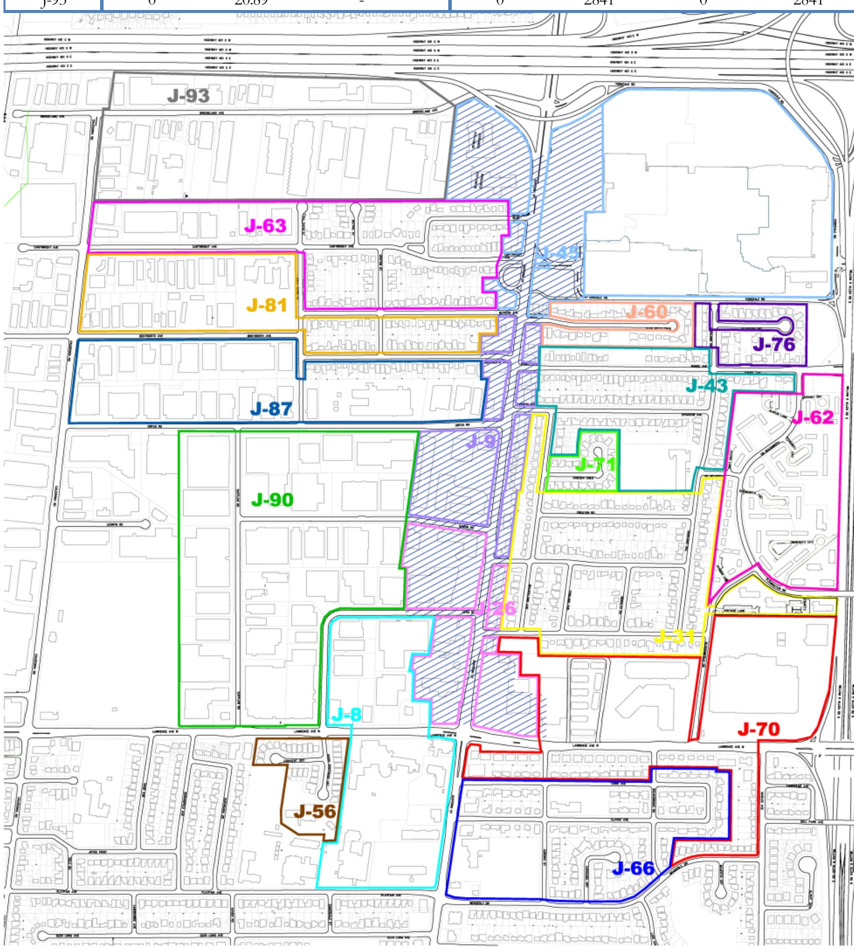
The resulting demand estimates are provided in the following table while the areas external to the Study Area, and the nodes at which their demands were modelled, are provided in the figure below.

Node	No. of Residentail Units	Tributary Land Area (ha)	Tributary Development Blocks	Residential Population	Industrial Population	Commercial Population	Total Population	Avg Day Flow (L/s)	Max Day Flow (L/s)	Peak Hour Flow (L/s)	Min Hour Flow (L/s)
J-8	0	13.68	-	0	700	939	1639	3.62	3.99	2.49	3.04
J-9	0	0.00	5,6,11,12	92	0	487	579	1.28	1.45	1.80	1.07
J-26	0	0.00	7,8,9,9A,10	2711	0	333	3044	6.73	8.60	15.86	5.65
J-31	190	1.51	-	618	0	0	618	1.37	1.78	3.42	1.15
J-43	128	2.45	-	243	210	0	454	1.00	1.21	1.76	0.84
J-45	0	24.78	1,2,3,4,13,14	231	0	3700	3931	8.69	9.66	11.09	7.30
J-56	21	1.28	-	40	110	0	150	0.33	0.38	0.44	0.28
J-60	35	0.00	-	67	0	0	67	0.15	0.19	0.37	0.12
J-62	0	12.08	-	2053	0	0	2053	4.54	5.90	11.35	3.81
J-63	131	4.89	-	249	665	0	914	2.02	2.33	2.70	1.70
J-66	112	4.25	-	213	323	55	590	1.31	1.53	1.96	1.10
J-70	72	16.25	-	137	0	1788	1925	4.25	4.74	5.50	3.57
J-71	23	0.00	-	44	0	0	44	0.10	0.13	0.24	0.08
J-76	36	0.00	-	68	0	0	68	0.15	0.20	0.38	0.13
J-81	52	8.60	-	99	1169	0	1268	2.80	3.13	2.87	2.35
J-87	32	16.89	-	61	107	1722	1889	4.18	4.62	5.11	3.51
J-90	0	27.92	-	0	3797	0	3797	8.39	9.23	7.56	7.05
J-93	0	20.89	-	0	2841	0	2841	6.28	6.91	5.65	5.28



Existing Development Areas and Nodes Where Demands Modelled

Analysis & Discussion of Results

Minimum Hour Demand

As a conservative alternative to testing the system under minimum hour demand conditions, the highest static pressure (i.e., no demand) loading was determined assuming that the maximum hydraulic grade in the system is at 235.0 m, being conservatively above the hydrant flow test results reported above under static conditions. The lowest elevation in the modelled system is on the order of 175.0 m (Node J-72, located at the intersection of Dufferin Street and Wenderly Drive, two blocks south of Lawrence Avenue West), resulting in a maximum static loading of 60 m (588 kPa or 85 psi). This is comfortably below the City's desired maximum criterion of 700 kPa (just above 100 psi).

Peak Hour Demand

The hydraulic model was tested under peak hour demand conditions for both the existing and anticipated future demand conditions, the results of which are as follows:

Scenario	Total Demand	Residual Pressures Overall Area Modelled	Residual Pressures Study Area	Guideline Pressure	Result
Existing	80.63 L/s	292-442 kPa	291-442 kPa	275 kPa	✓
Future	136.93 L/s	292-399 kPa	291-399 kPa	275 kPa	✓

Based on the modelling results, the existing municipal water infrastructure is expected to be able to support the increased populations associated with re-development within the Study Area under peak hour demand conditions and with negligible impact to current performance levels.

Maximum Day + Fire Demand

The more critical demand scenario is during maximum day conditions with a fire superimposed thereon. As noted earlier, the fire flow applied to the Study Area is 19,000 L/min (or 317 L/s) which, pursuant to the City's criteria is applicable to commercial developments over 2 stories in height, high-rise residential developments and industrial parks. Combined with the maximum day demand for the area, the total demand from the modelled area under this condition is 356 L/s. The modelling results (see following pages) indicate that the available fire flow throughout the study area is in excess of 500 L/s while providing residual pressures in excess of the guideline criterion of 140 kPa, therefore, the existing infrastructure system is capable of satisfying this performance requirement as well.

Conclusions

The existing water distribution system infrastructure supporting the area considered in the Dufferin Street Avenue Study is capable of supporting the intensification in land use proposed by the preferred land use planning solution without any upgrades.

Detailed Modelling Results

Peak Hour Demand – Existing Conditions

Label	Elevation (m)	Demand (Calculated) (l/s)	Calculated Hydraulic Grade (m)	Pressure (kPa)
J-1	185.79	0	219.81	333
J-2	185.85	0	219.81	332
J-3	182.03	0	219.93	371
J-4	181.98	0	219.93	371
J-5	188.86	0	219.95	304
J-6	188.82	0	219.95	305
J-7	178.13	0	219.98	410
J-8	178.13	2.5	219.98	410
J-9	184.94	1.8	219.97	343
J-10	185.16	0	219.97	341
J-11	184.71	0	219.97	345
J-12	179.07	0	219.95	400
J-13	179.07	0	219.95	400
J-14	189.74	0	219.97	296
J-15	189.83	0	219.97	295
J-16	185.44	0	219.38	332
J-17	185.42	0	219.38	332
J-18	184	0	219.37	346
J-19	179.54	0	220	396
J-20	180.09	0	220	391
J-21	187.45	0	219.97	318
J-22	188.11	0	219.97	312
J-23	188.77	0	219.98	305
J-24	188.6	0	219.98	307
J-25	179.15	0	219.97	399
J-26	179.37	15.86	219.97	397
J-27	186.03	0	219.92	332
J-28	185.7	0	219.9	335
J-29	187.71	0	219.95	316
J-30	177.91	0	219.98	412
J-31	185.08	3.42	219.81	340
J-32	178.31	0	219.88	407
J-33	178.22	0	219.9	408
J-34	180.97	0	219.97	382
J-35	181.73	0	219.97	374
J-36	178.24	0	219.9	408
J-37	186.4	0	219.8	327
J-38	178.98	0	220	401
J-39	178.32	0	219.99	408
J-40	179.94	0	219.9	391
J-41	178.92	0	219.93	401
J-42	187.26	0	219.89	319
J-43	187.87	1.8	219.98	314
J-44	182.18	0	219.9	369
J-45	190.17	11.05	219.97	292
J-46	189.34	0	219.97	300
J-47	185.5	0	219.38	332
J-48	180.4	0	219.81	386
J-49	187.34	0	219.94	319
J-50	186.76	0	219.9	324
J-51	182.85	0	219.92	363
J-52	186.38	0	219.83	327
J-53	185.91	0	219.84	332
J-54	182.98	0	219.93	362
J-55	184.22	0	219.92	349
J-56	177.49	0.4	219.98	416
J-57	183.76	0	219.93	354
J-58	188.37	0	219.97	309
J-59	189	0	219.97	303
J-60	188.65	0.4	219.97	306
J-61	185.16	0	219.38	335
J-62	185.75	11.3	218.21	318
J-63	183.29	2.7	219.85	358
J-64	178.5	0	219.9	405
J-65	177.48	0	219.98	416
J-66	176.64	2	219.87	423
J-67	182.94	0	219.86	361
J-68	184.62	0	219.86	345
J-69	183.75	0	219.38	349
J-70	184	5.5	219.61	349
J-71	186.81	0.2	219.93	324
J-72	174.86	0	219.99	442
J-75	185.13	0	219.81	339
J-76	186.44	0.4	219.97	328
J-77	185.5	0	220	338
J-78	178.75	0	219.98	404
J-81	182.5	2.9	219.84	365
J-82	182.24	0	219.93	369
J-83	176.5	0	219.95	425
J-84	178.61	0	219.95	405
J-85	189.44	0	220	299
J-86	189.6	0	220	298
J-87	181.6	5.1	220	376
J-90	180.35	7.6	220	388
J-93	181.49	5.7	219.98	377
J-96	185.13	0	219.81	339
J-97	180.5	0	220	387

TOTAL DEMAND **80.63**

Peak Hour Demand – Future Conditions

Label	Elevation (m)	Demand (Calculated) (l/s)	Calculated Hydraulic Grade (m)	Pressure (kPa)
J-1	185.79	0	219.75	332
J-2	185.85	0	219.75	332
J-3	182.03	0	219.84	370
J-4	181.98	0	219.84	371
J-5	188.86	0	219.87	303
J-6	188.82	0	219.87	304
J-7	178.13	0	219.94	409
J-8	178.13	2.5	219.94	409
J-9	184.94	32.17	219.86	342
J-10	185.16	0	219.86	340
J-11	184.71	0	219.87	344
J-12	179.07	0	219.94	400
J-13	179.07	0	219.94	400
J-14	189.74	0	219.87	295
J-15	189.83	0	219.87	294
J-16	185.44	0	219.3	331
J-17	185.42	0	219.3	332
J-18	184	0	219.3	345
J-19	179.54	0	220	396
J-20	180.09	0	220	391
J-21	187.45	0	219.87	317
J-22	188.11	0	219.87	311
J-23	188.77	0	219.93	305
J-24	188.6	0	219.93	307
J-25	179.15	0	219.89	399
J-26	179.37	33.99	219.87	396
J-27	186.03	0	219.83	331
J-28	185.7	0	219.81	334
J-29	187.71	0	219.86	315
J-30	177.91	0	219.94	411
J-31	185.08	3.42	219.75	339
J-32	178.31	0	219.86	407
J-33	178.22	0	219.88	408
J-34	180.97	0	219.88	381
J-35	181.73	0	219.88	373
J-36	178.24	0	219.88	408
J-37	186.4	0	219.72	326
J-38	178.98	0	220	401
J-39	178.32	0	219.99	408
J-40	179.94	0	219.82	390
J-41	178.92	0	219.85	401
J-42	187.26	0	219.81	319
J-43	187.87	1.8	219.93	314
J-44	182.18	0	219.82	368
J-45	190.17	18.84	219.87	291
J-46	189.34	0	219.9	299
J-47	185.5	0	219.3	331
J-48	180.4	0	219.75	385
J-49	187.34	0	219.84	318
J-50	186.76	0	219.81	323
J-51	182.85	0	219.83	362
J-52	186.38	0	219.76	327
J-53	185.91	0	219.76	331
J-54	182.98	0	219.84	361
J-55	184.22	0	219.83	348
J-56	177.49	0.4	219.94	415
J-57	183.76	0	219.84	353
J-58	188.37	0	219.89	309
J-59	189	0	219.9	302
J-60	188.65	0.4	219.89	306
J-61	185.16	0	219.3	334
J-62	185.75	11.3	218.13	317
J-63	183.29	2.7	219.76	357
J-64	178.5	0	219.88	405
J-65	177.48	0	219.94	416
J-66	176.64	2	219.85	423
J-67	182.94	0	219.79	361
J-68	184.62	0	219.79	344
J-69	183.75	0	219.3	348
J-70	184	5.5	219.55	348
J-71	186.81	0.2	219.84	323
J-72	174.86	0	219.99	442
J-75	185.13	0	219.75	339
J-76	186.44	0.4	219.93	328
J-77	185.5	0	220	338
J-78	178.75	0	219.94	403
J-81	182.5	2.9	219.76	365
J-82	182.24	0	219.84	368
J-83	176.5	0	219.94	425
J-84	178.61	0	219.94	404
J-85	189.44	0	220	299
J-86	189.6	0	220	298
J-87	181.6	5.1	220	376
J-90	180.35	7.6	220	388
J-93	181.49	5.7	219.98	377
J-96	185.13	0	219.75	339
J-97	180.5	0	220	387

TOTAL DEMAND **136.93**

Maximum Day + Fire Demand – Existing Conditions

Label	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (L/s)	Demand (L/s)	Flow (Total Needed) (L/s)	Flow (Total Available) (L/s)	Pressure (Calculated Residual) (kPa)
J-9	✓	317	1.45	318.45	501.45	281
J-10	✓	317	0	317	500	268
J-11	✓	317	0	317	500	287
J-14	✓	317	0	317	500	184
J-15	✓	317	0	317	500	180
J-19	✓	317	0	317	500	337
J-20	✓	317	0	317	500	391
J-21	✓	317	0	317	500	243
J-22	✓	317	0	317	500	222
J-25	✓	317	0	317	500	329
J-26	✓	317	8.6	325.6	508.6	330
J-34	✓	317	0	317	500	308
J-35	✓	317	0	317	500	308
J-45	✓	317	9.66	326.66	509.66	161
J-46	✓	317	0	317	500	177
J-85	✓	317	0	317	500	299

MAX DAY DEMAND	39.3
FIRE FLOW DEMAND	317
TOTAL DEMAND	**356.3**

Maximum Day + Fire Demand – Future Conditions

Label	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (L/s)	Demand (L/s)	Flow (Total Needed) (L/s)	Flow (Total Available) (L/s)	Pressure (Calculated Residual) (kPa)
J-9	✓	317	19.87	336.87	519.87	275
J-10	✓	317	0	317	500	262
J-11	✓	317	0	317	500	282
J-14	✓	317	0	317	500	180
J-15	✓	317	0	317	500	176
J-19	✓	317	0	317	500	337
J-20	✓	317	0	317	500	391
J-21	✓	317	0	317	500	240
J-22	✓	317	0	317	500	219
J-25	✓	317	0	317	500	326
J-26	✓	317	22.48	339.48	522.48	326
J-34	✓	317	0	317	500	305
J-35	✓	317	0	317	500	305
J-45	✓	317	16.81	333.81	516.81	156
J-46	✓	317	0	317	500	173
J-85	✓	317	0	317	500	299

TOTAL DEMAND	105.4
FIRE FLOW DEMAND	317
TOTAL DEMAND	**422.4**

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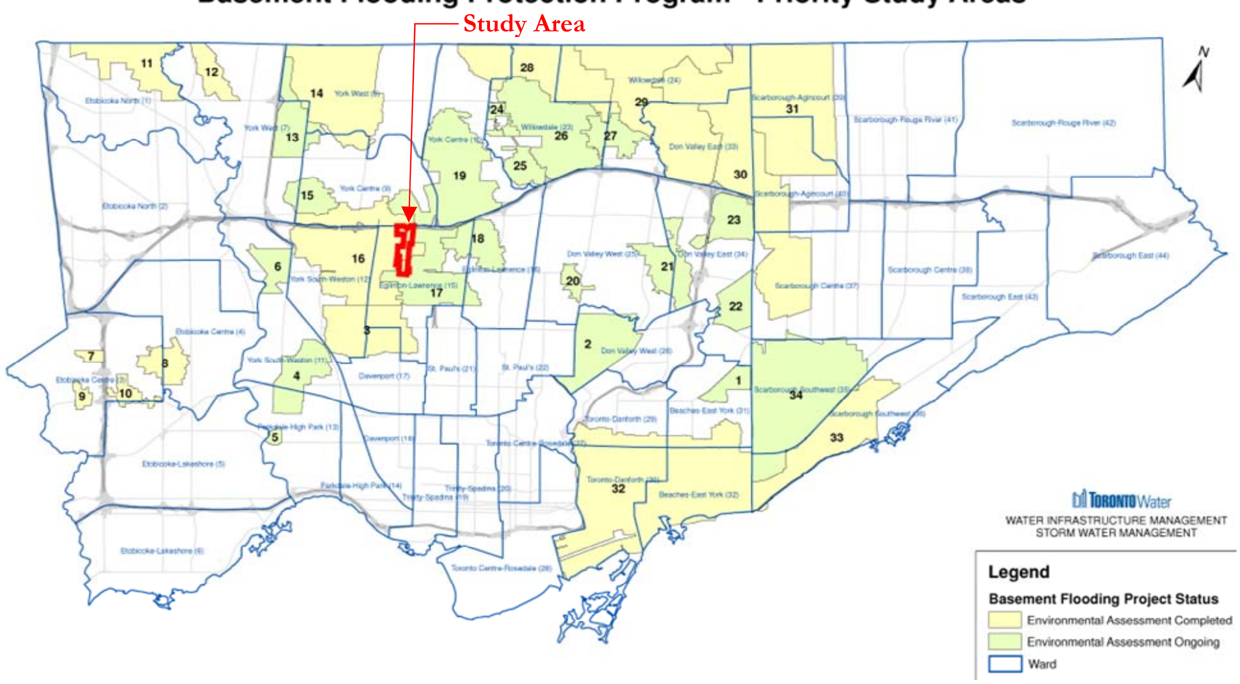
Appendix B

Sanitary Sewer System Analysis
Infrastructure Master Plan | Dufferin Street Avenue Study
City of Toronto
Final Report | November 2014

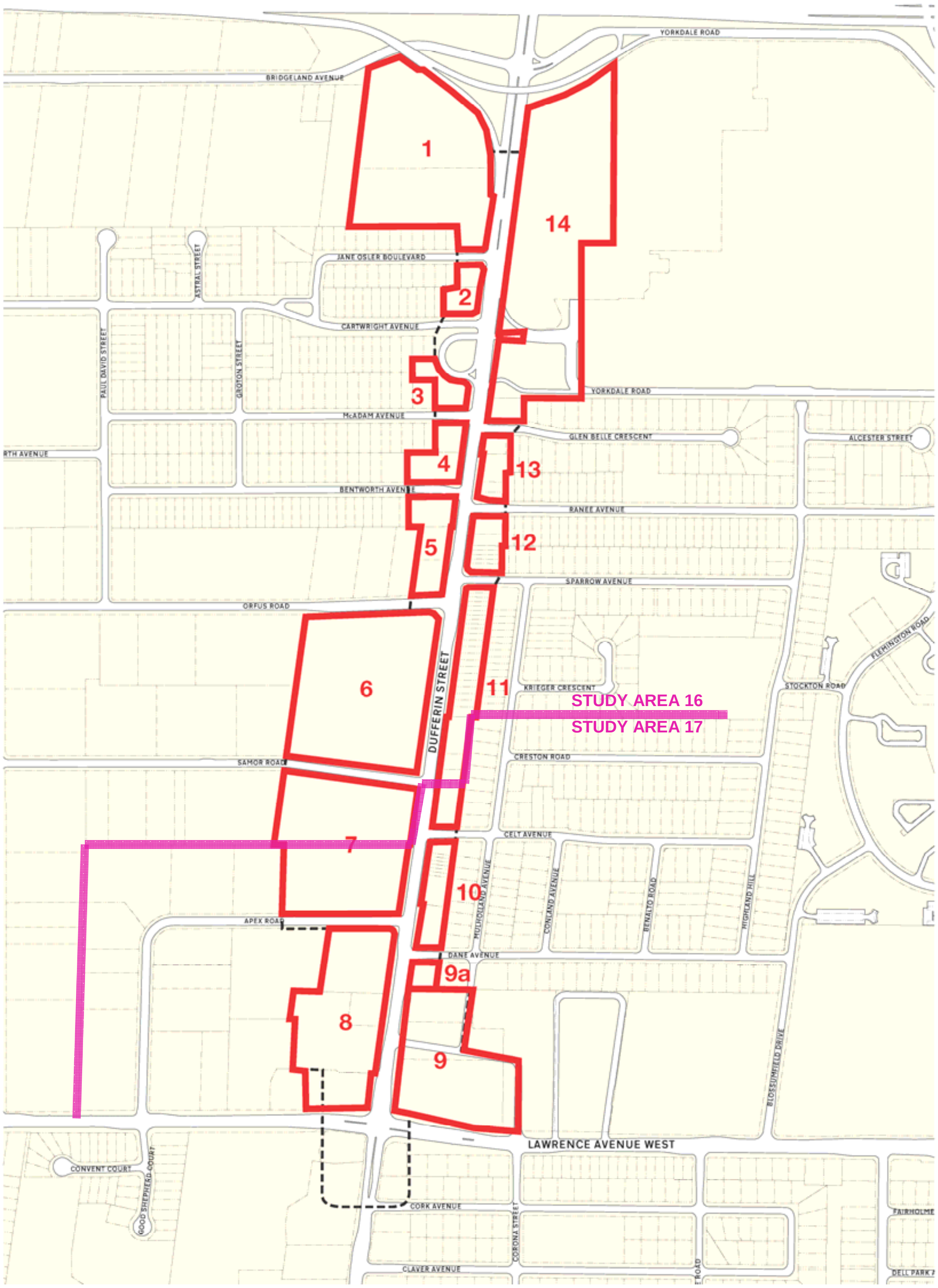
This appendix to the Infrastructure Master Plan provides relevant information in respect of the assessment of the sanitary sewer system for the Dufferin Street Avenue Study.

The Study Area, as indicated below, straddles the City's Area 16 and Area 17 Basement Flooding Study areas, each of which are discussed separately below as they relate to the sanitary servicing infrastructure supporting the Dufferin Street Avenue Study area.

Basement Flooding Protection Program - Priority Study Areas



The preferred land use planning alternative identified residential and employment populations for the discrete development blocks in the Study Area as indicated below. The population estimates used to determine design flows for analysis in the subsequent sections make reference to these block identification numbers.



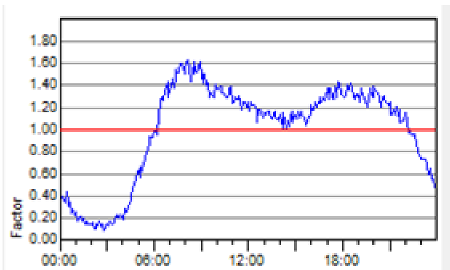
Study Area Development Block Numbers & Basement Flooding Study Area Class EA Boundary

Area 16 Basement Flooding Study Area

The Class EA for this basement flooding study area was completed in August 2012 and included the development of detailed InfoWorks CS dynamic sewer system models calibrated with flow monitoring data and representing both existing conditions and proposed conditions following implementation of the preferred solutions to improve flooding concerns. The analysis undertaken herein builds upon this work and assesses the impact of the planned growth in the study area with respect to both the existing conditions and with the implementation of the preferred solutions as represented in the Area 16 Class EA so as to identify additional works which may be necessary to support the anticipated growth.

The InfoWorks model developed for the Area 16 Basement Flooding Study Area assumes the following for the analysis:

- Average Daily Flow: 450 Lpcd
- Diurnal flow pattern as determined through flow monitoring in the Area 16 Class EA, as follows:



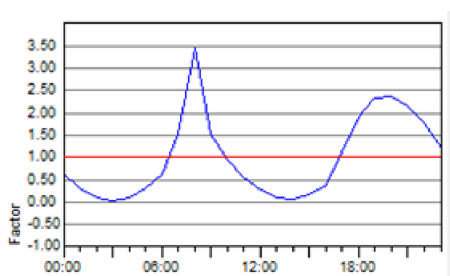
- Infiltration/Inflow from May 12, 2000 storm event

Upon review of the above parameters, particularly the diurnal flow pattern with a peak-to-average ratio of approximately 1.60, an alternative methodology was used for the analyses conducted herein to lend some conservatism to the results. While the diurnal pattern shown above was developed using monitored flow data, it may not be representative for upstream reaches of the sewer system as is the case with the infrastructure servicing the study area. Also, the existing conditions are largely characterized by non-residential land uses, whereas the proposed growth is envisioned to have a very significant residential component with different flow generation characteristics. Accordingly, the following were applied for the analysis presented herein:

- Average Daily Flow: 240 Lpcd

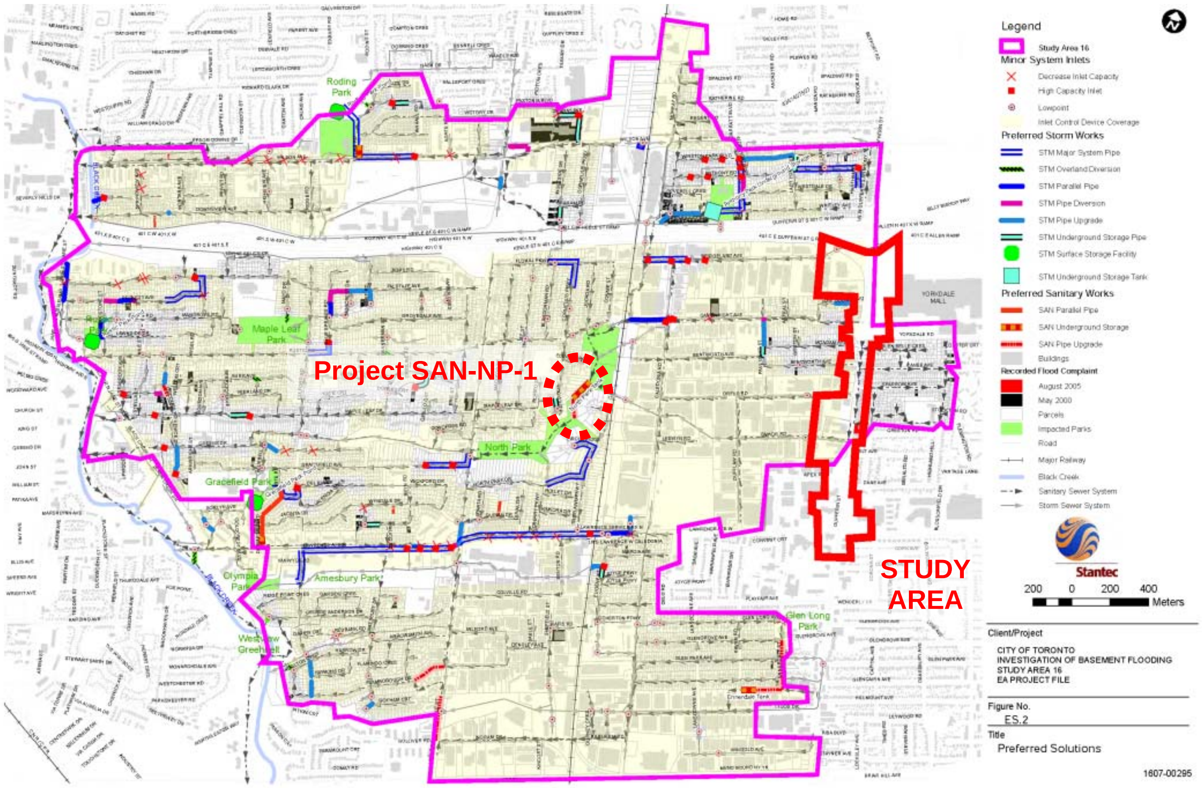
  (While this is certainly less conservative than the 450 Lpcd used above, it is deemed to be more realistic and consistent with typical observed wastewater generation rates across the City.)

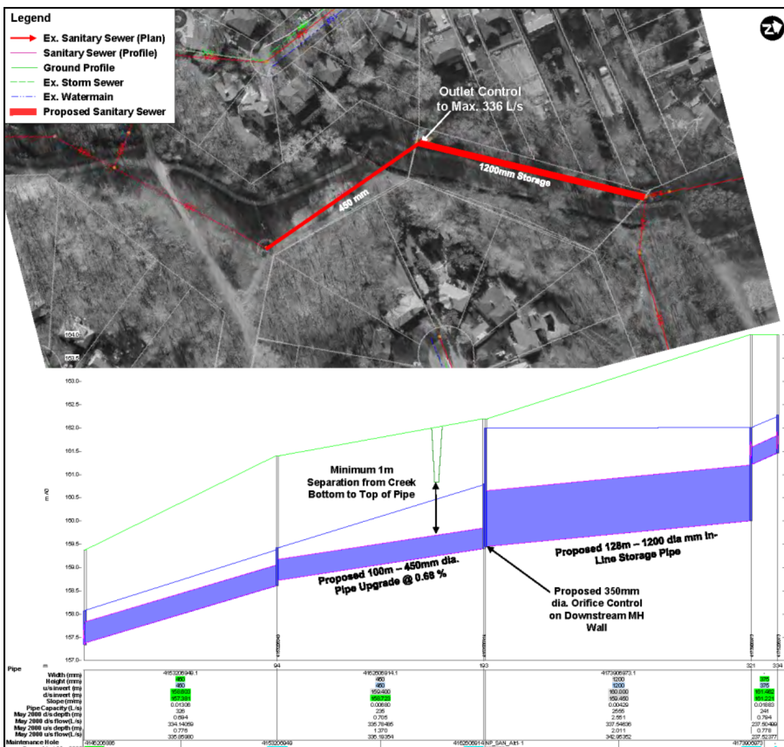
- Diurnal flow pattern based on Harmon Formula, as follows:



- Infiltration/Inflow from May 12, 2000 storm event

Through the Area 16 Basement Flooding Class EA work, two upgrades to the relevant receiving sanitary sewer system were identified in the sub-trunk sewer which runs through the North Park Ravine. These include the implementation of an in-line storage pipe followed by an increased sanitary sewer immediately downstream thereof, identified as project SAN-NP-1 (see images below).





Description

- New 1200mm diameter sanitary underground in-line storage pipe at the North Park Ravine (North Park Greenbelt)
- Orifice control for storage (0.35m dia.)
- New 450mm diameter sanitary sewer upgrade at the North Park Ravine

Design and Construction Details

- Field-verification of existing pipe and creek elevations required for final design
- In-line storage pipe
  - Dimensions: 128m-1200mm diameter
  - Design storm May 12, 2000: storage volume = 153m^3
  - Inverts: upstream = 160.00m; downstream 159.45m
  - Orifice located at downstream of storage pipe, restricting flow to 336 L/s for design storm (or equivalent control structure @ HGL=162.00m)
- 450mm pipe upgrade downstream of storage pipe
  - Dimensions: 100m-450mm diameter
  - Inverts: upstream = 159.40m; downstream 158.723m

Design and Construction Considerations

- Jack and Bore tunneling required for 450mm pipe upgrade for creek crossing
- Sufficient cover from creek bed to pipe obvert (at least 1 m) or encasement of pipe at creek crossing, to ensure pipe is not affected by future down-cutting of creek
- Crossing will require TRCA & DFO review and approval
- Minimize disturbance to existing vegetation and restore disturbed area immediately

GENIVAR constructive people · Stantec · XCG	Toronto Basement Flooding Study Area 16 Conceptual Design (May 12, 2000 – Gauge 102 Design Event Results)	Project: SAN-NP-1 Location: North Park Ravine Sanitary In-line Storage	Scale: NTS Date: December 2009	Figure: SAN-NP-1

Excerpts from Basement Flooding Study Area 16 Class EA Showing Location and Details of Project SAN-NP-1

While it is noted that some pipes were modelled in the Class EA work to experience at or near surcharging conditions under the specified design conditions, the hydraulic grade lines are sufficiently deep to not give rise to basement flooding concerns (i.e., >1.8 m below ground surface).

Below is a table showing the additional populations anticipated for the receiving sewer system in question, followed by the results of the analysis.

The following summarizes the populations allocated to each of the receiving nodes in the InfoWorks model:

Receiving Node	Location	Contributing Block(s)	Gross-Up Factor[1]	Commercial	Residential
4270007995	East limit of sewer on Bridgeland Avenue	Block 1 @ 100%	1.00	234 × 100% = **234**	2284 × 100% = **2284**
42411108200	East limit of sewer on Jane Osler Boulevard	Block 2 @ 50%	1.25	9 × 50% × 1.25 = **6**	184 × 50% × 1.25 = **115**
4242608253	East limit of sewer on Cartwright Avenue	Block 2 @ 50%	1.25	9 × 50% × 1.25 = **6**	184 × 50% × 1.25 = **115**
4229908250	East limit of sewer on McAdam Avenue	Block 3 @ 100%	1.00	5 × 100% = 5	231 × 100% = 231
		Block 4 @ 50%	1.25	14 × 50% × 1.25 = 9	289 × 50% × 1.25 = 181
		Totals		**14**	**412**
4220308277	East limit of sewer on Bentworth Avenue	Block 4 @ 50%	1.25	14 × 50% × 1.25 = 9	289 × 50% × 1.25 = 181
		Block 5 @ 33%	1.50	12 × 33% × 1.50 = 6	245 × 33% × 1.50 = 123
		Totals		**15**	**304**
4204708298	East limit of sewer on Orfus Road	Block 5 @ 33%	1.50	12 × 33% × 1.50 = 6	245 × 33% × 1.50 = 123
		Block 6 @ 50%	1.25	116 × 50% × 1.25 = 73	2401×50%×1.25=1501
		Totals		**79**	**1624**
4202008337	Dufferin Street sewer at Orfus Road	Block 6 @ 50%	1.25	116 × 50% × 1.25 = 73	2401×50%×1.25=1501
		Block 11@100%	1.00	36 × 100% = 36	747 × 100% = 747
		Totals		**109**	**2248**
4218408303	Dufferin Street sewer at Ranee Avenue	Block 5 @ 33%	1.50	12 × 33% × 1.50 = 6	245 × 33% × 1.50 = 123
		Block 12@100%	1.00	11 × 100% = 11	228 × 100% = 228
		Totals		**17**	**351**
418508345	Dufferin Street at Samor Road	Block 7 @ 50%[2]	1.25	99 × 50% × 1.25 = **62**	2043×50%×1.25=**1277**
4229308285	Dufferin Street at Glen Belle Crescent	Block 13@100%	1.00	10 × 100% = **10**	213 × 100% × **213**
			Totals	**552**	**8943**

[1] The Gross-Up Factor is used to lend additional conservatism to the analysis and to accommodate potentially different relative allocations of populations to the different receiving sewers, affording future flexibility in development forms.

[2] The remainder of Block 7 is allocated to the Area 17 sewershed, discussed further below.

Discussion of Area 16 Existing Condition Model

Under existing conditions, the model suggests that the sanitary sewer in the North Park Ravine surcharges to grade, which is the reason for the Project SAN-NP-1 identified in the Area 16 Class EA. Depending on the degree to which the set of preferred solutions identified in that study are implemented, and their respective timing, the size of the storage element proposed in that study can vary. That is, with none of the preferred solutions being implemented a storage element much larger than the 1200 mm ø proposed in the Class EA is required, largely due to existing rainfall-derived infiltration and inflow (RDII).

General Impact of Additional Population

The following is a description of the general impacts of the additional population proposed by the preferred planning alternative on the existing sanitary infrastructure system, without additional improvements:

- Modestly increased flow and hydraulic grade levels in the receiving sewer system.
- Additional dependency on the capacity of the in-line storage element proposed in the North Park Ravine subtrunk sewer (Area 16 Class EA Project SAN-NP-1) with all Area 16 Class EA preferred solutions implemented. In the absence of the Area 16 Class EA preferred solutions being implemented, the required sizing of this facility is rather onerous and its practical implementation requires further assessment. It is reiterated that this result is largely due to the effects of RDII rather than the projected population increase resulting from the Dufferin Street Avenue Study.
- Dramatic increase in hydraulic grade level across two legs of sanitary sewer in easement between Dufflaw Road/Samor Road intersection and Caledonia Road. (There appear to be two legs of 250 mm ø sanitary sewer fed by a 300 mm ø sewer upstream, and discharging to a 375 mm ø sewer downstream. These pipe legs act like a bottleneck in the system which, while limiting flows to downstream reaches, do so at the potential expense of elevated hydraulic grade lines to upstream pipe sections.)
- Apart from these observations, the remainder of the pipe network appears to be capable of handling the additional populations without surcharge or with very limited surcharge while still maintaining adequate freeboard to potential basements or the ground surface.

Options Considered for Infrastructure Upgrades

Although a broader array of alternatives were considered at the Master Plan level and which are discussed in the main body of the Infrastructure Master Plan report, this discussion is focused on the infrastructure upgrade options considered which generally included modifying the operation of existing or already proposed in-line storage elements, implementing new or modifying the sizing of planned in-line storage elements, and increasing conveyance through pipe size increases.

After testing several potential upgrades, three viable option pairs[3] which contain multiple common components have been developed in further detail and are reported below along with some performance and assessment information. In general, all three option pairs are technically feasible, although Option 1 appears to be inferior to Options 2 and 3 by virtue of its costs alone – that is, it envisions the installation of an additional storage element on Samor Road, immediately downstream of the existing storage pipe. For practical purposes, however, all components for all three option pairs are recommended as part of the preferred solution so as to allow for flexibility in future implementation. Moreover, the final implemented solution should be accompanied by confirmatory modelling and supported by flow monitoring, wherever possible.

For the purpose of presenting results, those of Option 3 are generally reported below, unless otherwise noted. Also, the results developed using the Area 16 Class EA existing conditions base model are generally provided below since the performance of the system improves once the Area 16 Class EA preferred solutions are implemented. That is, the existing conditions model provides a worst-case scenario in this regard.

Descriptions of the proposed upgrades are also provided below.

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[3] The use of option pairs is to identify the range of each option's infrastructure sizing/scale, corresponding to the need depending on whether development in the study area occurs prior to any Area 16 Class EA preferred solutions being implemented (i.e., Area 16 "existing" model) at one extreme, and if all such preferred solutions (i.e., Area 16 "preferred" model) at the other extreme.

Sanitary Infrastructure Upgrade Options

Option ID	Option 1		Option 2		Option 3	
Area 16 Class EA Modelling Condition[4]	Area 16 - Ex	Area 16 – Pref	Area 16 - Ex	Area 16 – Pref	Area 16 - Ex	Area 16 – Pref
Description of Upgrade						
Increase size of SAN-NP-1 storage element[5,6] from 1200 mm ø to:	2-2400×1500	1500 mm ø	2-2400×1500	1500 mm ø	1-2400×1500 1-3000×1500	1650 mm ø
Modify outlet orifice of existing Samor Road storage element to:	200 mm ø		150 mm ø		200 mm ø	
Add new 1200 mm ø Samor Road storage element with outlet orifice of:	200 mm ø		n/a		n/a	
Increase pipe sizes for 2 legs of sewer in easement from 250 mm ø to:	n/a		n/a		375 mm ø	
Evaluation of Options						
Capital Cost	Highest[7]		Lowest		Moderate	
Operating & Maintenance Costs	Highest[8]		Moderate[9]		Lowest	
Technical Performance	All generally similar and satisfy City guidelines and accepted practices					

[4] Upgrades are based on which Area 16 Class EA base model was used. "Area 16 – Ex" refers to the existing conditions and is representative of the worst-case scenario assuming none of the preferred solutions to deal with basement flooding identified in the Area 16 Class EA are implemented, and "Area 16 – Pref" considers the case where all such solutions are implemented.

[5] As identified in Basement Flooding Study Area 16 Class EA preferred solution. In all cases, the pipe downstream of the storage element is increased to 450 mm ø as per the study.

[6] It is to be recognized that the increase in sizing for this storage element between the "preferred" and "existing" conditions is largely due to the rainfall-derived infiltration and inflow, rather than by development growth. See additional discussion below.

[7] This option is deemed to have the highest cost due to the implementation of a new 1200 mm ø storage element on Samor Road.

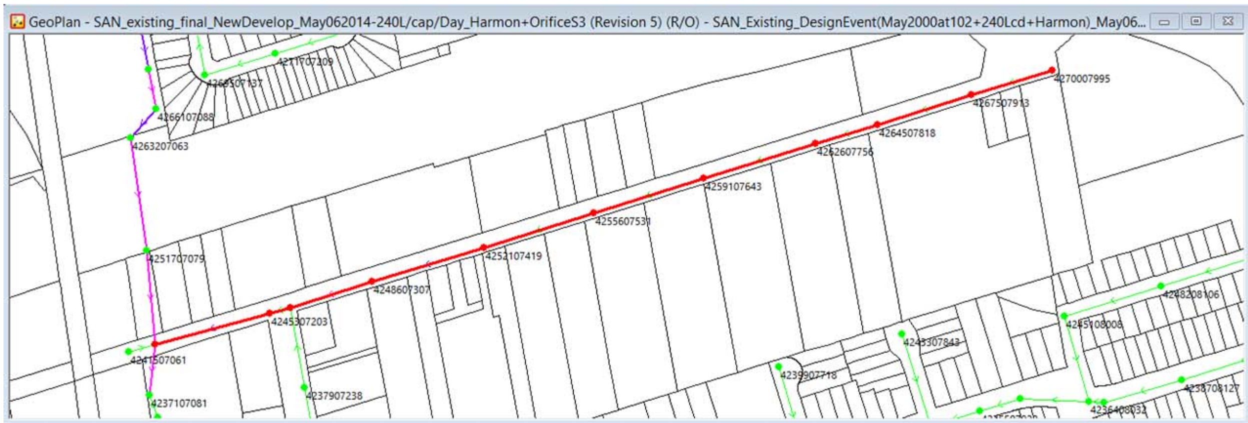
[8] With the additional storage element on Samor Road, there is expected to be higher operation and maintenance costs with this option.

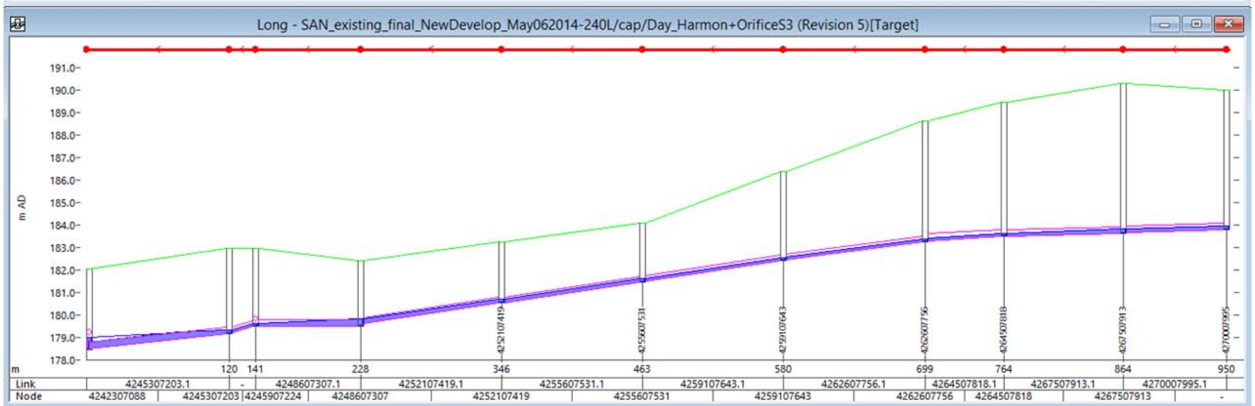
[9] Although very similar to Option 3, this option considers a 150 mm ø orifice (i.e., smaller than 200 mm ø orifice in Option 3) for the existing Samor Road storage element, thereby increasing the need for the City to be vigilant with respect to its continued operational performance.

Overall Results based on Area 16 Class EA Existing Conditions Model + Option 3 Improvements

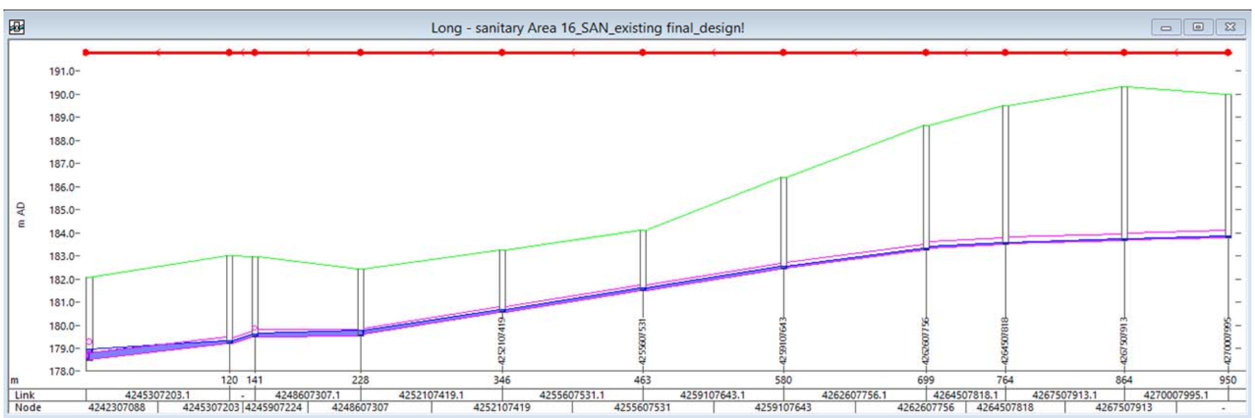
Location: **Bridgeland Avenue**

Condition: **Growth with Improvements + Existing Conditions** (as per Area 16 Class EA)





Condition: **Existing Conditions** (as per Area 16 Class EA)

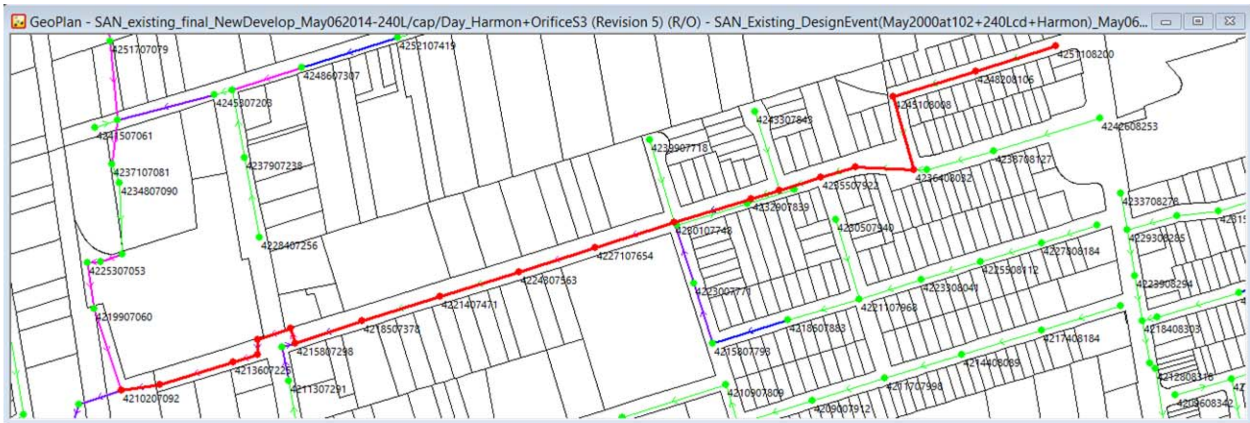


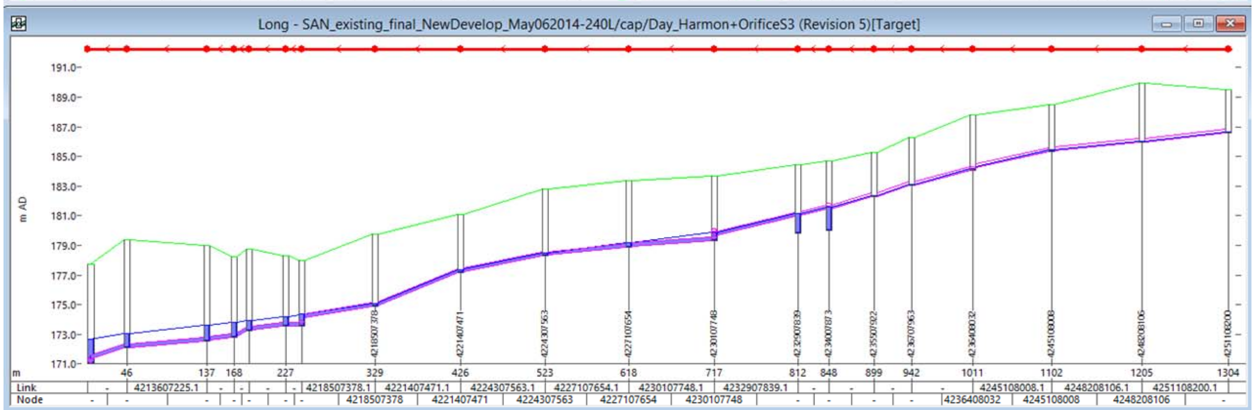
Comments:

- Modest increase in flow levels
- HGL > 1.8 m below ground surface under proposed conditions

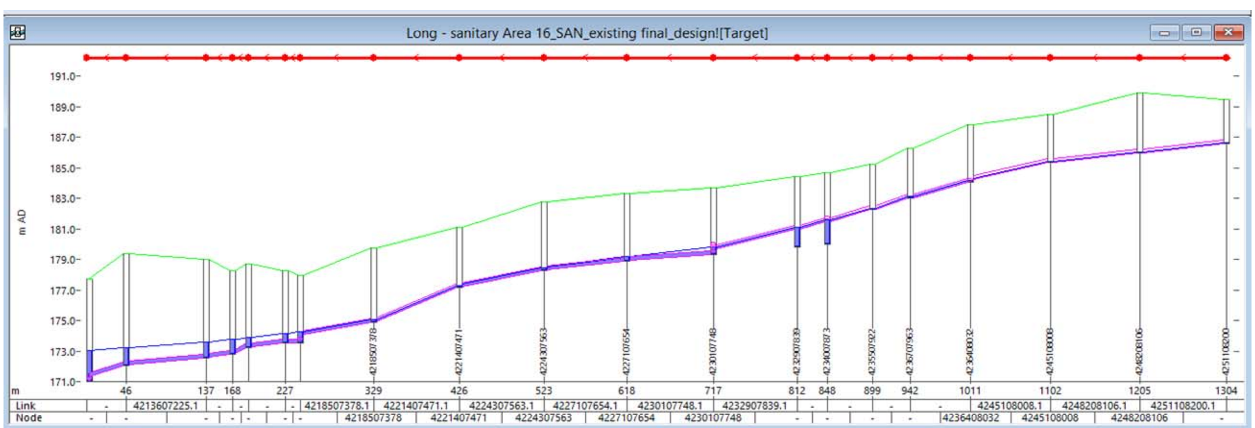
Location: **Jane Osler Boulevard & Cartwright Avenue**

Condition: **Growth with Improvements + Existing Conditions** (as per Area 16 Class EA)





Condition: **Existing Conditions** (as per Area 16 Class EA)

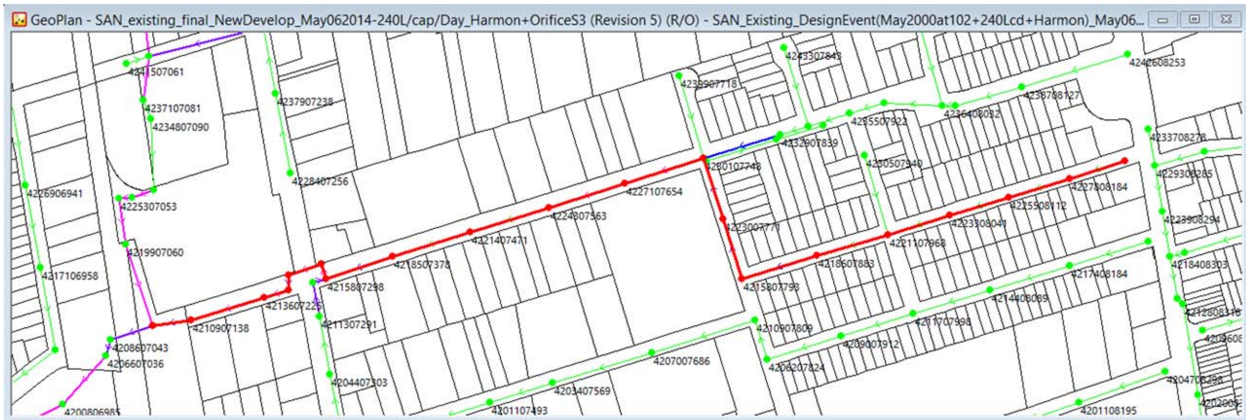


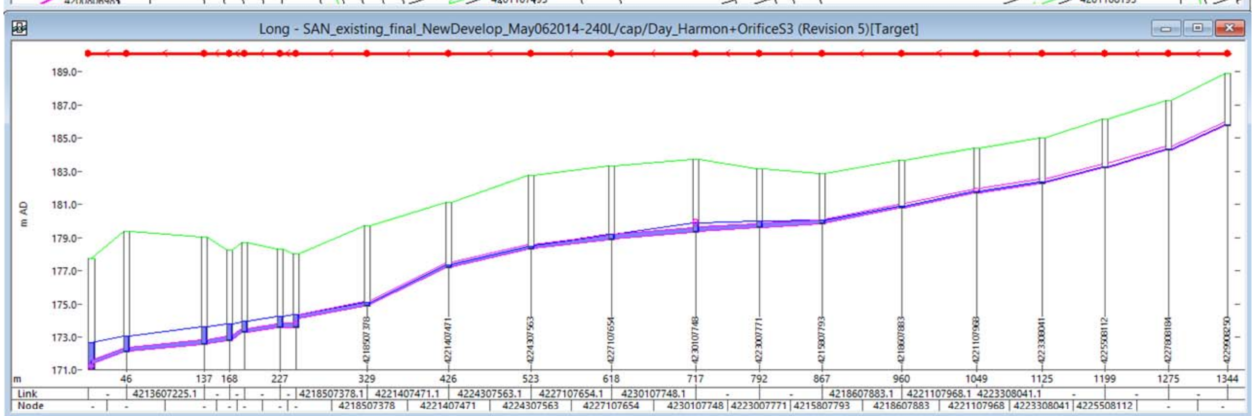
Comments:

- Modest increase in flow levels
- HGL > 1.8 m below ground surface under proposed conditions
- N.B. Results are similar for stretch of Cartwright Avenue west of its intersection with Jane Osler Boulevard

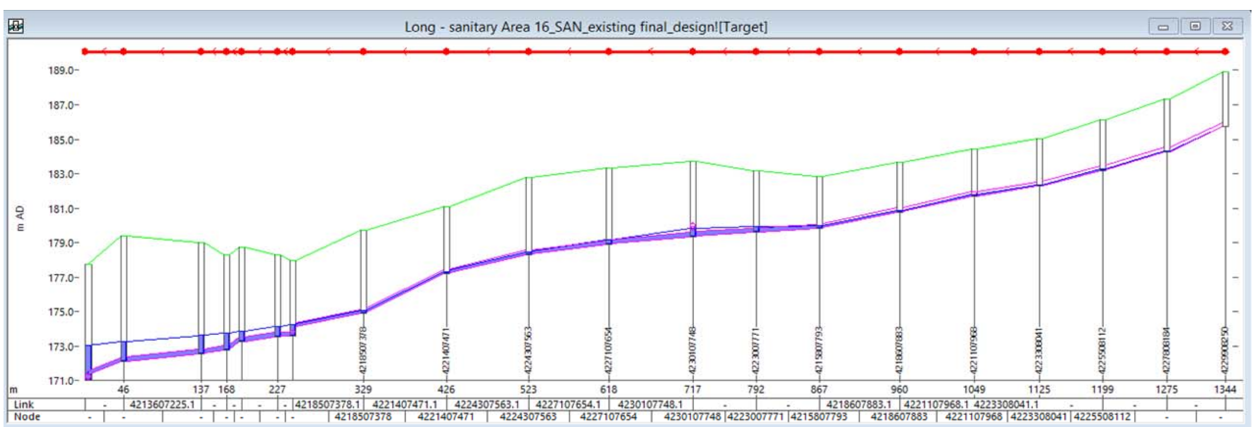
Location: **McAdam Avenue, Paul David Street & Cartwright Avenue**

Condition: **Growth with Improvements + Existing Conditions** (as per Area 16 Class EA)





Condition: **Existing Conditions** (as per Area 16 Class EA)

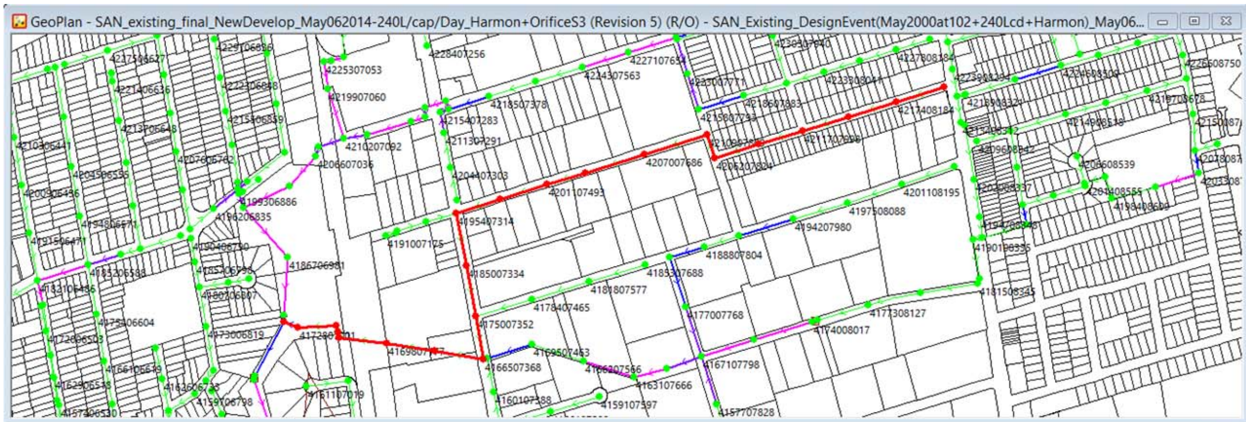


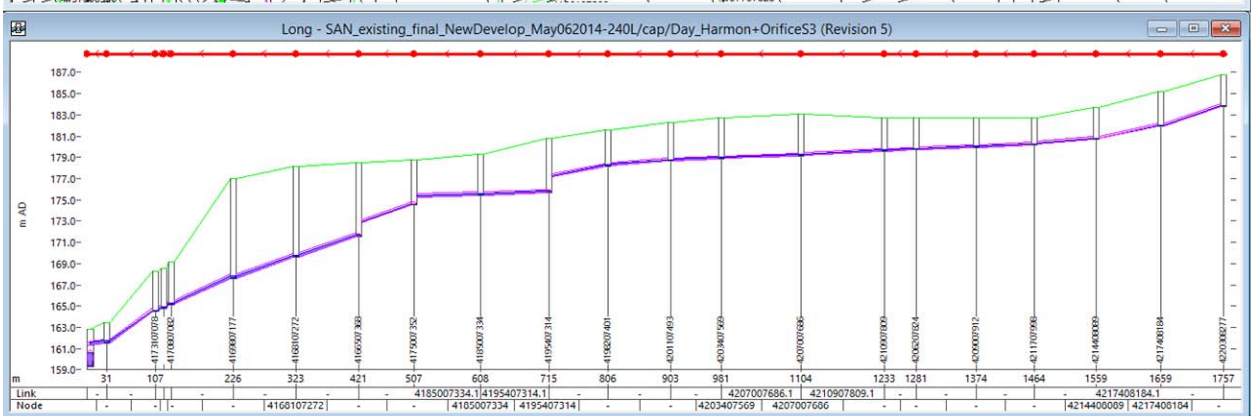
Comments:

- Modest increase in flow levels
- HGL > 1.8 m below ground surface under proposed conditions

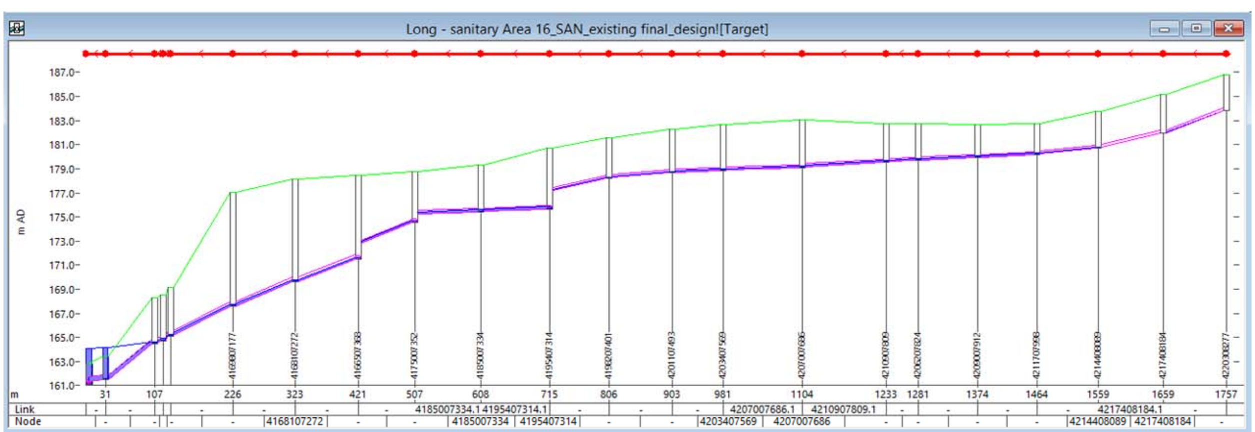
Location: **Bentworth Avenue, Caledonia Road & Easement**

Condition: **Growth with Improvements + Existing Conditions** (as per Area 16 Class EA)





Condition: **Existing Conditions** (as per Area 16 Class EA)

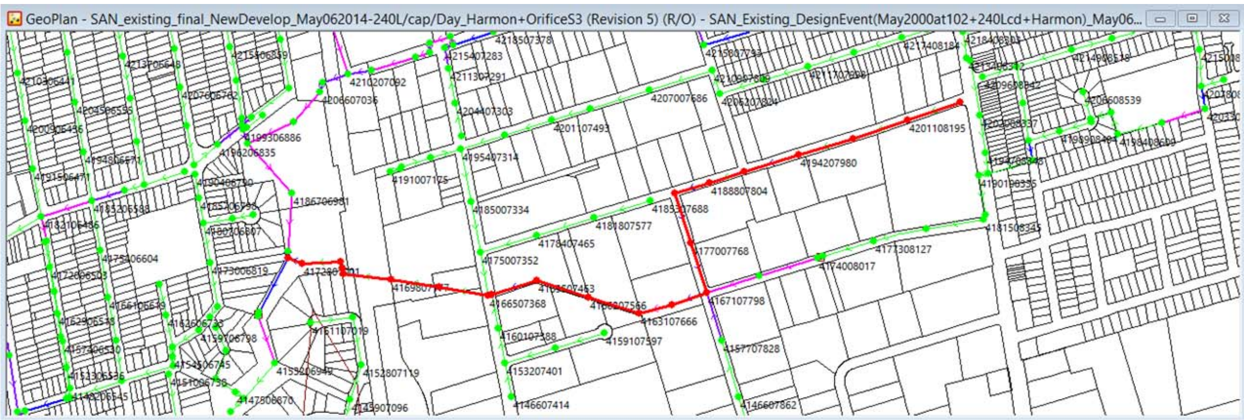


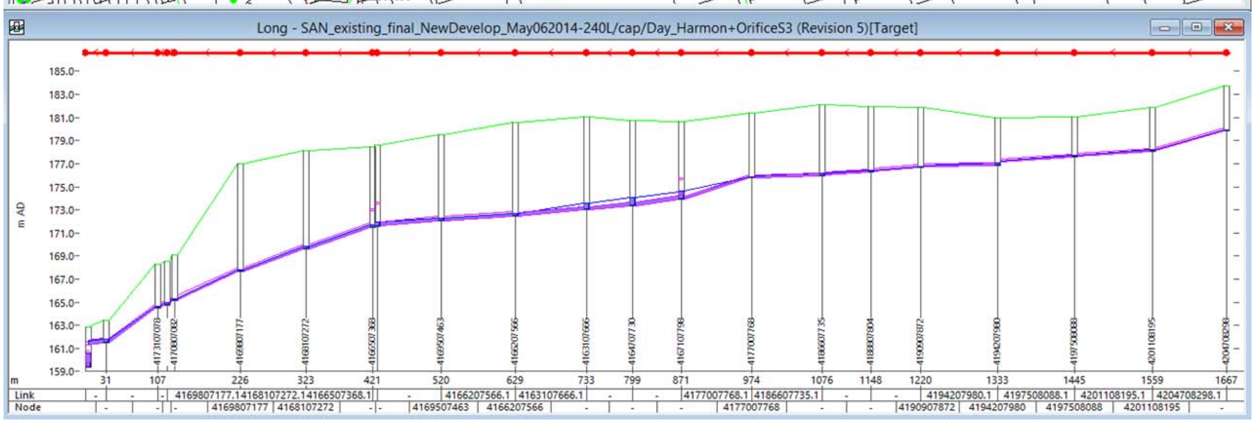
Comments:

- Sewer system fails in North Park Ravine under existing conditions
- HGL > 1.8 m below ground surface under proposed conditions

Location: **Orfus Road, Dufflaw Road & Easement**

Condition: **Growth with Improvements + Existing Conditions** (as per Area 16 Class EA)





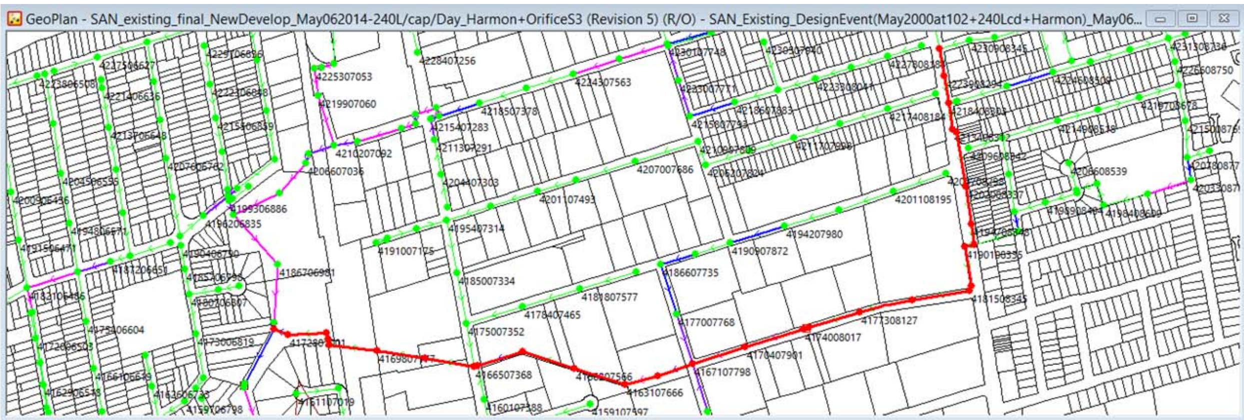
Condition: **Existing Conditions** (as per Area 16 Class EA)

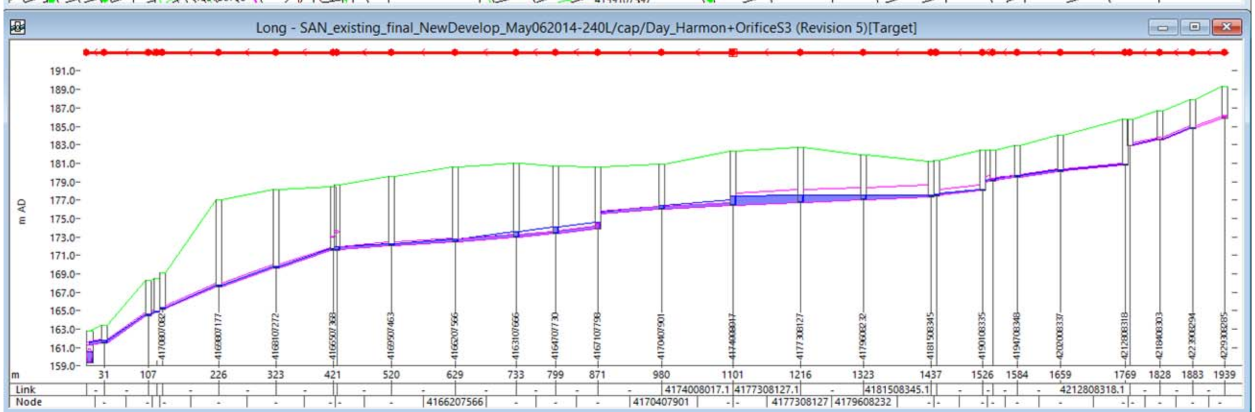
Comments:

- Sewer system fails in North Park Ravine under existing conditions
- HGL > 1.8 m below ground surface under proposed conditions

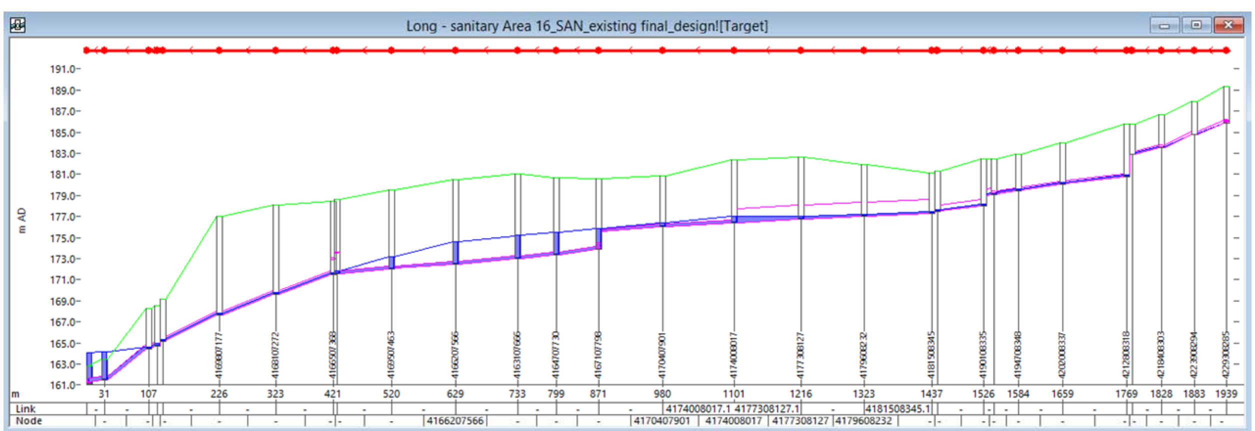
Location: **Dufferin Street, Samor Road & Easement**

Condition: **Growth with Improvements + Existing Conditions** (as per Area 16 Class EA)





Condition: **Existing Conditions** (as per Area 16 Class EA)

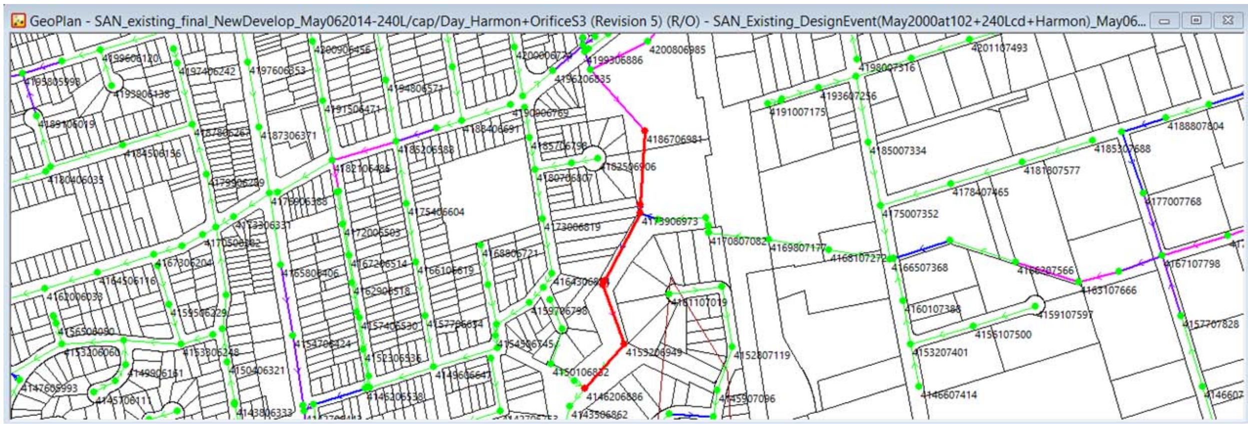


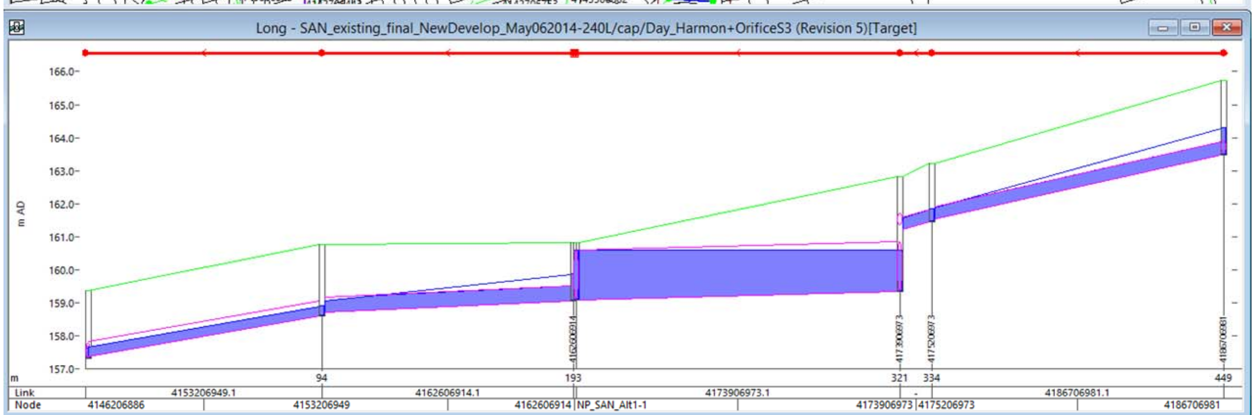
Comments:

- Sewer system fails in North Park Ravine under existing conditions
- HGL > 1.8 m below ground surface under proposed conditions

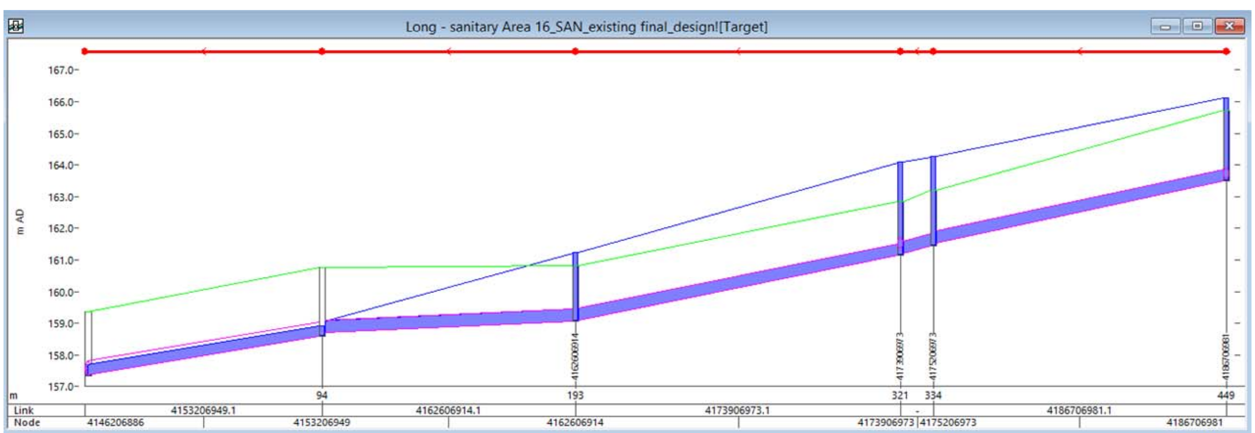
Location: **North Park Ravine** (Class EA Project SAN-NP-1)

Condition: **Growth with Improvements + Existing Conditions** (as per Area 16 Class EA)





Condition: **Existing Conditions** (as per Area 16 Class EA)



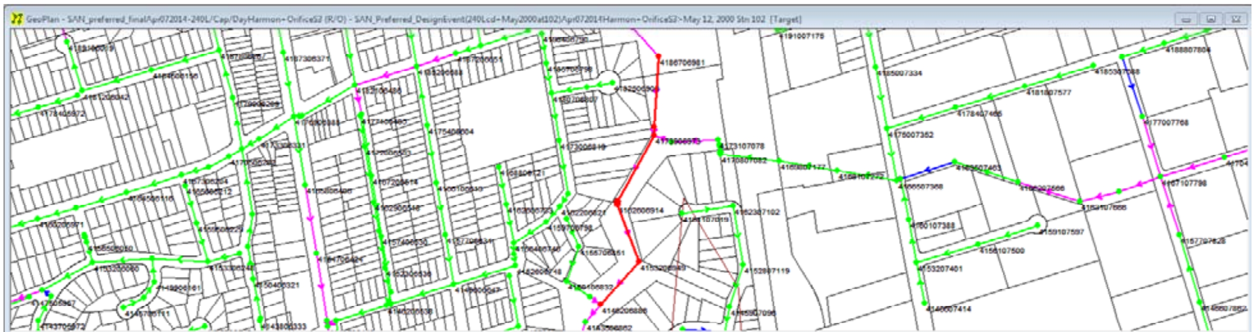
Comments:

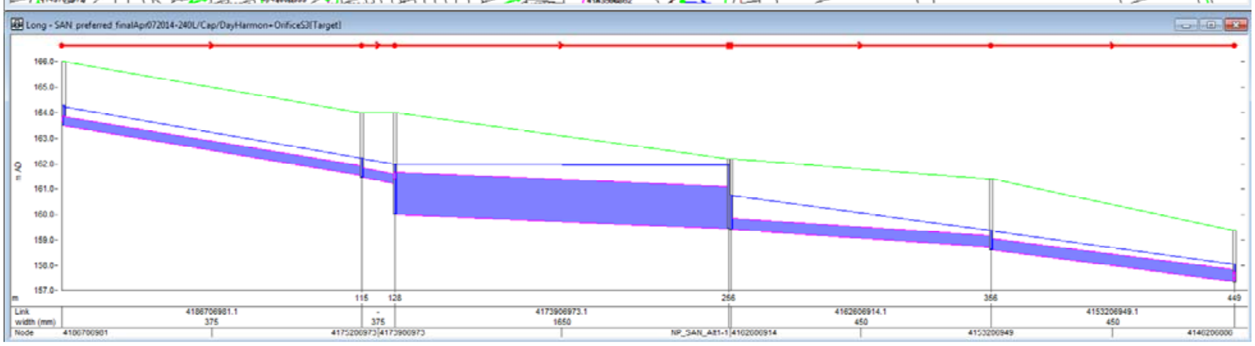
- Sewer system fails in North Park Ravine under existing conditions
- Basements not connected in ravine (i.e., 1.8 m threshold not applicable)

Area 16 Class EA Project SAN-NP-1 under Preferred Solution Model + Option 3 Improvements

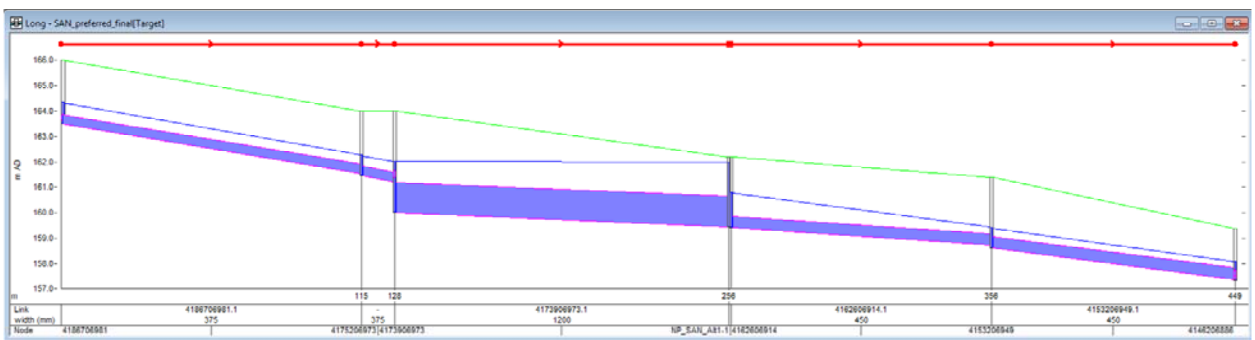
Location: **North Park Ravine** (Class EA Project SAN-NP-1)

Condition: **Growth with Improvements + Preferred Conditions** (as per Area 16 Class EA)





Condition: **Preferred Conditions** (as per Area 16 Class EA)



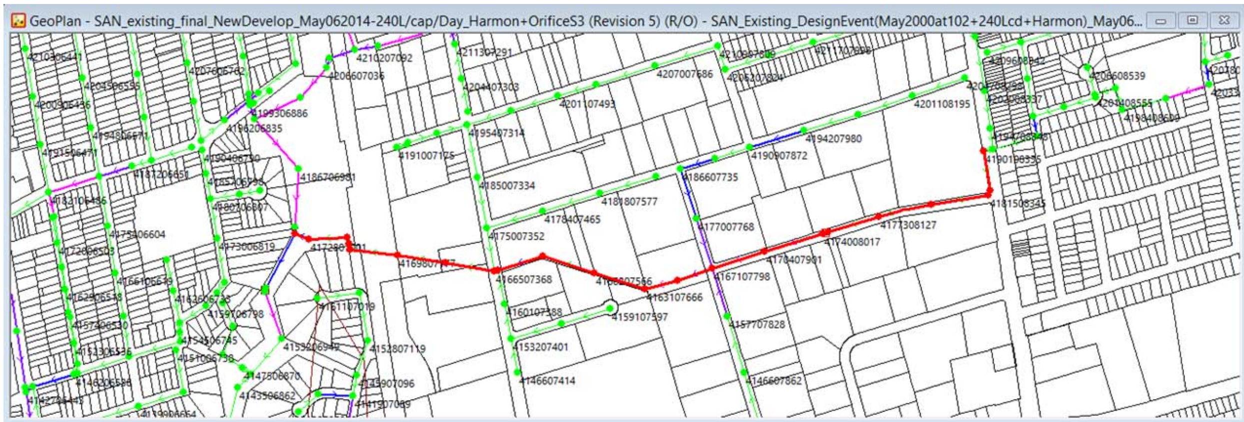
Comments:

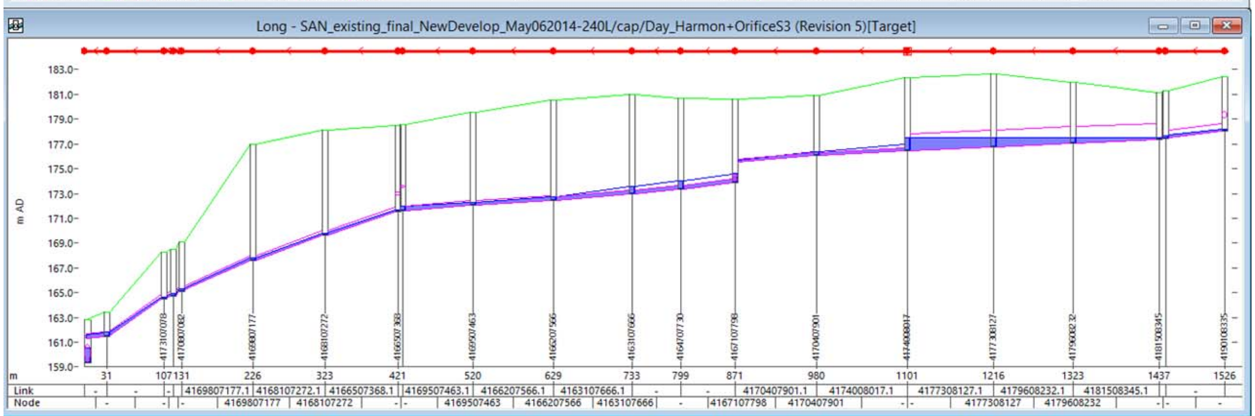
- Pipe size increased to maintain similar hydraulic performance when including growth from study area
- Basements not connected in ravine (i.e., 1.8 m threshold not applicable)

Impact of Increasing Pipe Sizes in Easement

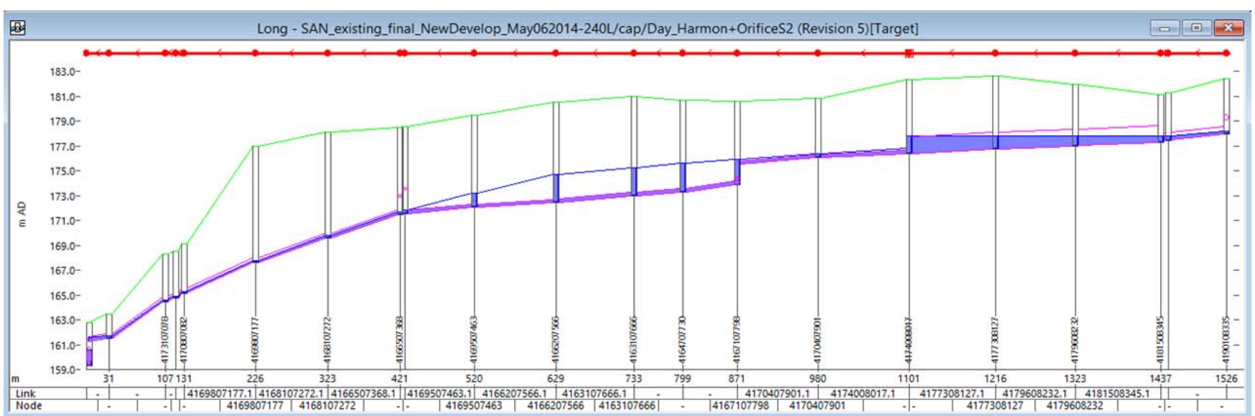
Location: **Easement between Dufflaw Road & Caledonia Road**

Condition: **Growth with Option 3 Improvements + Existing Conditions** (as per Area 16 Class EA)





Condition: **Growth with Option 2 Improvements + Existing Conditions** (as per Area 16 Class EA)

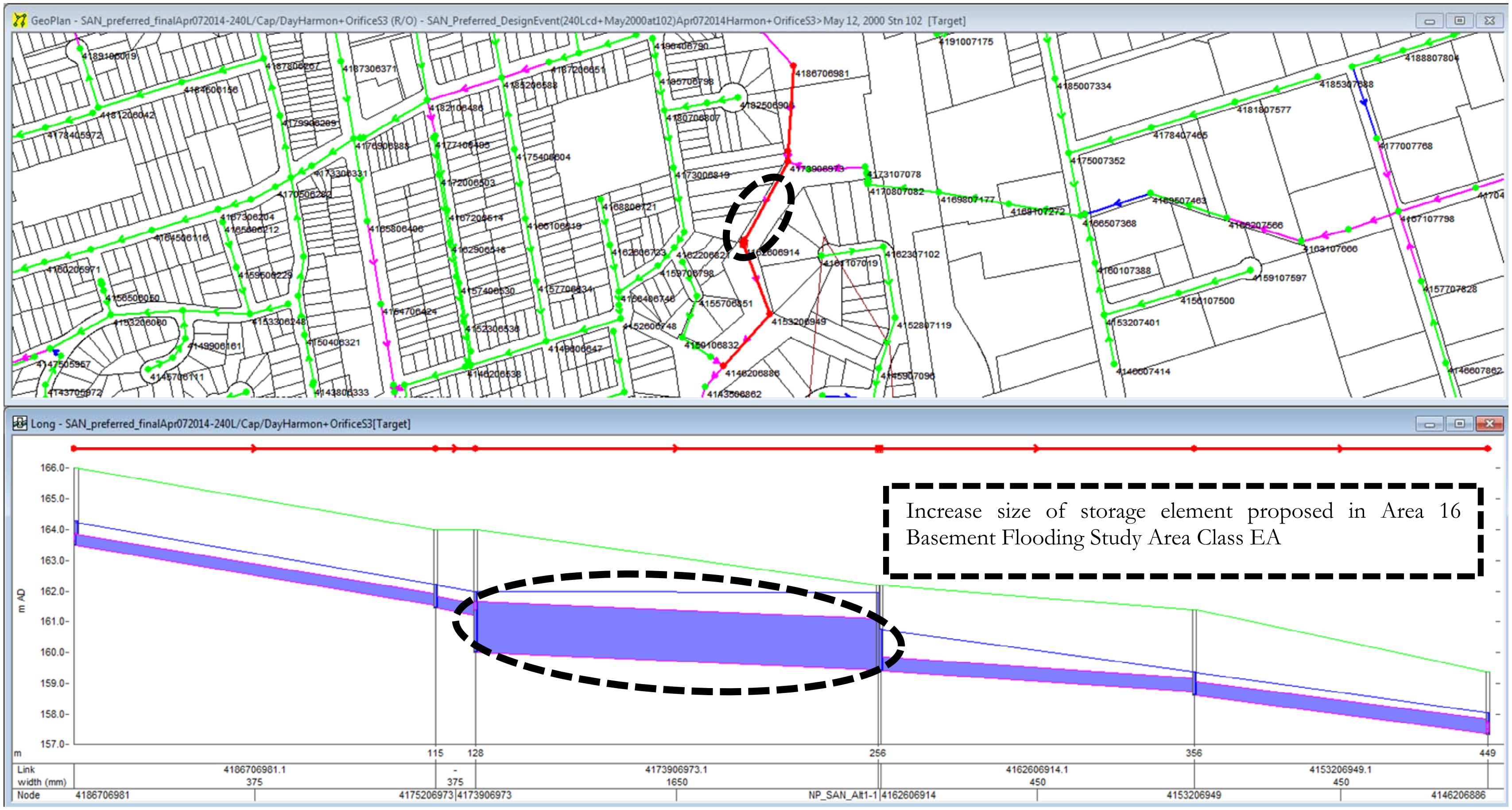


Comments:

- HGL > 1.8 m below ground surface under proposed conditions under all options identified

Description of Upgrades: **Increase of Area 16 Class EA Project SAN-NP-1 Storage Element in North Park Ravine**

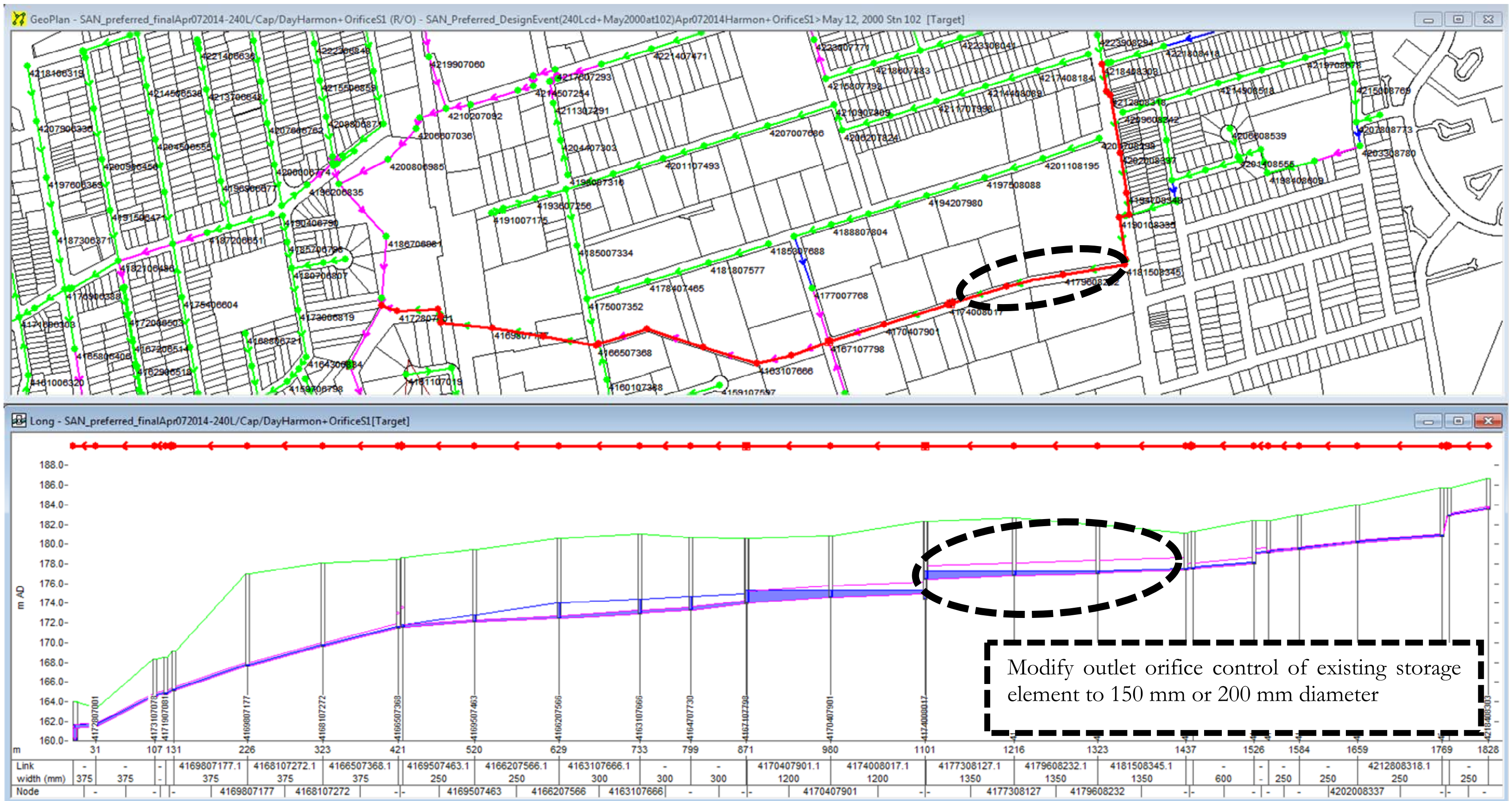
- Option 1: 2 - 2400×1500 mm box sections (can be reduced to 1500 mm ø pipe if all Area 16 preferred solutions implemented)
- Option 2: 2 - 2400×1500 mm box sections (can be reduced to 1500 mm ø pipe if all Area 16 preferred solutions implemented)
- Option 3: 1 - 2400×1500 mm + 1 - 3000×1500 mm box sections (can be reduced to 1650 mm ø pipe if all Area 16 preferred solutions implemented)



N.B. See additional discussion below.

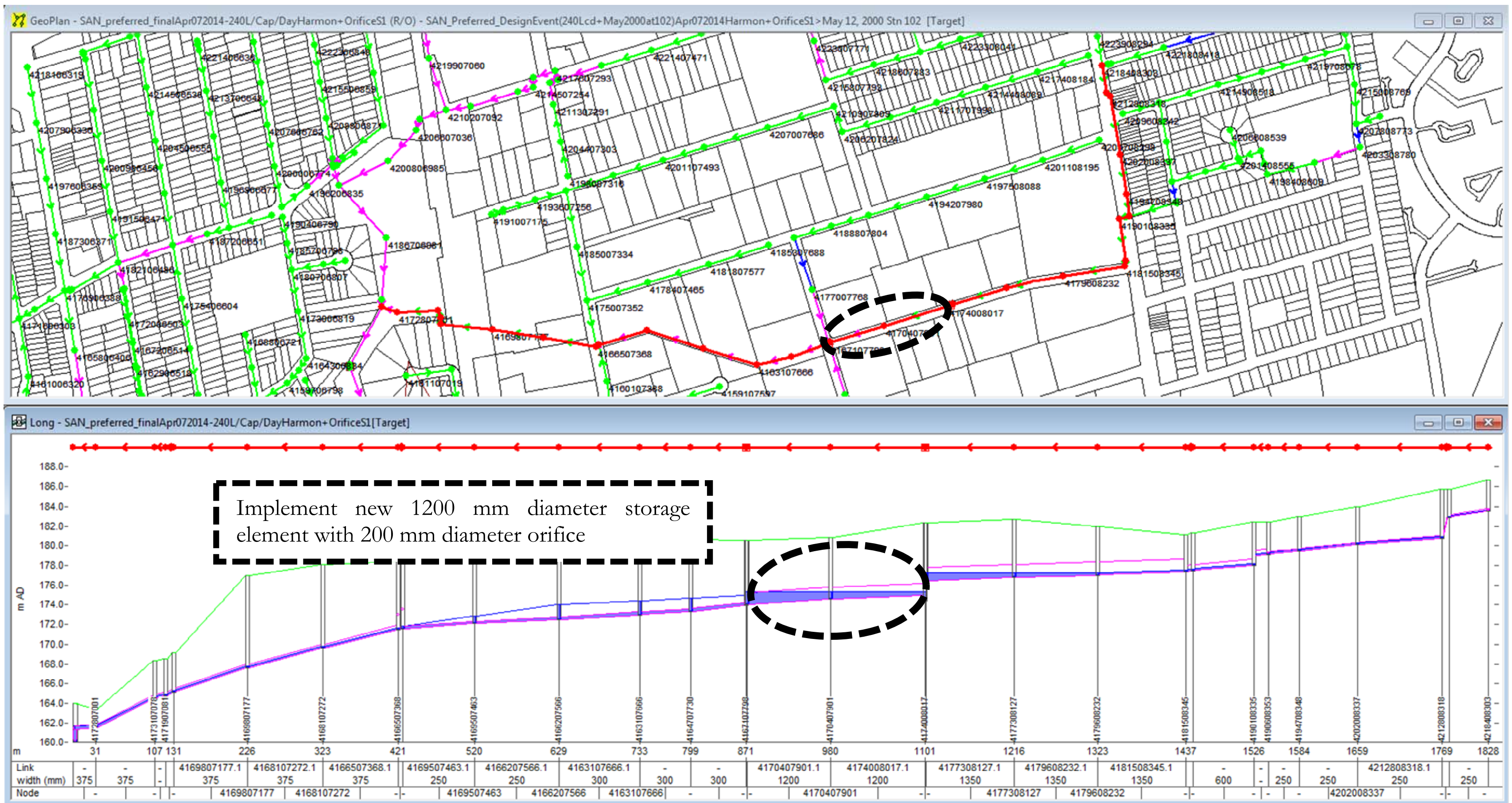
Description of Upgrades: **Modify Outlet of Existing Samor Road Storage Element**

- Option 1: 200 mm ø Orifice
- Option 2: 150 mm ø Orifice
- Option 3: 200 mm ø Orifice



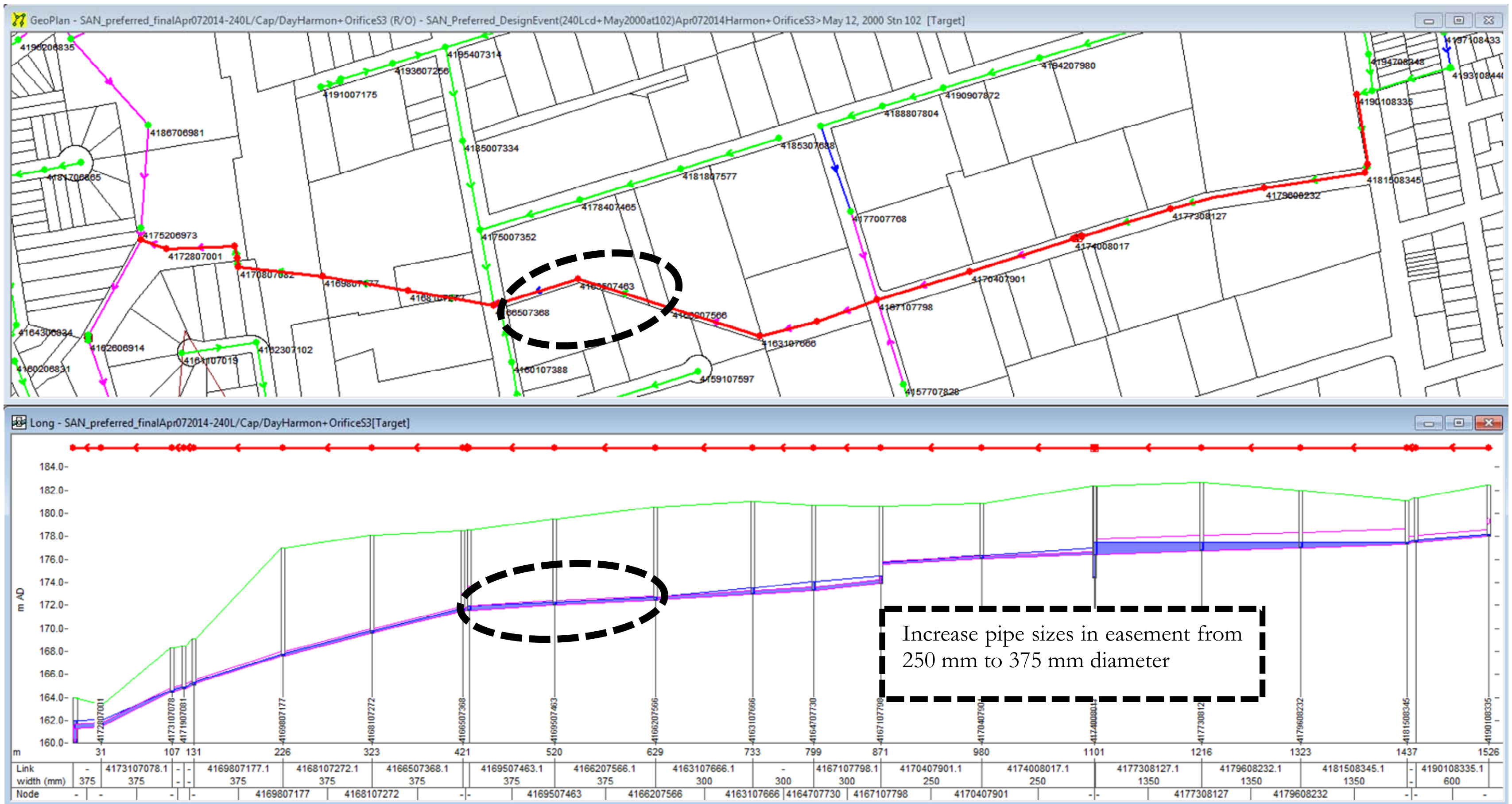
Description of Upgrades: **Add New 1200 mm ø Storage Element on Samor Road with 200 mm Orifice**

- Option 1: Applicable
- Option 2: Not Applicable
- Option 3: Not Applicable



Description of Upgrades: **Increase Pipe Sizes for 2 Legs of Sewer in Easement Between Dufflaw Road & Caledonia Road**

- Option 1: Not Applicable
- Option 2: Not Applicable
- Option 3: 375 mm ø



Additional Discussion on Improvements to North Park Ravine Sewer

It is important to note that the predominant factor contributing to the proposed in-line storage element in the North Park Ravine (Area 16 Class EA Project SAN-NP-1) is rainfall-derived infiltration and inflow, rather than increased wastewater flow resulting from population growth. Accordingly, it is not necessarily appropriate to limit growth on account of this, nor is it necessarily appropriate to consider storage solutions that are egregiously large. Rather it is recommended that the following principles be applied to allow for growth in the Dufferin Street Avenue Study area to proceed:

- Growth may proceed without implementation of the North Park Ravine storage element (Area 16 Class EA Project SAN-NP-1) provided that:
    - The peak stormwater runoff flow rate from the re-developed site under the 100-year storm condition is: (a) in conformity with the recommendations of this Implementation Master Plan; and (b) less than under pre-development (i.e., existing) conditions.
    - The peak sanitary sewage flow from the re-developed is less than the I/I reduction afforded by the re-development.

Using this approach, re-development activity will not exacerbate current conditions and affords the opportunity to improve them, particularly in combination with the proposed stormwater management controls. This further affords the City the opportunity to prioritize, plan, schedule and implement overall system upgrades as its budget permits.

Area 17 Basement Flooding Study Area

As at the time of preparation of this work, the Class EA for the Area 17 basement flooding study area was in process with preliminary recommended solutions having been presented to the public, but without having been finalized. As a result, the InfoWorks CS dynamic hydraulic models for this area were not available. In the absence of this model, and for the purpose of assessing the available capacity in the receiving sanitary sewer network in this work, the spreadsheet-based model used in support of the Treviso (Duflaw) development at the northeast corner of Dufferin Street and Lawrence Avenue West was utilized.

As part of the Treviso development, it was identified that 6 pipe lengths along Lawrence Avenue West would need to be upgraded from the existing 300 mm ø size to 450 mm ø. In addition, part of the preliminary – and subsequently finalized – recommended solution from the Area 17 Class EA study included upgrading of sewers along Dufferin Street extending north from Lawrence Avenue West, initially to Dane Avenue, then subsequently to Samor Road. Accordingly, for purposes of the analysis conducted herein, it was assumed that these works would be in place for when development within the Dufferin Street Avenue Study would occur.

The spreadsheet model was developed using the following parameters:

- Average Daily Residential Flow: 240 Lpcd
- Average Daily Commercial Flow: 250 Lpcd
- Harmon peaking factor applied to residential flows
- Infiltration Flow: 0.26 L/s/ha

At the time that this work was conducted, these assumptions appeared to be reasonable in light of the findings of the Area 16 Class EA study which, based on flow monitoring at several locations[10], observed that the average residential flow generation rate ranged from 94.7 Lpcd to 288 Lpcd with an average of 179.1 Lpcd. Also, the flow monitoring suggested that the average peak infiltration flow rate from residential areas ranged from 0.15 L/s/ha to 0.26 L/s/ha with an average of 0.20 L/s/ha. In addition, the use of the Harmon peaking factor is known to be rather conservative relative to monitored flows. Therefore, the above parameters are deemed to be appropriate for application in this analysis, particularly considering that the land use in Area 17 is predominantly residential.

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[10] "Technical Memorandum #2 – Flow and Precipitation Monitoring" prepared by Clarifica Inc. dated 10 September 2008, forming an appendix to "Sewershed Area 16 Investigations of Basement Flooding Class Environmental Assessment" prepared by Stantec, dated August 2012.

Furthermore, in reviewing the finalized Class EA Project File documentation for the Area 17 study, it is further confirmed that these assumptions are reasonable noting that the adjusted calculated and model calibrated sewage generation rates were determined to be 243 and 265 Lpcd[11]. The peak-to-average flow ratio determined through flow monitoring was 1.58, being considerably less than what the Harmon peaking factor would otherwise suggest, thereby lending conservatism to the analysis. In terms of infiltration and inflow (I&I), the monitoring data suggests a response of 0.87 L/s/ha applies to that component of the Area 17 sewershed that lies within the bounds of the Dufferin Street Avenue Study. Interestingly, using these values for flow generation rate, I&I and peak-to-average flow ratio with the area and population figures determined in the spreadsheet model for the location of the relevant flow monitor[11] results in a peak flow of 104.3 L/s, whilst the spreadsheet model based on the originally assumed values noted on the previous page predicts a peak flow at this location of 104.9 L/s. This accordingly provides comfort that there is no serious disconnect between the approach adopted for this study in light of the recently released results for the Area 17 Class EA.

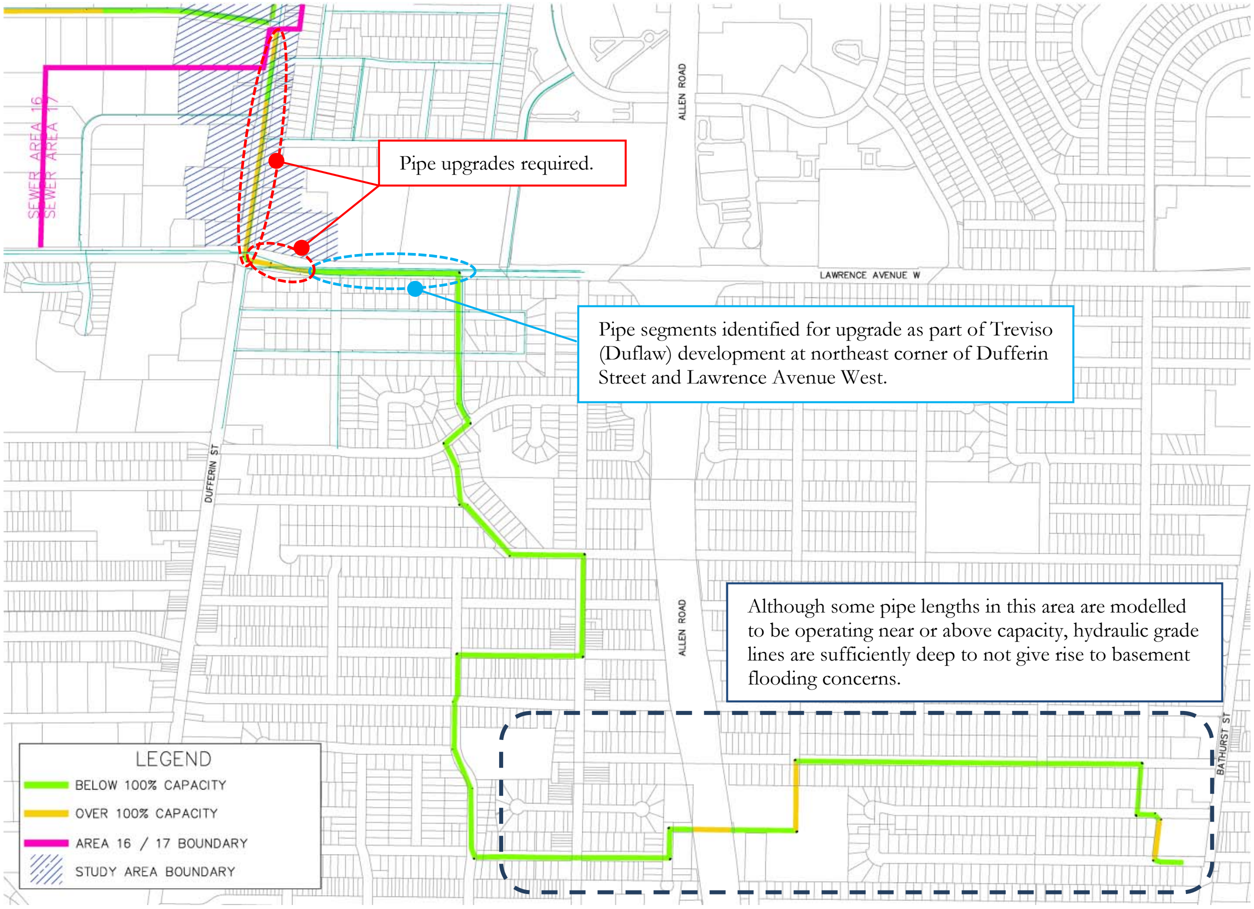
In addition, the detailed reporting for the both the Area 16 and 17 Class EAs suggested that flooding events are more related to the storm drainage system, rather than being the result of sanitary system hydraulic capacity.

The graphic below illustrates the modelled hydraulic performance of that portion of the Area 17 sewershed receiving flows from the Study Area under existing conditions, noting that the planned upgrade projects for the Treviso (Duflaw) development are accounted for. Given the surcharged state of the pipes upstream thereof, combined with the known historic upstream basement flooding, it seems reasonable to specify upgrades to these pipes as well. The current sizing of these pipes ranges from 250 to 300 mm ø and it is recommended to increase them to 450 mm ø. The preferred solutions identified in the Area 17 Class EA recommend similar upgrades.

The graphic also indicates several pipe lengths that are operating near or above capacity toward the downstream end of the system. The resulting hydraulic grade lines (HGLs) are calculated to be well below the ground surface and anticipated basement levels. The criterion applied in this context is that the maximum HGL must be maintained at an elevation at least 1.8 m below the ground elevation. While this criterion is often applied in the City in conjunction with a specific design storm so as to account for rainfall-derived infiltration and inflow (RDII), any future improvements to the storm drainage system specified by the Area 17 Class EA will further mitigate this situation. Further, the incremental impact to the HGL resulting from the addition of flows due to re-development in the Study Area is deemed to be a relevant and meaningful assessment of system impacts which, in turn, would inform any system upgrades (if any).

[11] Based on results from flow monitor HH01A525 as reported in: "Stormwater Runoff Control and Investigation of Chronic Basement Flooding: Area 17, 18 & 19 – Technical Memorandum #2 (FINAL)", Stantec Consulting Ltd., August 2014.

Modelled Existing Conditions – Area 17 Sewershed Receiving Flows from Study Area



The projected increase in future population tributary to this system, assumed to be collected by the Dufferin Street sanitary sewer (rather than Apex Road, for instance), is estimated as follows:

Contributing Block	Residential	Commercial	Gross-Up Factor[12]	Residential	Commercial
7 (@ 50%[13])	2043	99	1.0	1021.5	49.5
8a	746	36	1.25	932.5	45
8b	862	42	1.25	1077.5	52.5
9a	87	4	1.0	87	4
9 (new estimate)	2701	160	1.0	2701	160
9 (orig. estimate)[14]	(2489)	(88)	1.0	(2489)	(88)
10	320	15	1.0	320	15
Total estimated increase in population (rounded):				3651	238

The table below provides a comparison between the modelled future condition with the addition of flows resulting from re-development and intensification in the Study Area relative to the modelled existing condition. The results indicate that the system generally continues to perform well with some additional pipes nearing or marginally exceeding their full flow capacities. As noted above, the most meaningful way to assess the impact is to compare the estimated HGLs under existing and future conditions to: (i) understand the incremental effect resulting from the addition of flows; and (ii) to compare the resultant HGLs with ground (basement) elevations.

This comparison is provided in the table below[15] which indicates that the anticipated increases in the HGL are rather modest and the resulting HGL continues to lie beneath the 1.8 m threshold below the road surface. There is one exception to this where the HGL is estimated to lie 1.74 m beneath the road surface (under both existing and proposed conditions), however, this situation occurs at the Allen Road Crossing at which point there are no houses (basements) and thus the criterion is not meaningful. Moreover, the increase in the HGL is estimated to be on the order of 1 cm which is negligible.

Based on this analysis, it appears that the planned intensification in the Study Area can be accommodated by the existing system without any upgrades other than those previously contemplated and noted above.

[12] The Gross-Up Factor is used to lend additional conservatism to the analysis and to accommodate potentially different relative allocations of populations to the different receiving sewers, affording future flexibility in development forms.

[13] Assumed that sewage from Block 7 will be split evenly between sanitary sewers on Dufferin Street (Area 17) and Samor Road (Area 16).

[14] The model used for this analysis carried population estimates for the Treviso Development on Block 9 and is deducted here to determine the incremental population which is the purpose of this analysis.

[15] HGL analysis based on receiving trunk storm sewer system surcharged to approximately 0.5 m above obvert of discharge pipe, deemed to be a conservative assumption. It is noted that the exact tailwater elevation is less relevant than the impact of adding flows to the system in the context of this analysis.

Comparison of Existing and Future Modelled Hydraulic Grade Line Elevations

Location	Description	Existing (m)	Future (m)	Change (m)	Depth (m)
MH1A	Lawrence Avenue West	176.44	176.45	+0.018	4.23
MH3A	Lawrence Avenue West	176.18	176.20	+0.023	3.88
MH23A	Marlee Avenue	171.73	171.77	+0.040	3.15
MH5	Stayner Avenue	167.84	167.84	+0.015	2.15
MH3	Stayner Avenue	167.65	167.65	+0.006	4.41
MH43A	Allen Road Crossing	167.33	167.34	+0.009	3.91
MH44A	Allen Road Crossing	167.31	167.32	+0.005	1.74
MH46A	Shermont Avenue	167.02	167.04	+0.017	6.85
MH47A	Shermont Avenue	166.99	167.00	+0.009	6.69
MH104	Prue Avenue	165.28	165.31	+0.030	5.66
MH105	Prue Avenue	165.21	165.23	+0.022	6.26
MH106	Easement	165.18	165.20	+0.019	6.49

The following pages include the relevant spreadsheets computing design flows and assessing system performance under existing and future conditions.

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City of Toronto - Technical Services Division
AREA 17 SANITARY SEWER DESIGN SHEET

Dufferin Avenue Study
PRE DEVELOPMENT

Designed By: Jason Jenkins, P.Eng., P.E.
Checked By: Fabian Papa, P.Eng.
File No.: 13073
Date: 14, February 2014

				RESIDENTIAL						COMMERCIAL			INFILTRATION	TOTAL	SLOPE	CAPACITY	SURCHARGE
	STREET	FROM	TO	TOTAL POPULATION (Pers)	CUMULATIVE AREA (Ha)	CUMULATIVE POPULATION (Pers)	AVERAGE FLOW (l/s)	PEAKING FACTOR	PEAK FLOW (l/s)	CUMULATIVE AREA (Ha)	CUMULATIVE POPULATION (Pers)	AVERAGE FLOW (l/s)	FLOW (l/s)	FLOW (l/s)	(%)	(l/s)	(%)
				0													
1	LAWRENCE AVENUE	ExMH5A	ExMH6A														
		TOTAL TO	ExMH6A														
				38.42	23.16	3667.58	10.18772222	3.366826818	34.30029639	2.32	349.12	1.010185185	6.6248	41.93528157	0.2000	133.0162777	
2	LAWRENCE AVENUE	ExMH6A	ExMH6AA														
				6.02	23.36	3673.6	10.20444444	3.366198342	34.35018397	2.32	349.12	1.010185185	6.6768	42.03716916	0.5600	222.5788049	
3	LAWRENCE AVENUE	ExMH6AA	ExMH7A														
				298.52	25.39	3972.12	11.03366667	3.336051792	36.80888346	2.32	349.12	1.010185185	7.2046	45.02366864	0.1100	98.64751178	
4	LAWRENCE AVENUE	ExMH7A	ExMH7AA														
				0	25.43	3972.12	11.03366667	3.336051792	36.80888346	2.32	349.12	1.010185185	7.215	45.03406864	0.2800	157.3869823	
5	LAWRENCE AVENUE	ExMH7AA	ExMH8A														
				19.78	25.82	3991.9	11.08861111	3.334121499	36.97077669	6.21	878.16	2.540972222	8.3278	47.83954892	0.1600	118.9733757	
6	LAWRENCE AVENUE	ExMH8A	ExMH9A														
				13.76	26.16	4005.66	11.12683333	3.33278338	37.0833252	6.21	878.16	2.540972222	8.4162	48.04049742	0.3600	178.4600635	
7	BOLINGBROKE ROAD	ExMH9A	ExMH10A														
				0	27.34	4034.04	11.20566667	3.330035567	37.31526856	6.59	929.84	2.690509259	8.8218	48.82757782	0.3600	178.4600635	
8	BOLINGBROKE ROAD	ExMH10A	ExMH11A														
				0	31.37	4266.24	11.85066667	3.308140809	39.20367401	6.79	957.04	2.769212963	9.9216	51.89448698	0.1300	107.2411516	
9	BOLINGBROKE ROAD	ExMH11A	ExMH12A														
				0	35.09	4512.2	12.53388889	3.28601512	41.1865484	6.79	957.04	2.769212963	10.8888	54.84456136	0.1100	98.64751178	
10	BOLINGBROKE ROAD	ExMH12A	ExMH13A														
				28.38	35.52	4540.58	12.61272222	3.283528185	41.41422891	6.79	957.04	2.769212963	11.0006	55.18404187	0.2500	148.7167196	
11	BOLINGBROKE ROAD	ExMH13A	ExMH14A														
				21.5	35.86	4562.08	12.67244444	3.281652899	41.58656405	6.79	957.04	2.769212963	11.089	55.44477701	0.9200	285.2881327	
12	WENDERLY DRIVE	ExMH14A	ExMH15A														
				28.38	46.04	5439.88	15.11077778	3.210867825	48.51871018	6.79	957.04	2.769212963	13.7358	65.02372314	0.4200	192.7588994	
13	LOIS AVENUE	ExMH15A	ExMH16A														
				18.92	49.84	5686.7	15.79638889	3.192748799	50.43390166	6.79	957.04	2.769212963	14.7238	67.92691462	0.3600	178.4600635	
14	LOIS AVENUE	ExMH16A	ExMH17A		49.84	5686.7	15.79638889	3.192748799	50.43390166	6.79	957.04	2.769212963	14.7238	67.92691462	0.3000	162.911004	
15	LOIS AVENUE	ExMH17A	ExMH18A														
				21.5	50.24	5708.2	15.85611111	3.191203147	50.60007167	6.79	957.04	2.769212963	14.8278	68.19708463	0.4400	197.2950236	
16	LOIS AVENUE	ExMH18A	ExMH19A														
				6.02	52.8	5885.36	16.34822222	3.178657343	51.96539661	6.79	957.04	2.769212963	15.4934	70.22800958	0.3000	162.911004	
17	LOIS AVENUE	ExMH19A	ExMH20A														
				24.08	53.2	5909.44	16.41511111	3.176977722	52.15044231	6.79	957.04	2.769212963	15.5974	70.51705527	0.2200	139.508649	
18	LOIS AVENUE	ExMH20A	ExMH21A														
				43.86	53.85	5953.3	16.53694444	3.173933796	52.48716685	6.79	957.04	2.769212963	15.7664	71.02277981	0.3300	170.8625024	
19	GLENGROVE AVENUE	ExMH21A	ExMH22A														
				24.08	54.92	6019.52	16.72088889	3.169375206	52.99477066	6.79	957.04	2.769212963	16.0446	71.80858362	0.2600	151.661891	
20	GLENGROVE AVENUE	ExMH22A	ExMH23A														
				0	56.46	6019.52	16.72088889	3.169375206	52.99477066	6.79	957.04	2.769212963	16.445	72.20898362	0.3100	165.6039303	
21	MARLEE AVENUE	ExMH23A	ExMH24A														
				0	60.15	6249.14	17.35872222	3.153903151	54.74772872	6.79	957.04	2.769212963	17.4044	74.92134168	0.3200	168.2537614	
22	MARLEE AVENUE	ExMH24A	ExMH25A														
				0	63.59	6465	17.95833333	3.139810175	56.38575773	7.17	1008.72	2.91875	18.3976	77.70210773	0.2000	133.0162777	
23	GLENCAIRN AVENUE	ExMH25A	ExMH26A														
				20.64	64.93	6542.4	18.17333333	3.134858537	56.97082914	7.93	1112.08	3.217824074	18.9436	79.13225321	0.1400	111.2894025	
24	GLENCAIRN AVENUE	ExMH26A	ExMH27A														
				52.46	65.7	6594.86	18.31905556	3.131531982	57.36670835	7.93	1112.08	3.217824074	19.1438	79.72833242	0.3700	180.9216979	
25	GLENCAIRN AVENUE	ExMH27A	ExMH12														
				51.6	66.47	6646.46	18.46238889	3.128282882	57.75557512	7.93	1112.08	3.217824074	19.344	80.3173992	0.3900	185.7471232	
26	DANESBURY AVENUE	ExMH12	ExMH11														
				0	66.64	6646.46	18.46238889	3.128282882	57.75557512	7.93	1112.08	3.217824074	19.3882	80.3615992	0.6800	245.2698972	
27	DANESBURY AVENUE	ExMH11	ExMH10														
				0	66.65	6646.46	18.46238889	3.128282882	57.75557512	7.93	1112.08	3.217824074	19.3908	80.3641992	4.9100	659.0684752	
28	DANESBURY AVENUE	ExMH10	ExMH9														
				0	130.88	13871.26	38.53127778	2.81243521	108.3667223	26.38	3621.28	10.47824074	40.8876	159.7325631	0.2200	300.4492315	
29	DANESBURY AVENUE	ExMH9	ExMH8														

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City of Toronto - Technical Services Division
AREA 17 SANITARY SEWER DESIGN SHEET

Designed By: Jason Jenkins, P.Eng., P.E.
Checked By: Fabian Papa, P.Eng.
File No.: 13073
Date: 14, February 2014

Dufferin Avenue Study
PRE DEVELOPMENT

				RESIDENTIAL						COMMERCIAL			INFILTRATION	TOTAL	SLOPE	CAPACITY	SURCHARGE
	STREET	FROM	TO	TOTAL POPULATION (Pers)	CUMULATIVE AREA (Ha)	CUMULATIVE POPULATION (Pers)	AVERAGE FLOW (l/s)	PEAKING FACTOR	PEAK FLOW (l/s)	CUMULATIVE AREA (Ha)	CUMULATIVE POPULATION (Pers)	AVERAGE FLOW (l/s)	FLOW (l/s)	FLOW (l/s)	(%)	(l/s)	(%)
				190.92	143.1	14678.8	40.77444444	2.787699862	113.6669131	27.2	3732.8	10.80092593	44.278	168.7458391	0.1000	202.5628305	
30	DANESBURY AVENUE	ExMH8	ExMH7														
				36.12	143.65	14714.92	40.87477778	2.786625116	113.9026824	27.2	3732.8	10.80092593	44.421	169.1246083	0.1100	212.449689	
31	DANESBURY AVENUE	ExMH7	ExMH6														
				25.8	144.06	14740.72	40.94644444	2.785859038	114.0710223	27.2	3732.8	10.80092593	44.5276	169.3995483	0.1800	271.7665553	
32	STAYNER AVENUE	ExMH6	ExMH6A														
				30.1	149.18	15041.72	41.78255556	2.777018312	116.0309219	27.43	3764.08	10.89143519	45.9186	172.8409571	0.1000	202.5628305	
33	STAYNER AVENUE	ExMH6A	ExMH5														
				49.88	151.05	15091.6	41.92111111	2.775570241	116.3549885	27.43	3764.08	10.89143519	46.4048	173.6512236	0.1400	239.6755733	
34	STAYNER AVENUE	ExMH5	ExMH4														
				10.32	151.3	15101.92	41.94977778	2.775271233	116.4220115	27.77	3810.32	11.02523148	46.5582	174.005443	0.0800	181.1777035	
35	STAYNER AVENUE	ExMH4	ExMH3														
				25.8	157.72	15478.6	42.99611111	2.764494174	118.8624987	30.1	4127.2	11.94212963	48.8332	179.6378283	0.0900	263.0799425	
36	STAYNER AVENUE	ExMH3	ExMH2														
				29.24	158.25	15507.84	43.07733333	2.763668543	119.0514711	30.1	4127.2	11.94212963	48.971	179.9646007	0.0500	196.0882117	
37	BENNER AVENUE	ExMH2	ExMH1														
				78.26	159.3	15586.1	43.29472222	2.761466374	119.5569196	30.1	4127.2	11.94212963	49.244	180.7430492	0.0800	248.0341485	
38		ExMH1	ExMH43A		159.3	15586.1	43.29472222	2.761466374	119.5569196	30.1	4127.2	11.94212963	49.244	180.7430492	0.1900	382.2462945	
39		ExMH43A	ExMH44A		159.3	15586.1	43.29472222	2.761466374	119.5569196	30.1	4127.2	11.94212963	49.244	180.7430492	0.1900	382.2462945	
40		ExMH44A	ExMH45A		159.3	15586.1	43.29472222	2.761466374	119.5569196	30.1	4127.2	11.94212963	49.244	180.7430492	0.0500	196.0882117	
41		ExMH45A	ExMH46A														
				530.62	165.47	16116.72	44.76866667	2.746820026	122.9714701	30.1	4127.2	11.94212963	50.8482	185.7617998	0.2100	401.8612501	
42		ExMH46A	ExMH47A		165.47	16116.72	44.76866667	2.746820026	122.9714701	30.1	4127.2	11.94212963	50.8482	185.7617998	0.0600	214.8038736	
43	SHERMOUNT AVENUE	ExMH47A	ExMH48A														
				0	165.56	16116.72	44.76866667	2.746820026	122.9714701	30.1	4127.2	11.94212963	50.8716	185.7851998	0.0145	105.5967337	75.94 % SURCHARGED
44	VIEWMOUNT AVENUE	ExMH48A	ExMH49A														
				110.08	177.45	16851.16	46.80877778	2.727325305	127.6627641	30.1	4127.2	11.94212963	53.963	193.5678938	0.2200	411.3181028	
45	VIEWMOUNT AVENUE	ExMH49A	ExMH50A														
				85.14	178.7	16936.3	47.04527778	2.725120822	128.204066	30.1	4127.2	11.94212963	54.288	194.4341957	0.1300	316.1827408	
46	VIEWMOUNT AVENUE	ExMH50A	ExMH51A														
				143.62	180.77	17079.92	47.44422222	2.721427322	129.1160026	30.1	4127.2	11.94212963	54.8262	195.8843323	0.1700	361.568797	
47	VIEWMOUNT AVENUE	ExMH51A	ExMH52A														
				44.72	181.46	17124.64	47.56844444	2.720283639	129.3996612	30.1	4127.2	11.94212963	55.0056	196.3473908	0.1000	277.3106084	
48	VIEWMOUNT AVENUE	ExMH52A	ExMH103														
				87.72	182.73	17212.36	47.81211111	2.718048985	129.9556601	30.1	4127.2	11.94212963	55.3358	197.2335897	0.3500	518.8006431	
49	GLENMOUNT AVENUE	ExMH103	ExMH104														
				313.9	352.07	38784.96	107.736	2.368824044	255.2076272	62.17	8488.72	24.56226852	107.7024	387.4722957	0.6300	696.0441028	
50	PRUE AVENUE	ExMH104	ExMH105														
				22.36	352.4	38807.32	107.7981111	2.368583863	255.3288664	62.17	8488.72	24.56226852	107.7882	387.679335	0.5800	667.8523837	
51	PRUE AVENUE	ExMH105	ExMH106														
				0	352.42	38807.32	107.7981111	2.368583863	255.3288664	62.17	8488.72	24.56226852	107.7934	387.684535	0.9400	850.2182255	
52		ExMH106	ExMH107														
				0	353.7	39201.64	108.8934444	2.364373306	257.4647533	62.17	8488.72	24.56226852	108.1262	390.1532218	0.1000	277.3106084	40.69 % SURCHARGED
53	HILLHURST BOULEVARD	ExMH107	ExMH108														
				0	360.29	39650.56	110.1404444	2.359636596	259.8914234	62.17	8488.72	24.56226852	109.8396	394.2932919	16.6700	3580.422548	

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Dufferin Avenue Study
POST DEVELOPMENT

				RESIDENTIAL						COMMERCIAL			INFILTRATION	TOTAL	SLOPE	CAPACITY	SURCHARGE
	STREET	FROM	TO	TOTAL POPULATION (Pers)	CUMULATIVE AREA (Ha)	CUMULATIVE POPULATION (Pers)	AVERAGE FLOW (l/s)	PEAKING FACTOR	PEAK FLOW (l/s)	CUMULATIVE AREA (Ha)	CUMULATIVE POPULATION (Pers)	AVERAGE FLOW (l/s)	FLOW (l/s)	FLOW (l/s)	(%)	(l/s)	(%)
				3651	Add additional Population for Dufferin Street Avenue Study						238						
1	LAWRENCE AVENUE	ExMH5A	ExMH6A														
		TOTAL TO	ExMH6A	38.42	23.16	7318.58	20.32938889	3.087904535	62.77521213	2.32	587.12	1.698842593	6.6248	71.09885473	0.2000	133.0162777	
2	LAWRENCE AVENUE	ExMH6A	ExMH6AA	6.02	23.36	7324.6	20.34611111	3.087558209	62.81980237	2.32	587.12	1.698842593	6.6768	71.19544497	0.5600	222.5788049	
3	LAWRENCE AVENUE	ExMH6AA	ExMH7A	298.52	25.39	7623.12	21.17533333	3.070699656	65.02308878	2.32	587.12	1.698842593	7.2046	73.92653138	0.1100	98.64751178	
4	LAWRENCE AVENUE	ExMH7A	ExMH7AA	0	25.43	7623.12	21.17533333	3.070699656	65.02308878	2.32	587.12	1.698842593	7.215	73.93693138	0.2800	157.3869823	
5	LAWRENCE AVENUE	ExMH7AA	ExMH8A	19.78	25.82	7642.9	21.23027778	3.069603873	65.16854288	6.21	1116.16	3.22962963	8.3278	76.72597251	0.1600	118.9733757	
6	LAWRENCE AVENUE	ExMH8A	ExMH9A	13.76	26.16	7656.66	21.2685	3.068843107	65.26968962	6.21	1116.16	3.22962963	8.4162	76.91551925	0.3600	178.4600635	
7	BOLINGBROKE ROAD	ExMH9A	ExMH10A	0	27.34	7685.04	21.34733333	3.067277945	65.47820473	6.59	1167.84	3.379166667	8.8218	77.67917139	0.3600	178.4600635	
8	BOLINGBROKE ROAD	ExMH10A	ExMH11A	0	31.37	7917.24	21.99233333	3.054666139	67.17923594	6.79	1195.04	3.45787037	9.9216	80.55870631	0.1300	107.2411516	
9	BOLINGBROKE ROAD	ExMH11A	ExMH12A	0	35.09	8163.2	22.67555556	3.041670069	68.97155864	6.79	1195.04	3.45787037	10.8888	83.31822901	0.1100	98.64751178	
10	BOLINGBROKE ROAD	ExMH12A	ExMH13A	28.38	35.52	8191.58	22.75438889	3.040193669	69.17774905	6.79	1195.04	3.45787037	11.0006	83.63621942	0.2500	148.7167196	
11	BOLINGBROKE ROAD	ExMH13A	ExMH14A	21.5	35.86	8213.08	22.81411111	3.039078304	69.3338701	6.79	1195.04	3.45787037	11.089	83.88074047	0.9200	285.2881327	
12	WENDERLY DRIVE	ExMH14A	ExMH15A	28.38	46.04	9090.88	25.25244444	2.995692548	75.64855964	6.79	1195.04	3.45787037	13.7358	92.84223001	0.4200	192.7588994	
13	LOIS AVENUE	ExMH15A	ExMH16A	18.92	49.84	9337.7	25.93805556	2.984193055	77.40416526	6.79	1195.04	3.45787037	14.7238	95.58583563	0.3600	178.4600635	
14	LOIS AVENUE	ExMH16A	ExMH17A		49.84	9337.7	25.93805556	2.984193055	77.40416526	6.79	1195.04	3.45787037	14.7238	95.58583563	0.3000	162.911004	
15	LOIS AVENUE	ExMH17A	ExMH18A	21.5	50.24	9359.2	25.99777778	2.983204816	77.55669587	6.79	1195.04	3.45787037	14.8278	95.84236624	0.4400	197.2950236	
16	LOIS AVENUE	ExMH18A	ExMH19A	6.02	52.8	9536.36	26.48988889	2.975141507	78.81116795	6.79	1195.04	3.45787037	15.4934	97.76243832	0.3000	162.911004	
17	LOIS AVENUE	ExMH19A	ExMH20A	24.08	53.2	9560.44	26.55677778	2.974056354	78.98135369	6.79	1195.04	3.45787037	15.5974	98.03662406	0.2200	139.508649	
18	LOIS AVENUE	ExMH20A	ExMH21A	43.86	53.85	9604.3	26.67861111	2.972086383	79.29113679	6.79	1195.04	3.45787037	15.7664	98.51540716	0.3300	170.8625024	
19	GLENGROVE AVENUE	ExMH21A	ExMH22A	24.08	54.92	9670.52	26.86255556	2.969128019	79.75836637	6.79	1195.04	3.45787037	16.0446	99.26083674	0.2600	151.661891	
20	GLENGROVE AVENUE	ExMH22A	ExMH23A	0	56.46	9670.52	26.86255556	2.969128019	79.75836637	6.79	1195.04	3.45787037	16.445	99.66123674	0.3100	165.6039303	
21	MARLEE AVENUE	ExMH23A	ExMH24A	0	60.15	9900.14	27.50038889	2.959014947	81.37406177	6.79	1195.04	3.45787037	17.4044	102.2363321	0.3200	168.2537614	
22	MARLEE AVENUE	ExMH24A	ExMH25A	0	63.59	10116	28.1	2.949707032	82.8867676	7.17	1246.72	3.607407407	18.3976	104.891775	0.2000	133.0162777	
23	GLENCAIRN AVENUE	ExMH25A	ExMH26A	20.64	64.93	10193.4	28.315	2.946415069	83.42774267	7.93	1350.08	3.906481481	18.9436	106.2778242	0.1400	111.2894025	
24	GLENCAIRN AVENUE	ExMH26A	ExMH27A	52.46	65.7	10245.86	28.46072222	2.944197236	83.7939797	7.93	1350.08	3.906481481	19.1438	106.8442612	0.3700	180.9216979	
25	GLENCAIRN AVENUE	ExMH27A	ExMH12	51.6	66.47	10297.46	28.60405556	2.9420262	84.15388086	7.93	1350.08	3.906481481	19.344	107.4043623	0.3900	185.7471232	
26	DANESBURY AVENUE	ExMH12	ExMH11	0	66.64	10297.46	28.60405556	2.9420262	84.15388086	7.93	1350.08	3.906481481	19.3882	107.4485623	0.6800	245.2698972	
27	DANESBURY AVENUE	ExMH11	ExMH10	0	66.65	10297.46	28.60405556	2.9420262	84.15388086	7.93	1350.08	3.906481481	19.3908	107.4511623	4.9100	659.0684752	
28	DANESBURY AVENUE	ExMH10	ExMH9	0	130.88	17522.26	48.67294444	2.710245375	131.9156226	26.38	3859.28	11.16689815	40.8876	183.9701207	0.2200	300.4492315	
29	DANESBURY AVENUE	ExMH9	ExMH8	190.92	143.1	18329.8	50.91611111	2.690549386	136.9923115	27.2	3970.8	11.48958333	44.278	192.7598948	0.1000	202.5628305	
30	DANESBURY AVENUE	ExMH8	ExMH7	36.12	143.65	18365.92	51.01644444	2.689689122	137.2183757	27.2	3970.8	11.48958333	44.421	193.128959	0.1100	212.449689	

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City of Toronto - Technical Services Division

AREA 17 SANITARY SEWER DESIGN SHEET

Dufferin Avenue Study
POST DEVELOPMENT

Designed By: Jason Jenkins, P.Eng., P.E.
Checked By: Fabian Papa, P.Eng.
File No.: 13073
Date: 14, February 2014

	STREET	FROM	TO	RESIDENTIAL TOTAL POPULATION (Pers)	RESIDENTIAL CUMULATIVE AREA (Ha)	RESIDENTIAL CUMULATIVE POPULATION (Pers)	RESIDENTIAL AVERAGE FLOW (l/s)	RESIDENTIAL PEAKING FACTOR	RESIDENTIAL PEAK FLOW (l/s)	COMMERCIAL CUMULATIVE AREA (Ha)	COMMERCIAL CUMULATIVE POPULATION (Pers)	COMMERCIAL AVERAGE FLOW (l/s)	INFILTRATION FLOW (l/s)	TOTAL FLOW (l/s)	SLOPE (%)	CAPACITY (l/s)	SURCHARGE (%)
31	DANESBURY AVENUE	ExMH7	ExMH6	25.8	144.06	18391.72	51.08811111	2.689075701	137.3797982	27.2	3970.8	11.48958333	44.5276	193.3969815	0.1800	271.7665553	
32	STAYNER AVENUE	ExMH6	ExMH6A	30.1	149.18	18692.72	51.92422222	2.681983159	139.2598895	27.43	4002.08	11.58009259	45.9186	196.7585821	0.1000	202.5628305	
33	STAYNER AVENUE	ExMH6A	ExMH5	49.88	151.05	18742.6	52.06277778	2.680819072	139.5708876	27.43	4002.08	11.58009259	46.4048	197.5557802	0.1400	239.6755733	
34	STAYNER AVENUE	ExMH5	ExMH4	10.32	151.3	18752.92	52.09144444	2.680578621	139.6352123	27.77	4048.32	11.71388889	46.5582	197.9073012	0.0800	181.1777035	9.23 % SURCHARGED
35	STAYNER AVENUE	ExMH4	ExMH3	25.8	157.72	19129.6	53.13777778	2.67189336	141.9784756	30.1	4365.2	12.63078704	48.8332	203.4424626	0.0900	263.0799425	
36	STAYNER AVENUE	ExMH3	ExMH2	29.24	158.25	19158.84	53.219	2.671226485	142.1600023	30.1	4365.2	12.63078704	48.971	203.7617893	0.0500	196.0882117	3.91 % SURCHARGED
37	BENNER AVENUE	ExMH2	ExMH1	78.26	159.3	19237.1	53.43638889	2.669446722	142.6455931	30.1	4365.2	12.63078704	49.244	204.5203802	0.0800	248.0341485	
38		ExMH1	ExMH43A		159.3	19237.1	53.43638889	2.669446722	142.6455931	30.1	4365.2	12.63078704	49.244	204.5203802	0.1900	382.2462945	
39		ExMH43A	ExMH44A		159.3	19237.1	53.43638889	2.669446722	142.6455931	30.1	4365.2	12.63078704	49.244	204.5203802	0.1900	382.2462945	
40		ExMH44A	ExMH45A		159.3	19237.1	53.43638889	2.669446722	142.6455931	30.1	4365.2	12.63078704	49.244	204.5203802	0.0500	196.0882117	4.3 % SURCHARGED
41		ExMH45A	ExMH46A	530.62	165.47	19767.72	54.91033333	2.657571647	145.928145	30.1	4365.2	12.63078704	50.8482	209.407132	0.2100	401.8612501	
42		ExMH46A	ExMH47A		165.47	19767.72	54.91033333	2.657571647	145.928145	30.1	4365.2	12.63078704	50.8482	209.407132	0.0600	214.8038736	
43	SHERMOUNT AVENUE	ExMH47A	ExMH48A	0	165.56	19767.72	54.91033333	2.657571647	145.928145	30.1	4365.2	12.63078704	50.8716	209.430532	0.0145	105.5967337	98.33 % SURCHARGED
44	VIEWMOUNT AVENUE	ExMH48A	ExMH49A	110.08	177.45	20502.16	56.95044444	2.641664296	150.4439557	30.1	4365.2	12.63078704	53.963	217.0377428	0.2200	411.3181028	
45	VIEWMOUNT AVENUE	ExMH49A	ExMH50A	85.14	178.7	20587.3	57.18694444	2.639858302	150.9654301	30.1	4365.2	12.63078704	54.288	217.8842171	0.1300	316.1827408	
46	VIEWMOUNT AVENUE	ExMH50A	ExMH51A	143.62	180.77	20730.92	57.58588889	2.636829218	151.8441543	30.1	4365.2	12.63078704	54.8262	219.3011414	0.1700	361.568797	
47	VIEWMOUNT AVENUE	ExMH51A	ExMH52A	44.72	181.46	20775.64	57.71011111	2.63589045	152.1175307	30.1	4365.2	12.63078704	55.0056	219.7539178	0.1000	277.3106084	
48	VIEWMOUNT AVENUE	ExMH52A	ExMH103	87.72	182.73	20863.36	57.95377778	2.634055067	152.653442	30.1	4365.2	12.63078704	55.3358	220.6200291	0.3500	518.8006431	
49	GLENMOUNT AVENUE	ExMH103	ExMH104	313.9	352.07	42435.96	117.8776667	2.331521334	274.8342947	62.17	8726.72	25.25092593	107.7024	407.7876206	0.6300	696.0441028	
50	PRUE AVENUE	ExMH104	ExMH105	22.36	352.4	42458.32	117.9397778	2.331304057	274.9534824	62.17	8726.72	25.25092593	107.7882	407.9926083	0.5800	667.8523837	
51	PRUE AVENUE	ExMH105	ExMH106	0	352.42	42458.32	117.9397778	2.331304057	274.9534824	62.17	8726.72	25.25092593	107.7934	407.9978083	0.9400	850.2182255	
52		ExMH106	ExMH107	0	353.7	42852.64	119.0351111	2.327493275	277.0534206	62.17	8726.72	25.25092593	108.1262	410.4305465	0.1000	277.3106084	48 % SURCHARGED
53	HILLHURST BOULEVARD	ExMH107	ExMH108	0	360.29	43301.56	120.2821111	2.323202381	279.4396869	62.17	8726.72	25.25092593	109.8396	414.5302129	16.6700	3580.422548	

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City of Toronto - Technical Services Division

AREA 17 HGL ANALYSIS DESIGN SHEET

Designed By: Jason Jenkins, P.Eng., P.E.
Checked By: Fabian Papa, P.Eng.
File No.: 13073
Date: 14, February 2014

Dufferin Avenue Study
HGL Analysis - PRE DEVELOPMENT

Street	Pipe Segment	From MH	To MH	Invert Elevation u/s (m)	Invert Elevation d/s (m)	Pipe Slope	MH Rim u/s (m)	Pipe Diameters Inches	Pipe Diameters Eq. Ht. (mm)	Pipe Diameters Nom. Ht. (mm)	Length (m)	'n'	TOTAL Combined Flow (l/s)	Q-cap (l/s)	Q-in / Q-cap	Surcharge u/s (m)	$ Surcharge	HGL u/s (m)	HGL d/s (m)	HGL u/s to Ground (m)	Remarks
Dufferin Street	A	Duf01	Duf02	178.186	178.180	0.01%	181.564	10	250.00	254.00	59.7	0.013	41.935	6.22	6.74	0.41	574.26	178.85	178.57	2.71	
Dufferin Street	B	Duf02	Duf03	177.603	177.220	0.46%	180.276	10	250.00	254.00	82.7	0.013	41.935	42.22	0.99	0.71		178.57	178.19	1.70	
Dufferin Street	C	Duf03	Duf04	177.220	176.455	0.95%	179.464	10	250.00	254.00	80.8	0.013	41.935	60.37	0.69	0.71		178.19	177.81	1.28	
Dufferin Street	D	Duf04	Duf05	176.455	176.449	0.06%	178.864	10	250.00	254.00	10.6	0.013	41.935	14.76	2.84	1.10	184.11	177.81	177.48	1.06	
Dufferin Street	E	Duf05	Duf06	176.444	176.287	0.22%	178.874	10	250.00	254.00	69.9	0.013	41.935	29.40	1.43	0.78	42.63	177.48	177.16	1.39	
Dufferin Street	F	Duf06	Duf07	176.277	176.082	0.26%	179.253	10	250.00	254.00	76.4	0.013	41.935	31.34	1.34	0.63	33.80	177.16	176.80	2.10	
Dufferin Street	G	Duf07	MH1A	176.052	175.927	0.16%	180.602	10	250.00	254.00	77.8	0.013	41.935	24.87	1.69	0.49	68.64	176.80	176.44	3.80	
Lawrence Avenue	H	MH1A	MH2A	175.915	175.830	0.91%	180.682	10	250.00	254.00	9.3	0.013	41.935	59.31	0.71	0.27		176.44	176.39	4.25	
Lawrence Avenue	I	MH2A	MH3A	175.810	175.730	0.17%	180.560	10	250.00	254.00	46.1	0.013	41.935	25.84	1.62	0.33	62.26	176.39	176.18	4.17	
Lawrence Avenue	J	MH3A	MH4A	175.725	175.720	0.17%	180.084	10	250.00	254.00	3.0	0.013	41.935	25.33	1.66	0.20	65.57	176.18	176.16	3.91	
Lawrence Avenue	K	MH4A	MH5A	175.720	175.512	0.45%	180.071	10	250.00	254.00	46.1	0.013	41.935	41.67	1.01	0.19	0.63	176.16	175.95	3.91	
Lawrence Avenue	1	MH5A	MH6A	175.492	175.330	0.20%	179.144	18	450.00	457.20	80.8	0.013	41.935	133.02	0.32	0.00		175.95	175.79	3.19	
Lawrence Avenue	2	MH6A	MH6AA	175.310	175.191	0.56%	178.153	18	450.00	457.20	21.4	0.013	41.935	222.63	0.19	0.00		175.77	175.65	2.39	
Lawrence Avenue	3	MH6AA	MH7A	175.171	175.108	0.11%	177.892	18	450.00	457.20	57.1	0.013	45.024	98.56	0.46	0.00		175.63	175.57	2.26	
Lawrence Avenue	4	MH7A	MH7AA	175.088	175.086	0.29%	177.892	18	450.00	457.20	0.7	0.013	45.034	158.98	0.28	0.00		175.55	175.54	2.35	
Lawrence Avenue	5	MH7AA	MH8A	175.066	174.954	0.16%	177.892	18	450.00	457.20	69.7	0.013	47.840	118.96	0.40	0.00		175.52	175.41	2.37	
Lawrence Avenue	6	MH8A	MH9A	174.934	174.735	0.36%	177.995	18	450.00	457.20	55.3	0.013	47.840	178.56	0.27	0.00		175.39	175.19	2.60	
Bolingbroke Road	7	MH9A	MH10A	174.717	174.394	0.38%	178.520	18	450.00	457.20	84.8	0.013	48.828	183.57	0.27	0.00		175.17	174.85	3.35	
Bolingbroke Road	8	MH10A	MH11A	174.384	174.182	0.24%	177.797	18	450.00	457.20	83.3	0.013	51.894	146.47	0.35	0.00		174.84	174.64	2.96	
Bolingbroke Road	9	MH11A	MH12A	174.182	174.082	0.28%	178.640	18	450.00	457.20	36.0	0.013	54.845	156.76	0.35	0.00		174.64	174.54	4.00	
Bolingbroke Road	10	MH12A	MH13A	174.074	173.822	0.45%	178.620	18	450.00	457.20	56.1	0.013	55.184	199.35	0.28	0.00		174.53	174.28	4.09	
Bolingbroke Road	11	MH13A	MH14A	173.812	173.625	0.42%	177.590	18	450.00	457.20	44.8	0.013	55.445	192.16	0.29	0.00		174.27	174.08	3.32	
Wenderly Drive	12	MH14A	MH15A	173.598	173.335	0.42%	177.040	18	450.00	457.20	63.1	0.013	65.024	192.02	0.34	0.00		174.06	173.79	2.98	
Lois Avenue	13	MH15A	MH16A	172.923	172.740	0.36%	176.723	18	450.00	457.20	51.5	0.013	67.927	177.30	0.38	0.00		173.38	173.20	3.34	
Lois Avenue	14	MH16A	MH17A	172.674	172.653	0.30%	176.325	18	450.00	457.20	7.0	0.013	67.927	162.91	0.42	0.00		173.13	173.11	3.19	
Lois Avenue	15	MH17A	MH18A	172.653	172.353	0.44%	176.228	18	450.00	457.20	68.5	0.013	68.197	196.84	0.35	0.00		173.11	172.81	3.12	
Lois Avenue	16	MH18A	MH19A	172.343	172.304	0.30%	175.580	18	450.00	457.20	12.9	0.013	70.228	163.54	0.43	0.00		172.80	172.76	2.78	
Lois Avenue	17	MH19A	MH20A	172.284	172.146	0.22%	175.560	18	450.00	457.20	62.8	0.013	70.517	139.43	0.51	0.00		172.74	172.60	2.82	
Lois Avenue	18	MH20A	MH21A	172.136	171.913	0.33%	175.118	18	450.00	457.20	68.0	0.013	71.023	170.33	0.42	0.00		172.59	172.37	2.52	
Glengrove Avenue	19	MH21A	MH22A	171.888	171.690	0.26%	174.758	18	450.00	457.20	75.2	0.013	71.809	152.62	0.47	0.00		172.35	172.15	2.41	
Glengrove Avenue	20	MH22A	MH23A	171.680	171.455	0.31%	174.411	18	450.00	457.20	71.9	0.013	72.209	166.39	0.43	0.00		172.14	171.91	2.27	
Marlee Avenue	21	MH23A	MH24A	171.345	171.025	0.32%	174.920	15	375.00	381.00	101.5	0.013	74.921	102.70	0.73	0.00		171.73	171.44	3.19	
Marlee Avenue	22	MH24A	MH25A	170.985	170.783	0.20%	173.970	18	450.00	457.20	100.3	0.013	77.702	133.48	0.58	0.00		171.44	171.24	2.53	
Glencairn Avenue	23	MH25A	MH26A	170.733	170.621	0.14%	174.588	18	450.00	457.20	82.5	0.013	79.132	109.59	0.72	0.00		171.19	171.08	3.40	
Glencairn Avenue	24	MH26A	MH27A	170.601	170.285	0.37%	174.283	18	450.00	457.20	85.0	0.013	79.728	181.35	0.44	0.00		171.06	170.74	3.22	
Glencairn Avenue	25	MH27A	MH12	170.285	169.969	0.39%	173.510	18	450.00	457.20	81.5	0.013	80.317	185.21	0.43	0.00		170.74	170.43	2.77	
Danesbury Avenue	26	MH12	MH11	169.919	169.358	0.68%	172.667	18	450.00	457.20	82.1	0.013	80.362	245.87	0.33	0.00		170.38	169.82	2.29	
Danesbury Avenue	27	MH11	MH10	169.228	168.533	4.57%	171.847	18	450.00	457.20	15.2	0.013	80.364	636.00	0.13	0.00		169.69	168.99	2.16	
Danesbury Avenue	28	MH10	MH9	167.973	167.807	0.18%	171.520	24	600.00	609.60	93.2	0.013	159.733	270.34	0.59	0.00		168.58	168.42	2.94	
Danesbury Avenue	29	MH9	MH8	167.736	167.649	0.10%	170.726	24	600.00	609.60	86.3	0.013	168.746	203.38	0.83	0.00		168.35	168.26	2.38	
Danesbury Avenue	30	MH8	MH7	167.639	167.564	0.11%	170.358	24	600.00	609.60	67.8	0.013	168.746	213.05	0.79	0.00		168.25	168.17	2.11	
Danesbury Avenue	31	MH7	MH7a	167.544	167.469	0.13%	170.803	24	600.00	609.60	59.5	0.013	169.400	227.42	0.74	0.00		168.15	168.08	2.65	
Danesbury Avenue	31a	MH7a	MH6	167.449	167.414	0.25%	171.411	24	600.00	609.60	14.1	0.013	169.400	319.14	0.53	0.00		168.06	168.02	3.35	
Stayner Avenue	32	MH6	MH6A	167.402	167.347	0.10%	171.354	24	600.00	609.60	57.8	0.013	172.841	197.60	0.87	0.00		168.01	167.96	3.34	
Stayner Avenue	33	MH6A	MH5	167.327	167.225	0.14%	170.620	24	600.00	609.60	74.3	0.013	173.651	237.34	0.73	0.00		167.94	167.84	2.68	
Stayner Avenue	34	MH5	MH4	167.195	167.137	0.08%	170.000	24	600.00	609.60	69.6	0.013	174.005	184.91	0.94	0.03		167.84	167.78	2.16	
Stayner Avenue	35	MH4	MH3	167.097	167.013	0.09%	170.593	27	675.00	685.80	92.7	0.013	179.638	263.98	0.68	0.00		167.78	167.70	2.81	

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City of Toronto - Technical Services Division
AREA 17 HGL ANALYSIS DESIGN SHEET

Designed By: Jason Jenkins, P.Eng., P.E.
Checked By: Fabian Papa, P.Eng.
File No.: 13073
Date: 14, February 2014

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Dufferin Avenue Study
HGL Analysis - PRE DEVELOPMENT

Street	Pipe Segment	From MH	To MH	Invert Elevation u/s (m)	Invert Elevation d/s (m)	Pipe Slope	MH Rim u/s (m)	Pipe Diameters Inches	Pipe Diameters Eq. Ht. (mm)	Pipe Diameters Nom. Ht. (mm)	Length (m)	'n'	TOTAL Combined Flow (l/s)	Q-cap (l/s)	Q-in / Q-cap	Surcharge u/s (m)	$ Surcharge	HGL u/s (m)	HGL d/s (m)	HGL u/s to Ground (m)	Remarks
Stayner Avenue	36	MH3	MH2	166.963	166.916	0.05%	172.066	27	675.00	685.80	96.1	0.013	179.965	193.93	0.93	0.00		167.65	167.60	4.42	
Benner Avenue	37	MH2	MH1	166.826	166.778	0.08%	171.964	27	675.00	685.80	57.9	0.013	180.743	252.49	0.72	0.00		167.51	167.46	4.45	
Allen Road Crossing	38	MH1	MH43A	166.748	166.656	0.19%	172.197	27	675.00	685.80	47.5	0.013	180.743	385.93	0.47	0.00		167.43	167.34	4.76	
Allen Road Crossing	39	MH43A	MH44A	166.636	166.623	0.03%	171.249	27	675.00	685.80	37.6	0.013	180.743	163.68	1.10	0.01	10.42	167.33	167.31	3.92	
Allen Road Crossing	40	MH44A	MH45A	166.623	166.610	0.03%	169.054	27	675.00	685.80	37.2	0.013	180.743	163.30	1.11	0.00	10.68	167.31	167.30	1.74	
Allen Road Crossing	41	MH45A	MH46A	166.600	166.380	0.17%	171.382	27	675.00	685.80	131.0	0.013	185.762	359.37	0.52	0.00		167.29	167.07	4.10	
Shermount Avenue	42	MH46A	MH47A	166.320	166.292	0.04%	173.889	27	675.00	685.80	69.9	0.013	185.762	175.51	1.06	0.02	5.84	167.02	166.99	6.86	
Shermount Avenue	43	MH47A	MH48A	166.282	166.275	0.01%	173.687	27	675.00	685.80	69.9	0.013	185.785	87.76	2.12	0.03	111.71	166.99	166.96	6.69	
Viewmount Avenue	44	MH48A	MH49A	166.265	166.035	0.16%	174.000	27	675.00	685.80	147.5	0.013	193.568	346.29	0.56	0.00		166.95	166.72	7.05	
Viewmount Avenue	45	MH49A	MH50A	165.935	165.760	0.12%	175.266	27	675.00	685.80	143.2	0.013	194.434	306.56	0.63	0.00		166.62	166.45	8.65	
Viewmount Avenue	46	MH50A	MH51A	165.760	165.471	0.15%	175.456	27	675.00	685.80	196.1	0.013	195.884	336.65	0.58	0.00		166.45	166.16	9.01	
Viewmount Avenue	47	MH51A	MH52A	165.431	165.355	0.09%	172.087	27	675.00	685.80	83.1	0.013	196.347	265.20	0.74	0.00		166.12	166.04	5.97	
Viewmount Avenue	48	MH52A	MH103	165.345	165.000	0.28%	171.363	27	675.00	685.80	123.8	0.013	197.234	462.93	0.43	0.00		166.03	165.69	5.33	
Easement (between single fam.)	49	MH103	MH104	164.910	164.390	0.51%	171.394	27	675.00	685.80	101.5	0.013	387.472	627.68	0.62	0.00		165.60	165.28	5.80	
Prue Avenue	50	MH104	MH105	164.265	164.108	0.45%	170.968	27	675.00	685.80	34.7	0.013	387.679	589.86	0.66	0.33		165.28	165.21	5.69	
Prue Avenue	51	MH105	MH106	164.078	163.958	0.82%	171.486	27	675.00	685.80	14.6	0.013	387.685	795.02	0.49	0.44		165.21	165.18	6.28	
Easement (Apartments)	52	MH106	MH107	163.938	163.850	0.11%	171.686	27	675.00	685.80	80.3	0.013	390.153	290.30	1.34	0.56	34.40	165.18	165.02	6.51	
Hillhurst Boulevard	53	MH107	MH108	163.850	163.780	0.85%	171.809	27	675.00	685.80	8.2	0.013	394.293	810.23	0.49	0.48		165.02	165.00	6.79	
																			165.0		

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AREA 17 HGL ANALYSIS DESIGN SHEET

Dufferin Avenue Study
HGL Analysis - POST DEVELOPMENT

Designed By: Jason Jenkins, P.Eng., P.E.
Checked By: Fabian Papa, P.Eng.
File No.: 13073
Date: 14, February 2014

Street	Pipe Segment	From MH	To MH	Invert Elevation u/s (m)	Invert Elevation d/s (m)	Pipe Slope	MH Rim u/s (m)	Pipe Diameters Inches	Pipe Diameters Eq. Ht. (mm)	Pipe Diameters Nom. Ht. (mm)	Length (m)	'n'	TOTAL Combined Flow (l/s)	Q-cap (l/s)	Q-in / Q-cap	Surcharge u/s (m)	$ Surcharge	HGL u/s (m)	HGL d/s (m)	HGL u/s to Ground (m)	Increase in HGL over Existing Conditions (m)
Dufferin Street	A	Duf01	Duf02	177.810	177.571	0.35%	181.564	18	450.00	457.20	59.7	0.013	71.099	188.17	0.38	0.00		178.27	178.03	3.30	-0.58
Dufferin Street	B	Duf02	Duf03	177.571	177.252	0.35%	180.276	18	450.00	457.20	82.7	0.013	71.099	184.86	0.38	0.00		178.03	177.71	2.25	-0.54
Dufferin Street	C	Duf03	Duf04	177.252	176.939	0.35%	179.464	18	450.00	457.20	80.8	0.013	71.099	185.06	0.38	0.00		177.71	177.40	1.75	-0.48
Dufferin Street	D	Duf04	Duf05	176.939	176.872	0.35%	178.864	18	450.00	457.20	10.6	0.013	71.099	236.65	0.30	0.00		177.40	177.33	1.47	-0.41
Dufferin Street	E	Duf05	Duf06	176.872	176.597	0.35%	178.874	18	450.00	457.20	69.9	0.013	71.099	186.44	0.38	0.00		177.33	177.05	1.54	-0.15
Dufferin Street	F	Duf06	Duf07	176.597	176.300	0.35%	179.253	18	450.00	457.20	76.4	0.013	71.099	185.57	0.38	0.00		177.05	176.76	2.20	-0.10
Dufferin Street	G	Duf07	MH1A	176.300	175.998	0.35%	180.602	18	450.00	457.20	77.8	0.013	71.099	185.40	0.38	0.00		176.76	176.45	3.84	-0.04
Lawrence Avenue	H	MH1A	MH2A	175.998	175.935	0.35%	180.682	18	450.00	457.20	9.3	0.013	71.099	243.93	0.29	0.00		176.45	176.39	4.23	0.02
Lawrence Avenue	I	MH2A	MH3A	175.935	175.744	0.35%	180.560	18	450.00	457.20	46.1	0.013	71.099	191.63	0.37	0.00		176.39	176.20	4.17	0.00
Lawrence Avenue	J	MH3A	MH4A	175.744	175.703	0.35%	180.084	18	450.00	457.20	3.0	0.013	71.099	345.59	0.21	0.00		176.20	176.16	3.88	0.02
Lawrence Avenue	K	MH4A	MH5A	175.703	175.512	0.35%	180.071	18	450.00	457.20	46.1	0.013	71.099	191.63	0.37	0.00		176.16	175.97	3.91	0.00
Lawrence Avenue	1	MH5A	MH6A	175.492	175.330	0.20%	179.144	18	450.00	457.20	80.8	0.013	71.099	133.02	0.53	0.00		175.95	175.79	3.19	0.00
Lawrence Avenue	2	MH6A	MH6AA	175.310	175.191	0.56%	178.153	18	450.00	457.20	21.4	0.013	71.099	222.63	0.32	0.00		175.77	175.65	2.39	0.00
Lawrence Avenue	3	MH6AA	MH7A	175.171	175.108	0.11%	177.892	18	450.00	457.20	57.1	0.013	73.927	98.56	0.75	0.00		175.63	175.57	2.26	0.00
Lawrence Avenue	4	MH7A	MH7AA	175.088	175.086	0.29%	177.892	18	450.00	457.20	0.7	0.013	73.937	158.98	0.47	0.00		175.55	175.54	2.35	0.00
Lawrence Avenue	5	MH7AA	MH8A	175.066	174.954	0.16%	177.892	18	450.00	457.20	69.7	0.013	76.726	118.96	0.64	0.00		175.52	175.41	2.37	0.00
Lawrence Avenue	6	MH8A	MH9A	174.934	174.735	0.36%	177.995	18	450.00	457.20	55.3	0.013	76.726	178.56	0.43	0.00		175.39	175.19	2.60	0.00
Bolingbroke Road	7	MH9A	MH10A	174.717	174.394	0.38%	178.520	18	450.00	457.20	84.8	0.013	77.679	183.57	0.42	0.00		175.17	174.85	3.35	0.00
Bolingbroke Road	8	MH10A	MH11A	174.384	174.182	0.24%	177.797	18	450.00	457.20	83.3	0.013	80.559	146.47	0.55	0.00		174.84	174.64	2.96	0.00
Bolingbroke Road	9	MH11A	MH12A	174.182	174.082	0.28%	178.640	18	450.00	457.20	36.0	0.013	83.318	156.76	0.53	0.00		174.64	174.54	4.00	0.00
Bolingbroke Road	10	MH12A	MH13A	174.074	173.822	0.45%	178.620	18	450.00	457.20	56.1	0.013	83.636	199.35	0.42	0.00		174.53	174.28	4.09	0.00
Bolingbroke Road	11	MH13A	MH14A	173.812	173.625	0.42%	177.590	18	450.00	457.20	44.8	0.013	83.881	192.16	0.44	0.00		174.27	174.08	3.32	0.00
Wenderly Drive	12	MH14A	MH15A	173.598	173.335	0.42%	177.040	18	450.00	457.20	63.1	0.013	92.842	192.02	0.48	0.00		174.06	173.79	2.98	0.00
Lois Avenue	13	MH15A	MH16A	172.923	172.740	0.36%	176.723	18	450.00	457.20	51.5	0.013	95.586	177.30	0.54	0.00		173.38	173.20	3.34	0.00
Lois Avenue	14	MH16A	MH17A	172.674	172.653	0.30%	176.325	18	450.00	457.20	7.0	0.013	95.586	162.91	0.59	0.00		173.13	173.11	3.19	0.00
Lois Avenue	15	MH17A	MH18A	172.653	172.353	0.44%	176.228	18	450.00	457.20	68.5	0.013	95.842	196.84	0.49	0.00		173.11	172.81	3.12	0.00
Lois Avenue	16	MH18A	MH19A	172.343	172.304	0.30%	175.580	18	450.00	457.20	12.9	0.013	97.762	163.54	0.60	0.00		172.80	172.76	2.78	0.00
Lois Avenue	17	MH19A	MH20A	172.284	172.146	0.22%	175.560	18	450.00	457.20	62.8	0.013	98.037	139.43	0.70	0.00		172.74	172.60	2.82	0.00
Lois Avenue	18	MH20A	MH21A	172.136	171.913	0.33%	175.118	18	450.00	457.20	68.0	0.013	98.515	170.33	0.58	0.00		172.59	172.37	2.52	0.00
Glengrove Avenue	19	MH21A	MH22A	171.888	171.690	0.26%	174.758	18	450.00	457.20	75.2	0.013	99.261	152.62	0.65	0.00		172.35	172.15	2.41	0.00
Glengrove Avenue	20	MH22A	MH23A	171.680	171.455	0.31%	174.411	18	450.00	457.20	71.9	0.013	99.661	166.39	0.60	0.00		172.14	171.91	2.27	0.00
Marlee Avenue	21	MH23A	MH24A	171.345	171.025	0.32%	174.920	15	375.00	381.00	101.5	0.013	102.236	102.70	1.00	0.04		171.77	171.44	3.15	0.04
Marlee Avenue	22	MH24A	MH25A	170.985	170.783	0.20%	173.970	18	450.00	457.20	100.3	0.013	104.892	133.48	0.79	0.00		171.44	171.24	2.53	0.00
Glencairn Avenue	23	MH25A	MH26A	170.733	170.621	0.14%	174.588	18	450.00	457.20	82.5	0.013	106.278	109.59	0.97	0.00		171.19	171.08	3.40	0.00
Glencairn Avenue	24	MH26A	MH27A	170.601	170.285	0.37%	174.283	18	450.00	457.20	85.0	0.013	106.844	181.35	0.59	0.00		171.06	170.74	3.22	0.00
Glencairn Avenue	25	MH27A	MH12	170.285	169.969	0.39%	173.510	18	450.00	457.20	81.5	0.013	107.404	185.21	0.58	0.00		170.74	170.43	2.77	0.00
Danesbury Avenue	26	MH12	MH11	169.919	169.358	0.68%	172.667	18	450.00	457.20	82.1	0.013	107.449	245.87	0.44	0.00		170.38	169.82	2.29	0.00
Danesbury Avenue	27	MH11	MH10	169.228	168.533	4.57%	171.847	18	450.00	457.20	15.2	0.013	107.451	636.00	0.17	0.00		169.69	168.99	2.16	0.00
Danesbury Avenue	28	MH10	MH9	167.973	167.807	0.18%	171.520	24	600.00	609.60	93.2	0.013	183.970	270.34	0.68	0.00		168.58	168.42	2.94	0.00
Danesbury Avenue	29	MH9	MH8	167.736	167.649	0.10%	170.726	24	600.00	609.60	86.3	0.013	192.760	203.38	0.95	0.00		168.35	168.26	2.38	0.00
Danesbury Avenue	30	MH8	MH7	167.639	167.564	0.11%	170.358	24	600.00	609.60	67.8	0.013	192.760	213.05	0.90	0.00		168.25	168.17	2.11	0.00
Danesbury Avenue	31	MH7	MH7a	167.544	167.469	0.13%	170.803	24	600.00	609.60	59.5	0.013	193.397	227.42	0.85	0.00		168.15	168.08	2.65	0.00
Danesbury Avenue	31a	MH7a	MH6	167.449	167.414	0.25%	171.411	24	600.00	609.60	14.1	0.013	193.397	319.14	0.61	0.00		168.06	168.02	3.35	0.00
Stayner Avenue	32	MH6	MH6A	167.402	167.347	0.10%	171.354	24	600.00	609.60	57.8	0.013	196.759	197.60	1.00	0.00		168.01	167.96	3.34	0.00
Stayner Avenue	33	MH6A	MH5	167.327	167.225	0.14%	170.620	24	600.00	609.60	74.3	0.013	197.556	237.34	0.83	0.00		167.94	167.85	2.68	0.00
Stayner Avenue	34	MH5	MH4	167.195	167.137	0.08%	170.000	24	600.00	609.60	69.6	0.013	197.907	184.91	1.07	0.05	7.03	167.85	167.78	2.15	0.02

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AREA 17 HGL ANALYSIS DESIGN SHEET

Designed By: Jason Jenkins, P.Eng., P.E.
Checked By: Fabian Papa, P.Eng.
File No.: 13073
Date: 14, February 2014

Dufferin Avenue Study
HGL Analysis - POST DEVELOPMENT

Street	Pipe	From	To	Invert Elevation		Pipe	MH Rim	Pipe Diameters			Length	'n'	TOTAL	Q-cap	Q-in / Q-cap	Surcharge	$	HGL	HGL	HGL u/s	Increase in HGL over
	Segment	MH	MH	u/s	d/s	Slope	u/s	Inches	Eq. Ht.	Nom. Ht.			Combined			u/s	Surcharge	u/s	d/s	to Ground	Existing Conditions
				(m)	(m)		(m)		(mm)	(mm)	(m)		Flow (l/s)	(l/s)		(m)		(m)	(m)	(m)	(m)
Stayner Avenue	35	MH4	MH3	167.097	167.013	0.09%	170.593	27	675.00	685.80	92.7	0.013	203.442	263.98	0.77	0.00		167.78	167.70	2.81	0.00
Stayner Avenue	36	MH3	MH2	166.963	166.916	0.05%	172.066	27	675.00	685.80	96.1	0.013	203.762	193.93	1.05	0.01	5.07	167.65	167.60	4.41	0.01
Benner Avenue	37	MH2	MH1	166.826	166.778	0.08%	171.964	27	675.00	685.80	57.9	0.013	204.520	252.49	0.81	0.00		167.51	167.46	4.45	0.00
Allen Road Crossing	38	MH1	MH43A	166.748	166.656	0.19%	172.197	27	675.00	685.80	47.5	0.013	204.520	385.93	0.53	0.00		167.43	167.34	4.76	0.00
Allen Road Crossing	39	MH43A	MH44A	166.636	166.623	0.03%	171.249	27	675.00	685.80	37.6	0.013	204.520	163.68	1.25	0.02	24.95	167.34	167.32	3.91	0.01
Allen Road Crossing	40	MH44A	MH45A	166.623	166.610	0.03%	169.054	27	675.00	685.80	37.2	0.013	204.520	163.30	1.25	0.01	25.24	167.32	167.30	1.74	0.00
Allen Road Crossing	41	MH45A	MH46A	166.600	166.380	0.17%	171.382	27	675.00	685.80	131.0	0.013	209.407	359.37	0.58	0.00		167.29	167.07	4.10	0.00
Shermount Avenue	42	MH46A	MH47A	166.320	166.292	0.04%	173.889	27	675.00	685.80	69.9	0.013	209.407	175.51	1.19	0.04	19.31	167.04	167.00	6.85	0.02
Shermount Avenue	43	MH47A	MH48A	166.282	166.275	0.01%	173.687	27	675.00	685.80	69.9	0.013	209.431	87.76	2.39	0.03	138.65	167.00	166.96	6.69	0.01
Viewmount Avenue	44	MH48A	MH49A	166.265	166.035	0.16%	174.000	27	675.00	685.80	147.5	0.013	217.038	346.29	0.63	0.00		166.95	166.72	7.05	0.00
Viewmount Avenue	45	MH49A	MH50A	165.935	165.760	0.12%	175.266	27	675.00	685.80	143.2	0.013	217.884	306.56	0.71	0.00		166.62	166.45	8.65	0.00
Viewmount Avenue	46	MH50A	MH51A	165.760	165.471	0.15%	175.456	27	675.00	685.80	196.1	0.013	219.301	336.65	0.65	0.00		166.45	166.16	9.01	0.00
Viewmount Avenue	47	MH51A	MH52A	165.431	165.355	0.09%	172.087	27	675.00	685.80	83.1	0.013	219.754	265.20	0.83	0.00		166.12	166.04	5.97	0.00
Viewmount Avenue	48	MH52A	MH103	165.345	165.000	0.28%	171.363	27	675.00	685.80	123.8	0.013	220.620	462.93	0.48	0.00		166.03	165.69	5.33	0.00
Easement (between single fam.)	49	MH103	MH104	164.910	164.390	0.51%	171.394	27	675.00	685.80	101.5	0.013	407.788	627.68	0.65	0.00		165.60	165.31	5.80	0.00
Prue Avenue	50	MH104	MH105	164.265	164.108	0.45%	170.968	27	675.00	685.80	34.7	0.013	407.993	589.86	0.69	0.36		165.31	165.23	5.66	0.03
Prue Avenue	51	MH105	MH106	164.078	163.958	0.82%	171.486	27	675.00	685.80	14.6	0.013	407.998	795.02	0.51	0.47		165.23	165.20	6.26	0.02
Easement (Apartments)	52	MH106	MH107	163.938	163.850	0.11%	171.686	27	675.00	685.80	80.3	0.013	410.431	290.30	1.41	0.57	41.38	165.20	165.02	6.49	0.02
Hillhurst Boulevard	53	MH107	MH108	163.850	163.780	0.85%	171.809	27	675.00	685.80	8.2	0.013	414.530	810.23	0.51	0.48		165.02	165.00	6.79	0.00
																			165.0		

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Appendix C

Stormwater Management (SWM) Supporting Documentation
Infrastructure Master Plan Dufferin Street Avenue Study
City of Toronto
Final Report | November 2014

This appendix to the Infrastructure Master Plan provides relevant information in respect of the assessment of stormwater management measures for the Dufferin Street Avenue Study.

Geotechnical Information

The information available for this work includes the following information:

- Borehole at the intersection of Dufferin Street and Cartwright Avenue which suggests that, at shallower depths, the subsurface is composed of reddish brown sandy clay, while at greater depths there exists grey fine sandy clay[1].
- Boreholes along Cartwright Avenue from Dufferin Street to Paul David Street which suggest that the subsurface soils consist of brown sandy silt till, generally ranging from compact to dense1.
- Commentary by the consulting engineer for the development proposal at 3130 Dufferin Street (Yorkdale Ford Lincoln, just north of Lawrence Avenue West) which indicates that the expected soils in the area consist of "sandy silt underlying a silt/clay or till layer". Although this was acknowledged to be subject to verification by a geotechnical investigation[2], this is generally consistent with the borehole information noted above.

For purposes of this analysis, the above information is used as a guide, however, development applications should be supported by geotechnical investigations that confirm the validity of these assumptions and any appropriate adjustments to the final SWM strategy for each individual site should be supported and documented accordingly.

The above information suggests that the materials are sandy clays, silts and silt tills, and accordingly the expected hydraulic conductivity[3] may be in the range of 1×10^{-9} to 2×10^{-6} m/s, corresponding to infiltration rates[4] ranging from 7 to 55 mm/h. It is prudent to assume that the actual infiltration rates would tend to be toward the lower end of this range – such as 15 mm/h or less – and, as such, would still be suitable for infiltration, however, perhaps not to a significant extent. Based on this, it is not proposed that any additional water balance storage requirements above the minimum contemplated in the Wet Weather Flow Management Guidelines (WWFMG) be applied in the study area. That is, the minimum 5 mm water balance objective should continue to be targeted. Of course, higher captured runoff volumes (rainfall depths) should be welcomed and encouraged, offering the simultaneous benefit of assisting to achieve water quality objectives whenever site-specific conditions can afford this.

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[1] Toronto Water, personal communication, 06 January 2014.

[2] "Functional Servicing Report for Proposed Redevelopment of 3130 Dufferin Street, Toronto, Ontario" by The Odan/Detech Group Inc., Project 10204, dated 10 December 2010.

[3] Table 3.2 in <u>Physical and Chemical Hydrogeology</u>, by Domenico & Schwartz, John Wiley & Sons, Inc., 1990

[4] Based on approximate relationship between infiltration rate and hydraulic conductivity as presented in Table C1 and Figure C1 of the "Low Impact Development Stormwater Management Planning and Design Guide", CVC/TRCA, 2010.

Controlled Release Rate

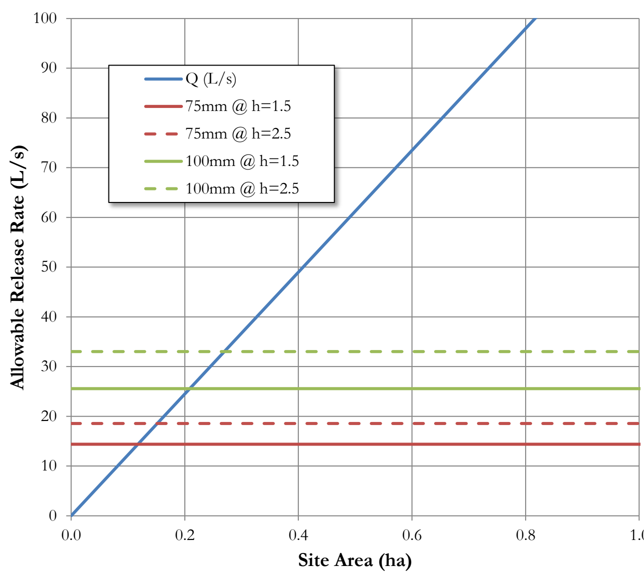
While the concept of controlling the release rate to the receiving storm sewer to the lesser of the pre-development peak flow rate or the available capacity of the receiving sewer is generally sensible and implementable, there is a practical limitation to this for smaller sites where the flow control, typically an orifice, cannot be smaller than a certain size. This lower limit on orifice size is typically 100 mm in diameter, although sizes as low as 75 mm are sometimes specified. The primary concern is the blockage or clogging of the orifice.

Given the number of smaller properties in the study area, it is conceivable that many of them, should they be redeveloped without being part of larger parcel assemblies, may not achieve the controlled release rates that would be dictated by the City's Wet Weather Flow Management Guidelines (WWFMG). However, flow control devices have been developed that can be reliably used for this purpose, affording rather low outflow rates with protections against clogging from floatables in the water. These devices rely on inducing a vortex action in the fluid and examples of manufacturers and products include IPEX's Tempest and Hydro International's Hydro-Brake devices, although others may be available. Traditionally, the City has preferred not to rely on such devices since they may be subject to tampering, however, given the sensitivity of the receiving drainage system with respect to basement flooding concerns, such solutions should be considered for smaller sites where traditional orifice control size limitations do not achieve the desired flow rates. Nevertheless, for the sake of conservatism, the analysis below assumes that smaller sites are not equipped with such devices.

Given that most or all properties in the study area have high levels of imperviousness (i.e., >50%), then the maximum permissible runoff coefficient for purposes of calculating the pre-development peak flow rate according to the WWFMG is 0.5. Using the City's IDF curve parameters with a 10 minute time of concentration, the resulting intensity is 88.2 mm/h. The following expression is derived and which represents the peak flow rate (Q, L/s) as a function of development area (A, m^2):

$$Q = CiA = 0.5 \times \frac{88.2\ \text{mm}}{\text{h}} \times A \times \frac{\text{h}}{3600\ \text{s}} \times \frac{\text{m}}{1000\ \text{mm}} \times \frac{1000\ \text{L}}{\text{m}^3} = 0.01225 \times A$$

This expression – which works out to 122.5 L/s/ha – is plotted to the right with orifice release rates (with orifice discharge coefficient, k = 0.6) for 75 mm and 100 mm diameter orifices with driving heads (h) of 1.5 m and 2.5 m.



This graphic suggests that the practical lower limit that can be considered for a site to achieve its pre-development peak release rate is on the order of 0.15 to 0.2 ha in size (1,500 to 2,000 m^2, or 0.37 to 0.5 acres). Below this threshold, the practically achievable release rate will be somewhat higher than the pre-development peak, thereby potentially contributing to higher flow rates than currently exist in the receiving system. Moreover, the composition of the Study Area is such that there are currently several smaller parcels, particularly on the east side of Dufferin Street. It is reiterated that this method of analysis is employed in the interest of conservatism and that, in practice, lower release rates for smaller sites may be achieved by installing flow control devices such as those noted above.

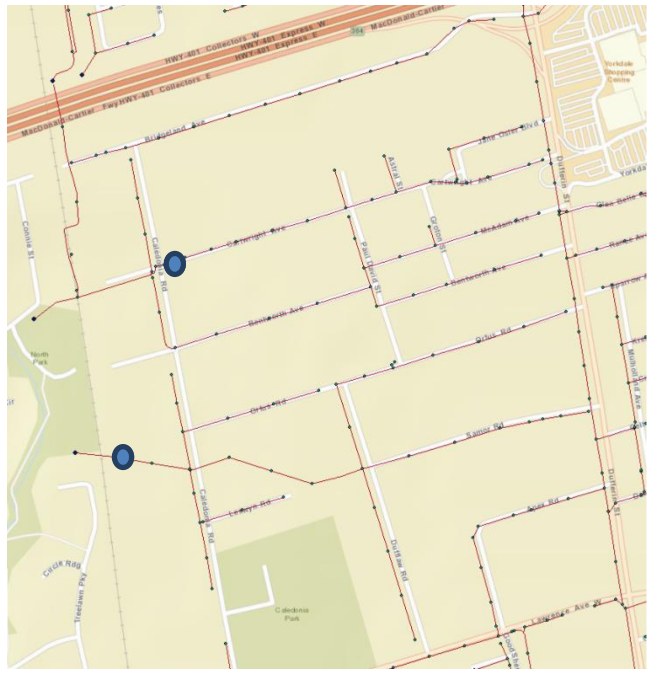
Through an analysis of all properties in the Study Area, and based on a minimum release rate of 30 L/s which is expected to afford a minimum orifice size of 100 mm in diameter, the aggregate controlled release rate from the Study Area is on the order 3,220 L/s, or approximately 11.1% higher than the 122.5 L/s/ha (or 2,900 L/s aggregate) required by the WWFMG. By maintaining the minimum threshold of 30 L/s and reducing the allowable release rate to 75 L/s/ha, the aggregate controlled release rate becomes 2,290 L/s, or approximately 21% lower than that required by the WWFMG. Moreover, the change in this allowable release rate is expected to result in increased on-site storage volume requirements on the order of 15% more than using the 122.5 L/s/ha release rate. It is expected that with the implementation of the vortex flow control devices noted above, significant additional protection can be achieved.

Of course, this analysis doesn't explicitly consider the impact on the individual receiving sewers, however, it is deemed to be a reasonable approach to adopt for this study area, noting that the proposed controls will serve to reduce release rates to the existing drainage system. Moreover, there is an inherent degree of conservatism resulting from the use of a maximum pre-development runoff coefficient of 0.5 pursuant to WWFMG methodology. It is also noted that this approach affords some flexibility with respect to the implementation of new public roads in which stormwater management controls may not be practical to implement.

It is instructive to calculate the effective time of concentration associated with this proposed control to 75 L/s/ha. Given the maximum runoff coefficient of 0.50 and using the 2-year return frequency IDF statistics for the City of Toronto, the equivalent time of concentration is just below 19 minutes as compared to the 10 minute criterion identified in the WWFMG. One interpretation of this is that the proposed level of quantity control is relevant not only to the sewer in to which it immediately discharges, but also for quite a distance downstream thereof.

As additional support, the InfoWorks model developed for the existing storm drainage system as part of the Basement Flooding Study Area Class EA was used to understand the unit flow rate at the following two locations in the storm sewer system under various design storm events:

- Cartwright Avenue, just east of Caledonia Road with a tributary drainage area of approximately 27.9 ha; and
- The storm sewer in the easement, just east of the CNR tracks and upstream of its discharge to the North Park Ravine, having a tributary area of 67.9 ha.



Locations where storm sewer unit flows estimated in InfoWorks model

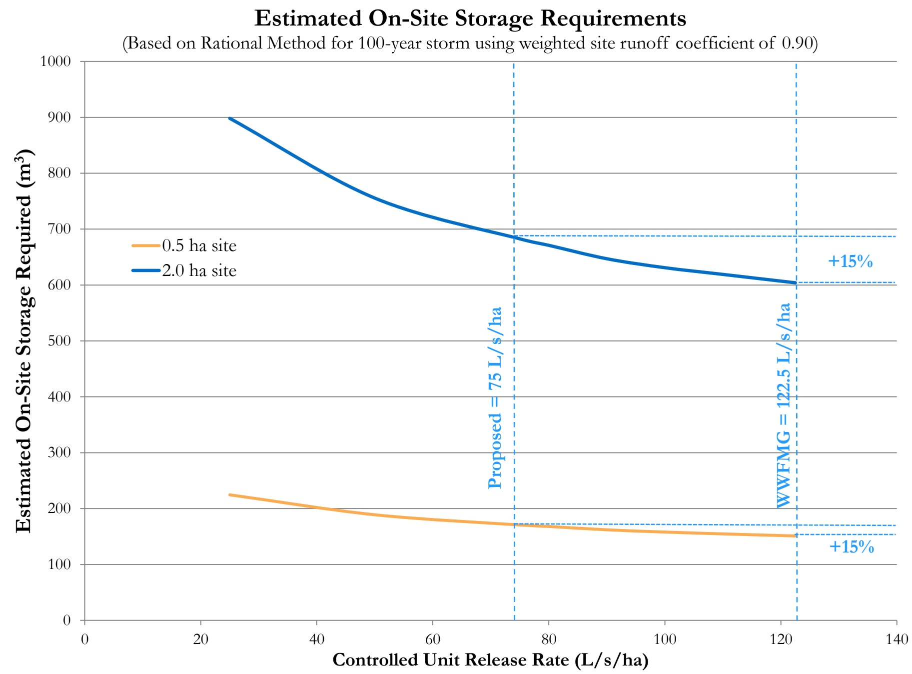
A summary of the modelling results, showing storm sewer flow rates and resulting estimated unit flow rates under various storm conditions, is provided in the following table:

Design Storm	Cartwright Avenue (InfoWorks Node ID 4216507282; Area: 27.9 ha)		Easement (InfoWorks Node ID 4168007272; Area: 67.9 ha)	
4 mm – 24 h	2.3 m^3/s	82 L/s/ha	5.6 m^3/s	82 L/s/ha
2-year Chicago, 12 h	2.1 m^3/s	75 L/s/ha	4.7 m^3/s	69 L/s/ha
5-year Chicago, 12 h	2.9 m^3/s	104 L/s/ha	6.2 m^3/s	91 L/s/ha
100-year Chicago, 12 h	3.0 m^3/s	108 L/s/ha	6.5 m^3/s	96 L/s/ha

These results suggest that the 75 L/s/ha controlled release rate is indeed reasonable given the characteristics of the catchments in question and, although it may be somewhat conservative relative to the high-intensity events, it is noted that the application of the release rate suggested by the WWFMG (i.e., 122.5 L/s/ha) may in fact exacerbate existing conditions under the 100-year storm, for instance.

Estimated Impact of Reducing Unit Release Rates to Receiving Storm Sewer System

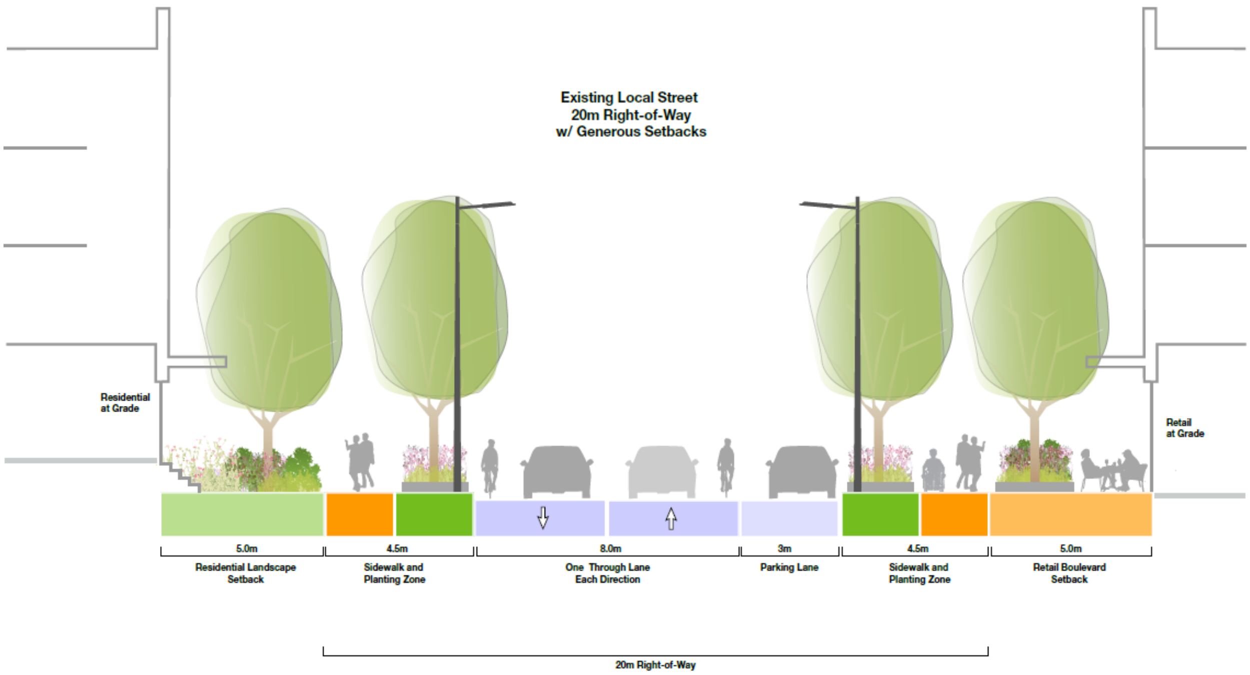
Analysis of Impact of Reducing Unit Release Rate			
WWFMG Unit Rate - L/s/ha	**122.5**		
Subject to Lower Limit (L/s)		**30**	
Adjust Unit Rate to (L/s/ha)			**75.0**
Reduction in Unit Rate			-38.8%
Site Areas (m²)	**WWFMG Q (L/s)**	**Lower Limit (L/s)**	**Adjust to (L/s/ha)**
20695	253.5	253.5	155.1
16181	198.2	198.2	121.3
1095	13.4	30.0	30.0
1755	21.5	30.0	30.0
2723	33.4	33.4	30.0
1851	22.7	30.0	30.0
2895	35.5	35.5	30.0
2493	30.5	30.5	30.0
1841	22.5	30.0	30.0
1964	24.1	30.0	30.0
37244	456.2	456.2	279.2
16300	199.7	199.7	122.2
15400	188.6	188.6	115.4
7834	96.0	96.0	58.7
2117	25.9	30.0	30.0
10657	130.5	130.5	79.9
3147	38.5	38.5	30.0
36295	444.6	444.6	272.1
5830	71.4	71.4	43.7
1483	18.2	30.0	30.0
797	9.8	30.0	30.0
1590	19.5	30.0	30.0
914	11.2	30.0	30.0
1100	13.5	30.0	30.0
763	9.3	30.0	30.0
1105	13.5	30.0	30.0
570	7.0	30.0	30.0
2328	28.5	30.0	30.0
4245	52.0	52.0	31.8
1676	20.5	30.0	30.0
708	8.7	30.0	30.0
833	10.2	30.0	30.0
1791	21.9	30.0	30.0
586	7.2	30.0	30.0
1043	12.8	30.0	30.0
1349	16.5	30.0	30.0
1946	23.8	30.0	30.0
1348	16.5	30.0	30.0
3847	47.1	47.1	30.0
6401	78.4	78.4	48.0
12130	148.6	148.6	90.9
Total Release Rate to Sewer (L/s):	**2901.3**	**3222.6**	**2288.3**
Increase(Reduction):		11.1%	-21.1%



Increasing Infiltration on Sites with Large Setbacks

This section is concerned with investigating the feasibility of increasing the amount of water to be captured and retained on-site for infiltration above the minimum 5 mm rainfall depth required by the WWFMG. This opportunity is available as a result of the relatively large (broad) setbacks proposed for the large properties located along the west side of Dufferin Street as well as on Orfus Road, Samor Road and Apex Road. For these cases, setback of 5 m has been identified and this distance also applies to below-grade structures (e.g., parking garages, foundations walls, etc.).

Example of Broad Setback Proposed on Private Property



The implementation of infiltration trenches along the inside of the private property line generally requires the observance of a minimum distance to nearby foundations to avoid excessive foundation drainage. The minimum distance commonly applied is 4 metres. Infiltration trenches should be located at least 1 m above the seasonally high ground water level and/or bedrock. The suitability of such devices is dependent upon the soils in which they are constructed, and it is recommended that the minimum percolation rate of the receiving soils is [5]15 mm/h. Based on the review of available geotechnical information for the area, the local soils are expected to be at or near this limit and, accordingly, the ability to implement such measures can only be assessed on a site-specific basis with an opinion from a geotechnical engineer with respect to the percolation rate of the local soils.

An analysis of the practical volumetric capacity of an infiltration trench is provided on the following page. The analysis suggests that it might only be reasonable to expect on the order of 3.5 mm (runoff depth) of storage capacity based on the assumptions made. Perhaps the most critical limitation is the minimum distance of 4 m from the building face/foundation wall to the infiltration trench, leaving only 1 m for the trench itself given the 5 m setback. Based on this result, it may not be reasonable to expect materially more than the 5 mm of on-site retention as required by the WWFMG water balance criterion.

In conclusion, no additional water balance requirements are recommended beyond the 5 mm required by the WWFMG with the methods of achieving this being the responsibility of the development proponent. Of course, development proponents should be encouraged to maximize this wherever possible and practical to do so, particularly where larger open areas (e.g., parkettes, etc.) are proposed.

[5] Ontario Ministry of Environment, Storm Water Management Planning & Design Manual, 2003.
CVC/TRCA, Low Impact Development Stormwater Management Planning and Design Guide, Version 1.0, 2010.

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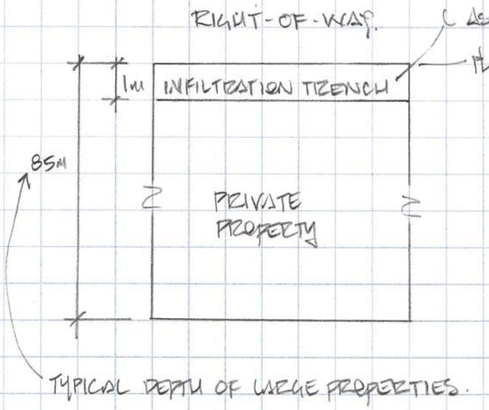
Date: 28 MARCH 2014 File: 13073
Project: DUFFERIN STREET AVENUE STUDY.

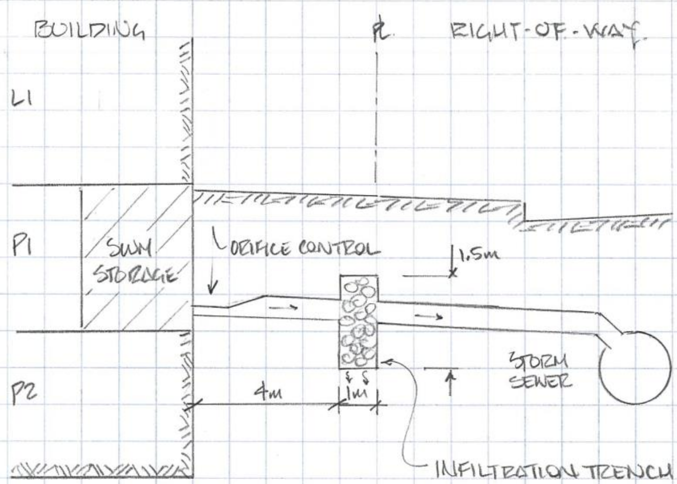
INFILTRATION TRENCHES ALONG FRONT PROPERTY LINES OF LARGE PROPERTIES.



TRIBUTARY AREA, $A = 85\ m^2/m$

CAPACITY, $V = 0.6 m^3/m$ (see below)
MUST BE MULTIPLIED BY F TO ACCOUNT FOR PRACTICAL LIMITATIONS.

$$\frac{V \times F}{A} = \frac{0.6 m^3/m \times 50\%}{85\ m^2/m} = 0.0035 m = 3.5\ mm$$



VOLUMETRIC CAPACITY $= 1m \times 1.5m \times 0.4 = 0.6 m^3/m = V.$
VOID RATIO

Prepared By: FABIAN PAPA

Page 1 of 1

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Appendix D

Public Consultation
Infrastructure Master Plan | Dufferin Street Avenue Study
City of Toronto
Final Report | November 2014

Dufferin Street Avenue Study – Local Advisory Committee Meeting #1
Yorkdale Adult Learning Centre
38 Orfus Road, Toronto ON
Wednesday, October 23rd, 2013
7:00 – 9:00 pm

MEETING OVERVIEW

On Wednesday October 23, 2013 11 members of the Local Advisory Committee (LAC) representing a range of interests, City Staff and members of the project team participated in the first LAC meeting of the Dufferin Street Avenue Study. The purpose of the meeting was to introduce the project and seek feedback on the study team's assessment of existing conditions and advice on materials to be used at the first public meeting. The following summary is not a verbatim transcript; it is a summary of the key feedback shared by participants at the meeting. This summary report was written by Yulia Pak and Bianca Wylie of Swerhun Facilitation and was circulated to participants in draft prior to being finalized.

Please note Appendix A. List of Project Team Participants and Appendix B. Meeting Agenda.

Key Messages from Feedback Received

The following 3 key messages emerged during the discussion. Detailed feedback follows.

1. **Congestion is a big issue, in four main ways:**
   - On Dufferin Street, especially going south in the morning, and north in the afternoon/evening
   - On the side streets, because of how congested Dufferin Street is (i.e.: Ranee Street)
   - Yorkdale Mall is a source of congestion
   - The Dufferin bus is at or over capacity, and service quality is a concern
2. **Dufferin should have an identity as a destination; it has great assets and an established neighbourhood.**
3. **Dufferin should have an improved visual identity and feeling: it's not desirable in terms of how it looks, or being on the streets.**

QUESTIONS OF CLARIFICATION

After the project overview, participants asked several questions of clarification. The project team's responses are in *italics.*

- **What is a charette?** *A charette is a more focused design work shop. We will be bringing forward high-level options and work with the charette participants to identify heights of the buildings, types of open spaces, locations for parks, etc. to create a common vision for Dufferin Street. The Technical Team will then work with the result of the charette to analyze the implications of this vision and how to inform and implement these options. We will also have a physical model of the street with different options, so people can start seeing what it would look like.*

- **Taking into consideration that 76% of land use is commercial, is there any research being conducted regarding car trips? It would be useful to know how many cars are just passing by and how many are actually travelling to commercial uses in the area.** *We are currently looking at the origin-destination data to include in our modelling exercise. We can share this information when data is ready.*

- **Is there going to be a traffic signal at Dane Avenue and Dufferin Street?** *There is no traffic signal secured at Dane Ave; however, we are pursuing a traffic signal at Apex Road as part of the 3130 Dufferin Street development application*

- **How long have articulated buses been planned for Dufferin Street?** *We will follow up on this.*

- **Why wasn't the entire Dufflaw property included in the study area?** *The study only includes lands with frontage properties along Dufferin Street designated Mixed Use Areas in the Official Plan.*

- **Why wasn't Dufferin Street in its entirety included in this Study?** *We needed to draw boundaries based on costs and logistics to ensure a manageable study.*

DETAILED FEEDBACK AND ADVICE FROM PARTICIPANTS

Why Do You Go to Dufferin Street? How Do You Get there?

During the meeting, stakeholders were asked why and how they go to Dufferin Street. Responses included:

- A majority of the LAC members primarily drive to Dufferin Street for work.
- Residents said they often drive and sometimes use public transit, especially to go to downtown.
- One participant said they drive to other neighbourhoods to go for a nice walk because Dufferin Street is a visually unappealing environment.
- There are great local restaurants and shops, including Katz's Deli and a gourmet cheese shop.
- Dufferin Street is good for shopping in local retail stores, on Orfus Road, or in Yorkdale Mall.
- The sports amenities in the neighbourhood are good and well used.
- There is convenient sheltered access to the subway station via Yorkdale Mall and good access to public transit, but only if you are familiar with the local area and its shortcuts.
- When asked if anyone cycled on or near Dufferin, participants said that cycling on Dufferin is very unsafe.

Advice on Streetscape and Walkability

- **Dufferin Street offers many great opportunities to improve walkability and existing streetscape.** One participant said that although currently there are very few people walking in the area, there are many possibilities for improvement.

- **Find creative ways to work with the large area of the paved curbside next to the sidewalk to improve streetscape and walkability.** One of the participants shared that this area is used for snow accumulation and is very difficult to get rezoned for other uses.

- **Improve how Dufferin Street looks, especially the retail strip on the east side.** Several participants identified the east side of Dufferin as problematic in terms of streetscape and visual appeal. In addition to the strip being visually unattractive, it is unclear what kinds of stores there are and what they sell.
- **Make Orfus Road more appealing for shoppers.** One participant said that Orfus Road retail stores are very affordable but not very visually appealing to shoppers, it lacks a connection to the subway, and the absence of an appropriate public realm (streets that look nice and are pleasant to be on).
- **Make streets safer for pedestrians by providing proper infrastructure and street furniture, including pedestrian crossings and street lights**. One participant commented that many people avoid walking on Dufferin at later hours of the day because there is no proper lighting and it feels unsafe.
- **Consider traffic calming opportunities in the study area to make Dufferin Street more enjoyable to walk.** Several participants mentioned that walking along the street with high-volume high-speed traffic does not feel safe and nor pleasant.
- **Create a process that allows rezoning of residential neighbourhoods for public realm improvements**. One member of the Local Advisory Committee suggested the City consider a more relaxed rezoning process in residential neighbourhoods for public realm improvements.
- **Make sure that Toronto District School Board is part of the project.**
- **Consider what can be done with the wider sidewalks or space beside the road.** One participant flagged that this area may be needed for snow removal, but others raised the opportunity to improve the public realm in this portion of the street.
- **Make the transit shortcuts official and valuable for visitors and shoppers;** this will help make the area more transit accessible.

Advice on Neighbourhood Identity

- **Create a neighbourhood identity that makes Dufferin Street an original and a recognizable destination**. Many members of the LAC expressed the need for Dufferin Street in the study area to have a distinct neighbourhood identity. Some of the suggestions included:
  - Create a destination similar to Midtown, as a place to visit and, in terms of transportation, as an 'exchange' or middle point.
  - Create a restaurant world instead of the dealership world. One participant responded to this suggestion by saying that dealerships do not hinder the visual appeal or neighbourhood character.
  - Dufferin is the place where Downtown meets Vaughan – it is a watershed and a midtown, approaching the end of the subway line and the beginning of driveways.
  - Consider abbreviations indicating the part of the area as neighbourhood names as is done in New York City. For example, West of Dufferin is WeDu, East of Dufferin is EDu, North of Lawrence is NoLa, and South of Lawrence is SoLa.

- **Dufferin Street can be both an exchange hub and a destination.** One participant said that many people use Dufferin Street as an area of transit transfer; many people already know it as an exchange hub. Utilize and elevate this knowledge and create a neighbourhood identity of an exchange mobility hub and a destination at the same time.

- **There should be a marketing strategy to promote an established neighbourhood, great local assets and landmark spots**. Several participants mentioned that Dufferin Street in the study area is a great undiscovered neighbourhood. It offers commercial diversity and affordability. Promoting local assets would attract more people to Dufferin to experience things other than Yorkdale Mall shopping.
- **Promote the neighbourhood as a place with a variety of commercial activities to improve the local economy.** One participant shared that a high turnover of commercial stores occurs in the area because people come to specific places only, such as Yorkdale Mall, and are not aware of or not attracted to the rest of commercial places on Dufferin Street.
- **It is important to take into consideration demographic shifts in the community**. A few participants noted that the neighbourhood is changing with all the new developments in the area that cause demographic shifts towards a younger population.

Advice regarding Congestion and Traffic

Congestion

- **Update the synchronization of traffic lights**. It will be an effective solution to reduce congestion, as it will create a better traffic flow.
- **Consider traffic impacts of intensification around Dufferin Street, including west of Dufferin on Caledonia Street, and east of the study area at Lawrence Heights.**
- **Consider eliminating street parking on Dufferin.** Eliminating street parking would be a major contributor to faster transit service and less congestion.

Road Configurations

- **There is a need for an exit/entrance from Highway 401 to Caledonia**. It will significantly help to reduce traffic on Dufferin Street.
- **The southbound ramp to exit Highway 401 onto Dufferin Street is confusing and dangerous.** Not many people realize the ramp is on the west side, which makes driving a huge safety concern.
- **Extend Marlee Avenue to Yorkdale Mall** to alleviate congestion.

Public Transportation

- **Address congestion and improve public transportation services.** One member of the LAC noted that although current residents will continue to drive because of car culture, there is a growing number of newcomers that come to the area for the good public transportation. Another suggestion was to consider imposing turning restrictions on Dufferin to help speed up traffic so there is less traffic and improved bus performance.
- **Update the Dufferin bus schedule so that buses arrive at set times with consistent headway.**
- **Consider an LRT corridor going through the study area, potentially underground.** One participant said that this solution would be aligned with the Official Plan, where Dufferin Street is identified as a transit priority; and would help alleviate the busy transit corridor and bus congestion. Other participants agreed with the LRT suggestions, due to the high ridership from Wilson, Yorkdale and Dufferin stations and their impact to draw people in transferring or taking

the bus from those stations south and or going east/west during peak times. And though this is a good idea, there may not be funds available to pay for it.

Cycling

- **It feels very unsafe to cycle due to high traffic volume.** Congestion on Bathurst Street pushes a lot of traffic to Dufferin Street, which makes Dufferin Street a high-speed, high-volume, congested traffic corridor.
- **Present the impact of introducing cycling lanes on local traffic.** One participant raised a question of space required for cycling lanes – where it would come from and how it would impact heavy volume of traffic in the area.

Yorkdale Mall

- **Engage Yorkdale Mall as a member of community and start a dialogue on how to address issues related to high traffic flow and parking pressures generated by Yorkdale Mall that are downloaded onto Dufferin Street**. One participant said that the highest level of congestion usually occurs on weekends; and Christmas time has the highest traffic volumes primarily due to Yorkdale Mall shoppers. Furthermore, several participants commented that the mall shoppers and TTC commuters occupy residential or local businesses' parking spots if they can't find parking at the Yorkdale Mall parking lot.
- **Create a northbound ramp entrance into Yorkdale Mall.** It would make driving into the mall much easier, as an almost full-stop, as is required in the present configuration, would not be necessary.
- **Increasing parking at Yorkdale Mall or providing additional underground parking will encourage more car usage and add to congestion.** The Spadina subway extension to Vaughan is being built and should reduce automobile traffic from Vaughan residents coming to Yorkdale.

Advice on Connectivity and Access

- **Create better east-west connections and improve access to Dufferin Street**, especially through large blocks to the west of Dufferin Street.
- **Improve northbound connections**. One participant noted that Dufferin ends at Wilson Avenue and does not have a good connectivity going north past that point. This configuration contributes to heavy congestion, unlike the many connections and lighter traffic when travelling south.
- **Improve pedestrian access from the subway to Dufferin Street.** Pedestrian access is especially problematic when Yorkdale Mall is closed.
- **Consider revitalizing big parking lots along Dufferin Street**. Big parking lots create unfriendly separation.
- **Consider an underground pedestrian path from the subway station to the west**. Many participants said that walking from the subway station to Dufferin Street looks unsafe and inconvenient to many people. In addition, many people, including local residents, prefer sheltered access to the subway station, especially during cold weather.
- **Look for opportunities to create connectivity with Lawrence Heights to share amenities and facilities.**

Process Advice:

- **Think about Dufferin and opportunities for improvements in a larger context than the study area**; it's important to consider the bigger picture.
- **Engage with Yorkdale Mall as part of the planning process** to consider how it is part of and/or related to Dufferin Street and the community.
- **Congestion and Yorkdale Mall may dominate the public meeting discussions**
- **Include a presentation slide with examples of major traffic problems in the area**. This should help to save time identifying these spots during the discussion at the public meeting.
- **Make the presentation more accessible by explaining what the proposed technical terms mean for local residents** (e.g. what does a deeper setback translate into for locals?).
- **Provide an explanation on how the boundaries of the area are defined.**
- **Create an efficient way for the City to share all studies and public work/services notifications** relevant to Dufferin Street with local residents and businesses.
- **Make a clear distinction between Dufflaw Road and the Dufflaw condo in future presentations.**
- **Include transit information in the next presentation that includes how many buses will run on the route, how the headways will change and how to reduce bunching and whether or not articulated buses increase capacity, and if so by how much.**

Next Steps

Bianca Wylie told the LAC that the summary notes would be distributed in draft for their review and encouraged everyone to attend the first public meeting on November 6th at the Yorkdale Adult Learning Center (38 Orfus Road) from 6:30 to 9 pm.

Appendix A. List of Participants
LAC members are in bold

Andrew Au, City of Toronto, Transportation Planning
Robert Allsopp, DTAH
Rene Biberstein, DTAH
Marco Covi, TTC Riders (on behalf of Luca DeFranco)
Councillor Josh Colle, City of Toronto
Angelina Conte, City of Toronto
Jocelyn Deeks, City of Toronto, Economic Development
David DeLuca, Yorkdale West Community Rate Payers' Association
Pal Di Iulio, Columbus Centre/Villa Charities
Jeffrey Dorfman, Katz's Deli
Mario Giambattista, City of Toronto, Strategic Initiatives and Planning Policy
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Gregory Jones, Lanterra Developments
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Lora Mazzoca, City of Toronto, Parks
Melanie Melnyk, R.E.Millward Associates
Anna Mirabelli, Liberty Walk Condo Association
Yulia Pak, Swerhun Facilitation
Victor Pamensky, V.J Pamensky, Employment Lands Business Owner (on behalf of David Wassyng)
Colin Ramdial, City of Toronto, Planning
Brent Raymond, DTAH
Paul Rycroft, Yorkdale Ford Lincoln
Andria Sallese, City of Toronto, Planning
Venkat Srinivas, Resident
Sasha Terry, City of Toronto, Urban Design
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Regrets
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John Filipetti, Oxford Properties
David Wassyng, V.J Panensksy, Employment Lands Business Owner
Cycle Toronto