2024/2025

Charles County Government Salt Management Plan

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1 Preface

In 2010, the Maryland State Legislature passed two (2) bills, House Bill 0903, and Senate Bill 0775, which required the establishment of a Statewide Salt Management Plan. The legislature tasked The Charles County Government (CCG), in conjunction with the Maryland Department of the Environment (MDE), to develop a road salt management best practices guidance document, for use by the state and use/or reference by local jurisdictions. The purpose of this document is to provide guidance and direction for the optimized use of road salt (primarily sodium chloride) during winter operations, to lessen the adverse impacts of salt in the state. These best practices for Salt Management discuss how to minimize road salt use from its delivery, storage, handling at salt storage locations, placement on highways during winter storms, and post-storm cleanup operations. The following best practices should be a starting point in an agency's plan to minimize the negative impacts of salt on highway assets and the existing environments of Maryland.

The primary objective and goal of this Statewide Salt Management Plan is to provide a framework for highway agencies to deliver safe, efficient roadway systems during winter storms in a cost effective, environmentally sound, and sustainable manner. The secondary objective and goal of this plan is to consolidate CCG's current practices and manuals into a single comprehensive guidance document.

2 Introduction

To be effective, a Salt Management Plan (SMP) should contain the principles and goals of a jurisdiction that deliver an enhanced Level of Service (LOS) to the traveling public while consistently meeting the agency's mission on environmental stewardship. The common goals for all jurisdictions include:

2.1 Public Safety

Effective winter storm maintenance has a direct impact on the safety of roadway users and on the personnel performing the maintenance. In the development of this plan, safety will be the primary goal.

2.2 Environmental Protection

Since the use of salt in high concentrations can have a negative impact on highway structures as well as roadside soil, plants and receiving waters, the development of the Best Management Practices (BMPs) contained in this plan will consider practices that promote careful handling and application of winter materials such as rock salt, minimize the total usage of those materials, and thereby minimize and reduce the negative impacts of winter operations.

2.3 Efficient Transportation System

Efficient transportation systems are essential in maintaining the mobility necessary for economic stability and in providing the quality of life expected by a jurisdiction's constituency. SMP development should factor in these requirements.

2.4 Fiscal Responsibility

State, county and local jurisdictions are bound by budgets determined by their governing bodies. The SMP for these jurisdictions must be within their financial capabilities.

2.5 Continual Improvement

To progress in the reduction of salt usage and negative impacts, jurisdictions need to consistently seek to improve current practices. Each jurisdiction should assess goals, technologies, practices, materials, and equipment on a recurring basis to determine if any changes can affect salt usage or reduce negative impacts. Since these changes may have a fiscal impact, there must be recognition that many changes may be incremental.

2.6 Local Development of Salt Management Plans

Because of the variances in state, county and local transportation agency resources and mission objectives, SMPs for said jurisdictions should be locally developed. The plans should define the key elements of an environmental management. Commitment to the plan should include accountability, goals, measurement of progress, communication, reporting, and periodic review. These aspects will ensure that local SMPs are living documents that allow for continual improvement.

3 Safety and Mobility

Agencies, such as CCG, are keenly aware of their goal to provide safety and mobility during winter storms in a cost-effective manner while minimizing environmental impacts to the maximum extent practicable.

In the reality of winter storms, the ideal outcomes for this goal are difficult to achieve and at times, conflict with one another. The principal driving force that often decides the hierarchy in this potential conflict is the defined LOS an agency is obligated to provide its customers.

However, LOS may not be the most appropriate and practical level of measurement during winter operations. During a winter storm, agencies should consider defining safety and mobility in terms of a “passable roadway”, considering the limitations imposed by weather conditions, resource availability and environmental concerns.

CCG defines “passable roadway” as a roadway surface that is free from snow drifts, snow ridges, and as much ice and snow as is practical that can be traveled safely at a “reasonable speed for the conditions”. A passable roadway should not be confused with "bare pavement," which is essentially free of all ice, snow, and any moisture. It should be assumed that a bare pavement condition may not exist until the weather conditions improve, and plowing can remove the full amount of snow and slush from the pavement.

"Reasonable speed" should be defined as a speed at which a vehicle can travel without losing traction. During and immediately after a winter storm event, a reasonable speed is assumed to be lower than the posted speed limit. Motorists should expect some inconvenience and modify their driving practices to suit road conditions.

3.1 Passable roadway expectations

It is considered inappropriate to attempt to melt snow as fast as it hits the ground or to keep the highway wet to eliminate any accumulation. Ideally, the proper combination of plowing with the appropriate amount of salt or brine should be used to prevent the bond from forming. If snowpack should occur, agencies should strive for “passable roadway” conditions and eventually “bare pavement” as soon as practical after the winter storm event has ended.

3.2 Class 1: High volume highways (high average daily traffic (ADT))

Highways in this category typically have high traffic volumes that make it necessary to focus on more than just the driving lanes during the winter storm event. On these highways “passable roadway” conditions should be maintained on the driving lanes, turn lanes and acceleration/ deceleration lanes during the winter storm event. Plowing is the priority for snow removal. Agencies should strive to keep the snow from packing on the driving lanes, turn lanes and acceleration/deceleration lanes during the winter storm event. Only enough road salt should be re-applied to keep the precipitation from bonding to the roadway surface.

3.3 Class 2: Highways with moderate ADT

On these highways, agencies should strive for “passable roadway” conditions on the driving lanes, turn lanes and acceleration/deceleration lanes during the winter storm event. Plowing is the first priority for snow removal. Agencies should apply only enough road salt to prevent bonding during the event.

3.4 Class 4: Highways with low ADT

On these highways, agencies should strive for “passable roadway” conditions on the driving lanes, during the winter storm event. Plowing is the priority for snow removal. The agency should strive to keep the snow from packing on the driving lanes during the event, only applying enough road salt to keep the precipitation from bonding to the roadway surface.

The classes generally correspond to the roadway functional classifications as defined by the Federal Highway Administration (FHWA).

3.5 Exceptions

Exceptions to this guideline will occur when a winter storm event is followed by subsequent storms that happen at a frequency where it is not possible to obtain passable roadway conditions and bare pavement between events. The severity of an event, roadway temperatures, geography, time of day, day of the week, and availability of re-deployable resources will dictate how soon passable roadway conditions and bare pavement can be obtained.

Passable roadways during winter storm events, as identified above allow emergency responders to provide adequate response times and transport to emergency facilities.

4 Establishing Goals to Reduce the Negative Impacts of Salt and Liquid Deicers

The tool that most winter maintenance agencies use to provide safe, passable roadways is the tried-and-true combination of plowing and salting. While the best practices of this plan are readily understood as tools for managing the impacts of winter materials on budgets, highway managers should also be aware of the costs and negative consequences of salt on highway infrastructure and environments beyond the right of way.

Salt and all winter materials have positive benefits as well as potentially negative impacts. In addition to the costs of the deicing materials and their application, the use of these materials can be economically damaging to CCG because they deteriorate concrete and corrode aluminum and steel. Of no less importance, these materials may also cause costly damage to trees, grass, and other plants, while having detrimental impacts to water quality and aquatic organisms.

Perhaps worst of all from the perspective of the highway maintenance manager, the heavy and repeated use of salt and other winter materials can permanently damage the structure of landscape soils, reduce the ability of soils to physically support traffic loads or resist rutting, and can destroy the ability of the soil to sustain plant growth. All these consequences can lead to large areas of bare soil, embankment erosion, and various types of structural failures.

As the use of salt and other winter materials increase in any area, the severity, economic costs, and environmental impacts of salt also tend to increase. The purpose of the SMP is ultimately to reduce the likelihood, severity and costs of winter materials and their consequences. To that end, some understanding of the specific problems that may be caused by winter materials are useful to understand.

Rock salt is predominantly sodium chloride. In addition to damaging structures, sodium causes physical deterioration of soils, makes soil more alkaline and removes nutrients, and after years of sufficiently heavy use can cause such extensive damage that complete removal and restoration of the soil is the only practical solution. In addition to damage from sodium, the chloride content of rock salt is cumulatively damaging to soils, plants, and water quality.

Although soils can absorb and safely ‘excrete’ relatively large amounts of sodium and chloride over time due to the cleansing action of rainfall, the heavy and repeated application of salt is eventually unsustainable and leads to irreversible damage. Likewise, heavy and repeated use of brine solutions which may contain sodium chloride as well as magnesium chloride pose similar problems and are eventually damaging to both plants and soils when applied in excess.

In the end, this plan is intended to serve the interests of citizens and the business community by reducing the cost of applying winter materials as well as the cumulative costs and environmental impacts of salt resource overutilization.

There is an adage “that which gets measured, gets done” and best practices for salt management are no exception. Winter operations managers must track salt usage along with other related snow and ice control efforts, and they should also measure the severity of winter weather to determine how severity correlates to salt use and salt damage to highway structures and landscaping.

Setting annual quantity goals for salt reduction is not always practical due to the dynamic nature of winter storms that vary in number, intensity, geography, and other factors. Thus, measurements should be used to recognize and respond to trends and usage patterns, rather than to simply develop annual reduction goals. However, by analyzing trends and understanding the negative impacts of winter materials, it is possible to develop and implement a responsible plan with long-term goals that reduce the likelihood of damage while maintaining acceptable safety and mobility for highway users.

5 Equipment and Materials

Winter operations require specific equipment and materials to maintain safe, passable roads. The equipment must be properly serviced, calibrated and/or repaired prior to the beginning of the season. Materials require proper storage, handling, and distribution across the roadway system.

5.1 Types of Winter Materials

Salt is the primary snow and ice control material used by CCG and by many agencies throughout the country. It is used because it is effective for winter storms in Maryland, inexpensive, easily stored, and readily available. Granular road salt is used primarily during storms when precipitation has already begun to fall. Over the past few decades, research into other materials has been conducted, but none have been able to replace salt in benefit/cost effectiveness and reliability. While it will continue to be the primary material for fighting winter storms, agencies should continue to look for ways to minimize its use. That is the focus of this SMP.

Agencies should continue to explore and research innovative materials which can produce results equal to or better than sodium chloride.

5.2 Material Storage and Handling

Agencies should store salt in salt barns, salt sheds, or other permanent structures whenever possible. CCG for example, stores all its material in domes or barns. The structures should be well maintained. Potential problems should be identified during routine operations or through a periodic inspection program. Maintenance should be performed on structures during the off-season. Aging structures that have repeated high repair costs should be replaced when funding is available. Preventive measures, including only loading a salt structure to design capacity, are the most effective method in maintaining these structures. Proper loading of any structure, sheds or barn, is crucial to maintaining its integrity and the safety of agency/contractor employees.

Properly maintained structures, along with good housekeeping practices, allow agencies to keep salt in proper structures, minimizing negative impacts. CCG uses a variety of methods to prevent salt from spilling out of structures. Maintenance facilities place straw bales, aggregates, or wooden gates at the structures' entrance. Agencies should gather salt spilled near salt structures during loading and unloading operations. Unused material should also be returned to the salt structure.

Agency procedures should be in place for capturing salt spilled on pavement during the loading or unloading of the material. CCG for example, maintains regulatory required Stormwater Pollution Prevention Plans (SWPPP) for all primary facilities, and has developed SWPPPs for satellite salt storage facilities as a BMP. The SWPPPs outline pollution prevention measures for salt storage and handling. Large salt spills should be addressed using equipment such as a front-end loader, while small amounts can be addressed with a shovel and broom. In either case, the material should be returned to the salt structure as soon as possible. To ensure salt is properly contained and not exposed to stormwater, routine inspections are conducted by facility personnel and environmental professionals.

5.3 Snow and Ice Control Equipment

CCG purchases a variety of equipment and assigns it across the county to meet the needs of each maintenance facility.

5.3.1 CCG Equipment

Agencies should procure and employ the most effective snow removal equipment possible. Dump trucks should be equipped with well-maintained front plows that can mechanically remove as much snow as possible from highways.

Dump trucks should also be equipped with well-maintained salt spreaders and spinners that can apply the required amount of salt on roads in an effective pattern that minimizes material waste. Agencies should consider and employ, whenever possible, electronically controlled salt spreading equipment. This equipment can be remotely controlled to a specific application rate that will prevent operators from using more salt than necessary.

Agencies should calibrate all salt spreading equipment, regardless of its type, prior to the start of a winter season and check it for accuracy periodically throughout the season. This is a critical aspect of effective salt management. Additionally, technological advances now allow for this equipment to capture location, as well as salt application rates and usage, which is specifically useful for tracking purposes in environmentally sensitive areas.

Agencies should use other specialty equipment for removal of snow from highways, when appropriate. Front end loaders are effective in removing a heavy buildup of snow from sections of roads where plows are not effective. Motor graders may be needed to mechanically remove snow or ice that has “packed’ on highways. Effective use of these specialized pieces of equipment lessens the need for salt to return a roadway to a passable condition.

CCG maintains a fleet of dump trucks, the majority of which are single axle units capable of carrying 5 to 6 tons of salt. The remainder of its dump truck fleet consists of tandem, tri-axle, or quad-axle trucks capable of carrying 10 to 15 tons of salt. The dump trucks are equipped with well-maintained plows, and electronically controlled spreaders that can apply the required amount of salt on roads in an effective pattern that limits material waste. The equipment is calibrated for accuracy prior to the winter season. CCG also has a limited fleet of specialty equipment including front end loaders, and motor graders.

As with winter materials, agencies should continue to explore and research innovative equipment for the mechanical removal of snow and ice from the roadways.

5.3.2 Hired Equipment Contract for Snow Removal Services

Agencies should consider hiring supplemental contract equipment to support their own forces if needed, to maintain prescribed LOS. Hired equipment must be equipped with well-maintained plows and spreaders to assure effective and efficient snow removal and salting operations. Poorly equipped and maintained contract equipment can lead to excessive salt use. Agencies should provide training materials to hired contract equipment operators in all facets of plowing and salting operations. Poorly trained contracted operators can use excessive amounts of salt. CCG provides required online training for its hired equipment operators prior to the winter season.

Agencies need to train frontline supervisors to ensure effective management of contractors and their equipment. This ensures that contract operators are following an agency's policies and procedures, particularly in salt usage.

For example: spreader systems on contracted dump trucks should be calibrated prior to winter. Tests should be performed on each unit to ensure that the amount of salt physically spread on a highway correlates to a setting on the control knobs in the truck's cab. It is critical that contract trucks are calibrated, and its operators are closely monitored by agency personnel to avoid improper salting. CCG ensures that contractors' trucks are calibrated and can pass a stringent quality control inspection prior to entering a contract.

6 Training Initiatives

Training is a critical component of salt management and a BMP in winter operations. Agencies should provide training in salt management to maintenance managers and frontline forces on a regular basis. The focus of the training should be on BMPs that stress the importance of using the least amount of material as possible to provide safe, passable roadways for motorists. In this manner, CCG ensures that all maintenance personnel receive updated training at least once every five years.

In the fall of every year, a CCG expert at winter maintenance operations and salt management best practices conducts training at the maintenance facilities. This training session presents information on the previous season's salt usage, equipment/storage upgrades, winter operations BMPs, and other winter topics relevant to any new initiatives. Internal outreach with our staff has had a huge impact on our salt reduction successes. Discussions encompass all aspects of CCG's salt usage and our obligation, not only to the environment but the individual customer as well. The information communicated among all parties has been extremely beneficial, leading to the creation of best practices in our salt reduction strategies that will be useful for years to come.

Training should also be provided to hired equipment operators and temporary employees. The training (Appendix A) concentrates on the need to adhere to CCG snow and ice control policies and procedures. A major focus of this training should be on the proper use of salt and other winter materials. CCG provides online training prior to utilizing hired contractors.

Should circumstances not allow in-person interactions between CCG managers, operators, or hired equipment vendors, technology will be used to convey any new presentations and initiatives.

7 Winter Storm Management

Winter storm management involves effective planning, execution, and review.

7.1 Pre-Storm Planning

Pre-storm planning is an effective tool for managing salt usage in a storm and a best practice in winter operations. Effective planning prior to storms will equate to better performance during a storm including more efficient usage of salt. CCG's pre-storm planning for example, can begin as early as 72 hours prior to major winter storms. CCG's planning for typical winter storms begins 18 to 24 hours prior to events.

CCG should begin resource planning well in advance of the forecasted start of a winter storm. CCG personnel and hired contractors, if applicable, need to report to their facilities or garages with enough lead time to thoroughly inspect plow trucks and make any minor repairs. All hired equipment units reporting for winter event operations should do so in effective, working condition. Any major repair should have been addressed prior to the season's start or immediately after the end of the previous storm. It is imperative that equipment is working properly and prepared for operations. CCG and hired truck operators should load salt materials on their equipment in an environmentally prudent manner.

Agencies should consider holding pre-storm meetings with facility or garage personnel. These meetings would provide managers with an opportunity to alert personnel about the latest weather and road forecasts, emphasize the need for effective plowing, reiterate the need for sensible salting, identify appropriate salt application rates. It also allows for information exchange and a sharing of opportunities for improvement. Many CCG facilities routinely hold pre-storm meetings for all events.

Once the equipment is ready, it should be pre-positioned on its snow route prior to the start of the event. Pre-positioned snow equipment speeds up the response time of an agency. This is particularly important if the forecasted start time of the storm could affect morning or evening rush hour traffic. If snow fighting equipment becomes trapped by traffic congestion, it might not be able to get to its snow route in an acceptable time.

7.2 Winter Storm Operations

Once a storm begins and precipitation starts to accumulate on highway surfaces, agencies begin de-icing operations. If a typical winter storm begins with light snowfall, a light coat of granular salt should be applied. If a winter storm begins with moderate to heavy snowfall, applications should be adjusted accordingly.

The key is to get material onto the roadway as early as possible to prevent snow or ice from bonding to the highway surface, but not so early that traffic moves it onto the shoulders, rendering it useless. This will allow for effective plowing and lighter salt applications throughout the remainder of a storm.

As the storm continues, forces need to react to changing conditions. As the initial application of salt begins to lose effectiveness and snow continues to build on highways, forces should begin plowing operations. If the initial application was successful, the buildup will be "mealy" and easy to remove with proper plowing techniques. The plow operator should re-apply just enough salt to keep subsequent snowfall from bonding to the pavement. This process may have to be repeated multiple times during a winter storm.

7.3 Severe Winter Storms

Severe winter storms create unique challenges for a SMP. Agencies must be prepared to step up their response throughout the event, from pre-planning operations to final storm cleanup. They will be called upon to provide passable roadways, especially for emergency response, while fighting heavy accumulations of snow, freezing rain, or blizzard conditions. CCG has fought several severe winter storms in the past and learned much in the process.

When fighting storms with heavy accumulations of snow, agencies should concentrate on plowing operations and limit salt applications. Plow trucks should still spread a small amount of salt to prevent snow from packing on the road. However, the emphasis should remain on continuous plowing. As the storm begins to wind down and most of the snow has been removed, an appropriate amount of salt will help remove the remaining frozen precipitation from the surface. As in all other events, salt applications should be as efficient as possible. CCG adheres to this approach.

Freezing rainstorms also present special challenges to agencies. Freezing rain, if left untreated, will coat highways with ice, creating severe safety and mobility issues for motorists. CCG has found that the best treatment for freezing rain is applying salt, which prevents the ice from forming. A focal point during a freezing rain event is ensuring salt is placed and always remains on the roadway to prevent ice formation.

Winter storms that occur at the start of or during rush hour traffic pose significant challenges to effective salt management. A winter storm that drops one or two inches of snow during rush hour can be more troublesome than a winter storm that drops five or six inches during off-peak travel times. CCG and other agencies have learned that they must place salt on highways prior to heavy traffic. Once traffic builds up on highways, plow and salt trucks cannot address snow buildup. In addition, snow can be "packed" on the highway surface, requiring very heavy plowing and salting to remedy it. Appropriate applications prior to rush hour is one of an agency's best tools in limiting total salt usage during this type of event.

Severe winter events such as blizzards or back-to-back storms create unique challenges to agencies and effective salt management. While normal plowing and salting can keep a highway in a passable condition during a typical winter storm, heavy snowfall requires more intensive plowing operations. Cycle times of plow trains to cover their assigned route are severely challenged with heavy snowfall storms. In these events, agencies should still apply salt, at a reduced rate, during each plow train cycle.

This is critical if snowpack or icepack is to be avoided. Salting should keep subsequent snowfall in a plowable state, so it can be addressed in the next plowing cycle.

8 Post Storm Operations

Post Storm Operations include a variety of tasks including cleaning equipment, stockpile maintenance, and operation reviews.

8.1 Equipment Cleaning and Maintenance

Agencies should develop plans for equipment cleanup and maintenance after winter storms. Cleaning of snowplows and trucks should occur immediately after operations are complete, when possible.

These cleaning operations should occur inside the wash bays at the facility. Cleaning of salt spreaders and plow blades that have been removed from vehicles should occur in a manner whereby wastewater does not discharge into stormwater systems.

CCG maintenance facilities where vehicle maintenance occurs are required by MDE's General Permit for Discharges from Stormwater Associated with Industrial Activities (Discharge Permit No. 12-SW) to develop and implement a site-specific Stormwater Pollution Prevention Plan (SWPPP). While the CCG plans are site specific, they all contain consistent protocols, inspections, documentation, and reporting requirements related to potential pollution sources such as equipment cleaning and maintenance operations. Should a plan not already exist, one should be developed.

8.2 Material Cleanup at Storage Facilities

Immediately after winter storm operations have ceased, all unused salt should be returned to a storage facility. CCG's SWPPPs, for example, include requirements for material storage at maintenance facilities.

8.3 Operations Review for Continual Improvement

A CCG review of operations after winter events is an essential best practice in winter operations and salt management. CCG will have post storm reviews at their maintenance facilities for most winter storms.

Post storm reviews should concentrate on three key elements: what worked well, what did not work well, and most importantly, opportunities for improvement. The opportunities for improvement lead to best practices. Post storm reviews can also be used to identify "champions" who get snow routes cleared with less salt. The "champions" should be encouraged to share ideas with others at the facility to encourage and promote efficiency in salt application.

9 Spill Prevention and Control Plan for Winter Operations

First and foremost, agencies should make every effort to prevent the uncontrolled release of winter materials into the environment at storage facilities and on highways. CCG, for example, developed and implemented site specific SWPPPs for each of its maintenance facilities. The individual plans consider potential sources of stormwater pollution and describes practices to reduce these potential pollutants. While the plans are site specific, they all contain a common approach to spill management of winter materials.

9.1 Salt Spill Prevention

When loading salt at storage locations, trucks should never be overloaded. If they are, salt can spill from the sides or back of the truck when it is leaving the facility or when it is on route.

Overloading trucks with salt should be avoided and is a clear violation of best practices for salt management. If spillage occurs, it should be addressed during a storm if time allows or at the close of the event.

Another best practice is the deployment of tailgate flaps that prevent salt from spilling out of the back of dump trucks. These small triangular pieces of metal can be made in house for a few dollars but can save tons of salt over the course of a winter season. CCG requires tailgate flaps on all county and contractor trucks.

There are times when salt can spill from a truck that was not overloaded. If the auger in a truck's salt spreader box becomes jammed with a large chunk of salt or debris, the operator may have to manually clear the box. At times, the jam is cleared but salt falls to the pavement. At other times, a truck operator may have to raise the dump truck bed to move material to the rear of the truck. This occurs when the salt in the bed of the dump truck begins to get low. During this operation material can spill from the rear of the truck.

Whenever salt spills from a truck, either from being overfilled or not, it should be swept up and placed back in the bed of the dump truck. Operators must do this in a safe fashion so as not to endanger themselves or motorists. Effective salt management does not equate with unsafe practices.

10 Recordkeeping and Annual Reports

Agencies should keep up-to-date records of all winter operations, especially records of salting. Records should be kept for each winter event, and for each winter season. This will allow for seasonal analysis and the identification of trends. CCG maintains up-to-date records of salt usage and other key performance measures and produces quarterly and annual reports for its statewide business plan.

11 Annual Winter Wrap-Up Meeting

Agencies should hold an annual meeting to review winter operations, deepening their understanding of lessons learned from post storm reviews, and identifying areas of concern such as salt management, equipment improvements, etc. The annual meeting can be used to identify key opportunities for improvement and set up teams to tackle them over the summer. It is critical that the progress of the teams is tracked closely so that the efforts come to completion prior to the following winter.

12 Public Education and Outreach

Agencies should make every effort to provide the public with information concerning their winter operations and winter storm activities. Agencies should consider an annual media briefing to update radio stations, television, and print media in their area about their winter operations program. Agencies can use this opportunity to review their experiences during the past winter, discuss their plans for the upcoming winter, and highlight new initiatives. This information could then be shared, through the media outlets, with the public.

Agencies should also consider providing customer service for their citizens during and after winter storm events via telephone and internet. An agency's maintenance facilities or garage personnel or its emergency operations center can respond directly to citizen needs in real-time on a localized basis. General questions about operations can be handled through the facility or garage managers or by the agency's office personnel.

13 Summary

Agencies should view these Best Practices for Salt Management as a starting point in their winter operations. Agencies should always strive for effective salt management and road safety.

Agencies should also seek opportunities to work with various regional, county, and local organizations to provide seamless operations during winter storms. However, agencies need to be cognizant of the fact that other agencies will have different needs based upon public safety, geography, traffic and weather patterns, environmentally sensitive areas, available resources, budgets, and constituency expectations.

Best Practices for Salt Management is a living document updated on a regular basis. In that regard, CCG will attach a series of appendices to this document. They will address issues such as training, pre-storm checklists, post storm reviews, and material handling. In addition, CCG will continue to attach appendices to this document as new information becomes available. Best Practices for Salt Management should be a key tool to provide the citizens of Maryland with safety and mobility during winter storms in a cost-effective, environmentally sustainable manner.

14 Appendix A: Contractor Operator Presentation


CHARLES
COUNTY
ROADS
Contractor Operator
Presentation

Invoicing Requirements

Snowstorm Invoices:

- Snowstorm invoices are required to be submitted within 5 working days from the completion of the call out. You as a contractor, are responsible for submitting an invoice for payment.
- Snowstorm invoices are to be completed using one invoice per day, per vehicle.
- Snowstorm invoices are required to be submitted by email, fax, drop-off, mail, or online using the county roads website.
- A valid email address shall be listed on the Contractor information sheet in the Contract.
- Snowstorm invoices must be the provided county invoices. No other invoices will be accepted.
- Payments will be distributed within three to four weeks after the invoice is received. DO NOT call or visit the Government building for your check.
- All checks will be mailed unless you have enrolled in direct deposit.

Invoicing Requirements

Retainer Fee Invoices:

- It is the Contractor's responsibility to submit an invoice to the Public Works after April 15th.
- Only single, tandem, tri-axle, and/or tractors can receive the retainer fee.
- All vehicles must have a snow route or have been called out during the snow season to obtain the retainer fee.
- All county equipment MUST BE picked up before November 12th and returned before April 14th. County equipment must be returned with all plow pins and in clean, free of salt/dirt condition.

Equipment Numbers:

- Equipment number(s) have been established for equipment type/configurations in the Contract. These will be required on the Contractor Equipment Statement and all invoices.
- If item number(s) and equipment type/configurations are not included on the Contract/invoices this will delay payment.

Insurance/Registrations

- All insurance policies/registration(s) must be maintained, at a minimum, from November 1st through April 30th.

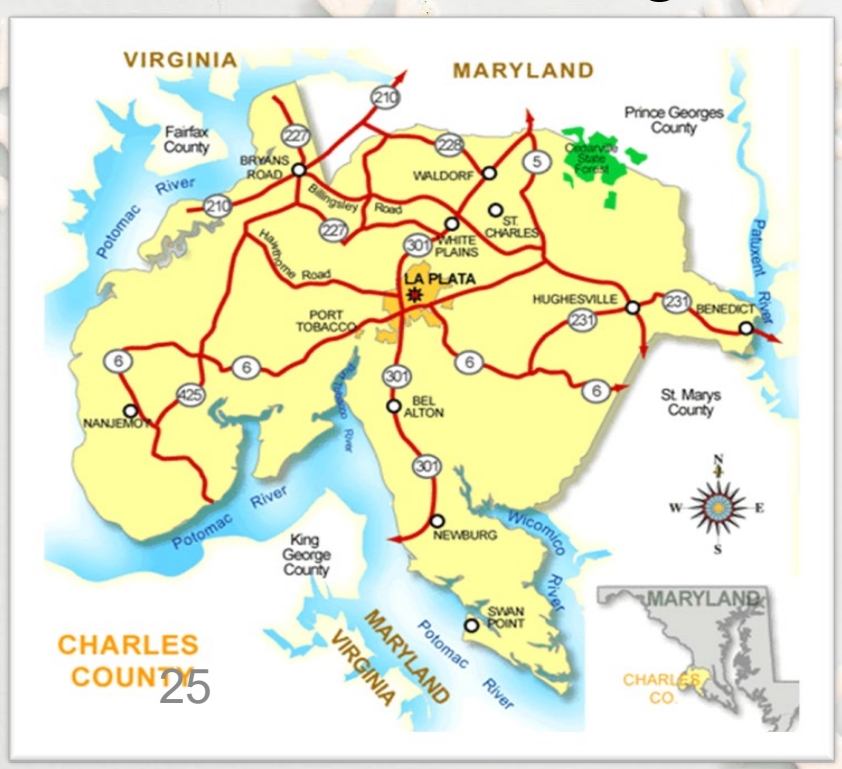
- The failure to maintain all insurance/registration requirements throughout the term of the Contract will be cause for termination of the Contract and will void the post-season retainer and any remaining minimum payment guaranteed due to the Contractor.

- The contractor shall make CCG aware of any changes to the status of certificate(s) of insurance or registration(s) within five (5) calendar days.

Maps and/or GPS

- Check your route before it snows for obstructions (tree limbs, manhole risers, potholes, etc.) If you see an obstruction, please notify Public Works.

- All snowplow drivers must know their routes before a snow event, or have one of the following:
  - GPS
  - Map Book



Winter Operations

- Safety is CCG's number one priority during all snowstorm activities.
- Snow removal equally shares first priority regarding highway maintenance operations.
- CCG and Contract forces are jointly responsible for minimizing impacts to our environment and minimizing winter operations costs.
- CCG's Policy states that winter operations will continue until all county roads are free from snow and ice.
- If needed, relief operators shall be employed by the Contractor and shift changes shall occur on the assigned snow route or at a predetermined location.
- Contractor operators/equipment are not exempt from any FMCSA laws or regulations, including hours of service, while performing winter operations for CCG.

Contractor Equipment Basic Guidelines

Single Axle

- GVW Min. 26,000
- Load capacity Approx. 8 tons/5yd min

Tandem Axle

- GVW Min. 55,000
- Load capacity approx. 15 tons/10 yd min

Triaxle Axle

- GVW Min 70,000
- Load capacity approx. 22 tons/15 yd min

4 Wheel Drive Trucks

- ¾- two ton pick up style trucks/ includes dual wheel "dually"
- **NO** tailgate spreaders

Tractors

- No tractors lower than 50 hp
- Tractors must have snowplows not buckets

See section F of the contract for all guidelines.

Contractor Equipment Requirements

- All equipment used for snow removal operations shall have met the Contract requirements.
- All equipment used for snow removal operations shall be inspected and approved by CCG and listed on or added to the Contract prior to its use.
- All new or returning contractors who are adding new equipment are required to pass inspection.
- All equipment inspections are by **APPOINTMENT ONLY!**
- Equipment inspections are done Monday-Friday from 7:00am – 2:00pm.
- If any equipment used by the vendor is found to be non-compliant and in breach of the Contract, it may be terminated.

County Equipment Pickup & Returns

- All county equipment must be picked up by November 12th

- All county equipment must be returned by April 14th unless told otherwise

- Please make sure you call or email roads staff for pickups and returns. You will be turned away, if you show up without an appointment. If you can't get through by phone, please email Jessie Settle at SettleJ@charlescountymd.gov

- If the county equipment needs to be repaired, please notify roads staff or the shop before returning the equipment

CHARLES COUNTY GOVERNMENT
Department of Public Works
Facilities Division
Bill Shreve
Director

Phone 301-932-3440
Fax 301-932-3449
Email DPF@CharlesCountyMD.gov

I, _____, agree to return Charles County snow
Print Name of Contractor
equipment listed below, properly cleaned and in good working condition to the Department of Public Works by April 15, 2019. I agree to forfeit my end of season retainer fee of $500.00 if these conditions are not satisfactory.

County Plow #	County Frame #	County Spreader #
PL-	FR-	SP-
PL-	FR-	SP-
PL-	FR-	SP-
PL-	FR-	SP-
PL-	FR-	SP-

_____
Signature of Contractor or Representative

_____
Print Company Name

_____
Pick-Up Date

_____
Witnessed By

Date Returned: _____

Condition: _____

Signature of Inspector: _____

Signature of Contractor: _____

1001 Radio Station Road | La Plata, Maryland 20646
Maryland Relay: 7-1-1 (TDD: 1-800-735-2258)

Equal Opportunity Employer
www.CharlesCountyMD.gov

Snow Removal Requirements

- Operators are required to have all equipment calibrated and operational prior to check-in.
- All contract personnel and equipment must be logged in and out of service and, at the request of the facility, operators must provide their cell phone number.
- **NO REPAIR DELAYS!** All equipment should be ready for work upon arrival.
- CCG will not pay for down time on trucks and equipment that extends beyond one hour. This will include any piece of equipment that is involved in an accident, at fault or not.

Call-Out Phases

- Each storm is evaluated based on the forecasted accumulation and severity.
- Report times can be accelerated based on intensity of the storm, timing of the event, and other factors beyond CCG's control.
- CCG will consider all factors when determining the proper response for each event.

Salt Impacts on the Environment

So, what's the big deal?? Salt is a naturally occurring substance!

While salt is a naturally occurring substance, high concentrations of salt negatively affect or destroy land and aquatic habitat/species

- Once granular salt mixes with snow or ice it becomes a brine solution. This solution then runs off the roadway and is forever stored in soil or water and can reach levels that are considered unhealthy to the environment.
- Salt will contaminate drinking water supplies in wells and reservoirs, slows the establishment of vegetation or crops, and destroys waterways for fish and other marine life.

Salt

- Only use salt when told to do so by your supervisor.
- Make sure your salt box is calibrated
- Report salt spills immediately
- Return all salt to DPW Yard (La Plata Shop)
- You will need a sticker in order to receive salt
- County trucks will be loaded first
- All first-round salt will be loaded at either the La Plata Shop or White Pains (Demarr Rd).
  - 4x4 Trucks – White Plains
  - Six & Ten Wheelers – La Plata Shop

Salt

- A Public Works staff member will be walking the salt line to sign you in

- Once signed in contact your supervisor (if they don't answer leave a message)

- Supervisor will inform you on where to meet, which will be the same location for the year, unless told otherwise or your truck is moved to a different route

- MOST IMPORTANT- Stay in contact with your supervisor at all times. If they don't answer leave a message, if you don't hear back within 15 minutes call the superintendent (located on route sheet), or the main office.

Salt Domes

La Plata Shop

1001 Radio Station Road
La Plata, Md.
20646

Demarr Rd

10791 Demarr Rd
Salt Barn Place
La Plata, Md.
20646

Breeze Farms

15950 Cobb Island Rd
Cobb Island Md.
20625

Pisgah

Pisgah Park Pl
/Landfill Rd

TMDL

- **T**otal **M**aximum **D**aily **L**oad

- Definition: a regulatory term in the U.S. Clean Water Act, describing a value of the maximum amount of a pollutant that a body of water can ingest daily while still meeting water quality standards.

- TMDL's already exist for phosphorus, nitrogen, and sediment for many watersheds and waterways in Maryland.

YOU play a more prominent role in protecting our environment during winter operations than you may have originally thought

Practical Salt Usage

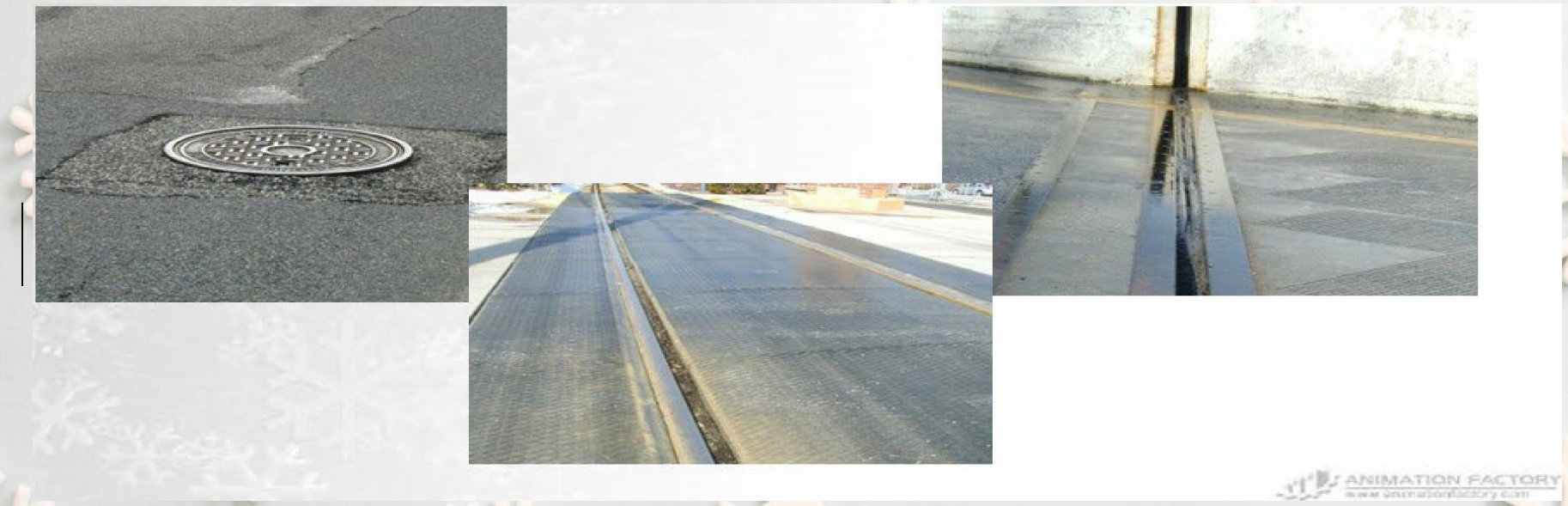
- A well-trained operator knows when to apply salt and when not to.
- Use the correct amount of salt necessary to get the job done.
- Using more salt than necessary works against you and damages the environment.
- Never overload trucks to avoid spillage of salt at CCG facilities and on the road.
- Always travel at a safe speed for optimum performance, safety, and to help keep salt on the road and out of the roadside ditches.

Practical Salt Usage

- Always keep your load covered to avoid unnecessary loss of material when traveling.
- Don't salt roads that have already been salted
- Only apply salt to your designated snow route when directed by CCG personnel
- Always use appropriate shop application rates or rates as directed by CCG management
- Don't apply salt to an undesignated snow route unless directed to by CCG personnel
- All unused salt must be returned to the barn that it was located from
- Never spread salt just to get rid of it

Best Practices for Plowing Safety

- Be aware of the weight of heavy snow and the damage it can cause when thrown by a plow
- Watch out for manholes, railroad tracks, expansion joints, bridge abutments, utility cuts, mailboxes, etc.



Best Practices for Plowing Safety

- Watch for curbs and steel plates
- Be aware your truck's bed height – watch for overhead signs, traffic signals, utility wires, tree limbs and bridges

Intersections

- Empty your plow before crossing intersections
- Reduce the size of the windrow
- Avoid building snowbanks that interfere with sight distance
- Keep traffic signs unobstructed from view

Curves

- Plow curves from the high side to the low side
- Spread salt on the high side of curves
- Keep your speed down on all curves

Bridges and Overpasses

- Bridge surface may be higher than the road surface due to the bridge freezing and expanding

Shoulders, Medians & Jersey Barriers

- Plow away from medians with minimum width shoulder and barrier wall
- Avoid plowing snow against a jersey barrier as this creates a ramp for vehicles to possibly become airborne

Hills

- Traction is limited on hills
- Stopping can be difficult on hills
- Watch for melted snow refreezing in the road valley

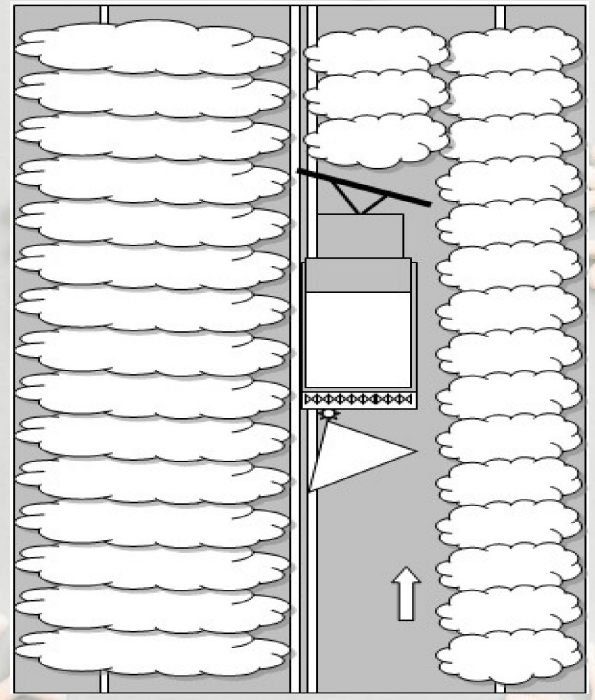
Railroad Crossing

- Avoid piling snow against signals, switch boxes, signs, etc.
- Raise plows slightly when crossing railroad tracks
- Watch for flashing lights and mast arms blocking the roadways

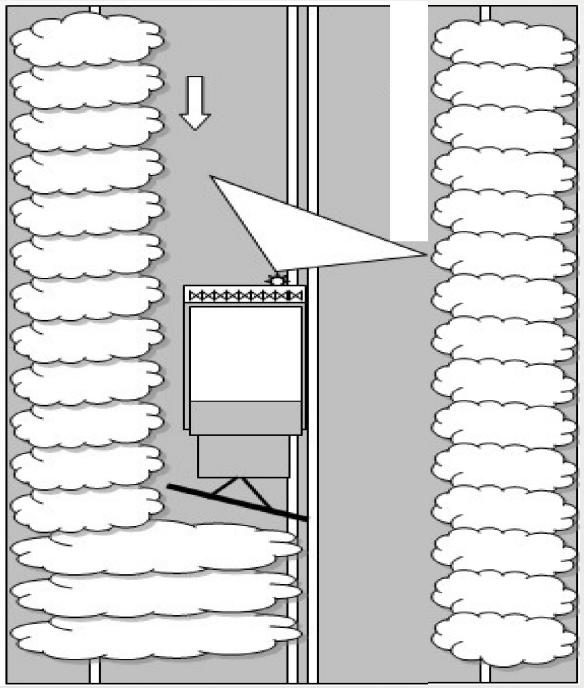
Two Way Road Single Truck

First Pass & Second Pass

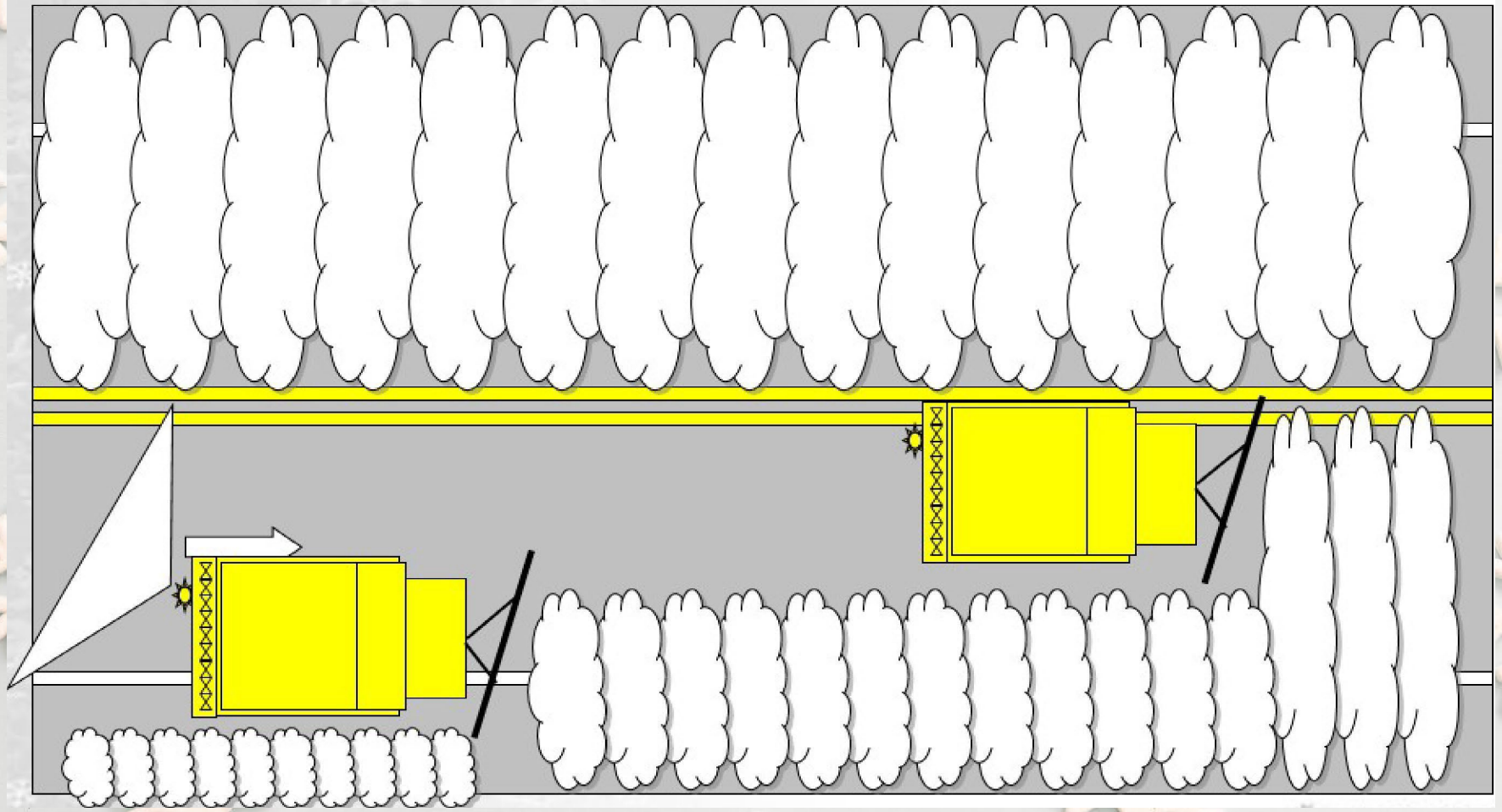
1st - Plow lane in one direction and drop salt behind truck



2nd - After plowing in one direction, turn at end of route, plow lane in opposite direction and salt both lanes



Two Way Road Two Trucks



Plowing Points to Remember

- Always give bridges and ramps special attention
- Salt the high sides of curves
- Do not over-use salt. Use just enough to get the job done
- Designate specific trucks in a plow train for salting to ensure no overlap of resources
- Salt loses most of its effectiveness at temperatures below 20°F
- Adding more salt to an already salted roadway can actually cause the brine solution to freeze
- Salt stops working altogether at -6°F

County Guidelines

- Always contact your supervisor prior to leaving your designated snow route or if you get separated from your assigned truck
- Show up or commute time, from the designated CCG facility to assigned route, must not be excessive
- Always communicate the need for fuel or meals with your snow supervisor prior to leaving your assigned route
- Coordinate all refueling to minimize disruptions to the snow removal operations

County Guidelines

- Check the cutting edge of your plow before each event to avoid damage to the plow structure
- When working for CCG, DON'T plow and salt parking lots, driveways or roads that do not belong to CCG
- All trucks loaded with salt while on standby or just plowing should be covered to avoid freezing

Accidents and Damage

- Always maintain a heightened state of awareness when working around salt structures or out on the roadways
- Please report mailbox or vehicle damages to your supervisor ASAP
- Report all accidents involving CCG equipment or facilities promptly to the snow supervisor and obtain a police report
- CCG will not be held responsible for damage incurred to the Contractor's vehicle while carrying CCG's snow removal equipment

Accidents and Damage

- Upon returning to the shop, the driver will stay with their truck and assist with the repairs of CCG equipment

- If a repair part is required at the shop, all repair parts must be acquired by a shop mechanic

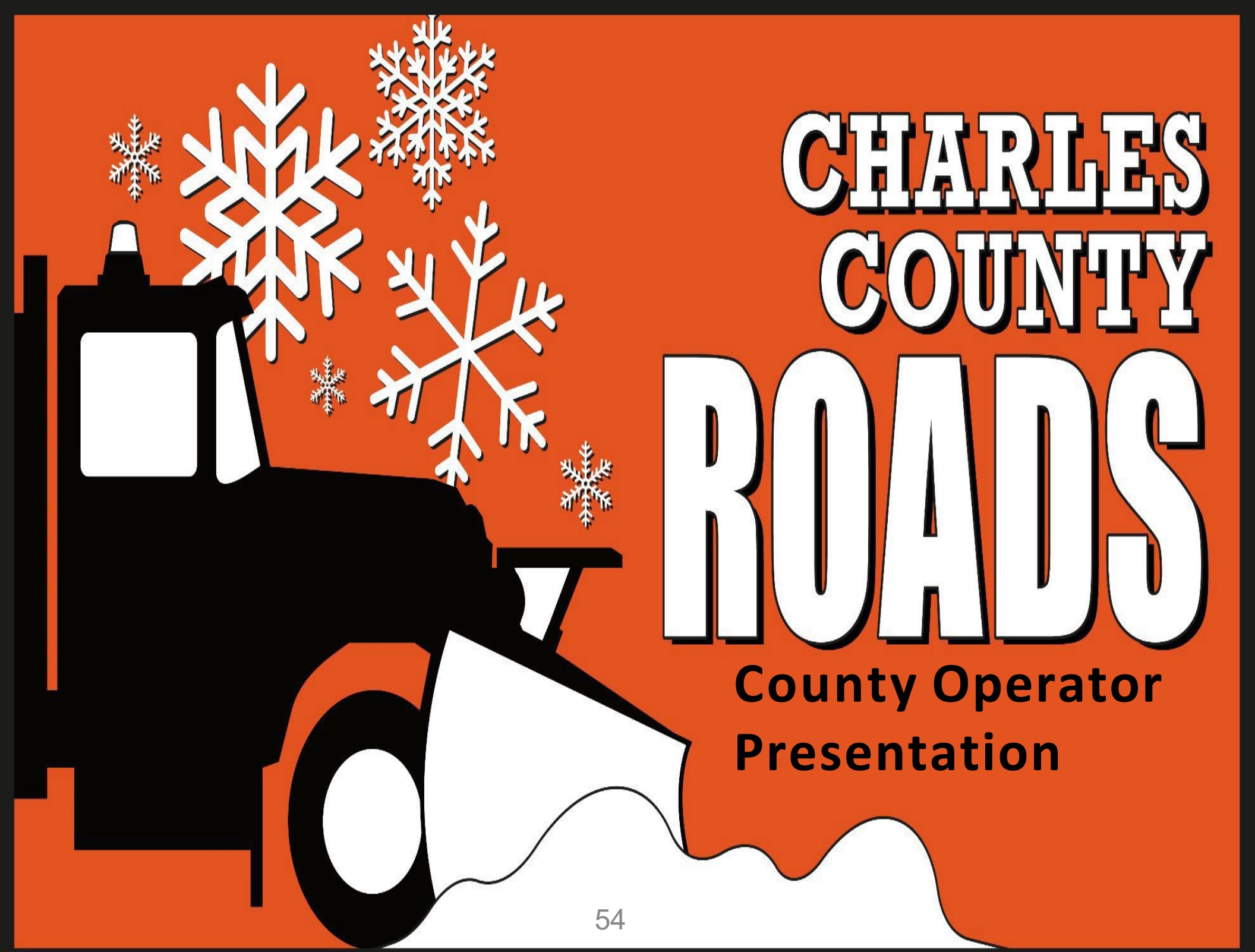
- All damaged or non-operating equipment must be reported to the snow supervisor, repaired ASAP and/or prior to the next storm

Thank You For Your Attendance!

There is no better time than the present to express our appreciation for your support

The Charles County Government thanks you for making a difference towards out winter snow removal activities

15 Appendix B: County Operator Presentation


CHARLES
COUNTY
ROADS
County Operator
Presentation

County Operator Guidelines

- Always communicate the need for fuel or meals with your snow supervisor prior to leaving your assigned route
- Coordinate all refueling to minimize disruptions to the snow removal operations
- Check the cutting edge of your plow before each event to avoid damage to the plow structure.
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Winter Operations Overview

- The primary objective for all maintenance personnel during winter operations is to make every effort to maintain all roadways under their jurisdiction in a safe and passable condition throughtout a storm.

- To provide an exceptionally high level of service to our customers at the lowest possible cost in dollars and damage to the environment and the highway network.

Winter Operations Strategies

- **Anti-icing** is a proactive winter strategy of preventing snow or ice from bonding to the pavement.
  - **De-icing** is traditional reactive winter maintenance strategy of breaking the snow/ice and pavement bond once formed.
    - **Both strategies are critical** and play roles in CCG's snow and ice control operations.

Using Solid Material

- For proper operation, spreader systems need to be calibrated yearly, at a minimum.
- At the beginning of a storm, the initial salt application should be made as soon as snow or ice begins to accumulate on the pavement.
- The prevention or breaking of the snow bond to the road is the primary reason for applying salt in a snowstorm.
- Salt produces a brine solution that keeps snow and ice from bonding to the pavement.

Using Solid Material

- A well-trained operator knows when to apply salt, and when not to.
  - The main idea in a storm is to use no more salt than is necessary to correct the condition at hand.
    - Using more salt than necessary to correct the condition will work against you and it damages the environment.

Safety

- Snowstorms are the number one hazard to traffic on our roadways.
- Snow removal equipment is the number two hazard to traffic.
- The number two cause of accidents was found to be the snowplow attached to the dump truck.
- Remove the plow after completing snow removal operations.
- Remove the plow frame or lower the lift arm to reduce the potential hazard to other vehicles.
- It is never a safe practice to back up a dump truck.

Safety

- Backing during a snowstorm is just asking for trouble.
- Watch for overhead obstructions during salt spreading operations when raising the dump bed.
- The higher the dump bed is raised, the more likely the truck is to tip over.
- The higher the truck bed, the lower the truck's speed should be.
- Operators must obey the same rules as any other vehicle on the road.

General Knowledge

Roadway Plowing

- Operator's knowledge must include the preventive maintenance (PM) of a dump truck and anyu related pieces of equipment.
    - How to mount the various types of plows, salt box, and spinner.
        - The operation of the plow, salt box and spinner.
            - Maneuver a truck around obstacles with a plow mounted.

Trouble Shooting

- Keep an eye on your plow blade for wear and replace when needed.

- Store extra plow pins in trucks.

- Keep all truck lights free of snow and ice.

- Keep radiator grill from obstructions to prevent engine overheating.

Troubleshooting

- Carry spare fuses and bulbs.
- Carry windshield cleaner and an ice scraper.
- Be familiar with the type and size of hoses for replacement.
- Know which hydraulic coupling controls what function.

Pre-Season Prepartion Meeting

- Have a meeting with all personnel involved in snow removal operations before the winter begins.
- Personnel involved are shop personnel, route supervisors and county equipment operators.

Some topics that should be covered:

-Route assignments

-Truck assignments (county/contract)

-Roadway/Snow hazards

-Turn around points

-Changes in traffic patterns

Roadway Hazards

Always be alert to obstructions to your plowing.

Roadway Hazards

Roadway Hazards

- Cold Spots and Black Ice
- Low Shoulders / No Shoulders
- Overhead obstructions – bridges, trees, wires
- And, of course, the traveling public

Salt Barn Loading

- Very little loader articulation is needed to load a barn design.

- A longer ramp with less incline is needed to load barn.

- Salt must still be kept below the maximum salt height line.

Pre-Storm Preparation

Equipment Checks

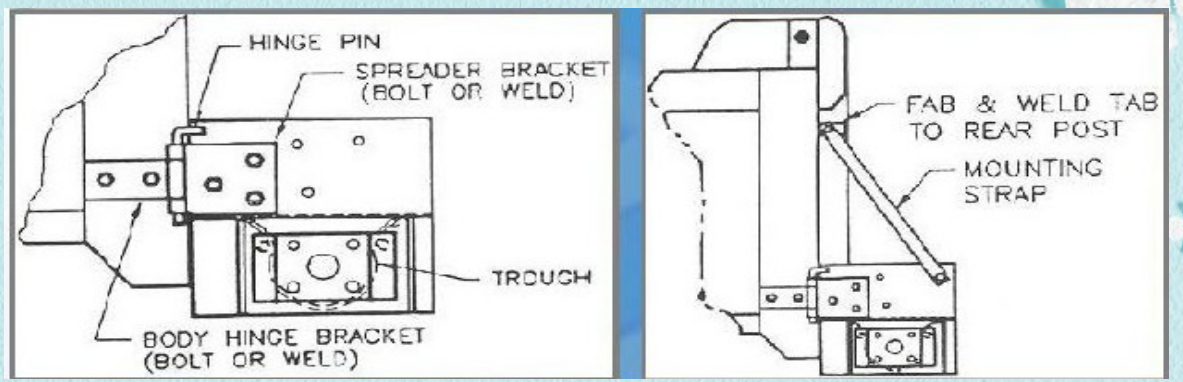
- Match plow number to truck number.
- Mount plow frame and plow to truck.
- Load truck bed with salt.
- Cover the load.

Salt Box Installation & Maintenance

Hing Installation

Strap Installation

Installation:



Maintenance:

Clean spreader after each storm.

Roadways & Surfaces

Two-Lane Roadways

- One 12ft wide lane traveling in each direction.
- The standard plow Angled correctly will clear 8 to 9 feet per pass.
- Four passes needed to clear the entire road.
- Clear road shoulders.

Roadway Configurations
Intersections

- Empty your plow before crossing intersections.
- Reduce the size of the windrow.
- Avoid building snowbanks that interfere with sight distance.
- Keep trafic signs unobstructed from view.

Bridges & Overpasses

- Bridge surface may be higher than the road surface due to the bridge freezing and expanding.
- Care must be taken not to throw snow over the bridge

Hills

- Traction is limited on hills.
- Stopping can be difficult on hills.
- Watch for melted snow refreezing in the road valley.

Railroad Crossings

- Avoid piling snow against signals, switch boxes, signs, etc.
- Raise plows slightly when crossing railroad tracks

Types Of Plows, Plowing Tips & Techniques

-The One-Way Plow-

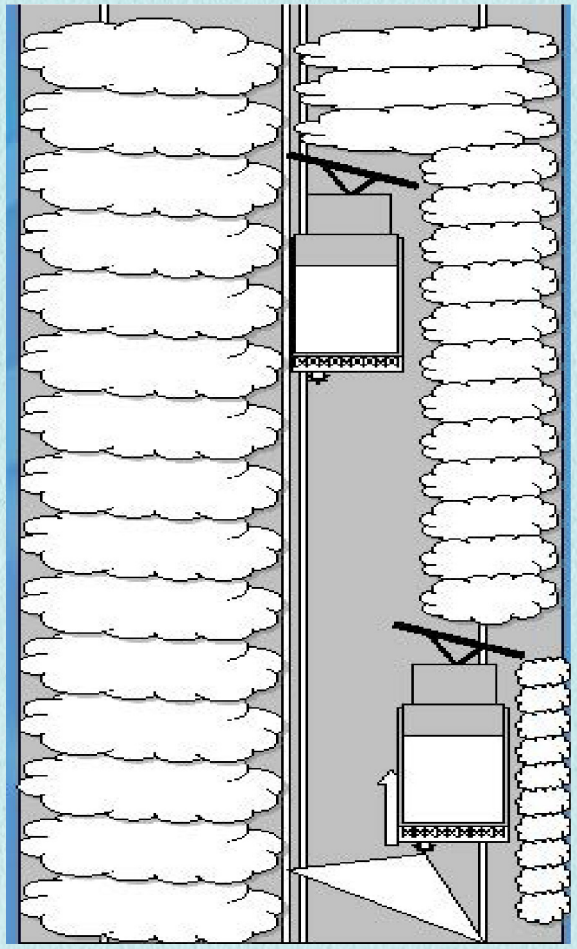
- One-way reversible plow (manual adjust)
- One-way reversible plow (hydroaulic adjust)

-Plowing Speed-

- Keep your speed fast enough to move the snow away from the roadway…
- …but slow enough so the windrow does not cause property damage.
- The faster your speed the more unstable the truck.

-Plowing Speed-

- Plowing too fast can create a blizzard-like condition that can obscure your vision.
- Reduce plowing speed at bridges.
- Reduce your left shoulder plowing speed when Jersey Barriers located in the median.
- When part of a plow train, continually adjust your speed to maintain a good, even spacing between trucks.
- The lead truck is in control of the plow train's speed.



Points To Remember

- Always give bridges, hills and ramps special attention.
- Salt the high sides of curves.
- Do not overuse salt.
- Use just enough to get the job done!

Points To Remember

- Salt loses most of its effectiveness at temperatures below 20°F.
- Salt stops working altogether at -6°F.
- Adding more salt to an already salted roadway can actually cause the brine solution to freeze.
- Maintain 300 to 500lbs salt distribution per lane mile.
- Do not use “Manual”, “Stationary Unload”, or “Blast” unless absolutely necessary.

Plowing Tips

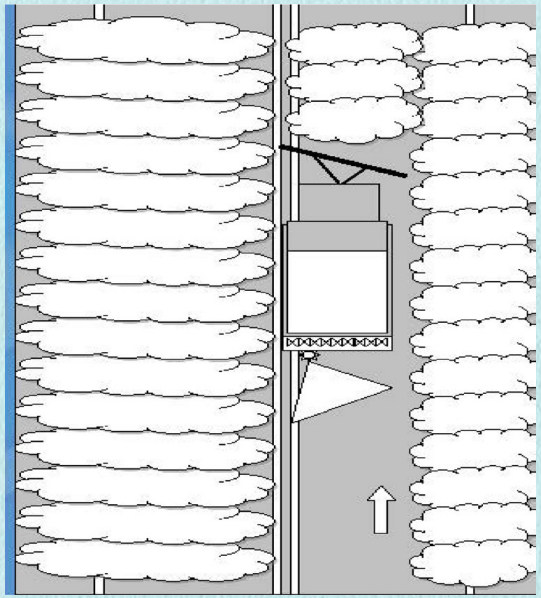
- Never drive faster than the posted speed limit.
- Use a lower gear than normal driving.
- Use extra care plowing curves.
- Plow with direction of traffic.
- Do not block radiator with plow when traveling.
- Plow from centerline out to shoulder.

Plowing Tips

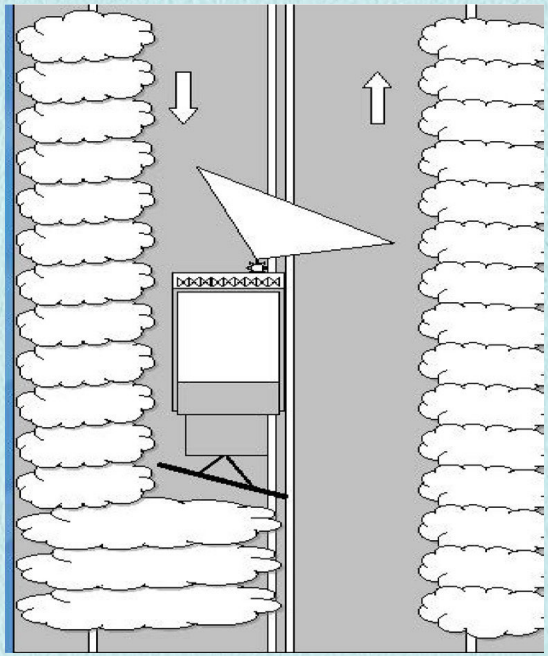
- Plow towards low side of ramps or curves.
- Plow away from wind when possible.
- Raise blade before making sharp turns.
- Don’t leave windrow across an intersection.
- Know your turn around points.
- Refuel with meal breaks or reloading.

Single Vehicle Plowing

- Plow lane in one direction and drop salt behind truck.



- Plow lane in one direction, turn at end of route, plow lane in opposite direction and salt both lanes.



Types Of Snow & Plow Angle

- Wet snow requires more plow angle to discharge snow from plow moldboard.

- Plow must still clear a path for the truck tires.

Winter Operations Environmental Considerations

Winter Materials Storage, Handling and Spreading

As CCG Employees you play an important role in protecting our environment during winter operations by "Salting Sensibly".

What's the big deal –
Salt is a naturally occurring substance!

While salt is a naturally occuring substance, high concentrations of salt negatively affect or destroy land based and aquatic habitats and species.

Once salt goes into solution (becomes a brine solution) it cannot be recovered. It is stored in soil or water and can reach levels that are considered contamination.

Salt can contaminate drinking water supplies in well and in reservoirs, inhibit the establishment of vegetation or crops, and eliminate habitat for rish and other quatic species.

By implementing a few Best Management Practices (BMP's) in handling salt and other de-icing materials, water resources can be protected.

Salt Storage

- During the off-season, a barrier should be placed across the structure's opening to prevent salt from contaminating the environment.

- Make sure when salt is delivered, that all inlets and drainage structures are protected, and all the salt is under covered storage by day's end. Here an inlet is protected by covering it with a sheet signing, but overnight rain-washed dissolved salt into the drainage system discharging it off site.

Salt Handling

- Uncovered salt/abrasive stockpiles are allowed during a storm event; however, they must be placed under cover immediately after plowing operations have stopped and the mixing area must then be free of any residual salt and/or abrasives.

- To minimize spillage do not overfill trucks with salt. Upon completion of plowing event, all material on pavement lot much be swept and returned to covered storage.

Materials Spreading

To provide bare pavement in a cost-effective and environmentally responsible manner:

- Use appropriate shop application rates to match specific storm conditions.
    - Unless otherwise directed, only apply salt to your designated route.
    - Return unused salt to designated dome or barn. Never spread salt just to get rid of it.

Materials Spreading

By following appropriate Salt Spreading Guidelines, you will be performing your job duties in an environmentally sensitive manner, reducing the amounts of material discharging from the roadway into the natural environment.

Remember – Excess salt run-off not only impacts aquatic habitat but also impacts drinking water in wells and reservoirs.

Materials Spreading

Keep your load covered.Use the tarp to reduce wind erosion of material.

Equipment Preparation & Cleaning

At a minimum, prior to winter maintenance season, alibrate equipment to ensure maximum efficiency and proper application rates.

Check all fluid systems for leaks to reduce the risk of discharge of petroleum-based products on roadways and paved lots.

Equipment Preparation & Cleaning

Clean equipment in wash bay so that wash water is treated by the grit separator and oil/water separator to minimize the discharge of sediment, salt and havy metals into the environment.

Total Daily Maximum Load (TMDL)

- Governs the amounts of specific pollutants discharged into streams, watersheds, rivers, ponds, lakes and other bodies of water that are “impaired waterways” under the authority of the US environmental Protection Agency and Maryland Department of the Environment.
    - Impaired waterways are those that have been adversely impacted by pollutants to the point that biological functions have been negatively impacted and/or diminished whereby habitat is marginal or non-existent and/or drinking water has been contaminated.

Do your part in helping to protect the environment.

Be an Environmental Steward.

Salt Sensibly.

Thank You For Your Attendance!

There is no better time than the present to express our appreciation for your support

The Charles County Government thanks you for making a difference towards out winter snow removal activities