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TECHNICAL MEMORANDUM

To:	J. Corsi Development Inc.	**RVA:**	236800
From:	R.V. Anderson Associates Limited		
Date:	June 26, 2023		
Subject:	Corsi Hill Townhomes – Preliminary Stormwater Management Plan		

1.0 Introduction

This technical memo outlines the preliminary stormwater management strategy for the proposed Corsi Hill Townhouse Development on Corsi Hill Drive within the City of Greater Sudbury (CGS).

2.0 Pre-Development Conditions

The proposed subject site is located on undeveloped lands generally sloping in a northwesterly direction. The subject site is on a bedrock outcrop and consists of undulating brush, trees, and bedrock.

The total area of the property is 5.93 ha. For stormwater management purposes, conditions were assessed only for the portion of the lands encompassing the proposed development. The 1.358 ha catchment area, PRE1, is outlined in the pre-development drainage area plan shown in Figure 1. The remaining areas, 4.335 ha, will be undisturbed and naturally drain away from the subject site.

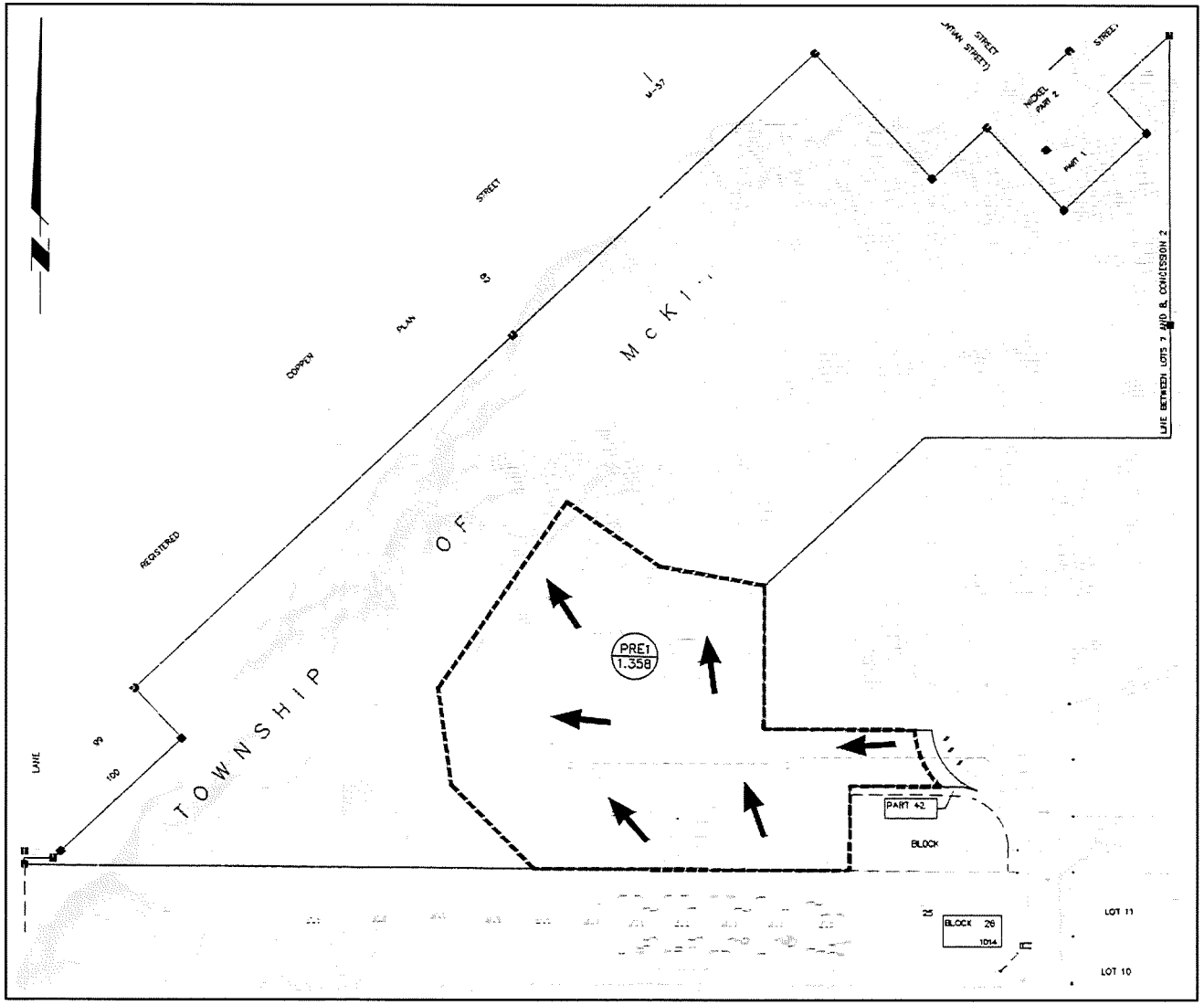

Figure 1: Pre-development Catchment Area

2.1 Pre-development Hydrologic Model

Pre-development runoff conditions of the subject area were calculated using the Rational Method. Based on CGS standards, the Chicago type distribution was used to evaluate peak flows and runoff volume. Visual OTTHYMO (VO) software version 6.2 was used to generate the 6-hour Chicago design storms. The Intensity-Duration-Frequency (IDF) curve parameters used for generating the design storms were as per the CGS Supplemental Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains, February 2023. The hydrologic response of the pre-development area was evaluated for the 5-year and 100-year design storm events. The A, B, and C values to determine the rainfall intensity are shown in Table 2.1.

Table **2.1** – Sudbury Rainfall – IDF Curve Parameters

Design Storm Event	A	B	C
5-year	600.938	4.000	0.7325
100-year	1092.988	3.656	0.7350

Based on the subject site land use and topography being a mix of woodland and bedrock with average slopes of 5-10%, a runoff coefficient of 0.65 was chosen. The pre-development runoff calculations are shown in Appendix 1. Table 2.2 shows the hydrologic results for the pre-development conditions.

Table **2.2** – Pre-Development Runoff Peak Flow and Runoff Volume

Design Storm Event	Runoff Peak Flow(m^3/s)	Total Runoff Volume (m^3)
5-year	0.215	423
100-year	0.494	949

3.0 Post-Development Conditions

The proposed development includes a new asphalt roadway and ten two-unit townhome buildings. Stormwater will be conveyed through the subject site via ditches and culverts.

The 1.358 ha subject site has been divided into two post-development sub-catchment areas, shown in Figure 2. Sub-catchment POST1, 0.700 ha, drains towards the southwest boundary of the subject site. Sub-catchment POST2, 0.658 ha, drains towards the northwest boundary of the subject site. A runoff coefficient of 0.9 and 0.6 was used for the right-of-way and lot areas, respectively. The weighted runoff coefficient calculated for the subject site is 0.65. Therefore, the impervious surfaces and grass areas of the proposed development create no increase in runoff compared to the pre-development woodlands and bare rock.

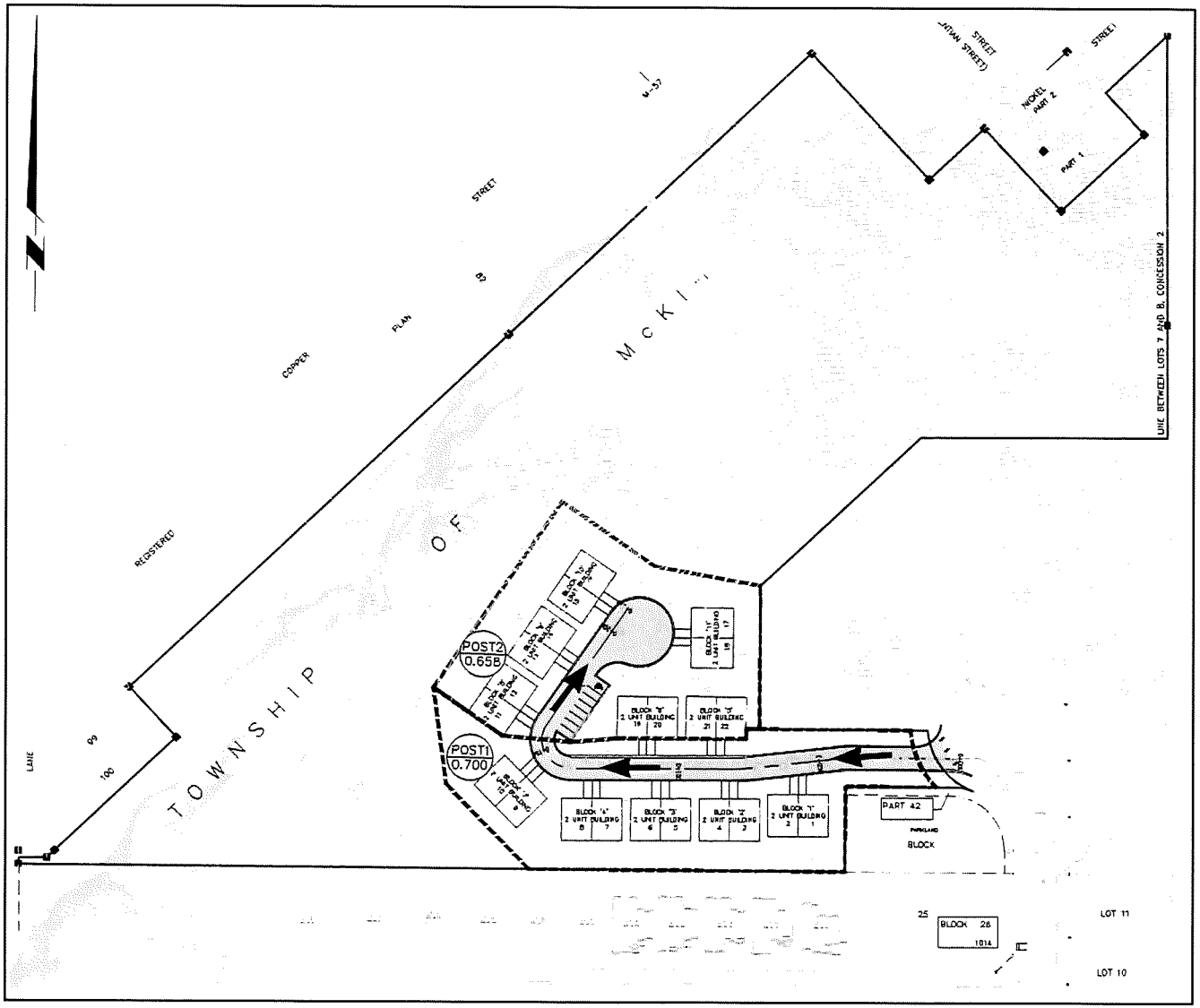

Figure 2: Post-development Catchment Areas

3.1 Post-development Hydrologic Model

Post-development runoff conditions of the subject area were calculated using the Rational Method. The hydrologic response was evaluated for the 5-year and 100-year 6-hour Chicago design storms.

The post-development runoff calculations are shown in Appendix 2. Table 3.1 shows the hydrologic results for the pre-development conditions.

Table 3.1 – Post-Development Runoff Peak Flow and Runoff Volume

Design Storm Event	Runoff Peak Flow (m^3/s)	Total Runoff Volume (m^3)
5-year	0.215	423
100-year	0.494	948

3.2 Quantity Control

The pre-development and post-development catchment areas and runoff coefficients are equivalent. There is no increase in peak runoff rate or total runoff volume, as shown in Table 2.2 and Table 3.1. Therefore, no quantity control will be provided for the subject site.

To mitigate the concentration of flow at ditch or culvert outlet locations, flow spreader or dissipator techniques will be implemented. Rip rap and/or dense vegetation can be used to maintain sheet flow to the natural areas surrounding the subject site.

3.3 Quality Control

To provide quality control, landscape features that incorporate dense vegetation and/or bioretention/biofilter areas will be implemented at the ditch or culvert outlet locations. The landscape features will likely be located between Block 7 and Block 8, and on the north side of Block 10.

4.0 Discussion and Conclusions

The preliminary stormwater management strategy for the Corsi Hill Townhouse Development is as follows:

- Post-development runoff volumes and peak flows from the subject site are equal to the pre-development volumes and peak flows for the 5-year and 100-year design storms; no quantity control will be provided.
- Flow spreader/dissipator techniques will be implemented at stormwater outlet locations within the subject site, to mitigate the concentration of flow.
- Landscape features will be implemented at stormwater outlet locations within the subject site, to provide quality control.

We trust that the above satisfies the City's requirements. If you have any questions or would like to discuss the above, please contact our office at your convenience.

Yours very truly,

R.V. ANDERSON ASSOCIATES LIMITED

Andrea Penny, P.Eng., M.A.Sc., ENV SP

Associate, Project Manager

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APPENDIX 1

PRE-DEVELOPMENT CALCULATIONS

The Rational Method calculations were completed using the formula Q=0.00278*C*I*A. Where Q = peak runoff rate (m^3/s), C = composite runoff coefficient, I = rainfall intensity (mm/hr), and A = drainage area (ha).

PRE-DEVELOPMENT

Catchment	Total Area (ha)	C (2-10 yr)	C + 25% (for 100-yr)
PRE1	1.358	0.65	0.81

Chicago 6hr 10min - Peak Intensity		
Design Storm	**5 Year**	**100 Year**
Peak Intensity (mm/hr)	87.0	160.0
Calculated Peak Runoff Rate Based on Rational Method		
PRE1	0.215	0.494
Total Peak Flow (m^3/s)	**0.215**	**0.494**

NOTES:

1) C values for 2-year design storm based upon Ministry of Transportation Drainage Management Manual

2) Overall C values for 100-year storm were determined by adding an additioanl 25% to the 5-year values according to MTO Drainage Management Manual

Chicago 6-hr 5-yr storm

Time (min)	Intensity (mm/hr)	Runoff Rate (m^3/s)	Runoff Volume (m^3)
0	2.38	0.00588	0.00
10	2.56	0.00633	3.80
20	2.78	0.00687	4.12
30	3.04	0.00752	4.51
40	3.38	0.00836	5.01
50	3.82	0.00944	5.67
60	4.42	0.01094	6.56
70	5.32	0.01314	7.88
80	6.79	0.01678	10.07
90	9.80	0.02423	14.54
100	21.12	0.05220	31.32
110	86.95	0.21491	128.95
120	27.05	0.06684	40.11
130	15.22	0.03761	22.57
140	10.94	0.02704	16.22
150	8.69	0.02147	12.88
160	7.28	0.01799	10.80
170	6.31	0.01560	9.36
180	5.60	0.01383	8.30
190	5.05	0.01247	7.48
200	4.61	0.01139	6.83
210	4.25	0.01051	6.30
220	3.95	0.00977	5.86
230	3.70	0.00914	5.48
240	3.48	0.00860	5.16
250	3.29	0.00813	4.88
260	3.12	0.00772	4.63
270	2.97	0.00735	4.41
280	2.84	0.00702	4.21
290	2.72	0.00672	4.03
300	2.61	0.00646	3.87
310	2.51	0.00621	3.73
320	2.42	0.00599	3.59
330	2.34	0.00578	3.47
340	2.26	0.00559	3.36
350	2.19	0.00542	3.25
		Total Runoff Volume (m^3)	423.2

Chicago 6-hr 100-yr storm

Time (min)	Intensity (mm/hr)	Runoff Rate (m^3/s)	Runoff Volume (m^3)
0	4.22	0.013033	0.000
10	4.54	0.014026	8.415
20	4.93	0.015219	9.131
30	5.40	0.016682	10.009
40	6.00	0.018527	11.116
50	6.78	0.020937	12.562
60	7.85	0.024246	14.548
70	9.43	0.029124	17.474
80	12.04	0.037182	22.309
90	17.37	0.053672	32.203
100	37.45	0.115715	69.429
110	160.01	0.494349	296.609
120	48.00	0.148307	88.984
130	26.95	0.083265	49.959
140	19.38	0.059882	35.929
150	15.40	0.047570	28.542
160	12.91	0.039876	23.925
170	11.19	0.034567	20.740
180	9.92	0.030660	18.396
190	8.95	0.027650	16.590
200	8.17	0.025253	15.152
210	7.54	0.023292	13.975
220	7.01	0.021655	12.993
230	6.56	0.020265	12.159
240	6.17	0.019068	11.441
250	5.83	0.018025	10.815
260	5.54	0.017108	10.265
270	5.27	0.016293	9.776
280	5.04	0.015563	9.338
290	4.83	0.014907	8.944
300	4.63	0.014312	8.587
310	4.46	0.013770	8.262
320	4.30	0.013274	7.965
330	4.15	0.012819	7.691
340	4.01	0.012399	7.439
350	3.89	0.012009	7.205
		Total Runoff Volume (m^3)	948.9

APPENDIX 2

POST-DEVELOPMENT CALCULATIONS

POST-DEVELOPMENT

Catchment	Total Area (ha)	ROW Area	Lot Area	C ROW	C lots	C (2-10 yr)	C + 25% (for 100-yr)
POST1	0.700	0.0351	0.6649	0.9	0.6	0.62	0.77
POST2	0.658	0.1889	0.469	0.9	0.6	0.69	0.86
TOTAL	**1.358**	**0.224**	**1.134**	**0.9**	**0.6**	**0.65**	**0.81**

Chicago 6hr 10min - MAX Intensity (mm/h)		
Design Storm	**5 Year**	**100 Year**
Peak Intensity (mm/hr)	87.0	160.0
Calculated Peak Runoff Rate (m^3/s) Based on Rational Method		
POST1	0.105	0.241
POST2	0.110	0.253
Total Peak Flow (m^3/s)	**0.215**	**0.494**

NOTES:

1) C values for 2-year design storm based upon Ministry of Transportation Drainage Management Manual
2) Overall C values based upon a weighted calculation
3) Overall C values for 100-year storm were determined by adding an additioanl 25% to the 5-year values according to MTO Drainage Management Manual

Chicago 6-hr 5-yr storm

Time (min)	Intensity (mm/hr)	Runoff Rate (m^3/s)	Runoff Volume (m^3)
0	2.38	0.005875	0.000
10	2.56	0.006323	3.794
20	2.78	0.006860	4.116
30	3.04	0.007519	4.511
40	3.38	0.008350	5.010
50	3.82	0.009436	5.662
60	4.42	0.010927	6.556
70	5.32	0.013127	7.876
80	6.79	0.016764	10.059
90	9.80	0.024214	14.528
100	21.12	0.052154	31.292
110	86.95	0.214742	128.845
120	27.05	0.066790	40.074
130	15.22	0.037581	22.549
140	10.94	0.027020	16.212
150	8.69	0.021457	12.874
160	7.28	0.017981	10.788
170	6.31	0.015584	9.350
180	5.60	0.013820	8.292
190	5.05	0.012463	7.478
200	4.61	0.011381	6.829
210	4.25	0.010498	6.299
220	3.95	0.009760	5.856
230	3.70	0.009133	5.480
240	3.48	0.008594	5.156
250	3.29	0.008124	4.874
260	3.12	0.007711	4.626
270	2.97	0.007344	4.406
280	2.84	0.007015	4.209
290	2.72	0.006720	4.032
300	2.61	0.006452	3.871
310	2.51	0.006208	3.725
320	2.42	0.005985	3.591
330	2.34	0.005779	3.468
340	2.26	0.005590	3.354
350	2.19	0.005415	3.249
	Total Runoff Volume (m^3)		**422.9**

Chicago 6-hr 100-yr storm

Time (min)	Intensity (mm/hr)	Runoff Rate (m^3/s)	Runoff Volume (m^3)
0	4.22	0.013022	0.000
10	4.54	0.014015	8.409
20	4.93	0.015207	9.124
30	5.40	0.016669	10.001
40	6.00	0.018512	11.107
50	6.78	0.020921	12.552
60	7.85	0.024227	14.536
70	9.43	0.029101	17.460
80	12.04	0.037152	22.291
90	17.37	0.053629	32.178
100	37.45	0.115623	69.374
110	160.01	0.493957	296.374
120	48.00	0.148189	88.914
130	26.95	0.083199	49.919
140	19.38	0.059834	35.900
150	15.40	0.047532	28.519
160	12.91	0.039844	23.906
170	11.19	0.034540	20.724
180	9.92	0.030635	18.381
190	8.95	0.027628	16.577
200	8.17	0.025233	15.140
210	7.54	0.023274	13.964
220	7.01	0.021638	12.983
230	6.56	0.020249	12.149
240	6.17	0.019053	11.432
250	5.83	0.018011	10.807
260	5.54	0.017094	10.256
270	5.27	0.016280	9.768
280	5.04	0.015551	9.331
290	4.83	0.014895	8.937
300	4.63	0.014301	8.581
310	4.46	0.013759	8.256
320	4.30	0.013264	7.958
330	4.15	0.012809	7.685
340	4.01	0.012389	7.433
350	3.89	0.011999	7.200
	Total Runoff Volume (m^3)		**948.1**