

COUNCIL REPORT

M&C No.	2019-64
Report Date	March 20, 2019
Meeting Date	March 25, 2019
Service Area	Transportation and Environment Services

His Worship Mayor Don Darling and Members of Common Council

SUBJECT: Winter Asphalt Maintenance

OPEN OR CLOSED SESSION

This matter is to be discussed in open session of Common Council.

AUTHORIZATION

Primary Author	Commissioner/Dept. Head	City Manager
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RECOMMENDATION

It is recommended that this report be received and filed by Common Council.

EXECUTIVE SUMMARY

During a winter, such as this, where the City experiences large temperature fluctuations, potholes become a common hazard on our streets that affects the travelling public. They are not only an inconvenience to citizens but also can create a safety hazard and potential for property damage. The purpose of the following report is to inform Council on how potholes are formed, the different types of surface defects, the materials used to maintain them, and the maintenance programs utilized in combatting them.

PREVIOUS RESOLUTION

REPORT

A pothole is a structural failure in a road surface due to water in the underlying soil structure and traffic passing over the affected area. Water first weakens the underlying soil; traffic then fatigues and breaks the asphalt surface in the affected area. Potholes can grow to several feet in width, though they usually only develop to depths of a few inches.

Two factors are always present in such a failure: traffic and water.

The mechanism that creates a pothole includes:

- Snow-melt or rain seeps through cracks in the pavement and into the sub-base; if the moisture cannot drain away from the sub-base and soil underneath, it becomes saturated and soft. This is typically because the soils are frozen in the winter. This is why we tend to see an increase in potholes during the winter months.
- Trapped moisture is subjected to repeated freeze/thaw cycles and with each occurrence the expanding ice lifts and cracks the pavement more. The passing traffic weakens the pavement, cracking it further.
- As temperatures rise and the ice melts, voids are left in the pavement. This void collects more water, and during the next freeze, the void will enlarge.
- Vehicles driving over the weakened pavement further deteriorates the surface until it fails even more, thus creating a pothole.

What affects pavement life?

Pavement life is influenced by many factors: vehicle loading (axle loads, tire pressure and gross vehicle weight), traffic volume and mix, environmental conditions, topography, subgrade condition, initial pavement design and construction practices, maintenance activity and pavement age.

In areas such as ours that are subject to freezing and thawing, frost heaving can damage the pavement and create openings for water to enter. During the Spring thaw and mid-winter thaws, the thawing of the sub soils accelerates this process. When the thawing of upper portions of the soil structure in a road cannot drain past still-frozen lower layers, thus saturating the supporting soil and weakening it.

The decision and capability to patch potholes is influenced by: severity (priority) of the pothole; current weather; traffic conditions; major maintenance work or utility work in the roadway; availability of personnel, equipment, and materials, and the demands of the travelling public.

Types of Surface Defects:

Delamination

Delamination is a failure mode that occurs in layered materials. With respect to roads it refers to the loss of an area of the wearing course layer (top most layer, typically 1.5 inches), usually in conjunction with a clear delineation of the wearing course from the layer below. This is a clear sign of not having an adequate bond between the two layers. These types of defects cannot be repaired during the winter months.

Pothole

Potholes are bowl-shaped holes caused by the localized breakdown of the pavement surface. Potholes typically result from the continuous cycle of thawing and freezing. Poor mixtures and weak spots in the base or subgrade can accelerate pothole failures.

Alligator Cracking

Potholes can form progressively from fatigue of the road surface which can lead to a precursor failure pattern known as alligator cracking. Eventually, chunks of pavement between the fatigue cracks gradually work loose, and may then be plucked or forced out of the surface by continued wheel loads to create a pothole. This is a sign of deterioration or failure of the sub-base soils layer. Generally when this type of defect is present that section road may be beyond preventative maintenance and will require full depth repair.

Seam Separation

Longitudinal cracks occur parallel to the centerline of the pavement. They can be caused by: a poorly constructed joint; shrinkage of the asphalt layer; cracks reflecting up from an underlying layer; and longitudinal segregation due to improper paver operation. These cracks are not load-related. These typically can be maintained through a preventative maintenance program commonly known as crack sealing. These types of defects cannot be repaired during the winter months.

Materials

Asphaltic patch materials consist of a binder and aggregate that come in two broad categories, hot mix and cold mix. Hot mixes are generally used in warmer months and are produced at local asphalt plants.

The cold mix used by the City is called EZ Street. It is a polymer-modified cold asphalt designed to temporarily repair potholes, utility cuts, and edge repairs in asphalt or concrete, when properly installed. The polymers that are added to the cold mix are designed to keep the asphalt pliable in sub-zero temperatures. The addition of aggressive compaction activates the cold mix and hardens the material. It is noteworthy that with successive freeze and thaw cycles the material may eventually fail and thus the repair will need to be revisited.

Repair

Pothole patching methods may be either temporary or semi-permanent. Temporary patching is reserved for weather conditions that are not favourable to a more permanent solution and usually uses a cold mix asphalt patching compound placed in an expedient manner to temporarily restore pavement smoothness.

Semi-permanent patching uses more care in reconstructing the perimeter of the failed area to blend with the surrounding pavement and usually employs a hot-mix asphalt fill above replacement of appropriate base materials. The City has the capability to make hot mix during the winter months with our recycler and tumbler. These units can make small batches of hot mix recycled from a pile of virgin asphalt that is stored at our Bay Street facility. This material can be used when the conditions are dry, i.e. the pothole is not full of water, and the pothole is of adequate size.

Priorities

Surface maintenance defects are reported from the public either through our customer service line or our risk management department. Additionally, the crews are out and visually inspecting our network of streets for any surface defects and will report them back to their supervisor. All requests for service, whether initiated internally or externally, are inspected and prioritized based on the criteria below:

Critical:

- Major Pothole > 4" x 8" x 4" deep

Urgent:

- Pothole < 4" x 8" x 4" deep

Important:

- Major potholes in driveway aprons at the edge of a road

Minor:

- Minor potholes in driveway aprons at the edge of the road

During the winter maintenance program, there are a number of other tasks that compete for limited resources. The main focus of the Transportation & Environment team is plowing snow from City streets and sidewalks. In addition crews are busy doing equipment maintenance, cutting ice, and dealing with winter drainage issues. The latter has been particularly challenging this year due to the amount and frequency of rain events. This has eroded our capacity to address potholes on a timely basis.

Asphalt Programs

The City of Saint John has many maintenance programs for asphalt repairs. The type of surface defect and the time of year will determine how and when the defect can be addressed.

The Winter Asphalt Maintenance Program is focused on identifying priority potholes and addressing them as resources and weather conditions permit. This program is not able to rectify surface defects such as delamination, alligator

cracking or seam separation. The only surface defects that can be maintained during the winter months are potholes.

During the Spring Blitz Program, the City makes a consolidated effort to address any potholes throughout city. The entire asphalt department puts on hold all other asphalt work, such as the overlay program and driveway apron reinstatements, until they have addressed all outstanding potholes city wide. Other surface defects, such as delamination, alligator cracking and seam separation, cannot be done at this time. The material needed for these repairs is called sand seal and the required pavement temperature to be at least 15 degrees Celsius.

Once the weather allows the asphalt temperature to remain above 15 degrees Celsius, the City will start their Sand Seal Blitz. This program will allow the City to address any delaminations and other surface defects. This typically starts at the end of June or beginning of July.

All other surface defects are maintained throughout the construction season. These requests are prioritized and planned in the work schedule for the Surface Maintenance Department. With the exception of seam separation, all other surface defects are maintained through the Surface Maintenance Department. Seam separation is a stand alone program that is currently contracted out on an annual basis.

STRATEGIC ALIGNMENT

This report aligns with Council's Priority for Valued Service Delivery, specifically as it relates to investing in sustainable City services and municipal infrastructure.

SERVICE AND FINANCIAL OUTCOMES

Asphalt pavements, and concrete curb and sidewalks are essential infrastructure which directly impacts the quality of life in our community. Roadway infrastructure is important to the economic health of the community and citizens expect these assets to be maintained to an acceptable standard. Proper and timely maintenance of all roadway assets will ensure public safety, extend service life of the asset, and achieve best value for the investment.

We have purchased 140 tonnes of cold mix at a cost of approximately \$28,000 and have used approximately 55 tonnes of recycled hot mix.

The pothole count (as of March 19) includes the potholes where we have been back several times.

	<i>Potholes</i>	<i>Patching Days</i>
January	57	8
February	455	13
March	651	9

Most days crews would be placing cold mix asphalt and making use of the recycled asphalt capability. As temperatures start to warm up and there is additional meltwater in the potholes, we rely more heavily on the cold mix patching as it is less sensitive to wet conditions.

INPUT FROM OTHER SERVICE AREAS AND STAKEHOLDERS

Continued support from our citizens to assist us with our pothole patching program by calling our Customer Service line at 506-658-4455 to inform us of the location of the pothole.

ATTACHMENTS

Winter Pothole Maintenance (*Presentation*)