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January 19, 2026

D.G. Biddle & Associates Ltd.
200-481 Taunton Road West
Oshawa, Ontario
L1J 0G3

Attention: David McNaull, P.Eng. Senior Project Engineer, Associate

**Re: Response to D.G. Biddle & Associates Ltd. Comment Matrix
Township of Scugog – File: S-S-2021-01 & Z/01/2021
O'Connor Bros. Corp Proposed Residential Subdivision
1370 King Street, Manchester, Part Lot 13, Concession 4, Geographic Township of
Reach, Township of Scugog, Regional Municipality of Durham, Ontario**

1.0 INTRODUCTION

Grace & Associates Inc. (GAI) was retained by O'Connor Bros. Corp. (hereinafter referred to as O'Connor) proponent of the proposed development to prepare a response to the D.G. Biddle & Associates Ltd. Comment Matrix, Township of Scugog – File: S-S-2021-01 & Z/01/2021, dated November 13, 2025 (Biddle Comment Matrix).

Review of the *Proposed Draft Plan Part of Lot 13, Conc 4, Formerly in the Township of Reach, Now in the Township of Scugog, Regional Municipality of Durham*, dated July 15, 2025 provided by D.G. Biddle & Associates Ltd. (hereinafter referred to as Biddle), identifies the creation of a six (6) lot residential subdivision with lots ranging in size from 0.40 to 0.95 hectares (0.99 to 2.35 acres).

Our report *Hydrogeological Assessment Residential Subdivision – O'Connor Bros. Corp. - 1370 King Street, Manchester, Part Lot 13, Concession 4, Geographic Township of Reach, Township of Scugog, Ontario Region of Durham. Reference No.: R15-635*, dated December 30, 2020 (updated February 24, 2021) was based on private servicing for a nine (9) lot residential development.

The following sections present our response to the Biddle Comment Matrix, recognizing the proposed residential development of six (6) new lots in comparison to our Hydrogeological report assessment of nine (9) proposed lots.

Comment 3.02

Additional details on the nitrate calculations were provided in the February 2021 report. These calculations show that under natural conditions the projected concentration of nitrate at the property boundary would be 13.29 mg/L which does not comply with Procedure D-5-4. The report notes that enhanced infiltration from individual lot infiltration trenches and infiltration trenches in boulevard areas will be employed to enhance infiltration. The use of enhanced infiltration to augment the onsite infiltration rates is anticipated to reduce nitrates to 9.6 mg/L at the downgradient property boundary. The calculations demonstrate that 9.6 mg/L is not achievable without enhanced infiltration. It is therefore important that imported fill in the area of infiltration facilities not reduce the rate of infiltration over the current levels. Infiltration trenches should be located so as not to cause mounding around foundations.

In response to the 2025 Proposed Draft Plan, a new nitrate loading impact assessment was conducted for the proposed six (6) lot residential development. According to MECP Procedure D-5-4 (1996), a risk assessment is required to assess the impact of individual on-site systems to concentrations of nitrate-nitrogen in groundwater. The Predictive Assessment method was completed using a Mass Balance Equation to calculate nitrogen attenuation for the proposed development using the following inputs, as summarized in Table 1.

- The proposed 2.973 hectares hectare development involves the creation of a six (6) lot residential subdivision, with lots ranging in size from 0.40 to 0.95 hectares, which are significantly larger than the existing residential lots within the hamlet of Manchester;
- Climatic station Burketon McLaughlin reported an average 30-year precipitation normal of about 921 mm/yr;
- Calculated annual water surplus of about 336 mm/yr based on annual potential evapotranspiration of about 584 mm/yr;
- The water surplus is divided between run-off and infiltration, and the amount of infiltration is estimated by multiplying the water surplus by an infiltration factor of 0.8 (values of 0.3, 0.4 and 0.1) for topography, soil type and cover);
- The background nitrate concentration is projected to be 0.5 mg/L, based on declining concentrations as determined from monitoring data from 2015 to 2020; and,
- Nitrate concentrations reported in the test wells were reported to range from 1.93 mg/L (TW-1) and <0.05 mg/L (TW-2 and TW-3) for an average of 0.55 mg/L (added to the nitrate loading).

TABLE 1
NITRATE IMPACT ASSESSMENT- CONVENTIONAL APPROACH

Input	Value	Source
WATER SURPLUS		
S1:Average Total Annual Precipitation (mm/yr)	920.6	Station: Burketon McLaughlin Environment Canada 1981 to 2010 Canadian Climate Normals
S2:Average Annual Potential Evapotranspiration (mm/yr)	584.2	Converted units from inches (23") Atlas of Canada (1974)
S3: Water Surplus (mm/yr)	336.4	Calculation: S3 = S1 - S2
S: Water Surplus (mm/day)	0.92	Converted units from S3
INFILTRATION FACTOR		
Topography (flat)	0.3	Table 2 :Infiltration Factors MOEE Hydrogeological Technical Information Requirements for Land Development Applications (1995)
Soil (open sandy loam)	0.4	
Cover (cultivated land)	0.1	
AVAILABLE DILUTION		
A: Site Area (m²)	29730	2019 Lot Grading Plan Coe Fisher Cameron, OLS
S: Water Surplus (m/day)	0.00092	Converted units from S3 (above)
I: Infiltration Factor	0.8	Calculated Total of all factors (above)
Qi: Available Dilution (m³/day)	21.92	Calculation: Qti = A x S x I
NITRATE ASSESSMENT		
Qe1: Number of Lots	6	Proposed Draft Plan Part of Lot 13, Conc 4, Formerly in the Township of Reach, Now in the Township of Scugog, Regional Municipality of Durham, dated July 15, 2025
Qe2: Sewage Effluent Input Rate (m³/lot/day)	1	According to Procedure D-5-4 (1,000 L/lot/day)
Qe: Volume of Sewage Effluent (m³/day)	6	Calculation: Qe1 x Qe2
Ce: Concentration Nitrate in Effluent (g/lot/day)	40	According to Procedure D-5-4
Ci: Concentration of Nitrate in supply water (mg/L)	0.55	Mean [NO₃] from testing of TW-1, Tw-2 & TW-3
Qt: Concentration of Nitrate at property boundary (mg/L)	8.72	Calculation: Qt = (Qe x Ce) ÷ (Qti + Qe)
Ctb:Background Nitrate Input (mg/L)	0.5	Groundwater monitoring values projected
CT: Total Attenuated Concentration of Nitrate at property boundary (mg/L)	9.22	Calculation: CT = Qt + Ctb

As indicated in Table 1, there is sufficient dilution available onsite under natural conditions to achieve compliance with Procedure D-5-4's 10 mg/L nitrate limit.

Comment 3.08

6. Burnside recommends that infiltration trenches should be located so as to not cause groundwater mounding beneath houses. The project hydrogeologist should advise the proponent on the required separation distances between the infiltration facility and each house.

Response from Biddle Civil: All infiltration galleries/LID's are located a minimum 5m away from proposed foundation layout/basements.

Infiltration trenches were originally proposed as a means of increasing the available dilution for nitrate attenuation for the proposed nine (9) lots. Since only natural attenuation is approved by the Region of Durham Health Department, infiltration trenches are not required for this purpose. However, if the infiltration trenches are proposed, GAI concurs with Biddle Civil that all infiltration galleries/LIDS be located a minimum of 5 metres away from the proposed foundation layout/basements to prevent the potential of groundwater mounding beneath the dwellings.

Comment 4.01

The Health Department has reviewed the updated hydrogeological study provided by the applicant and the peer review provided by R.J. Burnside and Associates dated January 23, 2023 and we are unable to support the proposal as described. The nitrate concentration identified at the property boundary was 13.29 mg/L under natural conditions which does not comply with the Ministry of the Environment, Conservation and Parks' Procedure D 5-4 and the Durham Region's Lot Sizing Policy.

The Health Department review comment was based on the former nine (9) lot development and is no longer applicable. The concentrations of nitrate-nitrogen in groundwater does not exceed 10 mg/L (as prescribed in the Ministry of Environment Conservation and Parks (MECP) Procedure D-5-4 *Individual On-Site Sewage Systems: Water Quality Impact Risk Assessment*) at the downgradient property boundary of the proposed six (6) lot development.

Comment 4.02

The applicant has proposed utilizing enhanced surface water infiltration trenches located on individual proposed lots and infiltration trenches on the boulevard as a solution. This solution is not supported by the Health Department for the following reasons:

- 1. We require that the predicted nitrate concentrations are based on natural conditions.*
- 2. The houses in this proposed subdivision and the houses surrounding it are serviced by private water wells. There is a risk to human health when elevated nitrate concentrations are present in a potable drinking water source.*

The Regional Municipality of Durham Health Department review comment was based on the former nine (9) lot development and is no longer applicable. The predicted nitrate concentration for the proposed six (6) lot development is based on natural conditions.

Comment 5.03

Please add the summary of all calculations in a table, including:

- a) Step-by-step calculations of the pre-development water budget*
- b) Step-by-step calculations of the post-development water budget without mitigation measures*
- c) Step-by-step calculations of the post development water budget with mitigation measures; with a separate table showing calculations of the LID impact.*

This should include calculations for evapotranspiration, surplus, runoff, and infiltration quantities under pre-development, post-development, and post-development with mitigation conditions.

The water budget completed by Grace & Associates Inc./Dobri Engineering Ltd. has been updated to reflect the new proposed six (6) lot development plans prepared by Biddle (Refer to Appendix C - Water Budget).

Comment 5.04

The Brief states that the Hydrogeological studies (by Grace & Associates Inc.) had estimated the yearly infiltration on the development site in 240 mm (pg.2). I do not see this exact number stated at the Hydrogeological studies. Please clarify.

Please provide more detailed explanation as to how a yearly infiltration of 269mm, the design infiltration rate of 400mm, and target rainfall infiltration volume of 421m³ were determined. These numbers were not found in the hydrogeological study.

The SWM report presents the calculated annual infiltration of 269 mm/year. The 2021 report value of 240 mm/year was a spreadsheet input value error. The value of 400 mm/year represents a design infiltration rate applied in the calculations of enhanced infiltration (from impermeable surfaces) of Low Impact Design (LID) features for stormwater management and to support Grace & Associates Inc. Mass Balance Nitrate Calculation - Enhanced Infiltration Approach. This is no longer required for the proposed six (6) lot development.

The climatic station Burketon McLaughlin reported an average 30-year precipitation normal of about 921 mm/yr with a calculated annual water surplus of about 336 mm/yr based on annual potential evapotranspiration of about 584 mm/yr. The water surplus is divided between run-off and infiltration, and the amount of infiltration is estimated by multiplying the water surplus by an infiltration factor of 0.8 (values of 0.3, 0.4 and 0.1) for topography, soil type and cover), resulting in an estimated annual infiltration of 269 mm/yr.

Comment 5.05

Please develop/submit a phosphorus budget using the Nottawasaga Valley Conservation Authority (NVCA)'s Managing New Urban Development in Phosphorus Sensitive Watersheds P tool. Please provide detailed Phosphorus Removal calculations in detailed design to show that the proposed development

achieves a net zero in phosphorus loadings from pre-development to post-development.

The Phosphorus budget will be completed by Biddle as part of their stormwater management report for the proposed six (6) lot development.

Comment 5.12

Please provide the Port Perry annual rainfall data referenced in the report.

The Port Perry annual rainfall data referenced in the stormwater management brief is presented in the MMAH Supplementary Standard SB-1, “*Climatic and Seismic Data*”, as stipulated in the Ontario Building Code (OBC). The Port Perry data is presented in Attachment A.

Comment 5.12

Please provide a copy of the climatic data for Burketon McLaughlin Station in the Appendices as mentioned in the body of the report.

The Environment and Climate Change Canada Canadian Climate Normals 1981-2010 for Burketon McLaughlin Station is presented in Attachment B.

Comment 5.21

Please provide detailed Water Balance calculations. Please present calculations for evapotranspiration, surplus, runoff, and infiltration quantities under pre-development, post development, and post-development with mitigation conditions. We recommend using the Thornthwaite and Mather’s methodology.

The LID strategy is to infiltrate runoff via sand bars. Each 6 lots has 2 sandbars – 12 total.

The combined infiltration from all 12 lots is 2,670m² – this area is from rooftops and driveways within the subject site boundary – 45mm x 2,670m² = 120m³ minimum runoff to be infiltrated from hardscapes. This info is shown on Figure 3.

The water budget completed by Grace & Associates Inc./Dobri Engineering Ltd. has been updated to reflect the new proposed six (6) lot development plans prepared by Biddle (Refer to Attachment C - Water Balance Calculations).

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Should you have any questions regarding this letter-response, or require any additional information, please do not hesitate to contact the undersigned.

Respectfully Submitted,
GRACE & ASSOCIATES INC.

Thomas P. Grace



Thomas P. Grace C.E.T., B.Sc., P.Geo.
Environmental Geologist
Principal

Attachment: A: MMAH Supplementary Standard SB-1, "Climatic and Seismic Data" - Port Perry
 B: Canada Canadian Climate Normals 1981-2010 - Burketon McLaughlin Station
 C: Water Balance Calculations

Peer Review Response Distribution: 1 digital copy D.G. Biddle & Associates Ltd.
 1 digital copy O'Connor Bros. Corp.
 1 file copy Grace & Associates Inc.

ATTACHMENT A

MMAH SUPPLEMENTARY STANDARD SB-1
"CLIMATIC AND SEISMIC DATA" - PORT PERRY

Table 1.2 (Cont'd)
Design Data for Selected Locations in Ontario

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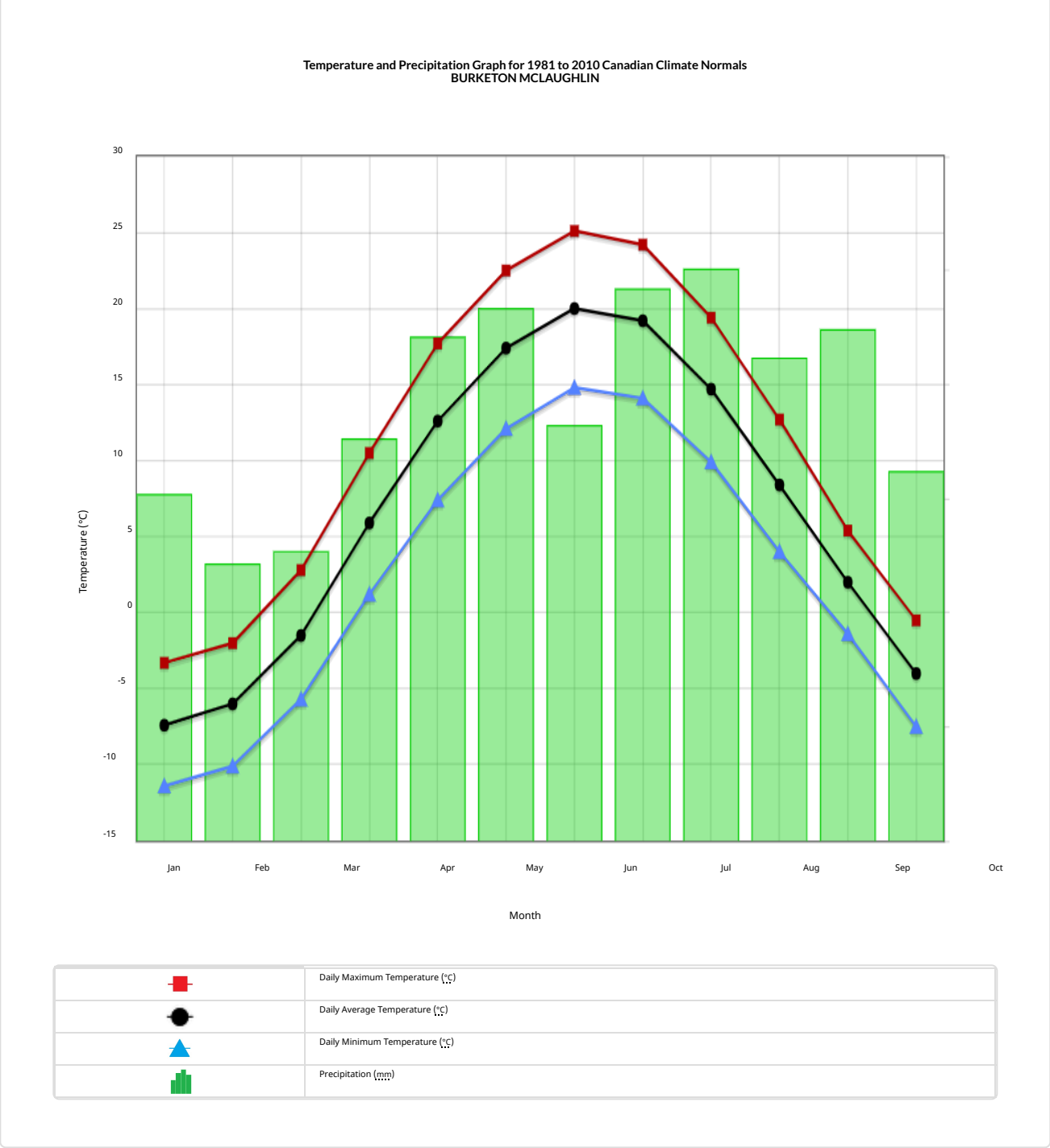
Location	Elevation, m	Design Temperature				Degree Days Below 18°C	15 Min Rainfall, mm	One Day Rainfall, 1/50, mm	Annual Rainfall, mm	Annual Total Precipitation, mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/50		Hourly Wind Pressures, kPa		Seismic Data				
		January		July 2.5%										1/10	1/50	S _a (0.2)	S _a (0.5)	S _a (1.0)	S _a (2.0)	PGA
		2.5%, °C	1%, °C	Dry, °C	Wet, °C															
		S _s	S _t																	
Point Alexander	150	-29	-32	30	22	4960	23	92	650	850	100	2.5	0.4	0.27	0.35	0.630	0.300	0.130	0.043	0.320
Port Burwell	195	-15	-17	30	24	3800	25	92	930	1000	180	1.2	0.4	0.36	0.47	0.170	0.099	0.058	0.018	0.092
Port Colborne	180	-15	-17	30	24	3600	23	108	850	1000	160	2.3	0.4	0.36	0.46	0.330	0.180	0.066	0.022	0.190
Port Elgin	205	-17	-19	28	22	4100	25	92	790	850	180	2.8	0.4	0.43	0.55	0.110	0.078	0.051	0.017	0.036
Port Hope	100	-21	-23	29	23	3970	23	94	760	825	180	1.2	0.4	0.37	0.48	0.210	0.130	0.077	0.024	0.094
Port Perry	270	-22	-24	30	23	4260	25	97	720	850	140	2.4	0.4	0.34	0.44	0.170	0.120	0.070	0.023	0.053
Port Stanley	180	-15	-17	31	24	3850	25	92	940	975	180	1.2	0.4	0.36	0.47	0.170	0.099	0.055	0.017	0.090
Prescott	90	-23	-25	29	23	4120	25	103	770	975	180	2.2	0.4	0.34	0.44	0.420	0.240	0.120	0.038	0.018
Princeton	280	-18	-20	30	23	4000	25	97	810	925	160	1.5	0.4	0.33	0.42	0.160	0.100	0.059	0.018	0.082
Raith	475	-34	-37	28	22	5900	23	97	570	750	120	2.7	0.4	0.23	0.30	0.095	0.057	0.026	0.008	0.036
Rayside-Balfour (Chelmsford)	270	-28	-30	29	21	5200	25	92	650	850	180	2.5	0.4	0.35	0.45	0.140	0.097	0.057	0.020	0.045
Red Lake	360	-35	-37	28	21	6220	20	92	470	630	120	2.4	0.3	0.23	0.30	0.095	0.057	0.026	0.008	0.036
Renfrew	115	-27	-30	30	23	4900	23	97	620	810	140	2.5	0.4	0.27	0.35	0.580	0.290	0.130	0.043	0.300
Richmond Hill	230	-21	-23	31	24	4000	25	97	740	850	140	1.5	0.4	0.34	0.44	0.180	0.110	0.065	0.021	0.063
Rockland	50	-26	-28	30	23	4600	23	92	780	950	160	2.4	0.4	0.31	0.40	0.600	0.300	0.140	0.045	0.310
Sarnia	190	-16	-18	31	24	3750	25	100	750	825	180	1.1	0.4	0.36	0.47	0.120	0.073	0.048	0.015	0.037
Sault Ste. Marie	190	-25	-28	29	22	4960	23	97	660	950	200	3.1	0.4	0.34	0.44	0.095	0.057	0.032	0.012	0.036
Schreiber	310	-34	-36	27	21	5960	20	103	600	850	160	3.3	0.4	0.30	0.39	0.095	0.057	0.026	0.008	0.036
Seaforth	310	-17	-19	30	23	4100	25	108	810	1025	160	2.5	0.4	0.37	0.48	0.120	0.080	0.051	0.017	0.040
Shelburne	495	-22	-24	29	23	4700	28	108	740	900	150	3.1	0.4	0.31	0.40	0.140	0.094	0.059	0.020	0.046
Simcoe	210	-17	-19	30	24	3700	28	113	860	950	160	1.3	0.4	0.35	0.45	0.180	0.100	0.060	0.018	0.093
Sioux Lookout	375	-34	-36	28	22	5950	25	97	520	710	100	2.4	0.3	0.23	0.30	0.095	0.057	0.026	0.008	0.036
Smiths Falls	130	-25	-27	30	23	4540	25	92	730	850	140	2.3	0.4	0.32	0.41	0.390	0.220	0.120	0.037	0.170
Smithville	185	-16	-18	30	23	3650	23	108	800	900	160	1.5	0.4	0.33	0.42	0.340	0.180	0.068	0.022	0.200
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

ATTACHMENT B

CANADIAN CLIMATE NORMALS 1981-2010-
BURKETON MCLAUGHLIN STATION

Canadian Climate Normals 1981-2010 Station Data

▼ Temperature and Precipitation Graph



▼ Normals Data

The minimum number of years used to calculate these Normals is indicated by a code for each element. A "+" beside an extreme date indicates that this date is the first occurrence of the extreme value. Values and dates in bold indicate all-time extremes for the location.

Data used in the calculation of these Normals may be subject to further quality assurance checks. This may result in minor changes to some values presented here.

BURKETON MCLAUGHLIN
ONTARIO

Latitude:	44°02'00.000" N	Longitude:	78°48'00.000" W	Elevation:	312.40 m
Climate ID:	6151042	WMO ID:		TC ID:	

▼ Temperature

Temperature														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
Daily Average (°C)	-7.4	-6.0	-1.5	5.9	12.6	17.4	20.0	19.2	14.7	8.4	2.0	-4.0	6.8	Ⓒ
Standard Deviation	3.1	2.4	1.9	1.6	2.0	1.3	1.2	1.2	1.3	1.3	1.6	3.0	2.2	Ⓒ
Daily Maximum (°C)	-3.3	-2.0	2.8	10.5	17.7	22.5	25.1	24.2	19.4	12.7	5.4	-0.5	11.2	Ⓒ
Daily Minimum (°C)	-11.4	-10.1	-5.7	1.2	7.4	12.1	14.8	14.1	9.9	4.0	-1.4	-7.5	2.3	Ⓒ
Extreme Maximum (°C)	12.0	11.0	23.5	29.5	31.0	34.5	34.5	36.0	33.0	27.2	21.1	17.5		
Date (yyyy/dd)	1995/ 14	2000/ 26	1998/ 30	1990/ 25	1988/ 30	1995/ 19	1988/ 07	2001/ 08	1983/ 10	1971/ 02	1974/ 01	1982/ 03		
Extreme Minimum (°C)	-34.5	-30.0	-25.0	-17.8	-3.5	0.5	4.5	2.8	-2.5	-8.0	-17.0	-31.0		
Date (yyyy/dd)	1981/ 04	1976/ 02	1980/ 02	1972/ 07	1997/ 08	1980/ 09	2001/ 02	1971/ 24	1989/ 27	1992/ 20	1989/ 29	1980/ 25		

▼ Precipitation

Precipitation														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
Rainfall (mm)	23.1	21.5	30.6	65.7	88.3	93.3	72.8	96.7	100.2	83.7	78.4	33.6	787.9	Ⓒ
Snowfall (cm)	37.7	27.1	20.1	4.7	0.0	0.0	0.0	0.0	0.0	0.9	11.2	31.1	132.7	Ⓒ
Precipitation (mm)	60.7	48.5	50.7	70.4	88.3	93.3	72.8	96.7	100.2	84.6	89.6	64.7	920.6	Ⓒ
Average Snow Depth (cm)	0	0	0	0	0	0	0	0	0	0	0	0	0	
Median Snow Depth (cm)	0	0	0	0	0	0	0	0	0	0	0	0	0	
Snow Depth at Month-end (cm)	0	0	0	0	0	0	0	0	0	0	0	0	0	
Extreme Daily Rainfall (mm)	37.6	46.0	42.2	35.6	40.4	81.5	65.8	72.6	62.6	52.8	69.2	41.8		
Date (yyyy/dd)	1993/ 04	1985/ 23	1976/ 31	1992/ 16	2001/ 22	1971/ 27	1980/ 20	1996/ 07	1986/ 10	1995/ 05	1985/ 03	1998/ 06		
Extreme Daily Snowfall (cm)	24.8	45.7	21.4	12.0	1.3	0.0	0.0	0.0	0.0	13.7	17.8	25.4		
Date (yyyy/dd)	1995/ 06	1972/ 03	2002/ 26	1995/ 04	1974/ 06	1969/ 06	1969/ 01	1969/ 01	1969/ 01	1969/ 21	1969/ 30	1992/ 10		
Extreme Daily Precipitation (mm)	37.6	46.0	42.2	35.6	40.4	81.5	65.8	72.6	62.6	52.8	69.2	41.8		
Date (yyyy/dd)	1993/ 04	1985/ 23	1976/ 31	1992/ 16	2001/ 22	1971/ 27	1980/ 20	1996/ 07	1986/ 10	1995/ 05	1985/ 03	1998/ 06		
Extreme Snow Depth (cm)	0	0	0	0	0	0	0	0	0	1	3	0		
Date (yyyy/dd)		1981/ 25		1991/ 30	1983/ 01	1983/ 01	1983/ 01	1983/ 01	1983/ 01	1981/ 22	1995/ 08	1996/ 01		

▼ Days with Maximum Temperature

Days with Maximum Temperature														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
<= 0 °C	22.0	17.3	10.5	0.86	0.0	0.0	0.0	0.0	0.0	0.10	4.4	16.0	71.1	Ⓒ
> 0 °C	9.0	11.0	20.5	29.1	31.0	30.0	31.0	31.0	30.0	30.9	25.6	15.0	294.1	Ⓒ
> 10 °C	0.05	0.05	3.6	15.2	29.4	29.9	31.0	31.0	29.4	21.2	5.5	0.81	197.1	Ⓒ
> 20 °C	0.0	0.0	0.27	1.6	9.5	20.9	29.1	27.8	12.6	1.6	0.0	0.0	103.3	Ⓒ

Days with Maximum Temperature														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
> 30 °C	0.0	0.0	0.0	0.0	0.05	0.67	1.8	1.1	0.14	0.0	0.0	0.0	3.7	Ⓒ
> 35 °C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.05	0.0	0.0	0.0	0.0	0.05	Ⓒ

▼ Days with Minimum Temperature

Days with Minimum Temperature														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
> 0 °C	1.1	1.6	4.1	16.4	29.7	30.0	31.0	31.0	29.6	24.5	10.6	2.5	212.1	Ⓒ
<= 2 °C	30.6	27.6	28.9	18.0	4.3	0.0	0.0	0.0	1.7	12.0	23.9	30.1	177.0	Ⓒ
<= 0 °C	29.9	26.7	26.9	13.6	1.3	0.0	0.0	0.0	0.43	6.5	19.4	28.5	153.1	Ⓒ
< -2 °C	27.6	23.4	20.9	6.4	0.14	0.0	0.0	0.0	0.05	1.6	11.4	23.7	115.2	Ⓒ
< -10 °C	16.3	13.8	7.0	0.24	0.0	0.0	0.0	0.0	0.0	0.0	1.2	10.2	48.7	Ⓒ
< -20 °C	3.9	2.3	0.41	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	7.6	Ⓒ
< -30 °C	0.18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.18	Ⓒ

▼ Days with Rainfall

Days with Rainfall														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
>= 0.2 mm	3.8	3.7	5.4	10.8	12.8	12.3	11.2	11.9	12.6	13.5	10.4	5.6	113.8	Ⓒ
>= 5 mm	1.3	1.4	2.1	4.4	6.4	5.6	4.3	5.3	5.9	5.5	5.2	2.4	49.8	Ⓒ
>= 10 mm	0.67	0.71	1.1	2.2	3.3	3.0	2.4	3.2	3.3	3.0	2.7	1.2	26.8	Ⓒ
>= 25 mm	0.24	0.05	0.14	0.25	0.38	0.65	0.52	0.90	0.95	0.33	0.50	0.05	5.0	Ⓒ

▼ Days With Snowfall

Days With Snowfall														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
>= 0.2 cm	10.8	7.6	6.1	2.2	0.05	0.0	0.0	0.0	0.0	0.48	3.5	8.8	39.4	Ⓒ
>= 5 cm	2.6	1.9	1.3	0.25	0.0	0.0	0.0	0.0	0.0	0.05	0.90	1.8	8.8	Ⓒ
>= 10 cm	0.68	0.48	0.45	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.10	0.57	2.3	Ⓒ
>= 25 cm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.05	0.05	Ⓒ

▼ Days with Precipitation

Days with Precipitation														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
>= 0.2 mm	13.6	10.5	10.7	12.0	12.8	12.3	11.2	11.9	12.6	13.6	13.2	13.0	147.4	Ⓒ
>= 5 mm	4.0	3.4	3.4	4.8	6.4	5.6	4.3	5.3	5.9	5.5	6.2	4.3	59.1	Ⓒ
>= 10 mm	1.3	1.3	1.6	2.3	3.3	3.0	2.4	3.2	3.3	3.1	2.8	2.0	29.5	Ⓒ
>= 25 mm	0.24	0.05	0.14	0.30	0.38	0.65	0.52	0.90	0.95	0.33	0.50	0.10	5.1	Ⓒ

▼ Days with Snow Depth

Days with Snow Depth															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code	
>= 1 cm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
>= 5 cm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
>= 10 cm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
>= 20 cm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		

▼ Degree Days

Degree Days															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code	
Above 24 °C	0	0	0	0	0.1	0.9	4	2.6	0.1	0	0	0	7.7	D	
Above 18 °C	0	0	0	1	8.6	33.8	74.6	62.2	14.5	0.1	0	0	194.8	D	
Above 15 °C	0	0	0.1	2.9	27.9	87	155.8	138.1	45.4	2.6	0	0	459.9	D	
Above 10 °C	0	0	2.6	17.9	102.5	221.3	309.4	290.8	148	31.8	1.8	0.2	1126.3	D	
Above 5 °C	0.5	0.5	13.2	71.2	235.7	370.6	464.4	445.8	290.2	117.8	23.2	3.4	2036.5	D	
Above 0 °C	7.8	11	51.9	184	390	520.6	619.4	600.8	439.9	259.3	90.3	21.6	3196.6	D	
Below 0 °C	236.6	181.1	98	7.4	0	0	0	0	0	0.4	29.5	144.8	697.7	D	
Below 5 °C	384.2	311.7	214.2	44.6	0.7	0	0	0	0.3	13.9	112.4	281.6	1363.6	D	
Below 10 °C	538.8	452.3	358.6	141.3	22.5	0.7	0	0	8.1	82.9	241	433.4	2279.6	D	
Below 15 °C	693.8	593.5	511.2	276.3	102.9	16.4	1.4	2.3	55.5	208.7	389.2	588.2	3439.4	D	
Below 18 °C	786.8	678.1	604.1	364.4	176.6	53.2	13.2	19.4	114.6	299.2	479.2	681.2	4269.9	D	

▼ Bright Sunshine

Bright Sunshine															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code	
Total Hours	73.3	99.6	140.8	160.9	215.1	238.8	261.5	229.0	164.1	134.6	80.6	66.3	1864.4	D	
Days with measurable	18.2	19.9	23.9	24.0	27.4	27.6	29.7	28.6	25.4	25.6	19.7	17.9	287.7	D	
% of possible daylight hours	25.4	33.8	38.1	39.9	47.1	51.6	55.8	52.8	43.6	39.3	27.7	23.9	39.9	D	
Extreme Daily	8.9	10.2	11.5	13.4	14.6	15.0	15.0	14.0	12.3	10.3	9.7	8.5			
Date (yyyy/dd)	1991/ 28	1989/ 24	1997/ 31	1978/ 30	1971/ 30	1972/ 17	1971/ 03	1972/ 04	1969/ 03	1969/ 09	1981/ 03	1978/ 28			

▼ Frost-Free

1981 to 2010 Canadian Climate Normals station data

Frost-Free		
	Date/Days	Code
Average Date of Last Spring Frost	May 05	C
Average Date of First Fall Frost	Oct 08	C
Average Length of Frost-Free Period	155 Days	C

1981 to 2010 Canadian Climate Normals station data

Frost-Free							
Probability of last temperature in spring of 0 °C or lower on or after indicated dates	10%	25%	33%	50%	66%	75%	90%

Frost-Free							
Date	May 18	May 12	May 08	May 04	Apr 30	Apr 29	Apr 27
Probability of first temperature in fall of 0 °C or lower on or before indicated dates	10%	25%	33%	50%	66%	75%	90%
Date	Sep 23	Sep 30	Oct 03	Oct 07	Oct 10	Oct 15	Oct 23
Probability of frost-free period equal to or less than indicated period (Days)	10%	25%	33%	50%	66%	75%	90%
Days	134	142	146	157	161	165	170

Legend

- A = WMO "3 and 5 rule" (i.e. no more than 3 consecutive and no more than 5 total missing
- B = At least 25 years

- C = At least 20 years
- D = At least 15 years

for either temperature or precipitation)

▼ Station / Element Metadata

Statistics listed below are provided as a guide to determine the validity of Normals and Extremes calculations. For example, a station with 30 years of record between 1981 and 2010 with no missing years would be a more reliable normal than a station with 15 years of record and 2 missing years.

Less than 100% possible observations indicates that out of the total number of observations used, some records were missing.

BURKETON MCLAUGHLIN

Province/Territory	ON
Latitude (dd mm):	44 02 N
Country	CAN
Longitude (ddd mm):	78 48 W
Time Zone	EST
Latitude (decimal degrees):	44.03 N
Climate ID:	6151042
Longitude (decimal degrees):	78.8 W
WMO ID:	
Elevation (m):	312.4
TC ID:	

▼ Temperature

Temperature						
	Begin Year	End Year	Total Number of Years	Missing Years	Total Count of Observations	% of Possible Observations
Daily Average (°C)	1981	2002	22	0	7758	100
Standard Deviation	1981	2002	22	0	7758	100
Daily Maximum (°C)	1981	2002	22	0	7758	100
Daily Minimum (°C)	1981	2002	22	0	7760	100
Extreme Maximum (°C)	1969	2002			12042	99.9
Extreme Minimum (°C)	1969	2002			12043	99.9

▼ Precipitation

Precipitation						
	Begin Year	End Year	Total Number of Years	Missing Years	Total Count of Observations	% of Possible Observations
Rainfall (mm)	1981	2002	22	1	7610	98
Snowfall (cm)	1981	2002	22	1	7610	98
Precipitation (mm)	1981	2002	22	1	7610	98
Average Snow Depth (cm)	1983	2001	14	7	2565	78.1

Precipitation						
	Begin Year	End Year	Total Number of Years	Missing Years	Total Count of Observations	% of Possible Observations
Median Snow Depth (cm)	1983	2001	14	7	2565	78.1
Snow Depth at Month-end (cm)	1983	2001	14	6	95	92
Extreme Daily Rainfall (mm)	1969	2002			12038	99.9
Extreme Daily Snowfall (cm)	1969	2002			12047	100
Extreme Daily Precipitation (mm)	1969	2002			12035	99.8
Extreme Snow Depth (cm)	1981	2001			2742	70

► Days with Maximum Temperature

► Days with Minimum Temperature

► Days with Rainfall

► Days With Snowfall

► Days with Precipitation

► Days with Snow Depth

► Degree Days

► Bright Sunshine

► Frost-Free

Date modified:
2020-09-17

ATTACHMENT C

WATER BALANCE CALCULATIONS

**WATER BALANCE CALCULATIONS
O'CONNOR RESIDENTIAL SUBDIVISION
PART LOT 13, CONCESSION 4
GEOGRAPHIC TOWNSHIP OF REACH
TOWNSHIP OF SCUGOG
REGION OF DURHAM, ONTARIO**

Dobri Engineering Ltd.
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Port Hope, Ontario
L1A 3Z3
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E-mail dobrieng@bellnet.ca

JANUARY 13, 2026

WATER BALANCE CALCULATIONS

O'Connor Bros. Corp. is proposing to develop six (6) residential lots in Part Lot 13, Concession 4 in the Geographical Township of Reach, Township of Scugog (File No.'s S-S-2021-01 and Z/01/2021). The property is located at 1370 King Street in Manchester. The property comprises a total of 2.97 hectares.

D.G. Biddle & Associates has completed the Stormwater Management Report for the proposed development. Each of the lots have been designed with 'sand bars', which have been designed to capture 45mm rainfall from the impervious building and driveway areas.

The impervious areas (Building + Driveway) for each of the 6 lots are tabulated below.

Lot No.	Impervious Area (sq.m)
1	440
2	440
3	440
4	440
5	455
6	455
TOTAL	2,670

Approximately 10% of the site area will become an impervious surface.

Hydrogeological Study completed by Grace & Associates Inc.

The Hydrogeological Study estimated the percolation rate of the native soils at 25-35 min/cm. The soils infiltration rate is estimated at 20 mm/hr for design purposes.

The average yearly precipitation for Burketon McLaughlin Station is 921mm. The water surplus for the property was calculated at 336mm (runoff plus infiltration). The infiltration is multiplied by a factor of 0.8 for the existing conditions (269mm). The infiltration factors would be reduced to 0.3, 0.4, and 0.1 for topography, soil type and cover, respectively.

Government of Canada Climatic Data

A copy of the climatic data for Burketon McLaughlin Station is included in the Appendix. The annual rainfall for Burketon is 787.9mm. The rain will collect on surface, infiltrate, evaporate, and runoff.

The rainfall events are summarized in the following table.

MONTH	DAYS WITH RAINFALL			
	$\geq 0.2\text{mm}$	$\geq 5\text{mm}$	$\geq 10\text{mm}$	$\geq 25\text{mm}$
January	3.8	1.3	0.67	0.24
February	3.7	1.4	0.71	0.05
March	5.4	2.1	1.1	0.14
April	10.8	4.4	2.2	0.25
May	12.8	6.4	3.3	0.38
June	12.3	5.6	3	0.65
July	11.2	4.3	2.4	0.52
August	11.9	5.3	3.2	0.09
September	12.6	5.9	3.3	0.95
October	13.5	5.5	3	0.33
November	10.4	5.2	2.7	0.5
December	5.6	2.4	1.2	0.05
TOTAL	113.8	49.8	26.8	5

The total yearly rainfall for all rain events less than 25mm is tabulated below.

Rainfall	No. of Events	Avg. Rainfall (mm)	Rainfall (mm)
$\leq 0.2\text{mm}$			
$> 0.2\text{mm} \ \& \ \leq 5\text{mm}$	64	2.6	166.4
$> 5\text{mm} \ \& \ \leq 10\text{mm}$	23	7.5	172.5
$> 10\text{mm} \ \& \ \leq 25$	21.8	17.5	381.5
TOTAL RAINFALL			720.4

(Note: Number of rainfall events $> 0.2\text{mm} \ \& \ \leq 5\text{mm} = 113.8 - 49.8 = 64$)

The initial rainfall will collect on the surface. The SWM Report by D.G. Biddle uses an initial abstraction of 5mm in their analysis. Removing 5mm from the above table results in the following potential rainfall (infiltrate, evaporate, or runoff).

Rainfall	No. of Events	Avg. Rainfall (mm)	Rainfall (mm)
$\leq 0.2\text{mm}$			
$> 0.2\text{mm} \ \& \ \leq 5\text{mm}$	64	$2.6 - 5.0 = 0$	0
$> 5\text{mm} \ \& \ \leq 10\text{mm}$	23	$7.5 - 5.0 = 2.5$	57.5
$> 10\text{mm} \ \& \ \leq 25$	21.8	$17.5 - 5.0 = 12.5$	272.5
TOTAL RAINFALL			330.0

(Note: Runoff will only occur once the rainfall event exceeds 5mm. The 5 rainfall events greater than 25mm will add to the total infiltration.)

The proposed Sand Bars will capture all the rainfall of 330.0 mm of rainfall on the proposed impervious site area of 2,670 sq.m., or a potential 881.1 cu.m of stormwater runoff ($2,610 \times 330.0 = 881.1$).

Water Balance

The yearly infiltration is estimated at 269mm on the site, under existing site conditions. This equates to a yearly total volume of 7,989 cu.m over the entire 2.97 ha area for the existing conditions.

Once the site is developed, the remaining site pervious area of 27,030 sq.m will infiltrate 7,271cu.m of rainfall. Without any LID features, the infiltration volume will be reduced by 718 cu.m. The proposed sand bars will capture 881.1 cu.m of surface runoff from the impervious areas. Once the site is developed as noted, the total infiltration volume will be 8,152.1 cu.m.

Conclusions

The proposed O'Connor Bros. Corp. development will increase the total volume of infiltration on the site by 163.1 cu.m ($8,152.1 - 7,989 = 163.1$). A summary of the Stormwater Management Report prepared by D.G. Biddle & Associates is presented under separate cover.

Prepared by:

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APPENDIX

D.G. Biddle & Associates SWM Report Summary
Trademark Homes – 1310 King Street

The design completed by D.G. Biddle & Associates is based on constructing Sand Bars on each lot in order to capture 45mm of runoff from the total impervious surface areas (Building and Driveway).

VISUAL OTTHYMO 3.0 Computer Simulation

4-hr Chicago Storm

Area = 2.97 ha for Pre-Development

Area = 2.70 ha for Post-Development (Sand Bars capture 45mm runoff from all the impervious surfaces)

Ia = 5.00 mm (Initial Abstraction)

Table 2 – PRE vs POST Development Peak Flows

Storm Event (Year)	Pre-Development Peak Flow (cms)	Routed Post-Development Peak Flow (cms)
2	62	57
5	119	109
10	165	150
25	230	224
50	282	282
100	337	343

The Post-Development peak discharge for all storms up to and including the 25-yr storm event will be reduced by constructing the Sand Bars as noted. The Post-Development peak discharge will only exceed the peak Pre-Development discharge during the 100-yr storm event (or greater), by 1.8%, which is not significant.

Climate Normals 1981-2010 Station Data

Metadata including Station Name, Province, Latitude, Longitude, Elevation, Climate ID, WMO ID, TC ID

STATION_NAME	PROVINCE	LATITUDE	LONGITUDE	ELEVATION	CLIMATE_ID	WMO_ID	TC_ID
BURKETON MCLAUGHLIN	ON	44°02'00.000"	78°48'00.000"	312.4 m	6151042		

Legend

A = WMO "3 and 5 rule" (i.e. no more than 3 consecutive and no more than 5 total missing for either temperature or precipitation)

B = At least 25 years

C = At least 20 years

D = At least 15 years

1981 to 2010 Canadian Climate Normals station data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
Precipitation														
Rainfall (mm)	23.1	21.5	30.6	65.7	88.3	93.3	72.8	96.7	100.2	83.7	78.4	33.6	787.9	C
Precipitation (mm)	60.7	48.5	50.7	70.4	88.3	93.3	72.8	96.7	100.2	84.6	89.6	64.7	920.6	C
Days with Rainfall														
>= 0.2 mm	3.8	3.7	5.4	10.8	12.8	12.3	11.2	11.9	12.6	13.5	10.4	5.6	113.8	C
>= 5 mm	1.3	1.4	2.1	4.4	6.4	5.6	4.3	5.3	5.9	5.5	5.2	2.4	49.8	C
>= 10 mm	0.67	0.71	1.1	2.2	3.3	3	2.4	3.2	3.3	3	2.7	1.2	26.8	C
>= 25 mm	0.24	0.05	0.14	0.25	0.38	0.65	0.52	0.9	0.95	0.33	0.5	0.05	5	C
Days with Precipitation														
>= 0.2 mm	13.6	10.5	10.7	12	12.8	12.3	11.2	11.9	12.6	13.6	13.2	13	147.4	C
>= 5 mm	4	3.4	3.4	4.8	6.4	5.6	4.3	5.3	5.9	5.5	6.2	4.3	59.1	C
>= 10 mm	1.3	1.3	1.6	2.3	3.3	3	2.4	3.2	3.3	3.1	2.8	2	29.5	C
>= 25 mm	0.24	0.05	0.14	0.3	0.38	0.65	0.52	0.9	0.95	0.33	0.5	0.1	5.1	C