ENGINEERING AND OPERATIONS DEPARTMENT
ENGINEERING DIVISION

Report Number: 2014-29 **Date: September 8, 2014**

SUBJECT: UPDATE REPORT ON THE OMER PUMPING STATION CATCHMENT AREA EXTRANEOUS FLOW REDUCTION PROGRAM

1) PURPOSE:

This report is prepared by Jim Huppunen, Manager of Engineering Services under the direction of Chris Lee, Acting Director of Engineering and Operations to update Council on the progress and status of the Omer Pumping Station (PS) Area Extraneous Flow Reduction Programs.

2) HISTORY, BACKGROUND, COUNCIL POLICY, PRACTICES

The City has been actively engaged in the identification and remediation of extraneous flows since the 1970's, when the first sections of the 1929 vitrified clay sanitary sewer system were replaced. Today, that system now consists of PVC pipe materials, which is substantially superior to previous materials such as asbestos cement. Emphasis on rehabilitation and remediation in the past has focused primarily on the infrastructure located within the road allowances, with few attempts to rectify sources of extraneous flow from the private sector.

In conjunction with the Region of Niagara, the Port Colborne Pollution Control and Infrastructure Study was completed in 2006. The study identified existing Combined Sewer Overflow (CSO) locations and sources of extraneous flow contributing to the problem. As a result of the study, recommendations for source control in key areas have been identified. As detailed in the Strategic Planning sessions and at Budget deliberations, Staff presented a proposed Pilot Program for the Arena Sewershed, with an initial allocation of $200,000 for 2008. A successful application under the Region's CSO Plan matched those funds with an additional $200,000 for the project. Upon the conclusion of the Pilot Program, Staff requested funds to start flow monitoring and investigation in the Omer PS catchment area in 2009.

The results of source control measures will be lower treatment costs to the Municipality, reduced capital costs to the Region for pumping station, treatment plant upgrades and forcemain, gravity sewer replacements/upgrades and additional capacity for future development connecting to the system.

Redirection of any sources of storm water from the sanitary sewer system should be encouraged, since the payback in treatment costs is immediate. A source of sewer surcharging is removed, which could result in reduced instances of basement flooding.

By-law No. 5228/134/08 was adopted by Council in December 2008. The bylaw prohibits any form of storm water connection to the sanitary sewer system and provides the means to disconnect such connections. While the owner of the building is responsible for the cost of disconnection of the sources of storm water, section 4.8.2

provides for a reimbursement program, subject to budget and Council concurrence, which would provide financial incentives to assist in the work. To date, it has not been necessary to levy fines under this by-law.

As reported to Council over the past seven years, we have been successful with a CSO remediation program in the Arena PS catchment area. Upon the completion of that project, the next phase of the CSO work has moved into the Omer PS catchment area, where pre-flow monitoring, Closed Circuit Television (CCTV) work and private property inspections of the area has been completed. The Omer area is significantly larger than the Arena area and has presented new challenges to identification of sources of extraneous flow. The CSO projects are funded on a 50% basis, jointly by the Region and the City. The City's Arena CSO program was initiated in 2008 under the previous Region guidelines which allowed the 50% funding from the Region to be utilized to complete spot repairs and disconnection of sump pumps in the private sector, however, with changes to the terms of the Region's funding program in 2009, the City will be 100% responsible for any works related to private property works and spot repairs which are considered to be a maintenance item.

In 2011, the City also initiated a Storm Sewer Review Program in the Omer PS catchment area to determine the condition of the storm sewers to review the possibility of the redirection of sump pumps or weeping tiles from the sanitary sewer system. This program was funded 50% by the Region through the CSO funding program.

3) STAFF COMMENTS AND DISCUSSIONS

Private Property Sources

To date there have been 76 sump pumps and 11 weeping tiles found to be connected to the sanitary system in the Omer area with only 321 properties requiring inspections out of the 980 properties contributing to the Omer PS. There have also been 6 downspout connections and 12 private catchbasin connections to the sanitary sewer. There are 11 sewer laterals that are good candidates for a full length lining which is more economical that open cut, spot repair or replacement. There are 3 sewer laterals with root infestation severe enough to be completely replaced or cleared and then lined. The total projected cost for work on private property is $379,200.00 which will have to be funded 100% by the City as the Regional funding does not allow for work on private property.

Municipal Sewer Sources

There have been 30 points of inflow and infiltration found within the sanitary sewer pipes. Out of the 30 points of inflow and infiltration, 22 points could be removed from the system by the spot repair method which is most cost effective for these types of inflow and infiltration points. The remainder of the points of inflow and infiltration are good candidates for full length pipe liners. The condition of the Barrick Road sewer is a lot better than anticipated and only required repairs at two manholes to rectify the inflow and infiltration points.

With the new guidelines for the Regional funding, only capital projects qualify for the 50% contribution. The private property work, full length liners and spot repairs to the sanitary sewers will need to be funded 100% by the City which may need to be phased over several years in order to complete spot repairs and full length liners to the sanitary system. This cost of this project is expected to be approximately $254,500.

The total costs of the Omer PS CSO program to date for all inspection work are $702,214.58. This cost includes all investigative and administrative work. Currently the City's expenses for the Omer PS CSO program are $377,073.19 which dates back to 2009. This includes the costs for the disconnection of 15 sump pumps from the sanitary sewer system. There are approximately 60 sump pumps that are still connected to the sanitary sewer. These 60 sump pumps will need to be disconnected when designed storm sewers are established in the Omer PS Area.

By removing extraneous flows from the sanitary system, the capacity of the entire system is theoretically increased allowing the City and the Region to delay future capital upgrades to the system such as construction of CSO tanks, sewer replacement, upgrade of pumping stations or the upgrade of the treatment plant.

Attached is the Executive Summary report, prepared by Associated Engineering, to provide Council with a report of the project. The attached report outlines the findings found during the Omer PS Area project.

Most recently, Staff have been working with the Region of Niagara to revise the current CSO Policy and the Funding Options. There is the potential that the Region's CSO Funding Policy could be expanded to once again include private side work and sewer rehabilitation works such as spot repairs.

Staff recommend that the current Omer PS Area project be deferred by providing direction to Staff to request the Region of Niagara to reassign the remaining funding for the Omer PS Area projects. This would allow City Staff to review the direction of the CSO Programs in the City and prepare new applications under the recently revised Region of Niagara CSO Control & Wet Weather Management Policy. The existing Regional funding applications for the Omer PS Area programs cannot be transferred over to another program.

4) OPTIONS AND FINANCIAL CONSIDERATIONS:

a) Do nothing.

This report is presented as information for Council.

b) Other Options

None.

5) COMPLIANCE WITH STRATEGIC PLAN INITIATIVES

Continue with CSO I&I investigative work with the Region of Niagara to identify sewer infiltration issues and their remediation from private property and City infrastructure. Second Phase of this program will continue during 2011 and Council will receive a report on the findings later this year. (P. 12 Strategic Planning Report 2010)

6) ATTACHMENTS

1. Omer Area Inflow and Infiltration Reduction Program Final Report, Executive Summary prepared by Associated Engineering – March 2014

7) RECOMMENDATION

A. That the Council of the City of Port Colborne receive the Engineering & Operations Report 2014-29 – Update Report on the Omer Pumping Station Catchment Area Extraneous Flow Reduction Program be received for information;

B. AND THAT the Council of the City of Port Colborne direct Staff to defer the current Omer Pumping Station Catchment Area Combined Sewer Overflow Programs by requesting the Region of Niagara to reassign the existing funding.

8) SIGNATURES

Prepared on August 28, 2014 by:

29/08/2014

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Associated Engineering | GLOBAL PERSPECTIVE. LOCAL FOCUS.

REPORT

The City of Port Colborne

Omer Area
Inflow and Infiltration
Reduction Program

Final Report

March 2014

CANADA'S BEST MANAGED COMPANIES

Executive Summary

1 RECOMMENDATIONS

The Omer Area Inflow and Infiltration (I&I) Reduction Program was initiated with the intention of reducing I&I at the source, and particularly by re-directing sump pump discharges to grade or to the local storm sewer system. Field investigations conducted as part of this study have concluded that local surface grading is inadequate, and that the current condition of the existing storm sewers is inadequate to support a sump pump re-direction program.

Associated Engineering recommends the following to address the condition of the existing storm sewers and to meet the City's objectives for community and infrastructure improvement projects in the Omer Area:

1. Do not redirect sump pumps to existing storm sewer network. Based on the condition assessment, the existing storm sewer diameters and grades do not provide adequate capacity to support the sump pump disconnection program originally proposed for the Omer Area I&I Program. Re-direction of sump pump discharges to the existing storm sewer will likely result in surcharging of the storm sewer, surface and basement flooding, and damage to public and private property. No significant savings in treatment costs are projected relative to implementation costs related to the sump pump disconnection program.
2. Do not redirect sump pumps to grade. Existing lot grading is not adequate to accommodate this alternative, and this alternative has a high potential for failure.
3. Investigate design and construction of a new trunk storm sewer on Elm Street, with a connection to the existing North End trunk storm sewer outlet to service the Focus Area of the drainage investigation.
4. Investigate design and construction of new storm sewers in the Focus Area of the drainage investigation to provide long term service and accommodate a future sump pump disconnection program.

2 I&I PROGRAM INTRODUCTION

The I&I Reduction Program is a comprehensive work plan designed to identify, quantify and remediate all sources of I&I within the targeted study area. The Omer Area I&I Program is the second phase in the City of Port Colborne's I&I reduction initiative. The first phase was completed in the Arena Pump Station catchment areas, and the third phase has been initiated in the Nickel Pump Station catchment area.

The study area for the current program is defined as the area tributary to the Region of Niagara's Omer Avenue Pump Station, which comprises Sanitary Sub-Catchments 6, 7 and 8, and the Steele Street and Oxford Avenue Pump Stations. The study area includes approximately 980 private residential and commercial properties and represents a drainage area of approximately 140 ha. Figure ES-1 illustrates the study area boundaries and properties within the study area.

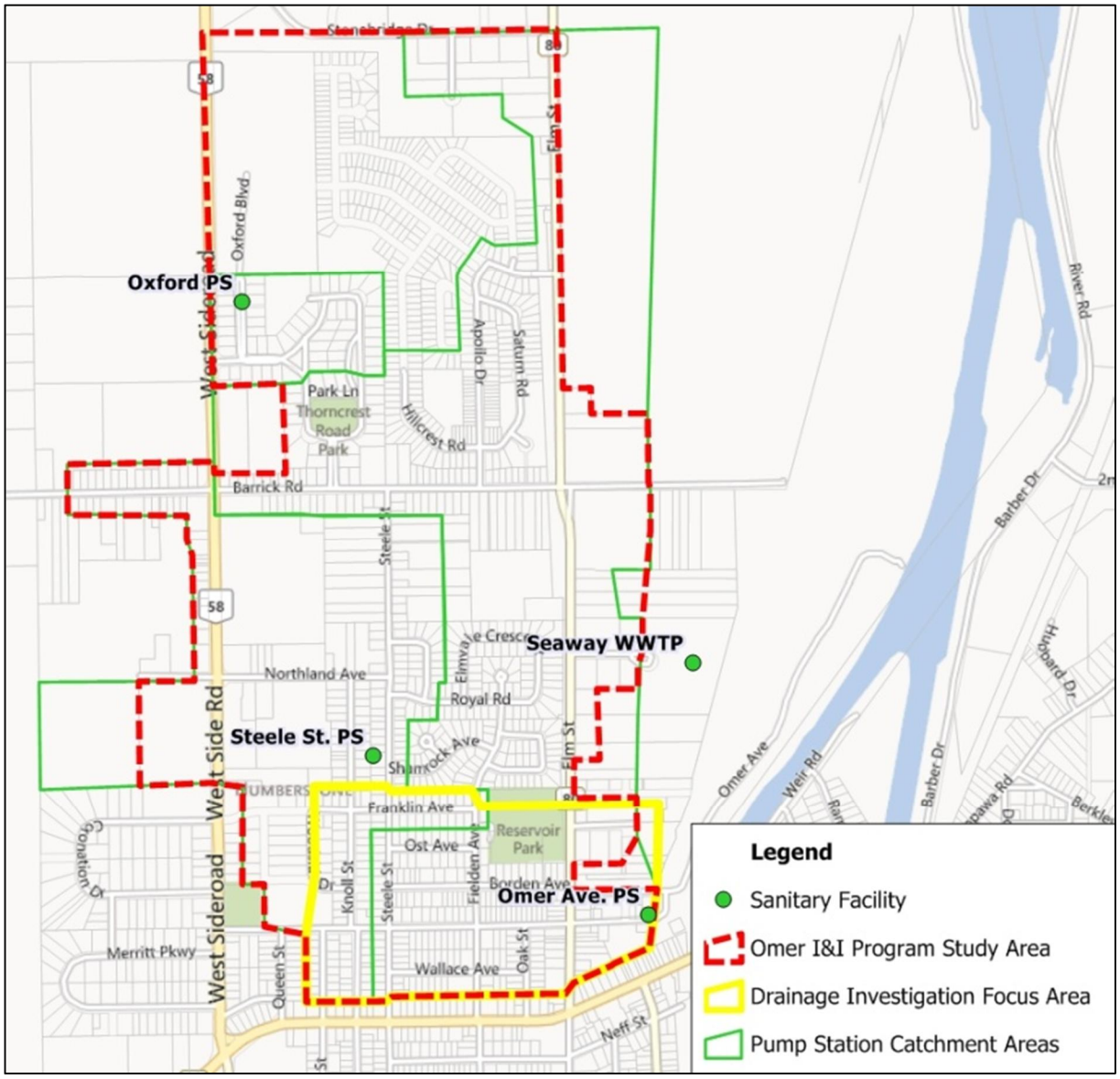

Figure ES-1
Study Area

3 PUBLIC CONSULTATION

Property owners in the Study Area were engaged in the program through a variety of newspaper advertisements, direct mailed letters and information packages. Every advertisement, letter or brochure provided to residents included AE's contact information, and AE's Project Manager was always available to discuss the program with residents.

4 PRIVATE PROPERTY INVESTIGATION

The City of Port Colborne's Sewer Use Bylaw 5228/134/08 provides the necessary legislation to allow entry upon private property for the purposes of inspection and remediation/removal of sources of I&I.

Approximately 66% of the ±980 properties in the study area were inspected and all inspection data was stored in a Project Knowledge Database System. A total of 75 private properties were found to have sump pumps connected directly to the sanitary sewer.

Sump pumps were disconnected at 15 properties at a total cost of approximately $40,000 (exclusive of AE fees for coordination and documentation). AE coordinated and documented all work by plumbing contractors and provided records of all sump pump disconnections to City Staff. All plumbing costs were invoiced to and paid by the City of Port Colborne based on AE's recommendation for payment.

5 MUNICIPAL SANITARY SEWER INVESTIGATION

The City's 2009 sewer inspection program targeted the Omer I&I Program Study Area. The entire data record resulting from the sewer inspection program was placed in the Project Knowledge Database System, and evaluated using purpose built queries to extract defects deemed as contributing extraneous flow. These defects were then plotted within the project GIS to give an overall view of the defect record.

The sanitary sewers in the Study Area are in generally good condition. A total of 40 points in the sanitary sewer were identified as exhibiting active infiltration, evidence of previous infiltration or defects that could potentially cause I&I to the sewer system. Each of the defects were identified as good candidates, and recommended, for trenchless repair. Two of the most severe defects were subsequently spot repaired with the trenchless installation of 1m long liners.

6 MUNICIPAL STORM SEWER INVESTIGATION

The portion of the Study Area having the highest concentration of sump pumps discharging to the sanitary sewer became the focus area for an investigation of the condition of the existing storm sewer network; much of this area is located within the City's Storm Drainage Area 22. The existing storm sewers in the drainage investigation Focus Area are categorized as "Non-Designed" pipes in the City's infrastructure asset registry and is a tiled system that was created by the piecemeal infilling of roadside ditches.

Field investigations that were undertaken to assess the condition of the existing storm sewers included topographic survey, visual inspection of manholes and catchbasins, and closed circuit television (CCTV) inspection of storm sewer pipes. The investigations indicate that the storm sewers in the are inconsistent in grade, diameter and material and have numerous localized low points were identified in the surveyed pipe inverts, likely due to the piecemeal construction of the tiled system.

The storm sewers in the Focus Area are in poor condition. A heavy buildup of sediment was observed in most of the storm sewers and is the result of insufficient capacity and/or lack of maintenance. Many of the storm sewers exhibited various stages of collapse. Given their current condition, the existing storm sewers in the Focus Area cannot accommodate additional flow from sump pumps. The condition of the storm sewers must be addressed prior to a sump pump disconnection program.

Figure ES-2
Partially Collapsed Sewer on Omer Avenue

7 FLOW MONITORING AND QUANTIFICATION OF I&I

Six open channel flow monitors were placed at strategic locations in the study area for a total of approximately six months. Flow data was compared against local rainfall data and infiltration coefficients were calculated as a means of quantifying I&I under existing conditions.

The Infiltration Coefficient (C_v) is calculated as the ratio of extraneous flow measured in the sewer to the volume of rain that fell over the monitored area. Typical values for infiltration coefficients in a sanitary sewer are as follows:

- 0% to 5% - "Tight" separated system
- 5% to 10% - Separate system
- 10% to 15% - Separate system where improvements can be reasonably achieved
- 15%+ - Typical of a Combined System

The annual cost associated with treatment of extraneous flow is calculated in Table ES-1 based on the average infiltration coefficient for each sub-catchment area. The annual precipitation volume for each drainage area is based on an annual precipitation of 973.75mm, as recorded at the Seaway WWTP Rain Gauge in 2011. The annual treatment cost is based on a theoretical volumetric cost of $0.859/m3, which was calculated based on order of magnitude information provided by the Region of Niagara.

Table ES-1
Quantification and Cost of Extraneous Flow

	Omer Area
Catchment Area (m^2)	1,489,983
Annual Precipitation Volume (m^3)	1,450,871
Average C_v	3%
Average Annual Extraneous Flow Volume (m^3)	48,589
Treatment Cost of Average Extraneous Flow	**$41,745**

The calculated infiltration coefficients, and resulting estimated cost of extraneous flow are very low given the number of sump pumps found to be connected to the sanitary sewer system, and on their own do not justify the costs associated with a sump pump disconnection program, or storm sewer reconstruction.

Anecdotal information however suggests that extraneous flow is an issue of concern in the Study Area. While reported CSO volumes and related data have not been provided to AE for the purposes of this investigation, City Staff have indicated to AE that bypass pumping has been required in the Omer Area to relieve surcharging in the Bartok Crescent sanitary sewer, and that CSO's do occur at the Seaway WWTP.

8 ALTERNATIVES FOR DRAINAGE IMPROVEMENTS

The objective of the I&I Program is to reduce I&I from sources such as sump pump connections to the sanitary sewer, however there are two major obstacles to achieving this objective in the Omer Area. Many of the residential lots, particularly those with drainage connections to the sanitary sewer, do not have adequate grade to provide positive surface drainage, making it difficult, if not impossible to redirect foundation drains from the sanitary sewer to the surface without causing surface flooding on adjacent properties. Within the right of way, the study area's existing storm sewer system is a network of non-designed drainage tiles and culverts. The infrastructure required to support a sump pump disconnection program and provide a suitable drainage outlet, is not currently present in the study area.

The following alternatives (with estimated construction costs) were identified as potential solutions to address the condition of the existing storm drainage system, and to meet the City's objectives of I&I reduction within the Omer Drainage Investigation Focus Area:

1.	Do Nothing	($0)
2.	Redirect Sump Pumps to Grade	($76,760)
3.	Redirect Sump Pumps to Existing Drainage System	($803,320)
4.	Repair Existing Storm Sewers	($5,542,320)
5.	Extend North End Trunk Sewer on Elm Street	($714,626)
6.	Reconstruct Existing Storm Sewers	($6,166,945)
7.	Construct New Storm Sewers	($6,287,188)

Each alternative includes various combinations of sump pump disconnection, construction of storm sewer laterals, and repair or replacement of storm sewers. Budgetary construction cost estimates were developed for each alternative and compared against a theoretical reduction in sewage treatment costs associated with sump pump disconnection. The costs associated with litigation from storm sewer failure or resulting flooding or damage has not been included in this evaluation.

Alternative 7, which involves construction of approximately 4,015m of new storm sewers is the preferred solution to meet the City's objectives of I&I reduction within the Omer Drainage Investigation Focus Area.