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PRELIMINARY
FUNCTIONAL SERVICING REPORT

SHAYNE AVENUE
Town of Fort Erie
February 2022

INTRODUCTION

This report is prepared to address the servicing needs for the proposed residential subdivision development located within the community of Crescent Park in the Town of Fort Erie. The subject land is located west of Daytona Drive, east of Parkdale Avenue, south of Evelyn Avenue and is bound to the south by the Edgewood Avenue. The subject land has frontage along the opened, but untravelled municipal road allowance for the extension of Shayne Avenue to Evelyn Avenue. The subject land is surrounded by existing low-density residential land uses. The subject land has been an open land with some green cover.

The subject lands, as identified on the proposed Draft Plan of subdivision, comprises 23 single family residential dwellings within a total development area of approximately 1.56 hectares and will include associated asphalt roadways, concrete curb, catch basins, storm sewers, sanitary sewers, and watermains.

As part of the site development, Evelyn Avenue will be reconstructed from Parkdale Avenue to Daytona Drive to an urban standard.

The objectives of this study are as follows:

1. Identify domestic and fire protection water servicing needs for the site;
2. Identify sanitary servicing needs for the site;
3. Identify stormwater management needs for the site; and,

WATER SERVICING

There is an existing 150mm diameter PVC watermain located on existing Shayne Avenue which is running along the Daytona Drive from north to south. It is proposed to extend a new watermain for the subject lands between Edgewood Avenue and Evelyn Avenue with connections to the existing 150mm diameter watermain at Shayne Avenue and the existing watermains on either Daytona Drive or Parkdale Avenue. The new watermain will provide domestic water supply and fire protection for the subject lands.

There is an existing municipal fire hydrant located at the current dead-end of the Shayne Avenue. It is proposed to construct additional municipal fire hydrants within the subject land as needed to provide fire protection for the proposed dwellings. The locations of the proposed hydrants will be determined as part of the detailed engineering design for the site.

SANITARY SERVICING

There is an existing 200mm diameter sanitary sewer flowing southerly on Daytona drive. This existing sewer currently receives flow from the existing properties on Daytona Drive. It is proposed to convey the sanitary flows from proposed Shayne Avenue between Evelyn Avenue and Edgewood Avenue to the existing 200mm diameter sanitary sewer on Daytona Drive.

The total drainage area of the subject lands is approximately 2.54 hectares. It is also proposed to accommodate sanitary flows from an external drainage area of 2.44 ha north of the site which will comprise future dwellings on Shayne Avenue in the event that the road is extended from Evelyn Avenue to Orchard Avenue. Assuming a population density of 35 ppha (per Town of Fort Erie Standards, 2016), a future population of 174 persons for both, the subject lands and the external future lands will be accommodated. The subject lands and external future lands will produce a peak sanitary flow of approximately 3.09 L/s to the receiving sanitary sewer on Daytona Drive. The proposed sanitary flow of 3.09 L/s utilizes approximately 22.8% of the total capacity in the receiving 200mm diameter sanitary sewers, assuming the minimum slope of 0.40%. Therefore, there is expected to be adequate capacity in the receiving Daytona Drive sanitary sewer to service the subject land.

STORMWATER MANAGEMENT

The following will serve as a preliminary summary of the stormwater management requirements and the preliminary stormwater management plan for the subject lands.

A Master Storm Servicing Plan was prepared for the community of Crescent Park (reference North Crescent Park Storm Drainage Plan, Philips Engineering, 2009). This master plan allocated 2-year design storm flows from the subject lands and the future external lands to the north to Evelyn Avenue. A runoff coefficient of 0.2 was considered in the proposed storm sewers that convey flows from Daytona Drive to Lakeview Road, along the northern limit of the St. Philomena Elementary School property. Since the subject lands will have a proposed runoff coefficient of 0.50 for the proposed future development on the subject lands, stormwater quality controls will be required to control future peak flows to the existing levels at 0.20. In accordance with the Master Servicing Plan, a 750mm diameter quantity controls will be required to control future peak flows to the existing levels at 0.20. A copy of the Master Storm Servicing Plan and associated sewer design calculations have been included in Appendix A for reference.

There is an existing storm sewer located on Daytona Drive which conveys the storm water from existing roadside ditches and catch basins from the properties on the Daytona Drive. The existing storm sewer on Daytona Drive and storm sewers downstream of it, are sized for 2-year designed storm event.

It is proposed to construct a stormwater management dry pond facility to control the 2-year future stormwater flows from the subject land. The future stormwater flows from the subject land and the future external lands to the north of Evelyn Avenue shall be collected and conveyed to the proposed stormwater management dry pond facility located on the Edgewood Avenue between Shayne Avenue and Daytona Drive. The Existing Storm Drainage Area and the Proposed Storm Drainage Area with the preliminary footprint of the proposed day pond facility can be found on the Appendix B. The future stormwater flows from the dry pond facility then proposed to discharge through an Oil/Grit separator (OGS) to provide quality control and shall be connected to an existing storm manhole located on the Daytona Drive. In accordance with the Master Servicing Plan, a 750mm diameter storm sewer will be constructed between Daytona Drive and Lakeview Road, at the cost of the Town of Fort Erie. The proposed stormwater management facility is design in accordance with the Master Storm Servicing Plan that was prepared for the community of Crescent Park. Major overland flows from the subject lands (in excess of 2-year design storm event) will be conveyed overland within the existing roadway system to Daytona Drive. A preliminary design of Proposed Dry Pond facility along with Proposed Storm sewer is shown in Appendix C for reference.

The proposed stormwater management facility will receive and provide quantity controls for the future stormwater flows from the proposed future development on the subject lands between Evelyn Avenue and Edgewood Avenue, and the future external lands between Orchard Avenue and Evelyn Avenue. A dry pond facility servicing total drainage area of approximately 6.87 hectares with overall imperviousness of 44.2% will be required to provide storage of 243m^3 at a depth of 0.4m. Therefore, there is an adequate storage volume available in the dry pond facility to control the 2-year design storm event flows from the subject land and the future external lands of north of Evelyn Avenue. Preliminary dry pond calculations can be found in Appendix D for reference. A MIDUSS model developed for the dry pond facility is enclosed in Appendix E with this report.

Therefore, the preliminary dry pond design can provide adequate storage, the proposed stormwater management facility is adequately sized for the subject land.

To improve stormwater quality level from the proposed development land, a manhole oil/grit (OGS) separator is proposed. The drainage area of the proposed development is 6.87 hectares, with an imperviousness of approximately 44.2% contributing to the oil/grit separator. The preliminary modelling for a Hydroworks unit has indicated that a HD 3 will provide approximately 70% TSS overall removal and capture 100% of the stormwater flows. Therefore, the Hydroworks HD 3 can be used to provide MECP Basic protection (70% TSS removal) for the proposed development on the subject land. Preliminary sizing software output file can be found in Appendix E for reference.

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CONCLUSIONS AND RECOMMENDATIONS

Therefore, based on the above comments and design calculations provided for this site, the following summarizes the servicing for this site:

1. The subject lands will be serviced by the existing 150mm diameter watermain on Shayne Avenue and will provide both domestic water supply and fire protection.

2. The receiving 200mm diameter sanitary sewers on Daytona Drive is expected to have adequate capacity for the subject land.

3. Stormwater quantity controls can be provided by the proposed dry pond facility.

4. Stormwater quality controls can be provided to MECP Basic protection levels (70% TSS Removal) by the proposed manhole oil/grit separator.

5. Major overland flows will be conveyed on Daytona drive.

Based on the above and the accompanying calculations, there exists adequate municipal servicing for this development. We trust the above comments and enclosed calculations are satisfactory for approval. If you have any questions or require additional information, please do not hesitate to contact our office.

Prepared By:

K. J. Prajapati

Keyur Prajapati, E.I.T.,

Reviewed By:

J. Schooley

Jason Schooley, P.Eng.

Encl.

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APPENDICES

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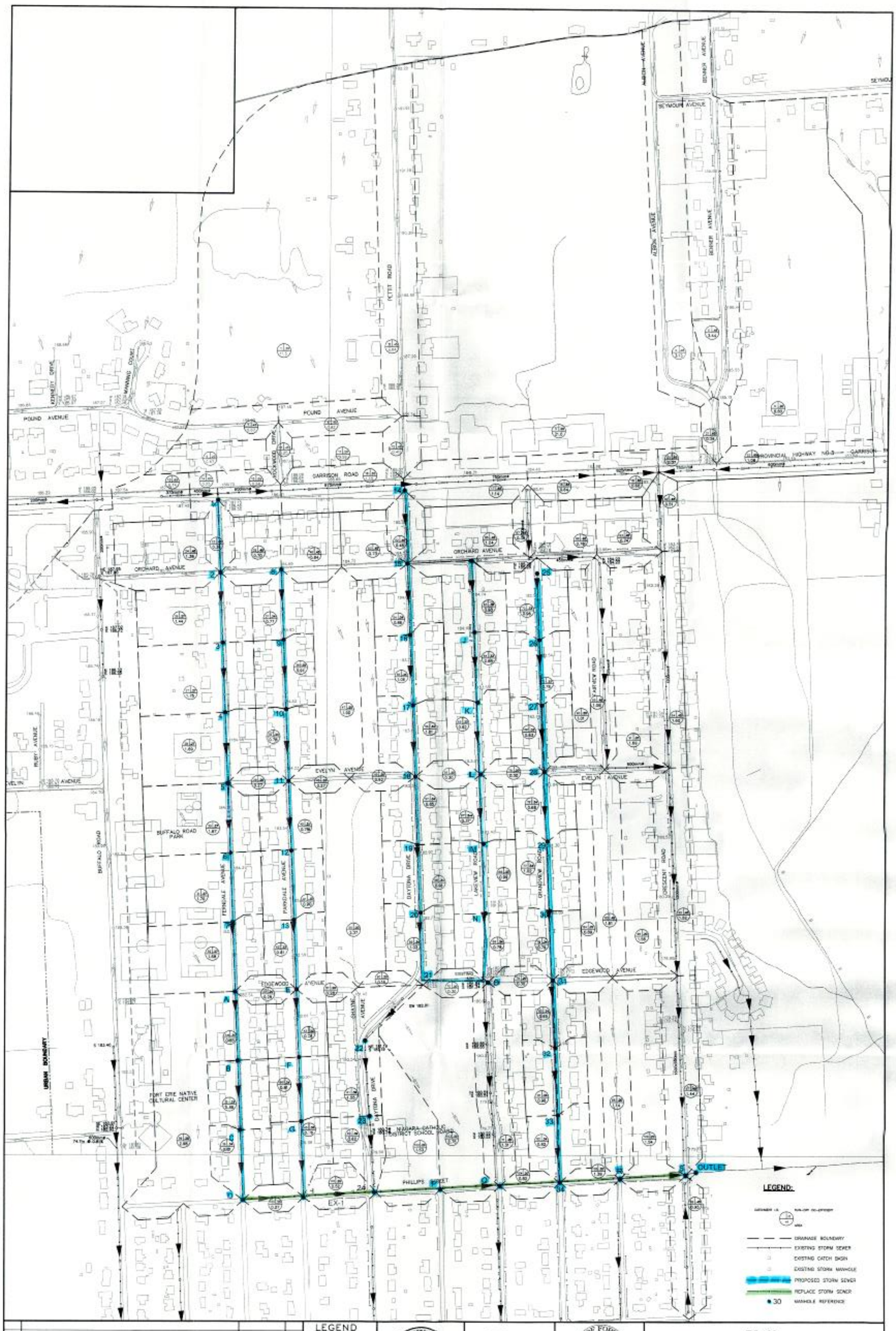
APPENDIX A

North Crescent Park Storm Drainage Area Plan
(Philips Engineering)
North Crescent Park Storm Sewer Design Sheet
(Philips Engineering)



No.	REVISION	DATE	BY
1	ISSUED FOR NOE APPROVAL	JUN 09	MWF

LEGEND

M. W. FISHER
100088817
PROVINCE OF ONTARIO
LICENSED PROFESSIONAL ENGINEER

PHILIPS ENGINEERING

TOWN OF FORT ERIE
INFRASTRUCTURE SERVICES
ENGINEERING DIVISION

PLAN
NORTH CRESCENT PARK STORM DRAINAGE

DSN. S.W.H.	DSN. CKD. S.W.H.	DWN. A.K.	DWG. CKD. M.W.F.
SCALE 1: 2,500		PROJ. No. 108021	
DATE MARCH 2009		DWG. No. 1 OF 1	REV.

FILE COPY

FILE: 108021 - STMDESIGN.xls
DATE: July 14, 2009

THE TOWN OF FORT ERIE
COMMUNITY PLANNING & DEVELOPMENT SERVICES
STORM SEWER DESIGN SHEET

PIPE:
n: 0.013

	2 Year		100 Year
A	628.050	A	1083.550
B	6.652	B	6.618
C	0.796	C	0.735

Modified System
2 Year

$Q = 2.778\ CIA$
$I = A/(B + T_c)^C$

LOCATION	STRUCTURE						AREA ID	AREA (ha)	RUNOFF COEFF C	CxA (ha)	TOTAL CxA (ha)	TIME OF CONC (min)	RAINFALL INTENSITY i_5 (mm/hr)	DESIGN FLOW		PIPE DIA (mm)	PIPE VELOCITY (m/s)	LENGTH (m)	TIME OF FLOW (min)	PIPE CAPACITY (l/s)	PERCENT FULL	RAINFALL INTENSITY i_{100} (mm/hr)	DES FLOW Q_{100} (l/s)	OVERLAND FLOW (l/s)
	FROM MH			TO MH										Q_5 (l/s)	SLOPE (%)									
	NO.	INV.	APPROX. COVER	NO.	INV.	Sani. Invert																		
East Drainage - Towards Kraft Drain																								
Garrison Road and North Area																								
Garrison	North Area			Crescent			1 - 22	61.01	0.30	18.1245	18.1245	10.00	66.9433	3371	0.10	**825**	0.86	675.00	13.11	474	**712**	137.3168	6914	6.4403
Ferndale Avenue - Garrison to Phillips																								
Ferndale	MH 1	184.793		MH 2	184.526	184.89	23	0.35	0.45	0.1575	0.1575	10.00	66.9433	29	0.25	**375**	0.80	107.00	2.22	91	**32**	137.3168	60	-31
Orchard	Buffalo			Ferndale			24	1.38	0.45	0.6210	0.6210	10.00	66.9433	115	0.20	OVLD		170.00				137.3168	237	237
Orchard	Parkdale			Ferndale			25	0.70	0.45	0.3150	0.3150	10.00	66.9433	59	0.20	OVLD		90.00				137.3168	120	120
Ferndale	MH 2	184.301		MH 3	184.136	184.96	26	1.44	0.27	0.3888	1.4823	12.22	60.5879	249	0.16	**600**	0.88	103.00	1.96	256	**97**	125.2119	516	259
Ferndale	MH 3	184.136		MH 4	183.899	184.53	27	1.75	0.27	0.4725	1.9548	14.18	56.0155	304	0.23	**600**	1.05	103.00	1.63	307	**99**	116.4461	632	325
Ferndale	MH 4	183.899		MH 5	183.577	184.21	28	1.69	0.27	0.4563	2.4111	15.81	52.7532	353	0.31	**600**	1.22	104.00	1.42	357	**99**	110.1602	738	381
Evelyn	Parkdale			Ferndale			29	0.27	0.20	0.0540	0.0540	10.00	66.9433	10	0.20	OVLD		100.00				137.3168	21	21
Ferndale	MH 5	183.577		MH 6	183.067	183.83	30	1.67	0.27	0.4509	2.9160	17.23	50.2434	407	0.50	**600**	1.55	102.00	1.10	453	**90**	105.3049	853	400
Ferndale	MH 6	183.067		MH 7	182.455	183.23	31	1.70	0.27	0.4590	3.3750	18.32	48.4813	455	0.60	**600**	1.70	102.00	1.00	496	**92**	101.8854	955	459
Ferndale	MH 7	182.455		MH A	181.751	182.85	32	1.68	0.27	0.4536	3.8286	19.32	46.9897	500	0.61	**600**	1.71	115.41	1.12	500	**100**	98.9837	1053	552
Edgewood	Parkdale	181.730		Ferndale			33	0.28	0.20	0.0560	0.0560	10.00	66.9433	10	0.10	OVLD		150.00				137.3168	21	21
Ferndale	MH A	181.751		MH B	181.151	181.65	34	0.85	0.34	0.2890	4.1736	20.45	45.4341	527	0.68	**600**	1.81	88.18	0.81	528	**100**	95.9503	1112	584
Ferndale	MH B	180.851		MH C	180.749	179.97	35	0.88	0.33	0.2904	4.4640	21.26	44.3787	550	0.10	**900**	0.91	102.00	1.87	597	**92**	93.8878	1164	567
Ferndale	MH C	180.749		MH D	180.647	179.60	36	0.81	0.34	0.2754	4.7394	23.13	42.1467	555	0.10	**900**	0.91	102.00	1.87	597	**93**	89.5140	1179	581
Parkdale Avenue - Orchard to Phillips																								
Parkdale	MH 8	184.360		MH 9	184.103	184.53	37	0.77	0.34	0.2618	0.2618	10.00	66.9433	49	0.25	**375**	0.80	103.00	2.14	91	**53**	137.3168	100	0.0084
Parkdale	MH 9	184.103		MH 10	183.814	184.13	38	0.91	0.34	0.3094	0.5712	12.14	60.8011	96	0.28	**375**	0.85	103.00	2.02	97	**100**	125.6194	199	0.1025
Parkdale	MH 10	183.739		MH 11	183.531	183.64	39	0.78	0.34	0.2652	0.8364	14.16	56.0507	130	0.20	**450**	0.81	104.00	2.14	133	**98**	116.5138	271	0.1377
Parkdale	MH 11	183.531		MH 12	182.511	182.88	40	0.78	0.33	0.2574	1.0938	16.30	51.8512	158	1.00	**450**	1.81	102.00	0.94	297	**53**	108.4173	329	0.0320
Parkdale	MH 12	182.511		MH 13	181.899	182.30	41	0.90	0.33	0.2970	1.3908	17.24	50.2236	194	0.60	**450**	1.40	102.00	1.21	230	**84**	105.2666	407	0.1763
Parkdale	MH 13	181.899		MH E	181.185	181.85	42	0.81	0.33	0.2673	1.6581	18.45	48.2847	222	0.70	**450**	1.52	102.00	1.12	249	**89**	101.5034	468	0.2187
Parkdale	MH E	180.960		MH F	180.838	180.71	43	0.76	0.33	0.2508	1.9089	19.57	46.6337	247	0.12	**675**	0.82	102.00	2.07	304	**81**	98.2902	521	0.2174
Parkdale	MH F	180.763		MH G	180.661	179.52	44	0.81	0.34	0.2754	2.1843	21.64	43.9007	266	0.10	**750**	0.81	102.00	2.11	367	**73**	92.9525	564	0.1968
Parkdale	MH G	180.661		MH H	180.559		45	0.78	0.35	0.2730	2.4573	23.75	41.4567	283	0.10	**750**	0.81	102.00	2.11	367	**77**	88.1586	602	0.2345
Shayne Avenue - Orchard to Daytona																								
Orchard	Parkdale			Shayne			46	0.84	0.45	0.3780	0.3780	10.00	66.9433	70	0.10	OVLD		90.00				137.3168	144	0.1442
Shayne	Orchard			Evelyn			47	1.90	0.20	0.3800	0.7580	10.00	66.9433	141	0.60	OVLD		320.00				137.3168	289	0.2892
Evelyn	Parkdale			Shayne			48	0.27	0.20	0.0540	0.0540	10.00	66.9433	10	0.10	OVLD		90.00				137.3168	21	0.0206
Evelyn	Daytona			Shayne			49	0.92	0.20	0.1840	0.1840	10.00	66.9433	34	0.10	OVLD		90.00				137.3168	70	0.0702
Shayne	Evelyn			Edgewood			50	2.37	0.20	0.4740	1.4700	10.00	66.9433	273	1.00	OVLD		320.00				137.3168	561	0.5608
Edgewood	Parkdale			Shayne			51	0.28	0.20	0.0560	0.0560	10.00	66.9433	10	0.10	OVLD		100.00				137.3168	21	0.0214

LOCATION	STRUCTURE						AREA ID	AREA (ha)	RUNOFF COEFF C	CxA (ha)	TOTAL CxA (ha)	TIME OF CONC (min)	RAINFALL INTENSITY i_5 (mm/hr)	DESIGN FLOW		PIPE DIA (mm)	PIPE VELOCITY (m/s)	LENGTH (m)	TIME OF FLOW (min)	PIPE CAPACITY (l/s)	PERCENT FULL	RAINFALL INTENSITY i_{100} (mm/hr)	DES FLOW Q_{100} (l/s)	OVERLAND FLOW (l/s)
	FROM MH			TO MH										Q_5 (l/s)	SLOPE (%)									
	NO.	INV.	APPROX. COVER	NO.	INV.	Sani. Invert																		
Daytona Drive - Garrison to Phillips																								
Daytona	MH 14	184.170		MH 15	183.902	184.17	52	0.48	0.45	0.2160	0.2160	10.00	66.9433	40	0.25	**375**	0.80	107.00	2.22	91	**44**	137.3168	82	0.0000
Orchard	Shayne			Daytona			53	0.73	0.45	0.3285	0.3285	10.00	66.9433	61	0.10	OVLD		100.00				137.3168	125	0.1253
Daytona	MH 15	183.827		MH 16	183.197	183.45	54	0.86	0.34	0.2924	0.8369	12.22	60.5879	141	0.60	**450**	1.40	105.00	1.25	230	**61**	125.2119	291	0.0607
Daytona	MH 16	183.122		MH 17	182.860	183.14	55	1.06	0.34	0.3604	1.1973	13.47	57.5797	192	0.25	**525**	1.00	105.00	1.74	224	**85**	119.4506	397	0.1730
Daytona	MH 17	182.860		MH 18	182.492	182.85	56	1.01	0.34	0.3434	1.5407	15.21	53.8950	231	0.35	**525**	1.19	105.00	1.47	265	**87**	112.3634	481	0.2155
Daytona	MH 18	182.417		MH 19	182.237	182.47	57	0.85	0.34	0.2890	1.8297	16.69	51.1689	260	0.18	**600**	0.93	100.00	1.79	272	**96**	107.0974	544	0.2726
Daytona	MH 19	182.237		MH 20	181.987	182.17	58	0.96	0.34	0.3264	2.1561	18.48	48.2460	289	0.25	**600**	1.10	100.00	1.52	320	**90**	101.4281	608	0.2872
Daytona	MH 20	181.987		MH 21	181.736	180.93	59	1.03	0.34	0.3502	2.5063	20.00	46.0441	321	0.25	**600**	1.10	100.00	1.52	321	**100**	97.1406	676	0.3554
Edgewood	Shayne			Daytona			60	0.16	0.20	0.0320	1.5580	10.00	66.9433	290	0.10	OVLD		100.00				137.3168	594	0.5943
Daytona	MH 21	181.526		MH O	181.350			0.00	0.00	0.0000	4.0643	21.51	44.0604	497	0.20	**750**	1.14	88.00	1.29	519	**96**	93.2651	1053	0.5336
Daytona	MH 22			MH 23			60A, 61	1.55	0.39	0.6106	0.6106	10.00	66.9433	114	0.40	**525**	1.27	112.00	1.47	284	**40**	137.3168	233	0.0000
Daytona	MH 23			MH 24			62	0.62	0.39	0.2418	0.8524	11.47	62.5838	148	0.40	**525**	1.27	111.00	1.46	284	**52**	129.0229	306	0.0218
Lakeview Road - Orchard to Phillips																								
Lakeview	MH I	183.670		MH J	183.435	183.67	63	0.98	0.35	0.3430	0.3430	10.00	66.9433	64	0.25	**375**	0.80	94.00	1.95	91	**70**	137.3168	131	0.0394
Lakeview	MH J	183.435		MH K	182.857	183.08	64	0.88	0.33	0.2904	0.6334	11.95	61.2870	108	0.55	**375**	1.19	105.00	1.47	136	**79**	126.5478	223	0.0870
Lakeview	MH K	182.782		MH L	182.205	182.44	65	0.92	0.33	0.3036	0.9370	13.42	57.6854	150	0.55	**450**	1.34	105.00	1.30	221	**68**	119.6534	311	0.0909
Evelyn	Daytona			Lakeview			66	0.30	0.20	0.0600	0.0600	10.00	66.9433	11	0.20	OVLD		90.00				137.3168	23	0.0229
Lakeview	MH L	182.205		MH M	181.786	181.91	67	0.77	0.34	0.2618	1.2588	14.73	54.8701	192	0.41	**450**	1.16	102.00	1.46	191	**101**	114.2422	399	0.2088
Lakeview	MH M	181.636		MH N	181.493	180.98	68	0.99	0.33	0.3267	1.5855	16.19	52.0526	229	0.14	**600**	0.82	102.00	2.07	240	**96**	108.8066	479	0.2396
Lakeview	MH N	181.493		MH O	181.350	180.28	69	0.78	0.34	0.2652	1.8507	22.80	42.5199	219	0.14	**600**	0.82	102.00	2.07	240	**91**	90.2466	464	0.2243
Edgewood	Daytona			Lakeview			70	0.30	0.20	0.0600	0.0600	10.00	66.9433	11	0.10	OVLD		90.00				137.3168	23	0.0229
Lakeview	Edgewood	181.350		Phillips	179.860		71	1.31	0.45	0.5895	6.5645	24.87	40.2818	735	0.50	**750**	1.80	310.00	2.87	821	**89**	85.8464	1566	0.7443
Grandview - Orchard to Phillips																								
Grandview	MH 25	182.259	4.34	MH 26	182.063	182.31	72	0.96	0.33	0.3168	0.3168	10.00	66.9433	59	0.20	**450**	0.81	98.00	2.02	133	**44**	137.3168	121	0.0000
Grandview	MH 26	182.063	4.54	MH 27	181.671	181.88	73	0.78	0.33	0.2574	0.5742	12.02	61.1226	97	0.40	**450**	1.15	98.00	1.43	188	**52**	126.2337	201	0.0132
Grandview	MH 27	181.671	4.93	MH 28	181.279	181.48	74	0.83	0.33	0.2739	0.8481	13.44	57.6453	136	0.40	**450**	1.15	98.00	1.43	188	**72**	119.5764	282	0.0936
Evelyn	Lakeview			Grandview			75	0.30	0.20	0.0600	0.0600	10.00	66.9433	11	0.30	OVLD		90.00				137.3168	23	0.0229
Grandview	MH 28	181.279	3.02	MH 29	180.565	180.99	76	0.68	0.34	0.2312	1.1393	14.87	54.5846	173	0.70	**450**	1.52	102.00	1.12	249	**69**	113.6925	360	0.1110
Grandview	MH 29	180.265	3.73	MH 30	180.163	180.19	77	1.02	0.34	0.3468	1.4861	15.99	52.4212	216	0.10	**750**	0.81	102.00	2.11	367	**59**	109.5189	452	0.0849
Grandview	MH 30	180.163	3.84	MH 31	180.061	179.67	78	0.79	0.34	0.2686	1.7547	18.10	48.8305	238	0.10	**750**	0.81	102.00	2.11	367	**65**	102.5637	500	0.1327
Edgewood	Lakeview			Grandview			79	0.30	0.20	0.0600	0.0600	10.00	66.9433	11	0.10	OVLD		90.00				137.3168	23	0.0229
Grandview	MH 31	180.061	2.04	MH 32	179.961	179.22	80	0.69	0.34	0.2346	2.0493	20.21	45.7508	260	0.10	**750**	0.81	100.00	2.07	367	**71**	96.5684	550	0.1825
Grandview	MH 32	179.961	2.14	MH 33	179.861	178.82	81	0.96	0.34	0.3264	2.3757	22.28	43.1262	285	0.10	**750**	0.81	100.00	2.07	367	**77**	91.4356	603	0.2362
Grandview	MH 33	179.861	2.24	MH 34	179.761		82	0.82	0.34	0.2788	2.6545	24.35	40.8186	301	0.10	**750**	0.81	100.00	2.07	367	**82**	86.9035	641	0.2736
Fairview - Evelyn to Phillips																								
Fairview	Evelyn			Edgewood			83	1.61	0.45	0.7245	0.7245	10.00	66.9433	135	0.50	OVLD		300.00				137.3168	276	0.2764
Edgewood	Grandview			Fairview			84	0.89	0.20	0.1780	0.1780	10.00	66.9433	33	0.10	OVLD		90.00				137.3168	68	0.0679
Fairview	Edgewood			Phillips			85	1.14	0.20	0.2280	1.1305	10.00	66.9433	210	0.50	OVLD		310.00				137.3168	431	0.4312

LOCATION	STRUCTURE						AREA ID	AREA (ha)	RUNOFF COEFF C	CxA (ha)	TOTAL CxA (ha)	TIME OF CONC (min)	RAINFALL INTENSITY i_5 (mm/hr)	DESIGN FLOW		PIPE DIA (mm)	PIPE VELOCITY (m/s)	LENGTH (m)	TIME OF FLOW (min)	PIPE CAPACITY (l/s)	PERCENT FULL	RAINFALL INTENSITY i_{100} (mm/hr)	DES FLOW Q_{100} (l/s)	OVERLAND FLOW (l/s)
	FROM MH			TO MH										Q_5 (l/s)	SLOPE (%)									
	NO.	INV.	APPROX. COVER	NO.	INV.	Sani. Invert																		
Crescent - Garrison to Phillips																								
Orchard	Daytona			Grandview			86	1.24	0.45	0.5580	0.5580	10.00	66.9433	104	0.20	OVLD		100.00				137.3168	213	0.2129
Grandview	Garrison			Orchard			87	0.38	0.45	0.1710	0.1710	10.00	66.9433	32	1.50	**450**	2.22	90.00	0.68	364	**9**	137.3168	65	0.0000
Orchard	Grandview			Fairview			88	0.78	0.45	0.3510	1.0800	10.68	64.8560	195	0.50	**450**	1.28	180.00	2.34	210	**93**	133.3508	400	0.1898
Fairview	Orchard			Evelyn			89	1.06	0.45	0.4770	1.5570	13.02	58.6313	254	0.70	**525**	1.68	320.00	3.17	375	**68**	121.4669	525	0.1500
Evelyn	Grandview			Fairview			90	1.01	0.20	0.2020	0.2020	10.00	66.9433	38	0.70	OVLD		90.00				137.3168	77	0.0771
Evelyn	Fairview			Crescent			91	1.69	0.20	0.3380	2.0970	16.19	52.0476	303	0.50	**600**	1.55	90.00	0.97	453	**67**	108.7970	634	0.1808
Crescent	Garrison			Orchard			92	0.51	0.45	0.2295	18.3540	23.11	42.1668	2150	0.90	**1050**	3.02	120.00	0.66	2703	**80**	89.5535	4566	1.8635
Orchard	Fairview			Crescent			93	0.74	0.45	0.3330	0.3330	10.00	66.9433	62	0.50	OVLD		95.00				137.3168	127	0.1270
Crescent	Orchard			Evelyn			94	1.60	0.45	0.7200	19.4070	23.77	41.4354	2234	0.80	**1050**	2.85	320.00	1.87	2548	**88**	88.1166	4751	2.2026
Crescent	Evelyn			Edgewood			95	1.52	0.45	0.6840	22.1880	25.64	39.5130	2436	0.67	**1200**	2.85	310.00	1.81	3329	**73**	84.3309	5198	1.8688
Edgewood	Fairview			Crescent			96	1.56	0.20	0.3120	0.3120	10.00	66.9433	58	0.20	OVLD		90.00				137.3168	119	0.1190
Crescent	Edgewood			Phillips			97	1.44	0.45	0.6480	23.1480	27.45	37.8329	2433	0.50	**1500**	2.86	300.00	1.75	5215	**47**	81.0111	5209	0.0000
Crescent	Hollywood			Phillips			98	0.95	0.45	0.4275	0.4275	10.00	66.9433	80	0.30	**450**	0.99	200.00	3.36	163	**49**	137.3168	163	0.0002
Old Phillips -Lakeview to Crescent																								
Phillips	Parkdale	180.579		MH EX-1	180.520			0.00	0.00	0.0000	0.0000	0.00	138.9710	0	0.14	**675**	0.89	40.00	0.75	328	**0**	270.1561	0	
Phillips	MH EX-1	180.520		Daytona	180.433			0.00	0.00	0.0000	0.0000	0.00	138.9710	0	0.14	**675**	0.89	56.00	1.05	328	**0**	270.1561	0	
Phillips	Daytona	180.403		MH 24	180.383			0.00	0.00	0.0000	0.0000	0.00	138.9710	0	1.00	**450**	1.81	2.00	0.02	297	**0**	270.1561	0	
Phillips	Daytona	180.283		Lakeside	180.176			0.00	0.00	0.0000	0.0000	0.00	138.9710	0	0.12	**825**	0.94	106.00	1.88	519	**0**	270.1561	0	
Phillips	Lakeside	180.176		Lakeview	180.056			0.00	0.00	0.0000	0.0000	0.00	138.9710	0	0.12	**825**	0.94	71.00	1.26	519	**0**	270.1561	0	
Phillips	Lakeview	180.026		MH Q	179.986			0.00	0.00	0.0000	0.0000	0.00	138.9710	0	1.00	**450**	1.81	4.00	0.04	297	**0**	270.1561	0	
Phillips	Lakeview	179.831		Grandview	179.745			0.00	0.00	0.0000	0.0000	0.00	138.9710	0	0.10	**1050**	1.01	85.00	1.41	901	**0**	270.1561	0	
Phillips	Grandview	179.745		Fairview	179.658		105	1.39	0.20	0.2780	2.9325	26.42	38.7720	316	0.10	**1050**	1.01	87.00	1.44	901	**35**	82.8681	675	0.0000
Phillips	Fairview	179.658		Crescent	179.556		106	1.54	0.20	0.3080	4.3710	27.86	37.4798	455	0.12	**1050**	1.10	83.00	1.25	987	**46**	80.3121	975	0.0000
Phillips	Crescent	179.556		MH S	179.553			0.00	0.00	0.0000	4.3710	34.02	32.8833	399	0.12	**750**	0.88	3.00	0.06	402	**99**	71.1648	864	0.4618
New Phillips -Buffalo to Crescent																								
Phillips	Buffalo			Ferndale			99	2.98	0.20	0.5960	0.5960	10.00	66.9433	111	0.20	OVLD		90.00				137.3168	227	227
Phillips	MH D	180.587		MH H	180.499		100	0.27	0.20	0.0540	5.3894	25.00	40.1529	601	0.10	**975**	0.96	88.00	1.53	739	**81**	85.5925	1281	0.5421
Phillips	MH H	180.424		MH 24	180.320		101	0.52	0.20	0.1040	7.9507	25.86	39.2997	868	0.10	**1050**	1.01	104.00	1.72	901	**96**	83.9102	1853	0.9525
Phillips	MH 24	180.170		MH P	180.073		102	1.53	0.20	0.3060	9.1091	27.58	37.7200	955	0.10	**1200**	1.10	97.00	1.47	1286	**74**	80.7876	2044	0.7581
Phillips	MH P	180.073		MH Q	179.992		103	2.75	0.20	0.5500	9.6591	29.05	36.4806	979	0.10	**1200**	1.10	81.00	1.23	1286	**76**	78.3311	2102	0.8157
Phillips	MH Q	179.842		MH 34	179.761		104	0.82	0.20	0.1640	16.3876	30.27	35.5137	1617	0.10	**1350**	1.19	93.00	1.30	1761	**92**	76.4103	3479	1.7177
Phillips	MH 34	179.761		MH R	179.668			0.00	0.20	0.0000	16.3876	31.57	34.5484	1573	0.10	**1350**	1.19	88.00	1.23	1761	**89**	74.4889	3391	1.6303
Phillips	MH R	179.668		MH S	179.553			0.00	0.20	0.0000	16.3876	32.81	33.6879	1534	0.10	**1350**	1.19	87.00	1.22	1761	**87**	72.7726	3313	1.5521
Phillips	MH S	179.553		Outlet	179.535			0.00	0.20	0.0000	20.7586	34.02	32.8833	1896	0.12	**1350**	1.31	15.00	0.19	1929	**98**	71.1648	4104	2.1750

UPPER CANADA CONSULTANTS
ENGINEERS / PLANNERS

APPENDIX B

Existing Storm Drainage Area Plan
Proposed Storm Drainage Area Plan

GARRISON RD.

ORCHARD AVE.

PARKDALE AVE.

DAYTONA DR.

A
6.82
0.40

EVELYN ST.

PROP. SHAYNE AVE.

LAKEVIEW ROAD

PARKDALE AVE.

DAYTONA DR.

DAYTONA DR.

PRELIMINARY

UPPER CANADA CONSULTANTS
ENGINEERS / PLANNERS

EXISTING STORM DRAINAGE AREA

SHAYNE AVENUE

TOWN OF FORT ERIE

DATE	2022–02–18
SCALE	1:2500 m
REF No.	2113
DWG No.	-

DRAWING FILE: F:\2113\SWM\1764_BASE pond004.dwg PLOTTED: Feb 18, 2022 – 3:35pm PLOTTED BY: keyur

GARRISON RD.

ORCHARD AVE.

PARKDALE AVE.

DAYTONA DR.

A
6.87
0.40

EVELYN ST.

SUBJECT LANDS

PROP. SHAYNE AVE.

PROP. DRY POND FACILITY

LAKEVIEW ROAD

DAYTONA DR.

PARKDALE AVE.

DAYTONA DR.

PRELIMINARY

UPPER CANADA CONSULTANTS
ENGINEERS / PLANNERS

PROPOSED STORM DRAINAGE AREA

SHAYNE AVENUE
TOWN OF FORT ERIE

DATE	2022–02–18
SCALE	1:2500 m
REF No.	2113
DWG No.	-

DRAWING FILE: F:\2113\SWM\1764_BASE pond004.dwg PLOTTED: Feb 22, 2022 – 3:10pm PLOTTED BY: keyur

UPPER CANADA CONSULTANTS
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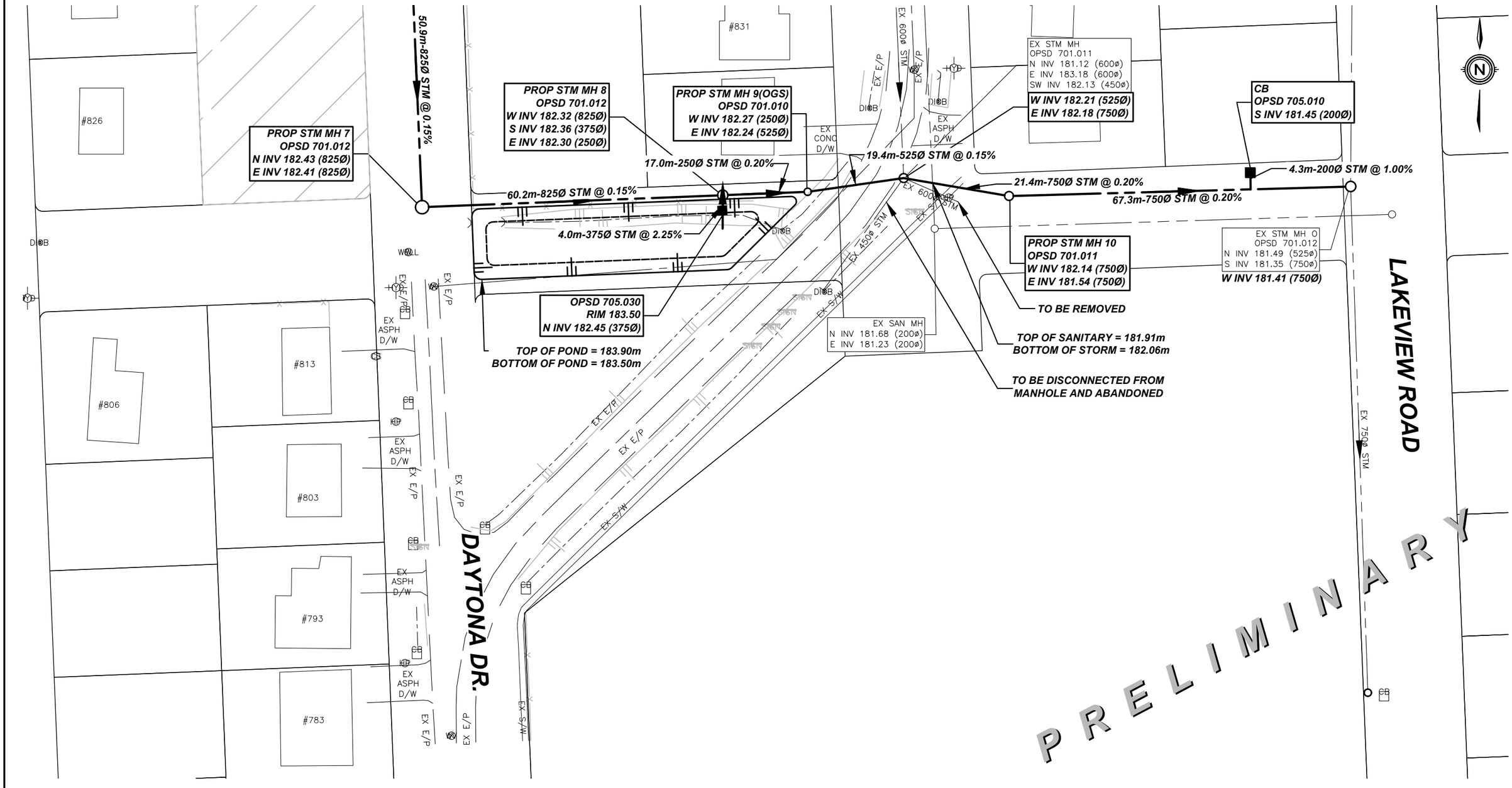
APPENDIX C

Proposed Dry Pond Facility and Proposed Storm Sewers



UPPER CANADA CONSULTANTS
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SHAYNE AVENUE DRY POND

TOWN OF FORT ERIE

DATE	2022–02–18
SCALE	1:750 m
REF No.	***2113***
DWG No.	*-*

DRAWING FILE: F:\2113\SWM\1764_BASE pond004.dwg PLOTTED: Feb 23, 2022 – 8:51am PLOTTED BY: keyur

UPPER CANADA CONSULTANTS
ENGINEERS / PLANNERS

APPENDIX D

Preliminary Dry Pond Facility Calculations

Upper Canada Consultants
30 Hannover Drive, Unit 3
St. Catharines, Ontario L2W 1A3
PROJECT NAME: Shayne Avenue
PROJECT NO.: 2113

PROPOSED DRY POND CALCULATIONS

Quantity Orifice
Diameter (m) = 0.250
Cd = 0.63
Invert (m) = 182.57

Elevation	Increment Depth (m)	Active Depth (m)	Surface Area (m2)	Average Surface Area (m2)	Increment Volume (m3)	Active Volume (m3)	Quantity Orifice (m3/s)
182.57		0	0			0	0.000
	0			0	0		
183.30		0.00	450			0	0.103
	0.10			489	49		
183.40		0.10	527			49	0.112
	0.10			575	57		
183.50		0.20	622			106	0.120
	0.10			674	67		
183.60		0.30	725			174	0.127
	0.10			776	78		
183.70		0.40	828			251	0.134

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APPENDIX E

MIDUSS Model for Dry Pond Facility
Preliminary Stormwater Quality Analysis

UPPER CANADA CONSULTANTS
ENGINEERS / PLANNERS

MIDUSS Model for Dry Pond Facility

```
                Output File (4.7) SWM.OUT      opened 2022-02-18
11:58
          Units used are defined by G =     9.810
              24   144    10.000        are MAXDT MAXHYD & DTMIN
values
          Licensee: UPPER CANADA CONSULTANTS
   35     COMMENT
         4     line(s) of comment
          STORMWATER MANAGEMENT PLAN
          SHAYNE AVENUE
          TOWN OF FORT ERIE
          FUTURE CONDITIONS WITH STORAGE
   35     COMMENT
         3     line(s) of comment
          *********
          2-YEAR STORM EVENT
          *********
    2     STORM
              1     1=Chicago;2=Huff;3=User;4=Cdnlhr;5=Historic
        628.050     Coefficient  a
          6.652     Constant  b    (min)
           .796     Exponent  c
           .450     Fraction to peak  r
        240.000     Duration ó  240 min
                   31.327 mm     Total depth
    3     IMPERVIOUS
              1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt;
4=Repeat
           .015     Manning "n"
         98.000     SCS Curve No or C
           .100     Ia/S Coefficient
           .518     Initial Abstraction
    4     CATCHMENT
          1.000     ID No.ó 99999
          6.870     Area in hectares
        214.010     Length (PERV) metres
          1.000     Gradient (%)
         44.200     Per cent Impervious
        214.010     Length (IMPERV)
           .000     %Imp. with Zero Dpth
              1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt;
4=Repeat
           .250     Manning "n"
         74.000     SCS Curve No or C
           .100     Ia/S Coefficient
          8.924     Initial Abstraction
              1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD;
4=Lin. Reserv
                 .369       .000       .000       .000 c.m/s
                 .143       .840       .451     C
perv/imperv/total
   15     ADD RUNOFF
                 .369       .369       .000       .000 c.m/s
   27     HYDROGRAPH DISPLAY
          5     is # of Hyeto/Hydrograph chosen
           Volume  =  .9700866E+03 c.m
   10     POND
          6 Depth - Discharge - Volume sets
          182.570        .000          .0
          183.300        .103          .1
          183.400        .112        49.0
          183.500        .120       106.0
          183.600        .127       174.0
          183.700        .134       251.0
          Peak Outflow    =      .133 c.m/s
          Maximum Depth   =   183.690 metres
          Maximum Storage =      243. c.m
                 .369       .369       .133       .000 c.m/s
   15     ADD RUNOFF
                 .369       .737       .133       .000 c.m/s
   27     HYDROGRAPH DISPLAY
          5     is # of Hyeto/Hydrograph chosen
           Volume  =  .1940173E+04 c.m
   14     START
          1     1=Zero; 2=Define
   35     COMMENT
          3     line(s) of comment
           ************
           100-YEAR STORM EVENT
           ************
    2     STORM
              1     1=Chicago;2=Huff;3=User;4=Cdnlhr;5=Historic
       1083.550     Coefficient  a
          6.618     Constant  b    (min)
           .735     Exponent  c
           .450     Fraction to peak  r
        240.000     Duration ó  240 min
                   75.636 mm     Total depth
    3     IMPERVIOUS
              1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt;
4=Repeat
           .015     Manning "n"
         98.000     SCS Curve No or C
           .100     Ia/S Coefficient
           .518     Initial Abstraction
    4     CATCHMENT
          1.000     ID No.ó 99999
          6.870     Area in hectares
        214.010     Length (PERV) metres
          1.000     Gradient (%)
         44.200     Per cent Impervious
        214.010     Length (IMPERV)
           .000     %Imp. with Zero Dpth
              1     Option 1=SCS CN/C; 2=Horton; 3=Green-Ampt;
4=Repeat
           .250     Manning "n"
         74.000     SCS Curve No or C
           .100     Ia/S Coefficient
          8.924     Initial Abstraction
              1     Option 1=Trianglr; 2=Rectanglr; 3=SWM HYD;
4=Lin. Reserv
                 .833       .000       .133       .000 c.m/s
                 .377       .913       .614     C
perv/imperv/total
   15     ADD RUNOFF
                 .833       .833       .133       .000 c.m/s
   27     HYDROGRAPH DISPLAY
          5     is # of Hyeto/Hydrograph chosen
           Volume  =  .3189586E+04 c.m
   20     MANUAL
```

UPPER CANADA CONSULTANTS
ENGINEERS / PLANNERS

Preliminary Stormwater Quality Analysis

```
************************************************

         *      Storm Water Management Sizing Model      *
         *               Hydroworks, LLC                 *
         *                Version 4.4                    *
         *                                               *
         *        Continuous Simulation Program          *
         *              Based on SWMM 4.4H               *
         *              Hydroworks, LLC                  *
         *               Graham Bryant                   *
         *                2003 - 2021                    *
         ************************************************

                          Developed by

         ************************************************
         *               Hydroworks, LLC                 *
         *             Metcalf & Eddy, Inc.              *
         *            University of Florida              *
         *       Water Resources Engineers, Inc.         *
         *      (Now Camp Dresser & McKee, Inc.)         *
         *              Modified SWMM 4.4                *
         ************************************************

                   Distributed and Maintained by

         ************************************************
         *                                              *
         *               Hydroworks, LLC                *
         *                888-290-7900                  *
         *              www.hydroworks.com              *
         *                                              *
         ************************************************

         ************************************************
         *     If any problems occur executing this     *
         *     model, contact Mr. Graham Bryant at      *
         *     Hydroworks, LLC by phone at 908-272-4411 *
         *     or by e-mail: support@hydroworks.com     *
         ************************************************

         ************************************************
         *     This model is based on EPA SWMM 4.4      *
         *  "Nature is full of infinite causes which    *
         *   have never occurred in experience" da Vinci *
         ************************************************


************************************************
* Entry made to the Rain Block                 *
* Created by the University of Florida - 1988  *
* Updated by Oregon State University, March 2000 *
************************************************


         Shayne Ave - Beam
         Town of Fort Erie


      ########################################
      #  Precipitation Block Input Commands  #
      ########################################

    Station Name.........................  St. Catherines A

    Station Location.....................  Ontario

    Station, ISTA........................    7287

    Beginning date, IYBEG (Yr/Mo/Dy).....  1971/ 1/ 1

    Ending date, IYEND (Yr/Mo/Dy).........  2005/12/31

    Minimum interevent time, MIT.........     1

    Number of ranked storms, NPTS.........    10

    NWS format, IFORM (See text).........     1

    Print storm summary, ISUM (O-No 1-Yes)     0

    Print all rainfall, IYEAR (O-No 1-Yes)     0

    Save storm event data on NSCRAT(1)....     0
    (IFILE =0 -Do not save, =1 -Save data)

    IDECID 0 - Create interface file
           1 - Create file and analyze
           2 - Synoptic analysis.........     2

    Plotting position parameter, A.........  0.40

    Storm event statistics, NOSTAT........  1100
```

```
    KODEA (from optional group B0).........     2
     = 0, Do not include NCDC cumulative values.
     = 1, Average NCDC cumulative values.
     = 2, Use NCDC cumulative value as inst. rain.

    KODEPR (from optional group B0).......     0
     Print NCDC special codes in event summary:
     = 0, only on days with events.
     = 1, on all days with codes present.
     Codes: A = accumulated value, I = incomplete value,
            M = missing value,     O = other code present



*********************************************************
*  Precipitation output created using the Rain block    *
*  Number of precipitation stations...        1         *
*********************************************************

Location Station Number
-------- --------------
       1.     7287


STATION ID ON PRECIP. DATA INPUT FILE = 7287
REQUESTED STATION ID =     7287  CHECK TO BE SURE THEY MATCH.


$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
Note, 15-min. data are being processed, but hourly
print-out, summaries, and statistics are based on
hourly totals only.  Data placed on interface file
are at correct 15-min. intervals.
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

#####################################################
# Entry made to the Runoff Block, last updated by #
# Oregon State University, and Camp, Dresser and  #
# McKee, Inc., March 2002.                        #
#####################################################
# "And wherever water goes, amoebae go along for  #
#  the ride"                    Tom Robbins       #
#####################################################


                  Shayne Ave - Beam

                  Town of Fort Erie


Snowmelt parameter - ISNOW.....................          0

Number of rain gages - NRGAG...................          1

Horton infiltration equation used - INFILM.....          2
Maximum infiltration volume is limited to RMAXINF input on  subcatchment lines.
Infiltration volume regenerates during  non rainfall periods.

Quality is simulated - KWALTY..................          1

IVAP is negative.  Evaporation will be set to zero
    during time steps with rainfall.

Read evaporation data on line(s) F1 (F2) - IVAP..          1

Hour of day at start of storm - NHR............          1

Minute of hour at start of storm - NMN.........          1

Time TZERO at start of storm (hours)...........      1.017

Use Metric units for I/O - METRIC..............          1
 ===> Ft-sec units used in all internal computations

Runoff input print control...                             0

Runoff graph plot control....                             1

Runoff output print control..                             0

Print headers every 50 lines - NOHEAD (0=yes, 1=no)       0

Print land use load percentages -LANDUPR (0=no, 1=yes)    0

Limit number of groundwater convergence messages to 10000 (if simulated)

Month, day, year of start of storm is:             1/ 1/1971

Wet time step length (seconds).......                   300.

Dry time step length (seconds).......                   900.

Wet/Dry time step length (seconds)...                   450.
```

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Simulation length is..... 20051231.0 Yr/Mo/Dy

Percent of impervious area with zero detention depth 25.0

Horton infiltration model being used
Rate for regeneration of infiltration = REGEN * DECAY
DECAY is read in for each subcatchment
REGEN = ... 0.25400

****
* Processed Precipitation will be read from file *
****

  ############################
  # Data Group F1 #
  # Evaporation Rate (mm/day) #
  ############################

JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
0.00	0.00	0.00	2.54	2.54	3.81	3.81	3.81	2.54	2.54	0.00	0.00

****
* C H A N N E L A N D P I P E D A T A *
****

Input equen umber	NAMEG: Channel ID #	Drains to NGTO:	Channel Type	Width (m)	Length (m)	Invert Slope (m/m)	L Side Slope (m/m)	R Side Slope (m/m)	Intial Depth (m)	Max Depth (m)	Mann- ings "N"	Full Flow (cms)
1	201	200	Dummy	0.0	0.0	0.0000	0.0000	0.0000	0.0	0.0	0.0000	0.00E+00

****
* S U B C A T C H M E N T D A T A *
****

NOTE. SEE LATER TABLE FOR OPTIONAL SUBCATCHMENT PARAMETERS

SUBCATCH- MENT NO.	CHANNEL OR INLET	WIDTH (M)	AREA (HA)	PERCENT IMPERV.	SLOPE (M/M)	RESISTANCE IMPERV.	FACTOR PERV.	DEPRES. IMPERV.	STORAGE(MM) PERV.	INFILTRATION RATE(MM/HR) MAXIMUM	INFILTRATION RATE(MM/HR) MINIMUM	DECAY RATE (1/SEC)	GAGE NO.	MAXIMUM VOLUME (MM)
1	300	200	181.38	6.58	41.40	0.0200	0.015	0.250	0.510	5.080	63.50	10.16	0.00055	1 101.60000

TOTAL NUMBER OF SUBCATCHMENTS... 1
TOTAL TRIBUTARY AREA (HECTARES). 6.58
IMPERVIOUS AREA (HECTARES)..... 2.72
PERVIOUS AREA (HECTARES)..... 3.86
TOTAL WIDTH (METERS)..... 181.38
PERCENT IMPERVIOUSNESS..... 41.40

****
* U P S T R E A M S T O R A G E D A T A *
****

Storage (m3)	Flow (m3/s)
0.	0.000
0.	0.091
24.	0.095
107.	0.103
243.	0.110

****
* G R O U N D W A T E R I N P U T D A T A *
****

SUB-CATCH NUMBER	CHANNEL OR INLET	ELEVATIONS GROUND (M)	BOTTOM (M)	STAGE (M)	BC (M)	TW (M)	FLOW CONSTANTS A1 (MM/HR-M^B1)	B1	A2 (MM/HR-M^B2)	B2	A3 (MM/HR-M^2)
0	602	3.05	0.00	0.00	0.61	0.61	3.484E-04	2.600	0.000E+00	1.000	0.00E+00

****
* G R O U N D W A T E R I N P U T D A T A (CONTINUED) *
****

S O I L P R O P E R T I E S

SUBCAT. NO.	POROSITY	SATURATED HYDRAULIC CONDUCTIVITY (mm/hr)	WILTING POINT	FIELD CAPACITY	INITIAL MOISTURE	MAX. DEEP PERCOLATION (mm/hr)	PERCOLATION PARAMETERS HCO	PCO	ET PARAMETERS DEPTH OF ET (m)	FRACTION OF ET TO UPPER ZONE
0	.4000	127.000	.1500	.3000	.3000	5.080E-02	10.00	4.57	4.27	0.350

****

UPPER CANADA CONSULTANTS
ENGINEERS / PLANNERS

```
*    Arrangement of Subcatchments and Channel/Pipes     *
*********************************************************
* See second subcatchment output table for connectivity *
* of subcatchment to subcatchment flows.                *
*********************************************************

   Channel
   or Pipe
       201     No Tributary Channel/Pipes
               No Tributary Subareas.....


    INLET
       200     Tributary Channel/Pipes...        201
               Tributary Subareas........        300


*********************************************************
* Hydrographs will be stored for the following   1 INLETS *
*********************************************************
          200


#####################################################
#                Quality Simulation                 #
#####################################################
#      General Quality Control Data Groups          #
#####################################################

 Description                              Variable       Value
 -----------                              --------       -----

 Number of quality constituents.....      NQS.......         1

 Number of land uses.................     JLAND.....         1

 Standard catchbasin volume.........      CBVOL.....      1.22 cubic meters

 Erosion is not simulated.........        IROS......         0

 DRY DAYS PRIOR TO START OF STORM...      DRYDAY....      3.00 DAYS

 DRY DAYS REQUIRED TO RECHARGE
 CATCHBASIN CONCENTRATION TO
 INITIAL VALUES..................... DRYBSN.....      5.00 DAYS

 DUST AND DIRT
 STREET SWEEPING EFFICIENCY......... REFFDD.....     0.300

 DAY OF YEAR ON WHICH STREET
 SWEEPING BEGINS.................... KLNBGN.....       120

 DAY OF YEAR ON WHICH STREET
 SWEEPING ENDS...................... KLNEND.....       270


#########################################
#     Land use data on data group J2      #
#########################################

                                                                LIMITING                                CLEANING  AVAIL.    DAYS SINCE
                                                                BUILDUP    BUILDUP   BUILDUP   BUILDUP   INTERVAL  FACTOR      LAST
AND USE   BUILDUP EQUATION TYPE   FUNCTIONAL DEPENDENCE OF     QUANTITY   POWER     COEFF.    IN DAYS   FRACTION  SWEEPING
LNAME)            (METHOD)        BUILDUP PARAMETER(JACGUT)  (DDLIM)    (DDPOW)   (DDFACT)  (CLFREQ)  (AVSWP)   (DSLCL)
-------   ---------------------   -------------------------  --------   -------   --------  --------  -------   ---------
Urban De  EXPONENTIAL(1)                  AREA(1)            2.802E+01     0.500    67.250    30.000     0.300    30.000


#################################################
#     Constituent data on data group J3      #
#################################################


                              Total Su
                              --------
Constituent units........      mg/l
Type of units............           0
KALC.....................           2
Type of buildup calc.....    EXPONENTIAL(2)
KWASH....................           0
Type of washoff calc.....  POWER EXPONEN.(0)
KACGUT...................           1
Dependence of buildup....         AREA(1)
LINKUP...................           0
Linkage to snowmelt......   NO SNOW LINKAGE
Buildup param 1 (QFACT1).         28.020
Buildup param 2 (QFACT2).          0.500
Buildup param 3 (QFACT3).         67.250
Buildup param 4 (QFACT4).          0.000
Buildup param 5 (QFACT5).          0.000
Washoff power (WASHPO)...          1.100
Washoff coef. (RCOEF)....          0.086
Init catchb conc (CBFACT)        100.000
Precip. conc. (CONCRN)...          0.000
Street sweep effic (REFF)          0.300
Remove fraction (REMOVE).          0.000
1st order QDECAY, 1/day..          0.000
Land use number..........              1
```

```
**************************************************
* Constant Groundwater Quality Concentration(s) *
**************************************************

 Total Susp has a concentration of..    0.0000   mg/l



*************************************************
* REMOVAL FRACTIONS FOR SELECTED CHANNEL/PIPES *
* FROM J7 LINES                                 *
*************************************************

  CHANNEL/   CONSTITUENT
     PIPE Total Susp
---------- --------
       201     0.000


*****************************************************
*     Subcatchment surface quality on data group L1 *
*****************************************************



                                  Total   Number   Input
                         Land    Gutter     of    Loading
                 Land     Use    Length   Catch-  load/ha
            No.  Usage    No.      Km     Basins   Total Su
        ------ --------  ----   -------- --------  -------
   1        300 Urban De  1         0.36     2.00  0.0E+00
   Totals (Loads in kg or other)    0.36     2.00  0.0E+00

    ***********************
    *    DATA GROUP M1    *
    ***********************


TOTAL NUMBER OF PRINTED GUTTERS/INLETS...NPRNT..        1
NUMBER OF TIME STEPS BETWEEN PRINTINGS..INTERV..        0
STARTING AND STOPPING PRINTOUT DATES...........         0         0


    ***********************
    *    DATA GROUP M3    *
    ***********************

CHANNEL/INLET PRINT DATA GROUPS......       -200

===> WARNING !! STORAGE UNIT IS FLOODING.  EXCESS VOLUME CONVEYED AS DISCHARGE
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```
*******************************************
* Rainfall from Nat. Weather Serv. file  *
* in units of hundredths of an inch      *
*******************************************
```

Shayne Ave - Beam
Town of Fort Erie

Rainfall Station   St. Catherines A
State/Province   Ontario

Rainfall Depth Summary (mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1971.	31.	0.	0.	0.	0.	0.	126.	93.	52.	60.	29.	0.	391.
1972.	0.	0.	0.	47.	65.	100.	39.	115.	63.	90.	1.	0.	521.
1973.	0.	0.	0.	103.	77.	71.	53.	29.	63.	139.	0.	0.	534.
1974.	0.	0.	0.	67.	105.	62.	50.	31.	74.	37.	110.	0.	536.
1975.	0.	0.	0.	0.	0.	94.	78.	76.	73.	56.	59.	6.	442.
1976.	0.	0.	0.	119.	136.	87.	101.	60.	72.	73.	13.	1.	662.
1977.	0.	0.	0.	94.	29.	69.	57.	150.	230.	71.	0.	1.	701.
1978.	0.	0.	0.	72.	43.	72.	43.	86.	156.	95.	0.	0.	567.
1979.	0.	0.	0.	84.	92.	33.	91.	88.	84.	129.	71.	0.	673.
1980.	0.	0.	0.	81.	39.	122.	60.	32.	79.	96.	45.	0.	554.
1981.	0.	0.	0.	91.	71.	106.	122.	61.	123.	91.	84.	0.	749.
1982.	0.	0.	0.	28.	65.	97.	36.	66.	82.	25.	143.	0.	544.
1983.	0.	0.	0.	78.	100.	65.	55.	106.	75.	122.	92.	0.	694.
1984.	0.	0.	0.	31.	113.	136.	19.	51.	144.	24.	44.	0.	562.
1985.	0.	0.	67.	32.	52.	64.	40.	94.	42.	109.	0.	1.	501.
1986.	0.	0.	0.	93.	113.	60.	85.	83.	98.	80.	43.	65.	719.
1987.	0.	2.	11.	77.	42.	80.	122.	97.	99.	71.	94.	34.	730.
1988.	0.	0.	41.	71.	42.	21.	110.	82.	70.	68.	75.	5.	585.
1989.	0.	0.	13.	63.	137.	108.	36.	45.	89.	73.	84.	0.	647.
1990.	0.	2.	38.	99.	124.	44.	68.	95.	56.	112.	96.	0.	735.
1991.	0.	0.	86.	124.	67.	31.	85.	57.	79.	64.	61.	28.	682.
1992.	0.	0.	29.	127.	56.	92.	185.	116.	77.	47.	103.	38.	869.
1993.	3.	0.	7.	83.	56.	86.	32.	61.	71.	92.	80.	38.	610.
1994.	0.	0.	44.	88.	105.	124.	48.	77.	117.	15.	0.	15.	633.
1995.	112.	23.	16.	48.	37.	60.	123.	66.	8.	137.	94.	0.	724.
1998.	0.	0.	0.	0.	51.	54.	64.	29.	9.	0.	1.	0.	207.
1999.	0.	0.	0.	79.	59.	35.	61.	58.	116.	78.	0.	0.	487.
2000.	0.	0.	0.	123.	134.	216.	51.	0.	0.	0.	10.	0.	534.

2001.	0.	0.	0.	56.	88.	45.	25.	30.	81.	129.	0.	0.	454.
2002.	0.	0.	0.	73.	104.	64.	53.	49.	52.	65.	8.	0.	468.
2003.	0.	0.	0.	10.	163.	77.	81.	64.	67.	73.	2.	0.	537.
2004.	0.	0.	0.	131.	126.	99.	115.	40.	88.	17.	0.	0.	616.
2005.	0.	0.	0.	38.	42.	78.	53.	120.	112.	0.	0.	0.	443.

Total Rainfall Depth for Simulation Period 19310. (mm)

Rainfall Intensity Analysis (mm/hr)

(mm/hr)	(#)	(%)	(mm)	(%)
2.50	21481	74.6	6454.	33.4
5.00	3585	12.4	3088.	16.0
7.50	1973	6.8	2886.	14.9
10.00	575	2.0	1233.	6.4
12.50	389	1.4	1070.	5.5
15.00	194	0.7	660.	3.4
17.50	210	0.7	846.	4.4
20.00	66	0.2	306.	1.6
22.50	92	0.3	487.	2.5
25.00	39	0.1	232.	1.2
27.50	37	0.1	246.	1.3
30.00	34	0.1	245.	1.3
32.50	29	0.1	228.	1.2
35.00	5	0.0	42.	0.2
37.50	10	0.0	90.	0.5
40.00	10	0.0	97.	0.5
42.50	12	0.0	124.	0.6
45.00	9	0.0	99.	0.5
47.50	1	0.0	12.	0.1
50.00	3	0.0	37.	0.2
>50.00	49	0.2	829.	4.3

Total # of Intensities 28803

Daily Rainfall Depth Analysis (mm)

(mm)	(#)	(%)	(mm)	(%)
2.50	1077	38.9	1247.	6.5
5.00	507	18.3	1850.	9.6
7.50	326	11.8	2006.	10.4
10.00	226	8.2	1958.	10.1
12.50	150	5.4	1672.	8.7
15.00	111	4.0	1495.	7.7
17.50	100	3.6	1620.	8.4
20.00	67	2.4	1260.	6.5
22.50	45	1.6	958.	5.0
25.00	37	1.3	881.	4.6
27.50	23	0.8	609.	3.2
30.00	20	0.7	575.	3.0
32.50	20	0.7	631.	3.3
35.00	12	0.4	405.	2.1
37.50	8	0.3	290.	1.5
40.00	9	0.3	350.	1.8
42.50	4	0.1	165.	0.9
45.00	4	0.1	173.	0.9
47.50	2	0.1	91.	0.5
50.00	4	0.1	192.	1.0
>50.00	15	0.5	882.	4.6

Total # Days with Rain 2767

```
************************************************
*      End of time step DO-loop in Runoff      *
************************************************

Final Date (Mo/Day/Year)   =                 12/31/2005
Total number of time steps =                    2056689
Final Julian Date  =                            2005365
Final time of day  =                             86398. seconds.
Final time of day  =                               24.00   hours.
Final running time =                          306816.0000   hours.
Final running time =                           12784.0000    days.

************************************************
*     Extrapolation Summary for Watersheds     *
* # Steps ==> Total Number of Extrapolated Steps *
* # Calls ==> Total Number of OVERLND Calls     *
************************************************
```

Subcatch	# Steps	# Calls	Subcatch	# Steps	# Calls	Subcatch	# Steps	# Calls
300	6303709	1638587						

```
************************************************
*     Extrapolation Summary for Channel/Pipes  *
* # Steps ==> Total Number of Extrapolated Steps *
* # Calls ==> Total Number of GUTNR Calls       *
************************************************
```

Chan/Pipe	# Steps	# Calls	Chan/Pipe	# Steps	# Calls	Chan/Pipe	# Steps	# Calls
201	0	0						

```
************************************************
```

```
*       Continuity Check for Surface Water   *
*********************************************
                                                                Millimeters over
                                                cubic meters    Total Basin
Total Precipitation (Rain plus Snow)               1267466.      19263.
Total Infiltration                                  741899.      11275.
Total Evaporation                                    59511.        904.
Surface Runoff from Watersheds                      468616.       7122.
Total Water remaining in Surface Storage                 0.          0.
Infiltration over the Pervious Area...              741899.      19241.
                    --------
Infiltration + Evaporation +
Surface Runoff + Snow removal +
Water remaining in Surface Storage +
Water remaining in Snow Cover.........             1270025.      19302.
Total Precipitation + Initial Storage.             1267466.      19263.


The error in continuity is calculated as
****************************************
* Precipitation + Initial Snow Cover  *
*      - Infiltration -               *
*Evaporation - Snow removal -         *
*Surface Runoff from Watersheds -     *
*Water in Surface Storage -           *
*Water remaining in Snow Cover        *
*-------------------------------------*
* Precipitation + Initial Snow Cover  *
****************************************
Error.................................       -0.202 Percent


*********************************************
*       Continuity Check for Channel/Pipes   *
*********************************************
                                                                Millimeters over
                                                cubic meters    Total Basin
Initial Channel/Pipe Storage.................            0.          0.
Final Channel/Pipe Storage...................            0.          0.
Surface Runoff from Watersheds...............       468616.       7122.
Baseflow.....................................            0.
Groundwater Subsurface Inflow................            0.          0.
Evaporation Loss from Channels...............            0.          0.
Channel/Pipe/Inlet Outflow...................       468616.       7122.
Initial Storage + Inflow.....................       468616.       7122.
Final Storage + Outflow......................       468616.       7122.
*********************************************
* Final Storage + Outflow + Evaporation  - *
* Watershed Runoff - Groundwater Inflow  - *
*     Initial Channel/Pipe Storage         *
*     ----------------------------------   *
*  Final Storage + Outflow  + Evaporation  *
*********************************************
Error.........................................      0.000 Percent


*************************************************
*     Continuity Check for Subsurface Water       *
*************************************************
                                                                Millimeters over
                                                cubic meters    Subsurface Basin

Total Infiltration                                       0.          0.
Total Upper Zone ET                                      0.          0.
Total Lower Zone ET                                      0.          0.
Total Groundwater flow                                   0.          0.
Total Deep percolation                                   0.          0.
Initial Subsurface Storage                           60165.        914.
Final Subsurface Storage                             60165.        914.
Upper Zone ET over Pervious Area                         0.          0.
Lower Zone ET over Pervious Area                         0.          0.


****************************************
* Infiltration + Initial Storage - Final *
* Storage - Upper and Lower Zone ET -    *
* Groundwater Flow - Deep Percolation    *
* -------------------------------------- *
*     Infiltration + Initial Storage     *
****************************************
Error ........................................     0.000 Percent
```

SUMMARY STATISTICS FOR SUBCATCHMENTS

SUBCATCHMENT NO.	GUTTER OR INLET NO.	AREA (HA)	PERCENT IMPER.	TOTAL SIMULATED RAINFALL (MM)	PERVIOUS AREA TOTAL RUNOFF DEPTH (MM)	PERVIOUS AREA TOTAL LOSSES (MM)	PERVIOUS AREA PEAK RUNOFF RATE (CMS)	IMPERVIOUS AREA RUNOFF DEPTH (MM)	IMPERVIOUS AREA PEAK RUNOFF RATE (CMS)	TOTAL SUBCATCHMENT AREA RUNOFF DEPTH (MM)	TOTAL SUBCATCHMENT AREA PEAK RUNOFF RATE (CMS)	TOTAL SUBCATCHMENT AREA PEAK UNIT RUNOFF (MM/HR)
300	200	6.58	41.41	9262.47	19.823********		0.27717	170.824	1.469	7120.338	1.745	96.297

*** NOTE *** IMPERVIOUS AREA STATISTICS AGGREGATE IMPERVIOUS AREAS WITH AND WITHOUT DEPRESSION STORAGE

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SUMMARY STATISTICS FOR CHANNEL/PIPES

CHANNEL NUMBER	FULL FLOW (CMS)	FULL VELOCITY (M/S)	FULL DEPTH (M)	MAXIMUM COMPUTED INFLOW (CMS)	MAXIMUM COMPUTED OUTFLOW (CMS)	MAXIMUM COMPUTED DEPTH (M)	MAXIMUM COMPUTED VELOCITY (M/S)	TIME OF OCCURRENCE DAY	TIME OF OCCURRENCE HR.	LENGTH OF SURCHARGE (HOUR)	MAXIMUM SURCHARGE VOLUME (CU-M)	RATIO OF MAX. TO FULL FLOW	RATIO OF MAX. DEPTH TO FULL DEPTH
201				0.00				1/ 0/1900	0.00				
200				1.75				8/14/1972	14.25				

TOTAL NUMBER OF CHANNELS/PIPES = 2

*** NOTE *** THE MAXIMUM FLOWS AND DEPTHS ARE CALCULATED AT THE END OF THE TIME INTERVAL

```
##################################################
#             Runoff Quality Summary Page        #
# If NDIM = 0 Units for:   loads    mass rates   #
#             METRIC = 1    lb        lb/sec     #
#             METRIC = 2    kg        kg/sec     #
# If NDIM = 1 Loads are in units of quantity     #
#             and mass rates are quantity/sec    #
# If NDIM = 2 loads are in units of concentration#
#             times volume and mass rates have units#
#             of concentration times volume/second #
##################################################
```

Total Su NDIM = 0
METRIC = 2

	Total Su
Inputs	
1. INITIAL SURFACE LOAD.....	143.
2. TOTAL SURFACE BUILDUP.....	81730.
3. INITIAL CATCHBASIN LOAD.....	0.
4. TOTAL CATCHBASIN LOAD.....	0.
5. TOTAL CATCHBASIN AND SURFACE BUILDUP (2+4).....	81730.
Remaining Loads	
6. LOAD REMAINING ON SURFACE...	83.
7. REMAINING IN CATCHBASINS....	0.
8. REMAINING IN CHANNEL/PIPES..	0.
Removals	
9. STREET SWEEPING REMOVAL.....	10070.
10. NET SURFACE BUILDUP (2-9)...	71660.
11. SURFACE WASHOFF.....	71561.
12. CATCHBASIN WASHOFF.....	0.
13. TOTAL WASHOFF (11+12).....	71561.
14. LOAD FROM OTHER CONSTITUENTS	0.
15. PRECIPITATION LOAD.....	0.
15a.SUM SURFACE LOAD (13+14+15).	71561.
16. TOTAL GROUNDWATER LOAD.....	0.
16a.TOTAL I/I LOAD.....	0.
17. NET SUBCATCHMENT LOAD (15a-15b-15c-15d+16+16a)....	71561.
>>Removal in channel/pipes (17a, 17b):	
17a.REMOVE BY BMP FRACTION.....	0.
17b.REMOVE BY 1st ORDER DECAY...	0.
18. TOTAL LOAD TO INLETS.....	71562.
19. FLOW WT'D AVE.CONCENTRATION (INLET LOAD/TOTAL FLOW)..... mg/l	153.
Percentages	
20. STREET SWEEPING (9/2).....	12.
21. SURFACE WASHOFF (11/2).....	88.
22. NET SURFACE WASHOFF(11/10)..	100.
23. WASHOFF/SUBCAT LOAD(11/17)..	100.
24. SURFACE WASHOFF/INLET LOAD (11/18).....	100.
25. CATCHBASIN WASHOFF/ SUBCATCHMENT LOAD (12/17)...	0.
26. CATCHBASIN WASHOFF/ INLET LOAD (12/18).....	0.
27. OTHER CONSTITUENT LOAD/ SUBCATCHMENT LOAD (14/17)...	0.
28. INSOLUBLE FRACTION/ INLET LOAD (14/18).....	0.
29. PRECIPITATION/ SUBCATCHMENT LOAD (15/17)...	0.
30. PRECIPITATION/ INLET LOAD (15/18).....	0.
31. GROUNDWATER LOAD/ SUBCATCHMENT LOAD (16/17)...	0.
32. GROUNDWATER LOAD/ INLET LOAD (16/18).....	0.
32a.INFILTRATION/INFLOW LOAD/	

```
    SUBCATCHMENT LOAD (16a/17)..        0.
32b.INFILTRATION/INFLOW LOAD/
    INLET LOAD (16a/18).........        0.
32c.CH/PIPE BMP FRACTION REMOVAL/
    SUBCATCHMENT LOAD (17a/17)..        0.
32d.CH/PIPE 1st ORDER DECAY REMOVAL/
    SUBCATCHMENT LOAD (17b/17)..        0.
33. INLET LOAD SUMMATION ERROR
    (18+8+6a+17a+17b-17)/17.....        0.

CAUTION. Due to method of quality routing (Users Manual, Appendix IX)
quality routing through channel/pipes is sensitive to the time step.
Large "Inlet Load Summation Errors" may result.
These can be reduced by adjusting the time step(s).
Note: surface accumulation during dry time steps at end of simulation is
not included in totals.  Buildup is only performed at beginning of
wet steps or for street cleaning.


*********************************************************
*            TSS Particle Size Distribution             *
*********************************************************
   Diameter    %     Specific    Settling Velocity   Critical Peclet
     (um)             Gravity        (m/s)                Number


      20.    20.0      2.65         0.000267            0.070000
      60.    20.0      2.65         0.002319            0.210000
     150.    20.0      2.65         0.012234            0.525000
     400.    20.0      2.65         0.047806            1.400000
    2000.    20.0      2.65         0.180097            7.000000


*****************************************************
*                                                   *
*              Summary of TSS Removal               *
*                                                   *
*****************************************************

TSS Removal based on Lab Performance Curve

 Model      Low Q Treated  High Q Treated     Runoff Treated        TSS Removed
   #           (cms)          (cms)               (%)                 (%)

 HG 4          0.036          0.108              81.9                50.4
 HG 5          0.045          0.108              85.8                60.6
 HG 6          0.054          0.108              89.0                70.8
 Unavaila      0.064          0.108              91.8                81.8
 HG 8          0.075          0.108              94.4                84.7
 Unavaila      0.085          0.108              96.5                86.8
 HG 10         0.096          0.108              98.3                91.3
 HG 12         0.108          0.108              98.8                93.8


*****************************************************
*                                                   *
*  Summary of Annual Flow Treatmnet & TSS Removal   *
*                                                   *
*****************************************************


 HG 4
 Year       Flow Vol       Flow Treated     TSS IN     TSS Rem     TSS Out     Flow Treated  TSS Removal
              (m3)             (m3)           (kg)       (kg)        (kg)          (%)          (%)

 1971.        49047.          33322.        1427.       615.        759.          67.9         43.1
 1972.        62720.          48226.        1902.       924.        909.          76.9         48.6
 1973.        62413.          52762.        1961.       977.        984.          84.5         49.8
 1974.        63243.          56644.        2051.      1233.        795.          89.6         60.1
 1975.        53917.          42508.        1792.       833.        923.          78.8         46.5
 1976.        79942.          66318.        2338.      1200.       1107.          83.0         51.3
 1977.        85813.          64983.        2352.       909.       1416.          75.7         38.7
 1978.        69120.          52899.        2133.       907.       1225.          76.5         42.5
 1979.        81793.          65897.        2463.      1258.       1177.          80.6         51.1
 1980.        66197.          53762.        2211.      1105.       1094.          81.2         50.0
 1981.        91616.          75451.        2566.      1413.       1138.          82.4         55.1
 1982.        64707.          58230.        2011.      1121.        890.          90.0         55.8
 1983.        85157.          73285.        2622.      1361.       1241.          86.1         51.9
 1984.        68852.          53879.        2049.       937.       1111.          78.3         45.7
 1985.        59747.          51328.        1937.       992.        946.          85.9         51.2
 1986.        87242.          76958.        2712.      1490.       1222.          88.2         54.9
 1987.        90064.          72715.        2774.      1424.       1334.          80.7         51.3
 1988.        71768.          61017.        2268.      1276.        984.          85.0         56.3
 1989.        79233.          66557.        2274.      1315.        922.          84.0         57.8
 1990.        90206.          81316.        2809.      1693.       1116.          90.1         60.3
 1991.        84599.          71538.        2622.      1427.       1170.          84.6         54.4
 1992.       107817.          89220.        3171.      1564.       1598.          82.8         49.3
 1993.        73164.          65780.        2450.      1475.        974.          89.9         60.2
 1994.        77360.          57634.        2196.      1000.       1115.          74.5         45.5
 1995.        90489.          73527.        2615.      1249.       1366.          81.3         47.8
 1998.        23347.          18585.         872.       401.        470.          79.6         46.0
 1999.        57265.          46403.        1896.       891.       1003.          81.0         47.0
 2000.        66468.          48634.        1826.       669.       1149.          73.2         36.6
 2001.        52389.          47107.        1552.       928.        624.          89.9         59.8
 2002.        54619.          47238.        1801.       958.        843.          86.5         53.2
 2003.        62268.          49363.        1877.       870.       1007.          79.3         46.4
 2004.        74553.          57425.        2053.       905.       1148.          77.0         44.1
 2005.        53179.          35966.        1542.       517.        978.          67.6         33.5
```

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HG 5

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	49047.	35465.	1427.	747.	627.	72.3	52.3
1972.	62720.	50671.	1902.	1132.	701.	80.8	59.5
1973.	62413.	55089.	1961.	1172.	789.	88.3	59.8
1974.	63243.	58310.	2051.	1450.	578.	92.2	70.7
1975.	53917.	44757.	1792.	1014.	742.	83.0	56.6
1976.	79942.	69231.	2338.	1433.	874.	86.6	61.3
1977.	85813.	69097.	2352.	1128.	1197.	80.5	48.0
1978.	69120.	56436.	2133.	1119.	1014.	81.6	52.5
1979.	81793.	69206.	2463.	1488.	948.	84.6	60.4
1980.	66197.	56185.	2211.	1295.	904.	84.9	58.6
1981.	91616.	79112.	2566.	1697.	854.	86.4	66.1
1982.	64707.	60354.	2011.	1371.	640.	93.3	68.2
1983.	85157.	76417.	2622.	1656.	946.	89.7	63.2
1984.	68852.	57207.	2049.	1148.	900.	83.1	56.1
1985.	59747.	53762.	1937.	1212.	726.	90.0	62.6
1986.	87242.	80002.	2712.	1802.	910.	91.7	66.4
1987.	90064.	76089.	2774.	1666.	1091.	84.5	60.1
1988.	71768.	63425.	2268.	1517.	744.	88.4	66.9
1989.	79233.	68805.	2274.	1527.	711.	86.8	67.1
1990.	90206.	83568.	2809.	1963.	846.	92.6	69.9
1991.	84599.	74328.	2622.	1689.	908.	87.9	64.4
1992.	107817.	93364.	3171.	1864.	1298.	86.6	58.8
1993.	73164.	67887.	2450.	1757.	692.	92.8	71.7
1994.	77360.	61008.	2196.	1196.	919.	78.9	54.4
1995.	90489.	77327.	2615.	1490.	1125.	85.5	57.0
1998.	23347.	19643.	872.	484.	388.	84.1	55.5
1999.	57265.	48981.	1896.	1111.	783.	85.5	58.6
2000.	66468.	52404.	1826.	843.	974.	78.8	46.2
2001.	52389.	48821.	1552.	1089.	463.	93.2	70.2
2002.	54619.	49322.	1801.	1159.	641.	90.3	64.4
2003.	62268.	52311.	1877.	1046.	832.	84.0	55.7
2004.	74553.	61387.	2053.	1143.	910.	82.3	55.7
2005.	53179.	39062.	1542.	667.	829.	73.5	43.2

HG 6

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	49047.	37314.	1427.	905.	469.	76.1	63.5
1972.	62720.	52389.	1902.	1315.	518.	83.5	69.1
1973.	62413.	56965.	1961.	1387.	574.	91.3	70.7
1974.	63243.	59560.	2051.	1627.	400.	94.2	79.3
1975.	53917.	46524.	1792.	1204.	552.	86.3	67.2
1976.	79942.	71543.	2338.	1669.	638.	89.5	71.4
1977.	85813.	72542.	2352.	1429.	895.	84.5	60.8
1978.	69120.	59474.	2133.	1379.	753.	86.0	64.7
1979.	81793.	71864.	2463.	1731.	704.	87.9	70.3
1980.	66197.	58287.	2211.	1532.	667.	88.1	69.3
1981.	91616.	81917.	2566.	1930.	620.	89.4	75.2
1982.	64707.	61771.	2011.	1563.	448.	95.5	77.7
1983.	85157.	78669.	2622.	1912.	691.	92.4	72.9
1984.	68852.	59955.	2049.	1389.	660.	87.1	67.8
1985.	59747.	55551.	1937.	1416.	522.	93.0	73.1
1986.	87242.	82103.	2712.	2063.	649.	94.1	76.1
1987.	90064.	79000.	2774.	1956.	802.	87.7	70.5
1988.	71768.	65309.	2268.	1714.	547.	91.0	75.6
1989.	79233.	70528.	2274.	1712.	526.	89.0	75.3
1990.	90206.	85217.	2809.	2200.	609.	94.5	78.3
1991.	84599.	76569.	2622.	1923.	674.	90.5	73.3
1992.	107817.	96705.	3171.	2201.	961.	89.7	69.4
1993.	73164.	69418.	2450.	1947.	502.	94.9	79.5
1994.	77360.	63785.	2196.	1423.	692.	82.5	64.8
1995.	90489.	80348.	2615.	1766.	849.	88.8	67.5
1998.	23347.	20521.	872.	586.	286.	87.9	67.2
1999.	57265.	50903.	1896.	1310.	584.	88.9	69.1
2000.	66468.	55728.	1826.	1103.	715.	83.8	60.4
2001.	52389.	49882.	1552.	1221.	331.	95.2	78.7
2002.	54619.	50743.	1801.	1326.	474.	92.9	73.6
2003.	62268.	54761.	1877.	1272.	605.	87.9	67.8
2004.	74553.	64544.	2053.	1386.	667.	86.6	67.5
2005.	53179.	41744.	1542.	871.	624.	78.5	56.5

Unavailabl

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	49047.	39140.	1427.	1082.	292.	79.8	75.8
1972.	62720.	53896.	1902.	1511.	322.	85.9	79.4
1973.	62413.	58636.	1961.	1608.	353.	93.9	82.0
1974.	63243.	60567.	2051.	1762.	265.	95.8	85.9
1975.	53917.	48176.	1792.	1416.	340.	89.4	79.0
1976.	79942.	73592.	2338.	1901.	406.	92.1	81.3
1977.	85813.	75810.	2352.	1789.	536.	88.3	76.1
1978.	69120.	62314.	2133.	1685.	448.	90.2	79.0
1979.	81793.	74309.	2463.	2008.	428.	90.9	81.5
1980.	66197.	60334.	2211.	1801.	398.	91.1	81.5

1981.	91616.	84427.	2566.	2153.	397.	92.2	83.9
1982.	64707.	62834.	2011.	1713.	298.	97.1	85.2
1983.	85157.	80587.	2622.	2169.	433.	94.6	82.7
1984.	68852.	62470.	2049.	1643.	406.	90.7	80.2
1985.	59747.	56940.	1937.	1600.	338.	95.3	82.6
1986.	87242.	83770.	2712.	2289.	423.	96.0	84.4
1987.	90064.	81836.	2774.	2287.	471.	90.9	82.4
1988.	71768.	66975.	2268.	1924.	337.	93.3	84.8
1989.	79233.	72223.	2274.	1917.	320.	91.2	84.3
1990.	90206.	86725.	2809.	2425.	384.	96.1	86.3
1991.	84599.	78552.	2622.	2183.	414.	92.9	83.3
1992.	107817.	99740.	3171.	2588.	574.	92.5	81.6
1993.	73164.	70628.	2450.	2134.	316.	96.5	87.1
1994.	77360.	66388.	2196.	1697.	418.	85.8	77.3
1995.	90489.	83151.	2615.	2113.	502.	91.9	80.8
1998.	23347.	21344.	872.	703.	169.	91.4	80.6
1999.	57265.	52592.	1896.	1537.	358.	91.8	81.0
2000.	66468.	58799.	1826.	1376.	442.	88.5	75.3
2001.	52389.	50707.	1552.	1342.	210.	96.8	86.5
2002.	54619.	51912.	1801.	1515.	285.	95.0	84.2
2003.	62268.	57047.	1877.	1512.	366.	91.6	80.5
2004.	74553.	67432.	2053.	1638.	415.	90.4	79.8
2005.	53179.	44268.	1542.	1120.	375.	83.2	72.6

HG 8

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	49047.	40883.	1427.	1140.	234.	83.4	79.9
1972.	62720.	55313.	1902.	1565.	268.	88.2	82.2
1973.	62413.	60155.	1961.	1663.	299.	96.4	84.8
1974.	63243.	61360.	2051.	1821.	206.	97.0	88.8
1975.	53917.	49698.	1792.	1476.	280.	92.2	82.3
1976.	79942.	75490.	2338.	1982.	324.	94.4	84.8
1977.	85813.	78900.	2352.	1867.	458.	91.9	79.4
1978.	69120.	64919.	2133.	1741.	391.	93.9	81.6
1979.	81793.	76639.	2463.	2081.	355.	93.7	84.5
1980.	66197.	62245.	2211.	1861.	337.	94.0	84.2
1981.	91616.	86761.	2566.	2236.	314.	94.7	87.2
1982.	64707.	63625.	2011.	1774.	237.	98.3	88.2
1983.	85157.	82236.	2622.	2248.	354.	96.6	85.7
1984.	68852.	64873.	2049.	1702.	347.	94.2	83.1
1985.	59747.	58123.	1937.	1665.	272.	97.3	86.0
1986.	87242.	85119.	2712.	2373.	339.	97.6	87.5
1987.	90064.	84593.	2774.	2351.	407.	93.9	84.7
1988.	71768.	68434.	2268.	1989.	272.	95.4	87.7
1989.	79233.	73872.	2274.	1983.	254.	93.2	87.2
1990.	90206.	88086.	2809.	2496.	313.	97.6	88.9
1991.	84599.	80354.	2622.	2258.	339.	95.0	86.1
1992.	107817.	102526.	3171.	2680.	482.	95.1	84.5
1993.	73164.	71634.	2450.	2203.	247.	97.9	89.9
1994.	77360.	68856.	2196.	1763.	352.	89.0	80.3
1995.	90489.	85771.	2615.	2190.	425.	94.8	83.7
1998.	23347.	22098.	872.	726.	146.	94.7	83.3
1999.	57265.	54194.	1896.	1594.	301.	94.6	84.0
2000.	66468.	61432.	1826.	1445.	373.	92.4	79.1
2001.	52389.	51448.	1552.	1388.	164.	98.2	89.4
2002.	54619.	52986.	1801.	1564.	237.	97.0	86.9
2003.	62268.	59061.	1877.	1560.	318.	94.8	83.1
2004.	74553.	70019.	2053.	1706.	347.	93.9	83.1
2005.	53179.	46636.	1542.	1174.	321.	87.7	76.1

Unavailabl

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	49047.	42406.	1427.	1163.	211.	86.5	81.5
1972.	62720.	56469.	1902.	1608.	225.	90.0	84.5
1973.	62413.	61358.	1961.	1713.	248.	98.3	87.3
1974.	63243.	61972.	2051.	1864.	163.	98.0	90.9
1975.	53917.	51022.	1792.	1509.	247.	94.6	84.2
1976.	79942.	77073.	2338.	2039.	268.	96.4	87.2
1977.	85813.	81616.	2352.	1916.	409.	95.1	81.5
1978.	69120.	67097.	2133.	1790.	343.	97.1	83.9
1979.	81793.	78627.	2463.	2119.	316.	96.1	86.0
1980.	66197.	63892.	2211.	1903.	296.	96.5	86.1
1981.	91616.	88779.	2566.	2294.	257.	96.9	89.4
1982.	64707.	64210.	2011.	1824.	187.	99.2	90.7
1983.	85157.	83521.	2622.	2308.	294.	98.1	88.0
1984.	68852.	66886.	2049.	1751.	298.	97.1	85.5
1985.	59747.	59085.	1937.	1709.	228.	98.9	88.2
1986.	87242.	86133.	2712.	2437.	275.	98.7	89.9
1987.	90064.	86968.	2774.	2403.	355.	96.6	86.6
1988.	71768.	69665.	2268.	2028.	233.	97.1	89.4
1989.	79233.	75374.	2274.	2017.	220.	95.1	88.7
1990.	90206.	89211.	2809.	2549.	260.	98.9	90.7
1991.	84599.	81935.	2622.	2303.	294.	96.9	87.8
1992.	107817.	104878.	3171.	2738.	424.	97.3	86.3
1993.	73164.	72455.	2450.	2239.	211.	99.0	91.4
1994.	77360.	70975.	2196.	1801.	314.	91.7	82.0
1995.	90489.	88067.	2615.	2231.	384.	97.3	85.3
1998.	23347.	22744.	872.	746.	126.	97.4	85.6
1999.	57265.	55582.	1896.	1626.	268.	97.1	85.7

2000.	66468.	63706.	1826.	1488.	330.	95.8	81.5
2001.	52389.	52028.	1552.	1420.	132.	99.3	91.5
2002.	54619.	53910.	1801.	1597.	204.	98.7	88.7
2003.	62268.	60699.	1877.	1604.	274.	97.5	85.4
2004.	74553.	72213.	2053.	1756.	297.	96.9	85.5
2005.	53179.	48693.	1542.	1204.	291.	91.6	78.1

HG 10

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	49047.	43838.	1427.	1226.	148.	89.4	85.9
1972.	62720.	57339.	1902.	1674.	159.	91.4	88.0
1973.	62413.	62289.	1961.	1813.	148.	99.8	92.4
1974.	63243.	62459.	2051.	1917.	110.	98.8	93.4
1975.	53917.	52092.	1792.	1603.	153.	96.6	89.5
1976.	79942.	78345.	2338.	2130.	177.	98.0	91.1
1977.	85813.	83832.	2352.	2070.	255.	97.7	88.0
1978.	69120.	68773.	2133.	1922.	210.	99.5	90.1
1979.	81793.	80247.	2463.	2227.	208.	98.1	90.4
1980.	66197.	65306.	2211.	2019.	179.	98.7	91.3
1981.	91616.	90444.	2566.	2382.	168.	98.7	92.8
1982.	64707.	64622.	2011.	1886.	124.	99.9	93.8
1983.	85157.	84533.	2622.	2401.	201.	99.3	91.6
1984.	68852.	68502.	2049.	1864.	184.	99.5	91.0
1985.	59747.	59689.	1937.	1799.	138.	99.9	92.9
1986.	87242.	86953.	2712.	2528.	184.	99.7	93.2
1987.	90064.	88902.	2774.	2538.	220.	98.7	91.5
1988.	71768.	70677.	2268.	2111.	149.	98.5	93.1
1989.	79233.	76833.	2274.	2090.	148.	97.0	91.9
1990.	90206.	90050.	2809.	2660.	149.	99.8	94.7
1991.	84599.	83251.	2622.	2417.	180.	98.4	92.2
1992.	107817.	106883.	3171.	2886.	276.	99.1	91.0
1993.	73164.	73081.	2450.	2316.	133.	99.9	94.6
1994.	77360.	72897.	2196.	1895.	220.	94.2	86.3
1995.	90489.	89996.	2615.	2378.	237.	99.5	90.9
1998.	23347.	23261.	872.	796.	76.	99.6	91.2
1999.	57265.	56797.	1896.	1726.	168.	99.2	91.0
2000.	66468.	65634.	1826.	1594.	223.	98.7	87.3
2001.	52389.	52389.	1552.	1475.	77.	100.0	95.0
2002.	54619.	54554.	1801.	1679.	122.	99.9	93.2
2003.	62268.	62014.	1877.	1703.	174.	99.6	90.7
2004.	74553.	74053.	2053.	1864.	189.	99.3	90.8
2005.	53179.	50564.	1542.	1303.	192.	95.1	84.5

HG 12

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	49047.	44560.	1427.	1275.	99.	90.9	89.4
1972.	62720.	57650.	1902.	1736.	97.	91.9	91.3
1973.	62413.	62413.	1961.	1847.	114.	100.0	94.2
1974.	63243.	62626.	2051.	1961.	67.	99.0	95.6
1975.	53917.	52383.	1792.	1651.	105.	97.2	92.1
1976.	79942.	78813.	2338.	2190.	117.	98.6	93.7
1977.	85813.	84446.	2352.	2139.	185.	98.4	91.0
1978.	69120.	69120.	2133.	1970.	162.	100.0	92.4
1979.	81793.	80794.	2463.	2294.	142.	98.8	93.1
1980.	66197.	65647.	2211.	2062.	136.	99.2	93.3
1981.	91616.	90914.	2566.	2447.	103.	99.2	95.4
1982.	64707.	64707.	2011.	1942.	69.	100.0	96.6
1983.	85157.	84811.	2622.	2474.	128.	99.6	94.4
1984.	68852.	68852.	2049.	1915.	134.	100.0	93.5
1985.	59747.	59747.	1937.	1844.	94.	100.0	95.2
1986.	87242.	87241.	2712.	2606.	106.	100.0	96.1
1987.	90064.	89515.	2774.	2596.	162.	99.4	93.6
1988.	71768.	71009.	2268.	2158.	103.	98.9	95.2
1989.	79233.	77538.	2274.	2154.	83.	97.9	94.7
1990.	90206.	90203.	2809.	2711.	98.	100.0	96.5
1991.	84599.	83520.	2622.	2470.	127.	98.7	94.2
1992.	107817.	107524.	3171.	2971.	191.	99.7	93.7
1993.	73164.	73164.	2450.	2361.	89.	100.0	96.4
1994.	77360.	73752.	2196.	1971.	143.	95.3	89.8
1995.	90486.	90476.	2615.	2446.	169.	100.0	93.5
1998.	23347.	23347.	872.	813.	59.	100.0	93.2
1999.	57265.	57151.	1896.	1782.	112.	99.8	94.0
2000.	66468.	66245.	1826.	1654.	164.	99.7	90.6
2001.	52389.	52389.	1552.	1500.	52.	100.0	96.6
2002.	54619.	54619.	1801.	1718.	83.	100.0	95.4
2003.	62268.	62268.	1877.	1746.	131.	100.0	93.0
2004.	74553.	74549.	2053.	1923.	130.	100.0	93.7
2005.	53179.	51231.	1542.	1358.	137.	96.3	88.1

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**************************************************
*  Summary of Quantity and Quality Results at    *
*  Location        200  INFlow in cms.            *
*  Values are instantaneous at indicated time step *
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UPPER CANADA CONSULTANTS
ENGINEERS / PLANNERS

Shayne Ave - Beam
Town of Fort Erie

Date Mo/Da/Year	Time Hr:Min	Flow cum/s	Total Su mg/l
Flow wtd means.....		0.007	152.
Flow wtd std devs..		0.017	92.
Maximum value.....		1.746	19338.
Minimum value.....		0.000	0.
Total loads.....		468031. Cub-Met	71123. KILOGRAM

===> Runoff simulation ended normally.

===> SWMM 4.4 simulation ended normally.
Always check output file for possible warning messages.

```
**********************************************************
*       SWMM 4.4    Simulation Date and Time Summary  *
**********************************************************
* Starting Date... December   16, 2021                *
*          Time...          16: 1: 4.515               *
*   Ending Date... December   16, 2021                *
*          Time...          16: 1: 7.380               *
*  Elapsed Time...                0.048 minutes.       *
*  Elapsed Time...                2.865 seconds.       *
**********************************************************
```