



MEMORANDUM

To: Hanover Planning Commission

From: David Capparuccini, PE, PTOE
Kyle Lowther, E.I.T.
Kimley-Horn and Associates, Inc.

Date: March 20, 2026

Subject: Mountain Road Technology Park – Supplemental Traffic Analysis

Introduction

Kimley-Horn and Associates, Inc. under contract with Tract completed the *Mountain Road Technology Park Traffic Impact Analysis (TIA)* in November 2025. The purpose of the TIA was to identify the potential future impacts of a proposed 900-megawatt (MW) data center and evaluate potential solutions to address those impacts. The TIA was approved by VDOT in December 2025. The proposed data center campus is generally located in the northeast quadrant of the intersection of US-33 (Mountain Road) and Hunton Park Boulevard in Hanover County, Virginia. Access to the proposed site would be provided via one full-access driveway along US-33 at an existing median break and a secondary access along US-33 to be used during construction (right-in/right-out), and a third access off of Winns Church Road to be used as an emergency/utility full access. A conceptual site plan is included in **Appendix A**.

The TIA included assumptions for the trips generated from the proposed data center campus during construction activities and post construction, when the development is fully operational. The TIA evaluated the potential traffic impacts and identified alternative solutions to address those impacts. Improvements at the study intersections were identified to address the operational and safety issues at the intersections under the opening year (2034) during construction activities and post construction, when the development is operational.

Based on the future (2034) construction peak traffic operational analysis results in the TIA, the unsignalized intersection of US-33 and Project Driveway #1 was projected to operate with delays equivalent to LOS F during the PM peak hour. The TIA recommended that on occasions where vehicles are unable to exit the site, or excessive queues are observed on-site, it is expected that the contractor will deploy flaggers to maintain the safety and operations of the intersection.

During the Hanover Planning Commission hearing for the rezoning application, the Hanover Planning Commission requested that additional analysis be conducted to evaluate more permanent solutions for the intersection of US-33 and Project Driveway #1 due to the six-year estimated duration of construction and to re-evaluate the construction employee arrival/departure assumptions to provide a more conservative analysis.

This supplemental analysis includes an operational analysis that accounts for the redistribution of construction employees arriving/departing the site under peak construction conditions for the opening year (2034).

Trip Generation Assumptions

The purpose of this memorandum is to re-evaluate the potential traffic impacts of the proposed development during construction activities and identify more permanent solutions to address those impacts. In the previously approved TIA, the anticipated site-generated traffic for the proposed development was determined based on data provided by the applicant. Based on this data, the anticipated peak construction work force consists of 600-800 employees on-site daily. Construction employees were assumed to arrive between 4:00–7:00 AM and depart between 2:00–5:00 PM. The following assumptions were made regarding the peak construction traffic:

- 1,600 weekday daily trips
- 800 morning trips; employee arrival distributed between 4:00–7:00 AM; directional distribution was assumed to be 90% entering, 10% exiting
- 800 evening trips; employee departures distributed between 2:00–5:00 PM; directional distribution was assumed to be 10% entering, 90% exiting

The hourly distribution of construction employees arriving/departing the site was provided by the applicant and used to distribute the morning and evening trips to capture the employees' non-uniform arrival/departure. The anticipated hourly arrival and departure volumes are provided in **Table 1**.

Table 1: Previously Approved TIA Anticipated Hourly Construction Traffic Volumes

Start Time	Percent Arriving/Departing	Trip Generation		
		In	Out	Total
AM Peak Period				
4:00 AM	10%	72	8	80
5:00 AM	30%	216	24	240
6:00 AM	50%	360	40	400
7:00 AM	10%	72	8	80
PM Peak Period				
2:00 PM	10%	8	72	80
3:00 PM	50%	40	360	400
4:00 PM	30%	24	216	240
5:00 PM	10%	8	72	80

During the Hanover Planning Commission hearing for the rezoning application, the Hanover Planning Commission requested that additional analysis be conducted to evaluate more permanent solutions for the intersection of US-33 and Project Driveway #1 due to the six-year estimated duration of construction and to re-evaluate the construction employee arrival/departure assumptions to provide a more conservative analysis. The Hanover Planning Commission requested changes be made to the trip distribution percentages shown in the table below. **Table 2** depicts the revised anticipated hourly arrival and departure distribution of construction traffic volumes. Updated trip distributions, assignment, and peak hour Build volumes figures are provided in **Appendix B**.

Table 2: Revised Anticipated Hourly Construction Traffic Volumes

Start Time	Percent Arriving/Departing	Trip Generation		
		In	Out	Total
AM Peak Period				
5:00 AM	15%	108	12	120
6:00 AM	70%	504	56	560
7:00 AM	15%	108	12	120
PM Peak Period				
3:00 PM	15%	12	108	120
4:00 PM	70%	56	504	560
5:00 PM	15%	12	108	120

Traffic Analysis Methodology

The traffic operational analysis performed for this study using Synchro 11TM was conducted in accordance with VDOT's Traffic Operations Safety Analysis Manual (TOSAM), version 2.0 for deterministic intersection capacity analyses. Existing signal timings were provided by VDOT and were input into Synchro 11TM.

The evaluation of traffic operations within the study area was comprised of an intersection capacity level of service (LOS) analysis during the AM and PM peak hours and a 95th percentile queueing analysis to evaluate the adequacy of existing turn lanes and the potential need for turn lane improvements. Capacity analyses were conducted using methodologies contained in the Highway Capacity Manual (HCM) reported from Synchro 11TM. Queue analyses were conducted using the 95th percentile queues from Synchro 11TM.

As part of the traffic operational analysis, the projected No-Build conditions served as the baseline for evaluating intersection delays and identifying mitigation measures under the Build conditions.

Intersection capacity defines the volume of traffic that can be accommodated by a roadway at a specified LOS. Capacity is affected by various geometric factors including roadway type (e.g., divided or undivided), number of lanes, lane widths, and grades. LOS, which is a measure of the degree of congestion, ranges from LOS A (free flowing) to LOS F (a congested, forced flow condition). Delay, measured in seconds per vehicle, and the associated LOS thresholds for signalized and unsignalized intersections based on HCM methodologies are presented in **Table 3**.

Table 3: Intersection Level of Service (LOS) Analysis Criteria

Level of Service (LOS)	Average Control Delay per Vehicle (sec/veh)		Description of Traffic Conditions
	Signalized	Unsignalized	
A	≤ 10	≤ 10	No delays at intersections with continuous traffic flow. Uncongested operations; high frequency of long gaps available for all left and right-turning traffic; no observable queues.
B	> 10 and ≤ 20	> 10 and ≤ 15	
C	> 20 and ≤ 35	> 15 and ≤ 25	Moderate delays at intersections with satisfactory traffic flow. Light congestion; infrequent backups on critical approaches.
D	> 35 and ≤ 55	> 25 and ≤ 35	Increased probability of delays along every approach. Significant congestion on critical approaches, but intersection functional. No long-standing lines formed.
E	> 55 and ≤ 80	> 35 and ≤ 50	Heavy traffic flow conditions. Heavy delays probable. No available gaps for cross-street traffic or main street turning traffic. Limit of stable flow.
F	> 80	> 50	Unstable traffic flow. Heavy congestion. Traffic moves in forced flow conditions. Average delays greater than one minute highly probable. Total breakdown.

In addition to using *Synchro 11TM* to evaluate the study area intersection performance, microsimulation (*SimTrafficTM*) delay and maximum queue lengths were reported for the Median U-Turn alternative as it was deemed more accurate for analyzing the U-turn movements. Note that the SimTraffic models were not calibrated based on existing conditions, all calibration settings were left as the default values.

Intersection analysis included an evaluation of the opening year (2034) Build conditions during peak construction activities. Build conditions represent the future roadway network with the addition of background traffic growth, proposed roadway improvements, and traffic generated by the peak construction operations prior to the completion of the project. Modeling assumptions for the Build conditions during peak construction activities are consistent with the previously approved TIA. The revised future traffic volumes were distributed along the study intersections in accordance with the revised trip generation assumptions made for this memorandum.

Concept Development

The following roadway improvements were identified as potential mitigation strategies to mitigate the traffic impacts anticipated to occur during the peak construction activities, and were included in the operational analysis.

Alternative # 1 - TIA Recommended Improvements

The TIA Recommended Improvements alternative assumes no new improvements would take place, with the exception of warranted turn lane improvements as recommended by the TIA. This concept would permit construction employees to turn left out of the site onto US-33. This configuration was evaluated in the previously approved TIA. Based on the results from the TIA, the westbound approach at the intersection of US-33 and Project Driveway #1 was projected to operate with delays equivalent to LOS F during the PM peak hour under. Note that these results are typical where a low volume, stop-controlled road intersects a high-volume, free-flow road.

Alternative # 2 - Flagger Implementation

The flagger implementation alternative assumes no additional improvements beyond those recommended in the approved TIA. However, in this alternative, it was assumed that flaggers would be deployed by the contractor when vehicles are unable to exit the site, or excessive queues are observed on-site. For the purposes of the operational analysis, this concept was analyzed as a conventional signalized intersection to mimic flaggers.

Alternative # 3 - Median U-Turn (MUT)

The MUT alternative assumes that the westbound approach at the intersection of Project Driveway #1 and US-33 would restrict left-turn movements from the project driveway for passenger vehicles. Passenger vehicles heading to I-295 would be directed to make a right-turn out of the site and perform a U-turn maneuver at the nearest median break on US-33. The developer is committed to implementing the use of traffic control devices to enforce the left-turn restriction during peak periods. Note that commercial vehicles would be permitted to make a left-turn out of the site; however, commercial vehicle traffic will be staggered to arrive/depart the site outside the morning and evening peak periods, 8 AM to 9 AM and 4 PM to 6 PM.

Traffic Operational Analysis Results

The traffic operational analysis for each alternative considered was conducted for the following intersections:

- US-33 (Mountain Road) & Hunton Park Boulevard
- US-33 (Mountain Road) & Project Driveway #1
- US-33 (Mountain Road) & Project Driveway #2
- US-33 (Mountain Road & Proposed Median Break (MUT alternative only)

Note that only the TIA study area intersections that are anticipated to be impacted by the reconfiguration of the intersection of US-33 and Project Driveway #1 were included in this supplemental analysis.

Alternative #1 – TIA Recommended Improvements Analysis Results

Under the TIA Recommended Improvements alternative, during the construction peak hours, all signalized intersections and all unsignalized approaches operate with overall delays equivalent to LOS C or better, with the exception of the westbound approach at the intersection of US-33 and Project Driveway #1, which is projected to operate with delays equivalent to LOS F during the PM peak hour. Control delay and LOS results are summarized in **Table 4** following the analysis sections. The intersection capacity analysis results are included in **Appendix C**.

The Build 95th percentile vehicle queue lengths during the construction peak hours were calculated by movement for each study intersection using Synchro 11TM. All queue lengths are expected to be accommodated within storage lanes during the AM and PM peak hours. The queue results are summarized in **Table 5** following the analysis sections. The queueing analysis results are included in **Appendix C**.

Alternative #2 – Flagger Implementation Analysis Results

Under the flagger implementation, during the construction peak hours, all signalized intersections and all unsignalized approaches operate with overall delays equivalent to LOS C or better. Control delay and LOS results are summarized in **Table 4** following the analysis sections. The intersection capacity analysis results are included in **Appendix C**.

The Build 95th percentile vehicle queue lengths during the construction peak hours were calculated by movement for each study intersection using Synchro 11TM. All queue lengths are expected to be accommodated within storage lanes during the AM and PM peak hours. The queue results are summarized in **Table 5** following the analysis sections. The queueing analysis results are included in **Appendix C**.

Alternative #3 – Median U-Turn (MUT) Analysis Results

Under the median U-Turn alternative, during the construction peak hours, all signalized intersections and all unsignalized approaches operate with overall delays equivalent to LOS C or better, with the exception of the westbound approach at the intersection of US-33 and Project Driveway #1 which is projected to operate with a delay equivalent to LOS E during the PM peak hour. Note that the delay and queues for this approach would be internal to the site and are not anticipated to impact the operations of the US-33 mainline. Control delay and LOS results are summarized in **Table 4** following the analysis sections. The intersection capacity analysis results are included in **Appendix B**.

The total delay for the median U-Turn alternative, during the construction peak hours, was calculated by movement for each study intersection using *SimTraffic*TM. Under these conditions, all intersections are projected to operate with a delay less than 40 seconds per vehicle. The SimTraffic performance analysis results are included in **Appendix C**.

The Build 95th percentile vehicle queue lengths during the construction peak hours were calculated by movement for each study intersection using Synchro 11TM. All queue lengths are expected to be accommodated within storage lanes during the AM and PM peak hours. The queue results are summarized in **Table 5** following the analysis sections. The queueing analysis results are included in **Appendix C**.

The maximum vehicle queue lengths for the median U-Turn alternative, during the construction peak hours, were calculated for each study intersection using *SimTraffic*TM. Based on the queue analysis results, all turn lane queues are projected to be accommodated within storage lanes. SimTraffic queueing analysis results are included in **Appendix C**.

A conceptual sketch of the median U-turn alternative is shown in **Appendix D**. Passenger cars exiting the site will be directed to use the median U-turn alternative, and commercial vehicles will use the primary project driveway (#1).

Table 4: Control Delay and LOS Summary

Intersection Number and Description		Approach	Lane Group	2034 Build Conditions											
				TIA Recommended Improvements				Flagger Implementation				Median U-Turn			
				AM		PM		AM		PM		AM		PM	
Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS		
1	US-33/Staples Mill Road & Hunton Park Boulevard	Eastbound	Left	s	s	s	s	s	s	s	s	s	s	s	s
			Through	0.0	A	38.6	D	0.0	A	38.6	D	0.0	A	38.6	D
			Right	s	s	s	s	s	s	s	s	s	s	s	s
			Approach	0.0	A	38.6	D	0.0	A	38.6	D	0.0	A	38.6	D
		Westbound	Left	25.2	C	32.5	C	25.2	C	32.5	C	25.2	C	32.5	C
			Through	25.2	C	32.6	C	25.2	C	32.6	C	25.2	C	32.6	C
			Right	23.2	C	30.1	C	23.2	C	30.1	C	23.2	C	30.1	C
			Approach	25.0	C	32.4	C	25.0	C	32.4	C	25.0	C	32.4	C
		Northbound	Left	9.8	A	13.4	B	9.8	A	13.4	B	9.8	A	13.4	B
			Through	14.0	B	17.1	B	14.0	B	17.1	B	14.0	B	17.1	B
			Right	10.3	B	14.1	B	10.3	B	14.1	B	10.3	B	14.1	B
			Approach	13.9	B	16.4	B	13.9	B	16.4	B	13.9	B	16.4	B
		Southbound	Left	9.8	A	12.9	B	9.8	A	12.9	B	9.8	A	12.9	B
			Through	13.1	B	20.0	C	13.1	B	20.0	C	13.0	B	19.8	B
			Right	s	s	s	s	s	s	s	s	s	s	s	s
			Approach	13.0	B	19.9	B	13.0	B	19.9	B	13.0	B	19.6	B
		Intersection			14.5	B	19.4	B	14.5	B	19.4	B	14.5	B	19.2
5	US-33/Staples Mill Road & Project Driveway #1	Westbound	Left	20.0	C	285.6	F	17.6	B	13.8	B	s	s	s	s
			Right	s	s	s	s	s	s	s	s	11.6	B	38.6	E
			Approach	20.0	C	285.6	F	17.6	B	13.8	B	11.6	B	38.6	E
		Northbound	U-Turn	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A
			Through	0.0	A	0.0	A	2.8	A	12.5	B	0.0	A	0.0	A
			Approach	0.0	A	0.0	A	2.8	A	12.5	A	0.0	A	0.0	A
		Southbound	U-Turn	14.0	B	13.0	B	2.4	A	9.6	A	14.9	B	47.1	E
			Through	0.0	A	0.0	A	2.6	A	11.2	B	0.0	A	0.0	A
			Approach	1.1	A	0.2	A	2.6	A	11.2	B	1.1	A	0.3	A
		Intersection			–	–	–	–	3.3	A	12.5	B	–	–	–
6	US-33/Staples Mill Road & Project Driveway #2	Northbound	Through	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A
			Right	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A
			Approach	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A
		Southbound	Through	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A
			Approach	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A
		Intersection			0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0
7	US-33/Staples Mill Road & Median U-Turn	Northbound	U-Turn	N.A.	N.A.	N.A.	N.A.	N.A.	0.0	A	0.0	A			
			Through						0.0	A	0.0	A			
			Approach						0.0	A	0.0	A			
		Southbound	Through						0.0	A	0.0	A			
			Approach						0.0	A	0.0	A			
		Intersection							0.0	A	0.0	A	0.0	A	0.0

Notes: N/A Movement does not exist for scenario
S Shared lane

Table 5: 95th Percentile Queue Lengths

Intersection Number and Description		Type of Control	Lane Group	Effective Storage	2034 Build Conditions					
					TIA Recommended Improvements		Flagger Implementation		Median U-Turn	
					AM	PM	AM	PM	AM	PM
1	US-33/Staples Mill Road & Hunton Park Boulevard	Eastbound	Left	s	s	s	s	s	s	s
			Through	Continuous	0	0	0	0	0	0
			Right	s	s	s	s	s	s	
		Westbound	Left	215	68	103	68	103	68	103
			Through	Continuous	69	103	69	103	69	103
			Right	530	0	0	0	0	0	0
		Northbound	Left	175	4	9	4	9	4	9
			Through	Continuous	212	249	212	249	212	249
			Right	Continuous	0	45	0	45	0	45
		Southbound	Left	350	3	14	3	14	3	13
Through	Continuous		172	367	172	367	167	331		
Right	s		s	s	s	s	s	s		
5	US-33/Staples Mill Road & Project Driveway #1	Westbound	Left	s	18	770	35	272	s	s
			Right	Continuous	s	s	s	s	8	260
		Northbound	U-Turn	230	0	0	0	0	0	0
			Through	250	0	0	66	184	0	0
		Southbound	U-turn	245	10	0	15	10	10	5
			Through	Continuous	0	0	52	123	0	0
6	US-33/Staples Mill Road & Project Driveway #2	Northbound	Through	Continuous	0	0	0	0	0	0
			Right	300	0	0	0	0	0	0
		Southbound	Through	Continuous	0	0	0	0	0	0
7	US-33/Staples Mill Road & Median U-Turn	Northbound	U-Turn	400	N.A.	N.A.	N.A.	N.A.	0	0
			Through	Continuous					0	0
		Southbound	Through	Continuous					0	0

Notes: Effective storage length is equal to the storage length plus half of the taper length, per VDOT Traffic Operations and Safety Analysis Manual (TOSAM) version 2.0
N/A Movement does not exist for scenario
S Shared lane

Conclusions and Recommendations

Based on the future (2034) construction peak traffic operational analysis results in the previously approved TIA, the unsignalized intersection of US-33 and Project Driveway #1 was projected to operate with delays equivalent to LOS F during the PM peak hour. The TIA stated that flaggers would be deployed on occasions where vehicles are unable to exit the site, or where excessive queues are observed on-site.

An additional analysis was requested by the Hanover Planning Commission during a hearing for the rezoning application. The request was to evaluate permanent solutions for the intersection of US-33 and Project Driveway #1 due to the six-year estimated duration of construction. It was also requested to re-evaluate the construction employee arrival/departure assumptions for a more conservative analysis.

Based on the results of the operational analysis, the median U-Turn alternative operated the best in terms of congestion, with all signalized intersections and all unsignalized intersection approaches projected to operate with an overall delay equivalent to LOS C, with the exception of the westbound approach at the intersection of US-33 and Project Driveway #1 which is projected to operate with a delay equivalent to LOS E during the PM peak hour. Note that the delay and queues for this approach would be internal to the site and are not anticipated to impact the operations of the US-33 mainline.

Additional analysis was conducted in *SimTraffic*TM to evaluate the operations of the median U-Turn alternative. The results showed that all movements are projected to operate with a delay less than 40 seconds per vehicle and all maximum queues are projected to be accommodated within storage lanes.

Based on these findings, it is recommended that a more permanent “median U-Turn” be utilized at the proposed median break along US-33, north of the project driveway #1. The median U-Turn alternative would provide a more permanent solution to the traffic impacts that are anticipated to occur during the estimated six-year construction period. A conceptual sketch of the median U-turn alternative is shown in **Appendix D**. During site plan development, a construction management plan will be provided to the County/VDOT for review that may consist of shift stagger to the maximum extent practicable, limiting commercial vehicle traffic during peak periods, and maintenance of traffic plans.

Appendix A: Conceptual Site Plan

key:

- DEVELOPMENT AREA
- NATURAL BUFFER
- PRELIMINARY WETLANDS
- PRELIMINARY RPA
- PROPOSED SWM
- EXISTING POND
- PRIMARY PRIVATE ACCESS ROAD
- SECONDARY PRIVATE ACCESS ROAD



HANOVER INDUSTRIAL PARK

Hanover County, VA



08.20.2025 SCALE: 1" = 300'

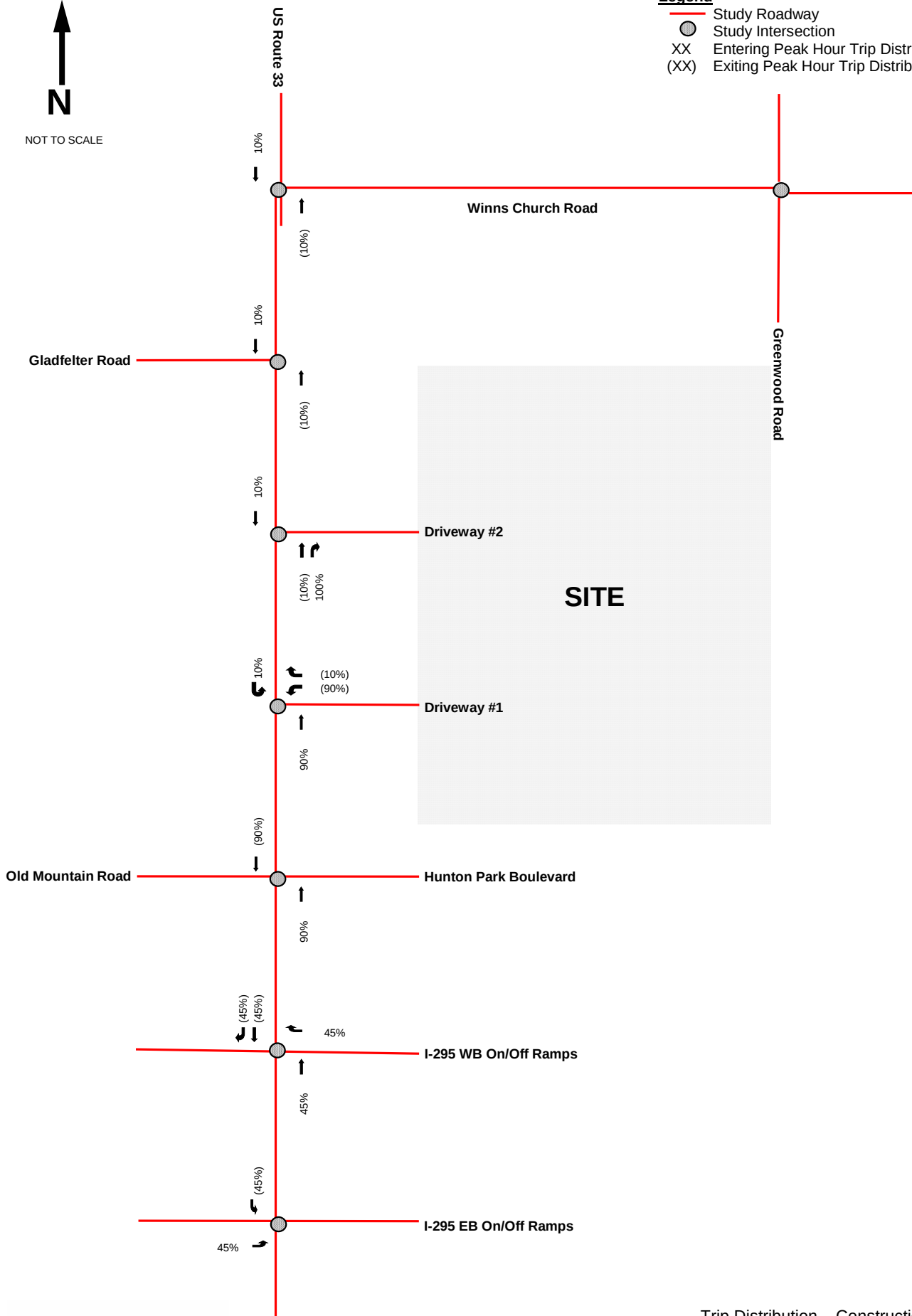
Appendix B: Volume Development Figures

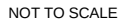


NOT TO SCALE

Legend

- Study Roadway
- Study Intersection
- XX Entering Peak Hour Trip Distribution
- (XX) Exiting Peak Hour Trip Distribution





 Study Roadway
 Study Intersection
XX Entering Peak Hour Trip Assignment
(XX) Exiting Peak Hour Trip Assignment

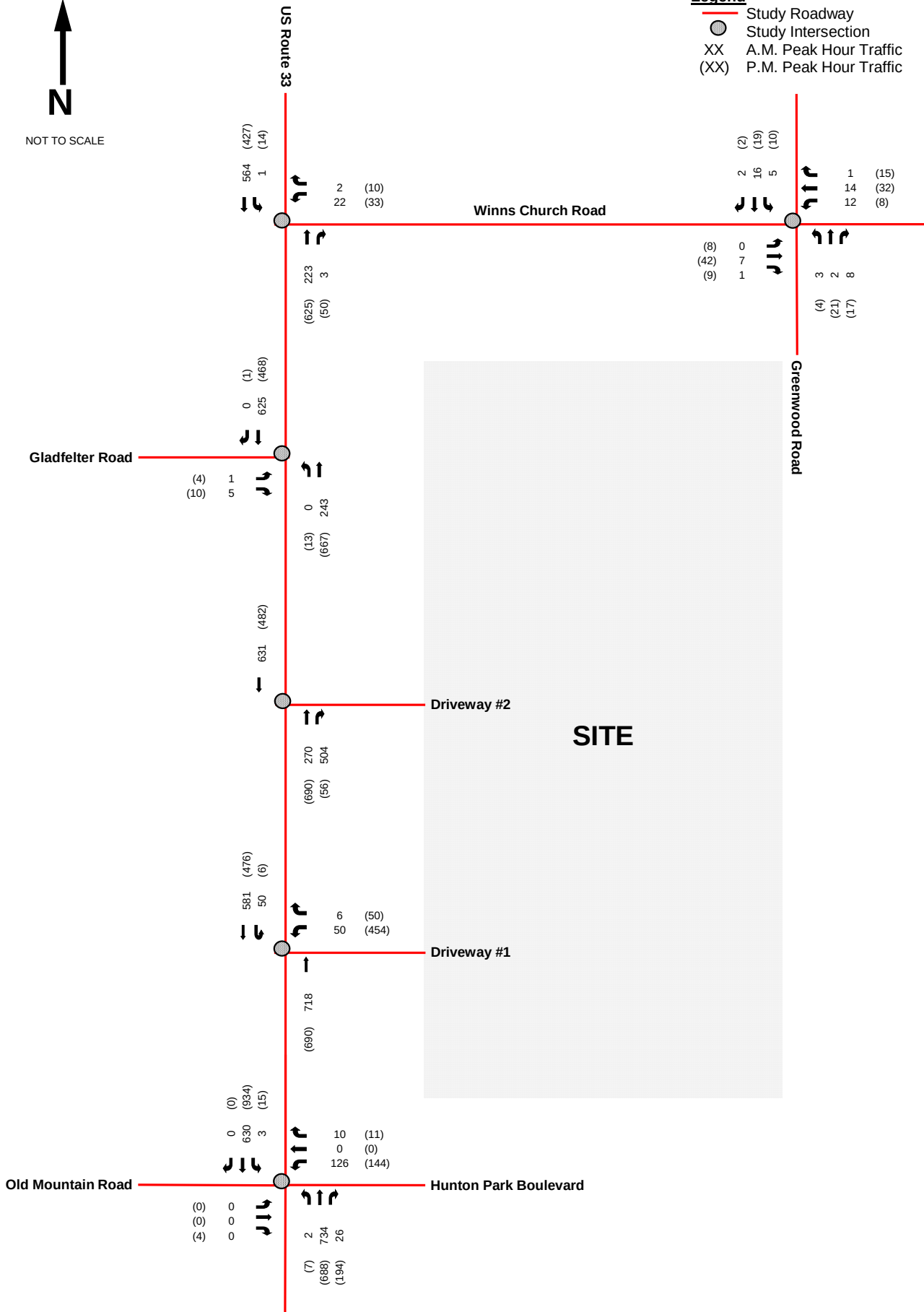




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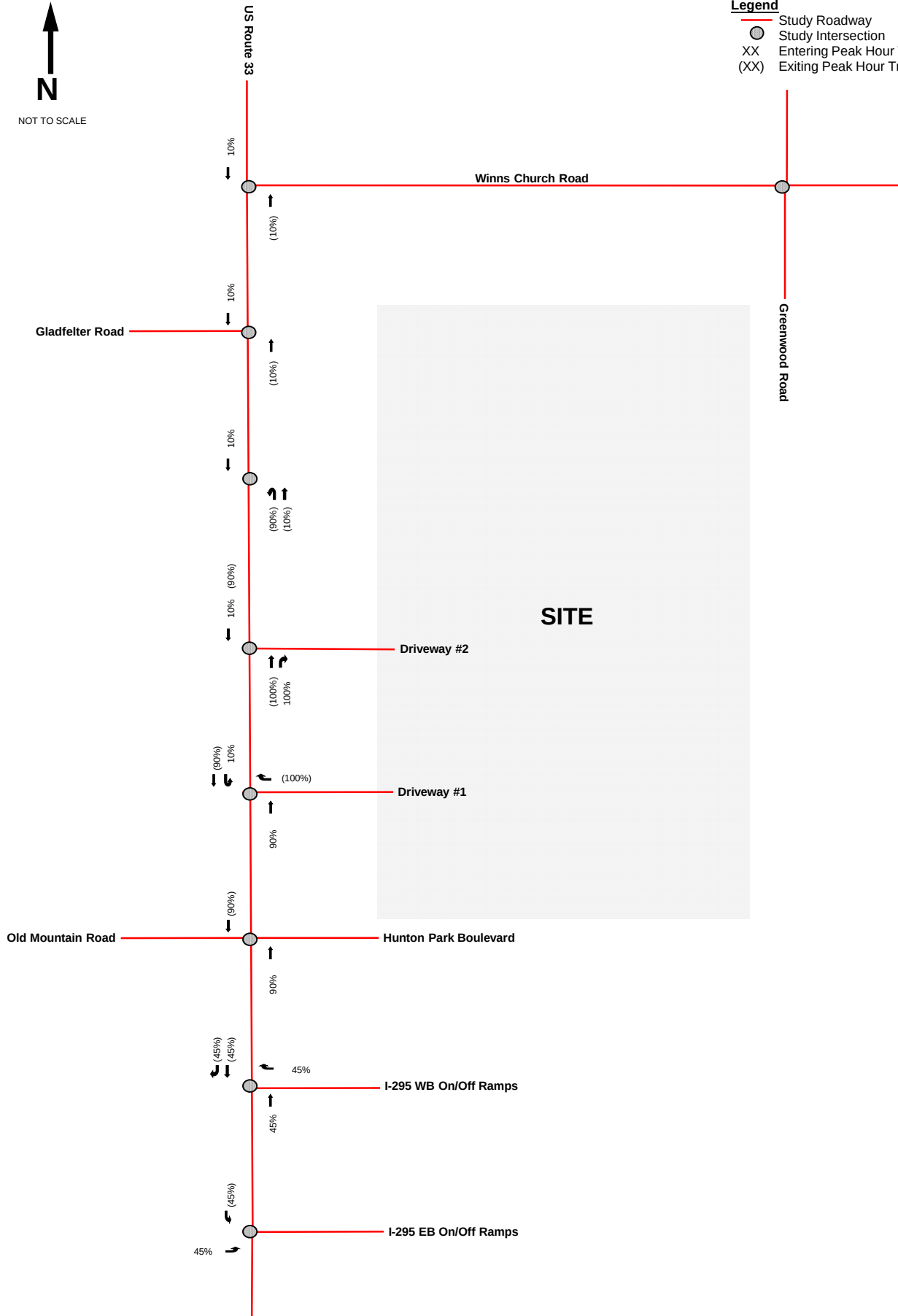
-  Study Roadway
-  Study Intersection
- XX A.M. Peak Hour Traffic
- (XX) P.M. Peak Hour Traffic





Legend

- Study Roadway
- Study Intersection
- XX Entering Peak Hour Trip Distribution
- (XX) Exiting Peak Hour Trip Distribution

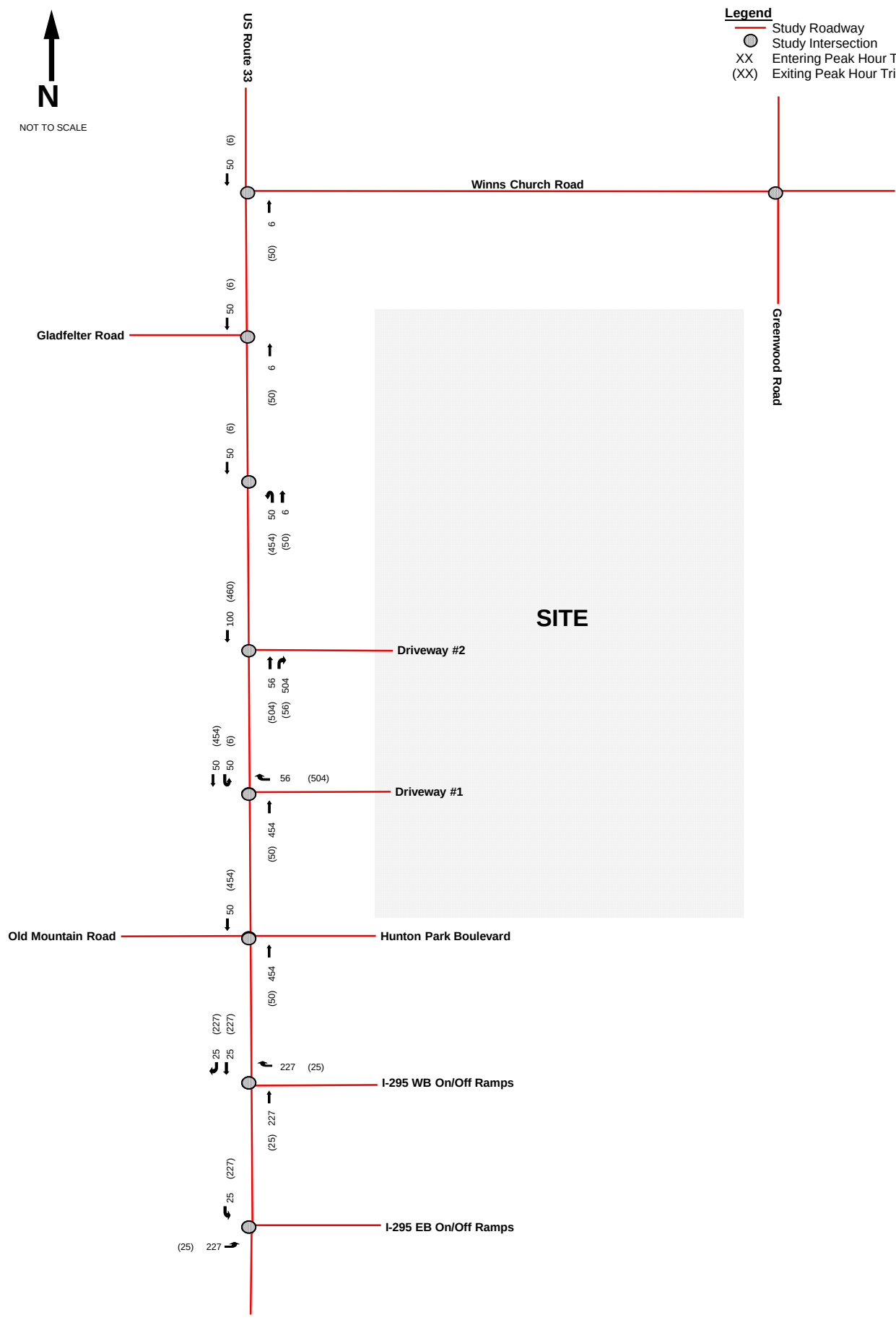




NOT TO SCALE

Legend

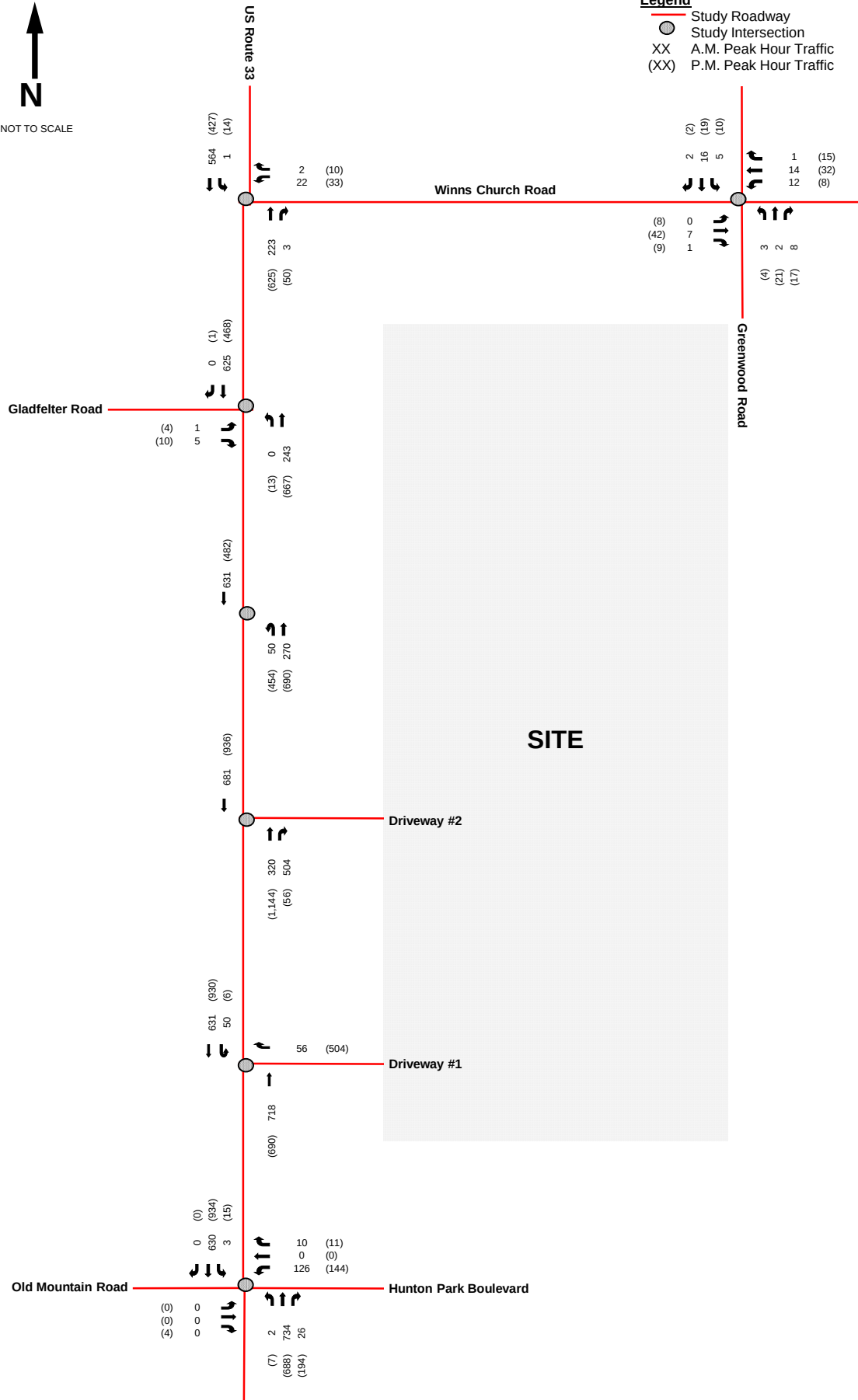
- Study Roadway
- Study Intersection
- XX Entering Peak Hour Trip Assignment
- (XX) Exiting Peak Hour Trip Assignment





Legend

- Study Roadway
- Study Intersection
- XX A.M. Peak Hour Traffic
- (XX) P.M. Peak Hour Traffic



Appendix C: Synchro and SimTraffic Outputs

Alternative #1 – TIA Recommended Improvements

Queues

2034 Build Construction Conditions

1: Route 33 & Old Mountain Road/Hunton Park Boulevard

AM Peak Hour

↙←↗↖↑↘↙↓

Lane Group	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	68	69	11	2	798	28	3	685
v/c Ratio	0.23	0.24	0.03	0.01	0.43	0.03	0.01	0.36
Control Delay (s/veh)	23.4	23.5	0.1	7.0	11.8	0.1	6.7	11.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	23.4	23.5	0.1	7.0	11.8	0.1	6.7	11.0
Queue Length 50th (ft)	15	15	0	0	77	0	1	62
Queue Length 95th (ft)	68	69	0	4	212	0	3	172
Internal Link Dist (ft)		602			695			613
Turn Bay Length (ft)	215		530	175			350	
Base Capacity (vph)	1003	1003	1023	569	3150	1448	841	3242
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.07	0.01	0.00	0.25	0.02	0.00	0.21
Intersection Summary								

Alternative #1 – TIA Recommended Improvements

HCM Signalized Intersection Capacity Analysis

2034 Build Construction Conditions

1: Route 33 & Old Mountain Road/Hunton Park Boulevard

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	126	0	10	2	734	26	3	630	0
Future Volume (vph)	0	0	0	126	0	10	2	734	26	3	630	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				7.5	7.5	7.5	9.8	9.8	9.8	9.8	9.8	
Lane Util. Factor				0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt				1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected				0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)				1698	1698	1615	1203	3406	1553	1805	3505	
Flt Permitted				0.95	0.95	1.00	0.39	1.00	1.00	0.34	1.00	
Satd. Flow (perm)				1698	1698	1615	495	3406	1553	643	3505	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	137	0	11	2	798	28	3	685	0
RTOR Reduction (vph)	0	0	0	0	0	10	0	0	16	0	0	0
Lane Group Flow (vph)	0	0	0	68	69	1	2	798	12	3	685	0
Heavy Vehicles (%)	0%	0%	0%	1%	0%	0%	50%	6%	4%	0%	3%	0%
Turn Type				Split	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	
Protected Phases		4		3	3		5	2		1	6	
Permitted Phases	4					3	6		2	2		
Actuated Green, G (s)				7.0	7.0	7.0	25.4	24.6	24.6	25.4	24.6	
Effective Green, g (s)				7.0	7.0	7.0	25.4	24.6	24.6	25.4	24.6	
Actuated g/C Ratio				0.12	0.12	0.12	0.43	0.41	0.41	0.43	0.41	
Clearance Time (s)				7.5	7.5	7.5	9.8	9.8	9.8	9.8	9.8	
Vehicle Extension (s)				3.0	3.0	3.0	3.0	4.0	4.0	3.0	4.0	
Lane Grp Cap (vph)				199	199	190	220	1408	642	290	1449	
v/s Ratio Prot				0.04	c0.04		0.00	c0.23		c0.00	0.20	
v/s Ratio Perm						0.00	0.00		0.01	0.00		
v/c Ratio				0.34	0.35	0.01	0.01	0.57	0.02	0.01	0.47	
Uniform Delay, d1				24.1	24.1	23.2	9.8	13.4	10.3	9.8	12.7	
Progression Factor				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2				1.0	1.1	0.0	0.0	0.6	0.0	0.0	0.3	
Delay (s)				25.2	25.2	23.2	9.8	14.0	10.3	9.8	13.1	
Level of Service				C	C	C	A	B	B	A	B	
Approach Delay (s/veh)		0.0			25.0			13.9			13.0	
Approach LOS		A			C			B			B	
Intersection Summary												
HCM 2000 Control Delay (s/veh)			14.5									
HCM 2000 Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			59.5									
Intersection Capacity Utilization			39.7%									
Analysis Period (min)			15									
c Critical Lane Group												

Alternative #1 – TIA Recommended Improvements

HCM 6th TWSC
5: Route 33 & Project Driveway #1

2034 Build Construction Conditions
AM Peak Hour

Intersection								
Int Delay, s/veh	1.3							
Movement	WBL	WBR	NBU	NBT	NBR	SBU	SBL	SBT
Lane Configurations	↔↔		↔	↑↑		↔		↑↑
Traffic Vol, veh/h	50	6	0	718	0	50	0	581
Future Vol, veh/h	50	6	0	718	0	50	0	581
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	None	-	-	None	-	-	None
Storage Length	0	-	230	-	-	-	245	-
Veh in Median Storage, #	1	-	-	0	-	-	-	0
Grade, %	0	-	-	0	-	-	-	0
Peak Hour Factor	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2
Mvmt Flow	54	7	0	780	0	54	0	632
Major/Minor	Minor1	Major1		Major2				
Conflicting Flow All	1204	390	632	0	-	780	-	-
Stage 1	780	-	-	-	-	-	-	-
Stage 2	424	-	-	-	-	-	-	-
Critical Hdwy	6.84	6.94	6.44	-	-	6.44	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.52	-	-	2.52	-	-
Pot Cap-1 Maneuver	177	609	571	-	0	459	0	-
Stage 1	412	-	-	-	0	-	0	-
Stage 2	628	-	-	-	0	-	0	-
Platoon blocked, %				-				-
Mov Cap-1 Maneuver	156	609	571	-	-	454	-	-
Mov Cap-2 Maneuver	284	-	-	-	-	-	-	-
Stage 1	412	-	-	-	-	-	-	-
Stage 2	553	-	-	-	-	-	-	-
Approach	WB	NB		SB				
HCM Ctrl Dly, s/v	20	0		1.1				
HCM LOS	C							
Minor Lane/Major Mvmt	NBU	NBTWBLn1		SBU	SBT			
Capacity (veh/h)	571	-		301	454			
HCM Lane V/C Ratio	-	-		0.202	0.12			
HCM Ctrl Dly (s/v)	0	-		20	14			
HCM Lane LOS	A	-		C	B			
HCM 95th %tile Q (veh)	0	-		0.7	0.4			

Alternative #1 – TIA Recommended Improvements

Queues

2034 Build Construction Conditions

1: Route 33 & Old Mountain Road/Hunton Park Boulevard

PM Peak Hour



Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	4	77	78	12	8	740	209	16	1004
v/c Ratio	0.01	0.31	0.31	0.03	0.02	0.42	0.23	0.04	0.58
Control Delay (s/veh)	0.0	32.2	32.3	0.2	8.4	12.7	3.2	8.4	14.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	0.0	32.2	32.3	0.2	8.4	12.7	3.2	8.4	14.5
Queue Length 50th (ft)	0	22	22	0	1	71	1	2	108
Queue Length 95th (ft)	0	103	103	0	9	249	45	14	367
Internal Link Dist (ft)	354		602			695			613
Turn Bay Length (ft)		215		530	175			350	
Base Capacity (vph)	839	784	784	717	682	2776	1306	685	2750
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.10	0.10	0.02	0.01	0.27	0.16	0.02	0.37
Intersection Summary									

Alternative #1 – TIA Recommended Improvements

HCM Signalized Intersection Capacity Analysis

2034 Build Construction Conditions

1: Route 33 & Old Mountain Road/Hunton Park Boulevard

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↔	↔	↔	↔	↕	↔	↔	↕	
Traffic Volume (vph)	0	0	4	144	0	11	7	688	194	15	934	0
Future Volume (vph)	0	0	4	144	0	11	7	688	194	15	934	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0		7.5	7.5	7.5	9.8	9.8	9.8	9.8	9.8	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt		0.87		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		1.00		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1644		1681	1681	1346	1805	3471	1583	1687	3438	
Flt Permitted		1.00		0.95	0.95	1.00	0.21	1.00	1.00	0.34	1.00	
Satd. Flow (perm)		1644		1681	1681	1346	394	3471	1583	604	3438	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	0	4	155	0	12	8	740	209	16	1004	0
RTOR Reduction (vph)	0	4	0	0	0	11	0	0	117	0	0	0
Lane Group Flow (vph)	0	0	0	77	78	2	8	740	92	16	1004	0
Heavy Vehicles (%)	0%	0%	0%	2%	0%	20%	0%	4%	2%	7%	5%	0%
Turn Type		NA		Split	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	
Protected Phases		4		3	3		5	2		1	6	
Permitted Phases	4					3	6		2	2		
Actuated Green, G (s)		0.7		9.8	9.8	9.8	33.8	33.0	33.0	33.8	33.1	
Effective Green, g (s)		0.7		9.8	9.8	9.8	33.8	33.0	33.0	33.8	33.1	
Actuated g/C Ratio		0.01		0.13	0.13	0.13	0.43	0.42	0.42	0.43	0.42	
Clearance Time (s)		7.0		7.5	7.5	7.5	9.8	9.8	9.8	9.8	9.8	
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	4.0	4.0	3.0	4.0	
Lane Grp Cap (vph)		14		210	210	168	182	1461	666	271	1451	
v/s Ratio Prot		c0.00		0.05	c0.05		0.00	0.21		c0.00	c0.29	
v/s Ratio Perm						0.00	0.02		0.06	0.02		
v/c Ratio		0.00		0.37	0.37	0.01	0.04	0.51	0.14	0.06	0.69	
Uniform Delay, d1		38.5		31.5	31.5	30.0	13.3	16.7	14.0	12.9	18.5	
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.1		1.1	1.1	0.0	0.1	0.4	0.1	0.1	1.6	
Delay (s)		38.6		32.5	32.6	30.1	13.4	17.1	14.1	12.9	20.0	
Level of Service		D		C	C	C	B	B	B	B	C	
Approach Delay (s/veh)		38.6			32.4			16.4			19.9	
Approach LOS		D			C			B			B	
Intersection Summary												
HCM 2000 Control Delay (s/veh)			19.4									
HCM 2000 Volume to Capacity ratio			0.60									
Actuated Cycle Length (s)			78.4									
Intersection Capacity Utilization			50.9%									
Analysis Period (min)			15									
c Critical Lane Group												

Alternative #1 – TIA Recommended Improvements

HCM 6th TWSC
5: Route 33 & Project Driveway #1

2034 Build Construction Conditions
PM Peak Hour

Intersection								
Int Delay, s/veh	85.9							
Movement	WBL	WBR	NBU	NBT	NBR	SBU	SBL	SBT
Lane Configurations								
Traffic Vol, veh/h	454	50	0	690	0	6	0	476
Future Vol, veh/h	454	50	0	690	0	6	0	476
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	None	-	-	None	-	-	None
Storage Length	0	-	230	-	-	-	245	-
Veh in Median Storage, #	1	-	-	0	-	-	-	0
Grade, %	0	-	-	0	-	-	-	0
Peak Hour Factor	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2
Mvmt Flow	493	54	0	750	0	7	0	517
Major/Minor	Minor1	Major1		Major2				
Conflicting Flow All	1023	375	517	0	-	750	-	-
Stage 1	750	-	-	-	-	-	-	-
Stage 2	273	-	-	-	-	-	-	-
Critical Hdwy	6.84	6.94	6.44	-	-	6.44	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.52	-	-	2.52	-	-
Pot Cap-1 Maneuver	~ 232	623	675	-	0	480	0	-
Stage 1	~ 427	-	-	-	0	-	0	-
Stage 2	748	-	-	-	0	-	0	-
Platoon blocked, %				-				-
Mov Cap-1 Maneuver	~ 228	623	675	-	-	441	-	-
Mov Cap-2 Maneuver	~ 339	-	-	-	-	-	-	-
Stage 1	~ 427	-	-	-	-	-	-	-
Stage 2	736	-	-	-	-	-	-	-
Approach	WB	NB		SB				
HCM Ctrl Dly, s/v	285.6	0		0.2				
HCM LOS	F							
Minor Lane/Major Mvmt	NBU	NBTWBLn1		SBU	SBT			
Capacity (veh/h)	675	-	355	441	-			
HCM Lane V/C Ratio	-	-	1.543	0.015	-			
HCM Ctrl Dly (s/v)	0	-	285.6	13.3	-			
HCM Lane LOS	A	-	F	B	-			
HCM 95th %tile Q (veh)	0	-	30.8	0	-			
Notes								
~: Volume exceeds capacity		\$: Delay exceeds 300s						
+: Computation Not Defined		*: All major volume in platoon						

Alternative #2 – Flagger Implementation

Queues

1: Route 33 & Old Mountain Road/Hunton Park Boulevard

2034 Build Construction Conditions
AM Peak Hour

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Lane Group	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	68	69	11	2	798	28	3	685
v/c Ratio	0.23	0.24	0.03	0.01	0.43	0.03	0.01	0.36
Control Delay (s/veh)	23.4	23.5	0.1	7.0	11.8	0.1	6.7	11.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	23.4	23.5	0.1	7.0	11.8	0.1	6.7	11.0
Queue Length 50th (ft)	15	15	0	0	77	0	1	62
Queue Length 95th (ft)	68	69	0	4	212	0	3	172
Internal Link Dist (ft)		602			695			613
Turn Bay Length (ft)	215		530	175			350	
Base Capacity (vph)	1003	1003	1023	569	3150	1448	841	3242
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.07	0.01	0.00	0.25	0.02	0.00	0.21

Intersection Summary

Alternative #2 – Flagger Implementation

HCM Signalized Intersection Capacity Analysis

2034 Build Construction Conditions

1: Route 33 & Old Mountain Road/Hunton Park Boulevard

AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	126	0	10	2	734	26	3	630	0
Future Volume (vph)	0	0	0	126	0	10	2	734	26	3	630	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				7.5	7.5	7.5	9.8	9.8	9.8	9.8	9.8	
Lane Util. Factor				0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt				1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected				0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)				1698	1698	1615	1203	3406	1553	1805	3505	
Flt Permitted				0.95	0.95	1.00	0.39	1.00	1.00	0.34	1.00	
Satd. Flow (perm)				1698	1698	1615	495	3406	1553	643	3505	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	137	0	11	2	798	28	3	685	0
RTOR Reduction (vph)	0	0	0	0	0	10	0	0	16	0	0	0
Lane Group Flow (vph)	0	0	0	68	69	1	2	798	12	3	685	0
Heavy Vehicles (%)	0%	0%	0%	1%	0%	0%	50%	6%	4%	0%	3%	0%
Turn Type				Split	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	
Protected Phases		4		3	3		5	2		1	6	
Permitted Phases	4					3	6		2		2	
Actuated Green, G (s)				7.0	7.0	7.0	25.4	24.6	24.6	25.4	24.6	
Effective Green, g (s)				7.0	7.0	7.0	25.4	24.6	24.6	25.4	24.6	
Actuated g/C Ratio				0.12	0.12	0.12	0.43	0.41	0.41	0.43	0.41	
Clearance Time (s)				7.5	7.5	7.5	9.8	9.8	9.8	9.8	9.8	
Vehicle Extension (s)				3.0	3.0	3.0	3.0	4.0	4.0	3.0	4.0	
Lane Grp Cap (vph)				199	199	190	220	1408	642	290	1449	
v/s Ratio Prot				0.04	c0.04		0.00	c0.23		c0.00	0.20	
v/s Ratio Perm						0.00	0.00		0.01	0.00		
v/c Ratio				0.34	0.35	0.01	0.01	0.57	0.02	0.01	0.47	
Uniform Delay, d1				24.1	24.1	23.2	9.8	13.4	10.3	9.8	12.7	
Progression Factor				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2				1.0	1.1	0.0	0.0	0.6	0.0	0.0	0.3	
Delay (s)				25.2	25.2	23.2	9.8	14.0	10.3	9.8	13.1	
Level of Service				C	C	C	A	B	B	A	B	
Approach Delay (s/veh)		0.0			25.0			13.9			13.0	
Approach LOS		A			C			B			B	
Intersection Summary												
HCM 2000 Control Delay (s/veh)			14.5									
HCM 2000 Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			59.5									
Intersection Capacity Utilization			39.7%									
Analysis Period (min)			15									
c Critical Lane Group												

Alternative #2 – Flagger Implementation

Queues
5: Route 33 & Project Driveway #1

2034 Build Construction Conditions
AM Peak Hour

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Lane Group	WBL	NBT	SBU	SBT
Lane Group Flow (vph)	61	780	54	632
v/c Ratio	0.18	0.28	0.11	0.23
Control Delay (s/veh)	15.6	3.4	4.0	3.2
Queue Delay	0.0	0.0	0.0	0.0
Total Delay (s/veh)	15.6	3.4	4.0	3.2
Queue Length 50th (ft)	12	36	4	27
Queue Length 95th (ft)	35	66	15	52
Internal Link Dist (ft)	255	613		466
Turn Bay Length (ft)			245	
Base Capacity (vph)	1220	3539	663	3539
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.05	0.22	0.08	0.18
Intersection Summary				

Alternative #2 – Flagger Implementation

HCM Signalized Intersection Capacity Analysis 5: Route 33 & Project Driveway #1

2034 Build Construction Conditions
AM Peak Hour

								
Movement	WBL	WBR	NBU	NBT	NBR	SBU	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	50	6	0	718	0	50	0	581
Future Volume (vph)	50	6	0	718	0	50	0	581
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5			4.5		4.5		4.5
Lane Util. Factor	1.00			0.95		1.00		0.95
Frt	0.98			1.00		1.00		1.00
Flt Protected	0.96			1.00		0.95		1.00
Satd. Flow (prot)	1756			3539		1770		3539
Flt Permitted	0.96			1.00		0.36		1.00
Satd. Flow (perm)	1756			3539		664		3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	7	0	780	0	54	0	632
RTOR Reduction (vph)	6	0	0	0	0	0	0	0
Lane Group Flow (vph)	55	0	0	780	0	54	0	632
Turn Type	Prot		Perm	NA		Perm		NA
Protected Phases	8			2				6
Permitted Phases			2			6		
Actuated Green, G (s)	3.9			26.5		26.5		26.5
Effective Green, g (s)	3.9			26.5		26.5		26.5
Actuated g/C Ratio	0.10			0.67		0.67		0.67
Clearance Time (s)	4.5			4.5		4.5		4.5
Vehicle Extension (s)	3.0			3.0		3.0		3.0
Lane Grp Cap (vph)	173			2380		446		2380
v/s Ratio Prot	c0.03			c0.22				0.18
v/s Ratio Perm						0.08		
v/c Ratio	0.32			0.33		0.12		0.27
Uniform Delay, d1	16.5			2.7		2.3		2.6
Progression Factor	1.00			1.00		1.00		1.00
Incremental Delay, d2	1.1			0.1		0.1		0.1
Delay (s)	17.6			2.8		2.4		2.6
Level of Service	B			A		A		A
Approach Delay (s/veh)	17.6			2.8				2.6
Approach LOS	B			A				A
Intersection Summary								
HCM 2000 Control Delay (s/veh)			3.3		HCM 2000 Level of Service			A
HCM 2000 Volume to Capacity ratio			0.33					
Actuated Cycle Length (s)			39.4		Sum of lost time (s)			9.0
Intersection Capacity Utilization			39.4%		ICU Level of Service			A
Analysis Period (min)			15					
c Critical Lane Group								

Alternative #2 – Flagger Implementation

Queues

2034 Build Construction Conditions

1: Route 33 & Old Mountain Road/Hunton Park Boulevard

PM Peak Hour



Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	4	77	78	12	8	740	209	16	1004
v/c Ratio	0.01	0.31	0.31	0.03	0.02	0.42	0.23	0.04	0.58
Control Delay (s/veh)	0.0	32.2	32.3	0.2	8.4	12.7	3.2	8.4	14.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	0.0	32.2	32.3	0.2	8.4	12.7	3.2	8.4	14.5
Queue Length 50th (ft)	0	22	22	0	1	71	1	2	108
Queue Length 95th (ft)	0	103	103	0	9	249	45	14	367
Internal Link Dist (ft)	354		602			695			613
Turn Bay Length (ft)		215		530	175			350	
Base Capacity (vph)	839	784	784	717	682	2776	1306	685	2750
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.10	0.10	0.02	0.01	0.27	0.16	0.02	0.37
Intersection Summary									

Alternative #2 – Flagger Implementation

HCM Signalized Intersection Capacity Analysis

2034 Build Construction Conditions

1: Route 33 & Old Mountain Road/Hunton Park Boulevard

PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	0	0	4	144	0	11	7	688	194	15	934	0
Future Volume (vph)	0	0	4	144	0	11	7	688	194	15	934	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0		7.5	7.5	7.5	9.8	9.8	9.8	9.8	9.8	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt		0.87		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		1.00		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1644		1681	1681	1346	1805	3471	1583	1687	3438	
Flt Permitted		1.00		0.95	0.95	1.00	0.21	1.00	1.00	0.34	1.00	
Satd. Flow (perm)		1644		1681	1681	1346	394	3471	1583	604	3438	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	0	4	155	0	12	8	740	209	16	1004	0
RTOR Reduction (vph)	0	4	0	0	0	11	0	0	117	0	0	0
Lane Group Flow (vph)	0	0	0	77	78	2	8	740	92	16	1004	0
Heavy Vehicles (%)	0%	0%	0%	2%	0%	20%	0%	4%	2%	7%	5%	0%
Turn Type		NA		Split	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	
Protected Phases		4		3	3		5	2		1	6	
Permitted Phases	4					3	6		2	2		
Actuated Green, G (s)		0.7		9.8	9.8	9.8	33.8	33.0	33.0	33.8	33.1	
Effective Green, g (s)		0.7		9.8	9.8	9.8	33.8	33.0	33.0	33.8	33.1	
Actuated g/C Ratio		0.01		0.13	0.13	0.13	0.43	0.42	0.42	0.43	0.42	
Clearance Time (s)		7.0		7.5	7.5	7.5	9.8	9.8	9.8	9.8	9.8	
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	4.0	4.0	3.0	4.0	
Lane Grp Cap (vph)		14		210	210	168	182	1461	666	271	1451	
v/s Ratio Prot		c0.00		0.05	c0.05		0.00	0.21		c0.00	c0.29	
v/s Ratio Perm						0.00	0.02		0.06	0.02		
v/c Ratio		0.00		0.37	0.37	0.01	0.04	0.51	0.14	0.06	0.69	
Uniform Delay, d1		38.5		31.5	31.5	30.0	13.3	16.7	14.0	12.9	18.5	
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.1		1.1	1.1	0.0	0.1	0.4	0.1	0.1	1.6	
Delay (s)		38.6		32.5	32.6	30.1	13.4	17.1	14.1	12.9	20.0	
Level of Service		D		C	C	C	B	B	B	B	C	
Approach Delay (s/veh)		38.6			32.4			16.4			19.9	
Approach LOS		D			C			B			B	
Intersection Summary												
HCM 2000 Control Delay (s/veh)			19.4									
HCM 2000 Volume to Capacity ratio			0.60									
Actuated Cycle Length (s)			78.4									
Intersection Capacity Utilization			50.9%									
Analysis Period (min)			15									
c Critical Lane Group												

Alternative #2 – Flagger Implementation

Queues
5: Route 33 & Project Driveway #1

2034 Build Construction Conditions
PM Peak Hour

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Lane Group	WBL	NBT	SBU	SBT
Lane Group Flow (vph)	547	750	7	517
v/c Ratio	0.72	0.58	0.04	0.40
Control Delay (s/veh)	17.8	15.1	12.8	13.2
Queue Delay	0.0	0.0	0.0	0.0
Total Delay (s/veh)	17.8	15.1	12.8	13.2
Queue Length 50th (ft)	110	81	1	51
Queue Length 95th (ft)	272	184	10	123
Internal Link Dist (ft)	255	613		466
Turn Bay Length (ft)			245	
Base Capacity (vph)	1511	2864	431	2864
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.36	0.26	0.02	0.18
Intersection Summary				

Alternative #2 – Flagger Implementation

HCM Signalized Intersection Capacity Analysis 5: Route 33 & Project Driveway #1

2034 Build Construction Conditions
PM Peak Hour

								
Movement	WBL	WBR	NBU	NBT	NBR	SBU	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	454	50	0	690	0	6	0	476
Future Volume (vph)	454	50	0	690	0	6	0	476
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5			4.5		4.5		4.5
Lane Util. Factor	1.00			0.95		1.00		0.95
Frt	0.99			1.00		1.00		1.00
Flt Protected	0.96			1.00		0.95		1.00
Satd. Flow (prot)	1759			3539		1770		3539
Flt Permitted	0.96			1.00		0.29		1.00
Satd. Flow (perm)	1759			3539		533		3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	493	54	0	750	0	7	0	517
RTOR Reduction (vph)	4	0	0	0	0	0	0	0
Lane Group Flow (vph)	543	0	0	750	0	7	0	517
Turn Type	Prot		Perm	NA		Perm		NA
Protected Phases	8			2				6
Permitted Phases			2			6		
Actuated Green, G (s)	21.1			17.9		17.9		17.9
Effective Green, g (s)	21.1			17.9		17.9		17.9
Actuated g/C Ratio	0.44			0.37		0.37		0.37
Clearance Time (s)	4.5			4.5		4.5		4.5
Vehicle Extension (s)	3.0			3.0		3.0		3.0
Lane Grp Cap (vph)	773			1319		198		1319
v/s Ratio Prot	c0.31			c0.21				0.15
v/s Ratio Perm						0.01		
v/c Ratio	0.70			0.57		0.04		0.39
Uniform Delay, d1	10.9			12.0		9.6		11.1
Progression Factor	1.00			1.00		1.00		1.00
Incremental Delay, d2	2.9			0.6		0.1		0.2
Delay (s)	13.8			12.5		9.6		11.2
Level of Service	B			B		A		B
Approach Delay (s/veh)	13.8			12.5				11.2
Approach LOS	B			B				B
Intersection Summary								
HCM 2000 Control Delay (s/veh)			12.5		HCM 2000 Level of Service			B
HCM 2000 Volume to Capacity ratio			0.64					
Actuated Cycle Length (s)			48.0		Sum of lost time (s)			9.0
Intersection Capacity Utilization			54.8%		ICU Level of Service			A
Analysis Period (min)			15					
c Critical Lane Group								

Alternative #3 – Median U-Turn

Queues

2034 Build_Construction_MUT

1: Route 33 & Old Mountain Road/Hunton Park Boulevard

AM Peak Hour

								
Lane Group	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	68	69	11	2	798	28	3	685
v/c Ratio	0.23	0.24	0.03	0.01	0.43	0.03	0.01	0.36
Control Delay (s/veh)	23.4	23.5	0.1	7.0	11.8	0.1	6.7	11.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	23.4	23.5	0.1	7.0	11.8	0.1	6.7	11.0
Queue Length 50th (ft)	15	15	0	0	77	0	1	61
Queue Length 95th (ft)	68	69	0	4	212	0	3	167
Internal Link Dist (ft)		602			695			613
Turn Bay Length (ft)	215		530	175			350	
Base Capacity (vph)	1003	1003	1023	569	3150	1448	841	3242
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.07	0.01	0.00	0.25	0.02	0.00	0.21
Intersection Summary								

HCM Signalized Intersection Capacity Analysis

1: Route 33 & Old Mountain Road/Hunton Park Boulevard

2034 Build_Construction_MUT
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	126	0	10	2	734	26	3	630	0
Future Volume (vph)	0	0	0	126	0	10	2	734	26	3	630	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				7.5	7.5	7.5	9.8	9.8	9.8	9.8	9.8	
Lane Util. Factor				0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt				1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected				0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)				1698	1698	1615	1203	3406	1553	1805	3505	
Flt Permitted				0.95	0.95	1.00	0.39	1.00	1.00	0.34	1.00	
Satd. Flow (perm)				1698	1698	1615	495	3406	1553	643	3505	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	137	0	11	2	798	28	3	685	0
RTOR Reduction (vph)	0	0	0	0	0	10	0	0	16	0	0	0
Lane Group Flow (vph)	0	0	0	68	69	1	2	798	12	3	685	0
Heavy Vehicles (%)	0%	0%	0%	1%	0%	0%	50%	6%	4%	0%	3%	0%
Turn Type				Split	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	
Protected Phases		4		3	3		5	2		1	6	
Permitted Phases	4					3	6		2	2		
Actuated Green, G (s)				7.0	7.0	7.0	25.4	24.6	24.6	25.4	24.6	
Effective Green, g (s)				7.0	7.0	7.0	25.4	24.6	24.6	25.4	24.6	
Actuated g/C Ratio				0.12	0.12	0.12	0.43	0.41	0.41	0.43	0.41	
Clearance Time (s)				7.5	7.5	7.5	9.8	9.8	9.8	9.8	9.8	
Vehicle Extension (s)				3.0	3.0	3.0	3.0	4.0	4.0	3.0	4.0	
Lane Grp Cap (vph)				199	199	190	220	1408	642	290	1449	
v/s Ratio Prot				0.04	c0.04		0.00	c0.23		c0.00	0.20	
v/s Ratio Perm						0.00	0.00		0.01	0.00		
v/c Ratio				0.34	0.35	0.01	0.01	0.57	0.02	0.01	0.47	
Uniform Delay, d1				24.1	24.1	23.2	9.8	13.4	10.3	9.8	12.7	
Progression Factor				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2				1.0	1.1	0.0	0.0	0.6	0.0	0.0	0.3	
Delay (s)				25.2	25.2	23.2	9.8	14.0	10.3	9.8	13.0	
Level of Service				C	C	C	A	B	B	A	B	
Approach Delay (s/veh)		0.0			25.0			13.9			13.0	
Approach LOS		A			C			B			B	
Intersection Summary												
HCM 2000 Control Delay (s/veh)			14.5		HCM 2000 Level of Service					B		
HCM 2000 Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			59.5		Sum of lost time (s)					34.1		
Intersection Capacity Utilization			39.7%		ICU Level of Service					A		
Analysis Period (min)			15									
c Critical Lane Group												

Intersection								
Int Delay, s/veh	1							
Movement	WBL	WBR	NBU	NBT	NBR	SBU	SBL	SBT
Lane Configurations		↗	↘	↑↑	↗	↘		↑↑
Traffic Vol, veh/h	0	56	0	718	0	50	0	631
Future Vol, veh/h	0	56	0	718	0	50	0	631
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	None	-	-	None	-	-	None
Storage Length	-	0	230	-	205	-	245	-
Veh in Median Storage, #	1	-	-	0	-	-	-	0
Grade, %	0	-	-	0	-	-	-	0
Peak Hour Factor	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2
Mvmt Flow	0	61	0	780	0	54	0	686
Major/Minor	Minor1	Major1		Major2				
Conflicting Flow All	-	390	686	0	0	780	-	-
Stage 1	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-
Critical Hdwy	-	6.94	6.44	-	-	6.44	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	2.52	-	-	2.52	-	-
Pot Cap-1 Maneuver	0	609	527	-	-	459	0	-
Stage 1	0	-	-	-	-	-	0	-
Stage 2	0	-	-	-	-	-	0	-
Platoon blocked, %	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	609	527	-	-	417	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-
Approach	WB	NB		SB				
HCM Ctrl Dly, s/v	11.6	0		1.1				
HCM LOS	B							
Minor Lane/Major Mvmt	NBU	NBT	NBRWBLn1	SBU	SBT			
Capacity (veh/h)	527	-	-	609	417			
HCM Lane V/C Ratio	-	-	-	0.1	0.13			
HCM Ctrl Dly (s/v)	0	-	-	11.6	14.9			
HCM Lane LOS	A	-	-	B	B			
HCM 95th %tile Q (veh)	0	-	-	0.3	0.4			

Queues

2034 Build_Construction_MUT

1: Route 33 & Old Mountain Road/Hunton Park Boulevard

PM Peak Hour

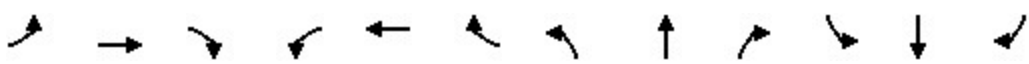


Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	4	77	78	12	8	740	209	16	1004
v/c Ratio	0.01	0.31	0.31	0.03	0.02	0.42	0.23	0.04	0.58
Control Delay (s/veh)	0.0	32.2	32.3	0.2	8.4	12.7	3.2	8.4	14.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (s/veh)	0.0	32.2	32.3	0.2	8.4	12.7	3.2	8.4	14.3
Queue Length 50th (ft)	0	22	22	0	1	71	1	2	103
Queue Length 95th (ft)	0	103	103	0	9	249	45	13	331
Internal Link Dist (ft)	354		602			695			613
Turn Bay Length (ft)		215		530	175			350	
Base Capacity (vph)	839	784	784	717	682	2776	1306	685	2750
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.10	0.10	0.02	0.01	0.27	0.16	0.02	0.37
Intersection Summary									

HCM Signalized Intersection Capacity Analysis

1: Route 33 & Old Mountain Road/Hunton Park Boulevard

2034 Build_Construction_MUT
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↔	↔	↔	↔	↕	↔	↔	↕	↔
Traffic Volume (vph)	0	0	4	144	0	11	7	688	194	15	934	0
Future Volume (vph)	0	0	4	144	0	11	7	688	194	15	934	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0		7.5	7.5	7.5	9.8	9.8	9.8	9.8	9.8	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt		0.87		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		1.00		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1644		1681	1681	1346	1805	3471	1583	1687	3438	
Flt Permitted		1.00		0.95	0.95	1.00	0.21	1.00	1.00	0.34	1.00	
Satd. Flow (perm)		1644		1681	1681	1346	394	3471	1583	604	3438	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	0	4	155	0	12	8	740	209	16	1004	0
RTOR Reduction (vph)	0	4	0	0	0	11	0	0	117	0	0	0
Lane Group Flow (vph)	0	0	0	77	78	2	8	740	92	16	1004	0
Heavy Vehicles (%)	0%	0%	0%	2%	0%	20%	0%	4%	2%	7%	5%	0%
Turn Type		NA		Split	NA	Perm	D.P+P	NA	Perm	D.P+P	NA	
Protected Phases		4		3	3		5	2		1	6	
Permitted Phases	4					3	6		2	2		
Actuated Green, G (s)		0.7		9.8	9.8	9.8	33.8	33.0	33.0	33.8	33.1	
Effective Green, g (s)		0.7		9.8	9.8	9.8	33.8	33.0	33.0	33.8	33.1	
Actuated g/C Ratio		0.01		0.13	0.13	0.13	0.43	0.42	0.42	0.43	0.42	
Clearance Time (s)		7.0		7.5	7.5	7.5	9.8	9.8	9.8	9.8	9.8	
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	4.0	4.0	3.0	4.0	
Lane Grp Cap (vph)		14		210	210	168	182	1461	666	271	1451	
v/s Ratio Prot		c0.00		0.05	c0.05		0.00	0.21		c0.00	c0.29	
v/s Ratio Perm						0.00	0.02		0.06	0.02		
v/c Ratio		0.00		0.37	0.37	0.01	0.04	0.51	0.14	0.06	0.69	
Uniform Delay, d1		38.5		31.5	31.5	30.0	13.3	16.7	14.0	12.9	18.5	
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	
Incremental Delay, d2		0.1		1.1	1.1	0.0	0.1	0.4	0.1	0.1	1.6	
Delay (s)		38.6		32.5	32.6	30.1	13.4	17.1	14.1	12.9	19.8	
Level of Service		D		C	C	C	B	B	B	B	B	
Approach Delay (s/veh)		38.6			32.4			16.4			19.6	
Approach LOS		D			C			B			B	
Intersection Summary												
HCM 2000 Control Delay (s/veh)			19.2									
HCM 2000 Volume to Capacity ratio			0.60									
Actuated Cycle Length (s)			78.4									
Intersection Capacity Utilization			50.9%									
Analysis Period (min)			15									
c Critical Lane Group												

1: Route 33 & Old Mountain Road/Hunton Park Boulevard Performance by movement

Movement	WBL	WBR	NBL	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.2	3.9	3.4	0.3	0.1	0.0	0.0	0.2
Total Del/Veh (s)	20.1	8.1	11.9	7.9	2.8	15.1	6.5	8.3

2: Route 33 & Gladfelter Road Performance by movement

Movement	EBL	EBR	NBT	SBT	All
Denied Del/Veh (s)		0.1	0.2	0.5	0.4
Total Del/Veh (s)		4.3	0.8	1.1	1.1

3: Route 33 & Winns Church Road Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.1	0.2	0.3		0.5	0.4
Total Del/Veh (s)	7.4	1.0	1.3	0.0		1.0	1.2

4: Greenwood Road & Winns Church Road Performance by movement

Movement	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total Del/Veh (s)	0.5	0.0	0.6	0.5	0.1	2.2	9.4	1.0	2.7	8.2	1.1	3.0

5: Route 33 & Project Driveway #1 Performance by movement

Movement	WBR	NBT	SBU	SBT	All
Denied Del/Veh (s)	0.1	0.0	0.0	0.0	0.0
Total Del/Veh (s)	9.3	3.3	6.6	0.4	2.4

6: Route 33 & Project Driveway #2 Performance by movement

Movement	NBT	NBR	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.1
Total Del/Veh (s)	0.1	1.4	1.1	1.0

7: Route 33 Performance by movement

Movement	NBU	NBT	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	5.0	2.9	0.2	1.8

Total Network Performance

Movement	All
Denied Del/Veh (s)	0.3
Total Del/Veh (s)	7.4

Intersection: 1: Route 33 & Old Mountain Road/Hunton Park Boulevard

Movement	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	LT	R	L	T	T	L	T	TR
Maximum Queue (ft)	36	127	32	23	130	168	14	110	78
Average Queue (ft)	4	56	7	1	45	73	1	48	21
95th Queue (ft)	22	101	26	11	96	138	7	92	57
Link Distance (ft)		623			737	737		603	603
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	215		530	175			350		
Storage Blk Time (%)					0				
Queuing Penalty (veh)					0				

Intersection: 2: Route 33 & Gladfelter Road

Movement	EB
Directions Served	LR
Maximum Queue (ft)	30
Average Queue (ft)	6
95th Queue (ft)	25
Link Distance (ft)	425
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: Route 33 & Winns Church Road

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (ft)	33	2
Average Queue (ft)	11	0
95th Queue (ft)	29	2
Link Distance (ft)	724	528
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Greenwood Road & Winns Church Road

Movement	NB	SB
Directions Served	LTR	LTR
Maximum Queue (ft)	24	24
Average Queue (ft)	8	13
95th Queue (ft)	24	31
Link Distance (ft)	457	393
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: Route 33 & Project Driveway #1

Movement	WB	SB
Directions Served	R	U
Maximum Queue (ft)	60	61
Average Queue (ft)	25	19
95th Queue (ft)	50	47
Link Distance (ft)	264	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		245
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Route 33 & Project Driveway #2

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 7: Route 33

Movement	NB	NB
Directions Served	U	T
Maximum Queue (ft)	47	10
Average Queue (ft)	16	0
95th Queue (ft)	41	9
Link Distance (ft)		
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	400	135
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 0

1: Route 33 & Old Mountain Road/Hunton Park Boulevard Performance by movement

Movement	EBR	WBL	WBR	NBL	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.2	4.0	3.2	0.1	0.2	0.0	0.1	0.2
Total Del/Veh (s)	8.8	22.3	5.5	12.3	8.6	4.1	11.6	7.8	8.8

2: Route 33 & Gladfelter Road Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.6	0.6	0.4	0.6	0.5
Total Del/Veh (s)	12.8	4.4	1.9	1.4	1.1	0.0	1.4

3: Route 33 & Winns Church Road Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	0.1	0.1	0.6	0.6	0.3	0.4	0.5
Total Del/Veh (s)	14.5	7.7	2.6	0.4	4.4	1.4	2.5

4: Greenwood Road & Winns Church Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total Del/Veh (s)	1.0	0.8	0.0	0.7	0.7	0.0	3.5	8.7	1.5	3.8	8.6	1.6

4: Greenwood Road & Winns Church Road Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	2.5

5: Route 33 & Project Driveway #1 Performance by movement

Movement	WBR	NBT	SBU	SBT	All
Denied Del/Veh (s)	15.3	0.0	0.0	0.0	3.6
Total Del/Veh (s)	38.1	4.4	5.0	0.8	10.9

6: Route 33 & Project Driveway #2 Performance by movement

Movement	NBT	NBR	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.0
Total Del/Veh (s)	0.7	0.2	1.6	1.0

7: Route 33 Performance by movement

Movement	NBU	NBT	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	12.2	1.8	0.7	4.1

Total Network Performance

Denied Del/Veh (s)	2.0
Total Del/Veh (s)	13.2

Intersection: 1: Route 33 & Old Mountain Road/Hunton Park Boulevard

Movement	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LTR	L	LT	R	L	T	T	L	T	TR
Maximum Queue (ft)	32	52	136	55	29	179	121	31	144	142
Average Queue (ft)	4	7	64	10	4	79	43	6	61	54
95th Queue (ft)	21	37	115	36	20	144	95	21	115	111
Link Distance (ft)	374		623			737	737		603	603
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)		215		530	175			350		
Storage Blk Time (%)						0				
Queuing Penalty (veh)						0				

Intersection: 2: Route 33 & Gladfelter Road

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	44	50
Average Queue (ft)	14	4
95th Queue (ft)	41	26
Link Distance (ft)	425	476
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Route 33 & Winns Church Road

Movement	WB	NB	SB
Directions Served	LR	UTR	LT
Maximum Queue (ft)	84	2	103
Average Queue (ft)	22	0	10
95th Queue (ft)	53	2	51
Link Distance (ft)	724	362	528
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Greenwood Road & Winns Church Road

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	4	2	34	30
Average Queue (ft)	0	0	17	14
95th Queue (ft)	2	1	35	32
Link Distance (ft)	337	349	457	393
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: Route 33 & Project Driveway #1

Movement	WB	SB
Directions Served	R	U
Maximum Queue (ft)	304	28
Average Queue (ft)	216	3
95th Queue (ft)	339	16
Link Distance (ft)	264	
Upstream Blk Time (%)	30	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		245
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Route 33 & Project Driveway #2

Movement	NB	NB
Directions Served	T	T
Maximum Queue (ft)	23	4
Average Queue (ft)	1	0
95th Queue (ft)	12	4
Link Distance (ft)	150	150
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: Route 33

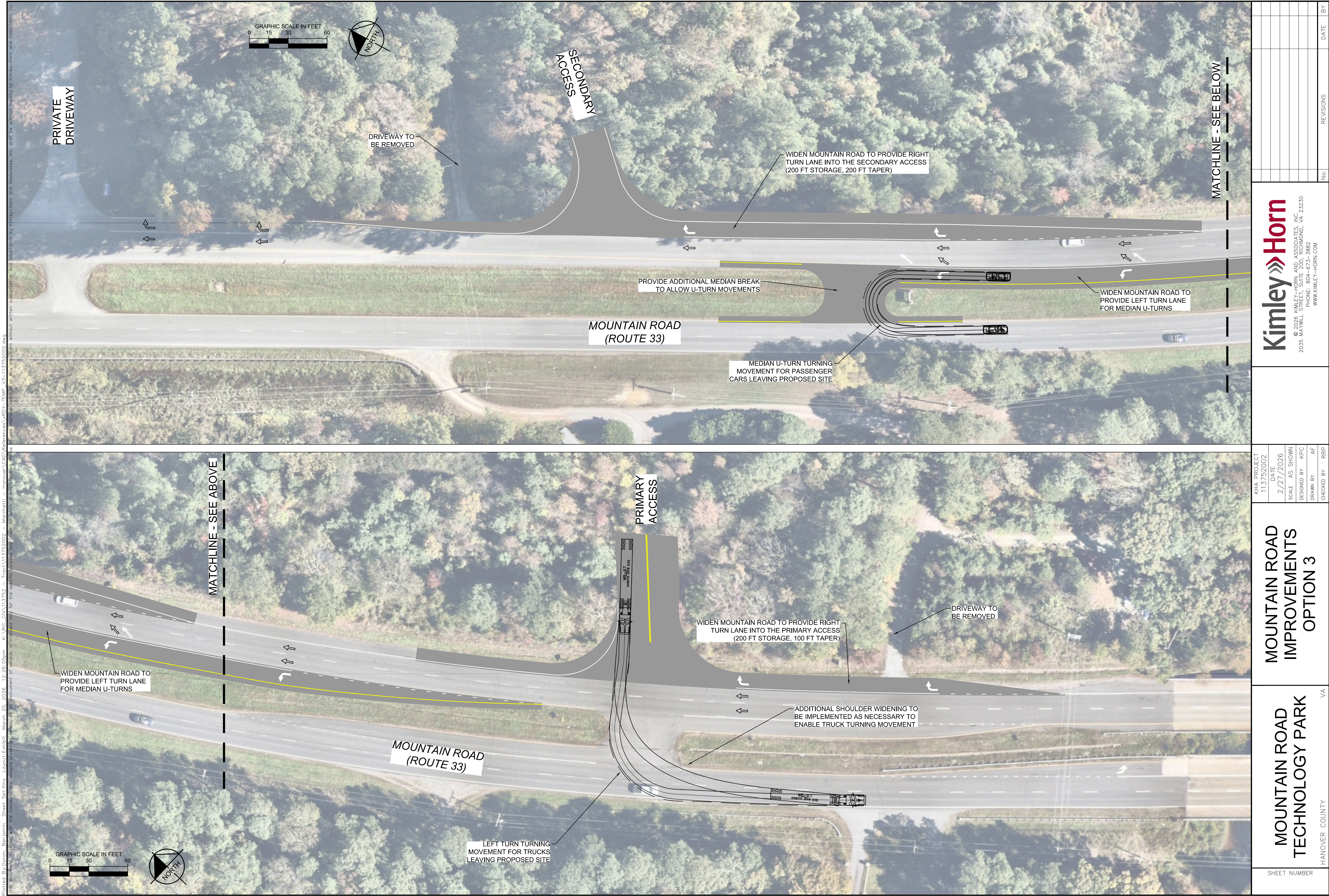
Movement	NB
Directions Served	U
Maximum Queue (ft)	202
Average Queue (ft)	102
95th Queue (ft)	172
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	400
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 0

Intersection								
Int Delay, s/veh	9.3							
Movement	WBL	WBR	NBU	NBT	NBR	SBU	SBL	SBT
Lane Configurations		↗	↘	↑↑	↗	↘		↑↑
Traffic Vol, veh/h	0	504	0	690	0	6	0	930
Future Vol, veh/h	0	504	0	690	0	6	0	930
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	None	-	-	None	-	-	None
Storage Length	-	0	230	-	205	-	245	-
Veh in Median Storage, #	1	-	-	0	-	-	-	0
Grade, %	0	-	-	0	-	-	-	0
Peak Hour Factor	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2
Mvmt Flow	0	548	0	750	0	7	0	1011
Major/Minor	Minor1	Major1		Major2				
Conflicting Flow All	-	375	1011	0	0	750	-	-
Stage 1	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-
Critical Hdwy	-	6.94	6.44	-	-	6.44	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	2.52	-	-	2.52	-	-
Pot Cap-1 Maneuver	0	623	327	-	-	480	0	-
Stage 1	0	-	-	-	-	-	0	-
Stage 2	0	-	-	-	-	-	0	-
Platoon blocked, %	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	623	327	-	-	92	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-
Approach	WB	NB		SB				
HCM Ctrl Dly, s/v	38.6	0		0.3				
HCM LOS	E							
Minor Lane/Major Mvmt	NBU	NBT	NBRWBLn1	SBU	SBT			
Capacity (veh/h)	327	-	-	623	92			
HCM Lane V/C Ratio	-	-	-	0.879	0.071			
HCM Ctrl Dly (s/v)	0	-	-	38.6	47.1			
HCM Lane LOS	A	-	-	E	E			
HCM 95th %tile Q (veh)	0	-	-	10.4	0.2			

Appendix D: Median U-Turn Exhibit



SHEET NUMBER	MOUNTAIN ROAD TECHNOLOGY PARK		HANOVER COUNTY		VA
	MOUNTAIN ROAD IMPROVEMENTS OPTION 3				
	KHA PROJECT 113752002				
	DATE 2/27/2026				
	SCALE AS SHOWN				
	DESIGNED BY KPC				
	DRAWN BY AF				
	CHECKED BY RRP				
</					