M E M O R A N D U M

DATE: JULY 28, 2023

TO: ABI DIEME (CITY OF OTTAWA)

FROM: DREW BLAIR

RE: 5000 ROBERT GRANT AVENUE
SITE SERVICING – MULTIPLE SERVICE CONNECTIONS
PRECON #: PC2023-0046
NOVATECH #: 117151
CC: F. LEPINE, A. LALONDE (LEPINE), A. WENDZICH (NEUF), S. EZZIO (CITY)

Novatech has been retained to prepare a site servicing and stormwater management report to support the site plan application for the property located at 5000 Robert Grant Avenue within the City of Ottawa. The subject site is a vacant lot with a total site area of approximately 2.02 hectares. The site plan application proposes three new residential mid to high-rise towers (ranging between 4 and 18-storeys) to be built on top of a single common podium structure for the on-site underground parking. The proposed site entrance off Robert Grant Avenue will provide access to all buildings at the ground level as well as access to the underground parking structure via. a ramp near the south-west corner of the site. The Livery Street site entrance will provide access to the underground parking garage only and is to be located near the south-east corner of the subject site.

This technical memorandum is being submitted in support of the site plan application process for the justification of multiple service connections to the adjacent municipal infrastructure. The City of Ottawa previously identified that multiple sanitary and storm outlet sewers are available for connecting the proposed site servicing. While the City typically allows one sanitary and one storm sewer connection per property, it was stated in the pre-consultation meeting that multiple servicing connections may be permitted on a case-by-case basis.

Multiple Sanitary Service Outlets

As part of the Fernbank Crossing Subdivision, the original concept for the subject site was to develop the lands as a commercial/mixed use residential area. A 250mm diameter sanitary service stub connected to Livery Street was installed as part of the Fernbank Crossing Subdivision works near the north-east corner of the site. The approved design flow from the subject site to the existing Livery Street sanitary sewer was approximately 3.3 L/s via. the existing 250mm service stub. Refer to the sanitary sewer design sheet and drainage area plan in **Appendix A** for details of the approved sanitary site flows and sewer pipe capacities in the downstream system along Livery Street in Fernbank Crossing. The site was Block 203 (labelled as Area A4-3) in the Fernbank Crossing drainage area plan and design sheet.

The current site development proposal contains high density residential buildings with anticipated sanitary flows greater than originally accounted for in the downstream Livery Street sanitary sewer

system. Peak sanitary flows for the entire site will be in the order of 10.8 L/s and are summarized in **Table 1** below:

Table 1: Proposed Sanitary Peak Flow Summary

Proposed Use	Unit Count / Area	Peaking Factor (1)	Peak Design Flow (L/s)
Building A			
Residential Tower	113	3.52	2.32
Extraneous Infiltration (ha)	0.68	-	0.22
Building A	-	-	**2.5**
Building B			
Residential Tower	153	3.47	3.11
Extraneous Infiltration (ha)	0.67	-	0.22
Building B	-	-	**3.3**
Building C			
Residential Tower	238	3.41	4.74
Commercial/Retail Space (m^2)	157	1.5	0.01
Extraneous Infiltration (ha)	0.67	-	0.22
Building C	-	-	**5.0**
Site Totals	504 / 157	-	**10.8**

(1) *Peaking Factor for industrial and commercial areas as per Section 3.2.1*

Refer to the sanitary design sheets in **Appendix A** for details of the theoretical site flows generated by the full site development.

Upon review of the downstream sanitary sewers, it is noted that there is one section of sewer within the Westpark Phase 1 sanitary sewer system that is near capacity. The sanitary sewer design sheet for the Westpark Phase 1 development, prepared by IBI, indicates that the existing 375mm diameter sewer on Oxford Place (between MH 103A and MH 202A) is currently operating at 92% with 6.57 L/s of available capacity. This sewer is downstream of Livery Street in Fernbank Crossing and is shown on the IBI West Park General Plan of Services provided in **Appendix A**.

The proposed site will generate sanitary flows greater than the original design flows (10.8 L/s versus 3.3 L/s), and as noted above, there are capacity limitations in the downstream sanitary sewer within the Westpark Phase 1 development, so it would be beneficial to split post-development sanitary flows between two separate sanitary service outlets.

As indicated in the pre-consultation meeting with the City, there is an existing 250mm diameter PVC sanitary sewer accessible in the Robert Grant Avenue right-of-way (ROW). The existing 250mm diameter PVC sanitary sewer in the Robert Grant Avenue ROW outlets directly to the municipal 750mm diameter Stittsville sanitary trunk sewer on the north side of the hydro corridor. This segment of the 250mm diameter sewer was constructed at a slope of 0.35% and has an approximate capacity of 36.7 L/s. The theoretical sanitary flow from the upstream tributary area (including the future residential build-out area) is approximately 14.5 L/s, leaving approximately 22.2 L/s of available flow capacity in the pipe segment downstream of the subject site. Refer to **Appendix A** for details of the anticipated off-site flows and sewer pipe capacities in the downstream system along Robert Grant Avenue.

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In the post-development condition, the subject site may be serviced by the 250mm diameter sanitary sewer in the Robert Grant Avenue ROW with the anticipated peak sanitary flow of 8.3 L/s from Towers 'B' and 'C'. The remaining 2.5 L/s of sanitary flow from Tower 'A' will outlet to the existing sanitary servicing stub on Livery Street. The sanitary flow to Livery Street will be less than the approved allowable release rate and the available capacity in the municipal system.

The internal mechanical plumbing will benefit from splitting flows to reduce the lengths and sizes of the internal runs and still be able to service all of the residential units through the use of gravity sewers. Reducing or avoiding pumping sanitary flows will increase the reliability and the safety of the system for the long-term maintenance of the system.

It is proposed to split flows and utilize the available downstream sewer capacities of both the Livery Street and Robert Grant Avenue municipal sanitary sewer systems with the additional sanitary connection (i.e.: two (2) sanitary connections in total for this site).

Multiple Storm Service Outlets

The Fernbank Crossing Subdivision design proposed a storm service from the subject site to outlet to the existing 1200mm/1350mm diameter concrete storm trunk sewer within the on-site City easement along the north side of the site. The approved design included approximately 440 L/s from the subject site outletting to the 1200mm/1350mm diameter storm sewer segments which drains to Pond 6 providing quality control of stormwater for a portion of the Fernbank Crossing Subdivision. The site's allowable release rate, as defined in the pre-consultation notes from the City, is significantly less than the modelled system capacity and has been calculated to be 353 L/s.

Under post-development conditions, it is proposed that stormwater from the majority of the site will be controlled using two (2) internal storage tanks. One internal tank will outlet to the existing maintenance hole on the 1350mm storm trunk sewer next to the north-east corner of Building A. The second internal tank will outlet to the existing maintenance hole on the 1200mm storm trunk sewer located midway within the easement along the northern edge of the site.

The proposed development will require some direct runoff towards the municipal ROW's and the hydro corridor in order to match the existing elevations surrounding the site. The actual flows directed to the municipal storm sewer system will be significantly less than the allowable (approximately 165 L/s outlet from the internal storage tanks to the 1200mm/1350mm storm trunk sewer system).

To protect the south building façade from off-site drainage that currently slopes towards the subject site and self-contain stormwater within the site area, a diversion berm is proposed to direct off-site stormwater runoff to the existing catchbasin near the south-east property corner (as intended in the approved Fernbank Crossing design for stormwater flowing from the adjacent site). The on-site diversion berm and swale will protect the building from flooding and provide storage for the controlled stormwater flows prior to outletting to the proposed additional storm connection to the local 375mm diameter storm sewer on Livery Street. These external storm flows and a portion of the access ramp to the underground parking garage would need to be taken internally into the building (which is not desirable or encouraged) to outlet on the east side of the site on Livery Street. The existing 375mm diameter storm sewer in Livery Street is currently operating at 65% with approximately 35 L/s of available capacity. Therefore, it is proposed to have a small portion of the post-development storm flows outlet separately from the main building services to the additional Livery Street storm sewer connection. Refer to **Appendix B** for details of the sewer pipe capacities in the downstream storm sewer system along Livery Street.

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The internal mechanical plumbing will benefit from splitting flows and having three (3) storm service connections to the municipal system to reduce the lengths and sizes of the internal runs as intake of exterior storm flow to be conveyed and stored is reduced. Reducing the pumping of stormwater will increase the reliability and the safety of the system for the long-term maintenance of the system.

It is proposed to split flows and utilize the available downstream sewer capacities of both the 1200mm/1350mm storm trunk sewer along the north side of the site and the Livery Street municipal storm sewer system with the additional storm service connections (i.e.: three (3) storm service connections in total for this site).

Conclusion

In order to meet the allowable release rates and available downstream capacities in the municipal sanitary and storm sewer systems, it is proposed to service the subject site with more than one each for the sanitary and storm service connections. Multiple sanitary and storm service outlets for the proposed development at 5000 Robert Grant Avenue will provide a beneficial design in the follow aspects:

- Splitting sanitary flows to meet existing downstream sewer capacities in the municipal systems.
- Reduction of the length and sizes of internal sanitary and storm plumbing to increase reliability and safety of the internal systems.
- Allows the internal sanitary and storm plumbing systems to maximize gravity servicing of the large podium and multiple towers while minimizing the amount of pumping required.

We trust this justifies the site requirements for multiple sanitary and storm connections to service the proposed development. Should you have any questions or require additional information, please contact the undersigned.

Yours truly,

NOVATECH

Drew Blair, P. Eng.
Senior Project Manager

List of Appendices:

Appendix A:	Sanitary Flow Calculations and Sewer Capacities
Appendix B:	Storm Drainage Areas and Sewer Capacities
Appendix C:	Proposed Servicing Sketch

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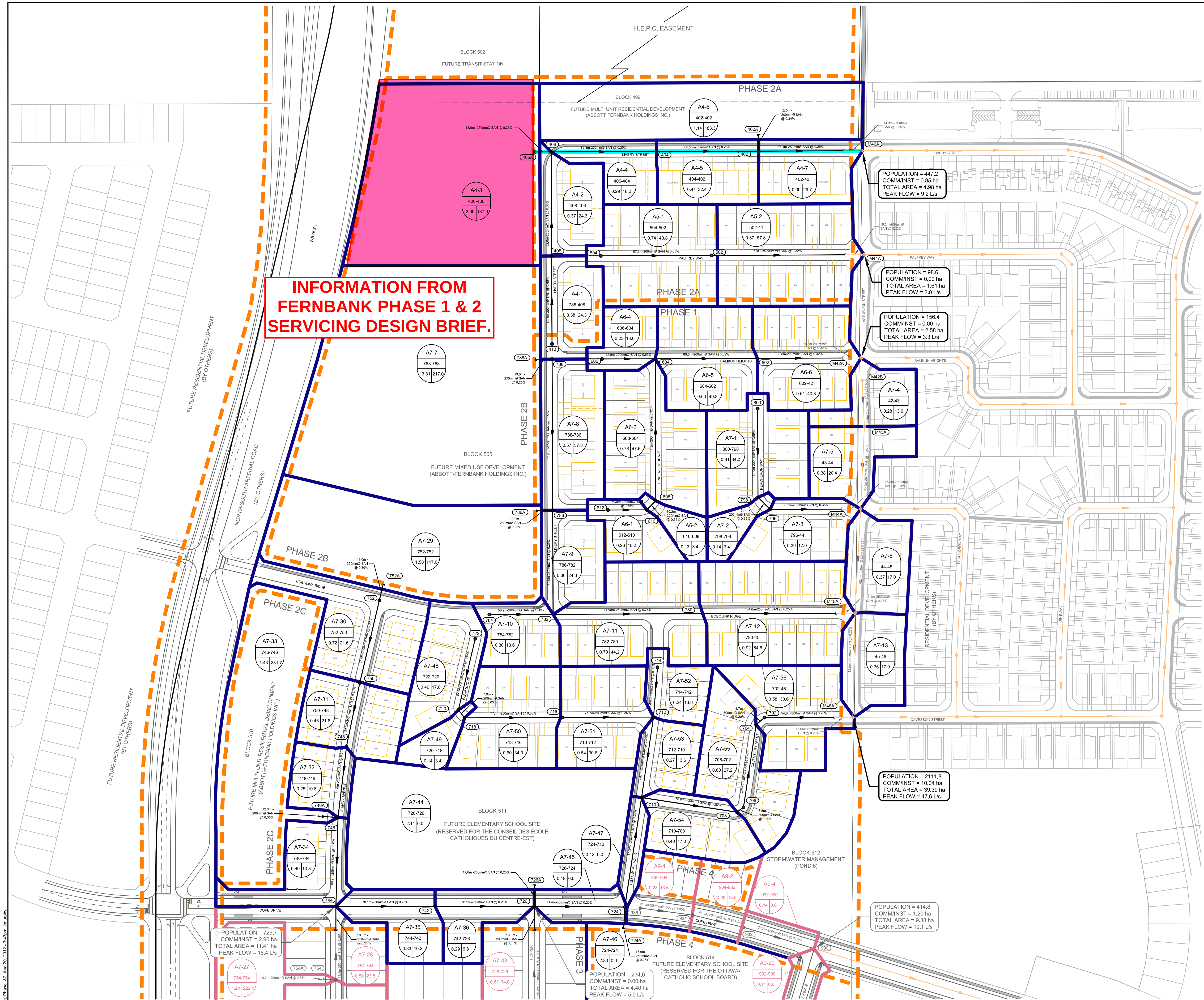
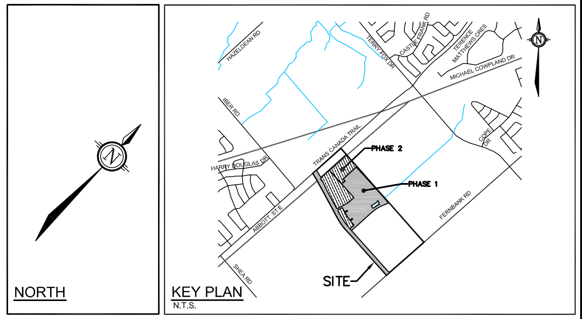
APPENDIX A

Sanitary Flow Calculations and Sewer Capacities





LEGEND

- A4-4 / 404-402 / 0.29 19.8 — AREA ID; MANHOLE TO MANHOLE; POPULATION EQUIVALENT; AREA IN HECTARES
- A4-4 / 404-402 / 0.29 19.8 — FUTURE AREA ID; FUTURE MANHOLE TO MANHOLE; FUTURE POPULATION EQUIVALENT; FUTURE AREA IN HECTARES
- SANITARY DRAINAGE AREA BOUNDARY
- FUTURE SANITARY DRAINAGE AREA BOUNDARY
- PHASE BOUNDARY LINE
- FUTURE DIRECTION OF FLOW
- DIRECTION OF FLOW
- PROPOSED SANITARY SEWER AND MANHOLE
- FUTURE PROPOSED SANITARY SEWER AND MANHOLE

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

FERNBANK CROSSING · the Heart of the Community

ABBOTT-FERNBANK HOLDINGS INC.
REGIONAL — THE REGIONAL GROUP

No.	REVISION	DATE	BY
3.	ISSUED FOR APPROVAL (PHASE 1&2)	AUG 17/12	KJM
2.	ISSUED FOR APPROVAL (PHASE 1&2)	JUN 21/12	KJM
1.	ISSUED FOR APPROVAL	MAR 9/12	KJM

SCALE 1:1250

DESIGN	KJM
CHECKED	MAB
DRAWN	RCH
CHECKED	KJM
APPROVED	MAB

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER — K. J. MURPHY 100123021 — AUG.17/12 — PROVINCE OF ONTARIO

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CITY OF OTTAWA
FERNBANK CROSSING

SANITARY DRAINAGE AREA PLAN PHASE 1 & 2

PROJECT No. 108180-10
REV # 3
DRAWING No. 108180-SAN1

PLANB1.DWG - 1000mmx707mm

Fernbank Crossing - Sanitary Sewer Design Sheet

FLOW ALLOTED FROM BLOCK 203

AREA			RESIDENTIAL												ICI				INFILTRATION				PIPE					
			SINGLES		TOWNS				MIXED USE		TOTAL																	
ID	From	To	Units	Pop.	Units	Pop.	Area	Pop.	Net Area (ha)	Pop.	Pop.	Accum. Pop.	Peak Factor	Peak Flow (l/s)	Commercial Area (ha)	Institutional Area (ha)	Accum. Area (ha)	Peak Flow (l/s)	Total Area (ha)	Accum. Area (ha)	Infilt. Flow (l/s)	**Total Flow (l/s)**	Size (mm)	Slope (%)	Length (m)	Capacity (l/s)	Full Flow Vel. (m/s)	Q/Q_{full} (%)
Outlet 400																												
4-1	410	408	0	0.0	9	24.3	0.0	0.0	0.00	0.0	24.3	24.3	4.0	0.4	0.00	0.00	0.00	0.0	0.38	0.38	0.1	0.5	200	0.65	69.3	27.6	0.85	1.8%
4-2	408	**406**	0	0.0	9	24.3	0.0	0.0	0.00	0.0	24.3	48.6	4.0	0.8	0.00	0.00	0.00	0.0	0.37	0.75	0.2	1.0	200	0.35	82.0	20.2	0.62	4.9%
4-3	406A	**406**	0	0.0	0	0.0	0.0	0.0	1.70	137.0	137.0	137.0	4.0	2.2	0.85	0.00	0.85	0.5	2.00	2.00	0.6	3.3	250	0.25	11.0	31.0	0.61	10.6%
4-4	**406**	404	0	0.0	6	16.2	0.0	0.0	0.00	0.0	16.2	201.8	4.0	3.3	0.00	0.00	0.85	0.5	0.29	3.04	0.9	4.6	250	0.25	82.8	31.0	0.61	14.9%
4-5	404	**402**	0	0.0	12	32.4	0.0	0.0	0.00	0.0	32.4	234.2	4.0	3.8	0.00	0.00	0.85	0.5	0.41	3.45	1.0	5.3	250	0.25	80.5	31.0	0.61	17.0%
4-6	402A	**402**	0	0.0	0	0.0	1.1	183.3	0.00	0.0	183.3	183.3	4.0	3.0	0.00	0.00	0.00	0.0	1.14	1.14	0.3	3.3	200	0.35	11.0	20.2	0.62	16.3%
4-7	**402**	**40A**	0	0.0	11	29.7	0.0	0.0	0.00	0.0	29.7	447.2	4.0	7.2	0.00	0.00	0.85	0.5	0.39	4.98	1.4	9.2	250	0.25	81.3	31.0	0.61	29.5%
Outlet 500																												
5-1	504	502	12	40.8	0	0.0	0.0	0.0	0.00	0.0	40.8	40.8	4.0	0.7	0.00	0.00	0.00	0.0	0.74	0.74	0.2	0.9	200	0.65	87.3	27.6	0.85	3.2%
5-2	502	**41A**	17	57.8	0	0.0	0.0	0.0	0.00	0.0	57.8	98.6	4.0	1.6	0.00	0.00	0.00	0.0	0.87	1.61	0.5	2.0	200	0.32	120.0	19.4	0.60	10.6%
Outlet 600																												
6-1	612	610	3	10.2	0	0.0	0.0	0.0	0.00	0.0	10.2	10.2	4.0	0.2	0.00	0.00	0.00	0.0	0.26	0.26	0.1	0.2	200	0.65	30.6	27.6	0.85	0.9%
6-2	610	608	1	3.4	0	0.0	0.0	0.0	0.00	0.0	3.4	13.6	4.0	0.2	0.00	0.00	0.00	0.0	0.13	0.39	0.1	0.3	200	0.65	10.2	27.6	0.85	1.2%
6-3	608	**604**	14	47.6	0	0.0	0.0	0.0	0.00	0.0	47.6	61.2	4.0	1.0	0.00	0.00	0.00	0.0	0.76	1.14	0.3	1.3	200	0.32	111.8	19.4	0.60	6.8%
6-4	606	**604**	4	13.6	0	0.0	0.0	0.0	0.00	0.0	13.6	13.6	4.0	0.2	0.00	0.00	0.00	0.0	0.23	0.23	0.1	0.3	200	0.65	42.0	27.6	0.85	1.0%
6-5	**604**	602	12	40.8	0	0.0	0.0	0.0	0.00	0.0	40.8	115.6	4.0	1.9	0.00	0.00	0.00	0.0	0.60	1.97	0.6	2.4	200	0.32	80.5	19.4	0.60	12.5%
6-6	602	**42A**	12	40.8	0	0.0	0.0	0.0	0.00	0.0	40.8	156.4	4.0	2.5	0.00	0.00	0.00	0.0	0.61	2.58	0.7	3.3	200	0.32	81.6	19.4	0.60	16.8%
Outlet 700																												
7-1	800	798	10	34.0	0	0.0	0.0	0.0	0.00	0.0	34.0	34.0	4.0	0.6	0.00	0.00	0.00	0.0	0.61	0.61	0.2	0.7	200	0.65	69.9	27.6	0.85	2.6%
7-2	798	796	1	3.4	0	0.0	0.0	0.0	0.00	0.0	3.4	37.4	4.0	0.6	0.00	0.00	0.00	0.0	0.14	0.75	0.2	0.8	200	0.65	13.4	27.6	0.85	3.0%
7-3	796	**44A**	5	17.0	0	0.0	0.0	0.0	0.00	0.0	17.0	54.4	4.0	0.9	0.00	0.00	0.00	0.0	0.39	1.14	0.3	1.2	200	0.35	71.3	20.2	0.62	5.9%
7-4	42B	43A	4	13.6	0	0.0	0.0	0.0	0.00	0.0	13.6	13.6	4.0	0.2	0.00	0.00	0.00	0.0	0.28	0.28	0.1	0.3	200	0.65	36.5	27.6	0.85	1.1%
7-5	43A	**44A**	6	20.4	0	0.0	0.0	0.0	0.00	0.0	20.4	34.0	4.0	0.6	0.00	0.00	0.00	0.0	0.38	0.66	0.2	0.7	200	0.35	65.0	20.2	0.62	3.6%
7-6	**44A**	**45A**	5	17.0	0	0.0	0.0	0.0	0.00	0.0	17.0	105.4	4.0	1.7	0.00	0.00	0.00	0.0	0.37	2.17	0.6	2.3	200	0.35	82.1	20.2	0.62	11.4%
7-7	788A	788	0	0.0	0	0.0	0.0	0.0	2.68	217.0	217.0	217.0	4.0	3.5	1.34	0.00	1.34	0.8	3.31	3.31	0.9	5.3	250	0.25	11.0	31.0	0.61	17.0%
7-8	788	786	0	0.0	14	37.8	0.0	0.0	0.00	0.0	37.8	254.8	4.0	4.1	0.00	0.00	1.34	0.8	0.57	3.89	1.1	6.0	250	0.25	119.0	31.0	0.61	19.4%
7-9	786	**782**	0	0.0	9	24.3	0.0	0.0	0.00	0.0	24.3	279.1	4.0	4.5	0.00	0.00	1.34	0.8	0.36	4.25	1.2	6.5	250	0.25	82.0	31.0	0.61	21.0%
7-10	784	**782**	4	13.6	0	0.0	0.0	0.0	0.00	0.0	13.6	13.6	4.0	0.2	0.00	0.00	0.00	0.0	0.30	0.30	0.1	0.3	200	1.00	50.2	34.2	1.06	0.9%
7-11	**782**	780	13	44.2	0	0.0	0.0	0.0	0.00	0.0	44.2	336.9	4.0	5.5	0.00	0.00	1.34	0.8	0.80	5.35	1.5	7.8	250	0.75	117.8	53.7	1.06	14.5%
7-12	780	**45A**	19	64.6	0	0.0	0.0	0.0	0.00	0.0	64.6	401.5	4.0	6.5	0.00	0.00	1.34	0.8	0.93	6.28	1.8	9.1	250	0.25	120.0	31.0	0.61	29.3%
7-13	**45A**	**46A**	5	17.0	0	0.0	0.0	0.0	0.00	0.0	17.0	523.9	4.0	8.4	0.00	0.00	1.34	0.8	0.36	8.81	2.5	11.7	250	0.25	82.0	31.0	0.61	37.7%

INFORMATION FROM FERNBANK PHASE 1 & 2 SERVICING DESIGN BRIEF.

NOVATECH ENGINEERING CONSULTANTS LTD.

Fernbank Crossing - Sanitary Sewer Design Sheet

AREA			RESIDENTIAL												ICI				INFILTRATION				PIPE					
			SINGLES		TOWNS				MIXED USE		TOTAL																	
ID	From	To	Units	Pop.	Units	Pop.	Area	Pop.	Net Area (ha)	Pop.	Pop.	Accum. Pop.	Peak Factor	Peak Flow (l/s)	Commercial Area (ha)	Institutional Area (ha)	Accum. Area (ha)	Peak Flow (l/s)	Total Area (ha)	Accum. Area (ha)	Infilt. Flow (l/s)	**Total Flow (l/s)**	Size (mm)	Slope (%)	Length (m)	Capacity (l/s)	Full Flow Vel. (m/s)	Q/Q_{full} (%)
Future		**744**	101	343.4	0	0.0	2.4	382.3	0.00	0.0	725.7	725.7	3.9	11.4	0.00	2.90	2.90	1.8	11.41	11.41	3.2	16.4						
7-29	752A	752	0	0.0	0	0.0	0.0	0.0	1.45	117.0	117.0	117.0	4.0	1.9	0.73	0.00	0.73	0.4	1.58	1.58	0.4	2.8	250	0.30	11.0	34.0	0.67	8.2%
7-30	752	750	0	0.0	8	21.6	0.0	0.0	0.00	0.0	21.6	138.6	4.0	2.2	0.00	0.00	0.73	0.4	0.72	2.30	0.6	3.3	250	0.30	67.0	34.0	0.67	9.8%
7-31	750	748	0	0.0	8	21.6	0.0	0.0	0.00	0.0	21.6	160.2	4.0	2.6	0.00	0.00	0.73	0.4	0.44	2.74	0.8	3.8	250	0.30	51.6	34.0	0.67	11.2%
7-32	748	**746**	0	0.0	4	10.8	0.0	0.0	0.00	0.0	10.8	171.0	4.0	2.8	0.00	0.00	0.73	0.4	0.23	2.97	0.8	4.0	250	0.30	55.9	34.0	0.67	11.9%
7-33	746A	**746**	0	0.0	0	0.0	1.4	231.7	0.00	0.0	231.7	231.7	4.0	3.8	0.00	0.00	0.00	0.0	1.43	1.43	0.4	4.2	200	0.35	10.2	20.2	0.62	20.5%
7-34	**746**	**744**	0	0.0	4	10.8	0.0	0.0	0.00	0.0	10.8	413.5	4.0	6.7	0.00	0.00	0.73	0.4	0.40	4.80	1.3	8.5	250	0.30	69.9	34.0	0.67	25.0%
7-35	**744**	742	3	10.2	0	0.0	0.0	0.0	0.00	0.0	10.2	1149.3	3.8	17.5	0.00	0.00	3.76	2.3	0.33	16.54	4.6	24.4	250	0.25	78.1	31.0	0.61	78.7%
7-36	742	**726**	2	6.8	0	0.0	0.0	0.0	0.00	0.0	6.8	1156.1	3.8	17.6	0.00	0.00	3.76	2.3	0.29	16.83	4.7	24.6	250	0.25	78.1	31.0	0.61	79.3%
Future		**726**	69	234.6	0	0.0	0.0	0.0	0.00	0.0	234.6	234.6	4.0	3.8	0.00	0.00	0.00	0.0	4.40	4.40	1.2	5.0						
7-44	726A	**726**	0	0.0	0	0.0	0.0	0.0	0.00	0.0	0.0	0.0	4.0	0.0	0.00	2.12	2.12	1.3	2.12	2.12	0.6	1.9	250	0.25	15.0	31.0	0.61	6.1%
7-45	**726**	**724**	0	0.0	0	0.0	0.0	0.0	0.00	0.0	0.0	1390.7	3.7	20.9	0.00	0.00	5.87	3.6	0.18	23.53	6.6	31.0	300	0.20	71.4	45.1	0.62	68.7%
7-46	**724A**	**724**	0	0.0	0	0.0	0.0	0.0	0.00	0.0	0.0	0.0	4.0	0.0	0.00	2.83	2.83	1.7	2.83	2.83	0.8	2.5	250	0.25	15.0	31.0	0.61	8.1%
7-47	**724**	**710**	0	0.0	0	0.0	0.0	0.0	0.00	0.0	0.0	1390.7	3.7	20.9	0.00	0.00	8.70	5.3	0.11	26.47	7.4	33.6	300	0.20	87.2	45.1	0.62	74.4%
7-48	722	720	5	17.0	0	0.0	0.0	0.0	0.00	0.0	17.0	17.0	4.0	0.3	0.00	0.00	0.00	0.0	0.46	0.46	0.1	0.4	200	0.65	57.6	27.6	0.85	1.5%
7-49	720	718	1	3.4	0	0.0	0.0	0.0	0.00	0.0	3.4	20.4	4.0	0.3	0.00	0.00	0.00	0.0	0.14	0.60	0.2	0.5	200	0.65	7.9	27.6	0.85	1.8%
7-50	718	716	10	34.0	0	0.0	0.0	0.0	0.00	0.0	34.0	54.4	4.0	0.9	0.00	0.00	0.00	0.0	0.60	1.20	0.3	1.2	200	0.35	75.7	20.2	0.62	6.0%
7-51	716	**712**	9	30.6	0	0.0	0.0	0.0	0.00	0.0	30.6	85.0	4.0	1.4	0.00	0.00	0.00	0.0	0.54	1.74	0.5	1.9	200	0.35	73.1	20.2	0.62	9.2%
7-52	714	**712**	4	13.6	0	0.0	0.0	0.0	0.00	0.0	13.6	13.6	4.0	0.2	0.00	0.00	0.00	0.0	0.23	0.23	0.1	0.3	200	0.65	39.4	27.6	0.85	1.0%
7-53	**712**	**710**	4	13.6	0	0.0	0.0	0.0	0.00	0.0	13.6	112.2	4.0	1.8	0.00	0.00	0.00	0.0	0.28	2.25	0.6	2.4	200	0.35	64.1	20.2	0.62	12.1%
7-54	**710**	708	5	17.0	0	0.0	0.0	0.0	0.00	0.0	17.0	1519.9	3.7	22.6	0.00	0.00	8.70	5.3	0.40	29.11	8.2	36.1	300	0.20	75.8	45.1	0.62	79.9%
	708	706	0	0.0	0	0.0	0.0	0.0	0.00	0.0	0.0	1519.9	3.7	22.6	0.00	0.00	8.70	5.3	0.00	29.11	8.2	36.1	300	0.20	6.6	45.1	0.62	79.9%
7-55	706	704	8	27.2	0	0.0	0.0	0.0	0.00	0.0	27.2	1547.1	3.7	23.0	0.00	0.00	8.70	5.3	0.60	29.71	8.3	36.6	300	0.20	65.7	45.1	0.62	81.1%
	704	702	0	0.0	0	0.0	0.0	0.0	0.00	0.0	0.0	1547.1	3.7	23.0	0.00	0.00	8.70	5.3	0.00	29.71	8.3	36.6	300	0.20	8.7	45.1	0.62	81.1%
7-56	702	**46A**	9	30.6	0	0.0	0.0	0.0	0.00	0.0	30.6	1577.7	3.7	23.4	0.00	0.00	8.70	5.3	0.58	30.29	8.5	37.2	300	0.20	69.6	45.1	0.62	82.4%
	46A	**31A**	3	10.2	0	0.0	0.0	0.0	0.00	0.0	10.2	2111.8	3.6	30.5	0.00	0.00	10.04	6.1	0.29	39.39	11.0	47.6	300	0.65	82.0	81.3	1.11	58.6%

Design Parameters:

Avg Flow/Person =	350	l/day
Comm./Inst. Flow =	35000	l/ha/day
Infiltration =	0.28	l/s/ha
Pipe Friction n =	0.013	

Residential Peaking Factor = Harmon Equation (max 4, min 2)

Peaking Factor Comm./Inst. 1.5

Population Density:

	ppl/unit	units/net ha
Mixed Use	1.80	90
Singles	3.40	
Towns	2.70	60

Project: Abbott-Fernbank (108180)

Designed: KJM

Checked: MAB

Date: August 17, 2012

INFORMATION FROM FERNBANK CROSSING PHASE 1 & 2 DEVELOPMENT

NOVATECH ENGINEERING CONSULTANTS LTD.

5000 Robert Grant - Tower 'A' and Podium
POST-DEVELOPMENT SANITARY FLOWS

Residential Flows	**Post-Development**	
Total Number of Units	113	
Average Number of Persons per Unit	1.8	
Design Population	204	
Average Daily Flow per Resident	280	L/c/day
Peak Factor (Harmon Formula)	3.52	
Peak Residential Flow	**2.32**	**L/s**
Commercial Flows		
Ground Floor Area	0	m^2
Average Commercial Daily Demand	2.8	$L/m^2/day$
Peaking Factor	1.5	
Peak Commercial Flows	**0.00**	**L/s**
Extraneous Flow		
Site Area	0.68	ha
Infiltration Allowance	0.33	L/s/ha
Peak Extraneous Flow	**0.22**	**L/s**
Total Peak Sanitary Flow	**2.5**	**L/s**

5000 Robert Grant - Tower 'B' and Podium
POST-DEVELOPMENT SANITARY FLOWS

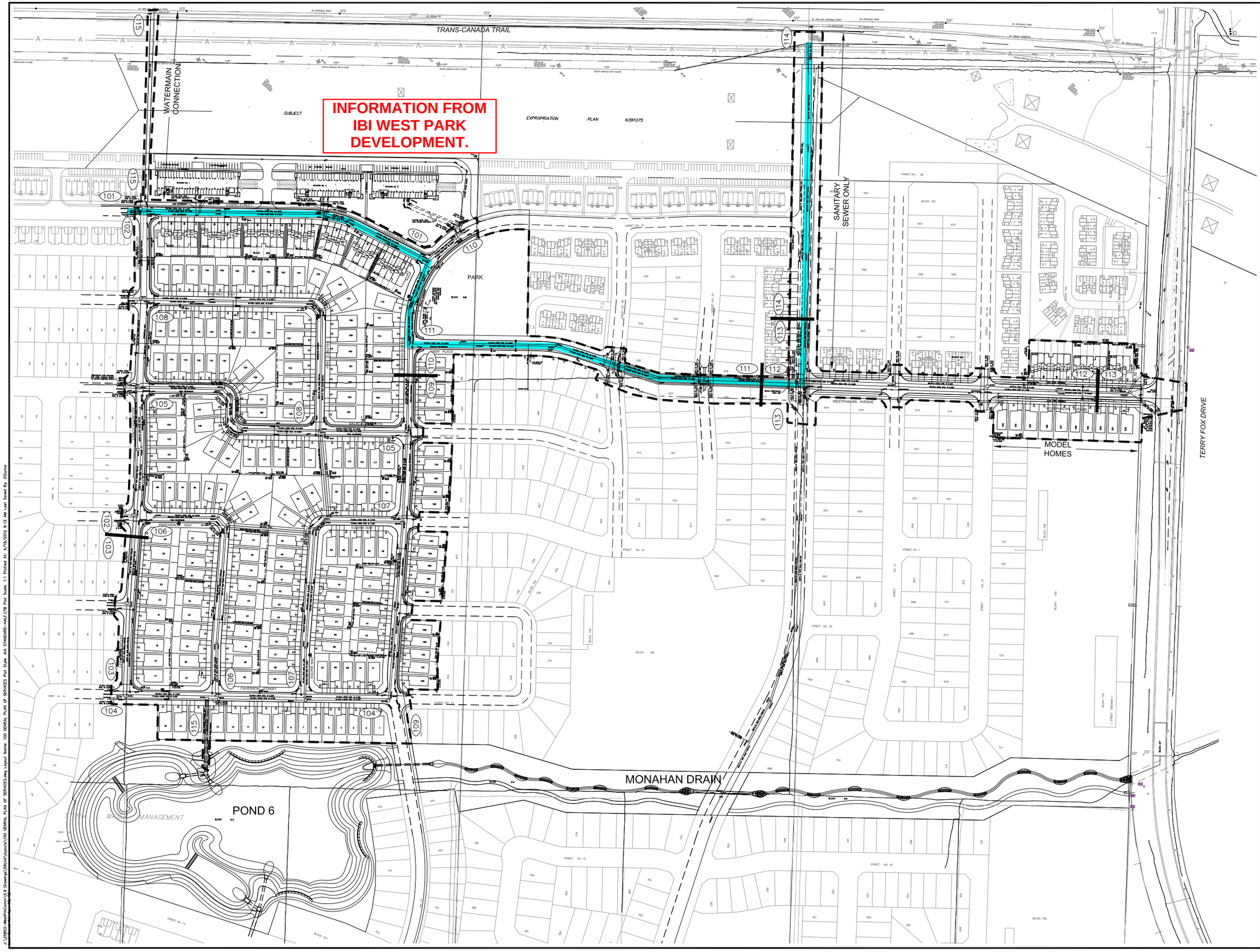
Residential Flows	**Post-Development**	
Total Number of Units	153	
Average Number of Persons per Unit	1.8	
Design Population	276	
Average Daily Flow per Resident	280	L/c/day
Peak Factor (Harmon Formula)	3.47	
Peak Residential Flow	**3.11**	**L/s**
Commercial Flows		
Ground Floor Area	0	m^2
Average Commercial Daily Demand	2.8	$L/m^2/day$
Peaking Factor	1.5	
Peak Commercial Flows	**0.00**	**L/s**
Extraneous Flow		
Site Area	0.67	ha
Infiltration Allowance	0.33	L/s/ha
Peak Extraneous Flow	**0.22**	**L/s**
Total Peak Sanitary Flow	**3.3**	**L/s**

5000 Robert Grant - Tower 'C' and Podium
POST-DEVELOPMENT SANITARY FLOWS

Residential Flows	**Post-Development**	
Total Number of Units	238	
Average Number of Persons per Unit	1.8	
Design Population	429	
Average Daily Flow per Resident	280	L/c/day
Peak Factor (Harmon Formula)	3.41	
Peak Residential Flow	**4.74**	**L/s**
Commercial Flows		
Ground Floor Area	157	m^2
Average Commercial Daily Demand	2.8	$L/m^2/day$
Peaking Factor	1.5	
Peak Commercial Flows	**0.01**	**L/s**
Extraneous Flow		
Site Area	0.67	ha
Infiltration Allowance	0.33	L/s/ha
Peak Extraneous Flow	**0.22**	**L/s**
Total Peak Sanitary Flow	**5.0**	**L/s**

5000 Robert Grant - Towers A + B + C and Podium
SUBJECT SITE: SANITARY FLOW SUMMARY TABLE

Area	**Allowable (to Livery)** Peak Flow (L/s)	**Available Capacity RGA 250 Sewer** (L/s)	**Post-Development** Peak Flow (L/s)
Overall Site	3.3	22.2	-
Tower A	-	-	2.5
Tower B	-	-	3.3
Tower C	-	-	5.0
Totals	**3.3**	**22.2**	**10.8**



LEGEND:

- SINGLE SERVICE LOCATION
- DOUBLE SERVICE LOCATION
- STACKED TOWNHOUSE DOUBLE SERVICE
- DRIVEWAY LOCATION
- CB — STANDARD STREET CATCHBASIN *
- RYCB — REARYARD CB C/W TOP OF GRATE *
- TECB — ELBOW OR TEE REARYARD CB C/W TOP OF GRATE
- SC — SINGLE CONNECTION BETWEEN PAIRS OF STREET CATCHBASINS
- BARRIER CURB
- MOUNTABLE CURB
- PHASE 1 LIMITS
- DEPRESSED CURB
- * REFER TO CATCHBASIN DATA TABLE ON DRAWING 25853-DETAILS 1 FOR TOP OF GRATE, LEAD INVERT, PIPE SIZE AND INLET CONTROL DEVICE INFORMATION
- 101 — DRAWING NUMBER
- MAIL BOX C/W 2.0m DEPRESSED CURB

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5			
4	ISSUED FOR MOE APPROVAL	LME	12:04:19
3	ISSUED FOR SUBMISSION #3	LME	12:03:29
2	ISSUED FOR SUBMISSION #2	LME	12:01:27
1	ISSUED FOR SUBMISSION #1	LME	11:09:22

IBI GROUP
333 Preston Street
Tower 1, Suite 400
Ottawa, Ontario
Canada K1S 5N4
Tel (613)225-1311
Fax (613)225-9868

Project Title

WEST PARK
MONARCH - CARDEL
PHASE 1

LICENSED PROFESSIONAL ENGINEER
L. M. ERION
PROVINCE OF ONTARIO

N

Drawing Title

GENERAL PLAN
OF SERVICES

Scale: 1 : 1500

Design	Date
LME	SEPT 2011
Drawn	Checked
D.D.	RWW
Project No.	Drawing No.
25853	100

J:\25853-WestPark\Comm\5.0 Drawings\5.0civil\Layouts\100 GENERAL PLAN OF SERVICES.dwg Layout Name: 100 GENERAL PLAN OF SERVICES Plot Style: AIA STANDARD-HALF.CTB Plot Scale: 1:1 Plotted At: 4/19/2012 9:12 AM Last Saved By: DSturno

INFORMATION FROM IBI WEST PARK DEVELOPMENT

IBI Group
333 Preston Street - Suite 400
Ottawa, Ontario
K1S 5N4

SANITARY SEWER DESIGN SHEET

JOB #: 25853-5.7
DATE PRINTED: 01-May-12
DESIGN: LE

PROJECT: WEST PARK IN FERNBANK - PHASE 1
DEVELOPER: MONARCH CORPORATION

FLOW FROM FERNBANK CROSSING LIVERY STREET

LOCATION			INDIVIDUAL				CUM. RES. FLOW			ICI				INFILTRATION			TOTAL	PROPOSED SEWER							FLOW DEPTH	
STREET	FROM MH	TO MH	RESID. UNITS Sngls	Towns Semis	Multi Res	POP.	POP.	PEAK FACT.	PEAK FLOW (l/s)	COMM. AREA (Ha)	INSTIT. AREA (Ha)	CUM. AREA (Ha)	PEAK FLOW (l/s)	INCR. AREA (Ha)	CUM. AREA (Ha)	FLOW (l/s)	DESIGN FLOW (l/s)	CAP. l/s	PIPE (mm)	LGTH. (m)	SLOPE %	VEL. (full) m/s	AVAIL. CAP. (l/s)	AVAIL. CAP. (%)	Flow qa/Qa	Depth da/Df
Private Site	211 A	100 A			45	103.5	104	4.00	1.70					0.72	0.72	0.20	**1.90**	**26.49**	200	8.5	0.60	0.82	24.60	93%		
Tapadero Avenue	100 A	101 A				0.0	104	4.00	1.70					0.09	0.81	0.23	**1.92**	**26.49**	200	41.0	0.60	0.82	24.57	93%		
External	Stub	40 A				468.1	468	3.99	7.66					5.05	5.05	1.41	**9.07**	**31.01**	250	15.0	0.25	0.61	21.94	71%	0.29	0.37
Livery Street	40 A	90 A		6		16.2	484	3.98	7.91					0.22	5.27	1.48	**9.38**	**70.74**	250	51.1	1.30	1.40	61.36	87%	0.13	0.25
Private Site	240 A	90 A			56	128.8	129	4.00	2.11					0.49	0.49	0.14	**2.25**	**34.21**	200	9.5	1.00	1.06	31.96	93%		
Livery Street	90 A	91 A		16		43.2	656	3.91	10.52					0.55	6.31	1.77	**12.29**	**39.22**	250	111.5	0.40	0.77	26.93	69%	0.31	0.39
Private Site	241 A	91 A			45	103.5	104	4.00	1.70					0.43	0.43	0.12	**1.82**	**34.21**	200	9.5	1.00	1.06	32.40	95%		
Livery Street	91 A	92 A		3		8.1	768	3.87	12.19					0.11	6.85	1.92	**14.11**	**62.02**	250	27.0	1.00	1.22	47.92	77%	0.23	0.33
	92 A	101 A		10		27.0	795	3.86	12.59					0.39	7.24	2.03	**14.61**	**53.71**	250	83.0	0.75	1.06	39.10	73%	0.27	0.35
Tapadero Avenue	101 A	102 A				0.0	898	3.83	14.11					0.07	8.12	2.27	**16.38**	**34.00**	250	46.2	0.30	0.67	17.62	52%	0.48	0.49
	102 A	103 A	3			10.2	909	3.83	14.25					0.22	8.34	2.34	**16.59**	**34.00**	250	33.0	0.30	0.67	17.41	51%	0.49	0.49
Asturcon Street	42 B	43 A	4			13.6	14	4.00	0.22					0.28	0.28	0.08	**0.30**	**27.60**	200	36.5	0.65	0.85	27.30	99%		
Asturcon Street	43 A	44 A	7			23.8	37	4.00	0.61					0.38	0.66	0.18	**0.80**	**20.24**	200	65.0	0.35	0.62	19.44	96%		
External	Stub	44 A				52.8	53	4.00	0.87					1.14	1.14	0.32	**1.19**	**20.24**	200	15.0	0.35	0.62	19.05	94%		
Asturcon Street	44 A	45 A	5			17.0	107	4.00	1.76					0.36	2.16	0.60	**2.36**	**20.24**	200	82.2	0.35	0.62	17.87	88%		
External	Stub	45 A				412.1	412	4.00	6.76	1.40		1.40	0.85	6.39	6.39	1.79	**9.40**	**31.01**	250	15.0	0.25	0.61	21.61	70%	0.30	0.38
Asturcon Street	45 A	46 A	5			17.0	536	3.96	8.70			1.40	0.85	0.37	8.92	2.50	**12.05**	**31.01**	250	82.0	0.25	0.61	18.96	61%	0.39	0.43
External	Stub	46 A				1586.4	1586	3.66	23.82	0.73	5.15	5.88	3.57	28.97	28.97	8.11	**35.50**	**45.09**	300	15.0	0.20	0.62	9.59	21%	0.79	0.67
Cavesson Street	46 A	31 A	3			10.2	2133	3.56	31.17			7.28	4.42	0.29	38.18	10.69	**46.28**	**127.18**	300	82.0	1.59	1.74	80.90	64%	0.36	0.41
Percheron Way	50 A	51 A	6			20.4	20	4.00	0.33					0.38	0.38	0.11	**0.44**	**28.64**	200	74.4	0.70	0.88	28.19	98%		
	51 A	52 A	2			6.8	27	4.00	0.45					0.21	0.59	0.17	**0.61**	**61.68**	200	10.7	3.25	1.90	61.07	99%		
	52 A	53 A	15			51.0	78	4.00	1.28					0.83	1.42	0.40	**1.68**	**22.96**	200	107.8	0.45	0.71	21.28	93%		
	53 A	31 A	6			20.4	99	4.00	1.62					0.37	1.79	0.50	**2.12**	**42.61**	200	48.6	1.55	1.31	40.49	95%		
Cavesson Street	31 A	30 A	6			20.4	2252	3.55	32.73			7.28	4.42	0.39	40.36	11.30	**48.46**	**59.69**	300	82.0	0.35	0.82	11.23	19%	0.81	0.68

Where Q = average daily per capita flow (350 l/cap.d.) or (0.0041l/sec./cap)
I = Unit of peak extraneous flow (0.28 l/sec/ha)
M = Residential Peaking factor = Harmon Peaking Factor , M = 1+(14/(4+P^0.5)) , where P = population in thousa
Q(p) = Peak population flow (l/s)
Q(i) = peak extraneous flow (l/s)
Commercial, Office Space and School - Average flow 35,000 l/day/ha (0.405 l/s/ha) with Peaking Factor = 1.5

Population Density

Singles	**3.4**
Towns/Semis	**2.7**
Multi Residential	

IBI Group
333 Preston Street - Suite 400
Ottawa, Ontario
K1S 5N4

SANITARY SEWER DESIGN SHEET

PROJECT: WEST PARK IN FERNBANK - PHASE 1
DEVELOPER: MONARCH CORPORATION

JOB #: 25853-5.7
DATE PRINTED: 01-May-12
DESIGN: LE

LOCATION			INDIVIDUAL				CUM. RES. FLOW			ICI				INFILTRATION			TOTAL	PROPOSED SEWER							FLOW DEPTH	
STREET	FROM MH	TO MH	RESID. UNITS Sngls	Towns Semis	Multi Res	POP.	POP.	PEAK FACT.	PEAK FLOW (l/s)	COMM. AREA (Ha)	INSTIT. AREA (Ha)	CUM. AREA (Ha)	PEAK FLOW (l/s)	INCR. AREA (Ha)	CUM. AREA (Ha)	FLOW (l/s)	DESIGN FLOW (l/s)	CAP. l/s	PIPE (mm)	LGTH. (m)	SLOPE %	VEL. (full) m/s	AVAIL. CAP. (l/s)	AVAIL. CAP. (%)	Flow qa/Qa	Depth da/Df
Equine Way	60 A	61 A	3			10.2	10	4.00	0.17					0.23	0.23	0.06	**0.23**	**34.21**	200	12.0	1.00	1.06	33.98	99%		
	61 A	62 A	15			51.0	61	4.00	1.00					0.77	1.00	0.28	**1.28**	**21.63**	200	109.8	0.40	0.67	20.35	94%		
	62 A	30 A	4			13.6	75	4.00	1.23					0.24	1.24	0.35	**1.57**	**37.49**	200	45.4	1.20	1.16	35.91	96%		
Cavesson Street	30 A	107 A	12			40.8	2368	3.53	34.24			7.28	4.42	0.62	42.22	11.82	**50.49**	**63.77**	300	79.4	0.40	0.87	13.29	21%	0.79	0.66
Tapadero Avenue	107 A	106 A	9			30.6	2398	3.52	34.64			7.28	4.42	0.50	42.72	11.96	**51.02**	**70.80**	375	82.2	0.15	0.62	19.77	28%	0.72	0.62
	106 B	105 A	8			27.2	2425	3.52	34.99			7.28	4.42	0.45	43.17	12.09	**51.50**	**70.80**	375	82.2	0.15	0.62	19.30	27%	0.73	0.63
Equine Way	60 A	105 A	10			34.0	34	4.00	0.56					0.55	0.55	0.15	**0.71**	**56.23**	200	73.9	2.70	1.73	55.52	99%		
Tapadero Avenue	105 A	104 A	5			17.0	2476	3.51	35.66			7.28	4.42	0.34	44.06	12.34	**52.41**	**70.80**	375	82.1	0.15	0.62	18.39	26%	0.74	0.63
External	Stub	42 A				151.8	152	4.00	2.49					2.59	2.59	0.73	**3.21**	**20.24**	200	15.0	0.35	0.62	17.02	84%		
Balikun Heights	42 A	70 A	6			20.4	172	4.00	2.82					0.37	2.96	0.83	**3.65**	**21.63**	200	76.2	0.40	0.67	17.98	83%		
	70 A	71 A	2			6.8	179	4.00	2.94					0.18	3.14	0.88	**3.81**	**21.63**	200	11.5	0.40	0.67	17.82	82%		
	71 A	72 A	3			10.2	189	4.00	3.10					0.18	3.32	0.93	**4.03**	**21.63**	200	19.4	0.40	0.67	17.60	81%		
	72 A	73 A	3			10.2	199	4.00	3.27					0.27	3.59	1.01	**4.28**	**21.63**	200	13.5	0.40	0.67	17.35	80%		
	73 A	74 A	5			17.0	216	4.00	3.55					0.35	3.94	1.10	**4.65**	**28.64**	200	72.5	0.70	0.88	23.98	84%		
External	Stub	41 A				95.7	96	4.00	1.57					1.61	1.61	0.45	**2.02**	**20.24**	200	15.0	0.35	0.62	18.22	90%		
Palfrey Way	41 A	80 A	7			23.8	120	4.00	1.96					0.39	2.00	0.56	**2.52**	**30.61**	200	60.0	0.80	0.94	28.09	92%		
	80 A	81 A	13			44.2	164	4.00	2.68					0.76	2.76	0.77	**3.46**	**21.63**	200	95.5	0.40	0.67	18.17	84%		
	81 B	82 A	1			3.4	167	4.00	2.74					0.09	2.85	0.80	**3.54**	**54.09**	200	11.5	2.50	1.67	50.55	93%		
	82 A	74 A	15			51.0	218	4.00	3.58					0.91	3.76	1.05	**4.63**	**21.63**	200	110.2	0.40	0.67	17.00	79%		
Balikun Heights	74 A	104 A	5			17.0	452	4.00	7.40					0.36	8.06	2.26	**9.66**	**39.01**	200	82.0	1.30	1.20	29.36	75%		
Tapadero Avenue	104 A	103 A	10			34.0	2962	3.45	41.86			7.28	4.42	0.58	52.70	14.76	**61.04**	**70.80**	375	82.0	0.15	0.62	9.76	14%	0.86	0.72
Oxer Place	103 A	200 A	3			10.2	3881	3.35	53.22			7.28	4.42	0.20	61.24	17.15	**74.79**	**81.86**	375	68.5	0.20	0.72	7.07	9%	0.91	0.75
	200 A	201 A	4			13.6	3894	3.34	53.39			7.28	4.42	0.30	61.54	17.23	**75.04**	**81.86**	375	66.7	0.20	0.72	6.82	8%	0.92	0.75
	201 A	202 A	4			13.6	3908	3.34	53.55			7.28	4.42	0.28	61.82	17.31	**75.28**	**81.86**	375	57.2	0.20	0.72	6.57	8%	0.92	0.76
Street No. 26	Stub North	202 A	7	19		75.1	75	4.00	1.23					1.00	1.00	0.28	**1.51**	**41.90**	200	11.0	1.50	1.29	40.39	96%		
Street No. 26	Stub South	202 A	31			105.4	105	4.00	1.73					1.80	1.80	0.50	**2.23**	**48.38**	200	6.5	2.00	1.49	46.15	95%		
Block 205	202 A	203 A				0.0	4088	3.32	55.73			7.28	4.42		64.62	18.09	**78.25**	**91.44**	375	42.7	0.25	0.80	13.19	14%	0.86	0.72
	203 A	204 A				0.0	4088	3.32	55.73			7.28	4.42		64.62	18.09	**78.25**	**163.60**	375	40.9	0.80	1.44	85.36	52%	0.48	0.48

Where Q = average daily per capita flow (350 l/cap.d.) or (0.0041l/sec./cap)
I = Unit of peak extraneous flow (0.28 l/sec/ha)
M = Residential Peaking factor = Harmon Peaking Factor , M = 1+(14/(4+P^0.5)) , where P = population in thousa
Q(p) = Peak population flow (l/s)
Q(i) = peak extraneous flow (l/s)
Commercial, Office Space and School - Average flow 35,000 l/day/ha (0.405 l/s/ha) with Peaking Factor = 1.5

Population Density

Singles	**3.4**
Towns/Semis	**2.7**
Multi Residential	

IBI Group
333 Preston Street - Suite 400
Ottawa, Ontario
K1S 5N4

SANITARY SEWER DESIGN SHEET

PROJECT: WEST PARK IN FERNBANK - PHASE 1
DEVELOPER: MONARCH CORPORATION

JOB #: 25853-5.7
DATE PRINTED: 01-May-12
DESIGN: LE

LOCATION			INDIVIDUAL				CUM. RES. FLOW			ICI				INFILTRATION			TOTAL	PROPOSED SEWER							FLOW DEPTH	
STREET	FROM MH	TO MH	RESID. UNITS Sngls	Towns Semis	Multi Res	POP.	POP.	PEAK FACT.	PEAK FLOW (l/s)	COMM. AREA (Ha)	INSTIT. AREA (Ha)	CUM. AREA (Ha)	PEAK FLOW (l/s)	INCR. AREA (Ha)	CUM. AREA (Ha)	FLOW (l/s)	DESIGN FLOW (l/s)	CAP. l/s	PIPE (mm)	LGTH. (m)	SLOPE %	VEL. (full) m/s	AVAIL. CAP. (l/s)	AVAIL. CAP. (%)	Flow qa/Qa	Depth da/Df
Street No. 24	Stub North	204 A	15	29	46	235.1	235	4.00	3.86					3.53	3.53	0.99	**4.84**	**37.49**	200	12.0	1.20	1.16	32.64	87%		
Street No. 24	Stub South	204 A	82			278.8	279	4.00	4.57					5.09	5.09	1.43	**6.00**	**21.63**	200	10.0	0.40	0.67	15.63	72%	0.28	0.36
Block 204	204 A	205 B				0.0	4602	3.28	61.86			7.28	4.42		73.24	20.51	**86.79**	**129.29**	375	89.7	0.50	1.13	42.50	33%	0.67	0.62
Westphalian Avenue	Stub North	209 A		42		113.4	113	4.00	1.86					1.42	1.42	0.40	**2.26**	**21.63**	200	13.8	0.40	0.67	19.37	90%		
	209 A	208 A	6	9		44.7	158	4.00	2.59					0.67	2.09	0.59	**3.18**	**27.60**	200	64.9	0.65	0.85	24.42	88%		
	208 A	207 A	4	4		24.4	183	4.00	2.99					0.41	2.50	0.70	**3.69**	**45.27**	200	67.5	1.75	1.40	41.58	92%		
Street No. 28	Stub North	207 A	12	35		135.3	135	4.00	2.22					1.48	1.48	0.41	**2.63**	**34.21**	200	19.0	1.00	1.06	31.58	92%		
Street No. 21	Stub South	207 A	97			329.8	330	4.00	5.41					6.02	6.02	1.69	**7.09**	**31.01**	250	19.0	0.25	0.61	23.92	77%	0.23	0.33
Westphalian Avenue	207 A	206 A		9		24.3	672	3.90	10.76					0.38	10.38	2.91	**13.66**	**45.09**	300	82.0	0.20	0.62	31.43	70%	0.30	0.38
Street No. 28	Stub North	206 A	20			68.0	68	4.00	1.12					1.16	1.16	0.32	**1.44**	**38.27**	200	20.0	1.25	1.18	36.83	96%		
Westphalian Avenue	206 A	205 A		9		24.3	764	3.87	12.13					0.40	11.94	3.34	**15.48**	**45.09**	300	85.0	0.20	0.62	29.62	66%	0.34	0.40
Street No. 1	Stub South	205 B	27			91.8	92	4.00	1.51					0.90	0.90	0.25	**1.76**	**21.63**	200	20.0	0.40	0.67	19.87	92%		
Street No. 1	Stub North	205 B	10	15		74.5	75	4.00	1.22					1.40	1.40	0.39	**1.61**	**40.47**	200	18.0	1.40	1.25	38.86	96%		
Street No. 1	205 B	205 A				0.0	4769	3.26	63.81			7.28	4.42		75.54	21.15	**89.39**	**129.29**	375	2.5	0.50	1.13	39.90	31%	0.69	0.63
Street No. 1	Stub South	205 A	506	260	86	2620.2	2620	3.49	37.51		2.90	2.90	1.76	57.88	57.88	16.21	**55.48**	**132.98**	450	20.0	0.20	0.81	77.50	58%	0.42	0.47
Street No. 1	205 A	222 A				0.0	8153	3.04	101.69			10.18	6.18	0.30	145.66	40.78	**148.66**	**221.82**	600	120.0	0.12	0.76	73.16	33%	0.67	0.62
Street No. 1	222 A	221 A				0.0	8153	3.04	101.69			10.18	6.18	0.26	145.92	40.86	**148.73**	**221.82**	600	100.0	0.12	0.76	73.08	33%	0.67	0.62
Street No. 1	221 A	FT06				0.0	8153	3.04	101.69			10.18	6.18	0.19	146.11	40.91	**148.79**	**221.82**	600	94.0	0.12	0.76	73.03	33%	0.67	0.62

Where Q = average daily per capita flow (350 l/cap.d.) or (0.0041l/sec./cap)
I = Unit of peak extraneous flow (0.28 l/sec/ha)
M = Residential Peaking factor = Harmon Peaking Factor , M = 1+(14/(4+P^0.5)) , where P = population in thousa
Q(p) = Peak population flow (l/s)
Q(i) = peak extraneous flow (l/s)
Commercial, Office Space and School - Average flow 35,000 l/day/ha (0.405 l/s/ha) with Peaking Factor = 1.5

Population Density	
Singles	**3.4**
Towns/Semis	**2.7**
Multi Residential	**2.3**

Off-Site Sanitary Drainage Areas

5000 Robert Grant: Off-Site Townhome Development
THEORETICAL SANITARY FLOWS

Residential Flows	**Post-Development**	
Total Number of Townhomes	137	
Average Number of Persons per Townhome	2.7	
Design Population	370	
Average Daily Flow per Resident	280	L/c/day
Peak Factor (Harmon Formula)	3.43	
Peak Residential Flow	**4.11**	**L/s**
Commercial Flows		
Ground Floor Area	0	m^2
Average Commercial Daily Demand	2.8	$L/m^2/day$
Peaking Factor	1.5	
Peak Commercial Flows	**0.00**	**L/s**
Extraneous Flow		
Site Area	4.47	ha
Infiltration Allowance	0.33	L/s/ha
Peak Extraneous Flow	**1.48**	**L/s**
Total Peak Sanitary Flow	**5.6**	**L/s**

5000 Robert Grant: Off-Site Future Residential Development
THEORETICAL SANITARY FLOWS

Residential Flows	**Post-Development**	
Total Number of Units	433	
Average Number of Persons per Unit	1.8	
Design Population	780	
Average Daily Flow per Resident	280	L/c/day
Peak Factor (Harmon Formula)	3.29	
Peak Residential Flow	**8.33**	**L/s**
Commercial Flows		
Ground Floor Area	150	m^2
Average Commercial Daily Demand	2.8	$L/m^2/day$
Peaking Factor	1.5	
Peak Commercial Flows	**0.01**	**L/s**
Extraneous Flow		
Site Area	1.7	ha
Infiltration Allowance	0.33	L/s/ha
Peak Extraneous Flow	**0.56**	**L/s**
Total Peak Sanitary Flow	**8.9**	**L/s**

PROJECT #: 117151
PROJECT NAME: 5000 Robert Grant
LOCATION: Ottawa

NOVATECH
Engineers, Planners & Landscape Architects

DATE: 7/13/2023
PREPARED BY: SM
REVIEWED BY: DDB

Post-Development Sanitary Flow Calculations

Location			Residential		Commercial / Institutional		Residential Cumulative		Peak Factor		Commercial / Institutional		Residential	Infiltration		Foundation		PEAK DESIGN FLOW (l/s)	Pipe Data					
Street / Area	From	To	Population	Area (ha)	Area (ha)	Accu. Area (ha)	Pop.	Area (ha)	Res Peak Factor	Comm Peak Factor	Peak Flow (l/s)	Accu. Peak Flow	Acc. Peak Flow (l/s)	Infilt. Flow (l/s)	Accu Infil. Flow	Found. Flow (l/s)	Accu Found. Flow		Size (mm)	Slope (%)	Length (m)	Capacity (l/s)	Full Flow Vel. (m/s)	Q/Q_{full} (%)
Robert Grant Avenue	MHSA72812	MHSA72813	1198	6.17	0.02	0.02	1198	6.17	3.2	1.5	0.01	0.01	12.42	2.04	2.04	0.00	0.00	**14.5**	254	0.35	90.5	36.7	0.72	39.5%

Population includes both existing off-site townhome development area (4.47 ha) + future residential medium/high-density development parcel (1.7 ha) with average apartment units
The number of units allotted to the 1.7 ha future parcel development has been approximated based on a pro-rated area comparisson to the proposed subject site at 5000 Robert Grant Avenue

36.7 - 14.5 = **22.2 L/s** available capacity in outlet sewer

City of Ottawa Sewer Design Guidelines

Studio / 1-Bedroom Apartment Unit	1.4	persons/unit	
2-Bedroom Apartment Unit	2.1	persons/unit	
3-Bedroom Apartment Unit	3.1	persons/unit	
Average Medium / High-Density Apartment Unit	1.8	persons/unit	
Townhomes	2.7	persons/unit	
Average Domestic Flow	280	L/person/day	
Institutional / Commercial Flow	28,000	L/ha/day	
Extraneous Flows	0.33	L/s/ha	
Foundation Drain Allowance	5.0	L/s/ha	(use 5.0 L/s/ha for tributary areas < 10 ha; 3.0 L/s/ha for tributary areas >10 ha and < 100 ha; 2.0 L/s/ha for tributary areas >100 ha)
Residential Peaking Factor	Harmon Equation, Correction Factor = 0.8		
Institutional / Commercial Peaking Factor	1.5		

Notes:
The number of units has been counted from geoOttawa imagery of the recently constructed townhouse development upstream of MHSA72812.
Existing pipe information has been taken from the City of Ottawa geoOttawa website.
A foundation drain allowance would only be accounted for along those existing streets that do not have a separated storm sewer as indicated on the geoOttawa website.

APPENDIX B

Storm Drainage Areas and Sewer Capacities

INFORMATION FROM FERNBANK CROSSING PHASE 1 & 2 DEVELOPMENT STORMWATER MANAGEMENT REPORT.

STM MANHOLE TABLE	
MANHOLE ID	OBVERT
203	S=98.33 NE=98.33
205	SE=98.38 NW98.35
207	S=98.72 NW=98.68
209	SW=98.78 NW98.74
211	NW=99.01 NE=99.01
213	SW=99.33 NW=99.33 SE=99.33
215	SE=99.61
217	SW=100.05 NE=100.05
219	W=100.82 NE=100.82
221	NW=100.90 E=100.87
223	SE=101.27
227	SW=99.12 NE=99.12
229	SW=99.70 NE=99.70 NW=99.70
231	SE=100.11 SW=100.18 NW=100.11
233	SE=100.63 SW=100.68
235	SW=101.33 NE=101.33
237	NE=102.02
241	W=99.13 NE=99.13
243	NW=99.21 E=99.21
245	SE=99.65
251	SW=99.09 NE=99.09
253	SE=99.34 SW=99.34 NE=99.34
255	NE=99.63
257	S=99.68 NW=99.68
259	SW=99.78 N=99.75
261	NE=100.01
265	SW=99.45 NE=99.45
267	NE=100.01
269A	SE=99.19
271	SW=99.37 NW=99.37 NE=99.37
273	SW=99.65 NE=99.65
275	SW=99.94 SE=99.94 NE=99.94
277	SE=100.19 NW=100.19
279	NW=100.64
281	NW=100.03 NE=99.97
283	SW=100.13 SE=100.13
285	SW=100.40 NE=100.40
287	NE=100.67
301	SW=98.59 SE=98.59 NE=98.59
335	SW=98.76 SE=98.76 NE=98.76
337	SW=98.89 NE=98.89
339	SW=99.00 NE=99.00
341	SW=99.27 NW=99.27 SE=99.27 NE=99.27
361	SW=100.68 NE=100.68
363	NW=102.05 SW=102.05 SE=102.11 NE=102.05
365	NW=102.15 SW=102.15 SE=102.15
367	NW=102.24 SE=102.24
369	NW=102.34 SE=102.34
371	SE=102.69
391	NE=102.65

NORTH

KEY PLAN
N.T.S.

SITE

LEGEND

- NORTH DRAINAGE AREA (hectares)
- NORTH AREA ID
- NORTH RUN-OFF COEFFICIENT
- SOUTH DRAINAGE AREA (hectares)
- SOUTH AREA ID
- SOUTH RUN-OFF COEFFICIENT
- TRIBUTARY TO POND 6 NORTH INLET
- TRIBUTARY TO POND 6 SOUTH INLET
- PROPOSED STORM MANHOLE & SEWER WITH DIRECTION OF FLOW
- PROPOSED ROAD CATCHBASIN
- MAJOR SYSTEM FLOW ROUTE
- PONDING AREA

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED, BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

FERNBANK CROSSING
the Heart of the Community

ABBOTT-FERNBANK HOLDINGS INC.
REGIONAL
THE REGIONAL GROUP

No.	REVISION	DATE	BY
3.	ISSUED FOR APPROVAL (PHASE 1&2)	AUG 17/12	KJM
2.	ISSUED FOR APPROVAL (PHASE 1&2)	JUN 21/12	KJM
1.	ISSUED FOR APPROVAL	MAR 9/12	KJM

SCALE
1:1250
1:1250
0 10 20 30 40 50

DESIGN KJM
CHECKED MAB
DRAWN RCH
CHECKED KJM
APPROVED MAB

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER
K.J. MURPHY
100120211
AUG. 17/12
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
M.A. BISSETT
AUG. 17/12
PROVINCE OF ONTARIO

NOVATECH ENGINEERING CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada
K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email: novatech@novatech-eng.com

CITY OF OTTAWA
FERNBANK CROSSING

STORM DRAINAGE AREA PLAN
PHASE 1 & 2

PROJECT No. 108180-10
REV REV # 3
DRAWING No. 108180-STM1

Fernbank Crossing - Storm Sewer Design Sheet (Rational Method)

LOCATION			AREA											FLOW							PROPOSED SEWER							
Location	From node	To node	Mixed Use	Park N' Ride Paramedic Post Medium Block	Arterial Road ROW	Schools	Parks	Hydro Corridor	Singles Front Yards	Singles Rear Yard	Towns Front Yard	Towns Rear Yard	Total Area	Weighted Runoff Coefficient	Indivi 2.78 AR	Accum 2.78 AR	Time of Concentration	Rain Intensity (mm/hr) 5yr	Rain Intensity (mm/hr) 10yr	Peak Flow	Total Peak Flow (Q) (L/s)	Pipe	Size	Grade	Length	Capacity	Full Flow Velocity	Time of Flow	Q/Qfull
			0.80	0.80	0.90	0.60	0.40	0.20	0.65	0.55	0.70	0.60	(ha)							(L/s)		Type	(mm)	(%)	(m)	(l/s)	(m/s)	(min.)	(%)
POND 6 North Inlet																													
CRT	CRT	287						2.91					13.95	0.38	14.54	14.54	15.00	83.6		1215.2	**1215.2**								
													0.00		0.00	0.00	15.00			0.0									
1	287	285											0.00		0.00	14.54	15.00	83.6		1215.2	**2257.9**	CONC	1200	0.35	76.7	2406.2	2.06	0.62	93.8%
				0.34	3.11								3.45	0.89	8.54	8.54	10.00		122.1	1042.8									
	285	283											0.00		0.00	14.54	15.62	81.6		1186.8	**2002.6**	CONC	1200	0.35	76.7	2406.2	2.06	0.62	83.2%
													0.00		0.00	8.54	15.62		95.6	815.8									
2	283	281		1.11									1.11	0.80	2.47	17.01	16.24	79.8		1356.7	**2153.9**	CONC	1350	0.25	41.5	2784.1	1.88	0.37	77.4%
													0.00		0.00	8.54	16.24		93.4	797.2									
3	281	275	2.00										2.00	0.80	4.45	21.46	16.61	78.7		1688.9	**2475.5**	CONC	1350	0.30	11.0	3049.8	2.06	0.09	81.2%
													0.00		0.00	8.54	16.61		92.1	786.6									
4	279	277									0.20		0.20	0.70	0.39	0.39	10.00	104.2		40.6	**40.6**	PVC	250	0.65	69.8	50.0	0.99	1.18	81.1%
													0.00		0.00	0.00	10.00			0.0									
5	277	275									0.14		0.14	0.70	0.27	0.66	11.18	98.4		65.1	**65.1**	PVC	375	0.30	83.0	100.2	0.88	1.57	65.0%
													0.00		0.00	0.00	11.18			0.0									
6	275	273									0.35		0.35	0.70	0.68	22.80	16.70	78.4		1788.8	**2572.9**	CONC	1350	0.35	82.8	3294.2	2.23	0.62	78.1%
													0.00		0.00	8.54	16.70		91.8	784.1									
7	273	271									0.36		0.36	0.70	0.70	23.50	17.32	76.8		1803.9	**2571.0**	CONC	1350	0.35	80.5	3294.2	2.23	0.60	78.0%
													0.00		0.00	8.54	17.32		89.9	767.1									
8	271A	271		0.85									0.85	0.80	1.89	1.89	10.00	104.2		197.0	**197.0**	CONC	525	0.25	8.5	224.3	1.00	0.14	87.8%
													0.00		0.00	0.00	10.00			0.0									
9,10	271	**M40**									0.50		0.50	0.70	0.97	26.37	17.92	75.2		1982.2	**2733.6**	CONC	1350	0.40	82.6	3521.6	2.38	0.58	77.6%
													0.00		0.00	8.54	17.92		88.0	751.3									
11	269A	**M40**						2.91					2.91	0.20	1.62	1.62	15.00	83.6		135.2	**135.2**	CONC	450	0.25	54.5	148.7	0.91	1.00	90.9%
													0.00		0.00	0.00	15.00			0.0									
13	267	265							0.30				0.30	0.65	0.54	0.54	10.00	104.2		56.5	**56.5**	PVC	300	0.65	86.6	81.3	1.11	1.29	69.4%
													0.00		0.00	0.00	10.00			0.0									
14	265	**M41**							0.78	0.40			1.18	0.62	2.02	2.56	15.00	83.6		214.2	**214.2**	CONC	525	0.50	115.4	317.2	1.42	1.35	67.5%
													0.00		0.00	0.00	15.00			0.0									
16	261	259								0.15			0.15	0.55	0.23	0.23	15.00	83.6		19.2	**19.2**	PVC	250	0.65	34.9	50.0	0.99	0.59	38.3%
													0.00		0.00	0.00	15.00			0.0									
	259	257											0.00		0.00	0.23	15.59	81.7		18.7	**18.7**	PVC	250	0.65	10.4	50.0	0.99	0.18	37.5%
													0.00		0.00	0.00	15.59			0.0									
17	257	253							0.79				0.79	0.65	1.43	1.66	15.76	81.2		134.5	**134.5**	CONC	525	0.30	115.2	245.7	1.10	1.75	54.7%
													0.00		0.00	0.00	15.76			0.0									
18	255	253							0.19	0.15			0.34	0.61	0.57	0.57	15.00	83.6		47.9	**47.9**	PVC	300	0.65	45.3	81.3	1.11	0.68	58.8%
													0.00		0.00	0.00	15.00			0.0									
19	253	251							0.21	0.38			0.59	0.59	0.96	3.19	17.51	76.2		243.2	**243.2**	CONC	600	0.30	80.5	350.8	1.20	1.12	69.3%
													0.00		0.00	0.00	17.51			0.0									
20	251	**M42**							0.61				0.61	0.65	1.10	4.29	18.63	73.4		315.1	**315.1**	CONC	600	0.50	77.2	452.9	1.55	0.83	69.6%
													0.00		0.00	0.00	18.63			0.0									

INFORMATION FROM FERNBANK CROSSING PHASE 1 & 2 DEVELOPMENT STORMWATER MANAGEMENT REPORT.

NOVATECH ENGINEERING CONSULTANTS LTD.

Fernbank Crossing - Storm Sewer Design Sheet (Rational Method)

LOCATION			AREA											FLOW						Total Peak Flow (Q)	PROPOSED SEWER							
Location	From node	To node	Mixed Use	Park N' Ride Paramedic Post Medium Block	Arterial Road ROW	Schools	Parks	Hydro Corridor	Singles Front Yards	Singles Rear Yard	Towns Front Yard	Towns Rear Yard	Total Area	Weighted Runoff Coefficient	Indivi 2.78 AR	Accum 2.78 AR	Time of Concentration	Rain Intensity (mm/hr) 5yr	Rain Intensity (mm/hr) 10yr	Peak Flow		Pipe	Size	Grade	Length	Capacity	Full Flow Velocity	Time of Flow	Q/Qfull
			0.80	0.80	0.90	0.60	0.40	0.20	0.65	0.55	0.70	0.60	(ha)							(L/s)	(L/s)	Type	(mm)	(%)	(m)	(l/s)	(m/s)	(min.)	(%)
21	245	243								0.32			0.32	0.55	0.49	0.49	15.00	83.6		40.9	**40.9**	PVC	250	0.65	66.9	50.0	0.99	1.13	81.7%
													0.00		0.00	0.00	15.00			0.0									
	243	241							0.35				0.35	0.65	0.63	1.12	16.13	80.1		89.8	**89.8**	PVC	375	0.65	12.9	147.5	1.29	0.17	60.9%
													0.00		0.00	0.00	16.13			0.0									
22	241	**M44**							0.30	0.30			0.60	0.60	1.00	2.12	16.30	79.6		168.9	**168.9**	CONC	450	1.00	67.3	297.4	1.81	0.62	56.8%
													0.00		0.00	0.00	16.30			0.0									
24	233A	233	3.32										3.32	0.80	7.38	7.38	10.00	104.2		769.3	**769.3**	CONC	825	0.45	8.5	1004.6	1.82	0.08	76.6%
													0.00		0.00	0.00	10.00			0.0									
25	233	231									0.35		0.35	0.70	0.68	8.06	10.08	103.8		837.0	**837.0**	CONC	825	0.45	114.0	1004.6	1.82	1.04	83.3%
													0.00		0.00	0.00	10.08			0.0									
26	231	229									0.24		0.24	0.70	0.47	8.53	11.12	98.6		841.4	**841.4**	CONC	825	0.50	82.0	1058.9	1.92	0.71	79.5%
													0.00		0.00	0.00	11.12			0.0									
27	237A	237	1.58										1.58	0.80	3.51	3.51	10.00	104.2		366.1	**366.1**	CONC	600	0.50	9.0	452.9	1.55	0.10	80.8%
													0.00		0.00	0.00	10.00			0.0									
28	237	235									0.15		0.15	0.70	0.29	3.81	10.10	103.7		394.6	**394.6**	CONC	600	1.40	49.0	757.9	2.60	0.31	52.1%
													0.00		0.00	0.00	10.10			0.0									
29	235	229							0.37				0.37	0.65	0.67	4.47	10.41	102.1		456.7	**456.7**	CONC	600	1.85	88.1	871.3	2.99	0.49	52.4%
													0.00		0.00	0.00	10.41			0.0									
30	229	227							0.57				0.57	0.65	1.03	14.04	11.83	95.4		1339.2	**1339.2**	CONC	975	0.50	117.4	1653.2	2.15	0.91	81.0%
													0.00		0.00	0.00	11.83			0.0									
31	227	**M45**							0.73	0.47			1.20	0.61	2.04	16.07	15.00	83.6		1343.1	**1343.1**	CONC	975	0.65	120.0	1884.9	2.45	0.82	71.3%
													0.00		0.00	0.00	15.00			0.0									
	223	221											0.00		0.00	0.00	10.00			0.0	**0.0**	PVC	250	0.65	57.1	50.0	0.99	0.96	0.0%
													0.00		0.00	0.00	10.00			0.0									
	221	219											0.00		0.00	0.00	10.96			0.0	**0.0**	PVC	250	0.65	8.6	50.0	0.99	0.15	0.0%
													0.00		0.00	0.00	10.96			0.0									
33	219	217							0.41	0.50			0.91	0.60	1.51	1.51	15.00	83.6		125.8	**125.8**	PVC	375	1.00	76.8	182.9	1.60	0.80	68.8%
													0.00		0.00	0.00	15.00			0.0									
34	217	213							0.48				0.48	0.65	0.87	2.37	15.80	81.1		192.3	**192.3**	CONC	450	1.00	71.7	297.4	1.81	0.66	64.7%
													0.00		0.00	0.00	15.80			0.0									
35	215	213								0.41			0.41	0.55	0.63	0.63	15.00	83.6		52.4	**52.4**	PVC	300	0.65	42.6	81.3	1.11	0.64	64.4%
													0.00		0.00	0.00	15.00			0.0									
36	213	211							0.25	0.14			0.39	0.61	0.67	3.67	16.46	79.1		290.0	**290.0**	CONC	600	0.50	64.9	452.9	1.55	0.70	64.0%
													0.00		0.00	0.00	16.46			0.0									
37	211	209							0.25	0.30			0.55	0.60	0.91	4.58	17.15	77.2		353.2	**353.2**	CONC	675	0.30	78.4	480.3	1.30	1.00	73.5%
													0.00		0.00	0.00	17.15			0.0									
	209	207											0.00		0.00	4.58	18.16	74.6		341.2	**341.2**	CONC	675	0.30	8.7	480.3	1.30	0.11	71.0%
													0.00		0.00	0.00	18.16			0.0									
38	207	205							0.41	0.21			0.62	0.62	1.06	5.64	18.27	74.3		418.8	**418.8**	CONC	675	0.45	65.8	588.3	1.59	0.69	71.2%
													0.00		0.00	0.00	18.27			0.0									
	205	203											0.00		0.00	5.64	18.96	72.6		409.4	**409.4**	CONC	675	0.45	6.0	588.3	1.59	0.06	69.6%
													0.00		0.00	0.00	18.96			0.0									
	203	**M46**							0.21				0.21	0.65	0.38	6.02	19.02	72.5		436.1	**436.1**	CONC	750	0.25	66.3	580.7	1.27	0.87	75.1%
													0.00		0.00	0.00	19.02			0.0									

NOVATECH ENGINEERING CONSULTANTS LTD.

Fernbank Crossing - Storm Sewer Design Sheet (Rational Method)

LOCATION			AREA											FLOW						Total Peak Flow (Q)	PROPOSED SEWER							
Location	From node	To node	Mixed Use	Park N' Ride Paramedic Post Medium Block	Arterial Road ROW	Schools	Parks	Hydro Corridor	Singles Front Yards	Singles Rear Yard	Towns Front Yard	Towns Rear Yard	Total Area	Weighted Runoff Coefficient	Indivi 2.78 AR	Accum 2.78 AR	Time of Concentration	Rain Intensity (mm/hr) 5yr	Rain Intensity (mm/hr) 10yr	Peak Flow		Pipe	Size	Grade	Length	Capacity	Full Flow Velocity	Time of Flow	Q/Qfull
			0.80	0.80	0.90	0.60	0.40	0.20	0.65	0.55	0.70	0.60	(ha)							(L/s)	(L/s)	Type	(mm)	(%)	(m)	(l/s)	(m/s)	(min.)	(%)
South Outlet																													
107	FUT	363		5.15					3.90	1.36			10.41	0.71	20.58	20.58	20.48	69.2		1424.5	**1424.5**	CONC	1350	0.20	58.8	2490.2	1.69	0.58	57.2%
													0.00		0.00	0.00	20.48			0.0									
105	391	363							0.22				0.22	0.65	0.40	0.40	15.00	83.6		33.2	**1469.2**	CONC	1050	0.50	120.4	2014.4	2.25	0.89	72.9%
				0.64	4.13								4.13	1.02	11.76	11.76	10.00		122.1	1436.0									
101	371	369							0.42	0.09			0.51	0.63	0.90	0.90	15.00	83.6		74.9	**74.9**	PVC	375	0.65	53.5	147.5	1.29	0.69	50.8%
													0.00		0.00	0.00	15.00			0.0									
	369	367											0.00	0.00	0.00	0.90	15.69	81.4		73.0	**73.0**	CONC	450	0.20	50.9	133.0	0.81	1.05	54.9%
													0.00		0.00	0.00	15.69			0.0									
102	367	365							0.35	0.18			0.53	0.62	0.91	1.80	16.74	78.3		141.3	**141.3**	CONC	600	0.15	59.8	248.1	0.85	1.17	57.0%
													0.00		0.00	0.00	16.74			0.0									
103	365A	365		1.39									1.39	0.80	3.09	3.09	10.00	104.2		322.1	**322.1**	CONC	600	0.30	8.7	350.8	1.20	0.12	91.8%
													0.00		0.00	0.00	10.00			0.0									
104	365	363							0.18	0.08			0.26	0.62	0.45	5.34	17.91	75.2		401.8	**401.8**	CONC	825	0.15	66.1	580.0	1.05	1.05	69.3%
													0.00		0.00	0.00	17.91			0.0									
108	363	361							0.20				0.20	0.65	0.36	6.10	20.48	69.2		422.4	**1374.6**	CONC	1350	1.74	78.6	7344.9	4.97	0.26	18.7%
													0.00		0.00	11.76	20.48		81.0	952.2									
109	361	341							0.34	0.36			0.70	0.60	1.16	7.27	20.74	68.7		499.0	**1443.6**	CONC	1350	1.74	81.1	7344.9	4.97	0.27	19.7%
													0.00		0.00	11.76	20.74		80.3	944.6									
111	FUT	341							3.23	1.67			4.90	0.62	8.39	8.39	19.28	71.9		603.1	**603.1**	CONC	825	1.88	86.2	2053.3	3.72	0.39	29.4%
													0.00		0.00	0.00	19.28			0.0									
110	341A	341				2.12							2.12	0.60	3.54	3.54	10.00	104.2		368.4	**368.4**	CONC	675	0.25	12.5	438.5	1.19	0.18	84.0%
													0.00		0.00	0.00	10.00			0.0									
112	341	339							0.18				0.18	0.65	0.33	19.52	21.01	68.1		1329.2	**2266.1**	CONC	1650	0.40	67.8	6013.7	2.72	0.41	37.7%
													0.00		0.00	11.76	21.01		79.7	936.8									
113	339	337							0.11				0.11	0.65	0.20	19.72	21.43	67.3		1326.2	**2251.5**	CONC	1800	0.25	45.2	5995.9	2.28	0.33	37.6%
													0.00		0.00	11.76	21.43		78.7	925.3									
114	337	335							0.29				0.29	0.65	0.52	20.24	21.76	66.6		1348.3	**2264.6**	CONC	1800	0.25	50.8	5995.9	2.28	0.37	37.8%
													0.00		0.00	11.76	21.76		77.9	916.3									
115	335A	335				2.83							2.83	0.60	4.72	4.72	10.00	104.2		491.8	**491.8**	CONC	750	0.25	17.9	580.7	1.27	0.23	84.7%
													0.00		0.00	0.00	10.00			0.0									
116	335	301							0.21				0.21	0.65	0.38	25.34	22.13	65.9		1669.9	**2576.4**	CONC	1800	0.30	57.7	6568.2	2.50	0.38	39.2%
													0.00		0.00	11.76	22.13		77.1	906.4									
117	FUT	301					1.20		5.13	1.57			7.90	0.59	11.67	11.67	23.33	63.7		743.4	**743.4**	CONC	975	0.61	54.7	1826.0	2.37	0.38	40.7%
													0.00		0.00	0.00	23.33			0.0									
118	301	**M97**									0.30		0.30	0.70	0.58	37.60	23.76	63.0		2366.8	**3232.6**	CONC	1950	0.30	78.3	8131.0	2.64	0.49	39.8%
													0.00		0.00	11.76	23.76		73.6	865.8									
119	M97	M98								0.94	0.40		1.34	0.59	2.22	39.81	24.25	62.1		2473.0	**3327.2**	CONC	2100	0.20	78.3	8089.5	2.26	0.58	41.1%
													0.00		0.00	11.76	24.25		72.7	854.2									
119	M98	**M99**											0.00	0.00	0.00	39.81	24.83	61.2		2435.3	**3276.4**	CONC	2400	0.15	29.6	10002.3	2.14	0.23	32.8%
													0.00		0.00	11.76	24.83		71.5	841.2									

Q = 2.78 AIR WHERE : Q = PEAK FLOW IN LITRES PER SECOND (L/s)
A = AREA IN HECTARES (ha)
I = RAINFALL INTENSITY IN MILLIMETERS PER HOUR (mm/hr)
R = WEIGHTED RUNOFF COEFFICIENT

Q = (1/n) A R(2/3)So(1/2) WHERE : Q = CAPACITY (L/s)
n = MANNING COEFFICIENT OF ROUGHNESS (0.013)
A = FLOW AREA (m2)

Project: Fernbank Crossing (108180-10)
Designed: KJM
Checked: MAB
Date: August 17 2012

NOVATECH ENGINEERING CONSULTANTS LTD.

APPENDIX C

Proposed Servicing Sketch

PROPOSED SERVICING SKETCH

LIVERY STREET

SAN MH 01
T/G=103.30
INV.NE=100.20
INV.SW=100.25

VB
PVC DR18 WMs
VB
45° H.BENDS

9.2m-200mmØ PVC
DR35 SAN @ 2.0%

4.3m-250mmØ PVC
DR35 STM @ 2.0%

INTERNAL SWM TANK
> 176m³ ACTIVE STORAGE

WATER ENTRY ROOM
STM INV=100.40
SAN INV=100.45
TWM=100.85

SIAMESE

PROPOSED 4/5-STOREY
RESIDENTIAL BLDG "A"
GROUND FLOOR = 105.90m
P1 PARKING = 102.90m - 103.70m
P2 PARKING = 100.30m
USF = VARIES

8.0m-300mmØ PVC
DR35 STM @ 1.0%

STM MH 01
T/G=103.10
INV.NE=100.26
INV.S=100.31
INV.SW=100.31
BACKWATER VALVE
4.7m-250mmØ PVC
DR35 STM @ 1.0%

CBMH 01
T/G=103.05
INV.N=100.36
INV.SW=100.50

24.4m-250mmØ PVC
DR35 STM @ 1.0%

CB 01
T/G=103.05
INV=101.05

0.6m-200mmØ PVC DR35 CB
LEAD & TEE @ 1.0% (MIN.)

7.0m / 9.3m-200mmØ PVC DR35
TRENCH OUTLETS @ 1.0%

TRENCH DRAIN

41.4m-610mmØ PVC DR35 STM @ 0.5%

STM MH 02
T/G=103.12
INV.NE=100.55
INV.NW=100.85
INV.SW=100.85

DICB 01
LOW T/G=102.85
INV.NE=100.70

PD 01 T/G=106.10
PD 02 T/G=105.65
PD 03 T/G=105.65
PD 04 T/G=105.75
PD 05 T/G=105.60
PD 08 T/G=105.70
PD 09 T/G=105.70
PD 10 T/G=105.57
PD 12 T/G=105.57
PD 13 T/G=105.57
PD 14 T/G=105.57

CIPD 06 T/G=105.62
CIPD 07 T/G=105.57
CIPD 11 T/G=105.57

HYD T/FL=105.95

200mmØ SWM TANK OVERFLOW
FROM TOP OF BOTH INTERNAL
TANKS. REFER TO MECHANICAL.

INTERNAL SWM TANK
> 176m³ ACTIVE STORAGE

5.7m-250mmØ PVC
DR35 STM @ 2.0%

STM INV=100.63

PROPOSED 9-STOREY
RESIDENTIAL BLDG "B"
GROUND FLOOR = 105.90m
P1 PARKING = 102.90m - 102.90m
P2 PARKING = 99.10m
USF = VARIES

PROPOSED 18-STOREY
MIXED USE BLDG "C"
GROUND FLOOR = 105.90m
P1 PARKING = 102.30m
P2 PARKING = 99.10m
P3 PARKING = 95.90m
USF = VARIES

BUILDING 'C' - P1 LEVEL
MECHANICAL ROOM

4m-500mmØ HDPE
CULVERT @ 1.0%
(10% EMBEDMENT)
INV.N=102.12
INV.S=102.16

SAN INV=101.50

SAN MH 03
T/G=104.60
INV.NE=101.30
INV.SE=101.30
INV.SW=101.25

250x200 REDUCER
9.6m-200mmØ PVC
DR35 SAN @ 2.0%

55.6m-200mmØ PVC DR35 SAN @ 0.35%

3.0m-200mmØ PVC
DR35 SAN @ 1.0%

SAN MH 04
T/G=105.33
INV.NE=101.54
INV.NW=101.49

8.4m-200mmØ PVC
DR35 SAN @ 0.35%

34.0m-200mmØ PVC DR35 SAN @ 0.35%

INV=101.07

SAN MH 02
T/G=104.15
INV.NE=101.22
INV.NW=101.17

EX. 250mmØ PVC SAN @ 0.35%

TRENCH DRAIN
T/G=102.28

RAMP TO U/G PARKING

ROBERT GRANT AVENUE

EX. HYDRO DUCT
EX. U/G HYDRO
EX. 100mmØ GAS
82.0m-200mmØ SAN @ 0.35%
83.0m-375mmØ STM @ 0.38%
SANMH 406
T/G=103.06
INV.NE=100.00
INV.SW=100.15
13.0m-250mmØ SAN
11.0m-1350mmØ STM @ 1.32%
76.7m-1200mmØ STM @ 0.20%
59.6m-1200mmØ STM @ 0.50%
X46030
X46029
X46028
Gravel Road
DC
DMC
OHW
HP
UP
AN
LS