Chloride Total Maximum Daily Load (TMDL) Action Plan

Stormwater Management / MS4 Permit Compliance

City of Fairfax
10455 Armstrong Street
Fairfax, VA 22030-3630

Version 01/2025

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Report Certification

As required by the MS4 General Permit, Part IV. K. 4.

"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: Satoshi Eto

Signature: 
Digitally signed by Satoshi Eto
Date: 2025.02.06 13:31:54 -05'00'

Title: Public Works Program Manager

Date:

Acronyms

Acronym	Meaning
BMP	Best Management Practice
CBPA	Chesapeake Bay Preservation Act
City	City of Fairfax, Virginia
CWA	Clean Water Act
DEQ	Virginia Department of Environmental Quality
EPA	United States Environmental Protection Agency
HP-SWPPP	High-Priority Stormwater Pollution Prevention Plan
HUC	Hydrologic Unit Code
LA	Load Allocation
Lbs.	Pounds
LOS	Level of Service
MCM	Minimum Control Measure
MOS	Margin of Safety
MS4	Municipal Separate Storm Sewer System
MS4 General Permit	VPDES General Permit for Discharges of Stormwater from Small MS4s
NVRC	Northern Virginia Regional Commission
RPA	Resource Protection Area
SaMS	Virginia Salt Management Strategy
SMP	Salt Management Plan
SWM	Stormwater Management
TMDL	Total Maximum Daily Load
VDOT	Virginia Department of Transportation
VESMP	Virginia Erosion and Stormwater Management Program
VPDES	Virginia Pollutant Discharge Elimination System
WLA	Wasteload Allocation
Yr.	Year

1.0 Introduction

The City of Fairfax (City) is an independent 6.24 square mile city of approximately 24,000 residents in the heart of Northern Virginia (Figure 1). It includes neighborhoods in four Potomac River tributary watersheds:

- Accotink Creek (Virginia Hydrologic Unit Code (HUC) PL30)
- Difficult Run (HUC PL22)
- Lower Bull Run (HUC PL46)
- Pohick Creek (HUC PL29) (Figure 2).

The City operates a small municipal separate storm sewer system (MS4) that collects stormwater from both private stormwater infrastructure and other MS4s, including Fairfax County and the Virginia Department of Transportation (VDOT).

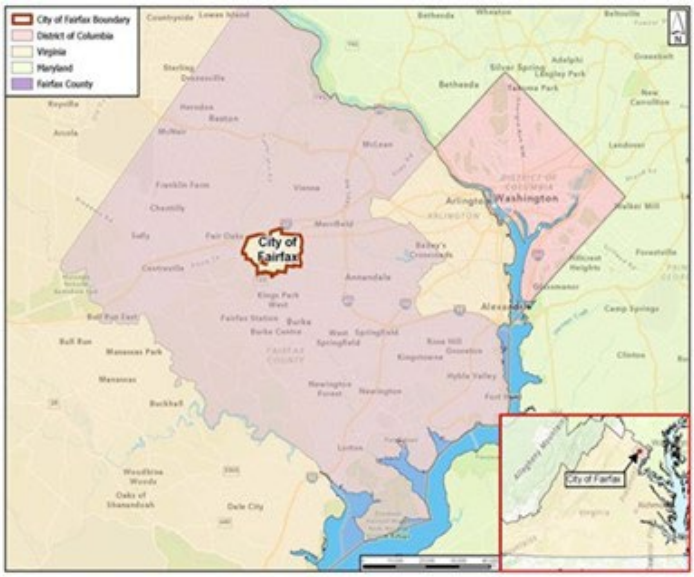

Figure 1. The City of Fairfax, located in Northern Virginia, is surrounded by Fairfax County

Discharges from the MS4 are authorized under the Virginia Pollutant Discharge Elimination System (VPDES) program. As such, the City applied for and has maintained coverage for MS4 discharges under the appropriate VPDES General Permit for Discharges of Stormwater from Small MS4s (MS4 General Permit) since the initial MS4 General Permit was approved by the State Water Control Board in 2003.

2.0 City of Fairfax Stormwater Pollutant Reduction Efforts

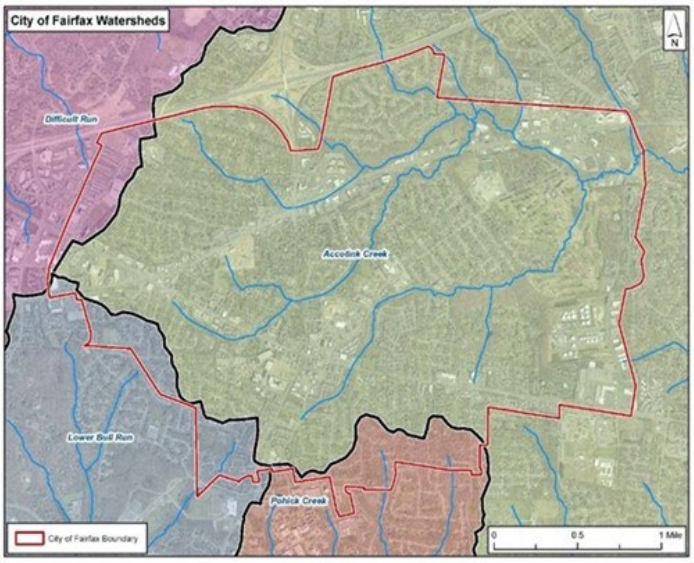

Figure 2. The City of Fairfax intersects four 6th Order Hydrologic Unit Codes in the Potomac River watershed

The City has developed an MS4 Program Plan to document its strategies and implementation schedules for addressing the MS4 General Permit conditions. The MS4 Program Plan includes best management practices (BMPs) for each of the permit's six minimum control measures (MCMs) (Table 1). These BMPs have varying impacts on reducing individual pollutants of concern (POCs) found in Total Maximum Daily Loads (TMDLs) based on the POC and the City's BMP implementation strategy. The MS4 General Permit contains additional information regarding the implementation and implementation schedule of these BMPs.

Table 1. BMPs Implemented by the City of Fairfax to Meet the MS4 General Permit MCMs

BMP	BMP Title
MCM #1 - Public Education and Outreach	
BMP 1A	Public Education and Outreach Program
MCM #2 - Public Involvement and Participation	
BMP 2A	Public Involvement Procedures
BMP 2B	Stormwater and Floodplain Management Webpage
BMP 2C	Stormwater Public Participation Initiative
MCM #3 - Illicit Discharge Detection and Elimination	
BMP 3A	Geographic Information System Mapping
BMP 3B	MS4 Outfall Data Management Tracking
BMP 3C	Downstream MS4 Interconnection – Operator Notification
BMP 3D	Prohibition of MS4 Illicit Discharges
BMP 3E	Illicit Discharge Detection and Elimination
BMP 3F	Dry Weather Screening
MCM #4 - Construction Site Stormwater Runoff and Erosion and Sediment Control	
BMP 4A	DEQ – Authorized Virginia Erosion and Stormwater Management Program (VESMP)
MCM #5 - Post-Construction Stormwater Management (SWM) for New Development and Development on Prior Developed Lands	
BMP 5A	DEQ-Authorized VESMP
BMP 5B	City-Owned/Operated SWM Facility Inspections
BMP 5C	City-Owned/Operated SWM Facility Maintenance
BMP 5D	Private SWM Facility Inspection and Long-Term Compliance
MCM #6 - Pollution Prevention and Good Housekeeping for Facilities Owned or Operated by the Permittee within the MS4 Service Area	
BMP 6A	Pollution Prevention and Good Housekeeping Standard Operating Procedures
BMP 6B	High Priority City Facility Evaluations
BMP 6C	HP-SWPPP for the City Property Yard
BMP 6D	Turf and Landscape Nutrient Management Plans
BMP 6E	Contractor Management and Oversight
BMP 6F	Stormwater Management Training

Additionally, the City of Fairfax is a Tidewater, Virginia, locality, as defined by the Chesapeake Bay Preservation Act (CBPA). As such, the City has established Resource Protection Areas (RPAs) along sensitive water resources. RPAs provide buffers between development and receiving waters to further reduce pollutants from anthropogenic sources entering impaired watersheds. Additional information regarding the City's CBPA Program and riparian buffers is available at: https://www.fairfaxva.gov/government/public-works/stormwater-and-floodplain-management/chesapeake-bay-ordinance.

3.0 City of Fairfax TMDLs

The current MS4 General Permit, effective November 1, 2023, includes updated compliance requirements for MS4 operators who discharge to surface waters for which a TMDL study has been developed and approved by the Environmental Protection Agency (EPA). TMDLs are developed for surface waters that are "impaired" (i.e., not meeting their designated uses under the federal Clean Water Act (CWA) and State Water Control Law). TMDLs identify the cause and source of surface waters to be impaired and calculate the maximum loading rates of the identified pollutant of concern that can be discharged into the impaired waterbody while still meeting its designated uses.

TMDL = Wasteload Allocation (WLA) + Load Allocation (LA) + Margin of Safety (MOS)	
where	
WLA	The amount of the total pollutant load that can be discharged to the receiving water from VPDES-regulated point sources, such as the discharges from the City's MS4.
LA	The amount of the total pollutant load that can be discharged to the receiving water from unregulated non-point sources.
MOS	Provides a margin of safety in the TMDL.

MS4 General Permit conditions require the City to develop and implement TMDL Action Plans for waterbodies when EPA-approved TMDLs allocate a wasteload to the MS4. These TMDL Action Plans are implemented in multiple phases over more than one MS4 General Permit cycle using an adaptive iterative approach to achieve adequate progress to reduce discharge of the pollutant identified in the TMDL through implementation of BMPs in a manner consistent with the assumptions and requirements of the TMDL and compliant with the MS4 General Permit. Part II.B. of the current MS4 General Permit requires that the City evaluates the progress demonstrated through its existing TMDL Action Plans and update them to continue progression towards meeting the WLAs and implement the requirements of the MS4 General Permit for local TMDLs associated with:

- Bacteria
- Sediment
- Chloride

The Virginia DEQ has developed, and the EPA has approved eight TMDLs for local waterbodies that receive discharges from the City's MS4 (Figure 3).

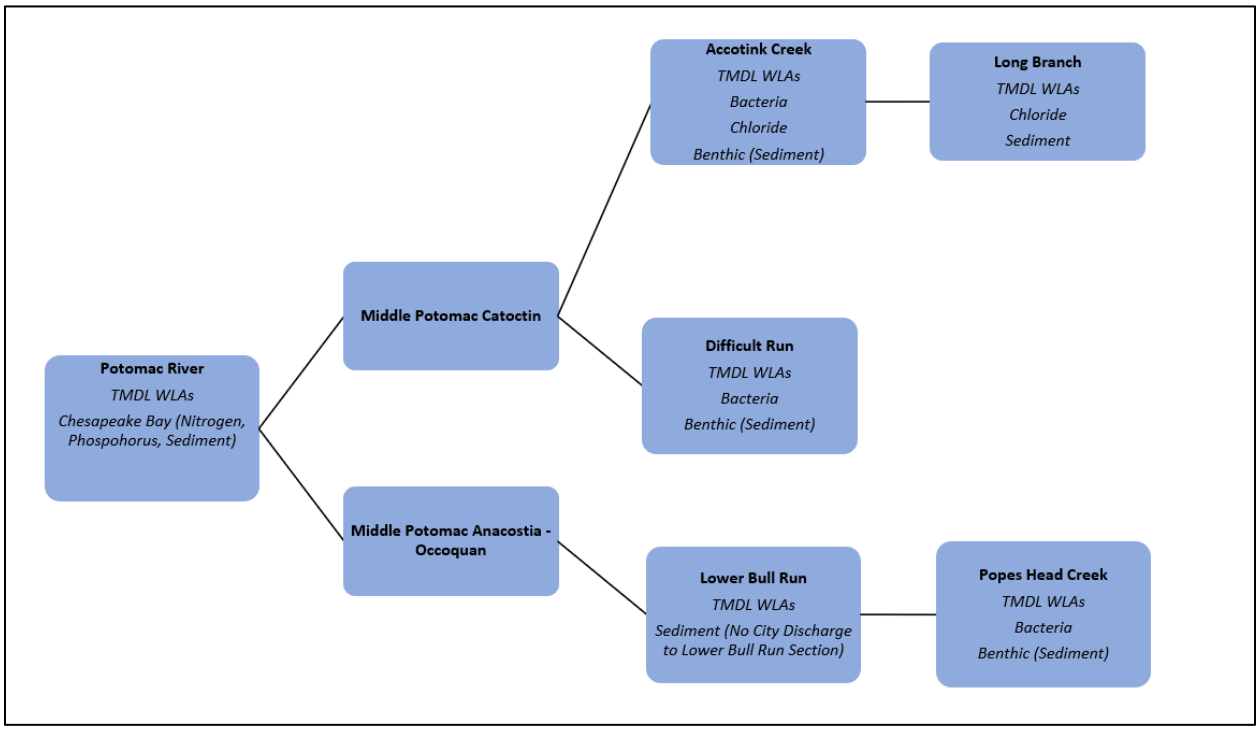

Figure 3. Waterbodies with TMDL Wasteloads or Pollutant Reductions Allocated to City of Fairfax MS4 Discharges

3.1 Chloride TMDLs for the Accotink Creek Watershed

The Chloride TMDLs for the Accotink Creek watershed described in Table 2 apply to 88% of the City of Fairfax MS4 service area. The Accotink Creek Benthic TMDL allocates wasteloads to the City's MS4 in two of the three impaired sections in the Accotink Creek watershed. The Upper Accotink Creek section (Segments VAN-A15R_ACO05A04, VAN-A15R_ACO04A02, VAN-A15R_ACO03A02, and VAN-A15R_ACO02A00) and Long Branch (VAN-A15R_LOE01A02). The Upper Accotink Creek impaired section begins at the creek's headwaters in the City and proceeds downstream 11.59 miles to the start of Lake Accotink in Fairfax County. The Long Branch impaired section is in Fairfax County between Guinea Road and the confluence with Accotink Creek and receives City stormwater from 47 acres of the total 2,458-acre Long Branch watershed. Of these 47 acres, 11 are public property associated with transportation, State Route 236, and a few segments of secondary residential roads. The remaining 36 acres comprise privately owned properties zoned for a mixture of commercial and low- and high-density residential land uses, some of which are not served by the City's MS4.

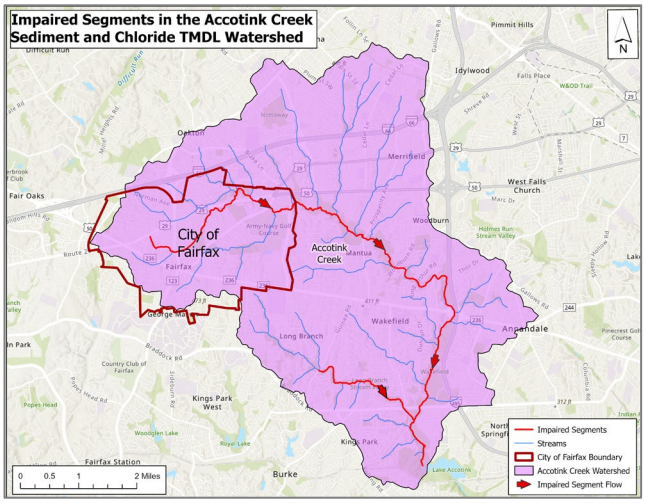

Figure 4. Impaired Segments in the Chloride TMDL for Accotink Creek Watershed

Table 2. Chloride TMDLs for the Accotink Creek Watershed Summary Data

MS4 Permit Special Condition Requirement	Individual TMDL	
TMDL	Chloride TMDLs for the Accotink Creek Watershed	
EPA Approval Date	5/23/2018	
Waterbody	Accotink Creek	
Pollutant	Chloride	
WLA	Upper Accotink - 4,972,399 lbs./yr.	
	Long Branch - 860,119 lbs./yr.	
WLA Type	Aggregate	
Additional Aggregated WLA MS4 Operators	Upper Accotink	Fairfax County (VA0088587), VDOT (VA0092975), Fairfax County Public Schools (VAR040104), Town of Vienna (VAR040066); Northern Virginia Community College (VAR040095)
	Long Branch	Fairfax County, VDOT, Fairfax County Public Schools

3.2 MS4 General Permit Chloride TMDL Special Condition

The MS4 General Permit special condition applicable to the Accotink Creek Chloride TMDL requires that the City complete the following:

- No later than 36 months after the permit effective date (November 1, 2023), the permittee [City of Fairfax] shall develop an anti-icing and deicing agent education and outreach strategy that identifies target audiences for increasing awareness of anti-icing and deicing agent application impacts on receiving waters and encourages implementation of enhanced BMPs for application, handling, and storage of anti-icing and de-icing agents used for snow and ice management.
- Anti-icing and deicing agent education and outreach strategies shall contain a schedule to implement two or more strategies listed in Part I E 1 d Table 1 per year to communicate to target audiences the importance of responsible anti-icing and deicing agent application, transport, and storage.
- No later than 36 months after permit issuance, the permittee [City of Fairfax] shall review good housekeeping procedures for anti-icing and deicing agent application, handling, storage, and transport activities required under Part I E 6 b (1) (a) and identify a minimum of two strategies for implementing enhanced BMPs that promote efficient management and application of anti-icing and deicing agents while maintaining public safety.

4.0 City of Fairfax Chloride TMDL Action Plan

The City of Fairfax developed and implemented a Salt Management Plan (SMP) in the fall of 2022 (Appendix A). The SMP details the City's strategies for minimizing chloride discharge via winter weather management of roads, streets, and other impervious cover. The SMP:

- Is designed for City-wide implementation.
- Is specific to chloride use and not intended to modify, change, or eliminate the City’s expressed level of service (LOS).
- Is intended to raise employee awareness regarding better management and use of chlorides.
- Corresponds with the Virginia Salt Management Strategy (SaMS) toolkit and other referenced published guidance.
- Accounts for City actions previously implemented to use chlorides more effectively and efficiently in an environmentally conscious manner.
- Recognizes that a feasible mechanism for removing chlorides from the environment once they are released does not currently exist.
- Is a “living” document intended to be updated as the City continues to evaluate and refine its use of chlorides based on the best available data at the time.

4.1 Potential Significant Sources of Chloride

Based on the MS4 General Permit definition of ‘significant source of pollutants of concern,' the City operates one facility where the stormwater discharge could be considered a potentially significant source of chloride in the Upper Accotink Creek watershed:

- City Property Yard, 3410 Pickett Road

The 10-acre Property Yard is the central hub of the City's winter weather management and includes several buildings that house road salt, brine, and associated equipment. The SMP identifies specific

sources and strategies implemented to manage chloride discharge from the Property Yard. The SMP also provides specific training for City staff associated with winter weather management. In addition, the Property Yard high-priority municipal stormwater pollution prevention plan (HP-SWPPP) includes monthly inspections of both the stock storage facilities and brine storage facilities. It includes a combination of pollution prevention / SWPPP training regarding salt management good housekeeping. The City will continue to implement the SMP and Property Yard HP-SWPPP to minimize the discharge of chloride.

4.2 Public Outreach Strategy

The City has identified three target audiences for directing public outreach concerning chloride:

- City staff responsible for winter weather management
- Property management staff
- Residential property owners

Concurrent with the development of the City's SMP, the City developed and delivered Chloride Awareness Training to City staff on October 6, 2022. Participants included staff from numerous City departments and divisions, including Public Works - Streets, Storm, Fleet, Right-of-Ways, Operations, and Parks and Recreation. The City also updated its biannual Pollution Prevention & Good Housekeeping / SWPPP training to include a refresher on chloride management.

The City has integrated its chloride management message into its City Winter Weather Information webpage (https://www.fairfaxva.gov/government/emergency-management/city-winter-weather-information). Here, the City promotes how citizens and property managements can be "Winter Salt Smart." Outreach materials include residential and property management snow and ice management tips and a link to the Northern Virginia Regional Commission (NVRC) Virginia Salt Management Strategy (SaMS) toolkit. The City will continue to utilize this webpage as the center of its public outreach strategy. It will promote it through social media, newsletters, and other sources, such as the Stormwater and Floodplain Management webpage and the Cityscene newsletter (Table 3).

Strategy	PY01	PY02	PY03	PY04	PY05
Implement Training Schedule as Outlined in MS4 Program Plan and Include Salt Management as Part of HP-SWPPP Training	As Outlined in the MS4 Program Plan				
Integrate the "Winter Salt Smart" Program into the City Winter Weather Information Webpage	✓	✓	✓	✓	✓

4.3 Progress Evaluation Through October 31, 2023

The City has made considerable progress and advances in managing chloride discharges associated with winter weather management. As part of SMP development, the City evaluated its current salt management practices in relationship to the SaMS toolkit, which was developed cooperatively by the NVRC, the Virginia DEQ, and a large group of stakeholders, including the City. The City evaluation identified that the SMP implemented 30 of 35 practices identified in the SaMS toolkit, including:

- Winter Operations Planning

- Level of Service
- Training
- Salt Storage and Handling
- Calibration
- Storm Meetings
- Weather Forecasts
- Enhanced Equipment and Technology
- Anti-Icing
- Plowing Practices

The results of the City's evaluation are included in the SMP. Additionally, the City has published a CityScene YouTube video at https://www.youtube.com/watch?v=JnhdARJ6wUM that provides an inside look at the City's winter weather management and demonstrates many of the SaMS practices implemented by the City.

4.4 City of Fairfax Chloride Action Plan

The City will continue to implement its SMP as developed and make necessary revisions based on future events.

Appendix A. City of Fairfax Salt Management Plan

CITY OF FAIRFAX, VIRGINIA

CHLORIDE MANAGEMENT PLAN

City of Fairfax, Virginia
Public Works - Stormwater
10455 Armstrong Street, Room 200
Fairfax, VA 22030

Version 06/2022

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Attachments

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Attachment 2	City Chloride and Associated Equipment Storage Location Map
Attachment 3	Pollution Prevention and Good Housekeeping Practices Associated with the Storage and Handling of Solid Chlorides
Attachment 4	Pollution Prevention and Good Housekeeping Practices Associated with Brine Creation, Storage, and Handling
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Attachment 7	Pollution Prevention and Good Housekeeping Practices Associated with the Application of Solid Chlorides on Pedestrian Walkways
Attachment 8	Pollution Prevention and Good Housekeeping Practices Associated with the Application of Solid Chlorides on Streets, Roads, and Parking Lots

Acronyms

BMP	Best Management Practice
CAT	Chloride Awareness Training
CMP	Chloride Management Plan
CUE	City University Energysaver Bus System
DEQ	Department of Environmental Quality
DPR	Department of Parks and Recreation
DPW	Department of Public Works
EPA	U.S. Environmental Protection Agency
FFD	City of Fairfax Fire Department
FPD	City of Fairfax Police Department
HPMF	High Priority Municipal Facility
HP-SWPPP	High Priority-Stormwater Pollution Prevention Plan
LOS	Level of Service
MS4	Municipal Separate Storm Sewer System
NaCl	Sodium Chloride (Rock salt)
NVRC	Northern Virginia Regional Commission
NWS	National Weather Service
PWO	Public Works – Operations Division
PWS	Public Works – Streets Division
SaMS	Northern Virginia Salt Management Strategy
SRH	Snow Removal Handbook (applicable to roads, streets, and parking lots)
SRP	Snow Removal Plan (applicable to sidewalks, trails, and other pedestrian walkways)
SWPPP	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Load
UTV	Utility Terrain Vehicle
VPDES	Virginia Pollutant Discharge Elimination System

Glossary

The following terms are specific to this document:

Anti-Icing	The application of chlorides before a winter storm event as a means of pretreatment to minimize the formation of ice and accumulation of snow.
Deicing	The reactive application of chlorides during and after a winter storm event as a treatment measure to control ice and snow.

1. Introduction

The City of Fairfax (City) is responsible for controlling ice and snow accumulation on approximately 146 lane miles of streets; public parking lots, sidewalks, walkways, trails, parks; and City-University Energysaver (CUE) bus stops.[1] The City's snow and ice control responsibility routinely ranges from late October to early April during which the average daily low temperature is below freezing. During this period of freezing temperatures, the City receives an average of 21.5-inches of snow with approximately 18 winter storm events where frozen precipitation accumulation exceeds one (1) inch (**Figure 1**). The City's response to winter events is best described as an "all hands-on deck" approach that:

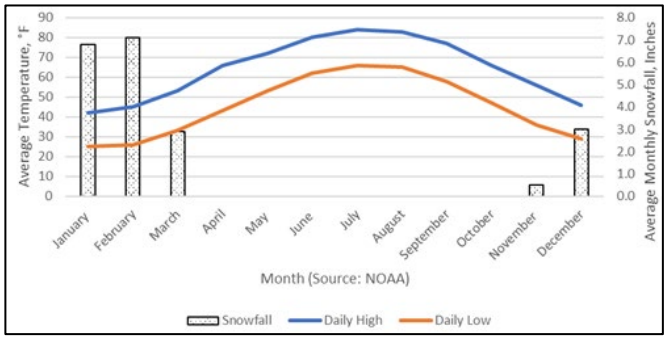

Figure 1. Temperature and snowfall averages for Northern Virginia (Ronald Reagan National Airport).

- Is based on an expected Level of Service (LOS) established by the City Council,
- Involves response from over 90-pieces of equipment,
- Is integrated across numerous City departments and is administered by the Department of Public Works (DPW),
- Is based on the physical manipulation (plowing and shoveling), and
- Is supported through the use of the chloride-based chemical application.

The following City departments play a key role in the City's winter storm event response:

- **DPW – Streets Division (PWS)**
  PWS implements ice and snow controls on City transportation infrastructure including streets, roads, and most public parking lots. PWS is the predominant applicator of chloride-based chemicals for the City using vehicle-mounted brine applicators and salt spreaders to apply chlorides to City infrastructure.
- **DPW – Operations Division (PWO)**

  PWO implements ice and snow controls on non-vehicular City properties. PWO applies solid chlorides using various equipment-mounted and hand-operated spreaders.
- **Department of Parks and Recreation (DPR)**
  DPR supports PWO with the implementation of ice and snow controls on non-vehicular City properties.
- **Fairfax City Police Department (FPD)**
  FPD provides PWS with supplemental information regarding point-in-time road conditions.

[1] The City's annual budgets for controlling ice and snow control have averaged $383,027 since 2017.

- **Fairfax City Fire Department (FFD)**
  FFD clears accumulated snow and ice while providing limited chloride-based spot treatment around City fire stations. DPW is responsible for the application of bulk chlorides on FFD properties and nearby public infrastructure.

2. Chloride Impacts in the City of Fairfax

First, and foremost, the use of chlorides as part of its overall winter storm event response greatly enhances the City's ability to rapidly meet the expected LOS and ensure public safety. The City continuously strives to maximize the short-term benefits associated with chloride application while minimizing the potential long-term negative impacts resulting from chloride release into the environment. These known environmental impacts associated with chloride release are especially evident in the City where the federal Environmental Protection Agency (EPA) approved a Total Maximum Daily Load (TMDL) study that found excess chlorides were the cause of biological impairments in Accotink Creek. Approximately 87% of the City is located in the Accotink Creek watershed (**Figure 2**).

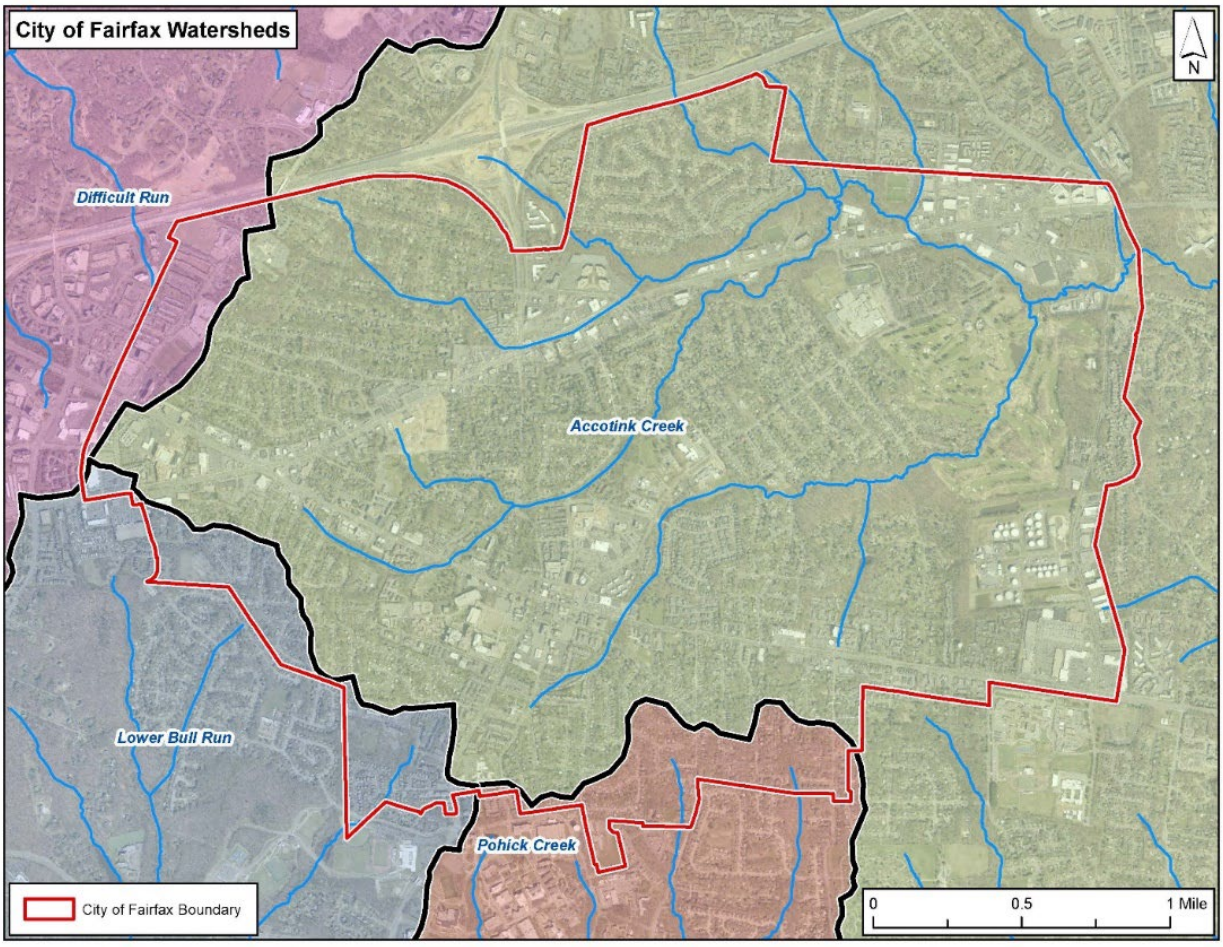

Figure 2. Accotink Creek Watershed in Relationship to the City's Jurisdictional Boundaries.

One source of chlorides identified in the TMDL is stormwater runoff discharging from the City's Municipal Separate Storm Sewer System (MS4). Discharges from the City's MS4 are regulated under the Virginia Pollutant Discharge Elimination System (VPDES) program and, as such, the

City is mandated to reduce the quantity of chlorides discharged to Accotink Creek. To do so, the City has developed this Chloride Management Plan (CMP). The CMP:

- Is designed for City-wide implementation,
- Is specific to chloride use and not intended to modify, change, or eliminate the City's expressed LOS,
- Is intended to raise awareness among employees regarding better management and use of chlorides,
- Corresponds with the Virginia Salt Management Strategy (SaMS) toolkit and other referenced published guidance,
- Accounts for City actions previously implemented to use chlorides more effectively and efficiently in an environmentally conscious manner,
- Recognizes that a feasible mechanism for the removal of chlorides from the environment once they are released does not currently exist, and
- Is a "living" document and is intended to be updated as the City continues to evaluate and refine its use of chlorides based on the best available data at the time.

3. Supportive and Concurrent Guidance Materials

The following materials provide additional support, guidance, and follow-up information on the implementation of the CMP).

3.1 SaMS

The Virginia Department of Environmental Quality (DEQ), in cooperation with the Northern Virginia Regional Commission (NVRC) and a large group of stakeholders (including the City), developed the SaMS Toolkit[2] aimed at striking a balance between the benefits and the negative impacts of salt in chloride use. The SaMS Toolkit details strategies designed to improve the efficient use of chlorides while minimizing their discharge into the environment (**Figure 3**). The SaMS Toolkit provides stakeholders with a list of voluntary strategies, management practices, and actions to choose from based on their appropriateness to the situation and needs.

Figure 3. SaMS Toolkit voluntary chloride management strategies.

The City incorporates many SaMS Toolkit strategies and has considered but chosen not to implement others. In doing so, the City has utilized the SaMS as intended. **Attachment 1** contains a synopsis of the City's currently implemented chloride management best management practices (BMPs) and pollution prevention strategies as they pertain to the SaMS Toolkit.

[2] https://www.novaregion.org/DocumentCenter/View/13054/SaMS_Toolkit_final?bidId=

3.2 CMP Relationship to the City Ice and Snow Removal Handbook/Plan

The City maintains two guidance documents to address annual winter conditions: PWS Snow Removal Handbook (SRH) and the PWO Snow Removal Plan (SRP). These documents outline the City's overall response to winter weather conditions and include:

- Response priorities based on the City's level of service,
- Identification of the primary, secondary and residential roadways that are to receive City attention (SRH),
- Identification of the pedestrian walkways that are to receive City attention (SRP),
- Equipment maintenance requirements,
- Personnel and equipment assignments,
- Coordination and communication directives,
- Pollution prevention and maintenance responsibilities, and
- Instruction using commercial weather forecast software.

These documents function as a starting point in preparing for each winter season. Daily modifications to these documents occur based on personnel and equipment availability, winter storm event conditions, and overall City needs. Informal discussions and training occur on an as-needed basis during the preparation process. Seasonal preparation includes updating the SRH and SRP, equipment inspection and maintenance, and supplementing chloride inventories.

3.3 Property Yard High Priority Stormwater Pollution Prevention Plan (HP-SWPPP)

The City has developed and continues to implement a HP-SWPPP detailing site-specific, which details additional pollution prevention and good housekeeping activities required at the Property Yard including chloride storage and handling.

4. Sources of Chlorides Associated with Winter Storm Response

The City relies on two sources of chlorides in response to winter storms:

- Bulk rock salt (sodium chloride)
- Commercial deicers (manufactured products containing sodium chloride, magnesium chloride, potassium chloride, and calcium chloride)

4.1 Rock Salt

Rock salt is the most commonly available and economic source of chloride (**Figure 4**).[3] As such, the City predominantly utilizes rock salt, in both liquid (brine) and solid phases, in response to winter storm events. Brine is utilized as a proactive measure (anti-icing) that is applied to public infrastructure in preparation for a pending winter storm event while solid rock salt is primarily used as a reactive deicing measure that is applied after precipitation has fallen. Solid rock salt is applied to public infrastructure after frozen precipitation has begun to accumulate as a deicing agent. Rock salt loses effectiveness with colder temperatures as it must have liquid to effectively react with snow and ice.

[3] The City may apply up to 300-tons of rock salt in response to larger winter storm events.

4.2 Commercial Deicers

Commercial deicers are products that are comprised of varying percentages of rock salt, calcium chloride, magnesium chloride, and potassium chloride (**Figure 5**). The chemical composition of deicers provides for more effective ice and snow control at colder temperatures than rock salt alone as it does not require a liquid primer to begin working. Deicers are considerably more expensive than rock salt and are generally purchased in 40–50-pound bags. Commercial deicer products are often dyed for use during application to monitor application rates specific to spread and concentration.

Figure 4. Rock salt is the predominant form of chloride used in liquid and solid forms to control ice formation and snow accumulation.

Figure 5. Commercial deicers are comprised of various salt mixtures that are primarily applied to pedestrian walkways.

5. Chloride Storage and Handling

The City warehouses its chloride inventory (and its specialized equipment used in chloride application) at the City Property Yard, which is located at 3410 Picket Road. As part of its MS4 Program Plan implementation, the City has identified the Property Yard as a high-priority municipal facility (HPMF) that has a high risk of stormwater pollution. As such, the City has developed and implemented a site-specific stormwater pollution prevention plan (HP-SWPPP), which directs the pollution prevention and good housekeeping activities at the Property Yard. The HP-SWPPP has several requirements that apply to the storage and handling of chlorides at the Property Yard.

At a minimum, the following policies should be followed regarding the storage and handling of chloride:

- Implement the applicable portions of the Property Yard HP-SWPPP. Locations at the Property Yard specific to chloride storage and handling are identified in **Attachment 2**.
- Warehouse rock salt on paved surfaces in the covered salt barn. The salt barn has a storage capacity of 1,200 tons and is located outside of the Accotink Creek 100-year floodplain elevation. If necessary, utilize the two additional roofed bins located south of the salt barn for temporarily increasing storage capacity if inventories exceed the salt

barn's capacity. Rock salt is routinely delivered once in the fall (October/November) with the inventory being restocked again in January/February.

- Store commercial deicers in their original, unopened bags on the raised platforms located in covered storage areas on the northside of the Property Yard. Storage on the raised platforms allows for deicer storage to occur above the Accotink Creek 100-year floodplain elevation. Deicers are purchased in the fall and restocked as necessary throughout the winter season.
- Begin brine production at the Property Yard in the late fall (late October – early November) and continue production, as necessary, throughout the winter season. Store the brine in the four 20,000-gallon storage tanks, which are located in secondary containment immediately east of the salt barn. Beginning in mid-February, scale back brine production to allow for the drawdown of the brine reserve and eliminate the necessity to store brine outside of the winter season.
- Store specialized winter equipment undercover. Specialized winter equipment includes:
    - Brine applicators and salt spreaders,
    - Level drop spreaders, which can be mounted on utility terrain vehicles (UTV) and tractors, and
    - Walk-behind spreaders.
- The outside water faucets have been disconnected from the water supply to prevent vehicle and equipment washing and preventing the discharge of wash waters and accumulated pollutants, including chlorides, from being discharged to Accotink Creek. The City employs a private contractor to wash the vehicles and equipment at the end of each winter season (and occasionally more often, if necessary)[4]. The private contractor recycles the rinse water to prevent discharges or chlorides to the Creek.
- Employ the applicable pollution prevention and good housekeeping practices found in the following SOPS:
    - Pollution Prevention and Good Housekeeping Practices Associated with the Storage and Handling of Solid Chlorides (**Attachment 3**)
    - Pollution Prevention and Good Housekeeping Practices Associated with Brine Creation, Storage, and Handling (**Attachment 4**).

6. Preparing for Approaching Winter Seasons

The City begins preparation for the forthcoming winter seasons in late October. City crews complete several activities to ensure adequate preparation to respond to upcoming winter storm events, including:

- Updating the SRH and SRP, including labor roles and responsibilities and equipment assignments,
- Inspecting and conducting necessary maintenance on the equipment that will be utilized,
- Accruing necessary chloride inventories,

[4] The Fiscal Year 2022 budget includes funding for the construction of a Property Yard wash bay. The City anticipates that this wash bay will be in service before the 2022-2023 winter season.

- Ensuring that truck-mounted electronic controls are
  - Set to factory settings,
  - Adjusted to ensure even rock salt application and minimize overspray, and
- Creating a brine reserve in the brine storage tanks.

As part of the winter preparation, PWS staff are provided firsthand training including brine production and operation of electronic vehicle controls. A limited number of City crew, such as supervisors and key staff, also attend formal training through the University of Virginia Transportation Training Academy's 'Winter Maintenance Operations' workshop when and if the budget and time allow.

Concurrent with the development of this CMP, the City has developed a Chloride Awareness Training (CAT) program (**Attachment 5**). The CAT will begin in the fall of 2022 and is designed to increase staff awareness regarding the negative impacts associated with chlorides and how their actions can minimize those impacts when employed during winter storm events.

7. Winter Storm Deployment and Chloride Application

City supervisory staff regularly monitor weather forecasts issued by the National Weather Service (NWS), local media, and other forecasting sources. Supervisory staff review weather forecasts and evaluate neighboring entity responses and local road conditions to determine the City's level of response. Based on the anticipated impact of a pending winter weather event, the City deploys chlorides proactively by applying brine before frozen precipitation accumulation (anti-icing), reactively through the deployment of solid chlorides after accumulation of frozen precipitation (deicing), or, in most circumstances, a combination of both.

Supervisory staff continually monitor road conditions preceding and throughout each winter storm event and modify the City's response as necessary to address the storm-specific conditions. PWO crews continuously monitor conditions, such as ambient air temperature and pavement temperature, using various sources including truck-mounted infrared thermometers, street cameras, and supplemental point-in-time reports from citizens, emergency personnel, and field crews.

7.1 Anti-Icing Using Chlorides

The City is steadfast in its proactive application of chlorides as an anti-icing agent. Anti-icing practices provide increased public safety while decreasing the overall quantity of chlorides necessary to respond to individual winter storm events. PWS crews apply brine using vehicle-mounted spray applicators either broadscale (i.e., City-wide) or targeted to specific known points of concern such as bridges, steep street intersections, and critical facility parking lots (**Figure 6**).

PWS crews should employ the following policies regarding the use of brine on roads, streets, and parking lots:

- Brine should first be applied to primary and secondary streets unless traffic conditions are such that it is safer to begin on residential streets. See the SRH for additional information on which streets are to be prioritized.

Figure 6. The City relies on anti-icing to increase public safety while minimizing its overall application of chlorides.

- Begin brine application within 48-hours of the anticipated start of the winter event. Consult with supervisory staff before brine application if the pending winter event is expected to begin as rain or if the pavement temperatures are expected to remain above freezing.
- Set brine application rates using the vehicle electronic control systems, which must be calibrated per the electronic control system's reference manual.
- Operators of the safety vehicle following the brine applicators should monitor the rate and direction of the brine being applied to minimize ponding and overspray.
- Crews should employ the applicable BMPs and pollution prevention strategies found in Pollution Prevention and Good Housekeeping Practices Associated with the Application of Liquid Chlorides (Brine) (**Attachment 6**).

Out of a preponderance of pedestrian safety concerns associated with the potential for slips and falls, brine is not a recommended anti-icing option for City walkways (sidewalks, trails, paths, etc.). Crews may apply solid chlorides (rock salt, commercial deicers) as an anti-icing agent on these walkways but should follow the following guidelines:

- Prioritize application based on anticipated pedestrian usage. Refer to the SRP for additional guidance regarding the pedestrian walkway prioritization.
- To the maximum extent practicable, apply solid chlorides using appropriate equipment such as level drop spreaders mounted on universal terrain vehicles (UTVs), walk-behind spreaders, and hand-held spreaders.
- Employ applicable BMPs and pollution prevention strategies found in Pollution Prevention and Good Housekeeping Practices Associated with the Application of Solid Chlorides on Pedestrian Walkways (**Attachment 7**).

7.2 Deicing Using Chlorides

Deicing involves the application of chlorides to City infrastructure. Deicing should occur only after crews have minimized the quantity of frozen precipitation on impervious surfaces via physical relocation (i.e., use of plows and shovels). City crews apply chlorides, either in the form of solid rock salt or commercial deicers to the exposed impervious surfaces. Rock salt is applied to streets, parking lots, and other large sections of imperviousness using truck-mounted, electronically controlled, speed-adjusted salt spreaders (**Figure 7**). Rock salt is also applied to the longer sections of park trails using UTV and tractor-mounted spreaders and walk-behind and hand-held spreaders concurrently with the application of commercial deicers to smaller pedestrian walkways via the same distribution methods.

Figure 7. The City employs deicing techniques to minimize safety concerns after winter weather events.

City crews should follow these guidelines when applying chlorides as deicing agents:

- Prioritize snow removal from primary and secondary streets during winter events. Generally, subdivision roads and side streets should only be plowed once the precipitation is complete and the primary and secondary streets are passable. Chloride deicers should be employed after, or in combination with, the physical removal of the frozen precipitation.
- Employ the SRP prioritizations regarding frozen precipitation removal from pedestrian walkways before employing chlorides as a deicing agent.
- To minimize overspray, confirm that the gate height and spreader wings are set following supervisor direction and the user reference manual before leaving the Property Yard.[5]
- Set the spreader on 'manual' mode to ensure control over auger and spinner speeds.
- Adjust the application rates by turning one of two dials labeled 1 (lower application rates) through 10 (higher application rates) during successive passes on primary and secondary streets based on the road and weather conditions. Note: Subdivision roads/side streets are generally only plowed and treated with chloride once since they are not addressed until the precipitation stops, and the primary and secondary streets have become passable.
- Employ applicable BMPs and pollution prevention strategies found in Pollution Prevention and Good Housekeeping Practices Associated with the Application of Solid Chlorides on Pedestrian Walkways (**Attachment 7**).
- Employ applicable BMPs and pollution prevention strategies found in Pollution Prevention and Good Housekeeping Practices Associated with the Application of Solid Chlorides on Streets, Roads, and Parking Lots (**Attachment 8**).

Chlorides are applied to pedestrian walkways identified in the SRP after the precipitation has stopped and the accumulated ice and snow have been minimized by plow or shovel. Crews use drop spreaders, including walk-behind and UTV/tractor-mounted, to spread rock salt on long stretches of pedestrian walkways, such as park trails, and deicers on the remaining sidewalks and walkways. The drop spreaders minimize the potential for overspray and bouncing as they drop the salt vertically onto the impervious surface. For small areas that are difficult to access (e.g., steps), crews still apply deicers via hand application.

Upon completion of chloride application activities, surplus loads are offloaded (i.e., sprayed) back into their covered storage locations at the Property Yard, brine is pumped back into the storage tanks, and unopened bags of deicers returned to the elevated platforms. Open containers of deicers should be closed tightly, or the deicers are placed in a container with a lid. If additional precipitation or refreezing is anticipated, PWS may keep the brine in the applicator tanks and place the associated vehicles in a heated building to prevent freezing. Rock salts and deicers may remain loaded on equipment that is stored undercover.

[5] Truck-mounted salt spreaders are equipped with brine side-saddle tanks for the pre-treating of rock salt to increase salt efficiency and reduce salt particle bouncing. The City is currently not utilizing the side-saddle tanks to pre-wet rock salt prior to application.

8. Recordkeeping and Documentation

Crews document the total tonnage of chlorides applied during each 12-hour shift on City-developed spreadsheets. PWS is responsible for documenting the total amount of rock salt applied as either brine or solids. PWO is responsible for documenting the total number of bags of deicers applied during each 12-hour shift. The City utilizes this information to maintain a running tally of the salt inventory and the quantity of chlorides applied These records are maintained and summarized for each winter event. Formal training records (other than day-to-day hands-on training, which are not documented) are maintained by the individual departments, who coordinate with the DPW-Administration and Engineering Division to provide the records as needed.

Attachment 1. Review of City's Chloride Management Program with the SaMS Toolkit Strategies

SaMS Toolbox Strategies				
BMPs		**Applicable City Department(s)**	**BMP Implemented by City? (Y/N)**	**Comment**
Winter Operations Planning	Winter Maintenance Plan is developed	PWS, PWO, DPR	Y	The City maintains a Snow Removal Handbook, which is applicable to streets, roads, and parking lots and a Snow Removal Plan, which applies to property management.
	Preseason meetings are held	PWS, PWO, DPR	Y	The City annuPWS, PWO, DPRy conducts pre-season preparation events where the equipment is inspected and maintained.
	Postseason meetings are held	PWS, PWO, DPR	Y	Discussions regarding the post-season are held as part of routine staff meetings.
	Accountability is at every level	PWS, PWO, DPR	Y	Staff assignments for the winter season are defined in the Snow Removal Handbook and the Snow Removal Plan.
	Transportation Audiences - Snowplow routes are planned	PWS	Y	Priorities are identified in the Snow Removal Handbook and the Snow Removal Plan.
	Property (Pedestrian) Management Audiences - Properties are visited before the season	PWO, DPR	N/A	Staff responsible for snow and ice control have year-round responsibilities for properties and as such visit the locations numerous times throughout the year.
Level of Service (LOS)	Transportation Audiences - LOS are communicated internally	PWS	Y	Priorities are identified in the Snow Removal Handbook and the Snow Removal Plan.
	Transportation Audiences - LOS are communicated externally	PWS	Y	The City Council has approved a level of service that is included in the City's Annual Budget. The City promotes its activities on-line and through social media.
	Property (Pedestrian) Management Audiences - LOS are discussed and agreed upon	PWO, DPR	Y	The City Council has approved a level of service that is included in the City's Annual Budget. The City promotes its activities on-line and through social media.
Training	Training is held	PWS, PWO, DPR	Y	The City holds Property Yard SWPPP training to discuss pollution prevention including chlorides at the Property Yards. The City conducts informal training on new pieces of equipment and operational strategies as necessary. City staff have attended the UVA Transportation Training Academy's 'Winter Maintenance Operations' workshop. The City has developed and will implement a Chloride Awareness training program for applicable staff prior to the 2022-2023 winter season.

SaMS Toolbox Strategies				
BMPs		**Applicable City Department(s)**	**BMP Implemented by City? (Y/N)**	**Comment**
Salt Storage / Handling	Deicer piles are properly stored	PWS, PWO, DPR	Y	Chloride-containing materials are stored at the City property yard. Bulk rock salt is stored on the pavement in the roofed salt barn. Excess rock salt inventories are stored on the pavement in roofed, three-sided bins. Deicers are stored on raised platforms under roof.
	Liquid products are properly stored	PWS, PWO, DPR	Y	Upon creation, brine is pumped into one of four storage tanks with a combined capacity of 20,000 gPWS, PWO, DPRons. The storage tanks are contained within a secondary containment system. Unused brine is off-loaded from applicator tanks back into the storage tanks after the infrastructure is treated unless it is anticipated to be used shortly. In such cases, the trucks carrying the brine are parked in a heated garage.
	Loading and hauling of deicers are done properly	PWS, PWO, DPR	Y	Loading and unloading of rock salt is conducted at the Property Yards. The Property Yards has implemented a site-specific Stormwater Pollution Prevention Plan that details how to clean up spills including chlorides.
	Equipment is cleaned and wastewater is contained	PWS, PWO, DPR	Y	Currently, vehicles and equipment associated with chloride application are not cleaned during the winter season. Contractors who collect and recycle the rinse water wash the vehicles and equipment after the season. The City has delegated FY2022 funds to instPWS, PWO, DPR a wash rack at the Property Yards to PWS, PWO, DPRow for more frequent washing. Until such time, the outside water spigots at the City Yards have been disconnected.
	Property (Pedestrian) Management Audiences - Storage of deicers and abrasive piles delivered to a Property (Pedestrian)	PWO, DPR	N/A	Deicers are stored at the Property Yard until such time as they are to be applied. Bags of deicer remain unopened when transported to specific locations for application. Bulk rock salt is transported in a closed truck bed if it needs to be transported to refill application equipment.
	Property (Pedestrian) Management Audiences - Storage and handling of deicer bags is done properly	PWO, DPR	Y	Bags of deicer are stored under roof on a raised platform at the City Property Yard. Open bags of deicer are closed and placed in secondary containers (e.g., buckets with lids).
Calibration	A calibration process is established	PWS, PWO, DPR	Y	Operators are directed to set the electronic brine applicator and salt spreader controls to factory settings and are provided with the reference manuals with the appropriate settings highlighted.
	Equipment is calibrated	PWS, PWO, DPR	Y	Operators are reminded to check the settings at the beginning of each shift.

SaMS Toolbox Strategies				
BMPs		**Applicable City Department(s)**	**BMP Implemented by City? (Y/N)**	**Comment**
Storm Meetings	Pre-storm meetings are held	PWS, PWO, DPR	Y	Coordination and communication occur throughout the storm event. Assignments and meetings occur at the beginning of each shift and at the end of each shift. Inspections and maintenance needs are documented at the end of each shift.
	Post-storm meetings are held	PWS, PWO, DPR	Y	Coordination and communication occur throughout the storm event. Assignments and meetings occur at the beginning of each shift and at the end of each shift. Inspections and maintenance needs are documented at the end of each shift.
Weather Forecasts	Accurate weather forecasting is obtained and is a part of decision making	PWS, PWO, DPR	Y	City supervisory staff pay close attention to pending winter weather forecasts. Staff rely on subscription weather services, local TV and radio, and National Weather Services forecasts in order to make their decisions. During the winter event, weather forecasts are supplemented by police, public, and staff reports and monitoring of numerous street cameras located throughout the City.
	Know the surface temperature	PWS, PWO, DPR	Y	The City monitors the surface temperature using both hand-held and truck-mounted infrared thermometers.
Enhanced Equipment & Technology	Advanced plows are used	PWS, PWO, DPR	Y	The City equipment inventory includes reverse plows.
	Advanced spreaders are used	PWS, PWO, DPR	Y	The City uses electronicPWS, PWO, DPRy controlled spreaders for applying chlorides to the streets, roads, and parking lots. Application rates can be applied using the automatic or manual setting.
	Proper/Advanced equipment needed for making liquid products is used	PWS, PWO, DPR	Y	The City utilizes a computerized brine mixer that is housed at the City Property Yard. The mixing station automaticPWS, PWO, DPRy mixes the rock salt and potable water to the desired concentration prior to pumping it into storage tanks. Directions for setting up and operating the brine mixing station are located in the mixer building.
	Transportation Audiences - Automated Vehicle Location (AVL) is used	PWS	N	The City does not use AVL.
	Transportation Audiences - Maintenance Decision Support System (MDSS) is used	PWS	N	The City does not use MDSS.
	Transportation Audiences - Precision Deicing is used	PWS	N	The City does not use precision deicing.
Anti- Icing	Anti-icing is used	PWS, PWO, DPR	Y	The City relies heavily on anti-icing in preparing for anticipated events. Brine is applied to roadways beginning approximately 48-hours prior to the start of the anticipated event unless the event is forecast to begin as unfrozen precipitation. Brine is not used as an anti-icing tool on pedestrian walkways. If necessary, solid rock salt or deicers are spread on the pedestrian walkways as a anti-icing agent.

SaMS Toolbox Strategies				
BMPs		**Applicable City Department(s)**	**BMP Implemented by City? (Y/N)**	**Comment**
Plowing Practices	Plowing early and often is common practice	PWS, PWO, DPR	Y	Primary and secondary streets are prioritized when plowing. Once primary and secondary streets are clear, plowing shifts to residential streets where they are most often plowed one time prior to deicing treatment. Snow removal on pedestrian walkways is outlined in the Snow Removal Plan based on the depth of accumulation.
	Transportation Audiences - Plowing activities are coordinated	PWS	Y	Plowing activities are coordinated and have continuous supervision.
	Transportation Audiences - Plow trains are used	PWS	Y	If necessary, plow trains are used on multi-lane streets and roads. This is not a common occurrence.
	Property (Pedestrian) Management Audiences - The right plow, shovel, pusher, blower, blade, or broom for the Property (Pedestrian) is used	PWO, DPR	Y	The Snow Removal Plan identifies the equipment to be used on priority locations, sidewalks, and fire stations.
	Property (Pedestrian) Management Audiences - Opportunities to close areas with a small footprint	PWO, DPR	Y	The Snow Removal Plan identifies the equipment to be used on priority locations, sidewalks, and fire stations.
	Property (Pedestrian) Management Audiences - Snow is placed in proper places	PWO, DPR	Y	The Snow Removal Plan identifies where snow from the front and back of City hPWS, PWO, DPR is to be placed. Snow removed from roads, streets, and parking lots is placed on asphalt at either Kutner Park or Van Dyck Park.

SaMS Toolbox Strategies				
BMPs		**Applicable City Department(s)**	**BMP Implemented by City? (Y/N)**	**Comment**
Product Application Practices	Dyed deicers are used	PWS, PWO, DPR	Y	The City uses dyed deicers on smaller sections of pedestrian walkways are dyed. Bulk rock salt that is placed elsewhere is not.
	Use of Abrasives	PWS, PWO, DPR	N	The City does not apply abrasives to the streets, roads, or parking lots at this time. In extreme conditions, the City may apply abrasives to pedestrian walkways near critical areas.
	Deicers are cleaned up after storm	PWS, PWO, DPR	N	Street cleaning operations are not in service during winter months due to the freezing temperatures.
	Transportation Audiences - Spinners set-are up properly	PWS	Y	Operators are required to set their electronic spreaders to factory settings highlighted in the user manual. Deflectors and shields are set to the lane widths to minimize overspray.
	Transportation Audiences - Plows drive 17-25 mph on non-high-speed roads	PWS	Y	Adequate speeds are maintained during application.
	Transportation Audiences - On high-speed roads deicer is applied to the center of the road or high side of a curve	PWS	N/A	The City does not maintain high-speed roads.
	Transportation Audiences - Auger, shoots, or conveyors are turned off when stopped	PWS	Y	The electronic spreaders are speed controlled and automaticPWS, PWO, DPRy stop spreading when stopped.
	Transportation Audiences - Deicer application rate is reduced on successive passes	PWS	Y	Application rates are based upon current and expected conditions. GenerPWS, PWO, DPRy speaking, successive passes result in spot application rather than general broadcast application. Non-primary and secondary streets are most often treated once after plowing with follow-up as necessary to treat trouble spots.
	Property (Pedestrian) Management Audiences - Spread patterns that prevent overlapping applications are used	PWO, DPR	Y	The City uses drop spreaders to minimize overlap on pedestrian walkways.
	Property (Pedestrian) Management Audiences - Drop spreaders or rotary spreaders with shields are used for sidewalks	PWO, DPR	Y	The City employs a significant number of drop spreaders (either mounted on UTVs or tractors or walk-behind) to apply chlorides on pedestrian pathways. Any spinner spreaders that are utilized have shields to deflect chlorides and reduce overspray.
	Property (Pedestrian) Management Audiences - Managing stairways or areas with a small footprint #2	PWO, DPR	Y	The Snow Removal Plan prioritizes critical locations, sidewalks, pathways, and buildings.

SaMS Toolbox Strategies				
BMPs		**Applicable City Department(s)**	**BMP Implemented by City? (Y/N)**	**Comment**
Vary Application to Conditions	Variable application rates are used for surface temperature, precipitation type/rate, and intended levels of service	PWS, PWO, DPR	Y	Equipment operators have the final decision on application rates based on current and expected conditions and experience.
	Deicers are used within their temperature range	PWS, PWO, DPR	N	The City applies traditional rock salt to roads, streets, and long pedestrian pathways. Deicers are applied along short pedestrian pathways. This application protocol does not change based on temperature.
Use of Liquids	Deicers are pretreated	PWS, PWO, DPR	N	The City does not pretreat its rock salt prior to application.
	Deicers are prewetted	PWS, PWO, DPR	N	The City does not prewet its rock salt prior to application. Truck-mounted spreaders do have brine saddle tanks and the electronic spreader controls can be set to PWS, PWO, DPRow for prewetting. The City initiated prewetting but stopped the process due to inconsistent application.
	Direct Liquid Application is used	PWS, PWO, DPR	N	The City does not apply brine as a deicing mechanism.
Measurement	Deicer use is measured and recorded	PWS, PWO, DPR	Y	The quantity of brine and rock salt applied during each 12-hour shift is documented on a Public Works-Streets spreadsheet and automaticPWS, PWO, DPRy calculates the remaining rock salt inventory. The quantity of deicers applied is documented on a Public Works-Right of Way spreadsheet.

Attachment 2. City Chloride and Associated Equipment Storage Location Map

Ft
0 40 80 120

Accotink Creek
(Receiving Water)

HPMF Outfall 001

HPMF Outfall 002

HPMF Outfall 004

Outfall 003
(Sheet Flow)

Trailer Storage

CUE Bus
Parking

Fleet
Parking

Bus Wash

Vehicle /
Equipment
Maintenance

CUE Bus
Parking

2020148313

Police
Firing
Range

2020148312

Administration

Employee
Parking

Pickett Rd

Rip Rap for
Golf Course
Run-On

Legend

- Curb Inlet
- Grate Inlet
- Storm Sewer Manhole
- Oil Water Separator
- Sanitary Sewer Manhole
- HPMF Outfall
- Sheet Flow Outfall
- Runoff Flow Direction
- Spill Kit
- BMPs
- Silt Fence
- Sanitary Sewer
- Ashphalt Channel
- SW Pipe
- Rip Rap
- 2ft Contour
- Stream
- Onsite Buildings
- Salt Management Buildings
- Additional Structures
- Impervious Area
- Drainage Areas
- Parcels
- Property Boundary
- Offsite Buildings
- Offsite Impervious

Number	Description
1	Elevated Deicer Storage
2	Brine Tanks (4)
3	Brine Secondary Containment
4	Salt Overflow Storage
5	Brine Application Equipment
6	Salt Spreaders
7	Salt Barn
8	Salt / Brine Storage Shed
9	Brine Mixing Tank
10	Brine Pumps

GKY

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CITY OF FAIRFAX PROPERTY YARD
SITE (7.056 ACRES)
3410 PICKETT RD
FAIRFAX, VA 22031

SITE DIAGRAM SHOWING
SALT MANAGEMENT BUILDINGS

N

1 inch = 80 feet

Attachment 3. Pollution Prevention and Good Housekeeping Practices Associated with the Storage and Handling of Solid Chlorides

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Version 06/2022

CHLORIDE MANAGEMENT PLAN

STORMWATER POLLUTION PREVENTION & GOOD HOUSEKEEPING PRACTICES

SOLID CHLORIDE STORAGE AND HANDLING

The following good housekeeping practices should be employed to the maximum extent practicable when storing and handling solid chlorides.

- **Store rock salt in either the Salt Barn or the covered salt overflow sheds. Place the rock salt deep enough in the storage units to prevent exposure to precipitation.** Rock salt should be placed deep in the salt barn as far away from the point of entry as possible to minimize its contact with precipitation and stormwater runoff (**Figure 1**). As a supplement, waterproof tarps can be placed on top of the exposed rock salt to prevent contact with precipitation.

Figure 1. Loose rock salt should be placed deep enough into storage bins to prevent contact with precipitation.

- **Store unopened bags of deicers on the covered, elevated storage platforms.** Deicers should be stored on the raised platforms to ensure they are stored above the 100-year floodplain elevation (**Figure 2**). Opened bags of deicers should be placed in closed containers to prevent accidental spillage.

Figure 2. Deicers should be stored on the elevated platforms at the Property Yard.

- **Secure loose rock salt during transportation and protect it from precipitation.** Rock salt is often transported from the Property Yard to a field location for loading into the application equipment. Rock salt should not be piled higher than the sides of any transportation vehicle (e.g., pickup truck). Cover the rock salt with a waterproof tarp if being transported during periods of precipitation. Clean up any rock salt accidentally spilled during product transfer.

- **Transport deicers in unopened or closed containers.** Deicers are also often transported from the Property Yard to a field location for loading into the application equipment. Deicers should be transported in unopened bags. Before transport, open bags should be closed tightly or placed in covered buckets. Clean up any deicers accidentally spilled during product transfer.

- **Follow the City of Fairfax Property Yard Stormwater Pollution Prevention Plan (SWPPP) in response to spills, leaks, or accidental releases.** The City has developed and implemented a SWPPP detailing how to address spills, leaks, and accidental releases such as sweeping up that is rock salt spilled onto the pavement and cleaning up spills from leaking hydraulic lines. The procedures outlined in the SWPPP should be followed.

Attachment 4. Pollution Prevention and Good Housekeeping Practices Associated with Brine Creation, Storage, and Handling

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Version 06/2022

CHLORIDE MANAGEMENT PLAN

STORMWATER POLLUTION PREVENTION & GOOD HOUSEKEEPING PRACTICES

LIQUID CHLORIDE (BRINE) CREATION, STORAGE, AND HANDLING

The following good housekeeping practices should be employed to the maximum extent practicable while producing, storing, and handling brine.

- **If possible, produce brine during dry weather.**
  Rock salt is exposed to precipitation when it is brought via backhoe from the covered salt barn to the brine hopper for mixing. During this time, exposed rock salt that comes into contact with the precipitation will begin to dissolve and be carried away with the precipitation. By feeding the hopper during dry weather, this opportunity for pollution is eliminated.

- **Follow the City of Fairfax Property Yard Stormwater Pollution Prevention Plan (SWPPP) in response to spills, leaks, or accidental releases.**
  The City has developed and implemented a SWPPP detailing how to address spills, leaks, and accidental releases such as rock salt spillage onto the pavement or leaking hydraulic lines on equipment used to make brine. The procedures outlined in the SWPPP should be followed.

- **Keep the mixing shed temperature above freezing.**
  The mixing shed contains a large number of valves, feed lines, and sensitive equipment for mixing brine. The temperature in the mixing shed should be kept above freezing to minimize the potential for damage to this expensive equipment.

- **Before mixing brine, check lines for leaks and ensure that they are securely fastened and that all valves are correctly set**.
  The brine mixing shed, pump shed, and hopper are located outside the brine storage tank secondary containment area. Therefore, any leaks, spills, or accidental discharges will likely travel over land and directly into Accotink Creek. The brine hopper and accessory infrastructure (i.e., pipes and valves) should be inspected for leaks and that they are correctly connected prior to making brine. All valves should be inspected to ensure that they are set properly to ensure accidental brine release.

- **Hopper wings must be completely open prior to feeding rock salt in order to minimize spillage.**
  The rock salt hopper contains wings on both ends (**Figure 1**). These wings should be completely opened manually before feeding salt into the hopper to minimize the overspill of rock salt when loading the hopper.

Figure 1. The brine feeder hopper wings must be fully opened (arrows) prior to feeding rock salt.

- **Follow the written instructions in the brine-making manual located in the brine mixing shed.**
  The City has developed a step-by-step manual for mixing brine. This manual is located in the mixing shed and should be followed in order to ensure that the brine has the desired salt concentration.

- **Keep the secondary containment drain valve closed while the brine is stored in the storage tanks.**
  The secondary containment drain valve must remain closed when brine is being warehoused in the storage tanks (**Figure 2**).

  Draining of accumulated precipitation is allowed under the following conditions:

  - If the brine is actively stored in storage tanks, precipitation may be drained if there is no evidence of leaks from the tanks or visual evidence of chlorides in the material to be drained.
  - If the brine is not actively stored in storage tanks, precipitation may passively discharge through the open drain valve

Figure 2. The brine secondary containment drain valve must remain closed when brine is being stored.

To drain accumulated precipitation while the brine is being stored, the drain valved can be temporarily opened while under direct supervision once it has been confirmed that the storage tanks have not leaked brine into the secondary containment system and mixed with the accumulated precipitation. The drain valve must be closed once the accumulated precipitation is discharged.

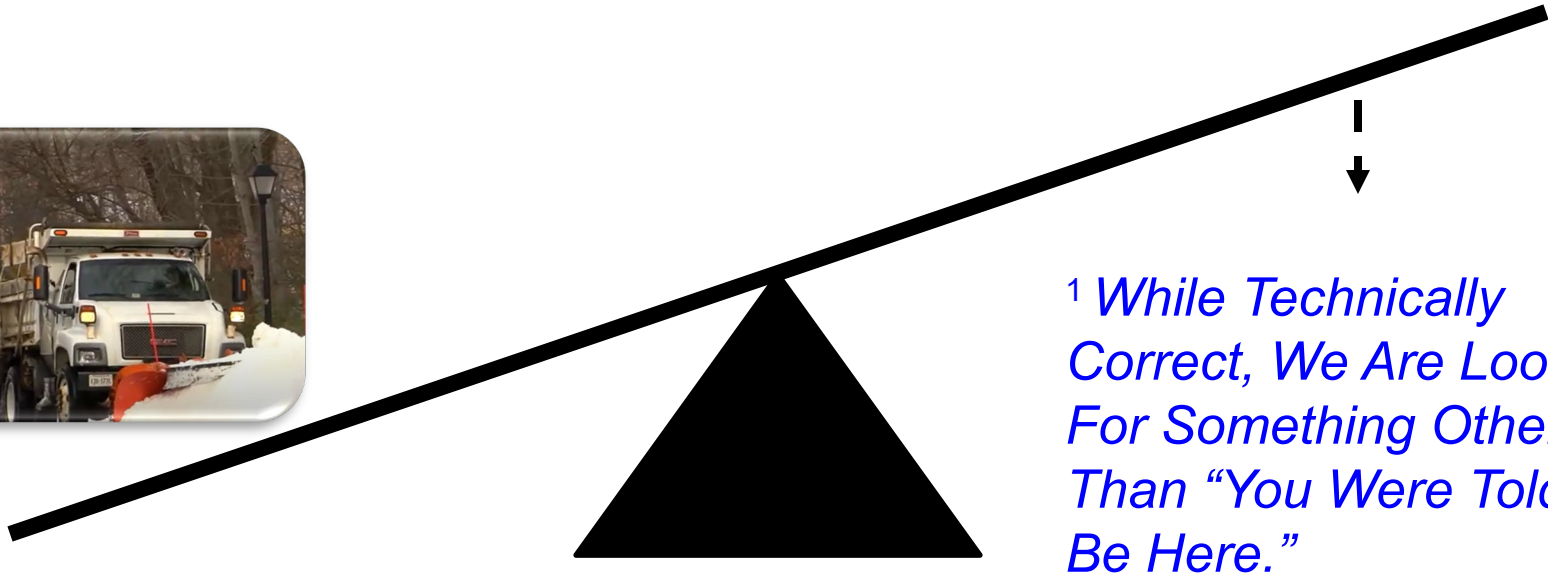
Attachment 5. Chloride Awareness Training Program Presentation

City of Fairfax, Virginia
Chloride (Salt) Awareness Training

FAIRFAX CITY

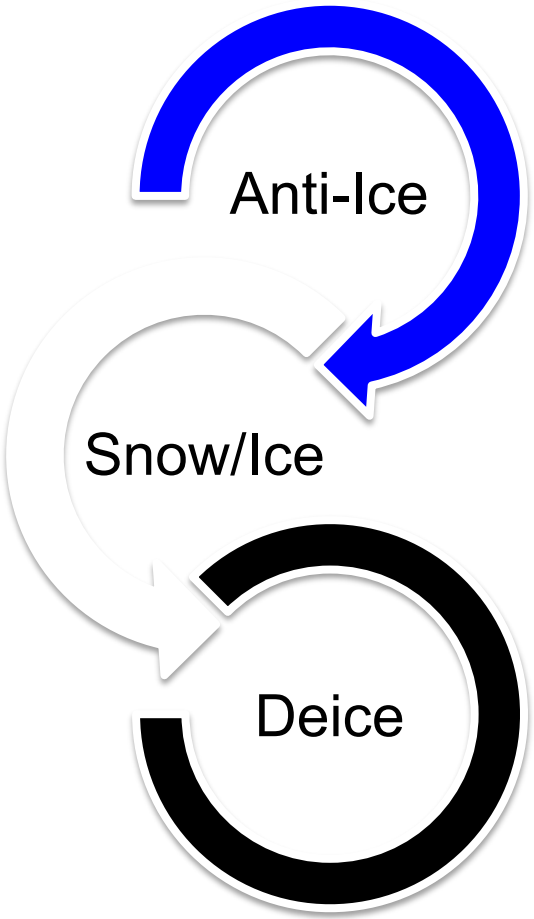
Why Are We Here?[1]

- Raise Awareness Regarding Chloride Application
- Promote Wise Chloride Use
- Minimize Collateral Damage



[1] *While Technically Correct, We Are Looking For Something Other Than "You Were Told To Be Here."*

Chloride Uses



- Anti-Icing
  - Proactive (Prevention)
  - Before storm
  - Often brine
- Deicing
  - Reactive
  - After storm
  - Often solid chloride

Chlorides (Salts)

Dry Salt

Brine

Commercial Deicers

Sodium Chloride
"Rock Salt"

Sodium Chloride
Calcium Chloride
Magnesium Chloride

Rock Salt Is The Rock 'Star'

- Most commonly used
- Most practical above 15°F
  - Lowers the Freezing Point
  - Speed
  - Cost
- Does not produce heat

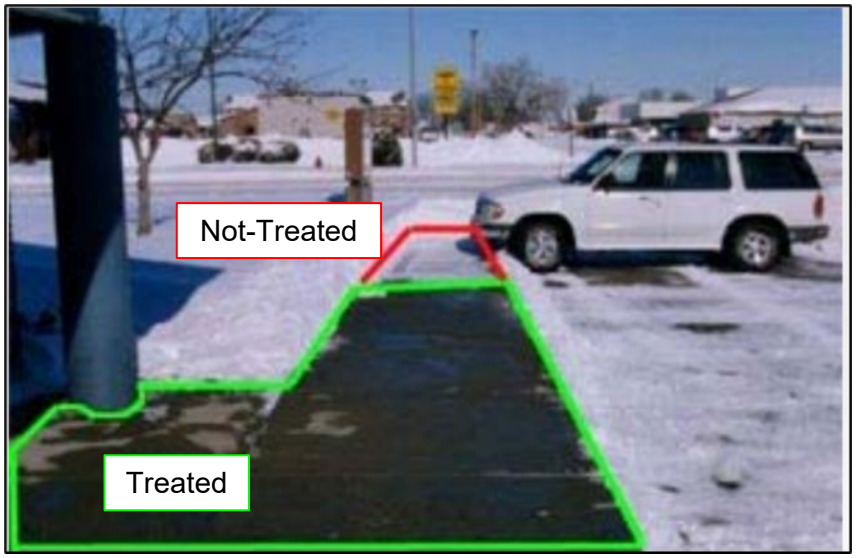
https://fb.watch/fZqYQUvY8x/

Commercial Deicers

- Combination of
  - Rock Salt
  - Calcium chloride
  - Magnesium chloride
  - Potassium chloride
- More versatile at lower temperatures
- Often contains dyes

Benefits Associated with Chloride

- Effective
- Reliable
- Affordable
- Easy to store
- Easy to Apply



CHLORIDES WORK

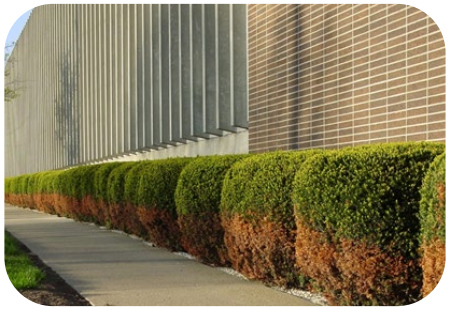
Drawbacks of Chlorides

- Kills aquatic life

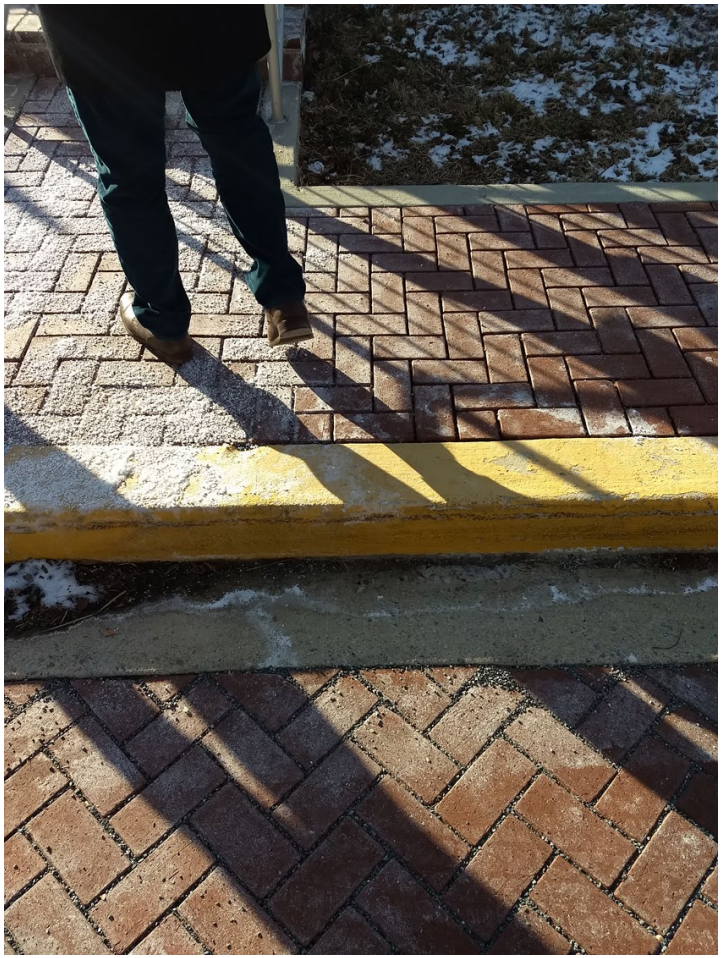
- Damages concrete

- Corrodes equipment

- Burns plants

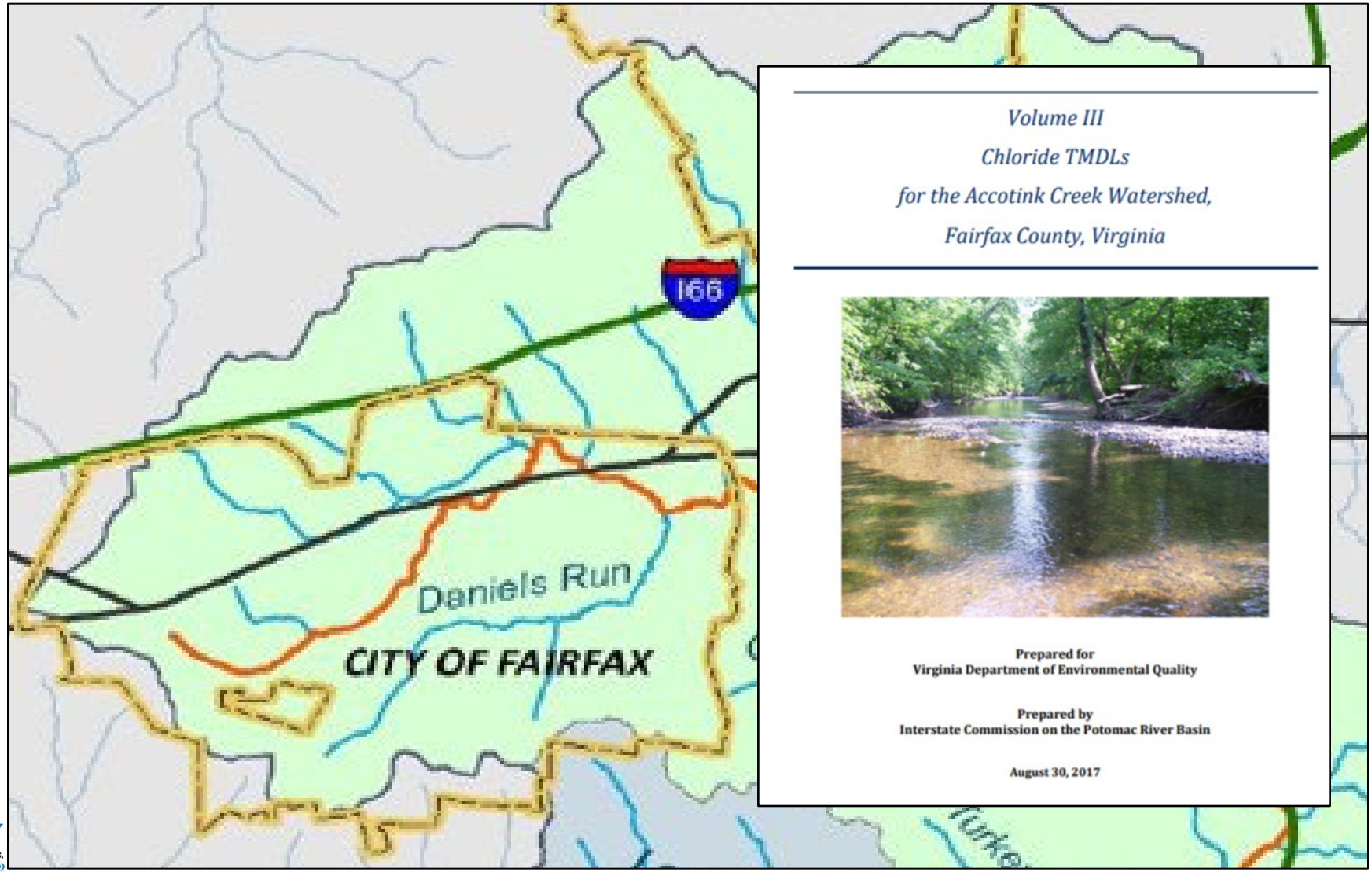


Other Chloride Concerns



- Resources
  - Overapplication = $ loss
- Pedestrian dangers
  - Piles of salt
- More work for you
  - Put it down. Pick it back up

Documented Local Impacts



Volume III

Chloride TMDLs

for the Accotink Creek Watershed,

Fairfax County, Virginia

Prepared for
Virginia Department of Environmental Quality

Prepared by
Interstate Commission on the Potomac River Basin

August 30, 2017

Citizen Awareness

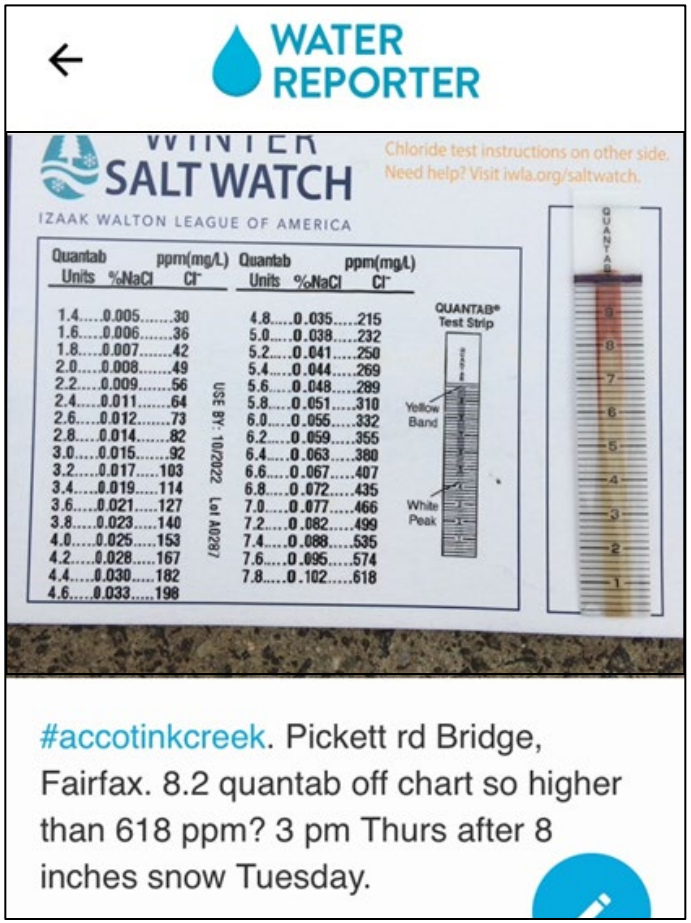
Dear Mr. Eto and Ms. **[Eyles]**,

The reason that I am sending this email to you is that I saw a runoff sluice right outside of the area ***where salting trucks are loaded on the City Property Yard****....*

It looked as if ***the runoff from the pavement*** *inside the property went right into the sluice and thus into the creek* ***without any processing whatsoever****...*

I am concerned about the creek and the effects downstream.

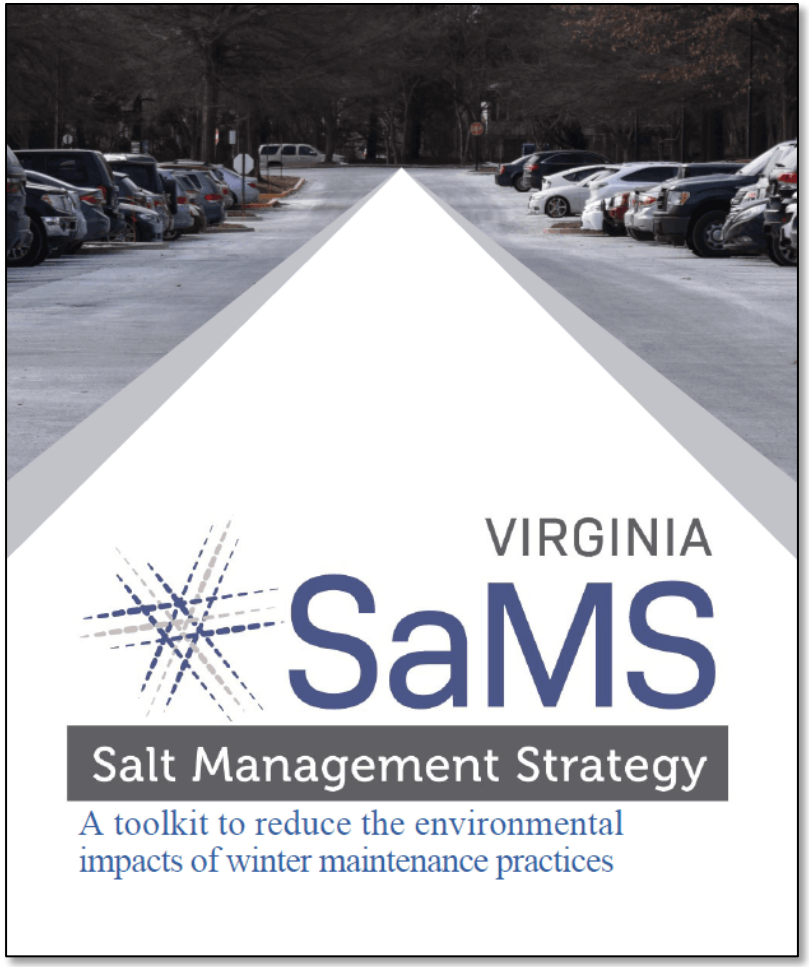
Private citizen e-mail complaint, 10/11/21



Private citizen salt monitoring results, 1/6/22

Regional Efforts

- Northern Virginia participants
- Identifies and describes strategies for reducing chlorides
- City resource for meeting MS4 General Permit requirements
- City already implements a number of the strategies



SaMS Best Management Practices

- Winter Operations Planning
- Levels of Service
- Training
- Salt Storage/Handling
- Calibration
- Storm Meetings
- Weather Forecasts
- Enhanced Equipment & Technology
- Anti-Icing
- Plowing Practices
- Product Application Practices
- Vary Applications to Conditions
- Use of Liquids
- Measurement

City SOPs Based on SaMS

- Pollution prevention and good housekeeping practices
  - Storage and handling of solid chlorides
  - Brine creation, storage, and handling
  - Application of liquid chlorides (brine)
  - Application of solid chlorides on streets, roads, and parking lots
  - Application of solid chlorides on pedestrian walkways

City of Fairfax, Virginia
10455 Armstrong Street • Fairfax, VA 22030-3630
703-385-7810 • www.fairfaxva.gov

Satoshi Eto
Public Works Program Manager
(703) 273-6073
Satoshi.Eto@fairfaxva.gov

Version 03.02.2022

CHLORIDE MANAGEMENT PLAN

STORMWATER POLLUTION PREVENTION & GOOD HOUSEKEEPING PRACTICES

SOLID CHLORIDE STORAGE AND HANDLING

The following good housekeeping practices should be employed to the maximum extent practicable when storing and handling solid chlorides.

- **Store rock salt in either the Salt Barn or the covered Salt Overflow Shed. Place the rock salt deep enough in the storage units to prevent exposure to precipitation.**
  Rock salt should be placed deep in the salt barn as far away from the point of entry as possible to minimize its contact with precipitation and stormwater runoff (**Figure 1**). As a supplement, waterproof tarps can be placed on top of the exposed rock salt to prevent contact with precipitation.

Figure 1. Loose rock salt should be placed deep enough into storage bins to prevent contact with precipitation.

- **Store unopened bags of deicers on the covered, elevated storage platforms.**
  Deicers should be stored on the raised platforms to ensure they are stored above the 100-year floodplain elevation (**Figure 2**). Opened bags of deicers should be placed in closed containers to prevent accidental spillage.

Figure 2. Deicers should be stored on the elevated platforms at the Property Yard.

- **Secure loose rock salt during transportation and protect it from precipitation.**
  Rock salt is often transported from the Property Yard to a field location for loading into the application equipment. Rock salt should not be piled higher than the sides of any transportation vehicle (e.g., pickup truck). Cover the rock salt with a waterproof tarp if being transported during periods of precipitation. Clean up any rock salt accidentally spilled during product transfer.
- **Transport deicers in unopened or closed containers.**
  Deicers are also often transported from the Property Yard to a field location for loading into the application equipment. Deicers should be transported in unopened bags. Before transport, open bags should be closed tightly or placed in covered buckets. Clean up any deicers accidentally spilled during product transfer.
- **Follow the City of Fairfax Property Yard Stormwater Pollution Prevention Plan (SWPPP) in response to spills, leaks, or accidental releases.**
  The City has developed and implemented a SWPPP detailing how to address spills, leaks, and accidental releases such as sweeping up that is rock salt spilled onto the pavement and cleaning up spills from leaking hydraulic lines. The procedures outlined in the SWPPP should be followed.

Planning and Guidance

SAMS BMP

- **Winter Operations Planning**
- **Levels of Service**
- Training
- Salt Storage/Handling
- Calibration
- **Storm Meetings**
- Weather Forecasts
- Enhanced Equipment & Technology
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- Plowing Practices
- Product Application Practices
- Vary Applications to Conditions
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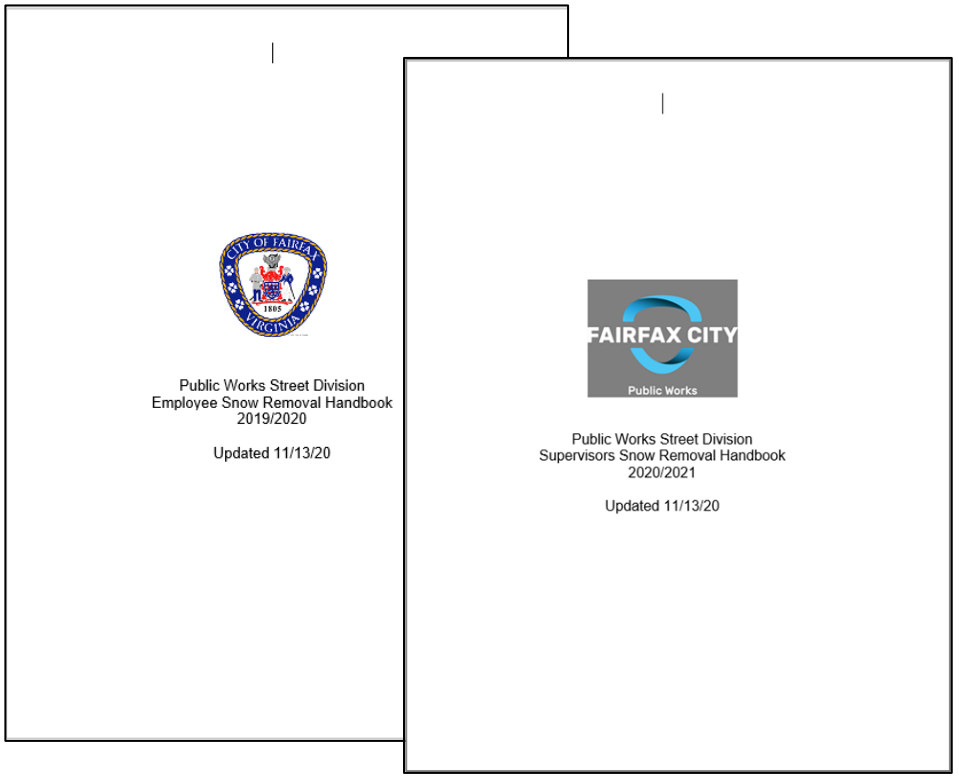
- Assign Responsibilities
- Dictate Level of Services



Preparing for Application

SAMS BMP

- Winter Operations Planning
- Levels of Service
- Training
- Salt Storage/Handling
- **Calibration**
- Storm Meetings
- Weather Forecasts
- Enhanced Equipment & Technology
- Anti-Icing
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- Vary Applications to Conditions
- Use of Liquids
- Measurement

- Follow procedures outlined in the equipment reference manuals

Implement Anti-Icing

SAMS BMP

- Winter Operations Planning
- Levels of Service
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- Storm Meetings
- Weather Forecasts
- Enhanced Equipment & Technology
- **Anti-Icing**
- Plowing Practices
- Product Application Practices
- Vary Applications to Conditions
- Use of Liquids
- Measurement

- Proactive snow and ice control strategy
- Most efficient utilization of chlorides
- Prevents bond between ice and surface

Anti-Icing Works

SAMS BMP

- Winter Operations Planning
- Levels of Service
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- Salt Storage/Handling
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- Storm Meetings
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- **Anti-Icing**
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- Product Application Practices
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- Use of Liquids
- Measurement

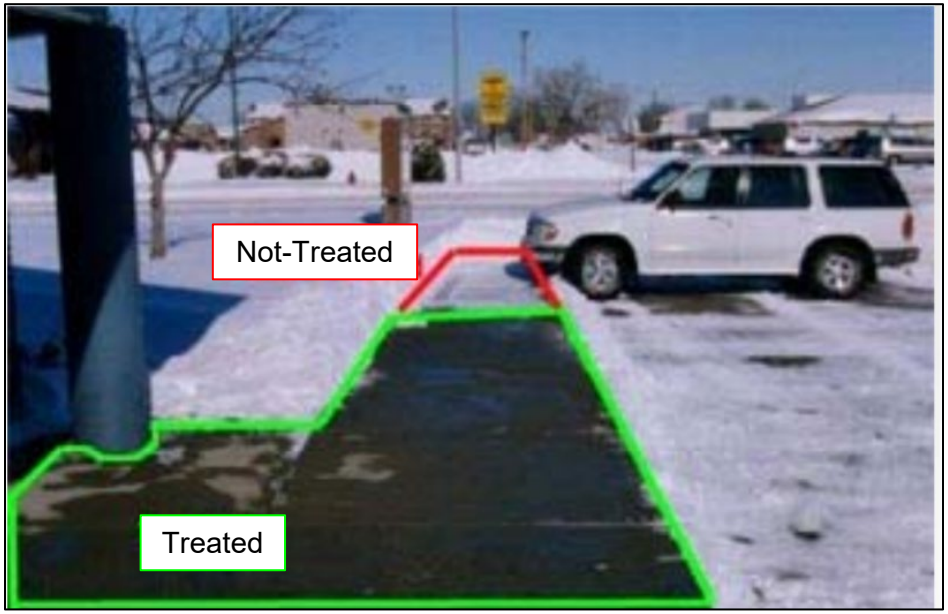

Photo Courtesy of: Pass the Salt: Efficient Snow & Ice Management Refresher – Patrick Santoso Axiomatic

Brine Science

SAMS BMP

- Winter Operations Planning
- Levels of Service
- Training
- Salt Storage/Handling
- **Calibration**
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- Plowing Practices
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- Vary Applications to Conditions
- Use of Liquids
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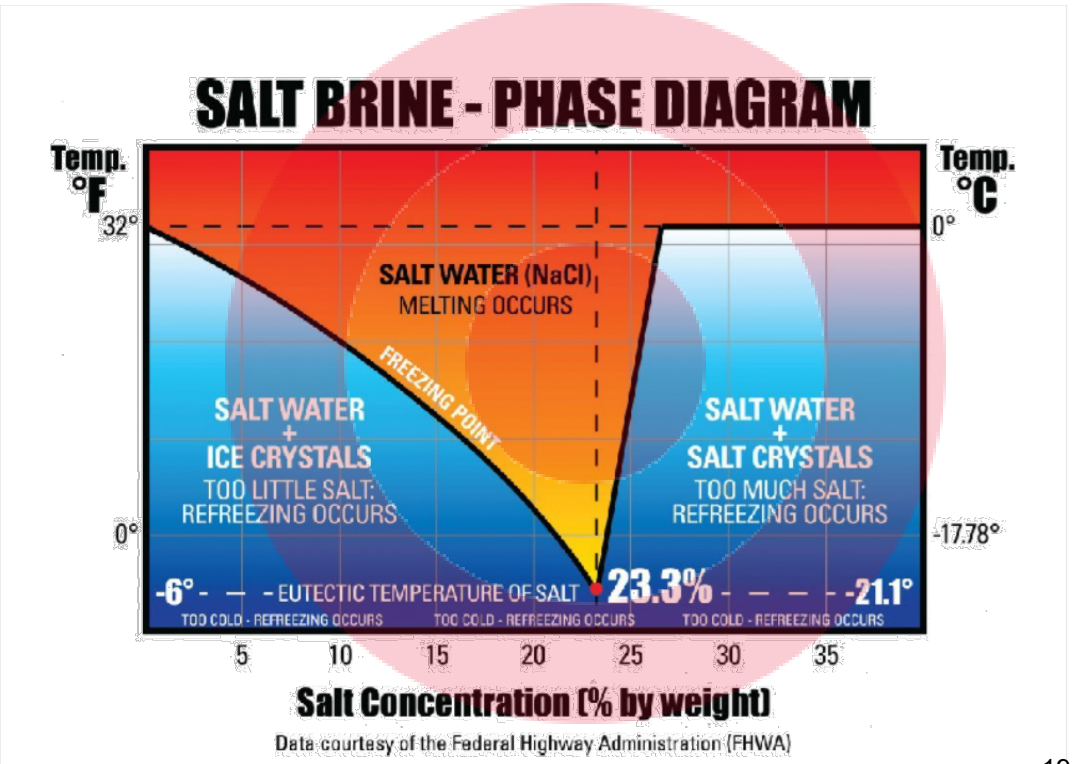
City mixing ratio

- Follow directions in the pump house manual



Common Sense Application

SAMS BMP

- Winter Operations Planning
- Levels of Service
- Training
- Salt Storage/Handling
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- Enhanced Equipment & Technology
- **Anti-Icing**
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- Vary Applications to Conditions
- Use of Liquids
- Measurement

- Apply prior to the pending winter storm event
  - Not effective if precipitation starts as rain

The Plow – Your Best Assistant

SAMS BMP

- Winter Operations Planning
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- **Vary Applications to Conditions**
- Use of Liquids
- Measurement

Less Snow/Ice = Less Chloride

SAMS BMP

- Winter Operations Planning
- Levels of Service
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- Salt Storage/Handling
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- Anti-Icing
- **Plowing Practices**
- Product Application Practices
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- Use of Liquids
- Measurement

- One (1) pound of salt “melts” 46.3 lbs. of ice in 5 minutes at 30°F

Be Cautious Where Snow Is Placed

SAMS BMP

- Winter Operations Planning
- Levels of Service
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- Salt Storage/Handling
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- Enhanced Equipment & Technology
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- **Product Application Practices**
- Vary Applications to Conditions
- Use of Liquids
- Measurement

- Place collected snow where it avoids contact with chlorides as it melts
  - Kutner and Van Dyck Parks

- Be aware of sensitive areas

After the Plow-Deicing

SAMS BMP

- Winter Operations Planning
- Levels of Service
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- Salt Storage/Handling
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- Storm Meetings
- Weather Forecasts
- Enhanced Equipment & Technology
- Anti-Icing
- Plowing Practices
- **Product Application Practices**
- **Vary Applications to Conditions**
- Use of Liquids
- Measurement

- Reactive snow and ice control strategy
- Not as efficient as anti-icing
- Spot application vs. widespread application

Environmental Conditions Impact Chloride Effectiveness

SAMS BMP

- Winter Operations Planning
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- Training
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- Plowing Practices
- **Product Application Practices**
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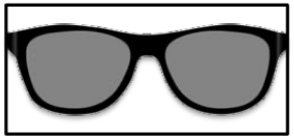
Precipitation

Rain washes off chlorides



Shade

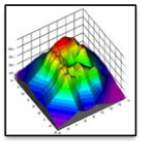
Doesn't have the benefit of the sun

Humidity

Salt effectiveness improves with moisture

Road conditions

More vehicles on the road spreads salt



Elevation

Cold air sinks

Time of day

Night brings cooler temperatures

Effectiveness of One Pound of Salt

SAMS BMP

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- **Vary Applications to Conditions**
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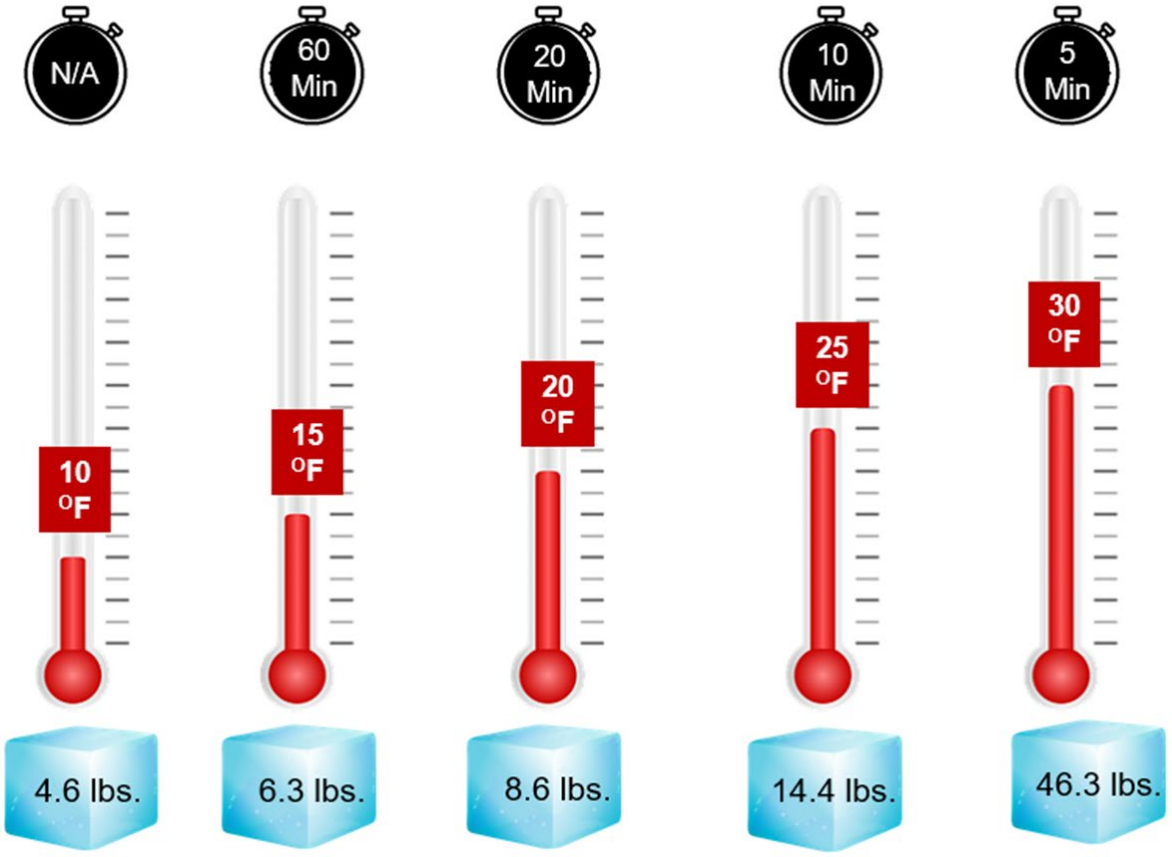

Snow weighs approximately 15 lbs./ft.^{3}

Application Rates Must Vary

FAIRFAX CITY

SAMS BMP

- Winter Operations Planning
- Levels of Service
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- Product Application Practices
- **Vary Applications to Conditions**
- Use of Liquids
- Measurement

Weather Forecast			City Response	Application Rate	
				Salt, lbs. / lane mile	Salt Brine, gal. / lane mile
Event Type 1	Precipitation	20% or Greater Chance	Spot Treatment of Critical Structures and Locations	325	50
	Accumulation	Ice/Snow Possible			
	Ambient or Pavement Temperature	30°-36° F			
Event Type 2	Precipitation	20-49% Chance	Spot Treatment of Critical Structures and Locations	325	
	Accumulation	Snow Possible			
	Ambient or Pavement Temperature	30°-36° F			
Event Type 3	Precipitation	50-100% Chance	Light Salting Operation	400	
	Accumulation	Up to 1-inch of snow			
	Ambient or Pavement Temperature	25°-29° F			
Event Type 4	Precipitation	50-100% Chance	Salting Operation	475	
	Accumulation	Up to 2-inches of snow or up to a 1/10-inch of ice			
	Ambient or Pavement Temperature	20°-24° F			
Event Type 5	Precipitation	50-100% Chance	Salting/Plowing Operations	550	
	Accumulation	Up to 6-inches of snow or up to a 1/4-inch of ice			
	Ambient or Pavement Temperature	15°-19° F			
Event Type 6	Precipitation	50-100% Chance	Salting/Heavy Plowing Operations	625	
	Accumulation	More than 6-inches of snow or more than 1/4-inch of ice			
	Ambient or Pavement Temperature	10°-14° F			

Based on Salt Institute Standards

GKY & Associates, Inc.

Moisture Improves on Deicing Efficiency

SAMS BMP

- Winter Operations Planning
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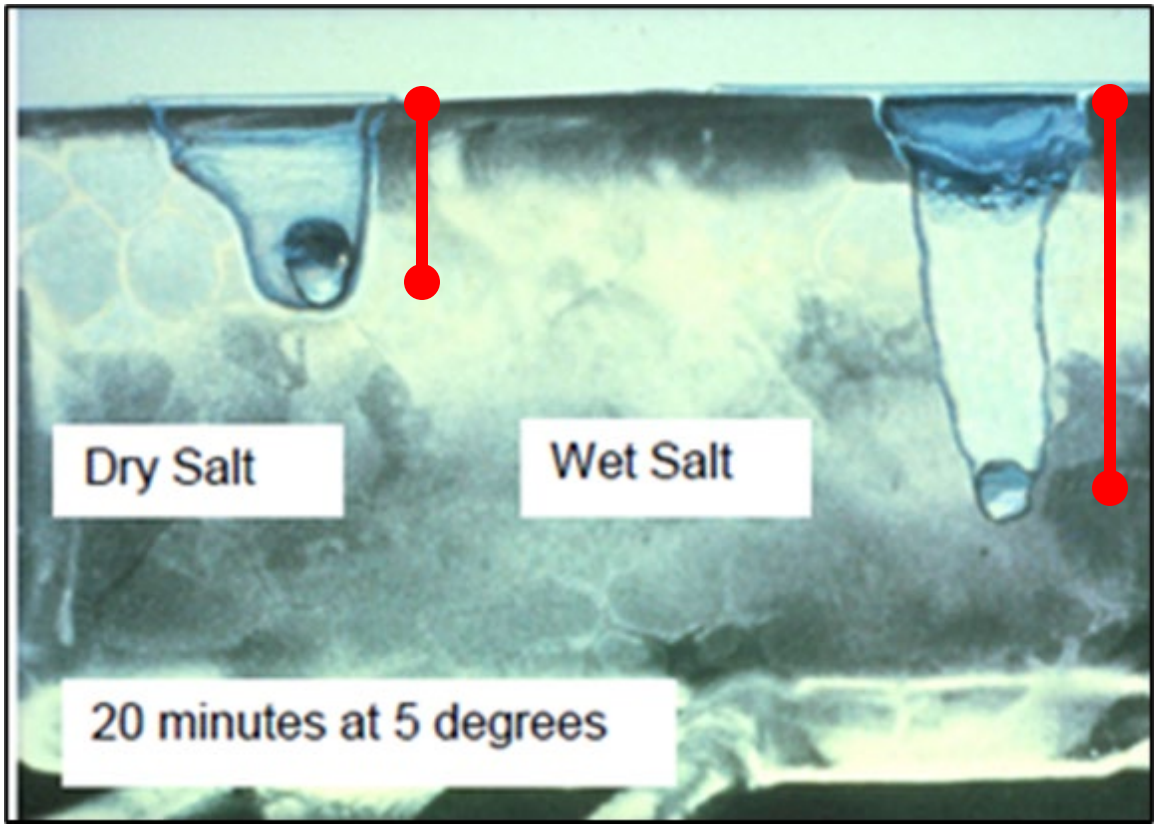

Take Your Choice

SAMS BMP

- Winter Operations Planning
- Levels of Service
- Training
- Salt Storage/Handling
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- Weather Forecasts
- Enhanced Equipment & Technology
- Anti-Icing
- Plowing Practices
- Product Application Practices
- Vary Applications to Conditions
- **Use of Liquids**
- Measurement

Pre-Treatment

Mix brine in prior to application

Pre-Wetting

Mix brine in during application

Seek Uniform Application

SAMS BMP

- Winter Operations Planning
- Levels of Service
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- Clear snow
- Apply where needed
- Space about 3-inches between pieces of rock salt
  - Use hand spreaders and other equipment

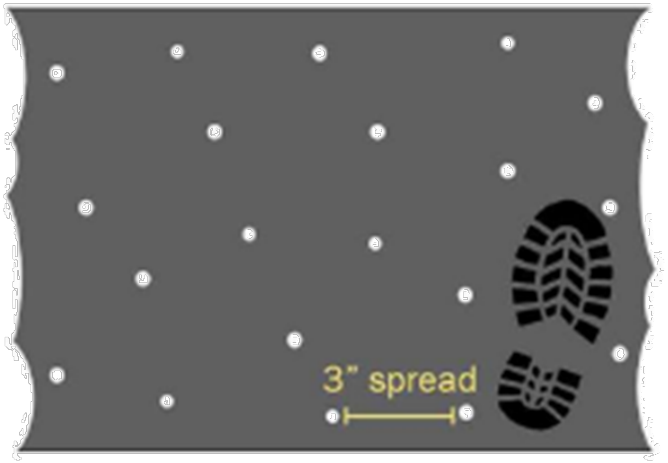

Image Credit: Vadnais Lake Area Water Management Organization

Remember the Coffee Cup Rule of Thumb

SAMS BMP

- Winter Operations Planning
- Levels of Service
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- Salt Storage/Handling
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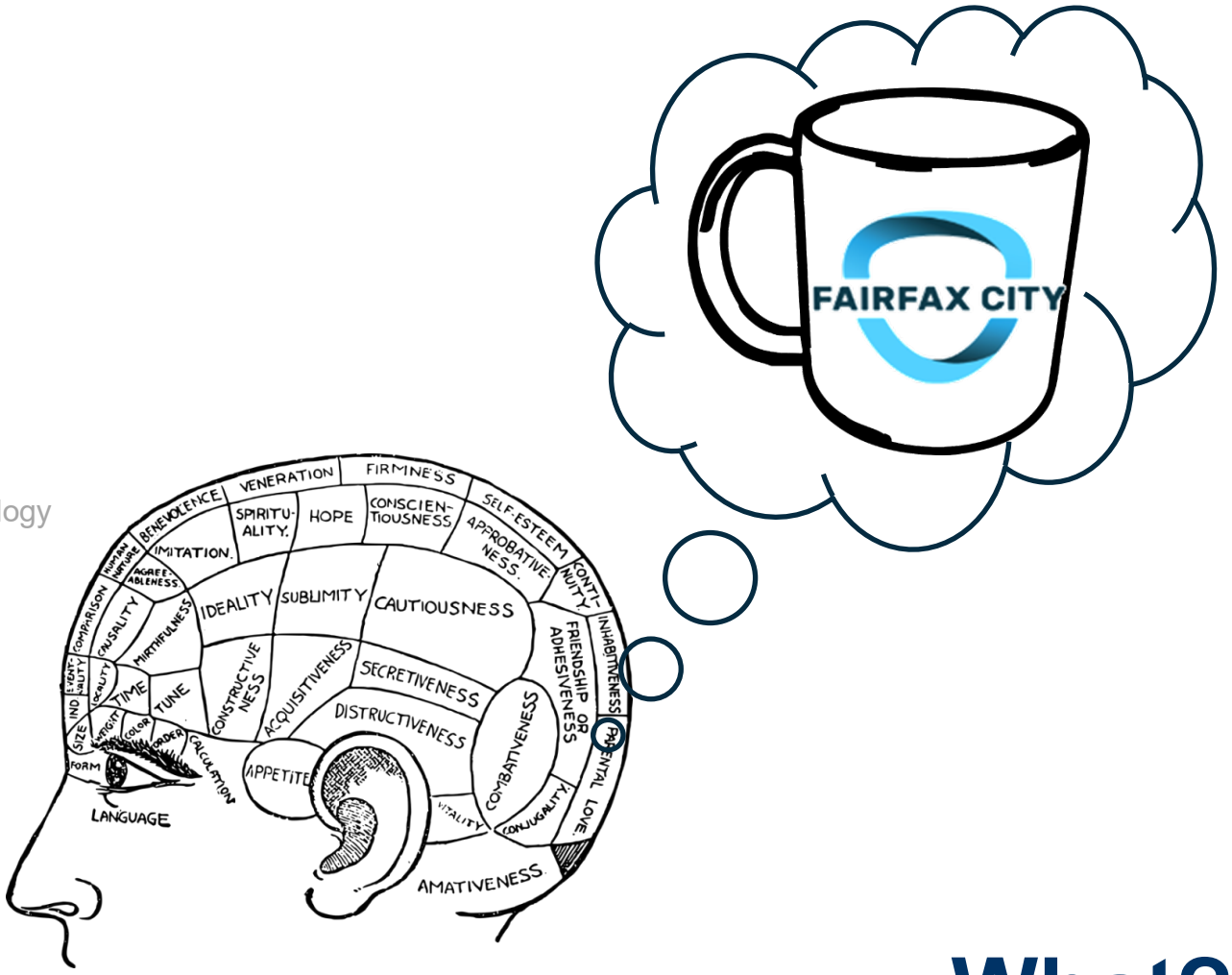
- **Measurement**



What?

Coffee Cup Rule of Thumb

SAMS BMP

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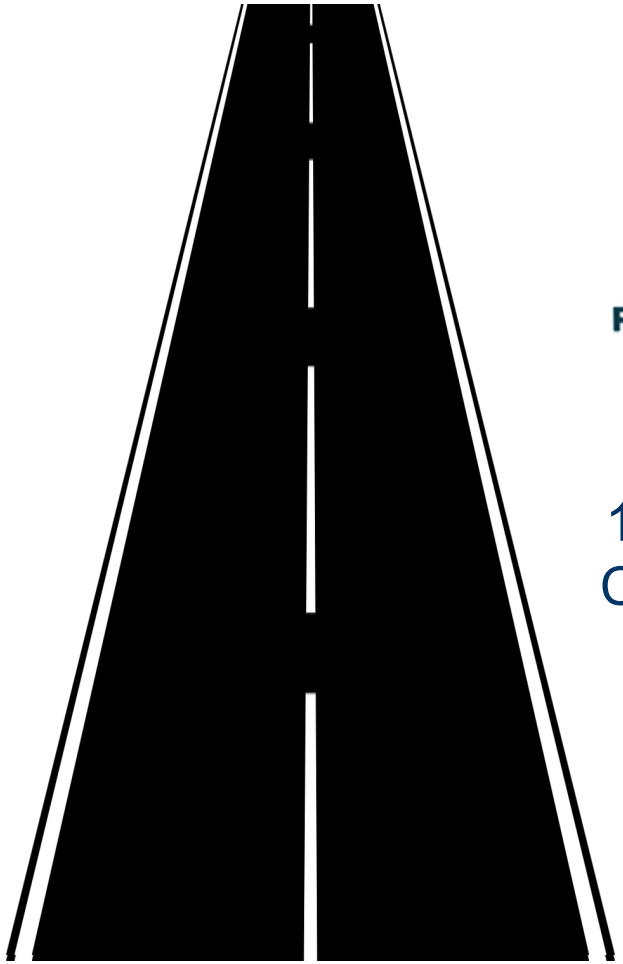
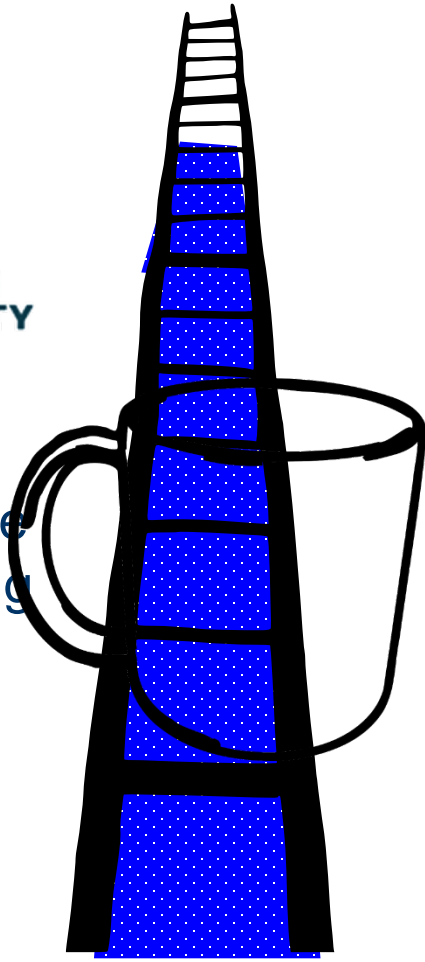


20 - Foot of Driveway

12 - Ounce Coffee Mug



10 Sidewalk Squares

Do Not “Burn” Off Snow & Ice

SAMS BMP

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Storage and Handling of Chlorides

SAMS BMP

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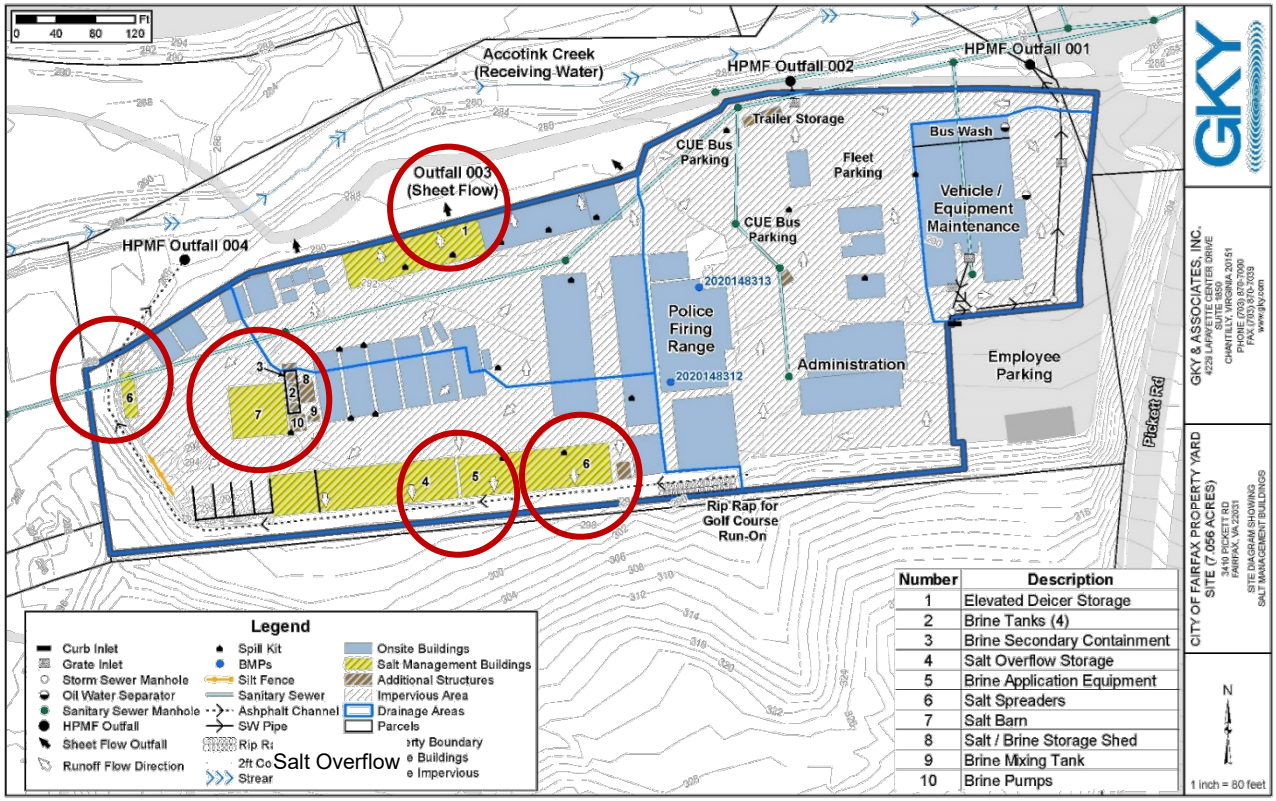

Property Yard

Extreme Caution: Accotink Creek Watershed

Points of Discharge to Accotink Creek

Stormwater Pollution Prevention Plan

SAMS BMP

- Winter Operations Planning
- Levels of Service
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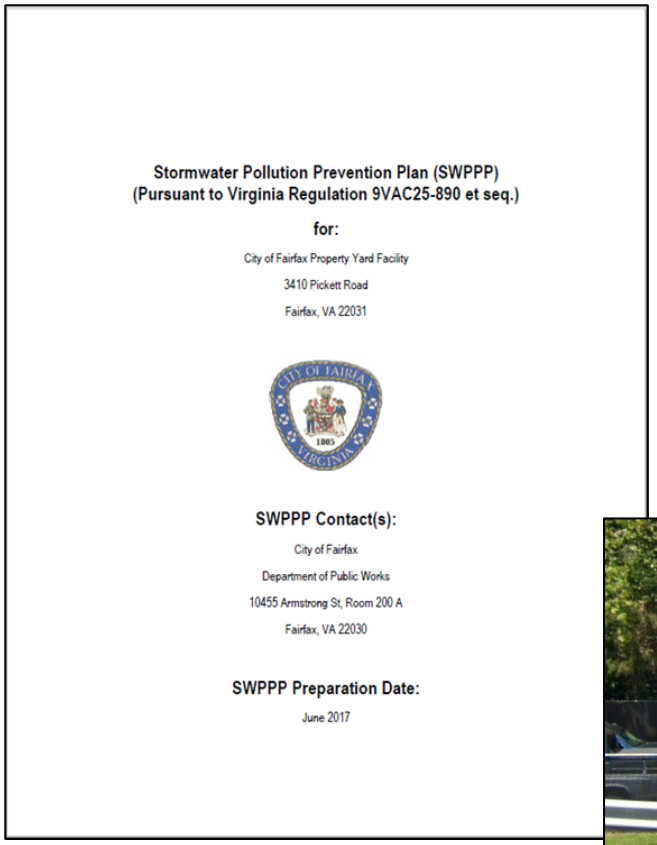


Stormwater Pollution Prevention Plan (SWPPP)
(Pursuant to Virginia Regulation 9VAC25-890 et seq.)

for:

City of Fairfax Property Yard Facility
3410 Pickett Road
Fairfax, VA 22031

SWPPP Contact(s):

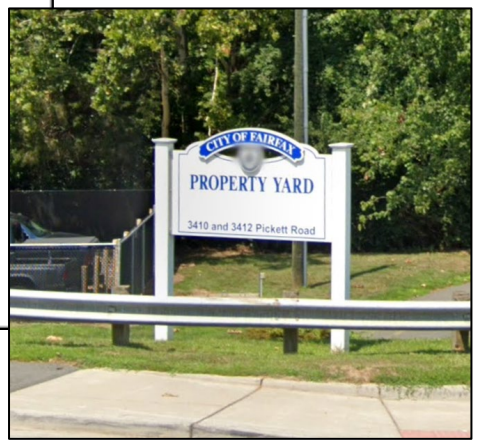
City of Fairfax
Department of Public Works
10455 Armstrong St, Room 200 A
Fairfax, VA 22030

SWPPP Preparation Date:

June 2017

Individual SWPPP

- Best management practices
- Routine inspections
- Training



Use the Covered Storage

SAMS BMP

- Winter Operations Planning
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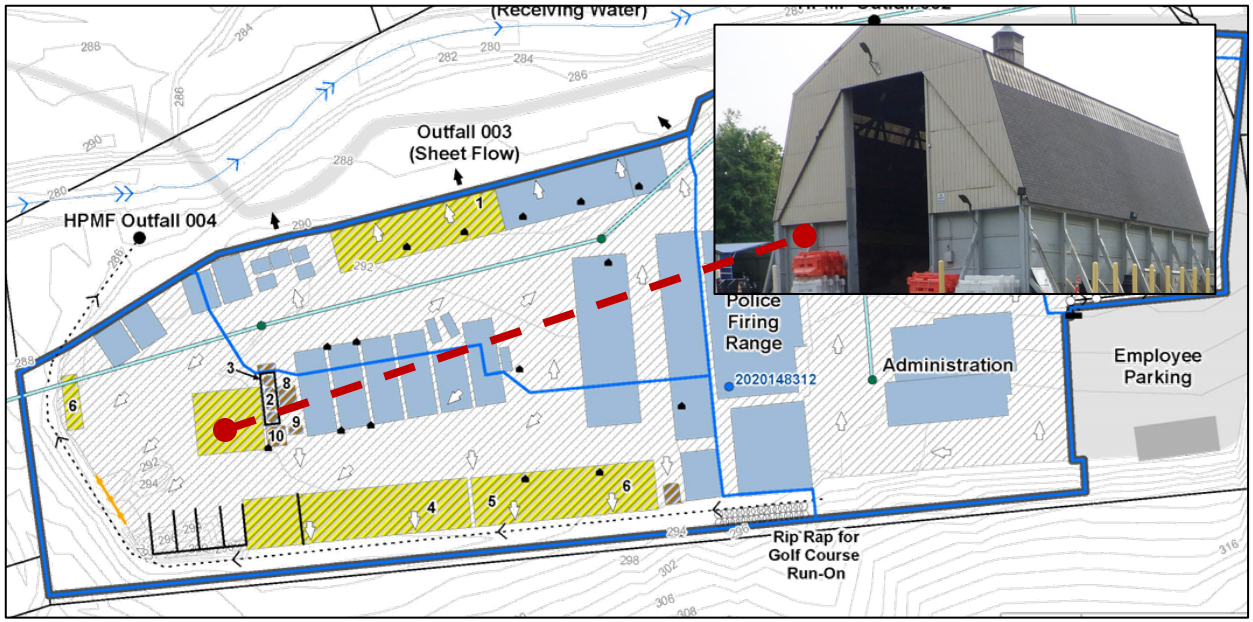

- Warehouse rock salt in storage dome
- Store excess rock salt in covered bins
- If necessary, cover rock salt with tarps to minimize contact with precipitation

Minimize Contact with Precipitation

SAMS BMP

- Winter Operations Planning
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- Measurement

Brine Facilities

SAMS BMP

- Winter Operations Planning
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- Product Application Practices
- Vary Applications to Conditions
- Use of Liquids
- Measurement

- Sweep up salt spilled during loading
- Check pipes and connections for leaks
- Close secondary containment discharge valves when brine present

Commercial Deicers

SAMS BMP

- Winter Operations Planning
- Levels of Service
- Training
- **Salt Storage/Handling**
- Calibration
- Storm Meetings
- Weather Forecasts
- Enhanced Equipment & Technology
- Anti-Icing
- Plowing Practices
- Product Application Practices
- Vary Applications to Conditions
- Use of Liquids
- Measurement

- Store under roof and off the ground
  - 100-year floodplain
- Keep bags sealed to prevent spills and gathering moisture

Equipment Storage and Maintenance

SAMS BMP

- Winter Operations Planning
- Levels of Service
- Training
- **Salt Storage/Handling**
- Calibration
- Storm Meetings
- Weather Forecasts
- Enhanced Equipment & Technology
- Anti-Icing
- Plowing Practices
- Product Application Practices
- Vary Applications to Conditions
- Use of Liquids
- Measurement

- Do not store salt in equipment
- Store equipment under roof
- Keep equipment maintained

Equipment Clean-Up

SAMS BMP

- Winter Operations Planning
- Levels of Service
- Training
- **Salt Storage/Handling**
- Calibration
- Storm Meetings
- Weather Forecasts
- Enhanced Equipment & Technology
- Anti-Icing
- Plowing Practices
- Product Application Practices
- Vary Applications to Conditions
- Use of Liquids
- Measurement

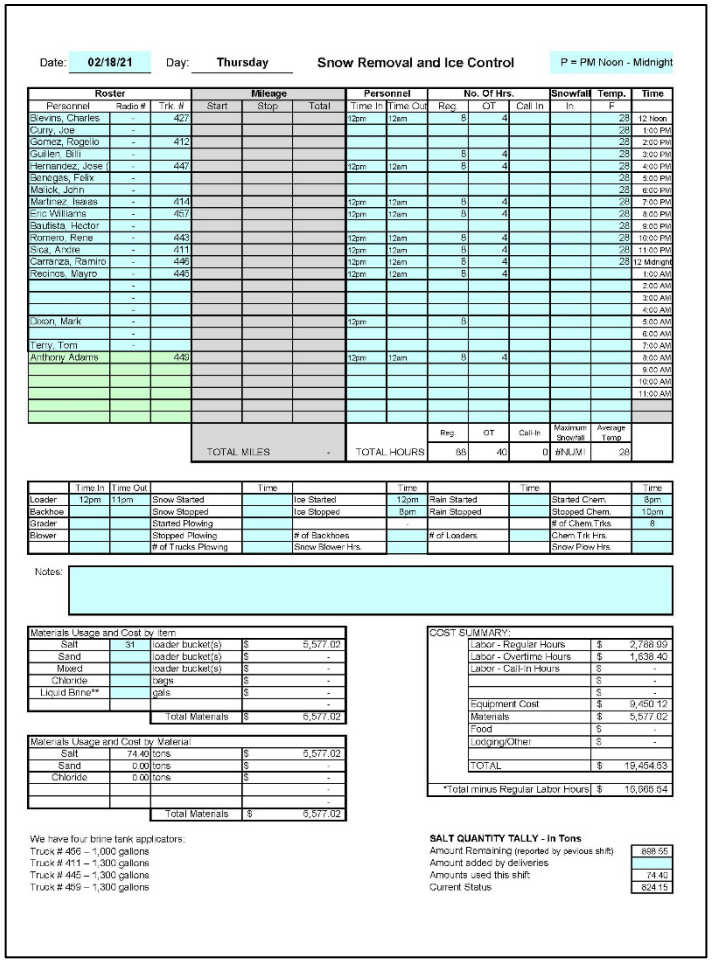
- Wash water cannot be discharged into the storm drains
- Wash rack to be installed in 2022

The Importance of Documentation

SAMS BMP

- Winter Operations Planning
- Levels of Service
- Training
- Salt Storage/Handling
- Calibration
- Storm Meetings
- Weather Forecasts
- Enhanced Equipment & Technology
- Anti-Icing
- Plowing Practices
- Product Application Practices
- Vary Applications to Conditions
- Use of Liquids
- **Measurement**

- Track salt application



Date: 02/18/21 Day: Thursday **Snow Removal and Ice Control** P = PM Noon - Midnight

Roster			Mileage			Personnel		No. Of Hrs.			Snowfall	Temp.	Time
Personnel	Radio #	Trk. #	Start	Stop	Total	Time In	Time Out	Reg.	OT	Call In	In	F	
Blevins, Charles	-	427				12pm	12am	8	4			28	12 Noon
Curry, Joe	-											28	1:00 PM
Gomez, Rogelio	-	412										28	2:00 PM
Guillen, Billi	-							8	4			28	3:00 PM
Hernandez, Jose [	-	447				12pm	12am	8	4			28	4:00 PM
Benegas, Felix	-											28	5:00 PM
Malick, John	-											28	6:00 PM
Martinez, Isaias	-	414				12pm	12am	8	4			28	7:00 PM
Eric Williams	-	457				12pm	12am	8	4			28	8:00 PM
Bautista, Hector	-											28	9:00 PM
Romero, Rene	-	443				12pm	12am	8	4			28	10:00 PM
Sica, Andre	-	411				12pm	12am	8	4			28	11:00 PM
Carranza, Ramiro	-	446				12pm	12am	8	4			28	12 Midnight
Recinos, Mayro	-	445				12pm	12am	8	4				1:00 AM
	-												2:00 AM
	-												3:00 AM
	-												4:00 AM
Dixon, Mark	-					12pm		8					5:00 AM
	-												6:00 AM
Terry, Tom	-												7:00 AM
Anthony Adams		449				12pm	12am	8	4				8:00 AM
													9:00 AM
													10:00 AM
													11:00 AM
			TOTAL MILES		-	TOTAL HOURS		Reg. 96	OT 40	Call In 0	Maximum Snowfall #NUM!	Average Temp 28	

	Time In	Time Out			Time			Time			Time
Loader	12pm	11pm	Snow Started			Ice Started	12pm	Rain Started		Started Chem.	8pm
Backhoe			Snow Stopped			Ice Stopped	8pm	Rain Stopped		Stopped Chem.	10pm
Grader			Started Plowing				-			# of Chem.Trks.	8
Blower			Stopped Plowing			# of Backhoes		# of Loaders		Chem.Trk.Hrs.	
			# of Trucks Plowing			Snow Blower Hrs.				Snow Plow Hrs.	

Notes:

Materials Usage and Cost by Item				
Salt	31	loader bucket(s)	$	5,577.02
Sand		loader bucket(s)	$	-
Mixed		loader bucket(s)	$	-
Chloride		bags	$	-
Liquid Brine**		gals	$	-
				-
		Total Materials	$	5,577.02

Materials Usage and Cost by Material				
Salt	74.40	tons	$	5,577.02
Sand	0.00	tons	$	-
Chloride	0.00	tons	$	-
				-
		Total Materials	$	5,577.02

COST SUMMARY:		
Labor - Regular Hours	$	2,786.99
Labor - Overtime Hours	$	1,636.40
Labor - Call-In Hours	$	-
	$	-
	$	-
Equipment Cost	$	9,450.12
Materials	$	5,577.02
Food	$	
Lodging/Other	$	-
TOTAL	$	19,454.63
*Total minus Regular Labor Hours	$	16,667.64

We have four brine tank applicators:
Truck # 456 – 1,000 gallons
Truck # 411 – 1,300 gallons
Truck # 445 – 1,300 gallons
Truck # 459 – 1,300 gallons

SALT QUANTITY TALLY - In Tons

Amount Remaining (reported by pevious shift)	898.55
Amount added by deliveries	
Amounts used this shift:	74.40
Current Status	824.15

- Maintain log

Questions?

Attachment 6. Pollution Prevention and Good Housekeeping Practices Associated with the Application of Liquid Chlorides (Brine)

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Version 06/2022

CHLORIDE MANAGEMENT PLAN

STORMWATER POLLUTION PREVENTION & GOOD HOUSEKEEPING PRACTICES

APPLICATION OF LIQUID CHLORIDE (BRINE)

The following good housekeeping practices should be employed to the maximum extent practicable when applying liquid chloride (i.e., brine).

- **When loading and off-loading brine at the Property Yard, tightly attach the pump station feed lines to the mobile tank.**
  The loading and unloading of brine from the storage tanks for application occurs outside the brine storage tank secondary containment system. The feed lines must be properly attached before the transfer of the brine is initiated in order to minimize spillage of brine in the Property Yard (**Figure 1**). Brine spilled as a result of not utilizing this practice will likely travel over land and directly into Accotink Creek.

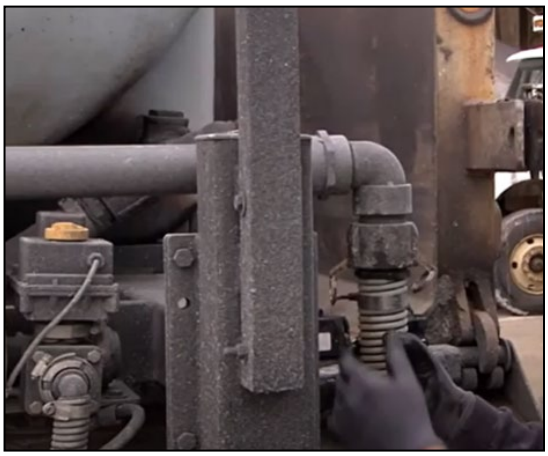

Figure 1. Tightly attach feed lines between the pump house and brine trucks.

- **Calibrate and set the brine electronic control systems per the written directions in the applicable Reference Manual.**
  Electronic control systems are installed in the cab of each truck utilized in brine application. These control systems should be calibrated and set in accordance with the applicable Reference Manual. The Reference Manual includes the City's selected settings as well as the manufacturer's directions for how to adjust the settings.

- **Set the initial brine application rates for pre-treatment (anti-ice) at a rate that minimizes runoff and provides for definable patterns.**
  Brine application rates should be set so that brine is applied in vertical lines with minimal runoff. The City's recommended application rate is 55 gallons/lane mile. Individual vertical lines of brine application with alternating strips of clean pavement should be visible (**Figure 2**).

Figure 2. Brine application should result in a repeating pattern of brine and clean pavement with minimal brine runoff.

- **Do not pretreat roads, streets, and parking lots with brine if the anticipated storm is expected to begin as unfrozen precipitation and the pavement temperature will be above freezing.**
  Brine applied as an anti-icing control will be washed off the pavement prior to providing any benefits if the precipitation event begins as rain and the pavement temperature is above freezing. Pretreatment may be applicable if the pavement temperature is expected to be below freezing as rainfall may freeze on contact and cause icing conditions.

- **Apply brine to one lane at a time using a direct, vertical drop technique.**
  Brine should be applied to one lane at a time using the vertical drop section of the application boom. Side spray boom sections should be employed minimally to prevent overspray on to vegetation and damage to vehicles or private property.

- **Conduct quality control and assessment during brine application.**
  Operators of chase vehicles should provide quality control during application to ensure that the brine is being applied as intended. Modifications in brine application (including maintenance) should be employed as soon as possible if brine is not being applied as intended.

- **Off-load unapplied brine back into the Property Yard storage tanks if it is not expected to be utilized within a reasonably short period of time.**
  Brine loaded into the brine trucks, but not applied, should be off-loaded back into the brine storage tanks. If additional brine application is expected to occur within a reasonably short period of time, the brine can remain loaded on the brine truck, provided it is parked in a heated garage.

Attachment 7. Pollution Prevention and Good Housekeeping Practices Associated with the Application of Solid Chlorides on Pedestrian Walkways

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CHLORIDE MANAGEMENT PLAN

STORMWATER POLLUTION PREVENTION - GOOD HOUSEKEEPING PRACTICES

SOLID CHLORIDE APPLICATION ON PEDESTRIAN WALKWAYS

The following good housekeeping practices should be employed to the maximum extent practicable when applying solid chlorides to sidewalks, paths, and trails.

- **Physically remove as much frozen precipitation as possible prior to chloride application.**
  The physical removal of as much frozen precipitation as possible prior to chloride application minimizes the amount of salt needed (**Figure 1**). There is a limitation on the quantity and speed in which chlorides can melt frozen precipitation. For example, one (1) pound of salt can melt 46 pounds of snow in five (5) minutes if the temperature is 30°F. The more frozen precipitation that is removed prior to chloride application, the more effective and efficient it is at providing safe streets and pedestrian walkways. Chlorides should not be used to "burn off" snow or ice.

Figure 1. Physically remove as much snow and ice from the infrastructure as possible prior to treatment with chlorides.

- **Apply rock salt and deicers in a uniform pattern.**
  To maximize performance, rock salts and deicers should be spread in a uniform pattern across the impervious surface (**Figure 2**). Pattern density will be based on the desired quantity being applied.

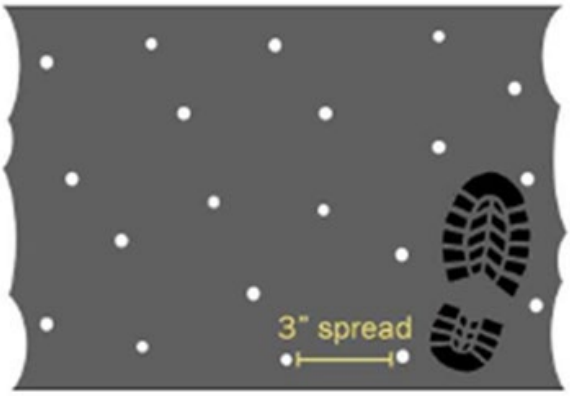

Figure 2. Chlorides should be dispersed in a uniform pattern. Density will be determined by the application rate.

- **Minimize overspray.**
  The use of drop spreaders minimizes the potential of overspray as the chlorides are not 'thrown' as with a disc spreader. When using disc spreaders, adjust the flaps or deflectors so that chlorides are thrown only the width of the infrastructure being treated (e.g., sidewalk, trail, or path).

  The use of liquid brine to pre-treat or pre-wet rock salt prior to dispersal will increase its efficiency in melting frozen precipitation and minimize bouncing when the rock salt hits the road.

- **Operate the equipment at consistent speeds.**
  Application rates are often influenced by the speed at which the machinery is operated. While some spreaders have electronic controls to automatically adjust application rates, other spreaders do not. In these instances, application rates are influenced by the speed at which they are traveling. For example, walk behind spinner spreaders are designed to be operated at a brisk walk (approximately 3 mph). Walking faster or slower than this speed will influence the amount of chlorides being dispersed through the spreader. Be sure to prevent chlorides from being continuously applied to the same spot when the equipment is not in motion.

- **Vary application rates based on current and expected conditions.**
  Application rates should be varied based upon current and expected conditions. Chlorides are not to be applied to sidewalks, trails, and pathways until after the precipitation has stopped falling and what has accumulated shoveled or plowed from the pathways. Applicators should consider such influences as current and future temperature, the potential for additional precipitation, anticipated use, time of day, shading, path slope, and type of chloride applied when determining application rates. **Table 1** on the following page provides an example of how to adjust application rates based on temperature, precipitation, and type of pretreatment.

- **Employ spot treatment rather than general broadcast application.**
  When applicable, spot treat individual sections of impervious surfaces. This ensures that the trouble spots are treated, and that chloride use is minimized.

- **Assess product application.**
  Crew members should continuously assess how the chlorides are being applied. This can be done either by the applicator or by another person. Assessments should be made as to whether the chloride is being spread evenly across the desired treatment swath without overspray and whether the equipment is working properly. Follow-up assessments should be made to determine if the expected level of service has been met.

- **Store equipment under cover when not in use.**
  Chlorides accumulate on the equipment during their use in applying chlorides so the equipment should be stored undercover when not in use. Equipment should only be washed at approved locations where the wash water is collected rather than discharged into the storm drainage system.

Table 1. Example Variable Rate Applications Based on Temperature, Weather, and Pretreatment

Pavement Temp. (°F) and Trend (↑↓)	Weather Condition	Maintenance Actions	Application Rate (lbs. / per 1000 sq. ft.)		
			Salt Prewetted / Pretreated with Salt Brine	Salt Prewetted / Pretreated with Deicer Blends	Dry Salt
>30 ↑	Snow	Plow, treat intersections only	0.75	0.50	0.75
	Frz. Rain	Apply chemical	1.25	1.00	1.50
30 ↓	Snow	Plow and apply chemical	1.25	1.00	1.50
	Frz. Rain	Apply chemical	1.50	1.25	1.75
25 - 30 ↑	Snow	Plow and apply chemical	1.25	1.00	1.50
	Frz. Rain	Apply chemical	1.50	1.25	1.75
25 - 30 ↓	Snow	Plow and apply chemical	1.25	1.00	1.50
	Frz. Rain	Apply chemical	1.75	1.50	2.25
20 - 25 ↑	Snow or Frz. Rain	Plow and apply chemical	1.75	1.50	2.25
20 - 25 ↓	Snow	Plow and apply chemical	2.00	2.00	2.75
	Frz. Rain	Apply chemical	2.50	2.00	3.00
15 - 20 ↑	Snow	Plow and apply chemical	2.00	2.00	2.75
	Frz. Rain	Apply chemical	2.50	2.00	3.00
15 - 20 ↓	Snow or Frz. Rain	Plow and apply chemical	2.50	2.00	3.00
0 to 15 ↑↓	Snow	Plow, treat with blends, apply sand to hazardous areas	Not recommended	3.00	Not recommended
< 0	Snow	Plow, treat with blends, apply sand to hazardous areas	Not recommended	4.50	Not recommended

Courtesy of the Minnesota Pollution Control Agency

Attachment 8. Pollution Prevention and Good Housekeeping Practices Associated with the Application of Solid Chlorides on Streets, Roads, and Parking Lots

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CHLORIDE MANAGEMENT PLAN

STORMWATER POLLUTION PREVENTION - GOOD HOUSEKEEPING PRACTICES

SOLID CHLORIDE APPLICATION ON STREETS, ROADS, AND PARKING LOTS

The following good housekeeping practices should be employed to the maximum extent practicable when applying solid chlorides.

- **Physically remove as much frozen precipitation as possible prior to chloride application.**
  The physical removal of as much frozen precipitation as possible prior to chloride application minimizes the amount of salt needed (**Figure 1**). There is a limitation on the quantity and speed in which chlorides can melt frozen precipitation. For example, one (1) pound of salt can melt 46 pounds of snow in five (5) minutes if the temperature is 30°F. The more frozen precipitation that is removed prior to chloride application, the more effective and efficient it is at providing safe streets and pedestrian walkways. Chlorides should not be used to "burn off" snow or ice.

Figure 1. Physically remove as much snow and ice from the infrastructure as possible prior to treatment with chlorides.

- **Apply rock salt and deicers in a uniform pattern.**
  To maximize performance, rock salts and deicers should be spread in a uniform pattern across the impervious surface. Pattern density will be based on the desired quantity being applied.

- **Minimize overspray.**
  Adjust the flaps or deflectors so that chlorides are thrown only the width of the infrastructure being treated (e.g., lane width).

- **Pre-treat or pre-wet rock salt prior to application.**
  The use of liquid brine to pre-treat or pre-wet rock salt prior to dispersal will increase its efficiency in melting frozen precipitation and minimize bouncing when the rock salt hits the road (**Figure 2**).

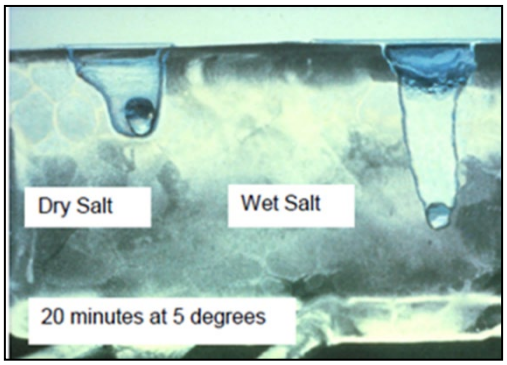

Figure 2. Pre-wetting or pre-treating rock salt with brine prior to application increases its melting efficiency.

- **Calibrate the spreader controls to factory settings.**
  The spreader controls allow for both automatic and manual operation control. Refer to the Reference Manual on the appropriate settings for lane width and feed rate. Be sure that the spreader control is set to automatically start/stop the spinner when the truck is not in motion. Use the minimum feed rate necessary to meet the expected level of service.

- **Vary application rates based on current and expected conditions.**
  Application rates should be varied based upon current and expected conditions. Repeated applications may be required for primary and secondary streets and critical areas such as parking lots, fire and police stations, and the Property Yards. Rock salt is most often applied only once in residential areas after precipitation has stopped falling and what has accumulated has been removed from the roadways and streets. Applicators should consider such influences as current and future temperatures, the potential for additional precipitation, anticipated use, time of day, shading, path slope, and type of chloride applied when determining application rates. **Table 1** on the following page provides an example of how to adjust application rates based on temperature, precipitation, and type of pretreatment.

- **Employ spot treatment rather than general broadcast application.**
  When applicable, spot treat individual sections of impervious surfaces. This ensures that the trouble spots are treated, and that chloride use is minimized.

- **Assess product application.**
  Continuously assess how the chlorides are being applied. This can be done either by the operator or by another person such as the driver of a following safety truck. Assessments should be made as to whether the chloride is being spread evenly across the desired treatment swath without overspray and whether the equipment is working properly. Follow-up assessments should be made to determine if the expected level of service has been met.

- **Store equipment under cover when not in use.**
  Chlorides accumulate on the equipment during their use in applying chlorides so the equipment should be stored under cover when not in use. Equipment should only be washed at approved locations where the wash water is collected rather than discharged into the storm drainage system.