Vermont 2015 Annual Seat Belt Use Survey

Final Report

TRC Report 16-001
March 2016

Samantha Tilton, Jim Sullivan and Karen Sentoff

Vermont 2015 Annual Seat Belt Use Survey

March 2016

Prepared by:

Samantha Tilton
Jim Sullivan
Karen Sentoff

Transportation Research Center
Farrell Hall
210 Colchester Avenue
Burlington, VT 05405

Phone: (802) 656-1312
Website: www.uvm.edu/trc

Acknowledgements

The authors would like to acknowledge VTrans for providing funding for this work.

Disclaimer

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of the UVM Transportation Research Center. This report does not constitute a standard, specification, or regulation.

Table of Contents

List of Tables

List of Figures

1 Introduction

The UMV TRC is contracted to conduct the seat belt observational surveys to evaluate use rates in Vermont after the annual Click-It-or-Ticket enforcement mobilizations in May of 2015 and 2016. This report was prepared pursuant to the "GHSP Annual Seat Belt Survey" scope of work for the contract with the Vermont Agency of Transportation (VTrans). The objective of the project is to continue the annual survey of seatbelt use in accordance with 23 CFR Part 1340 – *Uniform Criteria for State Observational Surveys of Seat Belt Use*. The purpose of this report is to document the activities which were completed under this contract.

In 2014, there were an estimated 44 fatalities in Vermont due to vehicle crashes, 46% were not wearing their seatbelts. This is reduction of 38% from 2013 which reported 70 fatalities in Vermont (DPS, 2015). The use of safety belts reduces both fatalities and injuries to drivers and passengers. Vermont's seat belt use rate has been increasing each year, from approximately 54% in 1992 to approximately 84% in 2014. (VCJR, 2008). Fatalities have also dropped from approximately 90 deaths in 1992 to 44 in 2014. (DPS, 2015). Seatbelt usage is thought to be a significant factor in reducing highway fatalities.

The Vermont Governor's Highway Safety Program exists to support safe driving on Vermont highways. By promoting awareness through education, along with enforcement, the GHSP strives for zero deaths on the road. The GHSP has been contracting seatbelt survey work to gauge usage on Vermont roads and compare the results over time. 2008 marked the tenth year that the GHSP used the current methodology which includes the survey matched with the awareness and enforcement program ("click it or ticket").(VCJR, 2008) Each survey presents an opportunity to reflect on the effectiveness of the awareness and enforcement efforts. Over the past twelve years, the seatbelt usage rate in Vermont has been around 85% with lower use in the more rural areas of the state. (GHSP, 2014)

The purpose of this study was to conduct the annual seat belt survey for 2015 at 82 roadside locations to determine the percentage of drivers and front-seat passengers who were using seat belts correctly. The field work for this survey was conducted primarily during the months of June, July, and August in 2015, following the annual Click-It or Ticket campaign in May. The overall goals of this work were:

1. To develop and document an updated methodology for collecting roadside seat-belt observation data;
2. To summarize the data in a statewide estimate of seat-belt use and a standard error for that estimate.

2 Study Area and Survey Design

The study area and design for this survey follows the previous year's design as established by VTrans in accordance with 23 CFR Part 1340. Sampling requirements state that sites be selected to reflect areas that account for 85 percent of fatalities as well as road coverage from a NHTSA approved road inventory which then is based on probability sampling. Assignment of observation times and procedures were also followed under 23 CFR Part 1340 by working between 7:00am and 6:00pm during all days of the week at random. Drivers and passengers were recorded as wearing a seatbelt if the shoulder belt was in front of the person's shoulder. (23 CFR 1340, 2012)

Computation of estimates, including sampling weights, variance estimation, and standard error also followed the CFR 1340 guidelines.

The survey has been stratified across two dimensions: geographically by county groups that have demonstrated policy and enforcement relevance, and further by roadway functional classification (FC). All of Vermont's counties were included in the site selection process and were grouped in the survey design as follows:

Table 1 County Group Description

County Group	Counties
BAD	Bennington, Addison (southwest)
CC	Chittenden
FGI	Franklin, Grand Isle (northwest)
NEK	Essex, Orleans, Caledonia (the "Northeast Kingdom")
Rut	Rutland (central-west)
WL	Washington, Lamoille (central)
WOW	Windsor, Windham, Orange (southeast)

The same 82 sites that had been used in the survey design for previous years were targeted for use in the 2015 survey, except that two of the sites could not be used so back-up sites were substituted. Of these two, one could not be accessed due to construction and the other featured less than 10 vehicles in the 45-minute period of observation. For each of these sites, a back-up site was selected for substitution in the survey. A map of the final set of observation sites is provided in Figure 1.

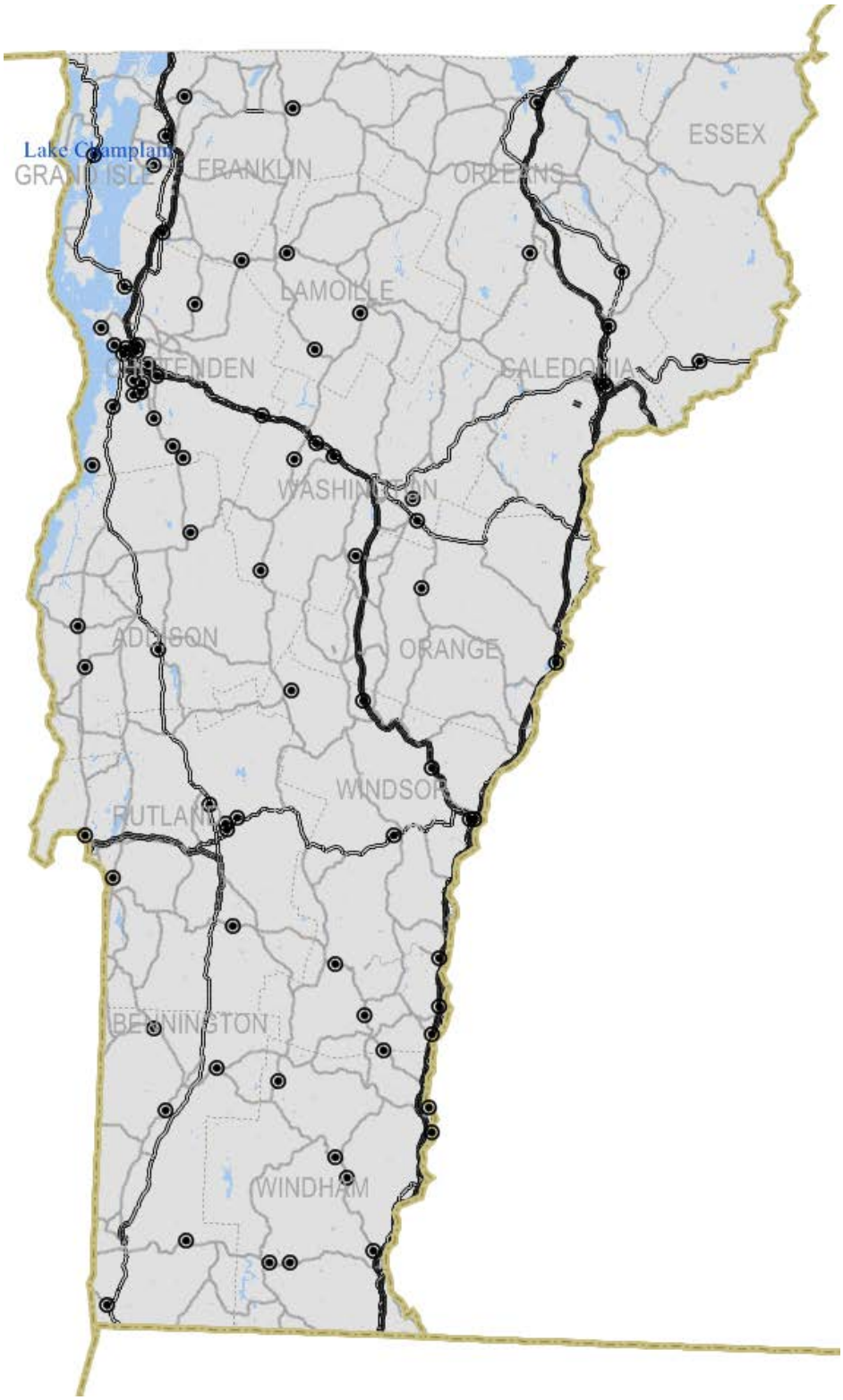

Figure 1 Observation Sites Used in the 2015 Seat Belt Use Survey

These sites were designed to collect an adequate set of observations for the effective estimation of a statewide seat-belt use rate with a standard error that is under 2.5% and a “non-response” rate, or “couldn’t tell” rate that is under 10%, as dictated by the 23 CFR 1340. This design was expected to generate between 12,000 and 15,000 observations of drivers on Vermont roads and to meet the CFR requirement for standard error. Staff observed 86 sites in total, 6 of which were backup sites.

3 Methodology

3.1 Data Collection Method Development

A method collecting the observation data was first developed while staff were trained to make effective observations. Sites near the UVM TRC in Burlington were used for testing the roadside observation procedures before implementing the survey on a full scale. The goals of the method development were (1) to keep roadside observers safe, and (2) to contribute effective counts of seat-belt use rates.

Staff considered several different options on how to create the optimal counting procedure which would allow for maximum effectiveness and ease for the user. An iPad was chosen as the ideal tool as it would allow for easy data collection that could be saved for future reference. Three tally apps were considered - Fulcrom, Tally Pro, and Tally Counters. Staff decided to use Tally Counters as it allowed for multiple variables to be counted at the same time. The saving method was to take a screenshot at the end of the count to identify the site location and time. Screenshots (see Figure 2) were then sent to one staff person who then entered the data into an Excel worksheet and archived the screenshots.

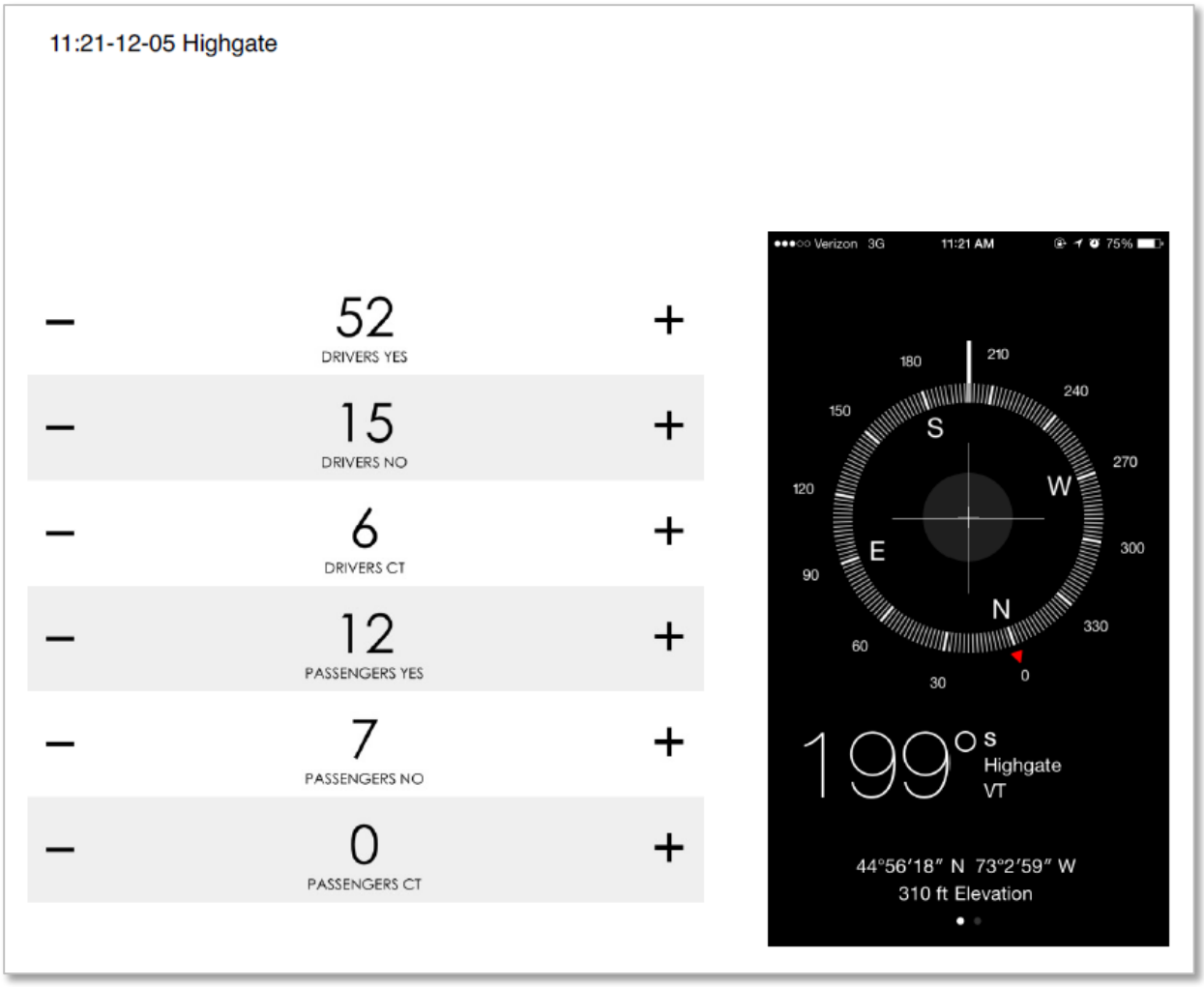

Figure 2 Example Screenshot

For each site, the following data was recorded:

- Name of observer
- Site ID
- Direction of travel being observed
- Start time and date
- End time and date

For each observation, the seat-belt use status of driver and front-seat passenger (if applicable) were recorded:

- Belted (if the shoulder belt is in front of the person's shoulder)
- Unbelted (if the shoulder belt is not in front of the person's shoulder)

- Couldn't Tell (if it cannot reasonably be determined whether the driver or passenger is belted)

Observations were conducted during randomly selected daylight hours on weekdays between 7 a.m. and 6 p.m. Data collection was conducted for 45 minutes at each site.

Several challenges to data collection presented themselves over the course of the field work. While weather, especially rain, had the potential to impact staff's ability to collect data, it proved to be the sun that was the biggest obstacle to obtaining clear counts. Overall the most common challenges were as follows:

- Glare on windshields was the most difficult obstacle to seeing if a driver was wearing their seatbelt. Staff could sometimes move positions or observe in the opposite direction to avoid glare, but often times this did not solve the problem.
- Seats with a built-in seatbelt which was anchored into the seat rather than on the frame of the vehicle also created a difficult situation to see if the seatbelt was being used or not.
- Large vehicles were often times too high for staff to see inside. This included construction vehicles and large pick-up trucks.
- Clothing color that matched the color of the seatbelt was another challenging situation to make a clear observation. Paired with glare, this was especially difficult to be sure what was being observed.

3.2 Collection of Data

Staff observed drivers from the side of the road to record seat belt use by drivers and front seat passengers. An iPad was used with the app Tally Counters to mark "Yes", "No", or "Couldn't Tell" for both driver and passenger. Compass directions were also noted through various apps on staff member's smartphones to note the direction of traffic as well as latitude and longitude of the observation site. Screenshots were taken of the tally counts and saved for further analysis. Staff were instructed to observe one lane of traffic and to note which lane they were observing in the event of multiple lanes. Observations were made of all front seat occupants (driver and passenger) within a 45-minute time slot which was also noted on the tally sheet.

Previously identified backup sites were also observed to serve as additional information, if necessary. Only two sites proved to need a backup site as a replacement due to lack of vehicles to observe or construction obstacles.

A typical day of field work would be a driver and one or more staff accompanying them. If there were multiple staff available, the driver would drop off staff at a site, drop the next staff person off, then backtrack to pick up the first staff person. As travel time to sites grew throughout the timing of this project, two staff people were assigned to the majority of the field work.

Interstate sites were observed from the emergency turnaround nearest the proposed site, by senior staff, following the protocols required by an Interstate U-Turn Authorization permit (Appendix C). A separate staff person was responsible for the interstate sites as well as obtaining the permit to allow for the TRC vehicle to use the median.

3.3 Data Analysis

Under the stratified multistage sample design that was used to determine the 82 intended sites, the inclusion probability for each observation in the statewide sample is the product of the inclusion probabilities at each stage (NHTSA, 2011). A total of 8 stages were used in the sample design:

For the location of each observation site:

a. County Group

b. Functional Classification of the Roadway

c. Road Segment

For the specific observations at each site:

d. Time Segment Observed – weekend, weekday non-peak, weekday peak

e. Travel Direction Observed

f. Lanes Each Way Observed

g. Observation Rate

h. Front Seat Occupants Observed

Therefore, in order to calculate a weighted average of the observation rates at each site, inclusion probabilities corresponding to each of the stratification stages were needed.

The inclusion probabilities for the first 3 stages (a., b., and c.) are directly related to the selection of sites. Since the site locations were maintained from the original survey design for the Vermont, the combined inclusion probabilities to account for these three location-based stages was already known. These inclusion probabilities are included in the site-description table in Appendix A. These inclusion probabilities are based on the vehicle-miles of travel (VMT) represented by the specific site location divided by the total VMT in the stage-category being considered. The VMT represented by each specific site is also provided in Appendix A.

The inclusion probabilities for the Time Segment Observed stage corresponds to the probability of an observation being on a weekend, a non-peak hour of a weekday, or a peak-hour of a weekday. This inclusion probability is also based on the VMT represented by the specific site location divided by the total VMT in the stage-category being considered (weekend, weekday peak, or weekday non-peak).

The inclusion probabilities of the Travel Direction Observed stage corresponds to the probability of an observation being made in both travel directions at its site. Since all of the sites observed in this study were on roads with two-way traffic and only one of those directions was observed, the inclusion probabilities for all of the sites for Travel Direction Observed were 0.5. This value indicates that, for every site, one of two possible travel directions was observed.

The inclusion probabilities of the Lanes Each Way Observed stage corresponds to the probability of an observation being made for all of the travel lanes in each direction at a site. Since all of the sites observed in this study included observation of all travel lanes in the direction being observed, the inclusion probabilities for all of the sites for Lanes Each Way Observed were 1.0.

The inclusion probabilities of the Observation Rate stage corresponds to the probability of an observation being made for each vehicle that passes. Therefore, these inclusion probabilities correspond to the success rate of observations for the site, or the inverse of the non-response rate. This value was calculated by dividing the number of vehicle where a successful observation was made (Belted or Unbelted) divided by the total number of vehicles that passed during the observation period (Belted or Unbelted + Couldn't Tell).

The inclusion probabilities of the Front Seat Occupants Observed stage correspond to the probability of an observation being made for all of the front-row occupants of a vehicle (driver and passenger) at a site. Since all of the sites observed in this study included observation of all front seat occupants for the site being observed, the inclusion probabilities for all of the sites for Front Seat Occupants Observed were 1.0.

From these inclusion probabilities, a sample weight was calculated for each site, by taking the inverse of the product of all its inclusion probabilities. These sample weights were then used to find a statewide average seat-belt usage rate by taking a weighted average of the raw usage rates for each site. (23 CFR 1340, 2012)

4 Results

During our field work, a total of 25,277 observations of seat belt use were made at 86 sites. Observations from 6 of the sites were reserved as back-up in case one or more of the primary sites could not be accessed. Two of these back-up sites were eventually used in place of 2 primary sites, one of which was inaccessible due to construction activity and the other of which did not have any observations during the 45-minute period when observation was attempted. Additional observations beyond the 45-minute period were made at site TRC01 to ensure a non-response observation rate below 10%. The final non-response rate was 9.9%. 20,379 individual vehicles were observed, so the average front-row occupancy of each observed vehicle was 1.24. **The overall weighted statewide safety belt use rate for Vermont was calculated to be 85.8% and the standard error rate was calculated to 0.2%.**

Table 2 provides the raw (unweighted) average rates across all observations used to calculate the statewide rate.

Table 2: Raw (Unweighted) Seat-Belt Usage Rates

Front-Seat Occupant	Raw Average Observation Rate
Driver Only	86.8%
Passenger Only	86.5%
Both	86.7%

Summary statistics for the sample weights and the raw seat-belt usage rates at all 82 sites used to calculate the statewide rate are provided in Table 3.

Table 3: Sample Weights and Raw Usage Rates

	Min	Max	Mean	Standard Deviation
Observation Rates	62%	100%	88%	8%
Sample Weights	14	2,351,124	61,887	268,448
Raw Usage Rates (Driver)	68%	100%	86%	6%
Raw Usage Rates (Pass.)	57%	100%	87%	9%

Seat-belt use rates observed at each of the 82 sites statewide which contributed to the final weighted rate of 86% are shown in Figure 3.

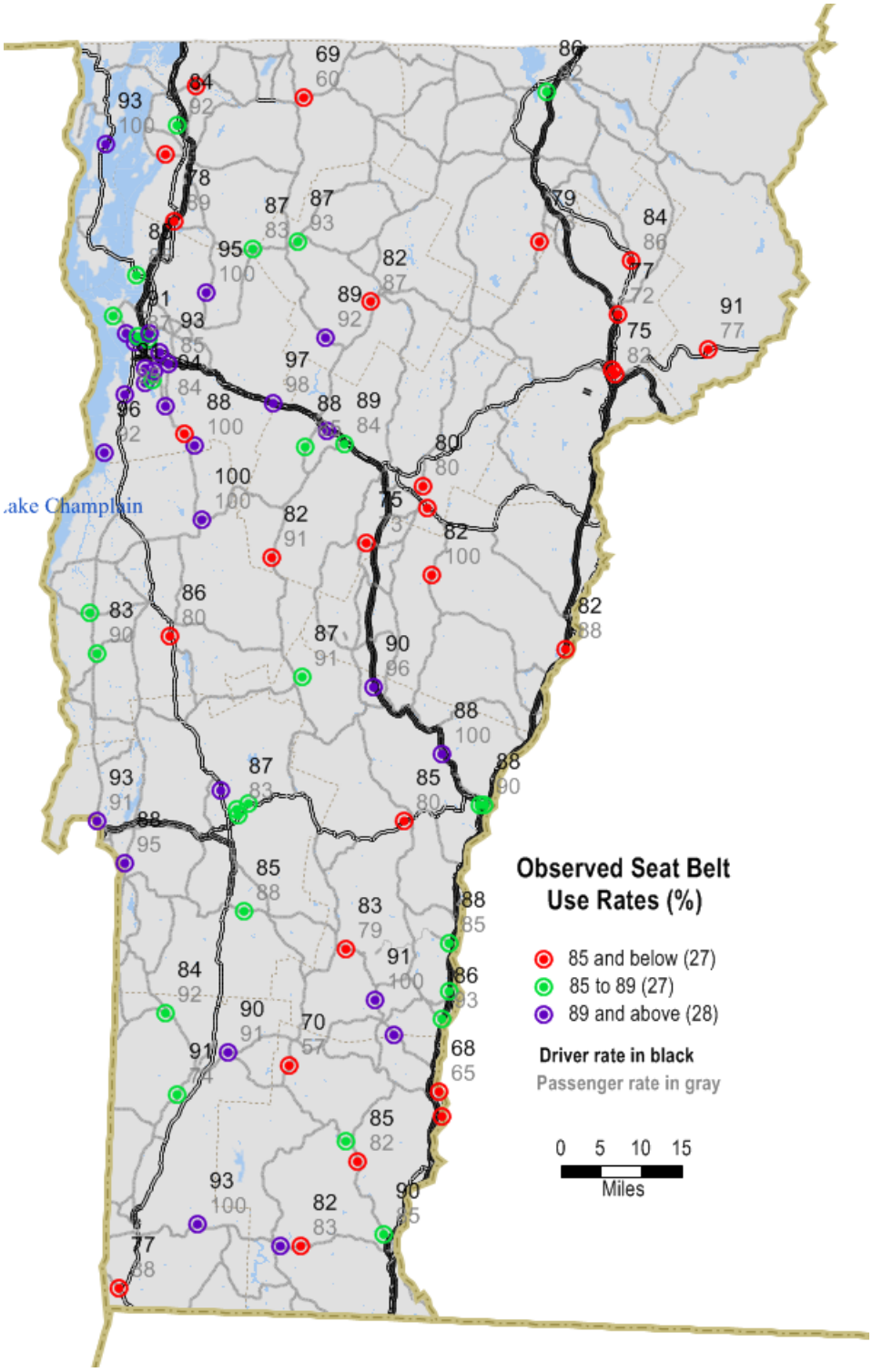

Figure 3 Statewide Seat Belt Use Rates

Site-by-site details of the observations are provided in Appendix B.

5 Future Improvements to the Methodology

With the potential of using cameras to record field observations in the future, TRC staff believe that improvements can be made in observer safety, non-response rates, and sample size. Video cameras could provide new insight about seat-belt use across different seasons of the year, during adverse weather conditions, during construction, and across more hours of the day. Video-based data collection offers to potential to substantially reduce or eliminate missed observations if issues with glare and vehicle speed can be addressed.

6 References

WSU, 2014. *2014 Annual Direct Observation Survey of Safety Belt and Cell Phone Use.* Prepared for the Office of Highway Safety Planning by the Wayne State University Transportation Research Group, September 2014.

GHSP, 2014. *2014 Highway Safety Plan.* Prepared by the State of Vermont Governor's Highway Safety Program, Vermont Department of Public Safety. 2014.

VCJR, 2008. *Vermont 2008 Safety Belt Use Study*. Prepared by William Clements, Ph.D. & Michael Oman, P.E. of the Vermont Center for Justice Research for the Governor's Highway Safety Program, Vermont Department of Public Safety, August 2008

23 CFR 1340, 2012. *Uniform Criteria for State Observational Surveys of Seat Belt Use*. Title 23, Chapter III, Part 1340 of the Code of Federal Regulations, April 1, 2012.

DPS, 2015. *Traffic Crash Fatalities*. Vermont State Police Department of Public Safety. http://vsp.vermont.gov/trafficsafety/fatalities Accessed 10/28/2015.

Appendix A: Observation Results by 45-Minute Observation Period

Heading Legend:

SID = Observation Site ID Number (internal to study).

TRC ID = Observation site ID for sites observed in 2015

CG = County group.

FC = Functional classification of roadway.

S = Site status – Primary (P) or Back-up (B).

DVMT = Daily vehicle-miles of travel represented by the road segment

SEGID = Agency of Transportation Segment ID

Route = Agency of Transportation highway designation of roadway.

CntSta = Nearest continuous traffic count station.

AADT = Annualized Average Daily Traffic.

$\boldsymbol{\pi_{ifr}}$ **=** Probability that a segment is included in its County Group, Functional Classification group , and Segment group.

City or Town = Vermont city or town where the count site was located

Date Observed = Date which observations were conducted.

Driver Belted = Driver was observed wearing a seat belt.

Driver Not Belted = Driver was observed not wearing a seat belt.

Driver Couldn't Tell = Observer could not determine if driver was wearing a seat belt.

Passenger Belted = Passenger was observed wearing a seat belt.

Passenger Not Belted = Passenger was observed not wearing a seat belt.

Passenger Couldn't Tell = Observer could not determine if passenger was wearing a seat belt.

SID	TRC ID	CG	FC	S	DVMT	SEGID	Route	FC	CntSta	AADT	π *i/fr*	City or Town	Date Observed	Driver Belted	Driver Not Belted	Driver Couldn't Tell	Total # of Drivers	Passenger Belted	Passenger Not Belted	Passenger Couldn't Tell	Total # of Passengers
1106	TRC01	CC	Art	P	3,779	8817	TH-4	14	D156	15,300	0.0645	BURLINGTON	6/18/2015	161	33	8	202	33	10	0	43
1106	TRC01	CC	Art	P	3,779	8817	TH-4	14	D156	15,300	0.0645	BURLINGTON	12/22/2015	192	24	0	216	29	8	0	37
1106	TRC01	CC	Art	P	3,779	8817	TH-4	14	D156	15,300	0.0645	BURLINGTON	12/22/2015	420	50	0	470	48	12	0	60
1106	TRC01	CC	Art	P	3,779	8817	TH-4	14	D156	15,300	0.0645	BURLINGTON	12/18/2015	398	88	0	486	112	13	0	125
1106	TRC01	CC	Art	P	3,779	8817	TH-4	14	D156	15,300	0.0645	BURLINGTON	12/18/2015	366	83	0	449	115	7	0	122
1106	TRC01	CC	Art	P	3,779	8817	TH-4	14	D156	15,300	0.0645	BURLINGTON	12/18/2015	569	68	0	637	129	36	0	165
1106	TRC01	CC	Art	P	3,779	8817	TH-4	14	D156	15,300	0.0645	BURLINGTON	12/18/2015	457	78	0	535	121	32	0	153
1106	TRC01	CC	Art	P	3,779	8817	TH-4	14	D156	15,300	0.0645	BURLINGTON	12/18/2015	414	68	0	482	80	24	0	104
1106	TRC01	CC	Art	P	3,779	8817	TH-4	14	D156	15,300	0.0645	BURLINGTON	12/21/2015	435	65	0	500	45	22	0	67
1106	TRC01	CC	Art	P	3,779	8817	TH-4	14	D156	15,300	0.0645	BURLINGTON	12/21/2015	342	50	0	392	59	16	0	75
1106	TRC01	CC	Art	P	3,779	8817	TH-4	14	D156	15,300	0.0645	BURLINGTON	12/21/2015	287	41	0	328	68	14	0	82
1106	TRC01	CC	Art	P	3,779	8817	TH-4	14	D156	15,300	0.0645	BURLINGTON	12/21/2015	348	66	0	414	83	17	0	100
1106	TRC01	CC	Art	P	3,779	8817	TH-4	14	D156	15,300	0.0645	BURLINGTON	12/21/2015	297	38	0	335	91	5	0	96
1111	TRC02	CC	Art	P	13,242	7984	TH-9	12	D001	14,600	0.2261	BURLINGTON	6/18/2015	238	24	13	275	65	5	7	77
1207	TRC03	CC	Col	P	1,156	8189	TH-13	17	D447	11,800	0.0189	BURLINGTON	6/18/2015	103	7	7	117	14	2	4	20
1103	TRC04	CC	Art	P	1,338	40542	TH-3	16	D331	6,400	0.0229	SO. BURLINGTON	6/18/2015	122	15	1	138	25	4	1	30
1110	TRC05	CC	Art	P	5,242	40244	VT-116	14	D525	5,500	0.0894	SO. BURLINGTON	6/18/2015	206	22	13	241	41	8	4	53
1206	TRC06	CC	Col	P	1,380	40505	TH-6	17	D524	5,000	0.0225	SO. BURLINGTON	6/18/2015	118	6	32	156	18	0	13	31
1121	TRC07	CC	Art	B	4,769	40223	US-2	14	SOBR57	19,000	0.0545	SO. BURLINGTON	6/18/2015	116	6	8	130	21	1	2	24
1201	TRC08	CC	Col	P	2,056	40497	TH-10	17	SOBR40	4,000	0.0336	SO. BURLINGTON	6/18/2015	503	42	29	574	91	7	31	129
6104	TRC09	WL	Art	P	22,599	V015-080207	V015-	6	NA	5,700	0.1055	CAMBRIDGE	6/18/2015	39	7	6	52	13	2	1	16
6107	TRC10	WL	Art	P	6,885	V104-080201	V104-	6	NA	3,500	0.0321	CAMBRIDGE	6/18/2015	37	3	4	44	3	0	0	3
3202	TRC11	FGI	Col	P	403	V207-060902	VT-207	7	F155	3,100	0.0152	HIGHGATE	6/19/2015	109	16	11	136	42	3	6	51
6102	TRC12	WL	Art	P	6,818	U302-120201	U302-	14	NA	6,800	0.0319	BARRE TOWN	6/19/2015	65	10	11	86	15	3	6	24
6201	TRC13	WL	Col	P	1,091	S6104120201	S6104	17	W239	2,000	0.0065	BARRE TOWN	6/29/2015	52	15	6	73	12	7	0	19
1102	TRC14	CC	Art	P	42,509	5177	I-89	1	W089	25,500	0.7258	BOLTON	6/22/2015	110	36	13	159	17	2	4	23
6101	TRC15	WL	Art	P	23,382	V100-120601	V100-	6	W364	3,800	0.1091	DUXBURY	6/22/2015	35	9	1	45	8	2	1	11
6121	TRC16	WL	Art	B	13,574	V014-120702	V014-	6	W114	4,400		E MONTPELIER	8/26/2015	453	16	217	686	52	1	99	152
6122	TRC17	WL	Art	B	1,840	U002-121103	U002-	16	W184	10,600		MONTPELIER	6/22/2015	61	8	6	75	11	2	5	18
6105	TRC18	WL	Art	P	115,783	I089-000011	I089-	1	W034	23,100	0.5405	MIDDLESEX	6/22/2015	44	14	5	63	10	3	2	15
6203	TRC19	WL	Col	P	1,799	U002-121002	U002-	7	W145	3,800	0.0107	MIDDLESEX	6/22/2015	128	24	6	158	35	2	0	37
6221	TRC20	WL	Col	B	8,465	V064-121301	V064-	7	W357	3,400	0.0035	NORTHFIELD	8/11/2015	406	20	226	652	94	4	84	182
6202	TRC21	WL	Col	P	32,378	V108-080803	V108-	7	L130	8,400	0.1929	STOWE	6/22/2015	85	11	5	101	16	3	6	25
1107	TRC22	CC	Art	P	5,333	12336	US-2	16	D019	10,100	0.091	COLCHESTER	6/22/2015	48	16	4	68	8	3	1	12
1105	TRC23	CC	Art	P	5,292	57918	TH-1	16	COLC19	14,000	0.0904	COLCHESTER	8/3/2015	164	21	4	189	57	5	22	84
1112	TRC24	CC	Art	P	3,428	11978	VT-15	14	COLC13	20,900	0.0585	COLCHESTER	6/25/2015	127	18	15	160	22	3	14	39
1108	TRC25	CC	Art	P	1,488	51145	I-89	11	D423	8,500	0.0254	WILLISTON	6/24/2015	179	29	19	227	37	5	2	44
1203	TRC26	CC	Col	P	2,254	39275	TH-5	19	SHEL01	3,400	0.0368	SHELBURNE	6/25/2015	322	34	20	376	57	5	8	70
1113	TRC27	CC	Art	P	7,582	61599	VT-116	6	D296	10,400	0.1295	HINESBURG	8/26/2015	823	61	180	1064	69	12	57	138
1109	TRC28	CC	Art	P	2,179	22281	VT-116	6	D127	3,700	0.0372	HINESBURG	6/25/2015	168	13	1	182	40	3	0	43
1101	TRC29	CC	Art	P	8,906	39109	US-7	14	D243	18,400	0.1521	SHELBURNE	6/25/2015	173	12	29	214	31	6	8	45
1205	TRC30	CC	Col	P	3,706	22311	TH-5	7	D360	1,600	0.0606	HINESBURG	6/25/2015	71	17	21	109	17	3	6	26
1222	TRC31	CC	Col	B	2,533	12282	TH-9	17	D089	7,300		COLCHESTER	6/25/2015	500	47	11	558	123	7	6	136

SID	TRC ID	CG	FC	S	DVMT	SEGID	Route	FC	CntSta	AADT	π_{ijfr}	City or Town	Date Observed	Driver Belted	Driver Not Belted	Driver Couldn't Tell	Total # of Drivers	Passenger Belted	Passenger Not Belted	Passenger Couldn't Tell	Total # of Passengers
1204	TRC32	CC	Col	P	437	10583	TH-4	9	D370	770	0.0071	CHARLOTTE	6/25/2015	36	5	9	50	9	0	0	9
2201	TRC33	BAd	Col	P	2,737	V017-010302	V017-	7	A015	1,600	0.0146	BRISTOL	6/24/2015	128	31	8	167	20	5	17	42
6103	TRC34	WL	Art	P	38,340	V100-080701	V100-	6	L179	8,700	0.179	MORRISTOWN	6/25/2015	24	1	0	25	12	1	0	13
1202	TRC35	CC	Col	P	4,897	49157	VT-128	7	D309	2,100	0.08	WESTFORD	6/26/2015	39	0	1	40	9	0	0	9
3101	TRC36	FGI	Art	P	8,207	V104A060801	VT-104A	6	F047	4,700	0.0344	GEORGIA	8/3/2015	214	46	11	271	48	7	20	75
2101	TRC37	BAd	Art	P	2,048	V022A010203	V022A	6	A113	4,500	0.0104	BRIDPORT	6/25/2015	38	2	4	44	2	0	1	3
2203	TRC38	BAd	Col	P	6,245	V074-011807	V074-	7	A154	1,900	0.0332	SHOREHAM	6/25/2015	47	13	5	65	17	2	0	19
2106	TRC39	BAd	Art	P	14,919	U007-011703	U007-	2	A107	7,900	0.0761	SALISBURY	6/26/2015	123	19	5	147	41	4	3	48
6106	TRC40	WL	Art	P	2,683	V100-121702	V100-	6	W008	1,300	0.0125	WARREN	6/26/2015	20	4	3	27	9	1	1	11
4122	TRC41	NEK	Art	B	30,557	I091-000026	I091-	1	P002	5,600		BARTON	7/6/2015	160	25	22	207	35	9	23	67
7109	TRC42	WOW	Art	P	47,229	I091-000016	I091-	1	N002	7,700	0.2214	FAIRLEE	7/2/2015	78	17	12	107	29	3	1	33
7104	TRC43	WOW	Art	P	78,002	I089-000002	I089-	1	Y085	23,300	0.3659	HARTFORD	8/13/2015	130	42	13	185	52	2	11	65
7114	TRC44	WOW	Art	P	123,938	I089-000005	I089-	1	Y001	14,200	0.5813	RANDOLPH	8/13/2015	193	43	14	250	68	9	26	103
7121	TRC45	WOW	Art	B	165,517	I089-000003	I089-	1	Y086	17,400		SHARON	8/13/2015	617	91	87	795	233	14	60	307
7112	TRC46	WOW	Art	P	115,603	I091-000008	I091-	1	Y075	11,900	0.5422	WEATHERSFIELD	8/13/2015	460	53	94	607	100	4	66	170
7206	TRC47	WOW	Col	P	3,952	U005-140810	U005-	7	Y223	10,400	0.0216	HARTFORD	8/13/2015	252	40	17	309	76	8	31	115
7201	TRC48	WOW	Col	P	7,990	V014-141701	V014-	7	Y003	1,600	0.0437	SHARON	7/20/2015	185	26	6	217	78	9	2	89
3103	TRC49	FGI	Art	P	11,314	U002-070402	US-2	6	G102	2,900	0.0475	N HERO	7/16/2015	30	4	6	40	6	0	6	12
3201	TRC50	FGI	Col	P	774	S6F239	TH12	9	F165	1,500	0.0036	St Albans Town	6/29/2015	66	5	10	81	1	0	5	6
3203	TRC51	FGI	Col	P	1,337	U007-061501	US-7	7	F149	4,500	0.1157	SWANTON	6/29/2015	61	13	8	82	12	3	4	19
3102	TRC52	FGI	Art	P	13,555	V105-060308	VT-105	6	NA	6,400	0.0569	ENOSBURG	6/29/2015	69	13	19	101	12	1	8	21
5104	TRC53	Rut	Art	P	6,124	V022A110710	V022A	6	NA	4,900	0.0285	FAIR HAVEN	6/29/2015	90	40	14	144	15	10	21	46
5103	TRC54	Rut	Art	P	13,632	U004-112003	U004-	14	R081	12,900	0.0633	RUTLAND TOWN	7/6/2015	150	11	8	169	64	6	2	72
5102	TRC55	Rut	Art	P	8,740	V030-111706	V030-	6	R126	2,800	0.0406	POULTNEY	7/2/2015	250	46	25	321	84	6	11	101
5202	TRC56	Rut	Col	P	373	S3216112001	S3216	17	R472	1,200	0.0023	RUTLAND TOWN	7/6/2015	43	6	11	60	21	1	2	24
5101	TRC57	Rut	Art	P	24,261	U004-111003	U004-	2	R112	11,200	0.1126	MENDON	7/2/2015	39	6	0	45	10	2	3	15
5105	TRC58	Rut	Art	P	25,189	U007-111601	U007-	2	R102	9,000	0.117	PITTSFORD	7/2/2015	197	30	27	254	61	7	15	83
5201	TRC59	Rut	Col	P	5,419	V140-112502	V140-	7	R316	910	0.0328	WALLINGFORD	7/2/2015	142	14	46	202	44	8	16	68
2105	TRC60	BAd	Art	P	9,207	V030-021002	V030-	6	B121	2,500	0.047	RUPERT	7/9/2015	17	3	0	20	7	1	0	8
2102	TRC61	BAd	Art	P	17,478	V011-021602	V011-	6	B114	6,900	0.0891	WINHALL	7/9/2015	48	9	4	61	11	1	2	14
2202	TRC62	BAd	Col	P	12,555	V007A020601	V007A	7	B103	4,900	0.0668	MANCHESTER	7/21/2015	120	14	29	163	40	4	19	63
2104	TRC63	BAd	Art	P	12,972	V009-021703	V009-	2	B130	3,500	0.0662	WOODFORD	7/13/2015	70	7	19	96	17	6	4	27
2103	TRC64	BAd	Art	P	17,562	U007-020802	U007-	2	B112	6,100	0.0896	POWNAL	7/21/2015	69	5	19	93	25	0	10	35
7204	TRC65	WOW	Col	P	1,620	S0176141502	S0176	7	Y300	1,300	0.0089	ROCHESTER	7/13/2015	62	19	24	105	22	3	8	33
7116	TRC66	WOW	Art	P	7,387	U004-142403	U004-	2	Y116	8,600	0.0347	WOODSTOCK	7/16/2015	33	5	1	39	10	1	0	11
7101	TRC67	WOW	Art	P	12,406	V103-141002	V103-	2	Y062	9,000	0.0582	LUDLOW	7/20/2015	96	17	1	114	24	6	3	33
7111	TRC68	WOW	Art	P	15,536	V103-140708	V103-	2	Y161	4,600	0.0728	CHESTER	7/28/2015	164	34	5	203	44	12	10	66
7107	TRC69	WOW	Art	P	2,928	V103-140701	V103-	2	Y427	5,200	0.0138	CHESTER	7/28/2015	103	10	11	124	18	0	21	39
7108	TRC70	WOW	Art	P	3,832	V100-131002	V100-	6	NA	2,500	0.0179	LONDONDERRY	7/28/2015	113	11	22	146	9	3	18	30
7113	TRC71	WOW	Art	P	9,162	V011-141813	V011-	6	Y133	9,000	0.043	SPRINGFIELD	7/28/2015	47	20	1	68	4	3	2	9
7203	TRC72	WOW	Col	P	2,111	S0117131404	S0117	7	X153	6,700	0.0115	BELLOWS FALLS	7/30/2015	171	27	22	220	27	2	53	82
7102	TRC73	WOW	Art	P	2,835	U005-132005	U005-	6	NA	4,300	0.0133	WESTMINSTER	7/30/2015	168	79	27	274	50	27	4	81
7103	TRC74	WOW	Art	P	16,967	V030-131704	V030-	6	X124	3,800	0.0795	TOWNSHEND	7/30/2015	110	32	20	162	43	8	7	58
7105	TRC75	WOW	Art	P	8,813	V030-131204	V030-	6	NA	5,200	0.0413	NEWFANE	7/27/2015	75	12	5	92	30	4	3	37

SID	TRC ID	CG	FC	S	DVMT	SEGID	Route	FC	CntSta	AADT	π_{ijfr}	City or Town	Date Observed	Driver Belted	Driver Not Belted	Driver Couldn't Tell	Total # of Drivers	Passenger Belted	Passenger Not Belted	Passenger Couldn't Tell	Total # of Passengers
7110	TRC76	WOW	Art	P	10,410	V009-132204	V009-	2	X133	5,700	0.0488	WILMINGTON	7/27/2015	134	24	11	169	18	4	16	38
7115	TRC77	WOW	Art	P	17,794	V009-131101	V009-	2	X134	4,800	0.0835	MARLBORO	7/27/2015	86	11	60	157	63	3	10	76
7106	TRC78	WOW	Art	P	17,323	V030-130203	V030-	16	X130	6,300	0.0813	BRATTLEBORO	7/27/2015	112	24	2	138	52	11	0	63
7202	TRC79	WOW	Col	P	10,500	V131-142005	V131-	7	Y177	5,400	0.0574	WEATHERSFIELD	7/27/2015	129	14	10	153	39	7	7	53
4104	TRC80	NEK	Art	P	2,505	V191-100703	V191-	6	NA	3,300	0.0125	DERBY	7/20/2015	92	12	26	130	35	6	2	43
4102	TRC81	NEK	Art	P	4,245	V016-100801	V016-	6	P022	1,600	0.0212	GLOVER	8/6/2015	74	12	6	92	14	3	5	22
4202	TRC82	NEK	Col	P	5,151	U005-030202	U005-	7	C101	2,700	0.0283	BURKE	8/6/2015	34	9	5	48	11	4	6	21
4203	TRC83	NEK	Col	P	627	S0277051101	S0277	7	E144	160	0.0035	GUILDHALL	8/12/2015	47	9	8	64	12	2	10	24
4201	TRC84	NEK	Col	P	14,437	U005-030707	U005-	7	C146	14,300	0.0794	LYNDON	8/12/2015	262	80	4	346	82	32	1	115
4101	TRC85	NEK	Art	P	1,746	U005-031108	U005-	16	C165	5,600	0.0087	ST JOHNSBURY	8/12/2015	132	32	7	171	29	8	17	54
4103	TRC86	NEK	Art	P	2,843	U002-031115	U002-	14	C160	8,600	0.0142	ST JOHNSBURY	8/12/2015	190	63	1	254	58	13	1	72
7205	TRC87	WOW	Col	P	4,614	V110-091502	V110-	7	N127	860	0.0252	WASHINGTON	8/17/2015	9	2	1	12	1	0	1	2
4105	TRC88	NEK	Art	P	3,603	U002-050706	U002-	2	E007	2,600	0.018	CONCORD	8/10/2015	39	4	19	62	24	7	5	36
1104		CC	Art	P	3,187	51487	US-2	14	WILL12	11,590	0.0545	WILLISTON									
1122		CC	Art	B	4,010	73071	VT-2A	16	D135	17,900		WILLISTON									
1221		CC	Col	B	2,356	35675	TH-3	8	RICH27	1,100		RICHMOND									
2121		BAd	Art	B	9,234	V116-011903	V116-	6	A122	3,600		STARKSBORO									
2122		BAd	Art	B	5,227	S1006020202	S1006	16	B142	10,800		BENNINGTON									
2221		BAd	Col	B	9,356	S0199011203	S0199	7	A326	3,000		MONKTON									
3121		FGI	Art	B	8,575	V105-061402	V105-	6	NA	6,400		SHELDON									
3221		FGI	Col	B	5,679	S0280060401	S0280	7	NA	3,000		FAIRFAX									
4121		NEK	Art	B	3,194	V100-101304	V100-	6	NA	1,500		LOWELL									
4221		NEK	Col	B	13,008	U005-030710	U005-	7	C102	4,900		LYNDON									
5121		Rut	Art	B	2,423	B004-111903	B004-	16	R225	8,500		RUTLAND CITY									
5122		Rut	Art	B	4,860	U007-112002	U007-	2	R502	19,200		RUTLAND TOWN									
5221		Rut	Col	B	947	V073-110206	V073-	7	NA	2,100		BRANDON									
7122		WOW	Art	B	10,699	V103-140601	V103-	2	Y160	5,200		CAVENDISH									
7221		WOW	Col	B	198	S0126132301	S0126	7	X047	130		WINDHAM									
7222		WOW	Col	B	627	S0152142305	S0152	7	NA	580		WINDSOR									

.Appendix B: Raw Seat Belt Use Rates by Site

TRC ID	City or Town	Raw Use Rate (driver)	Raw Use Rate (passenger)	Raw Rate (driver & passenger)	Sample Weight (w)
TRC01	BURLINGTON	86.1%	82.4%	85.4%	7,873
TRC02	BURLINGTON	90.8%	92.9%	91.3%	678
TRC03	BURLINGTON	91.1%	86.7%	90.4%	91,562
TRC04	SO. BURLINGTON	90.4%	83.7%	89.2%	66,385
TRC05	SO. BURLINGTON	95.2%	100.0%	95.8%	1,089
TRC06	SO. BURLINGTON	95.1%	95.5%	95.1%	65,988
TRC08	SO. BURLINGTON	92.3%	92.9%	92.4%	16,118
TRC09	CAMBRIDGE	88.4%	88.9%	88.5%	6,204
TRC10	CAMBRIDGE	87.2%	93.3%	88.8%	884
TRC11	HIGHGATE	86.7%	83.3%	86.0%	10,254
TRC12	BARRE TOWN	77.6%	63.2%	74.4%	334,718
TRC13	BARRE TOWN	75.3%	89.5%	77.0%	3,931
TRC14	BOLTON	79.5%	80.0%	79.6%	56,675
TRC15	DUXBURY	96.6%	98.1%	96.7%	199
TRC18	MIDDLESEX	88.4%	84.6%	87.8%	852
TRC19	MIDDLESEX	95.3%	95.9%	95.4%	97
TRC21	STOWE	88.5%	84.2%	87.8%	109,052
TRC22	COLCHESTER	75.0%	72.7%	74.7%	68,974
TRC23	COLCHESTER	88.6%	91.9%	89.5%	339
TRC24	COLCHESTER	87.6%	88.0%	87.6%	935
TRC25	WILLISTON	86.1%	88.1%	86.4%	4,341
TRC26	SHELBURNE	90.4%	91.9%	90.7%	4,125
TRC27	HINESBURG	93.1%	85.2%	92.4%	63,162
TRC28	HINESBURG	92.8%	93.0%	92.9%	23,199
TRC29	SHELBURNE	93.5%	83.8%	91.9%	2,277
TRC30	HINESBURG	80.7%	85.0%	81.5%	29,540
TRC32	CHARLOTTE	91.4%	94.6%	92.0%	1,450
TRC33	BRISTOL	87.8%	100.0%	90.0%	2,037
TRC34	MORRISTOWN	96.0%	92.3%	94.7%	616,976
TRC35	WESTFORD	100.0%	100.0%	100.0%	48,950
TRC36	GEORGIA	82.3%	87.3%	83.2%	62
TRC37	BRIDPORT	95.0%	100.0%	95.2%	5,472
TRC38	SHOREHAM	78.3%	89.5%	81.0%	7,216
TRC39	SALISBURY	86.6%	91.1%	87.7%	93,812
TRC40	WARREN	83.3%	90.0%	85.3%	10,328
TRC42	FAIRLEE	86.5%	79.5%	85.2%	2,019
TRC43	HARTFORD	82.1%	90.6%	84.3%	62,963

TRC ID	City or Town	Raw Use Rate (driver)	Raw Use Rate (passenger)	Raw Rate (driver & passenger)	Sample Weight (w)
TRC44	RANDOLPH	81.8%	88.3%	83.4%	413
TRC46	WEATHERSFIELD	87.1%	94.3%	89.0%	155
TRC47	HARTFORD	89.7%	96.2%	90.8%	67
TRC48	SHARON	86.3%	90.5%	87.2%	14
TRC49	N HERO	87.7%	89.7%	88.3%	46,097
TRC50	St Albans Town	88.2%	100.0%	90.0%	7,133
TRC51	SWANTON	93.0%	100.0%	93.1%	4,308
TRC52	ENOSBURG	82.4%	80.0%	82.0%	157,917
TRC53	FAIR HAVEN	84.1%	92.3%	85.3%	3,217
TRC54	RUTLAND TOWN	69.2%	60.0%	67.7%	3,045
TRC55	POULTNEY	93.2%	91.4%	92.6%	11,453
TRC56	RUTLAND TOWN	84.5%	93.3%	86.5%	4,855
TRC57	MENDON	87.8%	95.5%	90.1%	6,388
TRC58	PITTSFORD	86.7%	83.3%	86.0%	2,351,124
TRC59	WALLINGFORD	86.8%	89.7%	87.5%	801
TRC60	RUPERT	91.0%	84.6%	89.4%	844
TRC61	WINHALL	85.0%	87.5%	85.7%	10,780
TRC62	MANCHESTER	84.2%	91.7%	85.5%	4,812
TRC63	WOODFORD	89.6%	90.9%	89.9%	3,124
TRC64	POWNAL	90.9%	73.9%	87.0%	2,810
TRC65	ROCHESTER	93.2%	100.0%	94.9%	2,884
TRC66	WOODSTOCK	76.5%	88.0%	79.2%	3,170
TRC67	LUDLOW	86.8%	90.9%	87.8%	27,433
TRC68	CHESTER	85.0%	80.0%	83.9%	7,683
TRC69	CHESTER	82.8%	78.6%	81.9%	2,810
TRC70	LONDONDERRY	91.2%	100.0%	92.4%	2,108
TRC71	SPRINGFIELD	91.1%	75.0%	89.7%	61,364
TRC72	BELLOWS FALLS	70.1%	57.1%	68.9%	5,879
TRC73	WESTMINSTER	86.4%	93.1%	87.2%	12,940
TRC74	TOWNSHEND	68.0%	64.9%	67.3%	86,472
TRC75	NEWFANE	77.5%	84.3%	79.3%	57,928
TRC76	WILMINGTON	86.2%	88.2%	86.8%	1,514
TRC77	MARLBORO	84.8%	81.8%	84.4%	6,053
TRC78	BRATTLEBORO	88.7%	95.5%	91.4%	5,391
TRC79	WEATHERSFIELD	82.4%	82.5%	82.4%	2,605
TRC80	DERBY	90.2%	84.8%	88.9%	1,483
TRC81	GLOVER	88.5%	85.4%	87.6%	3,792
TRC82	BURKE	86.0%	82.4%	85.4%	67,708
TRC84	LYNDON	79.1%	73.3%	77.6%	25,328
TRC85	ST JOHNSBURY	83.9%	85.7%	84.3%	16,521

TRC ID	City or Town	Raw Use Rate (driver)	Raw Use Rate (passenger)	Raw Rate (driver & passenger)	Sample Weight (w)
TRC86	ST JOHNSBURY	76.6%	71.9%	75.4%	1,690
TRC87	WASHINGTON	80.5%	78.4%	80.1%	141,146
TRC88	CONCORD	75.1%	81.7%	76.5%	47,746

Appendix C: Interstate U-Turn Authorization Permit

CERTIFICATE

James Sullivan and Jacob Leopold
UVM Transportation Research Center
University of Vermont

Vermont Agency of Transportation

INTERSTATE U-TURN AUTHORIZATION

The Bearer of this Certificate, as a representative of the University of Vermont, is hereby authorized to utilize the U-Turns on Interstate 89/91, during the execution of their duties while conducting research for the Governor's Highway Safety Alliance as follows:

I-89	I-91
Northbound, MM 1.2	Northbound, MM 158.8
Southbound, MM 61.	Northbound, MM 93.4
Northbound, MM 25.2	Northbound, MM 45.2

Anticipated timeframe for this research work is **July 8 to July 31, 2015**. If the work is not completed by that date, this Certificate will remain in effect until the work is completed.

Persons using the U-Turns shall abide by the following, and the Guidelines for the Proper use of U-Turns on Limited Access Highways on the reverse side of this Certificate:

1. Have this authorization in his/her possession.
2. Use the U-Turn with the utmost caution.
3. Use a flashing amber light located on the roof of the vehicle.
4. Yield to all Interstate-through traffic.
5. U-Turns will not be utilized during inclement weather or fog conditions.

Failure to comply with any of the above shall be grounds for revoking this authorization.

Kevin L. Marshia 7/1/15

Kevin Marshia, P. E. Date
Acting Chief Engineer
Highway Division
Vermont Agency of Transportation
1 National Life Drive
Montpelier, VT 05633-5001

VTrans Working to Get You There

c: State Police, Lt. Garry Scott and Sgt. Eric Albright
Montpelier Project Files

C:\Users\kmarshia\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Outlook\58PM73TE\UVM Research Program for Governors Highway Safety Alliance 2015 U-Turn Permit Application.docx