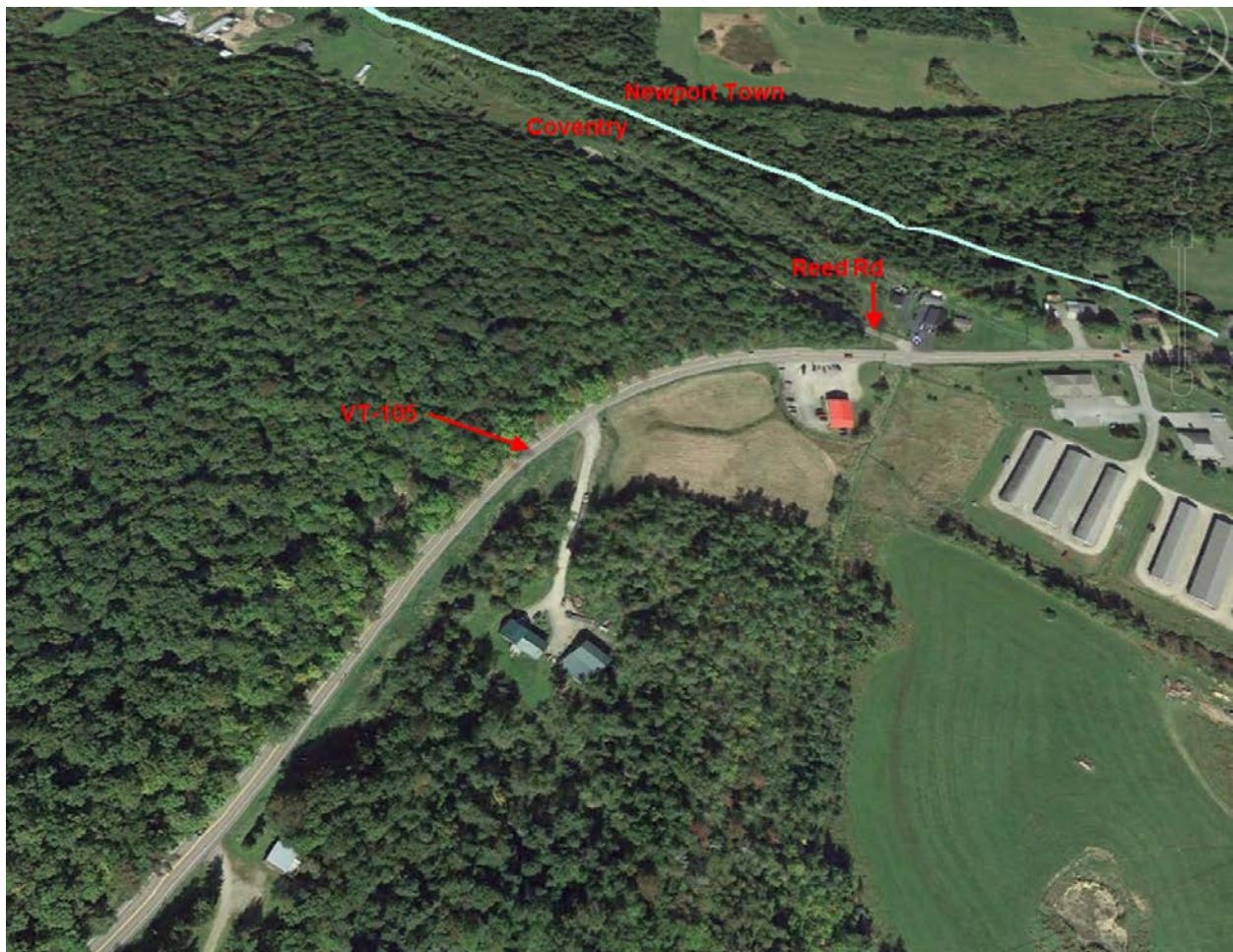


# Office of Highway Safety

## Road Safety Audit Review

<b>Town:</b>	Coventry	<b>Date Reviewed:</b>	October 27, 2016
<b>Route:</b>	VT 105	<b>Mile points:</b>	VT 105 MM 0.792-1.092

### 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.

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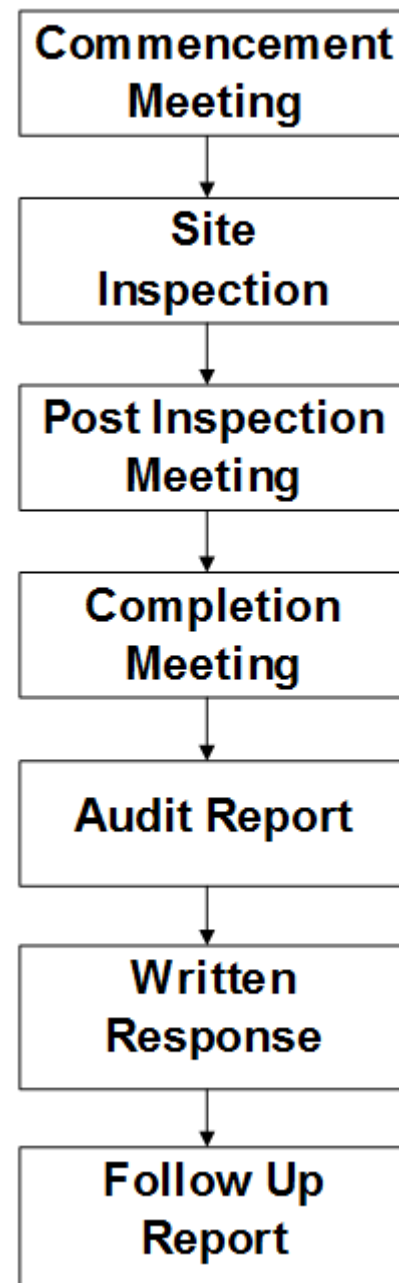
## Road Safety Audit Review

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 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.

Figure 1 - Road Safety Audit Process



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## Road Safety Audit Review

### **Location**

The location of this RSAR is the section of road on VT 105 between mile points 0.792 and 1.092 in Coventry. This segment is located mostly west of Reed Road (Reed Road is within the segment but at the eastern end).

### **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:

Pat McManamon,	DMV, VTrans
Chris Mercon,	TSMO, VTrans
Shawn Morin,	District 9, VTrans

### **Information Reviewed**

#### **Geometry**

This section of VT 105 is a two-lane road with eleven-foot lanes and three-foot shoulders.

The specific section is bounded between mile points 0.792 and 1.092. Within this section, there is a seven-degree horizontal curve from about mile point 0.87 to mile point 1.00. This is a curve

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## Road Safety Audit Review

to the right when traveling east on VT 105. There is another horizontal curve to the right prior to this one, between mile points 0.77 and 0.86. This is a four-degree horizontal curve. There is also a five percent vertical downgrade from about mile points 0.73 to 0.90.

There is one intersection within this segment located at mile point 1.04 (this is the intersection with Reed Road).

The pavement surface of this section of VT 105 is rated as good. The year the road was last paved was in 2012 (VTtransparency, December 2016). The pavement surface condition prior to being paved was rated as very poor in 2011.

Pavement edge drop off was observed on the outside of the curve as the backfill material has eroded. However, the pavement edge is shaped to 30 degrees (SafetyEdge) and this should facilitate recovery by motorists in the event that a wheel goes off the paved surface.

### Speed Limit

The posted speed limit on VT 105 is 50 mph.

The 7-degree curve was travelled in the eastbound direction to determine its safe speed. Using a ballbank indicator, it was determined that the curve could be traveled at 50 mph.

### Traffic Volumes

The 2014 Average Annual Daily Traffic on VT 105 was 4100 vehicles per day.

### Traffic Signs

There is a curve warning sign to the right that is located at mile point 0.848 for eastbound traffic. At Reed Road, there is a stop sign and a legal load sign. There are also two Reed Road street name signs that are installed on either side of the utility pole at the corner.

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### Past Projects

Project STP 2802(1) was for the resurfacing of VT 105. This project was completed in 2012. Superelevation was corrected as part of this project. The project also replaced the right hand curve sign at the same location.

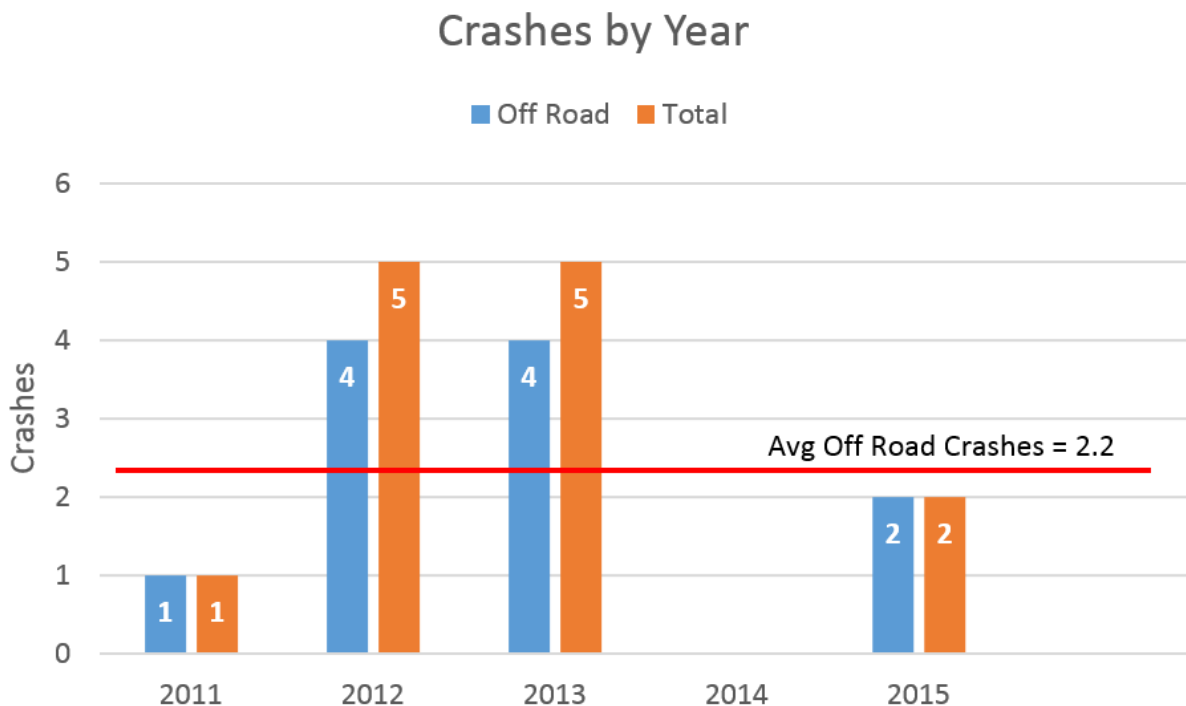
### Future Projects

No future projects were identified for this area.

### Crash History

The crash history was reviewed along this segment for the five-year period covering the years 2011 to 2015. A total of thirteen crashes were reported during this period.

The principal crash pattern at this location is a single vehicle that went off the road. This crash pattern represents eleven out of thirteen crashes within this section (85%).



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## Road Safety Audit Review

The majority of these run off the road crashes took place between the months of December and February (55%). Not surprisingly, fifty-five percent of the run of the road crashes took place when the road was covered with snow or ice.

Six of the eleven run off the road crashes took place in the evening or at night (55%), and sixty-six percent of the run off the road crashes that took place in the evening or night also happened when the road was snowy or ice covered.

Furthermore, the two run off the road crashes, that took place during the evening or night but on a road surface that was not covered with snow or ice, happened in a construction zone when the speed was set at 40 mph due to construction.

Overall, eighty-six percent of the run off the road crashes happened when traveling in the eastbound direction.

In three of the run off the road crashes, the vehicle hit a utility pole. The pole that was hit was the same for all three crashes. This is the pole at the Reed Road intersection, the one that currently has the two street name signs on it. Specifically, this is pole number VT Elec Coop 115 C 42 20 13 VZ.

Crash narratives are provided at the end of this report along with a collision diagram.

### **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.

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Concern: Substantively<sup>1</sup> Unsafe Curve

There is a clear run off the road crash pattern attributable to the presence of the horizontal curve in this section of VT 105. While this 0.3-mile section of VT 105 is a high crash location, the crashes are concentrated at the curve. Most of the crashes are in the eastbound direction. Note, however, that the majority of these crashes took place before Project STP 2802(1) which resurfaced VT 105 and corrected superelevation deficiencies. Note also that a common condition in several of the crashes was a snow or ice covered road surface.

Safety Enhancements:

On-Going

Review winter maintenance practice.

Mid to Long Term

Monitor crashes since significant changes were made to the road. If the utility pole (*VT Elec Coop 115 C 42 20 13 VZ*) is hit again in a crash, have it relocated (this pole has been hit 3 times already).

Keep monitoring and install 6" x 8" white delineators if crashes continues.



### **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.

<sup>1</sup> A roadway could be nominally safe (i.e., all design elements meet design criteria) but at the same time substantively unsafe (i.e., it reflects a high crash problem relative to expectations). Source: [http://safety.fhwa.dot.gov/geometric/pubs/mitigationstrategies/chapter1/1\\_comparnominal.htm](http://safety.fhwa.dot.gov/geometric/pubs/mitigationstrategies/chapter1/1_comparnominal.htm)

## Potential Safety Enhancements Summary Table

Safety Concern	Safety Enhancement	Responsibility	Safety Payoff	Time Frame	Cost
Substantively Unsafe Curve <i>(Clear eastbound run off the road crash pattern at the horizontal curve)</i>	Review winter maintenance practice	VTrans District	Mid-High	Once a Year	Low
	Monitor and have utility pole VT Elec Coop 115 C 42 20 13 VZ relocated	VTrans District	36% <sup>2</sup> reduction (if go with 5 foot offset)	Mid-Long	Mid
	Monitor and install 6" x 8" white delineators	VTrans (TSMO)		Mid	Low

<sup>2</sup> CMF # 5240



# COLLISION DIAGRAM

Key Number = \_\_\_\_\_

MUNICIPALITY: <u>Coventry</u> COUNTY: _____	FILE: <u>coventryVT105</u>
INTERSECTION: <u>VT-105</u>	CASE #: _____
PERIOD: <u>5</u> YEARS <u>0</u> MONTHS FROM <u>1/1/2011</u> TO <u>12/31/2015</u>	BY: _____ DATE: <u>10/21/2016</u>



3 6 7

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

Crash Number	Road	Marker	Date	Time	Weather	Injuries	Fatalities	Type	Description
1	VT-105	0.94	3/8/2012	13:12	Cloudy	1	0	Single Vehicle Crash	Single-vehicle collision located on VT 105 WB. The weather at the time of the collision was cloudy and the road was dry. The highway at the scene curves to the left and is slightly uphill. Witness explained that he was just walking into Freedom Physical Therapy when he observed a motorcycle driving past him at a speed that he estimated to be about 45-50 miles per hour. Witness advised that the motorcycle was traveling "dangerously close" to the edge of the roadway. Witness advised that he then saw the motorcycle go down and parts and pieces "were going everywhere". There were no other cars in the area at the time of the collision. Op #1 advised that he had just purchased the motorcycle on Tuesday, 03-06-12. Op #1 advised that this was his first day driving it. Op #1 stated that the motorcycle got stuck in a groove in the roadway and pulled it to the right of the lane. He stated that he tried to steer the motorcycle to the left, but he could not before it went into the mud in the ditch. Op #1 stated that there was some dirt that was still on the roadway from the sanders, which he believed also to have caused him to not be able to get the motorcycle back under control. Op #1 advised that he was traveling at about 55 miles per hour. Op #1 advised that there were no vehicles in the area when he crashed. Inj 2

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Crash Number	Road	Marker	Date	Time	Weather	Injuries	Fatalities	Type	Description
2	VT-105	0.95	12/15/2013	16:31	Snow	2	0	Single Vehicle Crash	Just west of Reed Rd on Vermont Route 105. Single vehicle crash. The roadway at that location of the Crash, in the easterly direction, consists of a slight down-hill slope with a sweeping left to right corner. The pavement at the time of the crash was <b>snow covered and slick</b> . Op # stated he was traveling back from Jay Peak at approximately 30 mph going towards Newport, when he continued straight, traveling off the road and into the trees before rolling over on the roof. Op #1 stated he just moved from Washington State and had not experienced roads this slippery. Op #1 advised he and his passenger were wearing their seatbelts. Officer concluded that Veh #1 left the roadway before traveling up embankment indicated by tire tracks traveling eastbound. Vehicle #1 then made contact with several small trees between 8-12 inches in circumference while rolling clockwise 180 degrees onto the roof. Veh #1 then slid approximately 10 yards down a slight incline, leaving a field of broken glass and plastic trim parts, before coming to rest. All of the vehicle's windows were broken due to the slight crushing of the roof when it made contact with the ground. Op #1 failed to drive to the given road conditions causing the vehicle to lose traction and maintain lane proper lane position. Inj 3
3	VT-105	0.95	12/21/2013	0:30		0	0	[No Direction of Collision]	No narrative nor diagram. Lost control
4	VT-105	0.95	12/28/2013	1:15	Clear	0	0		No narrative. Lost control on <b>Ice</b>

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Crash Number	Road	Marker	Date	Time	Weather	Injuries	Fatalities	Type	Description
5	VT-105	0.96	12/17/2012	11:00	Cloudy	1	0	Single Vehicle Crash	One vehicle crash occurred on VT RT 105 approximately a quarter mile south of White Mountain Auto in the town of Coventry. This crash occurred on the open highway away from any intersections. The highway at the scene is slightly curved and is level. The weather at the time of the crash was cloudy and the <b>road surface was snowy</b> . Op #1 advised he was traveling east on VT RT 105 at approximately 35 mph when her passenger side tires caught some snow. Op #1 advised once the vehicle made contact with the snow in the roadway; the vehicle was pulled off the roadway and collided with the telephone pole. Officer's investigation revealed the Veh #1 was traveling east on VT RT 105 in Coventry at approximately 35 mph. Veh #1 then came in contact with a slippery section of roadway causing the operator to lose control of the vehicle a go off south side of the traveled portion of the roadway. Veh #1 then <b>side swiped a telephone</b> , causing damage to the passenger side of the vehicle. Veh #1 then came to a position of uncontrolled rest perpendicular to the roadway approximately 50 feet from the telephone pole. Inj 3
6	VT-105	0.99	2/21/2015	18:20		0	0	[No Direction of Collision]	No narrative nor diagram. Ran off Road. <b>Snow, Ice</b> .
7	VT-105	0.99	3/6/2015	0:02		0	0	[No Direction of Collision]	No narrative nor diagram. DUI, <b>Snow</b>

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Crash Number	Road	Marker	Date	Time	Weather	Injuries	Fatalities	Type	Description
8	VT-105	1.00	1/28/2013	19:35	Snow	1	0	Single Vehicle Crash	One vehicle crash. The roads were <b>snow covered</b> at the time. The highway at the scene slopes slightly downward, curves to the right. Impact point was the driver's side door. Op #1 advised she was traveling home from her son's residence up the road. She advised she did not know what happened and slid off the roadway and struck the telephone pole. Investigation revealed that Op #1 was traveling east on VT RT 105 when she failed to negotiate the curve at the bottom of the hill. Tracks in the snow showed Op #1 crossed the center lines and continued into the west bound travel lane, then continued approximately 30ft off of the westbound shoulder and <b>struck a telephone pole</b> with the front end of the vehicle, then the driver's side of the vehicle slid along the side of the pole, trapping Op #1 inside. Inj 3
9	VT-105	1.03	5/6/2011	7:56	Clear	0	0	Head On	One vehicle accident with unknown injury. Op #1 advised officer he was traveling West on Route 105 when he struck a pothole and lost his right front tire causing vehicle #1 to go off the road into the ditch, where it struck a tree and continued in the ditch for approximately 100 feet. Op#1 also advised that the tire that fell off his vehicle was a doughnut tire (aka temp emergency tire) as he had recently had a flat tire with V#1. Cause of the accident was runoff roads causing the vehicles right front tire to fall off.

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Crash Number	Road	Marker	Date	Time	Weather	Injuries	Fatalities	Type	Description
10	VT-105	1.04	5/20/2012	19:59	Clear	0	0	Single Vehicle Crash	One vehicle rollover. Route 105 is a blacktop road, free of any obstructions, with a sharp curve and level in this area. The weather was clear and the roadway was dry. On 05/20/2012, this portion of Route 105 was undergoing construction and the roadway was both gravel and blacktop. Op #1 advised she was traveling into Newport and explained she was doing about 40 - 45 MPH and made an attempt to shift down to fourth gear. Op #1 stated that she thought she had not depressed the clutch early enough because she was able to shift down. Stated she was going too fast and the vehicle began to fishtail, she lost control and went off the road, which caused the vehicle to overturn. Officer's conclusion: Prior to the collision Veh #1 was traveling east on Route 105. Due to the speed of the vehicle and the condition of the roadway Operator #1 was unable to control the vehicle on the sharp curve and left the roadway, which caused the vehicle to overturn. The primary cause of this crash was Operator # 1 driving too fast for conditions or hazards.

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Crash Number	Road	Marker	Date	Time	Weather	Injuries	Fatalities	Type	Description
11	VT-105	1.04	5/20/2012	18:21	Clear	1	0	Single Vehicle Crash	Officer observed Vehicle #1 off the north side of the roadway, with contact damage to the front bumper, headlights, hood, front quarter panel and windshield. Route 105 is a blacktop road, free of any obstructions, with a sharp curve and level in this area. On 05 20 /2012, the weather was clear and the roadway was dry. On 05/20/2012, this portion of Route 105 was undergoing construction and the roadway was both gravel and blacktop. Op #1 advised he was traveling to Newport to visit his child. Op #1 explained he was doing about 35 MPH when the vehicle began to fishtail and he lost control and went off the road and hit a pole. Witness #1 advised he was traveling west on Route 105 and observed Vehicle #2 traveling east. Witness #1 explained as Vehicle #1 rounded the curve the rear end of the vehicle began to fishtail causing the vehicle to leave the road and strike the utility pole. Officer determined from the operator's statement and visual observations of the vehicle and the collision scene that prior to the collision Veh #1 was traveling east on Route 105. Due to the speed of the vehicle Op #1 was unable to control the vehicle on the sharp curve and left the roadway, striking a utility pole. The primary cause of this crash was Op # 1 driving too fast for conditions or hazards. Inj 4

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Crash Number	Road	Marker	Date	Time	Weather	Injuries	Fatalities	Type	Description
12	VT-105	1.04	8/25/2012	18:41	Clear	0	0	Rear End	One vehicle crash with contact damage to the front bumper. Two vehicles originally involved, but one left the scene. Route 105 is gravel, free of any obstructions, with a sharp curve and up/down hill in this area. On 08/25/2012, the weather was clear and the roadway was dry. All occupants were reportedly wearing their seatbelts and no injuries were reported. Op #2 advised officer he was stopped on Route 105 at the end of Reed Road and explained that he was turning onto Reed Road but was waiting for a vehicle to pass. Operator#2 stated that he was struck by a white full size truck (Operator #1). Op #2 advised the operator of the truck stopped asked him if he was injured and turned back to the truck. Op #2 stated he thought that Op #1 was getting his vehicle information, however, Op #1 got back into the truck and left. Officer concluded that prior to the collision Vehicle #1 was traveling east on Route 105 and Vehicle #2 was stopped at the intersection of Reed Road and Route 105.

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Crash Number	Road	Marker	Date	Time	Weather	Injuries	Fatalities	Type	Description
13	VT-105	1.04	9/24/2014	12:24	Clear	0	0	Rear End	Two vehicle crash. Traveling east. VT Rte. 105. The road surface at the scene is straight with a street (Reed Road) on the left hand side when traveling east. The highway is of blacktop construction with a slight downhill. The weather was clear and the road surface was dry. There were no injuries at the scene. Op #1 advised she had been following Veh #2, down the road when Veh #2 stopped in the roadway to make a left hand turn and she couldn't get her truck and trailer stopped in time rear ending vehicle #2. Op #1 advised she had heard the trailer brakes squealing, but there were no visible brake marks. Operator #2 advised she had stopped to take a left hand turn onto Reed Road when she was rear ended by Veh #1. Investigation revealed that both vehicles were traveling east on Vt Rte 105 when Op #2 had stopped to make a left hand turn onto Reed Road. Op #1 was unable to stop her truck and cattle trailer with two cows in it, thus hitting the rear end of Vehicle #2 hard enough sending Vehicle #2 across the west bound lane of traffic into a mailbox onto someone's lawn. Veh #1 came to a point of controlled rest a few feet east of the crash in the same traveled lane. Vehicle #2 came to a point of uncontrolled final approximately 150 feet from the point of impact.

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