



INFORMATION REPORT

TO:	Chair and Members Public Works Committee
COMMITTEE DATE:	November 28, 2022
SUBJECT/REPORT NO:	Feasibility of Testing Soil on City-Owned Property to Assess Risks to Drinking Water (PW22085) (City Wide) (Outstanding Business List Item)
WARD(S) AFFECTED:	City Wide
PREPARED BY:	Cassandra Kristalyn (905) 546-2424 Ext. 3791
SUBMITTED BY:	Nick Winters Director, Hamilton Water Public Works Department
SIGNATURE:	

COUNCIL DIRECTION

On November 17, 2021, the General Issues Committee approved the following motion: “That staff be directed to review the feasibility of testing soil on City-owned property, which may come into contact with city drinking water, on a risk-assessment basis, and report back to the Public Works Committee”.

INFORMATION

Background:

In August of 2020, during a capital rehabilitation and upgrade project at the Kenilworth water reservoir, soil sample results indicated that the soil covering the concrete reservoir contained various levels of polycyclic aromatic hydrocarbons (PAHs), a group of chemicals which include known carcinogens. As a precautionary measure, the Hamilton Water Division (HW) initiated enhanced water quality testing to ensure that the contaminated soil was not impacting the City’s drinking water. No concerns were detected at either the Kenilworth reservoir or any of the other sample locations.

On November 25, 2020, General Issues Committee (Rate Budget) Report 20-020 was approved, and staff were directed to remove the contaminated soil at the Kenilworth Reservoir and replace it with clean fill.

OUR Vision: To be the best place to raise a child and age successfully.

OUR Mission: To provide high quality cost conscious public services that contribute to a healthy, safe and prosperous community, in a sustainable manner.

OUR Culture: Collective Ownership, Steadfast Integrity, Courageous Change, Sensational Service, Engaged Empowered Employees.

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On November 17, 2021, the HDR01 Kenilworth Reservoir Soil Removal and East Cell Upgrades (PW20074(a)) Report was presented to the General Issues Committee which detailed the soil removal/replacement scope. During this meeting, Committee members inquired whether historical soil pollution posed a risk of contamination to any of the other City drinking water reservoirs or drinking water infrastructure. HW routinely tests drinking water at the City's reservoirs, but there is no formal program to test the soils on City-owned property to assess the risks to drinking water. As soil contamination was discovered at the Kenilworth reservoir during a capital project, the question of proactive soil testing at these types of facilities was also posed by Committee.

Analysis:

The City's drinking water infrastructure consists of vertical and linear assets. Vertical assets that store drinking water underground (either partially or fully treated), include the sedimentation tanks and clear wells at the City's Woodward Water Treatment Plant (WTP), and water storage reservoirs across the City. These underground storage tanks are not pressurized and as a result there is a risk of groundwater infiltration if seals and expansion joints are not properly maintained and begin to leak, or if the tanks are otherwise compromised. The City's linear assets include over 2,100 km of buried watermains and more than 146,000 buried water services. However, these linear assets operate under pressure and as a result they are not susceptible to infiltration during normal operation. Through discussions with the City's Public Health Services and Engineering Services Divisions, HW staff determined that soil contamination is prevalent within the City's road allowance, but that the risk to the buried infrastructure is negligible because they are pressurized assets and there are appropriate processes and controls in place to manage any risk. At the same time HW staff determined that it would be a worthwhile exercise to complete a desktop analysis to provide a strategy and cost estimates for evaluating soil conditions at the City's non-pressurized facilities. In addition to presenting the results of the desktop analysis for the soil sampling at non-pressurized facilities, this report also highlights many safeguards and best practices that HW utilizes to mitigate risk to the drinking water system for both pressurized and non-pressurized assets.

HW engaged a third-party consulting firm (Jacobs) to complete the desktop analysis for the development of a strategy to assess soil conditions for the presence or absence of contaminants at 12 City drinking water reservoirs, and at the Woodward WTP sedimentation tanks and clear wells. This desktop analysis provided a budget level cost estimate, the assessment framework and estimated level of effort, along with aerial imaging of the subject facilities with proposed sampling locations. The report from Jacobs is attached as Appendix "A" to report PW22085 and the key points are summarized below:

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1. Methodology for Strategy Development and Cost Estimate for Evaluating Soil Conditions at 12 City Reservoirs and at the Woodward WTP Sedimentation Tanks and Clear Wells

As outlined in Appendix “A” to report PW22085, the overview of the proposed sampling program includes the following:

- Estimate the surface area of each subject facility.
 - Consider regulations and policies applicable to the proposed soil quality evaluation.
 - Develop a conceptual site model (CSM) based on existing information/data, including consideration of principles used for the Kenilworth Reservoir soil management program and definition of Contaminants of Concern (COCs) and mobility properties.
 - Determine information/data gaps.
 - Recommendations for soil sampling to assess the presence or absence of impacts relative to the applicable Ministry of Environment Conservation and Parks (MECP) standards.
 - Completion of the Assessment of Past Uses (AOPU) in accordance with O. Reg 406/19 On-Site and Excess Soil Management, to identify potential COCs based on past uses in the area.
 - Prepare a schedule, budget level cost estimate, and details for each site such as sample collection methodology, analytical requirements, and reporting.
2. Budget Level Cost Estimate for Evaluating Soil Conditions at 12 City Reservoirs and at the Woodward WTP Sedimentation Tanks and Clear Wells

Appendix “A” to report PW22085 includes Table 1 - Desktop Cost Estimate of Soil Conditions at 12 City Reservoirs and at the Woodward WTP Sedimentation Tanks and Clear Wells. The cost estimate for sampling and analysis all 14 proposed subject facilities was \$135,288 with a \$14,000 contingency. The table was populated by each individual site with estimates on:

- Size of infrastructure;
- Estimated soil volume;
- Preliminary sampling and analysis details (number of samples, depth of sample, chemical analytes, etc.);
- Labour costs for screening level AOPU including Eco-Log Eris report;
- Contingency/provisional scope item associated with additional analytical or background analysis if required.

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3. Limitations and Assumptions for Strategy Development and Cost Estimate for Evaluating Soil Conditions at 12 City Reservoirs and at the Woodward WTP Sedimentation Tanks and Clear Wells
- The cost estimate and associated level of effort is for the initial baseline soil sampling. A more detailed AOPU for each location may reveal additional sampling needs.
 - The proposed sample locations are based on aerial imagery and assumed facility limits. The number of samples may change pending the receipt of additional background information such as historical drawings and/or geotechnical reports.
 - Any work to be performed as part of this soil sampling strategy is to be conducted under the supervision of a Qualified Person as defined under regulation O. Reg 153/04.
 - Utility locates are not included in the cost estimate.

Safeguards and Best Practices to Mitigate Risk to the Drinking Water System:

The City has many safeguards in place to protect drinking water assets, pressurized and non-pressurized. Appendix “B” to report PW22085 attached to this report details the safeguards and best practices that are employed to mitigate risk to the drinking water system, Table 1 is a high-level summary of the details that are provided in Appendix “B” to report PW22085. Note that while this list is comprehensive, it is not an exhaustive list of all the programs, procedures, and practices employed by HW to protect the City’s drinking water quality.

Table 1 - Summary Safeguards and Best Practices to Mitigate Risk to the Drinking Water System

a) Managing and Maintaining Pressure in the Water Distribution System	Pressurized assets like watermains are less vulnerable to contamination. The internal pressure is managed and maintained through a combination of gravity fed assets, pumping stations, pressure tanks, various types of valves and the Supervisory Control and Data Acquisition System (SCADA).
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b) Pressure Transient Mitigation and Monitoring	To assist with documenting the frequency and magnitude of pressure transient events, the City completes pressure monitoring utilizing pressure data loggers. The generation of this high-quality pressure data helps to determine the effect of routine operational practices on the distribution system, such as impact of hydrant operations, pump start-up/shut down and valve closing speed, among others.
c) Backflow Prevention Bylaw	The Prevention of Backflow into the Water Distribution System of the City of Hamilton (By-Law No. 10-103) ensures that through the installation of a backflow prevention device, the drinking water quality and distribution system is protected from contaminants from industrial, commercial, institutional and multi-residential properties should backflow conditions occur.
d) Proactive Leak Detection	Efforts to reduce distribution system leakage are beneficial not only from a water conservation standpoint, but to mitigate the potential for contaminant intrusion into the potable water supply. To date, the City has successfully proactively detected approximately 332 public and private leaks.
e) Drinking Water Quality Management System (DWQMS)	Drinking water contamination mitigation and intervention measures are well documented and exercised through the DWQMS.
f) Water Quality Sampling	To ensure the production and distribution of safe drinking water, the City completes grab sampling, such as discrete samples representing water characteristics at a particular time, and continuous sampling. Samples are collected from approximately 111 locations in the distribution system every month, and more than 55,000 laboratory tests are completed annually.
g) Ministry of Environment, Conservation and Parks (MECP) Watermain Disinfection Procedure	The Ministry of Environment, Conservation and Parks (MECP) Watermain Disinfection Procedure is a tool that outlines a risk management approach to categorize watermain breaks based on the potential for contamination. The procedure sets minimum disinfection requirements to minimize the potential for drinking water health hazards during emergency or unplanned repairs due to watermain and/or appurtenance failure.

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h) Procedures for Shutting Down and Recharging Watermains	The City's internal procedure Isolation and Recharging of Watermains (PW-WW-DC-WD-P-011-006) incorporates the requirements of the MECP Watermain Disinfection Procedure while shutting down and recharging watermains. Prior to the watermain shutdown, the licensed operator performing the processes will ensure that there is an air gap to ensure no back siphonage and minimize potential contamination to the drinking water supply.
i) Excess Soils Regulation O. Reg 406/19 On-Site and Excess Soil Management	With the introduction of O. Reg 406/19 On-Site and Excess Soil Management which came into effect Jan 1, 2021, the rules and regulations around managing and re-using excess soils were strengthened to facilitate local beneficial reuse while protecting human health and the environment.
j) Geotechnical Investigation	For the construction of new roads and infrastructure within the right-of-way, such as underground utilities, geotechnical investigation is completed to determine the type of soil and soil conditions. The samples are assessed through laboratory testing, soil classification, estimated permeability and soil chemical analysis.
k) Spills Response	The City has 24 hours a day, 7 days a week Spills Reporting Line and Spills Response Team who co-ordinate with in house staff and qualified contractors to promptly respond to spills and do everything practicable to prevent and eliminate the negative effects from a spill, including clean up and remediation.
l) Reservoir Cleaning & Inspection Program	The City of Hamilton maintains a regular schedule and inspection of all drinking water storage facilities, including in-ground reservoirs which help to ensure that any deficiencies requiring repairs are addressed before they become significant enough to adversely impact water quality.
m) Water Quality Trending and Data Review	Water quality trending allows us to identify any potential decline in water quality or instability in the distribution system. Identifying poor water quality indicators enables us to request pre-emptive flushing in areas of concern. Part of this process involves creating warning limits that serve as internal water quality indicators, including elevated heterotrophic plate counts and high ortho-phosphate results. In the event of elevated results, due diligence resampling takes place to help identify next steps.

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n) Annual MECP Drinking Water System Inspections	The Ministry of Environment, Conservation and Parks (MECP) has a comprehensive annual inspection program to help assure the public that owners and operators of drinking water systems (DWS) and owners of laboratories are fulfilling their legislated obligations. Inspections of water systems focus on source, treatment, and distribution components as well as management practices.
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Conclusions and Next Steps:

Through discussions with the City’s Public Health Services and Engineering Services Divisions, HW staff have determined the risk from contaminated soils to the City’s buried linear infrastructure is negligible because they are pressurized assets and there are appropriate processes and controls in place to manage any risk.

HW staff have also identified that there is some risk from contaminated soils to the City’s vertical assets that store drinking water underground (either partially or fully treated), including the sedimentation tanks and clear wells at the City’s Woodward Water Treatment Plant (WTP), and 12 water storage reservoirs across the City. These underground storage tanks are not pressurized and as a result there is a risk of groundwater infiltration if seals and expansion joints are not properly maintained and begin to leak, or if the tanks are otherwise compromised.

HW’s consultant (Jacobs) has developed recommendations for a strategy to assess soil conditions for the presence or absence of contaminants at the 12 drinking water reservoirs, and at the Woodward WTP sedimentation tanks and clear wells. The estimated costs for this assessment are \$149,228. HW staff have included these costs in the 2023 Water, Wastewater and Storm Rate Budget, and intend to initiate this study once the budget has been approved. If any contamination is detected as a result of this study, HW staff will report back to Committee and also advise of any required actions.

APPENDICES AND SCHEDULES ATTACHED

Appendix “A” to Report PW22085 – Strategy Development and Cost Estimate for Evaluating Soil Conditions at 12 City Reservoirs and at the Woodward WTP Sedimentation Tanks and Clear Wells

Appendix “B” to Report PW22085 – Safeguards and Best Practices to Mitigate Risk to the Drinking Water System