Final Report

North Main Street Road Diet Study – Phase 2

West Hartford, Connecticut

PREPARED FOR

Town of West Hartford

PREPARED BY

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June 2022

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Introduction

Vanasse Hangen Brustlin, Inc (VHB)was retained by the Town of West Hartford in the summer of 2020 to conduct the second phase of a transportation planning and implementation study for a road diet trial along North Main Street. This document presents a summary of the study methodology, evaluation criteria, and recommendations for the road diet trial.

The initial efforts included a feasibility analysis to verify the road diet trial should commence in late summer 2021. With the ongoing trial, evaluation of several measures were prepared to verify the efficacy of the road diet trial. These efforts are detailed in the following sections of the report.

1.1 Study Background

The Capitol Region Council of Governments (CRCOG) sponsored a West Hartford Road Diet and Safety Study (Phase 1) in 2016. The Phase 1 study analyzed the feasibility of implementing a road diet on North Main Street between Albany Avenue (Route 44) and Farmington Avenue. The study produced "Developmental Concepts" such as the Town's preference for changing the four travel lanes on North Main Street from two lanes in each direction to one lane in each direction with a two-way center left turn lane or exclusive left turn lane at intersections. At the completion of the study in 2016, the Town requested a second study with an expansion of the study area to the parallel roadways including Trout Brook Drive and Mountain Road as well as additional analysis of the potential impacts of the road diet with more detail on the trial.

In 2020, the Town of West Hartford retained VHB to conduct the second phase of the North Main Street Road Diet Study. This second phase included additional data collection and analysis to evaluate the anticipated impacts of the road diet on North Main Street as well as on the surrounding roadways. The initial efforts of the second phase were to research road diets in several similar communities with positive or constructive feedback, review the feasibility of the road diet implementation, and provide a recommendation. This research included road diet projects in Arlington, Virginia, Newton, Massachusetts and Charlotte, North Carolina. VHB corresponded with project representatives in those communities to help the Town understand cross section elements and project success factors. This understanding included the experience in the Charlotte road diet projects where lessons learned included eliminating10 foot wide Two Way Left Turn Lanes (TWLTL) from consideration on future projects and only using wider lanes. This was result of new road diet requirements that all projects must include fire department approvals prior to moving forward. In fact, VHB's research on other road diets indicated that a minimum 11 foot wide and preferably 12 foot wide TWLTL's should be utilized on road diets.

VHB's efforts resulted in the recommendation to begin the road diet trial which began in August 2021. The purpose of the trial was to evaluate the road diet concept with extensive data collection, observations, and public outreach to determine if it is a success or failure.

VHB also prepared engineering design plans for the road diet trial and developed recommendations for traffic signal timing modifications, which were implemented during the road diet trial to improve progression along the corridor. The design recommendations and applicable design standards for the road diet trial were documented in a Design Summary technical memorandum, dated April 8, 2021 (included in the Appendix).

1.2 Study Area

The Phase 2 study area consisted of the North Main Street, Mountain Road, and Trout Brook corridors between Farmington Avenue and Albany Avenue (Route 44). A study area map is depicted on Figure 1.

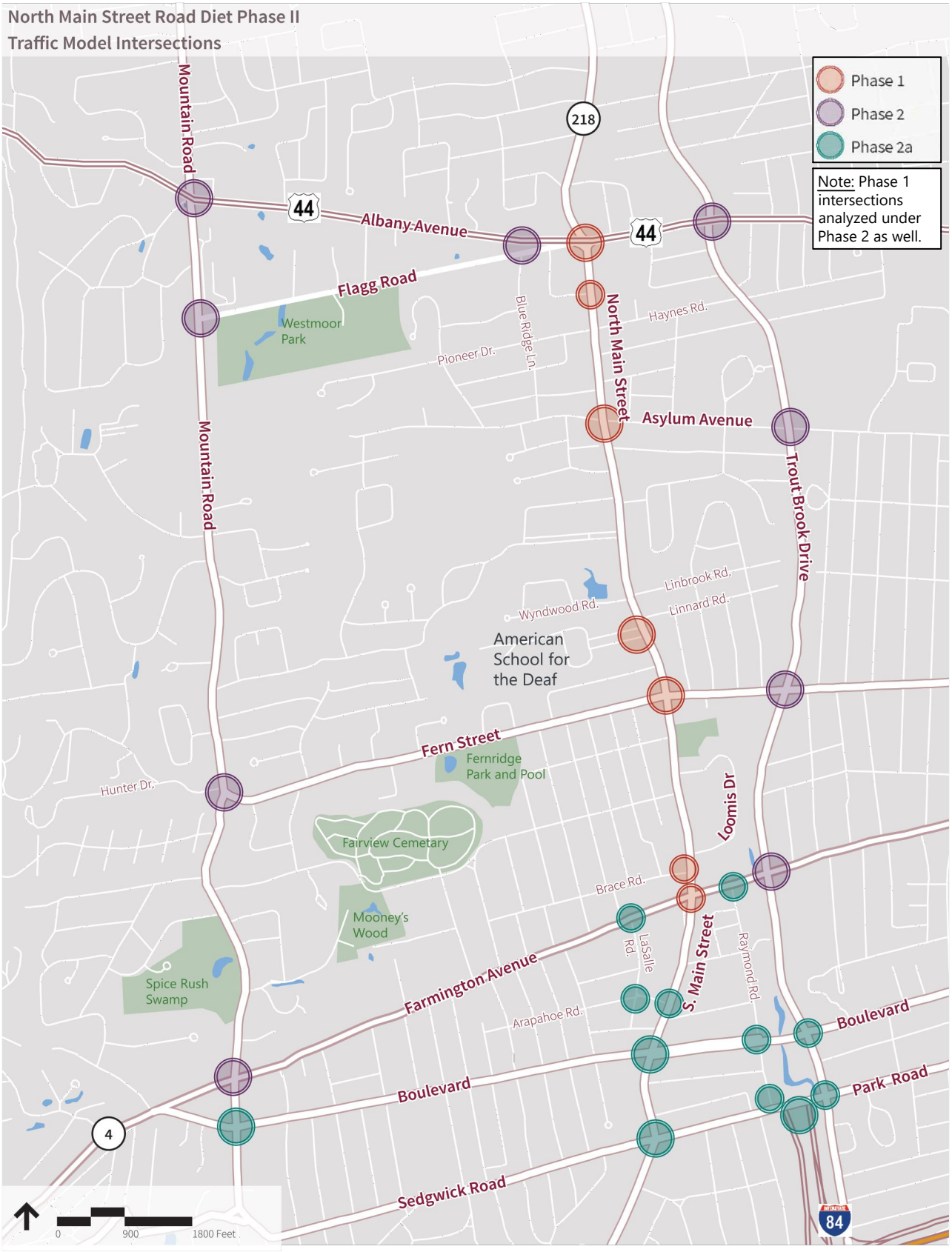
1.3 Project Objectives and Evaluation Criteria

The primary objectives of a road diet are to reduce vehicular crashes, reduce travel speeds, and make the corridor more accessible for pedestrians and bicyclists. The following criteria were used to evaluate the North Main Street road diet trial:

Performance Criteria	How to Measure
1. Crash frequency and severity	Data
2. Traffic operations	Data/Traffic Models
3. Emergency services	Agency provided responses
4. Public feedback	Summarized survey results

1.4 Summary of Recommendations

Based on the results of this investigation, since the beginning of the road diet trial in August 2021 and continuing through this month, the road diet trial has achieved the objectives to reduce crash frequency, reduce operating speeds, and improve accessibility for pedestrians and bicyclists. In fact, the prediction of crash reductions on North Main Street was also found on the parallel study roadways for the same time period. The Town's Emergency Services representatives from Fire, Police, Ambulance as well as Public Works all provided support for the road diet trail AFTER the initial implementation and after the winter months. The road diet trial has also received a favorable response from the community across public input such as the two surveys, two public information meetings and the feedback documented, with a consensus who consider the minor increases in vehicle delays to be tolerable. With the key objectives achieved, VHB recommends maintaining the road diet in the permanent condition with additional monitoring of crash and traffic volume/speed data in the future.



West Hartford Road Diet
Location Map
West Hartford, CT

Figure 1

June 2022

2

Road Diet Trial Evaluation

The road diet trial was implemented by the Town starting in August 2021 and continued through summer 2022. The following section summarizes the data collection and analysis conducted during the road diet trial.

2.1 Traffic Volume Data

The study area roadways had the traditional weekday morning and weekday afternoon peak hours, when commuting and intra-town traffic volumes were the highest, higher than the weekend peak hours. Based upon the historical traffic volume data in the study area, the weekday afternoon peak hour was chosen as the peak hour analysis over all other peak hours. While the pandemic has shifted traffic volumes and patterns in the study area, the afternoon peak hours were found to remain higher than the other peak hours and therefore serve as the key peak hour for evaluation of traffic analysis.

As part of the road diet feasibility review, VHB compiled weekday evening peak hour traffic volumes at all signalized intersections within the study area from multiple sources. The volumes along North Main Street from Albany Avenue (Route 44) to Farmington Avenue were obtained from the 2016 Phase 1 Road Diet study. The traffic volumes along Trout Brook Drive and Mountain Road were compiled from various previous studies, data downloaded from Town-owned GridSmart video detection cameras, and additional peak hour traffic counts conducted by VHB. These volumes were then conservatively balanced to form the weekday evening peak hour traffic volume networks for background (or pre-road diet) conditions, which are depicted on Figure 2.

Traffic volume data were collected again at each of the signalized intersections in the study area in October 2021, two months after the implementation of the road diet trial, to identify any potential changes in traffic patterns caused by the road diet. The resulting weekday evening peak hour traffic volume network during the road diet trial is depicted on Figure 3.

The background weekday afternoon peak hour traffic volumes were compared to the traffic volumes collected during the road diet trial, and the net change in traffic volumes by approach are depicted on Figure 4. This comparison reveals a reduction in traffic volumes along North Main Street (-22%) and an increase in traffic volumes along Trout Brook Drive (+16%) between Farmington Avenue and Fern Street during the road diet trial. This indicates that the road diet trial has likely influenced some motorists to divert from North Main Street to Trout Brook Drive to avoid the road diet during the peak traffic period. There was also a modest reduction in overall traffic volumes within the study area during the road diet trial, including a reduction in traffic volumes along Mountain Drive (-8%), which is likely attributed to the effects of the COVID-19 pandemic on commuter traffic patterns.

2.2 Speed Data

The Town of West Hartford installed Automatic Traffic Recorders (ATRs) in 2017 to collect daily traffic volume and vehicle speed data along North Main Street, Trout Brook Drive, and Mountain Road. VHB installed ATRs along these same roadways during the road diet trial in November 2021 and again in April 2022 to evaluate how the road diet trial affected operating speeds.

The vehicle speed data is summarized in Figure 5. This figure shows the average speeds and 85th percentile speeds in each travel direction. The 85th percentile speed is the speed at which 85-percent of vehicles travel at or below, and transportation agencies typically use it to establish speed limits. The current edition of the Manual on Uniform Traffic Control Devices (MUTCD) states that the posted speed limit should be within 5 mph of the speed of free-flowing traffic.

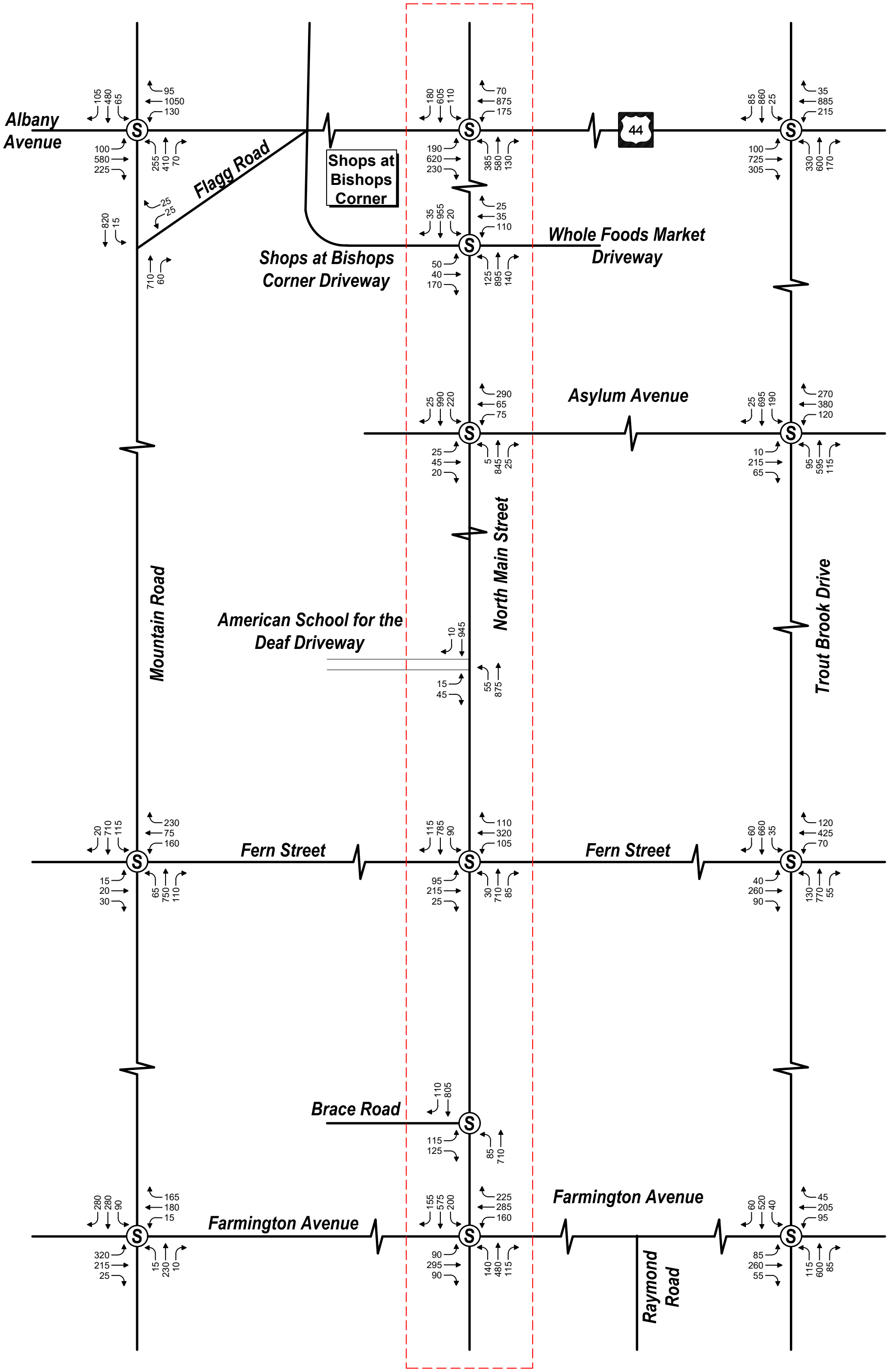
According to this speed data, the 85th percentile speeds along North Main Street between Fern Street and Asylum Avenue were 46 mph northbound and 48 mph southbound prior to the road diet trial implementation. During the road diet trial, the 85th percentile speeds at this location were reduced to 39 mph northbound and 44 mph southbound, for a net reduction of 4-7 mph. This indicates that the road diet trial was successful in reducing operating speeds along the corridor.

VHB also reviewed vehicle speed data at various other locations along North Main Street within the road diet limits. This data indicates that operating speeds along North Main Street are consistent along most of the corridor, except that 85th percentile speeds in the southbound direction are reduced to 33 mph at the southern end of the corridor near Brace Road. This speed data appears to support a change in the posted speed limit to 35 mph along North Main Street. However, additional criteria should also be considered in establishing a posted speed limit. Therefore, VHB recommends conducting a speed study in accordance with the October 2021 published procedures outlined in the Connecticut Department of Transportation "Guidelines on Establishing Speed Limits in the State of

Connecticut"[1] to evaluate a potential change in the posted speed limit along North Main Street.

There were no significant changes to operating speeds along Mountain Road and Trout Brook Drive during the road diet trial.

[1] Connecticut Department of Transportation Guidelines on Establishing Speed Limits in the State of Connecticut, dated 10/2021 Available at: https://portal.ct.gov/DOT/Commissions/STC/Speed-Limit-Certificates-and-Listings



Legend

XX → Weekday Evening Traffic Volume

NEG (Negligible)

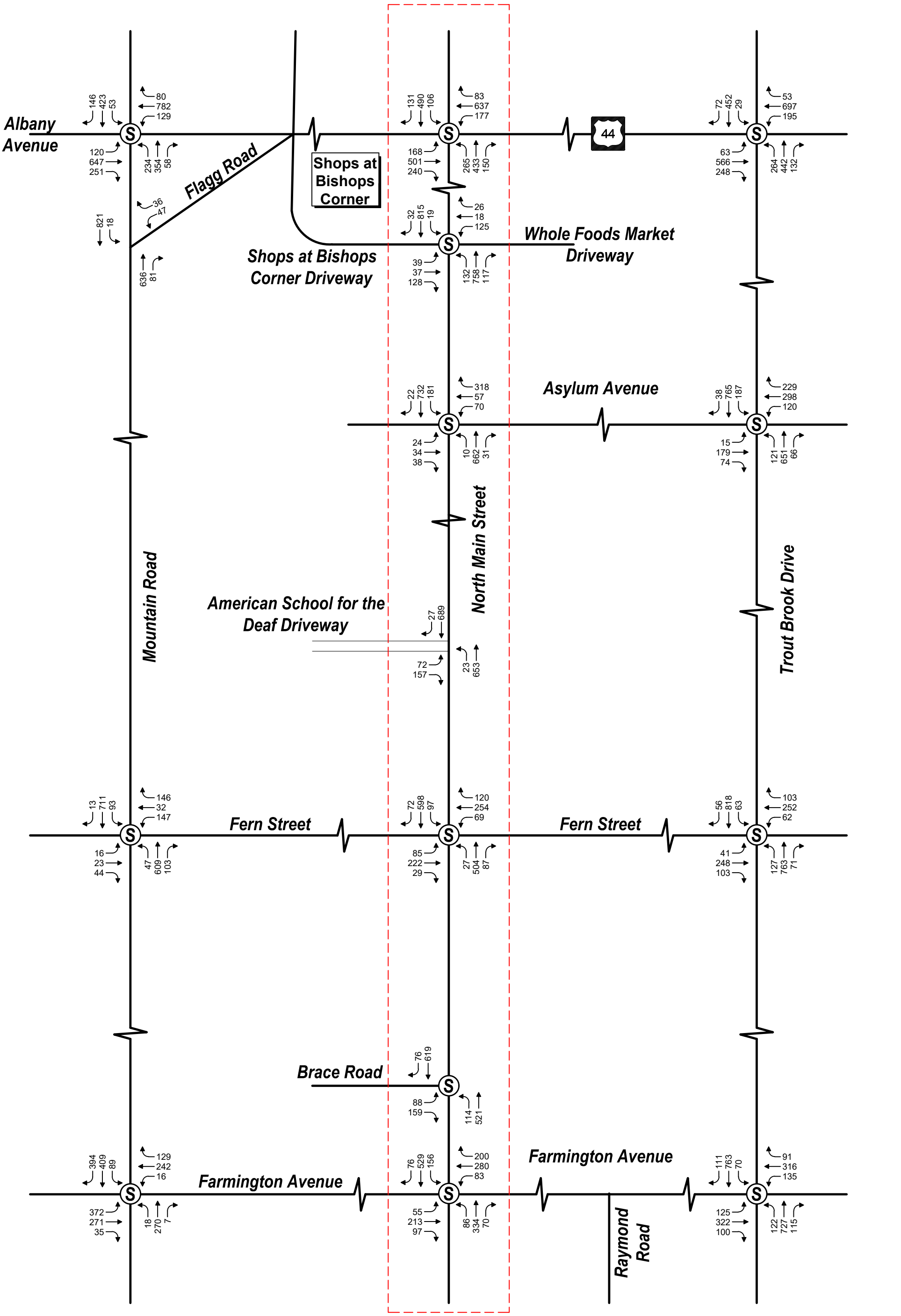
Ⓢ Signalized

Primary Study Area Corridor

NOT TO SCALE

N. Main Street Road Diet - Phase 2
Background (Pre-Road Diet)
Weekday Evening Traffic Volumes
West Hartford, Connecticut

Figure 2



Legend

XX → Weekday Evening Traffic Volume

NEG (Negligible)

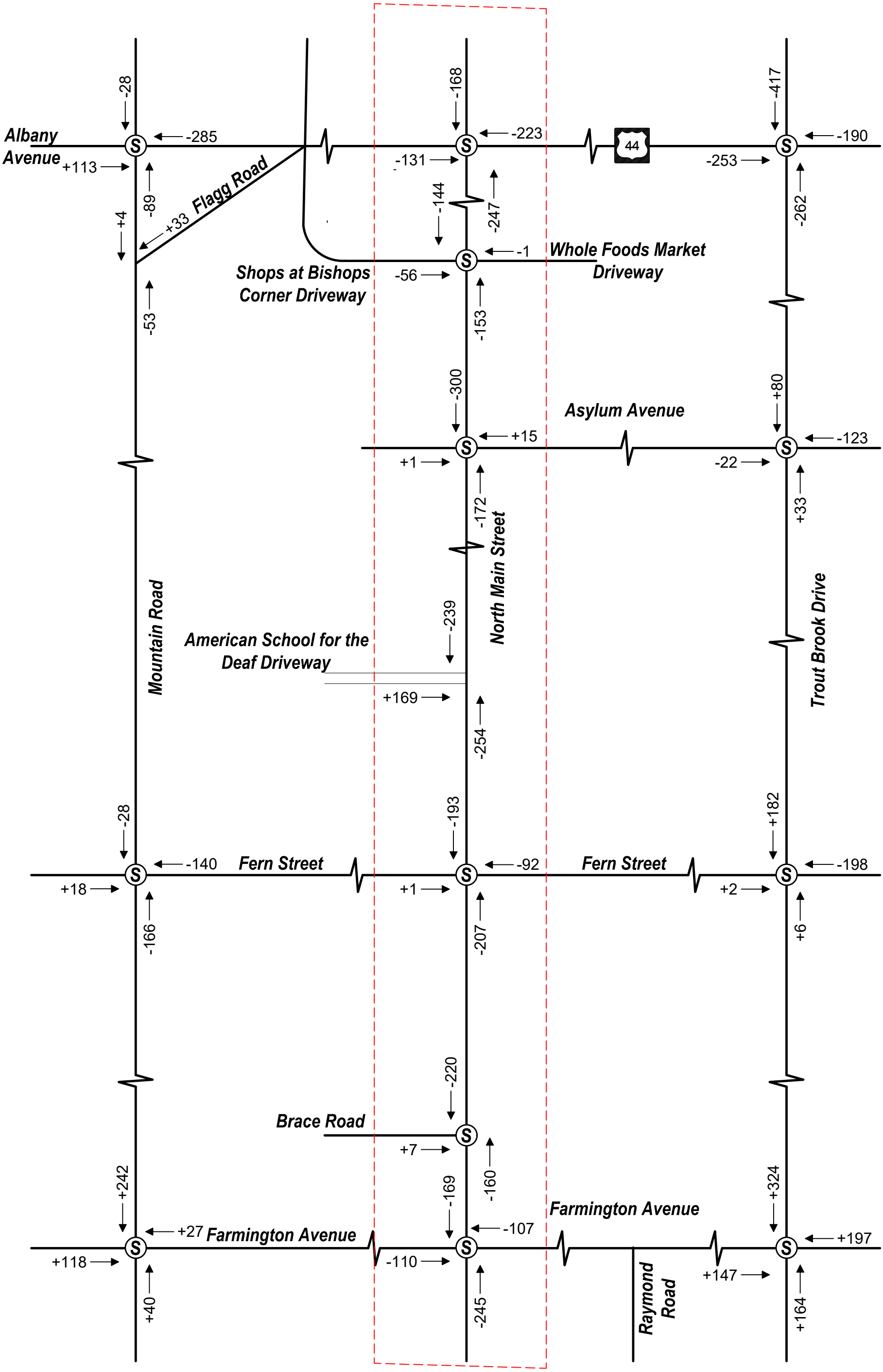
Ⓢ Signalized

– – Primary Study Area Corridor

NOT TO SCALE

N. Main Street Road Diet - Phase 2
Road Diet Trial
Weekday Evening Traffic Volumes
West Hartford, Connecticut

Figure 3



Legend

XX → Weekday Evening Traffic Volume

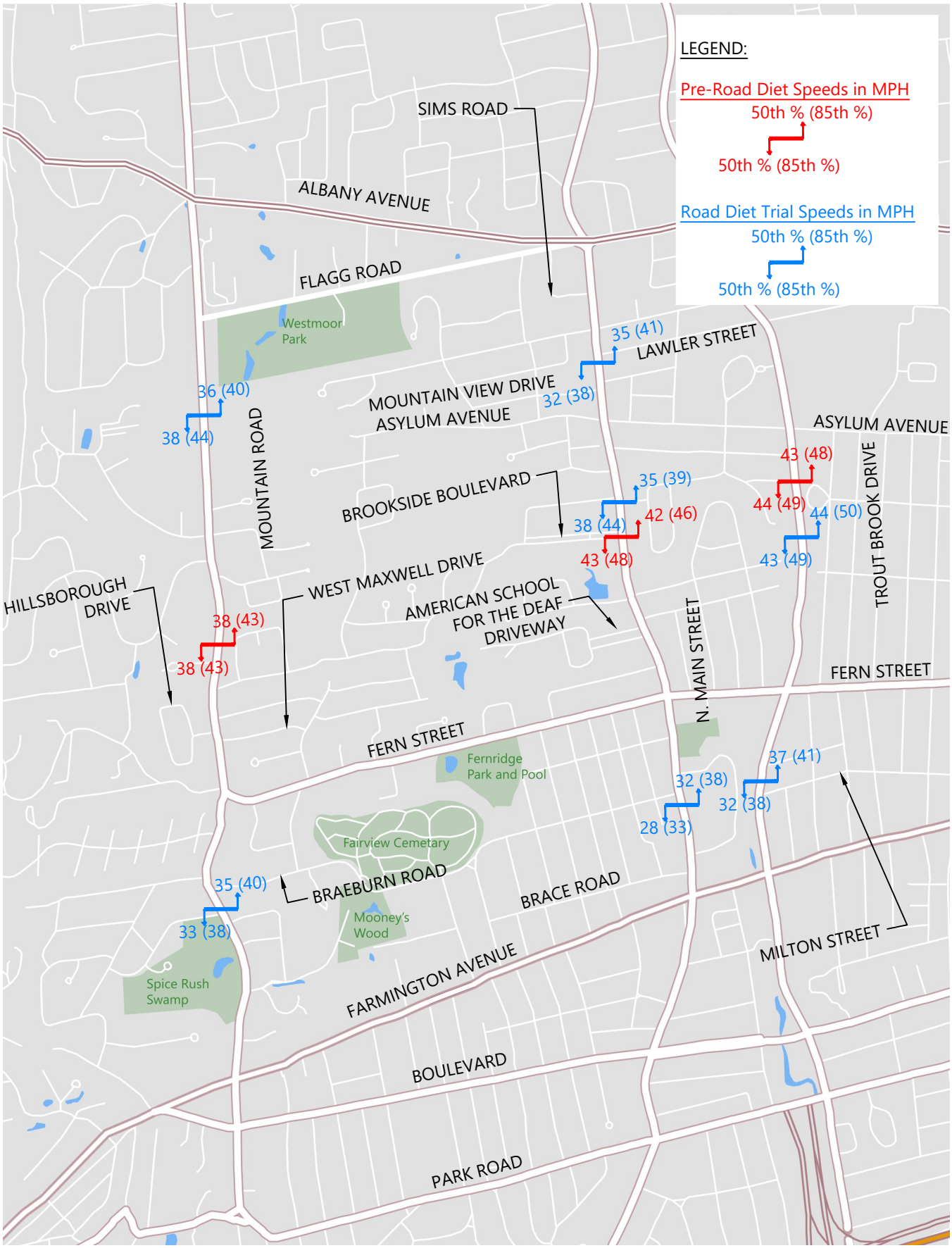
NEG Ⓢ (Negligible) Signalized

– – Primary Study Area Corridor

NOT TO SCALE

N. Main Street Road Diet - Phase 2
Net Change in Traffic Patterns
Weekday Evening Traffic Volumes
West Hartford, Connecticut

Figure 4



N. Main Street Road Diet - Phase 2
Speed Data Summary

West Hartford, Connecticut

Figure 5

2.3 Crash History

The primary objective for the road diet trial is the reduction of crashes. To evaluate the impacts of the road diet trial on safety conditions in the project area, VHB compared crash rates during the road diet trial (seven months) to the historical crash rates in the project area over the previous four years. The crash rates during the road diet trial were determined based on a review of police crash reports provided by the Town of West Hartford Police Department for the period between September 2021 and March 2022, a full seven-month period. This time-period covered the fall 2021 and winter months and early spring 2022. The crash rates over the previous four years were determined based on collision data compiled from the University of Connecticut, Connecticut Crash Data Repository (CTCDR). The crash data over the previous four years was reviewed during the same months as the road diet trial (September to March) to account for any potential seasonal variations in crash trends.

A summary of the crash data compiled within the project area is presented in Table 1. Based on these crash records, the road diet trial has achieved a noticeable reduction in crash rates along North Main Street within the road diet limits. For example, 16 crashes were reported along the North Main Street roadway in the seven-month trial period. During the similar seven-month period in each the four years reviewed, at least 18 crashes were reported in each time period. In fact, the crash rates on all three corridors in the study area were lower during the road diet trial than the crash rates during the same months in any of the previous four years.

Since the road diet trial crash review involves only the seven months from September 2021 to March 2022, VHB recommends that crash records be reviewed over the remaining five months as well as annual monitoring of crash records until three full years of crash records are compiled (fall 2021 to fall 2024). This recommendation is intended to affirm the observed crash frequency reductions will continue. This is important to review a larger sample size of crash data as this study has only reviewed seven months of crash data.

Table 1 Crash Analysis Summary

	Mountain Road Corridor					North Main Street Corridor					Trout Brook Drive Corridor				
	Sept 2017-March 2018	Sept 2018-March 2019	Sept 2019-March 2020	Sept 2020-March 2021	Sept 2021-March 2022	Sept 2017-March 2018	Sept 2018-March 2019	Sept 2019-March 2020	Sept 2020-March 2021	Sept 2021-March 2022	Sept 2017-March 2018	Sept 2018-March 2019	Sept 2019-March 2020	Sept 2020-March 2021	Sept 2021-March 2022
Crash Rate per Million Vehicle Miles[a]	1.36	1.09	2.73	1.91	1.09	2.92	3.90	5.52	8.28	2.60	2.85	4.35	2.70	4.50	1.05
Month															
September	0	1	0	2	0	1	6	2	5	1	3	6	0	5	1
October	2	1	4	3	2	5	0	8	3	3	2	6	7	4	1
November	1	2	2	2	1	2	4	2	3	3	4	3	1	6	0
December	2	1	2	2	1	1	3	3	13	4	4	3	3	4	2
January	3	1	6	2	1	4	6	7	8	2	4	5	1	6	2
February	1	2	0	1	0	5	2	7	10	2	0	2	2	2	0
March	1	0	6	2	3	5	3	5	9	1	2	4	4	3	1
Total	10	8	20	14	8	18	24	34	51	16	19	29	18	30	7
Collision Type															
Angle	4	2	6	0	1	8	9	12	27	4	8	11	9	11	4
Head-on	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Rear-end	3	5	9	8	4	5	7	11	12	8	8	9	7	15	1
Sideswipe, same direction	2	1	1	2	1	4	4	6	8	2	2	5	1	3	2
Unknown	1	0	4	2	2	1	4	5	4	2	1	4	1	1	0
Total	10	8	20	14	8	18	24	34	51	16	19	29	18	30	7
Severity															
Fatal Injury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-Fatal Injury	1	2	7	3	2	4	4	9	8	3	7	13	4	7	2
Property Damage Only	9	6	13	11	6	14	20	25	43	13	12	16	14	23	5
Not Reported/Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	10	8	20	14	8	18	24	34	51	16	19	29	18	30	7
Time of day															
Weekday, 7:00 AM - 9:00 AM	1	2	4	0	1	3	0	2	2	3	3	1	3	6	0
Weekday, 4:00 – 6:00 PM	2	1	5	1	1	2	4	6	8	3	2	3	5	5	0
Saturday, 11:00 AM – 2:00 PM	0	1	0	1	1	2	1	0	2	0	1	2	0	0	0
Weekday, other time	5	2	9	10	3	9	14	19	9	8	9	15	8	17	6
Weekend, other time	2	3	2	2	2	2	5	7	10	2	4	8	2	2	1
Total	10	8	20	4	8	18	24	34	51	16	19	29	18	30	7
Pavement Conditions															
Dry	6	5	16	12	4	11	19	23	42	12	13	21	15	26	3
Wet	2	3	3	1	1	4	4	11	3	3	5	8	2	1	3
Snow	2	0	0	1	2	3	1	0	6	0	0	0	1	3	0
Ice	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Unknown	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0
Total	10	8	20	14	8	18	24	34	51	16	19	29	18	30	7
Light Conditions															
Daylight	7	5	14	8	7	13	15	21	44	9	10	21	10	26	5
Dawn/Dusk	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Dark, Not Lighted	0	0	1	2	0	0	0	1	0	0	1	0	0	0	0
Dark, Lighted	3	3	5	4	1	5	9	12	7	6	8	7	8	4	2
Unknown	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Total	10	8	20	14	8	18	24	34	51	16	19	29	18	30	7
Non-Motorist (Bike, Pedestrian)	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**2**	**0**	**0**	**0**

Source: West Hartford Police Department 2021, 2022. UConn Crash Repository 2017-2021

a Crash Rate per million vehicle miles traveled based on Highway Safety Manual calculation.

2.4 Traffic Operations

Capacity analyses were conducted to evaluate the impacts of the road diet trial on traffic operating conditions. The pre-road diet conditions were analyzed using the background traffic volume networks noted in the previous section with the previous four-lane roadway cross section. The road diet trial conditions were analyzed using the traffic volumes collected during the road diet trial with the three-lane roadway cross section. The road diet trial analysis also includes traffic signal timing improvements that were implemented by the Town of West Hartford during the road diet trial.

The following section summarizes the methods of capacity analysis used in this study and documents the results.

2.4.1 Capacity Analysis Methodology

The capacity analyses were conducted using industry standard Synchro™ software, based on the evaluation criteria contained in the 2000 Highway Capacity Manual[2] (HCM). The HCM 2000 methodology was used instead of HCM 2010 or HCM 6th Edition due to limitations in these newer HCM methodologies that would preclude analysis of some study intersections. For instance, the HCM 2010 and HCM 6th Edition methodologies do not support analysis of intersections with non-NEMA phasing, more than four approaches, or clustered intersections.

Capacity analyses results are reported using a variety of performance measures, including "Level of Service" (LOS) and vehicle queue lengths. The level of service designation is based on the average control delay experienced by a vehicle traveling through the intersection. Similar to a report card, LOS designations are letter based, ranging from A to F, with LOS A representing the best operating condition (lowest vehicle delays) and LOS F representing the worst operating condition (highest vehicle delays). At signalized intersections, LOS can be reported for individual lane groups and/or for the overall intersection.

In addition to the level of service analysis, Synchro software was utilized to evaluate the projected maximum vehicle queue lengths within each lane group at the project intersections during the peak traffic periods. Since traffic flow rates (and thus queue lengths) vary throughout the day and during the peak traffic periods, the results of the peak hour queue length analysis are reported in terms of the 50th percentile and 95th percentile vehicle queue lengths. The 50th percentile queue represents the maximum vehicle queue that is expected to occur during a signal cycle under median peak hour traffic flow rates. The 95th percentile queue, which is typically considered the maximum vehicle queue for design purposes, represents the maximum vehicle queue that is expected to occur under 95th percentile traffic flow rates.

[2] Highway Capacity Manual 2000; Transportation Research Board, National Research Council, Washington, DC (2000).

2.4.2 Signalized Intersection Capacity Analysis Results

The overall intersection level of service and average delay for all signalized study intersections is summarized in Table 2. More detailed capacity analysis tables and Synchro output reports are included in the Appendix.

Table 2 Signalized Intersection Capacity Analysis Summary

Location	Pre-Road Diet		Road Diet Trial	
	LOS[1]	Delay[2]	LOS	Delay
North Main Street				
at Albany Avenue (Route 44)	F	93	D	50
at Sims Road & Bishops Corner	C	34	C	34
at Asylum Avenue	D	37	C	28
at Fern Street	D	48	D	47
at Brace Road	B	13	B	19
at Farmington Avenue	E	62	D	50
Trout Brook Drive				
at Albany Avenue (Route 44)	E	77	D	37
at Asylum Avenue	C	34	C	33
at Fern Street	D	36	D	30
at Farmington Avenue	D	40	D	38
Mountain Road				
at Albany Avenue (Route 44)	E	61	D	50
at Soby Drive & Fern Street	C	33	C	23
at Farmington Avenue	C	33	D	54

Source: Synchro 11 software using the procedures in the 2000 Highway Capacity Manual. Compiled by VHB.
1 Overall intersection level-of-service
2 Average delay per vehicle entering the intersection, in seconds

As shown in the table above, the capacity analyses indicate that the signalized intersections in the study area operate at similar or improved levels of service during the road diet trial.

The road diet, which reduced the number of travel lanes from two lanes in each direction to a single lane in each direction, was expected to reduce the overall capacity along North Main Street. However, the optimized traffic signal timings that were implemented during the road diet trial, combined with a diversion of some traffic to Trout Brook Drive, has mitigated the potential negative impacts of the road diet on traffic operating conditions. Overall, the signalized intersections along North Main Street operate at similar levels of service with the road diet in place than they did prior to the road diet implementation. Although increased vehicle queuing has occurred on some approaches, the vehicle queues have largely been deemed tolerable by the public, as noted in a subsequent section of this report.

The Trout Brook Drive and Mountain Road corridors did not undergo any roadway or traffic signal timing changes during the road diet trial, so any fluctuation in operations were due to the shift in volumes experienced between pre-pandemic conditions and October 2021 when the road diet trial traffic counts were conducted. Although the road diet appears to have

diverted some additional traffic to Trout Brook Drive, the capacity analyses indicate that Trout Brook Drive has sufficient capacity to accommodate this minor increase in volume.

2.4.3 Unsignalized Intersection Capacity Analysis Results

Capacity analyses were also conducted at the unsignalized intersection of Mountain Road at Flagg Road and at the American School for the Deaf (ASD) driveway on North Main Street. The results of the unsignalized intersection capacity analyses are summarized in Table 3.

Table 3 Unsignalized Intersection Capacity Analysis Summary

Location	Lane Group	Pre-Road Diet		Road Diet Trial	
		LOS[1]	Delay[2]	LOS	Delay
Mountain Road at Flagg Road	Westbound LT	F	>100	F	>100
	Westbound RT	C	15	B	14
North Main Street at American School for the Deaf Driveway	Eastbound LT/RT	C	20	F	>100

Source: Synchro 11 software using the procedures in the 2000 Highway Capacity Manual. Compiled by VHB.
1 Level-of-service for lane group/approach
2 Average delay per vehicle in lane group/approach, in seconds

As indicated in the above table, the Flagg Road approach on Mountain Road previously operated at level-of-service 'F' with lengthy delays for motorists attempting to turn onto Mountain Road, and the road diet trial has not affected this condition.

The ASD driveway operated at an acceptable level-of-service 'C' prior to the implementation of the road diet. During the road diet trial, the level-of-service at this driveway degraded to an 'F' with motorists experiencing lengthy delays waiting for a gap in traffic.

The delays experienced by motorists attempting to turn onto North Main Street from other side streets and driveways along the corridor follow a similar pattern as the ASD driveway, since these delays are primarily a function of the availability of gaps in traffic to safely enter the traffic stream. Reducing the number of through lanes in each direction reduces the number of acceptable gaps in traffic, and therefore, increases the delays side street motorists experience while waiting for a gap in traffic.

However, the capacity analysis results do not fully account for gaps in traffic created by nearby traffic signals. As previously mentioned, the Town implemented coordinated signal timing settings during the road diet trial. This coordinated traffic signal operation creates regular platoons of vehicles, followed by gaps in traffic as the signals turn red that provide an opportunity for motorists on side streets to turn onto North Main Street. Although the delays between acceptable gaps in traffic may be longer with the road diet in place, there is sufficient capacity and ample opportunities for motorists on side streets to enter the traffic stream on North Main Street. Furthermore, many motorists may be more comfortable turning left from side streets onto North Main Street with the road diet in place, since they

only need to cross one lane of opposing traffic instead of two. These reduced conflicts are likely a contributing factor to the decreased crash rates reported along the corridor.

2.5 Stakeholder and Public Outreach

VHB discussed the road diet with Town of West Hartford Police Department, Fire Department, and Ambulatory Services and the agencies expressed no life safety concerns with the road diet. Public Works was also consulted with regards to snow plowing and no concerns were noted.

The first public information meeting was held prior to the road diet trial implementation, on April 29, 2021. This meeting was conducted to solicit feedback from the public on the initial recommendation to consider the road diet trial later in 2021. Based upon the feedback at the first public information meeting, VHB recommended the road diet trial begin in August 2021.

Throughout the road diet trial, VHB and the Town of West Hartford have been maintaining a project website and email address allowing residents to write in or call Town Hall to provide input on the trial project. As of the end of April 2022, the public comment email/phone registry has recorded approximately 210 responses from local roadway users.

Additional to the project email, two public surveys were sent to the Town to gain further insights into the general attitude toward the road diet trial, both pre-trial and during the trial. The initial public survey was sent to the Town in spring 2021 and received 460 responses. The second survey, sent in fall/winter 2021/2022, received 1,900 responses.

A public information meeting was also held on April 28, 2022. VHB and the Town of West Hartford presented background on the project and preliminary findings from the road diet trial, and then the meeting was opened up for public comments and questions.

The public response through each of the outreach efforts noted above was mainly positive, with numerous public comments citing improved safety for all users and reduced speeds. An additional endorsement from the Pedestrian and Bicycle Commission echoed the improved safety and reduced speeds.

The results of the public comment email/call register, and both public surveys can be found in the Appendix.

2.6 Other Road Diet Evaluation Measures

As summarized in the preceding sections, the Road Diet trial was objectively reviewed for impacts to crashes, traffic operations and emergency services as well as public input via the public information meetings, online surveys and comments to the project email.

Beyond these assessments, additional measures were reviewed for the trial, including pedestrian and bicyclist usage and safety, adjacent neighborhood traffic safety concerns, travel time run results, and intersection/driveway accessibility.

2.6.1 Pedestrian and Bicycle Usage

Pedestrian and bicycle usage of the undedicated shoulders along the project limits were observed on numerous site observations as well as through the use of the project cameras and public feedback. In addition, VHB rode the corridor on a bicycle in the paved shoulders, recording video from front and rear cameras for the duration of the bicycle ride on a Sunday afternoon in April 2022.

A specific count of the number of bicycles and pedestrians in the corridor was not tallied. Instead, general observations from field visits, public comment and firsthand riding the corridor were considered in the conclusion there has been an increased number of bicycles using the corridor since before the road diet trial.

Observations from the bicycle ride reveal that many drivers passing by gave well more than 3 feet as required by law between the bicycle rider and the vehicle. This was done by using part of the TWLTL and was more apparent in the southern section of corridor where the paved shoulder is presently 3 feet wide (and recommended to be widened to the standard 5-foot bike lane in the future).

In addition, pedestrian activity along the corridor sidewalks has markedly increased with the road diet based on several observations driving the corridor, public comments provided at the 2nd public information meeting as well as comments provided to the project email.

2.6.2 Neighborhood Traffic Safety

During the first public information meeting and comments to the project email, concerns were raised by some residents from the adjacent neighborhoods north of Fern Street regarding the potential for an increase in cut through traffic. The concerns were that traffic would divert from the Road Diet roadway to avoid congestion and use the local side streets. This diverted traffic was thought to drive faster and potentially increase the crash frequency along these neighborhood streets adjacent to North Main Street.

To address this concern, traffic counts were conducted at specific locations to measure traffic volume data before and during the road diet trial and observations were conducted as well. Based upon the traffic data collected and lack of subsequent concerns raised by the residents, the concern on increase traffic, speeds and crashes did not materialize. The neighborhood streets have not been documented as being significantly impacted by any of the diverted traffic volume from the road diet trial. In essence, the traffic is not cutting through the side streets.

2.6.3 Travel Times

Most road diet projects usually cause increased travel times from prior lane configurations, as the capacity of the roadway is reduced through the elimination of operational lanes to carry through traffic. Simply put, there are less lanes to carry the same traffic volume, resulting in slower speeds, potentially increased congestion at signalized intersections which

increases the travel times along the corridor. Where the increased travel times are significant, or congestion is noticeably apparent, road diets can result in the diversion of normal corridor traffic volume to other roadways, typically a parallel roadway that when used, provides the same amount of travel time as the increased travel time on the road diet corridor. Drivers typically try out the road diet travel route and where delays and congestion are excessive to the point where alternate routes are similar or faster, they will divert.

Travel time runs were conducted along the corridor several times during the road diet trial and documented in the travel time run summaries in the Appendix.

In addition, the traffic model was utilized to predict the travel times in the corridor as compared to the actual observed travel times. The corridor is approximately 1.5 miles in length with traffic signals at each end (Brace Road on the south end and Sims Road on the north end) and signalized intersections of Fern Street and Asylum Street in between. With posted speed limits of 30 miles per hour south of the American School for Deaf intersection and 35 miles per hour north, a 3-minute travel time through the corridor without stopping at the signalized intersections is possible. This was recorded before the road diet and for one of the travel runs, also during the road diet trial.

Prior to the road diet, travel speeds were found to be well in excess of the posted speeds, with upwards of 44 miles per hour recorded at one location. At that speed, travel time through the corridor could be less than three minutes with no stopping at signalized intersections (green lights).

As part of the road diet trial evaluation, traffic models were developed to model this traffic flow and suggestions were provided to more efficiently time the traffic signals through coordination of the traffic signals along the corridor. These signals were not coordinated prior road diet trial.

The improved traffic models and timing, and implementation of traffic signal coordination resulted in more efficient management of the traffic volume with the road diet trial and therefore, congested operations were less extensive than initially considered. This also resulted in less traffic diverting to the side streets and parallel roadways of Trout Brook Drive and Mountain Road.

With the implementation of the road diet and traffic signal improvements, travel times through the corridor did not significantly increase with travel times of 4 – 5 minutes being recorded on most runs. These are provided in the Appendix.

2.6.4 Intersection/Driveway Accessibility

Exiting unsignalized intersections and driveways can be impacted with road diet projects, as the traffic flow from four lanes is conveyed to two lanes, usually resulting in longer “platoons” of traffic flow. These platoons are essentially clumps of vehicles driving close together at the same speed along the corridor, the result of the single travel lane in each direction and the slowest car becomes the pace car. When these platoons happen, drivers must wait longer for an acceptable gap in the traffic stream to enter and exit an intersection and driveway. The benefit of the road diet is that drivers are only crossing a single lane of traffic to enter/exit the intersection or driveway whereas the pre-road diet condition, drivers

had to cross two lanes. Another benefit is the use of the TWLTL for accessibility into and out of these intersections and driveways. The TWLTL provides an area for the turning vehicle away from the through traffic, with the potential for a rear end collision substantially reduced from the pre-road diet condition.

Observations of these turning vehicles indicates that during peak hours, entering or exiting the unsignalized intersections and driveways is delayed longer than the pre-road diet condition. During off peak times, the observations suggest the turning vehicles have little to no reduction in delay.

In summary, road diet vehicles turning from and into these intersections and driveways is a safer maneuver than the pre-road diet condition for the following reasons:

- Crossing of lanes is reduced
- Storage area in the TWLTL for entering and existing vehicles
- Through vehicle speeds are reduced

The crash data noted in the previous sections appears to support the safer maneuvers. While driver may have to wait longer for acceptable gaps in the through traffic streams, the wait hasn't been found to be significant and manageable.

3

Findings and Recommendations

Based on the results of this investigation, since the beginning of the road diet trial in August 2021 and continuing through this month, the road diet trial has achieved the objectives to reduce crash frequency, reduce operating speeds, and improve accessibility for pedestrians and bicyclists. In fact, the prediction of crash reductions on North Main Street was also found on the parallel study roadways for the same time period. The road diet trial has also received a favorable response from the community across public input such as the two surveys, two public information meetings and the feedback documented, with a consensus who consider the minor increases in vehicle delays to be tolerable. With the key objectives achieved, VHB recommends maintaining the road diet. VHB also recommends monitoring of crash records and traffic volumes on an annual basis until three full years of crash records are compiled (fall 2021 to fall 2024) to affirm that the observed crash frequency reductions and tolerable traffic operating conditions continue. This is important to review a larger sample size of crash data as this study has only reviewed seven months of crash data (fall 2021 to spring 2022).

As noted above, the implementation of the road diet has successfully achieved the key project objectives, and the design is fully compliant with the requirements of the Manual on Uniform Traffic Control Devices (MUTCD). However, VHB recommends that the following additional modifications be considered for implementation in the future to further improve operating conditions:

1. Widen North Main Street pavement section by two-feet to a 42-foot width south of Fern Street to accommodate 5-foot bike lanes. Additional information on lane widths can be seen in the cross section on the Signing and Marking Plan.

2. Establish bike lanes by adding 6-inch white edge lines (instead of typical 4 inch) and bike lane signs along North Main Street according to the Signing and Marking Plan.
3. Modify signal phasing at the intersection of North Main Street at Fern Street to add an eastbound protected/permitted left-turn phase. This change will require replacing an existing 3-section signal head with a 5-section signal head to provide left-turn arrows. The existing mast arm structure should be reviewed to verify that it can accommodate this minor increase in loading.
4. Restripe North Main Street between Asylum Avenue and Mountain View Drive to extend the length of the southbound left-turn lane at Asylum Avenue to provide a storage length of approximately 215-feet.
5. Public comments requested modifications to the intersection of North Main Street at Asylum Avenue to provide a dedicated left-turn lane and/or left-turn phasing for the eastbound Asylum Avenue approach. VHB does not recommend modifying the phasing to provide a left-turn phase, as this would increase overall delays at the intersection, and there is minimal demand for the left-turning movement. However, consideration may be given to restriping the eastbound Asylum Avenue approach to provide an exclusive left-turn lane and a shared through/right-turn lane.
6. Install a marked pedestrian crossing across North Main Street with Rectangular Rapid Flashing Beacons (RRFB) on the south side of the intersection of Wyndwood Road/Linbrook Road.
7. The current edition of the Manual on Uniform Traffic Control Devices (MUTCD) states that the posted speed limit should be within 5mph of the speed of free-flowing traffic. Based on a review of speed data collected since the implementation of the road diet, the 85th percentile speed data appears to support a change in the posted speed limit to 35mph within the study area. However, additional criteria should also be considered in establishing a posted speed limit. Therefore, VHB recommends conducting a speed study in accordance with the procedures outlined in the Connecticut Department of Transportation "Guidelines on Establishing Speed Limits in the State of Connecticut".
8. Modify signal phasing at the intersection of Trout Brook Drive at Fern Street to add leading protected/permitted left-turn phasing for the eastbound and westbound approaches. This change will require replacing existing 3-section signal heads in each direction with a 5-section signal head to provide left-turn arrows. The existing mast arm structures should be reviewed to verify that it can accommodate this minor increase in loading.

Sign and pavement marking plans showing an aerial view of the road diet trial implementation with the above recommendations are included in the Appendix.