Simon Fraser University

Salt Management Plan

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1.0 Overview

1.1 Purpose of the Salt Management Plan

The purpose of the Simon Fraser University’s (SFU) Salt Management Plan is to fulfill the University’s obligation as per Environment Canada’s “Code of Practice for the Environmental Management of Road Salts”. The plan establishes a framework with specific goals and actions to ensure the University’s roads are maintained in a safe manner while minimizing the negative impacts of road salts on the local environment.

The Salt Management Plan is required to ensure the University establishes salt management procedures that follow the Transportation Association of Canada’s best management practices as set out in “Syntheses of Best Practices Road Salt Management”.

1.2 Salt Management Plan Policy Statement

Simon Fraser University will work to provide an acceptable level of winter maintenance to the SFU Road network and other public facilities while managing the salt usage effectively. To achieve this objective, each year SFU will:

- Meet the guidelines within this document
- Work to improve the Salt Management Plan by reviewing it and identifying any shortfalls
- Constantly strive to improve on practices and utilize the newest technologies to provide better salt usage and management
- Stay current and update the plan to meet or exceed the Federal regulatory guidelines
- Continue to train staff on the importance of salt management and the impacts that excessive use has on the environment.

1.3 Policy Application

This Policy is adopted by the Simon Fraser University’s Facilities Services Snow and Ice Operations and applies to all employees involved with snow removal.

1.4 Policy Principles

The SFU salt management plan is a dynamic model and it will be reviewed annually. The review process and improvement implementation will be based on environmental management principles. Reviews will be based on:

- Review of industry standards and equivalent benchmarking
- Implementation and documentation of the implemented plan
- Ongoing training and education of staff
- Monitoring of environmental impacts by sampling and lab analysis at identified locations
- Policy review and revisions
2.0 Winter Maintenance Practices

2.1 Introduction

Simon Fraser University’s Facilities Services Snow and Ice Operations under the direction of Buildings and Grounds provide winter snow and ice control services for:

- The University’s 28.0 lane kilometres of roadways
- University’s 3.3 lane kilometres of residential roads
- The 110,000 square meters of uncovered parking area (see appendix A).
- Sidewalk de-icing and walkway snow clearing

Winter Maintenance Practices are maintained throughout snow and ice season by the University’s staff and sub-contractors. During extreme snow and ice conditions laneway snow clearing services may be assisted by private grader and bobcat contractors. Private contractors do not assist SFU in the application of road salt or brine on sidewalks, laneways, or parking areas.

Table 2.1 Roadway and Parking Salt Application Area Data

<table>
<thead>
<tr>
<th>ID</th>
<th>Designation</th>
<th>Laneway (Km)</th>
<th>Area (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lane*</td>
<td>University Primary Bus Route</td>
<td>12.04</td>
<td></td>
</tr>
<tr>
<td>Lane*</td>
<td>University Primary Road</td>
<td>9.56</td>
<td></td>
</tr>
<tr>
<td>Lane*</td>
<td>University Secondary Road</td>
<td>5.08</td>
<td></td>
</tr>
<tr>
<td>Lane*</td>
<td>UniverCity Secondary Road</td>
<td>4.74</td>
<td></td>
</tr>
<tr>
<td>Parking Areas</td>
<td>Parking Uncovered</td>
<td></td>
<td>110,000</td>
</tr>
</tbody>
</table>

*lane is defined as one standard road-width.

2.2 Snow and Ice Control Best Practice Guidelines

Improvements in salt management and snow and ice control are the primary goal of the Salt Management Plan. Areas identified as requiring improvement(s) have been identified using the guiding principles of the Transportation Association of Canada “Syntheses of Best Practices Road Salt Management”.

The following sections of the “Syntheses of Best Practices Road Salt Management” have been used in the development of goals in managing and improving Salt, and Snow and Ice management at Simon Fraser University:

1.0 Salt Management Plans
4.0 Drainage and Storm water Management
5.0 Pavements and Salt Management
7.0 Design and Operation of Road Maintenance Yards
9.0 Winter Maintenance Equipment and Technologies

Table 2.2 identifies SFU’s goals for improvement in the management of Snow and Ice at Simon Fraser University as is follows:
## Table 2.2 Salt Management Plan Objectives and Goals

<table>
<thead>
<tr>
<th>Section</th>
<th>Area of Objective</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAC 1.0</td>
<td>Snow and Policy</td>
<td>To develop a Salt Management Policy in conjunction with senior</td>
</tr>
<tr>
<td></td>
<td></td>
<td>University administration and Facilities Services.</td>
</tr>
<tr>
<td>TAC 4.0</td>
<td>Impact Identification</td>
<td>Implementation of a comprehensive surface water monitoring program.</td>
</tr>
<tr>
<td>TAC 4.0</td>
<td>Impact Identification</td>
<td>Implementation of a ground water monitoring program.</td>
</tr>
<tr>
<td>TAC 4.0</td>
<td>Impact Identification</td>
<td>Identify areas within the University that indicate high levels of residual</td>
</tr>
<tr>
<td></td>
<td></td>
<td>salt contamination.</td>
</tr>
<tr>
<td>TAC 5.0</td>
<td>Improved Information Systems</td>
<td>To add road temperature sensors to monitor current road temperatures.</td>
</tr>
<tr>
<td>TAC 5.0</td>
<td>Applying Road Salts</td>
<td>To reduce salt use by operating at 100% pre-wet application.</td>
</tr>
<tr>
<td>TAC 7.0</td>
<td>Improved Yard Operations</td>
<td>Operate the road salt loading under cover or utilize contained loading</td>
</tr>
<tr>
<td></td>
<td></td>
<td>methods.</td>
</tr>
<tr>
<td>TAC 7.0</td>
<td>Improved Salt Storage</td>
<td>Install bay doors on the existing salt storage shed.</td>
</tr>
<tr>
<td>TAC 7.0</td>
<td>New Winter operations Facility</td>
<td>Design of a new relocated state of the art winter operations facility to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>contain all wash down water, improve salt storage and recycle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>wash down water for brine uses to reduce overall salt requirements.</td>
</tr>
<tr>
<td>TAC 9.0</td>
<td>Alternative Products &amp; Methodology</td>
<td>Reduce salt application on walkways through the introduction of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>alternative products.</td>
</tr>
</tbody>
</table>

### 2.3 Operating Practices

Roads are maintained by University operators trained in the safe operation of University snow and ice equipment; this includes a complete understanding of the operation of salt application equipment. Standardized operator training with yearly updates is mandatory for all University operators (see appendix D). Training involves a training session to review “Syntheses of Best Practices Road Salt Management” best practice and salt application rates specific to University snow and ice conditions.

Operators of snow and ice vehicles are required to maintain the following:

- The appropriate class of driver’s license and brake endorsements; licenses and endorsements must be maintained in good standing.
- Adequate training, both in snow and ice theory and practical application, on all equipment operated by the individual; assessments are kept on file for review.
- Annual re-certification procedures.
- Education on the environmental impacts that salt can have.
2.4 Existing Winter Operations Facility

The existing SFU winter operations facility is located across from the Facilities Service works yard. The facility operates under the guiding principles identified in the Transportation Association of Canada’s best practice guideline “Design and Operation of Road Maintenance Yards” including the following:

- Salt storage is covered year round.
- Ground area is covered with a asphalt surface (low permeable);
- Surface water from the salt storage site is captured and redirected away from the storm drainage into alternate drainage, in this case the existing sanitary system.

Brine storage is located within the surface water capture zone at the salt storage facility and is further contained within a membrane lined capture tank.

The vehicle wash down site is also at this location. Water from wash down is directed away from storm drains and directed into alternate drainage.

The salt storage facility has been use at the current location for decades and may have salt residue present in-situ. A program of surface soil sampling and core sampling has been undertaken to assist in determining if a salt contamination problem exists at the site. If the current site is maintained efforts will be undertaken to ensure any road salt entering the environment is minimized. If testing determines the site is contaminated a rehabilitation plan will be explored.

To assist in walkway salt applications salt box storage sites are maintained at locations throughout the University (see appendix D). Due to the corrosive and harmful impact salt has on the surrounding environment, salt will no longer be stored at these sites. Instead and environmentally safe alternative De-Icer will be used on all walkways and stairs around campus.

2.5 Snow Clearing and Removal

During heavy snowfalls, SFU employs the use of plows, bobcats, graders and loaders to clear snow from roadways and parking areas. Snow is piled at the edges of parking areas and roadways and left to melt during the warmer temperatures.

Snow removal at the University is not utilized. In future, severe conditions may result in snow being removed from the campus, but snow removed in this manner would be removed prior to the application of road salt and only to authorized and pre-approved dumping sites.

2.6 Road Salt and Brine Usage

2.6.1 Salt Usage

Salt application is paramount to SFU’s snow and ice operations. Minimizing application rates reduces costs and mitigates the negative effects of road salt on the local environment. In order for salt to be used most effectively and efficiently road salt and brine solutions are applied as follows:
• At the application rate specified in the operators training session.
• In correct places; road crowns, elevated corners, and roadway travel paths.
• At the correct vehicle speed.

Salt on SFU laneways, parking lots, and walkways is applied when temperatures are above -6° Celsius and at an application rate that utilizes the “working effect” of traffic. Utilizing the “working effect” of traffic reduces application rates and the number of applications required to ensure roadway safety. Traffic breaks the road salt down into a solution more quickly than environmental conditions alone which improve road salt de-icing properties.

2.6.2 Brine Usage
Salt brine is applied to University roads at 23% salt to water solution. Brine is utilized in both pre-wetting and in brine only applications. When conditions indicate salting is required but the salt will not adhere to the road surface due to dry road conditions brine only applications are utilized to minimize salt loss along the road verge. Table 2.3 identifies the equipment used to place salt and brine on the SFU road network. As technologies improve upgrades to the fleet are made to improve controls on spreading rates and to monitor the road conditions to help determine the best method for ice and snow mitigation.

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Spreader Control Type</th>
<th>Nacl/Sand Application Rate (kg/lane-km)</th>
<th>Liquid Application</th>
<th>Liquid Application Rate (kg/lane-km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>One Ton</td>
<td>-</td>
<td>Brine</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Three Ton</td>
<td>Broadcast</td>
<td>Est. 124</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Three Ton</td>
<td>Broadcast</td>
<td>Est. 124</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Five Ton</td>
<td>Computer Control</td>
<td>Preset 124</td>
<td>Brine</td>
<td>60</td>
</tr>
<tr>
<td>Five Ton</td>
<td>Broadcast</td>
<td>Preset 124</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Kubota Tractor</td>
<td>Broadcast</td>
<td>As req’d</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Bobcat Truck</td>
<td>Broadcast</td>
<td>As req’d</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 2.4 indicated the historic usage of road salt and brine at SFU. As identified, the severity of the winter months can greatly affect the required usage and will vary from year to year.

<table>
<thead>
<tr>
<th>Material</th>
<th>2004/05 winter</th>
<th>2005/06 winter</th>
<th>2006/07 winter</th>
<th>2007/08 winter</th>
<th>2008/09 winter</th>
<th>Average annual usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nacl Solid Bulk Road Salt (Tonnes)</td>
<td>350</td>
<td>907</td>
<td>1196</td>
<td>1262</td>
<td>1042</td>
<td>951</td>
</tr>
<tr>
<td>Nacl Solid Bag Salt</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
2.7 Salt Venerable Areas

Areas identified as salt vulnerable in the SFU Strategic Infrastructure Plan (2005 Update) are Stoney Creek, Silver Creek, and Eagle Creek. Areas identified as salt vulnerable by Facilities Services’ Snow and Ice Operations are any stream and watercourse subjected to salt contaminated storm drain water, or salt storage run-off water.

Salt vulnerable streams can be adversely influenced the runoff that is captured and concentrated in the elaborate University storm drainage system (see appendix C), as such, monitoring stations are being established at locations along the storm drain system and at the convergence streams to identify and monitor salt concentrations. Efforts to trace high salt concentrations back to the source location will be taken in order to minimize high salt concentration sources. Salt application procedures will be established to reduce or redirect salt entering the storm drainage system at these locations.

2.8 Training

See appendixes “D Winter Operations Driver Operator Procedures” and “E Winter Operations Equipment and Material Procedures”
3.0 Salt Management Strategies

3.1 Storm Water Management

The objective of SFU’s storm water quality monitoring program is to provide baseline water quality data on conductivity levels and chloride concentrations as they relate to SFU’s salt management program. Total metal and coliform water quality parameters will be included in sample analyses to provide additional insights into the quality of storm water discharging from SFU campus.

Five storm water runoff sites will be monitored from parking lot “B” (MH85) and “C” (MH27), as well as discharges from below the salt storage area, and discharges from the east (MH212) and west (MH8F) campus area. The first three sites allow monitoring of areas where salt usage is most prominent. The last two sites will provide information on overall cumulative effects of salt management activities prior to discharge of storm water into the Stoney Creek system.

Monitoring will be undertaken on or near too monthly basis. However, the determining factor for sampling will be rainwater events since the parking lots have no surface runoff during dry periods.

In-situ measurements will include pH, conductivity, and temperature. Samples will be collected for laboratory testing of hardness, dissolved chloride, total metals, and total and fecal coliforms. Summary data reports will be submitted twice per year.

3.2 Weather

The University utilizes the services of professional weather forecasts for timely and accurate weather information to assist in decision-making. These sites include:

- Weather data collected from the University’s weather station
- Environment Canada
- The SFU web site – www.sfu.ca/
- The Weather Network – www.theweathernetwork.com

In addition, University staff (including Campus Security) continuously monitor and report on weather and road conditions, both on and off-campus.

3.3 Record-Keeping

The University keeps logs of snow and ice callouts and collects the following data related to daily snow operations:

- Annual use of salt and salt brine solution.
- Training of Snow and ice operations personnel.
- Geographical areas of salt/brine application by vehicle operators.
- Weather conditions from snow and ice events.
- Vehicle and equipment deficiencies or maintenance requirements.
- Snow and Ice worker shift data.

Examples of data collected are in the following tables:
3.4 Management Review

After each snow and ice season SFU management and University groups affected by the previous year’s snow and ice program review the previous year’s snow and ice program to confirm the University achieved the desired objectives. The Salt Management Plan is included in this review. Salt management and snow and ice removal objectives are developed and best practice procedures are used to identify any shortcomings or opportunity for improvement in the operations.

3.5 Benchmarking the Salt Management Plan

SFU recognizes that the salt management plan is a dynamic model and it must constantly be reviewed and improved upon. In order to improve the practices SFU has
in place, benchmarking existing usages, etc and then setting goals to improve on these procedures will help effectively develop a strategy to maintain road safety and also mitigate the local environmental impacts. Table 3.1 identifies SFU’s benchmarking and improvement strategies for their Salt management on a 5 year basis.

Table 3.1 Benchmarking and improvement strategies

<table>
<thead>
<tr>
<th>Item</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road Salt</td>
<td>100%</td>
<td>50%</td>
<td>TBD*</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>Walkway Salt</td>
<td>100%</td>
<td>0%</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>Brine</td>
<td>33,000 L</td>
<td>40,000 L</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>Abrasive</td>
<td>0%</td>
<td>50%</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>Alternate Walkway Products</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>CMA</td>
<td>0%</td>
<td>90%</td>
<td>90%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eco-Traction</td>
<td>10%</td>
<td>10%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*A accurate estimate or target cannot be determined until a review of the effectiveness from the previous year is completed and an assessment is done to develop any improvements or changes to the strategies.*
Appendices

Appendix A University Roadways
Appendix B University De-Icer Location
Appendix C University Drainage Systems
Appendix D Winter Operations Driver Operator Procedures
Appendix E Winter Operations Equipment and Material Procedures
Appendix F Environment Canada Code of Practice
Appendix G Code of Practice annex a environmental management of road salts
Appendix H Code of Practice annex b identifying areas vulnerable to road salts
Appendix I Code of Practice annex c monitoring and measuring progress
Appendix J Transportation Association of Canada 1.0 Salt Management Plans
Appendix K Transportation Association of Canada 4.0 Drainage and Storm Water Management
Appendix L Transportation Association of Canada 5.0 Pavements and Salt Management
Appendix M Transportation Association of Canada 7.0 Design and Operation of Road Maintenance Yards
Appendix N Transportation Association of Canada 9.0 Winter Maintenance Equipment and Technologies