

# VERMONT AGENCY OF TRANSPORTATION



## SNOW AND ICE CONTROL PLAN

FOR STATE AND INTERSTATE HIGHWAYS

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Date

By: Joe Flynn  
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### **A. PURPOSE AND NEED**

The purpose of this plan is to define levels of service, operational procedures, performance and efficiency measures and best management practices for performing winter maintenance activities on Vermont's Highways. It supports VTrans' mission and goals to provide for the safe and efficient movement of people and goods; and to preserve, maintain, and operate the transportation system in a cost effective and environmentally responsible manner. Ongoing efforts to consider innovation, efficiency and continuous improvement will result in periodic updates to reflect state-of-the art thinking in snow and ice control.

Since storms vary, this Snow and Ice Control Plan (SIC Plan) is designed to be flexible. It is structured to fit typical conditions but provides leeway to adapt to the wide variety of conditions that will be encountered.

Snow and ice control operations are guided by State and Federal Regulatory mandates noted under **Section I** to reduce salt usage in areas designated impaired due to Chlorides. Consequently, VTrans' SIC Plan was developed to address source control and reduction in usage of Chlorides in these impaired watersheds. To the extent practicable, these standards are carried out statewide to minimize costs and impacts to the environment outside Chloride impaired watersheds. VTrans is committed to the stewardship of natural resource in Chloride impaired watersheds and in the rest of the State. In addition to being fiscally responsible, VTrans developed its SIC Plan to be more sensitive to these natural resources.

### **B. LEVEL OF SERVICE - GENERAL INFORMATION**

Considerations in conducting VTrans' snow and ice control operations include safe and efficient movement of people and goods, state and federal regulation, environmental sensitivity, 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 are maintained to allow safe travel at reduced 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 focused on those hours. Motorists should anticipate reduced coverage and varying road conditions at night and should drive accordingly.

## **C. CORRIDOR PRIORITIES**

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. Materials noted under **Section E** will be applied to keep the roads open for traffic and provide a treated surface on which to operate, though road surface may be snow covered at times during and after the storm depending upon level of service expected. Intersections, sharp curves, and steeper hills may experience increased level of service to maintain safety and mobility. Note that typical plow routes take approximately 2 hours to complete; some may take as long as 4 hours. Hours of operation and routes may be adjusted to accommodate weather conditions and traffic demands. During overnight hours, resources may be shifted to prioritize coverage on higher priority routes.

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

These are the highest volume and highest speed roads. Plowing and material application will be performed during storm events, with reduced coverage generally between 8 p.m. and 4 a.m. After the storm has subsided, bare travel lanes will be provided as soon as practical and on these roads before all others. 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)**

These are high volume roads. Plowing and material application will be performed during storm events, with reduced coverage generally between 8 p.m. and 4 a.m. The road surface may be snow covered at times during the storm. After the storm has subsided, 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)**

These are medium volume roads. Plowing and material application will be performed during storm events, with reduced coverage generally between 8 p.m. and 4 a.m. The road surface may be snow covered at times during and after the storm. During the next regular working day after the storm has subsided, 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)**

These are lower volume roads. Plowing and material application will be performed during storm events, with significantly reduced coverage generally between 8 p.m. and 4 a.m. The 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. A bare pavement shoulder-to-shoulder will be provided as soon thereafter as practical. Travelers are reminded to reduce speed and drive according to conditions.

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

VTrans monitors its snow and ice control performance and continually seeks improvement. Activities are reviewed relative to the weather experienced and roadway conditions delivered to travelers. The goal is to most effectively provide safe roads at safe speeds considering availability of personnel, equipment, and budget while operating in an environmentally responsible manner.

The following metrics may be considered to gauge program effectiveness:

- Material application rates
- 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

The Agency publishes winter maintenance data in the VTrans Fact Book each spring, summarizing the previous winter's performance as well as includes annual salt usage in its Transportation Separate Storm Sewer System (TS4) annual report to the Agency of Natural Resources.

## **E. MATERIALS**

The materials and typical application procedures described in this section are those used by VTrans for snow and ice control. Choice of materials and their application depends on consideration of 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.

### **1. Road Salt (granular)**

Road salt (Sodium Chloride) is the primary snow and ice control material. Road salt prevents snow and ice from bonding to the pavement surface and melts snow and ice that cannot be removed by plowing. Unless combined with other chemicals, sodium chloride is only effective down to 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 forecasted weather.

### **2. Liquids**

- a) Liquid Salt is Sodium Chloride dissolved in water. This can be combined with commercially available deicing liquids and is a tool used to melt snow and ice more effectively at lower temperatures.
- b) Liquid Magnesium Chloride is a commercially available deicing liquid used to melt snow and ice more effectively at lower temperatures and can be utilized with Liquid Sodium Chloride to be even more effective at lower temperatures. Liquid Magnesium Chloride typically includes a corrosion inhibitor which makes it less corrosive than granular road salt.

### **3. Winter Sand**

Winter sand is coarse, clean, sharp sand used to provide traction. It has no melting capabilities. Sand may be appropriate for steep hills, sharp curves, and some intersections where temporary traction is needed or when pavement temperatures are too low for salt to work properly.

Excessive use of sand can have detrimental impacts to the road and environment. Sand can insulate snow and ice and slow its melting. Sand 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.

## **F. APPLICATION PROCEDURES**

### **1. Dry Material Applications**

Road salt or sand is typically applied from a “spinner” on the truck which distributes the material evenly across the road surface. In some cases, the material is purposely applied in a windrow to be “worked” by traffic or run downslope. The application rate of materials is adjusted automatically to compensate for changes in a truck’s speed.

### **2. Pre-wetting**

Liquids are typically sprayed on dry road salt as it leaves the truck. Pre-wetting road salt this way significantly increases the proportion of salt that stays on the road and accelerates the melting of snow and ice. Liquid Magnesium Chloride is used to more effectively melt snow and ice at lower temperatures.

### **3. Direct Application of Liquid Salts**

In limited circumstances, Liquids may be sprayed directly on the road surface. This may be done in advance of a storm to prevent snow and ice from bonding with the road surface, or to quickly remove snowpack or ice.

## **G. EQUIPMENT**

### **1. Washing Equipment**

Trucks and equipment should be thoroughly washed as soon after use as practical. Particular attention should be paid to the areas in contact with sand, salt and liquid deicers while avoiding wash water discharge directly to surface waters.

### **2. Loads**

Trucks should not be loaded in excess of their axle load ratings. This typically means no more than a “level load”. Unused material should be unloaded as soon as practical and the trucks washed clean.

### **3. Spreader system calibration**

Each spreader system should be calibrated annually, after any spreader or hydraulic maintenance, or as selected rates of application warrant recalibration. Confirm that application rates are being transmitted by the truck’s Automated Vehicle Location (AVL) system.

### **4. Liquids maker calibration**

Liquids makers should be calibrated annually and periodically validated to ensure they are making liquids at the proper salt concentrations. Proper salinity is important for compatibility with additives and for performance on the roadway.

## **H. OPERATIONS**

### **1. Mailboxes and Other Structures Within the Highway Right-Of-Way**

Mailboxes or other structures are occasionally damaged by snow plowing operations due to poor visibility, the mailbox being buried in a snowbank, 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 they were 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 Snowbanks

Following storms with heavy snowfall, or when several storms result in substantial snowbanks, VTrans may push back snowbanks with truck wings or a motor grader. This provides room for future snow storage, reduces or prevents melted snow from running out onto the roadway pavement and creating icing conditions, and increases safe sight distance at 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 communities where on-street parking is permitted, snow removal from the parking areas, including plowing and or hauling away, is a local responsibility.

# I. STATE AND FEDERAL REGULATORY OVERSIGHT

## 1. Winter Maintenance Practices located within designated National Pollutant Discharge Elimination System (NPDES) Transportation Separate Storm Sewer System (TS4) 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 TS4 Stormwater Management Plan required under [State of Vermont TS4 General Permit](#) issued to VTrans. Refer to the VTrans Maintenance Bureau [Pollution Prevention and Compliance Section web site](#) for more information regarding the above referenced designations as they may change from time to time and for information regarding the VTrans TS4 Stormwater Management Plan.

## 2. Winter Maintenance Practices located in watersheds classified as Chloride Impaired by Vermont Agency of Natural Resources:

This SIC Plan (and its subsequent amendments) outlines strategies, performance and efficiency measures and best management practices intended to minimize Chloride loading to watersheds designated as impaired for Chlorides by the Vermont Agency of Natural Resources on its "State of Vermont 303(d) List of Impaired Waters Part A - Impaired Waters in Need of TMDL."

TS4 Requirement:

*Per Subpart 4.2 of the Permit, if the TS4 discharges to an impaired water that is without an approved TMDL, but that is listed as impaired on the "State of Vermont 303(d) List of Impaired Waters, Part A - Impaired Surface Waters in Need of TMDL," VTrans shall address in its SWMP and annual reports how any identified and mapped VTrans' discharges that cause or contribute to the impairment will be controlled to ensure compliance with the VWQS.*

VTrans Response:

VTrans is committed to environmental stewardship in its winter maintenance activities. The Agency achieves an increased level of control through enhanced best management practices and efficiency measures listed under **Section J** of the SIC Plan not only to conserve salt and other materials, but provides ongoing training program for plow operators, and uses innovative equipment technologies to improve material delivery. As conditions warrant, the Agency also uses alternative deicing chemicals that work more efficiently than salt alone can at very low temperatures.

To address this requirement VTrans applies control measures MCM #1 Public Education & Outreach and #6 Pollution Prevention (TS4 SWMP Parts 6.A and 6.F); VTrans Snow and Ice Control Plan (SIC Plan); and report annually on Chloride usage within Chloride impaired watersheds.

As the following table shows best management practice and efficiency measure deployment and reduction percentages are dependent on several factors including storm type, severity and duration, equipment type, calibration, operator skill and natural resources and environmental factors.

<b>Chloride Reduction BMP</b>	<b>Definition</b>	<b>Potential % Chloride Reduction</b>
<b>Pre-Wetting</b>	Application of liquids or proprietary chemical to dry salt as it is being applied to the roadway.	20% - 30%
<b>Pre-Treating</b>	Application of liquids or proprietary chemical to dry salt either before, during, or after it has been loaded into the truck.	10% - 30%
<b>Anti-Icing</b>	Application of liquids or proprietary chemical in advance of onset of winter storm in problem areas such as steep grades and curves.	10% - 30%
<b>Equipment Calibration</b>	Ensures equipment application of Chlorides is accurate.	5% - 20%
<b>In-Cab Air/Ground Temperature Sensor</b>	Installation and monitoring of pavement and air temperature sensors with in-cab readout.	1% - 10%
<b>Training, Storage and Handling</b>	Annual training of staff about various BMPs, improving storage and handling practices for loading and unloading salt.	10% - 25%

## **J. BEST MANAGEMENT PRACTICES, EFFICIENCY MEASURES, TRACKING AND REPORTING**

VTrans deployed best management practices and efficiency measures for winter maintenance activities include, but are not limited to:

1. 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 Bureau Director ensures 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) are signed in the field accordingly.
3. Weekly internal reporting of salt/sand usage are completed by Maintenance Bureau Director commencing on the first week of November and terminating 26 weeks later, typically with the last week of April. VTrans makes 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 Maintenance Bureau Director makes this information available to ANR upon request.
4. Fully cover with impervious material all bulk salt storage areas under VTrans control to reduce the amount and concentration of salt to the runoff of stormwater from these storage areas. All bulk salt storage facilities are situated on an impervious material to minimize leaching of salt-laden runoff into the ground or directly into surface waters. Districts maintain their salt storage sheds and undertake shed improvement work related to shed door repairs/replacement and roof extensions.

5. Locate sand piles at District Maintenance Facilities in areas that will not result in sediment-laden runoff into surface waters. If sand piles are in close proximity to surface waters, then 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. Equip VTrans plow trucks with closed loop ground speed spread controllers. Closed loop ground speed spread controllers continue to be one of the primary tools for maintaining consistency and efficiency in salt use. Controllers are dashboard computers with electronic sensors that adjust application rate based on vehicle and auger speed to provide a more consistent rate of material application. Spreader calibration is an important tool used to ensure most efficient material usage.
8. Use Road Weather Information Stations (RWIS) and mobile surface friction and temperature sensors to help guide decisions regarding application type and method. Mobile surface temperature sensors are mounted to vehicles allowing for more real-time feedback on pavement temperatures during snow events. VTrans also uses traffic cameras to monitor road conditions. The evolution in monitoring technology provides greater access to data for pre, during and post-storm evaluation.
9. Use Global Positioning System (GPS) and Automated Vehicle Location (AVL) equipment allowing the collection of vehicle and route specific information regarding the timing and rate of application, and roadway condition data.
10. Maintain a robust public outreach program including:
  - a) Using Variable Messaging Signs (VMS) to inform the traveling public of impending weather and changing road conditions in order to affect driver behavior and reduce speeds.
  - b) Using VTrans Transportation Management Center (TMC) to keep 511 road condition public facing maps updated; coordinate with Vermont State Police and VTrans Maintenance Districts; and providing media alerts regarding weather and road conditions to the traveling public.
  - c) Using VTrans [Snow and Ice web page](#) in order to provide information with respect to new policies, programs and weather-related alerts.
11. Provide employee training programs, through consultation with other state transportation agencies, to explore other methods to deliver content and increase the level of understanding of the technical aspects and science behind snow and ice control practices.
12. Evaluate opportunities to retrofit drainage systems, as appropriate, on a case-by-case basis, to better manage and redirect highway runoff away from sensitive environmental receptors including surface waters in Chloride Impaired Watersheds.
13. Seek opportunities to reduce the use of sand as part of its snow and ice operations due to various environmental concerns, its limited effectiveness and added cleanup costs.

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 and participates in ongoing research and new technology to explore newer technologies and measures to reduce material usage and improve road surface conditions during winter weather. In doing so, VTrans collaborates with many partners and subject matter experts undertaking research on this topic, including:

### **Clear Roads**

This research program brings together transportation professionals and researchers from around the country to drive innovation in the field of winter maintenance. By evaluating materials, equipment and

methods in real-world conditions, the program identifies the most effective techniques and technologies to save agencies money, improve safety and increase efficiency.

**Winooski Natural Resource Conservation District**

The WNRCD Road Salt Reduction Initiative; Through science understanding the impacts and through partnerships providing cost effective solutions. Research to document reduction strategies and developing educational material and workshops for applicators. WNRCD partners with state agencies, watershed groups, national organizations, public and private sector businesses and students to reduce the salting to our waterways. [Road Salt Factsheet](#)

Attachments:

- APPENDIX A – Salt Application Quick Reference Guideline
- Corridor Priority Map



## APPENDIX A

<b>Salt Application Quick-Reference Guideline</b> (Double these rates for centerline applications)		
<b>Pavement Temp. Range</b>	<b>Typical Application Rate (#/LM)</b>	<b>Comments</b>
<b>Above 32°</b>	<b>0 to 100</b>	A little salt goes a long way when temperatures are near freezing
<b>25° to 32°</b>	<b>100 to 200</b>	Salt is very effective here
<b>20° to 25°</b>	<b>200 to 300</b>	Salt effectiveness is dropping off in this range
<b>15° to 20°</b>	<b>300 to 400</b>	Salt effectiveness is further reduced in this range
<b>15° or Below</b>	<b>300 to 400</b>	Snow may be dry and blowing in this range. If no ice or pack exists, plow only – do not apply material. It may be appropriate to spot treat icy patches with abrasives.

**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. Prewetting salt at the spinner should be the standard practice. The appropriate liquid blend will vary based on the current and predicted temperature.
3. In any of the ranges, if the snow is dry and blowing off the roadway, do not apply material.
4. This is a guideline only. Application rates will vary based on climatic conditions experienced in the field, corridor priority, and judgement.

