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Memorandum

To	Carlos Reyes, P.Eng., Municipality of Thames Centre	Page	1
CC	Phil Masschelein, Sifton Properties Limited		
Subject	Dorchester Subdivision (187 Dorchester Road) – Sanitary Servicing Strategy		
From	Ryan Maguire, EIT, AECOM		
Date	July 13, 2020	Project Number	60568894

AECOM Canada Limited has been retained by Sifton Properties Limited to undertake the design study reports and to prepare the conceptual servicing and grading design for the 187 Dorchester Road residential subdivision (Dorchester Subdivision); located in the town of Dorchester, ON, part of the Municipality of Thames Centre. The following represents the conceptual sanitary servicing design prepared in support of the Dorchester Subdivision Draft Plan submission.

1. Existing Conditions

The existing site is currently an agricultural field; therefore, is not serviced by an existing sanitary sewer connection. There is an existing 600mm-diameter trunk sanitary located on Byron Avenue conveying sanitary sewage east eventually extending south on Oakwood Drive and continuing east on Turnberry Drive to the sewage treatment facility. Due to growth requirements in the area, including the proposed development of the subject site and additional development to the west of Dorchester Road, the construction of a sanitary sewage pumping station is being constructed west of Dorchester Road to provide additional sewage capacity and forced conveyance to a gravity outlet for future developments. This pumping station will provide a gravity outlet for the majority of the proposed development as shown on the Sanitary Area plan provided (**attachment 1**). The sanitary pumping station, once constructed, will outlet to the existing 600 mm diameter trunk sanitary sewer at the intersection of Byron Avenue and Dorchester Road. A second sanitary sewer connection is proposed through an easement connecting to the Oakwood Avenue trunk sanitary sewer. As a result, the proposed subdivision will have two adequate sanitary sewer outlets as discussed below.

2. Proposed Sanitary Sewershed

The subject development area represents approximately 21 ha of land, which consists of low-density development (166 lots), a medium-density block (1.60 ha), medium density street facing townhouses (1.45 ha), commercial block (1.34 ha), park and open-space, and municipal right-of-ways. As the Municipality of Thames Centre does not have any published design guidelines for sanitary sewer design, the Municipality has directed AECOM to utilize current City of London design guidelines.

Sanitary Peak Flows within the proposed Dorchester Subdivision were based on the following criteria:

- Per Capita Flow = 230 Litres/day/capita = 0.002662 L/s/c;
- Peaking Factor = Harmon; and,
- Infiltration = 8,640 L/ha/day = 0.100 L/s/ha.

Population estimates for the Dorchester Subdivision were based on the current site plan which is summarized below as follows:

Low-Density / Single-Family Residential

- 166 low-density / single-family residential lots

Medium-Density / Multi-Family Residential

- Area = 1.62 ha, 122 units, 292 population

Medium-Density / Multi-Family Residential – Street-Facing Townhouses

- Area = 1.45 ha, 48 units, 116 population

Commercial

- Area = 1.34 ha, 134 population

Population density estimates were based on the following:

- Low-density / single-family residential = 3 persons per lot / unit;
- Medium-density / multi-family residential = 2.4 persons per unit (assumed 75 units / ha); and,
- Commercial = 100 people/ha.

As identified in the above bullet points, the proposed site is approximately 21 ha which includes 166 single-family lots, 122 multi-family units (1.62 ha), 48 street-facing townhomes, and a 1.34 ha commercial block for a total population of approximately 1,039 persons. Based on an average daily flow of 230 L/c/day, a total peak discharge of approximately 13.57 L/s for the entire development including infiltration allowance, and Harmon peaking factor. No external lands are anticipated to be serviced by the sanitary sewer system within this proposed development.

3. Sanitary Servicing Strategy

It is proposed that the Dorchester Subdivision will have to 2 sanitary sewage outlets. The first outlet, which receives flows from the south east corner of the subdivision, will be located at the south east corner of the subdivision through an easement located north of the Quail Run Subdivision SWM facility and a private lot known as 211 Oakwood Drive. The proposed sanitary sewer will connect into the existing manhole located on Oakwood Drive just north of Turnberry Drive.

The second outlet, which receives flows from the remainder of the subdivision is located on the west side of the subdivision, west of Dorchester Road. Sanitary sewers will extend from the subdivision, beneath Dorchester Road and connect into a sanitary sewer stub that will be provided through the sanitary sewage pump station contract which will convey the sewage to the pump station and

ultimately to the Byron Avenue and Dorchester Road intersection via forcemain. Refer to items 1 and 2 below for further detail.

1) Oakwood Drive Outlet

This proposed outlet will convey peak flows for the south east corner of the site. As per the Sanitary Plan and design sheet provided, sanitary drainage for 38 single-family residential lots (114 persons) will be conveyed via 200mm diameter gravity sanitary sewers resulting in a peak design flow 1.68 L/s to the trunk sanitary sewer within Oakwood Drive. This sewer will be located within an easement between the existing SWM facility and 211 Oakwood Drive.

2) Dorchester Road (Pumping Station)

As per the sanitary plan and design sheet provided, the remaining 128 single-family residential lots, 122 multi-family units, 48 street-facing townhouses and the 1.34 ha commercial block for a total population of 925 persons will be conveyed via a 200mm diameter gravity sanitary sewer resulting in a design peak flow 11.89 L/s to pumping station #3 located to the west of Dorchester Road. Based on the civil sanitary plan attached completed by Stantec for the design and construction of the Dorchester sewage pumping station #3 and forcemain, the proposed development has been allocated a population of 500 (equivalent residential) to discharge to the gravity sewer to the west of Dorchester Road and ultimately to pumping station #3. As the proposed population of 925 people exceeds the previously allocated 500 persons, pump upgrades at the pump station may be required once the full buildout of future residential lands occur. A second option could also be to raise the subject site to allow for more lots to be serviced by the sanitary sewer connection to Oakwood Drive. This option should be considered during detailed design.

Due to the proximity of the site to the wellhead protection areas (WHPA ‘A’ and ‘B’), stricter pipe installation/construction methods in these areas as well as the remainder of the subdivision will be considered through detailed design and construction.

4. Summary

Based on the preliminary sanitary sewer design as shown on the plans provided, the Oakwood Drive outlet will receive a peak flow of 1.68 L/s and the Dorchester Road outlet will receive a peak flow of 11.89 L/s from the proposed development. During detailed design, consideration for conveying additional sanitary discharge directly to the trunk sanitary sewer on Oakwood Drive should be considered.

If you have any questions, comments, or concerns regarding the information provided, do not hesitate to contact the undersigned.

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Jack Brand, M.Eng., P.Eng.
Water Resources Engineer
AECOM Canada Limited
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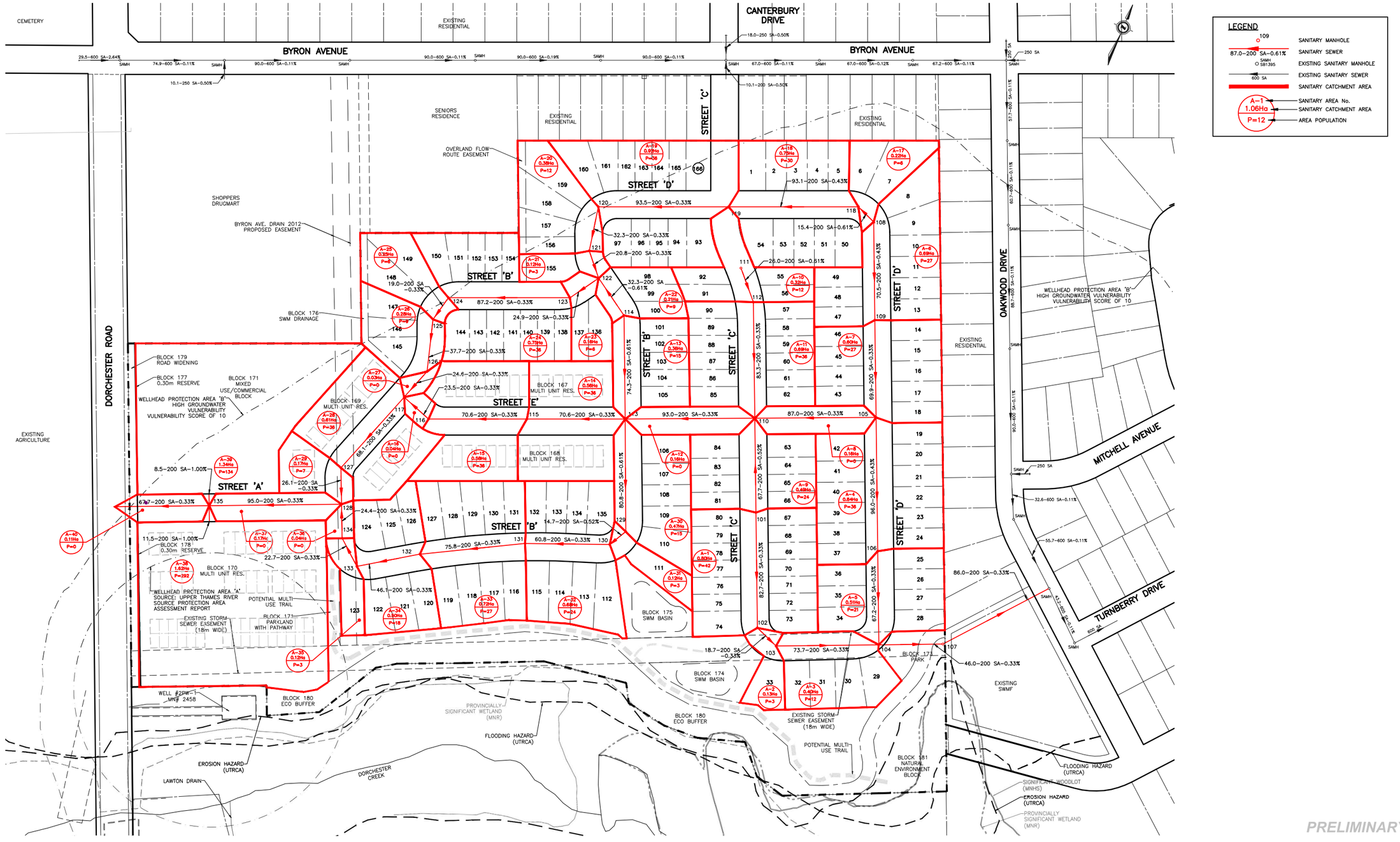
Included:

Attachment 1: Sanitary Area Plan prepared by AECOM

Attachment 2: Sanitary Design Sheet prepared by AECOM

Attachment 3: Design Brief for Dorchester Sewage Pumping Station #3 prepared by Stantec

Attachment 4: Civil Sanitary Plan prepared by Stantec



EXISTING SERVICES	DRAWING #, SOURCE	DATE	AS CONSTRUCTED SERVICES	COMPLETION

DETAILS	
DESIGN	RJG/JCB
DRAWN BY	RJG
CHECKED	RDM
APPROVED	JCB
DATE	OCT. 2018

No.	REVISIONS	DATE	CONSULTANT
1.	UPDATED DRAFT PLAN–MARCH 19, 2020	JULY 6/20	AECOM

AECOM
London, Ontario
519.673.0510

ENGINEER'S STAMP

MUNICIPALITY OF Thames Centre

SCALE
SCALE – 1 : 1250
10 0 25m

DORCHESTER SUBDIVISION
SIFTON PROPERTIES LIMITED

SANITARY AREA PLAN

PROJECT No.	SHEET No.	PLAN FILE No.
60568894	3	

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POPULATION DENSITIES

SINGLE FAMILY	3	PP / UNIT
SEMI DETACHED	3	PP / UNIT
TOWNHOUSES	2.4	PP / UNIT
APARTMENTS- AVERAGE	1.6	PP / UNIT
I.C.I. FLOW	100	PP/ HA EQUIVALENT
SCHOOLS- ELEM.	400	P
INFILTRATION ALLOWANCE	8640	L/ GROSS HA/ DAY
AVERAGE FLOW	230	L/ PP / DAY

SANITARY SEWER DESIGN SHEET

DORCHESTER SUBDIVISION

Dorchester Subd.
PROJECT NO. 60512345
DRAINAGE AREA 18.07 ha
DESIGNED BY RJG
CHECKED BY RM
DATE 07/10/20

SEWER LOCATION				AREA			TOTAL	RESIDENTIAL AREA & POPULATION							SEWAGE FLOW			SEWER DESIGN						PROFILE				
AREA NO.	STREET	FROM MH	TO MH	NET AREA ha.	GROSS AREA ha.	CUM. AREA ha.	CUM. AREA ha.	PER ha.	PERS. PER LOT	NO. OF LOTS	POPUL.	TOTAL CUM. POPUL.	HARMON PEAKING FACTOR	INFILT. l/s	SEWAGE l/s	TOTAL l/s	"n"	NOM. PIPE D mm	PIPE SLOPE %	CAPACITY Q l/s	VELOCITY (0.61 min.) m/s	LENGTH m	SEWER FALL m	DROP IN MANHOLE m	INVERT ELEVATION U.S. m	INVERT ELEVATION D.S. m	
A-1	STREET 'C'	101	102	0.80			0.80		3.0	14	42	42	4.7624	0.08	0.53	0.61	0.013	200	0.33	18.84	0.60	82.7	0.273				
A-2	STREET 'C'	102	103	0.13			0.93		3.0	1	3	45	4.7561	0.09	0.57	0.66	0.013	200	0.33	18.84	0.60	18.7	0.062				
A-3	STREET 'C'	103	104	0.40			1.33		3.0	4	12	57	4.7331	0.13	0.72	0.85	0.013	200	0.33	18.84	0.60	73.7	0.243				
A-4	STREET 'C'	105	106	0.84			0.84		3.0	12	36	36	4.7756	0.08	0.46	0.54	0.013	200	0.43	21.51	0.68	96.0	0.413				
A-5	STREET 'C'	106	104	0.51			1.35		3.0	7	21	57	4.7331	0.14	0.72	0.85	0.013	200	0.33	18.84	0.60	67.2	0.222				
	EASEMENT	104	107	0.00			2.68		3.0	0	0	114	4.6503	0.27	1.41	1.68	0.013	200	0.33	18.84	0.60	46.0	0.152				
	EASEMENT	107	*EX. SAMH*	0.00			2.68		3.0	0	0	114	4.6503	0.27	1.41	1.68	0.013	200	0.33	18.84	0.60	86.0	0.284				
A-6	STREET 'D'	108	109	0.69			0.69		3.0	9	27	27	4.7981	0.07	0.34	0.41	0.013	200	0.43	21.51	0.68	70.5	0.303				
A-7	STREET 'D'	109	105	0.60			1.29		3.0	9	27	54	4.7386	0.13	0.68	0.81	0.013	200	0.33	18.84	0.60	69.9	0.231				
A-8	STREET 'E'	105	110	0.16			1.45		3.0	0	0	54	4.7386	0.15	0.68	0.83	0.013	200	0.33	18.84	0.60	87.0	0.287				
A-9	STREET 'C'	101	110	0.49			0.49		3.0	8	24	24	4.8064	0.05	0.31	0.36	0.013	200	0.52	23.65	0.75	67.7	0.352				
A-10	STREET 'C'	111	112	0.32			0.32		3.0	4	12	12	4.8474	0.03	0.15	0.19	0.013	200	0.61	25.62	0.82	26.0	0.159				
A-11	STREET 'C'	112	110	0.69			1.01		3.0	12	36	48	4.7501	0.10	0.61	0.71	0.013	200	0.33	18.84	0.60	83.3	0.275				
A-12	STREET 'E'	110	113	0.16			3.11		3.0	0	0	126	4.6362	0.31	1.56	1.87	0.013	200	0.33	18.84	0.60	93.0	0.307				
A-13	STREET 'B'	114	113	0.36			0.36		3.0	5	15	15	4.8356	0.04	0.19	0.23	0.013	200	0.61	25.62	0.82	74.3	0.453				
A-14	STREET 'E'	113	115	0.56			4.03		2.4	15	36	177	4.5836	0.40	2.16	2.56	0.013	200	0.33	18.84	0.60	70.6	0.233				
A-15	STREET 'E'	115	116	0.58			4.61		2.4	15	36	213	4.5517	0.46	2.58	3.04	0.013	200	0.33	18.84	0.60	70.6	0.233				
A-16	STREET 'E'	116	117	0.04			4.65		2.4	0	0	213	4.5517	0.47	2.58	3.05	0.013	200	0.33	18.84	0.60	23.5	0.078				
A-17	STREET 'D'	108	118	0.22			0.22		3.0	2	6	6	4.8769	0.02	0.08	0.10	0.013	200	0.61	25.62	0.82	15.4	0.094				
A-18	STREET 'D'	118	119	0.75			0.97		3.0	10	30	36	4.7756	0.10	0.46	0.55	0.013	200	0.43	21.51	0.68	93.1	0.400				
A-19	STREET 'D'	119	120	0.92			1.89		3.0	12	36	72	4.7080	0.19	0.90	1.09	0.013	200	0.33	18.84	0.60	93.5	0.309				
A-20	STREET 'D'	120	121	0.38			2.27		3.0	4	12	84	4.6899	0.23	1.05	1.28	0.013	200	0.33	18.84	0.60	32.3	0.107				
A-21	STREET 'D'	121	122	0.12			2.39		3.0	1	3	87	4.6856	0.24	1.09	1.32	0.013	200	0.33	18.84	0.60	20.8	0.069				
A-22	STREET 'B'	114	122	0.21			0.21		3.0	3	9	9	4.8608	0.02	0.12	0.14	0.013	200	0.61	25.62	0.82	32.3	0.197				
A-23	STREET 'B'	122	123	0.16			2.76		3.0	2	6	102	4.6653	0.28	1.27	1.54	0.013	200	0.33	18.84	0.60	24.9	0.082				
A-24	STREET 'B'	123	124	0.75			3.51		3.0	12	36	138	4.6228	0.35	1.70	2.05	0.013	200	0.33	18.84	0.60	87.2	0.288				
A-25	STREET 'B'	124	125	0.25			3.76		3.0	2	6	144	4.6164	0.38	1.77	2.15	0.013	200	0.33	18.84	0.60	19.0	0.063				
A-26	STREET 'B'	125	126	0.28			4.04		3.0	3	9	153	4.6071	0.40	1.88	2.28	0.013	200	0.33	18.84	0.60	37.7	0.124				
A-27	STREET 'B'	126	117	0.03			4.07		3.0	0	0	153	4.6071	0.41	1.88	2.28	0.013	200	0.33	18.84	0.60	24.6	0.081				
A-28	STREET 'B'	117	127	0.61			9.33		2.4	15	36	402	4.4232	0.93	4.73	5.67	0.013	200	0.33	18.84	0.60	68.1	0.225				
A-29	STREET 'B'	127	128	0.17			9.50		2.4	3	7	409	4.4192	0.95	4.81	5.76	0.013	200	0.33	18.84	0.60	26.1	0.086				
A-30	STREET 'B'	113	129	0.47			0.47		3.0	5	15	15	4.8356	0.05	0.19	0.24	0.013	200	0.61	25.62	0.82	80.8	0.493				
A-31	STREET 'B'	129	130	0.12			0.59		3.0	1	3	18	4.8251	0.06	0.23	0.29	0.013	200	0.52	23.65	0.75	14.7	0.076				
A-32	STREET 'B'	130	131	0.68			1.27		3.0	8	24	42	4.7624	0.13	0.53	0.66	0.013	200	0.33	18.84	0.60	60.8	0.201				
A-33	STREET 'B'	131	132	0.72			1.99		3.0	9	27	69	4.7128	0.20	0.87	1.06	0.013	200	0.33	18.84	0.60	75.8	0.250				
A-34	STREET 'B'	132	133	0.50			2.49		3.0	6	18	87	4.6856	0.25	1.09	1.33	0.013	200	0.33	18.84	0.60	46.1	0.152				
A-35	STREET 'B'	133	134	0.12			2.61		3.0	1	3	90	4.6814	0.26	1.12	1.38	0.013	200	0.33	18.84	0.60	22.7	0.075				
A-36	STREET 'B'	134	128	0.04			2.65		3.0	0	0	90	4.6814	0.27	1.12	1.39	0.013	200	0.33	18.84	0.60	24.4	0.081				
A-37	STREET 'A'	128	135	0.17			12.32		3.0	0	0	499	4.3720	1.23	5.81	7.04	0.013	200	0.33	18.84	0.60	95.0	0.314				
A-38	BLOCK 170-MULTI UNIT RES.	PLUG	135	1.62			1.62	180			292	292	4.4921	0.16	3.49	3.65	0.013	200	1.00	32.80	1.04	11.5	0.115				
A-39	BLOCK 171-MIXED USE COMMERCIAL	PLUG	135	1.34			1.34	100			134	134	4.6272	0.13	1.65	1.78	0.013	200	1.00	32.80	1.04	8.5	0.085				
A-40	STREET 'A'	135	FUT. SAN	0.11			15.39		3.0	0	0	925	4.2038	1.54	10.35	11.89	0.013	200	0.33	18.84	0.60	67.7	0.223				

PRELIMINARY

EXISTING SERVICES	DRAWING #, SOURCE	DATE	AS CONSTRUCTED SERVICES	COMPLETION

DETAILS	
DESIGN	RJG/JCB
DRAWN BY	RJG
CHECKED	RDM
APPROVED	JCB
DATE	OCT. 2018

No.	REVISIONS	DATE	CONSULTANT
1.	UPDATED DRAFT PLAN–MARCH 19, 2020	JULY 6/20	AECOM

CONSULTANT OR DIVISION

AECOM
London, Ontario
519.673.0510

ENGINEER'S STAMP

MUNICIPALITY OF Thames Centre

SCALE

DORCHESTER SUBDIVISION
SIFTON PROPERTIES LIMITED

SANITARY SEWER DESIGN SHEET

PROJECT No. 60568894
SHEET No. 3A
PLAN FILE No.

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Design Services for the Dorchester Sewage Pumping Station #3, Sanitary Sewer and Forcemain

Design Brief

Prepared for:
Municipality of Thames Centre

Prepared by:
Stantec Consulting Ltd.

October 4, 2018

Sign-off Sheet

This document entitled Design Services for the Dorchester Sewage Pumping Station # 3, Sanitary Sewer and Forcemain was prepared by Stantec Consulting Ltd. ("Stantec") for the account of the Municipality of Thames Centre (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by

Brittany Bryans, P. Eng. Signature

Reviewed by

Cameron Gorrie, P. Eng Signature

Stantec

Table of Contents

1.0 INTRODUCTION

1.1 BACKGROUND

Stantec was retained in 2017 to provide the detailed design for the Dorchester Drainage Area DA3 Pumping Station (PS) and Forcemain for the Municipality of Thames Centre. As a part of the Municipality of Thames Centre Water and Wastewater Master Plan, an expansion of the Dorchester WWTP and construction of five (5) pumping stations was identified. The DA3 PS will be located south of the Mill Pond and west of Dorchester Road and will collect flows from the surrounding developing lands.

As result of this project being retendered, the depth of the wet well was increased slightly to accommodate greater cover under the Mill Pond crossing and the gravity sanitary sewer crossing was re-aligned which is reflected in the design brief and design drawings. The project is now referred to as the Dorchester Sewage Pumping Station #3, Sanitary Sewer and Forcemain project.

1.2 PURPOSE

The intent of this technical memorandum is to provide preliminary information relating to the proposed DA3 Pumping Station, including sizing of the wet well and forcemain as well as forcemain and gravity sewer routing. This design brief will also provide a written narrative description to accompany the design documents that form part of the Environmental Compliance Approval application to the MOECP (as required).

1.3 INFORMATION SOURCES

The following information sources were used in the development and analysis of the anticipated wet well and forcemain sizing:

1. Ministry of the Environment (MOE) Design Guidelines for Sewage Works, 2008;
2. Municipality of Thames Centre Water and Wastewater Master Plan Class Environmental Assessment Class EA Report (2008);
3. Dorchester Wastewater Treatment Plant Schedule C Municipal Class Environmental Assessment (2016); and
4. City of London Design Specifications and Requirements Guide (2017).

1.4 ASSUMPTIONS

The following assumptions were made as part of this study:

1. DA3 PS flow rates are based upon the Dorchester Development Map and Szucs Development site plans – 115 planned single-family dwellings (Szucs Phase 1 and 1a) and 169.7 hectares of development lands; residential lots. Design average daily flow of 230 L/cap/day (not including I/I) was used to determine total flows; and

2. Peaking factor based upon the Harmon formula.

2.0 SERVICING AREA REVIEW

2.1 GENERAL

To undertake forcemain and wet well sizing, future flow requirements to the DA3 PS were determined. The Municipality's Water and Wastewater Master Plan Class EA Report and the Dorchester Development Map were used as the basis for this evaluation.

2.2 PROJECTED FLOWS TO THE DA3 PS

The Dorchester Master Plan identified the following sanitary catchment areas that represent the projected flows to the DA3 PS. The areas that will be serviced by DA3 PS are: 18, 22, 23, 25, the west half of 29, W, and the south half of 19. Refer to the Dorchester Development Map below:

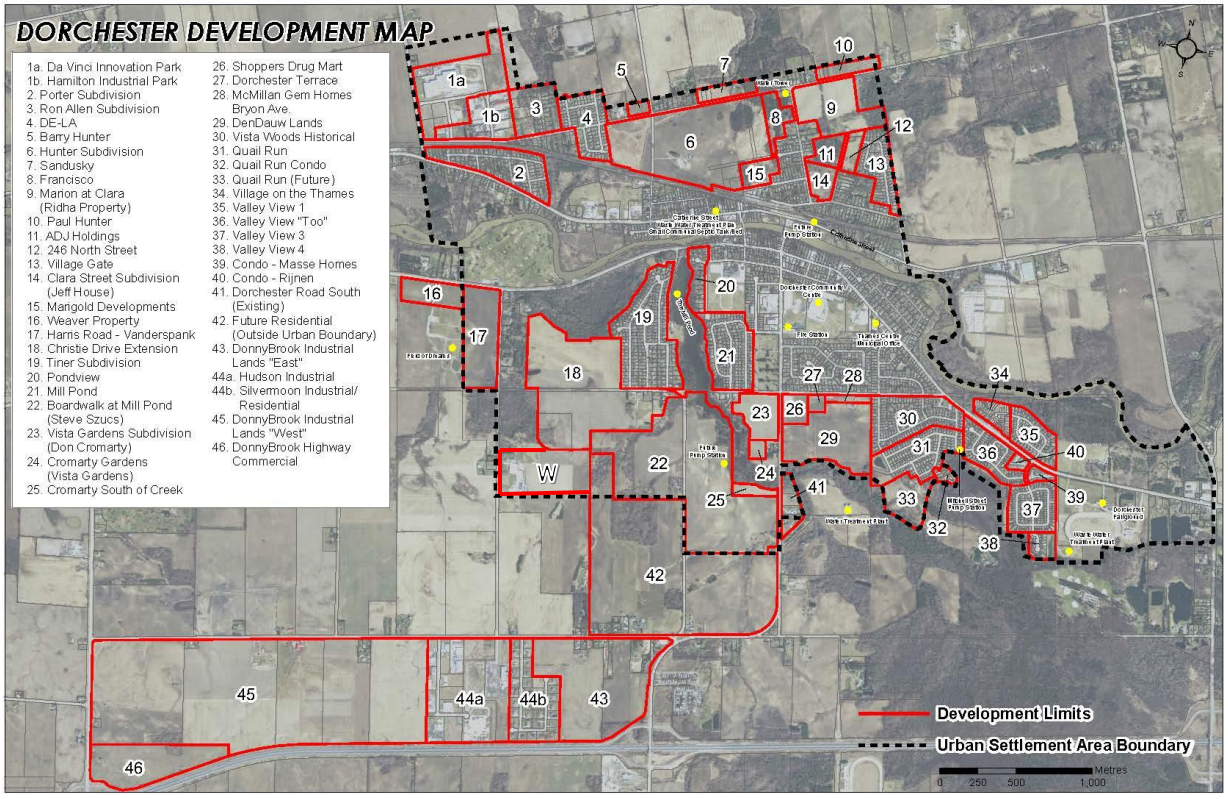


Figure 2.1: Dorchester Development Map

As all lands being serviced by the pump station are not yet developed, flow projection calculations were completed based on current development plans and the City of London Design Specifications and Requirements as adopted by Thames Centre. The design values used to calculate flows can be found in Table 2.1.

Table 2.1: Design Parameters for Flow Projections

Design Parameter	Value
People per Unit: Low Density[1]	3 ppu
People per Unit: Commercial[1]	100 cap/ha
Low Density Development[2]	15 units/ha
Medium Density Development[2]	30 units/ha
Sanitary Generation Rate[1]	230 L/cap/ha
Commercial Sanitary Generation Rate[1]	100 L/cap/ha
Infiltration[1]	0.1 L/s/ha

Note:
[1] Obtained from City of London Design Specifications and Guidelines
[2] Obtained from Szucs Development Plan

The lands will develop over time and therefore three (3) phases of growth were calculated. The initial flows will account for the first year of development of the Szucs development. The medium development flows will include areas development plan portion of 22, 23, 25, west side of 29, and 18 (Szucs, Cromarty, Cromarty, DenDauw, and Doug Tarry respectively). The ultimate flows will include the previously mentioned flows plus the remaining portion of 22 and 19. Area 19 has already been developed and is currently serviced by private septic systems.

Peaking factors were calculated using the Harmon Peaking Factor Formula, which is based on population. Below is the Harmon Peaking Factor formula.

$$PF = 1 + \left(\frac{14}{4 + \left(\frac{P}{1000}\right)^{0.5}}\right)$$

$P = Population, in\ thousands$

$Per\ Capita\ Flow = 230\ L/cap/day$

$Uncertain\ Development\ Factor = 1.1$

$Infiltration\ Allowance = 8640\ L/ha/day$

Using the values from Table 2.1 and the land areas from Figure 2.1 flows projections were calculated and are summarized in Table 2.2.

Table 2.2: DA3 Pump Station Projected Flows

Development Phase	Estimated Area Serviced (ha)	Estimated Number of Lots	Equivalent Population	Average Flow (with I/I) (L/s)	Peak Flow (with I/I) (L/s)
Initial	7.9	40	120	1.1	2.2
Medium	85.1	967	3,012	16.0	34.5
Ultimate	176.9	1905	5,824	31.5	65.3

The large variation in flows during the lifespan of pump station will be addressed in the following sections.

3.0 FORCEMAIN SIZING AND ROUTING

3.1 FORCEMAIN SIZING

The diameter of a forcemain is primarily based upon the minimum and maximum velocities expected through the pipe and the Total Dynamic Head (TDH) at the required pumping levels. Additionally, the MOECP recommends a minimum velocity of 0.6 m/s and a maximum velocity of 3.0 m/s.

The ultimate forcemain capacity will be sized in accordance with the ultimate development flows anticipated. The Municipality has requested a twinned forcemain from DA3 PS be installed. This will allow the Municipality to use one forcemain for initial flows while allowing for ultimate flows to be serviced by bringing the second forcemain into service.

To calculate the velocity within a forcemain, the pipe is assumed to be flowing full, allowing the following formula to be used:

$$V = Q/A$$

Where:

V = Velocity in forcemain, m/s;

Q = Flow in forcemain, m^3/s; and

$A = \pi r^2$ = Cross-sectional area, m^2.

Below in Table 3.1 is a summary of potential forcemain sizes compared to the three phases of flow rates and their corresponding velocities.

Table 3.1: Forcemain Velocity Comparison

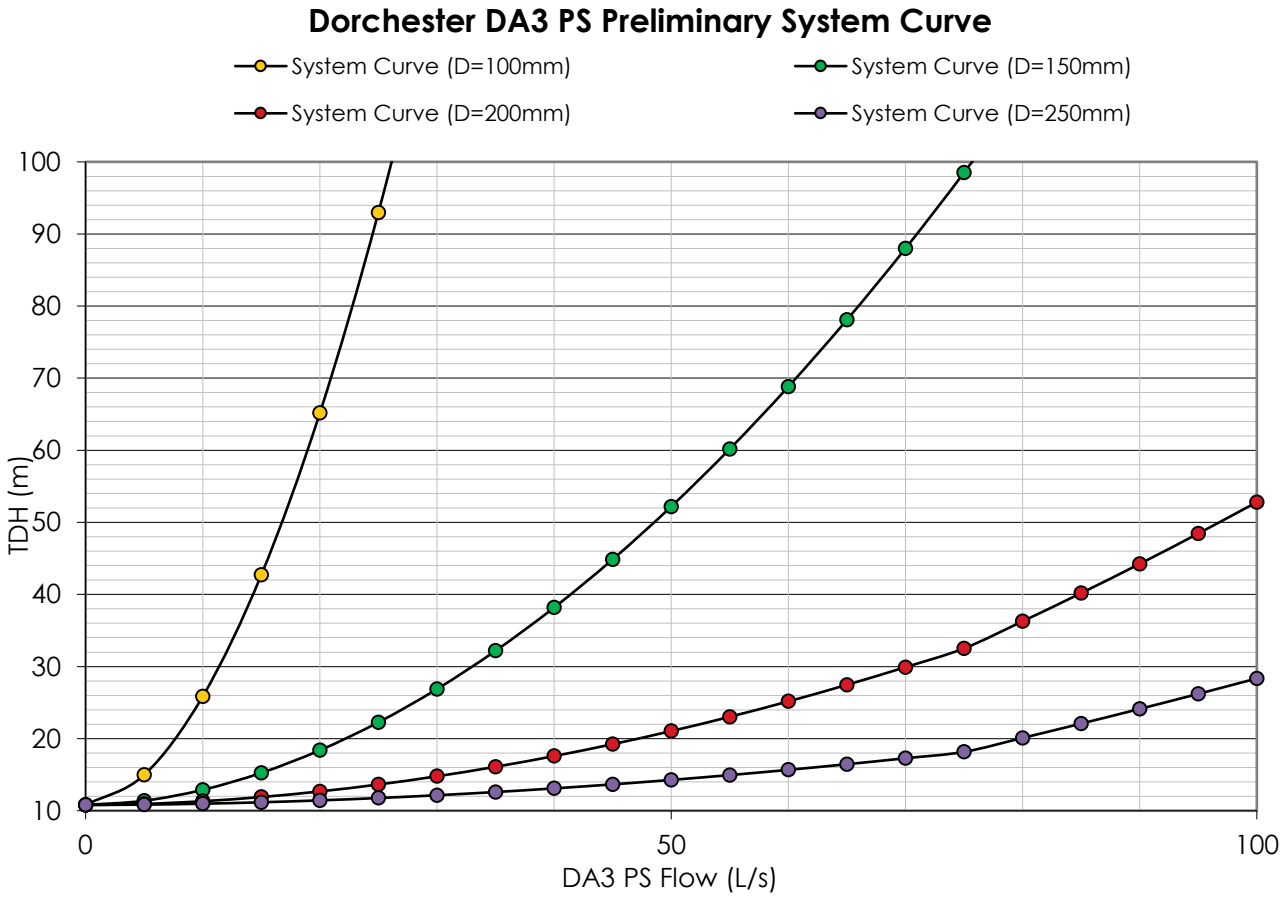
Pipe Velocity (m/s)						
Phase		**Pipe Diameter (mm)**	**50**	**100**	**150**	**200**
	Phase of Flows	**Flow (L/s)**				
1	Initial Average	1.1	0.6	0.1	0.1	0.04
	Initial Peak	2.2	1.1	0.3	0.1	0.1
2	Medium Average	16.0	8.1	2.0	0.9	0.5
	Medium Peak	34.5	17.6	4.4	2.0	1.1
3	Ultimate Average	31.5	16.0	4.0	1.8	1.0
	Ultimate Peak	65.3	33.3	8.3	3.7	2.1

Consideration must be given to the timelines of buildouts, as sizing a forcemain too large for the flows it conveys can lead to the settlement of solids in the forcemain over time. With this in mind, the initial forcemain has been sized to accept initial flows with the capacity to increase flow rates

prior to using the second forcemain. The second forcemain should be sized to provide the additional capacity necessary to allow the pumping station to operate at its intended ultimate capacity.

Another aspect in selection of a forcemain size is the potential head loss. The TDH of the proposed forcemain and system is directly related to the size of the forcemains and rate of pumping. To show the implications of forcemain diameter on TDH over a range of flows, the following graph has been constructed showing multiple system curves of different forcemain sizes.

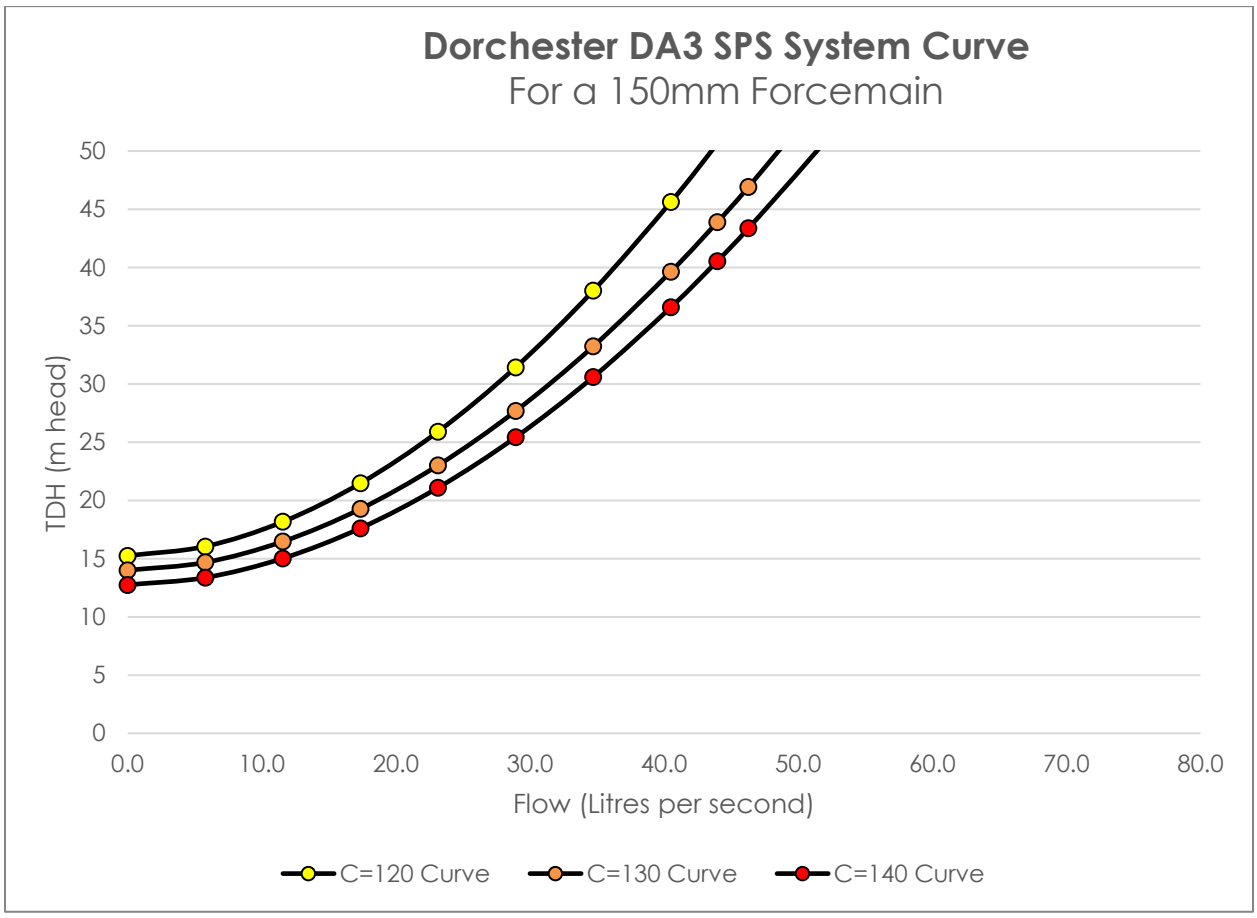
Figure 3.1: Dorchester DA 3 PS Preliminary Forcemain Selection System Curves



The above graph assumes a Hazen-Williams C-factor of 120, which is consistent with the MOE Design Guidelines. It is likely that the C-factor will be higher during the initial stages of operation (due to newer pipe characteristics), which would reduce the TDH seen at the station compared to the design TDH at a given flow value.

Taking a closer look at the functionality of a 150 mm forcemain for all flow scenarios, Figure 3.1 shows moderate head loss. Below in Figure 3.2 it can be noted at flow rates of 35 L/s (3100 m^3/d), head loss ranges from 30 m to 35 m, depending on the C factor. As a rule of thumb, head loss should be capped at a maximum of 30 m to 40 m. At 35 L/s the velocity in a 150 mm diameter forcemain is 2.0 m/s, which is within the acceptable design values.

Figure 3.2: Dorchester DA3 PS Preliminary System Curve for a 150 mm Forcemain



When peak flows reach 35 L/s consistently (average flow will equal approximately 16 L/s with I/I) it will be necessary to open the second 150 mm to allow flows exceeding 35 L/s to be pumped out of the PS and maintain the operational levels of the wet well.

Given the information above, the lifecycle of the pump station and forcemains can be split into two phases. Phase 1 will account for flows up to 35 L/s peak flow and Phase 2 will account for all flows above 35 L/s peak or 16 L/s average flow. The use of one 150 mm forcemain will last for approximately 20 years based on an assumed buildout rate of 40 homes per year.

Due to the size of the forcemains and the anticipated low initial flow, it may be necessary to provide odour control equipment due to the length of time that sewage remains in the forcemain

prior to being discharged to the outlet at the existing maintenance hole on Byron Avenue. The time when this is most likely to occur is during the initial operation of the station when average flows are anticipated to be at their lowest. Utilizing the initial average flow of 1.1 L/s, the retention time as a function of forcemain diameter is included in Table 3.2.

Table 3.2: Initial Flow Forcemain Retention Time and Turnovers

Forcemain (mm)	Retention Time (min)	Forcemain Turnovers per day (24 hrs)
100	311	5
150	699	2
200	1243	1

As shown in Table 3.2, the smaller the diameter of the forcemain the shorter the retention time and more turnovers in a day. With the 150 mm diameter forcemain there will be two (2) forcemain turnovers with a retention time of approximately 699 minutes (11.7 hours). A forcemain any larger could create odour issues.

With low initial flows, long retention times are unavoidable; therefore, if odours do become an issue a contingency plan should be put into place as a precaution. Chemical addition may be considered as an odour mitigation measure, if necessary. It is also recommended that large pumps are installed initially to allow for periodic flushing of the forcemain.

It is recommended that the two forcemains installed are both 150 mm to accommodate Phase 1 and Phase 2 flows, including the estimated ultimate peak flow rate of 65.3 L/s. Twinned forcemains would provide redundancy in emergency and planned maintenance situations.

3.2 FORCEMAIN ROUTING

The forcemains will extend from the pumping station under the Mill Pond northeast towards Cromarty's land and end up on the east side of the Mill Pond for an approximate length of 143.6 m. The forcemains will the run perpendicular to Dorchester Road and run east for approximately 200.9 m. At Dorchester Road, the forcemain then run parallel to Dorchester Road for approximately 317.0 m. The forcemain will terminate at Byron Road at a new manhole (MHSA2). A manhole (MHSA1) will be constructed directly north of MHSA2 on Byron Road. Flows from MHSA2 will flow by gravity to MHSA1 through a 600 mm diameter pipe. MHSA1 will connect to the existing SANMH101 at the intersection of Dorchester Road and Byron Road with a 600 mm diameter pipe. The existing 250 mm diameter pipe connecting SANMH101 and SANMH113 will be upgraded to a 600 mm diameter to accommodate the new flows from DA3 PS. Drawings are located in Appendix A for more detail. The exact termination location will be determined during detailed design.

3.3 INSTALLATION METHODS

The forcemain and gravity sewer will be installed using two methods of installation. Both the forcemain and gravity sewer will have to cross the Mill Pond and therefore open cut methods of installation cannot be used; instead direction drilling methods are proposed.

Horizontal Directional Drilling (HDD) is a surfaced launched system often used for installation of pipes under rivers or other surface obstructions. A pilot tube is drilled, which determines the path of the installed pipe. This method would be used to install the two (2) forcemains and one (1) gravity sewer under Mill Pond.

The bore pits for the forcemain will be located on either side of the Mill Pond in the approximate location of the PS on the west side and north of the northwest corner of the garden on the east side. The bore pits for the gravity sewer will be in the approximate location of the maintenance hole feeding into the PS on the west side and south of the southwest corner of the gardens on the east side. Please refer to the drawings in Appendix A for more detail.

4.0 GRAVITY SEWER

4.1 SERVICING AREAS EAST OF MILL POND

A 250 mm gravity sewer will be installed to service areas east of Mill Pond. This includes Development Areas 23, and the west half of 29 (See Figure 2.1 for more detail). The gravity sewer will be installed using the same methods as the forcemain, direction drilling under Mill Pond and open cut methods in Development Area 23.

The gravity sewer will be installed starting at Dorchester Road traveling west towards Mill Pond. MHSA3 will have a capped pipe out towards Dorchester Road for future connections. A 250 mm pipe will travel for 99.0 m to MHSA4. At MHSA4 the 250 mm pipe will exit and travel for 13.6 m to connect at MHSA5. From MHSA5 the 250 mm pipe will run perpendicular to Dorchester Road for 80.6 m and connect to MHSA6.

The direction drill portion will be approximately 141.7 m in length and terminate at the bore pit (MHSA6) on the east side of Mill Pond and connect to MHSA7.

Open cut methods will be used to continue the installation of the remaining portion of the gravity sewer. From MHSA7, a 300 m pipe will run for 21.2 m to MHSA8. The pipe will run parallel with the PS for 19.8 m to MHSA9. The pipe will exit MHSA9 for a 7.0 m run to connect and terminate at MHSA10. This sewer will service development areas 23 and the west half of 29.

4.2 SERVICING DEVELOPMENT AREA 22 - SOUTH

Using open cut methods, a 200 mm pipe will be installed to service development area 22. MHSA12 will have a 200 mm capped pipe exiting southward and a 200 mm exiting northly for a run of 47.6 m and connect to MHSA11. From MHSA11 a 450 mm pipe will run north for 28.6 m and connect to MHSA10. This pipe portion will accommodate flow from development area 25 and the trunk connecting developments areas to the west and north on Mill Road.

4.3 SERVICING AREAS WEST AND NORTH ON MILL ROAD

At Mill Road MHSA14 will be installed. There will be a 375 mm capped pipe exiting on the west for a length of 83.4 m and a 375 mm pipe running easterly for 95.0 m and connect to MHSA13. From MHSA13 the 375 mm pipe will run east for 91.5 m and connect to MHSA11. As above, flows will run through a 450 mm pipe to MHSA10 and finally to the PS. This trunk sewer will service development areas 18, the south half of 19, the west and north portion of 22 and W.

5.0 WET WELL HYDRAULIC ANALYSIS

5.1 DESIGN PARAMETERS

The design parameters for the DA3 PS wet well are reviewed per the following:

- Storage volume – the MOE Design Standards require 30-minute retention at average day flow between firm capacity pump off and bypass. An ultimate average flow rate (with I/I) of 31.5 L/s allows the use of a 150 mm forcemain, while maintaining a minimum pipe scouring velocity with reasonable pump efficiency. This is more conducive to anticipated future flow through this facility. Based upon the development land areas flow rates calculated above, the retention volume is as follows:

	Flow Rate (L/s)	Storage Volume (30min)
Ultimate Q_{ave}	31.5 L/s	56.8 m^3

- Wet well dimensions: One wet well will be circular with a diameter of 4.7 m and a total depth of 13.65 m depth. (Depth from the top of slab to the bottom of the wet well).
- Gravity sewer inlet to maintenance hole: 246.36 m
- Gravity sewer inlet to wet well: 246.35 m
- Total operating volume available = 33.6 m^3 (based on preliminary pump selection)
- Number of pumps = 3 (jockey, lead, lag)

Before basement flooding occurs in the system, inline storage capacity is approximately 81 m^3 of storage. This is based on the manhole which development area 22 connects at MHSA12 is not flooded. There is potential for more storage in the system. This can be confirmed when a sanitary servicing plan is in place for the proposed development of area 22.

5.2 FUTURE FLOW CONSIDERATIONS

The wet well is intended to be sized to accommodate future flows up to the estimated full build-out scenario per the Official Plan boundaries and information provided for the Szucs, Cromarty and DenDauw properties. The pumps would be sized to address the estimated 10-year growth projections; at which time the pumps will likely need to be replaced and can be sized for future ultimate flows. It is anticipated that twinned 150 mm diameter forcemain will be in service up to the design life of the pipe. Twinned forcemain allows for redundancy in the system during emergency situations or for operations and maintenance reasons.

Piping and valves within the valve chamber and into the wet well will be sized to accommodate the ultimate pumping requirements, reducing the need to replace these in the future.

6.0 SITE LAYOUT

The pump station has been designed as a precast structure. The pump station location was selected based on discussion with the Municipality at an October 2017 project meeting.

From a functional perspective, the following list provides a general description of preferred site layout. The site layout is provided in Appendix A:

- Circular wet well;
- Generator (80 kW);
- Single driveway access, fencing, and landscaping to be undertaken to mitigate visual impacts to future adjacent development areas; and
- Lower capital cost investment to construct a pre-cast valve chamber and separate electrical panel which will not require complex HVAC and electrical upgrades to suit NFPA 820 requirements.

7.0 GEOTECHNICAL REPORT

A Geotechnical Report has been completed by Golder Associates. The report will assist in determining the extent of dewatering required as well as provide recommendations for pipe installation and construction methods.

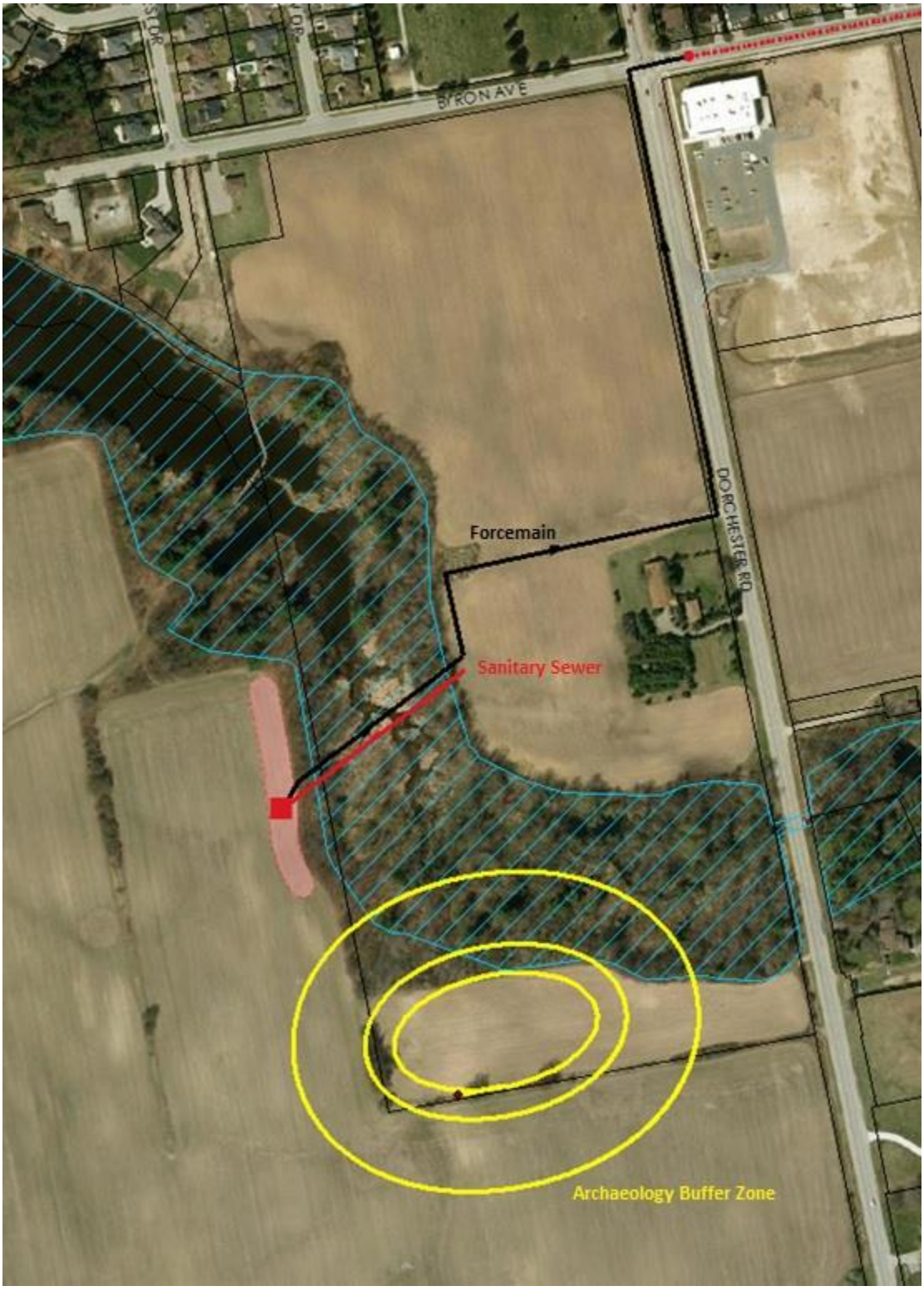
8.0 ARCHAEOLOGY ASSESSMENT

A desktop archaeology assessment of the proposed pump station location and forcemain route was completed. The Szucs development (Area 22) lands have been previously assessed and a number of archaeological sites were identified. None of the sites identified appear to be within the pumping station construction area.

Some artifacts were identified along the eastern limit of Dorchester Road, but the artifacts were from the late 19th and 20th century and do not meet the current criteria for additional Stage 3 work. This area is also outside of the project limits and therefore does not impact the project.

A Stage 1-2 report had previously been completed for the Cromarty property which included the proposed pump station and forcemain routing areas. The survey identified the Cromarty Site (AfHg-206) and recommended Stage 4 mitigation by excavation. It is a significant archaeological site that yielded numerous stone tools and Aboriginal pottery. The site appears to be located south of the preliminary Dorchester PS routing; and is located south of the Mill Creek. This site was found through the assessment and is indicated by a red circle below in Figure 8.1. A 20 m no go zone and an additional 50 m construction monitoring zone have been detailed in Figure 8.1. As shown in Figure 8.1, the proposed pump station site and forcemain/gravity sewer routes will not impact the archaeologically significant area.

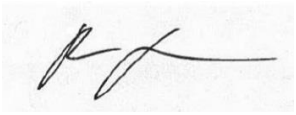
Figure 8.1- Archaeology Buffer Zone Map



9.0 CLOSING

Thank you for your review of this design brief. Your comments are critical to the success of this project and you are encouraged to provide feedback to the undersigned at your earliest convenience.

Regards,



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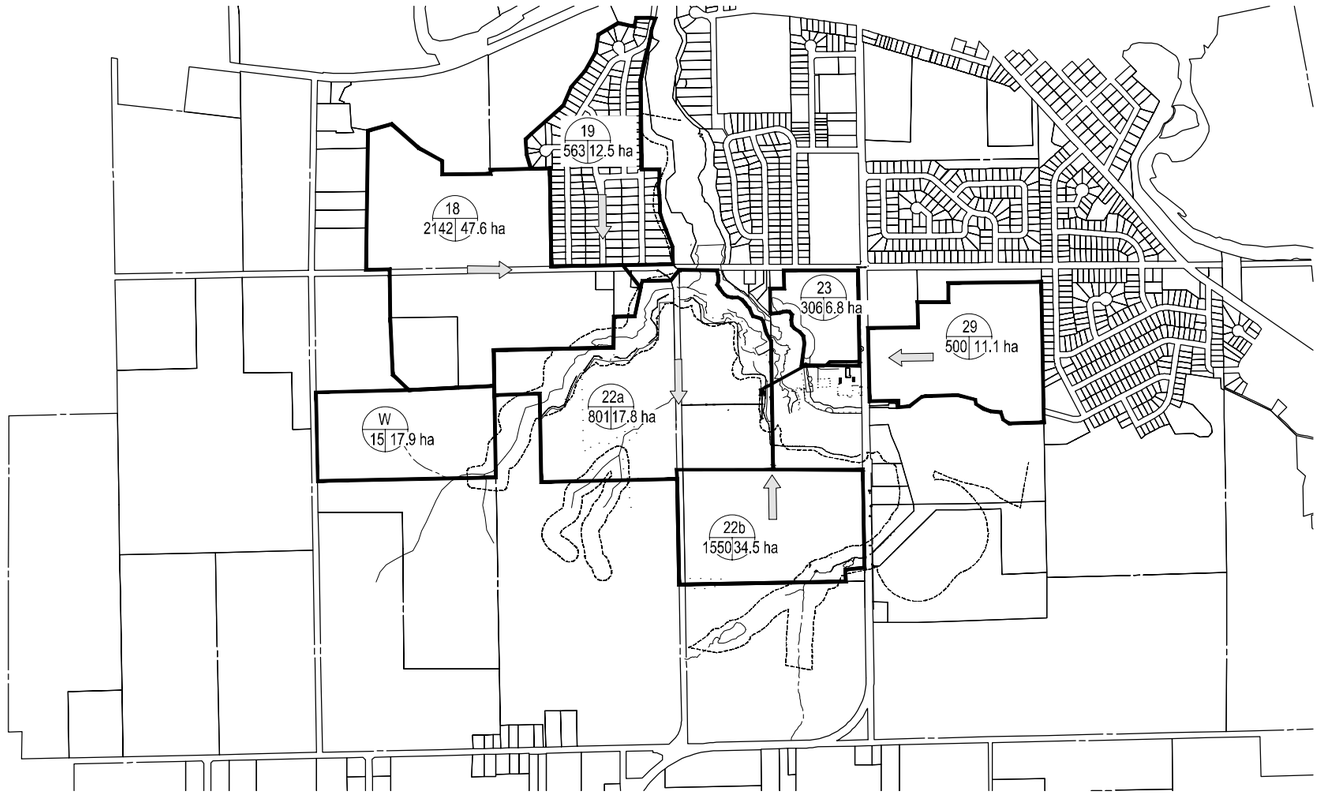

LEGEND

A1 — AREA NUMBER
555 | 27 ha — POPULATION | SIZE OF AREA IN HECTARES

FLOW DIRECTION

SANITARY AREA BOUNDARY

SANITARY SEWER DESIGN SHEET
CITY OF LONDON

RESIDENTIAL COMMERCIAL AND INSTITUTIONAL POPULATION DENSITIES

THE FOLLOWING POPULATION ALLOWANCES WILL APPLY WHEN DESIGNING SANITARY SEWERS:	
LOW DENSITY (SINGLE-FAMILY / SEMI-DETACHED)	= 15 UNITS / HECTARE @ 3 PEOPLE / UNIT
MEDIUM DENSITY (MULTI-FAMILY / TOWNHOUSE / ROWHOUSE)	= 30 UNITS / HECTARE @ 2.4 PEOPLE / UNIT
HIGH DENSITY (APARTMENTS)	= 150 - 300 UNIT / HECTARE @ 1.6 PEOPLE / UNIT
COMMERCIAL / INSTITUTIONAL	= 100 PEOPLE / HECTARE
SECONDARY SCHOOL	= 1500 PEOPLE
ELEMENTARY SCHOOL	= 600 PEOPLE
INDUSTRIAL	= 100 PEOPLE / HECTARE

DESIGN CRITERIA

SEWAGE =	230 LITRE / CAPITA / DAY
INFILTRATION =	8.640 l/ha/day
INFILTRATION =	0.1 Litres/sec/hectare
PEAKING FACTOR:	1 + 14 / 4 + P ^ 0.5
UNCERTINITY =	10%

DATE: October 2018
DESIGNED BY: JKT
PROJECT: CTPS - Gravity Sewer
PROJECT 165630124

Infiltration = 0.1 l/sec/ha

PROJECT NAME: DORCHESTER DA3 PUMP STATION - SANITARY SEWER FROM CHRISTIE DRIVE EXTENSION

				AREA			POPULATION						SEWAGE FLOWS			SEWER DESIGN						PROFILE					
AREA No.	STREET	FROM MH	TO MH	NET OR GROSS	DELTA HEC.	TOTAL HEC.	PER HEC.	PER LOT	NO. OF LOTS	DELTA POP.	TOTAL POP.	PEAKING FACTOR	INFILT L / s	SEW. L / s	Q TOTAL L / s	PIPE SIZE mm	n	SLOPE %	CAP L / s	VEL. m / s	LENGTH m	FALL IN SEWER	HEADLOSS IN U.S. MH	DROP IN MH	INVERT ELEVATION U.S.	INVERT ELEVATION D.S.	Total Q/Q cap
18,19,22a,W		Stub	MHSA14	N	64.500	64.500	-	-	968	2903	2903	3.45	6.45	29.36	35.81	375	0.013	1.40	207.45	1.88	83.4	1.168	-	-	251.210	250.070	17.3%
		MHSA14	MHSA13	N		64.500	-	-	0	0	2903	3.45	6.45	29.36	35.81	375	0.013	1.40	207.45	1.88	95.0	1.330	-	-	250.040	248.730	17.3%
		MHSA13	MHSA11	N		64.500	-	-	0	0	2903	3.45	6.45	29.36	35.81	375	0.013	1.40	207.45	1.88	91.5	1.281	-	-	248.700	247.419	17.3%
22b		MHSA12	MHSA11	N	34.450	**34.450**	-	-	517	1550	4453	3.29	3.45	42.91	46.36	250	0.013	1.60	79.78	1.63	47.6	0.857	-	-	248.240	247.383	58.1%
18,19,W,22		MHSA11	MHSA10	N	64.500	**98.950**	-	-	1484	4453	4453	3.29	9.90	42.91	52.81	450	0.013	0.25	142.55	0.90	28.6	0.072	-	-	246.470	246.399	37.0%
29		Stub	MHSA3	N	11.100	**11.100**	-	-	167	500	500	3.97	1.11	5.81	6.92	250	0.013	0.25	29.73	0.61	8.0	0.020	-	-	251.840	251.820	23.3%
		MHSA3	MHSA4	N		**11.100**	-	-	167	500	500	3.97	1.11	5.81	6.92	250	0.013	0.25	29.73	0.61	99.0	0.248	-	-	251.760	251.513	23.3%
		MHSA4	MHSA5	N		**11.100**	-	-	167	500	500	3.97	1.11	5.81	6.92	250	0.013	0.25	29.73	0.61	13.6	0.034	-	-	251.480	251.446	23.3%
		MHSA5	MHSA6	N		**11.100**	-	-	167	500	500	3.97	1.11	5.81	6.92	250	0.013	0.25	29.73	0.61	80.6	0.202	-	-	250.820	250.619	23.3%
23,29		MHSA6	MHSA7	N	6.800	**17.900**	-	-	102	306	806	3.86	1.79	9.10	10.89	250	0.013	1.50	72.83	1.48	141.9	2.129	-	-	248.720	246.592	15.0%
		MHSA7	MHSA8	N		**17.900**	-	-	0	0	806	3.86	1.79	9.10	10.89	300	0.013	0.25	48.35	0.68	21.2	0.053	-	-	246.580	246.527	22.5%
		MHSA8	MHSA9	N		**17.900**	-	-	0	0	806	3.86	1.79	9.10	10.89	300	0.013	0.25	48.35	0.68	19.8	0.050	-	-	246.500	246.451	22.5%
		MHSA9	MHSA10	N		**17.900**	-	-	0	0	806	3.86	1.79	9.10	10.89	300	0.013	0.25	48.35	0.68	7.0	0.018	-	-	246.400	246.383	22.5%
																						0.000					
		MHSA10	Pump Station	N		116.850	-	-	0	0	806	3.86	11.69	9.10	20.79	450	0.013	0.25	142.55	0.90	**3.0**	0.008			246.360	246.353	14.6%

Stantec

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Notes

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Permit/Seal

Client/Project Logo

Client/Project

DORCHESTER SEWAGE PUMPING STATION #3, SANITARY SEWER AND FORCEMAIN

Dorchester, ON Canada

Title

CIVIL SANITARY PLAN

Project No. 165630124

Scale 1:10,000

Revision 0

Sheet - of

Drawing No.