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Lora Bay Development - Phase 4B

FUNCTIONAL SERVICING REPORT

NG Lora Bay Limited

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Issue	Date	Description
1	August 3, 2022	Final Report
2	August 25, 2023	Revised Site Plan

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1 Introduction

Tatham Engineering Limited has been retained by NG Lora Bay Limited to prepare a Functional Servicing Report in support of the proposed Draft Plan of Subdivision for Phase 4B of the Lora Bay Development.

1.1 OBJECTIVE

This report is intended to demonstrate that the existing external infrastructure networks have adequate capacity to service the proposed Phase 4B residential development. Specifically, the report summarizes the servicing strategy with respect to the water supply for domestic and firefighting purposes, sanitary sewage servicing, stormwater management, transportation and utility distribution.

Summaries of the stormwater management and transportation strategies are provided herein and further detailed in the *Stormwater Management Report* (August 2023) and *Traffic Impact Study* (August 2023) prepared by Tatham Engineering and submitted under separate cover.

1.2 BACKGROUND AND GUIDANCE DOCUMENTS

The proposed servicing strategy was developed recognizing pertinent Municipal and Provincial guidelines on municipal design, and relevant background documents, including the following:

- *Fire Protection Water Supply Guideline for Part 3 in the Ontario Building Code.* Office of the Fire Marshall (1999);
- *Water Supply for Public Fire Protection.* Fire Underwriter's Survey (1999);
- *Lora Bay Corporation Servicing Design Report for Phase 3 Residential Development West of Roundabout and Adjacent to Sunset Blvd*. Henderson, Paddon & Associates Limited (February 2007);
- *Design Guidelines for Drinking Water Systems*, Ministry of Environment, Conservation and Parks (2008);
- *Design Guidelines for Sewage Works*, Ministry of Environment, Conservation and Parks (2008);
- *The Blue Mountains Engineering Standards*. Town of The Blue Mountains (May 2023);
- *Stormwater Management & Functional Servicing Report – Addendum No.1 Lora Bay Phase 4*. C.F. Crozier & Associates Inc. (August 2018); and

- *CSOPS.23.041 2022 Year End Water & Wastewater Capacity Assessment*. Town of The Blue Mountains (June 2023).

2 Site Description

2.1 LOCATION AND TOPOGRAPHY

The property is located directly east of the West Ridge Drive road allowance, north of the Georgian Trail and southwest of Holes 16 and 17 of the Golf Club at Lora Bay. The site is legally described as Part of Block 1 within Plan 16M-8, Town of The Blue Mountains, County of Grey. The site location is illustrated on Figure 1.

The site is comprised of approximately 6.5 ha of heavily forested, gently sloping land. Drainage from the site is split with surface water runoff flowing north or northeast onto the existing golf course.

The soils on the property are classified as imperfectly drained silty clay (southwest) or poorly drained clay loam (northeast) based on the Soil Survey of Grey County. A geotechnical investigation will be completed and prepared in support of detailed design.

2.2 EXISTING AND SURROUNDING LAND USES

The site is currently zoned 'Development' in accordance with the Town of The Blue Mountains Comprehensive Zoning By-law and is classified as Residential Recreational land use in accordance with the Official Plan. Land uses adjacent to the site are as follows:

- Georgian Trail (south): an existing hard packed, granular trail blended within the natural forested environment within a previous rail line allowance;
- The Golf Club at Lora Bay (north and east): Holes 16 and 17;
- Lora Bay Development – Phase 4 (north of West Ridge Drive dead end): residential subdivision currently under building construction;
- future West Ridge Drive extension (west): an undeveloped road allowance, extending from the dead end of West Ridge Drive to the Georgian Trail; and
- future development lands (south of the Georgian Trail and west of the future West Ridge Drive Extension): future residential subdivisions.

3 Lora Bay Phase 4B Development

The Draft Plan of Subdivision for Phase 4B includes 45 single detached dwelling units with minimum lot frontages of 15.2 m and minimum lot areas of approximately 500 m^2 and 13 rowhouse dwelling units with minimum lot frontages of 7.6 m and minimum lot areas of approximately 250 m^2. The West Ridge Drive (Street 'A') road allowance will be developed from its current dead end at the limit of Phase 4, through Phase 4B to the Georgian Trail where it will be temporarily dead ended with a pedestrian linkage at the Georgian Trail until such time as the road is extended into a future development phase. Street 'B' will be a looped road allowance providing access to the majority of the proposed residential development from its intersection with Street 'A' approximately 50 m north of the Georgian Trail. Street 'B' will be temporarily dead ended approximately 45 m west of its intersection with Street 'A' until such time as the road is extended into a future development phase. All proposed road allowances will be 20 m wide.

A 12.0 m wide Servicing Block at the northwest limit of Phase 4B and a 17.0 m wide Servicing Easement traversing the golf club lands will be provided for sanitary sewer and storm sewer. A second 15.0 m Servicing Block at the south limit of Phase 4B between the single detached lots and Park Block will be provided for storm sewer and sanitary sewer connections to future development phases.

The municipal roads and lot servicing will be designed and constructed in accordance with the Town of The Blue Mountains Engineering Standards as illustrated on the Conceptual Servicing Plan (Drawing CSP-1) enclosed.

4 Sanitary Servicing

4.1 EXISTING SANITARY SEWAGE SYSTEM

A 250 mm diameter sanitary sewer has been installed within the West Ridge Drive road allowance to the south limit of Phase 4. This sewer conveys sewage along West Ridge Drive to a servicing easement near the east intersection of West Ridge Drive with Landry Lane. Sewage is conveyed via a 250 mm diameter gravity sewer through the easement and the 11th Concession ROW to a 375 mm diameter trunk sanitary sewer which conveys sewage along Sunset Boulevard to the existing sewage pumping station located at the intersection of Sunset Boulevard and Lora Bay Drive. Sewage is conveyed via force main from this pumping station to gravity sewers on East Ridge Drive and ultimately the Thornbury Wastewater Treatment Plant (WWTP).

As per the *CSOPS.23.041 2022 Year End Water & Wastewater Capacity Assessment* prepared by the Town, the Thornbury WWTP has a capacity of 3,580 m^3/day. Currently, the 5-year rolling Average Daily Flows (ADFs) are utilizing 76% of the treatment plant's capacity.

In 2017, the Town completed an Addendum to the 2006 Environmental Assessment (EA) for the Thornbury WWTP and following that the Town applied for and acquired an Environmental Compliance Approval (ECA) for the construction and expansion of the WWTP. Construction of the plant expansion is underway and Phase 1A upgrades are expected to be completed in the fourth quarter of 2024 which will increase the firm-built capacity of the WWTP from 3,580 m^3/day to 5,330 m^3/day. The Phase 1B expansion once completed will further increase the WWTP Average Day Flow capacity to 7,080 m^3/day and the Peak Daily Flow to 16,187m^3/day. The Town plans to proceed with the Phase 1B expansion immediately after the completion of Phase 1A works.

Currently there are 3,646 units (3,325 m^3/day) allocated to the Thornbury WWTP and 187 units (171 m^3/day) reserved. As the Town can reserve units based on the Phase 1A design expansion of 5,330 m^3/day, the Thornbury WWTP has a remaining total reservation of 2,011 units (1,834 m^3/day).

4.2 PROPOSED SANITARY SEWAGE SYSTEM

The proposed sanitary sewage system is illustrated on the enclosed Sanitary Drainage Plan (Drawing SAN-1), key elements of which are detailed below.

The West Ridge Drive 250 mm diameter trunk sanitary sewer will be extended from the existing maintenance hole SAN MH8 across the golf club lands, through a servicing block to the Phase 4B development and ultimately terminating at a maintenance hole north of the Georgian Trail within

a proposed Park Block. A second 250 mm diameter trunk sanitary sewer will be extended from the existing stub south of existing maintenance hole SAN MH9 past the intersection of West Ridge Drive and Street 'B' to the south limit of Phase 4B. These sewers will be available to receive flows from future development south of Phase 4B.

Sanitary drainage from the Phase 4B units will be collected via 200 mm and 250 mm diameter sanitary sewers within West Ridge Drive (Street 'A') and Street 'B'. Flows from the Street 'B' sanitary sewer will be conveyed via the 250 mm diameter trunk sanitary sewer extension through a servicing block and servicing easement across the golf course lands and will discharge to the existing 250 mm diameter sanitary sewer in West Ridge Drive at the existing sanitary maintenance hole SAN MH8. Phase 4 design drawings show the existing north sewer invert at SAN MH8 to be 213.91 m which will be confirmed prior to construction. The existing sewer is deep enough to extend proposed sewers into and throughout Phase 4B and provide a gravity service connection to each unit sufficient to outlet basement flows via gravity.

4.3 SEWAGE DEMAND

The sewage demands for the proposed sanitary sewer system were calculated based on Town design standards as noted in Table 1, with corresponding calculations noted below.

Table 1: Sanitary Sewer Demand Design Criteria

DESIGN CRITERIA	DESIGN VALUE
Residential occupancy	2.15 persons/unit
Average day demand per person	350 L/p/day
Maximum day factor	4.22

Design Population (P)	= 58 units x 2.15 persons per unit
	= 124.7 persons
Infiltration (I)	= Infiltration Flow x Drainage Area
	= 0.28 L/s/ha x 6.35 ha
	= 1.78 L/s (153,619 L/day or 153.6 m^3/day)
Average Daily Flow (ADF)	= P x Average daily demand per capita + I
	= 124.7 persons x 350 L/cap/day + 153,619 L/day
	= 43,645.0 L/day + 153,619 L/day

= 197,264 L/day (197.3 m^3/day)

= 2.3 L/s

Maximum Day Flow (MDF) = (ADF – I) x PF + I

= (197.3 m^3/day – 153.6 m^3/day) x 4.22 + 153.6 m^3/day

= 337.6 m^3/day (337,630 L/day or 3.9 L/s)

Note the maximum day peaking factor was calculated using the Harmon Formula as per Town standards.

4.4 SEWAGE CAPACITY

The sewage system downstream of the Phase 4B development was designed to accommodate flows from the Phase 4B development and future development lands south of the Georgian Trail. A review of the *Stormwater Management & Functional Servicing Report – Addendum No.1 Lora Bay Phase 4* and the *Lora Bay Corporation Servicing Design Report for Phase 3 Residential Development West of Roundabout and Adjacent to Sunset Blvd.* determined the existing downstream sewage system capacity is limited by the capacity of the sanitary sewer at the servicing easement near the east intersection of West Ridge Drive with Landry Lane. The capacity of this portion of sanitary sewer is 35.7 L/s. Based on an assessment of the existing Phase 3 and 4 developments in conjunction with the proposed Phase 4B development, the proposed peak flow at this location was determined to be 16.4 L/s which can therefore be conveyed by the existing sewer (16.4 L/s < 35.7 L/s). Given the reserve capacity, the sewer at this location can convey flows from Phase 4B plus flows from approximately 250 units from future development lands to the south. To convey flows from future development lands to the south in excess of 250 units, flows at proposed SAN MH13 will need to be directed through future development lands to the west, or improvements to the existing sanitary sewer through Phase 4 and downstream would be required where restrictions are identified.

As previously noted, the Thornbury WWTP is currently utilizing 76% of its ADF capacity which is equivalent to 2,712 m^3/day of 3,580 m^3/day. Expansions are planned to bring the ADF and MDF capacities of the plant to 7,080 m^3/day and 16,187 m^3/day respectively, whereas the proposed development will have an ADF and MDF of 197.3 m^3/day and 337.6 m^3/day respectively. Therefore, the Thornbury WWTP can readily accommodate the increased flows from the proposed development.

5 Water Supply and Distribution

5.1 EXISTING WATER DISTRIBUTION SYSTEM

The Lora Bay Development is serviced by the Town municipal water distribution system. Water is supplied to the development by the booster pumping station (BPS) located on the 10th Line between Highway 26 and the Georgian Trail. A 300 mm diameter municipal watermain extends from the BPS west along the Georgian Trail and East Ridge Drive to Lora Bay Drive, and along West Ridge Drive up to the south limit of Phase 4 where an auto-flusher and stub are installed to allow for extension of the watermain to Phase 4B.

5.2 PROPOSED WATER SERVICING

To service Phase 4B, a new 300 mm diameter municipal watermain will be installed on the proposed West Ridge Drive extension (Street 'A') from the existing West Ridge Drive dead end to the north side of the Georgian Trail. A 300 mm diameter stub will be installed west of the intersection of West Ridge Drive (Street 'A') and Street 'B' for future developments to the west.

A network of internal 250 mm and 200 mm diameter municipal watermains are proposed for Phase 4B as shown on Drawing CSP-1. Watermain sizes will be confirmed at the design stage based on the Town's hydraulic model boundary conditions for Lora Bay Phase 4B.

A 250 mm diameter (minimum) watermain will be extended along Street 'B' from its intersection with West Ridge Drive (Street 'A') and along the servicing block to Block 56 (park), to allow for a looped connection to a future development phase. A temporary auto-flusher will be installed at the end of the 250 mm diameter watermain to ensure adequate chlorine residual is maintained until the connection is made to the future phase. 200 mm diameter (minimum) watermains will be installed along the remainder of Street 'B', creating a loop.

The proposed single detached and rowhouse units will be serviced with 25 mm diameter service connections.

5.3 WATER DEMANDS

5.3.1 Domestic Use

Water demands for domestic use for the proposed development were calculated based on the Town of Blue Mountains (TOBM) design standards and the Ministry of the Environment Conservation and Parks (MECP) guidelines as noted in Table 2.

Table 2: Water Demand Design Criteria

DESIGN CRITERIA	DESIGN VALUE	SOURCE
Residential occupancy	2.15 persons/unit	TOBM
Average day demand per person	350 L/p/day	TOBM
Maximum day factor	4.7	MECP
Peak hour factor	7.1	MECP

The water demands for 58 units are calculated as follows:

Design Population (P) = 58 units x 2.15 persons per unit
= 124.7 persons

Average Day Demand (ADD) = 124.7 persons x 350 L/p/day
= 43,645 L/day
= 43.6 m^3/day

Maximum Day Demand (MDD) = ADD x Maximum day factor
= 43.6 m^3/day x 4.7
= 205.1 m^3/day (2.4 L/s)

Peak Hour Demand (PHD) = ADD x Peak hour factor
= 43.6 m^3/day x 7.1
= 309.9 m^3/day (3.6 L/s)

5.3.2 Fire Flow Requirements

Town engineering standards require fire flows based on the *Fire Underwriter's Survey Guidelines* (FUS, 2020) to be available; however, if not achievable to be reviewed with the Town. The Town's previous engineering standards (2009) permitted interim fire flows based on OBC requirements, where there was evidence acceptable to the Town that FUS fire flows will be available within 5 years. Fire flow requirements for the proposed units in Phase 4B were calculated based on FUS as well as the *Ontario Fire Marshal's Fire Protection Water Supply Guideline for Part 3 of the Ontario Building Code* (OFM, 1999), and based on the following preliminary building design parameters:

Single Detached Units

- 2 storey units with a total floor area of approximately 2,500 ft^2;

- wood frame construction with masonry exterior and asphalt shingle roofing;
- not sprinklered; and
- 3 m spacing between units.

Rowhouse Units

- 3 storey units with a total floor area of approximately 4,900 ft^2;
- wood frame construction with masonry exterior and asphalt shingle roofing;
- 2-hour fire wall separation between units;
- not sprinklered; and
- 6 m front yards.

Calculations for the FUS and OFM fire flow requirements are included in Appendix B and summarized in Table 3. It is noted that the fire flow requirements will be updated when final building designs are available, and the building dimensions and characteristics can be confirmed.

Table 3: Summary of Required Fire Flows

BUILDING TYPE	FIRE UNDERWRITERS SURVEY		ONTARIO FIRE MARSHAL (OBC)	
	Fire Flow (L/s)	MDD + FF (L/s)	Fire Flow (L/s)	MDD + FF (L/s)
Single Detached	83	85.4	45	47.4
Rowhouse	83	85.4	45	47.4

5.4 WATER SUPPLY CAPACITY

The total Town water supply capacity is 16,390 m^3/day as per the *CSOPS.23.041 2022 Year End Water & Wastewater Capacity Assessment* prepared by the Town. This capacity is equivalent to 16,164 units based on the five-year rolling average MDD of 1.014 m^3/unit/day. Of the total system capacity:

- a total demand of 10,878 m^3/day (10,728 units) is currently connected or allocated; and
- a further demand of 2,718 m^3/day (2,681 units) is reserved for approved development or existing unserviced development.

Given the above, there is 2,794 m^3/day of available supply capacity, which is equivalent to 2,755 single detached residential units. This residual capacity exceeds the calculated MDD of 205.1 m^3/day for the 58 units for Lora Bay Phase 4B.

5.5 10TH LINE BOOSTER PUMPING STATION

The 10th Line BPS is designed to provide a fire flow of 85 L/s plus a MDD of 16.5 L/s for a total of 101.5 L/s at a hydraulic grade line of 256.4 m. Therefore, the BPS can supply the calculated MDD plus OFM fire flows (47.4 L/s) or the MDD plus FUS fire flows (85.4 L/s) for the single detached and rowhouse units in Phase 4B.

5.6 WATER PRESSURES

Acceptable pressure ranges for different demand scenarios based on Town design standards are presented in Table 4. Hydraulic boundary conditions from the water model for Lora Bay Phase 4 are presented in Table 5, along with estimated pressures for Phase 4B calculated based on lot elevation. Lot elevations are estimated to range from a low elevation of 218.04 m to a high elevation of 221.85 m. Model boundary conditions were provided by the Town for the range of anticipated demand scenarios, including MDD plus fire flows of 60 L/s and 100 L/s.

Estimated pressures within Phase 4B are within the acceptable range for all demand scenarios. Predicted pressures in Phase 4B will be confirmed by hydraulic modeling at the design stage.

Table 4: Pressure Design Criteria

DEMAND SCENARIO	ACCEPTABLE PRESSURE RANGE	
	kPa	psi
Average and Maximum Day	350 to 550	50 to 80
Minimum and Peak Hour	275 to 700	40 to 100
Maximum Day plus Fire Flow	140 to 700	20 to 100

Table 5: Estimated Phase 4B Pressures

DEMAND SCENARIO	PHASE 4 BOUNDARY CONDITIONS (ELEV. 206.15 m)		PHASE 4B PRESSURE (kPa)	
	Pressure (kPa)	HGL (m)	At Low Elev. (218.04 m)	At High Elev. (221.85 m)
Average Day Demand (ADD)	535	260.78	419	381
Peak Hour Demand (PHD)	532	260.52	416	375
Maximum Day Demand (MDD) + 60 L/s FF	622	269.71	506	469
Maximum Day Demand (MDD) + 100 L/s FF	361	243.07	245	208

6 Stormwater Management

6.1 SUMMARY OF STORMWATER MANAGEMENT REPORT

A separate *Stormwater Management (SWM) Report* has been prepared by Tatham Engineering to address drainage and stormwater management requirements for the Phase 4B development and should be read in conjunction with this report. A summary of the proposed stormwater management plan is as follows:

- Stormwater quality and quantity control will be provided by the existing wet pond SWM Facility known as SWM Pond No. 1 located south of Sunset Boulevard and east of the continuation of the 11th Concession ROW allowance.
- Minor storm drainage (up to the 1:5-year design storm) will be collected and conveyed by the Phase 4B storm sewer system which will outlet to the existing 600 mm diameter storm sewer on West Ridge Drive.
- Major storm drainage (greater than the 1:5-year design storm) will be conveyed by overland flow through the Phase 4B streets to a Servicing Block at the north end of Phase 4B. After passing through the Servicing Block, flows will cross Hole 16 of the Lora Bay golf course to be collected by an existing ditch along the south limit of Phase 4 and conveyed by the existing Phase 4 ditches to SWM Pond No. 1.
- Site grading and a proposed ditch through the park block will be used to safely convey flow overtopping the Georgian Trail around Phase 4B and towards the Hole 17 and downstream drainage system as per existing conditions.

The proposed storm sewer system is shown on the Conceptual Servicing Plan (Drawing CSP-1) enclosed for reference.

6.2 ECA REQUIREMENTS

It is noted that a condition of ECA No. 9869-BSNQR4 for Phase 4 required the Owner to submit an ECA application for SWM Pond No. 1 within 18 months of the issuance of the Phase 4 ECA Approval. The condition required the application to include a stormwater management report that addresses the water quality and quantity controls for the entire catchment area discharging SWM Pond No. 1. To address this requirement, Tatham Engineering prepared the *Lora Bay Development – SWM Pond No. 1 Stormwater Management Report* and submitted this report to the MECP with the ECA Application for SWM Pond No. 1 on April 5, 2022. This report also identified drainage improvements required to Boulder Channel and the outlet channel

downstream of SWM Pond No. 1. As mentioned, construction of these improvements are currently ongoing.

7 Transportation

A separate *Traffic Impact Study* has been prepared by Tatham Engineering to address traffic requirements for the Phase 4B development and should be read in conjunction with this report. A summary of the conclusions and recommendations of the report is as follows:

- Traffic signals are required at the intersection of Lora Bay Drive/11th Line with Highway 26 to serve the 2030 background conditions given the increased traffic volumes on Highway 26 (i.e. the traffic signals are not precipitated by the Lora Bay Phase 4B development).
- No additional improvements are required to support Phase 4B on its own.
- The existing turn lanes on Highway 26 at Lora Bay Drive/11th Line and Christie Beach Road are sufficiently configured to accommodate the future traffic volumes with consideration for Lora Bay Phase 4B.
- Sight lines on Highway 26 at Lora Bay Drive/11th Line and on Lora Bay Drive at West Ridge Drive are appropriate and comply with appropriate standards.

8 Utilities

The following utility agencies provide services in the Lora Bay development:

- Hydro One;
- Enbridge Gas;
- Bell; and
- Rogers.

Corresponding services (electrical, natural gas, telephone, television and internet) have been installed for the existing Phase 4 development and it has been confirmed with each utility provider that the proposed Phase 4B development can be serviced by an extension of these existing services.

9 Summary

As detailed in the previous chapters, existing infrastructure surrounding Lora Bay Phase 4B can adequately service the development for sanitary drainage, potable water and stormwater management. For utility services (hydro, natural gas, telephone, television and internet), such currently exist to service Phase 4 and can be extended to service Phase 4B.

A *Stormwater Management Report* (SWM) submitted under separate cover describes the stormwater management plan for the proposed development and confirms the development can be adequately serviced for stormwater management. Additionally, a Traffic Impact Study (TIS) submitted under separate cover confirms the proposed development will not adversely affect the existing surrounding road network.

The key findings of the FSR, SWM and TIS are as follows:

- Sanitary flows from the proposed development will drain via proposed 200 and 250 mm diameter sewers to the existing 250 mm diameter sewer in West Ridge Drive which ultimately drains to the sanitary pumping station at the intersection of Sunset Boulevard and Lora Bay Drive. Sewers will be terminated such that they can be easily extended into future development phases.
- A 300 mm diameter watermain will be extended from the existing 300 mm diameter watermain in West Ridge Drive (Street 'A') to its proposed termination at the Georgian Trail at the south limit of Phase 4B for connection of future development phases. A 300 mm diameter watermain will also be extended west along Street 'B' from West Ridge Drive to the west limit of Phase 4B for connection of future development phases. A minimum 250 mm diameter watermain will be extended along Street 'B' from West Ridge Drive (Street 'A') to a proposed Park block, to allow for a future looped connection to Phase 7. A minimum 200 mm diameter watermain loop will be installed along the remainder of Street 'B'.
- Stormwater management quality and quantity control will be provided by the existing SWM Pond No. 1 wet pond SWMF. Proposed storm sewers installed in West Ridge Drive and Streets 'A' and 'B' will connect to the existing Phase 4 storm sewer system to collect and convey drainage from Phase 4B to the downstream storm system.
- Site grading and a proposed ditch will be used to safely convey flow overtopping the Georgian Trail around Phase 4B and towards the 17th Hole and downstream drainage system as per existing conditions.

- A traffic signal will be required at the intersection of Lora Bay Drive/11th Line with Highway 26 to serve 2030 background conditions (eg. without Phase 4B). No further improvements are required to support Phase 4B.

Additional details related to the various servicing components will be provided at the detailed design stage. Detailed drawings will be completed for approval by the Town and relevant regulatory agencies to clear the conditions of Draft Plan Approval and allow for registration of the Plan of Subdivision and the associated Subdivision Agreement.

LORA BAY DEVELOPMENT – PHASE 4B

Figure 1: Site Location

EXISTING RESIDENTIAL PHASE 4

THE GOLF CLUB AT LORA BAY

WEST RIDGE DRIVE (STREET 'A')

17.0m SERVICING EASEMENT

12.0m SERVICING BLOCK

15.0m SERVICING BLOCK

STREET 'A'

STREET 'B'

GEORGIAN TRAIL

HOLE #16

HOLE #17

BLOCK 55 PARK

BLOCK 56 PARK

BLOCK 51 ROWHOUSE 3 UNITS

BLOCK 52 ROWHOUSE 3 UNITS

BLOCK 53 ROWHOUSE 3 UNITS

BLOCK 54 ROWHOUSE 4 UNITS

FUTURE DEVELOPMENT LANDS

FUTURE DEVELOPMENT PHASE 7

EX. SANMH 1
EX. CBMH2
EX. CBMH1
EX. 600ø STM @ 4.1%
EX. 250ø SAN @ 4.1%
EX. 500ø WATERMAIN
EX. 600ø STM @ 3.9%
EX. SANMH 8
EX. CB
EX. 1/BANK
EX. DITCH
EX. BUSH
EX. ASPH TRAIL
EX. GRVL TRAIL
EX. B/BANK

CONNECT TO EXISTING SANITARY MAINTENANCE HOLE INV: 213.91

CONNECT TO EXISTING STORM CATCH BASIN MAINTENANCE HOLE INV: 214.45

REMOVE EX. AUTOFLUSHER AND CONNECT TO EXISTING 300ø WATERMAIN STUB

MATCH TO EXISTING

CONNECT TO EXISTING SANITARY STUB INV: 214.76

MATCH TO EXISTING @ PROPERTY LINE

PROPOSED LOT GRADING "SPLIT" LOCATION

PROPOSED 0.30m DEEP SWALE @ MIN 1.0% C/W PERFORATED SUBDRAIN WRAPPED IN FILTER SOCK

MATCH TO EXISTING

DITCH TO DISCHARGE TOWARDS HOLE 17 AS PER EXISTING CONDITIONS

PROPOSED DITCH TO CONVEY FLOW OVERTOPPING GEORGIAN TRAIL TOWARDS HOLE 17

300ø WATERMAIN (SIZE TO BE CONFIRMED) STUB, CAP & AUTOFLUSHER TO BE INSTALLED FOR CONNECTION TO FUTURE DEVELOPMENT

250ø WATERMAIN (SIZE TO BE CONFIRMED) STUB, CAP & AUTOFLUSHER TO BE INSTALLED FOR FUTURE CONNECTION TO PHASE 7

300ø WATERMAIN (SIZE TO BE CONFIRMED) STUB, CAP & AUTOFLUSHER TO BE INSTALLED FOR FUTURE CONNECTION TO PHASE 7

MATCH TO EXISTING DITCH

300ø CSP CULV. (APPROX. LOCATION)

5.9m–300ø HDPE CULV. @ 0.85% SW INV:222.55 NE INV:222.50

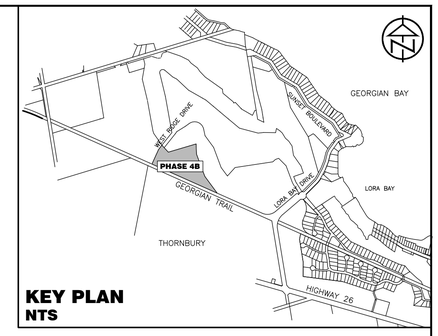
MATCH TO EXISTING @ PROPERTY LINE

EXISTING DITCH TO BE REGRADED

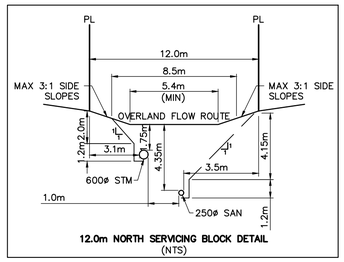
6.5m–300ø HDPE CULV. @ 1.3% SW INV:221.83 NE INV:221.62

PROPOSED DITCH

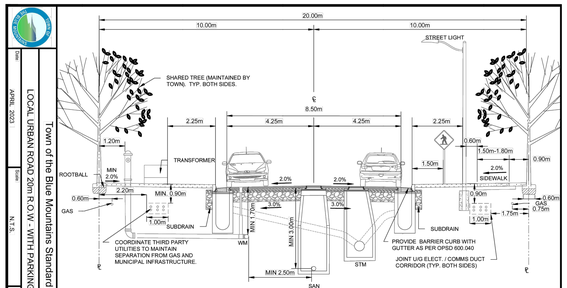
6.4m–300ø HDPE CULV. @ 0.8% SW INV:221.21 NE INV:221.16



KEY PLAN
NTS



12.0m NORTH SERVICING BLOCK DETAIL
(NTS)

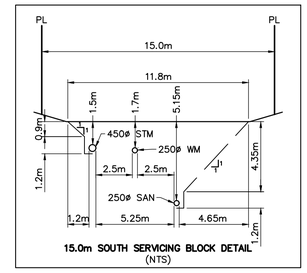


NOTES:

1. MINIMUM PAVEMENT STRUCTURE TO BE:

CLASSIFICATION	ASPHALT		GRANULAR	
	SURFACE	BASE	GRANULAR A	GRANULAR B
LOCAL RESIDENTIAL AND MINOR COLLECTOR	50mm HL3	50mm HL4 OR HL8	150mm	450mm
MAJOR COLLECTOR RESIDENTIAL	50mm HL3	70mm HL4 OR HL8	150mm	450mm

2. TO BE READ IN CONJUNCTION WITH TOTBM STD DWG 4.8.2.A.
3. THIRD PARTY UTILITY ALIGNMENTS TO BE ADJUSTED OVER SHORT DISTANCES AS NECESSARY AROUND TREES AND OTHER SURFACE AND UNDERGROUND STRUCTURES TO MAINTAIN REQUIRED SEPARATION DISTANCES.
4. WHERE TREES ARE BEING PLANTED AFTER GAS IS IN PLACE, TREE LOCATION SHALL BE ADJUSTED AND USE A ROOT DEFLECTOR AS NOT TO CONFLICT WITH REQUIRED SEPARATION DISTANCES. PROVIDE ROOT DEFLECTOR IN AREAS WHERE GAS IS LESS THAN 1000mm FROM ROOTBALL.



15.0m SOUTH SERVICING BLOCK DETAIL
(NTS)

EX. CB

DRAWING REFERENCES

LEGAL SURVEY INFORMATION SHOWN ON THIS PLAN BASED ON PLAN 16M–8 PREPARED BY ZUBEK, EMO, PATTEN AND THOMSON LIMITED, OLS, DATED MAY 1, 2006.

TOPOGRAPHIC INFORMATION SHOWN ON THIS PLAN BASED ON FIELD SURVEY COMPLETED BY TATHAM ENGINEERING LIMITED, DECEMBER 2020.

BENCHMARKS

TBM#1 ELEV. 213.80 m
CUT CROSS ON TRANSFORMER PAD B/W LOTS 16 & 17 IN PHASE 4.

TBM#2 ELEV. 209.78 m
CUT CROSS ON TRANSFORMER PAD B/W LOTS 23 & 24 IN PHASE 4.

TBM#3 ELEV. 220.02 m
CUT CROSS ON TRANSFORMER PAD WEST OF LORA BAY DRIVE AT THE EXTENSION OF THE GEORGIAN TRAIL

No.	REVISION DESCRIPTION	DATE
1.	FIRST SUBMISSION	AUG 2022

ENGINEER STAMP

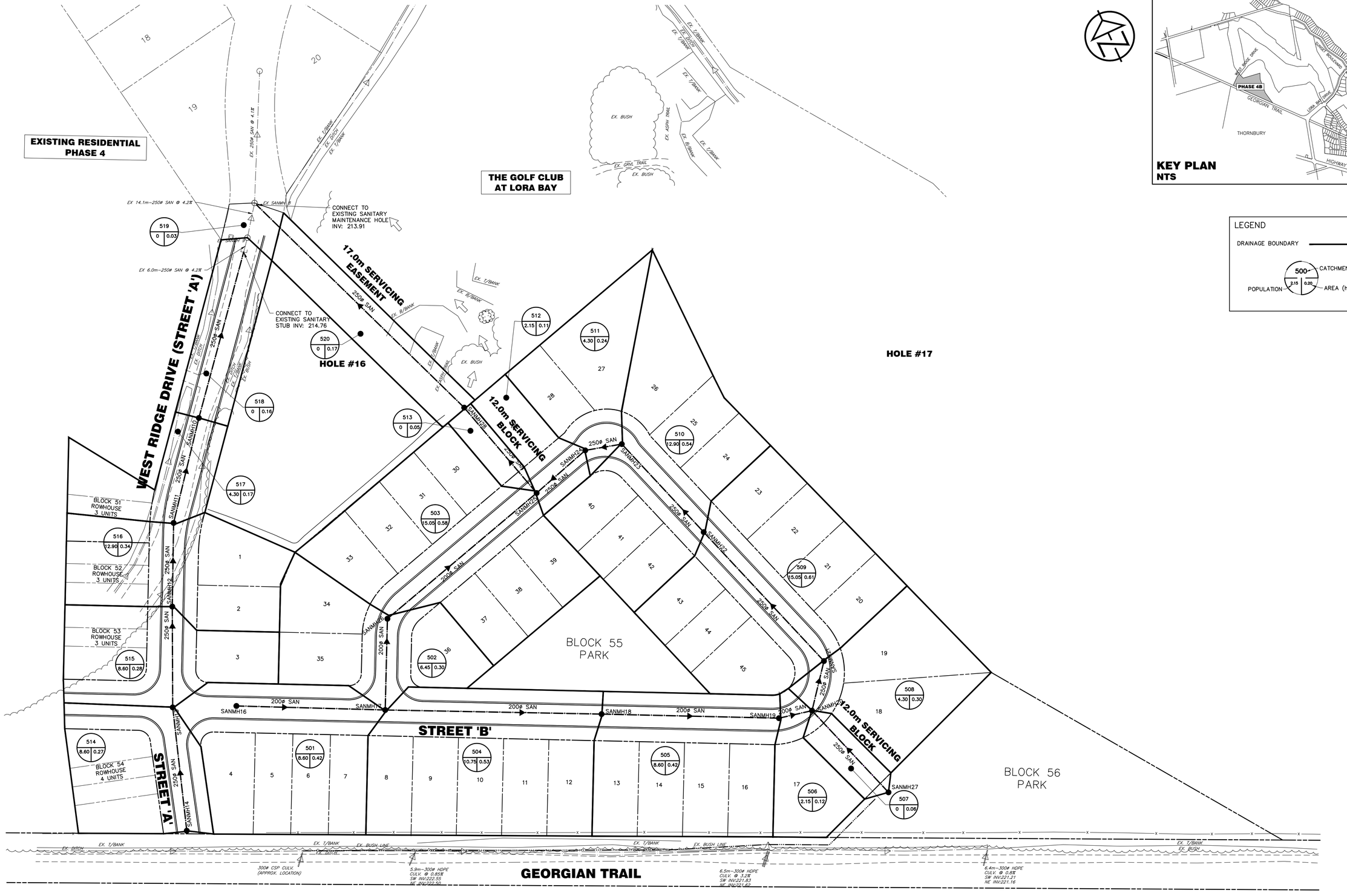
LORA BAY DEVELOPMENT: PHASE 4B
TOWN OF THE BLUE MOUNTAINS

TATHAM ENGINEERING

CONCEPTUAL SERVICING PLAN

DESIGN: JM/LC	FILE: 121361	**CSP-1**
DRAWN: JM/LC	DATE: AUG 2022	
CHECK: JPA	SCALE: 1:750	

Drawing Name: 121361–CSP01.dwg, Plotted: Aug 25, 2023



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CONTRACTOR MUST VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR SAME. ANY DISCREPANCIES MUST BE REPORTED TO THE ENGINEER BEFORE COMMENCING WORK. DRAWINGS ARE NOT TO BE SCALED.

DRAWING REFERENCES

LEGAL SURVEY INFORMATION SHOWN ON THIS PLAN BASED ON PLAN 16M-8 PREPARED BY ZUBEK, EMO, PATTEN AND THOMSON LIMITED, OLS, DATED MAY 1, 2006.

TOPOGRAPHIC INFORMATION SHOWN ON THIS PLAN BASED ON FIELD SURVEY COMPLETED BY TATHAM ENGINEERING LIMITED, DECEMBER 2020.

BENCHMARKS

TBM#1 ELEV. 213.80 m
CUT CROSS ON TRANSFORMER PAD B/W LOTS 16 & 17 IN PHASE 4.

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CUT CROSS ON TRANSFORMER PAD WEST OF LORA BAY DRIVE AT THE EXTENSION OF THE GEORGIAN TRAIL

No.	REVISION DESCRIPTION	DATE
1.	FIRST SUBMISSION	AUG 2022

ENGINEER STAMP

LORA BAY DEVELOPMENT: PHASE 4B
TOWN OF THE BLUE MOUNTAINS

TATHAM ENGINEERING

SANITARY DRAINAGE PLAN

DESIGN: JM/LC	FILE: 121361	**SAN-1**
DRAWN: JM/LC	DATE: AUG 2022	
CHECK: JPA	SCALE: 1:750	

Drawing Name: 121361-SAN1.dwg, Plotted: Aug 25, 2023

Appendix A:
Sanitary Sewer Analysis

TATHAM ENGINEERING

Sanitary Sewer Design Sheet

Version Number: 1 **Version Date:** August 25, 2023

Project Information

Lora Bay Development - Phase 4B	121361

Drawing Reference

Sanitary Drainage Plan SAN-1	August 25/23

Prepared By

John Birchard	August 25/23

Reviewed By

J. Acres	August 25/23

Municipality

Town of The Blue Mountains

Population Density

Capita per Unit	Low	Medium	High
	2.15	2.15	2.15

Infiltration

Infiltration (L/s/ha)	0.28

Flow

Development Type	Average (L/cap/day)	Peaking Factor
Residential	350	Harmon
Development Type	**Average (L/ha/day)**	**Peaking Factor**
Institution	-	-
Commercial	-	-
Industrial High Intensity	55,000	-
Industrial Low Intensity	20,000	-

Manning's Coefficient

Pipe Material	Value
Concrete	0.013
PVC	0.013
Applied	0.013

Engineer Stamp

Street Name	Area Label/ID	Upstream Maintenance Hole	Downstream Maintenance Hole	Development Type	Population Density	Number of Units	Population (cap)	Accumulated Population (cap)	Peaking Factor	Area (ha)	Cumulative Area (ha)	Average Flow (L/s)			Peak Flow (L/s)			Proposed Sanitary Sewer						
												Development	Infiltration	Total	Development	Infiltration	Total	Sewer Length (m)	Sewer Slope (%)	Actual Sewer Diameter (mm)	Full Flow Velocity (m/s)	Full Flow Capacity (L/s)	Actual Velocity (m/s)	Calculated Sewer Diameter (mm)	Percentage of Full Flow Capacity (%)
STREET B	501	SANMH16	SANMH17	Residential	Med.	4	8.6	8.6	4.42	0.42	0.42	0.03	0.12	0.15	0.15	0.12	0.27	61.0	1.5%	200	1.28	40.17	0.38	31	0.7%
STREET B	502	SANMH17	SANMH26	Residential	Med.	3	6.5	15.1	4.40	0.30	0.72	0.06	0.20	0.26	0.27	0.20	0.47	38.0	1.5%	200	1.28	40.17	0.44	38	1.2%
STREET B	503	SANMH26	SANMH25	Residential	Med.	7	15.1	30.1	4.35	0.58	1.30	0.12	0.36	0.49	0.53	0.36	0.90	84.0	1.5%	200	1.28	40.17	0.53	48	2.2%
STREET B	504	SANMH17(2)	SANMH18	Residential	Med.	5	10.8	10.8	4.41	0.53	0.53	0.04	0.15	0.19	0.19	0.15	0.34	88.0	1.0%	200	1.04	32.80	0.35	36	1.0%
STREET B	505	SANMH18	SANMH19	Residential	Med.	4	8.6	19.4	4.38	0.42	0.95	0.08	0.27	0.34	0.34	0.27	0.61	73.0	1.0%	200	1.04	32.80	0.41	45	1.9%
STREET B	506	SANMH19	SANMH20	Residential	Med.	1	2.2	21.5	4.38	0.12	1.07	0.09	0.30	0.39	0.38	0.30	0.68	13.0	1.0%	200	1.04	32.80	0.42	47	2.1%
FUTURE	-	-	SANMH27	Residential	Med.	250	537.5	537.5	3.96	25.00	25.00	2.18	7.00	9.18	8.62	7.00	15.62	-	0.5%	250	0.86	42.05	0.75	172	37.1%
SERVICING BLOCK	507	SANMH27	SANMH20	Residential	Med.	0	0.0	537.5	3.96	0.06	25.06	2.18	7.02	9.19	8.62	7.02	15.63	45.0	0.5%	250	0.86	42.05	0.75	172	37.2%
STREET B	508	SANMH20	SANMH21	Residential	Med.	2	4.3	563.3	3.95	0.30	26.43	2.28	7.40	9.68	9.07	7.40	16.47	21.0	0.5%	250	0.86	42.05	0.76	176	39.2%
STREET B	509	SANMH21	SANMH22	Residential	Med.	7	15.1	578.4	3.94	0.61	27.04	2.34	7.57	9.91	9.31	7.57	16.88	66.0	0.5%	250	0.86	42.05	0.77	177	40.1%
STREET B	510	SANMH22	SANMH23	Residential	Med.	6	12.9	591.3	3.94	0.54	27.58	2.40	7.72	10.12	9.52	7.72	17.24	54.0	0.5%	250	0.86	42.05	0.77	179	41.0%
STREET B	511	SANMH23	SANMH24	Residential	Med.	2	4.3	595.6	3.93	0.24	27.82	2.41	7.79	10.20	9.58	7.79	17.37	16.0	0.5%	250	0.86	42.05	0.78	179	41.3%
STREET B	512	SANMH24	SANMH25	Residential	Med.	1	2.2	597.7	3.93	0.11	27.93	2.42	7.82	10.24	9.62	7.82	17.44	26.5	0.5%	250	0.86	42.05	0.78	180	41.5%
SERVICING BLOCK	513	SANMH25	SANMH28	Residential	Med.	0	0.0	627.8	3.92	0.05	29.28	2.54	8.20	10.74	10.15	8.20	18.35	44.0	0.5%	250	0.86	42.05	0.79	183	43.6%
SERVICING BLOCK	520	SANMH28	*EX. SAN MH8*	Residential	Med.	0	0.0	627.8	3.92	0.17	29.45	2.54	8.25	10.79	10.15	8.25	18.40	119.5	0.5%	250	0.86	42.05	0.79	183	43.8%
FUTURE	-	-	SANMH14	Residential	Med.	166	356.9	356.9	4.05	16.60	16.60	1.45	4.65	6.09	5.85	4.65	10.50	-	1.0%	250	1.21	59.47	0.87	130	17.7%
WEST RIDGE DRIVE (STREET A)	514	SANMH14	SANMH13	Residential	Med.	4	8.6	365.5	4.04	0.27	16.87	1.48	4.72	6.20	5.99	4.72	10.71	50.5	1.0%	250	1.21	59.47	0.88	131	18.0%
Future flows at SANMH13 potentially directed through future development lands to the west																									
WEST RIDGE DRIVE (STREET A)	515	SANMH13	SANMH12	Residential	Med.	4	8.6	374.1	4.04	0.28	17.15	1.52	4.80	6.32	6.13	4.80	10.93	40.5	1.5%	250	1.48	72.83	1.02	123	15.0%

O:\Collingwood\2021 Projects\121361 - Lora Bay Development\03 - Phase 4B Draft Plan Approval\Design\FSR\Sanitary\Sewer Design Sheet - 2023 Town Standards

1. Existing Phase 4 sewer information obtained from Phase 4 servicing report prepared by Crozier.
2. Future unit counts are preliminary and subject to change.

TATHAM ENGINEERING

Sanitary Sewer Design Sheet

Version Number: 1 **Version Date:** August 25, 2023

Project Information

Lora Bay Development - Phase 4B	121361

Drawing Reference

Sanitary Drainage Plan SAN-1	August 25/23

Prepared By

John Birchard	August 25/23

Reviewed By

J. Acres	August 25/23

Municipality

Town of The Blue Mountains

Population Density

Capita per Unit	Low	Medium	High
	2.15	2.15	2.15

Infiltration

Infiltration (L/s/ha)	0.28

Flow

Development Type	Average (L/cap/day)	Peaking Factor
Residential	350	Harmon
Development Type	**Average (L/ha/day)**	**Peaking Factor**
Institution	-	-
Commercial	-	-
Industrial High Intensity	55,000	-
Industrial Low Intensity	20,000	-

Manning's Coefficient

Pipe Material	Value
Concrete	0.013
PVC	0.013
Applied	0.013

Engineer Stamp

Street Name	Area Label/ID	Upstream Maintenance Hole	Downstream Maintenance Hole	Development Type	Population Density	Number of Units	Population (cap)	Accumulated Population (cap)	Peaking Factor	Area (ha)	Cumulative Area (ha)	Average Flow (L/s)			Peak Flow (L/s)			Proposed Sanitary Sewer							
												Development	Infiltration	Total	Development	Infiltration	Total	Sewer Length (m)	Sewer Slope (%)	Actual Sewer Diameter (mm)	Full Flow Velocity (m/s)	Full Flow Capacity (L/s)	Actual Velocity (m/s)	Calculated Sewer Diameter (mm)	Percentage of Full Flow Capacity (%)
WEST RIDGE DRIVE (STREET A)	516	SANMH12	SANMH11	Residential	Med.	6	12.9	387.0	4.03	0.34	17.49	1.57	4.90	6.46	6.34	4.90	11.24	33.0	1.5%	250	1.48	72.83	1.03	124	15.4%
WEST RIDGE DRIVE (STREET A)	517	SANMH11	SANMH10	Residential	Med.	2	4.3	391.3	4.03	0.17	17.66	1.59	4.94	6.53	6.41	4.94	11.36	44.0	1.5%	250	1.48	72.83	1.03	124	15.6%
WEST RIDGE DRIVE (STREET A)	518	SANMH10	*EX. SAN MH9*	Residential	Med.	0	0.0	391.3	4.03	0.16	17.82	1.59	4.99	6.57	6.41	4.99	11.40	75.0	1.5%	250	1.48	72.83	1.03	125	15.7%
WEST RIDGE DRIVE (STREET A)	519	*EX. SAN MH9*	*EX. SAN MH8*	Residential	Med.	0	0.0	391.3	4.03	0.03	17.85	1.59	5.00	6.58	6.41	5.00	11.41	14.1	4.2%	250	2.48	121.87	1.51	103	9.4%

1. Existing Phase 4 sewer information obtained from Phase 4 servicing report prepared by Crozier.
2. Future unit counts are preliminary and subject to change.

TATHAM ENGINEERING

Sanitary Sewer Design Sheet

Version Number: 1 **Version Date:** August 25, 2023

Project Information

Lora Bay Development - Phase 4B	121361

Drawing Reference

Refer to Phase 4 and Phase 3 FSR's previously completed	

Prepared By

John Birchard	August 25/23

Reviewed By

J. Acres	August 25/23

Municipality

Town of The Blue Mountains

Population Density

Capita per Unit	Low	Medium	High
	2.15	2.15	2.15

Infiltration

Infiltration (L/s/ha)	0.28

Flow

Development Type	Average (L/cap/day)	Peaking Factor
Residential	350	Harmon
Development Type	**Average (L/ha/day)**	**Peaking Factor**
Institution	-	-
Commercial	-	-
Industrial High Intensity	55,000	-
Industrial Low Intensity	20,000	-

Manning's Coefficient

Pipe Material	Value
Concrete	0.013
PVC	0.013
Applied	0.013

Engineer Stamp

Street Name	Area Label/ID	Upstream Maintenance Hole	Downstream Maintenance Hole	Development Type	Population Density	Number of Units	Population (cap)	Accumulated Population (cap)	Peaking Factor	Area (ha)	Cumulative Area (ha)	Average Flow (L/s)			Peak Flow (L/s)			Proposed Sanitary Sewer						
												Development	Infiltration	Total	Development	Infiltration	Total	Sewer Length (m)	Sewer Slope (%)	Actual Sewer Diameter (mm)	Full Flow Velocity (m/s)	Full Flow Capacity (L/s)	Actual Velocity (m/s)	Calculated Sewer Diameter (mm)	Percentage of Full Flow Capacity (%)
STREET B (PH4B)		PH4B	MH8	Residential	Med.	58	124.7	124.7	4.22	6.35	6.35	0.51	1.78	2.28	2.13	1.78	3.91	-	0.5%	250	0.86	42.05	0.52	103	9.3%
WEST RIDGE DR (PH4)		MH8	MH101	Residential	Med.	74	159.1	283.8	4.09	8.11	14.46	1.15	4.05	5.20	4.76	4.05	8.81	-	0.6%	250	0.94	46.06	0.69	134	19.1%
WEST RIDGE DR (PH3)		MH101	MH107	Residential	Med.	62	133.3	417.1	4.01	5.80	20.26	1.69	5.67	7.36	6.93	5.67	12.60	-	0.6%	250	0.94	46.06	0.76	154	27.4%
WEST RIDGE DR (PH3)		MH113/ 207	MH107	Residential	Med.	50	107.5	107.5	4.23	7.00	7.00	0.44	1.96	2.40	1.84	1.96	3.80	-	0.4%	250	0.77	37.61	0.47	106	10.1%
EASEMENT (PH3)		MH107	MH 214	Residential	Med.	0	0.0	524.6	3.96	0.00	27.26	2.13	7.63	9.76	8.78	7.63	16.41	-	0.4%	250	0.73	35.68	0.68	187	46.0%

Appendix B:
Water Servicing Analysis

TATHAM ENGINEERING

PROJECT	Lora Bay Development Phase 4B	FILE	121361
		DATE	2022-06-28
SUBJECT	FUS Fire Flow Calculations Single Detached Home	NAME	JRC
		CHECKED	ST
REVISIONS			

Fire Underwriters Survey Fire Flow Calculations - Long Method
Calculation Based on 1999 Publication "Water Supply for Public Fire Protection" by Fire Underwriters Survey (FUS).

Step	Description	Term	Options	Multiplier Associated With Option	Choose	Value Used	Unit	Total Fire Flow (L/min)
1	Frame Use for Construction of Unit	**Framing Material**						
		Coefficient related to type of construction (C)	Wood Frame	1.5	**Ordinary Construction**	**1**	-	N/A
			Ordinary Construction	1				
			Non-combustible construction	0.8				
			Fire resistive construction (<2 hrs)	0.7				
			Fire resistive construction (>2 hrs)	0.6				
2	Type of Occupancy	**Floor Space Area**						
		Type of Occupancy	Single Family	1	**Single Family**	**1**	Units	N/A
			Townhouse/Apartment-inform # of units	1				
			Other (Comm., Ind., etc.)	1				
2.1	No. of Storeys	Number of Floors/Storeys in the unit (do not include basement				**2**	Storeys	
3	Floor Area	Total Floor Area (A) - for all storeys excluding basement			m^2	**232.3**	m^2	N/A
		Measurement Units	Square Feet (ft^2)	0.09290304	**232.3**			
			Square Metres (m^2)	1				
			Hectares (ha)	10000				
4	Required Fire Flow without Reductions or Increases	Required Fire Flow without Reductions or Increases per FUS: ($FF=220xCxA^{0.5}$)					L/min	3,000
5	Factors Affecting Burning	**Reductions / Increases Due to Factors Affecting Burning**						
5.1	Combustibility of Building Contents	Occupancy content hazard reduction or surcharge	Non-combustible	-0.25	**Combustible**	**0**	N/A	0
			Limited combustible	-0.15				
			Combustible	0				
			Free burning	0.15				
			Rapid burning	0.25				
5.2	Reduction Due to Presence of Sprinklers	Sprinkler reduction	Complete automatic strinkler protection	-0.3	**No Sprinklers**	**0**	N/A	0
			Standard hoses for both system & Fire Department	-0.1				
			Supervised system	-0.1				
5.3	Separation Distance Between Units	Exposure distance between units	North Side	21 m - 30 m	**0.15**	**0.75**	N/A	2,250
			East Side	0 m - 3 m	**0.25**			
			South Side	21 m - 30 m	**0.15**			
			West Side	0 m - 3 m	**0.25**			
6	Required Fire Flow, Duration and Volume	Total Required Fire Flow, rounded to nearest 1000 L/min, with max/min limits applied:						5,000
		Total Required Fire Flow (above) in L/s:						83
		Required Duration of Fire Flow of			5,000		L/min (hrs):	1.75
		Required Volume of Fire Flow of			5,000		L/min (m^3):	525

TATHAM ENGINEERING

PROJECT	Lora Bay Phase 5	FILE	120141
		DATE	June 28, 2022
SUBJECT	OFM Fire Flow Calculatsion SD and Duplex Homes	NAME	JRC
		PAGE	1 OF 2

Office of the Fire Marshal, OFM Guideline, Fire Protection Water Supply Guideline for Part 3 in the Ontario Building Code (OBC), October 1999

$Q = KVS_{TOT}$ Where: Q = minimum supply of water in litres (L)
K = water supply coefficient from Table 1
V = total building volume in cubic metres (m^3)
S_{TOT} = total of spatial coeff. values from property line exposures on all sides

$S_{TOT} = 1.0 + [S_{side\ 1} + S_{side\ 2}$ + etc.]
Where: S_{side} values are obtained from Figure 1 and modified accordingly
S_{TOT} need not exceed 2.0

According to OBC Table 3.1.2.1. Classification of Buildings, the major occupancy classification of the building is: **C - Residential**

Determining the Water Supply Coefficient

Assuming the building is made of combustible construction with fire separations but no fire-resistance ratings provided in accordance with Subsection 3.2.2. of the OBC, the water supply coefficient determined by Table 1 is: **K = 23**

Determining the Total Building Volume

The total building volume should be calculated as: all spaces below and above grade within the building, measured to the underside of the roof deck.

Floor	Area (m^2)	Height (m)	Volume (m^3)
Basement	116.13	3.05	354
First	116.13	3.05	354
Second	116.13	3.05	354
Roof	-	-	496

V = 1,557 m^3

Determining the Total Spatial Coefficient

Side	Exposure Distance (m)	Spatial Coefficient	
1	12	0	*Front to center of street*
2	3	0.6	*Side 1 to property line*
3	3	0.6	*Side 2 to property line*
4	12	0	*Back to property line*

S_{TOT} = 1.0 + [Sside 1 + Sside 2 + Sside 3 + Sside 4] **S_{TOT} = 2.0**
= 1.0 + 0 + 0.6 + 0.6 + 0 = 2.2

Calculating the Minimum Water Supply

The minimum water supply is calculated using the variables and equation determined above.

$Q = KVS_{TOT}$

$= 23 \times 1{,}557\ m^3 \times 2.0$

Q = 71,643 L

Based on Table 2, the minimum water supply flow rate for the calculated Q is: 2,700 L/min

or: 45 L/s

Therefore, a minimum fire flow of 45 L/s should be available at a minimum pressure of 140 kPa (20 psi).

TATHAM ENGINEERING	Project: Lora Bay Phase 4B	Date:	July 28, 2022
	File No.: 121361	Designed:	JRC
	Subject: FUS Fire Flow Calculation Middle Unit of 9 Rowhouses	Checked	JM
	Revisions:		

Fire Underwriters Survey Fire Flow Calculations
Long Method

Calculation Based on 1999 Publication "Water Supply for Public Fire Protection" by Fire Underwriters Survey (FUS).

Step	Description	Term	Options	Multiplier Associated with Option	Choose	Value used	Unit	Total Fire Flow (L/min)	
		Framing Material							
1	Frame Use for Construction of Unit	Coefficient related to type of construction (C)	Wood Frame	1.5	Ordinary Construction	**1**	-	N/A	
			Ordinary Construction	1					
			Non-combustible construction	0.8					
			Fire resistive construction (< 2 hrs)	0.7					
			Fire resistive construction (> 2 hrs)	0.6					
		Floor Space Area							
2	Type of Housing (if Townhouse, enter number of units per TH block)	Type of Housing	Single Family	1		**0**	Units	N/A	
			Townhouse / Apartment- inform # of units	1		**9**			
			Other (Comm. Ind., etc.)	1		**0**			
			2 hour Fire Separation Between Units	1	Yes	**1**			
2.1	Number of Storeys	Number of Floors / Storeys in the unit (do not include basement)				**3**	Storeys	N/A	
3	Floor Area (exclude basements, per unit for townhouses, per single family dwelling or per building for apartments, commercial or institutional)	Ground Floor Area				**152**	Square Metres (m2)	N/A	
		Total Floor Area - One Storey of Townhouse/Apartment Block				**152**			
		Total Floor Area - All Storeys				**456**			
		Does the building have fire-resistive design?			No	**456**			
		Are vertical openings/communications properly protected (1 hour rating)?			No	**456**			
		Total Floor Area (A) - for all storeys excluding basement - Single Family				**456**			
		Measurement Unis	Square Feet (ft^2)	0.093		**456**	m^2		
			Square Metres (m^2)	1					
			Hectares (ha)	10000					
4	Required Fire Flow without Reductions or Increases	Required Fire Flows without Reductions or Increases per FUS): (FF= 220 x C x $A^{0.5}$)					L/min	4,698	
5	Factors Affecting Burning	**Reductions / Increases Due to Factors Affecting Burning**							
5.1	Combustibility of Building Contents	Occupancy content hazard reduction or surcharge	Non-combustible	-0.25	Non-combustible	-0.25	N/A	(1,175)	3,524
			Limited combustible	-0.15					
			Combustible	0.00					
			Free burning	0.15					
			Rapid burning	0.25					
5.2	Reduction Due to Presence of Sprinklers	Sprinkler reduction	Fully supervised system	-0.5	None	0.0	N/A	-	3,524
			Water supply system/hose connections	-0.4					
			Automatic sprinkler protection	-0.3					
			None	0					
5.3	Separation Distance Between Units (Use 10% for 2 hour Fire Separation between adjacent units)	Exposure distance between units	North Side (Fire Wall Separation)	20.1 to 30.0 m	0.10	0.4	%	1,409	4,933
			East Side (6m front yards + 20m ROW)	30.1 to 45.0 m	0.05				
			South Side (Fire Wall Separation)	20.1 to 30.0 m	0.10				
			West Side (6m rear yards)	10.1 to 20.0 m	0.15				
5.4	Combustibility of Wood Shingle or Shake Roof Material	Surcharge for potential to spread fire	Non-combustible roofing material	0	Non-combustible roofing material	0	L/min	0	4,933
			Low risk of fire spread	2000					
			Moderate risk of fire spread	3000					
			High risk of fire spread	4000					
		Total Required Fire Flow, rounded to nearest 1000 L/min, with max/min limits applied:							5,000
6	Required Fire Flow, Duration and Volume	Total Required Fire Flow (above) in L/s:						83	
		Required Duration of Fire Flow of 5,000 L/min (hrs):						1.75	
		Required volume for Fire Flow of 5,000 L/min (m^3):						525	

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Office of the Fire Marshal, OFM Guideline, Fire Protection Water Supply Guideline for Part 3 in the Ontario Building Code (OBC), October 1999

$Q = KVS_{TOT}$ Where: Q = minimum supply of water in litres (L)

K = water supply coefficient from Table 1

V = total building volume in cubic metres (m^3)

S_{TOT} = total of spatial coeff. values from property line exposures on all sides

$S_{TOT} = 1.0 + [S_{side\ 1} + S_{side\ 2} + etc.]$

Where: S_{side} values are obtained from Figure 1 and modified accordingly

S_{TOT} need not exceed 2.0

According to OBC Table 3.1.2.1. Classification of Buildings, the major occupancy classification of the building is: **C - Residential**

Determining the Water Supply Coefficient

Assuming the building is made of combustible construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2. of the OBC, the water supply coefficient determined by Table 1 is: **K = 18**

Determining the Total Building Volume

The total building volume should be calculated as: all spaces below and above grade within the building, measured to the underside of the roof deck.

Floor	Area (m^2)	Height (m)	Volume (m^3)
Basement	152.00	3.05	463
First	152.00	3.05	463
Second	152.00	3.05	463
Third	152.00	3.05	463
Roof	-	-	496

V = 2,349 m^3

Determining the Total Spatial Coefficient

Side	Exposure Distance (m)	Spatial Coefficient	
1	16	0	*Front to center of street*
2	0	0	*Side with Fire Wall Separation*
3	0	0	*Side with Fire Wall Separation*
4	6	0.4	*Back to property line*

S_{TOT} = 1.0 + [Sside 1 + Sside 2 + Sside 3 + Sside 4] **S_{TOT} = 1.4**

= 1.0 + 0 + 0 + 0 + 0.4 = 1.4

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Calculating the Minimum Water Supply

The minimum water supply is calculated using the variables and equation determined above.

$Q = KVS_{TOT}$

$= 18 \times 2{,}349\ m^3 \times 1.4$

$Q = 59{,}188$ L

Based on Table 2, the minimum water supply flow rate for the calculated Q is: 2,700 L/min

or: 45 L/s

Therefore, a minimum fire flow of 45 L/s should be available at a minimum pressure of 140 kPa (20 psi).

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Phase 4B HGL Based on Phase 4 Boundary Conditions:

	Ph 4 Boundary Conditions Junction Node LB-501 (Elev. 206.15 m)			Phase 4B East Boundary (Elev. 218.04 m)			Phase 4B High Elevation (Elev. 221.85 m)		
	Pressure		HGL	Pressure		HGL	Pressure		HGL
Demand Scenario	(kPa)	(psi)	(m)	(kPa)	(psi)	(m)	(kPa)	(psi)	(m)
ADD	535	78	260.78	419	61	260.78	381	55	260.78
MDD + 60 L/s FF	622	90	269.71	506	73	269.71	469	68	269.71
MDD + 100 L/s FF	361	52	243.07	245	36	243.07	208	30	243.07
MDD + 105 L/s FF	324	47	239.21	207	30	239.21	170	25	239.21
PHD	532	77	260.52	416	60	260.52	379	55	260.52

** Shaded Grey = pressure not acceptable.*

TOTBM Acceptable Pressure Ranges:

Average and Maximum Day Demand:	350 - 550 kPa (50 - 80 psi)
Minimum and Peak Hour:	275 - 700 kPa (40 - 100 psi)
Maximum Day plus Fire Flow:	140 - 700 kPa (20 - 100 psi)