Department Note: As MS4 Permittees demonstrate compliance differently and MS4 Permittees may have different MS4 permit conditions, the following written program procedure is intended to provide ideas on various formats. Therefore, please note the provided example may not be appropriate, as is, for your community. Additionally, the following is a written program procedure that has been submitted to the Department by a MS4 Permittee. However, the MS4 Permittee name have been removed to keep them anonymous.

University of XYZ

Snow Management Plan

This manual is a guidance document on how the University of XYZ complies with the General Permit to Discharge under the Wisconsin Pollutant Discharge Elimination System WPDES Permit No. WI-S050075-3 (MS4 Permit)

Dates of Revisions	
2007	Original Plan
2024	Revision during 2024 audit

The following written program procedure was submitted to the Wisconsin DNR by a MS4 Permittee. However, the MS4 Permittee name have been removed to keep them anonymous. Uploaded to MS4 BMP Menu January 2025.

Table of Contents

Program Overview 3
Snow Management Operations 4
Curbside Storm Sewers, Fire Hydrants, & Sidewalk Marking 4
Equipment Calibration 6
Snow Removal Equipment Operator Guidelines 7
Appendix A – Snow Plow Map and Snow Storage 19

Program Overview

As a condition of the General Permit to Discharge under the Wisconsin Pollutant Discharge Elimination System WPDES Permit No. WI-S050075-3, UWP must provide documentation on deicing activities. This document covers the topics under 2.6.6 “Winter Road Management”. This program document will be updated on an annual basis to maintain compliance with the MS4 permit program.

The permit has the following conditions:

If road salt or other deicers are applied by the permittee or a contractor on behalf of the permittee, no more shall be applied than necessary to maintain public safety. Documentation on deicing activities shall be performed by the permittee or a contractor on behalf of the permittee and include the following:

a. Contact information for the individuals with overall responsibility for winter roadway maintenance.
b. A description of the types of deicing products used.
c. The amount of deicing product used per month.
d. A description of the type of equipment used.
e. An estimate of the number of lane-miles treated with deicing products for the roadways that the permittee is responsible for, and an estimate in acres of the total area of municipally-owned parking lots treated with deicing products by the permittee or contractor.
f. If applicable, snow disposal locations with a key corresponding to the locations on the storm sewer system map required under section 2.8.
g. A description of anti-icing, pre-wetting and brining, equipment calibration, pavement temperature monitoring, and/or salt reduction strategies implemented or being considered, and/or alternative products.
h. Other measurable data or information that the permittee uses to evaluate or modify its deicing activities.

Goals

1. Minimize damage to turf areas around campus.
2. Minimize damage done to curbs.
3. Eliminate damage done by plow vehicles to parking lot signs, parking meters and parking lot lights.
4. Eliminate blinds spots in parking lots and roads created by snow piles.
5. Mitigate ice formation due to melting snow.

Contact Information

Salt Team Role	Title	Office Phone Number	Email
Salting Coordinator	Chief Facilities Officer	[redacted]	

Snow Management Operations

Winter Preparation

Curbside Storm Sewers, Fire Hydrants, & Sidewalk Marking

Prior November 1, all curbside storm sewer grates along all roads and service drives on campus will be marked using 2 orange fiberglass driveway markers positioned in the grass directly behind the storm sewer grates. 1 marker demarking the leftmost and rightmost ends of the storm sewer grate (see Figure A below). Once snow season has concluded the driveway markers should be removed and stored for future use. During the secondary clean-up phase of the snow removal plan each of these curbside storm sewer grates are to be cleared of snow in order to facilitate appropriate drainage from melting snow and ice.

Figure A

Prior to November 1, all fire hydrants along all road, service drives and adjacent to buildings on campus will be marked with a mounted snow marker (see Figure B below). Markers are to remain on the hydrants year-round, and should be replaced as needed when they are missing, broken or bent beyond repair and unable to be

straightened. During the secondary clean-up phase of the snow removal plan each of the fire hydrants are to be cleared of snow so they are accessible in the event of a fire.

Figure B

Prior to November 1, all sidewalks will be marked using 2 orange fiberglass driveway markers positioned in the grass on either side of the sidewalk (see Figure C below). 2 orange fiberglass driveway markers will be placed no more than 6" from the edge of the sidewalk and sunk into the ground 10-12" in depth. Markers should be placed every 100' of straight sidewalk, at the beginning and end of each curve in the sidewalk, and at any intersection of sidewalks, sidewalk to road or drive, or sidewalk to parking lot. Once snow season has concluded the driveway markers should be removed and stored for future use.

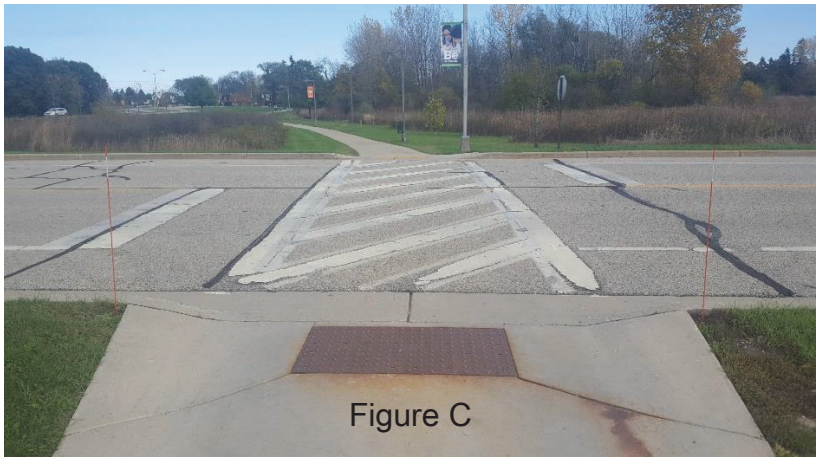

Figure C

Equipment Calibration

University maintains a fleet of trucks that spread salt and brine. Prior to the first snow, the salting equipment should be calibrated annually. Each spreader should be calibrated separately.

Salt Truck Calibration Procedure

For the salt hoppers, follow the instructions on Youtube video:
https://www.youtube.com/watch?v=ilsHIuJW-9M

Salt Truck Calibration Form:
https://www.wisaltwise.com/documents/manual-calibration.pdf

Brine Truck Calibration Procedure

Calibrate the brine truck annually with a brine solution. Brine should be a 23.3% solution. The solution should be tested with hydrometer/brineometer.

Test

Test 1:

- Fill the brine truck to a known amount. Record that amount
- Set the green nozzles (3 lines/nozzle) to 40 psi.
- Travel the outer loop (1.4 miles). Record the time to travel the loop
- *Example: Start with 100 gallons. Took 6 minutes and 55 seconds (6.92 minutes) and ended with 180 gallons*
    - *Gallons/minute = (starting gallons – ending gallons)/time spraying*
    - *GPM= (200-180)/6.92 = 20/6.92 = 2.9 gal/min.*

Test 2 :

- Rerun the test and record results
- *Example 2: Start with 180 gallons and spray for 7 minutes and 43 seconds (7.72 minutes). End with 155 gallons.*
    - *GPM= (180-155)/7.72 = 3.3 gallons/minute*

Result

Average the GPM between the 2 tests.

WI Saltwise recommends applying at a rate of 40 gallons per lane mile. A lane mile at UWP is 12 feet wide and the boom is 6 feet, so we need to do 2 passes of a lane to achieve proper coverage.

Calculate the necessary speed to go to achieve the desired application rate. Since the boom only applies 6' wide, we will need to do 2 passes per lane mile.

Example: Our tests found that we applied brine at a rate of 3.1 gpm. To apply 20 gallons per 1/2 lane mile:

$$test\ result\ in\ gpm \times convert\ to\ gph \times miles\ to\ apply\ 20\ gallons = speed\ to\ drive\ in\ mph$$

$$\frac{3.1\ gallons}{minute} \times \frac{60\ \ minute}{1\ hour} \times \frac{1\ mile}{20\ \ gallons} = \frac{9.3\ miles}{hour}$$

So, we should drive 9.3 mph to apply 20 gallons per ½ lane mile.

	Start Volume	End Volume	Time to travel	Calculate gallons/minute
Test 1	200	180	6.92	2.9
Test 2	180	155	7.72	3.3
Average				3.1

Table 1. Example of briner calibration.

Resources: https://www.wisaltwise.com/Take-Action/Winter-Maintenance-Professionals/Brine

Snow Removal Equipment Operator Guidelines

University XYZ manages approximately 4 lanes miles on campus (excluding parking lots) and a total area of 8.5 acres of sidewalk and 38.7 acres of parking lots and roads.

Operators of snow plowing equipment are to adhere to the following guidelines for the safety and welfare of themselves, and the general public:

- Preform visual inspection of equipment prior to use (check fuel level, tire levels, lights and safety strobes, etc.) and note any issues to the maintenance mechanic
- Utilize safety equipment on the vehicle or in the equipment appropriately
- Obey traffic laws
- Utilize vehicle lights and strobes at all times when operating equipment
- Demonstrate courtesy towards other drivers and pedestrians
- Be alert to potential hazards (downed trees, power lines, etc.)
- Be aware of salter spinner discharge at all times
- Flow with traffic as much as possible, and avoid sudden braking or turns
- Be aware of changing weather conditions and the effect they can have on braking conditions and sight lines
- Report stranded motorists to University Police

Snow management equipment used on campus includes:

- Pickup trucks with plow attachments and brine tanks in bed
- Front end loader
- Toolcat with plow attachment or brush attachment
- Snow thrower
- Hand-spreading salting cups
- Hand Shovels
- Gator with briner and salters

Operators of snow plowing equipment should also be aware of creation of snow clouds when removing snow. Snow clouds can form during any plowing or snow blowing operation and adversely affect sight lines and increase instances of accidents. If operators are driving vehicles reducing speed can reduce snow clouds, but be careful not to simply brake. If operators are utilizing snow throwers be aware of the wind direction, and throw the snow with the wind, but away from pedestrians and vehicle traffic. If needed, temporarily stop snow removal operations or wait for the cloud to dissipate before continuing snow removal operations.

Operators of snow plowing equipment are to exercise good judgment, caution and care when plowing parking lots in an effort to avoid damage to other vehicles, curbs, fire hydrants, signs, lights, parking meters, garden beds, and turf. Operators plowing in parking lots should not plow within 5 feet of parked vehicles.

Roads and Service Drives

The following areas on campus should be considered roads and plowed as such, gradually pushing snow to the shoulder of the roadway with each pass.

- Parkside Boulevard
- University Drive
- Service Drive, including the stretch between the Greenquist dock and the Student Center
- Avenue of the Arts
- RITA Circle
- Drive to Wyllie Hall parking lot
- Frontage Roads into Tallent parking lot off of Wood Road

Parking Lots

Snow plowing maps have been created for all lots on campus with the exception of the Facilities Management compound and the University Police parking lot area. Plowing maps should be in all snow removal vehicles. On the all maps the arrows indicate direction of the plow vehicle and the clouded areas indicate where snow can be piled. If an area on the map is not clouded then snow cannot be placed there when plowing.

In an effort to eliminate blind spots due to snow piles, no man-made snow piles are permitted within 25 feet of the entrance/exit to any parking lot, any endcap of an island in any parking lot, or any intersection with another road or sidewalk. If the snow fall exceeds 36 inches in a single storm or during multiple storms in close succession then the snow will need to be removed during the secondary clean-up phase of the snow removal plan.

Parking lots are listed below in the order of clearing priority. Operators who finish plowing in their assigned lots should check in with other operators in other lots to find out if those operators need assistance prior to plowing the Tallent Parking lot. Once all lots are plowed operators should check in with the Grounds Supervisor to make sure that their equipment is not needed somewhere else on campus prior to storing their plowing equipment. The lots adjacent to the old Child Care Center, the International House and the University House are not be cleared during snow storms unless otherwise specifically instructed to do so by the Grounds Supervisor or their designee.

Facilities Management Parking Lot

The areas around the garages, fuel pumps, parking spaces west of the Facilities Management building and the parking spaces north of the Heating and Chilling Plant are to be cleared prior to any other areas on campus. The remain areas around the Facilities Management compound will be cleared during the campus clean-up phase of the snow removal plan. Snow is to be pushed the green space south of the rear parking lot, south of the greenhouse, or in the grassy area located to the southwest of the Facilities Management building. Areas around the salt barn, garage bays, electrical sub-station and loading docks should remain free from snow piles.

University Police Parking Lot

The University Police parking lot should be cleared from Tallent Hall east. Snow is to be piled on the prairie southeast of the University Police garage building. All garage bays need to be cleared of snow. Any snow plowed into the lot from the roadway must likewise be pushed to either the prairie on the southeast corner of the police garage or in the wetland to the immediate east of the Tallent parking lot.

Student Health & Counseling Center Parking Lot

The Student Health & Counseling Center parking lot is to be cleared from south to north. Snow is to be plowed from the lot into the wetland to the north of the parking lot.

Student Center Parking Lot

Snow removal in the Student Center parking lot is to be plowed from west to east. Snow is to be plowed into the grass areas starting in the south east corner of the lot where it abuts University Drive and Parkside Boulevard, and stretching northwest around the lot adjacent to Pike River Suites. Snow may also be plowed out of the lot, across University Drive and into the wetland east of the parking lot.

RITA Parking Lot

Avenue of the Arts and the RITA Circle are considered roads. No snow should be piled in either area during plowing. Snow on these roads is to be pushed across County HWY JR onto the shoulder. All snow in the RITA parking lot is to be plowed east to west and utilizing the grass areas adjacent to University Drive for snow piles.

Greenquist Loading Dock

The Greenquist loading dock is to be plowed west to east coming off from the Service Road. Snow is to be pushed to the southwest corner of the lot, at the top of the hill, adjacent to the woods and opposite the middle bank of entry doors to Greenquist Hall.

SAC West Parking Lot

Snow in the SAC West parking lot is to be plowed east to west utilizing the ample grassy area to the immediate west of the parking lot for snow piles.

SAC South Parking Lot

Snow in the SAC South parking lot is to be plowed north to south utilizing the grassy areas southeast and south of the parking lot for snow piles.

Wyllie Hall Parking Lot

Snow in the Wyllie Hall parking lot is to be plowed west to east utilizing the prairie areas on the east side of the parking lot for snow piles.

University Apartments & Pike River Suite Parking Lot

On the initial pass through the parking lot for the University Apartments and the Pike River Suites the snow is to be cleared east to west. Snow is to be piled on the grass areas immediately north of the Pike River Suites. Snow is to be plowed from the lot out across University Drive to the shoulder. Snow is to be piled on the west end of the lot along the wetland.

During the clean-up of the parking lot the snow is all be removed and plowed to the wooded areas to the north and west of University Drive opposite the parking lot.

Ranger Hall Parking Lot

On the initial pass through the Ranger Hall parking lot the snow is to be plowed out and across University Drive from the parking lot.

During the clean-up of the parking lot the snow is all removed and plowed into the grass area to the immediate west and northwest of the Ranger Hall parking lot.

Tallent Parking Lot

All snow in the Tallent lot, and the lot adjacent to Tallent Hall is to be plowed from west to east. Snow is to be plowed into the wetland to the east of the Tallent lot along the whole length of the eastern side of the lot.

Sidewalks, Stairs, and Ramps

There are 3 main sidewalk zones on campus: the auxiliary zone, the academic buildings zone, and the east campus zone. The auxiliary zone consists of the sidewalks that connect Ranger Hall, the University Apartments, and Pike River Suites to each other and to the Student Center, and to the academic buildings and adjacent parking lots. The academic buildings zone consists of the entrances to and sidewalks that connect Molinaro Hall, Greenquist Hall, Wyllie Hall, the RITA and the SAC to each other, and to Student Center, Housing and Residence Life and adjacent parking lots. The east campus zone encompasses the sidewalks and entrances of Tallent Hall University Police, Student Health and Counseling Center and the Facilities Management compound.

The sidewalks around Tallent Hall and the Student Health and Counseling Center should be cleared quickly with one pass prior to the sidewalk plowing equipment moving up to the main campus to do the other zones. The academic zone and the auxiliary zones are to be cleared simultaneously.

Sidewalk maps are in an appendix at the end of this document and show which sidewalk areas can be plowed using vehicles and which areas need to be cleared of snow via snow thrower or hand shoveling. There are maps with clouding for each entrance and exit to buildings in order ensure all entrances and emergency exits are cleared of snow and ice. There is a snow removal map for the sidewalks around the SAC parking lots due to the lack of green space immediately adjacent to these sidewalks for snow piles. All other campus sidewalks have ample green space around them for snow piles, and as a result there is no need for snow removal maps in those areas at this time.

In an effort to eliminate blind spots due to snow piles, no man-made snow piles are permitted within 25 feet of the entrance/exit to any parking lot, any intersection with another road or sidewalk, or where stairs or ramps meet with the sidewalk. If the snow fall exceeds 36 inches in a single storm or during multiple storms in close succession then the snow will need to be removed during the secondary clean-up phase of the snow removal plan.

Snow removal is to be done with a combination of snow removal vehicles, snow throwers and hand shoveling. No piece of equipment larger than a Bobcat should be used to clear campus sidewalks. Operators of snow plowing vehicles should not attempt to clear the entire width of sidewalks or drive the plowing equipment within 15 feet of entrances to buildings. One pass down the middle of the sidewalk during initial plowing runs will be sufficient to clear the sidewalk and limit potential damage to turf and lights along the edge of the sidewalk. During the secondary clean-up phase of the snow removal plan snow throwers and hand shoveling are to be utilized to fully clear campus sidewalks.

SAC Sidewalks

SAC sidewalks to the west of the SAC building are to be cleared from south to north pushing the snow onto the grass hill to the north of the SAC. Sidewalks to the east of the SAC are to be plowed from north to south pushing the snow onto the grass area to the south east of the building. The south sidewalks are to be cleared from east to west pushing the snow into the grass area adjacent to the loading dock for the building.

Secondary Cleanup

The secondary clean-up phase of the snow removal plan occurs after all parking lots are cleared of snow, the roadways and service drives have been plowed and the entrances, ramps, stairs and sidewalks have been cleared of their “one pass accessibility”, and/or the storm has ceased.

In parking lots the work includes, but is no limited to:

- Removing snow and ice from all handicapped parking spaces and creating a clear and accessible route form these spaces to the nearest sidewalk
- Removing snow from around fire hydrants and curb storm sewer drains
- Making sure lots are appropriately salted
- Removing snow build up on road and parking lot signs
- As necessary, moving excess snow piles to increase lines of sight
- Policing lots after the storm to continue to remove loose snow and ice created by salting

On road and drives the work includes, but is not limited to:

- Making sure roads and intersections are appropriately salted
- Removing snow from around fire hydrants and curb storm sewer drains
- Clearing snow off the roads and drives from curb to curb
- Policing the roads and drives after the storm to continue to remove loose snow and ice created by salting

On sidewalks, stairs, entrances, and ramps work includes, but is not limited to:

- Clearing the full width of ramps, stairs, sidewalks by hand
- As necessary, moving excess snow piles to increase lines of sight
- Making sure sidewalks, stairs, entrances and ramps are appropriately salted
- Policing sidewalks, stairs, entrances and ramps after the storm to continue to remove loose snow and ice created by salting
- Clearing snow from around and on any outdoor benches and seating

Salting and Brining

University XYZ uses the following anti-icing and de-icing products:

- Rock salt – Estimated 50-200 tons per year
- Brine (23.5% salt) – Estimated 1500 – 5000 + gallons per year

Anti-Icing

Anti-icing is a preventative, cost-effective, and efficient strategy for the use of chemicals in the winter storm season. Applying chemical freeze-point-depressant materials prior to a storm snow and ice can be prevented from bonding to pavement.

Anti-icing materials in liquid form are the most efficient. Refer to the guidelines listed at the end of this section for guidance on appropriate anti-icing application rates. It is recommended that anti-icing materials be laid down close to the winter storm's anticipating start time as possible.

What to do:

- Apply liquids with stream nozzles, not fan spray
- Prioritize use in areas that are most likely to freeze
- Use the correct chemical for the pavement temperature
- Re-apply when shoulder ice moves onto roadways and sidewalks

What not to do:

- Apply under windy conditions
- Apply magnesium or calcium chloride to a warm road or pavement (above 28° F pavement temperature). It can become slippery and cause accidents.
- Apply prior to predicted rain
- Over-apply liquid chemicals as it can cause the roadway or sidewalks to become slippery

Deicing

Deicing is a reactive process of applying a deicing material to snow or ice that has already bonded to the pavement. Generally, larger quantities of material are required in deicing versus anti-icing. This is due to the fact that enough ice must be chemically melted to break its bond with the pavement and this reaction requires larger quantities of chemical. Refer to the guidelines listed at the end of this section for guidance on appropriate deicing application and rates.

What to do:

- Properly calibrate all equipment used for deicing operations
- Plow snow and ice from pavement prior to application of deicing material
- Apply an appropriate amount of chemical
- Coordinate plowing routes to avoid plowing off deicing chemicals

- Plow loose snow or ice after deicing application and re-apply deicing chemical as needed
- Below 20° F apply Calcium or Magnesium Chloride
- Drive 17-25 MPH to keep material on the roadways

Abrasives

When temperatures are too cold for deicing chemicals to be effective the use of winter sand or other abrasives is recommended. It should be noted that sand or other abrasive DO NOT melt anything, they simply provide temporary traction on the top layer of snow or ice.

In general a salt/sand mixture should not be utilized ad the sand and salt counteract the effectiveness of the other.

Anti-icing Application Rate Guidelines per Lane Mile

	Gallons	Per	Lane Mile
Condition	$CaCl_2$	$MgCl_2$	Salt Brine
Regular Applications	15-25	15-25	20-40
Prior to Frost or Black Ice Event	15-25	15-25	20-40
Prior to Light or Moderate Snow	15-25	15-25	20-50

**Source: State of Minnesota Department of Transportation*

Anti-icing Application Rate Guidelines per 1000 SF

	Gallons	Per/1000 SF
Condition	$MgCl_2$	Salt Brine
Regular Application	0.2-0.4	0.3-0.6
Prior to Frost or Black Ice Event	0.2-0.4	0.3-0.6

Prior to Light or Moderate Snow	0.2-0.4	0.3-0.8

**Source: State of Minnesota Department of Transportation*

Pounds of Ice melted Per Pound of Salt

Pavement Temp. °F	One Pound of Salt (NaCl) Melts…	Melt Time
30	46.3 pounds of ice	5 minutes
25	14.4 pounds of ice	10 minutes
20	8.6 pounds of ice	20 minutes
15	6.3 pounds of ice	60 minutes
10	4.9 pounds of ice	At temps at or below 15 degrees F, it may be more cost-effective to use a chemical other than NaCl $MgCl_2$ = -10°F melting temp. $CaCl_2$ = -20°F melting temp.
5	4.1 pounds of ice	
0	3.7 pounds of ice	
-6	3.2 pounds of ice	

**Source: State of Minnesota Department of Transportation*

Deicing Application Rate Guidelines for Parking Lots and Sidewalks

**Rate in pounds per 1000 SF area, take (rate x area)/1000 SF = material needed*

Pavement Temp. (F) and Temp. Trend	Weather Condition	Maintenance Action	Rate of Dry Salt, $MgCl_2$, $CaCl_2$	Winter Sand Abrasive
>30°↑	Snow	Plow, treat intersections only	0.75	N/A
>30°↑	Freezing Rain	Apply chemical	1.5	N/A
30°↓	Snow	Plow & apply chemical	1.5	N/A
30°↓	Freezing Rain	Apply chemical	1.75	N/A
25-30°↑	Snow	Plow & apply chemical	1.5	N/A
25-30°↑	Freezing Rain	Apply chemical	1.75	N/A
25-30°↓	Snow	Plow & apply chemical	1.5	N/A
25-30°↓	Freezing Rain	Apply chemical	2.25	3.25
20-25°↑	Snow/Freezing Rain	Plow & apply chemical	2.25	3.25 for freezing rain
20-25°↓	Snow	Plow & apply chemical	2.75	N/A
20-25°↓	Freezing Rain	Apply chemical	3.0	3.25

15-20°↑	Snow	Plow & apply chemical	2.75	N/A
15-20°↑	Freezing Rain	Apply chemical	3.0	3.2
15-20°↓	Snow/Freezing Rain	Plow & apply chemical	3.0	3.25 for freezing rain
0-15°↑	Snow	Plow, treat with blends, not NaCl, sand hazardous areas	3.0	5.0 spot treat as needed
< 0°	Snow	Plow, treat with blends, not NaCl, sand hazardous areas	4.5	5.0 spot treat as needed

**Source: State of Minnesota Department of Transportation*

Equipment Cleanup and Storage

Salt spreaders should be emptied by their operators prior to being put away regardless of the next anticipated use. Diesel powered equipment will be stored in a heated facility. All equipment must be cleaned off after the completion of all snow removal activities. The only exception would be the anticipated use of the equipment within the next 24 - 48 hours. All equipment is to the placed back in its designated storage space. All snow removal vehicles are to be backed into their designated garage bays or stalls.

Appendix A – Snow Plow Map and Snow Storage