

# Office of Highway Safety

## Road Safety Audit Review

<b>Town:</b>	Norwich	<b>Date Reviewed:</b>	May 24, 2017
<b>Route:</b>	VT 10a, I-91 NB exit, McKenna Rd	<b>Mile points:</b>	VT 10a MM 0.21 – 0.26

### Location Map



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### RSAR Process

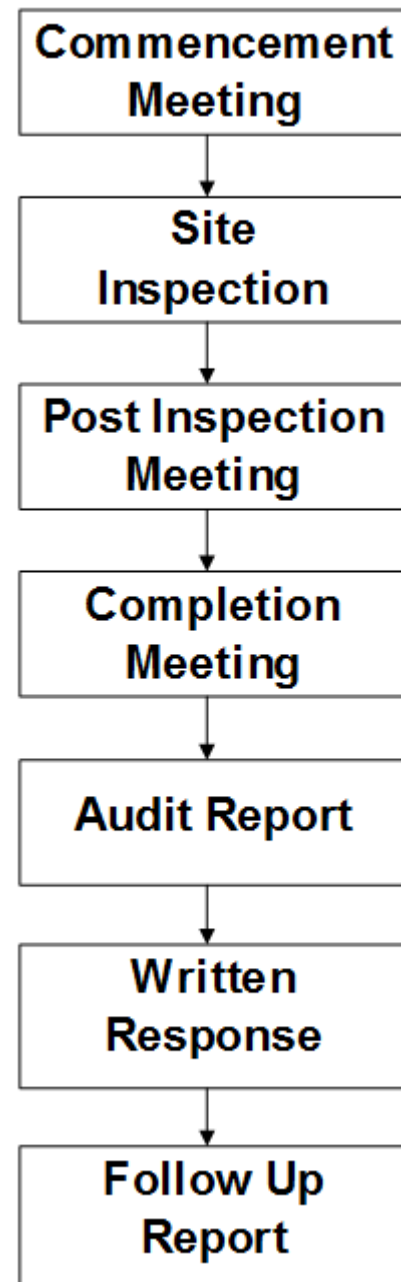
A Road Safety Audit Review (RSAR) is a formal examination of an existing road in which an independent, multi-discipline team (the Audit Team) reports on potential safety issues.

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.

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

**Figure 1 - Road Safety Audit Process**



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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 primary location of this RSAR is the intersection of VT 10a, Montshire Road and McKenna Road. This intersection is between mile points 0.21 and 0.26.

### **Purpose of the RSAR**

This RSAR was conducted at the request of the Town of Norwich to document safety concerns at the intersection of VT 10a, Montshire Road and McKenna Road and to propose countermeasures.

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 might 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:

Michael Blakslee	District 4, VTrans
John Holding,	District 4, VTrans
Jon Kaplan,	Bike/Ped, VTrans
Justin LaPerle,	OHS, VTrans
Derek Lyman,	TSMO, VTrans
Pat McManamon,	DMV, VTrans
Chris Mercon,	TSMO, VTrans
Paul White,	GHSP, VTrans
Kara Yelinek,	Bike/Ped, VTrans

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Phil Dechert,	Town of Norwich
Herb Durfee	Town of Norwich
Doug Robinson,	Town of Norwich PD
Sharon Racusin,	McKenna Road Resident
Rita Seto,	TRORC

### **Information Reviewed**

#### **Geometry**

This study area along VT 10a is comprised of the I-91 exit 13 ramps and of the Montshire/McKenna intersection.

Route 10A is a divided level road that runs west to east.

Traveling west on 10A, the lanes open into two lanes, one for travel on US 5 south and one for traveling to I-91 South and into Norwich Center.

Traveling east, VT 10a has two lanes prior to the ramps. At the ramps intersection, there is a left turn lane to go onto the northbound ram. After this intersection, the lanes merge into one east of the Montshire/McKenna intersection and continue to the Ledyard Bridge.

The exit 13 northbound off ramp intersection is controlled by a traffic signal. The ramp has a slight downgrade and traffic turning right have a dedicated right turn lane.

The Montshire/McKenna road intersection is a four-way intersection controlled by stop signs at the Montshire and at the McKenna approaches.

The next figure shows an aerial view from 2005 and one from 2016. It can be seen that the I-91 exit ramp used to have a slip lane and that there also used to be an exclusive right turn lane for traffic to get on the I-91 northbound on ramp. The space for this exclusive right turn lane is now being used for a bike lane.

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### Speed Limit

The posted speed limit on VT 10a in the area of the McKenna Road intersection is 30 mph.

### Traffic Volumes

The 2014 Average Annual Daily Traffic on VT 10a was 13,900 vehicles per day between the I-91 off ramp and River Road.

The Two Rivers-Ottawa Regional Commission conducted a peak turning movement count on May 9, 2017, between the hours of 6:00 am to 9:00 am and 3:00 pm to 6 pm. The raw count is shown in the following table.

Start Time	McKenna Road From North				VT10A Hanover From East				Montshire Road From South				VT10A Norwich From West			
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds
06:00 AM	1	0	0	0	0	11	0	0	0	0	0	0	0	75	2	0
06:15 AM	2	0	0	0	0	11	0	0	0	0	0	0	0	155	0	0
06:30 AM	0	0	1	0	0	52	0	0	0	0	0	0	0	167	0	0
06:45 AM	1	0	1	0	0	43	0	0	0	0	0	0	5	184	1	0
07:00 AM	1	0	0	0	0	61	0	0	0	0	2	0	3	192	0	0
07:15 AM	1	0	0	0	0	51	2	0	0	0	0	0	9	295	1	0
07:30 AM	0	0	0	0	0	68	2	0	3	0	4	0	6	259	0	0
07:45 AM	0	0	1	0	0	70	4	0	1	0	3	0	5	212	2	0
08:00 AM	2	0	0	0	1	79	6	0	2	0	2	0	8	202	1	0
08:15 AM	0	0	1	0	0	78	2	0	8	0	7	0	13	211	1	0
08:30 AM	1	0	1	0	0	78	0	0	1	0	2	0	7	190	0	0
08:45 AM	0	0	5	0	0	75	1	0	3	0	3	0	4	171	1	0
<b>Total 6:00 to 9:00 am</b>	<b>9</b>	<b>0</b>	<b>10</b>	<b>0</b>	<b>1</b>	<b>677</b>	<b>17</b>	<b>0</b>	<b>18</b>	<b>0</b>	<b>23</b>	<b>0</b>	<b>60</b>	<b>2313</b>	<b>9</b>	<b>0</b>
03:00 PM	2	0	0	0	0	169	2	0	1	0	5	0	3	109	4	0
03:15 PM	4	0	0	0	3	186	3	0	2	0	2	0	6	127	0	0
03:30 PM	5	0	1	0	1	196	1	0	4	0	7	0	3	121	0	0
03:45 PM	0	0	0	0	1	185	2	0	2	0	1	0	4	117	0	0
04:00 PM	1	0	0	0	0	252	0	0	2	0	4	0	2	121	2	0
04:15 PM	1	0	0	0	0	229	4	0	1	0	5	0	7	108	1	0
04:30 PM	2	0	0	0	3	253	2	0	6	0	10	0	1	124	3	0
04:45 PM	1	0	3	0	6	226	1	0	4	0	1	0	4	130	2	0
05:00 PM	0	0	1	0	1	221	7	0	6	0	13	0	11	145	1	0
05:15 PM	0	0	0	0	1	277	4	0	5	0	16	0	2	112	1	0
05:30 PM	0	0	0	0	0	256	1	0	7	0	5	0	1	123	1	0
05:45 PM	4	0	1	0	0	229	1	0	1	0	4	0	0	142	4	0
<b>Total 3:00 to 6:00 pm</b>	<b>20</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>16</b>	<b>2679</b>	<b>28</b>	<b>0</b>	<b>41</b>	<b>0</b>	<b>73</b>	<b>0</b>	<b>44</b>	<b>1479</b>	<b>19</b>	<b>0</b>

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### Pavement Condition

The pavement surface on VT 10a is rated as poor in the area of the I-91 ramps and of the Montshire/McKenna intersection with the year of last work being 2009 (VTransparency, August 7, 2017).

### Traffic Studies

VTrans Traffic Research Unit completed a left turn lane warrant analysis for the intersection of VT 10a and Montshire Road. The analysis was based on year 2017 Design Hour Volumes and shows that a westbound left turn lane is warranted.

VTrans Traffic Research also completed a capacity analyses for the subject intersection with and without an exclusive westbound left turn lane in place. This evaluation indicates that the level of service remains unchanged except for the movements from Montshire Road. The complete results are show in the next table.

	Existing Configuration				With Exclusive Westbound Left-Turn Lane			
	EB LT/TH	WB LT/TH	NB LT/TH/RT	SB LT/TH/RT	EB LT/TH	WB LT/TH	NB LT/TH/RT	SB LT/TH/RT
<b>V/C ratio</b>	0.01	0.02	0.35	0.06	0.01	0.02	0.83	0.06
<b>95% Queue Length</b>	0.0	0.0	1.6	1.6	0.0	0.0	7.1	0.2
<b>Control Delay (s/veh)</b>	11.1	8.8	33.4	33.4	11.1	8.8	195.4	40.3
<b>Level-of-Service (LOS)</b>	B	A	D	E	B	A	F	E

### Past Projects

HES 0170(4) was for the elimination of the yield condition (slip lane) at 1-91 exit #13 Ramp “A” and for the construction of a dedicated right turn lane. This project was completed with STP 2602(1) in 2009.

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Project STP 2602(1) was for the resurfacing of VT 10a. This included the striping of the bike lane as it currently exists. The original design was for two through lanes and one dedicated right turn lane west of McKenna Road. East of McKenna Road (but traveling west), the project plans showed a dedicated left turn lane where there is currently a share left and through lane along with a shared through and right turn lane.

A road safety audit was conducted at this same location in June 2008. A summary is provided at the end of this report.

### Future Projects

There are no known future projects for this area.

### Crash History

The crash history along this segment was reviewed for the five-year period covering the years 2012 to 2016. For the purpose of analyzing crashes, the segment was further divided into two sub areas, namely the intersection with the I-91 exit 13 northbound off ramp and the McKenna intersection.

Overall, along this segment of VT 10a, there were twenty crashes reported during this period. Of the twenty crashes, fourteen crashes took place at the exit 13 intersection and six in the area of the McKenna Road intersection.

The major crash pattern at the I-91 northbound exit ramp is a right angle crash involving a vehicle that is coming off I-91 northbound. Nine of the fourteen crashes at this intersection were of this type (71%). Of the nine crashes, seven happened when the ramp was icy or snow covered (78%). Of the seven crashes that occurred when the road was icy or snow covered, four were in 2014, two in 2015 and one in 2016. During the reporting period, total snowfall amounts were significantly larger in 2013, 2014 and 2015.

In contrast, a previous analysis of crash data indicated that there had been twenty-four crashes at this intersection between 2002 and 2004. The majority of the crashes were rear-end crashes



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at the slip lane (that was present at the time). There had been only three right angle crashes of the type described earlier and only one due to icy or snow on the ramp.

At the McKenna Road intersection, there were only four crashes reported during the 2012-2016 period. Two of these were right angle crashes (one involving a vehicle on the Montshire Road approach because of visibility issue with a snowbank and one with a vehicle on the McKenna Road approach also with a visibility issue caused by a bus that was stopped in the right hand lane. The other two crashes involved shifting lane maneuvers in the eastbound direction.

At total of three crashes were identified during the 2002-2004 three-year period at the McKenna Road intersection. One of the crashes was a right angle crash at McKenna Road. In this case, the driver who entered VT 10a thought that the oncoming westbound vehicle was about to turn left the other two crashes involved single motorists who lost control (one on VT 10a and one on Montshire Road).

Crash narratives are provided at the end of this report along with the 2002-2004 and the 2012-2016 collision diagrams.

### Current Local Concerns

The Town of Norwich reported the following issues:

The left turn to Montshire Road / straight (to Rt. 5) arrow is an issue.

Cars are speeding by McKenna Road in the left lane when cars in the right lane have stopped to let traffic out of McKenna Road.

The right turn onto I-91nb is hazardous. When there is a line of traffic stopped at the light, people repeatedly drive in the striped shoulder to turn right. When the light changes, the driver in the lane does not expect to see anyone on their right side also turning. There have been near misses at that spot.

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There is an incredible amount of traffic coming from every direction and especially from the exit 13 ramp. Motorists on McKenna road and Montshire Road have difficulties egressing onto 10A.

When traveling westbound and approaching McKenna Road, some motorists think they are getting onto the interstate and accelerate up McKenna Road instead.

There needs to be a way for people to move safely to and from the sidewalk and the bus stop at the Montshire Road approach. It is probably the most serious safety issue.

The walk signal indications (from River Rd all the way to US 5) give people a false sense of security.

The RPC reported the following issues:

Turning left off McKenna onto VT10A is an issue during the non-peak hours due to the flow of vehicles from both directions. Gaps between vehicles to enter VT 10A safely are perceived to be too short.

From McKenna, the corner sight distance is poor when looking towards Hanover.

McKenna Road Resident Sharon Racusin reported the following issues:

If there is a vehicle in the right most westbound through lane, people on McKenna Road cannot see if there is a vehicle coming in the left most westbound lane.

The bike lane under the underpass is too narrow.

The pedestrian button at the signal the I-91 northbound on ramp was broken all winter.

During the morning peak, traffic is backing up on I-91

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### 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: Lack of Pedestrian Connections to Go from One side of VT 10a to the Other

Westbound transit bus passengers at being dropped off at McKenna Road. They need to cross four lanes of traffic to get to Montshire Road.

Safety Enhancements:

Mid-to-Long Term

Install a south-to-north pedestrian signal at the I-91 northbound exit ramp and a sidewalk on the south side of VT 10a from the ramp to Montshire Road. Move the bus stop to the I-91 intersection.

#### Concern: Entering VT 10a from McKenna Road or Montshire Road is difficult

Vehicles on VT 10a are blocking the intersection at times. At other times, traffic on VT 10a is flowing from both directions and motorists on McKenna Road have a hard time finding gaps in traffic. Another issue is that a vehicle on McKenna Road waiting to enter onto VT 10a when a vehicle is stopped in the right most lane cannot see westbound oncoming vehicles in the left hand lane.

Safety Enhancements:

Immediate-to-Short Term

Install "Do Not Block Intersection" signs and corresponding pavement markings.

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Mid Term

Conduct a corridor study from the village center to Hanover.

Concern: The Right Turn onto I-91 Northbound Creates Conflicts

People have been observed to drive in the crosshatched shoulder to make a right turn onto the I-91 on-ramp. Conflicts and near misses occur when a vehicle that is in the correct lane initiates a right turn and a vehicle is also making a right turn but from the shoulder.



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Safety Enhancements:

Short Term

Install rumble stripes inside the shoulder to deter motorists from continuing through the shoulder to make a right turn.

Consider installing flexible delineators from May 1 to October 1 of each year.

Concern: Motorists confuse McKenna Road for the I-91 Northbound on Ramp

As stated, some motorists that are traveling westbound turn right onto McKenna Road, thinking that this is the I-91 on ramp.

Safety Enhancements:

Short Term

Increase the size of the McKenna street name sign to a 12-inch tall sign.

Install an additional No Outlet sign on the south side of McKenna Road



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Concern: The Walk Signal Indications at the Signals along VT 10a are Too Short and Provide a False Sense of Security

It has been reported that the walk phase at many of the signals was not long enough.

Immediate

The walk time was increased at all signals except at the one at the bridge (this is because the intersection at the bridge has a concurrent pedestrian phase to cross River Street and the current equipment is not compatible with a leading pedestrian interval or delay vehicle green).

### **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 respective parties for further consideration. The entities listed under the column called "Potential Responsibility" are suggested groups that could possibly implement some of the countermeasures.

## Potential Safety Enhancements Summary Table

Safety Concern	Safety Enhancement	Potential Responsibility	Safety Payoff	Time Frame	Cost
Lack of Pedestrian Connections to Go from One side of VT 10a to the Other	Install a south to north pedestrian signals at the I-91 northbound exit ramp and a sidewalk on the south side of VT 10a from the ramp to Montshire Road	VTrans (signal), Town (Sidewalk)		Mid - Long	Mid - High
Entering VT 10a from McKenna Road or Montshire Road is difficult	Install "Do Not Block Intersection" signs and pavement markings	VTrans		Immediate - Short	Low initial (must be maintained)
	Conduct a corridor study from the village center to Hanover	TRORC		Mid	Mid
The Right Turn onto I-91 Northbound Creates Conflicts	Install rumble stripes inside the shoulder to deter motorists from continuing through the shoulder to make a right turn	VTrans		Mid	Low Mid
	Consider installing flexible delineators from May 1 to October 1 of each year	VTrans		Mid	Low
Motorists confuse McKenna Road for the I-91 Northbound on Ramp	Increase the size of the McKenna street name sign to a 12-inch tall sign	Town		Short	Low
	Install an additional No Outlet sign on the south side of McKenna Road	Town		Short	Low
The Walk Signal Indications at the Signals along VT 10a are Too Short and Provide a False Sense of Security	The walk time has been increased at all signals except the one at the bridge	VTrans		Immediate (Done)	Low

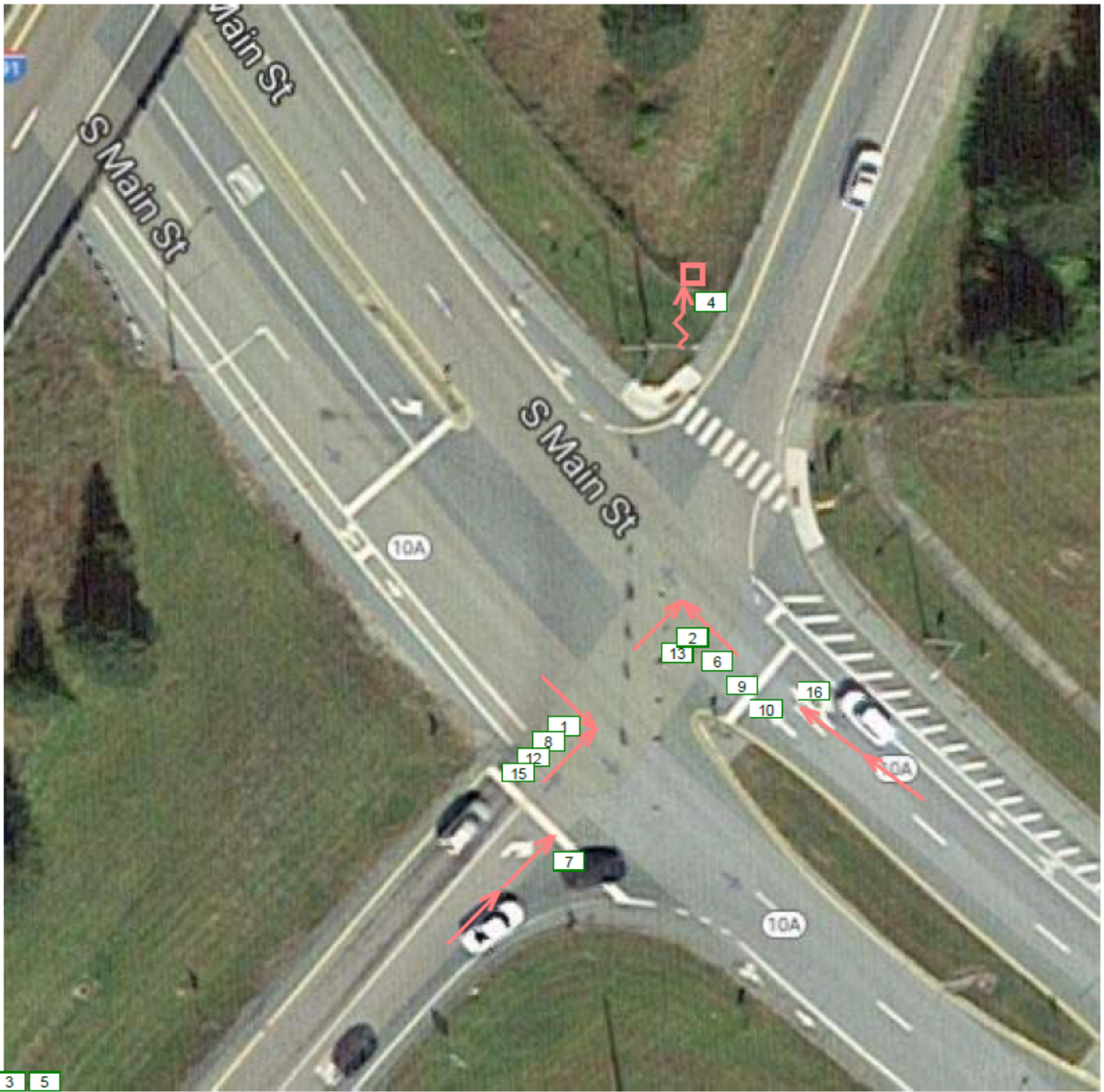
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# COLLISION DIAGRAM

Key Number = 1

MUNICIPALITY: 1411 COUNTY: \_\_\_\_\_  
 INTERSECTION: 10A  
 PERIOD: 5 YEARS 0 MONTHS FROM 1/1/2012 TO 12/31/2016

FILE: 10aMcKeena  
 CASE #: \_\_\_\_\_  
 BY: \_\_\_\_\_ DATE: 5/1/2017



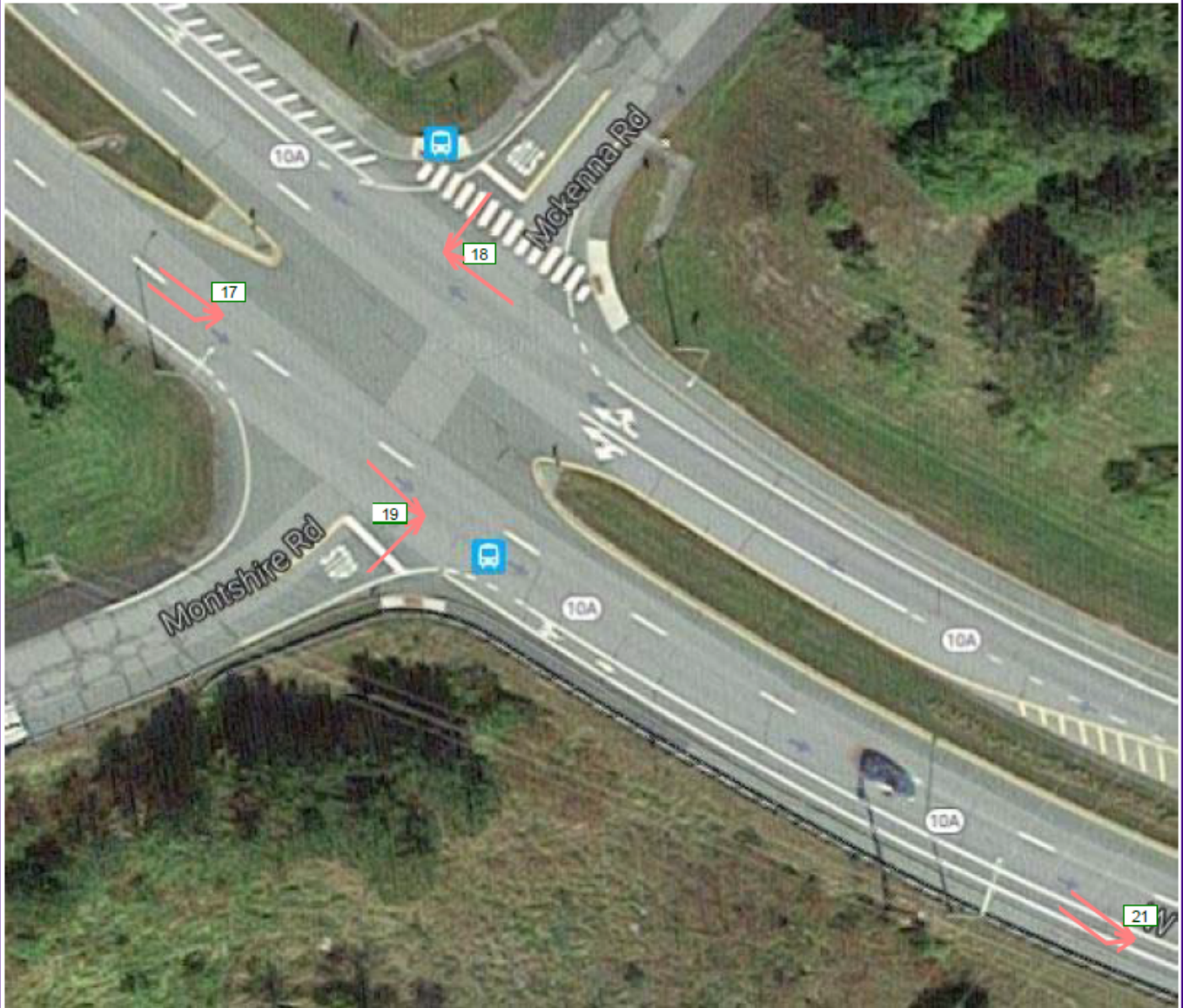
SYMBOLS		MANNER OF COLLISION	
→	MOVING VEHICLE	P	PEDESTRIAN
↘	TURNING VEHICLE	B	BICYCLIST
↔	BACKING VEHICLE	A	ANIMAL
▢	PARKED VEHICLE	□	FIXED OBJECT
[999]	RECORD NUMBER	■	Fatal
→	REAR END	↔	HEAD ON
↘	LEFT TURN	↘	RIGHT TURN
↘	LEFT TURN	↘	RIGHT TURN
→	OVERTAKE	↘	RIGHT ANGLE
↘	OUT OF CONTROL	↘	SIDE SWIPE



# COLLISION DIAGRAM

Key Number = 2

MUNICIPALITY: <u>1411</u> COUNTY: _____	FILE: <u>10aMcKeena</u>
INTERSECTION: <u>10A</u>	CASE #: _____
PERIOD: <u>5</u> YEARS <u>0</u> MONTHS FROM <u>1/1/2012</u> TO <u>12/31/2016</u>	BY: _____ DATE: <u>5/1/2017</u>



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

Crash #	Report #	Crash Date	AOT Route	Injury Type	Collision Type	Weather	Surface	Description
1	15NW0010	1/3/15 6:30 PM	VT-10A	Property Damage Only	Other - Explain in Narrative	Freezing Precipitation	Snow	<p>This crash occurred at the intersection of VT Rt 10A and the I91 Northbound off ramp. At the time of the crash, the weather was cold and it was snowing. The roadway is paved and the ramp is downhill connecting to a level RT 10A main road. The roadway was snow covered and slippery. No injuries were reported. Operator #1 advised he was exiting the interstate and coming down the ramp. He applied the brakes and the vehicle began to slide. He stepped on the brakes harder and tried to steer but the car slid into the intersection hitting the other vehicle. Operator #2 advised that she was traveling on RT 10A and approached the intersection on a green light. As she entered the intersection, the other vehicle slid into her vehicle causing it to veer to the left into a traffic sign. Investigation revealed the Vehicle #1 was traveling North on I91 and had exited onto the off ramp. Vehicle #2 was traveling East on RT 10A. At some point, Vehicle #1 attempted to slow down and began to slide on the snow-covered roadway. Operator #1 applied the brakes harder and attempted to steer causing the vehicle to continue to slide on the road. Vehicle #2 had continued on RT 10A and had entered the intersection on a green light. Vehicle #1 slid into the intersection against a red light and struck the right front passenger door and fender area of Vehicle #2 pushing it to the left and onto a divider median. Vehicle #1 hit a traffic sign post, snapping it off near the base. Vehicle #1 was then caught up on the broken sign post. The cause of this crash is the fact the Vehicle #1 was traveling at a speed not prudent for the weather conditions. Contributing factors to this crash include the fact that the weather was poor, the roadway was slippery and snow-covered and Operator #1 is a relatively new driver with approximately 6 months of driving experience.</p>

Crash #	Report #	Crash Date	AOT Route	Injury Type	Collision Type	Weather	Surface	Description
2	15NW00109	2/3/15 9:08 AM	VT-10A	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	Snow	This crash occurred in the town of Norwich at the intersection of Route 10A and the bottom of the I-91 Exit ramp at exit 13. At the time of the crash, the weather was clear although extremely cold. At the time of this crash, the road was packed snow covered and extremely slippery. Operator #1 stated that she was exiting I-91 via the exit ramp and was traveling at approximately 35 - 40 MPH. Stated that as she was approaching the Rte. 10A intersection, she tried to slow but her vehicle started to slide and she lost control, her vehicle slid on the ice, across Rte. 10A, across the median striking Vehicle #2 which was stopped in traffic. Operator 2 stated that he was stopped in a line of traffic waiting to proceed west on Rte. 10A. Stated that he observed Vehicle #1 coming down the exit ramp and saw that the vehicle was starting to slide. Advised that he was unable to move as there were vehicles stopped both in front and back of his vehicle.
3	15NW00831	8/18/15 1:47 PM	VT-10A	Property Damage Only		Unknown		Crash at the intersection of Rte. 10A and the I-91 North exit ramp onto Rte. 10A. It was reported that there were no injuries and no road blockage. Nothing more is available. No boxes were checked for direction of crash. Cannot map it.
4	12NW00771	6/11/12 7:24 PM	VT-10A	Property Damage Only	Single Vehicle Crash	Clear	Dry	On 6/11/12, single vehicle motor vehicle crash at the intersection of Rt 10A and Interstate 91 Exit 13 northbound on ramp. Op 1 had driven his vehicle off the road into a fence. There were rubber marks that went from the center of his lane right off the road into the fence. Said he was traveling at about 35 MPH and when he began to turn, the wheels did not move the car. He stated that as soon as this happened, the vehicle went into the fence. The rubber marks were consistent with his statement. The vehicle most likely suffered a steering failure. Cardinal direction on the report is north.

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Crash #	Report #	Crash Date	AOT Route	Injury Type		Collision Type	Weather	Surface	Description
5	13NW00733	6/9/13 2:00 PM	VT-10A	Property Damage Only			Clear	Dry	<p>13NW00733 5</p> <p>This accident occurred on Route 10A at the intersection with the I-91 On and Off Ramps. Traveling West on 10A, the lanes open into two lanes, and one for travel on Route 5S and one for traveling to I-91 S and into Norwich center. Traveling east, it is a two-lane road prior to the ramps. At the intersection, there is a left turn lane to go onto the NB ramp. After the intersection, the lanes merge to one and continue to the Ledyard Bridge. Operator #1 advised that he wanted to go to I-91 South and realized he made the wrong turn. He intended to do a U-Turn at the intersection. He saw Vehicle #2 approaching and saw his directional on. Believing Vehicle #2 was going to turn onto the On ramp, he began to make the U-turn and turned into the side of Vehicle #2 as it crossed the intersection. Operator #2 advised he was intending to take I-91 South and was in the right lane. He signaled his intention to stay in the lane. As he continued into the intersection, Vehicle #1 pulled out of lane and struck the driver side of his vehicle. Investigation revealed that Vehicle #1 was in the left turn lane facing East. Operator #1 intended to make a u turn from that lane to head back to the I-91 South on ramp. Vehicle #2 was traveling West and was intending to take the I-91 south on ramp. Operator #1 saw the directional of Vehicle #2 and believed it was going to turn onto the NB ramp. Operator #1 made the U-turn and did not see that vehicle #2 was continuing straight. Operator #1 should have ensured that Vehicle #2 was in fact turning before beginning the maneuver. Both vehicles were removed by Bob's Service Center due to damage. Operator #1 was issued VCV 2699997 for Vehicle Failing to Yield-Left Turn.</p>

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Crash #	Report #	Crash Date	AOT Route	Injury Type	Collision Type	Weather	Surface	Description
6	14NW00001	1/2/14 7:35 AM	VT-10A	Property Damage Only	Opp Direction Sideswipe	Freezing Precipitation	Snow	Two-car motor vehicle crash. There were no reported injuries and there was road blockage. One operator was issued a VCVC for defective equipment. Near the I91 northbound entrance and exit ramps. There were no reported injuries. Operator #1 said that she was the fifth vehicle in a line of traffic traveling down the exit ramp. She advised she approached the intersection to make a left hand turn. While turning she applied her brakes and the vehicle's wheels locked up. Advised the vehicle skidded across the eastbound lanes, across the median, and hit a westbound vehicle in the left lane. Advised that she was traveling slowly because of the road conditions in the line of traffic and none of the other vehicles showed signs of slipping. Operator #2 said that she was stopped in the westbound lane of VT Route 10a at a red light. She advised she did not see Vehicle #1 approaching her. She advised the impact was a surprise to her. My investigation reveals Vehicle #2 was traveling west on VT Route 10a and was stopped at the intersection with I91 northbound entrance and exit ramps. Vehicle #2 was in the left lane, closest to the median, was stopped because the traffic control signal was displaying a red light. Vehicle #1 exited I91 at Exit 13 (Norwich) and was negotiating a turn onto VT Route 10a. Vehicle #1 failed to negotiate the corner, crossed over the median, and collided with Vehicle #2. The impact did not activate air bags. The driver's side front corner of Vehicle #1 collided with the driver's side rear passenger door of Vehicle #2. Based on my investigation and Operator Statements this crash may have been avoided had Operator #1 been using winter rated tires or traveling at a very slow speed. Being that four vehicles in front of the Operator negotiated the same intersection and she did not, it appears the tires were not appropriate for the road condition.

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Crash #	Report #	Crash Date	AOT Route	Injury Type		Collision Type	Weather	Surface	Description
7	14NW00005	1/2/14 2:30 PM	VT-10A	Property Damage Only		Rear End	Freezing Precipitation	Snow	Vehicle #1 was coming off the exit 13 north bound off ramp and was trying to make a left hand turn when she hit vehicle #2 in the rear bumper. Vehicle #2 driven was also coming off the ramp and was trying to make a left hand turn as well. The 91 northbound off ramp was covered in snow/ice and was the cause of six slide offs or crashes.
8	14NW00016	1/4/14 1:00 PM	VT-10A	Property Damage Only		Same Direction Sideswipe	Clear	Ice	This accident occurred at the intersection of Vermont Route 10A and I-91 Northbound Off Ramp. At the time of the accident, the weather was clear and cold. No injuries were reported. Operator #1 advised that she had exited the interstate and was approaching the traffic light. As she was slowing, her vehicle was on an icy section of road and began to slide. The ABS of the vehicle was working but she did not gain any steering control until near the traffic light, but by that time, she was sliding into the intersection. Her vehicle caught at the last moment, but sideswiped a vehicle on the main road. Operator #2 advised she was traveling east on Route 10A. As she passed through the intersection, the other vehicle slid into her car. Investigation revealed that Vehicle #1 was exiting the interstate at the Norwich exit. As the vehicle came down the ramp, it apparently was on an icy/slippery section. Was unable to control the vehicle until the last second. Vehicle #2 was traveling east on 10A and had entered the intersection appropriately. Her vehicle was then sideswiped by Vehicle #1. Contributing factors to this accident are the fact that the exit ramp did have a section that was icy. There had been several other incidents of vehicles sliding into the intersection due to the improperly maintained ramp. While I was investigating this crash, several vehicles almost slid into the intersection or into my police car. An additional factor is the fact that vehicles that exit the ramp do travel at a speed greater than the suggested ramp speed. The average being at least 45 to 50 miles per hour. Which is a speed too fast for the conditions present at the time. State highway was contacted to lay salt or sand on the affected area.

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Crash #	Report #	Crash Date	AOT Route	Injury Type	Collision Type	Weather	Surface	Description
9	14NW00557	2/13/14 11:00 AM	VT-10A	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Freezing Precipitation	Snow	Op 2 called and reported that in February 2014 he was travelling on Route 10A during a storm and was struck by OP 1 who was coming down the Exit 13 ramp and could not stop. As months have passed, no investigation was completed.
10	14NW00217	2/19/14 12:30 PM	VT-10A	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Freezing Precipitation		Vehicle #1 was traveling north coming off the exit 13 northbound off ramp and hit ice near the bottom of the ramp. It was unable to stop at the red light and hit vehicle #2 in the passenger side, which was travelling eastbound on Route 10A. Vehicle #2 made no attempt to swerve as it didn't see vehicle #1 coming into the intersection as there was a large snow bank present. A significant amount of snow fell quickly in a short period of time and created the slippery conditions which mostly contributed to the crash.
11	14NW00238	2/24/14 6:35 AM	VT-10A	Property Damage Only	Rear End	Clear	Dry	Minor non-reportable crash on R10A. Op 1 hit Op 2's rear bumper with her front bumper. According to the crash report, this took place 200 feet west of River Road which is at mile point 0.48 and outside of the area of concern.

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Crash #	Report #	Crash Date	AOT Route	Injury Type	Collision Type	Weather	Surface	Description
12	14NW00356	3/30/14 9:30 AM	VT-10A	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Cloudy	Wet	This accident occurred at the intersection of I-91 Northbound ramps and Vermont 10A. At the time of the accident, the weather was overcast and cool. The roadway was free from defects and there were no obstructions to visibility in either direction. No injuries were reported. Operator #1 advised that she was traveling on 10A heading towards Hanover. She did not see the red light and the other car was just in front of her as she drove. She hit the car. Also advised that she thought Vehicle #2 was coming off the ramp fast. Operator #2 advised that he had just gotten off I-91 and was planning to turn left onto 10A. As he approached the intersection, he had a green light and proceeded into the intersection turning left. As he did, Vehicle #1 hit the side of his vehicle and spun it around and off the road. Witness #1 advised that he was stopped at the light, first car in line. He was watching traffic and saw the silver car (Vehicle #2) come off ramp on green light. He saw the blue car (Vehicle #1) hit Vehicle #2. Witness #2 advised that she was stopped at the traffic light. She advised they had been stopped for several seconds. She advised she could see both vehicles approaching the intersection as she was watching traffic. The light was not changing and was red for traffic on 10A and green for the off ramp. The blue car (Vehicle #1) did not appear to be slowing for the red light and subsequently hit the silver car in the intersection. Investigation revealed that the witness vehicles were stopped at a red light on 10A. These vehicles were in the westbound lane of 10A and were first in line at the lights. While conducting the investigation I did observe the traffic light several times and found that it was in proper working order and appeared to be functioning properly. No lights were out on the eastbound side.

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Crash #	Report #	Crash Date	AOT Route	Injury Type	Collision Type	Weather	Surface	Description
13	15NW00349	4/21/15 6:00 PM	VT-10A	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	Dry	This crash occurred on Route 10A at the intersection with the Northbound off ramp of I-91. The weather was clear and warm. No injuries were reported to this officer at the time of report. Operator #1 advised she was traveling east on 10A and did not notice the light was red and proceeded into the intersection and her vehicle hit the other vehicle. Operator #2 advised that he was coming off the ramp and intending to turn left onto 10A. As his vehicle entered the intersection, Vehicle #2 stuck the driver's side rear wheel, spinning the vehicle and trailer. Investigation revealed that Vehicle #1 was traveling east on Route 10A. Vehicle #2 had exited the northbound lane of I-91 and was on the exit ramp. Vehicle #2 had a green light and was preparing to turn left onto 10A. Vehicle #1 was facing a red light. Operator #1 did not see the red light and continued into the intersection as Vehicle #2 was entering the intersection to turn. Vehicle #1 struck the left rear wheel of Vehicle #2, which was towing a trailer, and caused the vehicle to "jack-knife".
14	15NW01269	12/10/15 4:28 PM	VT-10A	Property Damage Only	Left Turn and Thru, Angle Broadside -->v--	Clear	Dry	No in the area of concern. This crash occurred at the intersection of Main Street/US Route 5 S/VT 10A/I-91 SB ramps. At the time of the crash the weather was cold and the roadway was free from defects and visibility obstructions. No injuries were reported to this officer. Operator #1 advised she exited the interstate and was at the traffic light. The light turned green and cars began to move. She began to make a left turn onto Route 10A. Her vehicle was then struck by another car. Operator #2 advised she was intending to travel straight onto the Southbound Interstate ramp. As she proceeded through the intersection with traffic, the other car turned into her path and the vehicles hit. Investigation revealed that both vehicles were at the intersection with Operator #1 intending to make a left turn onto Route 10A and Operator #2 intending to enter the Southbound Interstate ramp. The roadway is level paved blacktop and the traffic light was functioning properly at the time.

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Crash #	Report #	Crash Date	AOT Route	Injury Type	Collision Type	Weather	Surface	Description
15	16NW00040	1/12/16 2:00 PM	VT-10A	Property Damage Only	Same Direction Sideswipe	Freezing Precipitation	Slush	On January 12, 2016, at approximately 1506 hours, OP 1 had been traveling north on Interstate 91 and had gotten off the interstate at exit 13. Said she had attempted to stop her vehicle at the end of the ramp but when she started to brake her vehicle began to slide, striking a vehicle passing through the intersection. Op 2 told me that he had been traveling east on 10A. He told me that he had a green light at the intersection and started to pass through when another vehicle hit the passenger side of his vehicle. At the time of the crash, the section of road where the crash occurred was paved. On the date and time of the crash, it was heavily snowing and the roadway was a mix of snow and frozen rain and the roadways had not been treated with sand/salt. Op 1s' speed and the road conditions were contributing factors in the crash.
16	16NW00277	3/26/16 6:15 PM	VT-10A	Injury	Rear End	Clear	Dry	On March 26, 2016, at approximately 1821 hours, the crash occurred at the intersection of Vermont 10A and the Interstate 91 northbound on ramp. Report of possible injury. Op1 told me that he had been traveling west on 10A when the crash occurred. He told me that the traffic light had been green as he approached the intersection. He told me that he had looked down to fiddle with the radio and did not notice the light change to red, rear ending the vehicle stopped at the light. Op 2 had been stopped at the red light at the intersection of 10A and the Interstate 91 northbound on ramp when the crash occurred. Said had been traveling west. Estimated that he had been stopped at the red light for approximately 10-15 seconds when his vehicle was struck. The traffic light was in normal operation at the time of the crash. The road was level and curved slightly to the right with a posted speed limit of 30 miles per hour. On the date and time of the crash, the weather was clear and the roadway was dry and free of debris.

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Crash #	Report #	Crash Date	AOT Route	Injury Type	Collision Type	Weather	Surface	Description
17	13NW00468	4/22/13 1:40 PM	VT-10A	Property Damage Only	Left Turn and Thru, Angle Broadside -->v--	Clear	Dry	This accident occurred on Route 10A at the intersections with Montshire and McKenna Roads. At the time of the accident, the weather was warm and clear. The roadway is paved blacktop and free from defects. The roadway is straight and has several intersections near it from I-91 ramps and turn lanes. Operator #1 advised that he had missed a turn to go to a business in town and saw the intersection ahead and wanted to turn around. He checked for traffic and was merging into the left lane. Said did not see that Vehicle #2 was next to him and his vehicle struck/sideswiped the other vehicle. Operator #2 advised he was traveling East on 10A intending to travel into New Hampshire. As he passed the I-91 ramps and approached the other intersection, Vehicle #1 struck the side of his vehicle.
18	14NW01132	10/20/14 4:00 PM	VT-10A	Injury	No Turns, Thru moves only, Broadside ^<	Clear	Dry	This crash occurred on Route 10A at the intersection of McKenna and Montshire Road. At the time of the accident, the weather was clear and warm. Passengers from Vehicle #2 were transported to DHMC as a precaution. Operator #2 advised that he was intending to turn left onto 10A from McKenna Road. Traffic had stopped and a school bus left room for him to enter the intersection. Advised the bus driver waved him into intersection. As he proceeded, Vehicle #2 had driven into intersection and he hit the side of the car. Operator #1 advised that she was in traffic on 10A. She intended to get into the left lane to eventually turn onto Route 5. Traffic had slowed and as she approached the lane opening, she continued to travel straight. A school bus was in the right lane. As she passed the front of the bus, the other vehicle hit the side of her car. Witness #1 advised that she was in traffic, driving the school bus. As traffic stopped, she saw Vehicle #1 at McKenna road. She stopped to allow him room to enter intersection. As she waited, Vehicle #1 drove out of McKenna Road and in front of her vehicle. It came out quickly. The vehicle then hit the side of a vehicle that was coming up through the intersection. Traffic was heavy with afternoon commuters.

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Crash #	Report #	Crash Date	AOT Route	Injury Type	Collision Type	Weather	Surface	Description
19	15NW00179	2/25/15 11:30 AM	VT- 10A	Property Damage Only	No Turns, Thru moves only, Broadside ^<	Clear	Dry	This crash occurred on Route 10A at the intersection with Montshire Drive. At the time of the crash, the weather was cool and clear. The roadway was dry and free from defects. Operator #1 advised that the accident was her fault as she ran into the side of Vehicle #2. Advised she was making a left turn from Montshire onto 10A. She did not see any approaching traffic and entered the intersection. As she did, Vehicle #2 was proceeding past her and her vehicle struck the side of the other car. Advised that her view was a bit obstructed by snow banks along Route 10A. Operator 32 advised that he made a right turn off the exit ramp and intended to head straight into Hanover, NH. As he drove past the Montshire Road, Vehicle #1 pulled out and hit the side of his vehicle. Investigation revealed that Vehicle #1 was preparing to make a left turn onto 10A from Montshire Road. Vehicle #2 had made a right turn off the exit ramp onto Route 10A. Due to winter snowfall, snow is piled up on the roadside and does obstruct view of approaching eastbound traffic. The exit ramp cannot be clearly seen from Montshire Road. A contributing factor to this crash is the fact that visibility is partially obstructed due to piled up snow along the south side of Route 10A.
20	16NW00897	8/25/16 5:20 PM	VT- 10A	Property Damage Only	Rear End	Cloudy	Dry	Not sure of the location. This could be at the light by the Ledyard Bridge or it could be at the ramp and traffic would have been backed up past McKenna. On August 25, 2016, at 1725 hours, Hartford Dispatch advised of a motor vehicle crash on Vermont Route 10A, near the Ledyard Bridge. Two vehicles parked on McKenna Road, OP 1 said she was driving west on 10A when the vehicle in front of her stopped suddenly. Said she was unable to stop in time and hit the back of the vehicle. Said that she was distracted because her son was screaming in the backseat. OP 2 said he had been stopped at the traffic light on 10A west for about a minute when someone crashed into the back of the trailer. The crash occurred on a paved public highway with a posted speed limit of 30 miles per hour. The section of road where the crash occurred was straight and had a clear line of sight in both directions. On the date and time of the crash, the weather was clear and the roadway was dry.

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Crash #	Report #	Crash Date	AOT Route	Injury Type		Collision Type	Weather	Surface	Description
21	15NW01283	12/15/15 2:30 PM	VT-10A	Property Damage Only	Same Direction Sideswipe	Cloudy	Dry	On December 15, 2015 at approximately 1530 hours, a two-car motor vehicle crash which occurred on Vermont Route 10a near Montshire Road. There were no reported injuries. There were no road obstructions, which could contribute to the crash. In the area of the crash, the eastbound lanes are preparing to merge into a single lane. The merge is warned by signs that the right hand eastbound lane will end and traffic should merge into the left lane. Operator #1 who advised she was traveling east on Vermont Route 10a in the right lane and began to merge into the left lane as the lane would be ending. She advised her speed was approximately 20 miles per hour. She advised that she did not see or hear Vehicle #2 in the left lane alongside of her. Advised she did not realize the vehicle was there until the point of impact. Op 2 advised he was traveling east on Vermont Route 10a in the left lane. He advised he was alongside of Vehicle #1 and traveling a nearly the same speed, which he believed to be approximately 20 miles per hour. Advised that Vehicle #1 began to merge into his lane striking his vehicle.	

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## Road Safety Audit Review Summary - DRAFT

### Norwich – Vermont Route 10a

June 11, 2008

**Introduction:** A Road Safety Audit Review is a formal examination of an existing road or intersection to recommend low-cost safety improvements. This work is done by an independent team of transportation professionals – these professionals bring many different transportation specialties to the review process. The role of being Independent is taken seriously, this means that most participants are not directly involved with the location being audited and all have no preconceived notions of what ought to happen. A safety audit can also involve town officials, interested citizens, and other responsible entities insofar as those individuals conform to the same unbiased perspective. The audit team is responsible for performing a site visit, identifying safety issues, and coming to a consensus about possible solutions.

**Safety Audit Process:** The safety audit process, nationally recognized and often used by VTrans officials, is composed of several steps. A project coordinator organizes and implements the audit. The process starts with a meeting of citizens and local officials – that was conducted on site with McKenna Road residents, town officials, and Montshire Museum representative on April 29th. The meeting purpose is to compile all the community concerns for the audit team to study.

The audit team then meets to review those comments and hold their own site inspection tour – held on May 8th. The site visit involves identification of safety deficiencies as seen in the field (not in a cubicle at VTrans Montpelier!). In preparation many of the audit team visit the site a few days prior to familiarize themselves with the location and collect traffic data (May 1<sup>st</sup> and 2<sup>nd</sup>).

Following the site inspection, the audit team reconvenes to discuss their observations and recommendations. Normally, the team is to reach a consensus on each safety issue and only those issues for which a consensus is reached are included in the findings. However, for this review we included any issues that had been raised by any members of the audit team.

The safety audit summary is developed and presented to the Norwich Selectboard for comments. The report findings showcase the list of issues found and identify the parties expected to address those issues. The last requirement of actually doing the work takes the greatest amount of time. The Selectboard reviews the audit findings and helps guide the local coordinator with the implementation piece.

**Locations:** We needed to prioritize the audit to include three separate areas along VT Route 10a. This was done to ensure we focused on the most important areas first. In priority, the locations were:

1. McKenna/Montshire/VT10a intersection
2. VT10a corridor and lane closure concept
3. River Road intersection.

**Audit team:** We had an unusually good audit team for this project. The field of transportation is comprised of numerous different specialties and fortunately this audit had a broad range of traffic operations, signage, maintenance, and road safety professionals. The VTrans staff were primarily out of the Montpelier offices, although one was from the White River Junction District office. The

participants: Trevor Starr, Mario Dupigny-Giroux, Maureen Carr, Susan Clark, Colin Philbrook, and Marcos Miller. We also had Sarah Nunan, Norwich Selectboard, Lucy Gibson, Jamie Hess, and John Lawe from the Norwich Transportation Committee, Doug Robinson and Steve Soares, Norwich staff. These folks not only brought a great deal of local knowledge to the table, most of them have good transportation backgrounds! Chuck Wise was the coordinator from the Two Rivers-Ottawaquechee Regional Commission.

**Traffic data summary:** This road has some of the most significant traffic volumes in the region – 14,000 vehicles per day. In 2008, the 85<sup>th</sup> percentile speed (the maximum speed that most vehicles are recorded traveling) was 37mph. The average speed on this road was 32mph. These speeds were collected by automatic traffic counters and independently confirmed with a traffic radar study. The crash history is fairly significant within the greater interstate/McKenna/Montshire Road intersection. The majority of crashes occur along the slip lane and McKenna Road averages 1 crash per year. Local officials indicated that crashes occurring along any spot on this intersection are interconnected. Additional traffic information included Alice Worth and Sharon Racusin’s summary of traffic data and crash history.

**Safety deficiencies:** The audit team and local officials discussed safety concerns and were able to distill the major safety deficiencies down to the following list.

1. Slip lane is dangerous and needs to be removed
2. Bicycle and pedestrian safety should be considered along that entire stretch of roadway
3. The entrance and egress for all the local roads are challenging/dangerous
4. Speed is an ever-present condition that deteriorates traffic and bike/ped safety
5. Traffic signals do not appear to be optimized for efficient traffic flows.

**Recommendations:** These are the safety improvement recommendations to be implemented.

1. Remove slip lane – As this is the source of most of the crashes, the slip lane needs to be removed. This work will be done as part of the VT10a/US5 paving project.
2. Temporary lane closure – Many people have many opinions on what will happen if VT Route 10a westbound was restricted to one travel lane. Absent studying the concept to death, the consensus of the audit group was to do an experimental trial period and let everyone evaluate the impacts. A single traffic lane would allow for the installation of a full-sized bicycle lane; however the lane reduction may result in an unacceptable level of traffic congestion. The lane closure would be accomplished using traffic barrels, barricades, and cones. This work would be done by the Town of Norwich with technical support provided by VTrans and TRORC.
3. Signage – The current assortment of signs is acceptable, but could be enhanced. VTrans will look to change the signs to better enforce speed limits (*strictly enforced*) and improve intersection safety. This work would be done by VTrans.
4. Permanent speed boards – The current speed enforcement and the use of the traffic speed board has resulted in a 5mph decrease in speeds. This is a substantial improvement that can be more permanently achieved. The audit team felt that many people are not aware that traffic speeds are an issue and these signs will provide important feedback for regional traffic. The Town of Norwich would install these signs with feedback from VTrans.

5. Signal coordination – There is a concern that the current traffic signals are not optimized for traffic flow. There is a regular schedule of signal maintenance and signal synchronization, but VTrans should examine the traffic signals again to ensure they are optimized for traffic flows.

