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Date January 21, 2025 **Report No.** 2025-18

To Chair and Members
Special City Council Meeting

From Inderjit Hans P.Eng., PMP
Commissioner, Public Works Commission

1.0 Type of Report

Consent Item	[ ]
Item For Consideration	[*]

2.0 Topic Increasing Nitrate Levels in the Grand River [No Financial Impact]

3.0 Recommendation

A. THAT Report No. 2025-18 titled “Increasing Nitrate Levels in the Grand River” BE RECEIVED.

4.0 Executive Summary

Nitrate, a form of nitrogen, occurs naturally in water, soil and air. Nitrate forms in the Grand River from agricultural operations, stormwater runoff and wastewater discharges in the watershed. The City’s water treatment plant, which has a conventional treatment process, cannot remove nitrate. High level of nitrate in the drinking water can adversely affect the health of pregnant women and infants under the age of one year (vulnerable population). The provincial drinking water limit for nitrate is 10 mg/L as nitrogen maximum acceptable concentration (MAC).

Nitrate level in the Grand River tends to be high during the winter when biological activity is low. In recent years nitrate levels in the Grand River have gradually increased, and for a few hours during a heavy rainfall event on January 1, 2025, the levels peaked at 9.8 mg/L. As an operational measure, the inlet gates to the Holmedale Canal were closed during this event. The nitrate level in the drinking water never exceeded 8.7 mg/L, as it was supplied from the storage reservoirs, and met all Ontario's Drinking Water Quality Standards.

To prepare for the scenario of nitrate levels staying above the MAC for a prolonged period, the City will be installing mobile trailer mounted reverse osmosis units procured under the emergency procurement clause in the City's Purchasing Policy. The installation will take approximately 4-6 weeks, with the units operational in February 2025. Regarding a permanent solution, the addition of reverse osmosis process will be pursued to address treatment needs and to provide capacity for sustainable growth. This modernization upgrade will take approximately 4-5 years.

Installation and operation of the mobile trailer mounted reverse osmosis treatment units will cost approximately $900,000 for this winter. It is estimated that the permanent reverse osmosis upgrade will be in the range of $50 to $100 million. Staff are pursuing provincial and federal grant funding for modernization of the existing water treatment plant. The 2025-2027 capital budget includes $15 million (debt supported by the water rate revenue) for municipal environmental assessment studies, emergency procurement, and preliminary design of the permanent reverse osmosis treatment process upgrades.

As per the City's emergency response plan, if the nitrate levels exceed the MAC in the drinking water, the Grand Erie Public Health will issue "No Drinking Water Advisory" to the vulnerable population. During this period, the City will supply drinking water (hauled and/or bottled) to the vulnerable population. The cost per event (lasting 5 days) to supply bottled water and hauled water to vulnerable populations along with media communications is estimated to be $20,000.

If the nitrate levels above the MAC persists for many days and a Drinking Water Advisory is issued by the Medical Officer of Health, the City may need to activate the Emergency Operations Centre (EOC). A defined communications protocol is developed in collaboration with Grand Erie Public Health.

5.0 Purpose and Overview

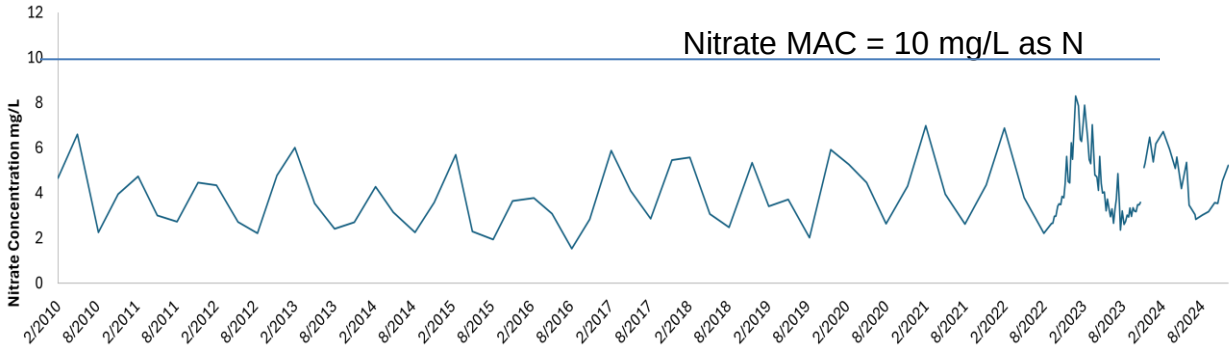
The purpose of this report is to inform Council about the increasing nitrate level trends in the Grand River in the recent weeks and about the City's response plan.

6.0 Background

Nitrate, a form of nitrogen, is naturally present in soil and ground water. Nitrate concentration in the Grand River water has increased due to human activities such as agriculture, wastewater treatment, septic systems, industrial processes and storm water runoff. Since nitrate is formed by a wide variety of activities, it takes a lot of concerted effort by various agencies to control its level in the Grand River.

The City has been monitoring nitrate level in the Grand River water for a long time. In recent years, gradual increase of the nitrate level was observed. Figure 1 below shows the trending of nitrate concentration in the Grand River water from 2010 to 2024.

Figure 1: Raw Water Nitrate Concentration Between 2010 and 2024



Cold water temperatures and low biological productivity are typical during winter. Nitrate-laden surface run-off discharge into the river during this period is unmetabolized by dormant nitrifying microorganisms. As shown in Figure 1, Grand River nitrate has a seasonal cycle with:

- Lowest nitrate levels most often observed during the warmer months when river metabolic processes are highest; and
- Highest nitrate levels measured during winter and early spring that approach the provincial drinking water limit. The maximum nitrate concentration observed so far by the City in the raw water is 9.8 mg/L on January 1, 2025 for a few hours.

The province has established a regulatory MAC of 10 mg/L as nitrogen in the drinking water, per O. Reg 169/03-Ontario Drinking Water Quality Standards. This MAC has been set to protect against negative health impacts for vulnerable populations (pregnant mothers and infants under the age of one year). Although nitrate levels in the Grand River have been trending higher in recent years, Brantford's drinking supply has always been safe with levels never exceeding the MAC of 10 mg/L as nitrogen. Nitrate level in drinking water higher than the MAC can cause adverse health effect such as methemoglobinemia (Blue Baby Syndrome).

The Holmedale Water Treatment Plant is a conventional treatment plant consisting of coagulant-assisted ballasted sand flocculation / sedimentation, ozonation, dual media filtration, UV disinfection, chloramination, and fluoridation. While this advanced system is robust to many surface water contaminants, none of these treatment processes reduce the concentration of nitrate in water.

To understand variation of nitrate level in the Grand River and to act as an early warning system, online monitoring analyzers have been recently installed at Bridgeport and Brant Monitoring Stations upstream of the Holmedale Water Treatment Plant by the GRCA.

A feasibility study to reduce nitrate level in the treated water was completed by the City in 2024 It confirmed that reverse osmosis treatment is the reliable preferred alternative for mitigating nitrate level. Source water protection and groundwater blending measures will also help in reducing nitrate levels.

The Mayor's delegation met with the Ministry of the Environment, Conservation and Parks (MECP) at the 2024 Association of Municipalities of Ontario (AMO) conference to secure funding support for the water treatment upgrades. The City is working with the Grand River Conservation Authority (GRCA), Lake Erie Region Source Protection Committee, MECP, University of Waterloo academia and the Grand River watershed municipalities on improving source water protection.

Emergency acquisition is allowed as per section 3.04 Special Provisions for emergencies in the City's Purchasing Policy to address the risk to the City's drinking water supply. As per the Policy, "Emergency" means that Council, the CAO, or the applicable Commissioner has determined that there is an unforeseeable or impending situation requiring immediate Procurement in order to: (i) maintain sufficient levels of required Goods and Services; (ii) prevent or mitigate danger to life, health, or property; or (iii) avoid a substantial or significant interference with City municipal operations. The Commissioner of

Public Works has exercised this provision to allow for the temporary trailer mounted reverse osmosis treatment units to be installed and operational by February 2025. As per the policy, a report to City Council will be provided detailing the circumstances of the emergency, the details of the procurement and any other information related to exercising the Emergency Procurement provision.

7.0 Corporate Policy Context

This Report and recommendation align with Council Priority #10 Build a Greener Brantford - The Grand River - Plan for the river to be an integral and unique part of the City, from economical perspective but also to improve the Quality of Life for the community.

8.0 Input From Other Sources

The emergency response plan and communications plan were developed in consultation with partner agencies including, Grand Erie Public Health (GEPH), MECP and the GRCA. staff also consulted with Communications and Customer Service Department, and Community Emergency Management Coordinator while preparing the Plans. Comments provided on this report by the Finance Department have been addressed.

9.0 Analysis

9.1 Operational Readiness Plan

In the instance where the river nitrate level rise above 8 mg/L as nitrogen, drinking water production will be increased until the canal and drinking water reservoirs are at maximum levels. When the river nitrate level reaches the MAC, the canal will be isolated from the Grand River by closing the inlet gates. Water available in the City’s storage will serve the City up to 36 hours during the winter months.

To prepare for the event where the nitrate level stays above the MAC for a prolonged period, the City will be installing mobile trailer mounted reverse osmosis units procured under section 3.04 Special Provisions for emergencies in the City’s Purchasing Policy. This emergency procurement will (i) maintain sufficient supply of drinking water for residents and business including fire water supply (ii) prevent danger to public health and (iii) avoid significant interference with Public Works operations.

In winter months, average water consumption is 30 million litres per day (MLD). The installed units will have a capacity of 10 MLD. The treated water from the mobile units will be blended to reduce the nitrate level to acceptable limit. The installation will take approximately 4-6 weeks and will be operational in February 2025. Staff will bring a report to Q2 2025 council cycle on the details of the emergency procurement and operation of the mobile reverse osmosis treatment units.

As a permanent solution, the reverse osmosis process will be pursued to address existing treatment needs and to provide capacity for sustainable growth. This process upgrade will take about 4-5 years. The 2025-2027 capital budget includes funding for the preliminary design of the upgrade. Design and construction funding will be included in 2026-2029 capital budget.

9.2 Emergency Response Plan

A multi-disciplinary City team which includes Community Emergency Management Coordinator, Communications and Environmental Services departments have prepared an emergency response plan in the event the nitrate level exceeds the drinking water limit of 10 mg/L (MAC).

If the nitrate level exceeds MAC in the drinking water, the GEPH will issue “No Drinking Water Advisory” to vulnerable population. Pregnant women and infants under a year old are identified as the vulnerable population. During this period, the City will distribute drinking water (hauled and/or bottled) to the vulnerable population.

If nitrate level above the MAC persists for many days and depending on the nature of the Drinking Water Advisory issued by the Medical Officer of Health, the City may need to activate the Emergency Operations Center (EOC). To prepare for this scenario, as a precautionary measure mobile reverse osmosis units will be installed and will be operational during winter months.

9.3 Communications Plan

In consultation with Grand Erie Public Health, and in the interest of full transparency, on January 13, 2025, Communications staff initiated a comprehensive nitrates public education campaign with the following objectives:

- To reaffirm that the City of Brantford's foremost priority is safeguarding public health by ensuring access to safe, high-quality drinking water

through rigorous testing, proactive management, and transparent communication with the community.

- To inform the community about the City's proactive measures in monitoring and managing nitrate levels in the Grand River, especially during winter months.

- To outline the known health effects of nitrate and the steps being taken to protect vulnerable populations including individuals who are pregnant, and infants under a year old.

- To communicate the City's contingency plans in the unlikely event of nitrate levels temporarily exceeding acceptable thresholds.

To promote transparency and public awareness through access to detailed resources.

On January 13th, a Public Notice was distributed by Communications staff to local and surrounding media and shared on the City's social media platforms whereby Communications staff engaged with several residents to respond to their questions and comments. Additionally, staff prepared a dedicated webpage/FAQ on the City's website to provide detailed answers to anticipated questions about nitrate levels in drinking water, including its sources, health effects, and acceptable levels. Specifically, the FAQ:

- Educates residents on how nitrate enters the water supply and the biological factors affecting its levels.

- Informs the public about the City's regular testing procedures and emergency response plans.

- Offers guidance on home treatment options and financial assistance programs for reducing nitrate levels.

- Encourages public engagement through resources such as water quality reports contact with the City's customer support and contact with Grand Erie Public Health regarding questions related to health impacts.

The nitrate response Communications plan also includes a defined communications protocol developed in collaboration with Grand Erie Public Health should nitrate levels in the drinking water supply ever exceed the provincial threshold. Initially, an Advisory would be issued to the community and

media by the Grand Erie Public Health Medical Officer of Health to make the community aware of the current levels, and the potential health impact on the identified vulnerable populations of pregnant individuals and infants under a year old.

Immediately following the release of a Grand Erie Public Health Drinking Water Advisory, the City's Communications staff will issue a Public Notice to make the community aware of how the vulnerable populations in the City of Brantford and Cainsville will be supplied with free low nitrate drinking water through the duration of a temporary "high nitrate level" event.

All communications regarding a nitrate response event will be posted across the City's digital platforms, with regular updates provided as the situation evolves. Depending on the size and significance of the event, City Communications staff will coordinate a press conference, providing media with the opportunity to ask City officials questions and ensuring important health-related information is shared across multiple platforms.

10.0 Financial Implications

In an emergency, supply of bottled water and hauled water to the vulnerable population and media communications could cost approximately $20,000 per event (lasting 5 days), impacting the operating budget.

Installation and operation of mobile reverse osmosis treatment units will cost approximately $900,000 for this winter. The permanent reverse osmosis upgrade will cost between $50 and $100 million. Staff are pursuing provincial and federal grant funding for this permanent modernization of the existing water treatment plant.

The 2025-2027 capital budget includes $15 million (debt supported by water rate) for municipal environmental assessment studies, emergency procurement and preliminary design of permanent reverse osmosis treatment process upgrades. The project ID is 002337 and titled, "Nitrate Issue in Source Water". Design and construction funding will be included in 2026-2029 capital budget.

11.0 Climate and Environmental Implications

In case of an adverse water condition, there may be a temporary environmental impact from air emissions for the transportation of bottled water or hauled water tanks to public and/or private distribution centers.

12.0 Conclusion

Nitrate is a form of nitrogen present in the Grand River peaks during the colder months due to several environmental and human made factors. Nitrate cannot be removed by conventional water treatment process. In recent years, the nitrate level in the Grand River is trending upwards. If the nitrate level exceeds the Ontario Drinking Water Limit, it may pose a health risk to pregnant women and infants under a year of age. To reduce the nitrate level, the City will be using mobile reverse osmosis treatment units as an emergency solution. The City needs to modernize the drinking water treatment plant by adding reverse osmosis treatment process. This modernization enables the City to provide high quality drinking water and supports sustainable growth.

Inderjit Hans P. Eng., PMP
Commissioner, Public Works

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Attachments:
Not Applicable.

Copy to:
Dr. Rebecca Comley, Medical Officer of Health, Grand Erie Public Health
Janet Ivey, Manager of Water Resources, Grand River Conservation Authority

In adopting this report, is a by-law or agreement required? If so, it should be referenced in the recommendation section.

By-law required [ ] yes [x] no

Agreement(s) or other documents to be signed by Mayor and/or City Clerk	[ ] yes	[x] no
Is the necessary by-law or agreement being sent concurrently to Council?	[ ] yes	[x] no