



REPORT FOR ACTION

Amendment to Purchase Order No. 6047271 for Engineering Design Services at the Island Water Treatment Plant

Date: June 24, 2020

To: Infrastructure and Environment Committee

From: Chief Engineer and Executive Director, Engineering and Construction Services and Chief Procurement Officer, Purchasing and Materials Management

Wards: 14

SUMMARY

The purpose of this report is to request authority to amend Purchase Order Number 6047271 with AECOM Canada Ltd., (AECOM) to provide additional professional engineering design services associated with the installation of a high lake level transfer system to remove excess process and lake water at the City's Island Water Treatment Plant and leveraging a financial opportunity to advance the installation of photovoltaic solar panels and battery energy storage system that are expected to save the City up to \$0.5 million per year in plant operating costs.

The total value of the Purchase Order Amendment being requested is \$2,018,422 net of HST and all applicable charges (\$2,053,946 net of HST recoveries), revising the value of the Purchase Order from \$3,835,494 to \$5,853,916 (net of HST). This revises the total value of the assignment awarded to AECOM from \$7,835,752 to \$9,854,174 net of HST and all applicable charges, (\$10,027,607 net of HST recoveries).

RECOMMENDATIONS

The Chief Engineer and Executive Director of Engineering and Construction Services and the Chief Procurement Officer recommend that:

1. The Infrastructure and Environment Committee, in accordance with Section 71-11.1.C of the City of Toronto Municipal Code Chapter 71 (Financial Control By-Law), grant authority to amend Purchase Order No. 6047271 with AECOM Canada Ltd., to provide professional engineering services for preliminary and detailed design for the Residuals and Ultraviolet Treatment Facilities at the Island Water Treatment Plant by an additional amount of \$2,018,422 net of all taxes and charges (\$2,053,946 net of HST

recoveries), revising the current Purchase Order value from \$3,835,494 net of all taxes and charges (\$3,902,998 net of HST recoveries) to \$5,853,916 net of all taxes and charges (\$5,956,945 net of HST recoveries).

FINANCIAL IMPACT

The Purchase Order Amendment request included in this report will increase the total contract value by \$2,018,422 net of all taxes (\$2,053,946 net of HST recoveries).

Funding for the contract amendment is available in the Toronto Water 2020 Approved Capital Budget and 2021-2029 Approved Capital Plan for Toronto Water under account CPW043-07, CPW070-07, and CPW064-24, with forecasted expenditures as summarized in the Table 1 below (net of HST recoveries):

Table 1. Financial Impact Summary

Account	2020	2021	Total
CPW043-07	\$495,238	\$610,818	\$1,106,056
CPW070-07	\$101,000	\$58,763	\$159,763
CPW064-24	\$100,000	\$688,127	\$788,127
Total	\$696,238	\$1,357,708	\$2,053,946

The Chief Financial Officer and Treasurer has reviewed this report and agrees with the financial impact information.

DECISION HISTORY

At its meeting of May 28, 2018, the Bid Award Panel granted authority to enter into an agreement with AECOM Canada Ltd., for the provision of Professional Engineering Services during design, construction and post construction for the Residuals Management and Ultraviolet Treatment Facilities at the Island Water Treatment Plant, being the highest scoring proponent meeting the requirements of Request for Proposal (RFP) 9117-17-7233, in the amount of \$7,835,752 net of all applicable taxes and charges (\$7,973,662 net of HST recoveries). Three purchase orders were issued: one for preliminary design and detailed design in an amount not to exceed \$3,835,494 net of taxes and charges; and two for services during construction including general office administration, site supervision and post-construction warranty inspection, respectively, in an amount not to exceed \$4,000,258 net of all taxes and charges.

A copy of the Bid Award Panel Decision Document can be found at:

<https://www.toronto.ca/legdocs/mmis/2018/ba/bgrd/backgroundfile-115847.pdf>

COMMENTS

Background

The Island Water Treatment Plant (Plant or WTP) is one of four water treatment plants operated by the City of Toronto. The Plant is located at 446 Lakeshore Avenue on Toronto Island, between Centre Island and Hanlan's Point. Some sections of the Plant were constructed in 1874, but the current day direct filtration Plant commenced operation in 1977.

The average Plant daily production of treated potable water is 240 million litres per day (MLD) with a maximum treatment capacity of 440 MLD. The Plant treated water flows to the John Street Pumping Station on mainland Toronto.

In 2015, the City completed a Water Quality Master Plan (WQMP) which identified treatment upgrades for the next 20 years based on anticipated source water quality needs and forthcoming regulatory changes. The WQMP recommended that an additional pathogen reduction barrier be implemented and ultraviolet (UV) disinfection was identified as the preferred technology to provide this additional treatment barrier.

Further, in the past, backwash water from the Plant's slow sand filter beds was discharged untreated through a shore based outfall. However, the high suspended solids concentrations in the discharge were often in non-compliance with the City's Municipal Drinking Water license, regulated under the Province's Safe Drinking Water Act, 2002. To address this issue, a Residuals Management Plan was developed by Toronto Water. Given the complexity and challenges associated with rehabilitating 100 year old infrastructure, the Plan implementation consisted of two phases.

Phase 1 of the Plan, involved the rehabilitation and conversion of the existing slow sand filters into settling basins. Several design options were reviewed to remove settled sludge from inside the tanks and the preferred option was to modify and convert 4 out of 8 existing slow sand filters into settling basin tanks. This was the lowest capital cost option, as it maximized the value of the existing infrastructure while simplifying the operational and maintenance requirements associated with the settled sludge, rather than constructing more costly deeper tanks in challenging soil conditions. This work was completed in 2018.

In June 2018, the City retained AECOM Canada Ltd., (AECOM) to provide professional engineering services for the design, construction and post construction contract administration for Phase 2 of the Plan. The scope of work for this assignment included the design for:

- An ultraviolet disinfection facility;
- The new residuals management facility with thickening and dewatering equipment; and
- Replacement and upgrade of the Plant's electrical substation and electrical systems, required to meet the additional power requirements for the new ultraviolet disinfection and residuals management facilities.

Subsequent to the award of this design assignment, Plant staff discovered unanticipated process issues associated with the operation of the Phase 1 components of the Residuals Management Facility. Specific issues included the inability to pump out excess lake water entering each basin because of unprecedented high lake levels in Lake Ontario, and a grid of internal tank support columns and shallow benching which has resulted in inconsistent solids concentrations which will impact the operation of the future Phase 2 Residuals Management Facility.

Further, an opportunity exists to integrate the complex installation of photovoltaic solar panels and a battery energy storage system into the Plant's overall electrical upgrades to reduce Plant operating costs. These design upgrades are described in more detail below.

1. Design Modifications to Phase 1 of the Residuals Management Facility

Subsequent to contract award for the Phase 2 design work, two major operational issues surfaced with Phase 1 components of the Residuals Management Facility, that impact the overall design and operation of the Phase 2 components. They are summarized in the following.

a) High Lake Level Impacts

In 2017 and 2019, Lake Ontario experienced historic record high water levels, reaching as high as 76.05 metres, effectively 1.29 metres above the long term average lake level of 74.76 metres. During these unprecedented/extreme lake level conditions, the supernatant is unable to drain by gravity into Lake Ontario because the drain pipe, set above the lake under normal lake levels, is submerged and is unable to decant the supernatant. In fact, because it is submerged, lake water is actually entering the basins and further decreasing the efficiency of the solids settling process.

A number of design modification alternatives have been considered to address this issue. The most cost effective solution uses new pumps installed in the decant chambers to pump out the supernatant, over an existing concrete weir wall which is connected to an existing overflow chamber situated above the high lake level, having enough capacity to allow the settling basins to be decanted.

b) Homogenous Mixing Requirements

During the Phase 1 upgrades, the existing hundred year old filter tanks were retrofitted into shallow settling tanks. After several months of operation, the untraditional large size of the existing settling basins, coupled with a grid of existing internal support columns that act as barriers for mixing and shallow benching, have presented significant challenges in achieving a consistent solids concentration. This will adversely impact the operation of the Phase 2 Residuals Management Facility's thickening and dewatering equipment.

To overcome this issue, AECOM has carefully studied the existing system and developed a new innovative approach that places the solids into suspension, instead of settling. This non-traditional mixing system will use a series of pumps connected to a

ring header with nozzles to thoroughly mix the tank contents to create a more homogenous solids mixture before transfer to the Phase 2 Residuals Management Facility's thickening and dewatering equipment. In addition, Computational Fluid Dynamic modelling will be used by AECOM designers to further optimize and validate the design. City staff have reviewed and agree with this proposed design.

The cost of the additional professional services required for the above referenced design alterations is \$793,926.00 (net of HST). These design fees are considered reasonable, when considering the complexity of the transfer system and construction costs estimated at \$10 million.

2. Solar Photovoltaic and Battery Energy Storage System Installation

In 2018, the City's Energy and Environment Division, identified the Island WTP as a suitable site for the installation of a solar photovoltaic and battery energy storage system based on the Plant's available roof area and the advanced state of solar energy technologies. Given the higher energy demands associated with new ultra-violet disinfection process and Residuals Management Facility, Toronto Water identified an opportunity to advance the installation of this system, and integrating it with the Plant's electrical supply, to reduce overall energy costs by about 50%. This is expected to reduce electricity costs by an estimated \$480,000 per year, representing a payback period of 13 years.

Implementing this system now, provides for a more holistic design which integrates the complex solar and battery power controls into the electrical upgrades which were already scoped as part of AECOM's Phase 2 design work. Other benefits include estimated savings of up to \$1 million in contract administration costs by using already committed resources for onsite inspection during construction of the Phase 2 work; and compliance with the October 2, 2019 Council directive to implement designs that reduce Green House Gas (GHG) emissions. When completed (expected by 2025), the solar photovoltaic and battery energy storage system will be largest installation in the City's photovoltaic portfolio.

The cost of the additional professional services required for the Battery Energy Storage System and Photovoltaic Installation is \$774,496.00 (net of HST). These design fees are considered reasonable, when considering the complexity of the transfer system and associated construction costs, currently estimated at \$7.5 million.

Purchase Order Amendment Summary

Engineering & Construction Services and Toronto Water have reviewed AECOM's estimates for the additional professional services required for completion of the Ultraviolet and Residuals Management Treatment Facility Project, as described above, and found them to be fair and reasonable for the effort required. As shown in the Table 2, the total amount for additional professional services fees for the Residuals Management and Ultraviolet Treatment Facilities is \$2,018,422 net of HST (\$2,053,946 net of HST recoveries), which includes a contingency allowance of \$450,000 to address unforeseen amendments or additions during detailed design.

Table 2. Summary of Additional Professional Services

Additional Professional Services Required	Amount
Additional Design Services for the High Lake Level Transfer and Mixing System	\$793,926
Additional Design Services for the Photovoltaic and Battery Energy Storage System Installation	\$774,496
Contingency	\$450,000
Total Purchase Order Amendment (net of HST)	\$2,018,422

The total amendment to Purchase Order No. 6047271 with AECOM Canada Ltd., for the additional professional services required to complete the detailed design for the Residuals Management and Ultraviolet Disinfection Project at the Island Water Treatment Plant and incorporating the design for the High Lake Level Transfer and Mixing System, Photovoltaic System, and contingency being requested is \$2,018,422 (net of HST), revising the value of the Purchase Order from \$3,835,494 (net of HST) to \$5,853,916 (net of HST). This revises the total value of the assignment awarded to AECOM from \$7,835,752 to \$9,854,174 net of HST and all applicable charges (\$10,027,607 net of HST recoveries).

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SIGNATURE

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