

Appendix I

Site Wide Water Balance

Site Information Sheet

Project Number: 2448-6683
 Project Name: Alloa Lands
 Municipality: Town of Caledon
 Designer: CM
 Reviewer: EF

Total Site Area (ha): 725

Pre-Development

Landuse	Woodland, Soil Group C	Woodland, Soil Group D	Woodland, Soil Unevaluated	Agricultural, Soil Group C	Agricultural, Soil Group D	Agricultural, Soil Unevaluated	Rural, Soil Group C	Rural, Soil Group D	Rural, Soil Unevaluated
Total Area	200000	350000	70000	4600000	1300000	100000	430000	180000	20000
Pervious Area	200000	350000	70000	4600000	1300000	100000	193500	81000	9000
Impervious Area	0	0	0	0	0	0	236500	99000	11000
Calculated Percent Imperviousness (%)	0%	0%	0%	0%	0%	0%	55%	55%	55%

Post-Development

Landuse	Neighbourhood Area, Soil Group C	Neighbourhood Area, Soil Group D	Mixed Use, Soil Group C	Mixed Use, Soil Group D	Industrial, Soil Group C	Industrial, Soil Group D	NHS, Soil Group C	NHS, Soil Group D
Area	3564282.14	745717.86	287483.74	2516.26	748045.01	191954.99	1000047.12	709952.88
Pervious Area	1247498.749	261001.251	14374.187	125.813	37402.2505	9597.7495	1000047.12	709952.88
Impervious Area	2316783.391	484716.609	273109.553	2390.447	710642.7595	182357.2405	0	0
Calculated Percent Imperviousness (%)	65%	65%	95%	95%	95%	95%	0%	0%

Notes Entry

Site Plan Reference | Alloa Secondary Plan: Land Use Area
 Consultant | Town of Caledon
 Date of Plan | Jun-24



Water Balance Parameters
Thornthwaite & Mather Method

Project Name: Alloa Lands
Project Number: 2448-6683
Created By: CM
Checked By: EF
Date: 2024-06-25

Project Name: **Alloa Lands**
Location: **Town of Caledon**

Climate Station: *GEORGETOWN WWTP
Longitude: 79°52'45.018" W
Latitude: 43°38'24.018" N
Elevation: 221.0 m
Station ID: 6152695

LATITUDE **DEGREES**
43

Month	Mean Temperature (C°) ¹	Heat Index [i = (t/5) ^{1.514}]	α	Potential Evapotranspiration (PET) (mm)	Correction Factor ²	Adjusted Potential Evapotranspiration (APET) (mm)	Total Precipitation (P) (mm) ¹	P - APET (mm)	APET - P (mm)
January	-6.3	0.0000	0.4924	0.0000	0.81	0	67.8	67.8	0.0
February	-5.2	0.0000	0.4924	0.0000	0.82	0	60	60.0	0.0
March	-0.9	0.0000	0.4924	0.0000	1.02	0	57.2	57.2	0.0
April	6	1.3179	0.5159	28.0446	1.12	31	76.5	45.1	0.0
May	12.3	3.9073	0.5613	59.9704	1.26	76	79.3	3.7	0.0
June	17.4	6.6062	0.6076	86.5845	1.28	111	74.8	0.0	36.0
July	20	8.1568	0.6338	100.3408	1.29	129	73.5	0.0	55.9
August	19	7.5473	0.6235	95.0367	1.2	114	79.3	0.0	34.7
September	14.8	5.1705	0.5831	72.9489	1.04	76	86.2	10.3	0.0
October	8.4	2.1934	0.5313	40.0470	0.95	38	68.3	30.3	0.0
November	2.8	0.4157	0.4998	12.5138	0.81	10	88.5	78.4	0.0
December	-2.9	0.0000	0.4924	0.0000	0.77	0	65.9	65.9	0.0
TOTAL	7.1	35.3	1.1			585.3	877.3	418.68	126.71

TOTAL WATER DEFICIT = 126.71 mm
TOTAL WATER SURPLUS (SURPLUS - DEFICIT) = 291.97 mm

NOTES: 1. Precipitation and Temperature data from the *GEORGETOWN WWTP (Station No.6152695) Environment Canada Station Data
2. Latitude adjustment factors determined based on site latitude assuming 12 hours of sunlight per day for 30 days

Rural, Soil Group C													
Evapotranspiration/Evaporation Analysis													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Precipitation (P)	68	60	57	77	79	75	74	79	86	68	89	66	877
Adjusted Potential Evapotranspiration (APET)	0	0	0	31	76	111	129	114	76	38	10	0	585
P-APET	68	60	57	45	4	-36	-56	-35	10	30	78	66	292
Change in Storage	0	0	0	0	0	-36	-56	-35	10	30	78	8	127
Storage (S) (mm)	125	125	125	125	125	89	33	-2	9	39	117	125	
Pervious Area Infiltration/Runoff Analysis													
Water Surplus (mm)	68	60	57	45	4	0	0	0	0	0	0	58	292
Potential Infiltration (I) (mm)	37	33	31	25	2	0	0	0	0	0	0	32	161
Potential Direct Surface Water Runoff (R) (mm)	31	27	26	20	2	0	0	0	0	0	0	26	131
Impervious Area Evapotranspiration/Evaporation/Runoff Analysis													
Impervious Evapotranspiration/Evaporation (mm)	0	0	0	11	12	11	11	12	13	10	13	0	94
Impervious Runoff (mm)	68	60	57	65	67	64	62	67	73	58	75	66	783
Combined Water Balance													
Pervious ET (m ³)	0	0	0	6078	14621	21445	25047	22068	14680	7362	1961	0	113262
Impervious ET (m ³)	0	0	0	2714	2813	2654	2607	2813	3058	2423	3140	0	22222
Pervious Runoff (m ³)	5904	5225	4981	3926	325	0	0	0	0	0	0	5063	25423
Impervious Runoff (m ³)	16035	14190	13528	15378	15941	15037	14775	15941	17328	13730	17791	15585	185260
Pervious Infiltration (m ³)	7216	6386	6088	4799	398	0	0	0	0	0	0	6188	31073
Impervious Infiltration (m ³)	0	0	0	0	0	0	0	0	0	0	0	0	0

Rural, Soil Group D													
Evapotranspiration/Evaporation Analysis													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Precipitation (P)	68	60	57	77	79	75	74	79	86	68	89	66	877
Adjusted Potential Evapotranspiration (APET)	0	0	0	31	76	111	129	114	76	38	10	0	585
P-APET	68	60	57	45	4	-36	-56	-35	10	30	78	66	292
Change in Storage	0	0	0	0	0	-36	-56	-35	10	30	78	8	127
Storage (S) (mm)	100	100	100	100	100	64	8	-27	-16	14	92	100	
Pervious Area Infiltration/Runoff Analysis													
Water Surplus (mm)	68	60	57	45	4	0	0	0	0	0	0	58	292
Potential Infiltration (I) (mm)	34	30	29	23	2	0	0	0	0	0	0	29	146
Potential Direct Surface Water Runoff (R) (mm)	34	30	29	23	2	0	0	0	0	0	0	29	146
Impervious Area Evapotranspiration/Evaporation/Runoff Analysis													
Impervious Evapotranspiration/Evaporation (mm)	0	0	0	11	12	11	11	12	13	10	13	0	94
Impervious Runoff (mm)	68	60	57	65	67	64	62	67	73	58	75	66	783
Combined Water Balance													
Pervious ET (m ³)	0	0	0	2544	6121	8977	10485	9238	6145	3082	821	0	47412
Impervious ET (m ³)	0	0	0	1136	1178	1111	1091	1178	1280	1014	1314	0	9302
Pervious Runoff (m ³)	2746	2430	2317	1826	151	0	0	0	0	0	0	2355	11825
Impervious Runoff (m ³)	6712	5940	5663	6437	6673	6294	6185	6673	7254	5747	7447	6524	77551
Pervious Infiltration (m ³)	2746	2430	2317	1826	151	0	0	0	0	0	0	2355	11825
Impervious Infiltration (m ³)	0	0	0	0	0	0	0	0	0	0	0	0	0

Rural, Soil Unevaluated													
Evapotranspiration/Evaporation Analysis													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Precipitation (P)	68	60	57	77	79	75	74	79	86	68	89	66	877
Adjusted Potential Evapotranspiration (APET)	0	0	0	31	76	111	129	114	76	38	10	0	585
P-APET	68	60	57	45	4	-36	-56	-35	10	30	78	66	292
Change in Storage	0	0	0	0	0	-36	-56	-35	10	30	78	8	127
Storage (S) (mm)	125	125	125	125	125	89	33	-2	9	39	117	125	
Pervious Area Infiltration/Runoff Analysis													
Water Surplus (mm)	68	60	57	45	4	0	0	0	0	0	0	58	292
Potential Infiltration (I) (mm)	37	33	31	25	2	0	0	0	0	0	0	32	161
Potential Direct Surface Water Runoff (R) (mm)	31	27	26	20	2	0	0	0	0	0	0	26	131
Impervious Area Evapotranspiration/Evaporation/Runoff Analysis													
Impervious Evapotranspiration/Evaporation (mm)	0	0	0	11	12	11	11	12	13	10	13	0	94
Impervious Runoff (mm)	68	60	57	65	67	64	62	67	73	58	75	66	783
Combined Water Balance													
Pervious ET (m ³)	0	0	0	283	680	997	1165	1026	683	342	91	0	5268
Impervious ET (m ³)	0	0	0	126	131	123	121	131	142	113	146	0	1034
Pervious Runoff (m ³)	275	243	232	183	15	0	0	0	0	0	0	235	1182
Impervious Runoff (m ³)	746	660	629	715	741	699	687	741	806	639	827	725	8617
Pervious Infiltration (m ³)	336	297	283	223	18	0	0	0	0	0	0	288	1445
Impervious Infiltration (m ³)	0	0	0	0	0	0	0	0	0	0	0	0	0

Pre-Development Water Balance Summary			
Pre-Development Infiltration	1098930.6	m ³ /yr	151.6 mm/yr
Pre-Development Runoff	101783.6	m ³ /yr	140.4 mm/yr

- NOTES: 1. Areas and percent imperviousness determined using Aloa Secondary Plan: Land Use Area dated June 2024 prepared by Town of Caledon.
2. The infiltration factor is determined using the MECF Methodology outlined in Stormwater Drainage Manual 2003.
3. Additional assumptions:
> Surplus water is unavailable for runoff and recharge in months where water losses from AET exceed precipitation inputs.
> Runoff, infiltration and evapotranspiration do not occur when average temperature is below zero.
> Precipitation during winter months (Dec. through Mar.) is assumed to be accumulated as snow.
> Soil Moisture Capacity is at a maximum in April.

Post-Development Water Balance Summary						
Post-Development Infiltration	437950.16	m ³ /yr	60.4	mm/yr	0.0019	L/s
Post-Development Runoff	3109839.8	m ³ /yr	428.9	mm/yr	0.0136	L/s

- NOTES: 1.Areas and percent imperviousness determined using Alcoa Secondary Plan: Land Use Area dated 45444 prepared by Town of Caledon.
2.The infiltration factor is determined using the MECF Methodology outlined in SWM 2003 Manual.
3. Additional assumptions:
> Surplus water is unavailable for runoff and recharge in months where water losses from AET exceed precipitation inputs.
> Runoff, infiltration and evapotranspiration do not occur when average temperature is below zero.
> Precipitation during winter months (Dec. through Mar. is assumed to be accumulated as snow.
> Soil Moisture Capacity is at a maximum in April.



Water Balance Summary

Thornthwaite & Mather Method

Project Name: Alloa Lands
Project Number: 2448-6683
Created By: CM
Checked By: EF
Date: 2024-06-25

Project Name: **Alloa Lands**
Location: **Town of Caledon**

Characteristic	Pre-Development	Post-Development	% Change (Pre to Post)
Precipitation (mm/yr)	877.30	877.30	0%
Water Surplus (mm/yr)	291.97	291.97	0%
Evapotranspiration (mm/yr)	585.33	585.33	0%
Natural Infiltration (mm/yr)	151.58	60.41	-60%
Total Infiltration (mm/yr)	151.58	60.41	-60%
Total Runoff (mm/yr)	140.39	428.95	206%

Infiltration Deficit (mm/yr)	91.17
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Adjustment Factors Based on Site Latitude Based on 12 hours of Sunlight per day for 30 days

Latitude °C	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
50	0.74	0.78	1.02	1.15	1.33	1.36	1.37	1.25	1.06	0.92	0.76	0.70
49	0.75	0.79	1.02	1.14	1.32	1.34	1.35	1.24	1.05	0.93	0.76	0.71
48	0.76	0.80	1.02	1.14	1.31	1.33	1.34	1.23	1.05	0.93	0.77	0.72
47	0.77	0.80	1.02	1.14	1.30	1.32	1.33	1.22	1.04	0.93	0.78	0.73
46	0.79	0.81	1.02	1.13	1.29	1.31	1.32	1.22	1.04	0.94	0.79	0.74
45	0.80	0.81	1.02	1.13	1.28	1.29	1.31	1.21	1.04	0.94	0.79	0.75
44	0.81	0.82	1.02	1.13	1.27	1.29	1.30	1.20	1.04	0.95	0.80	0.76
43	0.81	0.82	1.02	1.12	1.26	1.28	1.29	1.20	1.04	0.95	0.81	0.77
42	0.82	0.83	1.03	1.12	1.26	1.27	1.28	1.19	1.04	0.95	0.82	0.79
41	0.83	0.83	1.03	1.11	1.25	1.26	1.27	1.19	1.04	0.96	0.82	0.80
40	0.84	0.83	1.03	1.11	1.24	1.25	1.27	1.18	1.04	0.96	0.83	0.81
39	0.85	0.84	1.03	1.11	1.23	1.24	1.26	1.18	1.04	0.96	0.84	0.82
38	0.85	0.84	1.03	1.10	1.23	1.24	1.25	1.17	1.04	0.96	0.84	0.83
37	0.86	0.84	1.03	1.10	1.22	1.23	1.25	1.17	1.03	0.97	0.85	0.83
36	0.87	0.85	1.03	1.10	1.21	1.22	1.24	1.16	1.03	0.97	0.86	0.84
35	0.87	0.85	1.03	1.09	1.21	1.21	1.23	1.16	1.03	0.97	0.86	0.85
34	0.88	0.85	1.03	1.09	1.20	1.20	1.22	1.16	1.03	0.97	0.87	0.86
33	0.88	0.86	1.03	1.09	1.19	1.20	1.22	1.15	1.03	0.97	0.88	0.86
32	0.89	0.86	1.03	1.08	1.19	1.19	1.21	1.15	1.03	0.98	0.88	0.87
31	0.90	0.87	1.03	1.08	1.18	1.18	1.20	1.14	1.03	0.98	0.89	0.88
30	0.90	0.87	1.03	1.08	1.18	1.17	1.20	1.14	1.03	0.98	0.89	0.88
29	0.91	0.87	1.03	1.07	1.17	1.16	1.19	1.13	1.03	0.98	0.90	0.89
28	0.91	0.88	1.03	1.07	1.16	1.16	1.18	1.13	1.02	0.98	0.90	0.90
27	0.92	0.88	1.03	1.07	1.16	1.15	1.18	1.13	1.02	0.99	0.90	0.90
26	0.92	0.88	1.03	1.06	1.15	1.15	1.17	1.12	1.02	0.99	0.91	0.91
25	0.93	0.89	1.03	1.06	1.15	1.14	1.17	1.12	1.02	0.99	0.91	0.91
20	0.95	0.90	1.03	1.05	1.13	1.11	1.14	1.11	1.02	1.00	0.93	0.94
15	0.97	0.91	1.03	1.04	1.11	1.08	1.12	1.08	1.02	1.01	0.95	0.97
10	1.00	0.91	1.03	1.03	1.08	1.06	1.08	1.07	1.02	1.02	0.98	0.99
5	1.02	0.93	1.03	1.02	1.06	1.03	1.06	1.05	1.01	1.03	0.99	1.02
0	1.04	0.94	1.04	1.01	1.04	1.01	1.04	1.04	1.01	1.04	1.01	1.04
-5	1.06	0.91	1.04	1.00	1.02	0.99	1.02	1.03	1.00	1.05	1.03	1.06
-10	1.08	0.97	1.05	0.99	1.01	0.96	1.00	1.01	1.00	1.06	1.05	1.10
-15	1.12	0.98	1.05	0.98	0.98	0.94	0.97	1.00	1.00	1.07	1.07	1.12
-20	1.14	1.00	1.05	0.97	0.96	0.91	0.95	0.99	1.00	1.08	1.09	1.15
-25	1.17	1.01	1.05	0.96	0.94	0.88	0.93	0.98	1.00	1.10	1.11	1.18
-30	1.20	1.03	1.06	0.95	0.92	0.85	0.90	0.96	1.00	1.12	1.14	1.21
-35	1.23	1.04	1.06	0.94	0.89	0.82	0.87	0.94	1.00	1.13	1.17	1.25
-45	1.27	1.06	1.07	0.93	0.86	0.78	0.84	0.92	1.00	1.15	1.20	1.29
-42	1.28	1.07	1.07	0.92	0.85	0.76	0.82	0.92	1.00	1.16	1.22	1.31
-44	1.30	1.08	1.07	0.92	0.83	0.74	0.81	0.91	0.99	1.17	1.23	1.33
-46	1.32	1.10	1.07	0.91	0.82	0.72	0.79	0.90	0.99	1.17	1.25	1.35
-48	1.34	1.11	1.08	0.90	0.80	0.70	0.76	0.89	0.99	1.18	1.27	1.37
-50	1.37	1.12	1.08	0.89	0.77	0.67	0.74	0.88	0.99	1.19	1.29	1.41

Source: Dunne, T. and Leopold, L.B., 1978. Water in environmental planning, Freeman Publishers.