VERMONT
AGENCY OF TRANSPORTATION

US Route 5 & US Route 4
Intersection Scoping Report

Hartford, VT

June 2, 2021

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1. Introduction

1.1 Project Overview

This scoping report assesses existing conditions and operations at the three-way intersection of US Route 5 and US Route 4 in Hartford, VT. VTrans' Office of Highway Safety identified this site as a high crash location (HCL) based on the High Crash Location Report for 2010-2014, and subsequently selected it for a road safety audit review (RSAR) as part of the VTrans Highway Safety Improvement Program (HSIP). The RSAR occurred on October 5, 2016 with representation from VTrans, Town of Hartford, and Two Rivers-Ottauquechee Regional Commission (TRORC). The review identified potential hazards and other safety concerns, which are further discussed in this report. Design alternatives were compiled, expanding on the potential safety enhancements summarized in the RSAR (see Appendix-A). Each alternative – detailed in Section 3 of this report – was aimed at addressing the criteria put forth in the project's Purpose and Need Statement (below). A short-term and long-term alternative have been selected for advancement to improve safety and mobility for all users.

1.2 Purpose and Need Statement

Purpose: The purpose of this project is to enhance the safety of the US Route 5 and US Route 4 intersection for all users, reduce the number of lanes on US Route 5, and improve pedestrian and bicycle facilities through the intersection.

Need:

1. **Enhance safety for all users:** The intersection of US Route 5 and US Route 4 experienced 27 crashes during a 10-year period from 2011 to 2020. The major crash pattern at this intersection consists of right-angle crashes between vehicles turning off US Route 4 and vehicles traveling either Northbound or Southbound along US Route 5.

2. **Retain Mobility:** Reducing US Route 5 from four lanes down to two lanes of travel would leave roadway capacity unimpacted, while yielding a shorter distance for all left-turning vehicles. Reducing the number of lanes would also allow for bike lanes to be installed on US Route 5.

3. **Improving Pedestrian and Bicycle Facilities:** Currently, one sidewalk exists on the South side of the intersection; there are no bicycle facilities. The town has stated in their Local Concerns Survey that cyclists avoid utilizing this area due to safety concerns. Providing safe, adequate facilities for all users is a goal for the town.

2. Existing Conditions

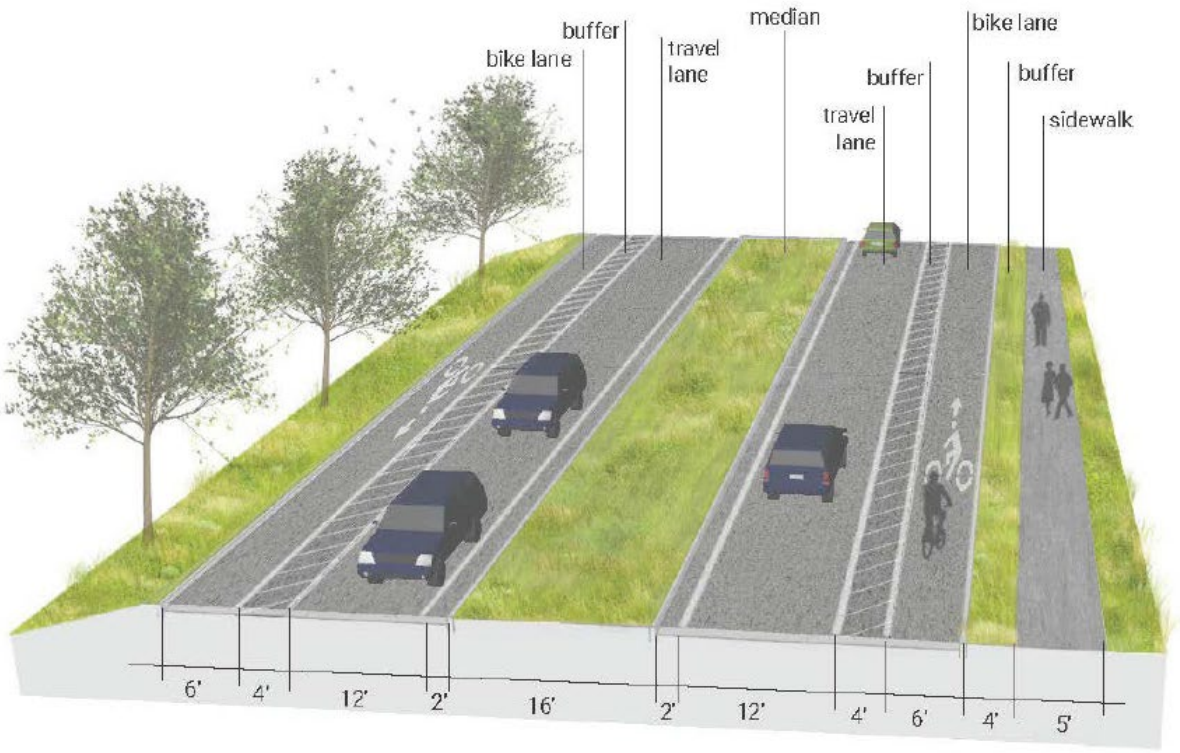
2.1 Study Area

The study area consists of the US Route 5/US Route 4 intersection and its respective approaches. This intersection is located within the designated growth center for Hartford. Positioned directly at the South end of the intersection is a commercial business, which has a paved surface out front and is separated from US Route 5 by an existing sidewalk. The northwest corner also has a commercial business, which may be accessed from either US Route 4 or US Route 5. Additional businesses and other residences – to which minimal impacts are anticipated – exist along US Route 5 as well.

Figure 1. *Location of Intersection.*

The intersection of US Route 5 and US Route 4 falls within the limits of a larger US Route 5 corridor scoping study that was previously completed by Stantec. The US Route 5 Improvements Study Project Definition Report, submitted to VTrans on April 16, 2020, considers several other intersections along US Route 5, in addition to the adjoining roadway segments. Though design considerations for the US Route 5/US Route 4 intersection were excluded from the corridor scoping report, the preferred short-term alternative from this report includes a road diet concept for the associated segment of US Route 5. This concept, illustrated in *Fig. 2* (below), was incorporated into each of the proposed alternatives outlined in this intersection scoping report. This road diet concept will be incorporated through the corridor during the Hartford NH PS24(3) paving project anticipated in 2023 and is therefore included in all of the alternatives presented within this report.

Figure 2. *Road Diet Concept (US Route 5 Improvements Study Project Definition Report, April 2020).*



2.2 Intersection Characteristics

The US Route 5/US Route 4 intersection is a state-controlled unsignalized intersection with an overhead flashing beacon. The following tables describe key characteristics of each leg at the intersection.

Table 1. *US Route 5 from South.*

Function Classification:	Major Collector
Posted Speed:	40 mph
Geometry:	Two 12’ through lanes in each direction One 12’ left turn lane 2’ shoulders Concrete median divided 7.7% Downhill to intersection
Pedestrian/Cyclist Accommodations:	5’ sidewalk on South side
AADT:	9000 vehicles/day
Truck Traffic:	AM NB: 13% AM SB: 8% Mid NB: 8% Mid SB: 7% PM NB: 4% PM SB: 5%
Pavement Condition:	Very Poor

Table 2. *US Route 5 from North.*

Function Classification:	Minor Arterial
Posted Speed:	40 mph
Geometry:	Two 12’ through lanes in each direction 2’ shoulders Concrete median divided
Pedestrian/Cyclist Accommodations:	5’ sidewalk on South side
AADT:	9000 vehicles/day
Truck Traffic:	AM NB: 11% AM SB: 8% Mid NB: 8% Mid SB: 6% PM NB: 2% PM SB: 4%
Pavement Condition:	Poor

Table 3. *US Route 4 from West.*

Function Classification:	Minor Arterial
Posted Speed:	45 mph
Geometry:	One 12' stop-controlled left turn lane One 12' right turn slip lane 6' shoulders Concrete median divided
Pedestrian/Cyclist Accommodations:	5' sidewalk on south side
AADT:	4600 veh/day
Truck Traffic:	AM EB: 5% AM WB: 9% Mid EB: 9% Mid WB: 9% PM EB: 5% PM WB: 5%
Pavement Condition:	Fair

2.3 Traffic Data

The most recent VTrans traffic count at this intersection was conducted on June 29th and June 30th, 2017; The counts ran from 12:00 pm to 6:00 pm on the 29th and from 6:00 am to 12:00 pm on the 30th. The collected volumes revealed three different peaks in daily traffic: an AM Peak Hour from 8:45 am – 9:45 am (see *Fig. 3*), a Midday Peak Hour from 11:00 am – 12:00 pm (see *Fig. 4*), and a PM Peak Hour 4:15 pm – 5:15 pm (see *Fig. 5*). This peak hour data, which can be found in Appendix-B, was used in the analysis of each design alternative.

Truck traffic through this intersection ranges from 5-13% depending on the time of day (see *Tables 3, 4, and 5*). The highest percentage of truck movements occurs during the AM Peak Hour, and is attributed to trucks heading northbound along US Route 5. The Midday Peak Hour accounts for the next highest truck traffic percentages, and demonstrates a more even distribution across all directions. The PM Peak Hour has the lowest percentage, with trucks traveling primarily southbound (i.e., towards I-91).

***Figure 3**. AM Peak Hour Turning Movement Diagram.*

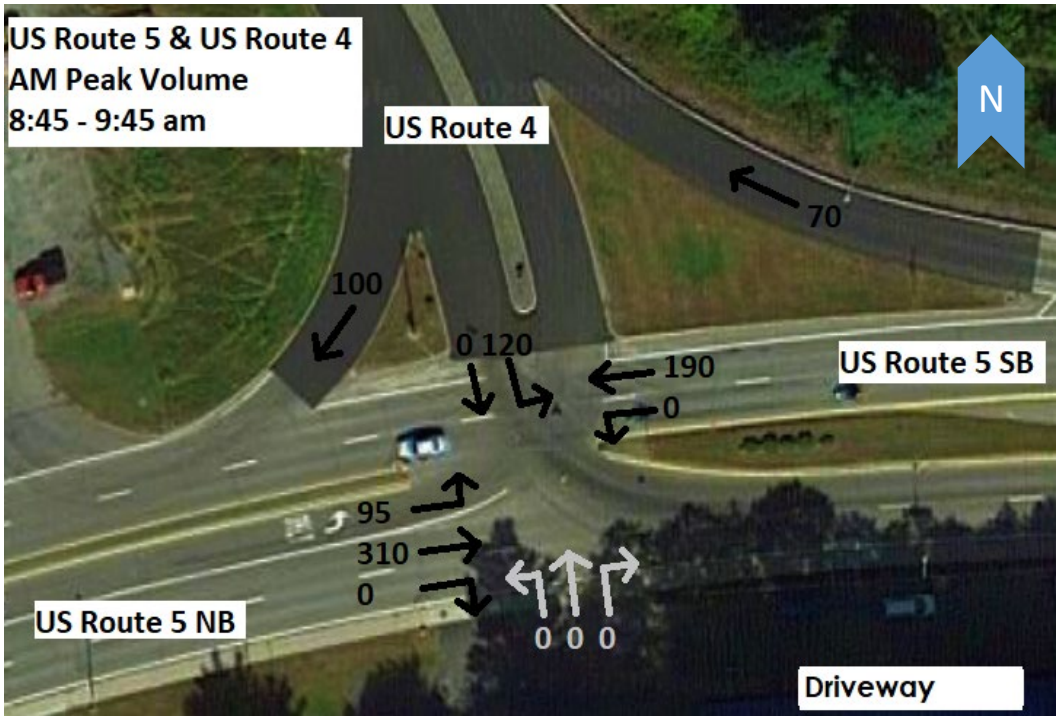


***Figure 4.** Midday Peak Hour Turning Movement Diagram.*

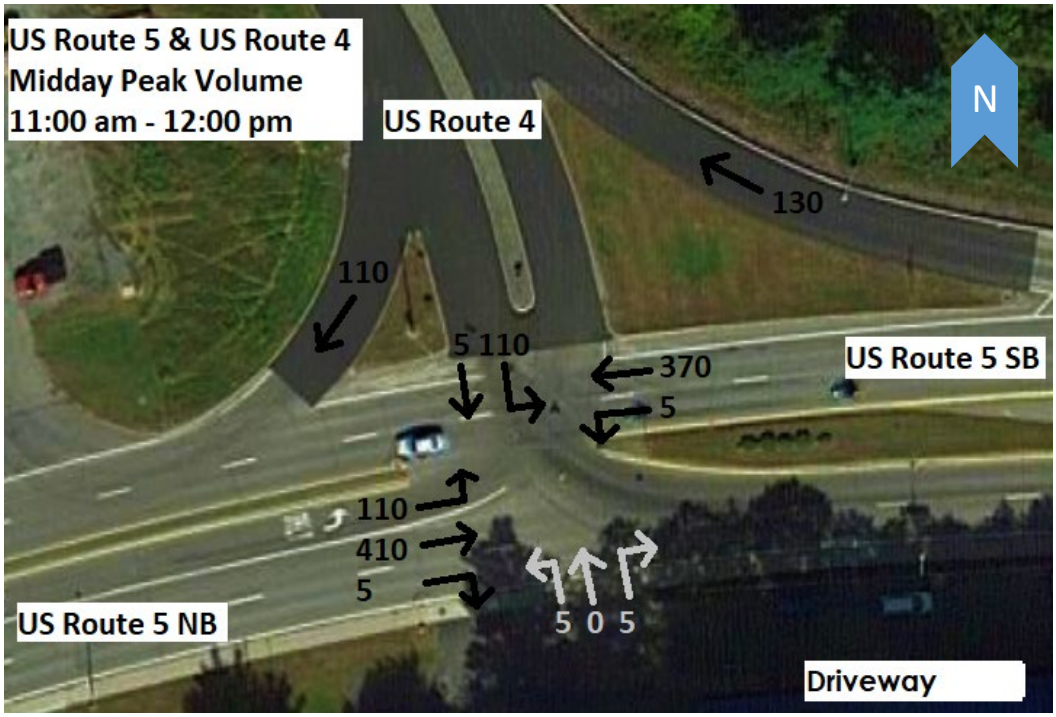
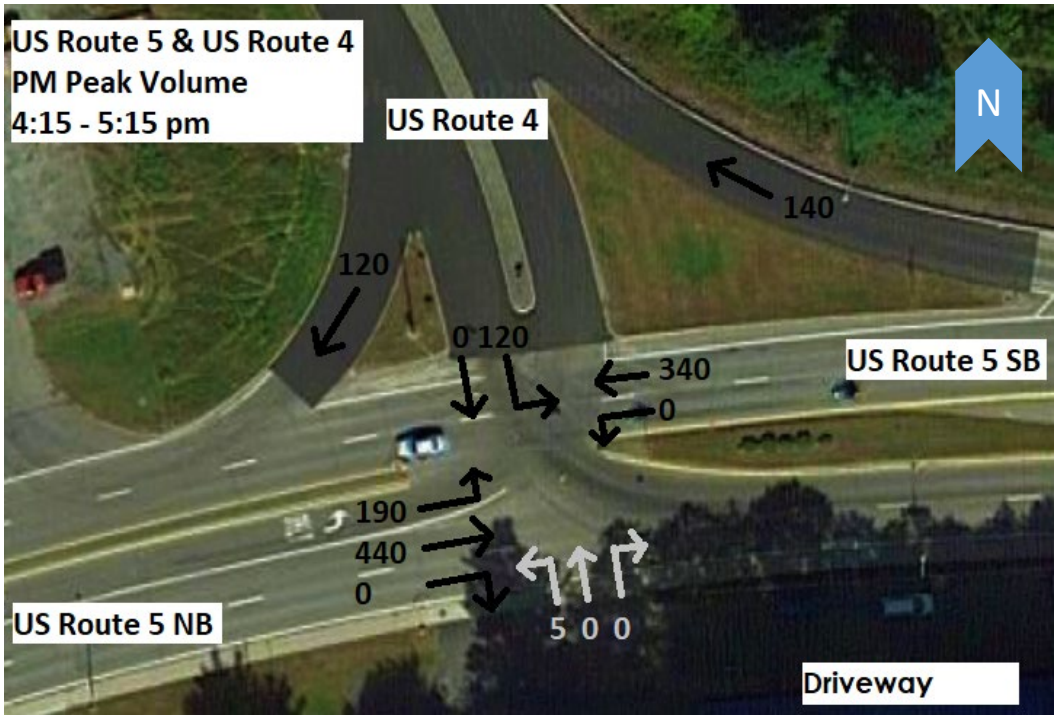


Figure 5. *PM Peak Hour Turning Movement Diagram.*

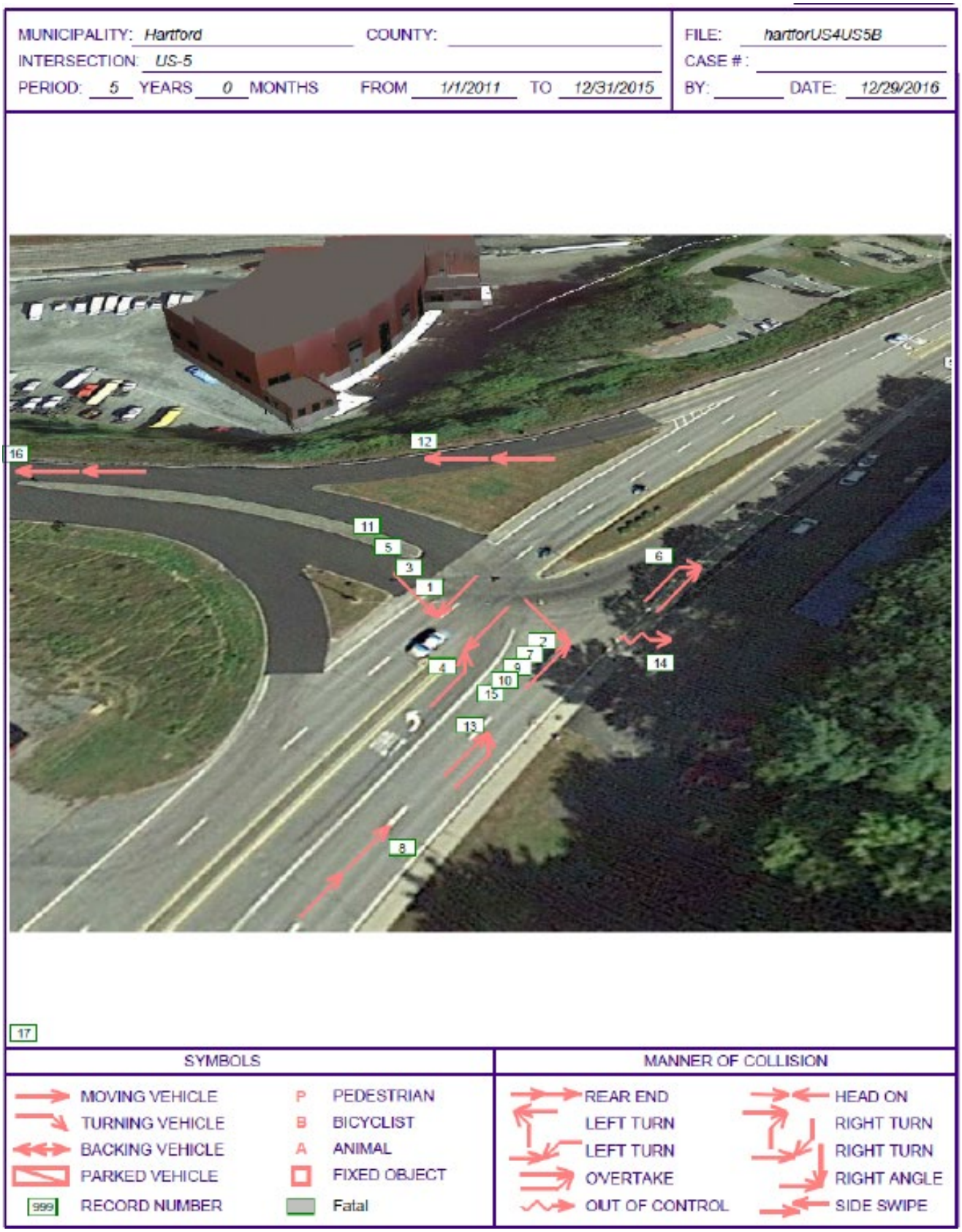


2.4 Crash History

The crash history review of this intersection considered a 10-year period, spanning from the beginning of 2011 to end of 2020. In that time, a total of 27 crashes occurred; nineteen of those were property damage only crashes (70%), five were non-incapacitating injury crashes (19%), and three were possible injury crashes (11%). It is important to note that the collision diagram shown on the following page (see *Fig. 6*) precludes the crash history data of 2016 to 2020, keeping consistent with data covered in the RSAR.

12 out the 27 total crashes involved vehicles making a left turn off US Route 4. More than half of those involved a collision with a vehicle headed northbound along US Route 5, making right-angle crashes the primary crash pattern at this intersection. In most cases, the US Route 4-to-US Route 5 left-turning motorists at fault claimed that they had not seen the approaching US Route 5 vehicle upon entering the intersection. The responses from US Route 5-to-US Route 4 left-turning motorists who were involved in a crash with an approaching southbound US Route 5 vehicle were generally more variable. They included: not seeing the other vehicle, misjudging the speed of the other vehicle, and assuming that the other vehicle was turning right onto US Route 4.

Figure 6. *Collision Diagram.*



2.5 Existing Utilities

Several different types of utilities are present at the intersection. The severity of any potential utility impacts will depend on which alternative is selected. See *Table 4* (below) for any additional information on which utilities are located throughout this study area.

Table 4. *Utility Information.*

Utility Location	Utility Type	Owner	Description
Underground	Sewer	Town	Located in NB Travel lane, then cuts diagonally under southern sidewalk
Underground	Water	Town	Located underneath southern sidewalk
Underground	Communication	Consolidated Communications	Located underneath southern sidewalk, cuts diagonally through commercial property on NW corner to head west on US Route 4
Aerial	Electric/Communication	Green Mountain Power	Single phase wire runs to flashing beacon

2.6 Natural/Cultural Resources

VTrans conducted a preliminary investigation into environmental resources at the project location in 2017.

Archaeological: A field visit was performed with subsurface core sampling to identify disturbances within grassy areas of the project. The collected samples deemed the project area highly disturbed and built entirely on fill in some areas. No further archaeological survey will be needed for the project.

Historic: No above-ground historic or Section 4(f) resources were identified inside the project location boundaries. The project site does border the Terraces Historic District, which is listed on the National Register of Historic Places, but due to the topography, any impacts from the projects would be unlikely.

Wetland/Watercourses: There is a small class III wetland within the project area. This area has limited functions and impacts should not be a major concern when considering design alternatives. There is a mapped stream within the project area, which is likely a stormwater conveyance from an adjacent neighborhood. There is a possibility that this is a regulated stream, but that is unlikely.

Wildlife Habitat: There is little to no wildlife habitat within the project area.

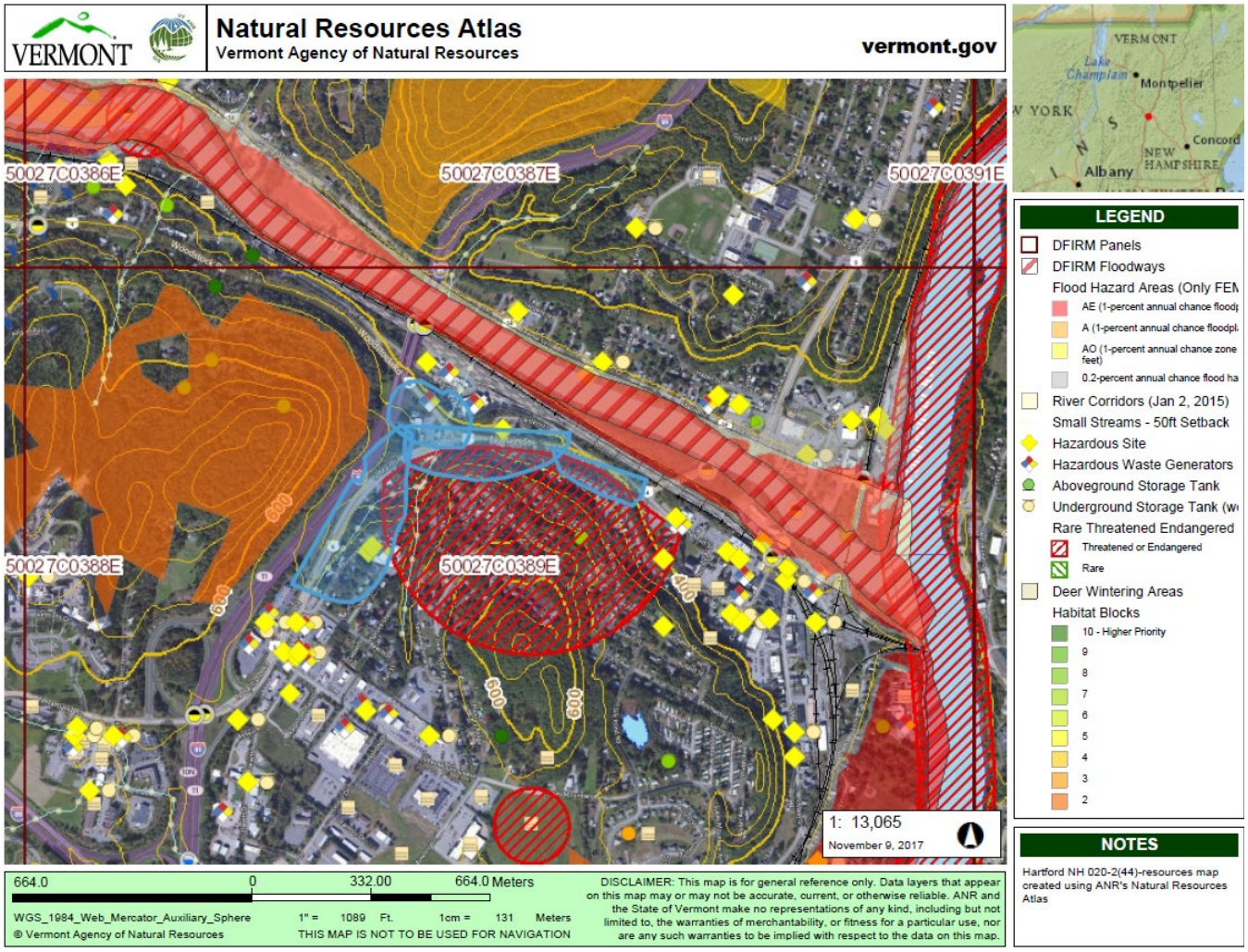
Rare, Threatened and Endangered Species: The entire state of Vermont is listed as a known habitat for the northern long-eared bat. There will likely be no impacts to this species within the project boundaries. There is an area directly south of the project area that has been documented to contain the State Endangered fowlers toad. The last observation of this species was in 1983. There is a high likelihood that this area no longer contains this species, but any impacts will require further review from the VT Fish & Wildlife Department.

Agricultural Soils: There are no mapped agricultural soils within the review area.

Hazardous Waste: In addition to the Hazardous Sites pointed out by the yellow diamonds in *Fig. 7* (below), there are two other potential sites located adjacent to the project area. These include two gas stations – one at Windshield World (formerly Atlantic Station), and one on the east side of US Route 5 (formerly Chevron Station) – which existed roughly 50 years ago.

Stormwater: It does not appear that there are any existing stormwater permits within the immediate vicinity of the project location, but there are several hydrologically connected outfalls that are mapped in connection with the Municipal Roads General Permit (MRGP). Curbing along the existing roadways and a closed drainage system currently exist at this intersection, the entire footprint of which happens to fall within the 0.2 percent annual chance flood hazard area (see *Fig. 7*). Any reduction of the total impervious area while also allowing for “disconnection" of runoff from the closed system represent a potential improvement to water quality and satisfy a "Complete Streets" approach to overall improvements.

Figure 7. *ANR Natural Resources Map.*



3. Alternatives Analysis

3.1 Alternative #1 – No Build

A no-build alternative, shown in *Fig. 8* (below), is included to understand whether no improvements to the intersection could be a viable option for the area. This also provides baseline and future comparison for the other alternatives under review. In this case, a no build alternative does not address the safety concerns exemplified by crash patterns or voiced by local stakeholders.

Figure 8. *Alternative #1 Intersection Layout.*

Per *Table 5* (below), the 2040 PM Peak Hour volume-to-capacity (V/C) ratio of 1.22 demonstrates that a no-build alternative does not meet the need to retain mobility for motorists. Pedestrian and cyclist mobility would also go unaddressed without any improvements. Without enhancements to safety or mobility, this no-build condition would not meet any of the three components of the purpose and need statement.

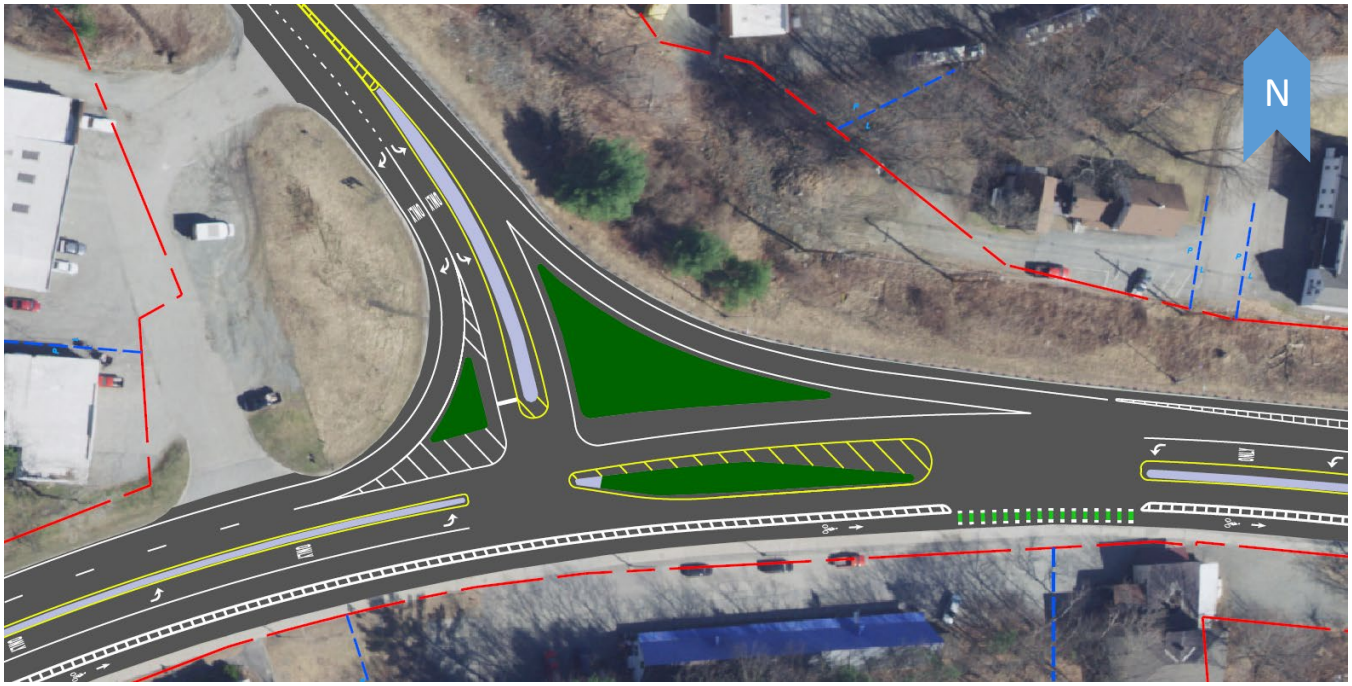
Table 5. *Alternative #1 Intersection Capacity Analysis Results.*

	Peak Hour	LOS	Delay (sec)	V/C
2020	AM	A	5.3	0.41
	PM	B	10.7	0.86
2040	AM	A	5.5	0.42
	PM	C	24.2	1.22

3.2 Alternative #2 – Road Diet

The second alternative applies the road diet concept along US Route 5, as described in Section 2.1 (see *Fig. 2*). Consistent with the corridor proposal, US Route 5 would be reduced to one travel lane in the northbound direction. The remainder of the existing pavement limits would then feature a buffered bike lane, both East and West of the intersection. Similarly, US Route 5 Southbound would also be reduced to one lane of vehicle travel, and utilize the leftover paved surface for cyclist accommodations. Under this alternative, however, a buffered bike lane is proposed to the East of the intersection only. Truncating the bike lane as shown in *Fig. 9* (below) will allow for the existing lane configuration to be maintained West of the intersection.

Figure 9. *Alternative #2 Intersection Layout.*



Due to the moderate volumes of truck traffic and relatively steep grade along the US Route 5 to the West of the intersection, Alternative #2 proposes retainment of the US Route 4 slip ramp and subsequent acceleration lane along US Route 5 Southbound. As a result, this alternative is unable to provide adequate cyclist facilities through the intersection. Additionally, long-term mobility is considerably diminished, as noted by the downgraded LOS, increased delay, and augmented volume-to-capacity ratios during the 2040 PM Peak Hour (see *Table 6*) when compared with existing operations.

In contrast, this alternative fits within the existing paved limits and therefore would not require any widening or reconstruction of the roadway. Other benefits associated with this alternative include a reduction in the number of travel lanes that left-turning traffic must cross – thus making it less likely to perpetuate the major crash pattern at this intersection – and the lack of impacts to existing utilities, right-of-way, stormwater, and environmental resources that it poses.

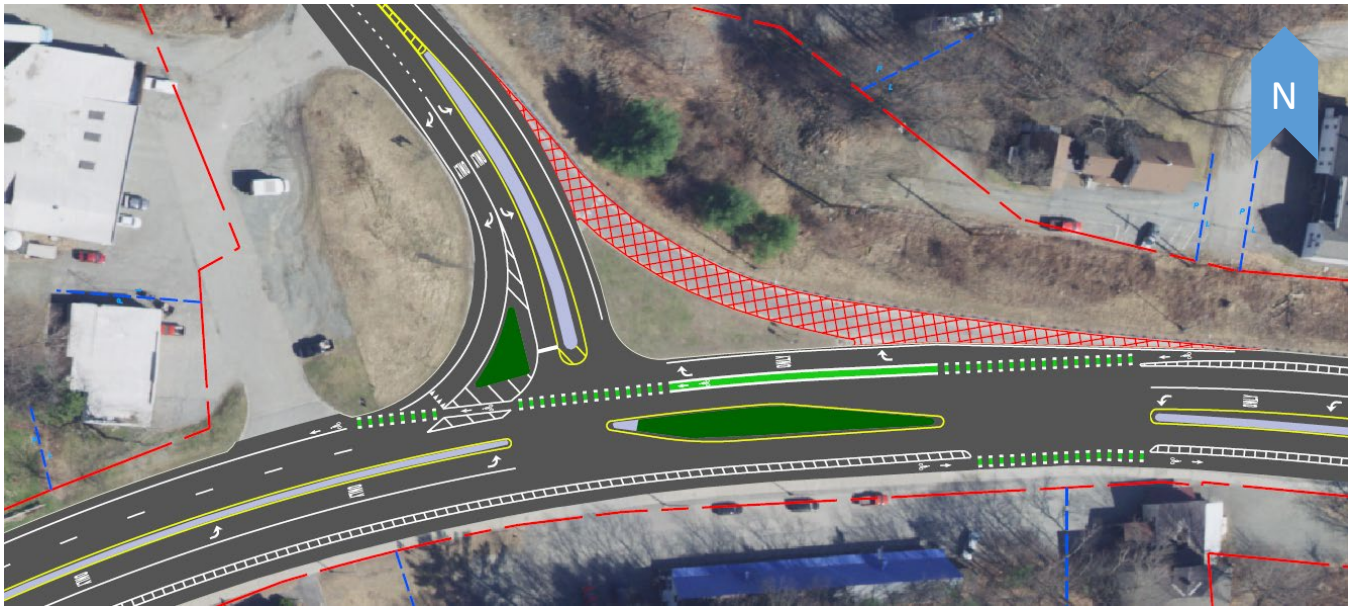
Table 6. *Alternative #2 Intersection Capacity Analysis Results.*

	Peak Hour	LOS	Delay (sec)	V/C
2020	AM	A	6.2	0.48
	PM	C	16.6	1.03
2040	AM	A	6.4	0.50
	PM	E	38.9	1.52

3.3 Alternative #3 – Road Diet with Ramp Removal

The third alternative incorporates the road diet features discussed in the previous section, while also proposing removal of the US Route 5 Southbound slip ramp. Removing the ramp aims to create a safer environment for both motorists and cyclists by reducing the number of conflict points. Like Alternative #2, the US Route 4 Eastbound slip ramp would remain in place to facilitate truck turning movements.

Figure 10. *Alternative #3 Intersection Layout.*



A buffered bike lane along US Route 5 Northbound both East and West of the intersection would be accommodated by this alternative. *Fig. 10* (above) also depicts the buffered bike lane along US Route 5 Southbound to the East of the intersection, coupled with green pavement markings to designate cyclist facility through the intersection. Finally, this alternative includes shoulder widening along US Route 5 to the West of the intersection to maintain a 5-foot width for cyclists as they ascend the hill, thus yielding a greater overall improvement to cyclist facilities when compared with Alternative #2. The shoulder widening, along with any minor curb and drainage inlet modifications resulting from the US Route 5 Southbound slip ramp removal, can be completed in conjunction with an upcoming resurfacing project that VTrans has programmed for construction in 2024, making this alternative a quite feasible short-term solution. Existing utilities and right-of-way would be unimpacted, and no stormwater permit is anticipated.

While the road diet with ramp removal concept sensibly improves safety for cyclists and motorists with its reduction of travel lanes and conflict points, this alternative still does not fully address the crash pattern of the intersection (despite its reduction in the number of travel lanes that left-turning traffic must cross). Likewise, the increased delay, heightened congestion, and downgraded LOS during PM Peak Hour conditions (see *Table 7*) signify an inability to address mobility concerns over the long-term.

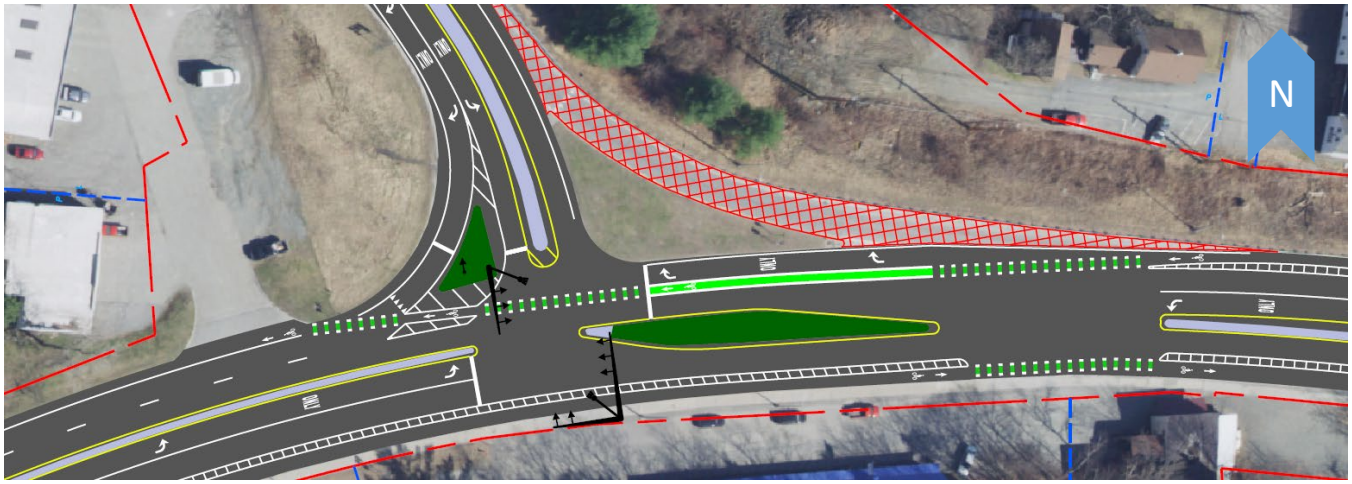
Table 7. *Alternative #3 Intersection Capacity Analysis Results.*

	Peak Hour	LOS	Delay (sec)	V/C
2020	AM	A	6.2	0.48
	PM	C	18.1	1.07
2040	AM	A	6.5	0.50
	PM	E	42.3	1.59

3.4 Alternative #4 – Signal

Alternative #4 mirrors the geometry of Alternative #3, and proposes replacement of the existing flashing beacon with a traffic signal system. Two mast arm poles (MAPs) would be placed in the vicinity of the existing span wire poles and located within existing right-of-way, as shown in *Fig. 11* (below).

Figure 11. *Alternative #4 Intersection Layout.*



Signal warrant analyses completed by the VTrans Traffic Research Unit at the end of 2016 evaluated four different intersection configurations: existing geometry, both slip ramps removed, road diet with US Route 4 slip ramp, and road diet without US Route 4 slip ramp. According to the study, removing the US Route 4 slip ramp is the only configuration that meets any of the signal warrants outlined by the MUTCD. Full results from the analyses can be found in Appendix-E.

Understanding the need for heavy truck accommodations, removal of the US Route 4 was once again not considered during the development of this alternative. Consequently, this intersection design does not meet any signal warrants. Minor utility impacts (both aerial and underground) and temporary right-of-way conflicts (resulting from the southernmost MAP) are also anticipated.

Access modifications at the recently reopened Listen Furniture Store (commercial property located South of the intersection) would be required because of the proposed traffic signal. The parcel currently has two access points along US Route 5, with one directly at the intersection and the other located approx. 200 feet Easterly. This alternative proposes a closure of the former; patrons would solely utilize the eastern access instead.

The installation of a traffic signal would help address the major crash pattern at the intersection, and cyclists would once again benefit from the combination of buffered bike lanes, green pavement markings, and shoulder widening. Lastly – and contrary to the two previous alternatives – long-term mobility is improved, compared with that of the no build option (see *Table 8*).

Table 8. *Alternative #4 Intersection Capacity Analysis Results.*

	Peak Hour	LOS	Delay (sec)	V/C
2020	AM	B	11.2	0.55
	PM	A	9.2	0.62
2040	AM	A	8.1	0.55
	PM	B	13.5	0.70

3.5 Alternative #5 – Roundabout

The final alternative – Alternative #5 – once again includes the road diet features shown along the US Route 5 approaches in the previous layouts, only now paired with a single-lane roundabout at the intersection (see *Fig. 12*). The proposed roundabout center is shifted slightly north of the existing intersection center to allow for proper deflection at all approaches and help mitigate right-of-way impacts. It features a 125-foot inscribed diameter and an 85-foot-diameter mountable truck apron to accommodate truck traffic.

Figure 12. *Alternative #5 Intersection Layout.*

Alternative #5 accommodates pedestrians and cyclists better than any of the other alternatives. Under this design, the bike lanes on US Route 5 transition to a shared use path at the roundabout's approaches. Like Alternatives #3 and #4, shoulder widening to the west of the intersection is included here to maintain a 5-foot width for cyclists, effectively providing adequate bicycle facilities in both directions along US Route 5. Lastly, proposed crossings at each leg of the intersection will allow pedestrians to safely navigate the entire intersection – something that could not be achieved by the other alternatives.

As with Alternative #4, access to the southern commercial property will also be impacted by this alternative. Proposed modifications once again include closing the access directly at the intersection closed and formalizing the eastern access. Other commercial driveways within the project area will largely remain the same, featuring only slight modifications needed to extend access beyond the shared use path.

A roundabout sufficiently addresses the intersection's major crash pattern via complete elimination of left-turn movements across opposing traffic. Furthermore, 2040 PM Peak Hour LOS, delay, and volume-to-capacity ratio all exhibit improvement compared the no build alternative, thus addressing future mobility (see *Table 9*). These two outcomes, combined with the pedestrian/cyclist upgrades described above, accredit Alternative #5 as only one to fully satisfy all components of the project purpose & need statement.

Table 9. *Alternative #5 Intersection Capacity Analysis Results.*

	Peak Hour	LOS	Delay (sec)	V/C
2020	AM	A	6.9	0.42
	PM	B	11	0.66
2040	AM	A	7.5	0.47
	PM	B	13.8	0.75

3.6 Benefit-Cost Analysis of Alternatives

The Benefit-Cost Analysis compares potential benefits associated with the implementation of each alternative against their respective conceptual cost estimate. The costs that were calculated included both Capital Costs (i.e., materials, installation, right-of-way) and future Operation and Maintenance Cost for an independent project. The benefits calculated for each alternative were primarily based on safety, since the intersection improvements themselves – as outlined by the project purpose and need statement – are safety-driven. Crash Reduction Factors (CRF) were collected using the CMF Clearinghouse website. CRFs used in the analysis are as follows:

- Conversion of intersection into single-lane roundabout (CRF = 0.36)
- Install traffic signal (CRF = 0.44)
- Road diet (CRF = 0.29)
- Remove slip ramp (CRF = 0.30)

A VTrans-generated Benefit-Cost Workbook was used to calculate the Present Value of Benefits based on a 20-year service life and 10-year crash data period (2011-2020) for each alternative. The analysis also considers traffic growth, factors for which were pulled from VTrans' 2019 version of the Continuous Traffic Counter Report ("The Redbook"). Ultimately, the Present Value of Benefits was divided by the assumed Project Cost (detailed in Appendix-C) to obtain B/C values for each alternative, which are summarized in *Table 10* (below). Benefit-Cost worksheets for each alternative have been included in Appendix-D.

Table 10. *Benefit-Cost Analysis Results.*

	Present Value of Benefits	Project Cost	Benefit-Cost Value
Alternative #1	$0	$0	--
Alternative #2	$794,403	$725,000	1.10
Alternative #3	$1,377,879	$940,000	1.47
Alternative #4	$1,976,913	$1,295,000	1.53
Alternative #5	$1,552,921	$1,650,000	0.94

B/C ratios are an effective measure for the value provided by these improvements but are not the only consideration when determining the preferred alternative. Alternative #5, although the B/C ratio is 0.94, is the alternative that most effectively addresses all of the components of the projects purpose and need. Likewise, the benefit-cost analysis does not consider the short-term additional viability of Alternative #3, which can be completed in conjunction with an upcoming resurfacing project for cost savings and an expedited process. Alternative #4 resulted in a B/C ratio of 1.47, but because the proposed traffic signal system does not meet any of the signal warrants in the MUTCD, it's an impractical alternative to pursue further.

4. Preferred Alternative and Town Input

4.1 Alternative Evaluation Matrix

The Alternative Evaluation Matrix shown in *Table 11* (below) provides a side-by-side comparison of Alternatives #1-5. This matrix summarizes information such as cost, future operations, safety, and impacts.

Table 11. *Alternative Evaluation Matrix.*

Criteria	Alternative #1	Alternative #2	Alternative #3	Alternative #4	Alternative #5
Project Cost	$0	$725,000	$940,000	$1,295,000	$1,650,000
Benefit Cost Value	--	1.10	1.47	1.53	0.94
Future AM Peak Hour LOS	A	A	A	A	A
Future AM Peak Hour Delay	5.5 sec	6.4 sec	6.5 sec	8.1 sec	7.5 sec
Future AM Peak Hour V/C	0.42	0.50	0.50	0.55	0.47
Future PM Peak Hour LOS	C	E	E	B	B
Future PM Peak Hour Delay	24.2 sec	38.9 sec	42.3 sec	13.5 sec	13.8 sec
Future PM Peak Hour V/C	1.22	1.52	1.59	0.70	0.75
Vehicle Safety	No Improvement	Partially Improved	Improved	Improved	Greatly Improved
Cyclist and Pedestrian Facilities	No Improvement	Partially Improved	Improved	Improved	Greatly Improved
Utilities	No Impact	No Impact	No Impact	Minimal Impact	Minimal Impact
Right-of-way	No Impact	No Impact	No Impact	Minimal Impact	Minimal Impact
Stormwater Permit	None	None	Not Anticipated	Not Anticipated	Not Anticipated
Environmental Resources	No Impact	No Impact	Minimal	Minimal	Minimal
Traffic Control	None	Simple	Simple	Moderate	Complex

4.2 Town Collaboration Meeting

A collaboration meeting between Town of Hartford representatives and VTrans occurred on January 16th, 2020 to discuss the US Route 5/US Route 4 intersection and its proposed alternatives. VTrans presented each alternative, and the Town provided feedback on them. The Town once again emphasized their request to retain the US Route 4 slip ramp and both US Route 5 Southbound travel lanes to assist truck traffic. After presenting each of the alternatives, the Town agreed on Alternative #5 as the best option.

Access management was also discussed. The property located on the South side of the intersection, which was vacant at the time of the meeting, has since reopened as a furniture store. However, minimal future development is planned for this parcel, and the Town has supported VTrans' proposal to close off the parcel's western access (i.e., located directly at the intersection) as part of the traffic signal and roundabout designs. Doing so would minimize vehicle conflicts and improve safety of all users. Additionally, the parcel's other access – located 250 feet easterly – already has a dedicated left-turn lane on the US Route 5 Southbound approach, and would remain open. Complete minutes from the Town Collaboration Meeting have been included in Appendix-F.

4.3 Preferred Alternative

Based on input received during separate Alternative Review meetings held on January 26th, 2021 and January 27th, 2021 with both Town and VTrans personnel, respectively, VTrans has decided to move forward with Alternative #3 as the short-term preferred alternative and Alternative #5 as the long-term preferred alternative. See Appendix-F for the complete meeting minutes.

Alternative #3, which improves safety for motorists via a travel lane reduction (i.e., road diet) and US Route 5 slip ramp removal, will still retain the US Route 4 slip ramp, satisfying the Town's request to accommodate heavy truck turning movements. This alternative better accommodates cyclists, who will have access to a buffered bike lane along US Route 5 Northbound both East and West of the intersection. Similarly, it proposes a buffered bike lane along US Route 5 Southbound to the East of the intersection, along with green pavement markings to designate cyclist facilities through the intersection. Finally, the featured shoulder widening – to be completed during paving – along US Route 5 to the West of the intersection, yields the desired 5-foot minimum bike lane width.

Alternative #5 fulfills the requirements in the purpose and need for this intersection improvement project. Elimination of left-turn movements across opposing traffic, slower vehicle speeds, and a reduced number of conflict points achieved via the roundabout will collectively enhance user safety at the intersection, while improving mobility over a 20-year service life. New shared use facilities on all sides of the intersection, paired with bike lanes and a widened shoulder along US Route 5, will allow cyclists and pedestrians to safely navigate the intersection and ultimately provide better connectivity of the US Route 5 corridor. For these reasons, Alternative #5 represents the preferred long-term alternative.

4.4 Preferred Alternative Public Presentation

On April 20th, 2021, VTrans presented their short-term and long-term preferred alternatives to the Town of Hartford. The Selectboard motioned to endorse the preferred alternatives with continued coordination together (VTrans/Town), voting 5-1. Preferred Alternative Public Presentation minutes drafted by both VTrans and the Hartford Selectboard have been included in Appendix-F.

Following the public meeting in April, the management approval of scope document was developed and signed off on by the VTrans' management team. This reflects the short-term and long-term alternatives for projects moving forward. See Appendix-I for additional detail.

Appendix-A: Road Safety Audit Report

Office of Highway Safety

Road Safety Audit Review

Town:	Hartford	**Date Reviewed:**	October 5, 2016
Route:	US 5 VT 14 South Intersection	**Mile points:**	US-5 MM 3.49-3.66 US-4 MM 9.29-9.35

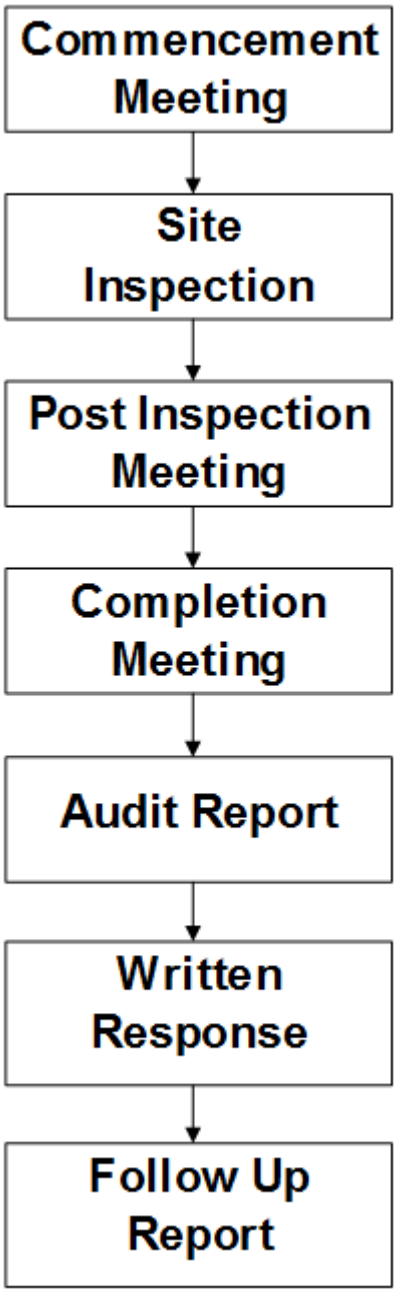
Location Map

RSAR Process

A ***Road Safety Audit Review*** (RSAR) is a formal examination of an existing road in which an independent, multi-discipline team (the Audit Team) reports on potential safety issues.

According to the Federal Highway Administration (FHWA), the purpose of a RSAR is to determine which elements of the road may present a safety concern, to what extent and under what circumstances as well as to identify opportunities to mitigate the identified safety concerns.

Figure 1 - Road Safety Audit Process



The RSAR process is composed of several steps as shown in Figure 1. The process starts with a ***Commencement Meeting*** during which the Audit Team reviews data and gathers community concerns. A ***Site Inspection*** is then performed by the Audit Team. The site visit involves the identification of safety deficiencies as seen in the field. The Audit Team will usually drive through the location of interest to “get a feel” for the area, traveling through each approach in the case of intersections. The team is to then drive at a slower speed to make observations. If needed, the team will also walk the location. Following the site inspection, the Audit Team holds a ***Post Inspection Meeting.*** It is during this meeting that the team members discuss their observations and identify safety issues. The team is to reach a consensus on the importance of each safety issue mentioned. Only those issues for which a consensus is reached are included in the RSAR findings. A RSAR report (Written Report) is prepared.

The ***Written Report*** identifies safety concerns and proposes guidance. These issues and solutions are presented in a tabular format associated to each Responsible Entity for ease of reporting. The ***Responsible Entities*** are any groups who own a roadway feature or who are responsible for making an improvement or for initiating further studies. These could include for example, the VTrans design section, the local town, the local police or the local RPC.

Location

The location of this RSAR is the intersection of US 5 and VT 14 in Hartford (near I-91).

Purpose of the RSAR

This RSAR was conducted as part of VTrans Highway Safety Improvement Program (HSIP). The locations selected for this HSIP effort were originally identified as high crash locations and subsequently ranked in terms of fatal and injury crash rate.

The RSAR herein has sought to identify potential safety hazards and physical features which may affect road user safety. However, it is possible that not every deficiency has been identified. It should further be recognized that the implementation of the guidance in this report may contribute to improve the level of safety of the facility reviewed but not necessarily remove all the risks.

RSAR Participants

Mario Dupigny-Giroux from the Office of Highway Safety, VTRANS, was the RSAR coordinator.

The other participants were:

Mike Blakslee,	District 4, VTRANS
Erin Lewis,	Traffic Design, VTRANS
Pat McManamon,	DMV, VTRANS
Marcos Miller,	TSMO, VTRANS
Kelsi Record,	Traffic Design, VTRANS
Simon Keeling,	Hartford PD
Tom Lyman,	Hartford PD
Allyn Ricker,	Hartford Highway Department
Rita Seto,	TRORC

Information Reviewed

Geometry

This intersection is a three-way stop controlled intersection with overhead flashing beacons. The stop sign is on the US 4 approach and controls traffic that is making a left turn onto US 5 northbound. US 4 traffic that is going southbound on US 5 uses a slip lane controlled by a yield sign.

There are two slip lanes on the US 4 approach. One for traffic entering US 4 from US 5 northbound and one for traffic entering US 5 southbound from US 4.

There are two lanes of traffic in each direction on US 5. In addition, US 5 also has a northbound left turn lane. There is also a right turn lane for the traffic to access the westbound US 4 slip lane.

Northbound and southbound traffic on US 5 is divided by raised concrete islands.

South of the intersection, there is a 7.7 percent vertical down grade when traveling towards the intersection and there is also an 8-degree horizontal curve.

Intersection sight distances where roughly measured while conducting the road safety audit to be between 550 and 650 feet in the northbound direction and 750 feet southbound.

The pavement surface on US 5 is rated as poor in the area of the intersection with the year of last work being 1994. The pavement surface is rated as fair on US 4 also with 1994 as being the year of last work. (VTransparency, December 2016).

Speed Limit

The posted speed limit on US 5 in the area of the intersection is 40 mph. The range of the 40 mph speed limit is from about just past Airport Road to just past Lantern Lane. The speed limit north of this zone is 35 mph and the speed limit south of this zone is 30 mph.

An 85th percentile speed estimate is available from a volume count that was done in May 2016. The count location was at mile point 3.2 on US 5.

From this count, the 85th percentile speed of the traffic traveling in the northbound direction on US 5 was determined to be 41 mph (meaning that 85% of the traffic travels at a speed of 41 mph or less). The 85th percentile speed of the traffic traveling in the southbound direction on US 5 was estimated to be 43 mph.

The 10-mph pace, which is defined as the range of speeds that encompasses the highest proportion of vehicles, was also determined from this count to be between 30 and 40 mph for northbound traffic and between 35 to 45 mph in the southbound direction.

On US 4, the approach speed limit is 45 mph.

Traffic Volumes

The 2014 Average Annual Daily Traffic on US 5 was 9000 vehicles per day south of the intersection and it was 8400 vehicles per day west of the intersection. On US 4, west of the intersection, the Average Annual Daily Traffic was 4400 vehicles per day.

The latest 12-hour turning movement count was done in July 2012.

Seventy-two percent of the traffic traveling from either the south or the north on US 5 is continuing through the intersection. From the south, twenty-six percent of the traffic is turning left onto US 4 while twenty-eight percent of the traffic on the north approach is turning right onto US 4.

From US 4, a slightly higher proportion of the traffic is making a left turn onto US 5 to travel north on US 5. Specifically, fifty-two percent of the motorists are making a left turn onto US 5 north, while forty-seven percent are making a right turn to travel south on US 5.

Traffic Signs

On all three approaches, the traffic signs consist of the usual typical intersection related signs: junction sign, destination boards, lane assignment sign, advance route markers and route markers at the intersection.

The intersection is controlled with gate posted stop signs that are located on the US 4 approach. There is also a stop ahead sign on US 4. This stop ahead sign is located east of the underpass for I-91.

Traffic Studies

VTrans Traffic Research Unit completed a signal warrant analysis as well as an all-way stop warrant analysis based on the 2009 edition of the Manual on Unified Traffic Control Devices in December 2016.

These analyses were based on a VTrans 2012 12-hour turning movement count. The morning half of the count (6:00 AM – 12:00 PM) was conducted on June 27, 2012. The afternoon half of the count (12:00 PM – 6:00 PM) was done on June 26, 2012. Seasonal adjustment factors and annual growth factors were applied to estimate 2017 Annual Average Weekday Daily Traffic.

Four intersection configurations were evaluated. The first was with the existing geometry, the second was with the US 4 slip lane removed while the third and fourth was with one lane of travel on US 5 in each direction with and without the US 4 slip lanes.

The results of these evaluations are as follows: With the current number of travel lanes on US 5, if the US 4 EB to US 5 SB slip-lane stays in place and the right turning traffic is not included in the signal warrant analysis, then the intersection does not meet any of the warrants. Similarly,

none of the warrants are met if the US 4 EB to US 5 SB slip lane is eliminated and the right turning traffic is rerouted through the intersection via a designated right-turn lane.

Signal warrants are also not met if US 5 is reduced to one lane of travel in each direction and the slip ramps remain in place. On the other end, if the US 4 EB to US 5 SB slip lane is eliminated then Warrants 1 and 2 are met.

For the multi-way warrant, only one MUTCD criteria is met (criteria A) and only when the number of lanes on US 5 is changed to one in each direction and that the US 4 to US 5 slip lane is removed.

The table below summarized the results of the signal warrant analysis and the multi-way stop evaluation.

Scenario: Single travel lanes on US 5				Scenario: Dual travel lanes on US 5			
Signal Warrants Met	Multi-Way Stop Criteria Met	Slip Ramp		Signal Warrants Met	Multi-Way Stop Criteria Met	Slip Ramp	
		US4 EB to US5 SB	US5 SB to US4WB			US4 EB to US5 SB	US5 SB to US4WB
none	none	In Place	In Place	none	none	In Place	In Place
none	none	In Place	Removed	none	none	In Place	Removed
1, 2	A	Removed	In Place	none	none	Removed	In Place
1, 2	A	Removed	Removed	none	none	Removed	Removed

Past Projects

Project CM-RS 0113(52) was for the resurfacing of US 5. This project was completed in 1994. Project STP 9411(1)S was for the resurfacing of US 4. It was completed in 1994.

In March 2010, VTrans directed the Listen Center (located on the east side of the intersection) to remove their newly entry and exit signs because of traffic concerns that where developing on US 4 and US 5. Under the configuration, traffic was entering from the south US 5 entrance and exiting from the north US 5 exit. One problem was that there was a left turn lane to enter the site from the north and that motorists who were in that left turn lane to enter the site were told by the

do no enter sign not to enter this way. Another problem was that people who were entering the site from the south access when not able to see clearly northbound traffic due to vehicles waiting in the left turn lane to US 4.

Future Projects

No upcoming projects were identified in VTransparency or QueryDB.

Crash History

The crash history was reviewed at the intersection for the five-year period covering the years 2011 to 2015. A total of sixteen crashes occurred at this intersection during this period. Summary of crash narratives are provided at the end of this report along with a collision diagram.

Of these sixteen crashes, eleven of them were property damage only crashes (69%), two were non-incapacitating injury crashes (13%) and three were possible injury crashes (19%).

There is a clear crash pattern at this intersection. Left turn crashes off US 4 represents fifty-six percent of all the crashes at this intersection. For this crash pattern, sixty-six percent involved a US 4 vehicle that collided with a northbound US 5 vehicle and forty-four percent involved a US 4 vehicle and a US 5 southbound vehicle.

The majority of the US 4-to-US 5 northbound left turners at fault indicated that they had not seen the other US 5 vehicle when entering the intersection. In the case of the left turners at fault who were involved in a collision with a vehicle that was traveling southbound on US 5, the reasons for the crash were more varied and included not seeing the other vehicle, seeing the other vehicle and thinking that there was enough time to complete the left turn, and seeing the other vehicle and thinking that this upcoming vehicle was making a right turn.

These left turn crashes of US 4 are happening around noontime or during the afternoon peak hour. More specifically, for the crashes involving a US 5 northbound vehicle, sixty percent took place between 11:00 am and 12:00 pm and forty percent between 4:00 pm and 5:00 pm.

When a US 5 southbound vehicle is involved, seventy-five percent of the crashes are happening during the afternoon peak hour between 3:00 pm and 5:30 pm.

Current Local Concerns

A number of comments were made during the commencement meeting:

1. The view to US 5 northbound vehicles for left turners off US 4 looking south on US 5 could potentially be blocked by US 5 motorists that are waiting in the US 5 northbound left turn lane to turn onto US 4.

2. The pole in the grass island on US 4 could block the view of oncoming traffic from the south.

3. Motorists who are making a left turn from US 4 have to cross many lanes.

4. Motorists coming down the hill during winter could be an issue.

5. There is a lot of truck traffic.

6. It is anticipated that the roundabout at Sykes Avenue, which will be constructed in 2018, will have an effect on the travel speed coming down the hill on US 5.

Economic Evaluation of Potential Alternatives

A roundabout option, a signal traffic option and a road safety diet option (the elimination of a lane) were evaluated in terms of the safety benefits that they would produce if constructed.

Recent roundabout project bids resulted in an average estimated construction cost of $1,474,900. Using this figure as a planning cost generates a B/C ratio of 0.42. Since this is well below 1, the safety benefits of doing this project do not exceed the costs. This indicates that the construction of a roundabout is not justifiable in terms of safety at this location.

Assuming a project cost of $300,000, the B/C ratio for converting the intersection from a stop controlled intersection to a signalized intersection is 0.24. This ratio is below 1 and does not justify from a safety perspective the conversion to a traffic signal.

Road diet, in terms of eliminating a through travel lane on US 5 in each direction, could potentially reduce crashes by twenty-nine percent (CMF 199, all crashes). If $100,000 project costs are assumed, the B/C ratio obtained is 4.14. This would justify an investment in terms of safety. It was determined that, to obtain a B/C ratio of above 1 at this location, the limiting project costs would have to be no more than $415,000.

Identified Safety Concerns

This section lists the areas of safety concern identified by the audit team during the site inspection and from the analysis of available data. This section also reports the potential safety enhancements suggested by the audit team. The concerns are not listed in order of importance.

Concern: Occurrence of Right Angle Crashes

The major crash pattern at this intersection are right angle crashes between a vehicle coming off US 4 and a northbound or southbound vehicle on US 5.

A traffic signal or a roundabout are two types of traffic control that would help achieve a reduction in this type of crashes. However, crash severity at this intersection is usually low or crashes have no injuries and the safety benefits of constructing a traffic signal or a roundabout are in turn low and do not support their construction (as the B/C ratios are well below 1).

Travel speeds are perceived to be a factor in the crashes at this intersection as well as visibility and overall geometry.

Safety Enhancements:

Short to Mid Term (interim actions)

Install a temporary radar speed feedback sign on US 5 north of the jug handle (just past it).

Make a request to the Traffic Committee for a reduction in speed limit from 40 mph to 35 mph.

Add backplates to the overhead beacons to make the beacon indications more conspicuous.

Mid Term

Relocate the pole on the grass island of US 4 about seven feet back.

Consider eliminating the left turn movement off US 4 and directing all left turning traffic to the jug handle south of the intersection on US 5.

Longer Term

Review the geometry of US 5 and reduce the number of travel lanes if possible (The current Annual Average Daily Traffic of about 9000 vehicles on US 5 is well below the typical maximum volume thresholds for this type of conversion and its implementation would not affect capacity).

If the number of lanes is reduced and the US 4 to US 5 slip lane was removed, the intersection could also be converted to an all-way-stop. A study to determine the resulting delay and intersection level of service resulting from this alternative needs to be performed.

Although the overall safety benefits in monetary value would be lower than the construction costs (as explained previously), it would be worthwhile to consider the construction of a roundabout.

Summary of Safety Enhancements

The safety concerns and potential actions that were identified in the previous sections are further summarized in the next table. These potential enhancements will be presented to the respective parties for further consideration.

Potential Safety Enhancements Summary Table

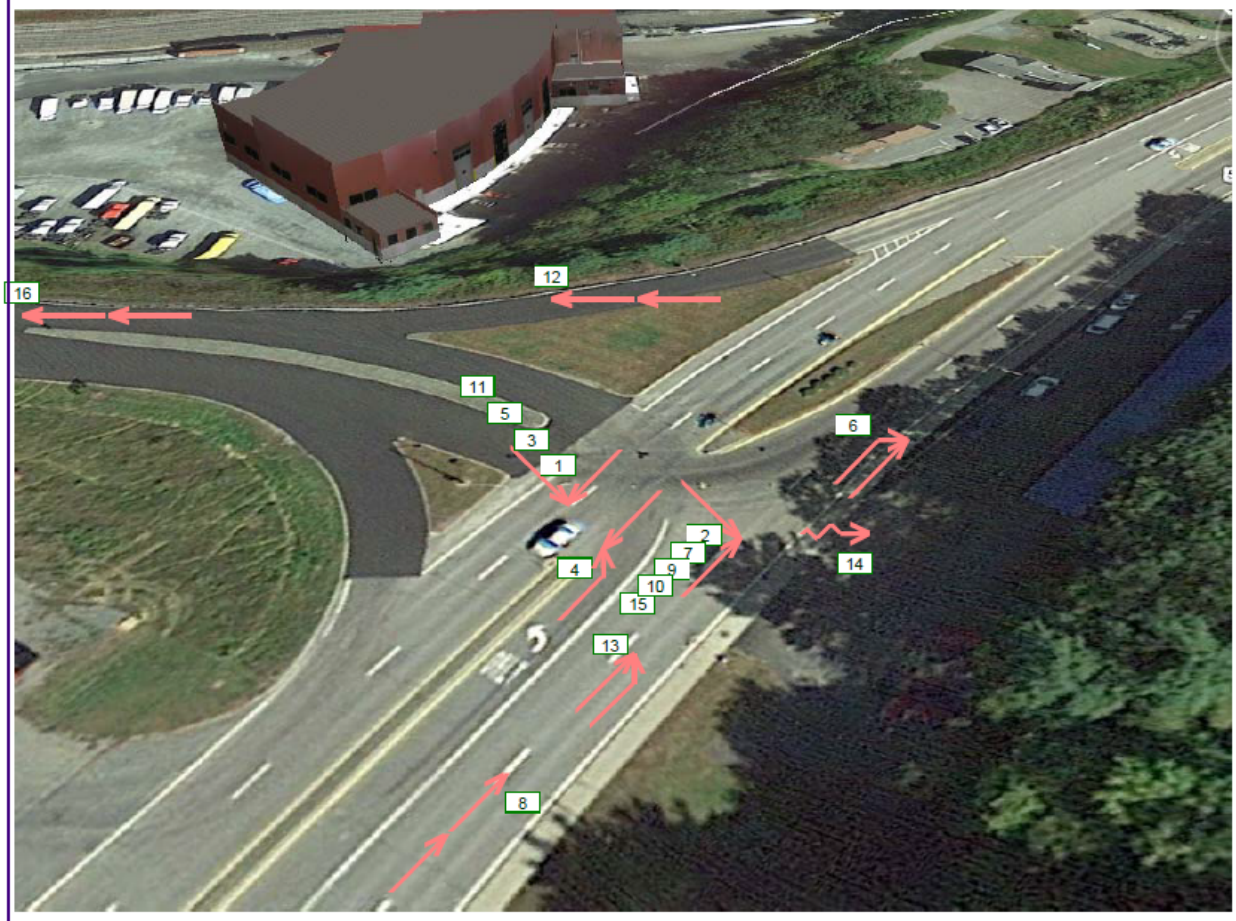
Safety Concern	Safety Enhancement	Responsibility	Safety Payoff	Time Frame	Cost
Occurrence of Right Angle Crashes (potentially due to Speeding & Geometry)	Install a temporary radar speed feedback sign on US 5 north of the jug handle (just past it)	Town of Hartford	Low (5% reduction)	Short	Low
	Make a request to the Traffic Committee for a reduction in speed limit from 40 mph to 35 mph	Town of Hartford	Mid (10% red PDO, 15% Inj[1])	Short	Low
	Add backplates to the overhead beacons	VTrans (TSMO work order)	~10% crash reduction[2]	Short-Mid	Low
	Relocate the pole on the grass island of US 4 about seven feet back	VTrans (TSMO work order?)	Mid-High (11% PDO, 48% Inj) reduction[3]	Mid	Mid (Max costs $560,000 to get B/C =1)
	Consider eliminating the left turn movement off US 4 and directing all left turning traffic to the jug handle south of the intersection on US 5.	VTrans (District)	Mid (20% reduction[4])	Mid	Low-Mid
	Review the geometry of US 5 and reduce the number of travel lanes	VTrans (AMP)	Mid-High (29% reduction[5])	Mid-Long	Mid-High
	Consider a Roundabout (although the B/C ratio is below 1)	VTrans (AMP)	Mid-High (39% reduction[6])	Long	High $1,474,900, B/C ratio=0.57

[1] CMF # 145 for Injury crashes, #146 for PDO crashes
[2] CMF # 1446, not rated. CMF was for the installation of backplates at traffic signals. May not be applicable to an overhead beacon.
[3] CMF # 307 for Injury crashes, # 308 for PDO crashes
[4] CMF # 351
[5] CMF #199 (this is for conversion from 4 to 2 of an undivided road, CMF may not apply)
[6] CMF #233

COLLISION DIAGRAM

Key Number =

MUNICIPALITY: *Hartford* COUNTY:	FILE: *hartforUS4US5B*
INTERSECTION: *US-5*	CASE # :
PERIOD: *5* YEARS *0* MONTHS FROM *1/1/2011* TO *12/31/2015*	BY: DATE: *12/29/2016*



SYMBOLS			MANNER OF COLLISION	
MOVING VEHICLE	P	PEDESTRIAN	REAR END	HEAD ON
TURNING VEHICLE	B	BICYCLIST	LEFT TURN	RIGHT TURN
BACKING VEHICLE	A	ANIMAL	LEFT TURN	RIGHT TURN
PARKED VEHICLE		FIXED OBJECT	OVERTAKE	RIGHT ANGLE
999 RECORD NUMBER		Fatal	OUT OF CONTROL	SIDE SWIPE

Crash Number	Road	Marker	Date	Time	Weather	Injuries	Fatalities	Type	Description
1	US 5	3.54	1/20/2011	17:23	Clear	0	0	No Turns- Thru moves only- Broadside ^<	Inj 5 Two vehicle crash with no injuries. The area where the collision took place is at the “t” intersection of the Woodstock Road and North Main Street. There were no disfigurements to the road surface that would have contributed to this crash. The weather at the time of the crash was cold, the ground was wet and approximately 20 degrees with good visibility in all directions. Op #1 advised that she was traveling east on the Woodstock Road and approached the intersection of North Main Street and advised that upon approaching the intersection she came to a full and complete stop at the red flashing light and observed Veh #2 traveling south towards her direction. Op #1 advised that she believed that she had enough time to proceed through the intersection, turn left and begin traveling north on North Main Street. Op #1 advised that she misjudged how fast Veh #2 was approaching and entered the intersection without enough time to avoid a collision with V#2. Op #1 advised that she entered the intersection at approximately 5 miles per hour when Veh #2 traveling south on North Main Street made contact with her vehicle. Passenger of Veh #1 provided the same account of the incident. Op #2 advised he was traveling south on North Main Street and approached the intersection of the Woodstock Road. He advised that he observed Veh #1 approach the intersection and come to a full and complete stop at the red flashing light. Op #1 advised that as he entered the intersection Veh #1 pulled into the intersection and attempted to turn left to proceed north on North Main Street. Op #2 advised that he fully applied his brakes but he was unable to come to a complete stop before making contact with Veh #1. Op #2 advised that he made contact with Veh #1 at approximately 10 miles per hour.

Crash Number	Road	Marker	Date	Time	Weather	Injuries	Fatalities	Type	Description
2	US 5	3.54	3/17/2011	11:56	Clear	0	0	Left Turn and Thru- Same Direction Sideswipe/Angle Crash vv--	Inj 5 Two vehicle crash with no injuries. The area of the crash was in the northbound travel lane of US#5. Woodstock Road (US-4) is controlled by a stop sign as well as a flashing red light. There was no disfigurement to the road surface that would have contributed to the crash. The weather at the time of the crash was daylight, sunny and wet at approximately 43 degrees with good visibility. Op #1 advised she had just pulled out from Woodstock Road and was turning northbound on North Main Street (US-5) and did not see that Veh #2 was traveling northbound in the right lane. Op #1 stated that she pulled into the right lane and heard a loud noise, but did not feel the impact of Veh #2. Op #1 stated that she was traveling approximately 20 to 25 miles per hour when the crash occurred. Op #2 advised that he was traveling north on North Main Street in the right lane and saw Veh #1 pull out onto North Main Street. Op #2 stated that he tried to brake to avoid the collision, but Veh #1 sideswiped his van on the driver's side fender, tire and door. Investigation showed that Veh #2 was traveling northbound on North Main Street in the right lane. Veh #1 pulled out and crossed over the left lane and into the right lane, sideswiping Veh #2. When Veh #1 pulled into lane number 2, Veh #2 struck the passenger side doors and rear quarter panel with the driver side front fender, tire and door in a side swiping motion. This caused damage to the passenger side doors and quarter panel of Veh #1. Veh #2 had damage to the driver's side fender and door.

Crash Number	Road	Marker	Date	Time	Weather	Injuries	Fatalities	Type	Description
3	US 5	3.54	7/7/2011	12:15	Clear	1	0	Left Turn and Thru- Head On ^v--	Inj 4 Two vehicle crash with injury. There was no disfigurement to the road surface that would have contributed to the crash. The weather was clear and sunny, and the road surface was dry and clean. It was approximately 80 degrees with excellent visibility. Officer determined it appeared that Op #1 had failed to yield the right of way and had pulled out in front of Op #2. Op #2 advised that she was heading south on North Main Street when Op #1 pulled out in front of her from the Woodstock Road. She stated, “She just took off. I just couldn't miss her." Op #1 advised that she "saw her car coming, I thought she was going to turn. That is why I pulled out. I thought she had her turn signal on. I took my eye off the car for a second. I really do not know what happened. "Investigation revealed that Veh #1 was traveling east on the Woodstock Road and came to a stop at the “t” intersection where it meets North Main Street. After stopping, Op #1 then pulled out into the southbound lane of North Main Street in front of Veh #2. Vehicle #2 was traveling south on North Main Street when Veh #1 pulled out in front of her. Op #1 failed to yield to the oncoming Veh #2 and caused the crash to occur. Veh #1 had damage at the driver side fender, grill and hood from where it impacted Veh #2.

Crash Number	Road	Marker	Date	Time	Weather	Injuries	Fatalities	Type	Description
4	US 5	3.54	8/23/2012	18:42	Clear	1	0	No Turns- Thru moves only- Broadside ^<	Inj 4 At the time of the collision the highway was dry and free from any obstructions. The weather was partly cloudy and warm. Both operators were present, one claiming of a possible injury. Op #1 stated that while making the turn, he did not see the other driver approaching until it was too late. Op #2 stated that he was traveling south on Route 5 when the other driver turned in front of him. A witness to the crash stated that she observed a vehicle stopped at the intersection of North Main street waiting for a vehicle to pass when another vehicle went around the vehicle and turned in front of an oncoming vehicle. The investigation determined that Op #1 had been traveling north on North Main Street while Op #2 had been traveling south on North Main Street. A collision occurred when Op #1 had failed to yield to Veh #2 who had been traveling in the opposite direction. A witness observed Op #1 making the turn into oncoming traffic. As a result of the collision, Op #1 complained of a possible injury. Both vehicles received extensive front end damage and where towed from the scene due to disabling damages.

Crash Number	Road	Marker	Date	Time	Weather	Injuries	Fatalities	Type	Description
5	US 5	3.54	8/24/2012	15:17	Clear	1	0	No Turns- Thru moves only- Broadside ^<	Inj 4 There was no disfigurement to the road surface that would have contributed to this crash. The weather conditions at the time of the crash were sunny and clear, the road surface was dry. It was approximately 74 degrees with good visibility. Op #1 appeared to be uninjured and was standing by his vehicle. Veh #2 appeared to have heavy damage to the front end and some minor damage to the passenger side. Op #2 was conscious and appeared alert was transported to DHMC for injuries. Both vehicles were towed due to damage. A witness stated that while he was waiting to turn right and head south on North Main Street (US#5), he saw Veh #2 approaching and was waiting for them to pass. He also saw Veh #1 stopped at the intersection. Witness stated that Veh #1 then pulled out into the intersection and was struck by Veh #2. Op #1 stated that he was traveling eastbound on Woodstock Rd (US#4) and came to a stop at the intersection. Op #1 stated that he did not see Veh #2 prior to pulling out into the intersection. Op #1 stated that by the time he noticed Veh #2, it was too late to try to avoid the collision. Op #2 stated that she was traveling southbound on North Main Street (US#5) and Veh #1 pulled into the intersection. Op #2 stated that once Veh #1 had entered the intersection there was no time to react and she struck Veh #1. Veh #2 stated that she was traveling approximately 40 MPH at the time of impact. While investigating the crash Op #1 stated that the collision was his fault, as he did not see Veh #2 prior to pulling out into the intersection. Investigation reveals that Op #1 was traveling eastbound on the Woodstock Road (US#4) and had attempted a left turn on to North Main Street (US#5) without yielding right of way.

Crash Number	Road	Marker	Date	Time	Weather	Injuries	Fatalities	Type	Description
6	US 5	3.54	6/19/2013	15:51	Clear	2	0	Same Direction Sideswipe	Inj 3 Two vehicle crash with injuries. Officer observed heavy contact and induced damage to the driver's side door and front quarter panel of Veh #2 and heavy contact and induced damage to the front passenger side door and front quarter panel of Veh #1. Op #1 advised that she was traveling East on US#4, came to a stop at the US#5 intersection and after looking both ways and not seeing any vehicles, she advised that she pulled through the intersection and turned left onto US#5 North. Op #1 advised that she looked in her mirrors as she turned left and did not see anyone in the right most lane of US#5 and at approximately 10 miles per hour began to traverse into the right most lane of US#5 North. Vehicle #1 advised that Veh #2 must have been in her blind spot, and explained that as she traversed into the right lane of US#5 with her blinker activated she sideswiped Veh #2. All occupants (3) of Veh #1 advised that they were not injured. Op #2 advised that he was traveling in the right most lane of US#5 traveling in a northern direction at approximately 35 to 40 miles per hour. Op #2 advised that he observed Veh #1 turn left onto US Route 5 from the US Route 4 intersection. Op #2 advised that Op #1 must not have seen him and began to traverse into his lane and side swiped him, striking his driver's side door with the passenger side of her vehicle pushing him off the roadway and onto the sidewalk. Veh #1 advised that he felt pain in the back and neck area. Witness also advised that Veh #2 was driving extremely fast at approximately 60 miles per hour. Second witness advised that she was standing in the Listen Center parking lot when she observed Veh #1 turn left at the intersection of US#4 and merge North onto US#5. Second witness advised that Veh #2 was traveling at a fast rate of speed traveling in the right lane of US#5 North. Second witness advised that Veh #1 attempted to

Crash Number	Road	Marker	Date	Time	Weather	Injuries	Fatalities	Type	Description
									merge into the right lane of US#5 and did not see Veh #2 to her right and side swiped the vehicle. Investigation, Veh #1 turned left from US#4 intersection onto the left most northern lane of US#5 traveling at approximately 10 miles per hour. Vehicle #1 than attempted to merge into the right northern lane of US#5 and did not see Veh #2 traveling in the right Northern lane of US#5. Vehicle #1 side swiped Veh #2 striking Veh #2.The impact of this sideswipe caused Veh #2 to be partially pushed off the roadway and on to the eastern shoulder/side walk where Veh #2 came to an uncontrolled rest.

Crash Number	Road	Marker	Date	Time	Weather	Injuries	Fatalities	Type	Description
7	US 5	3.54	6/24/2013	16:08	Rain	0	0	Left Turn and Thru- Broadside v<--	Inj 5 Two vehicle crash with injuries. Officer observed heavy contact and induced damage to the driver's side door and front quarter panel of Veh #2 and heavy contact and induced damage to the front passenger side door and front quarter panel of Veh #1. O
8	US 5	3.54	10/9/2013	19:59	Clear	1	0	Rear End	Inj 3 Two vehicle crash. There was no disfigurement to the road surface that would have contributed to this crash. The weather conditions at the time of the crash were nighttime and clear, the road surface was dry. It was approximately 50 degrees with reasonable visibility. Officer observed Veh #2 facing West bound, half in the road half on the raise median. The vehicle sustained minor damage to the back bumper, right above the tow hitch. Op #2 had an injured lower back, from a previous incident, but it got aggravated during the crash. Op #2 indicated that he was traveling North on North Main Street and was about to turn left onto Woodstock Road when he observed a vehicle approaching from behind him. Op #2 informed officer that it did not appear to be slowing down and slammed into the back of Veh #2. A witness indicated that he was traveling North on North Main Street and observed Vehicle #2 in the left turn lane, attempting to turn onto Woodstock Road when Vehicle #1 smashed into the back of Veh #2. Witness informed me that Veh #1 then drove off, traveling North on North Main Street in the South bound lane. Op #1 provided a breath sample through the PBT which yielded a result of .000% BAC. Later investigation revealed that Op #1 was having a diabetic reaction. Hartford EMS evaluated Op #1 and indicated that her blood sugar was extremely low, causing her to operate the vehicle in this manner.

Crash Number	Road	Marker	Date	Time	Weather	Injuries	Fatalities	Type	Description
9	US 5	3.54	9/17/2014	11:03	Clear	0	0	Left Turn and Thru- Angle Broadside -->v--	Inj 5 Two car motor vehicle crash. No parties involved were in need of medical attention. The visibility was good and the weather conditions were fair. Op #1 advised that she was attempting to make a left turn from Woodstock Road onto North Main Street when she did not see Veh 2 causing the crash. Vehicle 1 sustained minor damage to the front passenger side fender. Op #2 advised that Veh #1 had cut in front of her crashing into the side of her vehicle. Op #2 further indicated that she had attempted to swerve out of the way of Veh #1 in an attempt to prevent the crash, causing her to hit the curb on the far right side of the roadway, destroying her front passenger side tire. Veh #2 also sustained minor damage to the front driver side fender. Veh #1 was driven from the scene as it did not sustain debilitating damage.

Crash Number	Road	Marker	Date	Time	Weather	Injuries	Fatalities	Type	Description
10	US 5	3.54	7/13/2015	11:22	Clear	0	0	Left Turn and Thru- Same Direction Sideswipe/Angle Crash vv--	Inj 5 Two car motor vehicle crash. Weather was sunny and dry with no wind. The temperature was approximately 84 degrees. The visibility was good. The highway comprised a blacktop layer, which was dry and in good repair. No disfigurement that would have contributed to the collision. There were no obstacles in the road. Op #1 stated that she had turned left from Woodstock Rd onto N Main St and collided with Veh #2. Op #1 stated that she thought Veh 2 had been speeding, since she looked and saw nothing, then pulled out, and collided while making her turn. Op #1 stated that she saw Veh 1 was in lane one on N Main St, headed north and swerved into lane 2. Op #2 stated that she been driving at approximately 40mph, north on N Main St and collided with Vehicle #1. She stated that Veh #1 had turned left out of Woodstock Rd and collided while making a left turn into lane 1 of N Main St. Op #2 stated that she attempted to avoid a collision with Vehicle 1 by swerving to her right, into lane 2. Op #2 was alone in Vehicle 2 and refused medical attention. The Honda had fresh minor damage to the left front and rear doors. The outer door panels exhibited intrusion and the door trim strips were scuffed. There was no intrusion into the left fender or quarter panel. The vehicle did not require towing. The investigation reveals that the vehicles had been moved from the collision scene. There were no visible marks left on the road. The damage on the vehicles is consistent with both parties' accounts. Officer concluded Op #1 is at fault for the collision, in that she failed to yield to oncoming traffic and safely turn left. Veh #2 had the right of way. There is no evidence to support the claim that Vehicle 1 was traveling at an excessive speed.

Crash Number	Road	Marker	Date	Time	Weather	Injuries	Fatalities	Type	Description
11	US 5	3.55	2/2/2011	16:12	Snow	0	0	No Turns- Thru moves only- Broadside ^<	Inj 5 Two vehicle crash. The current weather was snowing and the roads were completely covered with snow. Ops #1 and #2 reported no injuries. Op #1 stated that he was traveling east from US#4 turning left onto North Main Street (US#5) and did not see Veh #2 before striking her with the front of his vehicle. Op #2 stated that she was traveling southbound on North Main Street at less than the posted speed limit of 40 when Veh #1 approached from the intersection of US#4 and struck the passenger side of her vehicle, forcing her car into the snow bank. Witness reported that he was traveling nb on North Main Street (US#5) when he witnessed Veh #1 drive east from the stop sign of US#4 (Woodstock Road) when his vehicle crashed into the passenger side of Veh #2 who was traveling south on North Main Street. The investigation showed that Veh #2 was traveling sb on North Main Street at a safe speed when Veh #1failed to yield the right of way to Veh #2 as he attempted to drive across the southbound lanes and turn left North onto North Main Street. There was minimal damage to Veh #2 passenger rear door and quarter panel. There was minimal damage to Veh #1 front license plate. Visibility was poor from current snowfall, overcast skies and high snow mounds.

Crash Number	Road	Marker	Date	Time	Weather	Injuries	Fatalities	Type	Description
12	US 5	3.58	5/3/2014	17:25	Clear	0	0	Rear End	Inj 5 Two vehicle crash. No injuries were reported. The weather condition at the time of the crash was overcast and the road surface in this area was dry. It was approximately 55 degrees and good visibility. Op #1 stated that he was traveling south on North Main St (US#5) and followed Vehicle #2 onto the Woodstock Rd on ramp. He stated that he looked to see if the other traffic was going to yield to them, but when he looked back up, he struck Vehicle #2 . Vehicle #2 stated she was traveling south on North Main St (US#5) and entered the Woodstock Rd (US#4) on ramp to head west. Stated that she slowed to a stop to allow the other vehicles in front of her when Vehicle #1 struck her in the rear.
13	US 5	3.59	2/11/2011	11:13	Clear	0	0	Same Direction Sideswipe	Inj 5 Two vehicle crash. The highway was dry and free from any obstructions. The weather was sunny and cold. Both operators were present, claiming no injury as a result of the crash. Op #1 stated that she was traveling north in the right lane. She put on her directional light to change lanes and as she did so she was struck by Veh #2. Op #1 thought that the driver may have been speeding because she did not see Veh #2. Op #2 stated that she was traveling north in the left lane when the other driver changed lanes and struck her. Investigation determined that both drivers were traveling in a northerly direction on North Main Street. As they approached the intersection of the Woodstock Road, a crash occurred between both vehicles when Op #1 attempted to change from the right lane into the left lane which was occupied by Veh #2. As a result of the crash, both vehicles received light damage. The damage to both vehicles was consistent with both operator statements. Op #1 is at fault for this crash for an unsafe lane change.

Crash Number	Road	Marker	Date	Time	Weather	Injuries	Fatalities	Type	Description
14	US 5	3.59	12/31/2011	5:25	Sleet- Hail (Freezing Rain or Drizzle)	0	0	Single Vehicle Crash	Inj 5 Single vehicle crash. The sky was dark with a light rain. There was visible damage to the front passenger wheel, which was laying sideways on the curve. Op #1 stated that he was traveling east on Woodstock Rd (US Rt4), and stopped at the stop sign. He then turned left onto N.Main Street (US Rt5) and proceeded to travel north bound. The road was ice covered causing the vehicle to continue to slide through the intersection and collide into the east side concrete curb. The investigation showed that Op #1 was attempting to turn north bound from Woodstock Rd onto N.Main Street, when his vehicle slid on ice and collided into the east side curb. Veh #1 sustained moderate damage to the passenger front wheel. The sky was dark, with light rain, and freezing temperature. It was determined that inclement weather was the cause of the crash.

Crash Number	Road	Marker	Date	Time	Weather	Injuries	Fatalities	Type	Description
15	US 5	3.62	11/26/2014	16:30	Snow	0	0	Rear End	Inj 5 Two vehicle crash. The road was covered with approximately 2.5-3.5 inches of snow. The weather conditions at the time of the crash were snowing, with limited visibility. The road surface was slippery, with a layer of snow. It was approximately 31 degrees with limited visibility. Veh #1 (transit bus). All parties refused medical treatment and denied injury. Op #1 stated that he was traveling northbound on North Main Street (US#5) and Vehicle #2 pulled out from the Woodstock Road (US#4) intersection into his lane. Op #1 stated Vehicle #1 was in his lane of travel, and he could not slowdown in time to avoid a collision. Op #1 stated he was traveling approximately 25 mph at the time of the crash. Op #2 stated he was at the intersection of Woodstock Road (US#4) and was entering the eastbound lane on North Main Street (US#5). Op #2 stated he entered the eastbound lane, and was attempting to pull off the road into the parking area to wait for a friend. Op #2 was struck by Vehicle #1 from the rear. There were visible slide marks in the snow showing the direction of travel of Vehicle #2 after it was struck, and how it came to rest. Passenger 1 stated he observed Vehicle #2 pull onto the eastbound lane of North Main Street (US#5) and in front of Vehicle #1. Passenger 2 stated she observed Vehicle #2 turn onto N Main St (US#5) from Woodstock Road (US#4) into the left hand travel lane headed northbound. Passenger 2 stated Vehicle #2 then changed lanes, and entered the right hand travel lane in front of the bus. Investigation reveals that Op #1 was traveling eastbound on North Main Street (US#5) and could not slowdown in time to avoid a collision with Vehicle #2. Op #1 was operating a large, heavy motor vehicle, in slippery conditions with limited visibility due to the heavy snow. Op #1 was traveling northbound on N Main Street (US#5) and changed

Crash Number	Road	Marker	Date	Time	Weather	Injuries	Fatalities	Type	Description
									lanes in front of Vehicle #2. Op #2 changed lanes with limited visibility under slippery road conditions without making sure the movement could be made safely. Op #1 is at fault for the crash due to his driving of a vehicle on a highway at a speed greater that is reasonable and prudent under the conditions. Op #2 is at fault for the crash due to moving from a lane without ascertaining that the movement can be made with safety.

Crash Number	Road	Marker	Date	Time	Weather	Injuries	Fatalities	Type	Description
16	US 4	9.29	3/28/2011	9:53	Clear	0	0	Rear End	Inj 5 Two vehicle crash. There were no reported injuries or road blockage. The weather conditions at the time of the crash were clear and sunny, cold, approximately 25 degrees, with good visibility and moderate traffic. Officer observed heavy contact and induced damage to the front driver's side bumper and fender of Veh #1 and heavy contact and induced damage to the rear passenger side bumper and fender of Veh #2. Op #1 advised that he was traveling south on North Main Street and turned onto the Woodstock Road. Op #1 advised that he was traveling at approximately 15 miles per hour as he pulled on to the Woodstock Road and the sun was in his eyes. Op 31 advised that he did not see Veh #2 come to a stop and his front bumper struck Veh #2 in the rear end. Op #2 advised that he was traveling west on the Woodstock Road and that he activated his left blinker to turn left into the Haun Welding Supply parking lot. Op #2 advised that he had to come to a complete stop and wait as there was oncoming traffic traveling east on the Woodstock Road. Op #2 advised that while he was at a complete stop with his foot on the brake he was struck from behind by Veh #1. Officer concluded Op #2 was traveling west on the Woodstock Road and came to a stop intending to make a left turn into the parking lot of Haun Welding Supply. Op #1 had just traversed from North Main Street onto the Woodstock Road at approximately 15 miles per hour. When Op #2 came to a stop to make a left turn, Op #1 struck the rear passenger side of V#2 with his front driver side bumper.

Appendix-B: Peak Hour Traffic Data

Peak Hour Data for Intersection

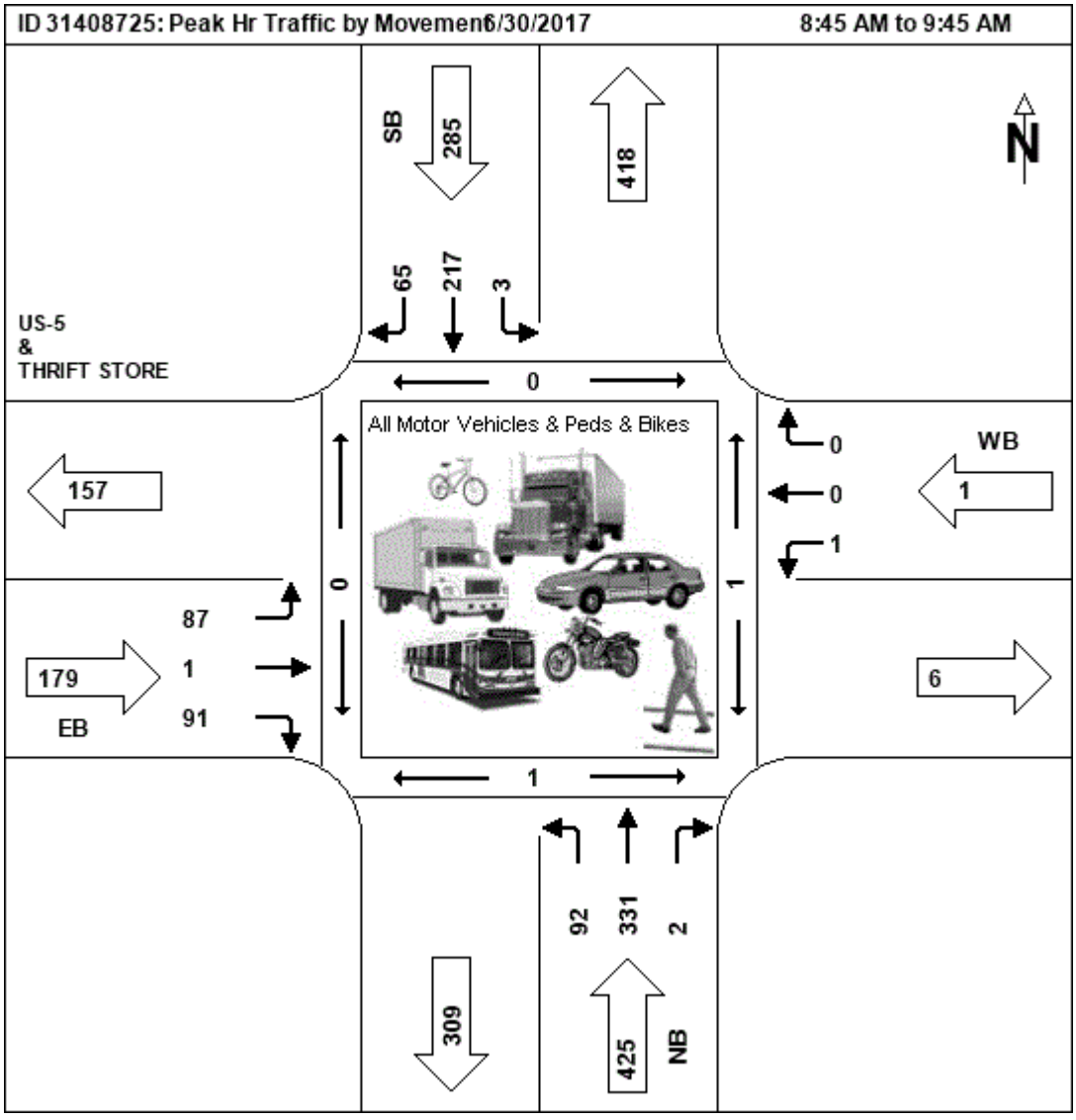
Int ID:	31408725		
Community:	HARTFORD	**Corridor:**	NA
Road 1:	US-5	**Road 3:**	US-5
Road 2:	THRIFT STORE	**Road 4:**	US-4

|<< < > >>| 1-8 of 8

AM Peak Hour
06/30/2017

Start Time	NB Left	NB Thru	NB Right	NB Ped	NB App Total	EB Left	EB Thru	EB Right	EB Ped	EB App Total	SB Left	SB Thru	SB Right	SB Ped	SB App Total	WB Left	WB Thru	WB Right	WB Ped	WB App Total	Int Total
8:45 AM	21	95	0	0	116	30	0	34	0	64	1	55	15	0	71	0	0	0	0	0	251
9:00 AM	27	71	1	1	99	19	0	17	1	36	1	50	16	0	67	1	0	0	0	1	203
9:15 AM	22	82	1	0	105	19	1	23	0	43	0	55	17	0	72	0	0	0	0	0	220
9:30 AM	22	83	0	0	105	19	0	17	0	36	1	57	17	0	75	0	0	0	0	0	216
Total	92	331	2	1	425	87	1	91	1	179	3	217	65	0	285	1	0	0	0	1	890
PHF	0.85	0.87	0.50		0.92	0.73	0.25	0.67		0.70	0.75	0.95	0.96		0.95	0.25				0.25	
HV %	15	10	0			5	0	3			0	7	12			0					

☑ Cars ☑ Trucks ☑ Pedestrians ☑ Bikes

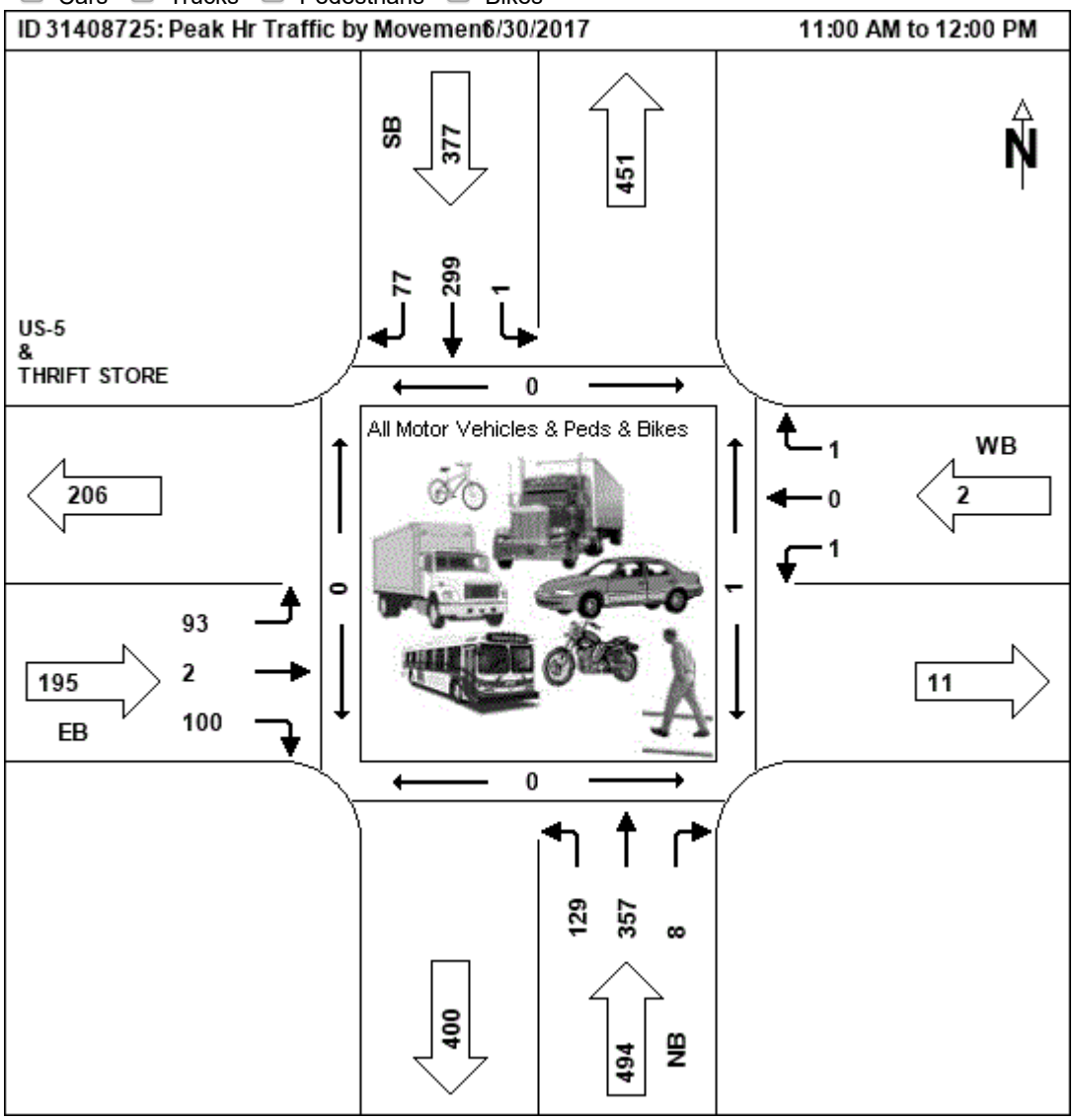


Midday Peak Hour
06/30/2017

Start Time	NB Left	NB Thru	NB Right	NB Ped	NB App Total	EB Left	EB Thru	EB Right	EB Ped	EB App Total	SB Left	SB Thru	SB Right	SB Ped	SB App Total	WB Left	WB Thru	WB Right	WB Ped	WB App Total	Int Total
11:00 AM	26	84	3	0	113	33	0	20	0	53	0	63	17	0	80	0	0	1	0	1	247

11:15 AM	28	96	2	1	126	25	0	15	0	40	0	66	14	0	80	0	0	0	0	0	246
11:30 AM	37	88	2	0	127	19	1	28	0	48	1	76	23	0	100	0	0	0	0	0	275
11:45 AM	38	89	1	0	128	16	1	37	0	54	0	94	23	0	117	1	0	0	0	1	300
Total	129	357	8	1	494	93	2	100	0	195	1	299	77	0	377	1	0	1	0	2	1068
PHF	0.85	0.93	0.67		0.96	0.70	0.50	0.68		0.90	0.25	0.80	0.84		0.81	0.25		0.25		0.50	
HV %	13	6	0			3	0	8			100	4	9			0		0			

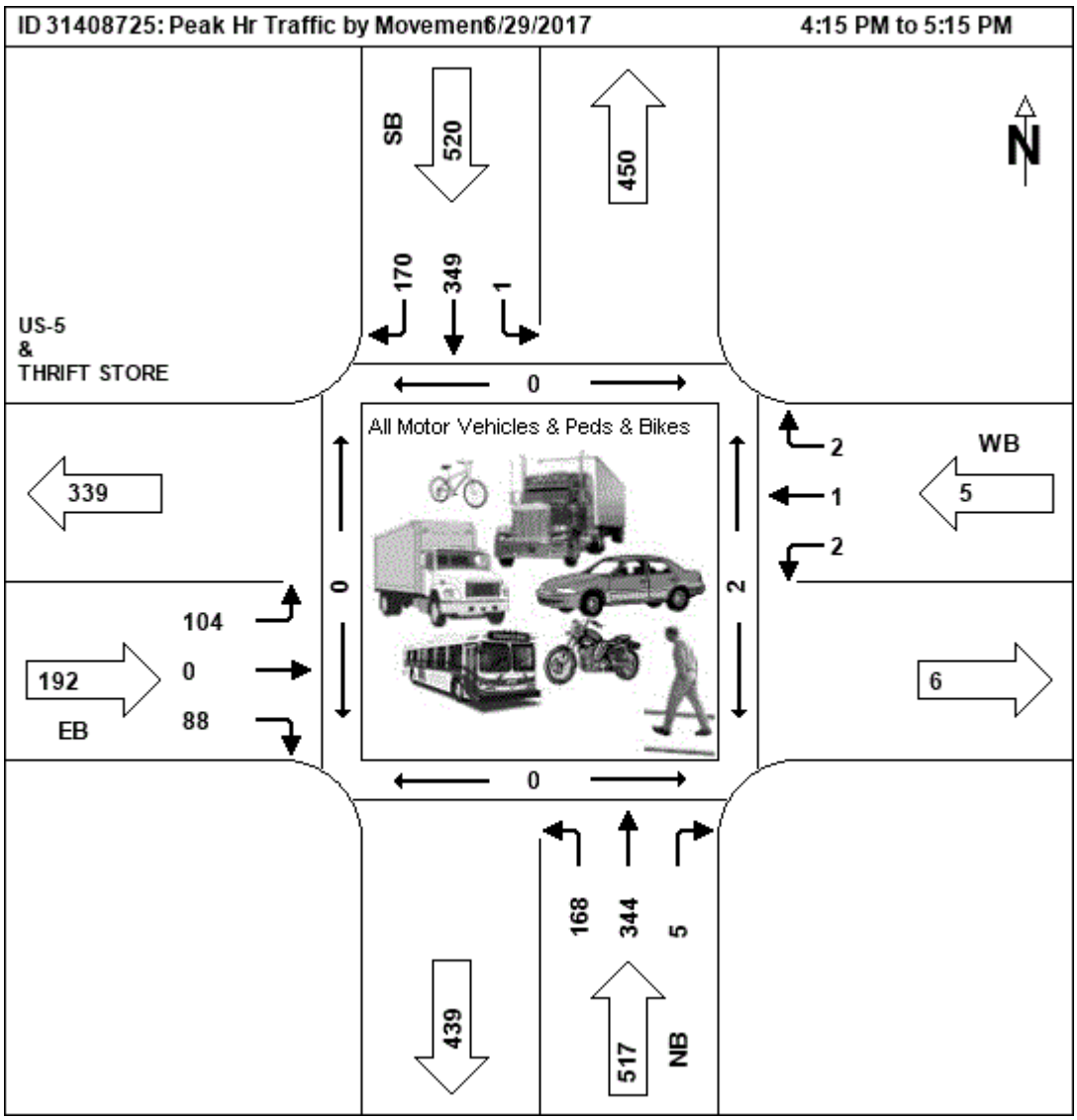
☑ Cars ☑ Trucks ☑ Pedestrians ☑ Bikes



PM Peak Hour
06/29/2017

	NB					EB					SB					WB					
Start Time	Left	Thru	Right	Ped	App Total	Left	Thru	Right	Ped	App Total	Left	Thru	Right	Ped	App Total	Left	Thru	Right	Ped	App Total	Int Total
4:15 PM	43	77	2	1	122	33	0	20	0	53	0	90	39	0	129	2	0	0	0	2	306
4:30 PM	39	87	0	1	126	24	0	23	0	47	1	78	46	0	125	0	0	0	0	0	298
4:45 PM	41	91	0	0	132	24	0	23	0	47	0	75	50	0	125	0	1	1	0	2	306
5:00 PM	45	89	3	0	137	23	0	22	0	45	0	106	35	0	141	0	0	1	0	1	324
Total	168	344	5	2	517	104	0	88	0	192	1	349	170	0	520	2	1	2	0	5	1234
PHF	0.93	0.95	0.42		0.94	0.79		0.96		0.91	0.25	0.82	0.85		0.92	0.25	0.25	0.50		0.63	
HV %	7	1	20			4		2			0	1	4			0	0	0			

☑ Cars ☑ Trucks ☑ Pedestrians ☑ Bikes


ID 31408725: Peak Hr Traffic by Movemen6/29/2017
4:15 PM to 5:15 PM
SB
520
450
N
170
349
1
US-5
&
THRIFT STORE
0
All Motor Vehicles & Peds & Bikes
2
1
2
WB
5
339
0
2
104
192
0
88
EB
6
0
168
344
5
439
517
NB

Appendix-C: Quantity Summaries

Project Delivery
Highway Safety & Design
Traffic Design

Quantity Summary

HARTFORD

NH 020-2(44)

Alternative #2

Road Diet

	Initials	Date
Calc'd By:	KAR	7/27/2020
Checked By:		
Revised By:	NMB	5/6/2021
Checked By:		

Item No.	Item Description	Qty	Unit Price	Unit	Cost
210.10	Coarse Milling, Bituminous Pavement	15900	$ 2.50	SY	$ 39,750.00
406.35	Superpave Bituminous Concrete Pavement	3500	$ 100.00	TON	$ 350,000.00
635.11	Mobilization/Demobilization	1	$ 50,000.00	LS	$ 50,000.00
641.11	Traffic Control, All-Inclusive	1	$ 100,000.00	LS	$ 100,000.00
646.406	Durable 4 Inch White Line, Recessed Polyurea	9000	$ 2.00	LF	$ 18,000.00
646.416	Durable 4 Inch Yellow Line, Recessed Polyurea	4650	$ 2.00	LF	$ 9,300.00
646.446	Durable 8 Inch White Line, Recessed Polyurea	1650	$ 4.00	LF	$ 6,600.00
646.456	Durable 8 Inch Yellow Line, Recessed Polyurea	215	$ 5.00	LF	$ 1,075.00
646.484	Durable 24 Inch Stop Bar, Polyurea	12	$ 7.00	LF	$ 84.00
646.492	Durable Letter or Symbol, Polyurea	60	$ 84.00	EA	$ 5,040.00
900.675	Special Provision (Green Pavement Markings)	30	$ 5.00	SY	$ 150.00
				Subtotal =	$ 580,000.00
				Contigency (25%) =	$ 145,000.00
				Total =	**$ 725,000.00**

Project Delivery
Highway Safety & Design
Traffic Design

Quantity Summary

HARTFORD

NH 020-2(44)

Alternative #3

Road Diet with Ramp Removal

	Initials	Date
Calc'd By:	KAR	7/27/2020
Checked By:		
Revised By:	NMB	5/6/2021
Checked By:		

Item No.	Item Description	Qty	Unit Price	Unit	Cost
203.15	Common Excavation	100	$ 16.00	CY	$ 1,600.00
203.28	Excavation of Surfaces and Pavements	100	$ 25.00	CY	$ 2,500.00
210.10	Coarse Milling, Bituminous Pavement	15300	$ 2.50	SY	$ 38,250.00
301.35	Subbase of Dense Graded Crushed Stone	200	$ 37.00	CY	$ 7,400.00
406.35	Superpave Bituminous Concrete Pavement	4000	$ 100.00	TON	$ 400,000.00
616.21	Vertical Granite Curb	1600	$ 51.00	LF	$ 81,600.00
635.11	Mobilization/Demobilization	1	$ 50,000.00	LS	$ 50,000.00
641.11	Traffic Control, All-Inclusive	1	$ 125,000.00	LS	$ 125,000.00
646.406	Durable 4 Inch White Line, Recessed Polyurea	8500	$ 2.00	LF	$ 17,000.00
646.416	Durable 4 Inch Yellow Line, Recessed Polyurea	4250	$ 2.00	LF	$ 8,500.00
646.446	Durable 8 Inch White Line, Recessed Polyurea	1500	$ 4.00	LF	$ 6,000.00
646.456	Durable 8 Inch Yellow Line, Recessed Polyurea	200	$ 5.00	LF	$ 1,000.00
646.484	Durable 24 Inch Stop Bar, Polyurea	12	$ 7.00	LF	$ 84.00
646.492	Durable Letter or Symbol, Polyurea	74	$ 84.00	EA	$ 6,216.00
651	General Landscaping	1	$ 5,400.00	LS	$ 5,400.00
675.20	Traffic Signs, Type A	50	$13.00	SF	$ 650.00
900.675	Special Provision (Green Pavement Markings)	160	$ 5.00	SY	$ 800.00
				Subtotal =	$ 752,000.00
				Contigency (25%) =	$ 188,000.00
				Total =	**$ 940,000.00**

Project Delivery
Highway Safety & Design
Traffic Design

Quantity Summary

HARTFORD

NH 020-2(44)

Alternative #4

Signal

	Initials	Date
Calc'd By:	KAR	7/27/2020
Checked By:		
Revised By:	NMB	5/6/2021
Checked By:		

Item No.	Item Description	Qty	Unit Price	Unit	Cost
203.15	Common Excavation	120	$ 16.00	CY	$ 1,920.00
203.28	Excavation of Surfaces and Pavements	100	$ 25.00	CY	$ 2,500.00
210.10	Coarse Milling, Bituminous Pavement	15300	$ 2.50	SY	$ 38,250.00
301.35	Subbase of Dense Graded Crushed Stone	200	$ 37.00	CY	$ 7,400.00
406.35	Superpave Bituminous Concrete Pavement	4000	$ 100.00	TON	$ 400,000.00
616.21	Vertical Granite Curb	1600	$ 51.00	LF	$ 81,600.00
635.11	Mobilization/Demobilization	1	$ 50,000.00	LS	$ 50,000.00
641.11	Traffic Control, All-Inclusive	1	$ 125,000.00	LS	$ 125,000.00
646.406	Durable 4 Inch White Line, Recessed Polyurea	8400	$ 2.00	LF	$ 16,800.00
646.416	Durable 4 Inch Yellow Line, Recessed Polyurea	4200	$ 2.00	LF	$ 8,400.00
646.446	Durable 8 Inch White Line, Recessed Polyurea	1500	$ 4.00	LF	$ 6,000.00
646.456	Durable 8 Inch Yellow Line, Recessed Polyurea	200	$ 5.00	LF	$ 1,000.00
646.484	Durable 24 Inch Stop Bar, Polyurea	70	$ 7.00	LF	$ 490.00
646.492	Durable Letter or Symbol, Polyurea	70	$ 84.00	EA	$ 5,880.00
651	General Landscaping	1	$ 5,400.00	LS	$ 5,400.00
675.20	Traffic Signs, Type A	50	$13.00	SF	$ 650.00
678.15	Traffic Control Signal System, Intersection	1	$ 280,000.00	EA	$ 280,000.00
900.675	Special Provision (Green Pavement Markings)	142	$ 5.00	SY	$ 710.00
				Subtotal =	$ 1,032,000.00
				Contigency (25%) =	$ 258,000.00
				Total =	**$ 1,290,000.00**

Project Delivery
Highway Safety & Design
Traffic Design

Quantity Summary

HARTFORD

NH 020-2(44)

Alternative #5
Roundabout

	Initials	Date
Calc'd By:	KAR	7/27/2020
Checked By:		
Revised By:	NMB	5/6/2021
Checked By:		

Item No.	Item Description	Qty	Unit Price	Unit	Cost
203.15	Common Excavation	3000	$ 16.00	CY	$ 48,000.00
203.28	Excavation of Surfaces and Pavements	350	$ 25.00	CY	$ 8,750.00
210.10	Coarse Milling, Bituminous Pavement	14800	$ 2.50	SY	$ 37,000.00
301.26	Subbase of Crushed Gravel, Fine Graded	500	$ 37.00	CY	$ 18,500.00
301.35	Subbase of Dense Graded Crushed Stone	1000	$ 37.00	CY	$ 37,000.00
406.35	Superpave Bituminous Concrete Pavement	5150	$ 100.00	TON	$ 515,000.00
605	Underdrain	650	$30.00	LF	$ 19,500.00
616.21	Vertical Granite Curb	1150	$ 51.00	LF	$ 58,650.00
635.11	Mobilization/Demobilization	1	$ 100,000.00	LS	$ 100,000.00
641.11	Traffic Control, All-Inclusive	1	$ 300,000.00	LS	$ 300,000.00
646.406	Durable 4 Inch White Line, Recessed Polyurea	5100	$ 2.00	LF	$ 10,200.00
646.416	Durable 4 Inch Yellow Line, Recessed Polyurea	4455	$ 2.00	LF	$ 8,910.00
646.456	Durable 8 Inch Yellow Line, Recessed Polyurea	160	$ 5.00	LF	$ 800.00
646.492	Durable Letter or Symbol, Polyurea	60	$ 84.00	EA	$ 5,040.00
646.502	Durable Crosswalk Markings, Polyurea	130	$ 19.00	LF	$ 2,470.00
675.20	Traffic Signs, Type A	60	$13.00	SF	$ 780.00
651	General Landscaping	1	$ 30,000.00	LS	$ 30,000.00
900.675	Special Provision (Stamped Colored Concrete Apron, 8 Inch)	400	$ 140.00	SY	$ 56,000.00
900.675	Special Provision (Concrete Island Treatment, 4 Inch)	180	$ 130.00	SY	$ 23,400.00
				Subtotal =	$ 1,280,000.00
				Contigency (25%) =	$ 320,000.00
				Total =	**$ 1,600,000.00**

Appendix-D: Benefit-Cost Worksheets

Prepared by:	NMB		
Date:	6-May-21		
Location:	US Route 4 & US Route 5	**Town(s):**	Hartford, VT
Notes	Alternative #2	Road Diet	

Crash Period	10	**T**	0.02	**Interest Rate**	0.0025	**Service Life**	20	**Highway Class**	s

			Reduction Factor		**Accident Summary**					**Costs**			
Crash Type	Improvement	Economic Life	Fatal + Inj	PDO	Fatal	Incap Injury A	Non-Incap Injury B	Possible Injury C	PDO	Project	RW	Salvage Value	O & M
All Crashes	Road Diet	20	0.29	0.29	0	0	5	3	19	725,000	0		
			0.29	0.29	0	0	5	3	19	$725,000	$0		
					Corrected Under Rep		5.55	3.33	23.75				

		% Change	Annual Change			Avg. Crash Type Cost		Annual Benefits
BENEFITS	Fatal	29	0.000			494,923		0
	Incap Injury (Severity A)	29	0.000			318,200		0
	Nonincap Injury (Severity B)	29	0.161			116,300		18,718
	Possible Injury (Severity C)	29	0.097			65,500		6,325
	PDO	29	0.689			10,600		7,301
							TOTAL	$32,345

B/C Ratio
0.87
NAW
($4,865)

		Economic Factor	Sinking Factor	Salvage Value	O & M		Project+RW Cost	Total Annual Cost
COSTS	Road Diet	0.0513	0.0488	0	0		725,000	37,209
							TOTAL	$37,209

Find P given A (uniform)	Present Value of Benefits (uniform annual benefits)
19.484488	$630,217

Net Present Value
$69,403

B/C Ratio
1.10

Adjusting for Traffic Growth

Annual Benefits w/out traffic adjustment
$32,345

Present Value of Benefits (non-uniform annual benefits)

$794,403.19

	Year in the Service Life	Find P given F	Crash Benefits	Present Value of Benefits (non-uniform annual benefits)
1	1	0.9975062	32344.57	$32,263.91
2	2	0.9950187	33117.101	$32,952.13
3	3	0.9925373	33908.083	$33,655.04
4	4	0.9900622	34717.958	$34,372.94
5	5	0.9875932	35547.176	$35,106.15
6	6	0.9851304	36396.199	$35,855.00
7	7	0.9826737	37265.501	$36,619.83
8	8	0.9802231	38155.566	$37,400.97
9	9	0.9777787	39066.889	$38,198.77
10	10	0.9753403	39999.978	$39,013.59
11	11	0.9729081	40955.354	$39,845.79
12	12	0.9704819	41933.549	$40,695.75
13	13	0.9680617	42935.107	$41,563.83
14	14	0.9656476	43960.587	$42,450.43
15	15	0.9632395	45010.559	$43,355.95
16	16	0.9608374	46085.61	$44,280.78
17	17	0.9584413	47186.338	$45,225.33
18	18	0.9560512	48313.355	$46,190.04
19	19	0.953667	49467.291	$47,175.32
20	20	0.9512888	50648.789	$48,181.62

Prepared by:	NMB		
Date:	6-May-21		
Location:	US Route 4 & US Route 5	**Town(s):**	Hartford, VT
Notes	Alternative #3	Road Diet with Ramp Removal	

Crash Period	10	**T**	0.02	**Interest Rate**	0.0025	**Service Life**	20	**Highway Class**	s

			Reduction Factor		**Accident Summary**					**Costs**			
Crash Type	Improvement	Economic Life	Fatal + Inj	PDO	Fatal	Incap Injury A	Non-Incap Injury B	Possible Injury C	PDO	Project	RW	Salvage Value	O & M
All Crashes	Road Diet	20	0.29	0.29	0	0	5	3	19	940,000			
			0.29	0.29	0	0	5	3	19	$940,000			
					Corrected Under Rep		5.55	3.33	23.75				

		% Change	Annual Change			Avg. Crash Type Cost		Annual Benefits
BENEFITS	Fatal	29	0.000			494,923		0
	Incap Injury (Severity A)	29	0.000			318,200		0
	Nonincap Injury (Severity B)	29	0.161			116,300		18,718
	Possible Injury (Severity C)	29	0.097			65,500		6,325
	PDO	29	0.689			10,600		7,301
							TOTAL	$32,345

B/C Ratio
0.67
NAW
($15,899)

		Economic Factor	Sinking Factor	Salvage Value	O & M		Project+RW Cost	Total Annual Cost
COSTS	Road Diet	0.0513	0.0488	0	0		940,000	48,244
							TOTAL	$48,244

Find P given A (uniform)	Present Value of Benefits (uniform annual benefits)
19.484488	$630,217

Net Present Value
($145,597)

B/C Ratio
0.85

Adjusting for Traffic Growth

Annual Benefits w/out traffic adjustment
$32,345

Present Value of Benefits (non-uniform annual benefits)
$794,403.19

	Year in the Service Life	Find P given F	Crash Benefits	Present Value of Benefits (non-uniform annual benefits)
1	1	0.9975062	32344.57	$32,263.91
2	2	0.9950187	33117.101	$32,952.13
3	3	0.9925373	33908.083	$33,655.04
4	4	0.9900622	34717.958	$34,372.94
5	5	0.9875932	35547.176	$35,106.15
6	6	0.9851304	36396.199	$35,855.00
7	7	0.9826737	37265.501	$36,619.83
8	8	0.9802231	38155.566	$37,400.97
9	9	0.9777787	39066.889	$38,198.77
10	10	0.9753403	39999.978	$39,013.59
11	11	0.9729081	40955.354	$39,845.79
12	12	0.9704819	41933.549	$40,695.75
13	13	0.9680617	42935.107	$41,563.83
14	14	0.9656476	43960.587	$42,450.43
15	15	0.9632395	45010.559	$43,355.95
16	16	0.9608374	46085.61	$44,280.78
17	17	0.9584413	47186.338	$45,225.33
18	18	0.9560512	48313.355	$46,190.04
19	19	0.953667	49467.291	$47,175.32
20	20	0.9512888	50648.789	$48,181.62

Prepared by:	NMB		
Date:	6-May-21		
Location:	US Route 4 & US Route 5	**Town(s):**	Hartford, VT
Notes	Alternative #4	Signal	

Crash Period	10	**T**	0.02	**Interest Rate**	0.0025	**Service Life**	20	**Highway Class**	s

			Reduction Factor		**Accident Summary**					**Costs**			
Crash Type	Improvement	Economic Life	Fatal + Inj	PDO	Fatal	Incap Injury A	Non-Incap Injury B	Possible Injury C	PDO	Project	RW	Salvage Value	O & M
All Crashes	Road Diet	20	0.29	0.29	0	0	5	3	19	1,070,000	5,000		
	Install Traffic Signal	20	0.44	0.44						350,000			15,000
			0.6024	0.6024	0	0	5	3	19	$1,420,000	$5,000		
					Corrected Under Rep		5.55	3.33	23.75				

		% Change	Annual Change			Avg. Crash Type Cost		Annual Benefits
BENEFITS	Fatal	60.24	0.000			494,923		0
	Incap Injury (Severity A)	60.24	0.000			318,200		0
	Nonincap Injury (Severity B)	60.24	0.334			116,300		38,883
	Possible Injury (Severity C)	60.24	0.201			65,500		13,139
	PDO	60.24	1.431			10,600		15,165
							TOTAL	$67,187

B/C Ratio
0.76
NAW
($20,948)

		Economic Factor	Sinking Factor	Salvage Value	O & M		Project+RW Cost	Total Annual Cost
COSTS	Road Diet	0.0513	0.0488	0	0		1,075,000	55,172
	Install Traffic Signal	0.0513	0.0488	0	15,000		350,000	32,963
				0	0		1,425,000	
							TOTAL	$88,135

Find P given A (uniform)	Present Value of Benefits (uniform annual benefits)
19.484488	$1,309,114

Net Present Value
$575,167

B/C Ratio
1.16

Adjusting for Traffic Growth

Annual Benefits w/out traffic adjustment
$67,187

Present Value of Benefits (non-uniform annual benefits)
$1,650,167.18

	Year in the Service Life	Find P given F	Crash Benefits	Present Value of Benefits (non-uniform annual benefits)
1	1	0.9975062	67187.479	$67,019.93
2	2	0.9950187	68792.213	$68,449.54
3	3	0.9925373	70435.274	$69,909.64
4	4	0.9900622	72117.579	$71,400.89
5	5	0.9875932	73840.065	$72,923.95
6	6	0.9851304	75603.691	$74,479.49
7	7	0.9826737	77409.441	$76,068.22
8	8	0.9802231	79258.32	$77,690.84
9	9	0.9777787	81151.358	$79,348.07
10	10	0.9753403	83089.61	$81,040.65
11	11	0.9729081	85074.157	$82,769.33
12	12	0.9704819	87106.103	$84,534.89
13	13	0.9680617	89186.581	$86,338.11
14	14	0.9656476	91316.749	$88,179.80
15	15	0.9632395	93497.796	$90,060.77
16	16	0.9608374	95730.936	$91,981.86
17	17	0.9584413	98017.413	$93,943.94
18	18	0.9560512	100358.5	$95,947.86
19	19	0.953667	102755.5	$97,994.53
20	20	0.9512888	105209.76	$100,084.86

Prepared by:	NMB		
Date:	6-May-21		
Location:	US Route 4 & US Route 5	**Town(s):**	Hartford, VT
Notes	Alternative #5	Roundabout	

Crash Period	10	**T**	0.02	**Interest Rate**	0.0025	**Service Life**	20	**Highway Class**	s

			Reduction Factor		**Accident Summary**					**Costs**			
Crash Type	Improvement	Economic Life	Fatal + Inj	PDO	Fatal	Incap Injury A	Non-Incap Injury B	Possible Injury C	PDO	Project	RW	Salvage Value	O & M
All Crashes	Roundabout	20	0.36	0.36	0	0	5	3	19	875,000	50,000		
All Crashes	Road Diet	20	0.29	0.29						725,000			
			0.5456	0.5456	0	0	5	3	19	$1,600,000	$50,000		
						Corrected Under Rep	5.55	3.33	23.75				

		% Change	Annual Change			Avg. Crash Type Cost		Annual Benefits
BENEFITS	Fatal	54.56	0.000			494,923		0
	Incap Injury (Severity A)	54.56	0.000			318,200		0
	Nonincap Injury (Severity B)	54.56	0.303			116,300		35,217
	Possible Injury (Severity C)	54.56	0.182			65,500		11,900
	PDO	54.56	1.296			10,600		13,735
							TOTAL	$60,852

B/C Ratio
0.72
NAW
($23,830)

		Economic Factor	Sinking Factor	Salvage Value	O & M		Project+RW Cost	Total Annual Cost
COSTS	Roundabout	0.0513	0.0488	0	0		925,000	47,474
	Road Diet	0.0513	0.0488	0	0		725,000	37,209
				0	0		1,650,000	
							TOTAL	$84,683

Find P given A (uniform)	Present Value of Benefits (uniform annual benefits)
19.484488	$1,185,678

Net Present Value	**B/C Ratio**
$569,574	**0.91**

Adjusting for Traffic Growth

Annual Benefits w/out traffic adjustment
$60,852

Present Value of Benefits (non-uniform annual benefits)

$1,494,573.73

	Year in the Service Life	Find P given F	Crash Benefits	Present Value of Benefits (non-uniform annual benefits)
1	1	0.9975062	60852.405	$60,700.65
2	2	0.9950187	62305.829	$61,995.46
3	3	0.9925373	63793.967	$63,317.89
4	4	0.9900622	65317.648	$64,668.53
5	5	0.9875932	66877.721	$66,047.98
6	6	0.9851304	68475.056	$67,456.86
7	7	0.9826737	70110.543	$68,895.79
8	8	0.9802231	71785.092	$70,365.41
9	9	0.9777787	73499.636	$71,866.38
10	10	0.9753403	75255.132	$73,399.37
11	11	0.9729081	77052.556	$74,965.05
12	12	0.9704819	78892.911	$76,564.14
13	13	0.9680617	80777.222	$78,197.34
14	14	0.9656476	82706.538	$79,865.37
15	15	0.9632395	84681.935	$81,568.98
16	16	0.9608374	86704.513	$83,308.94
17	17	0.9584413	88775.399	$85,086.01
18	18	0.9560512	90895.747	$86,900.99
19	19	0.953667	93066.739	$88,754.68
20	20	0.9512888	95289.583	$90,647.91

Appendix-E: Signal Warrant Analyses

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

HIGHWAY DIVISION

TO: Mario Dupigny-Giroux, Traffic Safety Engineer

FROM: Maureen Carr, Traffic Research Engineer

DATE: December 2, 2016

RE: Hartford US4/US5 (US5 mm 3.54)
Signal Warrant Analysis

The Traffic Research Unit has completed a signal warrant analysis for the intersection of US 4 and US 5 in Hartford. The intersection is currently stop sign controlled and has flashing beacons. The results of the analysis vary depending on the proposed lane configuration.

If the US 4 slip-lane stays in place and the right turning traffic is not included in the signal warrant analysis, then the intersection does not meet any of the warrants. If the US 4 slip lane is eliminated, however, and the right turning traffic is rerouted through the intersection via a designated right-turn lane, then the Crash warrant is met, but no other warrants. (The results are the same, regardless of whether the US 5 SB slip lane is included or not in the analysis.)

The analysis was based on a VTrans 2012 12-hour turning movement count. The morning half of the count (6:00 AM – 12:00 PM) was conducted on June 27, 2012. The afternoon half of the count (12:00 PM – 6:00 PM) was done on June 26, 2012. Seasonal adjustment factors and annual growth factors were applied to estimate 2017 Annual Average Weekday Daily Traffic.

The signal warrant analysis was based on the 2009 Edition of the Manual on Uniform Traffic Control Devices (MUTCD). The following warrants were analyzed:

Warrant 1: Eight-Hour Minimum Vehicular Volume.
Warrant 2: Four-Hour Vehicular Volume
Warrant 3B: Peak Hour Volume
Warrant 7: Crash Experience

I have attached a copy of the turning movement count and the signal warrant analysis reports. If you would like to discuss this project please call me at 522-2645.

CC: Data Analysis Files

VTrans
Highway Divsion

Counter: T-2091
Counted by: M. Hulbert
Weather: Rainy
Town: Hartford 4-15.2

File Name : 4-15_2merge12(2)
Site Code : 31408725
Start Date : 7/26/2012
Page No : 1

Groups Printed- Auto - Medium - Heavy

	US 5 from Norwich From North				Thrift Store From East				US 5 from Sykes Ave From South				US 4 from VA Cutoff Rd From West						
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Exclu. Total	Inclu. Total	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0			
06:00 AM	0	5	0	0	1	0	0	0	0	8	3	0	6	0	3	0	0	26	26
06:15 AM	4	14	0	0	0	0	0	0	0	15	11	0	12	0	2	1	1	58	59
06:30 AM	7	20	0	0	0	0	0	0	1	22	16	0	12	0	5	0	0	83	83
06:45 AM	6	20	0	0	0	0	0	0	0	25	24	0	14	0	11	0	0	100	100
Total	17	59	0	0	1	0	0	0	1	70	54	0	44	0	21	1	1	267	268
07:00 AM	3	31	0	0	0	0	0	0	0	39	11	0	15	0	13	0	0	112	112
07:15 AM	7	38	0	0	0	0	0	0	0	45	21	0	21	0	12	0	0	144	144
07:30 AM	8	39	0	0	0	0	0	0	0	64	13	0	14	0	12	0	0	150	150
07:45 AM	11	43	2	0	0	0	0	0	0	60	23	0	24	0	17	0	0	180	180
Total	29	151	2	0	0	0	0	0	0	208	68	0	74	0	54	0	0	586	586
08:00 AM	9	41	0	0	0	0	1	0	0	74	29	0	24	0	24	0	0	202	202
08:15 AM	13	36	0	0	1	0	0	0	1	64	15	0	14	0	25	0	0	169	169
08:30 AM	23	41	0	1	0	0	0	0	1	70	23	0	25	1	26	0	1	210	211
08:45 AM	17	49	0	0	0	0	0	0	0	64	19	0	27	0	30	0	0	206	206
Total	62	167	0	1	1	0	1	0	2	272	86	0	90	1	105	0	1	787	788
09:00 AM	7	52	0	0	0	0	0	0	0	66	27	0	19	0	25	0	0	196	196
09:15 AM	27	36	0	0	1	0	0	0	4	79	13	0	8	0	23	0	0	191	191
09:30 AM	16	57	1	0	0	0	2	0	3	81	23	0	24	0	22	0	0	229	229
09:45 AM	19	62	0	0	0	0	0	0	1	67	14	0	19	0	19	0	0	201	201
Total	69	207	1	0	1	0	2	0	8	293	77	0	70	0	89	0	0	817	817
10:00 AM	12	45	1	0	0	0	0	0	0	61	23	0	18	1	20	0	0	181	181
10:15 AM	14	60	0	0	0	0	1	0	3	84	13	0	20	0	19	0	0	214	214
10:30 AM	23	51	0	0	1	0	1	0	4	67	24	0	13	0	16	0	0	200	200
10:45 AM	23	60	0	0	0	0	1	0	2	70	21	0	19	0	32	0	0	228	228
Total	72	216	1	0	1	0	3	0	9	282	81	0	70	1	87	0	0	823	823
11:00 AM	24	72	0	0	0	0	0	0	1	74	20	0	25	0	38	0	0	254	254
11:15 AM	32	65	0	0	0	1	0	0	2	70	29	0	17	3	22	0	0	241	241
11:30 AM	22	60	1	0	1	0	1	0	4	95	16	0	13	0	24	0	0	237	237
11:45 AM	25	67	2	0	0	0	2	0	2	95	22	0	19	0	30	0	0	264	264
Total	103	264	3	0	1	1	3	0	9	334	87	0	74	3	114	0	0	996	996
12:00 PM	27	77	3	0	3	0	2	0	2	93	14	0	20	1	17	1	1	259	260
12:15 PM	26	81	0	0	0	0	1	0	1	106	30	0	26	1	21	0	0	293	293
12:30 PM	33	105	1	0	3	0	1	0	2	66	31	0	25	0	23	0	0	290	290
12:45 PM	32	71	0	0	0	0	1	0	0	103	23	0	29	1	34	0	0	294	294
Total	118	334	4	0	6	0	5	0	5	368	98	0	100	3	95	1	1	1136	1137
01:00 PM	27	97	1	0	0	0	0	0	2	92	23	0	18	0	24	0	0	284	284
01:15 PM	29	79	0	0	2	0	2	0	1	78	25	0	28	0	23	0	0	267	267
01:30 PM	40	80	0	0	1	0	0	0	0	93	33	0	30	0	26	0	0	303	303
01:45 PM	37	67	0	0	0	0	1	0	1	91	26	0	17	2	29	0	0	271	271
Total	133	323	1	0	3	0	3	0	4	354	107	0	93	2	102	0	0	1125	1125
02:00 PM	26	63	0	0	0	0	2	0	3	73	32	0	33	2	36	1	1	270	271
02:15 PM	31	61	0	0	1	1	1	0	3	84	32	0	23	0	47	0	0	284	284
02:30 PM	29	54	0	0	0	1	0	0	1	83	42	0	22	0	26	1	1	258	259
02:45 PM	30	77	1	0	0	0	1	1	1	79	29	0	21	1	25	0	1	265	266
Total	116	255	1	0	1	2	4	1	8	319	135	0	99	3	134	2	3	1077	1080
03:00 PM	32	84	1	0	2	0	0	0	0	74	32	0	23	0	21	0	0	269	269
03:15 PM	32	74	0	0	0	1	0	0	1	69	32	0	26	0	24	0	0	259	259

VTrans
Highway Divsion

Counter: T-2091
Counted by: M. Hulbert
Weather: Rainy
Town: Hartford 4-15.2

File Name : 4-15_2merge12(2)
Site Code : 31408725
Start Date : 7/26/2012
Page No : 2

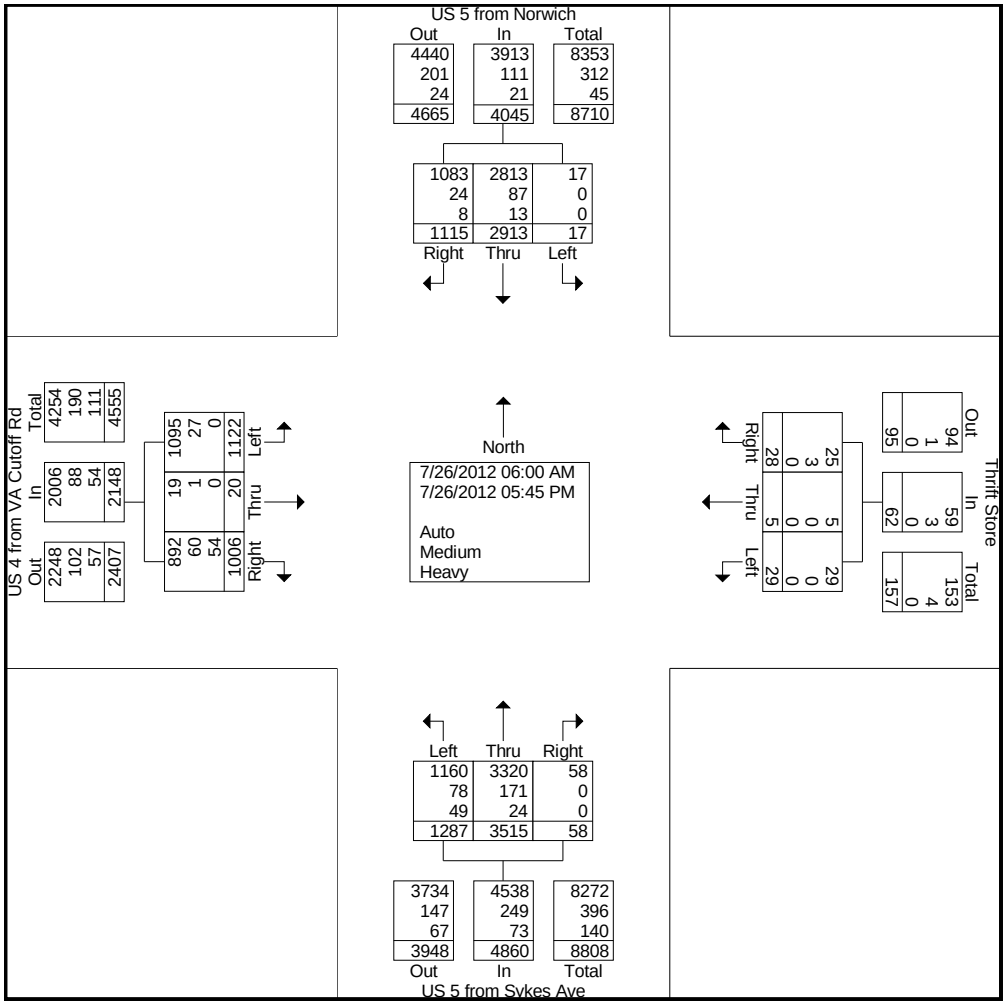
Groups Printed- Auto - Medium - Heavy

	US 5 from Norwich From North				Thrift Store From East				US 5 from Sykes Ave From South				US 4 from VA Cutoff Rd From West						
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Exclu. Total	Inclu. Total	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0			
03:30 PM	26	82	0	0	2	1	1	0	0	75	48	0	13	0	26	0	0	274	274
03:45 PM	35	71	1	0	1	0	1	0	3	66	42	0	24	0	34	0	0	278	278
Total	125	311	2	0	5	2	2	0	4	284	154	0	86	0	105	0	0	1080	1080
04:00 PM	27	81	0	0	2	0	0	0	0	79	41	0	22	0	22	0	0	274	274
04:15 PM	34	74	0	0	2	0	1	0	1	75	40	0	32	3	38	0	0	300	300
04:30 PM	37	92	0	0	0	0	1	0	0	94	41	0	23	1	30	0	0	319	319
04:45 PM	47	75	0	2	2	0	0	0	5	87	46	0	21	1	17	0	2	301	303
Total	145	322	0	2	6	0	2	0	6	335	168	0	98	5	107	0	2	1194	1196
05:00 PM	39	87	0	0	1	0	0	0	0	76	54	0	21	0	27	0	0	305	305
05:15 PM	27	71	0	0	1	0	1	0	1	105	39	0	26	1	26	0	0	298	298
05:30 PM	31	75	2	0	0	0	2	0	1	111	40	0	33	0	28	0	0	323	323
05:45 PM	29	71	0	0	0	0	1	0	0	104	39	0	28	1	28	0	0	301	301
Total	126	304	2	0	2	0	4	0	2	396	172	0	108	2	109	0	0	1227	1227
Grand Total	1115	2913	17	3	28	5	29	1	58	3515	1287	0	1006	20	1122	4	8	11115	11123
Apprch %	27.6	72	0.4		45.2	8.1	46.8		1.2	72.3	26.5		46.8	0.9	52.2				
Total %	10	26.2	0.2		0.3	0	0.3		0.5	31.6	11.6		9.1	0.2	10.1		0.1	99.9	
Auto	1083	2813	17		25	5	29		58	3320	1160		892	19	1095		0	0	10523
% Auto	97.1	96.6	100	100	89.3	100	100	100	100	94.5	90.1	0	88.7	95	97.6	75	0	0	94.6
Medium	24	87	0		3	0	0		0	171	78		60	1	27		0	0	452
% Medium	2.2	3	0	0	10.7	0	0	0	0	4.9	6.1	0	6	5	2.4	25	0	0	4.1
Heavy	8	13	0		0	0	0		0	24	49		54	0	0		0	0	148
% Heavy	0.7	0.4	0	0	0	0	0	0	0	0.7	3.8	0	5.4	0	0	0	0	0	1.3

VTrans
Highway Divsion

Counter: T-2091
Counted by: M. Hulbert
Weather: Rainy
Town: Hartford 4-15.2

File Name : 4-15_2merge12(2)
Site Code : 31408725
Start Date : 7/26/2012
Page No : 3

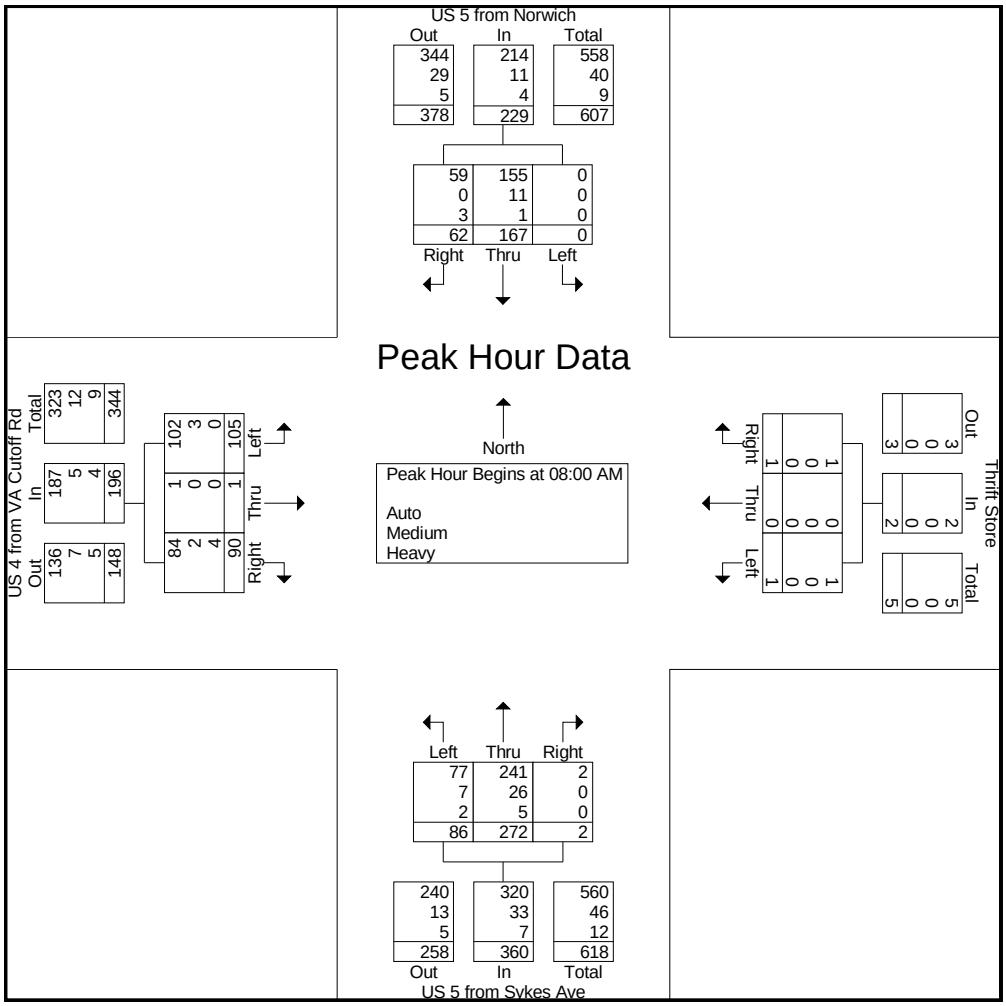


VTrans
Highway Divsion

Counter: T-2091
Counted by: M. Hulbert
Weather: Rainy
Town: Hartford 4-15.2

File Name : 4-15_2merge12(2)
Site Code : 31408725
Start Date : 7/26/2012
Page No : 4

	US 5 from Norwich From North				Thrift Store From East				US 5 from Sykes Ave From South				US 4 from VA Cutoff Rd From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	9	41	0	50	0	0	**1**	**1**	0	**74**	**29**	**103**	24	0	24	48	202
08:15 AM	13	36	0	49	**1**	0	0	1	**1**	64	15	80	14	0	25	39	169
08:30 AM	**23**	41	0	64	0	0	0	0	1	70	23	94	25	**1**	26	52	**210**
08:45 AM	17	**49**	0	**66**	0	0	0	0	0	64	19	83	**27**	0	**30**	**57**	206
Total Volume	62	167	0	229	1	0	1	2	2	272	86	360	90	1	105	196	787
% App. Total	27.1	72.9	0		50	0	50		0.6	75.6	23.9		45.9	0.5	53.6		
PHF	.674	.852	.000	.867	.250	.000	.250	.500	.500	.919	.741	.874	.833	.250	.875	.860	.937
Auto	59	155	0	214	1	0	1	2	2	241	77	320	84	1	102	187	723
% Auto	95.2	92.8	0	93.4	100	0	100	100	100	88.6	89.5	88.9	93.3	100	97.1	95.4	91.9
Medium	0	11	0	11	0	0	0	0	0	26	7	33	2	0	3	5	49
% Medium	0	6.6	0	4.8	0	0	0	0	0	9.6	8.1	9.2	2.2	0	2.9	2.6	6.2
Heavy	3	1	0	4	0	0	0	0	0	5	2	7	4	0	0	4	15
% Heavy	4.8	0.6	0	1.7	0	0	0	0	0	1.8	2.3	1.9	4.4	0	0	2.0	1.9

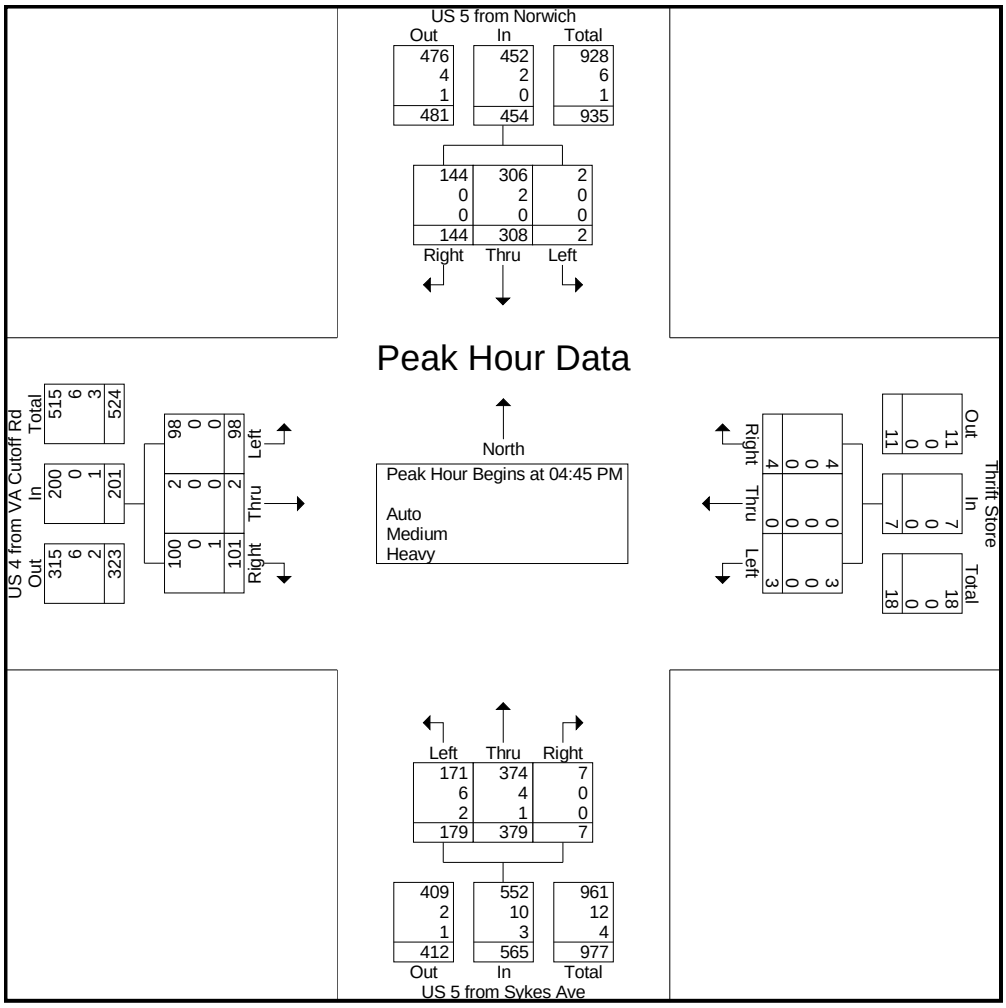


VTrans
Highway Divsion

Counter: T-2091
Counted by: M. Hulbert
Weather: Rainy
Town: Hartford 4-15.2

File Name : 4-15_2merge12(2)
Site Code : 31408725
Start Date : 7/26/2012
Page No : 5

	US 5 from Norwich From North				Thrift Store From East				US 5 from Sykes Ave From South				US 4 from VA Cutoff Rd From West				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	**47**	75	0	122	**2**	0	0	**2**	**5**	87	46	138	21	**1**	17	39	301
05:00 PM	39	**87**	0	**126**	1	0	0	1	0	76	**54**	130	21	0	27	48	305
05:15 PM	27	71	0	98	1	0	1	2	1	105	39	145	26	1	26	53	298
05:30 PM	31	75	**2**	108	0	0	**2**	2	1	**111**	40	**152**	**33**	0	**28**	**61**	**323**
Total Volume	144	308	2	454	4	0	3	7	7	379	179	565	101	2	98	201	1227
% App. Total	31.7	67.8	0.4		57.1	0	42.9		1.2	67.1	31.7		50.2	1	48.8		
PHF	.766	.885	.250	.901	.500	.000	.375	.875	.350	.854	.829	.929	.765	.500	.875	.824	.950
Auto	144	306	2	452	4	0	3	7	7	374	171	552	100	2	98	200	1211
% Auto	100	99.4	100	99.6	100	0	100	100	100	98.7	95.5	97.7	99.0	100	100	99.5	98.7
Medium	0	2	0	2	0	0	0	0	0	4	6	10	0	0	0	0	12
% Medium	0	0.6	0	0.4	0	0	0	0	0	1.1	3.4	1.8	0	0	0	0	1.0
Heavy	0	0	0	0	0	0	0	0	0	1	2	3	1	0	0	1	4
% Heavy	0	0	0	0	0	0	0	0	0	0.3	1.1	0.5	1.0	0	0	0.5	0.3



Warrants Summary Report

1: US4 and US5; slip ramps in place

Intersection Information:

	Major Street	Minor Street
Street Name	US 5	Business
Direction	NB/SB	EB/WB
Number of Lanes	2	1
Approach Speed	40	40

Warrant	Met?	Notes
Warrant 1, Eight-Hour Vehicular Volume		
	No	
Condition A or B Met?	No	0 Hours met (8 required)
Condition A and B Met?	No	2 Hours met (8 required)
Warrant 2, Four-Hour Vehicular Volume		
	No	0 Hours met (4 required)
Warrant 3, Peak Hour		
	No	
Condition A Met?	No	0 Hours met (1 required)
Condition B Met?	No	0 Hours met (1 required)
Warrant 7, Crash Experience		
	No	
Traffic Volume Condition?	No	0 Hours met (8 required)
Ped Condition?	No	6 Hours met (8 required)

Warrants Summary Report

1: US4 and US5; slip ramps removed

Intersection Information:

	Major Street	Minor Street
Street Name	US 5	Business
Direction	NB/SB	EB/WB
Number of Lanes	2	2
Approach Speed	40	40

Warrant	Met?	Notes
Warrant 1, Eight-Hour Vehicular Volume		
	No	
Condition A or B Met?	No	5 Hours met (8 required)
Condition A and B Met?	No	7 Hours met (8 required)
Warrant 2, Four-Hour Vehicular Volume		
	No	3 Hours met (4 required)
Warrant 3, Peak Hour		
	No	
Condition A Met?	No	0 Hours met (1 required)
Condition B Met?	No	0 Hours met (1 required)
Warrant 7, Crash Experience		
	Yes	
Traffic Volume Condition?	No	0 Hours met (8 required)
Ped Condition?	Yes	10 Hours met (8 required)

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

HIGHWAY DIVISION

TO: Mario Dupigny-Giroux, Traffic Safety Engineer

FROM: Maureen Carr, Traffic Research Engineer MC

DATE: December 16, 2016

RE: Hartford US4/US5 (US5 mm 3.54)
Signal Warrant Analysis

The Traffic Research Unit has updated the signal warrant analysis for the intersection of US 4 and US 5 in Hartford to model single through lanes on US 5 northbound and southbound.

If the slip ramps remain in place, and the US 5 NB and SB approaches are modeled as shared single lane approaches, then the Crash Warrant is met, but no others. If the US 4 slip lane is eliminated, however, then Warrants 1 and 2 are met, as well as the Crash Warrant.

The analysis was based on a VTrans 2012 12-hour turning movement count. The morning half of the count (6:00 AM – 12:00 PM) was conducted on June 27, 2012. The afternoon half of the count (12:00 PM – 6:00 PM) was done on June 26, 2012. Seasonal adjustment factors and annual growth factors were applied to estimate 2017 Annual Average Weekday Daily Traffic.

The signal warrant analysis was based on the 2009 Edition of the Manual on Uniform Traffic Control Devices (MUTCD). The following warrants were analyzed:

Warrant 1: Eight-Hour Minimum Vehicular Volume.
Warrant 2: Four-Hour Vehicular Volume
Warrant 3B: Peak Hour Volume
Warrant 7: Crash Experience

I have attached a copy of the signal warrant analysis report. If you would like to discuss this project please call me at 522-2645.

CC: Data Analysis Files

Traffic Signal Warrant Analysis Workbook

US 4 SLIP RAMP REMOVED

STUDY AND ANALYSIS INFORMATION

Municipality:	HARTFORD	**Analysis Date:**	12/16/2016
County:		**Conducted By:**	MC
PennDOT Engineering District:		**Agency/Company Name:**	VTRANS

Analysis Information

Data Collection Date:	6/26/2012 & 6/27/2012
Day of the Week:	Thursday

Is the intersection in a built-up area of an isolated community of <10,000 population? No

Major Street Information

Major Street Name and Route Number:	US 5
Major Street Approach #1 Direction:	N-Bound
Major Street Approach #2 Direction:	S-Bound

Number of Lanes for Moving Traffic on Each Major Street Approach:	1	**LANE(S)**
Speed Limit or 85th Percentile Speed on the Major Street:	40	**MPH**

Minor Street Information

Minor Street Name and Route Number:	US 4; SLIP RAMP REMOVED
Minor Street Approach #1 Direction:	E-Bound
Minor Street Approach #2 Direction:	W-Bound

Number of Lanes for Moving Traffic on Each Minor Street Approach:	2	**LANE(S)**

TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS

	Applicable?	Warrant Met?
Warrant 1, Eight-Hour Vehicular Volume	**Yes**	**Yes**
Warrant 2, Four-Hour Vehicular Volume	**Yes**	**Yes**
Warrant 3, Peak Hour	**Yes**	**No**
Warrant 4, Pedestrian Volume	**No**	**N/A**
Warrant 5, School Crossing	**No**	**N/A**
Warrant 6, Coordinated Signal System	**No**	**N/A**
Warrant 7, Crash Experience	**Yes**	**Yes**
Warrant 8, Roadway Network	**No**	**N/A**
Warrant 9, Intersection Near a Grade Crossing	**No**	**N/A**
Warrant PA-1, ADT Volume Warrant	**No**	**N/A**
Warrant PA-2, Midblock and Trail Crossings	**No**	**N/A**

Traffic Signal Warrant Analysis Workbook

US 4 SLIP RAMP IN PLACE

STUDY AND ANALYSIS INFORMATION

Municipality:	HARTFORD	**Analysis Date:**	12/16/2016
County:		**Conducted By:**	MC
PennDOT Engineering District:		**Agency/Company Name:**	VTRANS

Analysis Information

Data Collection Date:	6/26/2012 & 6/27/2012
Day of the Week:	Thursday

Is the intersection in a built-up area of an isolated community of <10,000 population? No

Major Street Information

Major Street Name and Route Number:	US 5
Major Street Approach #1 Direction:	N-Bound
Major Street Approach #2 Direction:	S-Bound

Number of Lanes for Moving Traffic on Each Major Street Approach:	1	**LANE(S)**
Speed Limit or 85th Percentile Speed on the Major Street:	40	**MPH**

Minor Street Information

Minor Street Name and Route Number:	US 4; SLIP RAMP IN PLACE
Minor Street Approach #1 Direction:	E-Bound
Minor Street Approach #2 Direction:	W-Bound

Number of Lanes for Moving Traffic on Each Minor Street Approach:	1	**LANE(S)**

TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS

	Applicable?	Warrant Met?
Warrant 1, Eight-Hour Vehicular Volume	**Yes**	**No**
Warrant 2, Four-Hour Vehicular Volume	**Yes**	**No**
Warrant 3, Peak Hour	**Yes**	**No**
Warrant 4, Pedestrian Volume	**No**	**N/A**
Warrant 5, School Crossing	**No**	**N/A**
Warrant 6, Coordinated Signal System	**No**	**N/A**
Warrant 7, Crash Experience	**Yes**	**Yes**
Warrant 8, Roadway Network	**No**	**N/A**
Warrant 9, Intersection Near a Grade Crossing	**No**	**N/A**
Warrant PA-1, ADT Volume Warrant	**No**	**N/A**
Warrant PA-2, Midblock and Trail Crossings	**No**	**N/A**

Appendix-F: Meeting Minutes

VERMONT

State of Vermont
Highway Safety & Design Section

Agency of Transportation
Highway Division

Project: Hartford NH 020-2(44)

Date: January 16, 2020

Subject: Hartford NH 020-2(44) - US 5/US 4 Intersection Scoping Study

Attendees: Erin Parizo – VTrans Traffic Design Project Manager
Nick Bredice – VTrans Traffic Design
Hannah Tyler – Hartford Public Works Director
Lori Hirshfield – Hartford Planning & Development Director
Brannon Godfrey – Hartford Town Manager

Time: 11:00 am – 11:23 am
Location: Hartford Town Office
Notes:

1. **Project Background**
    a. Comments and questions from the Town
        i. Both Lori and Hannah inquired about the exclusion of the US 5/US 4 intersection from the US 5 corridor project
            - Erin explained that that the intersection of US 5 & US 4 is on the list of VTrans High Crash Locations (HCL) for 2012-2016, resulting in a different programming process for this project
            - Like the US 5 corridor project, a short-term vs. long-term approach to developing alternatives was also used for this intersection
        ii. The Town does not currently have information on the intended use of the property directly to the South of the intersection
            - Existing access points are unclear
            - Town asked about the possibility of temporarily establishing these accesses with new pavement makings as part of the paving project
            - Town expressed willingness to work around VTrans' proposed design regarding access management

2. **Alternatives Overview**
    a. Alternative #1 – No build alternative
        i. Always has to be included in scoping efforts to compare existing conditions

    b. Alternative #2 – Unsignalized, with existing geometry
        i. US 5 NB right lane would be replaced with a bike lane and painted buffer
        ii. Both slip ramps would remain in place
        iii. Island modifications included to help facilitate cyclist thru movements along US 5 SB
        iv. US 5 SB right lane would remain in place

- Town agreed with this idea and expressed that they want to keep the US 4 EB slip ramp, especially for heavy trucks accelerating up the hill

c. Alternative #3 – Unsignalized, with removal of US 5 SB slip ramp
    i. Removal of US 5 SB slip lane is intended to improve safety by slowing down right-turners
    ii. Bike lane weaves between Thru & RT lanes along US 5 SB
        - Island modifications included once again to help facilitate cyclist thru movements
    iii. US 5 SB right lane (heading up the hill) would remain in place
        - Town reiterated the importance of keeping this lane

d. Alternative #4 – Signalized, with removal of US 5 SB slip ramp
    i. Erin explained that the proposed signal would be unwarranted
    - Town and VTrans agreed that they would rather not install a signal when the volumes do not warrant one

e. Alternative #5 – Roundabout
    i. Town supported the idea of a roundabout
        - Agreed that VTrans should not design a fourth leg to accommodate the vacant southside property
        - Expressed that they were OK with closing off a point of access to the southside property and would be willing to work with VTrans' proposed access relocation

3. Next Steps

a. VTrans will refine alternatives and perform more in-depth alternatives review
b. Once there is consensus on a preferred alternative, VTrans will work with the Town to schedule a "Preferred Alternatives Public Meeting" to present the concept

VERMONT

State of Vermont
Highway Safety & Design Section

Agency of Transportation
Highway Division

Project: Hartford NH 020-2(44)

Date: January 26, 2021

Subject: Hartford NH 020-2(44) - US 5/US 4 Intersection Alternative Review Meeting

Attendees: Erin Parizo – VTrans Traffic Design Project Manager
Kelsi Record – VTrans Traffic Design
Nick Bredice – VTrans Traffic Design
Hannah Tyler – Hartford Public Works Director
Matt Osborn – Hartford Planning & Development
Rita Seto – TRORC Senior Planner
Peter Gregory – TRORC Executive Director

Time: 8:00 am – 8:30 am
Location: Microsoft Teams Meeting (Virtual)
Notes:

1. **Project/Process Overview**
    a. Design alternatives were explored during an intersection scoping study collaboration meeting back in January 2020.
    b. VTrans Traffic Design has since taken a deeper dive into each alternative and developed a draft scoping report, which is currently out for review
    c. Hoping to hold a public meeting in the coming weeks to present the roundabout as the preferred alternative

2. **Discussion of Report**
    a. Summary of Alternatives
        i. Alternative #1 – No build alternative
            - This alternative is always included in scoping efforts for the purpose of comparing existing conditions.
        ii. Alternative #2 – Unsignalized, with existing geometry
            - Maintains existing curblines while encompassing road diet concept
            - Could be easily incorporated into an upcoming paving project
            - Does not directly solve safety concerns regarding vehicles turning left onto US 5
        iii. Alternative #3 – Unsignalized, with removal of US 5 SB slip ramp
            - Removal of US 5 SB slip ramp is intended to improve safety by slowing down vehicles turning right onto US 4
            - US 4 EB slip ramp & US 5 SB right lane would remain in place to accommodate large/heavy trucks ascending 7.7% grade along US 5

iv. Alternative #4 – Signalized, with removal of US 5 SB slip ramp

- Proposes the same geometric changes as Alternative #3, even though the intersection does not warrant a signal without removal of US 4 EB slip ramp
    - Installing a signal intended to solely address safety concerns and therefore would not be capacity driven.

v. Alternative #5 – Roundabout

- Addresses safety by slowing down vehicles and significantly reducing conflict points
- Proposes consolidation entrance points along south side of intersection
    - Much cleaner from an access management perspective
- Cyclists would be urged to utilize shared use path while navigating through the physical roundabout

b. Preferred Alternative

i. Alternative #5 – Roundabout

3. Next Steps

a. Preferred Alternative Public Meeting

i. Hannah expressed that she would get the preferred alternative presentation on the agenda for an upcoming virtual Selectboard meeting

- Approx. 20-min presentation (depending on level of interest)
- Looking to present within the next 4-6 weeks

ii. Hannah also noted that the new Town Manager is slated to assume role in Mid-February

b. Project to be Programmed for Design and Construction

i. Road diet concept could feasibly be implemented as an interim solution via paving project (summer 2024), with construction of long-term roundabout solution following a couple of years later

4. Questions?

a. Concerns regarding US 5 NB vehicles approaching roundabout in snowy/icy conditions:

i. Erin reaffirmed that any proposed geometric changes would neither augment nor diminish the safety challenges currently posed by snow and ice. Sufficient sight distance at that approach also allows drivers to safely stop/slow down, even in adverse conditions.

b. Concerns regarding public engagement following some residents' opposition to Sykes Ave project:

i. Ample State Right-of-Way at intersection could help quell locals' concerns

ii. There will be an opportunity to capitalize on lessons learned from construction of Sykes Ave roundabout

c. Concerns regarding cyclists' safety on Alternative #2:

i. After exploring solutions that ranged from "Bike Lane Ends" signage to shared use paths within the existing ramp islands, it was determined that slip ramps inherently hinder cyclist mobility and diminish their overall safety due to the imposed conflict points.

- Solidifies Alternative #2's standing as a solid interim solution, with Alternative #5 possessing the ability to adequately address cyclists' safety concerns

ii. Matt noted that there are currently very low cyclist volumes at intersection

VERMONT

State of Vermont
Highway Safety & Design Section

Agency of Transportation
Highway Division

Project: Hartford NH 020-2(44)

Date: January 27, 2021

Time: 10:00am – 10:46am

Location: Microsoft Teams Meeting

Subject: Hartford NH 020-2(44) - US 5/US 4 Intersection Alternative Review Meeting

Attendees: Erin Parizo – VTrans Traffic Design Project Manager
Kelsi Record – VTrans Traffic Design Engineer
Nick Bredice – VTrans Traffic Design Engineer
Jesse Devlin – VTrans Highway Safety & Design Program Manager
Rob White – VTrans Project Delivery Bureau Director
Chris Bump – VTrans District 4 Project Manager
Derek Lyman – VTrans Traffic Signal Operations Engineer
Jon Kaplan – VTrans Bicycle & Pedestrian Program Manager
Ian Degutis – VTrans Traffic Mobility Engineer
Lee Goldstein – VTrans Environmental Specialist
Melissa Rutter – VTrans Utility Coordination Supervisor
Brian Horbal – VTrans Utility Coordination Unit
Matt Bogacyzk – VTrans Pavement Design Project Manager
Josh Taylor – VTrans Traffic Operations Engineer

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1) Project Overview
    a) Meeting agenda
        i. Gain consensus on preferred alternative (roundabout)
        ii. Follow-up on yesterday's meeting with Town representatives & stakeholders
        iii. Summarize alternatives, weigh-in on OLSR comments, and have open discussion
    b) Intersection characteristics
        i. Overdesigned from vehicle perspective
            a. Two lanes of travel in either direction along US Route 5
        ii. Town has expressed desire for safer pedestrian/cyclist infrastructure
        iii. Initially a Road Safety Audit (RSA)
            a. High Crash Location (HCL)
            b. Eventually became a scoping study

2) Discussion of Report
    a) Summary of Alternatives
        i. Alternative #1 – No build alternative
            c. This alternative is always included in scoping efforts for the purpose of comparing existing conditions and understanding whether this is a feasible option.
        ii. Alternative #2 – Unsignalized, with existing geometry
            a. Maintains existing curblines while encompassing road diet concept through a new pavement marking package (essentially "cleaning up" the area)
            b. Could be easily incorporated into an upcoming paving project
                1. Slated for construction summer 2024 (coarse-mill, level & overlay)
                2. Matt agreed that incorporating this alternative into their project would certainly be feasible
            c. Does not directly solve safety concerns regarding vehicles turning left onto US 5 and leaves considerable room for improvement regarding cyclists' safety, solidifies this alternative's standing as an interim solution.
                1. Erin asked Jon whether it would be better to end the bike lane before the intersection, or carry it through the intersection and ultimately tie-in to a nonexistent bike lane.
                2. Jon emphasized the slip ramps' inherent risk to cyclists, but pointed out the newly installed pavement markings at VT-117 & VT-289 ramps as a good example to look at.
            d. Chris reiterated District's concerns about trucks traveling uphill (US 5 SB) in adverse conditions, emphasizing the need for those vehicles to have slow lane option.
                1. Kelsi explained that maintaining two lanes of travel along US 5 SB going up the hill was one of the Town's key requests, even though it further hinders bike lane continuity/feasibility through the intersection.
        iii. Alternative #3 – Unsignalized, with removal of US 5 SB slip ramp
            a. Erin asked Matt about potential for removing the slip ramp as part of the paving project. Matt explained that removal of the paved surface could easily fit within their scope just as it has on past projects
            b. Matt also suggested that the asphalt could be cut and removed, followed by a simple resodding with minimal reshaping in order to minimize costs since this work would be part of a short-term solution.
        iv. Alternative #4 – Signalized, with removal of US 5 SB slip ramp
            a. Erin explained that this alternative essentially proposes the same geometric changes as the previous alternative – with the addition of a traffic signal system – which would be unwarranted. There were no further questions or comments.
        v. Alternative #5 – Roundabout
            a. Addresses safety by slowing down vehicles and significantly reducing conflict points
            b. Proposes consolidation entrance points along south side of intersection
                1. Much cleaner from an access management perspective
            c. Cyclists would be urged to utilize shared use path while navigating through the physical roundabout

d. Incorporates road diet concept along both US 5 approaches while maintaining slow lane along US 5 SB
e. Ample ROW could potentially quell locals' concerns and improve public perception

b) Preferred Alternative (Alternative #5 – Roundabout)

i. Ian expressed concerns about the inscribed diameter, calling 125' a 'tight' roundabout
   a. Kelsi reassured him that an array of truck templates had been run (successfully) using AutoTurn, but Ian pointed out VT-15 roundabout as an example of truck templates not holding up in the field and lacked confidence in truck drivers' ability to turn left off US 5 onto US 4 without leaving paved surface.
      1. Turning radii will be reviewed again during design.

ii. Derek asked about the possibility of a right-turn bypass lane from US 4 onto US 5 (See FHWA Exhibit 6-42 in "Roundabouts: An Informational Guide" document)
   a. Erin replied that Town expressed confidence in large/heavy trucks being able to make that turn movement via the roundabout. Kelsi added that while trucks will likely have to decrease their speed more than they do under the existing condition, they can utilize the slow lane immediately after completing that movement.
      1. This will be reviewed again during design.
   b. Matt alluded to the Waterbury roundabout as an example, but Derek clarified that he was talking about a right-turn lane that completely bypasses the intersection, as opposed to a traditional slip lane. Ian provided an example of this configuration in Keene, NH, adding that it is not something that he would advocate for.

iii. Jon reiterated his advocacy of roundabouts as the safest option for cyclists
   a. Only other concern would be the crossings – bikers would be required to dismount in order for them to legally be considered part of a protected bike lane – something cyclists rarely do.

iv. Ian brought up the possibility of encouraging cyclists to utilize local roads instead
   a. According to the Town, several cyclists already do this. The Town has also made it clear they would like cyclists to travel along US 5

v. Chris inquired about ongoing issues with access permits for businesses along south side of intersections, suggesting that they be rechecked.
   a. Erin reaffirmed that these issues will be further explored during design

vi. Lee commented on potential issues for trucks navigating a left turn from US 4 onto US 5
   a. Could the roundabout center be relocated slightly?
   b. Kelsi described the current proposed center as the optimal location when compared to other truck turning templates.
   c. This can be verified during design as well.

vii. Melissa mentioned that Consolidated Communications has lines running down the hill and across US 5.
   a. Water & sewer also follow US 5 through intersection (roughly located)
   b. Sewer is likely located deep enough to be able to avoid conflict during construction

3) Next Steps
    a) Preferred Alternative Public Meeting
        i. Looking to present at virtual Selectboard meeting within the next 4-6 weeks
    b) Management Approval of Scope will be sent for signature along with the final version of the scoping report.

4) Other?
    a) Scoping Report still up for review and closes on 02-19-2021, so feel free to make any additional comments in the report before then.

VERMONT

State of Vermont
Highway Safety & Design Section

Agency of Transportation
Highway Division

Project: Hartford NH 020-2(44)

Date: April 20, 2021

Time: 7:45pm – 8:23pm

Location: Zoom Meeting

Subject: Hartford NH 020-2(44) - US 5/US 4 Intersection Preferred Alternative Meeting

Attendees: Erin Parizo – VTrans Traffic Design Project Manager
Nick Bredice – VTrans Traffic Design Engineer
Dan Fraser – Town of Hartford Selectboard Chair
Joe Major – Town of Hartford Selectboard Vice-Chair
Kim Souza – Town of Hartford Selectboard Clerk
Ally Tufenkjian – Town of Hartford Selectboard Member
Julia Dalphin – Town of Hartford Selectboard Member
Dennis Brown – Town of Hartford Selectboard Member
Other members of the community

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1) Project Overview – See presentation for additional detail
   a) Process to Date
   b) Existing Conditions
   c) Purpose & Need
   d) Alternatives Overview
   e) Short-Term Improvements
   f) Long-Term Improvements
   g) Next Steps
2) Questions/Comments
   a) Dennis advocated for the No Build alternative, asserting that the intersection should be left as is
      i. Expressed concern about trucks needing to slow down to navigate the roundabout, then losing the momentum required climb hill along US Route 5 Southbound
         (a) Erin brought up the potential for a bypass lane, referring to Exhibit 6-42 in FHWA document titled “Roundabouts: An Informational Guide”

ii. Contended that removal of the US Route 5 Southbound slip ramp would be highly unlikely to improve conditions at the intersection (cited past project in which VTrans removed the slip ramp at I-91 SB) and noted that the poor pavement condition already forces motorists to reduce their speeds.
    a. Erin mentioned that the future resurfacing project (programmed for 2024) would address concerns regarding the existing pavement condition.

b) Kim inquired about installing pedestrian crossings as part of the short-term preferred alternative
    a. Erin replied that crossings are not recommended due to the lack of both a traffic signal system as well as pedestrian facilities along the northern side of US Route 5.

3) Selectboard Verdict
    a. Selectboard motioned to endorse the preferred alternatives with continued coordination together (VTrans/Town), voting 5-1.

TOWN OF HARTFORD
SELECTBOARD MINUTES
Tuesday, April 20, 2021
6:00pm Hartford Town Hall
171 Bridge Street, White River Junction, VT 05001

This meeting was conducted in compliance with Vermont Open Meeting Law with electronic participation.

Present via Zoom: Joe Major, Selectboard Vice Chair; Kim Souza, Selectboard Clerk; Ally Tufenkjian, Selectboard Member; Dennis Brown, Selectboard Member; Julia Dalphin, Selectboard Member.

Present at Town Hall: Dan Fraser, Selectboard Chair; Tracy Yarlott-Davis, Town Manager; Lana Livingston, Administrative Assistant.

Absent: Rachel Edens, Selectboard Member.

CATV LINK: http://catv.cablecast.tv/CablecastPublicSite/show/14346?channel=1

The Chair read this script:
As Chair of the Town of Hartford Selectboard I find that, due to the State of Emergency declared by Governor Scott as a result of the COVID-19 pandemic and pursuant to Addendum 6 to Executive Order 01-20 and Act 92, this public body is authorized to meet electronically.
In accordance with Act 92, there is no physical location to observe and listen contemporaneously to this meeting. However, in accordance with the temporary amendments to the Open Meeting Law, I confirm that we are:
*a) Providing public access to the meeting by [telephone/video/other electronic means], with additional access offered through telephone, zoom and youtube.com. We are using Zoom for this remote meeting. All members of the Board have the ability to communicate contemporaneously during this meeting through this platform and the public has access to contemporaneously listen and, if desired, participate in this meeting by https://zoom.us/j/549799933 - Please mute your microphone, youtube.com/catv810 – click "live now". If you're calling in from phone dial: (415) 762-9988 Type in the Room ID: 549-799-933 followed by #. Press # a second time. Press *9 to raise your hand for public comment.*
b) Providing public notice of instructions for accessing the meeting. We previously gave notice to the public of the necessary information for accessing this meeting, including how to access the meeting using telephone, zoom and youtube.com in our posted meeting agenda. [Instructions have also been provided on the town website on the "Agendas and Minutes."]
c)Providing a mechanism for the public to alert the public body during the meeting if there are problems with access.
d)Continuing the meeting if necessary. In the event the public is unable to access this meeting, it will be continued to a time and place certain.
Please note that all votes taken during this meeting that are not unanimous will be done by roll call vote, in accordance with the law. Let's start the meeting by taking a roll call attendance of all Selectboard members participating in the meeting.

I. **Call to Order of the Selectboard Meeting:** The Selectboard Chair, Dan Fraser called the meeting to order at 5:58 P.M.

II. **Pledge of Allegiance** was recited.

III.Order of Agenda: there were no changes to the agenda.
IV. Selectboard

1. **Public:**

Lannie Collins from Hartford called to follow up on some past topics. First, he would like to know the current status for a Police Chief. Town Manager, Tracy Yarlott-Davis said that the position is currently under review and the next step will be to do a National search for a new Police Chief. Mr. Collins also asked for a follow-up on the vehicles that were towed from the South Main Street parking lot for snow removal. He would like to know the cost of the reimbursements paid to the individual owners. He has made this also in a public records request and has not heard back yet. He would like the answer in a public format. Town Manager Yarlott-Davis did not have the cost and will get back to him at a later time.

Jack Peisch from South Royalton and a teacher at Hartford Middle School wanted to know the status on the contract of the Community Wellness position and encourages the process to move along. Town Manager, Yarlott-Davis responded that we have a contract through HCRS and Whitney Hussong. We are also doing a needs and GAP assessment to see what the community needs.

Marcy Bartlett from Wilder called in to report that Norwich posted a summary for needs and recommendations for sewer connections. She recommends to let them expedite their process we would let them know that Hartford is not interested in doing the connection. Selectboard Chair, Dan Fraser responded that the last communication with the Norwich School Board was for them to ask Norwich Selectboard to contact Hartford Selectboard directly with any plans or requests. This has not happened. Still at the discussion stage and he realizes many Hartford residents do not want this to happen.
Marcy also asked if the Town was going to do the 4th of July Fireworks and celebration. Right now, there has been no decision. Parks & Rec will be making that decision closer to the date.

Selectboard Comments:

Ally Tufenkjian read a statement denouncing violence against Black, Latinx and Asian people that is supported by some of the Selectboard members.
Link to the Statement: Statement Denouncing Violence Against Black, Latinx and Asian People (2).pdf.

Dennis Brown said he could not support the letter read. It was a tragedy for the Asian people in Georgia but he feels the Selectboard should focus on Hartford town business.

Julia Dalphin thanked the group that worked on the letter that was put forward and supports it.

Kim Souza spoke about the Northern Stage housing issues. It shows that Hartford is desperate for affordable housing in Town. Hopefully we can capitalize on available funding. Kim also commented on the Norwich School hookup. Comments made in prior meetings by some citizens do not necessarily represent what the residents want or prefer.

2. **Appointments:**

   a. Consider the re-appointment of Denise Welch-May to the Design Review Committee for a three-year term beginning April 20, 2021 and ending April 21, 2024.

      Selectboard Clerk, Kim Souza made the motion to re-appoint Denise Welch-May to the Design Review Committee for a three-year term beginning April 20, 2021 and ending April 19, 2024. Selectboard Member, Dennis Brown seconded the motion. All were in favor and the motion passed.

   b. Consider the re-appointment of Dave Sherman to the Planning Commission for a three-year term beginning April 20, 2021 and ending April 19, 2024.

      Selectboard Clerk, Kim Souza made the motion to re-appoint Dave Sherman to the Planning Commission for a three-year term beginning April 20, 2021 and ending April 19. 2024. Selectboard Vice Chair, Joe Major seconded the motion. All were in favor and the motion passed.

3. **Town Manager's Report:**

Significant Activity Report link:
https://www.hartford-vt.org/ArchiveCenter/ViewFile/Item/209

Town Manager Report:

Town Hall Re-Opening
As part of Vermont Forward, the re-opening plan, I have developed a plan for a phased re-opening of Town Hall. It's currently under final review with the Department Directors. If allows for staff to ensure that we have enough signage and processes to comply with the core four universal guidelines of reopening: masks, distance, handwashing/sanitizing, and Covid-19 symptoms checks. I'm remaining in contact with our Health Officer to ensure that I can execute our plan within the guidelines of the Vermont Forward plan, which requires specific vaccination percentages for each phase. Please follow the Town on Facebook, join the Hartford listserv, and look out for other methods of communication on how we're reopening to serve the community.

Town of Hartford Cemeteries
Thank you to Henry Hazen for spending a lovely morning with me at the Christian Street Cemetery. Henry is retiring from his role leading the cemetery as of June 30th. At that time, the Town will become responsible for the cemetery. I've been working with several department directors to prepare for managing the cemetery which is still active. We are also determining how we can ensure that all Town managed cemeteries have accurate records, a regular maintenance plan, and a restoration plan. This is a long-term project. I anticipate that it will take time and outside help to ensure that the plot data for the historic cemeteries is complete as an accurate as possible.

Summer Construction
While it snowed on Friday, Town staff is preparing for our summer construction, both local- and state-managed projects. Thank you to our Public Works staff for a recent downtown walk so I could better visualize the projects. Kim Souza joined us and we all learned a lot. Stay tuned for the release of a multiple stream communications plan as staff take care of some vital infrastructure projects.

Outdoor Downtown WRJ Dining
I, along with several Departments, are working to assist downtown business with outdoor dining requirements, including permitting and safety inspections. We know that our local businesses are balancing the Vermont Forward capacity guidelines, our vital summer construction projects, and their past reduced revenue. Thank you to everyone for their flexibility and patience as we balance several considerations.

End of Fiscal Year Financials
As we move into the final two months of fiscal year 2021, our Finance team is ensuring that we're managing cash flow, executing projects, and wrapping up items. We're also preparing for our annual audit and I look forward to the feedback the auditors provide.

Upcoming Projects
In the next few weeks, I'll be finalizing plans for diversity, equity, and inclusion workshops during the rest of calendar year 2021. We're also working on a contract to provide additional community wellness staff and a needs assessment for Hartford, so we know where to focus our efforts. Finally, we've identified funding for a new Town website and will be developing a public request for proposals for the project.

4. **Board Reports, Motions & Ordinances:**

a. Climate Action Plan – Planning and Development and The Climate Action Committee

Background: In December of 2019, the Selectboard and School Board voted unanimously to pass a Joint Resolution Declaring a Climate Emergency ("the Resolution"). By declaring an emergency, the Resolution makes climate change a defining focus for Town planning, funding, and action, and resolves the Town to achieve net-zero greenhouse gas (GHG) emissions town-wide by 2030, while ensuring the response is "just and equitable, especially with respect to the most vulnerable and impacted members of society." The Resolution led to pursuing development of a plan that "identifies action steps in response to the climate emergency and explains how progress will be tracked and measured". In March of 2020, Hartford voters passed Article 25, requiring the development, operation, and maintenance of the Town's municipal infrastructure and equipment achieve carbon neutrality by 2027. The Town budgeted $30,000 in FY 2021 to hire a consultant to develop an action plan for achieving these goals. In September of 2020, the Selectboard contracted with paleBLUEdot (pBd) to assist the Town in the plan development.

What's Next:

- Wrap up the collaborative stakeholder planning process
- Create a full draft Climate Action Plan (CAP) and Implementation Matrix
- Bring draft CAP to Selectboard for review and input
- Finalize the CAP including a project summary and prioritization for implementation through the Climate Action Reserve Fund

b. US Route 4/5 Intersection Scoping Study Alternatives Presentation – Public Works and VTrans

Presentation Link: 4.b. US Rte 45\Hartford NH 020-2(44) Preferred Alternative Presentation.pdf

Purpose
The purpose of this project is to develop intersection improvements that will enhance safety at the intersection of US Route 5 & US Route 4 for all users, reduce the number of vehicle lanes on US Route 5, and improve accommodations for pedestrians and cyclists.

Needs
Enhance Safety for All Users
Retain Mobility
Improve Pedestrian and Bicycle Facilities

Short-Term Preferred Alternative: Road Diet with Ramp Removal
Long-Term Preferred Alternative: Roundabout

Motion: Selectboard Clerk, Kim Souza made the motion to endorse the conceptual design as presented by VTrans so that the project can move further into the design process. Selectboard Member, Ally Tufenkjian seconded the motion. 5 were in favor and 1 (Brown) was not in favor. The motion passed.

c. VA Cut-off Road Bridge Update – Public Works and VTrans

Presentation Link: 4.c.VA Cut-off Road\Hartford Bridge 7 Informational Meeting 4-20-21.pdf

The project team for the VA Cutoff Bridge has been busy preparing the VA Cutoff Bridge Replacement Project for construction in 2024.

Currently, the project is in the design, permitting, and property owner meeting phase. As part of this process, the team asked to hold a public presentation to update the community.

d. Local Emergency Management Plan Adoption – Fire

Background: In accordance with 20 V.S.A § 6 and the 2013 State Emergency Operations Plan, "each Vermont jurisdiction is expected to develop and maintain a Local Emergency Operations Plan". A current local emergency plan is also required for municipalities to receive federal preparedness funds and increased state reimbursement through the Emergency Relief and Assistance Fund (ERAF).

Discussion: Municipalities should review and update their emergency plans annually and readopt them between Town Meeting and May 1 every year. Municipalities report adoption of LEMPs through their Regional Planning Commission with the LEMP adoption form.

Motion: Selectboard Member, Dennis Brown made the motion to adopt the 101 Local Emergency Management Plan. Selectboard Member, Julia Dalphin seconded the motion. All were in favor and the motion passed.

e. Arbor Day Proclamation – Parks & Rec

TOWN OF HARTFORD, VERMONT ARBOR DAY PROCLAMATION 2021

WHEREAS *~ Vermonters have long recognized the contributions forests provide to the* ecological, social and economic sustainability of the state; and

WHEREAS *~ Trees in our cities and towns increases property values, enhances economic* vitality of business areas and beautify our community; and

WHEREAS *~ Vermonters are encouraged to become stewards of their own environment by* managing forest land, and planting and maintaining trees to improve the quality of life that we all enjoy;

NOW THEREFORE *~ We, the Selectboard, and on behalf of the citizens of the Town of* Hartford, do hereby proclaim May *1, 2021 as Arbor Day in the Town of Hartford and we* urge all citizens to celebrate Arbor Day, to support efforts to protect our trees and woodlands, and to support our community forestry program.

Signed this 20th day of April, 2021

Selectboard Member, Julia Dalphin made to motion to accept the Proclamation as read. Selectboard Member, Ally Tufenkjian seconded the motion. All were in favor and the motion passed.

f. Town of Hartford Encampment Response Policy – Town Manager

Link to the Policy: 4.f. Emerg. Shelters\042021 Agenda Memo Encampment Response Policy.pdf

Information:
On April 15, 2021 I, Town Manager, activated the Town of Hartford Encampment Response Policy. This goal of the policy is to manage the adverse impacts of homeless encampments by balancing the interests of all residents and focusing encampment actions on mitigating negative outcomes as they pertain to public safety and public health.

The policy aims to create clear criteria for designated high-sensitivity areas, findings that will prompt intervention, and guidance on addressing those findings. This includes promoting voluntary compliance and strategies to address non-compliance by the individuals residing in the encampment.

Financial Impact: The complete financial impact of an encampment response will change depending on the specifics of an encampment. However, there may be costs associated with providing services to the unhoused people, cleaning the encampment or debris, or mitigating health hazards that require specialized attention such as vermin or biological hazards.

g. Strategic Equity and Inclusion Plan - Selectboard

Joe Major has met with the authors of the Strategic Plan to get insight into its history as it is now 2 years old. He is looking at it from the 10,000-foot view and to see how we have progressed. Currently the has been no data collected except from the Police Department. To find a starting point we need to begin to start a process with all departments for both employment and services for data collection.

V. Local Liquor Control Board: Selectboard Chair, Dan Fraser recessed the Selectboard meeting and opened the Local Liquor Control Board at 928 PM.

New: 1. Consider the Approval of the Nostalgia Café LLC, 5945 Woodstock Road, White River Junction, VT 05001 for 1st, 2nd and Outside Consumption Liquor Licenses.

Selectboard Member, Dennis Brown made the motion to Approve Nostalgia Café LLC, 5945 Woodstock Road, White River Junction, VT 05001 for a 1st, 2nd and Outside Consumption liquor license. Selectboard Member, Ally Tufenkjian seconded the motion. 4 approved, 1 abstained (Fraser) and 1 recused (Souza). The motion passed.

Renewals: 1. Consider the Approval of the Public House at Quechee Gorge, LLC, 5813 Woodstock Road, Quechee, VT 05059 for 1st, 3rd and Outside Consumption Liquor Licenses.

Selectboard Vice Chair, Joe Major made the motion to approve the Public House at Quechee Gorge, LLC, 5813 Woodstock Road, Quechee, VT 05059 for 1st, 3rd and Outside Consumption Liquor Licenses. Selectboard Member, Julia Dalphin seconded the motion. 4 approved, 1 abstained (Fraser) and 1 recused (Souza). The motion passed.

2. Consider the Approval of the Public House Diner, Inc. 5573 Woodstock Road, Quechee, VT 05059 for a 1st Class Liquor License.

Selectboard Member, Ally Tufenkjian made the motion to approve the Public House Diner, Inc. 5573 Woodstock Road, Quechee, VT 05059 for a 1st Class Liquor License. Selectboard Vice Chair, Joe Major seconded the motion. 4 approved, 1 abstained (Fraser) and 1 recused (Souza). The motion passed.

Selectboard Chair, Dan Fraser closed the Local Liquor Control Board at 9:35 PM and reopened the Selectboard Meeting.

VI. Commission Meetings Reports

Joe Major reported from HCOREI. They had a good presentation by Laura Perez on race and disabilities actions with police in general and HPD that has actually had more training in this than the State has done. Still work to be done so making sure that training continues. Mr. Major also reported on the joint School Board and Selectboard and HCOREI community engagement meeting to try to make it better. This needs to be advertised more to have the community participate more.

Dennis Brown reported from the Historic Preservation Commission and the Planning Commission joint meeting in regards to the Hartford Historic Demolition Ordinance. They are still working on it and will meet again. Remember Green Up day on May 1st.

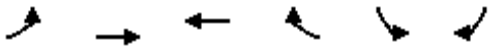
VII. Consent Agenda: Selectboard Clerk, Kim Souza made the motion to accept the Consent Agenda. Selectboard Member, Ally Tufenkjian.

Approve Payroll Ending: 4/17/2021
Approve Meeting Minutes of: 4/6/2021
Approve A/P Manifest of: 4/6/2021 & 4/16/2021 & 4/20/2021

Selectboard Meeting Dates of: Approved: **5/4/2021 & 5/18/2021**

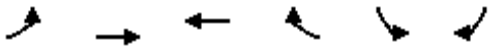
IX. Adjourn the Selectboard Meeting: Selectboard Clerk, Kim Souza made the motion to adjourn the meeting at 9:40 PM. Selectboard Member, Ally Tufenkjian seconded the motion. All were in favor and the motion passed.

Appendix-G: Synchro Reports



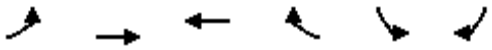
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	95	310	190	70	120	100
Future Volume (vph)	95	310	190	70	120	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		8%	0%		0%	
Storage Length (ft)	170			200	200	200
Storage Lanes	1			1	1	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1547	3094	3343	1495	1719	1538
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1547	3094	3343	1495	1719	1538
Link Speed (mph)		40	40		30	
Link Distance (ft)		863	658		184	
Travel Time (s)		14.7	11.2		4.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.73	0.67
Heavy Vehicles (%)	12%	12%	8%	8%	5%	5%
Adj. Flow (vph)	103	337	207	76	164	149
Shared Lane Traffic (%)						
Lane Group Flow (vph)	103	337	207	76	164	149
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.05	1.05	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 27.2%		ICU Level of Service A	
Analysis Period (min) 15			



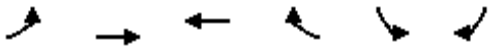
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	190	440	340	140	120	120
Future Volume (vph)	190	440	340	140	120	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		8%	0%		0%	
Storage Length (ft)	170			200	200	200
Storage Lanes	1			1	1	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1619	2888	3574	1553	1736	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1619	2888	3574	1553	1736	1583
Link Speed (mph)		40	40		45	
Link Distance (ft)		863	658		184	
Travel Time (s)		14.7	11.2		2.8	
Peak Hour Factor	0.93	0.95	0.82	0.85	0.79	0.96
Heavy Vehicles (%)	7%	20%	1%	4%	4%	2%
Adj. Flow (vph)	204	463	415	165	152	125
Shared Lane Traffic (%)						
Lane Group Flow (vph)	204	463	415	165	152	125
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.05	1.05	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 36.6%		ICU Level of Service A	
Analysis Period (min) 15			



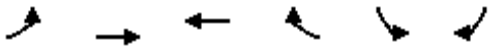
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	106	344	211	78	111	134
Future Volume (vph)	106	344	211	78	111	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		8%	0%		0%	
Storage Length (ft)	170			200	200	200
Storage Lanes	1			1	1	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1547	3094	3343	1495	1719	1538
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1547	3094	3343	1495	1719	1538
Link Speed (mph)		40	40		30	
Link Distance (ft)		863	658		184	
Travel Time (s)		14.7	11.2		4.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.73	0.67
Heavy Vehicles (%)	12%	12%	8%	8%	5%	5%
Adj. Flow (vph)	115	374	229	85	152	200
Shared Lane Traffic (%)						
Lane Group Flow (vph)	115	374	229	85	152	200
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.05	1.05	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 27.9%		ICU Level of Service A	
Analysis Period (min) 15			



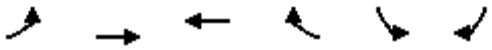
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	211	488	378	156	134	134
Future Volume (vph)	211	488	378	156	134	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		8%	0%		0%	
Storage Length (ft)	170			200	200	200
Storage Lanes	1			1	1	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1547	3094	3343	1495	1719	1538
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1547	3094	3343	1495	1719	1538
Link Speed (mph)		40	40		45	
Link Distance (ft)		863	658		184	
Travel Time (s)		14.7	11.2		2.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.73	0.67
Heavy Vehicles (%)	12%	12%	8%	8%	5%	5%
Adj. Flow (vph)	229	530	411	170	184	200
Shared Lane Traffic (%)						
Lane Group Flow (vph)	229	530	411	170	184	200
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.05	1.05	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 39.6%		ICU Level of Service A	
Analysis Period (min) 15			



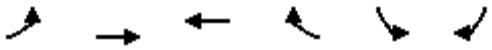
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	95	310	190	70	120	100
Future Volume (vph)	95	310	190	70	120	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		-8%	0%		0%	
Storage Length (ft)	170			200	200	200
Storage Lanes	1			1	1	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1676	1764	1759	1495	1719	1538
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1676	1764	1759	1495	1719	1538
Link Speed (mph)		40	40		30	
Link Distance (ft)		863	658		184	
Travel Time (s)		14.7	11.2		4.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.73	0.67
Heavy Vehicles (%)	12%	12%	8%	8%	5%	5%
Adj. Flow (vph)	103	337	207	76	164	149
Shared Lane Traffic (%)						
Lane Group Flow (vph)	103	337	207	76	164	149
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	0.95	0.95	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 31.9%		ICU Level of Service A	
Analysis Period (min) 15			



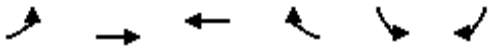
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	190	440	340	140	120	120
Future Volume (vph)	190	440	340	140	120	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		8%	0%		0%	
Storage Length (ft)	170			200	200	200
Storage Lanes	1			1	1	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1619	1520	1881	1553	1736	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1619	1520	1881	1553	1736	1583
Link Speed (mph)		40	40		45	
Link Distance (ft)		863	658		184	
Travel Time (s)		14.7	11.2		2.8	
Peak Hour Factor	0.93	0.95	0.82	0.85	0.79	0.96
Heavy Vehicles (%)	7%	20%	1%	4%	4%	2%
Adj. Flow (vph)	204	463	415	165	152	125
Shared Lane Traffic (%)						
Lane Group Flow (vph)	204	463	415	165	152	125
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.05	1.05	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	45.1%	ICU Level of Service	A
Analysis Period (min)	15		



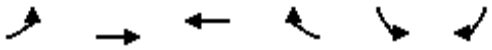
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	106	344	211	78	111	134
Future Volume (vph)	106	344	211	78	111	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		8%	0%		0%	
Storage Length (ft)	170			200	200	200
Storage Lanes	1			1	1	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1547	1629	1759	1495	1719	1538
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1547	1629	1759	1495	1719	1538
Link Speed (mph)		40	40		30	
Link Distance (ft)		863	658		184	
Travel Time (s)		14.7	11.2		4.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.73	0.67
Heavy Vehicles (%)	12%	12%	8%	8%	5%	5%
Adj. Flow (vph)	115	374	229	85	152	200
Shared Lane Traffic (%)						
Lane Group Flow (vph)	115	374	229	85	152	200
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.05	1.05	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 33.1%		ICU Level of Service A	
Analysis Period (min) 15			



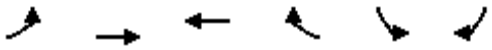
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	211	488	378	156	134	134
Future Volume (vph)	211	488	378	156	134	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		8%	0%		0%	
Storage Length (ft)	170			200	200	200
Storage Lanes	1			1	1	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1547	1629	1759	1495	1719	1538
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1547	1629	1759	1495	1719	1538
Link Speed (mph)		40	40		45	
Link Distance (ft)		863	658		184	
Travel Time (s)		14.7	11.2		2.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.73	0.67
Heavy Vehicles (%)	12%	12%	8%	8%	5%	5%
Adj. Flow (vph)	229	530	411	170	184	200
Shared Lane Traffic (%)						
Lane Group Flow (vph)	229	530	411	170	184	200
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.05	1.05	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 49.0%		ICU Level of Service A	
Analysis Period (min) 15			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	95	310	190	70	120	100
Future Volume (vph)	95	310	190	70	120	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		-8%	0%		0%	
Storage Length (ft)	170			200	200	200
Storage Lanes	1			1	1	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1676	1764	1759	1495	1719	1538
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1676	1764	1759	1495	1719	1538
Link Speed (mph)		40	40		30	
Link Distance (ft)		863	658		184	
Travel Time (s)		14.7	11.2		4.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.73	0.67
Heavy Vehicles (%)	12%	12%	8%	8%	5%	5%
Adj. Flow (vph)	103	337	207	76	164	149
Shared Lane Traffic (%)						
Lane Group Flow (vph)	103	337	207	76	164	149
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	0.95	0.95	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 31.9%		ICU Level of Service A	
Analysis Period (min) 15			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	190	440	340	140	120	120
Future Volume (vph)	190	440	340	140	120	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		8%	0%		0%	
Storage Length (ft)	170			200	200	200
Storage Lanes	1			1	1	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1619	1520	1881	1553	1736	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1619	1520	1881	1553	1736	1583
Link Speed (mph)		40	40		45	
Link Distance (ft)		863	658		184	
Travel Time (s)		14.7	11.2		2.8	
Peak Hour Factor	0.93	0.95	0.82	0.85	0.79	0.96
Heavy Vehicles (%)	7%	20%	1%	4%	4%	2%
Adj. Flow (vph)	204	463	415	165	152	125
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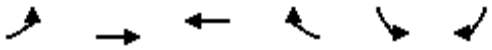
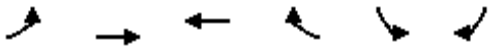
Lane Group Flow (vph)	204	463	415	165	152	125
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.05	1.05	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization	45.1%	ICU Level of Service	A
Analysis Period (min)	15		



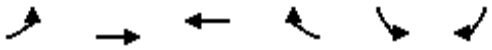
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	106	344	211	78	111	134
Future Volume (vph)	106	344	211	78	111	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		8%	0%		0%	
Storage Length (ft)	170			200	200	200
Storage Lanes	1			1	1	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1547	1629	1759	1495	1719	1538
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1547	1629	1759	1495	1719	1538
Link Speed (mph)		40	40		30	
Link Distance (ft)		863	658		184	
Travel Time (s)		14.7	11.2		4.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.73	0.67
Heavy Vehicles (%)	12%	12%	8%	8%	5%	5%
Adj. Flow (vph)	115	374	229	85	152	200
Shared Lane Traffic (%)						
Lane Group Flow (vph)	115	374	229	85	152	200
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.05	1.05	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 33.1%		ICU Level of Service A	
Analysis Period (min) 15			

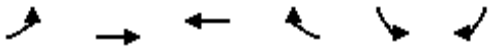


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	211	488	378	156	134	134
Future Volume (vph)	211	488	378	156	134	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		8%	0%		0%	
Storage Length (ft)	170			200	200	200
Storage Lanes	1			1	1	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1547	1629	1759	1495	1719	1538
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1547	1629	1759	1495	1719	1538
Link Speed (mph)		40	40		45	
Link Distance (ft)		863	658		184	
Travel Time (s)		14.7	11.2		2.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.73	0.67
Heavy Vehicles (%)	12%	12%	8%	8%	5%	5%
Adj. Flow (vph)	229	530	411	170	184	200
Shared Lane Traffic (%)						
Lane Group Flow (vph)	229	530	411	170	184	200
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.05	1.05	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 49.0%		ICU Level of Service A	
Analysis Period (min) 15			



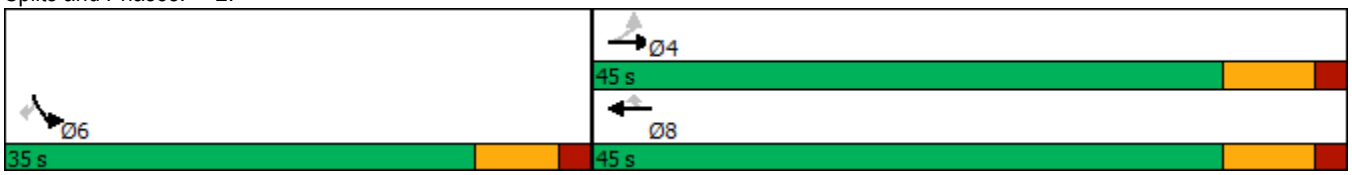
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	95	310	190	70	120	100
Future Volume (vph)	95	310	190	70	120	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		-8%	0%		0%	
Storage Length (ft)	170			200	200	200
Storage Lanes	1			1	1	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1676	1764	1759	1495	1719	1538
Flt Permitted	0.628				0.950	
Satd. Flow (perm)	1108	1764	1759	1495	1719	1538
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				76		149
Link Speed (mph)		40	40		30	
Link Distance (ft)		863	658		184	
Travel Time (s)		14.7	11.2		4.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.73	0.67
Heavy Vehicles (%)	12%	12%	8%	8%	5%	5%
Adj. Flow (vph)	103	337	207	76	164	149
Shared Lane Traffic (%)						
Lane Group Flow (vph)	103	337	207	76	164	149
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	0.95	0.95	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2	1	1	1
Detector Template	Left	Thru	Thru	Right	Left	Right
Leading Detector (ft)	20	100	100	20	20	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	6	20	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	Perm	NA	NA	Perm	Prot	Perm

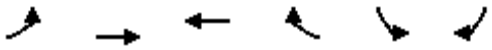


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Protected Phases		4	8		6	
Permitted Phases	4			8		6
Detector Phase	4	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	25.5	25.5	25.5	25.5	25.0	25.0
Total Split (s)	45.0	45.0	45.0	45.0	35.0	35.0
Total Split (%)	56.3%	56.3%	56.3%	56.3%	43.8%	43.8%
Maximum Green (s)	37.5	37.5	37.5	37.5	28.0	28.0
Yellow Time (s)	5.5	5.5	5.5	5.5	5.0	5.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.5	7.5	7.5	7.5	7.0	7.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	Min	Min
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
Act Effct Green (s)	12.7	12.7	12.7	12.7	9.2	9.2
Actuated g/C Ratio	0.35	0.35	0.35	0.35	0.25	0.25
v/c Ratio	0.27	0.55	0.34	0.13	0.38	0.30
Control Delay	11.0	13.8	10.8	3.5	15.3	5.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.0	13.8	10.8	3.5	15.3	5.0
LOS	B	B	B	A	B	A
Approach Delay		13.2	8.9		10.4	
Approach LOS		B	A		B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 80			
Actuated Cycle Length: 36.8			
Natural Cycle: 55			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.55			
Intersection Signal Delay: 11.2		Intersection LOS: B	
Intersection Capacity Utilization 40.2%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 2:



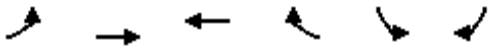


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	190	440	340	140	120	120
Future Volume (vph)	190	440	340	140	120	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		8%	0%		0%	
Storage Length (ft)	170			200	200	200
Storage Lanes	1			1	1	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1619	1520	1881	1553	1736	1583
Flt Permitted	0.491				0.950	
Satd. Flow (perm)	837	1520	1881	1553	1736	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				165		125
Link Speed (mph)		40	40		45	
Link Distance (ft)		863	658		184	
Travel Time (s)		14.7	11.2		2.8	
Peak Hour Factor	0.93	0.95	0.82	0.85	0.79	0.96
Heavy Vehicles (%)	7%	20%	1%	4%	4%	2%
Adj. Flow (vph)	204	463	415	165	152	125
Shared Lane Traffic (%)						
Lane Group Flow (vph)	204	463	415	165	152	125
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.05	1.05	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2	1	1	1
Detector Template	Left	Thru	Thru	Right	Left	Right
Leading Detector (ft)	20	100	100	20	20	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	6	20	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	Perm	NA	NA	Perm	Prot	Perm

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Protected Phases		4	8		6	
Permitted Phases	4			8		6
Detector Phase	4	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	65.0	65.0	65.0	65.0	30.0	30.0
Total Split (%)	68.4%	68.4%	68.4%	68.4%	31.6%	31.6%
Maximum Green (s)	60.5	60.5	60.5	60.5	25.5	25.5
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	Min	Min
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
Act Effct Green (s)	17.8	17.8	17.8	17.8	9.2	9.2
Actuated g/C Ratio	0.49	0.49	0.49	0.49	0.25	0.25
v/c Ratio	0.50	0.62	0.45	0.20	0.35	0.25
Control Delay	11.3	11.2	7.8	1.8	15.7	5.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.3	11.2	7.8	1.8	15.7	5.3
LOS	B	B	A	A	B	A
Approach Delay		11.2	6.1		11.0	
Approach LOS		B	A		B	

Intersection Summary			
Area Type:	Other		
Cycle Length: 95			
Actuated Cycle Length: 36.5			
Natural Cycle: 55			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.62			
Intersection Signal Delay: 9.2		Intersection LOS: A	
Intersection Capacity Utilization 46.3%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 2:

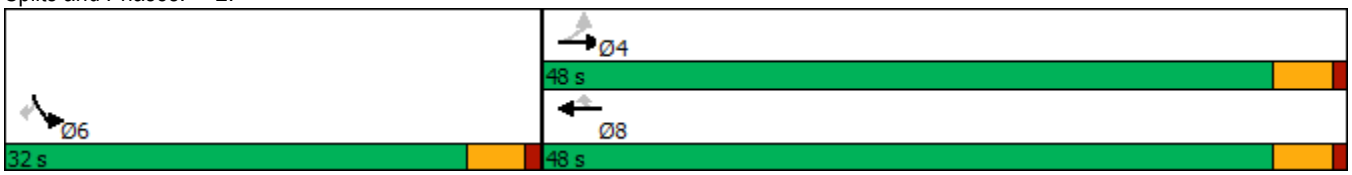


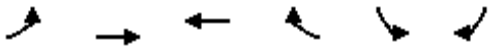
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	106	344	211	78	111	134
Future Volume (vph)	106	344	211	78	111	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		8%	0%		0%	
Storage Length (ft)	170			200	200	200
Storage Lanes	1			1	1	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1547	1629	1759	1495	1719	1538
Flt Permitted	0.616				0.950	
Satd. Flow (perm)	1003	1629	1759	1495	1719	1538
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				85		200
Link Speed (mph)		40	40		30	
Link Distance (ft)		863	658		184	
Travel Time (s)		14.7	11.2		4.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.73	0.67
Heavy Vehicles (%)	12%	12%	8%	8%	5%	5%
Adj. Flow (vph)	115	374	229	85	152	200
Shared Lane Traffic (%)						
Lane Group Flow (vph)	115	374	229	85	152	200
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.05	1.05	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2	1	1	1
Detector Template	Left	Thru	Thru	Right	Left	Right
Leading Detector (ft)	20	100	100	20	20	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	6	20	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	Perm	NA	NA	Perm	Prot	Perm

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Protected Phases		4	8		6	
Permitted Phases	4			8		6
Detector Phase	4	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	48.0	48.0	48.0	48.0	32.0	32.0
Total Split (%)	60.0%	60.0%	60.0%	60.0%	40.0%	40.0%
Maximum Green (s)	43.5	43.5	43.5	43.5	27.5	27.5
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	Min	Min
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
Act Effct Green (s)	13.0	13.0	13.0	13.0	8.6	8.6
Actuated g/C Ratio	0.42	0.42	0.42	0.42	0.28	0.28
v/c Ratio	0.27	0.55	0.31	0.13	0.32	0.35
Control Delay	7.9	10.3	7.3	2.3	12.2	4.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.9	10.3	7.3	2.3	12.2	4.4
LOS	A	B	A	A	B	A
Approach Delay		9.7	6.0		7.7	
Approach LOS		A	A		A	

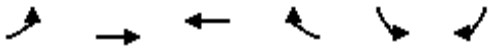
Intersection Summary			
Area Type:	Other		
Cycle Length: 80			
Actuated Cycle Length: 31			
Natural Cycle: 45			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.55			
Intersection Signal Delay: 8.1		Intersection LOS: A	
Intersection Capacity Utilization 34.4%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 2:





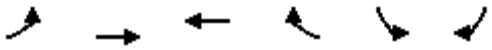
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	211	488	378	156	134	134
Future Volume (vph)	211	488	378	156	134	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		8%	0%		0%	
Storage Length (ft)	170			200	200	200
Storage Lanes	1			1	1	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1547	1629	1759	1495	1719	1538
Flt Permitted	0.519				0.950	
Satd. Flow (perm)	845	1629	1759	1495	1719	1538
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				170		200
Link Speed (mph)		40	40		45	
Link Distance (ft)		863	658		184	
Travel Time (s)		14.7	11.2		2.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.73	0.67
Heavy Vehicles (%)	12%	12%	8%	8%	5%	5%
Adj. Flow (vph)	229	530	411	170	184	200
Shared Lane Traffic (%)						
Lane Group Flow (vph)	229	530	411	170	184	200
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.05	1.05	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Turn Type	Perm	NA	NA	Perm	Prot	Perm
Protected Phases		4	8		6	
Permitted Phases	4			8		6
Detector Phase	4	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	60.0	60.0	60.0	60.0	30.0	30.0
Total Split (%)	66.7%	66.7%	66.7%	66.7%	33.3%	33.3%
Maximum Green (s)	52.5	52.5	52.5	52.5	23.0	23.0
Yellow Time (s)	5.5	5.5	5.5	5.5	5.0	5.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.5	7.5	7.5	7.5	7.0	7.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Recall Mode	None	None	None	None	Min	Min
Act Effct Green (s)	23.0	23.0	23.0	23.0	11.2	11.2
Actuated g/C Ratio	0.46	0.46	0.46	0.46	0.23	0.23
v/c Ratio	0.59	0.70	0.50	0.22	0.48	0.40
Control Delay	16.8	16.2	11.6	2.3	23.5	6.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.8	16.2	11.6	2.3	23.5	6.5
LOS	B	B	B	A	C	A
Approach Delay		16.4	8.9		14.6	
Approach LOS		B	A		B	

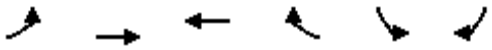
Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 49.7			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.70			
Intersection Signal Delay: 13.5		Intersection LOS: B	
Intersection Capacity Utilization 57.3%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 2:



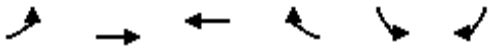
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	95	310	190	70	120	100
Future Volume (vph)	95	310	190	70	120	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		-8%	0%		0%	
Storage Length (ft)	170			200	200	200
Storage Lanes	0			0	0	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.964		0.936	
Flt Protected		0.988			0.974	
Satd. Flow (prot)	0	1743	1696	0	1650	0
Flt Permitted		0.988			0.974	
Satd. Flow (perm)	0	1743	1696	0	1650	0
Link Speed (mph)		40	40		45	
Link Distance (ft)		863	658		482	
Travel Time (s)		14.7	11.2		7.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.73	0.67
Heavy Vehicles (%)	12%	12%	8%	8%	5%	5%
Adj. Flow (vph)	103	337	207	76	164	149
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	440	283	0	313	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	0.95	0.95	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Yield	Yield		Yield	

Intersection Summary			
Area Type:	Other		
Control Type: Roundabout			
Intersection Capacity Utilization 58.6%		ICU Level of Service B	
Analysis Period (min) 15			



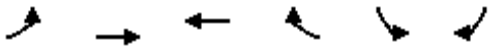
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	190	440	340	140	120	120
Future Volume (vph)	190	440	340	140	120	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		8%	0%		0%	
Storage Length (ft)	170			200	200	200
Storage Lanes	0			0	0	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.962		0.939	
Flt Protected		0.985			0.973	
Satd. Flow (prot)	0	1549	1795	0	1684	0
Flt Permitted		0.985			0.973	
Satd. Flow (perm)	0	1549	1795	0	1684	0
Link Speed (mph)		40	40		45	
Link Distance (ft)		863	658		449	
Travel Time (s)		14.7	11.2		6.8	
Peak Hour Factor	0.93	0.95	0.82	0.85	0.79	0.96
Heavy Vehicles (%)	7%	20%	1%	4%	4%	2%
Adj. Flow (vph)	204	463	415	165	152	125
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	667	580	0	277	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.05	1.05	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Yield	Yield		Yield	

Intersection Summary			
Area Type:	Other		
Control Type: Roundabout			
Intersection Capacity Utilization 84.1%		ICU Level of Service E	
Analysis Period (min) 15			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	106	344	211	78	111	134
Future Volume (vph)	106	344	211	78	111	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		8%	0%		0%	
Storage Length (ft)	170			200	200	200
Storage Lanes	0			0	0	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.963		0.923	
Flt Protected		0.988			0.979	
Satd. Flow (prot)	0	1609	1694	0	1635	0
Flt Permitted		0.988			0.979	
Satd. Flow (perm)	0	1609	1694	0	1635	0
Link Speed (mph)		40	40		30	
Link Distance (ft)		863	658		398	
Travel Time (s)		14.7	11.2		9.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.73	0.67
Heavy Vehicles (%)	12%	12%	8%	8%	5%	5%
Adj. Flow (vph)	115	374	229	85	152	200
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	489	314	0	352	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.05	1.05	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Yield	Yield		Yield	

Intersection Summary			
Area Type:	Other		
Control Type: Roundabout			
Intersection Capacity Utilization 64.2%		ICU Level of Service C	
Analysis Period (min) 15			



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	211	488	378	156	134	134
Future Volume (vph)	211	488	378	156	134	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)		8%	0%		0%	
Storage Length (ft)	170			200	200	200
Storage Lanes	0			0	0	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.960		0.930	
Flt Protected		0.985			0.977	
Satd. Flow (prot)	0	1604	1689	0	1644	0
Flt Permitted		0.985			0.977	
Satd. Flow (perm)	0	1604	1689	0	1644	0
Link Speed (mph)		40	40		45	
Link Distance (ft)		863	658		344	
Travel Time (s)		14.7	11.2		5.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.73	0.67
Heavy Vehicles (%)	12%	12%	8%	8%	5%	5%
Adj. Flow (vph)	229	530	411	170	184	200
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	759	581	0	384	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.05	1.05	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Yield	Yield		Yield	

Intersection Summary			
Area Type:	Other		
Control Type: Roundabout			
Intersection Capacity Utilization 92.4%		ICU Level of Service F	
Analysis Period (min) 15			

Appendix-H: Alternative Plan Layouts

LEGEND

- PROPOSED ROADWAY
- EXISTING CONCRETE ISLAND
- EXISTING GRASS ISLAND
- EXISTING STATE RIGHT-OF-WAY LINE
- EXISTING PROPERTY LINE

N

VT STATE PLANE GRID

0 50 100

SCALE IN FEET

PROJECT NAME: HARTFORD

PROJECT NUMBER: NH 020-2(44)

FILE NAME: t17t048alt2.dgn
PROJECT LEADER: E. PARIZO
DESIGNED BY: N. BREDICE
ALTERNATIVE #2

PLOT DATE: 5/6/2021
DRAWN BY: N. BREDICE
CHECKED BY: E. PARIZO
SHEET $S#$ OF $T#$

LEGEND

- PROPOSED ROADWAY
- EXISTING CONCRETE ISLAND
- EXISTING GRASS ISLAND
- REMOVAL OF EXISTING ROADWAY
- EXISTING STATE RIGHT-OF-WAY LINE
- EXISTING PROPERTY LINE

N

VT STATE PLANE GRID

0 50 100

SCALE IN FEET

PROJECT NAME: HARTFORD

PROJECT NUMBER: NH 020-2(44)

FILE NAME: t17t048alt3.dgn
PROJECT LEADER: E. PARIZO
DESIGNED BY: N. BREDICE
ALTERNATIVE #3

PLOT DATE: 5/6/2021
DRAWN BY: N. BREDICE
CHECKED BY: E. PARIZO
SHEET $S#$ OF $T#$

LEGEND

- PROPOSED ROADWAY
- EXISTING CONCRETE ISLAND
- EXISTING GRASS ISLAND
- REMOVAL OF EXISTING ROADWAY
- TRAFFIC SIGNAL MAST ARM & POLE
- PEDESTAL POST MOUNTED TRAFFIC SIGNAL
- LUMINAIRE & BRACKET ARM
- EXISTING STATE RIGHT-OF-WAY LINE
- EXISTING PROPERTY LINE

N

VT STATE PLANE GRID

0 50 100

SCALE IN FEET

PROJECT NAME: HARTFORD

PROJECT NUMBER: NH 020-2(44)

FILE NAME: t17t048alt4.dgn
PROJECT LEADER: E. PARIZO
DESIGNED BY: N. BREDICE
ALTERNATIVE #4

PLOT DATE: 5/6/2021
DRAWN BY: N. BREDICE
CHECKED BY: E. PARIZO
SHEET $S#$ OF $T#$

LEGEND

- PROPOSED ROADWAY
- EXISTING CONCRETE ISLAND
- EXISTING GRASS ISLAND
- REMOVAL OF EXISTING ROADWAY
- PROPOSED SHARED USE PATH
- PROPOSED ROUNDABOUT APRON
- EXISTING STATE RIGHT-OF-WAY LINE
- EXISTING PROPERTY LINE

N

VT STATE PLANE GRID

0 50 100

SCALE IN FEET

PROJECT NAME: HARTFORD

PROJECT NUMBER: NH 020-2(44)

FILE NAME: t17t048alt5.dgn
PROJECT LEADER: E. PARIZO
DESIGNED BY: K. RECORD
ALTERNATIVE #5

PLOT DATE: 5/6/2021
DRAWN BY: N. BREDICE
CHECKED BY: E. PARIZO
SHEET $S#$ OF $T#$

Appendix-I: VTrans' Management Approval of Scope

Management Approval Of Scope

May 28, 2021

Project: Hartford NH 020-2(44) - US Route 4 and US Route 5 Intersection

Project Manager: Erin Parizo, Traffic Design

Project Briefing: This project definition effort included analysis of alternatives for improvements to safety and mobility at the intersection of US 4/US 5 in Hartford, VT. The Final Report outlines the alternatives that were evaluated, along with the short-term and long-term preferred alternatives that were endorsed by the Town Selectboard on April 20th, 2021. The short-term alternative includes shoulder widening along US Route 5 south of the intersection, removal of the westbound US 4 slip ramp, and vehicle lane reductions and enhanced bicycle facilities through the intersection via updated pavement markings. The short-term alternative is anticipated to be accommodated through the Hartford NH PS24(3) paving project. The long-term preferred alternative is a roundabout at the intersection which provides the best improvements for safety, mobility and operations at the intersection, and creates facilities for all users of the intersection. The long-term preferred alternative is anticipated to be funded through a continuation of the existing EA.

Maintenance of Traffic: The short-term alternative can be incorporated into the programmed paving project and traffic will be maintained consistent with current practices for resurfacing projects. The long-term alternative will require extensive traffic management to ensure safe travel through the intersection during construction, using similar practices as the on-going roundabout projects at Sykes Mountain Avenue in Hartford.

☒ Project Delivery Bureau Management approves the project scope.

☐ Project Delivery Bureau Management will require more information before making a decision.

☐ Project Delivery Bureau Management recommends getting higher level approval for the proposed scope.

☐ Project Delivery Bureau Management does not recommend the project scope.

☐ Project Delivery Bureau Management approves the project scope with modifications.

E-SIGNED by Jesse Devlin
on 2021-06-01 17:39:09 GMT

Highway Safety and Design Program Manager

June 01, 2021

Date

E-SIGNED by Robert M. White
on 2021-06-02 14:14:33 GMT

Project Delivery Bureau Director

June 02, 2021

Date