



**Penryn Mason Homes-Phase 5
Functional Servicing Report**

Port Hope, Ontario

D.M. Wills Project Number 17-10323



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**Prepared for:
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Summary of Revisions

Revision No.	Revision Title	Date of Release	Summary of Revisions
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This report/proposal has been formatted considering the requirements of the Accessibility for Ontarians with Disabilities Act.

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1.0 Introduction

D.M. Wills Associates Limited (Wills) has been retained by Penryn Mason Homes to prepare a Functional Servicing Review (FSR) for a proposed residential subdivision development. The purpose of this review is to provide sufficient supporting information to the Municipality of Port Hope (Municipality) and the County of Northumberland (County) for the servicing of the proposed development. The proposed development as it pertains to service 43 freehold townhouses on 9 townhouse blocks for a total of 369 units for Phase 5. Two future development lands are also proposed within the limits of the Phase 5 development boundary. This report will provide guidance for the future detailed design of sanitary, water, stormwater and utility servicing of the subject lands.

2.0 Site Description

The Site is located south of the existing Phase 4, and north of the existing Port Hope Golf and Country Club, west of Victoria Street South in Port Hope, Ontario and is described as Phase 5 of the Penryn Mason Homes development. The surrounding land uses include residential, agriculture and recreational (Port Hope Golf and Country Club). The location of the subject Site is shown in **Figure 1 – Location and Phasing Plan**.

2.1 Site Layout

The Site will be readily accessible from Strachan Street from the west side and Victoria Street from the east side. The proposed development of 326 single detached units and 43 freehold townhouses on 9 townhouse blocks is connected internally with a network of public and private streets. Please refer to the **Draft Plan of Subdivision** in **Appendix B**.

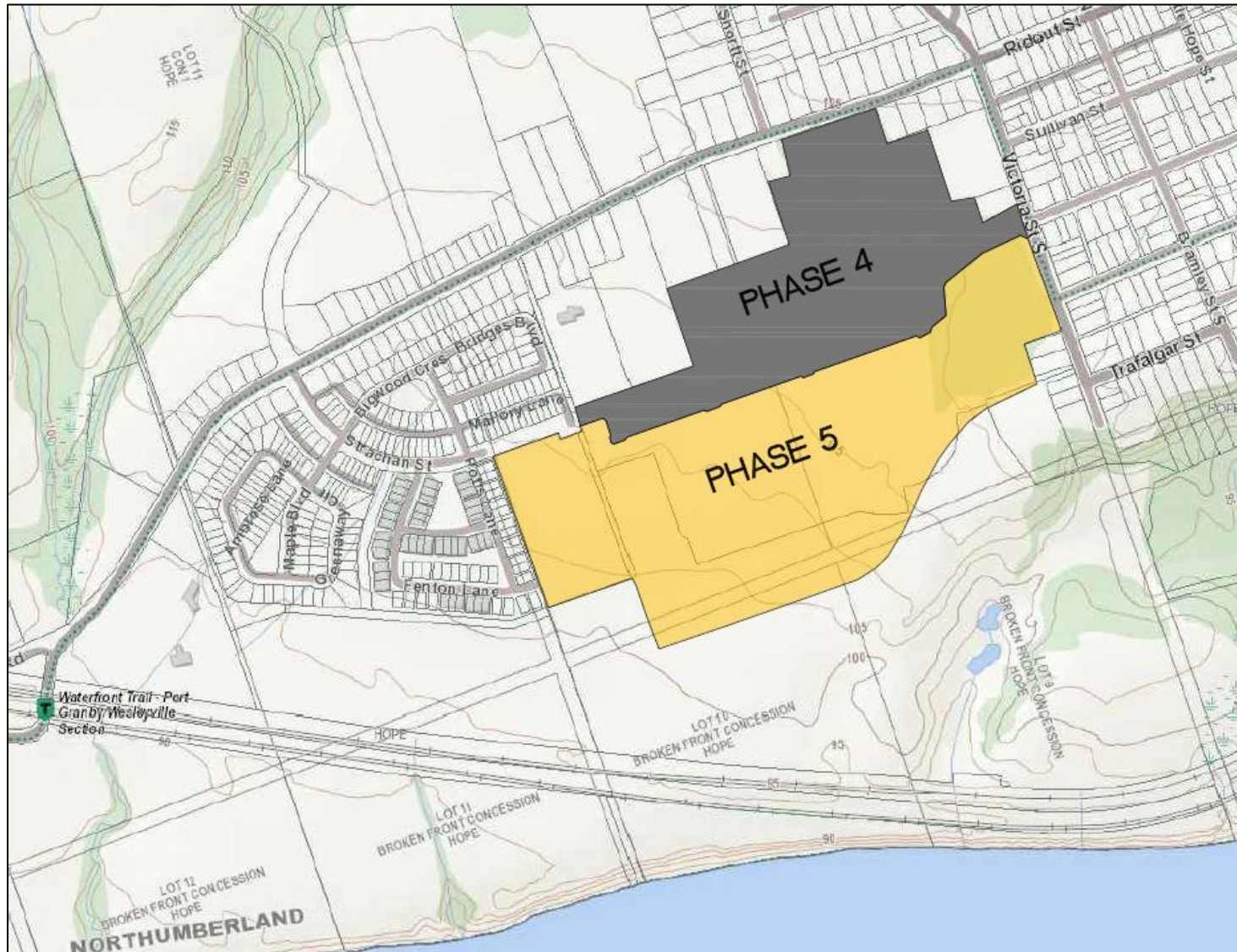
2.2 Road Cross-Section

The Municipality's 'New Urbanism' standard street sections are proposed for these phases of development (drawings MPH-1 and MPH-2, dated August 2016, of **Appendix F**). The road configurations are as follows:

- 17.0 m Right-of-Way (ROW): 8.6 m road width measured from face of curb to face of curb, containing one 2.5 m wide parking lane and two 2.75 m wide travelled lanes, for two-way traffic configurations.
- 14.5 m ROW: 7.1 m road width measured from face of curb to face of curb, containing one 2.5 m wide parking lane and one 4.0 m wide travelled lane, for one-way traffic configurations.

Please see **Appendix F** for typical road cross sections.

Figure 1 – Location and Phasing Plan



2.3 Easements and Servicing Blocks

The Site contains five servicing blocks, Block 329 to Block 333, inclusive, to accommodate existing and proposed service connections. Please refer to the **Draft Plan of Subdivision** in **Appendix B**, prepared by WND Associates for the draft plan of subdivision.

3.0 Site Servicing

Currently there are existing services for water, sanitary sewer and storm sewer available from Strachan Street, Street F (also known as Tarrington Street), Servicing Blocks 330, 331, and 332, and the south servicing easement located at the southwest corner of the Site.

3.1 Water Servicing

Water servicing is available for both phases of the Site via an existing 300 mm diameter watermain along the proposed Street F, and Strachan Street for the phase. Please refer to the 'Issued for Construction' Aon Inc. – Port Hope Trunk Servicing Plan and Profiles Strachan Street (Extension), Drawing Sheet No. 11, 14, 21, 22 and 23, prepared by Wills, dated April 19, 2005. Refer to the **Functional Servicing Plan** prepared by GHD in **Appendix A** for all existing and proposed servicing information within the development.

The size of the internal watermain will be confirmed during detailed design. There are existing fire hydrants located on Strachan Street and Street F. Coordination with the Municipality to determine available fire flows will need to occur during the detailed design.

3.2 Sanitary Sewer

Sanitary servicing is available for both phases by means of an existing 200 mm diameter PVC sanitary sewer located in the Strachan Street and Street F ROW.

Sanitary sewage of both phases will be conveyed to the pump station via the servicing blocks. Refer to the **Functional Servicing Plan** prepared by GHD in **Appendix A** for Strachan Street servicing drawings, and the proposed sanitary servicing within the Site. The internal sanitary sewer will connect to the existing 200 mm sewer in the Strachan Street and Street H ROW's. The exact connections to the sewer main will be determined during the detail design stage. Given the 3.5 m ± difference in elevation of the existing sanitary sewer invert and the finished ground elevation along Strachan Street, and Street H, and the overall grade of the property, there is sufficient opportunity for sanitary servicing of the proposed development by means of gravity sewer.

The Street A ROW also provides an alternate sanitary connection location to the existing golf club, and a future access location to the golf course.

Using 3.5 persons / unit for sanitary sewer calculations, a 200 mm diameter PVC sanitary sewer will be adequate to service both phases of the development. Please refer to

Appendix C for Sanitary Sewer Design sheets for Phase 5 and 9, prepared by GHD. The proposed on-site sanitary sewer will be designed to Municipality and MECP standards.

3.3 Storm Sewer

Storm sewer servicing is available for the Site via existing storm sewers located along Strachan Street and Street F ROW's. The proposed internal storm sewer for the subdivision will connect to the existing storm sewer infrastructure, and new connection points will be required along Strachan Street and Street F. The exact locations of the connections will be determined during design. Storm sewer servicing will be available via 450 mm PVC and 750 mm diameter concrete pipe along Strachan Street and 750 mm diameter concrete pipe along Street F. Refer to the **Functional Servicing Plan** prepared by GHD in **Appendix A** for the existing and proposed storm sewer layout for the development. Given the 3.0 m ± difference in elevation of the existing storm sewer invert and the finished ground elevation along Strachan Street and Street F and the overall grade of the property, there is sufficient clearance available for proposed storm servicing to connect to existing storm infrastructure.

The existing 1050mm diameter storm sewer contained in Servicing Block 330 has been determined to be undersized to service Phase 5 with the current draft plan configuration. As a result, the existing storm sewers west of MH178 to XMH61, inclusive, will be removed and replaced with 1200 mm diameter storm sewers. The total sewer replacement length will be 220.2 meters. Refer to the **Storm Sewer Design Sheet** prepared by GHD in **Appendix C** for the supporting sewer sizing calculations.

The proposed development will be designed to Municipality, MECP, and Ganaraska Region Conservation Authority (GRCA) standards.

3.4 Site Grading

The existing grade falls from Northwest to Southwest with an elevation difference of approximately 15 m. The current Draft plan may require a small grading buffer south of the Site, from lots 127 to 137, inclusive, though the majority of the elevation difference across the Site will be accounted for in 3:1 sloping within the lots. We note that the lands immediately south of lots 127 to 137 are owned by the applicant, and grading into the south lands could be accommodated if required. Proposed preliminary grading does not anticipate major slopes or retaining walls to match the exiting grade.

The preliminary grading has been established respecting existing sanitary sewer, storm sewer main, drainage patterns and natural topography. Please refer to the **Functional Lot Grading Plans** prepared by GHD in **Appendix A** for preliminary grading for the Site.

3.5 Utility Servicing

Based on the previous Phase 3 development adjacent to this project Site and existing utilities along Victoria Street and Strachan Street, no issues are anticipated regarding the ability to service the project Site with hydro, gas, telecommunications and cable. Utility service connections are available from Phase 3 development on the west side

and from Victoria Street on the East side of the project Site. Confirmation of utility servicing and layout will be completed in conjunction with the detailed design.

Bell – Existing services are available along Ridout Street, Victoria Street and Strachan Street per the Phase 3 development.

Cogeco – Two (2) 38 mm conduits are available along Strachan Street and one (1) 38 mm conduit on Bridges Boulevard per the Phase 3 development.

Veridian – The main feeder is available at the intersection of Strachan Street and Victoria Street and existing overhead low voltage service along Strachan Street connects the main feeder and Phase 3 development on the west side of Strachan Street.

Please refer to **Appendix E** for utility servicing coordination details.

3.6 Future Servicing Connection to Golf Course Lands

It is anticipated that during detailed design for this phase of development, a future servicing connection will be made that will include sanitary servicing, water servicing, and shallow utility servicing to the golf course lands. Stormwater from the golf course lands are to be accommodated as an on-site requirement for the golf course lands and are not anticipated to drain through this phase. As such, the golf course redevelopment stormwater has not been included in the functional servicing analysis of this report.

The flow contributions, servicing requirements, and connection configurations to the golf course lands will be evaluated and determined during detailed design.

4.0 Stormwater Management

The present hierarchy of watershed planning in Ontario can be described by the following descending order: watershed plans, sub-watershed plans and individual Stormwater Management (SWM) plans. A Watershed Plan for this area exists and is titled Port Hope West Community Water Management Master Plan, prepared by Gartner Lee Limited and D.G. Biddle Associates, August 1998. Penryn Park falls within the catchment area of the Master Plan, and was designed in accordance with the Master Plan in the Stormwater Quantity and Quality Control Report prepared by M.J. Davenport and Associates (June 2003), and in the SWM Report prepared by Wills (revised January 2005). The January 2005 SWM Plan (Wills) was prepared as an addendum to the M.J. Davenport and Associates report. Both the Wills and Davenport reports were approved by the GRCA, and an extended detention wet pond facility was constructed. The Penryn Park Phase 5 development falls within the overall catchment area of the approved reports, and will discharge to the existing SWM facility. The scope of the FSR with regards to Phase 5 is to confirm that the proposed layout and drainage boundaries are in conformance with the intent of the original SWM

report, and that the existing stormwater facility has capacity for the proposed development.

The following list summarizes the original SWM design strategy:

- Provide stormwater quantity control by maintaining post development flows at or below the approved peak flows outlined in the Wills January 2005 SWM report.
- Provide water quality control to Normal (Level 2) protection.

The original catchment boundaries for Penryn Park were provided in the Davenport SWM report, drawing 3332-SW3 (April 2001). These drainage boundaries were used as the base for the Visual Otthymo (VO2) modelling in the Wills January 2005 SWM report. The drainage boundaries were also used as the base for the purposes of this FSR, and both the drainage boundaries and Visual Otthymo modelling have been adjusted based on the proposed layout for Phase 5. The original Davenport drainage boundaries and adjusted Wills drainage boundaries for the overall development are shown in **Appendix C** on the Storm Drainage Area Plan drawing. As part of an exercise Wills conducted in July 2013 to analyze the Penryn Park overland flow route, the Davenport boundaries were adjusted to conform to the latest grading scheme for the overall development. These adjustments are also considered and shown in **Appendix C** on the Storm Drainage Area Plan drawing.

4.1 Water Quantity

Water quantity and quality control is provided for the Penryn Park development by an existing extended detention wet pond facility located within the golf course at the south part of the development. The pond was designed to provide both water quantity and quality control, and the provided storage volumes exceeded the required storage volumes for the full build out of the development.

The total drainage area discharging to the existing SWM facility in the original Visual Otthymo (VO2) modelling was 137.22 hectares. Considering the latest revised drainage boundaries, the total area discharging to the existing SWM facility in the proposed condition is 148.03 hectares. It should be noted that only the major system from sub-watershed A-9 drains to the SWM facility in the currently modelling. Sub-watershed D-2 consists of external drainage area discharging to Strachan Street. The drainage boundary for sub-watershed D-2 was approved during the Phase 4 detailed design, and was taken from The Municipality of Port Hope Storm Water Drainage System mapping (December 1, 2017). The drainage boundary for Phase 5 is shown as D-4 on the Storm Drainage Area Plan drawing in **Appendix C**. This drainage boundary is part of the original drainage boundary D-4 as considered in the original modelling. The hydrologic parameters for Phase 5 (D-4) were updated based on the latest street and lot configuration as provided by GHD (August 2019), and consider percent impervious values, soil infiltration properties and runoff response. The hydrologic parameters are summarized in **Table 1** and included in **Appendix D**.

Table 1 – Phase 5 Hydrologic Parameters

Sub-watershed	Area (ha)	VO3 Object	% Impervious	SCS CN*1	Ia (mm)
Pr. D-4	19.50	StandHyd	61.5	47.6	5.0

- Notes:
1. SCS Curve Number is modified to southern Ontario conditions and is based on AMC II moisture conditions.
 2. SCS Curve Number and Ia values represent pervious areas only for StandHyd objects.

The original VO2 model was upgraded to VO3 and the latest hydrologic parameters were input to estimate the peak flows and storage volume requirements of the existing SWM facility. **Table 2** shows the original pre-development condition peak flows, the proposed peak flows as documented in the January 2005 SWM report, and the peak flows based on the latest drainage boundaries including Phase 5. In keeping with the original approved SWM reports, the peak flows were estimated using each of the 2, 5, 10, 25, 50 and 100-year design storms based on the 2 hour Chicago storm distribution. The results of the latest modelling indicate that the September 2019 post-development peak flows are less than the approved January 2005 peak flows for all storms. The only exception being the 50-year, and all the peak flows are less than the original pre-development flows for the development with the exception of the 2-year design storm, which was exceeded and approved in January 2005. The variation in peak flows in the September 2019 condition can be attributed to adjustments made to the Phase 5 layout, the external drainage area discharging to Strachan Street, and the stage-storage-discharge relationship to reflect the current nature of the outlet structure.

Table 2 – Existing SWM Facility Peak Flows

Design Storm (year)	Peak Flows (m ³ /s)		
	Pre-Development	Post-Development (Jan. 2005)	Post-Development (Sept 2019)
2	0.50	0.62	0.54
5	0.93	0.84	0.76
10	1.25	0.97	0.88
25	1.70	1.10	0.98
50	2.07	1.20	1.52
100	2.45	2.49	2.07

A review of the modeling output data indicates that a maximum storage volume of 45,614 m³ is required for the 100-year design storm. The existing SWM pond has a total storage capacity of 80,996 m³, exceeding the storage volume required. The existing SWM pond is acceptable to provide stormwater quantity control for Phase 5 as well as the remaining full build out of the overall contributing drainage area.

4.2 Water Quality

Water quality control is provided for the Penryn Park development by the existing extended detention wet pond facility located within the golf course at the south part of the development. The permanent pool volume of the existing pond is 11,864 m³ and was sized in the original SWM report for Normal (Level 2) Protection based on a contributing drainage area of 145.19 hectares at 40% impervious.

In order to confirm the current overall percent impervious discharging to the SWM pond, the percent impervious values used in the original VO model for each sub-watershed were extracted and applied to the current drainage areas. Sub-watershed D-5 (golf course) is a NASHYD, and the percent impervious was calculated at 7% with the imperviousness consisting entirely of the SWM pond area (1.06 ha). Using the current proposed impervious value for Phase 5 (61.5%), and the impervious values taken directly from the approved VO model for all other sub-watersheds, the total weighted impervious value was calculated at 43% for the 148.03 hectares discharging to the existing SWM pond. It should be noted that only the major system from sub-watershed A-9 drains to the SWM facility. **Table 3** outlines the calculations for the overall percent impervious in the September 2019 condition.

Table 3 – Percent Impervious Calculations

Drainage Area ID	Area (ha)	Percent Impervious
A-9	6.02	35 **
D-1	16.69	35 **
D-2	4.67	40
D-3a	57.6	45 **
D-3b (Phase 4)	14.7	64
D-3c	13.39	45 **
D-4 (Phase 5)	19.5	61.5
D-5	15.46	7
	148.03	43

** taken from original VO model.

Table 4 – Existing SWM Facility Water Quality Features

Feature	Remarks
Level of Protection	Normal (Level 2) Protection
Contributing Area	148.03 ha
Percent Impervious	43%
Storage Volumes	<ul style="list-style-type: none"> 98 m³/ha for 42% impervious

Feature	Remarks
	<ul style="list-style-type: none"> • 40 m³/ha for extended detention • 58 m³/ha for permanent pool
Permanent Pool Design	<ul style="list-style-type: none"> • Volume required is 8,586 m³ • Volume provided is 11,864 m³ • Ponding depth is 1.5 m • Side slope varies
Extended Detention Design	<ul style="list-style-type: none"> • Volume required is 5,921 m³ • Volume provided is 41,702 m³ • Side slope varies
Outlet Design	<ul style="list-style-type: none"> • 215 mm orifice plate at permanent pool level • Spill into outlet structure at elevation 93.25 • 675 mm outlet pipe • 1.0 m deep x 12.90 m wide overflow weir at the extended detention level

4.3 Stormwater Conveyance – Pr. D-4

4.3.1 Overland Flow to Pond

An existing storm sewer will convey flows from sub-watershed Pr. D-4 (Phase 5) westerly through an easement to the existing SWM pond. Based on the VO3 peak flows for sub-watershed, Pr. D-4, the 5-year peak flow is 2.25 m³/s and the 100-year peak flow is 4.77 m³/s. The existing storm system is designed to carry the 5-year storm event, which leaves a remaining peak flow of 2.52 m³/s. An overland swale could be constructed along the existing easement to convey storm events greater than the 5-year event to the existing SWM pond. The hydraulics program Autodesk Hydraflow Express was used to size a theoretical channel to convey the storm events. A 0.6 m deep trapezoidal channel with a bottom width of 5.0 m, side slopes of 3:1 and a channel slope of 1.3% (the average existing slope along the easement) can convey the 2.52 m³/s peak flow at a depth of 0.30 m during the 100-year peak flow, leaving 0.30 m of freeboard and allowing safe access.

5.0 Conclusion

In conclusion, Wills concludes that this phase of the development has the ability to be successfully serviced with respect to sanitary sewer, storm sewer, watermain and utility servicing. Servicing can be achieved through connecting to the existing services and utilities with the information currently available. Existing information must be field verified prior to the commencement of detailed design.

Phases 4 and 5 were considered during the original design of the SWM pond for Penryn Park, and calculations have confirmed that the SWM facility has the capacity to accept runoff from the proposed development, with adequate conveyance.

If you require any further information, or have any questions, please do not hesitate to contact the undersigned.

Respectfully submitted,



Mark Wilson, A.Sc.T.
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