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To: Mayor and Council

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RE: Phosphorus Reduction Demonstration Project

Report No.: IED 2021-11

AIM

To demonstrate innovative Phosphorous reduction technology (RE 300) in the Lakeshore West Wastewater Pollution Control Plant (LSWWPCP) and compare this solution to conventional chemical based removal in terms of performance, cost, sludge production and other key parameters.

BACKGROUND

Wastewater treatment plants in Ontario typically use iron or aluminum-based chemicals to remove phosphorus. The use of these chemicals is proven and effective at removing phosphorus. However, the use of these chemicals can be costly to achieve low effluent phosphorus concentrations; produce substantial amounts of chemical sludge that needs to be trucked and disposed off-site; and can consume alkalinity needed in the treatment process.

The LWWPCP discharges to the Western Basin of Lake Erie and has a Total Phosphorus (TP) effluent limit of 1.0 mg/L. The treatment plant consistently meets its effluent limit despite being heavily impacted by nutrient loadings from greenhouses and wineries that discharge to the treatment plant. The number of greenhouses discharging to the treatment plant is increasing as this industry expands within the treatment plant's sewer-shed, which will result in higher amounts of conventional chemical addition to meet the TP effluent compliance limit. Adding large amounts of conventional phosphorus removal chemicals is costly, could negatively affect the treatment process, and results in excessive amounts of chemical sludge. Additional sludge production increases sludge handling costs and may require expansion or upgrade of the plant's solid and/or liquid treatment processes.

The Ministry of Environment Conservation and Parks (MECP) recognizes that Phosphorus in Lake Erie has become a critical environmental concern, and so they have created a funding opportunity through the MECP Great Lakes Program to encourage advancement and innovation in the reduction of Phosphorus discharges from municipal wastewater treatment plants into Lake Erie.

This project is supported with commitments made by the Province of Ontario under the Lake Erie Action Plan (LEAP) and Made in Ontario, Environmental Plan on reducing Phosphorus loading in urban areas. In addition, the project supports the Canada-Ontario Agreement and Great Lakes Strategy between Canada and Ontario by promoting innovative technology, and developing climate change adaptation strategies.

DISCUSSION

The technology proposed to improve phosphorus removal is RE300, which is a rare-earth based chemical composed of lanthanum and cerium. It is different than iron and aluminum-based phosphorus removal chemicals because it requires a lower dose, does not produce as much chemical sludge, improves sludge dewatering and does not consume alkalinity or lower pH like other coagulants (Haneline et. al, 2017). Switching to RE300 is straightforward because it can be used with existing chemical dosing equipment without expansion or upgrades of infrastructure.

RE300 removes phosphorus efficiently. For example, to achieve an effluent phosphorus concentration as low as 0.07 mg/L, a molar ratio of coagulant: phosphorus of 1:1 is required for RE300, whereas a ratio between 5:2 to 8:1 is required for conventional iron and aluminum-based coagulants. This high removal can be achieved using only RE300 coagulant without effluent filtration. A potential side benefit of lower sludge production by RE300 is treatment could be achieved with a lower sludge mass, which could reduce the likelihood of plant washout during wet weather flows and the need to bypass treatment processes. Moreover, RE300 has been demonstrated to not cause effluent toxicity, and it is currently in use at over 50 treatment plants in the USA (Bishop Water Technologies).

The Ontario Clean Water Agency (OCWA) has brought in project partners; Ministry of Environment Conservation and Parks (MECP), and Bishop Water Technologies (Bishop) including funding of \$99,500 from Ministry of Environment, Conservation and Parks.

The pilot project will run for a period of 12 months with technical support from both Bishop and OCWA.

The plant's Environmental Compliance Approval (ECA# 9716-9WUKTU-14) has Limited Operational Flexibility that allows pilot tests using side streams. An ECA amendment is required for direct addition of RE300 because Limited Operational Flexibility cannot be used for a chemical that is not commonly used or is proprietary.

If successfully demonstrated by this project, the innovative technology is a cost-effective option that all municipal wastewater treatment plants in Ontario (including LSWWPCP) could use to help them meet the 0.5 mg/L effluent total phosphorus limit set out in the Lake Erie Action Plan, and reduce phosphorus loadings to Lake Erie.

LINK TO STRATEGIC PLAN

Effectively manage corporate resources and maximize performance in day-to-day operations.

This project supports Town's strategic objectives around energy conservation and (Greenhouse Gas) GHG reduction goals including environmental awareness and fostering innovation.

FINANCIAL CONSIDERATIONS

The project has received funding support of \$99,500 from MECP upon successful execution of Transfer Payment Agreement (TPA) between the Town and MECP.

Bishop will provide in-kind support of \$9,000 as technical expert's time.

OCWA will provide operational and other support as required in the plant.

The Town is expected to provide in-kind support of \$9,460 in staff time. There is no cash contribution expected from Town for this project.

CONSULTATIONS

Ontario Clean Water Agency
Bishop Water Technologies
Ministry of Environment Conservation and Parks

RECOMMENDATION

That Council authorize the completion of a pilot test of RE300, with project partners OCWA and Bishop Water Technologies, at the Lakeshore West Wastewater Pollution Control Plant whereby RE300 is added to the Pollution Control Plant's wastewater;

And That Council authorize Administration to execute the Transfer Payment Agreement with the Ministry of Environment Conservation and Parks in order to access the funding for this project in the amount of \$99,500.

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