

Alternatives to Sodium Chloride for Safe Winter Management Within the KED Site

Presented To:	City Council
Meeting Date:	October 4, 2022
Type:	Correspondence for Information Only
Prepared by:	David Shelsted Engineering Services
Recommended by:	General Manager of Growth and Infrastructure

Report Summary

This report provides information outlining alternatives that were being considered regarding the use of sodium chloride for the safe winter management of roads, parking lots, and pedestrian pathways within the KED site.

Relationship to the Strategic Plan, Health Impact Assessment and Community Energy & Emissions Plan (CEEP)

This report refers to Support Ecological Sustainability as identified in the Strategic Plan.

This report refers to operational matters and has no direct connection to the Community Energy & Emissions Plan.

Financial Implications

There are no financial implications associated with this report.

Background

Council resolution C2022-116 requested a report outlining alternatives that were being considered to the use of sodium chloride for the safe winter management of roads, parking lots, and pedestrian pathways within the Kingsway Entertainment District (KED).

In July, Council did not approve the project budget for the Event Centre at the KED and there is a Council Report on winding down the Event Centre project.

As part of the Event Centre project, a Venue Management firm was in the process of being retained, and their function amongst other items was to include winter maintenance for the Event Centre, including the parking lots, sidewalks, and internal roads. It was the intention to work with the Venue Management firm to develop a pilot project that considered alternatives to sodium chloride, and to be able to cost out the alternatives for Council's consideration. Instead, this report will focus on the alternatives that were to be considered, provide commentary on the cost and availability of alternatives, and some additional information for private sites within the Ramsey Lake Watershed.

Salt Management

The Ramsey Lake Watershed Study was recently completed and contains the following background on salt management within the watershed.

De-icing salt is used to control snow and ice formation, making winter driving safer and more efficient. It is used extensively in Canada because it is effective, relatively easy to transport and use, and low in cost. De-icing salt enters the environment from the salt storage and snow disposal sites through runoff and splash from the roadways. Due to concerns about the large quantities of chlorides being released to the environment, de-icing salts underwent a comprehensive five-year scientific assessment under the Canadian Environmental Protection Act. This assessment concluded that de-icing salt is entering the environment in quantities that may pose immediate or long-term environmental risk. Elevated concentrations of chloride salts may cause adverse effects to aquatic life, terrestrial vegetation, soil structure, and drinking water.

A Code of Practice for the Environmental Management of Road Salts was created to reduce environmental contamination by road salts while maintaining road safety. This Code is applicable for any organizations that uses more than 500 tonnes of road salts per year and have vulnerable areas in their territory that could potentially be impacted by the road salts. The City of Greater Sudbury is required to follow this code, but most private sites fall below the 500 tonne threshold. Commercial operators for clearing snow and ice from parking lots have the potential to use larger amounts of salt, in part because the commercial operators are often compensated on the basis of use.

The City has the Greater Source Protection Plan which contains policies on salt management, and the City has a Salt Management Plan that is routinely updated. The Salt Management Plan sets out a policy and procedural framework to ensure the City's Road Operations Section continuously improves the effective delivery of winter maintenance services and the management of de-icing salt used in winter operations.

The Greater Sudbury Source Protection Plan requires risk management plans for those private properties with exterior parking lots equal to or greater than one (1) hectare in area. Expansions to existing activities are permitted provided that the activity can be adequately managed.

The Event Centre has an approved Risk Management Plan that was required to be updated once the site plan was finalized. This risk management plan outlined the winter maintenance activities and identified the areas allocated for snow storage.

While commercial operators do not need to have salt management plans, there is training and programs available. The Regional Municipality of Waterloo created "Smart About Salt" as part of a groundwater salt loading reduction strategy. This program is designed to promote improved safe snow and ice control practices on parking lots and sidewalks to reduce the amount of de-icing salt entering the environment. Generally, 40% of the salt used in urban areas is placed on parking lots and sidewalks at commercial, industrial, and institutional areas.

Alternatives to Sodium Chloride

The following is a summary of the typical alternatives to sodium chloride. Many of the road salt alternatives have a relatively short history or limited amount of use. It is unclear what the potential long-term impacts will be for many of these chemicals.

Chemical	Comments
Calcium Chloride	<ul style="list-style-type: none"> - Second most common deicing chemical to salt. - Is more corrosive to metal than sodium chloride. - Is effective at lower temperatures, -15 C. - Has environmental impact due to chlorides. - Is more difficult to store. - Can contribute to slippery conditions if applied incorrectly. - Is approximately 10 times more expensive than sodium chloride.
Potassium Chloride	<ul style="list-style-type: none"> - It can be damaging to concrete. - Has environmental impact due to chlorides. - Can inhibit plant growth and burn foliage. - Is only effective to – 4 C. - Is approximately 10 times more expensive than sodium chloride.
Magnesium Chloride	<ul style="list-style-type: none"> - Has environmental impact due to chlorides. - Is being used by some Ontario municipalities as a pre-wetting agent. - Must be placed at twice the rate of Calcium Chloride. - Is effective at lower temperatures, -15 C. - Can contribute to slippery conditions if applied incorrectly. - Is more expensive than Calcium Chloride.
Urea	<ul style="list-style-type: none"> - Primarily used as a fertilizer, and releases nitrogen into the soil and can lead to a chemical imbalance in water systems due to nutrient loading. - Is only effective to -4 C. - Is corrosive and breaks down rapidly to ammonia. - Is approximately 10 times more expensive than sodium chloride.
Potassium Acetate	<ul style="list-style-type: none"> - Is non-corrosive, and is commonly used in the airline industry. - Is effective at -26 C. - Is biodegradable. - Can contribute to slippery conditions if applied incorrectly. - Can lower oxygen levels in the waterbody. - Is more expensive than Calcium Chloride.
Calcium Magnesium Acetate	<ul style="list-style-type: none"> - Is less damaging to soils and vegetation, less corrosive to steel and concrete. - Is effective at -6 C. - Does not melt ice and snow, but turns it into an oatmeal texture. - Used to prevent the bonding of ice and snow to the pavement at the outset of a storm. - Is more expensive than Calcium Chloride.
Agricultural By-products (organic compounds/sugar by-products)	<ul style="list-style-type: none"> - Generally proprietary products derived from sources such as corn, beet, grain, alcohol, or molasses. - Are not deicing material, however they slow down the formation of ice crystals and have a lower freezing point. - More expensive than sodium chloride, but dependent on the location of the source of the material.

As noted above, and in the literature, there are no cost-effective alternatives to salt. Other options also contain chlorides, or nitrogen, and are also environmentally problematic.

Proposed Winter Maintenance

The proposed winter maintenance for the Event Centre was to maintain a snow packed parking lot and sidewalks, similar to the conditions for local roads and sidewalks in the City's transportation network. This would have been accomplished through plowing and sanding. The winter sand does contain approximately 5% salt (sodium chloride) to prevent the freezing of material.

Many commercial, industrial, and institutional properties also maintain snow packed parking lots, with some using salt on the main entrance areas to prevent icing.

The proposed pilot project for the Event Centre was to use an alternative product around the main entrance area. The concerns with this approach was the increased liability for using an alternate product or a change in the operation. If there were to be a claim (for example a slip and fall), the operator and City would have to prove that the operation met the equivalent of other practices. And as noted above, if used improperly, slippery conditions could be a result of excessive use. The operation would have to be monitored and discussed with the insurance provider prior to be undertaken.

The proposed crescent (streets A and C of the draft plan of subdivision) was to be a multiple lane road and become part of the City's transportation network. With the expected traffic volume, the road would have been a class 1 to 3 road and become a salt route. For multi-lane roads it is common practice to maintain bare pavement conditions as pavement markings convey information to the driver without diverting the driver's attention from the road. As noted above, the Roads Operations Section follows the Salt Management Plan and operational best practices.

Resources Cited

City of Greater Sudbury, Salt Management Plan

City of Greater Sudbury, Ramsey Lake Watershed Study and Master Plan, February 2022

Transportation Association of Canada, April 2013, Salt Management Guide

Transportation Association of Canada, Sixth Edition, 2021, Manual of Uniform Traffic Control Devices for Canada

New Hampshire Department of Environmental Services, Environmental Fact Sheet WD-WMB-4 dated 2016
Operations Committee Report dated May 14, 2018, titled "Use of Road Deicers"

<https://pub-greatersudbury.escribemeetings.com/FileStream.ashx?DocumentId=31038>