

Functional Servicing Report

**281 Chippawa Road
Port Colborne, Ontario**

Residential Development

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281 Chippawa Road

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1.0 Introduction

This functional servicing report (FSR) serves to demonstrate how servicing of the subject development can be appropriately achieved and to provide a basis for detailed engineering. It also provides a basis for evaluation of how the proposed development will impact the City's existing infrastructure capacity. This FSR will discuss the following key aspects of municipal design:

- Water Supply and Distribution
- Sanitary Sewerage
- Drainage and Stormwater Management
- Parking and Roadway
- Utility Servicing
- Servicing Locations

2.0 Background

The subject lands are located on the west side of Highway 140, south of Chippawa Road. The parcel is approximately 6.647 hectares in size with +/- 160 metres of frontage on Chippawa Road. The parcel is mainly vacant.

A conceptual site servicing plan, CSS1, is shown in *Appendix A*. An aerial map showing the subject property is found in Figure 1.



Figure 1. Aerial Map of Development Site

3.0 Water Supply and Distribution

Based on City-provided information, the existing municipal water distribution system around the site consists of a 150 mm diameter PVC watermain on Chippawa Road and a 400 mm diameter concrete watermain on the west side of the Highway 140 right-of-way. The 400mm watermain is owned and operated by the Region of Niagara. The pre-consultation meeting notes confirm the Region's position that connection to this main line to service this development is not permitted. There is also a 150mm cast iron watermain on Berkley Avenue approximately 175 metres south of the development site.

A hydrant flow test was completed at the hydrant at 281 Chippawa Road on October 7th, 2022. The results show a static pressure of 52 psi and available flow of 150 L/s at residual pressure of 20 psi.

The population projection and water demand for the development site are summarized in Table 1.

Table 1 Water Demand Summary

Site	Units	Population	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)
Total	169	507	1.76	2.75	7.04

Design Criteria:

Residential Average Day Demand: 300 Lpcd

Maximum Day Peaking Factor: 1.56

Peak Hour Factor: 4

The average day demand, maximum day and peak hour peaking factors are based on Niagara Region 2016 Water and Wastewater Master Servicing Plan Update.

The City of Port Colborne's water system is supplied by Port Colborne water treatment plant on King Street, with water drawn from the Welland Ship Canal. There is one single pressure zone of 223m in the water system. The existing elevations of the proposed residential units as per the site plan are 183.5m to 180.6m. The static pressure for the site is estimated at 56-60 psi.

Initial Estimate of Required Fire Flow:

Formula: $F = 220 * C * \text{SQRT}(A)$

F = the required fire flow in litres per minute

C = coefficient related to the type of construction

= 1.5 for wood frame construction (structure essentially all combustible)

= 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior)

= 0.8 for non-combustible construction (unprotected metal structural components, masonry or metal walls)

= 0.6 for fire resistive construction (fully protected frame, floor, roof)

A = the total floor area in square metres (incl all storeys but not basements at least 50% below grade)

* for fire resistive buildings, consider the two (2) largest adjoining floors plus 50% of each of any floors immediately above them up to eight (8), when the vertical openings are inadequately protected. If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25% of each of the two (2) immediately adjoining floors.

In order to determine the total Design Water Demand, Fire Flow Demand has been estimated as per the Fire Underwriters Survey. It has been assumed that the buildings will be constructed with ordinary construction materials. The Required Fire Flow Demand has been estimated to be 87 L/s.

There are three (3) existing fire hydrants adjacent to the development site as shown in the attached conceptual site servicing plan. However, these hydrants cannot provide coverage for the whole development site. Therefore, three (3) new fire hydrants are proposed for the residential development. The locations of the new fire hydrants can be found in the site servicing plan.

It is our understanding that the City of Port Colborne will take the estimated demand values presented herein and have their water network management engineering consultant run the model to confirm that the existing network can adequately support these design flows. Meanwhile, we are not aware that there will be any impediments to water supply and distribution servicing for the development using currently existing municipal water supply infrastructure and based on the drawings and design support presented herein.

4.0 Sanitary Sewerage

There is an existing 200mm sanitary sewer on Chippawa Road. Due to the site's topographic characteristics and shallow municipal sanitary sewer on Chippawa Road, the sanitary flows generated from the development cannot discharge to the sewer on Chippawa Road by gravity. It is proposed that the sanitary sewage flows be collected through a new 200mm diameter on-site sewer system and flow to a prefabricated lift station wet well at the south limit of the site. Sewage will be pumped from there to the 200mm PVC sewer on Chippawa Road.

Key design data sanitary sewage servicing is as follows:

Table 3 Sanitary Design Parameters

No. of Residence Units	169
Population Density	3.0 Persons/unit
Total Design Population	507 persons
Peaking Factor	Babbitt Equation
Mean sewage flow	275 L/cap/day
Sewage shed area (total)	2.80 ha
Manning's 'n'	0.013
Infiltration Rate	0.286 L/ha•s

Average Sewage for the development: $275 \times 507 / (24 \times 3600) = 1.614 \text{ L/s}$

Peaking Factor: $5 / (507/1000)^{0.2} = 5.7 > 4.5$ (maximum value), so use 4.5

I/I flow: $0.286 \times 2.8 = 0.80$

Peak sewage flow: $1.614 \times 4.5 + 0.80 = \mathbf{8.06 \text{ L/s}}$

From the above, we estimate the peak sewage flow at 8.06 L/s for the new development. It is noted that capacity of the receiving sewer, 200mm diameter PVC with a slope of 0.8% based on the record drawing, is 29.3 L/s. This additional flow represents 27.5% of the sewer's capacity (assuming unsurcharged operation). However, if necessitated by the available downstream sewer capacity, a smaller allowed discharge rate may possibly be accommodated by designing of the lift station.

A sanitary sewer design sheet is attached.

It is our understanding that the City of Port Colborne will take the estimated demand values presented herein and have their sanitary sewer network management engineering consultant run the model to confirm that the existing network can adequately support these design flows. Meanwhile, we are not aware that there will be any impediments to sanitary sewer servicing for the development using currently existing municipal sewage works and based on the drawings and design support presented herein.

5.0 Drainage and Stormwater Management

The existing site topography features a general slope down from north to south. The elevation of the site varies from 184.75 to 179.85. The outlet point of the site for existing overland runoff appears to be the very southeast point of the property. A natural watercourse conveys runoffs and discharges to the west roadside ditch of Highway 140 which flows south towards Main Street.

In the pre-consultation meeting notes, Niagara Region requires that post-development flows be controlled to pre-development flow levels for all storms (2-year up to and including 100-year storm) prior to discharge.

Minor system stormwater flows will be collected by new storm sewers in the roadway and drained to a stormwater management pond. Flows in excess of the minor system will be temporarily stored in a stormwater management pond prior to being discharged. It is proposed to locate a stormwater management dry pond at the south-east limit of the site and discharge the managed flows to the Highway 140 east side ditch as happens currently. As indicated above, flows will be managed to pre-development level for 2- through 100-year return period storms. The sizing of the pond and the details of the outlet onto the Highway 140 right-of-way are pending review by and discussion with the Ministry of Transportation will review this approach.

Design criteria

The stormwater management criteria used for the analysis of the site is as follows:

1. Post-development runoff generated from the site during the 1:2, 1:5 and 1:100 year return storm events is to be attenuated and retained to the pre-development flow rates.
2. Water quality control to 'Normal' standard is required prior to the discharge of runoff from the site.
3. The underground storm sewer system is sized to handle 1:5 year return storm event.

The City of Port Colborne's design storm will be used to size the quality and quantity control components of the stormwater management.

Grading design is to direct minor storm runoff to the on-site collection points, and provide on-site storage for 100-year storm runoff. Site grading will also take into consideration the following:

- The proposed grading will match the existing grade elevations along the property limit when possible.
- Minimize disruption to existing municipal rights-of-way containing existing utilities and services.
- Promote drainage into the minor storm sewer system.
- Building floor level will be set to avoid building/property damage during all design storms.

Niagara Regional staff have indicated that stormwater runoff should be captured and treated to 'Normal' protection prior to discharge from the development site.

6.0 Parking and Roadways

Per attached site plan drawing, the intent is to construct a 6.0m wide driveway, consistent with zoning bylaw requirements. Parking areas to be bounded by standard barrier curb only per OPSD 600.110.

7.0 Utility Servicing

Hydro, Gas, and Bell services are all located in the Chippawa Road right-of-way. Utilities have been notified of the proposed development plan and have not expressed any challenges to servicing this development.

8.0 Service Locations

Appendix A contains drawing 21092-CSS1, a schematic representation of the approximate locations of existing services and possible locations for proposed services for the development.

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Functional Servicing Report

Proposed Residential Development

281 Chippawa Road

Port Colborne, Ontario

APPENDIX A

Conceptual Site Servicing Drawing

