TOWN OF CASTLETON

SNOW & ICE CONTROL PLAN

FOR TOWN HIGHWAYS & SIDEWALKS

Approved: 3/11/24
Date

Approved By Castleton Select Board:

A. PURPOSE AND NEED

The purpose of this plan is to define efficiency measures and best management practices for performing winter maintenance activities on Town Highways and sidewalks. The Town of Castleton's mission and goals is to provide for the safe winter travel on Town highways and sidewalks in a cost effective and environmentally responsible manner. Our effort for continuous improvement will result in an openness to try new technologies and materials.

Since storms vary, this Snow and Ice Control Plan (SIC Plan) is designed to be flexible. Although structured, this plan remains flexible by providing leeway to adapt to varying and sometimes unpredictable conditions.

The Town of Castleton is sensitive to its natural resources, and this SIC Plan supports the reduction of Chlorides near watersheds.

B. GENERAL INFORMATION

Castleton's SIC policy does not promise "bare roads" however outlines a "safe roads" approach. The driver has a responsibility to understand the road conditions and maintain travel at "safe speeds". Castleton's roads are maintained to allow safe travel at reduced speeds, and drivers should expect to see snow on the roadway during a storm. Most travel takes place during the day, therefore the Town's priority for ice and snow control is before the morning and evening commutes. There will be reduced coverage from 10 p.m. – 4:00 a.m., so motorists should drive accordingly.

C. CORRIDOR PRIORITIES

Color-coded levels of service have been established and are shown on the attached ***"Corridor Priority Map".*** Route priorities are shown in Appendix B **(Route Priority Map)** Materials noted under ***Section E*** will be used to treat the road surface to provide for safer road conditions, with the priority going to intersections, sharp curves and hills. Intersections, sharp curves, and steeper hills may experience increased level of service to maintain safety and mobility. Note that typical plow routes take approximately 2-4 hours to complete; however, depending on road conditions, storm duration/severity, and driver's rest periods, it make take longer to reach a "clear road" condition. During overnight hours, resources may be shifted to prioritize coverage on higher priority routes.

1. PRIORITY 1- HIGH TRAFFIC HIGHWAYS (Main arterial roads & collector streets) (ORANGE ROADS)

These are high volume roads. Plowing and material application will be performed during storm events, with reduced coverage generally between 10 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. Major intersections with traffic signal lights and stop signs are treated with deicing materials. Streets that are heavily used, two lane collector streets, school bus routes and streets are plowed & treated with de-icing materials. Some lower priority roads will be plowed and treated along these routes to increase efficiency. Travelers are reminded to reduce speed and drive according to conditions.

2. PRIORITY 2 - MEDIUM TRAFFIC HIGHWAYS (BLUE ROADS)

These are medium volume roads. Once Priority I roadways are in good shape, the single and tandem dump trucks move to the gravel roads to remove snow and apply sand. 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.

3. PRIORITY 3 - LOW TRAFFIC HIGHWAYS (GREEN ROADS)

These are lower volume roads and public facility parking lots. The two smaller 1-ton plow trucks begin plowing and deicing the paved residential roads and critical facilities such as the Police/Fire Department and Town office. Plowing and material application will be performed during storm events, with significantly reduced coverage generally between 10 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.

4. **PRIORITY 4 - SIDEWALKS (YELLOW)** - These are the lowest priority for clearing following a storm. Sidewalks will be cleared as soon as practical following a storm. Pedestrians are reminded to use sidewalks according to conditions.

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

The Road Commissioner, DPW Director, and Highway Foreman monitor snow and ice control performance and continually seek improvement to provide safe travel at safe speed for motorists on Town highways and safe walking on sidewalks. The goal is to provide safe roads most effectively, at safe speeds, considering availability of personnel, equipment, and budget while operating in an environmentally responsible manner.

The following metrics may be considered to gage 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 Department of Public Works publishes winter maintenance data in the Brightly Asset Management Program each spring, summarizing the previous winter's performance as well as including annual salt and sand usage in its annual reporting to the Town Manager.

E. MATERIALS

The materials and typical application procedures described in this section are those used by Town of Castleton for snow and ice control. Many factors are considered when deciding on application of materials: pavement temperature, nature of the snow and ice event, consistency of the snow, forecast storm conditions, air temperature, wind velocity, traffic volume, time of day/year, and the availability of resources.

1. **Road Salt (granular)**
   Road salt (Sodium Chloride)(Magnesium Chloride) are 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**
   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. *Sand will be used sparingly and given additional consideration prior to use as it can have negative effects to the road and environment. Sand can slow ice melt and create roadway drainage issues by clogging ditches; it is also expensive to clean

up in the spring. Therefore, 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 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 when melting 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 will be thoroughly washed after use as soon as is practical to do so. 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. The Town 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 Town plow truck. In these cases, the Town 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. See Mailbox policy for further details and clarification.

2. Widening or Pushing Back Snowbanks

Following storms with heavy snowfall, or when several storms result in substantial snowbanks, the Town highway crew 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 the Department of Public Works. Sidewalks are the lowest of priorities when clearing snow or ice for public use during winter storms and will be addressed as soon as resources are available.

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 Storm water 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."

The Select Board and Road Commissioner are committed to environmental stewardship in its winter maintenance activities. The Town achieves an increased level of control through enhanced best management practices and efficiency measures listed under ***Section*** 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 Town may also use alternative deicing chemicals that work more efficiently than salt alone can at very low temperatures.

As the following table shows best management practice (BMP) 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.

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

The Town of Castleton deploys best management practices and efficiency measures for winter maintenance activities include, but are not limited to:

1. Distribute this SIC Plan to DPW employees & emergency/rescue personnel, and those supporting the maintenance of Town infrastructure such as sewer and water. This plan will also be made available for the Department of Environmental Conservation should there need be a reference for stormwater mitigation. Provide training for DPW employees adhering to these standards. The Road Commissioner ensures that this information is posted on the Town of Castleton Web Site, kept current, and made available upon a public records request.

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 the Department of Public Works Director commencing on the first week of *November* and terminating 26 weeks later, typically with the last week of April. The Highway Foreman 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 DPW Director makes this information available upon request.

4. Fully cover with impervious material all bulk salt storage areas under Town control to reduce the amount and concentration of salt to the runoff of storm water 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. Town maintain their salt storage sheds and undertake shed improvement work related to shed door repairs/replacement and roof extensions.

5. Locate sand piles on Town property 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. Consider equipping Town 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. Consider using 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. The evolution in monitoring technology provides greater access to data for pre, during and post-storm evaluation.

9. Consider using 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. Informed public outreach:

a) Utilize, Town website announcements and social media to inform the public of weather alerts and road conditions in order to communicate driving caution to motorists.

b) Report road conditions and closures to the VTrans Transportation Management Center (TMC) to keep 511 road condition public facing maps updated; coordinate with Castleton Police Department and VTrans Maintenance Districts; and providing media alerts regarding weather and road conditions to the traveling public.

c) Using the Town of Castleton www.castletonvermont.org to convey information, new policies, and weather-related alerts.

11. Provide employee training programs, through consultation with Vermont State transportation agencies, such as the Better Roads Program, and explore other methods of delivering content to 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.

The details outlined in this SIC Plan shall not preclude Castleton from utilizing experimental or new technologies to achieve better efficacy and results in an environmentally sensitive manner. The Castleton Select Board and Road Commissioner actively support innovation and promote the idea of seeking better ways to reach our goals. We will continue to explore new technologies looking to reduce material usage and improve road surface conditions during winter weather. In doing so, the Town collaborates with VTrans and other subject matter experts who undertake research on this topic, including:

Clear Roads

A Clear Roads Program brings together research and data compiled by 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, a Clear Roads Program identifies the most effective techniques and technologies to save agencies money, improve safety and increase efficiency.

Attachments:

- APPENDIX A - Salt Application Quick Reference Guideline
- APPENDIX B – Route Priority List
- APPENDIX C – Route Priority Map

APPENDIX A: Salt Application Quick Reference Guideline

Salt Application Quick-Reference Guideline

(Double these rates for centerline applications)

Pavement Temp. Range	Typical Application Rate (#/LM)	Comments
Above 32°	**0 to 100**	A little salt goes a long way when temperatures are near freezing
25° to 32°	**100 to 200**	Salt is very effective here
20° to 25°	**200 to 300**	Salt effectiveness is dropping off in this range
15° to 20°	**300 to 400**	Salt effectiveness is further reduced in this range
15° or Below	**300 to 400**	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.

APPENDIX B – ROAD PRIORITY MAP

Priority 1 Roads- (ORANGE)

Route No. 1- Single Axle Dump Truck #1-

South St, Main St, East Hubbardton Rd, Frisbee Hill Rd (paved section), Crampton Rd (paved section)

Route No. 2- Single Axle Dump Truck #2-
Pond Hill Rd, Parker, Piontek Rd, Birdseye Rd, Crampton Rd

Route No. 3- Tandem Dump Truck #1-
Staso Rd, South St, Creek Rd, West Castleton Rd, Rice-Willis Rd, River St, Blissville Rd, Point of Pines (paved section),

Route No. 4- Tandem Dump Truck #2-
Main St, North Rd, Float Bridge Rd, Johnson-Spooner Rd

Route No. 5- 1 Ton Dump Truck #1-
Main St, Park and Ride, Sand Hill Rd, Elementary School Rd, Drake Rd, Indian Point Rd

Route No. 6- 1 Ton Dump Truck #2-
Little Rutland Rd, Indian Bay S, Indian Bay N, Crystal Meadows, Rosewood Ln

Priority 2 Roads- (BLUE)

Route No. 7- Single Axle Dump Truck #1-
Belgo Rd, Grandpas Knob Rd, Eaton Hill East, Frisbee Hill Rd, Sugarwood Ln, Higgins Rd

Route No. 8- Single Axle Dump Truck #2-
Spooner Loop, Old Town, Float Bridge Ext, Crystal Haven, Crystal Heights, New Rd, Brown Farm Rd

Route No. 9- Tandem Dump Truck #1-
Moscow Rd, Cedar Mountain Rd, Coryell Rd, Coon Hill Rd, Point of Pines, East Creek Rd

Route No. 10- Tandem Dump Truck #2-
Pencil Mill Rd, Stables Rd, Barker Hill Rd, Eaton Hill West, Blue Bird Ln

Route No. 11- 1 Ton Dump Truck #1-
Corey Ln, Eagles Nest, A Woodard Way, S A Woodard Way, Pine St, School St, Park St, Farr

Route No. 12- 1 Ton Dump Truck #2-
Police and Fire Department parking lots town office parking lot, Castleton Meadows Lane

Priority 3 Roads- (GREEN)

Single Axle Dump Truck #1-
Tanya Rd, David Ave, N David Ave, Sheldon Rd, Beam Rd, Meadow Rd

Route No. 13- Single Axle Dump Truck #2-
Gump Rd, Patricia Ln, Preston Ln, Sand Hill Ext, Griffin Rd, Verona Rd

Tandem Dump Truck #1-
Clean-up where needed.

Tandem Dump Truck #2-
Clean-up where needed.

Route No. 14- 1 Ton Dump Truck #1-
Seminary, Elm St, Mill St, Mechanic St, Cemetery Rd, Glenbrook Rd, Suncrest Terrace, Blue Cat Ln

Route No. 15- 1 Ton Dump Truck #2-
Carter Lane, Mary Lane, Brown Lane, Terrace Depot, Village School Parking

Priority 4 SIDEWALKS- (Yellow)