

TOWN OF WALLINGFORD NORTHROP ROAD STUDY

Prepared for:

SCRCOG

Town of Wallingford

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Town of Wallingford Northrup Road Study

Prepared for:
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This document has been prepared by SLR International Corporation (SLR). The material and data in this report were prepared under the supervision and direction of the undersigned.



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1. PROJECT OVERVIEW

This report presents an evaluation of Northrop Road. The study was initiated by the South Central Regional Council of Governments (SCRCOG) in partnership with the Town of Wallingford and the City of Meriden. The purpose of the study is to understand and identify existing issues and deficiencies related to the roadway's vertical and horizontal geometry, widths, drainage, and traffic; as well as safety conditions. These issues and deficiencies were then corrected through various roadway improvement alternatives.

The Northrop Road corridor covers approximately 1.35 miles, beginning to the south at its intersection with Route 68 (Barnes Road) in Wallingford, and continuing north alongside Interstate-91 (I-91) before terminating at its intersection with North Farms Road and Murdock Avenue in Meriden. Although spanning two towns, the majority of Northrop Road is situated within the Town of Wallingford. **Figure 1** illustrates the Northrop Road study area within the surrounding area context.



Northrop Road is conveniently located just west of I-91 and north of Route 68 on the Wallingford/Meriden town line, it runs north/south for half its length then east/west into Meriden and is classified by the Connecticut Department of Transportation (CTDOT) as an urban local roadway with a posted speed limit of 30 miles per hour (mph) throughout its entirety.

Northrop Road consists of a mix of agricultural, residential, commercial, and industrial land uses that provides direct access to Connecticut's State Highway System. Such access makes Northrop Road an attractive corridor for developers, businesses, and residences. Northrop Road is also home to the Town of Wallingford's school bus depot facility.

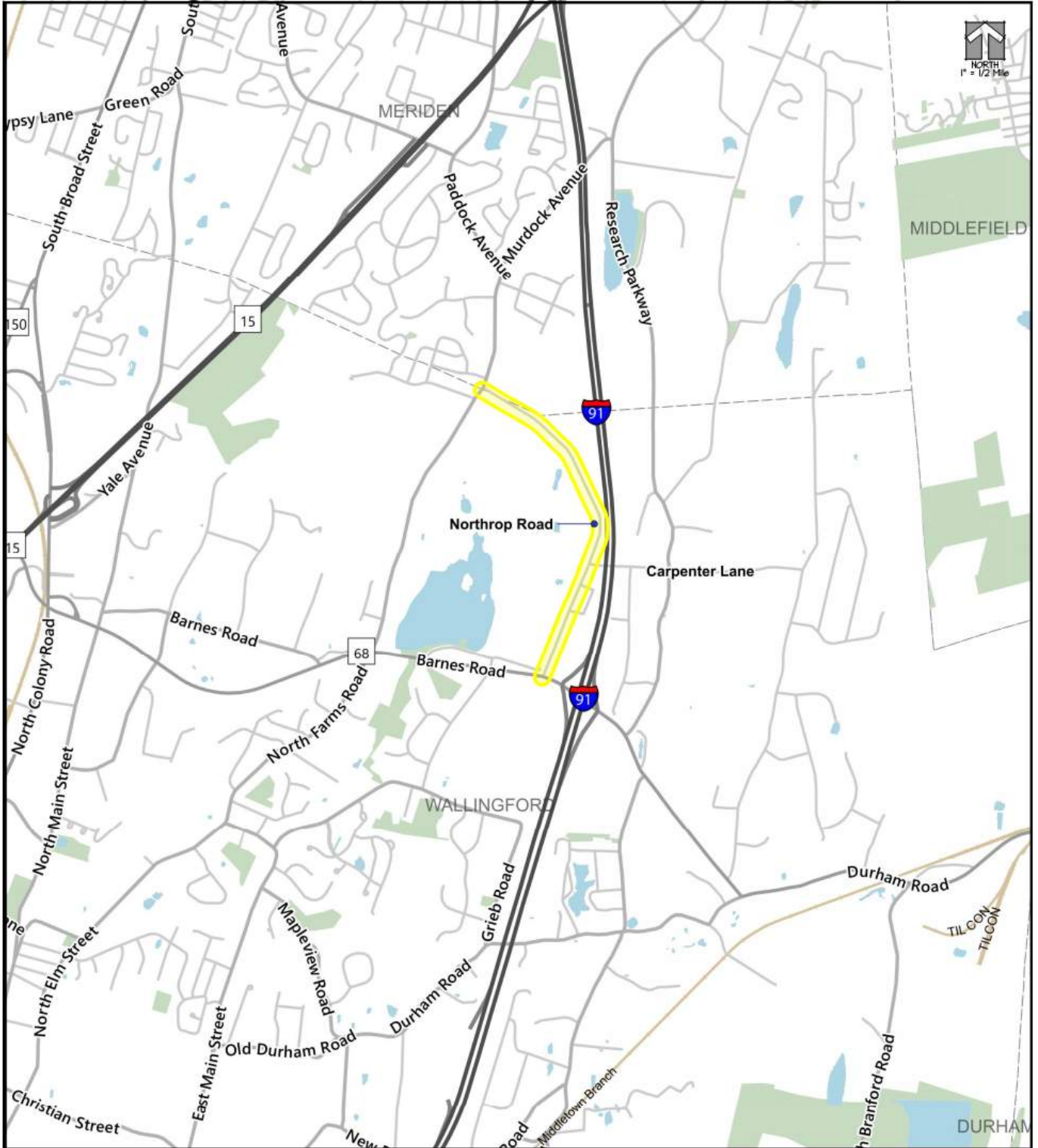


FIGURE 1: STUDY AREA LOCATION

**NORTHROP ROAD STUDY
EXISTING CONDITIONS ASSESSMENT**

NORTHROP ROAD
WALLINGFORD, CT



2. EXISTING CONDITIONS ASSESSMENT

To further gain an understanding of the Northrop Road corridor and the existing geometry and conditions, the SLR International Corporation (SLR) team compiled existing relevant study area data/reports such as Geographic Information System (GIS) mapping of the area, signal plans from CTDOT, off-site improvement plans for planned development projects, and recent traffic reports.

The SLR team supplemented the compiled information above by conducting a topographic and right-of-way survey of Northrop Road, for which a survey base map of the project area was created. Our team also conducted turning movement traffic counts during typical weekday morning and afternoon peak hours at the intersections of Northrop Road at Barnes Road, and Northrop Road at North Farms Road. In addition, 24-hour Automatic Traffic Recorder (ATR) counts were obtained along Northrop Road during a typical weekday to derive average and 85th percentile vehicles speeds and average daily traffic.



Equally important to gathering all the relevant and important data is the ability to correctly analyze it. The SLR team conducted a field investigation along Northrop Road to thoroughly assess existing corridor needs and deficiencies as relates to vertical and horizontal geometry, road width, utilities, mobility, safety, need to accommodate alternate travel modes, and other opportunities for the study area. Additionally, a review of existing horizontal and vertical curvature and associated sight

lines was conducted to identify substandard and problematic areas along the corridor.

The results of the field investigation along with the data collected and survey conducted will help to establish a framework upon which eventual recommendations can be developed. It is important to note that the existing conditions assessment is based on design standards stipulated in the CTDOT *Highway Design Manual* (HDM) as well as Town of Wallingford Engineering Standards.

2.1 ROADWAY CHARACTERISTICS

This section provides a general description of the physical roadway features (such as travel lane and shoulder widths, alignments, and grades) that characterize the Northrop Road corridor.

Northrop Road, starting from the south, intersects with Route 68 (Barnes Road) at a four-legged signalized intersection in the town of Wallingford. The Northrop Road approach (north leg) carries one exclusive left-turn lane and a combined through/right-turn travel lane directly across from the Miles Road approach (south leg) that carries one combined left/through travel lane and a single exclusive right-turn lane. The Route 68 (Barnes Road) eastbound approach carries one exclusive left-turn lane onto Northrop Road and

two through lanes while the westbound approach carries one exclusive left-turn lane, two through lanes, and one exclusive right-turn lane onto Northrop Road.

From its intersection with Route 68, Northrop Road continues north alongside I-91 to the east before heading west to a terminus at North Farms Road and Murdock Avenue, a three-legged unsignalized intersection in the city of Meriden. The Northrop Road approach is stop controlled and carries one single combined left, through, and right-turn travel lane, while the North Farms Road and Murdock Avenue approaches, running north/south, are free-flowing and carry one single combined travel lane.

Northrop Road between Route 68 and North Farms Road/Murdock Avenue is a two-lane roadway that varies from 20 feet to 30 feet in width, generally consisting of 11-foot travel lanes, no painted shoulders, a painted double yellow centerline separating the two travel lanes, and bituminous concrete lip curbing intermittently along both sides of the roadway. The majority of Northrop Road lacks alternative modes of transportation for pedestrians and cyclists. Sidewalks and bike lanes were not observed throughout the corridor besides 1,100 feet of concrete sidewalk to the north along the frontage of 1200 Northrop Road.



Looking north along Northrop Road prior to its intersection with Carpenter Lane

The alignment and grade of Northrop Road generally follow the natural topography of the area and are characterized by various horizontal and vertical curves flanked by long, straight sections of roadway with gradual grades in between. The terrain in the area can be characterized as “rolling” where natural slopes consistently rise above and fall below the roadway grade, and occasionally, steep slopes present some restriction to the desirable roadway alignment. Existing vertical and horizontal curves were evaluated against roadway standards obtained from CTDOT’s *HDM* 2003 Edition, and results can be found in **Table 3** in Section 2.4 Roadway Standards.

Within the town-owned right-of-way, flanking the side of the roadway are utility poles with overhead wires and “cobra-head” lighting at strategic locations to partially illuminate the roadway. These utility poles run along both sides of the road, alternating in sections for the entirety of the roadway. Other utilities along the corridor include a water main within the existing roadway with fire hydrants stemming from the main line behind the edge of the road. Accompanying the water main is a storm drainage system at various locations throughout the corridor that collects stormwater runoff with catch basins along the edge of the road. These collections of catch basins are generally located at the 600 Northrop Road driveway, McDonald Lane, Carpenter Lane, and along the northern end of Northrop Road. Most of the stormwater runoff throughout the remainder of the corridor is deposited roadside, where there is no curbing.

Northrop Road's proximity to Connecticut's State Highway System and diverse collection of land uses has served, and will continue to serve, as an attractive location for developers and businesses. During SLR's field visit, large trucks (WB-67) from commercial and industrial land uses along the northern end of Northrop Road were seen traveling south between Carpenter Lane and Route 68. Note that this section has been designated by the CTDOT Office of the State Traffic Administration (OSTA) as a No Thru-Truck route with existing "NO THRU TRUCKS" signs between these two roadways. The statutory definition of a through truck is one that has neither an origin nor a destination within the town that the road is in. Consequently, these would not be considered through trucks and therefore not subject to the through truck prohibition.

While Northrop Road has seen recent interest in the development of vacant parcels, much of the roadway lacks the characteristics desired to provide safe mobility for not only the industrial, commercial, and agricultural land uses but for residents that utilize the roadway as well.

2.2 TRAFFIC CRASH HISTORY

Traffic crash data made available by the Connecticut Crash Data Repository, hosted by the University of Connecticut (UConn), was evaluated for the entirety of the Northrop Road study corridor for the last 5 years, from April 1, 2017, through March 31, 2022. This data is summarized in **Table 1** by location, crash severity, and collision type. This information was used to determine if there are any sections of the roadway where an unusual pattern or frequency of collisions exists, and consequently, where roadway improvements may be required to address any identified deficiencies.

Table 1 Crash History Summary

Location	Type Of Collision										Crash Severity						
	Angle	Fixed-Object	Head-On	Pedestrian	Rear-End	Rear To Side	Rollover	Sideswipe, Opposite Direction	Sideswipe, Same Direction	Wildlife	Total	Fatality	Suspected Serious Injury	Suspected Minor Injury	Possible Injury	Property Damage Only	Total
Northrop Road at North Farms Road Intersection	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	1
Northrop Road between North Farms Road and Wallingford/Meriden Town Line	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	1	1
Northrop Road between Wallingford/Meriden Town Line and 1043 Northrop Road	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	1	1
Northrop Road along curve between 1043 Northrop Road and Carpenter Lane	1	3	-	-	-	-	-	-	-	-	4	-	-	1	1	2	4
Northrop Road at Carpenter Lane Intersection	1	1	-	-	-	-	-	-	-	-	2	-	-	-	-	2	2
Northrop Road between Carpenter Lane and Barnes Road (Route 68)	-	1	-	-	-	-	-	-	-	1	2	-	-	-	-	2	2
Northrop Road at Barnes Road (Route 68) Intersection	3	1	2	1	15	1	-	1	3	-	27	1	1	3	5	17	27
Grand Total	6	7	2	1	15	1	1	1	3	1	38	1	1	4	6	26	38

Source: Connecticut Crash Data Repository, April 1, 2017, through March 31, 2022.

Within the 5-year study period, crashes most often occurred at the signalized intersection of Northrop Road at Barnes Road (Route 68). Intersections tend to have more crashes than roadway segments between intersections due to the number of potential conflict points that exist at intersections. Signalized intersections tend to have many rear-end and angle-type crashes; in the case of Northrop Road at Barnes Road, rear-end crashes were the most prevalent.

Nearly all eight crashes that did not occur at an intersection along the Northrop Road study corridor were single-vehicle crashes and were the result of motorists maneuvering around an animal in the roadway or snowy/icy roadway conditions. Four of these crashes occurred along the horizontal curve between 1043 Northrop Road and Carpenter Lane. The geometric characteristics of the roadway, such as the minimal shoulder and roadside clear zone available, in combination with motorists' speeds being higher than appropriate, may have contributed to these single-vehicle crashes.

A pedestrian was hit and injured by a motorist at the Barnes Road and Northrop Road intersection during the 5-year period. The collision occurred during dark, unlighted conditions when the pedestrian was crossing the eastern leg of Barnes Road, and a motorist was turning left from Northrop Road onto Barnes Road. There are no pedestrian crossing locations/facilities along Barnes Road within at least 1 mile of the Northrop Road intersection. No other crashes involving pedestrians were reported within the 5-year period. There was no bicycle involved crashes identified.

One fatality resulting from a single-vehicle crash at the Barnes Road and Northrop Road intersection was reported within the study area during the 5-year period. The crash happened during the early morning hours, and the roadway was reported to be unlighted with wet pavement conditions. A motorcyclist travelling westbound along Barnes Road veered to the right, off the paved roadway along a slight curve. He struck the guardrail along the northwestern corner of the intersection and was thrown from his vehicle. Information about contributing factors to the fatal crash was not available.

Throughout the study area, there were no crashes involving trucks reported along Northrop Road.

2.3 TRAFFIC CHARACTERISTICS

An understanding of the existing traffic characteristics of Northrop Road was developed using standard traffic data collection techniques. Three Automatic Traffic Recorders (ATRs) were placed along Northrop Road that recorded traffic volume, vehicle classification, and speed data on Wednesday, March 30, 2022. The ATRs were placed at the following locations: between Barnes Road and Carpenter Lane, labelled as "Location A"; along the roadway's horizontal curvature north of Carpenter Lane, "Location B"; and near the Wallingford-Meriden town line, "Location C".

The traffic information is summarized in **Table 2** by location, direction along Northrop Road, and time of day (weekday morning peak hour, weekday afternoon peak hour, and weekday total), where applicable. The first section of the table shows the number of vehicles recorded at that location, followed by the portion of those vehicles that were classified as buses, and the percentage of trucks. The last section in the table shows the average and 85th percentile speeds recorded.

Table 2 Traffic Characteristics Summary

Location A (Between Barnes Road and Carpenter Lane)				Location B (Along Curve North of Carpenter Lane)				Location C (Near Wallingford-Meriden Town Line)			
Vehicular Volumes											
	A.M.	P.M.	Daily		A.M.	P.M.	Daily		A.M.	P.M.	Daily
Northbound	191	180	1,861	Northbound	75	135	1,011	Northbound	78	132	998
Southbound	116	195	1,563	Southbound	84	79	826	Southbound	81	78	819
Both Directions	307	375	3,424	Both Directions	159	214	1,837	Both Directions	159	210	1,817
Percent Buses											
	A.M.	P.M.	Daily		A.M.	P.M.	Daily		A.M.	P.M.	Daily
Northbound	6%	5%	5%	Northbound	8%	4%	5%	Northbound	8%	4%	5%
Southbound	3%	2%	2%	Southbound	3%	2%	3%	Southbound	3%	2%	3%
Both Directions	5%	3%	4%	Both Directions	6%	3%	4%	Both Directions	6%	3%	4%
Percent Trucks											
	A.M.	P.M.	Daily		A.M.	P.M.	Daily		A.M.	P.M.	Daily
Northbound	12%	11%	12%	Northbound	17%	11%	14%	Northbound	15%	9%	11%
Southbound	13%	10%	11%	Southbound	15%	12%	13%	Southbound	16%	12%	13%
Both Directions	12%	11%	11%	Both Directions	16%	12%	14%	Both Directions	15%	11%	12%
Vehicular Speeds (mph)											
	Average	85th Percentile		Average	85th Percentile		Average	85th Percentile			
Northbound	35.6	44.0	Northbound	35.0	41.0	Northbound	38.7	44.9			
Southbound	37.8	46.5	Southbound	34.7	41.1	Southbound	41.5	48.6			
Both Directions	36.6	44.9	Both Directions	34.9	41.0	Both Directions	40.0	47.0			

The ATR data indicated the corridor peak hours were generally from 7:30 a.m. to 8:30 a.m. for the morning and 4:15 p.m. to 5:15 p.m. for the afternoon. Traffic volumes were found to be the highest along the southern portion of Northrop Road south of Carpenter Lane. Within this section, there was a northbound orientation in the morning and generally balanced flow in the afternoon. North of Carpenter Lane, the traffic was generally balanced in the morning and slightly oriented northbound in the afternoon.

The percentage of trucks ranged between 9 and 17 percent depending on the location, direction of travel and time period. Buses made up around 5 percent of the traffic volumes on Northrop Road, varying between 2 and 8 percent, again depending on direction, time period, and road segment.

Despite Northrop Road having a posted speed limit of 30 mph throughout its entirety, the 85th percentile motorist speeds were found to be at least 11 mph higher. The 85th percentile speed is the speed at which 85 percent of the traffic travels at or below and is typically used as a measuring stick for certain roadway design criteria. Along the horizontal curvature of the road at Location B, the 85th percentile speeds were the lowest of the three locations at approximately 41 mph. The highest speeds were found to be at Location C near the town line where the 85th percentile speed was 47 mph. This is due to the straightaway and widened section of Northrop Road within the city of Meriden, which allows motorists to feel safe driving at a higher speed.

Manual turning movement counts at the intersection of Northrop Road and North Farms Road/Murdock Avenue were also conducted on Wednesday, March 30, 2022, from 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m. to capture peak commuter traffic. The weekday morning and afternoon peak hours for the intersection were found to be from 7:30 a.m. to 8:30 a.m. and 4:30 p.m. to 5:30 p.m., respectively. Traffic volumes at the intersection of Northrop Road and Barnes Road were available from a traffic impact study produced by Solli Engineering for the approved 850 Murdock Avenue project. The traffic counts were initially conducted in September 2020, and were adjusted and approved by the CTDOT Bureau of Policy and Planning. **Figure 2** shows these existing peak-hour traffic volumes in addition to a summary of the key traffic characteristics measured by ATR.

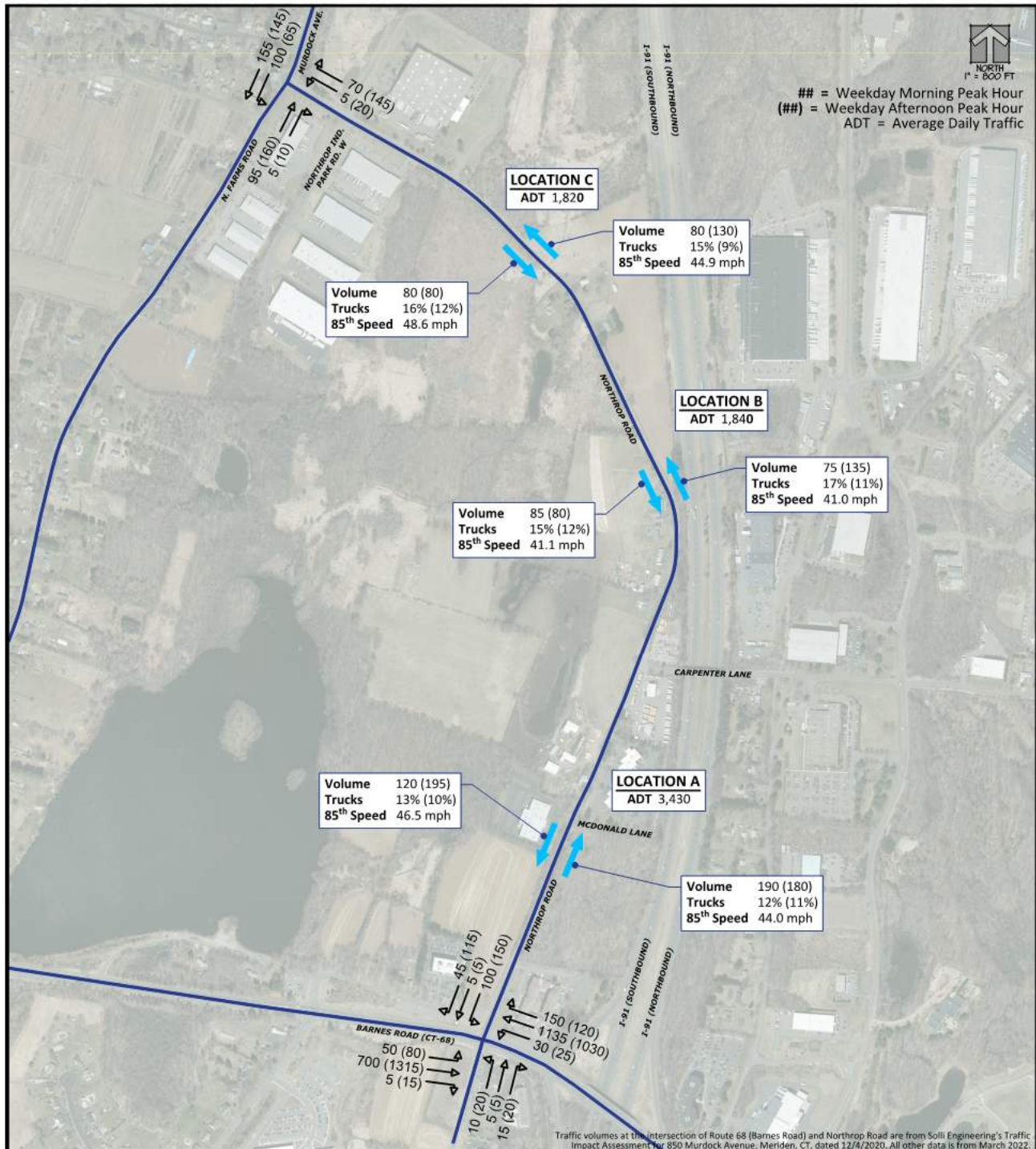


FIGURE 2: SUMMARY OF TRAFFIC CHARACTERISTICS

**NORTHROP ROAD STUDY
 EXISTING CONDITIONS ASSESSMENT**

NORTHROP ROAD
 WALLINGFORD, CT



2.4 ROADWAY STANDARDS

Northrop Road is classified by CTDOT as an urban local roadway with a posted speed limit of 30 mph through its entirety. This functional classification serves to determine the minimum geometric standards for the corridor that are used as a basis for evaluating the existing roadways and as a basis for developing improvement recommendations. These minimum roadway standards include travel and turning lane widths, shoulder widths, horizontal curvature, vertical curvature, and sight distances.

Table 3 and **Table 4** summarize the horizontal and vertical roadway design standards for Northrop Road that were obtained from CTDOT's *HDM* 2003 Edition. Standard design values for Northrop Road are provided for a speed of 25 mph, a current posted speed of 30 mph and an approximate 85th percentile speed of 45 mph.

Using a combination of aerial photographs, field observations, field measurements, and surveyed base map, SLR assessed the existing geometric characteristics of Northrop Road to determine any existing roadway deficiencies. A summary of deficiencies is provided in **Table 3** and **Table 4**, and **Figure 3**.



Looking north along Northrop Road at 1043 Northrop Road

Table 3 Horizontal Geometry Design Criteria

Design Element		Required for 25 mph	Required for 30 mph (Posted Speed)	Required for 45 mph (Design Speed)	Existing	Comments
Travel Lane Width (CTDOT HDM – Figure 2-3I)		10 ft - 11 ft	10 ft - 11 ft	10 ft - 11 ft	10 ft - 11 ft	-
Shoulder Width (CTDOT HDM – Figure 2-3I)		2 ft - 4 ft	2 ft - 4 ft	2 ft - 4 ft	0 ft	No shoulders along existing roadway
Cross Slope Travel Lane (CTDOT HDM – Figure 2-3I)		1.5% - 2% (1.5% - 3% w. curbing)	1.5% - 2% (1.5% - 3% w. curbing)	1.5% - 2% (1.5% - 3% w. curbing)	1.5% - 4%	-
Cross Slope Shoulder (CTDOT HDM – Figure 2-3I)	(W<4 ft)	Same as adjacent travelway	Same as adjacent travelway	Same as adjacent travelway	Same as adjacent travelway	-
	(W≥4 ft)	4% - 6%	4% - 6%	4% - 6%	NA	-
Minimum Radius (e=4%) (CTDOT HDM – Figure 2-5A)		145 ft	280 ft	725 ft	550 ft min. (See comment)	Ex. Curve at STA. 32+70 = 600 ft Ex. Curve at STA. 41+47 = 550 ft Ex. Curve at STA. 45+06 = 600 ft Ex. Curve at STA. 60+35 = 600 ft
Superelevation Rate (emax) (CTDOT HDM – Figure 8-3C)		4%	4%	4%	4%	-
Intersection Sight Distance (CTDOT HDM – Figure 11-2C)	Cars	280 ft	335 ft	500 ft	400 ft (L) 375 ft (R)	Substandard for 45 mph Sufficient for 30 mph Sufficient for 25 mph
	S-U Trucks	350 ft	420 ft	630 ft	400 ft (L) 375 ft (R)	Substandard for 45 mph Substandard for 30 mph Sufficient for 25 mph
	Semitrailers	425 ft	510 ft	765 ft	400 ft (L) 375 ft (R)	Substandard for 45 mph Substandard for 30 mph Substandard for 25 mph

Table 4 Vertical Geometry Design Criteria

Design Element	Required for 25 mph	Required for 30 mph (Posted Speed)	Required for 45 mph (Design Speed)	Existing	Comments
Crest Vertical Curve at STA. 26+25					
Stopping Sight Distance (+4.75%) (CTDOT HDM – Figure 7-1A)	147 ft	192 ft	340 ft	205 ft	Substandard for 45 mph
Maximum Grade (CTDOT HDM – Figure 2-3I and Figure 2-3D)	13%	12%	11%	4.75%	-
Minimum Grade (CTDOT HDM – Figure 2-3D)	0.5%	0.5%	0.5%	1.0%	-
K Value (4.75%) (CTDOT HDM – Figure 9-3C and Figure 2-6A)	11	17	54	13	Substandard for 45 and 30 mph
Sag Vertical Curve at STA. 28+82					
Headlight Sight Distance (-10.0%) (CTDOT HDM – Figure 7-1A)	175 ft	235 ft	440 ft	103 ft.	Substandard for 45, 30 and 25 mph
Maximum Grade (CTDOT HDM – Figure 2-3I and Figure 2-3D)	13%	12%	11%	10%	-
Minimum Grade (CTDOT HDM – Figure 2-3D)	0.5%	0.5%	0.5%	1.0%	-
K Value (-10%) (CTDOT HDM – Figure 9-3C and Figure 2-6A)	14	20	44	14	Substandard for 45 and 30 mph
Crest Vertical Curve at STA. 29+76					
Stopping Sight Distance (10.0%) (CTDOT HDM – Figure 7-1A)	140 ft	180 ft	320 ft	215 ft.	Substandard for 45 mph
Maximum Grade (CTDOT HDM – Figure 2-3I and Figure 2-3D)	13%	12%	11%	10.0%	-
Minimum Grade (CTDOT HDM – Figure 2-3D)	0.5%	0.5%	0.5%	6.75%	-
K Value (10.0%) (CTDOT HDM – Figure 9-3C and Figure 2-6A)	9	15	48	8	Substandard for 45, 35 and 25 mph

Design Element	Required for 25 mph	Required for 30 mph (Posted Speed)	Required for 45 mph (Design Speed)	Existing	Comments
Crest Vertical Curve at STA. 31+15					
Stopping Sight Distance (6.75%) (CTDOT HDM – Figure 7-1A)	145 ft	185 ft	330 ft	203 ft	Substandard for 45 mph
Maximum Grade (CTDOT HDM – Figure 2-3I and Figure 2-3D)	13%	12%	11%	6.75%	-
Minimum Grade (CTDOT HDM – Figure 2-3D)	0.5%	0.5%	0.5%	3.0%	-
K Value (6.75%) (CTDOT HDM – Figure 9-3C and Figure 2-6A)	10	16	51	13	Substandard for 45 and 30 mph
Crest Vertical Curve at STA. 32+31					
Stopping Sight Distance (4.0%) (CTDOT HDM – Figure 7-1A)	145 ft	190 ft	340 ft	125 ft	Substandard for 45, 30 and 25 mph
Maximum Grade (CTDOT HDM – Figure 2-3I and Figure 2-3D)	13%	12%	11%	4.0%	-
Minimum Grade (CTDOT HDM – Figure 2-3D)	0.5%	0.5%	0.5%	3.0%	-
K Value (4.0%) (CTDOT HDM – Figure 9-3C and Figure 2-6A)	10	17	54	9	Substandard for 40, 30 and 25 mph
Sag Vertical Curve at STA. 33+35					
Headlight Sight Distance (-4.0%) (CTDOT HDM – Figure 7-1A)	160 ft	210 ft	385 ft	185 ft	Substandard for 45 and 30 mph
Maximum Grade (CTDOT HDM – Figure 2-3I and Figure 2-3D)	13%	12%	11%	-4.0%	-
Minimum Grade (CTDOT HDM – Figure 2-3D)	0.5%	0.5%	0.5%	-0.10%	-
K Value (-4.0%) (CTDOT HDM – Figure 9-3C and Figure 2-6A)	14	20	44	25	Substandard for 45 mph

Design Element	Required for 25 mph	Required for 30 mph (Posted Speed)	Required for 45 mph (Design Speed)	Existing	Comments
Crest Vertical Curve at STA. 42+71					
Stopping Sight Distance (3.45%) (CTDOT HDM – Figure 7-1A)	150 ft	190 ft	345 ft	290 ft	Substandard for 45 mph
Maximum Grade (CTDOT HDM – Figure 2-3I and Figure 2-3D)	13%	12%	11%	3.45%	-
Minimum Grade (CTDOT HDM – Figure 2-3D)	0.5%	0.5%	0.5%	2.40%	-
K Value (3.45%) (CTDOT HDM – Figure 9-3C and Figure 2-6A)	10	17	55	63	-
Crest Vertical Curve at STA. 45+89					
Stopping Sight Distance (9.5%) (CTDOT HDM – Figure 7-1A)	140 ft	180 ft	320 ft	140 ft	Substandard for 45, 30 mph
Maximum Grade (CTDOT HDM – Figure 2-3I and Figure 2-3D)	13%	12%	11%	9.5%	-
Minimum Grade (CTDOT HDM – Figure 2-3D)	0.5%	0.5%	0.5%	-2.40%	-
K Value (9.5%) (CTDOT HDM – Figure 9-3C and Figure 2-6A)	9	15	48	11	Substandard for 45 and 30 mph
Sag Vertical Curve at STA. 49+37					
Headlight Sight Distance (-9.5%) (CTDOT HDM – Figure 7-1A)	175 ft	230 ft	435 ft	155 ft	Substandard for 45, 30 and 25 mph
Maximum Grade (CTDOT HDM – Figure 2-3I and Figure 2-3D)	13%	12%	11%	-9.5%	-
Minimum Grade (CTDOT HDM – Figure 2-3D)	0.5%	0.5%	0.5%	-0.25%	-
K Value (-9.5%) (CTDOT HDM – Figure 9-3C and Figure 2-6A)	14	25	88	26	Substandard for 45 mph

Design Element	Required for 25 mph	Required for 30 mph (Posted Speed)	Required for 45 mph (Design Speed)	Existing	Comments
Crest Vertical Curve at STA. 53+36					
Stopping Sight Distance (4.10%) (CTDOT HDM – Figure 7-1A)	145 ft	190 ft	340 ft	160 ft	Substandard for 45 and 30 mph
Maximum Grade (CTDOT HDM – Figure 2-3I and Figure 2-3D)	13%	12%	11%	4.10%	-
Minimum Grade (CTDOT HDM – Figure 2-3D)	0.5%	0.5%	0.5%	2.0%	-
K Value (4.10%) (CTDOT HDM – Figure 9-3C and Figure 2-6A)	10	17	54	16	Substandard for 45 and 30 mph
Sag Vertical Curve at STA. 58+34					
Headlight Sight Distance (-4.10%) (CTDOT HDM – Figure 7-1A)	160 ft	210 ft	385 ft	240 ft	Substandard for 45 mph
Maximum Grade (CTDOT HDM – Figure 2-3I and Figure 2-3D)	13%	12%	11%	-4.10%	-
Minimum Grade (CTDOT HDM – Figure 2-3D)	0.5%	0.5%	0.5%	1.80%	-
K Value (-4.10%) (CTDOT HDM – Figure 9-3C and Figure 2-6A)	14	20	44	47	-
Crest Vertical Curve at STA. 59+65					
Stopping Sight Distance (3.60%) (CTDOT HDM – Figure 7-1A)	150 ft	190ft	345 ft	150 ft	Substandard for 45 and 30 mph
Maximum Grade (CTDOT HDM – Figure 2-3I and Figure 2-3D)	13%	12%	11%	3.60%	
Minimum Grade (CTDOT HDM – Figure 2-3D)	0.5%	0.5%	0.5%	1.8%	
K Value (3.60%) (CTDOT HDM – Figure 9-3C and Figure 2-6A)	11	17	55	9	Substandard for 45, 30 and 25 mph

Design Element	Required for 25 mph	Required for 30 mph (Posted Speed)	Required for 45 mph (Design Speed)	Existing	Comments
Sag Vertical Curve at STA. 61+96					
Headlight Sight Distance (-3.60%) (CTDOT HDM – Figure 7-1A)	160 ft	210 ft	385 ft	248 ft	Substandard for 45 mph
Maximum Grade (CTDOT HDM – Figure 2-3I and Figure 2-3D)	13%	12%	11%	-3.60%	-
Minimum Grade (CTDOT HDM – Figure 2-3D)	0.5%	0.5%	0.5%	-3.25%	-
K Value (-3.60%) (CTDOT HDM – Figure 9-3C and Figure 2-6A)	14	20	44	49	-
Crest Vertical Curve at STA. 66+33					
Stopping Sight Distance (4.70%) (CTDOT HDM – Figure 7-1A)	145 ft	190 ft	340 ft	205 ft	Substandard for 45 mph
Maximum Grade (CTDOT HDM – Figure 2-3I and Figure 2-3D)	13%	12%	11%	3.60%	-
Minimum Grade (CTDOT HDM – Figure 2-3D)	0.5%	0.5%	0.5%	2.65%	-
K Value (4.70%) (CTDOT HDM – Figure 9-3C and Figure 2-6A)	10	17	54	32	Substandard for 45 mph

2.5 IDENTIFIED ROADWAY DEFICIENCIES

As shown in Table 3 and Table 4, the geometric deficiencies along the study corridor include substandard horizontal curvature (minimum radius) at four locations along Northrop Road for a design speed of 45 mph. Horizontal curvature should provide for safe and continuous operation of vehicles at a uniform design speed. Although the horizontal curvature is substandard for the design speed of 45 mph in the four noted locations, the radius of these curves exceeds the minimum standard for the posted speed of 30 mph (295 feet) and a speed of 25 mph; therefore, these deficiencies will not necessarily warrant roadway realignment to increase radii. Given the horizontal curvature deficiency for the design speed of 45 mph, the need for mitigating measures such as advanced warning signage in these areas will be investigated.

Stopping Sight Distance (SSD) along one crest vertical curve, and Headlight Sight Distance (HSD) along two sag vertical curves throughout the corridor are substandard for the design speed of 45 mph, posted speed of 30 mph and for 25 mph. Furthermore, SSD along three crest vertical curves, and HSD along one sag vertical curves, are substandard for the design speed of 45 mph and posted speed of 30 mph.



Looking south along Northrop Road by the school bus depot

SSD serves as the principal concern in the evaluation of crest vertical curves, and

HSD serves as the principal concern in the evaluation of sag vertical curves to assure safe and efficient operation of a vehicle. SSD is the sum of two distances: the distance a vehicle travels from the instant the driver sights an object necessitating a stop to the instant the brakes are applied (brake reaction distance), and the distance required to stop the vehicle from the instant brake application begins (braking distance). HSD is equivalent to SSD but takes into consideration the distance of the road available under the illumination of head lights of vehicles during nighttime driving along a sag vertical curve.

Adequate SSD and HSD should be provided on all crest and sag vertical curves to ensure a driver's ability to see an upcoming object within the roadway. Substandard SSD and HSD in conjunction with substandard K-values (abruptness of the vertical grade change) at these three crest vertical curves may warrant a modification to the vertical roadway geometry to provide for safer driving conditions.

An evaluation of K-values determined that three crest vertical curves contain substandard K-values for the design speed of 45 mph, posted speed of 30 mph, and 25 mph; while four crest vertical curves had a substandard K-value for both the design speed of 45 mph and posted speed limit of 30 mph.

K-values at sag vertical curves were also evaluated, and it was determined that none of the sag vertical curves contained a substandard K-value for the design speed of 45 mph, posted speed of 30 mph, and 25 mph; while one sag vertical curves had a substandard K-value for both the design speed of 45 mph and

posted speed limit of 30 mph. These substandard K-values for the crest and sag vertical curves as shown in Table 4 need careful evaluation relative to corrective and mitigating measures. Lengthening of these curves, or reduction in the algebraic difference between the two tangent grades to reduce the abruptness in vertical grade change, should be evaluated to ensure the minimum K-value is met.

Restricted intersection sight distances (ISD) from unsignalized intersections in the corridor also need careful evaluation relative to corrective or mitigating measures. Given the higher speeds and crest vertical curves along the corridor, motorists entering from side streets need as much sight distance as possible to perceive gaps in oncoming traffic. The sight distance available from a vehicle stopped at Carpenter Lane looking left is approximately 400 feet and 375 feet looking right along Northrop Road. With a speed of 25 mph, a posted speed limit of 30 mph, and a design speed of 45 mph, the ISD at this intersection is substandard for cars entering a 45-mph zone (minimum 500 feet) but sufficient for a 30-mph zone (minimum 335 feet) and a 25-mph zone (minimum 280 feet), substandard for single-unit trucks entering both a 45-mph zone (minimum 630 feet) and a 30-mph zone (minimum 420 feet) but sufficient for a 25-mph zone (minimum 350 feet), and substandard for semitrailers entering a 45-mph zone (minimum 765 feet) a 30-mph zone (minimum 510 feet) and a 25-mph zone (minimum 425 feet).

During SLR's field investigation, it was noted that the limiting factor for ISD looking to the left was a crest vertical curve along the roadway and overgrown vegetation for ISD looking to the right.

Northrop Road measures approximately 22 to 30 feet wide throughout its entirety, with no available shoulder on either side of the roadway. With no available shoulders, the roadway is considered substandard in accordance with the requirements in the HDM based on roadway classification. Opportunities for the narrowing of travel lanes along Northrop Road should be evaluated to provide adequate shoulder width, which will serve to improve the safety, capacity, and maintenance of the roadway.

Upon completion of SLR's evaluation of the existing conditions along Northrop Road and determination of roadway deficiencies it is recommended to reduce the speed limit to 25 mph and implement traffic calming techniques rather than building up to the existing infrastructure which promotes a travel speed of 45 mph. The philosophy of traffic calming will prioritize the safety and well-being of all roadway users while introducing the principles of speed reduction and safety enhancements.

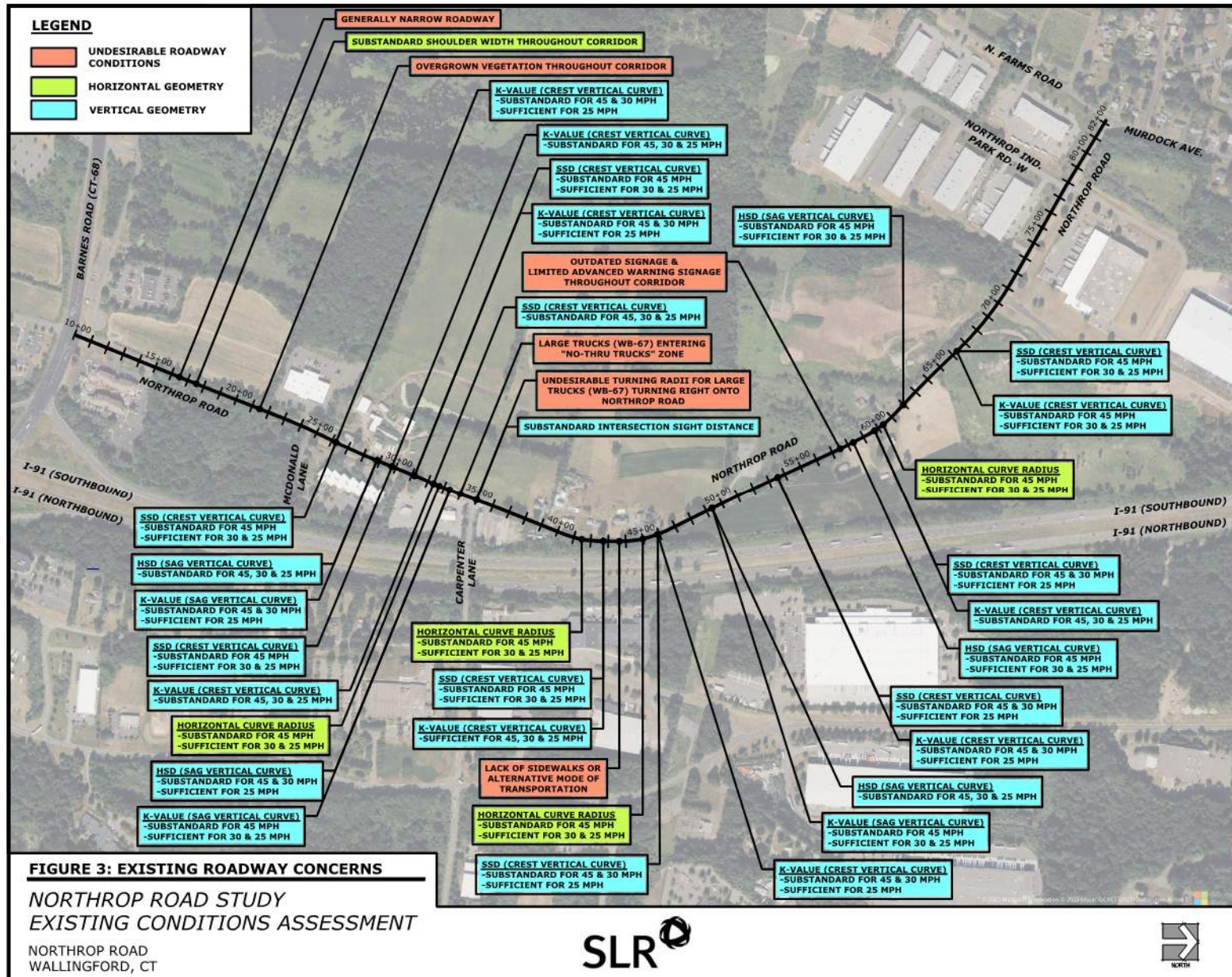
2.6 UNDESIREABLE ROADWAY CONDITIONS

In addition to the geometric deficiencies identified, there are other conditions that are not necessarily considered substandard or deficient but were identified through our existing conditions assessment to be undesirable. These are shown in Figure 3 and include the following:

- Outdated signage and limited advanced warning signage
- Overgrown vegetation limiting sight distance
- Lack of sidewalks or alternative mode of transportation
- Generally narrow roadway for expanding roadway usage, including larger trucks
- Large trucks (WB-67) entering the “No Thru-Trucks” zone, south of Carpenter Lane
- Large trucks (WB-67) encroaching into the oncoming Northrop Road southbound travel lane when turning right from Carpenter Lane, combined with deficient ISD and the Town of Wallingford’s school bus depot facility parking lot, can cause severe issues for motorists navigating this intersection.



Looking north along Northrop Road in the vicinity of 1102 Northrop Road



2.7 TRAFFIC CAPACITY ANALYSIS

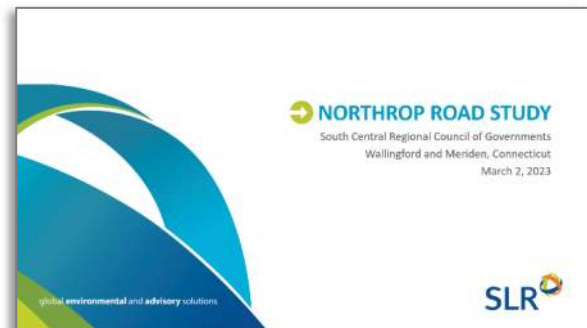
The existing traffic volumes at the study intersections were evaluated by means of *Highway Capacity Software* (HCS) and *Synchro* software, which use the methodologies of the *Highway Capacity Manual*. The quality of traffic operations is expressed as a level of service (LOS), a qualitative indicator directly related to delay and inconvenience to motorists, ranging from designation A through F. LOS A through LOS D during peak hours are often deemed acceptable in many communities while LOS E and LOS F signify higher levels of delay to road users. A more detailed explanation of LOS and the analysis output sheets are provided in the Appendix.

The LOS results of the *HCS* analysis, which was conducted for the unsignalized, two-way-stop-controlled intersection of Northrop Road at North Farms Road/Murdock Avenue, showed that the stop approach as well as the Murdock Avenue left-turn lane onto Northrop Road both operate at favorable LOS during the weekday morning and afternoon peak hours (LOS A and LOS B). Maximum vehicle queueing was reported to be typically only one car length. These factors indicate the roadway capacity is sufficient to handle the existing traffic volumes without causing excessive motorist delays. The traffic impact study produced by Solli Engineering for the approved 850 Murdock Avenue project also analyzed the signalized intersection of Barnes Road at Northrop Road and determined that the intersection operates at an overall LOS B during the morning and afternoon peak hours. During the morning and afternoon peak hours, each lane group movement (for example, each of the Northrop Road southbound lanes, the Barnes Road through lanes, the turn lanes, etc.) was reported to operate at LOS D or better, indicating that traffic capacity is sufficient, and operations are at a desirable congestion level for peak-hour conditions.

3. PUBLIC ENGAGEMENT

A public information meeting was held on March 2, 2023, at the Parks and Recreation Department in Wallingford. The project was presented to around fifteen Northrop Road residents and other interested members of the public, and their feedback was collected to incorporate into the study and guide improvement recommendations.

Safety was the major theme members of the public emphasized to the project team. Some Northrop Road families have called the corridor home for generations and have watched it change over time. While Northrop Road was once a gravel, slowly travelled roadway, today it is paved and can accommodate motorist speeds well above the current posted speed limit of 30 mph, as corroborated by the speed data collected as part of this study.



3.1 SUMMARY OF COMMUNITY FEEDBACK

Community members outlined the following concerns and objectives that would be important to address through this process and suggested the accompanying methods in **Table 5**. Throughout the meeting, the project team emphasized that all concepts presented were *not* final and can be added to, modified, or discarded. The public agreed that slowing traffic down and implementing traffic calming were the main priorities, and they did not object to any particular recommendation that the project team had come forth with.

Table 5 Summary of Community Feedback

Concern	Objective	Methods Discussed
High motorist speeds	Reduce motorist speeds	<ul style="list-style-type: none"> • Law enforcement • Speed humps/tables • Lane narrowing • Medians • Signage • Traffic control • Raised intersection at Carpenter Lane
Inadequate roadway geometry, especially at curves	Improve roadway geometry without taking of private property for widening	<ul style="list-style-type: none"> • Vertical geometry improvements • Horizontal geometry improvements • Shoulder maintenance
Inadequate warning signage	Install the appropriate signage and clarify process to request signage	<ul style="list-style-type: none"> • Illuminated stop signs to increase visibility and compliance • Wildlife/deer warning signs

Other topics discussed included the process for requesting new or replacement signage from the Town, through-truck prohibitions, and the Signal Warrant process. These are discussed in some detail below.

3.2 NO THRU TRUCKS DESIGNATION

One of the community's concerns was the increased number of trucks/tractor trailers travelling Northrop Road as industrial development has increased along the northern segment of the corridor. A "No Thru Trucks" zone is posted along Northrop Road from Barnes Road to Carpenter Lane. According to the CTDOT Office of State Traffic Administration (OSTA): "A 'Thru Truck' is a truck which travels from a point outside of the limits of a city, town, or borough in Connecticut through such city, town, or borough without any scheduled stop in such locality. Any truck originating or having a destination within a city, town, or borough where any through truck prohibition has been established is not subject to such prohibition within that city, town, or borough where the truck originates or has a destination within." This designation is different from a "No Trucks" designation, which prohibits all trucks from the use of a segment of roadway. Thus, trucks with either an origin or destination within Wallingford are not prohibited from using Northrop Road.



Looking north along Northrop Road from Barnes Road. Source: Google



Looking south along Northrop Road from Carpenter Lane

3.3 TRAFFIC SIGNAL WARRANTS

During the public outreach meeting, community members asked about installing a traffic signal at the Carpenter Lane intersection. SLR responded that the need for a signal is based on a study or “warrant” as described in the *Manual on Uniform Traffic Control Devices (MUTCD)*, Chapter 4C. The MUTCD is what dictates the national requirements and guidelines for traffic control. The pertinent sections of this manual have been included in Appendix A.



Carpenter Lane at Northrop Road

The MUTCD has nine warrants of which at least one must be met to determine whether signalized control should be considered for an intersection. The first four warrants require a traffic volume threshold to be met for a particular duration of the day. It was determined, based on a review of the traffic volume information recorded along Northrop Road, that traffic volumes near Carpenter Lane are not high enough to meet the warrants’ thresholds. The remaining five warrants are not applicable to this location as they concern school crossings, coordinated signal systems, crash experience (of which two “fender-bender”-type crashes over the last five years showed no patterns), roadway networks, and at-grade rail crossings. Therefore, a traffic signal is not warranted. Operations are expected to be acceptable under all-way-stop control. The MUTCD pages relevant to this matter are included in the Appendix.

4. CORRIDOR IMPROVEMENT RECOMMENDATIONS AND PROBABLE COSTS

SLR developed improvement recommendations and concepts for the Northrop Road corridor that are consistent with the goals and objectives for transportation and land use throughout the corridor and respond to the needs and deficiencies that were identified through the existing conditions assessment and shared by the community at the public engagement meeting.

4.1 CORRIDOR IMPROVEMENT RECOMMENDATIONS

Many of the recommendations are improvements that can be accomplished in the near term, in a relatively short time frame, at a relatively low cost, and with minor impacts. Some recommendations are considered mid-term improvements that may require a slightly longer time frame (perhaps some regulatory requirements that take some time or complicated design issues, for example), and some are considered long-term that may require a longer time frame, additional funding sources, and perhaps impacts to existing facilities. The recommendations presented in this section detail the transportation improvement opportunities along the Northrop Road corridor and suggest a strategy for implementation with construction cost estimates.

In general, the improvement recommendations aim to provide a safer corridor for all as they pertain to the horizontal geometric design including reducing vehicular speeds, addressing sight distance deficiencies, updating pedestrian crossing accommodations and providing appropriate turning radii and advanced warning signage. As described in Section 3, Public Engagement, public support to address safety-related facility issues was evident at the public meeting held in March 2023. Recommendations focused on the vertical geometry address specific vehicular safety needs along the corridor with a focus on the re-design of vertical curves to meet design criteria for a desired posted speed limit of 25 mph.

Roadway Improvement Recommendation Plans can be found in Appendix B.

4.2 OPINION OF PROBABLE COSTS

Planning-level construction cost estimates for the various improvement recommendations described in the following section were developed in accordance with CTDOT guidelines for preliminary cost estimating dated April 2022. The information in this section is intended to help guide the prioritization and programming of these projects as the municipalities and SCRCOG pursue improvements to the Northrop Road corridor. Table 6, Table 7, and Table 8 present a summary of the estimated construction costs for various components of the improvement recommendations.

The cost estimates assume the following conditions:

- Roadway widening will be accomplished by providing full-depth, bituminous concrete pavement structure outside the limits of the existing pavement.

- Existing pavement surfaces adjacent to widened sections will be milled and repaved with new bituminous concrete pavement.
- Additional cost allowances for right-of-way acquisitions, utility relocations, environmental mitigation, and engineering are not included in the overall cost estimate.

The opinions of probable costs are representative of current construction costs in the year 2023. For planning purposes, an annual inflation rate of 5 percent is recommended for improvements implemented beyond the year 2023. It should be noted that current CTDOT estimating guidelines recommend the use of a 10 percent annual inflation rate in developing planning-level cost estimates, though the rate may be overly conservative.

4.3 SHORT TERM RECCOMENDATIONS

Roadway improvements are essential for maintaining safe and efficient roadways. In the short term, implementing targeted measures can have significant positive impacts on speed, safety, and overall road conditions. These recommended improvements range from simple signage additions to the addition of new pavement markings that address specific challenges and address immediate needs. By focusing on short-term roadway enhancements, the town can quickly address critical issues, improve the driving experience, and lay the foundation for long-term improvements.

As previously mentioned, SLR recommends reducing the speed limit to 25 mph and implementing traffic calming techniques rather than building up to the existing infrastructure which promotes a travel speed of 45 mph. While this can be implemented in the short term at a low cost, this reduction has long-term effects to the safety of the roadway. To change the speed limit of the roadway, the municipality may apply with the Office of the State Traffic Administration (OSTA) to manage roadway speed limits town-wide or on a location-by-location basis. Typically, the latter option is more practical and may be achieved with the appropriate engineering study of the roadway.

The reduction in speed limit can be coupled with the use of digital radar speed signs, which have several benefits in promoting safer driving behavior and improving road safety. Digital radar speed signs provide real-time feedback to drivers about their current speed. By displaying the driver's speed, these signs create awareness and serve as a reminder for drivers to stay within the speed limit. These signs are proven that they can effectively reduce speeding behavior. The visual display of a driver's speed on a digital radar speed sign acts as a feedback mechanism, influencing driver behavior. Drivers who see their speeds displayed tend to self-regulate and adjust their speeds, accordingly, leading to a reduction in speeding incidents. Digital radar speed signs can contribute to traffic calming efforts by encouraging drivers to slow down. When drivers are alerted to their speeds, they become more conscious of their surroundings and are more likely to drive at appropriate speeds, which enhances safety for pedestrians, cyclists, and other road users. Compared to other traffic calming measures like speed bumps or road redesign, digital radar speed signs are relatively cost-effective. They can be easily installed and moved to different locations as needed. Their effectiveness in reducing speeding incidents makes them a worthwhile investment for improving road safety.

One of our short-term recommendations includes the installation of overhead roadway lighting on existing utility poles. The existing corridor lacks sufficient lighting for motorists with overhead lights few and far between. Additional roadway lighting contributes to improved safety, visibility, and overall functionality of roads. The primary benefit of roadway lighting is improved visibility during nighttime conditions or in areas with reduced natural light. Illuminated roadways enable drivers to clearly see the road ahead, identify obstacles, and react in a timely manner. This reduces the risk of crashes caused by poor visibility. Roadway lighting also helps drivers navigate and stay on the correct route. Illuminated road signs, lane markings, and intersections provide clear guidance and improve wayfinding, reducing driver confusion.

Included in **Table 6** are luminaires that can be mounted to existing utility poles to improve lighting at key locations. These locations are not identified in the plans but should be considered particularly where vertical curves do not meet the design criteria for 25 mph to alleviate the need to meet exact headlight sight distance requirements.

Another short-term recommendation includes the addition of painted shoulder lines throughout the length of the roadway. The painted shoulders serve to slow vehicles down by reducing the effective width of the roadway causing drivers to reduce their speed while maintaining their position within the travel lane. By painting the shoulders of a roadway, they become more distinguishable from the travel lanes. The contrasting color helps drivers clearly identify the edge of the road, especially in low light conditions or inclement weather. This increased visibility reduces the risk of unintentional lane departures and improves overall roadway guidance at a relatively low cost.








The implementation of all-way stop control at the intersection of Northrop Road and Carpenter Lane serves as another short-term recommendation. All-way stop control requires all vehicles approaching the intersection from different directions to come to a complete stop before proceeding. This ensures that drivers have a dedicated and equal opportunity to assess the intersection, check for any approaching vehicles, and make safe decisions. By requiring all vehicles to stop, it reduces the likelihood of high-speed collisions and allows drivers with limited sight distance to proceed with caution. In situations where insufficient sight distance exists at an intersection, implementing all-way stop control can help enhance visibility. By requiring vehicles from multiple directions to stop, it ensures that they are positioned in a way that maximizes sight lines for all drivers. This enables drivers to have a clearer view of the intersection and any potential hazards, reducing the risk of crashes caused by limited visibility. All-way stop control also has a traffic calming effect on high-speed roadways. By introducing stop signs at all approaches, it disrupts the flow of traffic and forces drivers to reduce their speeds as they approach the intersection. This reduction in travel speed enhances safety, as lower speeds provide drivers with more time to react to unexpected situations and mitigate the consequences of crashes that may occur due to limited sight distance.

Lastly, it is recommended to implement centerline rumble strips throughout the Northrop Road corridor. The primary benefit of centerline rumble strips is the ability to provide audible and tactile warning to drivers. By providing an audible and tactile warning to drivers, rumble strips serve as an effective countermeasure to prevent vehicles from crossing into the opposing lane. The audible and vibrational feedback alerts drivers who may be drowsy, distracted, or inadvertently drifting out of their lane, prompting them to correct their course and stay within their lane. Centerline rumble strips can serve as a

traffic calming measure by visually and audibly narrowing the roadway and encouraging drivers to reduce their speed. The presence of rumble strips prompts drivers to be more cautious and alert, promoting safer driving behaviors and reducing vehicular speeds. Centerline rumble strips are a cost-effective safety measure compared to other infrastructure improvements or interventions. They can be easily installed on existing road surfaces with minimal disruption or expense. The relatively low cost makes them an attractive option for enhancing road safety.

A summary of all our short-term recommendations and estimated construction costs can be found in **Table 6**.

Table 6 Short-Term Recommendations

Identified Issues and Needs	Short-Term Recommendation	Estimated Cost (2023)	Notes
High Travel Speeds	 Digital Radar Speed Signs	\$6,500/Sign	Post Mounted
Areas of Low Visibility and Lighting	Installation of Overhead Roadway Lighting on Existing Utility Poles 	\$3,000/Light	Luminaire Mounted on Existing Utility Pole
High Travel Speeds	 Pavement Markings: Provide 10-foot-wide painted Travel Lanes with 1-foot-wide painted shoulder	\$35,000	Includes Cost to Remove Existing Pavement Markings
High Travel Speeds Substandard Vertical Curves (30 MPH)	Reduce Speed Limit to 25 MPH 	\$600/Sign	Includes cost of new sign and removal of existing sign
High Travel Speeds Substandard Intersection Sight Distance	 Implementation of All-Way Stop Control at Intersection of Northrop Road and Carpenter Lane	\$2,000	Includes cost of new signs, stop bars and removal of existing pavement markings
Areas of Overgrown Vegetation	Clear Overgrown Vegetation 	\$10,000	-
Limited Signage in Advance of Challenging Roadway Geometry	 Add Advanced Warning Signage for Challenging Roadway Geometry, Animal Crossings, Children at Play in Strategic Locations	\$600/New Sign \$250/Existing Sign Removal	-

4.4 MID-TERM RECCOMENDATIONS



Mid-term needs and improvements play a crucial role in enhancing transportation networks, addressing evolving needs, and improving overall road conditions. These improvements go beyond short-term interventions and focus on implementing more substantial measures that can have a lasting impact. From pedestrian crossings to minor roadway widening and the installation of roadway lighting, mid-term roadway improvements are vital for creating safer transportation corridors that enhance the quality of life for residents and commuters.

One of the primary areas of concern along the Northrop Road corridor is at the intersection of Carpenter Lane and Northop Road where the lack of an adequate turning radius is observed on the northeast corner. This is where larger trucks can be seen encroaching into oncoming southbound traffic as they turn from Carpenter Lane and head north on Northrop Road. To eliminate this safety concern, we recommend widening the roadway on the northeast corner to provide sufficient roadway width to allow for better maneuverability for large trucks and reducing the probability of a fatal collisions.

Additionally, the existing pedestrian crossing along Carpenter Lane at its intersection with Northrop Road is not Americans with Disabilities Act (ADA) compliant and lacks a sidewalk ramp and sidewalk connection to the bus depot and employee parking. ADA compliant pedestrian crossings enhance safety for all pedestrians and ensure that people with disabilities, such as those using wheelchairs, walkers, or mobility aids, can safely and easily navigate roadways. The inclusion of features like curb ramps, accessible pedestrian signals, and tactile indicators helps to alert and guide pedestrians, reducing the risk of crashes and improving overall pedestrian safety. As a result, we recommend upgrading the pedestrian amenities at this crossing to provide for a safer travel route to and from the bus depot for employees.

A summary of all our mid-term recommendations and estimated construction costs can be found in **Table 7**.

Table 7 Mid-Term Recommendations

Identified Issues and Needs	Mid-Term Recommendation	Estimated Cost (2023)	Notes
<p>Substandard Turning Radius on NE Corner of Northrop Road at Carpenter Lane Intersection</p>	<p>Full-Depth Roadway Widening on the NE Corner to Increase Turning Radius for Large Trucks and Eliminate Centreline Encroachment</p> 	<p>\$25,000</p>	<p>-</p>
<p>Insufficient Pedestrian crossing at Intersection of Northrop Road at Carpenter Lane</p>	 <p>Install Formalized Pedestrian Crossing across Carpenter Lane with Pedestrian Ramp and Sidewalk</p>	<p>\$15,000</p>	<p>-</p>

4.5 LONG TERM RECCOMENDATIONS

Long-term roadway improvements are critical for the sustained development and efficient functioning of transportation networks. These improvements go beyond immediate fixes and often involve significant investments in infrastructure, planning, and design, with a focus on durability, sustainability, and scalability. By prioritizing these long-term solutions, Northrop Road can become a safer roadway for years to come.




To further aid in the reduction of high speeds, the addition of raised and/or stamped medians are recommended at strategic locations along Northrop Road, particularly along long, straight sections of roadway. Raised and stamped medians offer several benefits in terms of safety, traffic management, and aesthetics. These types of medians can serve as a traffic calming measure by visually narrowing the roadway and encouraging drivers to reduce their speed. The presence of a median prompts drivers to be more cautious and alert, promoting safer driving behaviors and reducing the likelihood of high-speed collisions. Raised medians provide space for landscaping and the incorporation of greenery. Planting trees, shrubs, and flowers along the medians not only adds visually appealing elements to the roadway but also contributes to environmental benefits such as improved air quality, shade, and habitat for wildlife. Stamped medians can incorporate decorative patterns, textures, or colored surfaces that enhance the visual appeal of the roadway. This adds to the overall attractiveness of the streetscape, creating a more visually appealing and inviting environment for drivers, pedestrians, and residents.

Through our existing conditions assessment, it was determined that select crest vertical curves along the corridor have substandard k-value design criteria at 45 mph, 30 mph and 25 mph therefore the reconstruction of these vertical curves is recommended. Well-designed and smooth crest vertical curves with adequate k-values improve driver comfort by minimizing sudden changes in road grade. Reconstructing curves with appropriate radii and transitions ensures a gradual change in elevation, reducing the perception of steepness and minimizing the discomfort experienced by drivers and passengers.

Lastly, given the generally narrow roadway along the corridor, larger trucks traveling in opposite directions at the same time may have difficulty safely maneuvering around horizontal curves as more roadway width is required within horizontal curves. This scenario, which may not frequently occur under current conditions, may become more prevalent with future growth of the corridor and may lead to head-on and side-swipe collisions among larger trucks. To prevent this scenario, we recommend widening the roadway from Station 38+00 to Station 49+00 to provide for a larger shoulder for safe passage of these larger trucks. While the roadway widening will be limited to a few feet beyond the existing edge of roadway, easements from adjacent property owners may be required.

A summary of all our long-term recommendations and estimated construction costs can be found in **Table 8**.

Table 8 Long-Term Recommendations

Identified Issues and Needs	Long-Term Recommendation	Estimated Cost (2023)	Notes
<p>High Travel Speeds</p>	 <p>Installation of Raised and/or Flush Stamped Center Medians to visually narrow the travel lane and slightly shift traffic requiring vehicles to reduce travel speeds</p>	<p>\$100,000/Raised Median \$85,000/Stamped Median</p>	<p>Includes Roadway Widening Required</p>
<p>Substandard Vertical Roadway Curves</p>	<p>Reconstruct Select Vertical Curves to Meet Design Criteria for Recommended Posted Speed Limit (25 MPH)</p> 	<p>\$200,000</p>	<p>Includes Full-Depth Reconstruction</p>
<p>Insufficient Roadway Width to Allow for Simultaneous Passage of Tractor Trailers</p>	 <p>Full-Depth Roadway Widening (0 feet to 3 feet) to provide a larger shoulder and additional roadway width for safe passage (STATION 38+00 to STATION 49+00). This may require the town to obtain future easements.</p>	<p>\$185,000</p>	<p>-</p>

4.6 OTHER CONSIDERATIONS

Speed humps and tables are an effective method to limit how fast motorists can traverse the segment of roadway physically. A speed hump is a smooth mound in the roadway that causes motorists to slow down when one drives over it. A speed table is longer and has a flat top that allows for slightly higher speeds. Both contrast with a speed bump, which is a shorter, more abrupt mound that must be taken at a crawling speed. While speed bumps would not be recommended for Northrop Road, speed humps or tables could slow motorists along key segments.



A speed hump and speed table. Source: FHWA

Locations for speed humps/tables have not been provided in the Roadway Improvement Recommendation Plans. Oftentimes speed humps/tables are not favored by the general public due to inconvenience or the noise generated when they are traveled over. They are similarly not favored by municipal public works departments due to maintenance requirements. However, community members at the public information meeting voiced their support for speed humps/tables to reduce speeds. With community support, these facilities may be a viable traffic calming measure for Northrop Road. For example, in the locations where center medians have been proposed in the Roadway Improvement Recommendation Plans, alternatively, speed humps or tables could be installed to decrease motorist speeds along straightaway segments of the road. They can also be used in advance of horizontal curves to decrease motorist speeds through the curve.



A straightaway segment where a center median is proposed but a speed hump or table may be used instead.

4.7 IMPLEMENTATION AND FUNDING

Implementation of the study recommendations should begin with the prioritization of individual improvement projects by the participating municipalities and SCRCOG. Short-term recommendations, those that can be completed in a relatively short time frame at a relatively low cost and with minor impacts, should be considered for highest priority and early implementation.

A phased priority implementation strategy should be considered for the more costly, mid-term and long-term projects that may take a few years to plan, program, and fund. Ideally, long-term improvement recommendations may be coordinated with future land-use changes and redevelopment along Northrop Road so that components of the overall strategy can be integrated into future improvements over time.

Our recommendations are strategically structured so that short-term improvements can be implemented by the Town of Wallingford with local funds, local paving and or roadway maintenance programs. Town-planned pavement resurfacing, and overlays are an excellent opportunity to install traffic calming measures. When an existing road is planned to be resurfaced, traffic calming could be included, where feasible. Before any construction, or reconstruction project, the town would review the cross-section of the roadway (Northrop Road) to determine if any modifications can be made to the pavement markings.

Should the town consider additional funding sources outside of available town funds for mid-term and long-term improvements, the following Federal and State funding programs could be considered:

- Local Transportation Capital Improvements Program (LOTICIP)
- Local Capital improvement Projects (LoCIP)
- Community Connectivity Grant Program (CCGP)
- Safe Streets For All
- Small Town Economic Assistance Program (STEAP)
- The American Rescue Plan Act (ARPA)

In conjunction with the funding programs listed above, the town can consider depositing local funds into a bond which will then be eligible towards a match for the grants listed above. Most state/federal grant programs match each dollar the town contributes with four dollars of state/federal money, thus turning each dollar spent into five dollars' worth of improvements.

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APPENDIX A

TRAFFIC INFORMATION

Northrop Road Study

SCRCOG
Town of Wallingford

June 2023

Daily Vehicle Volume Report

Study Date: Wednesday, 03/30/2022

Unit ID:

Location: Location A on Northrop Road in Wallingford, CT

	Northbound Volume	Southbound Volume	Total Volume
00:00 - 00:59	4	18	22
01:00 - 01:59	4	1	5
02:00 - 02:59	6	8	14
03:00 - 03:59	7	10	17
04:00 - 04:59	9	8	17
05:00 - 05:59	79	29	108
06:00 - 06:59	112	58	170
07:00 - 07:59	191	116	307
08:00 - 08:59	169	113	282
09:00 - 09:59	130	106	236
10:00 - 10:59	65	67	132
11:00 - 11:59	86	76	162
12:00 - 12:59	118	101	219
13:00 - 13:59	122	86	208
14:00 - 14:59	126	93	219
15:00 - 15:59	123	146	269
16:00 - 16:59	180	195	375
17:00 - 17:59	110	139	249
18:00 - 18:59	70	79	149
19:00 - 19:59	58	35	93
20:00 - 20:59	33	21	54
21:00 - 21:59	27	10	37
22:00 - 22:59	14	16	30
23:00 - 23:59	18	32	50
Totals	1861	1563	3424
AM Peak Time	07:32 - 08:31	07:40 - 08:39	07:30 - 08:29
AM Peak Volume	220	127	339
PM Peak Time	16:09 - 17:08	16:07 - 17:06	16:07 - 17:06
PM Peak Volume	182	210	391

Daily Northbound Classes Report

Study Date: Wednesday, 03/30/2022

Unit ID:

Location: Location A on Northrop Road in Wallingford, CT

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	Total
00:00 - 00:59	0	4	0	0	0	0	0	0	0	0	0	0	0	4
01:00 - 01:59	0	3	0	0	0	0	0	1	0	0	0	0	0	4
02:00 - 02:59	0	4	0	1	0	0	0	1	0	0	0	0	0	6
03:00 - 03:59	0	5	1	0	0	0	0	0	1	0	0	0	0	7
04:00 - 04:59	0	7	2	0	0	0	0	0	0	0	0	0	0	9
05:00 - 05:59	0	67	6	1	2	0	0	2	1	0	0	0	0	79
06:00 - 06:59	0	87	6	1	17	0	0	0	1	0	0	0	0	112
07:00 - 07:59	0	156	16	4	12	2	0	0	1	0	0	0	0	191
08:00 - 08:59	0	132	14	6	15	1	0	0	1	0	0	0	0	169
09:00 - 09:59	0	59	13	34	23	0	0	0	1	0	0	0	0	130
10:00 - 10:59	0	48	9	1	7	0	0	0	0	0	0	0	0	65
11:00 - 11:59	0	63	7	1	9	2	0	2	1	0	0	1	0	86
12:00 - 12:59	0	94	11	2	7	2	0	1	1	0	0	0	0	118
13:00 - 13:59	0	95	9	3	12	0	0	1	2	0	0	0	0	122
14:00 - 14:59	1	99	8	1	16	0	1	0	0	0	0	0	0	126
15:00 - 15:59	0	94	6	4	18	0	0	0	1	0	0	0	0	123
16:00 - 16:59	2	109	17	31	17	2	0	2	0	0	0	0	0	180
17:00 - 17:59	0	91	6	1	11	0	0	0	1	0	0	0	0	110
18:00 - 18:59	0	52	5	3	9	0	0	1	0	0	0	0	0	70
19:00 - 19:59	0	51	4	0	3	0	0	0	0	0	0	0	0	58
20:00 - 20:59	0	29	1	0	3	0	0	0	0	0	0	0	0	33
21:00 - 21:59	1	23	0	1	2	0	0	0	0	0	0	0	0	27
22:00 - 22:59	0	13	1	0	0	0	0	0	0	0	0	0	0	14
23:00 - 23:59	0	17	0	0	1	0	0	0	0	0	0	0	0	18
Totals	4	1402	142	95	184	9	1	11	12	0	0	1	0	1861
Percent of Total	0.2	75.3	7.6	5.1	9.9	0.5	0.1	0.6	0.6	0.0	0.0	0.1	0.0	100
Percent of AM	0.0	73.7	8.6	5.7	9.9	0.6	0.0	0.7	0.8	0.0	0.0	0.1	0.0	100
Percent of PM	0.4	76.8	6.8	4.6	9.9	0.4	0.1	0.5	0.5	0.0	0.0	0.0	0.0	100

Truck Summary:

Total Trucks: 313 % Trucks: 16.8 AM % Trucks: 17.7 PM % Trucks: 16.0

Classification Scheme: FHWA (ID: 1)

- | | | |
|-----------------------------------|-----------------------------------|----------------------------------|
| #1 Motorcycles - 2 Axles | #6 Single Unit Truck - 3 Axles | #11 Multi-Unit - 5 Axles or Less |
| #2 Passenger Cars - 2 Axles | #7 Single Unit - 4 Axles | #12 Multi-Unit - 6 Axles |
| #3 Pickup Trucks, Vans - 2 Axles | #8 Single Unit - 4 Axles or Less | #13 Multi-Unit - 7 Axles or More |
| #4 Buses | #9 Double Unit - 5 Axles | |
| #5 Single Unit - 2 Axles, 6 Tires | #10 Double Unit - 6 Axles or More | |

Daily Southbound Classes Report

Study Date: Wednesday, 03/30/2022

Unit ID:

Location: Location A on Northrop Road in Wallingford, CT

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	Total
00:00 - 00:59	0	18	0	0	0	0	0	0	0	0	0	0	0	18
01:00 - 01:59	0	1	0	0	0	0	0	0	0	0	0	0	0	1
02:00 - 02:59	1	4	0	0	0	2	0	0	1	0	0	0	0	8
03:00 - 03:59	0	5	2	2	0	0	0	0	1	0	0	0	0	10
04:00 - 04:59	0	6	0	0	2	0	0	0	0	0	0	0	0	8
05:00 - 05:59	0	16	4	5	3	0	0	0	1	0	0	0	0	29
06:00 - 06:59	0	45	4	2	5	0	0	1	1	0	0	0	0	58
07:00 - 07:59	0	90	12	1	9	2	0	1	1	0	0	0	0	116
08:00 - 08:59	0	86	11	2	13	1	0	0	0	0	0	0	0	113
09:00 - 09:59	0	77	12	3	12	1	0	0	1	0	0	0	0	106
10:00 - 10:59	0	49	5	2	11	0	0	0	0	0	0	0	0	67
11:00 - 11:59	2	51	10	0	12	0	0	0	1	0	0	0	0	76
12:00 - 12:59	0	77	10	0	9	3	0	2	0	0	0	0	0	101
13:00 - 13:59	0	64	9	1	8	0	1	1	2	0	0	0	0	86
14:00 - 14:59	1	68	11	4	8	1	0	0	0	0	0	0	0	93
15:00 - 15:59	0	113	12	4	17	0	0	0	0	0	0	0	0	146
16:00 - 16:59	1	155	16	3	18	2	0	0	0	0	0	0	0	195
17:00 - 17:59	1	116	9	2	8	2	0	0	1	0	0	0	0	139
18:00 - 18:59	0	68	3	0	8	0	0	0	0	0	0	0	0	79
19:00 - 19:59	0	30	5	0	0	0	0	0	0	0	0	0	0	35
20:00 - 20:59	0	18	1	0	2	0	0	0	0	0	0	0	0	21
21:00 - 21:59	0	9	1	0	0	0	0	0	0	0	0	0	0	10
22:00 - 22:59	1	11	1	1	2	0	0	0	0	0	0	0	0	16
23:00 - 23:59	0	30	1	0	1	0	0	0	0	0	0	0	0	32
Totals	7	1207	139	32	148	14	1	5	10	0	0	0	0	1563
Percent of Total	0.4	77.2	8.9	2.0	9.5	0.9	0.1	0.3	0.6	0.0	0.0	0.0	0.0	100
Percent of AM	0.5	73.4	9.8	2.8	11.0	1.0	0.0	0.3	1.1	0.0	0.0	0.0	0.0	100
Percent of PM	0.4	79.6	8.3	1.6	8.5	0.8	0.1	0.3	0.3	0.0	0.0	0.0	0.0	100

Truck Summary:

Total Trucks: 210 % Trucks: 13.4 AM % Trucks: 16.2 PM % Trucks: 11.6

Classification Scheme: FHWA (ID: 1)

- | | | |
|-----------------------------------|-----------------------------------|----------------------------------|
| #1 Motorcycles - 2 Axles | #6 Single Unit Truck - 3 Axles | #11 Multi-Unit - 5 Axles or Less |
| #2 Passenger Cars - 2 Axles | #7 Single Unit - 4 Axles | #12 Multi-Unit - 6 Axles |
| #3 Pickup Trucks, Vans - 2 Axles | #8 Single Unit - 4 Axles or Less | #13 Multi-Unit - 7 Axles or More |
| #4 Buses | #9 Double Unit - 5 Axles | |
| #5 Single Unit - 2 Axles, 6 Tires | #10 Double Unit - 6 Axles or More | |

Daily Total Classes Report

Study Date: Wednesday, 03/30/2022

Unit ID:

Location: Location A on Northrop Road in Wallingford, CT

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	Total
00:00 - 00:59	0	22	0	0	0	0	0	0	0	0	0	0	0	22
01:00 - 01:59	0	4	0	0	0	0	0	1	0	0	0	0	0	5
02:00 - 02:59	1	8	0	1	0	2	0	1	1	0	0	0	0	14
03:00 - 03:59	0	10	3	2	0	0	0	0	2	0	0	0	0	17
04:00 - 04:59	0	13	2	0	2	0	0	0	0	0	0	0	0	17
05:00 - 05:59	0	83	10	6	5	0	0	2	2	0	0	0	0	108
06:00 - 06:59	0	132	10	3	22	0	0	1	2	0	0	0	0	170
07:00 - 07:59	0	246	28	5	21	4	0	1	2	0	0	0	0	307
08:00 - 08:59	0	218	25	8	28	2	0	0	1	0	0	0	0	282
09:00 - 09:59	0	136	25	37	35	1	0	0	2	0	0	0	0	236
10:00 - 10:59	0	97	14	3	18	0	0	0	0	0	0	0	0	132
11:00 - 11:59	2	114	17	1	21	2	0	2	2	0	0	1	0	162
12:00 - 12:59	0	171	21	2	16	5	0	3	1	0	0	0	0	219
13:00 - 13:59	0	159	18	4	20	0	1	2	4	0	0	0	0	208
14:00 - 14:59	2	167	19	5	24	1	1	0	0	0	0	0	0	219
15:00 - 15:59	0	207	18	8	35	0	0	0	1	0	0	0	0	269
16:00 - 16:59	3	264	33	34	35	4	0	2	0	0	0	0	0	375
17:00 - 17:59	1	207	15	3	19	2	0	0	2	0	0	0	0	249
18:00 - 18:59	0	120	8	3	17	0	0	1	0	0	0	0	0	149
19:00 - 19:59	0	81	9	0	3	0	0	0	0	0	0	0	0	93
20:00 - 20:59	0	47	2	0	5	0	0	0	0	0	0	0	0	54
21:00 - 21:59	1	32	1	1	2	0	0	0	0	0	0	0	0	37
22:00 - 22:59	1	24	2	1	2	0	0	0	0	0	0	0	0	30
23:00 - 23:59	0	47	1	0	2	0	0	0	0	0	0	0	0	50
Totals	11	2609	281	127	332	23	2	16	22	0	0	1	0	3424
Percent of Total	0.3	76.2	8.2	3.7	9.7	0.7	0.1	0.5	0.6	0.0	0.0	0.0	0.0	100
Percent of AM	0.2	73.6	9.1	4.5	10.3	0.7	0.0	0.5	1.0	0.0	0.0	0.1	0.0	100
Percent of PM	0.4	78.2	7.5	3.1	9.2	0.6	0.1	0.4	0.4	0.0	0.0	0.0	0.0	100

Truck Summary:

Total Trucks: 523 % Trucks: 15.3 AM % Trucks: 17.1 PM % Trucks: 13.9

Classification Scheme: FHWA (ID: 1)

- | | | |
|-----------------------------------|-----------------------------------|----------------------------------|
| #1 Motorcycles - 2 Axles | #6 Single Unit Truck - 3 Axles | #11 Multi-Unit - 5 Axles or Less |
| #2 Passenger Cars - 2 Axles | #7 Single Unit - 4 Axles | #12 Multi-Unit - 6 Axles |
| #3 Pickup Trucks, Vans - 2 Axles | #8 Single Unit - 4 Axles or Less | #13 Multi-Unit - 7 Axles or More |
| #4 Buses | #9 Double Unit - 5 Axles | |
| #5 Single Unit - 2 Axles, 6 Tires | #10 Double Unit - 6 Axles or More | |

Daily Northbound Speeds (MPH)

Study Date: Wednesday, 03/30/2022

Unit ID:

Location: Location A on Northrop Road in Wallingford, CT

Posted Speed: 30

	5-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-99	Total
00:00 - 00:59	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	4
01:00 - 01:59	0	1	0	0	1	1	0	1	0	0	0	0	0	0	0	4
02:00 - 02:59	0	0	0	1	3	0	0	1	1	0	0	0	0	0	0	6
03:00 - 03:59	0	0	0	0	2	3	2	0	0	0	0	0	0	0	0	7
04:00 - 04:59	0	0	1	0	0	3	3	2	0	0	0	0	0	0	0	9
05:00 - 05:59	0	3	5	4	22	23	17	4	1	0	0	0	0	0	0	79
06:00 - 06:59	0	5	14	10	19	32	19	10	3	0	0	0	0	0	0	112
07:00 - 07:59	4	11	27	22	24	47	36	15	3	2	0	0	0	0	0	191
08:00 - 08:59	0	5	23	15	22	44	43	12	2	3	0	0	0	0	0	169
09:00 - 09:59	0	5	10	37	39	17	13	8	1	0	0	0	0	0	0	130
10:00 - 10:59	0	2	5	3	10	34	8	2	1	0	0	0	0	0	0	65
11:00 - 11:59	0	1	13	7	13	20	26	5	1	0	0	0	0	0	0	86
12:00 - 12:59	0	2	20	15	18	29	25	9	0	0	0	0	0	0	0	118
13:00 - 13:59	0	5	12	10	27	38	21	7	1	1	0	0	0	0	0	122
14:00 - 14:59	1	2	19	21	23	16	27	13	2	2	0	0	0	0	0	126
15:00 - 15:59	0	5	14	11	31	26	25	8	3	0	0	0	0	0	0	123
16:00 - 16:59	0	0	3	27	56	48	25	12	7	0	0	1	0	0	0	179
17:00 - 17:59	3	0	5	6	12	35	33	13	1	2	0	0	0	0	0	110
18:00 - 18:59	0	0	1	6	6	20	27	8	2	0	0	0	0	0	0	70
19:00 - 19:59	1	0	0	2	6	22	18	7	1	1	0	0	0	0	0	58
20:00 - 20:59	0	0	3	1	4	8	12	5	0	0	0	0	0	0	0	33
21:00 - 21:59	0	2	3	2	5	4	5	6	0	0	0	0	0	0	0	27
22:00 - 22:59	0	0	1	0	3	3	2	4	1	0	0	0	0	0	0	14
23:00 - 23:59	1	0	2	0	2	8	3	1	1	0	0	0	0	0	0	18
Totals	10	49	181	201	348	482	391	154	32	11	0	1	0	0	0	1860
Percent of Total	0.5	2.6	9.7	10.8	18.7	25.9	21.0	8.3	1.7	0.6	0.0	0.1	0.0	0.0	0.0	100
Percent of AM	0.5	3.8	11.4	11.6	18.0	26.1	19.5	7.1	1.5	0.6	0.0	0.0	0.0	0.0	0.0	100
Percent of PM	0.6	1.6	8.3	10.1	19.3	25.8	22.3	9.3	1.9	0.6	0.0	0.1	0.0	0.0	0.0	100

Standard Deviation:	8.4 MPH	Ten Mile Pace:	35 to 44 MPH	85th Percentile:	44.0 MPH
Mean Speed:	35.6 MPH	Percent in Ten Mile Pace:	46.9%	15th Percentile:	26.0 MPH
Median Speed:	36.5 MPH			90th Percentile:	45.4 MPH
Modal Speed:	37.5 MPH			95th Percentile:	48.4 MPH

Daily Southbound Speeds (MPH)

Study Date: Wednesday, 03/30/2022

Unit ID:

Location: Location A on Northrop Road in Wallingford, CT

Posted Speed: 30

	5-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-99	Total
00:00 - 00:59	0	1	0	1	2	8	4	2	0	0	0	0	0	0	0	18
01:00 - 01:59	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
02:00 - 02:59	0	0	3	0	0	1	2	2	0	0	0	0	0	0	0	8
03:00 - 03:59	0	0	0	0	3	4	2	1	0	0	0	0	0	0	0	10
04:00 - 04:59	0	0	0	1	0	0	1	2	3	0	1	0	0	0	0	8
05:00 - 05:59	0	1	0	2	5	8	4	6	2	1	0	0	0	0	0	29
06:00 - 06:59	0	3	2	1	6	10	18	7	11	0	0	0	0	0	0	58
07:00 - 07:59	1	0	1	7	6	23	45	26	7	0	0	0	0	0	0	116
08:00 - 08:59	0	5	3	2	11	25	40	19	6	2	0	0	0	0	0	113
09:00 - 09:59	0	2	4	1	21	39	26	9	4	0	0	0	0	0	0	106
10:00 - 10:59	0	6	7	0	6	21	15	11	1	0	0	0	0	0	0	67
11:00 - 11:59	0	4	6	3	10	16	22	10	1	0	2	0	0	0	0	74
12:00 - 12:59	0	8	6	6	13	19	31	13	5	0	0	0	0	0	0	101
13:00 - 13:59	0	3	4	4	15	23	27	7	2	1	0	0	0	0	0	86
14:00 - 14:59	1	11	13	2	10	21	20	9	5	1	0	0	0	0	0	93
15:00 - 15:59	0	13	23	8	15	32	32	21	1	1	0	0	0	0	0	146
16:00 - 16:59	1	17	16	7	33	43	45	27	5	1	0	0	0	0	0	195
17:00 - 17:59	1	6	15	6	13	28	48	17	3	1	0	0	0	0	1	139
18:00 - 18:59	0	2	4	5	6	25	23	9	4	1	0	0	0	0	0	79
19:00 - 19:59	0	1	0	2	1	8	12	7	3	0	1	0	0	0	0	35
20:00 - 20:59	0	0	2	0	1	7	5	4	1	1	0	0	0	0	0	21
21:00 - 21:59	0	0	1	0	2	2	5	0	0	0	0	0	0	0	0	10
22:00 - 22:59	0	5	3	0	2	1	1	4	0	0	0	0	0	0	0	16
23:00 - 23:59	1	1	4	2	5	4	8	5	2	0	0	0	0	0	0	32
Totals	5	90	117	60	186	368	436	218	66	10	4	0	0	0	1	1561
Percent of Total	0.3	5.8	7.5	3.8	11.9	23.6	27.9	14.0	4.2	0.6	0.3	0.0	0.0	0.0	0.1	100
Percent of AM	0.2	3.8	4.3	3.0	11.5	25.5	29.4	15.6	5.8	0.5	0.5	0.0	0.0	0.0	0.0	100
Percent of PM	0.4	7.0	9.5	4.4	12.2	22.4	27.0	12.9	3.3	0.7	0.1	0.0	0.0	0.0	0.1	100

Standard Deviation:	9.4 MPH	Ten Mile Pace:	35 to 44 MPH	85th Percentile:	46.5 MPH
Mean Speed:	37.8 MPH	Percent in Ten Mile Pace:	51.5%	15th Percentile:	26.8 MPH
Median Speed:	39.4 MPH			90th Percentile:	48.3 MPH
Modal Speed:	42.5 MPH			95th Percentile:	50.2 MPH

Daily Total Speeds (MPH)

Study Date: Wednesday, 03/30/2022

Unit ID:

Location: Location A on Northrop Road in Wallingford, CT

Posted Speed: 30

	5-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-99	Total
00:00 - 00:59	0	1	0	2	2	9	5	3	0	0	0	0	0	0	0	22
01:00 - 01:59	0	2	0	0	1	1	0	1	0	0	0	0	0	0	0	5
02:00 - 02:59	0	0	3	1	3	1	2	3	1	0	0	0	0	0	0	14
03:00 - 03:59	0	0	0	0	5	7	4	1	0	0	0	0	0	0	0	17
04:00 - 04:59	0	0	1	1	0	3	4	4	3	0	1	0	0	0	0	17
05:00 - 05:59	0	4	5	6	27	31	21	10	3	1	0	0	0	0	0	108
06:00 - 06:59	0	8	16	11	25	42	37	17	14	0	0	0	0	0	0	170
07:00 - 07:59	5	11	28	29	30	70	81	41	10	2	0	0	0	0	0	307
08:00 - 08:59	0	10	26	17	33	69	83	31	8	5	0	0	0	0	0	282
09:00 - 09:59	0	7	14	38	60	56	39	17	5	0	0	0	0	0	0	236
10:00 - 10:59	0	8	12	3	16	55	23	13	2	0	0	0	0	0	0	132
11:00 - 11:59	0	5	19	10	23	36	48	15	2	0	2	0	0	0	0	160
12:00 - 12:59	0	10	26	21	31	48	56	22	5	0	0	0	0	0	0	219
13:00 - 13:59	0	8	16	14	42	61	48	14	3	2	0	0	0	0	0	208
14:00 - 14:59	2	13	32	23	33	37	47	22	7	3	0	0	0	0	0	219
15:00 - 15:59	0	18	37	19	46	58	57	29	4	1	0	0	0	0	0	269
16:00 - 16:59	1	17	19	34	89	91	70	39	12	1	0	1	0	0	0	374
17:00 - 17:59	4	6	20	12	25	63	81	30	4	3	0	0	0	0	1	249
18:00 - 18:59	0	2	5	11	12	45	50	17	6	1	0	0	0	0	0	149
19:00 - 19:59	1	1	0	4	7	30	30	14	4	1	1	0	0	0	0	93
20:00 - 20:59	0	0	5	1	5	15	17	9	1	1	0	0	0	0	0	54
21:00 - 21:59	0	2	4	2	7	6	10	6	0	0	0	0	0	0	0	37
22:00 - 22:59	0	5	4	0	5	4	3	8	1	0	0	0	0	0	0	30
23:00 - 23:59	2	1	6	2	7	12	11	6	3	0	0	0	0	0	0	50
Totals	15	139	298	261	534	850	827	372	98	21	4	1	0	0	1	3421
Percent of Total	0.4	4.1	8.7	7.6	15.6	24.8	24.2	10.9	2.9	0.6	0.1	0.0	0.0	0.0	0.0	100
Percent of AM	0.3	3.8	8.4	8.0	15.3	25.9	23.6	10.6	3.3	0.5	0.2	0.0	0.0	0.0	0.0	100
Percent of PM	0.5	4.3	8.9	7.3	15.8	24.1	24.6	11.1	2.6	0.7	0.1	0.1	0.0	0.0	0.1	100

Standard Deviation:	8.9 MPH	Ten Mile Pace:	35 to 44 MPH	85th Percentile:	44.9 MPH
Mean Speed:	36.6 MPH	Percent in Ten Mile Pace:	49.0%	15th Percentile:	26.2 MPH
Median Speed:	37.7 MPH			90th Percentile:	47.1 MPH
Modal Speed:	37.5 MPH			95th Percentile:	49.4 MPH

Daily Vehicle Volume Report

Study Date: Wednesday, 03/30/2022

Unit ID: 1

Location: Location B on Northrop Road in Wallingford, CT

	Northbound Volume	Southbound Volume	Total Volume
00:00 - 00:59	3	5	8
01:00 - 01:59	2	0	2
02:00 - 02:59	4	3	7
03:00 - 03:59	4	2	6
04:00 - 04:59	4	11	15
05:00 - 05:59	20	33	53
06:00 - 06:59	45	51	96
07:00 - 07:59	79	78	157
08:00 - 08:59	75	84	159
09:00 - 09:59	58	42	100
10:00 - 10:59	32	33	65
11:00 - 11:59	44	40	84
12:00 - 12:59	66	52	118
13:00 - 13:59	58	46	104
14:00 - 14:59	74	55	129
15:00 - 15:59	85	59	144
16:00 - 16:59	135	79	214
17:00 - 17:59	98	63	161
18:00 - 18:59	38	38	76
19:00 - 19:59	29	18	47
20:00 - 20:59	21	17	38
21:00 - 21:59	16	6	22
22:00 - 22:59	9	6	15
23:00 - 23:59	12	5	17
Totals	1011	826	1837
AM Peak Time	07:33 - 08:32	07:34 - 08:33	07:34 - 08:33
AM Peak Volume	91	94	184
PM Peak Time	16:16 - 17:15	16:12 - 17:11	16:12 - 17:11
PM Peak Volume	147	84	230

Daily Northbound Classes Report

Study Date: Wednesday, 03/30/2022

Unit ID: 1

Location: Location B on Northrop Road in Wallingford, CT

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	Total
00:00 - 00:59	0	3	0	0	0	0	0	0	0	0	0	0	0	3
01:00 - 01:59	0	0	0	0	2	0	0	0	0	0	0	0	0	2
02:00 - 02:59	0	3	0	0	0	0	0	0	1	0	0	0	0	4
03:00 - 03:59	0	3	0	0	0	0	0	1	0	0	0	0	0	4
04:00 - 04:59	0	2	0	1	1	0	0	0	0	0	0	0	0	4
05:00 - 05:59	0	8	2	4	3	1	0	1	1	0	0	0	0	20
06:00 - 06:59	0	17	6	15	5	0	0	0	2	0	0	0	0	45
07:00 - 07:59	0	64	5	3	6	0	0	0	1	0	0	0	0	79
08:00 - 08:59	0	62	4	1	5	2	0	0	1	0	0	0	0	75
09:00 - 09:59	0	35	5	3	13	1	0	0	1	0	0	0	0	58
10:00 - 10:59	0	21	5	0	5	0	1	0	0	0	0	0	0	32
11:00 - 11:59	0	30	4	1	4	1	0	4	0	0	0	0	0	44
12:00 - 12:59	0	48	6	5	6	0	0	1	0	0	0	0	0	66
13:00 - 13:59	0	36	3	10	5	0	1	1	2	0	0	0	0	58
14:00 - 14:59	0	56	5	1	10	1	0	1	0	0	0	0	0	74
15:00 - 15:59	0	64	7	4	8	0	0	1	1	0	0	0	0	85
16:00 - 16:59	0	107	10	2	13	0	0	0	3	0	0	0	0	135
17:00 - 17:59	0	80	7	0	10	0	0	0	1	0	0	0	0	98
18:00 - 18:59	0	27	3	1	6	0	0	1	0	0	0	0	0	38
19:00 - 19:59	0	24	5	0	0	0	0	0	0	0	0	0	0	29
20:00 - 20:59	0	17	3	0	1	0	0	0	0	0	0	0	0	21
21:00 - 21:59	1	13	0	1	1	0	0	0	0	0	0	0	0	16
22:00 - 22:59	0	9	0	0	0	0	0	0	0	0	0	0	0	9
23:00 - 23:59	0	11	0	0	1	0	0	0	0	0	0	0	0	12
Totals	1	740	80	52	105	6	2	11	14	0	0	0	0	1011
Percent of Total	0.1	73.2	7.9	5.1	10.4	0.6	0.2	1.1	1.4	0.0	0.0	0.0	0.0	100
Percent of AM	0.0	67.0	8.4	7.6	11.9	1.4	0.3	1.6	1.9	0.0	0.0	0.0	0.0	100
Percent of PM	0.2	76.8	7.6	3.7	9.5	0.2	0.2	0.8	1.1	0.0	0.0	0.0	0.0	100

Truck Summary:

Total Trucks: 190 % Trucks: 18.8 AM % Trucks: 24.6 PM % Trucks: 15.4

Classification Scheme: FHWA (ID: 1)

- | | | |
|-----------------------------------|-----------------------------------|----------------------------------|
| #1 Motorcycles - 2 Axles | #6 Single Unit Truck - 3 Axles | #11 Multi-Unit - 5 Axles or Less |
| #2 Passenger Cars - 2 Axles | #7 Single Unit - 4 Axles | #12 Multi-Unit - 6 Axles |
| #3 Pickup Trucks, Vans - 2 Axles | #8 Single Unit - 4 Axles or Less | #13 Multi-Unit - 7 Axles or More |
| #4 Buses | #9 Double Unit - 5 Axles | |
| #5 Single Unit - 2 Axles, 6 Tires | #10 Double Unit - 6 Axles or More | |

Daily Southbound Classes Report

Study Date: Wednesday, 03/30/2022

Unit ID: 1

Location: Location B on Northrop Road in Wallingford, CT

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	Total
00:00 - 00:59	0	4	0	0	1	0	0	0	0	0	0	0	0	5
01:00 - 01:59	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00 - 02:59	0	1	0	0	1	0	0	0	1	0	0	0	0	3
03:00 - 03:59	0	1	0	0	0	0	0	0	1	0	0	0	0	2
04:00 - 04:59	0	8	0	1	2	0	0	0	0	0	0	0	0	11
05:00 - 05:59	0	22	2	5	3	0	0	0	1	0	0	0	0	33
06:00 - 06:59	0	40	3	1	5	0	0	0	2	0	0	0	0	51
07:00 - 07:59	0	63	4	1	6	1	0	1	2	0	0	0	0	78
08:00 - 08:59	0	68	5	2	8	1	0	0	0	0	0	0	0	84
09:00 - 09:59	0	28	4	2	7	0	0	0	1	0	0	0	0	42
10:00 - 10:59	0	25	3	1	3	1	0	0	0	0	0	0	0	33
11:00 - 11:59	0	27	4	0	7	1	0	1	0	0	0	0	0	40
12:00 - 12:59	0	41	3	0	5	2	0	1	0	0	0	0	0	52
13:00 - 13:59	1	33	1	1	7	0	1	2	0	0	0	0	0	46
14:00 - 14:59	0	39	7	2	4	1	0	1	1	0	0	0	0	55
15:00 - 15:59	0	49	3	1	5	1	0	0	0	0	0	0	0	59
16:00 - 16:59	0	64	7	2	5	0	0	1	0	0	0	0	0	79
17:00 - 17:59	0	48	5	2	5	1	0	0	2	0	0	0	0	63
18:00 - 18:59	0	30	3	1	4	0	0	0	0	0	0	0	0	38
19:00 - 19:59	0	15	3	0	0	0	0	0	0	0	0	0	0	18
20:00 - 20:59	0	13	1	0	3	0	0	0	0	0	0	0	0	17
21:00 - 21:59	0	6	0	0	0	0	0	0	0	0	0	0	0	6
22:00 - 22:59	1	4	0	1	0	0	0	0	0	0	0	0	0	6
23:00 - 23:59	0	2	1	0	2	0	0	0	0	0	0	0	0	5
Totals	2	631	59	23	83	9	1	7	11	0	0	0	0	826
Percent of Total	0.2	76.4	7.1	2.8	10.0	1.1	0.1	0.8	1.3	0.0	0.0	0.0	0.0	100
Percent of AM	0.0	75.1	6.5	3.4	11.3	1.0	0.0	0.5	2.1	0.0	0.0	0.0	0.0	100
Percent of PM	0.5	77.5	7.7	2.3	9.0	1.1	0.2	1.1	0.7	0.0	0.0	0.0	0.0	100

Truck Summary:

Total Trucks: 134 % Trucks: 16.2 AM % Trucks: 18.3 PM % Trucks: 14.4

Classification Scheme: FHWA (ID: 1)

- | | | |
|-----------------------------------|-----------------------------------|----------------------------------|
| #1 Motorcycles - 2 Axles | #6 Single Unit Truck - 3 Axles | #11 Multi-Unit - 5 Axles or Less |
| #2 Passenger Cars - 2 Axles | #7 Single Unit - 4 Axles | #12 Multi-Unit - 6 Axles |
| #3 Pickup Trucks, Vans - 2 Axles | #8 Single Unit - 4 Axles or Less | #13 Multi-Unit - 7 Axles or More |
| #4 Buses | #9 Double Unit - 5 Axles | |
| #5 Single Unit - 2 Axles, 6 Tires | #10 Double Unit - 6 Axles or More | |

Daily Total Classes Report

Study Date: Wednesday, 03/30/2022

Unit ID: 1

Location: Location B on Northrop Road in Wallingford, CT

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	Total
00:00 - 00:59	0	7	0	0	1	0	0	0	0	0	0	0	0	8
01:00 - 01:59	0	0	0	0	2	0	0	0	0	0	0	0	0	2
02:00 - 02:59	0	4	0	0	1	0	0	0	2	0	0	0	0	7
03:00 - 03:59	0	4	0	0	0	0	0	1	1	0	0	0	0	6
04:00 - 04:59	0	10	0	2	3	0	0	0	0	0	0	0	0	15
05:00 - 05:59	0	30	4	9	6	1	0	1	2	0	0	0	0	53
06:00 - 06:59	0	57	9	16	10	0	0	0	4	0	0	0	0	96
07:00 - 07:59	0	127	9	4	12	1	0	1	3	0	0	0	0	157
08:00 - 08:59	0	130	9	3	13	3	0	0	1	0	0	0	0	159
09:00 - 09:59	0	63	9	5	20	1	0	0	2	0	0	0	0	100
10:00 - 10:59	0	46	8	1	8	1	1	0	0	0	0	0	0	65
11:00 - 11:59	0	57	8	1	11	2	0	5	0	0	0	0	0	84
12:00 - 12:59	0	89	9	5	11	2	0	2	0	0	0	0	0	118
13:00 - 13:59	1	69	4	11	12	0	2	3	2	0	0	0	0	104
14:00 - 14:59	0	95	12	3	14	2	0	2	1	0	0	0	0	129
15:00 - 15:59	0	113	10	5	13	1	0	1	1	0	0	0	0	144
16:00 - 16:59	0	171	17	4	18	0	0	1	3	0	0	0	0	214
17:00 - 17:59	0	128	12	2	15	1	0	0	3	0	0	0	0	161
18:00 - 18:59	0	57	6	2	10	0	0	1	0	0	0	0	0	76
19:00 - 19:59	0	39	8	0	0	0	0	0	0	0	0	0	0	47
20:00 - 20:59	0	30	4	0	4	0	0	0	0	0	0	0	0	38
21:00 - 21:59	1	19	0	1	1	0	0	0	0	0	0	0	0	22
22:00 - 22:59	1	13	0	1	0	0	0	0	0	0	0	0	0	15
23:00 - 23:59	0	13	1	0	3	0	0	0	0	0	0	0	0	17
Totals	3	1371	139	75	188	15	3	18	25	0	0	0	0	1837
Percent of Total	0.2	74.6	7.6	4.1	10.2	0.8	0.2	1.0	1.4	0.0	0.0	0.0	0.0	100
Percent of AM	0.0	71.1	7.4	5.5	11.6	1.2	0.1	1.1	2.0	0.0	0.0	0.0	0.0	100
Percent of PM	0.3	77.1	7.6	3.1	9.3	0.6	0.2	0.9	0.9	0.0	0.0	0.0	0.0	100

Truck Summary:

Total Trucks: 324 % Trucks: 17.6 AM % Trucks: 21.4 PM % Trucks: 15.0

Classification Scheme: FHWA (ID: 1)

- | | | |
|-----------------------------------|-----------------------------------|----------------------------------|
| #1 Motorcycles - 2 Axles | #6 Single Unit Truck - 3 Axles | #11 Multi-Unit - 5 Axles or Less |
| #2 Passenger Cars - 2 Axles | #7 Single Unit - 4 Axles | #12 Multi-Unit - 6 Axles |
| #3 Pickup Trucks, Vans - 2 Axles | #8 Single Unit - 4 Axles or Less | #13 Multi-Unit - 7 Axles or More |
| #4 Buses | #9 Double Unit - 5 Axles | |
| #5 Single Unit - 2 Axles, 6 Tires | #10 Double Unit - 6 Axles or More | |

Daily Northbound Speeds (MPH)

Study Date: Wednesday, 03/30/2022

Unit ID: 1

Location: Location B on Northrop Road in Wallingford, CT

Posted Speed: 30

	5-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-99	Total
00:00 - 00:59	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	3
01:00 - 01:59	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
02:00 - 02:59	0	0	0	2	1	0	1	0	0	0	0	0	0	0	0	4
03:00 - 03:59	0	0	0	1	1	1	0	1	0	0	0	0	0	0	0	4
04:00 - 04:59	0	0	0	1	0	3	0	0	0	0	0	0	0	0	0	4
05:00 - 05:59	0	0	2	5	3	4	5	0	0	1	0	0	0	0	0	20
06:00 - 06:59	1	1	6	15	7	10	5	0	0	0	0	0	0	0	0	45
07:00 - 07:59	0	0	0	7	16	34	20	2	0	0	0	0	0	0	0	79
08:00 - 08:59	0	0	0	6	19	29	15	5	1	0	0	0	0	0	0	75
09:00 - 09:59	1	1	0	11	24	12	9	0	0	0	0	0	0	0	0	58
10:00 - 10:59	0	0	1	7	10	9	4	1	0	0	0	0	0	0	0	32
11:00 - 11:59	0	1	1	7	14	14	4	3	0	0	0	0	0	0	0	44
12:00 - 12:59	0	0	2	17	18	19	8	2	0	0	0	0	0	0	0	66
13:00 - 13:59	0	0	1	16	19	18	3	1	0	0	0	0	0	0	0	58
14:00 - 14:59	1	0	2	12	23	23	11	2	0	0	0	0	0	0	0	74
15:00 - 15:59	0	0	1	10	29	27	16	2	0	0	0	0	0	0	0	85
16:00 - 16:59	0	0	4	20	41	54	12	4	0	0	0	0	0	0	0	135
17:00 - 17:59	0	0	3	8	36	35	12	4	0	0	0	0	0	0	0	98
18:00 - 18:59	0	0	0	1	18	10	8	1	0	0	0	0	0	0	0	38
19:00 - 19:59	0	1	3	5	5	13	1	1	0	0	0	0	0	0	0	29
20:00 - 20:59	0	0	0	1	9	7	3	0	1	0	0	0	0	0	0	21
21:00 - 21:59	0	2	0	1	5	4	4	0	0	0	0	0	0	0	0	16
22:00 - 22:59	0	0	0	0	3	4	2	0	0	0	0	0	0	0	0	9
23:00 - 23:59	0	0	0	2	1	7	2	0	0	0	0	0	0	0	0	12
Totals	3	6	26	155	302	338	148	30	2	1	0	0	0	0	0	1011
Percent of Total	0.3	0.6	2.6	15.3	29.9	33.4	14.6	3.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	100
Percent of AM	0.5	0.8	2.7	16.8	25.7	31.6	17.8	3.5	0.3	0.3	0.0	0.0	0.0	0.0	0.0	100
Percent of PM	0.2	0.5	2.5	14.5	32.3	34.5	12.8	2.7	0.2	0.0	0.0	0.0	0.0	0.0	0.0	100

Standard Deviation:	6.0 MPH	Ten Mile Pace:	30 to 39 MPH	85th Percentile:	41.0 MPH
Mean Speed:	35.0 MPH	Percent in Ten Mile Pace:	63.3%	15th Percentile:	28.7 MPH
Median Speed:	35.2 MPH			90th Percentile:	42.7 MPH
Modal Speed:	37.5 MPH			95th Percentile:	44.4 MPH

Daily Southbound Speeds (MPH)

Study Date: Wednesday, 03/30/2022

Unit ID: 1

Location: Location B on Northrop Road in Wallingford, CT

Posted Speed: 30

	5-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-99	Total
00:00 - 00:59	0	0	0	0	1	2	2	0	0	0	0	0	0	0	0	5
01:00 - 01:59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00 - 02:59	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	3
03:00 - 03:59	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	2
04:00 - 04:59	0	1	0	0	4	3	1	1	1	0	0	0	0	0	0	11
05:00 - 05:59	0	0	2	2	11	14	3	0	1	0	0	0	0	0	0	33
06:00 - 06:59	0	0	1	10	12	15	7	4	2	0	0	0	0	0	0	51
07:00 - 07:59	0	0	2	7	21	24	22	2	0	0	0	0	0	0	0	78
08:00 - 08:59	0	1	2	8	29	25	14	5	0	0	0	0	0	0	0	84
09:00 - 09:59	0	0	3	17	7	10	5	0	0	0	0	0	0	0	0	42
10:00 - 10:59	0	1	0	4	11	15	2	0	0	0	0	0	0	0	0	33
11:00 - 11:59	0	0	0	6	8	19	5	2	0	0	0	0	0	0	0	40
12:00 - 12:59	0	0	2	8	21	17	3	1	0	0	0	0	0	0	0	52
13:00 - 13:59	0	0	2	10	13	15	4	1	1	0	0	0	0	0	0	46
14:00 - 14:59	0	1	1	13	19	14	5	2	0	0	0	0	0	0	0	55
15:00 - 15:59	1	2	3	7	22	17	7	0	0	0	0	0	0	0	0	59
16:00 - 16:59	0	0	15	14	15	23	12	0	0	0	0	0	0	0	0	79
17:00 - 17:59	0	0	3	8	20	23	8	1	0	0	0	0	0	0	0	63
18:00 - 18:59	0	0	1	4	9	15	9	0	0	0	0	0	0	0	0	38
19:00 - 19:59	0	0	1	2	3	5	6	0	0	1	0	0	0	0	0	18
20:00 - 20:59	0	0	1	1	4	7	1	3	0	0	0	0	0	0	0	17
21:00 - 21:59	0	0	0	0	5	1	0	0	0	0	0	0	0	0	0	6
22:00 - 22:59	0	2	0	1	1	0	2	0	0	0	0	0	0	0	0	6
23:00 - 23:59	0	0	0	1	0	1	3	0	0	0	0	0	0	0	0	5
Totals	1	8	40	123	237	267	121	23	5	1	0	0	0	0	0	826
Percent of Total	0.1	1.0	4.8	14.9	28.7	32.3	14.6	2.8	0.6	0.1	0.0	0.0	0.0	0.0	0.0	100
Percent of AM	0.0	0.8	2.9	14.1	27.5	33.8	16.0	3.9	1.0	0.0	0.0	0.0	0.0	0.0	0.0	100
Percent of PM	0.2	1.1	6.5	15.5	29.7	31.1	13.5	1.8	0.2	0.2	0.0	0.0	0.0	0.0	0.0	100

Standard Deviation:	6.4 MPH	Ten Mile Pace:	30 to 39 MPH	85th Percentile:	41.1 MPH
Mean Speed:	34.7 MPH	Percent in Ten Mile Pace:	61.0%	15th Percentile:	28.0 MPH
Median Speed:	35.1 MPH			90th Percentile:	42.8 MPH
Modal Speed:	37.5 MPH			95th Percentile:	44.5 MPH

Daily Total Speeds (MPH)

Study Date: Wednesday, 03/30/2022

Unit ID: 1

Location: Location B on Northrop Road in Wallingford, CT

Posted Speed: 30

	5-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-99	Total
00:00 - 00:59	0	0	0	0	1	3	3	1	0	0	0	0	0	0	0	8
01:00 - 01:59	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
02:00 - 02:59	0	0	0	2	2	1	1	1	0	0	0	0	0	0	0	7
03:00 - 03:59	0	0	1	1	1	2	0	1	0	0	0	0	0	0	0	6
04:00 - 04:59	0	1	0	1	4	6	1	1	1	0	0	0	0	0	0	15
05:00 - 05:59	0	0	4	7	14	18	8	0	1	1	0	0	0	0	0	53
06:00 - 06:59	1	1	7	25	19	25	12	4	2	0	0	0	0	0	0	96
07:00 - 07:59	0	0	2	14	37	58	42	4	0	0	0	0	0	0	0	157
08:00 - 08:59	0	1	2	14	48	54	29	10	1	0	0	0	0	0	0	159
09:00 - 09:59	1	1	3	28	31	22	14	0	0	0	0	0	0	0	0	100
10:00 - 10:59	0	1	1	11	21	24	6	1	0	0	0	0	0	0	0	65
11:00 - 11:59	0	1	1	13	22	33	9	5	0	0	0	0	0	0	0	84
12:00 - 12:59	0	0	4	25	39	36	11	3	0	0	0	0	0	0	0	118
13:00 - 13:59	0	0	3	26	32	33	7	2	1	0	0	0	0	0	0	104
14:00 - 14:59	1	1	3	25	42	37	16	4	0	0	0	0	0	0	0	129
15:00 - 15:59	1	2	4	17	51	44	23	2	0	0	0	0	0	0	0	144
16:00 - 16:59	0	0	19	34	56	77	24	4	0	0	0	0	0	0	0	214
17:00 - 17:59	0	0	6	16	56	58	20	5	0	0	0	0	0	0	0	161
18:00 - 18:59	0	0	1	5	27	25	17	1	0	0	0	0	0	0	0	76
19:00 - 19:59	0	1	4	7	8	18	7	1	0	1	0	0	0	0	0	47
20:00 - 20:59	0	0	1	2	13	14	4	3	1	0	0	0	0	0	0	38
21:00 - 21:59	0	2	0	1	10	5	4	0	0	0	0	0	0	0	0	22
22:00 - 22:59	0	2	0	1	4	4	4	0	0	0	0	0	0	0	0	15
23:00 - 23:59	0	0	0	3	1	8	5	0	0	0	0	0	0	0	0	17
Totals	4	14	66	278	539	605	269	53	7	2	0	0	0	0	0	1837
Percent of Total	0.2	0.8	3.6	15.1	29.3	32.9	14.6	2.9	0.4	0.1	0.0	0.0	0.0	0.0	0.0	100
Percent of AM	0.3	0.8	2.8	15.4	26.6	32.7	16.9	3.7	0.7	0.1	0.0	0.0	0.0	0.0	0.0	100
Percent of PM	0.2	0.7	4.1	14.9	31.2	33.1	13.1	2.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	100

Standard Deviation:	6.2 MPH	Ten Mile Pace:	30 to 39 MPH	85th Percentile:	41.0 MPH
Mean Speed:	34.9 MPH	Percent in Ten Mile Pace:	62.3%	15th Percentile:	28.4 MPH
Median Speed:	35.1 MPH			90th Percentile:	42.7 MPH
Modal Speed:	37.5 MPH			95th Percentile:	44.4 MPH

Daily Vehicle Volume Report

Study Date: Wednesday, 03/30/2022

Unit ID:

Location: Location C on Northrop Road in Wallingford, CT

	Northbound Volume	Southbound Volume	Total Volume
00:00 - 00:59	2	5	7
01:00 - 01:59	3	0	3
02:00 - 02:59	4	3	7
03:00 - 03:59	4	2	6
04:00 - 04:59	4	11	15
05:00 - 05:59	17	35	52
06:00 - 06:59	46	50	96
07:00 - 07:59	78	81	159
08:00 - 08:59	75	78	153
09:00 - 09:59	56	42	98
10:00 - 10:59	35	34	69
11:00 - 11:59	44	43	87
12:00 - 12:59	62	50	112
13:00 - 13:59	58	45	103
14:00 - 14:59	75	53	128
15:00 - 15:59	83	57	140
16:00 - 16:59	132	78	210
17:00 - 17:59	100	66	166
18:00 - 18:59	36	36	72
19:00 - 19:59	28	17	45
20:00 - 20:59	20	16	36
21:00 - 21:59	16	6	22
22:00 - 22:59	9	6	15
23:00 - 23:59	11	5	16
Totals	998	819	1817
AM Peak Time	07:33 - 08:32	07:33 - 08:32	07:33 - 08:32
AM Peak Volume	89	92	181
PM Peak Time	16:18 - 17:17	16:21 - 17:20	16:18 - 17:17
PM Peak Volume	150	86	234

Daily Northbound Classes Report

Study Date: Wednesday, 03/30/2022

Unit ID:

Location: Location C on Northrop Road in Wallingford, CT

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	Total
00:00 - 00:59	0	2	0	0	0	0	0	0	0	0	0	0	0	2
01:00 - 01:59	0	1	0	0	2	0	0	0	0	0	0	0	0	3
02:00 - 02:59	0	3	0	0	0	0	0	0	1	0	0	0	0	4
03:00 - 03:59	0	3	0	0	1	0	0	0	0	0	0	0	0	4
04:00 - 04:59	0	2	0	1	1	0	0	0	0	0	0	0	0	4
05:00 - 05:59	0	5	2	4	5	0	0	1	0	0	0	0	0	17
06:00 - 06:59	0	18	6	15	6	0	0	0	1	0	0	0	0	46
07:00 - 07:59	0	65	4	3	5	0	0	0	1	0	0	0	0	78
08:00 - 08:59	0	61	6	1	6	1	0	0	0	0	0	0	0	75
09:00 - 09:59	0	35	7	2	11	1	0	0	0	0	0	0	0	56
10:00 - 10:59	0	22	9	1	3	0	0	0	0	0	0	0	0	35
11:00 - 11:59	0	30	3	2	6	1	0	2	0	0	0	0	0	44
12:00 - 12:59	0	45	6	5	6	0	0	0	0	0	0	0	0	62
13:00 - 13:59	0	36	5	10	4	0	0	1	2	0	0	0	0	58
14:00 - 14:59	1	57	4	1	11	1	0	0	0	0	0	0	0	75
15:00 - 15:59	0	65	7	4	6	0	0	1	0	0	0	0	0	83
16:00 - 16:59	1	104	17	2	6	1	0	1	0	0	0	0	0	132
17:00 - 17:59	0	82	9	0	8	0	0	0	1	0	0	0	0	100
18:00 - 18:59	0	25	6	1	3	0	0	1	0	0	0	0	0	36
19:00 - 19:59	0	24	4	0	0	0	0	0	0	0	0	0	0	28
20:00 - 20:59	0	17	2	0	1	0	0	0	0	0	0	0	0	20
21:00 - 21:59	0	14	1	0	0	0	0	0	1	0	0	0	0	16
22:00 - 22:59	0	9	0	0	0	0	0	0	0	0	0	0	0	9
23:00 - 23:59	0	10	0	0	1	0	0	0	0	0	0	0	0	11
Totals	2	735	98	52	92	5	0	7	7	0	0	0	0	998
Percent of Total	0.2	73.6	9.8	5.2	9.2	0.5	0.0	0.7	0.7	0.0	0.0	0.0	0.0	100
Percent of AM	0.0	67.1	10.1	7.9	12.5	0.8	0.0	0.8	0.8	0.0	0.0	0.0	0.0	100
Percent of PM	0.3	77.5	9.7	3.7	7.3	0.3	0.0	0.6	0.6	0.0	0.0	0.0	0.0	100

Truck Summary:

Total Trucks: 163 % Trucks: 16.3 AM % Trucks: 22.8 PM % Trucks: 12.5

Classification Scheme: FHWA (ID: 1)

- | | | |
|-----------------------------------|-----------------------------------|----------------------------------|
| #1 Motorcycles - 2 Axles | #6 Single Unit Truck - 3 Axles | #11 Multi-Unit - 5 Axles or Less |
| #2 Passenger Cars - 2 Axles | #7 Single Unit - 4 Axles | #12 Multi-Unit - 6 Axles |
| #3 Pickup Trucks, Vans - 2 Axles | #8 Single Unit - 4 Axles or Less | #13 Multi-Unit - 7 Axles or More |
| #4 Buses | #9 Double Unit - 5 Axles | |
| #5 Single Unit - 2 Axles, 6 Tires | #10 Double Unit - 6 Axles or More | |

Daily Southbound Classes Report

Study Date: Wednesday, 03/30/2022

Unit ID:

Location: Location C on Northrop Road in Wallingford, CT

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	Total
00:00 - 00:59	0	4	0	0	1	0	0	0	0	0	0	0	0	5
01:00 - 01:59	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00 - 02:59	0	1	0	0	2	0	0	0	0	0	0	0	0	3
03:00 - 03:59	0	1	0	0	0	0	0	0	1	0	0	0	0	2
04:00 - 04:59	0	8	0	1	2	0	0	0	0	0	0	0	0	11
05:00 - 05:59	0	23	2	5	4	0	0	0	1	0	0	0	0	35
06:00 - 06:59	0	39	4	1	4	0	0	2	0	0	0	0	0	50
07:00 - 07:59	0	65	4	1	8	1	0	1	1	0	0	0	0	81
08:00 - 08:59	0	62	5	2	8	1	0	0	0	0	0	0	0	78
09:00 - 09:59	0	28	3	2	7	0	0	0	2	0	0	0	0	42
10:00 - 10:59	0	26	3	1	3	1	0	0	0	0	0	0	0	34
11:00 - 11:59	2	27	4	0	8	2	0	0	0	0	0	0	0	43
12:00 - 12:59	1	40	3	0	5	0	0	1	0	0	0	0	0	50
13:00 - 13:59	0	33	1	1	6	0	1	1	2	0	0	0	0	45
14:00 - 14:59	0	36	8	2	4	1	0	1	1	0	0	0	0	53
15:00 - 15:59	0	46	4	1	6	0	0	0	0	0	0	0	0	57
16:00 - 16:59	1	64	6	2	3	0	0	1	1	0	0	0	0	78
17:00 - 17:59	1	48	6	2	6	2	0	0	1	0	0	0	0	66
18:00 - 18:59	0	30	2	1	3	0	0	0	0	0	0	0	0	36
19:00 - 19:59	0	14	3	0	0	0	0	0	0	0	0	0	0	17
20:00 - 20:59	0	12	1	0	3	0	0	0	0	0	0	0	0	16
21:00 - 21:59	0	6	0	0	0	0	0	0	0	0	0	0	0	6
22:00 - 22:59	1	4	0	1	0	0	0	0	0	0	0	0	0	6
23:00 - 23:59	0	2	1	0	2	0	0	0	0	0	0	0	0	5
Totals	6	619	60	23	85	8	1	7	10	0	0	0	0	819
Percent of Total	0.7	75.6	7.3	2.8	10.4	1.0	0.1	0.9	1.2	0.0	0.0	0.0	0.0	100
Percent of AM	0.5	74.0	6.5	3.4	12.2	1.3	0.0	0.8	1.3	0.0	0.0	0.0	0.0	100
Percent of PM	0.9	77.0	8.0	2.3	8.7	0.7	0.2	0.9	1.1	0.0	0.0	0.0	0.0	100

Truck Summary:

Total Trucks: 134 % Trucks: 16.4 AM % Trucks: 19.0 PM % Trucks: 14.0

Classification Scheme: FHWA (ID: 1)

- | | | |
|-----------------------------------|-----------------------------------|----------------------------------|
| #1 Motorcycles - 2 Axles | #6 Single Unit Truck - 3 Axles | #11 Multi-Unit - 5 Axles or Less |
| #2 Passenger Cars - 2 Axles | #7 Single Unit - 4 Axles | #12 Multi-Unit - 6 Axles |
| #3 Pickup Trucks, Vans - 2 Axles | #8 Single Unit - 4 Axles or Less | #13 Multi-Unit - 7 Axles or More |
| #4 Buses | #9 Double Unit - 5 Axles | |
| #5 Single Unit - 2 Axles, 6 Tires | #10 Double Unit - 6 Axles or More | |

Daily Total Classes Report

Study Date: Wednesday, 03/30/2022

Unit ID:

Location: Location C on Northrop Road in Wallingford, CT

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	Total
00:00 - 00:59	0	6	0	0	1	0	0	0	0	0	0	0	0	7
01:00 - 01:59	0	1	0	0	2	0	0	0	0	0	0	0	0	3
02:00 - 02:59	0	4	0	0	2	0	0	0	1	0	0	0	0	7
03:00 - 03:59	0	4	0	0	1	0	0	0	1	0	0	0	0	6
04:00 - 04:59	0	10	0	2	3	0	0	0	0	0	0	0	0	15
05:00 - 05:59	0	28	4	9	9	0	0	1	1	0	0	0	0	52
06:00 - 06:59	0	57	10	16	10	0	0	2	1	0	0	0	0	96
07:00 - 07:59	0	130	8	4	13	1	0	1	2	0	0	0	0	159
08:00 - 08:59	0	123	11	3	14	2	0	0	0	0	0	0	0	153
09:00 - 09:59	0	63	10	4	18	1	0	0	2	0	0	0	0	98
10:00 - 10:59	0	48	12	2	6	1	0	0	0	0	0	0	0	69
11:00 - 11:59	2	57	7	2	14	3	0	2	0	0	0	0	0	87
12:00 - 12:59	1	85	9	5	11	0	0	1	0	0	0	0	0	112
13:00 - 13:59	0	69	6	11	10	0	1	2	4	0	0	0	0	103
14:00 - 14:59	1	93	12	3	15	2	0	1	1	0	0	0	0	128
15:00 - 15:59	0	111	11	5	12	0	0	1	0	0	0	0	0	140
16:00 - 16:59	2	168	23	4	9	1	0	2	1	0	0	0	0	210
17:00 - 17:59	1	130	15	2	14	2	0	0	2	0	0	0	0	166
18:00 - 18:59	0	55	8	2	6	0	0	1	0	0	0	0	0	72
19:00 - 19:59	0	38	7	0	0	0	0	0	0	0	0	0	0	45
20:00 - 20:59	0	29	3	0	4	0	0	0	0	0	0	0	0	36
21:00 - 21:59	0	20	1	0	0	0	0	0	1	0	0	0	0	22
22:00 - 22:59	1	13	0	1	0	0	0	0	0	0	0	0	0	15
23:00 - 23:59	0	12	1	0	3	0	0	0	0	0	0	0	0	16
Totals	8	1354	158	75	177	13	1	14	17	0	0	0	0	1817
Percent of Total	0.4	74.5	8.7	4.1	9.7	0.7	0.1	0.8	0.9	0.0	0.0	0.0	0.0	100
Percent of AM	0.3	70.6	8.2	5.6	12.4	1.1	0.0	0.8	1.1	0.0	0.0	0.0	0.0	100
Percent of PM	0.6	77.3	9.0	3.1	7.9	0.5	0.1	0.8	0.8	0.0	0.0	0.0	0.0	100

Truck Summary:

Total Trucks: 297 % Trucks: 16.3 AM % Trucks: 20.9 PM % Trucks: 13.1

Classification Scheme: FHWA (ID: 1)

- | | | |
|-----------------------------------|-----------------------------------|----------------------------------|
| #1 Motorcycles - 2 Axles | #6 Single Unit Truck - 3 Axles | #11 Multi-Unit - 5 Axles or Less |
| #2 Passenger Cars - 2 Axles | #7 Single Unit - 4 Axles | #12 Multi-Unit - 6 Axles |
| #3 Pickup Trucks, Vans - 2 Axles | #8 Single Unit - 4 Axles or Less | #13 Multi-Unit - 7 Axles or More |
| #4 Buses | #9 Double Unit - 5 Axles | |
| #5 Single Unit - 2 Axles, 6 Tires | #10 Double Unit - 6 Axles or More | |

Daily Northbound Speeds (MPH)

Study Date: Wednesday, 03/30/2022

Unit ID:

Location: Location C on Northrop Road in Wallingford, CT

Posted Speed: 30

	5-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-99	Total
00:00 - 00:59	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	2
01:00 - 01:59	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	3
02:00 - 02:59	0	0	0	1	2	0	0	1	0	0	0	0	0	0	0	4
03:00 - 03:59	0	0	0	0	1	1	1	0	1	0	0	0	0	0	0	4
04:00 - 04:59	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	4
05:00 - 05:59	0	0	1	1	6	3	3	2	1	0	0	0	0	0	0	17
06:00 - 06:59	0	1	2	10	14	6	10	2	0	0	0	0	0	1	0	46
07:00 - 07:59	0	0	0	1	11	16	30	17	3	0	0	0	0	0	0	78
08:00 - 08:59	0	0	0	0	6	24	26	12	7	0	0	0	0	0	0	75
09:00 - 09:59	0	0	1	7	12	13	19	3	1	0	0	0	0	0	0	56
10:00 - 10:59	0	0	0	4	5	14	7	3	2	0	0	0	0	0	0	35
11:00 - 11:59	0	0	0	5	9	16	9	4	1	0	0	0	0	0	0	44
12:00 - 12:59	0	1	0	11	11	14	15	9	0	1	0	0	0	0	0	62
13:00 - 13:59	0	0	0	5	23	14	12	4	0	0	0	0	0	0	0	58
14:00 - 14:59	0	1	0	7	12	20	23	10	2	0	0	0	0	0	0	75
15:00 - 15:59	0	0	0	5	17	22	28	11	0	0	0	0	0	0	0	83
16:00 - 16:59	0	0	1	7	23	53	38	9	1	0	0	0	0	0	0	132
17:00 - 17:59	0	0	2	3	14	37	33	10	1	0	0	0	0	0	0	100
18:00 - 18:59	0	0	0	3	3	11	14	4	1	0	0	0	0	0	0	36
19:00 - 19:59	1	0	3	0	4	10	5	5	0	0	0	0	0	0	0	28
20:00 - 20:59	0	0	0	0	3	6	5	4	1	0	1	0	0	0	0	20
21:00 - 21:59	0	1	0	0	2	6	5	2	0	0	0	0	0	0	0	16
22:00 - 22:59	0	0	0	0	1	4	2	1	1	0	0	0	0	0	0	9
23:00 - 23:59	0	0	0	1	1	1	5	3	0	0	0	0	0	0	0	11
Totals	1	4	10	71	180	293	293	119	24	1	1	0	0	1	0	998
Percent of Total	0.1	0.4	1.0	7.1	18.0	29.4	29.4	11.9	2.4	0.1	0.1	0.0	0.0	0.1	0.0	100
Percent of AM	0.0	0.3	1.1	7.9	17.9	25.8	29.3	12.8	4.6	0.0	0.0	0.0	0.0	0.3	0.0	100
Percent of PM	0.2	0.5	1.0	6.7	18.1	31.4	29.4	11.4	1.1	0.2	0.2	0.0	0.0	0.0	0.0	100

Standard Deviation:	6.6 MPH	Ten Mile Pace:	35 to 44 MPH	85th Percentile:	44.9 MPH
Mean Speed:	38.7 MPH	Percent in Ten Mile Pace:	58.7%	15th Percentile:	31.8 MPH
Median Speed:	39.0 MPH			90th Percentile:	46.9 MPH
Modal Speed:	37.5 MPH			95th Percentile:	49.0 MPH

Daily Southbound Speeds (MPH)

Study Date: Wednesday, 03/30/2022

Unit ID:

Location: Location C on Northrop Road in Wallingford, CT

Posted Speed: 30

	5-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-99	Total
00:00 - 00:59	0	0	0	0	0	1	2	0	2	0	0	0	0	0	0	5
01:00 - 01:59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00 - 02:59	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	3
03:00 - 03:59	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	2
04:00 - 04:59	0	0	0	1	0	1	4	1	2	2	0	0	0	0	0	11
05:00 - 05:59	0	0	0	2	2	8	9	9	4	1	0	0	0	0	0	35
06:00 - 06:59	0	0	0	0	5	12	17	7	9	0	0	0	0	0	0	50
07:00 - 07:59	0	0	0	0	4	17	25	21	11	3	0	0	0	0	0	81
08:00 - 08:59	0	0	0	2	4	18	26	19	9	0	0	0	0	0	0	78
09:00 - 09:59	0	0	1	3	11	5	14	7	1	0	0	0	0	0	0	42
10:00 - 10:59	0	0	1	0	2	11	13	7	0	0	0	0	0	0	0	34
11:00 - 11:59	0	0	0	1	2	11	13	9	4	1	0	0	0	0	0	41
12:00 - 12:59	0	0	0	2	8	16	17	5	1	1	0	0	0	0	0	50
13:00 - 13:59	0	0	1	1	5	15	8	11	3	0	1	0	0	0	0	45
14:00 - 14:59	0	0	1	0	8	16	16	8	3	1	0	0	0	0	0	53
15:00 - 15:59	0	0	0	2	10	17	15	12	1	0	0	0	0	0	0	57
16:00 - 16:59	0	0	0	9	17	16	15	18	2	0	0	0	0	0	0	77
17:00 - 17:59	0	0	0	1	7	17	26	12	1	1	1	0	0	0	0	66
18:00 - 18:59	0	1	0	1	0	8	14	10	2	0	0	0	0	0	0	36
19:00 - 19:59	0	1	0	0	1	4	5	4	1	1	0	0	0	0	0	17
20:00 - 20:59	0	0	0	1	1	6	2	4	0	1	1	0	0	0	0	16
21:00 - 21:59	0	0	0	0	0	3	2	0	0	0	1	0	0	0	0	6
22:00 - 22:59	0	0	2	0	1	1	0	1	1	0	0	0	0	0	0	6
23:00 - 23:59	0	0	0	0	1	0	1	2	1	0	0	0	0	0	0	5
Totals	0	2	6	27	89	204	244	169	58	12	5	0	0	0	0	816
Percent of Total	0.0	0.2	0.7	3.3	10.9	25.0	29.9	20.7	7.1	1.5	0.6	0.0	0.0	0.0	0.0	100
Percent of AM	0.0	0.0	0.5	2.6	7.9	22.3	32.2	21.5	11.0	1.8	0.3	0.0	0.0	0.0	0.0	100
Percent of PM	0.0	0.5	0.9	3.9	13.6	27.4	27.9	20.0	3.7	1.2	0.9	0.0	0.0	0.0	0.0	100

Standard Deviation:	6.9 MPH	Ten Mile Pace:	35 to 44 MPH	85th Percentile:	48.6 MPH
Mean Speed:	41.5 MPH	Percent in Ten Mile Pace:	54.9%	15th Percentile:	34.9 MPH
Median Speed:	41.6 MPH			90th Percentile:	49.8 MPH
Modal Speed:	42.5 MPH			95th Percentile:	52.9 MPH

Daily Total Speeds (MPH)

Study Date: Wednesday, 03/30/2022

Unit ID:

Location: Location C on Northrop Road in Wallingford, CT

Posted Speed: 30

	5-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-99	Total
00:00 - 00:59	0	0	0	0	0	1	2	1	3	0	0	0	0	0	0	7
01:00 - 01:59	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	3
02:00 - 02:59	0	0	0	1	2	1	0	2	0	0	1	0	0	0	0	7
03:00 - 03:59	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	6
04:00 - 04:59	0	0	0	1	0	3	6	1	2	2	0	0	0	0	0	15
05:00 - 05:59	0	0	1	3	8	11	12	11	5	1	0	0	0	0	0	52
06:00 - 06:59	0	1	2	10	19	18	27	9	9	0	0	0	0	1	0	96
07:00 - 07:59	0	0	0	1	15	33	55	38	14	3	0	0	0	0	0	159
08:00 - 08:59	0	0	0	2	10	42	52	31	16	0	0	0	0	0	0	153
09:00 - 09:59	0	0	2	10	23	18	33	10	2	0	0	0	0	0	0	98
10:00 - 10:59	0	0	1	4	7	25	20	10	2	0	0	0	0	0	0	69
11:00 - 11:59	0	0	0	6	11	27	22	13	5	1	0	0	0	0	0	85
12:00 - 12:59	0	1	0	13	19	30	32	14	1	2	0	0	0	0	0	112
13:00 - 13:59	0	0	1	6	28	29	20	15	3	0	1	0	0	0	0	103
14:00 - 14:59	0	1	1	7	20	36	39	18	5	1	0	0	0	0	0	128
15:00 - 15:59	0	0	0	7	27	39	43	23	1	0	0	0	0	0	0	140
16:00 - 16:59	0	0	1	16	40	69	53	27	3	0	0	0	0	0	0	209
17:00 - 17:59	0	0	2	4	21	54	59	22	2	1	1	0	0	0	0	166
18:00 - 18:59	0	1	0	4	3	19	28	14	3	0	0	0	0	0	0	72
19:00 - 19:59	1	1	3	0	5	14	10	9	1	1	0	0	0	0	0	45
20:00 - 20:59	0	0	0	1	4	12	7	8	1	1	2	0	0	0	0	36
21:00 - 21:59	0	1	0	0	2	9	7	2	0	0	1	0	0	0	0	22
22:00 - 22:59	0	0	2	0	2	5	2	2	2	0	0	0	0	0	0	15
23:00 - 23:59	0	0	0	1	2	1	6	5	1	0	0	0	0	0	0	16
Totals	1	6	16	98	269	497	537	288	82	13	6	0	0	1	0	1814
Percent of Total	0.1	0.3	0.9	5.4	14.8	27.4	29.6	15.9	4.5	0.7	0.3	0.0	0.0	0.1	0.0	100
Percent of AM	0.0	0.1	0.8	5.2	12.8	24.0	30.8	17.2	7.9	0.9	0.1	0.0	0.0	0.1	0.0	100
Percent of PM	0.1	0.5	0.9	5.5	16.3	29.8	28.8	14.9	2.2	0.6	0.5	0.0	0.0	0.0	0.0	100

Standard Deviation:	6.9 MPH	Ten Mile Pace:	35 to 44 MPH	85th Percentile:	47.0 MPH
Mean Speed:	40.0 MPH	Percent in Ten Mile Pace:	57.0%	15th Percentile:	32.8 MPH
Median Speed:	40.2 MPH			90th Percentile:	48.6 MPH
Modal Speed:	42.5 MPH			95th Percentile:	50.7 MPH

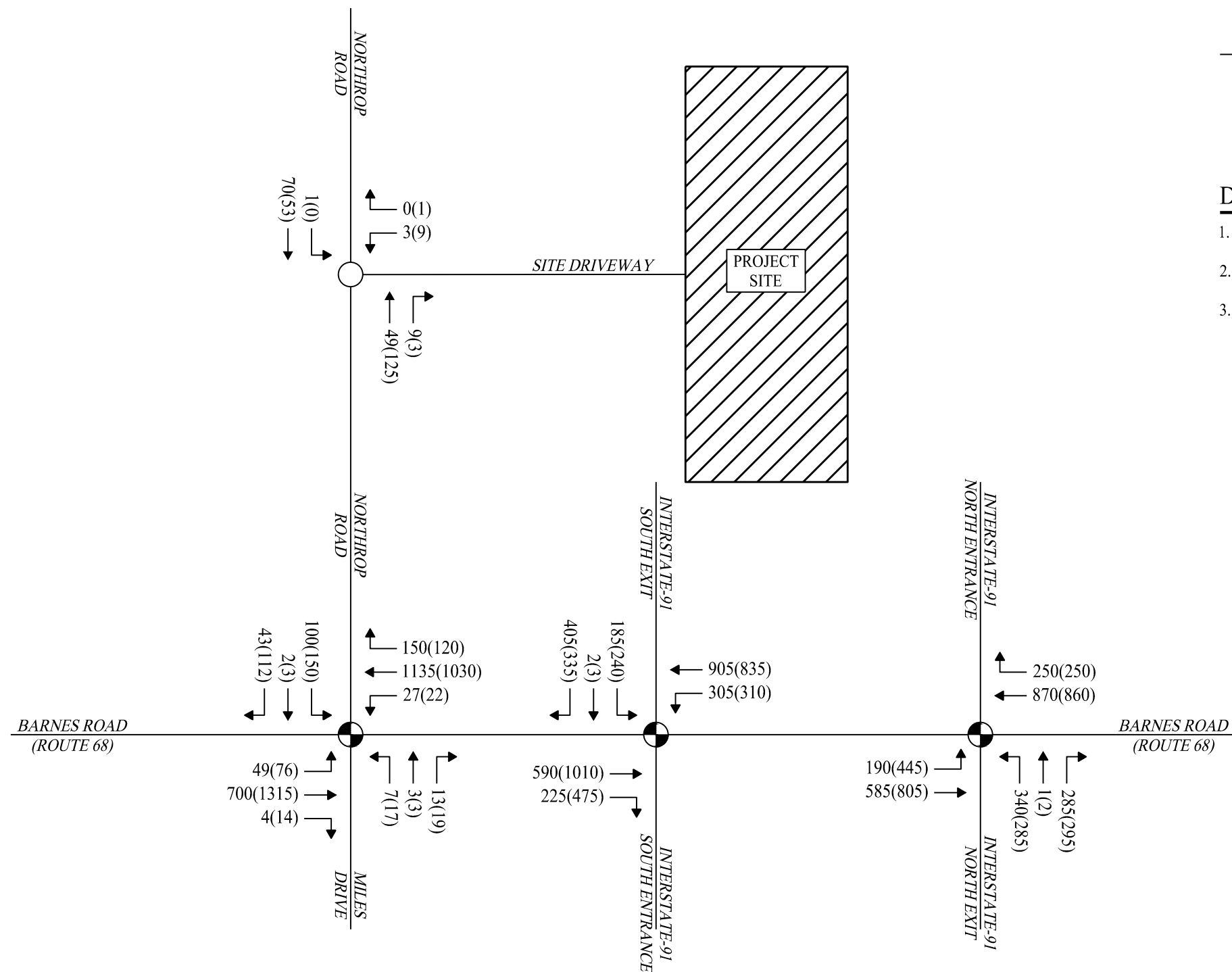


LEGEND

- SIGNALIZED INTERSECTION
- UNSIGNALIZED INTERSECTION
- EXISTING ROADWAY
- AM(PM)

DATA COLLECTION NOTES

1. TURNING MOVEMENT COUNT DATA COLLECTED ON SEPTEMBER 15, 2020
2. THE AM OBSERVED PEAK HOUR OCCURRED FROM 7:30 AM TO 8:30 AM
3. THE PM OBSERVED PEAK HOUR OCCURRED FROM 4:15 PM TO 5:15 PM



Rev. #:	Date	Description

SOLLI ENGINEERING
 501 Main Street, Monroe, CT 06468
 T: (203) 880-5455 | F: (203) 880-9695

Drawn By:	SWG
Checked By:	KMS
Project #:	2011901
Plan Date:	11/30/20
Scale:	NTS

Project:
PROPOSED WAREHOUSE
 850 MURDOCK AVENUE
 MERIDEN, CT

Sheet Title:
EXISTING TRAFFIC VOLUMES 2020

SHEET #:
Figure 2

LEVEL OF SERVICE FOR TWO-WAY STOP SIGN CONTROLLED INTERSECTIONS

The level of service for a TWSC (two-way stop controlled) intersection is determined by the computed or measured control delay and is defined for each minor movement. Level of service is not defined for the intersection as a whole. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. LOS criteria are given in the Table. LOS criteria are given below:

LEVEL-OF SERVICE CRITERIA FOR AWSC INTERSECTIONS	
LOS¹	CONTROL DELAY (s/veh)
A	≤ 10
B	$> 10 \text{ AND } \leq 15$
C	$> 15 \text{ AND } \leq 25$
D	$> 25 \text{ AND } \leq 35$
E	$> 35 \text{ AND } \leq 50$
F	> 50

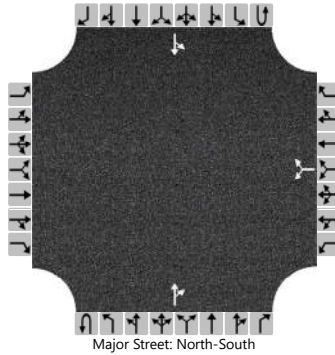
Note: LOS criteria apply to each lane on a given approach and to each approach on the minor street.
 LOS is not calculated for major-street approaches or for the intersection as a whole.
 LOS F is assigned to a movement if the volume-to-capacity ratio exceeds 1.0, regardless of the control delay

Reference: Highway Capacity Manual Version 6.0, Transportation Research Board, 2016.

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	SLR			Intersection	North Farms at Northrup		
Agency/Co.				Jurisdiction			
Date Performed	7/6/2022			East/West Street	Northrup Road		
Analysis Year	2022			North/South Street	Murdock Ave/N Farms Road		
Time Analyzed	AM PEAK			Peak Hour Factor	0.92		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	Northrup Road						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						5		69			95	5		100	156	
Percent Heavy Vehicles (%)						3		3						3		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2							4.1		
Critical Headway (sec)						6.43		6.23							4.13		
Base Follow-Up Headway (sec)						3.5		3.3							2.2		
Follow-Up Headway (sec)						3.53		3.33							2.23		

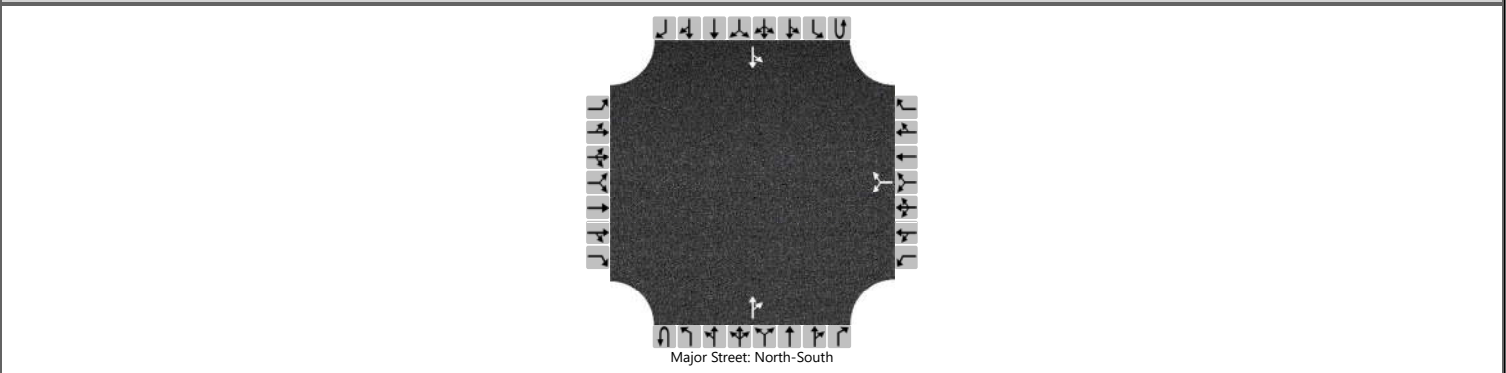
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						80									109		
Capacity, c (veh/h)						1014									1476		
v/c Ratio						0.08									0.07		
95% Queue Length, Q ₉₅ (veh)						0.3									0.2		
Control Delay (s/veh)						8.9									7.6		
Level of Service (LOS)						A									A		
Approach Delay (s/veh)					8.9								3.4				
Approach LOS					A												

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	SLR			Intersection	North Farms at Northrup		
Agency/Co.				Jurisdiction			
Date Performed	7/6/2022			East/West Street	Northrup Road		
Analysis Year	2022			North/South Street	Murdock Ave/N Farms Road		
Time Analyzed	PM PEAK			Peak Hour Factor	0.93		
Intersection Orientation	North-South			Analysis Time Period (hrs)	0.25		
Project Description	Northrup Road						

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement																
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						17		144			161	10		63	143	
Percent Heavy Vehicles (%)						3		3						3		
Proportion Time Blocked																
Percent Grade (%)					0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.43		6.23						4.13		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.53		3.33						2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						173								68		
Capacity, c (veh/h)						964								1385		
v/c Ratio						0.18								0.05		
95% Queue Length, Q ₉₅ (veh)						0.7								0.2		
Control Delay (s/veh)						9.6								7.7		
Level of Service (LOS)						A								A		
Approach Delay (s/veh)					9.6								2.7			
Approach LOS					A											

CHAPTER 4C. TRAFFIC CONTROL SIGNAL NEEDS STUDIES

Section 4C.01 Studies and Factors for Justifying Traffic Control Signals

Standard:

- 01 An engineering study of traffic conditions, pedestrian characteristics, and physical characteristics of the location shall be performed to determine whether installation of a traffic control signal is justified at a particular location.
- 02 The investigation of the need for a traffic control signal shall include an analysis of factors related to the existing operation and safety at the study location and the potential to improve these conditions, and the applicable factors contained in the following traffic signal warrants:
- Warrant 1, Eight-Hour Vehicular Volume
 - Warrant 2, Four-Hour Vehicular Volume
 - Warrant 3, Peak Hour
 - Warrant 4, Pedestrian Volume
 - Warrant 5, School Crossing
 - Warrant 6, Coordinated Signal System
 - Warrant 7, Crash Experience
 - Warrant 8, Roadway Network
 - Warrant 9, Intersection Near a Grade Crossing
- 03 The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Support:

- 04 Sections 8C.09 and 8C.10 contain information regarding the use of traffic control signals instead of gates and/or flashing-light signals at highway-rail grade crossings and highway-light rail transit grade crossings, respectively.
- Guidance:*
- 05 A traffic control signal should not be installed unless one or more of the factors described in this Chapter are met.
- 06 A traffic control signal should not be installed unless an engineering study indicates that installing a traffic control signal will improve the overall safety and/or operation of the intersection.
- 07 A traffic control signal should not be installed if it will seriously disrupt progressive traffic flow.
- 08 The study should consider the effects of the right-turn vehicles from the minor-street approaches. Engineering judgment should be used to determine what, if any, portion of the right-turn traffic is subtracted from the minor-street traffic count when evaluating the count against the signal warrants listed in Paragraph 2.
- 09 Engineering judgment should also be used in applying various traffic signal warrants to cases where approaches consist of one lane plus one left-turn or right-turn lane. The site-specific traffic characteristics should dictate whether an approach is considered as one lane or two lanes. For example, for an approach with one lane for through and right-turning traffic plus a left-turn lane, if engineering judgment indicates that it should be considered a one-lane approach because the traffic using the left-turn lane is minor, the total traffic volume approaching the intersection should be applied against the signal warrants as a one-lane approach. The approach should be considered two lanes if approximately half of the traffic on the approach turns left and the left-turn lane is of sufficient length to accommodate all left-turn vehicles.
- 10 Similar engineering judgment and rationale should be applied to a street approach with one through/left-turn lane plus a right-turn lane. In this case, the degree of conflict of minor-street right-turn traffic with traffic on the major street should be considered. Thus, right-turn traffic should not be included in the minor-street volume if the movement enters the major street with minimal conflict. The approach should be evaluated as a one-lane approach with only the traffic volume in the through/left-turn lane considered.
- 11 At a location that is under development or construction and where it is not possible to obtain a traffic count that would represent future traffic conditions, hourly volumes should be estimated as part of an engineering study for comparison with traffic signal warrants. Except for locations where the engineering study uses the satisfaction of Warrant 8 to justify a signal, a traffic control signal installed under projected conditions should have an engineering study done within 1 year of putting the signal into stop-and-go operation to determine if the signal is justified. If not justified, the signal should be taken out of stop-and-go operation or removed.
- 12 For signal warrant analysis, a location with a wide median, even if the median width is greater than 30 feet, should be considered as one intersection.

Option:

- 13 At an intersection with a high volume of left-turn traffic from the major street, the signal warrant analysis may be performed in a manner that considers the higher of the major-street left-turn volumes as the “minor-street” volume and the corresponding single direction of opposing traffic on the major street as the “major-street” volume.
- 14 For signal warrants requiring conditions to be present for a certain number of hours in order to be satisfied, any four sequential 15-minute periods may be considered as 1 hour if the separate 1-hour periods used in the warrant analysis do not overlap each other and both the major-street volume and the minor-street volume are for the same specific one-hour periods.
- 15 For signal warrant analysis, bicyclists may be counted as either vehicles or pedestrians.

Support:

- 16 When performing a signal warrant analysis, bicyclists riding in the street with other vehicular traffic are usually counted as vehicles and bicyclists who are clearly using pedestrian facilities are usually counted as pedestrians.

Option:

- 17 Engineering study data may include the following:
- A. The number of vehicles entering the intersection in each hour from each approach during 12 hours of an average day. It is desirable that the hours selected contain the greatest percentage of the 24-hour traffic volume.
 - B. Vehicular volumes for each traffic movement from each approach, classified by vehicle type (heavy trucks, passenger cars and light trucks, public-transit vehicles, and, in some locations, bicycles), during each 15-minute period of the 2 hours in the morning and 2 hours in the afternoon during which total traffic entering the intersection is greatest.
 - C. Pedestrian volume counts on each crosswalk during the same periods as the vehicular counts in Item B and during hours of highest pedestrian volume. Where young, elderly, and/or persons with physical or visual disabilities need special consideration, the pedestrians and their crossing times may be classified by general observation.
 - D. Information about nearby facilities and activity centers that serve the young, elderly, and/or persons with disabilities, including requests from persons with disabilities for accessible crossing improvements at the location under study. These persons might not be adequately reflected in the pedestrian volume count if the absence of a signal restrains their mobility.
 - E. The posted or statutory speed limit or the 85th-percentile speed on the uncontrolled approaches to the location.
 - F. A condition diagram showing details of the physical layout, including such features as intersection geometrics, channelization, grades, sight-distance restrictions, transit stops and routes, parking conditions, pavement markings, roadway lighting, driveways, nearby railroad crossings, distance to nearest traffic control signals, utility poles and fixtures, and adjacent land use.
 - G. A collision diagram showing crash experience by type, location, direction of movement, severity, weather, time of day, date, and day of week for at least 1 year.
- 18 The following data, which are desirable for a more precise understanding of the operation of the intersection, may be obtained during the periods described in Item B of Paragraph 17:
- A. Vehicle-hours of stopped time delay determined separately for each approach.
 - B. The number and distribution of acceptable gaps in vehicular traffic on the major street for entrance from the minor street.
 - C. The posted or statutory speed limit or the 85th-percentile speed on controlled approaches at a point near to the intersection but unaffected by the control.
 - D. Pedestrian delay time for at least two 30-minute peak pedestrian delay periods of an average weekday or like periods of a Saturday or Sunday.
 - E. Queue length on stop-controlled approaches.

Section 4C.02 Warrant 1, Eight-Hour Vehicular Volume

Support:

- 01 The Minimum Vehicular Volume, Condition A, is intended for application at locations where a large volume of intersecting traffic is the principal reason to consider installing a traffic control signal.
- 02 The Interruption of Continuous Traffic, Condition B, is intended for application at locations where Condition A is not satisfied and where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street.
- 03 It is intended that Warrant 1 be treated as a single warrant. If Condition A is satisfied, then Warrant 1 is satisfied and analyses of Condition B and the combination of Conditions A and B are not needed. Similarly, if Condition B is satisfied, then Warrant 1 is satisfied and an analysis of the combination of Conditions A and B is not needed.

Standard:

- 04 The need for a traffic control signal shall be considered if an engineering study finds that one of the following conditions exist for each of any 8 hours of an average day:
- A. The vehicles per hour given in both of the 100 percent columns of Condition A in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection;
 - B. The vehicles per hour given in both of the 100 percent columns of Condition B in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection.

In applying each condition the major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of these 8 hours.

Option:

- 05 If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the traffic volumes in the 70 percent columns in Table 4C-1 may be used in place of the 100 percent columns.

Guidance:

- 06 The combination of Conditions A and B is intended for application at locations where Condition A is not satisfied and Condition B is not satisfied and should be applied only after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems.

Standard:

- 07 The need for a traffic control signal shall be considered if an engineering study finds that both of the following conditions exist for each of any 8 hours of an average day:
- A. The vehicles per hour given in both of the 80 percent columns of Condition A in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection;
 - B. The vehicles per hour given in both of the 80 percent columns of Condition B in Table 4C-1 exist on the major-street and the higher-volume minor-street approaches, respectively, to the intersection.

These major-street and minor-street volumes shall be for the same 8 hours for each condition; however, the 8 hours satisfied in Condition A shall not be required to be the same 8 hours satisfied in Condition B. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours.

Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	56% ^d	100% ^a	80% ^b	70% ^c	56% ^d
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	56% ^d	100% ^a	80% ^b	70% ^c	56% ^d
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

^a Basic minimum hourly volume

^b Used for combination of Conditions A and B after adequate trial of other remedial measures

^c May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

^d May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Option:

- 08 If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the traffic volumes in the 56 percent columns in Table 4C-1 may be used in place of the 80 percent columns.

Section 4C.03 Warrant 2, Four-Hour Vehicular Volume

Support:

- 01 The Four-Hour Vehicular Volume signal warrant conditions are intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic control signal.

Standard:

- 02 **The need for a traffic control signal shall be considered if an engineering study finds that, for each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) all fall above the applicable curve in Figure 4C-1 for the existing combination of approach lanes. On the minor street, the higher volume shall not be required to be on the same approach during each of these 4 hours.**

Option:

- 03 If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, Figure 4C-2 may be used in place of Figure 4C-1.

Section 4C.04 Warrant 3, Peak Hour

Support:

- 01 The Peak Hour signal warrant is intended for use at a location where traffic conditions are such that for a minimum of 1 hour of an average day, the minor-street traffic suffers undue delay when entering or crossing the major street.

Standard:

- 02 **This signal warrant shall be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.**
- 03 **The need for a traffic control signal shall be considered if an engineering study finds that the criteria in either of the following two categories are met:**
- A. **If all three of the following conditions exist for the same 1 hour (any four consecutive 15-minute periods) of an average day:**
 1. **The total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach; and**
 2. **The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes; and**
 3. **The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches.**
 - B. **The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor-street approach (one direction only) for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4C-3 for the existing combination of approach lanes.**

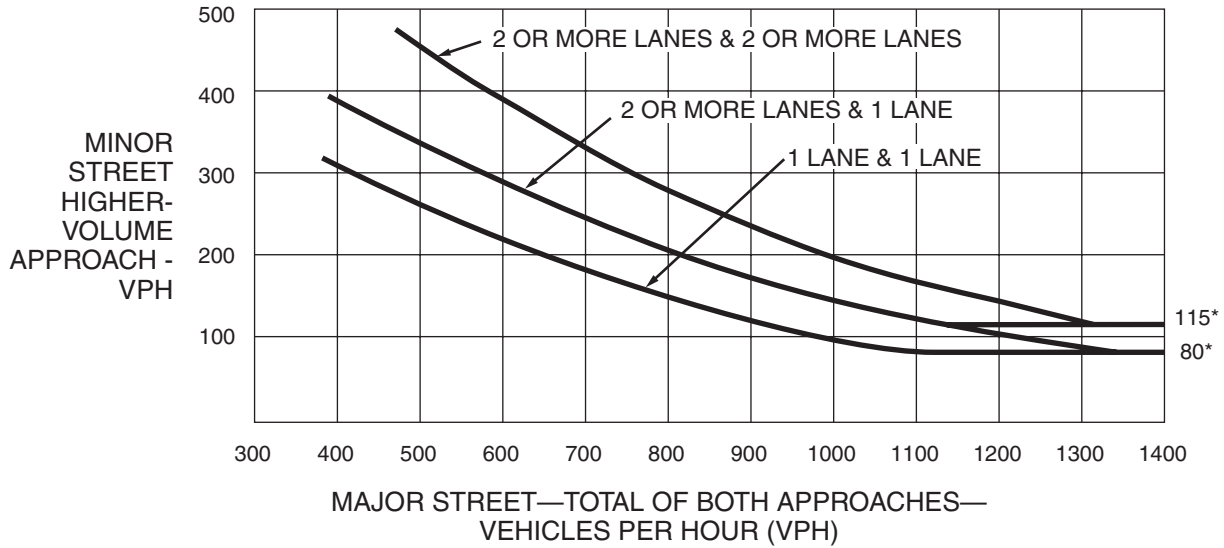
Option:

- 04 If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, Figure 4C-4 may be used in place of Figure 4C-3 to evaluate the criteria in the second category of the Standard.
- 05 If this warrant is the only warrant met and a traffic control signal is justified by an engineering study, the traffic control signal may be operated in the flashing mode during the hours that the volume criteria of this warrant are not met.

Guidance:

- 06 *If this warrant is the only warrant met and a traffic control signal is justified by an engineering study, the traffic control signal should be traffic-actuated.*

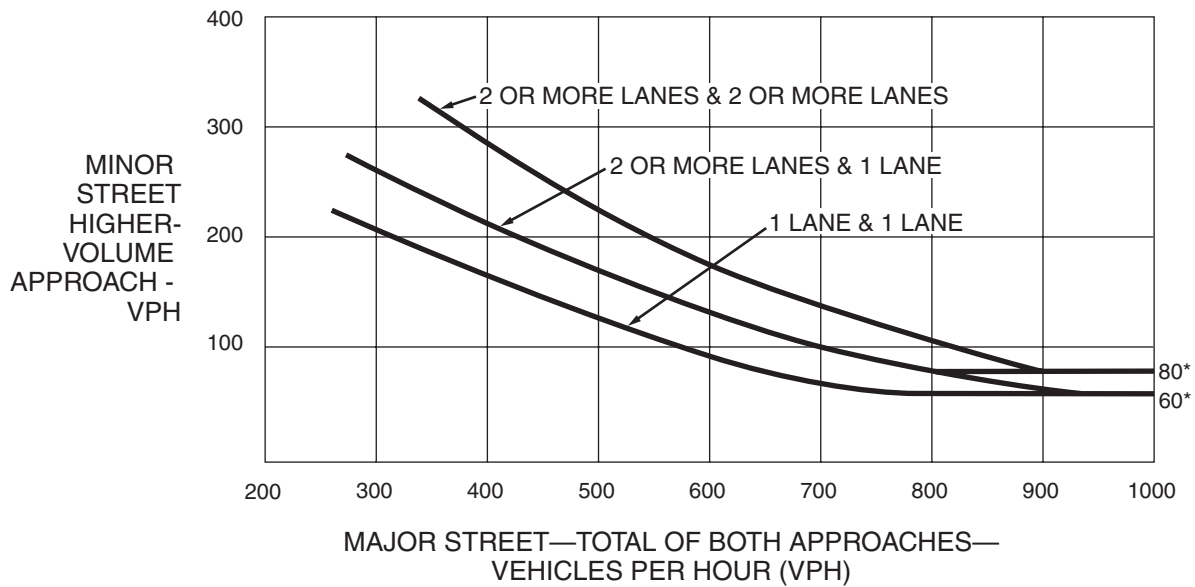
Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

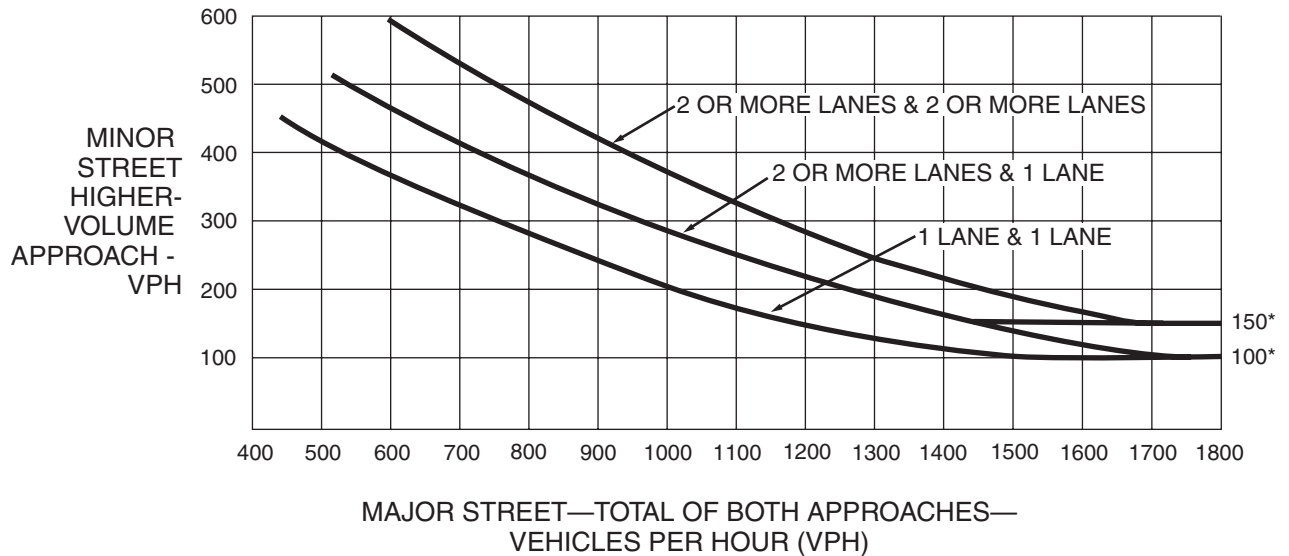
Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)

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



*Note: 80 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

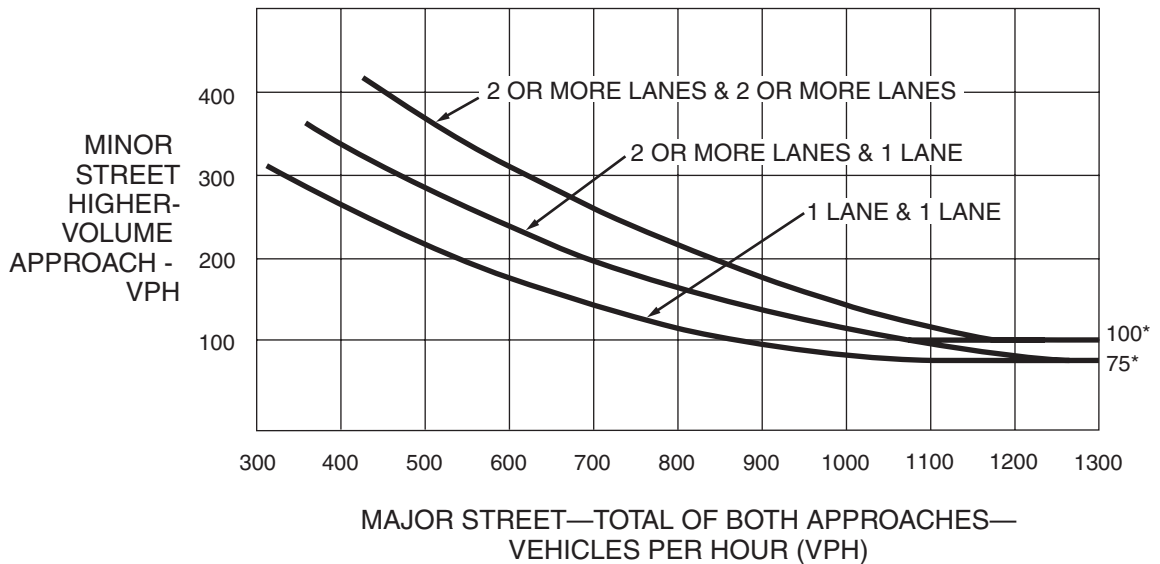
Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

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

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



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

Section 4C.05 Warrant 4, Pedestrian Volume

Support:

- 01 The Pedestrian Volume signal warrant is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street.

Standard:

- 02 **The need for a traffic control signal at an intersection or midblock crossing shall be considered if an engineering study finds that one of the following criteria is met:**
- A. For each of any 4 hours of an average day, the plotted points representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) all fall above the curve in Figure 4C-5; or
 - B. For 1 hour (any four consecutive 15-minute periods) of an average day, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding pedestrians per hour crossing the major street (total of all crossings) falls above the curve in Figure 4C-7.

Option:

- 03 If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 35 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, Figure 4C-6 may be used in place of Figure 4C-5 to evaluate Criterion A in Paragraph 2, and Figure 4C-8 may be used in place of Figure 4C-7 to evaluate Criterion B in Paragraph 2.

Standard:

- 04 **The Pedestrian Volume signal warrant shall not be applied at locations where the distance to the nearest traffic control signal or STOP sign controlling the street that pedestrians desire to cross is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of traffic.**
- 05 **If this warrant is met and a traffic control signal is justified by an engineering study, the traffic control signal shall be equipped with pedestrian signal heads complying with the provisions set forth in Chapter 4E.**

Guidance:

- 06 *If this warrant is met and a traffic control signal is justified by an engineering study, then:*
- A. *If it is installed at an intersection or major driveway location, the traffic control signal should also control the minor-street or driveway traffic, should be traffic-actuated, and should include pedestrian detection.*
 - B. *If it is installed at a non-intersection crossing, the traffic control signal should be installed at least 100 feet from side streets or driveways that are controlled by STOP or YIELD signs, and should be pedestrian-actuated. If the traffic control signal is installed at a non-intersection crossing, at least one of the signal faces should be over the traveled way for each approach, parking and other sight obstructions should be prohibited for at least 100 feet in advance of and at least 20 feet beyond the crosswalk or site accommodations should be made through curb extensions or other techniques to provide adequate sight distance, and the installation should include suitable standard signs and pavement markings.*
 - C. *Furthermore, if it is installed within a signal system, the traffic control signal should be coordinated.*

Option:

- 07 The criterion for the pedestrian volume crossing the major street may be reduced as much as 50 percent if the 15th-percentile crossing speed of pedestrians is less than 3.5 feet per second.
- 08 A traffic control signal may not be needed at the study location if adjacent coordinated traffic control signals consistently provide gaps of adequate length for pedestrians to cross the street.

Section 4C.06 Warrant 5, School Crossing

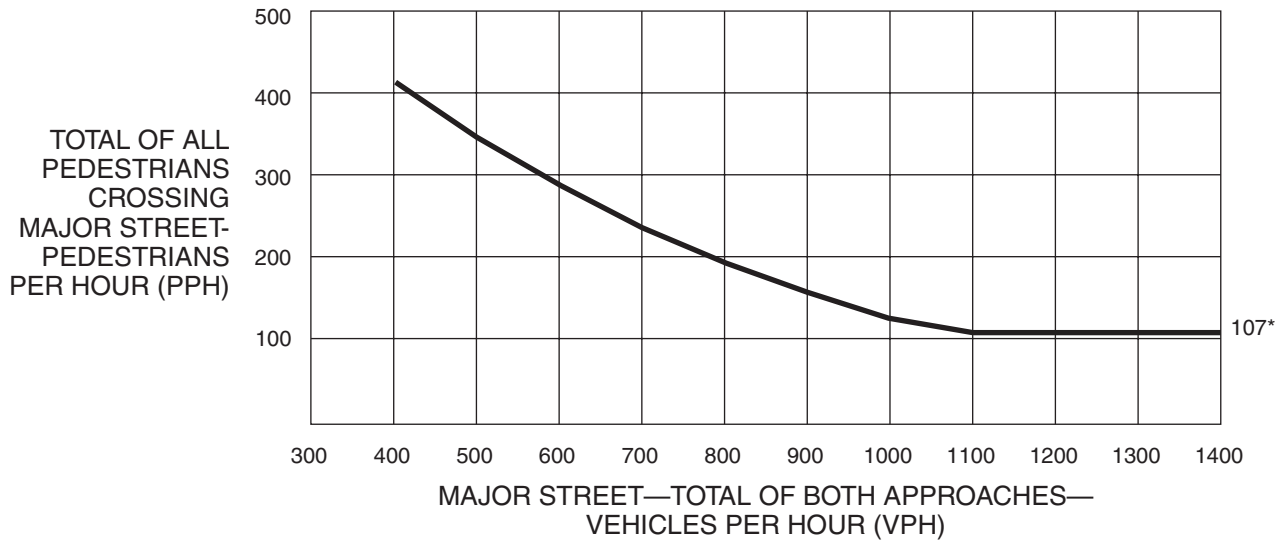
Support:

- 01 The School Crossing signal warrant is intended for application where the fact that schoolchildren cross the major street is the principal reason to consider installing a traffic control signal. For the purposes of this warrant, the word “schoolchildren” includes elementary through high school students.

Standard:

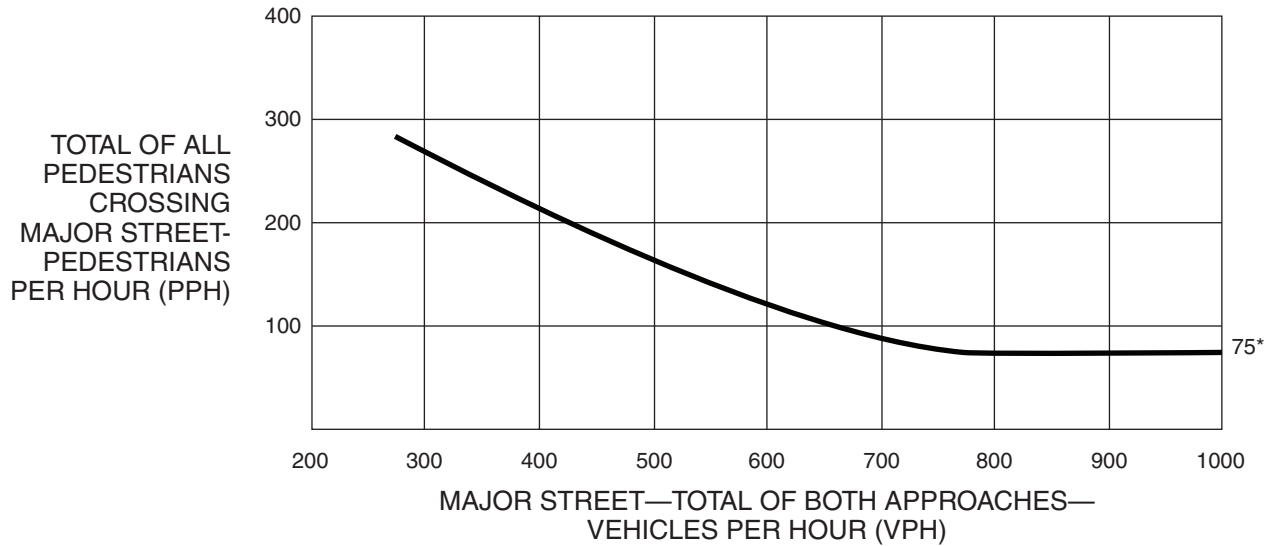
- 02 **The need for a traffic control signal shall be considered when an engineering study of the frequency and adequacy of gaps in the vehicular traffic stream as related to the number and size of groups of schoolchildren at an established school crossing across the major street shows that the number of adequate gaps in the traffic stream during the period when the schoolchildren are using the crossing is less than the number of minutes in the same period (see Section 7A.03) and there are a minimum of 20 schoolchildren during the highest crossing hour.**

Figure 4C-5. Warrant 4, Pedestrian Four-Hour Volume



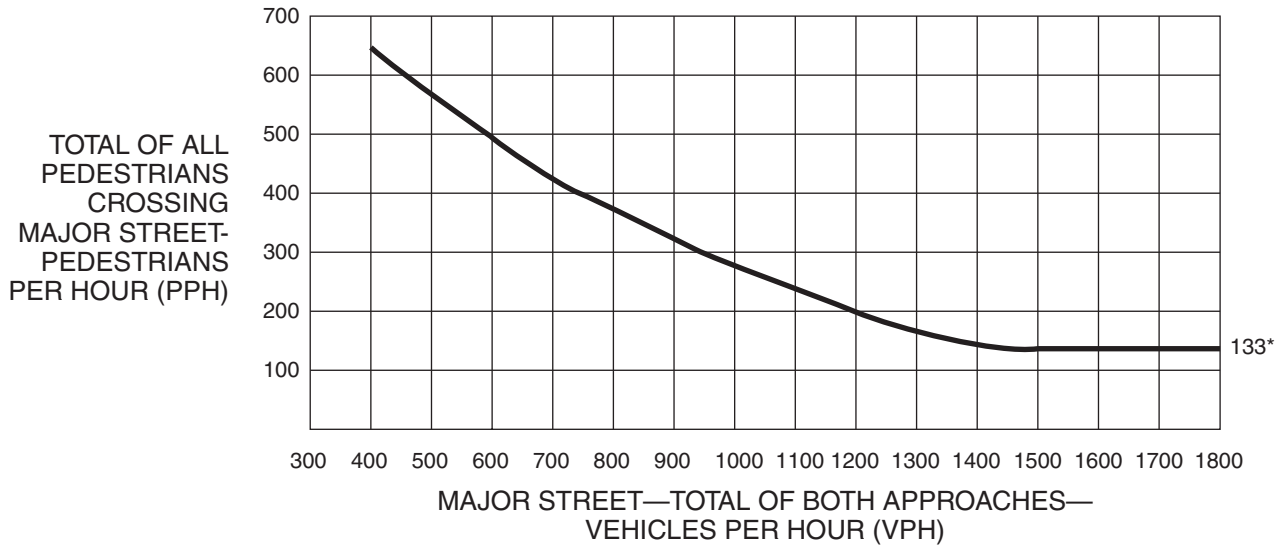
*Note: 107 pph applies as the lower threshold volume.

Figure 4C-6. Warrant 4, Pedestrian Four-Hour Volume (70% Factor)



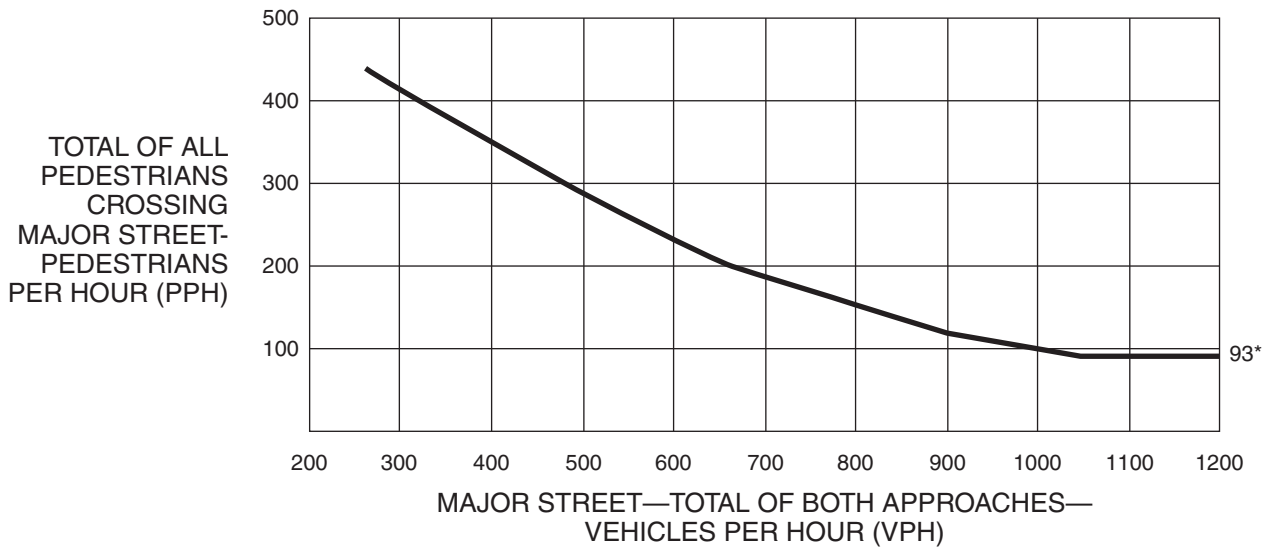
*Note: 75 pph applies as the lower threshold volume.

Figure 4C-7. Warrant 4, Pedestrian Peak Hour



*Note: 133 pph applies as the lower threshold volume.

Figure 4C-8. Warrant 4, Pedestrian Peak Hour (70% Factor)



*Note: 93 pph applies as the lower threshold volume.

- 03 **Before a decision is made to install a traffic control signal, consideration shall be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing.**
- 04 **The School Crossing signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 300 feet, unless the proposed traffic control signal will not restrict the progressive movement of traffic.**

Guidance:

- 05 *If this warrant is met and a traffic control signal is justified by an engineering study, then:*
- A. *If it is installed at an intersection or major driveway location, the traffic control signal should also control the minor-street or driveway traffic, should be traffic-actuated, and should include pedestrian detection.*
 - B. *If it is installed at a non-intersection crossing, the traffic control signal should be installed at least 100 feet from side streets or driveways that are controlled by STOP or YIELD signs, and should be pedestrian-actuated. If the traffic control signal is installed at a non-intersection crossing, at least one of the signal faces should be over the traveled way for each approach, parking and other sight obstructions should be prohibited for at least 100 feet in advance of and at least 20 feet beyond the crosswalk or site accommodations should be made through curb extensions or other techniques to provide adequate sight distance, and the installation should include suitable standard signs and pavement markings.*
 - C. *Furthermore, if it is installed within a signal system, the traffic control signal should be coordinated.*

Section 4C.07 Warrant 6, Coordinated Signal System

Support:

- 01 Progressive movement in a coordinated signal system sometimes necessitates installing traffic control signals at intersections where they would not otherwise be needed in order to maintain proper platooning of vehicles.

Standard:

- 02 **The need for a traffic control signal shall be considered if an engineering study finds that one of the following criteria is met:**
- A. **On a one-way street or a street that has traffic predominantly in one direction, the adjacent traffic control signals are so far apart that they do not provide the necessary degree of vehicular platooning.**
 - B. **On a two-way street, adjacent traffic control signals do not provide the necessary degree of platooning and the proposed and adjacent traffic control signals will collectively provide a progressive operation.**

Guidance:

- 03 *The Coordinated Signal System signal warrant should not be applied where the resultant spacing of traffic control signals would be less than 1,000 feet.*

Section 4C.08 Warrant 7, Crash Experience

Support:

- 01 The Crash Experience signal warrant conditions are intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal.

Standard:

- 02 **The need for a traffic control signal shall be considered if an engineering study finds that all of the following criteria are met:**
- A. **Adequate trial of alternatives with satisfactory observance and enforcement has failed to reduce the crash frequency; and**
 - B. **Five or more reported crashes, of types susceptible to correction by a traffic control signal, have occurred within a 12-month period, each crash involving personal injury or property damage apparently exceeding the applicable requirements for a reportable crash; and**
 - C. **For each of any 8 hours of an average day, the vehicles per hour (vph) given in both of the 80 percent columns of Condition A in Table 4C-1 (see Section 4C.02), or the vph in both of the 80 percent columns of Condition B in Table 4C-1 exists on the major-street and the higher-volume minor-street approach, respectively, to the intersection, or the volume of pedestrian traffic is not less than 80 percent of the requirements specified in the Pedestrian Volume warrant. These major-street and minor-street volumes shall be for the same 8 hours. On the minor street, the higher volume shall not be required to be on the same approach during each of the 8 hours.**

Option:

- 03 If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, the traffic volumes in the 56 percent columns in Table 4C-1 may be used in place of the 80 percent columns.

Section 4C.09 Warrant 8, Roadway Network

Support:

- 01 Installing a traffic control signal at some intersections might be justified to encourage concentration and organization of traffic flow on a roadway network.

Standard:

- 02 **The need for a traffic control signal shall be considered if an engineering study finds that the common intersection of two or more major routes meets one or both of the following criteria:**

- A. **The intersection has a total existing, or immediately projected, entering volume of at least 1,000 vehicles per hour during the peak hour of a typical weekday and has 5-year projected traffic volumes, based on an engineering study, that meet one or more of Warrants 1, 2, and 3 during an average weekday; or**
- B. **The intersection has a total existing or immediately projected entering volume of at least 1,000 vehicles per hour for each of any 5 hours of a non-normal business day (Saturday or Sunday).**

- 03 **A major route as used in this signal warrant shall have at least one of the following characteristics:**

- A. **It is part of the street or highway system that serves as the principal roadway network for through traffic flow.**
- B. **It includes rural or suburban highways outside, entering, or traversing a city.**
- C. **It appears as a major route on an official plan, such as a major street plan in an urban area traffic and transportation study.**

Section 4C.10 Warrant 9, Intersection Near a Grade Crossing

Support:

- 01 The Intersection Near a Grade Crossing signal warrant is intended for use at a location where none of the conditions described in the other eight traffic signal warrants are met, but the proximity to the intersection of a grade crossing on an intersection approach controlled by a STOP or YIELD sign is the principal reason to consider installing a traffic control signal.

Guidance:

- 02 *This signal warrant should be applied only after adequate consideration has been given to other alternatives or after a trial of an alternative has failed to alleviate the safety concerns associated with the grade crossing. Among the alternatives that should be considered or tried are:*
- A. *Providing additional pavement that would enable vehicles to clear the track or that would provide space for an evasive maneuver, or*
 - B. *Reassigning the stop controls at the intersection to make the approach across the track a non-stopping approach.*

Standard:

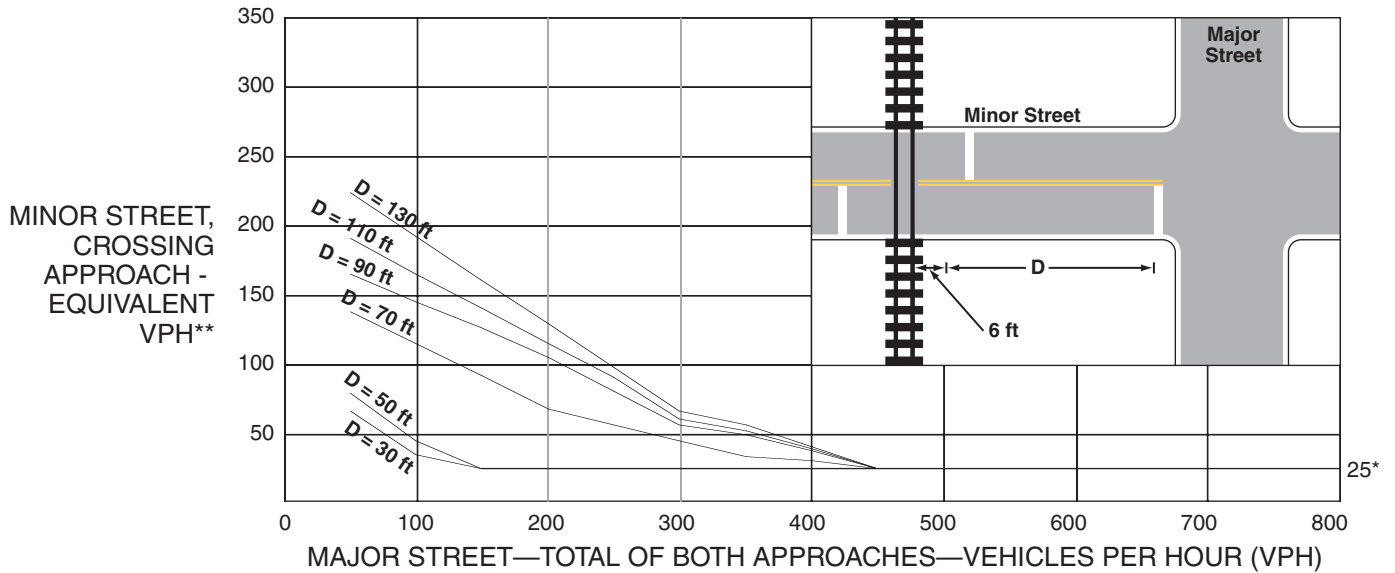
- 03 **The need for a traffic control signal shall be considered if an engineering study finds that both of the following criteria are met:**

- A. **A grade crossing exists on an approach controlled by a STOP or YIELD sign and the center of the track nearest to the intersection is within 140 feet of the stop line or yield line on the approach; and**
- B. **During the highest traffic volume hour during which rail traffic uses the crossing, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the minor-street approach that crosses the track (one direction only, approaching the intersection) falls above the applicable curve in Figure 4C-9 or 4C-10 for the existing combination of approach lanes over the track and the distance D, which is the clear storage distance as defined in Section 1A.13.**

Guidance:

- 04 *The following considerations apply when plotting the traffic volume data on Figure 4C-9 or 4C-10:*
- A. *Figure 4C-9 should be used if there is only one lane approaching the intersection at the track crossing location and Figure 4C-10 should be used if there are two or more lanes approaching the intersection at the track crossing location.*

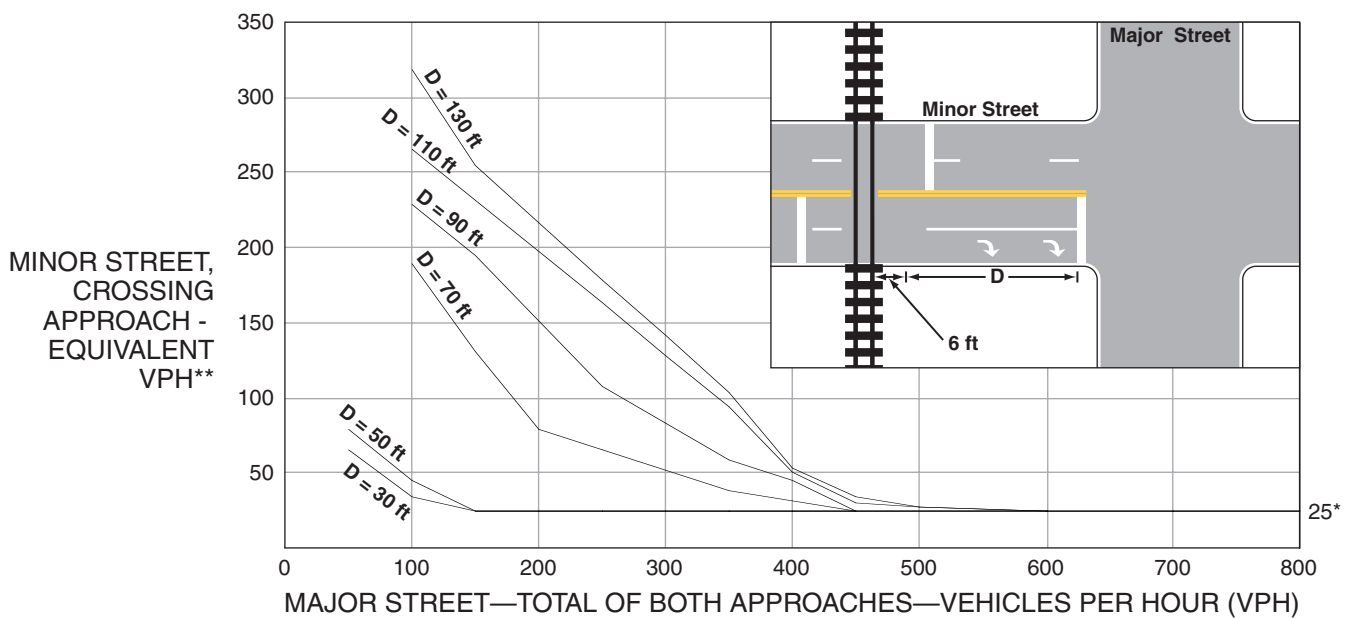
Figure 4C-9. Warrant 9, Intersection Near a Grade Crossing (One Approach Lane at the Track Crossing)



* 25 vph applies as the lower threshold volume

** VPH after applying the adjustment factors in Tables 4C-2, 4C-3, and/or 4C-4, if appropriate

Figure 4C-10. Warrant 9, Intersection Near a Grade Crossing (Two or More Approach Lanes at the Track Crossing)



* 25 vph applies as the lower threshold volume

** VPH after applying the adjustment factors in Tables 4C-2, 4C-3, and/or 4C-4, if appropriate

- B. After determining the actual distance *D*, the curve for the distance *D* that is nearest to the actual distance *D* should be used. For example, if the actual distance *D* is 95 feet, the plotted point should be compared to the curve for *D* = 90 feet.
- C. If the rail traffic arrival times are unknown, the highest traffic volume hour of the day should be used.

Option:

- 05 The minor-street approach volume may be multiplied by up to three adjustment factors as provided in Paragraphs 6 through 8.
- 06 Because the curves are based on an average of four occurrences of rail traffic per day, the vehicles per hour on the minor-street approach may be multiplied by the adjustment factor shown in Table 4C-2 for the appropriate number of occurrences of rail traffic per day.
- 07 Because the curves are based on typical vehicle occupancy, if at least 2% of the vehicles crossing the track are buses carrying at least 20 people, the vehicles per hour on the minor-street approach may be multiplied by the adjustment factor shown in Table 4C-3 for the appropriate percentage of high-occupancy buses.
- 08 Because the curves are based on tractor-trailer trucks comprising 10% of the vehicles crossing the track, the vehicles per hour on the minor-street approach may be multiplied by the adjustment factor shown in Table 4C-4 for the appropriate distance and percentage of tractor-trailer trucks.

Standard:

- 09 **If this warrant is met and a traffic control signal at the intersection is justified by an engineering study, then:**
 - A. The traffic control signal shall have actuation on the minor street;
 - B. Preemption control shall be provided in accordance with Sections 4D.27, 8C.09, and 8C.10; and
 - C. The grade crossing shall have flashing-light signals (see Chapter 8C).

Guidance:

- 10 *If this warrant is met and a traffic control signal at the intersection is justified by an engineering study, the grade crossing should have automatic gates (see Chapter 8C).*

Table 4C-2. Warrant 9, Adjustment Factor for Daily Frequency of Rail Traffic

Rail Traffic per Day	Adjustment Factor
1	0.67
2	0.91
3 to 5	1.00
6 to 8	1.18
9 to 11	1.25
12 or more	1.33

Table 4C-3. Warrant 9, Adjustment Factor for Percentage of High-Occupancy Buses

% of High-Occupancy Buses* on Minor-Street Approach	Adjustment Factor
0%	1.00
2%	1.09
4%	1.19
6% or more	1.32

* A high-occupancy bus is defined as a bus occupied by at least 20 people.

Table 4C-4. Warrant 9, Adjustment Factor for Percentage of Tractor-Trailer Trucks

% of Tractor-Trailer Trucks on Minor-Street Approach	Adjustment Factor	
	D less than 70 feet	D of 70 feet or more
0% to 2.5%	0.50	0.50
2.6% to 7.5%	0.75	0.75
7.6% to 12.5%	1.00	1.00
12.6% to 17.5%	2.30	1.15
17.6% to 22.5%	2.70	1.35
22.6% to 27.5%	3.28	1.64
More than 27.5%	4.18	2.09

APPENDIX B

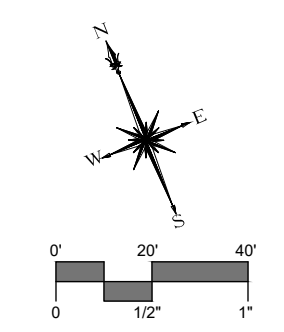
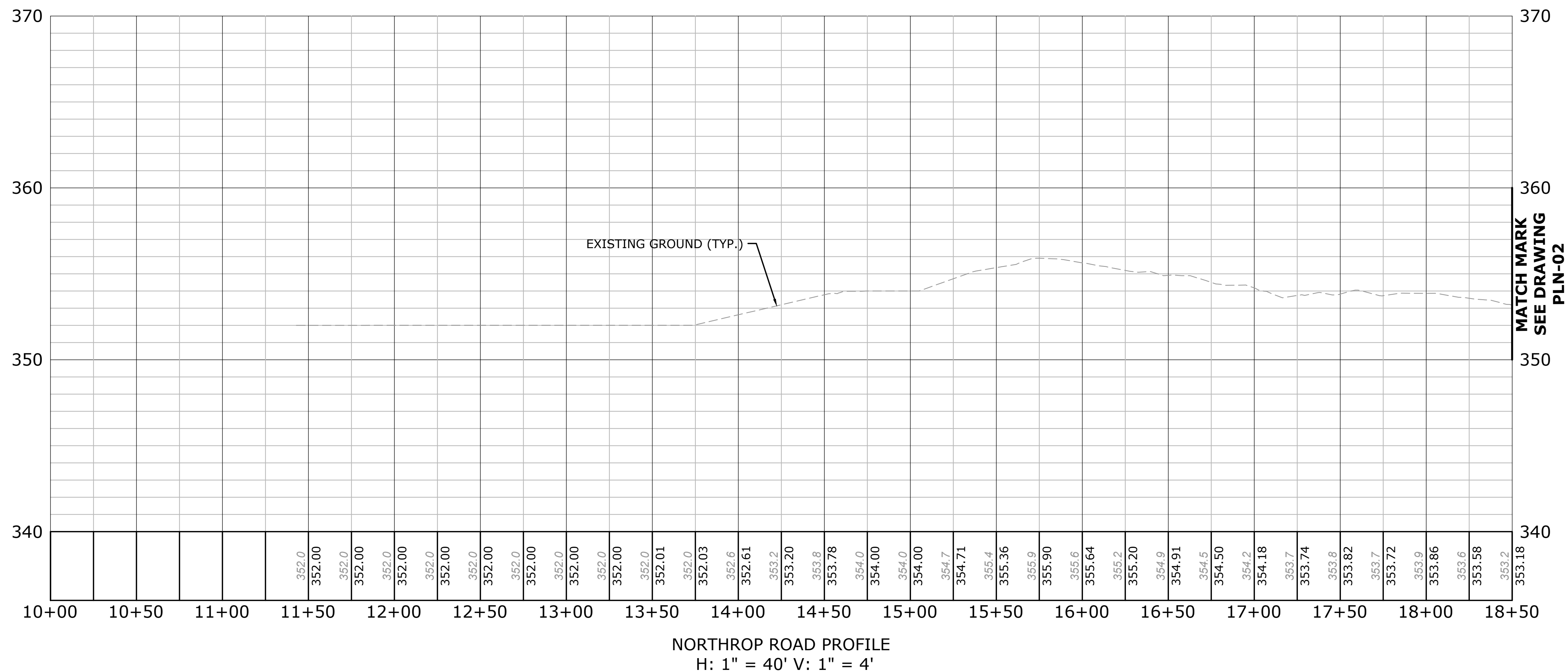
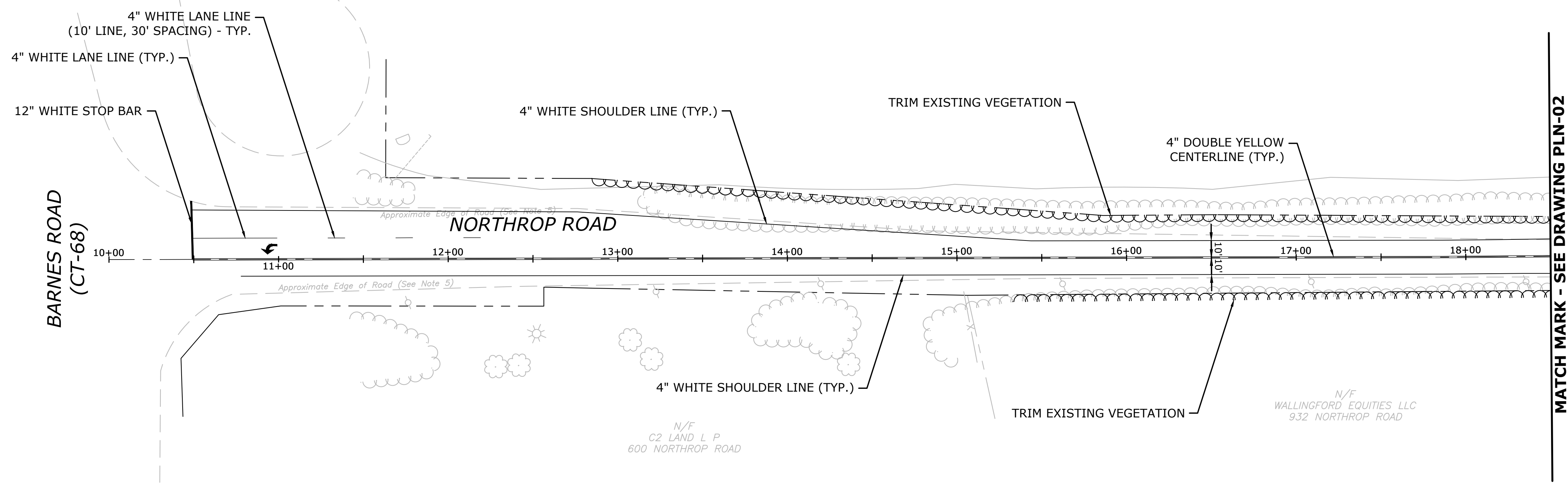
ROADWAY IMPROVEMENT RECOMMENDATION PLANS

Northrop Road Study

SCRCOG

Town of Wallingford

June 2023



DESCRIPTION	DATE	BY

ROADWAY IMPROVEMENT RECOMMENDATION PLANS

NORTHROP ROAD STUDY
45 SOUTH MAIN ST.
WALLINGFORD, CT

MSM DESIGNED, MSM DRAWN, PD CHECKED

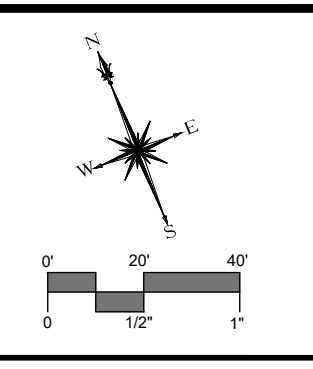
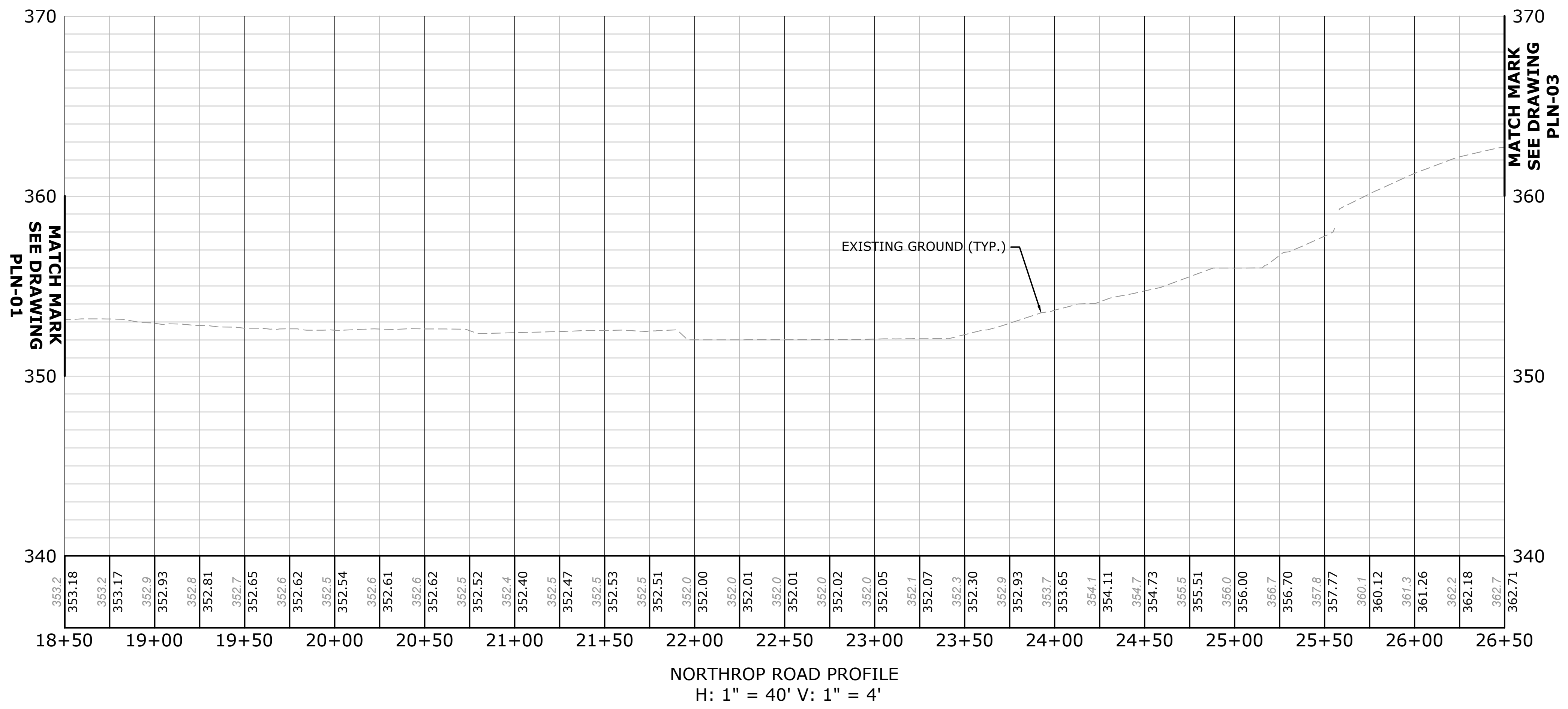
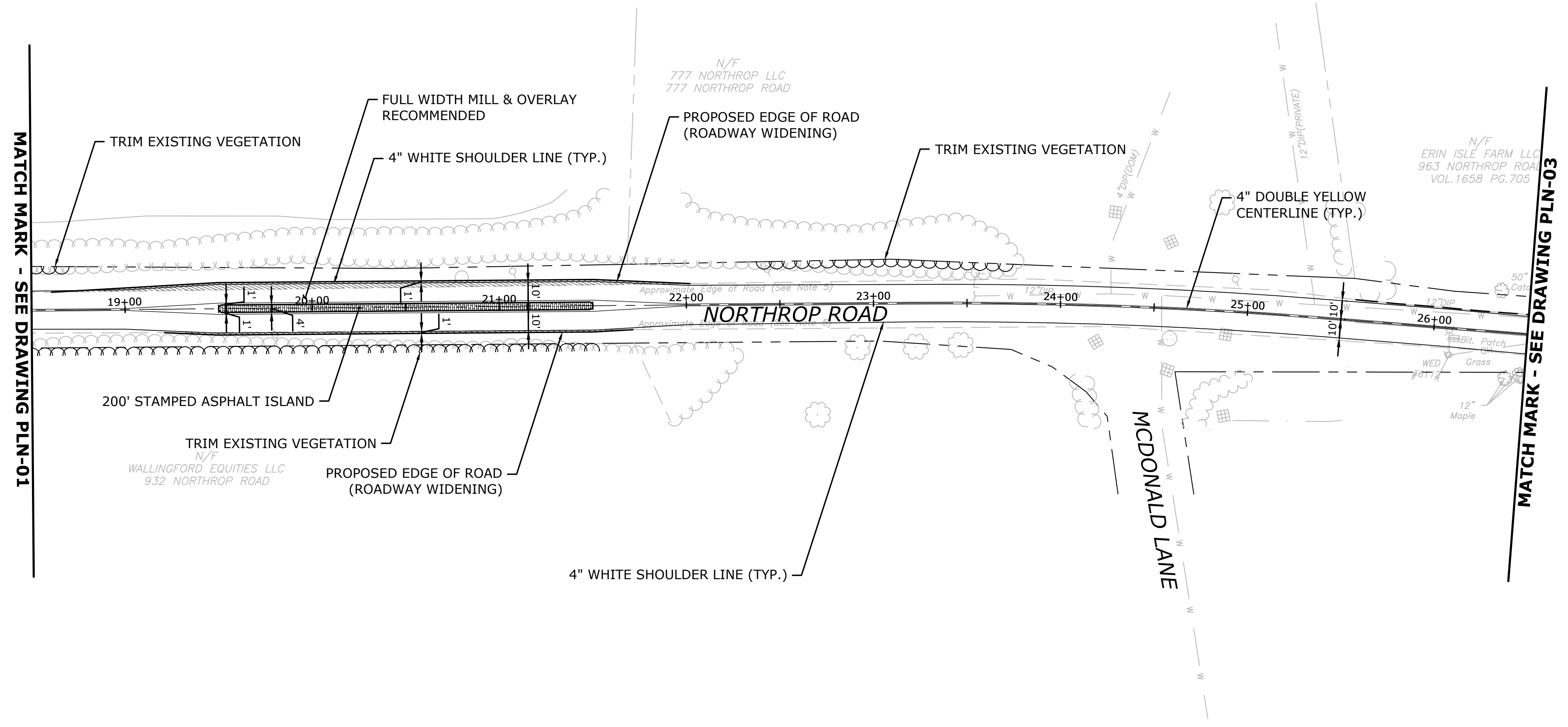
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DATE: MAY 3, 2023

PROJECT NO: 20130.00002

DRAWING NO: PLN-01

SHEET NO: 01

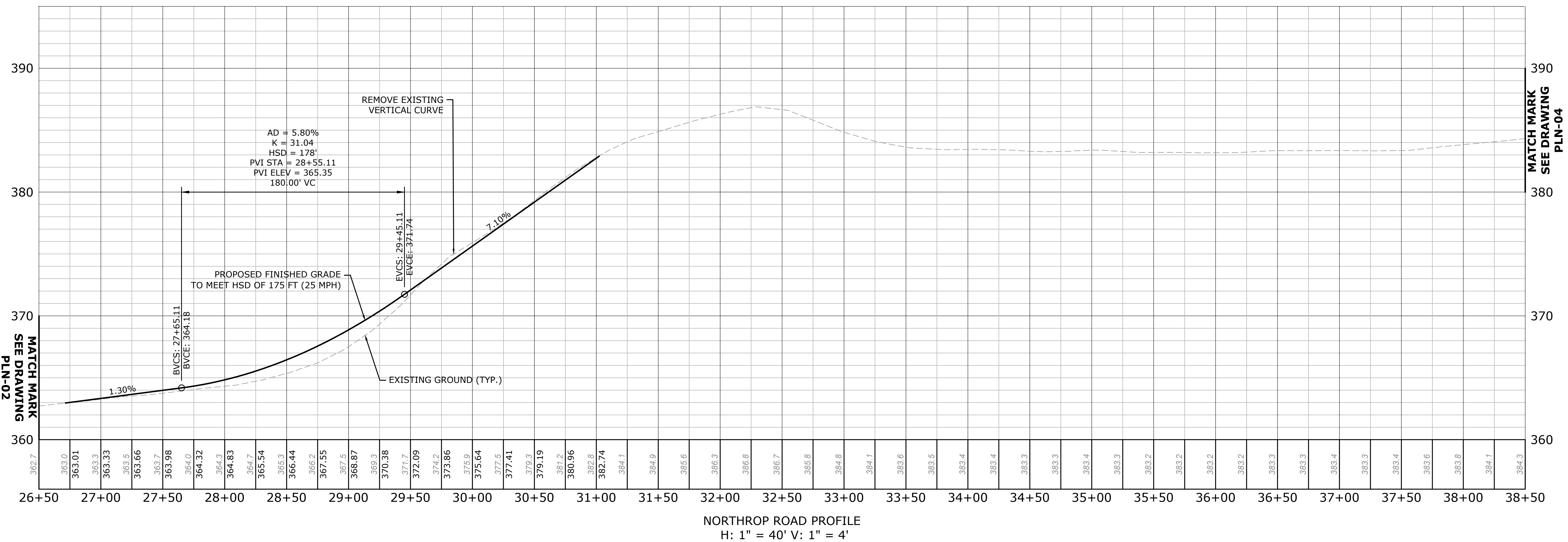
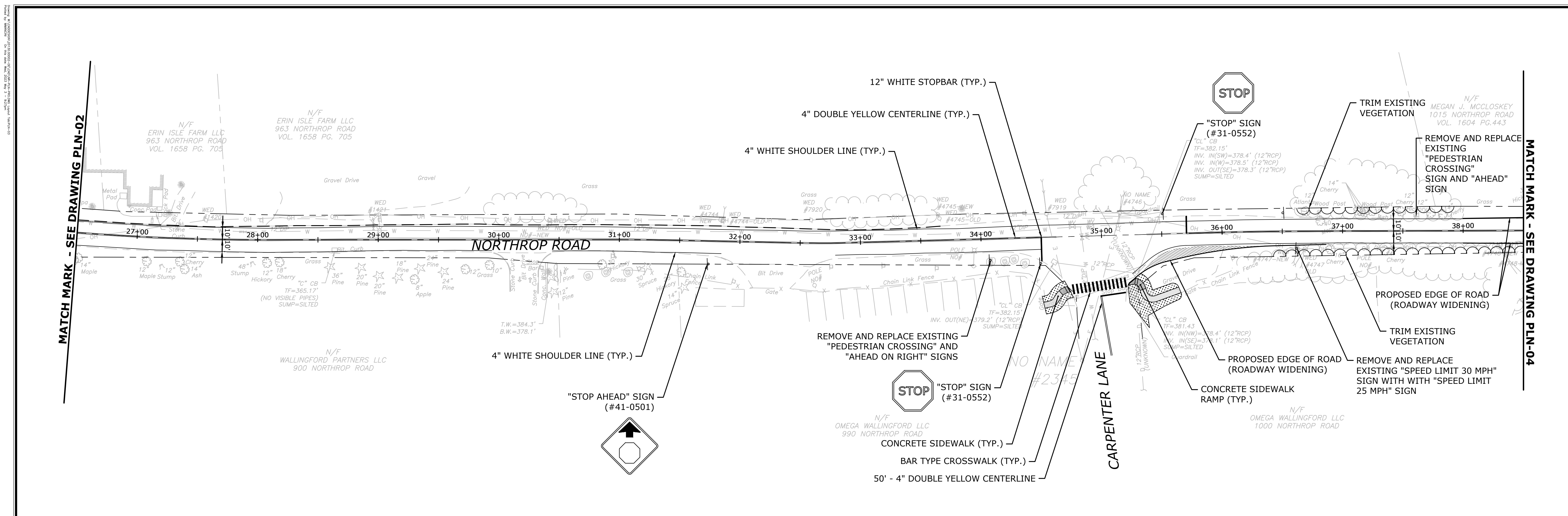


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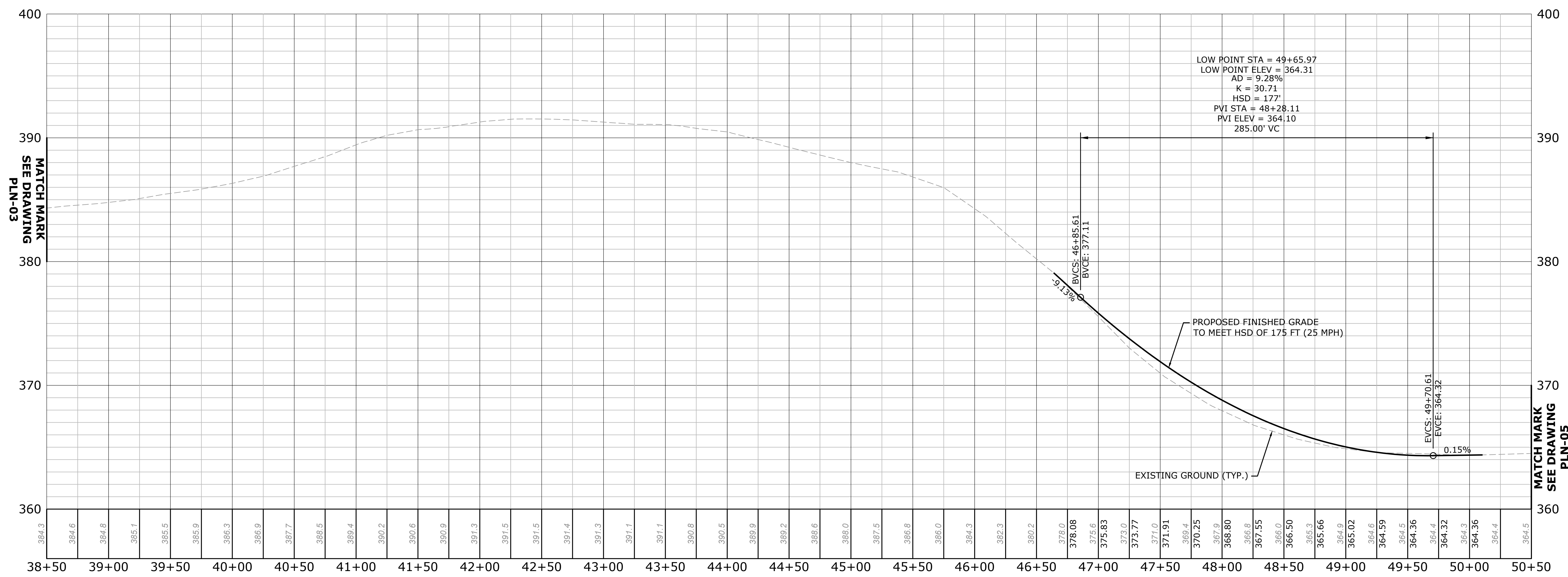
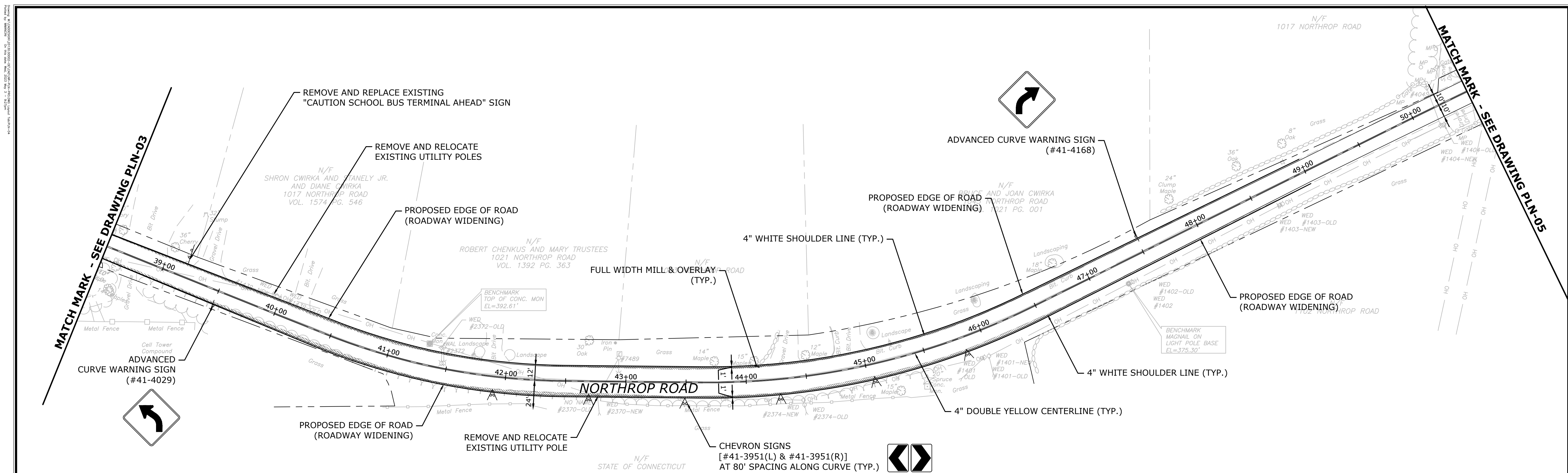
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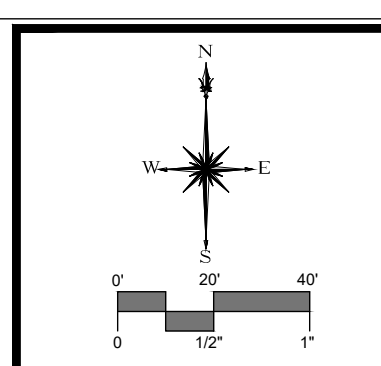
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03

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NORTHROP ROAD PROFILE
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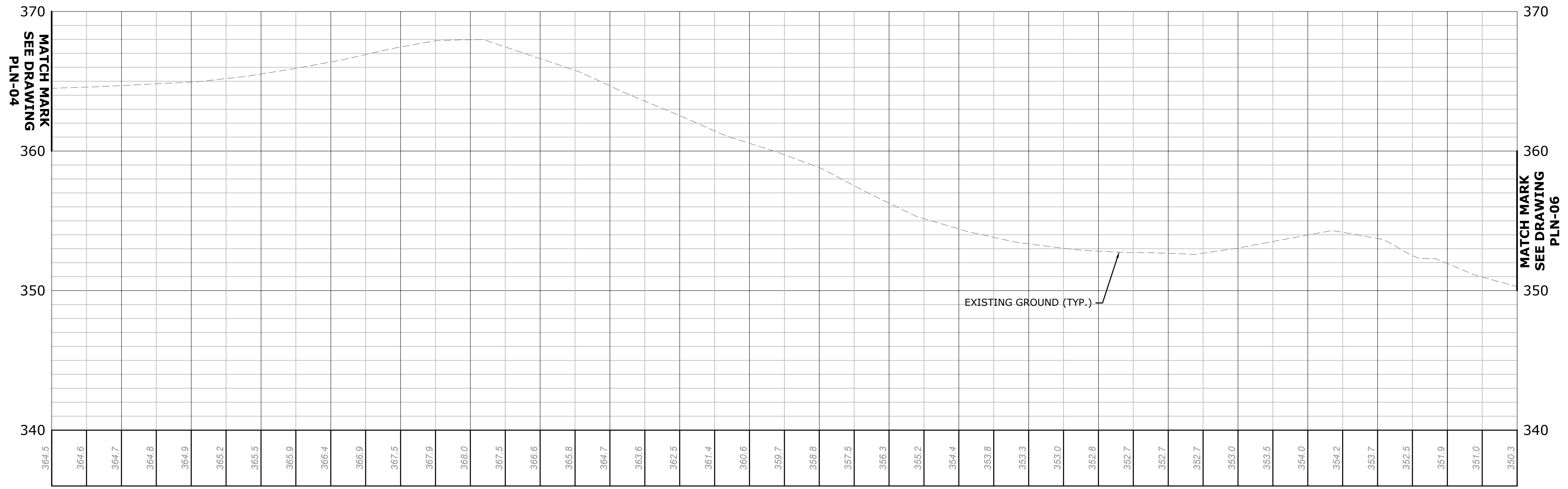
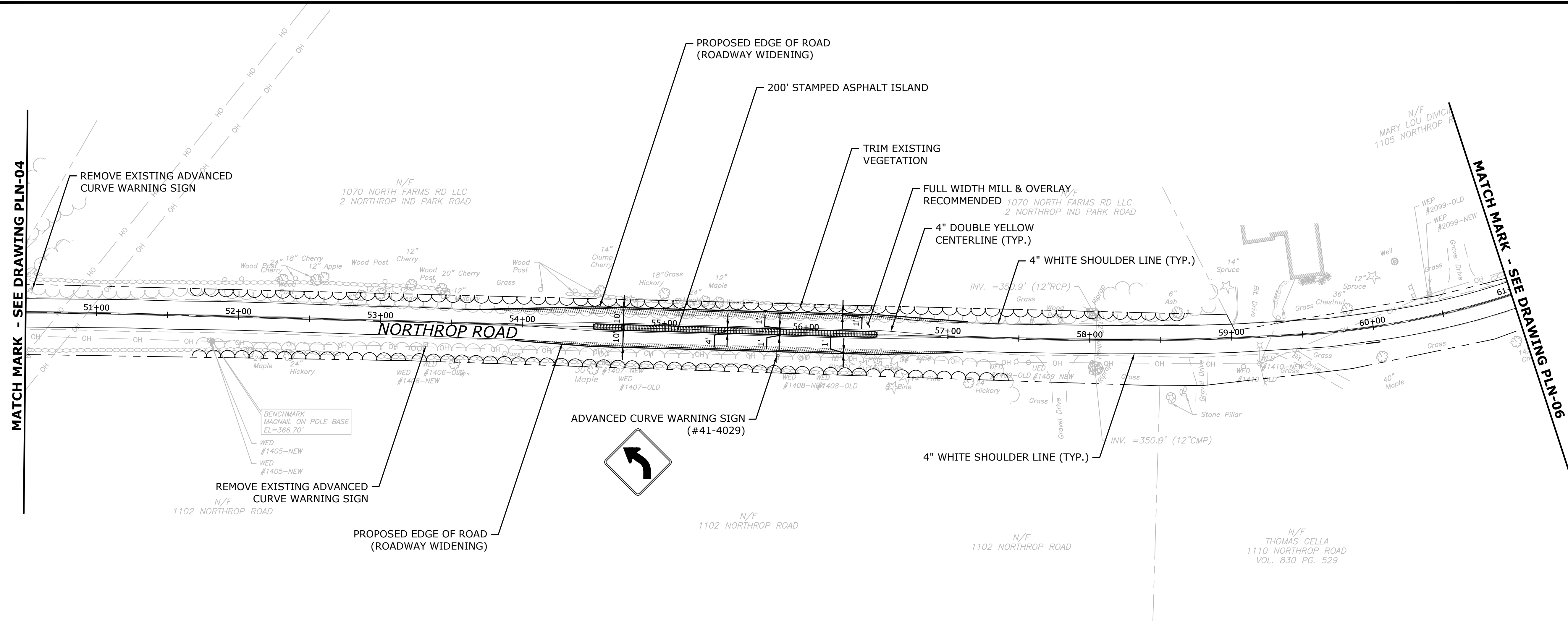


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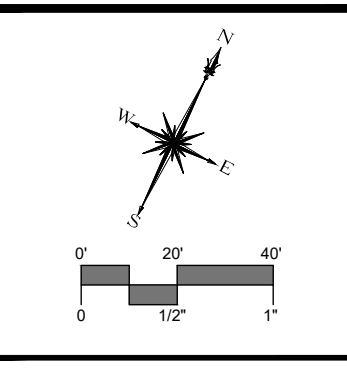
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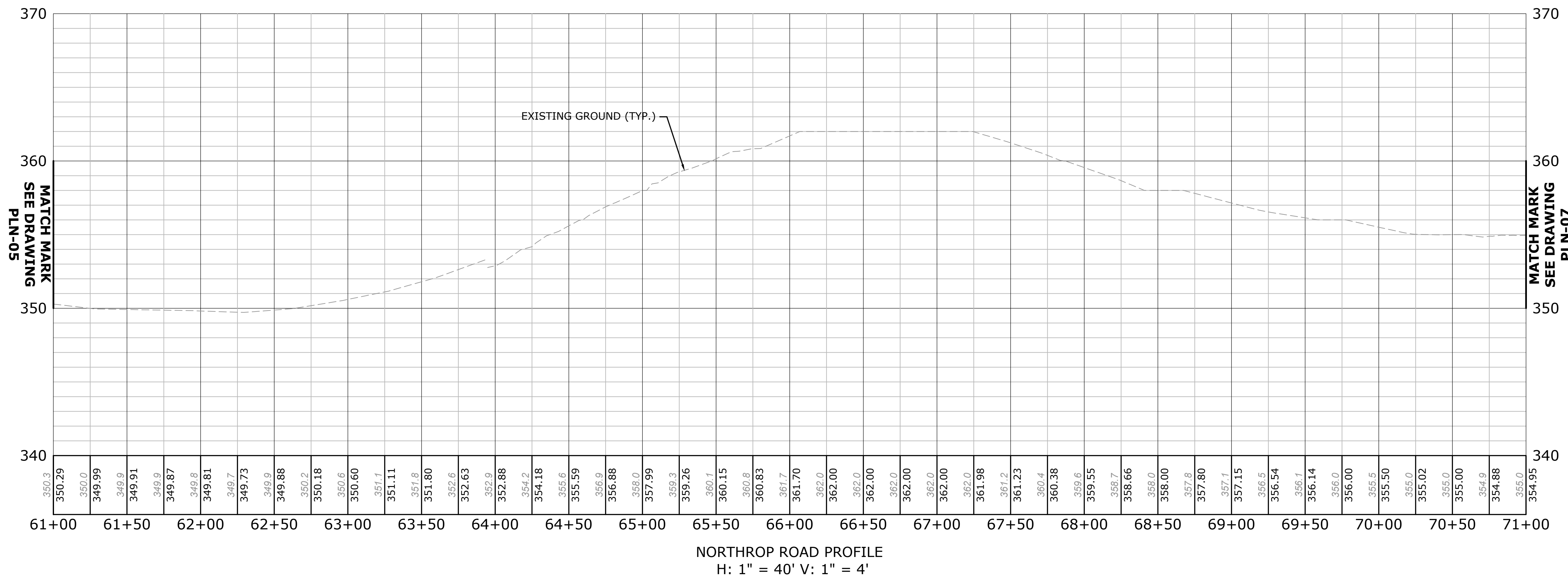
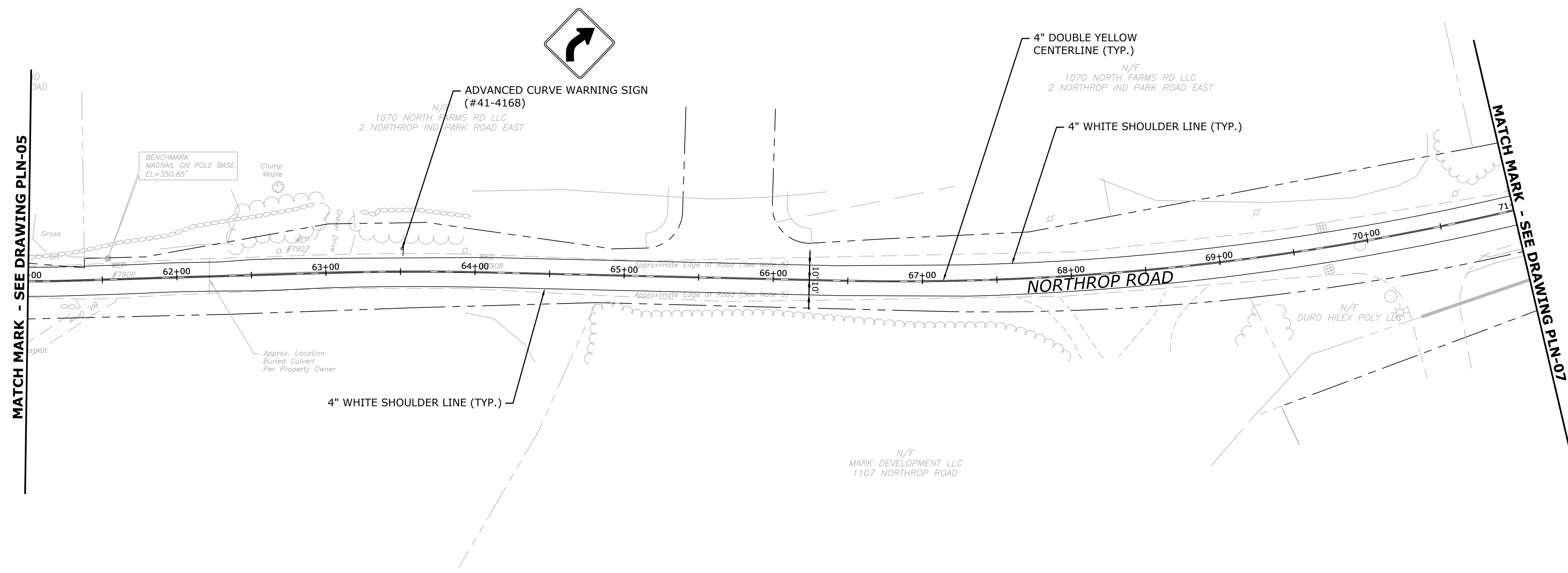
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1"=40'

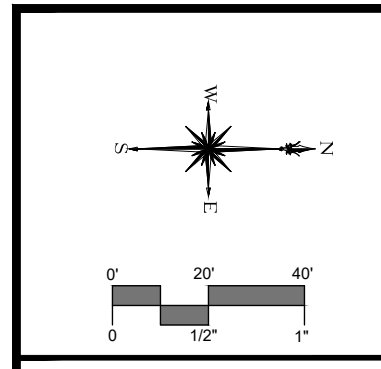
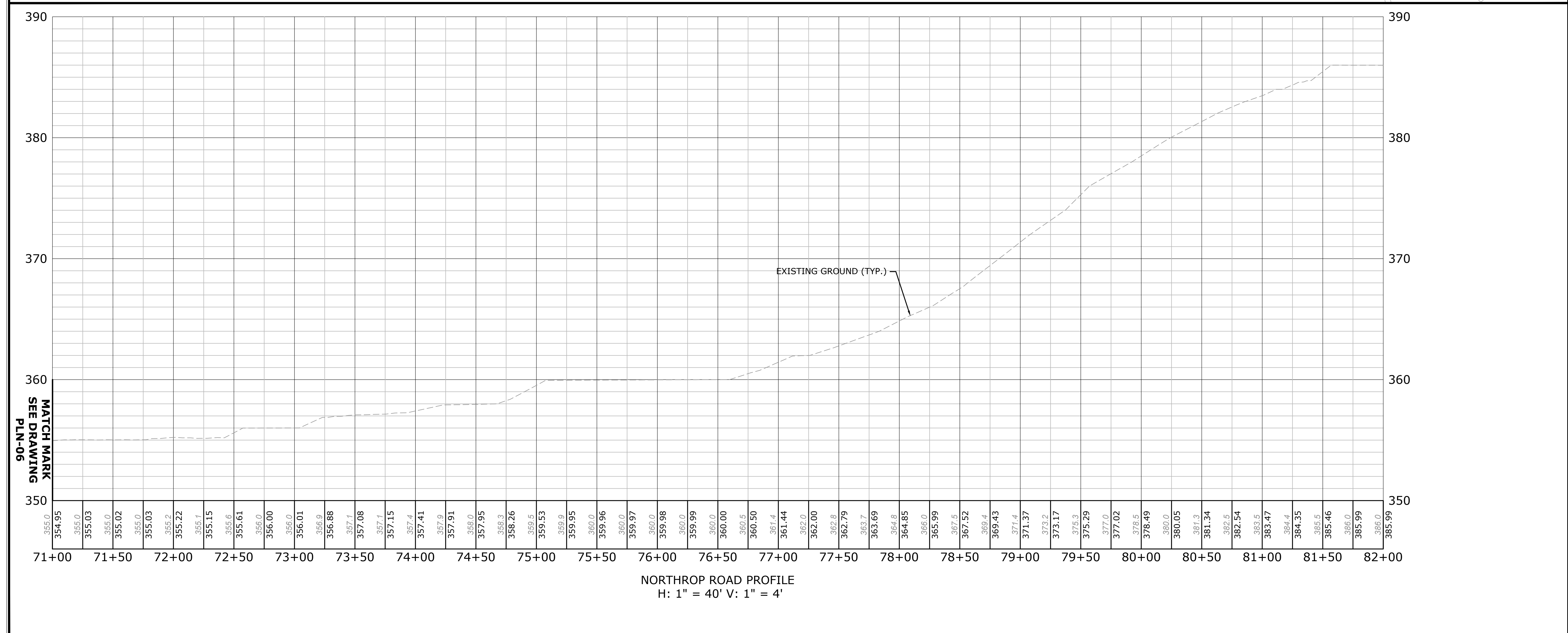
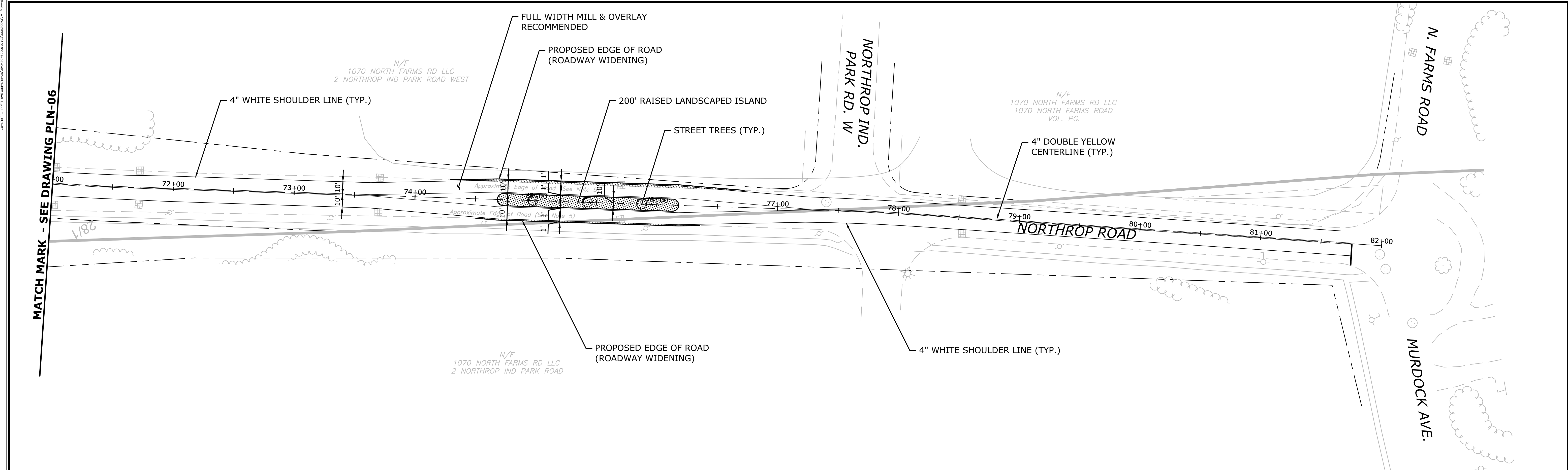
DATE: **MAY 3, 2023**

PROJECT NO.: 20130.00002

DRAWING NO.: **PLN-06**

06

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WALLINGFORD, CT 06495
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SLRCONSULTING.COM

DESCRIPTION	DATE	BY

ROADWAY IMPROVEMENT RECOMMENDATION PLANS

NORTHRUP ROAD STUDY

45 SOUTH MAIN ST.
WALLINGFORD, CT

MSM	MSM	PD
DESIGNED	DRAWN	CHECKED

SCALE: 1"=40'

DATE: MAY 3, 2023

PROJECT NO.: 20130.00002

DRAWING NO.: PLN-07

07

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