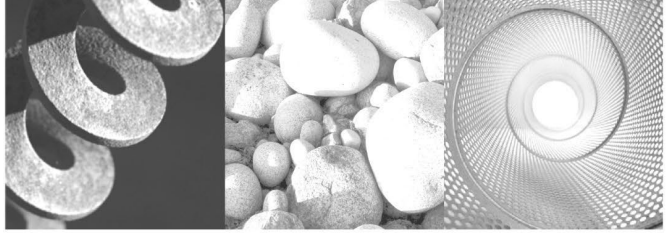


GEI Consultants

**Servicing Feasibility Study**

# 36 Unit Apartment Building

# 1115 10th Street East, Owen Sound

Owen Sound, Ontario

**Submitted to:**
Ismail Aboo
3580 East Bayshore Road
Owen Sound, ON N4K 5N3

**Submitted by:**
GEI Consultants Canada Ltd.
1260 2nd Avenue East
Owen Sound, ON N4K 2J3
519.376.1805

March 31, 2025
Project No. 2408466

Christopher Slocombe, B.Eng.
Project Professional

Amanda Froese, P.Eng., FEC
Branch Manager, Project Manager

# Certification

**PREPARED BY:**
GEI Consultants Canada Ltd.

**Christopher Slocombe, B.Eng.**
Project Professional

**CHECKED BY:**
GEI Consultants Canada Ltd.

**Amanda Froese, P.Eng., FEC**
Branch Manager, Project Manager


# Record of Revisions

| Identification | Date | Description of Issued and/or Revision |
|---|---|---|
| Servicing Feasibility | March 31, 2025 | Submitted for Zone Change Amendment Application |
| | | |

# Statement of Conditions

This report has been prepared at the request of Paaji Inc and for the exclusive use of GEI Consultants Canada Ltd. (GEI), the Client, its affiliates and approval agencies (the City of Owen Sound) (the "Intended Users"). No one other than the intended user has the right to use and rely on the work without first obtaining the written authorization of GEI and the Client. GEI expressly excludes liability to any party except the intended user for any use of, and/or reliance upon, the work. Neither possession of the work, nor a copy of it, carries the right of publication. All copyright in the work is reserved to GEI. The work shall not be disclosed, produced or reproduced, quoted from, or referred to, in whole or in part, or published in any manner, without the express written consent of GEI, or the Client.

# Table of Contents

# 1. Introduction

## 1.1. Background

GEI Consultants Canada Ltd. (formerly GM BluePlan Engineering Limited.) has been retained by Paaji Inc. to provide engineering services in support of the development of a 36 unit apartment building located at 1115 10th Street East Owen Sound. The existing lot was previously a long-term care home with a 979.9m$^2$ one story building. The site will be serviced by the storm, water and sanitary trunks along 10th Street East.

The City of Owen Sound has requested a Servicing Feasibility Study to confirm whether the proposed sanitary and water service connections are adequate in support of the Zoning Bylaw Amendment Application.

## 1.2. Site Description

The site consists of a single-story former long-term care facility located at 1115 10th Street East, with associated parking and landscaped areas. It can be accessed by a driveway from 10th Street East, which is a collector road with a bus stop along the property frontage. The site generally slopes downward from south to north with runoff from the site draining overland and into an existing stormwater system which ultimately drains to 10th Street East. The site has a total area of 7,899 m$^2$ (1.95 acres) and a depth of approximately 124 m. Residential, commercial, institutional, employment, and vacant residential lands surround the property.

The site is currently serviced with a 100mmØ ductile iron potable water service and a 150mmØ A.C. sanitary service extending out of the Northwest corner of the site. The site is also serviced by a 250mmØ concrete storm pipe per Gamsby and Mannerow Ltd. 10th Street East Plans and Profiles dated March 1975. Figure 1.0 –shows the site location for reference (Appendix A).

## 1.3. Standards and Guidelines

This report has been prepared recognizing the following Government Guidelines, Provincial and Municipal Standard and Publications:

- Design Guidelines for Sewage Works, Ontario Ministry of the Environment Sewage Technical Working Group, (www.ontario.ca), (September 2024)
- Ministry of Environment, Conservation & Parks (MECP), Design Guidelines for Drinking-Water Systems, (www.ontario.ca), (May 2023)
- Site Development Engineering Standards, The Owen Sound Engineering Standards, (www.owensound.ca), (February 2021)
- Subdivision Policies & Engineering Design Standards, Owen Sound, (www.owensound.ca), (June 2021)
- Municipal Engineering Design Standards (Draft), Owen Sound
- Zoning By-Law (2010-078), Owen Sound Zoning by-law, (www.owensound.ca), (December 2023); and
- 17th Street East Stormwater Management Study, Gamsby and Mannerow Limited, (May 2013)
- 10th Street East Plan & Profiles, Gamsby and Mannerow Limited, (March 1975)
- City of Owen Sound Water card, (January 2025)
- City of Owen Sound Water Plats, (February 2015)

- The Building Code Act, Ontario Building Code
- MECP, Design Guidelines for Sewage Works

# 2. Sanitary Servicing

## 2.1. Existing Infrastructure

An existing 150mmØ Asbestos Cement. sanitary service extends out of the Northwest corner of the site which is connected to a 300mmØ sanitary main located along 10th Street East.

## 2.2. Sanitary Demands Assessment

To estimate the peak flow, we have assumed and calculated the following in accordance with standards noted above.

**Table 1: Sanitary Peak Flow Calculations**

| Site Development Standards | Calculations |
|---|---|
| Average Flow (q) | = 400 (L/capita/day) |
| Residential Equivalent Population (P) | = 2.3 persons/unit x [36 units] =82.8 persons |
| Site Area | = 0.79 ha |
| Peak Extraneous Flow (I) | =0.20 (L/ha/s) |
| Harmon Peaking Factor (M) | = 1+(14/ (4+$PP/1000^{0.5}$)) = 4.27 |
| Peak Design Flow (Q) | = (Mq(P/1000))/86.4 + IA = **1.79 (L/s)** |

As per Table 1 above, the total peak sanitary flow is calculated to be 1.79 (L/s) for the 36-unit Apartment building. The Sanitary Design Sheet for the proposed development can be found in Appendix B.

## 2.3. Proposed Sanitary Service

The proposed sanitary service is to be a 150mmØ PVC sanitary service at 0.5% grade capable of handling the peak flow rate of 1.79 L/s from the proposed residential development. Per the plan & Profiles prepared by Gamsby & Mannerow dated March 1975 the existing sanitary sewer is approximately 3.60m below finished grade at a top of pipe elevation of 228.04(+/-). This provides approximately 5.06m between the top of the sanitary sewer and the proposed basement addition. We have attached a sanitary sewer design sheet for the proposed residential development for the purposes of supporting a zoning application. A more detailed design of the sanitary sewer is to occur upon detailed design.

# 3. Water Servicing

## 3.1. Existing Infrastructure

The site is currently serviced with a 100mmØ ductile iron potable water service off the northwest corner of the property. This service is connected to the existing 200mmØ Cast Iron watermain on 10th Street East. The static pressure noted on the City of Owen Sound Water Plat 19 (2015) for hydrant 2-D-115 (located approximately 64m West from the subject property) is 102psi. Alternatively, hydrant 2-D-150 (located approximately 180m East from the subject property) is 90psi.

## 3.2. Water Demands Assessment

To estimate the water demands, we have assumed and calculated the following in accordance with standards previously noted.

As Owen Sound's Design Standards do not specify an average flow/capita/day or persons per unit for design purpose, and consistency, the average sanitary demands of 400L/capita/day and 2.3 persons per unit were used for the water demand.

**Table 2: Watermain Maximum Day Demand & Fire Flow Calculations**

| Site Development Standards | Calculations |
|---|---|
| Average Daily Demand Per Person (q) | = 400 (L/capita/day) |
| Residential Equivalent Population (REP) | = 2.3 persons/unit x [36 units] =82.8 persons |
| Site Area | = 0.79 ha |
| Average Daily Demand (ADD) | =REP x Avg Daily Demand Per Person = 33,120 L/d = $3.83\ xx\ 10^{-4}\ mm^3/ss$ = 0.383 L/s |
| Peak Hour – (Table 3-3: MECP Design Guidelines) | = ADD x Peak hour factor = $33.12 mm^3/ss$ x 9.82 = $3.76 \times 10^{-3}\ mm^3/ss$ = **3.76 L/s** |
| Maximum Day Demand (MDD) – (Table 3-3: MECP Design Guidelines) | = ADD x Maximum daily factor = $33.12 mm^3/ss$ x 6.51 = $2.5 \times 10^{-3}\ mm^3/ss$ = 2.50 L/s |
| Required Fire Flow (RFF) – Water Supply for Public Protection 2020 | = 184.22 L/s |
| MDD + FF | = 2.50 + 184.22 = **186.72 L/s** |

As per MECP Design Guidelines for Drinking Water systems "drinking water systems should be designed to satisfy the greater of the Maximum day demand (MDD) plus fire flow (FF) or the Peak hour demand". As shown in Table 2 above, the maximum design capacity to satisfy MECP guidelines is 186.72 (L/s) for the 36-unit Apartment building.

## 3.3. Proposed Water Service

Per the City of Owen Sound Subdivision Policy's and Engineering Standards (June 2021) the Hazen Williams equation is to be used for the design of water distribution systems. Table 3 below shows the calculations required to meet the above maximum design capacity to satisfy MECP guidelines.

**Table 3: Fire Flow Calculations**

| Owen Sound Subdivision Policy | Calculations |
|---|---|
| Hazen Williams Equation | $QQ = 0.84918(CCCCCC)^{0.63}(SS)^{0.54}$ |
| C = Coefficient of Roughness (150mmØ) | 100 |
| Hydraulic Radius (m) | 0.075m |
| A = Cross sectional Flow Area | $=\pi\pi rr^2 = 0.0177m^2$ |
| S = Slope of the Energy Grade Line | 1.0% |
| | |
| Discharge (Q) | **=232.97 L/s** |

The residential development will be serviced with municipally treated water. A new 150mmØ connection is proposed to replace of the existing 100mm service. The new 150mmØ service will run to property line with a further T connection at property line with a fire hydrant for Fire Flow demand. The 150mmØ service will continue along the west property line and enter at the existing building location. This 150mmØ connection exceeds the MECP requirements of 186.72 L/s of required flow for the 36-Unit Apartment Building.

## 3.4. Water Capacity

The water service to the building is proposed to be a 150mmØ PVC watermain to provide sufficient pressure for residence. As per the appended Water Service Friction Headloss calculations, there would be a friction headloss through the water service during the fire flow conditions of 62.5 psi. Based on the static water pressure of 102psi from hydrant 2-D-115, there would still be 39.5psi (272.3 kPa) of pressure in the system. Per the Fire Underwriters Survey the minimum required pressure to meet fire flow demands is 20psi (150kPa).

Fire flow supply to each building is to be confirmed by the building mechanical engineer at the time of detailed design and sprinkler design (if necessary). In addition, a hydrant flow test adjacent to the site is to be completed to ensure the fire flow is available from the City's watermain system. The proposed development will have an Average Day Demand (ADD) of 0.383 L/$ss$ and a Maximum Day Demand (MDD) of 2.50 L/$ss$ based on the residential equivalent population of 82.8 persons.

The City's existing water treatment plant has a capacity of 27,300 $(mm^3/dd)$ and is operating at approximately 50% capacity as per correspondence from the City. Based on the remaining

operational capacity of the plant and the existing infrastructure available adjacent to the site, sufficient water supply to provide water to the proposed residential development is available.

The preceding calculations are intended to justify the sizes of the development's proposed water services only for the purposes of supporting a zoning application. Plumbing design is expected to be completed by a licensed plumber at the time of a Building Permit Application.

Both the required fire flow and friction headloss calculations can be found in Appendix B.

# 4. Recommendations and Conclusions

The proposed on-site sanitary servicing works are expected to be sufficiently sized including:

- The proposed 150mmØ PVC sanitary service to connect to the existing 300mmØ sanitary sewer located on 10th Street East and has the capacity to convey the proposed flows.
- The required peak sanitary flow for residential is 1.79 (L/s).
- This flow is reasonable for the proposed development within an urban setting
- City staff to confirm this peak flow is able to be accommodated is their downstream system.
- Detailed design for the internal sanitary service should be reviewed in accordance with the final site configuration and building details.

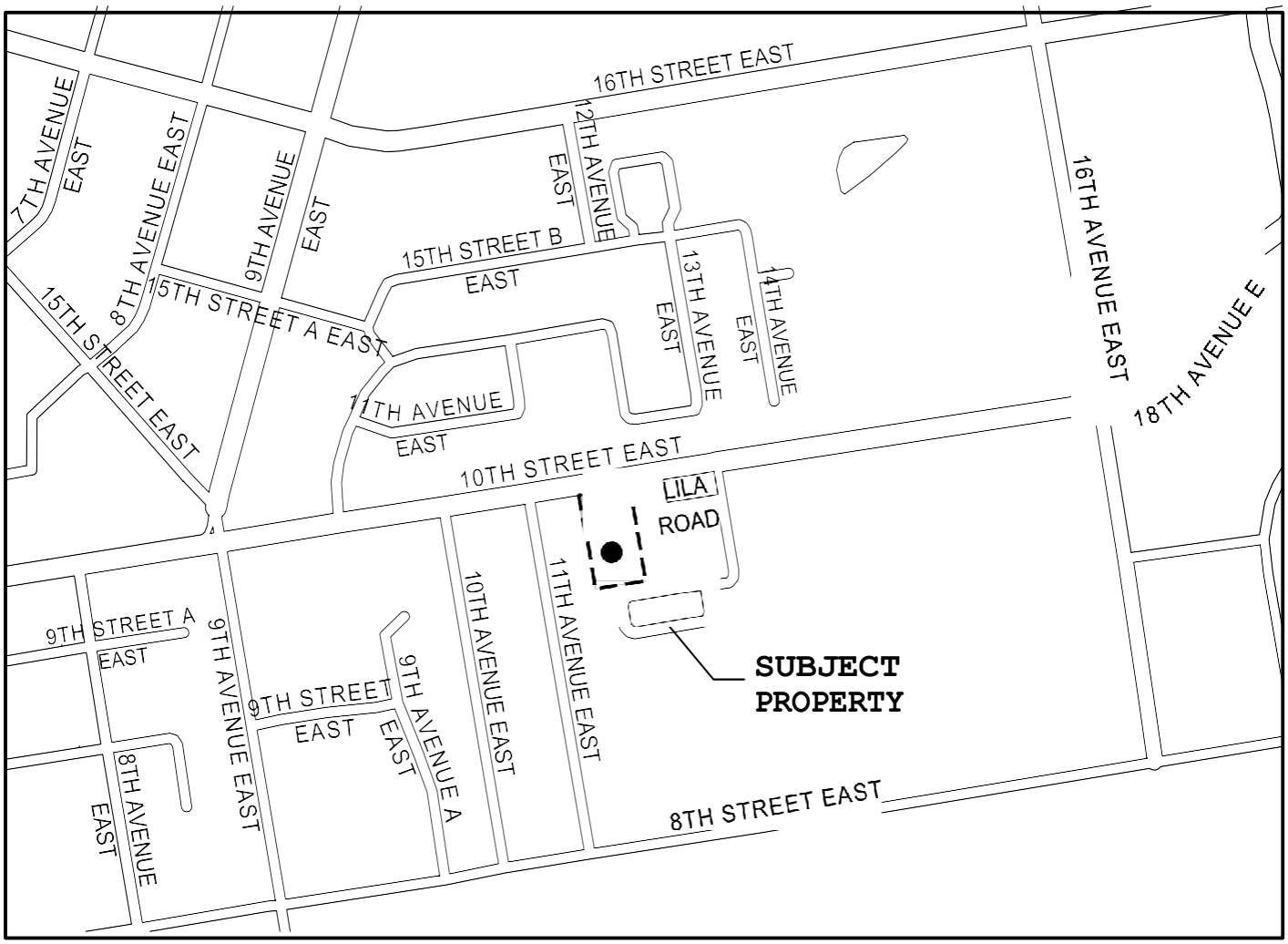
The proposed on-site water servicing works are expected to be sufficiently sized including:

- The proposed 150mmØ PVC water service connecting to the existing 200mmØ watermain on 10th Street East
- The required peak water demands for residential is 184.22 L/s.
- Required Fire flows based on Fire Underwriter's Survey are 2.50 L/s
- The water supply system appears to be operating at 50% capacity and should therefore have capacity to accommodate the development. City staff should confirm based on the current conditions in their system.
- Detailed design of the water system should be reviewed and completed in accordance with detailed site demands with the final building and site details.

Both the sanitary flows and water demands (domestic and fire) are reasonable for the proposed development within an urban setting. The proposed zoning and site layout can be accommodated using industry standard infrastructure.

# Appendix A GEI Figures

## A.1. Site Location Map




NOTTO SCALE

JANUARY 2025

# SITE LOCATION MAP

## 2408466
## PAAJI HEIGHTS
## 1115 10th St E,
## Owen Sound, ON

**Figure No. 1**

GEi Consultants
GEi CONSULTANTS CANADA LTD.
1260-2ND AVENUE EAST
OWEN SOUND, ONTARIO N4K 2J3
(519)376-1805

# Appendix B Design Calculations

## B.1. Sanitary Design Sheet

## B.2 Required Fire Flow Calculations

## B.3 Friction Headloss Calculations

*q = average daily per capita flow*
*i = unit of peak extraneous flow*
*M = peaking factor* *Q(p) = peak population flow (L/s)*
*Q(i) = peak extraneous flow (L/s)*
*Q(d) = peak design flow*

**DESIGN FLOWS**

| | | |
|---|---|---|
| Domestic Flows = | 400 | *L/cap/day* |
| Infiltration Flows = | 0.20 | *L/ha/s* |
| Population Density = | 2.3 | *Cap/unit* |

# SANITARY SEWER DESIGN SHEET

*M = 1 + 14 / [4 + (P)^1/2]*
*where P = population in 1000's*

*Q(p) = PqM (L/s)*
*Q(i) = IA (L/s) ; where A = area in hectares*
*Q(d) = Q(p) + Q(i) (L/s)*

GEI Consultants

| LOCATION | | | INDIVIDUAL | | CUMULATIVE | | | | | | SEWER DATA | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | FROM (Structure #) | To (Structure #) | Pop. | Area A (ha) | Pop. | Area A (ha) | Peaking Factor M | Pop. Flow Q (p) (L/s) | Peak Extraneous Flow Q (i) (L/s) | Peak Design Flow Q (d) (L/s) | Type of Pipe | Roughness Coefficient (n) | Diameter (mm) | Slope (%) | Length (m) | Capacity $Q_{full}$ (L/s) | Full Flow Velocity (m/s) | Actual Velocity at Q (d) (m/s) | $Q/Q_{full}$ |
| 1115 10th Street East | Proposed Development | City Sewer | 82.8 | 0.79 | 82.8 | 0.79 | 4.27 | 1.63 | 0.16 | 1.79 | PVC | 0.013 | 150 | 0.50 | 30.0 | 10.8 | 0.61 | 0.45 | 17% |

**DESIGNER:** Christopher Slocombe, B.Eng
**DATE:** March 2025
**PROJECT:** 11115 10th Street East
**PROJECT NO:** 2408466
**SHEET NO:** 1 of 1

| | |
|---|---|
| **Project:** | 1115 10th Street East, Owen Sound |
| **File No.:** | 2408466 |
| **Date:** | March, 2025 |
| **Designed** | CS |
| **Checked:** | AF |
| **Subject:** | Fire Flow Calculations |

Note: The calculations below are based off of the Water Supply for Public Fire Protection 2020 - Recommended Practice in Canada

**Determining Construction Coefficient**

The following Construction Types and Coefficients are used in the required fire flow formula:

C = 1.5 for **Type V** Wood Frame Construction
= 0.8 for **Type IV-A** Mass Timber Construction
= 0.9 for **Type IV-B** Mass Timber Construction
= 1.0 for **Type IV-C** Mass Timber Construction
= 1.5 for **Type IV-D** Mass Timber Construction
= 1.0 for **Type III** Ordinary Construction
= 0.8 for **Type II** Noncombustible Construction
= 0.6 for **Type I** Fire Resistive Construction

**C =** 1

**Total Effective Floor Area**

**A =** 3334.87 m²

**Required Fire Flow** **RFF = 220*C*** $\sqrt{A}$

RFF = 12704.63 LPM
211.7439 LPS
0.211744 m3/s

**Adjustment Factors**

**Increase or Decrease for the Occupancy Contents Adjustment Factor**
Table 3 - Fire Unerwriters Survey 2020 **-15%**
Adjusted RFF = **-1905.69** LPM

**Automatic Sprinkler Protection**
Table 4 - Fire Unerwriters Survey 2020 **0%**
Adjusted RFF = **0** LPM

**Total Exposure Adjustment Charge**
Table 6 - Fire Unerwriters Survey 2020 **2%**
Adjusted RFF = **254.09** LPM

**Total Required Fire Flow After Adjustment Factors**

**11053.03** LPM
**184.22** LPS
**0.184** m3/s

| | |
|---|---|
| **Project:** | 1115 10th Street East, Owen Sound |
| **File No.:** | 2408466 |
| **Date:** | March, 2025 |
| **Designed** | CS |
| **Checked:** | AF |
| **Subject:** | Fire Flow Calculations |

**Notes for Water Flow Calculations**

1. Peak Flow Rate to be determined by Hydraulic Loads for Fixtures as outlined in Ontario Building Code

2. Hazen-Williams Roughness Coefficients Per Owen Sound Subdivision Policies & Engineering Design Standards

| Pipe Size (mm) | C' Values |
|---|---|
| 150 | 100 |
| 200 to 300 | 110 |
| 350 to 600 | 120 |
| over 600 | 130 |

3. Dircharge Calculation (Q) $Q = 0.84918(CAR)^{0.63}(S)^{0.54}$

| Pipe Diameter (mm) | Coefficient of Roughness | Cross-sectional Flow Area ($m^2$) | Hydraulic Radius (m) | Slope of Energy Grade (%) | Flow Rate ($m^3/s$) | Flow Rate (L/s) |
|---|---|---|---|---|---|---|
| 150 | 100 | 0.0177 | 0.075 | 1.0 | 0.23296641 | 232.97 |

3. Hazen-Williams Formula

$$h_L = \frac{10.67 * L * Q^{1.85}}{C^{1.85} * d^{4.8655}}$$

where:
$h_L$ = head loss (m)
L = Length of pipe (m)
C = Hazen Williams coefficient (-)
Q = Peak flow ($m^3/s$)
D = Diameter of pipe (m)

**Water Service Friction Headloss Calculations**

| Location | Flow Rate (L/s) | Flow Velocity (m/s) | Pipeline Length (m) | Friction Headloss (m/m) | Friction Headloss (m) | Friction Headloss (kPa) | Friction Headloss (psi) |
|---|---|---|---|---|---|---|---|
| Proposed Watermain | 232.97 | 13.19 | 30 | 1.46 | 43.9 | 430.7 | 62.5 |