City of Kingston
Report to Environment, Infrastructure & Transportation Policies Committee
Report Number EITP-24-019

To:	**Chair and Members of the Environment, Infrastructure & Transportation Policies Committee**
From:	**Brad Joyce, Commissioner, Infrastructure, Transportation & Emergency Services**
Resource Staff:	**Karen Santucci, Director, Public Works & Solid Waste**
Date of Meeting:	**October 8, 2024**
Subject:	**Pothole Key Performance Indicators**

Council Strategic Plan Alignment:

Theme: 3. Build an Active and Connected Community

Goal: 3.4 Improve road condition, performance, and safety.

Executive Summary:

Kingston's Strategic Plan includes an initiative to develop and implement a means of tracking pothole repairs and develop metrics which can be reported to Environment, Infrastructure & Transportation Policies Committee.

Over the past two years, Public Works has implemented two new pothole tracking systems to transition away from a paper-based system. The first improvement occurred in Q1 2023 and involved using a geographic information system (GIS) application to record potholes on an iPad from inside the road patrol vehicle. The second system implemented in the spring of 2024 involved using Artificial Intelligence (AI) and camera systems to track, identify, and map potholes into the same GIS. This new system will provide more detailed accurate tracking and give staff ability to report on meaningful Key Performance Indicators (KPIs).

Recommendation:

That the Environment, Infrastructure & Transportation Policies Committee recommend to Council:

That Council direct staff, starting in 2025, to report to the Environment, Infrastructure and Transportation Policies Committee annually on the following four pothole key performance indicators (KPI) and the following index for context:

1. KPI: Total number of potholes identified for each classification of road;
2. KPI: Percentage of potholes repaired (filled) within the timeframe outlined in the provincial Minimum Maintenance Standards;
3. KPI: Percentage of identified potholes that were reported by the public;
4. KPI: Average number of days to repair a pothole based on road classification; and
5. Index: Weather Severity Index.

Authorizing Signatures:

ORIGINAL SIGNED BY COMMISSIONER

Brad Joyce, Commissioner,
Infrastructure, Transportation &
Emergency Services

p.p. ORIGINAL SIGNED BY COMMISSIONER

Lanie Hurdle, Chief
Administrative Officer

Consultation with the following Members of the Corporate Management Team:

Paige Agnew, Commissioner, Growth & Development Services	☑
Jennifer Campbell, Commissioner, Community Services	Not required
Neil Carbone, Commissioner, Corporate Services	Not required
David Fell, President & CEO, Utilities Kingston	Not required
Peter Huigenbos, Commissioner, Major Projects & Strategic Initiatives	Not required
Desirée Kennedy, Chief Financial Officer & City Treasurer	Not required

Options/Discussion:

Section 3.4.1 of Kingston's Strategic Plan, includes the following initiative:

Improve the overall state of the City's roads through maintenance and capital planning.

- Develop and implement a means of tracking pothole repairs and develop metrics which can be reported to Environment, Infrastructure & Transportation Policies Committee.

This report provides information pertaining to pothole data collection and analysis as well as providing Key Performance Indicators recommended to be used by Public Works.

A review of current data from 2023-2024 shows a decrease in potholes being identified through customer reports and road patrol inspections. Many factors can contribute to this but two that are dominant are that the winter was much less severe than prior winters and that Public Works prioritized pothole maintenance work over the past 18 months.

Background

A pothole is a depression in a road surface, usually asphalt pavement. Two primary factors normally contribute to the physical development of a pothole – water in the underlying base structure and vehicle traffic passing over the affected area. Water first weakens the underlying base, and then traffic fatigues and breaks the poorly supported asphalt surface. Freeze/thaw cycles greatly accelerate the deterioration process and continued vehicular traffic ejects both asphalt and the underlying base material thereby creating a hole in the pavement. The number of potholes found each year can vary significantly depending on the weather, amount of traffic and road conditions. Certainly, the City experiences higher levels of potholes associated with seasons having more freeze/thaw cycles.

Staff introduced changes to pothole identification and tracking over the past two years that changed how the data is collected. Inspections are conducted based on legislative requirements established through provincial minimum maintenance standards. For example, main arterial roads are inspected thrice weekly while low-volume local roads are inspected once monthly. Prior to late 2023, Public Works used a manual recording method but has since transitioned to using a GIS application and, in the summer of 2024, added cameras and Artificial Intelligence (AI) technology. This permits scanning of the road as driven, with the AI system identifying issues and automatically entering them into the GIS system. These changes have improved efficiency and effectiveness, having a positive effect on the ability to properly identify and track potholes.

Analysis

The changes in tracking methods of potholes have made it difficult to have accurate comparable data for previous years. The technological changes implemented provide a more solid data foundation and early results point to more reliable objective information being obtained. Public

reporting of potholes will continue to be received and inputted, and this combination will form the basis for data analysis and direct repairs.

A review of KPIs used in other municipalities indicated that there were many KPIs related to highways, however many of these relate to assigning a road condition survey index to a segment of highway, which Kingston's Engineering department already completes. For the purpose of this report, staff looked strictly at development of KPIs based on potholes and not on larger segments of roadways. A KPI review of other municipalities found that there is little consistency on pothole statistics including repair and associated completion times. This lack of cohesive data means comparators are not readily available, however, there is value in reporting and comparing internal KPIs over time.

Weather is one of the main contributing factors to the development of potholes, more specifically water. Water can impact potholes due to insufficient drainage, pavement defects that allow moisture to compromise the structural integrity of the pavement and extreme weather variations which cause freezing. Weather can have a significant effect on the number of potholes generated in a given year. For this reason, a Winter Severity Index is often used to establish how severe the weather was for a given year. A Winter Severity Index is a measure of the relative impact of winter weather on winter road maintenance operations using historical meteorological or road weather information system data. It can be used to evaluate the relative harshness of a winter in comparison with a base period.

The implementation of the new software and AI tracking will allow staff to provide consistent KPI data going forward. Starting in 2025, staff recommend that the following pothole KPIs be reported to the EITP Committee on an annual basis:

- The total number of potholes identified for each classification of road.
- The percentage of potholes repaired (filled) within the time frame outlined in the provincial Minimum Maintenance Standards.
- Percentage of identified potholes that were reported by the public.
- Average number of days to repair a pothole based on road classification.

Staff also recommend that in addition to the KPIs above, supplementary context be provided by staff report:

- the Winter Severity Index.

Financial Considerations

None

Contacts:

Karen Santucci, Director of Public Works & Solid Waste 613-546-4291 extension 1856

Exhibits Attached:

Exhibit A - Minimum Maintenance Standards for Potholes

Minimum Maintenance Standards for Potholes

O. Reg. 239/02: Minimum Maintenance Standards for Municipal Highways
Under Municipal Act, 2001, S.). 2001, c. 25

Classification of Highways

Column 1 Average Daily Traffic (# of motor vehicles)	Column 2 91 - 100 km/h speed limit	Column 3 81 - 90 km/h speed limit	Column 4 71 - 80 km/h speed limit	Column 5 61 - 70 km/h speed limit	Column 6 51 - 60 km/h speed limit	Column 7 41 - 50 km/h speed limit	Column 8 1 - 40 km/h speed limit
53,000 or more	1	1	1	1	1	1	1
23,000 - 52,999	1	1	1	2	2	2	2
15,000 - 22,999	1	1	2	2	2	3	3
12,000 - 14,999	1	1	2	2	2	3	3
10,000 - 11,999	1	1	2	2	3	3	3
8,000 - 9,999	1	1	2	3	3	3	3
6,000 - 7,999	1	2	2	3	3	4	4
5,000 - 5,999	1	2	2	3	3	4	4
4,000 - 4,999	1	2	3	3	3	4	4
3,000 - 3,999	1	2	3	3	3	4	4
2,000 - 2,999	1	2	3	3	4	5	5
1,000 - 1,999	1	3	3	3	4	5	5

Column 1 Average Daily Traffic (# of motor vehicles)	Column 2 91 - 100 km/h speed limit	Column 3 81 - 90 km/h speed limit	Column 4 71 - 80 km/h speed limit	Column 5 61 - 70 km/h speed limit	Column 6 51 - 60 km/h speed limit	Column 7 41 - 50 km/h speed limit	Column 8 1 - 40 km/h speed limit
500 - 999	1	3	4	4	4	5	5
200 - 499	1	3	4	4	5	5	6
50 - 199	1	3	4	5	5	6	6
0 - 49	1	3	6	6	6	6	6

O. Reg. 366/18, s. 1 (5)

Maintenance Standards

Patrolling

3. (1) The standard for the frequency of patrolling of highways to check for conditions described in this Regulation is set out in the Table to this section. O. Reg. 23/10, s. 3 (1); O. Reg. 366/18, s. 3 (2).

(2) If it is determined by the municipality that the weather monitoring referred to in section 3.1 indicates that there is a substantial probability of snow accumulation on roadways, ice formation on roadways or icy roadways, the standard for patrolling highways is, in addition to that set out in subsection (1), to patrol highways that the municipality selects as representative of its highways, at intervals deemed necessary by the municipality, to check for such conditions. O. Reg. 47/13, s. 2; O. Reg. 366/18, s. 3 (2).

(3) Patrolling a highway consists of observing the highway, either by driving on or by electronically monitoring the highway, and may be performed by persons responsible for patrolling highways or by persons responsible for or performing highway maintenance activities. O. Reg. 23/10, s. 3 (1).

(4) This section does not apply in respect of the conditions described in section 10, subsections 11 (0.1) and 12 (1) and section 16.1, 16.2, 16.3 or 16.4. O. Reg. 23/10, s. 3 (1); O. Reg. 366/18, s. 3 (3).

Patrolling Frequency

Class of Highway	Patrolling Frequency
1	3 times every 7 days
2	2 times every 7 days
3	once every 7 days
4	once every 14 days
5	once every 30 days

O. Reg. 239/02, s. 3, Table; O. Reg. 23/10, s. 3 (2)

Potholes

6. (1) If a pothole exceeds both the surface area and depth set out in Table 1, 2 or 3 to this section, as the case may be, the standard is to repair the pothole within the time set out in Table 1, 2 or 3, as appropriate, after becoming aware of the fact. O. Reg. 239/02, s. 6 (1); O. Reg. 366/18, s. 8 (1).

(1.1) For the purposes of this section, the surface area and depth of a pothole may be determined in accordance with subsections (1.2) and (1.3), as applicable, by a municipal employee, agent or contractor whose duties or responsibilities include one or more of the following:

1. Patrolling highways.
2. Performing highway maintenance activities.
3. Supervising staff who perform activities described in paragraph 1 or 2. O. Reg. 366/18, s. 8 (2).

(1.2) The depth and surface area of a pothole may be determined by,

(a) performing an actual measurement; or

(b) performing a visual estimate. O. Reg. 366/18, s. 8 (2).

(1.3) For the purposes of this section, the surface area of a pothole does not include any area that is merely depressed and not yet broken fully through the surface of the roadway. O. Reg. 366/18, s. 8 (2).

(2) A pothole is deemed to be in a state of repair if its surface area or depth is less than or equal to that set out in Table 1, 2 or 3, as appropriate. O. Reg. 239/02, s. 6 (2); O. Reg. 47/13, s. 6.

Table 1: Potholes on Paved Surface of Roadway

Class of Highway	Surface Area	Depth	Time
1	600 cm²	8 cm	4 days
2	800 cm²	8 cm	4 days
3	1000 cm²	8 cm	7 days
4	1000 cm²	8 cm	14 days
5	1000 cm²	8 cm	30 days

O. Reg. 239/02, s. 6, Table 1.

Table 2: Potholes on Non-paved Surface of Roadway

Class of Highway	Surface Area	Depth	Time
3	1500 cm²	8 cm	7 days
4	1500 cm²	10 cm	14 days
5	1500 cm²	12 cm	30 days

O. Reg. 239/02, s. 6, Table 2.