GPI

Engineering | Design | Planning | Construction Management

FINAL REPORT

June, 2024

INTERSECTION IMPROVEMENT FEASIBILITY STUDY

CLIENT: **Putnam County Highway Department**
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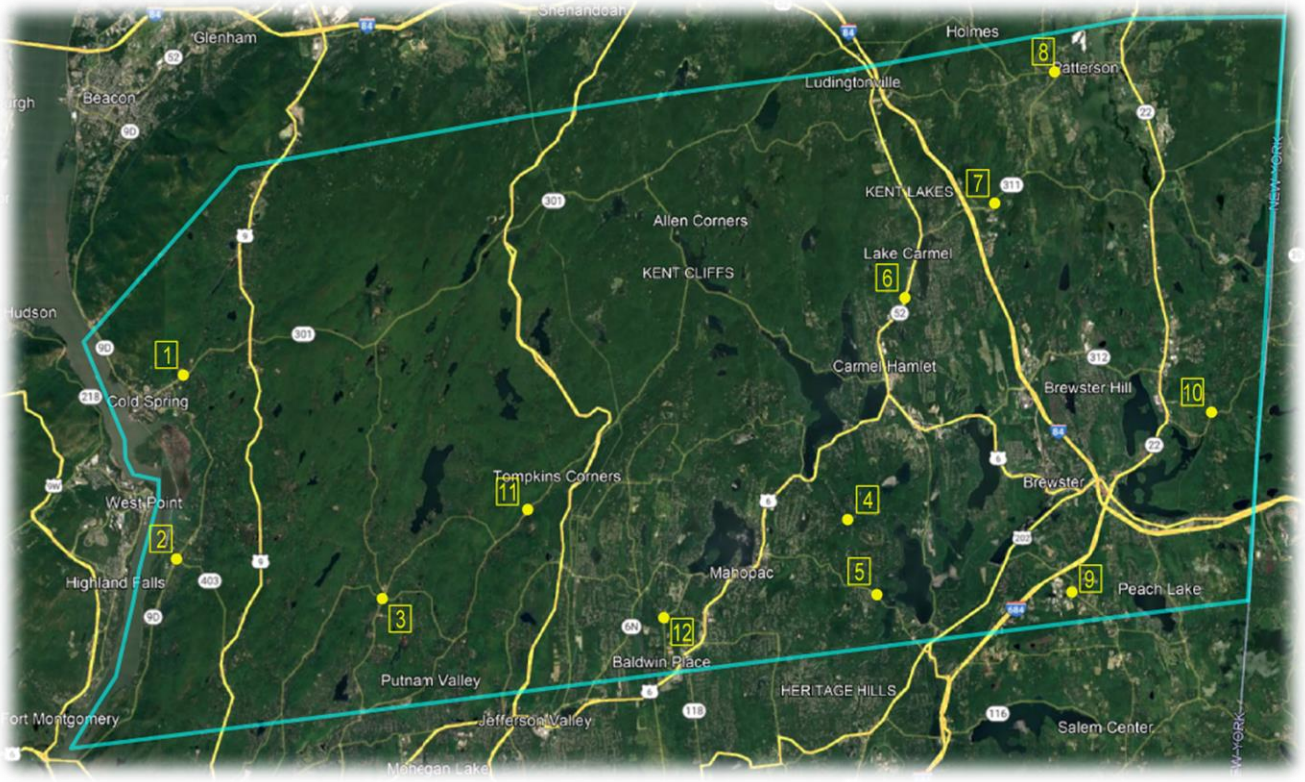
1. INTRODUCTION & BACKGROUND

Greenman-Pedersen, Inc. (GPI) was retained by the Putnam County Planning Department to perform traffic analysis at various intersections throughout Putnam County to assess existing traffic conditions and determine the operational, capacity and safety needs for each. This assessment included a review of potential intersection improvements, where appropriate, and an assessment of the costs and feasibility of the improvement alternatives.

The locations selected by the County for review under this study include:

1. Fishkill Rd (CR 10) @ NYS Route 301
2. Lower Station Rd (CR 12) @ NYS Route 9D
3. Oscawana Lake Rd (CR 20) @ Church Rd (CR 22)
4. Drewville Rd (CR 36) @ Weber Hill Rd
5. Croton Falls Rd (CR 34) @ West Shore Dr (CR 38)
6. Towners Rd (CR 45) @ NYS Route 52
7. Fair St (CR 60) @ NYS Route 311
8. Cornwall Hill Rd (CR 64) @ NYS Route 311
9. North Salem Rd (CR 55) @ Fields Lane
10. Milltown Rd (CR 54) @ Gage Rd
11. Peekskill Hollow Rd (CR 21) @ Bryant Pond Rd
12. Baldwin Place Rd (CR 37) @ Myrtle Ave (CR 71)

These locations are noted on the County aerial map below:



For each location, GPI performed data collection, analysis and evaluation, which included the following:

- Peak Hour Traffic Counts
- Sight Distance measurements at unsignalized intersections
- Radar Speed Study at unsignalized intersections
- Field Review of terrain and existing condition to identify constraints and conflicts
- Right-of-way review based on County tax maps
- Capacity Analysis for existing conditions and improvement alternatives
- Signal Warrant Analysis for unsignalized intersections
- Turn Lane Warrants where appropriate
- Safety analysis including the review of crash history, crash rates and Potential for Safety Improvement factors
- A review of possible improvement alternatives
- Development of conceptual cost estimates for recommended improvements
- Concept sketches for improvements, where appropriate

The report text below provides a discussion of the analysis methodologies used and gives a general summary of the findings for each of the intersections included in this project. Detailed analysis, considered alternatives, and recommendations for improvements at each specific intersection can be found in the Intersection Appendices at the end of this report.

2. ANALYSIS METHODS/PROCEDURES

A general discussion concerning the data collection and analysis methods is included below. Site specific details, analysis results and improvement recommendations are summarized later in this report and detailed in the intersection specific appendices.

2.1. Traffic Volume Development

Turn movement traffic counts were conducted at each intersection during various times of the year. Some locations were counted as part of the County's Annual Count program, while others were counted separately, during two separate periods, under this project. Overall, each location was counted in one of the following three time periods; October 2022, April 2023 or July 2023. For each traffic count, turn movement data was collected between hours of 7:00-9:00 AM and 4:00-6:00 PM in order to determine the AM and PM peak hour traffic volumes. NYSDOT seasonal adjustment factors were considered to adjust count data to average annual conditions, but for each of the time periods counted, the seasonal adjustment factor was either very near average or slightly above average. As such, volumes were not generally adjusted and provide a conservative estimate of average traffic at the intersections. Volume diagrams and count data are included in the intersection specific appendices in this report.

2.2. Capacity Analysis

Traffic conditions at each intersection were analyzed based on the methodologies found in the *Highway Capacity Manual*, 6th Edition (HCM6), published by the Transportation Research Board. These procedures describe operating conditions in terms of a Level of Service (LOS) letter grade. In general, "A" represents the best operating condition with unrestricted flow and little or no delay per vehicle, and "F" represents the worst, with congested conditions, long delays and poor traffic operations. LOS C or better is generally desirable, but LOS D for signalized locations and LOS E for unsignalized are generally acceptable during peak periods as long as the volume to capacity ratio (v/c) is below 1.0. The criteria for the various levels of service are as follows:

LEVEL OF SERVICE CRITERIA

LOS	Unsignalized Intersection Delay Per Vehicle (sec.)	Signalized Intersection Delay Per Vehicle (sec.)
A	≤ 10.0	≤ 10.0
B	> 10.0 and ≤ 15.0	> 10.0 and ≤ 20.0
C	>15.0 and ≤25.0	>20.0 and ≤ 35.0
D	> 25.0 and ≤ 35.0	> 35.0 and ≤ 55.0
E	> 35.0 and ≤ 50.0	> 55.0 and ≤ 80.0
F	> 50.0	> 80.0

It should be noted that the LOS criteria for an unsignalized intersection is reported for the Stop and Yield controlled approaches and the mainline left turn movements only, as the uncontrolled through and right turn movements along a mainline roadway are assumed to have a theoretical delay of zero in the methodology. The level of service results performed as part of this study and capacity analysis worksheets are included in the intersection specific appendices. These results are shown for both the existing condition and potential improvement alternatives.

2.3. Signal Warrant Analysis/Turn Lane Warrant Analysis

Existing conditions were reviewed at unsignalized intersection to determine the need for signalization. The warrant analysis was based on criteria detailed in Chapter 4 of the Manual on Uniform Traffic Control Devices (MUTCD, 11th Edition, 2023) and the warrants considered at each location were as follows:

- Warrant 1 – 8-Hour Vehicular Volume
- Warrant 2 – 4-Hour Vehicular Volume
- Warrant 3 – Peak Hour Volume
- Warrant 7 – Crash Experience

There are five additional warranting conditions that could justify a traffic signalization at a

particular location. These warrants cover conditions from high pedestrian traffic and school zones to traffic flow needs. However, none of those conditions apply at the studied intersections, so none of these five warrants were evaluated.

It should be noted that procedures state, if a studied intersection is located where the critical speed of the major street traffic is greater than 40 mph, or the intersection is in a built-up area of an isolated community with population less than 10,000, the warranting criteria is reduced to 70% of the standard warranting thresholds. Due to this, the warranting criteria does vary depending on the location reviewed.

It should also be noted that satisfaction of one or more signal warrants shall not in itself require the installation of a traffic signal. Before a signal installation can be justified, an engineering study should be done to show that signalization will improve overall safety and/or operations of the intersection.

The signal warrant analysis worksheets for each location are included later in this report in the intersection specific appendices.

In addition to signal warrants, left turn or right turn lanes warrants were conducted at select locations. The need for left turn lanes was examined using the procedures and methodology described in NCHRP Report 457 "Evaluating Intersection Improvements: An Engineering Study Guide", while the need for right turn lane was determine using Figure 4-23 of NCHRP Report 279 "Intersection Channelization Design Guide"

2.4. Crash/Safety Analysis

Crash data for the most recent 4-year period available was obtained from NYSDOT through their CLEAR System. This data covered the period from December 31, 2019, through December 31, 2023. The data was compiled, crash rates were calculated and compared to Statewide averages, and crash types and crash severity were reviewed.

Additionally, NYSDOT's "Potential for Safety Improvement" (PSI) factors were reviewed and considered. PSI is the primary performance measure for NYSDOT network screening and is based on a comparison of site-specific safety performance (i.e., Excess Expected Crash Frequency) and location characteristics to statewide average to gauge the need for safety improvement. PSI factors are given for both total crash potential ($PSI_{tot)}$ and fatal/serious injury crash potential (PSI_{KA}) The focus crash type for statewide network screening is fatal and serious injury crashes and therefore PSI_{KA} is generally considered the most important screening value when prioritizing safety improvements. PSI values greater than zero indicate that there is more potential for safety improvement at a particular location than the statewide average for similar intersections.

2.5. Field Condition & Right-of-Way Review

A field review was conducted at each location. During this review, sight distance measurements were taken, speed readings were obtained using a radar speed gun, and geometric limitations due to utility conflicts, wetlands, terrain considerations and historic sites were noted.

When considering sight distance, two criteria were reviewed. These criteria are as defined in AASHTO's "*A policy on Geometric Design of Highways and Streets*". First is *stopping sight distance*. This is the distance required for a vehicle to make a safe stop if an obstruction is observed along their path. This criterion is the most critical and if not met poses a significant safety concern. The other criteria reviewed is *Intersection Sight Distance*. The intersection sight distance is the distance required for a vehicle stopped on a side street to enter the mainline roadway safely without need for oncoming traffic to slow down to accommodate them. Although it is recommended to meet this criteria, a sight distance shorter than the recommended intersection sight distance does not necessarily pose a significant safety concern if stopping sight distance requirements are met.

Right-of-way/Property line information were obtained through available tax map data. This data is not as accurate as performing a right of way survey. However, it is accurate enough to provide a planning level assessment of potential needs.

2.6. Improvement Options & Consideration

Based on intersection operational and safety needs and feasible alternatives, given geometric constraints and other factors, improvement alternatives were developed. These alternatives included a variety of geometric and traffic control improvements to include lane additions, roundabouts, traffic signals, traffic calming, intersection approach realignment, etc. Concept sketches were developed for alternatives where visualization would be beneficial. These sketches are included in the individual intersection specific appendices.

It should be noted that some locations exhibited no operational or safety issues. Their levels of service were within acceptable ranges, their crash rates were lower than statewide averages, and there were no sight distance limitations. For those locations, the analysis provides a basis to not make improvements and therefore no improvements were recommended.

2.7. Cost Estimating

Cost estimating for each alternative was performed at a conceptual level using typical costs for "big picture" items. These costs were based on GPI's previous project experience for similar style intersections and rule of thumb assumptions from other sources. The cost estimate for each intersection includes potential costs for right of way acquisitions, design and construction inspection, in addition to the roadway construction costs. The costs presented should be used for order of magnitude comparisons only and do not represent actual programming costs.

3. SUMMARY OF INTERSECTION RECOMMENDATIONS

The procedures and analyses discussed above were performed for each intersection to review existing operations and to determine the most appropriate improvements to provide safe and efficient traffic operations at each intersection.

It should be noted that there are currently no sidewalks that connect to the intersections reviewed and there was little to no pedestrians observed crossing at these locations, so pedestrian crossing improvements were recommended.

The detailed analysis, findings, and recommendations for each individual intersection is included under the separate Appendix tabs that follow. A summary of the improvement recommendations for each location is below.

3.1. Fishkill Rd (CR 10) @ NYS Route 301

This unsignalized skewed intersection has stop sign control on Fishkill Drive only. It operates at LOS B or better for all traffic movements, so vehicular capacity is not an issue. Sight Distance meets both stopping and intersection sight distance criteria. The crash rate at this location is 3.7 times the statewide average and reviewing crash data it appears rear end crashes are the biggest issue. This is likely because of the single lane approaches and turn traffic blocking through traffic. This location does satisfy traffic signal warrants, but only in a single lane configuration. If right turn traffic were removed from the analysis, a signal would not be justified. Based on the analysis, there is a safety need at this intersection and reducing rear end crashes would satisfy that need.

Reviewing design options, the close proximity of buildings to the roadway makes a roundabout infeasible and a traffic signal would exacerbate the number of rear end collision. Adding a right turn lane on Fishkill Rd would reduce rear end collisions and would eliminate a traffic signal from being warranted. As such, it is a recommended improvement for this intersection. Adding an eastbound left turn lane along NYS Route 301 would also be beneficial but would require extensive utility relocations and may significantly impact the residences and businesses along that approach because of how close the buildings are to the roadway.

		Estimated Construction Cost
Recommended Improvements:	Add Southbound Right Turn Lane on Fishkill Rd	$100,000
Optional "Feasible" Alternatives:	*Add Eastbound left turn lane on NYS Route 301*	*$450,000*
Implementation Priority:	Medium	

3.2. Lower Station Rd (CR 12) @ NYS Route 9D

This 4-legged signalized intersection operates at LOS B or better for all approaches and has maximum queues that are 150 feet or less, so vehicular capacity is not an issue. The crash rate at this location is below the statewide average for similar facilities and the PSI values are below zero. Additionally, no pattern of correctable crashes was identified.

Based on the analysis, no improvements are recommended at this time, but there are design considerations that could marginally improve operations. The addition of a southbound left turn lane, which would help reduce some rear end collisions and the construction of a single lane roundabout, which would eliminate left turn collisions. Both options would improve operations to LOS A. Given the current low crash rate and decent level of service, these options would likely not provide a significant enough benefit to justify the cost, but they could be considered in the future if conditions change.

		Estimated Construction Cost
Recommended Improvements:	None at this time	$0
Optional "Feasible" Alternatives:	*Add Southbound left turn lane on NYS Route 9D* *Construct Single Lane Roundabout*	*$350,000* *$2.34M*
Implementation Priority:	Low	

3.3. Oscawana Lake Rd (CR 20) @ Church Rd (CR 22)

This unsignalized intersection has stop sign control on the side streets (Church Rd/Cimarron Rd) only. It operates at LOS B or better for all traffic movements, so vehicular capacity is not an issue. Stopping Sight Distance criteria are met at this intersection, but sight distance is short of meeting intersection sight distance recommendations looking south. The crash rate at this location is a little high at nearly 3 times the statewide average. Reviewing crash data it appears right angle crashes are predominant. This location does not satisfy traffic signal warrants.

Based on the analysis, reduction of the right angle crashes would be beneficial. Without justification for a traffic signal, a single lane roundabout would be an appropriate improvement to reduce these type crashes, and it would improve the level of service to LOS A on all approaches. It will require the acquisition of some right-of-way and minor utility relocations, but construction of a roundabout is feasible at this location. Given the somewhat limited sight distance and the higher than average crash rate, a roundabout is recommended.

		Estimated Construction Cost
Recommended Improvements:	Construct Single Lane Roundabout	$2.48M
Optional "Feasible" Alternatives:	*None identified at this time*	
Implementation Priority:	Medium	

3.4. Drewville Rd (CR 36) @ Weber Hill Rd

This unsignalized skewed intersection has stop sign control on Weber Hill Rd, which intersections Drewville road at a significant turn in the roadway (20 mph advisory speed). It operates at LOS B or better for all traffic movements, so vehicular capacity is not an issue. Sight Distance meets stopping sight distance criteria, but is shorter than intersection sight distance recommendations looking north up Drewville Rd. The predominate traffic movements are east-west between Drewville Rd and Weber Hill Rd, with the northern approach of Drewville Rd having less traffic. Traffic signal Warrants were not satisfied at this location. The crash rate at this location is higher than the statewide average for similar intersection, but that is mostly because of low traffic volumes. There were only 3 crashes in the 4 year period studied at this location and none of those indicated a pattern subject to correction.

Based on the analysis, there does not appear to be any operational or safety issues at this location. Certainly, having a skewed intersection entering a curved roadway is not ideal, and it would be preferred to extend the somewhat limited sight distance looking north, but these issues have not translated into a safety problem. If improvements were considered, two options could provide some benefit. First is to reconfigure the roadway to a more traditional "T" intersection with the southbound Drewville Rd approach becoming the stop controlled side street. This corresponds to the predominant traffic movements, which are east-west. A second option would be to construct a single lane roundabout. Right-of-way would need to be acquired to construct a roundabout and it could pose significant wetlands and environmental impacts, which would drive up costs, but it is feasible.

		Estimated Construction Cost
Recommended Improvements:	None at this time	
Optional "Feasible" Alternatives:	*Reconfigure intersection to a "T" with Southbound Drewville Rd Stop Controlled* *Construct Single Lane Roundabout*	*$175,000* *$2.83M*
Implementation Priority:	Low	

3.5. Croton Falls Rd (CR 34) @ West Shore Dr (CR 38)

This location is a complex 4-legged unsignalized intersection with heavily skewed side streets that enter Croton Falls Rd at a curve in the roadway. Levels of service appear acceptable at LOS B or better for all movements, but Intersection sight distance criteria are not met for most movements and stopping sight distance requirements are not met when looking to the south for vehicles approaching from Munich Rd. The crash rate at this location is twice the statewide average with half the crashes involving failure to yield the right-of-way, which is indicative of sight distances being an issue. A traffic signal is not warranted at this location.

It should be noted that Munich Dr is a 1,200 foot roadway with about 12 houses. Traffic along Munich Rd is extremely low, with no more than 2 vehicles per hour accessing the Croton Falls Rd intersection in the peak traffic hours. Additionally, Munich Rd has access to Croton Falls Rd via Ernhofer Dr from its eastern terminus, so access to Croton Falls Rd directly from Munich Rd should not be a requirement.

Based on the analysis, safety improvements are warranted at this intersection, but a traffic signal is not. Levels of service are acceptable in the existing condition, but sight lines and safety should be improved. It is recommended that the Munich Rd connection to Croton Falls Rd at this location be terminated. Combined with that, if possible, the realignment of W. Shore Dr to intersect about 100 feet north of the current intersection to improve sight lines and improve turn movements would be also prudent. Although a roundabout was reviewed, the geometric and environmental constraints would make constructing a roundabout extremely difficult and costly.

		Estimated Construction Cost
Recommended Improvements:	Remove Munich Rd approach from the intersection	$70,000
Optional "Feasible" Alternatives:	*Realign and shift north the W. Shore Drive approach* *Construct Single Lane Roundabout*	*$350,000* *$4.21M*
Implementation Priority:	High	

3.6. Towners Rd (CR 45) @ NYS Route 52

This 4-legged signalized intersection operates at LOS A in both the AM and PM peak hours with no approach operating worse than LOS B which indicates that vehicular capacity is not an issue. However, a gas station on the northeast corner does cause some operational concerns. The station's gas pumps are very close to the roadway, making it difficult to service vehicles without them being on the roadways right-of-way, maneuverability on-site is severely constrained and on-site pull-in parking must back out blindly into the roadway to exit the site. The crash rate at this location is about 60% above statewide average for similar facilities, with 19 crashes. Nearly half of those crashes are related to gas station operations.

As closure of the gas station is unlikely, two options could be considered to improve safety. First is to pull the westbound stop bar back approximately 100 feet, so that it is behind the gas station and install a "stop here on red" sign so gas station patrons can maneuver near the roadway without impacting a queue of stopped vehicles. The other option is to realign the eastern leg further to the south to better align with the Nichols St approach opposite the intersection. This realignment would allow room to the north to reconstruct the gas station driveway for better access management. This option could be negatively received by the public though. As it may appear that one business would benefit to the detriment of another (removing some of the island from the business to the south), but it would provide the greatest safety benefit.

		Estimated Construction Cost
Recommended Improvements:	Stop bar relocation and "Stop Here on Red" sign	$2,000
Optional "Feasible" Alternatives:	*Realign the eastern Towners Rd approach*	*$570,000*
Implementation Priority:	Medium	

3.7. Fair St (CR 60) @ NYS Route 311

This unsignalized 3-leg intersection has stop sign control on Fair St, which intersects NYS Route 311 within a horizontal curve. Sight distance meets stopping sight distance requirements but is below intersection sight distance recommendations looking to the west. This intersection operates with acceptable levels of service. However, the Fair St approach is nearing capacity with a volume to capacity ratio of 0.72 and LOS D in the PM peak hour. Traffic signalization is warranted at this location. The crash rate at this intersection is nearly 8 times the statewide average and nearly half of those crashes are right angle or left turn that could be correctable through signalization.

Based on the analysis, traffic signalization is recommended for this location. A roundabout was considered but given the rocky uneven terrain and roadway grades, construction of a roundabout was considered infeasible.

		Estimated Construction Cost
Recommended Improvements:	Installation of Traffic Signal	$250,000
Optional "Feasible" Alternatives:	*None identified at this time*	
Implementation Priority:	High	

3.8. Cornwall Hill Rd (CR 64) @ NYS Route 311

This unsignalized 3-leg intersection has stop sign control on Cornwall Hill Rd, which intersects NYS Route 311 within a horizontal curve. However, sight distance is more than sufficient to meet both stopping and intersection sight distance requirements. Operations are good, with no movement performing worse than LOS B. The crash rate is about the same as the statewide average for similar intersections. The 2 crashes that occurred within the 4-year period reviewed did not indicate a pattern that needs corrective action. No improvements are recommended for this intersection.

		Estimated Construction Cost
Recommended Improvements:	None at this time	-
Optional "Feasible" Alternatives:	*None identified at this time*	
Implementation Priority:	n/a	

3.9. North Salem Rd (CR 55) @ Fields Lane

This unsignalized 3-leg intersection has stop sign control on Fields Lane, which intersects N. Salem Rd within a horizontal curve. Sight distance meets stopping sight distance requirements but falls short of the recommended intersection sight distance values. The crash rate is about 3 times the statewide average at this intersection, but of the 4 crashes recorded, none caused an injury and there was no pattern that required corrective action. All approaches at this location operate at LOS B or better, so vehicular capacity is not an issue. Additionally, traffic signal warrants are not met at this location.

The somewhat limited sight distance and higher than average crash rate would indicate a need for safety improvement. However, the crash history does not indicate a significant issue and traffic volumes are fairly low at this intersection, so improvement consideration is low. To improve the issues identified, a single lane roundabout could be considered, but there are significant environmental, right-of-way, geometric and utility concerns that would make the installation of a roundabout difficult and costly. Traffic conditions should be monitored, and a roundabout could be a consideration for future improvement, but it is not recommended at this time.

		Estimated Construction Cost
Recommended Improvements:	None at this time	
Optional "Feasible" Alternatives:	*Construct Single Lane Roundabout*	*$3.38M*
Implementation Priority:	Low	

3.10. Milltown Rd (CR 54) @ Gage Rd

This unsignalized 3-leg intersection has stop sign control on Gage Rd, which intersects Milltown Rd within a horizontal curve. Sight distance is sufficient to meet both stopping and intersection sight distance requirements. The crash rate is about 2 times the statewide average at this intersection. However, of the 3 crashes recorded, none caused an injury and there was no pattern that required corrective action, so there is no significant safety concern. All approaches at this location operate at LOS B or better, so vehicular capacity is not an issue, and traffic signal warrants are not met at this location.

Level of service and safety do not appear to be an issue at this location, but vehicles are traveling around the curve at nearly 10 mph over the speed limit (and curve advisory speed), so traffic calming through the implementation of a single lane roundabout could be an option to improve conditions at this location. Right-of-way is wide and terrain is reasonably level so roundabout construction is feasible. However, given the good existing traffic operations and lack of crash history, no improvements are recommended at this time. A roundabout could be considered in the future but is a low priority currently.

		Estimated Construction Cost
Recommended Improvements:	None at this time	
Optional "Feasible" Alternatives:	*Construct Single Lane Roundabout*	*$2.78M*
Implementation Priority:	Low	

3.11. Peekskill Hollow Rd (CR 21) @ Bryant Pond Rd

This unsignalized 3-leg intersection has stop sign control on Bryant Pond Rd. Sight distance is sufficient to meet stopping sight distance requirements but is less than recommended intersection sight distance values looking south because of a crest vertical curve. 85th percentile speeds are nearly 10 mph above the speed limit. The crash rate is significantly higher than the statewide average for similar intersections, but looking at the crash history, 5 of the 6 crashes involved running off the road or animal collisions. The run off the road crashes are most likely due to excessive speeds and the lack of shoulders along Peekskill Hollow Rd. All approaches at this location operate at LOS B or better, so vehicular capacity is not an issue, and traffic signal warrants are not met at this location.

Although sight distance to the south is somewhat limited, it has not translated into a safety issue. Speeds northbound are a concern given the limited sight distance and the number of run off the road crashes that have occurred, so traffic calming to reduce travel speeds northbound would be beneficial. Given the grade variations and roadway grades, combined with significant utility impacts and the potential for significant historical impacts to the 'Travis Burial Ground', a roundabout is not feasible at this location. It is recommended that a speed feedback sign be installed approximately 300' in advance of the intersection in an effort to calm traffic and reduce speeds.

		Estimated Construction Cost
Recommended Improvements:	Install speed feedback sign on northbound approach	$6,000
Optional "Feasible" Alternatives:	*None identified at this time*	
Implementation Priority:	Low	

3.12. Baldwin Place Rd (CR 37) @ Myrtle Ave (CR 71)

This unsignalized 3-leg intersection has stop sign control on Myrtle Ave which curves horizontally directly before intersecting Baldwin Place Rd within a horizontal curve. Sight distance is sufficient to meet stopping sight distance requirements but is less than recommended intersection sight distance values looking south because of the horizontal curvature. All approaches at this location operate at LOS B or better, so vehicular capacity is not an issue. In addition, traffic signal warrants are not met at this location. The crash rate is about 3 times the statewide average at this intersection, but looking at the crash history, only 1 of the crashes involved conflicting movements

at the intersection. 7 of the 8 involved running off the roadway, many of which had excessive speeds as a contributing factor.

With the majority of crashes involving running off the roadway and/or excessive speeds, it is clear that warning signs are not being heeded. To bring better awareness to the intersection and roadway curvature, and in an attempt to slow traffic, it is recommended that an advanced "Stop Ahead" sign be placed along Myrtle Ave and that a flashing beacon be added to the existing southbound "Curve Ahead" sign assembly. If run off the roadway crashes persist after that, the construction of a single lane roundabout could be considered. A roundabout would impact state wetlands and would require right-of-way takings but is feasible to construct.

		Estimated Construction Cost
Recommended Improvements:	Add "Stop Ahead" sign on Myrtle Ave and a flashing beacon to the advanced curve sign southbound	$7,500
Optional "Feasible" Alternatives:	*Construct a Single Lane Roundabout*	*$2.89M*
Implementation Priority:	Medium	

3.13. Improvement Priority Summary Chart

The table on the next page summarized the improvement recommendations, costs and priorities discussed previously in this section.

IMPROVEMENT PRIORITY SUMMARY CHART			
Intersection	**Recommended Improvement (cost)**	**Priority**	***Optional "Feasible" Alternatives (cost)***
Fishkill Rd (CR 10) and NYS Route 301	Southbound Right Turn Lane on Fishkill Rd ($100,000)	**Medium**	*Eastbound Left Turn Lane on Route 301 ($450,000)*
Lower Station Rd (CR 12) and NYS Route 9D	None at this Time	Low	*Southbound Left Turn Lane on Route 9D ($350,000)* *Single Lane Roundabout ($2.34M)*
Oscawana Lake Rd (CR 20) and Church Rd (CR 22)	Single Lane Roundabout ($2.48M)	**Medium**	*None Identified*
Drewville Rd (CR 36) and Weber Hill Rd	None at this Time	Low	*Create T-Intersection w/ north-leg as Side St ($175,000)* *Single Lane Roundabout ($2.83M)*
Croton Falls Rd (CR 34) and West Shore Dr (CR 38)	Close Munich Rd Access to Intersection ($70,000)	**High**	*Realign & shift north W. Shore Dr Approach ($350,000)* *Single Lane Roundabout ($4.21M)*
Towners Rd (CR 45) and NYS Route 52	Relocate Stop Bar and Add "Stop Here on Red" Sign ($2,000)	**Medium**	*Realign Towners Rd Approach with Access Management ($570,000)*
Fair St (CR 60) and NYS Route 311	Install Traffic Signal ($250,000)	**High**	*None Identified*
Cornwall Hill Rd (CR 64) and NYS Route 311	None at this Time	n/a	*None Identified*
North Salem Rd (CR 55) and Fields Lane	None at this Time	Low	*Single Lane Roundabout ($3.38M)*
Milltown Rd (CR 54) and Gage Rd	None at this Time	Low	*Single Lane Roundabout ($2.78M)*
Peekskill Hollow Rd (CR 21) and Bryant Pond Rd	Install Speed Feedback Sign on Northbound Approach ($6,000)	Low	*None Identified*
Baldwin Place Rd (CR 37) and Myrtle Ave (CR 71)	Install "Stop Ahead" Signing on Myrtle Ave and Flashing Beacon on Southbound Curve Warning Sign. ($7,500)	**Medium**	*Single Lane Roundabout ($2.89M)*

APPENDIX A
Fishkill Road (CR 10)
at NY Route 301

SUMMARY OF ANALYSIS
FISHKILL RD (CR 10) @ NYS ROUTE 301

Existing Conditions:

The existing intersection has three approaches and a 1-way fourth leg that is offset 50' to the east and leads away from the intersection. Fishkill Rd (CR 10) approaches from the northeast and is stop sign controlled. This roadway curves near the intersection to form a southbound approach. NYS Route 301 generally travels east-west and is uncontrolled at the intersection. All approaches are single lane entering the intersection and all lanes are 11' wide. Paved shoulders vary in width but are generally 2'-3' wide. There is a small residential driveway across from Fishkill Rd and no pedestrian accommodations at the intersection.

The posted speed limit is 30 mph on all roadways at this location. Speed measurements were performed along NYS Route 301 and the 85th percentile speeds were determined to be 42 mph both eastbound and westbound.

Available sight distance on the Fishkill Rd approach is 550' when looking to the left and more than 1000' when looking to the right. These sight distances meet both the stopping and intersection sight distance requirements for a 45-mph design speed.

The analysis shows that all movements operate at LOS B or better in both the AM and PM peak hours. As such, there does not appear to be any vehicular delay or capacity issues at the intersection.

Signal/Lane Warrant Analysis:

A review of the hourly traffic volumes between 7:00 AM to 9:00AM and 4:00PM to 6:00 PM show that Warrant 1 (8-hour warrant) is satisfied for all 4 hours reviewed and may be satisfied if more data were available. Warrant 2 (4-hour warrant) is satisfied with all 4 reviewed hours meeting criteria. Warrant 3 (peak hour warrant) is not satisfied, though 1 of the 4 hours reviewed does meet the volume threshold for Warrant 3, but the delay at this location is too low to justify a signal under this warrant. Warrant 7 (crash experience) is not satisfied, as none of the crash criteria were met.

However, it should be noted that the traffic signal warrant analysis performed assumes that all approaches are single lane and that the right turn traffic on Fishkill Rd cannot move past stopped left turn vehicles. This approach has a high number of right turn vehicles and if they could move without impedance by other stopped vehicles, these right turn vehicles would be removed from the signal warrant analysis, per the standard methodology, and a traffic signal would not be warranted.

In addition to the traffic signal warrants, left turn lane and right turn lane warrants were reviewed for the intersection. Based on the existing traffic volumes, both an eastbound left turn lane and southbound right turn lane are warranted. Warranting graphs are located later in this appendix.

Safety Analysis:

Based on the NYSDOT Clear Safety System, the Potential for Safety Improvement (PSI) for this intersection is 0.90 overall and -0.01 for serious injury/fatality crashes. These factors indicate there is potential for safety improvement, with PSI>0.0, but the potential for serious injury crashes is not above that of similar facilities. The crash rate for this intersection was calculated at 1.23 crashes per million entering vehicles (Cr/MEV), which is 3.7 times the statewide average of 0.33 Cr/MEV for similar intersections, so a more detailed look at crashes is warranted.

A review of the crash history revealed 11 crashes occurring in the 4-year period studied. Of those crashes, more than 60% were rear end, where oncoming vehicles ran into stopped vehicles waiting to turn. There were only 3 crashes were vehicles in conflicting directions collided. Based on the crash types at this location, the addition of turn lanes may help reduce the number of crashes. Given that most of the crashes are rear end, which are typically exacerbated by signalization, the introduction of a traffic signal has the potential to increase crashes at this intersection.

A summary of the crash types and severity are shown in the table below:

CRASH SUMMARY

Crash Type	Number of Occurrences	Crash Severity	Number of Occurrences
Right Angle	1	Fatality	0
Right Turn	1	Personal Injury	3
Left Turn	1	Property Damage Only	8
Rear End	7		
Overtaking	1		
	11		11

Field Condition and Right of Way Review:

This intersection is surrounded by residential properties and a small country plaza featuring desserts and an ice cream stand on the south side of the intersection. The limited space, proximity of the buildings, and utility conflicts would not be conducive to the installation of a roundabout. However, there is sufficient room at the corner to construct a southbound turn lane with some minor utility relocations. Although there is sufficient width to construct a left turn lane on NYS Route 301. An improvement of that nature would have extensive utility impacts, would reduce on-street parking, and would bring the roadway even closer to the roadside buildings, which are as close as 20' off the travelway in the existing condition.

Right-of-way is very wide at the intersection, based on tax map data, and goes reasonably close to the building faces. There appears to be enough right-of-way to construct turn lanes at the intersection, but not enough to construct a roundabout.

Design Alternative Consideration:

As stated above, a traffic signal is warranted, but only if turn lanes were not considered. In addition, a traffic signal could increase the rear end crashes, which are the predominant crash type at this intersection. Furthermore, a roundabout would not be reasonable at this location because of the proximity of the buildings near the intersection.

Based on the analysis and intersection traffic needs, the best improvement alternative would be he construction of a short right turn lane on the southbound approach of Fishkill Rd. This improvement can be made within the existing right-of-way with minimal conflicts. The installation of this lane is recommended, and a concept sketch of the improvement is located later in this appendix.

Another improvement to consider would be the construction of an eastbound left turn lane along NYS Route 301. This lane has the potential to reduce the number of rear end crashes on that approach and could be constructed within the right-of-way, but would impact utilities, on-street parking, and would bring the roadway closer to the adjacent building faces, which could be detrimental to the character of the area. A concept sketch for this alternative has been provided, but because of the potential impacts, is not recommended at this time. If rear end crashes become more of an issue in the future, it could be considered.

In both cases, level of service changes only minimally and operations remain at LOS B or better, just as in the existing condition.

Conceptual Cost Estimate:

Based on our experience with similar projects, knowledge of construction pricing in this region of New York State and our understanding of the issues, it is estimated that the southbound right turn lane would cost approximately $100,000 and the eastbound left turn lane would cost approximately $450,000. These costs include construction of all improvements including the costs for design and inspection. A breakdown of the cost items is included later in this appendix.

Summary & Conclusion:

The existing levels of service are more than acceptable at this intersection and sight distance appears adequate, but the crash history indicates an issue with rear end collisions. Although a signal warrant is satisfied, assuming all single lane approaches, a signal could worsen this rear end crash issue, so it is not recommended. At this time, it is recommended that a southbound right turn lane be added to the Fishkill Rd, and that an eastbound left turn lane be considered in the future if a rear end problem on that approach persists.

The intersection evaluation worksheet summarizing the lane geometry and traffic operations, traffic volume data sheets, traffic signal warrant analysis sheets, crash summary sheets, capacity analysis worksheets, cost estimate breakdown and concept sketches for this intersection can be found on the following pages in this appendix.

INTERSECTION EVALUATION WORKSHEET

Project:	Putnam County Intersection Improvements
Location:	Putnam County (Various Locations)
Intersection:	Fishkill Rd (CR 10) at State Route 301
GPS Coord.:	41.42769, -73.93995
Traffic Control:	Stop Sign (SB)

Traffic Control Notes (if applicable):

None

Other Intersection Notes (if applicable):

No Pedestrian Crossings.
Healy Road is one-way out of intersection.

APPROACH DATA

	Healy Rd			Fishkill Rd (CR 10)			SR 301			SR 301		
	Northbound			**Southbound**			**Eastbound**			**Westbound**		
	Left	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
Lane Assignments:					<-1->			<-1			1->	
Lane Widths:					11'			11'			11'	
Turn Bay Lengths:					-			-			-	
Speed Limits:					30 mph			30 mph			30 mph	

TRAFFIC COUNT DATA

AM Peak Hour	Time Period:		7:15	to	8:15					Date Counted:		10/6/2022
Volume:				4	0	234	124	123	3	0	184	2
Truck %:				2%	2%	2%	4%	4%	4%	5%	5%	5%
Peds (Bikes):					0 (0)			0 (0)			0 (0)	
PHF = 0.81												
PM Peak Hour	Time Period:		4:00	to	5:00					Date Counted:		10/6/2022
Volume:				3	0	208	193	228	6	0	224	4
Truck %:				2%	2%	2%	2%	2%	2%	2%	2%	2%
Peds (Bikes):					0 (0)			0 (0)			0 (0)	
PHF = 0.89												

EXISTING CONDITION LEVEL OF SERVICE

AM Peak Delay (s):				12.2			8.1					
LOS:				B			A					
v/c:				0.37			0.12					
95% Queue:				43'			< 25'					
A (5.8) Overall				**B (12.2)**			**A (4.0)**					
PM Peak Delay (s):				11.9			8.3					
LOS:				B			A					
v/c:				0.31			0.17					
95% Queue:				33'			< 25'					
A (4.7) Overall				**B (11.9)**			**A (3.7)**					

Note: LOS calculated using HCM 6 methodologies. For unsignalized intersections, only side street approach delay and mainline left turn delay is shown. The HCM 6 methodology assumes zero delay for all other movements.

INTERSECTION EVALUATION WORKSHEET

INTERSECTION SAFETY

Travel Speeds	Direction:	Eastbound	Westbound	
	Average Speed:	38.1	37.0	
	85th Percentile:	42.0	42.7	
Sight Distance	Approach:	Southbound		
	Looking Left:	550'		
	Looking Right:	1,000'+		
	Summary:	Sight distance meets the required stopping sight distance and recommended intersection sight distance in both directions.		

Crashes	From:	12/31/2019	To:	12/31/2023	No. of Months:	48						
	No. of Crashes:	11	PDO:	8	PI:	3	PI (A):	0	K:	0		
	Crash Rate:	1.23 Cr/MEV			Above/Below Statewide Average:			3.71 Times				

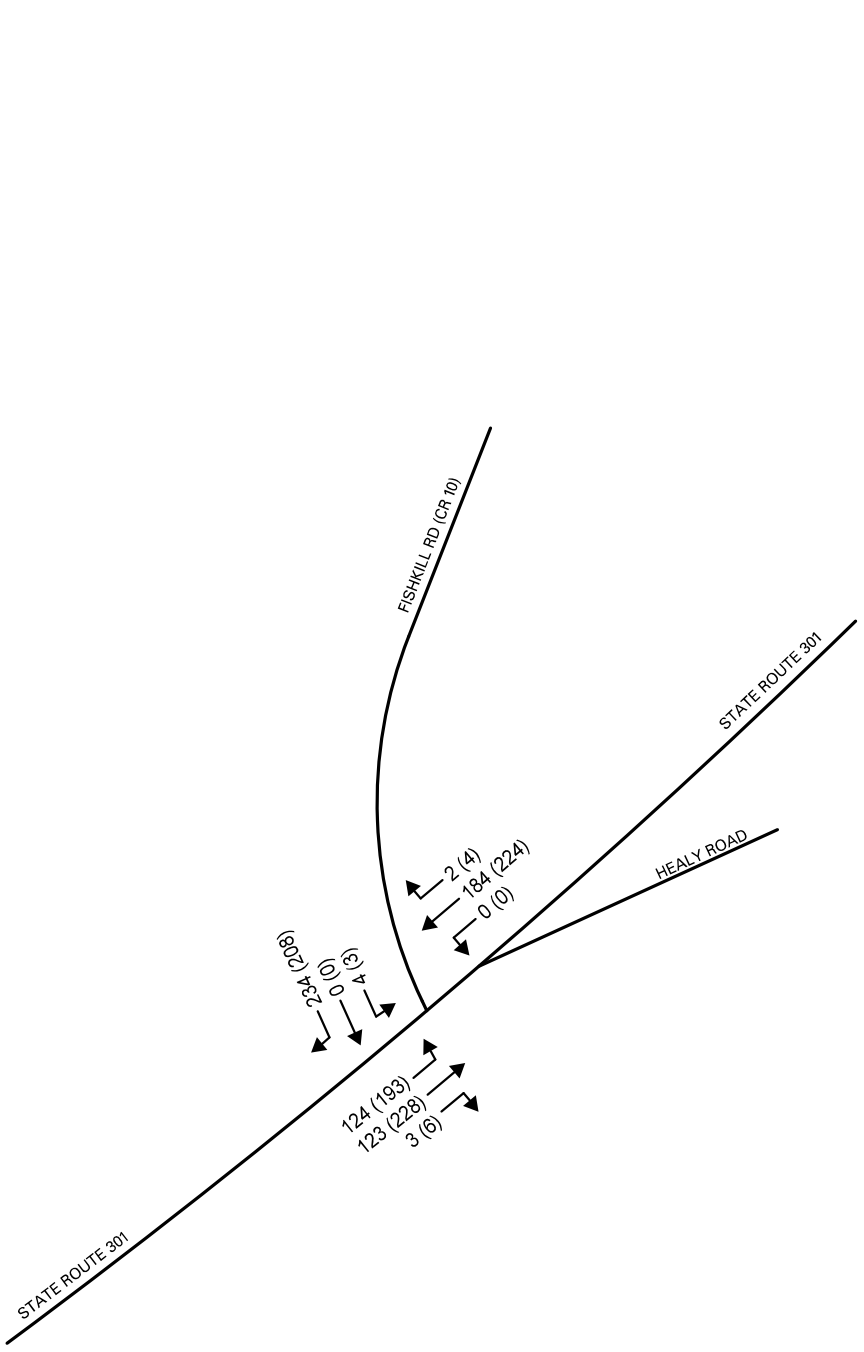
PSI Factors	PSI (KA):	-0.01
	PSI (Tot):	0.90

BUILD ALTERNATIVE #1 - LEVEL OF SERVICE

	Healy Rd			Fishkill Rd (CR 10)			SR 301			SR 301		
	Northbound			**Southbound**			**Eastbound**			**Westbound**		
	Left	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
Description of Improvements:	Add southbound right turn lane											
AM Peak Delay (s):				15.1	11.9		8.1					
LOS:				C	B		A					
v/c:				0.01	0.36		0.12					
95% Queue:				< 25'	40'		< 25'					
A (5.7) Overall				**B (12.0)**			**A (4.0)**					
PM Peak Delay (s):				20.7	11.5		8.3					
LOS:				C	B		A					
v/c:				0.01	0.30		0.17					
95% Queue:				< 25'	30'		< 25'					
A (4.7) Overall				**B (11.6)**			**A (3.7)**					

BUILD ALTERNATIVE #2 - LEVEL OF SERVICE

Description of Improvements:	Add eastbound left turn lane (75' storage + 75' taper)											
AM Peak Delay (s):				12.2			8.1					
LOS:				B			A					
v/c:				0.37			0.12					
95% Queue:				43'			< 25'					
A (5.8) Overall				**B (12.2)**			**A (4.0)**					
PM Peak Delay (s):				11.9			8.3					
LOS:				B			A					
v/c:				0.31			0.17					
95% Queue:				33'			< 25'					
A (4.7) Overall				**B (11.9)**			**A (3.7)**					



KEY:

XXX (XXX) = AM (PM) PEAK HOUR TRAFFIC VOLUMES

GPI Engineering Design Planning Construction Inspection

PUTNAM COUNTY
INTERSECTION IMPROVEMENTS
PUTNAM COUNTY, NEW YORK

STATE ROUTE 301 AT FISHKILL RD (CR 10)
PEAK HOUR TRAFFIC VOLUMES

SCALE:	DATE:	FIGURE NO.
NO SCALE	JUNE 2024	A-1

Study Name	6. FISHKILL RD & 301
Start Date	Thursday, October 06, 2022 7:00 AM
End Date	Thursday, October 06, 2022 6:00 PM
Site Code	

Report Summary

		Southbound						Westbound						Northbound						Eastbound								Crosswalk		
Time Period	**Class.**	**L**	**T**	**R**	**U**	**I**	**O**	**L**	**T**	**R**	**U**	**I**	**O**	**L**	**T**	**R**	**U**	**I**	**O**	**L**	**T**	**R**	**U**	**I**	**O**	**Total**		**Bikes**	**Peds**	**Total**
Peak 1	Motorcycles	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	SB	0	0	0
Specified Period	%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		0%	0%	
7:00 AM - 9:00 AM	Cars	4	0	201	0	205	104	0	156	2	0	158	106	0	0	0	0	0	1	102	102	1	0	205	357	568	WB	0	0	0
One Hour Peak	%	100%	0%	86%	0%	86%	83%	0%	85%	100%	0%	85%	83%	0%	0%	0%	0%	0%	33%	82%	83%	33%	0%	82%	85%	84%		0%	0%	
7:15 AM - 8:15 AM	ıt Goods Vehi	0	0	28	0	28	19	0	19	0	0	19	14	0	0	0	0	0	2	19	14	2	0	35	47	82	NB	0	0	0
	%	0%	0%	12%	0%	12%	15%	0%	10%	0%	0%	10%	11%	0%	0%	0%	0%	0%	67%	15%	11%	67%	0%	14%	11%	12%		0%	0%	
	Buses	0	0	4	0	4	3	0	1	0	0	1	3	0	0	0	0	0	0	3	3	0	0	6	5	11	EB	0	0	0
	%	0%	0%	2%	0%	2%	2%	0%	1%	0%	0%	1%	2%	0%	0%	0%	0%	0%	0%	2%	2%	0%	0%	2%	1%	2%		0%	0%	
	ıgle-Unit Truc	0	0	1	0	1	0	0	6	0	0	6	4	0	0	0	0	0	0	0	4	0	0	4	7	11		**0**	**0**	**0**
	%	0%	0%	0%	0%	0%	0%	0%	3%	0%	0%	3%	3%	0%	0%	0%	0%	0%	0%	0%	3%	0%	0%	2%	2%	2%				
	ticulated Truc	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1				
	%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				
	icycles on Roa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				
	Total	**4**	**0**	**234**	**0**	**238**	**126**	**0**	**184**	**2**	**0**	**186**	**127**	**0**	**0**	**0**	**0**	**0**	**3**	**124**	**123**	**3**	**0**	**250**	**418**	**674**				
	PHF	0.5	0	0.75	0	0.76	0.93	0	0.7	0.5	0	0.69	0.86	0	0	0	0	0	0.38	0.94	0.88	0.38	0	0.92	0.73	0.81				
	Approach %					35%	19%					28%	19%					0%	0%					37%	62%					
Peak 2	Motorcycles	0	0	3	0	3	0	0	4	0	0	4	1	0	0	0	0	0	0	0	1	0	0	1	7	8	SB	0	0	0
Specified Period	%	0%	0%	1%	0%	1%	0%	0%	2%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	1%		0%	0%	
4:00 PM - 6:00 PM	Cars	3	0	183	0	186	173	0	200	4	0	204	195	0	0	0	0	0	5	169	192	5	0	366	383	756	WB	0	0	0
One Hour Peak	%	100%	0%	88%	0%	88%	88%	0%	89%	100%	0%	89%	84%	0%	0%	0%	0%	0%	83%	88%	84%	83%	0%	86%	89%	87%		0%	0%	
4:00 PM - 5:00 PM	ıt Goods Vehi	0	0	19	0	19	22	0	15	0	0	15	30	0	0	0	0	0	1	22	30	1	0	53	34	87	NB	0	1	1
	%	0%	0%	9%	0%	9%	11%	0%	7%	0%	0%	7%	13%	0%	0%	0%	0%	0%	17%	11%	13%	17%	0%	12%	8%	10%		0%	100%	
	Buses	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	EB	0	0	0
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		0%	0%	
	ıgle-Unit Truc	0	0	1	0	1	2	0	2	0	0	2	4	0	0	0	0	0	0	2	4	0	0	6	3	9		**0**	**1**	**1**
	%	0%	0%	0%	0%	0%	1%	0%	1%	0%	0%	1%	2%	0%	0%	0%	0%	0%	0%	1%	2%	0%	0%	1%	1%	1%				
	ticulated Truc	0	0	1	0	1	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	3	3				
	%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%				
	icycles on Roa	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	1	0	0	1	1	2				
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				
	Total	**3**	**0**	**208**	**0**	**211**	**197**	**0**	**224**	**4**	**0**	**228**	**231**	**0**	**0**	**0**	**0**	**0**	**6**	**193**	**228**	**6**	**0**	**427**	**432**	**866**				
	PHF	0.38	0	0.9	0	0.88	0.86	0	0.86	0.5	0	0.88	0.84	0	0	0	0	0	0.5	0.88	0.83	0.5	0	0.9	0.89	0.89				
	Approach %					24%	23%					26%	27%					0%	1%					49%	50%					

Study Name 6. FISHKILL RD & 301
Start Date 10-06-2022
Start Time 7:00 AM
Site Code

	FISHKILL RD Southbound				ROUTE 301 Westbound				HEALY RD Northbound				ROUTE 301 Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
7:00 AM	0	0	30	0	0	30	0	0	0	0	0	0	17	24	0	0
7:15 AM	0	0	78	0	0	66	1	0	0	0	0	0	30	33	1	0
7:30 AM	2	0	44	0	0	37	0	0	0	0	0	0	31	35	2	0
7:45 AM	2	0	58	0	0	39	1	0	0	0	0	0	33	25	0	0
8:00 AM	0	0	54	0	0	42	0	0	0	0	0	0	30	30	0	0
8:15 AM	0	0	44	0	0	44	0	0	0	0	0	0	31	38	2	0
8:30 AM	0	0	44	0	0	65	0	0	0	0	0	0	34	47	2	0
8:45 AM	1	0	36	0	0	36	0	0	0	0	0	0	42	42	4	0
4:00 PM	0	0	58	0	0	44	1	0	0	0	0	0	42	69	2	0
4:15 PM	2	0	58	0	0	63	1	0	0	0	0	0	52	65	1	0
4:30 PM	1	0	40	0	0	52	2	0	0	0	0	0	55	44	0	0
4:45 PM	0	0	52	0	0	65	0	0	0	0	0	0	44	50	3	0
5:00 PM	0	2	39	0	1	67	0	0	1	0	0	0	57	46	2	0
5:15 PM	1	0	32	0	1	37	0	0	0	0	0	0	63	46	1	0
5:30 PM	0	0	57	0	0	44	0	0	0	0	0	0	58	33	1	0
5:45 PM	0	1	42	0	0	50	0	0	0	0	0	0	39	35	0	0

Study Name 6. FISHKILL RD & 301
Start Date 10-06-2022
Start Time 7:00 AM
Site Code

	FISHKILL RD Southbound		ROUTE 301 Westbound		HEALY RD Northbound		ROUTE 301 Eastbound	
Start Time	Peds CCW	Peds CW	Peds CCW	Peds CW	Peds CCW	Peds CW	Peds CCW	Peds CW
7:00 AM	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	1	0	0	0
8:30 AM	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	1	0	0	0
5:00 PM	0	0	0	0	0	0	0	4
5:15 PM	0	0	0	0	2	0	0	0
5:30 PM	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0

TRAFFIC SIGNAL WARRANT SUMMARY

Project: Putnam County Intersection Improvements
Condition: Existing Condition
Location: Village of Philipstown
Date: October 6th, 2022

Major Street: SR 301 Lanes: 1 Critical Approach Speed: 45 mph
Minor Street: Fishkill Road (CR 10) Lanes: 1

Volume Level Criteria

1. Is the critical speed of major street traffic greater than 40 mph? Yes
2. Is the intersection in a built-up area of an isolated community with population less than 10,000? No

If either Question 1 or Question 2 is answered "Yes", then use the 70% volume level. Criteria used: 70%

WARRANT 1 - EIGHT HOUR VEHICULAR VOLUME **Warrant 1 Satisfied:** -

Warrant 1 is satisfied if EITHER Condition A OR Condition B is 100% satisfied.
Warrant 1 is also satisfied if BOTH Condition A AND Condition B are satisfied to the 80% volume level.

			Condition 1A - Minimum Vehicular Volume (X indicates that criteria is met for specified condition)				Condition 1B - Interuption of Continuous Traffic (X indicates that criteria is met for specified condition)				Total Satisfied Hours (8 required)		
											4	2	3
Minimum Volume Criteria:			350	105	280	84	525	53	420	42	Condition 1A Satisfied	Condition 1B Satisfied	80% for Both Satisfied
Start Time	Major St. Volume[1]	Minor St. Volume[2]	Major St. 100%	Minor St. 100%	Major St. 80%	Minor St. 80%	Major St. 100%	Minor St. 100%	Major St. 80%	Minor St. 80%			
12:00 AM			-	-	-	-	-	-	-	-	-	-	-
1:00 AM			-	-	-	-	-	-	-	-	-	-	-
2:00 AM			-	-	-	-	-	-	-	-	-	-	-
3:00 AM			-	-	-	-	-	-	-	-	-	-	-
4:00 AM			-	-	-	-	-	-	-	-	-	-	-
5:00 AM			-	-	-	-	-	-	-	-	-	-	-
6:00 AM			-	-	-	-	-	-	-	-	-	-	-
7:00 AM	405	214	X	X	X	X	-	X	-	X	1	-	-
8:00 AM	489	179	X	X	X	X	-	X	X	X	1	-	1
9:00 AM			-	-	-	-	-	-	-	-	-	-	-
10:00 AM			-	-	-	-	-	-	-	-	-	-	-
11:00 AM			-	-	-	-	-	-	-	-	-	-	-
12:00 PM			-	-	-	-	-	-	-	-	-	-	-
1:00 PM			-	-	-	-	-	-	-	-	-	-	-
2:00 PM			-	-	-	-	-	-	-	-	-	-	-
3:00 PM			-	-	-	-	-	-	-	-	-	-	-
4:00 PM	655	211	X	X	X	X	X	X	X	X	1	1	1
5:00 PM	581	174	X	X	X	X	X	X	X	X	1	1	1
6:00 PM			-	-	-	-	-	-	-	-	-	-	-
7:00 PM			-	-	-	-	-	-	-	-	-	-	-
8:00 PM			-	-	-	-	-	-	-	-	-	-	-
9:00 PM			-	-	-	-	-	-	-	-	-	-	-
10:00 PM			-	-	-	-	-	-	-	-	-	-	-
11:00 PM			-	-	-	-	-	-	-	-	-	-	-

[1] Major Street Volume is the total combined volume of both mainline approaches.

[2] Minor Street volumes is the highest single side street approach volume.

WARRANT 2 - FOUR HOUR VEHICULAR VOLUME **Warrant 2 Satisfied:** YES

Warrant is satisfied if four (4) or more hours satisfy the volume requirements depicted on the four hour warranting graph **(see page 2)**. No. of Points Above Criteria Curve: 4

WARRANT 3 - PEAK HOUR VEHICULAR VOLUME **Warrant 3 Satisfied:** NO

Warrant is satisfied if any hour satisfy the volume requirements depicted on the peak hour warranting graph **(see page 3)**, and ALL three of the following requirement are met. No. of Points Above Criteria Curve: 1

1. Total stopped time delay on Minor Street equals or exceeds 4 VHD (single lane) or 5 VHD (two lanes): 0.7 VHD Max. No
2. Volume on Minor Street equals or exceeds 100 vehicles (single lane) or 150 vehicles (two lanes): Yes
3. Total intersection volume serviced during the hour equals or exceeds 650 veh. (3-leg) or 800 veh. (4-leg or more): Yes

Criteria Source: Manual on Uniform Traffic Control Devices, 2023

TRAFFIC SIGNAL WARRANT SUMMARY

Project: Putnam County Intersection Improvements
Condition: Existing Condition
Location: Village of Philipstown
Date: October 6th, 2022

Major Street: SR 301 Lanes: 1 Critical Approach Speed: 45 mph
Minor Street: Fishkill Road (CR 10) Lanes: 1

WARRANT 7 - CRASH EXPERIENCE

Warrant 7 Satisfied: NO

1. Maximum number of angle[3] and pedestrian crashes in a one year period:	1
2. Maximum number of fatal-and-injury angle and pedestrian crashes in a one year period:	0
3. Maximum number of angle and pedestrian crashes in a three year period:	2
4. Maximum number of fatal-and-injury angle and pedestrian crashes in a three year period:	0

[3] Angle crashes include all crashes that occur at an angle and involve one or more vehicles on the major street and one or more vehicles on the minor street.

Warrant 7 is satisfied if **ANY** of the following criteria are met:

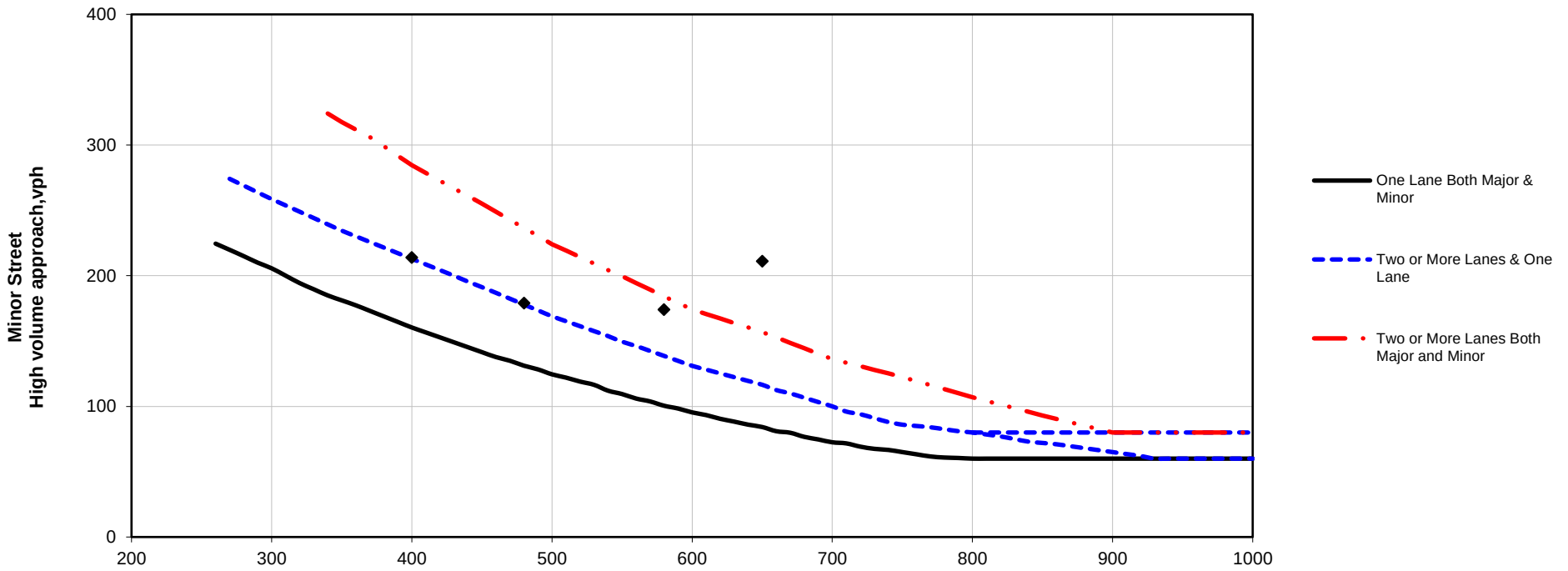
1. Are there more than 3 angle crashes in a one year period:	No
2. Are there more than 3 fatal-and-injury crashes in a one year period:	No
3. Are there more than 4 crashes in a three year period:	No
4. Are there more than 4 fatal-and-injury crashes in a three year period:	No

AND ANY of the following criteria are also met:

1. Are the VPH for **BOTH** 80% columns of Condition 1A satisfied for each of any 8 hrs:	-
2. Are the VPH for **BOTH** 80% columns of Condition 1B satisfied for each of any 8 hrs:	-

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)

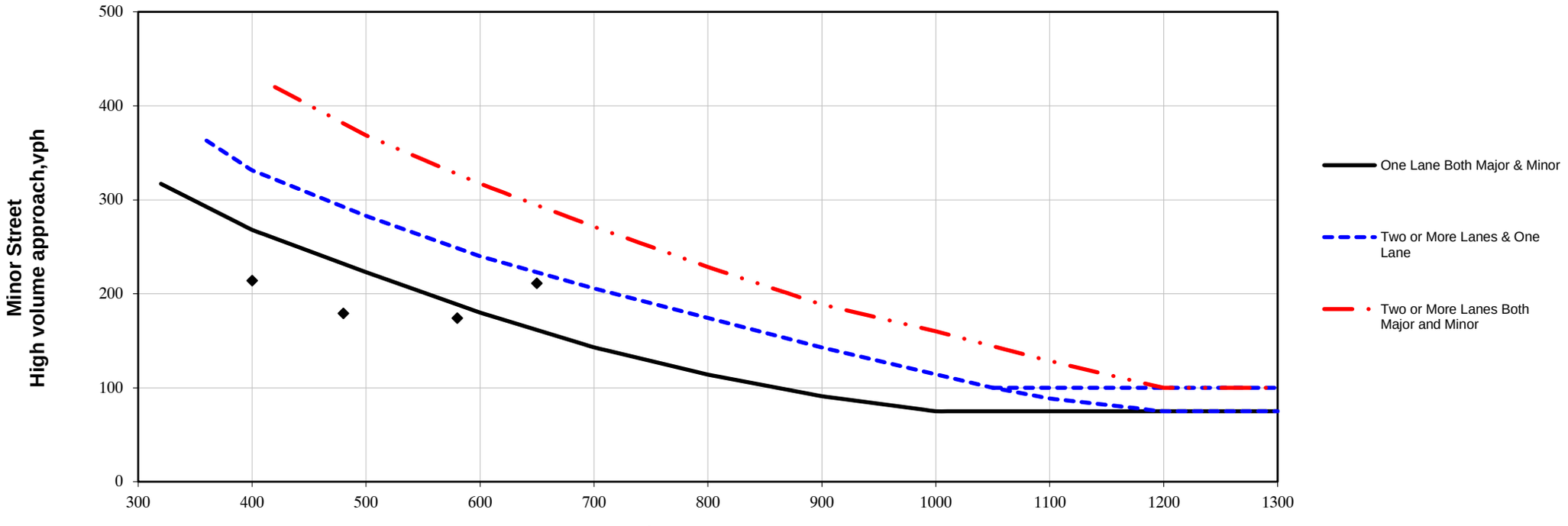
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 70 km/h (40 mph) ON MAJOR STREET)



Note: Points on graph represent hourly volumes. Points above the respective curve satisfy warrant, points below do not satisfy warrant.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 70 km/h (40 mph) ON MAJOR STREET)



Major Street
Total volume of both approaches, vph

Note: Points on graph represent hourly volumes. Points above the respective curve satisfy warrant, points below do not satisfy warrant.

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

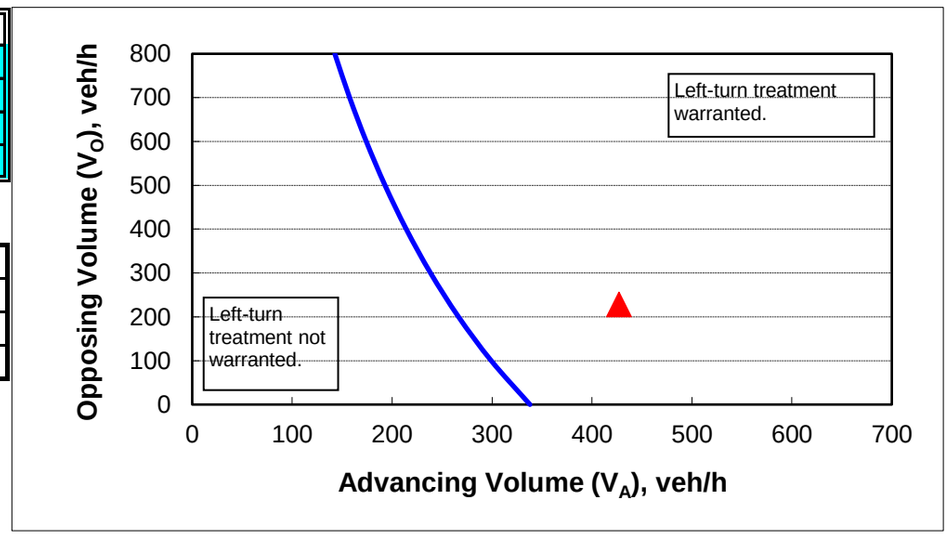
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	43
Percent of left-turns in advancing volume (V_A), %:	45%
Advancing volume (V_A), veh/h:	427
Opposing volume (V_O), veh/h:	228

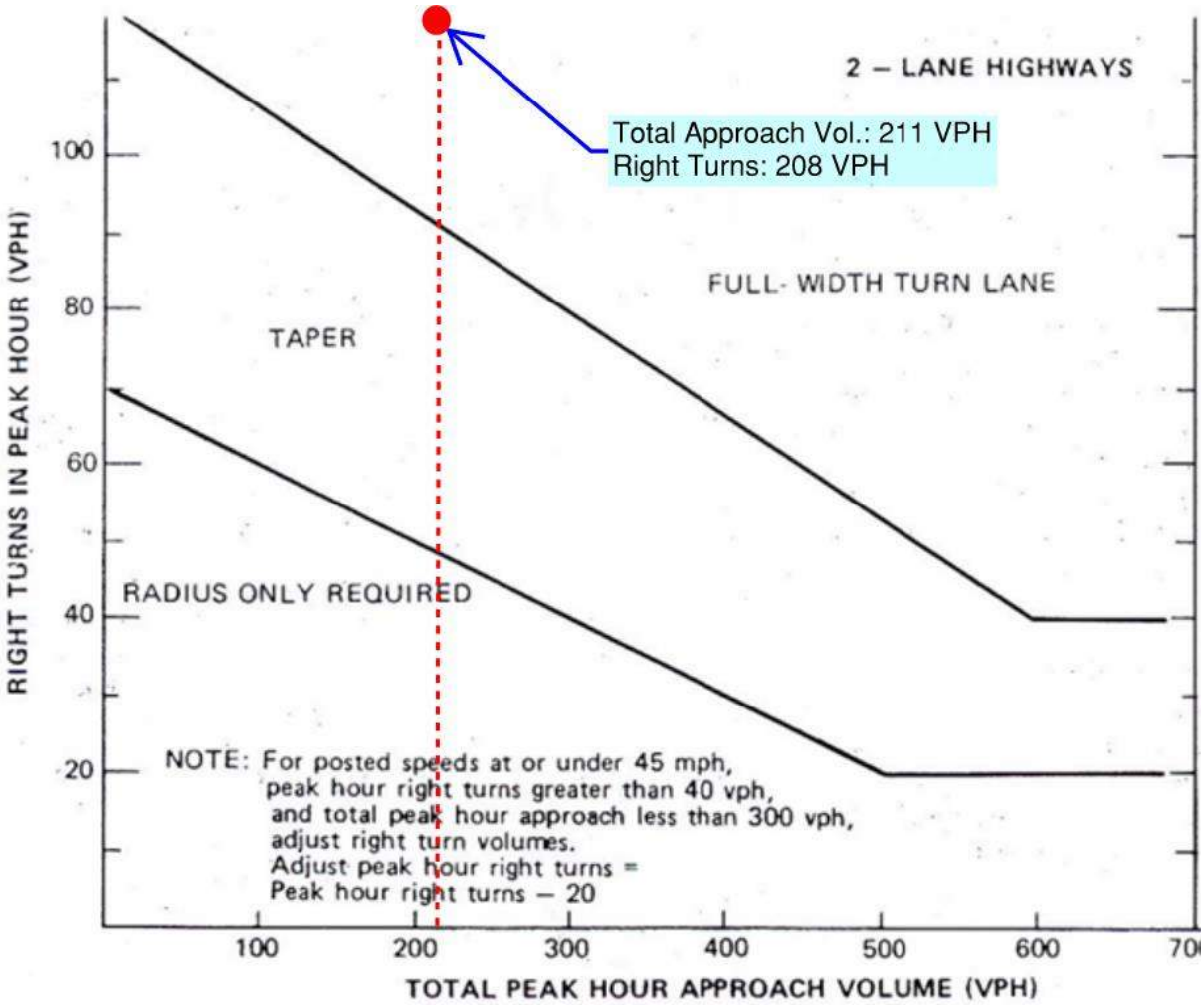
OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	258
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9


2 – LANE HIGHWAYS
Total Approach Vol.: 211 VPH
Right Turns: 208 VPH
FULL- WIDTH TURN LANE
TAPER
RADIUS ONLY REQUIRED
NOTE: For posted speeds at or under 45 mph, peak hour right turns greater than 40 vph, and total peak hour approach less than 300 vph, adjust right turn volumes.
Adjust peak hour right turns = Peak hour right turns – 20
RIGHT TURNS IN PEAK HOUR (VPH)
100
80
60
40
20
100
200
300
400
500
600
TOTAL PEAK HOUR APPROACH VOLUME (VPH)

NYS Route 301 - Speed Study

Eastbound	
Date:	7/20/2023
Time:	1:00 PM
Trial	Speed*
1	40
2	36
3	37
4	36
5	39
6	39
7	37
8	47
9	44
10	36
11	42
12	39
13	37
14	41
15	39
16	38
17	32
18	35
19	33
20	35
21	47
22	43
23	40
24	39
25	33
26	37
27	34
28	31
29	36
30	42
Avg.	**38.1**

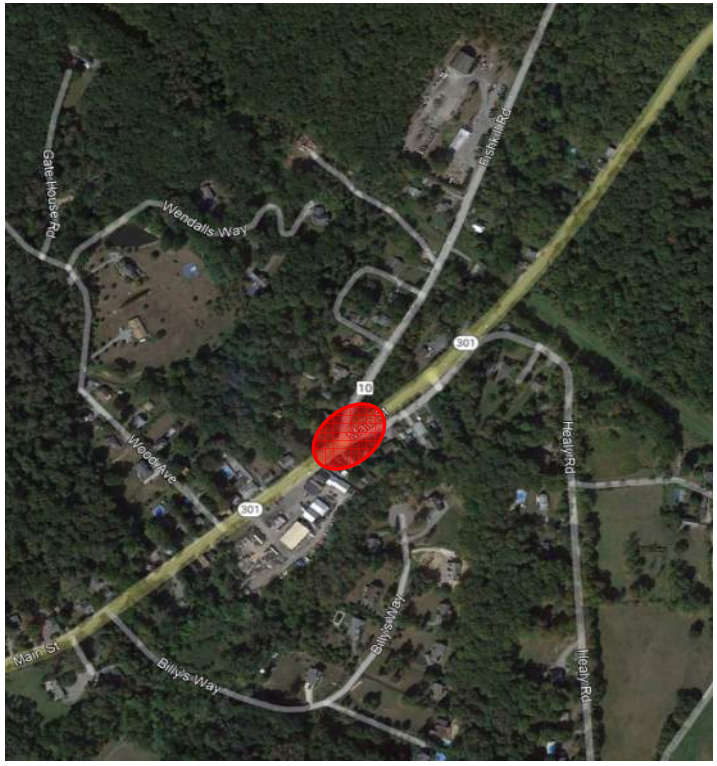
Westbound	
Date:	7/20/2023
Time:	1:00 PM
Trial	Speed*
1	30
2	45
3	33
4	30
5	31
6	34
7	35
8	36
9	31
10	36
11	33
12	49
13	32
14	43
15	41
16	43
17	41
18	35
19	39
20	31
21	42
22	39
23	39
24	31
25	40
26	44
27	39
28	34
29	42
30	33
Avg.	**37.0**

NYS Route 301 at
Fishkill Rd (CR 10)
Philipstown, New York

Posted Speed Limit: 30 MPH

85th Percentile Speeds		
EB		**WB**
42.0		**42.7**

Location Map



* - Denotes speed measured at proposed access location with vehicles traveling under free flow conditions, in MPH

Sight Distance Summary Fishkill (CR 10) at SR 301						
Location	**Side Street Turn Movement**	**Direction**	**Available Sight Distance**	**Design Speed (mph)**	**Required Stopping Sight Distance[1]**	**Recommended Intersection Sight Distance[1]**
Southbound Fishkill (CR 10) at SR 301	Right Turn	Looking Left (East)	550'	45	360'	430'
	Left Turn	Looking Left (East)	550'	45	360'	500'
		Looking Right (West)	1,000'+	45	360'	500'

[1] Recommended minimum sight distance values from AASHTO's *A Policy on Geometric Design of Highways and Streets* , 7th Edition and the NYSDOT's *Highway Design Manual* . The recommended values are based on the current free flow travel speeds of the roadway.

COUNTY: PUTNAM P.I.N.:

VILLAGE OF NELSONVILLE

ROUTE NO. OR STREET NAME: FISHKILL RD (CR 10)

AT INTERSECTION WITH/OR BETWEEN: STATE ROUTE 301

GPI
Engineering | Design | Planning | Construction Management

TIME PERIOD: FROM: 12/31/2019 TO: 12/31/2023

No. OF MONTHS: 48

ENVIRONMENTAL: Use Codes from MV 104 (shown at right) for these categories

Light Conditions:
1. Daylight
2. Dawn
3. Dusk
4. Dark Road Lighted
5. Dark Road Unlighted

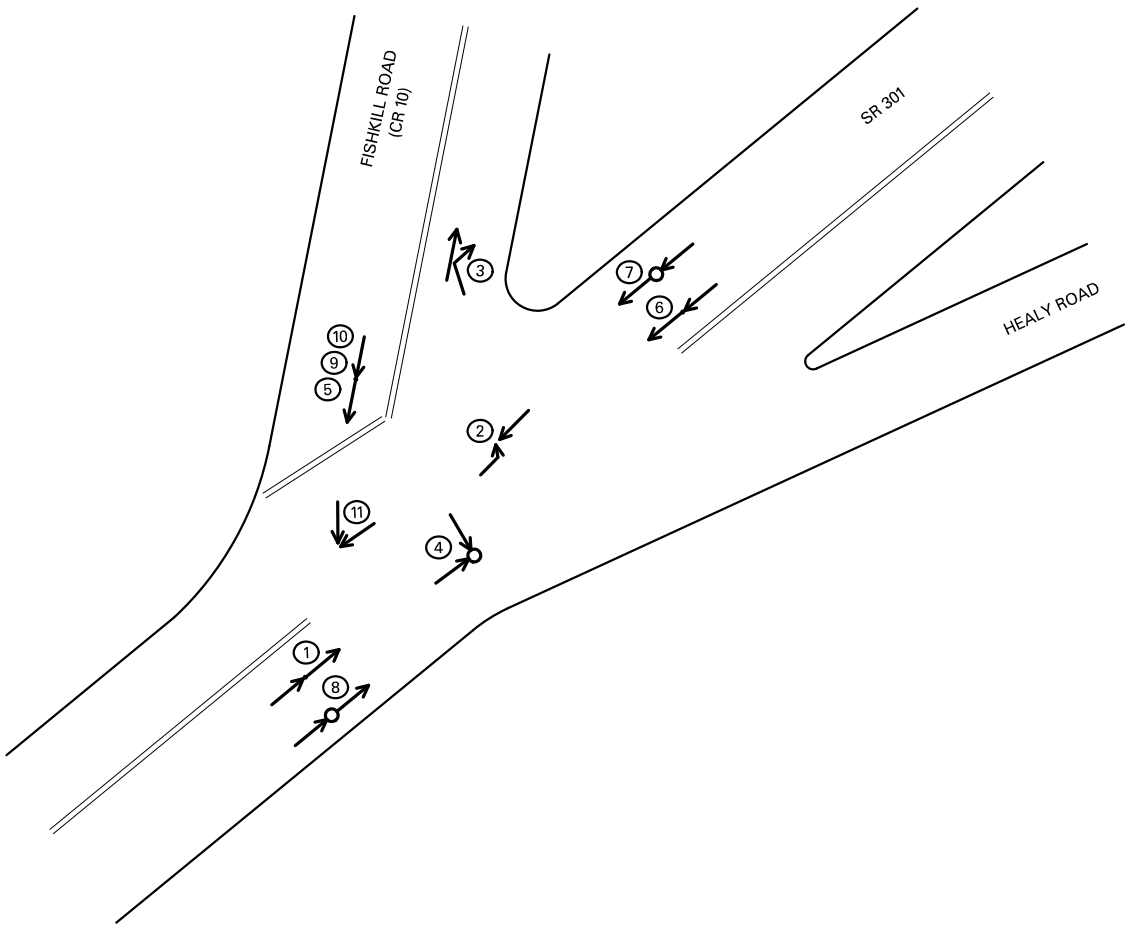
Roadway Character:
1. Straight & Level
2. Straight & Grade
3. Straight & Hillcrest
4. Curve & Level
5. Curve & Grade
6. Curve & Hillcrest

Roadway Surface Condition:
1. Dry
2. Wet
3. Muddy
4. Snow/Ice
5. Slush
10. Other

Weather:
1. Clear
2. Cloudy
3. Rain
4. Snow
5. Sleet/Hail/Freezing Rain
6. Fog/Smog/Smoke
10. Other

[1]Use Codes from MV 104 Police Report

ACCIDENT No.	DATE	TIME	No. of VEHICLES	SEVERITY	LIGHT CONDITIONS	ROADWAY CHARACTER	ROADWAY SURFACE CONDITION	WEATHER	APPARENT CONTRIBUTING FACTORS	DIRECTION	TYPE[1]	DESCRIPTION	CASE NO.
1	11/19/20	15:45	2	PI	1	1	1	1	FOLLOWING TOO CLOSELY	EAST/EAST	1	REAR END	38653737
2	09/30/20	15:30	2	PDO	1	1	1	1	FAILURE TO YIELD RIGHT OF WAY	EAST/WEST	1	LEFT TURN	38708730
3	03/24/21	12:16	2	PDO	1	2	2	3	FOLLOWING TOO CLOSELY	EAST/EAST	1	OVERTAKING	38796852
4	10/14/21	14:25	2	PI	1	2	1	1	VIEW OBSTURCTED/LIMITED	EAST/SOUTH	1	RIGHT ANGLE	39058150
5	06/09/22	7:30	2	PDO	1	1	2	2	FOLLOWING TOO CLOSELY	SOUTH/SOUTH	1	REAR END	39380876
6	06/25/22	13:24	2	PI	1	2	1	1	UNSAFE SPEED	WEST/WEST	1	REAR END	39402973
7	08/11/22	10:56	2	PDO	1	2	1	1	GLARE	WEST/WEST	1	REAR END	39465382
8	10/12/22	13:08	2	PDO	1	1	1	1	UNSAFE SPEED	EAST/EAST	1	REAR END	39544213
9	04/19/23	7:53	2	PDO	1	2	1	1	FOLLOWING TOO CLOSELY	SOUTH/SOUTH	1	REAR END	39797439
10	07/05/23	14:33	2	PDO	1	2	1	1	DRIVER INATTENTION	SOUTH/SOUTH	1	REAR END	39917668
11	10/24/23	16:06	2	PDO	1	1	1	1	VIEW OBSTURCTED/LIMITED	SOUTH/WEST	1	RIGHT TURN	40047444



LEGEND

- REAR END
- LEFT TURN
- PERSONAL INJURY
- RIGHT ANGLE
- (#) CRASH NUMBER
- SIDESWIPE

NOTE:
CRASH NUMBERS CORRELATE TO NUMBERS FOUND ON CRASH DATA SHEETS. SEE CRASH DATA SHEETS FOR ADDITIONAL CRASH INFORMATION.

GPI Engineering Design Planning Construction Inspection

PUTNAM COUNTY
INTERSECTION IMPROVEMENTS
PUTNAM COUNTY, NEW YORK

STATE ROUTE 301 AT FISHKILL RD (CR 10)
CRASH DIAGRAM

SCALE:	DATE:	FIGURE NO.
NO SCALE	JUNE 2024	A-2

Intersection	
Int Delay, s/veh	5.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Traffic Vol, veh/h	124	123	3	0	184	2	0	0	0	4	0	234
Future Vol, veh/h	124	123	3	0	184	2	0	0	0	4	0	234
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	81	81	81	81	81	81	81	81	81	81	81	81
Heavy Vehicles, %	4	4	4	5	5	5	2	2	2	2	2	2
Mvmt Flow	153	152	4	0	227	2	0	0	0	5	0	289

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	229	0	0	157	0	0	688	691	228
Stage 1	-	-	-	-	-	-	228	228	-
Stage 2	-	-	-	-	-	-	460	463	-
Critical Hdwy	4.14	-	-	4.15	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.236	-	-	2.245	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1327	-	-	1405	-	-	412	368	811
Stage 1	-	-	-	-	-	-	810	715	-
Stage 2	-	-	-	-	-	-	636	564	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1327	-	-	1405	-	-	360	0	811
Mov Cap-2 Maneuver	-	-	-	-	-	-	360	0	-
Stage 1	-	-	-	-	-	-	708	0	-
Stage 2	-	-	-	-	-	-	636	0	-

Approach	EB	WB	SB
HCM Control Delay, s	4	0	12.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1327	-	-	1405	-	-	794
HCM Lane V/C Ratio	0.115	-	-	-	-	-	0.37
HCM Control Delay (s)	8.1	0	-	0	-	-	12.2
HCM Lane LOS	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.4	-	-	0	-	-	1.7

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕						⇕	
Traffic Vol, veh/h	193	228	6	0	224	4	0	0	0	3	0	208
Future Vol, veh/h	193	228	6	0	224	4	0	0	0	3	0	208
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	217	256	7	0	252	4	0	0	0	3	0	234

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	256	0	0	264	0	0	948	952	254
Stage 1	-	-	-	-	-	-	254	254	-
Stage 2	-	-	-	-	-	-	694	698	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1309	-	-	1300	-	-	289	259	785
Stage 1	-	-	-	-	-	-	788	697	-
Stage 2	-	-	-	-	-	-	496	442	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1309	-	-	1300	-	-	233	0	785
Mov Cap-2 Maneuver	-	-	-	-	-	-	233	0	-
Stage 1	-	-	-	-	-	-	635	0	-
Stage 2	-	-	-	-	-	-	496	0	-

Approach	EB	WB	SB
HCM Control Delay, s	3.7	0	11.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1309	-	-	1300	-	-	759
HCM Lane V/C Ratio	0.166	-	-	-	-	-	0.312
HCM Control Delay (s)	8.3	0	-	0	-	-	11.9
HCM Lane LOS	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.6	-	-	0	-	-	1.3

Intersection	
Int Delay, s/veh	5.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕					↰	↕	
Traffic Vol, veh/h	124	123	3	0	184	2	0	0	0	4	0	234
Future Vol, veh/h	124	123	3	0	184	2	0	0	0	4	0	234
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	25	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	81	81	81	81	81	81	81	81	81	81	81	81
Heavy Vehicles, %	4	4	4	5	5	5	2	2	2	2	2	2
Mvmt Flow	153	152	4	0	227	2	0	0	0	5	0	289

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	229	0	0	157	0	0	688	691	228
Stage 1	-	-	-	-	-	-	228	228	-
Stage 2	-	-	-	-	-	-	460	463	-
Critical Hdwy	4.14	-	-	4.15	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.236	-	-	2.245	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1327	-	-	1405	-	-	412	368	811
Stage 1	-	-	-	-	-	-	810	715	-
Stage 2	-	-	-	-	-	-	636	564	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1327	-	-	1405	-	-	360	0	811
Mov Cap-2 Maneuver	-	-	-	-	-	-	360	0	-
Stage 1	-	-	-	-	-	-	708	0	-
Stage 2	-	-	-	-	-	-	636	0	-

Approach	EB	WB	SB
HCM Control Delay, s	4	0	12
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1327	-	-	1405	-	-	360	811
HCM Lane V/C Ratio	0.115	-	-	-	-	-	0.014	0.356
HCM Control Delay (s)	8.1	0	-	0	-	-	15.1	11.9
HCM Lane LOS	A	A	-	A	-	-	C	B
HCM 95th %tile Q(veh)	0.4	-	-	0	-	-	0	1.6

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕					↰	↱	
Traffic Vol, veh/h	193	228	6	0	224	4	0	0	0	3	0	208
Future Vol, veh/h	193	228	6	0	224	4	0	0	0	3	0	208
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	25	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	217	256	7	0	252	4	0	0	0	3	0	234

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	256	0	0	264	0	0	948	952	254
Stage 1	-	-	-	-	-	-	254	254	-
Stage 2	-	-	-	-	-	-	694	698	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1309	-	-	1300	-	-	289	259	785
Stage 1	-	-	-	-	-	-	788	697	-
Stage 2	-	-	-	-	-	-	496	442	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1309	-	-	1300	-	-	233	0	785
Mov Cap-2 Maneuver	-	-	-	-	-	-	233	0	-
Stage 1	-	-	-	-	-	-	635	0	-
Stage 2	-	-	-	-	-	-	496	0	-

Approach	EB	WB	SB
HCM Control Delay, s	3.7	0	11.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1309	-	-	1300	-	-	233	785
HCM Lane V/C Ratio	0.166	-	-	-	-	-	0.014	0.298
HCM Control Delay (s)	8.3	0	-	0	-	-	20.7	11.5
HCM Lane LOS	A	A	-	A	-	-	C	B
HCM 95th %tile Q(veh)	0.6	-	-	0	-	-	0	1.2

Intersection	
Int Delay, s/veh	5.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	124	123	3	0	184	2	0	0	0	4	0	234
Future Vol, veh/h	124	123	3	0	184	2	0	0	0	4	0	234
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	75	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	81	81	81	81	81	81	81	81	81	81	81	81
Heavy Vehicles, %	4	4	4	5	5	5	2	2	2	2	2	2
Mvmt Flow	153	152	4	0	227	2	0	0	0	5	0	289

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	229	0	0	157	0	0	688	691	228
Stage 1	-	-	-	-	-	-	228	228	-
Stage 2	-	-	-	-	-	-	460	463	-
Critical Hdwy	4.14	-	-	4.15	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.236	-	-	2.245	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1327	-	-	1405	-	-	412	368	811
Stage 1	-	-	-	-	-	-	810	715	-
Stage 2	-	-	-	-	-	-	636	564	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1327	-	-	1405	-	-	365	0	811
Mov Cap-2 Maneuver	-	-	-	-	-	-	365	0	-
Stage 1	-	-	-	-	-	-	717	0	-
Stage 2	-	-	-	-	-	-	636	0	-

Approach	EB	WB	SB
HCM Control Delay, s	4	0	12.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1327	-	-	1405	-	-	795
HCM Lane V/C Ratio	0.115	-	-	-	-	-	0.37
HCM Control Delay (s)	8.1	-	-	0	-	-	12.2
HCM Lane LOS	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.4	-	-	0	-	-	1.7

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	193	228	6	0	224	4	0	0	0	3	0	208
Future Vol, veh/h	193	228	6	0	224	4	0	0	0	3	0	208
Conflicting Peds, #/hr	0	0	1	1	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	75	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	217	256	7	0	252	4	0	0	0	3	0	234

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	256	0	0	264	0	0	948	952	254
Stage 1	-	-	-	-	-	-	254	254	-
Stage 2	-	-	-	-	-	-	694	698	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1309	-	-	1300	-	-	289	259	785
Stage 1	-	-	-	-	-	-	788	697	-
Stage 2	-	-	-	-	-	-	496	442	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1309	-	-	1300	-	-	241	0	785
Mov Cap-2 Maneuver	-	-	-	-	-	-	241	0	-
Stage 1	-	-	-	-	-	-	657	0	-
Stage 2	-	-	-	-	-	-	496	0	-

Approach	EB	WB	SB
HCM Control Delay, s	3.7	0	11.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1309	-	-	1300	-	-	761
HCM Lane V/C Ratio	0.166	-	-	-	-	-	0.312
HCM Control Delay (s)	8.3	-	-	0	-	-	11.9
HCM Lane LOS	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.6	-	-	0	-	-	1.3

GPI Greenman-Pedersen, Inc.
Engineering and Construction Services

Intersection:	Fishkill Rd (CR 10) and NYS Route 301		
Client:	Putnam County	GPI No.	2300070.00
Calculated By:	D. Creen	Date:	6/12/2024
Checked By:	M. Wieszchowski	Date:	6/13/2024

WIDEN AND RESTRIPE SOUTHBOUND APPROACH

DESCRIPTION	TOTAL QUANTITY	UNIT	UNIT PRICE	TOTAL COST
WIDEN SOUTHBOUND APPROACH AND RESTRIPE [1]	1	EA	$50,000.00	$50,000
WORK ZONE TRAFFIC CONTROL	1	LS	$15,000	$15,000
			ESTIMATED CONSTRUCTION COST (CONCEPTUAL)	**$65,000**
CONTIGENCY (20%)	1	LS	$13,000	$15,000
DESIGN AND INSPECTION (25%)	1	LS	$16,250	$20,000
			FINAL TOTAL	**$100,000**

[1] INCLUDES TYPICAL COST FOR EXCAVATION, PAVEMENT, CURBING, DRAINAGE, STRIPING, SIGNING, ETC.

ADD 75' EASTBOUND LEFT TURN LANE

DESCRIPTION	TOTAL QUANTITY	UNIT	UNIT PRICE	TOTAL COST
75' LEFT TURN LANE WITH 75' TAPER [2]	1	EA	$250,000	$250,000
RECONSTRUCT SIDEWALKS	225	LF	$100	$25,000
WORK ZONE TRAFFIC CONTROL	1	LS	$30,000	$30,000
			ESTIMATED CONSTRUCTION COST (CONCEPTUAL)	**$305,000**
CONTIGENCY (20%)	1	LS	$61,000	$65,000
DESIGN AND INSPECTION (25%)	1	LS	$76,250	$80,000
			FINAL TOTAL	**$450,000**

[2] INCLUDES TYPICAL COST FOR EXCAVATION, PAVEMENT, CURBING, DRAINAGE, STRIPING, SIGNING, ETC.

GPI

FISHKILL RD (CR 10)

STATE ROUTE 301

STATE ROUTE 301

HEALY RD

FOUNDRY BROOK

20 0 20 40 60 80'

Putnam County Intersections | FIG A-3

Fishkill Road (CR 10) at SR 301
Intersection Improvement Concept Sketch

GPI

FISHKILL RD (CR 10)

STATE ROUTE 301

STATE ROUTE 301

HEALY RD

FOUNDRY BROOK

20 0 20 40 60 80'

Putnam County Intersections | FIG A-4

Fishkill Road (CR 10) at SR 301

Intersection Improvement Concept Sketch

APPENDIX B
Lower Station Road (CR 12)
at NY Route 9D

SUMMARY OF ANALYSIS
LOWER STATION RD (CR 12) @ NYS ROUTE 9D

Existing Conditions:

This intersection consists of 4 one-lane approaches. Traffic control at this location is through signalization. The signal includes 3 phases (a north-south phase, an east-west phase, and a southbound left turn phase). There are no pedestrian facilities at this location. The posted speed limits are 40 mph on NYS-9D, 30 mph on CR-12 west of the intersection and 45 mph along CR-12 east of the intersection. Lanes at this location are generally 12-foot wide, while paved shoulders at this intersection are 2'-3' on NY-9D and 0'-1' on CR-12.

Overall, this intersection operates at LOS B on all approaches in both the weekday AM and PM peak hours, and maximum queues extend no more than about 150 feet. Vehicular capacity and delays are not an issue at this location.

Signal/Lane Warrant Analysis:

As a signal currently exists, no signal warrants were performed. There are no formal warrants to determine the need for a left turn lane at a traffic signal. However, a rule of thumb is that approaches having left turn volumes over 125 vehicles should be considered for a left turn lane. The southbound approach at this location has 143 to 183 left turning vehicles in the peak hours, so a left turn lane should be a consideration for this intersection.

Safety Analysis:

Based on the NYSDOT Clear Safety System, the Potential for Safety Improvement (PSI) for this intersection is -0.21 overall and -0.08 for serious injury/fatality crashes. These factors both being below 0.0 indicates that the crash potential at this location is below average when compared to similar intersections Statewide.

A review of the crash history revealed 8 crashes at this location in the 4-year period studied. However, only two crashes involved personal injury and no crash pattern was found that would indicate a specific safety issue. The crashes that occurred were split between all the approaches and no single approach stood out as a having a larger crash risk than the others. The crash rate calculated for this intersection is 0.58 crashes per million entering vehicles (Cr/MEV), which is lower than the state-wide average for similar intersections of 0.64 Cr/MEV. There appears to be no significant safety issues at this location. A summary of the crash types and severity are displayed in the table below:

CRASH SUMMARY

Crash Type	Number of Occurrences	Crash Severity	Number of Occurrences
Rear End	2	Fatality	0
Left Turn	3	Personal Injury	2
Animal	1	Property Damage Only	6
Sideswipe	2		
	8		8

Field Condition and Right of Way Review:

The terrain in this area is generally level and the utilities are set back from the roadway allowing for widening if necessary. Right-of-way along the roadways is between 48'-54' wide, potentially wide enough to accommodate a southbound left turn lane without the need of extra right-of-way. However, the installation a roundabout would require some right-of-way taking.

Design Alternative Consideration:

This location experiences good traffic operations (LOS B) and has no significant safety issues. Overall, no improvements are required at this location to maintain reasonably safe and efficient operations.

If improvements are desired, two alternatives could provide some benefit; (1) adding a southbound left turn lane and (2) constructing a single lane roundabout. If a southbound left turn lane is added, the need for the southbound left turn phase would be eliminated, as the turn vehicles will no longer block through vehicles. This lane would reduce the likelihood of rear end collisions and sideswipes on this approach. With the southbound left turn lane and new signal phasing, this intersection will operate at LOS A in the peak hours. With a roundabout, right angle and left turn crashes could be eliminated and crash severity will generally be less because of the slower speeds traversing through the roundabout. With a roundabout, the overall level of service will also be LOS A in the peak hours. However, a roundabout would require right-of-way taking.

Conceptual Cost Estimate:

Based on our experience with similar projects, knowledge of construction pricing in this region of New York State and our understanding of the issues, it is estimated that the southbound left turn lane would cost approximately $350,000 and the single lane roundabout would cost approximately $2,340,000. These costs include construction of all improvements including the costs for design and inspection. A breakdown of the cost items is included later in this appendix.

Summary & Conclusion:

The analyses show that there is not a significant need for operational or safety improvements at this location, but the construction of a southbound left turn lane or a roundabout would marginally increase safety and level of service. These improvements come at a cost though. Generally, the slight benefit from these improvements would not justify the expense, so no improvement is recommended for this location, but the left turn lane and roundabout could be considered in the future if conditions change.

The intersection evaluation worksheet summarizing the lane geometry and traffic operations, traffic volume data sheets, crash summary sheets, capacity analysis worksheets, cost estimate breakdown and improvement concept sketches for this intersection can be found on the following pages in this appendix.

INTERSECTION EVALUATION WORKSHEET

Project:	Putnam County Intersection Improvements
Location:	Putnam County (Various Locations)
Intersection:	Lower Station Rd (CR 12) at State Route 9D
GPS Coord.:	41.37612, -73.94384
Traffic Control:	Signalized

Traffic Control Notes (if applicable):

Permitted/Protected Southbound Left Turn

Other Intersection Notes (if applicable):

No Pedestrian Crossings.

APPROACH DATA

	State Route 9D			State Route 9D			Lower Station Rd (CR 12)			State Route 403		
	Northbound			**Southbound**			**Eastbound**			**Westbound**		
	Left	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
Lane Assignments:		<-1->			<-1->			<-1->			<-1->	
Lane Widths:		12'			12'			11'			11'	
Turn Bay Lengths:		-			-			-			-	
Speed Limits:	40 mph			40 mph			30 mph			45 mph		

TRAFFIC COUNT DATA

AM Peak Hour	Time Period:	7:30	to	8:30					Date Counted:	10/6/2022		
Volume:	13	166	31	183	231	3	5	3	5	24	14	149
Truck %:	3%	3%	3%	3%	3%	3%	15%	15%	15%	5%	5%	5%
Peds (Bikes):	-			0 (0)			0 (0)			0 (0)		
PHF = 0.91												
PM Peak Hour	Time Period:	4:30	to	5:30					Date Counted:	10/6/2022		
Volume:	7	293	32	143	250	0	8	11	14	33	7	227
Truck %:	3%	3%	3%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Peds (Bikes):	0 (0)			0 (0)			0 (0)			0 (0)		
PHF = 0.93												

EXISTING CONDITION LEVEL OF SERVICE

AM Peak Delay (s):	12.0	11.6	13.8	10.6
LOS:	B	B	B	B
v/c:	0.36	0.63	0.05	0.52
95% Queue:	88'	126'	< 25'	58'
B (11.5) Overall	**B (12.0)**	**B (11.6)**	**B (13.8)**	**B (10.6)**
PM Peak Delay (s):	17.2	12.4	12.5	9.8
LOS:	B	B	B	A
v/c:	0.61	0.64	0.12	0.59
95% Queue:	152'	124'	< 25'	64'
B (13.3) Overall	**B (17.2)**	**B (12.4)**	**B (12.5)**	**A (9.8)**

Note: LOS calculated using HCM 6 methodologies. For unsignalized intersections, only side street approach delay and mainline left turn delay is shown. The HCM 6 methodology assumes zero delay for all other movements.

INTERSECTION EVALUATION WORKSHEET

INTERSECTION SAFETY

Crashes	From:	12/31/2019	To:	12/31/2023	No. of Months:	48						
	No. of Crashes:	8	PDO:	6	PI:	2	PI (A):	0	K:	0		
	Crash Rate:	0.58 Cr/MEV			Above/Below Statewide Average:			0.91 Times				

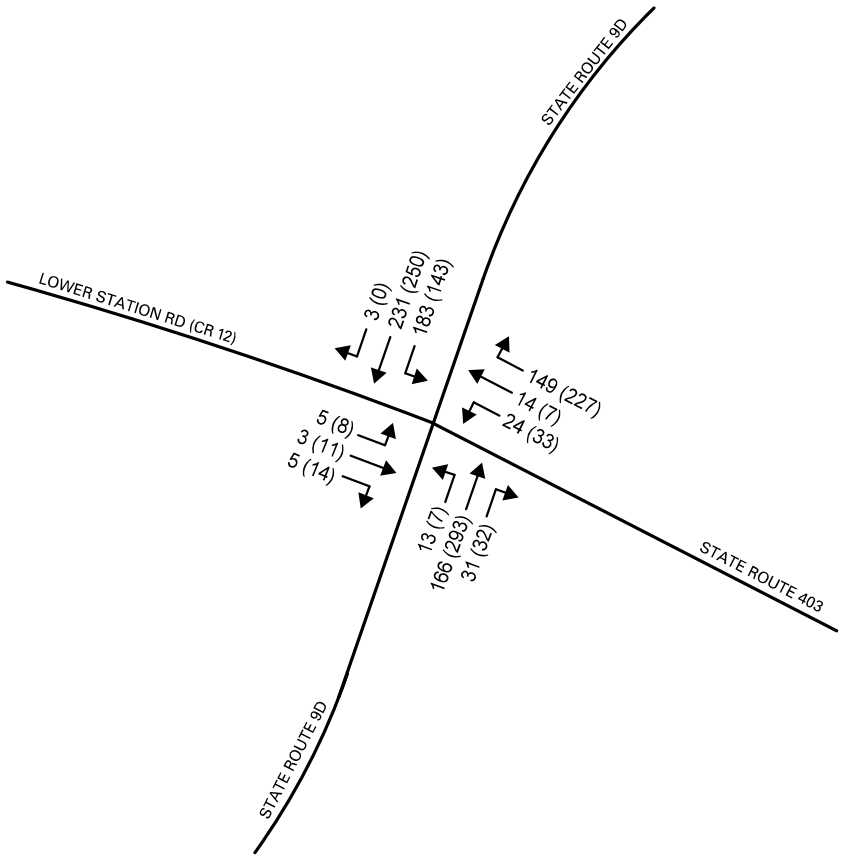
PSI Factors	PSI (KA):	-0.08
	PSI (Tot):	-0.21

BUILD ALTERNATIVE #1 - LEVEL OF SERVICE

	State Route 9D			State Route 9D			Lower Station Rd (CR 12)			State Route 403		
	Northbound			**Southbound**			**Eastbound**			**Westbound**		
	Left	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
Description of Improvements:	Add southbound left turn lane (75' storage + 100' taper)											
AM Peak Delay (s):	5.0			5.0	5.2		8.3			10.1		
LOS:	A			A	A		A			B		
v/c:	0.26			0.25	0.34		0.03			0.45		
95% Queue:	54'			60'	63'		< 25'			39'		
A (6.3) Overall	**A (5.0)**			**A (5.1)**			**A (8.3)**			**B (10.1)**		
PM Peak Delay (s):	6.7			6.0	6.5		7.6			9.8		
LOS:	A			A	A		A			A		
v/c:	0.44			0.21	0.39		0.06			0.52		
95% Queue:	93'			46'	70'		< 25'			43'		
A (7.4) Overall	**A (6.7)**			**A (6.3)**			**A (7.6)**			**A (9.8)**		

BUILD ALTERNATIVE #2 - LEVEL OF SERVICE

Description of Improvements:	Installation of a Roundabout.											
AM Peak Delay (s):	5.3			6.3			5.3			5.1		
LOS:	A			A			A			A		
v/c:	0.21			0.36			0.02			0.19		
95% Queue:	25'			50'			< 25'			25'		
A (5.8) Overall	**A (5.3)**			**A (6.3)**			**A (5.3)**			**A (5.1)**		
PM Peak Delay (s):	6.3			5.8			4.6			6.9		
LOS:	A			A			A			A		
v/c:	0.32			0.33			0.04			0.30		
95% Queue:	25'			25'			< 25'			25'		
A (6.2) Overall	**A (6.3)**			**A (5.8)**			**A (4.6)**			**A (6.9)**		



KEY:

XXX (XXX) = AM (PM) PEAK HOUR TRAFFIC VOLUMES

GPI Engineering Design Planning Construction Inspection

PUTNAM COUNTY
INTERSECTION IMPROVEMENTS
PUTNAM COUNTY, NEW YORK

STATE ROUTE 9D AT LOWER STATION RD (CR 12)
PEAK HOUR TRAFFIC VOLUMES

SCALE:	DATE:	FIGURE NO.
NO SCALE	JUNE 2024	B-1

Study Name	7- LOWER STATION RD & NYS 9D
Start Date	Thursday, October 06, 2022 7:00 AM
End Date	Thursday, October 06, 2022 6:00 PM
Site Code	

Report Summary

		Southbound						Westbound						Northbound						Eastbound								Crosswalk		
Time Period	**Class.**	**L**	**T**	**R**	**U**	**I**	**O**	**L**	**T**	**R**	**U**	**I**	**O**	**L**	**T**	**R**	**U**	**I**	**O**	**L**	**T**	**R**	**U**	**I**	**O**	**Total**		**Peds**	**Bikes**	**Total**
Peak 1	Motorcycles	1	0	0	0	1	1	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	2	SB	0	1	1
Specified Period	%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		0%	100%	
7:00 AM - 9:00 AM	Cars	153	189	1	0	343	252	20	12	120	0	152	185	13	130	29	0	172	213	2	3	4	0	9	26	676	WB	0	0	0
One Hour Peak	%	84%	82%	33%	0%	82%	79%	83%	86%	81%	0%	81%	85%	100%	78%	94%	0%	82%	82%	40%	100%	80%	0%	69%	87%	82%		0%	0%	
7:30 AM - 8:30 AM	ıt Goods Vehi	22	36	1	0	59	49	4	2	19	0	25	24	0	29	2	0	31	41	1	0	1	0	2	3	117	NB	0	0	0
	%	12%	16%	33%	0%	14%	15%	17%	14%	13%	0%	13%	11%	0%	17%	6%	0%	15%	16%	20%	0%	20%	0%	15%	10%	14%		0%	0%	
	Buses	3	2	0	0	5	8	0	0	5	0	5	3	0	2	0	0	2	2	1	0	0	0	1	0	13	EB	0	0	0
	%	2%	1%	0%	0%	1%	3%	0%	0%	3%	0%	3%	1%	0%	1%	0%	0%	1%	1%	20%	0%	0%	0%	8%	0%	2%		0%	0%	
	ngle-Unit Truc	4	3	1	0	8	8	0	0	4	0	4	4	0	3	0	0	3	3	1	0	0	0	1	1	16		**0**	**1**	**1**
	%	2%	1%	33%	0%	2%	3%	0%	0%	3%	0%	2%	2%	0%	2%	0%	0%	1%	1%	20%	0%	0%	0%	8%	3%	2%				
	ticulated Truc	0	1	0	0	1	2	0	0	1	0	1	0	0	1	0	0	1	1	0	0	0	0	0	0	3				
	%	0%	0%	0%	0%	0%	1%	0%	0%	1%	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				
	icycles on Roa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				
	Total	**183**	**231**	**3**	**0**	**417**	**320**	**24**	**14**	**149**	**0**	**187**	**217**	**13**	**166**	**31**	**0**	**210**	**260**	**5**	**3**	**5**	**0**	**13**	**30**	**827**				
	PHF	0.82	0.88	0.38	0	0.85	0.78	0.6	0.88	0.73	0	0.74	0.8	0.65	0.8	0.78	0	0.85	0.89	0.62	0.38	0.62	0	0.81	0.75	0.91				
	Approach %					50%	39%					23%	26%					25%	31%					2%	4%					
Peak 2	Motorcycles	0	5	0	0	5	3	0	0	0	0	0	0	0	3	0	0	3	5	0	0	0	0	0	0	8	SB	0	0	0
Specified Period	%	0%	2%	0%	0%	1%	1%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	1%	2%	0%	0%	0%	0%	0%	0%	1%		0%	0%	
4:00 PM - 6:00 PM	Cars	122	225	0	0	347	462	29	7	203	0	239	153	5	253	22	0	280	266	6	9	12	0	27	12	893	WB	1	0	1
One Hour Peak	%	85%	90%	0%	0%	88%	88%	88%	100%	89%	0%	90%	82%	71%	86%	69%	0%	84%	90%	75%	82%	86%	0%	82%	86%	87%		100%	0%	
4:30 PM - 5:30 PM	ıt Goods Vehi	19	19	0	0	38	52	4	0	19	0	23	25	2	32	4	0	38	25	1	2	2	0	5	2	104	NB	0	0	0
	%	13%	8%	0%	0%	10%	10%	12%	0%	8%	0%	9%	13%	29%	11%	13%	0%	11%	8%	13%	18%	14%	0%	15%	14%	10%		0%	0%	
	Buses	1	0	0	0	1	1	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2	EB	0	0	0
	%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		0%	0%	
	ngle-Unit Truc	1	1	0	0	2	9	0	0	4	0	4	3	0	4	2	0	6	1	1	0	0	0	1	0	13		**1**	**0**	**1**
	%	1%	0%	0%	0%	1%	2%	0%	0%	2%	0%	1%	2%	0%	1%	6%	0%	2%	0%	13%	0%	0%	0%	3%	0%	1%				
	ticulated Truc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				
	icycles on Roa	0	0	0	0	0	1	0	0	0	0	0	4	0	1	4	0	5	0	0	0	0	0	0	0	5				
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	13%	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%				
	Total	**143**	**250**	**0**	**0**	**393**	**528**	**33**	**7**	**227**	**0**	**267**	**186**	**7**	**293**	**32**	**0**	**332**	**297**	**8**	**11**	**14**	**0**	**33**	**14**	**1025**				
	PHF	0.78	0.75	0	0	0.83	0.96	0.82	0.35	0.93	0	0.93	0.88	0.58	0.92	0.73	0	0.9	0.8	0.67	0.55	0.44	0	0.69	0.58	0.93				
	Approach %					38%	52%					26%	18%					32%	29%					3%	1%					

Study Name 7- LOWER STATION RD & NYS 9D
Start Date 10-06-2022
Start Time 7:00 AM
Site Code

	ROUTE 9D Southbound				ROUTE 403 Westbound				ROUTE 9D Northbound				LOWER STATION RD Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
7:00 AM	59	60	0	0	8	3	18	0	6	35	11	0	2	1	0	0
7:15 AM	69	50	0	0	4	1	36	0	3	32	11	0	1	2	1	0
7:30 AM	56	66	0	0	6	4	24	0	5	32	10	0	1	2	1	0
7:45 AM	50	49	1	0	4	4	37	0	5	30	6	0	2	1	1	0
8:00 AM	39	56	0	0	4	4	37	0	0	52	8	0	2	0	1	0
8:15 AM	38	60	2	0	10	2	51	0	3	52	7	0	0	0	2	0
8:30 AM	52	44	1	0	10	1	32	0	4	47	3	0	2	0	4	0
8:45 AM	39	46	1	0	6	3	30	0	1	33	5	0	0	0	1	0
4:00 PM	48	40	0	0	7	0	50	0	3	63	3	0	1	3	4	0
4:15 PM	34	70	0	0	9	1	71	0	3	63	5	0	0	2	0	0
4:30 PM	46	44	0	0	8	0	61	0	1	60	6	0	3	1	8	0
4:45 PM	35	83	0	0	9	2	61	0	3	77	5	0	0	0	1	0
5:00 PM	31	60	0	0	6	5	51	0	1	76	11	0	2	5	4	0
5:15 PM	31	63	0	0	10	0	54	0	2	80	10	0	3	5	1	0
5:30 PM	31	49	0	0	5	0	36	0	1	68	7	0	3	2	8	0
5:45 PM	28	43	2	0	4	0	44	0	2	74	8	0	4	0	0	0

Study Name 7- LOWER STATION RD & NYS 9D
Start Date 10-06-2022
Start Time 7:00 AM
Site Code

	ROUTE 9D Southbound		ROUTE 403 Westbound		ROUTE 9D Northbound		LOWER STATION RD Eastbound	
Start Time	Peds CCW	Peds CW	Peds CCW	Peds CW	Peds CCW	Peds CW	Peds CCW	Peds CW
7:00 AM	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0
7:30 AM	0	1	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0
5:30 PM	0	2	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0

COUNTY: PUTNAM P.I.N.:

TOWN OF PHILIPSTOWN

ROUTE NO. OR STREET NAME: LOWER STATION RD (CR 12)

AT INTERSECTION WITH/OR BETWEEN: STATE ROUTE 9D

GPI
Engineering | Design | Planning | Construction Management

TIME PERIOD: FROM: 12/31/2019 TO: 12/31/2023

No. OF MONTHS: 48

ENVIRONMENTAL: Use Codes from MV 104 (shown at right) for these categories

Light Conditions:
1. Daylight
2. Dawn
3. Dusk
4. Dark Road Lighted
5. Dark Road Unlighted

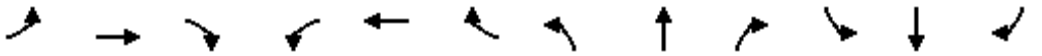
Roadway Character:
1. Straight & Level
2. Straight & Grade
3. Straight & Hillcrest
4. Curve & Level
5. Curve & Grade
6. Curve & Hillcrest

Roadway Surface Condition:
1. Dry
2. Wet
3. Muddy
4. Snow/Ice
5. Slush
10. Other

Weather:
1. Clear
2. Cloudy
3. Rain
4. Snow
5. Sleet/Hail/Freezing Rain
6. Fog/Smog/Smoke
10. Other

[1]Use Codes from MV 104 Police Report

ACCIDENT No.	DATE	TIME	No. of VEHICLES	SEVERITY	LIGHT CONDITIONS	ROADWAY CHARACTER	ROADWAY SURFACE CONDITION	WEATHER	APPARENT CONTRIBUTING FACTORS	DIRECTION	TYPE[1]	DESCRIPTION	CASE NO.
1	01/02/21	17:10	1	PDO	5	2	1	1	ANIMALS ACTION	NORTH	4	ANIMAL	38688826
2	01/19/21	12:10	2	PI	1	1	1	2	FAILURE TO YIELD RIGHT OF WAY	WEST/NORTH	1	LEFT TURN	38812820
3	06/29/21	17:30	2	PDO	1	1	1	1	FAILURE TO YIELD RIGHT OF WAY	WEST/EAST	1	LEFT TURN	38918565
4	10/25/21	20:13	2	PDO	5	1	1	1	FAILURE TO YIELD RIGHT OF WAY	NORTH/SOUTH	1	LEFT TURN	39074300
5	11/03/21	9:44	2	PDO	1	2	1	1	UNSAFE SPEED	NORTH/NORTH	1	REAR END	39086845
6	01/17/22	7:45	2	PI	1	1	4	3	PAVEMENT SLIPPERY	SOUTH/SOUTH	1	SIDESWIPE	39217473
7	06/10/22	16:58	2	PDO	1	2	1	2	FOLLOWING TOO CLOSELY	WEST/WEST	1	REAR END	39389361
8	01/05/23	8:30	2	PDO	1	1	2	2	FAILURE TO KEEP RIGHT	NORTH/WEST	1	SIDESWIPE	39669624



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	3	5	24	14	149	13	166	31	183	231	3
Future Volume (vph)	5	3	5	24	14	149	13	166	31	183	231	3
Satd. Flow (prot)	0	1485	0	0	1524	0	0	1802	0	0	1804	0
Flt Permitted		0.895			0.954			0.962			0.785	
Satd. Flow (perm)	0	1354	0	0	1462	0	0	1739	0	0	1447	0
Satd. Flow (RTOR)		5			164			18			1	
Adj. Flow (vph)	5	3	5	26	15	164	14	182	34	201	254	3
Lane Group Flow (vph)	0	13	0	0	205	0	0	230	0	0	458	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		custom	NA	
Protected Phases		3			3			5		4	1 4	
Permitted Phases	3			3			5			1		
Detector Phase	3	3		3	3		5	5		4	1 4	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		10.0	10.0		2.0		
Minimum Split (s)	10.0	10.0		10.0	10.0		15.0	15.0		7.0		
Total Split (s)	20.0	20.0		20.0	20.0		30.0	30.0		10.0		
Total Split (%)	33.3%	33.3%		33.3%	33.3%		50.0%	50.0%		16.7%		
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0		
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0		
Lost Time Adjust (s)		0.0			0.0			0.0				
Total Lost Time (s)		5.0			5.0			5.0				
Lead/Lag	Lead	Lead		Lead	Lead					Lag		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes					Yes		
Recall Mode	None	None		None	None		Min	Min		None		
Act Effct Green (s)		8.0			8.0			15.9			21.1	
Actuated g/C Ratio		0.18			0.18			0.36			0.47	
v/c Ratio		0.05			0.52			0.36			0.63	
Control Delay		13.8			10.6			12.0			11.6	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		13.8			10.6			12.0			11.6	
LOS		B			B			B			B	
Approach Delay		13.8			10.6			12.0			11.6	
Approach LOS		B			B			B			B	
Queue Length 50th (ft)		1			7			35			46	
Queue Length 95th (ft)		14			58			88			126	
Internal Link Dist (ft)		553			996			665			946	
Turn Bay Length (ft)												
Base Capacity (vph)		474			615			1015			1048	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.03			0.33			0.23			0.44	

Intersection Summary
Cycle Length: 60
Actuated Cycle Length: 44.6
Natural Cycle: 50
Control Type: Actuated-Uncoordinated

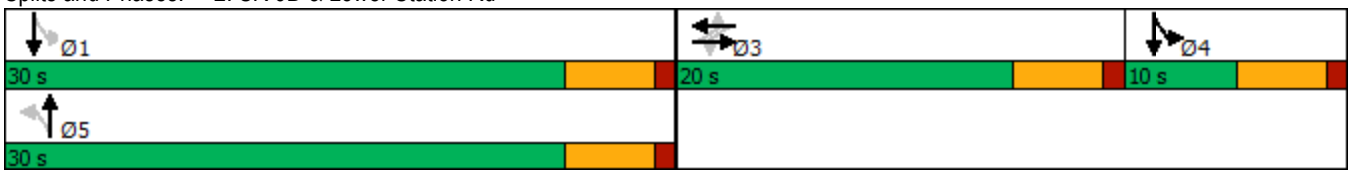
Lane Group	Ø1
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	1
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	10.0
Minimum Split (s)	15.0
Total Split (s)	30.0
Total Split (%)	50%
Yellow Time (s)	4.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	Min
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

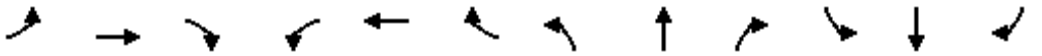
Intersection Summary

Maximum v/c Ratio: 0.63

Intersection Signal Delay: 11.5	Intersection LOS: B
Intersection Capacity Utilization 58.2%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 2: SR 9D & Lower Station Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	11	14	33	7	227	7	293	32	143	250	0
Future Volume (vph)	8	11	14	33	7	227	7	293	32	143	250	0
Satd. Flow (prot)	0	1679	0	0	1584	0	0	1815	0	0	1829	0
Flt Permitted		0.882			0.950			0.987			0.736	
Satd. Flow (perm)	0	1499	0	0	1514	0	0	1793	0	0	1371	0
Satd. Flow (RTOR)		15			244			11				
Adj. Flow (vph)	9	12	15	35	8	244	8	315	34	154	269	0
Lane Group Flow (vph)	0	36	0	0	287	0	0	357	0	0	423	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		custom	NA	
Protected Phases		3			3			5		4	1 4	
Permitted Phases	3			3			5			1		
Detector Phase	3	3		3	3		5	5		4	1 4	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		10.0	10.0		2.0		
Minimum Split (s)	10.0	10.0		10.0	10.0		15.0	15.0		7.0		
Total Split (s)	20.0	20.0		20.0	20.0		30.0	30.0		10.0		
Total Split (%)	33.3%	33.3%		33.3%	33.3%		50.0%	50.0%		16.7%		
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0		
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0		
Lost Time Adjust (s)		0.0			0.0			0.0				
Total Lost Time (s)		5.0			5.0			5.0				
Lead/Lag	Lead	Lead		Lead	Lead					Lag		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes					Yes		
Recall Mode	None	None		None	None		Min	Min		None		
Act Effct Green (s)		8.2			8.2			13.6			18.8	
Actuated g/C Ratio		0.19			0.19			0.32			0.44	
v/c Ratio		0.12			0.59			0.61			0.64	
Control Delay		12.5			9.8			17.2			12.4	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		12.5			9.8			17.2			12.4	
LOS		B			A			B			B	
Approach Delay		12.5			9.8			17.2			12.4	
Approach LOS		B			A			B			B	
Queue Length 50th (ft)		4			8			62			42	
Queue Length 95th (ft)		24			64			152			124	
Internal Link Dist (ft)		553			996			665			946	
Turn Bay Length (ft)												
Base Capacity (vph)		556			707			1095			1056	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.06			0.41			0.33			0.40	

Intersection Summary
Cycle Length: 60
Actuated Cycle Length: 42.5
Natural Cycle: 50
Control Type: Actuated-Uncoordinated

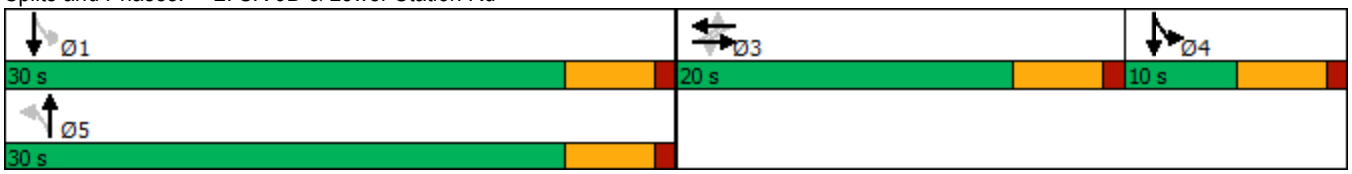
Lane Group	Ø1
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Satd. Flow (RTOR)	
Adj. Flow (vph)	
Lane Group Flow (vph)	
Turn Type	
Protected Phases	1
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	10.0
Minimum Split (s)	15.0
Total Split (s)	30.0
Total Split (%)	50%
Yellow Time (s)	4.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	Min
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Maximum v/c Ratio: 0.64

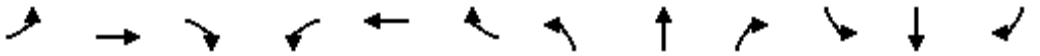
Intersection Signal Delay: 13.3	Intersection LOS: B
Intersection Capacity Utilization 69.8%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 2: SR 9D & Lower Station Rd



Lane Group	EBT	WBT	NBT	SBL	SBT
Lane Group Flow (vph)	13	205	230	201	257
v/c Ratio	0.04	0.43	0.24	0.33	0.26
Control Delay	8.3	6.7	6.3	8.4	6.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	8.3	6.7	6.3	8.4	6.9
Queue Length 50th (ft)	1	4	17	18	22
Queue Length 95th (ft)	9	39	54	60	63
Internal Link Dist (ft)	553	996	665		946
Turn Bay Length (ft)				75	
Base Capacity (vph)	877	1035	1681	1080	1754
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.01	0.20	0.14	0.19	0.15

Intersection Summary



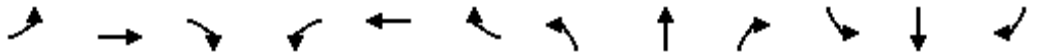
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	3	5	24	14	149	13	166	31	183	231	3
Future Volume (veh/h)	5	3	5	24	14	149	13	166	31	183	231	3
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1678	1678	1678	1826	1826	1826	1856	1856	1856	1856	1856	1856
Adj Flow Rate, veh/h	5	3	5	26	15	164	14	182	34	201	254	3
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	15	15	15	5	5	5	3	3	3	3	3	3
Cap, veh/h	259	114	106	190	32	228	172	603	107	818	747	9
Arrive On Green	0.18	0.18	0.18	0.18	0.18	0.18	0.41	0.41	0.41	0.41	0.41	0.41
Sat Flow, veh/h	300	622	576	136	175	1243	40	1478	263	1156	1830	22
Grp Volume(v), veh/h	13	0	0	205	0	0	230	0	0	201	0	257
Grp Sat Flow(s),veh/h/ln	1498	0	0	1554	0	0	1781	0	0	1156	0	1852
Q Serve(g_s), s	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3
Cycle Q Clear(g_c), s	0.2	0.0	0.0	3.0	0.0	0.0	2.1	0.0	0.0	1.9	0.0	2.3
Prop In Lane	0.38		0.38	0.13		0.80	0.06		0.15	1.00		0.01
Lane Grp Cap(c), veh/h	479	0	0	451	0	0	883	0	0	818	0	756
V/C Ratio(X)	0.03	0.00	0.00	0.45	0.00	0.00	0.26	0.00	0.00	0.25	0.00	0.34
Avail Cap(c_a), veh/h	1306	0	0	1423	0	0	2302	0	0	1762	0	2267
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	8.2	0.0	0.0	9.4	0.0	0.0	4.9	0.0	0.0	4.8	0.0	5.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.7	0.0	0.0	0.1	0.0	0.0	0.2	0.0	0.3
Initial Q Delay(d3),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
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	0.6	0.0	0.0	0.2	0.0	0.0	0.2	0.0	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.3	0.0	0.0	10.1	0.0	0.0	5.0	0.0	0.0	5.0	0.0	5.2
LnGrp LOS	A	A	A	B	A	A	A	A	A	A	A	A
Approach Vol, veh/h		13			205			230			458	
Approach Delay, s/veh		8.3			10.1			5.0			5.1	
Approach LOS		A			B			A			A	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		15.0		9.5		15.0		9.5				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		30.0		20.0		30.0		20.0				
Max Q Clear Time (g_c+I1), s		4.1		2.2		4.3		5.0				
Green Ext Time (p_c), s		0.6		0.0		2.0		0.8				

Intersection Summary												
HCM 6th Ctrl Delay			6.3									
HCM 6th LOS			A									

Lane Group	EBT	WBT	NBT	SBL	SBT
Lane Group Flow (vph)	36	287	357	154	269
v/c Ratio	0.09	0.51	0.48	0.31	0.35
Control Delay	7.3	6.3	9.2	8.6	8.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	7.3	6.3	9.2	8.6	8.1
Queue Length 50th (ft)	2	4	31	13	23
Queue Length 95th (ft)	16	43	93	46	70
Internal Link Dist (ft)	553	996	665		946
Turn Bay Length (ft)				75	
Base Capacity (vph)	1030	1105	1717	1148	1778
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.03	0.26	0.21	0.13	0.15

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	11	14	33	7	227	7	293	32	143	250	0
Future Volume (veh/h)	8	11	14	33	7	227	7	293	32	143	250	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1856	1856	1856	1870	1870	1870
Adj Flow Rate, veh/h	9	12	15	35	8	244	8	315	34	154	269	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	3	3	3	2	2	2
Cap, veh/h	213	203	177	180	32	345	142	605	64	745	696	0
Arrive On Green	0.26	0.26	0.26	0.26	0.26	0.26	0.37	0.37	0.37	0.37	0.37	0.00
Sat Flow, veh/h	178	794	694	114	123	1349	13	1625	172	1032	1870	0
Grp Volume(v), veh/h	36	0	0	287	0	0	357	0	0	154	269	0
Grp Sat Flow(s),veh/h/ln	1665	0	0	1587	0	0	1811	0	0	1032	1870	0
Q Serve(g_s), s	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	2.8	0.0
Cycle Q Clear(g_c), s	0.4	0.0	0.0	4.4	0.0	0.0	4.1	0.0	0.0	1.8	2.8	0.0
Prop In Lane	0.25		0.42	0.12		0.85	0.02		0.10	1.00		0.00
Lane Grp Cap(c), veh/h	593	0	0	556	0	0	811	0	0	745	696	0
V/C Ratio(X)	0.06	0.00	0.00	0.52	0.00	0.00	0.44	0.00	0.00	0.21	0.39	0.00
Avail Cap(c_a), veh/h	1331	0	0	1320	0	0	2145	0	0	1513	2088	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	7.6	0.0	0.0	9.1	0.0	0.0	6.6	0.0	0.0	5.8	6.2	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.7	0.0	0.0	0.1	0.0	0.0	0.1	0.4	0.0
Initial Q Delay(d3),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
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.0	0.8	0.0	0.0	0.6	0.0	0.0	0.3	0.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	7.6	0.0	0.0	9.8	0.0	0.0	6.7	0.0	0.0	6.0	6.5	0.0
LnGrp LOS	A	A	A	A	A	A	A	A	A	A	A	A
Approach Vol, veh/h		36			287			357			423	
Approach Delay, s/veh		7.6			9.8			6.7			6.3	
Approach LOS		A			A			A			A	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		15.0		11.9		15.0		11.9				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		30.0		20.0		30.0		20.0				
Max Q Clear Time (g_c+I1), s		6.1		2.4		4.8		6.4				
Green Ext Time (p_c), s		1.0		0.1		2.0		1.2				

Intersection Summary												
HCM 6th Ctrl Delay			7.4									
HCM 6th LOS			A									

Intersection	
Intersection Delay, s/veh	5.8
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	13	205	230	458
Demand Flow Rate, veh/h	15	215	236	472
Vehicles Circulating, veh/h	496	207	216	57
Vehicles Exiting, veh/h	33	245	295	365
Ped Vol Crossing Leg, #/h	0	0	0	1
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	5.3	5.1	5.3	6.3
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	15	215	236	472
Cap Entry Lane, veh/h	832	1117	1107	1302
Entry HV Adj Factor	0.841	0.955	0.973	0.971
Flow Entry, veh/h	13	205	230	458
Cap Entry, veh/h	699	1067	1077	1264
V/C Ratio	0.018	0.192	0.213	0.363
Control Delay, s/veh	5.3	5.1	5.3	6.3
LOS	A	A	A	A
95th %tile Queue, veh	0	1	1	2

Intersection	
Intersection Delay, s/veh	6.2
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	36	287	357	423
Demand Flow Rate, veh/h	36	293	367	431
Vehicles Circulating, veh/h	467	341	178	52
Vehicles Exiting, veh/h	16	204	325	582
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	4.6	6.9	6.3	5.8
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	36	293	367	431
Cap Entry Lane, veh/h	857	975	1151	1309
Entry HV Adj Factor	0.993	0.979	0.972	0.981
Flow Entry, veh/h	36	287	357	423
Cap Entry, veh/h	851	954	1118	1283
V/C Ratio	0.042	0.301	0.319	0.329
Control Delay, s/veh	4.6	6.9	6.3	5.8
LOS	A	A	A	A
95th %tile Queue, veh	0	1	1	1

GPI Greenman-Pedersen, Inc.
Engineering and Construction Services

Intersection: Lower Station Rd (CR 12) and NYS Route 9D
Client: Putnam County — GPI No. 2300070.00
Calculated By: D. Creen — Date: 6/12/2024
Checked By: M. Wieszchowski — Date: 6/13/2024

ADD 75' SOUTHBOUND LEFT TURN LANE

DESCRIPTION	TOTAL QUANTITY	UNIT	UNIT PRICE	TOTAL COST
75' LEFT TURN LANE WITH 100' TAPER [1]	1	EA	$200,000	$200,000
WORK ZONE TRAFFIC CONTROL	1	LS	$40,000	$40,000
			ESTIMATED CONSTRUCTION COST (CONCEPTUAL)	**$240,000**
CONTIGENCY (20%)	1	LS	$48,000	$50,000
DESIGN AND INSPECTION (25%)	1	LS	$60,000	$60,000
			FINAL TOTAL	**$350,000**

[1] INCLUDES TYPICAL COST FOR ROADWAY WIDENING, STRIPING, SIGNING, ETC.

SINGLE LANE ROUNDABOUT (120 FT DIAMETER)

DESCRIPTION	TOTAL QUANTITY	UNIT	UNIT PRICE	TOTAL COST
SINGLE LANE ROUNDABOUT [2]	1	EA	$1,250,000	$1,250,000
UTILITY RELOCATION [3]	1	EA	$75,000	$0
STORMWATER AND TREATMENT [4]	1	LS	$100,000	$100,000
WETLAND MITIGATION	1	LS	$25,000	$25,000
WORK ZONE TRAFFIC CONTROL	1	LS	$200,000	$200,000
			ESTIMATED CONSTRUCTION COST (CONCEPTUAL)	**$1,575,000.00**
RIGHT OF WAY (HISTORICAL)	0.069	ACRE	$750,000	$55,000
CONTIGENCY (20%)	1	LS	$315,000	$315,000
DESIGN AND INSPECTION (25%)	1	LS	$393,750	$395,000
			FINAL TOTAL	**$2,340,000.00**

[2] INCLUDES TYPICAL COST FOR PAVEMENT, CURB, EARTHWORK, DRAINAGE, LANDSCAPING, ETC., FOR A SINGLE LANE ROUNDABOUT.

[3] ELECTRIC AND GAS RELOCATIONS ARE ASSUMED NO COST FOR MUNICIPAL PROJECTS. WATER AND SEWER RELOCATIONS ARE ASSUMED AT $75,000 EACH.

[4] IMPACTS OVER 5,000 SF WITHIN DEP WATERSHEDS REQUIRE POST STORMWATER TREATMENT. $100,000 ALLOWANCE FOR EXTRA ROW OR WORK REQUIRED.

GPI

N

HISTORIC PROPERTY

GRIST MILL COTTAGE
USN:07904.000186
NR:92NR00349

LOWER STATION RD (CR 12)

HISTORIC PROPERTY

MANDEVILLE HOUSE
USN:07904.000088
NR:90NR02370

STATE ROUTE 9D

HISTORIC PROPERTY

ALAMO RESIDENCE
USN:07904.000095
NR:90NR02364

STATE ROUTE 403

20 0 20 40 60 80'

Putnam County Intersections | FIG B-2

Lower Station Road (CR 12) at SR 9D
Intersection Improvement Concept Sketch

GPI

N

HISTORIC PROPERTY

MANDEVILLE HOUSE
USN:07904.000088
NR:90NR02370

STATE ROUTE 9D

LOWER STATION RD (CR 12)

AHB

ST

AFEE

HISTORIC PROPERTY

GRIST MILL COTTAGE
USN:07904.000186
NR:92NR00349

0.069 ACRE ROW TAKING

HISTORIC PROPERTY

ALAMO RESIDENCE
USN:07904.000095
NR:90NR02364

STATE ROUTE 403

20 0 20 40 60 80'

Putnam County Intersections | FIG B-3

Lower Station Road (CR 12) at SR 9D
Intersection Improvement Concept Sketch

APPENDIX C

Oscawana Lake Road (CR 20)

at Church Road (CR 22)

SUMMARY OF ANALYSIS
OSCAWANA LAKE RD (CR 20) @ CHURCH RD (CR 22)

Existing Conditions:

This 4-legged intersection is stop sign controlled along the Church Rd and Cimarron Rd approaches. The Oscawana Lake Rd approaches are uncontrolled and do not have to stop at the intersection. Oscawana Lake Rd has 12-foot lanes and varying width shoulders between 1' and 12' at the intersection. Church Rd has 11-foot wide lanes and Cimarron Rd has 10-foot wide lanes. Neither of which have appreciable shoulders. There are no pedestrian facilities at this location.

The posted speed limit is 40 mph on all but the Cimarron Rd approach, which is assumed to be the Town speed limit of 30 mph. Speed measurements were performed along Oscawana Lake Rd and the 85th percentile speeds were determined to be 47 mph both northbound and southbound.

The available sight distance on the westbound approach of Church Road when looking left (to the south) is 525', which is less than desirable. Based on a 50-mph design speed, the required stopping sight distance is 425' and the preferred intersection sight distance is 555'. All the other sight distances are adequate, being greater than the recommended intersection sight distances.

Operationally, the analysis shows all movements operating extremely well (LOS A or LOS B) at this intersection in the AM and PM peak hours, and there appears to be no capacity issues.

Signal Warrant Analysis:

A review of the hourly traffic volumes between 7:00 AM to 9:00AM and 4:00PM to 6:00 PM show that Warrant 1 (8-hour warrant) is not satisfied, with only 2 of the 4 hours reviewed meeting criteria and it is assumed that non-peak hours would experience even less traffic on the roadway. Warrant 2 (4-hour warrant) is not satisfied with none of the hours meeting criteria. Warrant 3 (peak hour warrant) is not satisfied with none of the hours meeting criteria. Warrant 7 (crash experience) is also not satisfied, as none of the criteria were met.

Safety Analysis:

Based on the NYSDOT Clear Safety System, the Potential for Safety Improvement (PSI) for this intersection is -0.27 overall and -0.32 for serious injury/fatality crashes. These factors being below 0.0 indicate that the crash potential at this location is below average compared to similar intersections Statewide. However, the crash rate for this intersection was calculated at 0.83 crashes per million entering vehicles (Cr/MEV), which is nearly 3 times the statewide average for similar intersections. The skew and curvature of the side street approaches, and the limited sight distance could be contributing factors to this crash rate.

Crash data noted 7 crashes at this location in the 4-year period reviewed, with 3 crashes resulting in injury. 4 of these crashes are right angle, which would be correctable by a traffic signal or roundabout.

A summary of the crash types and severity are shown in the table below:

CRASH SUMMARY

Crash Type	Number of Occurrences	Crash Severity	Number of Occurrences
Animal	2	Fatality	0
Fixed Object	1	Personal Injury	3
Right Angle	4	Property Damage Only	4
	7		7

Field Condition and Right of Way Review:

The terrain at this location is generally level with upward grades to the south and west. There are no significant physical limitations that would preclude improvements at this intersection. Right-of-way is fairly significant along Oscawana Lake Rd at 76'-90' wide, but is more restrictive on the side streets, pinching to about 44' along Church Rd and 48' on Cimarron Rd. If a roundabout were to be constructed at this location, right-of-way would need to be purchased on both the northeast and northwest corners to accommodate. Additionally, there is at least one utility pole that will need to be relocated and the driveway for the property in the southeast corner will need to be realigned and reconstructed.

Design Alternative Consideration:

The crash rate being above Statewide average, the sight distance being limited, and travel speeds on Oscawana Lake Rd being nearly 20% above the posted limit all point to safety improvements being desirable at this location. With the traffic signal warrants not being satisfied, the recommended improvement would be the construction of a roundabout at this location. Traffic operations with a roundabout would improve to be LOS A for all movements, and it would help eliminate the right-angle crashes that currently represent nearly 60% of the crashes at this location.

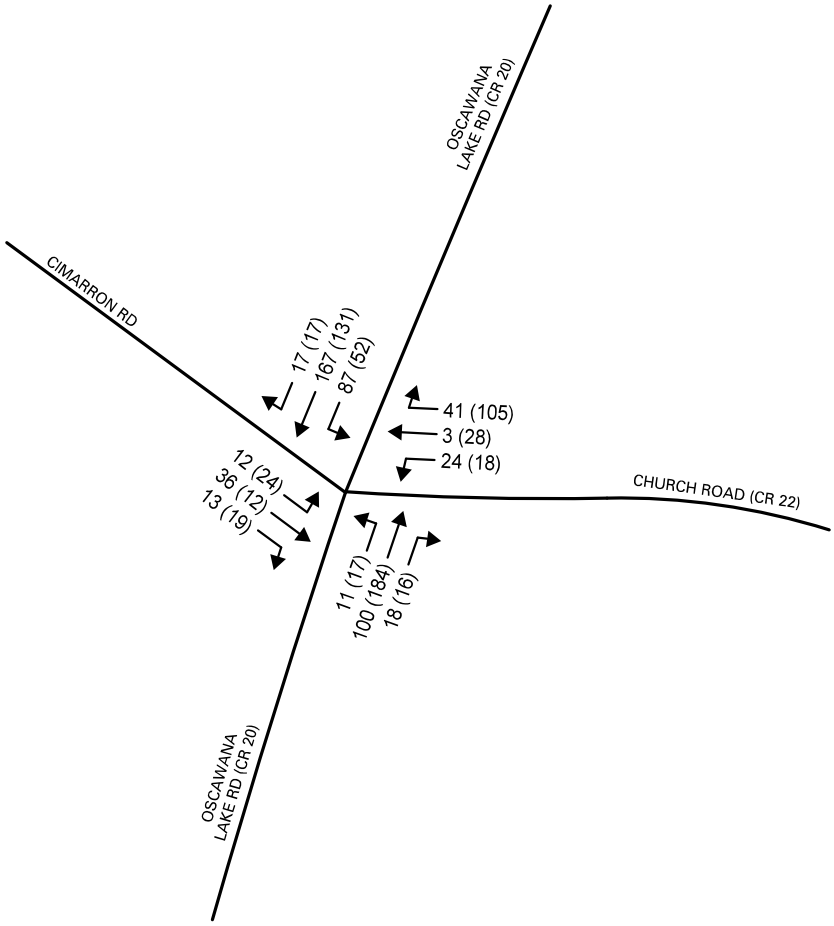
Conceptual Cost Estimate:

Based on our experience with similar projects, knowledge of construction pricing in this region of New York State and our understanding of the issues, it is estimated that a roundabout would cost approximately $2,480,000 to design, purchase right of way, and construct. A breakdown of the big picture cost items for the roundabout is included later in this appendix.

Summary & Conclusion:

The analyses show that existing overall levels of service are LOS B or better on all approaches, which indicates no traffic capacity issues, but as discussed above, there are safety concerns that suggest improvements should be considered. It is recommended that a roundabout be installed at this location. Based on our field review, the construction of a roundabout is feasible at this location but would require some right-of-way takings on the north side of the intersection.

The intersection evaluation worksheet summarizing the lane geometry and traffic operations, traffic volume data sheets, traffic signal warrant analysis sheets, crash summary sheets, capacity analysis worksheets, cost estimate breakdown, and a roundabout concept sketch for this intersection can be found on the following pages in this appendix.



KEY:

XXX (XXX) = AM (PM) PEAK HOUR TRAFFIC VOLUMES

GPI Engineering Design Planning Construction Inspection

PUTNAM COUNTY
INTERSECTION IMPROVEMENTS
PUTNAM COUNTY, NEW YORK

OSCAWANA LK RD (CR 20) AT CHURCH RD (CR 22)
PEAK HOUR TRAFFIC VOLUMES

SCALE:	DATE:	FIGURE NO.
NO SCALE	JUNE 2024	C-1

Greenman-Pedersen, Inc.
80 Wolf Rd, Suite 600
Albany, NY 12205
(518) 453-9431

Intersection: Oscawana Lake Rd at Cimarron Rd
Location: Town of Putnam Valley, New York
GPI Project No.: 2300070.00
Count Date: 7/19/2023

Total Traffic - Cars & Heavy Vehicles

Start Time	Oscawana Lake Rd Southbound					Church Rd Westbound					Oscawana Lake Rd Northbound					Cimarron Rd Eastbound				
	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes
7:00 AM	0	22	12	9	0	0	3	1	1	0	0	2	13	2	0	0	5	2	2	0
7:15 AM	0	23	31	8	0	0	2	3	3	0	0	2	19	3	0	0	4	6	3	0
7:30 AM	0	27	22	7	0	0	3	3	5	0	0	4	18	4	0	0	5	6	4	0
7:45 AM	0	20	39	1	0	0	7	0	9	0	0	3	22	6	0	0	3	5	4	0
8:00 AM	0	23	41	6	0	0	5	0	14	0	0	3	17	0	0	0	2	8	5	0
8:15 AM	0	25	36	5	0	0	10	1	9	0	0	2	30	6	0	0	5	10	3	0
8:30 AM	0	19	51	5	0	0	2	2	9	0	0	3	31	6	0	0	2	13	1	0
8:45 AM	0	20	37	3	0	0	5	3	11	0	0	1	20	3	0	0	2	7	5	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	14	42	1	0	0	6	9	21	0	0	7	43	9	0	0	1	5	2	0
4:15 PM	0	12	34	4	0	0	6	5	22	0	0	6	51	13	0	0	7	3	3	0
4:30 PM	0	9	42	6	0	0	5	7	19	0	0	3	32	4	0	0	6	5	2	0
4:45 PM	0	12	27	3	0	0	3	4	24	0	0	5	37	2	0	0	5	2	1	0
5:00 PM	0	13	39	6	0	0	7	5	23	0	0	7	47	8	0	0	7	1	4	0
5:15 PM	0	18	23	3	0	0	4	10	31	0	0	7	47	2	0	0	7	5	4	0
5:30 PM	0	13	28	4	0	0	5	5	31	0	0	2	33	4	0	0	6	4	3	0
5:45 PM	0	8	41	4	0	0	2	8	20	0	0	1	57	2	0	0	4	2	8	0
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Greenman-Pedersen, Inc.
80 Wolf Rd, Suite 600
Albany, NY 12205
(518) 453-9431

Intersection: Oscawana Lake Rd at Cimarron Rd
Location: Town of Putnam Valley, New York
GPI Project No.: 2300070.00
Count Date: 7/19/2023

Peak Hour Traffic Volumes

	Oscawana Lake Rd Southbound					Church Rd Westbound					Oscawana Lake Rd Northbound					Cimarron Rd Eastbound				
	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes
AM Peak Hour:			**7:45 AM**	**to**	**8:45 AM**															
7:45 AM	0	20	39	1	0	0	7	0	9	0	0	3	22	6	0	0	3	5	4	0
8:00 AM	0	23	41	6	0	0	5	0	14	0	0	3	17	0	0	0	2	8	5	0
8:15 AM	0	25	36	5	0	0	10	1	9	0	0	2	30	6	0	0	5	10	3	0
8:30 AM	0	19	51	5	0	0	2	2	9	0	0	3	31	6	0	0	2	13	1	0
Total Volume	0	87	167	17	0	0	24	3	41	0	0	11	100	18	0	0	12	36	13	0
529			271					68					129					61		
No. of Trucks	0	3	5	1	0	0	1	0	4	0	0	2	8	1	0	0	1	2	0	0
Truck %	0.0%	3.4%	3.0%	5.9%		0.0%	4.2%	0.0%	9.8%	0.0%	0.0%	18.2%	8.0%	5.6%	0.0%	0.0%	8.3%	5.6%	0.0%	0.0%
5.3%			3.3%					7.4%					8.5%					4.9%		
PHF	0.00	0.87	0.82	0.71		0.00	0.60	0.38	0.73	0.00	0.00	0.92	0.81	0.75	0.00	0.00	0.60	0.69	0.65	0.00
0.92			0.90					0.85					0.81					0.85		

	Oscawana Lake Rd Southbound					Church Rd Westbound					Oscawana Lake Rd Northbound					Cimarron Rd Eastbound				
	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes
PM Peak Hour:			**5:00 PM**	**to**	**6:00 PM**															
5:00 PM	0	13	39	6	0	0	7	5	23	0	0	7	47	8	0	0	7	1	4	0
5:15 PM	0	18	23	3	0	0	4	10	31	0	0	7	47	2	0	0	7	5	4	0
5:30 PM	0	13	28	4	0	0	5	5	31	0	0	2	33	4	0	0	6	4	3	0
5:45 PM	0	8	41	4	0	0	2	8	20	0	0	1	57	2	0	0	4	2	8	0
Total Volume	0	52	131	17	0	0	18	28	105	0	0	17	184	16	0	0	24	12	19	0
623			200					151					217					55		
No. of Trucks	0	0	1	0	0	0	0	1	1	0	0	0	1	1	0	0	1	0	0	0
Truck %	0.0%	0.0%	0.8%	0.0%		0.0%	0.0%	3.6%	1.0%	0.0%	0.0%	0.0%	0.5%	6.3%	0.0%	0.0%	4.2%	0.0%	0.0%	0.0%
1.0%			0.5%					1.3%					0.9%					1.8%		
PHF	0.00	0.72	0.80	0.71		0.00	0.64	0.70	0.85	0.00	0.00	0.61	0.81	0.50	0.00	0.00	0.86	0.60	0.59	0.00
0.93			0.86					0.84					0.88					0.86		

TRAFFIC SIGNAL WARRANT SUMMARY

Project: Putnam County Intersection Improvements
Condition: Existing Condition
Location: Town of Putnam Valley
Date: July 19th, 2023

Major Street: Oscawana Lake Rd. (CR 20) Lanes: 1 Critical Approach Speed: 50 mph
Minor Street: Church Rd. (CR 22) Lanes: 1

Volume Level Criteria

1. Is the critical speed of major street traffic greater than 40 mph? Yes
2. Is the intersection in a built-up area of an isolated community with population less than 10,000? No

If either Question 1 or Question 2 is answered "Yes", then use the 70% volume level. Criteria used: 70%

WARRANT 1 - EIGHT HOUR VEHICULAR VOLUME **Warrant 1 Satisfied: NO**

Warrant 1 is satisfied if EITHER Condition A OR Condition B is 100% satisfied.
Warrant 1 is also satisfied if BOTH Condition A AND Condition B are satisfied to the 80% volume level.

			Condition 1A - Minimum Vehicular Volume (X indicates that criteria is met for specified condition)				Condition 1B - Interuption of Continuous Traffic (X indicates that criteria is met for specified condition)				Total Satisfied Hours (8 required)		
											2	0	0
Minimum Volume Criteria:			350	105	280	84	525	53	420	42	Condition	Condition	80% for
Start Time	Major St. Volume[1]	Minor St. Volume[2]	Major St. 100%	Minor St. 100%	Major St. 80%	Minor St. 80%	Major St. 100%	Minor St. 100%	Major St. 80%	Minor St. 80%	1A Satisfied	1B Satisfied	Both Satisfied
12:00 AM			-	-	-	-	-	-	-	-	-	-	-
1:00 AM			-	-	-	-	-	-	-	-	-	-	-
2:00 AM			-	-	-	-	-	-	-	-	-	-	-
3:00 AM			-	-	-	-	-	-	-	-	-	-	-
4:00 AM			-	-	-	-	-	-	-	-	-	-	-
5:00 AM			-	-	-	-	-	-	-	-	-	-	-
6:00 AM			-	-	-	-	-	-	-	-	-	-	-
7:00 AM	319	49	-	-	X	-	-	-	-	X	-	-	-
8:00 AM	393	71	X	-	X	-	-	X	-	X	-	-	-
9:00 AM			-	-	-	-	-	-	-	-	-	-	-
10:00 AM			-	-	-	-	-	-	-	-	-	-	-
11:00 AM			-	-	-	-	-	-	-	-	-	-	-
12:00 PM			-	-	-	-	-	-	-	-	-	-	-
1:00 PM			-	-	-	-	-	-	-	-	-	-	-
2:00 PM			-	-	-	-	-	-	-	-	-	-	-
3:00 PM			-	-	-	-	-	-	-	-	-	-	-
4:00 PM	418	131	X	X	X	X	-	X	-	X	**1**	-	-
5:00 PM	417	151	X	X	X	X	-	X	-	X	**1**	-	-
6:00 PM			-	-	-	-	-	-	-	-	-	-	-
7:00 PM			-	-	-	-	-	-	-	-	-	-	-
8:00 PM			-	-	-	-	-	-	-	-	-	-	-
9:00 PM			-	-	-	-	-	-	-	-	-	-	-
10:00 PM			-	-	-	-	-	-	-	-	-	-	-
11:00 PM			-	-	-	-	-	-	-	-	-	-	-

[1] Major Street Volume is the total combined volume of both mainline approaches.

[2] Minor Street volumes is the highest single side street approach volume.

WARRANT 2 - FOUR HOUR VEHICULAR VOLUME **Warrant 2 Satisfied: NO**

Warrant is satisfied if four (4) or more hours satisfy the volume requirements depicted on the four hour warranting graph **(see page 2)**. No. of Points Above Criteria Curve: 0

WARRANT 3 - PEAK HOUR VEHICULAR VOLUME **Warrant 3 Satisfied: NO**

Warrant is satisfied if any hour satisfy the volume requirements depicted on the peak hour warranting graph **(see page 3)**, and ALL three of the following requirement are met. No. of Points Above Criteria Curve: 0

1. Total stopped time delay on Minor Street equals or exceeds 4 VHD (single lane) or 5 VHD (two lanes): N/A VHD Max. -
2. Volume on Minor Street equals or exceeds 100 vehicles (single lane) or 150 vehicles (two lanes): -
3. Total intersection volume serviced during the hour equals or exceeds 650 veh. (3-leg) or 800 veh. (4-leg or more): -

TRAFFIC SIGNAL WARRANT SUMMARY

Project: Putnam County Intersection Improvements
Condition: Existing Condition
Location: Town of Putnam Valley
Date: July 19th, 2023

Major Street: Oscawana Lake Rd. (CR 20) Lanes: 1 Critical Approach Speed: 50 mph
Minor Street: Church Rd. (CR 22) Lanes: 1

WARRANT 7 - CRASH EXPERIENCE

Warrant 7 Satisfied: NO

1. Maximum number of angle[3] and pedestrian crashes in a one year period: 4
2. Maximum number of fatal-and-injury angle and pedestrian crashes in a one year period: 0
3. Maximum number of angle and pedestrian crashes in a three year period: 4
4. Maximum number of fatal-and-injury angle and pedestrian crashes in a three year period: 0

[3] Angle crashes include all crashes that occur at an angle and involve one or more vehicles on the major street and one or more vehicles on the minor street.

Warrant 7 is satisfied if **ANY** of the following criteria are met:

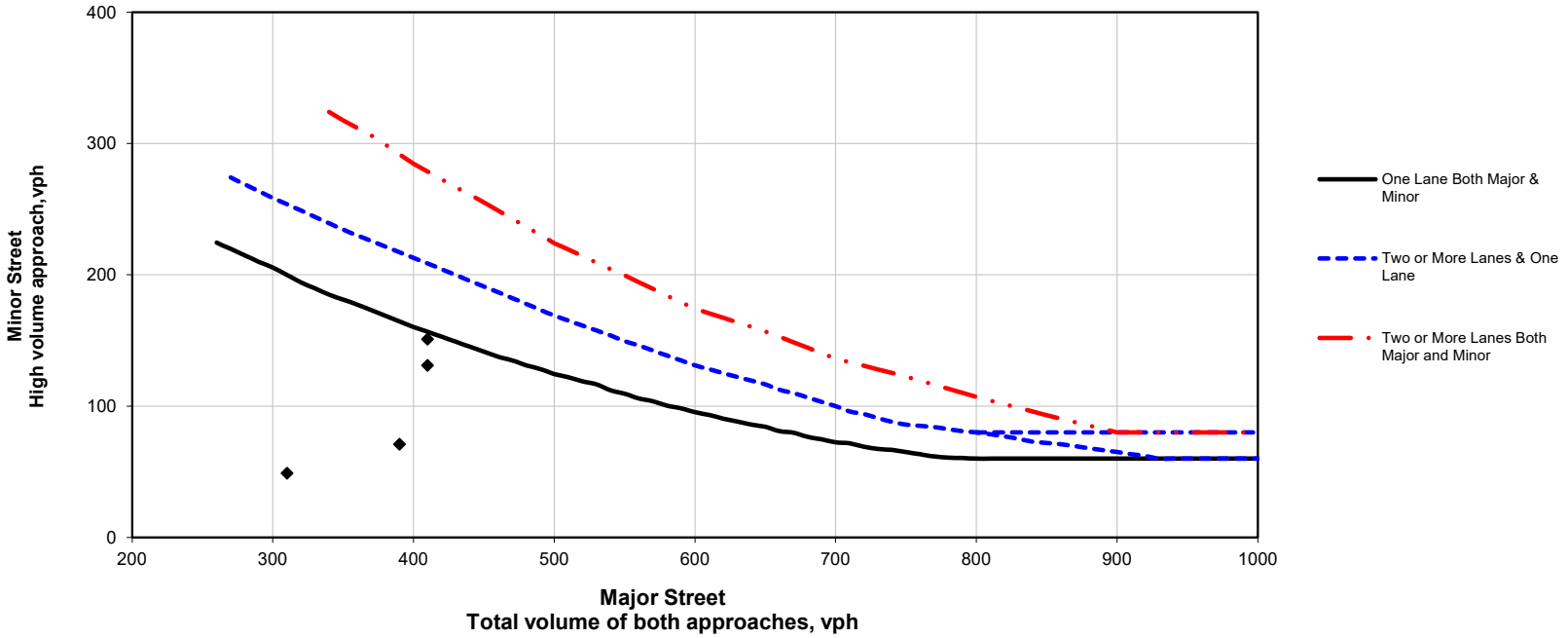
1. Are there more than 3 angle crashes in a one year period: Yes
2. Are there more than 3 fatal-and-injury crashes in a one year period: No
3. Are there more than 4 crashes in a three year period: No
4. Are there more than 4 fatal-and-injury crashes in a three year period: No

AND ANY of the following criteria are also met:

1. Are the VPH for **BOTH** 80% columns of Condition 1A satisfied for each of any 8 hrs: No
2. Are the VPH for **BOTH** 80% columns of Condition 1B satisfied for each of any 8 hrs: No

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)

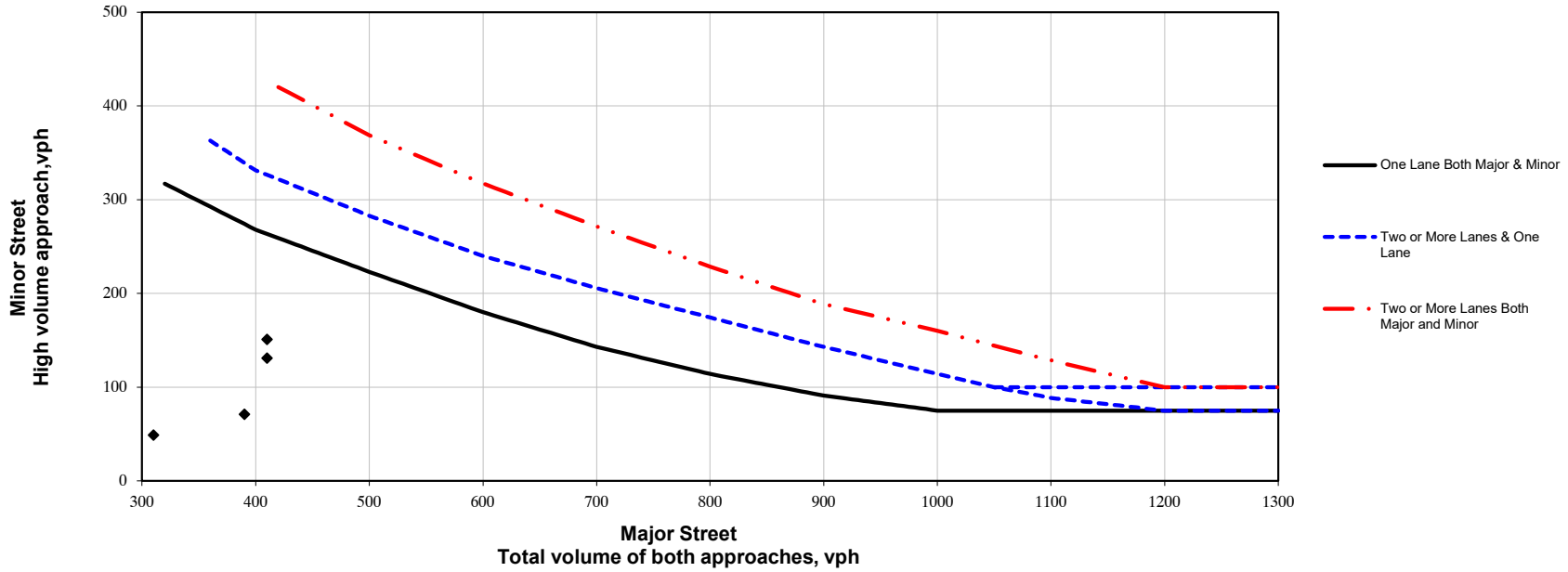
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 70 km/h (40 mph) ON MAJOR STREET)



Note: Points on graph represent hourly volumes. Points above the respective curve satisfy warrant, points below do not satisfy warrant.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 70 km/h (40 mph) ON MAJOR STREET)



Note: Points on graph represent hourly volumes. Points above the respective curve satisfy warrant, points below do not satisfy warrant.

Oscawana Lake Rd (CR 20) - Speed Study

Northbound	
Date:	7/19/2023
Time:	11:00 AM
Trial	Speed*
1	45
2	44
3	47
4	35
5	43
6	41
7	44
8	45
9	43
10	42
11	38
12	45
13	45
14	42
15	47
16	38
17	47
18	42
19	38
20	46
21	48
22	40
23	41
24	38
25	46
26	41
27	49
28	45
29	41
30	49
Avg.	**43.2**

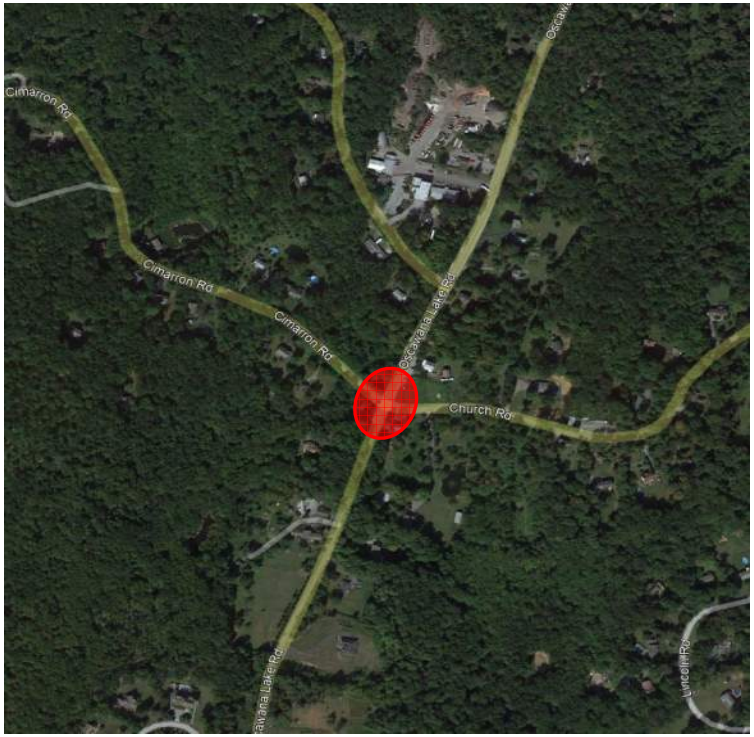
Southbound	
Date:	7/19/2023
Time:	11:00 AM
Trial	Speed*
1	41
2	45
3	44
4	41
5	51
6	47
7	43
8	43
9	42
10	38
11	42
12	41
13	42
14	46
15	48
16	44
17	42
18	47
19	45
20	43
21	44
22	45
23	39
24	43
25	46
26	42
27	47
28	48
29	43
30	52
Avg.	**44.1**

Oscawana Lake Rd (CR 20) at Church Rd (CR 22)/Cimarron Rd Putnam Valley, New York

Posted Speed Limit: 40 MPH

85th Percentile Speeds		
NB		**SB**
47.0		**47.0**

Location Map



* - Denotes speed measured at proposed access location with vehicles traveling under free flow conditions, in MPH

Sight Distance Summary Church Rd (CR 22) at Oscawanna Lake Rd (CR 20)						
Location	**Side Street Turn Movement**	**Direction**	**Available Sight Distance**	**Design Speed (mph)**	**Required Stopping Sight Distance[1]**	**Recommended Intersection Sight Distance[1]**
Westbound Church Rd (CR 22) at Oscawana Lake Rd (CR 20)	Right Turn	Looking Left (South)	525'	50	425'	480'
	Left Turn	Looking Left (South)	525'	50	425'	555'
		Looking Right (North)	1000'+	50	425'	555'
Eastbound Cimarron Rd at Oscawana Lake Rd (CR 20)	Right Turn	Looking Left (South)	1000'+	50	425'	480'
	Left Turn	Looking Left (South)	1000'+	50	425'	555'
		Looking Right (North)	700'	50	425'	555'

[1] Recommended minimum sight distance values from AASHTO's *A Policy on Geometric Design of Highways and Streets* , 7th Edition and the NYSDOT's *Highway Design Manual* . The recommended values are based on the current free flow travel speeds of the roadway.

COUNTY: PUTNAM P.I.N.:

TOWN OF PUTNAM VALLEY

ROUTE NO. OR STREET NAME: OSCAWANA LAKE ROAD (CR 20)

AT INTERSECTION WITH/OR BETWEEN: CHURCH ROAD (CR 22)

GPI
Engineering | Design | Planning | Construction Management

TIME PERIOD: FROM: 12/31/2019 TO: 12/31/2023

No. OF MONTHS: 48

ENVIRONMENTAL:
Use Codes from MV 104 (shown at right) for these categories

Light Conditions:
1. Daylight
2. Dawn
3. Dusk
4. Dark Road Lighted
5. Dark Road Unlighted

Roadway Character:
1. Straight & Level
2. Straight & Grade
3. Straight & Hillcrest
4. Curve & Level
5. Curve & Grade
6. Curve & Hillcrest

Roadway Surface Condition:
1. Dry
2. Wet
3. Muddy
4. Snow/Ice
5. Slush
10. Other

Weather:
1. Clear
2. Cloudy
3. Rain
4. Snow
5. Sleet/Hail/Freezing Rain
6. Fog/Smog/Smoke
10. Other

[1]Use Codes from MV 104 Police Report

ACCIDENT No.	DATE	TIME	No. of VEHICLES	SEVERITY	LIGHT CONDITIONS	ROADWAY CHARACTER	ROADWAY SURFACE CONDITION	WEATHER	APPARENT CONTRIBUTING FACTORS	DIRECTION	TYPE[1]	DESCRIPTION	CASE NO.
1	05/24/20	20:30	1	PDO	3	4	1	1	-	EAST	7	ANIMAL	38440848
2	06/10/21	2:20	1	PDO	1	1	1	1	ANIMALS ACTION	EAST	11	FIXED OBJECT	38896108
3	08/13/22	11:15	1	PDO	-	-	-	-	-	NORTH	7	ANIMAL	39471380
4	10/30/22	10:37	2	PDO	1	1	1	1	FAILURE TO YIELD RIGHT OF WAY	EAST/SOUTH	1	RIGHT ANGLE	39567844
5	04/09/23	19:15	2	PI	1	1	1	1	TRAFFIC CONTROL DEVICES DISREGARDED	SOUTH/WEST	1	RIGHT ANGLE	39790333
6	05/17/23	16:53	2	PI	1	2	1	1	FAILURE TO YIELD RIGHT OF WAY	NORTH/EAST	1	RIGHT ANGLE	39832980
7	10/15/23	14:11	2	PI	1	1	1	1	TRAFFIC CONTROL DEVICES DISREGARDED	SOUTH/EAST	1	RIGHT ANGLE	40045902

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	12	36	13	24	3	41	11	100	18	87	167	17
Future Vol, veh/h	12	36	13	24	3	41	11	100	18	87	167	17
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	7	7	7	9	9	9	3	3	3
Mvmt Flow	13	39	14	26	3	45	12	109	20	95	182	18

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	548	534	191	551	533	119	200	0	0	129	0	0
Stage 1	381	381	-	143	143	-	-	-	-	-	-	-
Stage 2	167	153	-	408	390	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.17	6.57	6.27	4.19	-	-	4.13	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.17	5.57	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.17	5.57	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.563	4.063	3.363	2.281	-	-	2.227	-	-
Pot Cap-1 Maneuver	443	448	843	437	446	919	1331	-	-	1451	-	-
Stage 1	635	608	-	848	769	-	-	-	-	-	-	-
Stage 2	828	765	-	610	599	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	392	411	843	373	409	919	1331	-	-	1451	-	-
Mov Cap-2 Maneuver	392	411	-	373	409	-	-	-	-	-	-	-
Stage 1	629	563	-	840	761	-	-	-	-	-	-	-
Stage 2	777	757	-	517	555	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.2	12	0.7	2.5
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1331	-	-	457	585	1451	-	-
HCM Lane V/C Ratio	0.009	-	-	0.145	0.126	0.065	-	-
HCM Control Delay (s)	7.7	0	-	14.2	12	7.7	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.5	0.4	0.2	-	-

Intersection	
Int Delay, s/veh	5.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	24	12	19	18	28	105	17	184	16	52	131	17
Future Vol, veh/h	24	12	19	18	28	105	17	184	16	52	131	17
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	26	13	20	19	30	113	18	198	17	56	141	18

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	576	513	150	522	514	207	159	0	0	215	0	0
Stage 1	262	262	-	243	243	-	-	-	-	-	-	-
Stage 2	314	251	-	279	271	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	428	465	896	465	464	833	1420	-	-	1355	-	-
Stage 1	743	691	-	761	705	-	-	-	-	-	-	-
Stage 2	697	699	-	728	685	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	335	438	896	425	437	833	1420	-	-	1355	-	-
Mov Cap-2 Maneuver	335	438	-	425	437	-	-	-	-	-	-	-
Stage 1	733	660	-	750	695	-	-	-	-	-	-	-
Stage 2	568	689	-	666	654	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14	12.4	0.6	2
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1420	-	-	457	650	1355	-	-
HCM Lane V/C Ratio	0.013	-	-	0.129	0.25	0.041	-	-
HCM Control Delay (s)	7.6	0	-	14	12.4	7.8	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.4	1	0.1	-	-

Intersection	
Intersection Delay, s/veh	4.6
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	66	74	141	295
Demand Flow Rate, veh/h	70	79	154	304
Vehicles Circulating, veh/h	313	146	153	44
Vehicles Exiting, veh/h	35	161	230	181
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	4.4	3.8	4.5	4.8
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	70	79	154	304
Cap Entry Lane, veh/h	1003	1189	1180	1319
Entry HV Adj Factor	0.944	0.934	0.917	0.969
Flow Entry, veh/h	66	74	141	295
Cap Entry, veh/h	946	1111	1082	1278
V/C Ratio	0.070	0.066	0.130	0.230
Control Delay, s/veh	4.4	3.8	4.5	4.8
LOS	A	A	A	A
95th %tile Queue, veh	0	0	0	1

Intersection	
Intersection Delay, s/veh	4.5
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	59	162	233	215
Demand Flow Rate, veh/h	60	165	237	219
Vehicles Circulating, veh/h	220	247	97	68
Vehicles Exiting, veh/h	67	87	183	344
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	3.8	4.8	4.6	4.3
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	60	165	237	219
Cap Entry Lane, veh/h	1103	1073	1250	1287
Entry HV Adj Factor	0.979	0.984	0.983	0.983
Flow Entry, veh/h	59	162	233	215
Cap Entry, veh/h	1079	1056	1229	1265
V/C Ratio	0.054	0.154	0.190	0.170
Control Delay, s/veh	3.8	4.8	4.6	4.3
LOS	A	A	A	A
95th %tile Queue, veh	0	1	1	1

GPI Greenman-Pedersen, Inc.
Engineering and Construction Services

Intersection:	Oscawana Lake Rd (CR 20) and Church Rd (CR 22)		
Client:	Putnam County	GPI No.	2300070.00
Calculated By:	D. Creen	Date:	6/12/2024
Checked By:	M. Wieszchowski	Date:	6/13/2024

SINGLE LANE ROUNDABOUT (120 FT DIAMETER)

DESCRIPTION	TOTAL QUANTITY	UNIT	UNIT PRICE	TOTAL COST
SINGLE LANE ROUNDABOUT [1]	1	EA	$1,250,000	$1,250,000
ADDITONAL EARTHWORK (ABOVE AND BEYOND TYPICAL)	2,500	CY	$50	$125,000
UTILITY RELOCATION [2]	0	EA	$50,000	$0
RESIDENTIAL DRIVEWAY RECONSTRUCTION	1	EA	$10,000	$10,000
STORMWATER AND TREATMENT [3]	1	LS	$100,000	$100,000
WORK ZONE TRAFFIC CONTROL	1	LS	$200,000	$200,000
			ESTIMATED CONSTRUCTION COST (CONCEPTUAL)	**$1,685,000**
RIGHT OF WAY	0.051	ACRE	$500,000	$30,000
CONTIGENCY (20%)	1	LS	$337,000	$340,000
DESIGN AND INSPECTION (25%)	1	LS	$421,250	$425,000
			FINAL TOTAL	**$2,480,000**

[1] INCLUDES TYPICAL COST FOR PAVEMENT, CURB, EARTHWORK, DRAINAGE, LANDSCAPING, ETC., FOR A SINGLE LANE ROUNDABOUT.

[2] ELECTRIC AND GAS RELOCATIONS ARE ASSUMED NO COST FOR MUNICIPAL PROJECTS. WATER AND SEWER RELOCATIONS ARE ASSUMED AT $75,000 EACH.

[3] IMPACTS OVER 5,000 SF WITHIN DEP WATERSHEDS REQUIRE POST STORMWATER TREATMENT. $100,000 ALLOWANCE FOR EXTRA ROW OR WORK REQUIRED.

GPI

N

CIMARRON RD

OSCAWANA LAKE RD (CR 20)

0.016 ACRE
ROW TAKING

UTILITY POLE
IMPACTS

0.035 ACRE
ROW TAKING

RECONSTRUCT
DRIVEWAY

CHURCH RD (CR 22)

20 0 20 40 60 80'

Putnam County Intersections | FIG C-2

Oscawana Lake Rd (CR 20) at Church Rd
Intersection Improvement Concept Sketch

APPENDIX D
Drewville Road (CR 36)
at Weber Hill Road

SUMMARY OF ANALYSIS
DREWVILLE RD (CR 36) @ WEBER HILL RD

Existing Conditions:

The existing intersection is 3-legged, with Drewville Rd approaching from the north and east and Weber Hill Rd approaching from the west as a skewed approach intersecting at a significant curve with 20 mph advisory speed signs posted along Drewville Rd. All lanes are 11-foot wide and there are little to no paved shoulders along the roadways. There is stop sign control on Weber Hill Rd while Drewville Rd is uncontrolled in both directions. There are no pedestrian facilities at this intersection.

Although Drewville Rd is a continuous County Road around the corner, the traffic volumes show the predominant traffic movements to be east and west between Drewville Rd and Weber Hill Rd.

The posted speed limit is 40 mph on Drewville Rd and 30 mph on Weber Hill Rd. Speed measurements were performed along Drewville Rd and the 85th percentile speeds were determined to be 37 mph southbound and 42 mph westbound approaching the intersection.

Sight distance for the eastbound Weber Hill Rd approach is 400' looking left (to the north). With a design speed of 40 mph, the required stopping sight distance is 305' and the recommended intersection sight distance is 445'. This indicates that sight distance is limited to the north, but not to the point where there would be a significant safety concern. All other sight distances are greater than the recommended intersection sight distances.

Traffic volumes are fairly low at this location and intersection level of service is well within acceptable levels at LOS B or better for all movements in the AM and PM peak hours. Vehicular capacity and delay are not an issue at this intersection.

Signal Warrant Analysis:

A review of the hourly traffic volumes between 7:00AM to 9:00AM and 4:00pm to 6:00pm show that no hours met the warranting criteria for any of the Signal Warrants reviewed. Additionally, Warrant 7 (crash experience) is also not satisfied, as none of the crash criteria reviewed were met.

Safety Analysis:

Based on the NYSDOT Clear Safety System, the Potential for Safety Improvement (PSI) for this intersection is -0.12 overall and -0.10 for serious injury/fatality crashes. These factors both being below 0.0 indicate that the crash potential at this location is below average compared to similar intersections Statewide. However, the crash rate for this intersection was calculated at 0.37 crashes per million entering vehicles (Cr/MEV), which is about 2 times the statewide average for similar intersections, so a more detailed look at crashes is warranted.

Crash data noted 3 crashes at this location in the 4-year period reviewed. 2 of the 3 were due to vehicles running off the road and were related to the road curvature, not intersection operations. There was no noticeable crash pattern, and it appears the high crash rate is only because volumes are lower at this location. A summary of the crash types and severity are shown in the table below:

CRASH SUMMARY

Crash Type	Number of Occurrences	Crash Severity	Number of Occurrences
Sideswipe	1	Fatality	0
Fixed Object	1	Personal Injury	3
Ran Off Road	1	Property Damage Only	0
	3		3

Field Condition and Right of Way Review:

A review of the existing terrain revealed some minor drop offs from the roadway and significant state wetland east and south of the intersection making any improvements involving intersection widening problematic. There are also a line of utility poles and a large drainage culvert that may need to be relocated for certain alternatives, such as a roundabout.

Right-of-way is 56' wide on the east approach, but only 38' wide on the north approach. Weber Hill Rd appears to have a right-of-way width of over 100', but if a roundabout option were progressed additional right-of-way would need to be acquired on the south side of the intersection.

Design Alternative Consideration:

Two alternatives could be considered that would marginally improve operations; (1) realign the intersection to make the east-west movements the through movement while changing the traffic control to have the southbound approach stop sign controlled and the other two approaches uncontrolled. This is more in line the majority traffic flow, and it would require those continuing along Drewville Rd (CR 36) to slow down and turn at the intersection, which would reduce the possibility of run off the road crashes and (2) Construction of a single lane roundabout. However, as stated above, this could significantly impact wetlands and would require the acquisition of right-of-way, driving up costs.

Because of the low traffic volumes, good level of service and low number of crashes, it is recommended to not improve this location, but if issues arise in the future, Alternative 1, realignment of the intersection is the preferred alternative.

Conceptual Cost Estimate:

Based on our experience with similar projects, knowledge of construction pricing in this region of New York State and our understanding of the issues, it is estimated that the east to west realignment of the intersection as shown in the following concept sketch would cost approximately $175,000 and a roundabout, because of the wetland impacts and right of way acquisition would cost approximately $2,825,000. These costs include construction of all improvements, as well as costs for design and inspection. A breakdown of the big picture cost items is included later in this appendix.

Summary & Conclusion:

There does not appear to be an operational issue at this location. Levels of service are well within acceptable limits and the crash history doesn't reveal any intersection related safety concerns outside of the roadway curvature. The sight distance looking north from Weber Hill Rd is somewhat limited, but that has not impacted safety based on the crash history. Because of this, it is recommended that the intersection remain unchanged. However, if conditions worsen in the future, alternative 1, which realigns the intersection and creates a more traditional "T"- intersection is recommended.

The intersection evaluation worksheet summarizing the lane geometry and traffic operations, traffic volume data sheets, traffic signal warrant analysis sheets, crash summary sheets, capacity analysis worksheets, cost estimate breakdown and intersection improvement concept sketches for this intersection can be found on the following pages in this appendix.

INTERSECTION EVALUATION WORKSHEET

Project:	Putnam County Intersection Improvements
Location:	Putnam County (Various Locations)
Intersection:	Drewville Rd (CR 36) at Weber Hill Rd
GPS Coord.:	41.38740, -73.69267
Traffic Control:	Stop Sign (NB)

Traffic Control Notes (if applicable):

None

Other Intersection Notes (if applicable):

No Pedestrian Crossings.
Sharp curve on Drewville Rd.

APPROACH DATA

				Drewville Rd (CR 36)			Weber Hill Rd			Drewville Rd (CR 36)		
	Northbound			**Southbound**			**Eastbound**			**Westbound**		
	Left	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
Lane Assignments:					<-1->			<-1			1->	
Lane Widths:					11'			11'			11'	
Turn Bay Lengths:					-			-			-	
Speed Limits:					40 mph			30 mph			40 mph	

TRAFFIC COUNT DATA

AM Peak Hour	Time Period:			8:00	to	9:00				Date Counted:		4/11/2024
Volume:				56	0	9	6	126	0	0	97	39
Truck %:				4%	0%	22%	1%	5%	0%	0%	4%	5%
Peds (Bikes):					0 (0)			0 (0)			0 (0)	
PHF = 0.92												
PM Peak Hour	Time Period:			5:00	to	6:00				Date Counted:		4/11/2024
Volume:				52	0	8	5	126	0	0	123	62
Truck %:				2%	0%	1%	1%	1%	0%	0%	1%	1%
Peds (Bikes):					0 (0)			0 (0)			0 (0)	
PHF = 0.8												

EXISTING CONDITION LEVEL OF SERVICE

AM Peak Delay (s):							9.4			7.5		
LOS:							A			A		
v/c:							0.15			0.07		
95% Queue:							< 25'			< 25'		
A (5.9) Overall							**A (9.4)**			**A (5.4)**		
PM Peak Delay (s):							9.5			7.6		
LOS:							A			A		
v/c:							0.17			0.10		
95% Queue:							< 25'			< 25'		
A (5.8) Overall							**A (9.4)**			**A (5.1)**		

Note: LOS calculated using HCM 6 methodologies. For unsignalized intersections, only side street approach delay and mainline left turn delay is shown. The HCM 6 methodology assumes zero delay for all other movements.

INTERSECTION EVALUATION WORKSHEET

INTERSECTION SAFETY

Travel Speeds	Direction:	Southbound	Westbound	
	Average Speed:	31.5	36.5	
	85th Percentile:	37.0	42.0	

Sight Distance	Approach:	Eastbound	
	Looking Left:	400'	
	Looking Right:	1,000' +	
	Summary:	The sight distance when Looking Left from the eastbound approach of Weber Hill Rd does not meet the Recommended Intersection Sight Distance for making a left turn.	

Crashes	From:	12/31/2019	To:	12/31/2023	No. of Months:	48			
	No. of Crashes:	3	PDO:	3	PI:	0	PI (A):	0	K: 0
	Crash Rate:	0.37 Cr/MEV			Above/Below Statewide Average:			2.18 Times	

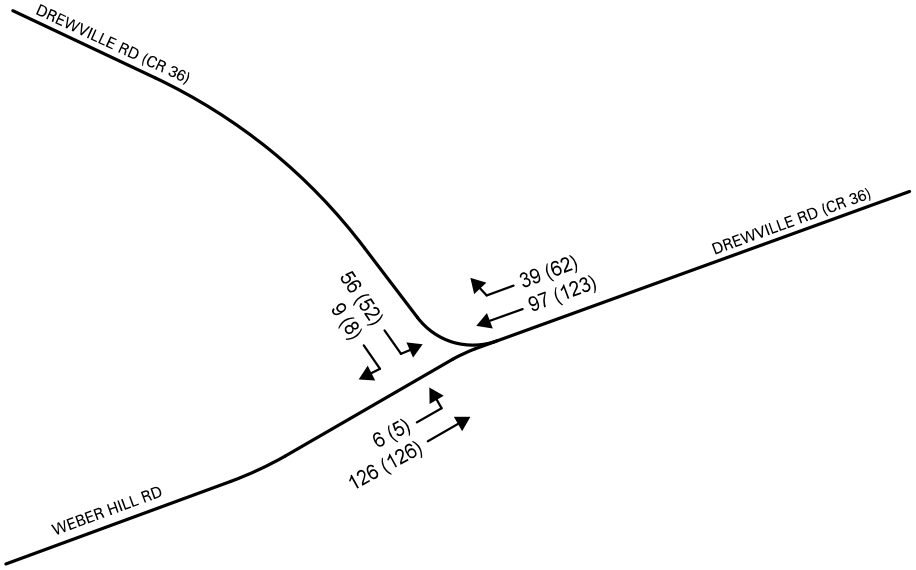
PSI Factors	PSI (KA):	-0.10
	PSI (Tot):	-0.12

BUILD ALTERNATIVE #1 - LEVEL OF SERVICE

	-			Drewville Rd (CR 36)			Weber Hill Rd			Drewville Rd (CR 36)		
	Northbound			**Southbound**			**Eastbound**			**Westbound**		
	Left	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
Description of Improvements:	Realigning and moving stop control to southbound Drewville Road Only											
AM Peak Delay (s):				10.5			7.6					
LOS:				B			A					
v/c:				0.10			0.01					
95% Queue:				< 25'			< 25'					
A (2.2) Overall				**B (10.5)**			**A (0.3)**					
PM Peak Delay (s):				11.2			7.7					
LOS:				B			A					
v/c:				0.12			0.01					
95% Queue:				< 25'			< 25'					
A (1.9) Overall				**B (11.2)**			**A (0.3)**					

BUILD ALTERNATIVE #2 - LEVEL OF SERVICE

	Weber Hill Rd			-			Drewville Rd			Drewville Rd		
	Northbound			**Southbound**			**Eastbound**			**Westbound**		
	Left	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
Description of Improvements:	Installation of a Roundabout.											
AM Peak Delay (s):	3.9						3.7			3.6		
LOS:	A						A			A		
v/c:	0.12						0.06			0.11		
95% Queue:	< 25'						< 25'			< 25'		
A (3.7) Overall	**A (3.9)**						**A (3.7)**			**A (3.6)**		
PM Peak Delay (s):	3.9						3.7			4.1		
LOS:	A						A			A		
v/c:	0.13						0.07			0.17		
95% Queue:	< 25'						< 25'			25'		
A (4.0) Overall	**A (3.9)**						**A (3.7)**			**A (4.1)**		



KEY:

XXX (XXX) = AM (PM) PEAK HOUR TRAFFIC VOLUMES

GPI Engineering Design Planning Construction Inspection

PUTNAM COUNTY
INTERSECTION IMPROVEMENTS
PUTNAM COUNTY, NEW YORK

DREWVILLE RD (CR 36) AT WEBER HILL RD
PEAK HOUR TRAFFIC VOLUMES

SCALE:	DATE:	FIGURE NO.
NO SCALE	JUNE 2024	D-1

Greenman-Pedersen, Inc.
80 Wolf Rd, Suite 600
Albany, NY 12205
(518) 453-9431

Intersection: Drewville Rd (CR 36) at Weber Hill Rd
Location: Town of Carmel, New York
GPI Project No.: 2300070.00
Count Date: 4/11/2024

Total Traffic - Cars & Heavy Vehicles

Start Time	- Southbound					Drewville Rd (CR 36) Westbound					Weber Hill Rd Northbound					Drewville Rd (CR 36) Eastbound				
	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes
7:00 AM	0	0	0	0	0	0	14	7	0	0	0	1	0	18	0	0	0	17	0	0
7:15 AM	0	0	0	0	0	0	20	2	0	0	0	0	0	23	0	0	0	13	0	0
7:30 AM	0	0	0	0	0	0	18	5	0	0	0	1	0	24	0	0	0	18	1	0
7:45 AM	0	0	0	0	0	0	32	7	0	0	0	1	0	30	0	0	0	12	2	0
8:00 AM	0	0	0	0	0	0	24	8	0	0	0	1	0	32	0	0	0	18	2	0
8:15 AM	0	0	0	0	0	0	29	8	0	0	0	1	0	32	0	1	0	9	0	0
8:30 AM	0	0	0	0	0	0	22	8	0	0	0	3	0	27	0	0	0	14	4	0
8:45 AM	0	0	0	0	0	0	22	15	0	0	0	1	0	35	0	0	0	15	3	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	45	12	0	0	0	0	0	25	0	1	0	11	1	0
4:15 PM	0	0	0	0	0	0	38	13	0	0	0	1	0	26	0	0	0	8	1	0
4:30 PM	0	0	0	0	0	0	28	14	0	0	0	5	0	23	0	0	0	10	1	0
4:45 PM	0	0	0	0	0	0	30	11	0	0	0	1	0	25	0	0	0	10	2	0
5:00 PM	0	0	0	0	0	0	36	19	0	0	0	1	0	24	0	0	0	12	2	0
5:15 PM	0	0	0	0	0	0	41	17	0	0	0	2	0	39	0	0	0	18	0	0
5:30 PM	0	0	0	0	0	0	26	10	0	0	0	0	0	32	0	0	0	11	2	0
5:45 PM	0	0	0	0	0	0	20	16	0	0	0	2	0	31	0	0	0	11	4	0
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Greenman-Pedersen, Inc.
80 Wolf Rd, Suite 600
Albany, NY 12205
(518) 453-9431

Intersection: Drewville Rd (CR 36) at Weber Hill Rd
Location: Town of Carmel, New York
GPI Project No.: 2300070.00
Count Date: 4/11/2024

Peak Hour Traffic Volumes

	- Southbound					Drewville Rd (CR 36) Westbound					Weber Hill Rd Northbound					Drewville Rd (CR 36) Eastbound				
	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes
AM Peak Hour:			**8:00 AM**	**to**	**9:00 AM**															
8:00 AM	0	0	0	0	0	0	24	8	0	0	0	1	0	32	0	0	0	18	2	0
8:15 AM	0	0	0	0	0	0	29	8	0	0	0	1	0	32	0	1	0	9	0	0
8:30 AM	0	0	0	0	0	0	22	8	0	0	0	3	0	27	0	0	0	14	4	0
8:45 AM	0	0	0	0	0	0	22	15	0	0	0	1	0	35	0	0	0	15	3	0
Total Volume	0	0	0	0	0	0	97	39	0	0	0	6	0	126	0	1	0	56	9	0
334			0					136					132					66		
No. of Trucks	0	0	0	0	0	0	4	2	0	0	0	0	0	6	0	1	0	2	2	0
Truck %	0.0%					0.0%	4.1%	5.1%	0.0%	0.0%	0.0%	0.0%	0.0%	4.8%	0.0%	100.0%	0.0%	3.6%	22.2%	0.0%
5.1%			0.0%					4.4%					4.5%					7.6%		
PHF	0.00					0.00	0.84	0.65	0.00	0.00	0.00	0.50	0.00	0.90	0.00	0.25	0.00	0.78	0.56	0.00
0.92			#DIV/0!					0.92					0.92					0.83		

	- Southbound					Drewville Rd (CR 36) Westbound					Weber Hill Rd Northbound					Drewville Rd (CR 36) Eastbound				
	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes
PM Peak Hour:			**5:00 PM**	**to**	**6:00 PM**															
5:00 PM	0	0	0	0	0	0	36	19	0	0	0	1	0	24	0	0	0	12	2	0
5:15 PM	0	0	0	0	0	0	41	17	0	0	0	2	0	39	0	0	0	18	0	0
5:30 PM	0	0	0	0	0	0	26	10	0	0	0	0	0	32	0	0	0	11	2	0
5:45 PM	0	0	0	0	0	0	20	16	0	0	0	2	0	31	0	0	0	11	4	0
Total Volume	0	0	0	0	0	0	123	62	0	0	0	5	0	126	0	0	0	52	8	0
376			0					185					131					60		
No. of Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Truck %	0.0%					0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%	0.0%	0.0%
0.3%			0.0%					0.0%					0.0%					1.7%		
PHF	0.00					0.00	0.75	0.82		0.00	0.00	0.63	0.00	0.81	0.00	0.00	0.00	0.72	0.50	0.00
0.80			#DIV/0!					0.80					0.80					0.83		

TRAFFIC SIGNAL WARRANT SUMMARY

Project: Putnam County Intersection Improvements
Condition: Existing Condition
Location: Town of Carmel
Date: April 11th, 2024

Major Street: Drewville Rd. (CR 36) Lanes: 1 Critical Approach Speed: 40 mph
Minor Street: Weber Hill Rd. Lanes: 1

Volume Level Criteria

1. Is the critical speed of major street traffic greater than 40 mph? No
2. Is the intersection in a built-up area of an isolated community with population less than 10,000? No

If either Question 1 or Question 2 is answered "Yes", then use the 70% volume level. Criteria used: 100%

WARRANT 1 - EIGHT HOUR VEHICULAR VOLUME **Warrant 1 Satisfied: NO**

Warrant 1 is satisfied if EITHER Condition A OR Condition B is 100% satisfied.
Warrant 1 is also satisfied if BOTH Condition A AND Condition B are satisfied to the 80% volume level.

			Condition 1A - Minimum Vehicular Volume (X indicates that criteria is met for specified condition)				Condition 1B - Interuption of Continuous Traffic (X indicates that criteria is met for specified condition)				Total Satisfied Hours (8 required)		
											0	0	0
Minimum Volume Criteria:			500	150	400	120	750	75	600	60	Condition	Condition	80% for
Start Time	Major St. Volume[1]	Minor St. Volume[2]	Major St. 100%	Minor St. 100%	Major St. 80%	Minor St. 80%	Major St. 100%	Minor St. 100%	Major St. 80%	Minor St. 80%	1A Satisfied	1B Satisfied	Both Satisfied
12:00 AM			-	-	-	-	-	-	-	-	-	-	-
1:00 AM			-	-	-	-	-	-	-	-	-	-	-
2:00 AM			-	-	-	-	-	-	-	-	-	-	-
3:00 AM			-	-	-	-	-	-	-	-	-	-	-
4:00 AM			-	-	-	-	-	-	-	-	-	-	-
5:00 AM			-	-	-	-	-	-	-	-	-	-	-
6:00 AM			-	-	-	-	-	-	-	-	-	-	-
7:00 AM	168	98	-	-	-	-	-	X	-	X	-	-	-
8:00 AM	202	132	-	-	-	X	-	X	-	X	-	-	-
9:00 AM			-	-	-	-	-	-	-	-	-	-	-
10:00 AM			-	-	-	-	-	-	-	-	-	-	-
11:00 AM			-	-	-	-	-	-	-	-	-	-	-
12:00 PM			-	-	-	-	-	-	-	-	-	-	-
1:00 PM			-	-	-	-	-	-	-	-	-	-	-
2:00 PM			-	-	-	-	-	-	-	-	-	-	-
3:00 PM			-	-	-	-	-	-	-	-	-	-	-
4:00 PM	236	106	-	-	-	-	-	X	-	X	-	-	-
5:00 PM	245	131	-	-	-	X	-	X	-	X	-	-	-
6:00 PM			-	-	-	-	-	-	-	-	-	-	-
7:00 PM			-	-	-	-	-	-	-	-	-	-	-
8:00 PM			-	-	-	-	-	-	-	-	-	-	-
9:00 PM			-	-	-	-	-	-	-	-	-	-	-
10:00 PM			-	-	-	-	-	-	-	-	-	-	-
11:00 PM			-	-	-	-	-	-	-	-	-	-	-

[1] Major Street Volume is the total combined volume of both mainline approaches.

[2] Minor Street volumes is the highest single side street approach volume.

WARRANT 2 - FOUR HOUR VEHICULAR VOLUME **Warrant 2 Satisfied: NO**

Warrant is satisfied if four (4) or more hours satisfy the volume requirements depicted on the four hour warranting graph **(see page 2)**. No. of Points Above Criteria Curve: 0

WARRANT 3 - PEAK HOUR VEHICULAR VOLUME **Warrant 3 Satisfied: NO**

Warrant is satisfied if any hour satisfy the volume requirements depicted on the peak hour warranting graph **(see page 3)**, and ALL three of the following requirement are met. No. of Points Above Criteria Curve: 0

1. Total stopped time delay on Minor Street equals or exceeds 4 VHD (single lane) or 5 VHD (two lanes): N/A VHD Max. -
2. Volume on Minor Street equals or exceeds 100 vehicles (single lane) or 150 vehicles (two lanes): -
3. Total intersection volume serviced during the hour equals or exceeds 650 veh. (3-leg) or 800 veh. (4-leg or more): -

TRAFFIC SIGNAL WARRANT SUMMARY

Project: Putnam County Intersection Improvements
Condition: Existing Condition
Location: Town of Carmel
Date: April 11th, 2024

Major Street: Drewville Rd. (CR 36) Lanes: 1 Critical Approach Speed: 40 mph
Minor Street: Weber Hill Rd. Lanes: 1

WARRANT 7 - CRASH EXPERIENCE

Warrant 7 Satisfied: NO

1. Maximum number of angle[3] and pedestrian crashes in a one year period: 0
2. Maximum number of fatal-and-injury angle and pedestrian crashes in a one year period: 0
3. Maximum number of angle and pedestrian crashes in a three year period: 0
4. Maximum number of fatal-and-injury angle and pedestrian crashes in a three year period: 0

[3] Angle crashes include all crashes that occur at an angle and involve one or more vehicles on the major street and one or more vehicles on the minor street.

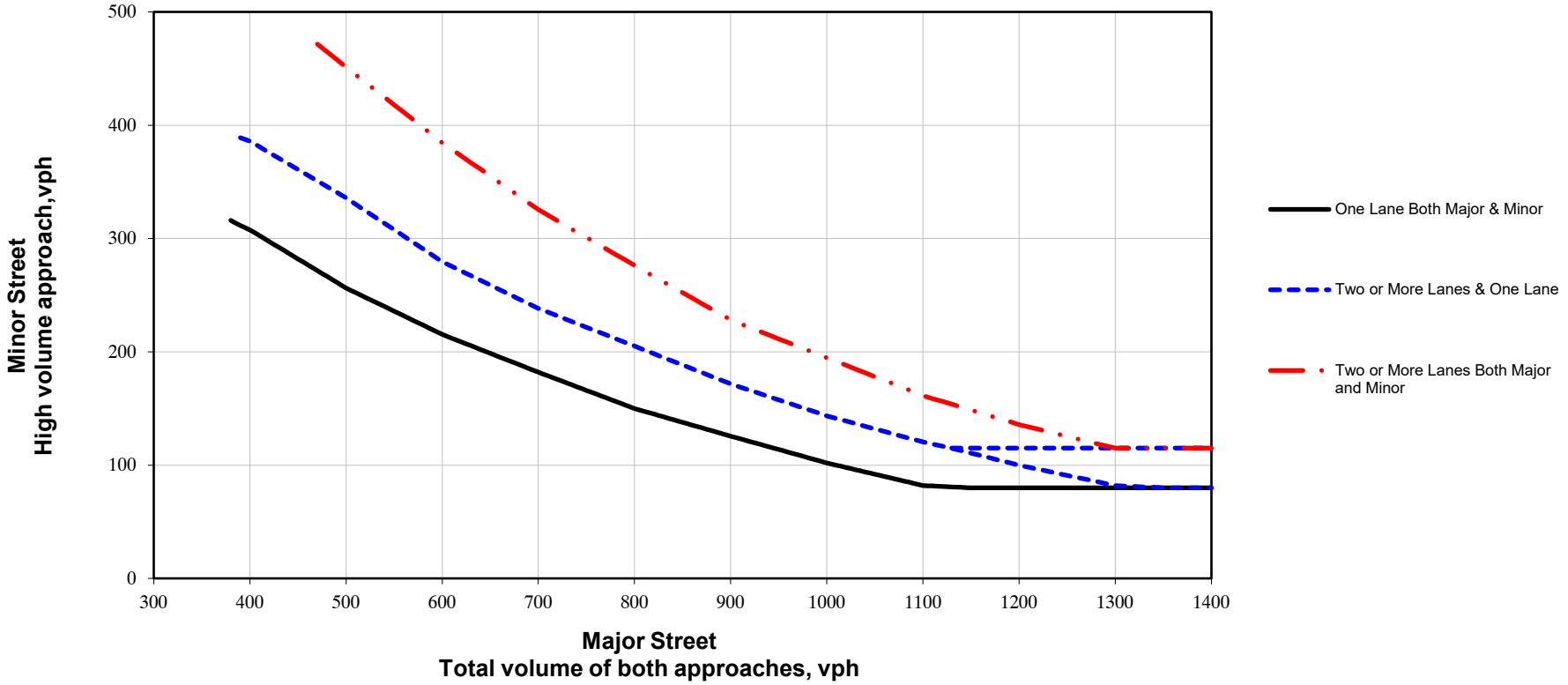
Warrant 7 is satisfied if **ANY** of the following criteria are met:

1. Are there more than 4 angle crashes in a one year period: No
2. Are there more than 3 fatal-and-injury crashes in a one year period: No
3. Are there more than 4 crashes in a three year period: No
4. Are there more than 4 fatal-and-injury crashes in a three year period: No

AND ANY of the following criteria are also met:

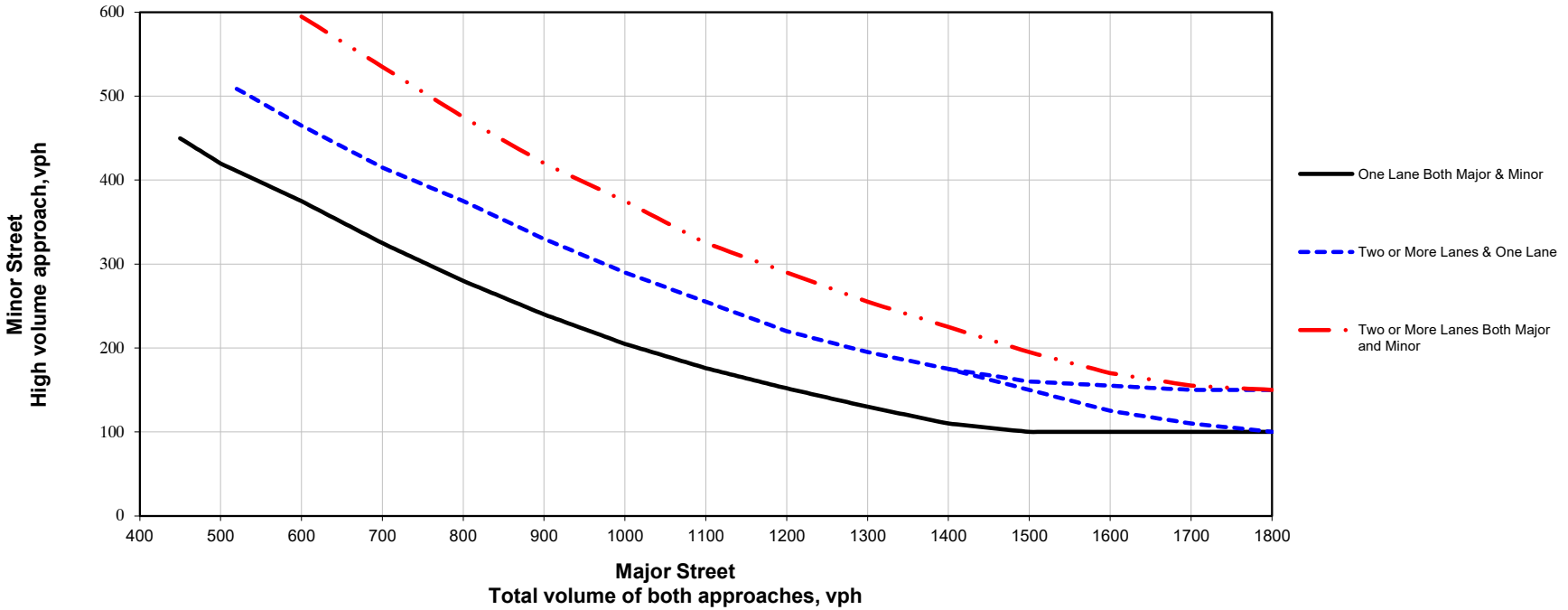
1. Are the VPH for **BOTH** 80% columns of Condition 1A satisfied for each of any 8 hrs: No
2. Are the VPH for **BOTH** 80% columns of Condition 1B satisfied for each of any 8 hrs: No

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



Note: Points on graph represent hourly volumes. Points above the respective curve satisfy warrant, points below do not satisfy warrant.

Figure 4C-3. Warrant 3, Peak Hour



Note: Points on graph represent hourly volumes. Points above the respective curve satisfy warrant, points below do not satisfy warrant.

Drewville Road (CR 36) - Speed Study

Southbound	
Date:	4/10/2024
Time:	3:00 PM
Trial	Speed*
1	25
2	34
3	30
4	29
5	35
6	27
7	31
8	35
9	37
10	34
11	27
12	34
13	31
14	28
15	33
16	29
17	27
18	33
19	38
20	40
21	26
22	33
23	25
24	29
25	28
26	32
27	37
28	27
29	32
30	38
Avg.	**31.5**

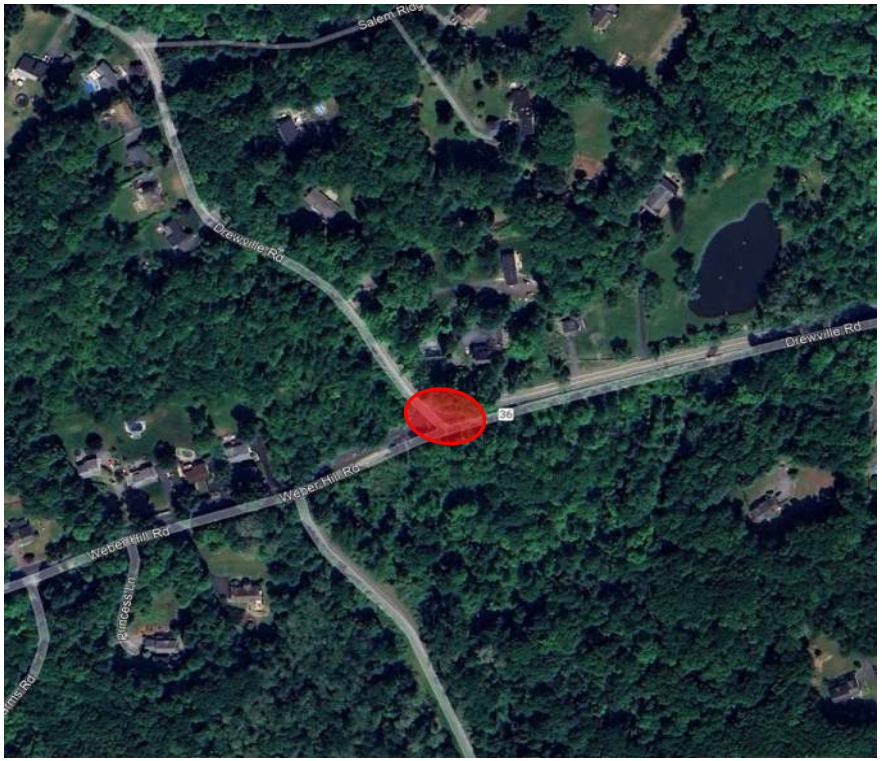
Westbound	
Date:	4/10/2024
Time:	3:00 PM
Trial	Speed*
1	40
2	38
3	36
4	41
5	29
6	39
7	37
8	40
9	32
10	39
11	26
12	36
13	38
14	40
15	37
16	29
17	43
18	42
19	43
20	27
21	30
22	39
23	27
24	38
25	29
26	35
27	42
28	37
29	43
30	42
Avg.	**36.5**

Drewville Road (CR 36)
at Weber Hill Road
Carmel, New York

Posted Speed Limit: 40 MPH

85th Percentile Speeds		
SB		**WB**
37.0		**42.0**

Location Map



* - Denotes speed measured at proposed access location with vehicles traveling under free flow conditions, in MPH

Sight Distance Summary Weber Hill Rd At Drewville Rd (CR 36)						
Location	**Side Street Turn Movement**	**Direction**	**Available Sight Distance**	**Design Speed (mph)**	**Required Stopping Sight Distance[1]**	**Recommended Intersection Sight Distance[1]**
Eastbound Weber Hill Rd at Drewville Rd (CR 36)	Right Turn	Looking Left (North)	400'	40	305'	385'
	Left Turn	Looking Left (North)	400'	40	305'	445'
		Looking Right (East)	1000'+	40	305'	445'

[1] Recommended minimum sight distance values from AASHTO's *A Policy on Geometric Design of Highways and Streets* , 7th Edition and the NYSDOT's *Highway Design Manual* . The recommended values are based on the current free flow travel speeds of the roadway.

COUNTY: PUTNAM P.I.N.:

TOWN OF CARMEL

ROUTE NO. OR STREET NAME: DREWVILLE ROAD (CR 36)

AT INTERSECTION WITH/OR BETWEEN: WEBER HILL ROAD

GPI
Engineering | Design | Planning | Construction Management

TIME PERIOD: FROM: 12/31/2019 TO: 12/31/2023

No. OF MONTHS: 48

ENVIRONMENTAL:
Use Codes from MV 104 (shown at right) for these categories

Light Conditions:
1. Daylight
2. Dawn
3. Dusk
4. Dark Road Lighted
5. Dark Road Unlighted

Roadway Character:
1. Straight & Level
2. Straight & Grade
3. Straight & Hillcrest
4. Curve & Level
5. Curve & Grade
6. Curve & Hillcrest

Roadway Surface Condition:
1. Dry
2. Wet
3. Muddy
4. Snow/Ice
5. Slush
10. Other

Weather:
1. Clear
2. Cloudy
3. Rain
4. Snow
5. Sleet/Hail/Freezing Rain
6. Fog/Smog/Smoke
10. Other

[1]Use Codes from MV 104 Police Report

ACCIDENT No.	DATE	TIME	No. of VEHICLES	SEVERITY	LIGHT CONDITIONS	ROADWAY CHARACTER	ROADWAY SURFACE CONDITION	WEATHER	APPARENT CONTRIBUTING FACTORS	DIRECTION	TYPE[1]	DESCRIPTION	CASE NO.
1	06/06/20	15:34	2	PDO	1	5	1	1	FAILURE TO KEEP RIGHT	EAST/WEST	1	SIDESWIPE	38432938
2	07/09/20	15:32	1	PDO	1	5	1	2	DRIVER INEXPERIENCE	WEST	17	FIXED OBJECT	38474874
3	09/17/20	12:21	1	PDO	1	5	1	1	UNSAFE SPEED	EAST	34	RAN OFF ROAD ONLY	38557003

Intersection	
Int Delay, s/veh	5.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	56	9	97	39	6	126
Future Vol, veh/h	56	9	97	39	6	126
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	8	8	4	4	5	5
Mvmt Flow	61	10	105	42	7	137

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	71	0	318	66
Stage 1	-	-	-	-	66	-
Stage 2	-	-	-	-	252	-
Critical Hdwy	-	-	4.14	-	6.45	6.25
Critical Hdwy Stg 1	-	-	-	-	5.45	-
Critical Hdwy Stg 2	-	-	-	-	5.45	-
Follow-up Hdwy	-	-	2.236	-	3.545	3.345
Pot Cap-1 Maneuver	-	-	1517	-	669	989
Stage 1	-	-	-	-	949	-
Stage 2	-	-	-	-	783	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1517	-	622	989
Mov Cap-2 Maneuver	-	-	-	-	622	-
Stage 1	-	-	-	-	949	-
Stage 2	-	-	-	-	727	-

Approach	EB	WB	NB
HCM Control Delay, s	0	5.4	9.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	963	-	-	1517	-
HCM Lane V/C Ratio	0.149	-	-	0.07	-
HCM Control Delay (s)	9.4	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.5	-	-	0.2	-

Intersection	
Int Delay, s/veh	5.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	52	8	123	62	5	126
Future Vol, veh/h	52	8	123	62	5	126
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	65	10	154	78	6	158

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	75	0	456	70
Stage 1	-	-	-	-	70	-
Stage 2	-	-	-	-	386	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1524	-	562	993
Stage 1	-	-	-	-	953	-
Stage 2	-	-	-	-	687	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1524	-	502	993
Mov Cap-2 Maneuver	-	-	-	-	502	-
Stage 1	-	-	-	-	953	-
Stage 2	-	-	-	-	614	-

Approach	EB	WB	NB
HCM Control Delay, s	0	5.1	9.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	957	-	-	1524	-
HCM Lane V/C Ratio	0.171	-	-	0.101	-
HCM Control Delay (s)	9.5	-	-	7.6	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0.3	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↑	
Traffic Vol, veh/h	6	126	97	39	56	9
Future Vol, veh/h	6	126	97	39	56	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	4	4	8	8
Mvmt Flow	7	137	105	42	61	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	147	0	-	0	277	126
Stage 1	-	-	-	-	126	-
Stage 2	-	-	-	-	151	-
Critical Hdwy	4.15	-	-	-	6.48	6.28
Critical Hdwy Stg 1	-	-	-	-	5.48	-
Critical Hdwy Stg 2	-	-	-	-	5.48	-
Follow-up Hdwy	2.245	-	-	-	3.572	3.372
Pot Cap-1 Maneuver	1417	-	-	-	700	909
Stage 1	-	-	-	-	885	-
Stage 2	-	-	-	-	862	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1417	-	-	-	697	909
Mov Cap-2 Maneuver	-	-	-	-	697	-
Stage 1	-	-	-	-	881	-
Stage 2	-	-	-	-	862	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	10.5
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1417	-	-	-	720
HCM Lane V/C Ratio	0.005	-	-	-	0.098
HCM Control Delay (s)	7.6	0	-	-	10.5
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.3

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	126	123	62	52	8
Future Vol, veh/h	5	126	123	62	52	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	6	158	154	78	65	10

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	232	0	-	0	363	193
Stage 1	-	-	-	-	193	-
Stage 2	-	-	-	-	170	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1336	-	-	-	636	849
Stage 1	-	-	-	-	840	-
Stage 2	-	-	-	-	860	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1336	-	-	-	633	849
Mov Cap-2 Maneuver	-	-	-	-	633	-
Stage 1	-	-	-	-	836	-
Stage 2	-	-	-	-	860	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	11.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1336	-	-	-	655
HCM Lane V/C Ratio	0.005	-	-	-	0.115
HCM Control Delay (s)	7.7	0	-	-	11.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.4

Intersection	
Intersection Delay, s/veh	3.7
Intersection LOS	A

Approach	EB	WB	NB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	71	147	144
Demand Flow Rate, veh/h	77	153	151
Vehicles Circulating, veh/h	109	7	66
Vehicles Exiting, veh/h	51	210	120
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	3.7	3.6	3.9
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	TR	LT	LR
Assumed Moves	TR	LT	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	77	153	151
Cap Entry Lane, veh/h	1235	1370	1290
Entry HV Adj Factor	0.924	0.963	0.954
Flow Entry, veh/h	71	147	144
Cap Entry, veh/h	1140	1319	1230
V/C Ratio	0.062	0.112	0.117
Control Delay, s/veh	3.7	3.6	3.9
LOS	A	A	A
95th %tile Queue, veh	0	0	0

Intersection	
Intersection Delay, s/veh	4.0
Intersection LOS	A

Approach	EB	WB	NB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	75	232	164
Demand Flow Rate, veh/h	76	237	167
Vehicles Circulating, veh/h	157	6	66
Vehicles Exiting, veh/h	86	227	167
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	3.7	4.1	3.9
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	TR	LT	LR
Assumed Moves	TR	LT	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	76	237	167
Cap Entry Lane, veh/h	1176	1371	1290
Entry HV Adj Factor	0.983	0.981	0.982
Flow Entry, veh/h	75	232	164
Cap Entry, veh/h	1156	1345	1267
V/C Ratio	0.065	0.173	0.129
Control Delay, s/veh	3.7	4.1	3.9
LOS	A	A	A
95th %tile Queue, veh	0	1	0

GPI Greenman-Pedersen, Inc.
Engineering and Construction Services

Intersection:	Drewville Rd (CR 36) and Weber Hill Rd		
Client:	Putnam County	GPI No.	2300070.00
Calculated By:	D. Creen	Date:	6/12/2024
Checked By:	M. Wieszchowski	Date:	6/13/2024

REALIGN INTERSECTION (EAST TO WEST)

DESCRIPTION	TOTAL QUANTITY	UNIT	UNIT PRICE	TOTAL COST
THREE-WAY INTERSECTION REALIGNMENT [1]	1	EA	$100,000	$100,000
WORK ZONE TRAFFIC CONTROL	1	LS	$20,000	$20,000
			ESTIMATED CONSTRUCTION COST (CONCEPTUAL)	**$120,000**
CONTIGENCY (20%)	1	LS	$24,000	$25,000
DESIGN AND INSPECTION (25%)	1	LS	$30,000	$30,000
			FINAL TOTAL	**$175,000**

[1] INCLUDES TYPICAL COST FOR MILLING, PAVEMENT, DRAINAGE, STRIPING, SIGNING, ETC.

SINGLE LANE ROUNDABOUT (120 FT DIAMETER)

DESCRIPTION	TOTAL QUANTITY	UNIT	UNIT PRICE	TOTAL COST
SINGLE LANE ROUNDABOUT [2]	1	EA	$1,250,000	$1,250,000
ADDITONAL EARTHWORK (ABOVE AND BEYOND TYPICAL)	3,000	CY	$50	$150,000
UTILITY RELOCATION [3]	1	EA	$75,000	$0
STORMWATER AND TREATMENT [4]	1	LS	$100,000	$100,000
WETLAND MITIGATION	1	LS	$175,000	$175,000
WORK ZONE TRAFFIC CONTROL	1	LS	$200,000	$200,000
			ESTIMATED CONSTRUCTION COST (CONCEPTUAL)	**$1,875,000.00**
RIGHT OF WAY	0.202	ACRE	$500,000	$105,000
CONTIGENCY (20%)	1	LS	$375,000	$375,000
DESIGN AND INSPECTION (25%)	1	LS	$468,750	$470,000
			FINAL TOTAL	**$2,825,000.00**

[2] INCLUDES TYPICAL COST FOR PAVEMENT, CURB, EARTHWORK, DRAINAGE, LANDSCAPING, ETC., FOR A SINGLE LANE ROUNDABOUT.

[3] ELECTRIC AND GAS RELOCATIONS ARE ASSUMED NO COST FOR MUNICIPAL PROJECTS. WATER AND SEWER RELOCATIONS ARE ASSUMED AT $75,000 EACH.

[4] IMPACTS OVER 5,000 SF WITHIN DEP WATERSHEDS REQUIRE POST STORMWATER TREATMENT. $100,000 ALLOWANCE FOR EXTRA ROW OR WORK REQUIRED.

GPI

N

DREWVLLE RD (CR 36)

DREWVLLE RD (CR 36)

STOP

WEBER HILL RD

20 0 20 40 60 80'

Putnam County Intersections | FIG D-2

Drewville Rd (CR 36) at Weber Hill Rd

Intersection Improvement Concept Sketch

GPI

N

DREWVLLE RD (CR 36)

DREWVLLE RD (CR 36)

WEBER HILL RD

UTILITY POLE IMPACTS

UTILITY POLE IMPACTS

0.202 ACRE ROW TAKING

POTENTIAL WETLAND IMPACTS

AHB

AFEE

ST

20 0 20 40 60 80'

Putnam County Intersections | FIG D-3

Drewville Rd (CR 36) at Weber Hill Rd
Intersection Improvement Concept Sketch

APPENDIX E

Croton Falls Road (CR 34)

at West Shore Drive (CR 38)

SUMMARY OF ANALYSIS
CROTON FALLS RD (CR 34) @ W SHORE DR (CR 38)

Existing Conditions:

This is a very complex 4-legged unsignalized intersection with Croton Falls Rd as the uncontrolled mainline. The intersection is located at a horizontal curve in the roadway with the two side streets, Munich Rd and West Shore Dr, entering the intersection at different skewed angles. In fact, the West Shore Dr approach is at a skew of about 60 degrees from Croton Falls Rd. Both side streets are stop sign controlled.

The posted speed limits are 35 mph along Croton Falls Rd, 45 mph along W. Shore Dr and 30 mph along Munich Rd. Speed measurements performed along Croton Falls Rd determined the 85th percentile speeds to be 46 mph northbound and 42 mph southbound, even though the curve is signed with an advisory speed of 20 mph.

Sight distance is significantly restricted for the side streets, with most movements not meeting intersection sight distance guidelines, and the sight distance looking south (to the right) from Munich Rd doesn't meet stopping sight distance requirements.

Level of services at the intersection are well within the acceptable range though, with no movement operating worse than LOS B.

Signal Warrant Analysis:

A review of the hourly traffic volumes between 7:00 AM to 9:00AM and 4:00 PM to 6:00 PM show that no hours met the warranting criteria for any of the Signal Warrants reviewed. Additionally, Warrant 7 (crash experience) was also not satisfied, as none of the crash criteria reviewed were met.

Safety Analysis:

Based on the NYSDOT Clear Safety System, the Potential for Safety Improvement (PSI) for this intersection is 0.16 overall and -0.07 for serious injury/fatality crashes. These factors indicate there is potential for safety improvement, with PSI>0.0, but the potential for serious injury crashes is not above that of similar facilities. The crash rate for this intersection was calculated at 0.60 crashes per million entering vehicles (Cr/MEV), which is around 2.16 times the statewide average of 0.28 Cr/MEV for similar intersections, so a more detailed look at crashes is warranted.

Crash data noted 6 crashes at this location in the 4-year period reviewed. Of these crashes, 3 involved failing to yield the right of way, which would be indicative of sight distance issues. These crashes all involved vehicles traveling on the West Shore Drive approach. 2 of the 6 crashes were personal injury indicating that these crashes may be occurring at higher speeds, which makes the need for improvement a higher priority.

A summary of the crash types and severity are shown in the table below:

CRASH SUMMARY

Crash Type	Number of Occurrences	Crash Severity	Number of Occurrences
Rear end	2	Fatality	0
Fixed Object	1	Personal Injury	2
Left Turn	3	Property Damage Only	4
	6		6

Field Condition and Right of Way Review:

There are Federal wetlands north of the intersection, sharply down sloped terrain on the east side of the intersection leading down to the reservoir, a stream traveling through a culvert under the intersection, utility poles close to the roadway along both Croton Falls Rd and W. Shore drive, and a well-maintained rock wall (possibly historic) is present. All these items pose significant issues for any improvements proposed at this intersection.

There is about 60' of right-of-way along Croton Fall Rd and W. Shore Dr and about 48' of right-of-way along Munich Rd. This right-of-way does not expand at the intersection, so additional right-of-way would need to be acquired is a roundabout were to be constructed.

Design Alternative Consideration:

Levels of service and vehicular capacity are not an issue at this location, but the significant skews and limited sight distance are a safety concern.

Peak hour traffic counts for the intersection reveled that only about 2 vehicles per direction utilize the Munich Rd approach. Given the limited sight distance and the fact that the dozen or so homes on that roadway segment have an alternate means of egress to Croton Falls Rd, closing the Munich Rd connection at this intersection should be considered.

Another improvement consideration, which could be made in conjunction with closing Munich Rd would be to reconfigure/relocate the W. Shore Dr approach to intersect more "squared-up" with Croton Falls Rd. This would require acquisition of some right-of-way north of the intersection, as it would bring in the approach about 100 feet north of where the intersection is currently, but this relocation should provide better sight lines and make the turn movements easier from that approach. See Figure E-3 for a concept sketch of this improvement.

A final improvement alternative to consider would be a single lane roundabout. A roundabout at this location would provide great level of service (LOS A), would calm traffic, and help eliminate the right angle and left turn crashes, but with the topography, the proximity of wetlands and water bodies, and the terrain drop off to the east of the intersection, the construction of a roundabout would be very difficult and expensive. A concept sketch of the roundabout improvement is show in Figure E-4 but this improvement is not recommended.

Conceptual Cost Estimate:

Based on our experience with similar projects, knowledge of construction pricing in this region of New York State and our understanding of the issues, the dead-ending of Munich Road would cost roughly $70,000, while the realignment of the West Shore Drive approach would cost roughly $350,000. Due to the uneven terrain, right-of-way acquisitions, and proximity to wetlands and the reservoir, the construction of a roundabout at this location would cost approximately $4,210,000. These costs include construction of all improvements, right-of-way takings, and design and inspection. A breakdown of the big picture cost items is included later in this appendix.

Summary & Conclusion:

Based on the analysis, safety improvements are warranted at this intersection, but a traffic signal is not. Levels of service are acceptable in the existing condition, but sight lines and safety should be improved. It is recommended that the Munich Rd connection to Croton Falls Rd at this location be terminated. Combined with that, if possible, the realignment of W. Shore Dr to intersect about 100 feet north of the current intersection to improve sight lines and improve turn movements would be also prudent. Although a roundabout was reviewed, the geometric and environmental constraints would make constructing a roundabout extremely difficult and costly.

INTERSECTION EVALUATION WORKSHEET

Project:	Putnam County Intersection Improvements
Location:	Putnam County (Various Locations)
Intersection:	Croton Falls Rd (CR 34) at West Shore Dr
GPS Coord.:	41.36587, -73.68236
Traffic Control:	Stop Sign (EB, WB)

Traffic Control Notes (if applicable):

None

Other Intersection Notes (if applicable):

No Pedestrian Crossings.

APPROACH DATA

	Croton Falls Rd (CR 34)			Croton Falls Rd (CR 34)			Munich Rd			West Shore Dr (CR 38)		
	Northbound			**Southbound**			**Eastbound**			**Westbound**		
	Left	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
Lane Assignments:		<-1->			<-1->			<-1->			<-1->	
Lane Widths:		11'			11'			10'			11'	
Turn Bay Lengths:		-			-			-			-	
Speed Limits:	35 mph			35 mph			30 mph			45 mph		

TRAFFIC COUNT DATA

AM Peak Hour	Time Period:	7:00	to	8:00					Date Counted:		4/11/2024	
Volume:	0	124	32	5	263	0	0	1	1	122	2	1
Truck %:	1%	7%	3%	20%	4%	1%	1%	1%	1%	1%	1%	1%
Peds (Bikes):	0 (0)			0 (0)			0 (0)			0 (0)		
PHF = 0.94												
PM Peak Hour	Time Period:	5:00	to	6:00					Date Counted:		4/11/2024	
Volume:	0	313	109	6	140	0	0	1	0	36	0	6
Truck %:	1%	1%	1%	1%	2%	1%	1%	1%	1%	1%	1%	1%
Peds (Bikes):	0 (0)			0 (0)			0 (0)			0 (0)		
PHF = 0.96												

EXISTING CONDITION LEVEL OF SERVICE

AM Peak Delay (s):	0.0			7.6			11.0	14.1
LOS:	A			A			B	B
v/c:	-			0.00			0.00	0.25
95% Queue:	< 25'			< 25'			< 25'	25'
A (3.3) Overall	**A (0)**			**A (0.1)**			**B (11.0)**	**B (14.1)**
PM Peak Delay (s):	0.0			8.2			13.7	13.4
LOS:	A			A			B	B
v/c:	-			0.01			0.00	0.09
95% Queue:	< 25'			< 25'			< 25'	< 25'
A (1.0) Overall	**A (0)**			**A (0.3)**			**B (13.7)**	**B (13.4)**

Note: LOS calculated using HCM 6 methodologies. For unsignalized intersections, only side street approach delay and mainline left turn delay is shown. The HCM 6 methodology assumes zero delay for all other movements.

INTERSECTION EVALUATION WORKSHEET

INTERSECTION SAFETY

Travel Speeds	Direction:	Northbound	Southbound
	Average Speed:	42.6	39.1
	85th Percentile:	46.3	42.0

Sight Distance	Approach:	Eastbound	Westbound
	Looking Left:	375'	450'
	Looking Right:	275'	385'
	Summary:	Sight Distance does not meet Recommended Intersection Sight Distance for both the EB Munich Rd and WB W Shore Dr Approaches. Required Stopping Sight distance is not met when looking right from EB Munich Rd.	

Crashes	From:	12/31/2019	To:	12/31/2023	No. of Months:	48			
	No. of Crashes:	6	PDO:	4	PI:	2	PI (A):	0	K: 0
	Crash Rate:	0.60 Cr/MEV			Above/Below Statewide Average:		2.16 Times		

PSI Factors	PSI (KA):	-0.07
	PSI (Tot):	0.16

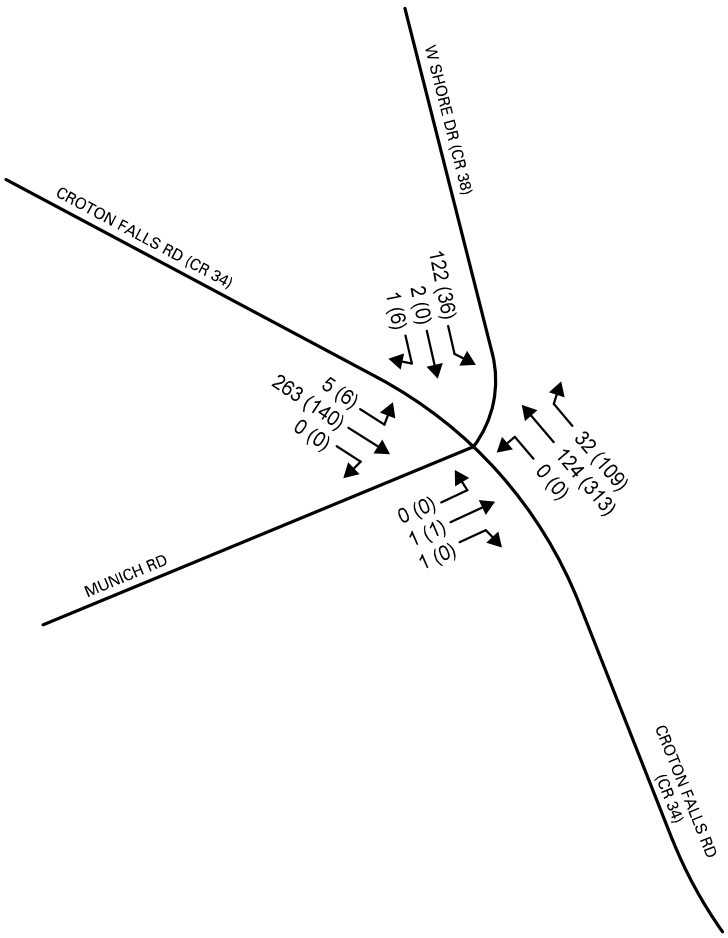
BUILD ALTERNATIVE #1 - LEVEL OF SERVICE

	Croton Falls Rd (CR 34)			Croton Falls Rd (CR 34)			Munich Rd			West Shore Dr (CR 38)		
	Northbound			**Southbound**			**Eastbound**			**Westbound**		
	Left	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
Description of Improvements:	Dead-end Munich Road.											
AM Peak Delay (s):	0.0			7.6						13.1		
LOS:	A			A						B		
v/c:	-			0.0						0.23		
95% Queue:	< 25'			< 25'						< 25'		
A (3.0) Overall	**A (0.0)**			**A (0.1)**						**B (13.1)**		
PM Peak Delay (s):	0.0			8.2						12.6		
LOS:	A			A						B		
v/c:	-			0.0						0.09		
95% Queue:	< 25'			< 25'						< 25'		
A (0.9) Overall	**A (0.0)**			**A (0.3)**						**B (12.6)**		

BUILD ALTERNATIVE #2 - LEVEL OF SERVICE

Description of Improvements: Installation of a Roundabout.

AM Peak Delay (s):	3.8	5.4	4.1	4.0
LOS:	A	A	A	A
v/c:	0.13	0.25	0.00	0.11
95% Queue:	< 25'	25'	< 25'	< 25'
A (4.6) Overall	**A (3.8)**	**A (5.4)**	**A (4.1)**	**A (4.0)**
PM Peak Delay (s):	5.6	3.7	3.3	4.2
LOS:	A	A	A	A
v/c:	0.33	0.12	0.00	0.05
95% Queue:	25'	< 25'	< 25'	< 25'
A (5.1) Overall	**A (5.6)**	**A (3.7)**	**A (3.3)**	**A (4.2)**



KEY:

XXX (XXX) = AM (PM) PEAK HOUR TRAFFIC VOLUMES

GPI Engineering Design Planning Construction Inspection

PUTNAM COUNTY
INTERSECTION IMPROVEMENTS
PUTNAM COUNTY, NEW YORK

CROTON FLS RD (CR 34) AT W SHORE DR (CR 38)
PEAK HOUR TRAFFIC VOLUMES

SCALE:	DATE:	FIGURE NO.
NO SCALE	JUNE 2024	E-1

Greenman-Pedersen, Inc.
80 Wolf Rd, Suite 600
Albany, NY 12205
(518) 453-9431

Intersection: Croton Falls Rd (CR 34) at West Shore Dr (CR 38)
Location: Town of Carmel, New York
GPI Project No.: 2300070.00
Count Date: 4/11/2024

Total Traffic - Cars & Heavy Vehicles

Start Time	Croton Falls Rd (CR 34) Southbound					West Shore Dr (CR 38) Westbound					Croton Falls Rd (CR 34) Northbound					Munich Rd Eastbound				
	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes
7:00 AM	0	0	80	0	0	0	36	0	0	0	0	0	28	3	0	0	0	0	0	0
7:15 AM	0	2	61	0	0	0	27	1	1	0	0	0	37	6	0	0	0	0	0	0
7:30 AM	0	3	63	0	0	0	32	0	0	0	0	0	27	8	0	0	0	0	0	0
7:45 AM	0	0	59	0	0	0	27	1	0	0	0	0	32	15	0	0	0	1	1	0
8:00 AM	0	1	63	0	0	0	38	1	0	0	0	0	28	14	0	0	0	0	0	0
8:15 AM	0	2	55	0	0	0	20	2	0	0	0	0	32	7	0	0	0	0	1	0
8:30 AM	0	3	49	0	0	0	23	0	1	0	0	0	32	10	0	0	0	0	0	0
8:45 AM	0	1	44	0	0	0	16	1	1	0	0	0	38	9	0	0	0	1	1	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	1	35	1	0	0	8	3	0	0	0	0	81	33	0	0	0	0	0	0
4:15 PM	0	0	34	0	0	0	18	1	1	0	0	0	68	26	0	0	0	0	1	0
4:30 PM	0	1	39	0	0	0	11	1	2	0	0	0	65	21	0	0	0	0	0	0
4:45 PM	0	1	24	0	0	0	6	0	0	0	0	0	69	30	0	0	0	0	1	0
5:00 PM	0	3	39	0	0	0	4	0	1	0	0	0	77	32	0	0	0	0	0	0
5:15 PM	0	1	38	0	0	0	8	0	1	0	0	0	68	22	0	0	0	0	0	0
5:30 PM	0	0	31	0	0	0	10	0	3	0	0	0	86	28	0	0	0	0	0	0
5:45 PM	0	2	32	0	0	0	14	0	1	0	0	0	82	27	0	0	0	1	0	0
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Greenman-Pedersen, Inc.
80 Wolf Rd, Suite 600
Albany, NY 12205
(518) 453-9431

Intersection: Croton Falls Rd (CR 34) at West Shore Dr (CR 38) GPI Project No.: 2300070.00
Location: Town of Carmel, New York Count Date: 4/11/2024

Peak Hour Traffic Volumes

	Croton Falls Rd (CR 34) Southbound					West Shore Dr (CR 38) Westbound					Croton Falls Rd (CR 34) Northbound					Munich Rd Eastbound				
	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes
AM Peak Hour:			**7:00 AM**	**to**	**8:00 AM**															
7:00 AM	0	0	80	0	0	0	36	0	0	0	0	0	28	3	0	0	0	0	0	0
7:15 AM	0	2	61	0	0	0	27	1	1	0	0	0	37	6	0	0	0	0	0	0
7:30 AM	0	3	63	0	0	0	32	0	0	0	0	0	27	8	0	0	0	0	0	0
7:45 AM	0	0	59	0	0	0	27	1	0	0	0	0	32	15	0	0	0	1	1	0
Total Volume	0	5	263	0	0	0	122	2	1	0	0	0	124	32	0	0	0	1	1	0
551			268					125					156					2		
No. of Trucks	0	1	10	0	0	0	1	0	0	0	0	0	9	1	0	0	0	0	0	0
Truck %	0.0%	20.0%	3.8%			0.0%	0.8%	0.0%	0.0%	0.0%	0.0%		7.3%	3.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
4.0%			4.1%					0.8%					6.4%					0.0%		
PHF	0.00	0.42	0.82			0.00	0.85	0.50	0.25	0.00	0.00		0.84	0.53	0.00	0.00	0.00	0.25	0.25	0.00
0.94			0.84					0.87					0.83					0.25		

	Croton Falls Rd (CR 34) Southbound					West Shore Dr (CR 38) Westbound					Croton Falls Rd (CR 34) Northbound					Munich Rd Eastbound				
	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes
PM Peak Hour:			**5:00 PM**	**to**	**6:00 PM**															
5:00 PM	0	3	39	0	0	0	4	0	1	0	0	0	77	32	0	0	0	0	0	0
5:15 PM	0	1	38	0	0	0	8	0	1	0	0	0	68	22	0	0	0	0	0	0
5:30 PM	0	0	31	0	0	0	10	0	3	0	0	0	86	28	0	0	0	0	0	0
5:45 PM	0	2	32	0	0	0	14	0	1	0	0	0	82	27	0	0	0	1	0	0
Total Volume	0	6	140	0	0	0	36	0	6	0	0	0	313	109	0	0	0	1	0	0
611			146					42					422					1		
No. of Trucks	0	0	3	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
Truck %	0.0%	0.0%	2.1%			0.0%	0.0%		0.0%	0.0%	0.0%		1.3%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%
1.1%			2.1%					0.0%					0.9%					0.0%		
PHF	0.00	0.50	0.90			0.00	0.64		0.50	0.00	0.00		0.91	0.85	0.00	0.00	0.00	0.25		0.00
0.96			0.87					0.70					0.93					0.25		

TRAFFIC SIGNAL WARRANT SUMMARY

Project: Putnam County Intersection Improvements
Condition: Existing Condition
Location: Town of Carmel
Date: April 11th, 2024

Major Street: Croton Falls Rd. (CR 34) Lanes: 1 Critical Approach Speed: 45 mph
Minor Street: West Shore Drive (CR 38) Lanes: 1

Volume Level Criteria

1. Is the critical speed of major street traffic greater than 40 mph? Yes
2. Is the intersection in a built-up area of an isolated community with population less than 10,000? No

If either Question 1 or Question 2 is answered "Yes", then use the 70% volume level. Criteria used: 70%

WARRANT 1 - EIGHT HOUR VEHICULAR VOLUME **Warrant 1 Satisfied: NO**

Warrant 1 is satisfied if EITHER Condition A OR Condition B is 100% satisfied.
Warrant 1 is also satisfied if BOTH Condition A AND Condition B are satisfied to the 80% volume level.

			Condition 1A - Minimum Vehicular Volume (X indicates that criteria is met for specified condition)				Condition 1B - Interuption of Continuous Traffic (X indicates that criteria is met for specified condition)				Total Satisfied Hours (8 required)		
											0	0	0
Minimum Volume Criteria:			350	105	280	84	525	53	420	42	Condition	Condition	80% for
Start Time	Major St. Volume[1]	Minor St. Volume[2]	Major St. 100%	Minor St. 100%	Major St. 80%	Minor St. 80%	Major St. 100%	Minor St. 100%	Major St. 80%	Minor St. 80%	1A Satisfied	1B Satisfied	Both Satisfied
12:00 AM			-	-	-	-	-	-	-	-	-	-	-
1:00 AM			-	-	-	-	-	-	-	-	-	-	-
2:00 AM			-	-	-	-	-	-	-	-	-	-	-
3:00 AM			-	-	-	-	-	-	-	-	-	-	-
4:00 AM			-	-	-	-	-	-	-	-	-	-	-
5:00 AM			-	-	-	-	-	-	-	-	-	-	-
6:00 AM			-	-	-	-	-	-	-	-	-	-	-
7:00 AM	268	127	-	X	-	X	-	X	-	X	-	-	-
8:00 AM	218	106	-	X	-	X	-	X	-	X	-	-	-
9:00 AM			-	-	-	-	-	-	-	-	-	-	-
10:00 AM			-	-	-	-	-	-	-	-	-	-	-
11:00 AM			-	-	-	-	-	-	-	-	-	-	-
12:00 PM			-	-	-	-	-	-	-	-	-	-	-
1:00 PM			-	-	-	-	-	-	-	-	-	-	-
2:00 PM			-	-	-	-	-	-	-	-	-	-	-
3:00 PM			-	-	-	-	-	-	-	-	-	-	-
4:00 PM	393	53	X	-	X	-	-	X	-	X	-	-	-
5:00 PM	422	43	X	-	X	-	-	-	X	X	-	-	-
6:00 PM			-	-	-	-	-	-	-	-	-	-	-
7:00 PM			-	-	-	-	-	-	-	-	-	-	-
8:00 PM			-	-	-	-	-	-	-	-	-	-	-
9:00 PM			-	-	-	-	-	-	-	-	-	-	-
10:00 PM			-	-	-	-	-	-	-	-	-	-	-
11:00 PM			-	-	-	-	-	-	-	-	-	-	-

[1] Major Street Volume is the total combined volume of both mainline approaches.

[2] Minor Street volumes is the highest single side street approach volume.

WARRANT 2 - FOUR HOUR VEHICULAR VOLUME **Warrant 2 Satisfied: NO**

Warrant is satisfied if four (4) or more hours satisfy the volume requirements depicted on the four hour warranting graph **(see page 2)**. No. of Points Above Criteria Curve: 0

WARRANT 3 - PEAK HOUR VEHICULAR VOLUME **Warrant 3 Satisfied: NO**

Warrant is satisfied if any hour satisfy the volume requirements depicted on the peak hour warranting graph **(see page 3)**, and ALL three of the following requirement are met. No. of Points Above Criteria Curve: 0

1. Total stopped time delay on Minor Street equals or exceeds 4 VHD (single lane) or 5 VHD (two lanes): N/A VHD Max. -
2. Volume on Minor Street equals or exceeds 100 vehicles (single lane) or 150 vehicles (two lanes): -
3. Total intersection volume serviced during the hour equals or exceeds 650 veh. (3-leg) or 800 veh. (4-leg or more): -

TRAFFIC SIGNAL WARRANT SUMMARY

Project: Putnam County Intersection Improvements
Condition: Existing Condition
Location: Town of Carmel
Date: April 11th, 2024

Major Street: Croton Falls Rd. (CR 34) Lanes: 1 Critical Approach Speed: 45 mph
Minor Street: West Shore Drive (CR 38) Lanes: 1

WARRANT 7 - CRASH EXPERIENCE

Warrant 7 Satisfied: NO

1. Maximum number of angle[3] and pedestrian crashes in a one year period: 2
2. Maximum number of fatal-and-injury angle and pedestrian crashes in a one year period: 0
3. Maximum number of angle and pedestrian crashes in a three year period: 2
4. Maximum number of fatal-and-injury angle and pedestrian crashes in a three year period: 0

[3] Angle crashes include all crashes that occur at an angle and involve one or more vehicles on the major street and one or more vehicles on the minor street.

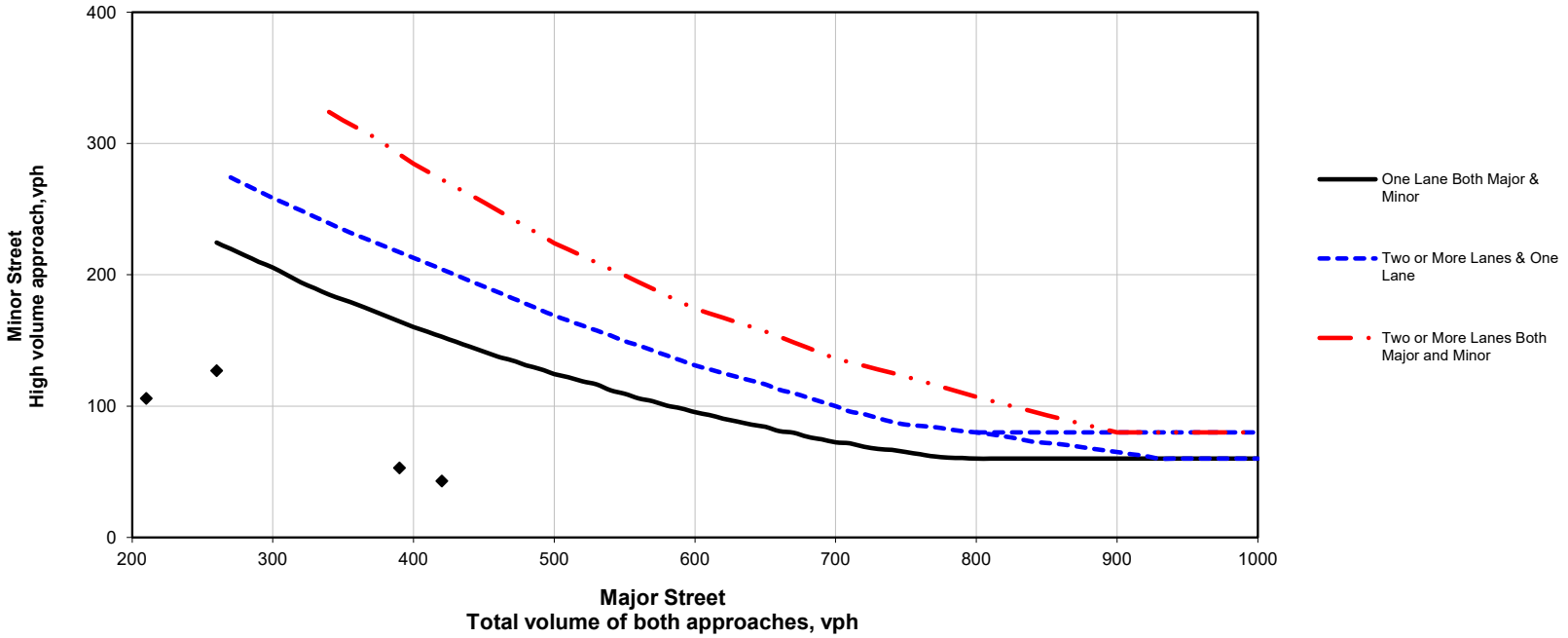
Warrant 7 is satisfied if **ANY** of the following criteria are met:

1. Are there more than 3 angle crashes in a one year period: No
2. Are there more than 3 fatal-and-injury crashes in a one year period: No
3. Are there more than 4 crashes in a three year period: No
4. Are there more than 4 fatal-and-injury crashes in a three year period: No

AND ANY of the following criteria are also met:

1. Are the VPH for **BOTH** 80% columns of Condition 1A satisfied for each of any 8 hrs: No
2. Are the VPH for **BOTH** 80% columns of Condition 1B satisfied for each of any 8 hrs: No

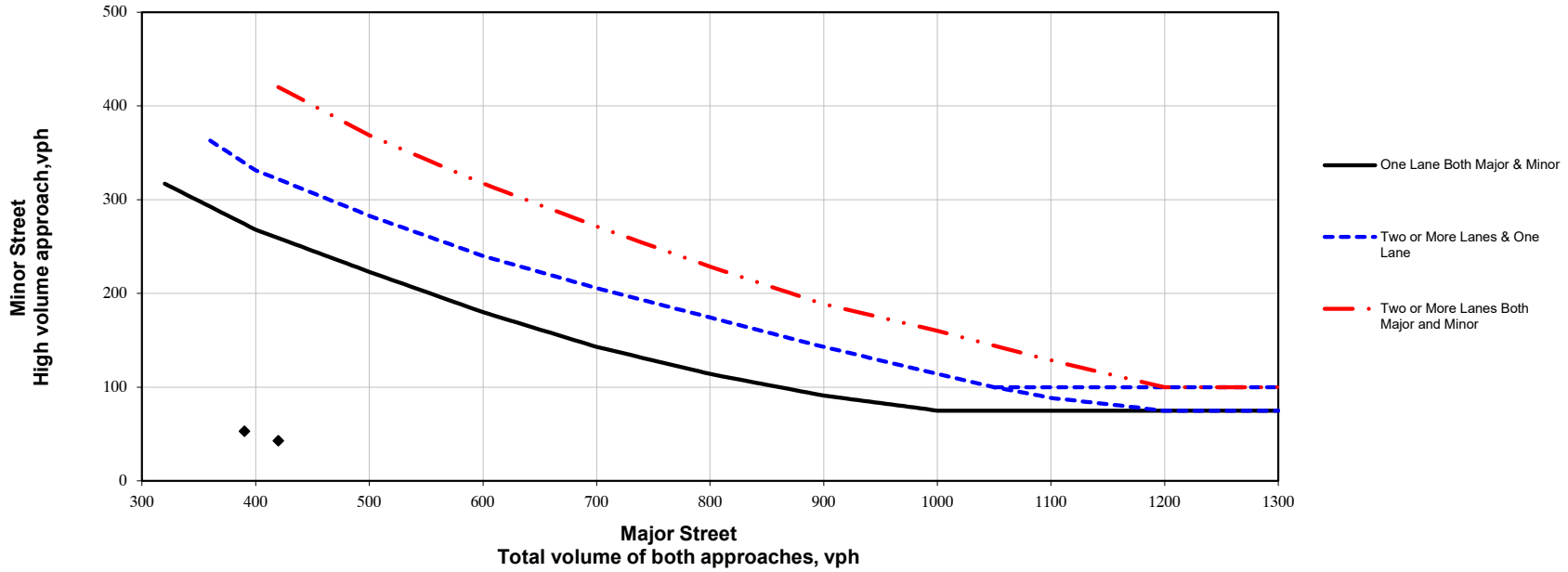
Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 70 km/h (40 mph) ON MAJOR STREET)



Note: Points on graph represent hourly volumes. Points above the respective curve satisfy warrant, points below do not satisfy warrant.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 70 km/h (40 mph) ON MAJOR STREET)



Note: Points on graph represent hourly volumes. Points above the respective curve satisfy warrant, points below do not satisfy warrant.

Croton Falls Road (CR 34) - Speed Study

Northbound	
Date:	4/10/2024
Time:	6:00 PM
Trial	Speed*
1	41
2	43
3	40
4	42
5	39
6	42
7	38
8	45
9	40
10	39
11	38
12	43
13	49
14	39
15	45
16	49
17	43
18	43
19	36
20	42
21	41
22	39
23	51
24	45
25	47
26	47
27	42
28	44
29	44
30	41
Avg.	**42.6**

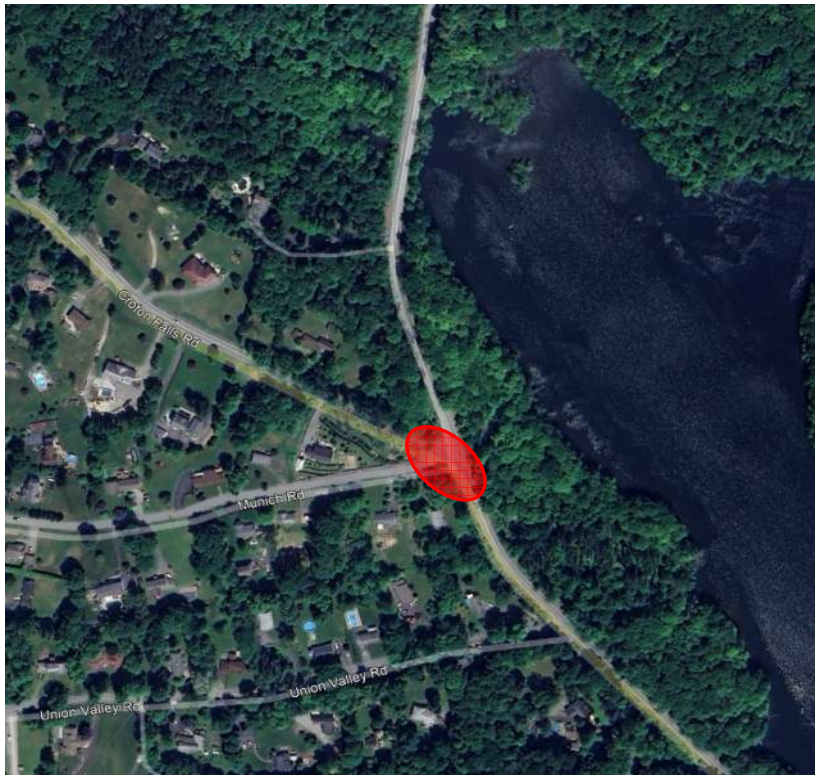
Southbound	
Date:	4/10/2024
Time:	6:00 PM
Trial	Speed*
1	35
2	36
3	37
4	39
5	42
6	37
7	33
8	39
9	36
10	37
11	38
12	42
13	40
14	36
15	39
16	42
17	42
18	46
19	41
20	35
21	39
22	35
23	37
24	45
25	42
26	42
27	43
28	38
29	35
30	46
Avg.	**39.1**

Croton Falls Road (CR 34)
at West Shore Drive (CR 38)
Carmel, New York

Posted Speed Limit: 35 MPH

85th Percentile Speeds		
NB		**SB**
46.3		**42.0**

Location Map



* - Denotes speed measured at proposed access location with vehicles traveling under free flow conditions, in MPH

Sight Distance Summary W Shore Dr (CR 38) at Croton Falls Rd (CR 34)						
Location	**Side Street Turn Movement**	**Direction**	**Available Sight Distance**	**Design Speed (mph)**	**Required Stopping Sight Distance[1]**	**Recommended Intersection Sight Distance[1]**
Westbound W Shore Dr (CR 38) at Croton Fall Rd (CR 34)	Right Turn	Looking Left (South)	450'	45	360'	430'
	Left Turn	Looking Left (South)	450'	45	360'	500'
		Looking Right (North)	385'	40	305'	445'
Eastbound Munich Rd at Croton Falls Rd (CR 34)	Right Turn	Looking Left (North)	375'	40	305'	385'
	Left Turn	Looking Left (North)	375'	40	305'	445'
		Looking Right (South)	275'	45	360'	500'

[1] Recommended minimum sight distance values from AASHTO's *A Policy on Geometric Design of Highways and Streets* , 7th Edition and the NYSDOT's *Highway Design Manual* . The recommended values are based on the current free flow travel speeds of the roadway.

COUNTY: PUTNAM P.I.N.:

TOWN OF CARMEL

ROUTE NO. OR STREET NAME: CROTON FALLS ROAD (CR 34)

AT INTERSECTION WITH/OR BETWEEN: WEST SHORE DRIVE (CR 38)

GPI
Engineering | Design | Planning | Construction Management

TIME PERIOD: FROM: 12/31/2019 TO: 12/31/2023

No. OF MONTHS: 48

ENVIRONMENTAL:
Use Codes from MV 104 (shown at right) for these categories

Light Conditions:
1. Daylight
2. Dawn
3. Dusk
4. Dark Road Lighted
5. Dark Road Unlighted

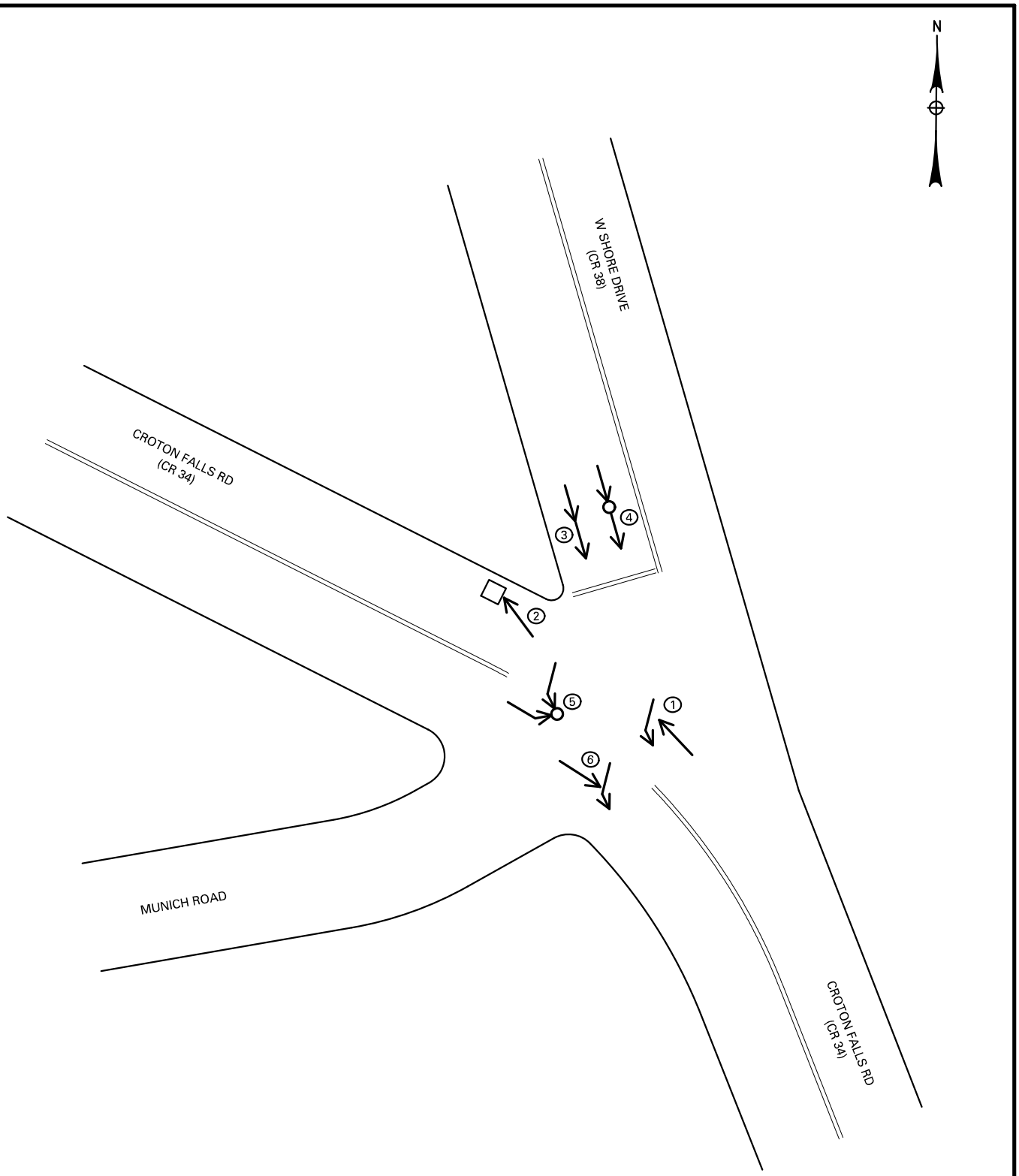
Roadway Character:
1. Straight & Level
2. Straight & Grade
3. Straight & Hillcrest
4. Curve & Level
5. Curve & Grade
6. Curve & Hillcrest

Roadway Surface Condition:
1. Dry
2. Wet
3. Muddy
4. Snow/Ice
5. Slush
10. Other

Weather:
1. Clear
2. Cloudy
3. Rain
4. Snow
5. Sleet/Hail/Freezing Rain
6. Fog/Smog/Smoke
10. Other

[1]Use Codes from MV 104 Police Report

ACCIDENT No.	DATE	TIME	No. of VEHICLES	SEVERITY	LIGHT CONDITIONS	ROADWAY CHARACTER	ROADWAY SURFACE CONDITION	WEATHER	APPARENT CONTRIBUTING FACTORS	DIRECTION	TYPE[1]	DESCRIPTION	CASE NO.
1	01/14/20	6:59	2	PDO	1	4	1	2	FAILURE TO YIELD RIGHT OF WAY	SOUTH/EAST	1	LEFT TURN	38286807
2	01/13/21	15:31	1	PDO	1	5	1	1	UNSAFE SPEED	WEST	23	FIXED OBJECT	38733631
3	05/27/21	17:51	2	PDO	1	4	1	1	FOLLOWING TOO CLOSELY	SOUTH/SOUTH	1	REAR END	38875248
4	12/17/21	8:40	2	PI	1	4	1	1	FOLLOWING TOO CLOSELY	SOUTH/SOUTH	1	REAR END	39154837
5	04/10/23	9:21	2	PI	1	5	1	1	FAILURE TO YIELD RIGHT OF WAY	SOUTH/EAST	1	LEFT TURN	39788740
6	10/07/23	11:12	2	PDO	1	5	2	3	FAILURE TO YIELD RIGHT OF WAY	SOUTH/EAST	1	LEFT TURN	40025655



LEGEND

- REAR END
- LEFT TURN
- PERSONAL INJURY
- FIXED OBJECT
- (##) CRASH NUMBER

NOTE:
CRASH NUMBERS CORRELATE TO NUMBERS FOUND ON CRASH DATA SHEETS. SEE CRASH DATA SHEETS FOR ADDITIONAL CRASH INFORMATION.

GPI Engineering Design Planning Construction Inspection

PUTNAM COUNTY
INTERSECTION IMPROVEMENTS
PUTNAM COUNTY, NEW YORK

CROTON FALLS RD (CR 34) AT
W SHORE DR (CR 38) CRASH DIAGRAM

SCALE:	DATE:	FIGURE NO.
NO SCALE	JUNE 2024	E-2

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	1	1	122	2	1	0	124	32	5	263	0
Future Vol, veh/h	0	1	1	122	2	1	0	124	32	5	263	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2	6	6	6	4	4	4
Mvmt Flow	0	1	1	130	2	1	0	132	34	5	280	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	441	456	280	440	439	149	280	0	0	166	0	0
Stage 1	290	290	-	149	149	-	-	-	-	-	-	-
Stage 2	151	166	-	291	290	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.16	-	-	4.14	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.254	-	-	2.236	-	-
Pot Cap-1 Maneuver	527	501	759	527	512	898	1260	-	-	1400	-	-
Stage 1	718	672	-	854	774	-	-	-	-	-	-	-
Stage 2	851	761	-	717	672	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	523	499	759	524	510	898	1260	-	-	1400	-	-
Mov Cap-2 Maneuver	523	499	-	524	510	-	-	-	-	-	-	-
Stage 1	718	669	-	854	774	-	-	-	-	-	-	-
Stage 2	848	761	-	712	669	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11	14.1	0	0.1
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1260	-	-	602	526	1400	-	-
HCM Lane V/C Ratio	-	-	-	0.004	0.253	0.004	-	-
HCM Control Delay (s)	0	-	-	11	14.1	7.6	0	-
HCM Lane LOS	A	-	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	1	0	-	-

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	0	1	0	36	0	6	0	313	109	6	140	0
Future Vol, veh/h	0	1	0	36	0	6	0	313	109	6	140	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1	0	38	0	6	0	326	114	6	146	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	544	598	146	542	541	383	146	0	0	440	0	0
Stage 1	158	158	-	383	383	-	-	-	-	-	-	-
Stage 2	386	440	-	159	158	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	450	416	901	451	448	664	1436	-	-	1120	-	-
Stage 1	844	767	-	640	612	-	-	-	-	-	-	-
Stage 2	637	578	-	843	767	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	444	414	901	448	445	664	1436	-	-	1120	-	-
Mov Cap-2 Maneuver	444	414	-	448	445	-	-	-	-	-	-	-
Stage 1	844	762	-	640	612	-	-	-	-	-	-	-
Stage 2	631	578	-	837	762	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.7	13.4	0	0.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1436	-	-	414	470	1120	-	-
HCM Lane V/C Ratio	-	-	-	0.003	0.093	0.006	-	-
HCM Control Delay (s)	0	-	-	13.7	13.4	8.2	0	-
HCM Lane LOS	A	-	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.3	0	-	-

Intersection	
Intersection Delay, s/veh	4.6
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	2	133	166	285
Demand Flow Rate, veh/h	2	136	176	296
Vehicles Circulating, veh/h	429	140	6	135
Vehicles Exiting, veh/h	2	42	425	141
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	4.1	4.0	3.8	5.4
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	2	136	176	296
Cap Entry Lane, veh/h	891	1196	1371	1202
Entry HV Adj Factor	0.990	0.978	0.944	0.962
Flow Entry, veh/h	2	133	166	285
Cap Entry, veh/h	882	1170	1294	1157
V/C Ratio	0.002	0.114	0.128	0.246
Control Delay, s/veh	4.1	4.0	3.8	5.4
LOS	A	A	A	A
95th %tile Queue, veh	0	0	0	1

Intersection	
Intersection Delay, s/veh	5.1
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	1	44	440	152
Demand Flow Rate, veh/h	1	45	449	155
Vehicles Circulating, veh/h	194	333	7	39
Vehicles Exiting, veh/h	0	123	188	339
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	3.3	4.2	5.6	3.7
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	1	45	449	155
Cap Entry Lane, veh/h	1132	983	1370	1326
Entry HV Adj Factor	0.980	0.978	0.981	0.981
Flow Entry, veh/h	1	44	440	152
Cap Entry, veh/h	1110	961	1344	1301
V/C Ratio	0.001	0.046	0.328	0.117
Control Delay, s/veh	3.3	4.2	5.6	3.7
LOS	A	A	A	A
95th %tile Queue, veh	0	0	1	0

GPI Greenman-Pedersen, Inc.
Engineering and Construction Services

Intersection:	Croton Falls Rd (CR 34) and West Shore Dr (CR 38)		
Client:	Putnam County	GPI No.	2300070.00
Calculated By:	D. Creen	Date:	6/12/2024
Checked By:	M. Wieszchowski	Date:	6/13/2024

DEAD END MUNICH ROAD

DESCRIPTION	TOTAL QUANTITY	UNIT	UNIT PRICE	TOTAL COST
DEAD END ROADWAY [1]	1	EA	$40,000	$40,000
WORK ZONE TRAFFIC CONTROL	1	LS	$5,000	$5,000
			ESTIMATED CONSTRUCTION COST (CONCEPTUAL)	**$45,000**
CONTIGENCY (20%)	1	LS	$9,000	$10,000
DESIGN AND INSPECTION (25%)	1	LS	$11,250	$15,000
			FINAL TOTAL	**$70,000**

[1] INCLUDES TYPICAL COST FOR EXCAVATION, EARTHWORK, SIGNING, ETC.

REALIGN WEST SHORE DRIVE

DESCRIPTION	TOTAL QUANTITY	UNIT	UNIT PRICE	TOTAL COST
THREE-WAY INTERSECTION REALIGNMENT [2]	1	EA	$200,000	$200,000
WORK ZONE TRAFFIC CONTROL	1	LS	$30,000	$30,000
			ESTIMATED CONSTRUCTION COST (CONCEPTUAL)	**$230,000**
RIGHT OF WAY	0.012	ACRE	$500,000	$10,000
CONTIGENCY (20%)	1	LS	$46,000	$50,000
DESIGN AND INSPECTION (25%)	1	LS	$57,500	$60,000
			FINAL TOTAL	**$350,000**

[2] INCLUDES TYPICAL COST FOR EARTHWORK, DRAINAGE, STRIPING, SIGNING, ETC.

SINGLE LANE ROUNDABOUT (120 FT DIAMETER)

DESCRIPTION	TOTAL QUANTITY	UNIT	UNIT PRICE	TOTAL COST
SINGLE LANE ROUNDABOUT [3]	1	EA	$1,250,000	$1,250,000
ADDITONAL EARTHWORK (ABOVE AND BEYOND TYPICAL)	15,000	CY	$50	$750,000
UTILITY RELOCATION [4]	1	EA	$75,000	$0
RETAINING WALLS	1,500	SF	$150	$225,000
STORMWATER AND TREATMENT [5]	1	LS	$175,000	$175,000
WETLAND MITIGATION	1	LS	$200,000	$200,000
WORK ZONE TRAFFIC CONTROL	1	LS	$250,000	$250,000
			ESTIMATED CONSTRUCTION COST (CONCEPTUAL)	**$2,850,000.00**
RIGHT OF WAY	0.143	ACRE	$500,000	$75,000
CONTIGENCY (20%)	1	LS	$570,000	$570,000
DESIGN AND INSPECTION (25%)	1	LS	$712,500	$715,000
			FINAL TOTAL	**$4,210,000.00**

[3] INCLUDES TYPICAL COST FOR PAVEMENT, CURB, EARTHWORK, DRAINAGE, LANDSCAPING, ETC., FOR A SINGLE LANE ROUNDABOUT.

[4] ELECTRIC AND GAS RELOCATIONS ARE ASSUMED NO COST FOR MUNICIPAL PROJECTS. WATER AND SEWER RELOCATIONS ARE ASSUMED AT $75,000 EACH.

[5] IMPACTS OVER 5,000 SF WITHIN DEP WATERSHEDS REQUIRE POST STORMWATER TREATMENT. $175,000 ALLOWANCE FOR EXTRA ROW OR WORK REQUIRED.

GPI

N

WEST SHORE DRIVE (CR 38)

CROTON FALLS RD (CR 34)

CROTON FALLS RESERVOIR

STOP

0.012 ACRE ROW TAKING

UTILITY POLE IMPACTS

MUNICH RD

CROTON FALLS RD (CR 34)

AHB

FW

ST

20 0 20 40 60 80'

Putnam County Intersections | FIG E-3

Croton Falls Rd (CR 34) at W Shore Dr (CR 38)
Intersection Improvement Concept Sketch

GPI

N

WEST SHORE DRIVE (CR 38)

CROTON FALLS RD (CR 34)

CROTON FALLS RESERVOIR

UTILITY POLE IMPACTS

0.004 ACRE ROW TAKING

STEEP DOWNGRADE

POTENTIAL RESERVOIR IMPACTS

0.022 ACRE ROW TAKING

UTILITY POLE IMPACTS

MUNICH RD

0.117 ACRE ROW TAKING

CROTON FALLS RD (CR 34)

20 0 20 40 60 80'

Putnam County Intersections | FIG E-4

Croton Falls Rd (CR 34) at W Shore Dr (CR 38)
Intersection Improvement Concept Sketch

APPENDIX F

Towners Road (CR 45)

at NY Route 52

SUMMARY OF ANALYSIS
TOWNERS RD (CR 45) @ NYS ROUTE 52

Existing Conditions:

This is a 4-legged traffic signal controlled intersection with NYS Route 52 being the primary roadway at this location. The two side street approaches (Towners Rd and Nichols St) at this intersection are slightly offset, with the roadway centerline being about 40′ off from each other. There are businesses in close proximity to the roadway on all sides of the intersection, some with curbing or walls at the edge of pavement. Utilities poles are also located fairly close to the roadway. NYS Route 52 has 12-foot-wide lanes with shoulders that are generally about 3′ wide, with the northbound approach having a roughly 10′ wide shoulder on the east side of the intersection. The side streets are 10′-11′ wide with little to no shoulders, and there are several access driveways to the adjacent businesses that are very close to the intersection.

Posted speed limits are 40 mph along NYS Route 52 and 30 mph along the side streets.

The traffic signal operates with two phases (east/west and north/south) and vehicles detection at the signal is fully actuated through video detection.

Operationally, the intersection has an overall level of service of LOS A during both the AM and PM peak hours, which is well within an acceptable range.

Signal Warrant Analysis:

As this location is already signalized, no signal warrants were reviewed for this intersection.

Safety Analysis:

Based on the NYSDOT Clear Safety System, the Potential for Safety Improvement (PSI) for this intersection is 0.11 overall and -0.81 for serious injury/fatality crashes. These factors indicate there is potential for safety improvement, with PSI>0.0, but the potential for serious injury crashes is not above that of similar facilities. The crash rate for this intersection was calculated at 1.03 crashes per million entering vehicles (Cr/MEV), which is around 60% higher that the statewide average of 0.64 Cr/MEV for similar intersections, so a more detailed look at crashes is warranted.

A review of the crash data noted 19 crashes at this location over the 4-year period studied. All crashes at this intersection resulted in property damage only, with the predominant crash type being rear ends (8) and fixed objects (3). Nearly half the crashes were related to the gas station located in the northeast quadrant of the intersection. This property has gas pumps located close to the roadway and little to no space for maneuvering a vehicle on-site. There is also pull-in parking along the building where vehicles are forced to back-up into traffic to leave the site.

A summary of the crash types and severity are shown in the table below:

CRASH SUMMARY

Crash Type	Number of Occurrences	Crash Severity	Number of Occurrences
Rear End	8	Fatality	0
Left Turn	2	Personal Injury	0
Right Turn	1	Property Damage Only	19
Animal Fixed	1		
Object	3		
Right Angle	2		
Sideswipe	2		
	19		19

Field Condition and Right of Way Review:

This area is built-up with commercial developments along both sides of the roadway with numerous utility poles dotting the intersection. There is no room for widening the roadway without significantly impacting the businesses and utilities. The gas station in the northeast quadrant is the closest to the roadway, with the building being just 25' off the travelway and with gas pumps between the building and travelway. This arrangement causes patrons to be within the right-of-way to service their vehicles. Additionally, the pull in parking along the building forces vehicles to pull out into traffic to exit the site. In addition, a privacy fence and bus shelter located to the east of this parking makes this is a completely blind maneuver, which poses a significant safety concern.

Design Alternative Consideration

To improve safety and operations, the best alternative would be to eliminate the gas station in the northeast quadrant. It is the cause of nearly half the crashes at and near this intersection and cannot function properly without patrons stopping within the public right-of-way. However, understanding that closing a business is not a feasible alternative, there are a couple other options that could be considered. One is to pull the westbound stop bar back about 100 feet to the east, behind the gas station entrance, and install a "Stop Here on Red" sign at that location. This will allow gas station vehicles to make maneuvers near the travelway without having a queue of stopped vehicles for the signal present. This should provide some safety benefit.

Another option is to realign Towners Rd, shifting it south to better align with Nichols St. This roadway shift can be constructed within the current right-of-way and would provide additional space on the north side of the intersection to allow more maneuverability and some access control at the gas station site. A concept sketch of this alternative can be found later in this appendix. This alternative does require cutting into the island on the property south on the intersection, which may make this improvement contentious, as it will appear you are taking from one business to give to another, but it would be the best alternative to not only help reduce crashes caused by gas station traffic, but any crashes caused by the existing offset approaches of Towners Rd and Nichols St, which would also be corrected with this improvement.

Conceptual Cost Estimate:

Based on our experience with similar projects, knowledge of construction pricing in this region of New York State and our understanding of the issues, it is estimated that moving the stop back and installing a 'Stop Here on Red' sign would be relatively cheap, costing roughly $2,000. The more extensive alternative of realigning Towners Road and improving access would cost approximately $570,000. These costs include construction of all improvements, design, and inspection. A breakdown of the big picture cost items is included later in this appendix.

Summary & Conclusion:

The level of service at this signalized intersection is well within the acceptable range, at an overall LOS A in the peak hours, but there are a high number of crashes. Most of the crashes are a result of the gas station to the northeast being close to the roadway and having gas pumps along the edge of the right-of-way and having no room to maneuver vehicles adequately on-site. As closing this business is likely not an option. It is recommended that the stop bar on the westbound approach be pulled back 100' to the east (behind the gas station entrance) and a "Stop Here on Red" sign be installed at the new stop bar location. Realignment of Towners Rd, to better align with Nichols St, would likely be more effective for improving safety, as it would allow some access management at the gas station, but the optics of taking from one business to give more room within the right-of-way for another business would probably not be favorable, so we mention this Alternative as something to consider, but it is not recommended at this time. If realignment is desired by the County, extensive public outreach should be performed first to gauge public support.

INTERSECTION EVALUATION WORKSHEET

Project:	Putnam County Intersection Improvements
Location:	Putnam County (Various Locations)
Intersection:	Towners Rd at State Route 52
GPS Coord.:	41.44984, -73.67219
Traffic Control:	Signalized

Traffic Control Notes (if applicable):

None

Other Intersection Notes (if applicable):

No Pedestrian Crossing.
Several Adjacent Pull-in Back-up Parking Lots.

APPROACH DATA

	State Route 52			State Route 52			Nichols St			Towners Rd		
	Northbound			**Southbound**			**Eastbound**			**Westbound**		
	Left	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
Lane Assignments:		<-1->			<-1->			<-1->			<-1->	
Lane Widths:		12'			12'			10'			11'	
Turn Bay Lengths:		-			-			-			-	
Speed Limits:		40 mph			40 mph			30 mph			30 mph	

TRAFFIC COUNT DATA

AM Peak Hour	Time Period:	7:30	to	8:30					Date Counted:		10/6/2022	
Volume:	0	265	44	39	444	5	16	3	0	71	7	59
Truck %:	15%	15%	15%	8%	8%	8%	5%	5%	5%	7%	7%	7%
Peds (Bikes):		-			0 (0)			0 (0)			0 (0)	
PHF = 0.9												
PM Peak Hour	Time Period:	4:30	to	5:30					Date Counted:		10/6/2022	
Volume:	0	600	113	56	410	16	21	9	2	72	8	64
Truck %:	3%	3%	3%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Peds (Bikes):		0 (0)			0 (0)			0 (0)			0 (0)	
PHF = 0.96												

EXISTING CONDITION LEVEL OF SERVICE

AM Peak Delay (s):	5.0	5.7	8.7	9.8
LOS:	A	A	A	A
v/c:	0.35	0.53	0.08	0.47
95% Queue:	88'	169'	18'	63'
A (6.1) Overall	**A (5.0)**	**A (5.7)**	**A (8.7)**	**A (9.8)**
PM Peak Delay (s):	6.2	5.0	11.1	12.3
LOS:	A	A	B	B
v/c:	0.63	0.47	0.12	0.47
95% Queue:	249'	150'	27'	69'
A (6.5) Overall	**A (6.2)**	**A (5.0)**	**B (11.1)**	**B (12.3)**

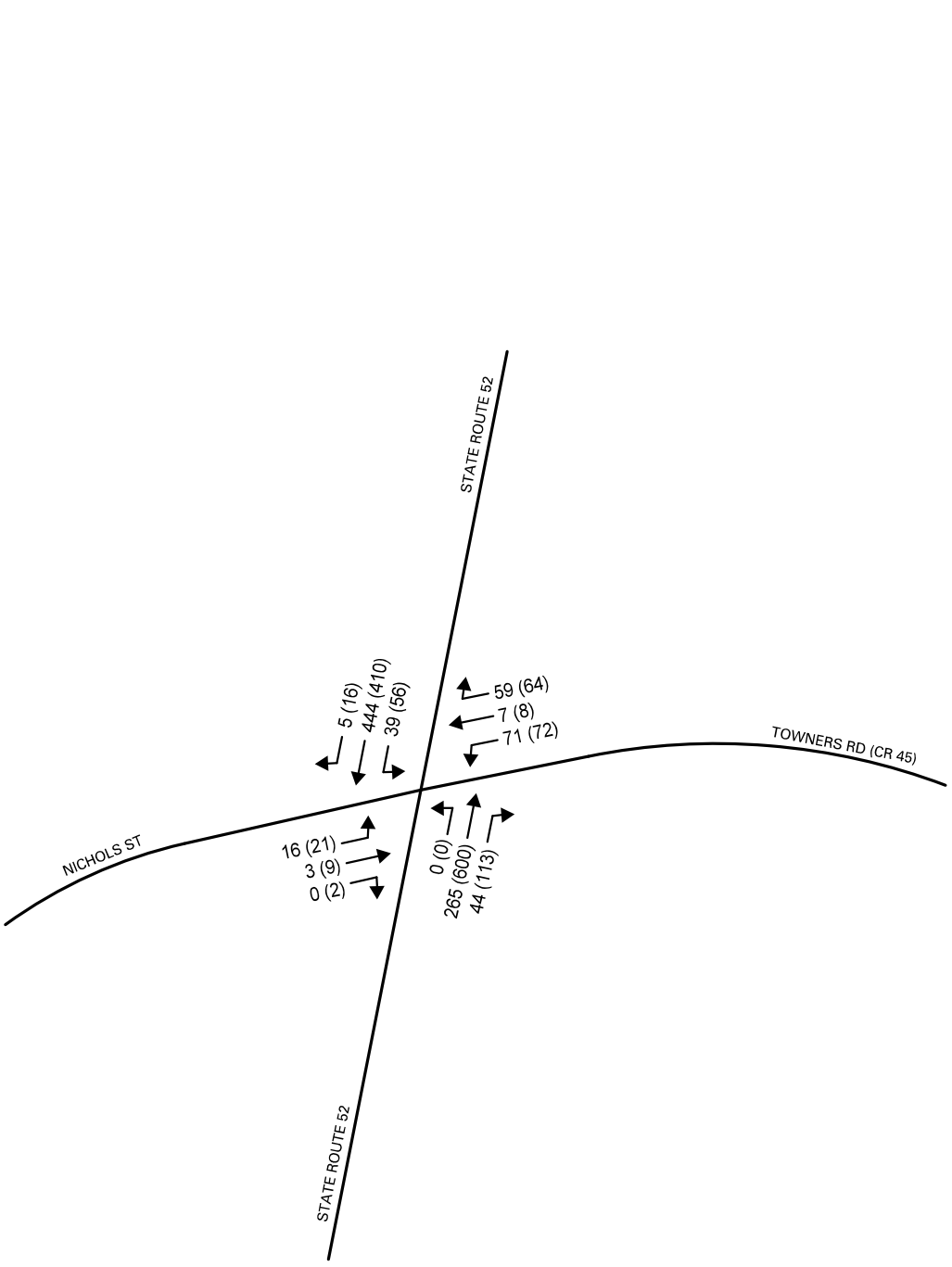
Note: LOS calculated using HCM 6 methodologies. For unsignalized intersections, only side street approach delay and mainline left turn delay is shown. The HCM 6 methodology assumes zero delay for all other movements.

INTERSECTION EVALUATION WORKSHEET

INTERSECTION SAFETY

Crashes	From:	12/31/2019	To:	12/31/2023	No. of Months:	48					
	No. of Crashes:	19	PDO:	19	PI:	0	PI (A):	0	K:	0	
	Crash Rate:	1.03 Cr/MEV			Above/Below Statewide Average:			1.61 Times			

PSI Factors	PSI (KA):	-0.81
	PSI (Tot):	0.11



KEY:

XXX (XXX) = AM (PM) PEAK HOUR TRAFFIC VOLUMES

GPI Engineering Design Planning Construction Inspection	PUTNAM COUNTY INTERSECTION IMPROVEMENTS PUTNAM COUNTY, NEW YORK	STATE ROUTE 52 AT TOWNERS RD (CR 45) PEAK HOUR TRAFFIC VOLUMES

SCALE:	DATE:	FIGURE NO.
NO SCALE	JUNE 2024	F-1

Study Name	8- TOWNERS RD& RT 52
Start Date	Thursday, October 06, 2022 7:00 AM
End Date	Thursday, October 06, 2022 6:00 PM
Site Code	

Report Summary

		Southbound						Westbound						Northbound						Eastbound								Crosswalk		
Time Period	**Class.**	**L**	**T**	**R**	**U**	**I**	**O**	**L**	**T**	**R**	**U**	**I**	**O**	**L**	**T**	**R**	**U**	**I**	**O**	**L**	**T**	**R**	**U**	**I**	**O**	**Total**		**Bikes**	**Peds**	**Total**
Peak 1	Motorcycles	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	SB	0	0	0
Specified Period	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		0%	0%	
7:00 AM - 9:00 AM	Cars	26	346	4	0	376	232	58	5	42	0	105	61	0	175	33	0	208	404	15	2	0	0	17	9	706	WB	0	0	0
One Hour Peak	%	67%	78%	80%	0%	77%	68%	82%	71%	71%	0%	77%	71%	0%	66%	75%	0%	67%	78%	94%	67%	0%	0%	89%	75%	74%		0%	0%	
7:30 AM - 8:30 AM	ıt Goods Vehi	6	69	0	0	75	63	9	1	13	0	23	12	0	49	6	0	55	78	1	0	0	0	1	1	154	NB	0	0	0
	%	15%	16%	0%	0%	15%	19%	13%	14%	22%	0%	17%	14%	0%	18%	14%	0%	18%	15%	6%	0%	0%	0%	5%	8%	16%		0%	0%	
	Buses	4	5	1	0	10	15	3	0	1	0	4	8	0	14	3	0	17	8	0	1	0	0	1	1	32	EB	0	0	0
	%	10%	1%	20%	0%	2%	4%	4%	0%	2%	0%	3%	9%	0%	5%	7%	0%	6%	2%	0%	33%	0%	0%	5%	8%	3%		0%	0%	
	ıgle-Unit Truc	3	14	0	0	17	18	1	1	3	0	5	5	0	15	2	0	17	15	0	0	0	0	0	1	39		**0**	**0**	**0**
	%	8%	3%	0%	0%	3%	5%	1%	14%	5%	0%	4%	6%	0%	6%	5%	0%	6%	3%	0%	0%	0%	0%	0%	8%	4%				
	ticulated Truc	0	10	0	0	10	12	0	0	0	0	0	0	0	12	0	0	12	10	0	0	0	0	0	0	22				
	%	0%	2%	0%	0%	2%	4%	0%	0%	0%	0%	0%	0%	0%	5%	0%	0%	4%	2%	0%	0%	0%	0%	0%	0%	2%				
	icycles on Roa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				
	Total	**39**	**444**	**5**	**0**	**488**	**340**	**71**	**7**	**59**	**0**	**137**	**86**	**0**	**265**	**44**	**0**	**309**	**515**	**16**	**3**	**0**	**0**	**19**	**12**	**953**				
	PHF	0.75	0.76	0.42	0	0.78	0.91	0.77	0.58	0.74	0	0.84	0.8	0	0.87	0.73	0	0.9	0.79	0.4	0.25	0	0	0.37	0.5	0.9				
	Approach %					51%	36%					14%	9%					32%	54%					2%	1%					
Peak 2	Motorcycles	0	0	0	0	0	3	0	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	0	0	3	SB	0	0	0
Specified Period	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		0%	0%	
4:00 PM - 6:00 PM	Cars	47	346	14	0	407	556	57	6	55	0	118	149	0	485	95	0	580	403	16	7	0	0	23	20	1128	WB	0	0	0
One Hour Peak	%	84%	84%	88%	0%	84%	81%	79%	75%	86%	0%	82%	84%	0%	81%	84%	0%	81%	83%	76%	78%	0%	0%	72%	83%	82%		0%	0%	
4:30 PM - 5:30 PM	ıt Goods Vehi	9	58	2	0	69	107	13	2	9	0	24	29	0	93	18	0	111	73	5	2	2	0	9	4	213	NB	0	0	0
	%	16%	14%	13%	0%	14%	16%	18%	25%	14%	0%	17%	16%	0%	16%	16%	0%	16%	15%	24%	22%	100%	0%	28%	17%	16%		0%	0%	
	Buses	0	1	0	0	1	7	2	0	0	0	2	0	0	7	0	0	7	3	0	0	0	0	0	0	10	EB	0	0	0
	%	0%	0%	0%	0%	0%	1%	3%	0%	0%	0%	1%	0%	0%	1%	0%	0%	1%	1%	0%	0%	0%	0%	0%	0%	1%		0%	0%	
	ıgle-Unit Truc	0	5	0	0	5	10	0	0	0	0	0	0	0	10	0	0	10	5	0	0	0	0	0	0	15		**0**	**0**	**0**
	%	0%	1%	0%	0%	1%	1%	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	1%	1%	0%	0%	0%	0%	0%	0%	1%				
	ticulated Truc	0	0	0	0	0	2	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	2				
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				
	icycles on Roa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				
	Total	**56**	**410**	**16**	**0**	**482**	**685**	**72**	**8**	**64**	**0**	**144**	**178**	**0**	**600**	**113**	**0**	**713**	**484**	**21**	**9**	**2**	**0**	**32**	**24**	**1371**				
	PHF	0.7	0.92	0.5	0	0.97	0.96	0.72	0.4	0.89	0	0.92	0.86	0	0.96	0.83	0	0.99	0.95	0.66	0.56	0.5	0	0.73	0.75	0.99				
	Approach %					35%	50%					11%	13%					52%	35%					2%	2%					

Study Name 8- TOWNERS RD& RT 52
Start Date 10-06-2022
Start Time 7:00 AM
Site Code

	RT 52 Southbound				TOWNERS RD Westbound				RT 52 Northbound				NICHOLS ST Eastbound			
Start Time	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn
7:00 AM	10	76	0	0	15	1	9	0	0	62	10	0	4	1	1	0
7:15 AM	6	78	3	0	15	1	12	0	1	32	7	0	6	1	1	0
7:30 AM	9	106	0	0	23	3	15	0	0	68	15	0	10	3	0	0
7:45 AM	8	147	1	0	17	1	20	0	0	59	9	0	2	0	0	0
8:00 AM	13	95	1	0	14	0	16	0	0	62	10	0	1	0	0	0
8:15 AM	9	96	3	0	17	3	8	0	0	76	10	0	3	0	0	0
8:30 AM	4	93	3	0	21	2	12	0	0	75	11	0	8	1	2	0
8:45 AM	4	125	2	0	19	1	13	0	0	89	14	0	8	1	0	0
4:00 PM	7	90	1	0	20	4	24	0	0	106	23	0	5	2	1	0
4:15 PM	14	97	6	0	20	3	22	0	0	141	25	0	1	1	1	0
4:30 PM	11	97	2	0	25	2	12	0	0	147	27	0	5	2	0	0
4:45 PM	11	112	1	0	15	5	18	0	0	156	24	0	4	1	0	0
5:00 PM	20	96	8	0	15	0	18	0	0	151	28	0	8	2	1	0
5:15 PM	14	105	5	0	17	1	16	0	0	146	34	0	4	4	1	0
5:30 PM	13	88	5	0	12	1	26	0	0	122	29	0	3	2	0	0
5:45 PM	23	89	5	0	16	3	20	0	0	108	31	0	1	3	4	0

Study Name 8- TOWNERS RD& RT 52
Start Date 10-06-2022
Start Time 7:00 AM
Site Code

	RT 52 Southbound		TOWNERS RD Westbound		RT 52 Northbound		NICHOLS ST Eastbound	
Start Time	Peds CCW	Peds CW	Peds CCW	Peds CW	Peds CCW	Peds CW	Peds CCW	Peds CW
7:00 AM	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0

COUNTY: PUTNAM P.I.N.:

TOWN OF KENT

ROUTE NO. OR STREET NAME: STATE ROUTE 52

AT INTERSECTION WITH/OR BETWEEN: TOWNERS ROAD (CR 45)

GPI
Engineering | Design | Planning | Construction Management

TIME PERIOD: FROM: 12/31/2019 TO: 12/31/2023

No. OF MONTHS: 48

ENVIRONMENTAL:
Use Codes from MV 104 (shown at right) for these categories

Light Conditions:
1. Daylight
2. Dawn
3. Dusk
4. Dark Road Lighted
5. Dark Road Unlighted

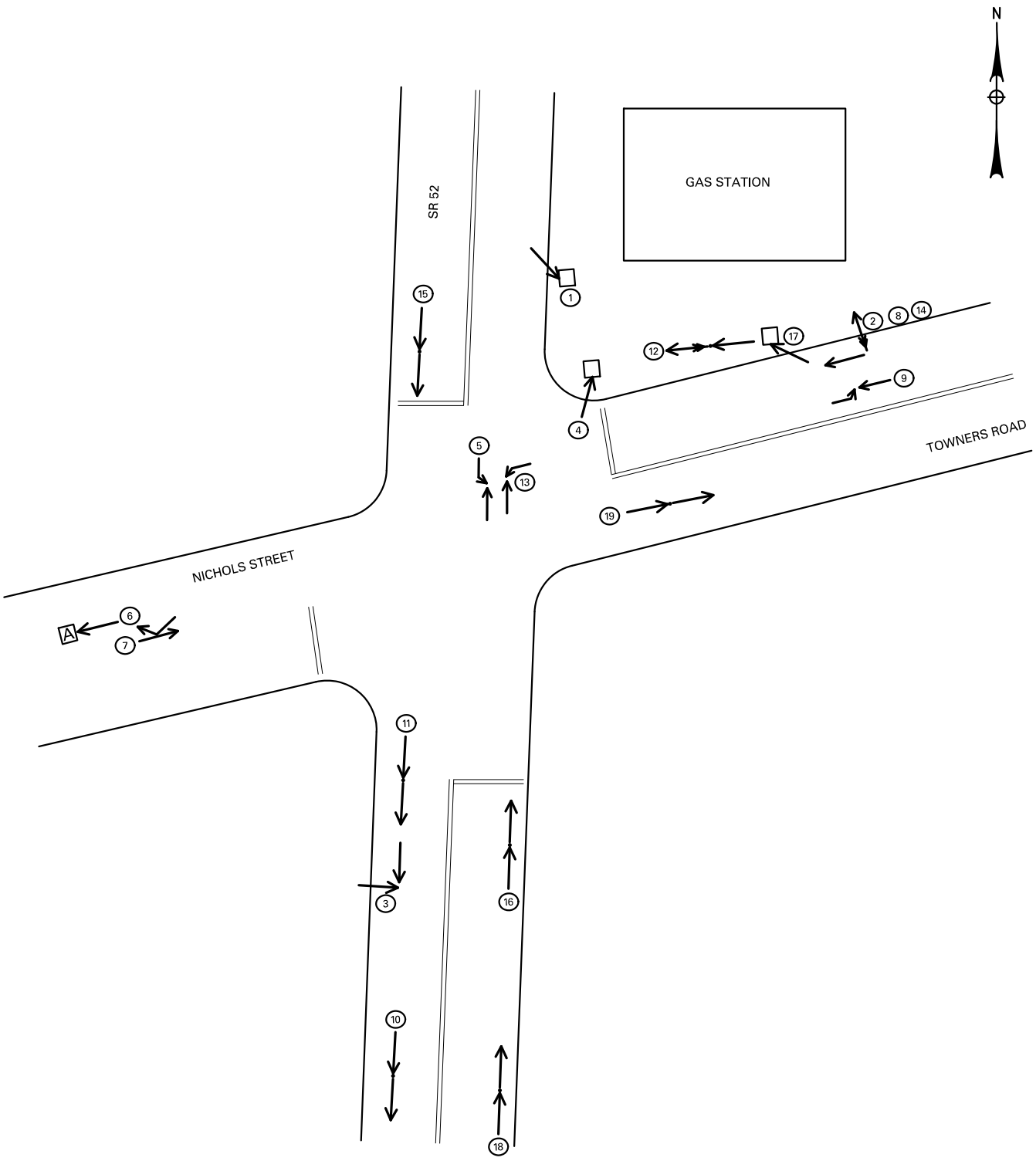
Roadway Character:
1. Straight & Level
2. Straight & Grade
3. Straight & Hillcrest
4. Curve & Level
5. Curve & Grade
6. Curve & Hillcrest

Roadway Surface Condition:
1. Dry
2. Wet
3. Muddy
4. Snow/Ice
5. Slush
10. Other

Weather:
1. Clear
2. Cloudy
3. Rain
4. Snow
5. Sleet/Hail/Freezing Rain
6. Fog/Smog/Smoke
10. Other

[1]Use Codes from MV 104 Police Report

ACCIDENT No.	DATE	TIME	No. of VEHICLES	SEVERITY	LIGHT CONDITIONS	ROADWAY CHARACTER	ROADWAY SURFACE CONDITION	WEATHER	APPARENT CONTRIBUTING FACTORS	DIRECTION	TYPE[1]	DESCRIPTION	CASE NO.
1	03/01/20	11:41	1	PDO	1	1	1	1	TURNING IMPROPER	SOUTH	30	FIXED OBJECT	38352885
2	04/07/20	9:19	2	PDO	1	1	1	2	BACKING UNSAFELY	WEST/EAST	1	SIDESWIPE	38400417
3	06/30/20	11:30	2	PDO	1	2	1	2	FAILURE TO YIELD RIGHT OF WAY	SOUTH/EAST	1	RIGHT TURN	38464045
4	10/09/20	13:50	1	PDO	1	1	1	1	TURNING IMPROPER	NORTH	14	FIXED OBJECT	38603164
5	01/08/21	19:19	3	PDO	4	2	1	1	FAILURE TO YIELD RIGHT OF WAY	NORTH/SOUTH	1	LEFT TURN	38675986
6	12/20/20	23:21	1	PDO	5	2	1	1	ANIMALS ACTION	WEST	7	ANIMAL	38678537
7	01/17/21	11:00	2	PDO	1	6	1	1	FAILURE TO KEEP RIGHT	EAST/WEST	1	SIDESWIPE	38756598
8	03/19/21	17:44	2	PDO	1	1	1	1	BACKING UNSAFELY	EAST/WEST	1	REAR END	38785059
9	09/11/21	8:53	2	PDO	1	1	1	1	FAILURE TO YIELD RIGHT OF WAY	EAST/WEST	1	LEFT TURN	39030566
10	12/06/21	16:20	2	PDO	3	2	2	1	FOLLOWING TOO CLOSELY	SOUTH/SOUTH	1	REAR END	39142364
11	12/11/21	11:20	2	PDO	1	1	2	3	FOLLOWING TOO CLOSELY	SOUTH/SOUTH	1	REAR END	39145405
12	02/20/22	12:25	2	PDO	1	1	1	1	BACKING UNSAFELY	EAST/WEST	1	REAR END	39246762
13	06/03/22	18:01	2	PDO	1	1	1	1	TRAFFIC CONTROL DEVICES DISREGARDED	NORTH/WEST	1	RIGHT ANGLE	39372656
14	09/02/22	15:55	2	PDO	1	1	1	1	BACKING UNSAFELY	WEST/SOUTH	1	RIGHT ANGLE	39496786
15	12/07/22	8:46	2	PDO	1	2	2	2	DRIVER INATTENTION	SOUTH/SOUTH	1	REAR END	39624478
16	07/13/23	16:25	2	PDO	1	1	1	1	FOLLOWING TOO CLOSELY	NORTH/NORTH	1	REAR END	39912131
17	07/10/23	13:00	1	PDO	1	1	1	2	VIEW OBSTRUCTED/LIMITED	WEST	30	FIXED OBJECT	39912210
18	09/12/23	15:16	2	PDO	1	1	1	1	DRIVER INATTENTION	NORTH/NORTH	1	REAR END	39986536
19	09/19/23	14:59	2	PDO	1	2	1	1	FOLLOWING TOO CLOSELY	EAST/EAST	1	REAR END	40001076



LEGEND

- REAR END
- BACKING UNSAFELY
- PERSONAL INJURY
- (##) CRASH NUMBER
- LEFT TURN
- RIGHT ANGLE
- FIXED OBJECT
- A ANIMAL

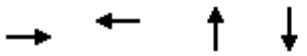
NOTE:
CRASH NUMBERS CORRELATE TO NUMBERS FOUND ON CRASH DATA SHEETS. SEE CRASH DATA SHEETS FOR ADDITIONAL CRASH INFORMATION.

GPI Engineering Design Planning Construction Inspection

PUTNAM COUNTY
INTERSECTION IMPROVEMENTS
PUTNAM COUNTRY, NEW YORK

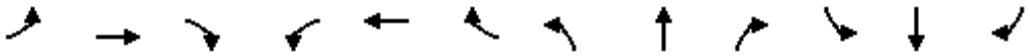
STATE ROUTE 52 AT TOWNERS RD (CR 45)
CRASH DIAGRAM

SCALE:	DATE:	FIGURE NO.
NO SCALE	JUNE 2024	F-2



Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	21	153	343	542
v/c Ratio	0.08	0.47	0.35	0.53
Control Delay	13.5	14.3	6.4	8.8
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	13.5	14.3	6.4	8.8
Queue Length 50th (ft)	3	13	30	60
Queue Length 95th (ft)	18	63	88	169
Internal Link Dist (ft)	679	473	1031	756
Turn Bay Length (ft)				
Base Capacity (vph)	574	606	1504	1554
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.04	0.25	0.23	0.35

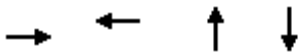
Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	16	3	0	71	7	59	0	265	44	39	444	5
Future Volume (veh/h)	16	3	0	71	7	59	0	265	44	39	444	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1826	1826	1826	1796	1796	1796	1678	1678	1678	1781	1781	1781
Adj Flow Rate, veh/h	18	3	0	79	8	66	0	294	49	43	493	6
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	5	5	5	7	7	7	15	15	15	8	8	8
Cap, veh/h	464	55	0	341	11	91	0	605	101	195	705	8
Arrive On Green	0.14	0.14	0.00	0.14	0.14	0.14	0.00	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	1251	381	0	756	77	632	0	1402	234	69	1635	19
Grp Volume(v), veh/h	21	0	0	153	0	0	0	0	343	542	0	0
Grp Sat Flow(s),veh/h/ln	1633	0	0	1465	0	0	0	0	1636	1723	0	0
Q Serve(g_s), s	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	3.6	1.1	0.0	0.0
Cycle Q Clear(g_c), s	0.2	0.0	0.0	2.3	0.0	0.0	0.0	0.0	3.6	6.0	0.0	0.0
Prop In Lane	0.86		0.00	0.52		0.43	0.00		0.14	0.08		0.01
Lane Grp Cap(c), veh/h	519	0	0	443	0	0	0	0	705	908	0	0
V/C Ratio(X)	0.04	0.00	0.00	0.35	0.00	0.00	0.00	0.00	0.49	0.60	0.00	0.00
Avail Cap(c_a), veh/h	1184	0	0	1154	0	0	0	0	2430	2670	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	8.7	0.0	0.0	9.6	0.0	0.0	0.0	0.0	4.8	5.5	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0
Initial Q Delay(d3),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
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.2	0.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.7	0.0	0.0	9.8	0.0	0.0	0.0	0.0	5.0	5.7	0.0	0.0
LnGrp LOS	A	A	A	A	A	A	A	A	A	A	A	A
Approach Vol, veh/h		21			153			343			542	
Approach Delay, s/veh		8.7			9.8			5.0			5.7	
Approach LOS		A			A			A			A	

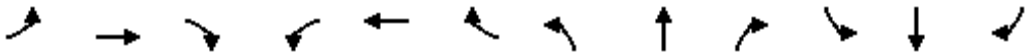
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		15.2		8.4		15.2		8.4				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		35.0		15.0		35.0		15.0				
Max Q Clear Time (g_c+I1), s		5.6		2.2		8.0		4.3				
Green Ext Time (p_c), s		1.3		0.0		2.2		0.4				

Intersection Summary												
HCM 6th Ctrl Delay			6.1									
HCM 6th LOS			A									



Lane Group	EBT	WBT	NBT	SBT
Lane Group Flow (vph)	33	150	743	502
v/c Ratio	0.12	0.47	0.63	0.47
Control Delay	16.3	15.9	9.3	7.5
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	16.3	15.9	9.3	7.5
Queue Length 50th (ft)	5	14	91	54
Queue Length 95th (ft)	27	69	249	150
Internal Link Dist (ft)	679	473	1031	756
Turn Bay Length (ft)				
Base Capacity (vph)	550	584	1582	1420
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.06	0.26	0.47	0.35

Intersection Summary



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	21	9	2	72	8	64	0	600	113	56	410	16
Future Volume (veh/h)	21	9	2	72	8	64	0	600	113	56	410	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1856	1856	1856	1870	1870	1870
Adj Flow Rate, veh/h	22	9	2	75	8	67	0	625	118	58	427	17
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	2	2	2	2	2	2	3	3	3	2	2	2
Cap, veh/h	321	100	14	286	13	92	0	793	150	172	677	25
Arrive On Green	0.13	0.13	0.13	0.13	0.13	0.13	0.00	0.52	0.52	0.52	0.52	0.52
Sat Flow, veh/h	860	746	104	750	100	686	0	1517	286	65	1297	48
Grp Volume(v), veh/h	33	0	0	150	0	0	0	0	743	502	0	0
Grp Sat Flow(s),veh/h/ln	1710	0	0	1536	0	0	0	0	1804	1410	0	0
Q Serve(g_s), s	0.0	0.0	0.0	2.2	0.0	0.0	0.0	0.0	9.7	1.3	0.0	0.0
Cycle Q Clear(g_c), s	0.5	0.0	0.0	2.7	0.0	0.0	0.0	0.0	9.7	11.1	0.0	0.0
Prop In Lane	0.67		0.06	0.50		0.45	0.00		0.16	0.12		0.03
Lane Grp Cap(c), veh/h	435	0	0	391	0	0	0	0	942	874	0	0
V/C Ratio(X)	0.08	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.79	0.57	0.00	0.00
Avail Cap(c_a), veh/h	990	0	0	964	0	0	0	0	2170	1942	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	11.1	0.0	0.0	12.0	0.0	0.0	0.0	0.0	5.6	4.7	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.6	0.2	0.0	0.0
Initial Q Delay(d3),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
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.8	0.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	11.1	0.0	0.0	12.3	0.0	0.0	0.0	0.0	6.2	5.0	0.0	0.0
LnGrp LOS	B	A	A	B	A	A	A	A	A	A	A	A
Approach Vol, veh/h		33			150			743			502	
Approach Delay, s/veh		11.1			12.3			6.2			5.0	
Approach LOS		B			B			A			A	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		20.2		8.9		20.2		8.9				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		35.0		15.0		35.0		15.0				
Max Q Clear Time (g_c+I1), s		11.7		2.5		13.1		4.7				
Green Ext Time (p_c), s		3.2		0.0		2.1		0.4				

Intersection Summary												
HCM 6th Ctrl Delay			6.5									
HCM 6th LOS			A									

GPI Greenman-Pedersen, Inc.
Engineering and Construction Services

Intersection: Towners Rd (CR 45) and NYS Route 52
Client: Putnam County — GPI No. 2300070.00
Calculated By: D. Creen — Date: 6/12/2024
Checked By: M. Wieszchowski — Date: 6/13/2024

RELOCATE STOP-BAR

DESCRIPTION	TOTAL QUANTITY	UNIT	UNIT PRICE	TOTAL COST
CLEANING AND PREPARATION OF PAVEMENT	250	LF	$1.00	$250
PAVEMENT STRIPES	50	LF	$2.00	$100
STOP HERE ON RED SIGNING	1	EA	$250	$250
WORK ZONE TRAFFIC CONTROL	1	LS	$1,000	$1,000
			ESTIMATED CONSTRUCTION COST (CONCEPTUAL)	**$1,600**
CONTIGENCY (20%)	1	LS	$320	$350
			FINAL TOTAL	**$1,950**

REALIGN TOWNERS ROAD AND RECONSTRUCT PARKING LOTS

DESCRIPTION	TOTAL QUANTITY	UNIT	UNIT PRICE	TOTAL COST
REALIGN TOWNERS ROAD [1]	1	EA	$150,000	$150,000
RECONSTRUCT PARKING LOTS [2]	10,000	SF	$15	$150,000
WORK ZONE TRAFFIC CONTROL	1	LS	$75,000	$75,000
			ESTIMATED CONSTRUCTION COST (CONCEPTUAL)	**$375,000**
PUBLIC INFORMATION AND OUTREACH	1	LS	$25,000	$25,000
CONTIGENCY (20%)	1	LS	$75,000	$75,000
DESIGN AND INSPECTION (25%)	1	LS	$93,750	$95,000
			FINAL TOTAL	**$570,000**

[1] INCLUDES TYPICAL COST FOR ROADWAY REALIGNMENT, CURBING, DRAINAGE, STRIPING, SIGNING, ETC.

[2] INCLUDES TYPICAL COST FOR PAVEMENT, CURB, EARTHWORK, DRAINAGE, LANDSCAPING, ETC., FOR A COMMERICAL PARKING LOT.

GPI

N

STATE ROUTE 52

TOWNERS RD (CR 45)

NICHOLS ST

MT HOPE RD

20 0 20 40 60 80'

Putnam County Intersections | FIG F-3

Towners Road (CR 45) at SR 52

Intersection Improvement Concept Sketch

APPENDIX G
Fair Street (CR 60)
at NY Route 311

SUMMARY OF ANALYSIS
FAIR ST (CR 60) @ NYS ROUTE 311

Existing Conditions:

This 3-legged T-intersection is located on a horizontal curve along NYS Route 311. There is stop sign control on the Fair St approach, while NYS Route 311 is uncontrolled at this intersection. All lanes are 11-foot wide and paved shoulders are generally 2' wide or less. There are no pedestrian facilities at this intersection.

Posted speed limits are 40 mph along Fair St and 45 mph along NYS Route 311, but the curve where the intersection is located has a 35-mph advisory speed. Speed readings taken along NYS Route 311 determined the 85th percentile speeds to be 45 mph eastbound and 41 mph westbound.

The sight distance looking west (to the left) from Fair St is 400 feet, which is more that the required stopping sight distance, but does not meet recommended intersection sight distance guidelines for a 45-mph design speed. This sight distance limitation is caused by the horizontal and vertical curvature of NYS Route 311 west of the intersection.

Operationally, the level of service at this intersection meets acceptable guidelines, with the northbound approach of Fair Street operating at LOS C in the AM peak hour and LOS D in the PM peak hour. However, the volume to capacity ratio of 0.72 on the Fair St approach in the PM peak hour indicates that the approach is nearing capacity.

Signal Warrant Analysis:

A review of the hourly traffic volumes between 7:00AM to 9:00AM and 4:00pm to 8:00pm show that Warrant 1 (8-hour warrant) is satisfied with all 4 hours reviewed meeting criteria and it is likely this warrant would be met if more data were available. Warrant 2 (4-hour warrant) is satisfied with all 4 hours reviewed meeting criteria. Warrant 3 (Peak Hour Warrant) was not satisfied as there was not enough delay to satisfy the warrant, but all 4 hours reviewed did show sufficient traffic volumes to warrant a signal in the peak hour. Warrant 7 (crash experience) was not satisfied, as not all of the crash criteria were met. Satisfaction of Warrant 2 is sufficient to justify a traffic signal at this location.

Safety Analysis:

Based on the NYSDOT Clear Safety System, the Potential for Safety Improvement (PSI) for this intersection is 1.26 overall and -0.24 for serious injury/fatality crashes. These factors indicate there is potential for safety improvement, with PSI>0.0, but the potential for serious injury crashes is not above that of similar facilities. The crash rate for this intersection was calculated at 1.31 crashes per million entering vehicles (Cr/MEV), which is almost 8 times the statewide average of 0.17 Cr/MEV for similar intersections, so a more detailed look at crashes is warranted.

A review of the crash data noted 19 crashes in the 4-year period studied. Of those crashes nearly half (9) were of a type that could be correctable through signalization or a roundabout (i.e left turn, right angle). A summary of the crash types and their severity at this location is shown in the table below:

CRASH SUMMARY

Crash Type	Number of Occurrences	Crash Severity	Number of Occurrences
Rear End	5	Fatality	0
Right Angle	3	Personal Injury	2 (1 Serious Injury)
Left Turn	6	Property Damage Only	17
Fixed Object	2		
Right Turns	1		
Sideswipe	1		
Other	1		
	19		19

Field Condition and Right of Way Review:

There is a significant grade on Fair St approaching the intersection and the surrounding terrain is extremely rocky and uneven. Utility poles are located approximately 5 feet from the edge of pavement and guiderail protecting a drop off is located along the southeastern quadrant on the intersection. The uneven grades and slopes are not conducive to the installation of a roundabout.

Design Alternative Consideration:

As mentioned above, the terrain makes a roundabout at this location infeasible, but a traffic signal is warranted at this location. Given the high crash rate, limited sight distance and deteriorating levels of service, the installation of a traffic signal at this location is recommended. With a traffic signal, the number of left turn and right-angle crashes should be reduced, and operations will improve to LOS A or LOS B on all approaches during both the AM and PM peak hours.

Conceptual Cost Estimate:

Based on our experience with similar projects, knowledge of construction pricing in this region of New York State and our understanding of the issues, it is estimated that a traffic signal would cost approximately $250,000. A breakdown of the cost items is included later in this appendix.

Summary & Conclusion:

This location has limited sight distance and a high crash rate. It meets traffic signal warrants and physical constraints make construction of a roundabout infeasible. As such, the installation of a traffic signal is recommended.

The intersection evaluation worksheet summarizing the lane geometry and traffic operations, traffic volume data sheets, traffic signal warrant analysis sheets, crash summary sheets, capacity analysis worksheets, and cost estimate breakdown for this intersection can be found on the following pages in this appendix.

INTERSECTION EVALUATION WORKSHEET

Project:	Putnam County Intersection Improvements
Location:	Putnam County (Various Locations)
Intersection:	State Route 311 at Fair St (CR 60)
GPS Coord.:	41.47462, -73.63881
Traffic Control:	Stop Sign (NB)

Traffic Control Notes (if applicable):

None

Other Intersection Notes (if applicable):

No Pedestrian Crossings.

APPROACH DATA

	Fair St (CR 60)			-			State Route 311			State Route 311		
	Northbound			**Southbound**			**Eastbound**			**Westbound**		
	Left	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
Lane Assignments:		<-1->						1->			<-1	
Lane Widths:		11'						11'			11'	
Turn Bay Lengths:		-						-			-	
Speed Limits:	40 mph						45 mph			45 mph		

TRAFFIC COUNT DATA

AM Peak Hour	Time Period:	7:00	to	8:00					Date Counted:	10/6/2022		
Volume:	64	0	83				0	237	53	153	344	0
Truck %:	16%	-	16%				-	5%	5%	4%	4%	-
Peds (Bikes):	0 (0)						0 (0)			0 (0)		
PHF = 0.95												
PM Peak Hour	Time Period:	4:15	to	5:15					Date Counted:	10/6/2022		
Volume:	87	0	174				0	399	64	113	276	0
Truck %:	2%	-	2%				-	3%	3%	3%	3%	-
Peds (Bikes):	0 (0)						0 (0)			0 (0)		
PHF = 0.93												

EXISTING CONDITION LEVEL OF SERVICE

AM Peak Delay (s):	21.6								8.3		
LOS:	C								A		
v/c:	0.42								0.13		
95% Queue:	50'								< 25'		
A (4.8) Overall	**C (21.6)**								**A (2.6)**		
PM Peak Delay (s):	34.4								8.8		
LOS:	D								A		
v/c:	0.72								0.12		
95% Queue:	138'								< 25'		
A (9.0) Overall	**D (34.4)**								**A (2.6)**		

Note: LOS calculated using HCM 6 methodologies. For unsignalized intersections, only side street approach delay and mainline left turn delay is shown. The HCM 6 methodology assumes zero delay for all other movements.

INTERSECTION EVALUATION WORKSHEET

INTERSECTION SAFETY

Travel Speeds	Direction:	Eastbound	Westbound
	Average Speed:	40.0	37.5
	85th Percentile:	45.4	41.4

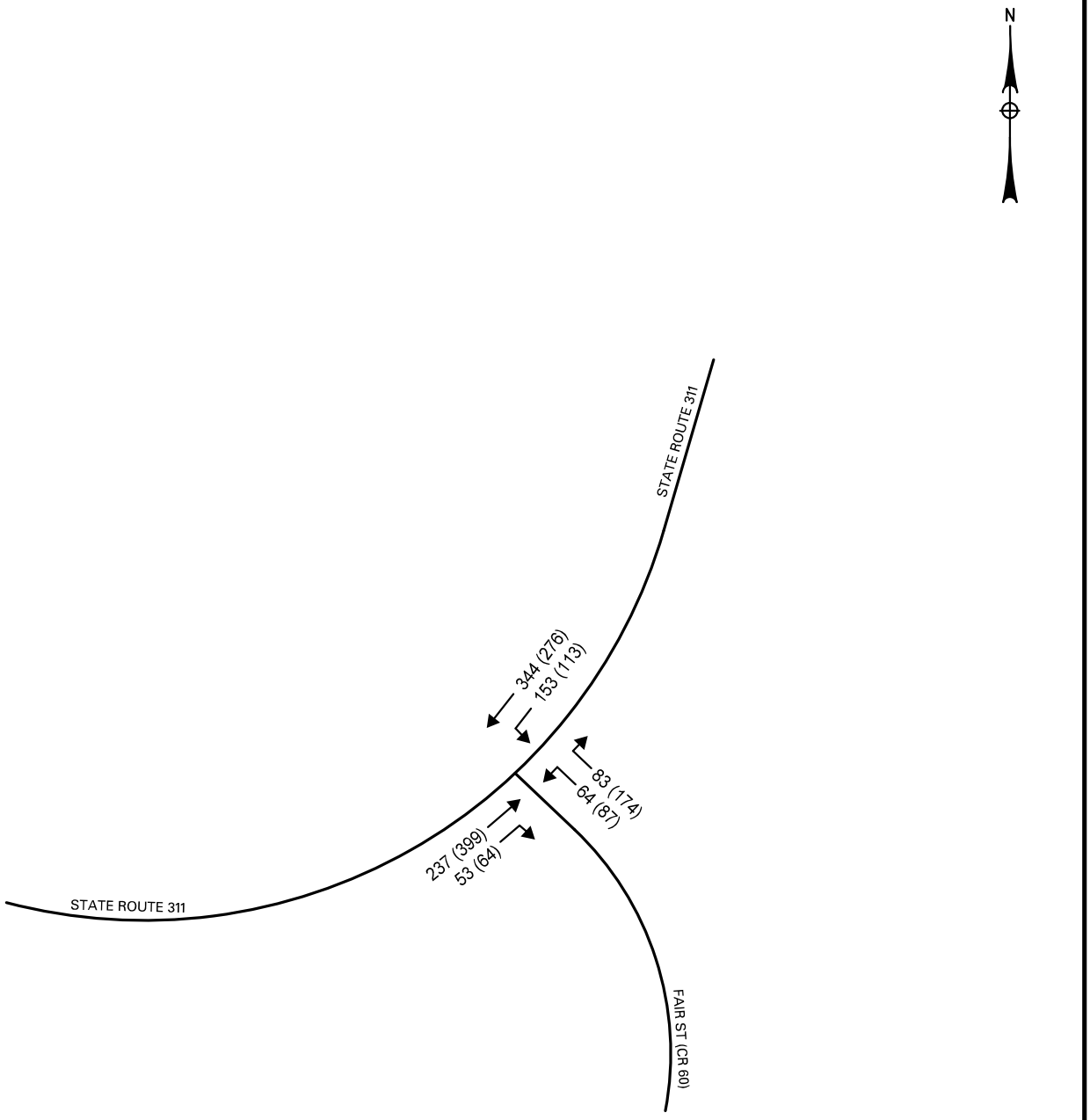
Sight Distance	Approach:	Northbound
	Looking Left:	400'
	Looking Right:	1,000'
	Summary:	The available sight distance when Looking Left from the northbound approach of Fair St does not meet the Recommended Intersection Sight Distance for making either a left turn or right turn.

Crashes	From:	12/31/2019	To:	12/31/2023	No. of Months:	48					
	No. of Crashes:	19	PDO:	17	PI:	1	PI (A):	1	K:	0	
	Crash Rate:	1.31 Cr/MEV			Above/Below Statewide Average:			7.73 Times			

PSI Factors	PSI (KA):	-0.24
	PSI (Tot):	1.26

BUILD ALTERNATIVE #1 - LEVEL OF SERVICE

	Fair St (CR 60)			-			State Route 311			State Route 311		
	Northbound			**Southbound**			**Eastbound**			**Westbound**		
	Left	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
Description of Improvements:	Actuated Traffic Signal with No Geometric Improvements											
AM Peak Delay (s):	11.7						8.6			12.5		
LOS:	B						A			B		
v/c:	0.32						0.39			0.71		
95% Queue:	95'						79'			203'		
B (11.2) Overall	**B (11.7)**						**A (8.6)**			**B (12.5)**		
PM Peak Delay (s):	12.9						10.3			12.2		
LOS:	B						B			B		
v/c:	0.51						0.62			0.67		
95% Queue:	159'						153'			172'		
B (11.6) Overall	**B (12.9)**						**B (10.3)**			**B (12.2)**		



KEY:

XXX (XXX) = AM (PM) PEAK HOUR TRAFFIC VOLUMES

GPI Engineering Design Planning Construction Inspection

PUTNAM COUNTY
INTERSECTION IMPROVEMENTS
PUTNAM COUNTY, NEW YORK

STATE ROUTE 311 AT FAIR ST (CR 60)
PEAK HOUR TRAFFIC VOLUMES

SCALE:	DATE:	FIGURE NO.
NO SCALE	JUNE 2024	G-1

Study Name	5- FAIR ST & ROUTE 311
Start Date	Thursday, October 06, 2022 7:00 AM
End Date	Thursday, October 06, 2022 6:00 PM
Site Code	

Report Summary

		Westbound					Northbound					Eastbound							Crosswalk		
Time Period	**Class.**	**L**	**T**	**U**	**I**	**O**	**L**	**R**	**U**	**I**	**O**	**T**	**R**	**U**	**I**	**O**	**Total**		**Bikes**	**Peds**	**Total**
Peak 1	Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	WB	0	0	0
Specified Period	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		0%	0%	
7:00 AM - 9:00 AM	Cars	124	280	0	404	252	38	64	0	102	160	188	36	0	224	318	730	NB	0	0	0
One Hour Peak	%	81%	81%	0%	81%	79%	59%	77%	0%	69%	78%	79%	68%	0%	77%	78%	78%		0%	0%	
7:00 AM - 8:00 AM	ıt Goods Vehi	23	50	0	73	53	10	12	0	22	34	41	11	0	52	60	147	EB	0	0	0
	%	15%	15%	0%	15%	17%	16%	14%	0%	15%	17%	17%	21%	0%	18%	15%	16%		0%	0%	
	Buses	5	2	0	7	7	3	5	0	8	7	2	2	0	4	5	19		**0**	**0**	**0**
	%	3%	1%	0%	1%	2%	5%	6%	0%	5%	3%	1%	4%	0%	1%	1%	2%				
	ıgle-Unit Truc	1	8	0	9	8	8	2	0	10	2	6	1	0	7	16	26				
	%	1%	2%	0%	2%	3%	13%	2%	0%	7%	1%	3%	2%	0%	2%	4%	3%				
	ticulated Truc	0	4	0	4	0	5	0	0	5	3	0	3	0	3	9	12				
	%	0%	1%	0%	1%	0%	8%	0%	0%	3%	1%	0%	6%	0%	1%	2%	1%				
	icycles on Roa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				
	Total	**153**	**344**	**0**	**497**	**320**	**64**	**83**	**0**	**147**	**206**	**237**	**53**	**0**	**290**	**408**	**934**				
	PHF	0.91	0.92	0	0.96	0.84	0.8	0.86	0	0.85	0.87	0.78	0.74	0	0.81	0.9	0.95				
	Approach %				53%	34%				16%	22%				31%	44%					
Peak 2	Motorcycles	1	5	0	6	5	0	1	0	1	3	4	2	0	6	5	13	WB	0	0	0
Specified Period	%	1%	2%	0%	2%	1%	0%	1%	0%	0%	2%	1%	3%	0%	1%	1%	1%		0%	0%	
4:00 PM - 6:00 PM	Cars	87	231	0	318	479	71	145	0	216	129	334	42	0	376	302	910	NB	0	0	0
One Hour Peak	%	77%	84%	0%	82%	84%	82%	83%	0%	83%	73%	84%	66%	0%	81%	83%	82%		0%	0%	
4:15 PM - 5:15 PM	ıt Goods Vehi	22	31	0	53	80	15	28	0	43	37	52	15	0	67	46	163	EB	0	0	0
	%	19%	11%	0%	14%	14%	17%	16%	0%	16%	21%	13%	23%	0%	14%	13%	15%		0%	0%	
	Buses	2	4	0	6	1	1	0	0	1	3	1	1	0	2	5	9		**0**	**0**	**0**
	%	2%	1%	0%	2%	0%	1%	0%	0%	0%	2%	0%	2%	0%	0%	1%	1%				
	ıgle-Unit Truc	0	5	0	5	7	0	0	0	0	3	7	3	0	10	5	15				
	%	0%	2%	0%	1%	1%	0%	0%	0%	0%	2%	2%	5%	0%	2%	1%	1%				
	ticulated Truc	0	0	0	0	1	0	0	0	0	1	1	1	0	2	0	2				
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	2%	0%	0%	0%	0%				
	icycles on Roa	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1				
	%	1%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%				
	Total	**113**	**276**	**0**	**389**	**573**	**87**	**174**	**0**	**261**	**177**	**399**	**64**	**0**	**463**	**363**	**1113**				
	PHF	0.86	0.91	0	0.89	0.94	0.81	0.89	0	0.92	0.88	0.96	0.7	0	0.96	0.88	0.93				
	Approach %				35%	51%				23%	16%				42%	33%					

Study Name 5- FAIR ST & ROUTE 311
Start Date 10-06-2022
Start Time 7:00 AM
Site Code

	ROUTE 311 Westbound			FAIR ST Northbound			ROUTE 311 Eastbound		
Start Time	Left	Thru	U-Turn	Left	Right	U-Turn	Thru	Right	U-Turn
7:00 AM	42	84	0	18	24	0	31	17	0
7:15 AM	37	93	0	20	23	0	59	6	0
7:30 AM	40	84	0	15	17	0	71	18	0
7:45 AM	34	83	0	11	19	0	76	12	0
8:00 AM	14	65	0	20	27	0	55	12	0
8:15 AM	21	84	0	12	24	0	65	15	0
8:30 AM	21	61	0	10	22	0	46	10	0
8:45 AM	36	77	0	4	46	0	49	20	0
4:00 PM	23	56	0	18	42	0	99	17	0
4:15 PM	32	65	0	16	48	0	104	17	0
4:30 PM	26	69	0	26	33	0	98	23	0
4:45 PM	22	66	0	18	49	0	96	7	0
5:00 PM	33	76	0	27	44	0	101	17	0
5:15 PM	29	69	0	12	44	0	94	21	0
5:30 PM	28	60	0	29	41	0	98	15	0
5:45 PM	34	70	0	13	57	0	81	15	0

Study Name 5- FAIR ST & ROUTE 311
Start Date 10-06-2022
Start Time 7:00 AM
Site Code

	ROUTE 311 Westbound		FAIR ST Northbound		ROUTE 311 Eastbound	
Start Time	Peds CCW	Peds CW	Peds CCW	Peds CW	Peds CCW	Peds CW
7:00 AM	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0

TRAFFIC SIGNAL WARRANT SUMMARY

Project: Putnam County Intersection Improvements
Condition: Existing Condition
Location: Town of Patterson
Date: October 6th, 2022

Major Street: SR 311 Lanes: 1 Critical Approach Speed: 45 mph
Minor Street: Fair St (CR 60) Lanes: 1

Volume Level Criteria

1. Is the critical speed of major street traffic greater than 40 mph? Yes
2. Is the intersection in a built-up area of an isolated community with population less than 10,000? No

If either Question 1 or Question 2 is answered "Yes", then use the 70% volume level. Criteria used: 70%

WARRANT 1 - EIGHT HOUR VEHICULAR VOLUME **Warrant 1 Satisfied:** -

Warrant 1 is satisfied if EITHER Condition A OR Condition B is 100% satisfied.
Warrant 1 is also satisfied if BOTH Condition A AND Condition B are satisfied to the 80% volume level.

			Condition 1A - Minimum Vehicular Volume (X indicates that criteria is met for specified condition)				Condition 1B - Interuption of Continuous Traffic (X indicates that criteria is met for specified condition)				Total Satisfied Hours (8 required)		
											4	4	4
Minimum Volume Criteria:			350	105	280	84	525	53	420	42	Condition 1A Satisfied	Condition 1B Satisfied	80% for Both Satisfied
Start Time	Major St. Volume[1]	Minor St. Volume[2]	Major St. 100%	Minor St. 100%	Major St. 80%	Minor St. 80%	Major St. 100%	Minor St. 100%	Major St. 80%	Minor St. 80%			
12:00 AM			-	-	-	-	-	-	-	-	-	-	-
1:00 AM			-	-	-	-	-	-	-	-	-	-	-
2:00 AM			-	-	-	-	-	-	-	-	-	-	-
3:00 AM			-	-	-	-	-	-	-	-	-	-	-
4:00 AM			-	-	-	-	-	-	-	-	-	-	-
5:00 AM			-	-	-	-	-	-	-	-	-	-	-
6:00 AM			-	-	-	-	-	-	-	-	-	-	-
7:00 AM	787	147	X	X	X	X	X	X	X	X	1	1	1
8:00 AM	651	165	X	X	X	X	X	X	X	X	1	1	1
9:00 AM			-	-	-	-	-	-	-	-	-	-	-
10:00 AM			-	-	-	-	-	-	-	-	-	-	-
11:00 AM			-	-	-	-	-	-	-	-	-	-	-
12:00 PM			-	-	-	-	-	-	-	-	-	-	-
1:00 PM			-	-	-	-	-	-	-	-	-	-	-
2:00 PM			-	-	-	-	-	-	-	-	-	-	-
3:00 PM			-	-	-	-	-	-	-	-	-	-	-
4:00 PM	820	250	X	X	X	X	X	X	X	X	1	1	1
5:00 PM	841	267	X	X	X	X	X	X	X	X	1	1	1
6:00 PM			-	-	-	-	-	-	-	-	-	-	-
7:00 PM			-	-	-	-	-	-	-	-	-	-	-
8:00 PM			-	-	-	-	-	-	-	-	-	-	-
9:00 PM			-	-	-	-	-	-	-	-	-	-	-
10:00 PM			-	-	-	-	-	-	-	-	-	-	-
11:00 PM			-	-	-	-	-	-	-	-	-	-	-

[1] Major Street Volume is the total combined volume of both mainline approaches.
[2] Minor Street volumes is the highest single side street approach volume.

WARRANT 2 - FOUR HOUR VEHICULAR VOLUME **Warrant 2 Satisfied:** **YES**

Warrant is satisfied if four (4) or more hours satisfy the volume requirements depicted on the four hour warranting graph **(see page 2)**. No. of Points Above Criteria Curve: 4

WARRANT 3 - PEAK HOUR VEHICULAR VOLUME **Warrant 3 Satisfied:** **NO**

Warrant is satisfied if any hour satisfy the volume requirements depicted on the peak hour warranting graph **(see page 3)**, and ALL three of the following requirement are met. No. of Points Above Criteria Curve: 4

1. Total stopped time delay on Minor Street equals or exceeds 4 VHD (single lane) or 5 VHD (two lanes): 2.6 VHD Max. No
2. Volume on Minor Street equals or exceeds 100 vehicles (single lane) or 150 vehicles (two lanes): Yes
3. Total intersection volume serviced during the hour equals or exceeds 650 veh. (3-leg) or 800 veh. (4-leg or more): Yes

TRAFFIC SIGNAL WARRANT SUMMARY

Project: Putnam County Intersection Improvements
Condition: Existing Condition
Location: Town of Patterson
Date: October 6th, 2022

Major Street: SR 311 Lanes: 1 Critical Approach Speed: 45 mph
Minor Street: Fair St (CR 60) Lanes: 1

WARRANT 7 - CRASH EXPERIENCE **Warrant 7 Satisfied:** -

1. Maximum number of angle[3] and pedestrian crashes in a one year period: 6
2. Maximum number of fatal-and-injury angle and pedestrian crashes in a one year period: 1
3. Maximum number of angle and pedestrian crashes in a three year period: 10
4. Maximum number of fatal-and-injury angle and pedestrian crashes in a three year period: 1

[3] Angle crashes include all crashes that occur at an angle and involve one or more vehicles on the major street and one or more vehicles on the minor street.

Warrant 7 is satisfied if **ANY** of the following criteria are met:

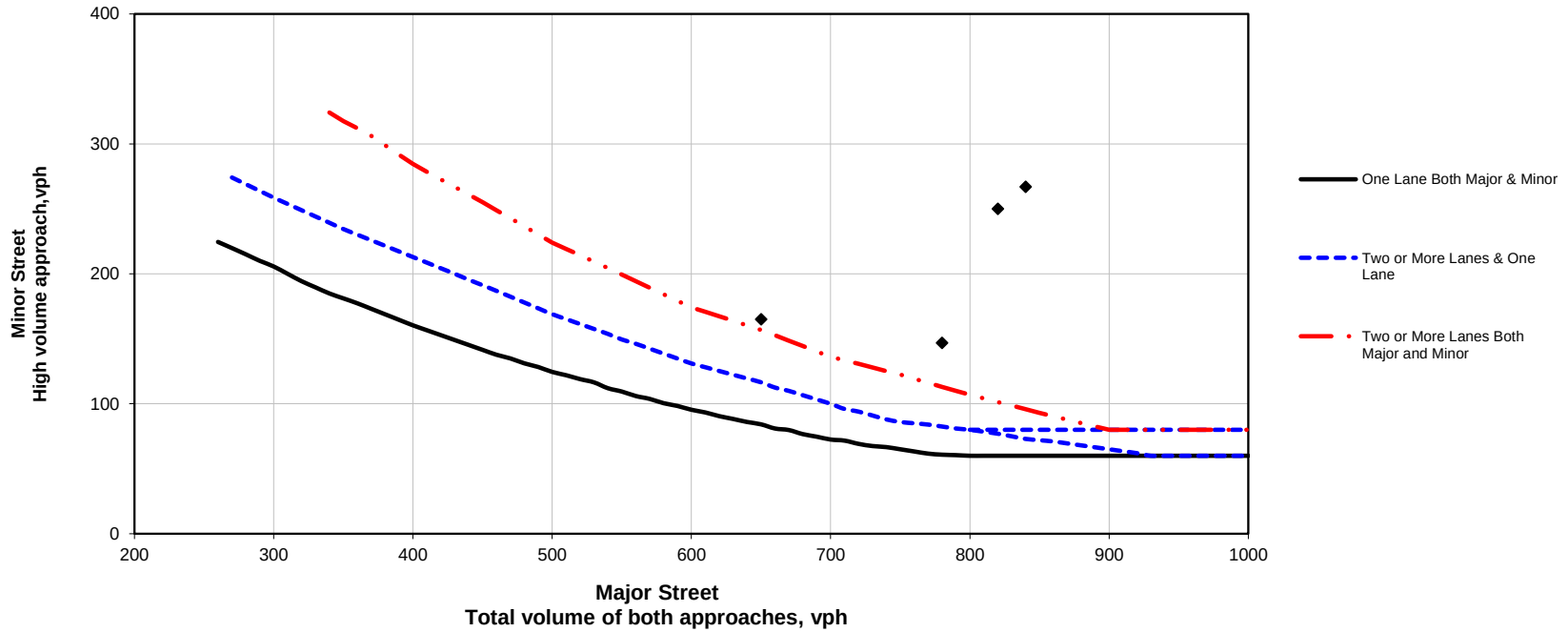
1. Are there more than 3 angle crashes in a one year period: Yes
2. Are there more than 3 fatal-and-injury crashes in a one year period: No
3. Are there more than 4 crashes in a three year period: Yes
4. Are there more than 4 fatal-and-injury crashes in a three year period: No

AND ANY of the following criteria are also met:

1. Are the VPH for **BOTH** 80% columns of Condition 1A satisfied for each of any 8 hrs: -
2. Are the VPH for **BOTH** 80% columns of Condition 1B satisfied for each of any 8 hrs: -

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)

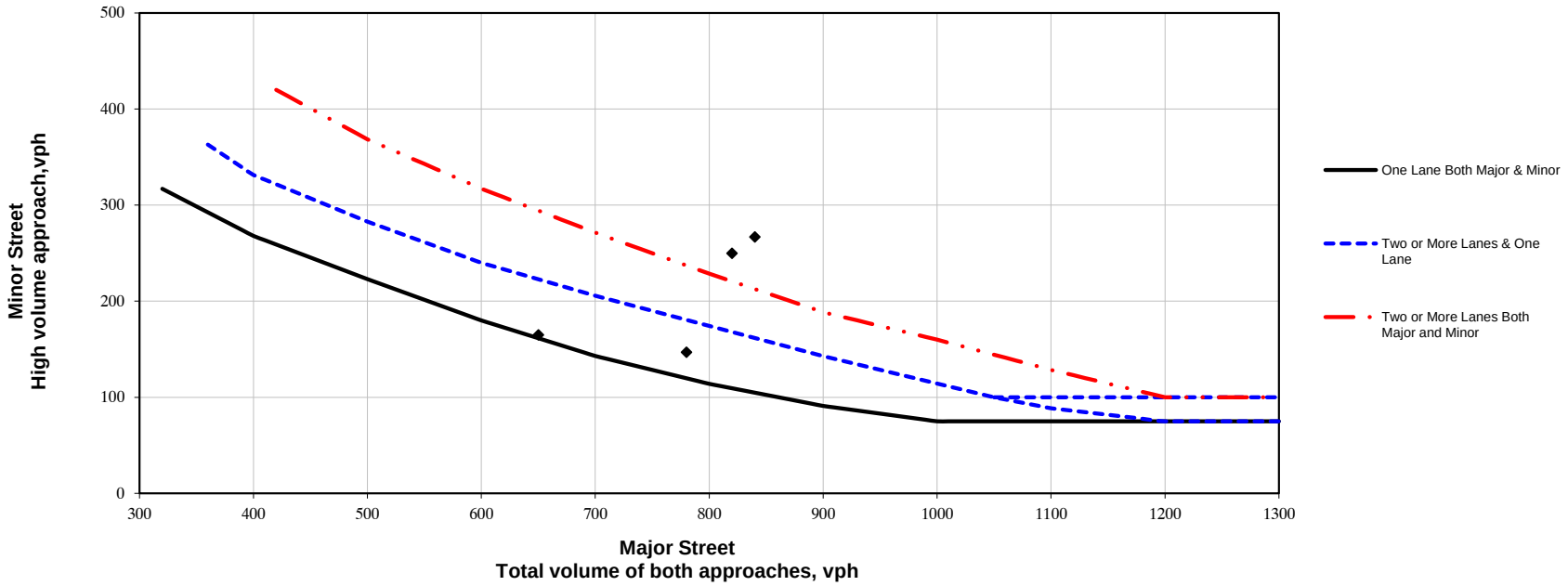
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 70 km/h (40 mph) ON MAJOR STREET)



Note: Points on graph represent hourly volumes. Points above the respective curve satisfy warrant, points below do not satisfy warrant.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 70 km/h (40 mph) ON MAJOR STREET)



Note: Points on graph represent hourly volumes. Points above the respective curve satisfy warrant, points below do not satisfy warrant.

State Route 311 - Speed Study

Eastbound	
Date:	4/11/2024
Time:	1:00 PM
Trial	Speed*
1	37
2	35
3	46
4	35
5	36
6	40
7	41
8	42
9	40
10	47
11	43
12	35
13	44
14	37
15	33
16	41
17	46
18	43
19	34
20	46
21	39
22	37
23	45
24	44
25	34
26	37
27	39
28	40
29	42
30	43
Avg.	**40.0**

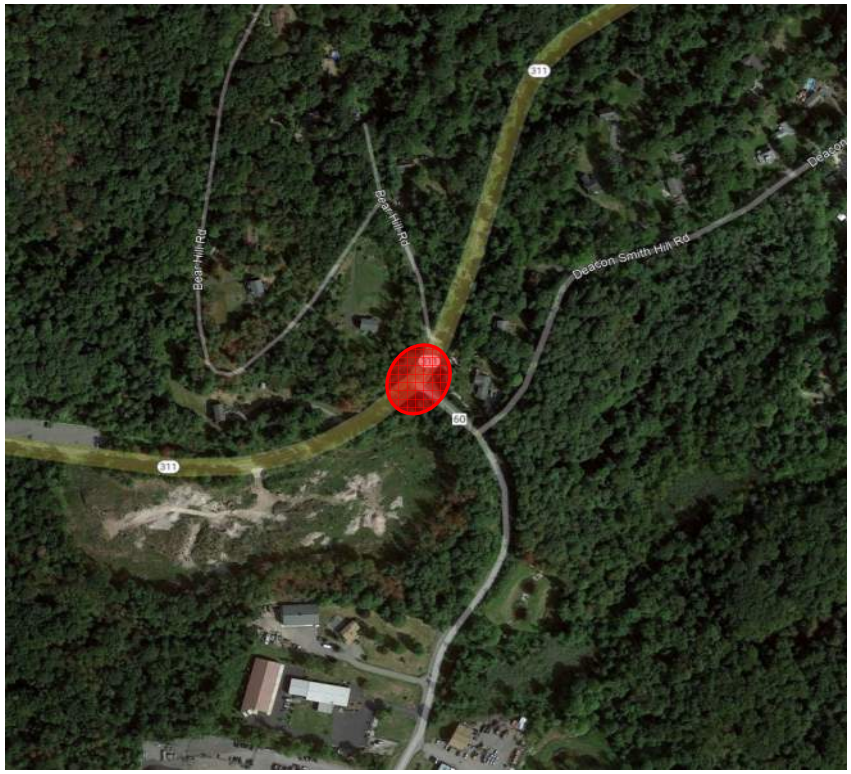
Westbound	
Date:	4/11/2024
Time:	1:00 PM
Trial	Speed*
1	39
2	37
3	33
4	34
5	36
6	36
7	34
8	37
9	43
10	46
11	33
12	38
13	36
14	38
15	37
16	42
17	38
18	41
19	40
20	34
21	38
22	34
23	34
24	33
25	39
26	38
27	37
28	40
29	44
30	36
Avg.	**37.5**

State Route 311 at
Fair Street (CR 60)
Patterson, New York

Posted Speed Limit: 45 MPH

85th Percentile Speeds		
EB		**WB**
45.4		**41.4**

Location Map



* - Denotes speed measured at proposed access location with vehicles traveling under free flow conditions, in MPH

COUNTY: PUTNAM P.I.N.:

TOWN OF PATTERSON

ROUTE NO. OR STREET NAME: FAIR STREET (CR 60)

AT INTERSECTION WITH/OR BETWEEN: STATE ROUTE 311

GPI
Engineering | Design | Planning | Construction Management

TIME PERIOD: FROM: 12/31/2019 TO: 12/31/2023

No. OF MONTHS: 48

ENVIRONMENTAL:
Use Codes from MV 104 (shown at right) for these categories

Light Conditions:
1. Daylight
2. Dawn
3. Dusk
4. Dark Road Lighted
5. Dark Road Unlighted

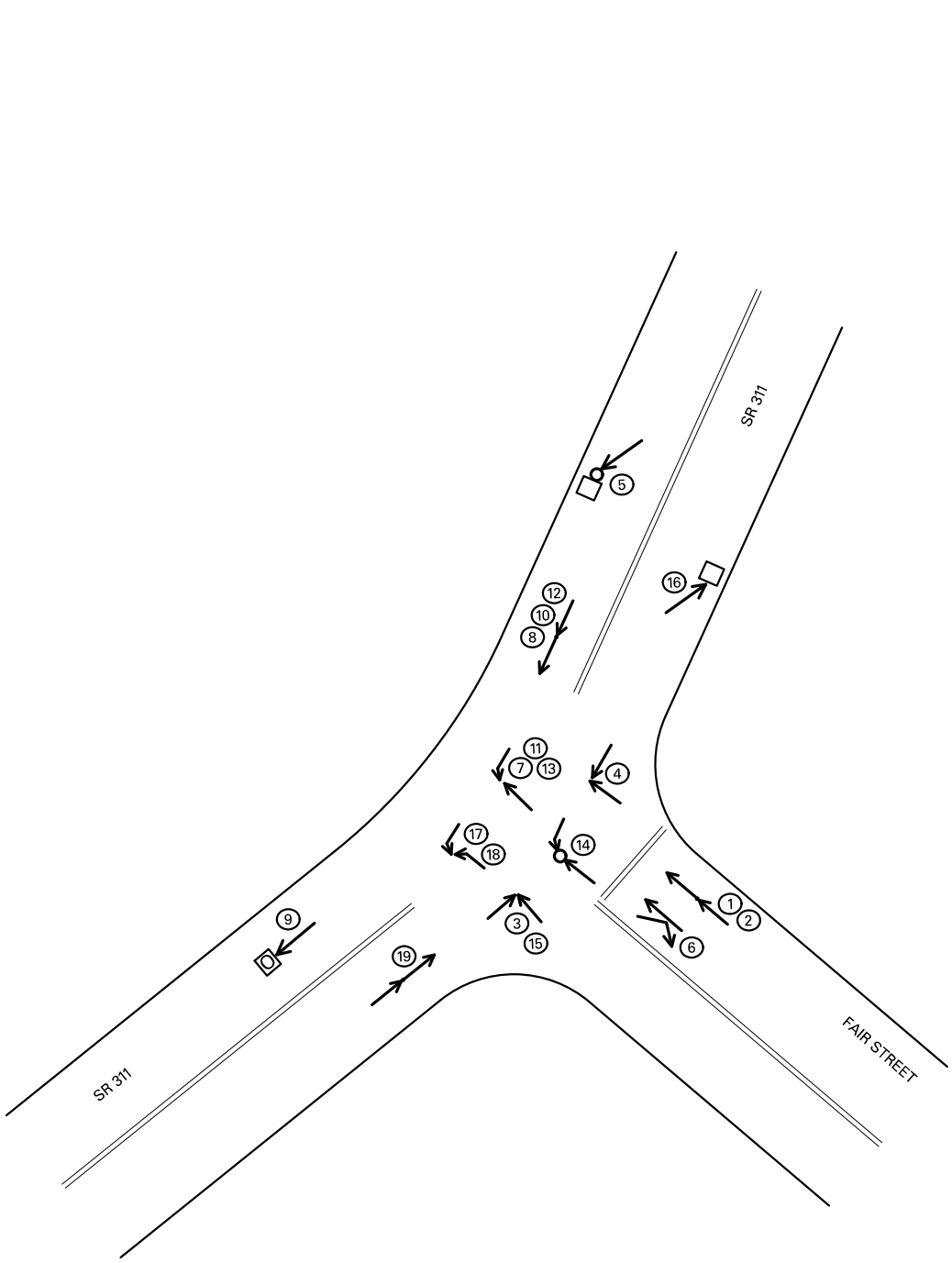
Roadway Character:
1. Straight & Level
2. Straight & Grade
3. Straight & Hillcrest
4. Curve & Level
5. Curve & Grade
6. Curve & Hillcrest

Roadway Surface Condition:
1. Dry
2. Wet
3. Muddy
4. Snow/Ice
5. Slush
10. Other

Weather:
1. Clear
2. Cloudy
3. Rain
4. Snow
5. Sleet/Hail/Freezing Rain
6. Fog/Smog/Smoke
10. Other

[1]Use Codes from MV 104 Police Report

ACCIDENT No.	DATE	TIME	No. of VEHICLES	SEVERITY	LIGHT CONDITIONS	ROADWAY CHARACTER	ROADWAY SURFACE CONDITION	WEATHER	APPARENT CONTRIBUTING FACTORS	DIRECTION	TYPE[1]	DESCRIPTION	CASE NO.
1	02/13/20	8:45	2	PDO	1	5	2	2	DRIVER INATTENTION	NORTH/NORTH	1	REAR END	38330427
2	06/22/21	15:45	2	PDO	1	5	2	3	FOLLOWING TOO CLOSELY	NORTH/NORTH	1	REAR END	38908731
3	08/18/21	18:51	2	PDO	1	2	1	1	FAILURE TO YIELD RIGHT OF WAY	NORTH/EAST	1	RIGHT ANGLE	38979852
4	10/27/21	8:05	2	PDO	1	5	2	2	REACTION TO OTHER UNINVOLVED VEHICLE	NORTH/WEST	1	RIGHT ANGLE	39078529
5	01/09/22	10:58	1	PI	1	5	4	3	PAVEMENT SLIPPERY	WEST	22	FIXED OBJECT	39191664
6	01/13/22	17:50	2	PDO	5	1	1	1	TURNING IMPROPER	NORTH/NORTH	1	SIDESWIPE	39201594
7	03/14/22	16:20	2	PDO	1	1	1	1	PASSING OR LANE USE IMPROPERLY	WEST/NORTH	1	LEFT TURN	39286899
8	04/02/22	14:03	2	PDO	1	1	1	1	FOLLOWING TOO CLOSELY	WEST/WEST	1	REAR END	39293696
9	06/25/22	20:45	1	PDO	5	4	1	1	-	WEST/WEST	10	OTHER	39402975
10	07/19/22	8:51	2	PDO	1	2	1	1	FOLLOWING TOO CLOSELY	WEST/WEST	1	REAR END	39454344
11	07/28/22	14:17	2	PDO	1	2	1	2	VIEW OBSTRUCTED/LIMITED	WEST/NORTH	1	LEFT TURN	39463825
12	11/29/22	16:35	2	PDO	3	5	1	1	FOLLOWING TOO CLOSELY	WEST/WEST	1	REAR END	39611742
13	01/30/23	7:10	2	PDO	2	1	1	1	TURNING IMPROPER	WEST/NORTH	1	LEFT TURN	39704247
14	02/22/23	10:49	2	PI(A)	1	2	1	2	TURNING IMPROPER	WEST/NORTH	1	LEFT TURN	39732072
15	02/24/23	14:52	2	PDO	1	2	1	1	FAILURE TO YIELD RIGHT OF WAY	NORTH/EAST	1	RIGHT ANGLE	39734762
16	04/11/23	19:45	1	PDO	5	5	1	1	ILLNESS, LOST CONSCIOUSNESS	EAST	25	FIXED OBJECT	39801037
17	07/31/23	20:04	2	PDO	3	1	1	1	TURNING IMPROPER	NORTH/WEST	1	LEFT TURN	39934131
18	09/27/23	14:20	2	PDO	1	1	1	1	TURNING IMPROPER	WEST/NORTH	1	LEFT TURN	40024862
19	11/02/23	17:00	2	PDO	1	2	1	1	FAILURE TO YIELD RIGHT OF WAY	NORTH/EAST	1	RIGHT TURN	40057339



LEGEND

- REAR END
- FIXED OBJECT
- PERSONAL INJURY
- (##) CRASH NUMBER
- OTHER OBJECT
- LEFT TURN
- RIGHT ANGLE
- SIDESWIPE

NOTE:
CRASH NUMBERS CORRELATE TO NUMBERS FOUND ON CRASH DATA SHEETS. SEE CRASH DATA SHEETS FOR ADDITIONAL CRASH INFORMATION.

GPI Engineering Design Planning Construction Inspection

PUTNAM COUNTY
INTERSECTION IMPROVEMENTS
PUTNAM COUNTY, NEW YORK

STATE ROUTE 311 AT FAIR ST (CR 60)
CRASH DIAGRAM

SCALE:	DATE:	FIGURE NO.
NO SCALE	JUNE 2024	G-2

Intersection	
Int Delay, s/veh	4.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	237	53	153	344	64	83
Future Vol, veh/h	237	53	153	344	64	83
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	5	5	4	4	16	16
Mvmt Flow	249	56	161	362	67	87

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	305	0	961	277
Stage 1	-	-	-	-	277	-
Stage 2	-	-	-	-	684	-
Critical Hdwy	-	-	4.14	-	6.56	6.36
Critical Hdwy Stg 1	-	-	-	-	5.56	-
Critical Hdwy Stg 2	-	-	-	-	5.56	-
Follow-up Hdwy	-	-	2.236	-	3.644	3.444
Pot Cap-1 Maneuver	-	-	1244	-	268	729
Stage 1	-	-	-	-	739	-
Stage 2	-	-	-	-	476	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1244	-	225	729
Mov Cap-2 Maneuver	-	-	-	-	225	-
Stage 1	-	-	-	-	739	-
Stage 2	-	-	-	-	399	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.6	21.6
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	369	-	-	1244	-
HCM Lane V/C Ratio	0.419	-	-	0.129	-
HCM Control Delay (s)	21.6	-	-	8.3	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	2	-	-	0.4	-

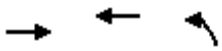
Intersection	
Int Delay, s/veh	9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	399	64	113	276	87	174
Future Vol, veh/h	399	64	113	276	87	174
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	3	3	3	3	2	2
Mvmt Flow	429	69	122	297	94	187

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	498	0	1005	464
Stage 1	-	-	-	-	464	-
Stage 2	-	-	-	-	541	-
Critical Hdwy	-	-	4.13	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.227	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1061	-	268	598
Stage 1	-	-	-	-	633	-
Stage 2	-	-	-	-	583	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1061	-	231	598
Mov Cap-2 Maneuver	-	-	-	-	231	-
Stage 1	-	-	-	-	633	-
Stage 2	-	-	-	-	503	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.6	34.4
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	391	-	-	1061	-
HCM Lane V/C Ratio	0.718	-	-	0.115	-
HCM Control Delay (s)	34.4	-	-	8.8	0
HCM Lane LOS	D	-	-	A	A
HCM 95th %tile Q(veh)	5.5	-	-	0.4	-



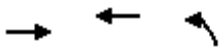
Lane Group	EBT	WBT	NBL
Lane Group Flow (vph)	305	523	154
v/c Ratio	0.36	0.76	0.35
Control Delay	7.8	18.1	18.4
Queue Delay	0.0	0.0	0.0
Total Delay	7.8	18.1	18.4
Queue Length 50th (ft)	43	111	31
Queue Length 95th (ft)	79	203	95
Internal Link Dist (ft)	921	567	648
Turn Bay Length (ft)			
Base Capacity (vph)	1220	994	435
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.25	0.53	0.35

Intersection Summary

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	237	53	153	344	64	83
Future Volume (veh/h)	237	53	153	344	64	83
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1826	1826	1841	1841	1663	1663
Adj Flow Rate, veh/h	249	56	161	362	67	87
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	5	5	4	4	16	16
Cap, veh/h	646	145	257	480	212	275
Arrive On Green	0.45	0.45	0.45	0.45	0.33	0.33
Sat Flow, veh/h	1443	325	343	1071	640	831
Grp Volume(v), veh/h	0	305	523	0	155	0
Grp Sat Flow(s),veh/h/ln	0	1767	1414	0	1481	0
Q Serve(g_s), s	0.0	5.2	10.0	0.0	3.5	0.0
Cycle Q Clear(g_c), s	0.0	5.2	15.2	0.0	3.5	0.0
Prop In Lane		0.18	0.31		0.43	0.56
Lane Grp Cap(c), veh/h	0	792	737	0	491	0
V/C Ratio(X)	0.00	0.39	0.71	0.00	0.32	0.00
Avail Cap(c_a), veh/h	0	1366	1224	0	491	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	8.3	11.2	0.0	11.3	0.0
Incr Delay (d2), s/veh	0.0	0.3	1.3	0.0	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	1.3	3.2	0.0	0.9	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.0	8.6	12.5	0.0	11.7	0.0
LnGrp LOS	A	A	B	A	B	A
Approach Vol, veh/h	305			523	155	
Approach Delay, s/veh	8.6			12.5	11.7	
Approach LOS	A			B	B	

Timer - Assigned Phs	2				6	8
Phs Duration (G+Y+Rc), s	25.3				25.3	20.0
Change Period (Y+Rc), s	5.0				5.0	5.0
Max Green Setting (Gmax), s	35.0				35.0	15.0
Max Q Clear Time (g_c+I1), s	7.2				17.2	5.5
Green Ext Time (p_c), s	1.7				3.1	0.3

Intersection Summary	
HCM 6th Ctrl Delay	11.2
HCM 6th LOS	B



Lane Group	EBT	WBT	NBL
Lane Group Flow (vph)	498	419	281
v/c Ratio	0.60	0.75	0.55
Control Delay	12.1	19.9	19.7
Queue Delay	0.0	0.0	0.0
Total Delay	12.1	19.9	19.7
Queue Length 50th (ft)	86	86	57
Queue Length 95th (ft)	153	172	#159
Internal Link Dist (ft)	921	567	648
Turn Bay Length (ft)			
Base Capacity (vph)	1303	881	512
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.38	0.48	0.55

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	399	64	113	276	87	174
Future Volume (veh/h)	399	64	113	276	87	174
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)		1.00	1.00		1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1870	1870
Adj Flow Rate, veh/h	429	69	122	297	94	187
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	3	3	3	3	2	2
Cap, veh/h	694	112	200	421	183	363
Arrive On Green	0.45	0.45	0.45	0.45	0.33	0.33
Sat Flow, veh/h	1560	251	217	947	549	1092
Grp Volume(v), veh/h	0	498	419	0	282	0
Grp Sat Flow(s),veh/h/ln	0	1810	1163	0	1646	0
Q Serve(g_s), s	0.0	9.5	6.1	0.0	6.2	0.0
Cycle Q Clear(g_c), s	0.0	9.5	15.6	0.0	6.2	0.0
Prop In Lane		0.14	0.29		0.33	0.66
Lane Grp Cap(c), veh/h	0	806	621	0	548	0
V/C Ratio(X)	0.00	0.62	0.67	0.00	0.51	0.00
Avail Cap(c_a), veh/h	0	1406	1089	0	548	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	0.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	9.6	11.0	0.0	12.1	0.0
Incr Delay (d2), s/veh	0.0	0.8	1.3	0.0	0.8	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	2.5	2.0	0.0	1.8	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	0.0	10.3	12.2	0.0	12.9	0.0
LnGrp LOS	A	B	B	A	B	A
Approach Vol, veh/h	498			419	282	
Approach Delay, s/veh	10.3			12.2	12.9	
Approach LOS	B			B	B	

Timer - Assigned Phs	2				6	8
Phs Duration (G+Y+Rc), s	25.1				25.1	20.0
Change Period (Y+Rc), s	5.0				5.0	5.0
Max Green Setting (Gmax), s	35.0				35.0	15.0
Max Q Clear Time (g_c+I1), s	11.5				17.6	8.2
Green Ext Time (p_c), s	2.9				2.5	0.5

Intersection Summary	
HCM 6th Ctrl Delay	11.6
HCM 6th LOS	B

GPI Greenman-Pedersen, Inc.
Engineering and Construction Services

Intersection:	Fair St (CR 60) and and NYS Route 311		
Client:	Putnam County	GPI No.	2300070.00
Calculated By:	D. Creen	Date:	6/12/2024
Checked By:	M. Wieszchowski	Date:	6/13/2024

ACTUATED TRAFFIC SIGNAL WITH NO GEOMETRIC IMPROVEMENTS

DESCRIPTION	TOTAL QUANTITY	UNIT	UNIT PRICE	TOTAL COST
ACTUATED TRAFFIC SIGNAL [1]	1	EA	$150,000	$150,000
WORK ZONE TRAFFIC CONTROL	1	LS	$20,000	$20,000
			ESTIMATED CONSTRUCTION COST (CONCEPTUAL)	**$170,000**
CONTIGENCY (20%)	1	LS	$34,000	$35,000
DESIGN AND INSPECTION (25%)	1	LS	$42,500	$45,000
			FINAL TOTAL	**$250,000**

[1] INCLUDES TYPICAL COST FOR CONTROLLER, SIGNAL POLES, LOOPS, WIRING, SIGNAL HEADS, ETC., FOR AN ACTUATED TRAFFIC SIGNAL.

APPENDIX H
Cornwall Hill Road (CR 64)
at NY Route 311

SUMMARY OF ANALYSIS
CORNWALL HILL RD (CR 64) @ NYS ROUTE 311

Existing Conditions:

This intersection consists of 3 one-lane approaches. Cornwall Hill Rd approaches from the south and is stop sign controlled. NYS Route 311 approaches from the east and west with both approaches being uncontrolled. NYS Route 311 has 11' wide lanes with 2'-3' paved shoulders while Cornwall Hill Rd has 10' wide lanes with little to no paved shoulders. The posted speed limits are 30 mph on NYS Route 311 and 40 mph on Cornwall Hill Rd. The measured 85th percentile speeds along NYS Route 311 are about 39 mph both eastbound and westbound. There are no pedestrian facilities at this intersection.

Although the intersection is located along a curve in NYS Route 311, the sight distance was measured to be well beyond the recommended intersection sight distance requirements.

Reviewing traffic operations, the analysis shows the intersection operating at LOS B or better for all movements. This is well within acceptable limits.

Signal Warrant Analysis:

A review of the hourly traffic volumes between 7:00AM to 9:00AM and 4:00pm to 6:00pm show that traffic volumes were not sufficient to satisfy even a single hour of Warrant 1 (8-hour warrant), Warrant 2 (4-hour warrant), or Warrant 3 (Peak Hour Warrant). Additionally, Warrant 7 (crash experience) is also not satisfied as none of the crash criteria were met either.

Safety Analysis:

Based on the NYSDOT Clear Safety System, the Potential for Safety Improvement (PSI) for this intersection is -0.27 overall and -0.06 for serious injury/fatality crashes. These factors being below 0.0 indicate that the crash potential at this location is below average compared to similar intersections Statewide. The crash rate at this location was calculated to be 0.17 crashes per million entering vehicles (Cr/MEV), which is equal to the statewide average for similar facilities. As such, safety does not appear to be an issue at this location.

This was confirmed through a review of the crash history, where only 2 crashes were noted at this location in the 4-year period reviewed. These two crashes were on separate approaches and does not indicate that there is a correctable crash pattern at this location.

A summary of the crash types and severity are shown in the table below:

CRASH SUMMARY

Crash Type	Number of Occurrences	Crash Severity	Number of Occurrences
Rear End	1	Fatality	0
Sideswipe	1	Personal Injury	0
		Property Damage Only	2
	2		2

Field Condition and Right of Way Review:

Even though Cornwall Hill Rd intersections NYS Route 311 within a horizontal curve of the roadway, sight lines appear good. There are overhead utilities along NYS Route 311 and utility poles are found on the east side of the intersection as near as 5 foot off the pavement. Terrain is rolling near the intersection, but the grades aren't significant.

Right-of-way is about 50' wide along NYS Route 311 and 58' wide along Cornwall Hill Rd, which is not enough to construct a roundabout without considerable right-of-way acquisitions.

Design Alternative Consideration:

No improvements are needed or recommended at this intersection. A roundabout could be considered but given the amount of property that would need to be acquired, the minimal benefit it would provide is far outweighed by the cost and impact to adjacent properties.

Conceptual Cost Estimate:

No improvements are recommended.

Summary & Conclusion:

Levels of service and sight lines are good at this location and the crash history does not indicate an existing safety issue at this location. As such, there are no improvement recommendations. The existing intersection functions well based on the analysis.

The intersection evaluation worksheet summarizing the lane geometry and traffic operations, traffic volume data sheets, traffic signal warrant analysis sheets, crash summary sheets, and capacity analysis worksheets for this intersection can be found on the following pages in this appendix.

INTERSECTION EVALUATION WORKSHEET

Project:	Putnam County Intersection Improvements
Location:	Putnam County (Various Locations)
Intersection:	State Route 311 at Cornwall Hill Rd (CR 64)
GPS Coord.:	41.50997, -73.61645
Traffic Control:	Stop Sign (NB)

Traffic Control Notes (if applicable):

None

Other Intersection Notes (if applicable):

No Pedestrian Crossings.

APPROACH DATA

	Cornwall Hill Rd (CR 64)			-			State Route 311			State Route 311		
	Northbound			**Southbound**			**Eastbound**			**Westbound**		
	Left	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
Lane Assignments:		<-1->						1->			<-1	
Lane Widths:		10'						11'			11'	
Turn Bay Lengths:		-						-			-	
Speed Limits:	40 mph						30 mph			30 mph		

TRAFFIC COUNT DATA

AM Peak Hour	Time Period:	7:00	to	8:00					Date Counted:	10/6/2022		
Volume:	19	0	68				0	236	12	58	236	0
Truck %:	11%	-	11%				-	8%	8%	4%	4%	-
Peds (Bikes):	0 (0)						0 (0)			0 (0)		
PHF = 0.95												
PM Peak Hour	Time Period:	4:45	to	5:45					Date Counted:	10/6/2022		
Volume:	18	0	107				0	383	20	67	244	0
Truck %:	2%	-	2%				-	2%	2%	2%	2%	-
Peds (Bikes):	0 (0)						0 (0)			0 (0)		
PHF = 0.93												

EXISTING CONDITION LEVEL OF SERVICE

AM Peak Delay (s):	12.8								8.1		
LOS:	B								A		
v/c:	0.19								0.06		
95% Queue:	< 25'								< 25'		
A (2.5) Overall	**B (12.8)**								**A (1.6)**		
PM Peak Delay (s):	13.5								8.4		
LOS:	B								A		
v/c:	0.24								0.06		
95% Queue:	< 25'								< 25'		
A (2.7) Overall	**B (13.5)**								**A (1.8)**		

Note: LOS calculated using HCM 6 methodologies. For unsignalized intersections, only side street approach delay and mainline left turn delay is shown. The HCM 6 methodology assumes zero delay for all other movements.

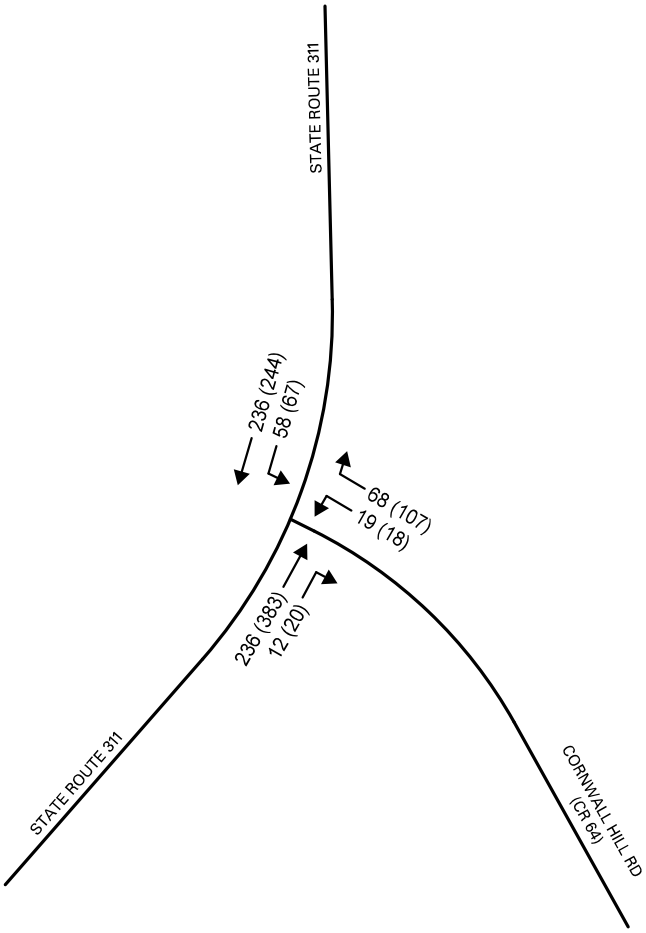
INTERSECTION EVALUATION WORKSHEET

INTERSECTION SAFETY

Travel Speeds	Direction:	Eastbound	Westbound	
	Average Speed:	34.7	35.6	
	85th Percentile:	38.4	39.0	
Sight Distance	Approach:	Northbound		
	Looking Left:	1,000' +		
	Looking Right:	600'		
	Summary:	Sight distance meets the required stopping sight distance and recommended intersection sight distance in both directions.		

Crashes	From:	12/31/2019	To:	12/31/2023	No. of Months:	48			
	No. of Crashes:	2	PDO:	2	PI:	0	PI (A):	0	K: 0
	Crash Rate:	0.17 Cr/MEV			Above/Below Statewide Average:			1.01 Times	

PSI Factors	PSI (KA):	-0.06
	PSI (Tot):	-0.27



KEY:

XXX (XXX) = AM (PM) PEAK HOUR TRAFFIC VOLUMES

GPI Engineering Design Planning Construction Inspection

PUTNAM COUNTY
INTERSECTION IMPROVEMENTS
PUTNAM COUNTY, NEW YORK

STATE ROUTE 311 AT CORNWALL HL RD (CR 64)
PEAK HOUR TRAFFIC VOLUMES

SCALE:	DATE:	FIGURE NO.
NO SCALE	JUNE 2024	H-1

Study Name	9- CORNWALL HILL & ROUTE 311
Start Date	Thursday, October 06, 2022 7:00 AM
End Date	Thursday, October 06, 2022 6:00 PM
Site Code	

Report Summary

		Westbound					Northbound					Eastbound							Crosswalk		
Time Period	**Class.**	**L**	**T**	**U**	**I**	**O**	**L**	**R**	**U**	**I**	**O**	**T**	**R**	**U**	**I**	**O**	**Total**		**Bikes**	**Peds**	**Total**
Peak 1	Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	WB	0	0	0
Specified Period	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		0%	0%	
7:00 AM - 9:00 AM	Cars	39	197	0	236	236	17	45	0	62	46	191	7	0	198	214	496	NB	0	0	0
One Hour Peak	%	67%	83%	0%	80%	78%	89%	66%	0%	71%	66%	81%	58%	0%	80%	84%	79%		0%	0%	
8:00 AM - 9:00 AM	ıt Goods Vehi	17	29	0	46	41	2	13	0	15	20	28	3	0	31	31	92	EB	0	0	0
	%	29%	12%	0%	16%	13%	11%	19%	0%	17%	29%	12%	25%	0%	13%	12%	15%		0%	0%	
	Buses	0	4	0	4	18	0	5	0	5	0	13	0	0	13	4	22		**0**	**0**	**0**
	%	0%	2%	0%	1%	6%	0%	7%	0%	6%	0%	6%	0%	0%	5%	2%	3%				
	ıgle-Unit Truc	2	6	0	8	9	0	5	0	5	4	4	2	0	6	6	19				
	%	3%	3%	0%	3%	3%	0%	7%	0%	6%	6%	2%	17%	0%	2%	2%	3%				
	ticulated Truc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				
	icycles on Roa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				
	Total	**58**	**236**	**0**	**294**	**304**	**19**	**68**	**0**	**87**	**70**	**236**	**12**	**0**	**248**	**255**	**629**				
	PHF	0.81	0.88	0	0.88	0.72	0.79	0.71	0	0.78	0.83	0.69	0.75	0	0.7	0.9	0.79				
	Approach %				47%	48%				14%	11%				39%	41%					
Peak 2	Motorcycles	2	1	0	3	6	0	1	0	1	2	5	0	0	5	1	9	WB	0	0	0
Specified Period	%	3%	0%	0%	1%	1%	0%	1%	0%	1%	2%	1%	0%	0%	1%	0%	1%		0%	0%	
4:00 PM - 6:00 PM	Cars	51	201	0	252	403	15	82	0	97	71	321	20	0	341	216	690	NB	0	0	0
One Hour Peak	%	76%	82%	0%	81%	82%	83%	77%	0%	78%	82%	84%	100%	0%	85%	82%	82%		0%	0%	
4:45 PM - 5:45 PM	ıt Goods Vehi	13	39	0	52	73	3	23	0	26	13	50	0	0	50	42	128	EB	0	0	0
	%	19%	16%	0%	17%	15%	17%	21%	0%	21%	15%	13%	0%	0%	12%	16%	15%		0%	0%	
	Buses	0	2	0	2	1	0	0	0	0	0	1	0	0	1	2	3		**0**	**0**	**0**
	%	0%	1%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%				
	ıgle-Unit Truc	0	1	0	1	6	0	0	0	0	0	6	0	0	6	1	7				
	%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	2%	0%	0%	1%	0%	1%				
	ticulated Truc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				
	icycles on Roa	1	0	0	1	1	0	1	0	1	1	0	0	0	0	0	2				
	%	1%	0%	0%	0%	0%	0%	1%	0%	1%	1%	0%	0%	0%	0%	0%	0%				
	Total	**67**	**244**	**0**	**311**	**490**	**18**	**107**	**0**	**125**	**87**	**383**	**20**	**0**	**403**	**262**	**839**				
	PHF	0.8	0.79	0	0.84	0.83	0.9	0.84	0	0.84	0.84	0.83	1	0	0.84	0.8	0.94				
	Approach %				37%	58%				15%	10%				48%	31%					

Study Name 9- CORNWALL HILL & ROUTE 311
Start Date 10-06-2022
Start Time 7:00 AM
Site Code

	ROUTE 311 Westbound			ROUTE 311 Northbound			CORNWALL HILL RD Eastbound		
Start Time	Left	Thru	U-Turn	Left	Right	U-Turn	Thru	Right	U-Turn
7:00 AM	9	65	0	1	8	0	29	2	0
7:15 AM	8	81	0	2	9	0	42	3	0
7:30 AM	8	76	0	10	16	0	37	2	0
7:45 AM	8	52	0	5	21	0	52	3	0
8:00 AM	15	42	0	6	10	0	48	4	0
8:15 AM	10	67	0	4	14	0	57	3	0
8:30 AM	15	61	0	4	24	0	45	2	0
8:45 AM	18	66	0	5	20	0	86	3	0
4:00 PM	17	59	0	4	17	0	87	6	0
4:15 PM	20	51	1	2	22	0	97	3	0
4:30 PM	17	64	0	1	15	0	88	8	0
4:45 PM	12	53	0	5	32	0	115	5	0
5:00 PM	16	77	0	5	25	0	96	5	0
5:15 PM	18	52	0	4	25	0	84	5	0
5:30 PM	21	62	0	4	25	0	88	5	0
5:45 PM	22	44	0	6	21	0	92	3	0

Study Name 9- CORNWALL HILL & ROUTE 311
Start Date 10-06-2022
Start Time 7:00 AM
Site Code

	ROUTE 311 Westbound		ROUTE 311 Northbound		CORNWALL HILL RD Eastbound	
Start Time	Peds CCW	Peds CW	Peds CCW	Peds CW	Peds CCW	Peds CW
7:00 AM	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0
4:00 PM	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0
4:30 PM	0	0	0	0	0	0
4:45 PM	0	0	0	0	0	0
5:00 PM	0	0	0	0	0	0
5:15 PM	0	0	0	0	0	0
5:30 PM	0	0	0	0	0	0
5:45 PM	0	0	0	0	0	0

TRAFFIC SIGNAL WARRANT SUMMARY

Project: Putnam County Intersection Improvements
Condition: Existing Condition
Location: Town of Patterson
Date: October 6th, 2022

Major Street: SR 311 Lanes: 1 Critical Approach Speed: 40 mph
Minor Street: Cornwall Hill Road (CR 64) Lanes: 1

Volume Level Criteria

1. Is the critical speed of major street traffic greater than 40 mph? No
2. Is the intersection in a built-up area of an isolated community with population less than 10,000? No

If either Question 1 or Question 2 is answered "Yes", then use the 70% volume level. Criteria used: 100%

WARRANT 1 - EIGHT HOUR VEHICULAR VOLUME **Warrant 1 Satisfied: NO**

Warrant 1 is satisfied if EITHER Condition A OR Condition B is 100% satisfied.
Warrant 1 is also satisfied if BOTH Condition A AND Condition B are satisfied to the 80% volume level.

			Condition 1A - Minimum Vehicular Volume (X indicates that criteria is met for specified condition)				Condition 1B - Interuption of Continuous Traffic (X indicates that criteria is met for specified condition)				Total Satisfied Hours (8 required)		
											0	0	0
Minimum Volume Criteria:			500	150	400	120	750	75	600	60	Condition	Condition	80% for
Start Time	Major St. Volume[1]	Minor St. Volume[2]	Major St. 100%	Minor St. 100%	Major St. 80%	Minor St. 80%	Major St. 100%	Minor St. 100%	Major St. 80%	Minor St. 80%	1A Satisfied	1B Satisfied	Both Satisfied
12:00 AM			-	-	-	-	-	-	-	-	-	-	-
1:00 AM			-	-	-	-	-	-	-	-	-	-	-
2:00 AM			-	-	-	-	-	-	-	-	-	-	-
3:00 AM			-	-	-	-	-	-	-	-	-	-	-
4:00 AM			-	-	-	-	-	-	-	-	-	-	-
5:00 AM			-	-	-	-	-	-	-	-	-	-	-
6:00 AM			-	-	-	-	-	-	-	-	-	-	-
7:00 AM	477	72	-	-	X	-	-	-	-	X	-	-	-
8:00 AM	542	87	X	-	X	-	-	X	-	X	-	-	-
9:00 AM			-	-	-	-	-	-	-	-	-	-	-
10:00 AM			-	-	-	-	-	-	-	-	-	-	-
11:00 AM			-	-	-	-	-	-	-	-	-	-	-
12:00 PM			-	-	-	-	-	-	-	-	-	-	-
1:00 PM			-	-	-	-	-	-	-	-	-	-	-
2:00 PM			-	-	-	-	-	-	-	-	-	-	-
3:00 PM			-	-	-	-	-	-	-	-	-	-	-
4:00 PM	703	98	X	-	X	-	-	X	X	X	-	-	-
5:00 PM	690	115	X	-	X	-	-	X	X	X	-	-	-
6:00 PM			-	-	-	-	-	-	-	-	-	-	-
7:00 PM			-	-	-	-	-	-	-	-	-	-	-
8:00 PM			-	-	-	-	-	-	-	-	-	-	-
9:00 PM			-	-	-	-	-	-	-	-	-	-	-
10:00 PM			-	-	-	-	-	-	-	-	-	-	-
11:00 PM			-	-	-	-	-	-	-	-	-	-	-

[1] Major Street Volume is the total combined volume of both mainline approaches.

[2] Minor Street volumes is the highest single side street approach volume.

WARRANT 2 - FOUR HOUR VEHICULAR VOLUME **Warrant 2 Satisfied: NO**

Warrant is satisfied if four (4) or more hours satisfy the volume requirements depicted on the four hour warranting graph **(see page 2)**. No. of Points Above Criteria Curve: 0

WARRANT 3 - PEAK HOUR VEHICULAR VOLUME **Warrant 3 Satisfied: NO**

Warrant is satisfied if any hour satisfy the volume requirements depicted on the peak hour warranting graph **(see page 3)**, and ALL three of the following requirement are met. No. of Points Above Criteria Curve: 0

1. Total stopped time delay on Minor Street equals or exceeds 4 VHD (single lane) or 5 VHD (two lanes): N/A VHD Max. -
2. Volume on Minor Street equals or exceeds 100 vehicles (single lane) or 150 vehicles (two lanes): -
3. Total intersection volume serviced during the hour equals or exceeds 650 veh. (3-leg) or 800 veh. (4-leg or more): -

TRAFFIC SIGNAL WARRANT SUMMARY

Project: Putnam County Intersection Improvements
Condition: Existing Condition
Location: Town of Patterson
Date: October 6th, 2022

Major Street: SR 311 Lanes: 1 Critical Approach Speed: 40 mph
Minor Street: Cornwall Hill Road (CR 64) Lanes: 1

WARRANT 7 - CRASH EXPERIENCE **Warrant 7 Satisfied: NO**

1. Maximum number of angle[3] and pedestrian crashes in a one year period: 0
2. Maximum number of fatal-and-injury angle and pedestrian crashes in a one year period: 0
3. Maximum number of angle and pedestrian crashes in a three year period: 0
4. Maximum number of fatal-and-injury angle and pedestrian crashes in a three year period: 0

[3] Angle crashes include all crashes that occur at an angle and involve one or more vehicles on the major street and one or more vehicles on the minor street.

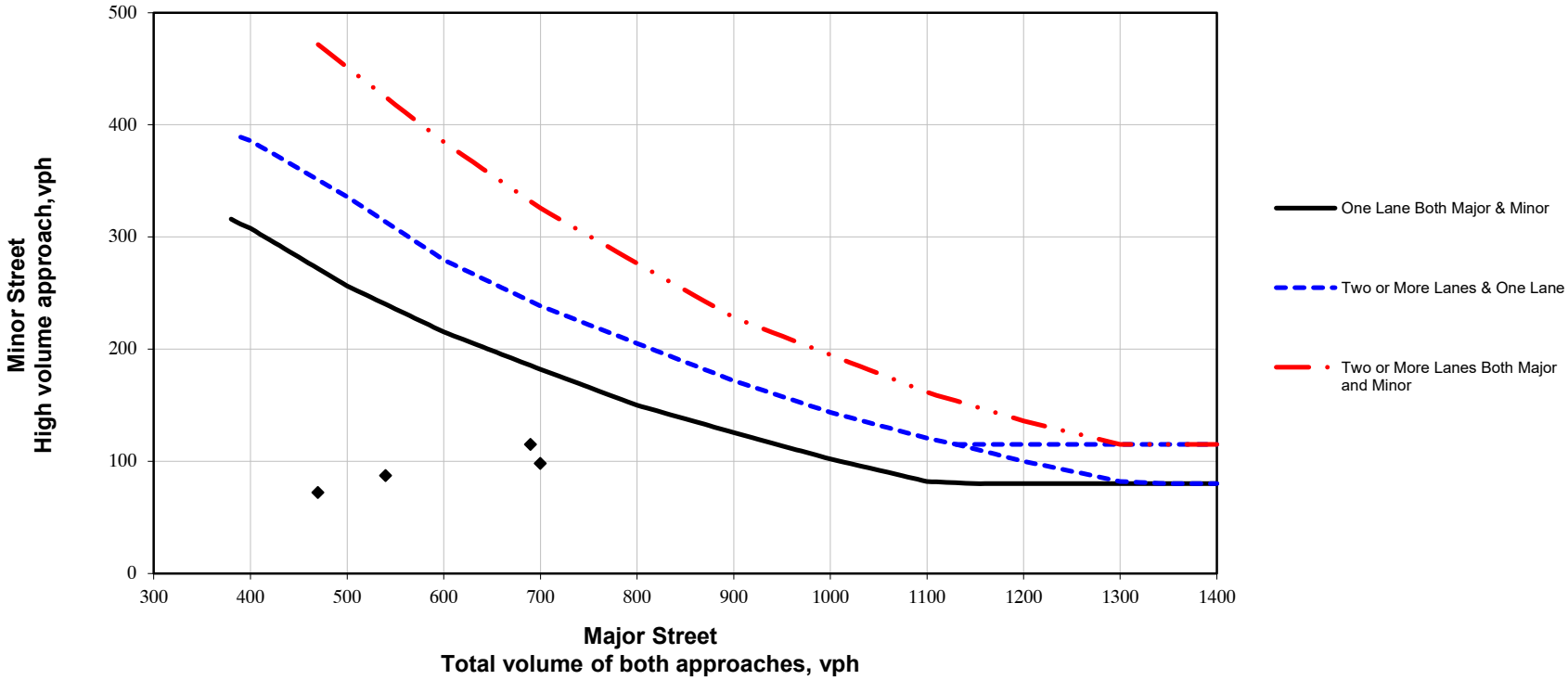
Warrant 7 is satisfied if **ANY** of the following criteria are met:

1. Are there more than 4 angle crashes in a one year period: No
2. Are there more than 3 fatal-and-injury crashes in a one year period: No
3. Are there more than 4 crashes in a three year period: No
4. Are there more than 4 fatal-and-injury crashes in a three year period: No

AND ANY of the following criteria are also met:

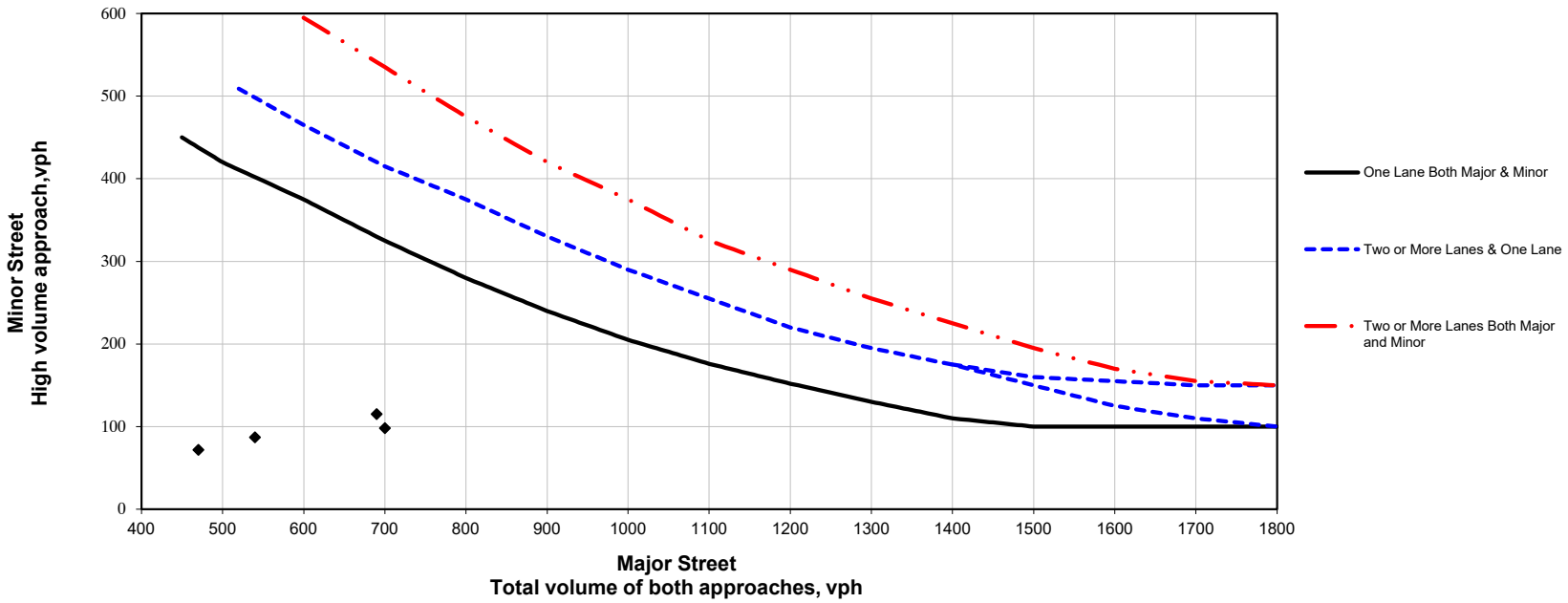
1. Are the VPH for **BOTH** 80% columns of Condition 1A satisfied for each of any 8 hrs: No
2. Are the VPH for **BOTH** 80% columns of Condition 1B satisfied for each of any 8 hrs: No

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



Note: Points on graph represent hourly volumes. Points above the respective curve satisfy warrant, points below do not satisfy warrant.

Figure 4C-3. Warrant 3, Peak Hour



Note: Points on graph represent hourly volumes. Points above the respective curve satisfy warrant, points below do not satisfy warrant.

State Route 311 - Speed Study

Eastbound	
Date:	4/11/2024
Time:	11:00 AM
Trial	Speed*
1	34
2	28
3	33
4	32
5	31
6	40
7	36
8	35
9	44
10	34
11	40
12	37
13	36
14	34
15	29
16	34
17	31
18	37
19	38
20	37
21	35
22	33
23	38
24	35
25	39
26	34
27	31
28	35
29	28
30	34
Avg.	**34.7**

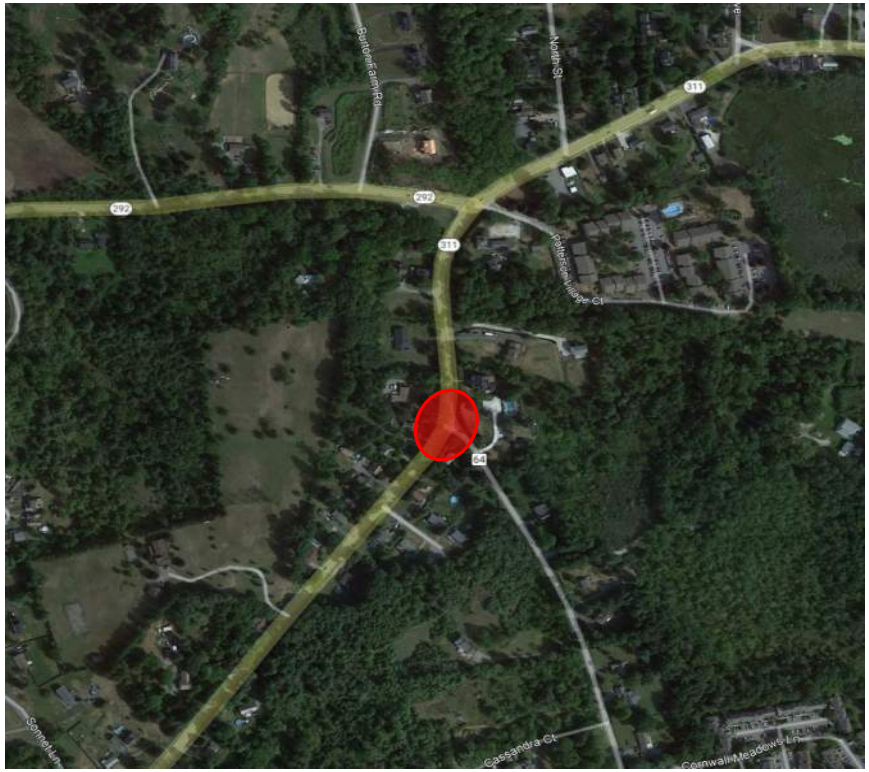
Westbound	
Date:	4/11/2024
Time:	11:00 AM
Trial	Speed*
1	40
2	32
3	36
4	33
5	35
6	29
7	36
8	38
9	36
10	34
11	31
12	36
13	39
14	38
15	32
16	29
17	36
18	37
19	32
20	36
21	35
22	29
23	40
24	38
25	44
26	38
27	38
28	35
29	36
30	39
Avg.	**35.6**

State Route 311 at
Cornwall Hill Road (CR 64)
Patterson, New York

Posted Speed Limit: 30 MPH

85th Percentile Speeds		
EB		**WB**
38.4		**39.0**

Location Map



* - Denotes speed measured at proposed access location with vehicles traveling under free flow conditions, in MPH

Sight Distance Summary Cornwall Hill Rd (CR 64) at SR 311						
Location	**Side Street Turn Movement**	**Direction**	**Available Sight Distance**	**Design Speed (mph)**	**Required Stopping Sight Distance[1]**	**Recommended Intersection Sight Distance[1]**
Northbound Cornwall Hill Rd (CR 64) at SR 311	Right Turn	Looking Left (West)	1000'+	40	305'	385'
	Left Turn	Looking Left (West)	1000'+	40	305'	445'
		Looking Right (East)	600'	40	305'	445'

[1] Recommended minimum sight distance values from AASHTO's *A Policy on Geometric Design of Highways and Streets* , 7th Edition and the NYSDOT's *Highway Design Manual* . The recommended values are based on the current free flow travel speeds of the roadway.

COUNTY: PUTNAM P.I.N.:

TOWN OF PATTERSON

ROUTE NO. OR STREET NAME: CORNWALL HILL ROAD (CR 64)

AT INTERSECTION WITH/OR BETWEEN: STATE ROUTE 311

GPI
Engineering | Design | Planning | Construction Management

TIME PERIOD: FROM: 12/31/2019 TO: 12/31/2023

No. OF MONTHS: 48

ENVIRONMENTAL:
Use Codes from MV 104 (shown at right) for these categories

Light Conditions:
1. Daylight
2. Dawn
3. Dusk
4. Dark Road Lighted
5. Dark Road Unlighted

Roadway Character:
1. Straight & Level
2. Straight & Grade
3. Straight & Hillcrest
4. Curve & Level
5. Curve & Grade
6. Curve & Hillcrest

Roadway Surface Condition:
1. Dry
2. Wet
3. Muddy
4. Snow/Ice
5. Slush
10. Other

Weather:
1. Clear
2. Cloudy
3. Rain
4. Snow
5. Sleet/Hail/Freezing Rain
6. Fog/Smog/Smoke
10. Other

[1]Use Codes from MV 104 Police Report

ACCIDENT No.	DATE	TIME	No. of VEHICLES	SEVERITY	LIGHT CONDITIONS	ROADWAY CHARACTER	ROADWAY SURFACE CONDITION	WEATHER	APPARENT CONTRIBUTING FACTORS	DIRECTION	TYPE[1]	DESCRIPTION	CASE NO.
1	07/10/20	14:32	2	PDO	-	-	-	-	-	NORTH/NORTH	1	REAR END	38515126
2	07/22/23	12:01	2	PDO	1	1	1	1	PASSING OR LANE USAGE IMPROPERLY	EAST/WEST	1	SIDESWIPE	39924682

Intersection	
Int Delay, s/veh	2.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	236	12	58	236	19	68
Future Vol, veh/h	236	12	58	236	19	68
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	79	79	79	79	79	79
Heavy Vehicles, %	8	8	4	4	11	11
Mvmt Flow	299	15	73	299	24	86

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	314	0	752	307
Stage 1	-	-	-	-	307	-
Stage 2	-	-	-	-	445	-
Critical Hdwy	-	-	4.14	-	6.51	6.31
Critical Hdwy Stg 1	-	-	-	-	5.51	-
Critical Hdwy Stg 2	-	-	-	-	5.51	-
Follow-up Hdwy	-	-	2.236	-	3.599	3.399
Pot Cap-1 Maneuver	-	-	1235	-	365	712
Stage 1	-	-	-	-	726	-
Stage 2	-	-	-	-	627	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1235	-	339	712
Mov Cap-2 Maneuver	-	-	-	-	339	-
Stage 1	-	-	-	-	726	-
Stage 2	-	-	-	-	582	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.6	12.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	574	-	-	1235	-
HCM Lane V/C Ratio	0.192	-	-	0.059	-
HCM Control Delay (s)	12.8	-	-	8.1	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.7	-	-	0.2	-

Intersection	
Int Delay, s/veh	2.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	383	20	67	244	18	107
Future Vol, veh/h	383	20	67	244	18	107
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	407	21	71	260	19	114

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	428	0	820	418
Stage 1	-	-	-	-	418	-
Stage 2	-	-	-	-	402	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1131	-	345	635
Stage 1	-	-	-	-	664	-
Stage 2	-	-	-	-	676	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1131	-	320	635
Mov Cap-2 Maneuver	-	-	-	-	320	-
Stage 1	-	-	-	-	664	-
Stage 2	-	-	-	-	627	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.8	13.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	556	-	-	1131	-
HCM Lane V/C Ratio	0.239	-	-	0.063	-
HCM Control Delay (s)	13.5	-	-	8.4	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.9	-	-	0.2	-

APPENDIX I
North Salem Road (CR 55)
at Fields Lane

SUMMARY OF ANALYSIS
N SALEM RD (CR 55) @ FIELDS LANE

Existing Conditions:

This 3-legged T-intersection is located on a horizontal curve along N. Salem Rd. There is stop sign control on the eastbound Fields Lane approach only with N. Salem Road being uncontrolled at this intersection. All lanes are 11-foot wide with paved shoulders being no more than 2' wide. There are no pedestrian facilities at this intersection.

Posted speed limits were not found along N. Salem Rd, but Fields Lane is posted at 30 mph. Speed measurements performed along N. Salem Rd determined the 85th percentile speeds to be 43 mph in both the northbound and southbound directions, even though the curve is signed with an advisory speed of 35 mph.

The sight distance looking north at Fields Lane Ave was measured to be 425', which meets stopping sight distance requirements, but is below the recommended intersection sight distance of 500' for a 45-mph design speed. This sight distance limitation is caused by the horizontal curvature of N. Salem Rd.

Operationally, the amount of traffic at this location is well below capacity and all movements operate at LOS B or better in both the peak hours.

Signal Warrant Analysis:

A review of the hourly traffic volumes between 7:00AM to 9:00AM and 4:00pm to 6:00pm show that Warrant 1 (8-hour warrant) is not satisfied, with none of the 4 hours reviewed meeting criteria. Warrant 2 (4-hour warrant) is not satisfied, with only 1 of the 4 hours reviewed meeting criteria. Warrant 3 (Peak Hour Warrant) was also not satisfied with none of the 4 hours reviewed meeting criteria. Warrant 7 (crash experience) is also not satisfied as none of the crash criteria were met.

Safety Analysis:

Based on the NYSDOT Clear Safety System, the Potential for Safety Improvement (PSI) for this intersection is 0.11 overall and -0.02 for serious injury/fatality crashes. These factors indicate there is potential for safety improvement, with PSI>0.0, but the potential for serious injury crashes is not above that of similar facilities. The crash rate for this intersection was calculated at 0.50 crashes per million entering vehicles (Cr/MEV), which is around 3 times the statewide average of 0.17 Cr/MEV for similar intersections, so a more detailed look at crashes is warranted.

Crash data noted 4 crashes at this location in the 4-year period reviewed. Of these crashes, 2 were fixed object (but from separate directions) and two were rear end on the side street, which is not uncommon. All crashes were property damage only and no injuries were recorded. Based on the analysis of the crash data, no significant crash pattern was identified.

A summary of the crash types and severity are shown below:

CRASH SUMMARY

Crash Type	Number of Occurrences	Crash Severity	Number of Occurrences
Rear End	2	Fatality	0
Fixed Object	2	Personal Injury	0
		Property Damage Only	4
	4		4

Field Condition and Right of Way Review:

There is a significant drop off in the terrain east of the intersection and significant State wetlands, that intersection widening would impact both east and north of the intersection. As such any intersection widening should be done to the south, if needed. However, there are utility poles and a gas line in that direction that will require relocation if improvements in that direction are progressed.

There is approximately 60' of right-of-way along N. Salem Rd and 48' of right-of-way along Field Rd. However, if an intersection widening project were progressed, such as a roundabout, right-of-way to the south would need to be acquired.

Design Alternative Consideration:

Given the low volume to capacity ratios, the good levels of service and low number of crashes, it is recommended to not improve this location, but if issues arise in the future, a single lane roundabout could be considered. A roundabout would result in LOS A operations for all approaches and would have a traffic calming effect resulting in slower travel speeds, but as mentioned above, there are several environmental, right-of-way, geometric and utility concerns that will make a roundabout difficult to construct at this location.

Conceptual Cost Estimate:

Due to the significant physical and environmental constraints it may be difficult to construct a roundabout at this location, but if so, our best estimate of cost would be approximately $3,380,000. These costs include construction of all improvements, right-of-way taking, as well as costs for design and inspection. A breakdown of the big picture cost items is included later in this appendix.

Summary & Conclusion:

The analyses show that a traffic signal is not warranted, and that traffic operates at LOS B or better for all movements in the peak hours. Additionally, there is no discernable crash pattern that would indicate a safety issue, even though sight distance is somewhat limited to the north. There are no improvement recommendations for this intersection, but if safety becomes an issue a single lane roundabout could be considered. However, that would be expensive and have numerous impacts.

The intersection evaluation worksheet summarizing the lane geometry and traffic operations, traffic volume data sheets, traffic signal warrant analysis sheets, crash summary sheets, capacity analysis worksheets, cost estimate breakdown and roundabout concept sketch for this intersection can be found on the following pages in this appendix.

INTERSECTION EVALUATION WORKSHEET

Project:	Putnam County Intersection Improvements
Location:	Putnam County (Various Locations)
Intersection:	North Salem Rd (CR 55) at Fields Ln
GPS Coord.:	41.36676, -73.61011
Traffic Control:	Stop Sign (EB)

Traffic Control Notes (if applicable):

None

Other Intersection Notes (if applicable):

No Pedestrian Crossings.

APPROACH DATA

	North Salem Rd			North Salem Rd			Fields Ln			-		
	Northbound			**Southbound**			**Eastbound**			**Westbound**		
	Left	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
Lane Assignments:		<-1			1->			<-1->				
Lane Widths:		11'			11'			11'				
Turn Bay Lengths:		-			-			-				
Speed Limits:	Unposted			Unposted			30 mph					

TRAFFIC COUNT DATA

AM Peak Hour	Time Period:	7:45	to	8:45				Date Counted:	10/6/2022			
Volume:	157	63	0	0	116	104	31	0	52			
Truck %:	6%	16%	-	-	14%	11%	48%	-	33%			
Peds (Bikes):	0 (0)			-			0 (0)					
PHF = 0.90												
PM Peak Hour	Time Period:	5:00	to	6:00				Date Counted:	10/6/2022			
Volume:	59	105	0	0	55	44	140	0	154			
Truck %:	7%	7%	-	-	2%	14%	6%	-	6%			
Peds (Bikes):	0 (0)			-			0 (0)					
PHF = 0.85												

EXISTING CONDITION LEVEL OF SERVICE

AM Peak Delay (s):	8.3						13.1					
LOS:	A						B					
v/c:	0.14						0.17					
95% Queue:	< 25'						< 25'					
A (4.6) Overall	**A (5.9)**						**B (13.1)**					
PM Peak Delay (s):	7.6						13.9					
LOS:	A						B					
v/c:	0.05						0.46					
95% Queue:	< 25'						63'					
A (8.1) Overall	**A (2.7)**						**B (13.9)**					

Note: LOS calculated using HCM 6 methodologies. For unsignalized intersections, only side street approach delay and mainline left turn delay is shown. The HCM 6 methodology assumes zero delay for all other movements.

INTERSECTION EVALUATION WORKSHEET

INTERSECTION SAFETY

Travel Speeds	Direction:	Northbound	Southbound
	Average Speed:	39.7	38.9
	85th Percentile:	42.7	43.0

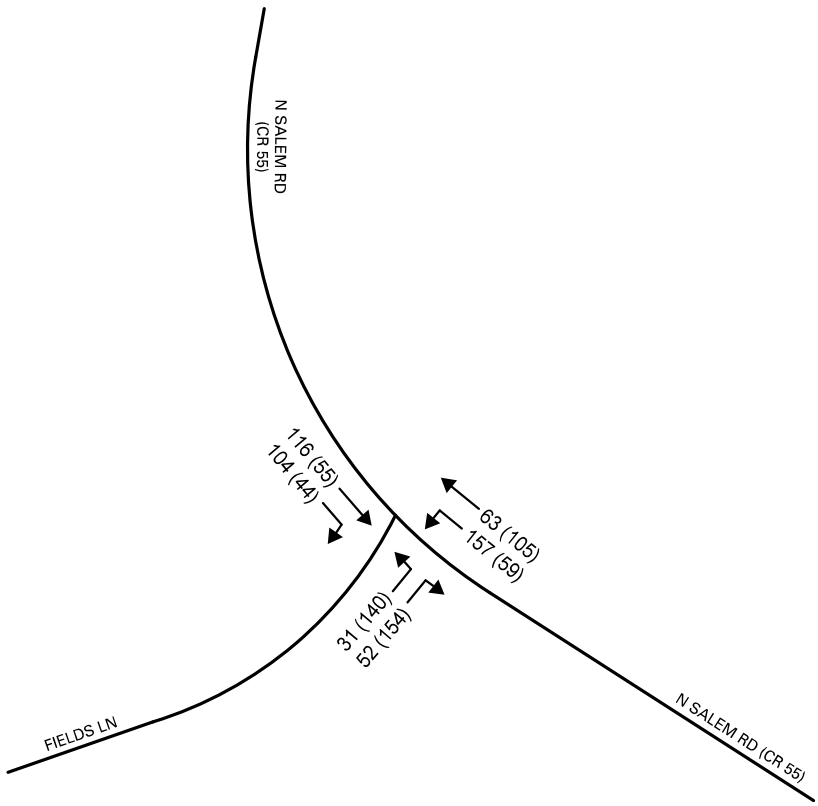
Sight Distance	Approach:	Eastbound
	Looking Left:	425'
	Looking Right:	775'
	Summary:	The sight distance when Looking Left from eastbound Fields Lane does not meet the Recommended Intersection Sight Distance for making a left turn or right turn.

Crashes	From:	12/31/2019	To:	12/31/2023	No. of Months:	48					
	No. of Crashes:	4	PDO:	4	PI:	0	PI (A):	0	K:	0	
	Crash Rate:	0.50 Cr/MEV			Above/Below Statewide Average:			2.96 Times			

PSI Factors	PSI (KA):	-0.02
	PSI (Tot):	0.12

BUILD ALTERNATIVE #1 - LEVEL OF SERVICE

	North Salem Rd			North Salem Rd			Fields Ln			-		
	Northbound			**Southbound**			**Eastbound**			**Westbound**		
	Left	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
Description of Improvements:	Installation of a Roundabout.											
AM Peak Delay (s):	4.7			5.9			5.1					
LOS:	A			A			A					
v/c:	0.20			0.24			0.10					
95% Queue:	25'			25'			< 25'					
A (5.3) Overall	**A (4.7)**			**A (5.9)**			**A (5.1)**					
PM Peak Delay (s):	5.0			3.8			5.6					
LOS:	A			A			A					
v/c:	0.18			0.10			0.29					
95% Queue:	25'			< 25'			25'					
A (5.1) Overall	**A (5.0)**			**A (3.8)**			**A (5.6)**					



KEY:

XXX (XXX) = AM (PM) PEAK HOUR TRAFFIC VOLUMES

GPI Engineering Design Planning Construction Inspection

PUTNAM COUNTY
INTERSECTION IMPROVEMENTS
PUTNAM COUNTY, NEW YORK

N SALEM RD (CR 55) AT FIELDS LN
PEAK HOUR TRAFFIC VOLUMES

SCALE:	DATE:	FIGURE NO.
NO SCALE	JUNE 2024	I-1

Greenman-Pedersen, Inc.
80 Wolf Rd, Suite 300
Albany, NY 12205
(518) 453-9431

Intersection: N Salem Rd at Fields Lane
Location: Town of Southeast, New York

GPI Project No.: 2300070.00
Count Date: 7/19/2023

Total Traffic - Cars & Heavy Vehicles

Start Time	N Salem Rd Southbound					Westbound					N Salem Rd Northbound					Fields Lane Eastbound				
	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	23	29	0	0	0	0	0	0	0	34	6	0	0	0	3	0	6	1
7:15 AM	0	0	34	37	0	0	0	0	0	0	0	39	8	0	0	0	7	0	4	0
7:30 AM	0	0	28	21	0	0	0	0	0	0	0	36	9	0	0	0	3	0	11	0
7:45 AM	0	0	31	27	0	0	0	0	0	0	0	45	24	0	0	0	5	0	13	0
8:00 AM	0	0	28	19	0	0	0	0	0	0	0	36	12	0	0	0	9	0	7	0
8:15 AM	0	0	28	36	0	0	0	0	0	0	0	33	11	0	0	0	6	0	19	0
8:30 AM	0	0	29	22	0	0	0	0	0	0	0	43	16	0	0	0	11	0	13	0
8:45 AM	0	0	18	26	0	0	0	0	0	0	0	43	11	0	0	0	10	0	10	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	16	7	0	0	0	0	0	0	0	10	21	0	0	0	32	0	33	0
4:15 PM	0	0	8	6	0	0	0	0	0	0	0	14	17	0	0	0	18	0	39	0
4:30 PM	0	0	18	6	0	0	0	0	0	0	0	10	29	0	0	0	28	0	29	0
4:45 PM	0	0	13	11	0	0	0	0	0	0	0	8	25	0	0	0	39	0	29	0
5:00 PM	0	0	15	7	0	0	0	0	0	0	0	9	29	0	0	0	47	0	56	0
5:15 PM	0	0	11	9	0	0	0	0	0	0	0	19	30	0	0	0	33	0	40	0
5:30 PM	0	0	11	12	0	0	0	0	0	0	0	17	27	0	0	0	28	0	28	0
5:45 PM	0	0	18	16	0	0	0	0	0	0	0	14	19	0	0	0	32	0	30	0
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Greenman-Pedersen, Inc.
80 Wolf Rd, Suite 300
Albany, NY 12205
(518) 453-9431

Intersection: N Salem Rd at Fields Lane
Location: Town of Southeast, New York

GPI Project No.: 2300070.00
Count Date: 7/19/2023

Peak Hour Traffic Volumes

	N Salem Rd Southbound					Westbound					N Salem Rd Northbound					Fields Lane Eastbound				
	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes
AM Peak Hour:			**7:45 AM**	**to**	**8:45 AM**															
7:45 AM	0	0	31	27	0	0	0	0	0	0	0	45	24	0	0	0	5	0	13	0
8:00 AM	0	0	28	19	0	0	0	0	0	0	0	36	12	0	0	0	9	0	7	0
8:15 AM	0	0	28	36	0	0	0	0	0	0	0	33	11	0	0	0	6	0	19	0
8:30 AM	0	0	29	22	0	0	0	0	0	0	0	43	16	0	0	0	11	0	13	0
Total Volume	0	0	116	104	0	0	0	0	0	0	0	157	63	0	0	0	31	0	52	0
523			220					0					220					83		
No. of Trucks	0	0	16	11	0	0	0	0	0	0	0	10	10	0	0	0	15	0	17	0
Truck %	0.0%		13.8%	10.6%		0.0%			0.0%	0.0%	0.0%	6.4%	15.9%		0.0%	0.0%	48.4%		32.7%	0.0%
15.1%			12.3%					0.0%					9.1%					38.6%		
PHF	0.00		0.94	0.72		0.00			0.00	0.00	0.00	0.87	0.66		0.00	0.00	0.70		0.68	0.00
0.90			0.86					#DIV/0!					0.80					0.83		

	N Salem Rd Southbound					Westbound					N Salem Rd Northbound					Fields Lane Eastbound				
	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes
PM Peak Hour:			**5:00 PM**	**to**	**6:00 PM**															
5:00 PM	0	0	15	7	0	0	0	0	0	0	0	9	29	0	0	0	47	0	56	0
5:15 PM	0	0	11	9	0	0	0	0	0	0	0	19	30	0	0	0	33	0	40	0
5:30 PM	0	0	11	12	0	0	0	0	0	0	0	17	27	0	0	0	28	0	28	0
5:45 PM	0	0	18	16	0	0	0	0	0	0	0	14	19	0	0	0	32	0	30	0
Total Volume	0	0	55	44	0	0	0	0	0	0	0	59	105	0	0	0	140	0	154	0
557			99					0					164					294		
No. of Trucks	0	0	1	6	0	0	0	0	0	0	0	4	7	0	0	0	8	0	9	0
Truck %	0.0%		1.8%	13.6%		0.0%				0.0%	0.0%	6.8%	6.7%		0.0%	0.0%	5.7%		5.8%	0.0%
6.3%			7.1%					0.0%					6.7%					5.8%		
PHF	0.00		0.76	0.69		0.00				0.00	0.00	0.78	0.88		0.00	0.00	0.74		0.69	0.00
0.85			0.73					#DIV/0!					0.84					0.71		

TRAFFIC SIGNAL WARRANT SUMMARY

Project: Putnam County Intersection Improvements
Condition: Existing Condition
Location: Town of Southeast
Date: July 19th, 2023

Major Street: North Salem Rd. (CR 55) Lanes: 1 Critical Approach Speed: 45 mph
Minor Street: Fields Lane Lanes: 1

Volume Level Criteria

1. Is the critical speed of major street traffic greater than 40 mph? Yes
2. Is the intersection in a built-up area of an isolated community with population less than 10,000? No

If either Question 1 or Question 2 is answered "Yes", then use the 70% volume level. Criteria used: 70%

WARRANT 1 - EIGHT HOUR VEHICULAR VOLUME **Warrant 1 Satisfied: NO**

Warrant 1 is satisfied if EITHER Condition A OR Condition B is 100% satisfied.
Warrant 1 is also satisfied if BOTH Condition A AND Condition B are satisfied to the 80% volume level.

			Condition 1A - Minimum Vehicular Volume (X indicates that criteria is met for specified condition)				Condition 1B - Interuption of Continuous Traffic (X indicates that criteria is met for specified condition)				Total Satisfied Hours (8 required)		
											0	0	0
Minimum Volume Criteria:			350	105	280	84	525	53	420	42	Condition	Condition	80% for
Start Time	Major St. Volume[1]	Minor St. Volume[2]	Major St. 100%	Minor St. 100%	Major St. 80%	Minor St. 80%	Major St. 100%	Minor St. 100%	Major St. 80%	Minor St. 80%	1A Satisfied	1B Satisfied	Both Satisfied
12:00 AM			-	-	-	-	-	-	-	-	-	-	-
1:00 AM			-	-	-	-	-	-	-	-	-	-	-
2:00 AM			-	-	-	-	-	-	-	-	-	-	-
3:00 AM			-	-	-	-	-	-	-	-	-	-	-
4:00 AM			-	-	-	-	-	-	-	-	-	-	-
5:00 AM			-	-	-	-	-	-	-	-	-	-	-
6:00 AM			-	-	-	-	-	-	-	-	-	-	-
7:00 AM	431	53	X	-	X	-	-	X	X	X	-	-	-
8:00 AM	411	85	X	-	X	X	-	X	-	X	-	-	-
9:00 AM			-	-	-	-	-	-	-	-	-	-	-
10:00 AM			-	-	-	-	-	-	-	-	-	-	-
11:00 AM			-	-	-	-	-	-	-	-	-	-	-
12:00 PM			-	-	-	-	-	-	-	-	-	-	-
1:00 PM			-	-	-	-	-	-	-	-	-	-	-
2:00 PM			-	-	-	-	-	-	-	-	-	-	-
3:00 PM			-	-	-	-	-	-	-	-	-	-	-
4:00 PM	219	247	-	X	-	X	-	X	-	X	-	-	-
5:00 PM	263	294	-	X	-	X	-	X	-	X	-	-	-
6:00 PM			-	-	-	-	-	-	-	-	-	-	-
7:00 PM			-	-	-	-	-	-	-	-	-	-	-
8:00 PM			-	-	-	-	-	-	-	-	-	-	-
9:00 PM			-	-	-	-	-	-	-	-	-	-	-
10:00 PM			-	-	-	-	-	-	-	-	-	-	-
11:00 PM			-	-	-	-	-	-	-	-	-	-	-

[1] Major Street Volume is the total combined volume of both mainline approaches.

[2] Minor Street volumes is the highest single side street approach volume.

WARRANT 2 - FOUR HOUR VEHICULAR VOLUME **Warrant 2 Satisfied: NO**

Warrant is satisfied if four (4) or more hours satisfy the volume requirements depicted on the four hour warranting graph **(see page 2)**. No. of Points Above Criteria Curve: 2

WARRANT 3 - PEAK HOUR VEHICULAR VOLUME **Warrant 3 Satisfied: NO**

Warrant is satisfied if any hour satisfy the volume requirements depicted on the peak hour warranting graph **(see page 3)**, and ALL three of the following requirement are met. No. of Points Above Criteria Curve: 0

1. Total stopped time delay on Minor Street equals or exceeds 4 VHD (single lane) or 5 VHD (two lanes): N/A VHD Max. -
2. Volume on Minor Street equals or exceeds 100 vehicles (single lane) or 150 vehicles (two lanes): -
3. Total intersection volume serviced during the hour equals or exceeds 650 veh. (3-leg) or 800 veh. (4-leg or more): -

TRAFFIC SIGNAL WARRANT SUMMARY

Project: Putnam County Intersection Improvements
Condition: Existing Condition
Location: Town of Southeast
Date: July 19th, 2023

Major Street: North Salem Rd. (CR 55) Lanes: 1 Critical Approach Speed: 45 mph
Minor Street: Fields Lane Lanes: 1

WARRANT 7 - CRASH EXPERIENCE

Warrant 7 Satisfied: NO

1. Maximum number of angle[3] and pedestrian crashes in a one year period: 0
2. Maximum number of fatal-and-injury angle and pedestrian crashes in a one year period: 0
3. Maximum number of angle and pedestrian crashes in a three year period: 0
4. Maximum number of fatal-and-injury angle and pedestrian crashes in a three year period: 0

[3] Angle crashes include all crashes that occur at an angle and involve one or more vehicles on the major street and one or more vehicles on the minor street.

Warrant 7 is satisfied if **ANY** of the following criteria are met:

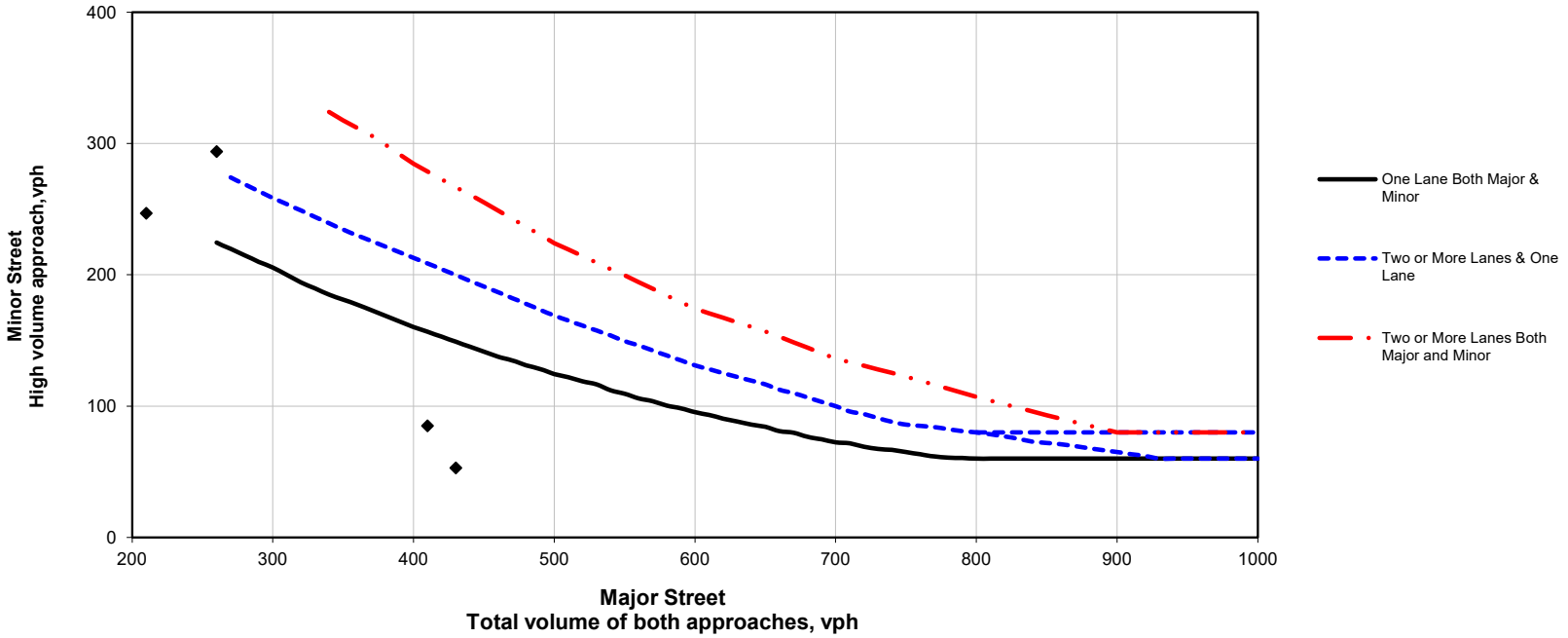
1. Are there more than 3 angle crashes in a one year period: No
2. Are there more than 3 fatal-and-injury crashes in a one year period: No
3. Are there more than 4 crashes in a three year period: No
4. Are there more than 4 fatal-and-injury crashes in a three year period: No

AND ANY of the following criteria are also met:

1. Are the VPH for **BOTH** 80% columns of Condition 1A satisfied for each of any 8 hrs: No
2. Are the VPH for **BOTH** 80% columns of Condition 1B satisfied for each of any 8 hrs: No

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)

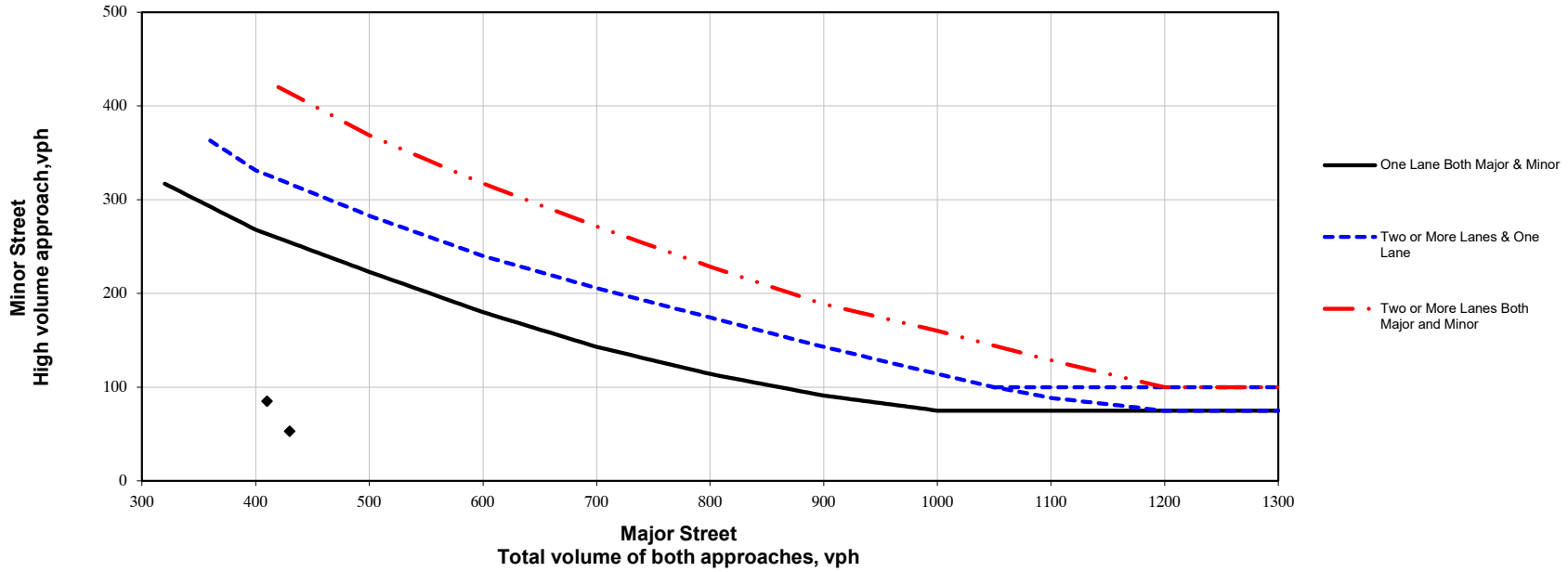
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 70 km/h (40 mph) ON MAJOR STREET)



Note: Points on graph represent hourly volumes. Points above the respective curve satisfy warrant, points below do not satisfy warrant.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 70 km/h (40 mph) ON MAJOR STREET)



Note: Points on graph represent hourly volumes. Points above the respective curve satisfy warrant, points below do not satisfy warrant.

North Salem Rd (CR 55)- Speed Study

Northbound	
Date:	7/19/2023
Time:	2:00 PM
Trial	Speed*
1	41
2	36
3	33
4	40
5	41
6	39
7	34
8	34
9	41
10	42
11	46
12	38
13	42
14	41
15	40
16	33
17	41
18	39
19	42
20	43
21	39
22	31
23	42
24	40
25	41
26	43
27	42
28	44
29	46
30	37
Avg.	**39.7**

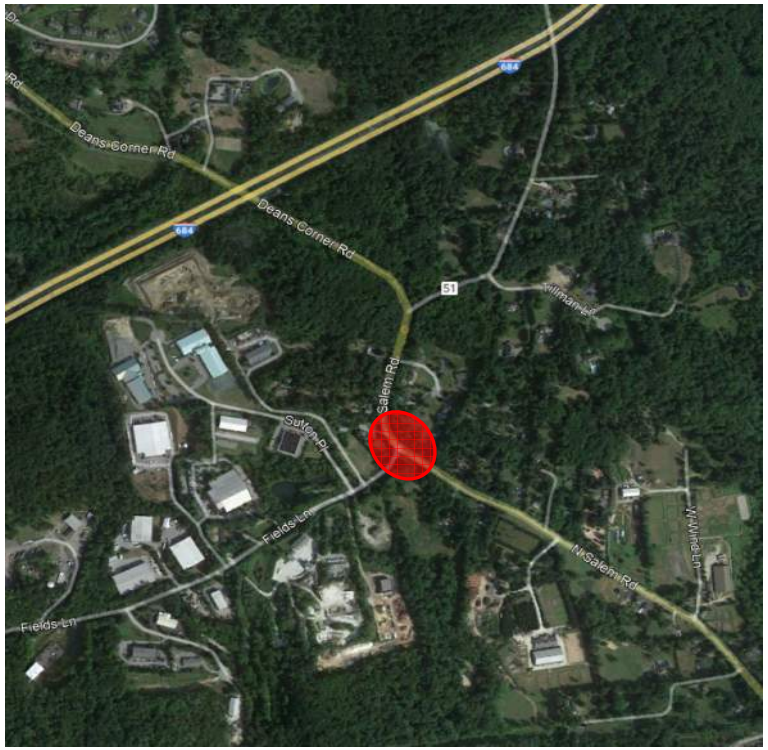
Southbound	
Date:	7/19/2023
Time:	2:00 PM
Trial	Speed*
1	47
2	37
3	36
4	39
5	34
6	43
7	37
8	37
9	35
10	36
11	48
12	42
13	41
14	43
15	33
16	36
17	37
18	41
19	39
20	43
21	37
22	46
23	36
24	35
25	37
26	42
27	33
28	46
29	35
30	37
Avg.	**38.9**

North Salem Rd (CR 55)
at Fields Lane
Southeast, New York

Posted Speed Limit: Unposted
(Therefore governed by the statewide 55 mph speed limit)

85th Percentile Speeds		
NB		**SB**
42.7		**43.0**

Location Map



* - Denotes speed measured at proposed access location with vehicles traveling under free flow conditions, in MPH

Sight Distance Summary Fields Lane at N Salem Rd (CR 55)						
Location	**Side Street Turn Movement**	**Direction**	**Available Sight Distance**	**Design Speed (mph)**	**Required Stopping Sight Distance[1]**	**Recommended Intersection Sight Distance[1]**
Northbound Fields Ln at N Salem Rd (CR 55)	Right Turn	Looking Left (West)	425'	45	360'	430'
	Left Turn	Looking Left (West)	425'	45	360'	500'
		Looking Right (East)	775'	45	360'	500'

[1] Recommended minimum sight distance values from AASHTO's *A Policy on Geometric Design of Highways and Streets* , 7th Edition and the NYSDOT's *Highway Design Manual* . The recommended values are based on the current free flow travel speeds of the roadway.

COUNTY: PUTNAM P.I.N.:

TOWN OF SOUTHEAST

ROUTE NO. OR STREET NAME: NORTH SALEM ROAD (CR 55)

AT INTERSECTION WITH/OR BETWEEN: FIELDS LANE

GPI
Engineering | Design | Planning | Construction Management

TIME PERIOD: FROM: 12/31/2019 TO: 12/31/2023

No. OF MONTHS: 48

ENVIRONMENTAL:
Use Codes from MV 104 (shown at right) for these categories

Light Conditions:
1. Daylight
2. Dawn
3. Dusk
4. Dark Road Lighted
5. Dark Road Unlighted

Roadway Character:
1. Straight & Level
2. Straight & Grade
3. Straight & Hillcrest
4. Curve & Level
5. Curve & Grade
6. Curve & Hillcrest

Roadway Surface Condition:
1. Dry
2. Wet
3. Muddy
4. Snow/Ice
5. Slush
10. Other

Weather:
1. Clear
2. Cloudy
3. Rain
4. Snow
5. Sleet/Hail/Freezing Rain
6. Fog/Smog/Smoke
10. Other

[1]Use Codes from MV 104 Police Report

ACCIDENT No.	DATE	TIME	No. of VEHICLES	SEVERITY	LIGHT CONDITIONS	ROADWAY CHARACTER	ROADWAY SURFACE CONDITION	WEATHER	APPARENT CONTRIBUTING FACTORS	DIRECTION	TYPE[1]	DESCRIPTION	CASE NO.
1	03/25/20	18:10	1	PDO	1	1	2	3	UNSAFE SPEED	SOUTH	30	FIXED OBJECT	38382266
2	09/26/22	11:10	2	PDO	1	1	1	1	FOLLOWING TOO CLOSELY	EAST/EAST	1	REAR END	39524567
3	05/22/23	11:00	2	PDO	1	1	1	1	BACKING UNSAFELY	EAST/EAST	1	REAR END	39845024
4	11/21/23	21:10	1	PDO	5	1	2	3	OBSTRUCTION/DEBRIS	NORTH	15	FIXED OBJECT	40090730

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	31	52	157	63	116	104
Future Vol, veh/h	31	52	157	63	116	104
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	35	35	9	9	12	12
Mvmt Flow	34	58	174	70	129	116

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	605	187	245	0	-	0
Stage 1	187	-	-	-	-	-
Stage 2	418	-	-	-	-	-
Critical Hdwy	6.75	6.55	4.19	-	-	-
Critical Hdwy Stg 1	5.75	-	-	-	-	-
Critical Hdwy Stg 2	5.75	-	-	-	-	-
Follow-up Hdwy	3.815	3.615	2.281	-	-	-
Pot Cap-1 Maneuver	411	777	1281	-	-	-
Stage 1	772	-	-	-	-	-
Stage 2	599	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	353	777	1281	-	-	-
Mov Cap-2 Maneuver	353	-	-	-	-	-
Stage 1	663	-	-	-	-	-
Stage 2	599	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.1	5.9	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1281	-	536	-	-
HCM Lane V/C Ratio	0.136	-	0.172	-	-
HCM Control Delay (s)	8.3	0	13.1	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.5	-	0.6	-	-

Intersection	
Int Delay, s/veh	8.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	140	154	59	105	55	44
Future Vol, veh/h	140	154	59	105	55	44
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	6	6	7	7	7	7
Mvmt Flow	165	181	69	124	65	52

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	353	91	117	0	-	0
Stage 1	91	-	-	-	-	-
Stage 2	262	-	-	-	-	-
Critical Hdwy	6.46	6.26	4.17	-	-	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.354	2.263	-	-	-
Pot Cap-1 Maneuver	637	956	1441	-	-	-
Stage 1	923	-	-	-	-	-
Stage 2	773	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	605	956	1441	-	-	-
Mov Cap-2 Maneuver	605	-	-	-	-	-
Stage 1	876	-	-	-	-	-
Stage 2	773	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.9	2.7	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1441	-	749	-	-
HCM Lane V/C Ratio	0.048	-	0.462	-	-
HCM Control Delay (s)	7.6	0	13.9	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.2	-	2.5	-	-

Intersection	
Intersection Delay, s/veh	5.3
Intersection LOS	A

Approach	EB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	92	244	245
Demand Flow Rate, veh/h	124	266	274
Vehicles Circulating, veh/h	144	46	190
Vehicles Exiting, veh/h	320	222	122
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	5.1	4.7	5.9
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	LR	LT	TR
Assumed Moves	LR	LT	TR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	124	266	274
Cap Entry Lane, veh/h	1191	1317	1137
Entry HV Adj Factor	0.742	0.916	0.893
Flow Entry, veh/h	92	244	245
Cap Entry, veh/h	884	1206	1015
V/C Ratio	0.104	0.202	0.241
Control Delay, s/veh	5.1	4.7	5.9
LOS	A	A	A
95th %tile Queue, veh	0	1	1

Intersection	
Intersection Delay, s/veh	5.1
Intersection LOS	A

Approach	EB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	346	193	117
Demand Flow Rate, veh/h	367	207	126
Vehicles Circulating, veh/h	70	175	74
Vehicles Exiting, veh/h	130	262	308
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	5.6	5.0	3.8
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	LR	LT	TR
Assumed Moves	LR	LT	TR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	367	207	126
Cap Entry Lane, veh/h	1285	1154	1280
Entry HV Adj Factor	0.943	0.934	0.932
Flow Entry, veh/h	346	193	117
Cap Entry, veh/h	1211	1078	1192
V/C Ratio	0.286	0.179	0.098
Control Delay, s/veh	5.6	5.0	3.8
LOS	A	A	A
95th %tile Queue, veh	1	1	0

GPI Greenman-Pedersen, Inc.
Engineering and Construction Services

Intersection:	North Salem Rd (CR 55) and Fields Lane		
Client:	Putnam County	GPI No.	2300070.00
Calculated By:	D. Creen	Date:	6/12/2024
Checked By:	M. Wieszchowski	Date:	6/13/2024

SINGLE LANE ROUNDABOUT (120 FT DIAMETER)

DESCRIPTION	TOTAL QUANTITY	UNIT	UNIT PRICE	TOTAL COST
SINGLE LANE ROUNDABOUT [1]	1	EA	$1,250,000	$1,250,000
ADDITONAL EARTHWORK (ABOVE AND BEYOND TYPICAL)	10,000	CY	$50	$500,000
UTILITY RELOCATION [2]	1	EA	$75,000	$0
RETAINING WALLS	1,000	SF	$150	$150,000
STORMWATER AND TREATMENT [3]	1	LS	$100,000	$100,000
WETLAND MITIGATION	1	LS	$50,000	$50,000
WORK ZONE TRAFFIC CONTROL	1	LS	$200,000	$200,000
			ESTIMATED CONSTRUCTION COST (CONCEPTUAL)	**$2,250,000.00**
RIGHT OF WAY	0.222	ACRE	$500,000	$115,000
CONTIGENCY (20%)	1	LS	$450,000	$450,000
DESIGN AND INSPECTION (25%)	1	LS	$562,500	$565,000
			FINAL TOTAL	**$3,380,000.00**

[1] INCLUDES TYPICAL COST FOR PAVEMENT, CURB, EARTHWORK, DRAINAGE, LANDSCAPING, ETC., FOR A SINGLE LANE ROUNDABOUT.

[2] ELECTRIC AND GAS RELOCATIONS ARE ASSUMED NO COST FOR MUNICIPAL PROJECTS. WATER AND SEWER RELOCATIONS ARE ASSUMED AT $75,000 EACH.

[3] IMPACTS OVER 5,000 SF WITHIN DEP WATERSHEDS REQUIRE POST STORMWATER TREATMENT. $100,000 ALLOWANCE FOR EXTRA ROW OR WORK REQUIRED.

GPI

N

N SALEM RD (CR 55)

STEEP
DOWNGRADE

UTILITY POLE
IMPACTS

0.222 ACRE
ROW TAKING

AFEE

UTILITY POLE
IMPACTS

FIELDS LANE

N SALEM RD (CR 55)

20 0 20 40 60 80'

Putnam County Intersections | FIG I-2

N Salem Rd (CR 55) at Fields Lane
Intersection Improvement Concept Sketch

APPENDIX J

Milltown Road (CR 54)

at Gage Road

SUMMARY OF ANALYSIS
MILLTOWN RD (CR 54) @ GAGE RD

Existing Conditions:

This intersection consists of 3 one-lane approaches. Gage Rd approaches from the North and is stop sign controlled. Milltown Rd approaches from the east and west, intersecting Gage Rd at a horizontal curve of the roadway, with both approaches being uncontrolled. Lanes are 10' wide on Gage Rd with no shoulders. Lanes are 11' wide on Milltown Rd with 1'-3' wide paved shoulders.

Posted speed limits are 35 mph on Milltown Rd and 30 mph on Gage Rd. Speed measurements performed along Gage Rd determined the 85th percentile speeds to be 44 mph in both directions, even though the curve is signed with an advisory speed of 35 mph.

The measured sight distance from Gage Rd is 650' or more in both directions, which is more than the 500' intersection sight distance requirement for a 45-mph design speed.

Analysis shows existing traffic operates with limited delays, with levels of service no worse than LOS B for any movement.

Signal Warrant Analysis:

A review of the hourly traffic volumes between 7:00AM to 9:00AM and 4:00pm to 6:00pm show that traffic volumes are not sufficient enough to satisfy even a single hour of Warrant 1 (8-hour warrant), Warrant 2 (4-hour warrant), or Warrant 3 (Peak Hour Warrant). Additionally, Warrant 7 (crash experience) is also not satisfied, as none of the crash criteria were met either.

Safety Analysis:

Based on the NYSDOT Clear Safety System, the Potential for Safety Improvement (PSI) for this intersection is -0.32 overall and -0.04 for serious injury/fatality crashes. These factors being below 0.0 indicate that the crash potential at this location is below average compared to similar intersections Statewide. However, the crash rate for this intersection was calculated at 0.36 crashes per million entering vehicles (Cr/MEV), which is nearly twice the statewide average for similar intersections, so a more detailed look at the crash data is warranted.

Reviewing the crash history, 3 crashes were noted at this location in the 4-year period reviewed. One crash involved a vehicle running off the road during slippery conditions, one involved an animal in the roadway, and one was a rear end crash caused by a driver following too closely. None of these suggest a crash pattern that could be addressed. A summary of the crash types and severity are shown in the table below:

CRASH SUMMARY

Crash Type	Number of Occurrences	Crash Severity	Number of Occurrences
Fixed Object	1	Fatality	0
Rear End	1	Personal Injury	0
Animal	1	Property Damage Only	3
	3		3

Field Condition and Right of Way Review:

The existing terrain is relatively flat in this area but there are some potential wetlands that could be impacted if roadway widening at the intersection were required. There is some guiderail along the curve and some utility poles near the edge of roadway that would also likely be impacted if improvements were made at this location.

Right-of-way is about 48 feet wide along Gage Rd and the southern leg of Milltown Rd, but this increases significantly at the intersection, with right-of-way along the northern leg being more than 200' wide. If a roundabout were installed at this intersection, right-of-way taking would be minimal.

Design Alternative Consideration:

No improvements are needed or recommended at this intersection. A roundabout is feasible at this location, but the minimal benefit it would provide is far outweighed by the cost of construction. A concept sketch for the roundabout has been provided for your information if conditions change and the County would like to install one in the future.

Conceptual Cost Estimate:

No improvements are recommended but it is estimated that the construction of a single lane roundabout at this location would cost roughly $2,780,000 with the costs of design, inspection and right-of-way acquisitions included.

Summary & Conclusion:

Levels of service and sight lines are good at this location and the crash history does not indicate a safety issue. As such, there are no improvement recommendations. The existing intersection functions well based on the analysis.

The intersection evaluation worksheet summarizing the lane geometry and traffic operations, traffic volume data sheets, traffic signal warrant analysis sheets, crash summary sheets, and capacity analysis worksheets for this intersection can be found on the following pages in this appendix.

INTERSECTION EVALUATION WORKSHEET

Project:	Putnam County Intersection Improvements
Location:	Putnam County (Various Locations)
Intersection:	Milltown Rd (CR 54) at Gage Rd
GPS Coord.:	41.41645, -73.55862
Traffic Control:	Stop Sign (SB)

Traffic Control Notes (if applicable):

None

Other Intersection Notes (if applicable):

No Pedestrian Crossings.

APPROACH DATA

	-			Gage Rd			Milltown Rd			Milltown Rd		
	Northbound			**Southbound**			**Eastbound**			**Westbound**		
	Left	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
Lane Assignments:					<-1->			<-1			1->	
Lane Widths:					10'			11'			11'	
Turn Bay Lengths:								-			-	
Speed Limits:					30 mph			35 mph			35 mph	

TRAFFIC COUNT DATA

AM Peak Hour	Time Period:		7:15	to	8:15					Date Counted:		7/19/2023
Volume:				1	0	54	25	65	0	0	408	2
Truck %:				1%	-	2%	8%	5%	-	-	1%	1%
Peds (Bikes):					0 (0)			0 (0)			0 (0)	
PHF = 0.85												
PM Peak Hour	Time Period:		5:00	to	6:00					Date Counted:		7/19/2023
Volume:				3	0	36	85	471	0	0	145	0
Truck %:				1%	-	1%	1%	1%	-	-	2%	-
Peds (Bikes):					0 (0)			0 (0)			0 (0)	
PHF = 0.94												

EXISTING CONDITION LEVEL OF SERVICE

AM Peak Delay (s):				12.0			8.5					
LOS:				B			A					
v/c:				0.11			0.03					
95% Queue:				< 25'			< 25'					
A (1.6) Overall				**B (12.0)**			**A (2.4)**					
PM Peak Delay (s):				9.9			7.7					
LOS:				A			A					
v/c:				0.05			0.06					
95% Queue:				< 25'			< 25'					
A (1.4) Overall				**A (9.9)**			**A (1.2)**					

Note: LOS calculated using HCM 6 methodologies. For unsignalized intersections, only side street approach delay and mainline left turn delay is shown. The HCM 6 methodology assumes zero delay for all other movements.

INTERSECTION EVALUATION WORKSHEET

INTERSECTION SAFETY

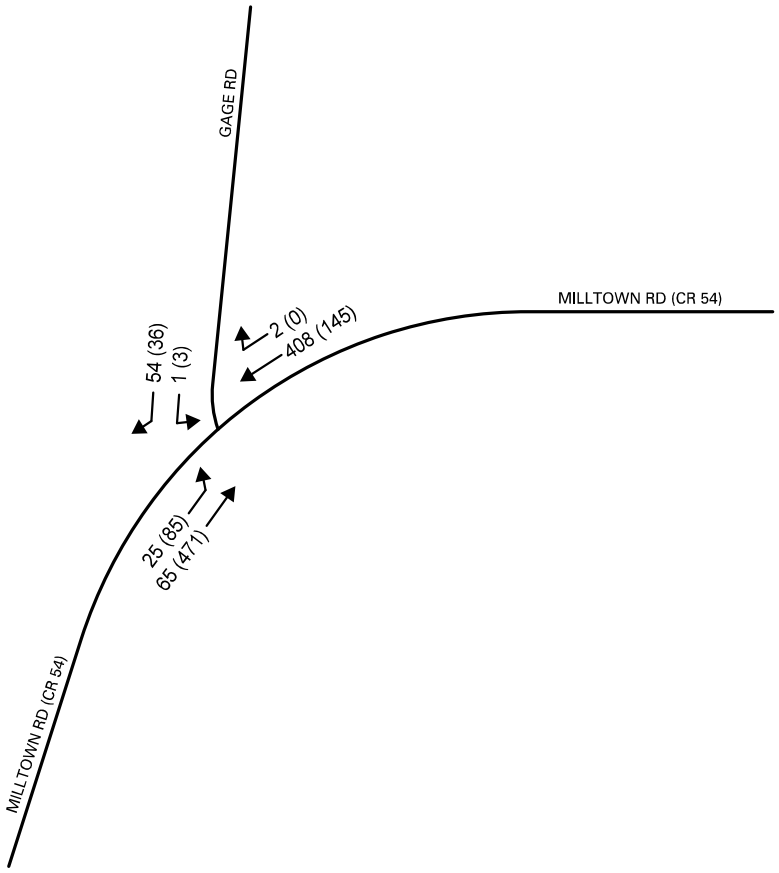
Travel Speeds	Direction:	Eastbound	Westbound	
	Average Speed:	39.8	41.1	
	85th Percentile:	44.0	44.4	
Sight Distance	Approach:	Southbound		
	Looking Left:	650'		
	Looking Right:	1,000'		
	Summary:	Sight distance meets the required stopping sight distance and recommended intersection sight distance in both directions.		

Crashes	From:	12/31/2019	To:	12/31/2023	No. of Months:	48			
	No. of Crashes:	3	PDO:	3	PI:	0	PI (A):	0	K: 0
	Crash Rate:	0.36 Cr/MEV			Above/Below Statewide Average:			2.12 Times	

PSI Factors	PSI (KA):	-0.04
	PSI (Tot):	-0.32

BUILD ALTERNATIVE #1 - LEVEL OF SERVICE

	-			Gage Rd			Milltown Rd			Milltown Rd		
	Northbound			**Southbound**			**Eastbound**			**Westbound**		
	Left	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
Description of Improvements:	Installation of a Roundabout.											
AM Peak Delay (s):				5.1			3.4			6.2		
LOS:				A			A			A		
v/c:				0.08			0.08			0.37		
95% Queue:				< 25'			< 25'			50'		
A (5.6) Overall				**A (5.1)**			**A (3.4)**			**A (6.2)**		
PM Peak Delay (s):				3.4			6.9			4.0		
LOS:				A			A			A		
v/c:				0.04			0.44			0.13		
95% Queue:				< 25'			50'			< 25'		
A (6.2) Overall				**A (3.4)**			**A (6.9)**			**A (4.0)**		



KEY:

XXX (XXX) = AM (PM) PEAK HOUR TRAFFIC VOLUMES

GPI Engineering Design Planning Construction Inspection

PUTNAM COUNTY
INTERSECTION IMPROVEMENTS
PUTNAM COUNTY, NEW YORK

MILLTOWN RD (CR 54) AT GAGE RD
PEAK HOUR TRAFFIC VOLUMES

SCALE:	DATE:	FIGURE NO.
NO SCALE	JUNE 2024	J-1

Greenman-Pedersen, Inc.
80 Wolf Rd, Suite 300
Albany, NY 12205
(518) 453-9431

Intersection: Gage Road at Milltown Road
Location: Town of Southeast, New York
GPI Project No.: 2300070.00
Count Date: 7/19/2023

Total Traffic - Cars & Heavy Vehicles

Start Time	Gage Road Southbound					Milltown Road Westbound					0 Northbound					Milltown Road Eastbound				
	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	0	0	10	0	0	0	99	0	0	0	0	0	0	0	0	3	5	0	0
7:15 AM	0	1	0	17	0	0	0	113	1	0	0	0	0	0	0	0	3	5	0	0
7:30 AM	0	0	0	8	0	0	0	103	0	0	0	0	0	0	0	0	5	19	0	0
7:45 AM	0	0	0	17	0	0	0	112	1	0	0	0	0	0	0	0	10	23	0	0
8:00 AM	0	0	0	12	0	0	0	80	0	0	0	0	0	0	0	0	7	18	0	0
8:15 AM	0	1	0	17	0	0	0	71	2	0	0	0	0	0	0	0	10	19	0	0
8:30 AM	0	2	0	15	0	0	0	81	0	0	0	0	0	0	0	0	10	19	0	0
8:45 AM	0	1	0	7	0	0	0	73	1	0	0	0	0	0	0	1	4	17	0	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	0	6	0	0	0	34	0	0	0	0	0	0	0	0	16	103	0	0
4:15 PM	0	0	0	5	0	0	0	32	1	0	0	0	0	0	0	0	14	89	0	0
4:30 PM	0	3	0	7	0	0	0	30	0	0	0	0	0	0	0	0	15	101	0	0
4:45 PM	0	0	0	7	0	0	0	41	0	0	0	0	0	0	0	0	11	92	0	0
5:00 PM	0	1	0	12	0	0	0	37	0	0	0	0	0	0	0	0	14	112	0	0
5:15 PM	0	0	0	9	0	0	0	29	0	0	0	0	0	0	0	0	32	126	0	0
5:30 PM	0	2	0	8	0	0	0	40	0	0	0	0	0	0	0	0	23	109	0	0
5:45 PM	0	0	0	7	0	0	0	39	0	0	0	0	0	0	0	0	16	124	0	0
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Location: Town of Southeast, New York
GPI Project No.: 2300070.00
Count Date: 7/19/2023

Peak Hour Traffic Volumes

	Gage Road Southbound					Milltown Road Westbound					0 Northbound					Milltown Road Eastbound				
	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes
AM Peak Hour:			**7:15 AM**	**to**	**8:15 AM**															
7:15 AM	0	1	0	17	0	0	0	113	1	0	0	0	0	0	0	0	3	5	0	0
7:30 AM	0	0	0	8	0	0	0	103	0	0	0	0	0	0	0	0	5	19	0	0
7:45 AM	0	0	0	17	0	0	0	112	1	0	0	0	0	0	0	0	10	23	0	0
8:00 AM	0	0	0	12	0	0	0	80	0	0	0	0	0	0	0	0	7	18	0	0
Total Volume	0	1	0	54	0	0	0	408	2	0	0	0	0	0	0	0	25	65	0	0
555			55					410					0					90		
No. of Trucks	0	0	0	1	0	0	0	5	0	0	0	0	0	0	0	0	2	3	0	0
Truck %	0.0%	0.0%		1.9%		0.0%		1.2%	0.0%	0.0%	0.0%		0.0%		0.0%	0.0%	8.0%	4.6%		0.0%
2.0%			1.8%					1.2%					0.0%					5.6%		
PHF	0.00	0.25		0.79		0.00		0.90	0.50	0.00	0.00		0.00		0.00	0.00	0.63	0.71		0.00
0.85			0.76					0.90					#DIV/0!					0.68		

	Gage Road Southbound					Milltown Road Westbound					0 Northbound					Milltown Road Eastbound				
	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes
PM Peak Hour:			**5:00 PM**	**to**	**6:00 PM**															
5:00 PM	0	1	0	12	0	0	0	37	0	0	0	0	0	0	0	0	14	112	0	0
5:15 PM	0	0	0	9	0	0	0	29	0	0	0	0	0	0	0	0	32	126	0	0
5:30 PM	0	2	0	8	0	0	0	40	0	0	0	0	0	0	0	0	23	109	0	0
5:45 PM	0	0	0	7	0	0	0	39	0	0	0	0	0	0	0	0	16	124	0	0
Total Volume	0	3	0	36	0	0	0	145	0	0	0	0	0	0	0	0	85	471	0	0
740			39					145					0					556		
No. of Trucks	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	1	0	0	0
Truck %	0.0%	0.0%		0.0%		0.0%		2.1%		0.0%	0.0%		0.0%		0.0%	0.0%	1.2%	0.0%		0.0%
0.5%			0.0%					2.1%					0.0%					0.2%		
PHF	0.00	0.38		0.75		0.00		0.91		0.00	0.00		0.00		0.00	0.00	0.66	0.93		0.00
0.94			0.75					0.91					#DIV/0!					0.88		

TRAFFIC SIGNAL WARRANT SUMMARY

Project: Putnam County Intersection Improvements
Condition: Existing Condition
Location: Town of Southeast
Date: July, 19th 2023

Major Street: Milltown Road (CR 54) Lanes: 1 Critical Approach Speed: 45 mph
Minor Street: Gage Road Lanes: 1

Volume Level Criteria

1. Is the critical speed of major street traffic greater than 40 mph? Yes
2. Is the intersection in a built-up area of an isolated community with population less than 10,000? No

If either Question 1 or Question 2 is answered "Yes", then use the 70% volume level. Criteria used: 70%

WARRANT 1 - EIGHT HOUR VEHICULAR VOLUME **Warrant 1 Satisfied: NO**

Warrant 1 is satisfied if EITHER Condition A OR Condition B is 100% satisfied.
Warrant 1 is also satisfied if BOTH Condition A AND Condition B are satisfied to the 80% volume level.

			Condition 1A - Minimum Vehicular Volume (X indicates that criteria is met for specified condition)				Condition 1B - Interuption of Continuous Traffic (X indicates that criteria is met for specified condition)				Total Satisfied Hours (8 required)		
											0	0	0
Minimum Volume Criteria:			350	105	280	84	525	53	420	42	Condition	Condition	80% for
Start Time	Major St. Volume[1]	Minor St. Volume[2]	Major St. 100%	Minor St. 100%	Major St. 80%	Minor St. 80%	Major St. 100%	Minor St. 100%	Major St. 80%	Minor St. 80%	1A Satisfied	1B Satisfied	Both Satisfied
12:00 AM			-	-	-	-	-	-	-	-	-	-	-
1:00 AM			-	-	-	-	-	-	-	-	-	-	-
2:00 AM			-	-	-	-	-	-	-	-	-	-	-
3:00 AM			-	-	-	-	-	-	-	-	-	-	-
4:00 AM			-	-	-	-	-	-	-	-	-	-	-
5:00 AM			-	-	-	-	-	-	-	-	-	-	-
6:00 AM			-	-	-	-	-	-	-	-	-	-	-
7:00 AM	502	53	X	-	X	-	-	X	X	X	-	-	-
8:00 AM	413	55	X	-	X	-	-	X	-	X	-	-	-
9:00 AM			-	-	-	-	-	-	-	-	-	-	-
10:00 AM			-	-	-	-	-	-	-	-	-	-	-
11:00 AM			-	-	-	-	-	-	-	-	-	-	-
12:00 PM			-	-	-	-	-	-	-	-	-	-	-
1:00 PM			-	-	-	-	-	-	-	-	-	-	-
2:00 PM			-	-	-	-	-	-	-	-	-	-	-
3:00 PM			-	-	-	-	-	-	-	-	-	-	-
4:00 PM	579	28	X	-	X	-	X	-	X	-	-	-	-
5:00 PM	701	39	X	-	X	-	X	-	X	-	-	-	-
6:00 PM			-	-	-	-	-	-	-	-	-	-	-
7:00 PM			-	-	-	-	-	-	-	-	-	-	-
8:00 PM			-	-	-	-	-	-	-	-	-	-	-
9:00 PM			-	-	-	-	-	-	-	-	-	-	-
10:00 PM			-	-	-	-	-	-	-	-	-	-	-
11:00 PM			-	-	-	-	-	-	-	-	-	-	-

[1] Major Street Volume is the total combined volume of both mainline approaches.

[2] Minor Street volumes is the highest single side street approach volume.

WARRANT 2 - FOUR HOUR VEHICULAR VOLUME **Warrant 2 Satisfied: NO**

Warrant is satisfied if four (4) or more hours satisfy the volume requirements depicted on the four hour warranting graph **(see page 2)**. No. of Points Above Criteria Curve: 0

WARRANT 3 - PEAK HOUR VEHICULAR VOLUME **Warrant 3 Satisfied: NO**

Warrant is satisfied if any hour satisfy the volume requirements depicted on the peak hour warranting graph **(see page 3)**, and ALL three of the following requirement are met. No. of Points Above Criteria Curve: 0

1. Total stopped time delay on Minor Street equals or exceeds 4 VHD (single lane) or 5 VHD (two lanes): N/A VHD Max. -
2. Volume on Minor Street equals or exceeds 100 vehicles (single lane) or 150 vehicles (two lanes): -
3. Total intersection volume serviced during the hour equals or exceeds 650 veh. (3-leg) or 800 veh. (4-leg or more): -

TRAFFIC SIGNAL WARRANT SUMMARY

Project: Putnam County Intersection Improvements
Condition: Existing Condition
Location: Town of Southeast
Date: July, 19th 2023

Major Street: Milltown Road (CR 54) Lanes: 1 Critical Approach Speed: 45 mph
Minor Street: Gage Road Lanes: 1

WARRANT 7 - CRASH EXPERIENCE

Warrant 7 Satisfied: NO

1. Maximum number of angle[3] and pedestrian crashes in a one year period: 0
2. Maximum number of fatal-and-injury angle and pedestrian crashes in a one year period: 0
3. Maximum number of angle and pedestrian crashes in a three year period: 0
4. Maximum number of fatal-and-injury angle and pedestrian crashes in a three year period: 0

[3] Angle crashes include all crashes that occur at an angle and involve one or more vehicles on the major street and one or more vehicles on the minor street.

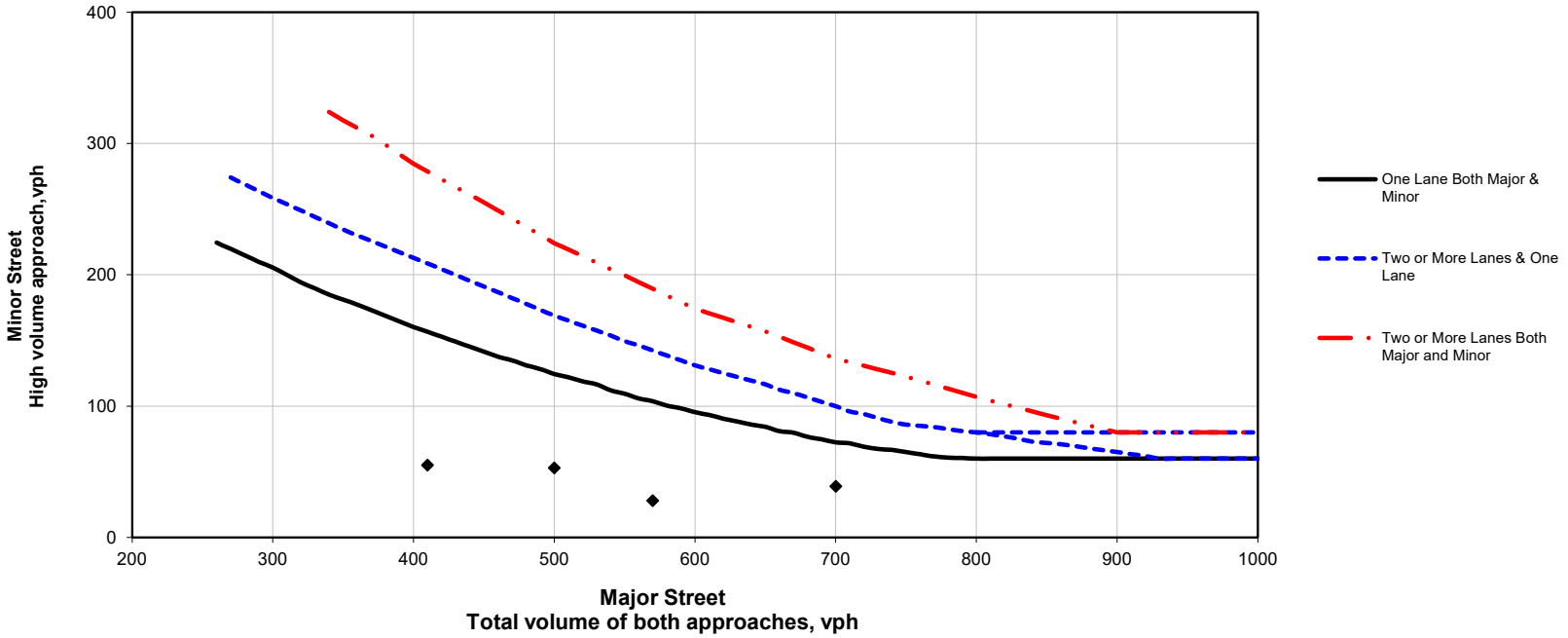
Warrant 7 is satisfied if **ANY** of the following criteria are met:

1. Are there more than 3 angle crashes in a one year period: No
2. Are there more than 3 fatal-and-injury crashes in a one year period: No
3. Are there more than 4 crashes in a three year period: No
4. Are there more than 4 fatal-and-injury crashes in a three year period: No

AND ANY of the following criteria are also met:

1. Are the VPH for **BOTH** 80% columns of Condition 1A satisfied for each of any 8 hrs: No
2. Are the VPH for **BOTH** 80% columns of Condition 1B satisfied for each of any 8 hrs: No

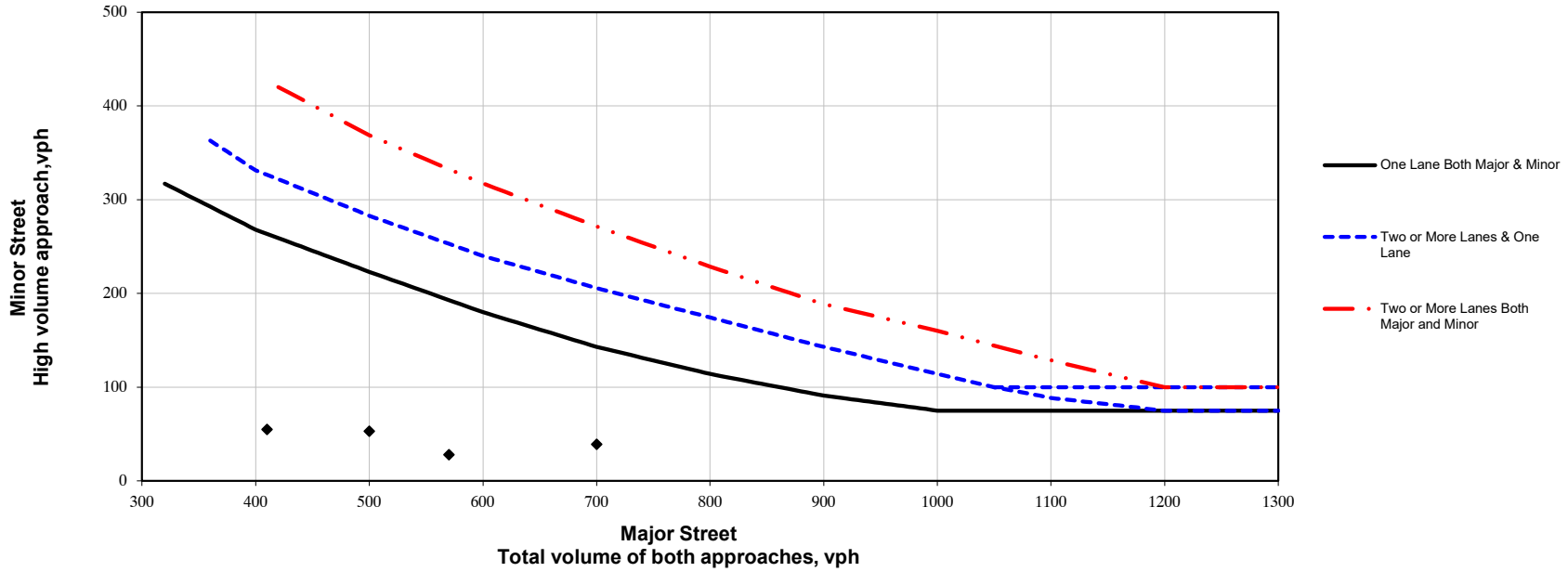
Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 70 km/h (40 mph) ON MAJOR STREET)



Note: Points on graph represent hourly volumes. Points above the respective curve satisfy warrant, points below do not satisfy warrant.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 70 km/h (40 mph) ON MAJOR STREET)



Note: Points on graph represent hourly volumes. Points above the respective curve satisfy warrant, points below do not satisfy warrant.

Milltown Road (CR 54)- Speed Study

Eastbound	
Date:	4/11/2024
Time:	10:00 AM
Trial	Speed*
1	42
2	37
3	40
4	44
5	40
6	38
7	36
8	39
9	42
10	40
11	37
12	39
13	41
14	38
15	34
16	36
17	37
18	42
19	41
20	45
21	38
22	41
23	45
24	40
25	41
26	38
27	36
28	44
29	47
30	37
Avg.	**39.8**

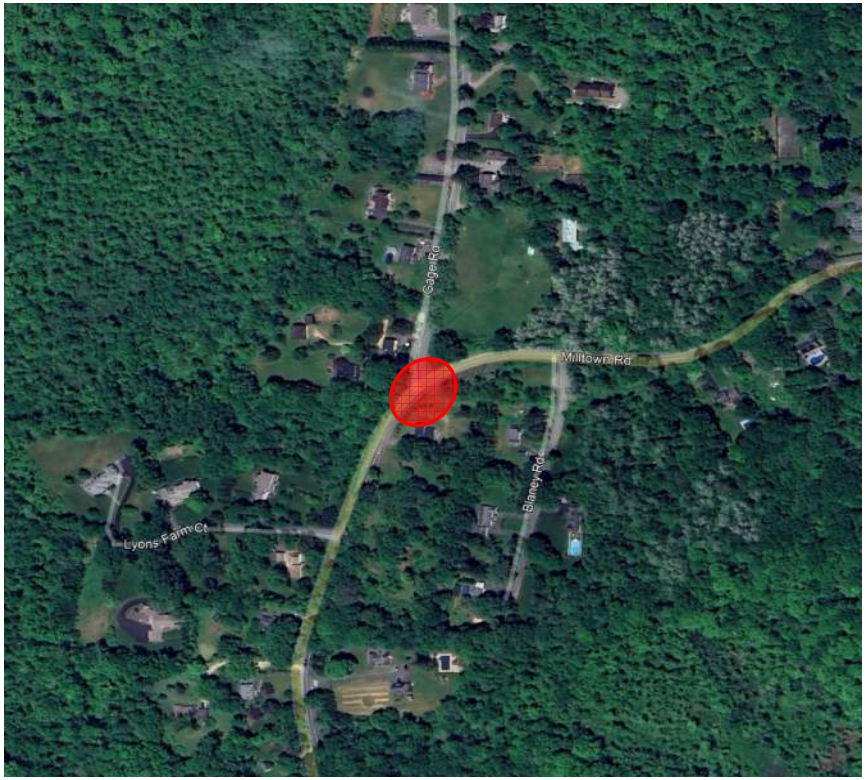
Westbound	
Date:	4/11/2024
Time:	10:00 AM
Trial	Speed*
1	36
2	43
3	41
4	42
5	41
6	47
7	46
8	41
9	44
10	39
11	43
12	40
13	41
14	42
15	38
16	41
17	37
18	42
19	40
20	41
21	39
22	36
23	44
24	40
25	45
26	39
27	36
28	44
29	47
30	37
Avg.	**41.1**

Milltown Road (CR 54)
at Gage Road
Southeast, New York

Posted Speed Limit: 35 MPH

85th Percentile Speeds		
EB		**WB**
44.0		**44.4**

Location Map



* - Denotes speed measured at proposed access location with vehicles traveling under free flow conditions, in MPH

Sight Distance Summary Gage Rd at Milltown Rd (CR 54)						
Location	**Side Street Turn Movement**	**Direction**	**Available Sight Distance**	**Design Speed (mph)**	**Required Stopping Sight Distance[1]**	**Recommended Intersection Sight Distance[1]**
Southbound Gage Rd at Milltown Rd (CR 54)	Right Turn	Looking Left (East)	650'	45	360'	430'
	Left Turn	Looking Left (East)	650'	45	360'	500'
		Looking Right (South)	1,000'	45	360'	500'

[1] Recommended minimum sight distance values from AASHTO's *A Policy on Geometric Design of Highways and Streets* , 7th Edition and the NYSDOT's *Highway Design Manual* . The recommended values are based on the current free flow travel speeds of the roadway.

COUNTY: PUTNAM P.I.N.:

TOWN OF SOUTHEAST

ROUTE NO. OR STREET NAME: MILLTOWN ROAD (CR 54)

AT INTERSECTION WITH/OR BETWEEN: GAGE ROAD

GPI
Engineering | Design | Planning | Construction Management

TIME PERIOD: FROM: 12/31/2019 TO: 12/31/2023

No. OF MONTHS: 48

ENVIRONMENTAL:
Use Codes from MV 104 (shown at right) for these categories

Light Conditions:
1. Daylight
2. Dawn
3. Dusk
4. Dark Road Lighted
5. Dark Road Unlighted

Roadway Character:
1. Straight & Level
2. Straight & Grade
3. Straight & Hillcrest
4. Curve & Level
5. Curve & Grade
6. Curve & Hillcrest

Roadway Surface Condition:
1. Dry
2. Wet
3. Muddy
4. Snow/Ice
5. Slush
10. Other

Weather:
1. Clear
2. Cloudy
3. Rain
4. Snow
5. Sleet/Hail/Freezing Rain
6. Fog/Smog/Smoke
10. Other

[1]Use Codes from MV 104 Police Report

ACCIDENT No.	DATE	TIME	No. of VEHICLES	SEVERITY	LIGHT CONDITIONS	ROADWAY CHARACTER	ROADWAY SURFACE CONDITION	WEATHER	APPARENT CONTRIBUTING FACTORS	DIRECTION	TYPE[1]	DESCRIPTION	CASE NO.
1	02/09/23	7:20	1	PDO	1	5	2	1	UNSAFE SPEED / PAVEMENT SLIPPERY	EAST	23	FIXED OBJECT	39711977
2	06/23/23	14:46	2	PDO	1	4	1	2	FOLLOWING TOO CLOSELY	EAST/EAST	1	REAR END	39884002
3	12/08/23	16:32	1	PDO	5	4	1	1	ANIMALS ACTION	NORTH	7	ANIMAL	40140404

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	25	65	408	2	1	54
Future Vol, veh/h	25	65	408	2	1	54
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	6	6	2	2	2	2
Mvmt Flow	29	76	480	2	1	64

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	482	0	-	0	615	481
Stage 1	-	-	-	-	481	-
Stage 2	-	-	-	-	134	-
Critical Hdwy	4.16	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.254	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1060	-	-	-	455	585
Stage 1	-	-	-	-	622	-
Stage 2	-	-	-	-	892	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1060	-	-	-	442	585
Mov Cap-2 Maneuver	-	-	-	-	442	-
Stage 1	-	-	-	-	604	-
Stage 2	-	-	-	-	892	-

Approach	EB	WB	SB
HCM Control Delay, s	2.4	0	12
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1060	-	-	-	582
HCM Lane V/C Ratio	0.028	-	-	-	0.111
HCM Control Delay (s)	8.5	0	-	-	12
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.4

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	85	471	145	0	3	36
Future Vol, veh/h	85	471	145	0	3	36
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	90	501	154	0	3	38

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	154	0	-	0	835	154
Stage 1	-	-	-	-	154	-
Stage 2	-	-	-	-	681	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1426	-	-	-	338	892
Stage 1	-	-	-	-	874	-
Stage 2	-	-	-	-	503	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1426	-	-	-	309	892
Mov Cap-2 Maneuver	-	-	-	-	309	-
Stage 1	-	-	-	-	798	-
Stage 2	-	-	-	-	503	-

Approach	EB	WB	SB
HCM Control Delay, s	1.2	0	9.9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1426	-	-	-	779
HCM Lane V/C Ratio	0.063	-	-	-	0.053
HCM Control Delay (s)	7.7	0	-	-	9.9
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.2	-	-	-	0.2

Intersection	
Intersection Delay, s/veh	5.6
Intersection LOS	A

Approach	EB	WB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	105	482	65
Demand Flow Rate, veh/h	112	492	66
Vehicles Circulating, veh/h	1	31	490
Vehicles Exiting, veh/h	555	82	33
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	3.4	6.2	5.1
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	112	492	66
Cap Entry Lane, veh/h	1378	1337	837
Entry HV Adj Factor	0.941	0.980	0.985
Flow Entry, veh/h	105	482	65
Cap Entry, veh/h	1297	1311	824
V/C Ratio	0.081	0.368	0.079
Control Delay, s/veh	3.4	6.2	5.1
LOS	A	A	A
95th %tile Queue, veh	0	2	0

Intersection	
Intersection Delay, s/veh	6.2
Intersection LOS	A

Approach	EB	WB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	591	154	41
Demand Flow Rate, veh/h	603	157	42
Vehicles Circulating, veh/h	3	92	157
Vehicles Exiting, veh/h	196	514	92
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	6.9	4.0	3.4
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	603	157	42
Cap Entry Lane, veh/h	1376	1256	1176
Entry HV Adj Factor	0.980	0.980	0.976
Flow Entry, veh/h	591	154	41
Cap Entry, veh/h	1348	1232	1148
V/C Ratio	0.438	0.125	0.036
Control Delay, s/veh	6.9	4.0	3.4
LOS	A	A	A
95th %tile Queue, veh	2	0	0

GPI Greenman-Pedersen, Inc.
Engineering and Construction Services

Intersection:	Milltown Rd (CR 54) and Gage Rd (CR 61)		
Client:	Putnam County	GPI No.	2300070.00
Calculated By:	D. Creen	Date:	6/12/2024
Checked By:	M. Wieszchowski	Date:	6/13/2024

SINGLE LANE ROUNDABOUT (120 FT DIAMETER)

DESCRIPTION	TOTAL QUANTITY	UNIT	UNIT PRICE	TOTAL COST
SINGLE LANE ROUNDABOUT [1]	1	EA	$1,250,000	$1,250,000
ADDITONAL EARTHWORK (ABOVE AND BEYOND TYPICAL)	5,000	CY	$50	$250,000
UTILITY RELOCATION [2]	1	EA	$75,000	$0
RESIDENTIAL DRIVEWAY RECONSTRUCTION	1	EA	$10,000	$10,000
STORMWATER AND TREATMENT [3]	1	LS	$100,000	$100,000
WETLAND MITIGATION	1	LS	$100,000	$100,000
WORK ZONE TRAFFIC CONTROL	1	LS	$200,000	$200,000
			ESTIMATED CONSTRUCTION COST (CONCEPTUAL)	**$1,910,000.00**
RIGHT OF WAY	0.004	ACRE	$500,000	$5,000
CONTIGENCY (20%)	1	LS	$382,000	$385,000
DESIGN AND INSPECTION (25%)	1	LS	$477,500	$480,000
			FINAL TOTAL	**$2,780,000.00**

[1] INCLUDES TYPICAL COST FOR PAVEMENT, CURB, EARTHWORK, DRAINAGE, LANDSCAPING, ETC., FOR A SINGLE LANE ROUNDABOUT.

[2] ELECTRIC AND GAS RELOCATIONS ARE ASSUMED NO COST FOR MUNICIPAL PROJECTS. WATER AND SEWER RELOCATIONS ARE ASSUMED AT $75,000 EACH.

[3] IMPACTS OVER 5,000 SF WITHIN DEP WATERSHEDS REQUIRE POST STORMWATER TREATMENT. $100,000 ALLOWANCE FOR EXTRA ROW OR WORK REQUIRED.

GPI

N

GAGE RD

MILLTOWN RD (CR 64)

MILLTOWN RD (CR 64)

0.004 ACRE
ROW TAKING

UTILITY POLE
IMPACTS

UTILITY POLE
IMPACTS

RECONSTRUCT
DRIVEWAY

POTENTIAL
IMPACTS TO
WETLANDS

AHB

℄

20 0 20 40 60 80'

Putnam County Intersections | FIG J-2

Milltown Rd (CR 54) at Gage Rd
Intersection Improvement Concept Sketch

APPENDIX K

Peekskill Hollow Road (CR 21)

at Bryant Pond Road

SUMMARY OF ANALYSIS
PEEKSKILL HOLLOW RD @ BRYANT POND RD

Existing Conditions:

This intersection consists of 3 one-lane approaches. Peekskill Hollow Rd approaches from the northeast and southwest, both approaches are uncontrolled. Bryant Pond Rd approaches from the southeast and is stop sign controlled. This intersection has 11' wide lanes with little to no paved shoulders and no pedestrian accommodations.

The posted speed limit is 40 mph on Peekskill Hollow Rd and 30 mph on Bryant Pond Rd. Speed measurements performed along Peekskill Hollow Rd determined the 85th percentile speeds to be 50 mph northbound and 48 mph southbound.

The available sight distance when looking left (to the south) from Bryant Pond Rd is limited to 425' due to a vertical crest curve. This distance meets stopping sight distance requirements but falls short of the recommended intersection sight distance of 480' to make a right turn or 555' to make a left turn.

Levels of service at the intersection are no worse than LOS B in both the AM and PM peak hours for all movements and is well within an acceptable range.

Signal Warrant Analysis:

A review of the hourly traffic volumes between 7:00AM to 9:00AM and 4:00pm to 6:00pm show that no hours met the warranting criteria for any of the Signal Warrants. Additionally, Warrant 7 (crash experience) is also not satisfied, as none of the crash criteria reviewed was met.

Safety Analysis:

Based on the NYSDOT Clear Safety System, the Potential for Safety Improvement (PSI) for this intersection is 0.27 overall and -0.03 for serious injury/fatality crashes. These factors indicate there is potential for safety improvement, with PSI>0.0, but the potential for serious injury crashes is not above that of similar facilities. The crash rate for this intersection was calculated at 1.35 crashes per million entering vehicles (Cr/MEV), which is significantly higher than the statewide average of 0.16 Cr/MEV for similar intersections, so a more detailed look at crashes is warranted.

Crash data noted 6 crashes at this location in the 4-year period reviewed. Of these crashes, 4 were fixed object and one hit an animal. All crashes were property damage only. Only one crash involved maneuvers at the intersection. The majority were caused by high travel speeds and animals in the roadway. Based on the analysis, no correctable crash pattern was identified.

A summary of the crash types and severity are shown in the table below:

CRASH SUMMARY

Crash Type	Number of Occurrences	Crash Severity	Number of Occurrences
Left Turn	1	Fatality	0
Fixed Object	4	Personal Injury	0
Animal	1	Property Damage Only	6
	6		6

Field Condition and Right of Way Review:

This intersection has narrow lanes little to no shoulders and numerous trees and utility poles within 5 feet of the roadway. The terrain is significantly sloped in this area, with Bryant Pond Rd rising on a nearly 10% grade as it approaches Peekskill Hollow Rd. There are two driveways across from Bryant Pond Rd and a tree canopy over Peekskill Hollow Rd near the intersection. Additionally, the northeast corner of the intersection has a significant raised berm and what appear to be a historical cemetery, the 'Travis Burial Ground'.

Design Alternative Consideration:

The uneven terrain, upward sloping of Bryant Pond Rd leading into the intersection, and the historical burial grounds, make the construction of a roundabout at this location infeasible. Given the good levels of service, vehicular capacity is not an issue. However, travel speeds, especially northbound where the sight distance from the intersection is limited, is a concern. It is recommended that speeds along Peekskill Hollow Rd be reduced through traffic calming measures near the intersection. It is recommended that a speed feedback sign be installed along northbound Peekskill Hollow Rd approximately 300' south of the intersection. This should reduce vehicle speeds approaching the intersection, which should in turn, improve safety.

Conceptual Cost Estimate:

It is estimated that the installation of a speed feedback sign south of the intersection would cost roughly $6,000 to install.

Summary & Conclusion:

The analysis shows that a traffic signal is not warranted at this location. There are some sight distance issues but a review of crashes did not reveal a crash pattern related to sight distance, so it should not be considered a significant concern. Almost all crashes at this location are related to elevated travel speeds or animals in the roadway. With the 85th percentile speed northbound being 10 mph above the speed limit and limited sight distance in that direction due to a crest vertical curve, it is recommended to install a speed feedback sign 300' in advance of the intersection along northbound Peekskill Hollow Rd. This should reduce vehicular speeds approaching the intersection from that direction. Levels of service are LOS B or better at the intersection on all approaches, so no capacity improvements are currently required.

The intersection evaluation worksheet summarizing the lane geometry and traffic operations, traffic volume data sheets, traffic signal warrant analysis sheets, crash summary sheets, capacity analysis worksheets, and cost estimate breakdown can be found on the following pages in this appendix.

INTERSECTION EVALUATION WORKSHEET

Project:	Putnam County Intersection Improvements
Location:	Putnam County (Various Locations)
Intersection:	Peekskill Hollow Rd (CR 21) at Bryant Pd Rd
GPS Coord.:	41.38935, -73.81335
Traffic Control:	Stop Sign (WB)

Traffic Control Notes (if applicable):

None

Other Intersection Notes (if applicable):

No Pedestrian Crossings.

APPROACH DATA

	Peekskill Hollow Rd			Peekskill Hollow Rd			-			Bryant Pond Rd		
	Northbound			**Southbound**			**Eastbound**			**Westbound**		
	Left	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
Lane Assignments:		1->			<-1						<-1->	
Lane Widths:		11'			11'						11'	
Turn Bay Lengths:		-			-						-	
Speed Limits:		40 mph			40 mph						30 mph	

TRAFFIC COUNT DATA

AM Peak Hour	Time Period:		8:00	to	9:00					Date Counted:		7/19/2023
Volume:	0	68	106	25	45	0				75	0	18
Truck %:	-	7%	3%	8%	7%	-				4%	-	6%
Peds (Bikes):		0 (0)			0 (0)						0 (0)	
PHF = 0.88												
PM Peak Hour	Time Period:		4:00	to	5:00					Date Counted:		7/19/2023
Volume:	0	68	81	16	76	0				98	0	26
Truck %:	-	4%	3%	1%	5%	-				1%	-	4%
Peds (Bikes):		0 (0)			0 (0)						0 (0)	
PHF = 0.91												

EXISTING CONDITION LEVEL OF SERVICE

AM Peak Delay (s):				7.7						10.6		
LOS:				A						B		
v/c:				0.02						0.14		
95% Queue:				< 25'						< 25'		
A (3.5) Overall				**A (2.8)**						**B (10.6)**		
PM Peak Delay (s):				7.6						10.7		
LOS:				A						B		
v/c:				0.01						0.18		
95% Queue:				< 25'						< 25'		
A (4.0) Overall				**A (1.3)**						**B (10.7)**		

Note: LOS calculated using HCM 6 methodologies. For unsignalized intersections, only side street approach delay and mainline left turn delay is shown. The HCM 6 methodology assumes zero delay for all other movements.

INTERSECTION EVALUATION WORKSHEET

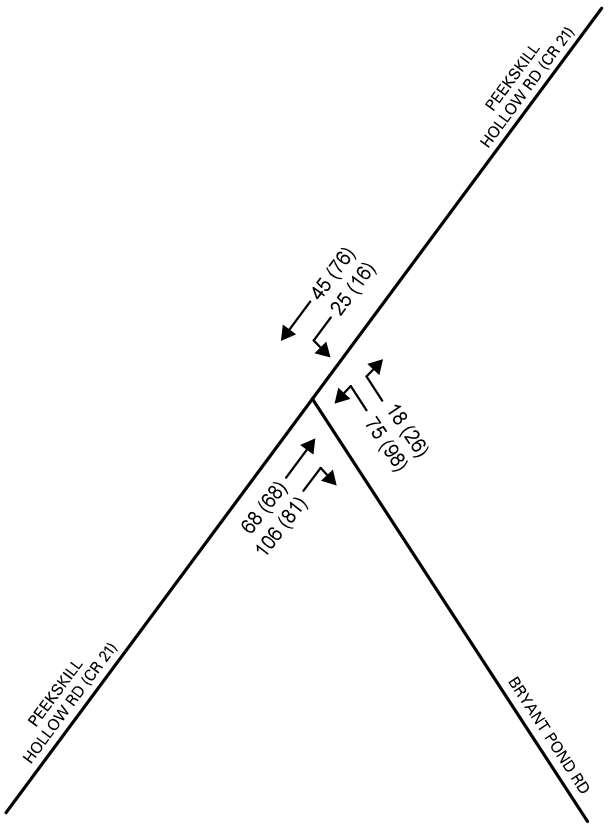
INTERSECTION SAFETY

Travel Speeds	Direction:	Northbound	Southbound	
	Average Speed:	44.1	43.8	
	85th Percentile:	50.1	47.7	

Sight Distance	Approach:	Westbound	
	Looking Left:	425'	
	Looking Right:	850'	
	Summary:	The available sight distance when Looking Left from the westbound approach of Bryant Pond Rd does not meet the Recommended Intersection Sight Distance for making either a left turn or right turn.	

Crashes	From:	12/31/2019	To:	12/31/2023	No. of Months:	48			
	No. of Crashes:	6	PDO:	6	PI:	0	PI (A):	0	K: 0
	Crash Rate:	1.35 Cr/MEV			Above/Below Statewide Average:				8.42 Times

PSI Factors	PSI (KA):	-0.03	
	PSI (Tot):	0.27	



KEY:

XXX (XXX) = AM (PM) PEAK HOUR TRAFFIC VOLUMES

GPI Engineering Design Planning Construction Inspection

PUTNAM COUNTY
INTERSECTION IMPROVEMENTS
PUTNAM COUNTY, NEW YORK

PEEKSKILL HOL RD (CR 21) AT BRYANT POND RD
PEAK HOUR TRAFFIC VOLUMES

SCALE:	DATE:	FIGURE NO.
NO SCALE	JUNE 2024	K-1

Greenman-Pedersen, Inc.
80 Wolf Rd, Suite 300
Albany, NY 12205
(518) 453-9431

Intersection: Peekskill Hollow Rd at Bryant Pond Rd
Location: Town of Putnam Valley, New York
GPI Project No.: 2300070.00
Count Date: 7/19/2023

Total Traffic - Cars & Heavy Vehicles

Start Time	Peekskill Hollow Rd Southbound					Bryant Pond Rd Westbound					Peekskill Hollow Rd Northbound					0 Eastbound				
	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes
6:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 AM	0	5	6	0	0	0	4	0	3	0	0	0	7	22	0	0	0	0	0	0
7:15 AM	0	6	7	0	0	0	7	0	2	0	0	0	11	29	0	0	0	0	0	0
7:30 AM	0	4	8	0	0	0	10	0	1	0	0	0	20	21	0	0	0	0	0	0
7:45 AM	0	7	19	0	0	0	12	0	2	0	0	0	15	35	0	0	0	0	0	0
8:00 AM	0	3	13	0	0	0	16	0	1	0	0	0	12	20	0	0	0	0	0	0
8:15 AM	0	10	6	0	0	0	14	0	6	0	0	0	16	28	0	0	0	0	0	0
8:30 AM	0	4	13	0	0	0	22	0	1	0	0	0	26	30	0	0	0	0	0	0
8:45 AM	0	8	13	0	0	0	23	0	10	0	0	0	14	28	0	0	0	0	0	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	5	16	0	0	0	26	0	9	0	0	0	10	22	0	0	0	0	0	0
4:15 PM	0	4	24	0	0	0	28	0	5	0	0	0	15	24	0	0	0	0	0	0
4:30 PM	0	1	18	0	0	0	21	0	6	0	0	0	23	17	0	0	0	0	0	0
4:45 PM	0	6	18	0	0	0	23	0	6	0	0	0	20	18	0	0	0	0	0	0
5:00 PM	0	2	12	0	0	0	24	0	5	0	0	0	13	18	0	0	0	0	0	0
5:15 PM	0	2	13	0	0	0	23	0	1	0	0	0	21	30	0	0	0	0	0	0
5:30 PM	0	6	10	0	0	0	25	0	8	0	0	0	16	16	0	0	0	0	0	0
5:45 PM	0	1	16	0	0	0	22	0	7	0	0	0	8	20	0	0	0	0	0	0
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Greenman-Pedersen, Inc.
80 Wolf Rd, Suite 300
Albany, NY 12205
(518) 453-9431

Intersection: Peekskill Hollow Rd at Bryant Pond Rd
Location: Town of Putnam Valley, New York
GPI Project No.: 2300070.00
Count Date: 7/19/2023

Peak Hour Traffic Volumes

	Peekskill Hollow Rd Southbound					Bryant Pond Rd Westbound					Peekskill Hollow Rd Northbound					0 Eastbound				
	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes
AM Peak Hour:			**8:00 AM**	**to**	**9:00 AM**															
8:00 AM	0	3	13	0	0	0	16	0	1	0	0	0	12	20	0	0	0	0	0	0
8:15 AM	0	10	6	0	0	0	14	0	6	0	0	0	16	28	0	0	0	0	0	0
8:30 AM	0	4	13	0	0	0	22	0	1	0	0	0	26	30	0	0	0	0	0	0
8:45 AM	0	8	13	0	0	0	23	0	10	0	0	0	14	28	0	0	0	0	0	0
Total Volume	0	25	45	0	0	0	75	0	18	0	0	0	68	106	0	0	0	0	0	0
337			70					93					174					0		
No. of Trucks	0	2	3	0	0	0	3	0	1	0	0	0	5	3	0	0	0	0	0	0
Truck %	0.0%	8.0%	6.7%			0.0%	4.0%		5.6%	0.0%	0.0%		7.4%	2.8%	0.0%	0.0%	0.0%			0.0%
5.0%			7.1%					4.3%					4.6%					0.0%		
PHF	0.00	0.63	0.87			0.00	0.82		0.45	0.00	0.00		0.65	0.88	0.00	0.00	0.00			0.00
0.88			0.83					0.70					0.78					#DIV/0!		

	Peekskill Hollow Rd Southbound					Bryant Pond Rd Westbound					Peekskill Hollow Rd Northbound					0 Eastbound				
	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes
PM Peak Hour:			**4:00 PM**	**to**	**5:00 PM**															
4:00 PM	0	5	16	0	0	0	26	0	9	0	0	0	10	22	0	0	0	0	0	0
4:15 PM	0	4	24	0	0	0	28	0	5	0	0	0	15	24	0	0	0	0	0	0
4:30 PM	0	1	18	0	0	0	21	0	6	0	0	0	23	17	0	0	0	0	0	0
4:45 PM	0	6	18	0	0	0	23	0	6	0	0	0	20	18	0	0	0	0	0	0
Total Volume	0	16	76	0	0	0	98	0	26	0	0	0	68	81	0	0	0	0	0	0
365			92					124					149					0		
No. of Trucks	0	0	4	0	0	0	1	0	1	0	0	0	3	2	0	0	0	0	0	0
Truck %	0.0%	0.0%	5.3%			0.0%	1.0%		3.8%	0.0%	0.0%		4.4%	2.5%	0.0%	0.0%	0.0%			0.0%
3.0%			4.3%					1.6%					3.4%					0.0%		
PHF	0.00	0.67	0.79			0.00	0.88		0.72	0.00	0.00		0.74	0.84	0.00	0.00	0.00			0.00
0.91			0.82					0.89					0.93					#DIV/0!		

TRAFFIC SIGNAL WARRANT SUMMARY

Project: Putnam County Intersection Improvements
Condition: Existing Condition
Location: Town of Putnam Valley
Date: July 19th, 2023

Major Street: Peekskill Hollow Road (CR 21) Lanes: 1 Critical Approach Speed: 50 mph
Minor Street: Bryant Pond Road Lanes: 1

Volume Level Criteria

1. Is the critical speed of major street traffic greater than 40 mph? Yes
2. Is the intersection in a built-up area of an isolated community with population less than 10,000? No

If either Question 1 or Question 2 is answered "Yes", then use the 70% volume level. Criteria used: 70%

WARRANT 1 - EIGHT HOUR VEHICULAR VOLUME **Warrant 1 Satisfied: NO**

Warrant 1 is satisfied if EITHER Condition A OR Condition B is 100% satisfied.
Warrant 1 is also satisfied if BOTH Condition A AND Condition B are satisfied to the 80% volume level.

			Condition 1A - Minimum Vehicular Volume (X indicates that criteria is met for specified condition)				Condition 1B - Interuption of Continuous Traffic (X indicates that criteria is met for specified condition)				Total Satisfied Hours (8 required)		
											0	0	0
Minimum Volume Criteria:			350	105	280	84	525	53	420	42	Condition	Condition	80% for
Start Time	Major St. Volume[1]	Minor St. Volume[2]	Major St. 100%	Minor St. 100%	Major St. 80%	Minor St. 80%	Major St. 100%	Minor St. 100%	Major St. 80%	Minor St. 80%	1A Satisfied	1B Satisfied	Both Satisfied
12:00 AM			-	-	-	-	-	-	-	-	-	-	-
1:00 AM			-	-	-	-	-	-	-	-	-	-	-
2:00 AM			-	-	-	-	-	-	-	-	-	-	-
3:00 AM			-	-	-	-	-	-	-	-	-	-	-
4:00 AM			-	-	-	-	-	-	-	-	-	-	-
5:00 AM			-	-	-	-	-	-	-	-	-	-	-
6:00 AM			-	-	-	-	-	-	-	-	-	-	-
7:00 AM	222	41	-	-	-	-	-	-	-	-	-	-	-
8:00 AM	244	93	-	-	-	X	-	X	-	X	-	-	-
9:00 AM			-	-	-	-	-	-	-	-	-	-	-
10:00 AM			-	-	-	-	-	-	-	-	-	-	-
11:00 AM			-	-	-	-	-	-	-	-	-	-	-
12:00 PM			-	-	-	-	-	-	-	-	-	-	-
1:00 PM			-	-	-	-	-	-	-	-	-	-	-
2:00 PM			-	-	-	-	-	-	-	-	-	-	-
3:00 PM			-	-	-	-	-	-	-	-	-	-	-
4:00 PM	241	124	-	X	-	X	-	X	-	X	-	-	-
5:00 PM	204	115	-	X	-	X	-	X	-	X	-	-	-
6:00 PM			-	-	-	-	-	-	-	-	-	-	-
7:00 PM			-	-	-	-	-	-	-	-	-	-	-
8:00 PM			-	-	-	-	-	-	-	-	-	-	-
9:00 PM			-	-	-	-	-	-	-	-	-	-	-
10:00 PM			-	-	-	-	-	-	-	-	-	-	-
11:00 PM			-	-	-	-	-	-	-	-	-	-	-

[1] Major Street Volume is the total combined volume of both mainline approaches.

[2] Minor Street volumes is the highest single side street approach volume.

WARRANT 2 - FOUR HOUR VEHICULAR VOLUME **Warrant 2 Satisfied: NO**

Warrant is satisfied if four (4) or more hours satisfy the volume requirements depicted on the four hour warranting graph **(see page 2)**. No. of Points Above Criteria Curve: 0

WARRANT 3 - PEAK HOUR VEHICULAR VOLUME **Warrant 3 Satisfied: NO**

Warrant is satisfied if any hour satisfy the volume requirements depicted on the peak hour warranting graph **(see page 3)**, and ALL three of the following requirement are met. No. of Points Above Criteria Curve: 0

1. Total stopped time delay on Minor Street equals or exceeds 4 VHD (single lane) or 5 VHD (two lanes): N/A VHD Max. -
2. Volume on Minor Street equals or exceeds 100 vehicles (single lane) or 150 vehicles (two lanes): -
3. Total intersection volume serviced during the hour equals or exceeds 650 veh. (3-leg) or 800 veh. (4-leg or more): -

TRAFFIC SIGNAL WARRANT SUMMARY

Project: Putnam County Intersection Improvements
Condition: Existing Condition
Location: Town of Putnam Valley
Date: July 19th, 2023

Major Street: Peekskill Hollow Road (CR 21) Lanes: 1 Critical Approach Speed: 50 mph
Minor Street: Bryant Pond Road Lanes: 1

WARRANT 7 - CRASH EXPERIENCE **Warrant 7 Satisfied: NO**

1. Maximum number of angle[3] and pedestrian crashes in a one year period: 1
2. Maximum number of fatal-and-injury angle and pedestrian crashes in a one year period: 0
3. Maximum number of angle and pedestrian crashes in a three year period: 1
4. Maximum number of fatal-and-injury angle and pedestrian crashes in a three year period: 0

[3] Angle crashes include all crashes that occur at an angle and involve one or more vehicles on the major street and one or more vehicles on the minor street.

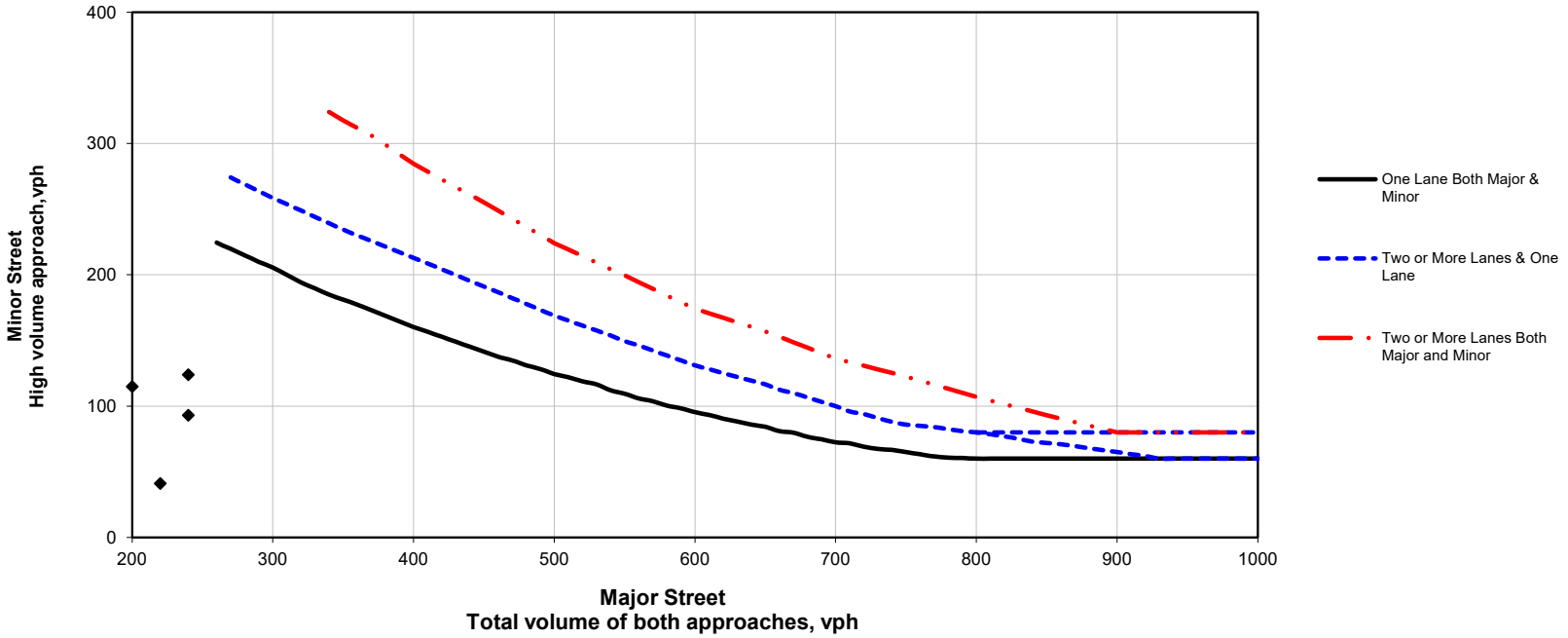
Warrant 7 is satisfied if **ANY** of the following criteria are met:

1. Are there more than 3 angle crashes in a one year period: No
2. Are there more than 3 fatal-and-injury crashes in a one year period: No
3. Are there more than 4 crashes in a three year period: No
4. Are there more than 4 fatal-and-injury crashes in a three year period: No

AND ANY of the following criteria are also met:

1. Are the VPH for **BOTH** 80% columns of Condition 1A satisfied for each of any 8 hrs: No
2. Are the VPH for **BOTH** 80% columns of Condition 1B satisfied for each of any 8 hrs: No

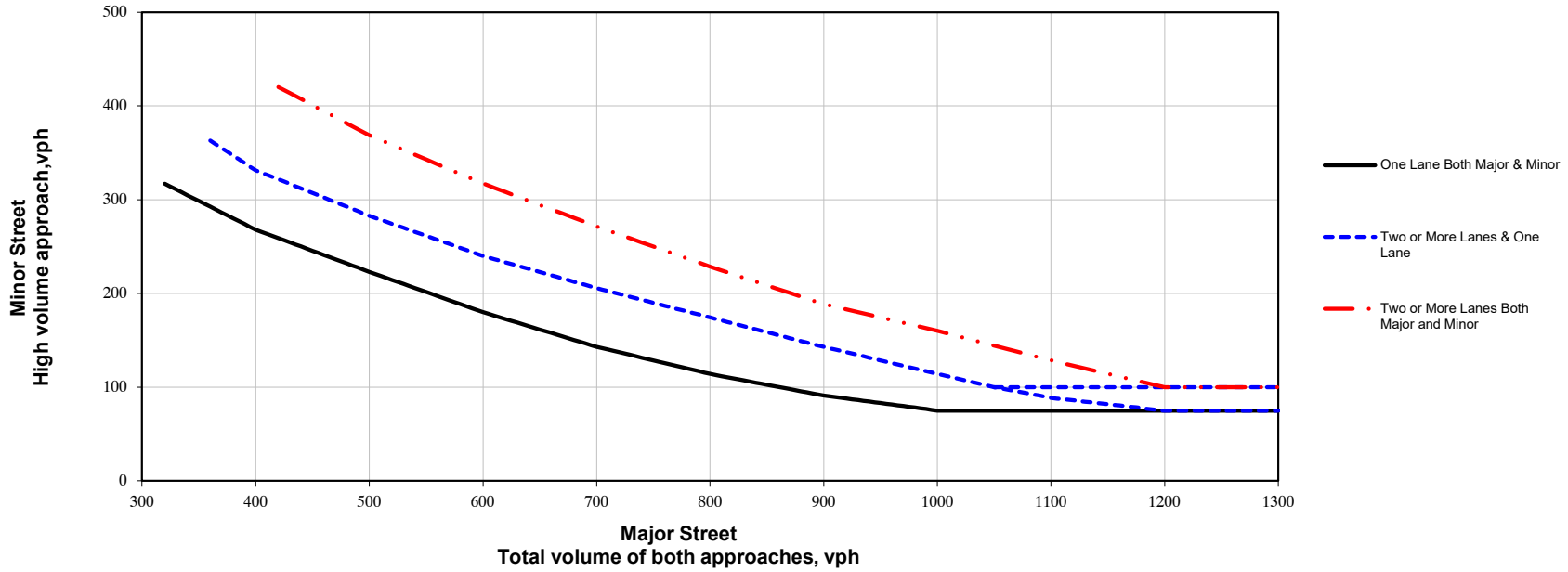
Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 70 km/h (40 mph) ON MAJOR STREET)



Note: Points on graph represent hourly volumes. Points above the respective curve satisfy warrant, points below do not satisfy warrant.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 70 km/h (40 mph) ON MAJOR STREET)



Note: Points on graph represent hourly volumes. Points above the respective curve satisfy warrant, points below do not satisfy warrant.

Peekskill Hollow Rd (CR 21) - Speed Study

Northbound	
Date:	4/11/2024
Time:	2:30 PM
Trial	Speed*
1	45
2	40
3	39
4	43
5	47
6	47
7	45
8	42
9	42
10	38
11	43
12	44
13	38
14	37
15	60
16	46
17	49
18	52
19	38
20	42
21	40
22	41
23	44
24	45
25	42
26	42
27	37
28	54
29	46
30	55
Avg.	**44.1**

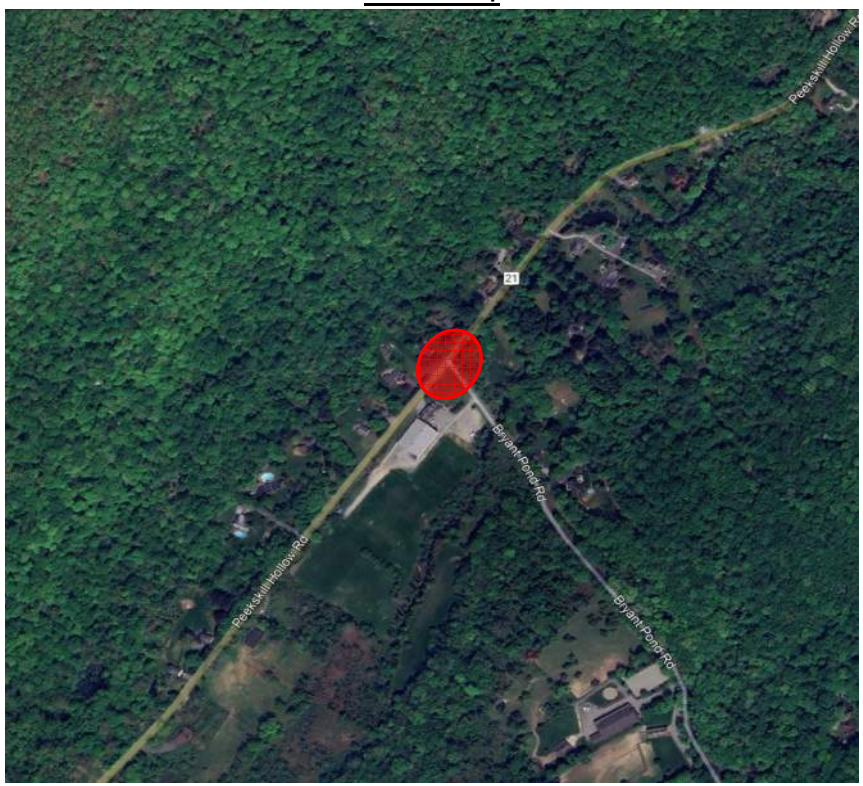
Southbound	
Date:	4/11/2024
Time:	2:30 PM
Trial	Speed*
1	43
2	41
3	39
4	44
5	42
6	39
7	40
8	38
9	42
10	44
11	40
12	45
13	49
14	46
15	62
16	38
17	42
18	46
19	50
20	47
21	39
22	57
23	41
24	40
25	43
26	47
27	38
28	43
29	42
30	46
Avg.	**43.8**

Peekskill Hollow Road (CR 21)
at Bryant Pond Road
Putnam Valley, New York

Posted Speed Limit: 40 MPH

85th Percentile Speeds		
NB		**SB**
50.1		**47.7**

Location Map



* - Denotes speed measured at proposed access location with vehicles traveling under free flow conditions, in MPH

Sight Distance Summary Bryant Pond Rd at Peekskill Hollow Rd (CR 21)						
Location	**Side Street Turn Movement**	**Direction**	**Available Sight Distance**	**Design Speed (mph)**	**Required Stopping Sight Distance[1]**	**Recommended Intersection Sight Distance[1]**
Northbound Bryant Pond Rd at Peekskill Hollow Rd (CR 21)	Right Turn	Looking Left (West)	425'	50	425'	480'
	Left Turn	Looking Left (West)	425'	50	425'	555'
		Looking Right (East)	850'	50	425'	555'

[1] Recommended minimum sight distance values from AASHTO's *A Policy on Geometric Design of Highways and Streets* , 7th Edition and the NYSDOT's *Highway Design Manual* . The recommended values are based on the current free flow travel speeds of the roadway.

COUNTY: PUTNAM P.I.N.:

TOWN OF PUTNAM VALLEY

ROUTE NO. OR STREET NAME: PEEKSKILL HOLLOW ROAD (CR 21)

AT INTERSECTION WITH/OR BETWEEN: BRYANT POND ROAD

GPI
Engineering | Design | Planning | Construction Management

TIME PERIOD: FROM: 12/31/2019 TO: 12/31/2023

No. OF MONTHS: 48

ENVIRONMENTAL: Use Codes from MV 104 (shown at right) for these categories

Light Conditions:
1. Daylight
2. Dawn
3. Dusk
4. Dark Road Lighted
5. Dark Road Unlighted

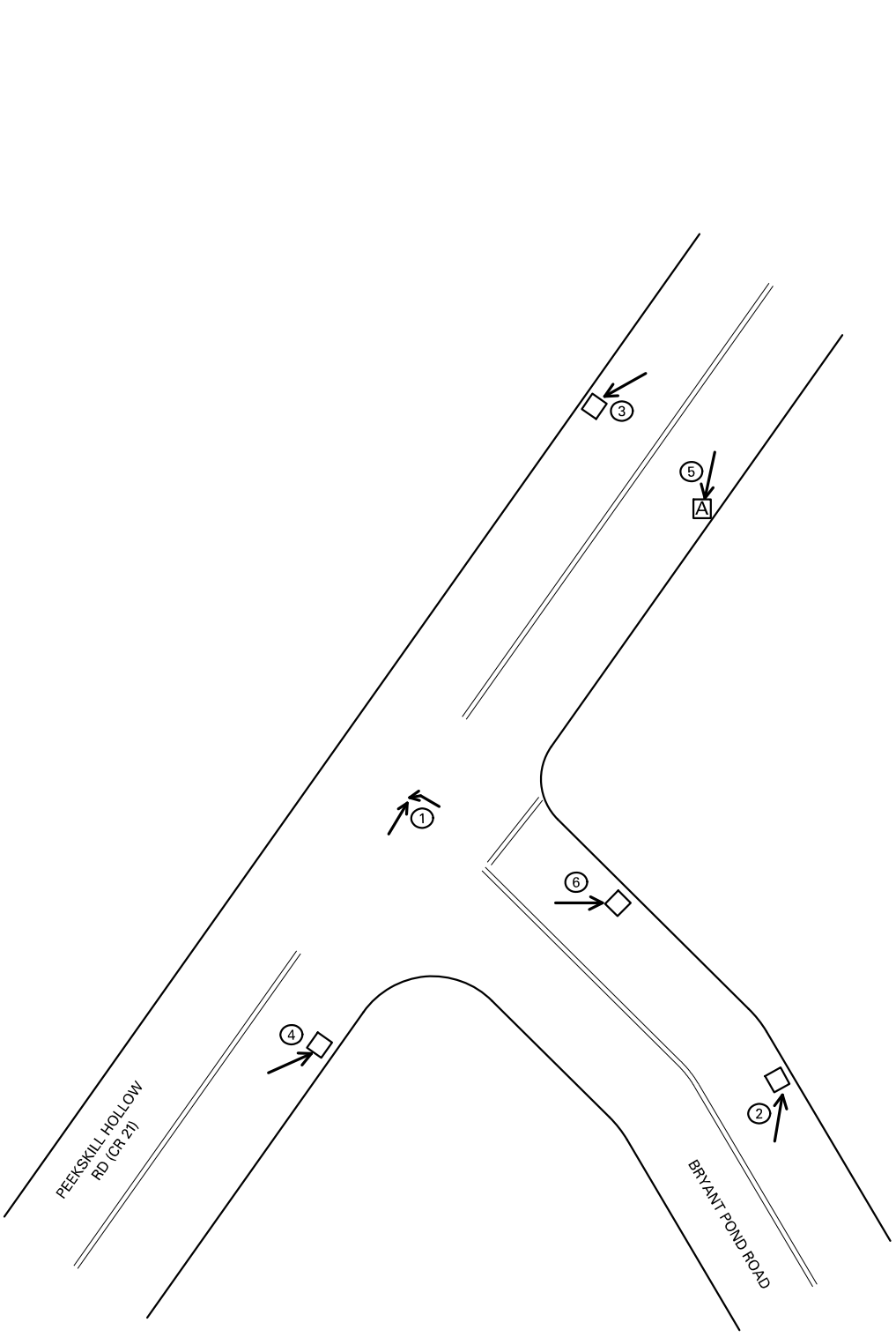
Roadway Character:
1. Straight & Level
2. Straight & Grade
3. Straight & Hillcrest
4. Curve & Level
5. Curve & Grade
6. Curve & Hillcrest

Roadway Surface Condition:
1. Dry
2. Wet
3. Muddy
4. Snow/Ice
5. Slush
10. Other

Weather:
1. Clear
2. Cloudy
3. Rain
4. Snow
5. Sleet/Hail/Freezing Rain
6. Fog/Smog/Smoke
10. Other

[1]Use Codes from MV 104 Police Report

ACCIDENT No.	DATE	TIME	No. of VEHICLES	SEVERITY	LIGHT CONDITIONS	ROADWAY CHARACTER	ROADWAY SURFACE CONDITION	WEATHER	APPARENT CONTRIBUTING FACTORS	DIRECTION	TYPE[1]	DESCRIPTION	CASE NO.
1	01/23/20	15:45	2	PDO	1	1	1	1	FAILURE TO YIELD RIGHT OF WAY	NORTH/WEST	1	LEFT TURN	38290939
2	02/27/20	2:52	1	PDO	5	6	2	3	ANIMALS ACTION	WEST	11	FIXED OBJECT	38367295
3	04/20/20	17:49	1	PDO	1	1	1	1	DRIVER INATTENTION	SOUTH	11	FIXED OBJECT	38399159
4	12/24/20	14:36	1	PDO	1	5	2	3	REACTION TO OTHER UNINVOLVED VEHICLE	SOUTH	23	FIXED OBJECT	38684989
5	08/07/22	0:30	1	PDO	5	1	1	1	ANIMALS ACTION	SOUTH	4	ANIMAL	39476996
6	05/18/23	9:37	1	PDO	1	5	1	1	STEERING FAILURE	NORTH	18	FIXED OBJECT	39837571



LEGEND

- PERSONAL INJURY
- CRASH NUMBER
- LEFT TURN
- ANIMAL
- FIXED OBJECT

NOTE:
CRASH NUMBERS CORRELATE TO NUMBERS FOUND ON CRASH DATA SHEETS. SEE CRASH DATA SHEETS FOR ADDITIONAL CRASH INFORMATION.

GPI Engineering Design Planning Construction Inspection

PUTNAM COUNTY
INTERSECTION IMPROVEMENTS
PUTNAM COUNTY, NEW YORK

PEEKSKILL HOLLOW RD (CR 21)
AT BRYANT POND RD CRASH DIAGRAM

SCALE:	DATE:	FIGURE NO.
NO SCALE	JUNE 2024	K-2

Intersection	
Int Delay, s/veh	3.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	75	18	68	106	25	45
Future Vol, veh/h	75	18	68	106	25	45
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	4	4	5	5	7	7
Mvmt Flow	85	20	77	120	28	51

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	244	137	0	0	197	0
Stage 1	137	-	-	-	-	-
Stage 2	107	-	-	-	-	-
Critical Hdwy	6.44	6.24	-	-	4.17	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.336	-	-	2.263	-
Pot Cap-1 Maneuver	740	906	-	-	1346	-
Stage 1	885	-	-	-	-	-
Stage 2	912	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	724	906	-	-	1346	-
Mov Cap-2 Maneuver	724	-	-	-	-	-
Stage 1	885	-	-	-	-	-
Stage 2	893	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.6	0	2.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	753	1346	-
HCM Lane V/C Ratio	-	-	0.14	0.021	-
HCM Control Delay (s)	-	-	10.6	7.7	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.5	0.1	-

Intersection	
Int Delay, s/veh	4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	98	26	68	81	16	76
Future Vol, veh/h	98	26	68	81	16	76
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	3	3	4	4
Mvmt Flow	108	29	75	89	18	84

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	240	120	0	0	164	0
Stage 1	120	-	-	-	-	-
Stage 2	120	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.14	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.236	-
Pot Cap-1 Maneuver	748	931	-	-	1402	-
Stage 1	905	-	-	-	-	-
Stage 2	905	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	738	931	-	-	1402	-
Mov Cap-2 Maneuver	738	-	-	-	-	-
Stage 1	905	-	-	-	-	-
Stage 2	893	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.7	0	1.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	772	1402	-
HCM Lane V/C Ratio	-	-	0.177	0.013	-
HCM Control Delay (s)	-	-	10.7	7.6	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.6	0	-

GPI Greenman-Pedersen, Inc.
Engineering and Construction Services

Intersection:	Peekskill Hollow Rd (CR 21) and Bryant Pond Rd		
Client:	Putnam County	GPI No.	2300070.00
Calculated By:	D. Creen	Date:	6/12/2024
Checked By:	M. Wieszchowski	Date:	6/13/2024

INSTALL SPEED FEEDBACK SIGNING

DESCRIPTION	TOTAL QUANTITY	UNIT	UNIT PRICE	TOTAL COST
SPEED FEEDBACK SIGN	1	EA	$5,000	$5,000
			ESTIMATED CONSTRUCTION COST (CONCEPTUAL)	**$5,000**
CONTIGENCY (20%)	1	LS	$1,000	$1,000
			FINAL TOTAL	**$6,000**

APPENDIX L

Baldwin Place Road (CR 37)

at Myrtle Avenue (CR 71)

SUMMARY OF ANALYSIS
BALDWIN PLACE RD @ MYRTLE AVE

Existing Conditions:

This 3-legged T-intersection has stop sign control on the Myrtle Ave side street approach only, while Baldwin Place Rd is uncontrolled. The intersection is skewed and located along a horizontal curve along the mainline. There are no pedestrian facilities at this intersection. All lanes are 11-foot wide and there are little to no paved shoulders.

Posted speed limits are 40 mph along Baldwin Place Rd and 30 mph along Myrtle Ave. Speed measurements were performed along Baldwin Place Rd and the 85th percentile speeds were determined to be 42 mph northbound and 47 mph southbound.

The sight distance when looking north (to the left) from the Myrtle Ave approach is more than sufficient to meet intersection sight distance requirements, but the 400' sight distance looking south (to the right), although longer than the required stopping sight distance of 360', is less than the recommended intersection sight distance of 500' for the 45-mph design speed in that direction. This sight distance limitation is caused by the horizontal curvature of Baldwin Place Rd.

Operationally, this intersection performs very well, with all movements operating at LOS A or LOS B. No traffic capacity issues exist at this location.

Signal Warrant Analysis:

A review of the hourly traffic volumes between 7:00AM to 9:00AM and 4:00pm to 6:00pm show that Warrant 1 (8-hour warrant) is not satisfied, with only 1 of the 4 hours reviewed meeting criteria and it assumed that non-peak hours would experience even less traffic on the roadway. Warrant 2 (4-hour warrant) is not satisfied with only 2 of the 4 hours reviewed meeting criteria. Warrant 3 (Peak Hour Warrant) is not satisfied, as none of the 4 hours reviewed met the criteria. Warrant 7 (crash experience) is also not satisfied as none of the crash criteria were met.

Safety Analysis:

Based on the NYSDOT Clear Safety System, the Potential for Safety Improvement (PSI) for this intersection is 0.19 overall and -0.04 for serious injury/fatality crashes. These factors indicate there is potential for safety improvement, with PSI>0.0, but the potential for serious injury crashes is not above that of similar facilities. The crash rate for this intersection was calculated at 0.57 crashes per million entering vehicles (Cr/MEV), which is around 3 times the statewide average of 0.17 Cr/MEV for similar intersections. The skew and curvature of the side street approach and limited sight distance could be contributing factors to this crash rate.

A review of the crash data noted 8 crashes at this location during the 4-year period studied. Reviewing the crash types, the predominant type is fixed object (7 crashes). There is no crash pattern discernable that would warrant a change in traffic control, but it does appear that unsafe speeds, particularly southbound, combined with the road curvature is causing a condition where vehicles are running off the roadway. A summary of the crash types and severity are shown in the table below:

CRASH SUMMARY

Crash Type	Number of Occurrences	Crash Severity	Number of Occurrences
Left Turn	1	Fatality	0
Fixed Object	7	Personal Injury	3
		Property Damage Only	5
	8		8

Field Condition and Right of Way Review:

As mentioned under the existing conditions, the intersection is located along a horizontal curve in Baldwin Place Roadway. This curve is identified through advanced "Curve Ahead" warning signs, but given the crash history, southbound vehicles are not always heeding the warning.

A review of the existing terrain revealed some minor drop offs from the roadway and significant state wetland east and north of the intersection, making any improvements involving intersection widening problematic.

There is approximately 48' of right-of-way along Baldwin Place Rd and 60' of right-of-way along Myrtle Ave, but if a roundabout were to be considered at this location, right-of-way taking will be required on the east side of the intersection.

Design Alternative Consideration:

As stated above, traffic operates at a very acceptable LOS A or LOS B and the crashes recorded are generally due to the horizontal curvature along both Baldwin Place Rd and Myrtle Ave. Two safety improvement alternatives could be considered at this location to reduce the run-off the roadway crashes; (1) add a "stop ahead" warning sign along Myrtle Ave and increase the visibility of the southbound "curve ahead" sign, either using an oversized sign or flashing beacons. (2) Construct a single-lane roundabout. A roundabout would improve operations to LOS A on all approaches at this location while calming traffic and forcing vehicles to reduce speeds. However, the surrounding wetlands and need for right-of-way acquisition could pose a significant hurdle to the roundabout construction and would increase costs.

Conceptual Cost Estimate:

It is estimated that the installation of a "Stop Ahead" warning sign and beacons to increase the visibility of the existing 'Curve Ahead' signs would cost roughly $7,500.

Due to the physical and environmental constraints it may be difficult to construct a roundabout at this location, but if a roundabout is so desired, our best estimate of cost would be approximately $2,885,000. These costs include construction of all improvements and right-of-way taking, as well as costs for design and inspection. A breakdown of the big picture cost items is included later under this tab.

Summary & Conclusion:

The analyses show that a traffic signal is not warranted, and that traffic operations are with an acceptable level of service. The available sight distance when looking south is marginally limited by the roadway curvature. However, there were no crashes that indicate that this sight distance limitation is an issue for the intersection. The only safety concern identified at this location is the above average speeds being carried into the curves and the runoff the road crashes they cause. It is recommended that a “Stop Ahead” warning sign be installed in advance of the intersection on Myrtle Ave and that the southbound “Curve Ahead” advanced warning sign be made more visible, either through using an oversized sign, or adding flashing beacons.

Although a roundabout was considered for this location, the wetland impacts and right-of-way hurdles would be significant, making construction difficult and increasing costs. As such, a roundabout is not recommended unless a crash history persists after upgrading the signing.

The intersection evaluation worksheets summarizing the lane geometry and traffic operations, traffic volume data sheets, traffic signal warrant analysis sheets, crash summary sheets, capacity analysis worksheets, cost estimate breakdown and a roundabout concept sketch for this intersection can be found on the following pages in this appendix.

INTERSECTION EVALUATION WORKSHEET

Project:	Putnam County Intersection Improvements
Location:	Putnam County (Various Locations)
Intersection:	Baldwin Pl Rd (CR37) at Myrtle Ave (CR71)
GPS Coord.:	41.36008, -73.76200
Traffic Control:	Stop Sign (EB)

Traffic Control Notes (if applicable):

None

Other Intersection Notes (if applicable):

No Pedestrian Crossings.
Close Proximity to Mahopac High School

APPROACH DATA

	Baldwin Place Rd			Baldwin Place Rd			Myrtle Ave			-		
	Northbound			**Southbound**			**Eastbound**			**Westbound**		
	Left	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
Lane Assignments:		<-1			1->			<-1->				
Lane Widths:		11'			11'			11'				
Turn Bay Lengths:		-			-			-				
Speed Limits:	40 mph			40 mph			30 mph					

TRAFFIC COUNT DATA

AM Peak Hour	Time Period:	7:00	to	8:00				Date Counted:	4/11/2024			
Volume:	147	122	0	0	178	87	12	0	158			
Truck %:	3%	11%	-	-	7%	46%	42%	-	8%			
Peds (Bikes):	0 (0)			0 (0)			0 (0)					
PHF = 0.95												
PM Peak Hour	Time Period:	4:45	to	5:45				Date Counted:	4/11/2024			
Volume:	165	163	0	0	144	11	17	0	127			
Truck %:	2%	1%	-	-	1%	1%	1%	-	2%			
Peds (Bikes):	0 (0)			0 (0)			0 (0)					
PHF = 0.99												

EXISTING CONDITION LEVEL OF SERVICE

AM Peak Delay (s):	8.3						11.6					
LOS:	A						B					
v/c:	0.12						0.25					
95% Queue:	< 25'						25'					
A (4.5) Overall	**A (4.5)**						**B (11.6)**					
PM Peak Delay (s):	7.9						10.9					
LOS:	A						B					
v/c:	0.12						0.20					
95% Queue:	< 25'						< 25'					
A (4.6) Overall	**A (4.0)**						**B (10.9)**					

Note: LOS calculated using HCM 6 methodologies. For unsignalized intersections, only side street approach delay and mainline left turn delay is shown. The HCM 6 methodology assumes zero delay for all other movements.

INTERSECTION EVALUATION WORKSHEET

INTERSECTION SAFETY

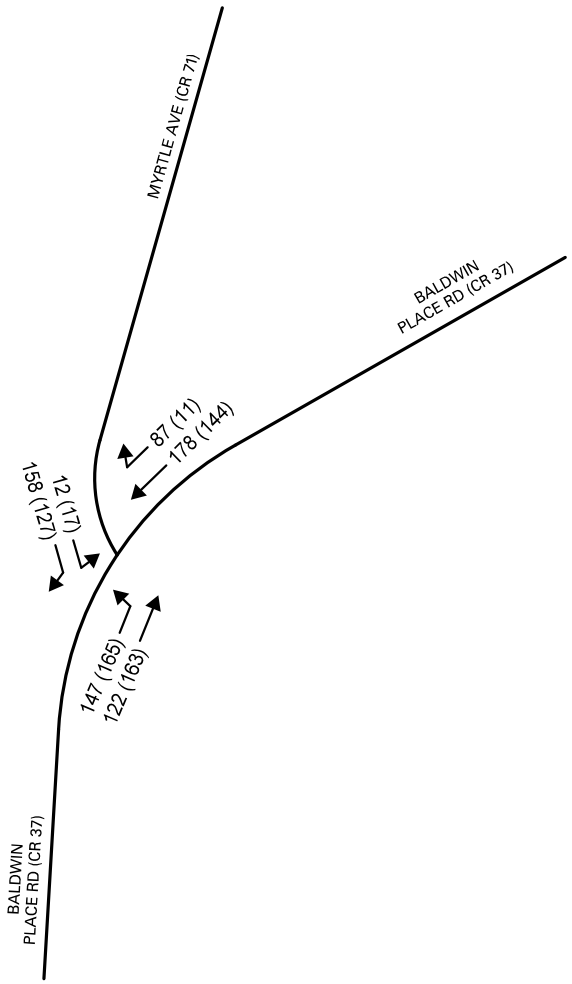
Travel Speeds	Direction:	Northbound	Southbound	
	Average Speed:	39.8	43.6	
	85th Percentile:	42.4	47.0	
Sight Distance	Approach:	Eastbound		
	Looking Left:	825'		
	Looking Right:	400'		
	Summary:	The available sight distance when Looking Right from the southbound approach of Myrtle Ave does not meet the Recommended Intersection Sight Distance for making a left turn.		

Crashes	From:	12/31/2019	To:	12/31/2023	No. of Months:	48						
	No. of Crashes:	8	PDO:	5	PI:	3	PI (A):	0	K:	0		
	Crash Rate:	0.57 Cr/MEV			Above/Below Statewide Average:			3.34 Times				

PSI Factors	PSI (KA):	-0.04
	PSI (Tot):	0.19

BUILD ALTERNATIVE #1 - LEVEL OF SERVICE

	Baldwin Place Rd			Baldwin Place Rd			Myrtle Ave			-		
	Northbound			**Southbound**			**Eastbound**			**Westbound**		
	Left	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**	**Left**	**Thru**	**Right**
Description of Improvements:	Installation of a Roundabout.											
AM Peak Delay (s):	4.8			6.6			5.3					
LOS:	A			A			A					
v/c:	0.22			0.29			0.18					
95% Queue:	25'			25'			25'					
A (5.6) Overall	**A (4.8)**			**A (6.6)**			**A (5.3)**					
PM Peak Delay (s):	4.9			4.4			4.2					
LOS:	A			A			A					
v/c:	0.26			0.14			0.13					
95% Queue:	25'			< 25'			< 25'					
A (4.6) Overall	**A (4.9)**			**A (4.4)**			**A (4.2)**					



KEY:

XXX (XXX) = AM (PM) PEAK HOUR TRAFFIC VOLUMES

GPI Engineering Design Planning Construction Inspection

PUTNAM COUNTY
INTERSECTION IMPROVEMENTS
PUTNAM COUNTY, NEW YORK

BALDWIN PL RD (CR 37) AT MYRTLE AVE (CR 71)
PEAK HOUR TRAFFIC VOLUMES

SCALE:	DATE:	FIGURE NO.
NO SCALE	JUNE 2024	L-1

Greenman-Pedersen, Inc.
80 Wolf Rd, Suite 600
Albany, NY 12205
(518) 453-9431

Intersection: Baldwin Place Rd (CR 37) at Myrtle Ave (CR 71)
Location: Town of Carmel, New York
GPI Project No.: 2300070.00
Count Date: 4/11/2024

Total Traffic - Cars & Heavy Vehicles

Start Time	Baldwin Place Rd (CR 37) Southbound					- Westbound					Baldwin Place Rd (CR 37) Northbound					Myrtle Ave (CR 71) Eastbound				
	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes
7:00 AM	0	0	49	38	0	0	0	0	0	0	0	46	29	0	0	0	0	0	24	0
7:15 AM	0	0	68	15	0	0	0	0	0	0	0	25	23	0	1	0	5	0	24	0
7:30 AM	0	0	23	20	0	0	0	0	0	0	0	42	38	0	0	0	4	0	47	0
7:45 AM	0	0	38	14	0	0	0	0	0	0	0	34	32	0	0	0	3	0	63	0
8:00 AM	0	0	23	6	0	0	0	0	0	0	0	29	18	0	0	0	3	0	37	0
8:15 AM	0	0	29	2	0	0	0	0	0	0	0	29	14	0	0	0	2	0	42	0
8:30 AM	0	0	35	5	0	0	0	0	0	0	1	37	14	0	0	0	2	0	37	0
8:45 AM	0	0	30	5	0	0	0	0	0	0	0	25	18	0	0	0	6	0	48	0
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00 PM	0	0	37	3	0	0	0	0	0	0	0	40	49	0	0	0	1	0	39	0
4:15 PM	0	0	31	2	0	0	0	0	0	0	0	34	43	0	0	0	1	0	29	0
4:30 PM	0	0	38	1	0	0	0	0	0	0	0	34	52	0	0	0	2	0	25	0
4:45 PM	0	0	31	5	0	0	0	0	0	0	0	31	46	0	0	0	7	0	34	0
5:00 PM	0	0	41	2	0	0	0	0	0	0	0	44	42	0	0	0	4	0	24	0
5:15 PM	0	0	42	1	0	0	0	0	0	0	0	48	33	0	0	0	2	0	33	0
5:30 PM	0	0	30	3	0	0	0	0	0	0	0	42	42	0	0	0	4	0	36	0
5:45 PM	0	0	16	6	0	0	0	0	0	0	0	30	38	0	0	0	3	0	22	0
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Greenman-Pedersen, Inc.
80 Wolf Rd, Suite 600
Albany, NY 12205
(518) 453-9431

Intersection: Baldwin Place Rd (CR 37) at Myrtle Ave (CR 71) GPI Project No.: 2300070.00
Location: Town of Carmel, New York Count Date: 4/11/2024

Peak Hour Traffic Volumes

	Baldwin Place Rd (CR 37) Southbound					- Westbound					Baldwin Place Rd (CR 37) Northbound					Myrtle Ave (CR 71) Eastbound				
	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes
AM Peak Hour:			**7:00 AM**	**to**	**8:00 AM**															
7:00 AM	0	0	49	38	0	0	0	0	0	0	0	46	29	0	0	0	0	0	24	0
7:15 AM	0	0	68	15	0	0	0	0	0	0	0	25	23	0	1	0	5	0	24	0
7:30 AM	0	0	23	20	0	0	0	0	0	0	0	42	38	0	0	0	4	0	47	0
7:45 AM	0	0	38	14	0	0	0	0	0	0	0	34	32	0	0	0	3	0	63	0
Total Volume	0	0	178	87	0	0	0	0	0	0	0	147	122	0	1	0	12	0	158	0
705			265					0					270					170		
No. of Trucks	0	0	12	40	0	0	0	0	0	0	0	5	13	0	0	0	5	0	12	0
Truck %	0.0%		6.7%	46.0%		0.0%			0.0%	0.0%	0.0%	3.4%	10.7%		0.0%	0.0%	41.7%		7.6%	0.0%
12.4%			19.6%					0.0%					6.7%					10.0%		
PHF	0.00		0.65	0.57		0.00			0.00	0.00	0.00	0.80	0.80		0.25	0.00	0.60		0.63	0.00
0.95			0.76					#DIV/0!					0.84					0.64		

	Baldwin Place Rd (CR 37) Southbound					- Westbound					Baldwin Place Rd (CR 37) Northbound					Myrtle Ave (CR 71) Eastbound				
	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes	U Turns	Left Turns	Straight Through	Right Turns	Peds/ Bikes
PM Peak Hour:			**4:45 PM**	**to**	**5:45 PM**															
4:45 PM	0	0	31	5	0	0	0	0	0	0	0	31	46	0	0	0	7	0	34	0
5:00 PM	0	0	41	2	0	0	0	0	0	0	0	44	42	0	0	0	4	0	24	0
5:15 PM	0	0	42	1	0	0	0	0	0	0	0	48	33	0	0	0	2	0	33	0
5:30 PM	0	0	30	3	0	0	0	0	0	0	0	42	42	0	0	0	4	0	36	0
Total Volume	0	0	144	11	0	0	0	0	0	0	0	165	163	0	0	0	17	0	127	0
627			155					0					328					144		
No. of Trucks	0	0	2	0	0	0	0	0	0	0	0	3	2	0	0	0	0	0	3	0
Truck %	0.0%		1.4%	0.0%		0.0%				0.0%	0.0%	1.8%	1.2%		0.0%	0.0%	0.0%		2.4%	0.0%
1.6%			1.3%					0.0%					1.5%					2.1%		
PHF	0.00		0.86	0.55		0.00				0.00	0.00	0.86	0.89		0.00	0.00	0.61		0.88	0.00
0.99			0.90					#DIV/0!					0.95					0.88		

TRAFFIC SIGNAL WARRANT SUMMARY

Project: Putnam County Intersection Improvements
Condition: Existing Condition
Location: Town of Carmel
Date: April 11th, 2024

Major Street: Baldwin Place Road (CR 37) Lanes: 1 Critical Approach Speed: 50 mph
Minor Street: Myrtle Avenue (CR 71) Lanes: 1

Volume Level Criteria

1. Is the critical speed of major street traffic greater than 40 mph? Yes
2. Is the intersection in a built-up area of an isolated community with population less than 10,000? No

If either Question 1 or Question 2 is answered "Yes", then use the 70% volume level. Criteria used: 70%

WARRANT 1 - EIGHT HOUR VEHICULAR VOLUME **Warrant 1 Satisfied: NO**

Warrant 1 is satisfied if EITHER Condition A OR Condition B is 100% satisfied.
Warrant 1 is also satisfied if BOTH Condition A AND Condition B are satisfied to the 80% volume level.

			Condition 1A - Minimum Vehicular Volume (X indicates that criteria is met for specified condition)				Condition 1B - Interuption of Continuous Traffic (X indicates that criteria is met for specified condition)				Total Satisfied Hours (8 required)		
											3	1	3
Minimum Volume Criteria:			350	105	280	84	525	53	420	42	Condition	Condition	80% for
Start Time	Major St. Volume[1]	Minor St. Volume[2]	Major St. 100%	Minor St. 100%	Major St. 80%	Minor St. 80%	Major St. 100%	Minor St. 100%	Major St. 80%	Minor St. 80%	1A Satisfied	1B Satisfied	Both Satisfied
12:00 AM			-	-	-	-	-	-	-	-	-	-	-
1:00 AM			-	-	-	-	-	-	-	-	-	-	-
2:00 AM			-	-	-	-	-	-	-	-	-	-	-
3:00 AM			-	-	-	-	-	-	-	-	-	-	-
4:00 AM			-	-	-	-	-	-	-	-	-	-	-
5:00 AM			-	-	-	-	-	-	-	-	-	-	-
6:00 AM			-	-	-	-	-	-	-	-	-	-	-
7:00 AM	535	170	X	X	X	X	X	X	X	X	1	1	1
8:00 AM	320	177	-	X	X	X	-	X	-	X	-	-	-
9:00 AM			-	-	-	-	-	-	-	-	-	-	-
10:00 AM			-	-	-	-	-	-	-	-	-	-	-
11:00 AM			-	-	-	-	-	-	-	-	-	-	-
12:00 PM			-	-	-	-	-	-	-	-	-	-	-
1:00 PM			-	-	-	-	-	-	-	-	-	-	-
2:00 PM			-	-	-	-	-	-	-	-	-	-	-
3:00 PM			-	-	-	-	-	-	-	-	-	-	-
4:00 PM	477	138	X	X	X	X	-	X	X	X	1	-	1
5:00 PM	460	128	X	X	X	X	-	X	X	X	1	-	1
6:00 PM			-	-	-	-	-	-	-	-	-	-	-
7:00 PM			-	-	-	-	-	-	-	-	-	-	-
8:00 PM			-	-	-	-	-	-	-	-	-	-	-
9:00 PM			-	-	-	-	-	-	-	-	-	-	-
10:00 PM			-	-	-	-	-	-	-	-	-	-	-
11:00 PM			-	-	-	-	-	-	-	-	-	-	-

[1] Major Street Volume is the total combined volume of both mainline approaches.

[2] Minor Street volumes is the highest single side street approach volume.

WARRANT 2 - FOUR HOUR VEHICULAR VOLUME **Warrant 2 Satisfied: NO**

Warrant is satisfied if four (4) or more hours satisfy the volume requirements depicted on the four hour warranting graph **(see page 2)**. No. of Points Above Criteria Curve: 2

WARRANT 3 - PEAK HOUR VEHICULAR VOLUME **Warrant 3 Satisfied: NO**

Warrant is satisfied if any hour satisfy the volume requirements depicted on the peak hour warranting graph **(see page 3)**, and ALL three of the following requirement are met. No. of Points Above Criteria Curve: 0

1. Total stopped time delay on Minor Street equals or exceeds 4 VHD (single lane) or 5 VHD (two lanes): N/A VHD Max. -
2. Volume on Minor Street equals or exceeds 100 vehicles (single lane) or 150 vehicles (two lanes): -
3. Total intersection volume serviced during the hour equals or exceeds 650 veh. (3-leg) or 800 veh. (4-leg or more): -

TRAFFIC SIGNAL WARRANT SUMMARY

Project: Putnam County Intersection Improvements
Condition: Existing Condition
Location: Town of Carmel
Date: April 11th, 2024

Major Street: Baldwin Place Road (CR 37) Lanes: 1 Critical Approach Speed: 50 mph
Minor Street: Myrtle Avenue (CR 71) Lanes: 1

WARRANT 7 - CRASH EXPERIENCE **Warrant 7 Satisfied: NO**

1. Maximum number of angle[3] and pedestrian crashes in a one year period: 0
2. Maximum number of fatal-and-injury angle and pedestrian crashes in a one year period: 0
3. Maximum number of angle and pedestrian crashes in a three year period: 0
4. Maximum number of fatal-and-injury angle and pedestrian crashes in a three year period: 0

[3] Angle crashes include all crashes that occur at an angle and involve one or more vehicles on the major street and one or more vehicles on the minor street.

Warrant 7 is satisfied if **ANY** of the following criteria are met:

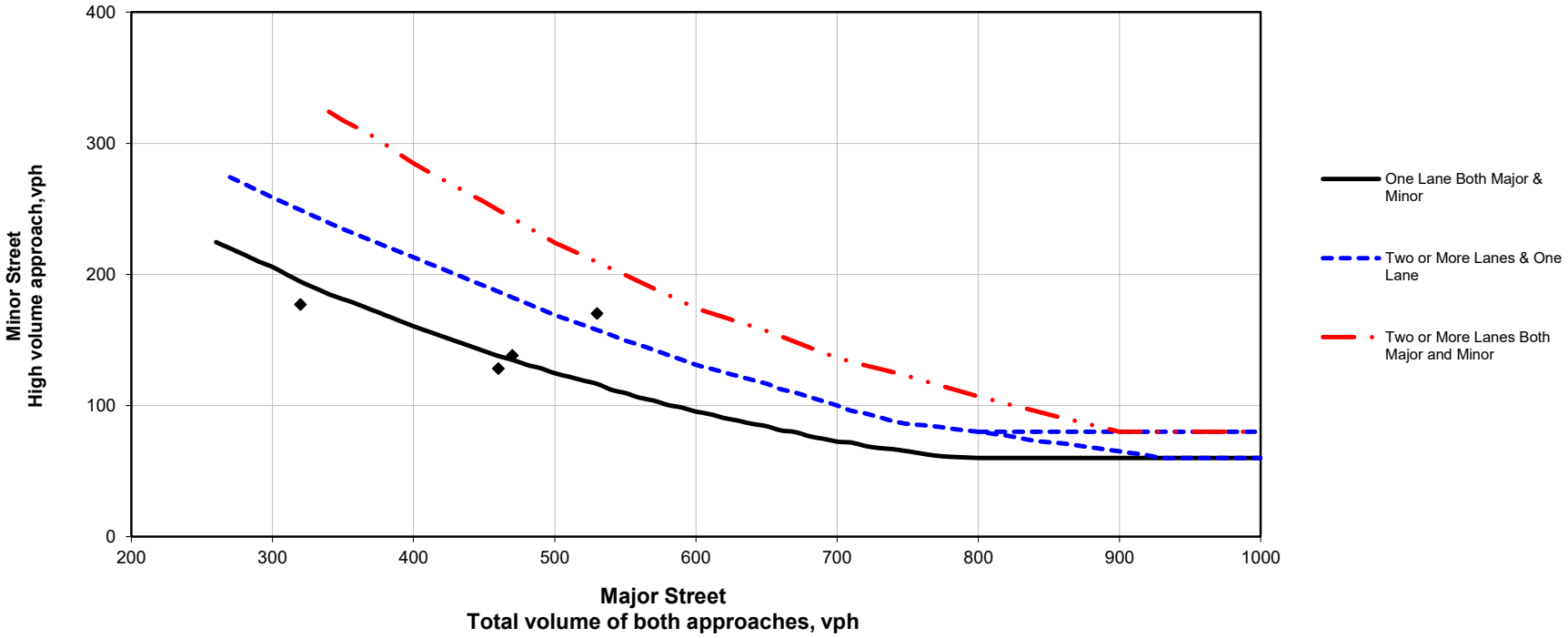
1. Are there more than 3 angle crashes in a one year period: No
2. Are there more than 3 fatal-and-injury crashes in a one year period: No
3. Are there more than 4 crashes in a three year period: No
4. Are there more than 4 fatal-and-injury crashes in a three year period: No

AND ANY of the following criteria are also met:

1. Are the VPH for **BOTH** 80% columns of Condition 1A satisfied for each of any 8 hrs: No
2. Are the VPH for **BOTH** 80% columns of Condition 1B satisfied for each of any 8 hrs: No

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)

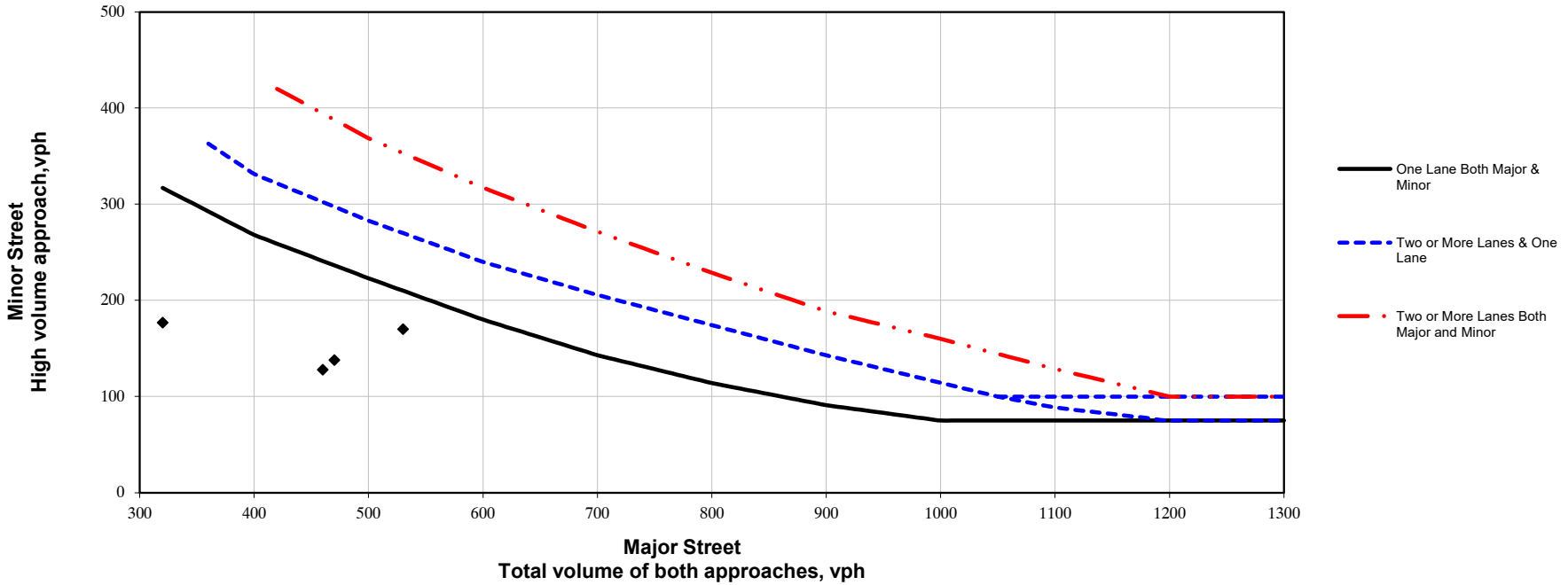
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 70 km/h (40 mph) ON MAJOR STREET)



Note: Points on graph represent hourly volumes. Points above the respective curve satisfy warrant, points below do not satisfy warrant.

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 70 km/h (40 mph) ON MAJOR STREET)



Note: Points on graph represent hourly volumes. Points above the respective curve satisfy warrant, points below do not satisfy warrant.

Baldwin Place Rd (CR 37) - Speed Study

Northbound	
Date:	4/10/2024
Time:	5:00 PM
Trial	Speed*
1	41
2	35
3	38
4	39
5	41
6	38
7	37
8	39
9	38
10	37
11	41
12	42
13	40
14	41
15	41
16	36
17	45
18	45
19	37
20	37
21	38
22	42
23	48
24	39
25	41
26	37
27	42
28	40
29	37
30	43
Avg.	**39.8**

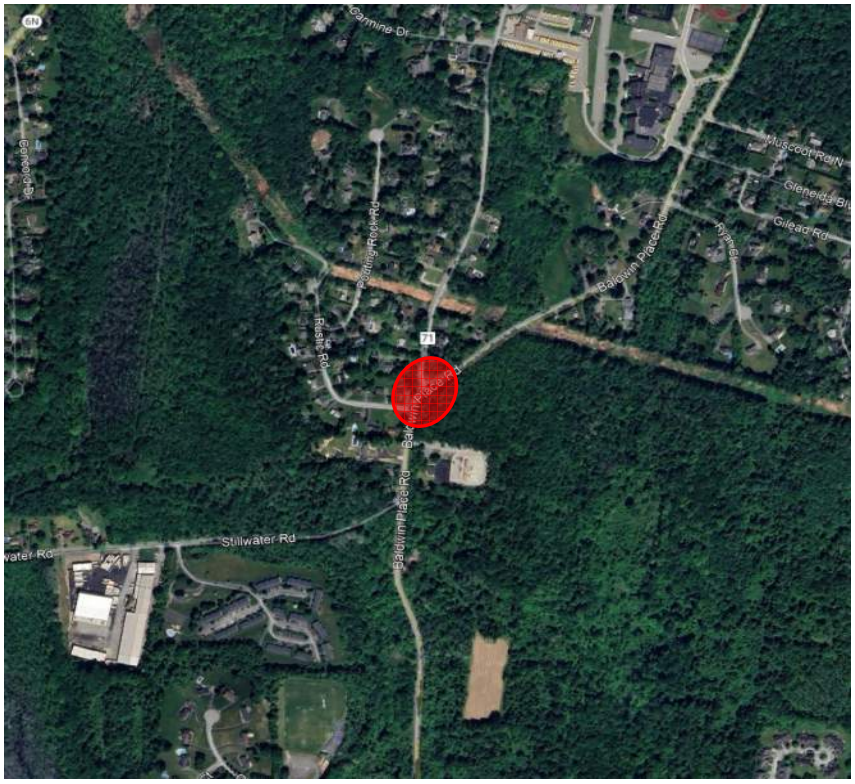
Southbound	
Date:	4/10/2024
Time:	5:00 PM
Trial	Speed*
1	47
2	44
3	42
4	40
5	47
6	43
7	41
8	48
9	47
10	51
11	40
12	47
13	48
14	42
15	37
16	45
17	39
18	44
19	47
20	42
21	44
22	46
23	44
24	41
25	38
26	47
27	36
28	42
29	44
30	46
Avg.	**43.6**

Baldwin Place Road (CR 37)
at Myrtle Avenue (CR 71)
Carmel, New York

Posted Speed Limit: 40 MPH

85th Percentile Speeds		
NB		**SB**
42.4		**47.0**

Location Map



* - Denotes speed measured at proposed access location with vehicles traveling under free flow conditions, in MPH

Sight Distance Summary Myrtle Ave (CR 71) at Baldwin Place Rd (CR 37)						
Location	**Side Street Turn Movement**	**Direction**	**Available Sight Distance**	**Design Speed (mph)**	**Required Stopping Sight Distance[1]**	**Recommended Intersection Sight Distance[1]**
Southbound Myrtle Ave (CR 71) at Baldwin Place Rd (CR 37)	Right Turn	Looking Left (North)	825'	50	425'	480'
	Left Turn	Looking Left (North)	825'	50	425'	555'
		Looking Right (South)	400'	45	360'	500'

[1] Recommended minimum sight distance values from AASHTO's *A Policy on Geometric Design of Highways and Streets* , 7th Edition and the NYSDOT's *Highway Design Manual* . The recommended values are based on the current free flow travel speeds of the roadway.

COUNTY: PUTNAM P.I.N.:

TOWN OF CARMEL

ROUTE NO. OR STREET NAME: BALDWIN PLACE ROAD (CR 37)

AT INTERSECTION WITH/OR BETWEEN: MYRTLE AVENUE (CR 71)

GPI
Engineering | Design | Planning | Construction Management

TIME PERIOD: FROM: 12/31/2019 TO: 12/31/2023

No. OF MONTHS: 48

ENVIRONMENTAL:
Use Codes from MV 104 (shown at right) for these categories

Light Conditions:
1. Daylight
2. Dawn
3. Dusk
4. Dark Road Lighted
5. Dark Road Unlighted

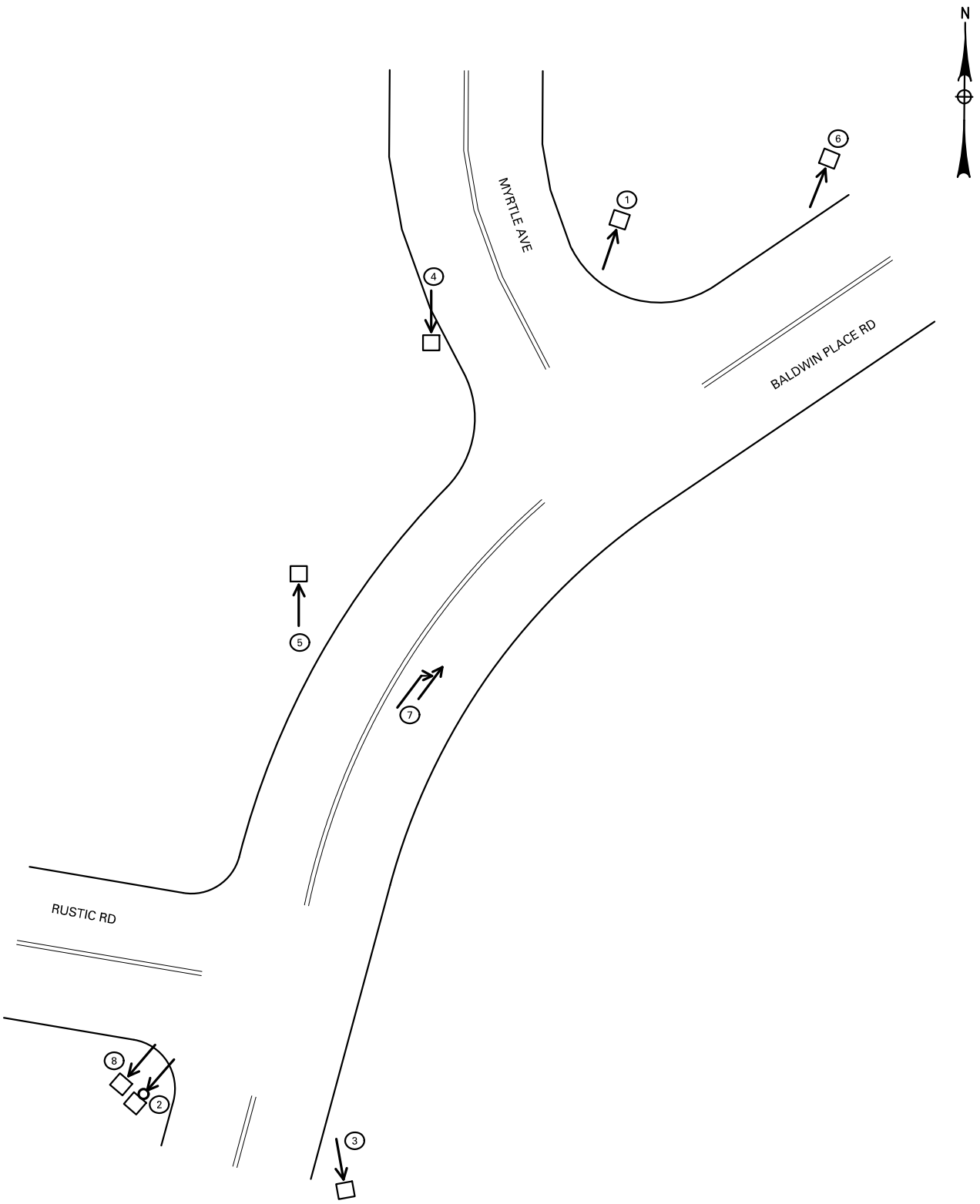
Roadway Character:
1. Straight & Level
2. Straight & Grade
3. Straight & Hillcrest
4. Curve & Level
5. Curve & Grade
6. Curve & Hillcrest

Roadway Surface Condition:
1. Dry
2. Wet
3. Muddy
4. Snow/Ice
5. Slush
10. Other

Weather:
1. Clear
2. Cloudy
3. Rain
4. Snow
5. Sleet/Hail/Freezing Rain
6. Fog/Smog/Smoke
10. Other

[1]Use Codes from MV 104 Police Report

ACCIDENT No.	DATE	TIME	No. of VEHICLES	SEVERITY	LIGHT CONDITIONS	ROADWAY CHARACTER	ROADWAY SURFACE CONDITION	WEATHER	APPARENT CONTRIBUTING FACTORS	DIRECTION	TYPE[1]	DESCRIPTION	CASE NO.
1	03/09/20	16:52	1	PI	1	4	1	1	LOST CONSCIOUSNESS	SOUTHWEST	15	FIXED OBJECT	38367485
2	09/28/21	13:29	1	PI	1	4	2	3	UNSAFE SPEED	SOUTHWEST	15	FIXED OBJECT	39043258
3	03/31/23	12:41	1	PDO	1	4	1	2	DRIVER INEXPERIENCE	SOUTHWEST	23	FIXED OBJECT	39777407
4	06/14/23	17:15	1	PDO	1	1	1	1	ANIMALS ACTION	SOUTHEAST	23	FIXED OBJECT	39918425
5	10/15/23	8:12	1	PDO	1	4	1	1	ANIMALS ACTION	NORTHEAST	14	FIXED OBJECT	40034464
6	11/05/23	20:43	1	PI	5	4	1	2	UNSAFE SPEED	NORTHEAST	23	FIXED OBJECT	40066711
7	12/08/23	17:37	2	PDO	5	1	1	2	UNSAFE LANE CHANGE	NORTHEAST	1	OVERTAKING	40114821
8	12/29/23	13:47	1	PDO	1	1	2	2	UNSAFE SPEED	SOUTHWEST	15	FIXED OBJECT	40140210



LEGEND

- PERSONAL INJURY
- OVERTAKING
- (##) CRASH NUMBER
- FIXED OBJECT

NOTE:
CRASH NUMBERS CORRELATE TO NUMBERS FOUND ON CRASH DATA SHEETS. SEE CRASH DATA SHEETS FOR ADDITIONAL CRASH INFORMATION.

GPI Engineering Design Planning Construction Inspection

PUTNAM COUNTY
INTERSECTION IMPROVEMENTS
PUTNAM COUNTY, NEW YORK

BALDWIN PLACE RD (CR 37) AT MYRTLE AVE (CR 71) CRASH DIAGRAM

SCALE:	DATE:	FIGURE NO.
NO SCALE	JUNE 2024	L-2

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	12	158	147	122	178	87
Future Vol, veh/h	12	158	147	122	178	87
Conflicting Peds, #/hr	0	1	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	10	10	7	7	20	20
Mvmt Flow	13	166	155	128	187	92

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	671	234	279	0	-	0
Stage 1	233	-	-	-	-	-
Stage 2	438	-	-	-	-	-
Critical Hdwy	6.5	6.3	4.17	-	-	-
Critical Hdwy Stg 1	5.5	-	-	-	-	-
Critical Hdwy Stg 2	5.5	-	-	-	-	-
Follow-up Hdwy	3.59	3.39	2.263	-	-	-
Pot Cap-1 Maneuver	410	786	1255	-	-	-
Stage 1	787	-	-	-	-	-
Stage 2	634	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	355	785	1255	-	-	-
Mov Cap-2 Maneuver	355	-	-	-	-	-
Stage 1	682	-	-	-	-	-
Stage 2	634	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.6	4.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1255	-	723	-	-
HCM Lane V/C Ratio	0.123	-	0.248	-	-
HCM Control Delay (s)	8.3	0	11.6	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.4	-	1	-	-

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	17	127	165	163	144	11
Future Vol, veh/h	17	127	165	163	144	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	18	132	172	170	150	11

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	670	156	161	0	-	0
Stage 1	156	-	-	-	-	-
Stage 2	514	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	422	890	1418	-	-	-
Stage 1	872	-	-	-	-	-
Stage 2	600	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	365	890	1418	-	-	-
Mov Cap-2 Maneuver	365	-	-	-	-	-
Stage 1	755	-	-	-	-	-
Stage 2	600	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.9	4	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1418	-	761	-	-
HCM Lane V/C Ratio	0.121	-	0.197	-	-
HCM Control Delay (s)	7.9	0	10.9	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.4	-	0.7	-	-

Intersection	
Intersection Delay, s/veh	5.6
Intersection LOS	A

Approach	EB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	179	283	279
Demand Flow Rate, veh/h	197	303	334
Vehicles Circulating, veh/h	224	14	166
Vehicles Exiting, veh/h	276	407	151
Ped Vol Crossing Leg, #/h	0	1	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	5.3	4.8	6.6
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	LR	LT	TR
Assumed Moves	LR	LT	TR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	197	303	334
Cap Entry Lane, veh/h	1098	1360	1165
Entry HV Adj Factor	0.909	0.934	0.834
Flow Entry, veh/h	179	283	279
Cap Entry, veh/h	998	1270	972
V/C Ratio	0.179	0.223	0.287
Control Delay, s/veh	5.3	4.8	6.6
LOS	A	A	A
95th %tile Queue, veh	1	1	1

Intersection	
Intersection Delay, s/veh	4.6
Intersection LOS	A

Approach	EB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	150	342	161
Demand Flow Rate, veh/h	153	348	164
Vehicles Circulating, veh/h	153	18	175
Vehicles Exiting, veh/h	186	288	191
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	4.2	4.9	4.4
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	LR	LT	TR
Assumed Moves	LR	LT	TR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	153	348	164
Cap Entry Lane, veh/h	1180	1355	1154
Entry HV Adj Factor	0.980	0.982	0.982
Flow Entry, veh/h	150	342	161
Cap Entry, veh/h	1157	1330	1133
V/C Ratio	0.130	0.257	0.142
Control Delay, s/veh	4.2	4.9	4.4
LOS	A	A	A
95th %tile Queue, veh	0	1	0

GPI Greenman-Pedersen, Inc.
Engineering and Construction Services

Intersection:	Baldwin Place Rd (CR 37) and Myrtle Ave (CR 71)		
Client:	Putnam County	GPI No.	2300070.00
Calculated By:	D. Creen	Date:	6/12/2024
Checked By:	M. Wieszchowski	Date:	6/13/2024

ADD INCREASED SIGNING

DESCRIPTION	TOTAL QUANTITY	UNIT	UNIT PRICE	TOTAL COST
STOP AHEAD SIGN	1	EA	$250	$250
FLASHING BEACONS	1	EA	$5,000	$5,000
WORK ZONE TRAFFIC CONTROL	1	LS	$1,000	$1,000
			ESTIMATED CONSTRUCTION COST (CONCEPTUAL)	**$6,250**
CONTIGENCY (20%)	1	LS	$1,250	$1,250
			FINAL TOTAL	**$7,500**

SINGLE LANE ROUNDABOUT (120 FT DIAMETER)

DESCRIPTION	TOTAL QUANTITY	UNIT	UNIT PRICE	TOTAL COST
SINGLE LANE ROUNDABOUT [1]	1	EA	$1,250,000	$1,250,000
ADDITONAL EARTHWORK (ABOVE AND BEYOND TYPICAL)	4,000	CY	$50	$200,000
UTILITY RELOCATION [2]	1	EA	$75,000	$0
STORMWATER AND TREATMENT [3]	1	LS	$100,000	$100,000
WETLAND MITIGATION	1	LS	$175,000	$175,000
WORK ZONE TRAFFIC CONTROL	1	LS	$200,000	$200,000
			ESTIMATED CONSTRUCTION COST (CONCEPTUAL)	**$1,925,000**
RIGHT OF WAY	0.177	ACRE	$500,000	$90,000
CONTIGENCY (20%)	1	LS	$385,000	$385,000
DESIGN AND INSPECTION (25%)	1	LS	$481,250	$485,000
			FINAL TOTAL	**$2,885,000**

[1] INCLUDES TYPICAL COST FOR PAVEMENT, CURB, EARTHWORK, DRAINAGE, LANDSCAPING, ETC., FOR A SINGLE LANE ROUNDABOUT.

[2] ELECTRIC AND GAS RELOCATIONS ARE ASSUMED NO COST FOR MUNICIPAL PROJECTS. WATER AND SEWER RELOCATIONS ARE NOT PRESENT.

[3] IMPACTS OVER 5,000 SF WITHIN DEP WATERSHEDS REQUIRE POST STORMWATER TREATMENT. $100,000 ALLOWANCE FOR EXTRA ROW OR WORK REQUIRED.

GPI

N

MYRTLE AVE (CR 71)

BALDWIN PLACE RD (CR 37)

RUSTIC RD

POTENTIAL WETLAND IMPACTS

0.132 ACRE ROW TAKING

POTENTIAL WETLAND IMPACTS

AHB

AFEE

ST

CW

20 0 20 40 60 80'

Putnam County Intersections | FIG L-3

Baldwin Place Rd (CR 37) at Myrtle Ave (CR 71)
Intersection Improvement Concept Sketch

GPI

Many Talents One Firm

gpinet.com