Town of Vienna, Virginia

Chloride TMDL Action Plan for Accotink Creek

May 1, 2021

Town of Vienna
Department of Public Works
127 Center Street, South
Vienna, Virginia 22180

Prepared with assistance by:
Wood Environment & Infrastructure Solutions
Chantilly, Virginia

TOWN OF
VIENNA

wood.

Prepared in Compliance with Municipal Separate Storm Sewer System (MS4)
Permit No. VAR040066

CERTIFICATION

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Name	Title	Date
[signature]	Town Manager	05/14/21

Town of Vienna, Virginia
Chloride TMDL Action Plan for Accotink Creek

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1. Introduction

1.1 Purpose

This Chloride TMDL Action Plan for Accotink Creek documents how the Town of Vienna intends to meet the "Local TMDL Special Condition" in Part II B of the General Permit for Discharges from Small Municipal Separate Storm Sewer Systems (MS4s). The Town of Vienna's current MS4 permit (VAR040066) issued by the Virginia Department of Environmental Quality (DEQ) became effective November 1, 2018.

In accordance with the 2018 MS4 permit, the Town must develop an action plan for any total maximum daily load (TMDL) approved by the U.S. EPA on or after July 1, 2013 and prior to June 30, 2018, where a waste load allocation (WLA) has been assigned to the Town no later than 30 months after the effective permit date (May 1, 2021). A TMDL establishes the maximum amount of a pollutant that can enter a water body without violating water quality standards. A WLA represents the total pollutant loading that is allocated to a specific permitted source.

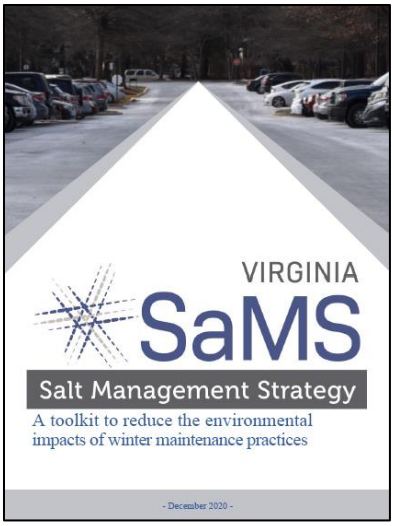
The "Chloride TMDLs for the Accotink Creek Watershed, Fairfax County, Virginia" was approved by the U.S. EPA on May 23, 2018. The TMDL assigns a WLA to the portion of the Town's MS4 regulated area draining to Accotink Creek. While deicers and anti-icers like chloride are important for maintaining public safety during winter weather events, they can also cause damage to the environment. After application, salts infiltrate into the groundwater or wash off into local streams. This has serious impacts on aquatic ecosystems, including sensitive species of fish as well as salamanders and frogs. Salt can also impede or kill vegetation, which can result in bare areas and erosion. Traditional stormwater management facilities are not designed to remove chloride. As a result, effective preventive management strategies are key to reducing these negative impacts.[1]

This plan addresses the requirements of the MS4 permit by: describing the WLAs assigned to the Town and the corresponding reduction requirements; identifying significant sources of the pollutants of concern discharging from the Town's MS4; identifying best management practices (BMPs) to reduce the pollutants of concern in accordance with special permit requirements; calculating existing and planned pollutant reductions; developing outreach strategies to enhance the public's ability to eliminate and reduce discharges of pollutants; and, establishing an implementation schedule for the permit term.

[1] "Why Some are Salty About Winter Roads: Road Salt and Stream Salinization," February 27, 2020, Virginia Tech, Virginia Water Resources Research Center.

1.2 Salt Management Strategy

To assist with the planning and implementation process, DEQ and the Interstate Commission on the Potomac River Basin (ICPRB), in coordination with a stakeholder advisory committee, developed the "Salt Management Strategy – A Toolkit to Reduce the Environmental Impacts of Winter Maintenance Practices." The Salt Management Strategy (SaMS) includes a range of practices and strategies that can be applied by both government and non-government entities to reduce the impacts of winter weather practices while maintaining public safety.



SaMS is designed so that the right mix of tools can be chosen from a menu to address situation-specific needs and objectives. The SaMS Toolkit has been used by the Town of Vienna in the development of this action plan and will continue to be referenced as the Town continuously assesses and adjusts its program.

1.3 Permit Compliance Crosswalk

Table 1A provides an overview of the organization of this plan and how each section addresses the 2018 MS4 permit.

Table 1A – Action Plan and Permit Compliance Crosswalk

Action Plan	Plan Element	2018 MS4 Permit	
Section 1	Introduction		
Section 2.1	Overview of TMDL	Part II B 3	a. The TMDL project name. b. The EPA approval date of the TMDL.
Section 2.2	Waste Load Allocation	Part II B 3	c. The wasteload allocated to the permittee (individually or in aggregate), and the corresponding percent reduction, if applicable.
Section 2.3	Identification of Significant Sources of Chloride	Part II B 3	d. Identification of the significant sources of the pollutants of concern discharging to the permittee's MS4 and that are not covered under a separate VPDES permit. For the purpose of this requirement, a significant source of pollutants means a discharge where the expected pollutant loading is greater than the average pollutant loading for the land use identified in the TMDL.

Action Plan	Plan Element	2018 MS4 Permit	
Section 2.4	Best Management Practices	Part II B 3	e. The BMPs designed to reduce the pollutants of concern in accordance with Parts II B 4, B 5, and B 6.[2] f. [Not applicable.]
Section 2.5	Outreach Strategy	Part II B 3	g. For action plans developed in accordance with Part II B 4 and B 5, an outreach strategy to enhance the public's education (including employees) on methods to eliminate and reduce discharges of the pollutants.
Section 3	Schedule of Anticipated Actions	Part II B 3	h. A schedule of anticipated actions planned for implementation during this permit term.
Section 4	Opportunity for Public Comment	Part II B 7	Prior to submittal of the action plan required in Part II B 1, the permittee shall provide an opportunity for public comment proposed to meet the local TMDL action plan requirements for no less than 15 days.

2. Chloride TMDL Action Plan

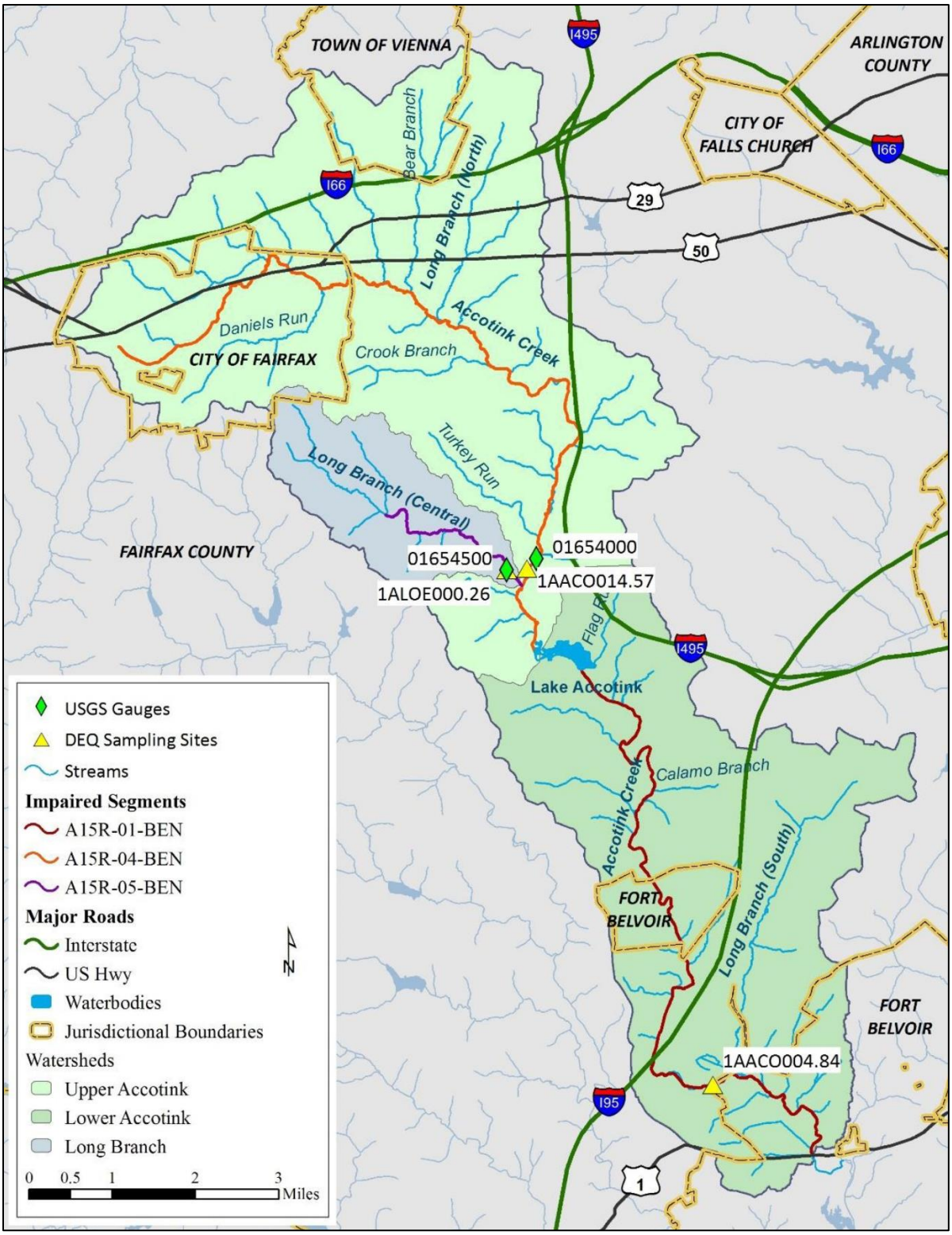
2.1 Overview of the TMDL

This TMDL action plan addresses the chloride WLA assigned to the Town of Vienna. The "Chloride TMDLs for the Accotink Creek Watershed, Fairfax County, Virginia" was approved by the State Water Control Board on April 12, 2018 and the U.S. EPA on May 23, 2018. Map 2A show the location of the Accotink Creek watershed in relation to the Town and the surrounding area.

Accotink Creek is on Virginia's List of Impaired Waters (Category 5 of the Integrated List) for not supporting its Aquatic Life Use. A Stressor Identification analysis was performed to determine the source(s) of the impairment. Ambient water quality monitoring was conducted as part of this analysis. Virginia's water quality standard for chloride includes an acute maximum concentration of 860 mg/l and a chronic maximum concentration of 230 mg/l. The acute maximum is defined as a one-hour average not to be exceeded more than once every three years. The chronic maximum is defined as a four-day average not to be exceeded more than once every three years. Seven chloride concentrations in the upper Accotink Creek (in which the Town is located) exceeded the acute criterion between 2010 and 2016. The chronic maximum was exceeded in the upper Accotink Creek during a snowmelt in late January 2016 and a combined snow/rain event in February 2016. As a result, the analysis concluded that chloride is a likely cause of the impairment.

[2] The permit only includes reference to bacteria, nutrients, sediment, and PCBs in Parts II B 4, 5, and 6. For the purpose of this plan, the Town assumes any pollutant should have BMPs and an outreach strategy.

Map 2A – Accotink Creek Watershed



Source: Chloride TMDLs for the Accotink Creek Watershed, Fairfax County, Virginia.

In addition to chloride, the analysis identified hydro-modification, habitat modification, and sediment as likely stressors. However, only chloride and sediment are defined as pollutants. As a result, TMDLs were developed for chloride and sediment. A separate TMDL action plan for sediment has been adopted by the Town for both the Accotink Creek and Difficult Run watersheds.

2.2 Waste Load Allocation

The Town is responsible for stormwater discharges from its MS4. The MS4 is defined in the MS4 permit as a system that discharges to waters of the Commonwealth that is owned or operated by the permittee. As a practical matter, the regulated MS4 area includes all of the Town with the exception of areas draining directly to a local stream without entering the Town's storm sewer system. Map 2B shows the Accotink Creek watershed in relation to the Town's MS4 service area.

According to the TMDL, Accotink Creek drains approximately 52 square miles, mostly within Fairfax County. The Town of Vienna represents approximately 4% of the total drainage area. The Accotink Creek watershed is divided into three impaired segments – Lower Accotink, Long Branch, and Upper Accotink. The Town is located in the Upper Accotink, which includes the headwaters of Accotink Creek to Lake Accotink. Major tributaries of Accotink Creek within the Town are Hunter's Branch and Bear Branch.

The WLA for MS4 permit holders in the Accotink Creek watershed is aggregated. Table 2A summarizes the TMDL and WLA for the Upper Accotink Creek.[3]

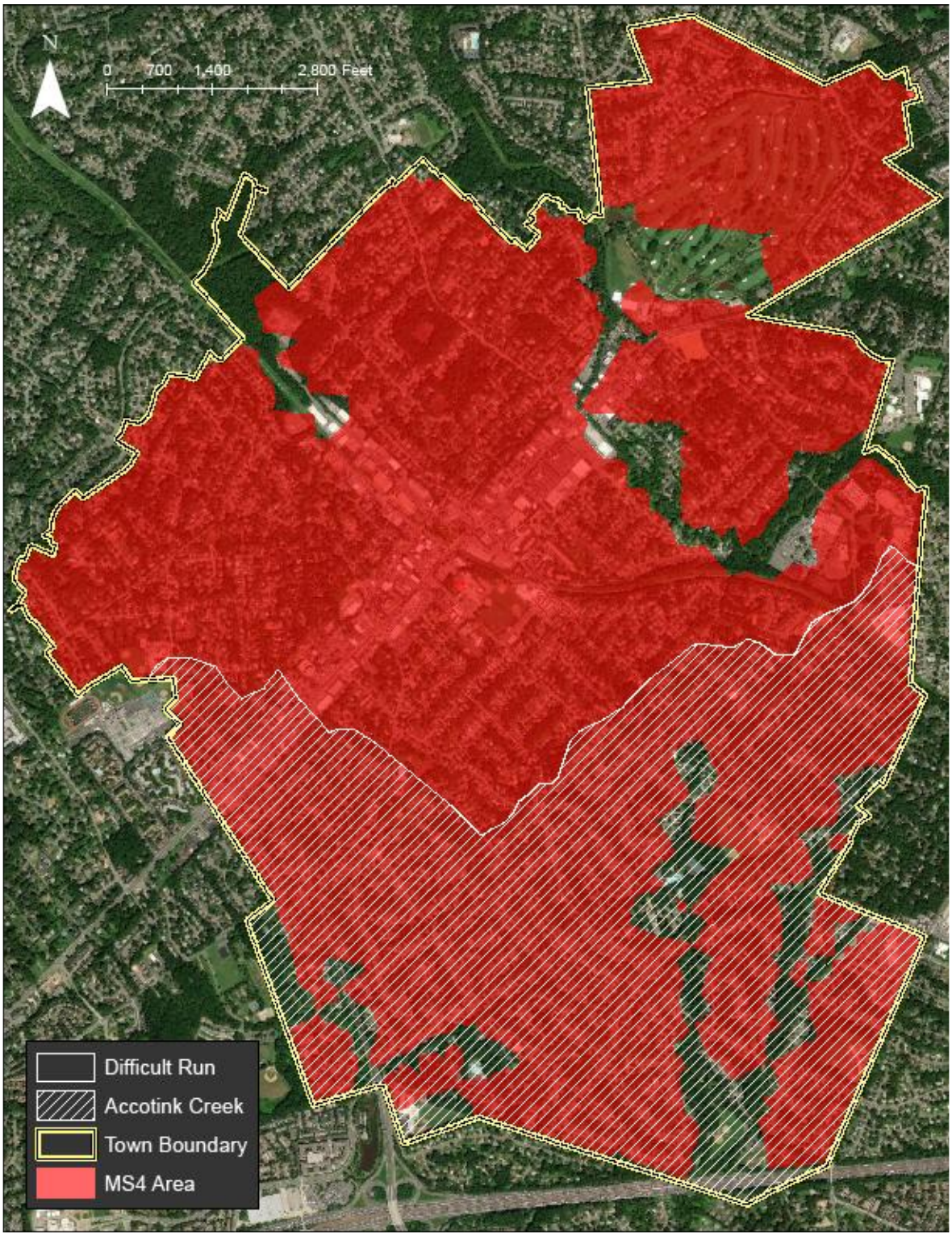
Table 2A – Upper Accotink Creek Aggregate MS4 WLA[4]

Aggregated MS4s	**TMDL (lbs/year)**	**MS4 WLA (lbs/year)**	**% of TMDL**
Town of Vienna City of Fairfax Fairfax County Virginia Department of Transportation Fairfax County Public Schools Northern Virginia Community College	8,217,030	4,972,399	66%

Unlike most TMDLs, the methodology used to develop the chloride TMDL did not allow for the estimation of baseline conditions. As a result, the percent reduction required to achieve the MS4 WLA is unknown. In addition, due to lack of information about chloride application rates, the TMDL does not attempt to refine the geographic distribution of the WLA beyond the aggregated MS4s. Therefore, the TMDL states that "aggregate WLAs are to be implemented using a performance-based BMP approach in accordance with 40 CFR § 122.44(k) as it is not appropriate, nor intended, to establish individual, numeric effluent limits for regulated stormwater sources using load duration-based TMDL WLAs."

[3] Table 4-1 of the TMDL.
[4] Does not include Long Branch or Lower Accotink Creek.

Map 2B – Town of Vienna MS4 Service Area



2.3 Identification of Significant Sources of Chloride

The TMDL states that deicing/anti-icing materials applied to roads, sidewalks, driveways, and other impervious surfaces are the primary source of chloride in urbanized watersheds such as Accotink Creek. Sources can be further refined as materials applied to transportation surfaces (public rights-of-way), other public property, commercial/institutional property (e.g. walkways and parking lots), homeowner/ condominium association common property, and individual private property.

Transportation Surfaces

According to the SaMS, transportation surfaces make up approximately 24% of impervious surfaces in the Accotink Creek watershed that have the potential to be treated with salt (that is, impervious surfaces minus features such as roof tops). Transportation is the largest land use category (followed by commercial/institutional and residential) and is the area most likely to have salt and other deicing/anti-icing materials consistently applied for safety reasons. It is also the area where the Town has the greatest amount of operational control. As such, it makes sense that transportation surfaces are the primary focus of the Town's chloride reduction efforts.

Application of deicers/anti-icers on transportation surfaces is the responsibility of the Streets Maintenance Division of the Department of Public Works. All public right-of-way is owned and maintained by the Town. Transportation-related operations are staged from the Northside Property Yard, which is located in the Difficult Run watershed. Dry materials are stored in a salt dome while liquid materials are stored in brine storage containers at the site.

The Streets Maintenance Division monitors winter weather forecasts and communicates with VDOT, Fairfax County, and other regional partners to gauge the extent and timing of precipitation events as well as to identify the strategies most appropriate to the situation. Liquid anti-icing materials (typically brine) may be applied prior to a winter weather event if there is no rain in the forecast. Typically, it takes three days to brine all roads in the Town. The Town currently uses salt as its primary deicer. For deicing operations, the Town uses the auger speed and gate height controls on spreaders to place the minimum effective level of material based on the current and forecasted weather conditions. Deicing materials are supplemented with sand at a 2:1 ratio if the temperature drops below freezing in order to help with traction during icy events. Once accumulation starts, the use of deicing materials stops and the strategy focuses on plowing. After roads are clear and accumulation has stopped, the Town may apply additional deicing materials to prevent refreezing.

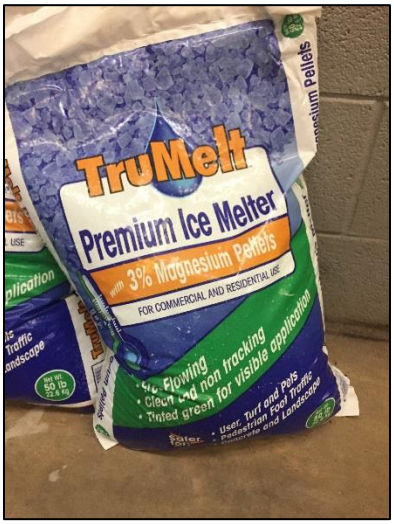
Town personnel are trained to identify areas of excess deicing material after each storm event, both at the Northside Property Yard and throughout the Town, so that the material may be collected. The Town also has a street sweeping program that typically begins in March.

Other Public Property

The Parks and Recreation Department is responsible for treating impervious surfaces around public buildings, including sidewalks and entrances. These areas may be pre-treated with brine and hand spreaders. Individual bags of deicing/anti-icing materials for these smaller applications are stored at the Northside Property Yard. The Town typically uses a commercially-available magnesium/chloride blend. Although still containing chloride, these products can be less harmful to surrounding vegetation when applied at recommended rates.

There are four Town properties in the MS4 service area of the Accotink Creek watershed where deicing/anti-icing materials may be applied. These properties include:

- Meadow Lane Park
- Southside Park
- Sarah Walker Mercer Park
- Nutley Street Maintenance Yard



None of these properties have impervious cover greater than one acre.

In addition to Town properties, Fairfax County Public Schools operates several properties in the Accotink Creek watershed. These include Louise Archer Elementary, Marshall Road Elementary, Cunningham Park Elementary, and Cedar Lane School. FCPS is covered under Fairfax County's MS4 permit. By agreement with the County, any pollutant loading from property owned by FCPS within the Town is the responsibility of the County. As a result, it is expected that these properties will be included in the chloride TMDL action plan developed by Fairfax County.

Commercial/Institutional Property

According to the SaMS, commercial/institutional properties make up approximately 20% of impervious surfaces in the Accotink Creek watershed that have the potential to be treated with salt. Property owners may apply salt and other deicers/anti-icers to parking lots, sidewalks, and building entrances. This may be done by the property owner or through the use of a contractor.

In the Accotink Creek portion of the Town, commercial properties are concentrated along Maple Avenue W (roughly the area between Pleasant Street and the southwestern Town boundary). Other areas of commercial activity in the Accotink Creek watershed include Cedar Park Shopping Mall and office complexes near the intersection of Follin Lane and Electric Avenue. There are several institutional uses throughout the watershed, including faith-based organizations. Overall, the Town has records of approximately 40 commercial properties with about 140 respective owners within the Accotink Creek watershed.

Homeowner/Condominium Association Common Property

Similar to commercial/institutional property, managers of HOA/condominium association property may apply salt and other deicers/anti-icers to parking lots, sidewalks, building entrances, and other common property on behalf of residents. This may be done by the property manager or through the use of a contractor. The Town has records of six residential HOA/condominium associations within the Accotink Creek watershed.

Single Family Residential Property

Vienna's portion of the Accotink Creek watershed is dominated by single family residential properties. Property owners may apply salt and other deicers/anti-icers to driveways and sidewalks. In comparison to other property types, the application of materials is more likely to be done by the resident themselves using small quantities purchased locally.

2.4 Best Management Practices

The Town's MS4 permit (Part II B 3 e) requires identification of BMPs designed to reduce pollutants of concern. Unlike several other pollutants (bacteria, nutrients, sediment, and PCBs), the permit does not mandate specific BMPs or approaches for chloride. Rather, it is up to the Town to select the most practicable mix of BMPs to reduce chloride while maintaining public safety.

The Town will implement the following BMPs and will continue to refine the plan in an iterative fashion to address the water quality goals of the chloride TMDL.

Snow Operating Procedure SOP

The Town's primary BMPs to reduce chloride from public property are contained in its Snow and Deicing/Anti-icing Operations Stormwater Pollution Prevention Standard Operating Procedure (SOP). The SOP was first developed in July 2015 and has been periodically updated to incorporate additional best practices and standards. The most recent version was revised to account for the chloride TMDL and in consideration of the SaMS tool kit. The SOP applies to all Town operations as well as operations conducted by contractors on behalf of the Town. A summary of the SOP is provided below. The full SOP is found in Appendix A.

- Establishes responsible parties, including Town staff and contractors.
- Prohibits the use of deicing/anti-icing agents containing urea or other nutrients.
- Specifies that the SOP applies to small applications as well as large applications.
- Specifies best practices and standards for deicer/anti-icer storage.
- Specifies best practices and standards for deicer/anti-icer use, including application rate, equipment calibration, and loading/unloading.
- Specifies best practices and standards for deicer/anti-icer clean up after a winter event.
- Provides that the SOP will be incorporated into annual training for applicable employees.

Salt Management Strategy Toolkit

The SaMS includes a range of strategies that can be applied by both government and non-government entities to reduce the impacts of winter weather practices while maintaining public safety. The core of the SaMS is a "BMP Pros and Cons" menu. The BMP menu provides a high-level summary of chloride management strategies and is divided into two major categories – planning BMPs (those performed in advance of a winter weather event) and storm-related BMPs (those performed during a winter weather event). Strategy details are contained in the SaMS appendices.

Snow operation decision-makers can review the practices and implement the ones that best address local needs and objectives. To help decision-makers prioritize strategies, the SaMS identifies BMPs that the Salt Institute considers the Fundamental 5 and the Second 6.

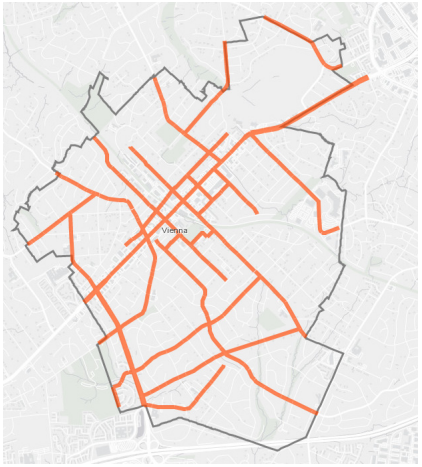
The Town reviewed the SaMS BMP menu for the development of this action plan. The priority for the Town is to implement those items identified as the Fundamental 5 by the Salt Institute. Table 2B provides a list of the Fundamental 5, the status of strategy implementation in the Town, and follow-up activities. Follow-up activities will be reported in the Town's annual MS4 reports to DEQ. The goal of the Town is to fully implement the Fundamental 5 by the end of the 2018-2023 permit cycle.

Table 2B – SaMS BMP Menu – Fundamental 5 Priorities

BMP	BMP Description	Status	Follow Up
Winter Operations Planning	Develop a winter maintenance plan	Partially Implemented	Review SOP against SaMS Winter Maintenance Plan and revise as needed.
	Pre-season meetings	Implemented	Document meeting dates.
	Post-season meetings	Implemented	Document meeting dates.
	Plan snowplow routes	Implemented	Primary Streets are cleared first, followed by secondary, and then neighborhood streets.
Levels of Service	Communicate LOS internally	Review	Define the Town's LOS and expectations.
	Communicate LOS externally	Review	Communicate LOS to elected officials and Town residents.
Training	Training	Implemented	Document and refine training program based on other BMPs.
Calibration	Establish calibration process	Implemented	Document calibration process to ensure consistency.
	Calibrate equipment	Implemented	
Measurement	Measure and record deicer use	Review	Utilize a standard process to measure and record annual deicer use over time. See Section 4.

Additional strategies from the SaMS BMP menu, including Second 6 strategies, are listed in Appendix B. Some of these strategies are already being implemented by the Town and are marked accordingly. Other strategies, and especially Second 6 strategies not already being implemented, will be considered for future implementation in an iterative manner over time.

Map 2C – Town of Vienna Primary Streets



2.6 Outreach Strategy

While the Town only has direct operational control over deicers and anti-icers applied to public property and right-of-way, non-governmental organizations play a critical role in reducing chloride in the Accotink Creek watershed. Education and outreach can be used to increase awareness of the harmful impacts of excess chloride and steps that can be taken to reduce chloride in the environment. Messaging should reflect the audience and actions should be easy to understand and implement. In some cases, it may be appropriate to use education and outreach to remind property owners that drain to the Town storm system that they are subject to enforcement action under the Town's MS4 permit.

The Town's chloride reduction education and outreach strategy builds on strategies from its adopted Public Education and Outreach Plan and MS4 Program Plan. Specific messaging should be developed around the following five principles from the SaMS (Appendix I):

(1) The importance of public safety.
(2) The unintended environmental impacts of salt use.
(3) Why minimizing salt application matters.
(4) The pros and cons of winter salt use.
(5) Specific actions the target audience can use to address the issue.

The following education and outreach strategies will be developed and integrated into the Town's Public Education and Outreach Plan and MS4 Program Plan no later than June 30, 2021.

Table 2C – Chloride Education and Outreach Strategies

Audience	Strategy	Timeline
Single Family Residential	Distribute message on proper use of deicing/anti-icing materials through one of the following: (1) press release; (2) Vienna Voice; (3) Town Calendar; (4) water bill.	Annually (ideally immediately before winter months).
Single Family Residential	Distribute deicing/anti-icing message using a social medial platform.	Annually (ideally immediately prior to a winter weather event).
HOA/Condominium Associations	Distribute deicing/anti-icing fact sheet to HOA/condominium associations.	Once during permit cycle (FY22 or FY23).
HOA/Condominium Association	Develop presentation on proper deicing/anti-icing techniques for use at HOA/condominium association meetings.	Beginning FY22.
Commercial/ Institutional	Distribute deicing/anti-icing fact sheet to commercial/institutional property owners.	Once during permit cycle (FY22 or FY23).

Web Site	Update Town web site with information about chloride reduction strategies.	Beginning FY22 (maintain after that time).

3. Schedule of Anticipated Actions

The Town will report on the status of priorities listed in Table 2B in each MS4 annual report to DEQ beginning with the reporting year ending June 30, 2022 and due to DEQ no later than October 1, 2022. The goal of the Town is to fully implement all items in Table 2B by the end of the 2018-2023 MS4 permit cycle.

The Town will update the Public Education and Outreach Plan and MS4 Program Plan to include the actions listed in Table 2C no later than June 30, 2021. Individual actions will be implemented in accordance with the timeline in Table 2C.

4. Assessment of Effectiveness

Unlike structural stormwater management controls, the practices put in place to reduce chloride pollution do not have assigned reduction efficiencies.

As stated in the SaMS, "You can't manage what you don't measure." One challenge with the chloride TMDL is a lack of consistent tracking of salt application over time to determine long-term trends and assess the success of reduction strategies. The SaMS has developed voluntary salt tracking forms for use by localities to assist in this effort. The Town will utilize these, or similar forms, for tracking purposes. Forms are located in Appendix C and can be downloaded at the following link: https://www.deq.virginia.gov/Home/ShowDocument?id=4027

The SaMS also contains a survey conducted by Amplitude Research to establish a baseline of attitudes and practices related to the use of deicers/anti-icers. Future surveys, potentially conducted as part of the Northern Virginia Regional Commission's Clean Water Partners program, may be useful to demonstrate weather collective education and outreach efforts are having the desired impact on Northern Virginia residents. As a member of the Clean Water Partners, the Town will encourage the group to consider future surveys to gauge progress over time.

5. Opportunity for Public Comment

This plan was made available for public comment in accordance with Part II B 7 of the MS4 permit. No comments were received before the May 1, 2021 deadline to submit the plan to DEQ.

Appendix A

Stormwater Pollution Prevention SOP
Snow and Deicing/Anti-icing Operations

Town of Vienna, Virginia

Stormwater Pollution Prevention Standard Operating Procedure (SOP)

Snow and Deicing/Anti-icing Operations	
Date:	July 16, 2015; Revised April 8, 2019; May 1, 2021
Purpose of SOP:	To minimize or prevent pollutant discharge from operations associated with snow removal and deicing/anti-icing.
MS4 Permit Reference	Part I E 6 a; Part II B "Local TMDL Special Condition"
Responsible Parties	Michael Gallagher, PE, Director of Public Works Christine Horner, PE, Water Quality Engineer James Kirby, Director, Streets Maintenance Division, DPW Leslie Herman, Director of Parks and Recreation

This SOP is designed to minimize, to the extent practical, the impacts of snow removal and deicing/anti-icing operations on local water quality while still ensuring public safety. This includes the storage and application of sand, salt, and other deicing/anti-icing chemicals.

1. Responsible Parties

a) Department of Public Works. The Street Maintenance Division of the Department of Public Works is responsible for snow removal and deicing/anti-icing operations in the Town's road right-of-way.

b) Department of Parks and Recreation. The Department of Parks and Recreation is responsible for deicing/anti-icing activities at public buildings, parks and recreational facilities, and adjoining sidewalks/access points.

c) Other Town Staff. Other Town staff members may engage in minor treatment of sidewalks and building entrances using bagged or boxed deicing/anti-icing materials.

d) Contractors. This SOP must be adopted by reference or otherwise incorporated into all contracting agreements dealing with snow removal or deicing/anti-icing operations within the Town's road right-of-way or on Town property.

2. Use of Deicing/Anti-icing Agents Containing Urea or Other Nutrients

The Town, including contractors, will not apply any deicing/anti-icing agent containing urea or other forms of nitrogen or phosphorus to parking lots, roadways, sidewalks, or other paved surfaces.

3. Small Applications

This SOP applies to smaller small applications of deicing/anti-icing materials, such as to sidewalks or building entrances, as appropriate. Smaller areas may be pre-treated with brine or hand spreaders. The area being treated should be the minimum necessary for safety purposes. The use of materials containing magnesium is encouraged to reduce impacts on water quality and surrounding vegetation. To the extent practical, excess materials should be swept up and disposed of properly when weather conditions allow.

4. Salt and Deicer/Anti-icer Storage

a) Proper Containment. Salt and other chemical deicers/anti-icers will be stored in a covered, corrosion-resistant structure or container at all times, unless active loading or spreading is occurring. The structure will have an impervious bottom such as a concrete slab. For the Town of Vienna, these are the salt dome and brine storage containers at the Northside Property Yard.

b) Temporary Storage. Temporary storage of salt and other chemical deicers/anti-icers is not recommended; however, if materials must be stored outside of a permanent structure, the storage must be on a temporary basis only. Temporary storage piles must be on an impervious surface (the use of a tarp as an impervious bottom is not adequate) and covered with a tarp that is adequately secured at all times when not being actively worked.

c) Management of Run-on and Run-off. Storage structures must provide adequate barriers to prevent run-on into the storage pile, and minimize erosion from the pile. All run-off from salt and other chemical deicer/anti-icer piles must be eliminated at all times. Any run-off containing salt material must be captured and either returned to the storage pile, managed as salt brine, or discharged to a sanitary sewer system in accordance with Fairfax County guidelines.

5. Sand and Deicer/Anti-icer Use

a) Deicing Material. Prior to each winter season, the Town will assess deicing materials, and to the extent practical, will select the materials and mix that has the least impact on water quality while still effectively meeting the Town's public safety needs.

b) Anti-icing.
- Liquid anti-icing materials (typically brine) may be applied prior to storm events to prevent the bond between winter precipitation and the road surface. This can effectively reduce the amount of deicing material necessary for a storm event.

- Prior to each winter season, the Town will assess anti-icing materials, and to the extent practical, will select the materials and mix that has the least impact on water quality while still effectively meeting the Town's public safety needs.
- Anti-icing should only occur if no rain is forecast prior to the event.
- Applications should be conducted per manufacturer's recommendations.

c) Application Rate. The Town will use the lowest application rate that will effectively treat surfaces to meet safety needs based on the forecast and current weather events.

d) Equipment Calibration.
- All equipment will be calibrated in accordance with the manufacturer's instructions and the specified applications rates for the material being applied. The manufacturer's instructions will be kept at the Northside Property Yard and referenced prior to each winter storm event.
- Calibration will include plowing speed, gate height, auger speed, and other applicable spreader settings.
- The appropriate gate height and auger speed will be determined prior to each shift and checked by the supervisor between shifts.

e) Loading. When loading salt, sand, or other deicers, care will be taken to not overfill the truck or tank.

6. Sand and Deicer/Anti-icer Clean Up

a) Clean-Up.
- Loading areas will be swept frequently to prevent salt or sand build-up and run-off. At a minimum, loading areas should be inspected and swept following each storm event or other period when handling occurs.
- To the extent practical, excess materials on Town right-of-way and property will be cleaned up after each winter weather event.

b) Street Sweeping. The Town conducts routine street sweeping beginning in spring to clean up debris and other materials that collect during winter months, including salt, sand, and other deicers.

c) Vehicle Washing. Spreading and other equipment used during deicing operations will only be washed inside the bay designed for that purpose at the Northside Property Yard. Wash water from that facility enters the sanitary sewer system.

7. Training

This SOP will be incorporated into annual training for applicable employees in accordance with the Town's MS4 Program Plan that involve snow and deicing/anti-icing operations. Documentation of the training, including sign-in sheets and materials used, will be included in the Town's MS4 annual reports.

Appendix B

SaMS BMP Menu – Additional Strategy Options

The following are SaMS BMP menu strategies that are above and beyond the priority strategies identified in Table 2B (Fundamental 5). Several of these strategies are already being implemented by the Town and are so noted. Additional strategies, including Second 6 strategies, will be considered for future implementation in an iterative manner over time.

BMP	BMP Description	Implemented?	Second 6?
Salt Storage and Handling	Proper storage of deicer piles	✓	
	Proper storage for liquid products	✓	
	Proper loading and hauling of deicers	✓	
	Clean equipment and contain wastewater	✓	
Storm Meetings	Pre-storm meetings	✓	
	Post-storm meetings	✓	
Weather Forecasts and Surface Temperature	Weather forecasting	✓	✓
	Know the surface and ambiant temperature	✓	
Enhanced Equipment and Directional Technology	Plows (side wing, tow plows, flexible or sectional blades)		
	Spreaders that can deliver at low rates, collect data, and/or are ground controlled/ speed synchronized		
	Equipment needed for making liquid products	✓	
	Automated Vehicle Location	✓	
	Maintenance Decision Support System		
	Precision Deicing		
Anti-icing	Anti-icing	✓	✓
Plowing Practices	Plowing early and often	✓	
	Coordinate plowing activities	✓	
	Plow trains	✓	

BMP	BMP Description	Implemented?	Second 6?
Product Application Practices	Dyed deicers		
	Use of abrasives	✓	
	Post-storm clean-up	✓	
	Spinners set up using a chute or spinner close to the ground	✓	
	Plows drive 17-25 mph on non-high-speed roads	✓	
	Turn off auger, shoots, or conveyors when stopped	✓	
	Reduce application rate on successive passage	✓	
Vary Application to Conditions	Variable application rates	✓	✓
	Use deicers within their temperature range	✓	✓
Use of Liquids	Pre-treat deicers	✓	✓
	Pre-wet deicers		✓
	Direct Liquid Application	✓	
Measurement	Measure and record deicer use	✓	

Appendix C

Salt Tracking Forms and Instructions

Salt Tracking and Reporting Data: Sheet #1 - Operations

Organization Name:						
Sub-Organization Name:						
Geographic Area(s) of Operations:	Area 1	Area 2	Area 3	Area 4	Area 5	Other (insert text)
Winter Season:						

Operational Area Description

Total Highways and Roads (lane miles)	0		
Total Bike/Other Maintained Trails (miles)	0		
Total Area of Treated Parking Lots	0	**Parking Area Units of Measure**	Acres
Total Area of Treated Travelways	0	**Driveways Units of Measure**	Linear Ft or Sq. Ft.
Total Area of Treated Sidewalks	0	**Sidewalks Units of Measure**	Linear Ft or Sq. Ft.
Total Area of "Other#1" Types of Treated Surfaces	0	**Units for "Other"**	Acres or Sq. Ft.
Total Area of "Other#2" Types of Treated Surfaces	0	**Units for "Other"**	Acres or Sq. Ft.

Detailed Property /Route Information

	Units	Property/ Route #1	Property/ Route #2	Property/ Route #3	Property/ Route #4	Property/ Route #5
Total Highways and Roads (lane miles)	lane miles					
Total Trails (miles)	miles					
Total Area of Treated Parking Lots	Acres or Sq. Ft.					

Salt Tracking and Reporting Data: Sheet #2 - Storms Tracking

Organization Name:							
Sub-Organization Name:							
Geographic Area(s) of Operations:	Area 1	Area 2	Area 3	Area 4	Area 5	Other (insert text)	
Winter Season:	0	**# Storm Operations (Seasonal Total):**					

Storm Descriptions

	Seasonal Total	**Storm 1**		**Storm 2**		**Storm 3**		**Storm 4**	
Beginning Date, Time of Each Storm Operations Deployment		Date	Time	Date	Time	Date	Time	Date	Time
End Date, Time of Operations:		Date	Time	Date	Time	Date	Time	Date	Time
Beginning Date, Time of Storm Precipitation		Date	Time	Date	Time	Date	Time	Date	Time
End Date, Time of Precipitation:		Date	Time	Date	Time	Date	Time	Date	Time
Full or Partial Deployment?		F, P		F, P		F, P		F, P	
Storm Type (Heavy Snow > 6", Medium 2-6", Light < 2")		H, M, L		H, M, L		H, M, L		H, M, L	
Inches of Snowfall:	**0**	**0**		**0**		**0**		**0**	
Ice or Freezing Rain?		Y, N		Y, N		Y, N		Y, N	
Road Temperature During Storm (Warm, >32, Mid, 25-32, Cold, <25 degrees F)		W, M, C		W, M, C		W, M, C		W, M, C	
Early Storm Conditions: Starts as Snow, SS; Starts as Rain, SR		SS, SR		SS, SR		SS, SR		SS, SR	
Winds During Storm (Light, < 15 mph, Strong, > 15 mph)		L, S		L, S		L, S		L, S	
Winds After Storm (Light, < 15 mph, Strong, > 15 mph)		L, S		L, S		L, S		L, S	
Forecasted Post Storm Temps (Same, Rising, Falling)		S, R, F		S, R, F		S, R, F		S, R, F	
Sources Used for Storm Information (NWS, Own Observation, other?)									
Other Notes Describing Storm Conditions (narrative)									

Salt Tracking and Reporting Data: Sheet #3 - Product Use

Organization Name:							
Sub-Organization Name:							
Geographic Area(s) of Operations:	Area 1	Area 2	Area 3	Area 4	Area 5	Other (insert text)	
Winter Season:	0						

Product Use Data

Treatment Products	Seasonal Total	Units of Measure	Amount used in Storm 1	Amount used in Storm 2	Amount used in Storm 3	Amount used in Storm 4	Amount used in Storm 10	Was this product effective? (narrative as applicable):	Is product planned for continuation? (Yes or No)
Sodium Chloride (NaCl)	**0**	dry lbs, tons							Y, N
Magnesium Chloride (MgCl)	**0**	dry lbs, tons							Y, N
Calcium Chloride (CaCl)	**0**	dry lbs, tons							Y, N
Sodium Chloride Brine % Brine Mixture: ____	**0**	gallons	Y, N	Y, N	Y, N	Y, N	Y, N		Y, N
Magnesium Chloride Brine % Brine Mixture: ____	**0**	gallons	Y, N	Y, N	Y, N	Y, N	Y, N		Y, N
Calcium Chloride Brine % Brine Mixture: ____	**0**	gallons	Y, N	Y, N	Y, N	Y, N	Y, N		Y, N
Abrasives Applied	**0**	sq. yds, tons							Y, N
Other Products Used? Name: .	**0**	Units							Y, N
Other Products Used? Name: .	**0**	Units							Y, N
Other Products Used? Name: .	**0**	Units							Y, N
Notes on Treatment Products Used									

Salt Tracking and Reporting Form Data Dictionary

This tool is provided for winter pavement treatment operators to record data that can be used over time to reduce costs while maintaining standards of service.

Service Area (Tab #1) **data can be entered by Operational Units (light green shaded section of Tab1), which will sum for the whole organization,** or **simply enter data at the organizational level (light blue shaded portion of Tab1).**

Winter Weather (Tab #2)**data can be entered by Storm Events (light green shaded section of Tab2), which will sum for the season,** or **simply enter data at the seasonal level (light blue shaded portion of Tab2).**

Product Use (Tab #3) **data can be entered by storm event (light green shaded section of Tab2), which will sum for the season,** or **simply enter data at the seasonal level (light blue shaded portion of Tab2).**

BMP Implementation (Tab #4) **data is only enterred at the seasonal level (light blue shaded portion of Tab4).**

Data Element	Data Element Definition/Data Entry Instructions
Tab 1: Operations	Organization Name, Geographic Areas of Operations, Winter Season Years, and the total extent of Transportation and Property Management areas maintained are **Core Tracking Elements**
Organization Name:	**Enter** name of Public or Private Organization tracking its winter operations
Sub-Organization Name:	**Enter** name of Sub-unit of the Organization for tracking information being recorded. Example Transportation Division, Property Maintanence Div., etc.
Geographic Area(s) of Operations:	**Select** all NoVA jurisdictions in which the organization conducts winter operations (B4-F4), with All NoVA an option. If > 5 individual areas, can specify any remaining areas of operations (G4)
Winter Season:	**Enter** the years corresponding to the winter season being tracked (i.e., 2020-21).
Seasonal Tracking	
Total Highways and Roads (lane miles)	**Enter t**otal lanes miles for all road surfaces maintained in the winter by the organization
Total Bike/Other Maintained Trails (miles)	**Enter t**otal miles for all trails maintained in the winter by the organization
Total Area of Treated Parking Lots	**Enter** total area for all Parking Lots treated by the organization. **Select** either Acres or Sq. Ft in the reporting unit field
Total Area of Treated Travelways	**Enter** total area for all "Travelways" treated by the organization, which include driveways, alleys, and other off-road vehicular paths. **Select** either Acres or Sq. Ft in the reporting unit field
Total Area of Treated Sidewalks	**Enter** total area for all Sidewalks treated by the organization. **Select** either Sq. Ft or Linear Ft. in the reporting unit field
Total Area of "Other #1" Treated Surfaces	**Enter** the type of surface (Column A) and its total area (Column B) for Other Areas #1 treated by the organization. **Select** either Acres or Sq. Ft in the reporting unit field
Total Area of "Other #2" Treated Surfaces	**Enter** the type of surface (Column A) and its total area (Column B) for Other Areas #2 treated by the organization. **Select** either Acres or Sq. Ft in the reporting unit field
Operations Area Tracking	
Total Highways and Roads (lane miles)	**Enter** lanes miles for road surfaces treated for this Route, add additional columns for >5 Routes/Property Groupings. **Note** that for this and other treatment area fields, if comprehensive data is enterred at "Property/Route" level of detail, organziational totals will be computed.
Total Bike/Other Maintained Trails (miles)	**Enter** Trail miles treated for this Route
Total Area of Treated Parking Lots	**Enter** total area for all Parking Lots treated for this Property Grouping. **Select** either Acres or Sq. Ft in the reporting unit field
Total Area of Treated Travelways	**Enter** total area for all "Travelways" (driveways, alleys, and other off-road vehicular paths) treated for this Property Grouping. **Select** either Acres or Sq. Ft in the reporting unit field
Total Area of Treated Sidewalks	**Enter** total area for all Sidewalks treated for this Property Grouping. **Select** either Sq. Ft or Linear Ft. in the reporting unit field
Total Area of "Other#1" Treated Surfaces	**Enter** the type of surface (Column A) and its total area (Column B) for Other Areas #1 treated for this Property Grouping. **Select** either Acres or Sq. Ft in the reporting unit field. Examples might include stairs, bus stops, etc.
Total Area of "Other#2" Treated Surfaces	**Enter** the type of surface (Column A) and its total area (Column B) for Other Areas #2 treated for this Property Grouping. **Select** either Acres or Sq. Ft in the reporting unit field. Examples might include stairs, bus stops, etc.
Tab 2: Storms Tracking	Number of Storm Operation Deployments and Total Inches of Snowfall for Season are **Core Tracking Elements**
Organization Name:	Auto Populates from Tab #1, similarly done for Tabs #3 and 4
Sub-Organization Name:	Auto Populates from Tab #1, similarly done for Tabs #3 and 4
Geographic Area(s) of Operations:	Auto Populates from Tab #1, similarly done for Tabs #3 and 4
Winter Season:	Auto Populates from Tab #1, similarly done for Tabs #3 and 4
Number of Storm Operations (Seasonal Total):	**Enter** the number of winter storms during which plowing and/or anti- or deicing activities were conducted.
Beginning Date, Time of Each Storm Operations Deployment	**Enter** the Date and Time that Storm Operations Deployment began - this could be a couple days in advance of forecast winter precipitation
End Date, Time of Operations:	**Enter** the Date and Time that Storm Operations Deployment ended - this could be a couple days after winter precipitation ended.
Beginning Date, Time of Storm Precipitation	**Enter** the Date and Time that Storm Precipitation actually began.
End Date, Time of Precipitation:	**Enter** the Date and Time that Storm Precipitation actually ended.
Storm Type (Heavy Snow > 6", Medium 2-6", Light < 2")	**Select** the code for the Storm Type; Heavy Snow (HS = > 6"), Medium Snow (M = 2-6"), or Light Snow (L = < 2").
Inches of Snowfall:	**Enter** the total amount of Snowfall during the winter season (Column B) for your organization, or enter the snowfall for individual storms (Columns C-V), and the seasonal total will be calculated. Add additional columns as needed to allow tracking of > 10 storms for the season.
Ice or Freezing Rain?	**Select** Yes or No to indicate whether the storm precipitation included ice or freezing rain.
Road Temperature During Storm (Warm, >32, Mid, 25-32, Cold, <25 degrees F)	**Select** the code for the Road Temperatures during Storm; Warm (W > 32F), Mid (M = 25-32F), or Cold (C < 25F).
Early Storm Conditions: Starts as Snow, SS; Starts as Rain, SR	**Select** the code for Early Storm Conditions; Starts as Snow (SS), Starts as Rain (SR).

Winds During Storm (Light, < 15 mph, Strong, > 15 mph)	**Select** the code for Wind Conditions during the Storm; Light (L , 15 mph) or Strong (S > 15 mph).
Winds After Storm (Light, < 15 mph, Strong, > 15 mph)	**Select** the code for Wind Conditions after Storm Precipitation ended; Light (L , 15 mph) or Strong (S > 15 mph).
Forecasted Post Storm Temps (Same, Rising, Falling)	**Select** the code for the **Forecasted** Post-Storm Temperatures; Same (S), Rising (R), or Falling (F).
Sources Used for Storm Information (NWS, Own Observation, other?)	**Enter** narrative information to identify the source of storm weather information reported above.
Other Notes Describing Storm Conditions (narrative)	**Enter** narrative information to document details or clarify any additional information desired to describe storm. This could include differences between forecast information and actual storm conditions, or anything else the organization wishes to record for future reference.
Tab #3: Treatment Products	Seasonal Totals for all Products Used are a **Core Tracking Element**
Sodium Chloride (NaCl)	**Enter** the amount of NaCl applied at the Seasonal level (Column B) or for individual storms (Columns D-M, expand for > 10 storms), which will calculate seasonal totals. ***For this and subsequent products*** , ***Select*** *the units (dry lbs or tons) in Column C,* ***Enter*** *narrative information to indicate the product's effectiveness (Column N), and* ***Select*** *a response to indicate whether the product is planned for future use; Yes (Y), or No (N).*
Magnesium Chloride (MgCl)	**Enter** the amount of MgCl applied at the Seasonal level (Column B) or for individual storms (Columns D-M), which will calculate seasonal totals.
Calcium Chloride (CaCl)	**Enter** the amount of CaCl applied at the Seasonal level (Column B) or for individual storms (Columns D-M), which will calculate seasonal totals.
Sodium Chloride Brine	In Column A, second line**, enter the % NaCl** in the brine product**. Enter** the gallons of NaCl **brine** applied at the Seasonal level (Column B), and **Select** Yes or No for brine application during individual storms (Columns D-M).
Magnesium Chloride Brine	In Column A, second line, **enter the % MgCl** in the brine product**. Enter** the gallons of MgCl **brine** applied at the Seasonal level (Column B), and **Select** Yes or No for brine application during individual storms (Columns D-M).
Calcium Chloride Brine	In Column A, second line, **enter the % CaCl** in the brine product. **Enter** the gallons of CaCl **brine** applied at the Seasonal level (Column B), and **Select** Yes or No for brine application during individual storms (Columns D-M).
Abrasives Applied	**Enter** the amount of abrasives applied at the Seasonal level (Column B) or for individual storms (Columns D-M), which will calculate seasonal totals.
Other Products Used? Name:	**Enter** the Product name (Column A), **Enter** the amount of other products applied at the Seasonal level (Column B) or for individual storms (Columns D-M, expand as needed), which will calculate seasonal totals. **Enter** the units used for Other Products (Column C).
Notes on Treatment Products Used	**Enter** narrative information to document and explain anything desired about products used during the winter season. This might include any use of Sand/Salt mixes, Use of Brines with Additives - such as beet juice, use of brines not at Industry Standard/Eustectic composition (23.3%), etc.
Tab #4: BMP Implementation	Indicating (Yes/No) for BMP Implementation at a Seasonal level is a recommended **Core Tracking Element**
Winter Maintenance Plan is developed	**Select** Yes or No (Column C) to indicate whether a written Winter Maintanence Plan has been prepared by organization and reviewed with crew and managers. ***For this and subsequent BMPs,*** *if Yes,* ***Enter*** *narrative information (Column D) to briefly explain the effectiveness of the BMP. If No,* ***Select*** *Yes or No to indicate Future Plans to use BMP (Column E), and, if Yes,* ***Enter*** *narrative information to explain plans to address any impediments or requirements needed to enable future use of the BMP.*
Preseason meetings are held	**Select** Yes or No (Column C) to indicate whether meeting(s) were held with the maintenance crew, supervisors, and management/property manager(s) to review the Winter Maintenance Plan, highlight any changes in operations, and revisit past lessons learned.
Postseason meetings are held	**Select** Yes or No (Column C)to indicate whether meeting(s) were held with the maintenance crew, supervisors, and management/property manager(s) to evaluate how well the season went, what worked, and what could be changed to improve operations.
Accountability is at every level	**Select** Yes or No (Column C) to indicate whether the winter maintenance plan clearly states everyone's accountability; Management accountability for decisions on storm response (i.e., type of material, number of deployed operators, etc.), and Crew Leaders and Operators accountability to follow these decisions and work within the operation's guidelines/policy.
Transportation Audiences - Snowplow routes are planned	**Select** Yes or No (Column C) to indicate whether the plan for road maintenance strategically plans each snowplow route to maximize efficiency, considering cycle time and levels of service for each route.
Property Management Audiences - the properties are visited before the season	**Select** Yes or No (Column C) to indicate whether a property visit/walk with the property manager was conducted to inspect for challenging areas, deicer storage areas (if applicable), and drainage issues prior to the winter season.
Transportation Audiences - Levels of Service are communicated internally	**Select** Yes or No (Column C) to indicate whether the levels of service for the various routes have been communicated to all operations staff.
Transportation Audiences - Levels of Service are communicated externally	**Select** Yes or No (Column C)to indicate whether the levels of service have been communicated to Inform residents and political leaders of the different levels of service for roads treated by the organization.
Property Management Audience - Levels of Service are discussed and agreed upon	**Select** Yes or No (Column C) to indicate whether property managers and service providers have discussed and agreed to the levels of service standards for all winter service areas.
Training is held	**Select** Yes or No (Column C)to indicate whether all staff have been trained on winter operations plans, including managers, operators, contract employees, seasonal employees.
Deicer piles are properly stored	**Select** Yes , No, or N/A to indicate whether storage piles are covered/enclosed to prevent exposure to precipitation, and situated on an impervious surface with stormwater collected and contained within a bermed basin lined with concrete or other impermeable materials or an underground storage tank(s); good housekeeping is practiced around storage piles.
Liquid products are properly stored	**Select** Yes , No, or N/A to indicate whether liquids are stored in double walled tanks or have secondary containment in case of a leak or spill, and that operators know the freezing point of the liquid products and prevent product freezing.
Loading and hauling of deicers are done properly	**Select** Yes or No (Column C) to indicate whether deicers are loaded under cover and on a level surface, and spreading equipment is not overloaded (to avoid spills) and the deicer is covered on the spreader. Good housekeeping practices are used around the loading area, and when deicer spills occur, products are recovered and returned to the stockpile.
Equipment is cleaned and wastewater is contained	**Select** Yes or No (Column C) to indicate whether equipment is cleaned after storm operations conclude, and that wastewater from the cleaning process is contained properly to avoid a discharge.
Property Management Audiences - Storage of deicers and abrasive piles delivered to a property:	**Select** Yes, No, or N/A to indicate whether deicers and abrasive piles delivered to a property are placed on an impervious surface, and covered with durable/waterproof material or placed in a covered storage facility. Storage piles are shaped properly to avoid interaction with precipitation, and if outdoors, piles are windrowed with well-sloped sides.
Property Management Audiences - Storage and handling of deicer bags is done properly	**Select** Yes, No, or N/A to indicate whether deicer bags are protected from precipitation, and located up-gradient/out of the path of stormwater/meltwater and away from waterbodies, wetlands, storm drains, and stormwater capture areas. Empty deicer bags are disposed of in a lined/contained receptacle.
A calibration process is established	**Select** Yes or No (Column C) to indicate whether a calibration process is in place for salt application equipment that takes into account flow settings, conveyor/auger and spinner speeds, ground speed, and material (size, density, etc.). Application rates are standardized across equipment types.
Equipment is calibrated	**Select** Yes,No, or Partially (Column C) to indicate whether (solid and liquid dispensers) are calibrated in the preseason, mid-season, and when equipment or deicer material changes are made to ensure accurate application rates relative to treatment plans.

Pre-storm meetings are held	**Select** Yes or No (Column C) to indicate whether, prior to the start of each storm operation, the maintenance crew, supervisors, and management/property manager(s) review operations plans, highlight potential challenges and solutions for the forecasted storm, and revisit lessons learned from post-storm meetings.
Post-storm meetings are held	**Select** Yes or No (Column C) to indicate whether, after storm operations conclude, the maintenance crew, supervisors, and management/property manager(s) evaluate what was done, how well it worked, and what could be changed to improve operations.
Accurate weather forecasting is obtained and is a part of decision making	**Select** Yes or No (Column C) to indicate whether accurate forecasts that detail the 1) start of precipitation, 2) type of precipitation, 3) total precipitation expected/storm intensity, 4) expected event length, 5) wind conditions (speed, gusts, directions), and temperature trends are considered prior to each storm operation.
Know the surface temperature	**Select** Yes or No (Column C) to indicate whether equipment and/or remote technology is used to know the temperature of the surface that will/may be treated with deicers, and use this information to determine the appropriate application rate for the storm conditions.
Advanced plows are used	**Select** Yes, No, or N/A to indicate whether organization uses plows that maximize the plow-able area; examples include 1) side wing plows, 2) tow plows, and 3) flexible or sectional blades.
Advanced spreaders are used	**Select** Yes, No, or N/A to indicate whether organization uses spreaders that can apply very low rates of deicers, including electronic spreaders that can lock in specific application rates and collect data.
Proper/Advanced equipment needed for making liquid products is used	**Select** Yes, No, or N/A to indicate whether organization has equpment to make and store liquid products, including 1) an open top mixing tank, 2) a holding tank, 3) pumps to transport liquid from mixing tank to holding tanks, to applicator tanks, and 4) a salimeter or a hydrometer to measure the salinity or density of water.
Transportation Audiences - Automated Vehicle Location (AVL) is used	**Select** Yes or No (Column C) to indicate whether organization tracks the position, spreader rate, and plow activity of different snow plows in the fleet (to show results live to supervisors, other plow operators, and the public).
Transportation Audiences - Maintenance Decision Support System (MDSS) is used	**Select** Yes or No (Column C) to indicate whether organization uses existing and new data (weather, road conditions, etc.) to integrate data and generate diagnostic and prognostic maps of road conditions, and provide recommendations on road maintenance actions.
Transportation Audiences - Precision Deicing is used	**Select** Yes or No (Column C) to indicate whether organization integrates LIDAR data, road condition index (severity based on road angles/curves and solar radiation), precipitation data, AVL, and automated spreaders to direct precision deicing that dynamically adjusts application rates of chemicals/liquids based on site-specific, local road conditions.
Anti-icing is used	**Select** Yes or No (Column C) to indicate whether either liquids or solids are used for anti-icing. Anti-icing with liquids (e.g., brines) can be done up to 48 hours before snow/ice fall, and uses significantly less deicer than solids. However, solid anti-icing can work best for events that start as rain or freezing rain.
Plowing early and often is common practice	**Select** Yes or No (Column C) to indicate whether frequent plowing is used to remove snow/ice, rather than using deicers to "burn off" any accumulations; frequent plowing limits the time for snow/ice to compact and bond with the pavement.
Transportation Audiences - Plowing activities are coordinated	**Select** Yes or No (Column C) to indicate whether operators plowing activities are coordinated to prevent plowing off another operator's material.
Transportation Audiences - Plow trains are used	**Select** Yes or No (Column C) to indicate whether plow trains are used on multilane highways to remove as much snow as possible in one coordinated sweep.
Property Management Audiences - The right plow, shovel, pusher, blower, blade, or broom for the property is used	**Select** Yes or No (Column C) to indicate whether plows, shovels, pushers, blowers, blades, and brooms are selectively used in accordance with recommended best practices (such as those contained in BMP Pro/Con guide table for this BMP).
Property Management Audiences - Opportunities to close areas with a small footprint,	**Select** Yes, No, or N/A to indicate whether organization utilizes opportunities to close selected property areas to reduce treatment needs.
Property Management Audiences - Snow is placed in proper places	**Select** Yes or No (Column C) to indicate whether plowed snow is stored downhill from deicer storage areas to stop melt water from interacting with deicers.
Dyed deicers are used	**Select** Yes or No (Column C) to indicate whether dyed deicers are used to observe and show deicer product presence.
Use of Abrasives	**Select** Yes or No (Column C) to indicate whether abrasives are used by organization. Abrasives alone provide traction during 1) freezing rain events, 2) in slow-moving traffic areas, and 3) when deicers are ineffective because it is too cold . For narrowly defined circumstances, a 50/50 blend of deicers and abrasives can be used, but this practice should be limited to those circumstances specifically defined by the organization.
Deicers are cleaned up after storm	**Select** Yes or No (Column C) to indicate whether left over deicer materials are cleaned-up after the snow/ice has melted away.
Transportation Audiences - Spinners set-are up properly	**Select** Yes or No (Column C) to indicate whether organization uses a chute or sets spinners close to the ground to reduce bounce and scatter of solid deicer products.
Transportation Audiences - Plows drive 17-25 mph on non-high-speed roads	**Select** Yes or No (Column C) to indicate whether operators drive at speeds of 17-25 mph when applying deicer to keep material on road.
Transportation Audiences - On high-speed roads deicer is applied to the center of the road or high side of a curve	**Select** Yes or No (Column C) to indicate whether operators apply deicers in center of high speed roads and on the high side of curves.
Transportation Audiences - Auger, shoots, or conveyors are turned off when stopped	**Select** Yes or No (Column C) to indicate whether operators turn off auger, shoot, or conveyor when stopped, even briefly.
Transportation Audiences - Deicer application rate is reduced on successive passes	**Select** Yes or No (Column C) to indicate whether operators reduce application rates on second/subsequent passes of a treated route to leverage deicing capacity of the remaining deicer.
Property Management Audiences - Spread patterns that prevent overlapping applications are used	**Select** Yes or No (Column C) to indicate whether service provider/operator surveys the property, and develops and utilizes a spread pattern that prevents applying deicers over areas that have already been treated.
Property Management Audiences - Drop spreaders or rotary spreaders with shields are used for sidewalks	**Select** Yes or No (Column C) to indicate whether drop spreaders or rotary spreaders with shields are used to prevent spreading deicer off of the sidewalk.
Property Management Audiences - Managing stairways or areas with a small footprint #2	**Select** Yes, No, or N/A to indicate whether when deicers are applied in small areas, the deicer needed is calculated (using an application rate chart) based on the total area to be treated, uses the proper tool (push shovel, scoop shovel, broom or blower, ice scraper, or an ice chisel) to most effectively remove snow and ice from small/challenging areas, and uses hand-held spreaders for more precise application in small treatment areas.
Variable application rates are used for surface temperature, precipitation type/rate, and intended levels of service	**Select** Yes or No (Column C) to indicate whether recommended application rates are varied based on: 1) pavement/surface temperature, 2) precipitation rate and type, and 3) cycle time/bare pavement regain time.
Deicers are used within their temperature range	**Select** Yes or No (Column C) to indicate whether treatment plans (which deicer and/or abrasives will be used) are based on forecasted temperatures/conditions, and organization maintains adequate amounts of the necessary deicers/abrasives to be prepared for extremely cold temperatures, when abrasives alone may be the best option.
Deicers are pretreated	**Select** Yes or No (Column C) to indicate whether solid deicers are pre-treated with a liquid, typically brine, to help deicer material stick to surfaces and speed up the melting process.
Deicers are prewetted	**Select** Yes or No (Column C) to indicate whether liquids, typically brine, are added to solid deicers as they are being applied (prewetting) to help material stick to surfaces and speed up the melting process.
Direct Liquid Application is used	**Select** Yes or No (Column C) to indicate whether mixtures of water and deicer are applied directly to a surface (Direct Liquid Application, or DLA) during or after a storm to deice immediately (there is no lag time for the deicer solution to form).
Deicer use is measured and recorded	**Select** Yes or No (Column C) to indicate whether a standardized process is used to measure and record deicer use as frequently, accurately, and refined (e.g., per route, shift, site, etc.) as possible.
Additional BMPs and Comments: Seasonal or Storm-specific	**Enter** the name of any additional BMPs implemented (Column B) and narrative information as desired to identify and discuss the effectiveness of any other BMPs used in the organization's winter operations (Column C). Additional comments may pertain to overall seasonal operations, or could be specific to individual storm operations. If storm specific, identify the storm that comments pertain to. Add additional rows as desired to accomodate all comments.