



TRAFFIC IMPROVEMENTS STUDY
CITY OF INDEPENDENCE, CUYAHOGA COUNTY, OHIO

I-77 / PLEASANT VALLEY ROAD

PREPARED BY GPD GROUP FOR: CITY OF INDEPENDENCE
JANUARY 2025



TRAFFIC IMPROVEMENTS STUDY

I-77 / Pleasant Valley Road

City of Independence, Cuyahoga County, Ohio

Prepared For:

City of Independence
6800 Brecksville Road
Independence, OH 44131

Part of the reason D12 has been sitting on this report is because current operation at Pleasant Valley has been adversely impacted by Broadview Heights' closure for its Wallings Road project. We were expecting it to be re-opened last fall, but delays have dragged that awful MOT scheme into 2026, all the while preventing us from making observations about the existing operation until it gets back to normal. We are aware of the issue of excessive queuing on the SB exit. We are not as familiar with the queuing on Pleasant Valley that this report shows to be pretty bad as well.

January 2025

Engineer's Seal

Prepared By:

Prepared
Under The Responsible
Charge of:

Judith M. Bennett, P.E., PTOE
Registration No. 64654
Certification No. 4173

Michael A. Hobbs, P.E., PTOE
Registration No. 68713
Certification No. 1346

Date



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I. Purpose:

This Traffic Improvements Study (TIS) is being prepared at the request of the City of Independence in association with the study of the I-77 / Pleasant Valley Road interchange in the City of Independence, Cuyahoga County, Ohio. The study will be based on traffic capacity and safety analyses on the freeway ramps and at the ramp junction intersections on Pleasant Valley Road.

A traffic study would identify the need to be served by an alternative. What recommendations have been identified? a Need for a study to existing

II. Project Setting:

Study Area

The Pleasant Valley corridor is primarily residential with several businesses along Pleasant Valley Road. See **Figure 1** for a project location map and an aerial photograph of the study area.

This report would be better-served if it included photos of the worst operating conditions at the intersection. It would probably show observations of traffic flow and approaches for different movements. Photos tend to be more compelling than text and would make a case for proposed improvements.

Pleasant Valley Road is a five-lane asphalt roadway with two travel lanes in each direction, a center two-way left-turn lane, and left-turn lanes at the signalized intersections. The posted speed limit along Pleasant Valley Road is 35 mph. According to information obtained from the Ohio Department of Transportation (ODOT), Pleasant Valley Road is classified as an Urban Principal Arterial Other.

I-77 is a six-lane interstate freeway with three travel lanes in each direction. The posted speed limit along I-77 is 60 mph. According to information obtained from ODOT, I-77 and the ramps to Pleasant Valley Road are classified as an Urban Principal Arterial Interstate.

The I-77 / Pleasant Valley Road interchange is a partial cloverleaf interchange with freeway ramps on the northeast and southwest quadrants of the interchange. The I-77 NB and SB exit ramps exist as loop ramps with unsignalized free-flow right-turn movements with the left and thru turning movements signalized. The I-77 NB and SB entrance ramps are diamond ramps located adjacent to the exit ramps. The southbound ramps are located on the west side of I-77 and the northbound ramps to the east.

Five existing intersections are located within the study area and are described as follows:

Pleasant Valley Road / Edgewood Lane / Ludwin Drive

This intersection is currently signalized using a suspended box span configuration with signal poles on all four corners of the intersection. This intersection consists of four approaches with the following lane configurations: EB and WB Pleasant Valley Road – three lanes (left, thru, thru-right), NB Edgewood Lane and SB Ludwin Drive – one lane (left-thru-right). There are protected-permitted phases on the EB and WB Pleasant Valley Road approaches. The NB Edgewood Lane and SB Ludwin Drive approaches operate with split phasing. This intersection is located within the City of Seven Hills city limits, but was included as this is the next signalized intersection adjacent to the interchange to the west.



Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive

This intersection is currently signalized using a simple span configuration with signal poles on the northwest and southeast corners of the intersection. This intersection consists of four approaches with the following lane configurations: EB and WB Pleasant Valley Road – three lanes (left, thru, thru-right), NB I-77 SB Ramps – two lanes (left-thru, right), and SB Forestwood Drive – two lanes (left-thru, right). There are protected-permitted phases on the EB and WB Pleasant Valley Road approaches. The NB I-77 SB Ramps and SB Forestwood Drive approaches operate with split phasing.

Pleasant Valley Road / I-77 NB Ramps

This intersection is currently signalized using a simple span configuration with signal poles on the northwest and southeast corners of the intersection. This intersection consists of three approaches with the following lane configurations: EB Pleasant Valley Road – three lanes (left, thru, thru), WB Pleasant Valley Road – two lanes (thru, thru-right), and SB I-77 NB Ramps – two lanes (left, right).

Pleasant Valley Road / Midland Road

This intersection is currently signalized using a typical mast arm configuration with signal poles on the northwest and southeast corners of the intersection. This intersection consists of four approaches with the following lane configurations: EB and WB Pleasant Valley Road – three lanes (left, thru, thru-right), NB and SB Midland Road – one lane (left-thru-right). There are protected-permitted phases on the EB and WB Pleasant Valley Road approaches.

Pleasant Valley Road / Brecksville Road (State Route 21)

This intersection is currently signalized using a typical mast arm configuration with signal poles on all four corners of the intersection. This intersection consists of four approaches with the following lane configurations: EB and WB Pleasant Valley Road – three lanes (left, thru, thru-right), NB and SB Brecksville Road – four lanes (left, thru, thru, right). There are protected-permitted phases on the EB and WB Pleasant Valley Road along with the NB and SB Brecksville Road approaches. It should be noted that the City of Independence is planning to construct EB and WB rights turn lanes at this intersection.

Traffic Counts

For this traffic analysis, Tri-State Traffic Data, Inc. performed turning movement traffic counts at the five study intersections previously mentioned. The counts were performed from 6:00 AM – 6:00 PM on Wednesday, April 17, 2024. See **Appendix A** for printouts of the turning movement counts. The systemwide AM peak hour was found to occur from 7:15 AM – 8:15 AM and the systemwide PM peak hour was found to occur from 4:30 PM – 5:30 PM.

Utilizing ODOT's Traffic Count Database System (TCDS), traffic counts for I-77 were utilized from the existing counting station at the I-77 / Wallings Road interchange to the south. The I-77 / Wallings Road northbound entrance ramp and southbound exit



ramp volumes were added southbound and subtracted northbound to determine the mainline I-77 northbound and southbound volumes at the I-77 / Pleasant Valley Road interchange. The traffic counts used for I-77 were counted on April 17, 2024, while the northbound entrance and southbound exit ramps were counted on May 17, 2023.

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It should be noted that there was active construction along Pleasant Valley Road east of the study area at the time of the traffic counts. Westbound traffic was restricted east of Rio Nero Drive approximately one mile east of the study area with no restrictions to eastbound thru traffic.

III. Crash Analysis:

Crash data was obtained from the ODOT's GIS Crash Analysis Tool (GCAT) for the calendar years of 2021 to 2023. A total of 98 crashes occurred within the study corridor during the three year analysis period with 11 crashes occurring on I-77 and the other 87 crashes occurring along Pleasant Valley Road. These crashes include 61 rear-end crashes, 13 sideswipe-passing crashes, ten left-turn crashes, seven angle crashes, six fixed object crashes, and one parked vehicle crash. During the three year analysis period, 81% of crashes occurred during the daylight and 82% occurred on dry pavement. Additionally, 70% of the crashes were property damage only, while 30% of the crashes were injury crashes with one serious injury and one fatal crash. The other 27 injury crashes resulted with an injury possible or minor injury. The fatal crash occurred on March 30th, 2021 at 7:07 PM when a driver struck a parked vehicle from behind in the right lane of westbound Pleasant Valley Road just west of Midland Road. The driver of the moving vehicle had fatal injuries as the result of the rear-end collision. See **Appendix B** for collision diagrams of the study area and **Appendix C** for the crash data summary.

The leading crash type along the Pleasant Valley Road corridor is the 61 rear-end crashes. Rear-end crashes are common at signalized intersections due to the frequent starting and stopping of vehicles. These crashes typically become more frequent with higher traffic volumes and when significant queueing occurs. There were 11 rear-end crashes at the eastbound approach of the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection with an additional four rear-end crashes eastbound between the Pleasant Valley Road / Edgewood Lane / Ludwin Drive and Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersections. The 15 rear-end crashes suggest there is traffic congestion and long queues occurring on this stretch of roadway. There were six rear-end crashes on the I-77 SB exit ramp to Pleasant Valley Road. Many of these six crashes occurred in the exit lane on the bridge over Pleasant Valley Road suggesting long vehicular queues are common at this exit ramp and causes vehicles to queue onto the freeway.

Another common crash type occurring along Pleasant Valley Road are the 13 sideswipe-passing crashes. A factor that could be contributing to the sideswipe-passing crashes is all of Pleasant Valley Road within the study area provides two travel lanes in each direction. As motorists are approach a traffic signal with a red indication, lane jockeying becomes a common occurrence. Motorists change lanes as they approach the intersection in an effort to move into the travel lane that has the shortest vehicular queue. These lane changes in close proximity to an intersection increase the likelihood for a sideswipe-passing crash to occur.



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There were ten left-turn crashes along the Pleasant Valley corridor with four of the left-turn crashes occurring at the Pleasant Valley Road / I-77 NB Ramps intersection eastbound approach. There is an existing left-turn lane at this intersection with a protected left-turn phase. The left-turn crashes may be reduced at this intersection if the permissive left-turn phase is removed from the eastbound approach.

A total of seven angle crashes occurred within the study area with five of the angle crashes occurring at the Pleasant Valley Road / Brecksville Road intersection. Clearance times were analyzed at this intersection with some being too short or long. The clearance times should be updated at the Pleasant Valley Road / Brecksville Road intersection as it may be contributing to the number of angle crashes.

IV. Traffic Volumes:

As previously noted, westbound thru traffic was restricted east of the study area at the time of the traffic counts. The Pleasant Valley Road / Brecksville Road intersection is the easternmost counted intersection to the existing construction. Traffic counts from 2014 were compared with the current 2024 traffic counts at this intersection. According to ODOT's Traffic Forecast Modeling System (TFMS), Pleasant Valley Road experienced no growth at the Pleasant Valley Road / Brecksville Road intersection. Additional westbound trips were added to existing trips at the Pleasant Valley Road / Brecksville Road intersection, so the total westbound trips entering the intersection in 2024 is equivalent to the westbound trips entering the intersection in 2014 during the AM and PM peak hours. These additional trips were then distributed throughout the rest of the study area utilizing existing traffic patterns and engineering judgement. **Figure 3** shows the Existing Year 2024 adjusted peak hour volumes.

Design hour volumes (DHV) were developed for the study area using the peak hour to design hour factors that are published by the ODOT Office of Statewide Planning and Research. The design hour factors utilized to develop the DHV are dependent upon the roadway's functional classification as well as the day of the week and month the count was performed. These factors were then applied to the raw turning movement counts to convert the existing volumes to DHV. For this study, a design hour factor of 1.12 was applied to the Pleasant Valley Road volumes and 1.09 was applied to I-77 as this data was obtained on a Wednesday in April. A design hour factor of 1.09 was applied to the Wallings Road northbound on ramp and southbound off ramp as this data was obtained on a Tuesday in May.

The construction of any recommended improvements is anticipated to be completed in the year 2030 which will serve as the 'Opening Year' for the study, while the 'Design Year' will be 2050 (20-year design criteria). According to ODOT's TFMS, the Pleasant Valley Road section located within the study area is expected to experience a growth rate of 0.31%, while I-77 is expected to experience no growth. However, the I-77 SB off ramp is expected to experience a growth rate of +1.25%. To be conservative and keep volumes balanced, a +0.75% annual growth rate was used to calculate the future traffic volumes on Pleasant Valley Road and the I-77 on and off ramps, while no growth was applied to the I-77 volumes. See **Appendix D** for the growth rate information. The annual growth rates were applied to the design hour volumes to develop the future Opening Year 2030 and Design Year 2050 background traffic volumes. **Figure 4** shows the Opening Year 2030 peak hour traffic volumes and **Figure 5** shows the Design Year 2050 peak hour traffic volumes.



V. Alternatives:

For the purpose of analyzing the I-77 / Pleasant Valley Road interchange, the following three scenarios were evaluated:

'No-Build'

The 'No-Build' scenario assumes no changes to the existing roadway configuration or traffic operations at the interchange or surrounding roadways and is the base condition to which the subsequent alternatives are compared.

'Build'

Due to the expected congestion and capacity issues, both I-77 / Pleasant Valley interchange intersections were evaluated. The 'Build' alternatives are not related between the two intersections allowing any combination of the 'Build' alternatives to be implemented.

'Build Alternative 1' - Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive Intersection

- Construct an eastbound right-turn lane with a total length of 200'.
- Reconstruct the existing westbound left-turn lane to a total length of 375'.
- Widen approximately 3,900' of the existing I-77 SB off ramp to two lanes including the I-77 bridge over Pleasant Valley Road.
- Reconstruct the northbound approach to a two lane (left-thru, right) lane configuration. The right lane of the I-77 SB off ramp will be an unsignalized right-turn channelized movement.
- See **Figure 6** for a rendering of the proposed improvements for 'Build Alternative 1' at the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection.
- Estimate of probable cost: \$6,747,100

'Build Alternative 2' - Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive Intersection

- Construct an eastbound right-turn lane with a total length of 200'.
- Reconstruct the existing westbound left-turn lane to a total length of 375'.
- Widen approximately 1,150' of the existing I-77 SB off ramp to two lanes up to the I-77 bridge over Pleasant Valley Road.
- Reconstruct the northbound approach to a two lane (left, left-thru-right) lane configuration. The right exit lane will be shared between the left-thru movement at the northbound approach with the unsignalized right-turn channelized movement.
- See **Figure 7** for a rendering of the proposed improvements for 'Build Alternative 2' at the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection.
- Estimate of probable cost: \$2,223,796



'Build Alternative 3' - Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive Intersection

- Construct an eastbound right-turn lane with a total length of 200'.
- Reconstruct the existing westbound left-turn lane to a total length of 375'.
- Widen approximately 1,150' of the existing I-77 SB off ramp to three lanes up to the I-77 bridge over Pleasant Valley Road.
- Reconstruct the northbound approach to a three lane (left, left-thru, right) lane configuration. An additional unsignalized channelized right-turn lane with a total length of 1,100' will be constructed beginning at the I-77 bridge over Pleasant Valley Road.
- See **Figure 8** for a rendering of the proposed improvements for 'Build Alternative 3' at the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection.
- Estimate of probable cost: \$2,396,124

'Build Alternative 4' - Pleasant Valley Road / I-77 NB Ramps

- Lengthen the existing eastbound left-turn lane to a total length of 425'.
- Restripe the eastbound left thru lane to a left-turn lane with a total length of 675'.
- Restripe eastbound approach to a left, left, thru lane configuration.
- Widen approximately 650' of the existing I-77 NB on ramp to two lanes to accept the two EB left-turn lanes.
- Construct a westbound right-turn lane with a total length of 300'.
- See **Figure 9** for a rendering of the proposed improvements for 'Build Alternative 4' at the Pleasant Valley Road / I-77 NB Ramps intersection.
- Estimate of probable cost: \$2,240,732

'Build Alternative 5' - Pleasant Valley Road / I-77 NB Ramps

- Widen approximately 1,250' of eastbound Pleasant Valley Road from the existing I-77 SB ramp channelized movement to Meadows Drive.
- Lengthen the existing eastbound left-turn lane to a total length of 425'. Construct an additional 675' eastbound left-turn lane adjacent to the existing turn lane.
- Widen eastbound approach to a left, left, thru, thru lane configuration. Remove the existing slope protection and install new soldier wall under the I-77 overpass.
- Widen approximately 650' of the existing I-77 NB on ramp to two lanes to accept the two EB left-turn lanes.
- Construct a westbound right-turn lane with a total length of 300'.
- See **Figure 10** for a rendering of the proposed improvements for 'Build Alternative 5' at the Pleasant Valley Road / I-77 NB Ramps intersection.
- Estimate of probable cost: \$4,487,356



VI. Traffic Analysis:

Traffic Signal Warrant Analysis

Utilizing the existing and proposed traffic volumes, as specified in Section 402-2 of the ODOT Traffic Engineering Manual (TEM), a traffic signal warrant analysis was performed for the existing traffic signals at the five study intersections. A traffic signal is considered warranted for construction if at least one of a possible nine 2012 Ohio Manual of Traffic Control Devices (OMUTCD) warrant requirements are satisfied.

Due to the availability of twelve hour turning movement traffic count data, Warrants #1, #2 and #3 were deemed applicable for the Existing Year 2024 warrant analysis. It should be noted that the warrant analysis utilized the traffic counts without the additional westbound traffic added, as these trips were only distributed during the AM and PM peak hours. See **Appendix E** for the hour-by-hour development calculations and the traffic signal warrant analysis. Warrants #1, #2 and #3 are described below:

Warrant #1 Eight Hour Vehicular Volume

The Eight Hour Vehicular Volume warrant is intended for application where the volume of intersection traffic is the principal reason for consideration of the signal installation. Three conditions are possible to satisfy this particular warrant. Condition A applies to specifically minimum vehicular volume requirements. Condition B deals with the interruption of continuous traffic flow. Condition C represents a combination of Conditions A and B being met at reduced volume requirements. When the 85th percentile speed of the major street traffic exceeds 40 mph in either an urban or rural area, or when the intersection lies within a built-up area of an isolated community having a population less than 10,000, the Eight Hour Vehicular Volume Warrant is seventy percent (70%) of the base requirements.

Warrant #2 Four Hour Vehicular Volume

The Four Hour Vehicular Volume warrant is satisfied when for four hours of an average day, minimum volumes are reached on both the major street (total of both approaches) and the highest volume minor street approach (one direction only). When the 85th percentile speed of the major street traffic exceeds 40 mph or when the intersection lies within a built-up area of an isolated community having a population less than 10,000, the Four Hour Vehicular Volume requirements are reduced to seventy percent (70%) of the base values.

Warrant #3 Peak Hour Vehicular Volume

The Peak Hour Vehicular Volume warrant is intended for application when traffic conditions are such that minor street traffic suffers undue delay in entering or crossing the major street. The Peak Hour Vehicular Volume warrant is satisfied when the minimum required volumes on the major and highest volume minor approach are met for any one hour period (any four consecutive 15-minute periods) on an average day. When the 85th percentile speed of the major street traffic exceeds 40 mph or when the intersection lies within a built up area of an isolated community having a population less than 10,000, the Peak Hour Vehicular Volume warrants are reduced.



The results of the Existing Year 2024 signal warrant analysis are shown in **Table 1**. See **Appendix E** for the traffic signal warrant analysis.

Table 1: Traffic Signal Warrant Analysis Summary – Existing Year 2024 Traffic Conditions			
Intersection	Signal Warrants		
	Warrant #1 (Eight Hour Volume)	Warrant #2 (Four Hour Volume)	Warrant #3 (Peak Hour Volume)
Pleasant Valley Road / Edgewood Lane / Ludwin Drive	Not Satisfied	Not Satisfied	Not Satisfied
Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive	Satisfied	Satisfied	Satisfied
Pleasant Valley Road / I-77 NB Ramps	Satisfied	Satisfied	Satisfied
Pleasant Valley Road / Midland Road	Not Satisfied	Not Satisfied	Not Satisfied
Pleasant Valley Road / Brecksville Road	Satisfied	Satisfied	Satisfied

As shown in **Table 1**, three of the five existing signalized intersections currently satisfy a volume based warrant under the Existing Year 2024 traffic conditions. It was found that the Pleasant Valley Road / Edgewood Lane / Ludwin Drive and Pleasant Valley Road / Midland Road intersections do not satisfy the minimum volume threshold to warrant a traffic signal under the Existing Year 2024 conditions. These intersections should be reevaluated in the future when the Pleasant Valley Road corridor returns to normal operating conditions. The Pleasant Valley Road / Edgewood Lane / Ludwin Drive traffic signal is owned by the City of Seven Hills and the Pleasant Valley Road / Midland Road intersection was recently reconstructed. See **Appendix E** for the traffic signal warrant analysis.

Turn Lane Length Calculations

Turn lane length calculations were performed to determine the calculated length for each proposed turn lane based on the Design Year 2050 'Build' peak hour traffic volumes. The required storage length is a function of site conditions, lane assignments, design speed, and the vehicular demand of the individual movement and is based on Figures 401-9 and 401-10 of the ODOT Location and Design Manual, Volume 1. **Table 2** shows the calculated turn lane lengths under the Design Year 2050 'Build' conditions. See **Appendix F** for turn lane length calculation printouts.



Table 2: Turn Lane Length Calculation Summary – Design Year 2050 'Build' Conditions				
Intersection / Movement	Turn Lane Length (ft.)			
	Calculated Length	Thru Back-up	Existing Turn Lane Length	Recommended Length
Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive				
'Build Alternative 1'				
Eastbound Right-Turn Lane	575'	975'	-	200'
Westbound Left-Turn Lane	425'	625'	165'	375'
'Build Alternative 2'				
Eastbound Right-Turn Lane	575'	975'	-	200'
Westbound Left-Turn Lane	425'	625'	165'	375'
'Build Alternative 3'				
Eastbound Right-Turn Lane	575'	975'	-	200'
Westbound Left-Turn Lane	425'	625'	165'	375'
Pleasant Valley Road / I-77 NB Ramps				
'Build Alternative 4'				
Eastbound Left-Turn Lanes	725'	1,125'	250'	475' & 675'
Westbound Right-Turn Lane	725'	550'	-	300'
'Build Alternative 5'				
Eastbound Left-Turn Lanes	725'	550'	250'	475' & 675'
Westbound Right-Turn Lane	725'	550'	-	300'

*Turn lane length shown includes 50' diverging taper.

As shown in **Table 2**, the existing 165' westbound left-turn lane at the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection has a calculated turn lane length of 425' under all Design Year 2050 'Build' alternatives. The westbound left-turn lane is recommended to be constructed at a total length of 375' with all 'Build' alternatives due to a conflict with the I-77 overpass. The eastbound right-turn lane has a calculated length of 575', but is recommended to be constructed at a length of 200' due to grading restrictions.

The existing 250' eastbound left-turn lane at the Pleasant Valley Road / I-77 NB Ramps intersection has a calculated length of 725' for each turn lane with two left-turn lanes. It is recommended an inside left-turn lane to be constructed with a total length of 425' and outside left-turn lane is recommended to be constructed at 675'. Although the outer left-turn lane could be lengthened further to increase the storage capacity, it is recommended to be constructed at 675' to allow for lane changing between intersections. The westbound right-turn lane has a calculated length of 725', but is recommended to be constructed at a length of 300' as the turn lane is expected to have adequate storage if a westbound right-turn overlap phase is implemented at the signal. More detail is provided in the capacity analysis section.



HCS Intersection Capacity Analysis

Intersection capacity analyses were performed for the Opening Year 2030 and Design Year 2050 'No-Build' and 'Build' scenarios to determine the operating conditions that would be expected at each study intersection. The quality of the operating conditions experienced by an intersection is measured in terms of Level-of-Service (LOS). Levels-of-Service can range from LOS A to LOS F.

Level-of-Service A, B, C, D and E are considered acceptable in an area within Metropolitan Planning Organization (MPO) for movements and approaches while the overall intersection must operate at LOS D or better. Level-of-Service F is considered unacceptable with significant levels of delay experienced by vehicles. The City of Independence is located within the Northeast Ohio Areawide Coordinating Agency (NOACA) MPO. The thresholds related to average control delay for signalized intersections are as follows:

<i>Level-of- Service</i>	<i>Delay Threshold – Signalized (Sec)</i>
A	< 10
B	> 10 – 20
C	> 20 – 35
D	> 35 – 55
E	> 55 – 80
F	> 80

The quantity of vehicles that a turning movement or approach has sufficient capacity for is measured with the volume-to-capacity ratio (v/c). A v/c less than 1.0 is considered acceptable with a v/c less than 0.93 preferred. An intersection is considered over capacity when signal timings or other intersection control cannot be adjusted to allow all turning movements to have a v/c less than 1.0.

The storage length represents the area at an approach where queued vehicles can be stored and not cause obstructions to adjacent turning movements or upstream intersections. The queue-storage ratio (QSR) is a measure of the expected queue length to the available storage length. A QSR equal to or less than 1.0 is considered acceptable, while a QSR greater than 1.0 indicates a strong possibility of vehicles obstructing an adjacent turning movement or upstream intersection.

The analysis was performed utilizing the computer program HCS 2024 which is developed by McTrans Corporation and based on the Freeway Capacity Manual, 7th Edition. Based on criteria established by ODOT, Freeway Capacity Software (HCS) is used to determine the required number of lanes and the lane assignments at intersections (i.e. the needed intersection capacity). The existing peak hour factors and heavy vehicle percentages were utilized during the AM and PM peak hours for the capacity analysis.

'No-Build' Peak Hour Intersection Capacity Analysis

Pleasant Valley Road / Edgewood Lane / Ludwin Drive

Table 3 summarizes the results of the capacity analysis for the Pleasant Valley Road / Edgewood Lane / Ludwin Drive intersection under the Opening Year 2030 and Design Year 2050 'No-Build' traffic conditions during the AM and PM peak hours. See **Appendix G** for the 'No-Build' HCS Intersection Capacity Analysis printouts.



**Table 3: HCS Intersection Capacity Analysis Summary
Opening Year 2030 and Design Year 2050 'No-Build' Conditions
Pleasant Valley Road / Edgewood Lane / Ludwin Drive Intersection**

Movement	'No-Build' Condition									
	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)
	AM Peak Hour					PM Peak Hour				
Opening Year 2030										
EB Left	A	8.0	0.007	0.01	1	B	12.8	0.020	0.01	1
EB Thru	B	19.7	0.864	0.49	491	B	12.1	0.445	0.16	160
EB Thru-Right	B	19.8	0.865	0.49	488	B	12.1	0.445	0.16	156
<i>EB Approach</i>	<i>B</i>	<i>19.8</i>	-	-	-	<i>B</i>	<i>12.1</i>	-	-	-
WB Left	B	14.6	0.060	0.03	3	A	7.2	0.209	0.27	24
WB Thru	A	9.1	0.305	0.12	120	B	14.1	0.824	0.35	349
WB Thru-Right	A	9.1	0.305	0.12	116	B	14.2	0.827	0.35	350
<i>WB Approach</i>	<i>A</i>	<i>9.2</i>	-	-	-	<i>B</i>	<i>13.8</i>	-	-	-
NB Left-Thru-Right	D	36.8	0.516	0.18	80	C	30.4	0.323	0.08	34
<i>NB Approach</i>	<i>D</i>	<i>36.8</i>	-	-	-	<i>C</i>	<i>30.4</i>	-	-	-
SB Left-Thru-Right	D	37.7	0.311	0.07	34	D	32.6	0.264	0.04	18
<i>SB Approach</i>	<i>D</i>	<i>37.7</i>	-	-	-	<i>D</i>	<i>32.6</i>	-	-	-
Intersection Total	B	17.9	-	-	-	B	13.7	-	-	-
Design Year 2050										
EB Left	A	7.8	0.010	0.02	2	B	15.3	0.032	0.02	2
EB Thru	C	28.9	0.927	0.73	727	B	12.1	0.455	0.21	206
EB Thru-Right	C	29.1	0.928	0.73	723	B	12.1	0.455	0.20	201
<i>EB Approach</i>	<i>C</i>	<i>29.0</i>	-	-	-	<i>B</i>	<i>12.1</i>	-	-	-
WB Left	B	19.9	0.090	0.07	6	A	7.5	0.255	0.35	31
WB Thru	A	9.1	0.326	0.15	153	B	18.8	0.871	0.51	509
WB Thru-Right	A	9.1	0.327	0.15	148	B	19.2	0.876	0.51	513
<i>WB Approach</i>	<i>A</i>	<i>9.2</i>	-	-	-	<i>B</i>	<i>18.4</i>	-	-	-
NB Left-Thru-Right	D	45.3	0.639	0.25	112	D	36.9	0.374	0.11	48
<i>NB Approach</i>	<i>D</i>	<i>45.3</i>	-	-	-	<i>D</i>	<i>36.9</i>	-	-	-
SB Left-Thru-Right	D	43.8	0.351	0.09	46	D	38.8	0.285	0.05	26
<i>SB Approach</i>	<i>D</i>	<i>43.8</i>	-	-	-	<i>D</i>	<i>38.8</i>	-	-	-
Intersection Total	C	24.8	-	-	-	B	17.0	-	-	-

Note: Yellow highlighted cells indicate a Level-of-Service D

As shown in **Table 3**, all movements and approaches at the Pleasant Valley Road / Edgewood Lane / Ludwin Drive intersection are anticipated to operate with acceptable Levels-of-Service, have sufficient roadway capacity, and adequate turn lane lengths under the Opening Year 2030 and Design Year 2050 'No-Build' conditions during both the AM and PM peak hours.



Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive

Table 4 summarizes the results of the capacity analysis for the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection under the Opening Year 2030 and Design Year 2050 'No-Build' traffic conditions during the AM and PM peak hours. See **Appendix G** for the 'No-Build' HCS Intersection Capacity Analysis printouts.

Table 4: HCS Intersection Capacity Analysis Summary Opening Year 2030 and Design Year 2050 'No-Build' Conditions Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive										
Movement	'No-Build' Condition									
	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)
	AM Peak Hour					PM Peak Hour				
Opening Year 2030										
EB Left	B	19.8	0.050	0.15	16	D	39.4	0.266	0.29	30
EB Thru	F	297.2	1.558	0.74	1,792	F	109.4	1.059	0.27	662
EB Thru-Right	F	331.1	1.643	1.28	3,094	F	112.3	1.062	0.26	615
EB Approach	F	315.2	-	-	-	F	108.4	-	-	-
WB Left	F	99.2	0.993	2.20	252	F	117.6	1.087	3.62	416
WB Thru	B	15.8	0.284	0.14	143	F	86.5	1.038	0.73	752
WB Thru-Right	B	15.9	0.288	0.14	136	F	87.3	1.038	0.71	726
WB Approach	D	37.5	-	-	-	F	92.8	-	-	-
NB Left-Thru	D	36.6	0.468	1.64	246	F	92.9	1.098	8.44	1,266
NB Right	A	0.0	-	-	-	A	0.0	-	-	-
NB Approach	B	12.2	-	-	-	E	62.3	-	-	-
SB Left-Thru	E	71.0	0.809	0.39	193	E	60.9	0.603	0.18	91
SB Right	D	51.4	0.086	0.13	15	E	56.7	0.336	0.38	42
SB Approach	E	69.3	-	-	-	E	59.5	-	-	-
Intersection Total	F	190.6	-	-	-	F	83.8	-	-	-

Note: Yellow highlighted cells indicate a Level-of-Service D
 Orange highlighted cells indicate a Level-of-Service E, $1 > v/c \text{ ratio} > 0.93$
 Red highlighted cells indicate a Level-of-Service F, $v/c \geq 1.0$, $QSR \geq 1.0$



**Table 4: HCS Intersection Capacity Analysis Summary
Opening Year 2030 and Design Year 2050 'No-Build' Conditions
Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive (Cont.)**

Movement	No-Build' Condition									
	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)
	AM Peak Hour					PM Peak Hour				
Design Year 2050										
EB Left	B	19.8	0.061	0.18	19	D	39.4	0.296	0.33	35
EB Thru	F	352.0	1.685	0.97	2,368	F	165.0	1.124	0.37	908
EB Thru-Right	F	399.1	1.796	1.52	3,668	F	166.7	1.124	0.35	835
EB Approach	F	376.2	-	-	-	F	161.5	-	-	-
WB Left	F	144.2	1.141	2.92	336	F	174.5	1.244	4.90	564
WB Thru	B	16.4	0.327	0.16	169	F	142.9	1.196	1.05	1,079
WB Thru-Right	B	16.5	0.330	0.16	160	F	144.8	1.199	1.03	1,046
WB Approach	D	49.8	-	-	-	F	149.7	-	-	-
NB Left-Thru	D	39.3	0.556	1.90	286	F	157.0	1.257	12.53	1,879
NB Right	A	0.0	-	-	-	A	0.0	-	-	-
NB Approach	B	13.1	-	-	-	F	105.4	-	-	-
SB Left-Thru	E	75.3	0.829	0.45	222	E	63.1	0.684	0.21	107
SB Right	D	50.3	0.092	0.16	17	E	57.1	0.377	0.44	48
SB Approach	E	73.1	-	-	-	E	61.2	-	-	-
Intersection Total	F	227.7	-	-	-	F	133.2	-	-	-

Note: Yellow highlighted cells indicate a Level-of-Service D

Orange highlighted cells indicate a Level-of-Service E, $1 > v/c \text{ ratio} > 0.93$

Red highlighted cells indicate a Level-of-Service F, $v/c \geq 1.0$, $QSR \geq 1.0$

As shown in **Table 4**, the eastbound approach and overall intersection of the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection is anticipated to be over capacity with failing Levels-of-Service under the Opening Year 2030 and Design Year 2050 'No-Build' conditions during the AM and PM peak hours. The westbound approach and northbound approach are expected to be over capacity with failing Levels-of-Service during the PM peak hour of both years. Additionally, the westbound left-turn lane is anticipated to have inadequate storage under the Opening Year 2030 and Design Year 2050 'No-Build' conditions.

A field visit was conducted at the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection during both the AM and PM peak hours. During the AM peak hour, eastbound queue lengths were observed up to 600' with heavy lane utilization in the eastbound left thru lane. Although the current eastbound queue is not too long, the 95th percentile queue length is anticipated to be 3,000' under the Opening Year 2030 'No-Build' conditions and 3,600' under the Design Year 2050 'No-Build' conditions as traffic volumes continue to increase. During the PM peak hour, long northbound I-77 SB off ramp queues up to 1,400' were observed with vehicles queueing beyond the I-77 / Pleasant Valley Road overpass. The length of the I-77 SB off ramp queue is anticipated to increase to over 1,800' under the Design Year 2050 'No-Build' conditions with vehicles queueing onto I-77 SB.



Pleasant Valley Road / I-77 NB Ramps

Table 5 summarizes the results of the capacity analysis for the Pleasant Valley Road / I-77 NB Ramps intersection under the Opening Year 2030 and Design Year 2050 'No-Build' traffic conditions during the AM and PM peak hours. See **Appendix G** for the 'No-Build' HCS Intersection Capacity Analysis printouts.

Table 5: HCS Intersection Capacity Analysis Summary Opening Year 2030 and Design Year 2050 'No-Build' Conditions Pleasant Valley Road / I-77 NB Ramps										
Movement	'No-Build' Condition									
	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)
	AM Peak Hour					PM Peak Hour				
Opening Year 2030										
EB Left	F	75.5	1.106	4.76	1,190	D	47.6	0.881	1.62	405
EB Thru	A	0.3	0.327	0.01	6	A	3.1	0.308	0.06	57
EB Approach	D	41.9	-	-	-	B	17.3	-	-	-
WB Thru	F	181.5	1.260	0.48	932	C	32.6	0.886	0.30	593
WB Thru-Right	F	216.5	1.337	0.48	887	D	36.3	0.887	0.29	562
WB Approach	F	198.1	-	-	-	C	34.4	-	-	-
SB Left-Thru	E	63.5	0.831	2.06	288	D	35.9	0.263	0.91	128
SB Right	A	0.0	-	-	-	A	0.0	-	-	-
SB Approach	C	33.9	-	-	-	A	7.4	-	-	-
Intersection Total	F	82.0	-	-	-	C	23.3	-	-	-
Design Year 2050										
EB Left	F	158.0	1.302	8.39	2,098	D	53.4	0.905	1.86	464
EB Thru	A	0.4	0.382	0.01	7	A	3.2	0.352	0.06	66
EB Approach	F	87.6	-	-	-	B	19.3	-	-	-
WB Thru	F	265.5	1.438	0.64	1,249	F	79.1	1.068	0.53	1,027
WB Thru-Right	F	298.5	1.530	0.63	1,171	F	101.3	1.125	0.55	1,067
WB Approach	F	276.5	-	-	-	F	89.7	-	-	-
SB Left-Thru	E	66.2	0.853		329	D	36.4	0.300		148
SB Right	A	0.0	-	-	-	A	0.0	-	-	-
SB Approach	D	35.1	-	-	-	A	7.5	-	-	-
Intersection Total	F	131.0	-	-	-	D	49.5	-	-	-

Note: Yellow highlighted cells indicate a Level-of-Service D

Orange highlighted cells indicate a Level-of-Service E, $1 > v/c \text{ ratio} > 0.93$

Red highlighted cells indicate a Level-of-Service F, $v/c \geq 1.0$, $QSR \geq 1.0$

As shown in **Table 5**, the Pleasant Valley Road / I-77 NB Ramps intersection eastbound approach and overall intersection are anticipated to be over capacity with failing Levels-of-Service under the Opening Year 2030 and Design Year 2050 'No-Build' conditions during the AM peak hour. The westbound approach is expected to be over capacity with failing Levels-of-Service under the Opening Year 2030 'No-Build' conditions during the AM peak hour and under the Design Year 2050 'No-Build' conditions during both peak hours. Additionally, the eastbound left-turn lane is



anticipated to have inadequate storage under the Opening Year 2030 and Design Year 2050 'No-Build' conditions.

A field visit was conducted at the Pleasant Valley Road / I-77 NB Ramps intersection during both the AM and PM peak hours. Eastbound left-turning vehicles were observed queueing up to 900'. The eastbound 95th percentile queue length is anticipated to be 1,200' under the Opening Year 2030 'No-Build' conditions and 2,100' under the Design Year 2050 'No-Build' conditions with vehicles expected to queue beyond the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection.

Pleasant Valley Road / Midland Road

Table 6 summarizes the results of the capacity analysis for the Pleasant Valley Road / Midland Road intersection under the Opening Year 2030 and Design Year 2050 'No-Build' traffic conditions during the AM and PM peak hours. See **Appendix G** for the 'No-Build' HCS Intersection Capacity Analysis printouts.

Table 6: HCS Intersection Capacity Analysis Summary Opening Year 2030 and Design Year 2050 'No-Build' Conditions Pleasant Valley Road / Midland Road										
Movement	'No-Build' Condition									
	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)
	AM Peak Hour					PM Peak Hour				
Opening Year 2030										
EB Left	A	2.6	0.007	0.01	1	A	1.8	0.120	0.07	6
EB Thru	A	0.7	0.376	0.03	14	A	0.5	0.280	0.02	9
EB Thru-Right	A	0.7	0.376	0.03	14	A	0.5	0.280	0.02	9
EB Approach	A	0.7	-	-	-	A	0.5	-	-	-
WB Left	A	2.5	0.014	0.01	1	A	2.5	0.018	0.02	2
WB Thru	A	0.4	0.255	0.02	8	A	1.3	0.519	0.05	24
WB Thru-Right	A	0.4	0.255	0.02	8	A	1.4	0.522	0.05	24
WB Approach	A	0.5	-	-	-	A	1.3	-	-	-
NB Left-Thru-Right	E	56.1	0.514	0.36	125	E	56.4	0.321	0.17	61
NB Approach	E	56.1	-	-	-	E	56.4	-	-	-
SB Left-Thru-Right	E	56.6	0.576	0.49	146	E	56.5	0.342	0.21	63
SB Approach	E	56.6	-	-	-	E	56.5	-	-	-
Intersection Total	A	5.9	-	-	-	A	3.0	-	-	-

Note: Orange highlighted cells indicate a Level-of-Service E, $1 > v/c \text{ ratio} > 0.93$



**Table 6: HCS Intersection Capacity Analysis Summary
Opening Year 2030 and Design Year 2050 'No-Build' Conditions
Pleasant Valley Road / Midland Road (Cont.)**

Movement	No-Build' Condition									
	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)
	AM Peak Hour					PM Peak Hour				
Design Year 2050										
EB Left	A	2.9	0.009	0.01	1	A	1.9	0.157	0.08	7
EB Thru	A	1.0	0.439	0.04	18	A	0.6	0.322	0.02	11
EB Thru-Right	A	1.0	0.439	0.04	18	A	0.6	0.322	0.02	11
EB Approach	A	1.0	-	-	-	A	0.7	-	-	-
WB Left	A	2.8	0.018	0.02	2	A	2.5	0.023	0.03	2
WB Thru	A	0.6	0.298	0.02	10	A	1.8	0.594	0.07	33
WB Thru-Right	A	0.6	0.298	0.02	10	A	1.9	0.602	0.07	34
WB Approach	A	0.6	-	-	-	A	1.8	-	-	-
NB Left-Thru-Right	E	55.4	0.543	0.41	142	E	56.9	0.374	0.21	72
NB Approach	E	55.4	-	-	-	E	56.9	-	-	-
SB Left-Thru-Right	E	55.5	0.592	0.55	166	E	56.9	0.384	0.24	72
SB Approach	E	55.5	-	-	-	E	56.9	-	-	-
Intersection Total	A	5.9	-	-	-	A	3.4	-	-	-

Note: Orange highlighted cells indicate a Level-of-Service E, 1 > v/c ratio > 0.93

As shown in **Table 6**, all movements and approaches at the Pleasant Valley Road / Midland Road intersection are anticipated to operate with acceptable Levels-of-Service, have sufficient roadway capacity, and adequate turn lane lengths under the Opening Year 2030 and Design Year 2050 'No-Build' conditions during both the AM and PM peak hours.

Pleasant Valley Road / Brecksville Road

Table 7 summarizes the results of the capacity analysis for the Pleasant Valley Road / Brecksville Road intersection under the Opening Year 2030 and Design Year 2050 'No-Build' traffic conditions during the AM and PM peak hours. It should be noted that the proposed eastbound and westbound right-turn lanes are included in the 'No-Build' condition. See **Appendix G** for the 'No-Build' HCS Intersection Capacity Analysis printouts.



Table 7: HCS Intersection Capacity Analysis Summary
Opening Year 2030 and Design Year 2050 'No-Build' Conditions
Pleasant Valley Road / Brecksville Road

Movement	'No-Build' Condition									
	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)
	AM Peak Hour					PM Peak Hour				
Opening Year 2030										
EB Left	C	27.2	0.582	0.52	203	C	28.7	0.691	0.41	158
EB Thru	D	38.6	0.746	0.49	488	C	28.0	0.410	0.26	263
EB Right	D	38.7	0.746	0.48	471	C	28.1	0.416	0.25	243
EB Approach	D	36.5	-	-	-	C	28.2	-	-	-
WB Left	C	32.0	0.320	0.21	57	C	22.0	0.415	0.49	133
WB Thru	D	38.0	0.519	0.29	286	D	38.3	0.766	0.52	521
WB Right	D	38.2	0.526	0.28	268	D	38.5	0.766	0.51	497
WB Approach	D	37.5	-	-	-	D	36.1	-	-	-
NB Left	C	23.1	0.241	0.25	101	C	29.1	0.407	0.22	90
NB Thru	C	31.3	0.429	0.45	253	C	31.3	0.272	0.28	155
NB Right	C	29.7	0.429	0.62	247	C	23.2	0.078	0.10	41
NB Approach	C	29.8	-	-	-	C	30.0	-	-	-
SB Left	C	22.9	0.467	0.50	160	C	26.4	0.227	0.25	81
SB Thru	C	26.0	0.209	0.16	125	D	39.5	0.684	0.49	388
SB Right	B	18.8	0.223	0.37	130	D	35.3	0.672	1.17	410
SB Approach	C	23.2	-	-	-	D	37.2	-	-	-
Intersection Total	C	32.3	-	-	-	C	34.1	-	-	-
Design Year 2050										
EB Left	C	26.0	0.643	0.56		C	34.1	0.806	0.48	188
EB Thru	D	38.8	0.788	0.55		C	26.6	0.441	0.29	289
EB Right	D	38.9	0.788	0.55		C	26.7	0.446	0.27	265
EB Approach	D	36.5	-	-	-	C	28.5	-	-	-
WB Left	C	31.1	0.379	0.24		C	20.7	0.469	0.54	145
WB Thru	D	36.7	0.550	0.32		D	40.3	0.823	0.60	604
WB Right	D	36.9	0.555	0.30		D	40.8	0.825	0.59	578
WB Approach	D	36.2	-	-	-	D	37.8	-	-	-
NB Left	C	26.5	0.306	0.31		D	35.1	0.583	0.28	112
NB Thru	D	37.8	0.568	0.55		D	35.7	0.353	0.34	191
NB Right	D	36.6	0.554	0.76		C	25.9	0.098	0.13	51
NB Approach	D	36.0	-	-	-	C	34.5	-	-	-
SB Left	C	26.7	0.605	0.62		C	29.5	0.298	0.31	99
SB Thru	C	30.1	0.269	0.20		D	54.2	0.894	0.63	505
SB Right	C	21.8	0.275	0.47		D	48.0	0.835	1.52	532
SB Approach	C	26.9	-	-	-	D	50.4	-	-	-
Intersection Total	C	34.5	-	-	-	D	39.9	-	-	-

Note: Yellow highlighted cells indicate a Level-of-Service D
 Red highlighted cells indicate a Level-of-Service F, v/c ≥ 1.0, QSR ≥ 1.0



As shown in **Table 7**, all movements and approaches at the Pleasant Valley Road / Brecksville Road intersection are anticipated to operate with acceptable Levels-of-Service and have sufficient roadway capacity under the Opening Year 2030 and Design Year 2050 'No-Build' conditions during both the AM and PM peak hours. The existing southbound right-turn is expected to be undersized during the PM peak hour under the Opening Year 2030 and Design Year 2050 'No-Build' conditions. Although this turn lane is expected to be undersized, operations along Brecksville Road are not anticipated to be affected, as vehicles desiring to make a southbound right-turn queueing in the right thru lane will not cause additional delay.

'Build' Peak Hour Intersection Capacity Analysis

Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive

Table 8 summarizes the results of the capacity analysis for the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection under the Opening Year 2030 and Design Year 2050 'Build Alternative 1' traffic conditions during the AM and PM peak hours. See **Appendix H** for the 'Build Alternative 1' HCS Intersection Capacity Analysis printouts.

Table 8: HCS Intersection Capacity Analysis Summary Opening Year 2030 and Design Year 2050 'Build Alternative 1' Conditions Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive										
Movement	'Build Alternative 1' Condition									
	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)
	AM Peak Hour					PM Peak Hour				
Opening Year 2030										
EB Left	B	13.4	0.040	0.12	13	D	39.9	0.266	0.29	31
EB Thru	C	28.4	0.805	0.25	615	E	58.6	0.853	0.16	382
EB Right	C	21.7	0.507	2.09	314	D	50.6	0.576	1.58	237
EB Approach	C	26.8	-	-	-	E	56.1	-	-	-
WB Left	C	34.5	0.729	0.42	137	D	46.8	0.822	0.85	276
WB Thru	A	8.6	0.232	0.09	91	E	67.5	0.975	0.66	672
WB Thru-Right	A	8.6	0.235	0.09	87	E	68.3	0.975	0.64	350
WB Approach	B	15.3	-	-	-	E	63.8	-	-	-
NB Left-Thru	D	54.9	0.723	0.26	306	F	111.4	1.142	1.19	1,424
NB Right	A	0.0	-	-	-	A	0.0	-	-	-
NB Approach	B	18.2	-	-	-	E	74.7	-	-	-
SB Left-Thru	E	71.0	0.809	0.39	193	E	60.9	0.603	0.18	91
SB Right	D	51.4	0.086	0.13	15	E	56.7	0.336	0.38	42
SB Approach	E	69.3	-	-	-	E	59.5	-	-	-
Intersection Total	C	24.5	-	-	-	E	66.1	-	-	-

Note: Yellow highlighted cells indicate a Level-of-Service D
 Orange highlighted cells indicate a Level-of-Service E, $1 > v/c \text{ ratio} > 0.93$
 Red highlighted cells indicate a Level-of-Service F, $v/c \geq 1.0$, $QSR \geq 1.0$



Table 8: HCS Intersection Capacity Analysis Summary
Opening Year 2030 and Design Year 2050 'Build Alternative 1' Conditions
Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive

Movement	'Build Alternative 1' Condition									
	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)
	AM Peak Hour					PM Peak Hour				
Design Year 2050										
EB Left	B	13.4	0.048	0.14	15	D	39.9	0.396	0.34	36
EB Thru	D	36.3	0.921	0.32	787	E	76.0	0.976	0.20	481
EB Right	C	23.5	0.580	2.46	368	D	54.3	0.659	1.82	273
EB Approach	C	33.3	-	-	-	E	69.9	-	-	-
WB Left	F	98.5	1.006	0.81	264	F	91.0	1.022	1.28	416
WB Thru	A	8.9	0.267	0.10	107	F	112.2	1.122	0.93	957
WB Thru-Right	A	9.0	0.270	0.10	102	F	114.0	1.125	0.91	929
WB Approach	C	32.3	-	-	-	F	108.9	-	-	-
NB Left-Thru	E	72.3	0.874	0.32	389	F	180.4	1.311	1.72	2,067
NB Right	A	0.0	-	-	-	A	0.0	-	-	-
NB Approach	C	24.0	-	-	-	F	121.1	-	-	-
SB Left-Thru	E	75.3	0.829	0.45	222	E	63.1	0.684	0.21	107
SB Right	D	50.3	0.092	0.16	17	E	57.1	0.377	0.44	48
SB Approach	E	73.1	-	-	-	E	61.2	-	-	-
Intersection Total	C	32.7	-	-	-	F	103.5	-	-	-

Note: Yellow highlighted cells indicate a Level-of-Service D
 Orange highlighted cells indicate a Level-of-Service E, $1 > v/c \text{ ratio} > 0.93$
 Red highlighted cells indicate a Level-of-Service F, $v/c \geq 1.0$, $QSR \geq 1.0$

As shown in **Table 8**, improvements to the roadway capacity and Levels-of-Service are anticipated under the 'Build Alternative 1' conditions for the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection compared to the 'No-Build' conditions. Although improvements are expected, the westbound approach, northbound approach, and overall intersection of the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection are anticipated to be over capacity with failing Levels-of-Service under the Design Year 2050 'Build Alternative 1' conditions during the PM peak hour. The westbound left-turn lane is expected to be over capacity during the AM peak hour. The proposed eastbound right-turn lane is anticipated to be undersized, however the turn lane will improve the capacity of the approach and there is limited space to construct a longer right-turn lane. The addition of the northbound right-turn unsignalized channelized lane will allow vehicles to not be blocked by queueing vehicles and increase the overall capacity of the approach, however one northbound left-thru lane does not provide adequate vehicular capacity for these turning movements.

Table 9 summarizes the results of the capacity analysis for the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection under the Opening Year 2030 and Design Year 2050 'Build Alternative 2' traffic conditions during the AM and PM peak hours. See **Appendix I** for the 'Build Alternative 2' HCS Intersection Capacity Analysis printouts.



Table 9: HCS Intersection Capacity Analysis Summary Opening Year 2030 and Design Year 2050 'Build Alternative 2' Conditions Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive										
Movement	'Build Alternative 2' Condition									
	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)
	AM Peak Hour					PM Peak Hour				
Opening Year 2030										
EB Left	B	19.8	0.050	0.15	16	D	36.0	0.213	0.27	29
EB Thru	F	59.5	1.002	0.35	853	D	47.5	0.723	0.14	348
EB Right	C	32.8	0.631	2.56	383	D	43.9	0.488	1.48	222
EB Approach	D	53.2	-	-	-	D	46.3	-	-	-
WB Left	F	99.1	0.993	0.78	252	D	36.6	0.749	0.76	247
WB Thru	B	15.8	0.284	0.14	143	D	46.9	0.878	0.55	563
WB Thru-Right	B	15.9	0.288	0.14	136	D	47.4	0.878	0.54	544
WB Approach	D	37.5	-	-	-	D	45.1	-	-	-
NB Left-Thru	C	34.5	0.324	0.17	179	D	42.1	0.860	0.63	659
NB Right	F	149.2	1.192	0.96	1,007	F	83.9	1.054	0.96	1,011
NB Approach	F	122.1	-	-	-	E	64.4	-	-	-
SB Left-Thru	E	71.0	0.809	0.39	193	E	61.3	0.603	0.18	91
SB Right	D	51.4	0.086	0.13	15	E	56.7	0.336	0.38	42
SB Approach	E	69.3	-	-	-	E	59.8	-	-	-
Intersection Total	E	65.3	-	-	-	D	53.1	-	-	-
Design Year 2050										
EB Left	B	19.8	0.061	0.18	19	D	37.7	0.296	0.32	34
EB Thru	F	109.6	1.146	0.52	1,263	D	53.6	0.837	0.17	413
EB Right	D	36.5	0.722	1.22	456	D	46.6	0.565	1.70	255
EB Approach	F	92.6	-	-	-	D	51.4	-	-	-
WB Left	F	144.2	1.141	1.03	336	E	60.7	0.922	1.05	341
WB Thru	B	16.4	0.327	0.16	169	F	71.8	1.010	0.76	780
WB Thru-Right	B	16.5	0.330	0.16	160	F	73.2	1.013	0.75	758
WB Approach	D	49.8	-	-	-	E	70.2	-	-	-
NB Left-Thru	D	36.1	0.383	0.20	206	F	81.9	1.051	1.04	1,056
NB Right	F	241.5	1.411	1.38	1,447	F	114.7	1.140	1.19	1,248
NB Approach	F	193.0	-	-	-	F	98.4	-	-	-
SB Left-Thru	E	75.3	0.829	0.45	222	E	67.7	0.684	0.23	113
SB Right	D	50.3	0.092	0.16	17	E	57.1	0.377	0.44	48
SB Approach	E	73.1	-	-	-	E	64.3	-	-	-
Intersection Total	F	104.9	-	-	-	E	76.6	-	-	-

Note: Yellow highlighted cells indicate a Level-of-Service D
 Orange highlighted cells indicate a Level-of-Service E, $1 > v/c \text{ ratio} > 0.93$
 Red highlighted cells indicate a Level-of-Service F, $v/c \geq 1.0$, $QSR \geq 1.0$



As shown in **Table 9**, 'Build Alternative 2' provides minimal improvements to the Levels-of-Service and capacity compared to the 'No-Build' conditions at the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection. The eastbound approach, westbound left turning movement, northbound approach and overall intersection are anticipated to be over capacity with failing Levels-of-Service under the Opening Year 2030 and Design Year 2050 'Build Alternative 2' conditions during the AM peak hour. Failing LOS is expected at the westbound approach, northbound approach, and overall intersection during the PM peak hour. The westbound left-turn lane is anticipated to be undersized during both peak hours. The proposed eastbound right-turn lane is anticipated to be undersized, however the turn lane will improve the capacity of the approach and there is limited space to construct a longer right-turn lane. Northbound, the additional left-turn lane provides thru and left turning vehicles adequate capacity, however unlike 'Build Alternative 1', right turning vehicles no longer have a channelized right-turn lane. Vehicles utilizing the left-thru lane will frequently block access to the unsignalized right turning movement.

Table 10 summarizes the results of the capacity analysis for the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection under the Opening Year 2030 and Design Year 2050 'Build Alternative 3' traffic conditions during the AM and PM peak hours. See **Appendix J** for the 'Build Alternative 3' HCS Intersection Capacity Analysis printouts.

Table 10: HCS Intersection Capacity Analysis Summary Opening Year 2030 and Design Year 2050 'Build Alternative 3' Conditions Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive										
Movement	'Build Alternative 3' Condition									
	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)
	AM Peak Hour					PM Peak Hour				
Opening Year 2030										
EB Left	A	9.6	0.035	0.10	10	C	24.9	0.129	0.22	23
EB Thru	B	19.9	0.706	0.21	512	C	31.5	0.484	0.12	288
EB Right	B	15.8	0.444	1.78	267	C	29.8	0.326	1.23	185
EB Approach	B	18.9	-	-	-	C	30.9	-	-	-
WB Left	C	20.2	0.631	0.31	100	C	22.3	0.600	0.60	196
WB Thru	A	4.9	0.207	0.06	59	C	23.7	0.675	0.37	382
WB Thru-Right	A	5.0	0.209	0.06	56	C	23.9	0.675	0.36	369
WB Approach	A	8.9	-	-	-	C	23.5	-	-	-
NB Left	D	53.3	0.520	0.14	152	D	42.9	0.755	0.43	455
NB Left-Thru	E	55.3	0.576	0.17	178	D	52.2	0.869	0.54	567
NB Right	A	0.0	-	-	-	A	0.0	-	-	-
NB Approach	B	18.0	-	-	-	C	32.1	-	-	-
SB Left-Thru	E	74.2	0.812	0.40	198	E	60.9	0.603	0.18	91
SB Right	D	51.4	0.086	0.13	15	E	56.7	0.336	0.38	42
SB Approach	E	72.3	-	-	-	E	59.5	-	-	-
Intersection Total	B	18.9	-	-	-	C	29.4	-	-	-

Note: Yellow highlighted cells indicate a Level-of-Service D
 Orange highlighted cells indicate a Level-of-Service E, $1 > v/c \text{ ratio} > 0.93$



Table 10: HCS Intersection Capacity Analysis Summary
Opening Year 2030 and Design Year 2050 'Build Alternative 3' Conditions
Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive

Movement	'Build Alternative 3' Condition									
	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)
	AM Peak Hour					PM Peak Hour				
Design Year 2050										
EB Left	A	9.8	0.042	0.11	12	C	26.8	0.187	0.26	27
EB Thru	C	24.1	0.816	0.27	647	C	33.3	0.559	0.14	333
EB Right	B	17.5	0.514	2.11	316	C	31.1	0.377	1.41	212
EB Approach	C	22.5	-	-	-	C	32.6	-	-	-
WB Left	D	41.5	0.836	0.58	188	C	32.5	0.769	0.77	249
WB Thru	A	5.2	0.238	0.07	70	C	29.8	0.792	0.48	495
WB Thru-Right	A	5.2	0.240	0.07	66	C	30.2	0.794	0.47	480
WB Approach	B	14.7	-	-	-	C	30.5	-	-	-
NB Left	E	60.3	0.648	0.18	188	D	48.9	0.842	0.52	545
NB Left-Thru	E	65.5	0.720	0.21	220	E	69.3	0.969	0.69	726
NB Right	A	0.0	-	-	-	A	0.0	-	-	-
NB Approach	C	21.0	-	-	-	D	40.2	-	-	-
SB Left-Thru	E	78.8	0.831	0.46	228	E	63.1	0.684	0.21	107
SB Right	D	50.4	0.092	0.16	17	E	5.1	0.377	0.44	48
SB Approach	E	76.3	-	-	-	E	61.2	-	-	-
Intersection Total	C	22.8	-	-	-	D	35.4	-	-	-

Note: Yellow highlighted cells indicate a Level-of-Service D
 Orange highlighted cells indicate a Level-of-Service E, 1 > v/c ratio > 0.93

As shown in **Table 10**, all movements and approaches at the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection are anticipated to operate with acceptable Levels-of-Service and have sufficient roadway capacity under the Opening Year 2030 and Design Year 2050 'Build Alternative 3' conditions during both the AM and PM peak hours. Although the proposed 200' eastbound right-turn lane is anticipated to be undersized, the turn lane will improve the capacity of the approach and there is limited space to construct a longer right-turn lane.

To determine the required widening of the I-77 SB Off-Ramp for each Build Alternative, the maximum queue length expected at the northbound approach of the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection under Design Year 2050 'Build' conditions was evaluated using *Synchro*. While *HCS 2024* calculates the capacity for each turning movement by approach, it does not account for interactions between adjacent traffic lanes. A northbound queue length of approximately 4,000' is expected under 'Build Alternative 1,' during the PM peak hour, requiring the I-77 SB Off-Ramp to be widened up to the I-77 Hillside Road overpass. One left-turn lane is currently provided for the I-77 SB off-ramp, and an additional lane would need to be added along the entire length, even though the right-turn channelized lane does not require full widening. This widening would also require the existing I-77 bridge over Pleasant Valley Road to be widened, which would be expensive. Additionally, there is concern



that some left-turning vehicles may queue into the right lane. Overall, 'Build Alternative 1' is an expensive option with minimal positive impact for the interchange. Under 'Build Alternative 2,' the I-77 SB Off-Ramp is expected to have a queue of approximately 2,800', with an additional queue of around 1,300' in the right lane of the loop ramp during the PM peak hour. In this alternative, the I-77 SB Off-Ramp is widened up to the I-77 bridge over Pleasant Valley Road. While vehicles will still queue onto I-77, traffic flow will improve once they reach the loop ramp, due to the dual left-turn lanes. The right-turn channelized movement is expected to be blocked only for short periods. 'Build Alternative 2' is much less expensive than 'Build Alternative 1' since the I-77 bridge over Pleasant Valley Road will not need to be widened. In 'Build Alternative 3,' a maximum queue length of approximately 1,300' is expected during the PM peak hour. Providing three lanes on the loop ramps prevents the right-turn channelized lane from being blocked most of the time. Like 'Build Alternative 2,' 'Build Alternative 3' is a cost-efficient solution and allows vehicles access to the channelized right-turn lane the majority of the time. See **Appendix I** for the queue analysis for the northbound approach of the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection.

Pleasant Valley Road / I-77 NB Ramps

Table 11 summarizes the results of the capacity analysis for the Pleasant Valley Road / I-77 NB Ramps intersection under the Opening Year 2030 and Design Year 2050 'Build Alternative 4' traffic conditions during the AM and PM peak hours. See **Appendix K** for the 'Build Alternative 4' HCS Intersection Capacity Analysis printouts.

Table 11: HCS Intersection Capacity Analysis Summary Opening Year 2030 and Design Year 2050 'Build Alternative 4' Conditions Pleasant Valley Road / I-77 NB Ramps										
Movement	'Build Alternative 4' Condition									
	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)
	AM Peak Hour					PM Peak Hour				
Opening Year 2030										
EB Left	D	36.4	0.887	1.03	514	D	53.4	0.758	0.44	219
EB Thru	A	2.0	0.626	0.04	37	A	5.2	0.586	0.14	144
EB Approach	C	21.1	-	-	-	C	20.6	-	-	-
WB Thru	C	22.9	0.361	0.09	182	B	14.2	0.487	0.11	221
WB Right	C	34.2	0.730	1.52	380	B	19.9	0.684	1.31	326
WB Approach	C	28.3	-	-	-	B	16.4	-	-	-
SB Left-Thru	E	58.3	0.809	2.02	283	D	35.9	0.263	0.95	133
SB Right	A	0.0	-	-	-	A	0.0	-	-	-
SB Approach	C	31.1	-	-	-	A	7.4	-	-	-
Intersection Total	C	24.1	-	-	-	B	16.2	-	-	-

Note: Yellow highlighted cells indicate a Level-of-Service D

Orange highlighted cells indicate a Level-of-Service E, $1 > v/c \text{ ratio} > 0.93$

Red highlighted cells indicate a Level-of-Service F, $v/c \geq 1.0$, $QSR \geq 1.0$



**Table 11: HCS Intersection Capacity Analysis Summary
Opening Year 2030 and Design Year 2050 'Build Alternative 4' Conditions
Pleasant Valley Road / I-77 NB Ramps**

Movement	'Build Alternative 4' Condition									
	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)
	AM Peak Hour					PM Peak Hour				
Design Year 2050										
EB Left	D	49.2	0.978	1.34	670	D	52.1	0.777	0.48	241
EB Thru	A	3.4	0.732	0.06	60	A	6.3	0.670	0.17	177
EB Approach	C	28.8	-	-	-	C	21.0	-	-	-
WB Thru	C	26.9	0.450	0.11	224	B	16.5	0.574	0.14	272
WB Right	D	54.6	0.912	2.18	545	C	27.0	0.808	1.79	447
WB Approach	D	40.0	-	-	-	C	20.6	-	-	-
SB Left-Thru	E	59.7	0.828	2.30	322	D	36.4	0.300	1.10	154
SB Right	A	0.0	-	-	-	A	0.0	-	-	-
SB Approach	C	31.7	-	-	-	A	7.5	-	-	-
Intersection Total	C	32.1	-	-	-	B	18.2	-	-	-

Note: Yellow highlighted cells indicate a Level-of-Service D

Orange highlighted cells indicate a Level-of-Service E, $1 > v/c \text{ ratio} > 0.93$

Red highlighted cells indicate a Level-of-Service F, $v/c \geq 1.0$, $QSR \geq 1.0$

As shown in **Table 11**, all movements and approaches at the Pleasant Valley Road / I-77 NB Ramps intersection are anticipated to operate with acceptable Levels-of-Service and have sufficient roadway capacity under the Opening Year 2030 and Design Year 2050 'Build Alternative 4' conditions during both the AM and PM peak hours. The eastbound left turning movement is expected to be approaching capacity under the Design Year 2050 conditions during the AM peak hour. The eastbound left-turn lanes will still be undersized, however the lengthened turn lane provides additional storage, and vehicles are able to queue in the left thru lane before the left-turn lane begins. Although the proposed 300' westbound right-turn lane is anticipated to be undersized, the turn lane will likely have adequate storage. *HCS 2024* cannot analyze a westbound right-turn overlap phase during the southbound phase, however an overlap can be programmed into the controller to process these right-turns and reduce the anticipated queues. Southbound left turning vehicles are likely going to block the unsignalized right turning movement, however queues are not likely to stack up to the highway. The Pleasant Valley Road / I-77 NB Ramps intersection can operate with acceptable LOS with one eastbound thru lane with no roadway widening required.

Table 12 summarizes the results of the capacity analysis for the Pleasant Valley Road / I-77 NB Ramps intersection under the Opening Year 2030 and Design Year 2050 'Build Alternative 5' traffic conditions during the AM and PM peak hours. See **Appendix L** for the 'Build Alternative 5' HCS Intersection Capacity Analysis printouts.



Table 12: HCS Intersection Capacity Analysis Summary
Opening Year 2030 and Design Year 2050 'Build Alternative 5' Conditions
Pleasant Valley Road / I-77 NB Ramps

Movement	'Build Alternative 5' Condition									
	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)	LOS	Delay (sec)	V/C Ratio	QSR	95 th % Queue (feet)
	AM Peak Hour					PM Peak Hour				
Opening Year 2030										
EB Left	D	36.4	0.887	1.03	514	D	53.4	0.758	0.44	219
EB Thru	A	0.3	0.329	0.01	6	A	3.1	0.308	0.07	57
EB Approach	C	20.3	-	-	-	B	19.1	-	-	-
WB Thru	C	22.9	0.361	0.09	182	B	14.2	0.487	0.11	221
WB Right	C	34.2	0.730	1.52	380	B	19.9	0.684	1.31	326
WB Approach	C	28.3	-	-	-	B	16.4	-	-	-
SB Left-Thru	E	58.3	0.809	2.02	283	D	35.9	0.263	0.95	133
SB Right	A	0.0	-	-	-	A	0.0	-	-	-
SB Approach	C	31.1	-	-	-	A	7.4	-	-	-
Intersection Total	C	23.7	-	-	-	B	15.7	-	-	-
Design Year 2050										
EB Left	D	49.2	0.978	1.34	670	D	52.1	0.777	0.48	241
EB Thru	A	0.4	0.384	0.01	7	A	3.2	0.352	0.08	66
EB Approach	C	27.4	-	-	-	B	18.8	-	-	-
WB Thru	C	26.9	0.450	0.11	224	B	16.5	0.574	0.14	272
WB Right	D	54.6	0.912	2.18	545	C	27.0	0.808	1.79	447
WB Approach	D	40.0	-	-	-	C	20.6	-	-	-
SB Left-Thru	E	59.7	0.828	2.30	322	D	36.4	0.300	1.10	154
SB Right	A	0.0	-	-	-	A	0.0	-	-	-
SB Approach	C	31.7	-	-	-	A	7.5	-	-	-
Intersection Total	C	31.3	-	-	-	B	17.5	-	-	-

Note: Yellow highlighted cells indicate a Level-of-Service D

Orange highlighted cells indicate a Level-of-Service E, $1 > v/c \text{ ratio} > 0.93$

Red highlighted cells indicate a Level-of-Service F, $v/c \geq 1.0$, $QSR \geq 1.0$

As shown in **Table 12**, all movements and approaches at the Pleasant Valley Road / I-77 NB Ramps intersection are anticipated to operate with acceptable Levels-of-Service and have sufficient roadway capacity under the Opening Year 2030 and Design Year 2050 'Build Alternative 5' conditions during both the AM and PM peak hours. The eastbound left turning movement is expected to be approaching capacity under the Design Year 2050 conditions during the AM peak hour while the westbound thru-right turning movement is expected to be approaching capacity during the PM peak hour. The eastbound left-turn lanes will still be undersized, however the lengthened turn lane provides additional storage. Although the proposed 300' westbound right-turn lane is anticipated to be undersized, the turn lane will likely have adequate storage. HCS 2024 cannot analyze a westbound right-turn overlap phase during the southbound phase, however an overlap can be programmed into the controller to process these right-turns and reduce the anticipated queues. Southbound



left turning vehicles are likely going to block the unsignalized right turning movement, however queues are not likely to stack up to the highway.

Freeway Capacity Analysis

Freeway capacity analyses were performed for the Opening Year 2030 and Design Year 2050 'No-Build' and 'Build' scenarios to determine the operating conditions that would be expected at each freeway segment of the I-77 / Pleasant Valley Road interchange. The quality of the operating conditions experienced by a freeway segment is measured in terms of Level-of-Service (LOS). Levels-of-Service can range from LOS A to LOS F.

Level-of-Service A, B, C and D are considered acceptable in an area within Metropolitan Planning Organization (MPO) for basic, merge, diverge, and weave segments. Level-of-Service E and F is considered unacceptable with significant density of traffic on a freeway segment. The thresholds related to average density for a freeway segment are as follows:

<i>Level-of- Service</i>	<i>Density Threshold – (pc/mi/ln)</i>
A	< 11
B	> 11 – 18
C	> 18 – 26
D	> 26 – 35
E	> 35 – 45
F	> 45

The quantity of vehicles a freeway segment has sufficient capacity for is measured with the demand-to-capacity ratio (d/c). A d/c less than 0.93 is considered acceptable. For a facilities analysis, a single freeway segment with a d/c over 1.0 results in a facility-wide LOS F.

'No-Build' Peak Hour Freeway Capacity Analysis

Table 13 summarizes the results of the freeway capacity analysis for the I-77 / Pleasant Valley Road interchange under the Opening Year 2030 and Design Year 2050 'No-Build' traffic conditions during the AM and PM peak hours. See **Appendix M** for the 'No-Build' HCS Freeway Capacity Analysis printouts.



**Table 13: HCS Freeway Capacity Analysis Summary
Opening Year 2030 and Design Year 2050 'No-Build' Conditions
I-77 / Pleasant Valley Road Interchange**

Analysis Type	Location	'No-Build' Condition					
		LOS	D/C		LOS	D/C	
			Free-way	Ramp		Free-way	Ramp
		AM Peak Hour			PM Peak Hour		
NB I-77							
Opening Year 2030							
Basic	NB I-77 South of Pleasant Valley	E	0.96	-	C	0.63	-
Diverge	NB I-77 Pleasant Valley Off Ramp	D	0.98	0.19	C	0.64	0.30
Basic	NB I-77 @ Pleasant Valley	E	0.91	-	C	0.54	-
Merge	NB I-77 Pleasant Valley On Ramp	D	0.84	0.75	C	0.50	0.46
Basic	NB I-77 North of Pleasant Valley	D	0.85	-	C	0.51	-
Design Year 2050							
Basic	NB I-77 South of Pleasant Valley	E	0.96	-	C	0.63	-
Diverge	NB I-77 Pleasant Valley Off Ramp	D	0.98	0.22	C	0.64	0.34
Basic	NB I-77 @ Pleasant Valley	E	0.90	-	C	0.53	-
Merge	NB I-77 Pleasant Valley On Ramp	D	0.86	0.86	C	0.51	0.52
Basic	NB I-77 North of Pleasant Valley	D	0.87	-	C	0.51	-
SB I-77							
Opening Year 2030							
Basic	SB I-77 North of Pleasant Valley	B	0.46	-	D	0.78	-
Diverge	SB I-77 Pleasant Valley Off Ramp	B	0.46	0.35	D	0.78	0.71
Basic	SB I-77 @ Pleasant Valley	C	0.50	-	D	0.82	-
Merge	SB I-77 Pleasant Valley On Ramp	B	0.60	0.31	D	0.90	0.24
Basic	SB I-77 South of Pleasant Valley	C	0.60	-	E	0.90	-
Design Year 2050							
Basic	SB I-77 North of Pleasant Valley	B	0.46	-	D	0.79	-
Diverge	SB I-77 Pleasant Valley Off Ramp	B	0.46	0.40	D	0.79	0.81
Basic	SB I-77 @ Pleasant Valley	C	0.49	-	D	0.81	-
Merge	SB I-77 Pleasant Valley On Ramp	B	0.60	0.36	D	0.90	0.28
Basic	SB I-77 South of Pleasant Valley	C	0.60	-	E	0.90	-

Note: Yellow highlighted cells indicate a Level-of-Service D
Orange highlighted cells indicate a Level-of-Service E, $1 > d/c \text{ ratio} > 0.93$

As shown in **Table 13**, northbound I-77 is expected to be over capacity and experience unacceptable Levels-of-Service at the interchange under the Opening Year 2030 and Design Year 2050 'No-Build' conditions during the AM peak hour, while southbound I-77 is expected to experience unacceptable Levels-of-Service for both analysis years during the PM peak hour south of the interchange.

'Build' Peak Hour Freeway Capacity Analysis

Table 14 summarizes the results of the freeway capacity analysis for the I-77 / Pleasant Valley Road interchange under the Opening Year 2030 and Design Year 2050



'Build' traffic conditions during the AM and PM peak hours. I-77 SB is recommended to be widened to five lanes just south of the Hillside Road overpass to the Pleasant Valley Road with two exit only lanes under all three southbound ramps 'Build' alternatives. It should be noted that there are no proposed changes to the I-77 SB on ramp and I-77 NB was not analyzed under 'Build' conditions as no improvements are considered for the northbound ramps. See **Appendix N** for the 'Build' HCS Freeway Capacity Analysis printouts.

Table 14: HCS Freeway Capacity Analysis Summary Opening Year 2030 and Design Year 2050 'Build' Conditions I-77 / Pleasant Valley Road Interchange							
Analysis Type	Location	'Build' Condition					
		LOS	D/C		LOS	D/C	
			Free-way	Ramp		Free-way	Ramp
		AM Peak Hour			PM Peak Hour		
SB I-77							
Opening Year 2030							
Basic	SB I-77 South of Rockside Road	B	0.43	-	D	0.72	-
Basic	SB I-77 North of Pleasant Valley	B	0.37	-	C	0.62	-
Diverge	SB I-77 Pleasant Valley Off Ramp	A	0.37	0.18	B	0.63	0.36
Basic	SB I-77 @ Pleasant Valley	C	0.50	-	D	0.82	-
Merge	SB I-77 Pleasant Valley On Ramp	B	0.60	0.31	D	0.90	0.24
Basic	SB I-77 South of Pleasant Valley	C	0.60	-	E	0.90	-
Design Year 2050							
Basic	SB I-77 South of Rockside Road	B	0.43	-	D	0.74	-
Basic	SB I-77 North of Pleasant Valley	B	0.37	-	C	0.63	-
Diverge	SB I-77 Pleasant Valley Off Ramp	A	0.37	0.20	B	0.64	0.41
Basic	SB I-77 @ Pleasant Valley	C	0.49	-	D	0.81	-
Merge	SB I-77 Pleasant Valley On Ramp	B	0.60	0.36	D	0.90	0.28
Basic	SB I-77 South of Pleasant Valley	C	0.60	-	E	0.90	-

Note: Yellow highlighted cells indicate a Level-of-Service D
Orange highlighted cells indicate a Level-of-Service E, 1 > d/c ratio > 0.93

As shown in **Table 14**, there are improvements to the Levels-of-Service before and at the I-77 SB off ramp are anticipated under the Opening Year 2030 and Design Year 2050 'Build' conditions during both the AM and PM peak hour. Failing Levels-of-Service are still expected south of the interchange during the PM peak hour. Although failing Levels-of-Service are expected south of the interchange, this is a 'No-Build' condition. The primary focus of the freeway capacity analysis is to ensure the proposed improvements to the interchange in the 'Build' conditions will not degrade the Levels-of-Service compared to the 'No-Build' conditions.

VII. Conceptual Cost Estimates:

Utilizing the proposed renderings for the scenarios presented above, conceptual cost estimates were created, which are summarized in **Table 15** below. Note that the following estimates are preliminary and should not be used for construction, bid,



reliance, recording purposes, or implementation. Cost estimates were created for both interchange intersections and for each combination of 'Build' alternatives. See **Appendix O** for full cost estimate breakdowns for each scenario.

Table 15: Conceptual Cost Estimates		
Alternatives	Description	Total Cost
'Build Alternative 1' + 'Build Alternative 4'	Construct an eastbound right-turn lane at I-77 SB Ramps intersection and lengthen existing westbound left-turn lane. Widen 3,900' of SB I-77 off ramp to two lanes. Construct a westbound right-turn lane and lengthen existing eastbound left-turn lane at I-77 NB ramps intersection. Restripe eastbound approach with two left-turn lanes and one thru lane.	\$8,987,832
'Build Alternative 1' + 'Build Alternative 5'	Construct an eastbound right-turn lane at I-77 SB Ramps intersection and lengthen existing westbound left-turn lane. Widen 3,900' of SB I-77 off ramp to two lanes. Construct a westbound right-turn lane and lengthen existing eastbound left-turn lane at I-77 NB ramps intersection. Widen eastbound approach to include two left-turn lanes and two thru lanes. Remove existing slope protection and install new soldier wall under the I-77 overpass.	\$11,234,456
'Build Alternative 2' + 'Build Alternative 4'	Construct an eastbound right-turn lane at I-77 SB Ramps intersection and lengthen existing westbound left-turn lane. Widen SB I-77 off ramp to two lanes up to the Pleasant Valley bridge with two left-turn lanes at northbound approach. Construct a westbound right-turn lane and lengthen existing eastbound left-turn lane at I-77 NB ramps intersection. Restripe eastbound approach with two left-turn lanes and one thru lane.	\$4,464,528
'Build Alternative 2' + 'Build Alternative 5'	Construct an eastbound right-turn lane at I-77 SB Ramps intersection and lengthen existing westbound left-turn lane. Widen SB I-77 off ramp to two lanes up to the Pleasant Valley bridge with two left-turn lanes at northbound approach. Construct a westbound right-turn lane and lengthen existing eastbound left-turn lane at I-77 NB ramps intersection. Widen eastbound approach to include two left-turn lanes and two thru lanes. Remove existing slope protection and install new soldier wall under the I-77 overpass.	\$6,711,152
'Build Alternative 3' + 'Build Alternative 4'	Construct an eastbound right-turn lane at I-77 SB Ramps intersection and lengthen existing westbound left-turn lane. Widen SB I-77 off ramp to three lanes up to the Pleasant Valley bridge with two left-turn lanes at northbound approach and one dedicated lane for channelized right-turn. Construct a westbound right-turn lane and lengthen existing eastbound left-turn lane at I-77 NB ramps intersection. Restripe eastbound approach with two left-turn lanes and one thru lane.	\$4,636,856
'Build Alternative 3' + 'Build Alternative 5'	Construct an eastbound right-turn lane at I-77 SB Ramps intersection and lengthen existing westbound left-turn lane. Widen SB I-77 off ramp to three lanes up to the Pleasant Valley bridge with two left turn lanes at northbound approach and one dedicated lane for channelized right turn. Construct a westbound right-turn lane and lengthen existing eastbound left-turn lane at I-77 NB ramps intersection. Widen eastbound approach to include two left-turn lanes and two thru lanes. Remove existing slope protection and install new soldier wall under the I-77 overpass.	\$6,883,480



VIII. Recommended Improvements:

Based on the analysis performed at the interchange intersections, GPD recommends constructing 'Build Alternative 3' at the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection. 'Build Alternative 1' and 'Build Alternative 2' do not provide adequate capacity and would both likely have failing LOS if constructed. 'Build Alternative 2' and 'Build Alternative 3' are much less expensive than 'Build Alternative 1' as the I-77 bridge over Pleasant Valley is not recommended to be widened. Constructing the third lane on the I-77 SB off ramp under 'Build Alternative 3' provides a substantial improvement to operations with a marginal increase in cost compared to 'Build Alternative 2'.

GPD recommends constructing 'Build Alternative 5' at the Pleasant Valley Road / I-77 NB Ramps intersection. The Pleasant Valley corridor has two thru lanes in each direction to the east and west of the interchange. If the left thru lane becomes a left-turn only lane at this intersection as recommended under 'Build Alternative 4', it could cause a sideswipe-passing crash pattern from people switching lanes at the last moment. Temporarily removing a thru lane may be confusing for drivers since the rest of the Pleasant Valley corridor contains two thru lanes in each direction. It should be noted that constructing the 300' westbound right-turn lane will require existing utility poles within the right-of-way to be relocated. Utility pole relocation within the right-of-way is not a project expense.

In addition to the previously discussed improvements, GPD recommends reconstructing the traffic signals at the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive and the Pleasant Valley Road / I-77 NB Ramps intersections. It is recommended to implement traffic signal timing improvements to the Pleasant Valley Road corridor with the improvements to the interchange intersections. Right-turn overlap phases should be implemented at the eastbound approach of the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection and the westbound approach of the Pleasant Valley Road / I-77 NB Ramps intersection. See **Figures 11 & 12** for a recommended 'Build' improvement rendering with 'Build Alternative 3' at the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection and 'Build Alternative 5' at the Pleasant Valley Road / I-77 NB Ramps intersection.



VII. Summary and Recommendations:

This TIS is being prepared at the request of the City of Independence in association with the study of the I-77 / Pleasant Valley Road interchange in the City of Independence, Cuyahoga County, Ohio. The study will be based on traffic capacity and safety analyses on the freeway ramps and at the ramp junction intersections on Pleasant Valley Road.

In Summary,

1. There was active construction along Pleasant Valley Road east of the study area when the traffic counts were performed. Westbound traffic was restricted east of Rio Nero Drive approximately one mile east of the study area with no restrictions to eastbound thru traffic.
2. Additional westbound trips were added at the Pleasant Valley Road / Brecksville Road intersection and distributed to the roadway network to account for the Pleasant Valley Road closure.
3. A total of 98 crashes were reported within the study corridor. There were 27 injury crashes with one fatal crash.
4. Three 'Build' alternatives were evaluated at the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection and two 'Build' alternative were evaluated at the Pleasant Valley Road / I-77 NB Ramps intersection.
5. The traffic signal warrant analysis determined three of the five existing signalized intersections currently satisfy a volume based signal warrant. The Pleasant Valley Road / Edgewood Lane / Ludwin Drive and Pleasant Valley Road / Midland Road intersections do not satisfy a warrant under the Existing Year 2024 conditions. It is recommended that both intersections are reevaluated in the future when the Pleasant Valley Road corridor returns to normal operating conditions.
6. The Pleasant Valley Road / Edgewood Lane / Ludwin Drive, Pleasant Valley Road / Midland Road, and Pleasant Valley Road / Brecksville Road intersections are anticipated to operate with acceptable Levels-of-Service with sufficient roadway capacity under the Opening Year 2030 and Design Year 2050 'No-Build' conditions. The Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive and Pleasant Valley Road / I-77 NB Ramps intersections are expected to experience failing Levels-of-Service.
7. The existing westbound left-turn lane at the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection is recommended to be lengthened to a total length of 375' and a 200' eastbound right-turn lane is recommended to be constructed under all 'Build' alternatives. The existing 250' eastbound left-turn lane at the Pleasant Valley Road / I-77 NB Ramps intersection is recommended to be constructed as a dual left-turn with turn lanes lengths of 425' and 675'. A 300' westbound right-turn lane is recommended to be constructed at the I-77 NB Ramps intersection.



8. Improvements to the roadway capacity and Level-of-Service are expected under the 'Build Alternative 1' conditions for the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection. Although improvements are anticipated, there will likely be failing Levels-of-Service.
9. Marginal improvements to the roadway capacity and Level-of-Service are expected under the 'Build Alternative 2' conditions for the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection. Under this intersection configuration, the unsignalized right-turn movement will often be block by vehicles making a left or thru turning movement.
10. The Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection is anticipated to operate with acceptable Levels-of-Service and have sufficient roadway capacity under the 'Build Alternative 3' conditions.
11. The Pleasant Valley Road / I-77 NB Ramps intersection is anticipated to operate with acceptable Levels-of-Service and have sufficient roadway capacity under the 'Build Alternative 4' conditions. The Pleasant Valley Road / I-77 NB Ramps intersection can operate with acceptable LOS with one eastbound thru lane with no roadway widening required.
12. The Pleasant Valley Road / I-77 NB Ramps intersection is anticipated to operate with acceptable Levels-of-Service and have sufficient roadway capacity under the 'Build Alternative 5' conditions.
13. Failing Levels-of-Service are anticipated to the south of the I-77 / Pleasant Valley Road interchange under the 'No-Build' and 'Build' conditions.

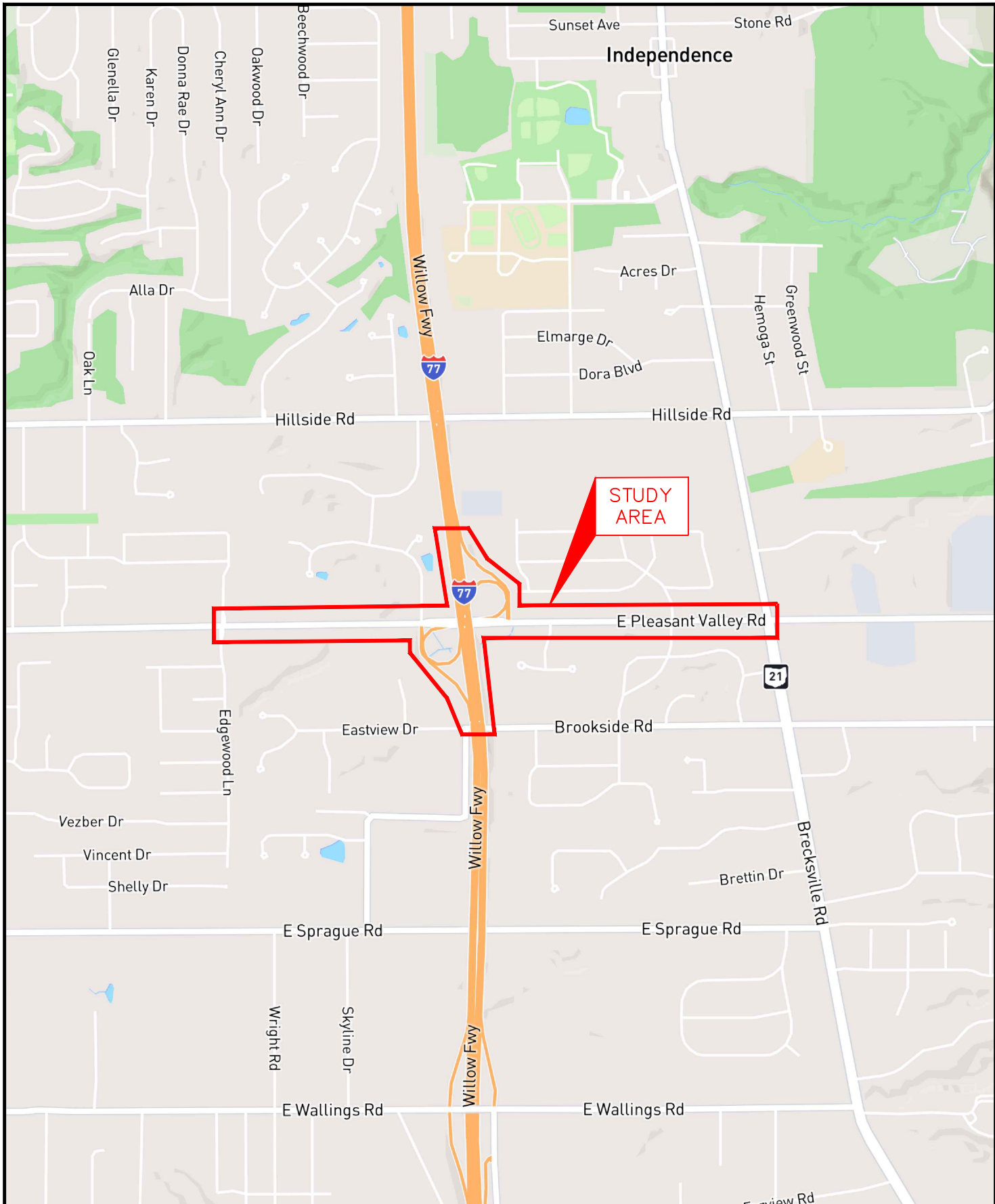
GPD Group recommends the following based on the information and analyses in this study:

1. GPD recommends constructing 'Build Alternative 3' at the Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive intersection and 'Build Alternative 5' at the Pleasant Valley Road / I-77 NB Ramps intersection.

This study makes multiple assumptions due to construction during the time of the counts. Despite all of the assumptions and estimating of traffic volumes, I believe in constructing Alternative 3 for the SB exit ramp. I would suggest constructing Alternative 4 with a modification of using a Dynamic Lane for the EB peak period when the double left turn is needed. This type of lane is already established within the City on Rockside Road WB at I-77 ramps. **HOWEVER**, using a Dynamic Lane needs to be evaluated for the flow and rush of traffic onto I-77. This is a concern that needs to be evaluated before allowing a double left turn NB onto I-77. (TT)



FIGURES



STUDY
AREA

E Pleasant Valley Rd

FIGURE 1

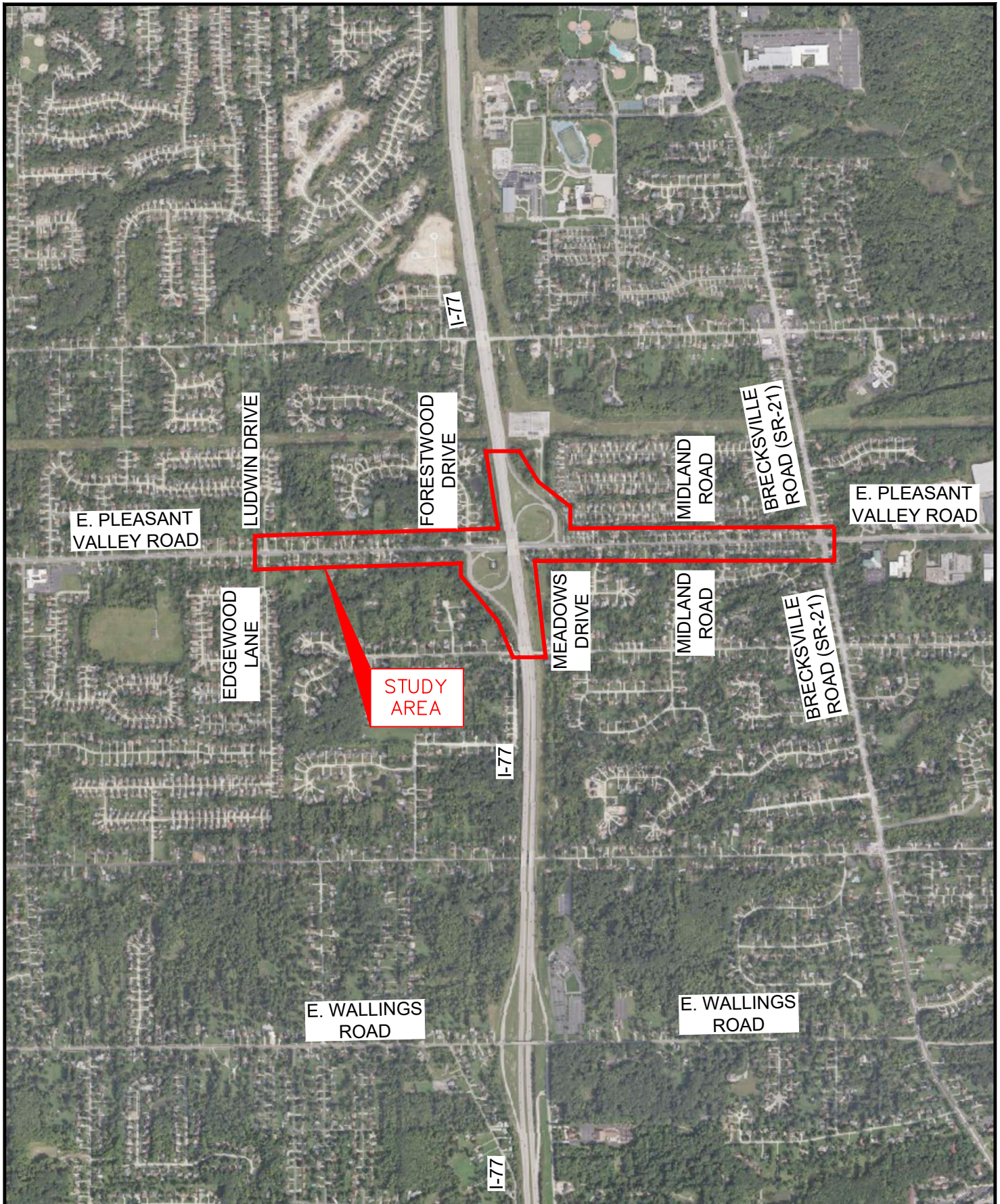
PROJECT LOCATION MAP

JANUARY 2025



N.T.S.





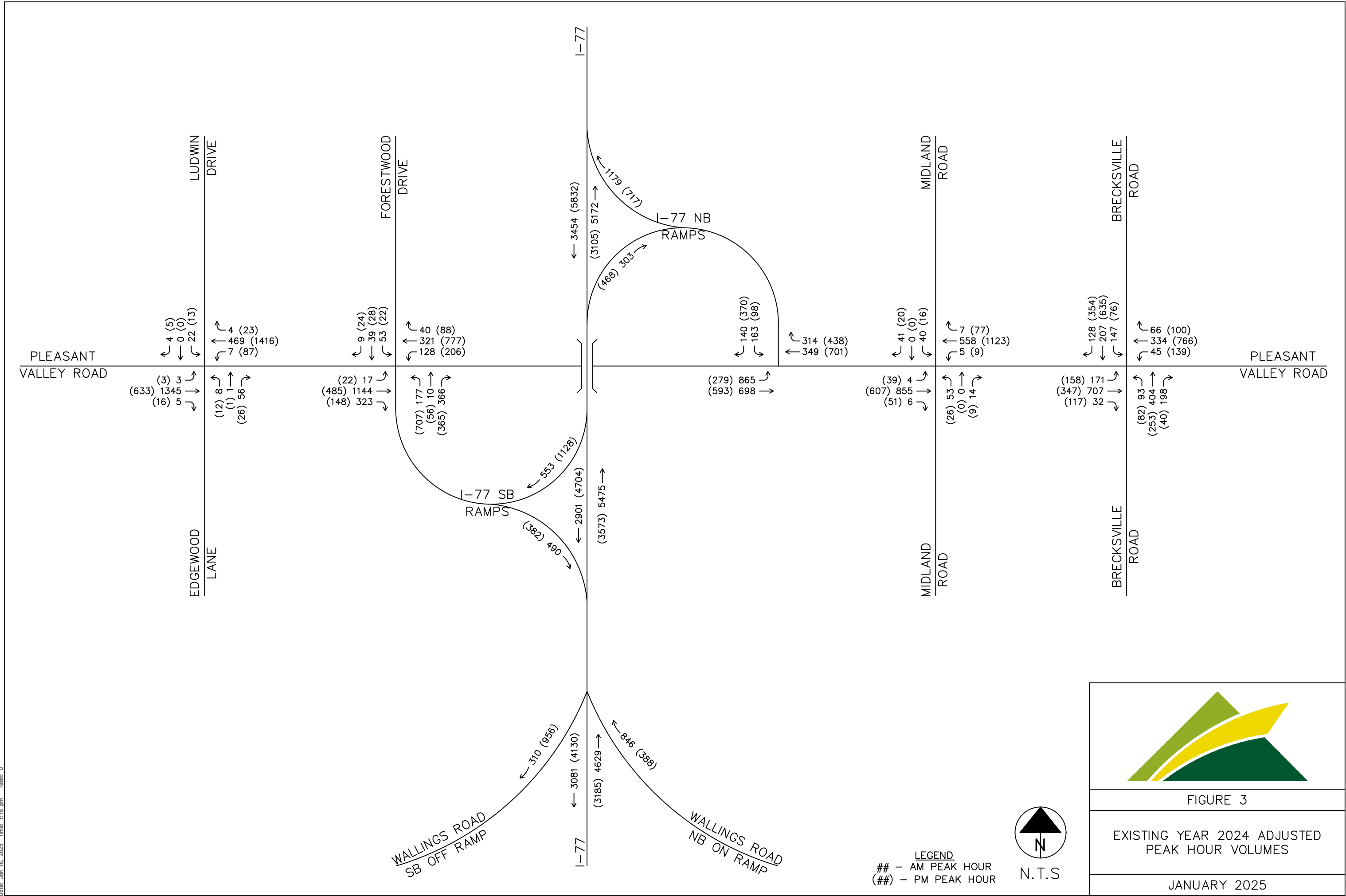
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FIGURE 2

AERIAL PHOTOGRAPH

JANUARY 2025





LEGEND
- AM PEAK HOUR
- PM PEAK HOUR



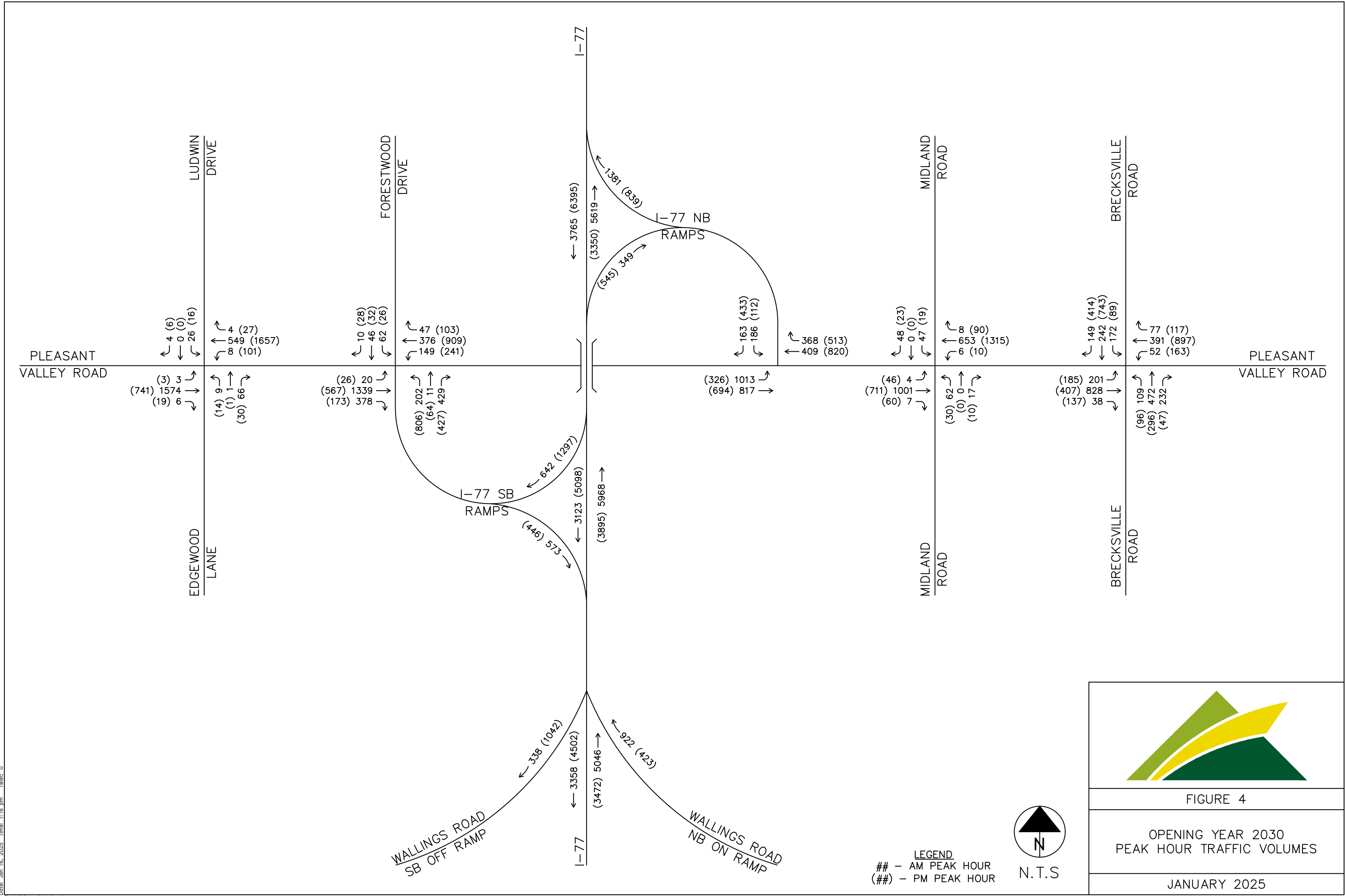
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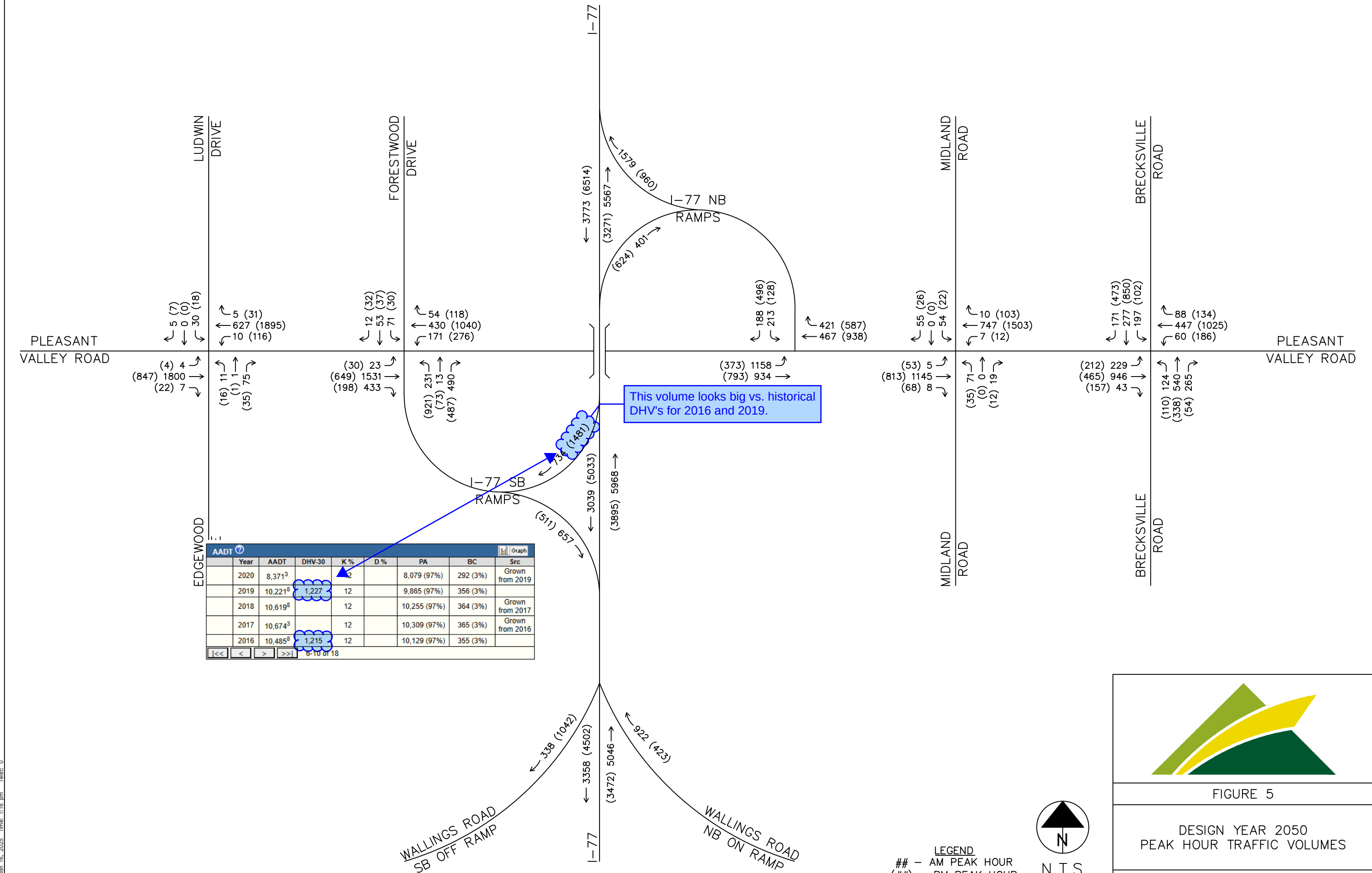


FIGURE 3

EXISTING YEAR 2024 ADJUSTED
PEAK HOUR VOLUMES

JANUARY 2025





This volume looks big vs. historical DHV's for 2016 and 2019.

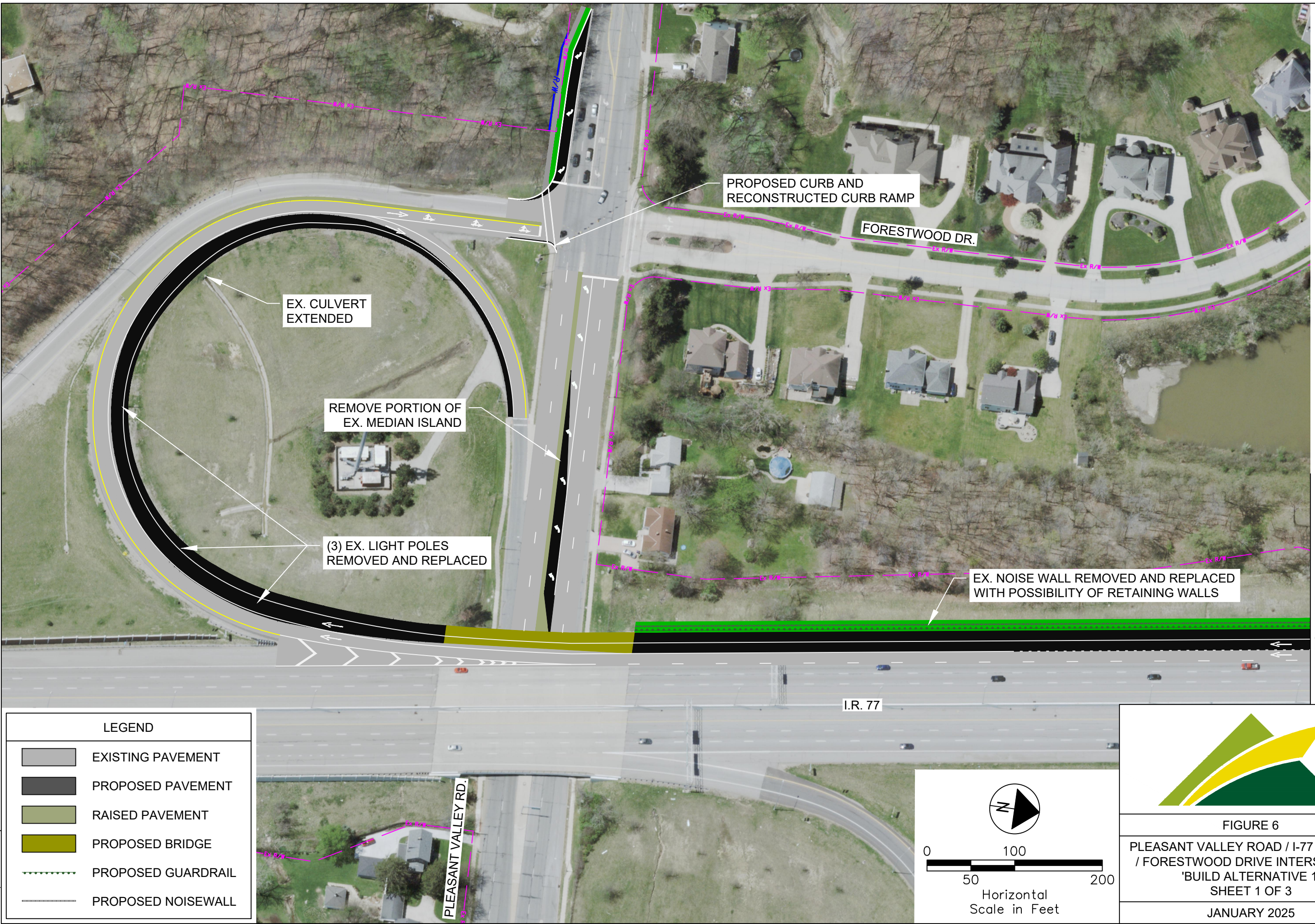


FIGURE 5

DESIGN YEAR 2050
PEAK HOUR TRAFFIC VOLUMES

JANUARY 2025

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Date: Jan 16, 2025 Time: 1:18 pm Title: 0
Technician: ddombrosky



LEGEND

- EXISTING PAVEMENT
- PROPOSED PAVEMENT
- RAISED PAVEMENT
- PROPOSED BRIDGE
- PROPOSED GUARDRAIL
- PROPOSED NOISEWALL

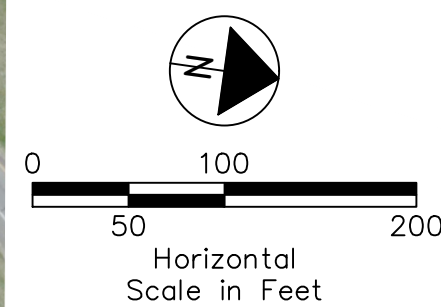
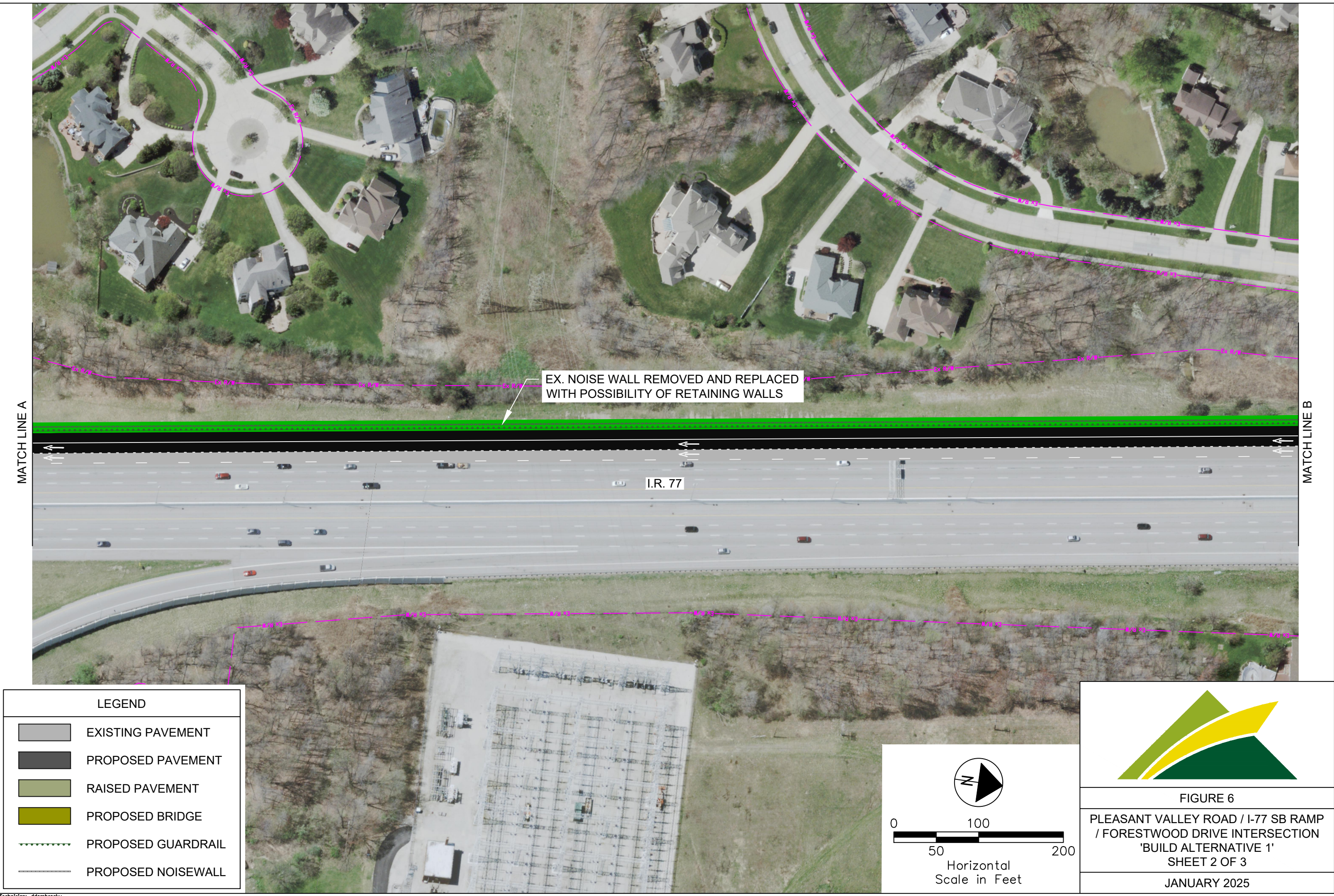


FIGURE 6

PLEASANT VALLEY ROAD / I-77 SB RAMP
/ FORESTWOOD DRIVE INTERSECTION
'BUILD ALTERNATIVE 1'
SHEET 1 OF 3

JANUARY 2025

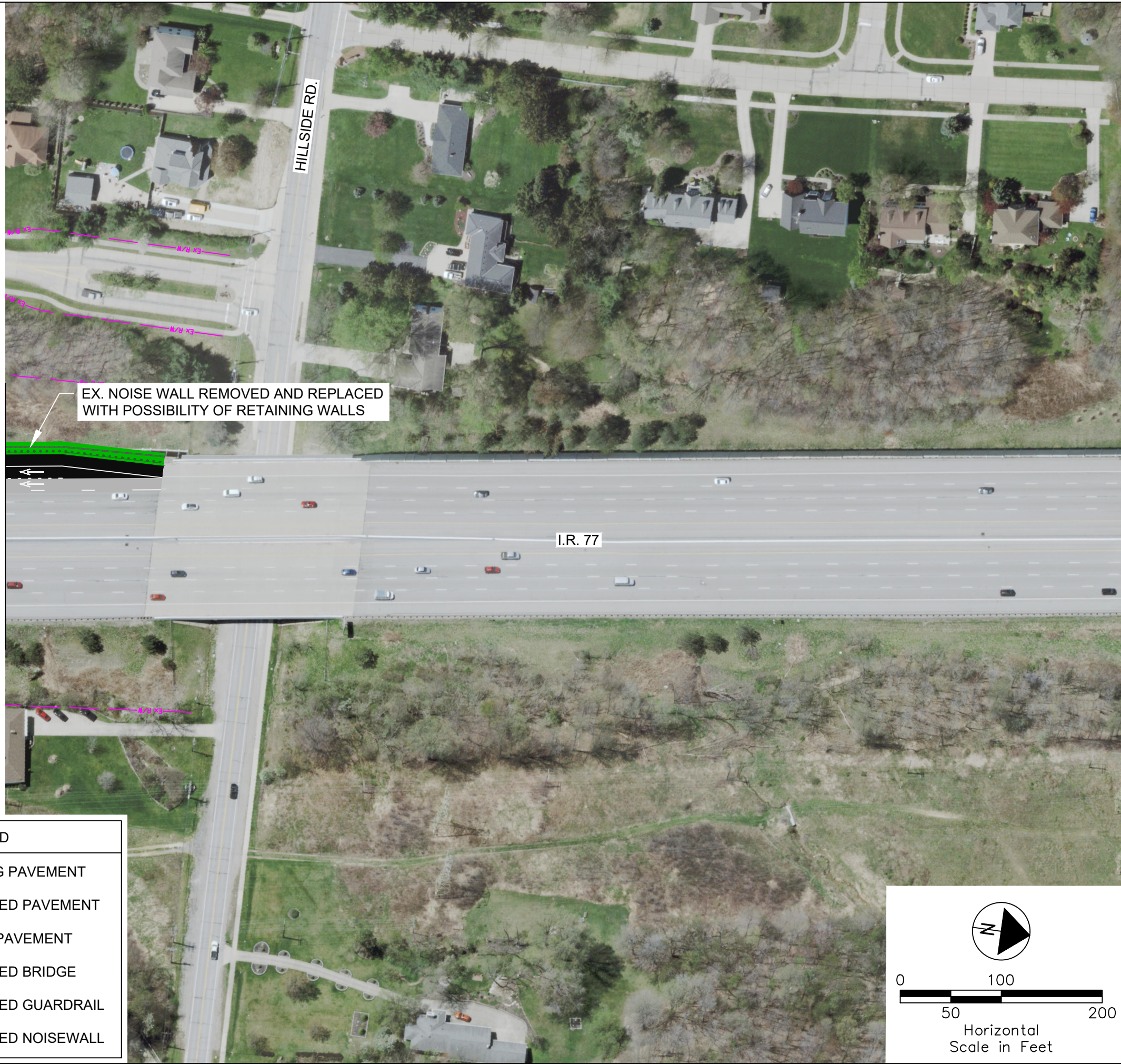
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Date: Jan 16, 2025 Time: 11:10 pm
Technician: ddombrosky



EX. NOISE WALL REMOVED AND REPLACED
WITH POSSIBILITY OF RETAINING WALLS

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Date: Jan 16, 2025 Time: 1:18 pm Title: 0
Technician: ddombrosky

MATCH LINE B



LEGEND

- | | |
|---|--------------------|
|  | EXISTING PAVEMENT |
|  | PROPOSED PAVEMENT |
|  | RAISED PAVEMENT |
|  | PROPOSED BRIDGE |
|  | PROPOSED GUARDRAIL |
|  | PROPOSED NOISEWALL |

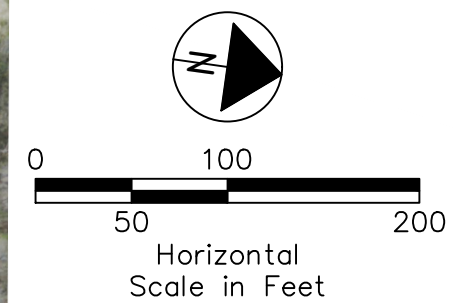
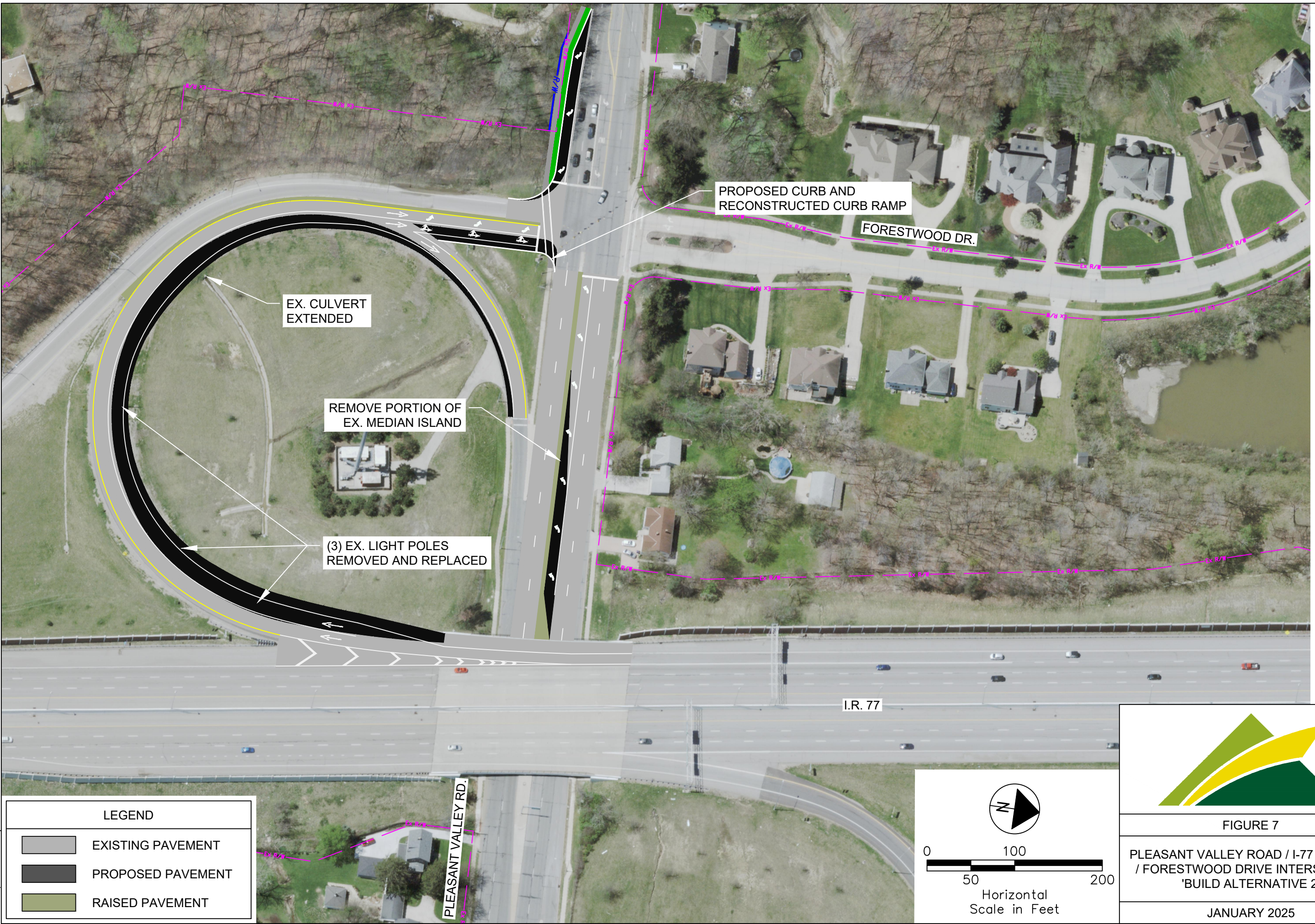


FIGURE 6

PLEASANT VALLEY ROAD / I-77 SB RAMP
/ FORESTWOOD DRIVE INTERSECTION
'BUILD ALTERNATIVE 1'
SHEET 3 OF 3

JANUARY 2025

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LEGEND	
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	PROPOSED PAVEMENT
	RAISED PAVEMENT

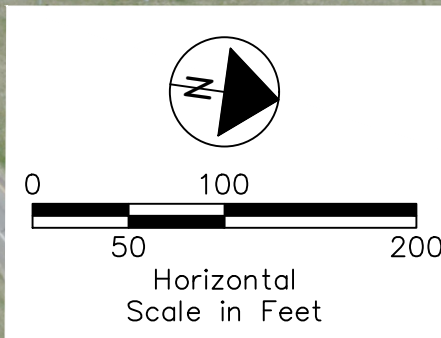


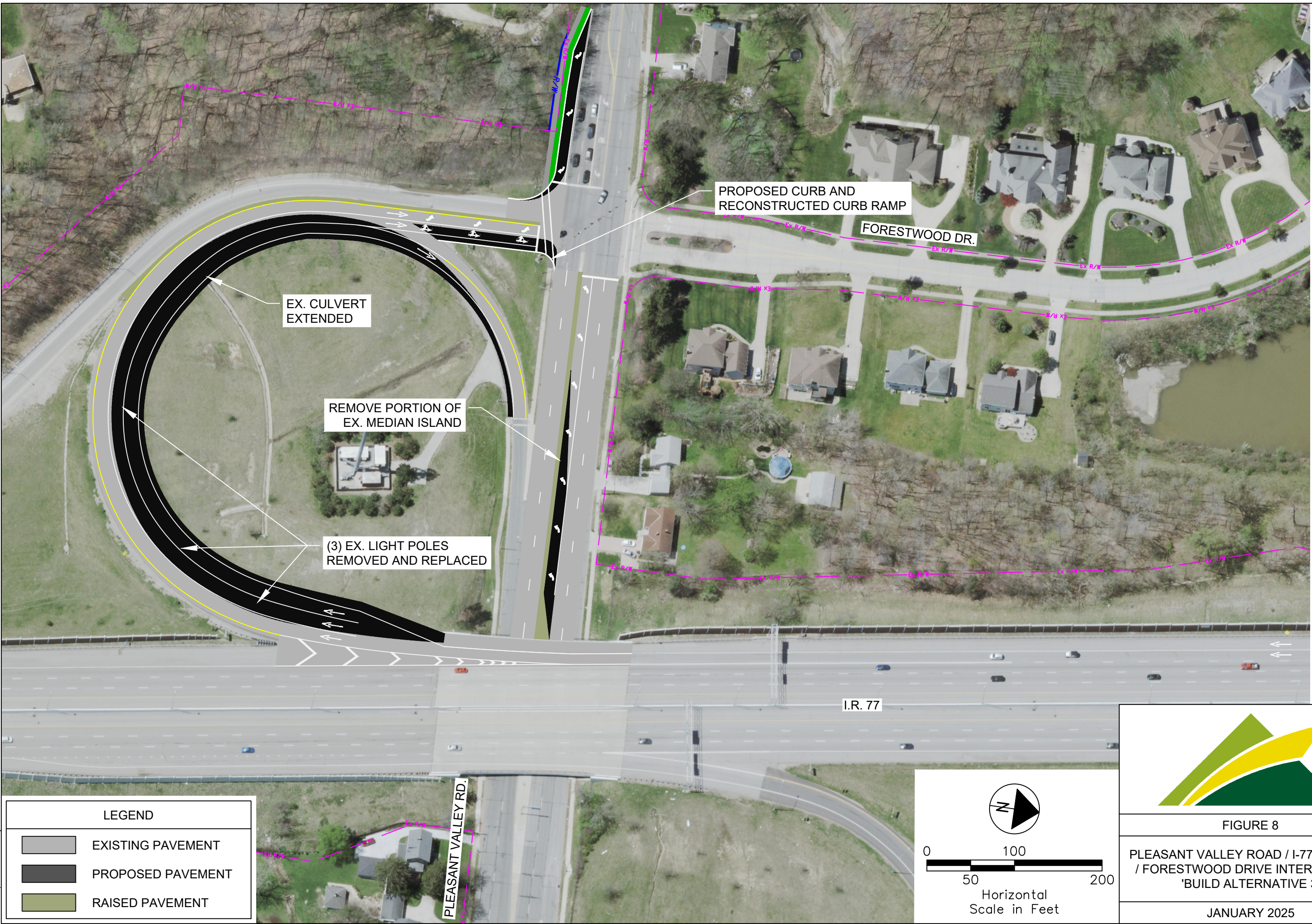


FIGURE 7

PLEASANT VALLEY ROAD / I-77 SB RAMP
/ FORESTWOOD DRIVE INTERSECTION
'BUILD ALTERNATIVE 2'

JANUARY 2025

Drawing File: C:\2023\2023000\90 - Traffic Engineering\Pleasant Valley\Study\Figures\Figure 8_SB Build Alt 3.dwg Layout: Layout
Date: Jan 16, 2025 Time: 1:10 pm User: 0
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LEGEND	
	EXISTING PAVEMENT
	PROPOSED PAVEMENT
	RAISED PAVEMENT

Horizontal Scale in Feet

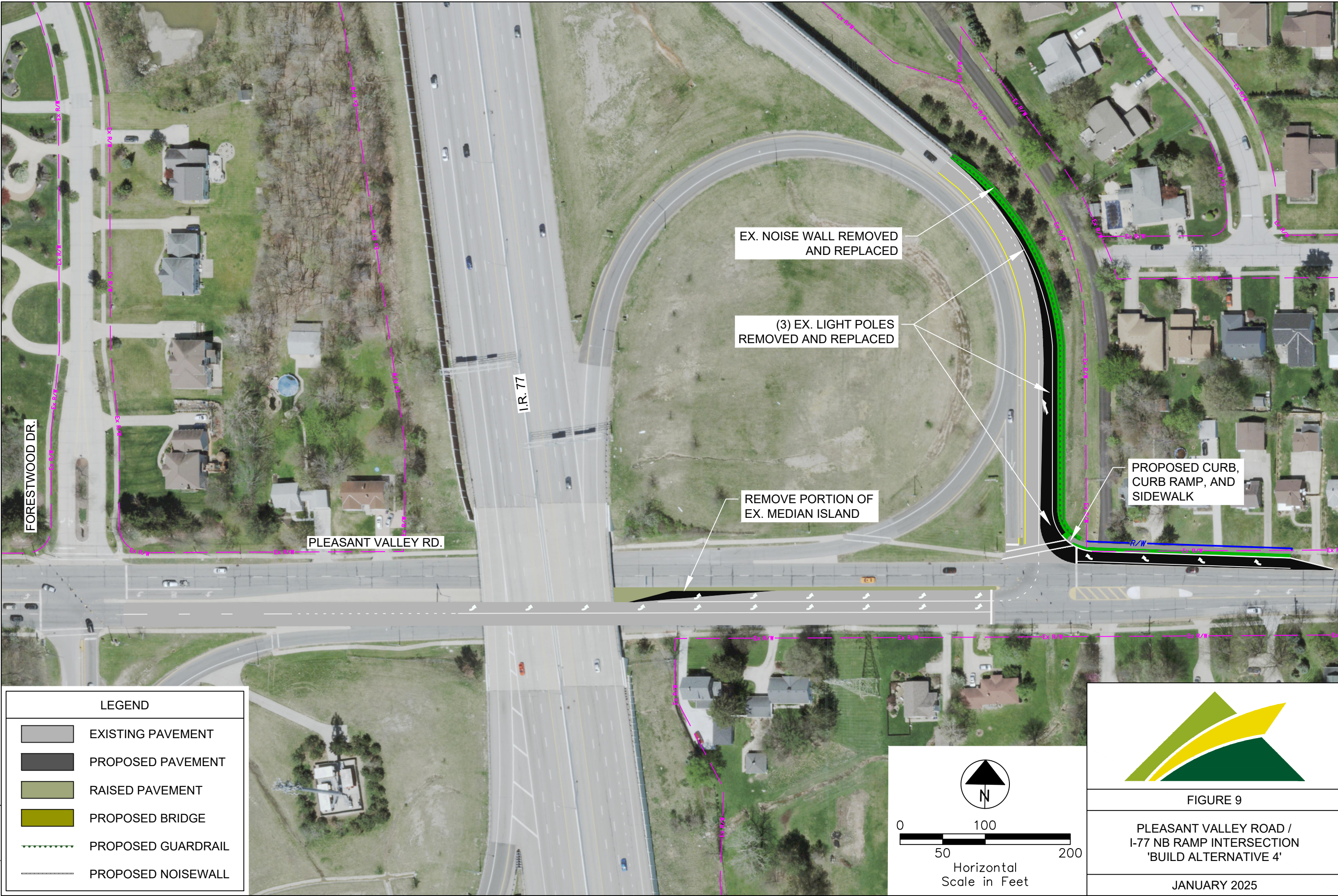
FIGURE 8

PLEASANT VALLEY ROAD / I-77 SB RAMP
/ FORESTWOOD DRIVE INTERSECTION
'BUILD ALTERNATIVE 3'

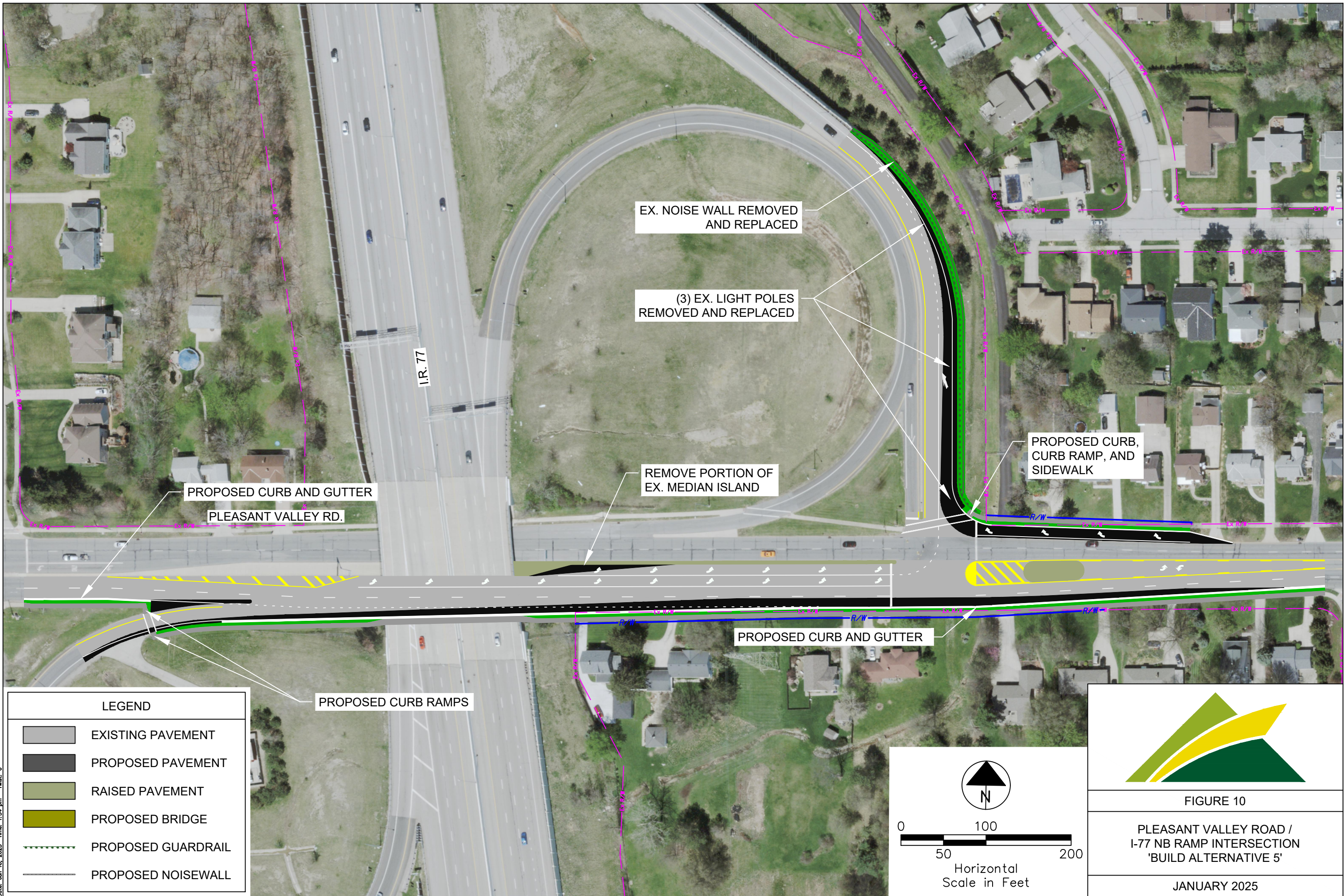
JANUARY 2025

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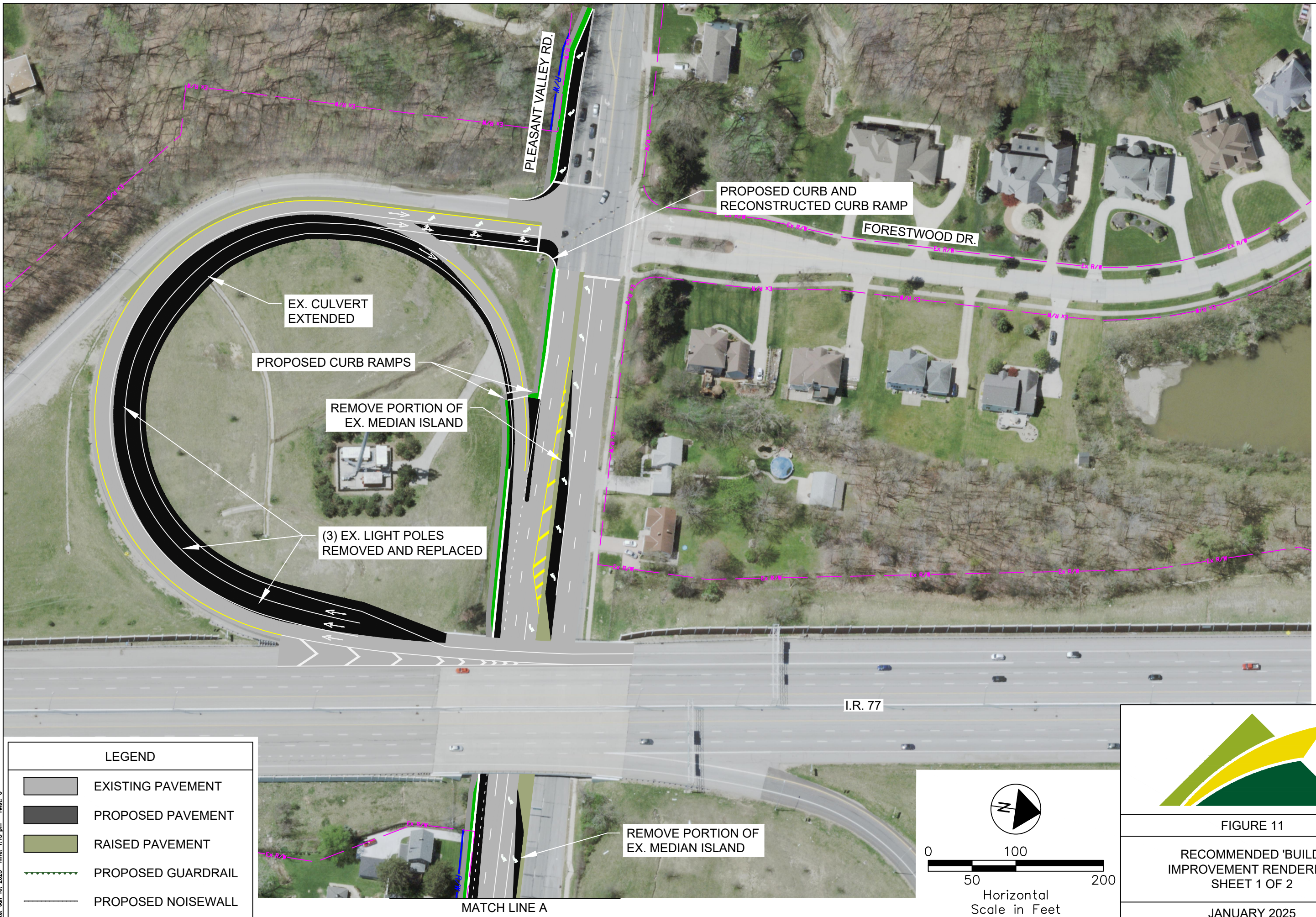
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LEGEND	
	EXISTING PAVEMENT
	PROPOSED PAVEMENT
	RAISED PAVEMENT
	PROPOSED GUARDRAIL
	PROPOSED NOISEWALL

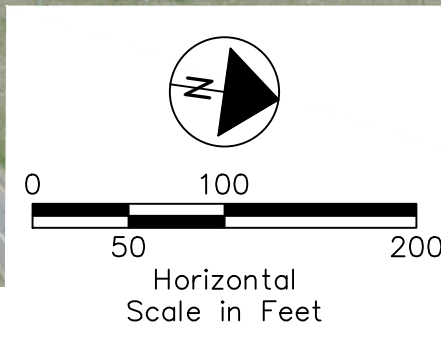
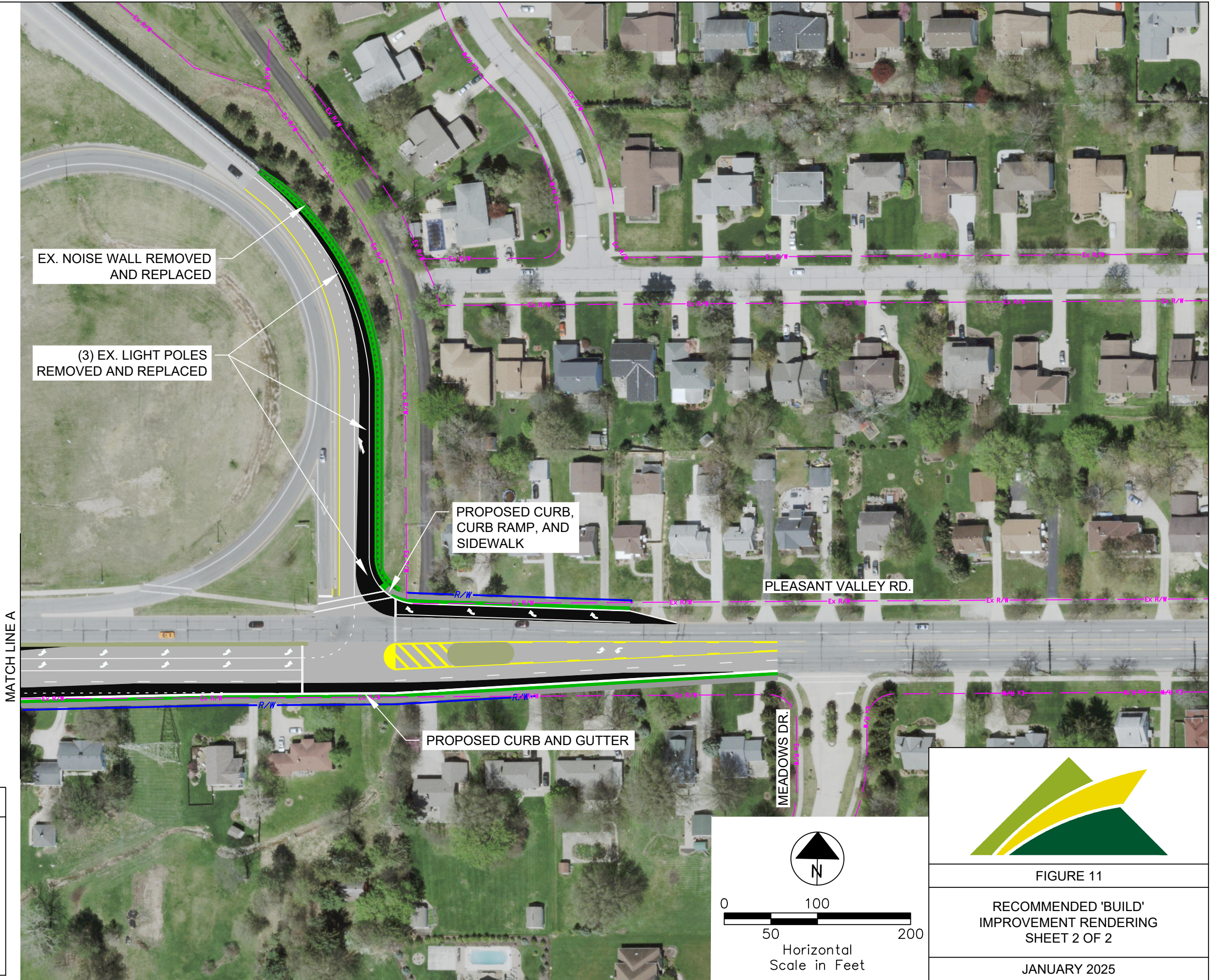
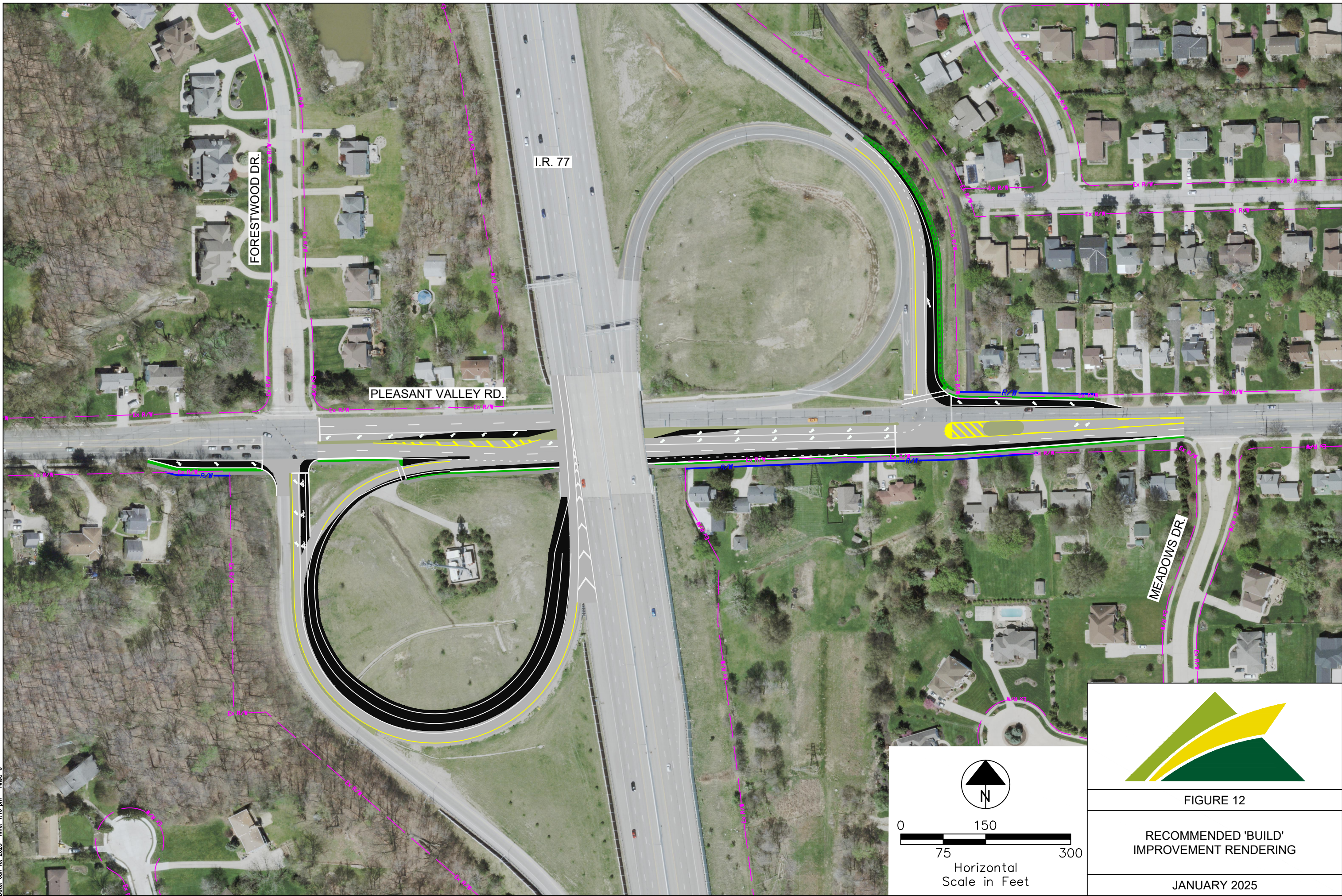


FIGURE 11
RECOMMENDED 'BUILD' IMPROVEMENT RENDERING SHEET 1 OF 2
JANUARY 2025

LEGEND	
	EXISTING PAVEMENT
	PROPOSED PAVEMENT
	RAISED PAVEMENT
	PROPOSED GUARDRAIL
	PROPOSED NOISEWALL



Drawing File: C:\Users\j0004886r\OneDrive\Local\Temp\AcPublish_17836\Figure 12_Full_Build_Roll_Plot.dwg Layout: Roll Plot
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Technician: ddombrosky



APPENDIX A
TURNING MOVEMENT COUNTS



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Tri-State Traffic Data, Inc

Coatesville, PA, Pennsylvania, United States 19320

610-466-1469

Serving Transportation Professionals Since 1995

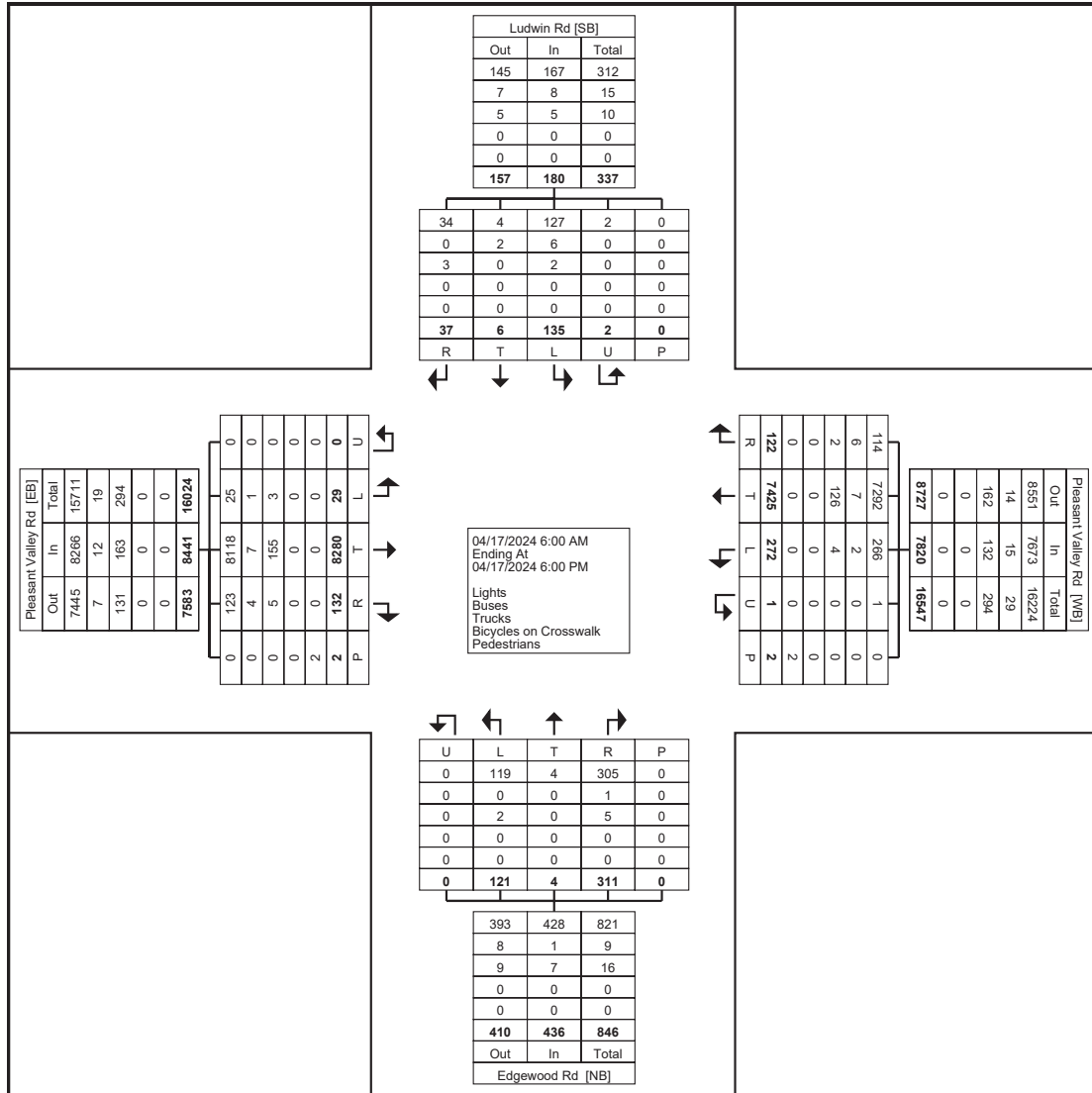
Independence, OH
Pleasant Valley Rd & Edgewood
Ln/Ludwin Rd
Wednesday, April 17, 2024
Location: 41.361727, -
81.661442

Count Name: Pleasant Valley
Rd & Edgewood Ln/Ludwin Rd
Site Code:
Start Date: 04/17/2024
Page No: 1

Turning Movement Data

Start Time	Pleasant Valley Rd Eastbound							Pleasant Valley Rd Westbound							Edgewood Rd Northbound							Ludwin Rd Southbound							Int. Total
	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	
6:00 AM	0	198	1	0	0	0	199	1	33	0	0	0	0	34	2	0	1	1	0	0	4	2	0	0	0	0	0	2	239
6:15 AM	0	233	0	0	0	0	233	0	46	1	0	0	0	47	0	0	2	3	0	0	5	1	0	0	0	0	0	1	286
6:30 AM	1	252	1	0	0	0	254	0	70	1	0	0	0	71	3	0	6	5	0	0	14	3	0	0	0	0	0	3	342
6:45 AM	0	249	1	0	0	0	250	2	72	1	0	0	0	75	1	0	6	5	0	0	12	5	1	0	0	0	0	6	343
Hourly Total	1	932	3	0	0	0	936	3	221	3	0	0	0	227	6	0	15	14	0	0	35	11	1	0	0	0	0	12	1210
7:00 AM	0	243	0	0	0	0	243	1	79	2	0	0	0	82	4	0	8	3	0	0	15	5	0	0	1	0	0	6	346
7:15 AM	0	323	0	0	0	0	323	1	77	0	0	0	0	78	2	0	13	3	0	0	18	8	0	0	1	0	0	9	428
7:30 AM	0	411	0	0	0	0	411	0	94	0	0	0	0	94	2	0	12	4	0	0	18	7	0	1	0	0	0	8	531
7:45 AM	2	343	2	0	0	0	347	2	111	0	0	0	0	113	4	1	8	2	0	0	15	4	0	1	1	0	0	6	481
Hourly Total	2	1320	2	0	0	0	1324	4	361	2	0	0	0	367	12	1	41	12	0	0	66	24	0	2	3	0	0	29	1786
8:00 AM	1	268	3	0	0	0	272	4	86	4	0	0	0	94	0	0	9	5	0	0	14	3	0	0	0	0	0	3	383
8:15 AM	1	230	4	0	0	0	235	4	99	3	1	0	0	107	4	0	2	6	0	0	12	9	0	0	0	0	0	9	363
8:30 AM	2	215	4	0	0	0	221	6	110	2	0	0	0	118	4	0	5	6	0	0	15	4	1	0	0	0	0	5	359
8:45 AM	0	171	2	1	0	0	174	2	105	0	0	0	0	107	4	0	5	6	0	0	15	9	0	0	1	0	0	10	306
Hourly Total	4	884	13	1	0	0	902	16	400	9	1	0	0	426	12	0	21	23	0	0	56	25	1	0	1	0	0	27	1411
9:00 AM	1	156	3	0	0	0	160	4	79	1	0	0	0	84	1	0	1	6	0	0	8	7	0	0	0	0	0	7	259
9:15 AM	0	170	1	0	0	0	171	4	99	1	0	0	0	104	3	0	5	0	0	0	8	3	0	0	0	0	0	3	286
9:30 AM	1	150	4	0	0	0	155	2	103	2	0	0	0	107	5	0	4	4	0	0	13	4	0	0	0	0	0	4	279
9:45 AM	0	126	6	0	0	0	132	3	86	3	0	0	0	92	3	0	1	2	0	0	6	2	0	0	3	0	0	5	235
Hourly Total	2	602	14	0	0	0	618	13	367	7	0	0	0	387	12	0	11	12	0	0	35	16	0	0	3	0	0	19	1059
10:00 AM	0	128	4	0	0	0	132	2	105	2	0	0	0	109	1	1	3	1	0	0	6	4	0	1	2	0	0	7	254
10:15 AM	1	130	1	1	0	0	133	3	117	5	0	0	0	125	2	0	6	5	0	0	13	1	0	0	3	0	0	4	275
10:30 AM	1	120	0	0	0	0	121	5	119	1	1	0	0	126	3	0	4	2	0	0	9	5	0	0	0	0	0	5	261
10:45 AM	0	113	2	0	0	0	115	5	102	1	0	0	0	108	1	0	2	2	0	0	5	1	0	0	1	0	0	2	230
Hourly Total	2	491	7	1	0	0	501	15	443	9	1	0	0	468	7	1	15	10	0	0	33	11	0	1	6	0	0	18	1020
11:00 AM	1	119	3	0	0	0	123	3	109	1	0	0	0	113	4	0	3	2	0	0	9	0	0	0	0	0	0	0	245
11:15 AM	2	144	0	1	0	0	147	3	109	1	0	0	0	113	4	0	1	0	0	0	5	2	0	0	0	1	0	3	268
11:30 AM	0	154	2	1	0	0	157	5	115	0	0	0	0	120	0	0	2	2	0	0	4	1	0	0	0	0	0	1	282
11:45 AM	1	142	2	0	0	0	145	2	131	3	0	0	0	136	6	0	2	4	0	0	12	3	0	0	0	0	0	3	296
Hourly Total	4	559	7	2	0	0	572	13	464	5	0	0	0	482	14	0	8	8	0	0	30	6	0	0	0	1	0	7	1091
12:00 PM	0	128	4	0	0	0	132	3	132	0	0	0	0	135	2	0	1	0	0	0	3	2	0	1	0	0	0	3	273
12:15 PM	0	147	2	0	0	0	149	6	135	1	0	0	0	142	1	0	0	3	0	0	4	2	0	1	0	0	0	3	298
12:30 PM	0	160	1	0	0	0	161	4	126	3	1	0	0	134	3	0	1	3	0	0	7	0	0	0	1	0	0	1	303
12:45 PM	3	146	0	0	0	0	149	4	118	1	1	0	0	124	2	0	0	5	0	0	7	1	0	0	0	0	0	1	281
Hourly Total	3	581	7	0	0	0	591	17	511	5	2	0	0	535	8	0	2	11	0	0	21	5	0	2	1	0	0	8	1155
1:00 PM	1	140	4	1	0	0	146	9	157	0	0	0	0	166	2	0	5	2	0	0	9	3	0	0	1	0	0	4	325
1:15 PM	0	144	1	0	0	0	145	3	133	2	0	0	0	138	2	0	2	4	0	0	8	0	0	0	0	0	0	0	291
1:30 PM	0	131	2	0	0	0	133	3	125	5	0	0	0	133	2	0	2	6	0	0	10	0	0	0	1	0	0	1	277
1:45 PM	0	138	6	0	0	2	144	10	161	1	0	0	0	172	1	0	1	3	0	0	5	4	0	0	0	0	0	4	325
Hourly Total	1	553	13	1	0	2	568	25	576	8	0	0	0	609	7	0	10	15	0	0	32	7	0	0	2	0	0	9	1218
2:00 PM	0	125	2	0	0	0	127	7	154	3	0	0	2	164	3	0	2	0	0	0	5	1	0	0	0	0	0	1	297
2:15 PM	0	147	0	0	0	0	147	5	157	4	0	0	0	166	1	0	4	1	0	0	6	3	0	1	0	0	0	4	323
2:30 PM	2	135	3	0	0	0	140	6	195	2	0	0	0	203	1	1	6	0	0	0	8	1	0	0	1	0	0	2	353
2:45 PM	0	147	11	0	0	0	158	6	200	5	0	0	0	211	1	0	2	1	0	0	4	2	0	1	0	1	0	4	377
Hourly Total	2	554	16	0	0	0	572	24	706	14	0	0	2	744	6	1	14	2	0	0	23	7	0	2	1	1	0	11	1350
3:00 PM	0	170	3	1	0	0	174	11	213	1	0	0	0	225	7	0	3	4	0	0	14	2	0	0	0	0	0	2	415
3:15 PM	0	142	3	0	0	0	145	11	246	5	0	0	0	262	2	0	1	2	0	0	5	0	2	0	0	0	0	2	414
3:30 PM	0	174	5	0	0	0	179	6	262	5	0	0	0	273	1	0	1	3	0	0	5	1	2	0	1	0	0	4	461
3:45 PM	2	142	2	0	0	0	146	7	281	4	1	0	0	293	1	0	2	4	0	0	7	1	0	2	1	0	0	4	450
Hourly Total	2	628	13	1	0	0	644	35	1002	15	1	0	0	1053	11	0	7	13	0	0	31	4	4	2	2	0	0	12	1740
4:00 PM	1	157	5	0	0	0	163	16	268	6	0	0	0	290	4	0	2	3	0	0	9	1	0	2	1	0	0	4	466
4:15 PM	1	153	3	1	0	0	158	14	310	5	0	0	0	329	2	0	4	3	0	0	9	2	0	1	0	0	0	3	499
4:30 PM	3	160	3	0	0	0	166	10	298	6	0	1	0	315	0	0	0	5	0	0	5	5	0	0	0	0	0	5	491
4:45 PM	0	159	3	0	0	0	162	11	328	5	0	0	0	344	6	0	0	5	0	0	11	5	0	1	0	0	0	6	523
Hourly Total	5	629	14	1	0	0	649	51	1204	22	0	1	0	1278	12	0	6	16	0	0	34	13	0	4	1	0	0	18	1979
5:00 PM	0	158	3	1	0	0	162	10	300	7	1	0	0	318	3	0	3	4	0	0	10	1	0	0	3	0	0	4	494
5:15 PM	0	156	6	0	0	0	162	23	325	4	0	0	0	352	3	1	2	7	0	0	13	2	0	1	0	0	0	3	

[illegible]



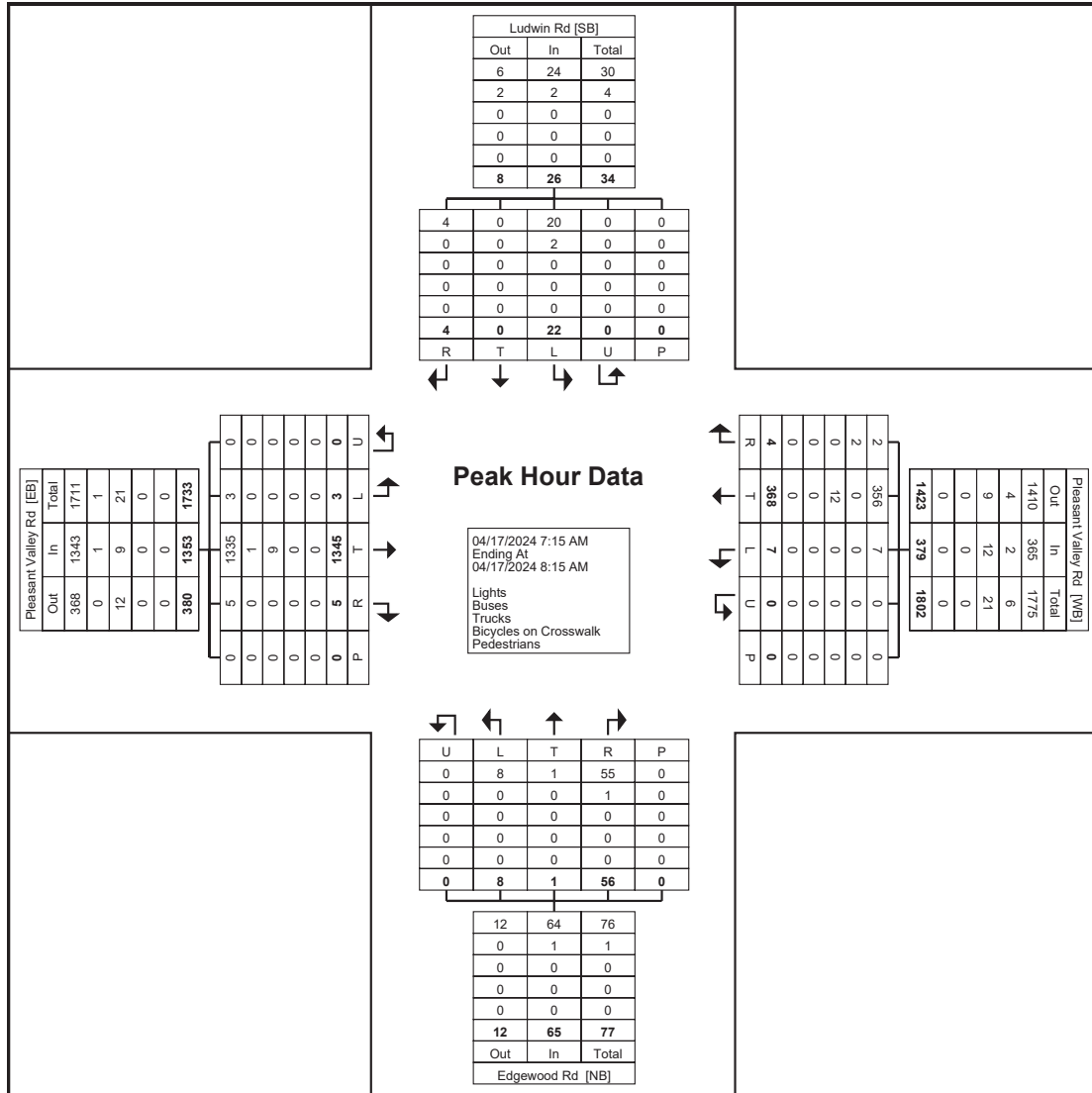
Turning Movement Data Plot



Coatesville, PA, Pennsylvania, United States 19320
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Count Name: Pleasant Valley
Rd & Edgewood Ln/Ludwin Rd
Site Code:
Start Date: 04/17/2024
Page No: 4

[illegible]



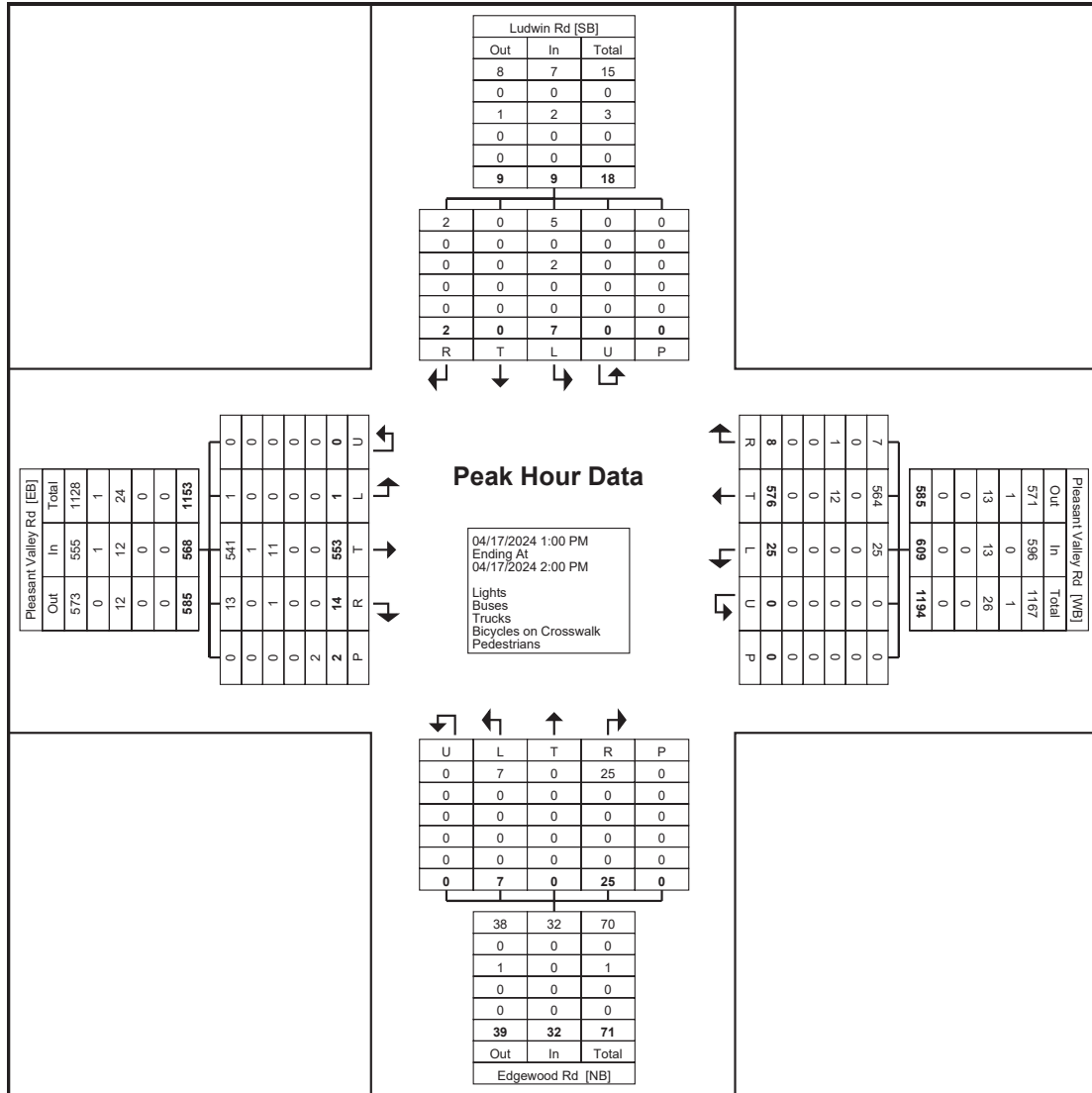
Independence, OH
Pleasant Valley Rd & Edgewood
Ln/Ludwin Rd
Wednesday, April 17, 2024
Location: 41.361727, -
81.661442

Coatesville, PA, Pennsylvania, United States 19320
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Count Name: Pleasant Valley
Rd & Edgewood Ln/Ludwin Rd
Site Code:
Start Date: 04/17/2024
Page No: 6

Turning Movement Peak Hour Data (1:00 PM)

[illegible]



Turning Movement Peak Hour Data Plot (1:00 PM)



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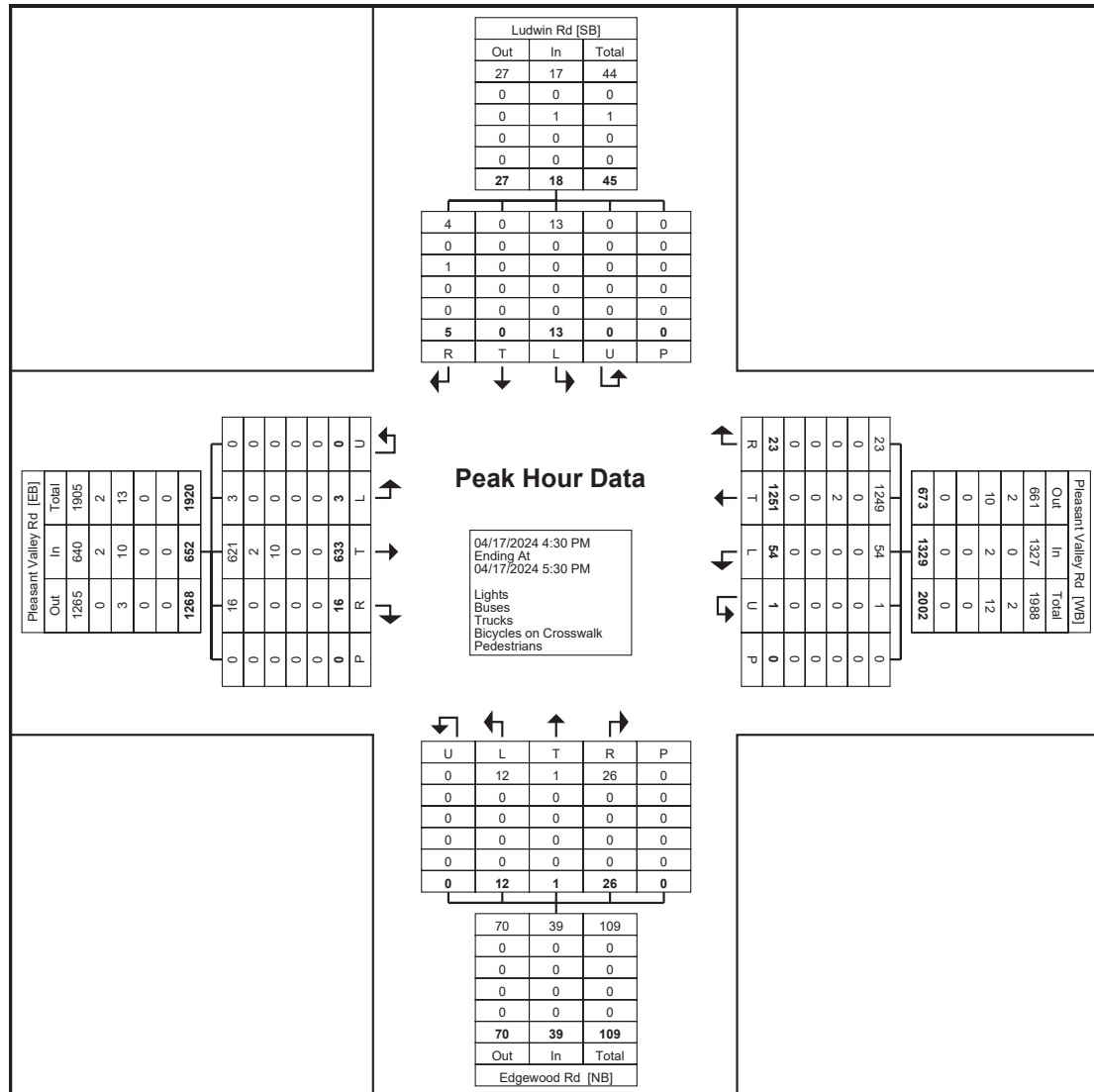
Count Name: Pleasant Valley
Rd & Edgewood Ln/Ludwin Rd
Site Code:
Start Date: 04/17/2024
Page No: 8

[illegible]

Independence, OH
Pleasant Valley Rd & Edgewood
Ln/Ludwin Rd
Wednesday, April 17, 2024
Location: 41.361727, -
81.661442

Coatesville, PA, Pennsylvania, United States 19320
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Count Name: Pleasant Valley
Rd & Edgewood Ln/Ludwin Rd
Site Code:
Start Date: 04/17/2024
Page No: 9



Turning Movement Peak Hour Data Plot (4:30 PM)



Independence, OH
Pleasant Valley Rd &
Forestwood Dr/I-77 Ramps
Wednesday, April 17, 2024
Location: 41.361818, -
81.652095

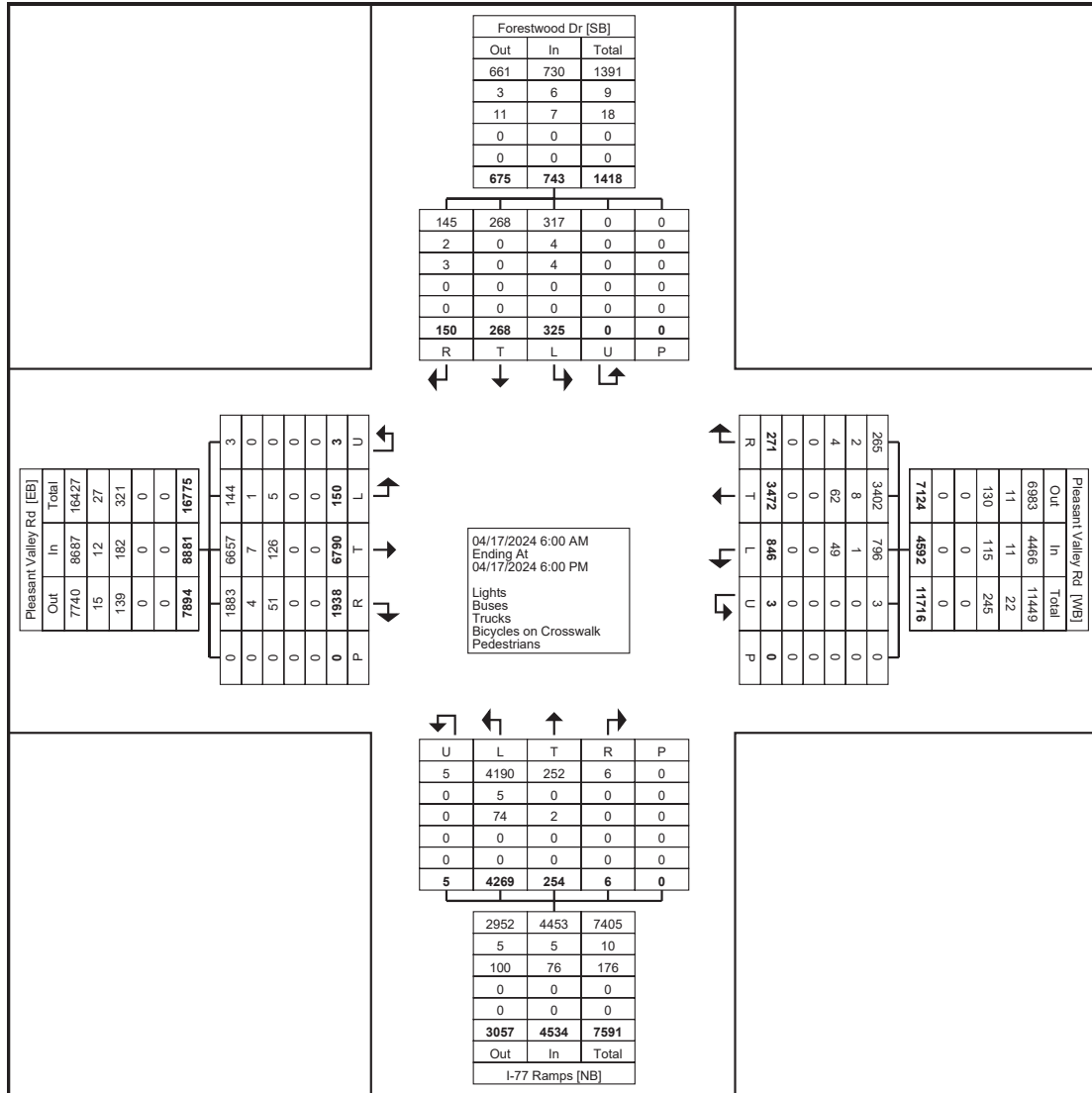
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Count Name: Pleasant Valley
Rd & Forestwood Dr/I-77 Ramps
Site Code:
Start Date: 04/17/2024
Page No: 1

Turning Movement Data

Start Time	Pleasant Valley Rd Eastbound							Pleasant Valley Rd Westbound							I-77 Ramps Northbound							Forestwood Dr Southbound							Int. Total
	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	
6:00 AM	1	154	26	10	0	0	191	5	19	0	1	0	0	25	14	0	0	0	0	0	14	4	2	0	0	0	0	6	236
6:15 AM	0	197	29	17	0	0	243	11	26	0	0	0	0	37	19	0	0	0	0	0	19	12	5	0	0	0	0	17	316
6:30 AM	1	206	36	16	0	0	259	15	42	0	0	0	0	57	28	1	0	0	0	0	29	7	8	1	1	0	0	17	362
6:45 AM	1	212	52	12	0	0	277	10	34	3	0	0	0	47	43	6	0	0	0	0	49	10	2	4	0	0	0	16	389
Hourly Total	3	769	143	55	0	0	970	41	121	3	1	0	0	166	104	7	0	0	0	0	111	33	17	5	1	0	0	56	1303
7:00 AM	2	197	47	9	0	0	255	20	42	5	2	0	0	69	36	1	0	0	1	0	38	16	9	1	1	0	0	27	389
7:15 AM	8	283	61	7	0	0	359	9	34	10	2	0	0	55	44	5	1	0	0	0	50	15	6	1	1	0	0	23	487
7:30 AM	7	315	90	6	0	0	418	15	58	4	0	0	0	77	41	2	0	0	0	0	43	13	16	0	2	0	0	31	569
7:45 AM	0	308	84	10	3	0	405	10	71	1	0	0	0	82	40	2	0	0	0	0	42	12	12	1	1	0	0	26	555
Hourly Total	17	1103	282	32	3	0	1437	54	205	20	4	0	0	283	161	10	1	0	1	0	173	56	43	3	5	0	0	107	2000
8:00 AM	2	238	54	11	0	0	305	14	57	3	0	0	0	74	52	1	0	0	0	0	53	13	5	2	1	0	0	21	453
8:15 AM	3	219	42	8	0	0	272	15	52	2	0	0	0	69	57	6	0	0	0	0	63	11	9	1	4	0	0	25	429
8:30 AM	3	180	41	4	0	0	228	14	73	4	0	0	0	91	55	4	0	0	1	0	60	6	13	0	2	0	0	21	400
8:45 AM	4	163	31	4	0	0	202	10	46	1	4	0	0	61	65	5	0	0	0	0	70	8	8	0	2	0	0	18	351
Hourly Total	12	800	168	27	0	0	1007	53	228	10	4	0	0	295	229	16	0	0	1	0	246	38	35	3	9	0	0	85	1633
9:00 AM	2	133	29	7	0	0	171	25	48	2	4	0	0	79	36	1	0	0	0	0	37	5	6	1	1	0	0	13	300
9:15 AM	3	151	23	8	0	0	185	13	52	1	2	0	0	68	46	2	0	0	0	0	48	6	8	3	0	0	0	17	318
9:30 AM	0	128	22	13	0	0	163	11	52	2	1	1	0	67	47	0	0	0	0	0	47	8	4	1	2	0	0	15	292
9:45 AM	2	110	28	4	0	0	144	13	33	4	0	1	0	51	45	3	0	0	0	0	48	6	4	1	1	0	0	12	255
Hourly Total	7	522	102	32	0	0	663	62	185	9	7	2	0	265	174	6	0	0	0	0	180	25	22	6	4	0	0	57	1165
10:00 AM	3	115	12	5	0	0	135	7	67	0	1	0	0	75	47	0	1	0	0	0	48	10	6	3	1	0	0	20	278
10:15 AM	2	115	22	8	0	0	147	8	56	3	0	0	0	67	64	2	0	0	0	0	66	7	5	2	0	0	0	14	294
10:30 AM	3	101	22	2	0	0	128	15	56	2	1	0	0	74	72	2	0	0	0	0	74	6	2	3	1	0	0	12	288
10:45 AM	1	117	19	2	0	0	139	15	55	3	0	0	0	73	54	3	0	0	0	0	57	5	5	1	3	0	0	14	283
Hourly Total	9	448	75	17	0	0	549	45	234	8	2	0	0	289	237	7	1	0	0	0	245	28	18	9	5	0	0	60	1143
11:00 AM	4	89	21	6	0	0	120	7	56	6	0	0	0	69	60	3	0	0	0	0	63	7	4	2	0	0	0	13	265
11:15 AM	1	115	27	3	0	0	146	10	55	3	0	0	0	68	57	3	0	0	1	0	61	1	3	1	0	0	0	5	280
11:30 AM	3	123	23	6	0	0	155	19	59	4	0	0	0	82	63	4	0	0	0	0	67	5	3	0	0	0	0	8	312
11:45 AM	2	113	27	9	0	0	151	12	63	5	0	0	0	80	68	3	0	0	0	0	71	8	1	2	0	0	0	11	313
Hourly Total	10	440	98	24	0	0	572	48	233	18	0	0	0	299	248	13	0	0	1	0	262	21	11	5	0	0	0	37	1170
12:00 PM	3	96	21	9	0	0	129	14	71	6	2	0	0	93	66	5	0	0	0	0	71	4	0	6	3	0	0	13	306
12:15 PM	2	121	28	5	0	0	156	10	71	5	0	0	0	86	72	4	0	0	0	0	76	4	4	1	0	0	0	9	327
12:30 PM	3	124	38	0	0	0	165	17	67	5	0	0	0	89	69	2	0	0	0	0	71	4	3	1	1	0	0	9	334
12:45 PM	4	112	21	10	0	0	147	12	59	5	0	0	0	76	74	3	0	0	0	0	77	6	2	0	1	0	0	9	309
Hourly Total	12	453	108	24	0	0	597	53	268	21	2	0	0	344	281	14	0	0	0	0	295	18	9	8	5	0	0	40	1276
1:00 PM	2	127	27	15	0	0	171	12	80	6	0	0	0	98	72	4	0	0	0	0	76	4	1	1	1	0	0	7	352
1:15 PM	0	114	26	10	0	0	150	15	57	3	0	0	0	75	81	5	0	0	0	0	86	7	3	1	1	0	0	12	323
1:30 PM	4	114	17	7	0	0	142	19	59	3	2	0	0	83	70	7	1	1	0	0	79	3	2	2	2	0	0	9	313
1:45 PM	4	126	22	8	0	0	160	12	78	6	0	0	0	96	92	6	0	0	0	0	98	8	4	1	1	0	0	14	368
Hourly Total	10	481	92	40	0	0	623	58	274	18	2	0	0	352	315	22	1	1	0	0	339	22	10	5	5	0	0	42	1356
2:00 PM	5	105	12	7	0	0	129	11	68	2	0	0	0	81	103	6	1	0	0	0	110	6	3	1	1	0	0	11	331
2:15 PM	8	114	18	10	0	0	150	18	67	3	1	0	0	89	102	4	0	0	0	0	106	10	2	1	0	0	0	13	358
2:30 PM	6	96	38	7	0	0	147	28	75	7	0	0	0	110	136	8	0	0	1	0	145	4	5	2	2	0	0	13	415
2:45 PM	3	120	23	15	0	0	161	14	82	5	0	0	0	101	129	10	0	0	0	0	139	8	12	7	2	0	0	29	430
Hourly Total	22	435	91	39	0	0	587	71	292	17	1	0	0	381	470	28	1	0	1	0	500	28	22	11	5	0	0	66	1534
3:00 PM	4	107	36	14	0	0	161	26	95	3	1	0	0	125	124	4	0	0	0	0	128	1	8	2	7	0	0	18	432
3:15 PM	7	102	29	17	0	0	155	20	92	7	4	0	0	123	166	13	0	0	0	0	179	6	15	3	2	0	0	26	483
3:30 PM	0	123	32	11	0	0	166	25	115	6	2	0	0	148	165	11	0	0	0	0	176	5	4	1	1	0	0	11	501
3:45 PM	2	112	20	12	0	0	146	35	104	9	0	0	0	148	168	10	0	0	0	0	178	3	8	0	3	0	0	14	486
Hourly Total	13	444	117	54	0	0	628	106																					

[illegible]



Turning Movement Data Plot



Coatesville, PA, Pennsylvania, United States 19320
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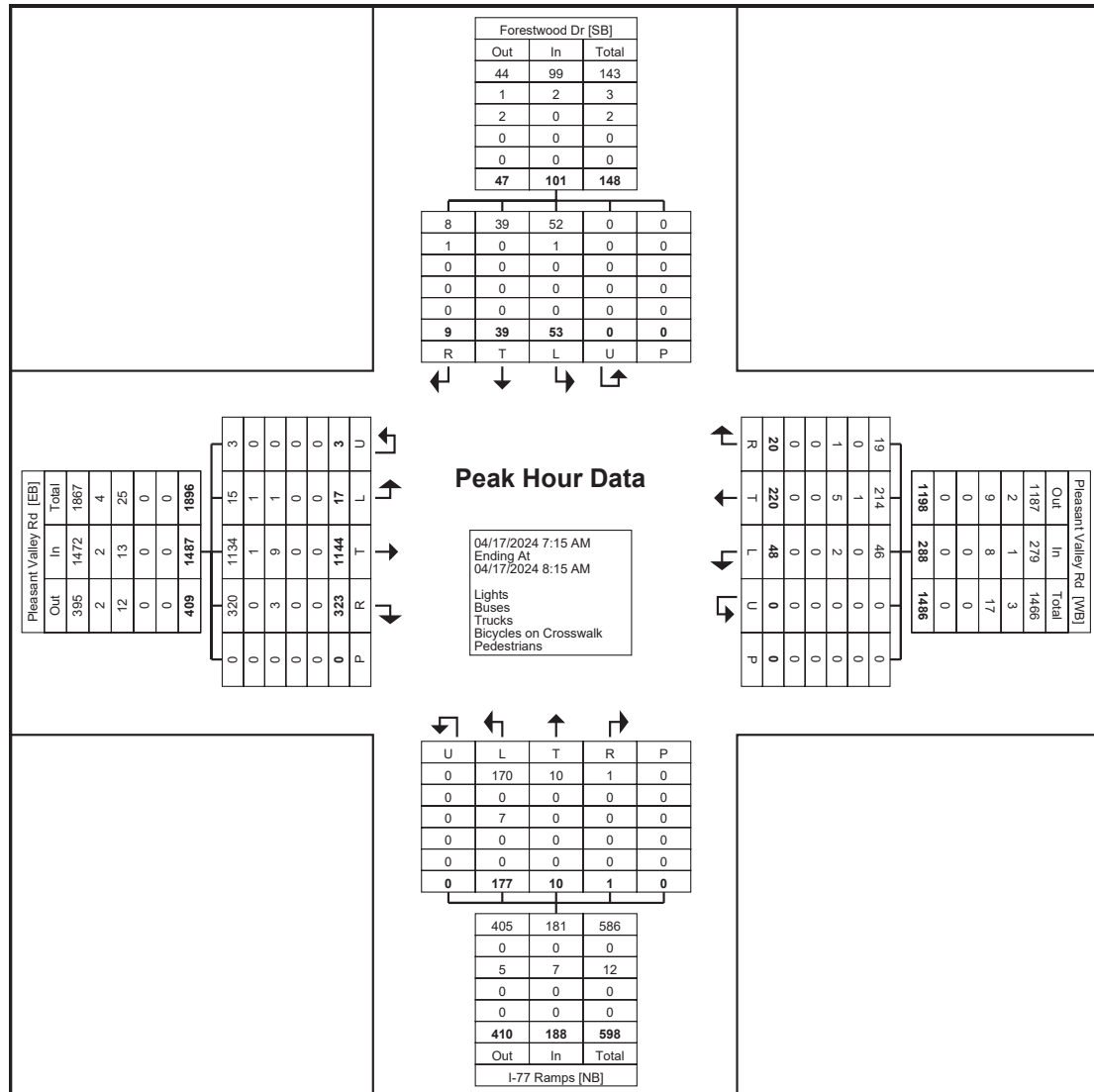
Count Name: Pleasant Valley
Rd & Forestwood Dr/I-77 Ramps
Site Code:
Start Date: 04/17/2024
Page No: 4

[illegible]

Independence, OH
Pleasant Valley Rd &
Forestwood Dr/177 Ramps
Wednesday, April 17, 2024
Location: 41.361818, -
81.652095

Coatesville, PA, Pennsylvania, United States 19320
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Count Name: Pleasant Valley
Rd & Forestwood Dr/I-77 Ramps
Site Code:
Start Date: 04/17/2024
Page No: 5



Turning Movement Peak Hour Data Plot (7:15 AM)



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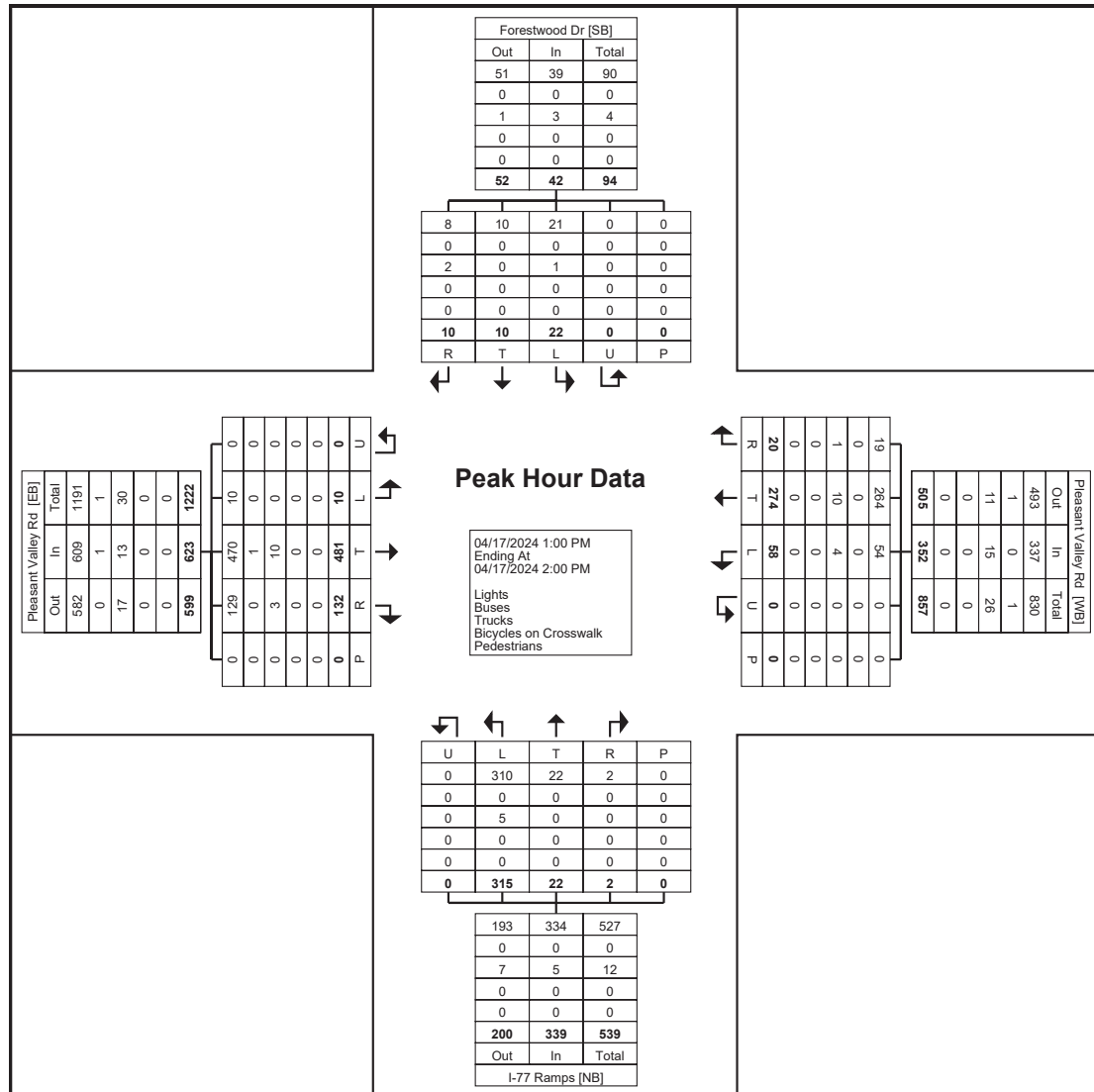
Count Name: Pleasant Valley
Rd & Forestwood Dr/I-77 Ramps
Site Code:
Start Date: 04/17/2024
Page No: 6

[illegible]

Independence, OH
Pleasant Valley Rd &
Forestwood Dr/177 Ramps
Wednesday, April 17, 2024
Location: 41.361818, -
81.652095

Coatesville, PA, Pennsylvania, United States 19320
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Count Name: Pleasant Valley
Rd & Forestwood Dr/I-77 Ramps
Site Code:
Start Date: 04/17/2024
Page No: 7



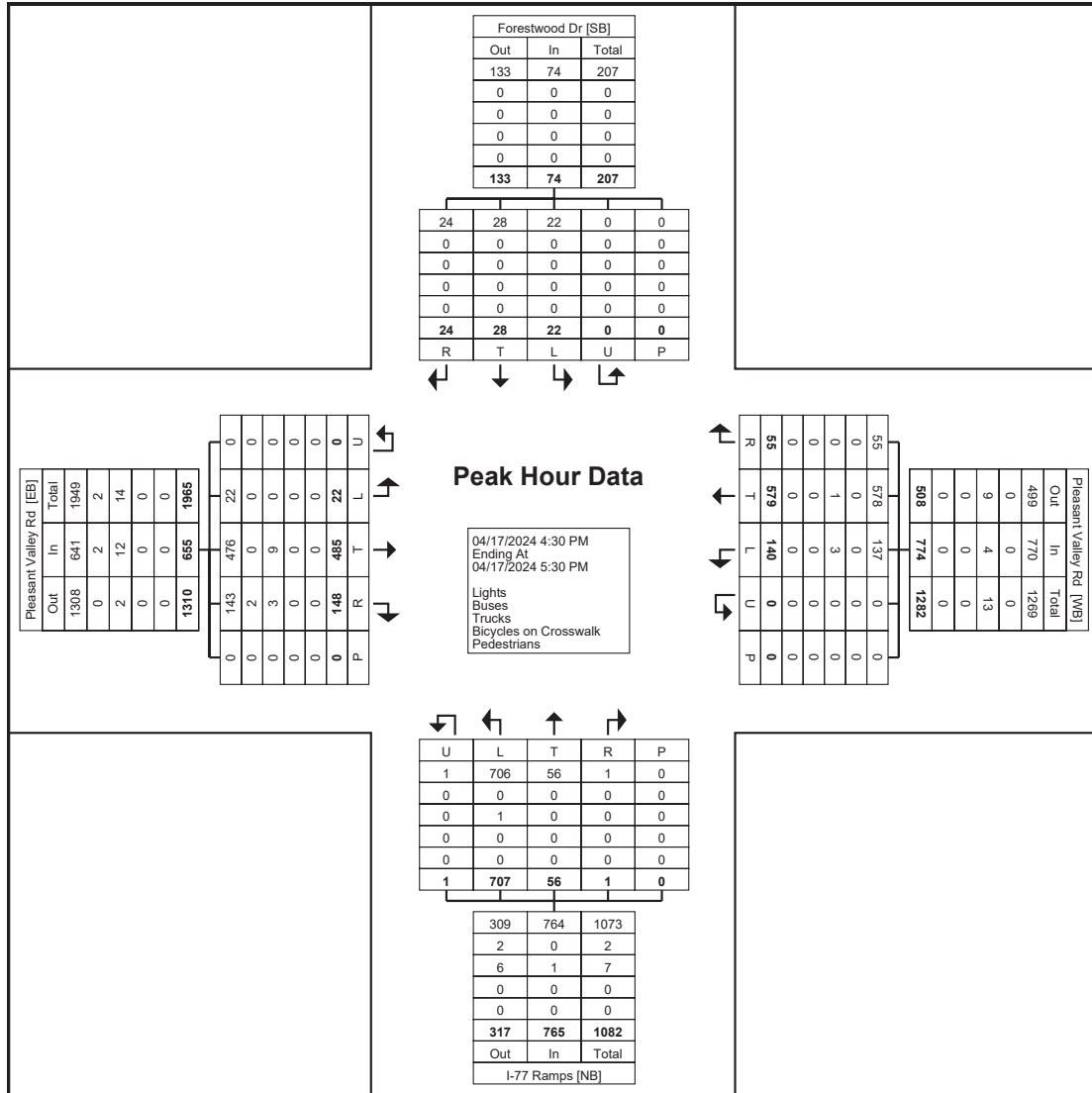
Turning Movement Peak Hour Data Plot (1:00 PM)



Coatesville, PA, Pennsylvania, United States 19320
610-466-1469
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Count Name: Pleasant Valley
Rd & Forestwood Dr/I-77 Ramps
Site Code:
Start Date: 04/17/2024
Page No: 8

[illegible]



Turning Movement Peak Hour Data Plot (4:30 PM)



Independence, OH
Pleasant Valley Rd & I77 NB
Ramps
Wednesday, April 17, 2024
Location: 41.361868, -
81.648143

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Count Name: Pleasant Valley
Rd & I-77 NB Ramps
Site Code:
Start Date: 04/17/2024
Page No: 1

Turning Movement Data

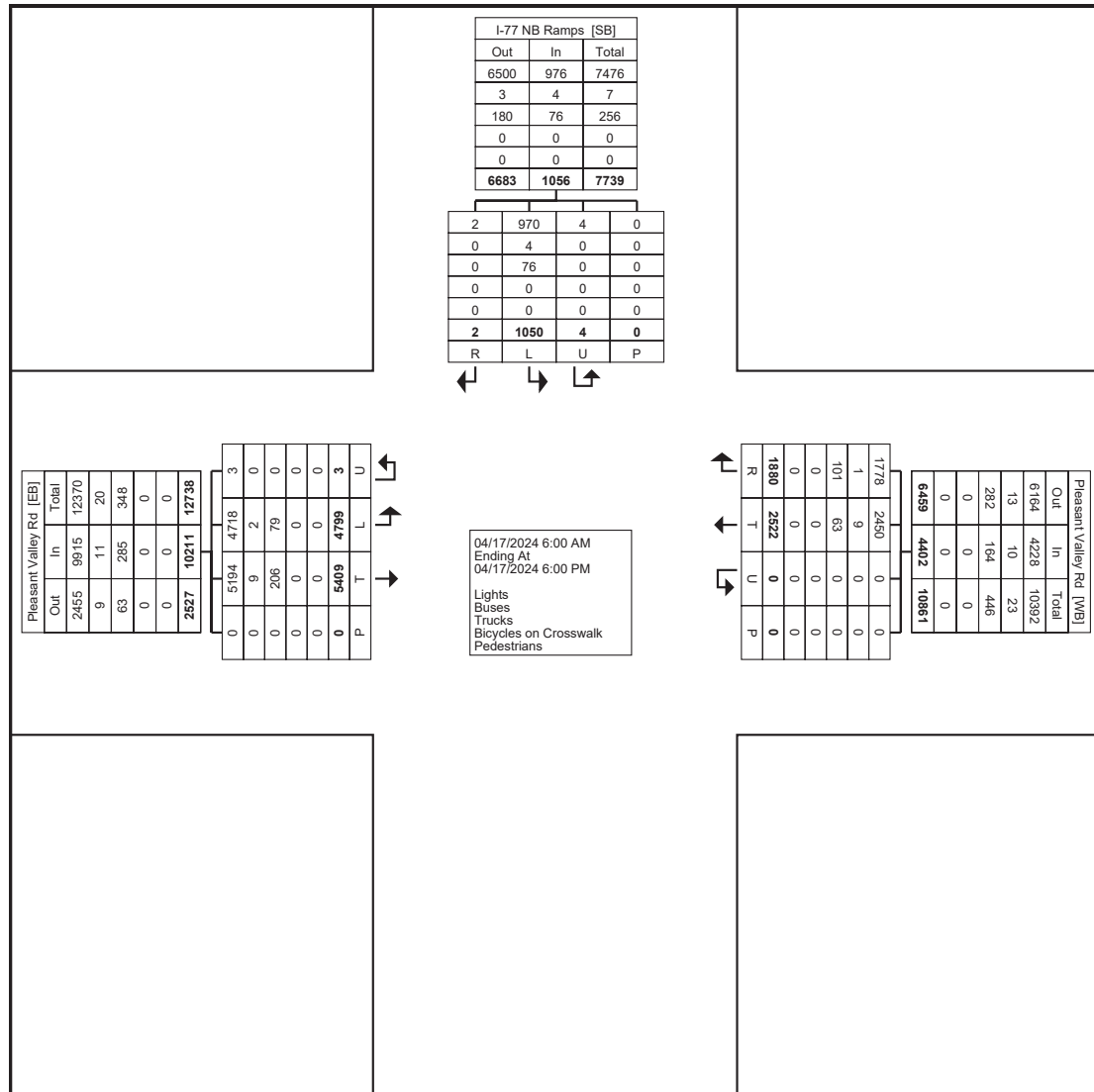
Start Time	Pleasant Valley Rd Eastbound					Pleasant Valley Rd Westbound						I-77 NB Ramps Southbound						Int. Total
	Left	Thru	U-Turn	Peds	App. Total	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Right	Right on Red	U-Turn	Peds	App. Total	
6:00 AM	132	84	0	0	216	15	15	5	0	0	35	14	0	0	0	0	14	265
6:15 AM	137	91	0	0	228	23	28	7	0	0	58	18	0	0	0	0	18	304
6:30 AM	156	112	0	0	268	29	34	14	0	0	77	25	0	0	0	0	25	370
6:45 AM	173	128	0	0	301	20	33	12	0	0	65	24	0	0	0	0	24	390
Hourly Total	598	415	0	0	1013	87	110	38	0	0	235	81	0	0	0	0	81	1329
7:00 AM	160	118	0	0	278	29	37	19	0	0	85	37	0	0	0	0	37	400
7:15 AM	230	164	0	0	394	23	25	17	0	0	65	29	0	1	0	0	30	489
7:30 AM	218	180	0	0	398	43	44	15	0	0	102	49	0	0	0	0	49	549
7:45 AM	238	212	0	0	450	32	40	16	0	0	88	43	0	0	0	0	43	581
Hourly Total	846	674	0	0	1520	127	146	67	0	0	340	158	0	1	0	0	159	2019
8:00 AM	179	142	0	0	321	50	42	15	0	0	107	42	1	0	1	0	44	472
8:15 AM	175	140	0	0	315	38	20	23	0	0	81	21	0	0	0	0	21	417
8:30 AM	135	121	0	0	256	48	26	12	0	0	86	42	0	0	0	0	42	384
8:45 AM	109	128	1	0	238	31	16	15	0	0	62	50	0	0	0	0	50	350
Hourly Total	598	531	1	0	1130	167	104	65	0	0	336	155	1	0	1	0	157	1623
9:00 AM	109	102	0	0	211	44	27	5	0	0	76	17	0	0	0	0	17	304
9:15 AM	119	81	0	0	200	32	24	4	0	0	60	29	0	0	0	0	29	289
9:30 AM	105	77	0	0	182	34	31	1	0	0	66	27	0	0	0	0	27	275
9:45 AM	75	78	0	0	153	35	31	1	0	0	67	19	0	0	0	0	19	239
Hourly Total	408	338	0	0	746	145	113	11	0	0	269	92	0	0	0	0	92	1107
10:00 AM	88	92	0	0	180	39	22	8	0	0	69	17	0	0	0	0	17	266
10:15 AM	81	80	0	0	161	33	29	1	0	0	63	13	0	0	0	0	13	237
10:30 AM	73	78	0	0	151	46	26	0	0	0	72	8	0	0	1	0	9	232
10:45 AM	80	66	0	0	146	44	22	1	0	0	67	15	0	0	0	0	15	228
Hourly Total	322	316	0	0	638	162	99	10	0	0	271	53	0	0	1	0	54	963
11:00 AM	59	77	0	0	136	42	22	8	0	0	72	12	0	0	0	0	12	220
11:15 AM	67	110	0	0	177	46	16	7	0	0	69	16	0	0	0	0	16	262
11:30 AM	82	93	0	0	175	50	16	7	0	0	73	13	0	0	0	0	13	261
11:45 AM	77	85	0	0	162	56	18	7	0	0	81	16	0	0	0	0	16	259
Hourly Total	285	365	0	0	650	194	72	29	0	0	295	57	0	0	0	0	57	1002
12:00 PM	61	100	0	0	161	55	18	10	0	0	83	17	0	0	0	0	17	261
12:15 PM	68	84	0	0	152	47	25	6	0	0	78	22	0	0	1	0	23	253
12:30 PM	84	86	0	0	170	57	26	7	0	0	90	24	0	0	0	0	24	284
12:45 PM	87	81	0	0	168	45	16	8	0	0	69	19	0	0	0	0	19	256
Hourly Total	300	351	0	0	651	204	85	31	0	0	320	82	0	0	1	0	83	1054
1:00 PM	78	87	0	0	165	48	24	4	0	0	76	16	0	0	0	0	16	257
1:15 PM	76	91	0	0	167	59	16	1	0	0	76	18	0	0	0	0	18	261
1:30 PM	82	112	0	0	194	33	12	11	0	0	56	22	0	0	0	0	22	272
1:45 PM	85	99	0	0	184	54	24	8	0	0	86	14	0	0	0	0	14	284
Hourly Total	321	389	0	0	710	194	76	24	0	0	294	70	0	0	0	0	70	1074
2:00 PM	74	101	0	0	175	50	16	9	0	0	75	13	0	0	0	0	13	263
2:15 PM	73	108	0	0	181	55	18	6	0	0	79	14	0	0	0	0	14	274
2:30 PM	62	83	0	0	145	62	31	12	0	0	105	11	0	0	0	0	11	261
2:45 PM	90	111	0	0	201	54	23	13	0	0	90	18	0	0	0	0	18	309
Hourly Total	299	403	0	0	702	221	88	40	0	0	349	56	0	0	0	0	56	1107
3:00 PM	68	114	0	0	182	82	49	1	0	0	132	16	0	0	0	0	16	330
3:15 PM	83	118	0	0	201	64	26	4	0	0	94	15	0	0	0	0	15	310
3:30 PM	76	131	1	0	208	77	66	0	0	0	143	15	0	0	0	0	15	366
3:45 PM	67	145	0	0	212	91	42	2	0	0	135	32	0	0	0	0	32	379
Hourly Total	294	508	1	0	803	314	183	7	0	0	504	78	0	0	0	0	78	1385
4:00 PM	74	137	0	0	211	95	73	6	0	0	174	16	0	0	0	0	16	401
4:15 PM	62	138	0	0	200	83	53	9	0	0	145	19	0	0	0	0	19	364
4:30 PM	60	134	0	0	194	100	82	7	0	0	189	22	0	0	0	0	22	405
4:45 PM	71	174	0	0	245	96	56	0	0	0	152	26	0	0	0	0	26	423
Hourly Total	267	583	0	0	850	374	264	22	0	0	660	83	0	0	0	0	83	1593
5:00 PM	75	147	1	0	223	98	70	13	0	0	181	25	0	0	0	0	25	429
5:15 PM	73	138	0	0	211	110	37	8	0	0	155	25	0	0	1	0	26	392
5:30 PM	53	136	0	0	189	70	34	9	0	0	113	19	0	0	0	0	19	321
5:45 PM	60	115	0	0	175	55	20	5	0	0	80	16	0	0	0	0	16	271

[illegible]

Independence, OH
Pleasant Valley Rd & I77 NB
Ramps
Wednesday, April 17, 2024
Location: 41.361868, -
81.648143

Coatesville, PA, Pennsylvania, United States 19320
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Count Name: Pleasant Valley
Rd & I-77 NB Ramps
Site Code:
Start Date: 04/17/2024
Page No: 3



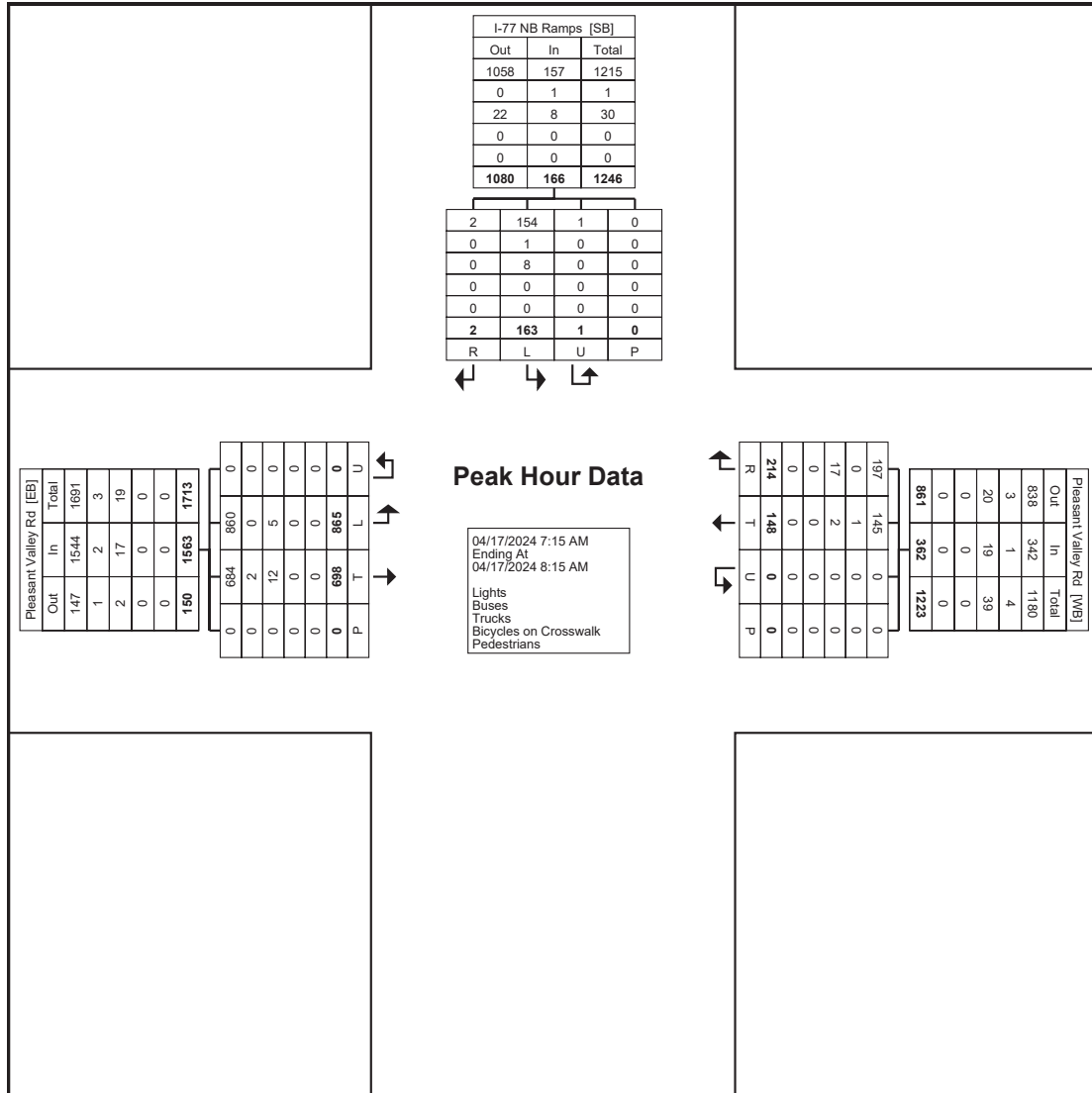
Turning Movement Data Plot



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Rd & I-77 NB Ramps
Site Code:
Start Date: 04/17/2024
Page No: 4

[illegible]



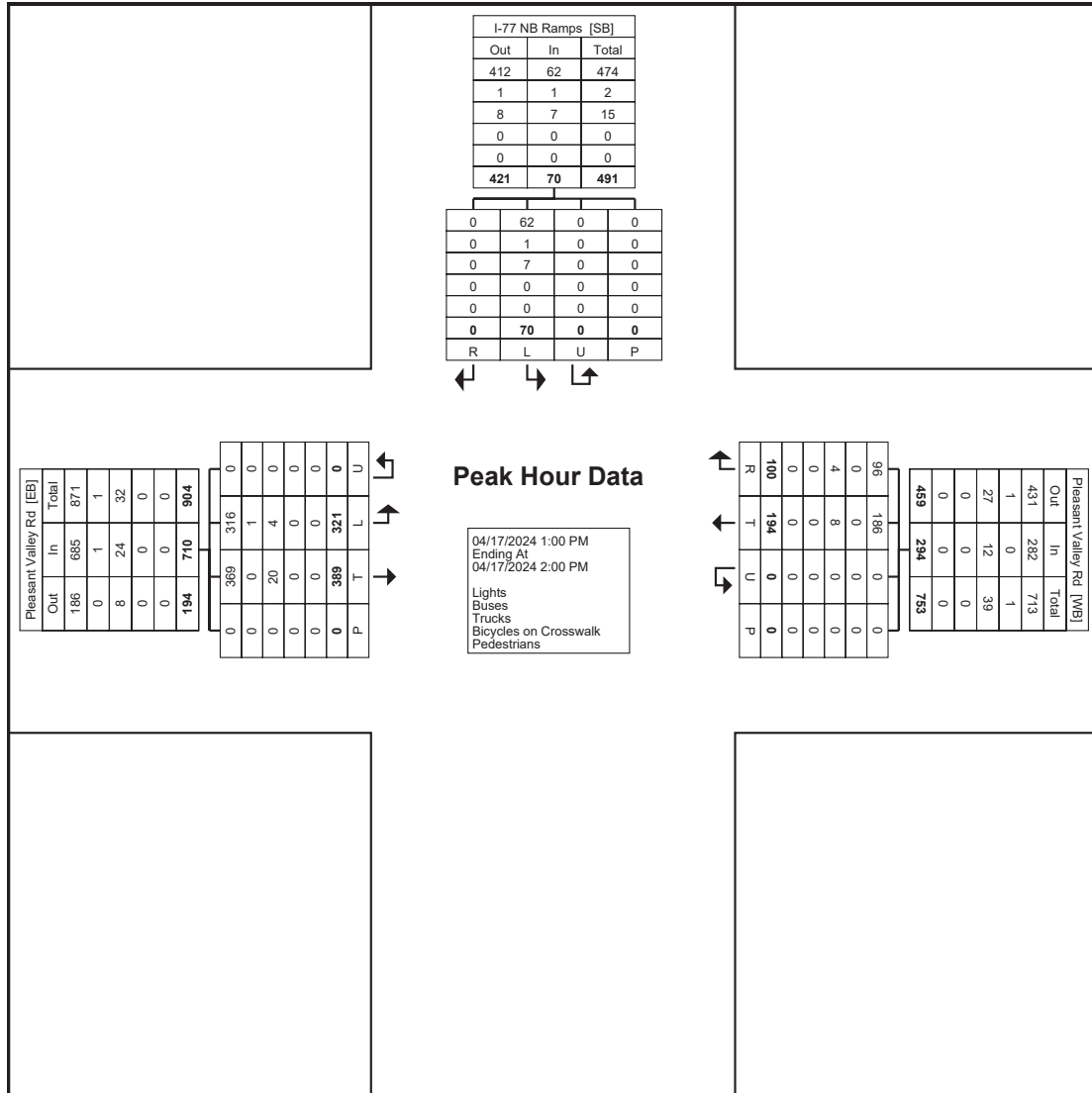
Turning Movement Peak Hour Data Plot (7:15 AM)



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Page No: 6

[illegible]



Turning Movement Peak Hour Data Plot (1:00 PM)

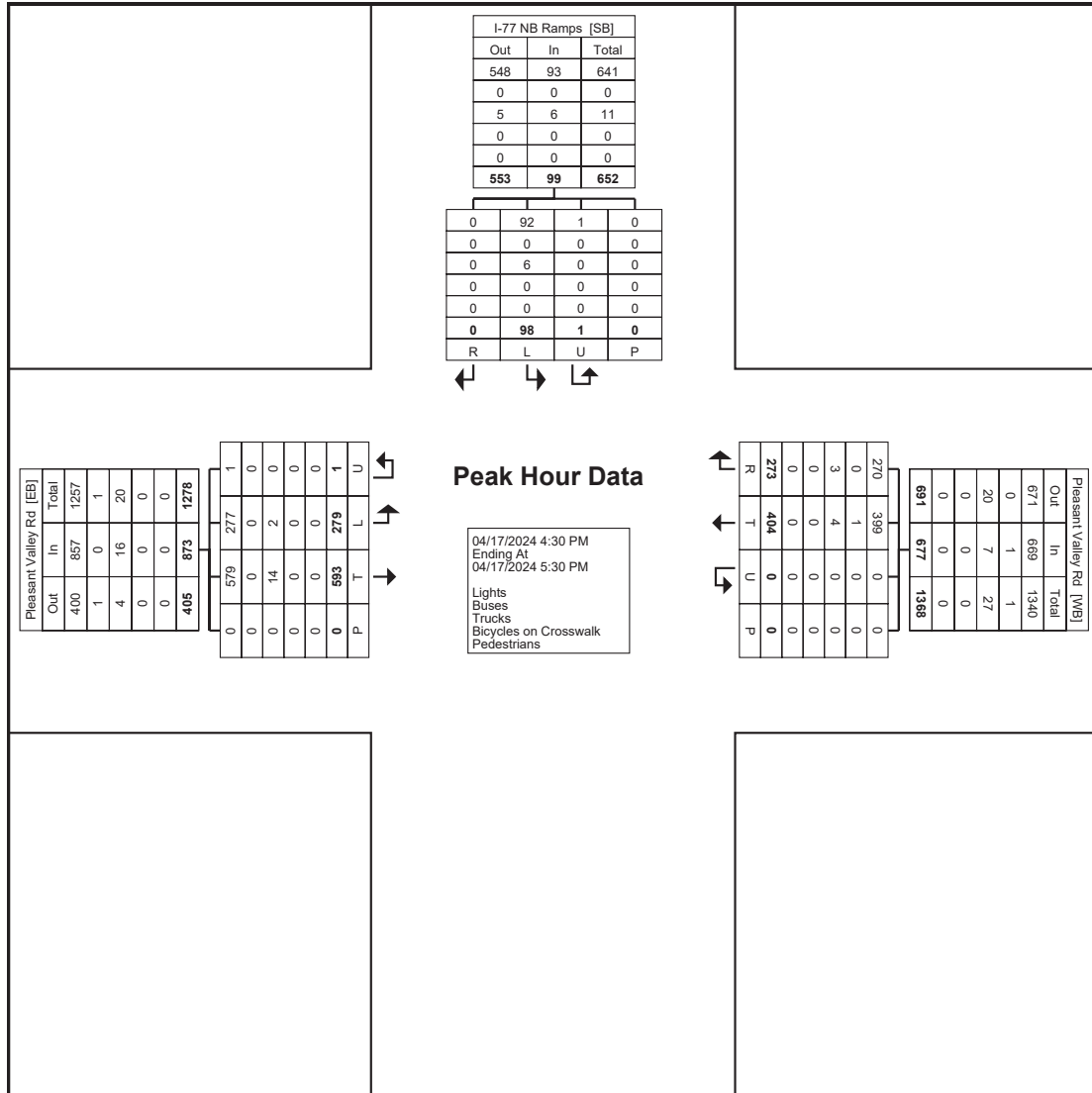


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Count Name: Pleasant Valley
Rd & I-77 NB Ramps
Site Code:
Start Date: 04/17/2024
Page No: 8

Turning Movement Peak Hour Data (4:30 PM)

[illegible]





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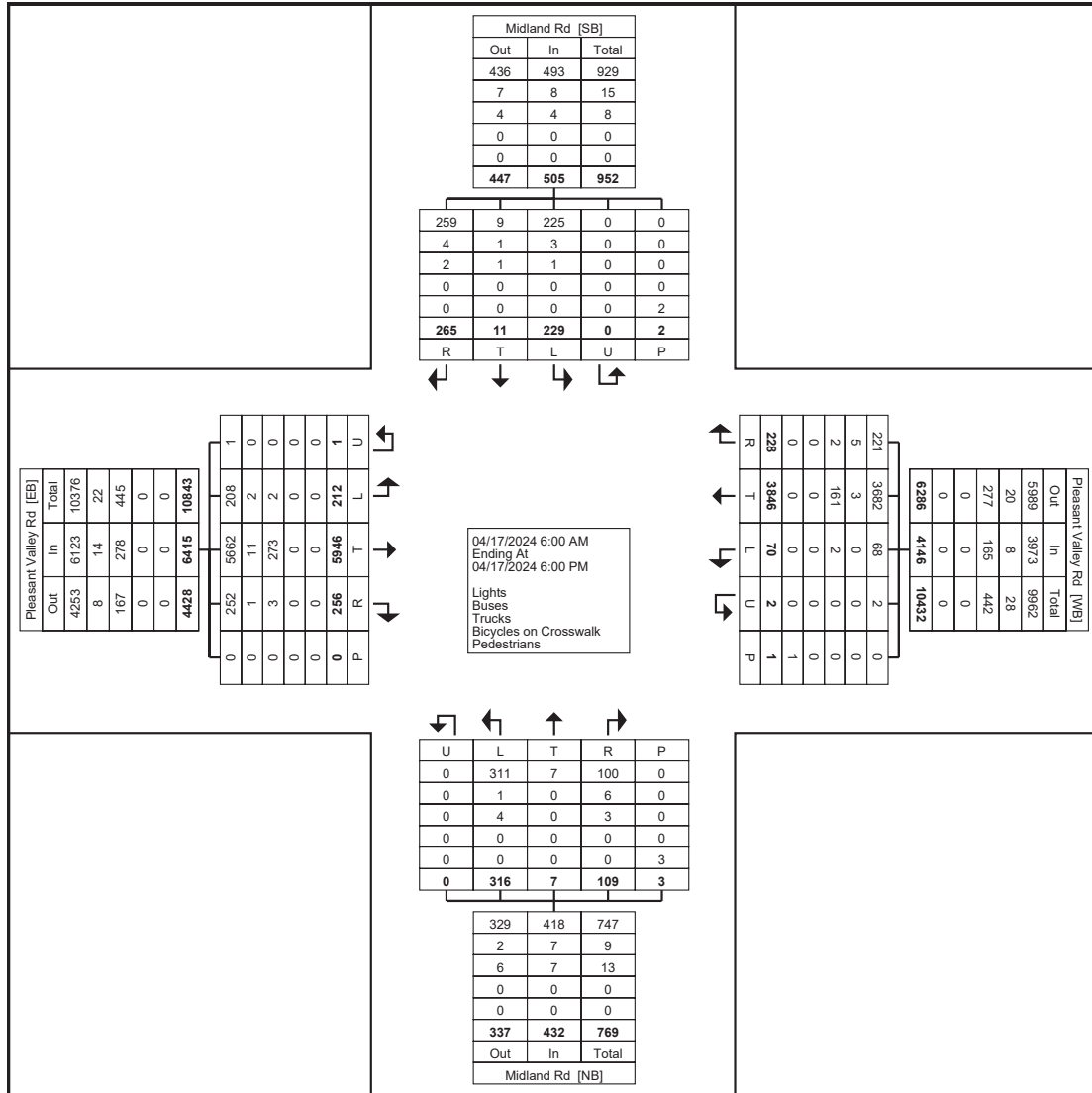
Independence, OH
Pleasant Valley Rd & Midland
Rd
Wednesday, April 17, 2024
Location: 41.361927, -
81.640574

Count Name: Pleasant Valley
Rd & Midland Rd
Site Code:
Start Date: 04/17/2024
Page No: 1

Turning Movement Data

Start Time	Pleasant Valley Rd Eastbound							Pleasant Valley Rd Westbound							Midland Rd Northbound							Midland Rd Southbound							Int. Total
	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	
6:00 AM	2	86	1	1	0	0	90	0	25	1	0	0	0	26	7	0	1	0	0	0	8	1	0	3	1	0	0	5	129
6:15 AM	0	102	0	0	0	0	102	0	48	0	0	0	0	48	11	0	0	0	0	0	11	2	0	0	1	0	0	3	164
6:30 AM	1	142	0	0	0	0	143	0	59	1	0	0	0	60	8	0	0	0	0	0	8	2	0	2	1	0	0	5	216
6:45 AM	1	147	1	0	0	0	149	0	43	0	0	0	0	43	12	0	1	0	0	0	13	2	0	1	8	0	0	11	216
Hourly Total	4	477	2	1	0	0	484	0	175	2	0	0	0	177	38	0	2	0	0	0	40	7	0	6	11	0	0	24	725
7:00 AM	1	152	1	0	0	0	154	0	62	1	0	0	0	63	9	1	1	1	0	0	12	5	0	6	4	0	0	15	244
7:15 AM	1	186	3	0	0	0	190	1	48	0	0	0	0	49	9	0	4	3	0	0	16	11	0	4	5	0	1	20	275
7:30 AM	1	223	0	0	0	0	224	1	71	1	0	0	0	73	15	0	0	0	0	0	15	15	0	7	5	0	1	27	339
7:45 AM	1	241	3	0	0	0	245	1	70	4	0	0	0	75	9	0	2	1	0	0	12	8	0	4	6	0	0	18	350
Hourly Total	4	802	7	0	0	0	813	3	251	6	0	0	0	260	42	1	7	5	0	0	55	39	0	21	20	0	2	80	1208
8:00 AM	1	205	0	0	0	0	206	2	68	2	0	0	0	72	20	0	3	1	0	0	24	6	0	4	6	0	0	16	318
8:15 AM	4	161	0	0	0	0	165	2	69	3	0	0	0	74	10	0	4	0	0	0	14	12	0	2	3	0	0	17	270
8:30 AM	3	154	0	0	0	0	157	1	69	6	0	0	0	76	8	0	1	3	0	0	12	4	0	3	5	0	0	12	257
8:45 AM	0	163	6	0	0	0	169	1	44	0	0	0	0	45	5	0	2	1	0	0	8	5	0	5	1	0	0	11	233
Hourly Total	8	683	6	0	0	0	697	6	250	11	0	0	0	267	43	0	10	5	0	0	58	27	0	14	15	0	0	56	1078
9:00 AM	3	129	4	0	0	0	136	2	63	4	0	0	0	69	6	0	1	0	0	0	7	9	0	7	1	0	0	17	229
9:15 AM	1	91	1	0	0	0	93	0	50	4	0	0	0	54	7	0	3	5	0	0	15	4	1	1	2	0	0	8	170
9:30 AM	3	102	5	1	0	0	111	0	51	1	0	0	0	52	4	1	0	0	0	0	5	2	0	2	6	0	0	10	178
9:45 AM	4	90	4	1	0	0	99	2	53	2	0	0	0	57	6	0	0	1	0	0	7	7	0	1	5	0	0	13	176
Hourly Total	11	412	14	2	0	0	439	4	217	11	0	0	0	232	23	1	4	6	0	0	34	22	1	11	14	0	0	48	753
10:00 AM	1	100	7	0	0	0	108	3	57	7	0	0	0	67	6	0	0	1	0	0	7	3	0	2	2	0	0	7	189
10:15 AM	3	85	3	0	0	0	91	2	49	3	0	0	0	54	7	1	2	3	0	0	13	2	0	1	4	0	0	7	165
10:30 AM	1	86	3	1	0	0	91	2	53	7	0	0	0	62	9	0	1	0	0	0	10	4	1	4	1	0	0	10	173
10:45 AM	4	71	4	0	0	0	79	3	54	7	0	1	0	65	9	0	0	1	0	0	10	8	1	0	0	0	0	9	163
Hourly Total	9	342	17	1	0	0	369	10	213	24	0	1	0	248	31	1	3	5	0	0	40	17	2	7	7	0	0	33	690
11:00 AM	6	80	4	0	0	0	90	4	64	13	1	0	0	82	3	0	3	0	0	0	6	4	1	2	2	0	0	9	187
11:15 AM	4	92	5	1	0	0	102	1	62	6	0	0	0	69	5	0	1	2	0	0	8	10	1	3	1	0	0	15	194
11:30 AM	4	110	5	0	0	0	119	1	64	1	1	1	0	68	3	0	0	2	0	0	5	0	0	0	5	0	0	5	197
11:45 AM	1	88	5	1	0	0	95	1	82	6	1	0	0	90	4	0	1	1	0	0	6	8	0	0	0	0	0	8	199
Hourly Total	15	370	19	2	0	0	406	7	272	26	3	1	0	309	15	0	5	5	0	0	25	22	2	5	8	0	0	37	777
12:00 PM	5	101	4	0	0	0	110	1	65	2	0	0	0	68	6	0	3	1	0	0	10	5	0	1	4	0	0	10	198
12:15 PM	2	107	2	0	0	0	111	1	73	3	0	0	0	77	1	0	0	2	0	0	3	2	0	4	3	0	0	9	200
12:30 PM	3	93	4	0	0	0	100	0	75	6	0	0	0	81	9	0	1	1	0	0	11	4	0	0	5	0	0	9	201
12:45 PM	4	104	7	0	0	0	115	1	61	2	0	0	0	64	7	0	0	1	0	0	8	3	0	2	4	0	0	9	196
Hourly Total	14	405	17	0	0	0	436	3	274	13	0	0	0	290	23	0	4	5	0	0	32	14	0	7	16	0	0	37	795
1:00 PM	6	88	7	0	0	0	101	1	70	6	0	0	0	77	3	1	0	1	0	0	5	2	0	5	1	0	0	8	191
1:15 PM	7	90	3	3	0	0	103	2	64	4	0	0	0	70	4	0	1	1	0	0	6	3	0	3	2	0	0	8	187
1:30 PM	7	116	2	2	0	0	127	0	51	1	1	0	0	53	4	1	1	2	0	0	8	5	0	2	3	0	0	10	198
1:45 PM	5	99	5	2	0	0	111	3	76	4	3	0	0	86	4	0	0	1	0	0	5	4	1	2	1	0	0	8	210
Hourly Total	25	393	17	7	0	0	442	6	261	15	4	0	0	286	15	2	2	5	0	0	24	14	1	12	7	0	0	34	786
2:00 PM	7	99	7	1	0	0	114	1	59	3	0	0	0	63	1	0	3	0	0	0	4	2	0	7	0	0	0	9	190
2:15 PM	5	102	5	1	0	0	113	1	71	6	0	0	0	78	5	0	4	1	0	1	10	6	0	3	0	0	0	9	210
2:30 PM	0	100	5	2	0	0	107	3	88	5	0	0	0	96	7	0	0	0	0	1	7	3	1	4	0	0	0	8	218
2:45 PM	4	119	3	1	0	0	127	2	88	4	0	0	1	94	5	0	1	1	0	0	7	7	0	2	0	0	0	9	237
Hourly Total	16	420	20	5	0	0	461	7	306	18	0	0	1	331	18	0	8	2	0	2	28	18	1	16	0	0	0	35	855
3:00 PM	11	113	8	3	0	0	135	4	120	7	1	0	0	132	7	0	1	1	0	1	9	5	0	2	1	0	0	8	284
3:15 PM	2	120	11	0	0	0	133	1	92	2	3	0	0	98	1	0	0	0	0	0	1	4	0	8	1	0	0	13	245
3:30 PM	5	125	2	1	0	0	133	2	127	2	3	0	0	134	3	2	0	2	0	0	7	2	1	6	2	0	0	11	285
3:45 PM	8	164	10	0	0	0	182	0	124	5	0	0	0	129	7	0	1	1	0	0	9	7	2	3	0	0	0	12	332
Hourly Total	26	522	31	4	0	0	583	7	463	16	7	0	0	493	18	2	2	4	0	1	26	18	3	19	4	0	0	44	1146
4:00 PM	6	126	5	2	0	0	139	0	175	6	0	0	0	181	7	0	0	2	0	0	9	6	0	5	0	0	0	11	340
4:15 PM	10	147	6	0	0	0	163	3	152	9	0																		

Hourly Total	39	537	45	1	1	0	623	8	496	28	1	0	0	533	20	0	6	6	0	0	32	16	1	8	17	0	0	42	1230
Grand Total	212	5946	230	26	1	0	6415	70	3846	210	18	2	1	4146	316	7	55	54	0	3	432	229	11	137	128	0	2	505	11498
Approach %	3.3	92.7	3.6	0.4	0.0	-	-	1.7	92.8	5.1	0.4	0.0	-	-	73.1	1.6	12.7	12.5	0.0	-	-	45.3	2.2	27.1	25.3	0.0	-	-	-
Total %	1.8	51.7	2.0	0.2	0.0	-	55.8	0.6	33.4	1.8	0.2	0.0	-	36.1	2.7	0.1	0.5	0.5	0.0	-	3.8	2.0	0.1	1.2	1.1	0.0	-	4.4	-
Lights	208	5662	226	26	1	-	6123	68	3682	204	17	2	-	3973	311	7	49	51	0	-	418	225	9	132	127	0	-	493	11007
% Lights	98.1	95.2	98.3	100.0	100.0	-	95.4	97.1	95.7	97.1	94.4	100.0	-	95.8	98.4	100.0	89.1	94.4	-	-	96.8	98.3	81.8	96.4	99.2	-	-	97.6	95.7
Buses	2	11	1	0	0	-	14	0	3	4	1	0	-	8	1	0	3	3	0	-	7	3	1	3	1	0	-	8	37
% Buses	0.9	0.2	0.4	0.0	0.0	-	0.2	0.0	0.1	1.9	5.6	0.0	-	0.2	0.3	0.0	5.5	5.6	-	-	1.6	1.3	9.1	2.2	0.8	-	-	1.6	0.3
Trucks	2	273	3	0	0	-	278	2	161	2	0	0	-	165	4	0	3	0	0	-	7	1	1	2	0	0	-	4	454
% Trucks	0.9	4.6	1.3	0.0	0.0	-	4.3	2.9	4.2	1.0	0.0	0.0	-	4.0	1.3	0.0	5.5	0.0	-	-	1.6	0.4	9.1	1.5	0.0	-	-	0.8	3.9
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	-	1	-	-	-	-	-	-	3	-	-	-	-	-	-	2	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	-	100.0	-	-	-	-	-	-	100.0	-	-



Turning Movement Data Plot



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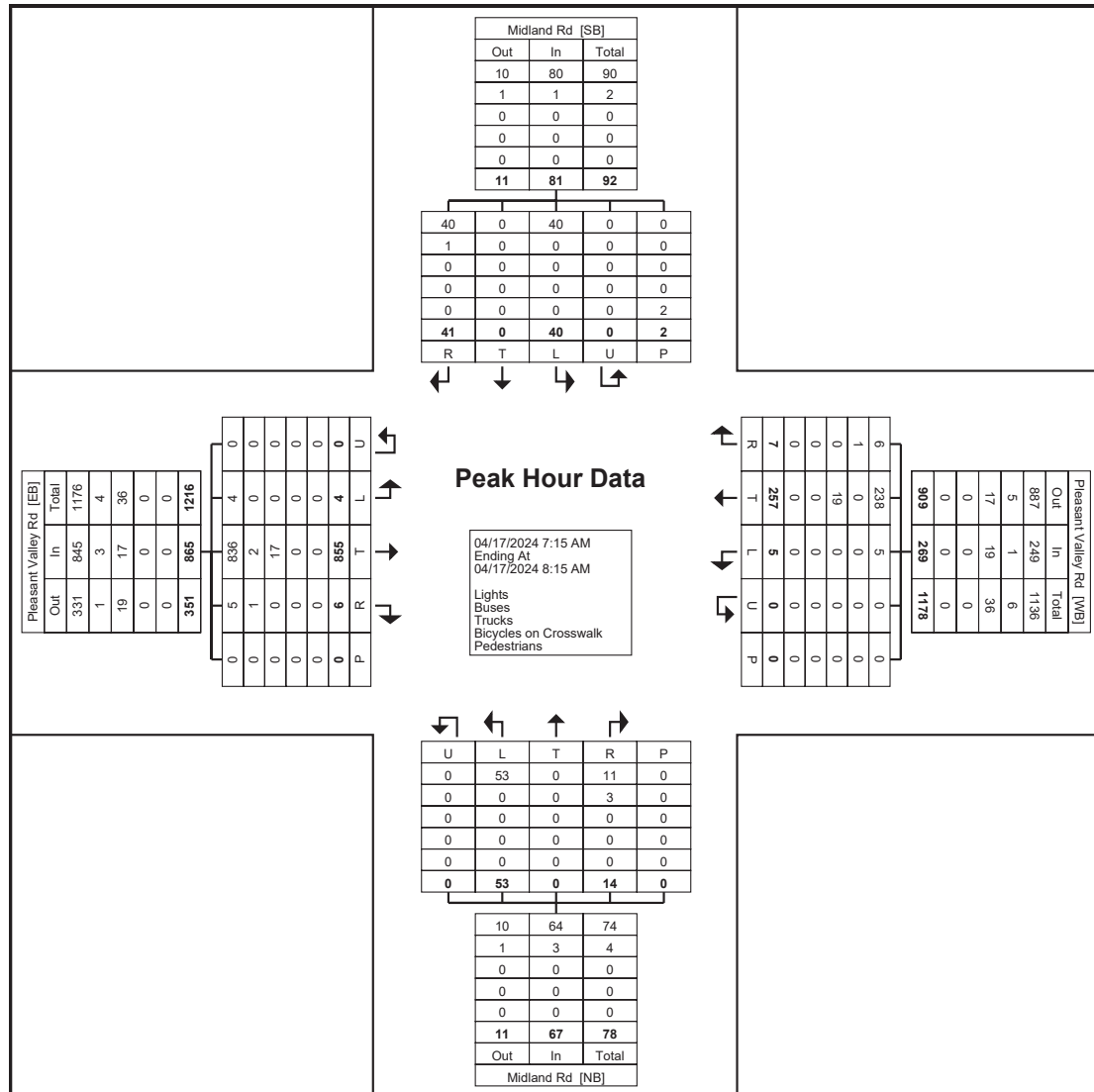
Count Name: Pleasant Valley
Rd & Midland Rd
Site Code:
Start Date: 04/17/2024
Page No: 4

[illegible]

Independence, OH
Pleasant Valley Rd & Midland Rd
Wednesday, April 17, 2024
Location: 41.361927, -
81.640574

Coatesville, PA, Pennsylvania, United States 19320
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Count Name: Pleasant Valley
Rd & Midland Rd
Site Code:
Start Date: 04/17/2024
Page No: 5



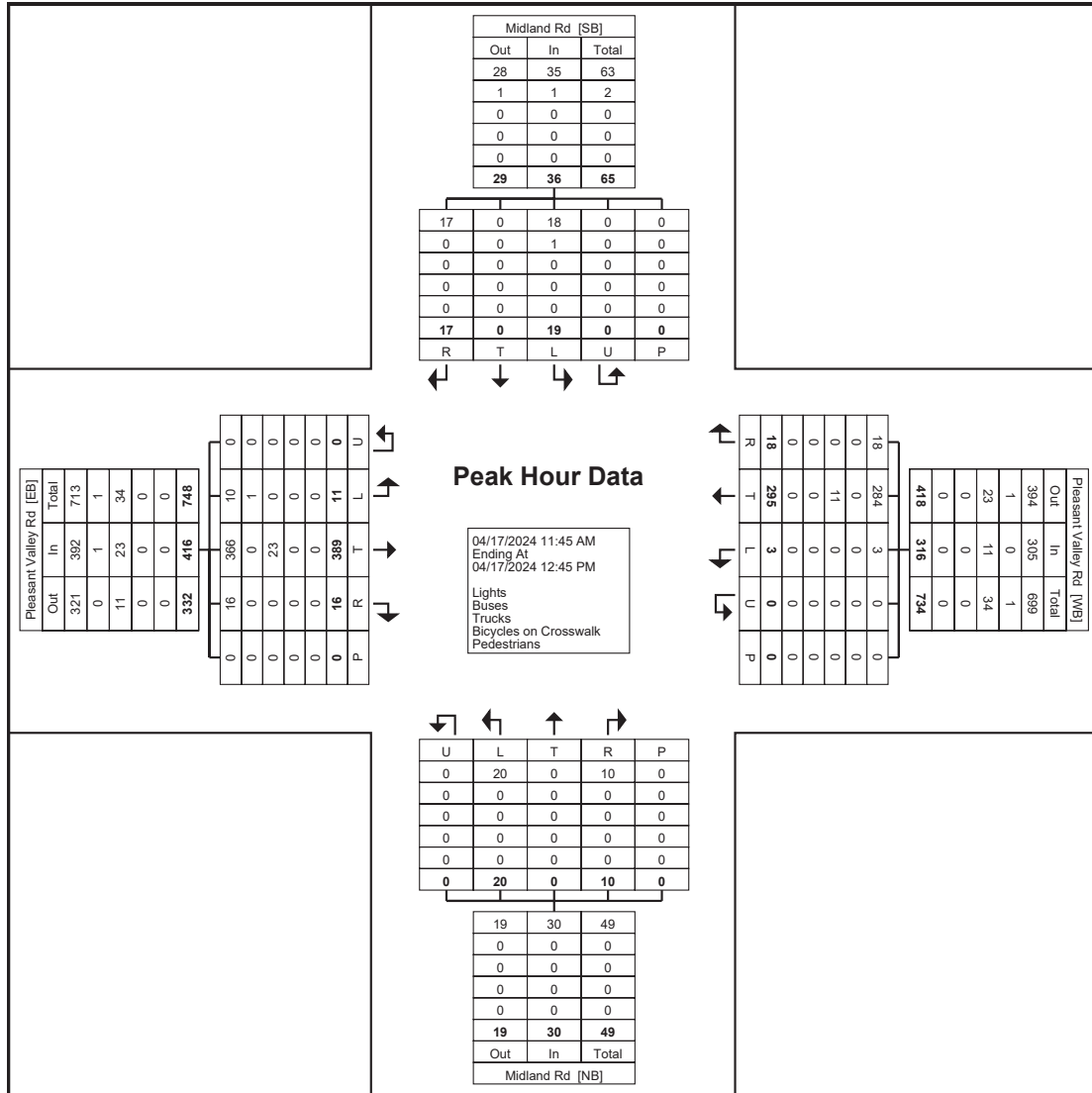
Turning Movement Peak Hour Data Plot (7:15 AM)



Coatesville, PA, Pennsylvania, United States 19320
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Count Name: Pleasant Valley
Rd & Midland Rd
Site Code:
Start Date: 04/17/2024
Page No: 6

[illegible]



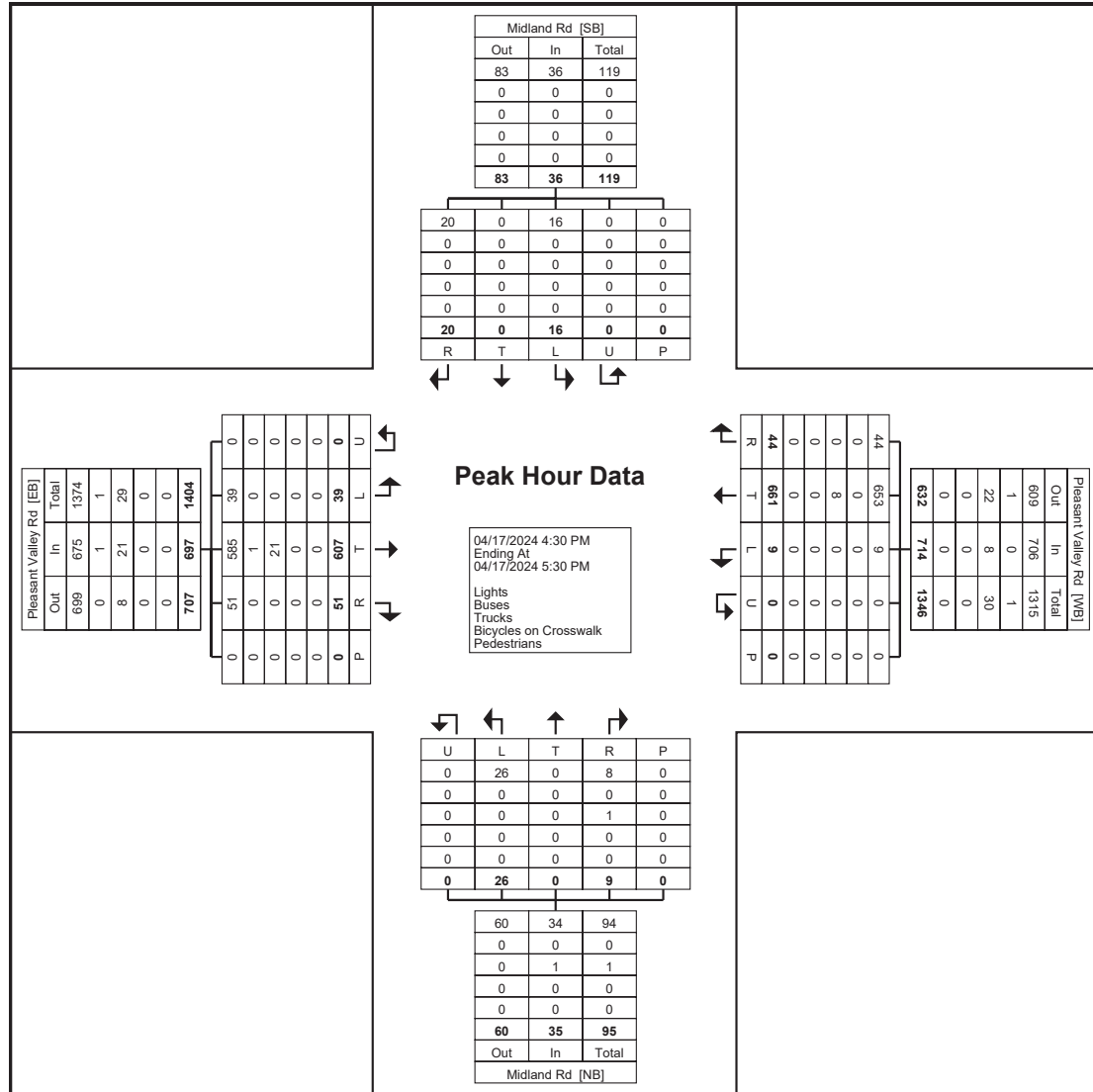
Turning Movement Peak Hour Data Plot (11:45 AM)



Coatesville, PA, Pennsylvania, United States 19320
610-466-1469
Serving Transportation Professionals Since 1995

Count Name: Pleasant Valley
Rd & Midland Rd
Site Code:
Start Date: 04/17/2024
Page No: 8

[illegible]



Turning Movement Peak Hour Data Plot (4:30 PM)



www.TSTData.com

Tri-State Traffic Data, Inc

Independence, OH
Pleasant Valley Rd & Brecksville
Rd
Wednesday, April 17, 2024
Location: 41.361964, -
81.636223

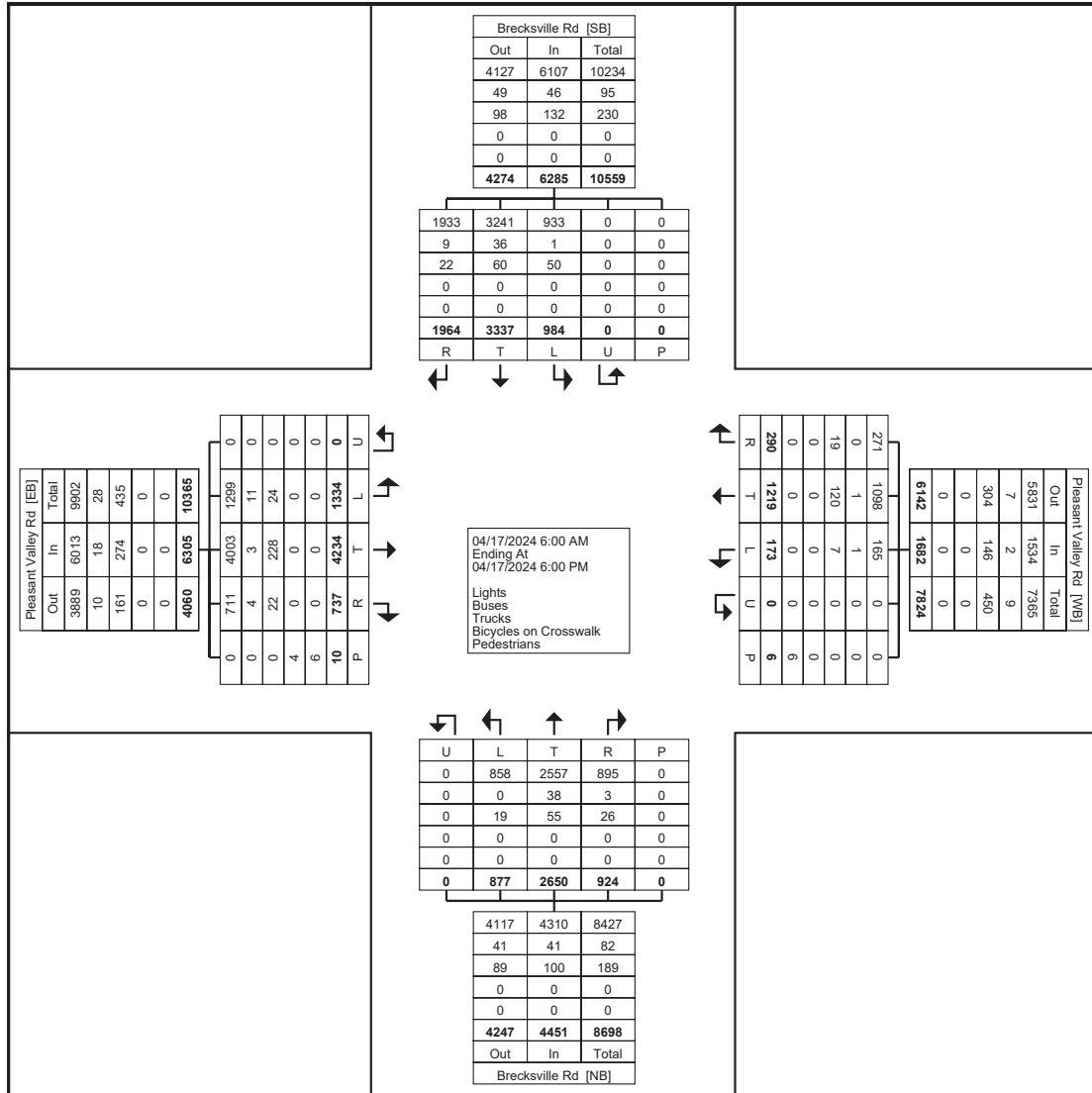
Coatesville, PA, Pennsylvania, United States 19320
610-466-1469
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Count Name: Pleasant Valley
Rd & Brecksville Rd
Site Code:
Start Date: 04/17/2024
Page No: 1

Turning Movement Data

Start Time	Pleasant Valley Rd Eastbound							Pleasant Valley Rd Westbound							Brecksville Rd Northbound							Brecksville Rd Southbound							Int. Total
	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	
6:00 AM	5	86	4	0	0	0	95	0	4	0	0	0	0	4	8	22	12	1	0	0	43	14	5	9	3	0	0	31	173
6:15 AM	7	93	3	2	0	0	105	1	17	0	0	0	0	18	7	31	26	6	0	0	70	20	14	16	8	0	0	58	251
6:30 AM	14	125	3	1	0	0	143	1	7	0	1	0	1	9	25	26	18	3	0	0	72	22	15	18	11	0	0	66	290
6:45 AM	18	121	5	2	0	0	146	0	7	0	1	0	0	8	21	34	25	2	0	0	82	28	19	10	8	0	0	65	301
Hourly Total	44	425	15	5	0	0	489	2	35	0	2	0	1	39	61	113	81	12	0	0	267	84	53	53	30	0	0	220	1015
7:00 AM	22	146	3	1	0	0	172	1	15	0	2	0	0	18	19	46	31	5	0	0	101	29	26	9	18	0	0	82	373
7:15 AM	42	149	5	4	0	0	200	2	6	0	1	0	0	9	15	114	53	3	0	0	185	32	40	13	10	0	0	95	489
7:30 AM	48	185	7	1	0	0	241	1	7	1	0	0	0	9	22	123	42	7	0	0	194	39	65	19	21	0	0	144	588
7:45 AM	44	199	6	4	0	0	253	0	12	4	0	0	0	16	30	101	50	10	0	0	191	50	61	11	16	0	0	138	598
Hourly Total	156	679	21	10	0	0	866	4	40	5	3	0	0	52	86	384	176	25	0	0	671	150	192	52	65	0	0	459	2048
8:00 AM	37	174	4	1	0	0	216	2	8	0	0	0	0	10	26	66	31	2	0	0	125	26	41	15	23	0	0	105	456
8:15 AM	44	128	4	0	0	0	176	1	8	0	0	0	0	9	26	79	42	4	0	0	151	19	57	26	24	0	0	126	462
8:30 AM	28	110	12	0	0	0	150	1	7	0	1	0	0	9	20	77	35	7	0	0	139	22	42	25	16	0	0	105	403
8:45 AM	39	127	15	1	0	0	182	2	7	0	0	0	0	9	18	59	26	1	0	0	104	20	49	13	12	0	0	94	389
Hourly Total	148	539	35	2	0	0	724	6	30	0	1	0	0	37	90	281	134	14	0	0	519	87	189	79	75	0	0	430	1710
9:00 AM	24	86	6	4	0	0	120	1	10	3	1	0	0	15	16	44	19	7	0	0	86	20	40	21	18	0	0	99	320
9:15 AM	24	74	7	3	0	0	108	2	6	1	0	0	0	9	15	46	12	9	0	0	82	12	30	18	10	0	0	70	269
9:30 AM	30	65	6	3	0	0	104	1	6	2	0	0	0	9	19	40	14	5	0	0	78	16	32	22	5	0	0	75	266
9:45 AM	27	62	4	4	0	0	97	0	18	1	0	0	0	19	15	45	13	7	0	0	80	18	36	17	9	0	0	80	276
Hourly Total	105	287	23	14	0	0	429	4	40	7	1	0	0	52	65	175	58	28	0	0	326	66	138	78	42	0	0	324	1131
10:00 AM	24	72	8	6	0	0	110	1	9	3	3	0	0	16	16	43	7	3	0	0	69	10	47	20	20	0	0	97	292
10:15 AM	26	54	10	4	0	0	94	0	10	3	1	0	1	14	19	48	7	6	0	0	80	8	51	13	10	0	0	82	270
10:30 AM	20	56	7	7	0	0	90	0	10	2	1	0	0	13	13	59	4	3	0	0	79	14	72	26	15	0	0	127	309
10:45 AM	20	44	7	4	0	0	75	0	12	7	0	0	0	19	17	62	15	6	0	0	100	15	71	12	25	0	0	123	317
Hourly Total	90	226	32	21	0	0	369	1	41	15	5	0	1	62	65	212	33	18	0	0	328	47	241	71	70	0	0	429	1188
11:00 AM	18	59	10	5	0	0	92	3	13	0	3	0	0	19	24	52	5	4	0	0	85	15	68	18	20	0	0	121	317
11:15 AM	29	64	12	5	0	0	110	3	12	8	2	0	0	25	21	39	5	2	0	0	67	11	71	17	22	0	0	121	323
11:30 AM	19	80	10	6	0	0	115	3	17	11	7	0	0	38	16	37	7	8	0	0	68	14	72	19	15	0	0	120	341
11:45 AM	23	53	13	5	0	0	94	7	27	9	7	0	0	50	19	67	6	4	0	0	96	21	73	17	22	0	0	133	373
Hourly Total	89	256	45	21	0	0	411	16	69	28	19	0	0	132	80	195	23	18	0	0	316	61	284	71	79	0	0	495	1354
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12:15 PM	28	74	10	4	0	0	116	6	31	13	7	0	0	57	15	52	11	4	0	0	82	29	78	13	12	0	0	132	387
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12:45 PM	33	77	5	3	0	0	118	4	19	7	2	0	0	32	16	50	6	6	0	0	78	29	69	16	12	0	0	126	354
Hourly Total	110	301	50	13	0	0	474	20	105	43	21	0	0	189	67	196	32	14	0	0	309	106	248	55	65	0	0	474	1446
1:00 PM	12	59	7	7	0	0	85	4	25	5	1	0	0	35	15	46	7	14	0	0	82	30	67	22	9	0	0	128	330
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1:45 PM	27	48	14	8	0	1	97	1	25	0	1	0	0	27	22	49	8	3	0	0	82	15	74	17	31	0	0	137	343
Hourly Total	88	259	45	22	0	1	414	16	78	11	5	0	1	110	71	182	38	26	0	0	317	85	244	69	66	0	0	464	1305
2:00 PM	23	62	16	1	0	0	102	2	25	7	0	0	0	34	20	50	4	5	0	0	79	17	62	8	12	0	0	99	314
2:15 PM	34	72	16	3	0	1	125	2	28	2	1	0	0	33	15	56	6	7	0	0	84	19	75	17	8	0	0	119	361
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2:45 PM	30	69	15	4	0	0	118	2	27	5	2	0	0	36	20	46	8	3	0	0	77	22	81	25	25	0	0	153	384
Hourly Total	111	259	51	14	0	2	435	8	107	22	5	0	0	142	82	207	36	25	0	0	350	77	312	72	69	0	0	530	1457
3:00 PM	21	74	14	3	0	2	112	8	39	5	4	0	0	56	18	57	6	4	0	0	85	24	77	47	30	0	0	178	431
3:15 PM	25	80	14	2	0	4	121	4	23	2	4	0	0	33	15	37	7	0	0	0	59	12	84	28	17	0	0	141	354
3:30 PM	32	85	22	3	0	0	142	7	54	8	0	0	0	69	18	56	10	2	0	0	86	20	94	34	18	0	0	166	463
3:45 PM	38	101	18	2	0	1	159	5	47	4	1	0	2	57	12	70	11	2	0	0	95	20	99	39	21	0	0	179	490
Hourly Total	116	340	68	10	0	7	534	24	163	19	9	0	2	215	63	220	34	8	0	0	325	76	354	148	86	0	0	664	1738
4:00 PM	40	92	21	4	0	0	157	14	118	18	0	0	0	150	13	64	12	1	0	0	90	17	110	37	18	0	0	182	579
4:15 PM	34	81	13	11	0	0	139	10	64	8	2	0	1	84	19	65	13	5	0	0	102	19	151	37	26	0	0	233	558
4:30 PM	36	93	23	1	0	0	153	12	96	10	0	0	0	118	22	64	7	2	0	0	95	21	135	60	43	0	0	259	625
4:45 PM	37	92	33	7	0	0	169	11	55	1	6	0	0	73	19	80	2	3	0	0	104	14	181	35	47	0	0	277	623
Hourly Total	147	358	90	23	0	0	618	47	333	37	8	0	1	425	73	273	34	11	0	0	391	71	577	169	134	0	0	951	2385

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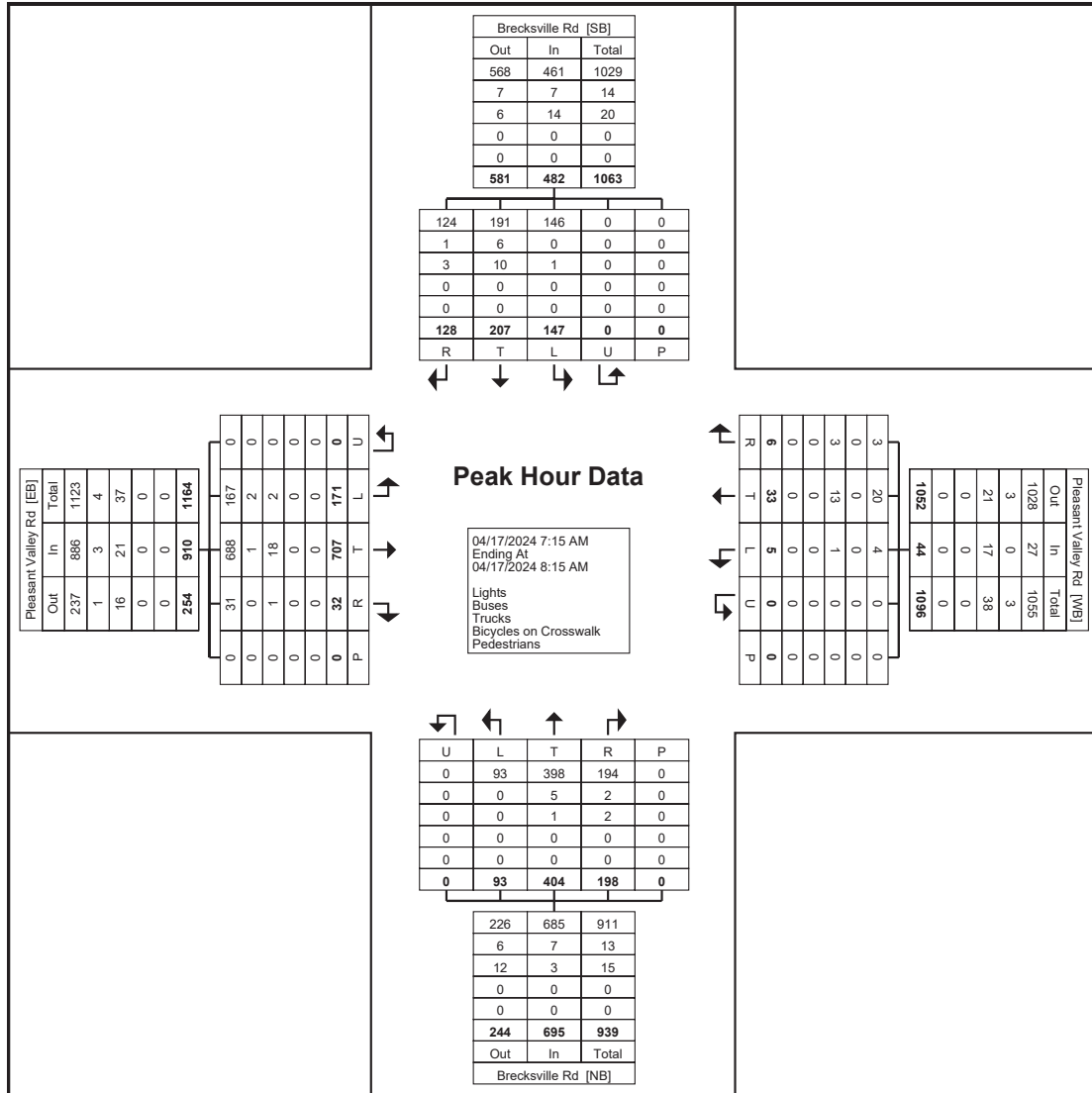
Turning Movement Data Plot



Coatesville, PA, Pennsylvania, United States 19320
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Turning Movement Peak Hour Data (7:15 AM)

[illegible]





Coatesville, PA, Pennsylvania, United States 19320
610-466-1469
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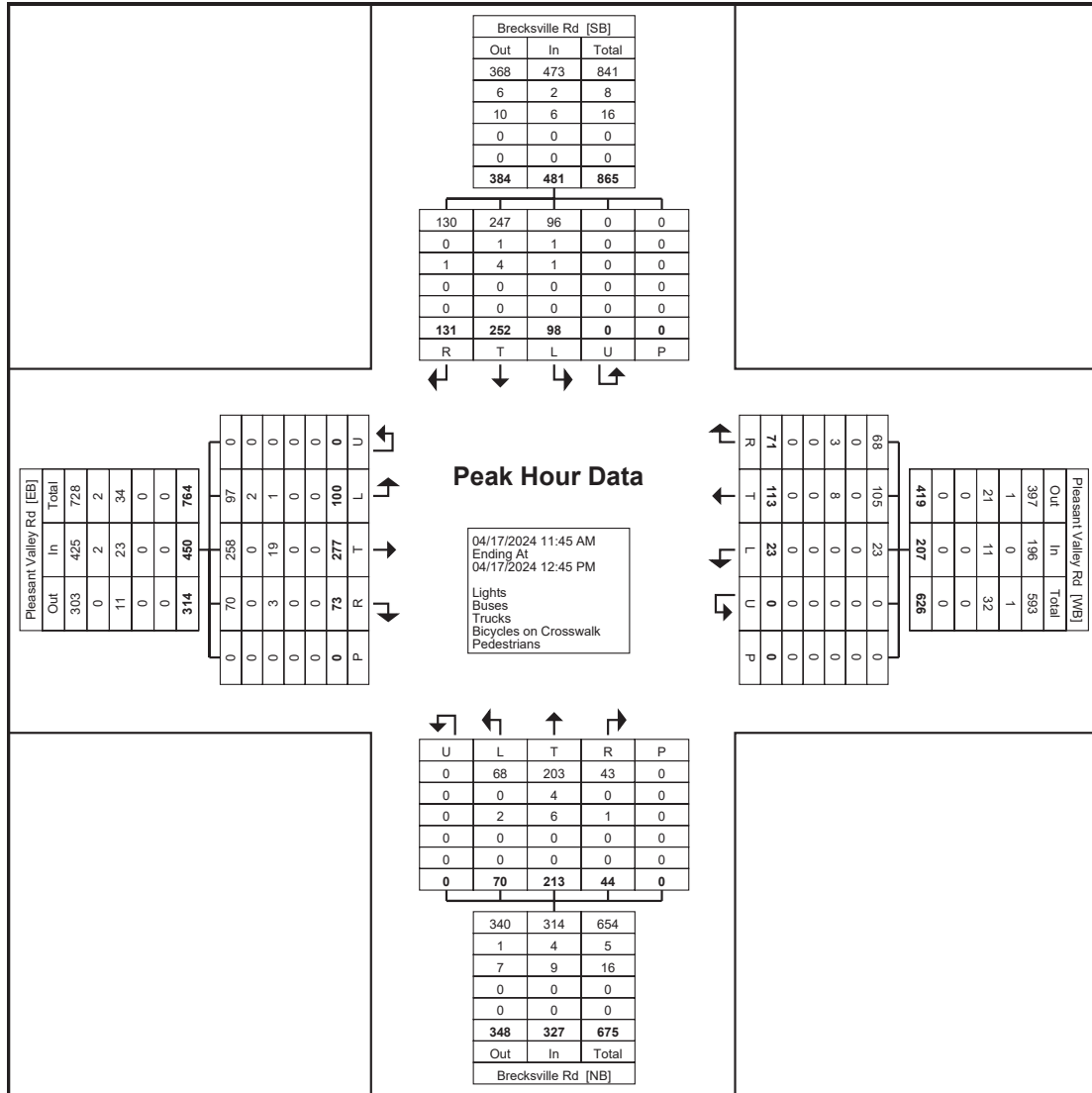
Count Name: Pleasant Valley
Rd & Brecksville Rd
Site Code:
Start Date: 04/17/2024
Page No: 6

[illegible]

Independence, OH
Pleasant Valley Rd & Brecksville
Rd
Wednesday, April 17, 2024
Location: 41.361964, -
81.636223

Coatesville, PA, Pennsylvania, United States 19320
610-466-1469
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Count Name: Pleasant Valley
Rd & Brecksville Rd
Site Code:
Start Date: 04/17/2024
Page No: 7



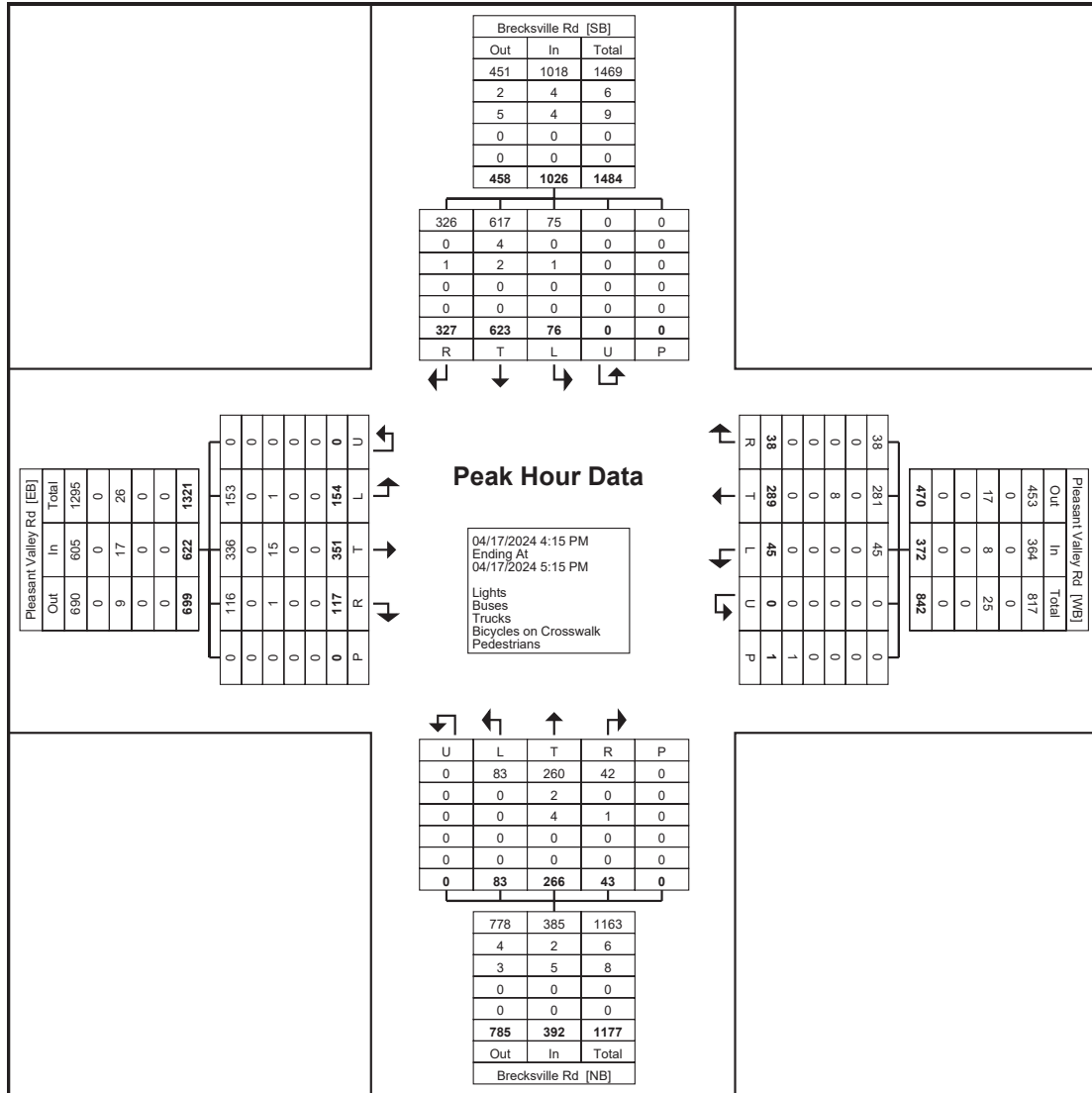
Turning Movement Peak Hour Data Plot (11:45 AM)



Coatesville, PA, Pennsylvania, United States 19320
610-466-1469
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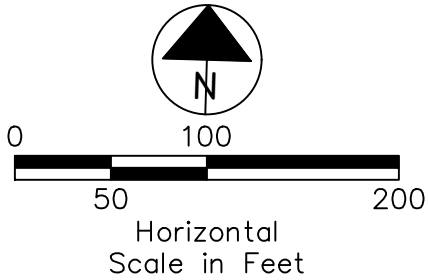
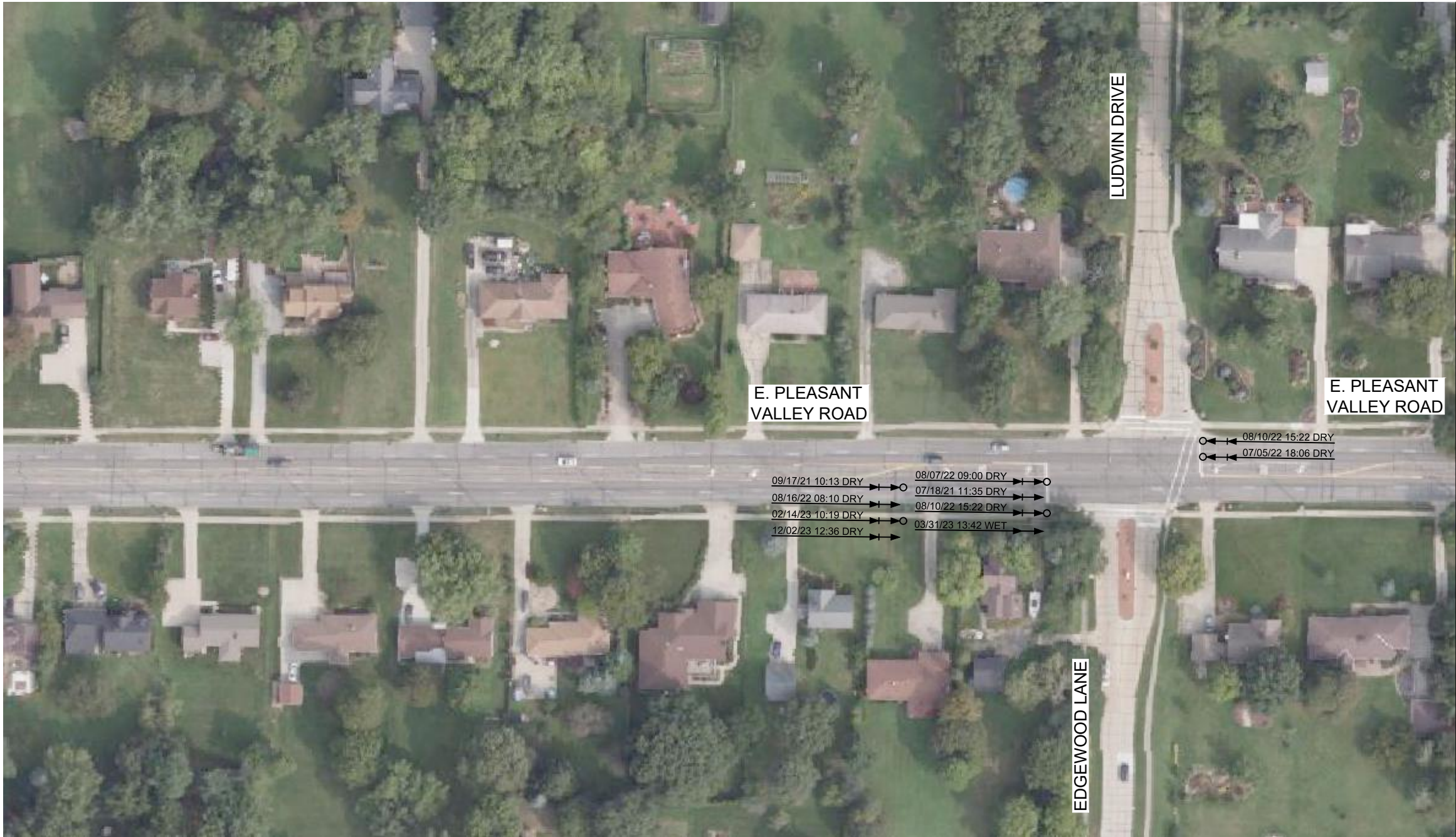
Count Name: Pleasant Valley
Rd & Brecksville Rd
Site Code:
Start Date: 04/17/2024
Page No: 8

[illegible]



APPENDIX B

COLLISION DIAGRAMS



LEGEND	
MOVING VEHICLE	REAR END
BACKING VEHICLE	HEAD ON
BICYCLIST	OUT OF CONTROL
PEDESTRIANS	LEFT TURN
PARKED VEHICLE	SIDESWIPE
FIXED OBJECT	ANGLE
FATAL CRASH	
INJURY CRASH	
NO FAULT CRASH	



APPENDIX B

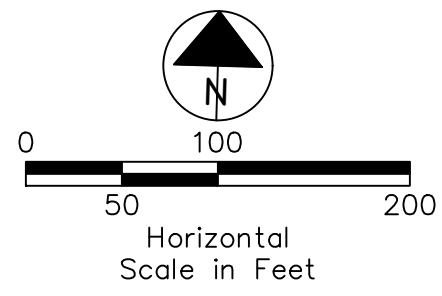
COLLISION DIAGRAM
SHEET 1 OF 8

JANUARY 2025

MATCH LINE 'A'



MATCH LINE 'B'



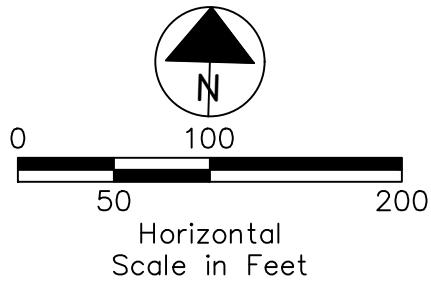
LEGEND	
← MOVING VEHICLE	→ REAR END
← BUCKING VEHICLE	→ HEAD ON
← BICYCLIST	→ OUT OF CONTROL
← PEDESTRIANS	→ LEFT TURN
← PARKED VEHICLE	→ SIDESWIPE
□ FIXED OBJECT	→ ANGLE
● FATAL CRASH	
○ INJURY CRASH	
○ NO FAULT CRASH	

APPENDIX B

COLLISION DIAGRAMS
SHEET 2 OF 8

JANUARY 2025

MATCH LINE 'B'



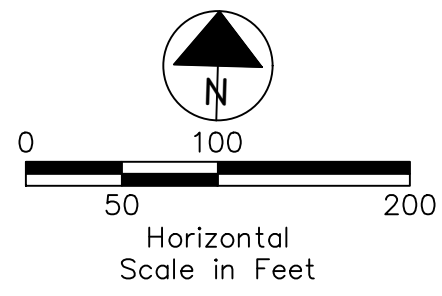
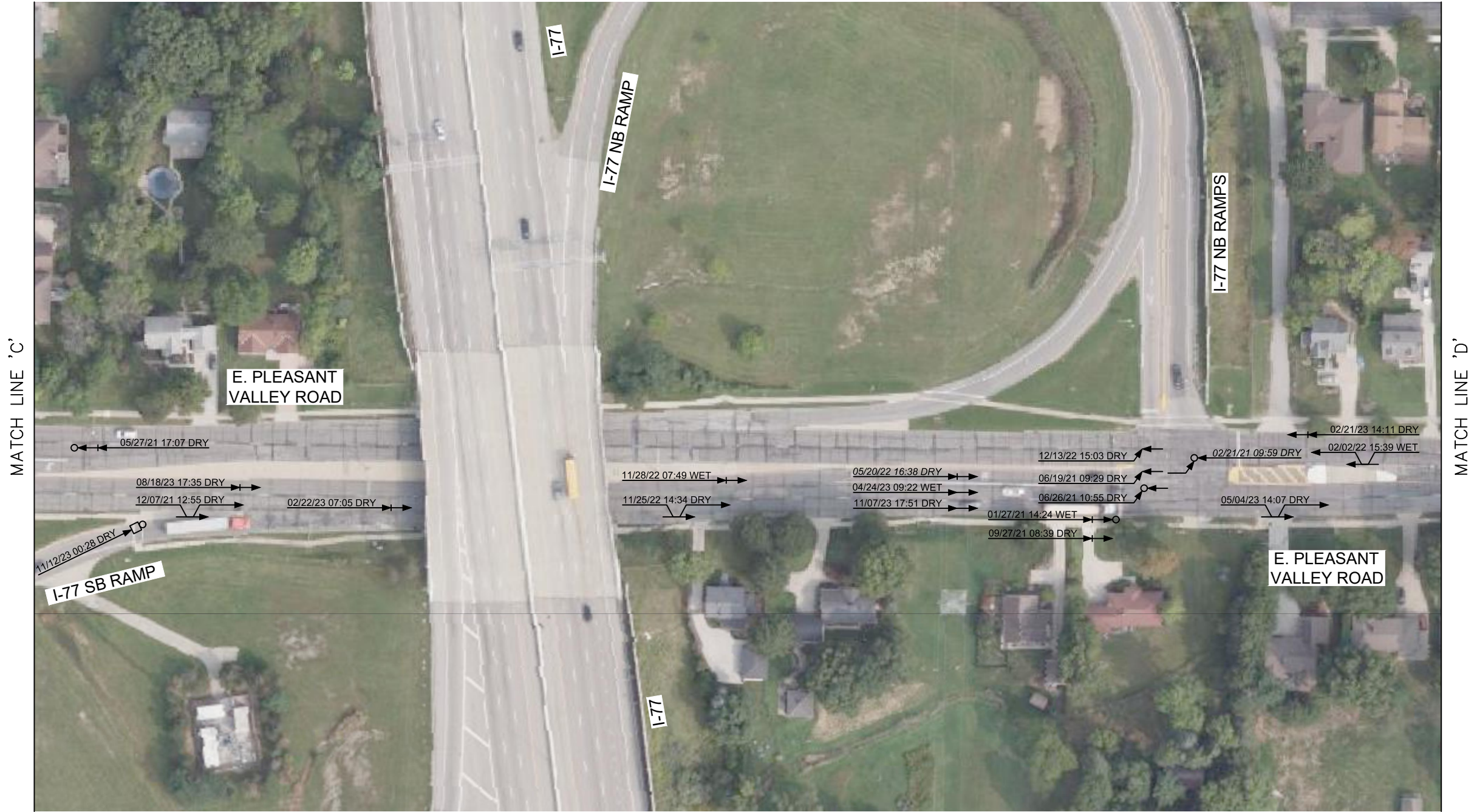
LEGEND	
← MOVING VEHICLE	→ REAR END
↔ BACKING VEHICLE	↔ HEAD ON
🚲 BICYCLIST	↔ OUT OF CONTROL
🚶 PEDESTRIANS	↔ LEFT TURN
🚗 PARKED VEHICLE	↔ SIDESWIPE
□ FIXED OBJECT	↔ ANGLE
● FATAL CRASH	
○ INJURY CRASH	
NO FAULT CRASH	



APPENDIX B

COLLISION DIAGRAMs
SHEET 3 OF 8

JANUARY 2025



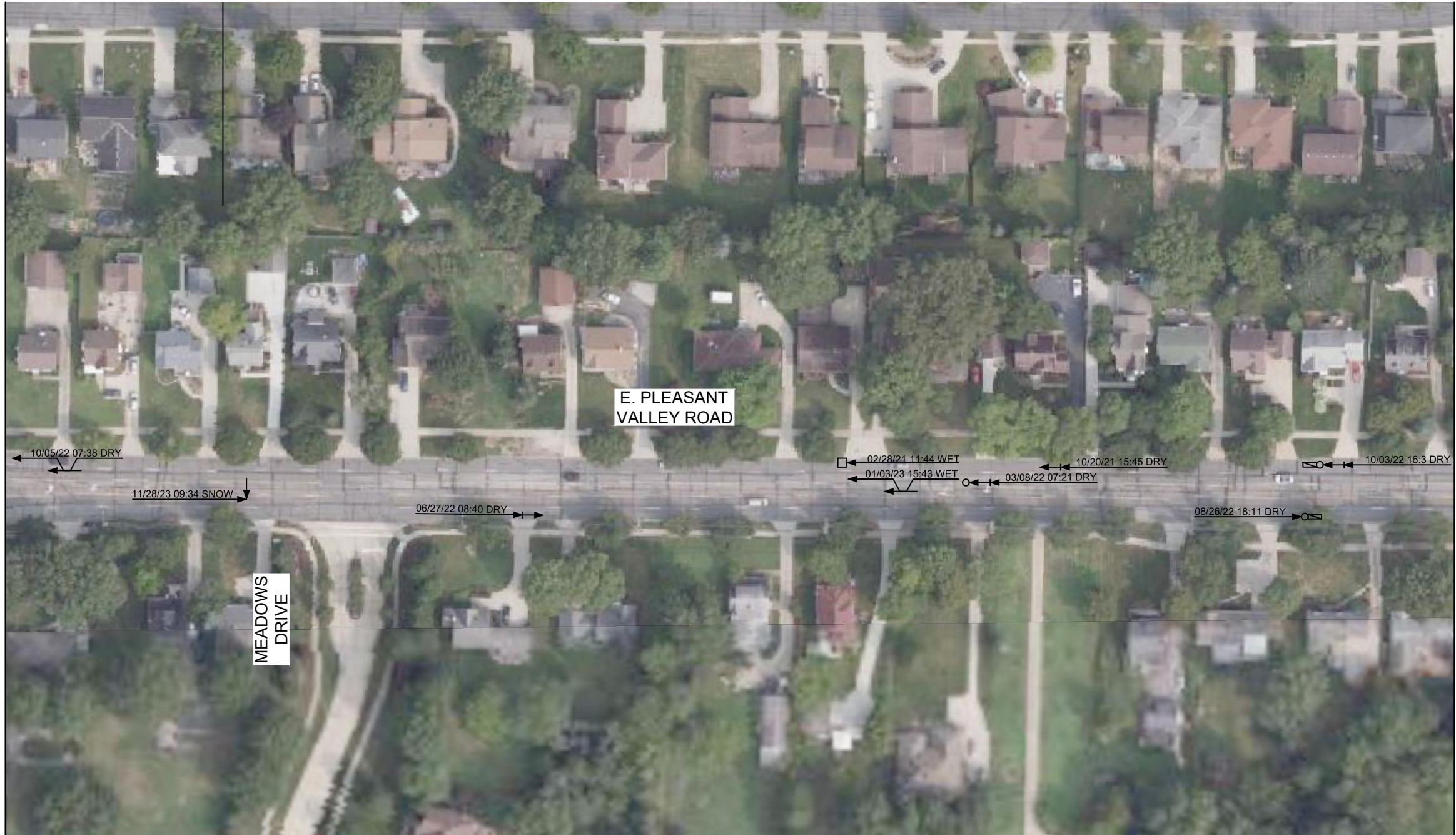
LEGEND	
← MOVING VEHICLE	→ REAR END
↔ BACKING VEHICLE	→ HEAD ON
🚲 BICYCLIST	↔ OUT OF CONTROL
🚶 PEDESTRIANS	↔ LEFT TURN
🚗 PARKED VEHICLE	↔ SIDESWIPE
📏 FIXED OBJECT	↔ ANGLE
● FATAL CRASH	
○ INJURY CRASH	
NO FAULT CRASH	

APPENDIX B

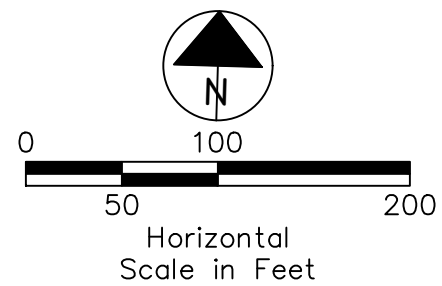
COLLISION DIAGRAMS
SHEET 4 OF 8

JANUARY 2025

MATCH LINE 'D'



MATCH LINE 'E'



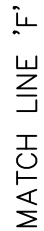
LEGEND	
← MOVING VEHICLE	→ REAR END
↔ BACKING VEHICLE	↔ HEAD ON
🚲 BICYCLIST	↔ OUT OF CONTROL
🚶 PEDESTRIANS	↔ LEFT TURN
🚗 PARKED VEHICLE	↔ SIDESWIPE
□ FIXED OBJECT	↔ ANGLE
● FATAL CRASH	
○ INJURY CRASH	
NO FAULT CRASH	



APPENDIX B

COLLISION DIAGRAMS
SHEET 5 OF 8

JANUARY 2025

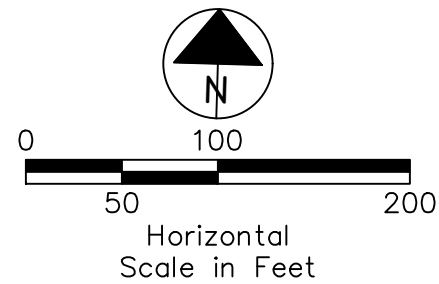


LEGEND



JANUARY 2025

MATCH LINE 'F'



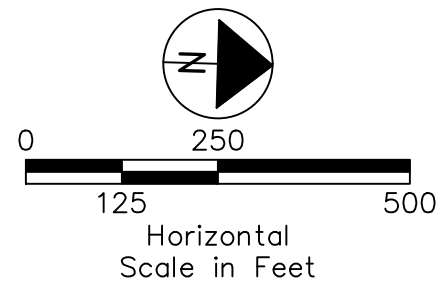
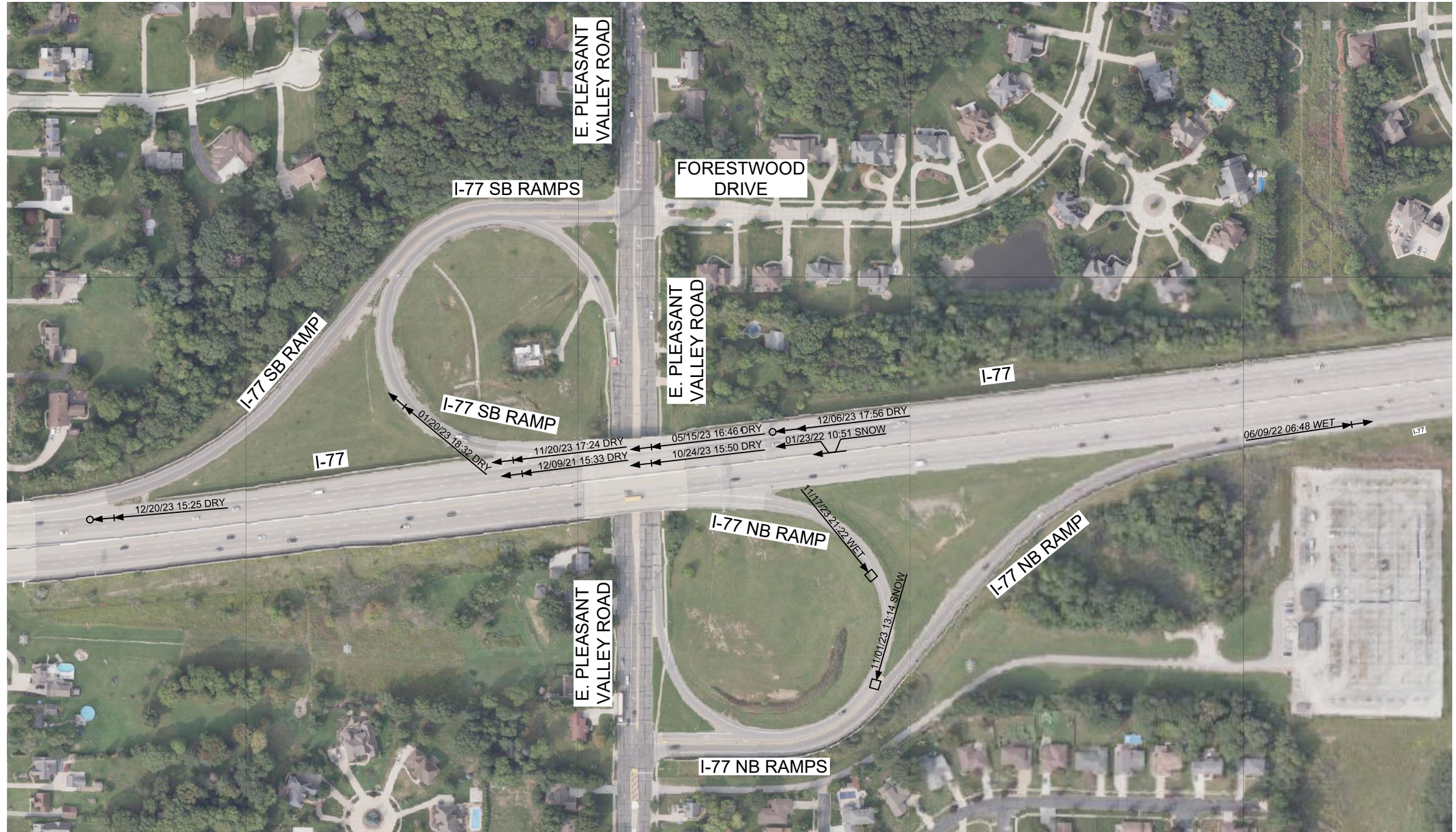
LEGEND	
← MOVING VEHICLE	→ REAR END
↔ BACKING VEHICLE	↔ HEAD ON
🚲 BICYCLIST	↔ OUT OF CONTROL
🚶 PEDESTRIANS	↔ LEFT TURN
🚗 PARKED VEHICLE	↔ SIDESWIPE
□ FIXED OBJECT	↔ ANGLE
● FATAL CRASH	
○ INJURY CRASH	
NO FAULT CRASH	



APPENDIX B

COLLISION DIAGRAM
SHEET 7 OF 8

JANUARY 2025



LEGEND	
MOVING VEHICLE	REAR END
BACKING VEHICLE	HEAD ON
BICYCLIST	OUT OF CONTROL
PEDESTRIANS	LEFT TURN
PARKED VEHICLE	SIDESWIPE
FIXED OBJECT	ANGLE
FATAL CRASH	
INJURY CRASH	
NO FAULT CRASH	

APPENDIX B

COLLISION DIAGRAMSSHEET 8 OF 8

JANUARY 2025

APPENDIX C
CRASH DATA SUMMARY

I-77 / Pleasant Valley Road Crash Data

I-77 / Pleasant Valley Road Interchange and Pleasant Valley Road Corridor
Analysis Years: 2021-2023

TRAFFIC CRASH YEAR	Number	%
2021	27	27.6%
2022	34	34.7%
2023	37	37.8%
Grand Total	98	100.0%

TYPE OF CRASH	Number	%
Rear End	61	62.2%
Sideswipe - Passing	13	13.3%
Left Turn	10	10.2%
Angle	7	7.1%
Fixed Object	6	6.1%
Parked Vehicle	1	1.0%
Grand Total	98	100.0%

CRASH SEVERITY	Number	%
Fatal Crash	1	1.0%
Injury Crash	28	28.6%
Property Damage Crash	69	70.4%
Grand Total	98	100.0%

LIGHT CONDITION	Number	%
Daylight	79	80.6%
Dark - Lighted Roadway	12	12.2%
Dawn/Dusk	7	7.1%
Grand Total	98	100.0%

WEATHER CONDITION	Number	%
Clear	64	65.3%
Cloudy	20	20.4%
Rain	8	8.2%
Snow	5	5.1%
Unknown	1	1.0%
Grand Total	98	100.0%

ROAD CONDITION	Number	%
Dry	80	81.6%
Wet	13	13.3%
Snow	4	4.1%
Ice	1	1.0%
Grand Total	98	100.0%

APPENDIX D

GROWTH RATE INFORMATION

Please provide some commentary on TFMS output sheets, especially when so many segments are included in the output runs. It's hard to tell how you arrived at the conclusion to use which one of the ten different growth rates the TFMS tools "recommended" for the ten different segments.

See recent TFMS run using updated inputs for comparison.

TFMS - Segment Forecast Report

Username	Email	Script Import Date	Script Version	Model Version
Kevin.Westbrooks	kwestbrooks@gpdgroup.com	4/14/2020 5:30:19 PM	2020.001	2023.1900

Forecast Summary

Project ID	Project Name	Opening Year	Design Year
	I-77 / Pleasant Valley Road	2030	2050

Project Description

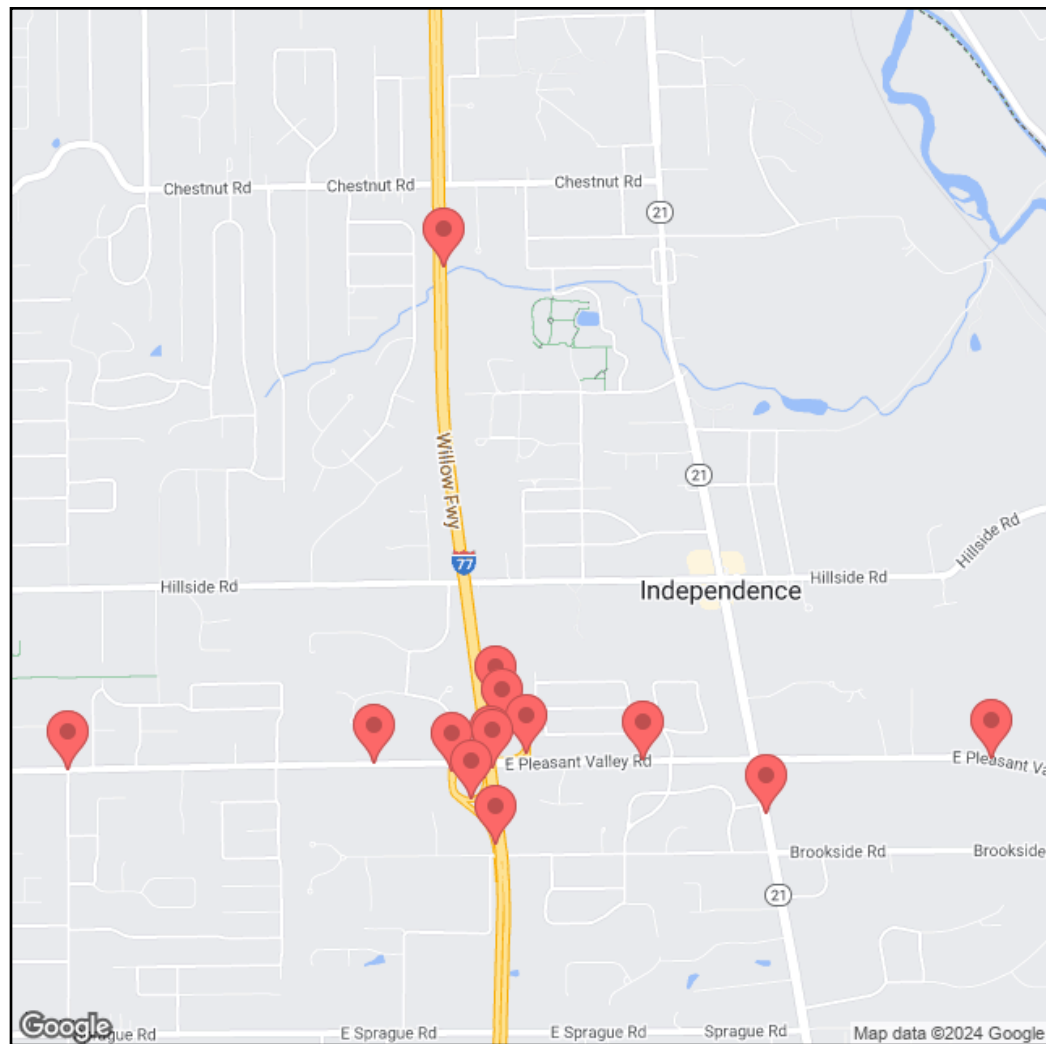
*Users of this data need to be aware that there are limitations to the forecasts generated by this product that make it suitable only for roadway design projects which are low risk.

Segment Information

Segment ID	LRS ID	BMP	EMP	Length	Latitude	Longitude
1812991	MCUYMR10556**C	5.327	6.579	1.252	-81.6725459256234	41.3615576123579
1812992	MCUYMR10556**C	6.579	7.014	0.435	-81.6563364397376	41.3617813786194
1812994	MCUYMR10556**C	7.014	7.227	0.213	-81.6501311336791	41.3617610315611
1812995	MCUYMR10556**C	7.227	7.853	0.626	-81.6420790635342	41.3619107169191
1813000	MCUYMR10556**C	7.853	9.145	1.292	-81.6236502679303	41.3619824553611
1829870	SCUYIR00077**C	5.597	6.320	0.723	-81.6500311916739	41.3616064702126
1829871	SCUYIR00077**C	6.320	8.360	2.040	-81.6526573352966	41.3814939771851
1830782	SCUYRA18379**C	0.000	0.376	0.376	-81.6511880592751	41.3603716233998
1830783	SCUYRA18380**C	0.000	0.044	0.044	-81.6521592431823	41.3614945362726
1830784	SCUYRA18381**C	0.000	0.413	0.413	-81.6495185005815	41.3632026194267
1830785	SCUYRA18382**C	0.000	0.051	0.051	-81.6482228671639	41.3621598499188
1830786	SCUYRA18383**C	0.000	0.396	0.396	-81.6498931861877	41.3640852555868
1830787	SCUYRA18384**C	0.000	0.539	0.539	-81.6499052068789	41.3585922560232
1831400	SCUYSR00021**C	5.169	6.377	1.208	-81.6355290236147	41.3598145195617

Forecast Information

RS ID	BMP	2030 AADT	2050 AADT	DHV-30	K%	D%	T24%	TD%
MR10556**C	5.327	24,500	25,500	2,900	11.5	68.8	2	1
MR10556**C	6.579	24,500	26,000	3,000	11.5	68.8	2	1
MR10556**C	7.014	24,000	25,000	2,900	11.5	68.8	2	1
MR10556**C	7.227	24,000	24,500	2,800	11.5	68.8	2	1
MR10556**C	7.853	15,500	16,000	2,300	14.6	59.3	2	2
IR00077**C	5.597	80,500	80,500	7,200	9.0	70.0	6	4
IR00077**C	6.320	90,500	90,500	8,100	9.0	70.0	6	4
RA18379**C	0.000	8,200	10,000	1,200	12.4	100.0	2	2
RA18380**C	0.000	8,400	10,500	1,300	12.4	100.0	2	2
RA18381**C	0.000	3,500	3,500	500	14.7	100.0	3	2
RA18382**C	0.000	3,500	3,500	500	14.7	100.0	3	2
RA18383**C	0.000	9,900	10,500	1,600	15.0	100.0	2	2
RA18384**C	0.000	3,800	3,800	500	13.3	100.0	2	2
SR00021**C	5.169	11,000	11,000	1,500	13.2	55.4	2	2



Definitions:

- o AADT – Annual Average Daily Traffic
- o DHV30 – Design Hour Volume for 30th highest hour of the year
- o $DHV30 = K * AADT$
- o K % – Design Hour Factor
- o D % – Peak Direction Factor
- o T24 % – Percent Daily Trucks
- o TD % – Percent Design Hour Trucks

Forecast Segment ID	Route	BMP	EMP
1812991	MCUYMR10556**C	5.327	6.579

Forecast

Year	K%	T24 % (Existing)	PA AADT	PA Method	PA Growth Rate %	PA Calculated Rate %
2050	◆ 11.5	2	25,000	Average	0.300	0.300
AADT	D%	TD % (Existing)	BC AADT	BC Method	BC Growth Rate %	BC Calculated Rate %
25,380	◆ 68.8	1	380	Average	● -2.400	0.000

● Warning: The growth rate was negative and was capped.

◆ K/D factors from TCDS were used.

Regression

Method Number	PA AADT	BC AADT	AADT
2	30,571		30,571

95% Confidence Min/Max

PA Min	PA Max	BC Min	BC Max	Year
4739	55549	23	319	2050

Method Number	PA Growth %	BC Growth %	PA Drop Count	BC Drop Count	PA AADT	BC AADT	PA Adjustment	PA Adjustment
1	1.42	-1.95	0	0	33,458	171	32,562	171
2	1.12	-999999.00	3	0	30,612		30,571	
3	1.00	-999999.00	0	0	30,493		29,795	
4	-999999.00	-999999.00	0	0				
5	-999999.00	-999999.00	0	0				
6	-999999.00	-999999.00	0	0				

Adjustment Info

ID	Adjustment Methods Name	Model vs Count AADT	Adjusted AADT	Model vs Count BC	Adjusted BC	PA Growth Rate %	BC Growth Rate %
1	DIF	-1,151	20,294	-639	43	-0.47	-3.16
2	RAT	0.95	20,450	0.37	253	-0.47	-1.17
3	MRAT	0.86	20,450	0.67	253	-0.47	-1.17
4	RAF		20,372		148	-0.47	-2.17
Adjust Method AADT		Adjust Method BC		Selected PA Growth Rate %		Selected BC Growth Rate %	
Ratio		Ratio		-0.500		-1.200	

Method 1 - 4 Volume

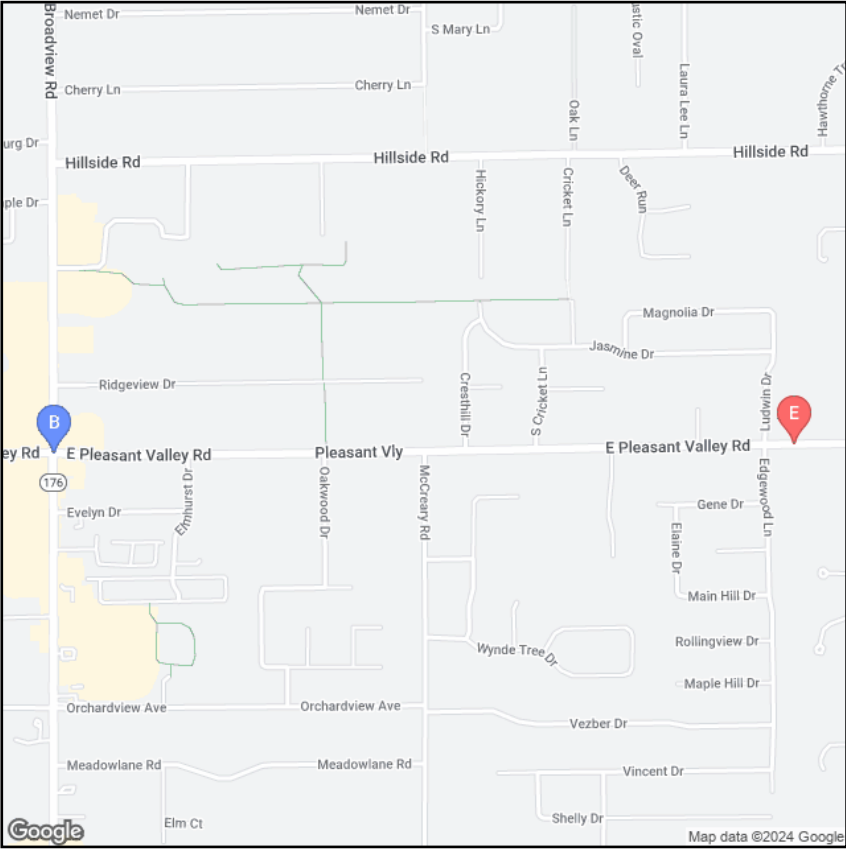
PA Min Volume	PA Max Volume	BC Min Volume	BC Max Volume	Total Min Volume	Total MaxVolume
20197	20251	43	253	20240	20504

Process Flag:	Adjusted model to counts with process per ODOT 255 spreadsheet
Comment:	No Comment

Historical Count

Year	All	Cars	Trucks
2013	20,903	20,903	
2016	21,891	21,891	
2019	25,081	24,682	399
* 2022	23,663	23,286	377

* Pivot Point



Segment ID	LRS ID	BMP	EMP	Length	Yr 2030 AADT	Yr 2050 AADT	DHV30	K %	D %	T24 %	TD %
1812991	MCUYMR10556** C	5.327	6.579	1.252	24,500	25,500	2900	11.5	68.8	2	1

Forecast Segment ID	Route	BMP	EMP
1812992	MCUYMR10556**C	6.579	7.014

Forecast

Year	K%	T24 % (Existing)	PA AADT	PA Method	PA Growth Rate %	PA Calculated Rate %
2050	◆ 11.5	2	26,000	Average	0.400	0.400
AADT	D%	TD % (Existing)	BC AADT	BC Method	BC Growth Rate %	BC Calculated Rate %
26,380	◆ 68.8	1	380	Average	● -2.400	0.000

● Warning: The growth rate was negative and was capped.

◆ K/D factors from TCDS were used.

Regression

Method Number	PA AADT	BC AADT	AADT
2	30,571		30,571

95% Confidence Min/Max

PA Min	PA Max	BC Min	BC Max	Year
4739	55549	-302	319	2050

Method Number	PA Growth %	BC Growth %	PA Drop Count	BC Drop Count	PA AADT	BC AADT	PA Adjustment	PA Adjustment
1	1.42	-1.95	0	0	33,458	171	32,562	171
2	1.12	-999999.00	3	0	30,612		30,571	
3	1.00	-999999.00	0	0	30,493		29,795	
4	-999999.00	-999999.00	0	0				
5	-999999.00	-999999.00	0	0				
6	-999999.00	-999999.00	0	0				

Adjustment Info

ID	Adjustment Methods Name	Model vs Count AADT	Adjusted AADT	Model vs Count BC	Adjusted BC	PA Growth Rate %	BC Growth Rate %
1	DIF	-12,015	19,992	-1,609	-302	-0.46	-6.43
2	RAT	0.66	21,228	0.19	248	-0.35	-1.22
3	MRAT	0.90	21,228	0.66	248	-0.35	-1.22
4	RAF		20,610		-27	-0.41	-3.83
Adjust Method AADT		Adjust Method BC		Selected PA Growth Rate %		Selected BC Growth Rate %	
Ratio		Ratio		-0.400		-1.200	

Method 1 - 4 Volume

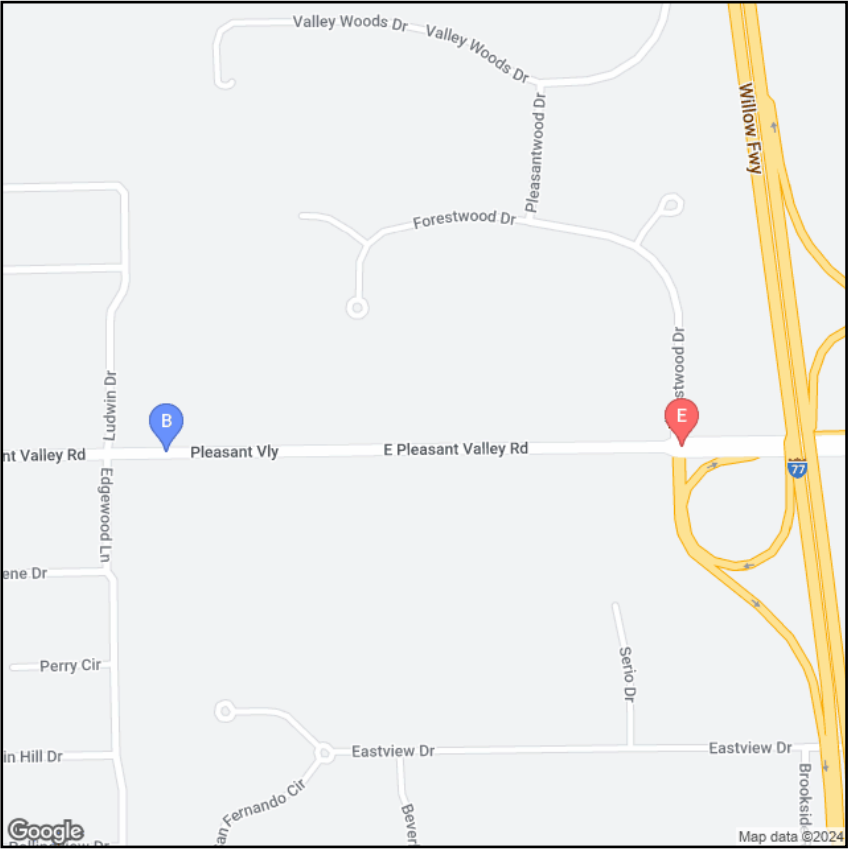
PA Min Volume	PA Max Volume	BC Min Volume	BC Max Volume	Total Min Volume	Total MaxVolume
20294	20980	-302	248	19992	21228

Process Flag:	Adjusted model to counts with process per ODOT 255 spreadsheet
Comment:	No Comment

Historical Count

Year	All	Cars	Trucks
2013	20,903	20,903	
2016	21,891	21,891	
2019	25,081	24,682	399
* 2022	23,663	23,286	377

* Pivot Point



Segment ID	LRS ID	BMP	EMP	Length	Yr 2030 AADT	Yr 2050 AADT	DHV30	K %	D %	T24 %	TD %
1812992	MCUYMR10556** C	6.579	7.014	0.435	24,500	26,000	3000	11.5	68.8	2	1

Forecast Segment ID	Route	BMP	EMP
1812994	MCUYMR10556**C	7.014	7.227

Forecast

Year	K%	T24 % (Existing)	PA AADT	PA Method	PA Growth Rate %	PA Calculated Rate %
2050	◆ 11.5	2	25,000	Average	0.200	0.200
AADT	D%	TD % (Existing)	BC AADT	BC Method	BC Growth Rate %	BC Calculated Rate %
25,380	◆ 68.8	1	380	Average	● -2.300	0.000

● Warning: The growth rate was negative and was capped.

◆ K/D factors from TCDS were used.

Regression

Method Number	PA AADT	BC AADT	AADT
2	30,571		30,571

95% Confidence Min/Max

PA Min	PA Max	BC Min	BC Max	Year
4739	55549	-64	319	2050

Method Number	PA Growth %	BC Growth %	PA Drop Count	BC Drop Count	PA AADT	BC AADT	PA Adjustment	PA Adjustment
1	1.42	-1.95	0	0	33,458	171	32,562	171
2	1.12	-999999.00	3	0	30,612		30,571	
3	1.00	-999999.00	0	0	30,493		29,795	
4	-999999.00	-999999.00	0	0				
5	-999999.00	-999999.00	0	0				
6	-999999.00	-999999.00	0	0				

Adjustment Info

ID	Adjustment Methods Name	Model vs Count AADT	Adjusted AADT	Model vs Count BC	Adjusted BC	PA Growth Rate %	BC Growth Rate %
1	DIF	-1,680	18,704	-1,124	-64	-0.69	-4.18
2	RAT	0.93	19,033	0.25	266	-0.69	-1.05
3	MRAT	0.80	19,033	0.71	266	-0.69	-1.05
4	RAF		18,869		101	-0.69	-2.61
Adjust Method AADT		Adjust Method BC		Selected PA Growth Rate %		Selected BC Growth Rate %	
Ratio		Ratio		-0.700		-1.100	

Method 1 - 4 Volume

PA Min Volume	PA Max Volume	BC Min Volume	BC Max Volume	Total Min Volume	Total MaxVolume
18767	18768	-64	266	18703	19034

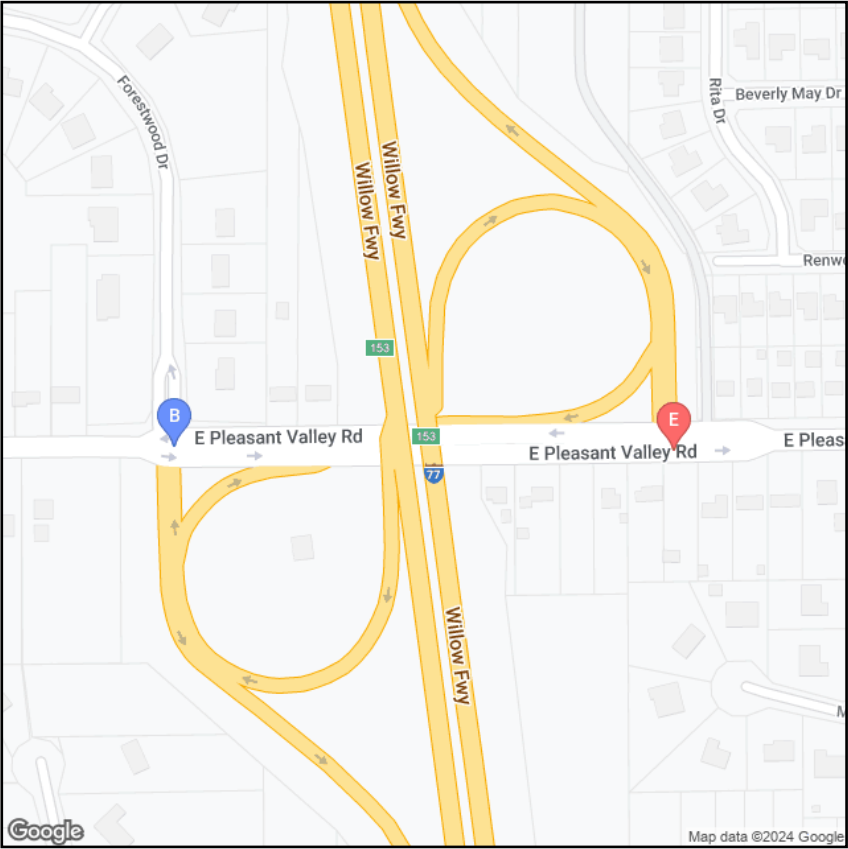
Process Flag: Adjusted model to counts with process per ODOT 255 spreadsheet

Comment: No Comment

Historical Count

Year	All	Cars	Trucks
2013	20,903	20,903	
2016	21,891	21,891	
2019	25,081	24,682	399
* 2022	23,663	23,286	377

* Pivot Point



Segment ID	LRS ID	BMP	EMP	Length	Yr 2030 AADT	Yr 2050 AADT	DHV30	K %	D %	T24 %	TD %
1812994	MCUYMR10556** C	7.014	7.227	0.213	24,000	25,000	2900	11.5	68.8	2	1

Forecast Segment ID	Route	BMP	EMP
1812995	MCUYMR10556**C	7.227	7.853

Forecast

Year	K%	T24 % (Existing)	PA AADT	PA Method	PA Growth Rate %	PA Calculated Rate %
2050	◆ 11.5	2	24,000	Average	0.200	0.200
AADT	D%	TD % (Existing)	BC AADT	BC Method	BC Growth Rate %	BC Calculated Rate %
24,380	◆ 68.8	1	380	Average	● -2.300	0.000

● Warning: The growth rate was negative and was capped.

◆ K/D factors from TCDS were used.

Regression

Method Number	PA AADT	BC AADT	AADT
2	30,571		30,571

95% Confidence Min/Max

PA Min	PA Max	BC Min	BC Max	Year
4739	55549	-50	319	2050

Method Number	PA Growth %	BC Growth %	PA Drop Count	BC Drop Count	PA AADT	BC AADT	PA Adjustment	PA Adjustment
1	1.42	-1.95	0	0	33,458	171	32,562	171
2	1.12	-999999.00	3	0	30,612		30,571	
3	1.00	-999999.00	0	0	30,493		29,795	
4	-999999.00	-999999.00	0	0				
5	-999999.00	-999999.00	0	0				
6	-999999.00	-999999.00	0	0				

Adjustment Info

ID	Adjustment Methods Name	Model vs Count AADT	Adjusted AADT	Model vs Count BC	Adjusted BC	PA Growth Rate %	BC Growth Rate %
1	DIF	6	18,318	-1,138	-50	-0.75	-4.05
2	RAT	1.00	18,316	0.25	271	-0.80	-1.00
3	MRAT	0.77	18,316	0.72	271	-0.80	-1.00
4	RAF		18,317		110	-0.78	-2.53
Adjust Method AADT		Adjust Method BC		Selected PA Growth Rate %		Selected BC Growth Rate %	
Average		Ratio		-0.800		-1.000	

Method 1 - 4 Volume

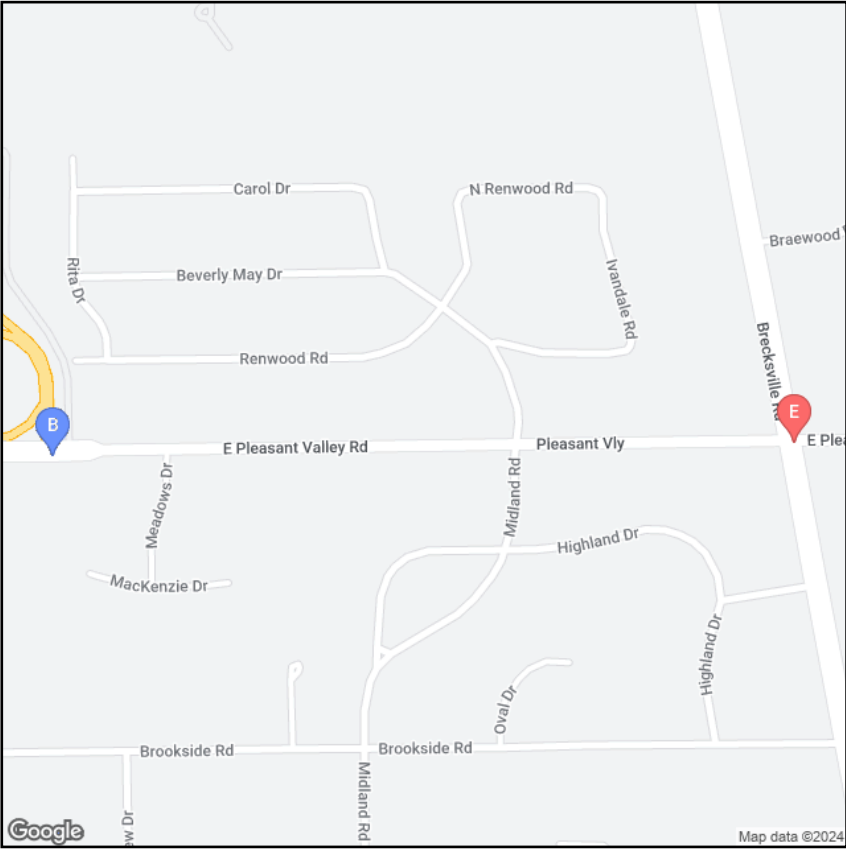
PA Min Volume	PA Max Volume	BC Min Volume	BC Max Volume	Total Min Volume	Total MaxVolume
18045	18368	-50	271	17995	18639

Process Flag:	Adjusted model to counts with process per ODOT 255 spreadsheet
Comment:	No Comment

Historical Count

Year	All	Cars	Trucks
2013	20,903	20,903	
2016	21,891	21,891	
2019	25,081	24,682	399
* 2022	23,663	23,286	377

* Pivot Point



Segment ID	LRS ID	BMP	EMP	Length	Yr 2030 AADT	Yr 2050 AADT	DHV30	K %	D %	T24 %	TD %
1812995	MCUYMR10556** C	7.227	7.853	0.626	24,000	24,500	2800	11.5	68.8	2	1

Forecast Segment ID	Route	BMP	EMP
1813000	MCUYMR10556**C	7.853	9.145

Forecast

Year	K%	T24 % (Existing)	PA AADT	PA Method	PA Growth Rate %	PA Calculated Rate %
2050	◆ 14.6	2	16,000	Average	0.200	0.200
AADT	D%	TD % (Existing)	BC AADT	BC Method	BC Growth Rate %	BC Calculated Rate %
16,340	◆ 59.3	2	340	Average	● -2.400	0.000

● Warning: The growth rate was negative and was capped.

◆ K/D factors from TCDS were used.

Regression

Method Number	PA AADT	BC AADT	AADT
2	18,927		18,927

95% Confidence Min/Max

PA Min	PA Max	BC Min	BC Max	Year
3462	32975	-200	272	2050

Method Number	PA Growth %	BC Growth %	PA Drop Count	BC Drop Count	PA AADT	BC AADT	PA Adjustment	PA Adjustment
1	1.18	-2.05	0	0	20,663	146	20,108	146
2	0.90	-999999.00	3	0	18,976		18,927	
3	0.69	-999999.00	0	0	18,421		18,016	
4	-999999.00	-999999.00	0	0				
5	-999999.00	-999999.00	0	0				
6	-999999.00	-999999.00	0	0				

Adjustment Info

ID	Adjustment Methods Name	Model vs Count AADT	Adjusted AADT	Model vs Count BC	Adjusted BC	PA Growth Rate %	BC Growth Rate %
1	DIF	-10,667	10,981	-1,252	-200	-0.93	-5.66
2	RAT	0.59	12,805	0.21	226	-0.60	-1.21
3	MRAT	0.83	12,805	0.66	226	-0.60	-1.21
4	RAF		11,893		13	-0.76	-3.44
Adjust Method AADT		Adjust Method BC		Selected PA Growth Rate %		Selected BC Growth Rate %	
Ratio		Ratio		-0.600		-1.200	

Method 1 - 4 Volume

PA Min Volume	PA Max Volume	BC Min Volume	BC Max Volume	Total Min Volume	Total MaxVolume
11181	12579	-200	226	10981	12805

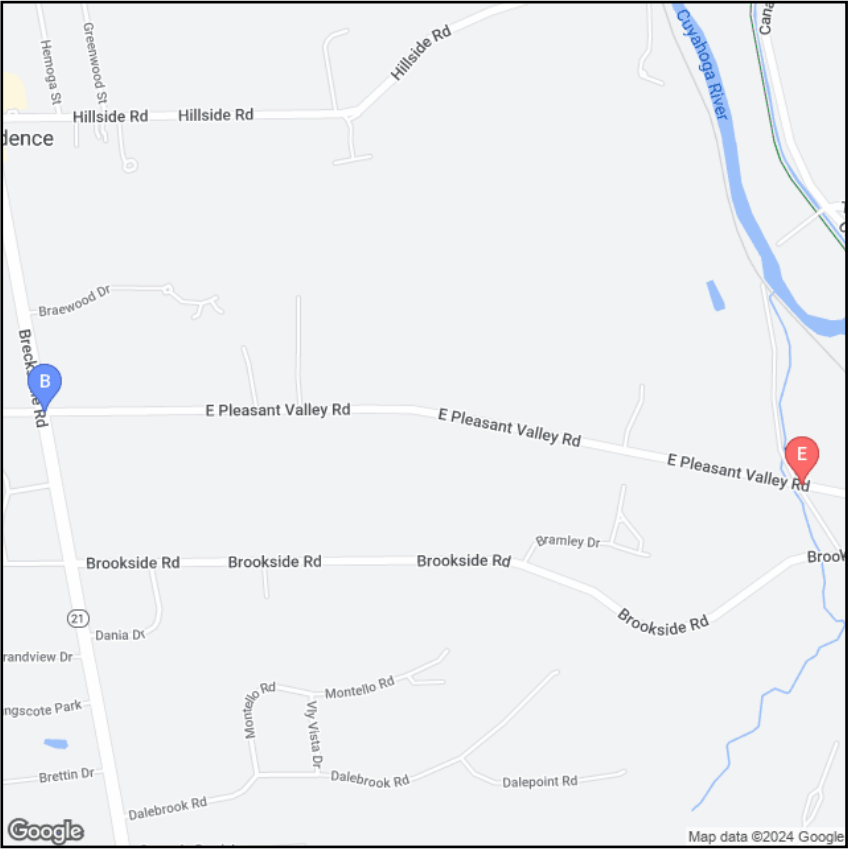
Process Flag: Adjusted model to counts with process per ODOT 255 spreadsheet

Comment: No Comment

Historical Count

Year	All	Cars	Trucks
2013	13,826	13,826	
2016	14,480	14,480	
2019	16,371	16,008	363
* 2022	15,446	15,104	342

* Pivot Point



Segment ID	LRS ID	BMP	EMP	Length	Yr 2030 AADT	Yr 2050 AADT	DHV30	K %	D %	T24 %	TD %
1813000	MCUYMR10556** C	7.853	9.145	1.292	15,500	16,000	2300	14.6	59.3	2	2

Forecast Segment ID	Route	BMP	EMP
1829870	SCUYIR00077**C	5.597	6.320

Forecast

Year	K%	T24 % (Existing)	PA AADT	PA Method	PA Growth Rate %	PA Calculated Rate %
2050	9.0	6	76,000	Average	 -0.100	0.000
AADT	D%	TD % (Existing)	BC AADT	BC Method	BC Growth Rate %	BC Calculated Rate %
80,800	70.0	4	4,800	Average	 -0.100	0.000

 Warning: The growth rate was negative and was capped.

Regression

Method Number	PA AADT	BC AADT	AADT
2	81,357	1,407	82,764

95% Confidence Min/Max

PA Min	PA Max	BC Min	BC Max	Year
21255	142107	-6343	8402	2050

Method Number	PA Growth %	BC Growth %	PA Drop Count	BC Drop Count	PA AADT	BC AADT	PA Adjustment	PA Adjustment
1	0.53	-2.31	0	0	91,481	2,059	86,904	1,708
2	0.27	-2.53	5	4	83,389	1,486	81,357	1,407
3	0.73	-2.22	0	0	96,200	2,193	91,066	1,826
4	2.06	-2.22	6	4	127,861	1,954	119,249	1,827
5	0.20	-3.93	0	0	83,858	-364	79,918	-483
6	-0.08	-3.23	5	4	75,303	482	73,929	464

Adjustment Info

ID	Adjustment Methods Name	Model vs Count AADT	Adjusted AADT	Model vs Count BC	Adjusted BC	PA Growth Rate %	BC Growth Rate %
1	DIF	-29,215	73,184	-3,740	8,402	-0.51	2.65
2	RAT	0.73	75,115	0.56	6,840	-0.35	1.49
3	MRAT	0.93	75,115	1.42	7,300	-0.37	1.83
4	RAF		74,150		7,851	-0.44	2.24
Adjust Method AADT		Adjust Method BC		Selected PA Growth Rate %		Selected BC Growth Rate %	
Ratio		Average		-0.400		2.200	

Method 1 - 4 Volume

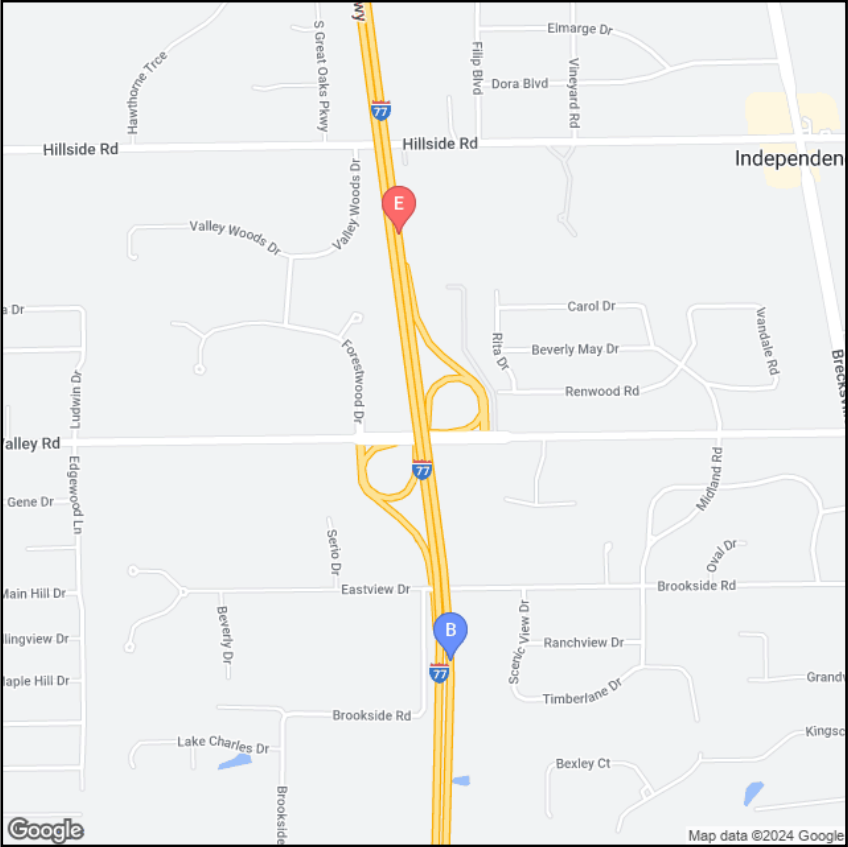
PA Min Volume	PA Max Volume	BC Min Volume	BC Max Volume	Total Min Volume	Total MaxVolume
64782	68275	6840	8402	71622	76677

Process Flag:	Adjusted model to counts with process per ODOT 255 spreadsheet
Comment:	No Comment

Historical Count

Year	All	Cars	Trucks
2008	82,990	76,210	6,780
2010	77,710	71,730	5,980
2013	81,009	74,775	6,234
2016	88,255	81,463	6,792
2019	88,913	83,578	5,335
* 2022	80,433	75,609	4,824

* Pivot Point



Segment ID	LRS ID	BMP	EMP	Length	Yr 2030 AADT	Yr 2050 AADT	DHV30	K %	D %	T24 %	TD %
1829870	SCUYIR00077**C	5.597	6.320	0.723	80,500	80,500	7200	9.0	70.0	6	4

Forecast Segment ID	Route	BMP	EMP
1829871	SCUYIR00077**C	6.320	8.360

Forecast

Year	K%	T24 % (Existing)	PA AADT	PA Method	PA Growth Rate %	PA Calculated Rate %
2050	9.0	6	85,000	Average	-1.100	0.000
AADT	D%	TD % (Existing)	BC AADT	BC Method	BC Growth Rate %	BC Calculated Rate %
90,400	70.0	4	5,400	Average	-3.400	0.000

Warning: The growth rate was negative and was capped.

Regression

Method Number	PA AADT	BC AADT	AADT
1	45,729	-7,166	38,563

95% Confidence Min/Max

PA Min	PA Max	BC Min	BC Max	Year
-27113	120600	-15691	8376	2050

Method Number	PA Growth %	BC Growth %	PA Drop Count	BC Drop Count	PA AADT	BC AADT	PA Adjustment	PA Adjustment
1	-1.65	-8.29	0	0	47,758	-7,397	45,729	-7,166
2	-999999.00	-999999.00	0	0				
3	-999999.00	-999999.00	0	0				
4	-999999.00	-999999.00	0	0				
5	-999999.00	-999999.00	0	0				
6	-999999.00	-999999.00	0	0				

Adjustment Info

ID	Adjustment Methods Name	Model vs Count AADT	Adjusted AADT	Model vs Count BC	Adjusted BC	PA Growth Rate %	BC Growth Rate %
1	DIF	-56,167	76,221	-5,178	8,376	-0.72	1.94
2	RAT	0.62	81,661	0.51	6,934	-0.43	0.99
3	MRAT	0.90	81,661	1.28	7,248	-0.44	1.20
4	RAF		78,941		7,812	-0.58	1.57
Adjust Method AADT		Adjust Method BC		Selected PA Growth Rate %		Selected BC Growth Rate %	
Ratio		Average		-0.500		1.600	

Method 1 - 4 Volume

PA Min Volume	PA Max Volume	BC Min Volume	BC Max Volume	Total Min Volume	Total MaxVolume
67845	74727	6934	8376	74779	83103

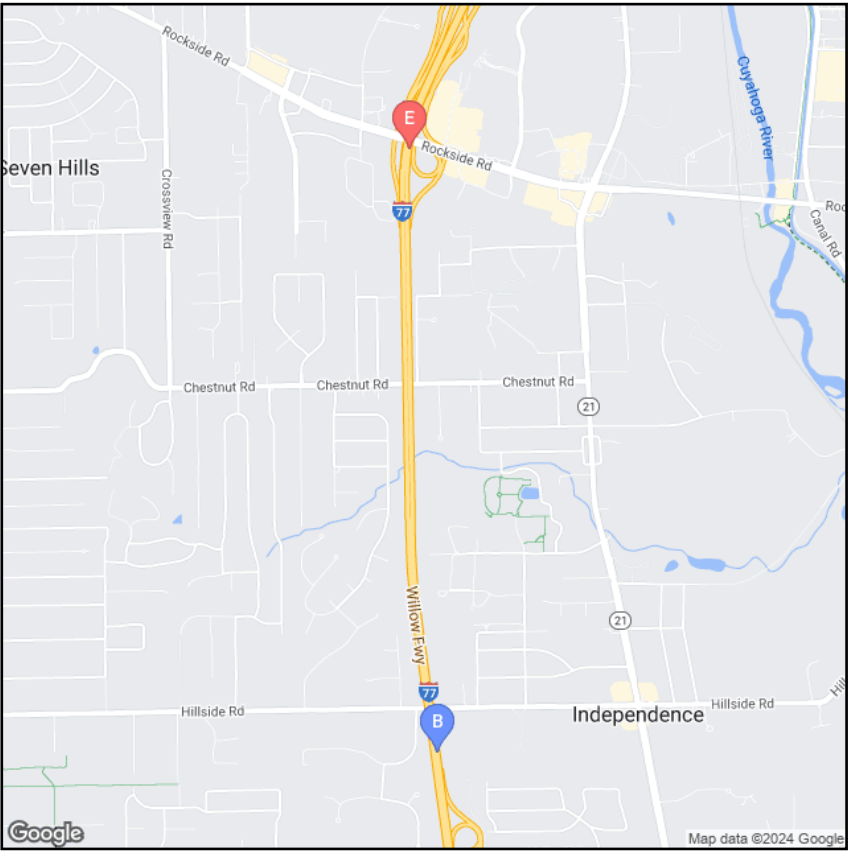
Process Flag: Adjusted model to counts with process per ODOT 255 spreadsheet

Comment: No Comment

Historical Count

Year	All	Cars	Trucks
2016	101,531	93,409	8,122
2019	101,368	95,288	6,080
* 2022	90,419	84,995	5,424

* Pivot Point



Segment ID	LRS ID	BMP	EMP	Length	Yr 2030 AADT	Yr 2050 AADT	DHV30	K %	D %	T24 %	TD %
1829871	SCUYIR00077**C	6.320	8.360	2.040	90,500	90,500	8100	9.0	70.0	6	4

Forecast Segment ID	Route	BMP	EMP
1830782	SCUYRA18379**C	0.000	0.376

Forecast

Year	K%	T24 % (Existing)	PA AADT	PA Method	PA Growth Rate %	PA Calculated Rate %
2050	◆ 12.4	3	9,900	Average	1.300	1.300
AADT	D%	TD % (Existing)	BC AADT	BC Method	BC Growth Rate %	BC Calculated Rate %
10,090	100.0	2	190	Average	● -4.500	0.000

● Warning: The growth rate was negative and was capped.

◆ K/D factors from TCDS were used.

Regression

Method Number	PA AADT	BC AADT	AADT
2	14,129	-227	13,902

95% Confidence Min/Max

PA Min	PA Max	BC Min	BC Max	Year
-12905	21133	-1197	315	2050

Method Number	PA Growth %	BC Growth %	PA Drop Count	BC Drop Count	PA AADT	BC AADT	PA Adjustment	PA Adjustment
1	0.04	-14.47	0	0	8,949	-568	7,393	-577
2	3.34	-7.86	6	1	17,115	-172	14,129	-227
3	-1.45	-7.86	0	0	5,485	-172	4,336	-227
4	2.46	-9.77	6	5	15,155	-312	12,329	-328
5	-2.51	-9.66	0	0	3,125	-275	2,166	-322
6	-3.20	-11.30	5	5	1,117	-400	761	-409

Adjustment Info

ID	Adjustment Methods Name	Model vs Count AADT	Adjusted AADT	Model vs Count BC	Adjusted BC	PA Growth Rate %	BC Growth Rate %
1	DIF	-12,385	3,111	-973	-195	-1.95	-7.26
2	RAT	0.38	5,840	0.16	127	-0.78	-1.17
3	MRAT	0.78	5,840	0.67	127	-0.78	-1.17
4	RAF		4,476		-34	-1.37	-4.21
Adjust Method AADT		Adjust Method BC		Selected PA Growth Rate %		Selected BC Growth Rate %	
Ratio		Ratio		-0.800		-1.200	

Method 1 - 4 Volume

PA Min Volume	PA Max Volume	BC Min Volume	BC Max Volume	Total Min Volume	Total MaxVolume
3306	5713	-195	127	3111	5840

Process Flag:	Adjusted model to counts with process per ODOT 255 spreadsheet
Comment:	No Comment

Historical Count

Year	All	Cars	Trucks
2009	8,465	7,795	670
2012	9,241	8,876	365
2013	9,420	9,048	372
2016	10,485	10,129	355
2019	10,221	9,865	356
* 2022	7,491	7,302	189

* Pivot Point



Segment ID	LRS ID	BMP	EMP	Length	Yr 2030 AADT	Yr 2050 AADT	DHV30	K %	D %	T24 %	TD %
1830782	SCUYRA18379**C	0.000	0.376	0.376	8,200	10,000	1200	12.4	100.0	2	2

Forecast Segment ID	Route	BMP	EMP
1830783	SCUYRA18380**C	0.000	0.044

Forecast

Year	K%	T24 % (Existing)	PA AADT	PA Method	PA Growth Rate %	PA Calculated Rate %
2050	◆ 12.4	3	10,000	Average	1.500	1.500
AADT	D%	TD % (Existing)	BC AADT	BC Method	BC Growth Rate %	BC Calculated Rate %
10,190	100.0	2	190	Average	● -4.600	0.000

● Warning: The growth rate was negative and was capped.

◆ K/D factors from TCDS were used.

Regression

Method Number	PA AADT	BC AADT	AADT
2	14,129	-227	13,902

95% Confidence Min/Max

PA Min	PA Max	BC Min	BC Max	Year
-12905	21133	-1197	315	2050

Method Number	PA Growth %	BC Growth %	PA Drop Count	BC Drop Count	PA AADT	BC AADT	PA Adjustment	PA Adjustment
1	0.04	-14.47	0	0	8,949	-568	7,393	-577
2	3.34	-7.86	6	1	17,115	-172	14,129	-227
3	-1.45	-7.86	0	0	5,485	-172	4,336	-227
4	2.46	-9.77	6	5	15,155	-312	12,329	-328
5	-2.51	-9.66	0	0	3,125	-275	2,166	-322
6	-3.20	-11.30	5	5	1,117	-400	761	-409

Adjustment Info

ID	Adjustment Methods Name	Model vs Count AADT	Adjusted AADT	Model vs Count BC	Adjusted BC	PA Growth Rate %	BC Growth Rate %
1	DIF	-3,034	6,447	-360	-5	-0.42	-3.67
2	RAT	0.71	6,748	0.34	122	-0.33	-1.27
3	MRAT	0.90	6,748	0.65	122	-0.33	-1.27
4	RAF		6,597		59	-0.37	-2.46
Adjust Method AADT		Adjust Method BC		Selected PA Growth Rate %		Selected BC Growth Rate %	
Ratio		Ratio		-0.300		-1.300	

Method 1 - 4 Volume

PA Min Volume	PA Max Volume	BC Min Volume	BC Max Volume	Total Min Volume	Total MaxVolume
6452	6626	-5	122	6447	6748

Process Flag: Adjusted model to counts with process per ODOT 255 spreadsheet

Comment: No Comment

Historical Count

Year	All	Cars	Trucks
2009	8,465	7,795	670
2012	9,241	8,876	365
2013	9,420	9,048	372
2016	10,485	10,129	355
2019	10,221	9,865	356
* 2022	7,491	7,302	189

* Pivot Point



Segment ID	LRS ID	BMP	EMP	Length	Yr 2030 AADT	Yr 2050 AADT	DHV30	K %	D %	T24 %	TD %
1830783	SCUYRA18380**C	0.000	0.044	0.044	8,400	10,500	1300	12.4	100.0	2	2

Forecast Segment ID	Route	BMP	EMP
1830784	SCUYRA18381**C	0.000	0.413

Forecast

Year	K%	T24 % (Existing)	PA AADT	PA Method	PA Growth Rate %	PA Calculated Rate %
2050	◆ 14.7	3	3,400	Average	● -0.300	0.000
AADT	D%	TD % (Existing)	BC AADT	BC Method	BC Growth Rate %	BC Calculated Rate %
3,490	100.0	2	90	Average	● -3.400	0.000

● Warning: The growth rate was negative and was capped.

◆ K/D factors from TCDS were used.

Regression

Method Number	PA AADT	BC AADT	AADT
2	3,690	-52	3,638

95% Confidence Min/Max

PA Min	PA Max	BC Min	BC Max	Year
1233	7050	-236	61	2050

Method Number	PA Growth %	BC Growth %	PA Drop Count	BC Drop Count	PA AADT	BC AADT	PA Adjustment	PA Adjustment
1	1.45	-5.44	0	0	5,076	-40	4,750	-47
2	0.33	-5.63	1	4	3,875	-51	3,690	-52
3	0.33	-6.71	0	0	3,875	-76	3,690	-79
4	-0.10	-6.55	5	4	3,306	-76	3,281	-75
5	0.10	-7.94	0	0	3,635	-110	3,469	-110
6	-0.28	-7.14	5	4	3,122	-92	3,110	-90

Adjustment Info

ID	Adjustment Methods Name	Model vs Count AADT	Adjusted AADT	Model vs Count BC	Adjusted BC	PA Growth Rate %	BC Growth Rate %
1	DIF	-4,197	1,507	-376	-58	-1.92	-5.87
2	RAT	0.45	2,581	0.19	61	-0.91	-1.15
3	MRAT	0.74	2,581	0.68	61	-0.91	-1.15
4	RAF		2,044		1	-1.41	-3.53
Adjust Method AADT		Adjust Method BC		Selected PA Growth Rate %		Selected BC Growth Rate %	
Ratio		Ratio		-0.900		-1.200	

Method 1 - 4 Volume

PA Min Volume	PA Max Volume	BC Min Volume	BC Max Volume	Total Min Volume	Total MaxVolume
1565	2520	-58	61	1507	2581

Process Flag:	Adjusted model to counts with process per ODOT 255 spreadsheet
Comment:	No Comment

Historical Count

Year	All	Cars	Trucks
2009	2,863	2,713	150
2012	3,531	3,387	144
2013	3,599	3,452	147
2016	3,632	3,483	148
2019	3,907	3,803	104
* 2022	3,468	3,378	90

* Pivot Point



Segment ID	LRS ID	BMP	EMP	Length	Yr 2030 AADT	Yr 2050 AADT	DHV30	K %	D %	T24 %	TD %
1830784	SCUYRA18381**C	0.000	0.413	0.413	3,500	3,500	500	14.7	100.0	3	2

Forecast Segment ID	Route	BMP	EMP
1830785	SCUYRA18382**C	0.000	0.051

Forecast

Year	K%	T24 % (Existing)	PA AADT	PA Method	PA Growth Rate %	PA Calculated Rate %
2050	◆ 14.7	3	3,400	Average	● -0.400	0.000
AADT	D%	TD % (Existing)	BC AADT	BC Method	BC Growth Rate %	BC Calculated Rate %
3,490	100.0	2	90	Average	● -2.700	0.000

● Warning: The growth rate was negative and was capped.

◆ K/D factors from TCDS were used.

Regression

Method Number	PA AADT	BC AADT	AADT
2	3,690	-52	3,638

95% Confidence Min/Max

PA Min	PA Max	BC Min	BC Max	Year
1233	7050	-236	99	2050

Method Number	PA Growth %	BC Growth %	PA Drop Count	BC Drop Count	PA AADT	BC AADT	PA Adjustment	PA Adjustment
1	1.45	-5.44	0	0	5,076	-40	4,750	-47
2	0.33	-5.63	1	4	3,875	-51	3,690	-52
3	0.33	-6.71	0	0	3,875	-76	3,690	-79
4	-0.10	-6.55	5	4	3,306	-76	3,281	-75
5	0.10	-7.94	0	0	3,635	-110	3,469	-110
6	-0.28	-7.14	5	4	3,122	-92	3,110	-90

Adjustment Info

ID	Adjustment Methods Name	Model vs Count AADT	Adjusted AADT	Model vs Count BC	Adjusted BC	PA Growth Rate %	BC Growth Rate %
1	DIF	-997	2,040	-71	99	-1.52	0.36
2	RAT	0.78	2,359	0.56	95	-1.18	0.20
3	MRAT	0.68	2,359	1.06	95	-1.18	0.20
4	RAF		2,199		97	-1.35	0.28
Adjust Method AADT		Adjust Method BC		Selected PA Growth Rate %		Selected BC Growth Rate %	
Ratio		Average		-1.200		0.300	

Method 1 - 4 Volume

PA Min Volume	PA Max Volume	BC Min Volume	BC Max Volume	Total Min Volume	Total MaxVolume
1941	2264	95	99	2036	2363

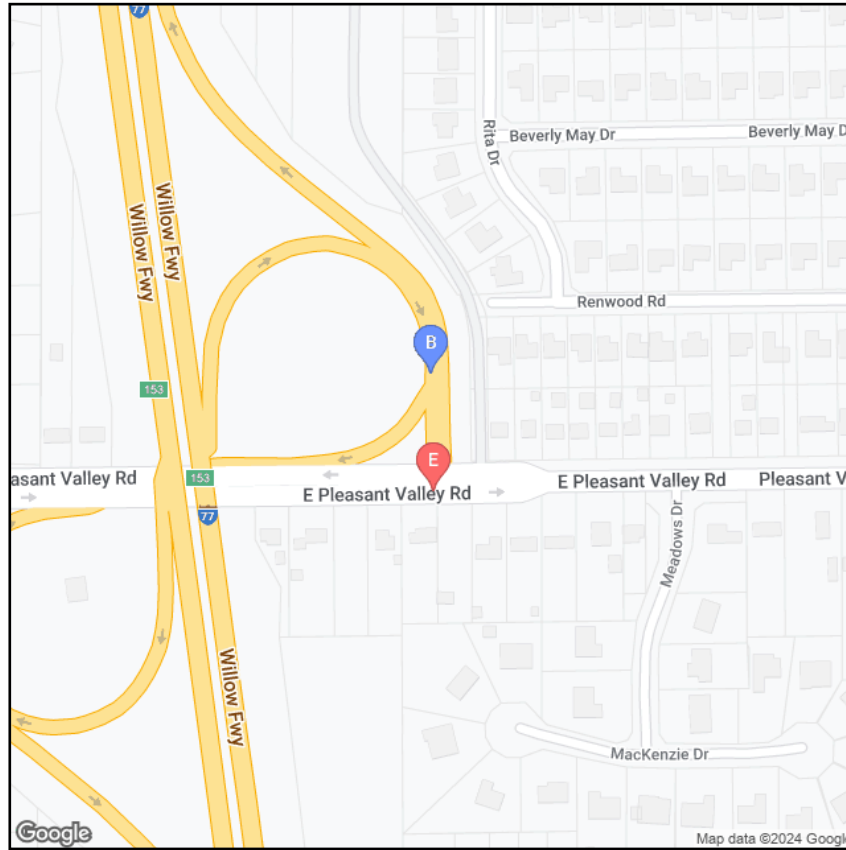
Process Flag: Adjusted model to counts with process per ODOT 255 spreadsheet

Comment: No Comment

Historical Count

Year	All	Cars	Trucks
2009	2,863	2,713	150
2012	3,531	3,387	144
2013	3,599	3,452	147
2016	3,632	3,483	148
2019	3,907	3,803	104
* 2022	3,468	3,378	90

* Pivot Point



Segment ID	LRS ID	BMP	EMP	Length	Yr 2030 AADT	Yr 2050 AADT	DHV30	K %	D %	T24 %	TD %
1830785	SCUYRA18382**C	0.000	0.051	0.051	3,500	3,500	500	14.7	100.0	3	2

Forecast Segment ID	Route	BMP	EMP
1830786	SCUYRA18383**C	0.000	0.396

Forecast

Year	K%	T24 % (Existing)	PA AADT	PA Method	PA Growth Rate %	PA Calculated Rate %
2050	◆ 15.0	2	10,000	Average	0.300	0.300
AADT	D%	TD % (Existing)	BC AADT	BC Method	BC Growth Rate %	BC Calculated Rate %
10,180	100.0	2	180	Average	● -7.100	0.000

● Warning: The growth rate was negative and was capped.

◆ K/D factors from TCDS were used.

Regression

Method Number	PA AADT	BC AADT	AADT
2	12,454	-474	11,980

95% Confidence Min/Max

PA Min	PA Max	BC Min	BC Max	Year
5558	16661	-749	127	2050

Method Number	PA Growth %	BC Growth %	PA Drop Count	BC Drop Count	PA AADT	BC AADT	PA Adjustment	PA Adjustment
1	1.15	-11.95	0	0	13,186	-430	12,604	-413
2	1.09	-13.19	4	2	12,877	-493	12,454	-474
3	0.70	-8.52	0	0	11,837	-238	11,413	-244
4	0.74	-8.34	4	4	11,833	-238	11,517	-235
5	0.36	-9.96	0	0	10,848	-315	10,504	-315
6	0.56	-9.05	4	4	11,323	-275	11,036	-270

Adjustment Info

ID	Adjustment Methods Name	Model vs Count AADT	Adjusted AADT	Model vs Count BC	Adjusted BC	PA Growth Rate %	BC Growth Rate %
1	DIF	-7,348	7,145	-701	-67	-0.87	-4.93
2	RAT	0.57	8,252	0.20	127	-0.53	-0.99
3	MRAT	0.85	8,252	0.72	127	-0.53	-0.99
4	RAF		7,699		30	-0.70	-2.96
Adjust Method AADT		Adjust Method BC		Selected PA Growth Rate %		Selected BC Growth Rate %	
Ratio		Ratio		-0.500		-1.000	

Method 1 - 4 Volume

PA Min Volume	PA Max Volume	BC Min Volume	BC Max Volume	Total Min Volume	Total MaxVolume
7212	8125	-67	127	7145	8252

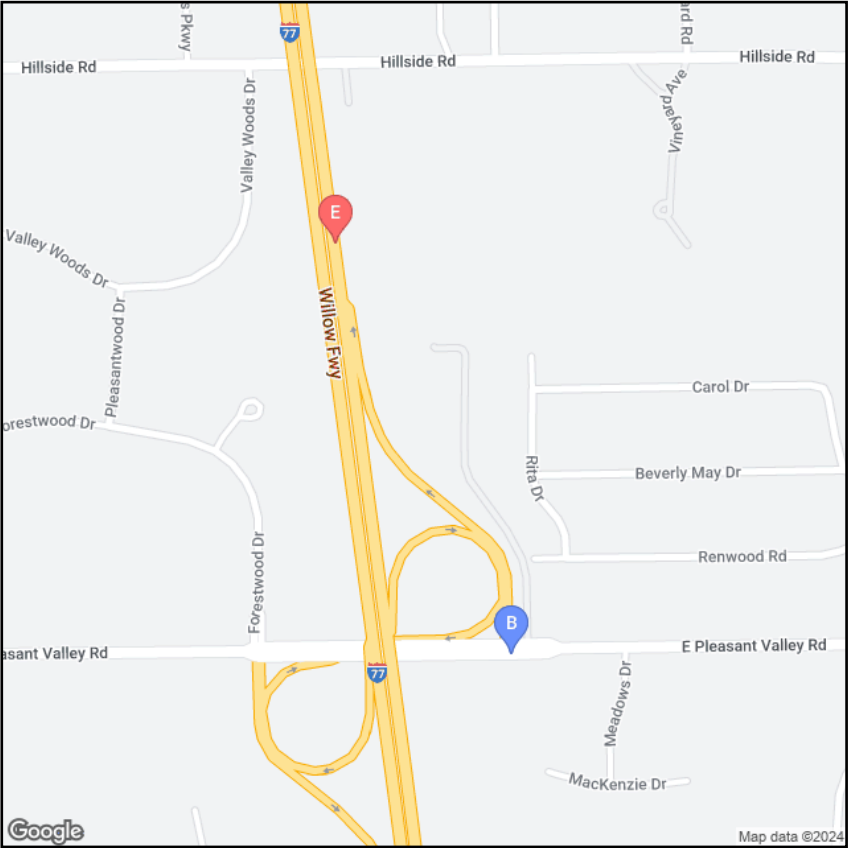
Process Flag: Adjusted model to counts with process per ODOT 255 spreadsheet

Comment: No Comment

Historical Count

Year	All	Cars	Trucks
2009	8,789	8,299	490
2012	9,337	9,026	311
2013	9,517	9,200	317
2016	10,389	10,074	314
2019	10,306	10,095	211
* 2022	9,714	9,538	176

* Pivot Point



Segment ID	LRS ID	BMP	EMP	Length	Yr 2030 AADT	Yr 2050 AADT	DHV30	K %	D %	T24 %	TD %
1830786	SCUYRA18383**C	0.000	0.396	0.396	9,900	10,500	1600	15.0	100.0	2	2

Forecast Segment ID	Route	BMP	EMP
1830787	SCUYRA18384**C	0.000	0.539

Forecast

Year	K%	T24 % (Existing)	PA AADT	PA Method	PA Growth Rate %	PA Calculated Rate %
2050	◆ 13.3	2	3,700	Average	● -0.600	0.000
AADT	D%	TD % (Existing)	BC AADT	BC Method	BC Growth Rate %	BC Calculated Rate %
3,790	100.0	2	90	Average	● -3.600	0.000

● Warning: The growth rate was negative and was capped.

◆ K/D factors from TCDS were used.

Regression

Method Number	PA AADT	BC AADT	AADT
2	3,932	-60	3,872

95% Confidence Min/Max

PA Min	PA Max	BC Min	BC Max	Year
431	6015	-457	292	2050

Method Number	PA Growth %	BC Growth %	PA Drop Count	BC Drop Count	PA AADT	BC AADT	PA Adjustment	PA Adjustment
1	0.59	-5.52	0	0	4,495	-45	4,267	-48
2	0.26	-6.01	5	4	4,018	-70	3,932	-60
3	0.28	-4.71	0	0	4,131	-22	3,946	-28
4	-0.11	-4.26	5	4	3,587	-22	3,555	-17
5	0.03	-6.94	0	0	3,861	-82	3,698	-83
6	-0.30	-4.46	5	4	3,372	-28	3,355	-22

Adjustment Info

ID	Adjustment Methods Name	Model vs Count AADT	Adjusted AADT	Model vs Count BC	Adjusted BC	PA Growth Rate %	BC Growth Rate %
1	DIF	-5,378	303	-526	-128	-3.15	-8.77
2	RAT	0.41	2,334	0.14	57	-1.35	-1.26
3	MRAT	0.62	2,334	0.65	57	-1.35	-1.26
4	RAF		1,319		-35	-2.25	-4.99
Adjust Method AADT		Adjust Method BC		Selected PA Growth Rate %		Selected BC Growth Rate %	
Ratio		Ratio		-1.400		-1.300	

Method 1 - 4 Volume

PA Min Volume	PA Max Volume	BC Min Volume	BC Max Volume	Total Min Volume	Total MaxVolume
431	2277	-128	57	303	2334

Process Flag:	Adjusted model to counts with process per ODOT 255 spreadsheet
Comment:	No Comment

Historical Count

Year	All	Cars	Trucks
2009	3,664	3,503	161
2012	3,793	3,674	119
2013	3,866	3,745	121
2016	3,966	3,795	170
2019	4,165	4,079	86
* 2022	3,751	3,663	88

* Pivot Point



Segment ID	LRS ID	BMP	EMP	Length	Yr 2030 AADT	Yr 2050 AADT	DHV30	K %	D %	T24 %	TD %
1830787	SCUYRA18384**C	0.000	0.539	0.539	3,800	3,800	500	13.3	100.0	2	2

Forecast Segment ID	Route	BMP	EMP
1831400	SCUYSR00021**C	5.169	6.377

Forecast

Year	K%	T24 % (Existing)	PA AADT	PA Method	PA Growth Rate %	PA Calculated Rate %
2050	◆ 13.2	2	11,000	Model	● -0.900	0.000
AADT	D%	TD % (Existing)	BC AADT	BC Method	BC Growth Rate %	BC Calculated Rate %
11,230	◆ 55.4	2	230	Average	● -6.000	0.000

● Warning: The growth rate was negative and was capped.

◆ K/D factors from TCDS were used.

Regression

Method Number	PA AADT	BC AADT	AADT
1	2,049	-456	1,593

95% Confidence Min/Max

PA Min	PA Max	BC Min	BC Max	Year
-10090	12460	-2640	497	2050

Method Number	PA Growth %	BC Growth %	PA Drop Count	BC Drop Count	PA AADT	BC AADT	PA Adjustment	PA Adjustment
1	-2.89	-10.56	0	0	2,947	-385	2,049	-456
2	-3.39	-11.74	5	4	747	-530	540	-533
3	-3.71	-13.95	0	0	143	-636	-424	-677
4	-4.30	-13.95	5	4	-2,366	-691	-2,180	-677
5	-3.29	-21.46	0	0	1,536	-1,178	834	-1,167
6	-3.88	-18.00	5	4	-973	-976	-922	-941

Adjustment Info

ID	Adjustment Methods Name	Model vs Count AADT	Adjusted AADT	Model vs Count BC	Adjusted BC	PA Growth Rate %	BC Growth Rate %
1	DIF	-6,990	6,267	-261	24	-1.50	-3.20
2	RAT	0.61	8,104	0.47	134	-0.93	-1.52
3	MRAT	0.74	8,104	0.58	134	-0.93	-1.52
4	RAF		7,185		79	-1.21	-2.36
Adjust Method AADT		Adjust Method BC		Selected PA Growth Rate %		Selected BC Growth Rate %	
Ratio		Ratio		-0.900		-1.500	

Method 1 - 4 Volume

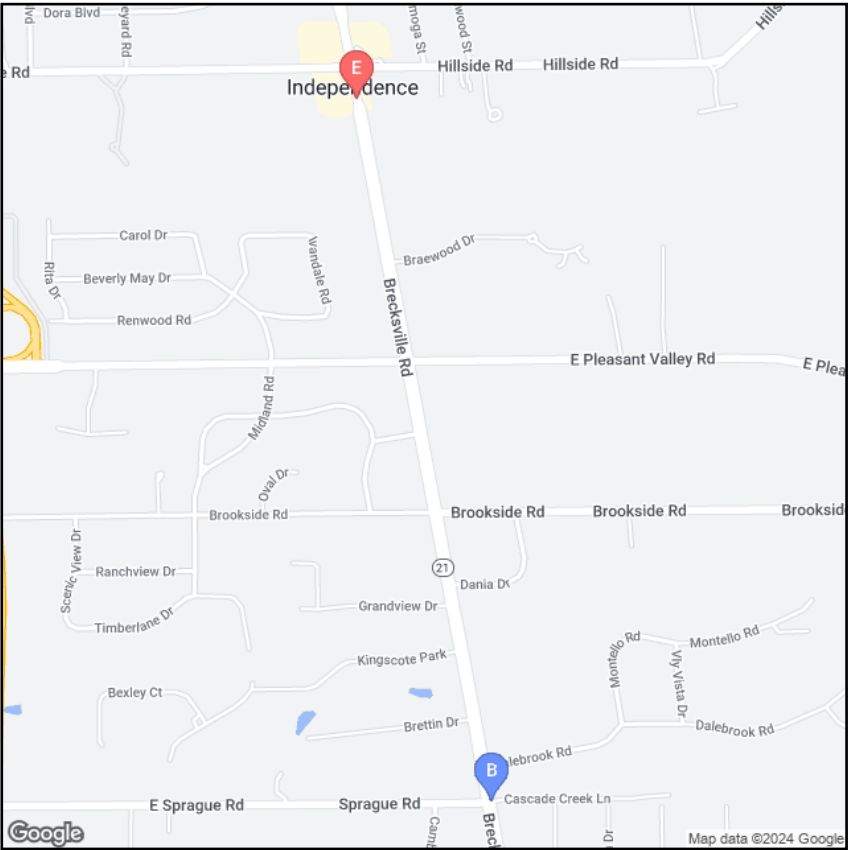
PA Min Volume	PA Max Volume	BC Min Volume	BC Max Volume	Total Min Volume	Total MaxVolume
6243	7970	24	134	6267	8104

Process Flag:	Adjusted model to counts with process per ODOT 255 spreadsheet
Comment:	No Comment

Historical Count

Year	All	Cars	Trucks
2008	15,580	15,020	560
2010	16,950	16,390	560
2013	15,160	14,566	593
2016	13,752	13,060	691
2019	14,114	13,843	271
* 2022	10,993	10,760	233

* Pivot Point



Segment ID	LRS ID	BMP	EMP	Length	Yr 2030 AADT	Yr 2050 AADT	DHV30	K %	D %	T24 %	TD %
1831400	SCUYSR00021**C	5.169	6.377	1.208	11,000	11,000	1500	13.2	55.4	2	2

APPENDIX E
TRAFFIC SIGNAL WARRANT ANALYSIS

STUDY AND ANALYSIS INFORMATION

Municipality:	City of Seven Hills	Traffic Volumes Obtained By:	Tri-State Traffic Data
County:	Cuyahoga	Analysis Date:	5/10/2024
ODOT Engineering District:	12	Agency/ Company Name Performing Warrant Analysis:	GPD Group
Google map link:	Map		

Analysis Information

Data Collection Date: 4/17/2024
Day of the Week: Wednesday

Is the intersection in a built-up area of an isolated community of <10,000 population? Yes

Existing Traffic Signal at intersection: Yes

Total Number of Approaches at Intersection: 4

Major Street Information

Major Street Name and Route Number: Pleasant Valley Road

Major Street Approach Direction: E-Bound
W-Bound

Number of Thru Lanes on Each Major Street Approach: 2 LANE(S)

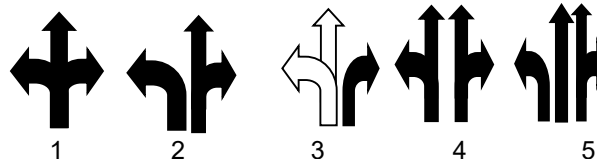
Speed Limit or 85th Percentile Speed on the Major Street*: 35 MPH

*Unknown assumes below 45 mph

Minor Street Information

Minor Street Name and Route Number: Edgewood Lane / Ludwin Drive

Minor Street Approach Configuration: 1 N-Bound
1 S-Bound



Number of Thru Lanes on Each Minor Street Approach: 1 LANE(S)

Apply Right Turn Lane Reduction*: Yes

*Right Turn Lane Reduction Shall be used for Warrants 1, 2, & 3 for New ODOT Signals. Please refer to TEM 402-3.2 for clarification and criteria under which Right Turn Reduction is not required.

TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS

	Warrant		Notes and Comments:
	Applicable?	Satisfied?	
Warrant 1, Eight-Hour Vehicular Volume	Yes	No	
Warrant 2, Four-Hour Vehicular Volume	Yes	No	
Warrant 3, Peak Hour	Yes	No	Signals installed under Warrant 3 should be traffic actuated. Peak Hour 7:15 AM 8:15 AM
For Warrants 1-3, new ODOT signals must be based off of 100% volume thresholds (TEM 402-3.2)			
Warrant 4, Pedestrian Volume	No		If this warrant is met, and a traffic control signal is justified by an engineering study, the traffic control signal shall be equipped with pedestrian signal heads complying with the provisions set forth in Chapter 4E of the OMUTCD. Peak Hour 4:30 PM 5:30 PM
Warrant 5, School Crossing	No		N/A
Warrant 6, Coordinated Signal System	No		(Shall not be used as the sole warrant in the analysis)
Warrant 7, Crash Experience	No		If this is the sole warrant, signal must be semi-actuated with control devices which provide proper coordination if installed at an intersection within a coordinated system and normally should be fully traffic actuated if installed at an isolated intersection.
Warrant 8, Roadway Network	No		(Shall not be used as the sole warrant in the analysis)
Warrant 9, Intersection Near a Grade Crossing	No		Figure 4C-9
Multi-Way Stop Warrant	No		May be used as an interim measure if traffic signal warrants are satisfied.

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

If no warrants are satisfied, additional options may be considered:

1. An engineering study, performed by a firm prequalified by ODOT for signal design, if approved by the ODOT district, may be used to justify a new signal installation or retention of an existing signal that otherwise does not meet the published warrants. An example of such an instance is a traffic signal in proximity to a railroad crossing that serves to reduce queuing across the tracks.
2. According to TEM 402-2, If the actual turning movement counts fail to satisfy a signal warrant, it may be acceptable to use traffic volumes projected to the second year after project completion. The **Modeling and Forecasting Section** should provide the projected traffic volumes.
3. A pedestrian hybrid beacon may be considered for installation to facilitate pedestrian crossings at a location that does not meet traffic signal warrants (see Chapter 4C of TEM) or at a location that meets traffic signal warrants under Sections 4C.05 and/or 4C.06 but a decision is made to not install a traffic control signal. **Please fill inputs on PHB Score Sheet and submit to ODOT.**

Considerations such as geometrics and lack of sight distance generally have not been accepted in lieu of satisfying signal warrants. These considerations may allow an otherwise unwarranted traffic signal to be retained at **100 percent** local cost. Please review TEM 402-4 for details.

Conclusion: **Do Not Retain Existing Traffic Signal**

Notes: Existing Year 2024 Traffic Signal Warrant Analysis. Restudy intersection once Pleasant Valley Road construction is finished and operating under normal traffic conditions.

OMUTCD WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach

Major Street:	2 or More Lanes
Minor Street:	1 Lane

Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street? **Yes**

*Only applicable after an adequate trial of other alternatives (See section 4C.02.06 of the 2012 OMUTCD)

Lanes Major/ Minor	Adjusted Volumes		Condition A				Condition B				Combination A/B*							
			100%		70%		100%		70%		Cond. A		Cond. B		Cond. A		Cond. B	
	Major	Minor	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.
1 / 1			500	150	350	105	750	75	525	53	400	120	600	60	280	84	420	42
2+ / 1	X		600	150	420	105	900	75	630	53	480	120	720	60	336	84	504	42
2+ / 2+			600	200	420	140	900	100	630	70	480	160	720	80	336	112	504	56
1 / 2+			500	200	350	140	750	100	525	70	400	160	600	80	280	112	420	56
12:00 AM	0	0																
12:15 AM	0	0																
12:30 AM	0	0																
12:45 AM	0	0																
1:00 AM	0	0																
1:15 AM	0	0																
1:30 AM	0	0																
1:45 AM	0	0																
2:00 AM	0	0																
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4:00 AM	0	0																
4:15 AM	0	0																
4:30 AM	0	0																
4:45 AM	0	0																
5:00 AM	0	0																
5:15 AM	233	3																
5:30 AM	513	4			1						1				1		1	
5:45 AM	838	11	1						1				1					
6:00 AM	1163	13					1											
6:15 AM	1255	18																
6:30 AM	1376	27			1						1				1		1	
6:45 AM	1556	31	1						1				1					
7:00 AM	1691	36					1											
7:15 AM	1732	33																
7:30 AM	1672	29			1						1				1		1	
7:45 AM	1506	30	1						1				1					
8:00 AM	1326	26					1											
8:15 AM	1204	30																
8:30 AM	1138	24			1						1				1		1	
8:45 AM	1061	23	1						1				1					
9:00 AM	1005	19					1											
9:15 AM	1002	21																
9:30 AM	984	21			1						1				1		1	
9:45 AM	968	19	1						1				1					

Existing Year 2024 Traffic Warrant Analysis Pleasant & Edgewood

10:00 AM	967	17					1										
10:15 AM	962	19															
10:30 AM	964	18			1					1				1		1	
10:45 AM	994	14	1						1			1					
11:00 AM	1052	19					1										
11:15 AM	1083	17															
11:30 AM	1115	12			1					1				1		1	
11:45 AM	1133	16	1						1				1				
12:00 PM	1124	10					1										
12:15 PM	1168	12															
12:30 PM	1160	14			1					1				1		1	
12:45 PM	1132	14	1						1				1				
1:00 PM	1176	13					1										
1:15 PM	1156	13															
1:30 PM	1186	13			1					1				1		1	
1:45 PM	1263	15	1						1				1				
2:00 PM	1316	16					1										
2:15 PM	1423	20															
2:30 PM	1517	20			1					1				1		1	
2:45 PM	1626	16	1						1				1				
3:00 PM	1695	16					1										
3:15 PM	1750	12															
3:30 PM	1829	14			1					1				1		1	
3:45 PM	1857	13	1						1				1				
4:00 PM	1925	17					1										
4:15 PM	1950	16															
4:30 PM	1978	17			1					1				1		1	
4:45 PM	1946	25	1						1				1				
5:00 PM	1806	21					1										
5:15 PM	1328	16															
5:30 PM	814	10			1					1				1		1	
5:45 PM	366	2															
6:00 PM	0	0															
6:15 PM	0	0															
6:30 PM	0	0															
6:45 PM	0	0															
7:00 PM	0	0															
7:15 PM	0	0															
7:30 PM	0	0															
7:45 PM	0	0															
8:00 PM	0	0															
8:15 PM	0	0															
8:30 PM	0	0															
8:45 PM	0	0															
9:00 PM	0	0															
9:15 PM	0	0															
9:30 PM	0	0															
9:45 PM	0	0															
HOURS MET			12		0	13		0	12		0	13		0	12		0
WARRANT SATISFIED?			NO		NO		NO		NO		NO				NO		

Warrant Met: **No**

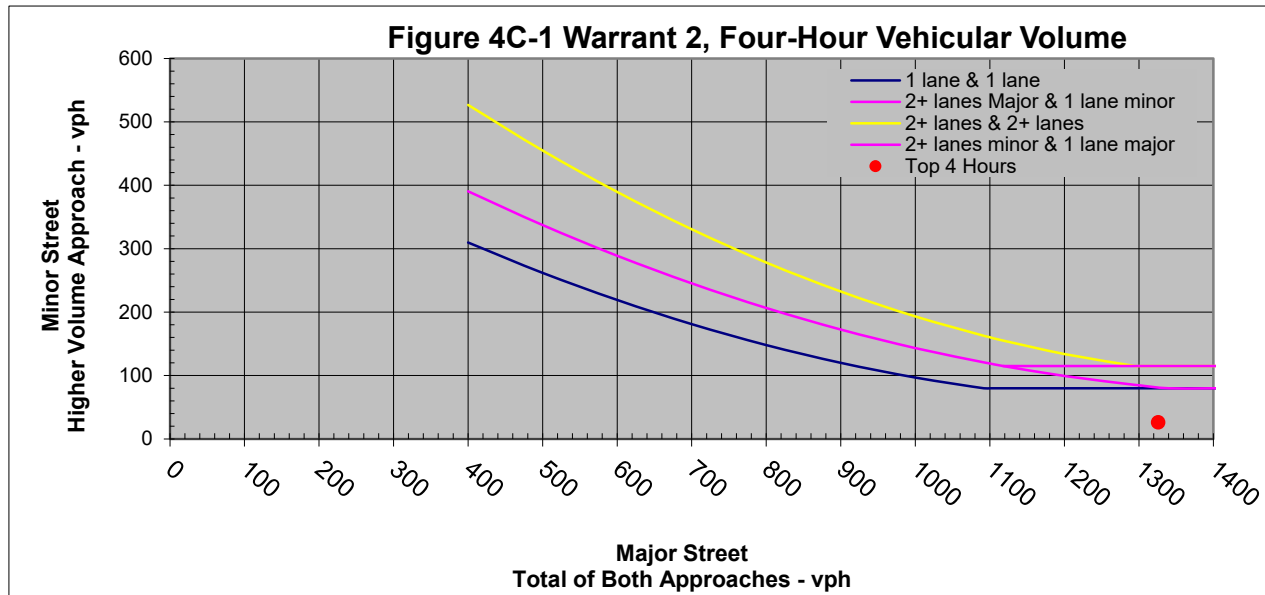
Notes:

OMUTCD WARRANT 2, FOUR-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	Total Number of Unique Hours Met on Figure 4C-1	0
Major street: 2 or More Lanes	Total Number of Unique Hours Met on Figure 4C-2 (70% Factor)	0
Minor Street: 1 Lane		

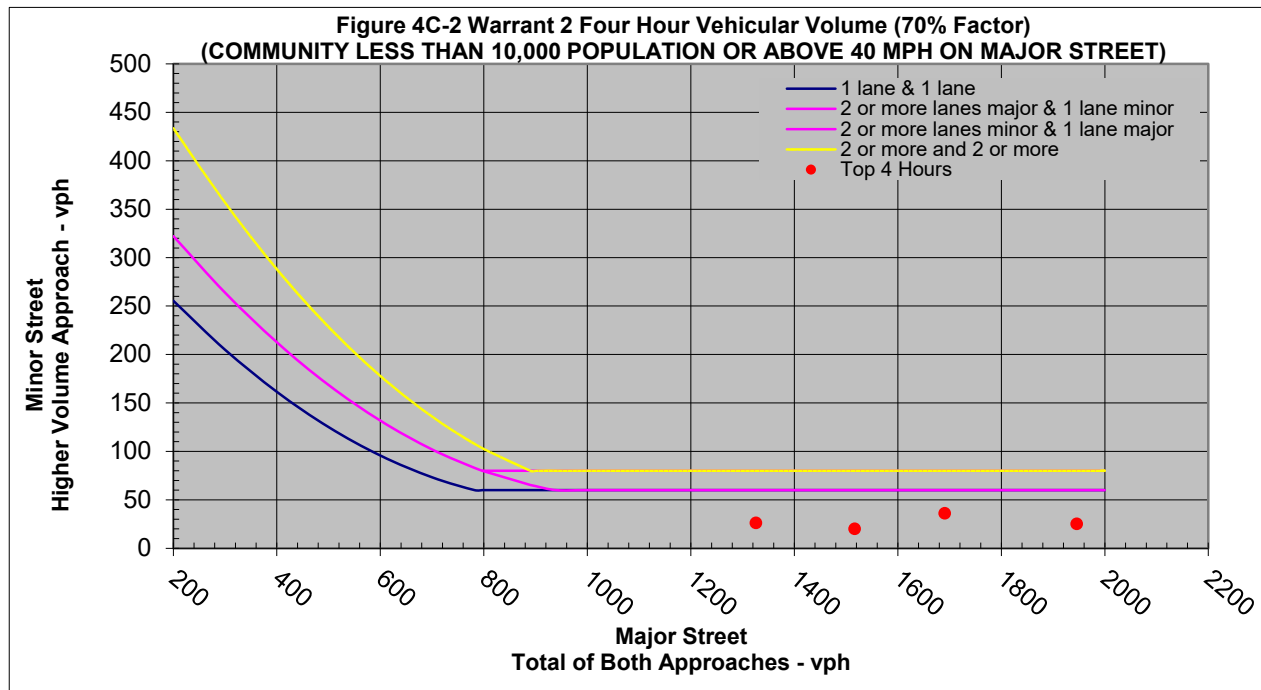
Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street?**Yes**

Hour Interval Beginning At	Raw Traffic Counts				Total Major Approach Volumes	Highest Actual Minor Street Approach Volumes	Hour Met?	Hour Met? (70% Factor)
	Minor - Edgewood Lane / Ludwin Dr		Major - Pleasant Valley Road					
	N-Bound	S-Bound	W-Bound	E-Bound				
6:00 AM	13	12	227	936	1163	13		
6:15 AM	18	15	275	980	1255	18		
6:30 AM	27	22	306	1070	1376	27		
6:45 AM	31	27	329	1227	1556	31		
7:00 AM	36	26	367	1324	1691	36		
7:15 AM	33	24	379	1353	1732	33		
7:30 AM	29	25	407	1265	1672	29		
7:45 AM	30	22	431	1075	1506	30		
8:00 AM	26	26	425	901	1326	26		
8:15 AM	21	30	415	789	1204	30		
8:30 AM	22	24	413	725	1138	24		
8:45 AM	22	23	402	659	1061	23		
9:00 AM	19	16	387	618	1005	19		
9:15 AM	21	14	412	590	1002	21		
9:30 AM	21	12	433	551	984	21		
9:45 AM	19	13	451	517	968	19		
10:00 AM	17	12	467	500	967	17		
10:15 AM	19	7	471	491	962	19		
10:30 AM	18	8	459	505	964	18		
10:45 AM	14	4	454	540	994	14		
11:00 AM	19	6	482	570	1052	19		
11:15 AM	17	9	504	579	1083	17		
11:30 AM	12	10	533	582	1115	12		
11:45 AM	16	9	546	587	1133	16		
12:00 PM	10	7	533	591	1124	10		
12:15 PM	12	7	564	604	1168	12		
12:30 PM	14	4	560	600	1160	14		
12:45 PM	14	4	560	572	1132	14		
1:00 PM	13	7	609	567	1176	13		
1:15 PM	13	5	607	549	1156	13		
1:30 PM	13	9	635	551	1186	13		
1:45 PM	15	10	705	558	1263	15		
2:00 PM	16	9	744	572	1316	16		
2:15 PM	20	10	805	618	1423	20		
2:30 PM	20	8	901	616	1517	20		
2:45 PM	16	10	971	655	1626	16		
3:00 PM	16	10	1052	643	1695	16		
3:15 PM	12	10	1117	633	1750	12		
3:30 PM	14	11	1184	645	1829	14		
3:45 PM	12	13	1225	632	1857	13		
4:00 PM	17	17	1277	648	1925	17		
4:15 PM	16	15	1304	646	1950	16		
4:30 PM	17	15	1327	651	1978	17		
4:45 PM	25	12	1332	614	1946	25		
5:00 PM	21	7	1243	563	1806	21		
5:15 PM	16	6	926	402	1328	16		
5:30 PM	10	3	574	240	814	10		
5:45 PM	2	1	255	111	366	2		
6:00 PM	0	0	0	0	0	0		
6:15 PM	0	0	0	0	0	0		
6:30 PM	0	0	0	0	0	0		
6:45 PM	0	0	0	0	0	0		
7:00 PM	0	0	0	0	0	0		
7:15 PM	0	0	0	0	0	0		
7:30 PM	0	0	0	0	0	0		
7:45 PM	0	0	0	0	0	0		
8:00 PM	0	0	0	0	0	0		



Top Hours for Figure 4C-1	Start Time	End Time	Major Street	Minor Street
Top Hour	7:00 AM	8:00 AM	1691	36
2nd Highest Hour	4:45 PM	5:45 PM	1946	25
3rd Highest Hour	8:00 AM	9:00 AM	1326	26
4th Highest Hour	2:30 PM	3:30 PM	1517	20

Top Hours for Figure 4C-2	Start Time	End Time	Major Street	Minor Street
Top Hour	7:00 AM	8:00 AM	1691	36
2nd Highest Hour	4:45 PM	5:45 PM	1946	25
3rd Highest Hour	8:00 AM	9:00 AM	1326	26
4th Highest Hour	2:30 PM	3:30 PM	1517	20



Are the requirements for Warrant 2 met?: **No**

OMUTCD WARRANT 3, PEAK HOUR

Number of Lanes for Moving Traffic on Each Approach		Peak Hour Start time	7:15 AM
Major Street:	2 or More Lanes	Peak Hour End Time	8:15 AM
Minor Street:	1 Lane		

Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street?

Yes

Is this signal warrant being applied for an unusual case, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time?

No

Indicate whether all three of the following conditions for the same 1 hour (any four consecutive 15-minute periods) of an average day are present*

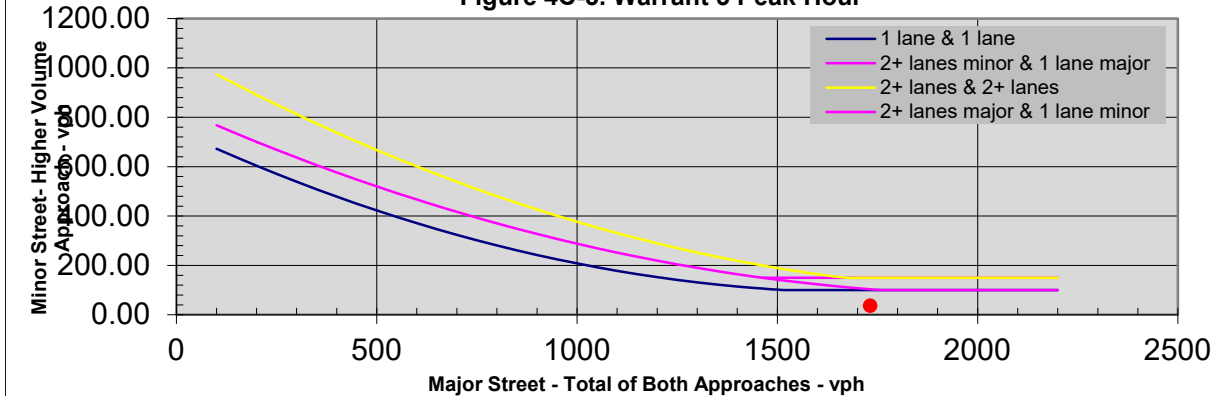
Does the total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equal or exceed 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach?	
Does the volume on the same minor-street approach (one direction only) equal or exceed 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes?	No
Does the total entering volume serviced during the hour equal or exceed 650 vehicles per hour for intersection with three approaches or 800 vehicles per hour for intersections with four or more approaches?	Yes

*If applicable, attach all supporting calculations and documentation.

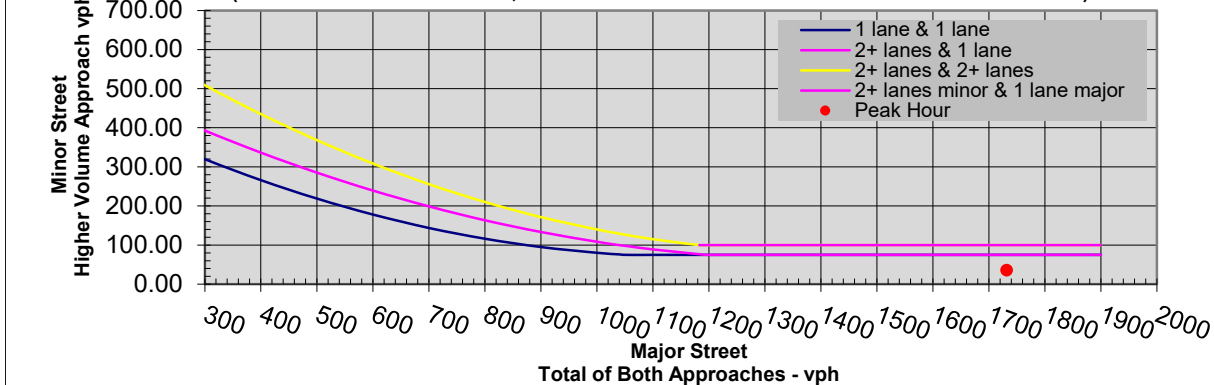
Are the requirements for Warrant 3 met?:

No

Figure 4C-3. Warrant 3 Peak Hour



(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



Existing Year 2024 Traffic Warrant Analysis Pleasant & Edgewood

Hour Vehicular Volume				
Hour Interval Beginning At	Major Street Combined Vehicles Per Hour (VPH)	Highest Minor Street Approach Vehicles Per Hour (VPH)	Sum of Major Street and Highest Minor Street	Sum of Major Street and Combined Minor Street
6:00 AM	1163	13	1176	1188
6:15 AM	1255	18	1273	1288
6:30 AM	1376	27	1403	1425
6:45 AM	1556	31	1587	1614
7:00 AM	1691	36	1727	1753
7:15 AM	1732	33	1765	1789
7:30 AM	1672	29	1701	1726
7:45 AM	1506	30	1536	1558
8:00 AM	1326	26	1352	1378
8:15 AM	1204	30	1234	1255
8:30 AM	1138	24	1162	1184
8:45 AM	1061	23	1084	1106
9:00 AM	1005	19	1024	1040
9:15 AM	1002	21	1023	1037
9:30 AM	984	21	1005	1017
9:45 AM	968	19	987	1000
10:00 AM	967	17	984	996
10:15 AM	962	19	981	988
10:30 AM	964	18	982	990
10:45 AM	994	14	1008	1012
11:00 AM	1052	19	1071	1077
11:15 AM	1083	17	1100	1109
11:30 AM	1115	12	1127	1137
11:45 AM	1133	16	1149	1158
12:00 PM	1124	10	1134	1141
12:15 PM	1168	12	1180	1187
12:30 PM	1160	14	1174	1178
12:45 PM	1132	14	1146	1150
1:00 PM	1176	13	1189	1196
1:15 PM	1156	13	1169	1174
1:30 PM	1186	13	1199	1208
1:45 PM	1263	15	1278	1288
2:00 PM	1316	16	1332	1341
2:15 PM	1423	20	1443	1453
2:30 PM	1517	20	1537	1545
2:45 PM	1626	16	1642	1652
3:00 PM	1695	16	1711	1721
3:15 PM	1750	12	1762	1772
3:30 PM	1829	14	1843	1854
3:45 PM	1857	13	1870	1882
4:00 PM	1925	17	1942	1959
4:15 PM	1950	16	1966	1981
4:30 PM	1978	17	1995	2010
4:45 PM	1946	25	1971	1983
5:00 PM	1806	21	1827	1834
5:15 PM	1328	16	1344	1350
5:30 PM	814	10	824	827
5:45 PM	366	2	368	369
6:00 PM	0	0	0	0
6:15 PM	0	0	0	0
6:30 PM	0	0	0	0
6:45 PM	0	0	0	0
7:00 PM	0	0	0	0
7:15 PM	0	0	0	0
7:30 PM	0	0	0	0
7:45 PM	0	0	0	0
8:00 PM	0	0	0	0

Actual Peak Hour Major Traffic Volume	Actual Peak Hour Minor Traffic Volume	Required Peak Hour Minor Traffic Volume for Fig. 4C-3	Required Peak Hour Minor Traffic Volume for Fig. 4C-4
1732	36	103	75

STUDY AND ANALYSIS INFORMATION

Municipality:	City of Independence	Traffic Volumes Obtained By:	Tri-State Traffic Data
County:	Cuyahoga	Analysis Date:	5/10/2024
ODOT Engineering District:	12	Agency/ Company Name Performing Warrant Analysis:	GPD Group
Google map link:	Map		

Analysis Information

Data Collection Date: 4/17/2024
Day of the Week: Wednesday

Is the intersection in a built-up area of an isolated community of <10,000 population? Yes

Existing Traffic Signal at intersection: Yes

Total Number of Approaches at Intersection: 4

Major Street Information

Major Street Name and Route Number: Pleasant Valley Road

Major Street Approach Direction: E-Bound
W-Bound

Number of Thru Lanes on Each Major Street Approach: 2 LANE(S)

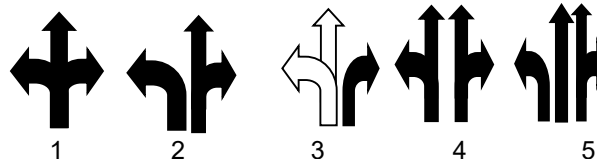
Speed Limit or 85th Percentile Speed on the Major Street*: 35 MPH

*Unknown assumes below 45 mph

Minor Street Information

Minor Street Name and Route Number: I-77 SB Ramps / Forestwood Drive

Minor Street Approach Configuration: 1 N-Bound
3 S-Bound



Number of Thru Lanes on Each Minor Street Approach: 1 LANE(S)

Apply Right Turn Lane Reduction*: Yes

*Right Turn Lane Reduction Shall be used for Warrants 1, 2, & 3 for New ODOT Signals. Please refer to TEM 402-3.2 for clarification and criteria under which Right Turn Reduction is not required.

TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS

Warrant			Notes and Comments:			
	Applicable?	Satisfied?				
Warrant 1, Eight-Hour Vehicular Volume	Yes	Yes	Condition A was met. Condition B was met. Condition A (70%) was met. Condition B (70%) was met. Combination of A/B (80%) was met.*Combination of A/B (56%) was met.*			
Warrant 2, Four-Hour Vehicular Volume	Yes	Yes	Figure 4C-2 (70% Factor)			
Warrant 3, Peak Hour	Yes	Yes	Signals installed under Warrant 3 should be traffic actuated.			
For Warrants 1-3, new ODOT signals must be based off of 100% volume thresholds (TEM 402-3.2)			<table><tr><td>Peak Hour</td></tr><tr><td>4:00 PM</td></tr><tr><td>5:00 PM</td></tr></table>	Peak Hour	4:00 PM	5:00 PM
Peak Hour						
4:00 PM						
5:00 PM						
Warrant 4, Pedestrian Volume	No		If this warrant is met, and a traffic control signal is justified by an engineering study, the traffic control signal shall be equipped with pedestrian signal heads complying with the provisions set forth in Chapter 4E of the OMUTCD.			
Warrant 5, School Crossing	No		N/A			
Warrant 6, Coordinated Signal System	No		(Shall not be used as the sole warrant in the analysis)			
Warrant 7, Crash Experience	No		If this is the sole warrant, signal must be semi-actuated with control devices which provide proper coordination if installed at an intersection within a coordinated system and normally should be fully traffic actuated if installed at an isolated intersection.			
Warrant 8, Roadway Network	No		(Shall not be used as the sole warrant in the analysis)			
Warrant 9, Intersection Near a Grade Crossing	No		Figure 4C-9			
Multi-Way Stop Warrant	No		May be used as an interim measure if traffic signal warrants are satisfied.			

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

If no warrants are satisfied, additional options may be considered:

1. An engineering study, performed by a firm prequalified by ODOT for signal design, if approved by the ODOT district, may be used to justify a new signal installation or retention of an existing signal that otherwise does not meet the published warrants. An example of such an instance is a traffic signal in proximity to a railroad crossing that serves to reduce queuing across the tracks.
2. According to TEM 402-2, If the actual turning movement counts fail to satisfy a signal warrant, it may be acceptable to use traffic volumes projected to the second year after project completion. The **Modeling and Forecasting Section** should provide the projected traffic volumes.
3. A pedestrian hybrid beacon may be considered for installation to facilitate pedestrian crossings at a location that does not meet traffic signal warrants (see Chapter 4C of TEM) or at a location that meets traffic signal warrants under Sections 4C.05 and/or 4C.06 but a decision is made to not install a traffic control signal. **Please fill inputs on PHB Score Sheet and submit to ODOT.**

Considerations such as geometrics and lack of sight distance generally have not been accepted in lieu of satisfying signal warrants. These considerations may allow an otherwise unwarranted traffic signal to be retained at **100 percent** local cost. Please review TEM 402-4 for details.

Conclusion: **Retain Existing Traffic Signal**

Notes: Existing Year 2024 Traffic Signal Warrant Analysis, Pleasant Valley Road / I-77 SB Ramps / Forestwood Drive

OMUTCD WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME

**Number of Lanes for Moving Traffic
on Each Approach**

Major Street: 2 or More Lanes

Minor Street: 1 Lane

Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street? Yes

**Only applicable after an adequate trial of other alternatives (See section 4C.02.06 of the 2012 OMUTCD)*

Lanes Major/ Minor	Adjusted Volumes		Condition A				Condition B				Combination A/B*							
			100%		70%		100%		70%		Cond. A		Cond. B		Cond. A		Cond. B	
	Major	Minor	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.
1 / 1			500	150	350	105	750	75	525	53	400	120	600	60	280	84	420	42
2+ / 1	X		600	150	420	105	900	75	630	53	480	120	720	60	336	84	504	42
2+ / 2+			600	200	420	140	900	100	630	70	480	160	720	80	336	112	504	56
1 / 2+			500	200	350	140	750	100	525	70	400	160	600	80	280	112	420	56
12:00 AM	0	0																
12:15 AM	0	0																
12:30 AM	0	0																
12:45 AM	0	0																
1:00 AM	0	0																
1:15 AM	0	0																
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4:15 AM	0	0																
4:30 AM	0	0																
4:45 AM	0	0																
5:00 AM	0	0																
5:15 AM	205	14																
5:30 AM	468	33			1										1			
5:45 AM	768	62	1						1	1	1		1	1			1	1
6:00 AM	1080	111					1	1										
6:15 AM	1188	134																
6:30 AM	1330	165			1	1									1	1		
6:45 AM	1519	179	1	1					1	1	1	1	1	1			1	1
7:00 AM	1681	172					1	1										
7:15 AM	1736	188																
7:30 AM	1664	201			1	1									1	1		
7:45 AM	1490	217	1	1					1	1	1	1	1	1			1	1
8:00 AM	1271	245					1	1										
8:15 AM	1142	229																
8:30 AM	1052	214			1	1									1	1		
8:45 AM	952	202	1	1					1	1	1	1	1	1			1	1
9:00 AM	887	180																
9:15 AM	852	191																
9:30 AM	815	209			1	1									1	1		
9:45 AM	799	236	1	1					1	1	1	1	1	1			1	1

Existing Year 2024 Traffic Warrant Analysis Pleasant & I-77 SB Ramps

10:00 AM	819	245																
10:15 AM	798	260																
10:30 AM	803	254			1	1								1	1			
10:45 AM	835	247	1	1					1	1	1	1	1	1			1	1
11:00 AM	847	261																
11:15 AM	875	269																
11:30 AM	901	285			1	1	1	1							1	1		
11:45 AM	924	289	1	1					1	1	1	1	1	1			1	1
12:00 PM	915	295																
12:15 PM	958	300																
12:30 PM	936	310			1	1	1	1							1	1		
12:45 PM	898	317	1	1					1	1	1	1	1	1			1	1
1:00 PM	933	338																
1:15 PM	882	372																
1:30 PM	895	392			1	1									1	1		
1:45 PM	929	458	1	1			1	1	1	1	1	1	1	1			1	1
2:00 PM	928	499																
2:15 PM	996	517																
2:30 PM	1025	590			1	1									1	1		
2:45 PM	1076	622	1	1			1	1	1	1	1	1	1	1			1	1
3:00 PM	1111	661																
3:15 PM	1135	738																
3:30 PM	1225	758			1	1									1	1		
3:45 PM	1232	785	1	1			1	1	1	1	1	1	1	1			1	1
4:00 PM	1340	798																
4:15 PM	1381	779																
4:30 PM	1407	764			1	1									1	1		
4:45 PM	1395	757	1	1			1	1	1	1	1	1	1	1			1	1
5:00 PM	1227	723																
5:15 PM	891	537																
5:30 PM	518	353			1	1									1	1		
5:45 PM	222	157																
6:00 PM	0	0																
6:15 PM	0	0																
6:30 PM	0	0																
6:45 PM	0	0																
7:00 PM	0	0																
7:15 PM	0	0																
7:30 PM	0	0																
7:45 PM	0	0																
8:00 PM	0	0																
8:15 PM	0	0																
8:30 PM	0	0																
8:45 PM	0	0																
9:00 PM	0	0																
9:15 PM	0	0																
9:30 PM	0	0																
9:45 PM	0	0																
HOURS MET			12	11	13	12	9	9	12	12	12	11	12	12	13	12	12	12
WARRANT SATISFIED?			YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Warrant Met: **Yes**

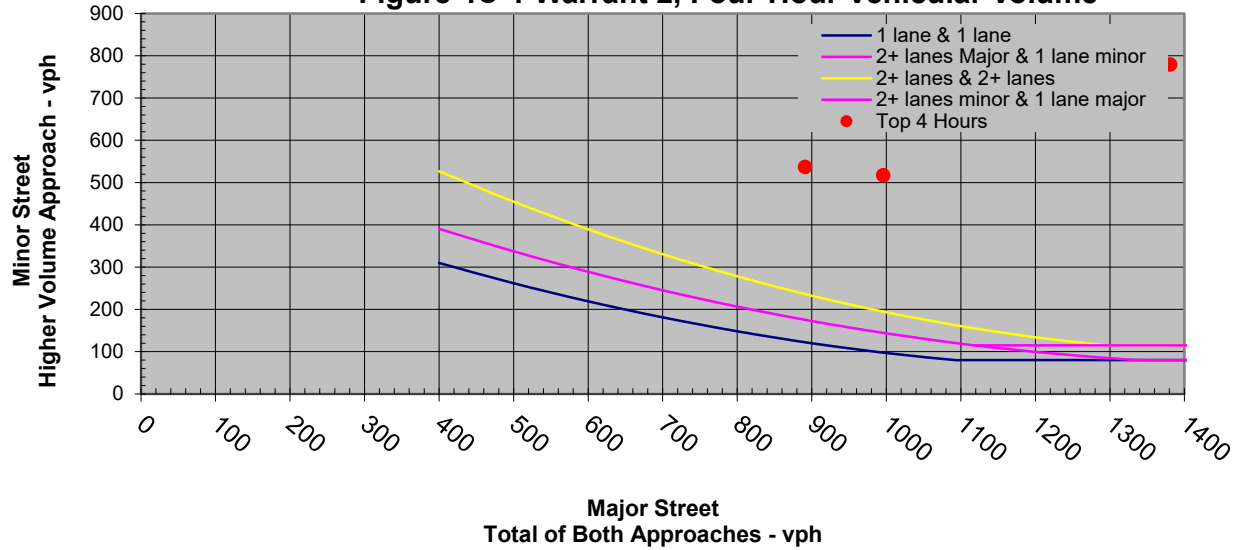
Notes: Condition A was met. Condition B was met. Condition A (70%) was met. Condition B (70%) was met. Combination of A/B (80%) was met.*Combination of A/B (56%) was met.*

OMUTCD WARRANT 2, FOUR-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	Total Number of Unique Hours Met on Figure 4C-1	12
Major street: 2 or More Lanes	Total Number of Unique Hours Met on Figure 4C-2 (70% Factor)	12
Minor Street: 1 Lane		

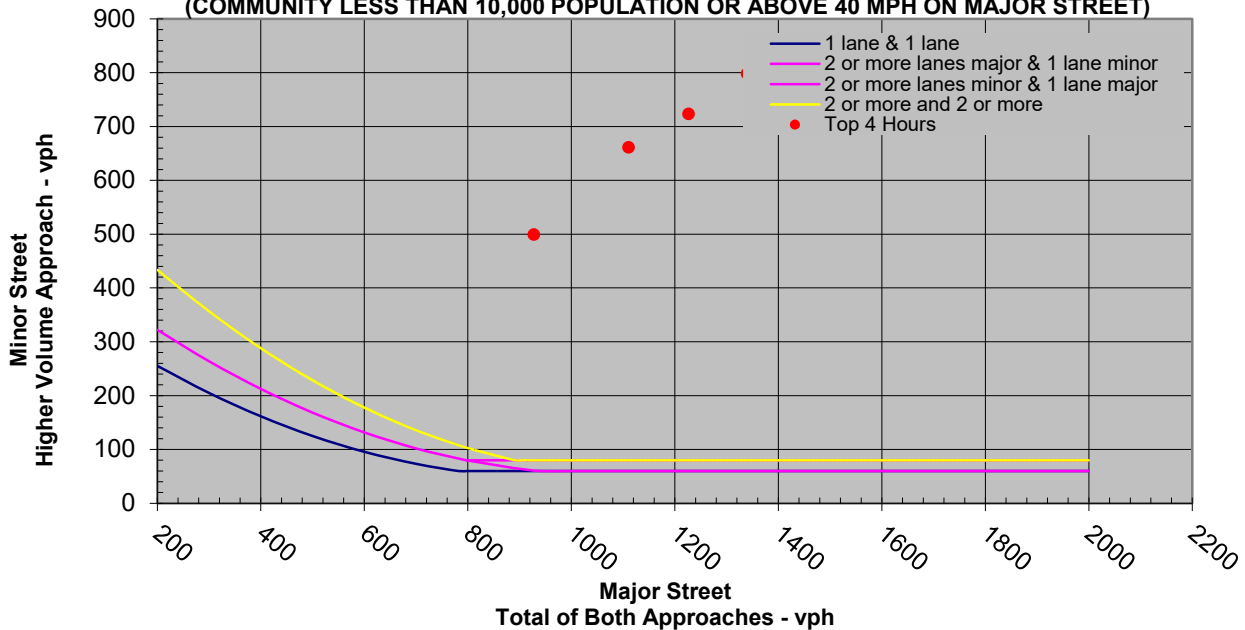
Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street?**Yes**

Hour Interval Beginning At	Raw Traffic Counts				Total Major Approach Volumes	Highest Actual Minor Street Approach Volumes	Hour Met?	Hour Met? (70% Factor)
	Minor - I-77 SB Ramps / Forestwood Dr		Major - Pleasant Valley Road					
	N-Bound	S-Bound	W-Bound	E-Bound				
6:00 AM	111	52	165	915	1080	111		Met
6:15 AM	134	71	208	980	1188	134	Met	
6:30 AM	165	75	224	1106	1330	165		
6:45 AM	179	89	244	1275	1519	179		
7:00 AM	172	100	279	1402	1681	172		Met
7:15 AM	188	93	286	1450	1736	188	Met	
7:30 AM	201	92	302	1362	1664	201		
7:45 AM	217	82	316	1174	1490	217		
8:00 AM	245	74	291	980	1271	245		Met
8:15 AM	229	67	292	850	1142	229	Met	
8:30 AM	214	61	289	763	1052	214		
8:45 AM	202	55	263	689	952	202		
9:00 AM	180	49	256	631	887	180		Met
9:15 AM	191	54	255	597	852	191	Met	
9:30 AM	209	52	256	559	815	209		
9:45 AM	236	49	264	535	799	236		
10:00 AM	245	49	287	532	819	245		Met
10:15 AM	260	43	282	516	798	260	Met	
10:30 AM	254	35	283	520	803	254		
10:45 AM	247	34	292	543	835	247		
11:00 AM	261	34	299	548	847	261		Met
11:15 AM	269	28	321	554	875	269	Met	
11:30 AM	285	32	339	562	901	285		
11:45 AM	289	31	346	578	924	289		
12:00 PM	295	29	342	573	915	295		Met
12:15 PM	300	29	349	609	958	300	Met	
12:30 PM	310	31	338	598	936	310		
12:45 PM	317	29	330	568	898	317		
1:00 PM	338	34	350	583	933	338		Met
1:15 PM	372	38	333	549	882	372	Met	
1:30 PM	392	40	346	549	895	392		
1:45 PM	458	44	375	554	929	458		
2:00 PM	499	53	380	548	928	499		Met
2:15 PM	517	53	423	573	996	517	Met	
2:30 PM	590	63	454	571	1025	590		
2:45 PM	622	63	490	586	1076	622		
3:00 PM	661	52	537	574	1111	661		Met
3:15 PM	738	57	560	575	1135	738	Met	
3:30 PM	758	43	620	605	1225	758		
3:45 PM	785	49	643	589	1232	785		
4:00 PM	798	53	709	631	1340	798		Met
4:15 PM	779	49	740	641	1381	779	Met	
4:30 PM	764	54	768	639	1407	764		
4:45 PM	757	44	757	638	1395	757		
5:00 PM	723	41	650	577	1227	723		Met
5:15 PM	537	30	472	419	891	537	Met	
5:30 PM	353	17	265	253	518	353		
5:45 PM	157	12	107	115	222	157		
6:00 PM	0	0	0	0	0	0		
6:15 PM	0	0	0	0	0	0		
6:30 PM	0	0	0	0	0	0		
6:45 PM	0	0	0	0	0	0		
7:00 PM	0	0	0	0	0	0		
7:15 PM	0	0	0	0	0	0		
7:30 PM	0	0	0	0	0	0		
7:45 PM	0	0	0	0	0	0		
8:00 PM	0	0	0	0	0	0		

Figure 4C-1 Warrant 2, Four-Hour Vehicular Volume

Top Hours for Figure 4C-1	Start Time	End Time	Major Street	Minor Street
Top Hour	4:15 PM	5:15 PM	1381	779
2nd Highest Hour	3:15 PM	4:15 PM	1135	738
3rd Highest Hour	2:15 PM	3:15 PM	996	517
4th Highest Hour	5:15 PM	6:15 PM	891	537

Top Hours for Figure 4C-2	Start Time	End Time	Major Street	Minor Street
Top Hour	4:00 PM	5:00 PM	1340	798
2nd Highest Hour	5:00 PM	6:00 PM	1227	723
3rd Highest Hour	3:00 PM	4:00 PM	1111	661
4th Highest Hour	2:00 PM	3:00 PM	928	499

**Figure 4C-2 Warrant 2 Four Hour Vehicular Volume (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)**Are the requirements for Warrant 2 met?: **Yes**

OMUTCD WARRANT 3, PEAK HOUR

Number of Lanes for Moving Traffic on Each Approach		Peak Hour Start time	4:00 PM
Major Street:	2 or More Lanes	Peak Hour End Time	5:00 PM
Minor Street:	1 Lane		

Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street?

Yes

Is this signal warrant being applied for an unusual case, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time?

No

Indicate whether all three of the following conditions for the same 1 hour (any four consecutive 15-minute periods) of an average day are present*

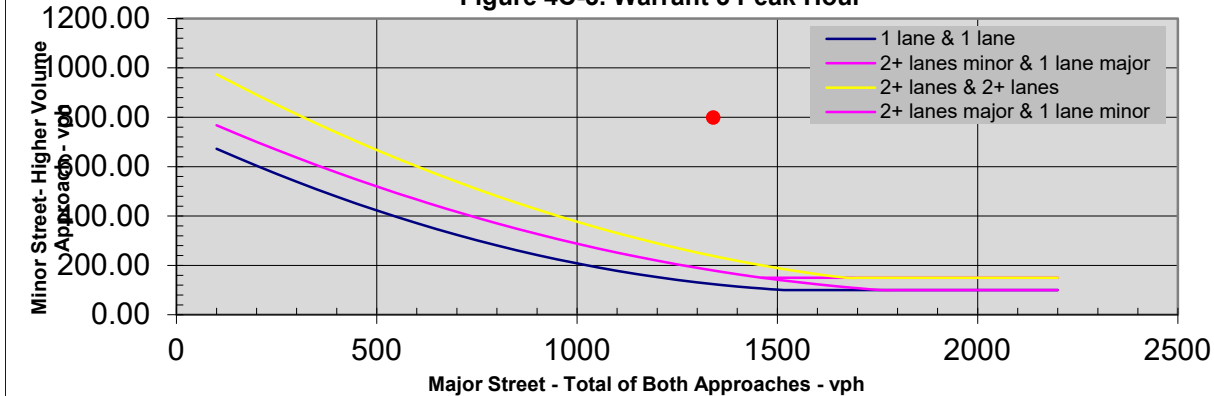
Does the total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equal or exceed 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach?	
Does the volume on the same minor-street approach (one direction only) equal or exceed 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes?	Yes
Does the total entering volume serviced during the hour equal or exceed 650 vehicles per hour for intersection with three approaches or 800 vehicles per hour for intersections with four or more approaches?	Yes

*If applicable, attach all supporting calculations and documentation.

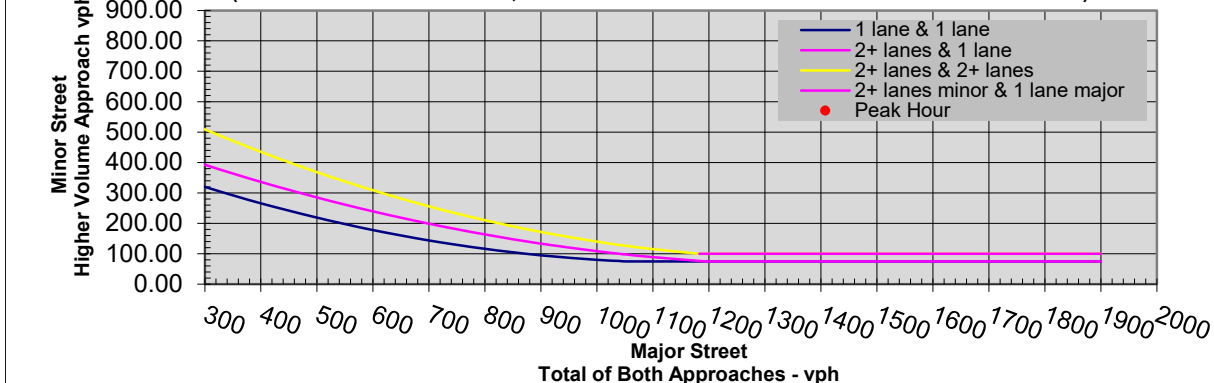
Are the requirements for Warrant 3 met?:

Yes

Figure 4C-3. Warrant 3 Peak Hour



(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



Existing Year 2024 Traffic Warrant Analysis Pleasant & I-77 SB Ramps

Hour Vehicular Volume				
Hour Interval Beginning At	Major Street Combined Vehicles Per Hour (VPH)	Highest Minor Street Approach Vehicles Per Hour (VPH)	Sum of Major Street and Highest Minor Street	Sum of Major Street and Combined Minor Street
6:00 AM	1080	111	1191	1243
6:15 AM	1188	134	1322	1393
6:30 AM	1330	165	1495	1570
6:45 AM	1519	179	1698	1787
7:00 AM	1681	172	1853	1953
7:15 AM	1736	188	1924	2017
7:30 AM	1664	201	1865	1957
7:45 AM	1490	217	1707	1789
8:00 AM	1271	245	1516	1590
8:15 AM	1142	229	1371	1438
8:30 AM	1052	214	1266	1327
8:45 AM	952	202	1154	1209
9:00 AM	887	180	1067	1116
9:15 AM	852	191	1043	1097
9:30 AM	815	209	1024	1076
9:45 AM	799	236	1035	1084
10:00 AM	819	245	1064	1113
10:15 AM	798	260	1058	1101
10:30 AM	803	254	1057	1092
10:45 AM	835	247	1082	1116
11:00 AM	847	261	1108	1142
11:15 AM	875	269	1144	1172
11:30 AM	901	285	1186	1218
11:45 AM	924	289	1213	1244
12:00 PM	915	295	1210	1239
12:15 PM	958	300	1258	1287
12:30 PM	936	310	1246	1277
12:45 PM	898	317	1215	1244
1:00 PM	933	338	1271	1305
1:15 PM	882	372	1254	1292
1:30 PM	895	392	1287	1327
1:45 PM	929	458	1387	1431
2:00 PM	928	499	1427	1480
2:15 PM	996	517	1513	1566
2:30 PM	1025	590	1615	1678
2:45 PM	1076	622	1698	1761
3:00 PM	1111	661	1772	1824
3:15 PM	1135	738	1873	1930
3:30 PM	1225	758	1983	2026
3:45 PM	1232	785	2017	2066
4:00 PM	1340	798	2138	2191
4:15 PM	1381	779	2160	2209
4:30 PM	1407	764	2171	2225
4:45 PM	1395	757	2152	2196
5:00 PM	1227	723	1950	1991
5:15 PM	891	537	1428	1458
5:30 PM	518	353	871	888
5:45 PM	222	157	379	391
6:00 PM	0	0	0	0
6:15 PM	0	0	0	0
6:30 PM	0	0	0	0
6:45 PM	0	0	0	0
7:00 PM	0	0	0	0
7:15 PM	0	0	0	0
7:30 PM	0	0	0	0
7:45 PM	0	0	0	0
8:00 PM	0	0	0	0

Actual Peak Hour Major Traffic Volume	Actual Peak Hour Minor Traffic Volume	Required Peak Hour Minor Traffic Volume for Fig. 4C-3	Required Peak Hour Minor Traffic Volume for Fig. 4C-4
1340	798	179	75

STUDY AND ANALYSIS INFORMATION

Municipality:	City of Independence	Traffic Volumes Obtained By:	Tri-State Traffic Data
County:	Cuyahoga	Analysis Date:	5/10/2024
ODOT Engineering District:	12	Agency/ Company Name Performing Warrant Analysis:	GPD Group
Google map link:	Map		

Analysis Information

Data Collection Date: 4/17/2024
Day of the Week: Wednesday

Is the intersection in a built-up area of an isolated community of <10,000 population? Yes

Existing Traffic Signal at intersection: Yes

Total Number of Approaches at Intersection: 3

Major Street Information

Major Street Name and Route Number: Pleasant Valley Road

Major Street Approach Direction: E-Bound
W-Bound

Number of Thru Lanes on Each Major Street Approach: 2 LANE(S)

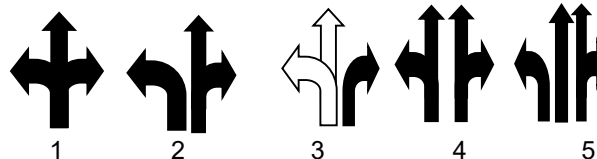
Speed Limit or 85th Percentile Speed on the Major Street*: 35 MPH

*Unknown assumes below 45 mph

Minor Street Information

Minor Street Name and Route Number: I-77 NB Ramps

Minor Street Approach Configuration: 1 N-Bound
1 S-Bound



Number of Thru Lanes on Each Minor Street Approach: 1 LANE(S)

Apply Right Turn Lane Reduction*: Yes

*Right Turn Lane Reduction Shall be used for Warrants 1, 2, & 3 for New ODOT Signals. Please refer to TEM 402-3.2 for clarification and criteria under which Right Turn Reduction is not required.

TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS

Warrant			Notes and Comments:			
	Applicable?	Satisfied?				
Warrant 1, Eight-Hour Vehicular Volume	Yes	Yes	Condition B (70%) was met.			
Warrant 2, Four-Hour Vehicular Volume	Yes	Yes	Figure 4C-2 (70% Factor)			
Warrant 3, Peak Hour	Yes	Yes	Signals installed under Warrant 3 should be traffic actuated.			
For Warrants 1-3, new ODOT signals must be based off of 100% volume thresholds (TEM 402-3.2)			<table><tr><td>Peak Hour</td></tr><tr><td>7:15 AM</td></tr><tr><td>8:15 AM</td></tr></table>	Peak Hour	7:15 AM	8:15 AM
Peak Hour						
7:15 AM						
8:15 AM						
Warrant 4, Pedestrian Volume	No		If this warrant is met, and a traffic control signal is justified by an engineering study, the traffic control signal shall be equipped with pedestrian signal heads complying with the provisions set forth in Chapter 4E of the OMUTCD.			
Warrant 5, School Crossing	No		N/A			
Warrant 6, Coordinated Signal System	No		(Shall not be used as the sole warrant in the analysis)			
Warrant 7, Crash Experience	No		If this is the sole warrant, signal must be semi-actuated with control devices which provide proper coordination if installed at an intersection within a coordinated system and normally should be fully traffic actuated if installed at an isolated intersection.			
Warrant 8, Roadway Network	No		(Shall not be used as the sole warrant in the analysis)			
Warrant 9, Intersection Near a Grade Crossing	No		Figure 4C-9			
Multi-Way Stop Warrant	No		May be used as an interim measure if traffic signal warrants are satisfied.			

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

If no warrants are satisfied, additional options may be considered:

1. An engineering study, performed by a firm prequalified by ODOT for signal design, if approved by the ODOT district, may be used to justify a new signal installation or retention of an existing signal that otherwise does not meet the published warrants. An example of such an instance is a traffic signal in proximity to a railroad crossing that serves to reduce queuing across the tracks.
2. According to TEM 402-2, If the actual turning movement counts fail to satisfy a signal warrant, it may be acceptable to use traffic volumes projected to the second year after project completion. The **Modeling and Forecasting Section** should provide the projected traffic volumes.
3. A pedestrian hybrid beacon may be considered for installation to facilitate pedestrian crossings at a location that does not meet traffic signal warrants (see Chapter 4C of TEM) or at a location that meets traffic signal warrants under Sections 4C.05 and/or 4C.06 but a decision is made to not install a traffic control signal. **Please fill inputs on PHB Score Sheet and submit to ODOT.**

Considerations such as geometrics and lack of sight distance generally have not been accepted in lieu of satisfying signal warrants. These considerations may allow an otherwise unwarranted traffic signal to be retained at **100 percent** local cost. Please review TEM 402-4 for details.

Conclusion: **Retain Existing Traffic Signal**

Notes: Existing Year 2024 Traffic Signal Warrant Analysis, Pleasant Valley Road / I-77 NB Ramps

OMUTCD WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach

Major Street:	2 or More Lanes
Minor Street:	1 Lane

Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street? **Yes**

*Only applicable after an adequate trial of other alternatives (See section 4C.02.06 of the 2012 OMUTCD)

Lanes Major/ Minor	Adjusted Volumes		Condition A				Condition B				Combination A/B*							
			100%		70%		100%		70%		Cond. A		Cond. B		Cond. A		Cond. B	
	Major	Minor	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.
1 / 1			500	150	350	105	750	75	525	53	400	120	600	60	280	84	420	42
2+ / 1	X		600	150	420	105	900	75	630	53	480	120	720	60	336	84	504	42
2+ / 2+			600	200	420	140	900	100	630	70	480	160	720	80	336	112	504	56
1 / 2+			500	200	350	140	750	100	525	70	400	160	600	80	280	112	420	56
12:00 AM	0	0																
12:15 AM	0	0																
12:30 AM	0	0																
12:45 AM	0	0																
1:00 AM	0	0																
1:15 AM	0	0																
1:30 AM	0	0																
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4:30 AM	0	0																
4:45 AM	0	0																
5:00 AM	0	0																
5:15 AM	240	13																
5:30 AM	513	28			1						1				1		1	
5:45 AM	839	52	1						1				1					
6:00 AM	1186	76					1	1										
6:15 AM	1281	100																
6:30 AM	1441	113			1	1					1				1	1	1	1
6:45 AM	1596	134	1						1	1			1	1				
7:00 AM	1761	152					1	1										
7:15 AM	1834	154																
7:30 AM	1769	146			1	1					1	1			1	1	1	1
7:45 AM	1606	140	1						1	1			1	1				
8:00 AM	1363	146					1	1										
8:15 AM	1227	121																
8:30 AM	1106	126			1	1					1	1			1	1	1	1
8:45 AM	1018	112	1						1	1			1	1				
9:00 AM	954	81					1	1										
9:15 AM	915	83																
9:30 AM	874	70			1						1				1		1	1
9:45 AM	861	52	1						1				1					

Existing Year 2024 Traffic Warrant Analysis Pleasant & I-77 NB Ramps

10:00 AM	858	50																
10:15 AM	815	45																
10:30 AM	839	47			1					1				1		1	1	
10:45 AM	848	51	1						1				1					
11:00 AM	871	52																
11:15 AM	903	58					1											
11:30 AM	888	65			1					1				1		1	1	
11:45 AM	907	76	1						1	1			1	1				
12:00 PM	897	77																
12:15 PM	904	72					1											
12:30 PM	923	68			1					1				1		1	1	
12:45 PM	902	66	1						1	1			1	1				
1:00 PM	943	62																
1:15 PM	947	63					1											
1:30 PM	957	59			1					1				1		1	1	
1:45 PM	959	48	1						1				1					
2:00 PM	967	48																
2:15 PM	1033	49					1											
2:30 PM	1068	49			1					1				1		1	1	
2:45 PM	1184	54	1						1	1			1					
3:00 PM	1258	68																
3:15 PM	1327	68					1											
3:30 PM	1377	74			1					1				1		1	1	
3:45 PM	1406	81	1						1	1			1	1				
4:00 PM	1460	76																
4:15 PM	1477	87					1	1										
4:30 PM	1498	92			1						1			1	1	1	1	
4:45 PM	1419	88	1						1	1			1	1				
5:00 PM	1273	82																
5:15 PM	888	57																
5:30 PM	538	33			1					1				1		1		
5:45 PM	246	16																
6:00 PM	0	0																
6:15 PM	0	0																
6:30 PM	0	0																
6:45 PM	0	0																
7:00 PM	0	0																
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8:45 PM	0	0																
9:00 PM	0	0																
9:15 PM	0	0																
9:30 PM	0	0																
9:45 PM	0	0																
HOURS MET			12	0	13	3	10	5	12	8	13	2	12	7	13	4	13	11
WARRANT SATISFIED?			NO		NO		NO		YES		NO				NO			

Warrant Met: **Yes**

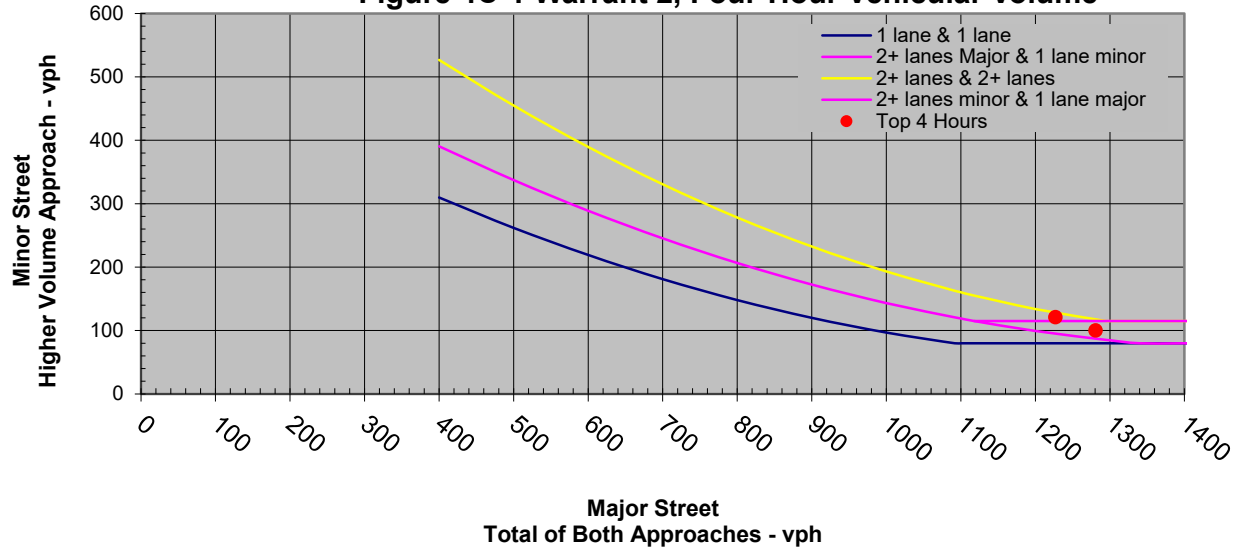
Notes: Condition B (70%) was met.

OMUTCD WARRANT 2, FOUR-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	Total Number of Unique Hours Met on Figure 4C-1	5
Major street: 2 or More Lanes	Total Number of Unique Hours Met on Figure 4C-2 (70% Factor)	9
Minor Street: 1 Lane		

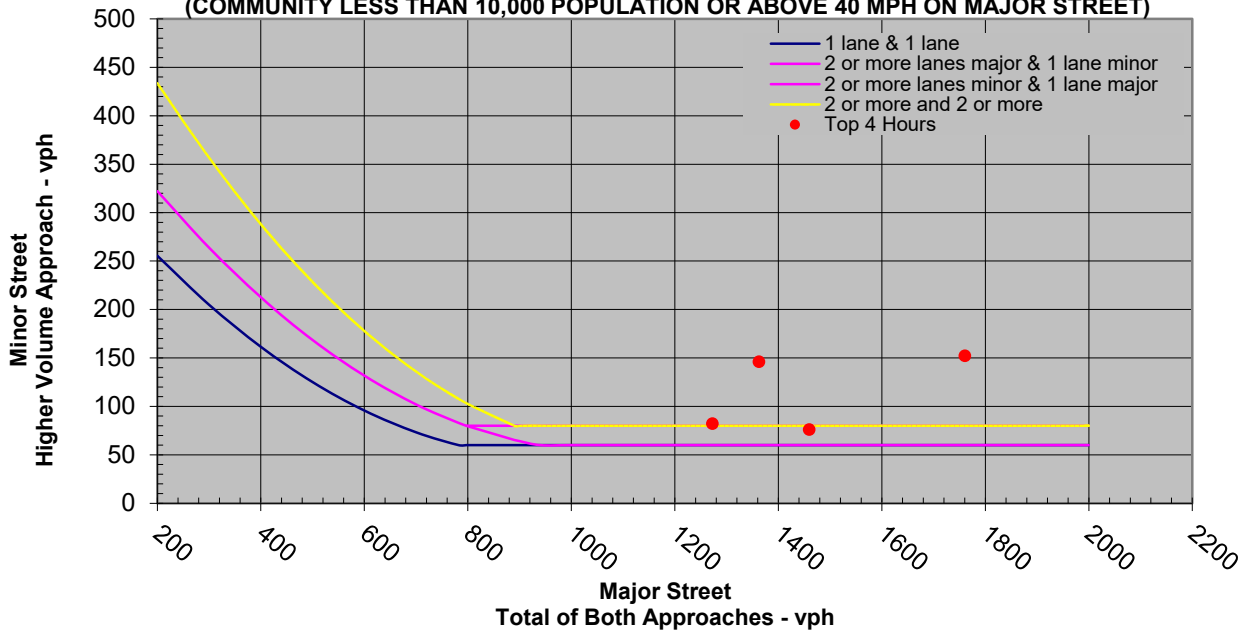
Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street?**Yes**

Hour Interval Beginning At	Raw Traffic Counts				Total Major Approach Volumes	Highest Actual Minor Street Approach Volumes	Hour Met?	Hour Met? (70% Factor)
	Minor - I-77 NB Ramps		Major - Pleasant Valley Road					
	N-Bound	S-Bound	W-Bound	E-Bound				
6:00 AM	0	76	184	1002	1186	76		Met
6:15 AM	0	100	219	1062	1281	100	Met	
6:30 AM	0	113	217	1224	1441	113		
6:45 AM	0	134	242	1354	1596	134		
7:00 AM	0	152	260	1501	1761	152		Met
7:15 AM	0	154	290	1544	1834	154	Met	
7:30 AM	0	146	300	1469	1769	146		
7:45 AM	0	140	286	1320	1606	140		
8:00 AM	0	146	261	1102	1363	146		Met
8:15 AM	0	121	236	991	1227	121	Met	
8:30 AM	0	126	234	872	1106	126		
8:45 AM	0	112	221	797	1018	112		
9:00 AM	0	81	240	714	954	81		Met
9:15 AM	0	83	229	686	915	83		
9:30 AM	0	70	231	643	874	70		
9:45 AM	0	52	243	618	861	52		
10:00 AM	0	50	245	613	858	50		
10:15 AM	0	45	252	563	815	45		
10:30 AM	0	47	254	585	839	47		
10:45 AM	0	51	248	600	848	51		
11:00 AM	0	52	257	614	871	52		
11:15 AM	0	58	264	639	903	58		
11:30 AM	0	65	275	613	888	65		
11:45 AM	0	76	293	614	907	76		Met
12:00 PM	0	77	276	621	897	77		
12:15 PM	0	72	275	629	904	72		
12:30 PM	0	68	279	644	923	68		
12:45 PM	0	66	239	663	902	66		Met
1:00 PM	0	62	258	685	943	62		
1:15 PM	0	63	253	694	947	63		
1:30 PM	0	59	252	705	957	59		
1:45 PM	0	48	297	662	959	48		
2:00 PM	0	48	295	672	967	48		
2:15 PM	0	49	358	675	1033	49		
2:30 PM	0	49	372	696	1068	49		
2:45 PM	0	54	427	757	1184	54		
3:00 PM	0	68	484	774	1258	68		Met
3:15 PM	0	68	524	803	1327	68		
3:30 PM	0	74	571	806	1377	74		
3:45 PM	0	81	609	797	1406	81	Met	
4:00 PM	0	76	631	829	1460	76		Met
4:15 PM	0	87	629	848	1477	87		
4:30 PM	0	92	642	856	1498	92		
4:45 PM	0	88	566	853	1419	88	Met	
5:00 PM	0	82	488	785	1273	82		Met
5:15 PM	0	57	323	565	888	57		
5:30 PM	0	33	178	360	538	33		
5:45 PM	0	16	74	172	246	16		
6:00 PM	0	0	0	0	0	0		
6:15 PM	0	0	0	0	0	0		
6:30 PM	0	0	0	0	0	0		
6:45 PM	0	0	0	0	0	0		
7:00 PM	0	0	0	0	0	0		
7:15 PM	0	0	0	0	0	0		
7:30 PM	0	0	0	0	0	0		
7:45 PM	0	0	0	0	0	0		
8:00 PM	0	0	0	0	0	0		

Figure 4C-1 Warrant 2, Four-Hour Vehicular Volume

Top Hours for Figure 4C-1	Start Time	End Time	Major Street	Minor Street
Top Hour	7:15 AM	8:15 AM	1834	154
2nd Highest Hour	8:15 AM	9:15 AM	1227	121
3rd Highest Hour	6:15 AM	7:15 AM	1281	100
4th Highest Hour	4:45 PM	5:45 PM	1419	88

Top Hours for Figure 4C-2	Start Time	End Time	Major Street	Minor Street
Top Hour	7:00 AM	8:00 AM	1761	152
2nd Highest Hour	8:00 AM	9:00 AM	1363	146
3rd Highest Hour	4:00 PM	5:00 PM	1460	76
4th Highest Hour	5:00 PM	6:00 PM	1273	82

**Figure 4C-2 Warrant 2 Four Hour Vehicular Volume (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)**Are the requirements for Warrant 2 met?: **Yes**

OMUTCD WARRANT 3, PEAK HOUR

Number of Lanes for Moving Traffic on Each Approach		Peak Hour Start time	7:15 AM
Major Street:	2 or More Lanes	Peak Hour End Time	8:15 AM
Minor Street:	1 Lane		

Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street?

Yes

Is this signal warrant being applied for an unusual case, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time?

No

Indicate whether all three of the following conditions for the same 1 hour (any four consecutive 15-minute periods) of an average day are present*

Does the total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equal or exceed 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach?

Does the volume on the same minor-street approach (one direction only) equal or exceed 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes?

Yes

Does the total entering volume serviced during the hour equal or exceed 650 vehicles per hour for intersection with three approaches or 800 vehicles per hour for intersections with four or more approaches?

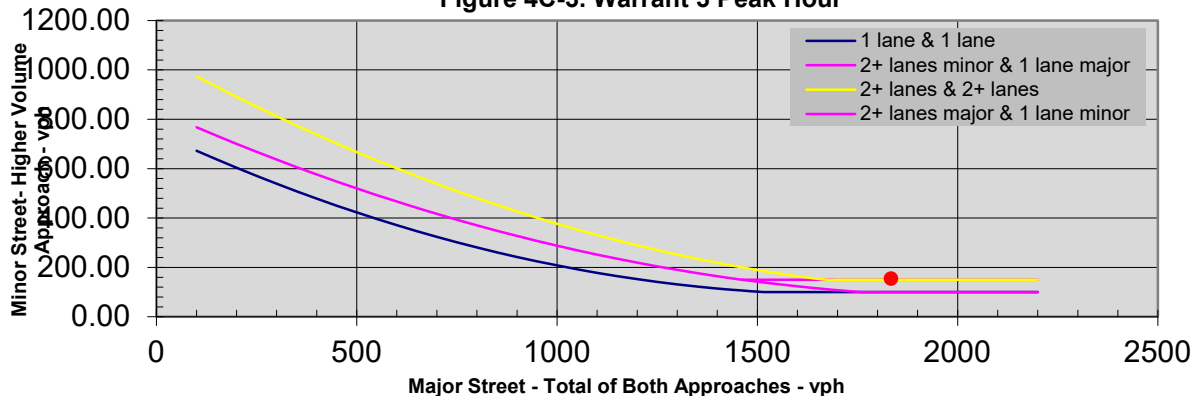
Yes

*If applicable, attach all supporting calculations and documentation.

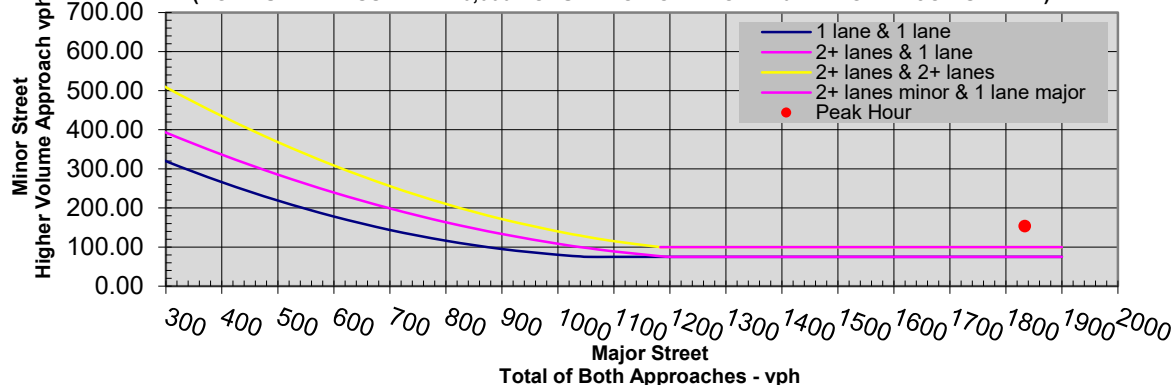
Are the requirements for Warrant 3 met?:

Yes

Figure 4C-3. Warrant 3 Peak Hour



(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



Existing Year 2024 Traffic Warrant Analysis Pleasant & I-77 NB Ramps

Hour Vehicular Volume				
Hour Interval Beginning At	Major Street Combined Vehicles Per Hour (VPH)	Highest Minor Street Approach Vehicles Per Hour (VPH)	Sum of Major Street and Highest Minor Street	Sum of Major Street and Combined Minor Street
6:00 AM	1186	76	1262	1262
6:15 AM	1281	100	1381	1381
6:30 AM	1441	113	1554	1554
6:45 AM	1596	134	1730	1730
7:00 AM	1761	152	1913	1913
7:15 AM	1834	154	1988	1988
7:30 AM	1769	146	1915	1915
7:45 AM	1606	140	1746	1746
8:00 AM	1363	146	1509	1509
8:15 AM	1227	121	1348	1348
8:30 AM	1106	126	1232	1232
8:45 AM	1018	112	1130	1130
9:00 AM	954	81	1035	1035
9:15 AM	915	83	998	998
9:30 AM	874	70	944	944
9:45 AM	861	52	913	913
10:00 AM	858	50	908	908
10:15 AM	815	45	860	860
10:30 AM	839	47	886	886
10:45 AM	848	51	899	899
11:00 AM	871	52	923	923
11:15 AM	903	58	961	961
11:30 AM	888	65	953	953
11:45 AM	907	76	983	983
12:00 PM	897	77	974	974
12:15 PM	904	72	976	976
12:30 PM	923	68	991	991
12:45 PM	902	66	968	968
1:00 PM	943	62	1005	1005
1:15 PM	947	63	1010	1010
1:30 PM	957	59	1016	1016
1:45 PM	959	48	1007	1007
2:00 PM	967	48	1015	1015
2:15 PM	1033	49	1082	1082
2:30 PM	1068	49	1117	1117
2:45 PM	1184	54	1238	1238
3:00 PM	1258	68	1326	1326
3:15 PM	1327	68	1395	1395
3:30 PM	1377	74	1451	1451
3:45 PM	1406	81	1487	1487
4:00 PM	1460	76	1536	1536
4:15 PM	1477	87	1564	1564
4:30 PM	1498	92	1590	1590
4:45 PM	1419	88	1507	1507
5:00 PM	1273	82	1355	1355
5:15 PM	888	57	945	945
5:30 PM	538	33	571	571
5:45 PM	246	16	262	262
6:00 PM	0	0	0	0
6:15 PM	0	0	0	0
6:30 PM	0	0	0	0
6:45 PM	0	0	0	0
7:00 PM	0	0	0	0
7:15 PM	0	0	0	0
7:30 PM	0	0	0	0
7:45 PM	0	0	0	0
8:00 PM	0	0	0	0

Actual Peak Hour Major Traffic Volume	Actual Peak Hour Minor Traffic Volume	Required Peak Hour Minor Traffic Volume for Fig. 4C-3	Required Peak Hour Minor Traffic Volume for Fig. 4C-4
1834	154	100	75

STUDY AND ANALYSIS INFORMATION

Municipality:	City of Independence	Traffic Volumes Obtained By:	Tri-State Traffic Data
County:	Cuyahoga	Analysis Date:	5/10/2024
ODOT Engineering District:	12	Agency/ Company Name Performing Warrant Analysis:	GPD Group
Google map link:	Map		

Analysis Information

Data Collection Date: 4/17/2024
Day of the Week: Wednesday

Is the intersection in a built-up area of an isolated community of <10,000 population? Yes

Existing Traffic Signal at intersection: Yes

Total Number of Approaches at Intersection: 4

Major Street Information

Major Street Name and Route Number: Pleasant Valley Road

Major Street Approach Direction: E-Bound
W-Bound

Number of Thru Lanes on Each Major Street Approach: 2 LANE(S)

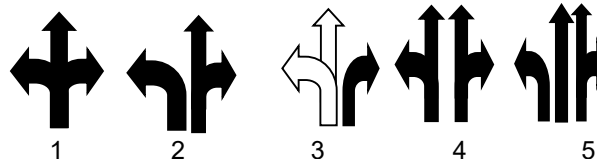
Speed Limit or 85th Percentile Speed on the Major Street*: 35 MPH

*Unknown assumes below 45 mph

Minor Street Information

Minor Street Name and Route Number: Midland Road

Minor Street Approach Configuration: 1 N-Bound
1 S-Bound



Number of Thru Lanes on Each Minor Street Approach: 1 LANE(S)

Apply Right Turn Lane Reduction*: Yes

*Right Turn Lane Reduction Shall be used for Warrants 1, 2, & 3 for New ODOT Signals. Please refer to TEM 402-3.2 for clarification and criteria under which Right Turn Reduction is not required.

TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS

	Warrant		Notes and Comments:
	Applicable?	Satisfied?	
Warrant 1, Eight-Hour Vehicular Volume	Yes	No	
Warrant 2, Four-Hour Vehicular Volume	Yes	No	
Warrant 3, Peak Hour	Yes	No	Signals installed under Warrant 3 should be traffic actuated. Peak Hour 4:15 PM 5:15 PM
For Warrants 1-3, new ODOT signals must be based off of 100% volume thresholds (TEM 402-3.2)			
Warrant 4, Pedestrian Volume	No		If this warrant is met, and a traffic control signal is justified by an engineering study, the traffic control signal shall be equipped with pedestrian signal heads complying with the provisions set forth in Chapter 4E of the OMUTCD. Peak Hour 4:30 PM 5:30 PM
Warrant 5, School Crossing	No		N/A
Warrant 6, Coordinated Signal System	No		(Shall not be used as the sole warrant in the analysis)
Warrant 7, Crash Experience	No		If this is the sole warrant, signal must be semi-actuated with control devices which provide proper coordination if installed at an intersection within a coordinated system and normally should be fully traffic actuated if installed at an isolated intersection.
Warrant 8, Roadway Network	No		(Shall not be used as the sole warrant in the analysis)
Warrant 9, Intersection Near a Grade Crossing	No		Figure 4C-9
Multi-Way Stop Warrant	No		May be used as an interim measure if traffic signal warrants are satisfied.

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

If no warrants are satisfied, additional options may be considered:

1. An engineering study, performed by a firm prequalified by ODOT for signal design, if approved by the ODOT district, may be used to justify a new signal installation or retention of an existing signal that otherwise does not meet the published warrants. An example of such an instance is a traffic signal in proximity to a railroad crossing that serves to reduce queuing across the tracks.
2. According to TEM 402-2, If the actual turning movement counts fail to satisfy a signal warrant, it may be acceptable to use traffic volumes projected to the second year after project completion. The **Modeling and Forecasting Section** should provide the projected traffic volumes.
3. A pedestrian hybrid beacon may be considered for installation to facilitate pedestrian crossings at a location that does not meet traffic signal warrants (see Chapter 4C of TEM) or at a location that meets traffic signal warrants under Sections 4C.05 and/or 4C.06 but a decision is made to not install a traffic control signal. **Please fill inputs on PHB Score Sheet and submit to ODOT.**

Considerations such as geometrics and lack of sight distance generally have not been accepted in lieu of satisfying signal warrants. These considerations may allow an otherwise unwarranted traffic signal to be retained at **100 percent** local cost. Please review TEM 402-4 for details.

Conclusion: **Do Not Retain Existing Traffic Signal**

Notes: Existing Year 2024 Traffic Signal Warrant Analysis. Restudy intersection once Pleasant Valley Road construction is finished and operating under normal traffic conditions.

OMUTCD WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic
on Each Approach

Major Street: 2 or More Lanes

Minor Street: 1 Lane

Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street? **Yes**

*Only applicable after an adequate trial of other alternatives (See section 4C.02.06 of the 2012 OMUTCD)

Lanes Major/ Minor	Adjusted Volumes		Condition A				Condition B				Combination A/B*							
			100%		70%		100%		70%		Cond. A		Cond. B		Cond. A		Cond. B	
	Major	Minor	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.
1 / 1			500	150	350	105	750	75	525	53	400	120	600	60	280	84	420	42
2+ / 1	X		600	150	420	105	900	75	630	53	480	120	720	60	336	84	504	42
2+ / 2+			600	200	420	140	900	100	630	70	480	160	720	80	336	112	504	56
1 / 2+			500	200	350	140	750	100	525	70	400	160	600	80	280	112	420	56
12:00 AM	0	0																
12:15 AM	0	0																
12:30 AM	0	0																
12:45 AM	0	0																
1:00 AM	0	0																
1:15 AM	0	0																
1:30 AM	0	0																
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4:30 AM	0	0																
4:45 AM	0	0																
5:00 AM	0	0																
5:15 AM	115	8																
5:30 AM	265	19																
5:45 AM	468	27			1										1			
6:00 AM	660	40	1						1		1						1	
6:15 AM	762	43											1					
6:30 AM	851	44																
6:45 AM	945	51			1		1								1			
7:00 AM	1073	56	1						1	1	1						1	1
7:15 AM	1134	61											1	1				
7:30 AM	1134	62																
7:45 AM	1070	55			1		1								1			
8:00 AM	964	51	1						1		1						1	1
8:15 AM	891	41											1					
8:30 AM	799	33																
8:45 AM	728	30			1										1			
9:00 AM	669	32	1						1		1						1	
9:15 AM	639	27																
9:30 AM	637	27																
9:45 AM	627	32			1										1			

Existing Year 2024 Traffic Warrant Analysis Pleasant & Midland

10:00 AM	615	35	1								1						1	
10:15 AM	611	34																
10:30 AM	636	38							1									
10:45 AM	669	29			1									1				
11:00 AM	709	28	1							1							1	
11:15 AM	716	28																
11:30 AM	734	19							1				1					
11:45 AM	730	24			1									1				
12:00 PM	726	27	1							1							1	
12:15 PM	726	22																
12:30 PM	708	26							1									
12:45 PM	704	22			1									1				
1:00 PM	717	23	1							1							1	
1:15 PM	715	24																
1:30 PM	735	27							1				1					
1:45 PM	759	27			1									1				
2:00 PM	787	29	1							1							1	
2:15 PM	874	31																
2:30 PM	912	30					1		1				1					
2:45 PM	974	30			1										1			
3:00 PM	1065	33	1							1							1	
3:15 PM	1120	36																
3:30 PM	1219	31					1		1				1					
3:45 PM	1337	28			1										1			
4:00 PM	1376	32	1							1							1	
4:15 PM	1398	35																
4:30 PM	1405	30					1		1				1					
4:45 PM	1287	30			1										1			
5:00 PM	1153	25	1							1							1	
5:15 PM	813	17																
5:30 PM	479	13																
5:45 PM	216	7																
6:00 PM	0	0																
6:15 PM	0	0																
6:30 PM	0	0																
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9:00 PM	0	0																
9:15 PM	0	0																
9:30 PM	0	0																
9:45 PM	0	0																
HOURS MET			12	0	12	0	5	0	11	1	12	0	8	1	12	0	12	2
WARRANT SATISFIED?			NO		NO		NO		NO		NO		NO		NO		NO	

Warrant Met: **No**

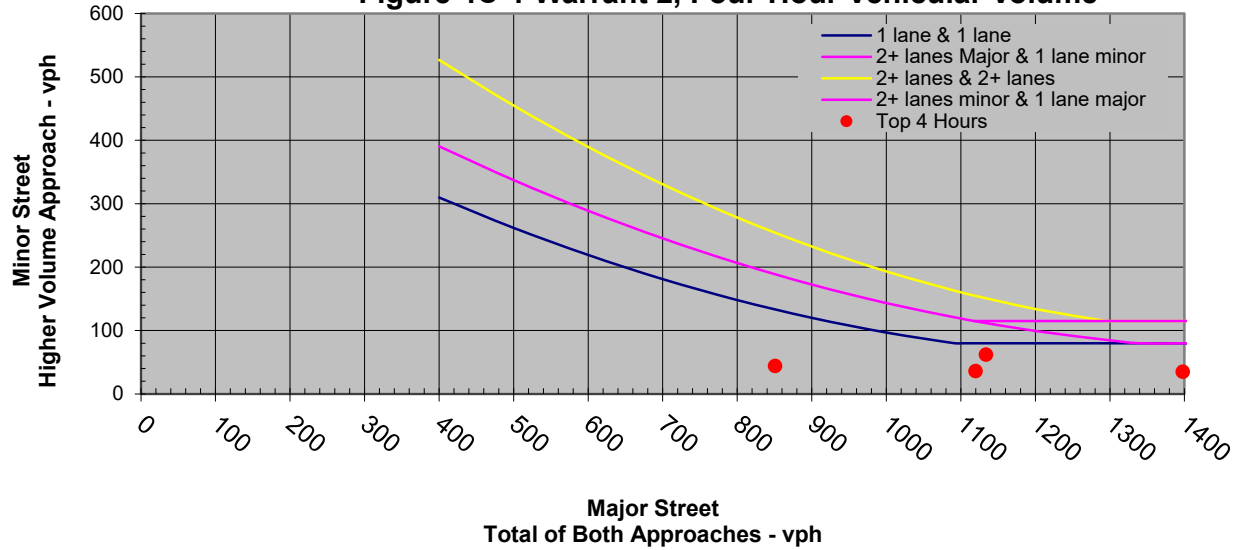
Notes:

OMUTCD WARRANT 2, FOUR-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	Total Number of Unique Hours Met on Figure 4C-1	0
Major street: 2 or More Lanes	Total Number of Unique Hours Met on Figure 4C-2 (70% Factor)	1
Minor Street: 1 Lane		

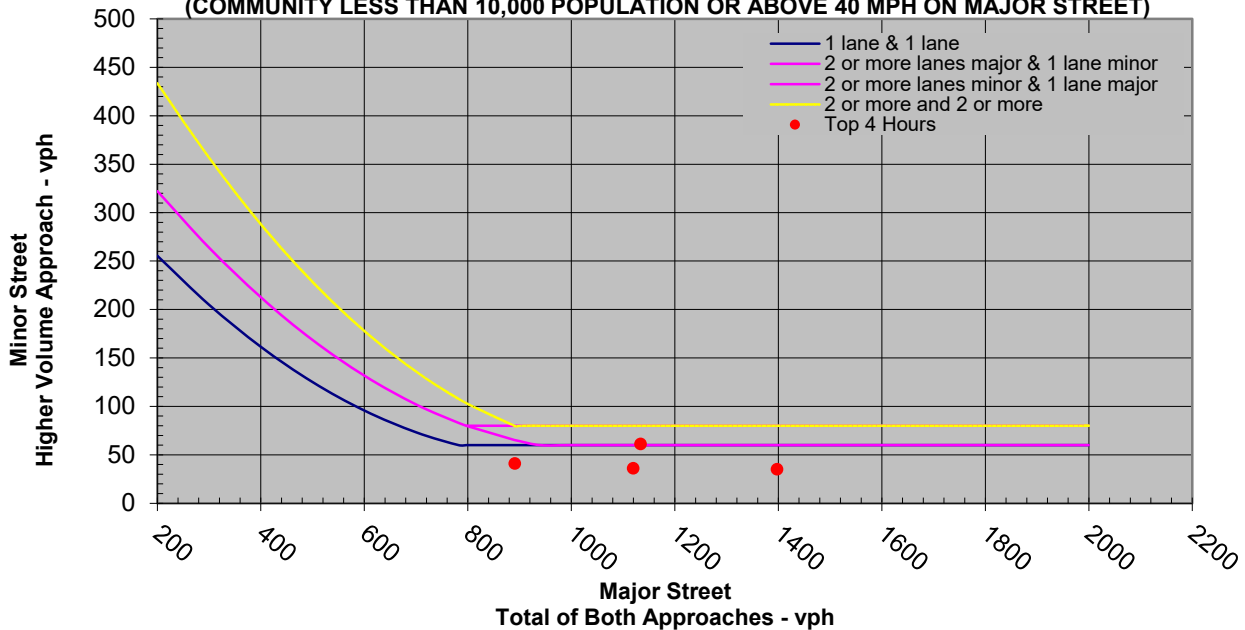
Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street? **Yes**

Hour Interval Beginning At	Raw Traffic Counts				Total Major Approach Volumes	Highest Actual Minor Street Approach Volumes	Hour Met?	Hour Met? (70% Factor)
	Minor - Midland Road		Major - Pleasant Valley Road					
	N-Bound	S-Bound	W-Bound	E-Bound				
6:00 AM	40	11	177	483	660	40		
6:15 AM	43	17	214	548	762	43		
6:30 AM	44	28	215	636	851	44		
6:45 AM	51	44	228	717	945	51		
7:00 AM	49	56	260	813	1073	56		
7:15 AM	61	56	269	865	1134	61		Met
7:30 AM	62	55	294	840	1134	62		
7:45 AM	55	41	297	773	1070	55		
8:00 AM	51	39	267	697	964	51		
8:15 AM	36	41	264	627	891	41		
8:30 AM	32	33	244	555	799	33		
8:45 AM	28	30	220	508	728	30		
9:00 AM	28	32	232	437	669	32		
9:15 AM	27	22	230	409	639	27		
9:30 AM	27	19	230	407	637	27		
9:45 AM	32	24	240	387	627	32		
10:00 AM	35	25	247	368	615	35		
10:15 AM	34	27	261	350	611	34		
10:30 AM	30	38	276	360	636	38		
10:45 AM	24	29	280	389	669	29		
11:00 AM	19	28	305	404	709	28		
11:15 AM	22	28	292	424	716	28		
11:30 AM	18	19	300	434	734	19		
11:45 AM	24	23	315	415	730	24		
12:00 PM	27	20	290	436	726	27		
12:15 PM	22	18	299	427	726	22		
12:30 PM	26	18	292	416	708	26		
12:45 PM	22	21	263	441	704	22		
1:00 PM	19	23	282	435	717	23		
1:15 PM	18	24	268	447	715	24		
1:30 PM	22	27	276	459	735	27		
1:45 PM	23	27	320	439	759	27		
2:00 PM	25	29	331	456	787	29		
2:15 PM	29	31	399	475	874	31		
2:30 PM	22	30	416	496	912	30		
2:45 PM	20	30	451	523	974	30		
3:00 PM	22	33	486	579	1065	33		
3:15 PM	21	36	536	584	1120	36		
3:30 PM	28	31	605	614	1219	31		
3:45 PM	28	28	689	648	1337	28		
4:00 PM	32	22	717	659	1376	32		
4:15 PM	35	19	714	684	1398	35		
4:30 PM	30	22	710	695	1405	30		
4:45 PM	30	24	606	681	1287	30		
5:00 PM	25	24	532	621	1153	25		
5:15 PM	15	17	354	459	813	17		
5:30 PM	13	9	194	285	479	13		
5:45 PM	7	6	83	133	216	7		
6:00 PM	0	0	0	0	0	0		
6:15 PM	0	0	0	0	0	0		
6:30 PM	0	0	0	0	0	0		
6:45 PM	0	0	0	0	0	0		
7:00 PM	0	0	0	0	0	0		
7:15 PM	0	0	0	0	0	0		
7:30 PM	0	0	0	0	0	0		
7:45 PM	0	0	0	0	0	0		
8:00 PM	0	0	0	0	0	0		

Figure 4C-1 Warrant 2, Four-Hour Vehicular Volume

Top Hours for Figure 4C-1	Start Time	End Time	Major Street	Minor Street
Top Hour	4:15 PM	5:15 PM	1398	35
2nd Highest Hour	7:30 AM	8:30 AM	1134	62
3rd Highest Hour	3:15 PM	4:15 PM	1120	36
4th Highest Hour	6:30 AM	7:30 AM	851	44

Top Hours for Figure 4C-2	Start Time	End Time	Major Street	Minor Street
Top Hour	7:15 AM	8:15 AM	1134	61
2nd Highest Hour	4:15 PM	5:15 PM	1398	35
3rd Highest Hour	3:15 PM	4:15 PM	1120	36
4th Highest Hour	8:15 AM	9:15 AM	891	41

**Figure 4C-2 Warrant 2 Four Hour Vehicular Volume (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)**Are the requirements for Warrant 2 met?: **No**

OMUTCD WARRANT 3, PEAK HOUR

Number of Lanes for Moving Traffic on Each Approach		Peak Hour Start time	4:15 PM
Major Street:	2 or More Lanes	Peak Hour End Time	5:15 PM
Minor Street:	1 Lane		

Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street?

Yes

Is this signal warrant being applied for an unusual case, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time?

No

Indicate whether all three of the following conditions for the same 1 hour (any four consecutive 15-minute periods) of an average day are present*

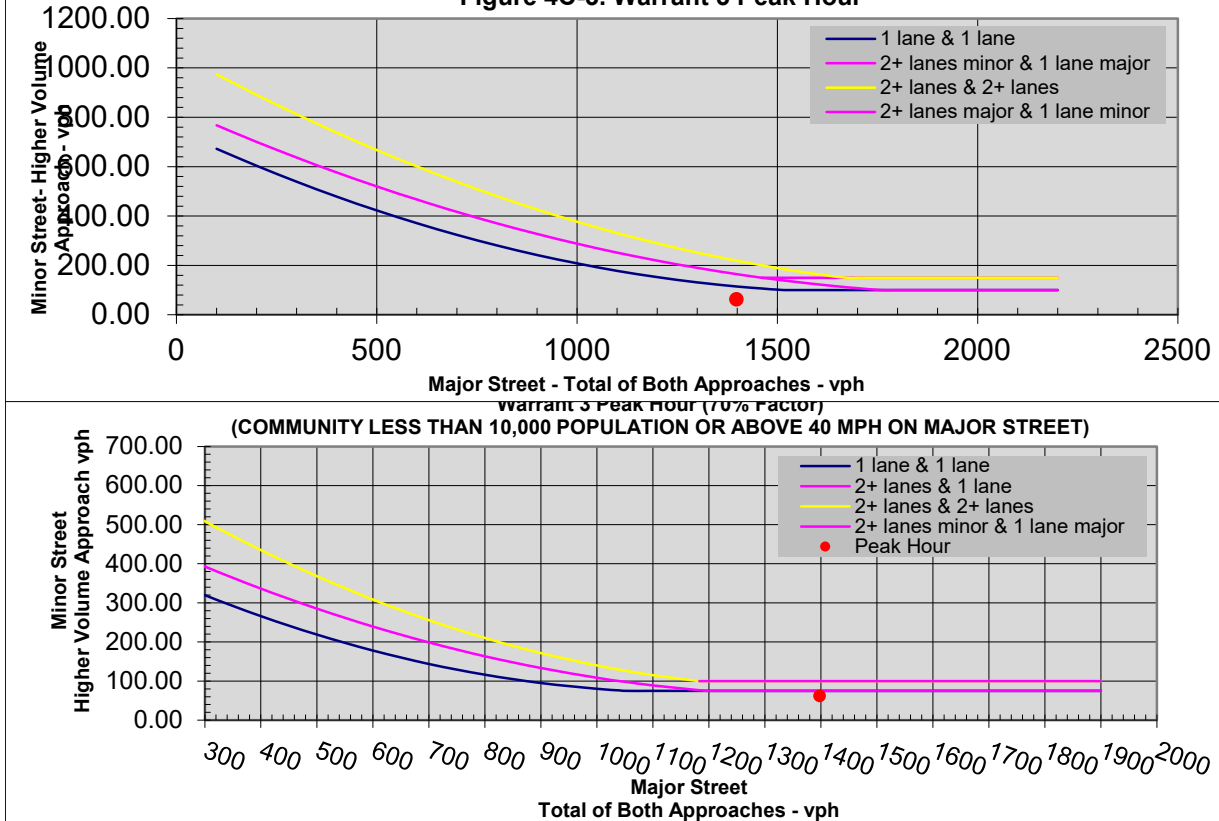
Does the total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equal or exceed 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach?	
Does the volume on the same minor-street approach (one direction only) equal or exceed 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes?	No
Does the total entering volume serviced during the hour equal or exceed 650 vehicles per hour for intersection with three approaches or 800 vehicles per hour for intersections with four or more approaches?	Yes

*If applicable, attach all supporting calculations and documentation.

Are the requirements for Warrant 3 met?:

No

Figure 4C-3. Warrant 3 Peak Hour



Existing Year 2024 Traffic Warrant Analysis Pleasant & Midland

Hour Vehicular Volume				
Hour Interval Beginning At	Major Street Combined Vehicles Per Hour (VPH)	Highest Minor Street Approach Vehicles Per Hour (VPH)	Sum of Major Street and Highest Minor Street	Sum of Major Street and Combined Minor Street
6:00 AM	660	40	700	711
6:15 AM	762	43	805	822
6:30 AM	851	44	895	923
6:45 AM	945	51	996	1040
7:00 AM	1073	56	1129	1178
7:15 AM	1134	61	1195	1251
7:30 AM	1134	62	1196	1251
7:45 AM	1070	55	1125	1166
8:00 AM	964	51	1015	1054
8:15 AM	891	41	932	968
8:30 AM	799	33	832	864
8:45 AM	728	30	758	786
9:00 AM	669	32	701	729
9:15 AM	639	27	666	688
9:30 AM	637	27	664	683
9:45 AM	627	32	659	683
10:00 AM	615	35	650	675
10:15 AM	611	34	645	672
10:30 AM	636	38	674	704
10:45 AM	669	29	698	722
11:00 AM	709	28	737	756
11:15 AM	716	28	744	766
11:30 AM	734	19	753	771
11:45 AM	730	24	754	777
12:00 PM	726	27	753	773
12:15 PM	726	22	748	766
12:30 PM	708	26	734	752
12:45 PM	704	22	726	747
1:00 PM	717	23	740	759
1:15 PM	715	24	739	757
1:30 PM	735	27	762	784
1:45 PM	759	27	786	809
2:00 PM	787	29	816	841
2:15 PM	874	31	905	934
2:30 PM	912	30	942	964
2:45 PM	974	30	1004	1024
3:00 PM	1065	33	1098	1120
3:15 PM	1120	36	1156	1177
3:30 PM	1219	31	1250	1278
3:45 PM	1337	28	1365	1393
4:00 PM	1376	32	1408	1430
4:15 PM	1398	35	1433	1452
4:30 PM	1405	30	1435	1457
4:45 PM	1287	30	1317	1341
5:00 PM	1153	25	1178	1202
5:15 PM	813	17	830	845
5:30 PM	479	13	492	501
5:45 PM	216	7	223	229
6:00 PM	0	0	0	0
6:15 PM	0	0	0	0
6:30 PM	0	0	0	0
6:45 PM	0	0	0	0
7:00 PM	0	0	0	0
7:15 PM	0	0	0	0
7:30 PM	0	0	0	0
7:45 PM	0	0	0	0
8:00 PM	0	0	0	0

Actual Peak Hour Major Traffic Volume	Actual Peak Hour Minor Traffic Volume	Required Peak Hour Minor Traffic Volume for Fig. 4C-3	Required Peak Hour Minor Traffic Volume for Fig. 4C-4
1398	62	165	75

STUDY AND ANALYSIS INFORMATION

Municipality:	City of Independence	Traffic Volumes Obtained By:	Tri-State Traffic Data
County:	Cuyahoga	Analysis Date:	5/10/2024
ODOT Engineering District:	12	Agency/ Company Name Performing Warrant Analysis:	GPD Group
Google map link:	Map		

Analysis Information

Data Collection Date: 4/17/2024
Day of the Week: Wednesday

Is the intersection in a built-up area of an isolated community of <10,000 population? Yes

Existing Traffic Signal at intersection: Yes

Total Number of Approaches at Intersection: 4

Major Street Information

Major Street Name and Route Number: Brecksville Road

Major Street Approach Direction: N-Bound
S-Bound

Number of Thru Lanes on Each Major Street Approach: 2 LANE(S)

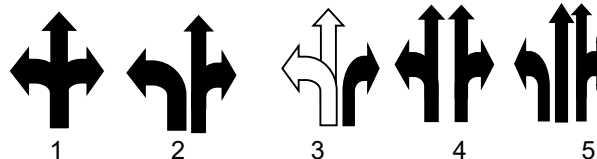
Speed Limit or 85th Percentile Speed on the Major Street*: 35 MPH

*Unknown assumes below 45 mph

Minor Street Information

Minor Street Name and Route Number: Pleasant Valley Road

Minor Street Approach Configuration: 5 E-Bound
5 W-Bound



Number of Thru Lanes on Each Minor Street Approach: 2 LANE(S)

Apply Right Turn Lane Reduction*: Yes

*Right Turn Lane Reduction Shall be used for Warrants 1, 2, & 3 for New ODOT Signals. Please refer to TEM 402-3.2 for clarification and criteria under which Right Turn Reduction is not required.

TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS

	Warrant		Notes and Comments:
	Applicable?	Satisfied?	
Warrant 1, Eight-Hour Vehicular Volume	Yes	Yes	Condition A was met. Condition A (70%) was met. Condition B (70%) was met. Combination of A/B (80%) was met.*Combination of A/B (56%) was met.*
Warrant 2, Four-Hour Vehicular Volume	Yes	Yes	Figure 4C-2 (70% Factor)
Warrant 3, Peak Hour	Yes	Yes	Signals installed under Warrant 3 should be traffic actuated. Peak Hour 7:15 AM 8:15 AM
For Warrants 1-3, new ODOT signals must be based off of 100% volume thresholds (TEM 402-3.2)			
Warrant 4, Pedestrian Volume	No		If this warrant is met, and a traffic control signal is justified by an engineering study, the traffic control signal shall be equipped with pedestrian signal heads complying with the provisions set forth in Chapter 4E of the OMUTCD. Peak Hour 4:30 PM 5:30 PM
Warrant 5, School Crossing	No		N/A
Warrant 6, Coordinated Signal System	No		(Shall not be used as the sole warrant in the analysis)
Warrant 7, Crash Experience	No		If this is the sole warrant, signal must be semi-actuated with control devices which provide proper coordination if installed at an intersection within a coordinated system and normally should be fully traffic actuated if installed at an isolated intersection.
Warrant 8, Roadway Network	No		(Shall not be used as the sole warrant in the analysis)
Warrant 9, Intersection Near a Grade Crossing	No		Figure 4C-10
Multi-Way Stop Warrant	No		May be used as an interim measure if traffic signal warrants are satisfied.

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

If no warrants are satisfied, additional options may be considered:

1. An engineering study, performed by a firm prequalified by ODOT for signal design, if approved by the ODOT district, may be used to justify a new signal installation or retention of an existing signal that otherwise does not meet the published warrants. An example of such an instance is a traffic signal in proximity to a railroad crossing that serves to reduce queuing across the tracks.
2. According to TEM 402-2, If the actual turning movement counts fail to satisfy a signal warrant, it may be acceptable to use traffic volumes projected to the second year after project completion. The **Modeling and Forecasting Section** should provide the projected traffic volumes.
3. A pedestrian hybrid beacon may be considered for installation to facilitate pedestrian crossings at a location that does not meet traffic signal warrants (see Chapter 4C of TEM) or at a location that meets traffic signal warrants under Sections 4C.05 and/or 4C.06 but a decision is made to not install a traffic control signal. **Please fill inputs on PHB Score Sheet and submit to ODOT.**

Considerations such as geometrics and lack of sight distance generally have not been accepted in lieu of satisfying signal warrants. These considerations may allow an otherwise unwarranted traffic signal to be retained at **100 percent** local cost. Please review TEM 402-4 for details.

Conclusion: **Retain Existing Traffic Signal**

Notes: Existing Year 2024 Traffic Signal Warrant Analysis, Brecksville Road / Pleasant Valley Road

OMUTCD WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach

Major Street:	2 or More Lanes
Minor Street:	2 or More Lanes

Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street? **Yes**

*Only applicable after an adequate trial of other alternatives (See section 4C.02.06 of the 2012 OMUTCD)

Lanes Major/ Minor	Adjusted Volumes		Condition A				Condition B				Combination A/B*							
			100%		70%		100%		70%		Cond. A		Cond. B		Cond. A		Cond. B	
	Major	Minor	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.	Maj.	Min.
1 / 1			500	150	350	105	750	75	525	53	400	120	600	60	280	84	420	42
2+ / 1			600	150	420	105	900	75	630	53	480	120	720	60	336	84	504	42
2+ / 2+		X	600	200	420	140	900	100	630	70	480	160	720	80	336	112	504	56
1 / 2+			500	200	350	140	750	100	525	70	400	160	600	80	280	112	420	56
12:00 AM	0	0																
12:15 AM	0	0																
12:30 AM	0	0																
12:45 AM	0	0																
1:00 AM	0	0																
1:15 AM	0	0																
1:30 AM	0	0																
1:45 AM	0	0																
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4:15 AM	0	0																
4:30 AM	0	0																
4:45 AM	0	0																
5:00 AM	0	0																
5:15 AM	70	95																
5:30 AM	184	197																
5:45 AM	308	339																
6:00 AM	445	482			1	1									1	1		
6:15 AM	535	558									1	1					1	1
6:30 AM	688	651	1	1					1	1								
6:45 AM	874	748											1	1				
7:00 AM	1040	853			1	1	1	1							1	1		
7:15 AM	1085	897									1	1					1	1
7:30 AM	1067	877	1	1					1	1								
7:45 AM	978	787											1	1				
8:00 AM	860	717			1	1									1	1		
8:15 AM	815	618									1	1					1	1
8:30 AM	699	546	1	1					1	1								
8:45 AM	621	498																
9:00 AM	580	412			1	1									1	1		
9:15 AM	563	400									1	1					1	1
9:30 AM	576	384																
9:45 AM	621	366	1	1														

Existing Year 2024 Traffic Warrant Analysis Pleasant & Brecksville

10:00 AM	669	344			1	1			1	1					1	1		
10:15 AM	708	326									1	1					1	1
10:30 AM	726	341											1	1				
10:45 AM	703	367	1	1														
11:00 AM	714	384			1	1			1	1					1	1		
11:15 AM	698	408									1	1					1	1
11:30 AM	732	416											1	1				
11:45 AM	721	427	1	1														
12:00 PM	704	454			1	1			1	1					1	1		
12:15 PM	725	421									1	1					1	1
12:30 PM	708	403																
12:45 PM	690	413	1	1														
1:00 PM	689	386			1	1			1	1					1	1		
1:15 PM	663	407									1	1					1	1
1:30 PM	670	434																
1:45 PM	769	389	1	1									1	1				
2:00 PM	786	414			1	1			1	1					1	1		
2:15 PM	854	422									1	1					1	1
2:30 PM	849	419																
2:45 PM	846	472	1	1									1	1				
3:00 PM	895	514			1	1			1	1					1	1		
3:15 PM	919	557					1	1			1	1					1	1
3:30 PM	1040	566																
3:45 PM	1117	579	1	1									1	1				
4:00 PM	1197	568			1	1			1	1					1	1		
4:15 PM	1261	568					1	1			1	1					1	1
4:30 PM	1282	573																
4:45 PM	1205	552	1	1									1	1				
5:00 PM	1076	489			1	1			1	1					1	1		
5:15 PM	759	343									1	1					1	1
5:30 PM	434	214																
5:45 PM	202	90																
6:00 PM	0	0																
6:15 PM	0	0																
6:30 PM	0	0																
6:45 PM	0	0																
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8:45 PM	0	0																
9:00 PM	0	0																
9:15 PM	0	0																
9:30 PM	0	0																
9:45 PM	0	0																
HOURS MET			11	11	12	12	3	3	11	11	12	12	8	8	12	12	12	12
WARRANT SATISFIED?			YES		YES		NO		YES		YES				YES			

Warrant Met: **Yes**

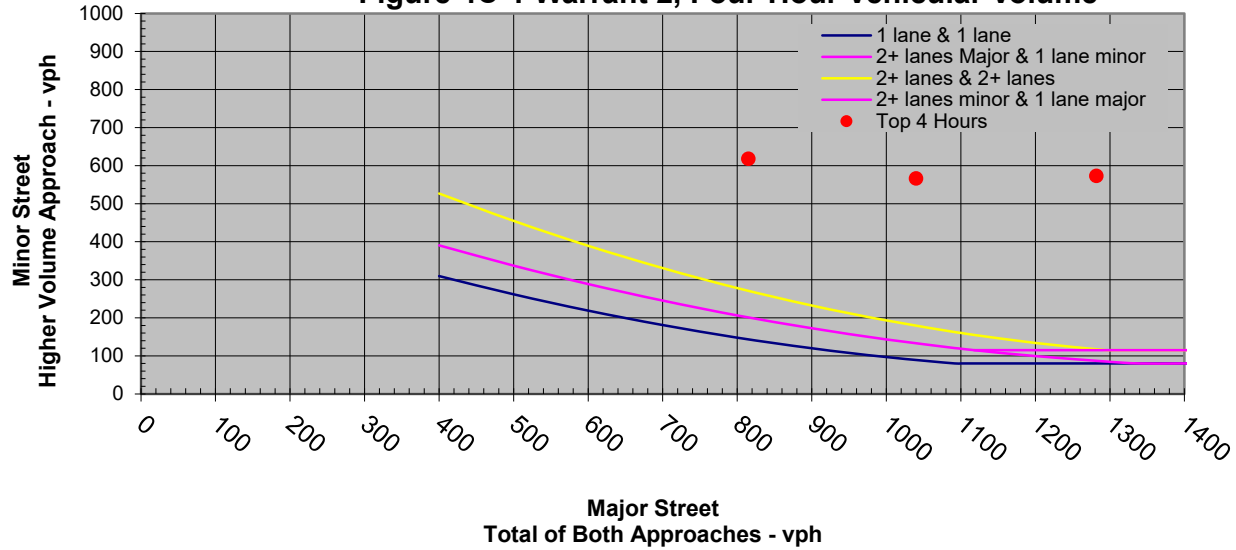
Notes: Condition A was met. Condition A (70%) was met. Condition B (70%) was met. Combination of A/B (80%) was met.*Combination of A/B (56%) was met.*

OMUTCD WARRANT 2, FOUR-HOUR VEHICULAR VOLUME

Number of Lanes for Moving Traffic on Each Approach	Total Number of Unique Hours Met on Figure 4C-1	10
Major street: 2 or More Lanes	Total Number of Unique Hours Met on Figure 4C-2 (70% Factor)	12
Minor Street: 2 or More Lanes		

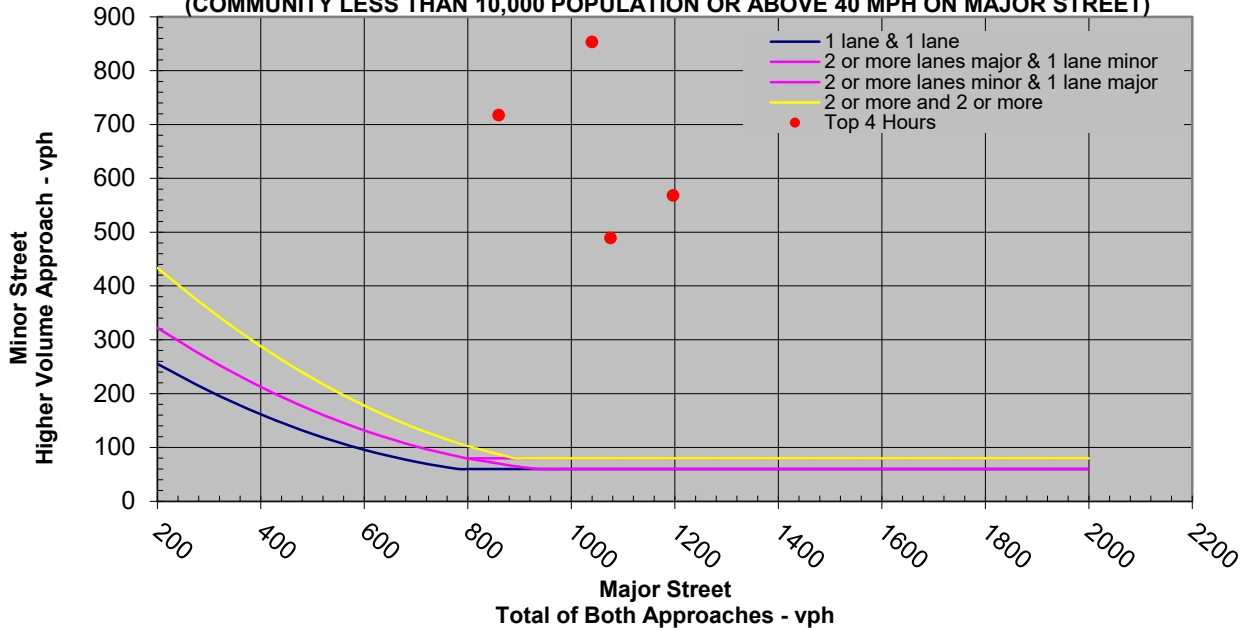
Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street?	Yes
--	------------

Hour Interval Beginning At	Raw Traffic Counts				Total Major Approach Volumes	Highest Actual Minor Street Approach Volumes	Hour Met?	Hour Met? (70% Factor)
	Major - Brecksville Road		Minor - Pleasant Valley Road					
	N-Bound	S-Bound	W-Bound	E-Bound				
6:00 AM	255	190	37	482	445	482		Met
6:15 AM	309	226	49	558	535	558	Met	
6:30 AM	427	261	39	651	688	651		
6:45 AM	545	329	40	748	874	748		
7:00 AM	646	394	49	853	1040	853		Met
7:15 AM	673	412	43	897	1085	897	Met	
7:30 AM	638	429	44	877	1067	877		
7:45 AM	583	395	43	787	978	787		
8:00 AM	505	355	36	717	860	717		Met
8:15 AM	461	354	40	618	815	618	Met	
8:30 AM	387	312	40	546	699	546		
8:45 AM	328	293	41	498	621	498		
9:00 AM	298	282	50	412	580	412		Met
9:15 AM	285	278	49	400	563	400		
9:30 AM	286	290	53	384	576	384		
9:45 AM	289	332	56	366	621	366		
10:00 AM	310	359	53	344	669	344		Met
10:15 AM	325	383	57	326	708	326		
10:30 AM	316	410	65	341	726	341	Met	
10:45 AM	300	403	82	367	703	367		
11:00 AM	298	416	105	384	714	384		Met
11:15 AM	293	405	139	408	698	408		
11:30 AM	306	426	158	416	732	416	Met	
11:45 AM	315	406	168	427	721	427		
12:00 PM	295	409	156	454	704	454		Met
12:15 PM	287	438	144	421	725	421		
12:30 PM	298	410	118	403	708	403	Met	
12:45 PM	284	406	107	413	690	413		
1:00 PM	291	398	104	386	689	386		Met
1:15 PM	297	366	104	407	663	407		
1:30 PM	285	385	115	434	670	434	Met	
1:45 PM	330	439	127	389	769	389		
2:00 PM	325	461	134	414	786	414		Met
2:15 PM	332	522	152	422	854	422		
2:30 PM	314	535	151	419	849	419	Met	
2:45 PM	298	548	183	472	846	472		
3:00 PM	317	578	205	514	895	514		Met
3:15 PM	325	594	302	557	919	557		
3:30 PM	363	677	352	566	1040	566	Met	
3:45 PM	372	745	400	579	1117	579		
4:00 PM	380	817	412	568	1197	568		Met
4:15 PM	381	880	359	568	1261	568		
4:30 PM	366	916	334	573	1282	573	Met	
4:45 PM	347	858	260	552	1205	552		
5:00 PM	320	756	220	489	1076	489		Met
5:15 PM	230	529	126	343	759	343		
5:30 PM	148	286	71	214	434	214		
5:45 PM	74	128	28	90	202	90		
6:00 PM	0	0	0	0	0	0		
6:15 PM	0	0	0	0	0	0		
6:30 PM	0	0	0	0	0	0		
6:45 PM	0	0	0	0	0	0		
7:00 PM	0	0	0	0	0	0		
7:15 PM	0	0	0	0	0	0		
7:30 PM	0	0	0	0	0	0		
7:45 PM	0	0	0	0	0	0		
8:00 PM	0	0	0	0	0	0		

Figure 4C-1 Warrant 2, Four-Hour Vehicular Volume

Top Hours for Figure 4C-1	Start Time	End Time	Major Street	Minor Street
Top Hour	7:15 AM	8:15 AM	1085	897
2nd Highest Hour	4:30 PM	5:30 PM	1282	573
3rd Highest Hour	3:30 PM	4:30 PM	1040	566
4th Highest Hour	8:15 AM	9:15 AM	815	618

Top Hours for Figure 4C-2	Start Time	End Time	Major Street	Minor Street
Top Hour	7:00 AM	8:00 AM	1040	853
2nd Highest Hour	8:00 AM	9:00 AM	860	717
3rd Highest Hour	4:00 PM	5:00 PM	1197	568
4th Highest Hour	5:00 PM	6:00 PM	1076	489

**Figure 4C-2 Warrant 2 Four Hour Vehicular Volume (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)**Are the requirements for Warrant 2 met?: **Yes**

OMUTCD WARRANT 3, PEAK HOUR

Number of Lanes for Moving Traffic on Each Approach		Peak Hour Start time	7:15 AM
Major Street:	2 or More Lanes	Peak Hour End Time	8:15 AM
Minor Street:	2 or More Lanes		

Built up Isolated Community with Less Than 10,000 Population or Above 40 MPH on Major Street?

Yes

Is this signal warrant being applied for an unusual case, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time?

No

Indicate whether all three of the following conditions for the same 1 hour (any four consecutive 15-minute periods) of an average day are present*

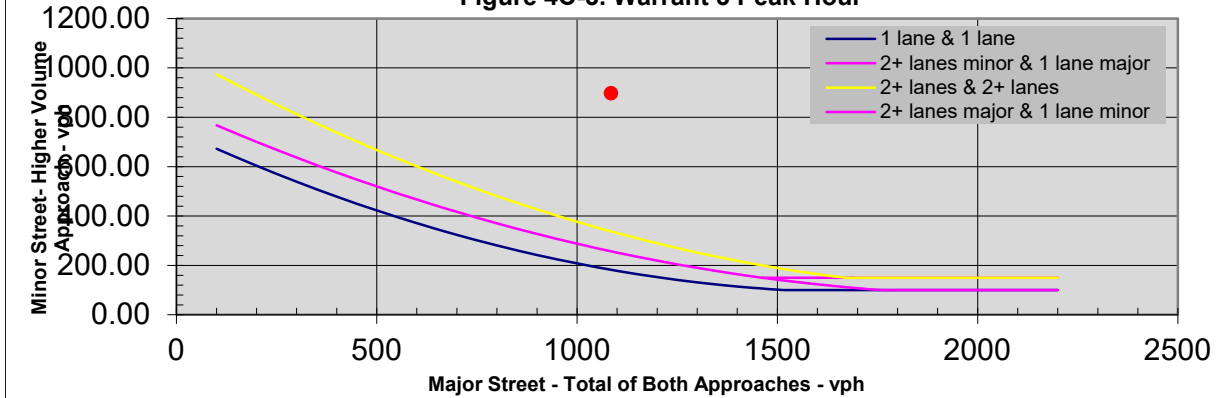
Does the total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equal or exceed 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach?	
Does the volume on the same minor-street approach (one direction only) equal or exceed 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes?	Yes
Does the total entering volume serviced during the hour equal or exceed 650 vehicles per hour for intersection with three approaches or 800 vehicles per hour for intersections with four or more approaches?	Yes

*If applicable, attach all supporting calculations and documentation.

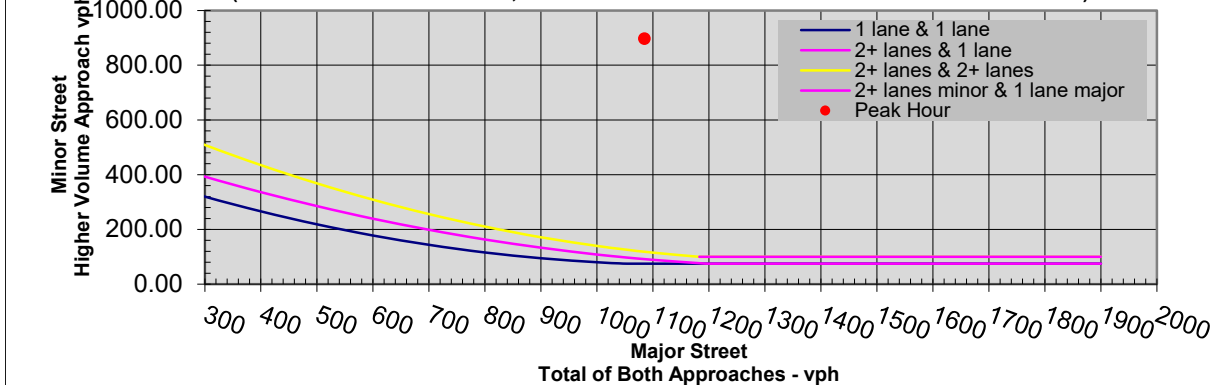
Are the requirements for Warrant 3 met?:

Yes

Figure 4C-3. Warrant 3 Peak Hour



(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



Existing Year 2024 Traffic Warrant Analysis Pleasant & Brecksville

Hour Vehicular Volume				
Hour Interval Beginning At	Major Street Combined Vehicles Per Hour (VPH)	Highest Minor Street Approach Vehicles Per Hour (VPH)	Sum of Major Street and Highest Minor Street	Sum of Major Street and Combined Minor Street
6:00 AM	445	482	927	964
6:15 AM	535	558	1093	1142
6:30 AM	688	651	1339	1378
6:45 AM	874	748	1622	1662
7:00 AM	1040	853	1893	1942
7:15 AM	1085	897	1982	2025
7:30 AM	1067	877	1944	1988
7:45 AM	978	787	1765	1808
8:00 AM	860	717	1577	1613
8:15 AM	815	618	1433	1473
8:30 AM	699	546	1245	1285
8:45 AM	621	498	1119	1160
9:00 AM	580	412	992	1042
9:15 AM	563	400	963	1012
9:30 AM	576	384	960	1013
9:45 AM	621	366	987	1043
10:00 AM	669	344	1013	1066
10:15 AM	708	326	1034	1091
10:30 AM	726	341	1067	1132
10:45 AM	703	367	1070	1152
11:00 AM	714	384	1098	1203
11:15 AM	698	408	1106	1245
11:30 AM	732	416	1148	1306
11:45 AM	721	427	1148	1316
12:00 PM	704	454	1158	1314
12:15 PM	725	421	1146	1290
12:30 PM	708	403	1111	1229
12:45 PM	690	413	1103	1210
1:00 PM	689	386	1075	1179
1:15 PM	663	407	1070	1174
1:30 PM	670	434	1104	1219
1:45 PM	769	389	1158	1285
2:00 PM	786	414	1200	1334
2:15 PM	854	422	1276	1428
2:30 PM	849	419	1268	1419
2:45 PM	846	472	1318	1501
3:00 PM	895	514	1409	1614
3:15 PM	919	557	1476	1778
3:30 PM	1040	566	1606	1958
3:45 PM	1117	579	1696	2096
4:00 PM	1197	568	1765	2177
4:15 PM	1261	568	1829	2188
4:30 PM	1282	573	1855	2189
4:45 PM	1205	552	1757	2017
5:00 PM	1076	489	1565	1785
5:15 PM	759	343	1102	1228
5:30 PM	434	214	648	719
5:45 PM	202	90	292	320
6:00 PM	0	0	0	0
6:15 PM	0	0	0	0
6:30 PM	0	0	0	0
6:45 PM	0	0	0	0
7:00 PM	0	0	0	0
7:15 PM	0	0	0	0
7:30 PM	0	0	0	0
7:45 PM	0	0	0	0
8:00 PM	0	0	0	0

Actual Peak Hour Major Traffic Volume	Actual Peak Hour Minor Traffic Volume	Required Peak Hour Minor Traffic Volume for Fig. 4C-3	Required Peak Hour Minor Traffic Volume for Fig. 4C-4
1085	897	337	119

APPENDIX F
TURN LANE LENGTH CALCULATIONS

TURN LANE LENGTH CALCULATIONS

DESIGN YEAR 2050 'BUILD ALTERNATIVE 1' TRAFFIC VOLUMES - AM PEAK HOUR



**PLEASANT VALLEY ROAD / I-77 SB RAMPS /
FORESTWOOD DRIVE**

ANTICIPATED CYCLE LENGTH: 120 SEC.

EB PLEASANT VALLEY ROAD

DESIGN SPEED: 35 MPH

MOVEMENT:	LEFT		THRU		RIGHT
VOLUME:	23		1531		433
% OF APPROACH VOLUME:	1.2%		77.1%		21.8%
LANE GROUP:			THRU		RIGHT
LANE GROUP VOLUME:			1531		433
NUMBER OF LANES:			2		1
VEHICLES PER CYCLE:			26		15
CONTROLLING LANE GROUP:					
TAPER LENGTH:					50
STORAGE LENGTH:			975		525
TOTAL TURN LANE LENGTH:			975		575

WB PLEASANT VALLEY ROAD

DESIGN SPEED: 35 MPH

MOVEMENT:	LEFT		THRU		RIGHT
VOLUME:	171		430		54
% OF APPROACH VOLUME:	26.1%		65.6%		8.2%
LANE GROUP:	LEFT		THRU		
LANE GROUP VOLUME:	171		430		
NUMBER OF LANES:	1		2		
VEHICLES PER CYCLE:	6		8		
CONTROLLING LANE GROUP:					
TAPER LENGTH:	50				
STORAGE LENGTH:	250		325		
TOTAL TURN LANE LENGTH:	300		325		

NB I-77 SB OFF RAMP

DESIGN SPEED: 25 MPH

MOVEMENT:	LEFT		THRU		RIGHT
VOLUME:	231		13		490
% OF APPROACH VOLUME:	31.5%		1.8%		66.8%
LANE GROUP:		LEFT/THRU			
LANE GROUP VOLUME:		244			
NUMBER OF LANES:		1			
VEHICLES PER CYCLE:		9			
CONTROLLING LANE GROUP:					
TAPER LENGTH:		50			
STORAGE LENGTH:		350			
TOTAL TURN LANE LENGTH:		400			

MOVEMENT:					
VOLUME:					
% OF APPROACH VOLUME:					
LANE GROUP:					
LANE GROUP VOLUME:					
NUMBER OF LANES:					
VEHICLES PER CYCLE:					
CONTROLLING LANE GROUP:					
TAPER LENGTH:					
STORAGE LENGTH:					
TOTAL TURN LANE LENGTH:					

RECOMMENDED TURN LANE LENGTHS INCLUDE 50' DIVERGING TAPER

TURN LANE LENGTH CALCULATIONS

DESIGN YEAR 2050 'BUILD ALTERNATIVE 1' TRAFFIC VOLUMES - PM PEAK HOUR



**PLEASANT VALLEY ROAD / I-77 SB RAMPS /
FORESTWOOD DRIVE**

ANTICIPATED CYCLE LENGTH: 120 SEC.

EB PLEASANT VALLEY ROAD

DESIGN SPEED: 35 MPH

MOVEMENT:	LEFT		THRU		RIGHT
VOLUME:	30		649		198
% OF APPROACH VOLUME:	3.4%		74.0%		10.0%
LANE GROUP:			THRU		RIGHT
LANE GROUP VOLUME:			649		198
NUMBER OF LANES:			2		1
VEHICLES PER CYCLE:			11		7
CONTROLLING LANE GROUP:					
TAPER LENGTH:					50
STORAGE LENGTH:			400		275
TOTAL TURN LANE LENGTH:			400		325

WB PLEASANT VALLEY ROAD

DESIGN SPEED: 35 MPH

MOVEMENT:	LEFT		THRU		RIGHT
VOLUME:	276		1040		118
% OF APPROACH VOLUME:	19.2%		72.5%		8.2%
LANE GROUP:	LEFT		THRU		
LANE GROUP VOLUME:	276		1040		
NUMBER OF LANES:	1		2		
VEHICLES PER CYCLE:	10		18		
CONTROLLING LANE GROUP:					
TAPER LENGTH:	50				
STORAGE LENGTH:	375		625		
TOTAL TURN LANE LENGTH:	425		625		

NB I-77 SB OFF RAMP

DESIGN SPEED: 25 MPH

MOVEMENT:	LEFT		THRU		RIGHT
VOLUME:	921		73		487
% OF APPROACH VOLUME:	62.2%		4.9%		32.9%
LANE GROUP:		LEFT/THRU			
LANE GROUP VOLUME:		994			
NUMBER OF LANES:		1			
VEHICLES PER CYCLE:		34			
CONTROLLING LANE GROUP:					
TAPER LENGTH:		50			
STORAGE LENGTH:		1125			
TOTAL TURN LANE LENGTH:		1175			

MOVEMENT:					
VOLUME:					
% OF APPROACH VOLUME:					
LANE GROUP:					
LANE GROUP VOLUME:					
NUMBER OF LANES:					
VEHICLES PER CYCLE:					
CONTROLLING LANE GROUP:					
TAPER LENGTH:					
STORAGE LENGTH:					
TOTAL TURN LANE LENGTH:					

RECOMMENDED TURN LANE LENGTHS INCLUDE 50' DIVERGING TAPER

TURN LANE LENGTH CALCULATIONS

DESIGN YEAR 2050 'BUILD ALTERNATIVE 2' TRAFFIC VOLUMES - AM PEAK HOUR



**PLEASANT VALLEY ROAD / I-77 SB RAMPS /
FORESTWOOD DRIVE**

ANTICIPATED CYCLE LENGTH: 120 SEC.

EB PLEASANT VALLEY ROAD

DESIGN SPEED: 35 MPH

MOVEMENT:	LEFT		THRU		RIGHT
VOLUME:	23		1531		433
% OF APPROACH VOLUME:	1.2%		77.1%		21.8%
LANE GROUP:			THRU		RIGHT
LANE GROUP VOLUME:			1531		433
NUMBER OF LANES:			2		1
VEHICLES PER CYCLE:			26		15
CONTROLLING LANE GROUP:					
TAPER LENGTH:					50
STORAGE LENGTH:			975		525
TOTAL TURN LANE LENGTH:			975		575

WB PLEASANT VALLEY ROAD

DESIGN SPEED: 35 MPH

MOVEMENT:	LEFT		THRU		RIGHT
VOLUME:	171		430		54
% OF APPROACH VOLUME:	26.1%		65.6%		8.2%
LANE GROUP:	LEFT		THRU		
LANE GROUP VOLUME:	171		430		
NUMBER OF LANES:	1		2		
VEHICLES PER CYCLE:	6		8		
CONTROLLING LANE GROUP:					
TAPER LENGTH:	50				
STORAGE LENGTH:	250		325		
TOTAL TURN LANE LENGTH:	300		325		

NB I-77 SB OFF RAMP

DESIGN SPEED: 25 MPH

MOVEMENT:	LEFT		THRU		RIGHT
VOLUME:	231		13		490
% OF APPROACH VOLUME:	31.5%		1.8%		66.8%
LANE GROUP:	LEFT	LEFT/THRU			
LANE GROUP VOLUME:	115	129			
NUMBER OF LANES:	1	1			
VEHICLES PER CYCLE:	4	5			
CONTROLLING LANE GROUP:					
TAPER LENGTH:	50	50			
STORAGE LENGTH:	175	200			
TOTAL TURN LANE LENGTH:	225	250			

MOVEMENT:					
VOLUME:					
% OF APPROACH VOLUME:					
LANE GROUP:					
LANE GROUP VOLUME:					
NUMBER OF LANES:					
VEHICLES PER CYCLE:					
CONTROLLING LANE GROUP:					
TAPER LENGTH:					
STORAGE LENGTH:					
TOTAL TURN LANE LENGTH:					

RECOMMENDED TURN LANE LENGTHS INCLUDE 50' DIVERGING TAPER

TURN LANE LENGTH CALCULATIONS

DESIGN YEAR 2050 'BUILD ALTERNATIVE 2' TRAFFIC VOLUMES - PM PEAK HOUR



PLEASANT VALLEY ROAD / I-77 SB RAMPS /
FORESTWOOD DRIVE

ANTICIPATED CYCLE LENGTH: 120 SEC.

EB PLEASANT VALLEY ROAD

DESIGN SPEED: 35 MPH

MOVEMENT:	LEFT		THRU		RIGHT
VOLUME:	30		649		198
% OF APPROACH VOLUME:	3.4%		74.0%		10.0%
LANE GROUP:			THRU		RIGHT
LANE GROUP VOLUME:			649		198
NUMBER OF LANES:			2		1
VEHICLES PER CYCLE:			11		7
CONTROLLING LANE GROUP:					
TAPER LENGTH:					50
STORAGE LENGTH:			400		275
TOTAL TURN LANE LENGTH:			400		325

WB PLEASANT VALLEY ROAD

DESIGN SPEED: 35 MPH

MOVEMENT:	LEFT		THRU		RIGHT
VOLUME:	276		1040		118
% OF APPROACH VOLUME:	19.2%		72.5%		8.2%
LANE GROUP:	LEFT		THRU		
LANE GROUP VOLUME:	276		1040		
NUMBER OF LANES:	1		2		
VEHICLES PER CYCLE:	10		18		
CONTROLLING LANE GROUP:					
TAPER LENGTH:	50				
STORAGE LENGTH:	375		625		
TOTAL TURN LANE LENGTH:	425		625		

NB I-77 SB OFF RAMP

DESIGN SPEED: 25 MPH

MOVEMENT:	LEFT		THRU		RIGHT
VOLUME:	921		73		487
% OF APPROACH VOLUME:	62.2%		4.9%		32.9%
LANE GROUP:	LEFT	LEFT/THRU			
LANE GROUP VOLUME:	461	533			
NUMBER OF LANES:	1	1			
VEHICLES PER CYCLE:	16	18			
CONTROLLING LANE GROUP:					
TAPER LENGTH:	50	50			
STORAGE LENGTH:	550	625			
TOTAL TURN LANE LENGTH:	600	675			

MOVEMENT:					
VOLUME:					
% OF APPROACH VOLUME:					
LANE GROUP:					
LANE GROUP VOLUME:					
NUMBER OF LANES:					
VEHICLES PER CYCLE:					
CONTROLLING LANE GROUP:					
TAPER LENGTH:					
STORAGE LENGTH:					
TOTAL TURN LANE LENGTH:					

RECOMMENDED TURN LANE LENGTHS INCLUDE 50' DIVERGING TAPER

TURN LANE LENGTH CALCULATIONS

DESIGN YEAR 2050 'BUILD ALTERNATIVE 3' TRAFFIC VOLUMES - AM PEAK HOUR



**PLEASANT VALLEY ROAD / I-77 SB RAMPS /
FORESTWOOD DRIVE**

ANTICIPATED CYCLE LENGTH: 120 SEC.

EB PLEASANT VALLEY ROAD

DESIGN SPEED: 35 MPH

MOVEMENT:	LEFT		THRU		RIGHT
VOLUME:	23		1531		433
% OF APPROACH VOLUME:	1.2%		77.1%		21.8%
LANE GROUP:			THRU		RIGHT
LANE GROUP VOLUME:			1531		433
NUMBER OF LANES:			2		1
VEHICLES PER CYCLE:			26		15
CONTROLLING LANE GROUP:					
TAPER LENGTH:					50
STORAGE LENGTH:			975		525
TOTAL TURN LANE LENGTH:			975		575

WB PLEASANT VALLEY ROAD

DESIGN SPEED: 35 MPH

MOVEMENT:	LEFT		THRU		RIGHT
VOLUME:	171		430		54
% OF APPROACH VOLUME:	26.1%		65.6%		8.2%
LANE GROUP:	LEFT		THRU		
LANE GROUP VOLUME:	171		430		
NUMBER OF LANES:	1		2		
VEHICLES PER CYCLE:	6		8		
CONTROLLING LANE GROUP:					
TAPER LENGTH:	50				
STORAGE LENGTH:	250		325		
TOTAL TURN LANE LENGTH:	300		325		

NB I-77 SB OFF RAMP

DESIGN SPEED: 25 MPH

MOVEMENT:	LEFT		THRU		RIGHT
VOLUME:	231		13		490
% OF APPROACH VOLUME:	31.5%		1.8%		66.8%
LANE GROUP:	LEFT	LEFT/THRU			
LANE GROUP VOLUME:	115	129			
NUMBER OF LANES:	1	1			
VEHICLES PER CYCLE:	4	5			
CONTROLLING LANE GROUP:					
TAPER LENGTH:	50	50			
STORAGE LENGTH:	175	200			
TOTAL TURN LANE LENGTH:	225	250			

*LEFT TURNS EVENLY DIVIDED OVER BOTH LANES

MOVEMENT:					
VOLUME:					
% OF APPROACH VOLUME:					
LANE GROUP:					
LANE GROUP VOLUME:					
NUMBER OF LANES:					
VEHICLES PER CYCLE:					
CONTROLLING LANE GROUP:					
TAPER LENGTH:					
STORAGE LENGTH:					
TOTAL TURN LANE LENGTH:					

RECOMMENDED TURN LANE LENGTHS INCLUDE 50' DIVERGING TAPER

TURN LANE LENGTH CALCULATIONS

DESIGN YEAR 2050 'BUILD ALTERNATIVE 3' TRAFFIC VOLUMES - PM PEAK HOUR



PLEASANT VALLEY ROAD / I-77 SB RAMPS /
FORESTWOOD DRIVE

ANTICIPATED CYCLE LENGTH: 120 SEC.

EB PLEASANT VALLEY ROAD

DESIGN SPEED: 35 MPH

MOVEMENT:	LEFT		THRU		RIGHT
VOLUME:	30		649		198
% OF APPROACH VOLUME:	3.4%		74.0%		10.0%
LANE GROUP:			THRU		RIGHT
LANE GROUP VOLUME:			649		198
NUMBER OF LANES:			2		1
VEHICLES PER CYCLE:			11		7
CONTROLLING LANE GROUP:					
TAPER LENGTH:					50
STORAGE LENGTH:			400		275
TOTAL TURN LANE LENGTH:			400		325

WB PLEASANT VALLEY ROAD

DESIGN SPEED: 35 MPH

MOVEMENT:	LEFT		THRU		RIGHT
VOLUME:	276		1040		118
% OF APPROACH VOLUME:	19.2%		72.5%		8.2%
LANE GROUP:	LEFT		THRU		
LANE GROUP VOLUME:	276		1040		
NUMBER OF LANES:	1		2		
VEHICLES PER CYCLE:	10		18		
CONTROLLING LANE GROUP:					
TAPER LENGTH:	50				
STORAGE LENGTH:	375		625		
TOTAL TURN LANE LENGTH:	425		625		

NB I-77 SB OFF RAMP

DESIGN SPEED: 25 MPH

MOVEMENT:	LEFT		THRU		RIGHT
VOLUME:	921		73		487
% OF APPROACH VOLUME:	62.2%		4.9%		32.9%
LANE GROUP:	LEFT	LEFT/THRU			
LANE GROUP VOLUME:	461	533			
NUMBER OF LANES:	1	1			
VEHICLES PER CYCLE:	16	18			
CONTROLLING LANE GROUP:					
TAPER LENGTH:	50	50			
STORAGE LENGTH:	550	625			
TOTAL TURN LANE LENGTH:	600	675			

*LEFT TURNS EVENLY DIVIDED OVER BOTH LANES

MOVEMENT:					
VOLUME:					
% OF APPROACH VOLUME:					
LANE GROUP:					
LANE GROUP VOLUME:					
NUMBER OF LANES:					
VEHICLES PER CYCLE:					
CONTROLLING LANE GROUP:					
TAPER LENGTH:					
STORAGE LENGTH:					
TOTAL TURN LANE LENGTH:					

RECOMMENDED TURN LANE LENGTHS INCLUDE 50' DIVERGING TAPER

TURN LANE LENGTH CALCULATIONS

DESIGN YEAR 2050 'BUILD ALTERNATIVE 4' TRAFFIC VOLUMES - AM PEAK HOUR



PLEASANT VALLEY ROAD / I-77 NB RAMPS

ANTICIPATED CYCLE LENGTH: 120 SEC.

EB PLEASANT VALLEY ROAD

DESIGN SPEED: 35 MPH

MOVEMENT:	LEFT		THRU		
VOLUME:	1158		934		
% OF APPROACH VOLUME:	55.4%		44.6%		
LANE GROUP:	LEFT		THRU		
LANE GROUP VOLUME:	1158		934		
NUMBER OF LANES:	2		1		
VEHICLES PER CYCLE:	20		32		
CONTROLLING LANE GROUP:					
TAPER LENGTH:	50				
STORAGE LENGTH:	675		1125		
TOTAL TURN LANE LENGTH:	725		1125		

WB PLEASANT VALLEY ROAD

DESIGN SPEED: 35 MPH

MOVEMENT:			THRU		RIGHT
VOLUME:			467		421
% OF APPROACH VOLUME:			52.6%		47.4%
LANE GROUP:			THRU		RIGHT
LANE GROUP VOLUME:			467		421
NUMBER OF LANES:			2		1
VEHICLES PER CYCLE:			8		15
CONTROLLING LANE GROUP:					
TAPER LENGTH:					50
STORAGE LENGTH:			325		525
TOTAL TURN LANE LENGTH:			325		575

MOVEMENT:					
VOLUME:					
% OF APPROACH VOLUME:					
LANE GROUP:					
LANE GROUP VOLUME:					
NUMBER OF LANES:					
VEHICLES PER CYCLE:					
CONTROLLING LANE GROUP:					
TAPER LENGTH:					
STORAGE LENGTH:					
TOTAL TURN LANE LENGTH:					

MOVEMENT:					
VOLUME:					
% OF APPROACH VOLUME:					
LANE GROUP:					
LANE GROUP VOLUME:					
NUMBER OF LANES:					
VEHICLES PER CYCLE:					
CONTROLLING LANE GROUP:					
TAPER LENGTH:					
STORAGE LENGTH:					
TOTAL TURN LANE LENGTH:					

RECOMMENDED TURN LANE LENGTHS INCLUDE 50' DIVERGING TAPER

TURN LANE LENGTH CALCULATIONS

DESIGN YEAR 2050 'BUILD ALTERNATIVE 4' TRAFFIC VOLUMES - PM PEAK HOUR



PLEASANT VALLEY ROAD / I-77 NB RAMPS

ANTICIPATED CYCLE LENGTH: 120 SEC.

EB PLEASANT VALLEY ROAD

DESIGN SPEED: 35 MPH

MOVEMENT:	LEFT		THRU		
VOLUME:	373		793		
% OF APPROACH VOLUME:	32.0%		68.0%		
LANE GROUP:	LEFT		THRU		
LANE GROUP VOLUME:	373		793		
NUMBER OF LANES:	2		1		
VEHICLES PER CYCLE:	7		27		
CONTROLLING LANE GROUP:					
TAPER LENGTH:	50				
STORAGE LENGTH:	275		975		
TOTAL TURN LANE LENGTH:	325		975		

WB PLEASANT VALLEY ROAD

DESIGN SPEED: 35 MPH

MOVEMENT:			THRU		RIGHT
VOLUME:			938		587
% OF APPROACH VOLUME:			61.5%		38.5%
LANE GROUP:			THRU		RIGHT
LANE GROUP VOLUME:			938		587
NUMBER OF LANES:			2		1
VEHICLES PER CYCLE:			16		20
CONTROLLING LANE GROUP:					
TAPER LENGTH:					50
STORAGE LENGTH:			550		675
TOTAL TURN LANE LENGTH:			550		725

MOVEMENT:					
VOLUME:					
% OF APPROACH VOLUME:					
LANE GROUP:					
LANE GROUP VOLUME:					
NUMBER OF LANES:					
VEHICLES PER CYCLE:					
CONTROLLING LANE GROUP:					
TAPER LENGTH:					
STORAGE LENGTH:					
TOTAL TURN LANE LENGTH:					

MOVEMENT:					
VOLUME:					
% OF APPROACH VOLUME:					
LANE GROUP:					
LANE GROUP VOLUME:					
NUMBER OF LANES:					
VEHICLES PER CYCLE:					
CONTROLLING LANE GROUP:					
TAPER LENGTH:					
STORAGE LENGTH:					
TOTAL TURN LANE LENGTH:					

RECOMMENDED TURN LANE LENGTHS INCLUDE 50' DIVERGING TAPER

TURN LANE LENGTH CALCULATIONS

DESIGN YEAR 2050 'BUILD ALTERNATIVE 5' TRAFFIC VOLUMES - AM PEAK HOUR



PLEASANT VALLEY ROAD / I-77 NB RAMPS

ANTICIPATED CYCLE LENGTH: 120 SEC.

EB PLEASANT VALLEY ROAD

DESIGN SPEED: 35 MPH

MOVEMENT:	LEFT		THRU		
VOLUME:	1158		934		
% OF APPROACH VOLUME:	55.4%		44.6%		
LANE GROUP:	LEFT		THRU		
LANE GROUP VOLUME:	1158		934		
NUMBER OF LANES:	2		2		
VEHICLES PER CYCLE:	20		16		
CONTROLLING LANE GROUP:					
TAPER LENGTH:	50				
STORAGE LENGTH:	675		550		
TOTAL TURN LANE LENGTH:	725		550		

WB PLEASANT VALLEY ROAD

DESIGN SPEED: 35 MPH

MOVEMENT:			THRU		RIGHT
VOLUME:			467		421
% OF APPROACH VOLUME:			52.6%		47.4%
LANE GROUP:			THRU		RIGHT
LANE GROUP VOLUME:			467		421
NUMBER OF LANES:			2		1
VEHICLES PER CYCLE:			8		15
CONTROLLING LANE GROUP:					
TAPER LENGTH:					50
STORAGE LENGTH:			325		525
TOTAL TURN LANE LENGTH:			325		575

MOVEMENT:					
VOLUME:					
% OF APPROACH VOLUME:					
LANE GROUP:					
LANE GROUP VOLUME:					
NUMBER OF LANES:					
VEHICLES PER CYCLE:					
CONTROLLING LANE GROUP:					
TAPER LENGTH:					
STORAGE LENGTH:					
TOTAL TURN LANE LENGTH:					

MOVEMENT:					
VOLUME:					
% OF APPROACH VOLUME:					
LANE GROUP:					
LANE GROUP VOLUME:					
NUMBER OF LANES:					
VEHICLES PER CYCLE:					
CONTROLLING LANE GROUP:					
TAPER LENGTH:					
STORAGE LENGTH:					
TOTAL TURN LANE LENGTH:					

RECOMMENDED TURN LANE LENGTHS INCLUDE 50' DIVERGING TAPER

TURN LANE LENGTH CALCULATIONS

DESIGN YEAR 2050 'BUILD ALTERNATIVE 5' TRAFFIC VOLUMES - PM PEAK HOUR



PLEASANT VALLEY ROAD / I-77 NB RAMPS

ANTICIPATED CYCLE LENGTH: 120 SEC.

EB PLEASANT VALLEY ROAD

DESIGN SPEED: 35 MPH

MOVEMENT:	LEFT		THRU		
VOLUME:	373		793		
% OF APPROACH VOLUME:	32.0%		68.0%		
LANE GROUP:	LEFT		THRU		
LANE GROUP VOLUME:	373		793		
NUMBER OF LANES:	2		2		
VEHICLES PER CYCLE:	7		14		
CONTROLLING LANE GROUP:					
TAPER LENGTH:	50				
STORAGE LENGTH:	275		500		
TOTAL TURN LANE LENGTH:	325		500		

WB PLEASANT VALLEY ROAD

DESIGN SPEED: 35 MPH

MOVEMENT:			THRU		RIGHT
VOLUME:			938		587
% OF APPROACH VOLUME:			61.5%		38.5%
LANE GROUP:			THRU		RIGHT
LANE GROUP VOLUME:			938		587
NUMBER OF LANES:			2		1
VEHICLES PER CYCLE:			16		20
CONTROLLING LANE GROUP:					
TAPER LENGTH:					50
STORAGE LENGTH:			550		675
TOTAL TURN LANE LENGTH:			550		725

MOVEMENT:					
VOLUME:					
% OF APPROACH VOLUME:					
LANE GROUP:					
LANE GROUP VOLUME:					
NUMBER OF LANES:					
VEHICLES PER CYCLE:					
CONTROLLING LANE GROUP:					
TAPER LENGTH:					
STORAGE LENGTH:					
TOTAL TURN LANE LENGTH:					

MOVEMENT:					
VOLUME:					
% OF APPROACH VOLUME:					
LANE GROUP:					
LANE GROUP VOLUME:					
NUMBER OF LANES:					
VEHICLES PER CYCLE:					
CONTROLLING LANE GROUP:					
TAPER LENGTH:					
STORAGE LENGTH:					
TOTAL TURN LANE LENGTH:					

RECOMMENDED TURN LANE LENGTHS INCLUDE 50' DIVERGING TAPER

APPENDIX G
'NO-BUILD' HCS INTERSECTION CAPACITY ANALYSIS

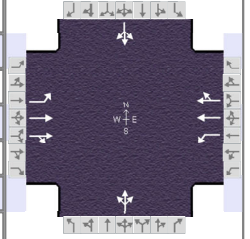
OPENING YEAR 2030

HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Seven Hills	Time Period	AM Peak Hour	PHF	0.86
Urban Street	Pleasant Valley Road	Analysis Year	2030 'No-Build'	Analysis Period	1> 7:00
Intersection	Edgewood Lane / Ludwi...	File Name	01 2030 AM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



A diagram of a four-way intersection. It shows a central square with a north arrow pointing upwards. Arrows indicate traffic flow: straight through, left turn, and right turn for each of the four approaches. The diagram is surrounded by a grid of small squares, likely representing a street grid or property lots.



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	3	1574	6	8	549	4	9	1	66	26	0	4

Signal Information											
Cycle, s	81.3	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	Yes	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	3	1574	6	8	549	4	9	1	66	26	0	4
Initial Queue (Q_0), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h	None			None			None			None		
Heavy Vehicles (P_{HV}), %	1	1		4	4			2			8	
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0		12.0	12.0			12.0			12.0	
Turn Bay Length, ft	95	999		90	999			450			499	
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35	35	35	35	35	25	25	25	25	25	25

Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	15.0	60.0	15.0	60.0		20.0		20.0
Yellow Change Interval (Y), s	4.0	4.0	4.0	4.0		4.0		4.0
Red Clearance Interval (R_c), s	1.0	1.0	1.0	1.0		1.0		1.0
Minimum Green (G_{min}), s	7	20	7	20		10		10
Start-Up Lost Time (l_t), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	3.0	3.0	3.0	3.0		3.0		3.0
Recall Mode	Off	Min	Off	Min		Off		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk ($Walk$), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No		0.50	No		0.50	No		0.50	No		0.50

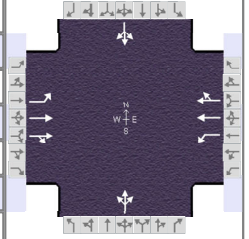
HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group		
Analyst	Ryan Barco	Analysis Date	May 10, 2024
Jurisdiction	City of Seven Hills	Time Period	AM Peak Hour
Urban Street	Pleasant Valley Road	Analysis Year	2030 'No-Build'
Intersection	Edgewood Lane / Ludwi...	File Name	01 2030 AM No-Build Capacity Analysis Pleasant...
Project Description	I-77 / Pleasant Valley Road		

Intersection Information

Duration, h	0.250
Area Type	Other
PHF	0.86
Analysis Period	1> 7:00



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	3	1574	6	8	549	4	9	1	66	26	0	4

Signal Information

Cycle, s	81.3	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	Off

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	4.0	1.1	4.0		12.0		12.0
Phase Duration, s	5.5	50.9	6.3	51.7		13.7		10.5
Change Period, ($Y+R_c$), s	5.0	5.0	5.0	5.0		5.0		5.0
Max Allow Headway (MAH), s	4.1	4.0	4.1	4.0		4.5		4.3
Queue Clearance Time (g_s), s	2.1	35.8	2.2	9.3		6.2		3.6
Green Extension Time (g_e), s	0.0	10.0	0.0	2.4		0.2		0.1
Phase Call Probability	0.08	1.00	0.19	1.00		0.86		0.55
Max Out Probability	0.00	0.28	0.00	0.00		0.00		0.00

Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	3	919	918	9	322	321		88			35	
Adjusted Saturation Flow Rate (s), veh/h/ln	1795	1885	1883	1753	1841	1836		1609			1669	
Queue Service Time (g_s), s	0.1	33.7	33.8	0.2	7.3	7.3		4.2			1.6	
Cycle Queue Clearance Time (g_c), s	0.1	33.7	33.8	0.2	7.3	7.3		4.2			1.6	
Green Ratio (g/C)	0.57	0.56	0.56	0.58	0.57	0.57		0.11			0.07	
Capacity (c), veh/h	466	1064	1062	154	1057	1054		171			112	
Volume-to-Capacity Ratio (X)	0.007	0.864	0.865	0.060	0.305	0.305		0.516			0.311	
Back of Queue (Q), ft/ln (95 th percentile)	1	491	488	3	120	116		80			34	
Back of Queue (Q), veh/ln (95 th percentile)	0.0	19.5	19.5	0.1	4.7	4.6		3.2			1.3	
Queue Storage Ratio (RQ) (95 th percentile)	0.01	0.49	0.49	0.03	0.12	0.12		0.18			0.07	
Uniform Delay (d_1), s/veh	7.9	15.1	15.1	14.5	8.9	8.9		34.4			36.2	
Incremental Delay (d_2), s/veh	0.0	4.7	4.7	0.2	0.2	0.2		2.4			1.6	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Control Delay (d), s/veh	8.0	19.7	19.8	14.6	9.1	9.1		36.8			37.7	
Level of Service (LOS)	A	B	B	B	A	A		D			D	
Approach Delay, s/veh / LOS	19.8		B	9.2		A	36.8		D	37.7		D
Intersection Delay, s/veh / LOS	17.9						B					

Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

HCS Signalized Intersection Results Graphical Summary

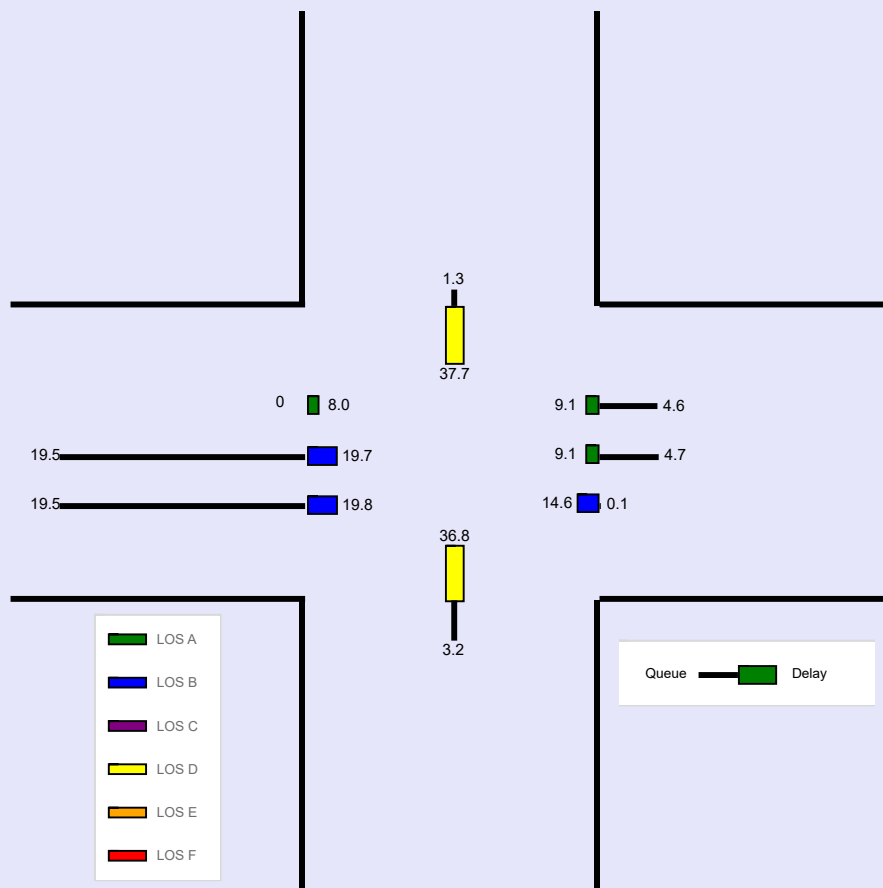
General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Seven Hills	Time Period	AM Peak Hour	PHF	0.86
Urban Street	Pleasant Valley Road	Analysis Year	2030 'No-Build'	Analysis Period	1 > 7:00
Intersection	Edgewood Lane / Ludwi...	File Name	01 2030 AM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				

The diagram illustrates a four-way intersection with a central green area. Arrows indicate traffic flow: Northbound (top), Southbound (bottom), Eastbound (right), and Westbound (left). Lane markings and traffic signals are shown at each approach. The intersection is labeled with 'N', 'S', 'E', and 'W' in the center.

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	3	1574	6	8	549	4	9	1	66	26	0	4

Signal Information																			
Cycle, s	81.3	Reference Phase	2																
Offset, s	0	Reference Point	End		Green	0.5	0.8	45.9	5.5	8.7	0.0	1	2	3	4				
Uncoordinated	Yes	Simult. Gap E/W	On		Yellow	4.0	0.0	4.0	4.0	4.0	0.0								
Force Mode	Fixed	Simult. Gap N/S	Off		Red	1.0	0.0	1.0	1.0	1.0	0.0					5	6	7	8

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	1	491	488	3	120	116		80			34	
Back of Queue (Q), veh/ln (95 th percentile)	0.0	19.5	19.5	0.1	4.7	4.6		3.2			1.3	
Queue Storage Ratio (RQ) (95 th percentile)	0.01	0.49	0.49	0.03	0.12	0.12		0.18			0.07	
Control Delay (d), s/veh	8.0	19.7	19.8	14.6	9.1	9.1		36.8			37.7	
Level of Service (LOS)	A	B	B	B	A	A		D			D	
Approach Delay, s/veh / LOS	19.8		B	9.2		A	36.8		D	37.7		D
Intersection Delay, s/veh / LOS	17.9						B					

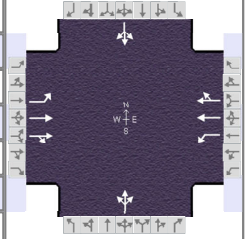


HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Seven Hills	Time Period	PM Peak Hour	PHF	0.96
Urban Street	Pleasant Valley Road	Analysis Year	2030 'No-Build'	Analysis Period	1> 7:00
Intersection	Edgewood Lane / Ludwi...	File Name	02 2030 PM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



A diagram of a four-way intersection. It shows a central square with a north arrow pointing upwards. Arrows indicate traffic flow: straight through, left turn, and right turn for all four approaches. The diagram is surrounded by a grid of small squares, likely representing a street grid or property lots.



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	3	741	19	101	1657	27	14	1	30	16	0	6

Signal Information											
Cycle, s	67.9	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	Yes	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	3	741	19	101	1657	27	14	1	30	16	0	6
Initial Queue (Q_0), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h	None			None			None			None		
Heavy Vehicles (P_{HV}), %	2	2		0	0			0			6	
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0		12.0	12.0			12.0			12.0	
Turn Bay Length, ft	95	999		90	999			450			499	
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35	35	35	35	35	25	25	25	25	25	25

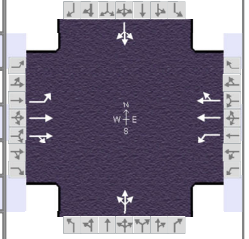
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	15.0	60.0	15.0	60.0		20.0		20.0
Yellow Change Interval (Y), s	4.0	4.0	4.0	4.0		4.0		4.0
Red Clearance Interval (R_c), s	1.0	1.0	1.0	1.0		1.0		1.0
Minimum Green (G_{min}), s	7	20	7	20		10		10
Start-Up Lost Time (l_t), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	3.0	3.0	3.0	3.0		3.0		3.0
Recall Mode	Off	Min	Off	Min		Off		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk ($Walk$), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Seven Hills	Time Period	PM Peak Hour	PHF	0.96
Urban Street	Pleasant Valley Road	Analysis Year	2030 'No-Build'	Analysis Period	1> 7:00
Intersection	Edgewood Lane / Ludwi...	File Name	02 2030 PM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	3	741	19	101	1657	27	14	1	30	16	0	6

Signal Information

Cycle, s	67.9	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	0.4	0.6	32.4	3.5	5.9	0.0		
Force Mode	Fixed	Simult. Gap N/S	Off	Yellow	4.0	4.0	4.0	4.0	4.0	0.0		
				Red	1.0	1.0	1.0	1.0	1.0	0.0		

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	4.0	1.1	4.0		12.0		12.0
Phase Duration, s	5.4	37.4	11.0	43.1		10.9		8.5
Change Period, ($Y+R_c$), s	5.0	5.0	5.0	5.0		5.0		5.0
Max Allow Headway (MAH), s	4.1	4.0	4.1	4.0		4.4		4.3
Queue Clearance Time (g_s), s	2.1	11.6	3.7	27.8		3.8		2.9
Green Extension Time (g_e), s	0.0	3.1	0.2	10.2		0.1		0.0
Phase Call Probability	0.06	1.00	0.86	1.00		0.59		0.35
Max Out Probability	0.00	0.00	0.00	0.14		0.00		0.00

Movement Group Results

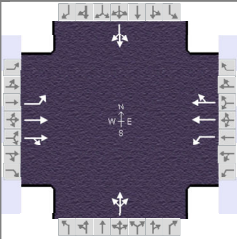
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	3	398	394	105	878	876		47			23	
Adjusted Saturation Flow Rate (s), veh/h/ln	1781	1870	1854	1810	1900	1889		1673			1668	
Queue Service Time (g_s), s	0.1	9.6	9.6	1.7	25.6	25.8		1.8			0.9	
Cycle Queue Clearance Time (g_c), s	0.1	9.6	9.6	1.7	25.6	25.8		1.8			0.9	
Green Ratio (g/C)	0.48	0.48	0.48	0.60	0.56	0.56		0.09			0.05	
Capacity (c), veh/h	158	894	886	503	1066	1060		145			87	
Volume-to-Capacity Ratio (X)	0.020	0.445	0.445	0.209	0.824	0.827		0.323			0.264	
Back of Queue (Q), ft/ln (95 th percentile)	1	160	156	24	349	350		34			18	
Back of Queue (Q), veh/ln (95 th percentile)	0.0	6.3	6.2	1.0	14.0	14.0		1.4			0.7	
Queue Storage Ratio (RQ) (95 th percentile)	0.01	0.16	0.16	0.27	0.35	0.35		0.08			0.04	
Uniform Delay (d_1), s/veh	12.7	11.8	11.8	7.0	12.2	12.2		29.2			31.0	
Incremental Delay (d_2), s/veh	0.0	0.3	0.4	0.2	1.9	2.0		1.3			1.6	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Control Delay (d), s/veh	12.8	12.1	12.1	7.2	14.1	14.2		30.4			32.6	
Level of Service (LOS)	B	B	B	A	B	B		C			C	
Approach Delay, s/veh / LOS	12.1	B		13.8	B		30.4	C		32.6	C	
Intersection Delay, s/veh / LOS	13.7						B					

Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

HCS Signalized Intersection Results Graphical Summary

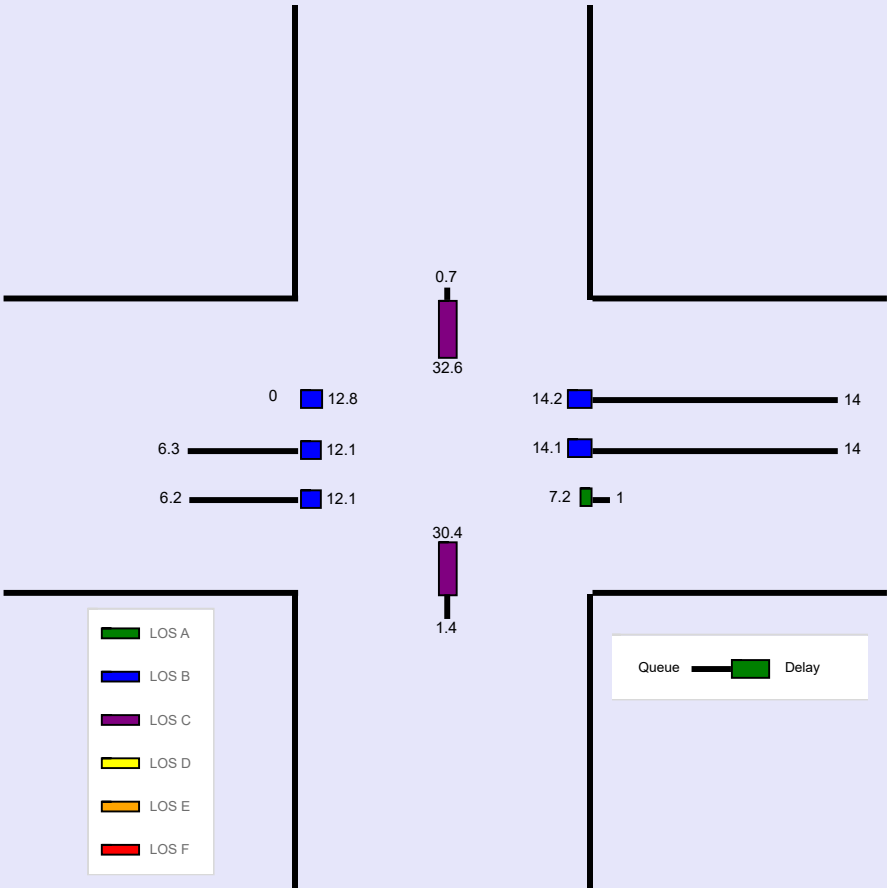
General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Seven Hills	Time Period	PM Peak Hour	PHF	0.96
Urban Street	Pleasant Valley Road	Analysis Year	2030 'No-Build'	Analysis Period	1> 7:00
Intersection	Edgewood Lane / Ludwi...	File Name	02 2030 PM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	3	741	19	101	1657	27	14	1	30	16	0	6

Signal Information											
Cycle, s	67.9	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	Yes	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off								

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	1	160	156	24	349	350		34			18	
Back of Queue (Q), veh/ln (95 th percentile)	0.0	6.3	6.2	1.0	14.0	14.0		1.4			0.7	
Queue Storage Ratio (RQ) (95 th percentile)	0.01	0.16	0.16	0.27	0.35	0.35		0.08			0.04	
Control Delay (d), s/veh	12.8	12.1	12.1	7.2	14.1	14.2		30.4			32.6	
Level of Service (LOS)	B	B	B	A	B	B		C			C	
Approach Delay, s/veh / LOS	12.1		B	13.8		B	30.4		C	32.6		C
Intersection Delay, s/veh / LOS	13.7						B					

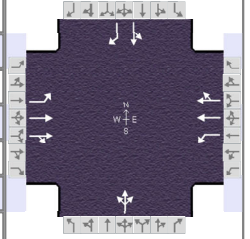


HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.91
Urban Street	Pleasant Valley Road	Analysis Year	2030 'No-Build'	Analysis Period	1> 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	03 2030 AM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



A diagram of a four-way intersection. A north arrow is in the center, pointing upwards. Arrows indicate traffic flow: straight through, left turn, and right turn for all four approaches. The diagram is surrounded by a grid of small squares, likely representing a street grid or property lots.



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	20	1339	378	149	376	47	202	11	429	62	46	10

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	20	1339	378	149	376	47	202	11	429	62	46	10
Initial Queue (Q_0), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h	None			None			None			None		
Heavy Vehicles (P_{HV}), %	1	1		3	3			4			2	2
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	4	4	4	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0		12.0	12.0			12.0			12.0	12.0
Turn Bay Length, ft	105	2430		115	1025			150			499	110
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35	35	35	35	35	25	25	25	25	25	25

Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	18.0	54.0	12.0	48.0		36.0		18.0
Yellow Change Interval (Y), s	3.6	3.6	3.6	3.6		3.0		3.0
Red Clearance Interval (R_c), s	1.3	1.3	1.3	1.3		2.1		2.1
Minimum Green (G_{min}), s	5	20	5	20		10		7
Start-Up Lost Time (l_t), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.5	2.0	2.5	2.0		4.5		3.0
Recall Mode	Off	Min	Off	Min		Min		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk ($Walk$), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No		0.50	No		0.50	No		0.50	No		0.50

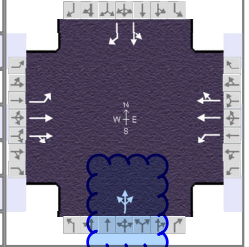
HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group		
Analyst	Ryan Barco	Analysis Date	May 10, 2024
Jurisdiction	City of Independence	Time Period	AM Peak Hour
Urban Street	Pleasant Valley Road	Analysis Year	2030 'No-Build'
Intersection	I-77 SB Ramps / Forest...	File Name	03 2030 AM No-Build Capacity Analysis Pleasant...
Project Description	I-77 / Pleasant Valley Road		

Intersection Information

Duration, h	0.250
Area Type	Other
PHF	0.91
Analysis Period	1 > 7:00



Demand Information

Approach Movement	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	20	1339	378	149	376	47	202	11	429	62	46	10

Signal Information

Cycle, s	120.0	Reference Phase	2											
Offset, s	0	Reference Point	End	Green	2.6	4.5	49.1	9.7	34.1	0.0				
Uncoordinated	No	Simult. Gap E/W	On	Yellow	3.6	0.0	3.6	3.0	3.0	0.0				
Force Mode	Fixed	Simult. Gap N/S	Off	Red	1.3	0.0	1.3	2.1	2.1	0.0				

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	4.0	1.1	4.0		12.0		11.0
Phase Duration, s	7.5	54.0	12.0	58.5		39.2		14.8
Change Period, ($Y+R_c$), s	4.9	4.9	4.9	4.9		5.1		5.1
Max Allow Headway (MAH), s	3.6	0.0	3.6	0.0		5.9		4.2
Queue Clearance Time (g_s), s	2.8		9.0			36.1		9.7
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0		0.0		0.1
Phase Call Probability	0.52		1.00			1.00		0.99
Max Out Probability	0.00		1.00			1.00		1.00

Movement Group Results

Approach Movement	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	22	754	1133	164	236	229		705			119	11
Adjusted Saturation Flow Rate (s), veh/h/ln	1795	1246	1768	1767	1856	1783		1620			1818	1585
Queue Service Time (g_s), s	0.8	49.1	49.1	7.0	7.4	7.5		34.1			7.7	0.8
Cycle Queue Clearance Time (g_c), s	0.8	49.1	49.1	7.0	7.4	7.5		34.1			7.7	0.8
Green Ratio (g/C)	0.43	0.41	0.41	0.48	0.45	0.45		0.28			0.08	0.08
Capacity (c), veh/h	442	510	723	165	829	797		461			147	128
Volume-to-Capacity Ratio (X)	0.050	1.480	1.566	0.993	0.284	0.288		1.531			0.809	0.086
Back of Queue (Q), ft/ln (95 th percentile)	16	1812	2790	252	143	136		1806			193	15
Back of Queue (Q), veh/ln (95 th percentile)	0.6	71.9	111.6	9.9	5.6	5.5		70.0			7.6	0.6
Queue Storage Ratio (RQ) (95 th percentile)	0.15	0.75	1.16	2.20	0.14	0.14		12.04			0.39	0.13
Uniform Delay (d_1), s/veh	19.8	35.5	35.5	31.1	14.9	14.9		42.9			54.3	51.1
Incremental Delay (d_2), s/veh	0.0	226.4	261.2	68.0	0.9	0.9		249.9			16.7	0.3
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	0.0
Control Delay (d), s/veh	19.8	261.9	296.7	99.2	15.8	15.9		292.8			71.0	51.4
Level of Service (LOS)	B	F	F	F	B	B		F			E	D
Approach Delay, s/veh / LOS	279.7		F	37.5		D		292.8		F	69.3	E
Intersection Delay, s/veh / LOS	229.2						F					

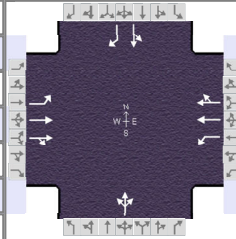
Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

HCS Signalized Intersection Results Graphical Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.91
Urban Street	Pleasant Valley Road	Analysis Year	2030 'No-Build'	Analysis Period	1> 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	03 2030 AM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

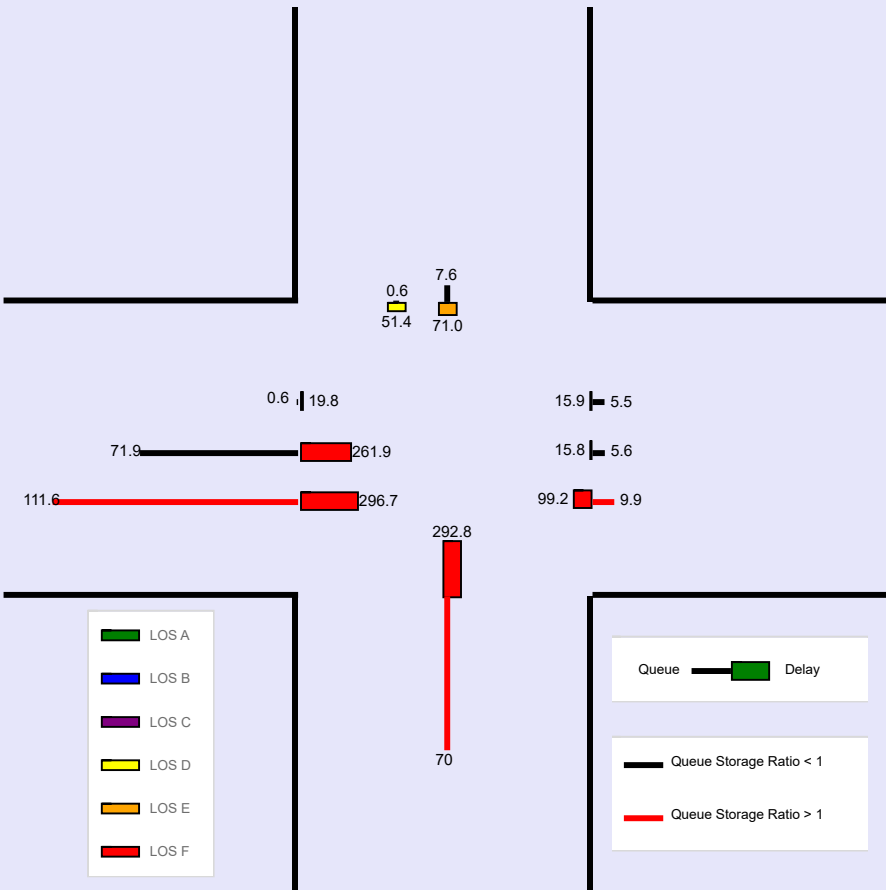
Approach Movement	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	20	1339	378	149	376	47	202	11	429	62	46	10

Signal Information

Cycle, s	120.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	No	Simult. Gap E/W	On	Green	2.6	4.5	49.1	9.7	34.1	0.0			
Force Mode	Fixed	Simult. Gap N/S	Off	Yellow	3.6	0.0	3.6	3.0	3.0	0.0			
				Red	1.3	0.0	1.3	2.1	2.1	0.0			

Movement Group Results

Approach Movement	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	16	1812	2790	252	143	136		1806			193	15
Back of Queue (Q), veh/ln (95 th percentile)	0.6	71.9	111.6	9.9	5.6	5.5		70.0			7.6	0.6
Queue Storage Ratio (RQ) (95 th percentile)	0.15	0.75	1.16	2.20	0.14	0.14		12.04			0.39	0.13
Control Delay (d), s/veh	19.8	261.9	296.7	99.2	15.8	15.9		292.8			71.0	51.4
Level of Service (LOS)	B	F	F	F	B	B		F			E	D
Approach Delay, s/veh / LOS	279.7		F	37.5		D		292.8		F	69.3	E
Intersection Delay, s/veh / LOS	229.2						F					

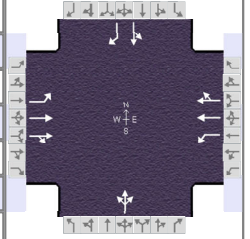


HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93
Urban Street	Pleasant Valley Road	Analysis Year	2030 'No-Build'	Analysis Period	1> 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	04 2030 PM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



A diagram of a four-way intersection. A north arrow is in the center, pointing upwards. Arrows indicate traffic flow: straight through, left turn, and right turn for each approach. The diagram is surrounded by a grid of small squares, likely representing a street grid or property lots.



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	26	567	173	241	909	103	806	64	427	26	32	28

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	26	567	173	241	909	103	806	64	427	26	32	28
Initial Queue (Q_0), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h	None			None			None			None		
Heavy Vehicles (P_{HV}), %	2	2		1	1			0			0	0
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	4	4	4	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0		12.0	12.0			12.0			12.0	12.0
Turn Bay Length, ft	105	2430		115	1025			150			499	110
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35	35	35	35	35	25	25	25	25	25	25

Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	16.8	30.0	16.8	30.0		57.6		15.6
Yellow Change Interval (Y), s	3.6	3.6	3.6	3.6		3.0		3.0
Red Clearance Interval (R_c), s	1.3	1.3	1.3	1.3		2.1		2.1
Minimum Green (G_{min}), s	5	20	5	20		10		7
Start-Up Lost Time (l_t), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.5	2.0	2.5	2.0		4.5		3.0
Recall Mode	Off	Min	Off	Min		Off		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk ($Walk$), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

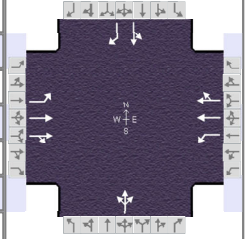
HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group		
Analyst	Ryan Barco	Analysis Date	May 10, 2024
Jurisdiction	City of Independence	Time Period	PM Peak Hour
Urban Street	Pleasant Valley Road	Analysis Year	2030 'No-Build'
Intersection	I-77 SB Ramps / Forest...	File Name	04 2030 PM No-Build Capacity Analysis Pleasant...
Project Description	I-77 / Pleasant Valley Road		

Intersection Information

Duration, h	0.250
Area Type	Other
PHF	0.93
Analysis Period	1> 7:00



Demand Information

Approach Movement	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	26	567	173	241	909	103	806	64	427	26	32	28

Signal Information

Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	Off

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	4.0	1.1	4.0		12.0		11.0
Phase Duration, s	7.9	30.0	16.8	38.9		61.4		11.8
Change Period, ($Y+R_c$), s	4.9	4.9	4.9	4.9		5.1		5.1
Max Allow Headway (MAH), s	3.6	0.0	3.6	0.0		5.8		4.3
Queue Clearance Time (g_s), s	3.5		13.9			58.3		5.9
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0		0.0		0.1
Phase Call Probability	0.61		1.00			1.00		0.95
Max Out Probability	0.00		1.00			1.00		0.78

Movement Group Results

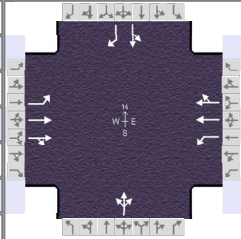
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	28	414	382	259	554	534		1395			62	30
Adjusted Saturation Flow Rate (s), veh/h/ln	1781	1870	1720	1795	1885	1817		1743			1858	1610
Queue Service Time (g_s), s	1.5	25.1	25.1	11.9	34.0	34.0		56.3			3.9	2.2
Cycle Queue Clearance Time (g_c), s	1.5	25.1	25.1	11.9	34.0	34.0		56.3			3.9	2.2
Green Ratio (g/C)	0.23	0.21	0.21	0.32	0.28	0.28		0.47			0.06	0.06
Capacity (c), veh/h	105	391	359	238	534	515		818			103	90
Volume-to-Capacity Ratio (X)	0.266	1.059	1.062	1.087	1.038	1.038		1.705			0.603	0.336
Back of Queue (Q), ft/ln (95 th percentile)	30	662	615	416	752	726		3773			91	42
Back of Queue (Q), veh/ln (95 th percentile)	1.2	26.1	24.6	16.5	29.8	29.1		150.9			3.6	1.7
Queue Storage Ratio (RQ) (95 th percentile)	0.29	0.27	0.26	3.62	0.73	0.71		25.15			0.18	0.38
Uniform Delay (d_1), s/veh	38.4	47.5	47.5	34.3	37.4	37.4		31.8			55.4	54.5
Incremental Delay (d_2), s/veh	1.0	62.0	64.8	83.3	49.1	50.0		322.6			5.5	2.2
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	0.0
Control Delay (d), s/veh	39.4	109.4	112.3	117.6	86.5	87.3		354.5			60.9	56.7
Level of Service (LOS)	D	F	F	F	F	F		F			E	E
Approach Delay, s/veh / LOS	108.4		F	92.8		F		354.5		F	59.5	E
Intersection Delay, s/veh / LOS				195.2							F	

Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

HCS Signalized Intersection Results Graphical Summary

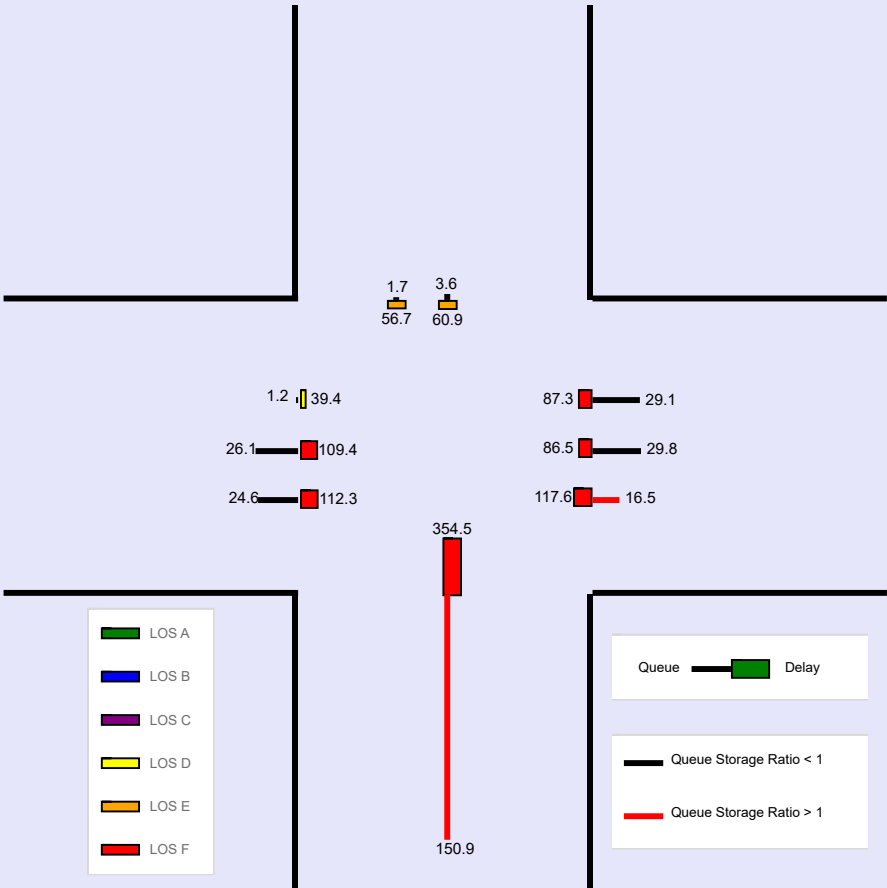
General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93
Urban Street	Pleasant Valley Road	Analysis Year	2030 'No-Build'	Analysis Period	1> 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	04 2030 PM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



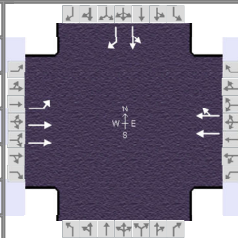
Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	26	567	173	241	909	103	806	64	427	26	32	28

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off								

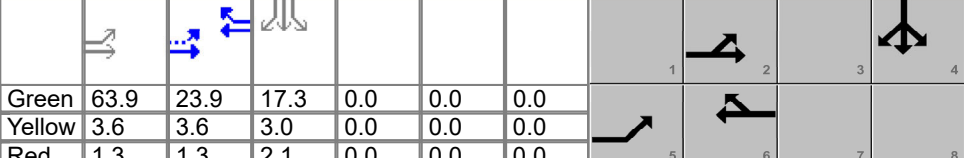
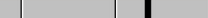
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	30	662	615	416	752	726		3773			91	42
Back of Queue (Q), veh/ln (95 th percentile)	1.2	26.1	24.6	16.5	29.8	29.1		150.9			3.6	1.7
Queue Storage Ratio (RQ) (95 th percentile)	0.29	0.27	0.26	3.62	0.73	0.71		25.15			0.18	0.38
Control Delay (d), s/veh	39.4	109.4	112.3	117.6	86.5	87.3		354.5			60.9	56.7
Level of Service (LOS)	D	F	F	F	F	F		F			E	E
Approach Delay, s/veh / LOS	108.4	F		92.8	F		354.5	F		59.5	E	
Intersection Delay, s/veh / LOS	195.2						F					



HCS Signalized Intersection Input Data

General Information				Intersection Information		
Agency	GPD Group			Duration, h	0.250	
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other	
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.90	
Urban Street	Pleasant Valley Road	Analysis Year	2030 'No-Build'	Analysis Period	1> 7:00	
Intersection	I-77 NB Ramps	File Name	05 2030 AM No-Build Capacity Analysis Pleasant...			
Project Description	I-77 / Pleasant Valley Road					

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	1013	817			409	368				186	0	163

Signal Information												
Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End	Green	63.9	23.9	17.3	0.0	0.0	0.0		
Uncoordinated	No	Simult. Gap E/W	On	Yellow	3.6	3.6	3.0	0.0	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.3	1.3	2.1	0.0	0.0	0.0		

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	1013	817			409	368				186	0	163
Initial Queue (Q_0), veh/h	0	0			0	0				0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900			1900	1900				1900	1900	1900
Parking (N_m), man/h		None			None						None	
Heavy Vehicles (P_{HV}), %	1	1			6						5	2
Ped / Bike / RTOR, /h	0	0			0	0	0	0		0	0	0
Buses (N_b), buses/h	0	0	0		0	0	0			0	0	0
Arrival Type (AT)	4	4			4	4				3	3	3
Upstream Filtering (I)	1.00	1.00			1.00	1.00				1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0			12.0					12.0	12.0	
Turn Bay Length, ft	250	1025			1950					140	0	
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35			35	35				25	25	25

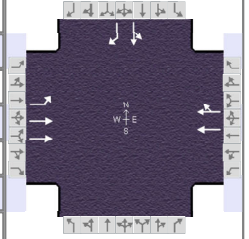
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	62.4	91.2		28.8				28.8
Yellow Change Interval (Y), s	3.6	3.6		3.6				3.0
Red Clearance Interval (R_c), s	1.3	1.3		1.3				2.1
Minimum Green (G_{min}), s	5	10		10				10
Start-Up Lost Time (l_t), s	2.0	2.0		2.0			2.0	2.0
Extension of Effective Green (e), s	2.0	2.0		2.0			2.0	2.0
Passage (PT), s	5.0	2.0		2.0				4.0
Recall Mode	Off	Min		Min				Off
Dual Entry	No	Yes		Yes				Yes
Walk ($Walk$), s				0.0		0.0		0.0
Pedestrian Clearance Time (PC), s				0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius				0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft				9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0		No	0.0	0	No		0		0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0				12.0	5.0	2.0
Pedestrian Signal / Occupied Parking		0.50	No		0.50	No				No		0.50

HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.90
Urban Street	Pleasant Valley Road	Analysis Year	2030 'No-Build'	Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	05 2030 AM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	1013	817			409	368				186	0	163

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	63.9	23.9	17.3	0.0	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.6	3.6	3.0	0.0	0.0	0.0		
				Red	1.3	1.3	2.1	0.0	0.0	0.0		

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6				4
Case Number	1.0	4.0		8.3				11.0
Phase Duration, s	68.8	97.6		28.8				22.4
Change Period, ($Y+R_c$), s	4.9	4.9		4.9				5.1
Max Allow Headway (MAH), s	6.1	0.0		0.0				5.4
Queue Clearance Time (g_s), s	65.9							15.9
Green Extension Time (g_e), s	0.0	0.0		0.0				1.4
Phase Call Probability	1.00							1.00
Max Out Probability	1.00							0.47

Movement Group Results

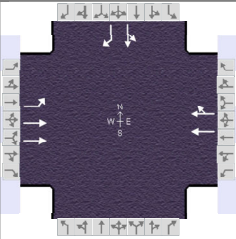
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16				7	4	14
Adjusted Flow Rate (v), veh/h	1126	908			454	409				207	181	
Adjusted Saturation Flow Rate (s), veh/h/ln	1795	1795			1811	1535				1739		
Queue Service Time (g_s), s	63.9	0.0			30.4	23.9				13.9		
Cycle Queue Clearance Time (g_c), s	63.9	0.0			30.4	23.9				13.9		
Green Ratio (g/C)	0.75	0.77			0.20	0.20				0.14		
Capacity (c), veh/h	1017	2774			361	306				250		
Volume-to-Capacity Ratio (X)	1.107	0.327			1.260	1.337				0.826		
Back of Queue (Q), ft/ln (95 th percentile)	1198	6			932	887				294		
Back of Queue (Q), veh/ln (95 th percentile)	47.5	0.2			35.6	35.5				11.3		
Queue Storage Ratio (RQ) (95 th percentile)	4.79	0.01			0.48	0.48				2.10		
Uniform Delay (d_1), s/veh	13.7	0.0			44.1	44.1				49.9		
Incremental Delay (d_2), s/veh	62.4	0.3			137.4	172.4				13.1		
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0				0.0		
Control Delay (d), s/veh	76.1	0.3			181.5	216.5				63.1	0.0	
Level of Service (LOS)	F	A			F	F				E	A	
Approach Delay, s/veh / LOS	42.3		D		198.1	F	0.0			33.6		C
Intersection Delay, s/veh / LOS				82.2						F		

Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

HCS Signalized Intersection Results Graphical Summary

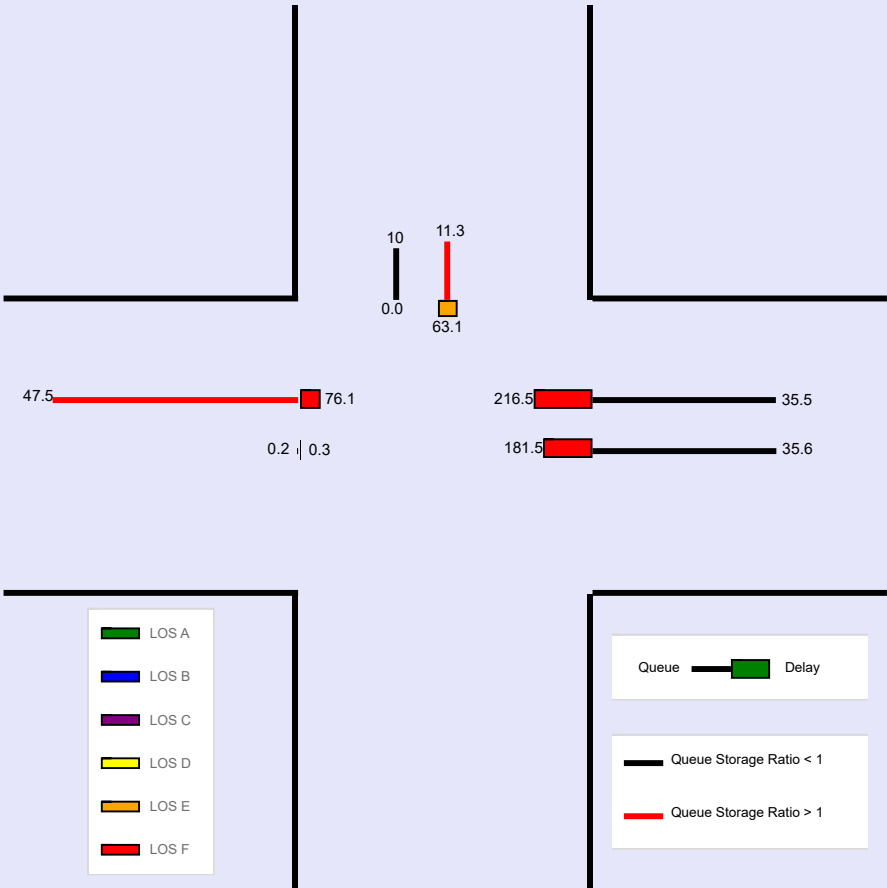
General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.90
Urban Street	Pleasant Valley Road	Analysis Year	2030 'No-Build'	Analysis Period	1 > 7:00
Intersection	I-77 NB Ramps	File Name	05 2030 AM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	1013	817			409	368				186	0	163

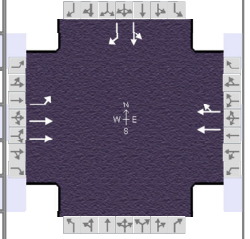
Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On								

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	1198	6			932	887					294	
Back of Queue (Q), veh/ln (95 th percentile)	47.5	0.2			35.6	35.5					11.3	
Queue Storage Ratio (RQ) (95 th percentile)	4.79	0.01			0.48	0.48					2.10	
Control Delay (d), s/veh	76.1	0.3			181.5	216.5					63.1	0.0
Level of Service (LOS)	F	A			F	F					E	A
Approach Delay, s/veh / LOS	42.3		D	198.1		F	0.0			33.6		C
Intersection Delay, s/veh / LOS	82.2						F					



HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.96
Urban Street	Pleasant Valley Road	Analysis Year	2030 'No-Build'	Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	06 2030 PM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	326	694			820	513				112	0	433

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	326	694			820	513				112	0	433
Initial Queue (Q_0), veh/h	0	0			0	0				0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900			1900	1900				1900	1900	1900
Parking (N_m), man/h		None			None						None	
Heavy Vehicles (P_{HV}), %	2	2			1						6	2
Ped / Bike / RTOR, /h	0	0			0	0	0	0			0	0
Buses (N_b), buses/h	0	0	0		0	0	0				0	0
Arrival Type (AT)	4	4			4	4					3	3
Upstream Filtering (I)	1.00	1.00			1.00	1.00					1.00	1.00
Lane Width (W), ft	12.0	12.0			12.0						12.0	12.0
Turn Bay Length, ft	250	1025			1950						140	0
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35			35	35					25	25

Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	36.0	84.0		48.0				36.0
Yellow Change Interval (Y), s	3.6	3.6		3.6				3.0
Red Clearance Interval (R_c), s	1.3	1.3		1.3				2.1
Minimum Green (G_{min}), s	5	10		10				10
Start-Up Lost Time (l_t), s	2.0	2.0		2.0			2.0	2.0
Extension of Effective Green (e), s	2.0	2.0		2.0			2.0	2.0
Passage (PT), s	5.0	2.0		2.0				4.0
Recall Mode	Off	Min		Min				Off
Dual Entry	No	Yes		Yes				Yes
Walk ($Walk$), s				0.0		0.0		0.0
Pedestrian Clearance Time (PC), s				0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius				0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft				9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0		No	0.0	0	No		0		0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0				12.0	5.0	2.0
Pedestrian Signal / Occupied Parking			0.50	No		0.50	No			No		0.50

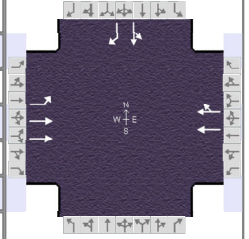
HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group		
Analyst	Ryan Barco	Analysis Date	May 10, 2024
Jurisdiction	City of Independence	Time Period	PM Peak Hour
Urban Street	Pleasant Valley Road	Analysis Year	2030 'No-Build'
Intersection	I-77 NB Ramps	File Name	06 2030 PM No-B
Project Description	I-77 / Pleasant Valley Road		

Intersection Information

Duration, h	0.250
Area Type	Other
PHF	0.96
Analysis Period	1> 7:00



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	326	694			820	513				112	0	433

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6				4
Case Number	1.0	4.0		8.3				11.0
Phase Duration, s	25.2	84.0		58.8				36.0
Change Period, ($Y+R_c$), s	4.9	4.9		4.9				5.1
Max Allow Headway (MAH), s	6.1	0.0		0.0				5.4
Queue Clearance Time (g_s), s	18.2							32.9
Green Extension Time (g_e), s	2.1	0.0		0.0				0.0
Phase Call Probability	1.00							1.00
Max Out Probability	0.16							1.00

Movement Group Results

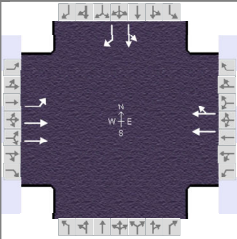
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16				7	4	14
Adjusted Flow Rate (v), veh/h	340	723			734	655					117	451
Adjusted Saturation Flow Rate (s), veh/h/ln	1781	1781			1885	1644					1725	
Queue Service Time (g_s), s	16.2	4.0			46.5	40.9					6.5	
Cycle Queue Clearance Time (g_c), s	16.2	4.0			46.5	40.9					6.5	
Green Ratio (g/C)	0.64	0.66			0.45	0.45					0.26	
Capacity (c), veh/h	385	2347			847	738					444	
Volume-to-Capacity Ratio (X)	0.881	0.308			0.866	0.887					0.263	
Back of Queue (Q), ft/ln (95 th percentile)	405	57			593	562					133	
Back of Queue (Q), veh/ln (95 th percentile)	15.9	2.3			23.5	22.5					5.1	
Queue Storage Ratio (RQ) (95 th percentile)	1.62	0.06			0.30	0.29					0.95	
Uniform Delay (d_1), s/veh	31.8	2.7			21.1	21.5					35.5	
Incremental Delay (d_2), s/veh	15.9	0.3			11.6	14.8					0.4	
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0					0.0	
Control Delay (d), s/veh	47.6	3.1			32.6	36.3					35.9	0.0
Level of Service (LOS)	D	A			C	D					D	A
Approach Delay, s/veh / LOS	17.3	B		34.4	C		0.0			7.4	A	
Intersection Delay, s/veh / LOS	23.3						C					

Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

HCS Signalized Intersection Results Graphical Summary

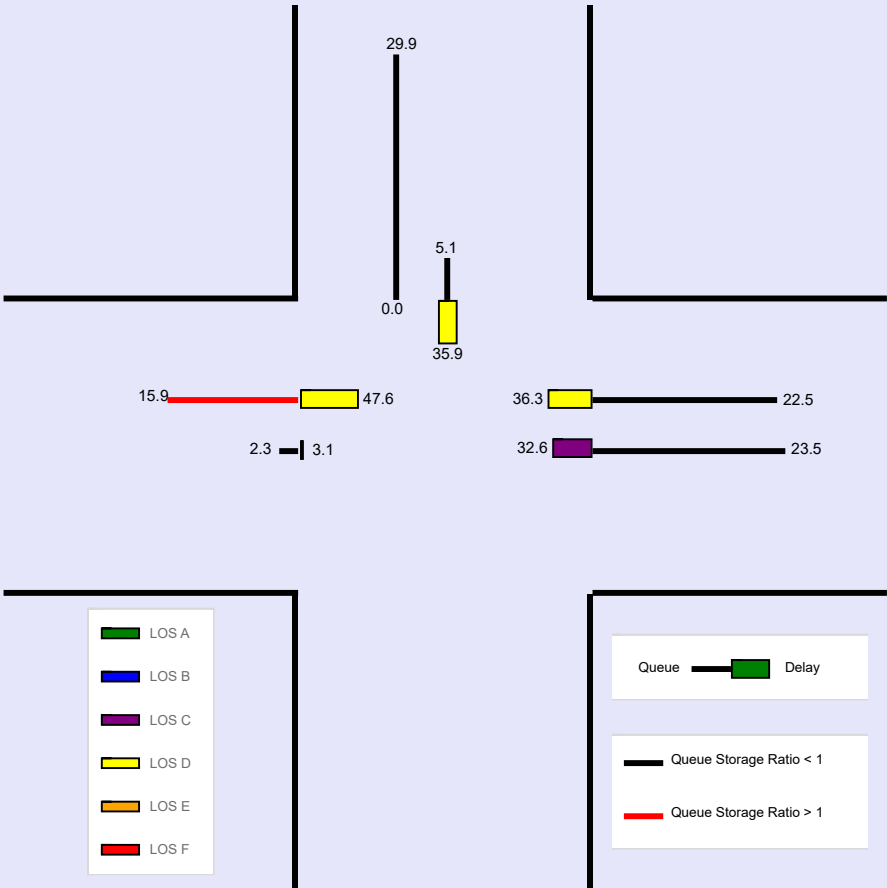
General Information					Intersection Information	
Agency	GPD Group			Duration, h	0.250	
Analyst	Ryan Barco	Analysis Date	May 10, 2024		Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour		PHF	0.96
Urban Street	Pleasant Valley Road	Analysis Year	2030 'No-Build'		Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	06 2030 PM No-Build Capacity Analysis Pleasant...			
Project Description						
I-77 / Pleasant Valley Road						



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	326	694			820	513				112	0	433

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On								

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	405	57			593	562					133	
Back of Queue (Q), veh/ln (95 th percentile)	15.9	2.3			23.5	22.5					5.1	
Queue Storage Ratio (RQ) (95 th percentile)	1.62	0.06			0.30	0.29					0.95	
Control Delay (d), s/veh	47.6	3.1			32.6	36.3					35.9	0.0
Level of Service (LOS)	D	A			C	D					D	A
Approach Delay, s/veh / LOS	17.3		B	34.4		C	0.0			7.4		A
Intersection Delay, s/veh / LOS	23.3						C					

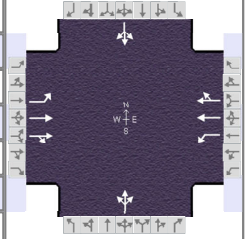


HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.92
Urban Street	Pleasant Valley Road	Analysis Year	2030 'No-Build'	Analysis Period	1> 7:00
Intersection	Midland Road	File Name	07 2030 AM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



A diagram of a four-way intersection. It shows a central square with a north arrow pointing upwards. Arrows indicate traffic flow: straight through, left turn, and right turn for each of the four approaches. The diagram is surrounded by a grid of small squares, likely representing a street grid or zoning map.



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	4	1001	7	6	653	8	62	0	17	47	0	48

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	4	1001	7	6	653	8	62	0	17	47	0	48
Initial Queue (Q_0), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h	None			None			None			None		
Heavy Vehicles (P_{HV}), %	2	2		7	7			5			1	
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	4	4	4	4	4	4	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0		12.0	12.0			12.0			12.0	
Turn Bay Length, ft	90	499		90	499			350			300	
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35	35	35	35	35	25	25	25	25	25	25

Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	15.0	70.0	15.0	70.0		35.0		35.0
Yellow Change Interval (Y), s	3.6	3.6	3.6	3.6		2.8		2.8
Red Clearance Interval (R_c), s	1.0	1.0	1.0	1.0		2.3		2.3
Minimum Green (G_{min}), s	10	10	10	10		7		7
Start-Up Lost Time (l_t), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	3.0	2.0	3.0	2.0		3.0		3.0
Recall Mode	Off	Min	Off	Min		Off		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk ($Walk$), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

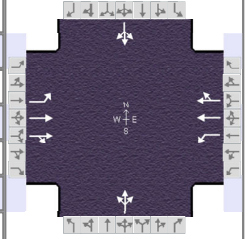
Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No		0.50	No		0.50	No		0.50	No		0.50

HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group		
Analyst	Ryan Barco	Analysis Date	May 10, 2024
Jurisdiction	City of Independence	Time Period	AM Peak Hour
Urban Street	Pleasant Valley Road	Analysis Year	2030 'No-Build'
Intersection	Midland Road	File Name	07 2030 AM No-B
Project Description	I-77 / Pleasant Valley Road		

Intersection Information



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	4	1001	7	6	653	8	62	0	17	47	0	48

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	4.0	1.1	4.0		8.0		8.0
Phase Duration, s	5.9	98.2	6.6	98.8		15.2		15.2
Change Period, ($Y+R_c$), s	4.6	4.6	4.6	4.6		5.1		5.1
Max Allow Headway (MAH), s	4.1	0.0	4.1	0.0		4.3		4.3
Queue Clearance Time (g_s), s	2.1		2.1			9.5		9.4
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0		0.6		0.6
Phase Call Probability	0.13		0.20			1.00		1.00
Max Out Probability	0.00		0.00			0.00		0.00

Movement Group Results

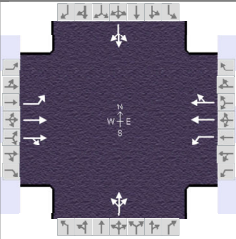
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	4	548	547	7	360	359		86			103	
Adjusted Saturation Flow Rate (s), veh/h/ln	1781	1870	1866	1711	1796	1788		1350			1594	
Queue Service Time (g_s), s	0.1	0.0	0.0	0.1	0.0	0.0		0.1			0.0	
Cycle Queue Clearance Time (g_c), s	0.1	0.0	0.0	0.1	0.0	0.0		7.5			7.4	
Green Ratio (g/C)	0.79	0.78	0.78	0.80	0.79	0.79		0.08			0.08	
Capacity (c), veh/h	644	1459	1456	474	1411	1405		167			179	
Volume-to-Capacity Ratio (X)	0.007	0.376	0.376	0.014	0.255	0.255		0.514			0.576	
Back of Queue (Q), ft/ln (95 th percentile)	1	14	14	1	8	8		125			146	
Back of Queue (Q), veh/ln (95 th percentile)	0.0	0.5	0.5	0.0	0.3	0.3		4.8			5.8	
Queue Storage Ratio (RQ) (95 th percentile)	0.01	0.03	0.03	0.01	0.02	0.02		0.36			0.49	
Uniform Delay (d_1), s/veh	2.6	0.0	0.0	2.5	0.0	0.0		53.7			53.7	
Incremental Delay (d_2), s/veh	0.0	0.7	0.7	0.0	0.4	0.4		2.4			2.9	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Control Delay (d), s/veh	2.6	0.7	0.7	2.5	0.4	0.4		56.1			56.6	
Level of Service (LOS)	A	A	A	A	A	A		E			E	
Approach Delay, s/veh / LOS	0.7		A	0.5		A	56.1		E	56.6		E
Intersection Delay, s/veh / LOS	5.9						A					

Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

HCS Signalized Intersection Results Graphical Summary

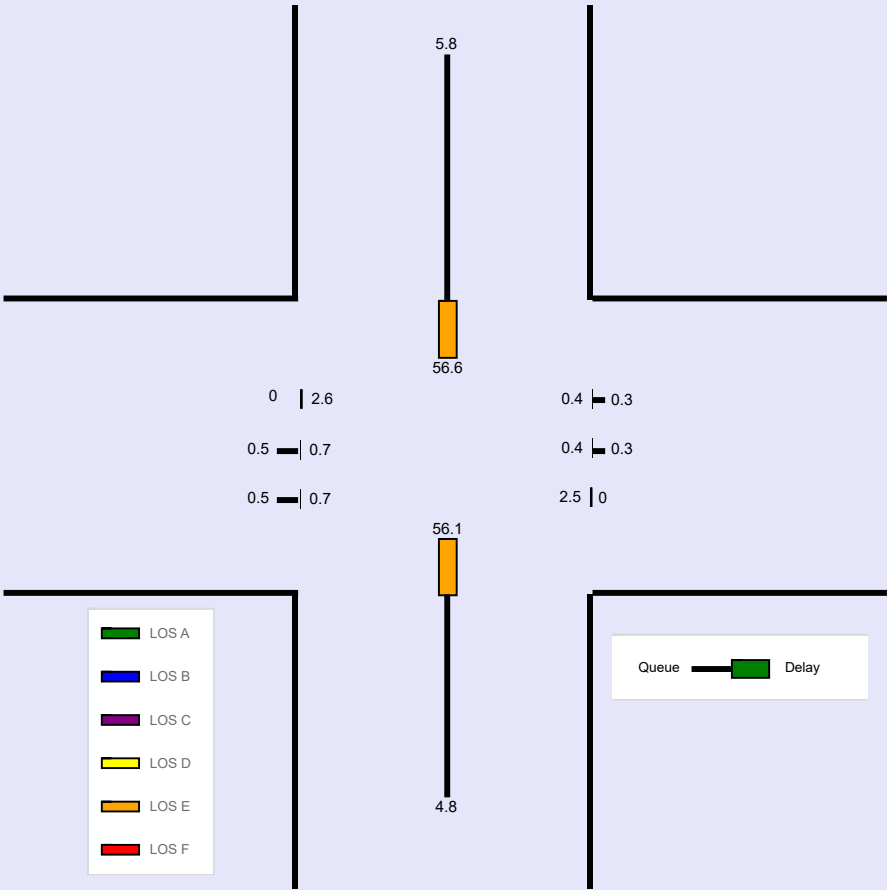
General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.92
Urban Street	Pleasant Valley Road	Analysis Year	2030 'No-Build'	Analysis Period	1> 7:00
Intersection	Midland Road	File Name	07 2030 AM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



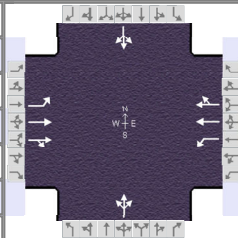
Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	4	1001	7	6	653	8	62	0	17	47	0	48

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On								

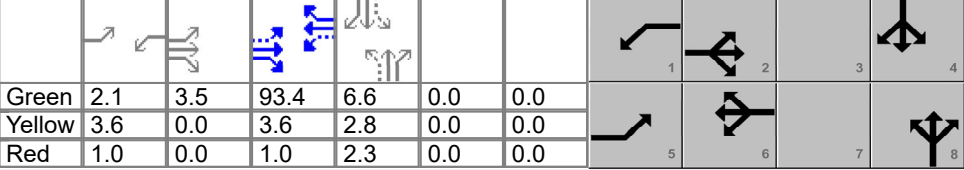
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	1	14	14	1	8	8		125			146	
Back of Queue (Q), veh/ln (95 th percentile)	0.0	0.5	0.5	0.0	0.3	0.3		4.8			5.8	
Queue Storage Ratio (RQ) (95 th percentile)	0.01	0.03	0.03	0.01	0.02	0.02		0.36			0.49	
Control Delay (d), s/veh	2.6	0.7	0.7	2.5	0.4	0.4		56.1			56.6	
Level of Service (LOS)	A	A	A	A	A	A		E			E	
Approach Delay, s/veh / LOS	0.7		A	0.5		A	56.1		E	56.6		E
Intersection Delay, s/veh / LOS	5.9						A					



HCS Signalized Intersection Input Data

General Information				Intersection Information		
Agency	GPD Group			Duration, h	0.250	
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other	
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93	
Urban Street	Pleasant Valley Road	Analysis Year	2030 'No-Build'	Analysis Period	1> 7:00	
Intersection	Midland Road	File Name	08 2030 PM No-Build Capacity Analysis Pleasant...			
Project Description	I-77 / Pleasant Valley Road					

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	46	711	60	10	1315	90	30	0	10	19	0	23

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On	Green	2.1	3.5	93.4	6.6	0.0	0.0	
				Yellow	3.6	0.0	3.6	2.8	0.0	0.0	
				Red	1.0	0.0	1.0	2.3	0.0	0.0	

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	46	711	60	10	1315	90	30	0	10	19	0	23
Initial Queue (Q_0), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h		None			None			None			None	
Heavy Vehicles (P_{HV}), %	3	3		1	1			3			0	
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	4	4	4	4	4	4	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0		12.0	12.0			12.0			12.0	
Turn Bay Length, ft	90	499		90	499			350			300	
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35	35	35	35	35	25	25	25	25	25	25

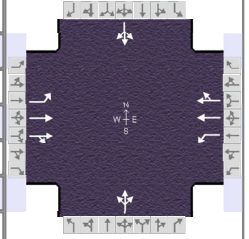
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	15.0	75.0	15.0	75.0		30.0		30.0
Yellow Change Interval (Y), s	3.6	3.6	3.6	3.6		2.8		2.8
Red Clearance Interval (R_c), s	1.0	1.0	1.0	1.0		2.3		2.3
Minimum Green (G_{min}), s	7	10	7	10		7		7
Start-Up Lost Time (l_t), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	3.0	2.0	3.0	2.0		3.0		3.0
Recall Mode	Off	Min	Off	Min		Off		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk ($Walk$), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No		0.50	No		0.50	No		0.50	No		0.50

HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93
Urban Street	Pleasant Valley Road	Analysis Year	2030 'No-Build'	Analysis Period	1> 7:00
Intersection	Midland Road	File Name	08 2030 PM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	46	711	60	10	1315	90	30	0	10	19	0	23

Signal Information

Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On	Green	2.1	3.5	93.4	6.6	0.0	0.0	
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.6	0.0	3.6	2.8	0.0	0.0	
				Red	1.0	0.0	1.0	2.3	0.0	0.0	

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	4.0	1.1	4.0		8.0		8.0
Phase Duration, s	10.3	101.6	6.7	98.0		11.7		11.7
Change Period, ($Y+R_c$), s	4.6	4.6	4.6	4.6		5.1		5.1
Max Allow Headway (MAH), s	4.1	0.0	4.1	0.0		4.3		4.3
Queue Clearance Time (g_s), s	2.6		2.1			5.3		5.1
Green Extension Time (g_e), s	0.1	0.0	0.0	0.0		0.2		0.2
Phase Call Probability	0.81		0.30			0.95		0.95
Max Out Probability	0.00		0.00			0.00		0.00

Movement Group Results

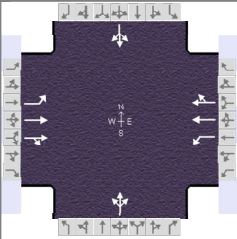
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	49	420	409	11	761	749		43			45	
Adjusted Saturation Flow Rate (s), veh/h/ln	1767	1856	1804	1795	1885	1842		1474			1602	
Queue Service Time (g_s), s	0.6	0.0	0.0	0.1	0.0	0.0		0.2			0.0	
Cycle Queue Clearance Time (g_c), s	0.6	0.0	0.0	0.1	0.0	0.0		3.3			3.1	
Green Ratio (g/C)	0.83	0.81	0.81	0.80	0.78	0.78		0.06			0.06	
Capacity (c), veh/h	411	1499	1458	611	1468	1434		134			132	
Volume-to-Capacity Ratio (X)	0.120	0.280	0.280	0.018	0.519	0.522		0.321			0.342	
Back of Queue (Q), ft/ln (95 th percentile)	6	9	9	2	24	24		61			63	
Back of Queue (Q), veh/ln (95 th percentile)	0.2	0.3	0.4	0.1	1.0	1.0		2.4			2.5	
Queue Storage Ratio (RQ) (95 th percentile)	0.07	0.02	0.02	0.02	0.05	0.05		0.17			0.21	
Uniform Delay (d_1), s/veh	1.7	0.0	0.0	2.5	0.0	0.0		55.0			55.0	
Incremental Delay (d_2), s/veh	0.1	0.5	0.5	0.0	1.3	1.4		1.4			1.5	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Control Delay (d), s/veh	1.8	0.5	0.5	2.5	1.3	1.4		56.4			56.5	
Level of Service (LOS)	A	A	A	A	A	A		E			E	
Approach Delay, s/veh / LOS	0.5		A	1.3		A	56.4		E	56.5		E
Intersection Delay, s/veh / LOS	3.0						A					

Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

HCS Signalized Intersection Results Graphical Summary

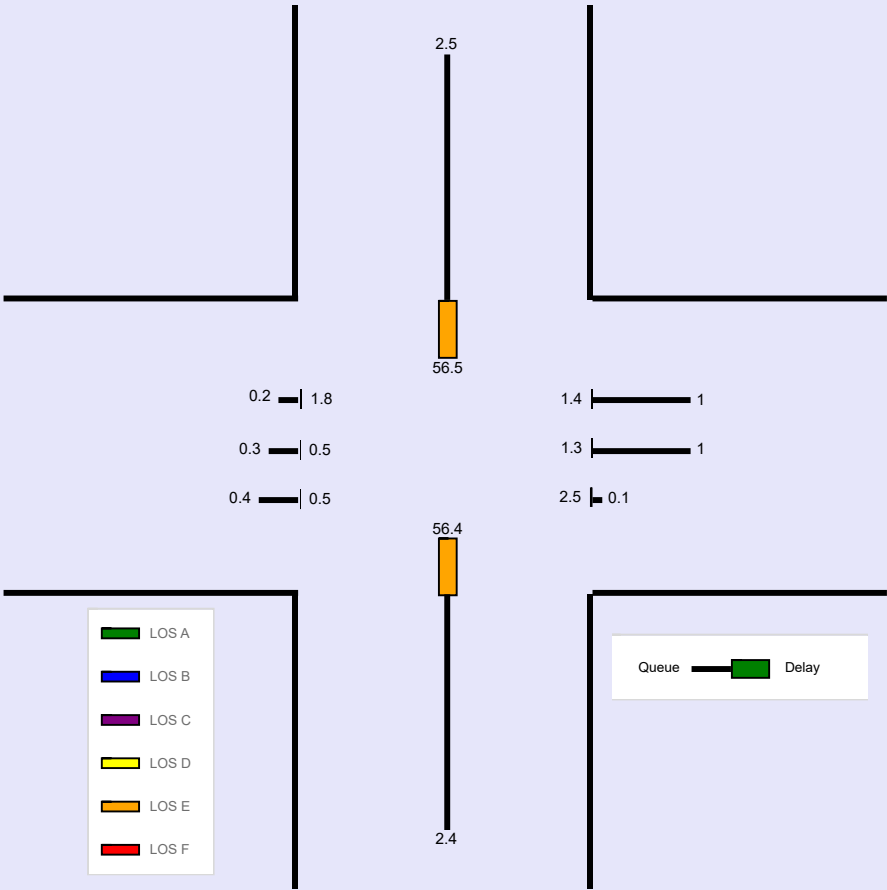
General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93
Urban Street	Pleasant Valley Road	Analysis Year	2030 'No-Build'	Analysis Period	1 > 7:00
Intersection	Midland Road	File Name	08 2030 PM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



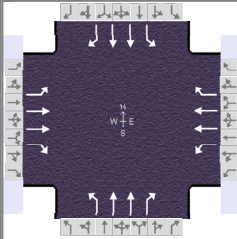
Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	46	711	60	10	1315	90	30	0	10	19	0	23

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On								

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	6	9	9	2	24	24		61			63	
Back of Queue (Q), veh/ln (95 th percentile)	0.2	0.3	0.4	0.1	1.0	1.0		2.4			2.5	
Queue Storage Ratio (RQ) (95 th percentile)	0.07	0.02	0.02	0.02	0.05	0.05		0.17			0.21	
Control Delay (d), s/veh	1.8	0.5	0.5	2.5	1.3	1.4		56.4			56.5	
Level of Service (LOS)	A	A	A	A	A	A		E			E	
Approach Delay, s/veh / LOS	0.5	A		1.3	A		56.4	E		56.5	E	
Intersection Delay, s/veh / LOS	3.0						A					



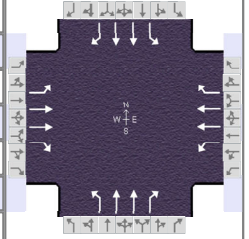
HCS Signalized Intersection Input Data

General Information						Intersection Information													
Agency	GPD Group			Duration, h	0.250														
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other														
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.89														
Urban Street	Brecksville Road	Analysis Year	2030 'No-Build'	Analysis Period	1 > 7:00														
Intersection	Pleasant Valley Road	File Name	09 2030 AM No-Build Capacity Analysis Pleasant...																
Project Description	I-77 / Pleasant Valley Road																		
Demand Information				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Demand (v), veh/h				201	828	38	52	391	77	109	472	232	172	242	149				
Signal Information																			
Cycle, s	120.0	Reference Phase	2																
Offset, s	0	Reference Point	End	Green	7.4	3.3	40.9	4.3	3.5	34.3									
Uncoordinated	No	Simult. Gap E/W	On	Yellow	3.6	0.0	3.6	3.6	3.6	3.6									
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.6	0.0	1.6	1.6	1.6	2.0									
Traffic Information				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Demand (v), veh/h				201	828	38	52	391	77	109	472	232	172	242	149				
Initial Queue (Q_0), veh/h				0	0	0	0	0	0	0	0	0	0	0	0				
Base Saturation Flow Rate (s_0), veh/h				1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900				
Parking (N_m), man/h				None			None			None			None						
Heavy Vehicles (P_{HV}), %				3	3	0	4	4	0	1	1	1	4	4	4				
Ped / Bike / RTOR, /h				0	0	0	0	0	0	0	0	0	0	0	0				
Buses (N_b), buses/h				0	0	0	0	0	0	0	0	0	0	0	0				
Arrival Type (AT)				3	3	3	3	3	3	3	3	3	3	3	3				
Upstream Filtering (I)				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
Lane Width (W), ft				12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0				
Turn Bay Length, ft				390	999	0	270	999	0	400	560	400	320	800	350				
Grade (P_g), %				0			0			0			0						
Speed Limit, mi/h				35	35	35	35	35	35	35	35	35	35	35	35				
Phase Information				EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Maximum Green (G_{max}) or Phase Split, s				30.0		48.0		18.0		36.0		18.0		36.0		18.0		36.0	
Yellow Change Interval (Y), s				3.6		3.6		3.6		3.6		3.6		3.6		3.6		3.6	
Red Clearance Interval (R_c), s				1.6		2.0		1.6		2.0		1.6		1.6		1.6		1.6	
Minimum Green (G_{min}), s				7		10		5		10		5		10		5		10	
Start-Up Lost Time (l_t), s				2.0		2.0		2.0		2.0		2.0		2.0		2.0		2.0	
Extension of Effective Green (e), s				2.0		2.0		2.0		2.0		2.0		2.0		2.0		2.0	
Passage (PT), s				3.0		5.0		3.0		5.0		3.0		2.0		2.0		2.0	
Recall Mode				Off		Off		Off		Off		Off		Min		Off		Min	
Dual Entry				No		Yes		No		Yes		No		Yes		No		Yes	
Walk ($Walk$), s						0.0				0.0				0.0				0.0	
Pedestrian Clearance Time (PC), s						0.0				0.0				0.0				0.0	
Multimodal Information				EB			WB			NB			SB						
85th % Speed / Rest in Walk / Corner Radius				0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0				
Walkway / Crosswalk Width / Length, ft				9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0				
Street Width / Island / Curb, ft				0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No				
Width Outside / Bike Lane / Shoulder, ft				12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0				
Pedestrian Signal / Occupied Parking				No		0.50	No		0.50	No		0.50	No		0.50				

HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group		
Analyst	Ryan Barco	Analysis Date	May 10, 2024
Jurisdiction	City of Independence	Time Period	AM Peak Hour
Urban Street	Brecksville Road	Analysis Year	2030 'No-Build'
Intersection	Pleasant Valley Road	File Name	09 2030 AM No-B
Project Description	I-77 / Pleasant Valley Road		



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	201	828	38	52	391	77	109	472	232	172	242	149

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	7.4	3.3	40.9	4.3	3.5	34.3		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.6	0.0	3.6	3.6	3.6	3.6		
				Red	1.6	0.0	1.6	1.6	1.6	2.0		

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	1.1	3.0	1.1	3.0	1.1	3.0	1.1	3.0
Phase Duration, s	18.2	48.5	9.5	39.9	12.6	46.1	15.9	49.4
Change Period, ($Y+R_c$), s	5.2	5.6	5.2	5.6	5.2	5.2	5.2	5.2
Max Allow Headway (MAH), s	4.1	6.1	4.1	6.1	4.1	0.0	3.1	0.0
Queue Clearance Time (g_s), s	12.4	29.5	4.8	14.3	7.3		10.5	
Green Extension Time (g_e), s	0.6	13.4	0.1	15.9	0.3	0.0	0.2	0.0
Phase Call Probability	1.00	1.00	0.86	1.00	0.98		1.00	
Max Out Probability	0.00	0.55	0.01	0.42	0.00		0.00	

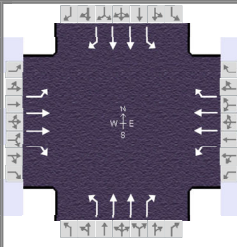
Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h	226	930	43	58	439	87	122	530	261	193	272	167
Adjusted Saturation Flow Rate (s), veh/h/ln	1767	1766	1610	1753	1752	1610	1795	1795	1598	1753	1752	1560
Queue Service Time (g_s), s	10.4	27.5	2.1	2.8	12.3	4.9	5.3	13.7	14.6	8.5	6.4	7.6
Cycle Queue Clearance Time (g_c), s	10.4	27.5	2.1	2.8	12.3	4.9	5.3	13.7	14.6	8.5	6.4	7.6
Green Ratio (g/C)	0.41	0.36	0.36	0.32	0.29	0.29	0.40	0.34	0.38	0.43	0.37	0.48
Capacity (c), veh/h	423	1264	576	189	1001	460	504	1223	601	411	1290	743
Volume-to-Capacity Ratio (X)	0.534	0.736	0.074	0.310	0.439	0.188	0.243	0.434	0.433	0.470	0.211	0.225
Back of Queue (Q), ft/ln (95 th percentile)	201	451	37	57	234	88	102	254	248	162	126	132
Back of Queue (Q), veh/ln (95 th percentile)	7.8	17.6	1.5	2.2	9.1	3.5	4.0	10.1	9.9	6.3	4.9	5.1
Queue Storage Ratio (RQ) (95 th percentile)	0.51	0.45	0.00	0.21	0.23	0.00	0.25	0.45	0.62	0.50	0.16	0.38
Uniform Delay (d_1), s/veh	25.1	33.6	25.4	30.6	35.0	32.4	23.1	30.6	27.9	22.9	26.0	18.4
Incremental Delay (d_2), s/veh	1.0	2.3	0.1	0.9	0.6	0.4	0.2	1.1	2.3	0.3	0.4	0.7
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	26.1	35.9	25.5	31.5	35.7	32.8	23.4	31.7	30.1	23.2	26.3	19.2
Level of Service (LOS)	C	D	C	C	D	C	C	C	C	C	C	B
Approach Delay, s/veh / LOS	33.7	C		34.8	C		30.2	C		23.5	C	
Intersection Delay, s/veh / LOS	31.0						C					

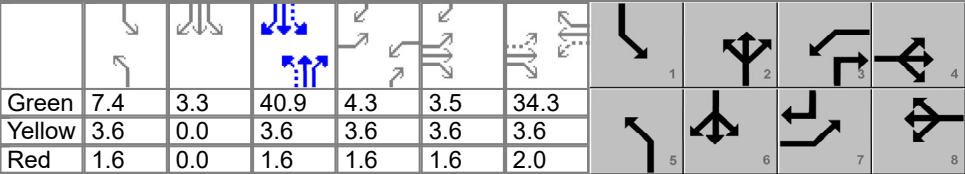
Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

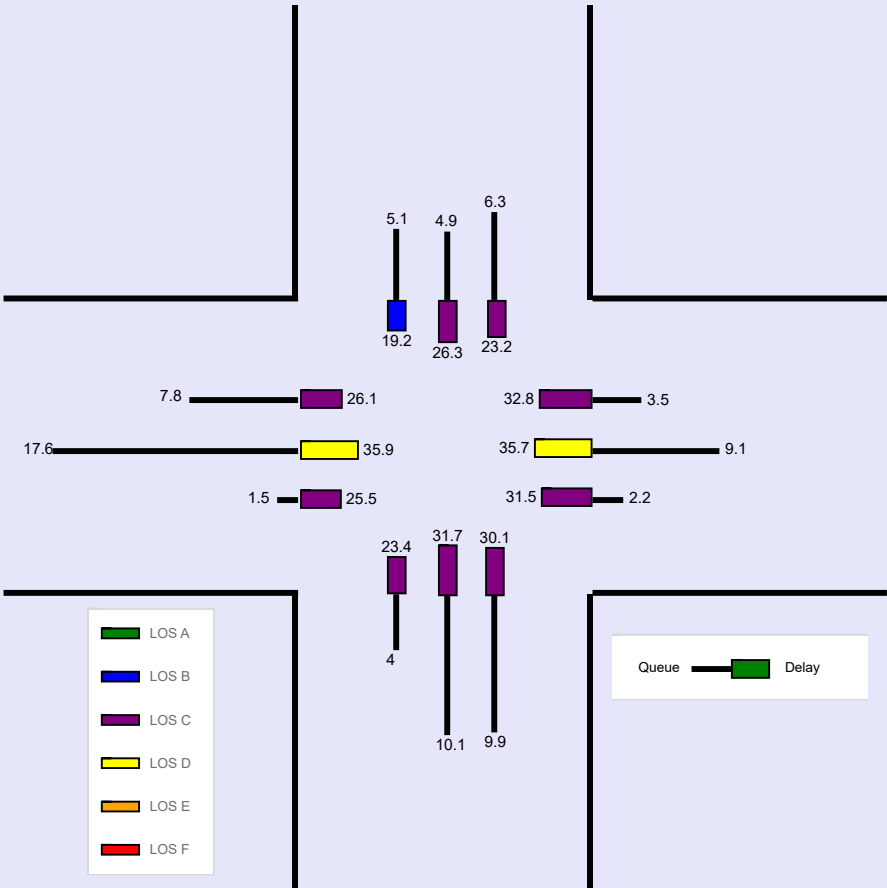
HCS Signalized Intersection Results Graphical Summary

General Information				Intersection Information		
Agency	GPD Group			Duration, h	0.250	
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other	
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.89	
Urban Street	Brecksville Road	Analysis Year	2030 'No-Build'	Analysis Period	1 > 7:00	
Intersection	Pleasant Valley Road	File Name	09 2030 AM No-Build Capacity Analysis Pleasant...			
Project Description	I-77 / Pleasant Valley Road					

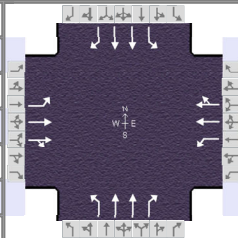
Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	201	828	38	52	391	77	109	472	232	172	242	149

Signal Information													
Cycle, s	120.0	Reference Phase	2										
Offset, s	0	Reference Point	End	Green	7.4	3.3	40.9	4.3	3.5	34.3			
Uncoordinated	No	Simult. Gap E/W	On	Yellow	3.6	0.0	3.6	3.6	3.6	3.6			
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.6	0.0	1.6	1.6	1.6	2.0			

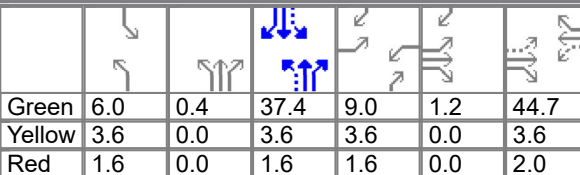
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	201	451	37	57	234	88	102	254	248	162	126	132
Back of Queue (Q), veh/ln (95 th percentile)	7.8	17.6	1.5	2.2	9.1	3.5	4.0	10.1	9.9	6.3	4.9	5.1
Queue Storage Ratio (RQ) (95 th percentile)	0.51	0.45	0.00	0.21	0.23	0.00	0.25	0.45	0.62	0.50	0.16	0.38
Control Delay (d), s/veh	26.1	35.9	25.5	31.5	35.7	32.8	23.4	31.7	30.1	23.2	26.3	19.2
Level of Service (LOS)	C	D	C	C	D	C	C	C	C	C	C	B
Approach Delay, s/veh / LOS	33.7	C		34.8	C		30.2	C		23.5	C	
Intersection Delay, s/veh / LOS	31.0						C					



HCS Signalized Intersection Input Data

General Information				Intersection Information		
Agency	GPD Group			Duration, h	0.250	
Analyst	Ryan Barco	Analysis Date	May 21, 2024	Area Type	Other	
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.97	
Urban Street	Brecksville Road	Analysis Year	2050 'No-Build'	Analysis Period	1> 7:00	
Intersection	Pleasant Valley Road	File Name	10 2030 PM No-Build Capacity Analysis Pleasant...			
Project Description	I-77 / Pleasant Valley Road					

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	185	407	137	163	897	117	96	296	47	89	743	414

Signal Information																		
Cycle, s	120.0	Reference Phase	2															
Offset, s	0	Reference Point	End	Green	6.0	0.4	37.4	9.0	1.2	44.7								
Uncoordinated	No	Simult. Gap E/W	On	Yellow	3.6	0.0	3.6	3.6	0.0	3.6								
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.6	0.0	1.6	1.6	0.0	2.0								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	185	407	137	163	897	117	96	296	47	89	743	414
Initial Queue (Q_0), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h		None			None			None			None	
Heavy Vehicles (P_{HV}), %	3	3		2	2		2	2	2	1	1	1
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0
Turn Bay Length, ft	390	999		270	999		400	560	400	320	800	350
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35	35	35	35	35	35	35	35	35	35	35

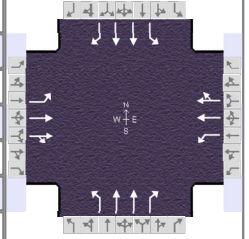
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	24.0	54.0	18.0	48.0	18.0	30.0	18.0	30.0
Yellow Change Interval (Y), s	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Red Clearance Interval (R_c), s	1.6	2.0	1.6	2.0	1.6	1.6	1.6	1.6
Minimum Green (G_{min}), s	7	10	5	10	5	10	5	10
Start-Up Lost Time (l_t), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	3.0	5.0	3.0	5.0	3.0	2.0	3.0	2.0
Recall Mode	Off	Off	Off	Off	Off	Min	Off	Min
Dual Entry	No	Yes	No	Yes	No	Yes	No	Yes
Walk ($Walk$), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 21, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.97
Urban Street	Brecksville Road	Analysis Year	2050 'No-Build'	Analysis Period	1> 7:00
Intersection	Pleasant Valley Road	File Name	10 2030 PM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	185	407	137	163	897	117	96	296	47	89	743	414

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	6.0	0.4	37.4	9.0	1.2	44.7		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.6	0.0	3.6	3.6	0.0	3.6		
				Red	1.6	0.0	1.6	1.6	0.0	2.0		

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	1.1	4.0	1.1	4.0	1.1	3.0	1.1	3.0
Phase Duration, s	15.4	51.5	14.2	50.3	11.6	43.1	11.2	42.6
Change Period, ($Y+R_c$), s	5.2	5.6	5.2	5.6	5.2	5.2	5.2	5.2
Max Allow Headway (MAH), s	4.1	6.1	4.1	6.1	4.1	0.0	4.1	0.0
Queue Clearance Time (g_s), s	9.9	16.0	8.9	32.1	6.5		6.1	
Green Extension Time (g_e), s	0.4	19.0	0.2	12.6	0.2	0.0	0.2	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	0.96		0.95	
Max Out Probability	0.03	0.41	1.00	0.68	0.00		0.00	

Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h	191	291	270	168	533	512	99	305	48	92	766	427
Adjusted Saturation Flow Rate (s), veh/h/ln	1767	1856	1696	1781	1870	1794	1781	1781	1585	1795	1795	1598
Queue Service Time (g_s), s	7.9	13.8	14.0	6.9	30.1	30.1	4.5	7.7	2.3	4.1	22.4	26.4
Cycle Queue Clearance Time (g_c), s	7.9	13.8	14.0	6.9	30.1	30.1	4.5	7.7	2.3	4.1	22.4	26.4
Green Ratio (g/C)	0.46	0.38	0.38	0.45	0.37	0.37	0.37	0.32	0.39	0.36	0.31	0.40
Capacity (c), veh/h	276	709	648	405	696	668	243	1124	620	404	1120	635
Volume-to-Capacity Ratio (X)	0.691	0.410	0.416	0.415	0.766	0.766	0.407	0.272	0.078	0.227	0.684	0.672
Back of Queue (Q), ft/ln (95 th percentile)	158	263	243	133	521	497	90	155	41	81	388	410
Back of Queue (Q), veh/ln (95 th percentile)	6.2	10.3	9.7	5.2	20.5	19.9	3.5	6.1	1.6	3.2	15.4	16.3
Queue Storage Ratio (RQ) (95 th percentile)	0.41	0.26	0.25	0.49	0.52	0.51	0.22	0.28	0.10	0.25	0.49	1.17
Uniform Delay (d_1), s/veh	25.6	27.1	27.2	21.4	33.1	33.1	28.0	30.7	23.0	26.1	36.1	29.7
Incremental Delay (d_2), s/veh	3.1	0.8	0.9	0.7	5.2	5.4	1.1	0.6	0.2	0.3	3.4	5.6
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	28.7	28.0	28.1	22.0	38.3	38.5	29.1	31.3	23.2	26.4	39.5	35.3
Level of Service (LOS)	C	C	C	C	D	D	C	C	C	C	D	D
Approach Delay, s/veh / LOS	28.2	C		36.1	D		30.0	C		37.2	D	
Intersection Delay, s/veh / LOS	34.1						C					

Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

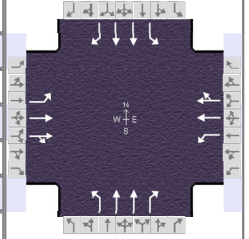
HCS Signalized Intersection Results Graphical Summary

General Information

Agency	GPD Group		
Analyst	Ryan Barco	Analysis Date	May 21, 2024
Jurisdiction	City of Independence	Time Period	PM Peak Hour
Urban Street	Brecksville Road	Analysis Year	2050 'No-Build'
Intersection	Pleasant Valley Road	File Name	10 2030 PM No-Build Capacity Analysis Pleasant...
Project Description	I-77 / Pleasant Valley Road		

Intersection Information

Duration, h	0.250
Area Type	Other
PHF	0.97
Analysis Period	1 > 7:00



Demand Information

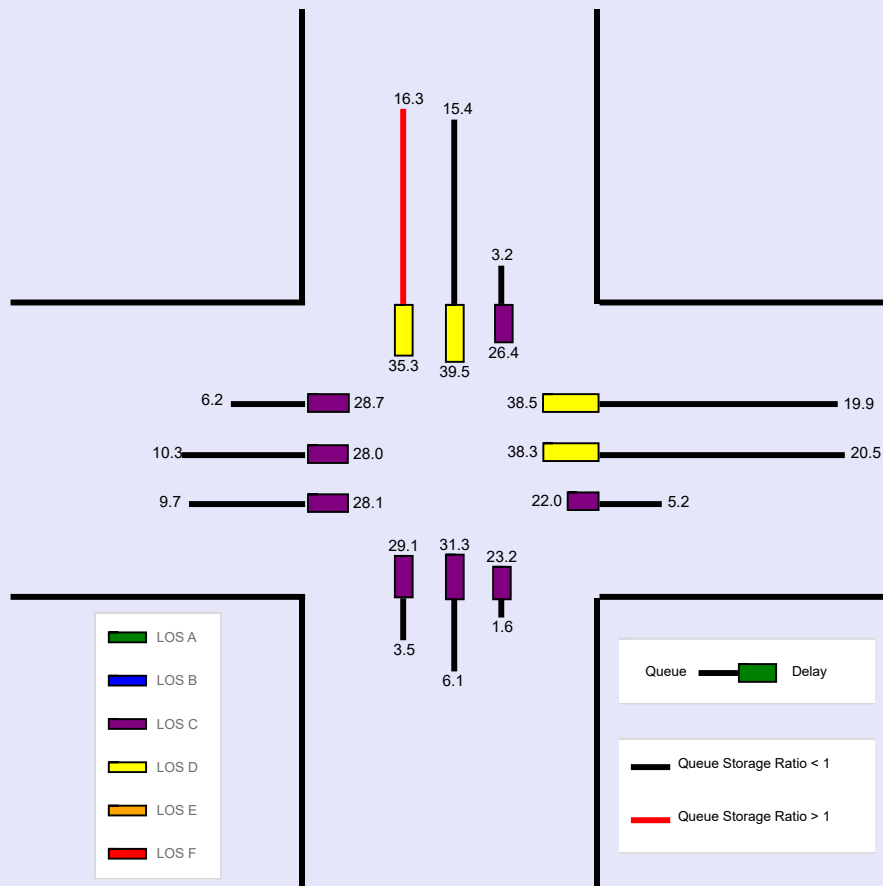
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	185	407	137	163	897	117	96	296	47	89	743	414

Signal Information

Cycle, s	120.0	Reference Phase	2											
Offset, s	0	Reference Point	End	Green	6.0	0.4	37.4	9.0	1.2	44.7				
Uncoordinated	No	Simult. Gap E/W	On	Yellow	3.6	0.0	3.6	3.6	0.0	3.6				
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.6	0.0	1.6	1.6	0.0	2.0				

Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	158	263	243	133	521	497	90	155	41	81	388	410
Back of Queue (Q), veh/ln (95 th percentile)	6.2	10.3	9.7	5.2	20.5	19.9	3.5	6.1	1.6	3.2	15.4	16.3
Queue Storage Ratio (RQ) (95 th percentile)	0.41	0.26	0.25	0.49	0.52	0.51	0.22	0.28	0.10	0.25	0.49	1.17
Control Delay (d), s/veh	28.7	28.0	28.1	22.0	38.3	38.5	29.1	31.3	23.2	26.4	39.5	35.3
Level of Service (LOS)	C	C	C	C	D	D	C	C	C	C	D	D
Approach Delay, s/veh / LOS	28.2	C		36.1	D		30.0	C		37.2	D	
Intersection Delay, s/veh / LOS	34.1						C					



DESIGN YEAR 2050

HCS Signalized Intersection Input Data

General Information						Intersection Information									
Agency	GPD Group				Duration, h	0.250									
Analyst	Ryan Barco		Analysis Date	May 10, 2024		Area Type	Other								
Jurisdiction	City of Seven Hills		Time Period	AM Peak Hour		PHF	0.86								
Urban Street	Pleasant Valley Road		Analysis Year	2050 'No-Build'		Analysis Period	1> 7:00								
Intersection	Edgewood Lane / Ludwi...		File Name	01 2050 AM No-Build Capacity Analysis Pleasant...											
Project Description	I-77 / Pleasant Valley Road														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				4	1800	7	10	627	5	11	1	75	30	0	5
Signal Information															
Cycle, s	94.6	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	Yes	Simult. Gap E/W	On	Green	0.8	1.0	56.9	6.6	9.3	0.0					
Force Mode	Fixed	Simult. Gap N/S	Off	Yellow	4.0	0.0	4.0	4.0	4.0	0.0					
				Red	1.0	0.0	1.0	1.0	1.0	0.0					
Traffic Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				4	1800	7	10	627	5	11	1	75	30	0	5
Initial Queue (Q_0), veh/h				0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h				1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h				None			None			None			None		
Heavy Vehicles (P_{HV}), %				1	1		4	4			2			8	
Ped / Bike / RTOR, /h				0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h				0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)				3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft				12.0	12.0		12.0	12.0			12.0			12.0	
Turn Bay Length, ft				95	999		90	999			450			499	
Grade (P_g), %					0			0			0			0	
Speed Limit, mi/h				35	35	35	35	35	35	25	25	25	25	25	25
Phase Information				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Maximum Green (G_{max}) or Phase Split, s				15.0	60.0	15.0	60.0		20.0			20.0			
Yellow Change Interval (Y), s				4.0	4.0	4.0	4.0		4.0			4.0			
Red Clearance Interval (R_c), s				1.0	1.0	1.0	1.0		1.0			1.0			
Minimum Green (G_{min}), s				7	20	7	20		10			10			
Start-Up Lost Time (lt), s				2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0			
Extension of Effective Green (e), s				2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0			
Passage (PT), s				3.0	3.0	3.0	3.0		3.0			3.0			
Recall Mode				Off	Min	Off	Min		Off			Off			
Dual Entry				No	Yes	No	Yes		Yes			Yes			
Walk ($Walk$), s					0.0		0.0		0.0			0.0			
Pedestrian Clearance Time (PC), s					0.0		0.0		0.0			0.0			
Multimodal Information				EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius				0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft				9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft				0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft				12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking				No	0.50		No	0.50		No	0.50		No	0.50	

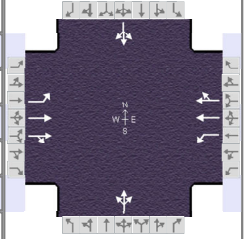
HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group		
Analyst	Ryan Barco	Analysis Date	May 10, 2024
Jurisdiction	City of Seven Hills	Time Period	AM Peak Hour
Urban Street	Pleasant Valley Road	Analysis Year	2050 'No-Build'
Intersection	Edgewood Lane / Ludwi...	File Name	01 2050 AM No-B...
Project Description	I-77 / Pleasant Valley Road		

Intersection Information

Duration, h	0.250
Area Type	Other
PHF	0.86
Analysis Period	1> 7:00
Build Capacity Analysis Pleasant...	



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	4	1800	7	10	627	5	11	1	75	30	0	5

Signal Information

Cycle, s	94.6	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	Off									

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	4.0	1.1	4.0		12.0		12.0
Phase Duration, s	5.8	61.9	6.8	62.9		14.3		11.6
Change Period, ($Y+R_c$), s	5.0	5.0	5.0	5.0		5.0		5.0
Max Allow Headway (MAH), s	4.1	4.0	4.1	4.0		4.5		4.3
Queue Clearance Time (g_s), s	2.1	49.6	2.2	11.2		7.7		4.2
Green Extension Time (g_e), s	0.0	7.2	0.0	2.8		0.2		0.1
Phase Call Probability	0.12	1.00	0.26	1.00		0.93		0.66
Max Out Probability	0.00	0.77	0.00	0.00		0.00		0.00

Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	5	1051	1051	12	368	367		101			41	
Adjusted Saturation Flow Rate (s), veh/h/ln	1795	1885	1883	1753	1841	1835		1610			1667	
Queue Service Time (g_s), s	0.1	47.5	47.6	0.2	9.2	9.2		5.7			2.2	
Cycle Queue Clearance Time (g_c), s	0.1	47.5	47.6	0.2	9.2	9.2		5.7			2.2	
Green Ratio (g/C)	0.61	0.60	0.60	0.62	0.61	0.61		0.10			0.07	
Capacity (c), veh/h	452	1134	1132	129	1127	1124		158			116	
Volume-to-Capacity Ratio (X)	0.010	0.927	0.928	0.090	0.326	0.327		0.639			0.351	
Back of Queue (Q), ft/ln (95 th percentile)	2	727	723	6	153	148		112			46	
Back of Queue (Q), veh/ln (95 th percentile)	0.1	28.8	28.9	0.2	5.9	5.9		4.4			1.7	
Queue Storage Ratio (RQ) (95 th percentile)	0.02	0.73	0.73	0.07	0.15	0.15		0.25			0.09	
Uniform Delay (d_1), s/veh	7.8	17.0	17.0	19.6	8.9	8.9		41.0			42.0	
Incremental Delay (d_2), s/veh	0.0	12.0	12.1	0.3	0.2	0.2		4.2			1.8	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Control Delay (d), s/veh	7.8	28.9	29.1	19.9	9.1	9.1		45.3			43.8	
Level of Service (LOS)	A	C	C	B	A	A		D			D	
Approach Delay, s/veh / LOS	29.0		C	9.2		A	45.3		D	43.8		D
Intersection Delay, s/veh / LOS	24.8						C					

Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

HCS Signalized Intersection Results Graphical Summary

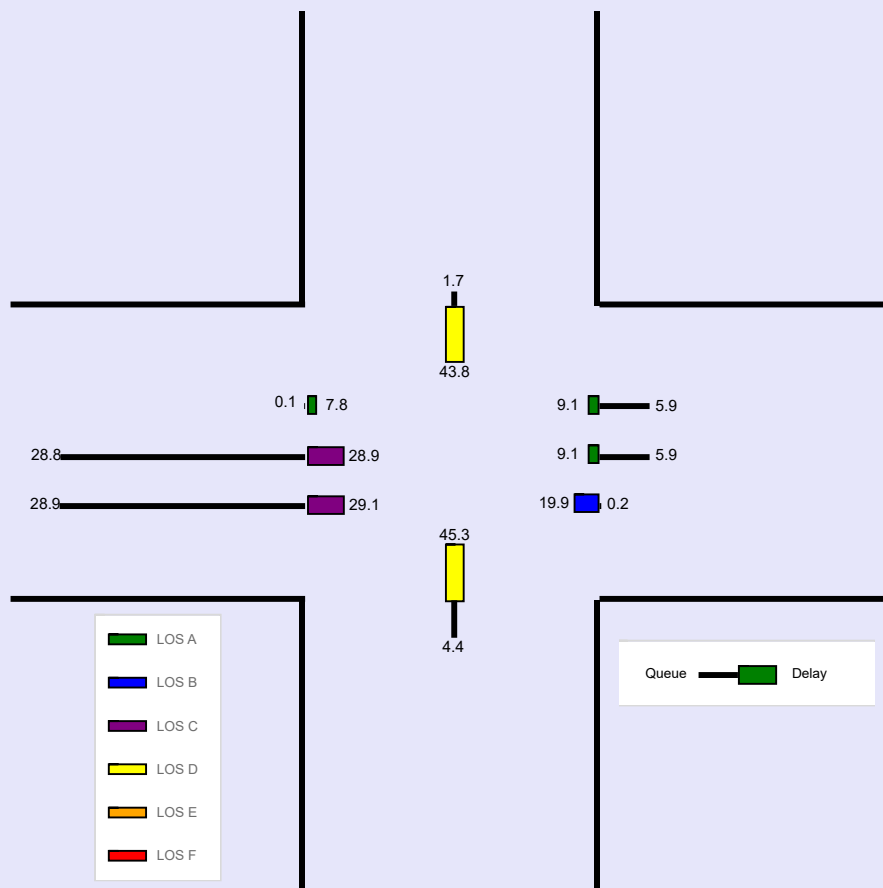
General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Seven Hills	Time Period	AM Peak Hour	PHF	0.86
Urban Street	Pleasant Valley Road	Analysis Year	2050 'No-Build'	Analysis Period	1 > 7:00
Intersection	Edgewood Lane / Ludwi...	File Name	01 2050 AM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				

The diagram illustrates a four-way intersection with a central green area. Arrows indicate traffic flow: Northbound (top), Southbound (bottom), Eastbound (right), and Westbound (left). Lane markings show varying numbers of lanes per direction, with some lanes having multiple arrows indicating different vehicle types or movements. A compass rose in the center indicates North (N), South (S), East (E), and West (W).

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	4	1800	7	10	627	5	11	1	75	30	0	5

Signal Information														
Cycle, s	94.6	Reference Phase	2											
Offset, s	0	Reference Point	End											
Uncoordinated	Yes	Simult. Gap E/W	On											
Force Mode	Fixed	Simult. Gap N/S	Off											
Green	0.8	1.0	56.9	6.6	9.3	0.0								
Yellow	4.0	0.0	4.0	4.0	4.0	0.0								
Red	1.0	0.0	1.0	1.0	1.0	0.0								

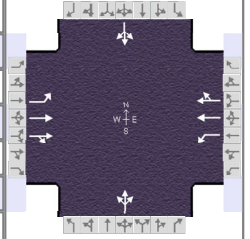
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	2	727	723	6	153	148		112			46	
Back of Queue (Q), veh/ln (95 th percentile)	0.1	28.8	28.9	0.2	5.9	5.9		4.4			1.7	
Queue Storage Ratio (RQ) (95 th percentile)	0.02	0.73	0.73	0.07	0.15	0.15		0.25			0.09	
Control Delay (d), s/veh	7.8	28.9	29.1	19.9	9.1	9.1		45.3			43.8	
Level of Service (LOS)	A	C	C	B	A	A		D			D	
Approach Delay, s/veh / LOS	29.0		C	9.2		A	45.3		D	43.8		D
Intersection Delay, s/veh / LOS	24.8						C					



HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Seven Hills	Time Period	PM Peak Hour	PHF	0.96
Urban Street	Pleasant Valley Road	Analysis Year	2050 'No-Build'	Analysis Period	1> 7:00
Intersection	Edgewood Lane / Ludwi...	File Name	02 2050 PM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				

A diagram of a four-way intersection. It is a square with a dark blue background. In the center, there is a white circle with a north arrow pointing upwards, labeled 'N' at the top, 'S' at the bottom, 'E' on the right, and 'W' on the left. Four white arrows point outwards from the center towards the corners of the square, representing traffic flow. The corners of the square are marked with small white icons representing traffic signals or lights.



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	4	847	22	116	1895	31	16	1	35	18	0	7

Signal Information											
Cycle, s	81.8	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	Yes	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	4	847	22	116	1895	31	16	1	35	18	0	7
Initial Queue (Q_0), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h	None			None			None			None		
Heavy Vehicles (P_{HV}), %	2	2		0	0			0			6	
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0		12.0	12.0			12.0			12.0	
Turn Bay Length, ft	95	999		90	999			450			499	
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35	35	35	35	35	25	25	25	25	25	25

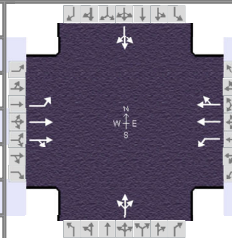
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	15.0	60.0	15.0	60.0		20.0		20.0
Yellow Change Interval (Y), s	4.0	4.0	4.0	4.0		4.0		4.0
Red Clearance Interval (R_c), s	1.0	1.0	1.0	1.0		1.0		1.0
Minimum Green (G_{min}), s	7	20	7	20		10		10
Start-Up Lost Time (l_t), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	3.0	3.0	3.0	3.0		3.0		3.0
Recall Mode	Off	Min	Off	Min		Off		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk ($Walk$), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No		0.50	No		0.50	No		0.50	No		0.50

HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Seven Hills	Time Period	PM Peak Hour	PHF	0.96
Urban Street	Pleasant Valley Road	Analysis Year	2050 'No-Build'	Analysis Period	1> 7:00
Intersection	Edgewood Lane / Ludwi...	File Name	02 2050 PM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	4	847	22	116	1895	31	16	1	35	18	0	7

Signal Information

Cycle, s	81.8	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	Yes	Simult. Gap E/W	On	Green	0.6	0.9	43.7	4.5	7.1	0.0		
Force Mode	Fixed	Simult. Gap N/S	Off	Yellow	4.0	4.0	4.0	4.0	4.0	0.0		
				Red	1.0	1.0	1.0	1.0	1.0	0.0		

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	4.0	1.1	4.0		12.0		12.0
Phase Duration, s	5.6	48.7	11.6	54.6		12.1		9.5
Change Period, ($Y+R_c$), s	5.0	5.0	5.0	5.0		5.0		5.0
Max Allow Headway (MAH), s	4.1	4.0	4.1	4.0		4.4		4.3
Queue Clearance Time (g_s), s	2.1	14.3	4.1	38.5		4.5		3.2
Green Extension Time (g_e), s	0.0	3.7	0.2	11.0		0.1		0.0
Phase Call Probability	0.09	1.00	0.94	1.00		0.71		0.45
Max Out Probability	0.00	0.00	0.00	0.43		0.00		0.00

Movement Group Results

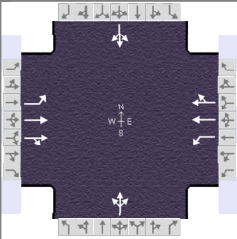
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	4	455	451	121	1003	1003		54			26	
Adjusted Saturation Flow Rate (s), veh/h/ln	1781	1870	1853	1810	1900	1889		1672			1667	
Queue Service Time (g_s), s	0.1	12.2	12.3	2.1	36.0	36.5		2.5			1.2	
Cycle Queue Clearance Time (g_c), s	0.1	12.2	12.3	2.1	36.0	36.5		2.5			1.2	
Green Ratio (g/C)	0.54	0.53	0.53	0.64	0.61	0.61		0.09			0.05	
Capacity (c), veh/h	131	999	990	474	1152	1145		145			91	
Volume-to-Capacity Ratio (X)	0.032	0.455	0.455	0.255	0.871	0.876		0.374			0.285	
Back of Queue (Q), ft/ln (95 th percentile)	2	206	201	31	509	513		48			26	
Back of Queue (Q), veh/ln (95 th percentile)	0.1	8.1	8.0	1.2	20.4	20.5		1.9			1.0	
Queue Storage Ratio (RQ) (95 th percentile)	0.02	0.21	0.20	0.35	0.51	0.51		0.11			0.05	
Uniform Delay (d_1), s/veh	15.2	11.7	11.7	7.2	13.4	13.5		35.3			37.1	
Incremental Delay (d_2), s/veh	0.1	0.3	0.3	0.3	5.4	5.7		1.6			1.7	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Control Delay (d), s/veh	15.3	12.1	12.1	7.5	18.8	19.2		36.9			38.8	
Level of Service (LOS)	B	B	B	A	B	B		D			D	
Approach Delay, s/veh / LOS	12.1	B		18.4	B		36.9	D		38.8	D	
Intersection Delay, s/veh / LOS	17.0						B					

Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

HCS Signalized Intersection Results Graphical Summary

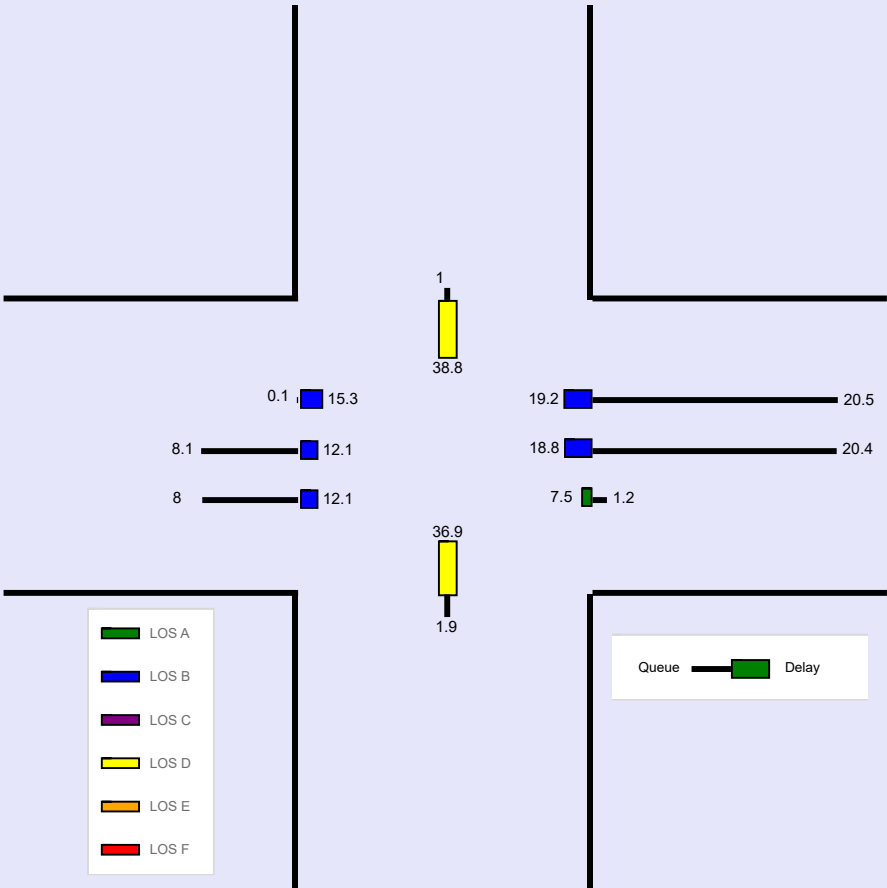
General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Seven Hills	Time Period	PM Peak Hour	PHF	0.96
Urban Street	Pleasant Valley Road	Analysis Year	2050 'No-Build'	Analysis Period	1> 7:00
Intersection	Edgewood Lane / Ludwi...	File Name	02 2050 PM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



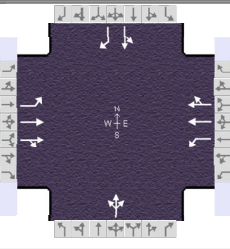
Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	4	847	22	116	1895	31	16	1	35	18	0	7

Signal Information											
Cycle, s	81.8	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	Yes	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off								

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	2	206	201	31	509	513		48			26	
Back of Queue (Q), veh/ln (95 th percentile)	0.1	8.1	8.0	1.2	20.4	20.5		1.9			1.0	
Queue Storage Ratio (RQ) (95 th percentile)	0.02	0.21	0.20	0.35	0.51	0.51		0.11			0.05	
Control Delay (d), s/veh	15.3	12.1	12.1	7.5	18.8	19.2		36.9			38.8	
Level of Service (LOS)	B	B	B	A	B	B		D			D	
Approach Delay, s/veh / LOS	12.1		B	18.4		B	36.9		D	38.8		D
Intersection Delay, s/veh / LOS	17.0						B					



HCS Signalized Intersection Input Data

General Information				Intersection Information		
Agency	GPD Group			Duration, h	0.250	
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other	
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.91	
Urban Street	Pleasant Valley Road	Analysis Year	2050 'No-Build'	Analysis Period	1> 7:00	
Intersection	I-77 SB Ramps / Forest...	File Name	03 2050 AM No-Build Capacity Analysis Pleasant...			
Project Description	I-77 / Pleasant Valley Road					

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	23	1531	433	171	430	54	231	13	490	71	53	12

Signal Information												
Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	Off									
				Green	2.8	4.3	49.1	10.9	32.9	0.0		
				Yellow	3.6	0.0	3.6	3.0	3.0	0.0		
				Red	1.3	0.0	1.3	2.1	2.1	0.0		

			
1	2	3	4

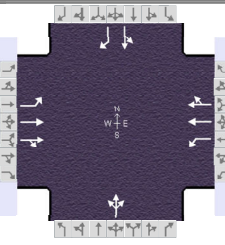
			
5	6	7	8

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	23	1531	433	171	430	54	231	13	490	71	53	12
Initial Queue (Q_0), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h	None			None			None			None		
Heavy Vehicles (P_{HV}), %	1	1		3	3			4			2	2
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	4	4	4	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0		12.0	12.0			12.0			12.0	12.0
Turn Bay Length, ft	105	2430		115	1025			150			499	110
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35	35	35	35	35	25	25	25	25	25	25

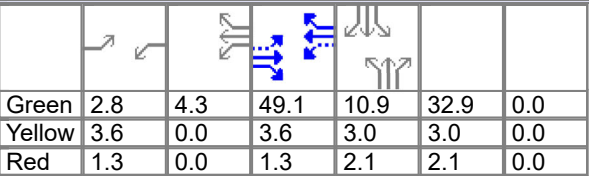
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	18.0	54.0	12.0	48.0		36.0		18.0
Yellow Change Interval (Y), s	3.6	3.6	3.6	3.6		3.0		3.0
Red Clearance Interval (R_c), s	1.3	1.3	1.3	1.3		2.1		2.1
Minimum Green (G_{min}), s	5	20	5	20		10		7
Start-Up Lost Time (l_t), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.5	2.0	2.5	2.0		4.5		3.0
Recall Mode	Off	Min	Off	Min		Min		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk ($Walk$), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No		0.50	No		0.50	No		0.50	No		0.50

HCS Signalized Intersection Results Summary

General Information				Intersection Information		
Agency	GPD Group			Duration, h	0.250	
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other	
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.91	
Urban Street	Pleasant Valley Road	Analysis Year	2050 'No-Build'	Analysis Period	1> 7:00	
Intersection	I-77 SB Ramps / Forest...	File Name	03 2050 AM No-Build Capacity Analysis Pleasant...			
Project Description	I-77 / Pleasant Valley Road					

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	23	1531	433	171	430	54	231	13	490	71	53	12

Signal Information											
Cycle, s	120.0	Reference Phase	2		Green	2.8	4.3	49.1	10.9	32.9	0.0
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off								
				Yellow	3.6	0.0	3.6	3.0	3.0	0.0	
				Red	1.3	0.0	1.3	2.1	2.1	0.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	4.0	1.1	4.0		12.0		11.0
Phase Duration, s	7.7	54.0	12.0	58.3		38.0		16.0
Change Period, ($Y+R_c$), s	4.9	4.9	4.9	4.9		5.1		5.1
Max Allow Headway (MAH), s	3.6	0.0	3.6	0.0		5.9		4.2
Queue Clearance Time (g_s), s	3.0		9.1			34.9		10.8
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0		0.0		0.1
Phase Call Probability	0.57		1.00			1.00		0.99
Max Out Probability	0.00		1.00			1.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	25	859	1299	188	270	262		807			136	13
Adjusted Saturation Flow Rate (s), veh/h/ln	1795	1246	1769	1767	1856	1783		1620			1818	1585
Queue Service Time (g_s), s	1.0	49.1	49.1	7.1	8.8	8.9		32.9			8.8	0.9
Cycle Queue Clearance Time (g_c), s	1.0	49.1	49.1	7.1	8.8	8.9		32.9			8.8	0.9
Green Ratio (g/C)	0.43	0.41	0.41	0.48	0.44	0.44		0.27			0.09	0.09
Capacity (c), veh/h	413	510	724	165	825	793		445			164	143
Volume-to-Capacity Ratio (X)	0.061	1.685	1.796	1.141	0.327	0.330		1.813			0.829	0.092
Back of Queue (Q), ft/ln (95 th percentile)	19	2368	3668	336	169	160		2405			222	17
Back of Queue (Q), veh/ln (95 th percentile)	0.7	94.0	146.7	13.1	6.6	6.4		93.2			8.8	0.7
Queue Storage Ratio (RQ) (95 th percentile)	0.18	0.97	1.52	2.92	0.16	0.16		16.04			0.45	0.16
Uniform Delay (d_1), s/veh	19.8	35.5	35.5	31.2	15.4	15.4		43.5			53.7	50.1
Incremental Delay (d_2), s/veh	0.0	316.6	363.6	113.0	1.1	1.1		374.7			21.7	0.3
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	0.0
Control Delay (d), s/veh	19.8	352.0	399.1	144.2	16.4	16.5		418.2			75.3	50.3
Level of Service (LOS)	B	F	F	F	B	B		F			E	D
Approach Delay, s/veh / LOS	376.2		F	49.8		D		418.2		F	73.1	E
Intersection Delay, s/veh / LOS	312.4						F					

Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS												
Bicycle LOS Score / LOS												

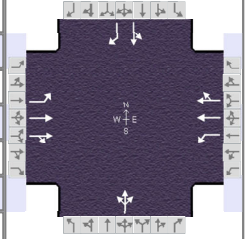
HCS Signalized Intersection Results Graphical Summary

General Information

Agency	GPD Group		
Analyst	Ryan Barco	Analysis Date	May 10, 2024
Jurisdiction	City of Independence	Time Period	AM Peak Hour
Urban Street	Pleasant Valley Road	Analysis Year	2050 'No-Build'
Intersection	I-77 SB Ramps / Forest...	File Name	03 2050 AM No-Build Capacity Analysis Pleasant...
Project Description	I-77 / Pleasant Valley Road		

Intersection Information

Duration, h	0.250
Area Type	Other
PHF	0.91
Analysis Period	1 > 7:00



Demand Information

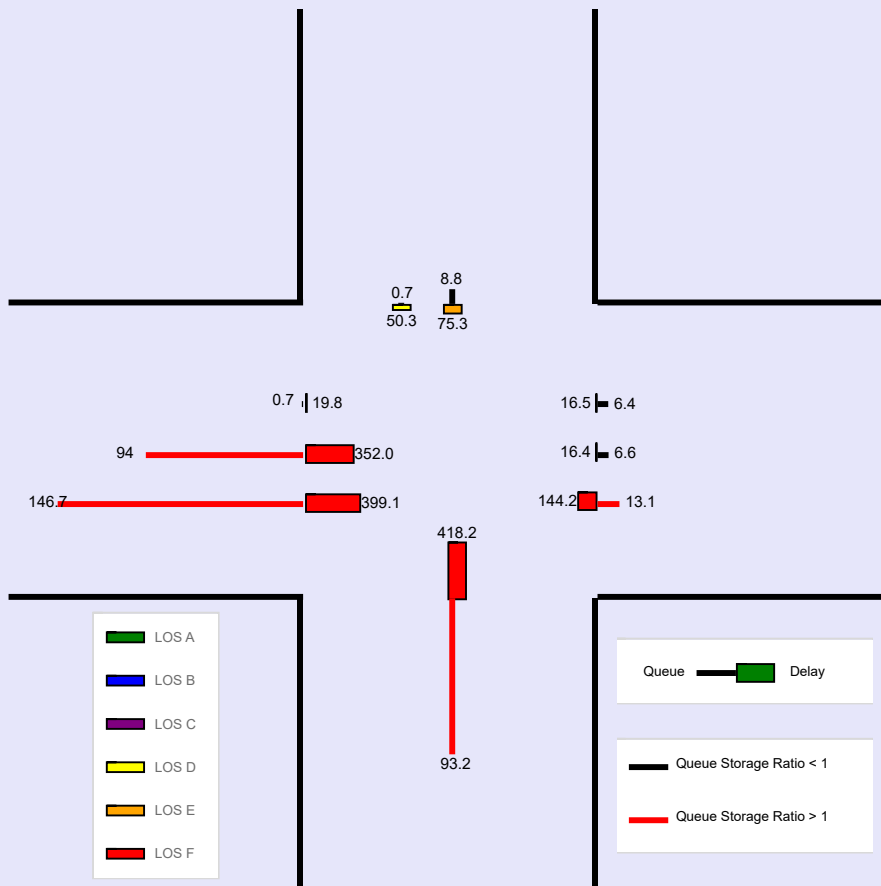
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	23	1531	433	171	430	54	231	13	490	71	53	12

Signal Information

Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	Off

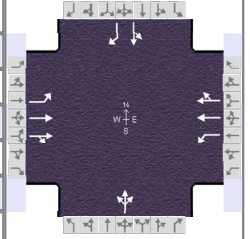
Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	19	2368	3668	336	169	160		2405			222	17
Back of Queue (Q), veh/ln (95 th percentile)	0.7	94.0	146.7	13.1	6.6	6.4		93.2			8.8	0.7
Queue Storage Ratio (RQ) (95 th percentile)	0.18	0.97	1.52	2.92	0.16	0.16		16.04			0.45	0.16
Control Delay (d), s/veh	19.8	352.0	399.1	144.2	16.4	16.5		418.2			75.3	50.3
Level of Service (LOS)	B	F	F	F	B	B		F			E	D
Approach Delay, s/veh / LOS	376.2		F	49.8		D	418.2		F	73.1		E
Intersection Delay, s/veh / LOS	312.4						F					



HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93
Urban Street	Pleasant Valley Road	Analysis Year	2050 'No-Build'	Analysis Period	1> 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	04 2050 PM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	30	649	198	276	1040	118	921	73	487	30	37	32

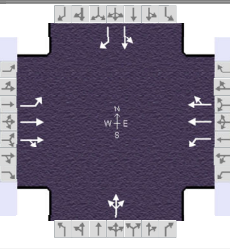
Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	30	649	198	276	1040	118	921	73	487	30	37	32
Initial Queue (Q_0), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h	None			None			None			None		
Heavy Vehicles (P_{HV}), %	2	2		1	1			0			0	0
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	4	4	4	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0		12.0	12.0			12.0			12.0	12.0
Turn Bay Length, ft	105	2430		115	1025			150			499	110
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35	35	35	35	35	25	25	25	25	25	25

Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	16.8	30.0	16.8	30.0		57.6		15.6
Yellow Change Interval (Y), s	3.6	3.6	3.6	3.6		3.0		3.0
Red Clearance Interval (R_c), s	1.3	1.3	1.3	1.3		2.1		2.1
Minimum Green (G_{min}), s	5	20	5	20		10		7
Start-Up Lost Time (l_t), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.5	2.0	2.5	2.0		4.5		3.0
Recall Mode	Off	Min	Off	Min		Off		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk ($Walk$), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

HCS Signalized Intersection Results Summary

General Information				Intersection Information		
Agency	GPD Group			Duration, h	0.250	
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other	
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93	
Urban Street	Pleasant Valley Road	Analysis Year	2050 'No-Build'	Analysis Period	1> 7:00	
Intersection	I-77 SB Ramps / Forest...	File Name	04 2050 PM No-Build Capacity Analysis Pleasant...			
Project Description	I-77 / Pleasant Valley Road					

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	30	649	198	276	1040	118	921	73	487	30	37	32

Signal Information												
Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	Off									
				Green	3.3	3.7	25.1	6.8	56.2	0.0		
				Yellow	3.6	3.6	3.6	3.0	3.0	0.0		
				Red	1.3	1.3	1.3	2.1	2.1	0.0		

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	4.0	1.1	4.0		12.0		11.0
Phase Duration, s	8.2	30.0	16.8	38.6		61.3		11.9
Change Period, ($Y+R_c$), s	4.9	4.9	4.9	4.9		5.1		5.1
Max Allow Headway (MAH), s	3.6	0.0	3.6	0.0		5.8		4.3
Queue Clearance Time (g_s), s	3.7		13.9			58.2		6.6
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0		0.0		0.1
Phase Call Probability	0.66		1.00			1.00		0.97
Max Out Probability	0.00		1.00			1.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	32	474	436	297	633	612		1592			72	34
Adjusted Saturation Flow Rate (s), veh/h/ln	1781	1870	1719	1795	1885	1817		1743			1858	1610
Queue Service Time (g_s), s	1.7	25.1	25.1	11.9	33.7	33.7		56.2			4.6	2.5
Cycle Queue Clearance Time (g_c), s	1.7	25.1	25.1	11.9	33.7	33.7		56.2			4.6	2.5
Green Ratio (g/C)	0.24	0.21	0.21	0.32	0.28	0.28		0.47			0.06	0.06
Capacity (c), veh/h	109	391	359	238	530	511		816			105	91
Volume-to-Capacity Ratio (X)	0.296	1.214	1.214	1.244	1.196	1.199		1.951			0.684	0.377
Back of Queue (Q), ft/ln (95 th percentile)	35	908	835	564	1079	1046		4838			107	48
Back of Queue (Q), veh/ln (95 th percentile)	1.4	35.7	33.4	22.4	42.8	41.9		193.5			4.3	1.9
Queue Storage Ratio (RQ) (95 th percentile)	0.33	0.37	0.35	4.90	1.05	1.03		32.25			0.21	0.44
Uniform Delay (d_1), s/veh	38.2	47.5	47.5	34.3	37.5	37.5		31.9			55.5	54.6
Incremental Delay (d_2), s/veh	1.1	117.5	119.2	140.2	105.4	107.2		432.6			7.6	2.6
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	0.0
Control Delay (d), s/veh	39.4	165.0	166.7	174.5	142.9	144.8		464.5			63.1	57.1
Level of Service (LOS)	D	F	F	F	F	F		F			E	E
Approach Delay, s/veh / LOS	161.5		F	149.7		F		464.5		F	61.2	E
Intersection Delay, s/veh / LOS	269.9						F					

Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS												
Bicycle LOS Score / LOS												

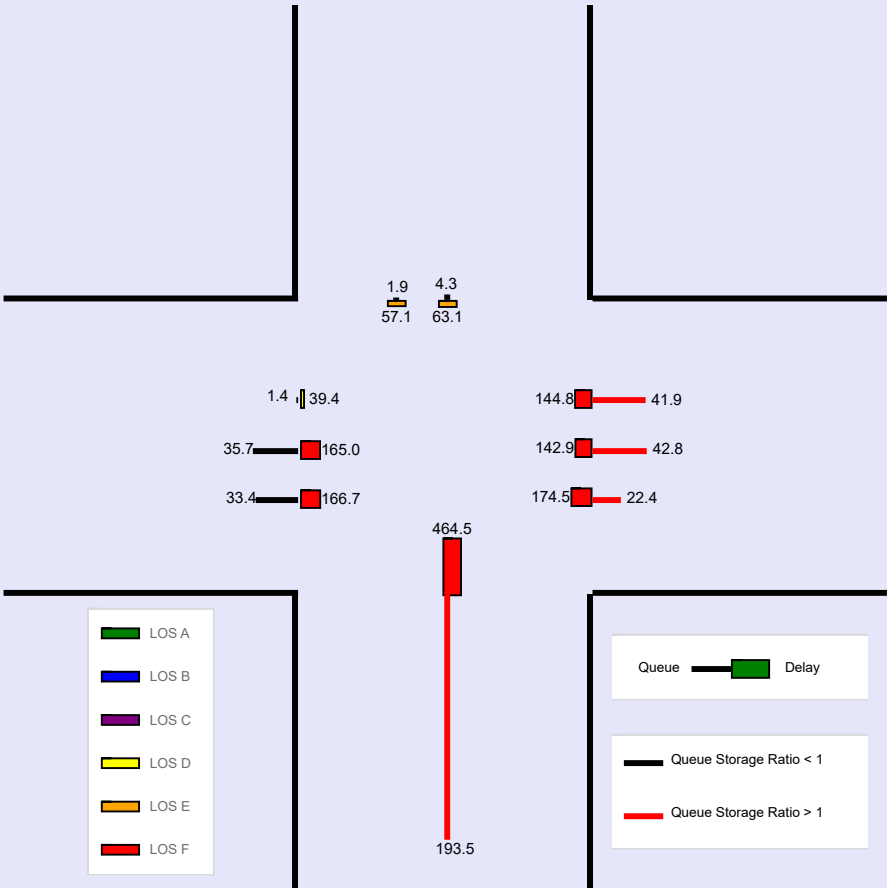
HCS Signalized Intersection Results Graphical Summary

General Information				Intersection Information		
Agency	GPD Group			Duration, h	0.250	
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other	
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93	
Urban Street	Pleasant Valley Road	Analysis Year	2050 'No-Build'	Analysis Period	1 > 7:00	
Intersection	I-77 SB Ramps / Forest...	File Name	04 2050 PM No-Build Capacity Analysis Pleasant...			
Project Description	I-77 / Pleasant Valley Road					

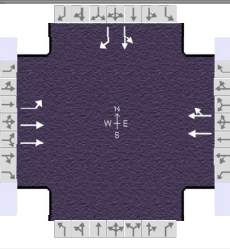
Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	30	649	198	276	1040	118	921	73	487	30	37	32

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off	Green	3.3	3.7	25.1	6.8	56.2	0.0	
				Yellow	3.6	3.6	3.6	3.0	3.0	0.0	
				Red	1.3	1.3	1.3	2.1	2.1	0.0	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	35	908	835	564	1079	1046		4838			107	48
Back of Queue (Q), veh/ln (95 th percentile)	1.4	35.7	33.4	22.4	42.8	41.9		193.5			4.3	1.9
Queue Storage Ratio (RQ) (95 th percentile)	0.33	0.37	0.35	4.90	1.05	1.03		32.25			0.21	0.44
Control Delay (d), s/veh	39.4	165.0	166.7	174.5	142.9	144.8		464.5			63.1	57.1
Level of Service (LOS)	D	F	F	F	F	F		F			E	E
Approach Delay, s/veh / LOS	161.5		F	149.7		F		464.5		F	61.2	E
Intersection Delay, s/veh / LOS	269.9						F					



HCS Signalized Intersection Input Data

General Information				Intersection Information		
Agency	GPD Group			Duration, h	0.250	
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other	
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.90	
Urban Street	Pleasant Valley Road	Analysis Year	2050 'No-Build'	Analysis Period	1> 7:00	
Intersection	I-77 NB Ramps	File Name	05 2050 AM No-Build Capacity Analysis Pleasant...			
Project Description	I-77 / Pleasant Valley Road					

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	1158	934			467	421				213	0	188

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	1158	934			467	421				213	0	188
Initial Queue (Q_0), veh/h	0	0			0	0				0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900			1900	1900				1900	1900	1900
Parking (N_m), man/h		None			None						None	
Heavy Vehicles (P_{HV}), %	1	1			6						5	2
Ped / Bike / RTOR, /h	0	0			0	0	0	0		0	0	0
Buses (N_b), buses/h	0	0	0		0	0	0			0	0	0
Arrival Type (AT)	4	4			4	4				3	3	3
Upstream Filtering (I)	1.00	1.00			1.00	1.00				1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0			12.0					12.0	12.0	
Turn Bay Length, ft	250	1025			1950					140	0	
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35			35	35				25	25	25

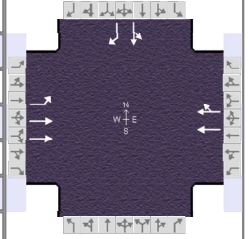
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	62.4	91.2		28.8				28.8
Yellow Change Interval (Y), s	3.6	3.6		3.6				3.0
Red Clearance Interval (R_c), s	1.3	1.3		1.3				2.1
Minimum Green (G_{min}), s	5	10		10				10
Start-Up Lost Time (l_t), s	2.0	2.0		2.0			2.0	2.0
Extension of Effective Green (e), s	2.0	2.0		2.0			2.0	2.0
Passage (PT), s	5.0	2.0		2.0				4.0
Recall Mode	Off	Min		Min				Off
Dual Entry	No	Yes		Yes				Yes
Walk ($Walk$), s				0.0		0.0		0.0
Pedestrian Clearance Time (PC), s				0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius				0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft				9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0		No	0.0	0	No		0		0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0				12.0	5.0	2.0
Pedestrian Signal / Occupied Parking		0.50	No	0.50	No					No	0.50	

HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.90
Urban Street	Pleasant Valley Road	Analysis Year	2050 'No-Build'	Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	05 2050 AM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	1158	934			467	421				213	0	188

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6				4
Case Number	1.0	4.0		8.3				11.0
Phase Duration, s	66.9	95.7		28.8				24.3
Change Period, ($Y+R_c$), s	4.9	4.9		4.9				5.1
Max Allow Headway (MAH), s	6.1	0.0		0.0				5.4
Queue Clearance Time (g_s), s	64.0							17.9
Green Extension Time (g_e), s	0.0	0.0		0.0				1.3
Phase Call Probability	1.00							1.00
Max Out Probability	1.00							0.88

Movement Group Results

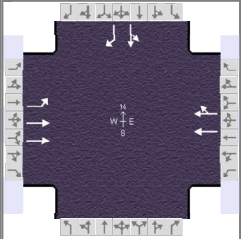
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16				7	4	14
Adjusted Flow Rate (v), veh/h	1287	1038			519	468					237	209
Adjusted Saturation Flow Rate (s), veh/h/ln	1795	1795			1811	1535					1739	
Queue Service Time (g_s), s	62.0	0.0			36.3	23.9					15.9	
Cycle Queue Clearance Time (g_c), s	62.0	0.0			36.3	23.9					15.9	
Green Ratio (g/C)	0.73	0.76			0.20	0.20					0.16	
Capacity (c), veh/h	987	2715			361	306					278	
Volume-to-Capacity Ratio (X)	1.303	0.382			1.438	1.530					0.850	
Back of Queue (Q), ft/ln (95 th percentile)	2105	7			1249	1171					336	
Back of Queue (Q), veh/ln (95 th percentile)	83.5	0.3			47.7	46.9					12.9	
Queue Storage Ratio (RQ) (95 th percentile)	8.42	0.01			0.64	0.63					2.40	
Uniform Delay (d_1), s/veh	14.8	0.0			44.1	44.1					49.0	
Incremental Delay (d_2), s/veh	143.8	0.4			212.5	254.5					16.7	
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0					0.0	
Control Delay (d), s/veh	158.7	0.4			256.6	298.5					65.7	0.0
Level of Service (LOS)	F	A			F	F					E	A
Approach Delay, s/veh / LOS	88.0	F		276.5	F		0.0			34.9	C	
Intersection Delay, s/veh / LOS	131.2						F					

Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

HCS Signalized Intersection Results Graphical Summary

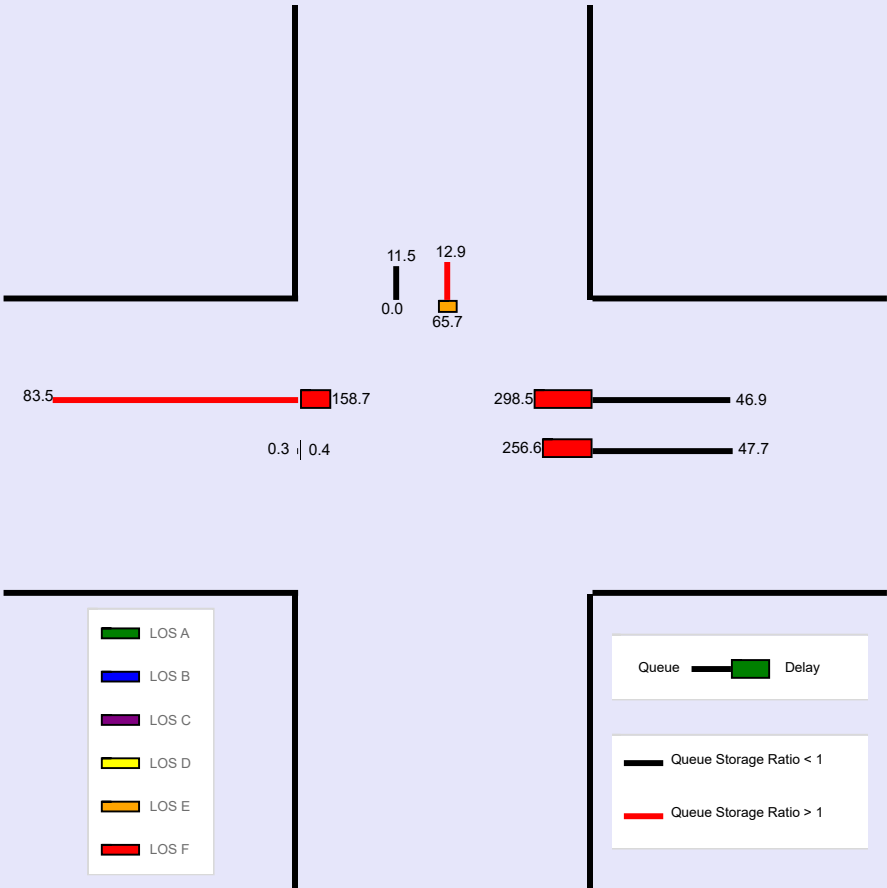
General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.90
Urban Street	Pleasant Valley Road	Analysis Year	2050 'No-Build'	Analysis Period	1 > 7:00
Intersection	I-77 NB Ramps	File Name	05 2050 AM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	1158	934			467	421				213	0	188

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On								

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	2105	7			1249	1171					336	
Back of Queue (Q), veh/ln (95 th percentile)	83.5	0.3			47.7	46.9					12.9	
Queue Storage Ratio (RQ) (95 th percentile)	8.42	0.01			0.64	0.63					2.40	
Control Delay (d), s/veh	158.7	0.4			256.6	298.5					65.7	0.0
Level of Service (LOS)	F	A			F	F					E	A
Approach Delay, s/veh / LOS	88.0		F		276.5	F			0.0		34.9	C
Intersection Delay, s/veh / LOS	131.2						F					

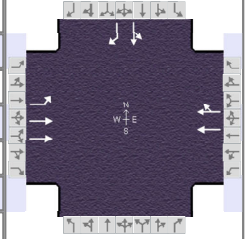


HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.96
Urban Street	Pleasant Valley Road	Analysis Year	2050 'No-Build'	Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	06 2050 PM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



The map shows a four-way intersection with a central intersection area. The surrounding streets are labeled: N (North), S (South), E (East), and W (West). Arrows indicate the direction of traffic flow for each approach. The intersection is located at the intersection of I-77 NB Ramps and Pleasant Valley Road.



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	373	793			938	587				128	0	496

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	373	793			938	587				128	0	496
Initial Queue (Q_0), veh/h	0	0			0	0				0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900			1900	1900				1900	1900	1900
Parking (N_m), man/h		None			None						None	
Heavy Vehicles (P_{HV}), %	2	2			1						6	2
Ped / Bike / RTOR, /h	0	0			0	0	0	0			0	0
Buses (N_b), buses/h	0	0	0		0	0	0				0	0
Arrival Type (AT)	4	4			4	4					3	3
Upstream Filtering (I)	1.00	1.00			1.00	1.00					1.00	1.00
Lane Width (W), ft	12.0	12.0			12.0						12.0	12.0
Turn Bay Length, ft	250	1025			1950						140	0
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35			35	35					25	25

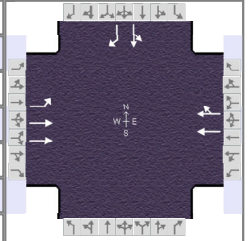
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	36.0	84.0		48.0				36.0
Yellow Change Interval (Y), s	3.6	3.6		3.6				3.0
Red Clearance Interval (R_c), s	1.3	1.3		1.3				2.1
Minimum Green (G_{min}), s	5	10		10				10
Start-Up Lost Time (l_t), s	2.0	2.0		2.0			2.0	2.0
Extension of Effective Green (e), s	2.0	2.0		2.0			2.0	2.0
Passage (PT), s	5.0	2.0		2.0				4.0
Recall Mode	Off	Min		Min				Off
Dual Entry	No	Yes		Yes				Yes
Walk ($Walk$), s				0.0		0.0		0.0
Pedestrian Clearance Time (PC), s				0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius				0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft				9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0		No	0.0	0	No		0		0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0				12.0	5.0	2.0
Pedestrian Signal / Occupied Parking			0.50	No		0.50	No			No		0.50

HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.96
Urban Street	Pleasant Valley Road	Analysis Year	2050 'No-Build'	Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	06 2050 PM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	373	793			938	587				128	0	496

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6				4
Case Number	1.0	4.0		8.3				11.0
Phase Duration, s	29.8	84.0		54.2				36.0
Change Period, ($Y+R_c$), s	4.9	4.9		4.9				5.1
Max Allow Headway (MAH), s	6.1	0.0		0.0				5.5
Queue Clearance Time (g_s), s	23.0							32.9
Green Extension Time (g_e), s	1.9	0.0		0.0				0.0
Phase Call Probability	1.00							1.00
Max Out Probability	0.63							1.00

Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16				7	4	14
Adjusted Flow Rate (v), veh/h	389	826			827	761				133	517	
Adjusted Saturation Flow Rate (s), veh/h/ln	1781	1781			1885	1647				1725		
Queue Service Time (g_s), s	21.0	4.9			58.3	49.3				7.5		
Cycle Queue Clearance Time (g_c), s	21.0	4.9			58.3	49.3				7.5		
Green Ratio (g/C)	0.64	0.66			0.41	0.41				0.26		
Capacity (c), veh/h	429	2347			775	677				444		
Volume-to-Capacity Ratio (X)	0.905	0.352			1.068	1.125				0.300		
Back of Queue (Q), ft/ln (95 th percentile)	464	66			1027	1067				154		
Back of Queue (Q), veh/ln (95 th percentile)	18.3	2.6			40.8	42.7				5.9		
Queue Storage Ratio (RQ) (95 th percentile)	1.86	0.06			0.53	0.55				1.10		
Uniform Delay (d_1), s/veh	33.6	2.8			27.1	27.1				35.8		
Incremental Delay (d_2), s/veh	19.8	0.4			52.0	74.2				0.5		
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0				0.0		
Control Delay (d), s/veh	53.4	3.2			79.1	101.3				36.4	0.0	
Level of Service (LOS)	D	A			F	F				D	A	
Approach Delay, s/veh / LOS	19.3	B		89.7	F		0.0			7.5	A	
Intersection Delay, s/veh / LOS	49.5						D					

Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

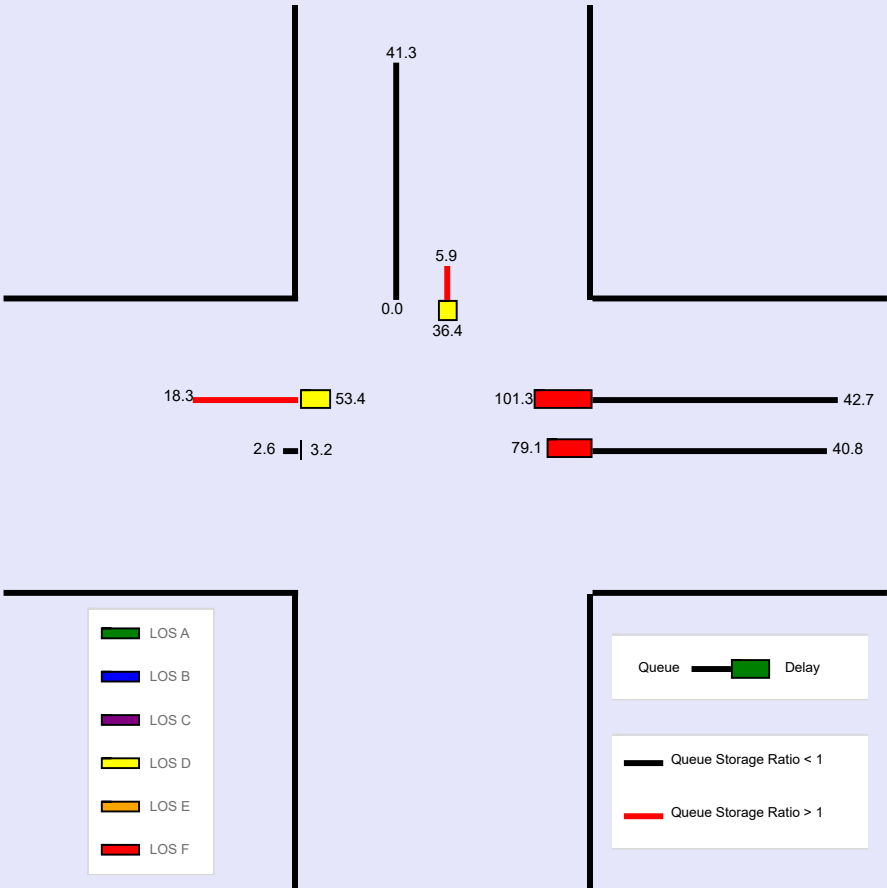
HCS Signalized Intersection Results Graphical Summary

General Information				Intersection Information		
Agency	GPD Group			Duration, h	0.250	
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other	
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.96	
Urban Street	Pleasant Valley Road	Analysis Year	2050 'No-Build'	Analysis Period	1> 7:00	
Intersection	I-77 NB Ramps	File Name	06 2050 PM No-Build Capacity Analysis Pleasant...			
Project Description						
I-77 / Pleasant Valley Road						

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	373	793			938	587				128	0	496

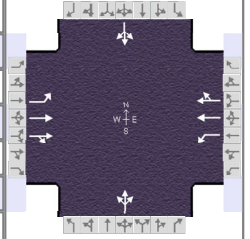
Signal Information															
Cycle, s	120.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	No	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
Green	24.9	49.3	30.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yellow	3.6	3.6	3.0	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	1.3	1.3	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	464	66			1027	1067					154	
Back of Queue (Q), veh/ln (95 th percentile)	18.3	2.6			40.8	42.7					5.9	
Queue Storage Ratio (RQ) (95 th percentile)	1.86	0.06			0.53	0.55					1.10	
Control Delay (d), s/veh	53.4	3.2			79.1	101.3					36.4	0.0
Level of Service (LOS)	D	A			F	F					D	A
Approach Delay, s/veh / LOS	19.3		B		89.7	F			0.0		7.5	A
Intersection Delay, s/veh / LOS	49.5						D					



HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.92
Urban Street	Pleasant Valley Road	Analysis Year	2050 'No-Build'	Analysis Period	1> 7:00
Intersection	Midland Road	File Name	07 2050 AM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	5	1145	8	7	747	10	71	0	19	54	0	55

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	5	1145	8	7	747	10	71	0	19	54	0	55
Initial Queue (Q_0), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h	None			None			None			None		
Heavy Vehicles (P_{HV}), %	2	2		7	7			5			1	
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	4	4	4	4	4	4	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0		12.0	12.0			12.0			12.0	
Turn Bay Length, ft	90	499		90	499			350			300	
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35	35	35	35	35	25	25	25	25	25	25

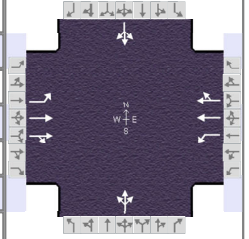
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	15.0	70.0	15.0	70.0		35.0		35.0
Yellow Change Interval (Y), s	3.6	3.6	3.6	3.6		2.8		2.8
Red Clearance Interval (R_c), s	1.0	1.0	1.0	1.0		2.3		2.3
Minimum Green (G_{min}), s	10	10	10	10		7		7
Start-Up Lost Time (l_t), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	3.0	2.0	3.0	2.0		3.0		3.0
Recall Mode	Off	Min	Off	Min		Off		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk ($Walk$), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No		0.50	No		0.50	No		0.50	No		0.50

HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.92
Urban Street	Pleasant Valley Road	Analysis Year	2050 'No-Build'	Analysis Period	1> 7:00
Intersection	Midland Road	File Name	07 2050 AM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	5	1145	8	7	747	10	71	0	19	54	0	55

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	1.7	0.6	91.8	11.7	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.6	0.0	3.6	2.8	0.0	0.0		
				Red	1.0	0.0	1.0	2.3	0.0	0.0		

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	4.0	1.1	4.0		8.0		8.0
Phase Duration, s	6.3	96.4	6.8	97.0		16.8		16.8
Change Period, ($Y+R_c$), s	4.6	4.6	4.6	4.6		5.1		5.1
Max Allow Headway (MAH), s	4.1	0.0	4.1	0.0		4.3		4.3
Queue Clearance Time (g_s), s	2.1		2.1			10.9		10.5
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0		0.7		0.7
Phase Call Probability	0.17		0.22			1.00		1.00
Max Out Probability	0.00		0.00			0.00		0.00

Movement Group Results

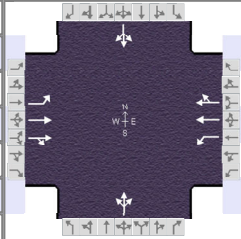
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	5	627	626	8	412	410		98			118	
Adjusted Saturation Flow Rate (s), veh/h/ln	1781	1870	1866	1711	1796	1788		1299			1595	
Queue Service Time (g_s), s	0.1	0.0	0.0	0.1	0.0	0.0		0.4			0.0	
Cycle Queue Clearance Time (g_c), s	0.1	0.0	0.0	0.1	0.0	0.0		8.9			8.5	
Green Ratio (g/C)	0.78	0.76	0.76	0.78	0.77	0.77		0.10			0.10	
Capacity (c), veh/h	586	1431	1427	417	1383	1376		180			200	
Volume-to-Capacity Ratio (X)	0.009	0.439	0.439	0.018	0.298	0.298		0.543			0.592	
Back of Queue (Q), ft/ln (95 th percentile)	1	18	18	2	10	10		142			166	
Back of Queue (Q), veh/ln (95 th percentile)	0.0	0.7	0.7	0.1	0.4	0.4		5.5			6.6	
Queue Storage Ratio (RQ) (95 th percentile)	0.01	0.04	0.04	0.02	0.02	0.02		0.41			0.55	
Uniform Delay (d_1), s/veh	2.9	0.0	0.0	2.8	0.0	0.0		52.9			52.7	
Incremental Delay (d_2), s/veh	0.0	1.0	1.0	0.0	0.6	0.6		2.5			2.8	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Control Delay (d), s/veh	2.9	1.0	1.0	2.8	0.6	0.6		55.4			55.5	
Level of Service (LOS)	A	A	A	A	A	A		E			E	
Approach Delay, s/veh / LOS	1.0		A	0.6		A	55.4		E	55.5		E
Intersection Delay, s/veh / LOS	5.9						A					

Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

HCS Signalized Intersection Results Graphical Summary

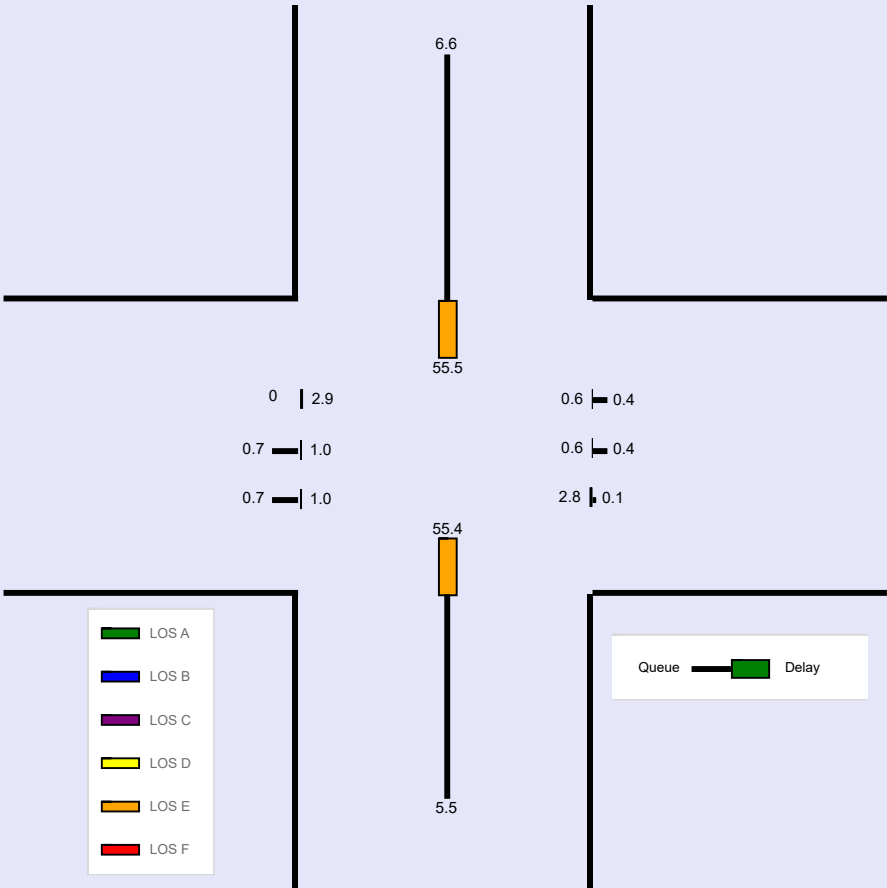
General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.92
Urban Street	Pleasant Valley Road	Analysis Year	2050 'No-Build'	Analysis Period	1> 7:00
Intersection	Midland Road	File Name	07 2050 AM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	5	1145	8	7	747	10	71	0	19	54	0	55

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On								

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	1	18	18	2	10	10		142			166	
Back of Queue (Q), veh/ln (95 th percentile)	0.0	0.7	0.7	0.1	0.4	0.4		5.5			6.6	
Queue Storage Ratio (RQ) (95 th percentile)	0.01	0.04	0.04	0.02	0.02	0.02		0.41			0.55	
Control Delay (d), s/veh	2.9	1.0	1.0	2.8	0.6	0.6		55.4			55.5	
Level of Service (LOS)	A	A	A	A	A	A		E			E	
Approach Delay, s/veh / LOS	1.0		A	0.6		A	55.4		E	55.5		E
Intersection Delay, s/veh / LOS	5.9						A					

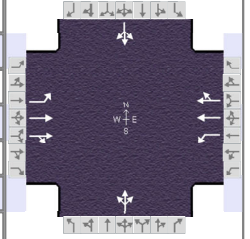


HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93
Urban Street	Pleasant Valley Road	Analysis Year	2050 'No-Build'	Analysis Period	1> 7:00
Intersection	Midland Road	File Name	08 2050 PM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



The map shows a four-way intersection of Midland Road and Pleasant Valley Road. Midland Road runs horizontally, and Pleasant Valley Road runs vertically. Traffic flow is indicated by arrows: Northbound and Southbound on Midland Road, and Eastbound and Westbound on Pleasant Valley Road. The intersection is marked with a central 'X' and a compass rose indicating North (N), South (S), East (E), and West (W). Surrounding streets are labeled: I-77 to the north, I-49 to the south, and I-20 to the east. The map also shows various traffic signs and lane markings.



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	53	813	68	12	1503	103	35	0	12	22	0	26

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	53	813	68	12	1503	103	35	0	12	22	0	26
Initial Queue (Q_0), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h	None			None			None			None		
Heavy Vehicles (P_{HV}), %	3	3		1	1			3			0	
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	4	4	4	4	4	4	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0		12.0	12.0			12.0			12.0	
Turn Bay Length, ft	90	499		90	499			350			300	
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35	35	35	35	35	25	25	25	25	25	25

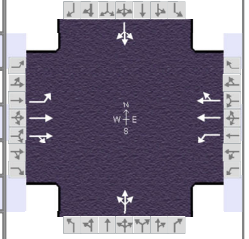
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	15.0	75.0	15.0	75.0		30.0		30.0
Yellow Change Interval (Y), s	3.6	3.6	3.6	3.6		2.8		2.8
Red Clearance Interval (R_c), s	1.0	1.0	1.0	1.0		2.3		2.3
Minimum Green (G_{min}), s	7	10	7	10		7		7
Start-Up Lost Time (l_t), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	3.0	2.0	3.0	2.0		3.0		3.0
Recall Mode	Off	Min	Off	Min		Off		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk ($Walk$), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No		0.50	No		0.50	No		0.50	No		0.50

HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93
Urban Street	Pleasant Valley Road	Analysis Year	2050 'No-Build'	Analysis Period	1> 7:00
Intersection	Midland Road	File Name	08 2050 PM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	53	813	68	12	1503	103	35	0	12	22	0	26

Signal Information

Cycle, s	120.0	Reference Phase	2																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				</
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Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	4.0	1.1	4.0		8.0		8.0
Phase Duration, s	10.6	101.1	7.0	97.6		11.9		11.9
Change Period, ($Y+R_c$), s	4.6	4.6	4.6	4.6		5.1		5.1
Max Allow Headway (MAH), s	4.1	0.0	4.1	0.0		4.3		4.3
Queue Clearance Time (g_s), s	2.7		2.2			5.9		5.6
Green Extension Time (g_e), s	0.1	0.0	0.0	0.0		0.3		0.3
Phase Call Probability	0.85		0.35			0.97		0.97
Max Out Probability	0.00		0.00			0.00		0.00

Movement Group Results

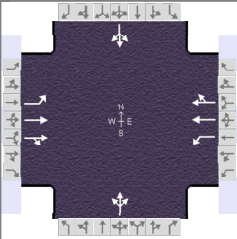
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	57	480	467	13	867	859		51			52	
Adjusted Saturation Flow Rate (s), veh/h/ln	1767	1856	1805	1795	1885	1842		1468			1609	
Queue Service Time (g_s), s	0.7	0.0	0.0	0.2	0.0	0.0		0.3			0.0	
Cycle Queue Clearance Time (g_c), s	0.7	0.0	0.0	0.2	0.0	0.0		3.9			3.6	
Green Ratio (g/C)	0.83	0.80	0.80	0.80	0.77	0.77		0.06			0.06	
Capacity (c), veh/h	364	1492	1451	559	1461	1428		135			134	
Volume-to-Capacity Ratio (X)	0.157	0.322	0.322	0.023	0.594	0.602		0.374			0.384	
Back of Queue (Q), ft/ln (95 th percentile)	7	11	11	2	33	34		72			72	
Back of Queue (Q), veh/ln (95 th percentile)	0.3	0.4	0.4	0.1	1.3	1.3		2.8			2.9	
Queue Storage Ratio (RQ) (95 th percentile)	0.08	0.02	0.02	0.03	0.07	0.07		0.21			0.24	
Uniform Delay (d_1), s/veh	1.7	0.0	0.0	2.5	0.0	0.0		55.2			55.1	
Incremental Delay (d_2), s/veh	0.2	0.6	0.6	0.0	1.8	1.9		1.7			1.8	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Control Delay (d), s/veh	1.9	0.6	0.6	2.5	1.8	1.9		56.9			56.9	
Level of Service (LOS)	A	A	A	A	A	A		E			E	
Approach Delay, s/veh / LOS	0.7	A		1.8	A		56.9	E		56.9	E	
Intersection Delay, s/veh / LOS	3.4						A					

Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

HCS Signalized Intersection Results Graphical Summary

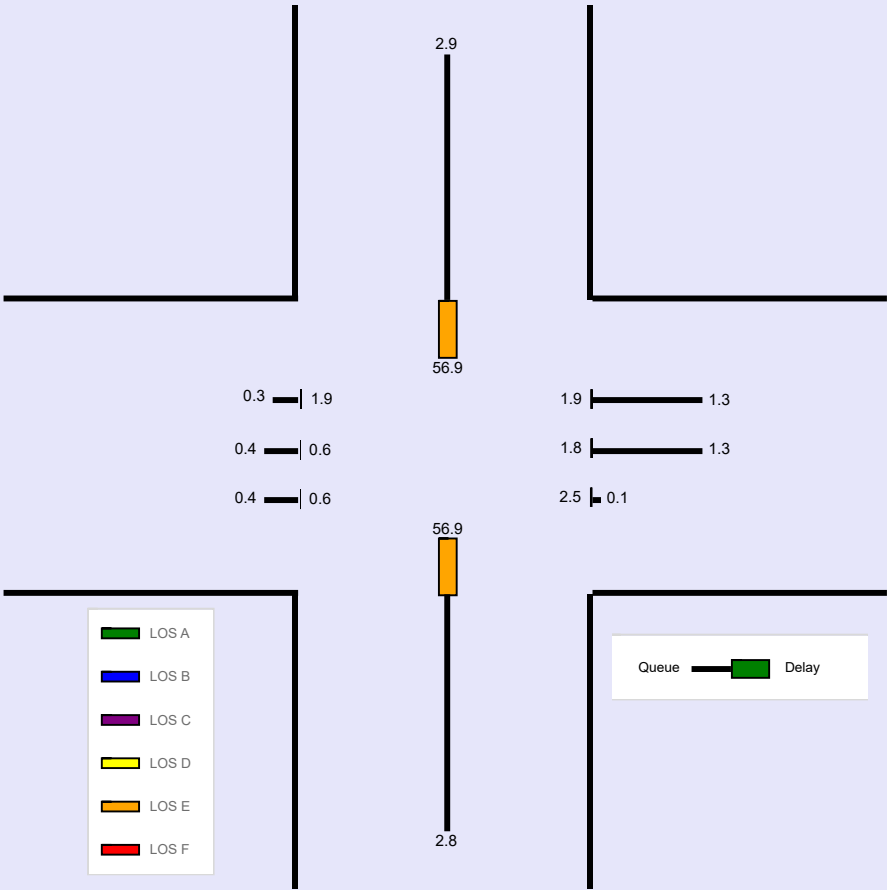
General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93
Urban Street	Pleasant Valley Road	Analysis Year	2050 'No-Build'	Analysis Period	1> 7:00
Intersection	Midland Road	File Name	08 2050 PM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	53	813	68	12	1503	103	35	0	12	22	0	26

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On								

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	7	11	11	2	33	34		72			72	
Back of Queue (Q), veh/ln (95 th percentile)	0.3	0.4	0.4	0.1	1.3	1.3		2.8			2.9	
Queue Storage Ratio (RQ) (95 th percentile)	0.08	0.02	0.02	0.03	0.07	0.07		0.21			0.24	
Control Delay (d), s/veh	1.9	0.6	0.6	2.5	1.8	1.9		56.9			56.9	
Level of Service (LOS)	A	A	A	A	A	A		E			E	
Approach Delay, s/veh / LOS	0.7		A	1.8		A	56.9		E	56.9		E
Intersection Delay, s/veh / LOS	3.4						A					



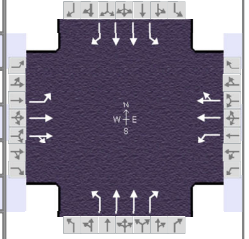
HCS Signalized Intersection Input Data

General Information						Intersection Information									
Agency	GPD Group				Duration, h	0.250									
Analyst	Ryan Barco		Analysis Date	May 10, 2024		Area Type	Other								
Jurisdiction	City of Independence		Time Period	AM Peak Hour		PHF	0.89								
Urban Street	Brecksville Road		Analysis Year	2050 'No-Build'		Analysis Period	1> 7:00								
Intersection	Pleasant Valley Road		File Name	09 2050 AM No-Build Capacity Analysis Pleasant...											
Project Description	I-77 / Pleasant Valley Road														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				229	946	43	60	447	88	124	540	265	197	277	171
Signal Information															
Cycle, s	120.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	No	Simult. Gap E/W	On	Green	8.5	3.9	35.7	4.7	4.3	36.5					
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.6	0.0	3.6	3.6	3.6	3.6					
				Red	1.6	0.0	1.6	1.6	1.6	2.0					
Traffic Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				229	946	43	60	447	88	124	540	265	197	277	171
Initial Queue (Q_0), veh/h				0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h				1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h				None			None			None			None		
Heavy Vehicles (P_{HV}), %				3	3		4	4		1	1	1	4	4	4
Ped / Bike / RTOR, /h				0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h				0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)				3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft				12.0	12.0		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0
Turn Bay Length, ft				390	999		270	999		400	560	400	320	800	350
Grade (P_g), %					0			0			0			0	
Speed Limit, mi/h				35	35	35	35	35	35	35	35	35	35	35	35
Phase Information				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Maximum Green (G_{max}) or Phase Split, s				30.0	48.0	18.0	36.0	18.0	36.0	18.0	36.0				
Yellow Change Interval (Y), s				3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6				
Red Clearance Interval (R_c), s				1.6	2.0	1.6	2.0	1.6	1.6	1.6	1.6				
Minimum Green (G_{min}), s				7	10	5	10	5	10	5	10				
Start-Up Lost Time (l_t), s				2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0				
Extension of Effective Green (e), s				2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0				
Passage (PT), s				3.0	5.0	3.0	5.0	3.0	2.0	2.0	2.0				
Recall Mode				Off	Off	Off	Off	Off	Min	Off	Min				
Dual Entry				No	Yes	No	Yes	No	Yes	No	Yes				
Walk ($Walk$), s					0.0		0.0		0.0		0.0				
Pedestrian Clearance Time (PC), s					0.0		0.0		0.0		0.0				
Multimodal Information				EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius				0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft				9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft				0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft				12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking				No	0.50	No	0.50	No	0.50	No	0.50	No	0.50		

HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group		
Analyst	Ryan Barco	Analysis Date	May 10, 2024
Jurisdiction	City of Independence	Time Period	AM Peak Hour
Urban Street	Brecksville Road	Analysis Year	2050 'No-Build'
Intersection	Pleasant Valley Road	File Name	09 2050 AM No-B
Project Description	I-77 / Pleasant Valley Road		



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	229	946	43	60	447	88	124	540	265	197	277	171

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	8.5	3.9	35.7	4.7	4.3	36.5		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.6	0.0	3.6	3.6	3.6	3.6		
				Red	1.6	0.0	1.6	1.6	1.6	2.0		

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	1.1	4.0	1.1	4.0	1.1	3.0	1.1	3.0
Phase Duration, s	19.3	51.6	9.9	42.1	13.7	40.9	17.7	44.8
Change Period, ($Y+R_c$), s	5.2	5.6	5.2	5.6	5.2	5.2	5.2	5.2
Max Allow Headway (MAH), s	4.1	6.1	4.1	6.1	4.1	0.0	3.1	0.0
Queue Clearance Time (g_s), s	13.5	34.0	5.2	19.0	8.4		12.3	
Green Extension Time (g_e), s	0.7	12.0	0.1	14.9	0.3	0.0	0.2	0.0
Phase Call Probability	1.00	1.00	0.89	1.00	0.99		1.00	
Max Out Probability	0.01	0.77	0.02	0.67	0.02		0.16	

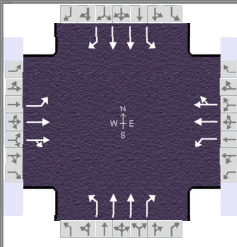
Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h	257	560	551	67	308	293	139	607	298	221	311	192
Adjusted Saturation Flow Rate (s), veh/h/ln	1767	1856	1827	1753	1841	1735	1795	1795	1598	1753	1752	1560
Queue Service Time (g_s), s	11.5	32.0	32.0	3.2	16.8	17.0	6.4	17.2	18.2	10.3	7.8	9.3
Cycle Queue Clearance Time (g_c), s	11.5	32.0	32.0	3.2	16.8	17.0	6.4	17.2	18.2	10.3	7.8	9.3
Green Ratio (g/C)	0.44	0.38	0.38	0.34	0.30	0.30	0.37	0.30	0.34	0.41	0.33	0.45
Capacity (c), veh/h	400	711	700	178	560	528	455	1068	537	366	1157	699
Volume-to-Capacity Ratio (X)	0.643	0.788	0.788	0.379	0.550	0.555	0.306	0.568	0.554	0.605	0.269	0.275
Back of Queue (Q), ft/ln (95 th percentile)	218	553	534	64	316	295	125	310	304	198	157	164
Back of Queue (Q), veh/ln (95 th percentile)	8.5	21.6	21.3	2.5	12.3	11.8	5.0	12.3	12.1	7.7	6.1	6.4
Queue Storage Ratio (RQ) (95 th percentile)	0.56	0.55	0.55	0.24	0.32	0.30	0.31	0.55	0.76	0.62	0.20	0.47
Uniform Delay (d_1), s/veh	24.3	32.7	32.7	29.8	34.9	34.9	26.1	35.6	32.5	26.0	29.6	20.9
Incremental Delay (d_2), s/veh	1.7	6.1	6.2	1.3	1.8	1.9	0.4	2.2	4.1	0.7	0.6	1.0
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	26.0	38.8	38.9	31.1	36.7	36.9	26.5	37.8	36.6	26.7	30.1	21.8
Level of Service (LOS)	C	D	D	C	D	D	C	D	D	C	C	C
Approach Delay, s/veh / LOS	36.5	D		36.2	D		36.0	D		26.9	C	
Intersection Delay, s/veh / LOS	34.5						C					

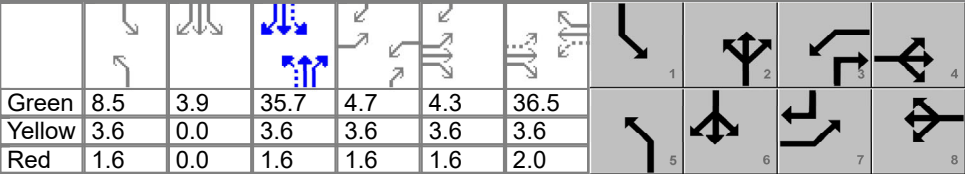
Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

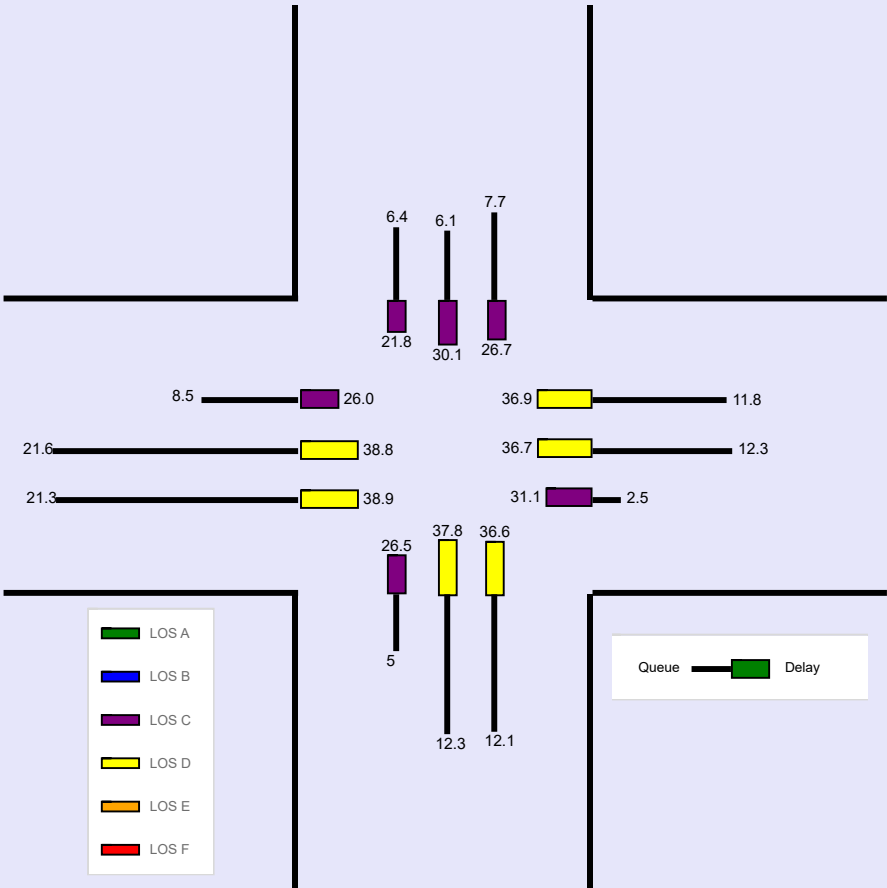
HCS Signalized Intersection Results Graphical Summary

General Information				Intersection Information		
Agency	GPD Group			Duration, h	0.250	
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other	
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.89	
Urban Street	Brecksville Road	Analysis Year	2050 'No-Build'	Analysis Period	1> 7:00	
Intersection	Pleasant Valley Road	File Name	09 2050 AM No-Build Capacity Analysis Pleasant...			
Project Description	I-77 / Pleasant Valley Road					

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	229	946	43	60	447	88	124	540	265	197	277	171

Signal Information													
Cycle, s	120.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	No	Simult. Gap E/W	On										
Force Mode	Fixed	Simult. Gap N/S	On										
				Green	8.5	3.9	35.7	4.7	4.3	36.5			
				Yellow	3.6	0.0	3.6	3.6	3.6	3.6			
				Red	1.6	0.0	1.6	1.6	1.6	2.0			

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	218	553	534	64	316	295	125	310	304	198	157	164
Back of Queue (Q), veh/ln (95 th percentile)	8.5	21.6	21.3	2.5	12.3	11.8	5.0	12.3	12.1	7.7	6.1	6.4
Queue Storage Ratio (RQ) (95 th percentile)	0.56	0.55	0.55	0.24	0.32	0.30	0.31	0.55	0.76	0.62	0.20	0.47
Control Delay (d), s/veh	26.0	38.8	38.9	31.1	36.7	36.9	26.5	37.8	36.6	26.7	30.1	21.8
Level of Service (LOS)	C	D	D	C	D	D	C	D	D	C	C	C
Approach Delay, s/veh / LOS	36.5		D	36.2		D	36.0		D	26.9		C
Intersection Delay, s/veh / LOS	34.5						C					



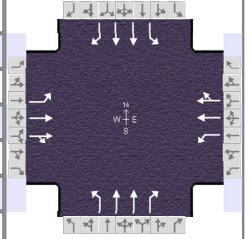
HCS Signalized Intersection Input Data

General Information						Intersection Information										
Agency	GPD Group				Duration, h	0.250										
Analyst	Ryan Barco		Analysis Date	May 21, 2024		Area Type	Other									
Jurisdiction	City of Independence		Time Period	PM Peak Hour		PHF	0.97									
Urban Street	Brecksville Road		Analysis Year	2050 'No-Build'		Analysis Period	1 > 7:00									
Intersection	Pleasant Valley Road		File Name	10 2050 PM No-Build Capacity Analysis Pleasant...												
Project Description	I-77 / Pleasant Valley Road															
Demand Information					EB			WB			NB			SB		
Approach Movement					L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h					212	465	157	186	1025	134	110	338	54	102	850	473
Signal Information																
Cycle, s	120.0	Reference Phase	2													
Offset, s	0	Reference Point	End													
Uncoordinated	No	Simult. Gap E/W	On													
Force Mode	Fixed	Simult. Gap N/S	On													
Green					6.9	0.5	32.8	9.7	1.4	47.5						
Yellow					3.6	0.0	3.6	3.6	0.0	3.6						
Red					1.6	0.0	1.6	1.6	0.0	2.0						
Traffic Information					EB			WB			NB			SB		
Approach Movement					L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h					212	465	157	186	1025	134	110	338	54	102	850	473
Initial Queue (Q_0), veh/h					0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h					1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h					None			None			None			None		
Heavy Vehicles (P_{HV}), %					3	3		2	2		2	2	2	1	1	1
Ped / Bike / RTOR, /h					0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h					0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)					3	3	3	3	3	3	3	3	3	3	3	3
Upstream Filtering (I)					1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft					12.0	12.0		12.0	12.0		12.0	12.0	12.0	12.0	12.0	12.0
Turn Bay Length, ft					390	999		270	999		400	560	400	320	800	350
Grade (P_g), %						0			0			0			0	
Speed Limit, mi/h					35	35	35	35	35	35	35	35	35	35	35	35
Phase Information					EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Maximum Green (G_{max}) or Phase Split, s					24.0	54.0	18.0	48.0	18.0	30.0	18.0	30.0				
Yellow Change Interval (Y), s					3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6				
Red Clearance Interval (R_c), s					1.6	2.0	1.6	2.0	1.6	1.6	1.6	1.6				
Minimum Green (G_{min}), s					7	10	5	10	5	10	5	10				
Start-Up Lost Time (l_t), s					2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0				
Extension of Effective Green (e), s					2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0				
Passage (PT), s					3.0	5.0	3.0	5.0	3.0	2.0	3.0	2.0				
Recall Mode					Off	Off	Off	Off	Off	Min	Off	Min				
Dual Entry					No	Yes	No	Yes	No	Yes	No	Yes				
Walk ($Walk$), s						0.0		0.0		0.0		0.0				
Pedestrian Clearance Time (PC), s						0.0		0.0		0.0		0.0				
Multimodal Information					EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius					0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft					9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft					0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft					12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking					No	0.50	No	0.50	No	0.50	No	0.50	No	0.50		

HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 21, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.97
Urban Street	Brecksville Road	Analysis Year	2050 'No-Build'	Analysis Period	1> 7:00
Intersection	Pleasant Valley Road	File Name	10 2050 PM No-Build Capacity Analysis Pleasant...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	212	465	157	186	1025	134	110	338	54	102	850	473

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	6.9	0.5	32.8	9.7	1.4	47.5		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	3.6	0.0	3.6	3.6	0.0	3.6		
				Red	1.6	0.0	1.6	1.6	0.0	2.0		

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	1.1	4.0	1.1	4.0	1.1	3.0	1.1	3.0
Phase Duration, s	16.3	54.5	14.9	53.1	12.6	38.5	12.1	38.0
Change Period, ($Y+R_c$), s	5.2	5.6	5.2	5.6	5.2	5.2	5.2	5.2
Max Allow Headway (MAH), s	4.1	6.1	4.1	6.1	4.1	0.0	4.1	0.0
Queue Clearance Time (g_s), s	10.7	17.8	9.6	37.1	7.4		7.0	
Green Extension Time (g_e), s	0.4	21.5	0.2	10.4	0.2	0.0	0.2	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	0.98		0.97	
Max Out Probability	0.07	0.57	1.00	0.87	0.03		0.02	

Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (v), veh/h	219	333	308	192	609	586	113	348	56	105	876	488
Adjusted Saturation Flow Rate (s), veh/h/ln	1767	1856	1695	1781	1870	1794	1781	1781	1585	1795	1795	1598
Queue Service Time (g_s), s	8.7	15.6	15.8	7.6	35.0	35.1	5.4	9.4	2.8	5.0	28.2	32.8
Cycle Queue Clearance Time (g_c), s	8.7	15.6	15.8	7.6	35.0	35.1	5.4	9.4	2.8	5.0	28.2	32.8
Green Ratio (g/C)	0.49	0.41	0.41	0.48	0.40	0.40	0.34	0.28	0.36	0.33	0.27	0.37
Capacity (c), veh/h	271	755	690	409	740	710	195	987	568	353	980	584
Volume-to-Capacity Ratio (X)	0.806	0.441	0.446	0.469	0.823	0.825	0.583	0.353	0.098	0.298	0.894	0.835
Back of Queue (Q), ft/ln (95 th percentile)	188	289	265	145	604	578	112	191	51	99	505	532
Back of Queue (Q), veh/ln (95 th percentile)	7.3	11.3	10.6	5.7	23.8	23.1	4.4	7.5	2.0	3.9	20.0	21.1
Queue Storage Ratio (RQ) (95 th percentile)	0.48	0.29	0.27	0.54	0.60	0.59	0.28	0.34	0.13	0.31	0.63	1.52
Uniform Delay (d_1), s/veh	26.0	25.7	25.8	19.9	32.5	32.5	32.3	34.7	25.6	29.1	41.9	34.7
Incremental Delay (d_2), s/veh	8.1	0.9	1.0	0.8	7.9	8.3	2.8	1.0	0.3	0.5	12.3	13.2
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	34.1	26.6	26.7	20.7	40.3	40.8	35.1	35.7	25.9	29.5	54.2	48.0
Level of Service (LOS)	C	C	C	C	D	D	D	D	C	C	D	D
Approach Delay, s/veh / LOS	28.5	C		37.8	D		34.5	C		50.4	D	
Intersection Delay, s/veh / LOS	39.9						D					

Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

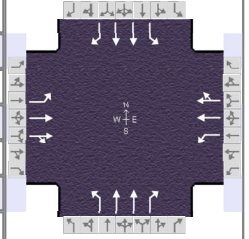
HCS Signalized Intersection Results Graphical Summary

General Information

Agency	GPD Group		
Analyst	Ryan Barco	Analysis Date	May 21, 2024
Jurisdiction	City of Independence	Time Period	PM Peak Hour
Urban Street	Brecksville Road	Analysis Year	2050 'No-Build'
Intersection	Pleasant Valley Road	File Name	10 2050 PM No-Build Capacity Analysis Pleasant...
Project Description	I-77 / Pleasant Valley Road		

Intersection Information

Duration, h	0.250
Area Type	Other
PHF	0.97
Analysis Period	1 > 7:00



Demand Information

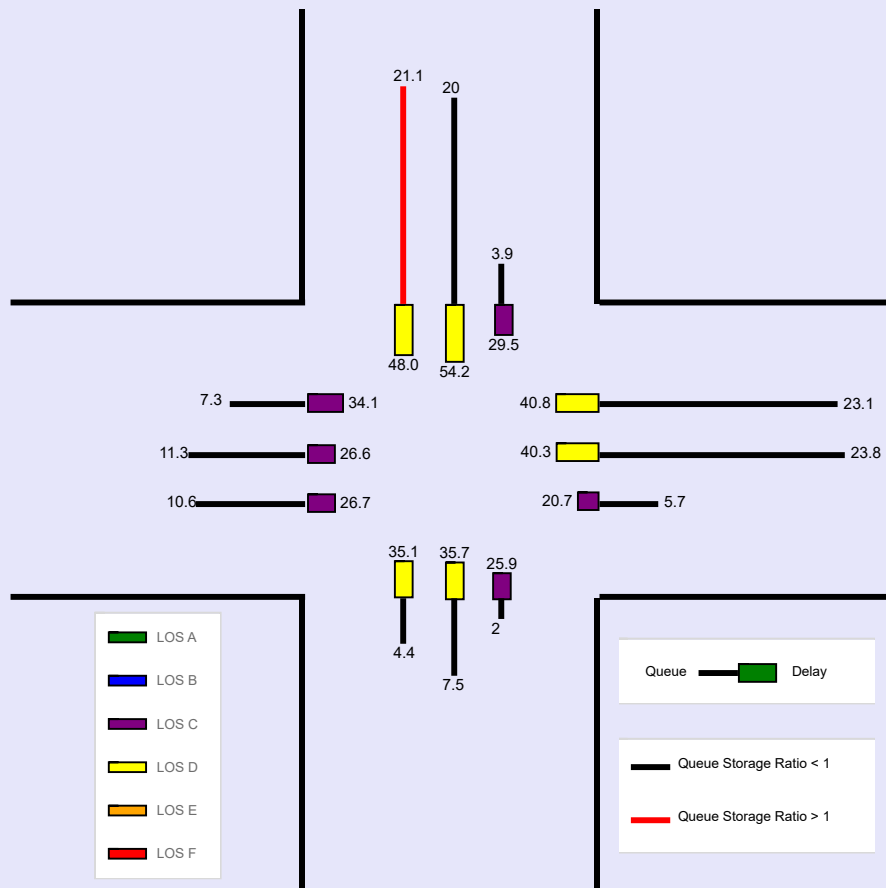
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	212	465	157	186	1025	134	110	338	54	102	850	473

Signal Information

Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	188	289	265	145	604	578	112	191	51	99	505	532
Back of Queue (Q), veh/ln (95 th percentile)	7.3	11.3	10.6	5.7	23.8	23.1	4.4	7.5	2.0	3.9	20.0	21.1
Queue Storage Ratio (RQ) (95 th percentile)	0.48	0.29	0.27	0.54	0.60	0.59	0.28	0.34	0.13	0.31	0.63	1.52
Control Delay (d), s/veh	34.1	26.6	26.7	20.7	40.3	40.8	35.1	35.7	25.9	29.5	54.2	48.0
Level of Service (LOS)	C	C	C	C	D	D	D	D	C	C	D	D
Approach Delay, s/veh / LOS	28.5	C		37.8	D		34.5	C		50.4	D	
Intersection Delay, s/veh / LOS	39.9						D					



APPENDIX H
'BUILD' ALTERNATE 1' HCS INTERSECTION CAPACITY ANALYSIS

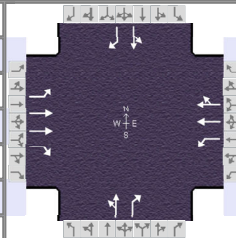
OPENING YEAR 2030

HCS Signalized Intersection Input Data

General Information						Intersection Information									
Agency	GPD Group				Duration, h	0.250									
Analyst	Ryan Barco		Analysis Date	May 10, 2024		Area Type	Other								
Jurisdiction	City of Independence		Time Period	AM Peak Hour		PHF	0.91								
Urban Street	Pleasant Valley Road		Analysis Year	2030 'Build Alt. 1'		Analysis Period	1> 7:00								
Intersection	I-77 SB Ramps / Forest...		File Name	03.1 2030 AM Build Capacity Analysis Pleasant &...											
Project Description	I-77 / Pleasant Valley Road														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				20	1339	378	149	376	47	202	11	429	62	46	10
Signal Information															
Cycle, s	120.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	No	Simult. Gap E/W	On	Green	2.6	4.5	61.1	9.7	22.1	0.0					
Force Mode	Fixed	Simult. Gap N/S	Off	Yellow	3.6	0.0	3.6	3.0	3.0	0.0					
				Red	1.3	0.0	1.3	2.1	2.1	0.0					
Traffic Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				20	1339	378	149	376	47	202	11	429	62	46	10
Initial Queue (Q_0), veh/h				0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h				1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h				None			None			None			None		
Heavy Vehicles (P_{HV}), %				1	1	0	3	3			4	0		2	2
Ped / Bike / RTOR, /h				0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h				0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)				3	3	3	4	4	4	3	3	3	3	3	3
Upstream Filtering (I)				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft				12.0	12.0	12.0	12.0	12.0			12.0	12.0		12.0	12.0
Turn Bay Length, ft				105	2430	150	325	1025			1200	0		499	110
Grade (P_g), %					0			0			0			0	
Speed Limit, mi/h				35	35	35	35	35	35	25	25	25	25	25	25
Phase Information				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Maximum Green (G_{max}) or Phase Split, s				18.0	66.0	12.0	60.0		24.0		18.0				
Yellow Change Interval (Y), s				3.6	3.6	3.6	3.6		3.0		3.0				
Red Clearance Interval (R_c), s				1.3	1.3	1.3	1.3		2.1		2.1				
Minimum Green (G_{min}), s				5	20	5	20		10		7				
Start-Up Lost Time (l_t), s				2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0				
Extension of Effective Green (e), s				2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0				
Passage (PT), s				2.5	2.0	2.5	2.0		4.5		3.0				
Recall Mode				Off	Min	Off	Min		Min		Off				
Dual Entry				No	Yes	No	Yes		Yes		Yes				
Walk ($Walk$), s					0.0		0.0		0.0		0.0				
Pedestrian Clearance Time (PC), s					0.0		0.0		0.0		0.0				
Multimodal Information				EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius				0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft				9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft				0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft				12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking				No	0.50	No	0.50	No	0.50	No	0.50	No	0.50		

HCS Signalized Intersection Results Summary

General Information				Intersection Information		
Agency	GPD Group			Duration, h	0.250	
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other	
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.91	
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 1'	Analysis Period	1> 7:00	
Intersection	I-77 SB Ramps / Forest...	File Name	03.1 2030 AM Build Capacity Analysis Pleasant &...			
Project Description	I-77 / Pleasant Valley Road					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	20	1339	378	149	376	47	202	11	429	62	46	10

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off								

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		11.0		11.0
Phase Duration, s	7.5	66.0	12.0	70.5		27.2		14.8
Change Period, ($Y+R_c$), s	4.9	4.9	4.9	4.9		5.1		5.1
Max Allow Headway (MAH), s	3.6	0.0	3.6	0.0		5.9		4.2
Queue Clearance Time (g_s), s	2.7		7.2			24.1		9.7
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0		0.0		0.1
Phase Call Probability	0.52		1.00			1.00		0.99
Max Out Probability	0.00		1.00			1.00		1.00

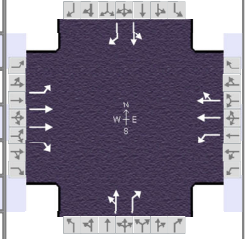
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	22	1471	415	164	236	229		234	471		119	11
Adjusted Saturation Flow Rate (s), veh/h/ln	1795	1795	1610	1767	1856	1783		1757			1818	1585
Queue Service Time (g_s), s	0.7	40.9	20.5	5.2	5.0	5.0		15.0			7.7	0.8
Cycle Queue Clearance Time (g_c), s	0.7	40.9	20.5	5.2	5.0	5.0		15.0			7.7	0.8
Green Ratio (g/C)	0.53	0.51	0.51	0.58	0.55	0.55		0.18			0.08	0.08
Capacity (c), veh/h	555	1827	820	225	1014	975		324			147	128
Volume-to-Capacity Ratio (X)	0.040	0.805	0.507	0.729	0.232	0.235		0.723			0.809	0.086
Back of Queue (Q), ft/ln (95 th percentile)	13	615	314	137	91	87		306			193	15
Back of Queue (Q), veh/ln (95 th percentile)	0.5	24.4	12.6	5.3	3.6	3.5		11.9			7.6	0.6
Queue Storage Ratio (RQ) (95 th percentile)	0.12	0.25	2.09	0.42	0.09	0.09		0.26			0.39	0.13
Uniform Delay (d_1), s/veh	13.4	24.5	19.5	23.7	8.0	8.1		46.1			54.3	51.1
Incremental Delay (d_2), s/veh	0.0	3.9	2.2	10.8	0.5	0.6		8.8			16.7	0.3
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	0.0
Control Delay (d), s/veh	13.4	28.4	21.7	34.5	8.6	8.6		54.9	0.0		71.0	51.4
Level of Service (LOS)	B	C	C	C	A	A		D	A		E	D
Approach Delay, s/veh / LOS	26.8		C	15.3		B	18.2		B	69.3		E
Intersection Delay, s/veh / LOS	24.5						C					

Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS												
Bicycle LOS Score / LOS												

HCS Signalized Intersection Results Graphical Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.91
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 1'	Analysis Period	1 > 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	03.1 2030 AM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

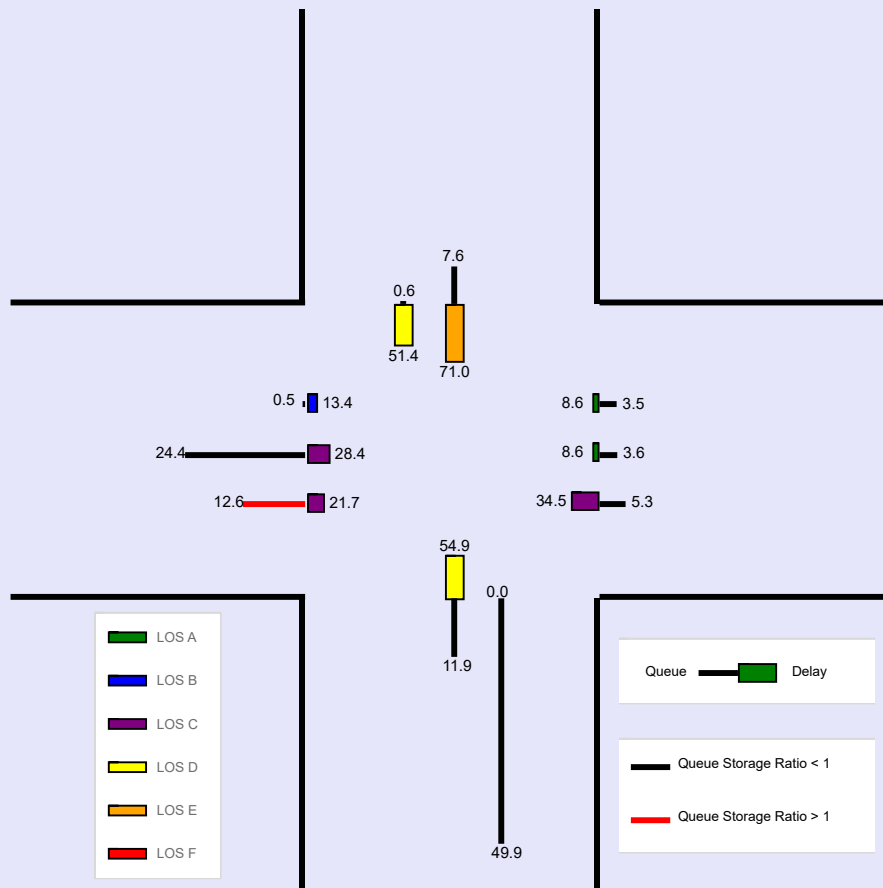
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	20	1339	378	149	376	47	202	11	429	62	46	10

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	2.6	4.5	61.1	9.7	22.1	0.0		
Force Mode	Fixed	Simult. Gap N/S	Off	Yellow	3.6	0.0	3.6	3.0	3.0	0.0		
				Red	1.3	0.0	1.3	2.1	2.1	0.0		

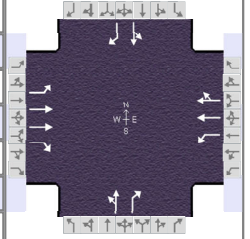
Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	13	615	314	137	91	87		306			193	15
Back of Queue (Q), veh/ln (95 th percentile)	0.5	24.4	12.6	5.3	3.6	3.5		11.9			7.6	0.6
Queue Storage Ratio (RQ) (95 th percentile)	0.12	0.25	2.09	0.42	0.09	0.09		0.26			0.39	0.13
Control Delay (d), s/veh	13.4	28.4	21.7	34.5	8.6	8.6		54.9	0.0		71.0	51.4
Level of Service (LOS)	B	C	C	C	A	A		D	A		E	D
Approach Delay, s/veh / LOS	26.8		C	15.3		B	18.2		B	69.3		E
Intersection Delay, s/veh / LOS	24.5						C					



HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 1'	Analysis Period	1> 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	04.1 2030 PM Build Capacity Analysis Pleasant & ...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	26	567	173	241	909	103	806	64	427	26	32	28

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off								

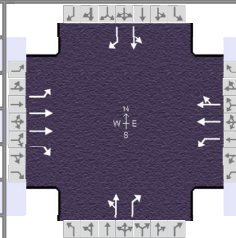
Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	26	567	173	241	909	103	806	64	427	26	32	28
Initial Queue (Q_0), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h	None			None			None			None		
Heavy Vehicles (P_{HV}), %	2	2	0	1	1			0	0		0	0
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	4	4	4	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0	12.0	12.0	12.0			12.0	12.0		12.0	12.0
Turn Bay Length, ft	105	2430	150	325	1025			1200	0		499	110
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35	35	35	35	35	25	25	25	25	25	25

Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	15.0	29.0	20.0	34.0		56.0		15.0
Yellow Change Interval (Y), s	3.6	3.6	3.6	3.6		3.0		3.0
Red Clearance Interval (R_c), s	1.3	1.3	1.3	1.3		2.1		2.1
Minimum Green (G_{min}), s	5	20	5	20		10		7
Start-Up Lost Time (l_t), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.5	2.0	2.5	2.0		4.5		3.0
Recall Mode	Off	Min	Off	Min		Off		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk ($Walk$), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

HCS Signalized Intersection Results Summary

General Information				Intersection Information		
Agency	GPD Group			Duration, h	0.250	
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other	
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93	
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 1'	Analysis Period	1> 7:00	
Intersection	I-77 SB Ramps / Forest...	File Name	04.1 2030 PM Build Capacity Analysis Pleasant &...			
Project Description	I-77 / Pleasant Valley Road					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	26	567	173	241	909	103	806	64	427	26	32	28

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off								

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		11.0		11.0
Phase Duration, s	7.9	29.0	20.0	41.1		59.2		11.8
Change Period, ($Y+R_c$), s	4.9	4.9	4.9	4.9		5.1		5.1
Max Allow Headway (MAH), s	3.6	0.0	3.6	0.0		5.8		4.3
Queue Clearance Time (g_s), s	3.5		15.4			56.1		5.9
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0		0.0		0.1
Phase Call Probability	0.61		1.00			1.00		0.95
Max Out Probability	0.01		1.00			1.00		1.00

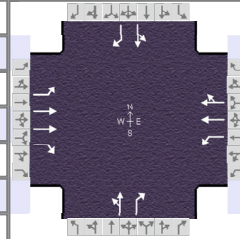
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (ν), veh/h	28	610	186	259	554	534		935	459		62	30
Adjusted Saturation Flow Rate (s), veh/h/ln	1781	1781	1610	1795	1885	1817		1816			1858	1610
Queue Service Time (g_s), s	1.5	19.8	12.5	13.4	34.7	34.7		54.1			3.9	2.2
Cycle Queue Clearance Time (g_c), s	1.5	19.8	12.5	13.4	34.7	34.7		54.1			3.9	2.2
Green Ratio (g/C)	0.23	0.20	0.20	0.34	0.30	0.30		0.45			0.06	0.06
Capacity (c), veh/h	105	715	323	315	568	548		819			103	90
Volume-to-Capacity Ratio (X)	0.266	0.853	0.576	0.822	0.975	0.975		1.142			0.603	0.336
Back of Queue (Q), ft/ln (95 th percentile)	31	382	237	276	672	650		1424			91	42
Back of Queue (Q), veh/ln (95 th percentile)	1.2	15.0	9.5	11.0	26.7	26.0		57.0			3.6	1.7
Queue Storage Ratio (RQ) (95 th percentile)	0.29	0.16	1.58	0.85	0.66	0.64		1.19			0.18	0.38
Uniform Delay (d_1), s/veh	38.9	46.2	43.3	31.3	35.4	35.4		32.9			55.4	54.5
Incremental Delay (d_2), s/veh	1.0	12.3	7.3	15.5	32.0	32.8		78.4			5.5	2.2
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	0.0
Control Delay (d), s/veh	39.9	58.6	50.6	46.8	67.5	68.3		111.4	0.0		60.9	56.7
Level of Service (LOS)	D	E	D	D	E	E		F	A		E	E
Approach Delay, s/veh / LOS	56.1		E	63.8		E	74.7		E	59.5		E
Intersection Delay, s/veh / LOS	66.1						E					

Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS												
Bicycle LOS Score / LOS												

HCS Signalized Intersection Results Graphical Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 1'	Analysis Period	1 > 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	04.1 2030 PM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

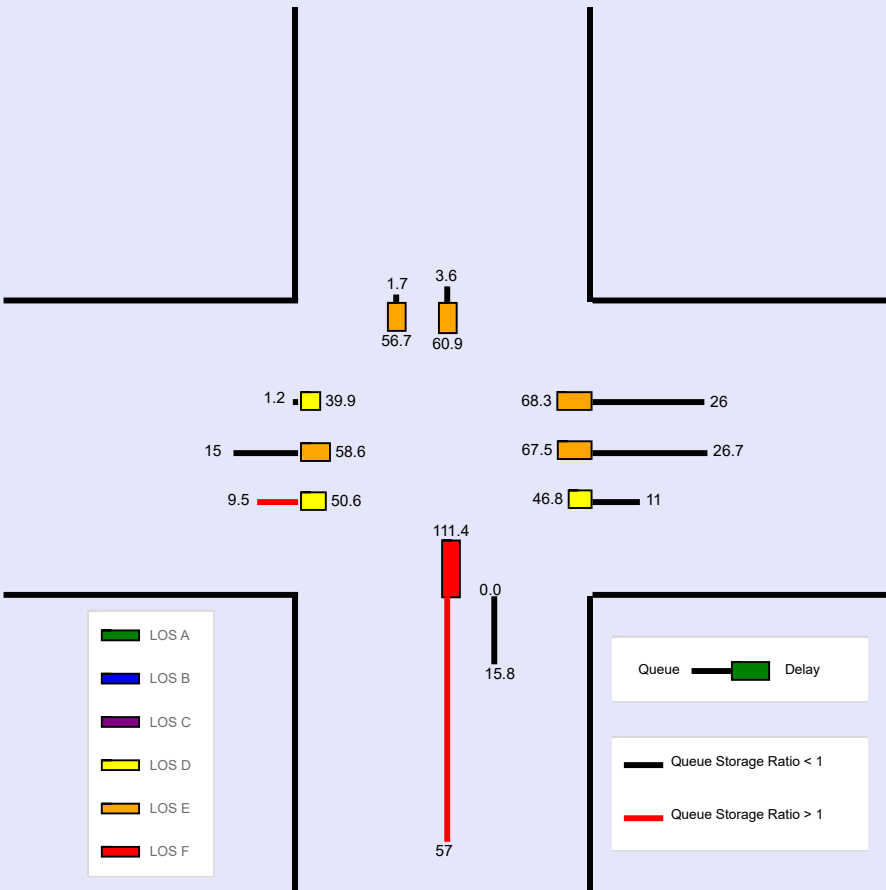
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	26	567	173	241	909	103	806	64	427	26	32	28

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	3.0	7.2	24.1	6.7	54.1	0.0		
Force Mode	Fixed	Simult. Gap N/S	Off	Yellow	3.6	3.6	3.6	3.0	3.0	0.0		
				Red	1.3	1.3	1.3	2.1	2.1	0.0		

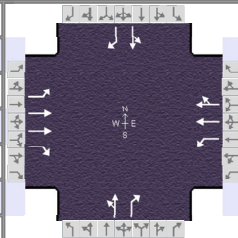
Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	31	382	237	276	672	650		1424			91	42
Back of Queue (Q), veh/ln (95 th percentile)	1.2	15.0	9.5	11.0	26.7	26.0		57.0			3.6	1.7
Queue Storage Ratio (RQ) (95 th percentile)	0.29	0.16	1.58	0.85	0.66	0.64		1.19			0.18	0.38
Control Delay (d), s/veh	39.9	58.6	50.6	46.8	67.5	68.3		111.4	0.0		60.9	56.7
Level of Service (LOS)	D	E	D	D	E	E		F	A		E	E
Approach Delay, s/veh / LOS	56.1		E	63.8		E	74.7		E	59.5		E
Intersection Delay, s/veh / LOS	66.1						E					



DESIGN YEAR 2050

HCS Signalized Intersection Input Data

General Information				Intersection Information		
Agency	GPD Group			Duration, h	0.250	
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other	
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.91	
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 1'	Analysis Period	1> 7:00	
Intersection	I-77 SB Ramps / Forest...	File Name	03.1 2050 AM Build Capacity Analysis Pleasant &...			
Project Description	I-77 / Pleasant Valley Road					

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	23	1531	433	171	430	54	231	13	490	71	53	12

Signal Information												
Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	Off									
				Green	2.8	4.3	61.1	10.9	20.9	0.0		
				Yellow	3.6	0.0	3.6	3.0	3.0	0.0		
				Red	1.3	0.0	1.3	2.1	2.1	0.0		

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Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	23	1531	433	171	430	54	231	13	490	71	53	12
Initial Queue (Q_0), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h	None			None			None			None		
Heavy Vehicles (P_{HV}), %	1	1	0	3	3			4	0		2	2
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	4	4	4	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0	12.0	12.0	12.0			12.0	12.0		12.0	12.0
Turn Bay Length, ft	105	2430	150	325	1025			1200	0		499	110
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35	35	35	35	35	25	25	25	25	25	25

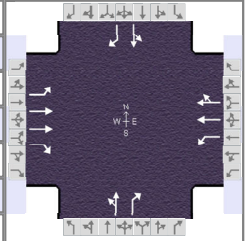
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	18.0	66.0	12.0	60.0		24.0		18.0
Yellow Change Interval (Y), s	3.6	3.6	3.6	3.6		3.0		3.0
Red Clearance Interval (R_c), s	1.3	1.3	1.3	1.3		2.1		2.1
Minimum Green (G_{min}), s	5	20	5	20		10		7
Start-Up Lost Time (l_t), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.5	2.0	2.5	2.0		4.5		3.0
Recall Mode	Off	Min	Off	Min		Min		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk ($Walk$), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.91
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 1'	Analysis Period	1> 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	03.1 2050 AM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	23	1531	433	171	430	54	231	13	490	71	53	12

Signal Information

Cycle, s	120.0	Reference Phase	2											
Offset, s	0	Reference Point	End	Green	2.8	4.3	61.1	10.9	20.9	0.0				
Uncoordinated	No	Simult. Gap E/W	On	Yellow	3.6	0.0	3.6	3.0	3.0	0.0				
Force Mode	Fixed	Simult. Gap N/S	Off	Red	1.3	0.0	1.3	2.1	2.1	0.0				

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		11.0		11.0
Phase Duration, s	7.7	66.0	12.0	70.3		26.0		16.0
Change Period, ($Y+R_c$), s	4.9	4.9	4.9	4.9		5.1		5.1
Max Allow Headway (MAH), s	3.6	0.0	3.6	0.0		5.9		4.2
Queue Clearance Time (g_s), s	2.8		9.1			22.9		10.8
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0		0.0		0.1
Phase Call Probability	0.57		1.00			1.00		0.99
Max Out Probability	0.00		1.00			1.00		1.00

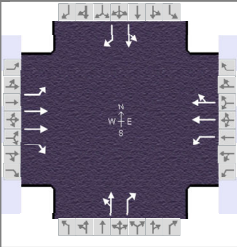
Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	25	1682	476	188	270	262		268	538		136	13
Adjusted Saturation Flow Rate (s), veh/h/ln	1795	1795	1610	1767	1856	1783		1758			1818	1585
Queue Service Time (g_s), s	0.8	52.0	24.7	7.1	5.9	6.0		17.8			8.8	0.9
Cycle Queue Clearance Time (g_c), s	0.8	52.0	24.7	7.1	5.9	6.0		17.8			8.8	0.9
Green Ratio (g/C)	0.53	0.51	0.51	0.58	0.54	0.54		0.17			0.09	0.09
Capacity (c), veh/h	523	1827	820	187	1011	971		307			164	143
Volume-to-Capacity Ratio (X)	0.048	0.921	0.580	1.006	0.267	0.270		0.874			0.829	0.092
Back of Queue (Q), ft/ln (95 th percentile)	15	787	368	264	107	102		389			222	17
Back of Queue (Q), veh/ln (95 th percentile)	0.6	31.2	14.7	10.3	4.2	4.1		15.1			8.8	0.7
Queue Storage Ratio (RQ) (95 th percentile)	0.14	0.32	2.46	0.81	0.10	0.10		0.32			0.45	0.16
Uniform Delay (d_1), s/veh	13.3	27.2	20.5	31.0	8.3	8.3		48.2			53.7	50.1
Incremental Delay (d_2), s/veh	0.0	9.1	3.0	67.5	0.6	0.7		24.1			21.7	0.3
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	0.0
Control Delay (d), s/veh	13.4	36.3	23.5	98.5	8.9	9.0		72.3	0.0		75.3	50.3
Level of Service (LOS)	B	D	C	F	A	A		E	A		E	D
Approach Delay, s/veh / LOS	33.3		C	32.3		C	24.0		C	73.1		E
Intersection Delay, s/veh / LOS	32.7						C					

Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

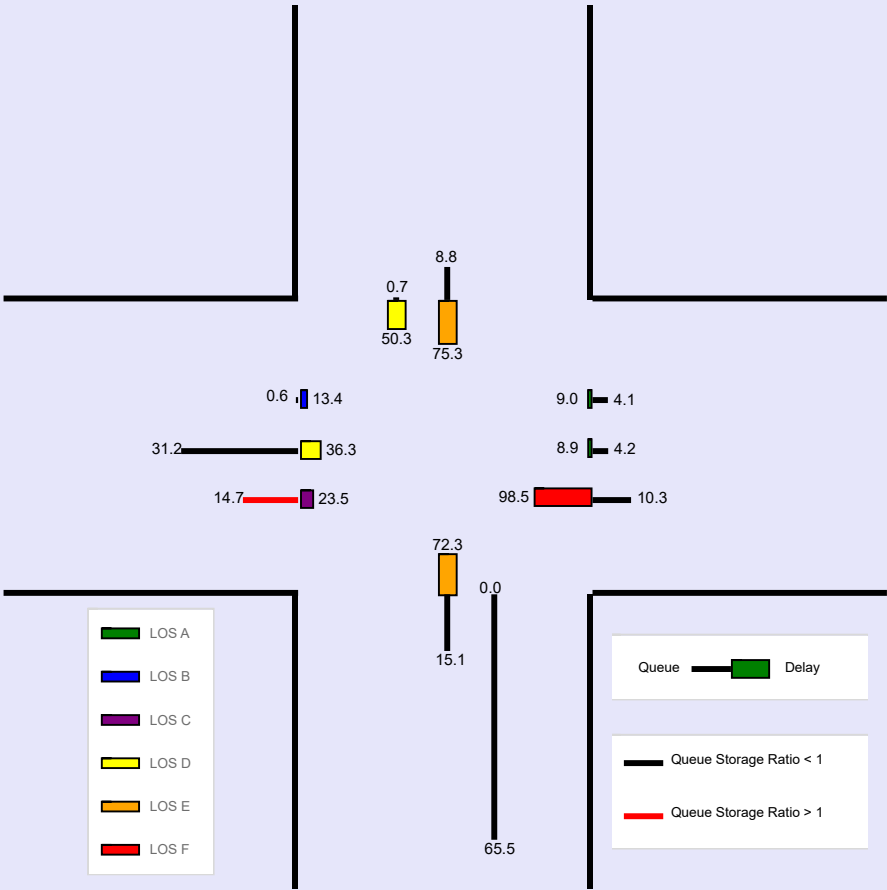
HCS Signalized Intersection Results Graphical Summary

General Information					Intersection Information	
Agency	GPD Group				Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024		Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour		PHF	0.91
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 1'		Analysis Period	1 > 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	03.1 2050 AM Build Capacity Analysis Pleasant &...			
Project Description						
						

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	23	1531	433	171	430	54	231	13	490	71	53	12

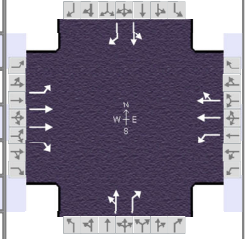
Signal Information												
Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	Off									
				Green	2.8	4.3	61.1	10.9	20.9	0.0		
				Yellow	3.6	0.0	3.6	3.0	3.0	0.0		
				Red	1.3	0.0	1.3	2.1	2.1	0.0		

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	15	787	368	264	107	102		389			222	17
Back of Queue (Q), veh/ln (95 th percentile)	0.6	31.2	14.7	10.3	4.2	4.1		15.1			8.8	0.7
Queue Storage Ratio (RQ) (95 th percentile)	0.14	0.32	2.46	0.81	0.10	0.10		0.32			0.45	0.16
Control Delay (d), s/veh	13.4	36.3	23.5	98.5	8.9	9.0		72.3	0.0		75.3	50.3
Level of Service (LOS)	B	D	C	F	A	A		E	A		E	D
Approach Delay, s/veh / LOS	33.3		C	32.3		C	24.0		C	73.1		E
Intersection Delay, s/veh / LOS	32.7						C					



HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 1'	Analysis Period	1> 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	04.1 2050 PM Build Capacity Analysis Pleasant & ...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	30	649	198	276	1040	118	921	73	487	30	37	32

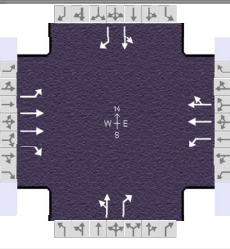
Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	30	649	198	276	1040	118	921	73	487	30	37	32
Initial Queue (Q_0), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h	None			None			None			None		
Heavy Vehicles (P_{HV}), %	2	2	0	1	1			0	0		0	0
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	4	4	4	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0	12.0	12.0	12.0			12.0	12.0		12.0	12.0
Turn Bay Length, ft	105	2430	150	325	1025			1200	0		499	110
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35	35	35	35	35	25	25	25	25	25	25

Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	15.0	29.0	20.0	34.0		56.0		15.0
Yellow Change Interval (Y), s	3.6	3.6	3.6	3.6		3.0		3.0
Red Clearance Interval (R_c), s	1.3	1.3	1.3	1.3		2.1		2.1
Minimum Green (G_{min}), s	5	20	5	20		10		7
Start-Up Lost Time (l_t), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.5	2.0	2.5	2.0		4.5		3.0
Recall Mode	Off	Min	Off	Min		Off		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk ($Walk$), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

HCS Signalized Intersection Results Summary

General Information				Intersection Information		
Agency	GPD Group			Duration, h	0.250	
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other	
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93	
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 1'	Analysis Period	1> 7:00	
Intersection	I-77 SB Ramps / Forest...	File Name	04.1 2050 PM Build Capacity Analysis Pleasant & ...			
Project Description	I-77 / Pleasant Valley Road					

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	30	649	198	276	1040	118	921	73	487	30	37	32

Signal Information														
Cycle, s	120.0	Reference Phase	2											
Offset, s	0	Reference Point	End											
Uncoordinated	No	Simult. Gap E/W	On											
Force Mode	Fixed	Simult. Gap N/S	Off											
				Green	3.3	6.9	24.1	6.8	54.0	0.0				
				Yellow	3.6	3.6	3.6	3.0	3.0	0.0				
				Red	1.3	1.3	1.3	2.1	2.1	0.0				

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		11.0		11.0
Phase Duration, s	8.2	29.0	20.0	40.8		59.1		11.9
Change Period, ($Y+R_c$), s	4.9	4.9	4.9	4.9		5.1		5.1
Max Allow Headway (MAH), s	3.6	0.0	3.6	0.0		5.8		4.3
Queue Clearance Time (g_s), s	3.7		17.1			56.0		6.6
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0		0.0		0.1
Phase Call Probability	0.66		1.00			1.00		0.97
Max Out Probability	0.01		1.00			1.00		1.00

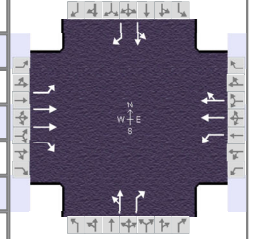
Movement Group Results	EB			WB			NB			SB			
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R	
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14	
Adjusted Flow Rate (v), veh/h	32	698	213	297	633	612		1069	524		72	34	
Adjusted Saturation Flow Rate (s), veh/h/ln	1781	1781	1610	1795	1885	1817		1816			1858	1610	
Queue Service Time (g_s), s	1.7	23.4	14.6	15.1	35.9	35.9		54.0			4.6	2.5	
Cycle Queue Clearance Time (g_c), s	1.7	23.4	14.6	15.1	35.9	35.9		54.0			4.6	2.5	
Green Ratio (g/C)	0.23	0.20	0.20	0.34	0.30	0.30		0.45			0.06	0.06	
Capacity (c), veh/h	109	715	323	290	564	544		817			105	91	
Volume-to-Capacity Ratio (X)	0.296	0.976	0.659	1.022	1.122	1.125		1.308			0.684	0.377	
Back of Queue (Q), ft/ln (95 th percentile)	36	481	273	416	957	929		2067			107	48	
Back of Queue (Q), veh/ln (95 th percentile)	1.4	19.0	10.9	16.5	38.0	37.2		82.7			4.3	1.9	
Queue Storage Ratio (RQ) (95 th percentile)	0.34	0.20	1.82	1.28	0.93	0.91		1.72			0.21	0.44	
Uniform Delay (d_1), s/veh	38.8	47.7	44.2	32.5	36.1	36.1		33.0			55.5	54.6	
Incremental Delay (d_2), s/veh	1.1	28.4	10.1	58.5	76.2	78.0		147.4			7.6	2.6	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	0.0	
Control Delay (d), s/veh	39.9	76.0	54.3	91.0	112.2	114.0		180.4	0.0		63.1	57.1	
Level of Service (LOS)	D	E	D	F	F	F		F	A		E	E	
Approach Delay, s/veh / LOS	69.9		E	108.9		F		121.1		F	61.2		E
Intersection Delay, s/veh / LOS	103.5						F						

Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS												
Bicycle LOS Score / LOS												

HCS Signalized Intersection Results Graphical Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 1'	Analysis Period	1> 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	04.1 2050 PM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

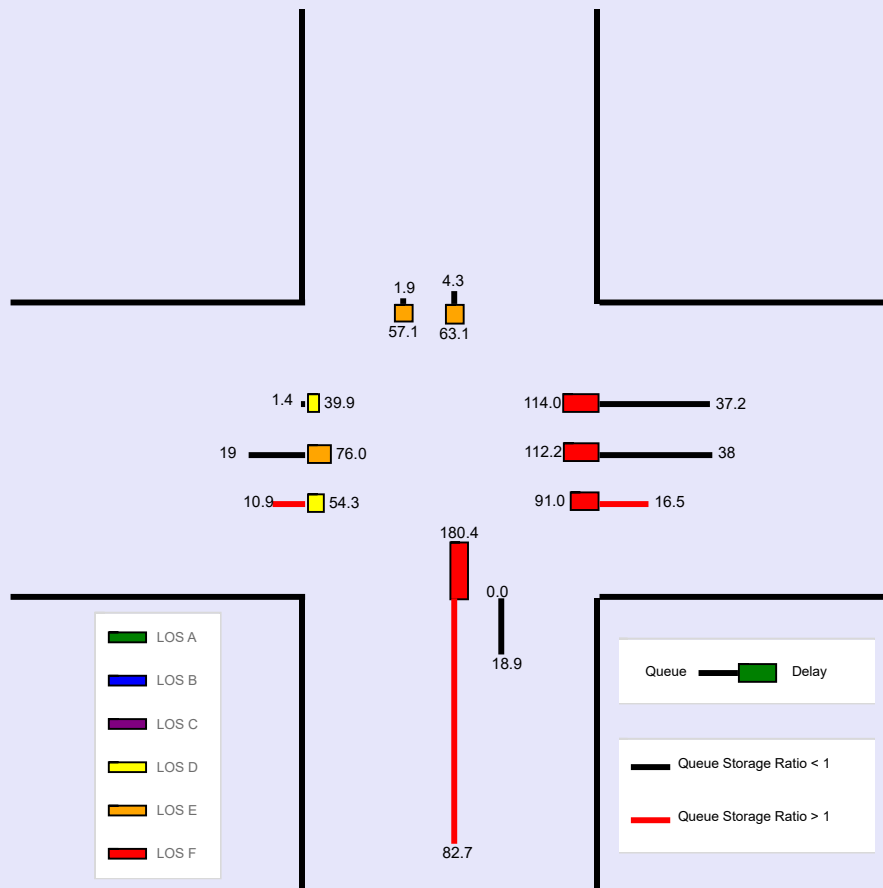
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	30	649	198	276	1040	118	921	73	487	30	37	32

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	3.3	6.9	24.1	6.8	54.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	Off	Yellow	3.6	3.6	3.6	3.0	3.0	0.0		
				Red	1.3	1.3	1.3	2.1	2.1	0.0		

Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R				
Back of Queue (Q), ft/ln (95 th percentile)	36	481	273	416	957	929		2067			107	48				
Back of Queue (Q), veh/ln (95 th percentile)	1.4	19.0	10.9	16.5	38.0	37.2		82.7			4.3	1.9				
Queue Storage Ratio (RQ) (95 th percentile)	0.34	0.20	1.82	1.28	0.93	0.91		1.72			0.21	0.44				
Control Delay (d), s/veh	39.9	76.0	54.3	91.0	112.2	114.0		180.4	0.0		63.1	57.1				
Level of Service (LOS)	D	E	D	F	F	F		F	A		E	E				
Approach Delay, s/veh / LOS	69.9		E		108.9		F		121.1		F		61.2		E	
Intersection Delay, s/veh / LOS	103.5						F									

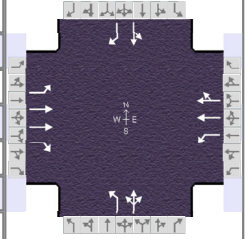


APPENDIX I
'BUILD' ALTERNATE 2' HCS INTERSECTION CAPACITY ANALYSIS

OPENING YEAR 2030

HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.91
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 2'	Analysis Period	1> 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	03.2 2030 AM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	20	1339	378	149	376	47	202	11	429	62	46	10

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	20	1339	378	149	376	47	202	11	429	62	46	10
Initial Queue (Q_0), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h	None			None			None			None		
Heavy Vehicles (P_{HV}), %	1	1	0	3	3		0	4		2	2	
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	4	4	4	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0	12.0	12.0	12.0		12.0	12.0		12.0	12.0	
Turn Bay Length, ft	105	2430	150	325	1025		1050	1050		499	110	
Grade (P_g), %	0			0			0			0		
Speed Limit, mi/h	35	35	35	35	35	35	25	25	25	25	25	25

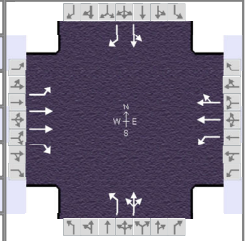
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	18.0	54.0	12.0	48.0		36.0		18.0
Yellow Change Interval (Y), s	3.6	3.6	3.6	3.6		3.0		3.0
Red Clearance Interval (R_c), s	1.3	1.3	1.3	1.3		2.1		2.1
Minimum Green (G_{min}), s	5	20	5	20		10		7
Start-Up Lost Time (l_t), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.5	2.0	2.5	2.0		4.5		3.0
Recall Mode	Off	Min	Off	Min		Min		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk ($Walk$), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.91
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 2'	Analysis Period	1> 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	03.2 2030 AM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	20	1339	378	149	376	47	202	11	429	62	46	10

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	2.6	4.5	49.1	9.7	34.1	0.0		
Force Mode	Fixed	Simult. Gap N/S	Off	Yellow	3.6	0.0	3.6	3.0	3.0	0.0		
				Red	1.3	0.0	1.3	2.1	2.1	0.0		

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		10.0		11.0
Phase Duration, s	7.5	54.0	12.0	58.5		39.2		14.8
Change Period, ($Y+R_c$), s	4.9	4.9	4.9	4.9		5.1		5.1
Max Allow Headway (MAH), s	3.6	0.0	3.6	0.0		5.9		4.2
Queue Clearance Time (g_s), s	2.8		9.0			36.1		9.7
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0		0.0		0.1
Phase Call Probability	0.52		1.00			1.00		0.99
Max Out Probability	0.00		1.00			1.00		1.00

Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	22	1471	415	164	236	229	166	539			119	11
Adjusted Saturation Flow Rate (s), veh/h/ln	1795	1795	1610	1767	1856	1783	1810	1591			1818	1585
Queue Service Time (g_s), s	0.8	49.1	24.7	7.0	7.4	7.5	8.7	34.1			7.7	0.8
Cycle Queue Clearance Time (g_c), s	0.8	49.1	24.7	7.0	7.4	7.5	8.7	34.1			7.7	0.8
Green Ratio (g/C)	0.43	0.41	0.41	0.48	0.45	0.45	0.28	0.28			0.08	0.08
Capacity (c), veh/h	442	1468	659	165	829	797	514	452			147	128
Volume-to-Capacity Ratio (X)	0.050	1.002	0.631	0.993	0.284	0.288	0.324	1.192			0.809	0.086
Back of Queue (Q), ft/ln (95 th percentile)	16	853	383	252	143	136	179	1007			193	15
Back of Queue (Q), veh/ln (95 th percentile)	0.6	33.9	15.3	9.9	5.6	5.5	7.2	39.0			7.6	0.6
Queue Storage Ratio (RQ) (95 th percentile)	0.15	0.35	2.56	0.78	0.14	0.14	0.17	0.96			0.39	0.13
Uniform Delay (d_1), s/veh	19.8	35.5	28.2	31.1	14.9	14.9	33.8	42.9			54.3	51.1
Incremental Delay (d_2), s/veh	0.0	24.0	4.5	68.0	0.9	0.9	0.6	106.3			16.7	0.3
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0
Control Delay (d), s/veh	19.8	59.5	32.8	99.1	15.8	15.9	34.5	149.2			71.0	51.4
Level of Service (LOS)	B	F	C	F	B	B	C	F			E	D
Approach Delay, s/veh / LOS	53.2		D	37.5		D	122.1		F	69.3		E
Intersection Delay, s/veh / LOS	65.3						E					

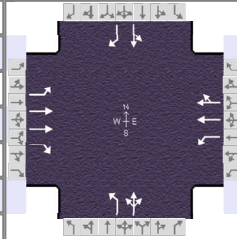
Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

HCS Signalized Intersection Results Graphical Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.91
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 2'	Analysis Period	1> 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	03.2 2030 AM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

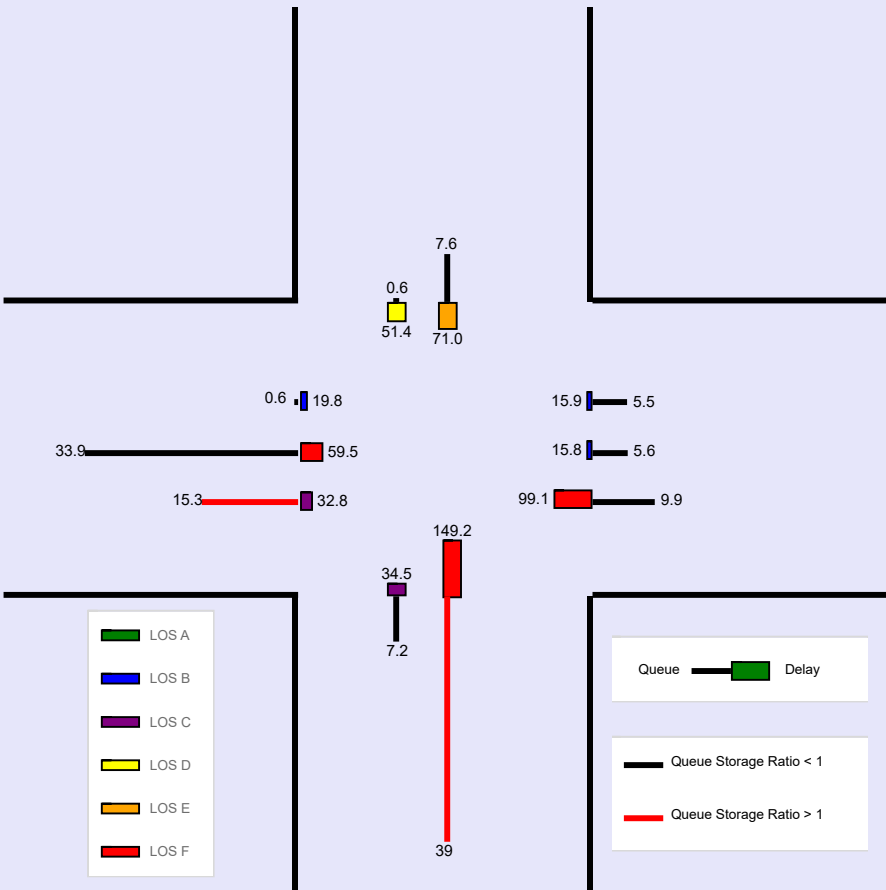
Approach Movement	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	20	1339	378	149	376	47	202	11	429	62	46	10

Signal Information

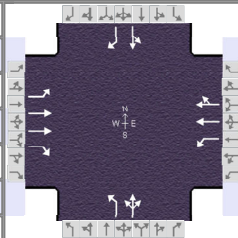
Cycle, s	120.0	Reference Phase	2											
Offset, s	0	Reference Point	End	Green	2.6	4.5	49.1	9.7	34.1	0.0	1	2	3	4
Uncoordinated	No	Simult. Gap E/W	On	Yellow	3.6	0.0	3.6	3.0	3.0	0.0				
Force Mode	Fixed	Simult. Gap N/S	Off	Red	1.3	0.0	1.3	2.1	2.1	0.0				

Movement Group Results

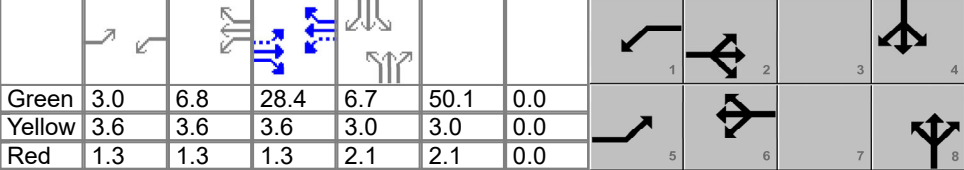
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	16	853	383	252	143	136	179	1007			193	15
Back of Queue (Q), veh/ln (95 th percentile)	0.6	33.9	15.3	9.9	5.6	5.5	7.2	39.0			7.6	0.6
Queue Storage Ratio (RQ) (95 th percentile)	0.15	0.35	2.56	0.78	0.14	0.14	0.17	0.96			0.39	0.13
Control Delay (d), s/veh	19.8	59.5	32.8	99.1	15.8	15.9	34.5	149.2			71.0	51.4
Level of Service (LOS)	B	F	C	F	B	B	C	F			E	D
Approach Delay, s/veh / LOS	53.2		D		37.5		D		122.1		F	
Intersection Delay, s/veh / LOS	65.3						E					



HCS Signalized Intersection Input Data

General Information				Intersection Information		
Agency	GPD Group			Duration, h	0.250	
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other	
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93	
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 2'	Analysis Period	1> 7:00	
Intersection	I-77 SB Ramps / Forest...	File Name	04.2 2030 PM Build Capacity Analysis Pleasant & ...			
Project Description	I-77 / Pleasant Valley Road					

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	26	567	173	241	909	103	806	64	427	26	32	28

Signal Information										
Cycle, s	120.0	Reference Phase	2							
Offset, s	0	Reference Point	End							
Uncoordinated	No	Simult. Gap E/W	On							
Force Mode	Fixed	Simult. Gap N/S	Off	Green	3.0	6.8	28.4	6.7	50.1	0.0
				Yellow	3.6	3.6	3.6	3.0	3.0	0.0
				Red	1.3	1.3	1.3	2.1	2.1	0.0

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	26	567	173	241	909	103	806	64	427	26	32	28
Initial Queue (Q_0), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h	None			None			None			None		
Heavy Vehicles (P_{HV}), %	2	2	0	1	1		0	0		0	0	0
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	4	4	4	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0	12.0	12.0	12.0		12.0	12.0		12.0	12.0	
Turn Bay Length, ft	105	2430	150	325	1025		1050	1050		499	110	
Grade (P_g), %	0			0			0			0		
Speed Limit, mi/h	35	35	35	35	35	35	25	25	25	25	25	25

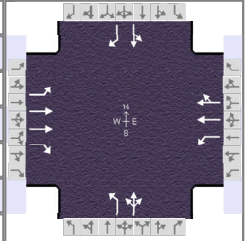
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	15.0	33.0	20.0	38.0		54.0		13.0
Yellow Change Interval (Y), s	3.6	3.6	3.6	3.6		3.0		3.0
Red Clearance Interval (R_c), s	1.3	1.3	1.3	1.3		2.1		2.1
Minimum Green (G_{min}), s	5	20	5	20		10		7
Start-Up Lost Time (l_t), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.5	2.0	2.5	2.0		4.5		3.0
Recall Mode	Off	Min	Off	Min		Off		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk ($Walk$), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 2'	Analysis Period	1 > 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	04.2 2030 PM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	26	567	173	241	909	103	806	64	427	26	32	28

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	Off									

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		10.0		11.0
Phase Duration, s	7.9	33.3	19.7	45.1		55.2		11.8
Change Period, ($Y+R_c$), s	4.9	4.9	4.9	4.9		5.1		5.1
Max Allow Headway (MAH), s	3.6	0.0	3.6	0.0		5.9		4.3
Queue Clearance Time (g_s), s	3.4		14.7			52.1		5.9
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0		0.0		0.0
Phase Call Probability	0.61		1.00			1.00		0.95
Max Out Probability	0.01		1.00			1.00		1.00

Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	28	610	186	259	554	534	650	745		62	30	
Adjusted Saturation Flow Rate (s), veh/h/ln	1781	1781	1610	1795	1885	1817	1810	1691		1858	1610	
Queue Service Time (g_s), s	1.4	18.9	12.0	12.7	32.1	32.1	39.2	50.1		3.9	2.2	
Cycle Queue Clearance Time (g_c), s	1.4	18.9	12.0	12.7	32.1	32.1	39.2	50.1		3.9	2.2	
Green Ratio (g/C)	0.26	0.24	0.24	0.38	0.33	0.33	0.42	0.42		0.06	0.06	
Capacity (c), veh/h	131	844	382	346	631	608	756	706		103	90	
Volume-to-Capacity Ratio (X)	0.213	0.723	0.488	0.749	0.878	0.878	0.860	1.054		0.603	0.336	
Back of Queue (Q), ft/ln (95 th percentile)	29	348	222	247	563	544	659	1011		91	42	
Back of Queue (Q), veh/ln (95 th percentile)	1.1	13.7	8.9	9.8	22.4	21.8	26.3	40.4		3.7	1.7	
Queue Storage Ratio (RQ) (95 th percentile)	0.27	0.14	1.48	0.76	0.55	0.54	0.63	0.96		0.18	0.38	
Uniform Delay (d_1), s/veh	35.4	42.2	39.5	28.5	31.0	31.0	31.8	34.9		55.4	54.5	
Incremental Delay (d_2), s/veh	0.6	5.3	4.4	8.1	15.9	16.4	10.4	49.0		5.9	2.2	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (d), s/veh	36.0	47.5	43.9	36.6	46.9	47.4	42.1	83.9		61.3	56.7	
Level of Service (LOS)	D	D	D	D	D	D	D	F		E	E	
Approach Delay, s/veh / LOS	46.3		D	45.1		D	64.4		E	59.8		E
Intersection Delay, s/veh / LOS	53.1						D					

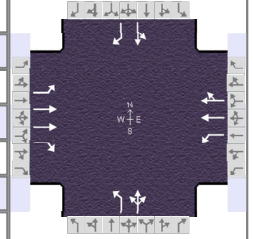
Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

HCS Signalized Intersection Results Graphical Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 2'	Analysis Period	1> 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	04.2 2030 PM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

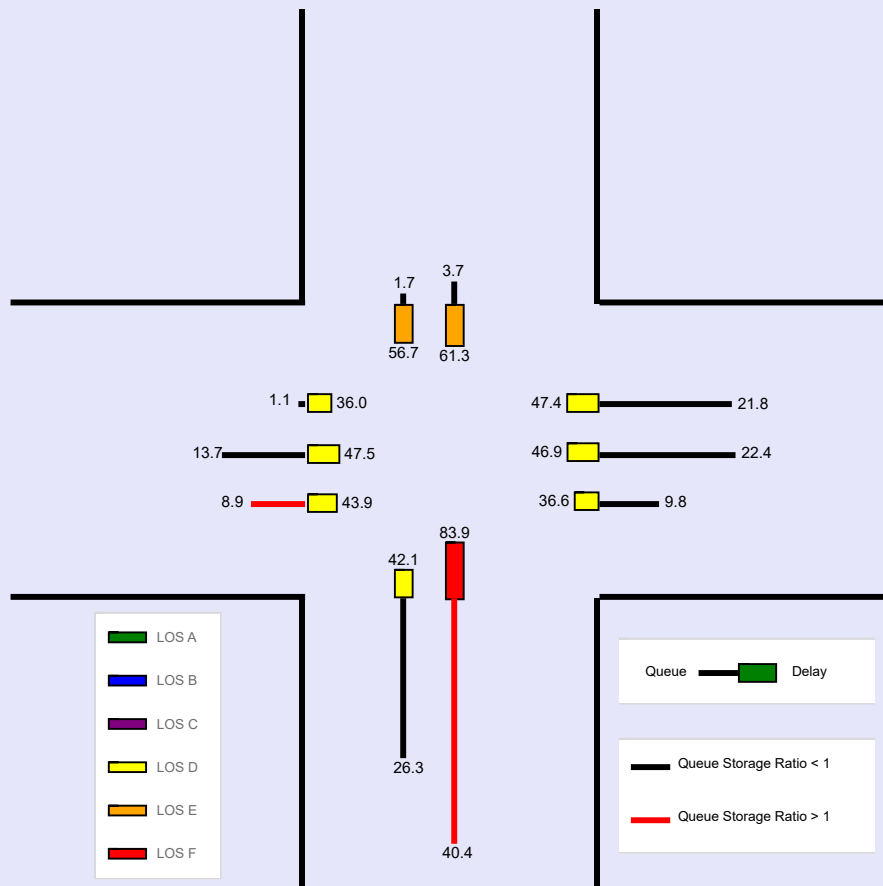
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	26	567	173	241	909	103	806	64	427	26	32	28

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	3.0	6.8	28.4	6.7	50.1	0.0		
Force Mode	Fixed	Simult. Gap N/S	Off	Yellow	3.6	3.6	3.6	3.0	3.0	0.0		
				Red	1.3	1.3	1.3	2.1	2.1	0.0		

Movement Group Results

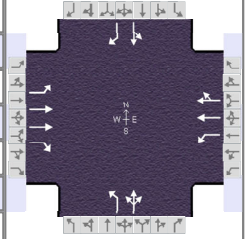
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	29	348	222	247	563	544	659	1011			91	42
Back of Queue (Q), veh/ln (95 th percentile)	1.1	13.7	8.9	9.8	22.4	21.8	26.3	40.4			3.7	1.7
Queue Storage Ratio (RQ) (95 th percentile)	0.27	0.14	1.48	0.76	0.55	0.54	0.63	0.96			0.18	0.38
Control Delay (d), s/veh	36.0	47.5	43.9	36.6	46.9	47.4	42.1	83.9			61.3	56.7
Level of Service (LOS)	D	D	D	D	D	D	D	F			E	E
Approach Delay, s/veh / LOS	46.3		D	45.1		D	64.4	E		59.8		E
Intersection Delay, s/veh / LOS	53.1						D					



DESIGN YEAR 2050

HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.91
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 2'	Analysis Period	1> 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	03.2 2050 AM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	23	1531	433	171	430	54	231	13	490	71	53	12

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off								

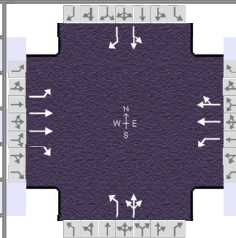
Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	23	1531	433	171	430	54	231	13	490	71	53	12
Initial Queue (Q_0), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h	None			None			None			None		
Heavy Vehicles (P_{HV}), %	1	1	0	3	3		0	4		2	2	
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	4	4	4	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0	12.0	12.0	12.0		12.0	12.0		12.0	12.0	
Turn Bay Length, ft	105	2430	150	325	1025		1050	1050		499	110	
Grade (P_g), %	0			0			0			0		
Speed Limit, mi/h	35	35	35	35	35	35	25	25	25	25	25	25

Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	18.0	54.0	12.0	48.0		36.0		18.0
Yellow Change Interval (Y), s	3.6	3.6	3.6	3.6		3.0		3.0
Red Clearance Interval (R_c), s	1.3	1.3	1.3	1.3		2.1		2.1
Minimum Green (G_{min}), s	5	20	5	20		10		7
Start-Up Lost Time (l_t), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.5	2.0	2.5	2.0		4.5		3.0
Recall Mode	Off	Min	Off	Min		Min		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk ($Walk$), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

HCS Signalized Intersection Results Summary

General Information				Intersection Information		
Agency	GPD Group			Duration, h	0.250	
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other	
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.91	
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 2'	Analysis Period	1> 7:00	
Intersection	I-77 SB Ramps / Forest...	File Name	03.2 2050 AM Build Capacity Analysis Pleasant &...			
Project Description	I-77 / Pleasant Valley Road					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	23	1531	433	171	430	54	231	13	490	71	53	12

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off								

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		10.0		11.0
Phase Duration, s	7.7	54.0	12.0	58.3		38.0		16.0
Change Period, (Y+R c), s	4.9	4.9	4.9	4.9		5.1		5.1
Max Allow Headway (MAH), s	3.6	0.0	3.6	0.0		5.9		4.2
Queue Clearance Time (g s), s	3.0		9.1			34.9		10.8
Green Extension Time (g e), s	0.0	0.0	0.0	0.0		0.0		0.1
Phase Call Probability	0.57		1.00			1.00		0.99
Max Out Probability	0.00		1.00			1.00		1.00

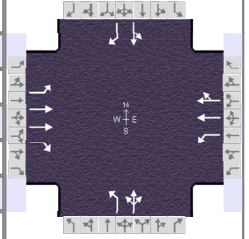
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	25	1682	476	188	270	262	190	616			136	13
Adjusted Saturation Flow Rate (s), veh/h/ln	1795	1795	1610	1767	1856	1783	1810	1591			1818	1585
Queue Service Time (g_s), s	1.0	49.1	29.7	7.1	8.8	8.9	10.2	32.9			8.8	0.9
Cycle Queue Clearance Time (g_c), s	1.0	49.1	29.7	7.1	8.8	8.9	10.2	32.9			8.8	0.9
Green Ratio (g/C)	0.43	0.41	0.41	0.48	0.44	0.44	0.27	0.27			0.09	0.09
Capacity (c), veh/h	413	1468	659	165	825	793	497	437			164	143
Volume-to-Capacity Ratio (X)	0.061	1.146	0.722	1.141	0.327	0.330	0.383	1.411			0.829	0.092
Back of Queue (Q), ft/ln (95 th percentile)	19	1263	456	336	169	160	206	1447			222	17
Back of Queue (Q), veh/ln (95 th percentile)	0.7	50.1	18.2	13.1	6.6	6.4	8.2	56.1			8.8	0.7
Queue Storage Ratio (RQ) (95 th percentile)	0.18	0.52	3.04	1.03	0.16	0.16	0.20	1.38			0.45	0.16
Uniform Delay (d_1), s/veh	19.8	35.5	29.7	31.2	15.4	15.4	35.3	43.5			53.7	50.1
Incremental Delay (d_2), s/veh	0.0	74.1	6.7	113.0	1.1	1.1	0.8	198.0			21.7	0.3
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0
Control Delay (d), s/veh	19.8	109.6	36.5	144.2	16.4	16.5	36.1	241.5			75.3	50.3
Level of Service (LOS)	B	F	D	F	B	B	D	F			E	D
Approach Delay, s/veh / LOS	92.6		F	49.8		D	193.0		F		73.1	E
Intersection Delay, s/veh / LOS	104.9						F					

Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS												
Bicycle LOS Score / LOS												

HCS Signalized Intersection Results Graphical Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.91
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 2'	Analysis Period	1 > 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	03.2 2050 AM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

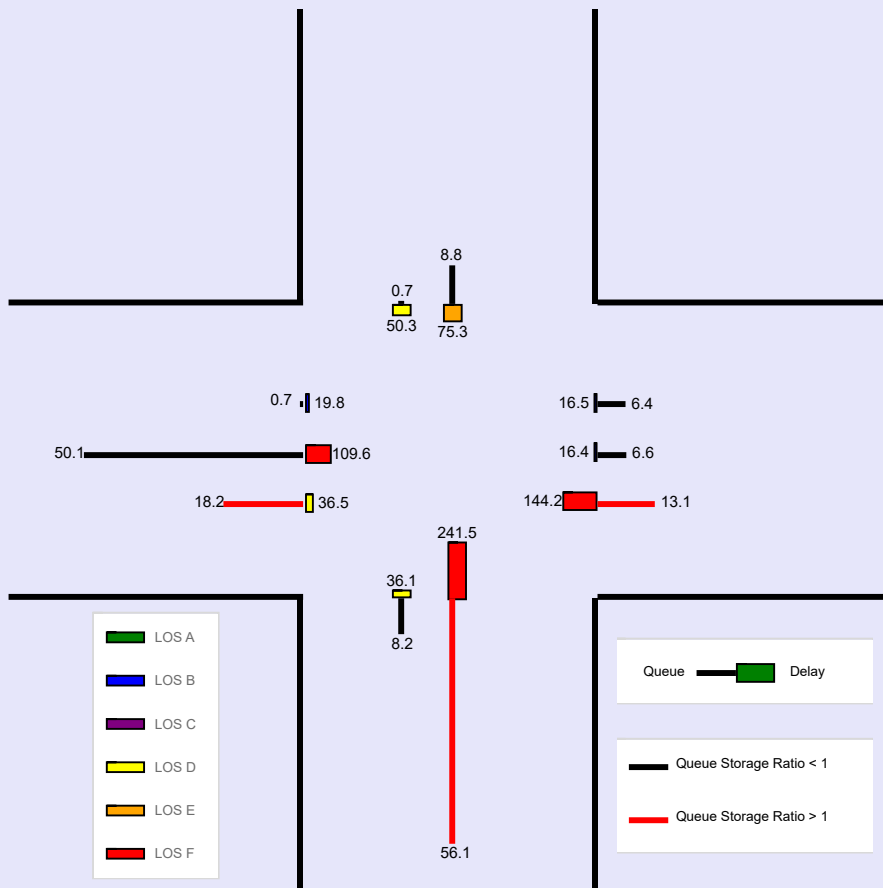
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	23	1531	433	171	430	54	231	13	490	71	53	12

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	2.8	4.3	49.1	10.9	32.9	0.0		
Force Mode	Fixed	Simult. Gap N/S	Off	Yellow	3.6	0.0	3.6	3.0	3.0	0.0		
				Red	1.3	0.0	1.3	2.1	2.1	0.0		

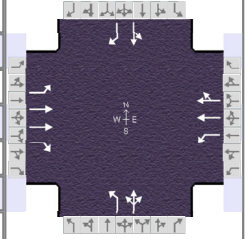
Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R				
Back of Queue (Q), ft/ln (95 th percentile)	19	1263	456	336	169	160	206	1447			222	17				
Back of Queue (Q), veh/ln (95 th percentile)	0.7	50.1	18.2	13.1	6.6	6.4	8.2	56.1			8.8	0.7				
Queue Storage Ratio (RQ) (95 th percentile)	0.18	0.52	3.04	1.03	0.16	0.16	0.20	1.38			0.45	0.16				
Control Delay (d), s/veh	19.8	109.6	36.5	144.2	16.4	16.5	36.1	241.5			75.3	50.3				
Level of Service (LOS)	B	F	D	F	B	B	D	F			E	D				
Approach Delay, s/veh / LOS	92.6		F		49.8		D		193.0		F		73.1		E	
Intersection Delay, s/veh / LOS	104.9						F									



HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 2'	Analysis Period	1> 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	04.2 2050 PM Build Capacity Analysis Pleasant & ...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	30	649	198	276	1040	118	921	73	487	30	37	32

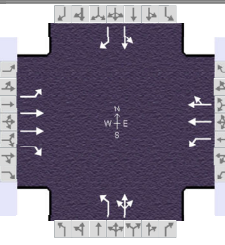
Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	30	649	198	276	1040	118	921	73	487	30	37	32
Initial Queue (Q_0), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h	None			None			None			None		
Heavy Vehicles (P_{HV}), %	2	2	0	1	1		0	0		0	0	0
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	4	4	4	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0	12.0	12.0	12.0		12.0	12.0		12.0	12.0	
Turn Bay Length, ft	105	2430	150	325	1025		1050	1050		499	110	
Grade (P_g), %	0			0			0			0		
Speed Limit, mi/h	35	35	35	35	35	35	25	25	25	25	25	25

Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	15.0	33.0	20.0	38.0		54.0		13.0
Yellow Change Interval (Y), s	3.6	3.6	3.6	3.6		3.0		3.0
Red Clearance Interval (R_c), s	1.3	1.3	1.3	1.3		2.1		2.1
Minimum Green (G_{min}), s	5	20	5	20		10		7
Start-Up Lost Time (l_t), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.5	2.0	2.5	2.0		4.5		3.0
Recall Mode	Off	Min	Off	Min		Off		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk ($Walk$), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

HCS Signalized Intersection Results Summary

General Information				Intersection Information		
Agency	GPD Group			Duration, h	0.250	
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other	
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93	
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 2'	Analysis Period	1> 7:00	
Intersection	I-77 SB Ramps / Forest...	File Name	04.2 2050 PM Build Capacity Analysis Pleasant &...			
Project Description	I-77 / Pleasant Valley Road					

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	30	649	198	276	1040	118	921	73	487	30	37	32

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off								

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		10.0		11.0
Phase Duration, s	8.2	33.0	20.0	44.8		55.1		11.9
Change Period, ($Y+R_c$), s	4.9	4.9	4.9	4.9		5.1		5.1
Max Allow Headway (MAH), s	3.6	0.0	3.6	0.0		5.9		4.3
Queue Clearance Time (g_s), s	3.6		17.1			52.0		6.6
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0		0.0		0.0
Phase Call Probability	0.66		1.00			1.00		0.97
Max Out Probability	0.01		1.00			1.00		1.00

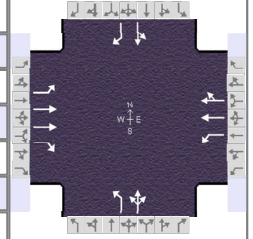
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	32	698	213	297	633	612	792	800		72	34	
Adjusted Saturation Flow Rate (s), veh/h/ln	1781	1781	1610	1795	1885	1817	1810	1684		1858	1610	
Queue Service Time (g_s), s	1.6	22.4	14.0	15.1	39.9	39.9	50.0	50.0		4.6	2.5	
Cycle Queue Clearance Time (g_c), s	1.6	22.4	14.0	15.1	39.9	39.9	50.0	50.0		4.6	2.5	
Green Ratio (g/C)	0.26	0.23	0.23	0.38	0.33	0.33	0.42	0.42		0.06	0.06	
Capacity (c), veh/h	109	834	377	322	627	604	754	702		105	91	
Volume-to-Capacity Ratio (X)	0.296	0.837	0.565	0.922	1.010	1.013	1.051	1.140		0.684	0.377	
Back of Queue (Q), ft/ln (95 th percentile)	34	413	255	341	780	758	1056	1248		113	48	
Back of Queue (Q), veh/ln (95 th percentile)	1.3	16.3	10.2	13.5	31.0	30.3	42.2	49.9		4.5	1.9	
Queue Storage Ratio (RQ) (95 th percentile)	0.32	0.17	1.70	1.05	0.76	0.75	1.01	1.19		0.23	0.44	
Uniform Delay (d_1), s/veh	36.6	43.8	40.6	29.9	33.4	33.4	35.0	35.0		55.5	54.6	
Incremental Delay (d_2), s/veh	1.1	9.8	6.0	30.8	38.4	39.8	46.9	79.7		12.1	2.6	
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Control Delay (d), s/veh	37.7	53.6	46.6	60.7	71.8	73.2	81.9	114.7		67.7	57.1	
Level of Service (LOS)	D	D	D	E	F	F	F	F		E	E	
Approach Delay, s/veh / LOS	51.4	D		70.2	E		98.4	F		64.3	E	
Intersection Delay, s/veh / LOS	76.6						E					

Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS												
Bicycle LOS Score / LOS												

HCS Signalized Intersection Results Graphical Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 2'	Analysis Period	1> 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	04.2 2050 PM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

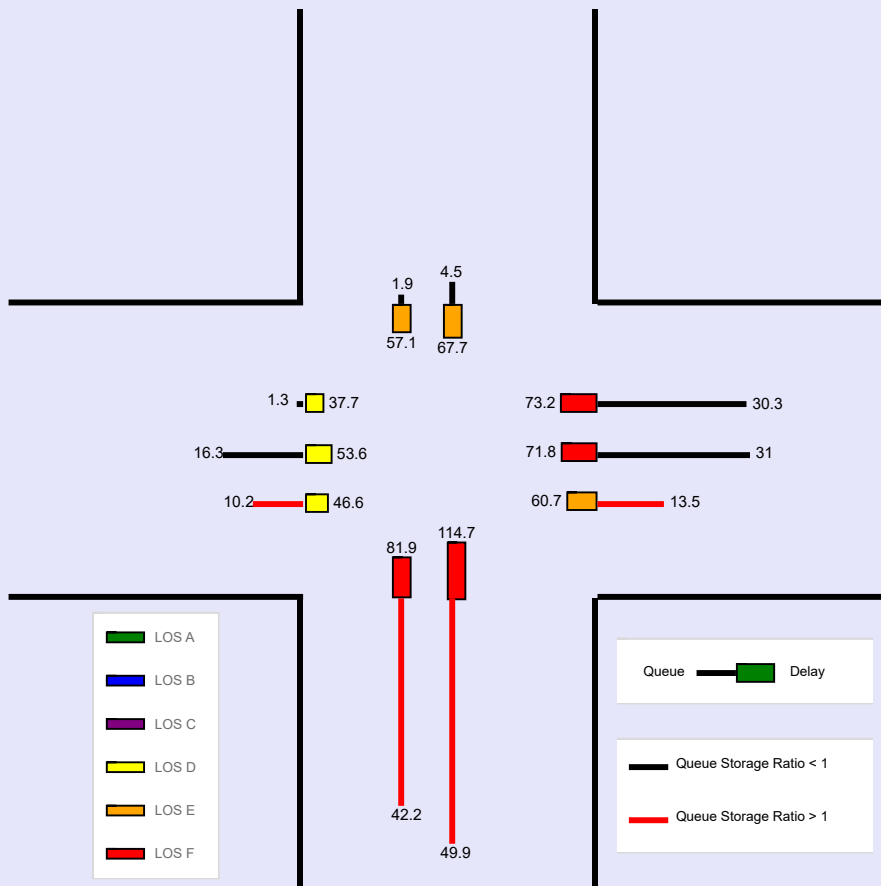
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	30	649	198	276	1040	118	921	73	487	30	37	32

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	Off									

Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R				
Back of Queue (Q), ft/ln (95 th percentile)	34	413	255	341	780	758	1056	1248			113	48				
Back of Queue (Q), veh/ln (95 th percentile)	1.3	16.3	10.2	13.5	31.0	30.3	42.2	49.9			4.5	1.9				
Queue Storage Ratio (RQ) (95 th percentile)	0.32	0.17	1.70	1.05	0.76	0.75	1.01	1.19			0.23	0.44				
Control Delay (d), s/veh	37.7	53.6	46.6	60.7	71.8	73.2	81.9	114.7			67.7	57.1				
Level of Service (LOS)	D	D	D	E	F	F	F	F			E	E				
Approach Delay, s/veh / LOS	51.4		D		70.2		E		98.4		F		64.3		E	
Intersection Delay, s/veh / LOS	76.6						E									



QUEUE ANALYSIS

Intersection: 2: SB I-77 Ramps/Forestwood Drive & Pleasant Valley Road

Movement	EB	EB	EB	EB	WB	WB	WB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	LT	LT	R
Maximum Queue (ft)	154	11889	11886	200	224	130	96	236	281	160
Average Queue (ft)	21	5594	5598	183	140	20	32	214	105	18
95th Queue (ft)	96	11365	11385	263	209	72	84	225	200	82
Link Distance (ft)		13902	13902			1017	1017		1357	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	105			150	325					110
Storage Blk Time (%)		66	49	0					18	
Queuing Penalty (veh)		15	210	2					2	

Intersection: 3: Pleasant Valley Road & NB I-77 Ramps

Movement	EB	EB	EB	EB	WB	WB	SB
Directions Served	L	L	T	T	T	TR	LR
Maximum Queue (ft)	525	550	1038	1017	568	700	387
Average Queue (ft)	524	549	996	208	191	267	189
95th Queue (ft)	525	551	1101	729	354	494	321
Link Distance (ft)			1017	1017	8773	8773	435
Upstream Blk Time (%)			19	0			
Queuing Penalty (veh)			202	1			
Storage Bay Dist (ft)	500	500					
Storage Blk Time (%)	55	56	2				
Queuing Penalty (veh)	256	264	27				

Intersection: 7: SB I-77 Ramps

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: 9: NB I-77 Ramps

Movement	WB	WB
Directions Served	R	R
Maximum Queue (ft)	409	188
Average Queue (ft)	124	21
95th Queue (ft)	323	94
Link Distance (ft)	435	435
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 978

Intersection: 2: SB I-77 Ramps/Forestwood Drive & Pleasant Valley Road

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	LT	R	LT	R
Maximum Queue (ft)	155	504	495	200	349	347	370	481	451	94	68
Average Queue (ft)	55	236	177	83	185	191	226	460	102	42	19
95th Queue (ft)	157	426	384	202	287	320	370	474	408	81	47
Link Distance (ft)		8712	8712			1017	1017	396	396	1357	
Upstream Blk Time (%)								74	8		
Queuing Penalty (veh)								549	56		
Storage Bay Dist (ft)	105			150	325						110
Storage Blk Time (%)		34	10	0	1	0				0	
Queuing Penalty (veh)		10	19	0	6	1				0	

Intersection: 3: Pleasant Valley Road & NB I-77 Ramps

Movement	EB	EB	EB	EB	WB	WB	SB
Directions Served	L	L	T	T	T	TR	LR
Maximum Queue (ft)	485	437	325	150	497	558	481
Average Queue (ft)	272	209	73	66	269	322	158
95th Queue (ft)	420	406	180	130	451	509	326
Link Distance (ft)			1017	1017	6592	6592	435
Upstream Blk Time (%)							0
Queuing Penalty (veh)							3
Storage Bay Dist (ft)	500	500					
Storage Blk Time (%)	0						
Queuing Penalty (veh)	0						

Intersection: 7: SB I-77 Ramps

Movement	WB	WB
Directions Served	R	R
Maximum Queue (ft)	3480	3480
Average Queue (ft)	3106	3100
95th Queue (ft)	4314	4317
Link Distance (ft)	3428	3428
Upstream Blk Time (%)	74	73
Queuing Penalty (veh)	0	0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 9: NB I-77 Ramps

Movement	WB
Directions Served	R
Maximum Queue (ft)	56
Average Queue (ft)	4
95th Queue (ft)	28
Link Distance (ft)	435
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 645

Intersection: 2: SB I-77 Ramps/Forestwood Drive & Pleasant Valley Road

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	LT	R	LT	R
Maximum Queue (ft)	154	11267	11267	200	226	76	101	194	199	336	263	160
Average Queue (ft)	18	7008	7049	172	128	19	42	110	119	11	118	20
95th Queue (ft)	95	12389	12325	281	195	54	90	172	186	111	203	97
Link Distance (ft)		11233	11233			1017	1017	284	284	284	1357	
Upstream Blk Time (%)		16	16							1		
Queuing Penalty (veh)		0	0							2		
Storage Bay Dist (ft)	105			150	325							110
Storage Blk Time (%)		65	51	0							25	
Queuing Penalty (veh)		15	222	2							3	

Intersection: 3: Pleasant Valley Road & NB I-77 Ramps

Movement	EB	EB	EB	EB	WB	WB	SB
Directions Served	L	L	T	T	T	TR	LR
Maximum Queue (ft)	525	550	1034	1027	408	445	330
Average Queue (ft)	524	549	1000	376	191	256	181
95th Queue (ft)	527	551	1138	1019	303	391	288
Link Distance (ft)			1017	1017	6326	6326	435
Upstream Blk Time (%)			20	1			
Queuing Penalty (veh)			205	7			
Storage Bay Dist (ft)	500	500					
Storage Blk Time (%)	62	59	4				
Queuing Penalty (veh)	290	275	50				

Intersection: 7: SB I-77 Ramps

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: 9: NB I-77 Ramps

Movement	WB	WB
Directions Served	R	R
Maximum Queue (ft)	353	219
Average Queue (ft)	190	42
95th Queue (ft)	386	135
Link Distance (ft)	435	435
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 1070

Intersection: 2: SB I-77 Ramps/Forestwood Drive & Pleasant Valley Road

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	LT	R	LT	R
Maximum Queue (ft)	154	365	459	200	374	432	436	375	355	351	113	67
Average Queue (ft)	32	182	130	53	159	209	234	343	334	92	46	25
95th Queue (ft)	93	311	316	123	298	350	381	388	380	342	90	53
Link Distance (ft)		13582	13582			1017	1017	286	286	286	1357	
Upstream Blk Time (%)								52	48	3		
Queuing Penalty (veh)								255	236	17		
Storage Bay Dist (ft)	105			150	325							110
Storage Blk Time (%)		29	2		0	1					1	
Queuing Penalty (veh)		9	5		1	4					0	

Intersection: 3: Pleasant Valley Road & NB I-77 Ramps

Movement	EB	EB	EB	EB	WB	WB	SB
Directions Served	L	L	T	T	T	TR	LR
Maximum Queue (ft)	392	299	217	188	498	660	492
Average Queue (ft)	198	124	71	71	284	349	168
95th Queue (ft)	337	271	155	132	463	587	359
Link Distance (ft)			1017	1017	9932	9932	435
Upstream Blk Time (%)							1
Queuing Penalty (veh)							7
Storage Bay Dist (ft)	500	500					
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 7: SB I-77 Ramps

Movement	NW	NW
Directions Served	R	R
Maximum Queue (ft)	2370	900
Average Queue (ft)	571	410
95th Queue (ft)	1792	955
Link Distance (ft)	3566	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		850
Storage Blk Time (%)	8	8
Queuing Penalty (veh)	59	57

Intersection: 9: NB I-77 Ramps

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)

Network Summary

Network wide Queuing Penalty: 650

Intersection: 2: SB I-77 Ramps/Forestwood Drive & Pleasant Valley Road

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	LT	LT	R
Maximum Queue (ft)	154	11248	11248	200	249	74	94	159	169	264	160
Average Queue (ft)	26	7148	7137	163	141	19	36	101	98	141	12
95th Queue (ft)	118	12882	12865	287	227	61	76	151	148	254	78
Link Distance (ft)		11233	11233			1017	1017	366	366	1357	
Upstream Blk Time (%)		19	18								
Queuing Penalty (veh)		0	0								
Storage Bay Dist (ft)	105			150	325						110
Storage Blk Time (%)		69	47	0						35	
Queuing Penalty (veh)		16	206	0						4	

Intersection: 3: Pleasant Valley Road & NB I-77 Ramps

Movement	EB	EB	EB	EB	WB	WB	SB
Directions Served	L	L	T	T	T	TR	LR
Maximum Queue (ft)	525	550	1032	1173	865	945	493
Average Queue (ft)	524	549	1021	324	258	320	193
95th Queue (ft)	527	550	1050	999	609	699	350
Link Distance (ft)			1017	1017	6326	6326	435
Upstream Blk Time (%)			25	1			2
Queuing Penalty (veh)			266	13			8
Storage Bay Dist (ft)	500	500					
Storage Blk Time (%)	64	66	1				
Queuing Penalty (veh)	300	308	7				

Intersection: 7: SB I-77 Ramps

Movement	WB	WB
Directions Served	R	R
Maximum Queue (ft)	81	84
Average Queue (ft)	6	12
95th Queue (ft)	38	55
Link Distance (ft)		
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	850	850
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 9: NB I-77 Ramps

Movement	EB	WB	WB
Directions Served	T	R	R
Maximum Queue (ft)	185	362	192
Average Queue (ft)	9	125	35
95th Queue (ft)	67	326	121
Link Distance (ft)	1406	435	435
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 1127

Intersection: 2: SB I-77 Ramps/Forestwood Drive & Pleasant Valley Road

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	LT	R	LT	R
Maximum Queue (ft)	155	412	337	200	375	556	520	462	459	419	134	68
Average Queue (ft)	51	251	162	69	212	270	284	430	426	14	61	21
95th Queue (ft)	149	394	304	178	396	472	465	452	445	138	103	52
Link Distance (ft)		13582	13582			1017	1017	364	364	364	1357	
Upstream Blk Time (%)								69	74	0		
Queuing Penalty (veh)								341	367	0		
Storage Bay Dist (ft)	105			150	325							110
Storage Blk Time (%)		36	7		12	1					2	
Queuing Penalty (veh)		11	13		61	3					1	

Intersection: 3: Pleasant Valley Road & NB I-77 Ramps

Movement	EB	EB	EB	EB	WB	WB	SB
Directions Served	L	L	T	T	T	TR	LR
Maximum Queue (ft)	396	360	138	202	1175	1097	493
Average Queue (ft)	206	132	54	62	424	442	159
95th Queue (ft)	348	335	112	123	936	908	335
Link Distance (ft)			1017	1017	9932	9932	435
Upstream Blk Time (%)							1
Queuing Penalty (veh)							6
Storage Bay Dist (ft)	500	500					
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 7: SB I-77 Ramps

Movement	WB	WB	WB
Directions Served	R	R	R
Maximum Queue (ft)	784	839	749
Average Queue (ft)	384	422	290
95th Queue (ft)	710	757	719
Link Distance (ft)	3548		
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		850	850
Storage Blk Time (%)		0	
Queuing Penalty (veh)		0	

Intersection: 9: NB I-77 Ramps

Movement	EB	WB
Directions Served	T	R
Maximum Queue (ft)	52	69
Average Queue (ft)	2	2
95th Queue (ft)	17	23
Link Distance (ft)	1370	435
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 802

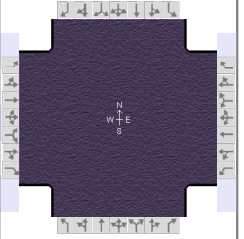
APPENDIX J
'BUILD' ALTERNATE 3' HCS INTERSECTION CAPACITY ANALYSIS

OPENING YEAR 2030

HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.91
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 3'	Analysis Period	1> 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	03.3 2030 AM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				

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Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	20	1339	378	149	376	47	202	11	429	62	46	10

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	20	1339	378	149	376	47	202	11	429	62	46	10
Initial Queue (Q_0), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h	None			None			None			None		
Heavy Vehicles (P_{HV}), %	1	1	0	3	3		0	4	0		2	2
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	4	4	4	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0	12.0	12.0	12.0		12.0	12.0	12.0		12.0	12.0
Turn Bay Length, ft	105	2430	150	325	1025		1050	1050	0		499	110
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35	35	35	35	35	25	25	25	25	25	25

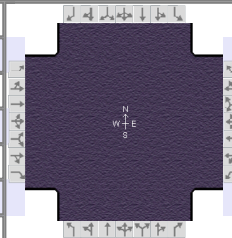
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	18.0	71.0	15.0	68.0		17.0		17.0
Yellow Change Interval (Y), s	3.6	3.6	3.6	3.6		3.0		3.0
Red Clearance Interval (R_c), s	1.3	1.3	1.3	1.3		2.1		2.1
Minimum Green (G_{min}), s	5	20	5	20		10		7
Start-Up Lost Time (l_t), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.5	2.0	2.5	2.0		4.5		3.0
Recall Mode	Off	Min	Off	Min		Min		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk ($Walk$), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.91
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 3'	Analysis Period	1> 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	03.3 2030 AM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	20	1339	378	149	376	47	202	11	429	62	46	10

Signal Information

Cycle, s	120.0	Reference Phase	2											
Offset, s	0	Reference Point	End	Green	2.6	3.9	69.7	9.7	14.1	0.0	1	2	3	4
Uncoordinated	No	Simult. Gap E/W	On	Yellow	3.6	0.0	3.6	3.0	3.0	0.0				
Force Mode	Fixed	Simult. Gap N/S	Off	Red	1.3	0.0	1.3	2.1	2.1	0.0	5	6	7	

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		9.0		11.0
Phase Duration, s	7.5	74.6	11.4	78.5		19.2		14.8
Change Period, (Y+R _c), s	4.9	4.9	4.9	4.9		5.1		5.1
Max Allow Headway (MAH), s	3.6	0.0	3.6	0.0		5.9		4.2
Queue Clearance Time (g _s), s	2.6		6.4			16.1		9.7
Green Extension Time (g _e), s	0.0	0.0	0.1	0.0		0.0		0.1
Phase Call Probability	0.52		1.00			1.00		0.99
Max Out Probability	0.00		0.96			1.00		1.00

Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	22	1471	415	164	236	229	111	123	471		119	11
Adjusted Saturation Flow Rate (s), veh/h/ln	1795	1795	1610	1767	1856	1783	1810	1813			1818	1585
Queue Service Time (g _s), s	0.6	35.0	17.5	4.4	3.3	3.4	6.9	7.7			7.7	0.8
Cycle Queue Clearance Time (g _c), s	0.6	35.0	17.5	4.4	3.3	3.4	6.9	7.7			7.7	0.8
Green Ratio (g/C)	0.60	0.58	0.58	0.64	0.61	0.61	0.12	0.12			0.08	0.08
Capacity (c), veh/h	630	2084	935	259	1138	1094	213	214			146	127
Volume-to-Capacity Ratio (X)	0.035	0.706	0.444	0.631	0.207	0.209	0.520	0.576			0.812	0.086
Back of Queue (Q), ft/ln (95 th percentile)	10	512	267	100	59	56	152	178			198	15
Back of Queue (Q), veh/ln (95 th percentile)	0.4	20.3	10.7	3.9	2.3	2.3	6.1	6.9			7.8	0.6
Queue Storage Ratio (RQ) (95 th percentile)	0.10	0.21	1.78	0.31	0.06	0.06	0.14	0.17			0.40	0.13
Uniform Delay (d ₁), s/veh	9.6	17.9	14.2	17.9	4.5	4.5	49.7	50.1			54.3	51.1
Incremental Delay (d ₂), s/veh	0.0	2.0	1.5	2.4	0.4	0.4	3.6	5.2			19.9	0.3
Initial Queue Delay (d ₃), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0
Control Delay (d), s/veh	9.6	19.9	15.8	20.2	4.9	5.0	53.3	55.3	0.0		74.2	51.4
Level of Service (LOS)	A	B	B	C	A	A	D	E	A		E	D
Approach Delay, s/veh / LOS	18.9		B	8.9		A	18.0		B		72.3	E
Intersection Delay, s/veh / LOS	18.9						B					

Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

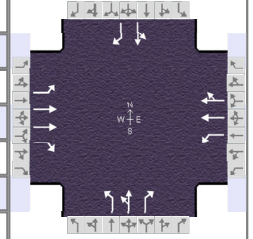
HCS Signalized Intersection Results Graphical Summary

General Information

Agency	GPD Group		
Analyst	Ryan Barco	Analysis Date	May 10, 2024
Jurisdiction	City of Independence	Time Period	AM Peak Hour
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 3'
Intersection	I-77 SB Ramps / Forest...	File Name	03.3 2030 AM Build Capacity Analysis Pleasant &...
Project Description	I-77 / Pleasant Valley Road		

Intersection Information

Duration, h	0.250
Area Type	Other
PHF	0.91
Analysis Period	1 > 7:00



Demand Information

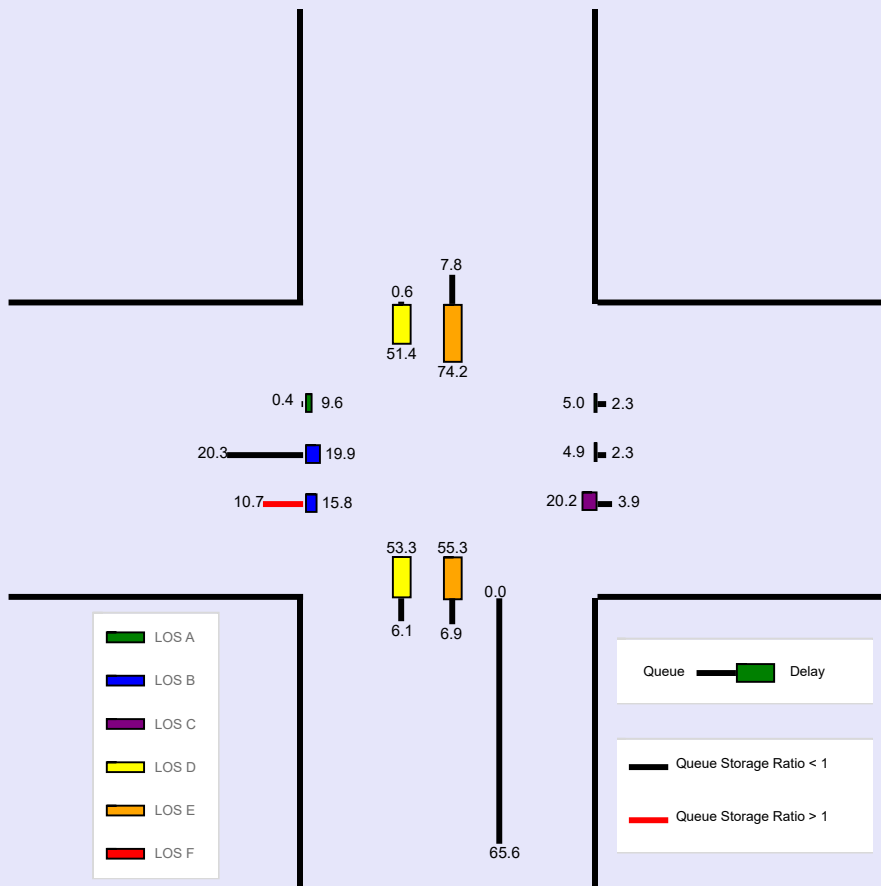
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	20	1339	378	149	376	47	202	11	429	62	46	10

Signal Information

Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	Off

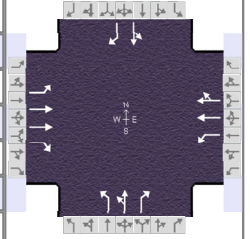
Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	10	512	267	100	59	56	152	178			198	15
Back of Queue (Q), veh/ln (95 th percentile)	0.4	20.3	10.7	3.9	2.3	2.3	6.1	6.9			7.8	0.6
Queue Storage Ratio (RQ) (95 th percentile)	0.10	0.21	1.78	0.31	0.06	0.06	0.14	0.17			0.40	0.13
Control Delay (d), s/veh	9.6	19.9	15.8	20.2	4.9	5.0	53.3	55.3	0.0		74.2	51.4
Level of Service (LOS)	A	B	B	C	A	A	D	E	A		E	D
Approach Delay, s/veh / LOS	18.9		B	8.9		A	18.0		B	72.3		E
Intersection Delay, s/veh / LOS	18.9						B					



HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 3'	Analysis Period	1> 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	04.3 2030 PM Build Capacity Analysis Pleasant & ...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	26	567	173	241	909	103	806	64	427	26	32	28

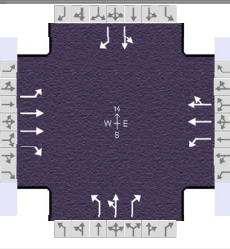
Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	26	567	173	241	909	103	806	64	427	26	32	28
Initial Queue (Q_0), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h	None			None			None			None		
Heavy Vehicles (P_{HV}), %	2	2	0	1	1		0	0	0		0	0
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	4	4	4	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0	12.0	12.0	12.0		12.0	12.0	12.0		12.0	12.0
Turn Bay Length, ft	105	2430	150	325	1025		1050	1050	0		499	110
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35	35	35	35	35	25	25	25	25	25	25

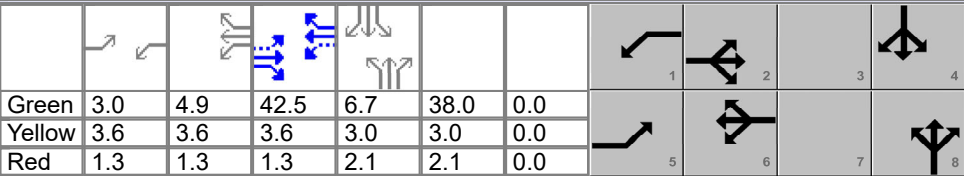
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	17.0	47.0	17.0	47.0		40.0		16.0
Yellow Change Interval (Y), s	3.6	3.6	3.6	3.6		3.0		3.0
Red Clearance Interval (R_c), s	1.3	1.3	1.3	1.3		2.1		2.1
Minimum Green (G_{min}), s	5	20	5	20		10		7
Start-Up Lost Time (l_t), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.5	2.0	2.5	2.0		4.5		3.0
Recall Mode	Off	Min	Off	Min		Off		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk ($Walk$), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

HCS Signalized Intersection Results Summary

General Information				Intersection Information		
Agency	GPD Group			Duration, h	0.250	
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other	
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93	
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 3'	Analysis Period	1> 7:00	
Intersection	I-77 SB Ramps / Forest...	File Name	04.3 2030 PM Build Capacity Analysis Pleasant & ...			
Project Description	I-77 / Pleasant Valley Road					

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	26	567	173	241	909	103	806	64	427	26	32	28

Signal Information													
Cycle, s	120.0	Reference Phase	2										
Offset, s	0	Reference Point	End										
Uncoordinated	No	Simult. Gap E/W	On	Green	3.0	4.9	42.5	6.7	38.0	0.0			
Force Mode	Fixed	Simult. Gap N/S	Off	Yellow	3.6	3.6	3.6	3.0	3.0	0.0			
				Red	1.3	1.3	1.3	2.1	2.1	0.0			

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		9.0		11.0
Phase Duration, s	7.9	47.4	17.7	57.1		43.1		11.8
Change Period, ($Y+R_c$), s	4.9	4.9	4.9	4.9		5.1		5.1
Max Allow Headway (MAH), s	3.6	0.0	3.6	0.0		5.8		4.3
Queue Clearance Time (g_s), s	3.2		12.8			34.7		5.9
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0		3.3		0.1
Phase Call Probability	0.61		1.00			1.00		0.95
Max Out Probability	0.00		1.00			1.00		0.53

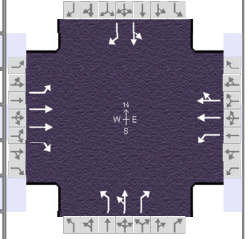
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	28	610	186	259	554	534	433	502	459		62	30
Adjusted Saturation Flow Rate (s), veh/h/ln	1781	1781	1610	1795	1885	1817	1810	1822			1858	1610
Queue Service Time (g_s), s	1.2	16.0	10.1	10.8	24.3	24.3	25.8	31.2			3.9	2.2
Cycle Queue Clearance Time (g_c), s	1.2	16.0	10.1	10.8	24.3	24.3	25.8	31.2			3.9	2.2
Green Ratio (g/C)	0.38	0.35	0.35	0.48	0.44	0.44	0.32	0.32			0.06	0.06
Capacity (c), veh/h	217	1261	570	432	821	791	574	578			103	90
Volume-to-Capacity Ratio (X)	0.129	0.484	0.326	0.600	0.675	0.675	0.755	0.869			0.603	0.336
Back of Queue (Q), ft/ln (95 th percentile)	23	288	185	196	382	369	455	567			91	42
Back of Queue (Q), veh/ln (95 th percentile)	0.9	11.4	7.4	7.8	15.1	14.7	18.2	22.7			3.6	1.7
Queue Storage Ratio (RQ) (95 th percentile)	0.22	0.12	1.23	0.60	0.37	0.36	0.43	0.54			0.18	0.38
Uniform Delay (d_1), s/veh	24.7	30.2	28.3	20.3	19.3	19.3	36.8	38.6			55.4	54.5
Incremental Delay (d_2), s/veh	0.2	1.3	1.5	1.9	4.4	4.6	6.1	13.6			5.5	2.2
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0
Control Delay (d), s/veh	24.9	31.5	29.8	22.3	23.7	23.9	42.9	52.2	0.0		60.9	56.7
Level of Service (LOS)	C	C	C	C	C	C	D	D	A		E	E
Approach Delay, s/veh / LOS	30.9		C	23.5		C	32.1		C	59.5		E
Intersection Delay, s/veh / LOS	29.4						C					

Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS												
Bicycle LOS Score / LOS												

HCS Signalized Intersection Results Graphical Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 3'	Analysis Period	1> 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	04.3 2030 PM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

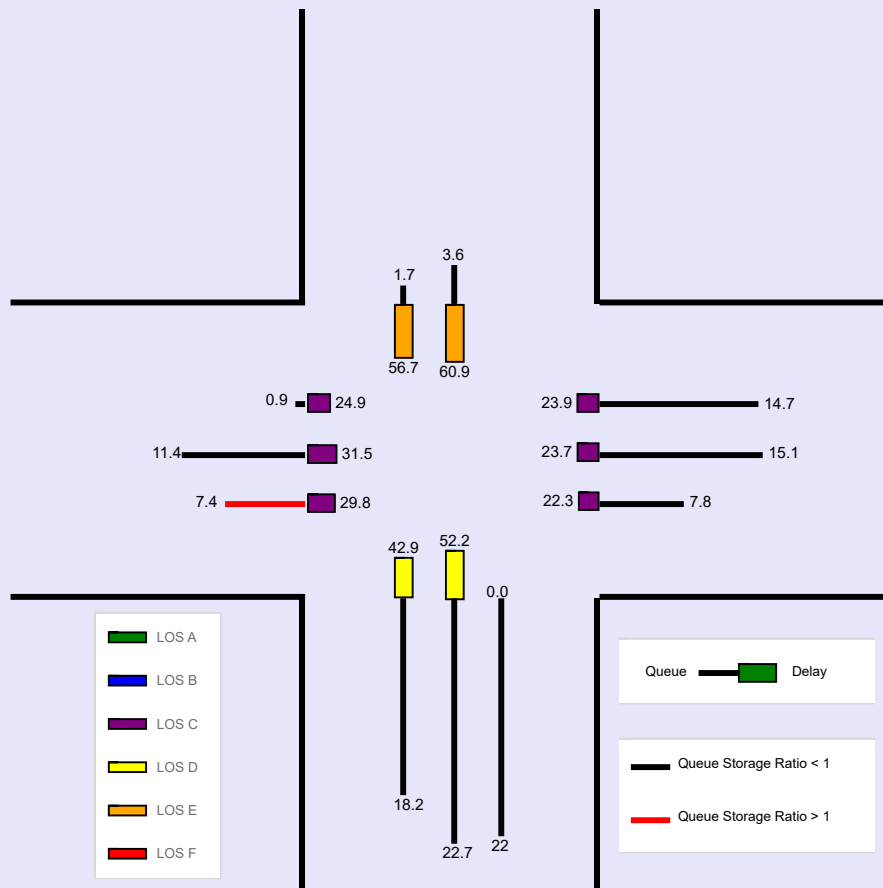
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	26	567	173	241	909	103	806	64	427	26	32	28

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	3.0	4.9	42.5	6.7	38.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	Off	Yellow	3.6	3.6	3.6	3.0	3.0	0.0		
				Red	1.3	1.3	1.3	2.1	2.1	0.0		

Movement Group Results

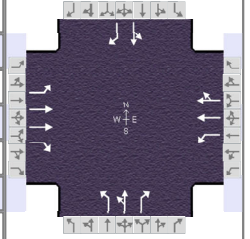
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	23	288	185	196	382	369	455	567			91	42
Back of Queue (Q), veh/ln (95 th percentile)	0.9	11.4	7.4	7.8	15.1	14.7	18.2	22.7			3.6	1.7
Queue Storage Ratio (RQ) (95 th percentile)	0.22	0.12	1.23	0.60	0.37	0.36	0.43	0.54			0.18	0.38
Control Delay (d), s/veh	24.9	31.5	29.8	22.3	23.7	23.9	42.9	52.2	0.0		60.9	56.7
Level of Service (LOS)	C	C	C	C	C	C	D	D	A		E	E
Approach Delay, s/veh / LOS	30.9		C	23.5		C	32.1		C		59.5	E
Intersection Delay, s/veh / LOS	29.4						C					



DESIGN YEAR 2050

HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.91
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 3'	Analysis Period	1> 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	03.3 2050 AM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	23	1531	433	171	430	54	231	13	490	71	53	12

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off								

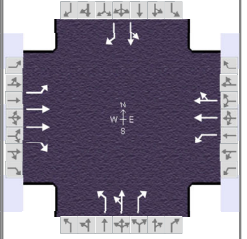
Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	23	1531	433	171	430	54	231	13	490	71	53	12
Initial Queue (Q_0), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h	None			None			None			None		
Heavy Vehicles (P_{HV}), %	1	1	0	3	3		0	4	0		2	2
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	4	4	4	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0	12.0	12.0	12.0		12.0	12.0	12.0		12.0	12.0
Turn Bay Length, ft	105	2430	150	325	1025		1050	1050	0		499	110
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35	35	35	35	35	25	25	25	25	25	25

Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	18.0	71.0	15.0	68.0		17.0		17.0
Yellow Change Interval (Y), s	3.6	3.6	3.6	3.6		3.0		3.0
Red Clearance Interval (R_c), s	1.3	1.3	1.3	1.3		2.1		2.1
Minimum Green (G_{min}), s	5	20	5	20		10		7
Start-Up Lost Time (l_t), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.5	2.0	2.5	2.0		4.5		3.0
Recall Mode	Off	Min	Off	Min		Min		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk ($Walk$), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No	0.50		No	0.50		No	0.50		No	0.50	

HCS Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.91
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 3'	Analysis Period	1> 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	03.3 2050 AM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	23	1531	433	171	430	54	231	13	490	71	53	12

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off								

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		9.0		11.0
Phase Duration, s	7.7	73.9	12.1	78.3		18.1		15.9
Change Period, ($Y+R_c$), s	4.9	4.9	4.9	4.9		5.1		5.1
Max Allow Headway (MAH), s	3.6	0.0	3.6	0.0		5.9		4.2
Queue Clearance Time (g_s), s	2.7		7.1			15.0		10.8
Green Extension Time (g_e), s	0.0	0.0	0.1	0.0		0.0		0.0
Phase Call Probability	0.57		1.00			1.00		0.99
Max Out Probability	0.00		1.00			1.00		1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	25	1682	476	188	270	262	127	141	538		136	13
Adjusted Saturation Flow Rate (s), veh/h/ln	1795	1795	1610	1767	1856	1783	1810	1813			1818	1585
Queue Service Time (g_s), s	0.7	45.0	21.4	5.1	4.0	4.1	8.1	9.0			8.8	0.9
Cycle Queue Clearance Time (g_c), s	0.7	45.0	21.4	5.1	4.0	4.1	8.1	9.0			8.8	0.9
Green Ratio (g/C)	0.60	0.57	0.57	0.65	0.61	0.61	0.11	0.11			0.09	0.09
Capacity (c), veh/h	596	2063	925	225	1134	1090	196	196			164	143
Volume-to-Capacity Ratio (X)	0.042	0.816	0.514	0.836	0.238	0.240	0.648	0.720			0.831	0.092
Back of Queue (Q), ft/ln (95 th percentile)	12	647	316	188	70	66	188	220			228	17
Back of Queue (Q), veh/ln (95 th percentile)	0.5	25.7	12.6	7.3	2.7	2.7	7.5	8.5			9.0	0.7
Queue Storage Ratio (RQ) (95 th percentile)	0.11	0.27	2.11	0.58	0.07	0.07	0.18	0.21			0.46	0.16
Uniform Delay (d_1), s/veh	9.8	20.4	15.4	24.7	4.7	4.7	51.3	51.8			53.7	50.1
Incremental Delay (d_2), s/veh	0.0	3.7	2.0	16.8	0.5	0.5	8.9	13.8			25.1	0.3
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0
Control Delay (d), s/veh	9.8	24.1	17.5	41.5	5.2	5.2	60.3	65.5	0.0		78.8	50.4
Level of Service (LOS)	A	C	B	D	A	A	E	E	A		E	D
Approach Delay, s/veh / LOS	22.5		C	14.7		B	21.0		C	76.3		E
Intersection Delay, s/veh / LOS	22.8						C					

Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS												
Bicycle LOS Score / LOS												

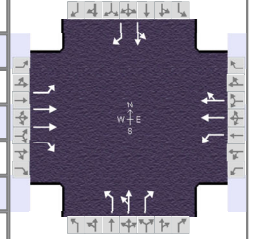
HCS Signalized Intersection Results Graphical Summary

General Information

Agency	GPD Group		
Analyst	Ryan Barco	Analysis Date	May 10, 2024
Jurisdiction	City of Independence	Time Period	AM Peak Hour
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 3'
Intersection	I-77 SB Ramps / Forest...	File Name	03.3 2050 AM Build Capacity Analysis Pleasant &...
Project Description	I-77 / Pleasant Valley Road		

Intersection Information

Duration, h	0.250
Area Type	Other
PHF	0.91
Analysis Period	1 > 7:00



Demand Information

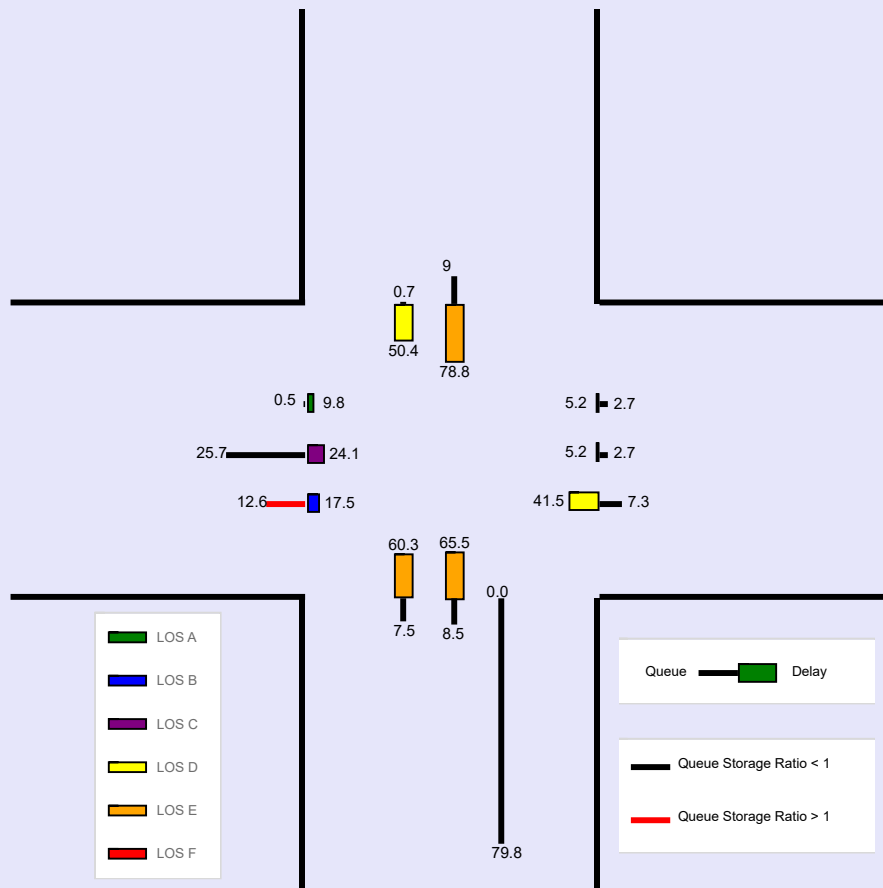
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	23	1531	433	171	430	54	231	13	490	71	53	12

Signal Information

Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	Off

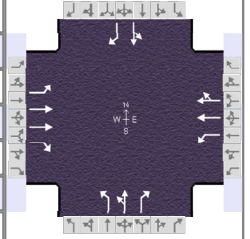
Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R				
Back of Queue (Q), ft/ln (95 th percentile)	12	647	316	188	70	66	188	220			228	17				
Back of Queue (Q), veh/ln (95 th percentile)	0.5	25.7	12.6	7.3	2.7	2.7	7.5	8.5			9.0	0.7				
Queue Storage Ratio (RQ) (95 th percentile)	0.11	0.27	2.11	0.58	0.07	0.07	0.18	0.21			0.46	0.16				
Control Delay (d), s/veh	9.8	24.1	17.5	41.5	5.2	5.2	60.3	65.5	0.0		78.8	50.4				
Level of Service (LOS)	A	C	B	D	A	A	E	E	A		E	D				
Approach Delay, s/veh / LOS	22.5		C		14.7		B		21.0		C		76.3		E	
Intersection Delay, s/veh / LOS	22.8						C									



HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 3'	Analysis Period	1> 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	04.3 2050 PM Build Capacity Analysis Pleasant & ...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	30	649	198	276	1040	118	921	73	487	30	37	32

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off								

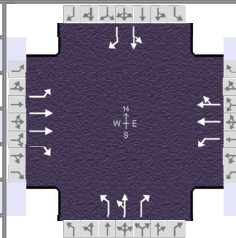
Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	30	649	198	276	1040	118	921	73	487	30	37	32
Initial Queue (Q_0), veh/h	0	0	0	0	0	0	0	0	0	0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Parking (N_m), man/h	None			None			None			None		
Heavy Vehicles (P_{HV}), %	2	2	0	1	1		0	0	0		0	0
Ped / Bike / RTOR, /h	0	0	0	0	0	0	0	0	0	0	0	0
Buses (N_b), buses/h	0	0	0	0	0	0	0	0	0	0	0	0
Arrival Type (AT)	3	3	3	4	4	4	3	3	3	3	3	3
Upstream Filtering (I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0	12.0	12.0	12.0		12.0	12.0	12.0		12.0	12.0
Turn Bay Length, ft	105	2430	150	325	1025		1050	1050	0		499	110
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35	35	35	35	35	25	25	25	25	25	25

Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	17.0	47.0	17.0	47.0		40.0		16.0
Yellow Change Interval (Y), s	3.6	3.6	3.6	3.6		3.0		3.0
Red Clearance Interval (R_c), s	1.3	1.3	1.3	1.3		2.1		2.1
Minimum Green (G_{min}), s	5	20	5	20		10		7
Start-Up Lost Time (l_t), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Extension of Effective Green (e), s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Passage (PT), s	2.5	2.0	2.5	2.0		4.5		3.0
Recall Mode	Off	Min	Off	Min		Off		Off
Dual Entry	No	Yes	No	Yes		Yes		Yes
Walk ($Walk$), s		0.0		0.0		0.0		0.0
Pedestrian Clearance Time (PC), s		0.0		0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0	0	No	0.0	0	No	0.0	0	No	0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0	12.0	5.0	2.0
Pedestrian Signal / Occupied Parking	No		0.50	No		0.50	No		0.50	No		0.50

HCS Signalized Intersection Results Summary

General Information				Intersection Information		
Agency	GPD Group			Duration, h	0.250	
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other	
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93	
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 3'	Analysis Period	1> 7:00	
Intersection	I-77 SB Ramps / Forest...	File Name	04.3 2050 PM Build Capacity Analysis Pleasant &...			
Project Description	I-77 / Pleasant Valley Road					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	30	649	198	276	1040	118	921	73	487	30	37	32

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	Off								

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6		8		4
Case Number	1.1	3.0	1.1	4.0		9.0		11.0
Phase Duration, s	8.2	47.0	17.0	55.8		44.1		11.9
Change Period, ($Y+R_c$), s	4.9	4.9	4.9	4.9		5.1		5.1
Max Allow Headway (MAH), s	3.6	0.0	3.6	0.0		5.8		4.3
Queue Clearance Time (g_s), s	3.4		14.1			41.0		6.6
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0		0.0		0.1
Phase Call Probability	0.66		1.00			1.00		0.97
Max Out Probability	0.00		1.00			1.00		0.96

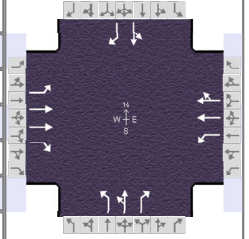
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	32	698	213	297	633	612	495	574	524		72	34
Adjusted Saturation Flow Rate (s), veh/h/ln	1781	1781	1610	1795	1885	1817	1810	1822			1858	1610
Queue Service Time (g_s), s	1.4	19.0	11.9	12.1	31.7	31.9	30.5	37.2			4.6	2.5
Cycle Queue Clearance Time (g_c), s	1.4	19.0	11.9	12.1	31.7	31.9	30.5	37.2			4.6	2.5
Green Ratio (g/C)	0.38	0.35	0.35	0.47	0.42	0.42	0.32	0.32			0.06	0.06
Capacity (c), veh/h	172	1249	565	386	800	771	588	592			105	91
Volume-to-Capacity Ratio (X)	0.187	0.559	0.377	0.769	0.792	0.794	0.842	0.969			0.684	0.377
Back of Queue (Q), ft/ln (95 th percentile)	27	333	212	249	495	480	545	726			107	48
Back of Queue (Q), veh/ln (95 th percentile)	1.1	13.1	8.5	9.9	19.6	19.2	21.8	29.0			4.3	1.9
Queue Storage Ratio (RQ) (95 th percentile)	0.26	0.14	1.41	0.77	0.48	0.47	0.52	0.69			0.21	0.44
Uniform Delay (d_1), s/veh	26.4	31.5	29.2	23.7	21.9	21.9	37.6	39.9			55.5	54.6
Incremental Delay (d_2), s/veh	0.4	1.8	1.9	8.7	7.9	8.3	11.3	29.4			7.6	2.6
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0
Control Delay (d), s/veh	26.8	33.3	31.1	32.5	29.8	30.2	48.9	69.3	0.0		63.1	57.1
Level of Service (LOS)	C	C	C	C	C	C	D	E	A		E	E
Approach Delay, s/veh / LOS	32.6		C	30.5		C	40.2		D	61.2		E
Intersection Delay, s/veh / LOS	35.4						D					

Multimodal Results	EB			WB			NB			SB		
Pedestrian LOS Score / LOS												
Bicycle LOS Score / LOS												

HCS Signalized Intersection Results Graphical Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.93
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 3'	Analysis Period	1> 7:00
Intersection	I-77 SB Ramps / Forest...	File Name	04.3 2050 PM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

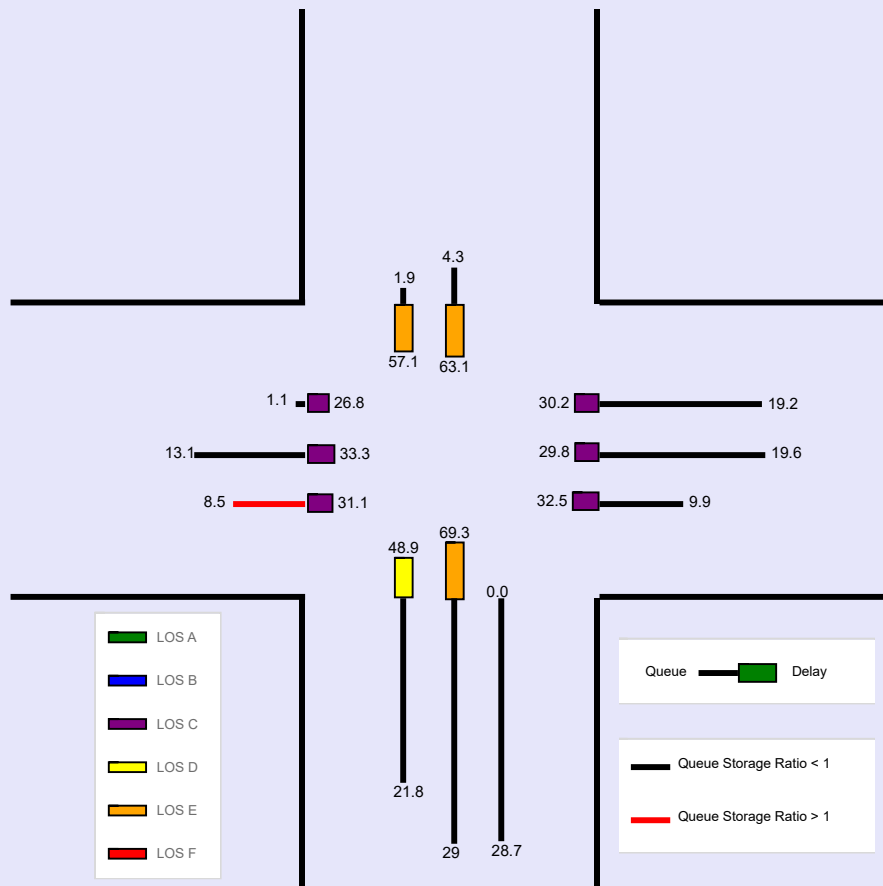
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	30	649	198	276	1040	118	921	73	487	30	37	32

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	3.3	3.9	42.1	6.8	39.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	Off	Yellow	3.6	3.6	3.6	3.0	3.0	0.0		
				Red	1.3	1.3	1.3	2.1	2.1	0.0		

Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R	
Back of Queue (Q), ft/ln (95 th percentile)	27	333	212	249	495	480	545	726			107	48	
Back of Queue (Q), veh/ln (95 th percentile)	1.1	13.1	8.5	9.9	19.6	19.2	21.8	29.0			4.3	1.9	
Queue Storage Ratio (RQ) (95 th percentile)	0.26	0.14	1.41	0.77	0.48	0.47	0.52	0.69			0.21	0.44	
Control Delay (d), s/veh	26.8	33.3	31.1	32.5	29.8	30.2	48.9	69.3	0.0		63.1	57.1	
Level of Service (LOS)	C	C	C	C	C	C	D	E	A		E	E	
Approach Delay, s/veh / LOS	32.6		C	30.5		C	40.2		D		61.2		E
Intersection Delay, s/veh / LOS	35.4						D						

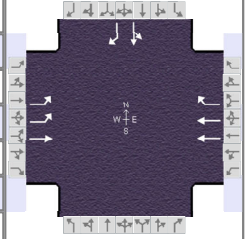


APPENDIX K
'BUILD' ALTERNATE 4' HCS INTERSECTION CAPACITY ANALYSIS

OPENING YEAR 2030

HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.90
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 4'	Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	05.4 2030 AM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	1013	817			409	368				186	0	163

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	1013	817			409	368				186	0	163
Initial Queue (Q_0), veh/h	0	0			0	0				0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900			1900	1900				1900	1900	1900
Parking (N_m), man/h		None			None						None	
Heavy Vehicles (P_{HV}), %	1	1			6	6					5	2
Ped / Bike / RTOR, /h	0	0			0	0		0	0		0	0
Buses (N_b), buses/h	0	0	0		0	0					0	0
Arrival Type (AT)	4	4			4	4					3	3
Upstream Filtering (I)	1.00	1.00			1.00	1.00					1.00	1.00
Lane Width (W), ft	12.0	12.0			12.0	12.0					12.0	12.0
Turn Bay Length, ft	500	1025			1950	250					140	0
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35			35	35					25	25

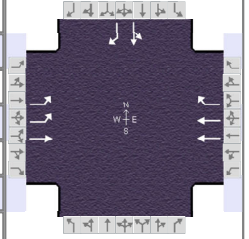
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	42.0	87.0		45.0				33.0
Yellow Change Interval (Y), s	3.6	3.6		3.6				3.0
Red Clearance Interval (R_c), s	1.3	1.3		1.3				2.1
Minimum Green (G_{min}), s	5	10		10				10
Start-Up Lost Time (l_t), s	2.0	2.0		2.0			2.0	2.0
Extension of Effective Green (e), s	2.0	2.0		2.0			2.0	2.0
Passage (PT), s	5.0	2.0		2.0				4.0
Recall Mode	Off	Min		Min				Off
Dual Entry	No	Yes		Yes				Yes
Walk ($Walk$), s				0.0		0.0		0.0
Pedestrian Clearance Time (PC), s				0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius				0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft				9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0		No	0.0	0	No		0		0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0				12.0	5.0	2.0
Pedestrian Signal / Occupied Parking		0.50	No		0.50	No				No		0.50

HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.90
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 4'	Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	05.4 2030 AM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	1013	817			409	368				186	0	163

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6				4
Case Number	2.0	4.0		7.3				11.0
Phase Duration, s	48.6	97.3		48.7				22.7
Change Period, ($Y+R_c$), s	4.9	4.9		4.9				5.1
Max Allow Headway (MAH), s	6.1	0.0		0.0				5.4
Queue Clearance Time (g_s), s	37.0							15.8
Green Extension Time (g_e), s	6.7	0.0		0.0				1.8
Phase Call Probability	1.00							1.00
Max Out Probability	0.77							0.13

Movement Group Results

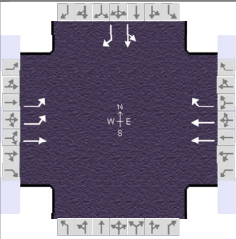
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16				7	4	14
Adjusted Flow Rate (v), veh/h	1126	908			454	409				207		181
Adjusted Saturation Flow Rate (s), veh/h/ln	1743	1885			1724	1535				1739		
Queue Service Time (g_s), s	35.0	0.0			9.8	25.4				13.8		
Cycle Queue Clearance Time (g_c), s	35.0	0.0			9.8	25.4				13.8		
Green Ratio (g/C)	0.36	0.77			0.37	0.37				0.15		
Capacity (c), veh/h	1269	1451			1259	560				255		
Volume-to-Capacity Ratio (X)	0.887	0.626			0.361	0.730				0.809		
Back of Queue (Q), ft/ln (95 th percentile)	514	37			182	380				283		
Back of Queue (Q), veh/ln (95 th percentile)	20.4	1.5			6.9	14.5				10.9		
Queue Storage Ratio (RQ) (95 th percentile)	1.03	0.04			0.09	1.52				2.02		
Uniform Delay (d_1), s/veh	28.7	0.0			22.1	26.1				49.6		
Incremental Delay (d_2), s/veh	7.8	2.0			0.8	8.1				8.8		
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0				0.0		
Control Delay (d), s/veh	36.4	2.0			22.9	34.2				58.3	0.0	
Level of Service (LOS)	D	A			C	C				E	A	
Approach Delay, s/veh / LOS	21.1	C		28.3	C		0.0			31.1	C	
Intersection Delay, s/veh / LOS	24.1						C					

Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

HCS Signalized Intersection Results Graphical Summary

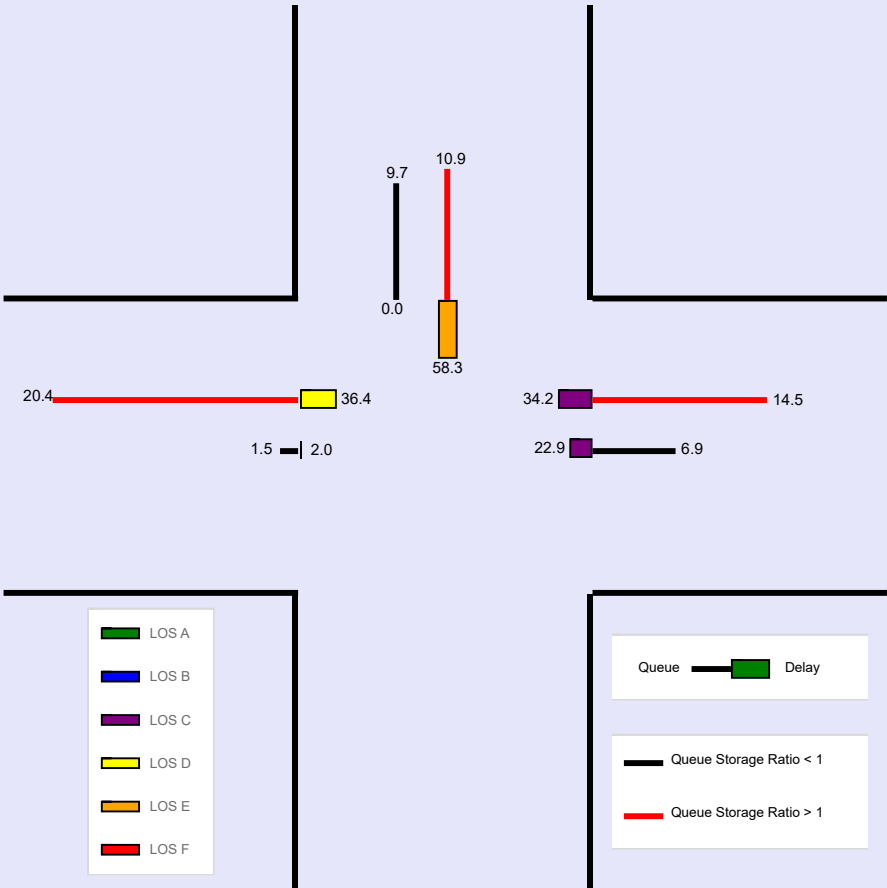
General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.90
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 4'	Analysis Period	1 > 7:00
Intersection	I-77 NB Ramps	File Name	05.4 2030 AM Build Capacity Analysis Pleasant & ...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	1013	817			409	368				186	0	163

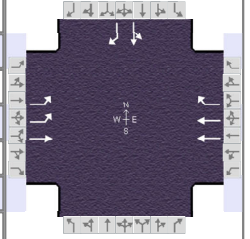
Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On								

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	514	37			182	380					283	
Back of Queue (Q), veh/ln (95 th percentile)	20.4	1.5			6.9	14.5					10.9	
Queue Storage Ratio (RQ) (95 th percentile)	1.03	0.04			0.09	1.52					2.02	
Control Delay (d), s/veh	36.4	2.0			22.9	34.2					58.3	0.0
Level of Service (LOS)	D	A			C	C					E	A
Approach Delay, s/veh / LOS	21.1		C	28.3		C	0.0			31.1		C
Intersection Delay, s/veh / LOS	24.1						C					



HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.96
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 4'	Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	06.4 2030 PM Build Capacity Analysis Pleasant & ...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	326	694			820	513				112	0	433

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	326	694			820	513				112	0	433
Initial Queue (Q_0), veh/h	0	0			0	0				0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900			1900	1900				1900	1900	1900
Parking (N_m), man/h		None			None						None	
Heavy Vehicles (P_{HV}), %	2	2			1	1					6	2
Ped / Bike / RTOR, /h	0	0			0	0		0	0		0	0
Buses (N_b), buses/h	0	0	0		0	0					0	0
Arrival Type (AT)	4	4			4	4					3	3
Upstream Filtering (I)	1.00	1.00			1.00	1.00					1.00	1.00
Lane Width (W), ft	12.0	12.0			12.0	12.0					12.0	12.0
Turn Bay Length, ft	500	1025			1950	250					140	0
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35			35	35					25	25

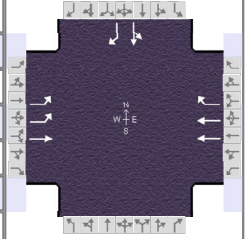
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	32.0	84.0		52.0				36.0
Yellow Change Interval (Y), s	3.6	3.6		3.6				3.0
Red Clearance Interval (R_c), s	1.3	1.3		1.3				2.1
Minimum Green (G_{min}), s	5	10		10				10
Start-Up Lost Time (l_t), s	2.0	2.0		2.0			2.0	2.0
Extension of Effective Green (e), s	2.0	2.0		2.0			2.0	2.0
Passage (PT), s	5.0	2.0		2.0				4.0
Recall Mode	Off	Min		Min				Off
Dual Entry	No	Yes		Yes				Yes
Walk ($Walk$), s				0.0		0.0		0.0
Pedestrian Clearance Time (PC), s				0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius				0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft				9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0		No	0.0	0	No		0		0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0				12.0	5.0	2.0
Pedestrian Signal / Occupied Parking		0.50	No		0.50	No				No		0.50

HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.96
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 4'	Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	06.4 2030 PM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	326	694			820	513				112	0	433

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6				4
Case Number	2.0	4.0		7.3				11.0
Phase Duration, s	20.4	84.0		63.6				36.0
Change Period, ($Y+R_c$), s	4.9	4.9		4.9				5.1
Max Allow Headway (MAH), s	6.1	0.0		0.0				5.4
Queue Clearance Time (g_s), s	13.2							32.9
Green Extension Time (g_e), s	2.3	0.0		0.0				0.0
Phase Call Probability	1.00							1.00
Max Out Probability	0.11							1.00

Movement Group Results

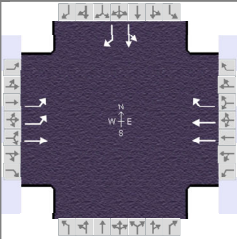
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16				7	4	14
Adjusted Flow Rate (v), veh/h	340	723			854	534					117	451
Adjusted Saturation Flow Rate (s), veh/h/ln	1730	1870			1795	1598					1725	
Queue Service Time (g_s), s	11.2	11.6			14.6	25.2					6.5	
Cycle Queue Clearance Time (g_c), s	11.2	11.6			14.6	25.2					6.5	
Green Ratio (g/C)	0.13	0.66			0.49	0.49					0.26	
Capacity (c), veh/h	448	1233			1754	781					444	
Volume-to-Capacity Ratio (X)	0.758	0.586			0.487	0.684					0.263	
Back of Queue (Q), ft/ln (95 th percentile)	219	144			221	326					133	
Back of Queue (Q), veh/ln (95 th percentile)	8.6	5.7			8.8	13.0					5.1	
Queue Storage Ratio (RQ) (95 th percentile)	0.44	0.14			0.11	1.31					0.95	
Uniform Delay (d_1), s/veh	47.8	3.2			13.2	15.1					35.5	
Incremental Delay (d_2), s/veh	5.5	2.0			1.0	4.8					0.4	
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0					0.0	
Control Delay (d), s/veh	53.4	5.2			14.2	19.9					35.9	0.0
Level of Service (LOS)	D	A			B	B					D	A
Approach Delay, s/veh / LOS	20.6	C			16.4	B			0.0		7.4	A
Intersection Delay, s/veh / LOS	16.2						B					

Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

HCS Signalized Intersection Results Graphical Summary

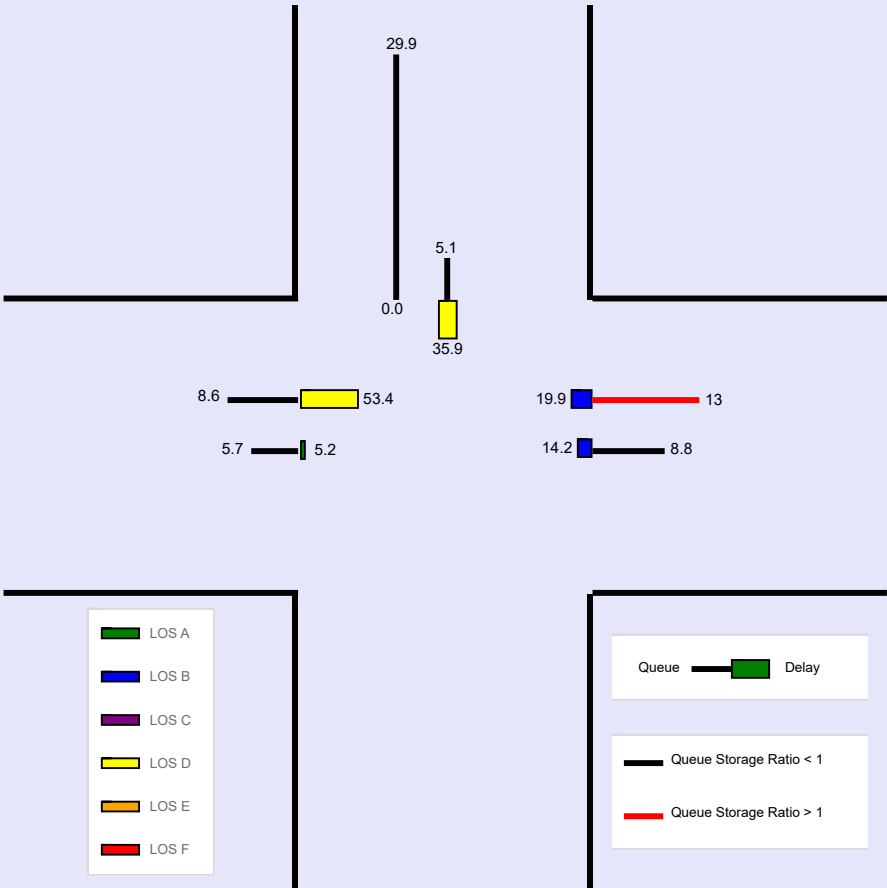
General Information					Intersection Information	
Agency	GPD Group				Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024		Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour		PHF	0.96
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 4'		Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	06.4 2030 PM Build Capacity Analysis Pleasant &...			
Project Description						
I-77 / Pleasant Valley Road						



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	326	694			820	513				112	0	433

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On								

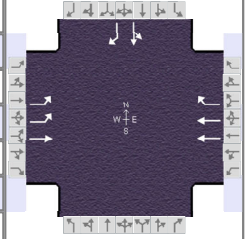
Movement Group Results	EB			WB			NB			SB			
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R	
Back of Queue (Q), ft/ln (95 th percentile)	219	144			221	326					133		
Back of Queue (Q), veh/ln (95 th percentile)	8.6	5.7			8.8	13.0					5.1		
Queue Storage Ratio (RQ) (95 th percentile)	0.44	0.14			0.11	1.31					0.95		
Control Delay (d), s/veh	53.4	5.2			14.2	19.9					35.9	0.0	
Level of Service (LOS)	D	A			B	B					D	A	
Approach Delay, s/veh / LOS	20.6		C		16.4		B		0.0		7.4		A
Intersection Delay, s/veh / LOS	16.2						B						



DESIGN YEAR 2050

HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.90
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 4'	Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	05.4 2050 AM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	1158	934			467	421				213	0	188

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	1158	934			467	421				213	0	188
Initial Queue (Q_0), veh/h	0	0			0	0				0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900			1900	1900				1900	1900	1900
Parking (N_m), man/h		None			None						None	
Heavy Vehicles (P_{HV}), %	1	1			6	6					5	2
Ped / Bike / RTOR, /h	0	0			0	0	0	0		0	0	0
Buses (N_b), buses/h	0	0	0		0	0				0	0	0
Arrival Type (AT)	4	4			4	4				3	3	3
Upstream Filtering (I)	1.00	1.00			1.00	1.00				1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0			12.0	12.0				12.0	12.0	
Turn Bay Length, ft	500	1025			1950	250				140	0	
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35			35	35				25	25	25

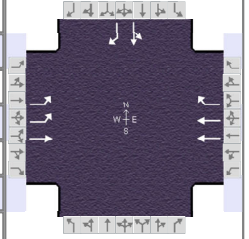
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	42.0	87.0		45.0				33.0
Yellow Change Interval (Y), s	3.6	3.6		3.6				3.0
Red Clearance Interval (R_c), s	1.3	1.3		1.3				2.1
Minimum Green (G_{min}), s	5	10		10				10
Start-Up Lost Time (l_t), s	2.0	2.0		2.0			2.0	2.0
Extension of Effective Green (e), s	2.0	2.0		2.0			2.0	2.0
Passage (PT), s	5.0	2.0		2.0				4.0
Recall Mode	Off	Min		Min				Off
Dual Entry	No	Yes		Yes				Yes
Walk ($Walk$), s				0.0		0.0		0.0
Pedestrian Clearance Time (PC), s				0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius				0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft				9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0		No	0.0	0	No		0		0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0				12.0	5.0	2.0
Pedestrian Signal / Occupied Parking			0.50	No		0.50	No			No		0.50

HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.90
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 4'	Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	05.4 2050 AM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	1158	934			467	421				213	0	188

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6				4
Case Number	2.0	4.0		7.3				11.0
Phase Duration, s	50.2	95.2		45.0				24.8
Change Period, ($Y+R_c$), s	4.9	4.9		4.9				5.1
Max Allow Headway (MAH), s	6.1	0.0		0.0				5.4
Queue Clearance Time (g_s), s	45.3							17.8
Green Extension Time (g_e), s	0.0	0.0		0.0				1.9
Phase Call Probability	1.00							1.00
Max Out Probability	1.00							0.27

Movement Group Results

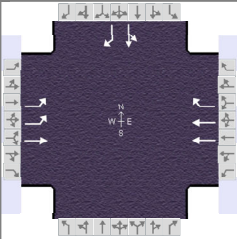
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16				7	4	14
Adjusted Flow Rate (v), veh/h	1287	1038			519	468				237		209
Adjusted Saturation Flow Rate (s), veh/h/ln	1743	1885			1724	1535				1739		
Queue Service Time (g_s), s	43.3	0.0			12.5	34.2				15.8		
Cycle Queue Clearance Time (g_c), s	43.3	0.0			12.5	34.2				15.8		
Green Ratio (g/C)	0.38	0.75			0.33	0.33				0.16		
Capacity (c), veh/h	1315	1418			1152	513				286		
Volume-to-Capacity Ratio (X)	0.978	0.732			0.450	0.912				0.828		
Back of Queue (Q), ft/ln (95 th percentile)	670	60			224	545				322		
Back of Queue (Q), veh/ln (95 th percentile)	26.6	2.4			8.6	20.8				12.4		
Queue Storage Ratio (RQ) (95 th percentile)	1.34	0.06			0.11	2.18				2.30		
Uniform Delay (d_1), s/veh	29.3	0.0			25.6	31.6				48.5		
Incremental Delay (d_2), s/veh	19.9	3.4			1.3	23.0				11.2		
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0				0.0		
Control Delay (d), s/veh	49.2	3.4			26.9	54.6				59.7		0.0
Level of Service (LOS)	D	A			C	D				E		A
Approach Delay, s/veh / LOS	28.8	C		40.0	D		0.0			31.7	C	
Intersection Delay, s/veh / LOS	32.1						C					

Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

HCS Signalized Intersection Results Graphical Summary

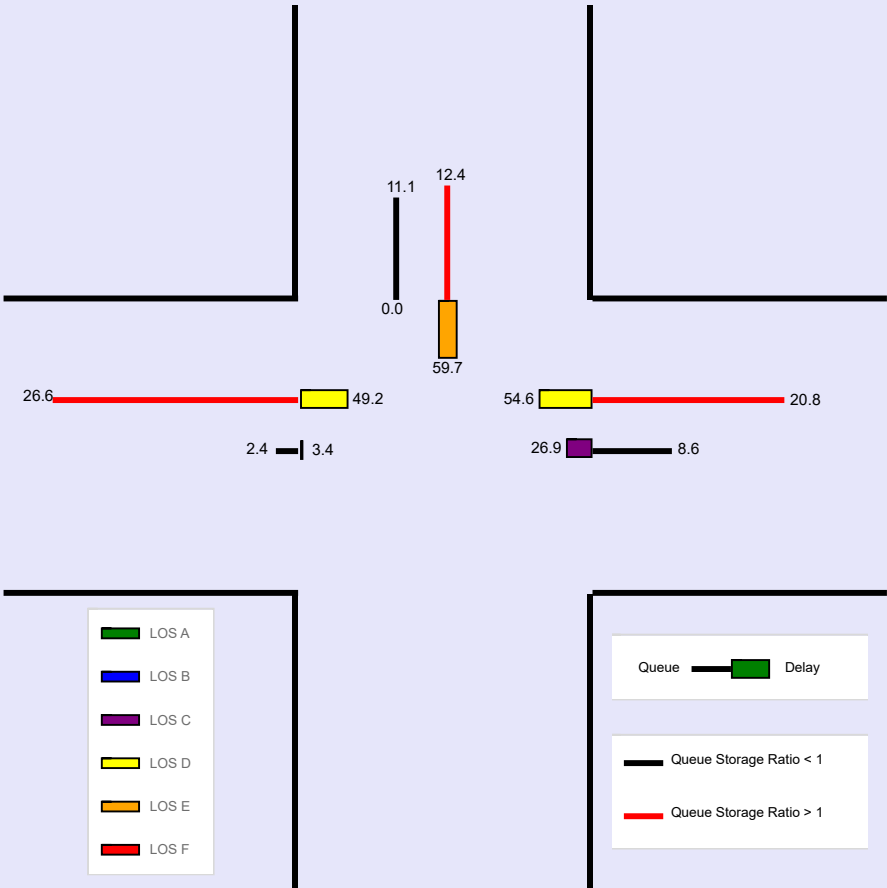
General Information					Intersection Information	
Agency	GPD Group			Duration, h	0.250	
Analyst	Ryan Barco	Analysis Date	May 10, 2024		Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour		PHF	0.90
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 4'		Analysis Period	1 > 7:00
Intersection	I-77 NB Ramps	File Name	05.4 2050 AM Build Capacity Analysis Pleasant &...			
Project Description						
I-77 / Pleasant Valley Road						



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	1158	934			467	421				213	0	188

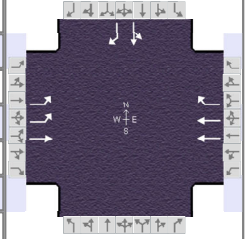
Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On								

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	670	60			224	545					322	
Back of Queue (Q), veh/ln (95 th percentile)	26.6	2.4			8.6	20.8					12.4	
Queue Storage Ratio (RQ) (95 th percentile)	1.34	0.06			0.11	2.18					2.30	
Control Delay (d), s/veh	49.2	3.4			26.9	54.6					59.7	0.0
Level of Service (LOS)	D	A			C	D					E	A
Approach Delay, s/veh / LOS	28.8		C	40.0		D	0.0			31.7		C
Intersection Delay, s/veh / LOS	32.1						C					



HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.96
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 4'	Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	06.4 2050 PM Build Capacity Analysis Pleasant & ...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	373	793			938	587				128	0	496

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	373	793			938	587				128	0	496
Initial Queue (Q_0), veh/h	0	0			0	0				0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900			1900	1900				1900	1900	1900
Parking (N_m), man/h		None			None						None	
Heavy Vehicles (P_{HV}), %	2	2			1	1					6	2
Ped / Bike / RTOR, /h	0	0			0	0		0	0		0	0
Buses (N_b), buses/h	0	0	0		0	0					0	0
Arrival Type (AT)	4	4			4	4					3	3
Upstream Filtering (I)	1.00	1.00			1.00	1.00					1.00	1.00
Lane Width (W), ft	12.0	12.0			12.0	12.0					12.0	12.0
Turn Bay Length, ft	500	1025			1950	250					140	0
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35			35	35					25	25

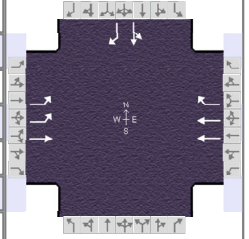
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	32.0	84.0		52.0				36.0
Yellow Change Interval (Y), s	3.6	3.6		3.6				3.0
Red Clearance Interval (R_c), s	1.3	1.3		1.3				2.1
Minimum Green (G_{min}), s	5	10		10				10
Start-Up Lost Time (l_t), s	2.0	2.0		2.0			2.0	2.0
Extension of Effective Green (e), s	2.0	2.0		2.0			2.0	2.0
Passage (PT), s	5.0	2.0		2.0				4.0
Recall Mode	Off	Min		Min				Off
Dual Entry	No	Yes		Yes				Yes
Walk ($Walk$), s				0.0		0.0		0.0
Pedestrian Clearance Time (PC), s				0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius				0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft				9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0		No	0.0	0	No		0		0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0				12.0	5.0	2.0
Pedestrian Signal / Occupied Parking			0.50	No		0.50	No			No		0.50

HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.96
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 4'	Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	06.4 2050 PM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	373	793			938	587				128	0	496

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6				4
Case Number	2.0	4.0		7.3				11.0
Phase Duration, s	22.2	84.0		61.8				36.0
Change Period, ($Y+R_c$), s	4.9	4.9		4.9				5.1
Max Allow Headway (MAH), s	6.1	0.0		0.0				5.5
Queue Clearance Time (g_s), s	14.8							32.9
Green Extension Time (g_e), s	2.5	0.0		0.0				0.0
Phase Call Probability	1.00							1.00
Max Out Probability	0.21							1.00

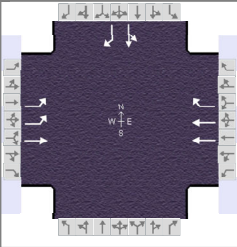
Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16				7	4	14
Adjusted Flow Rate (v), veh/h	389	826			977	611					133	517
Adjusted Saturation Flow Rate (s), veh/h/ln	1730	1870			1795	1598					1725	
Queue Service Time (g_s), s	12.8	15.6			18.9	34.5					7.5	
Cycle Queue Clearance Time (g_c), s	12.8	15.6			18.9	34.5					7.5	
Green Ratio (g/C)	0.14	0.66			0.47	0.47					0.26	
Capacity (c), veh/h	500	1233			1701	757					444	
Volume-to-Capacity Ratio (X)	0.777	0.670			0.574	0.808					0.300	
Back of Queue (Q), ft/ln (95 th percentile)	241	177			272	447					154	
Back of Queue (Q), veh/ln (95 th percentile)	9.5	7.0			10.8	17.7					5.9	
Queue Storage Ratio (RQ) (95 th percentile)	0.48	0.17			0.14	1.79					1.10	
Uniform Delay (d_1), s/veh	46.6	3.4			15.1	18.0					35.8	
Incremental Delay (d_2), s/veh	5.5	2.9			1.4	9.0					0.5	
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0					0.0	
Control Delay (d), s/veh	52.1	6.3			16.5	27.0					36.4	0.0
Level of Service (LOS)	D	A			B	C					D	A
Approach Delay, s/veh / LOS	21.0	C		20.6	C		0.0			7.5	A	
Intersection Delay, s/veh / LOS	18.2						B					

Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

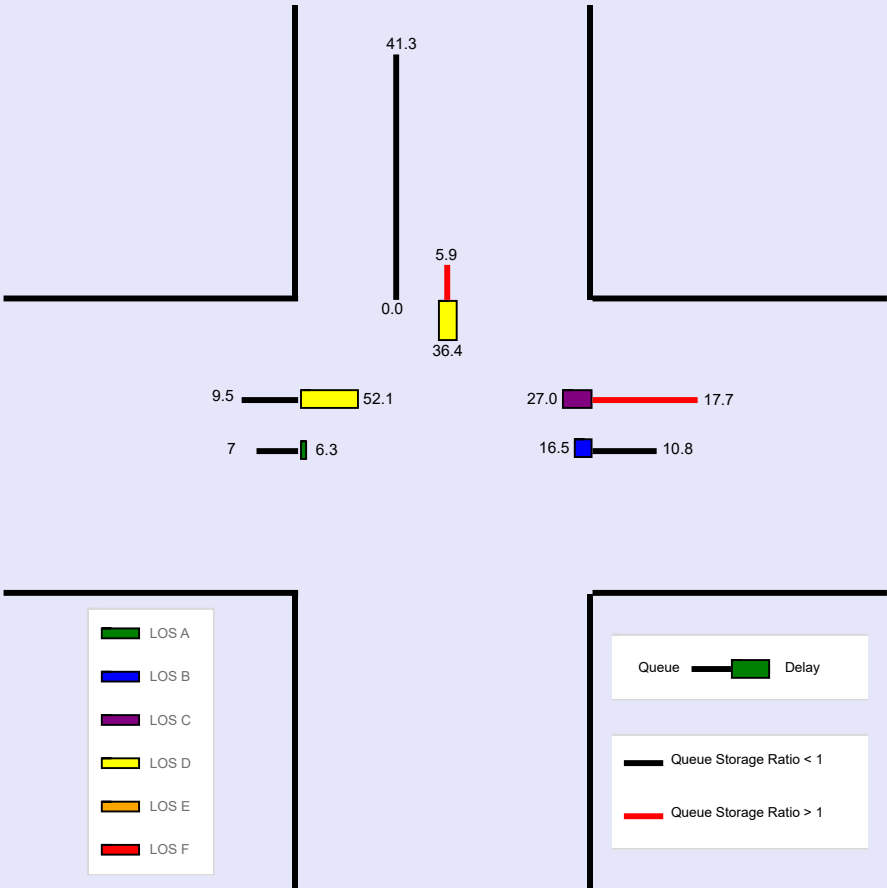
HCS Signalized Intersection Results Graphical Summary

General Information					Intersection Information	
Agency	GPD Group			Duration, h	0.250	
Analyst	Ryan Barco	Analysis Date	May 10, 2024		Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour		PHF	0.96
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 4'		Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	06.4 2050 PM Build Capacity Analysis Pleasant &...			
Project Description						
						

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	373	793			938	587				128	0	496

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End	Green	17.3	56.9	30.9	0.0	0.0	0.0	
Uncoordinated	No	Simult. Gap E/W	On	Yellow	3.6	3.6	3.0	0.0	0.0	0.0	
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.3	1.3	2.1	0.0	0.0	0.0	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	241	177			272	447					154	
Back of Queue (Q), veh/ln (95 th percentile)	9.5	7.0			10.8	17.7					5.9	
Queue Storage Ratio (RQ) (95 th percentile)	0.48	0.17			0.14	1.79					1.10	
Control Delay (d), s/veh	52.1	6.3			16.5	27.0					36.4	0.0
Level of Service (LOS)	D	A			B	C					D	A
Approach Delay, s/veh / LOS	21.0	C		20.6	C		0.0			7.5	A	
Intersection Delay, s/veh / LOS	18.2						B					



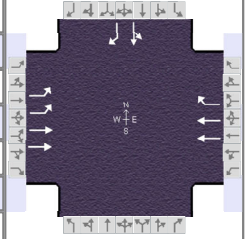
APPENDIX L
'BUILD' ALTERNATE 5' HCS INTERSECTION CAPACITY ANALYSIS

OPENING YEAR 2030

HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.90
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 5'	Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	05.5 2030 AM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				

The diagram illustrates a complex intersection layout. It features a central intersection with multiple lanes and traffic signals. The layout includes a north-south axis and a west-east axis. Traffic flow is indicated by arrows, showing various turning and through movements. Lane widths and configurations are detailed around the perimeter of the intersection. A compass rose in the center indicates the cardinal directions: North (N), South (S), East (E), and West (W).



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	1013	817			409	368				186	0	163

Signal Information												
Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	1013	817			409	368				186	0	163
Initial Queue (Q_0), veh/h	0	0			0	0				0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900			1900	1900				1900	1900	1900
Parking (N_m), man/h		None			None						None	
Heavy Vehicles (P_{HV}), %	1	1			6	6					5	2
Ped / Bike / RTOR, /h	0	0			0	0		0	0		0	0
Buses (N_b), buses/h	0	0	0		0	0					0	0
Arrival Type (AT)	4	4			4	4					3	3
Upstream Filtering (I)	1.00	1.00			1.00	1.00					1.00	1.00
Lane Width (W), ft	12.0	12.0			12.0	12.0					12.0	12.0
Turn Bay Length, ft	500	875			1950	250					140	0
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35			35	35					25	25

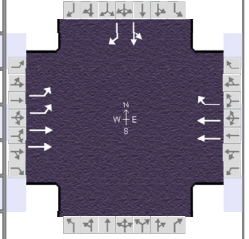
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	42.0	87.0		45.0				33.0
Yellow Change Interval (Y), s	3.6	3.6		3.6				3.0
Red Clearance Interval (R_c), s	1.3	1.3		1.3				2.1
Minimum Green (G_{min}), s	5	10		10				10
Start-Up Lost Time (lt), s	2.0	2.0		2.0			2.0	2.0
Extension of Effective Green (e), s	2.0	2.0		2.0			2.0	2.0
Passage (PT), s	5.0	2.0		2.0				4.0
Recall Mode	Off	Min		Min				Off
Dual Entry	No	Yes		Yes				Yes
Walk ($Walk$), s				0.0		0.0		0.0
Pedestrian Clearance Time (PC), s				0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius				0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft				9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0		No	0.0	0	No		0		0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0				12.0	5.0	2.0
Pedestrian Signal / Occupied Parking			0.50	No		0.50	No			No		0.50

HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.90
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 5'	Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	05.5 2030 AM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	1013	817			409	368				186	0	163

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6				4
Case Number	2.0	4.0		7.3				11.0
Phase Duration, s	48.6	97.3		48.7				22.7
Change Period, ($Y+R_c$), s	4.9	4.9		4.9				5.1
Max Allow Headway (MAH), s	6.1	0.0		0.0				5.4
Queue Clearance Time (g_s), s	37.0							15.8
Green Extension Time (g_e), s	6.7	0.0		0.0				1.8
Phase Call Probability	1.00							1.00
Max Out Probability	0.77							0.13

Movement Group Results

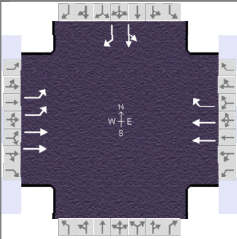
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16				7	4	14
Adjusted Flow Rate (v), veh/h	1126	908			454	409					207	181
Adjusted Saturation Flow Rate (s), veh/h/ln	1743	1795			1724	1535					1739	
Queue Service Time (g_s), s	35.0	0.0			9.8	25.4					13.8	
Cycle Queue Clearance Time (g_c), s	35.0	0.0			9.8	25.4					13.8	
Green Ratio (g/C)	0.36	0.77			0.37	0.37					0.15	
Capacity (c), veh/h	1269	2763			1259	560					255	
Volume-to-Capacity Ratio (X)	0.887	0.329			0.361	0.730					0.809	
Back of Queue (Q), ft/ln (95 th percentile)	514	6			182	380					283	
Back of Queue (Q), veh/ln (95 th percentile)	20.4	0.2			6.9	14.5					10.9	
Queue Storage Ratio (RQ) (95 th percentile)	1.03	0.01			0.09	1.52					2.02	
Uniform Delay (d_1), s/veh	28.7	0.0			22.1	26.1					49.6	
Incremental Delay (d_2), s/veh	7.8	0.3			0.8	8.1					8.8	
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0					0.0	
Control Delay (d), s/veh	36.4	0.3			22.9	34.2					58.3	0.0
Level of Service (LOS)	D	A			C	C					E	A
Approach Delay, s/veh / LOS	20.3	C		28.3	C		0.0			31.1	C	
Intersection Delay, s/veh / LOS	23.7						C					

Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

HCS Signalized Intersection Results Graphical Summary

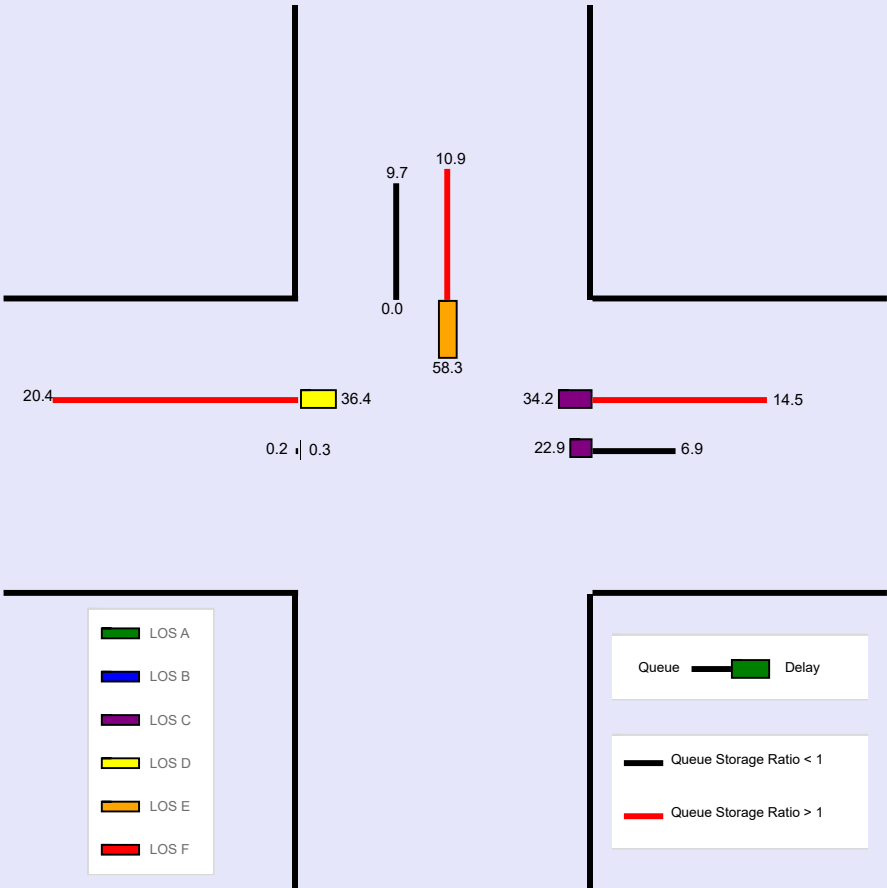
General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.90
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 5'	Analysis Period	1 > 7:00
Intersection	I-77 NB Ramps	File Name	05.5 2030 AM Build Capacity Analysis Pleasant & ...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	1013	817			409	368				186	0	163

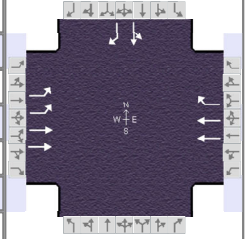
Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On								

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	514	6			182	380					283	
Back of Queue (Q), veh/ln (95 th percentile)	20.4	0.2			6.9	14.5					10.9	
Queue Storage Ratio (RQ) (95 th percentile)	1.03	0.01			0.09	1.52					2.02	
Control Delay (d), s/veh	36.4	0.3			22.9	34.2					58.3	0.0
Level of Service (LOS)	D	A			C	C					E	A
Approach Delay, s/veh / LOS	20.3		C	28.3		C	0.0			31.1		C
Intersection Delay, s/veh / LOS	23.7						C					



HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.96
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 5'	Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	06.5 2030 PM Build Capacity Analysis Pleasant & ...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	326	694			820	513				112	0	433

Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On								

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	326	694			820	513				112	0	433
Initial Queue (Q_0), veh/h	0	0			0	0				0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900			1900	1900				1900	1900	1900
Parking (N_m), man/h		None			None						None	
Heavy Vehicles (P_{HV}), %	2	2			1	1					6	2
Ped / Bike / RTOR, /h	0	0			0	0	0	0			0	0
Buses (N_b), buses/h	0	0	0		0	0					0	0
Arrival Type (AT)	4	4			4	4					3	3
Upstream Filtering (I)	1.00	1.00			1.00	1.00					1.00	1.00
Lane Width (W), ft	12.0	12.0			12.0	12.0					12.0	12.0
Turn Bay Length, ft	500	875			1950	250					140	0
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35			35	35					25	25

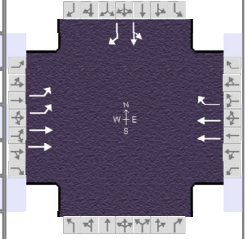
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	32.0	84.0		52.0				36.0
Yellow Change Interval (Y), s	3.6	3.6		3.6				3.0
Red Clearance Interval (R_c), s	1.3	1.3		1.3				2.1
Minimum Green (G_{min}), s	5	10		10				10
Start-Up Lost Time (l_t), s	2.0	2.0		2.0			2.0	2.0
Extension of Effective Green (e), s	2.0	2.0		2.0			2.0	2.0
Passage (PT), s	5.0	2.0		2.0				4.0
Recall Mode	Off	Min		Min				Off
Dual Entry	No	Yes		Yes				Yes
Walk ($Walk$), s				0.0		0.0		0.0
Pedestrian Clearance Time (PC), s				0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius				0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft				9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0		No	0.0	0	No		0		0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0				12.0	5.0	2.0
Pedestrian Signal / Occupied Parking			0.50	No		0.50	No			No		0.50

HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.96
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 5'	Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	06.5 2030 PM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	326	694			820	513				112	0	433

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6				4
Case Number	2.0	4.0		7.3				11.0
Phase Duration, s	20.4	84.0		63.6				36.0
Change Period, ($Y+R_c$), s	4.9	4.9		4.9				5.1
Max Allow Headway (MAH), s	6.1	0.0		0.0				5.4
Queue Clearance Time (g_s), s	13.2							32.9
Green Extension Time (g_e), s	2.3	0.0		0.0				0.0
Phase Call Probability	1.00							1.00
Max Out Probability	0.11							1.00

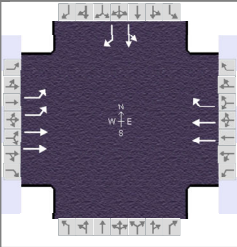
Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R	
Assigned Movement	5	2			6	16				7	4	14	
Adjusted Flow Rate (v), veh/h	340	723			854	534					117	451	
Adjusted Saturation Flow Rate (s), veh/h/ln	1730	1781			1795	1598					1725		
Queue Service Time (g_s), s	11.2	4.0			14.6	25.2					6.5		
Cycle Queue Clearance Time (g_c), s	11.2	4.0			14.6	25.2					6.5		
Green Ratio (g/C)	0.13	0.66			0.49	0.49					0.26		
Capacity (c), veh/h	448	2347			1754	781					444		
Volume-to-Capacity Ratio (X)	0.758	0.308			0.487	0.684					0.263		
Back of Queue (Q), ft/ln (95 th percentile)	219	57			221	326					133		
Back of Queue (Q), veh/ln (95 th percentile)	8.6	2.3			8.8	13.0					5.1		
Queue Storage Ratio (RQ) (95 th percentile)	0.44	0.07			0.11	1.31					0.95		
Uniform Delay (d_1), s/veh	47.8	2.7			13.2	15.1					35.5		
Incremental Delay (d_2), s/veh	5.5	0.3			1.0	4.8					0.4		
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0					0.0		
Control Delay (d), s/veh	53.4	3.1			14.2	19.9					35.9	0.0	
Level of Service (LOS)	D	A			B	B					D	A	
Approach Delay, s/veh / LOS	19.1		B		16.4		B		0.0		7.4		A
Intersection Delay, s/veh / LOS	15.7						B						

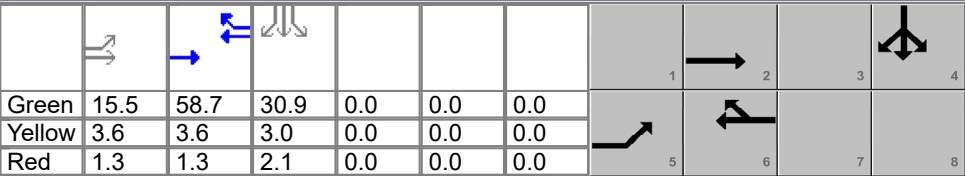
Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

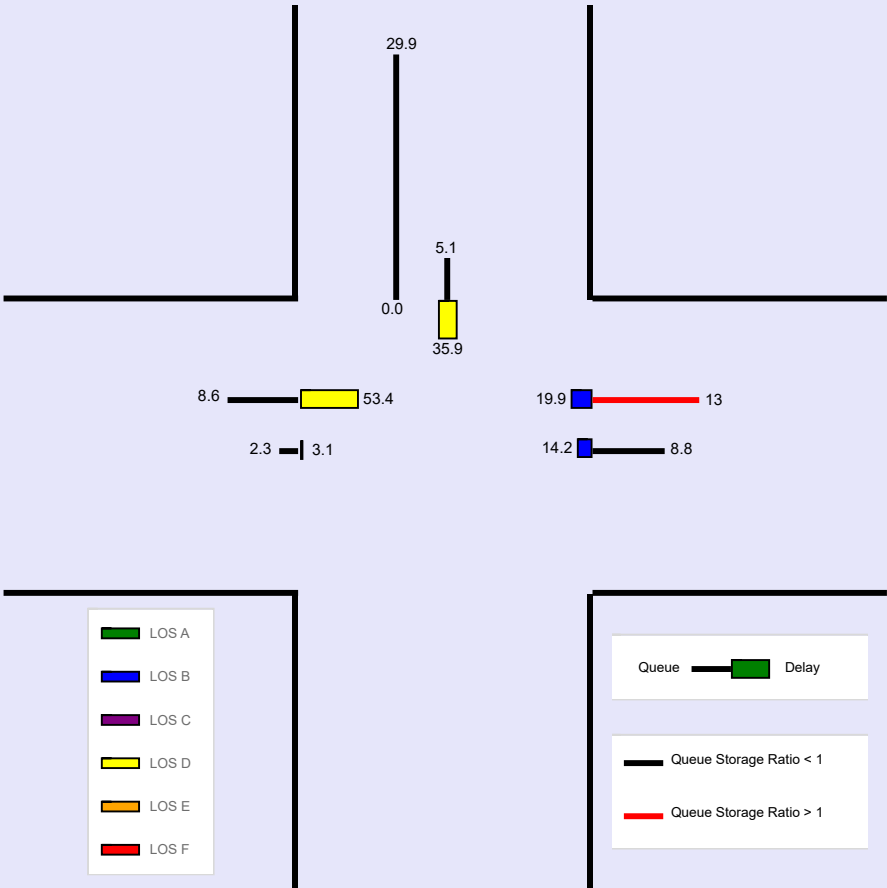
HCS Signalized Intersection Results Graphical Summary

General Information					Intersection Information	
Agency	GPD Group				Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024		Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour		PHF	0.96
Urban Street	Pleasant Valley Road	Analysis Year	2030 'Build Alt. 5'		Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	06.5 2030 PM Build Capacity Analysis Pleasant &...			
Project Description						

Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	326	694			820	513				112	0	433

Signal Information												
Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End	Green	15.5	58.7	30.9	0.0	0.0	0.0		
Uncoordinated	No	Simult. Gap E/W	On	Yellow	3.6	3.6	3.0	0.0	0.0	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Red	1.3	1.3	2.1	0.0	0.0	0.0		

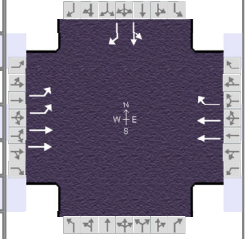
Movement Group Results	EB			WB			NB			SB			
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R	
Back of Queue (Q), ft/ln (95 th percentile)	219	57			221	326					133		
Back of Queue (Q), veh/ln (95 th percentile)	8.6	2.3			8.8	13.0					5.1		
Queue Storage Ratio (RQ) (95 th percentile)	0.44	0.07			0.11	1.31					0.95		
Control Delay (d), s/veh	53.4	3.1			14.2	19.9					35.9	0.0	
Level of Service (LOS)	D	A			B	B					D	A	
Approach Delay, s/veh / LOS	19.1		B		16.4		B		0.0		7.4		A
Intersection Delay, s/veh / LOS	15.7						B						



DESIGN YEAR 2050

HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.90
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 5'	Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	05.5 2050 AM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	1158	934			467	421				213	0	188

Signal Information												
Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	1158	934			467	421				213	0	188
Initial Queue (Q_0), veh/h	0	0			0	0				0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900			1900	1900				1900	1900	1900
Parking (N_m), man/h		None			None						None	
Heavy Vehicles (P_{HV}), %	1	1			6	6					5	2
Ped / Bike / RTOR, /h	0	0			0	0	0	0		0	0	0
Buses (N_b), buses/h	0	0	0		0	0				0	0	0
Arrival Type (AT)	4	4			4	4				3	3	3
Upstream Filtering (I)	1.00	1.00			1.00	1.00				1.00	1.00	1.00
Lane Width (W), ft	12.0	12.0			12.0	12.0				12.0	12.0	
Turn Bay Length, ft	500	875			1950	250				140	0	
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35			35	35				25	25	25

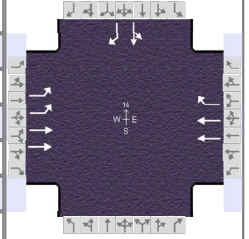
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	42.0	87.0		45.0				33.0
Yellow Change Interval (Y), s	3.6	3.6		3.6				3.0
Red Clearance Interval (R_c), s	1.3	1.3		1.3				2.1
Minimum Green (G_{min}), s	5	10		10				10
Start-Up Lost Time (l_t), s	2.0	2.0		2.0			2.0	2.0
Extension of Effective Green (e), s	2.0	2.0		2.0			2.0	2.0
Passage (PT), s	5.0	2.0		2.0				4.0
Recall Mode	Off	Min		Min				Off
Dual Entry	No	Yes		Yes				Yes
Walk ($Walk$), s				0.0		0.0		0.0
Pedestrian Clearance Time (PC), s				0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius				0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft				9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0		No	0.0	0	No		0		0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0				12.0	5.0	2.0
Pedestrian Signal / Occupied Parking			0.50	No		0.50	No			No		0.50

HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.90
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 5'	Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	05.5 2050 AM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	1158	934			467	421				213	0	188

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6				4
Case Number	2.0	4.0		7.3				11.0
Phase Duration, s	50.2	95.2		45.0				24.8
Change Period, ($Y+R_c$), s	4.9	4.9		4.9				5.1
Max Allow Headway (MAH), s	6.1	0.0		0.0				5.4
Queue Clearance Time (g_s), s	45.3							17.8
Green Extension Time (g_e), s	0.0	0.0		0.0				1.9
Phase Call Probability	1.00							1.00
Max Out Probability	1.00							0.27

Movement Group Results

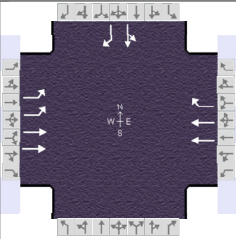
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2			6	16				7	4	14
Adjusted Flow Rate (v), veh/h	1287	1038			519	468					237	209
Adjusted Saturation Flow Rate (s), veh/h/ln	1743	1795			1724	1535					1739	
Queue Service Time (g_s), s	43.3	0.0			12.5	34.2					15.8	
Cycle Queue Clearance Time (g_c), s	43.3	0.0			12.5	34.2					15.8	
Green Ratio (g/C)	0.38	0.75			0.33	0.33					0.16	
Capacity (c), veh/h	1315	2700			1152	513					286	
Volume-to-Capacity Ratio (X)	0.978	0.384			0.450	0.912					0.828	
Back of Queue (Q), ft/ln (95 th percentile)	670	7			224	545					322	
Back of Queue (Q), veh/ln (95 th percentile)	26.6	0.3			8.6	20.8					12.4	
Queue Storage Ratio (RQ) (95 th percentile)	1.34	0.01			0.11	2.18					2.30	
Uniform Delay (d_1), s/veh	29.3	0.0			25.6	31.6					48.5	
Incremental Delay (d_2), s/veh	19.9	0.4			1.3	23.0					11.2	
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0					0.0	
Control Delay (d), s/veh	49.2	0.4			26.9	54.6					59.7	0.0
Level of Service (LOS)	D	A			C	D					E	A
Approach Delay, s/veh / LOS	27.4	C		40.0	D		0.0			31.7	C	
Intersection Delay, s/veh / LOS	31.3						C					

Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

HCS Signalized Intersection Results Graphical Summary

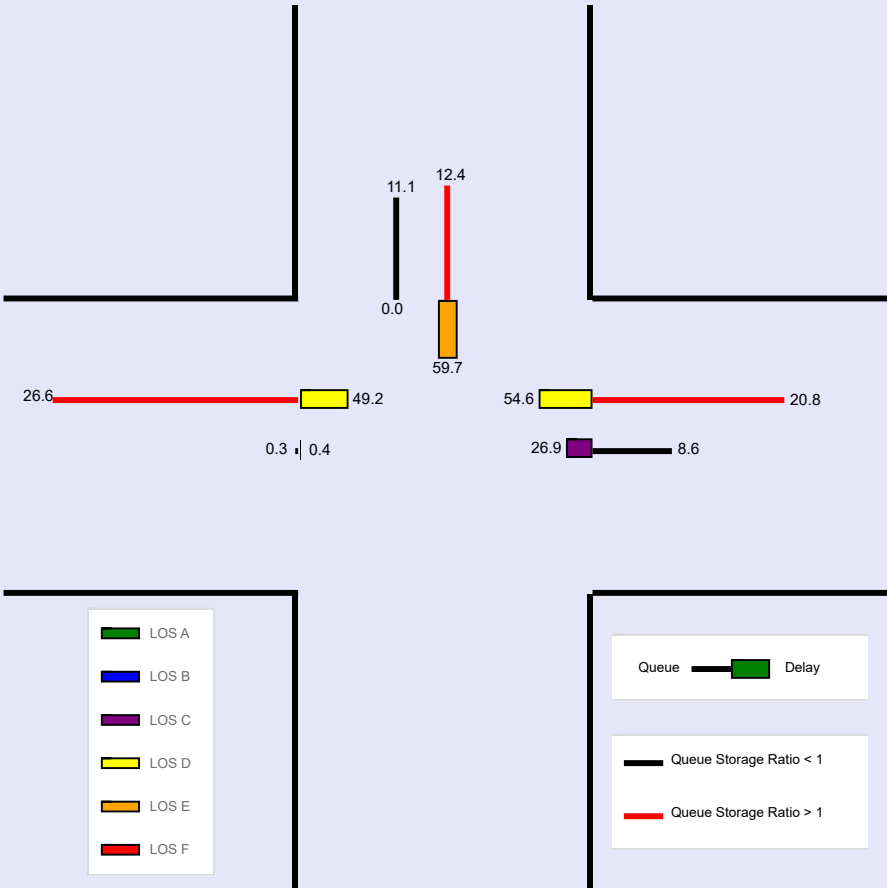
General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	AM Peak Hour	PHF	0.90
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 5'	Analysis Period	1 > 7:00
Intersection	I-77 NB Ramps	File Name	05.5 2050 AM Build Capacity Analysis Pleasant & ...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	1158	934			467	421				213	0	188

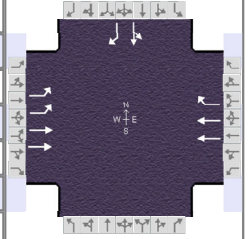
Signal Information											
Cycle, s	120.0	Reference Phase	2								
Offset, s	0	Reference Point	End								
Uncoordinated	No	Simult. Gap E/W	On								
Force Mode	Fixed	Simult. Gap N/S	On								

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	670	7			224	545					322	
Back of Queue (Q), veh/ln (95 th percentile)	26.6	0.3			8.6	20.8					12.4	
Queue Storage Ratio (RQ) (95 th percentile)	1.34	0.01			0.11	2.18					2.30	
Control Delay (d), s/veh	49.2	0.4			26.9	54.6					59.7	0.0
Level of Service (LOS)	D	A			C	D					E	A
Approach Delay, s/veh / LOS	27.4		C	40.0		D	0.0			31.7		C
Intersection Delay, s/veh / LOS	31.3						C					



HCS Signalized Intersection Input Data

General Information				Intersection Information	
Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.96
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 5'	Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	06.5 2050 PM Build Capacity Analysis Pleasant & ...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	373	793			938	587				128	0	496

Signal Information												
Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									

Traffic Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	373	793			938	587				128	0	496
Initial Queue (Q_0), veh/h	0	0			0	0				0	0	0
Base Saturation Flow Rate (s_0), veh/h	1900	1900			1900	1900				1900	1900	1900
Parking (N_m), man/h		None			None						None	
Heavy Vehicles (P_{HV}), %	2	2			1	1					6	2
Ped / Bike / RTOR, /h	0	0			0	0		0	0		0	0
Buses (N_b), buses/h	0	0	0		0	0					0	0
Arrival Type (AT)	4	4			4	4					3	3
Upstream Filtering (I)	1.00	1.00			1.00	1.00					1.00	1.00
Lane Width (W), ft	12.0	12.0			12.0	12.0					12.0	12.0
Turn Bay Length, ft	500	875			1950	250					140	0
Grade (P_g), %		0			0			0			0	
Speed Limit, mi/h	35	35			35	35					25	25

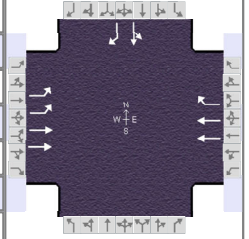
Phase Information	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Maximum Green (G_{max}) or Phase Split, s	32.0	84.0		52.0				36.0
Yellow Change Interval (Y), s	3.6	3.6		3.6				3.0
Red Clearance Interval (R_c), s	1.3	1.3		1.3				2.1
Minimum Green (G_{min}), s	5	10		10				10
Start-Up Lost Time (l_t), s	2.0	2.0		2.0			2.0	2.0
Extension of Effective Green (e), s	2.0	2.0		2.0			2.0	2.0
Passage (PT), s	5.0	2.0		2.0				4.0
Recall Mode	Off	Min		Min				Off
Dual Entry	No	Yes		Yes				Yes
Walk ($Walk$), s				0.0		0.0		0.0
Pedestrian Clearance Time (PC), s				0.0		0.0		0.0

Multimodal Information	EB			WB			NB			SB		
85th % Speed / Rest in Walk / Corner Radius				0.0	No	25.0	0.0	No	25.0	0.0	No	25.0
Walkway / Crosswalk Width / Length, ft				9.0	12.0	0.0	9.0	12.0	0.0	9.0	12.0	0.0
Street Width / Island / Curb, ft	0.0		No	0.0	0	No		0		0.0	0	No
Width Outside / Bike Lane / Shoulder, ft	12.0	5.0	2.0	12.0	5.0	2.0				12.0	5.0	2.0
Pedestrian Signal / Occupied Parking			0.50	No		0.50	No			No		0.50

HCS Signalized Intersection Results Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.96
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 5'	Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	06.5 2050 PM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	373	793			938	587				128	0	496

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6				4
Case Number	2.0	4.0		7.3				11.0
Phase Duration, s	22.2	84.0		61.8				36.0
Change Period, ($Y+R_c$), s	4.9	4.9		4.9				5.1
Max Allow Headway (MAH), s	6.1	0.0		0.0				5.5
Queue Clearance Time (g_s), s	14.8							32.9
Green Extension Time (g_e), s	2.5	0.0		0.0				0.0
Phase Call Probability	1.00							1.00
Max Out Probability	0.21							1.00

Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R	
Assigned Movement	5	2			6	16				7	4	14	
Adjusted Flow Rate (v), veh/h	389	826			977	611					133	517	
Adjusted Saturation Flow Rate (s), veh/h/ln	1730	1781			1795	1598					1725		
Queue Service Time (g_s), s	12.8	4.9			18.9	34.5					7.5		
Cycle Queue Clearance Time (g_c), s	12.8	4.9			18.9	34.5					7.5		
Green Ratio (g/C)	0.14	0.66			0.47	0.47					0.26		
Capacity (c), veh/h	500	2347			1701	757					444		
Volume-to-Capacity Ratio (X)	0.777	0.352			0.574	0.808					0.300		
Back of Queue (Q), ft/ln (95 th percentile)	241	66			272	447					154		
Back of Queue (Q), veh/ln (95 th percentile)	9.5	2.6			10.8	17.7					5.9		
Queue Storage Ratio (RQ) (95 th percentile)	0.48	0.08			0.14	1.79					1.10		
Uniform Delay (d_1), s/veh	46.6	2.8			15.1	18.0					35.8		
Incremental Delay (d_2), s/veh	5.5	0.4			1.4	9.0					0.5		
Initial Queue Delay (d_3), s/veh	0.0	0.0			0.0	0.0					0.0		
Control Delay (d), s/veh	52.1	3.2			16.5	27.0					36.4	0.0	
Level of Service (LOS)	D	A			B	C					D	A	
Approach Delay, s/veh / LOS	18.8		B		20.6		C		0.0		7.5		A
Intersection Delay, s/veh / LOS	17.5						B						

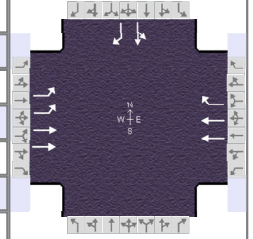
Multimodal Results

	EB	WB	NB	SB
Pedestrian LOS Score / LOS				
Bicycle LOS Score / LOS				

HCS Signalized Intersection Results Graphical Summary

General Information

Agency	GPD Group			Duration, h	0.250
Analyst	Ryan Barco	Analysis Date	May 10, 2024	Area Type	Other
Jurisdiction	City of Independence	Time Period	PM Peak Hour	PHF	0.96
Urban Street	Pleasant Valley Road	Analysis Year	2050 'Build Alt. 5'	Analysis Period	1> 7:00
Intersection	I-77 NB Ramps	File Name	06.5 2050 PM Build Capacity Analysis Pleasant &...		
Project Description	I-77 / Pleasant Valley Road				



Demand Information

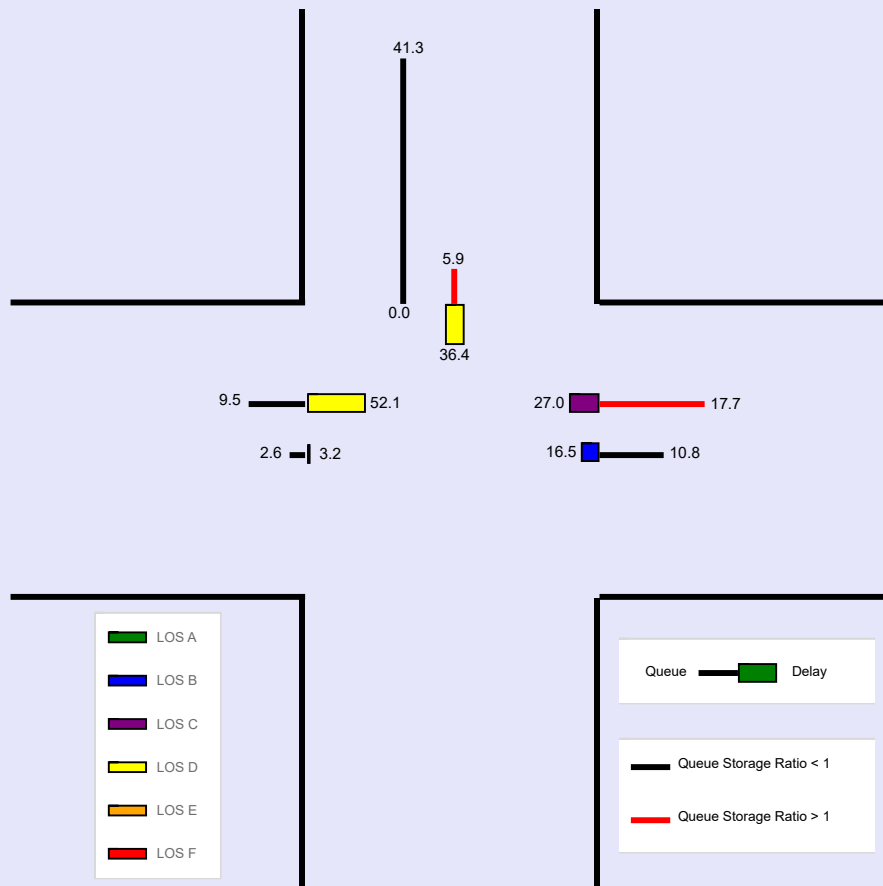
	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	373	793			938	587				128	0	496

Signal Information

Cycle, s	120.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									

Movement Group Results

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Back of Queue (Q), ft/ln (95 th percentile)	241	66			272	447					154	
Back of Queue (Q), veh/ln (95 th percentile)	9.5	2.6			10.8	17.7					5.9	
Queue Storage Ratio (RQ) (95 th percentile)	0.48	0.08			0.14	1.79					1.10	
Control Delay (d), s/veh	52.1	3.2			16.5	27.0					36.4	0.0
Level of Service (LOS)	D	A			B	C					D	A
Approach Delay, s/veh / LOS	18.8		B		20.6	C			0.0		7.5	A
Intersection Delay, s/veh / LOS	17.5						B					



APPENDIX M
'NO-BUILD' HCS FREEWAY CAPACITY ANALYSIS

OPENING YEAR 2030

HCS Freeway Facilities Report

Project Information

Analyst	Ryan Barco	Date	6/24/2024
Agency	GPD Group	Analysis Year	2030 'No-Build'
Jurisdiction	City of Independence	Time Analyzed	AM Peak Hour
Facility Name	I-77 NB	Units	U.S. Customary
Project Description	I-77 / Pleasant Valley Road		

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45
Queue Discharge Capacity Drop, %	7	Total Segments	5
Total Analysis Periods	1	Analysis Period Duration, min	15
Facility Length, mi	2.59		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	NB I-77 South of Pleasant Valley	1700	3
2	Diverge	Diverge	NB I-77 Pleasant Valley Off Ramp	1500	3
3	Basic	Basic	NB I-77 @ Pleasant Valley	1450	3
4	Merge	Basic	NB I-77 Pleasant Valley On Ramp	1500	4
5	Basic	Basic	NB I-77 North of Pleasant Valley	7500	4

Facility Segment Data

Segment 1: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	6733	6981	0.96	53.8	41.7	E

Segment 2: Diverge

AP	PHF		fHV		Volume Served (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.943	0.971	6733	382	6900	2000	0.98	0.19	56.4	53.1	39.8	32.9	D

Segment 3: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	6339	6981	0.91	56.6	37.3	E

Segment 4: Merge

AP	PHF		fHV		Volume Served (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.943	0.980	7838	1499	9308	2000	0.84	0.75	59.3	59.3	33.0	33.0	D

Segment 5: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	7897	9308	0.85	59.0	33.5	D

Facility Analysis Results

AP	VMT veh-mi/AP	VMT-Demand veh-mi/AP	VHD veh-h/AP	Total Delay Cost \$/AP	Speed mi/h	Density pc/mi/ln	Density veh/mi/ln	TT min	LOS
1	4542	4273	5.98	149.55	57.9	35.2	33.2	2.70	E
Facility Overall Results									
Space Mean Speed, mi/h			57.9		Average Density, veh/mi/ln		33.2		
Average Travel Time, min			2.70		Average Density, pc/mi/ln		35.2		
Total VMT, veh-mi/AP			4542		Total VHD, veh-h		5.98		
Vehicle Value of Time (VOT), \$/h			25.00		Total Delay Cost, \$		149.55		

HCS Freeway Facilities Report

Project Information

Analyst	Ryan Barco	Date	6/24/2024
Agency	GPD Group	Analysis Year	2030 'No-Build'
Jurisdiction	City of Independence	Time Analyzed	PM Peak Hour
Facility Name		Units	U.S. Customary
Project Description	I-77 / Pleasant Valley Road		

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45
Queue Discharge Capacity Drop, %	7	Total Segments	5
Total Analysis Periods	1	Analysis Period Duration, min	15
Facility Length, mi	2.59		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	NB I-77 South of Pleasant Valley	1700	3
2	Diverge	Diverge	NB I-77 Pleasant Valley Off Ramp	1500	3
3	Basic	Basic	NB I-77 @ Pleasant Valley	1450	3
4	Merge	Basic	NB I-77 Pleasant Valley On Ramp	1500	4
5	Basic	Basic	NB I-77 North of Pleasant Valley	7500	4

Facility Segment Data

Segment 1: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	4394	6981	0.63	62.7	23.4	C

Segment 2: Diverge

AP	PHF		fHV		Volume Served (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.943	0.971	4394	597	6900	2000	0.64	0.30	56.7	52.7	25.8	23.7	C

Segment 3: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	3779	6981	0.54	62.1	20.1	C

Segment 4: Merge

AP	PHF		fHV		Volume Served (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.943	0.980	4690	911	9308	2000	0.50	0.46	62.6	62.7	18.7	18.7	C

Segment 5: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	4726	9308	0.51	62.7	18.9	C

Facility Analysis Results

AP	VMT veh-mi/AP	VMT-Demand veh-mi/AP	VHD veh-h/AP	Total Delay Cost \$/AP	Speed mi/h	Density pc/mi/ln	Density veh/mi/ln	TT min	LOS
1	2769	2605	0.54	13.38	62.0	20.1	18.9	2.50	C
Facility Overall Results									
Space Mean Speed, mi/h			62.0		Average Density, veh/mi/ln		18.9		
Average Travel Time, min			2.50		Average Density, pc/mi/ln		20.1		
Total VMT, veh-mi/AP			2769		Total VHD, veh-h		0.54		
Vehicle Value of Time (VOT), \$/h			25.00		Total Delay Cost, \$		13.38		

HCS Freeway Facilities Report

Project Information

Analyst	Ryan Barco	Date	6/24/2024
Agency	GPD Group	Analysis Year	2030 'No-Build'
Jurisdiction	City of Independence	Time Analyzed	AM Peak Hour
Facility Name	I-77 SB	Units	U.S. Customary
Project Description	I-77 / Pleasant Valley Road		

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45
Queue Discharge Capacity Drop, %	7	Total Segments	5
Total Analysis Periods	1	Analysis Period Duration, min	15
Facility Length, mi	2.77		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	SB I-77 North of Pleasant Valley	8650	4
2	Diverge	Basic	SB I-77 Pleasant Valley Off Ramp	1500	4
3	Basic	Basic	SB I-77 @ Pleasant Valley	1750	3
4	Merge	Merge	SB I-77 Pleasant Valley On Ramp	1500	3
5	Basic	Basic	SB I-77 South of Pleasant Valley	1200	3

Facility Segment Data

Segment 1: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	4247	9308	0.46	62.7	16.9	B

Segment 2: Diverge

AP	PHF		fHV		Volume Served (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.943	0.971	4247	703	9308	2000	0.46	0.35	62.7	62.7	16.9	16.9	B

Segment 3: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	3523	6981	0.50	62.7	18.7	C

Segment 4: Merge

AP	PHF		fHV		Volume Served (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.943	0.980	4145	622	6900	2000	0.60	0.31	57.4	56.4	24.1	19.8	B

Segment 5: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	4170	6981	0.60	62.1	22.2	C

Facility Analysis Results

AP	VMT veh-mi/AP	VMT-Demand veh-mi/AP	VHD veh-h/AP	Total Delay Cost \$/AP	Speed mi/h	Density pc/mi/ln	Density veh/mi/ln	TT min	LOS
1	2701	2541	0.44	11.07	62.1	18.0	17.0	2.70	C
Facility Overall Results									
Space Mean Speed, mi/h			62.1		Average Density, veh/mi/ln		17.0		
Average Travel Time, min			2.70		Average Density, pc/mi/ln		18.0		
Total VMT, veh-mi/AP			2701		Total VHD, veh-h		0.44		
Vehicle Value of Time (VOT), \$/h			25.00		Total Delay Cost, \$		11.07		

HCS Freeway Facilities Report

Project Information

Analyst	Ryan Barco	Date	6/24/2024
Agency	GPD Group	Analysis Year	2030 'No-Build'
Jurisdiction	City of Independence	Time Analyzed	PM Peak Hour
Facility Name	I-77 SB	Units	U.S. Customary
Project Description	I-77 / Pleasant Valley Road		

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45
Queue Discharge Capacity Drop, %	7	Total Segments	5
Total Analysis Periods	1	Analysis Period Duration, min	15
Facility Length, mi	2.77		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	SB I-77 North of Pleasant Valley	8650	4
2	Diverge	Basic	SB I-77 Pleasant Valley Off Ramp	1500	4
3	Basic	Basic	SB I-77 @ Pleasant Valley	1750	3
4	Merge	Merge	SB I-77 Pleasant Valley On Ramp	1500	3
5	Basic	Basic	SB I-77 South of Pleasant Valley	1200	3

Facility Segment Data

Segment 1: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	7214	9308	0.78	61.2	29.5	D

Segment 2: Diverge

AP	PHF		fHV		Volume Served (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.943	0.971	7214	1421	9308	2000	0.78	0.71	61.2	61.2	29.5	29.5	D

Segment 3: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	5751	6981	0.82	59.9	32.0	D

Segment 4: Merge

AP	PHF		fHV		Volume Served (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.943	0.980	6235	484	6900	2000	0.90	0.24	54.4	53.3	38.2	29.4	D

Segment 5: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	6254	6981	0.90	57.2	36.5	E

Facility Analysis Results

AP	VMT veh-mi/AP	VMT-Demand veh-mi/AP	VHD veh-h/AP	Total Delay Cost \$/AP	Speed mi/h	Density pc/mi/ln	Density veh/mi/ln	TT min	LOS
1	4472	4205	3.14	78.58	60.1	30.9	29.2	2.80	D
Facility Overall Results									
Space Mean Speed, mi/h			60.1		Average Density, veh/mi/ln		29.2		
Average Travel Time, min			2.80		Average Density, pc/mi/ln		30.9		
Total VMT, veh-mi/AP			4472		Total VHD, veh-h		3.14		
Vehicle Value of Time (VOT), \$/h			25.00		Total Delay Cost, \$		78.58		

DESIGN YEAR 2050

HCS Freeway Facilities Report

Project Information

Analyst	Ryan Barco	Date	6/24/2024
Agency	GPD Group	Analysis Year	2050 'No-Build'
Jurisdiction	City of Independence	Time Analyzed	AM Peak Hour
Facility Name		Units	U.S. Customary
Project Description	I-77 / Pleasant Valley Road		

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45
Queue Discharge Capacity Drop, %	7	Total Segments	5
Total Analysis Periods	1	Analysis Period Duration, min	15
Facility Length, mi	2.59		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	NB I-77 South of Pleasant Valley	1700	3
2	Diverge	Diverge	NB I-77 Pleasant Valley Off Ramp	1500	3
3	Basic	Basic	NB I-77 @ Pleasant Valley	1450	3
4	Merge	Basic	NB I-77 Pleasant Valley On Ramp	1500	4
5	Basic	Basic	NB I-77 North of Pleasant Valley	7500	4

Facility Segment Data

Segment 1: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	6733	6981	0.96	53.8	41.7	E

Segment 2: Diverge

AP	PHF		fHV		Volume Served (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.943	0.971	6733	439	6900	2000	0.98	0.22	56.3	53.0	39.9	32.9	D

Segment 3: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	6280	6981	0.90	57.0	36.7	E

Segment 4: Merge

AP	PHF		fHV		Volume Served (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.943	0.980	7994	1714	9308	2000	0.86	0.86	58.7	58.7	34.0	34.0	D

Segment 5: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	8062	9308	0.87	58.4	34.5	D

Facility Analysis Results

AP	VMT veh-mi/AP	VMT-Demand veh-mi/AP	VHD veh-h/AP	Total Delay Cost \$/AP	Speed mi/h	Density pc/mi/ln	Density veh/mi/ln	TT min	LOS
1	4603	4332	6.57	164.16	57.6	35.9	33.8	2.70	E
Facility Overall Results									
Space Mean Speed, mi/h			57.6		Average Density, veh/mi/ln		33.8		
Average Travel Time, min			2.70		Average Density, pc/mi/ln		35.9		
Total VMT, veh-mi/AP			4603		Total VHD, veh-h		6.57		
Vehicle Value of Time (VOT), \$/h			25.00		Total Delay Cost, \$		164.16		

HCS Freeway Facilities Report

Project Information

Analyst	Ryan Barco	Date	6/24/2024
Agency	GPD Group	Analysis Year	2050 'No-Build'
Jurisdiction	City of Independence	Time Analyzed	PM Peak Hour
Facility Name		Units	U.S. Customary
Project Description	I-77 / Pleasant Valley Road		

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45
Queue Discharge Capacity Drop, %	7	Total Segments	5
Total Analysis Periods	1	Analysis Period Duration, min	15
Facility Length, mi	2.59		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	NB I-77 South of Pleasant Valley	1700	3
2	Diverge	Diverge	NB I-77 Pleasant Valley Off Ramp	1500	3
3	Basic	Basic	NB I-77 @ Pleasant Valley	1450	3
4	Merge	Basic	NB I-77 Pleasant Valley On Ramp	1500	4
5	Basic	Basic	NB I-77 North of Pleasant Valley	7500	4

Facility Segment Data

Segment 1: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	4394	6981	0.63	62.7	23.4	C

Segment 2: Diverge

AP	PHF		fHV		Volume Served (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.943	0.971	4394	684	6900	2000	0.64	0.34	56.6	52.6	25.9	23.8	C

Segment 3: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	3690	6981	0.53	62.1	19.6	C

Segment 4: Merge

AP	PHF		fHV		Volume Served (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.943	0.980	4732	1042	9308	2000	0.51	0.52	62.6	62.7	18.9	18.9	C

Segment 5: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	4773	9308	0.51	62.7	19.0	C

Facility Analysis Results

AP	VMT veh-mi/AP	VMT-Demand veh-mi/AP	VHD veh-h/AP	Total Delay Cost \$/AP	Speed mi/h	Density pc/mi/ln	Density veh/mi/ln	TT min	LOS
1	2782	2618	0.54	13.61	61.9	20.1	19.0	2.50	C
Facility Overall Results									
Space Mean Speed, mi/h			61.9		Average Density, veh/mi/ln		19.0		
Average Travel Time, min			2.50		Average Density, pc/mi/ln		20.1		
Total VMT, veh-mi/AP			2782		Total VHD, veh-h		0.54		
Vehicle Value of Time (VOT), \$/h			25.00		Total Delay Cost, \$		13.61		

HCS Freeway Facilities Report

Project Information

Analyst	Ryan Barco	Date	6/24/2024
Agency	GPD Group	Analysis Year	2050 'No-Build'
Jurisdiction	City of Independence	Time Analyzed	AM Peak Hour
Facility Name	I-77 SB	Units	U.S. Customary
Project Description	I-77 / Pleasant Valley Road		

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45
Queue Discharge Capacity Drop, %	7	Total Segments	5
Total Analysis Periods	1	Analysis Period Duration, min	15
Facility Length, mi	2.77		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	SB I-77 North of Pleasant Valley	8650	4
2	Diverge	Basic	SB I-77 Pleasant Valley Off Ramp	1500	4
3	Basic	Basic	SB I-77 @ Pleasant Valley	1750	3
4	Merge	Merge	SB I-77 Pleasant Valley On Ramp	1500	3
5	Basic	Basic	SB I-77 North of Pleasant Valley	1200	3

Facility Segment Data

Segment 1: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	4256	9308	0.46	62.7	17.0	B

Segment 2: Diverge

AP	PHF		fHV		Volume Served (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.943	0.971	4256	804	9308	2000	0.46	0.40	62.7	62.7	17.0	17.0	B

Segment 3: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	3428	6981	0.49	62.7	18.2	C

Segment 4: Merge

AP	PHF		fHV		Volume Served (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.943	0.980	4141	713	6900	2000	0.60	0.36	57.4	56.4	24.0	20.0	B

Segment 5: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	4170	6981	0.60	62.1	22.2	C

Facility Analysis Results

AP	VMT veh-mi/AP	VMT-Demand veh-mi/AP	VHD veh-h/AP	Total Delay Cost \$/AP	Speed mi/h	Density pc/mi/ln	Density veh/mi/ln	TT min	LOS
1	2697	2538	0.44	11.06	62.1	18.1	17.0	2.70	C
Facility Overall Results									
Space Mean Speed, mi/h			62.1		Average Density, veh/mi/ln		17.0		
Average Travel Time, min			2.70		Average Density, pc/mi/ln		18.1		
Total VMT, veh-mi/AP			2697		Total VHD, veh-h		0.44		
Vehicle Value of Time (VOT), \$/h			25.00		Total Delay Cost, \$		11.06		

HCS Freeway Facilities Report

Project Information

Analyst	Ryan Barco	Date	6/24/2024
Agency	GPD Group	Analysis Year	2050 'No-Build'
Jurisdiction	City of Independence	Time Analyzed	PM Peak Hour
Facility Name	I-77 SB	Units	U.S. Customary
Project Description	I-77 / Pleasant Valley Road		

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45
Queue Discharge Capacity Drop, %	7	Total Segments	5
Total Analysis Periods	1	Analysis Period Duration, min	15
Facility Length, mi	2.77		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	SB I-77 North of Pleasant Valley	8650	4
2	Diverge	Basic	SB I-77 Pleasant Valley Off Ramp	1500	4
3	Basic	Basic	SB I-77 @ Pleasant Valley	1750	3
4	Merge	Merge	SB I-77 Pleasant Valley On Ramp	1500	3
5	Basic	Basic	SB I-77 South of Pleasant Valley	1200	3

Facility Segment Data

Segment 1: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	7349	9308	0.79	60.8	30.2	D

Segment 2: Diverge

AP	PHF		fHV		Volume Served (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.943	0.971	7349	1623	9308	2000	0.79	0.81	60.8	60.8	30.2	30.2	D

Segment 3: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	5678	6981	0.81	60.2	31.4	D

Segment 4: Merge

AP	PHF		fHV		Volume Served (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.943	0.980	6233	555	6900	2000	0.90	0.28	54.3	53.2	38.3	29.5	D

Segment 5: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	6254	6981	0.90	57.2	36.5	E

Facility Analysis Results

AP	VMT veh-mi/AP	VMT-Demand veh-mi/AP	VHD veh-h/AP	Total Delay Cost \$/AP	Speed mi/h	Density pc/mi/ln	Density veh/mi/ln	TT min	LOS
1	4527	4256	3.50	87.44	59.8	31.4	29.6	2.80	D
Facility Overall Results									
Space Mean Speed, mi/h			59.8		Average Density, veh/mi/ln		29.6		
Average Travel Time, min			2.80		Average Density, pc/mi/ln		31.4		
Total VMT, veh-mi/AP			4527		Total VHD, veh-h		3.50		
Vehicle Value of Time (VOT), \$/h			25.00		Total Delay Cost, \$		87.44		

APPENDIX N
'BUILD' HCS FREEWAY CAPACITY ANALYSIS

OPENING YEAR 2030

HCS Freeway Facilities Report

Project Information

Analyst	Ryan Barco	Date	6/24/2024
Agency	GPD Group	Analysis Year	2030 'Build'
Jurisdiction	City of Independence	Time Analyzed	AM Peak Hour
Facility Name	I-77 SB	Units	U.S. Customary
Project Description	I-77 / Pleasant Valley Road		

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45
Queue Discharge Capacity Drop, %	7	Total Segments	6
Total Analysis Periods	1	Analysis Period Duration, min	15
Facility Length, mi	2.77		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	SB I-77 South of Rockside Road	7750	4
2	Basic	Basic	SB I-77 North of Pleasant Valley	900	5
3	Diverge	Diverge	SB I-77 Pleasant Valley Off Ramp	1500	5
4	Basic	Basic	SB I-77 @ Pleasant Valley	1750	3
5	Merge	Merge	SB I-77 Pleasant Valley On Ramp	1500	3
6	Basic	Basic	SB I-77 South of Pleasant Valley	1200	3

Facility Segment Data

Segment 1: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	1.000	4005	9400	0.43	65.0	15.4	B

Segment 2: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	4247	11635	0.37	62.7	13.5	B

Segment 3: Diverge

AP	PHF		fHV		Volume Served (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.943	0.971	4247	703	11500	4000	0.37	0.18	60.9	52.5	12.6	6.6	A

Segment 4: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	3523	6981	0.50	62.6	18.7	C

Segment 5: Merge

AP	PHF		fHV		Volume Served (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.943	0.980	4145	622	6900	2000	0.60	0.31	57.4	56.4	24.1	19.8	B

Segment 6: Basic									
AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS	
1	0.94	0.943	4170	6981	0.60	62.1	22.2	C	
Facility Analysis Results									
AP	VMT veh-mi/AP	VMT-Demand veh-mi/AP	VHD veh-h/AP	Total Delay Cost \$/AP	Speed mi/h	Density pc/mi/ln	Density veh/mi/ln	TT min	LOS
1	2701	2541	0.59	14.65	63.1	16.3	15.9	2.60	B
Facility Overall Results									
Space Mean Speed, mi/h			63.1		Average Density, veh/mi/ln		15.9		
Average Travel Time, min			2.60		Average Density, pc/mi/ln		16.3		
Total VMT, veh-mi/AP			2701		Total VHD, veh-h		0.59		
Vehicle Value of Time (VOT), \$/h			25.00		Total Delay Cost, \$		14.65		

HCS Freeway Facilities Report

Project Information

Analyst	Ryan Barco	Date	6/24/2024
Agency	GPD Group	Analysis Year	2030 'No-Build'
Jurisdiction	City of Independence	Time Analyzed	PM Peak Hour
Facility Name	I-77 SB	Units	U.S. Customary
Project Description	I-77 / Pleasant Valley Road		

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45
Queue Discharge Capacity Drop, %	7	Total Segments	6
Total Analysis Periods	1	Analysis Period Duration, min	15
Facility Length, mi	2.77		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	SB I-77 South of Rockside Road	7750	4
2	Basic	Basic	NB I-77 South of Pleasant Valley	900	5
3	Diverge	Diverge	NB I-77 Pleasant Valley Off Ramp	1500	5
4	Basic	Basic	NB I-77 @ Pleasant Valley	1750	3
5	Merge	Merge	NB I-77 Pleasant Valley On Ramp	1500	3
6	Basic	Basic	NB I-77 North of Pleasant Valley	1200	3

Facility Segment Data

Segment 1: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	1.000	6803	9400	0.72	63.7	26.7	D

Segment 2: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	7214	11635	0.62	62.7	23.0	C

Segment 3: Diverge

AP	PHF		fHV		Volume Served (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.943	0.971	7214	1421	11500	4000	0.63	0.36	58.7	51.2	19.7	15.4	B

Segment 4: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	5751	6981	0.82	59.9	32.0	D

Segment 5: Merge

AP	PHF		fHV		Volume Served (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.943	0.980	6235	484	6900	2000	0.90	0.24	54.4	53.3	38.2	29.4	D

Segment 6: Basic									
AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS	
1	0.94	0.943	6254	6981	0.90	57.2	36.5	E	
Facility Analysis Results									
AP	VMT veh-mi/AP	VMT-Demand veh-mi/AP	VHD veh-h/AP	Total Delay Cost \$/AP	Speed mi/h	Density pc/mi/ln	Density veh/mi/ln	TT min	LOS
1	4472	4205	3.17	79.35	61.2	27.5	26.8	2.70	D
Facility Overall Results									
Space Mean Speed, mi/h			61.2		Average Density, veh/mi/ln		26.8		
Average Travel Time, min			2.70		Average Density, pc/mi/ln		27.5		
Total VMT, veh-mi/AP			4472		Total VHD, veh-h		3.17		
Vehicle Value of Time (VOT), \$/h			25.00		Total Delay Cost, \$		79.35		

DESIGN YEAR 2050

HCS Freeway Facilities Report

Project Information

Analyst	Ryan Barco	Date	6/24/2024
Agency	GPD Group	Analysis Year	2050 'Build'
Jurisdiction	City of Independence	Time Analyzed	AM Peak Hour
Facility Name	I-77 SB	Units	U.S. Customary
Project Description	I-77 / Pleasant Valley Road		

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45
Queue Discharge Capacity Drop, %	7	Total Segments	6
Total Analysis Periods	1	Analysis Period Duration, min	15
Facility Length, mi	2.77		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	SB I-77 South of Rockside Road	7750	4
2	Basic	Basic	SB I-77 North of Pleasant Valley	900	5
3	Diverge	Diverge	SB I-77 Pleasant Valley Off Ramp	1500	5
4	Basic	Basic	SB I-77 @ Pleasant Valley	1750	3
5	Merge	Merge	SB I-77 Pleasant Valley On Ramp	1500	3
6	Basic	Basic	SB I-77 South of Pleasant Valley	1200	3

Facility Segment Data

Segment 1: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	1.000	4014	9400	0.43	65.0	15.4	B

Segment 2: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	4256	11635	0.37	62.7	13.6	B

Segment 3: Diverge

AP	PHF		fHV		Volume Served (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.943	0.971	4256	804	11500	4000	0.37	0.20	60.7	52.4	12.6	7.1	A

Segment 4: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	3428	6981	0.49	62.6	18.2	C

Segment 5: Merge

AP	PHF		fHV		Volume Served (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.943	0.980	4141	713	6900	2000	0.60	0.36	57.4	56.4	24.0	20.0	B

Segment 6: Basic									
AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS	
1	0.94	0.943	4170	6981	0.60	62.1	22.2	C	
Facility Analysis Results									
AP	VMT veh-mi/AP	VMT-Demand veh-mi/AP	VHD veh-h/AP	Total Delay Cost \$/AP	Speed mi/h	Density pc/mi/ln	Density veh/mi/ln	TT min	LOS
1	2698	2538	0.60	15.05	63.0	16.3	15.8	2.60	B
Facility Overall Results									
Space Mean Speed, mi/h			63.0		Average Density, veh/mi/ln		15.8		
Average Travel Time, min			2.60		Average Density, pc/mi/ln		16.3		
Total VMT, veh-mi/AP			2698		Total VHD, veh-h		0.60		
Vehicle Value of Time (VOT), \$/h			25.00		Total Delay Cost, \$		15.05		

HCS Freeway Facilities Report

Project Information

Analyst	Ryan Barco	Date	6/24/2024
Agency	GPD Group	Analysis Year	2050 'No-Build'
Jurisdiction	City of Independence	Time Analyzed	PM Peak Hour
Facility Name	I-77 SB	Units	U.S. Customary
Project Description	I-77 / Pleasant Valley Road		

Facility Global Input

Jam Density, pc/mi/ln	190.0	Density at Capacity, pc/mi/ln	45
Queue Discharge Capacity Drop, %	7	Total Segments	6
Total Analysis Periods	1	Analysis Period Duration, min	15
Facility Length, mi	2.77		

Facility Segment Data

No.	Coded	Analyzed	Name	Length, ft	Lanes
1	Basic	Basic	SB I-77 South of Rockside Road	7750	4
2	Basic	Basic	NB I-77 South of Pleasant Valley	900	5
3	Diverge	Diverge	NB I-77 Pleasant Valley Off Ramp	1500	5
4	Basic	Basic	NB I-77 @ Pleasant Valley	1750	3
5	Merge	Merge	NB I-77 Pleasant Valley On Ramp	1500	3
6	Basic	Basic	NB I-77 North of Pleasant Valley	1200	3

Facility Segment Data

Segment 1: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	1.000	6930	9400	0.74	63.4	27.3	D

Segment 2: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	7349	11635	0.63	62.7	23.4	C

Segment 3: Diverge

AP	PHF		fHV		Volume Served (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.943	0.971	7349	1623	11500	4000	0.64	0.41	58.2	50.8	20.2	16.9	B

Segment 4: Basic

AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS
1	0.94	0.943	5678	6981	0.81	60.2	31.4	D

Segment 5: Merge

AP	PHF		fHV		Volume Served (pc/h)		Capacity (pc/h)		d/c Ratio		Speed (mi/h)		Density (pc/mi/ln)		LOS
	F	R	F	R	Freeway	Ramp	Freeway	Ramp	F	R	F	R Infl.	F	R Infl.	
1	0.94	0.94	0.943	0.980	6233	555	6900	2000	0.90	0.28	54.3	53.2	38.3	29.5	D

Segment 6: Basic									
AP	PHF	fHV	Volume Served (pc/h)	Capacity (pc/h)	d/c Ratio	Speed (mi/h)	Density (pc/mi/ln)	LOS	
1	0.94	0.943	6254	6981	0.90	57.2	36.5	E	
Facility Analysis Results									
AP	VMT veh-mi/AP	VMT-Demand veh-mi/AP	VHD veh-h/AP	Total Delay Cost \$/AP	Speed mi/h	Density pc/mi/ln	Density veh/mi/ln	TT min	LOS
1	4527	4256	3.43	85.80	61.0	27.9	27.2	2.70	D
Facility Overall Results									
Space Mean Speed, mi/h			61.0		Average Density, veh/mi/ln		27.2		
Average Travel Time, min			2.70		Average Density, pc/mi/ln		27.9		
Total VMT, veh-mi/AP			4527		Total VHD, veh-h		3.43		
Vehicle Value of Time (VOT), \$/h			25.00		Total Delay Cost, \$		85.80		

APPENDIX O
CONCEPTUAL COST ESTIMATES

**I-77 / Pleasant Valley Road
Interchange Study -
Build Alternative 1**

January 2025

ITEM	DESCRIPTION	TOTAL QUANTITY	UNIT	ESTIMATED PRICE	TOTAL COST
	ROADWAY				
201	CLEARING AND GRUBBING	1	LS	\$20,000	\$20,000
202	PAVEMENT REMOVED	4,800	SY	\$14	\$67,200
202	WALK REMOVED	1,300	SF	\$4	\$5,200
202	CURB REMOVED	323	FT	\$6	\$1,938
202	GUARDRAIL REMOVED	2,730	FT	\$4	\$10,920
203	EXCAVATION / EMBANKMENT	10,000	CY	\$12	\$120,000
252	FULL DEPTH PAVEMENT SAWING	3,615	FT	\$2	\$7,230
606	ANCHOR ASSEMBLY, MGS TYPE E	1	EACH	\$2,000	\$2,000
606	ANCHOR ASSEMBLY, MGS TYPE T	1	EACH	\$850	\$850
606	GUARDRAIL, TYPE MGS	4	FT	\$20	\$80
609	4" CONCRETE MEDIAN	710	SY	\$80	\$56,800
659	SEEDING & MULCHING	5,000	SY	\$2	\$10,000
832	EROSION CONTROL	1	LS	\$20,000	\$20,000
832	EROSION CONTROL PLAN	1	LS	\$5,000	\$5,000
	ROADWAY SUBTOTAL:				\$327,218
	DRAINAGE				
202	PIPE REMOVED, 24" AND UNDER	0	FT	\$20	\$0
202	CATCH BASIN REMOVED	2	EACH	\$700	\$1,400
605	UNDERDRAINS	3,830	FT	\$12	\$45,960
611	XX" CONDUIT, TYPE B	20	FT	\$95	\$1,900
611	CATCH BASIN ADJUSTED TO GRADE	0	EACH	\$800	\$0
611	MANHOLE ADJUSTED TO GRADE	2	EACH	\$750	\$1,500
611	CATCH BASIN, NO. 2-2A	0	EACH	\$1,500	\$0
611	CATCH BASIN, NO. 3A	3	EACH	\$2,250	\$6,750
611	MANHOLE, NO. 3	2	EACH	\$3,500	\$7,000
	DRAINAGE SUBTOTAL:				\$64,510
	PAVEMENT				
254	PAVEMENT PLANING, ASPHALT CONCRETE	14,100	SY	\$4	\$56,400
302	ASPHALT CONCRETE BASE, PG64-22	1,590	CY	\$125	\$198,750
304	AGGREGATE BASE	1,590	CY	\$55	\$87,450
407	NON-TRACKING TACK COAT	1,374	GAL	\$4	\$5,496
442	ASPHALT CONCRETE INTERMEDIATE COURSE, 19 MM, TYPE B (446)	470	CY	\$165	\$77,550
806	ASPHALT CONCRETE SURFACE COURSE, 12.5 MM, TYPE A	340	CY	\$185	\$62,900
608	4" CONCRETE WALK	1,300	SF	\$10	\$13,000
609	CURB, TYPE 6	323	FT	\$12	\$3,876
	PAVEMENT SUBTOTAL:				\$505,422
	TRAFFIC CONTROL				
	SIGNING AND STRIPING	1	LS	\$120,000	\$120,000
	TRAFFIC CONTROL SUBTOTAL:				\$120,000
	SIGNALS				
	TRAFFIC SIGNAL RECONSTRUCTION	1	LS	\$350,000	\$350,000
	SIGNALS SUBTOTAL:				\$350,000
	MAINTENANCE OF TRAFFIC				
	MAINTENANCE OF TRAFFIC	1	LS	\$100,000	\$100,000
	MAINTENANCE OF TRAFFIC SUBTOTAL:				\$100,000
	LIGHTING				
	EXIST. LIGHT POLE TO BE REMOVED AND REPLACED	3	EACH	\$1,500	\$4,500
	LIGHTING SUBTOTAL:				\$4,500

**I-77 / Pleasant Valley Road
Interchange Study -
Build Alternative 1**

January 2025

ITEM	DESCRIPTION	TOTAL QUANTITY	UNIT	ESTIMATED PRICE	TOTAL COST
	NOISE WALL				
	NOISE WALL	24300	SF	\$45	\$1,093,500
	NOISE WALL REMOVED	2430	LF	\$10	\$24,300
	NOISE WALL SUBTOTAL:				\$1,117,800
	MISCELLANEOUS				
614	MAINTAINING TRAFFIC	1	LS	\$50,000	\$50,000
619	FIELD OFFICE	7	MON	\$2,500	\$17,500
623	CONSTRUCTION LAYOUT STAKES	1	LS	\$9,000	\$9,000
624	MOBILIZATION	1	LS	\$40,000	\$40,000
SPECIAL	PERFORMANCE BOND	1	LS	\$9,000	\$9,000
	MISCELLANEOUS SUBTOTAL:				\$125,500
	RIGHT OF WAY				
	TEMPORARY R/W TAKE - COMMERCIAL	0	EACH	\$5,000	\$0
	TEMPORARY R/W TAKE - RESIDENTIAL	0	EACH	\$2,000	\$0
	PERMANENT R/W TAKE - MINOR - COMMERCIAL	0	EACH	\$25,000	\$0
	PERMANENT R/W TAKE - MINOR - RESIDENTIAL	1	EACH	\$10,000	\$10,000
	ACQUISITION SERVICES	1	EACH	\$6,500	\$6,500
	APPRAISAL REVIEW SERVICES	1	EACH	\$650	\$650
	RIGHT OF WAY SUBTOTAL:				\$17,150
	STRUCTURES OVER 20' (CUY-77-5960L)				
	STRUCTURE WIDENING (20' WIDE X 215' LONG +/-)	4,300	SF	\$250	\$1,075,000
	ADDITIONAL STRUCTURE WORK	0	LS	\$0	\$0
	STRUCTURES OVER 20' SUBTOTAL:				\$1,075,000
	TOTAL CONSTRUCTION AND RIGHT OF WAY COST:				\$3,807,100
	DESIGN ENGINEERING COST:	(15% OF CONSTR. & R/W COST)			\$572,000
	GEOTECHNICAL ENGINEERING COST:	(1% OF CONSTR. & R/W COST)			\$39,000
	ENVIRONMENTAL COST:	(1% OF CONSTR. & R/W COST)			\$39,000
	SUBSURFACE UTILITY LOCATING (SUL):	(3% OF CONSTR. & R/W COST)			\$115,000
	DESIGN CONTINGENCY COSTS	(20% OF CONSTR. & R/W COST)			\$762,000
	PROJECT SUBTOTAL:				\$5,334,100
	3% INFLATION CONTINGENCY OVER 5 YEARS (15%):				\$800,000
	PROJECT TOTAL WITHOUT CONSTRUCTION INSPECTION				\$6,134,100
	CONSTRUCTION INSPECTION COST:	(10% OF PROJECT TOTAL)			\$613,000
				TOTAL:	\$6,747,100

**I-77 / Pleasant Valley Road
Interchange Study -
Build Alternative 2**

January 2025

ITEM	DESCRIPTION	TOTAL QUANTITY	UNIT	ESTIMATED PRICE	TOTAL COST
	ROADWAY				
201	CLEARING AND GRUBBING	1	LS	\$20,000	\$20,000
202	PAVEMENT REMOVED	4,800	SY	\$14	\$67,200
202	WALK REMOVED	1,560	SF	\$4	\$6,240
202	CURB REMOVED	323	FT	\$6	\$1,938
202	GUARDRAIL REMOVED	300	FT	\$4	\$1,200
203	EXCAVATION / EMBANKMENT	10,000	CY	\$12	\$120,000
252	FULL DEPTH PAVEMENT SAWING	2,040	FT	\$2	\$4,080
606	ANCHOR ASSEMBLY, MGS TYPE E	1	EACH	\$2,000	\$2,000
606	ANCHOR ASSEMBLY, MGS TYPE T	1	EACH	\$850	\$850
606	GUARDRAIL, TYPE MGS	300	FT	\$20	\$6,000
609	4" CONCRETE MEDIAN	0	SY	\$80	\$0
659	SEEDING & MULCHING	5,000	SY	\$2	\$10,000
832	EROSION CONTROL	1	LS	\$20,000	\$20,000
832	EROSION CONTROL PLAN	1	LS	\$5,000	\$5,000
	ROADWAY SUBTOTAL:				\$264,508
	DRAINAGE				
202	PIPE REMOVED, 24" AND UNDER	0	FT	\$20	\$0
202	CATCH BASIN REMOVED	2	EACH	\$700	\$1,400
605	UNDERDRAINS	2,040	FT	\$12	\$24,480
611	XX" CONDUIT, TYPE B	20	FT	\$95	\$1,900
611	CATCH BASIN ADJUSTED TO GRADE	0	EACH	\$800	\$0
611	MANHOLE ADJUSTED TO GRADE	2	EACH	\$750	\$1,500
611	CATCH BASIN, NO. 2-2A	0	EACH	\$1,500	\$0
611	CATCH BASIN, NO. 3A	3	EACH	\$2,250	\$6,750
611	MANHOLE, NO. 3	2	EACH	\$3,500	\$7,000
	DRAINAGE SUBTOTAL:				\$43,030
	PAVEMENT				
254	PAVEMENT PLANING, ASPHALT CONCRETE	14,100	SY	\$4	\$56,400
302	ASPHALT CONCRETE BASE, PG64-22	540	CY	\$125	\$67,500
304	AGGREGATE BASE	540	CY	\$55	\$29,700
407	NON-TRACKING TACK COAT	1,258	GAL	\$4	\$5,032
442	ASPHALT CONCRETE INTERMEDIATE COURSE, 19 MM, TYPE B (446)	160	CY	\$165	\$26,400
806	ASPHALT CONCRETE SURFACE COURSE, 12.5 MM, TYPE A	120	CY	\$185	\$22,200
608	4" CONCRETE WALK	1,300	SF	\$10	\$13,000
609	CURB, TYPE 6	323	FT	\$12	\$3,876
	PAVEMENT SUBTOTAL:				\$224,108
	TRAFFIC CONTROL				
	SIGNING AND STRIPING	1	LS	\$125,000	\$125,000
	TRAFFIC CONTROL SUBTOTAL:				\$125,000
	SIGNALS				
	TRAFFIC SIGNAL RECONSTRUCTION	1	LS	\$350,000	\$350,000
	SIGNALS SUBTOTAL:				\$350,000
	MAINTENANCE OF TRAFFIC				
	MAINTENANCE OF TRAFFIC	1	LS	\$100,000	\$100,000
	MAINTENANCE OF TRAFFIC SUBTOTAL:				\$100,000
	LIGHTING				
	EXIST. LIGHT POLE TO BE REMOVED AND REPLACED	3	EACH	\$1,500	\$4,500
	LIGHTING SUBTOTAL:				\$4,500

**I-77 / Pleasant Valley Road
Interchange Study -
Build Alternative 2**

January 2025

ITEM	DESCRIPTION	TOTAL QUANTITY	UNIT	ESTIMATED PRICE	TOTAL COST
	NOISE WALL				
	NOISE WALL	0	SF	\$45	\$0
	NOISE WALL REMOVED	0	LF	\$10	\$0
	NOISE WALL SUBTOTAL:				\$0
	MISCELLANEOUS				
614	MAINTAINING TRAFFIC	1	LS	\$50,000	\$50,000
619	FIELD OFFICE	7	MON	\$2,500	\$17,500
623	CONSTRUCTION LAYOUT STAKES	1	LS	\$9,000	\$9,000
624	MOBILIZATION	1	LS	\$40,000	\$40,000
SPECIAL	PERFORMANCE BOND	1	LS	\$9,000	\$9,000
	MISCELLANEOUS SUBTOTAL:				\$125,500
	RIGHT OF WAY				
	TEMPORARY R/W TAKE - COMMERCIAL	0	EACH	\$5,000	\$0
	TEMPORARY R/W TAKE - RESIDENTIAL	0	EACH	\$2,000	\$0
	PERMANENT R/W TAKE - MINOR - COMMERCIAL	0	EACH	\$25,000	\$0
	PERMANENT R/W TAKE - MINOR - RESIDENTIAL	1	EACH	\$10,000	\$10,000
	ACQUISITION SERVICES	1	EACH	\$6,500	\$6,500
	APPRAISAL REVIEW SERVICES	1	EACH	\$650	\$650
	RIGHT OF WAY SUBTOTAL:				\$17,150
	STRUCTURES OVER 20' (CUY-77-5960L)				
	STRUCTURE WIDENING (20' WIDE X 215' LONG +/-)	0	SF	\$250	\$0
	ADDITIONAL STRUCTURE WORK	0	LS	\$0	\$0
	STRUCTURES OVER 20' SUBTOTAL:				\$0
	TOTAL CONSTRUCTION AND RIGHT OF WAY COST:				\$1,253,796
	DESIGN ENGINEERING COST:	(15% OF CONSTR. & R/W COST)			\$189,000
	GEOTECHNICAL ENGINEERING COST:	(1% OF CONSTR. & R/W COST)			\$13,000
	ENVIRONMENTAL COST:	(1% OF CONSTR. & R/W COST)			\$13,000
	SUBSURFACE UTILITY LOCATING (SUL):	(3% OF CONSTR. & R/W COST)			\$38,000
	DESIGN CONTINGENCY COSTS	(20% OF CONSTR. & R/W COST)			\$251,000
	PROJECT SUBTOTAL:				\$1,757,796
	3% INFLATION CONTINGENCY OVER 5 YEARS (15%):				\$264,000
	PROJECT TOTAL WITHOUT CONSTRUCTION INSPECTION				\$2,021,796
	CONSTRUCTION INSPECTION COST:	(10% OF PROJECT TOTAL)			\$202,000
	TOTAL:				\$2,223,796

**I-77 / Pleasant Valley Road
Interchange Study -
Build Alternative 3**

January 2025

ITEM	DESCRIPTION	TOTAL QUANTITY	UNIT	ESTIMATED PRICE	TOTAL COST
	ROADWAY				
201	CLEARING AND GRUBBING	1	LS	\$20,000	\$20,000
202	PAVEMENT REMOVED	4,800	SY	\$14	\$67,200
202	WALK REMOVED	1,560	SF	\$4	\$6,240
202	CURB REMOVED	323	FT	\$6	\$1,938
202	GUARDRAIL REMOVED	300	FT	\$4	\$1,200
203	EXCAVATION / EMBANKMENT	10,000	CY	\$12	\$120,000
252	FULL DEPTH PAVEMENT SAWING	2,040	FT	\$2	\$4,080
606	ANCHOR ASSEMBLY, MGS TYPE E	1	EACH	\$2,000	\$2,000
606	ANCHOR ASSEMBLY, MGS TYPE T	1	EACH	\$850	\$850
606	GUARDRAIL, TYPE MGS	300	FT	\$20	\$6,000
609	4" CONCRETE MEDIAN	0	SY	\$80	\$0
659	SEEDING & MULCHING	5,000	SY	\$2	\$10,000
832	EROSION CONTROL	1	LS	\$20,000	\$20,000
832	EROSION CONTROL PLAN	1	LS	\$5,000	\$5,000
	ROADWAY SUBTOTAL:				\$264,508
	DRAINAGE				
202	PIPE REMOVED, 24" AND UNDER	0	FT	\$20	\$0
202	CATCH BASIN REMOVED	2	EACH	\$700	\$1,400
605	UNDERDRAINS	4,080	FT	\$12	\$48,960
611	XX" CONDUIT, TYPE B	32	FT	\$95	\$3,040
611	CATCH BASIN ADJUSTED TO GRADE	0	EACH	\$800	\$0
611	MANHOLE ADJUSTED TO GRADE	2	EACH	\$750	\$1,500
611	CATCH BASIN, NO. 2-2A	0	EACH	\$1,500	\$0
611	CATCH BASIN, NO. 3A	3	EACH	\$2,250	\$6,750
611	MANHOLE, NO. 3	2	EACH	\$3,500	\$7,000
	DRAINAGE SUBTOTAL:				\$68,650
	PAVEMENT				
254	PAVEMENT PLANING, ASPHALT CONCRETE	14,100	SY	\$4	\$56,400
302	ASPHALT CONCRETE BASE, PG64-22	780	CY	\$125	\$97,500
304	AGGREGATE BASE	780	CY	\$55	\$42,900
407	NON-TRACKING TACK COAT	1,285	GAL	\$4	\$5,140
442	ASPHALT CONCRETE INTERMEDIATE COURSE, 19 MM, TYPE B (446)	230	CY	\$165	\$37,950
806	ASPHALT CONCRETE SURFACE COURSE, 12.5 MM, TYPE A	170	CY	\$185	\$31,450
608	4" CONCRETE WALK	1,560	SF	\$10	\$15,600
609	CURB, TYPE 6	323	FT	\$12	\$3,876
	PAVEMENT SUBTOTAL:				\$290,816
	TRAFFIC CONTROL				
	SIGNING AND STRIPING	1	LS	\$130,000	\$130,000
	TRAFFIC CONTROL SUBTOTAL:				\$130,000
	SIGNALS				
	TRAFFIC SIGNAL RECONSTRUCTION	1	LS	\$350,000	\$350,000
	SIGNALS SUBTOTAL:				\$350,000
	MAINTENANCE OF TRAFFIC				
	MAINTENANCE OF TRAFFIC	1	LS	\$100,000	\$100,000
	MAINTENANCE OF TRAFFIC SUBTOTAL:				\$100,000
	LIGHTING				
	EXIST. LIGHT POLE TO BE REMOVED AND REPLACED	3	EACH	\$1,500	\$4,500
	LIGHTING SUBTOTAL:				\$4,500

**I-77 / Pleasant Valley Road
Interchange Study -
Build Alternative 3**

January 2025

ITEM	DESCRIPTION	TOTAL QUANTITY	UNIT	ESTIMATED PRICE	TOTAL COST
	NOISE WALL				
	NOISE WALL	0	SF	\$45	\$0
	NOISE WALL REMOVED	0	LF	\$10	\$0
	NOISE WALL SUBTOTAL:				\$0
	MISCELLANEOUS				
614	MAINTAINING TRAFFIC	1	LS	\$50,000	\$50,000
619	FIELD OFFICE	7	MON	\$2,500	\$17,500
623	CONSTRUCTION LAYOUT STAKES	1	LS	\$9,000	\$9,000
624	MOBILIZATION	1	LS	\$40,000	\$40,000
SPECIAL	PERFORMANCE BOND	1	LS	\$9,000	\$9,000
	MISCELLANEOUS SUBTOTAL:				\$125,500
	RIGHT OF WAY				
	TEMPORARY R/W TAKE - COMMERCIAL	0	EACH	\$5,000	\$0
	TEMPORARY R/W TAKE - RESIDENTIAL	0	EACH	\$2,000	\$0
	PERMANENT R/W TAKE - MINOR - COMMERCIAL	0	EACH	\$25,000	\$0
	PERMANENT R/W TAKE - MINOR - RESIDENTIAL	1	EACH	\$10,000	\$10,000
	ACQUISITION SERVICES	1	EACH	\$6,500	\$6,500
	APPRAISAL REVIEW SERVICES	1	EACH	\$650	\$650
	RIGHT OF WAY SUBTOTAL:				\$17,150
	STRUCTURES OVER 20' (CUY-77-5960L)				
	STRUCTURE WIDENING (20' WIDE X 215' LONG +/-)	0	SF	\$250	\$0
	ADDITIONAL STRUCTURE WORK	0	LS	\$0	\$0
	STRUCTURES OVER 20' SUBTOTAL:				\$0
	TOTAL CONSTRUCTION AND RIGHT OF WAY COST:				\$1,351,124
	DESIGN ENGINEERING COST:	(15% OF CONSTR. & R/W COST)			\$203,000
	GEOTECHNICAL ENGINEERING COST:	(1% OF CONSTR. & R/W COST)			\$14,000
	ENVIRONMENTAL COST:	(1% OF CONSTR. & R/W COST)			\$14,000
	SUBSURFACE UTILITY LOCATING (SUL):	(3% OF CONSTR. & R/W COST)			\$41,000
	DESIGN CONTINGENCY COSTS	(20% OF CONSTR. & R/W COST)			\$271,000
	PROJECT SUBTOTAL:				\$1,894,124
	3% INFLATION CONTINGENCY OVER 5 YEARS (15%):				\$284,000
	PROJECT TOTAL WITHOUT CONSTRUCTION INSPECTION				\$2,178,124
	CONSTRUCTION INSPECTION COST:	(10% OF PROJECT TOTAL)			\$218,000
				TOTAL:	\$2,396,124

**I-77 / Pleasant Valley Road
Interchange Study -
Build Alternative 4**

January 2025

ITEM	DESCRIPTION	TOTAL QUANTITY	UNIT	ESTIMATED PRICE	TOTAL COST
	ROADWAY				
201	CLEARING AND GRUBBING	1	LS	\$20,000	\$20,000
202	PAVEMENT REMOVED	220	SY	\$14	\$3,080
202	WALK REMOVED	1,330	SF	\$4	\$5,320
202	CURB REMOVED	325	FT	\$6	\$1,950
202	GUARDRAIL REMOVED	500	FT	\$4	\$2,000
203	EXCAVATION / EMBANKMENT	1,000	CY	\$12	\$12,000
252	FULL DEPTH PAVEMENT SAWING	1,800	FT	\$2	\$3,600
606	ANCHOR ASSEMBLY, MGS TYPE E	1	EACH	\$2,000	\$2,000
606	ANCHOR ASSEMBLY, MGS TYPE T	0	EACH	\$850	\$0
606	GUARDRAIL, TYPE MGS	500	FT	\$20	\$10,000
609	4" CONCRETE MEDIAN	260	SY	\$80	\$20,800
659	SEEDING & MULCHING	2,500	SY	\$2	\$5,000
832	EROSION CONTROL	1	LS	\$20,000	\$20,000
832	EROSION CONTROL PLAN	1	LS	\$5,000	\$5,000
	ROADWAY SUBTOTAL:				\$110,750
	DRAINAGE				
202	PIPE REMOVED, 24" AND UNDER	0	FT	\$20	\$0
202	CATCH BASIN REMOVED	1	EACH	\$700	\$700
605	UNDERDRAINS	1,425	FT	\$12	\$17,100
611	XX" CONDUIT, TYPE B	0	FT	\$95	\$0
611	CATCH BASIN ADJUSTED TO GRADE	2	EACH	\$800	\$1,600
611	MANHOLE ADJUSTED TO GRADE	3	EACH	\$750	\$2,250
611	CATCH BASIN, NO. 2-2A	0	EACH	\$1,500	\$0
611	CATCH BASIN, NO. 3A	1	EACH	\$2,250	\$2,250
611	MANHOLE, NO. 3	0	EACH	\$3,500	\$0
	DRAINAGE SUBTOTAL:				\$23,900
	PAVEMENT				
254	PAVEMENT PLANING, ASPHALT CONCRETE	5,100	SY	\$4	\$20,400
302	ASPHALT CONCRETE BASE, PG64-22	220	CY	\$125	\$27,500
304	AGGREGATE BASE	220	CY	\$55	\$12,100
407	NON-TRACKING TACK COAT	458	GAL	\$4	\$1,832
442	ASPHALT CONCRETE INTERMEDIATE COURSE, 19 MM, TYPE B (446)	460	CY	\$165	\$75,900
806	ASPHALT CONCRETE SURFACE COURSE, 12.5 MM, TYPE A	450	CY	\$185	\$83,250
608	4" CONCRETE WALK	1,330	SF	\$10	\$13,300
609	CURB, TYPE 6	325	FT	\$12	\$3,900
	PAVEMENT SUBTOTAL:				\$238,182
	TRAFFIC CONTROL				
	SIGNING AND STRIPING	1	LS	\$85,000	\$85,000
	TRAFFIC CONTROL SUBTOTAL:				\$85,000
	SIGNALS				
	TRAFFIC SIGNAL RECONSTRUCTION	1	LS	\$350,000	\$350,000
	SIGNALS SUBTOTAL:				\$350,000
	MAINTENANCE OF TRAFFIC				
	MAINTENANCE OF TRAFFIC	1	LS	\$50,000	\$50,000
	MAINTENANCE OF TRAFFIC SUBTOTAL:				\$50,000
	LIGHTING				
	EXIST. LIGHT POLE TO BE REMOVED AND REPLACED	4	EACH	\$1,500	\$6,000
	LIGHTING SUBTOTAL:				\$6,000

**I-77 / Pleasant Valley Road
Interchange Study -
Build Alternative 4**

January 2025

ITEM	DESCRIPTION	TOTAL QUANTITY	UNIT	ESTIMATED PRICE	TOTAL COST
	NOISE WALL				
	NOISE WALL	4750	SF	\$45	\$213,750
	NOISE WALL REMOVED	475	LF	\$10	\$4,750
	NOISE WALL SUBTOTAL:				\$218,500
	MISCELLANEOUS				
614	MAINTAINING TRAFFIC	1	LS	\$50,000	\$50,000
619	FIELD OFFICE	3	MON	\$2,500	\$7,500
623	CONSTRUCTION LAYOUT STAKES	1	LS	\$4,500	\$4,500
624	MOBILIZATION	1	LS	\$20,000	\$20,000
SPECIAL	PERFORMANCE BOND	1	LS	\$4,500	\$4,500
	MISCELLANEOUS SUBTOTAL:				\$86,500
	RIGHT OF WAY				
	TEMPORARY R/W TAKE - COMMERCIAL	0	EACH	\$5,000	\$0
	TEMPORARY R/W TAKE - RESIDENTIAL	1	EACH	\$2,000	\$2,000
	PERMANENT R/W TAKE - MINOR - COMMERCIAL	0	EACH	\$25,000	\$0
	PERMANENT R/W TAKE - MINOR - RESIDENTIAL	5	EACH	\$10,000	\$50,000
	ACQUISITION SERVICES	6	EACH	\$6,500	\$39,000
	APPRAISAL REVIEW SERVICES	6	EACH	\$650	\$3,900
	RIGHT OF WAY SUBTOTAL:				\$94,900
	STRUCTURES OVER 20' (CUY-77-5960L)				
	STRUCTURE WIDENING (20' WIDE X 215' LONG +/-)	0	SF	\$250	\$0
	ADDITIONAL STRUCTURE WORK	0	LS	\$0	\$0
	STRUCTURES OVER 20' SUBTOTAL:				\$0
	TOTAL CONSTRUCTION AND RIGHT OF WAY COST:				\$1,263,732
	DESIGN ENGINEERING COST:	(15% OF CONSTR. & R/W COST)			\$190,000
	GEOTECHNICAL ENGINEERING COST:	(1% OF CONSTR. & R/W COST)			\$13,000
	ENVIRONMENTAL COST:	(1% OF CONSTR. & R/W COST)			\$13,000
	SUBSURFACE UTILITY LOCATING (SUL):	(3% OF CONSTR. & R/W COST)			\$38,000
	DESIGN CONTINGENCY COSTS	(20% OF CONSTR. & R/W COST)			\$253,000
	PROJECT SUBTOTAL:				\$1,770,732
	3% INFLATION CONTINGENCY OVER 5 YEARS (15%):				\$266,000
	PROJECT TOTAL WITHOUT CONSTRUCTION INSPECTION				\$2,036,732
	CONSTRUCTION INSPECTION COST:	(10% OF PROJECT TOTAL)			\$204,000
				TOTAL:	\$2,240,732

**I-77 / Pleasant Valley Road
Interchange Study -
Build Alternative 5**

January 2025

ITEM	DESCRIPTION	TOTAL QUANTITY	UNIT	ESTIMATED PRICE	TOTAL COST
	ROADWAY				
201	CLEARING AND GRUBBING	1	LS	\$20,000	\$20,000
202	PAVEMENT REMOVED	810	SY	\$14	\$11,340
202	WALK REMOVED	9,400	SF	\$4	\$37,600
202	CURB REMOVED	2,215	FT	\$6	\$13,290
202	GUARDRAIL REMOVED	500	FT	\$4	\$2,000
203	EXCAVATION / EMBANKMENT	1,500	CY	\$12	\$18,000
252	FULL DEPTH PAVEMENT SAWING	3,900	FT	\$2	\$7,800
606	ANCHOR ASSEMBLY, MGS TYPE E	1	EACH	\$2,000	\$2,000
606	ANCHOR ASSEMBLY, MGS TYPE T	0	EACH	\$850	\$0
606	GUARDRAIL, TYPE MGS	500	FT	\$20	\$10,000
609	4" CONCRETE MEDIAN	430	SY	\$80	\$34,400
659	SEEDING & MULCHING	2,500	SY	\$2	\$5,000
832	EROSION CONTROL	1	LS	\$20,000	\$20,000
832	EROSION CONTROL PLAN	1	LS	\$5,000	\$5,000
	ROADWAY SUBTOTAL:				\$186,430
	DRAINAGE				
202	PIPE REMOVED, 24" AND UNDER	0	FT	\$20	\$0
202	CATCH BASIN REMOVED	7	EACH	\$700	\$4,900
605	UNDERDRAINS	2,760	FT	\$12	\$33,120
611	XX" CONDUIT, TYPE B	0	FT	\$95	\$0
611	CATCH BASIN ADJUSTED TO GRADE	0	EACH	\$800	\$0
611	MANHOLE ADJUSTED TO GRADE	6	EACH	\$750	\$4,500
611	CATCH BASIN, NO. 2-2A	0	EACH	\$1,500	\$0
611	CATCH BASIN, NO. 3A	7	EACH	\$2,250	\$15,750
611	MANHOLE, NO. 3	0	EACH	\$3,500	\$0
	DRAINAGE SUBTOTAL:				\$58,270
	PAVEMENT				
254	PAVEMENT PLANING, ASPHALT CONCRETE	8,200	SY	\$4	\$32,800
302	ASPHALT CONCRETE BASE, PG64-22	430	CY	\$125	\$53,750
304	AGGREGATE BASE	430	CY	\$55	\$23,650
407	NON-TRACKING TACK COAT	744	GAL	\$4	\$2,976
442	ASPHALT CONCRETE INTERMEDIATE COURSE, 19 MM, TYPE B (446)	890	CY	\$165	\$146,850
806	ASPHALT CONCRETE SURFACE COURSE, 12.5 MM, TYPE A	880	CY	\$185	\$162,800
608	4" CONCRETE WALK	9,400	SF	\$10	\$94,000
609	CURB, TYPE 6	2,215	FT	\$12	\$26,580
	PAVEMENT SUBTOTAL:				\$543,406
	TRAFFIC CONTROL				
	SIGNING AND STRIPING	1	LS	\$90,000	\$90,000
	TRAFFIC CONTROL SUBTOTAL:				\$90,000
	SIGNALS				
	TRAFFIC SIGNAL RECONSTRUCTION	1	LS	\$350,000	\$350,000
	SIGNALS SUBTOTAL:				\$350,000
	MAINTENANCE OF TRAFFIC				
	MAINTENANCE OF TRAFFIC	1	LS	\$50,000	\$50,000
	MAINTENANCE OF TRAFFIC SUBTOTAL:				\$50,000
	LIGHTING				
	EXIST. LIGHT POLE TO BE REMOVED AND REPLACED	4	EACH	\$1,500	\$6,000
	LIGHTING SUBTOTAL:				\$6,000

**I-77 / Pleasant Valley Road
Interchange Study -
Build Alternative 5**

January 2025

ITEM	DESCRIPTION	TOTAL QUANTITY	UNIT	ESTIMATED PRICE	TOTAL COST
	NOISE WALL				
	NOISE WALL	4750	SF	\$45	\$213,750
	NOISE WALL REMOVED	475	LF	\$10	\$4,750
	NOISE WALL SUBTOTAL:				\$218,500
	MISCELLANEOUS				
614	MAINTAINING TRAFFIC	1	LS	\$50,000	\$50,000
619	FIELD OFFICE	3	MON	\$2,500	\$7,500
623	CONSTRUCTION LAYOUT STAKES	1	LS	\$4,500	\$4,500
624	MOBILIZATION	1	LS	\$20,000	\$20,000
SPECIAL	PERFORMANCE BOND	1	LS	\$4,500	\$4,500
	MISCELLANEOUS SUBTOTAL:				\$86,500
	RIGHT OF WAY				
	TEMPORARY R/W TAKE - COMMERCIAL	0	EACH	\$5,000	\$0
	TEMPORARY R/W TAKE - RESIDENTIAL	3	EACH	\$2,000	\$6,000
	PERMANENT R/W TAKE - MINOR - COMMERCIAL	0	EACH	\$25,000	\$0
	PERMANENT R/W TAKE - MINOR - RESIDENTIAL	12	EACH	\$10,000	\$120,000
	ACQUISITION SERVICES	15	EACH	\$6,500	\$97,500
	APPRAISAL REVIEW SERVICES	15	EACH	\$650	\$9,750
	RIGHT OF WAY SUBTOTAL:				\$233,250
	STRUCTURES OVER 20' (CUY-77-5960L)				
	STRUCTURE WIDENING (20' WIDE X 215' LONG +/-)	0	SF	\$250	\$0
	ADDITIONAL STRUCTURE WORK (REMOVE EXIST. SLOPE PROTECTION, INSTALL PAVED GUTTER, AND SOLDIER WALL)	1	LS	\$710,000	\$710,000
	STRUCTURES OVER 20' SUBTOTAL:				\$710,000
	TOTAL CONSTRUCTION AND RIGHT OF WAY COST:				\$2,532,356
	DESIGN ENGINEERING COST:	(15% OF CONSTR. & R/W COST)			\$380,000
	GEOTECHNICAL ENGINEERING COST:	(1% OF CONSTR. & R/W COST)			\$26,000
	ENVIRONMENTAL COST:	(1% OF CONSTR. & R/W COST)			\$26,000
	SUBSURFACE UTILITY LOCATING (SUL):	(3% OF CONSTR. & R/W COST)			\$76,000
	DESIGN CONTINGENCY COSTS	(20% OF CONSTR. & R/W COST)			\$507,000
	PROJECT SUBTOTAL:				\$3,547,356
	3% INFLATION CONTINGENCY OVER 5 YEARS (15%):				\$532,000
	PROJECT TOTAL WITHOUT CONSTRUCTION INSPECTION				\$4,079,356
	CONSTRUCTION INSPECTION COST:	(10% OF PROJECT TOTAL)			\$408,000
	TOTAL:				\$4,487,356