

**FUNCTIONAL SERVICING REPORT
LAKESIDE ESTATES DEVELOPMENT**

December 2, 2021



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1 Background

George Marchi commissioned Jewell Engineering Inc. (Jewell) to complete a functional servicing study to review the feasibility of servicing a proposed development located on the part of Lots 104, 105, and 106, Concession 4 Bay Side, Ameliasburgh. This subdivision is located northeast of Loyalist Parkway and Lakeside Drive in Consecon, Ontario (Figure 1-1). Consecon is serviced with municipal water but does not have municipal sanitary sewer.

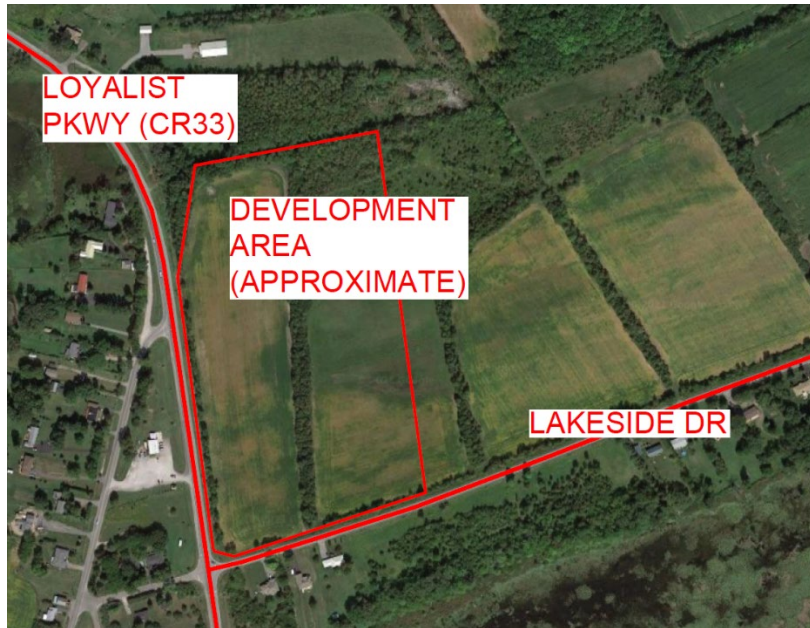


Figure 1-1: Satellite Overview (Google, Maxar Tech. September 2015).

The following services have been considered for the development:

- Water Distribution System
- Hydrogeological Assessment - Septic Evaluation
- Stormwater Management (separate cover)
- Traffic (separate cover)

1.1 Site Description

The proposed development area is approximately 9.2 hectares. The surrounding land use is low-density residential to the south and west and vacant land to the north and east.

Wellers Bay is located just west of the development, beyond the low-density residential lots. A Plan of Subdivision is required, and the property is currently zoned for future development.

1.2 Proposed Development

The development will consist of 26 single-family residential lots and 12 semi-detached units, for a total of 38 units. The subdivision will include the construction of a new public road to provide frontage and access for every lot. The municipal water system will be extended from Consecon to provide water services and fire protection. Each lot will have a Class 4 septic system and space for a spare bed.

The municipal water infrastructure will be designed to the specifications set out by the following:

- Ministry of Environment, Conservation, and Parks (MECP)
 - Design Guidelines for Drinking-Water Systems, 2008
- Fire Underwriters Survey (FUS)
 - Water Supply for Public Fire Protection, 1999

The private septic systems will be designed under the Building Code specifications.

2 Water Distribution System

2.1 Existing Conditions

Consecon receives its drinking water from Quinte West through a servicing agreement and by-law. Treated drinking water is transmitted along County Road 33 to Carrying Place booster station and from there to the Consecon water tower on the south side of the hamlet.

The hamlet is served through a local distribution network from the tower. A 200mm PVC watermain is located on County Road 33 along the north limits of the property and will provide the point of connection for the proposed subdivision. A loop has been requested by PEC staff. It is envisaged the loop can be secured by a watermain extension east along Lakeside Drive from the dead end at the intersection of County Road 33 and Lakeside Drive to the new access road.

Jewell received hydrant test data for Hydrant #3041 and for Hydrant #3072, dated June 2019, from Prince Edward County (Table 2-1).

Hydrant #3041 is located at the intersection of Loyalist Pkwy/CR 33 and Salem Road, and Hydrant #3072 is across from the proposed development land on the junction of Loyalist Parkway /CR 33 and CR 29.

Table 2-1: Hydrant 3041& Hydrant 3072 Test Data, June 2019, PEC

Test Hydrant			Flow Hydrants				
Hydrant	Pressure (psi)		Flow @ 20 psi (USGPM)	Hydrant	Flow Rate (USGPM)	Ports	Pitot (psi)
	Static	Residual					
3041	70.7	36.8	1,553.6	3072	1,250	2	19.8

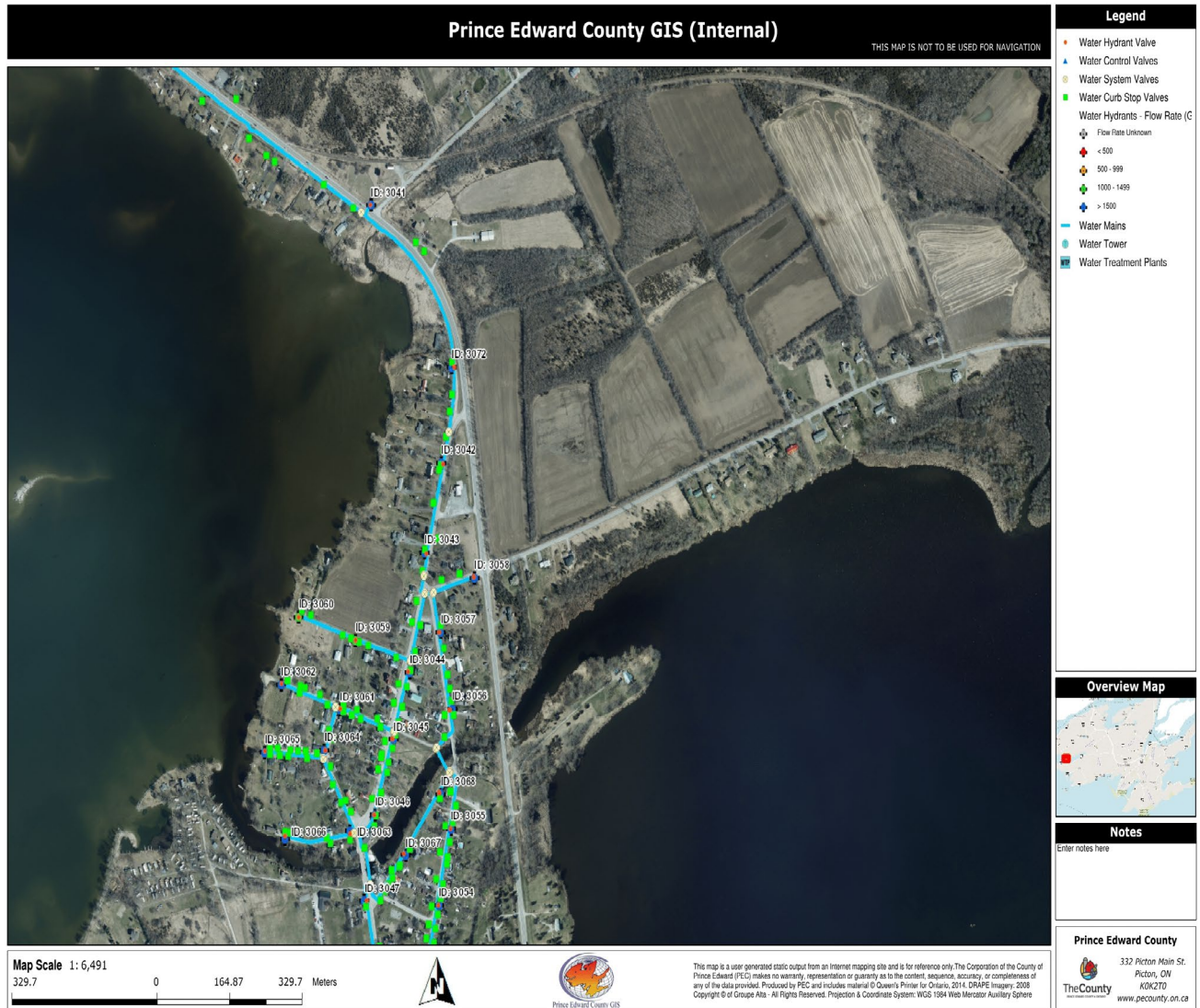


Figure: 1-2: PEC's Fire Hydrant Location Map with Estimated Flow Ranges.

2.2 Design Criteria

The watermain design criteria used are based on MOE drinking-water guidelines and Municipality of Prince Edward County Engineering Design Guidelines, or Fire Underwriters Survey, which are summarized below:

- Minimum Watermain Diameter Size: 200 mm
- Average Residential Daily Domestic Demand: 350 L/d*cap
- Minimum Required Fire Flow (Single Family Detached Dwelling): 4,000 L/min
- Maximum Day plus Fire Flow Demand Pressure Minimum: 20 psi
- Peak Hour Demand Pressure Minimum: 50 psi
- Peak Hour Demand Pressure Maximum: 80 psi
- Normal Operating Conditions Pressure Minimum: 40 psi
- Normal Operating Conditions Pressure Maximum: 100 psi

The proposed system expansion must provide adequate pressure and flow to supply the residential development under two scenarios:

Scenario 1. Maximum Day Demand + Fire Flow (MDD + FF)

Scenario 2. Peak Hour Demand (PHD)

2.3 Hydraulic Data

2.3.1 Fire Flow Requirement

The subdivision will consist of wood-frame, single-family detached dwellings with one to two stories. The separation between dwellings will exceed 3.0m and by Note J in FUS the recommended minimum fire flow is 4000 L/m (or 1057 USGPM). Table 2-2 illustrates the Note J methodology for determining fire flows.

Table 2-2: Note J found in Part II - Guide for Determining of Required Fire Flow of the FUS 1999 Guideline

Exposure Distances	Suggested Required Fire Flow for Wood Construction	
	(L/min)	(USGPM)
Less than 3 m	See Note "D"	
3 to 10 m	4,000	1,057
10.1 to 30 m	3,000	793
Over 30 m	2,000	528

2.3.2 Population Demand

The subdivision's maximum day (max day) and peak hour demands were calculated, as shown in Table 2-3 and Table 2-4, respectively. Peaking factors applied are from Table 3-1 in the MECP 2008 drinking-water system design guidelines.

Table 2-3: Max Day Demand

Type	Single		
# of Units	38		
Population/Unit	3.0		
Population	114		
Capita Usage	350	L/d*cap	
Max Day	Peaking Factor	2.75	
	Demand	109,725	L/d
		76.20	L/m
		20.13	USGPM

Table 2-4: Peak Hour Demand

Type	Single		
# of Units	38		
Population/Unit	3.0		
Population	114		
Capita Usage	350	L/d*cap	
Peak Hour	Peaking Factor	4.13	
	Demand	164,787	L/d
		114.44	L/m
		30.23	USGPM

2.3.3 Watermain Design

The existing 200 mm watermain will be extended from Loyalist Parkway to service the 38 lot subdivision.

The proposed development was reviewed under two scenarios:

Scenario 1 – Max Day Demand plus Fire Flow

Scenario 2 – Peak Hour Demand

Max Day Demand plus Fire Flow

The water distribution system must be able to provide the required fire flow while also meeting the max day demand at a minimum pressure of 20psi. The required flow is listed in Table 2-5.

Table 2-5: Total Required Flow per Scenario (USGPM)

Required Flow			Available Flow at 20 psi
MDD	Fire	Total Flow	
20.13	1,057	1,077.13	1,553.6

The calculated minimum required demand flow of 1,077.13 USGPM is less than the available flow of 1,553.6 USGPM at 20psi; therefore, there is sufficient fire flow to service the proposed subdivision.

Peak Hour Demand

Hydraulic Calculations were also completed to confirm that sufficient pressure available under the peak hour demand (Refer to Appendix B). The simulation was completed using a dead end calculation on a spreadsheet. This ignores the benefit of the loop feed and is therefore a conservative means of estimating pressure losses.

The static pressure of 70.7psi was measured at the proposed point of connection. The calculated end pressure for the watermain pipe at the end of the subdivision is 62.12psi under the peak hour demand, which is above the minimum 40psi required pressure to service the proposed subdivision.

Therefore, under peak hour demand, there will be sufficient pressure in the Consecon system to meet the projected demand.

3 Sanitary Sewage Servicing

Municipal sewage servicing is not available in Consecon, nor is it likely to become available in the foreseeable future. Sanitary servicing within Consecon is provided through private septic systems. To assist with the establishment of a minimum lot size such that private Class 4 systems would be feasible, Jewell Engineering engaged Geer Galloway Group Inc. (GGG) to perform suitable tests for water and soil in the proposed development land.

GGG completed test pits in order to characterize the soils and calculate the anticipated infiltration capacity.

Soils are finely grained silt-textured glacial till having suitable geotechnical properties. The low permeability of the beds requires the use of raised septic beds. The lots should be designed for the typical daily design for sewage flow (Q) for each dwelling estimated at 1,600L/day. **A minimum lot size of 0.2 ha is applicable for a single detached residential property.** The lots will be designed based on the physical size and location of the property. The design is based on the spacing available for a dwelling, driveway, and septic system, along with a replacement area.

For the lots fronting on Lakeside Drive, GGG recommends the septic systems be set back a minimum of 30m from Lakeside Drive to eliminate the potential for any interference with homes along the lake.

A lot fabric was developed with the support of the GGG study and lot sizes and setbacks are achieved. The hydrological study completed by GGG confirms that the proposed subdivision and severances can be serviced with private septic systems.

Jewell engaged Septic Designs by Carolle to prepare a concept design for a raised bed on the soils present at the site. This confirmed a Class 4 raised septic system and a spare bed will fit within the proposed lots. A concept is included in Appendix A.

4 Conclusion

Jewell studied the site and the proposed development to review the feasibility of servicing the proposed development on Loyalist Parkway and Lakeside Drive in the village of Consecon. The conclusions are as follows:

Water Distribution System:

There is sufficient flow and pressure available to provide domestic service and fire protection to the proposed subdivision. Water may be supplied by a 200mm watermain extension to the existing system.

Sanitary Sewer- Septic Systems:

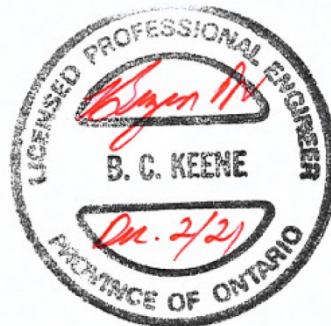
Soils are finely grained silt-textured glacial till having suitable geotechnical properties. The low permeability of the beds requires the use of raised septic beds. The typical daily design for sewage flow (Q) for each dwelling would be 1600L/day. Septic beds should not exceed a loading rate of 6 L/m². The minimum practical lot size is in the range of 0.2 ha.

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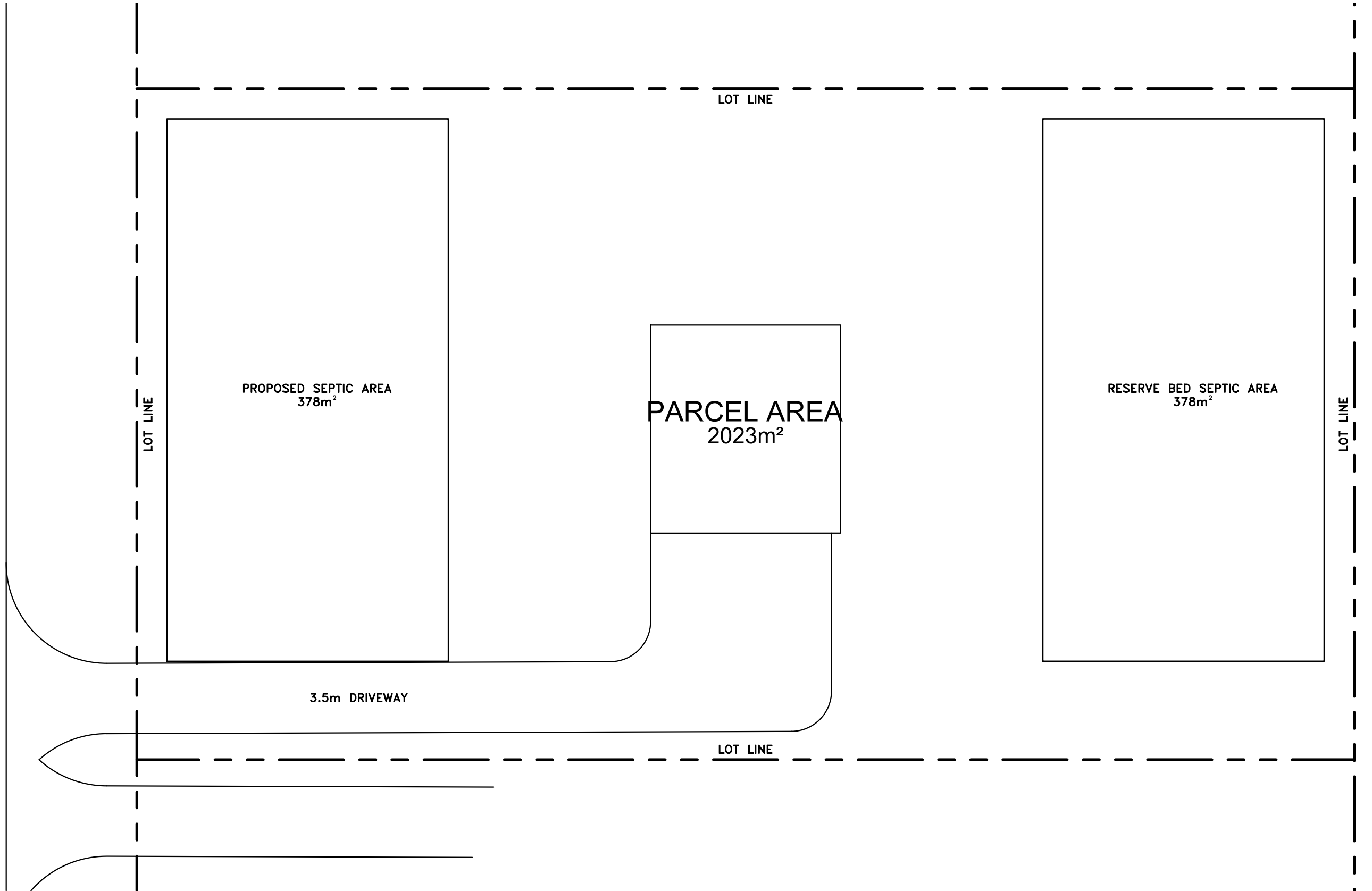
Approved by:



Bryon Keene, P.Eng.
Jewell Engineering Inc.

APPENDIX A
SEPTIC DESIGN DRAWING

STREET



PROPOSED SEPTIC AREA
378m²

PARCEL AREA
2023m²

RESERVE BED SEPTIC AREA
378m²

LOT LINE

LOT LINE

LOT LINE

3.5m DRIVEWAY

LOT LINE

APPENDIX B
WATER HYDRAULIC CALCULATION

Hydraulic Calculation- PHD

Watermain Hydraulics

Length (L)	775.0	m
Diameter (d)	200	mm
Diameter (d)	0.20	m
Area (A)	0.03	m ²
Flow (Q)	0.00	m ³ /s
Velocity (V)	0.06	m/s
Roughness (C)	110	
Friction Loss (H _f)	0.03	m
Start Elevation (EH _{START})	76.00	m
End Elevation (EH _{END})	82.00	m
Start Pressure	70.7	psi
Start Pressure	487.41	kPa
Start Pressure Head (PH _{START})	49.68	m
Gravity	9.81	kN/m ²
HGL _{END} = PH _{START} + EH _{START} - H _f	125.65	m
PH _{END} = HGL _{END} - EH _{END}	43.65	m
End Pressure	428.23	kPa
End Pressure	62.12	psi