

# Orleans Cumberland Collector Cleaning Project





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Cleaning Hose and Reel System Entering Access Structure

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Hose Reel and Water Recirculation System



Specialized Cleaning Nozzle



**This project is the longest single reach of cleaning that has ever been completed in North America**

# Innovation

Large diameter trunk and collector sewers are critical pieces of municipal infrastructure, where failure, pipe blockage or a collapse could impact public safety, private property and overflows to water bodies. Much like the City of Ottawa's Orleans Cumberland Collector (OCC), these sewers are often constructed with deep access structures and long distances between them, causing challenges for municipalities worldwide when it comes to the inspection, cleaning and maintenance.

For the City of Ottawa, the OCC is a critical sewer as it conveys 22% of the City's peak dry weather. Built in the 1970's by tunneling methods with very few access points, the bottom end of the OCC has operated in a submerged state for 40 years and is irregularly shaped (V shaped bottom). This has resulted in buildup of debris, and in some areas, up to half the pipe's diameter. The City identified the change in system operation (submerged to open channel flow) and potential movement of debris blocking the pipe as a major risk leading to basement flooding and overflows.

Sonar inspection for 5.5km of the sewer was required to determine the full extent of debris and the exact cleaning requirements. This data was used to help develop an effective cleaning plan, including a detailed review of the types of trenchless technologies that could clean a sewer of this complexity. With the sewer's irregular shape, specialized cleaning nozzles would be needed to achieve any effective cleaning results. Key challenges were also identified, including: cleaning in submerged

flow conditions without impeding flow, preventing debris migration during cleaning to downstream treatment processes, restoring 95% of the sewer's diameter, debris screening and monitoring and disposal requirements.

With the need to use a variety of approaches, a creative procurement process was implemented to select the most qualified contractor, the only company in North America capable of cleaning the sewer under such complex circumstances. The pipe was cleaned restoring full capacity without causing odour issues, noise complaints by area residents and without impacting operation of the sewer or the wastewater treatment plant. Additional innovation included reuse of sewage for the cleaning operation and flexibility of the hose reel system to accommodate lengths.

This project demonstrates how applying risk mitigation measures and industry best practices for technology selection coupled with qualification based procurement can be used to overcome challenges associated with aging infrastructure as well as supporting continued community growth.





Site-Set Up for Cleaning Operation



Odour Control System



# Complexity

Key challenges included minimizing impacts of the cleaning on hydraulic conveyance of the sewer, maintaining a live sewer, preventing sewer blockage, and minimizing debris migration and associated impacts on the downstream wastewater treatment process.

During the design phase and during construction, extensive discussions with the City's Operations group were held to establish thresholds for allowable amounts of debris migration. Stantec worked with the Contractor and Operations group to select the best flow regime for each section of sewer being cleaned (i.e. reversing flow in the sewer to deliberately direct suspended materials to catch points).

Stantec also worked with the City and the Contractor to develop emergency response plans in the event of pipe blockage during the cleaning. The work was scheduled

strategically during dry weather periods and suspended during rainfall events to reduce the risk of pipe blockage, unnecessarily surcharging the sewer, and to maintain the City's flexibility for operating the OCC in submerged conditions as required by the Wastewater Treatment Plant (WWTP) operation.

The Tender documents accounted for key constraints to protect the City's infrastructure, while being reasonable to allow for a competitive bidding process. To minimize impact on the surrounding community, all cleaning was completed from a small designated site at the WWTP. Odour control was implemented and specific measures were introduced to minimize noise during the work as the site was near a residential area. Routine noise and odour testing was completed for the duration of the cleaning project and no complaints were received by the public.

# Social and/or Economic Benefits

Cleaning the OCC and restoring the hydraulic capacity of the sewer reduces the risk of basement flooding. This reduces the potential of significant emotional and monetary impacts to private residences. This allows the community to grow with greater confidence in the resiliency of the area's wastewater servicing.

The cleaning also reduces overflows to local environmentally sensitive water courses, including a popular natural beach used for public recreation, and the National Capital Commission's recreational greenbelt. Ottawa residents can continue to enjoy the area's natural beauty and recreational opportunities that it offers.

Due to the long distances between access points, an innovative approach to inspection and cleaning of the sewer was needed. By employing specialized long distances cleaning technique versus conventional

cleaning methodologies, the need for construction of intermediate access points was eliminated saving the City of Ottawa approximately \$1.5M CAN.

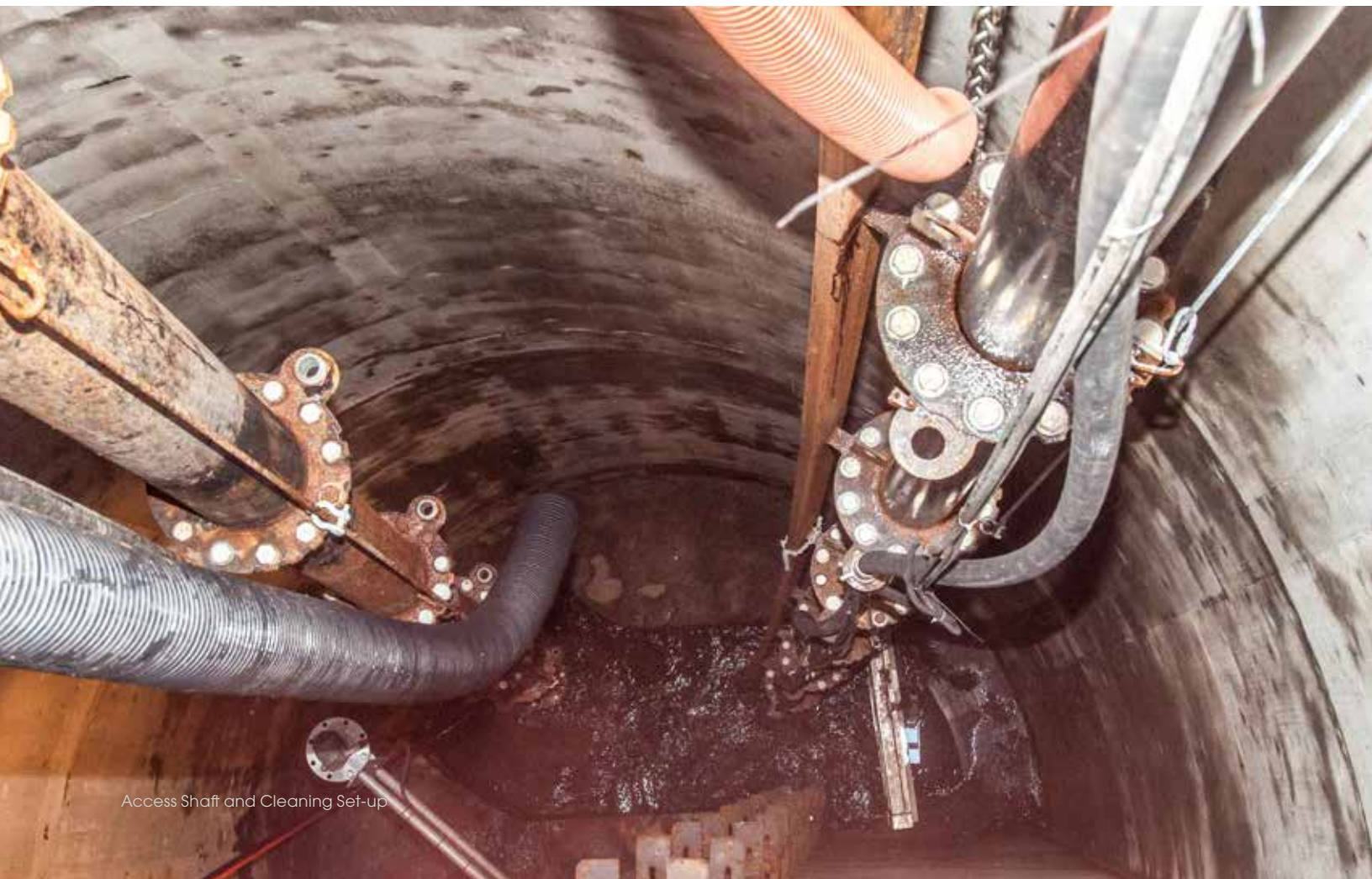
The use of recycled sewage for the cleaning operation eliminated the need for using treated potable water. This created cost savings both for the project and for Ottawa's Water Treatment and Distribution Operations.

Prior to and following completion of the OCC cleaning project, detailed multi-sensor inspections were carried out for a condition assessment of the sewer. The sewer was found to be in good shape with no need for immediate repairs, which was unknown prior to the project. This provided the City with the information necessary to plan long term monitoring of the sewer's condition, as well as scheduling of future repairs to extend the life cycle of this critical sewer.





Primary Debris Settling Tank



Access Shaft and Cleaning Set-up



# Environmental Benefits

By cleaning the OCC and restoring its conveyance capacity, the City effectively extended the life cycle of the sewer and minimized the need to disrupt the natural environmental area for its replacement. It also eliminated the need for construction of additional wastewater infrastructure to serve the 110,000 residents. With hydraulic capacity restored, the additional resiliency allows the City time to study long term wastewater servicing needs of the community to meet future growth versus reacting to emergency repairs or immediate and expensive construction projects.

The OCC cleaning process itself was environmentally sustainable for a number of reasons. Cleaning was completed by using only recycled wastewater and required no potable water which saved a significant amount of potable water and money. To mitigate impacts

on the environment, when the debris was removed from the sewer, all material was tested for hazardous materials and heavy metals and ultimately disposed of at a local landfill site. Removing the debris drastically changed the sewers characteristics and ability to generate odours which would be released to the natural environment impacting the public's use. All cleaning was completed without causing a sanitary sewer or combined sewer overflow as a result of diligent planning and staging of the work. The restored capacity reduces the likelihood of overflows to local environmentally sensitive water courses, including a popular natural beach and public swimming area, and the National Capital Commission's recreational greenbelt. Ottawa residents can continue to enjoy the area's recreational opportunities and its natural beauty.

# Meeting the Client's Needs

The primary objectives were to determine the amount of debris, the pipe's condition, remove the debris, reduce the risk of blockage, and to restore its hydraulic capacity. The secondary objective was to determine if the inspection and cleaning methods employed would be effective for other sewers in the City. Stantec successfully developed an inspection and cleaning program which met these objectives within the timeframes required.

The inspection and condition assessment demonstrated that the sewer is in good condition and is not in need of immediate rehabilitation or replacement. This certainty in the sewer's condition allows the City to develop a long term monitoring and rehabilitation plan for the OCC.

The cleaning surpassed the project objectives of removing 95% of the debris within the OCC and restoring the sewer to 95% of its diameter.

This project is the longest single reach of cleaning that has ever been completed in North America. Some key statistics from the cleaning program are as follows:

- **275** metric tonnes of debris removed
- **46** working days of active cleaning
- **1,853** meters of sewer cleaned
- **10,029** cubic meters of cleaning jet wastewater recycled

The success of this inspection and cleaning project has provided the City of Ottawa with confidence in the ability to inspect and clean other large diameter trunk sewers with limited access under difficult flow conditions. Following completion OCC inspection, the City completed inspection of 40 km of similar large diameter sewers with limited accesses, which were never fully inspected in the past.



