

December 16, 2021
Revised: September 29, 2022
28816-20

Sanjeev Rishi

**Re: Phase 2 Servicing and Stormwater Management Brief
Mixed-Use Building
820/840 St. David Street
Part of Lot 3, Plan 132
Town of Fergus
Township of Centre Wellington**

1.0 Introduction

Van Harten Surveying Inc. was retained by Mr. Sanjeev Rishi to prepare a site servicing and grading design for the above-mentioned property located on the east side of Highway 6, north of Strathallan Street, as noted on the key plan of the site engineering set attached as Appendix A. This work is being done in support of the proposed construction of a mixed-use, 5-storey residential/commercial building.

This report will summarize the proposed plan as it pertains to site servicing including water, sanitary and stormwater. This report will also summarize stormwater runoff rates pre- and post-development. This will be done in accordance with the accepted engineering practices and criteria as noted by the local approval agencies, as well as the municipal servicing standards.

2.0 Site and Project Description

The subject property is currently a mix of an existing commercial building, paved parking lots, and a mix of unpaved parking and grass area. There are several catchbasins servicing the existing parking lot areas for the commercial building as well as two catchbasins which appear to be functioning to drain the area around the proposed building. The property is currently serviced with municipal services, including water, sanitary, and storm sewers with connections to the servicing under Highway 6 and Strathallan Street. Work completed during the development of the existing hotel included the installation of water and sanitary stubs for the purpose of servicing the proposed development. The storm outlet/connection point will be to existing infrastructure previously installed with the intention of accepting future flow from the proposed development. As the property is part of a proposed severance, new, private water and sanitary services from Strathallan Street will be installed to service this building

The subject property is irregularly shaped with frontage onto Highway 6 to the west and Strathallan Street to the south. All on-site drainage appears to be captured in a series of catchbasins which outlet to a series of existing infiltration galleries with overflow out letting to Highway 6.

572 Weber Street North, Unit 7
Waterloo ON N2L 5C6
519-742-8371

Elmira, ON:
519-669-5070

423 Woolwich Street
Guelph, ON N1H 3X3
519-821-2763

660 Riddell Road, Unit 1
Orangeville, ON L9W 5G5
519-940-4110

Collingwood, ON:
249-499-8359

Phase 1 of the development will feature a proposed restaurant near the northeast corner of the site, adjacent St. David Street North (Highway 6). This building will cover approximately 1,900 m² and will involve the partial re-grading of a parking area between the existing hotel and gas station, as well as the expansion of the existing parking lot. The proposed building will cover approximately 233 m² and will comprise of a main floor commercial space and a basement storage/staff area. Phase 1 works will generally include the construction of both proposed subsurface storage systems, referred to here as infiltration galleries, and much of the on-site storm servicing. Water and sanitary servicing will be kept separate from the servicing to the Phase 2 building.

Phase 2 of the development, which is the subject of this report, will cover approximately 9,629 m² and will be placed on vacant land to the south of the existing hotel on the property. This will comprise the construction of a new, 5-storey mixed use commercial/residential building. This phase will involve the partial re-grading of a parking area between the existing hotel and gas station, as well as the expansion of the existing parking lot. The proposed building will cover approximately 969 m² and will comprise of a main floor commercial space and a total of forty-five (45) residential units divided between the second and fifth floor.

3.0 Water Supply

It is proposed to provide water to the proposed multi-storey building by installing a new 150 mm water service connected to the existing 200 mm watermain on Strathallan Street. The new service will connect within Strathallan Street with a Cut-In-Tee. The service will also include a 50 mm copper water service connected at the property line and ran separately to the building to supply domestic water. Preliminary calculations based on the potential tenants of the commercial space and forty-five (45) apartments suggest adequate capacity from the existing and proposed water services.

Testing of the existing on-site water supply system has been conducted and reveals water pressures between 248 kPa (36 psi) at a flow rate of 96 L/s (1,520 USGPM) and 283 kPa (41 psi) at a flow rate of 55 L/s (880 USGPM). Static pressure in the area has been measured at 310 kPa (45 psi). Please refer to Appendix B for the results of the pressure testing. It is noted these results are specifically for the on-site system which the proposed building will not connect to. However, based on these results it can be inferred that the municipal water system can provide flow rates and water pressures equal to or greater than that noted here. It is also anecdotally noted in the flow testing report that testing on municipal fire hydrants yielded much higher flows, although actual values were not recorded.

Typical desirable water pressures per Township standards are between 350 kPa and 550 kPa for average day and maximum day, and 275 kPa and 700 kPa for minimum hour and peak hour pressures. Due to the height of the proposed building a booster pump may be required to service domestic water demands for the upper floors. Please refer to mechanical designs for the proposed building when they are available.

4.0 Sanitary Servicing

Sanitary servicing to the new building will be achieved by connection of a new 150 mm sanitary service from the existing 200mm PVC Sanitary Main located on Strathallan Street. This work will include the installation of a manhole on the property line.

Average sanitary flows generated by the building are expected to be in the order of 29,400 L/day, assuming 1.4 residents per 1-bedroom unit (25 units), and 2.1 residents per 2-bedroom unit (20 units) and 350 L/cap/day, and 9,711 L/day considering 1.16 L/sec/ha of commercial space. The proposed restaurant on site will have seating for a total of 52 patrons at 125 L/day/seat. A summary of the sanitary flows for Phase 2 are presented below:

Proposed Use	Average Daily Flow (L/day)	Peaking Factor	Peak flow (L/second)
Residential	26,950	2.096	0.654
Commercial	9,711	2.500	0.281
Total	36,661	-	0.935

It is noted, considering the proposed sewer design for the building, featuring a 150 mm diameter PVC sanitary sewer with a slope of 2.0%, design flow velocities will be 0.525 m/second, less than the desired 0.600 m/second to accomplish self-flushing velocities. Due to site constraints, it does not appear the sanitary sewer servicing this site will be self-flushing, and monitoring at the proposed manhole will be required, and manual flushing may be necessary.

5.0 Stormwater Management

There are currently several catchbasins on-site collecting stormwater. New subsurface storage chambers will be installed to manage stormwater runoff rates on-site. Observations on-site confirm drainage from the neighbouring properties to the west and north are either captured in a series of storm water catchbasins or drainage is confirmed to be flowing to collection systems along Highway 6. A new network of storm sewers is proposed for the site with overland flow being sent to Highway 6 between the two existing buildings on-site. The new storm network will outlet to the two existing manholes located at the ends of the proposed infiltration galleries. It is noted the proposed infiltration galleries are part of the Phase 1 works proposed at this site, and all drainage and stormwater management for this phase will be handled by these devices, with the exception of the proposed rooftop flow controls on this building. As the stormwater system for the Phase 1 and Phase 2 stormwater modelling will consider the property as a whole.

Stormwater modelling calculations were previously completed by Gamsby and Mannerow (now GM Blue Plan Engineering - GM) and were approved by the Township in November 2006 for the entire site. Please see the Stormwater Management Report in Appendix D. Referring to this report, it is obvious several sections are out of date or not in conformance with the as-recorded conditions on the property. As such, we have updated the stormwater modelling for the site to ensure the proposed conditions from this application meet the intent of the original design.

Referring to the GM report, storm design parameters used are as follows:



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Parameter	2-Year Storm	5-Year Storm	10-Year Storm	25-Year Storm	50-Year Storm	100-Year Storm
a	695.047	1459.072	2327.596	3701.648	5089.418	6933.019
b	6.387	13.690	19.500	25.500	30.000	34.699
c	0.793	0.850	0.894	0.937	0.967	0.998
Rainfall Depth (mm)	33.014	49.792	61.359	75.581	86.737	97.921

Each storm was calculated as a 3-hour duration Chicago storm with an R = 0.40.

Referring to the GM report, allowable outlet rates for the site were calculated as follows:

Return Period	Allowable Release Rate for Entire Site (m ³ /s)	Allowable Release Rate Excluding Esso (m ³ /s)
2-Year	0.128	0.100
5-Year	0.173	0.135
10-Year	0.207	0.162
25-Year	0.267	0.209
50-Year	0.321	0.252
100-Year	0.379	0.297

The above release rates were calculated for the entire property considering 50% imperviousness. As the GM calculations include the Esso Gas Station property, which is no longer part of the subject property, the above numbers were re-calculated considering a reduced catchment area. Previously, the site was calculated with an area of approximately 1.225 ha. Excluding the Esso property, the site is a total of about 0.960 ha. A breakdown of the existing and proposed catchment areas is presented in the following table:

830 St David Street				
Catchment	Drains to:	Area (m ²)	% Impervious	Description
101	102	333	36.3	Area south of new apartment building
102	103	345	84.1	Area southeast of new apartment including site entrance
103	Infiltration gallery A	613	93.5	Area northeast of proposed apartment building
104	Infiltration gallery A	606	100	Area east of existing hotel
105	103	908	100	Roof of apartment building
201	202	904	80.9	Area west of new apartment building
202	Infiltration gallery B	1,674	88.6	Area northwest of apartment building
203	Infiltration gallery B	642	97.7	Area southwest of existing hotel
204	206	995	100	Roof of existing hotel
205	206	233	100	Roof of proposed restaurant
206	Infiltration gallery B	394	100	Parking lot between existing hotel and proposed restaurant
301	302	1,182	91.2	Parking lot south of proposed restaurant
302	Leaving site	196	100	Northwest portion of drive-thru
401	Leaving site	587	20.0	Northern portion of site flowing uncontrolled off-site
Total Proposed		9,612	86.9	

Per the current proposal, the site will now be divided into several catchments. Each catchment will drain to either a roof drain in the case of the existing and proposed buildings, or to a catchbasin within the existing or proposed parking lot area. Please refer to the attached Catchment Sketch in Appendix C for details of the proposed catchment areas.

Flow controls on site have been ascertained from the attached GM report, on-site observations, and details from the provided servicing and grading plans. Details of each flow control area are as follows:

Roof of Proposed 5-Storey Building (Catchment 105):

Flow control roof drains are proposed to be installed in the roof of the proposed 5-storey building, similar to those proposed for the existing hotel and what was proposed for the restaurant building from the GM Stormwater Management Report. The roof drains will control flows to 0.90 L/min/mm, or about 22.5 L/min/25mm (conforming to standard MIDUSS modelling parameters). Considering the size of the

building, 2 roof drains are proposed which will each drain approximately 455 m² of roof area. Ponding depths and outlet rates for each storm are as follows:

Return Period	Maximum Storage (m ³)	Ponding Depth (m)	Release Rate (m ³ /s)
2-Year	13.096	0.014	0.004
5-Year	21.743	0.024	0.004
10-Year	28.163	0.031	0.005
25-Year	36.387	0.040	0.005
50-Year	42.973	0.047	0.006
100-Year	49.704	0.055	0.006

Infiltration Gallery 1:

Downstream of Catchments 101 to 105, an infiltration gallery was proposed. As the status and condition of the gallery is unknown at this time, for the purpose of this study the gallery. It is also noted that the construction of this gallery is part of the Phase 1 works for the site. While many details of the previously proposed infiltration gallery are unknown, for the purpose of this design, the dimensions will be 52.0 m long, 5.0 m wide and 1.0 m deep. Based on measured inverts in the upstream and downstream manholes, and assuming minimum 1.2 m cover over the trench, ponding calculations within the gallery were completed. Based on a recent geotechnical investigation of the site, assumed hydraulic conductivity of the native soils were calculated to be approximately 10⁻⁷ to 10⁻⁸ m/sec. To evaluate the design and existing conditions, based on the prescribed hydraulic conductivity values, a conservative infiltration rate of 5.74 mm/hr has been assumed. Infiltration is not recommended based on these numbers, and minimal infiltration through the base and sidewalls of the gallery will be anticipated. As such, the primary function of the infiltration gallery will be subsurface retention of stormwater. Outflow from the gallery is controlled by a 100 mm diameter orifice installed at the outlet of "EX. MH1". Ponding depths within the gallery and calculated outlet rates are as follows:

Return Period	Elevation	Ponding Depth (m)	Maximum Storage (m ³)	Release Rate (m ³ /s)
	418.230 (Bottom of Trench)	-	-	-
2-Year	418.678	0.448	33.062	0.009
5-Year	418.845	0.615	50.440	0.013
10-Year	418.964	0.734	62.811	0.015
25-Year	419.112	0.882	78.212	0.017
50-Year	419.227	0.997	90.059	0.020
	419.230 (overflow)	1.000	104.000	0.020
100-Year	419.278	1.048	104.000	0.031

Roof of Existing Hotel (Catchment 204):

It is understood that 2 flow controlled roof drains were installed on the roof of the existing hotel. As per the GM Stormwater Management Report, the roof drains will control flows to 0.90 L/min/mm, or about 22.5 L/min/25mm (conforming to standard MIDUSS modelling parameters). Considering the size of the building, 2 roof drains will each drain approximately 497.5 m² of roof area. The installed roof drains will be replaced to conform with the design parameters of the GM report and this study. Ponding depths and outlet rates for each storm are as follows:

Return Period	Maximum Storage (m ³)	Ponding Depth (m)	Release Rate (m ³ /s)
2-Year	14.847	0.015	0.004
5-Year	24.782	0.025	0.004
10-Year	32.053	0.032	0.005
25-Year	41.323	0.042	0.005
50-Year	48.751	0.049	0.006
100-Year	56.311	0.057	0.006

Roof of Proposed Restaurant (Catchment 205):

Flow control roof drains are proposed to be installed in the roof of the proposed restaurant, similar to those proposed for the existing hotel and what was proposed for the restaurant building from the GM Stormwater Management Report. The roof drains will control flows to 0.90 L/min/mm, or about 22.5 L/min/25mm (conforming to standard MIDUSS modelling parameters). Considering the size of the building, 1 roof drain is proposed which will drain the entire 233 m² roof area. Ponding depths and outlet rates for each storm are as follows:

Return Period	Maximum Storage (m ³)	Ponding Depth (m)	Release Rate (m ³ /s)
2-Year	2.300	0.010	0.002
5-Year	3.746	0.016	0.002
10-Year	4.870	0.021	0.002
25-Year	6.366	0.027	0.002
50-Year	7.573	0.033	0.002
100-Year	8.833	0.038	0.003

Infiltration Gallery 2:

Downstream of the entire site, except for Catchment 401, an infiltration gallery was previously proposed. As the condition of the gallery is unknown at this time, it will be noted in this study as a proposed structure. While many details of the previously proposed infiltration gallery are unknown, for the purpose of this design, the dimensions will be 50.0 m long, 10.0 m wide and 1.0 m deep. Based on measured inverts in the upstream and downstream manholes, and assuming minimum 1.2 m cover over the trench, ponding calculations within the gallery were completed. Based on a recent geotechnical investigation of the site, assumed hydraulic conductivity of the native soils were calculated to be approximately 10⁻⁷ to 10⁻⁸ m/sec.

To evaluate the design and existing conditions, based on the prescribed hydraulic conductivity values, a conservative infiltration rate of 5.74 mm/hr has been assumed. Infiltration is not recommended based on these numbers and minimal infiltration through the base and sidewalls of the gallery will be anticipated. As such, the primary function of the infiltration gallery appears to be subsurface retention of stormwater. Outflow from the gallery is controlled by a 225 mm diameter orifice installed at the outlet of "EX. CBMH" located immediately upstream of the outlet from the site. Ponding depths within the gallery and calculated outlet rates are as follows:

Return Period	Elevation	Ponding Depth (m)	Maximum Storage (m ³)	Release Rate (m ³ /s)
	417.890 (Bottom of Trench)	-	-	-
2-Year	418.188	0.298	37.016	0.056
5-Year	418.323	0.433	64.118	0.069
10-Year	418.427	0.537	84.999	0.078
25-Year	418.565	0.675	112.432	0.088
50-Year	418.676	0.786	134.710	0.096
100-Year	418.810	0.920	161.516	0.104
	418.890 (overflow)	1.000	175.500	0.108

Conclusions

Updated MIDUSS modelling is available in Appendix D. Referring to the enclosed modelling, outflow from the site has been calculated to be well below the prescribed release rate obtained from the GM report. It is noted that this is assuming the on-site infiltration galleries were constructed according to plan, and the required orifices have been installed in their respective catchbasin or manhole. A summary of the total runoff rate from the site in relation to the allowable runoff rate is presented in the following table:

Return Period	Allowable Release Rate (m ³ /s)	Calculated Release Rate (m ³ /s)
2-Year	0.100	0.058
5-Year	0.135	0.074
10-Year	0.162	0.084
25-Year	0.209	0.096
50-Year	0.252	0.104
100-Year	0.297	0.112

It is noted that inspection reports and detailed as-built plans are not available at this time. During construction of the site, it is recommended that all on-site storage structures be excavated and inspected to confirm they conform to the assumed existing conditions. Should it be determined that the noted



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existing facilities are not present or sub-standard based on the prescribed design, they shall be retrofitted or constructed as required, to the discretion of Van Harten and the Township of Centre Wellington.

6.0 Erosion and Sediment Control

As per the Grading Plan presented in Appendix A, erosion and sediment controls are required during construction. The erosion and sediment control facilities shall include, but not limited to, silt fencing and sediment traps in existing and proposed catchbasins.

Additional erosion control measures may be required as site development progresses. The contractor is responsible to provide any additional erosion control structures. Erosion control structures are to be monitored regularly and any damage to structures are to be repaired immediately. Sediments are to be removed when the height of accumulation reaches a maximum for the fence and the clogged filter materials must be replaced as needed or as requested by the town.

All erosion control structures are to remain in place until all disturbed ground surfaces have been stabilized either by paving or restoration of vegetative ground cover. All areas not under active construction are to be stabilized with topsoil and seeded or sodded.

7.0 Conclusions

The completed Servicing and Grading Design is specific to the subject property and cannot be applied to different properties. It has been determined that municipal servicing exists to this property and is suitable for connection with the servicing for the proposed development. It is also noted that overland conveyance is available, where required.

It is noted that special attention and maintenance of the on-site sanitary sewer is required due to the lack of velocity calculated based on design flows and pipe slopes. Regular maintenance including flushing and manhole cleaning is required to ensure backup does not occur.



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I trust that this report and design has been completed within our terms of reference and is suitable for your present requirements. Please contact our office if you have any questions or require further consultation.

Van Harten Surveying Inc.



A handwritten signature in black ink, appearing to be 'Mike Vaughan', followed by a horizontal line.

Mike Vaughan, P. Eng.

A handwritten signature in black ink, appearing to be 'Scott Gabel'.

Scott Gabel, C.E.T.

- Encl. Appendix A – Engineering Drawings
- Encl. Appendix B – Water Pressure Test Results
- Encl. Appendix C – Catchment Sketch
- Encl. Appendix D – MIDUSS Modelling
- Encl. Appendix E – Stormwater Management Report by Gamsby & Mannerow
- Encl. Appendix F – Roof Drain Specification



Appendix A Engineering Drawings

Appendix B
Water Pressure Test Results



Appendix C

Catchment Sketches



Appendix D MIDUSS Modelling



Appendix E
Stormwater Management Report by Gamsby & Mannerow



Appendix F Roof Drain Specification