Clear 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ped Clear Max	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ped CO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Ext	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Ext 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Max 1	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
Max 2	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Max 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DYM Max	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DYM Stp	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yellow	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Red Clear	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Red Max	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Red Revert	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
ACT B4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SEC/ACT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Max Int	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Time B4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cars Wt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
STPT Duc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Min Gap	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

I-265 WB Ramp & State St

Plan 2

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Direction																
Min Green	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
BK Min Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CS Min Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Delay Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Walk	0	10	0	10	0	10	0	10	0	10	0	10	0	10	0	10
Walk 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Walk Max	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ped Clear	0	16	0	16	0	16	0	16	0	16	0	16	0	16	0	16
Ped Clear 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ped Clear Max	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ped CO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Ext	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Ext 2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Max 1	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
Max 2	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Max 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DYM Max	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DYM Stp	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yellow	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Red Clear	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Red Max	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Red Revert	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
ACT B4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SEC/ACT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Max Int	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Time B4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cars Wt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
STPT Duc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time To Reduce	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Min Gap	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0