North Rockwood Developments Inc.

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT 5150 WELLINGTON ROAD 27, ROCKWOOD TOWHSHIP OF GUELPH-ERAMOSA

GMBP File No. 318034
Revised January 2020

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FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

NORTH ROCKWOOD DEVELOPMENTS INC.

5150 WELLINGTON ROAD 27, ROCKWOOD

REVISED JANUARY 2020

GMBP FILE NO: 318034

1. INTRODUCTION

GM BluePlan Engineering Limited has been retained by North Rockwood Developments Inc. to prepare this revised Functional Servicing and Stormwater Management Report in support of a Vacant Land Draft Plan of Condominium application for a residential condominium development located at 5150 Wellington Road 27 in the Township of Guelph-Eramosa (Rockwood) in response to comments received from R.J. Burnside & Associates Limited (dated April 15, 2019).

The subject property, which used to be owned by the Roman Catholic Diocese, is located in the north end of Rockwood, legally described as Part of Lot 7, Concession 4, Geographic Township of Eramosa, Township of Guelph-Eramosa, County of Wellington. Figure No. 1, Site Location Map, shows the location of the proposed development and surrounding area. This report documents the servicing and stormwater management design for this development.

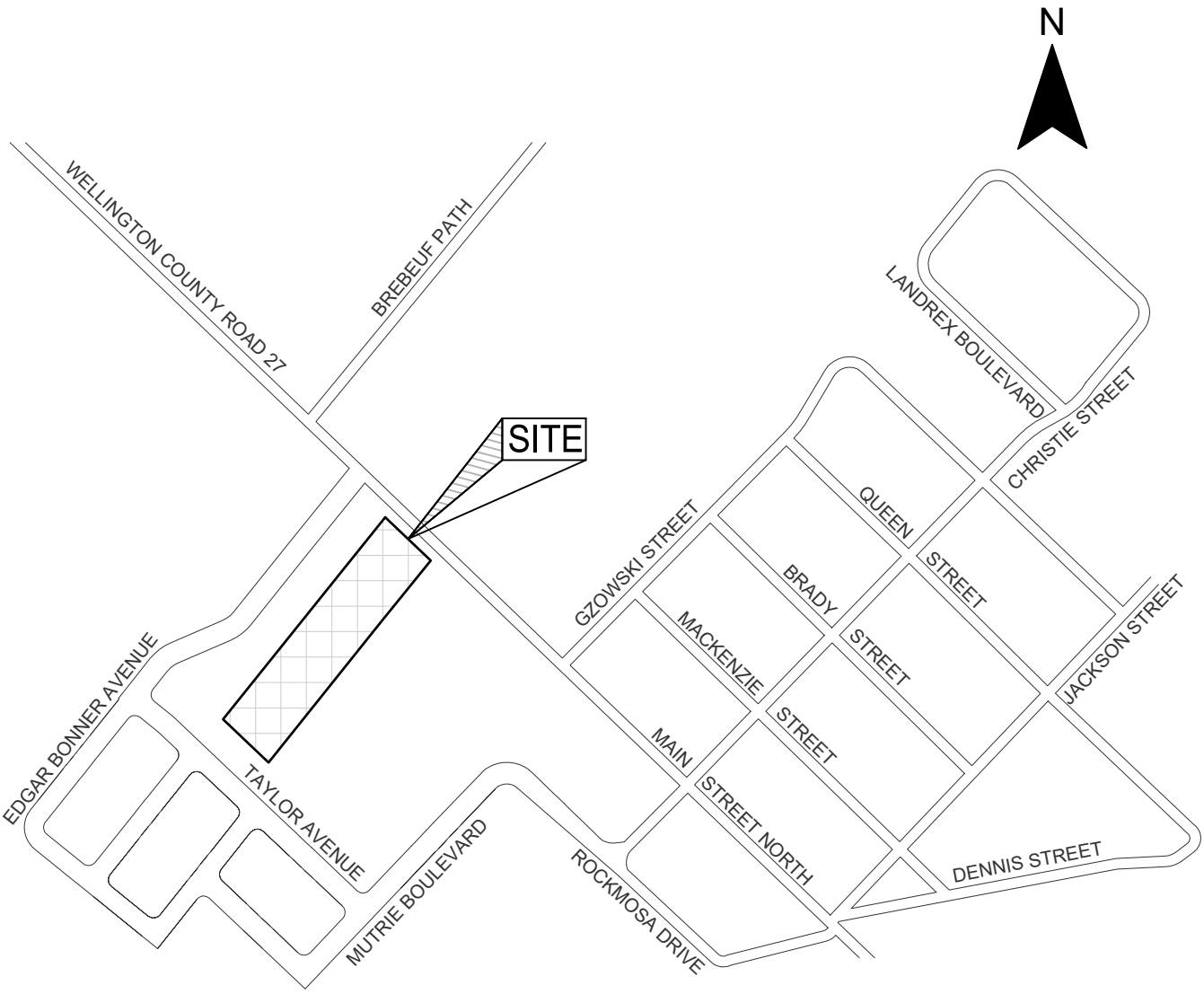
2. SITE INFORMATION

The property is currently designated for Residential use in the Wellington County Official Plan and zoned as a Low Density Residential Zone (R1) in Guelph-Eramosa's current Zoning By-Law.

The 1.45-hectare site is situated on the west side of County Road 27 (with approximately 62m frontage), between the Sacred Heart Catholic School (and proposed daycare facility) to the south and the Bonarrow Subdivision to the north and west.

The site is currently a rectangular shaped vacant field gently sloping from the south to the north. Figure No. 2, Existing Conditions Site Plan, shows the existing site conditions, as surveyed by Van Harten Surveying Inc., July 2018.

Functional Servicing and Stormwater Management Report
North Rockwood Developments Inc.
5150 Wellington Road 27, Rockwood
Township of Guelph-Eramosa



SITE LOCATION MAP

Figure No. 1

BluePlan ENGINEERING

318034
January 2020
Scale: N.T.S.

Functional Servicing and Stormwater Management Report
North Rockwood Developments Inc.
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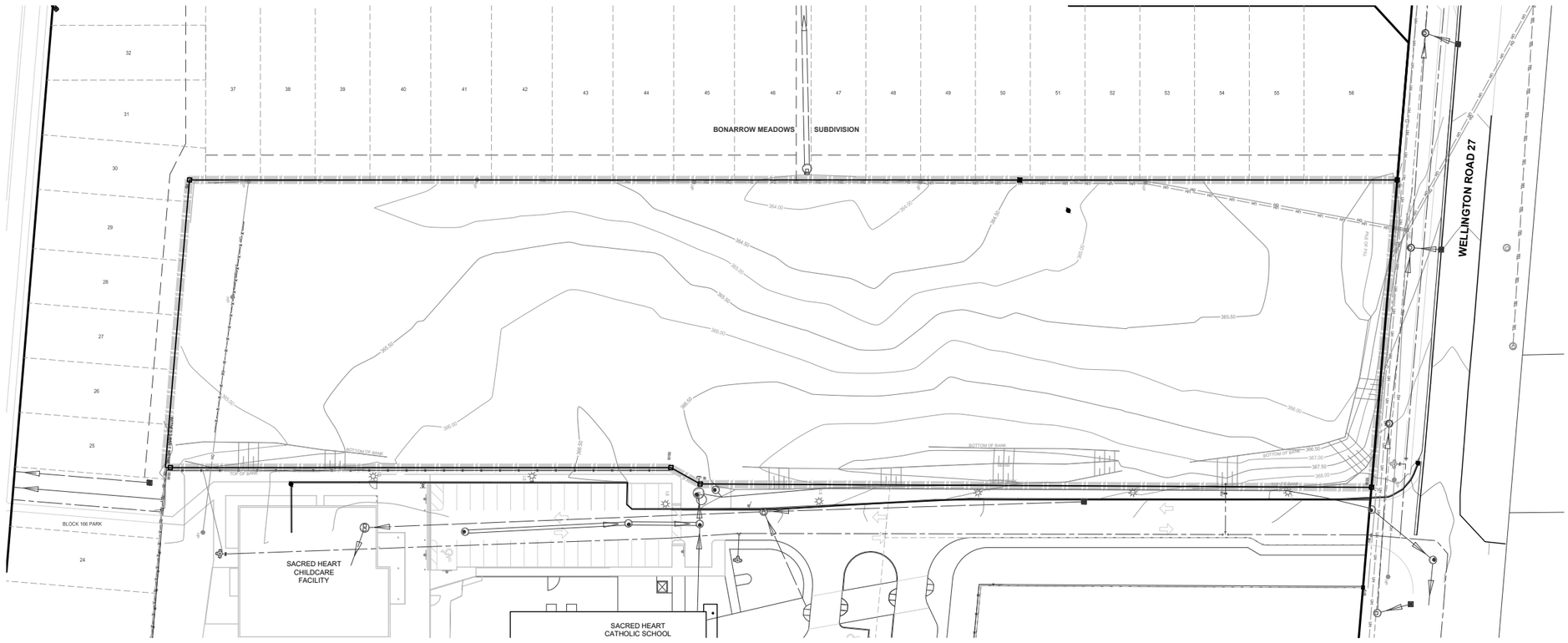

LEGEND

SITE BOUNDARY

ORIGINAL TOPOGRAPHICAL CONTOUR

15 0 10 20 40

1:1000 (m)

EXISTING CONDITIONS SITE PLAN

Figure No. 2

BluePlan ENGINEERING

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January 2020
Scale: 1:1000

3. PROPOSED DEVELOPMENT

The proposed plan of condominium has been prepared by Astrid J. Clos Planning Consultants. The plan consists of 51 cluster townhouse dwellings units aligned along an approximately 295m long, 7.0m wide urban common element laneway complete with a turning circle, sidewalk on one side of the street and some other common element areas. (See Figure No.3).

3.1 Grading

Based on our review of the site's topography and our preliminary calculations, the development can be graded to comply with the Township's Development Standards. The site's gentle slope from south to north will provide adequate opportunity for positive drainage with an outlet to the existing 100-year (pre-development) storm outlet, located between units 16 and 17, while providing an emergency overland flow route to the west through the adjacent separate school property and Block 166 of the Bonarrow Subdivision. An agreement to accommodate drainage and servicing through this portion of the adjacent site in an easement has been executed between the Developer and the WCDSB.

Road and lot grades will be designed to ensure proper drainage and sufficient cover over infrastructure. Some storm sewers will require insulation in areas where they will be above the frost penetration depth. Road grades will be constructed at 0.5% to 1.50% for the development. Lot grading will consist of a mixture of lot types such as rear-to-front drainage and split drainage (including walkout and backsplit lots). Some of the drainage from Lot 32 and the common element area south of the turning circle will be directed to an infiltration gallery. Runoff from roof leaders will be directed to and filtered across grassed surfaces.

During site grading construction, temporary sediment and erosion control measures (such as sediment fencing, sediment ponds, straw bale check dams, etc.) will be implemented for environmental protections. Further details are discussed in Section 7. Figure No. 4, Conceptual Grading Plan, shows the conceptual site grading.

3.2 Sanitary Sewers

A municipal 200mm diameter sanitary sewer currently exists in the Bonarrow Meadows Subdivision, west of the proposed development. The Township has confirmed that there is sufficient reserve capacity in the existing downstream sanitary sewers, sewage pumping station and treatment facility to accommodate this development.

Sanitary service will be provided to the subject property via the extension of a 200mm diameter sanitary sewer to the subject property from the existing 200mm diameter sanitary stub located on Park Block 166 of the Bonarrow Meadows Subdivision, through an easement on the Sacred Heart Catholic School property. The sanitary sewer will then be extended along the length of the proposed internal laneway across the frontage of each unit. Individual 125mm diameter sanitary service lateral connections will be provided for each unit. Figure No. 5, Conceptual Servicing Plan, shows the proposed sanitary sewer servicing layout.

3.3 Watermains

A municipal 200mm diameter watermain currently exists in the Bonarrow Meadows Subdivision, west of the proposed development and on Wellington Road 27, east of the proposed development. A private 200mm diameter watermain also exists along the access road to the Sacred Heart Catholic School. The Township has confirmed that there is sufficient reserve capacity in the existing water system to accommodate this development.

Water service will be provided to the subject property via an extension of a municipal 150mm diameter watermain to the subject property from the existing 200mm diameter watermain stub located on Park Block 166 of the Bonarrow Meadows Subdivision, through a municipal easement on the Sacred Heart Catholic School property, and from the existing 200mm diameter watermain located on Wellington County Road 27 to create a looped system, maximizing redundancy and reliability and minimizing the potential for stagnation. The watermain will then extend along the length of the proposed internal laneway, within a municipal easement, across the frontage of each unit. Individual 25mm diameter water service lateral connections will be provided

Functional Servicing and Stormwater Management Report
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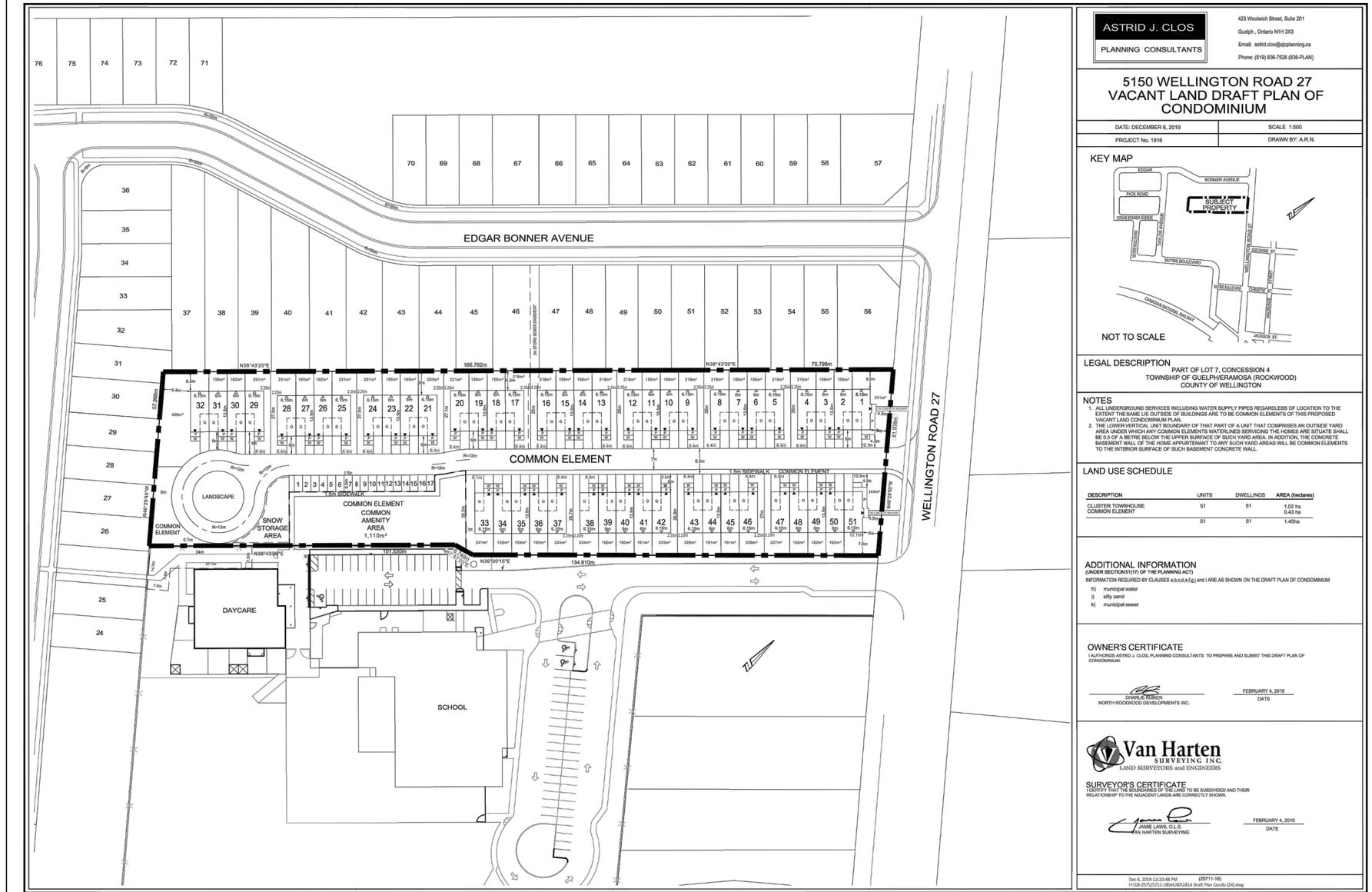


ASTRID J. CLOS
PLANNING CONSULTANTS

423 Woolwich Street, Suite 201
Guelph , Ontario N1H 3X3
Email: astrid.clos@ajcplanning.ca
Phone: (519) 836-7526 (836-PLAN)

5150 WELLINGTON ROAD 27
VACANT LAND DRAFT PLAN OF CONDOMINIUM

DATE: DECEMBER 6, 2019	SCALE 1:500
PROJECT No. 1916	DRAWN BY: A.R.N.

KEY MAP

NOT TO SCALE

LEGAL DESCRIPTION
PART OF LOT 7, CONCESSION 4
TOWNSHIP OF GUELPH/ERAMOSA (ROCKWOOD)
COUNTY OF WELLINGTON

NOTES
1. ALL UNDERGROUND SERVICES INCLUDING WATER SUPPLY PIPES REGARDLESS OF LOCATION TO THE EXTENT THE SAME LIE OUTSIDE OF BUILDINGS ARE TO BE COMMON ELEMENTS OF THIS PROPOSED VACANT LAND CONDOMINIUM PLAN.
2. THE LOWER VERTICAL UNIT BOUNDARY OF THAT PART OF A UNIT THAT COMPRISES AN OUTSIDE YARD AREA UNDER WHICH ANY COMMON ELEMENTS WATERLINES SERVICING THE HOMES ARE SITUATE SHALL BE 0.5 OF A METRE BELOW THE UPPER SURFACE OF SUCH YARD AREA. IN ADDITION, THE CONCRETE BASEMENT WALL OF THE HOME APPURTENANT TO ANY SUCH YARD AREAS WILL BE COMMON ELEMENTS TO THE INTERIOR SURFACE OF SUCH BASEMENT CONCRETE WALL.

LAND USE SCHEDULE

DESCRIPTION	UNITS	DWELLINGS	AREA (hectares)
CLUSTER TOWNHOUSE	51	51	1.02 ha
COMMON ELEMENT			0.43 ha
	51	51	1.45ha

ADDITIONAL INFORMATION
(UNDER SECTION 51(17) OF THE PLANNING ACT)
INFORMATION REQUIRED BY CLAUSES a,b,c,d,e,f,g,j and l ARE AS SHOWN ON THE DRAFT PLAN OF CONDOMINIUM
- h) municipal water
- i) silty sand
- k) municipal sewer

OWNER'S CERTIFICATE
I AUTHORIZE ASTRID J. CLOS, PLANNING CONSULTANTS TO PREPARE AND SUBMIT THIS DRAFT PLAN OF CONDOMINIUM.

CHARLIE ROBEN
NORTH ROCKWOOD DEVELOPMENTS INC.
FEBRUARY 4, 2019
DATE

Van Harten SURVEYING INC.
LAND SURVEYORS and ENGINEERS

SURVEYOR'S CERTIFICATE
I CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE CORRECTLY SHOWN.

JAMIE LAWS, O.L.S.
VAN HARTEN SURVEYING
FEBRUARY 4, 2019
DATE

Dec 6, 2019-12:20:48 PM (25711-18)
H:\18-25\725711-18\ACAD\3814 Draft Plan Condo (24).dwg

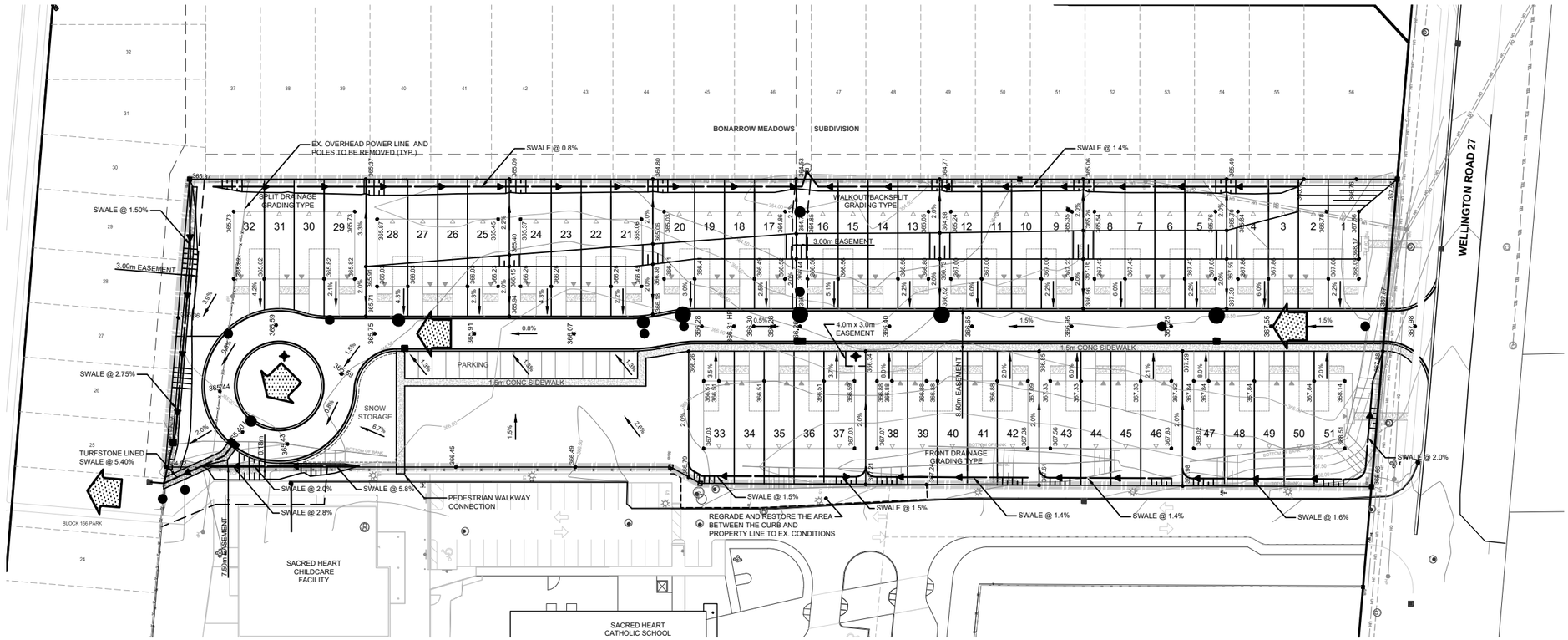
POST DEVELOPMENT SITE PLAN

Figure No. 3

BluePlan ENGINEERING

318034
January 2020
Scale: N.T.S.

Functional Servicing and Stormwater Management Report
North Rockwood Developments Inc.
5150 Wellington Road 27, Rockwood
Township of Guelph-Eramosa



LEGEND

- SITE BOUNDARY
- ORIGINAL TOPOGRAPHICAL CONTOUR
- APPROX. PROPOSED SLOPE
- APPROX. PROPOSED GRADE
- DIRECTION OF MAJOR/ EMERGENCY FLOW ROUTE

15 0 10 20 40

1:1000 (m)

CONCEPTUAL GRADING PLAN

Figure No. 4

BluePlan ENGINEERING

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Scale: 1:1000

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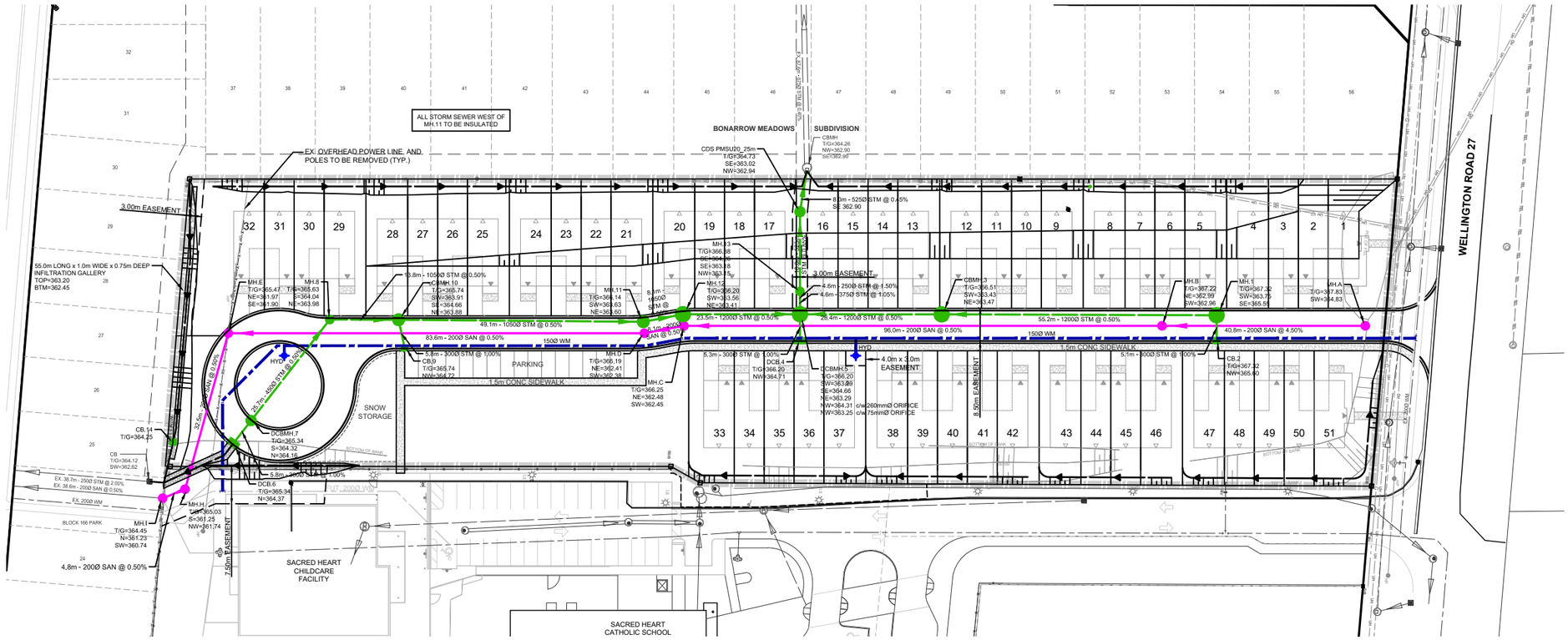

CONCEPTUAL SERVICING PLAN

Figure No. 5

BluePlan ENGINEERING

318034
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Scale: 1:1000

for each unit and hydrants will be spaced as per the Township's Development Standards. Figure No. 5, Conceptual Servicing Plan, shows the proposed watermain layout.

3.4 Storm Sewers

A municipal 675mm diameter storm sewer currently exists in the Bonarrow Meadows Subdivision, north of the proposed development. This storm sewer was sized to convey the 100-year predevelopment flows from the subject property. Other storm sewers in the vicinity of the site include a 250mm diameter storm sewer in Park Block 166 of the Bonarrow Meadows Subdivision and a 375mm diameter storm sewer on Wellington Road 27. The North Pond, an existing municipal stormwater management facility in the Bonarrow Subdivision was designed, approved and constructed with sufficient capacity to accommodate the equivalent of predevelopment flows from this development.

Storm sewers sized to convey and store runoff generated during minor and major storm events will be extended along the proposed internal laneway and through an easement between units 16 and 17, ultimately discharging to the existing 675mm diameter storm sewer and the existing North Pond in the Bonarrow Meadows Subdivision.

4. STORMWATER MANAGEMENT

4.1 Design Criteria

The stormwater management criteria are as follows:

1. Attenuate the post-development peak flow rates from the site to the existing condition peak flow rates during the 5 and 100-year design storm events.
2. Provide long-term average removal of 80% TSS on an annual basis, prior to discharge from the site.
3. Major storm flows are to be routed overland to an appropriate outlet.
4. Water balance conditions for the site should be managed such that post-development conditions mimic pre-development as much as practically feasible.

The Chicago Storm parameters are provided in Table No. 1 below.

Table No. 1: Chicago Storm Parameters

Return Period	A	B	C	Duration (minutes)	Total Depth (mm)
5-Year	539.204	0.093	0.701	180	42.440
100-Year	892.704	0.067	0.704	180	69.184

4.2 Existing Conditions

For the existing conditions analysis, the 1.45-ha site was modeled as two (2) drainage catchments. The existing conditions drainage catchments are shown on Figure No. 6 and described below. The existing conditions MIDUSS computer modeling is attached in Appendix A.

Catchment 10 (1.31 hectares, 0% impervious) represents the majority of the site. Runoff generated from Catchment 10 sheetflows overland to an existing 675mm diameter storm sewer on easement north of the site, ultimately discharging to the existing stormwater management facility (North Pond) on Edgar Bonner Avenue.

Catchment 20 (0.14 hectares, 0% impervious) represents the south corner of the site. Runoff generated from Catchment 20 sheetflows overland to an existing 250mm diameter storm sewer on easement south of the site, ultimately discharging to the existing stormwater management facility (South Pond) on Edgar Bonner Avenue and Mutrie Boulevard.

Functional Servicing and Stormwater Management Report
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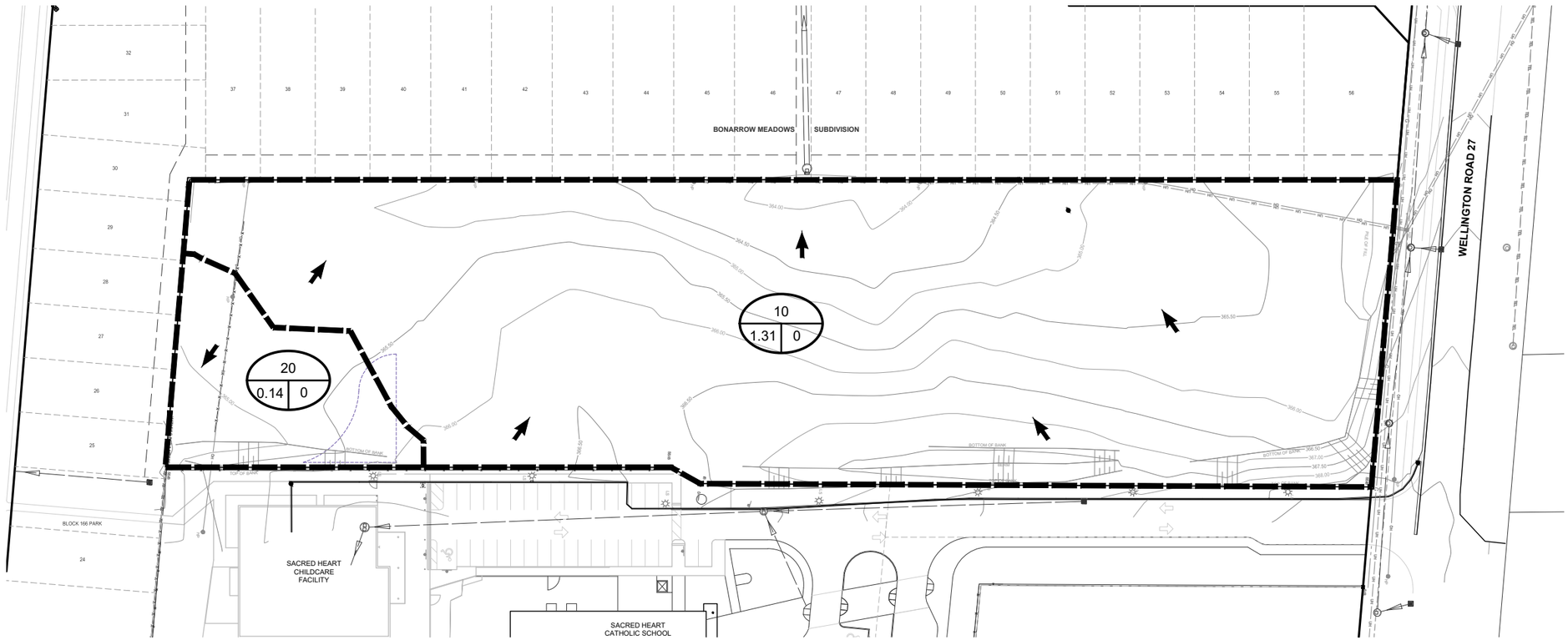

LEGEND

- DRAINAGE AREA BOUNDARY
- 10 / 1.45 / 0 — CATCHMENT NUMBER; % IMPERVIOUS; CATCHMENT AREA IN HECTARES
- DIRECTION OF SURFACE DRAINAGE

15 0 10 20 40

1:1000 (m)

PRE-DEVELOPMENT STORM DRAINAGE AREA PLAN

Figure No. 6

BluePlan ENGINEERING

318034
January 2020
Scale: 1:1000

In summary, the existing condition flow rates from the site are as follows:

Table No. 2: Existing Condition Flow Rates

	5-Year	100-Year
Catchment 10	0.088 m^3/s	0.305 m^3/s
Catchment 20	0.015 m^3/s	0.053 m^3/s
Total	**0.101 m^3/s**	**0.334 m^3/s**

4.3 Allowable Release Rates

The allowable release rates from the site have been established by determining the existing condition flow rates from the site during all storm events.

Therefore, the allowable release rates from the site under post-development conditions are as follows:

Table No. 3: Allowable Release Rates

	5-Year	100-Year
Total Flow from Site	0.101 m^3/s	0.334 m^3/s

Post-development flow rates generated from the site during the 5 and 100-year design storm events will be attenuated to the allowable release rates.

4.4 Post-Development Conditions

For post-development analysis purposes, the site was modeled as four (4) drainage catchments. The post-development drainage catchment is shown on Figure No. 7 and described below. The post-development MIDUSS computer modeling is attached in Appendix A.

Catchment 100 (0.19 hectares, 50% impervious) represents the west portion of proposed rooftops and landscaped area that will be conveyed via a grassed swale to the north of the houses, ultimately discharging to the proposed storm sewer on easement and the existing stormwater management facility (North Pond).

Catchment 200 (0.20 hectares, 50% impervious) represents the east portion of proposed rooftops and landscaped area that will be conveyed via a grassed swale to the north of the houses, ultimately discharging to the proposed storm sewer on easement and the existing stormwater management facility (North Pond).

Catchment 300 (1.01 hectares, 60% impervious) represents the proposed area that will drain overland to the internal driving aisle. Stormwater runoff generated from Catchment 300 is captured and attenuated on-site via a 450-1200mm diameter super-pipe system consisting of 450 mm diameter, 1050 mm diameter, and 1200 mm diameter storm sewers with approximately 255 m^3 of storage when combined with the storage generated from the storm sewer structures. Stormwater runoff generated from Catchment 300 will ultimately discharge to the existing 675mm diameter storm sewer on easement through the site and to the stormwater management facility (North Pond). Flow which exceeds the capacity of the superpipe system will sheetflow overland south towards Park Block 166 and Taylor Avenue.

Quality control for stormwater runoff generated from Catchment 300 will be provided via an oil/grit separator structure (Contech CDS PMSU_2015 or approved equal) prior to discharge to the existing 675mm diameter storm sewer. Details of the oil/grit separator sizing have been included in Appendix A.

Catchment 400 (0.05 hectares, 20% impervious) represents the west portion of proposed rooftop and landscaped area that will be conveyed via a grassed swale to the west of the houses. Runoff generated from Catchment 400 will discharge to the proposed on-site clear stone infiltration gallery in an easement along the west limits of the site. The clear stone infiltration gallery (40m L x 1m W x 1m D) will provide approximately 13.3

Functional Servicing and Stormwater Management Report
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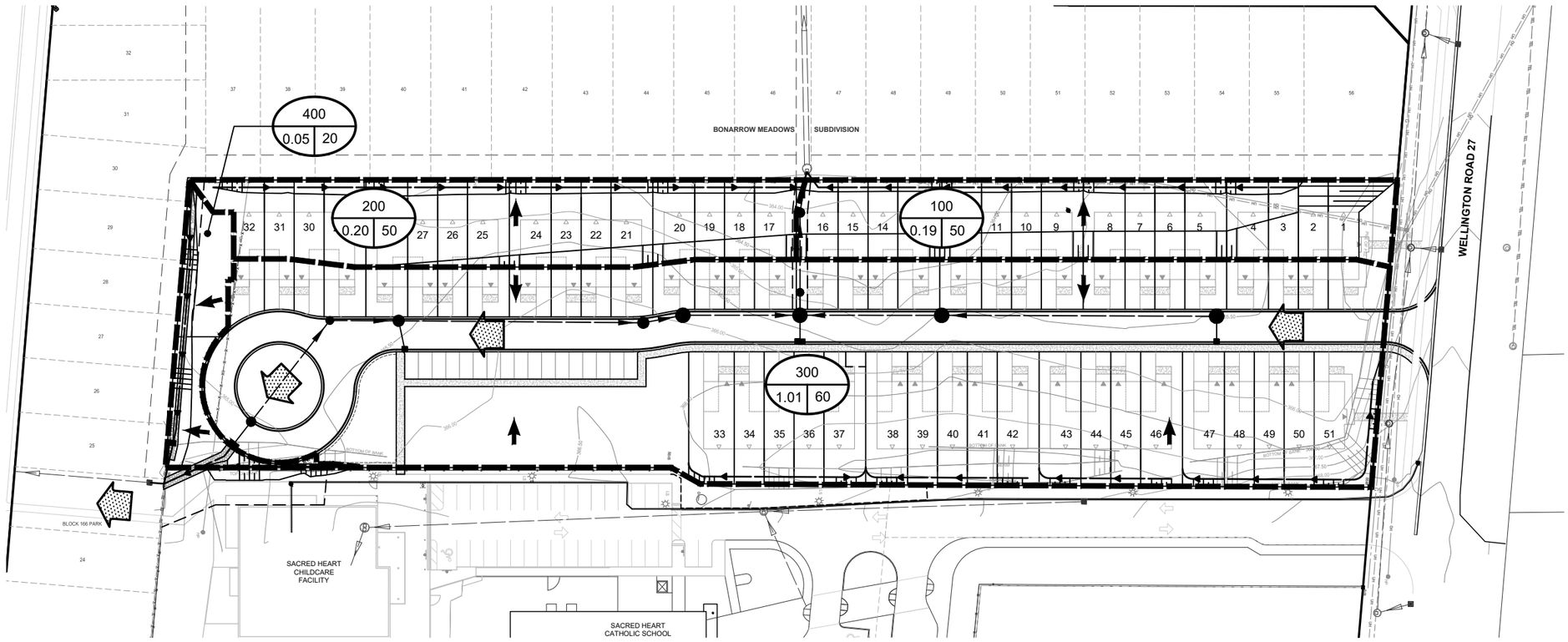

LEGEND

- DRAINAGE AREA BOUNDARY
- 100 / 0.20 | 60 — CATCHMENT NUMBER; % IMPERVIOUS; CATCHMENT AREA IN HECTARES
- DIRECTION OF SURFACE DRAINAGE
- DIRECTION OF MAJOR/ EMERGENCY FLOW ROUTE

15 0 10 20 40
1:1000 (m)

POST-DEVELOPMENT STORM DRAINAGE AREA PLAN

Figure No. 7

BluePlan ENGINEERING

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January 2020
Scale: 1:1000

m^3 of storage. Flows exceeding the capacity of the clear stone infiltration gallery and grassed swale will sheetflow overland to the catchbasin west of the swale and gallery, ultimately discharging to the proposed storm sewer on easement and the existing stormwater management facility (South Pond).

4.5 Routing

Hydrologic modeling was completed using MIDUSS Version 2.25 using the Horton infiltration method. The stage/storage/discharge relationship for the superpipe system and infiltration gallery is shown in Table No. 4 and Table No. 5 below.

Table No. 4: Superpipe System Stage/Storage/Discharge Summary

Control Point	Available Capacities			Actual Capacity Used		
	Peak Flow m^3/s	Storage Volume m^3	Storage Depth m	Peak Flow m^3/s	Storage Volume m^3	Storage Depth m
Orifice Invert	0.000	0.0	363.25	---	---	---
5-Year	---	---	---	0.034	166.84	364.52
Major Discharge Orifice Invert	0.077	188.22	364.65	---	---	---
100-Year	---	---	---	0.141	241.75	365.24
Top of Grate	0.150	245.27	365.34	---	---	---
Weir	0.162	264.58	365.49	---	---	---
Overflow	0.652	297.57	365.64	---	---	---

Table No. 5: Infiltration Gallery Stage/Storage/Discharge Summary

Control Point	Available Capacities			Actual Capacity Used		
	Peak Flow m^3/s	Storage Volume m^3	Storage Depth m	Peak Flow m^3/s	Storage Volume m^3	Storage Depth m
Bottom of Stone	0.000	0.0	362.45	---	---	---
5-Year	---	---	---	0.001	4.82	362.71
100-Year	---	---	---	0.001	13.01	363.16
Top of Stone	0.001	13.75	363.20	---	---	---
Weir	0.002	14.13	364.25	---	---	---
Overflow	0.050	14.18	364.40	---	---	---

In summary, the post-development flows from the site are as follows:

Table No. 6: Post-Development Condition Flow Rates

	5-Year	100-Year
Catchment 100 (uncontrolled)	0.040 m^3/s	0.077 m^3/s
Catchment 200 (uncontrolled)	0.042 m^3/s	0.081 m^3/s
Catchment 300 (controlled)	0.034 m^3/s	0.141 m^3/s
Catchment 400 (controlled)	0.001 m^3/s	0.001 m^3/s
Total	**0.091 m^3/s**	**0.214 m^3/s**

As shown in Table No. 7 below, post-development peak flows have been attenuated to less than the allowable release rates for the 5 and 100-year design storm events.

Table No. 7: Allowable Release Rates and Post-Development Peak Flow Rates from the Site

Design Storm	Flow to Edgar Bonner Avenue	
	Allowable Release Rates (m^3/s)	Post-Development Flows (m^3/s)
5-Year	0.101 m^3/s	0.091 m^3/s
100-Year	0.334 m^3/s	0.214 m^3/s

4.6 Stormwater Quality

Runoff generated in Catchment 300 will be conveyed to a Contech CDS PMSU_2025 hydrodynamic separator (or approved equivalent) prior to discharging to the existing 675mm diameter storm sewer on easement. The Contech CDS PMSU_2025 has been sized such that 80% of the total suspended solids (TSS) are removed. The oil and grit separator design summary is attached as Appendix A.

4.7 Water Balance

Per the “Fergus Shand Dam” rainfall station, the average annual precipitation for the area in which the study site is located is estimated to be about 945.7mm. The “Fergus Shand Dam” climate norms were used to estimate an evapotranspiration rate per the Thornthwaite Mather method. It has been estimated that the potential annual evapotranspiration for this area is 586.3 mm for pervious surfaces. Therefore, 359.4 mm remains available for infiltration and runoff. For impervious surfaces within the development, the annual evapotranspiration is estimated to be 192 mm, resulting in approximately 753.7 mm available for infiltration and runoff.

Under post-development conditions, runoff from the west portion of proposed rooftops and landscaped area will be directed to the infiltration gallery on-site. The infiltration gallery has been sized to infiltrate the first 26.7 mm of rainfall. Based on a probability analysis of the “Fergus Shand Dam” rainfall station (2000-2010), the probability of a rainfall event exceeding 26.7 mm is approximately 2.2%. In order to be conservative in our estimate, we will assume that only 95% of the runoff from the rooftop will be infiltrated each year. A similar process was undertaken with each of the infiltration trenches to determine the annual infiltration rates.

From the Geotechnical Investigation completed for the site prepared by Chung & Vander Doelen Engineering Ltd., the native soils in the area of the infiltration gallery were found to be silty gravelly sand and sand and gravel. The sand and gravel can be estimated to naturally infiltrate at a rate of 190mm/year. Additional infiltration

Water Budget - Existing and Post Development Conditions
5150 Wellington Road 27
Township of Guelph-Eramosa (Rockwood)

	Existing Conditions			Post Development Conditions								Totals		Percent Difference
	10		Existing	100		200		300		400		Post-Dev	Existing	Post-Dev	
	Impervious	Pervious	Total	Impervious	Pervious	Impervious	Pervious	Impervious	Pervious	Impervious	Pervious	Total	Total	Total	
Annual Precipitation (mm)	945.7	945.7		945.7	945.7	945.7	945.7	945.7	945.7	945.7	945.7				
Annual Evapotranspiration (mm)	192	586.3		192	586.3	192	586.3	192	586.3	192	586.3				
Available for Recharge & Runoff	753.7	359.4		753.7	359.4	753.7	359.4	753.7	359.4	753.7	359.4				
Total Area (ha)	**1.45**			**0.19**		**0.20**		**1.01**		**0.05**					
Area (ha)	0.00	1.45	**1.45**	0.11	0.08	0.12	0.08	0.61	0.40	0.01	0.04	**1.45**	**1.45**	**1.45**	
Area (m^2)	0	14,500	**14,500**	1,140	760	1,200	800	6,060	4,040	100	400	**14,500**	**14,500**	**14,500**	
Annual Infiltration:															
Pervious: @ 190 mm/year	-	2,755	**2,755**	-	144	-	152	-	768	-	76	**1,140**	**2,755**	**1,140**	
Impervious: @ 0 mm/year	0	-	**-**	0	-	0	-	0	-	0	-	**-**	**-**	**-**	
Total Annual Infiltration (m^3/year)	0	2,755	**2,755**	0	144	0	152	0	768	0	76	**1,140**	**2,755**	**1,140**	**-59%**
Annual Runoff:															
Pervious: @ 169.4 mm/year	-	2,456	**2,456**	-	129	-	136	-	684	-	68	**1,016**	**2,456**	**1,016**	
Impervious: @ 753.7 mm/year	0	-	**0**	859	-	904	-	4,567	-	75	-	**6,406**	**0**	**6,406**	
Total Annual Runoff (m^3/year)	0	2,456	**2,456**	859	129	904	136	4,567	684	75	68	**7,423**	**2,456**	**7,423**	**202%**
Additional Infiltration:															
Catchment Percent Infiltrated										95%					
Infiltrated m^3/year										72	64	**136**	**0**	**136**	
Summary:															
Total Runoff (m^3/year)	0	2,456	**2,456**	988		1,040		5,252		7		**7,287**	**2,456**	**7,287**	**197%**
Total Recharge (m^3/year)	0	2,755	**2,755**	144		152		768		212		**1,276**	**2,755**	**1,276**	**-54%**

occurs when water is captured via an infiltration gallery, allowing a longer retention and drawdown time than overland flow. Following the development, the natural infiltration volume from the site will be 1,102 m^3/year; the additional infiltration volume from the infiltration gallery will be 136 m^3/year for a total infiltration volume of 1,276 m^3/year, leaving an annual runoff volume of 7,287 m^3/year. The water budget analysis has been completed for the existing and post-development conditions for the site, as included in Appendix 'A'.

5. SITE ACCESS AND ROADWAYS

Site access, both vehicular and pedestrian, will be provided from Wellington Road 27. Consistent with current municipal policies and standards, roadways are to be developed to urban standards, including a 6.12m wide carriageway, mountable curb and gutter and sidewalk on one side of the street. Road grades are anticipated to 'seesaw' but will provide an emergency overland outlet for major storm events through the adjacent school site and Block 166 of the Bonarrow Meadows Subdivision. Typical road grades are anticipated to range from 0.5% to 1.50% with a standard road cross fall of 2.0%. A parking area, consisting of 17 standard parking spaces, has been shown at the south end of the site.

The turn circle configuration at the end of the internal roadway, which meets the Ontario Building Code requirements for access route design, with 12.0m dia. centerline radii and mountable curbs, provides sufficient space for fire, waste collection and snow removal trucks to safely turn around. A designated snow storage area is proposed on the north side of the turn circle. If the snow accumulation on site cannot be stored within the designated area it is to be removed from site.

A pedestrian walkway connection is shown between the common element road (behind on the parking spaces) and the future childcare facility on the Sacred Heart School site. The final location and connection of the sidewalk is to be confirmed and negotiated with the Wellington Catholic District School Board.

6. UTILITIES AND STREET LIGHTING

Local utility providers include Hydro One Networks, Bell Canada, Cogeco Connexion and Union Gas. All have been contacted for comment regarding the general location and capacity / size of their existing plant at the limits or boundaries of this development and / or the general vicinity, and to provide preliminary comments regarding their desire to service this subdivision and any anticipated opportunities or constraints associated with such servicing.

Hydro One Networks has confirmed that there is currently sufficient capacity in their existing system for this site. They did note that they do not reserve capacity and that it is available on a first come first serve basis. The existing overhead pole line that runs along the north and west lot lines is to be relocated to Wellington Road 27.

Bell Canada expressed interest in servicing this development and indicated that they have existing fiber optic services available near the site. Bell's process for servicing would commence at a later date following Draft plan application, and as detailed design proceeds the Developer's Consultant is to contact Bell and provide plans. At this point, Bell would submit a Greenfield Template to the Bell Governance Board to seek approval. Their decision at that time would be to either serve, to not serve, or to serve with a contribution from the Developer.

Cogeco Connexion has expressed interest in servicing this development and indicated that they have existing aerial plant in the vicinity of the site but may need to construct a small portion of plant to access the site.

Union Gas has expressed interest in servicing this development and indicated that their existing plant, a 100 mm dia. PE 420kPa main, located on the south side of Wellington Road 27 has sufficient capacity.

The Township of Guelph-Eramosa Development Standards include provisions for street lighting on all new internal streets, at the Developer's cost, which would be designed by the Developer's Consultant and coordinated with the Township and Hydro One.

Final confirmation of adequate services and arrangements for utility servicing will be made as the Draft Plan process proceeds, however at this time there does not appear to be any conflicts or restrictions that would significantly delay or prevent the local utilities from servicing the development based on demand.

7. SEDIMENT AND EROSION CONTROL

A silt fence will generally be installed along the property boundary and along any environmentally sensitive buffers/areas of the site. The silt fence will serve to minimize the opportunity for water borne sediments to be transported from the site to the adjacent properties. Temporary straw bale check dams will be installed in swales after the initial grading has been completed to slow flow rates and promote the settlement of water borne sediments before they reach the silt fence.

Upon completion of area grading, any area not subject to active construction within an agreed timeframe will be topsoiled and seeded as per OPSS 570 and 572.

Inspection and maintenance of all silt fencing and straw bale check dams will start after installation is complete. The silt fence and check dams will be inspected on a weekly basis during active construction or after a rainfall event of 13 mm or greater. Maintenance will be carried out, within 48 hours, on any part of the features found to need repair.

Once construction has been substantially completed and the ground surface is stabilized, the silt fence and straw bale check dams will be removed, any accumulated sediment within the limits of the development will be collected and removed and the site restoration will be completed.

After construction of the development, erosion and sediment transport will be minimal.

8. SOURCE WATER PROTECTION

The proposed site is not located within a Wellhead Protection Area (WHPA) for the Guelph/Eramosa municipal wells, however the WHPAs in Rockwood are being redefined and the site appears to fall into the future WHPA-B with a vulnerability score of 10. This is currently under final review with the Province.

9. SUMMARY

In our opinion, the foregoing adequately demonstrates that development of the subject property as an urban residential condominium site with full municipal and utility services is achievable, with no revisions to the Plan of Condominium.

The development will be fully serviced via connections to existing municipal infrastructure (water, sanitary and storm) on existing municipal rights-of-way, blocks or easements. Municipal infrastructure proposed to service the site is accessible and currently has adequate uncommitted reserve capacity in the treatment / supply and collection / distribution systems to accommodate this development.

Associated utility servicing (electrical, tele-communication and natural gas) is also anticipated to be fully achievable.

All of which is respectfully submitted.

GM BLUEPLAN ENGINEERING LIMITED

Per:

Angela Kroetsch, P. Eng.

Encl.

W:\Listowel\2018\318034 5150 Wellington Rd 27 Condos Rockwood\5 Work in Progress\Documents\318034 FSR and SWM\318034 FS and SWM Report_revised_2020-01-21.docx

Appendix A
Stormwater Management Analysis

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"     1500.000   Max. Hydrograph"
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"            1   Chicago storm"
"      539.204   Coefficient A"
"        0.093   Constant B"
"        0.701   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           172.252    mm/hr"
"             Total depth                  42.440    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 10"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"           10   Catchment 10"
"        0.000   % Impervious"
"        1.310   Total Area"
"      100.000   Flow length"
"        5.000   Overland Slope"
"        1.310   Pervious Area"
"      100.000   Pervious length"
"        5.000   Pervious slope"
"        0.000   Impervious Area"
"      100.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       50.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.088     0.000     0.000     0.000 c.m/sec"
"             Catchment 10           Pervious   Impervious Total Area "
"             Surface Area           1.310      0.000      1.310      hectare"
"             Time of concentration  18.940     2.792      18.940     minutes"
"             Time to Centroid       94.453     90.690     94.453     minutes"
"             Rainfall depth         42.440     42.440     42.440     mm"
"             Rainfall volume        555.96     0.00       555.96     c.m"
"             Rainfall losses        32.400     1.928      32.400     mm"
"             Runoff depth           10.040     40.512     10.040     mm"
"             Runoff volume          131.52     0.00       131.52     c.m"
"             Runoff coefficient     0.237      0.000      0.237      "
"             Maximum flow           0.088      0.000      0.088      c.m/sec"
```

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"            1   Equal length"
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"        0.000   % Impervious"
"        0.140   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.140   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       50.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.015     0.088     0.000     0.000 c.m/sec"
"             Catchment 20           Pervious   Impervious Total Area "
"             Surface Area           0.140      0.000      0.140      hectare"
"             Time of concentration  9.493      1.399      9.493      minutes"
"             Time to Centroid       85.556     88.358     85.556     minutes"
"             Rainfall depth         42.440     42.440     42.440     mm"
"             Rainfall volume        59.42      0.00       59.42      c.m"
"             Rainfall losses        32.461     2.342      32.461     mm"
"             Runoff depth           9.978      40.097     9.978      mm"
"             Runoff volume          13.97      0.00       13.97      c.m"
"             Runoff coefficient     0.235      0.000      0.235      "
"             Maximum flow           0.015      0.000      0.015      c.m/sec"
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"                    0.015     0.101     0.000     0.000"
" 38          START/RE-START TOTALS 20"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      1.450    hectare"
"             Total Impervious area                     0.000    hectare"
"             Total % impervious                        0.000"
" 38          START/RE-START TOTALS 20"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      1.450    hectare"
"             Total Impervious area                     0.000    hectare"
"             Total % impervious                        0.000"
" 19          EXIT"
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"           1   Equal length"
"           2   Horton equation"
"          10   Catchment 10"
"        0.000   % Impervious"
"        1.310   Total Area"
"      100.000   Flow length"
"        5.000   Overland Slope"
"        1.310   Pervious Area"
"      100.000   Pervious length"
"        5.000   Pervious slope"
"        0.000   Impervious Area"
"      100.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       50.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.305     0.000     0.000     0.000 c.m/sec"
"             Catchment 10           Pervious   Impervious Total Area "
"             Surface Area           1.310      0.000      1.310      hectare"
"             Time of concentration  12.992     2.283      12.992     minutes"
"             Time to Centroid       93.500     88.804     93.500     minutes"
"             Rainfall depth         69.183     69.183     69.183     mm"
"             Rainfall volume        906.30     0.00       906.30     c.m"
"             Rainfall losses        40.328     1.995      40.328     mm"
"             Runoff depth           28.855     67.189     28.855     mm"
"             Runoff volume          378.00     0.00       378.00     c.m"
"             Runoff coefficient     0.417      0.000      0.417      "
"             Maximum flow           0.305      0.000      0.305      c.m/sec"
```

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"            1   Triangular SCS"
"            1   Equal length"
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"        0.000   % Impervious"
"        0.140   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.140   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       50.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.053     0.305     0.000     0.000 c.m/sec"
"             Catchment 20           Pervious   Impervious Total Area "
"             Surface Area           0.140      0.000      0.140      hectare"
"             Time of concentration  6.512      1.144      6.512      minutes"
"             Time to Centroid       86.258     86.917     86.258     minutes"
"             Rainfall depth         69.183     69.183     69.183     mm"
"             Rainfall volume        96.86      0.00       96.86      c.m"
"             Rainfall losses        40.594     3.624      40.594     mm"
"             Runoff depth           28.590     65.560     28.590     mm"
"             Runoff volume          40.03      0.00       40.03      c.m"
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"             Total Impervious area                     0.000    hectare"
"             Total % impervious                        0.000"
" 19          EXIT"
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5150 Wellington Road 27
Our File: 318034
August 19, 2019

Catchment 300: Proposed Superpipe Storage

ELEVATION (m)	DEPTH (m)	SURFACE PONDING AREA (m^2)	PIPE + MANHOLE STORAGE VOL (m^3)	INCREASE STORAGE VOL (m^3)	ACCUM. STORAGE VOL (m^3)	
363.25	0.000	0.0	0.00	0.00	0	Pipe Invert
363.45	0.200	0.0	9.58	9.58	9.58	
363.65	0.400	0.0	25.46	25.46	35.04	
363.85	0.600	0.0	26.59	26.59	61.63	
364.05	0.800	0.0	30.86	30.86	92.50	
364.25	1.000	0.0	31.69	31.69	124.19	
364.45	1.200	0.0	31.81	31.81	156.00	Major Discharge Lip
364.65	1.400	0.0	32.22	32.22	188.22	
364.85	1.600	0.0	22.99	22.99	211.21	
365.05	1.800	0.0	22.05	22.05	233.27	
365.25	2.000	0.0	8.89	8.89	242.15	
365.34	2.090	0.0	3.11	3.11	245.27	Top of Grate
365.49	2.240	96.0	4.91	19.31	264.58	Weir
365.64	2.390	279.0	4.87	32.99	297.57	Overflow

Minor Discharge

Q =	0.018	m^3/s
Cd =	0.60	
H =	2.39	m
2g =	19.62	
A =	0.004	m^2
D =	0.075	m

Major Discharge

Q =	0.154	m^3/s
Cd =	0.60	
H =	1.19	m
2g =	19.62	
A =	0.053	m^2
D =	0.260	m

Weir Calculations

d1 =	2.39	m
h =	2.24	m
H =	0.15	m
2g =	19.62	
L =	6.00	m
Q =	0.480	m^3/s

ELEVATION	STORAGE (cu m)	MINOR DISCHARGE (cu m/s)	MAJOR DISCHARGE (cu m/s)	WEIR DISCHARGE (cu m/s)	TOTAL DISCHARGE (cu m/s)	
363.25	0.00	0.0000	0.0000	0.0000	0.0000	Pipe Invert
363.45	9.58	0.0053	0.0000	0.0000	0.0053	
363.65	35.04	0.0074	0.0000	0.0000	0.0074	
363.85	61.63	0.0091	0.0000	0.0000	0.0091	
364.05	92.50	0.0105	0.0000	0.0000	0.0105	
364.25	124.19	0.0117	0.0000	0.0000	0.0117	
364.45	156.00	0.0129	0.0000	0.0000	0.0129	Major Discharge Lip
364.65	188.22	0.0139	0.0631	0.0000	0.0770	
364.85	211.21	0.0149	0.0892	0.0000	0.1041	
365.05	233.27	0.0158	0.1093	0.0000	0.1251	
365.25	242.15	0.0166	0.1262	0.0000	0.1428	
365.34	245.27	0.0170	0.1331	0.0000	0.1501	Top of Grate
365.49	264.58	0.0176	0.1439	0.0000	0.1615	Weir
365.64	297.57	0.0182	0.1539	0.4803	0.6524	Overflow

5150 Wellington Road 27
Our File: 318034
August 19, 2019

Catchment 400: Proposed Infiltration Gallery

STORAGE VOLUME CALCULATIONS

ELEV (m)	INC D (m)	SURFACE AREA (Infil. Gall) (sq m)	INCR. STORAGE VOL (cu m)	ACCUM STORAGE VOL (cu m)	
362.45	0.000	55.0	0.00	0.00	Bottom of Stone
362.65	0.200	55.0	3.67	3.67	
362.85	0.400	55.0	3.67	7.33	
363.05	0.600	55.0	3.67	11.00	
363.20	0.750	55.0	2.75	13.75	Top of Stone
363.25	0.800	0.36	0.02	13.77	
363.50	1.050	0.36	0.09	13.86	
363.70	1.250	0.36	0.07	13.93	
363.90	1.450	0.36	0.07	14.00	
364.10	1.650	0.36	0.07	14.07	
364.25	1.800	0.36	0.05	14.13	Weir
364.40	1.950	0.36	0.05	14.18	Overflow

BOTTOM INFILTRATION

L(dw) =	55.0	m
W(dw) =	1.0	m
D(dw) =	0.75	m
A(c) =	55.0	sq m
VOL(dw)=	41.3	cu m
VOL(st)=	13.8	cu m
K =	22	mm/hr
=	6.11E-04	cm/s

SIDE INFILTRATION ALL SIDES

L(dw) =	55.0	m
W(dw) =	1.0	m
D(dw) =	0.75	m
A(c) =	84.0	sq m
K =	22	mm/hr
=	6.11E-04	cm/s

Weir Calculations

d1 =	1.95	m
h =	1.80	m
H =	0.15	m
2g =	19.62	
L =	0.60	m
Q =	0.048	m^3/s

ELEVATION	STAGE (m)	STORAGE (cu m)	INFILTRATION DISCHARGE (cu m/s)	WEIR DISCHARGE (cu m/s)	TOTAL DISCHARGE (cu m/s)	
362.45	0.000	0.00	0.0000	0.0000	0.0000	Bottom of Stone
362.65	0.200	3.67	0.0005	0.0000	0.0005	
362.85	0.400	7.33	0.0006	0.0000	0.0006	
363.05	0.600	11.00	0.0007	0.0000	0.0007	
363.20	0.750	13.75	0.0008	0.0000	0.0008	Top of Stone
363.25	0.800	13.77	0.0009	0.0000	0.0009	
363.50	1.050	13.86	0.0011	0.0000	0.0011	
363.70	1.250	13.93	0.0012	0.0000	0.0012	
363.90	1.450	14.00	0.0013	0.0000	0.0013	
364.10	1.650	14.07	0.0015	0.0000	0.0015	
364.25	1.800	14.13	0.0016	0.0000	0.0016	Weir
364.40	1.950	14.18	0.0017	0.0482	0.0499	Overflow

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"            1   Chicago storm"
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"        0.093   Constant B"
"        0.701   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           172.252    mm/hr"
"             Total depth                  42.440    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
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"       50.000   % Impervious"
"        0.190   Total Area"
"       15.000   Flow length"
"        2.000   Overland Slope"
"        0.095   Pervious Area"
"       15.000   Pervious length"
"        2.000   Pervious slope"
"        0.095   Impervious Area"
"       15.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
```

```
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.040     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           0.095      0.095      0.190      hectare"
"             Time of concentration  8.827      1.177      2.311      minutes"
"             Time to Centroid       83.275     87.989     87.290     minutes"
"             Rainfall depth         42.440     42.440     42.440     mm"
"             Rainfall volume        40.32      40.32      80.64      c.m"
"             Rainfall losses        35.528     2.729      19.128     mm"
"             Runoff depth           6.911      39.711     23.311     mm"
"             Runoff volume          6.57       37.73      44.29      c.m"
"             Runoff coefficient     0.163      0.936      0.549      "
"             Maximum flow           0.008      0.037      0.040      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.040     0.040     0.000     0.000"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          200   Catchment 200"
"       50.000   % Impervious"
"        0.200   Total Area"
"       15.000   Flow length"
"        2.000   Overland Slope"
"        0.100   Pervious Area"
"       15.000   Pervious length"
"        2.000   Pervious slope"
"        0.100   Impervious Area"
"       15.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.042     0.040     0.000     0.000 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.100      0.100      0.200      hectare"
"             Time of concentration  8.827      1.177      2.311      minutes"
"             Time to Centroid       83.275     87.989     87.290     minutes"
```

```
"             Rainfall depth         42.440     42.440     42.440     mm"
"             Rainfall volume        42.44      42.44      84.88      c.m"
"             Rainfall losses        35.528     2.729      19.128     mm"
"             Runoff depth           6.911      39.711     23.311     mm"
"             Runoff volume          6.91       39.71      46.62      c.m"
"             Runoff coefficient     0.163      0.936      0.549      "
"             Maximum flow           0.009      0.038      0.042      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.042     0.081     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.042     0.081     0.081     0.000"
" 40          HYDROGRAPH   Combine    100"
"            6   Combine "
"          100   Node #"
"                Uncontrolled Flow"
"             Maximum flow                  0.081    c.m/sec"
"             Hydrograph volume            90.913    c.m"
"                     0.042     0.081     0.081     0.081"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.042     0.000     0.081     0.081"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   Catchment 300"
"       60.000   % Impervious"
"        1.010   Total Area"
"       45.000   Flow length"
"        2.000   Overland Slope"
"        0.404   Pervious Area"
"       45.000   Pervious length"
"        2.000   Pervious slope"
"        0.606   Impervious Area"
"       45.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
```

```
"                    0.207     0.000     0.081     0.081 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.404      0.606      1.010      hectare"
"             Time of concentration  17.064     2.276      3.783      minutes"
"             Time to Centroid       90.141     89.764     89.803     minutes"
"             Rainfall depth         42.440     42.440     42.440     mm"
"             Rainfall volume        171.46     257.18     428.64     c.m"
"             Rainfall losses        35.523     1.805      15.292     mm"
"             Runoff depth           6.917      40.635     27.148     mm"
"             Runoff volume          27.94      246.25     274.19     c.m"
"             Runoff coefficient     0.163      0.957      0.640      "
"             Maximum flow           0.023      0.202      0.207      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.207     0.207     0.081     0.081"
" 54          POND DESIGN"
"         0.207   Current peak flow    c.m/sec"
"         0.038   Target outflow    c.m/sec"
"         274.2   Hydrograph volume    c.m"
"           14.   Number of stages"
"       363.250   Minimum water level    metre"
"       365.640   Maximum water level    metre"
"       363.250   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 363.250     0.000     0.000"
"                 363.450   0.00530     9.580"
"                 363.650   0.00740    35.040"
"                 363.850   0.00910    61.630"
"                 364.050   0.01050    92.500"
"                 364.250   0.01170   124.190"
"                 364.450   0.01290   156.000"
"                 364.650   0.07700   188.220"
"                 364.850    0.1041   211.210"
"                 365.050    0.1251   233.270"
"                 365.250    0.1428   242.150"
"                 365.340    0.1501   245.270"
"                 365.490    0.1615   264.580"
"                 365.640    0.6524   297.570"
"             Peak outflow                  0.034    c.m/sec"
"             Maximum level               364.517    metre"
"             Maximum storage             166.839    c.m"
"             Centroidal lag                3.636   hours"
"                  0.207     0.207     0.034     0.081 c.m/sec"
" 40          HYDROGRAPH   Combine    100"
"           6   Combine "
"         100   Node #"
"               Uncontrolled Flow"
```

```
"             Maximum flow                  0.091    c.m/sec"
"             Hydrograph volume           365.395    c.m"
"                     0.207     0.207     0.034     0.091"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                     0.207     0.000     0.034     0.091"
" 33          CATCHMENT 400"
"             1   Triangular SCS"
"             1   Equal length"
"             2   Horton equation"
"           400   Catchment 400"
"        20.000   % Impervious"
"         0.050   Total Area"
"        10.000   Flow length"
"         2.000   Overland Slope"
"         0.040   Pervious Area"
"        10.000   Pervious length"
"         2.000   Pervious slope"
"         0.010   Impervious Area"
"        10.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious Max.infiltration"
"        12.500   Pervious Min.infiltration"
"         0.250   Pervious Lag constant (hours)"
"         5.000   Pervious Depression storage"
"         0.015   Impervious Manning 'n'"
"         0.000   Impervious Max.infiltration"
"         0.000   Impervious Min.infiltration"
"         0.050   Impervious Lag constant (hours)"
"         1.500   Impervious Depression storage"
"                     0.006     0.000     0.034     0.091 c.m/sec"
"              Catchment 400          Pervious   Impervious Total Area "
"              Surface Area           0.040      0.010      0.050      hectare"
"              Time of concentration  6.921      0.923      3.373      minutes"
"              Time to Centroid       81.723     87.357     85.056     minutes"
"              Rainfall depth         42.440     42.440     42.440     mm"
"              Rainfall volume        16.98      4.24       21.22      c.m"
"              Rainfall losses        35.678     3.274      29.197     mm"
"              Runoff depth           6.762      39.166     13.243     mm"
"              Runoff volume          2.70       3.92       6.62       c.m"
"              Runoff coefficient     0.159      0.923      0.312      "
"              Maximum flow           0.004      0.004      0.006      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     0.006     0.006     0.034     0.091"
" 54          POND DESIGN"
"         0.006   Current peak flow    c.m/sec"
```

```
"        0.038   Target outflow    c.m/sec"
"          6.6   Hydrograph volume    c.m"
"          12.   Number of stages"
"      362.450   Minimum water level    metre"
"      364.400   Maximum water level    metre"
"      362.450   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                362.450     0.000     0.000"
"                362.650   0.00050     3.670"
"                362.850   0.00060     7.330"
"                363.050   0.00070    11.000"
"                363.200   0.00080    13.750"
"                363.250   0.00090    13.770"
"                363.500   0.00110    13.860"
"                363.700   0.00120    13.930"
"                363.900   0.00130    14.000"
"                364.100   0.00150    14.070"
"                364.250   0.00160    14.130"
"                364.400   0.04990    14.180"
"             Peak outflow                 0.001    c.m/sec"
"             Maximum level              362.713    metre"
"             Maximum storage              4.815    c.m"
"             Centroidal lag               3.571   hours"
"                  0.006     0.006     0.001     0.091 c.m/sec"
" 40          HYDROGRAPH   Combine    100"
"           6   Combine "
"         100   Node #"
"               Uncontrolled Flow"
"             Maximum flow                 0.091    c.m/sec"
"             Hydrograph volume          372.016    c.m"
"                     0.006     0.006     0.001     0.091"
" 38          START/RE-START TOTALS 400"
"           3   Runoff Totals on EXIT"
"             Total Catchment area                     1.450    hectare"
"             Total Impervious area                    0.811    hectare"
"             Total % impervious                      55.931"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                      Sunday, February 07, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:                                 W:\Listowel\2018\"
"                318034 5150 Wellington Rd 27 Condos Rockwood\5 Work in
Progress\Design Data\Modelling Files\2019-07-31"
"                Output filename:                              Post__100yr.out"
"                Licensee name:                                           gmbp"
"                Company                                                  gmbp"
"                Date & Time last used:                 8/1/2019 at 9:27:42 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      210.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      892.704   Coefficient A"
"        0.067   Constant B"
"        0.704   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          284.815    mm/hr"
"             Total depth                 69.184    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          100   Catchment 100"
"       50.000   % Impervious"
"        0.190   Total Area"
"       15.000   Flow length"
"        2.000   Overland Slope"
"        0.095   Pervious Area"
"       15.000   Pervious length"
"        2.000   Pervious slope"
"        0.095   Impervious Area"
"       15.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
```

```
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.077     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           0.095      0.095      0.190      hectare"
"             Time of concentration  5.759      0.963      2.292      minutes"
"             Time to Centroid       84.845     86.466     86.017     minutes"
"             Rainfall depth         69.184     69.184     69.184     mm"
"             Rainfall volume        65.72      65.72      131.45     c.m"
"             Rainfall losses        44.305     4.324      24.315     mm"
"             Runoff depth           24.878     64.859     44.869     mm"
"             Runoff volume          23.63      61.62      85.25      c.m"
"             Runoff coefficient     0.360      0.937      0.649      "
"             Maximum flow           0.032      0.062      0.077      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.077     0.077     0.000     0.000"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          200   Catchment 200"
"       50.000   % Impervious"
"        0.200   Total Area"
"       15.000   Flow length"
"        2.000   Overland Slope"
"        0.100   Pervious Area"
"       15.000   Pervious length"
"        2.000   Pervious slope"
"        0.100   Impervious Area"
"       15.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.081     0.077     0.000     0.000 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.100      0.100      0.200      hectare"
"             Time of concentration  5.759      0.963      2.292      minutes"
"             Time to Centroid       84.845     86.466     86.017     minutes"
```

```
"             Rainfall depth         69.184     69.184     69.184     mm"
"             Rainfall volume        69.18      69.18      138.37     c.m"
"             Rainfall losses        44.305     4.324      24.315     mm"
"             Runoff depth           24.878     64.859     44.869     mm"
"             Runoff volume          24.88      64.86      89.74      c.m"
"             Runoff coefficient     0.360      0.937      0.649      "
"             Maximum flow           0.034      0.065      0.081      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.081     0.157     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.081     0.157     0.157     0.000"
" 40          HYDROGRAPH   Combine    100"
"            6   Combine "
"          100   Node #"
"                Uncontrolled Flow"
"             Maximum flow                  0.157    c.m/sec"
"             Hydrograph volume           174.988    c.m"
"                     0.081     0.157     0.157     0.157"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.081     0.000     0.157     0.157"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   Catchment 300"
"       60.000   % Impervious"
"        1.010   Total Area"
"       45.000   Flow length"
"        2.000   Overland Slope"
"        0.404   Pervious Area"
"       45.000   Pervious length"
"        2.000   Pervious slope"
"        0.606   Impervious Area"
"       45.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
```

```
"                    0.381     0.000     0.157     0.157 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.404      0.606      1.010      hectare"
"             Time of concentration  11.133     1.862      3.712      minutes"
"             Time to Centroid       90.753     88.160     88.677     minutes"
"             Rainfall depth         69.184     69.184     69.184     mm"
"             Rainfall volume        279.50     419.25     698.75     c.m"
"             Rainfall losses        44.223     2.472      19.172     mm"
"             Runoff depth           24.961     66.712     50.011     mm"
"             Runoff volume          100.84     404.27     505.11     c.m"
"             Runoff coefficient     0.361      0.964      0.723      "
"             Maximum flow           0.084      0.353      0.381      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.381     0.381     0.157     0.157"
" 54          POND DESIGN"
"         0.381   Current peak flow    c.m/sec"
"         0.038   Target outflow    c.m/sec"
"         505.1   Hydrograph volume    c.m"
"           14.   Number of stages"
"       363.250   Minimum water level    metre"
"       365.640   Maximum water level    metre"
"       363.250   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 363.250     0.000     0.000"
"                 363.450   0.00530     9.580"
"                 363.650   0.00740    35.040"
"                 363.850   0.00910    61.630"
"                 364.050   0.01050    92.500"
"                 364.250   0.01170   124.190"
"                 364.450   0.01290   156.000"
"                 364.650   0.07700   188.220"
"                 364.850    0.1041   211.210"
"                 365.050    0.1251   233.270"
"                 365.250    0.1428   242.150"
"                 365.340    0.1501   245.270"
"                 365.490    0.1615   264.580"
"                 365.640    0.6524   297.570"
"             Peak outflow                  0.141    c.m/sec"
"             Maximum level               365.241    metre"
"             Maximum storage             241.754    c.m"
"             Centroidal lag                2.831   hours"
"                  0.381     0.381     0.141     0.157 c.m/sec"
" 40          HYDROGRAPH   Combine    100"
"           6   Combine "
"         100   Node #"
"               Uncontrolled Flow"
```

```
"             Maximum flow                  0.214    c.m/sec"
"             Hydrograph volume           682.008    c.m"
"                     0.381     0.381     0.141     0.214"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.381     0.000     0.141     0.214"
" 33          CATCHMENT 400"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          400   Catchment 400"
"       20.000   % Impervious"
"        0.050   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.040   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.010   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.016     0.000     0.141     0.214 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           0.040      0.010      0.050      hectare"
"             Time of concentration  4.515      0.755      3.035      minutes"
"             Time to Centroid       83.406     86.284     84.539     minutes"
"             Rainfall depth         69.184     69.184     69.184     mm"
"             Rainfall volume        27.67      6.92       34.59      c.m"
"             Rainfall losses        44.425     4.874      36.515     mm"
"             Runoff depth           24.758     64.310     32.669     mm"
"             Runoff volume          9.90       6.43       16.33      c.m"
"             Runoff coefficient     0.358      0.930      0.472      "
"             Maximum flow           0.014      0.007      0.016      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.016     0.016     0.141     0.214"
" 54          POND DESIGN"
"        0.016   Current peak flow    c.m/sec"
```

```
"        0.038   Target outflow    c.m/sec"
"         16.3   Hydrograph volume    c.m"
"          12.   Number of stages"
"      362.450   Minimum water level    metre"
"      364.400   Maximum water level    metre"
"      362.450   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                362.450     0.000     0.000"
"                362.650   0.00050     3.670"
"                362.850   0.00060     7.330"
"                363.050   0.00070    11.000"
"                363.200   0.00080    13.750"
"                363.250   0.00090    13.770"
"                363.500   0.00110    13.860"
"                363.700   0.00120    13.930"
"                363.900   0.00130    14.000"
"                364.100   0.00150    14.070"
"                364.250   0.00160    14.130"
"                364.400   0.04990    14.180"
"             Peak outflow                 0.001    c.m/sec"
"             Maximum level              363.160    metre"
"             Maximum storage             13.013    c.m"
"             Centroidal lag               4.787   hours"
"                  0.016     0.016     0.001     0.214 c.m/sec"
" 40          HYDROGRAPH   Combine    100"
"           6   Combine "
"         100   Node #"
"               Uncontrolled Flow"
"             Maximum flow                 0.214    c.m/sec"
"             Hydrograph volume          698.350    c.m"
"                      0.016     0.016     0.001     0.214"
" 38          START/RE-START TOTALS 400"
"           3   Runoff Totals on EXIT"
"             Total Catchment area                     1.450    hectare"
"             Total Impervious area                    0.811    hectare"
"             Total % impervious                      55.931"
" 19          EXIT"
```

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD
BASED ON A FINE PARTICLE SIZE DISTRIBUTION

Project Name: 5150 Wellington Road
Location: Rockwood, ON
OGS #: 1

Engineer: **GM BluePlan Engineering Limited**
Contact: **Patricia Wiebe, E.I.T**
Report Date: 18-Jul-19

Area	1.40	ha	**Rainfall Station #**	200	
Weighted C	0.64		**Particle Size Distribution**	FINE	
CDS Model	2025		**CDS Treatment Capacity**	45	l/s

Rainfall Intensity[1] (mm/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (l/s)	Treated Flowrate (l/s)	Operating Rate (%)	Removal Efficiency (%)	Incremental Removal (%)
1.0	9.7%	18.2%	2.5	2.5	5.5	97.3	9.5
1.5	8.5%	26.7%	3.7	3.7	8.2	96.5	8.2
2.0	8.2%	34.9%	5.0	5.0	11.0	95.7	7.8
2.5	6.2%	41.1%	6.2	6.2	13.7	94.9	5.9
3.0	6.3%	47.4%	7.5	7.5	16.5	94.1	5.9
3.5	3.9%	51.3%	8.7	8.7	19.2	93.3	3.6
4.0	4.0%	55.3%	10.0	10.0	22.0	92.6	3.7
4.5	4.0%	59.3%	11.2	11.2	24.7	91.8	3.7
5.0	3.5%	62.8%	12.5	12.5	27.5	91.0	3.2
6.0	6.4%	69.2%	14.9	14.9	33.0	89.4	5.8
7.0	4.7%	74.0%	17.4	17.4	38.5	87.8	4.2
8.0	3.4%	77.4%	19.9	19.9	44.0	86.3	2.9
9.0	2.6%	79.9%	22.4	22.4	49.5	84.7	2.2
10.0	1.9%	81.9%	24.9	24.9	55.0	83.1	1.6
15.0	9.1%	90.9%	37.4	37.4	82.5	75.2	6.8
20.0	3.8%	94.7%	49.8	45.3	100.0	63.8	2.4
25.0	2.7%	97.5%	62.3	45.3	100.0	51.1	1.4
30.0	0.7%	98.1%	74.7	45.3	100.0	42.6	0.3
35.0	0.8%	98.9%	87.2	45.3	100.0	36.5	0.3
40.0	0.5%	99.4%	99.6	45.3	100.0	31.9	0.1
45.0	0.3%	99.6%	112.1	45.3	100.0	28.4	0.1
50.0	0.0%	99.6%	124.5	45.3	100.0	25.5	0.0
							87.9

Removal Efficiency Adjustment[2] = 6.5%

Predicted Net Annual Load Removal Efficiency = 81.4%

Predicted Annual Rainfall Treated = 96.8%

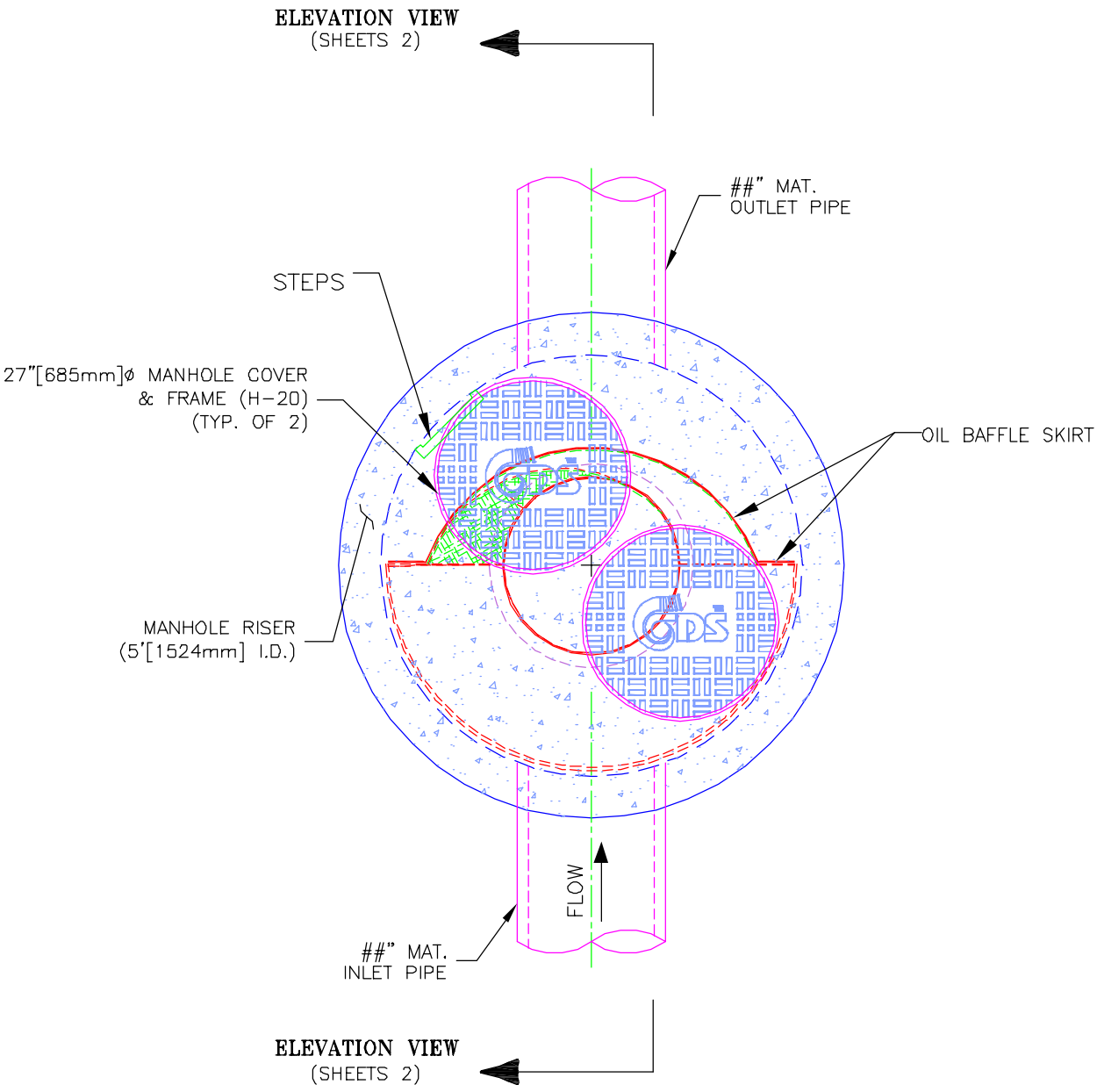
1 - Based on 34 years of hourly rainfall data from Canadian Station 6149387, Waterloo ON

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

3 - CDS Efficiency based on testing conducted at the University of Central Florida

4 - CDS design flowrate and scaling based on standard manufacturer model & product specifications

PLAN VIEW

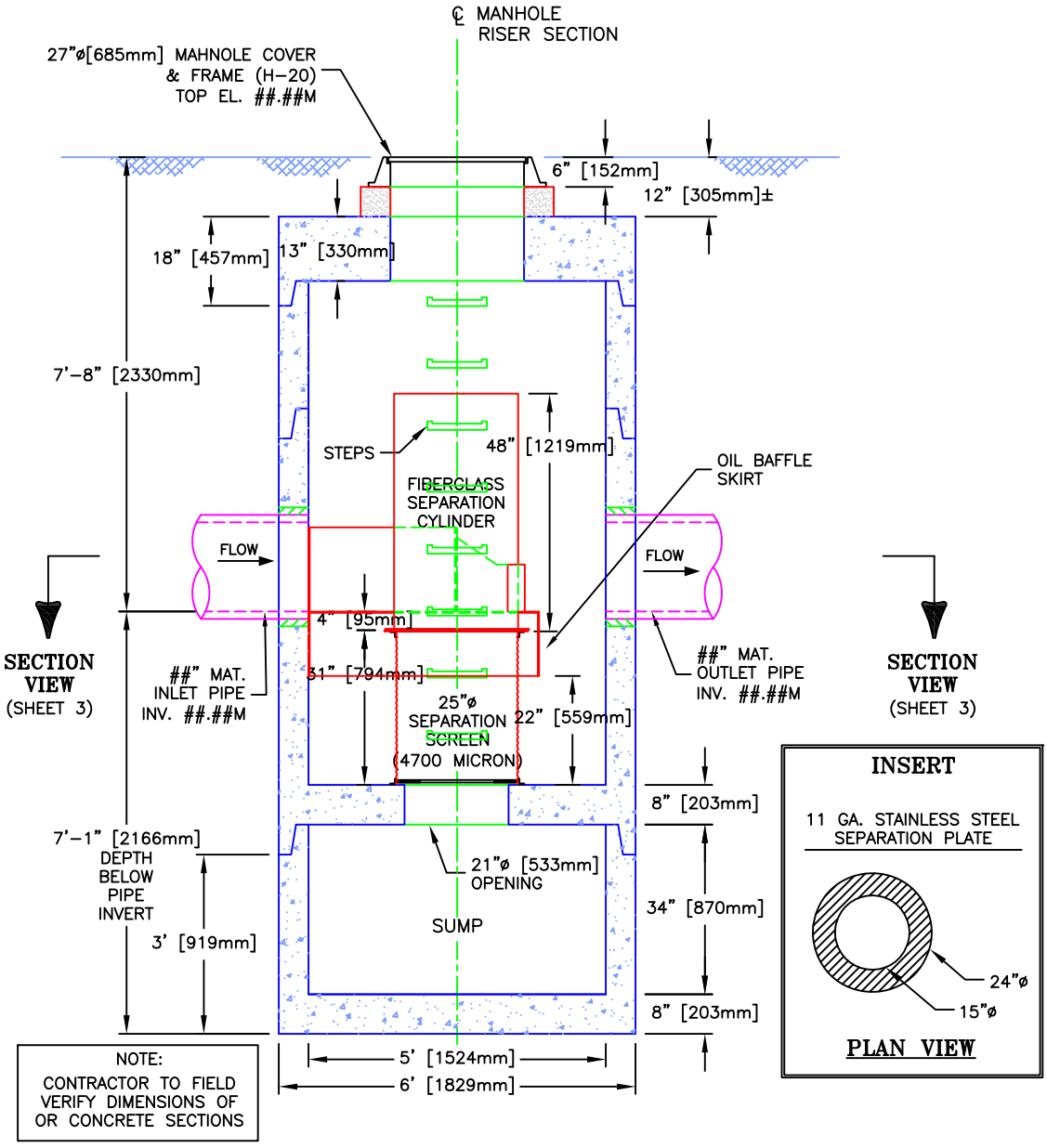


CDS MODEL PMSU20_25m, 1.7 CFS TREATMENT CAPACITY STORM WATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB# XX-##-###	SCALE 1" = 2'
		DATE ##/##/##	SHEET
		DRAWN INITIALS	1
		APPROV.	

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577
CONTECH Stormwater Solutions Inc. 930 Woodcock Road, Suite 101, Orlando, Florida 32803 Tel: (800) 848-9955

ELEVATION VIEW



CDS MODEL PMSU20_25m, 1.7 CFS TREATMENT CAPACITY STORM WATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB# XX-##-###	SCALE 1" = 3'
		DATE ##/##/##	SHEET 2
		DRAWN INITIALS	
		APPROV.	

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