

VERMONT AGENCY OF TRANSPORTATION



SNOW AND ICE CONTROL PLAN

FOR STATE AND INTERSTATE HIGHWAYS

A. PURPOSE AND NEED

The purpose of this plan is to define the operational procedures and best management practices (BMPs) for performing winter maintenance activities on Vermont's Highways. It defines the levels of service that the Vermont Agency of Transportation (VTrans) will strive to provide, and gives guidance to help minimize leaching of salt-laden and other winter maintenance material runoff from state-owned paved surfaces and storage facilities into the ground or into surface waters.

Since storms vary dramatically across the state, this Snow and Ice Control Plan (SIC Plan) is intended to be flexible. It is a guide structured to fit average conditions, but should still be able to accommodate the wide variety of conditions that will be encountered by maintenance crews.

B. LEVEL OF SERVICE – GENERAL INFORMATION

VTrans Maintenance District snow and ice control operations are limited by the resources (budget, personnel, equipment and materials) available for winter maintenance. Consequently, VTrans' SIC Plan calls for "safe roads at safe speeds", and not "bare roads". This means that roads during a storm are maintained to allow safe travel at safe speeds, but that drivers should expect to see snow on the roadway during a storm. Most travel takes place during the day, so the majority of VTrans resources are used between 4 a.m. and 10 p.m. During those hours, some plow routes can take as long as 2 to 2 ½ hours to cover. Motorists should anticipate reduced coverage and varying road conditions at night, and should drive accordingly.

C. CORRIDOR PRIORITIES

Four color-coded levels of service have been established and are shown on the attached "Corridor Priority Map". Priorities are based on winter traffic volumes, roadway classification, and expected truck traffic. Critical areas such as intersections, sharp curves, and hills may have to be treated differently to retain proper mobility and safety regardless of the corridor designation assigned to the balance of the route. Note that during off hours, resources may be shifted to prioritize coverage on higher priority routes.

1. CORRIDOR PRIORITY 1 – INTERSTATE AND LIMITED ACCESS HIGHWAYS (ORANGE ROADS)

Winter maintenance operations will generally be performed between 3 am and 10 pm. Materials noted under Section E will be applied as needed to keep the roads open for traffic and provide a safe surface on which to operate, though road surface may be snow covered at times during the storm. After the storm has subsided, bare travel lanes shall be provided as soon as practical and on these roads before all others. In

most cases, this will occur within 4 daylight hours. A bare pavement shoulder to shoulder will be provided as soon as practical. Travelers are reminded to reduce speed and drive according to conditions.

2. CORRIDOR PRIORITY 2 – HIGH TRAFFIC HIGHWAYS & TRUCK ROUTES (BLUE ROADS)

Winter maintenance operations will be performed between 4 am and 10 pm. Materials noted under Section E will be applied as needed to keep the roads open for traffic and provide a safe surface on which to operate, though road surface may be snow covered at times during the storm. After the storm has subsided, a bare pavement shoulder to shoulder will be provided as soon as practical. Travelers are reminded to reduce speed and drive according to conditions.

3. CORRIDOR PRIORITY 3 - MEDIUM TRAFFIC HIGHWAYS (GREEN ROADS)

Winter maintenance operations will be performed between 4 am and 10 pm. Materials noted under Section E will be applied as needed to keep the roads open for traffic and provide a safe surface on which to operate, though road surface may be snow covered at times during the storm. During the next regular working day after the storm has subsided, a bare pavement shoulder to shoulder will be provided as soon as practical. Travelers are reminded to reduce speed and drive according to conditions.

4. CORRIDOR PRIORITY 4 – LOW TRAFFIC HIGHWAYS (YELLOW ROADS)

Winter maintenance operations will be performed between 4 am and 10 pm. Materials noted under Section E will be applied as needed to keep the roads open to traffic and provide a safe surface on which to operate. Road surface may be snow covered during and immediately following the storm. During the next regular working day after the storm has subsided, one third bare pavement, in the middle of the road, will be provided as soon as practical. As soon thereafter as practical, a bare pavement shoulder to shoulder will be provided. Travelers are reminded to reduce speed and drive according to conditions.

D. PERFORMANCE MEASUREMENT: HOW ARE WE DOING AND HOW DO WE KNOW?

Performance during and immediately following individual storm events will be monitored by the District General Manager and the Area Maintenance Supervisors to ensure VTrans is providing safe roads at safe speeds and performing snow and ice removal in accordance with established Corridor Priorities noted under Section C.

The following information will be reviewed by the Director of Maintenance and Operations, the Maintenance Transportation Administrator (MTA), State Maintenance Engineer (SME) and the District Transportation Administrators (“DTAs”) to gage program effectiveness:

- Material application rates
- Vehicle speeds during and after storm events (Mobility)
- Condition of travel lanes and shoulders during and after storm events (level of “Grip”)
- Storm data -precipitation, air temperature, road surface temperature, wind speed, etc (Winter Severity Index)
- Plowing frequency

Seasonal performance will be measured by monitoring material usage, labor costs, and equipment costs with respect to the number of lane miles maintained and the number of storm events addressed. Assessments will be made based upon consideration of the resources used versus the winter severity encountered, as well as through comparisons between adjacent and nearby geographical areas that have encountered similar winter conditions.

VTrans Maintenance and Operations Bureau will publish the winter maintenance data in the VTrans Fact Book each spring which summarizes the previous winter, and VTrans' performance according to the above mentioned metrics.

E. MATERIALS AND APPLICATION PROCEDURES

The materials described in this section are those used by VTrans for snow and ice control on highways throughout Vermont. This section describes the general purpose of each material, the typical use that is expected under normal conditions, and the application procedure. Choice of materials will depend on experienced consideration of the following variables: pavement temperature, nature of the particular snow and ice event, forecast storm conditions, air temperature and wind velocity, traffic volume, time of day/year, and the availability of resources.

Procedures for determining application rates and methods will be the responsibility of District personnel based on the guidance included in this SIC Plan.

1. Road Salt (NaCl)

Unless otherwise designated for specific routes, salt is the primary material used on the majority of roads maintained by VTrans. Salt is used to prevent the bonding of snow and ice onto the pavement surface, and to melt snow and ice that cannot be removed by plowing. Unless salt is pre-wetted with a liquid having a lower working temperature than sodium chloride, the lowest effective working temperature is approximately 15 degrees F.

Application Rates shall normally be selected from the attached "Salt Application Quick Reference Guideline" (Appendix A) and shall be based upon the pavement temperature; snow-ice conditions encountered, and anticipated trends.

Appendix B (Application Rates vs. Miles You Can Treat) is provided as a quick reference guide for maintenance workers and supervisors.

2. Winter Sand

Winter sand shall consist of coarse, clean, sharp sand or other granular material. Sand is generally used to provide traction at intersections and corners during icy conditions. When conditions warrant, salt may be mixed with sand to break the bond between the ice pack and road surface.

Sand should generally be used in the following situations:

- On hills, curves and intersections where the supervisor determines that temporary traction is needed
- When pavement temperatures are too low for salt to work properly
- When wet pavements exist on lower-volume corridors and falling nighttime temperatures may cause glazing

Excessive use of sand can have many detrimental impacts to the road and environment, and sand has no melting capabilities. Sand can act as an insulator to snow and ice formed on the roadway making it harder to establish bare pavement following the storm. Sand also can create roadway drainage issues, clog ditches and receiving waters, and is expensive to clean up in the spring. Accordingly, the use of winter sand is generally minimized.

3. Liquids

A variety of liquids are used to either “pre-wet” solid materials that are applied from the plow trucks or to “anti-ice” the highways in advance of a storm event. Following are descriptions of the types of liquids used by VTrans, and descriptions of the “anti-icing” and “pre-wetting” process.

- a) **Salt Brine** - Salt brine is a 23% solution of salt in water. It can be used to either “pre-wet” solid materials that are applied from the plow trucks or to “pre-treat” the highways in advance of a storm event. However, unless salt brine is mixed with additives, the effective working temperature is the same as salt in its solid form – approximately 15 degrees F or greater.
- b) **Chemical Additives** – Chemical additives are used to pre-wet the solid materials that are applied by the plow trucks to lower the effective working temperature of salt and to help keep the solid materials on the road during the application process. Examples of such chemicals may include magnesium chloride (MgCl₂), calcium chloride (CaCl) and a number of proprietary products. Chemical additives shall include a corrosion inhibitor, and are generally less corrosive than salt. Chemical additives should be added to salt brine when road temperatures are lower than 15 degrees F.
- c) **Anti-icing** - For anti-icing with salt brine, the application rates per lane mile may vary when pavement temperatures *during the storm* are anticipated to be 15 degrees F or greater. Application will generally occur on designated routes 6 to 8 hours prior to the projected start of the storm, however, up to 12 hours may be permissible based on timing of the storm. Anti-icing may also be used to spot treat bridge decks and other problem areas located on any priority corridor whenever weather forecasts indicate the possibility of glazing. When anti-icing the roads with a blend, application rates may be cut back. Due to concerns associated with proper timing and effectiveness of anti-icing activities, as well as a desire to reduce salt usage, we reserve anti-icing for very special circumstances.
- d) **Pre-wetting** - Pre-wetting is the application of liquids onto solid materials. In general, salt brine shall normally be used when the pavement temperatures are above approximately 15 degrees F and chemical additive or blend shall be used when below. Pre-wetting is the preferred and typical liquid application method. Pre-wetting allows the salt to work immediately and reduces the loss of salt to “scatter and bounce” where up to 30% of the dry salt can be lost to the side of the road and ditches.

F. EQUIPMENT

1. Washing Equipment

Snow and ice control equipment are to be thoroughly washed during regular working hours as soon after use as practicable. Particular attention is to be paid to the areas of equipment in contact with sand, salt and liquid chlorides. Truck washing will normally be accomplished outdoors in designated areas.

2. Loads

When trucks are loaded with salt in advance of performing winter maintenance activities, the load size shall not exceed a level-load. If the storm does not occur, or if the material is not applied, the truck(s) loaded in advance shall be unloaded and washed out the following working day.

3. Spreaders

Each spreading unit shall be calibrated annually, and after any spreader or hydraulic maintenance, to ensure that selected rates of application are attained. Confirm that application rates are being transmitted by the truck’s AVL system.

G. OPERATIONS

1. Mailboxes And Other Structures Within The Highway Right-Of-Way

Occasionally mailboxes or other devices are damaged by snow plowing operations due to poor visibility, the mailbox being buried in a snow bank or the weight/volume of the snow being plowed.. VTrans is not responsible for damage and does not repair, replace or re-erect boxes that are located within the highway right-of-way unless physically struck by a VTrans plow truck. In these cases, VTrans will replace the mailbox at no cost to the property owner with a generic United States Post Office approved box and basic post if necessary.

2. Widening or Pushing Back Snow Banks

Following storms with heavy snowfall or when several storms result in substantial snow banks, VTrans will undertake a roadway widening procedure, which will push back the snow banks. This is generally done during normal working hours to accomplish the following:

- a) Provides room for future snow storage.
- b) Reduces or prevents melted snow from running out onto the roadway pavement and creating icing conditions.
- c) Increases safe sight distance at intersections and driveways.
- d) Maintains a uniform line by eliminating protrusions at driveways and intersections.

There is no practical way to prevent depositing snow in previously cleaned driveways or walkways.

3. Sidewalks

The maintenance of the sidewalks, including snow removal, is the responsibility of local communities. In addition, in those communities where on-street parking is permitted, snow removal from the parking areas, including plowing and or hauling away, is a local responsibility.

H. STATE AND FEDERAL REGULATORY OVERSIGHT

1. Winter Maintenance Practices located within designated National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) areas, including Watersheds of Sediment and Stormwater Impaired Waterways, and in the Lake Champlain Watershed Basin:

Winter maintenance activities in these areas have and will continue to be regulated and addressed under the VTrans MS4/ TS4 (Transportation Separate Storm Sewer System) Stormwater Management Plan. Please refer to the VTrans Operations Environmental Program web site for more information regarding the above referenced designations as they may change from time to time and for information regarding the VTrans MS4/ TS4 Stormwater Management Plan. Link to this site at:

<http://vtrans.vermont.gov/operations/technical-services/environmental/stormwater/managing/ms4gp3-9014>

2. Winter Maintenance Practices - Statewide Implementation and Jurisdiction:

VTrans SIC Plan has and will continue to be implemented across the state and will not be subject to ANR jurisdiction outside the designated MS4 & Lake Champlain Basin areas. The Operations Environmental Program will forward to the State Agency of Natural Resources (ANR) the SIC Plan as often as updates are made.

I. BEST MANAGEMENT PRACTICES, TRACKING AND REPORTING

Best management practices associated with winter maintenance activities in conformance with the provisions of the VTrans SIC Plan include, but are not limited to:

1. VTrans shall disseminate the SIC Plan statewide to employees involved in the application and storage of winter snow and ice control materials and train such employees in the proper performance of these standards. The Maintenance and Operations Environmental Program Manager will ensure that this information is posted on the VTrans Web Site, kept current, and made available to ANR.
2. Low salt and no salt roads (zones) will be signed in the field accordingly.
3. Weekly internal reporting of salt/sand usage will be completed by Maintenance and Operations Bureau staff commencing on the first week of November and terminating 26 weeks later, typically with the last week of April. VTrans shall make note of any single de-icing salt application in excess of 800 pounds per two-lane mile and report such incidents as part of the weekly reporting. The Director of Maintenance and Operations will make this information available to ANR upon request.
4. VTrans shall fully cover with impervious material all bulk salt storage areas under their control to reduce the amount and concentration of salt to the runoff of stormwater from these storage areas. All bulk salt storage shall be situated on an impervious material so as to minimize leaching of salt-laden runoff into the ground.
5. VTrans shall locate sand piles at District Maintenance Facilities in areas that will not result in sediment-laden runoff into surface waters. If sand piles are located in close proximity to surface waters then VTrans shall install adequate erosion prevention and sediment control practices to ensure sediment-laden runoff will not impact surface waters.
6. When it is desirable to charge sand piles with salt to prevent freezing (resulting in mixes or blends), the percentage of salt in the pile shall not exceed 5%.
7. VTrans will implement these activities on a statewide basis in accordance with the protocols and best management practices established within the MS4 and Lake Champlain Basin areas for seamless operational efficiencies across the state and to support the stated purpose of this SIC Plan. The Maintenance and Operations Environmental Program will report on these tasks as a part of each annual MS4/ TS4 report to ANR.
8. Nothing in this SIC Plan shall preclude the Agency from utilizing experimental and new technologies to achieve higher efficiency in a cost effective and environmentally sensitive manner. VTrans actively supports innovation and promotes the idea of finding new and better ways to reach our goals.

Approved: _____
Date

By: _____
Joe Flynn, Secretary of Transportation

Attachments:

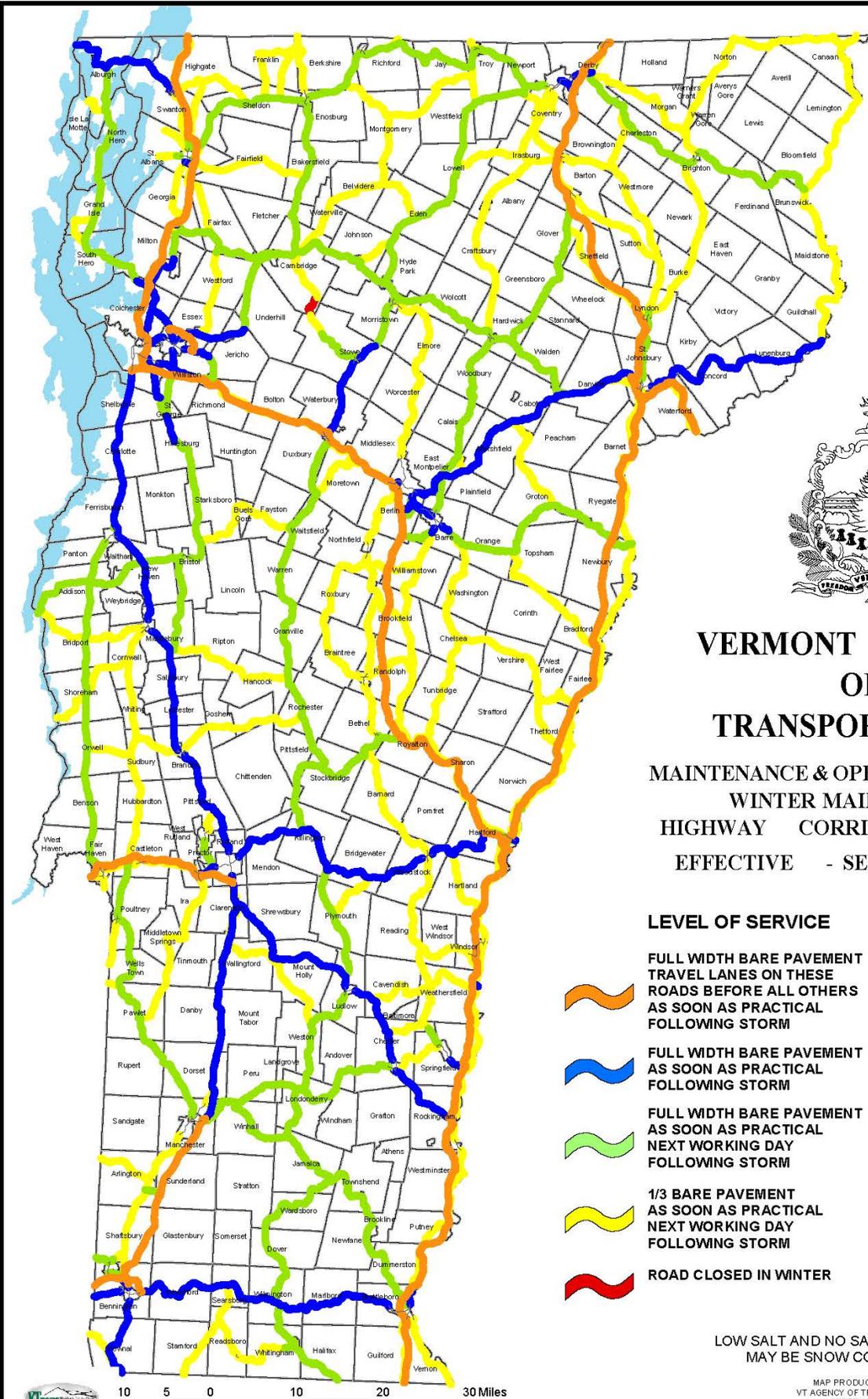
- APPENDIX A – Salt Application Quick Reference Guideline
- APPENDIX B – Application Rates vs. Miles You Can Treat
- Corridor Priority Map

APPENDIX A

Salt Application Quick-Reference Guideline (**Double these rates for centerline applications**)			
Pavement Temp. Range	Application Rate (#/LM)	Pre-wet Material	Comments
Above 32°	0 to 100	Salt Brine or Blend	A little salt goes a long way when temperatures are near freezing
25° to 32°	100 to 200	Salt Brine or Blend	Salt is very effective here. Pre-wetting with a blend will allow lower application rates.
20° to 25°	200 to 300	Salt Brine, Chemical, or Blend	Salt effectiveness is dropping off in this range. A Blend or straight chemical will help.
15° to 20°	300 to 400	Chemical or Blend	Pre-wetting is especially important. Your liquids will provide the extra boost needed.
15° or Below	Snow is usually dry and blowing in this range. If no ice or pack exists, plow only - DO NOT APPLY MATERIAL		If necessary, spot treat icy patches with abrasives. If glazing occurs on high-volume, high-speed, sand will not last and higher salt applications, with pre-wetting, will be needed.
General Notes: (1) Application rates should be on the lower end when temperatures are on the higher side of the range or remaining steady. Falling temperatures, and temperatures on the lower side of the range, will require applications on the higher side, and possibly in the next range if dropping rapidly. (2) In any of the ranges, if the snow is dry and blowing off of the roadway, do NOT apply material. (3) Pre-wetting under wet storm conditions is not required. In cases where the only pre-wetting liquid available is a high-performance chemical, it is better to save those products for the drier and colder conditions. (4) This is a guideline only. Application rates will vary based on climatic conditions experienced in the field, as well as corridor priority. (5) During cold storms, when the pavements are dry and the snow is blowing off the travel lanes, the application of salt or winter sand is to be avoided for as long as possible since it will hasten the formation of ice on the pavement. When ice does begin to form under these conditions, considerable judgment will be required on whether to use salt that is pre-wetted with liquid or spot applications of winter sand.			

APPENDIX B

Application Rates vs. Miles You Can Treat							
# of Tons	Application Rate (Pounds Per Lane Mile)						
	100	150	200	250	300	350	400
	Lane Miles You Can Treat						
1	20.0	13.3	10.0	8.0	6.7	5.7	5.0
2	40.0	26.7	20.0	16.0	13.3	11.4	10.0
3	60.0	40.0	30.0	24.0	20.0	17.1	15.0
4	80.0	53.3	40.0	32.0	26.7	22.9	20.0
5	100.0	66.7	50.0	40.0	33.3	28.6	25.0
6	120.0	80.0	60.0	48.0	40.0	34.3	30.0
7	140.0	93.3	70.0	56.0	46.7	40.0	35.0
8	160.0	106.7	80.0	64.0	53.3	45.7	40.0
9	180.0	120.0	90.0	72.0	60.0	51.4	45.0
10	200.0	133.3	100.0	80.0	66.7	57.1	50.0



VERMONT AGENCY OF TRANSPORTATION

MAINTENANCE & OPERATIONS BUREAU
WINTER MAINTENANCE
HIGHWAY CORRIDOR PRIORITY
EFFECTIVE - SEPTEMBER 2017

LEVEL OF SERVICE

-  FULL WIDTH BARE PAVEMENT TRAVEL LANES ON THESE ROADS BEFORE ALL OTHERS AS SOON AS PRACTICAL FOLLOWING STORM
-  FULL WIDTH BARE PAVEMENT AS SOON AS PRACTICAL FOLLOWING STORM
-  FULL WIDTH BARE PAVEMENT AS SOON AS PRACTICAL NEXT WORKING DAY FOLLOWING STORM
-  1/3 BARE PAVEMENT AS SOON AS PRACTICAL NEXT WORKING DAY FOLLOWING STORM
-  ROAD CLOSED IN WINTER

LOW SALT AND NO SALT ZONE ROADWAYS
MAY BE SNOW COVERED AND ICY



10 5 0 10 20 30 Miles

1:1,000,000

MAP PRODUCED BY THE
VT AGENCY OF TRANSPORTATION
SEPTEMBER 2017