

1 in 100 Year + 40% Climate Change Surface Water Attenuation Calculations

25 Holmes Street, Rochdale

Mr John Najdad

30th November 2018

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 16 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	118.574	0.284	0.0	3.8	3.8	4.8	O K
30 min Summer	118.636	0.346	0.0	4.2	4.2	5.8	O K
60 min Summer	118.663	0.373	0.0	4.4	4.4	6.3	O K
120 min Summer	118.638	0.348	0.0	4.2	4.2	5.8	O K
180 min Summer	118.595	0.305	0.0	3.9	3.9	5.1	O K
240 min Summer	118.559	0.269	0.0	3.7	3.7	4.5	O K
360 min Summer	118.504	0.214	0.0	3.2	3.2	3.6	O K
480 min Summer	118.466	0.176	0.0	2.9	2.9	3.0	O K
600 min Summer	118.439	0.149	0.0	2.6	2.6	2.5	O K
720 min Summer	118.420	0.130	0.0	2.4	2.4	2.2	O K
960 min Summer	118.393	0.103	0.0	2.0	2.0	1.7	O K
1440 min Summer	118.369	0.079	0.0	1.6	1.6	1.3	O K
2160 min Summer	118.355	0.065	0.0	1.2	1.2	1.1	O K
2880 min Summer	118.347	0.057	0.0	1.0	1.0	1.0	O K
4320 min Summer	118.338	0.048	0.0	0.7	0.7	0.8	O K
5760 min Summer	118.332	0.042	0.0	0.6	0.6	0.7	O K
7200 min Summer	118.327	0.037	0.0	0.5	0.5	0.6	O K
8640 min Summer	118.324	0.034	0.0	0.4	0.4	0.6	O K
10080 min Summer	118.323	0.033	0.0	0.4	0.4	0.5	O K
15 min Winter	118.611	0.321	0.0	4.1	4.1	5.4	O K
30 min Winter	118.674	0.384	0.0	4.5	4.5	6.5	O K
60 min Winter	118.689	0.399	0.0	4.6	4.6	6.7	O K
120 min Winter	118.634	0.344	0.0	4.2	4.2	5.8	O K
180 min Winter	118.573	0.283	0.0	3.8	3.8	4.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	112.159	0.0	6.7	15
30 min Summer	79.359	0.0	9.5	23
60 min Summer	53.779	0.0	12.9	40
120 min Summer	35.037	0.0	16.8	74
180 min Summer	26.688	0.0	19.2	104
240 min Summer	21.882	0.0	21.0	136
360 min Summer	16.527	0.0	23.8	196
480 min Summer	13.512	0.0	25.9	256
600 min Summer	11.542	0.0	27.7	316
720 min Summer	10.140	0.0	29.2	376
960 min Summer	8.253	0.0	31.7	492
1440 min Summer	6.155	0.0	35.4	734
2160 min Summer	4.574	0.0	39.5	1100
2880 min Summer	3.702	0.0	42.6	1460
4320 min Summer	2.754	0.0	47.6	2160
5760 min Summer	2.235	0.0	51.5	2912
7200 min Summer	1.902	0.0	54.8	3592
8640 min Summer	1.669	0.0	57.7	4264
10080 min Summer	1.496	0.0	60.3	5064
15 min Winter	112.159	0.0	7.5	15
30 min Winter	79.359	0.0	10.7	25
60 min Winter	53.779	0.0	14.4	44
120 min Winter	35.037	0.0	18.8	78
180 min Winter	26.688	0.0	21.5	110

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
240 min Winter	118.524	0.234	0.0	3.4	3.4	3.9	O K
360 min Winter	118.461	0.171	0.0	2.8	2.8	2.9	O K
480 min Winter	118.423	0.133	0.0	2.4	2.4	2.2	O K
600 min Winter	118.399	0.109	0.0	2.1	2.1	1.8	O K
720 min Winter	118.382	0.092	0.0	1.9	1.9	1.6	O K
960 min Winter	118.368	0.078	0.0	1.5	1.5	1.3	O K
1440 min Winter	118.354	0.064	0.0	1.2	1.2	1.1	O K
2160 min Winter	118.344	0.054	0.0	0.9	0.9	0.9	O K
2880 min Winter	118.337	0.047	0.0	0.7	0.7	0.8	O K
4320 min Winter	118.328	0.038	0.0	0.5	0.5	0.6	O K
5760 min Winter	118.324	0.034	0.0	0.4	0.4	0.6	O K
7200 min Winter	118.322	0.032	0.0	0.4	0.4	0.5	O K
8640 min Winter	118.320	0.030	0.0	0.3	0.3	0.5	O K
10080 min Winter	118.319	0.029	0.0	0.3	0.3	0.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
240 min Winter	21.882	0.0	23.5	140
360 min Winter	16.527	0.0	26.6	200
480 min Winter	13.512	0.0	29.0	260
600 min Winter	11.542	0.0	31.0	318
720 min Winter	10.140	0.0	32.7	376
960 min Winter	8.253	0.0	35.5	492
1440 min Winter	6.155	0.0	39.7	734
2160 min Winter	4.574	0.0	44.3	1096
2880 min Winter	3.702	0.0	47.8	1440
4320 min Winter	2.754	0.0	53.3	2200
5760 min Winter	2.235	0.0	57.7	2848
7200 min Winter	1.902	0.0	61.3	3624
8640 min Winter	1.669	0.0	64.6	4304
10080 min Winter	1.496	0.0	67.6	5008

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.259	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.032

Time (mins) From:	To:	Area (ha)
0	5	0.032

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Model Details

Storage is Online Cover Level (m) 119.750

Cellular Storage Structure

Invert Level (m) 118.290 Safety Factor 1.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	17.7	17.7	0.400	17.7	46.0	0.401	0.0	46.0

Orifice Outflow Control

Diameter (m) 0.060 Discharge Coefficient 0.600 Invert Level (m) 118.290

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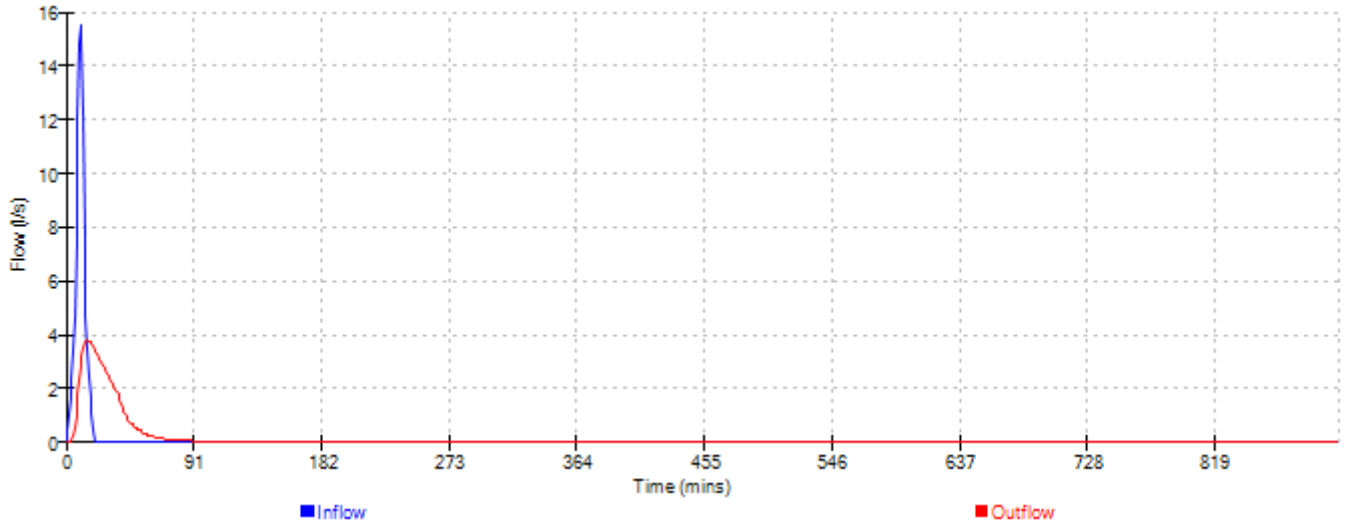
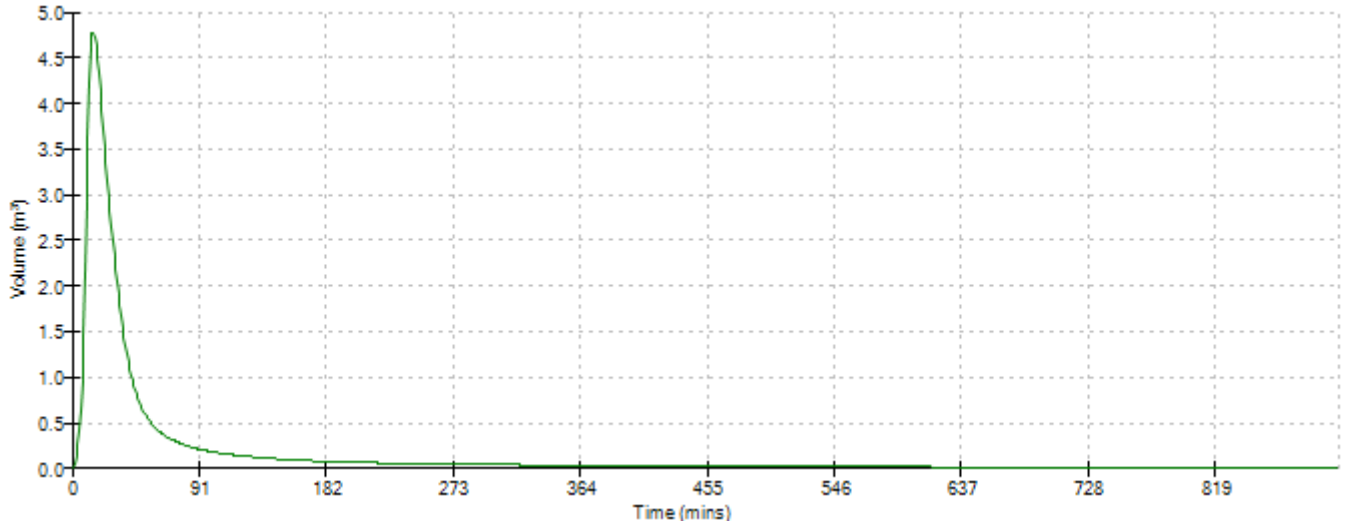
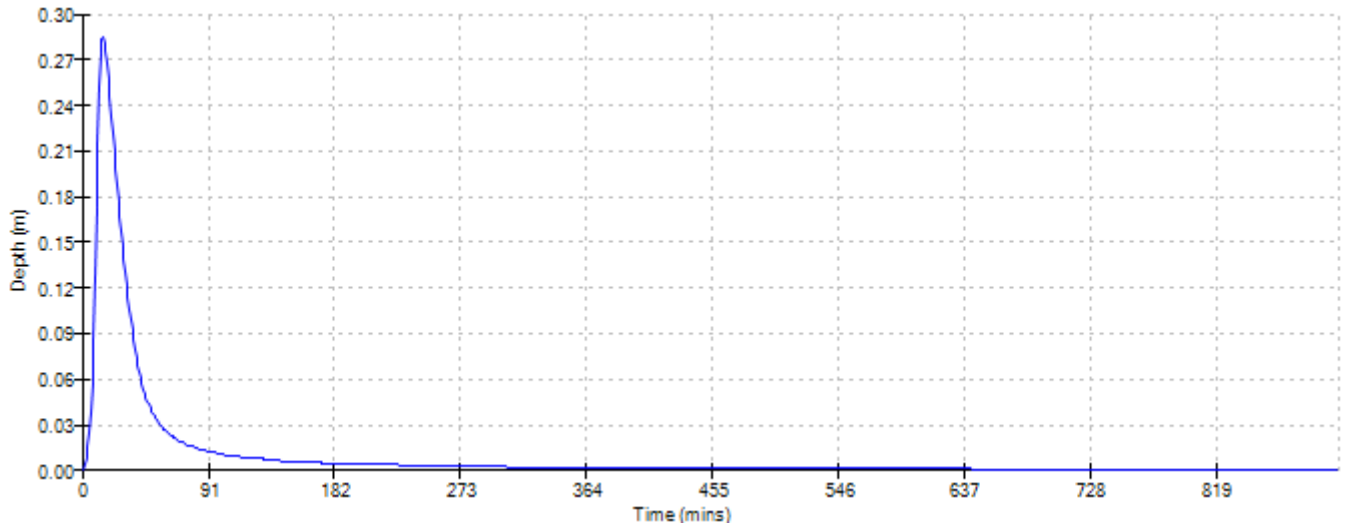
Event: 15 min Summer







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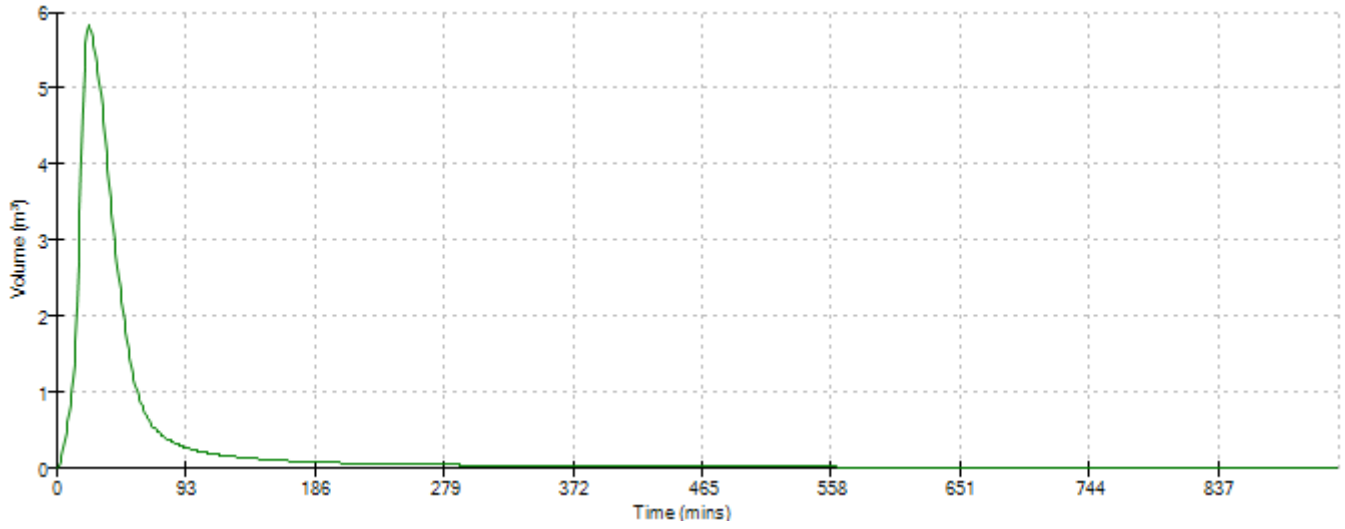
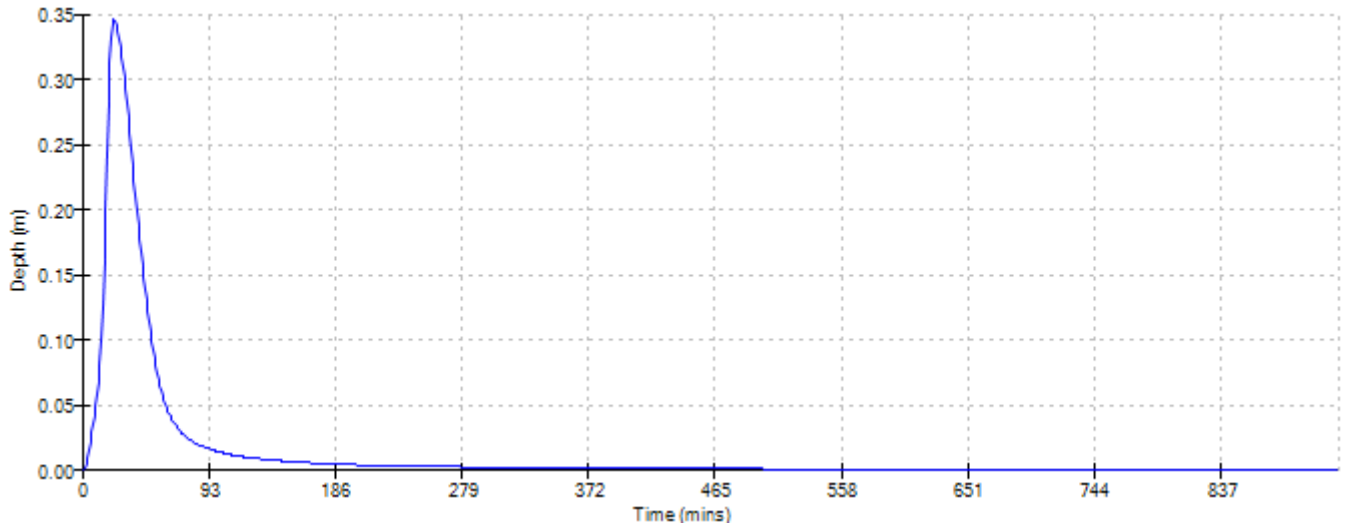
Event: 30 min Summer







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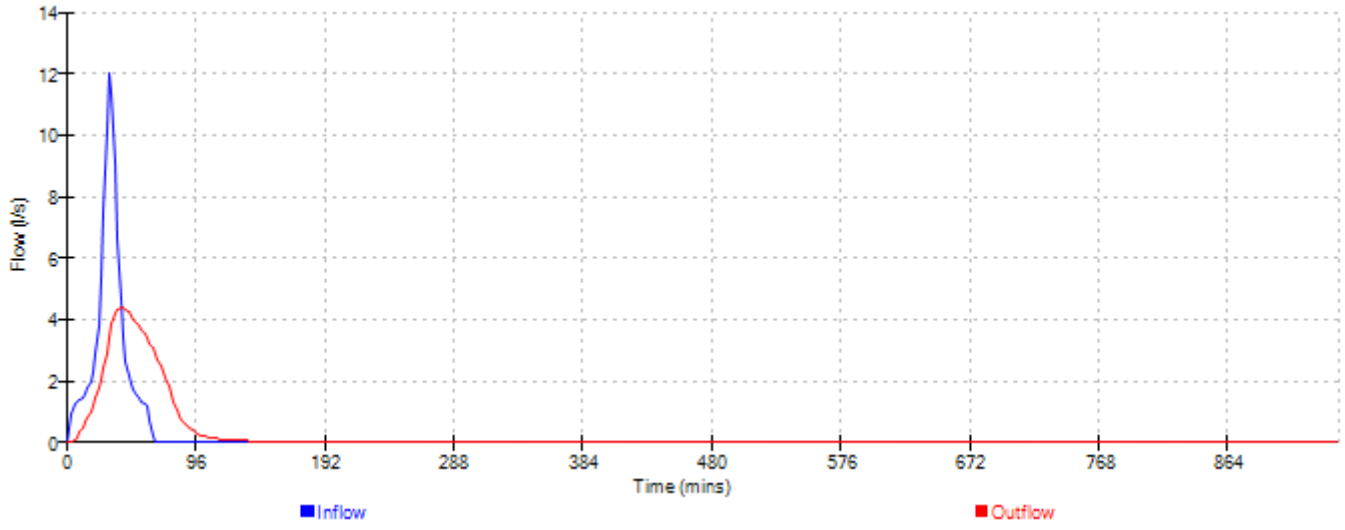
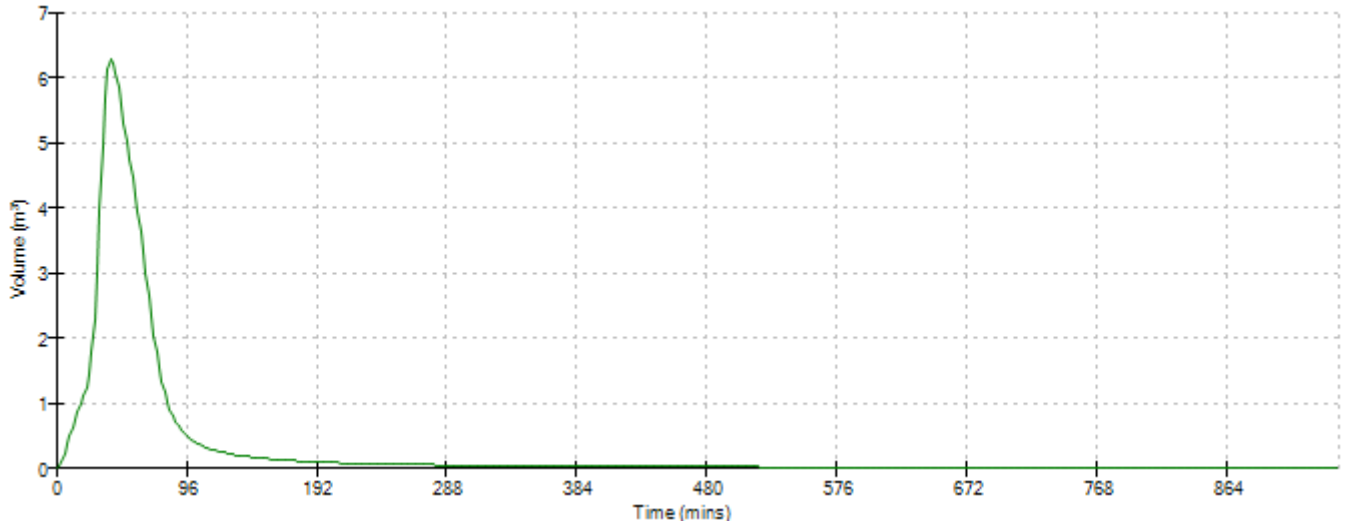
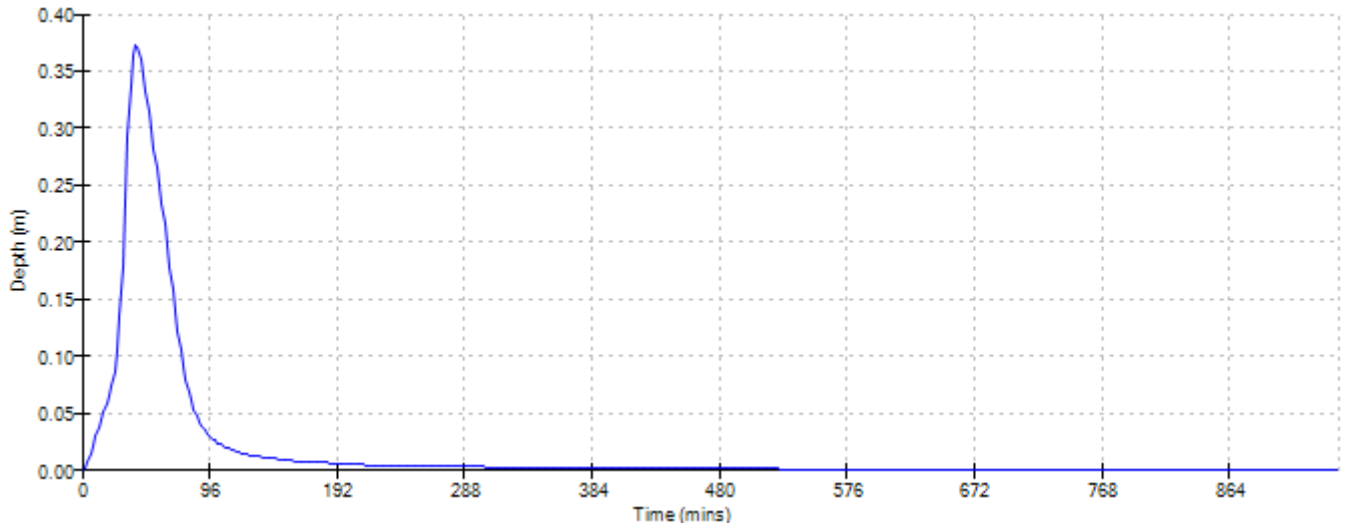
Event: 60 min Summer







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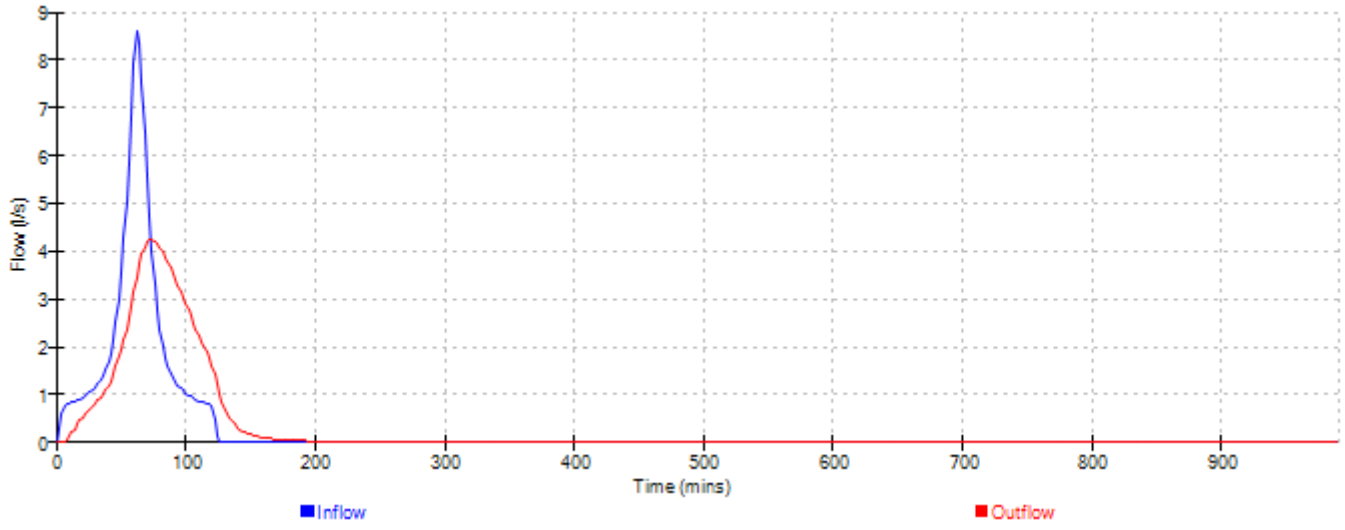
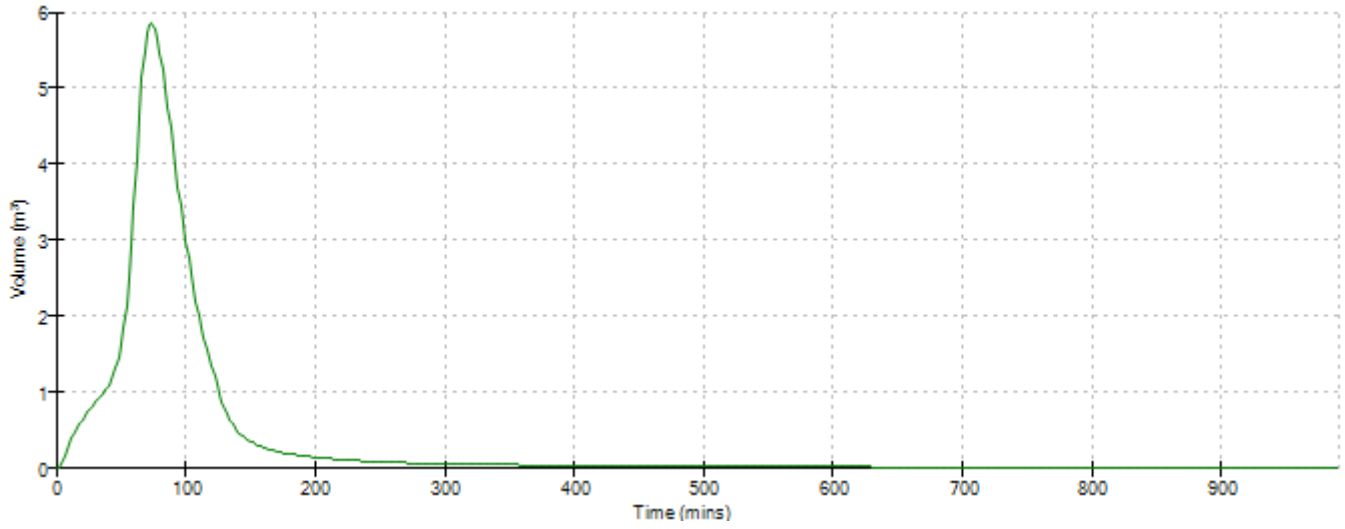
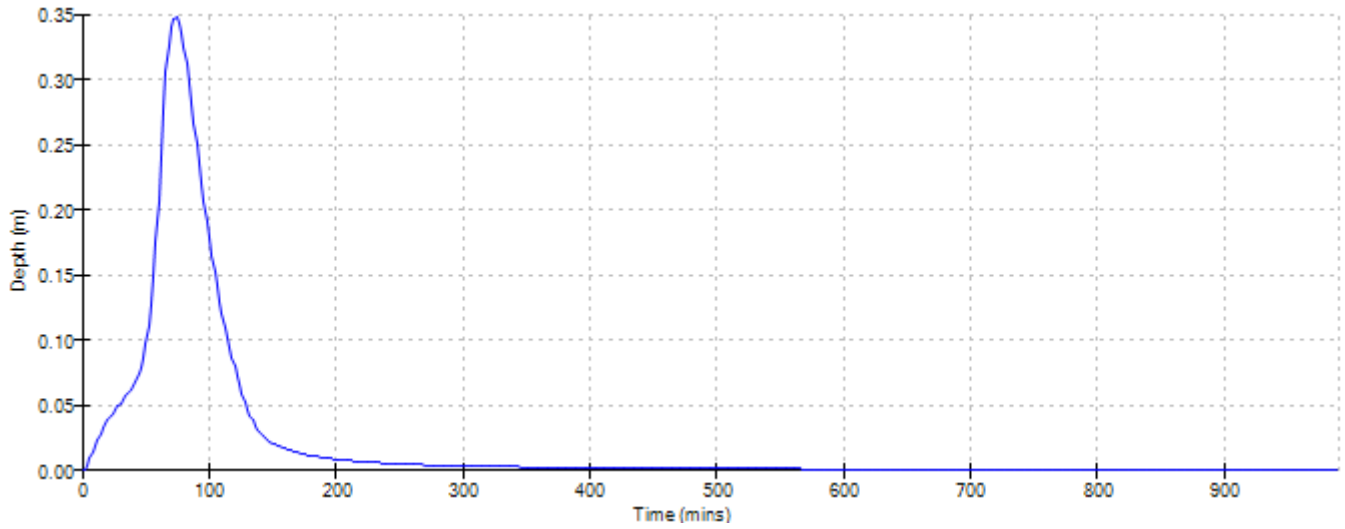
Event: 120 min Summer







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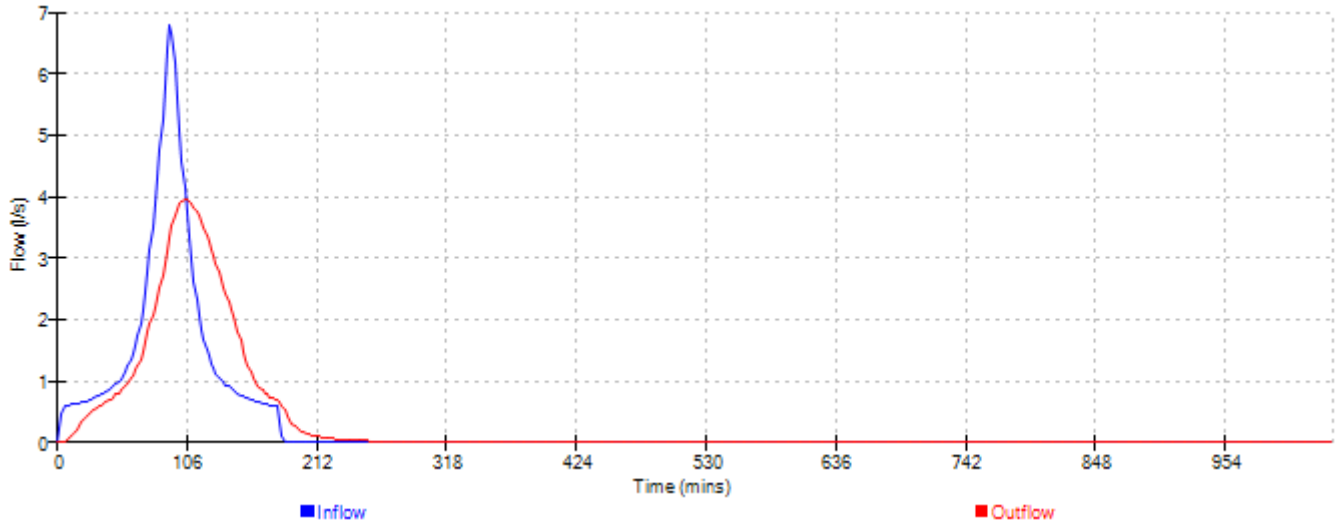
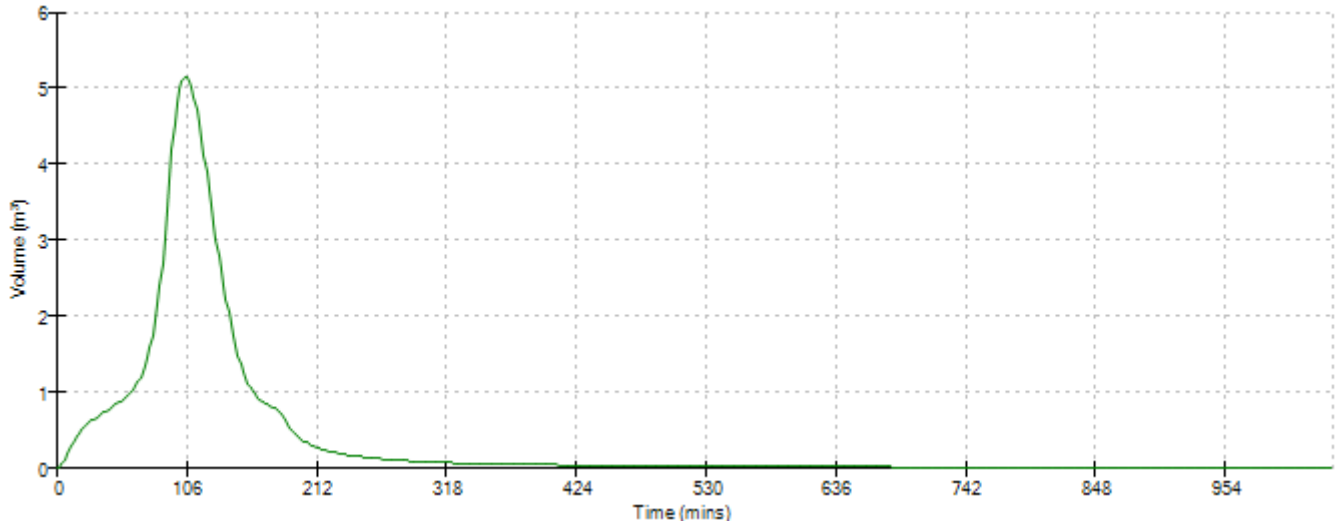
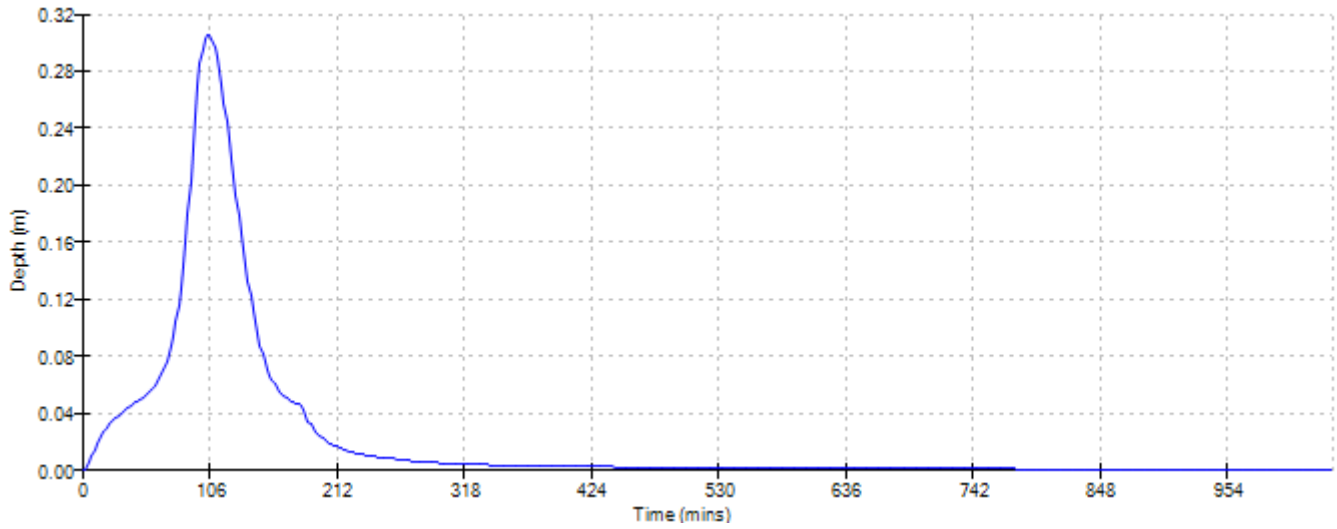
Event: 180 min Summer







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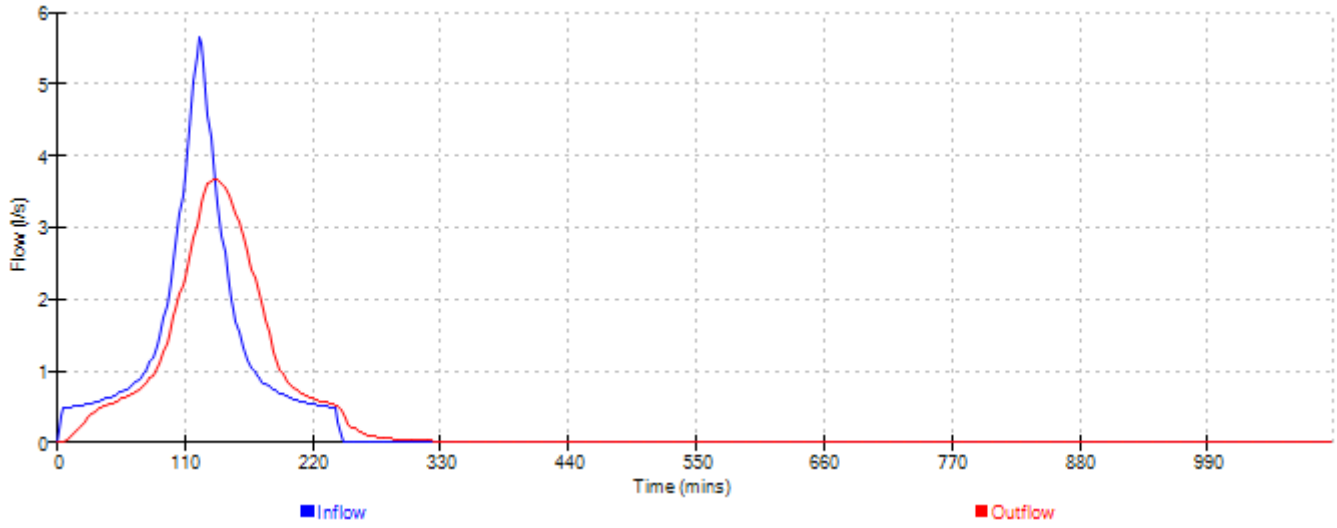
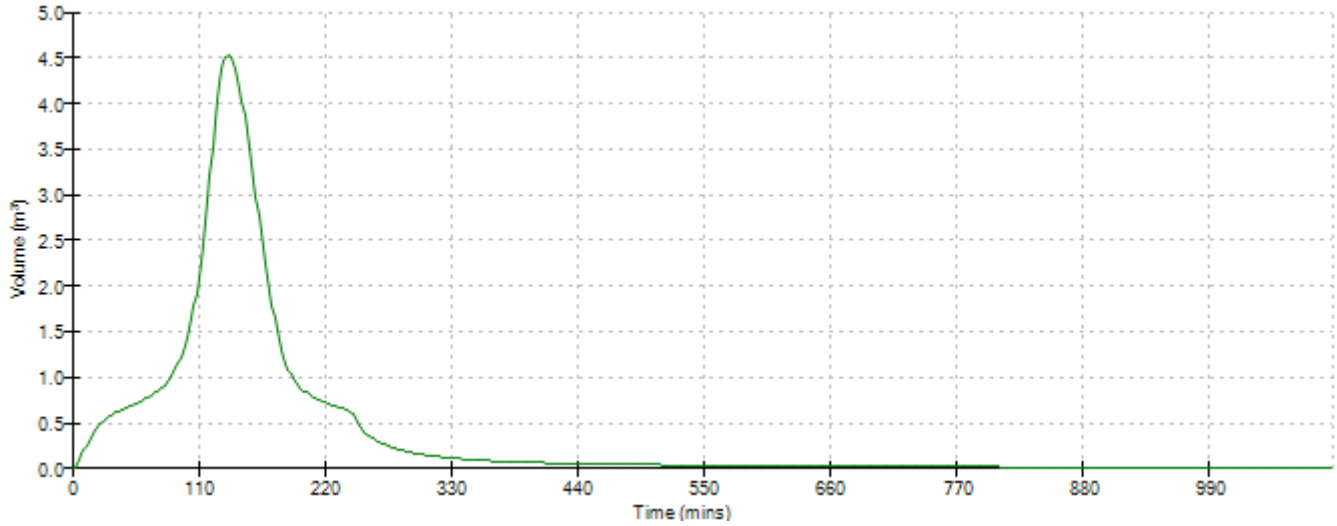
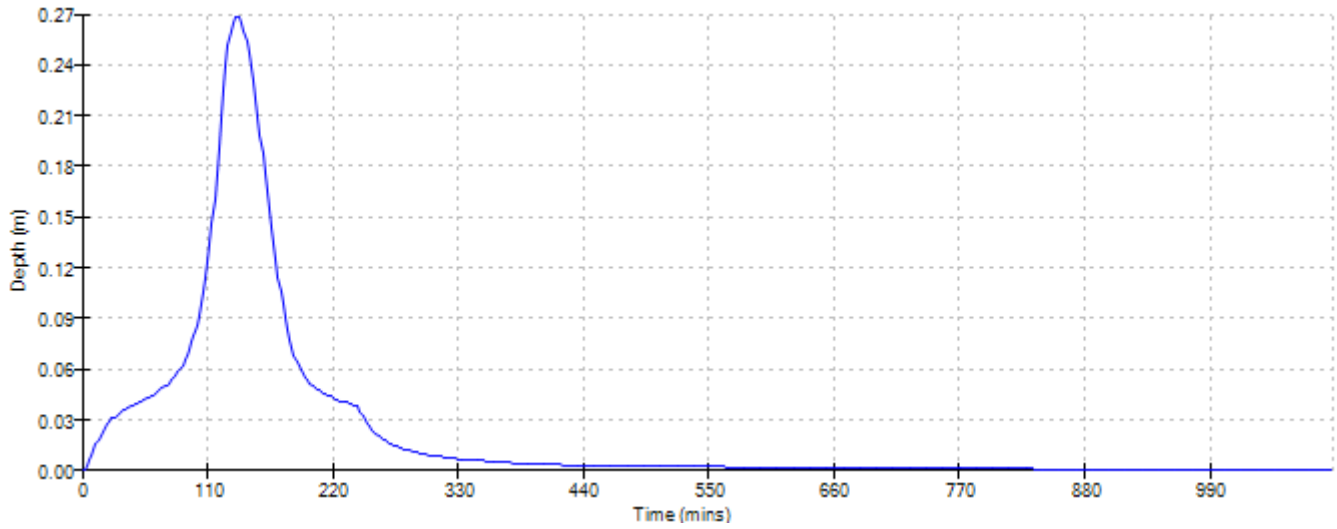
Event: 240 min Summer







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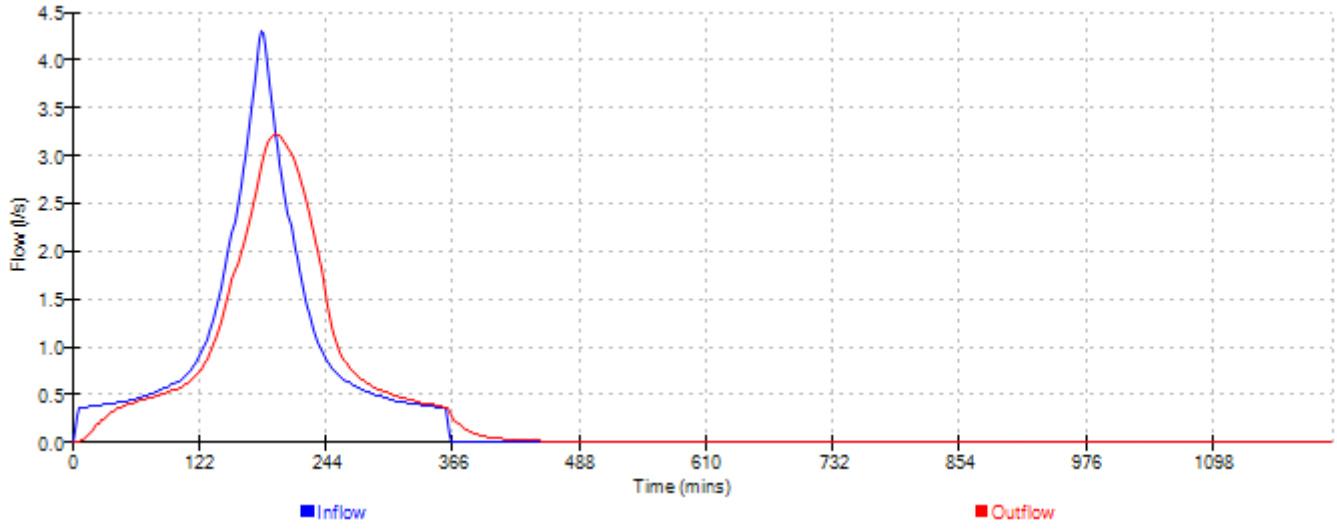
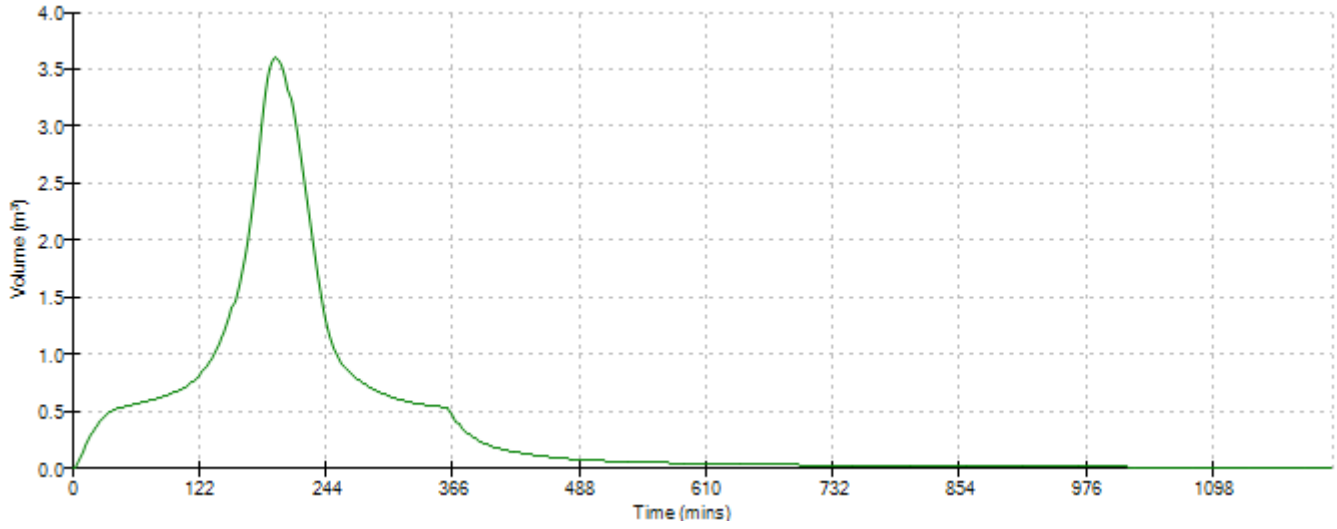
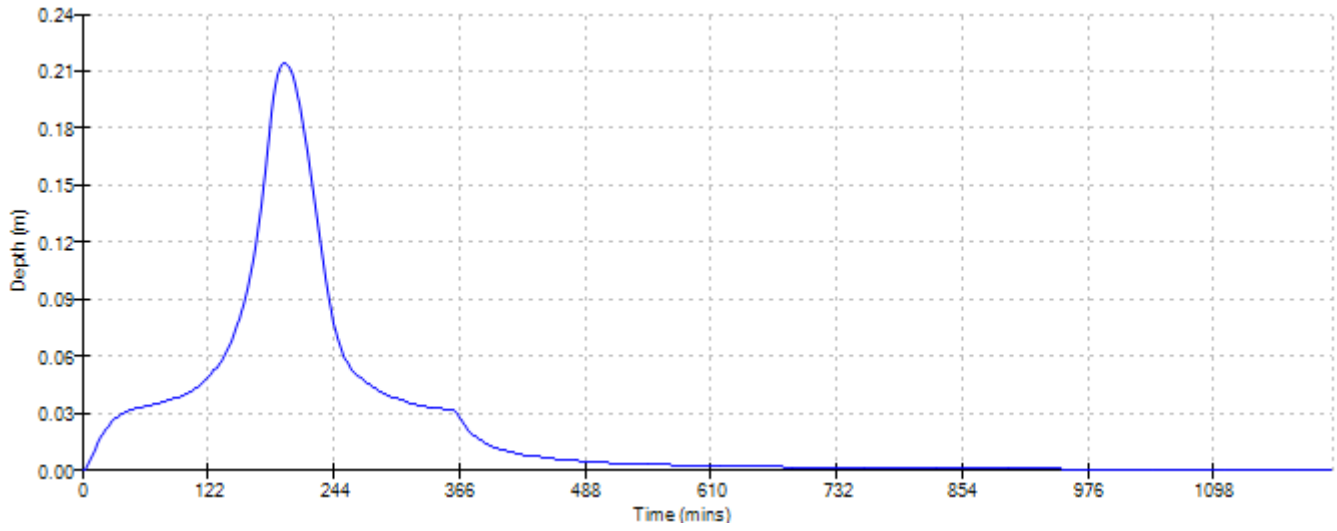
Event: 360 min Summer







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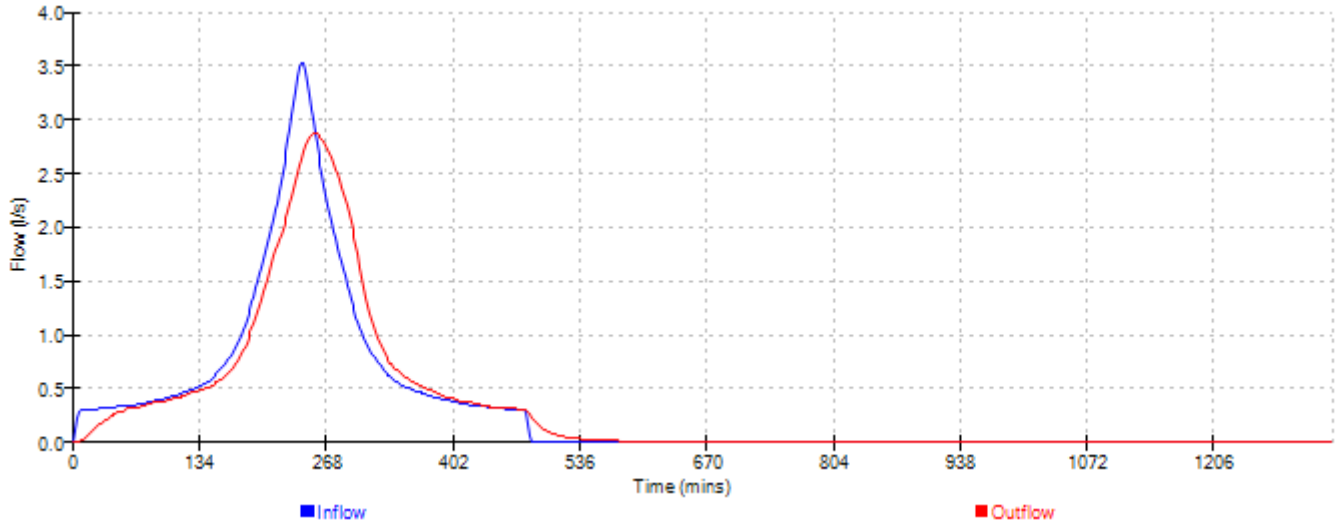
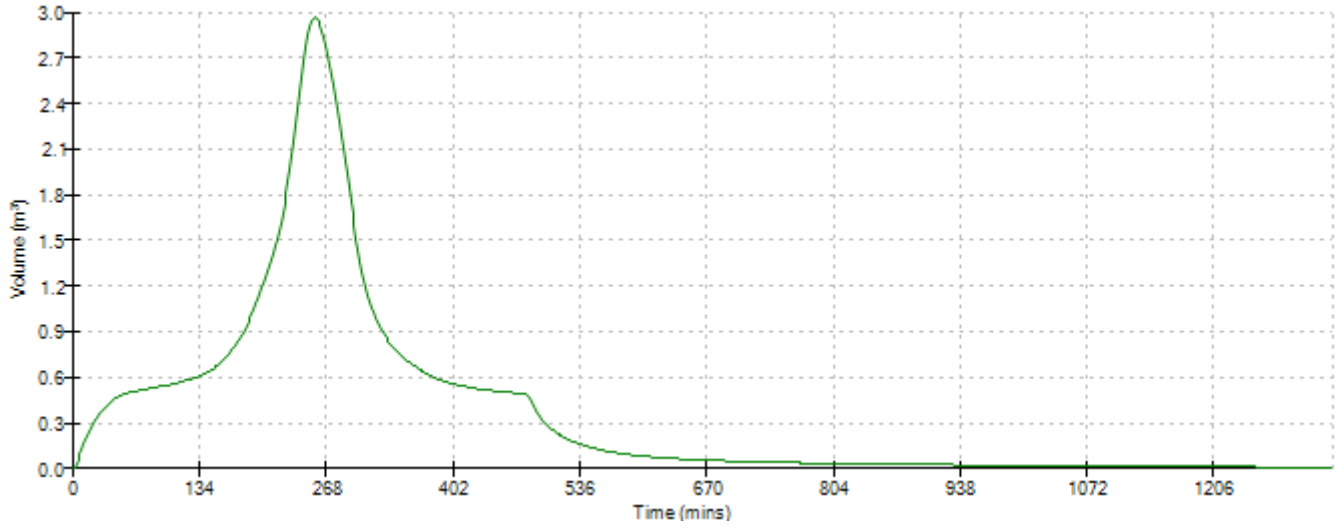
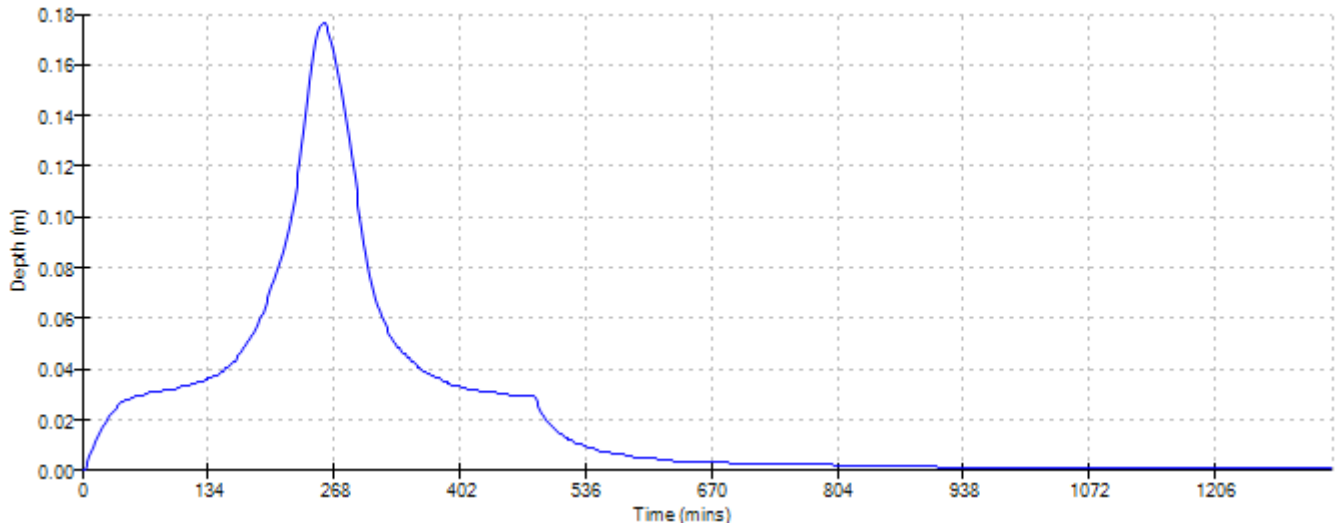
Event: 480 min Summer







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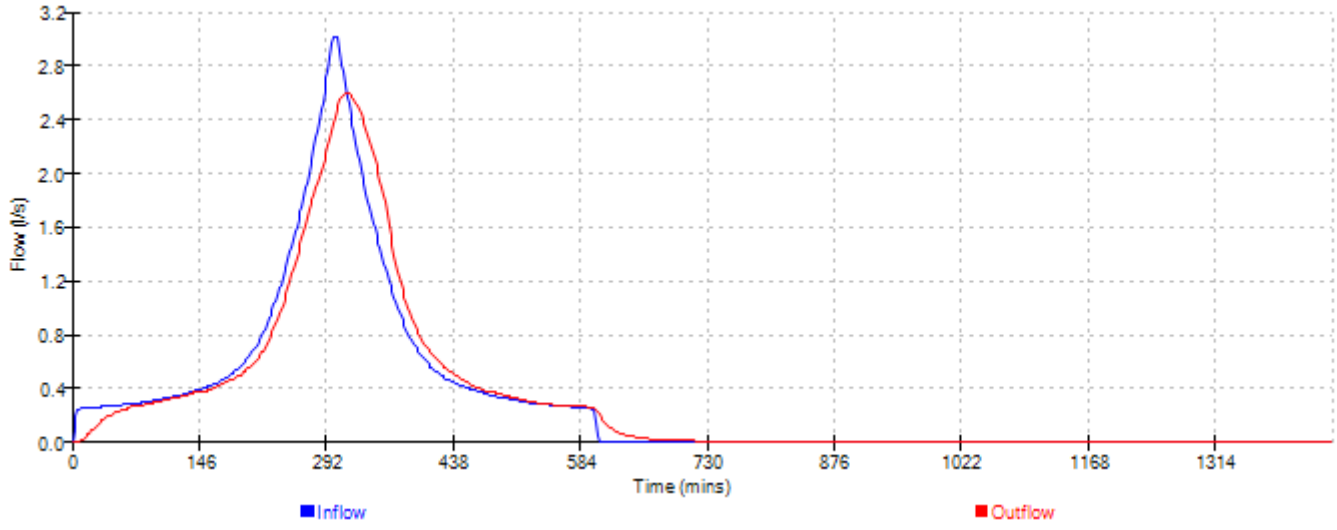
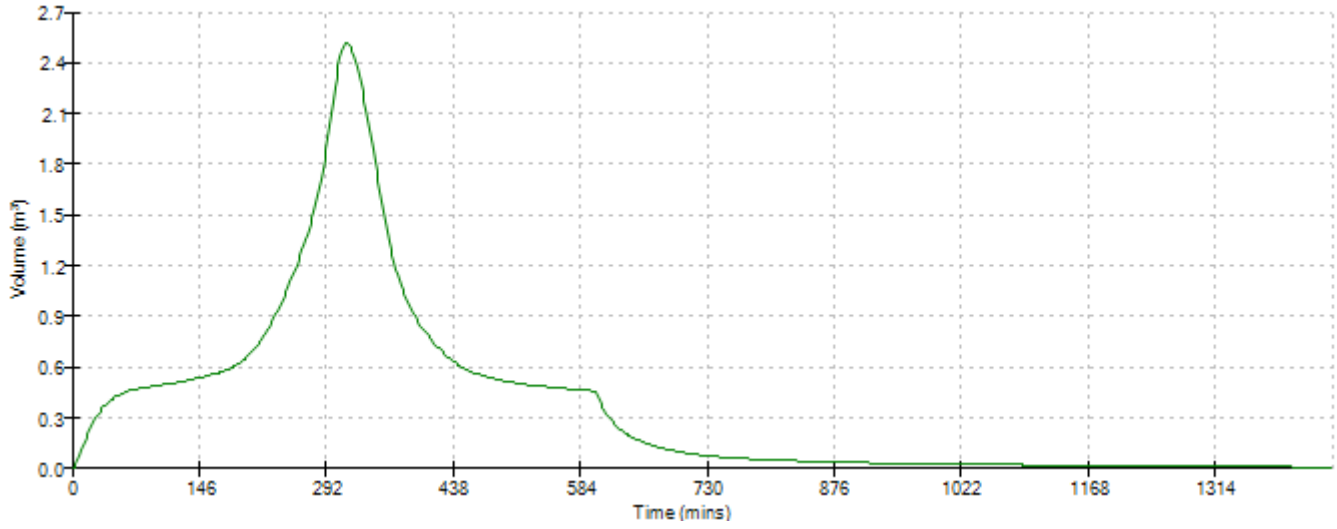
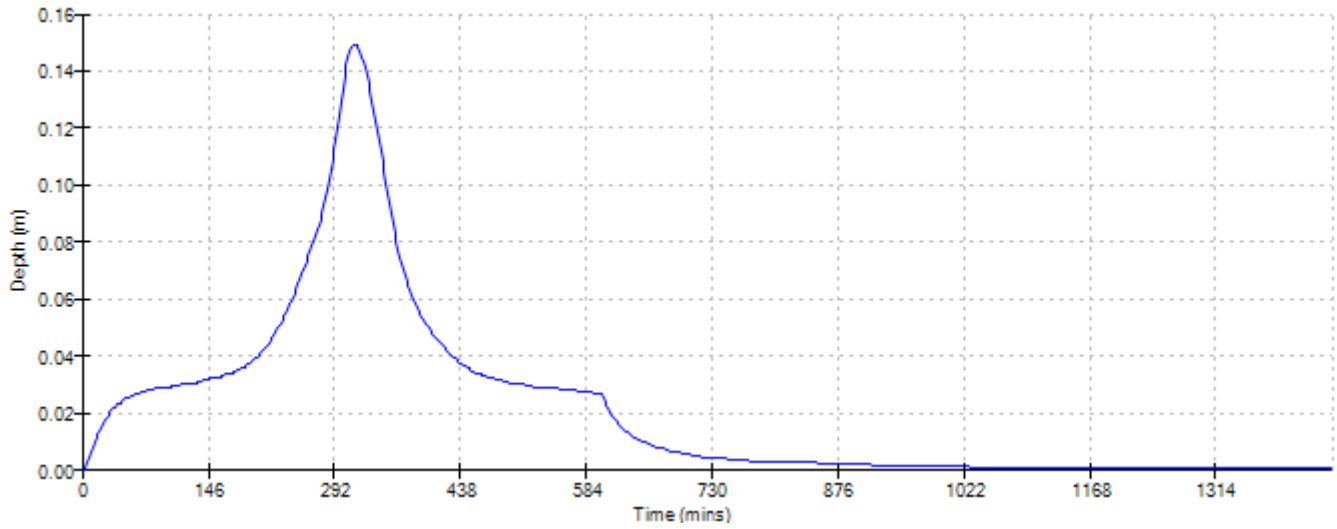
Event: 600 min Summer







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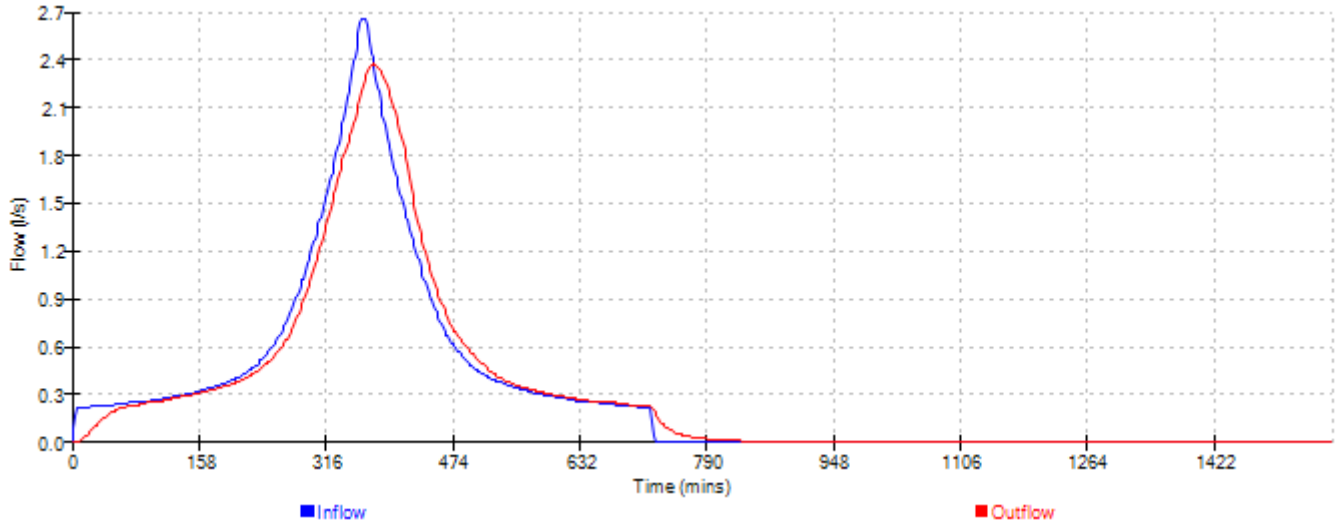
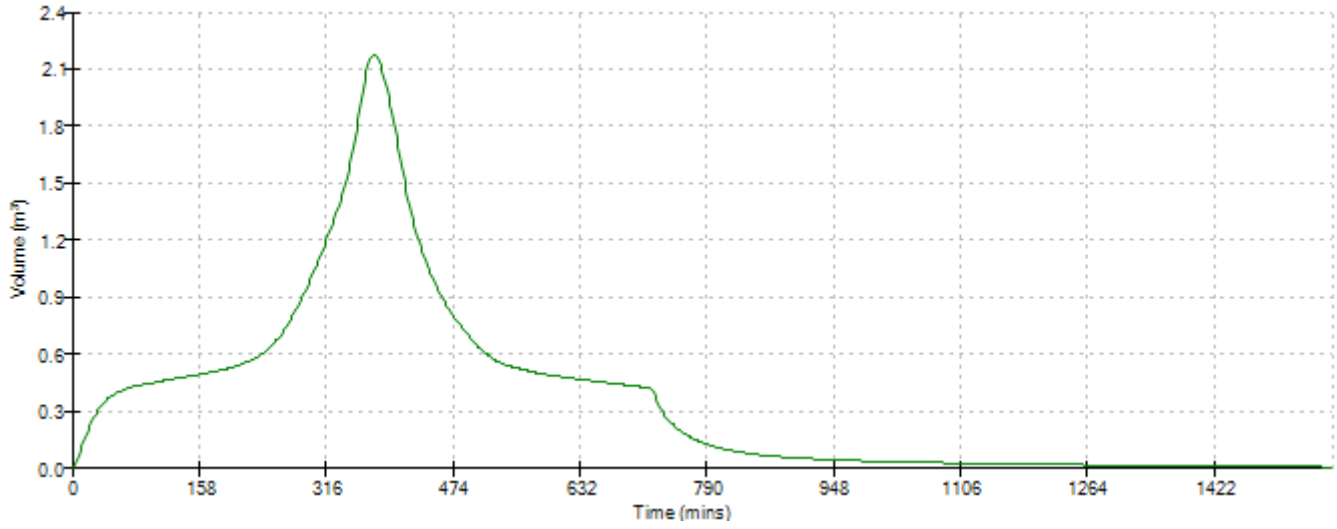
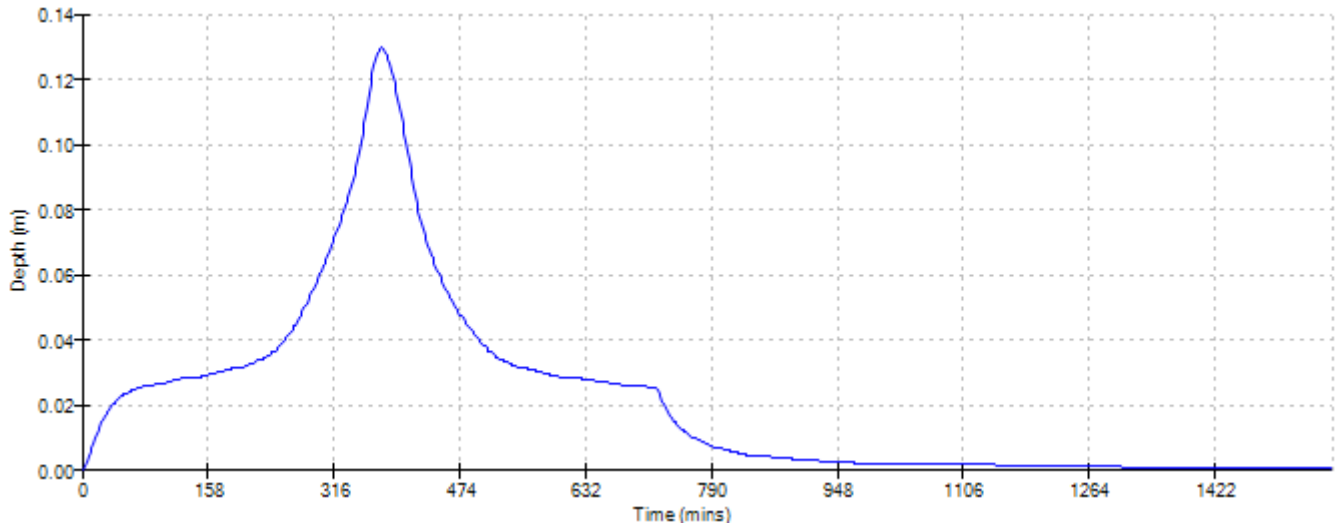
Event: 720 min Summer







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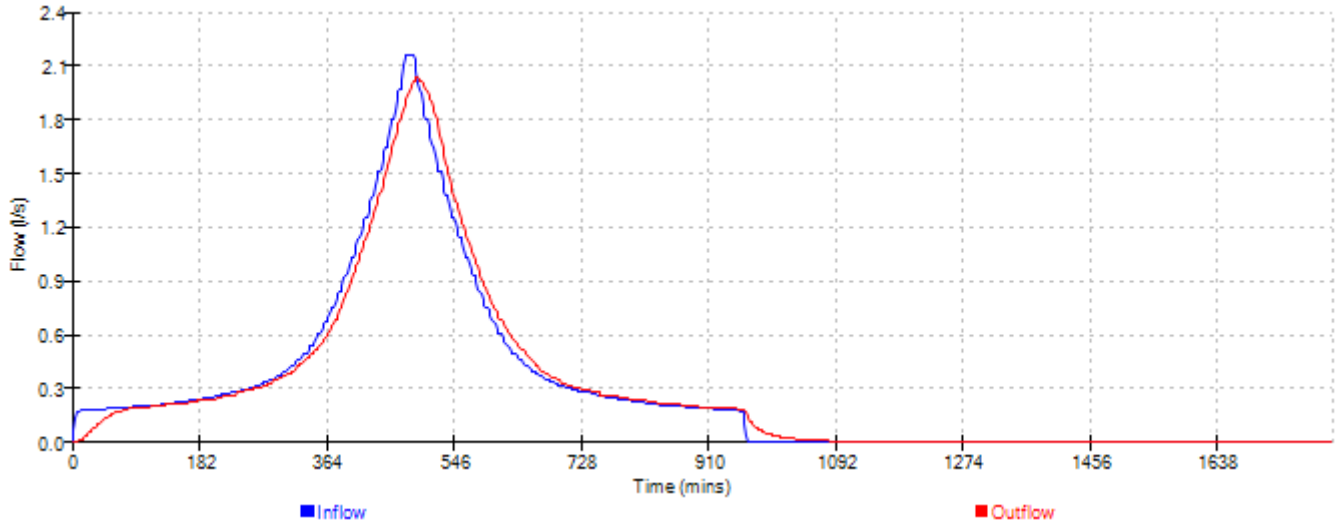
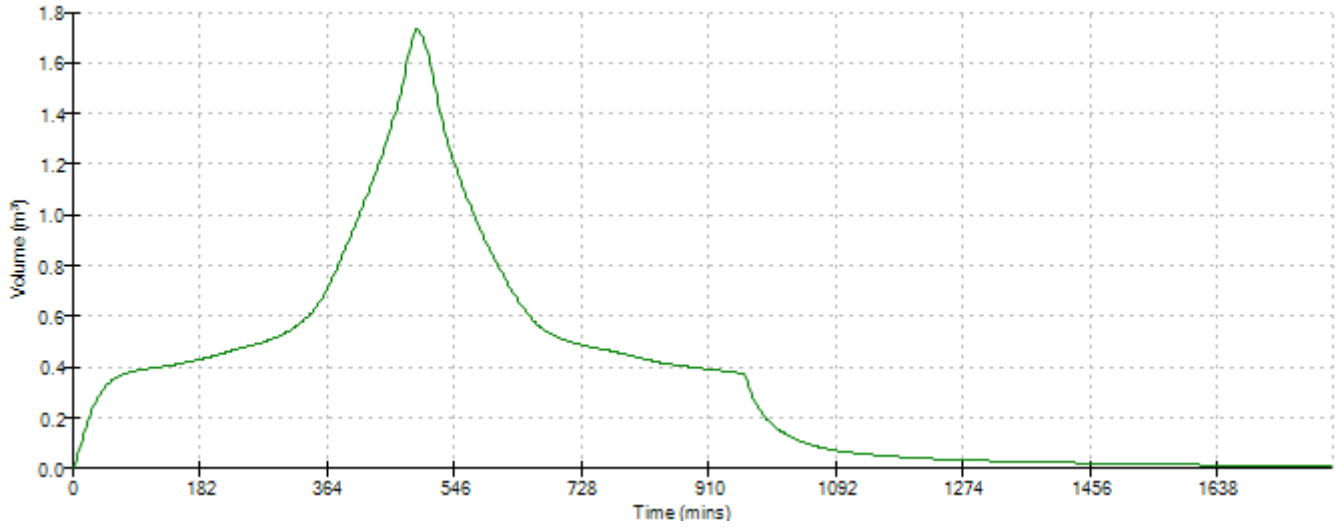
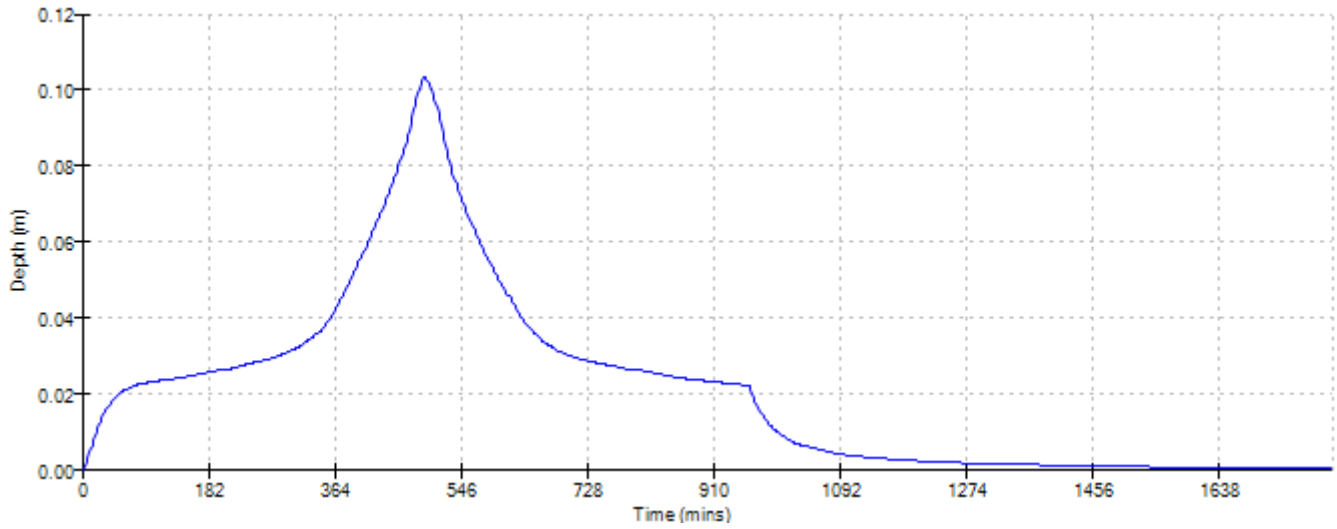
Event: 960 min Summer







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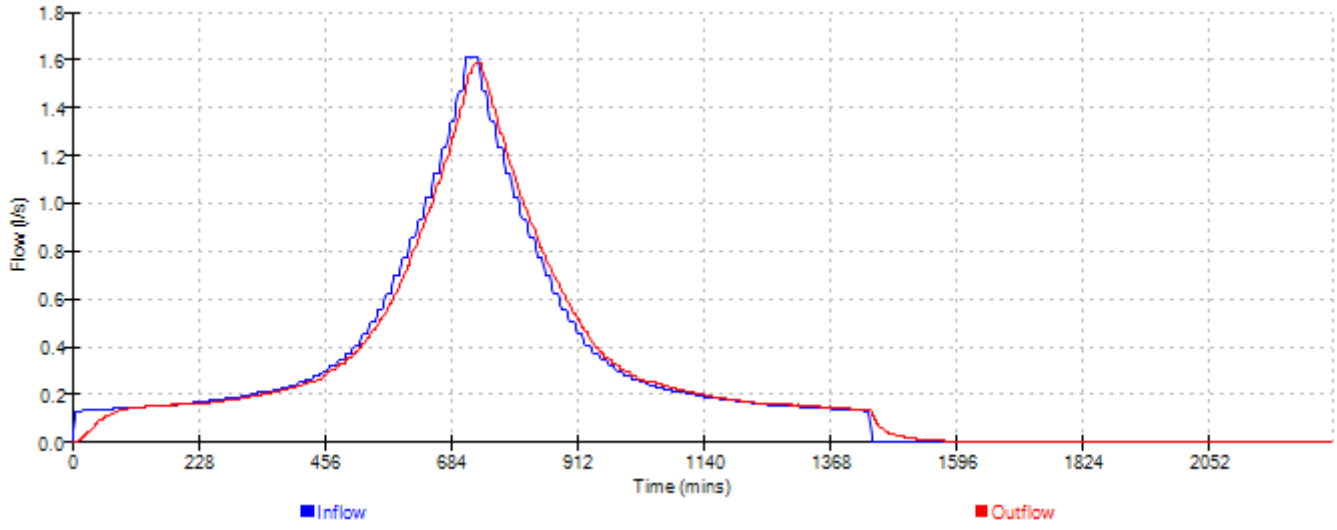
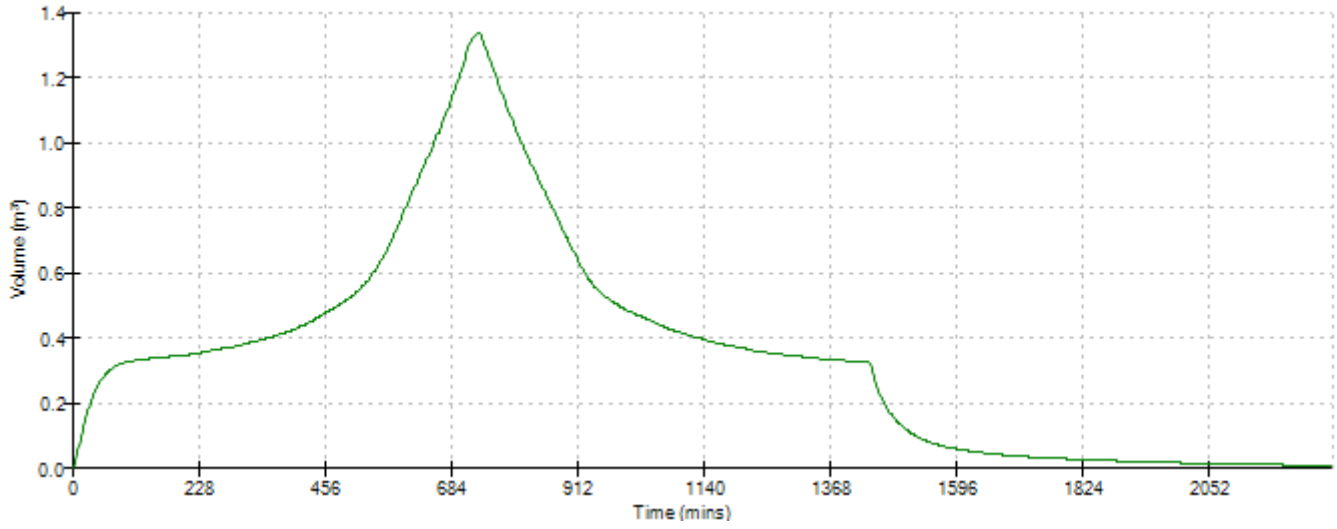
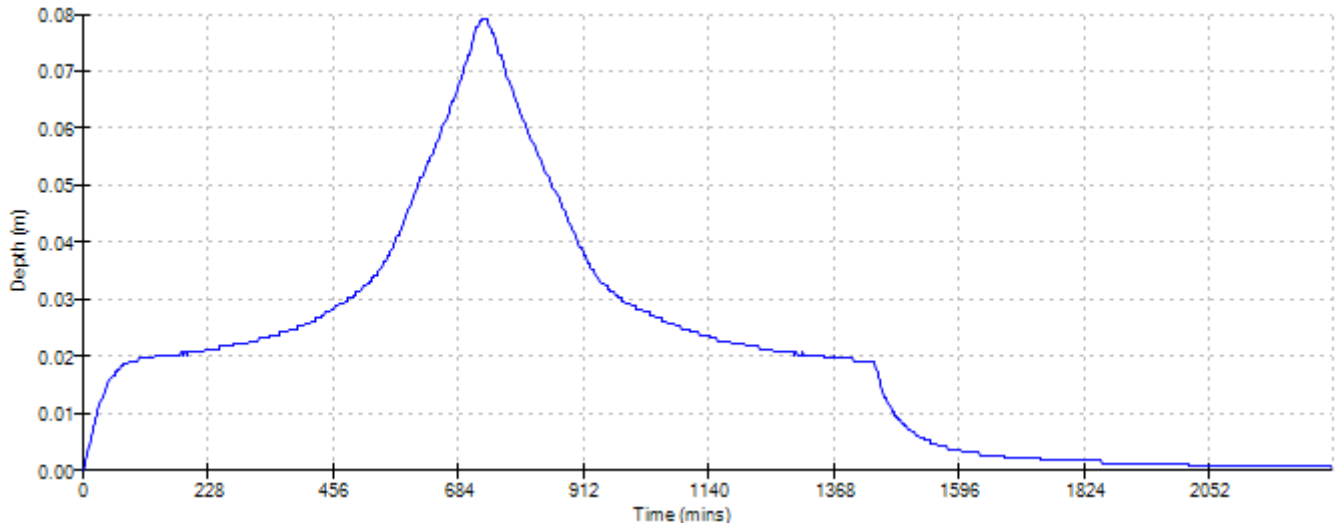
Event: 1440 min Summer







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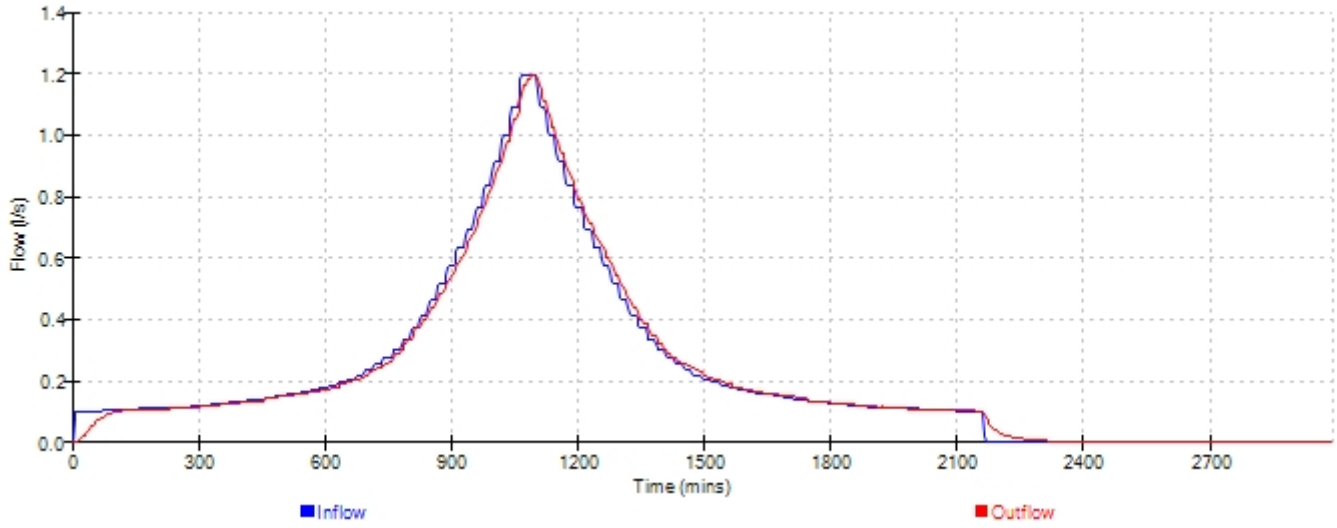
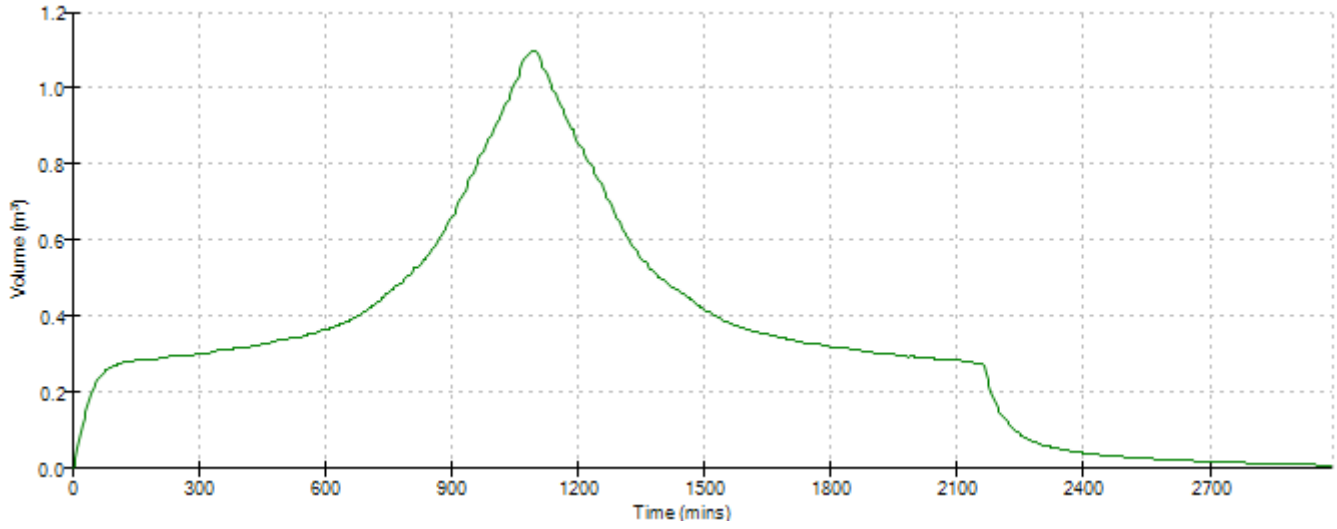
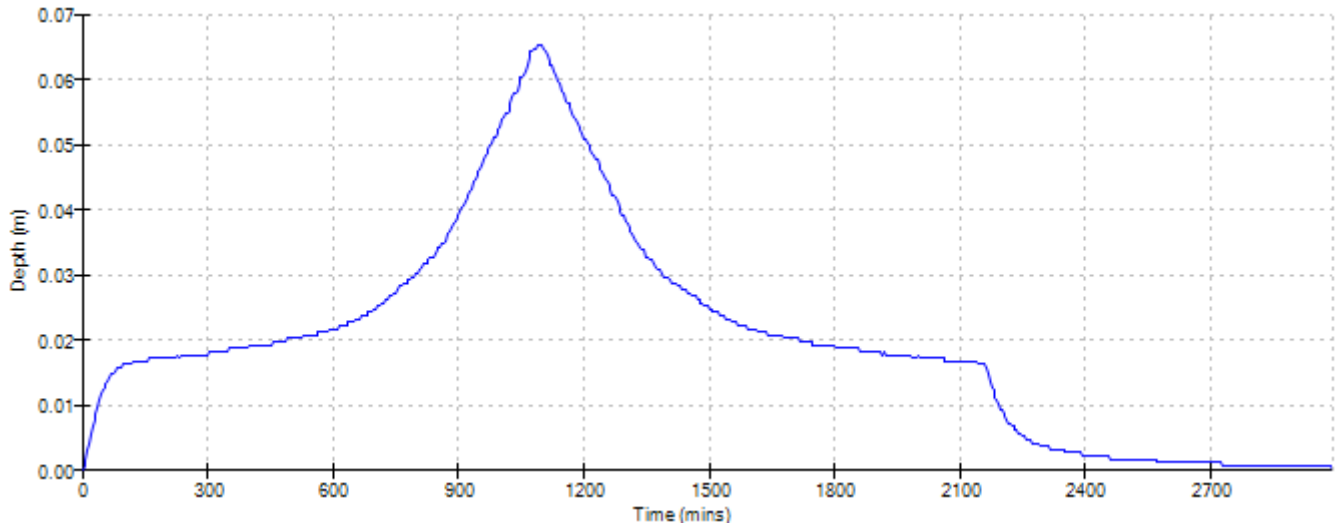
Event: 2160 min Summer







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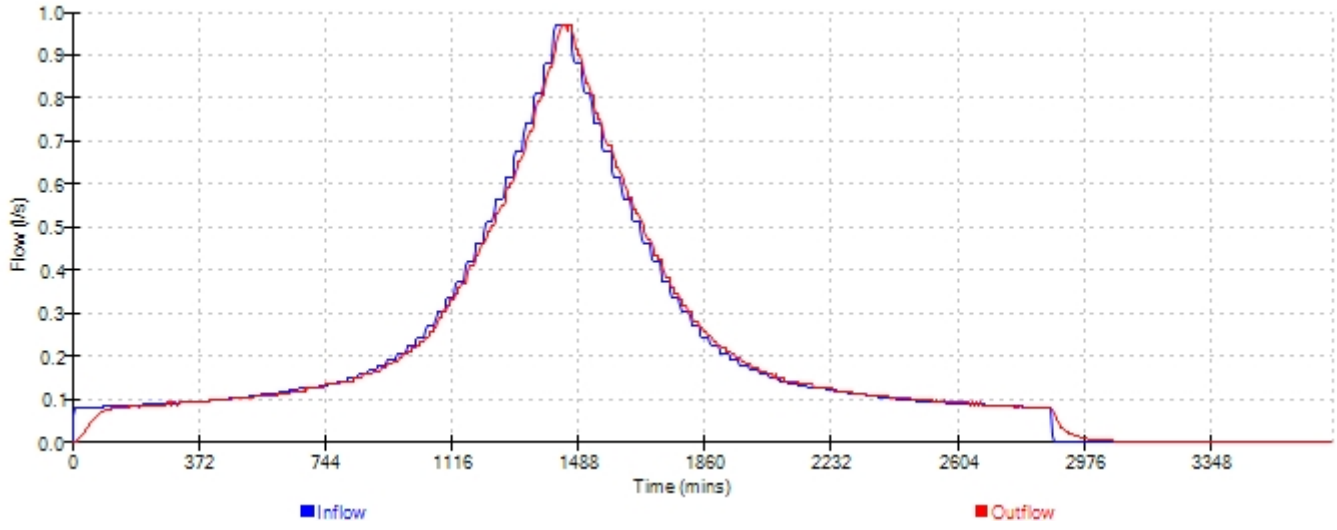
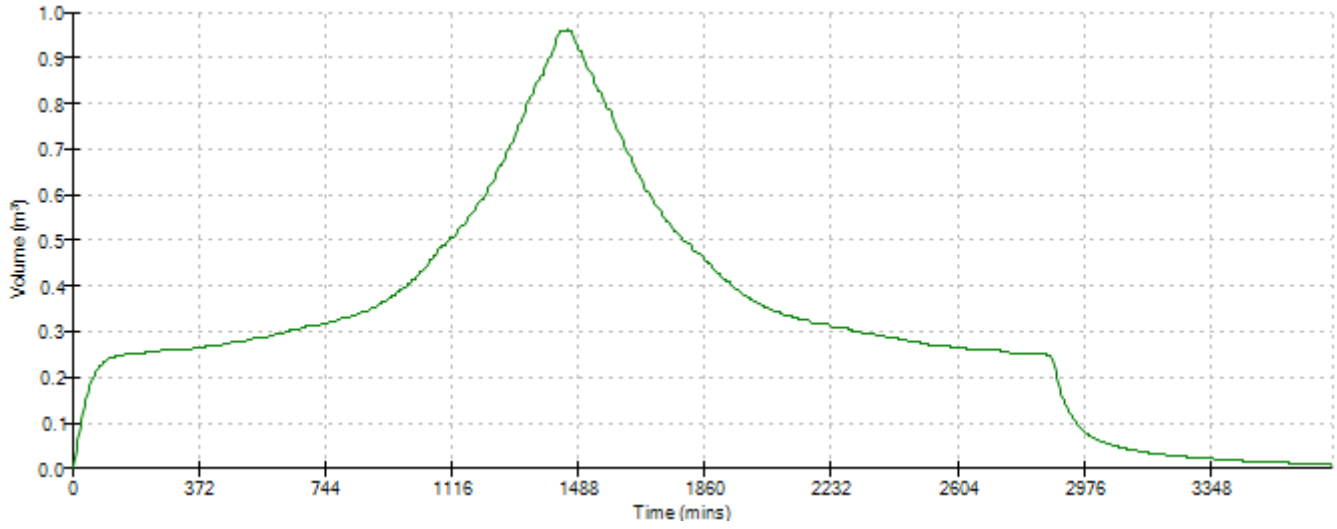
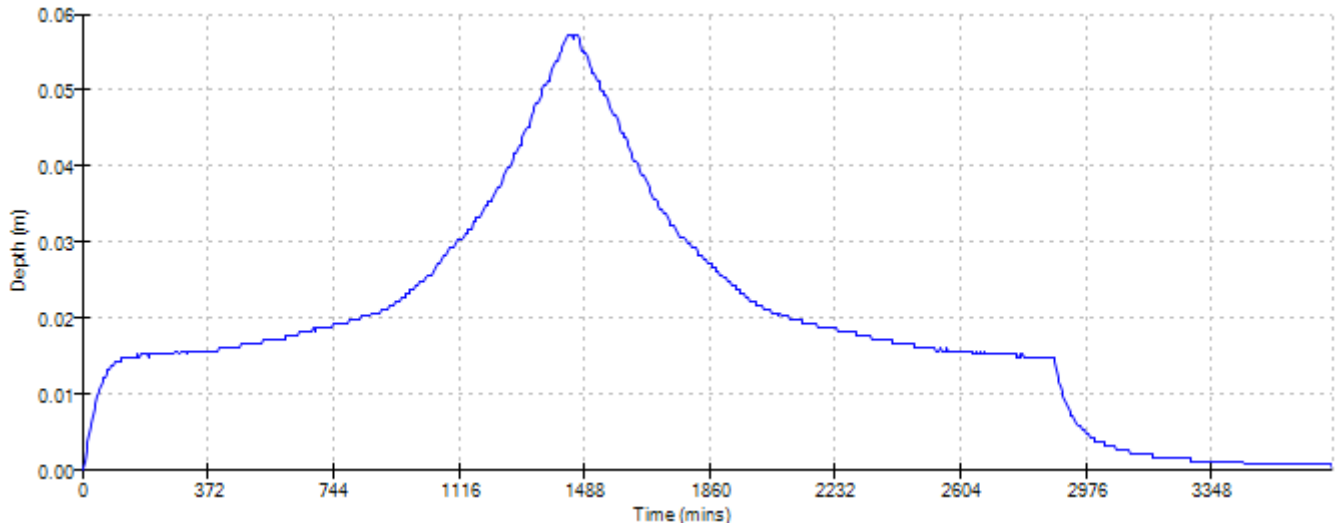
Event: 2880 min Summer







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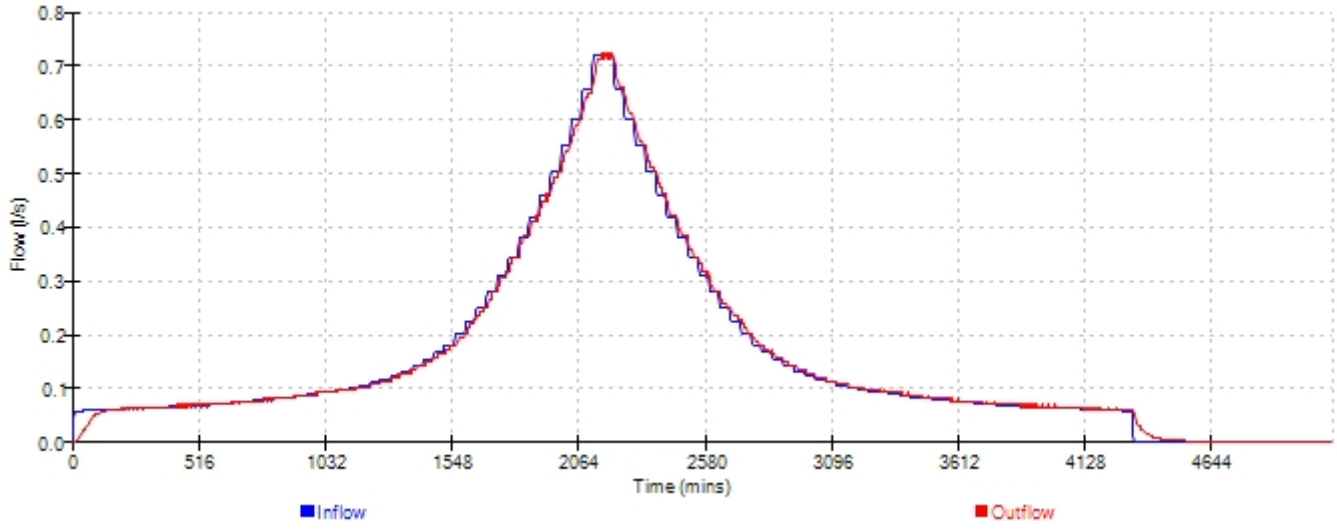
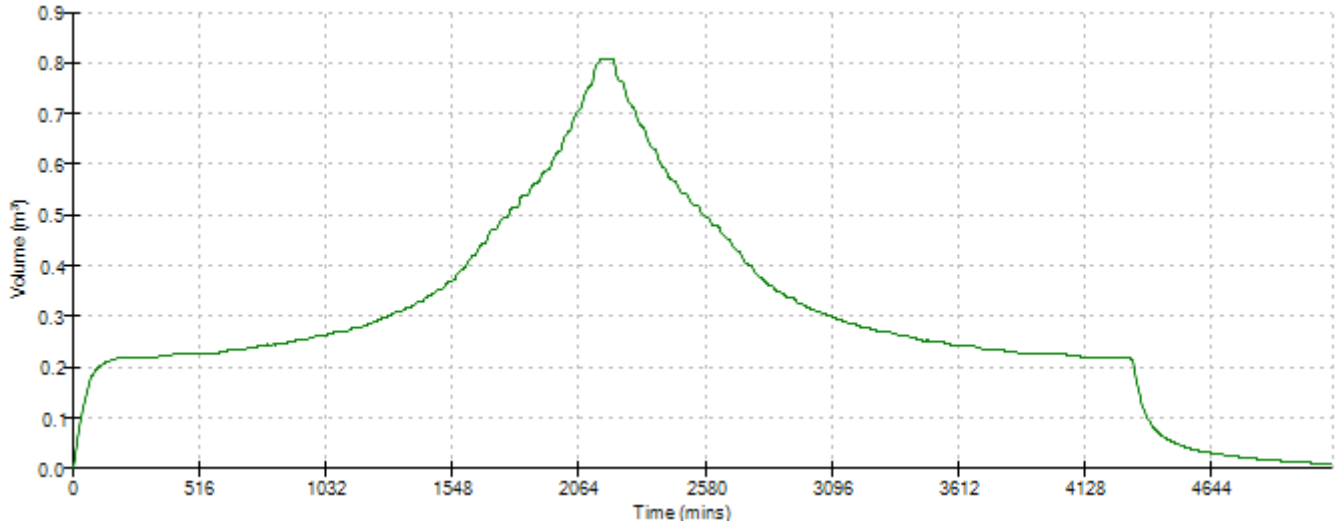
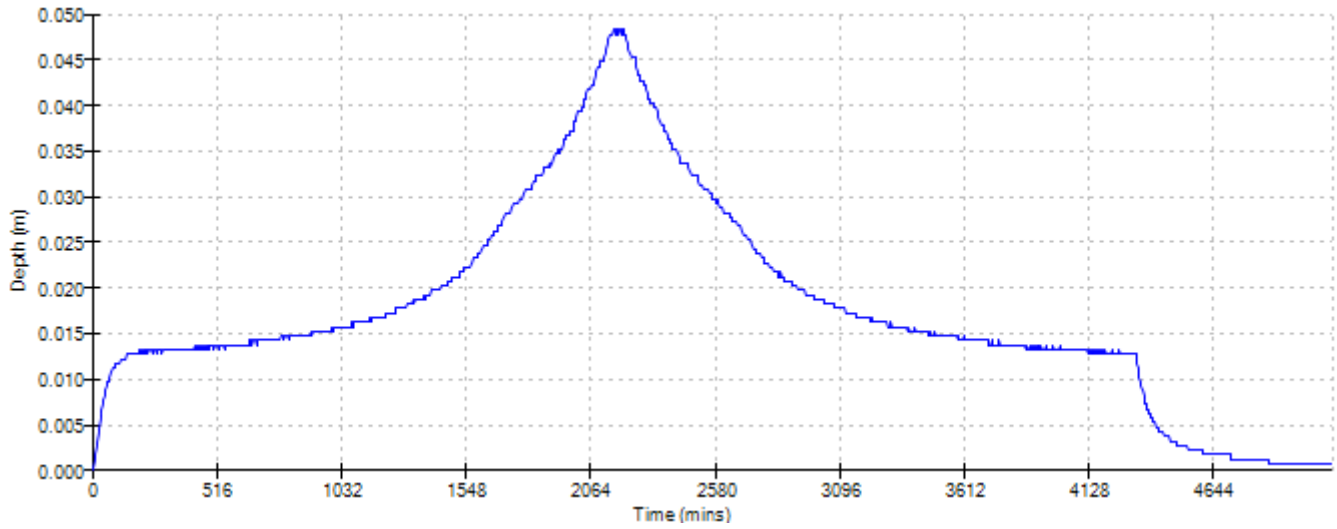
Event: 4320 min Summer







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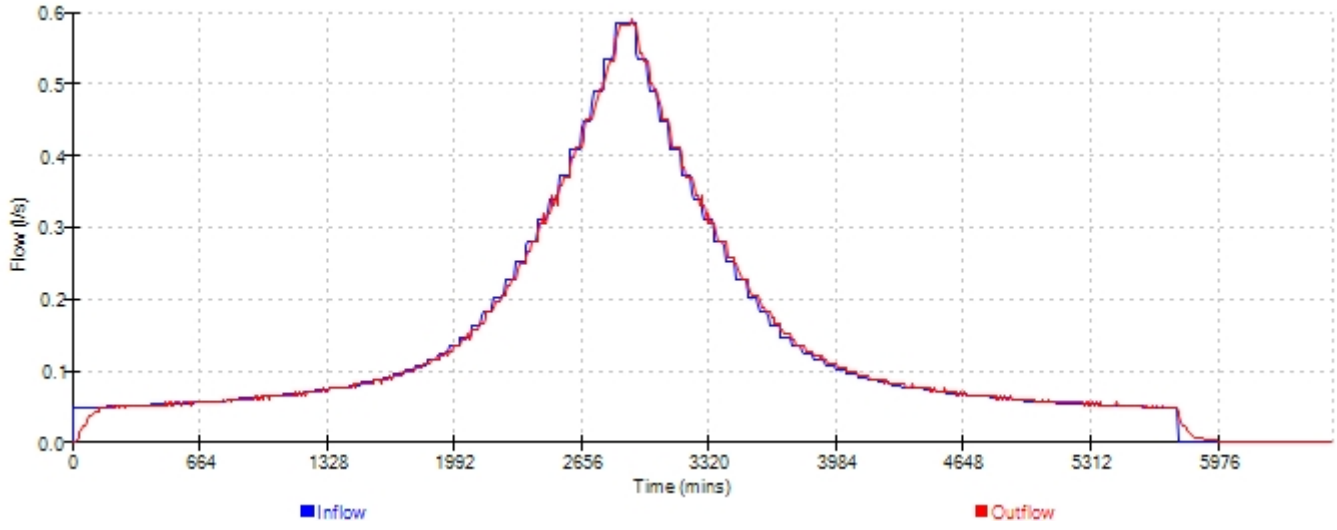
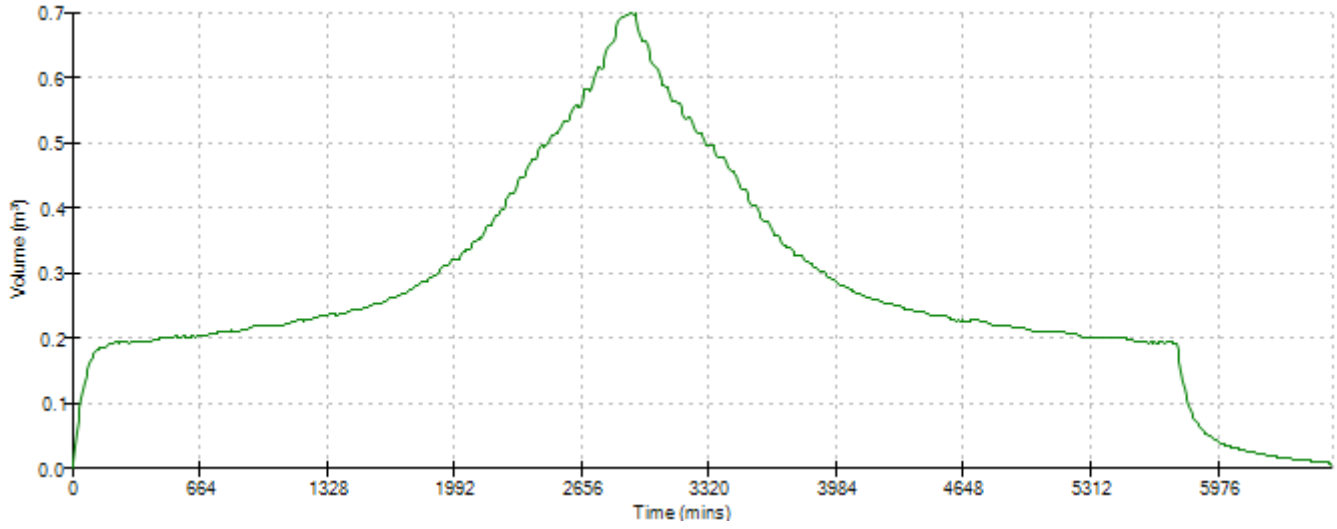
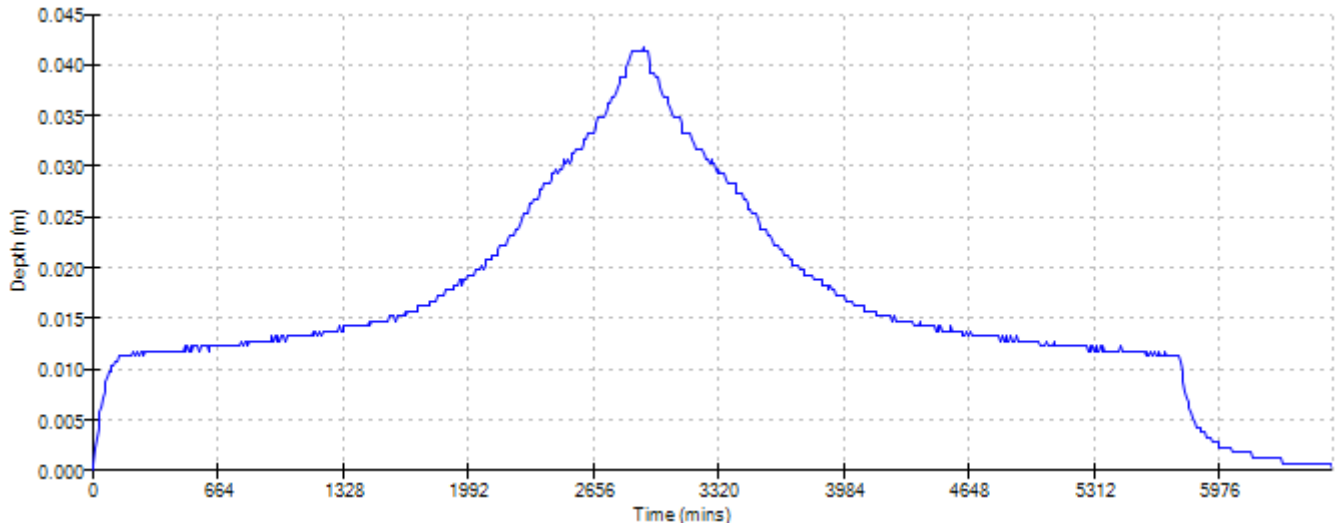
Event: 5760 min Summer







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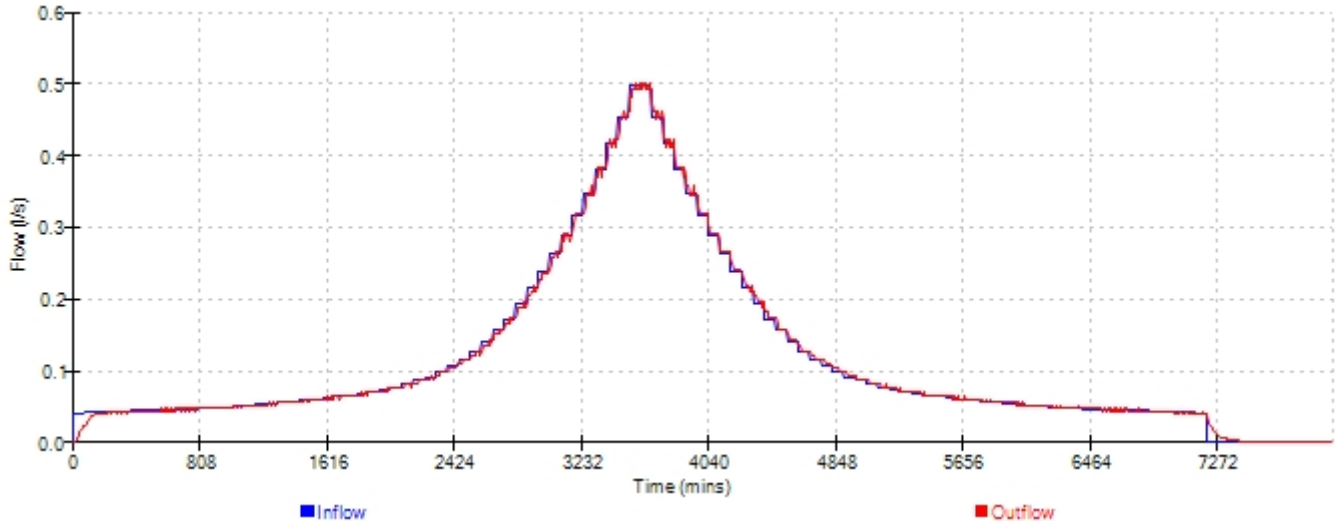
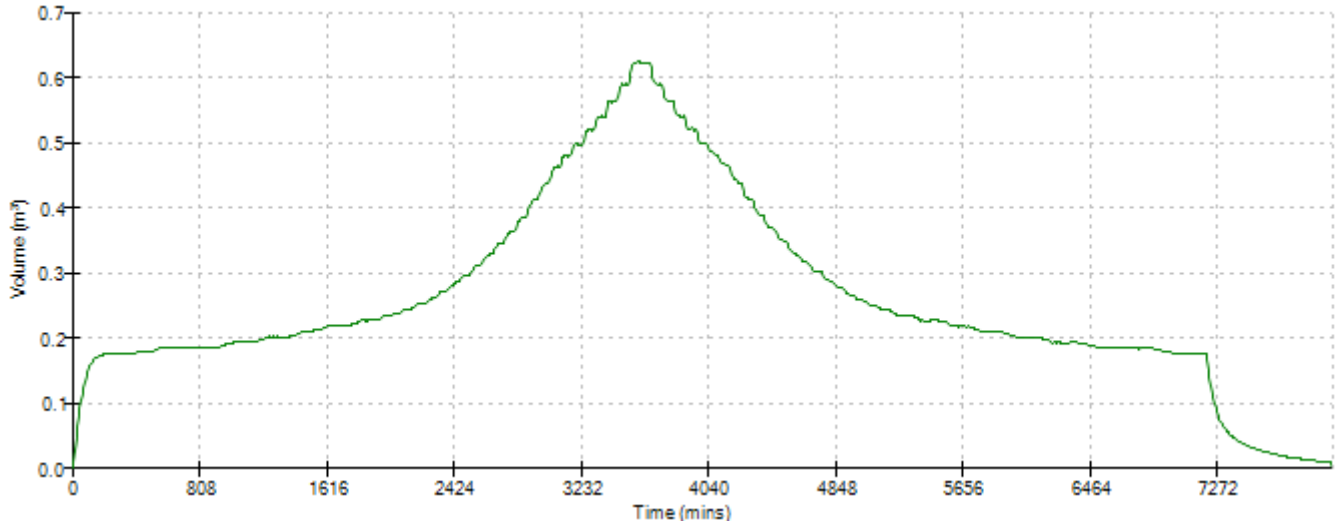
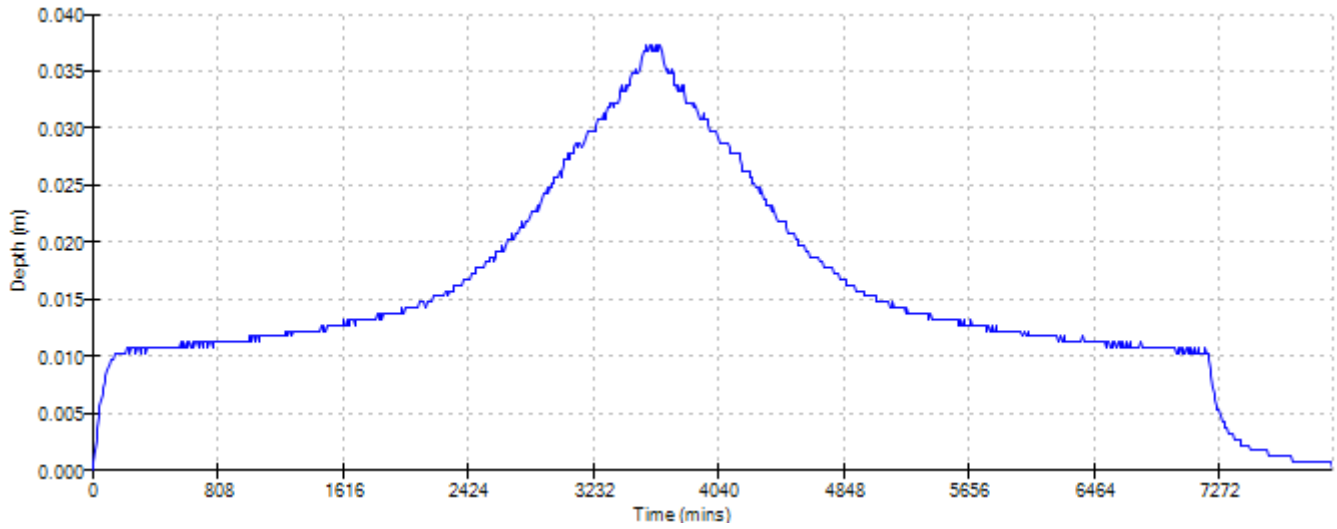
Event: 7200 min Summer







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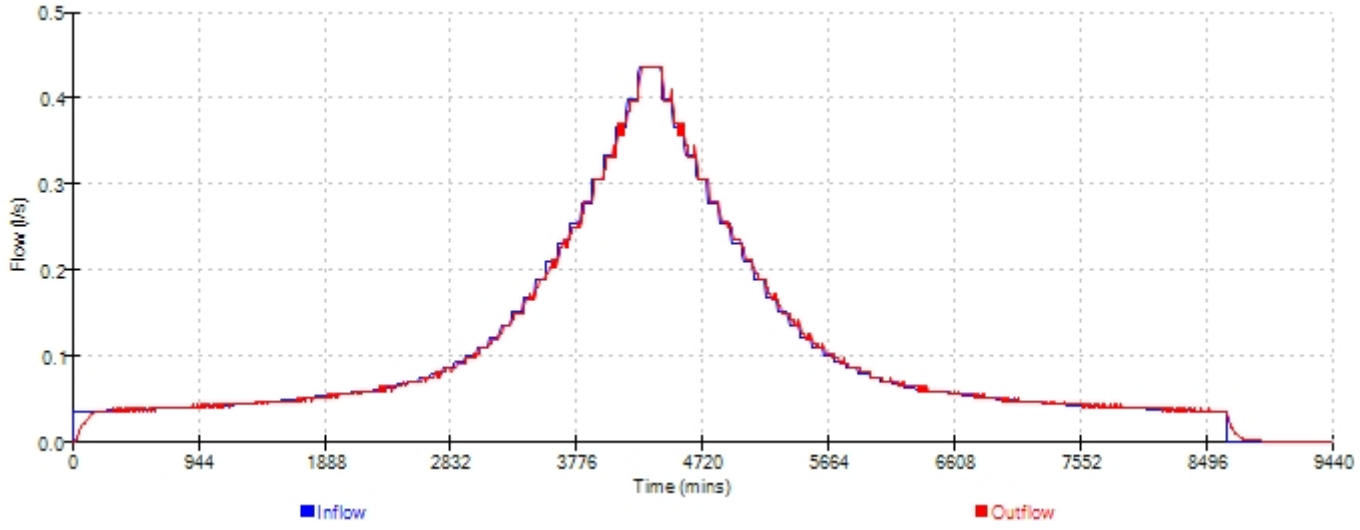
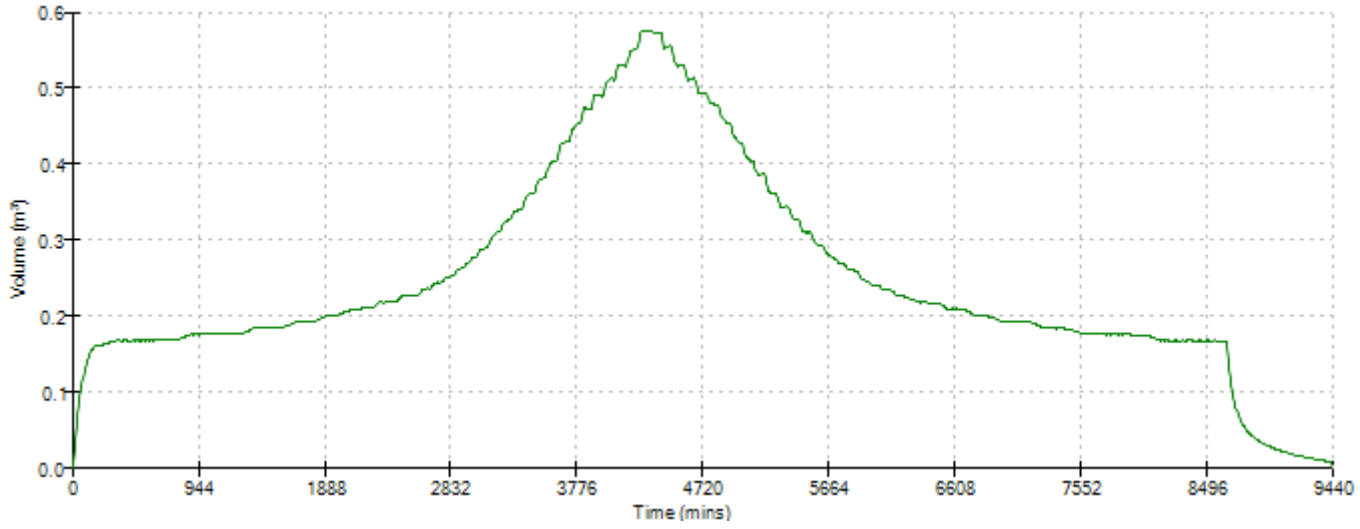
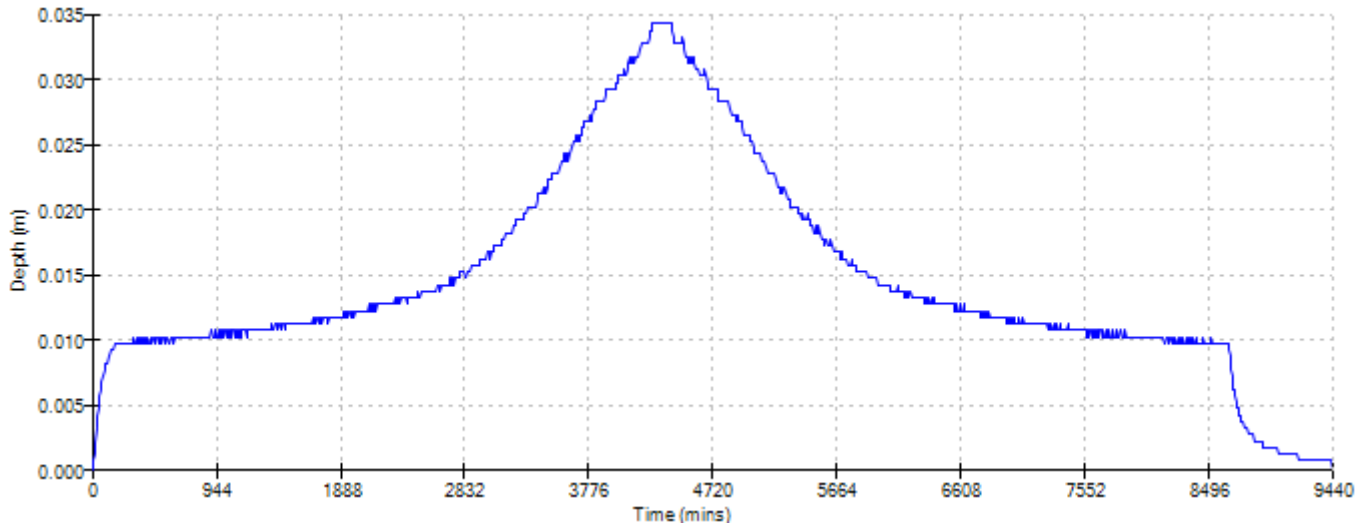
Event: 8640 min Summer







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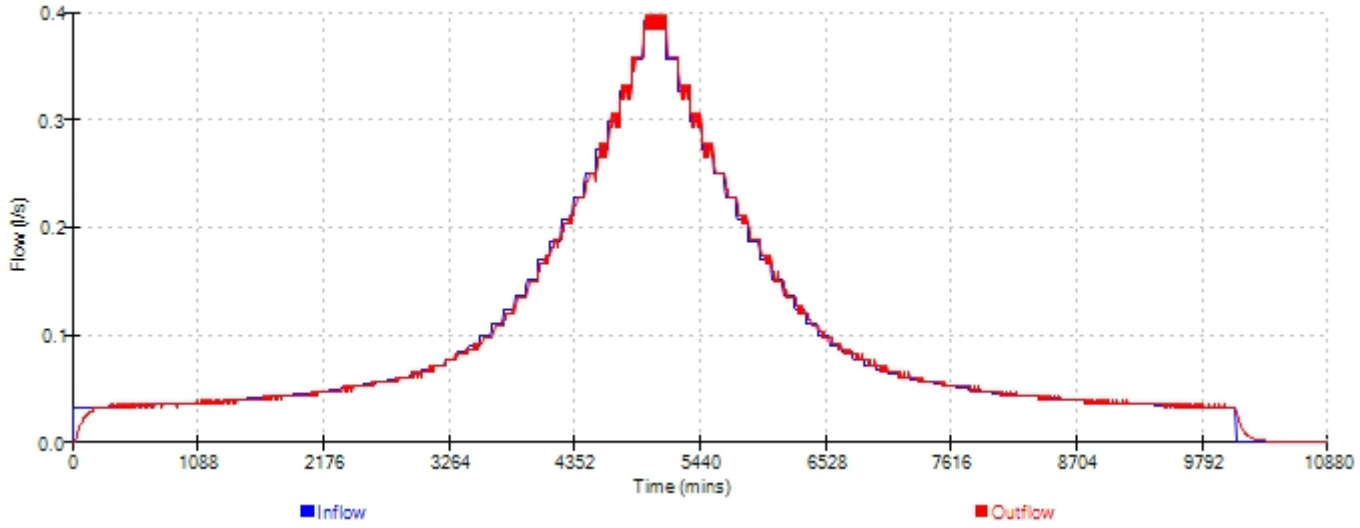
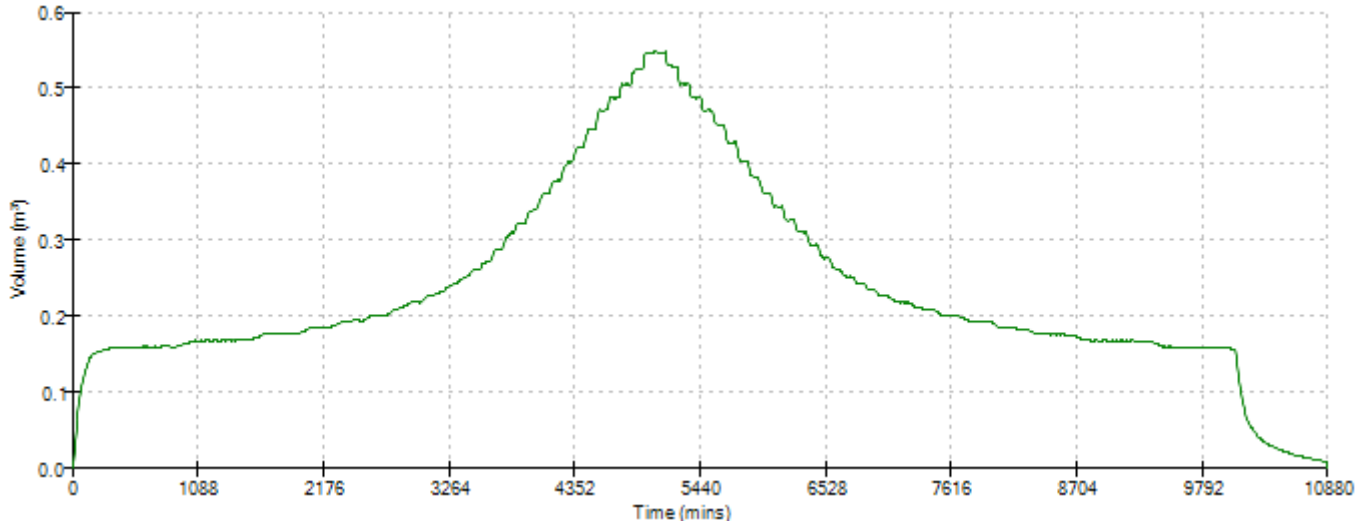
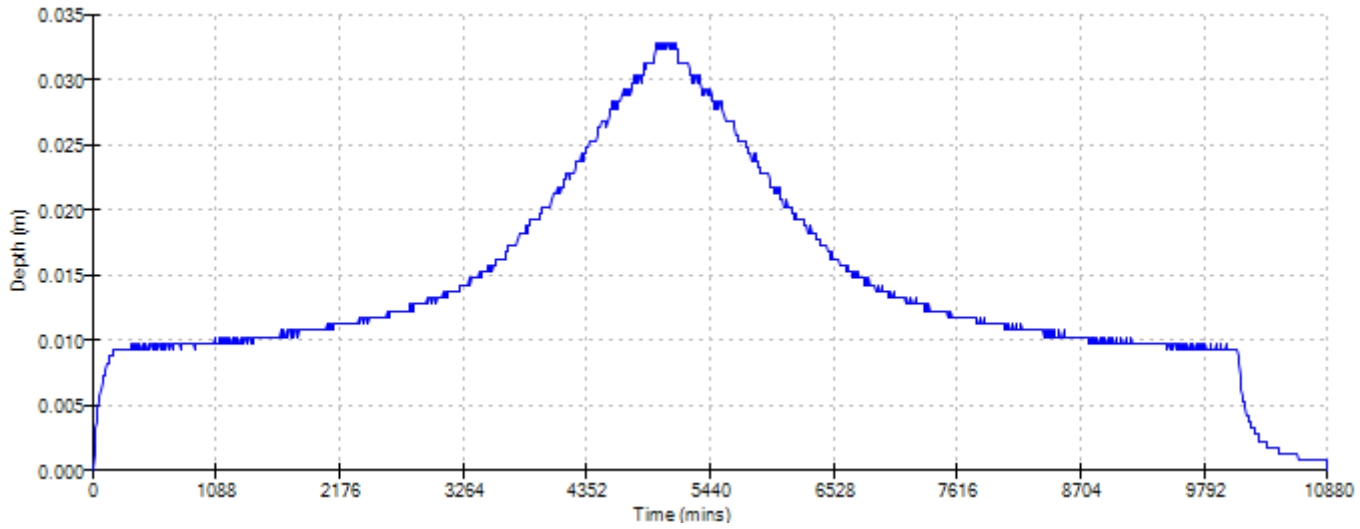
Event: 10080 min Summer







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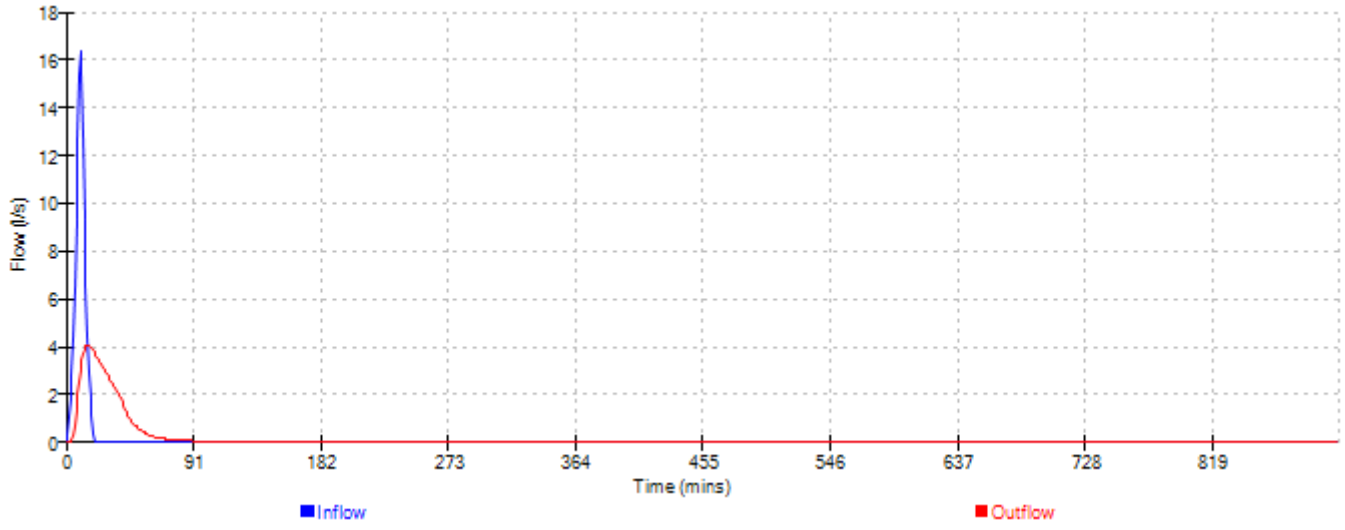
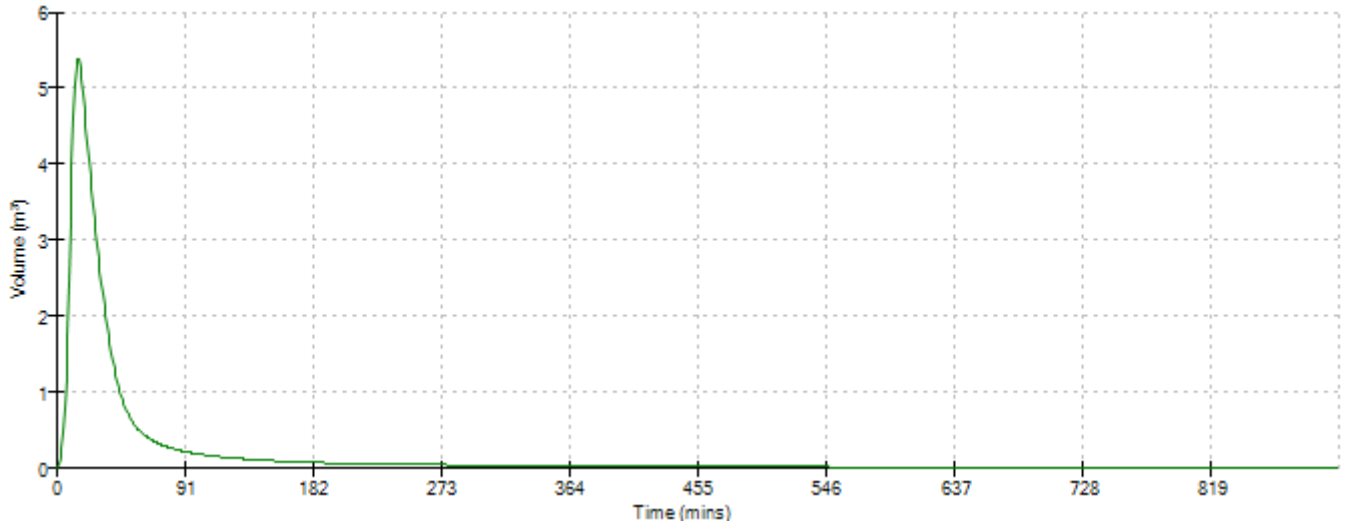
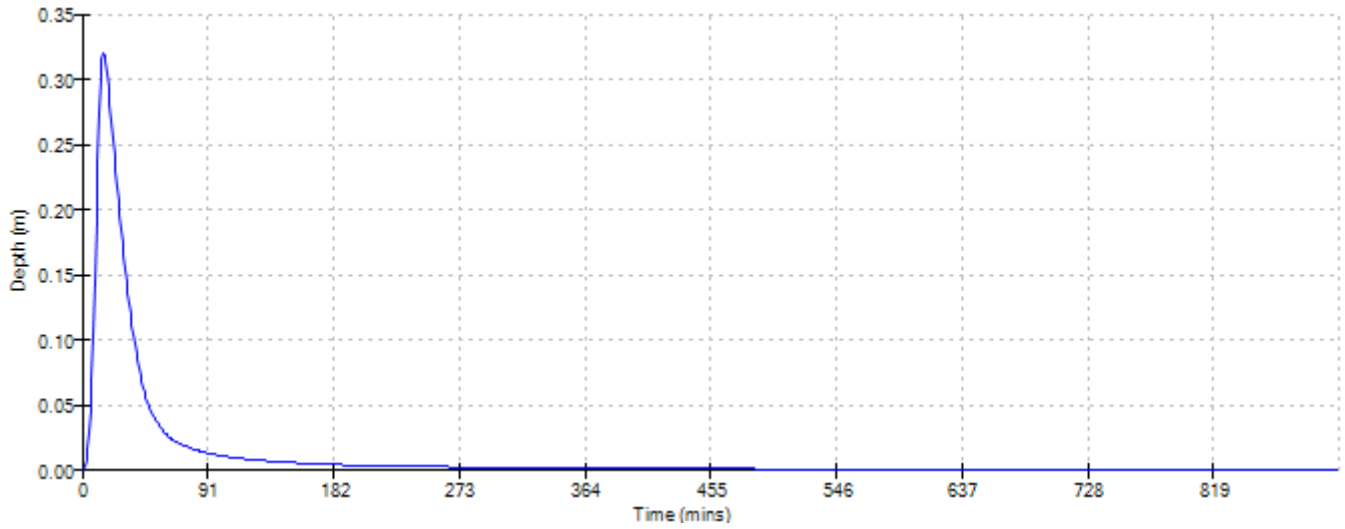
Event: 15 min Winter







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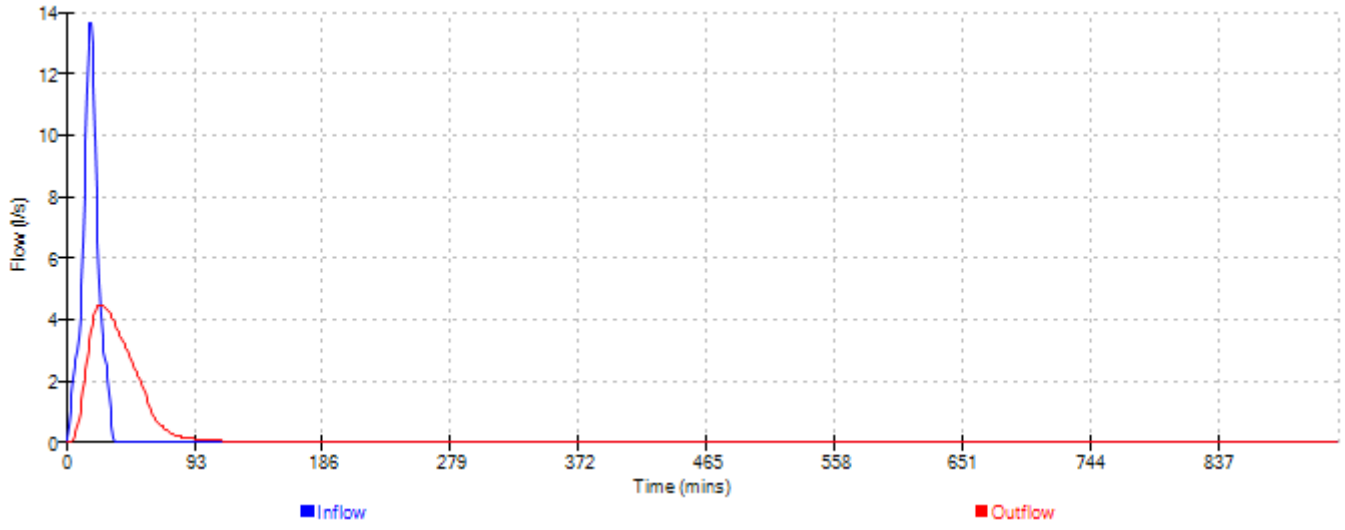
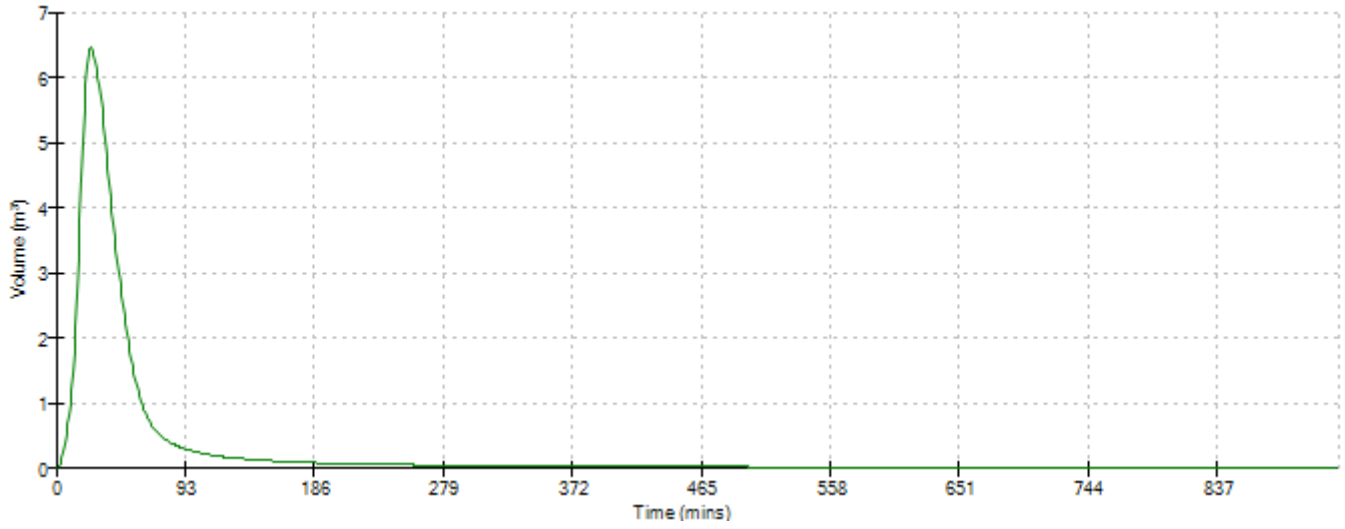
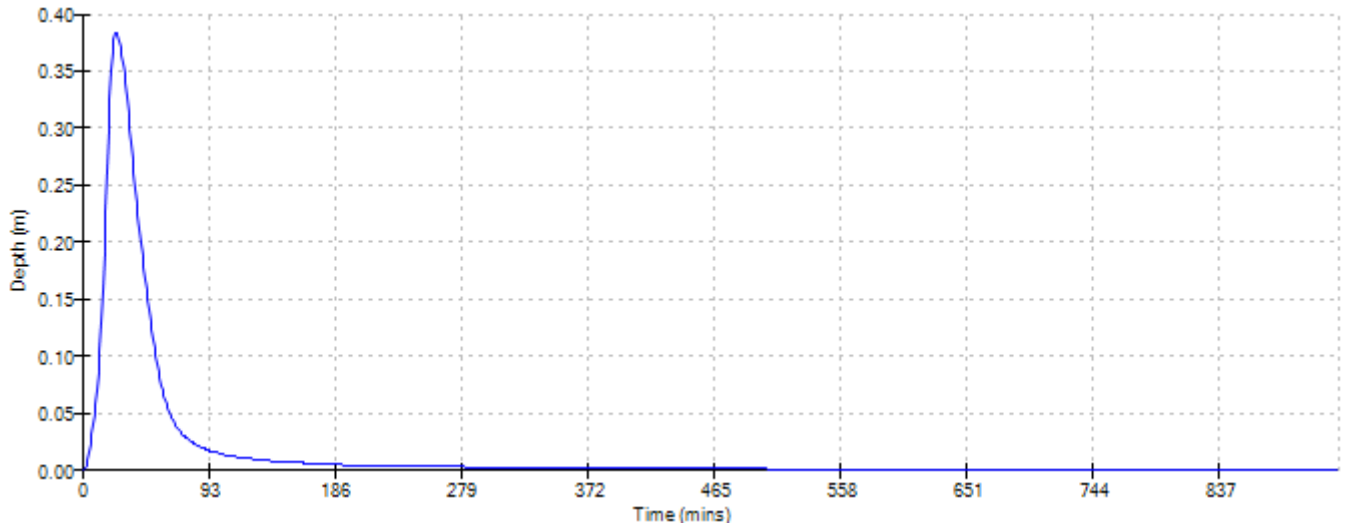
Event: 30 min Winter







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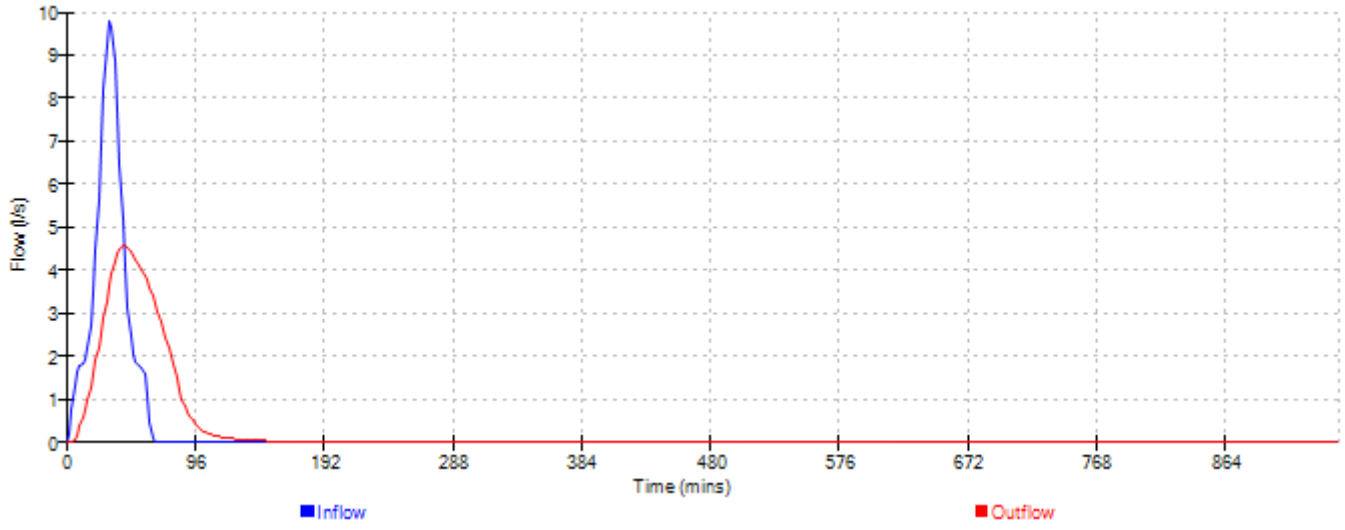
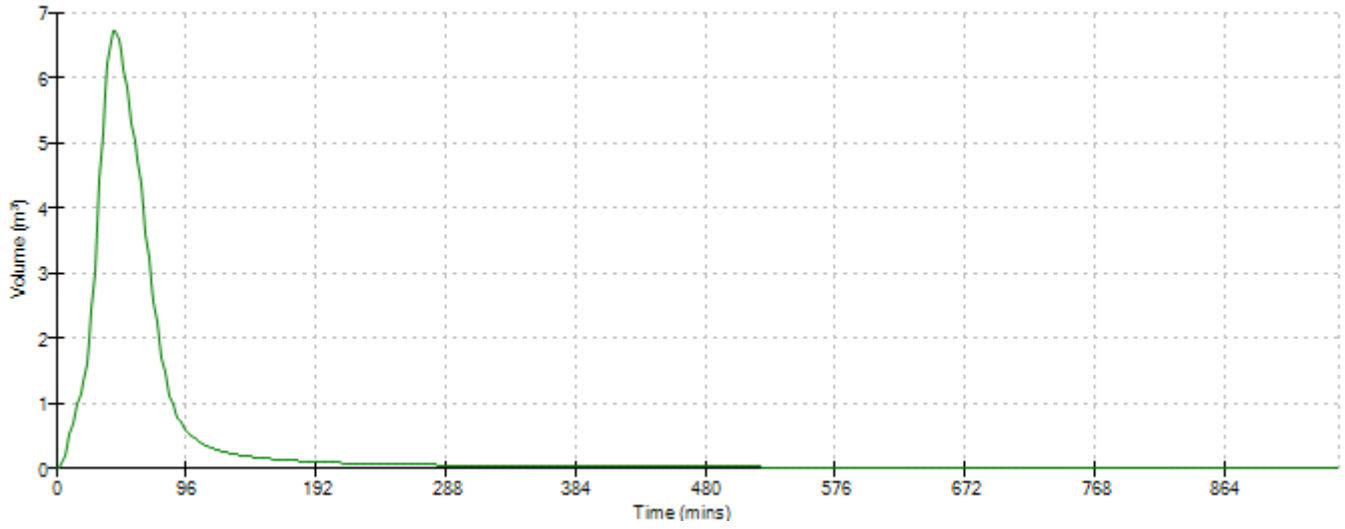
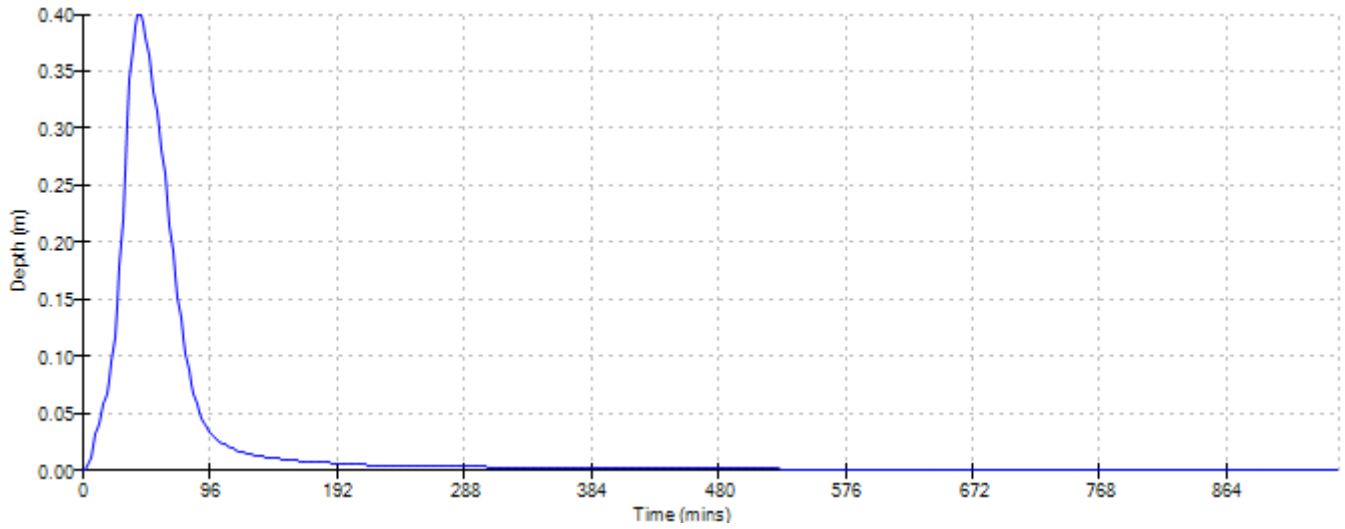
Event: 60 min Winter







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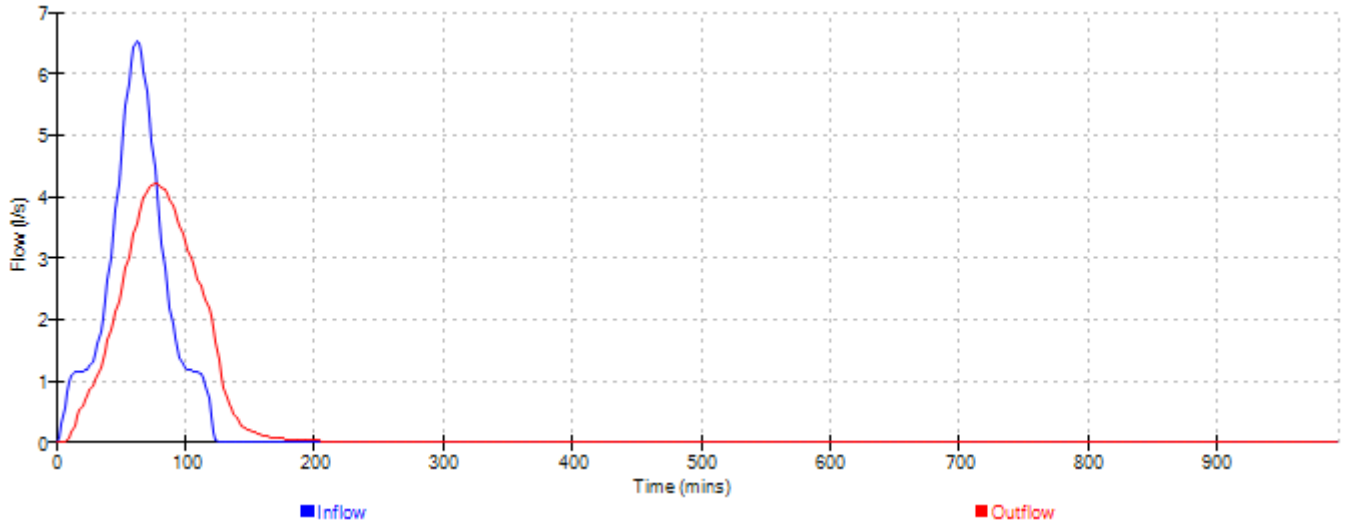
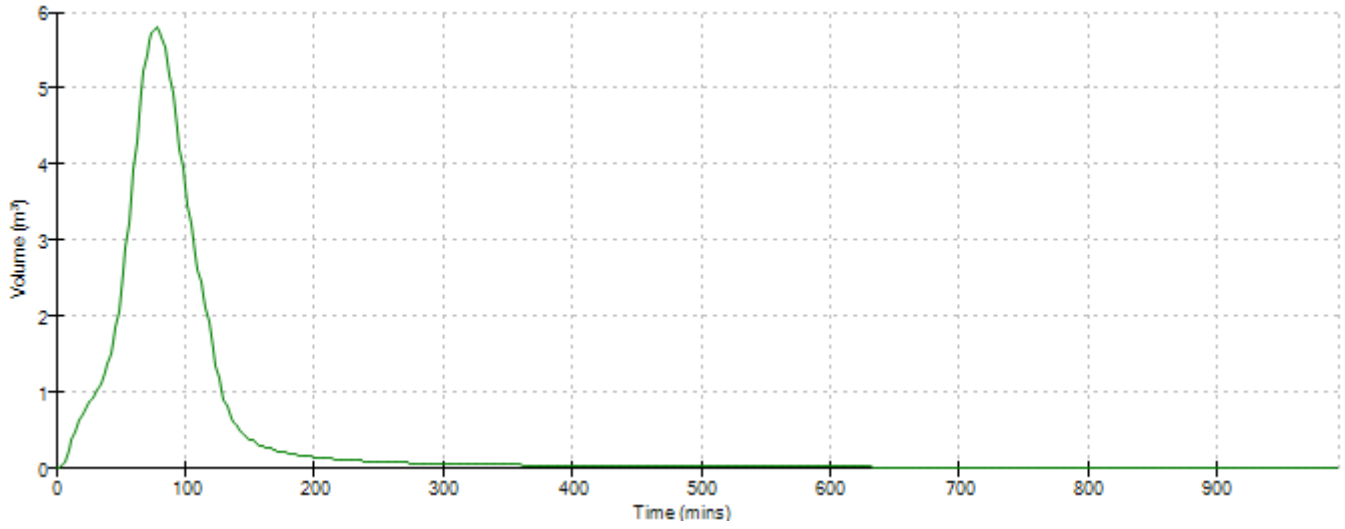
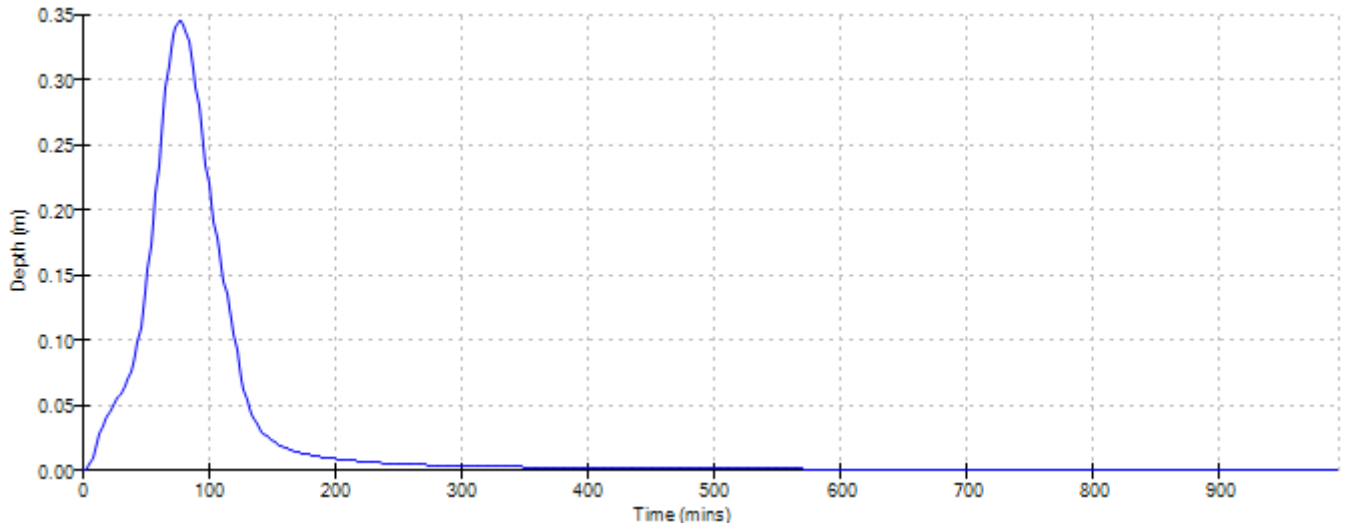
Event: 120 min Winter







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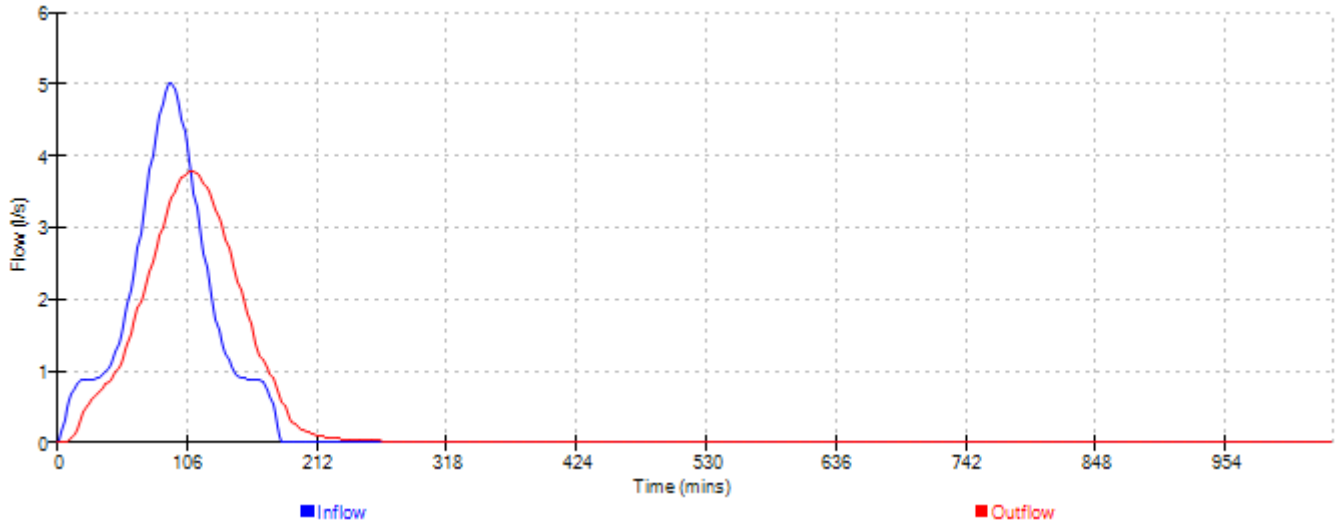
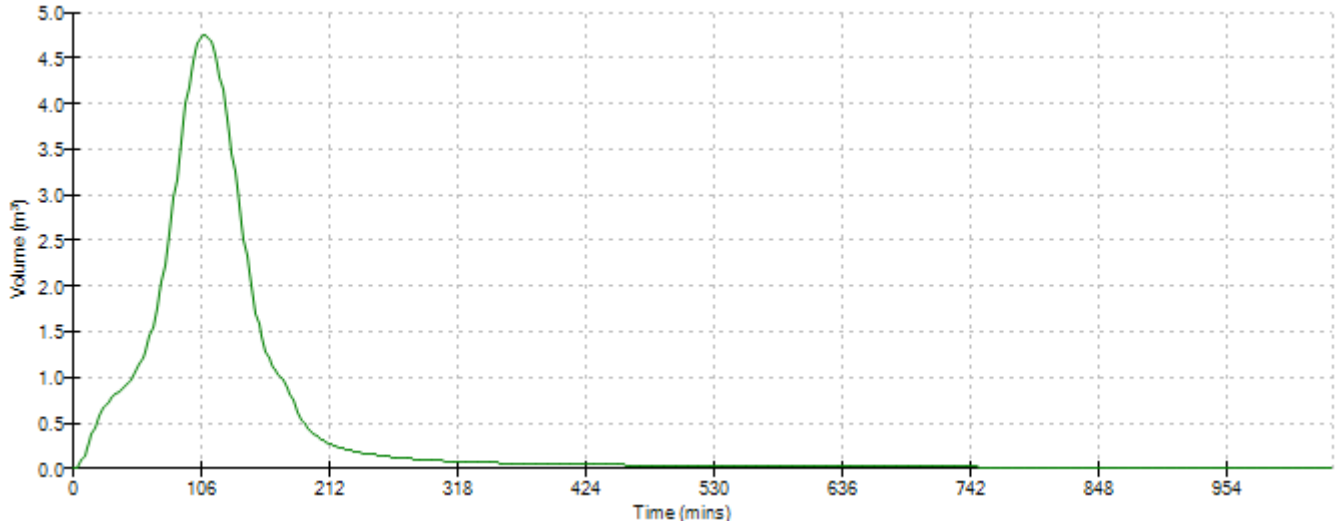
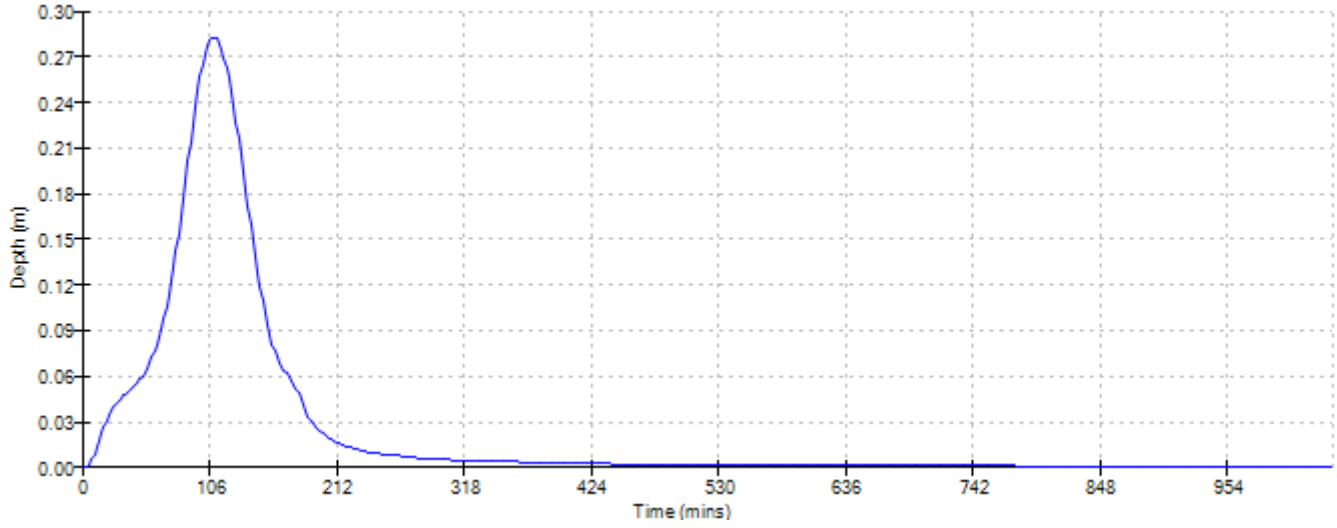
Event: 180 min Winter







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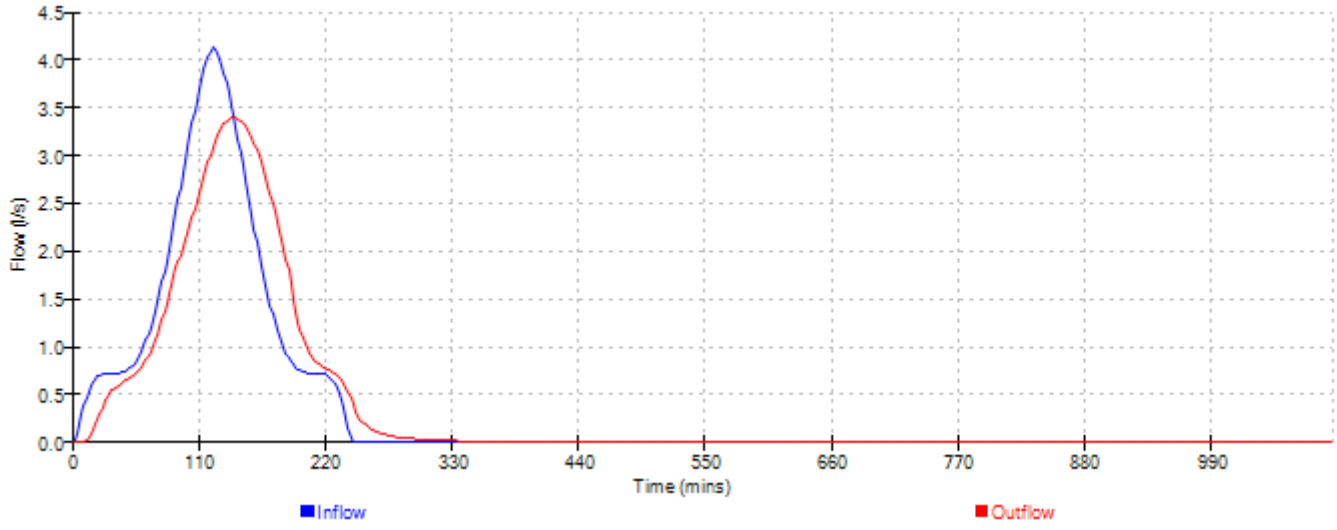
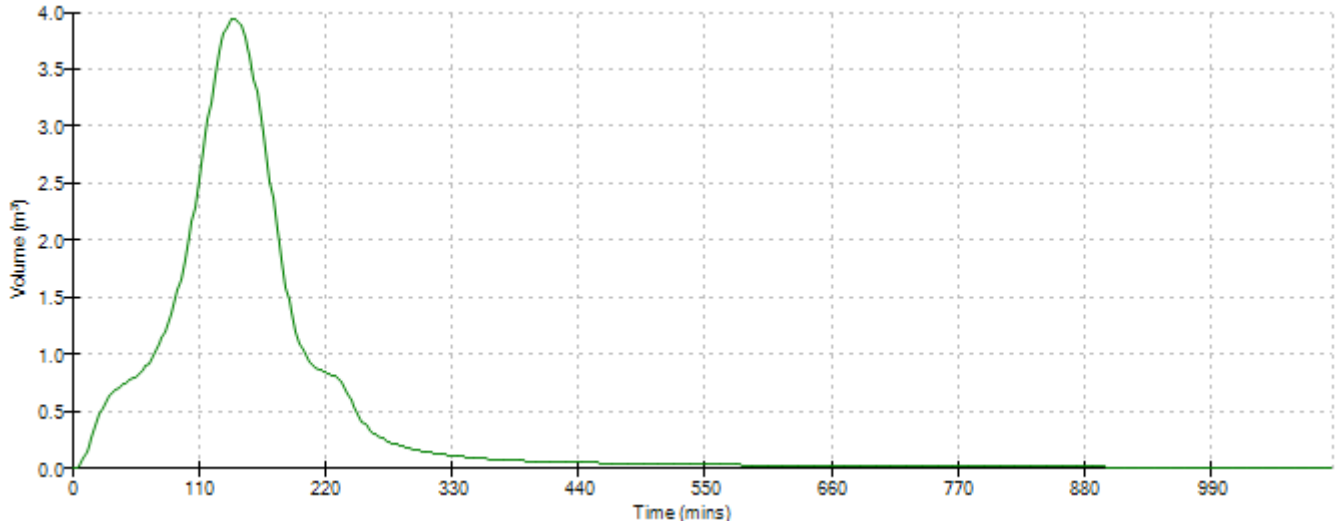
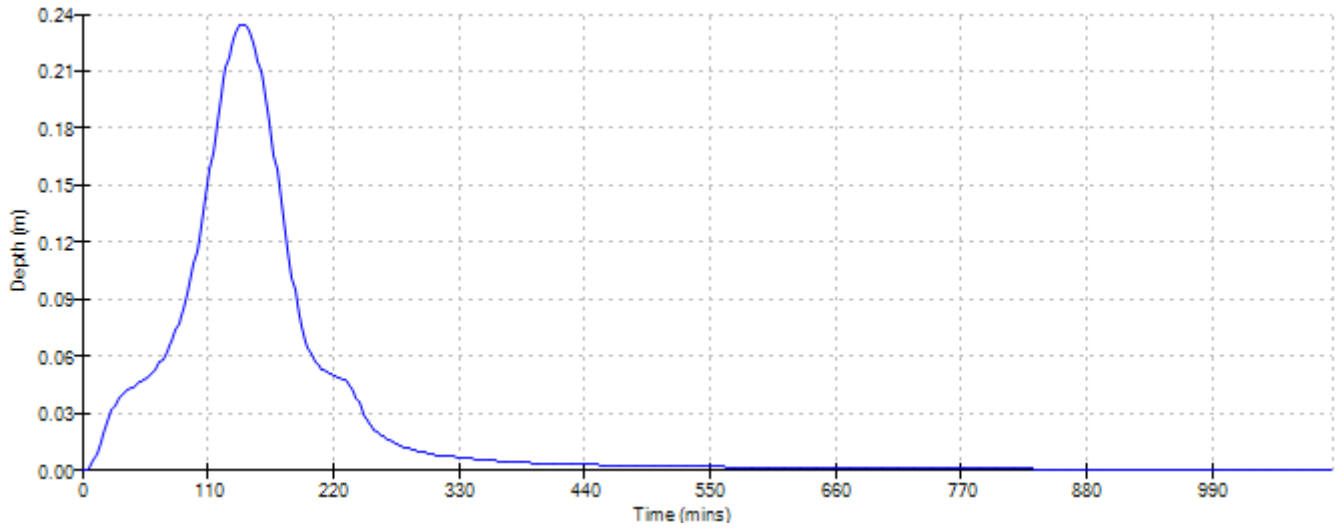
Event: 240 min Winter







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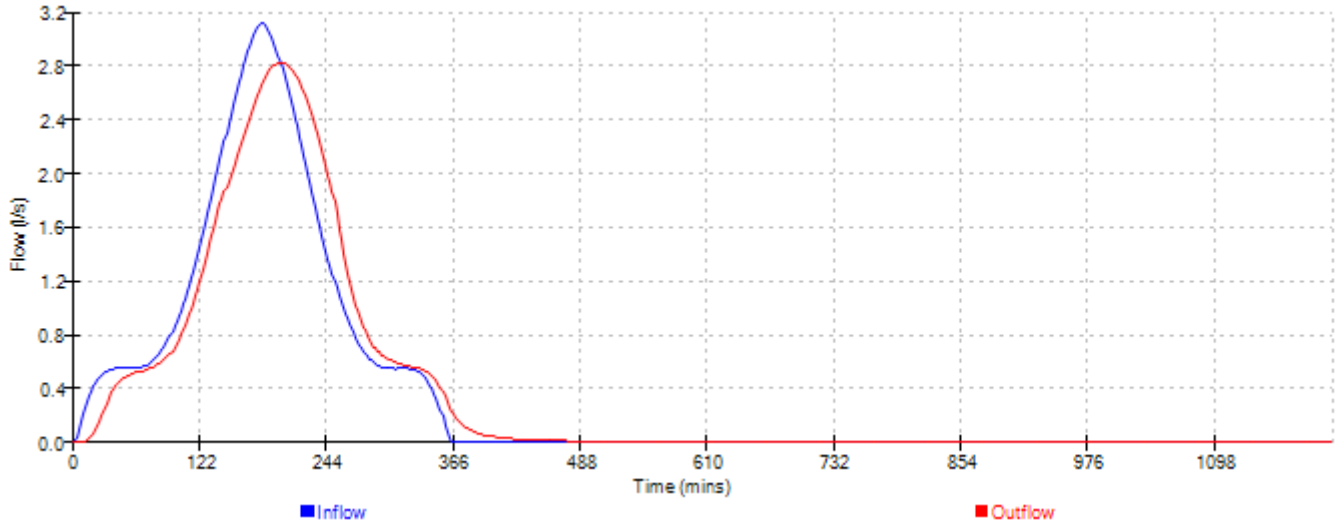
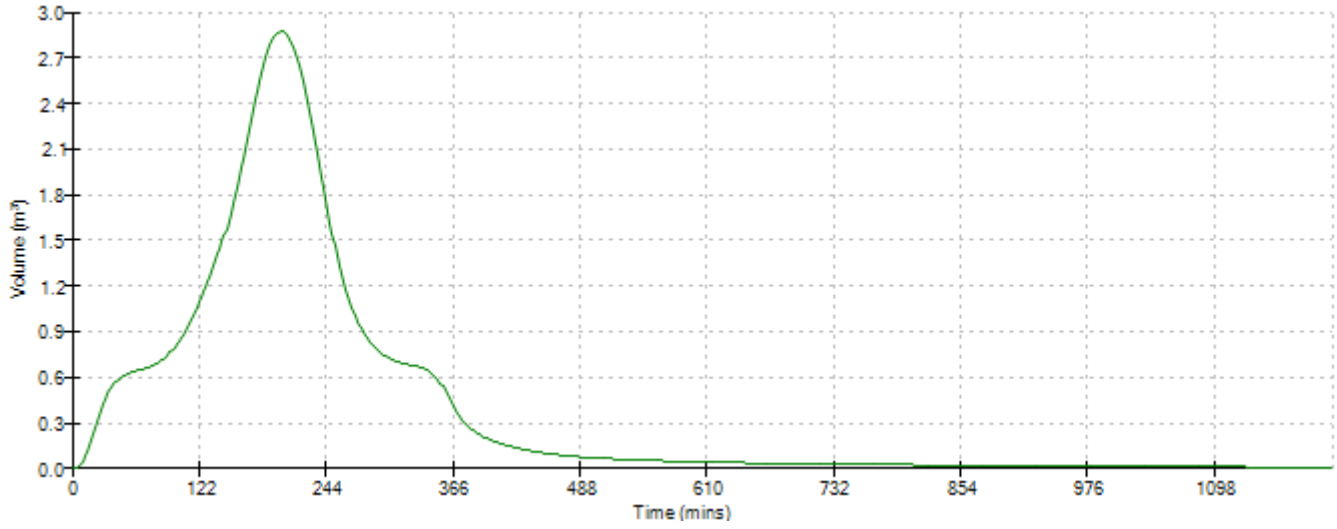
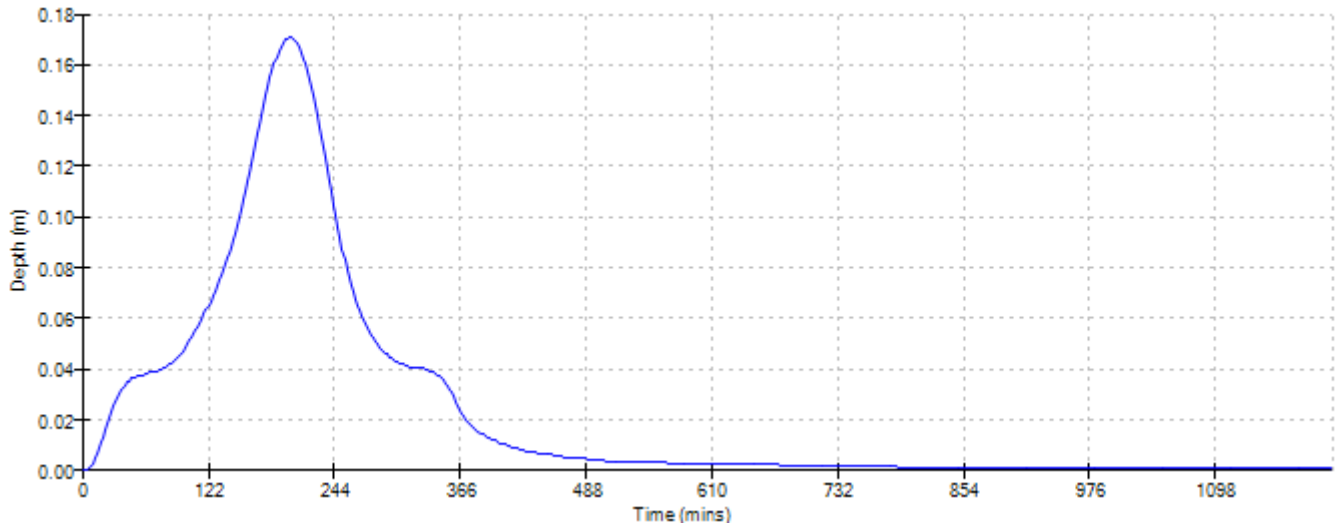
Event: 360 min Winter







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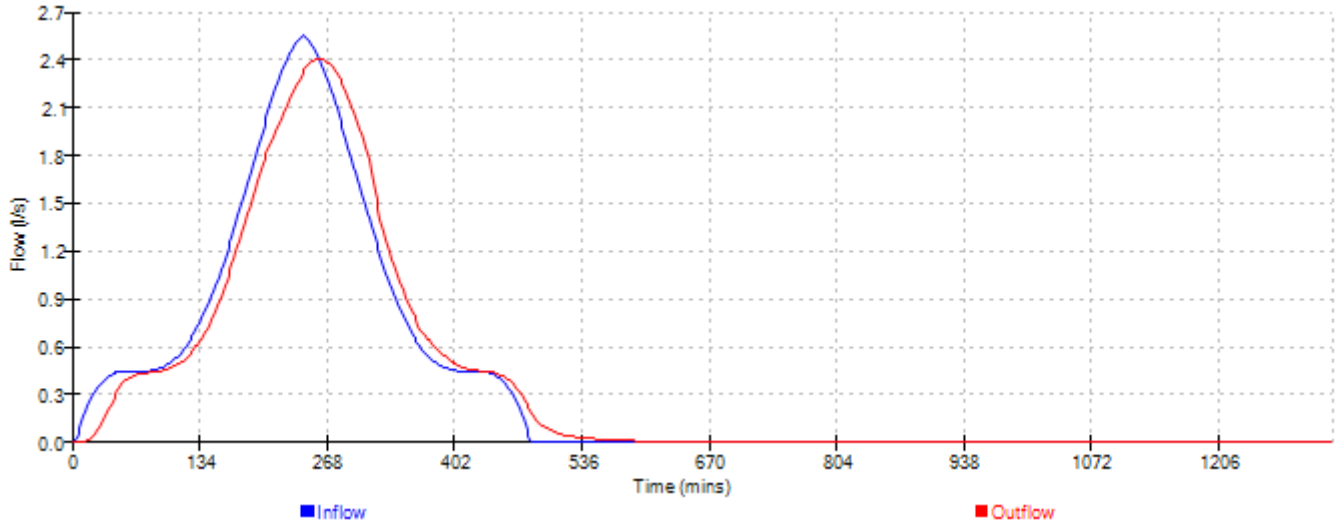
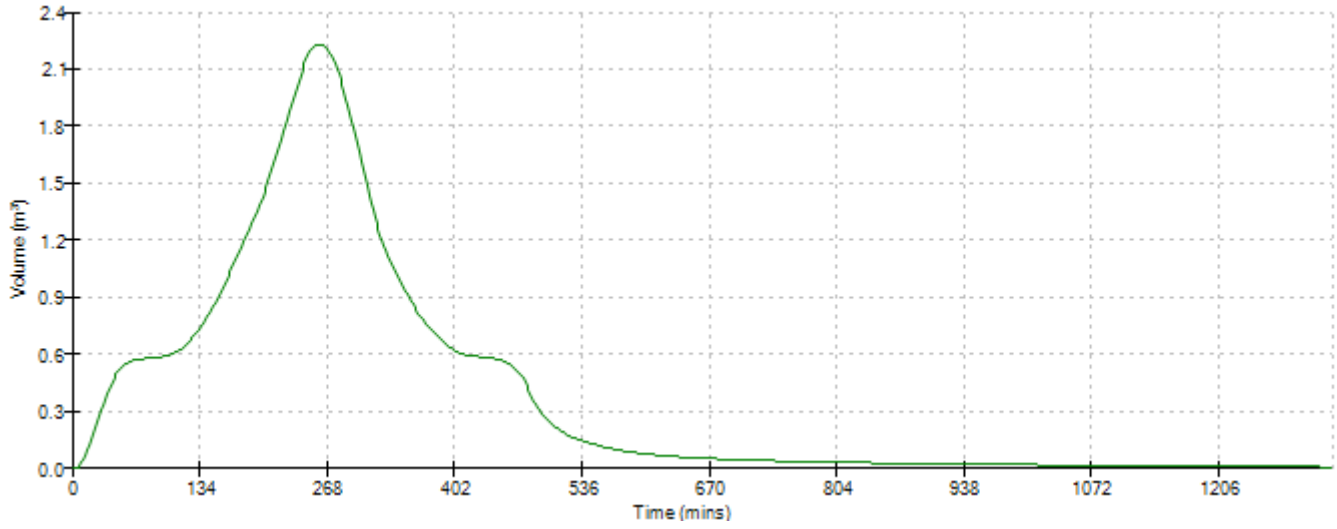
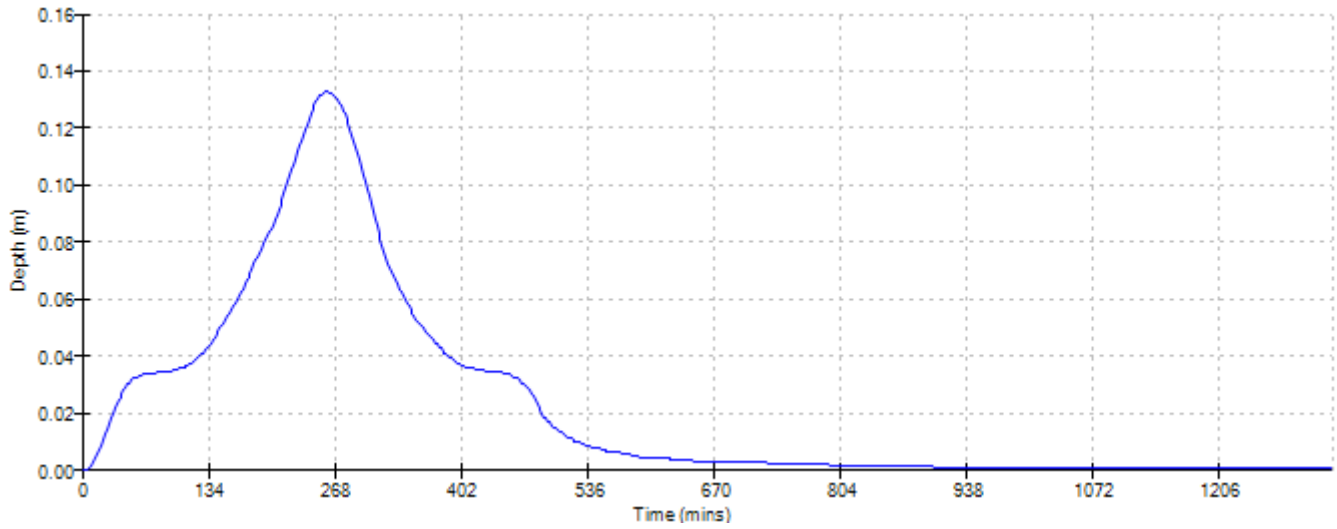
Event: 480 min Winter







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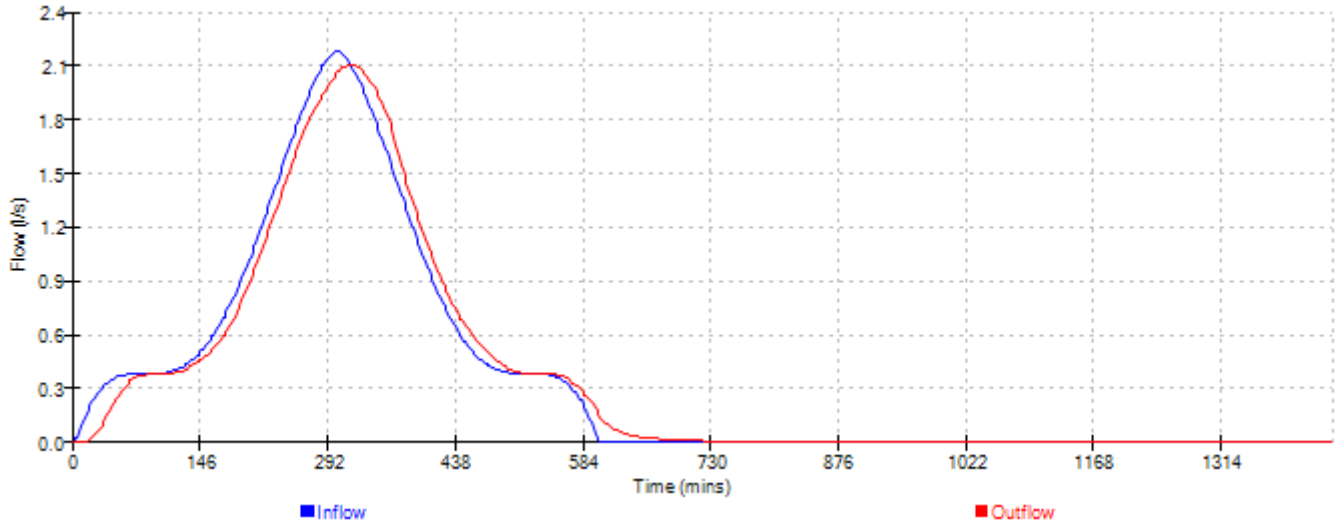
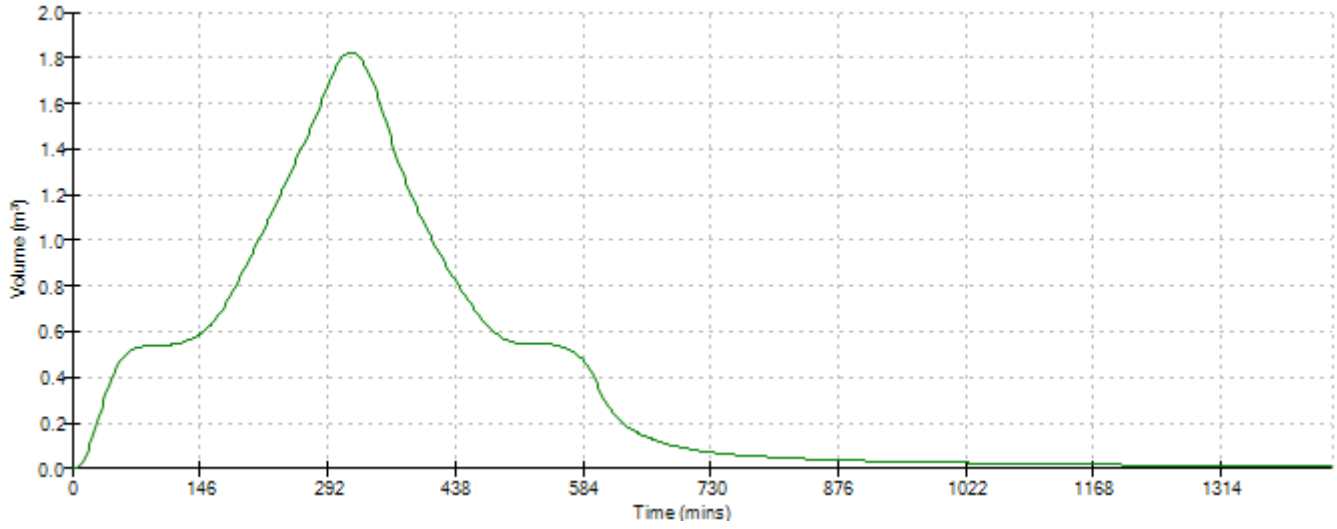
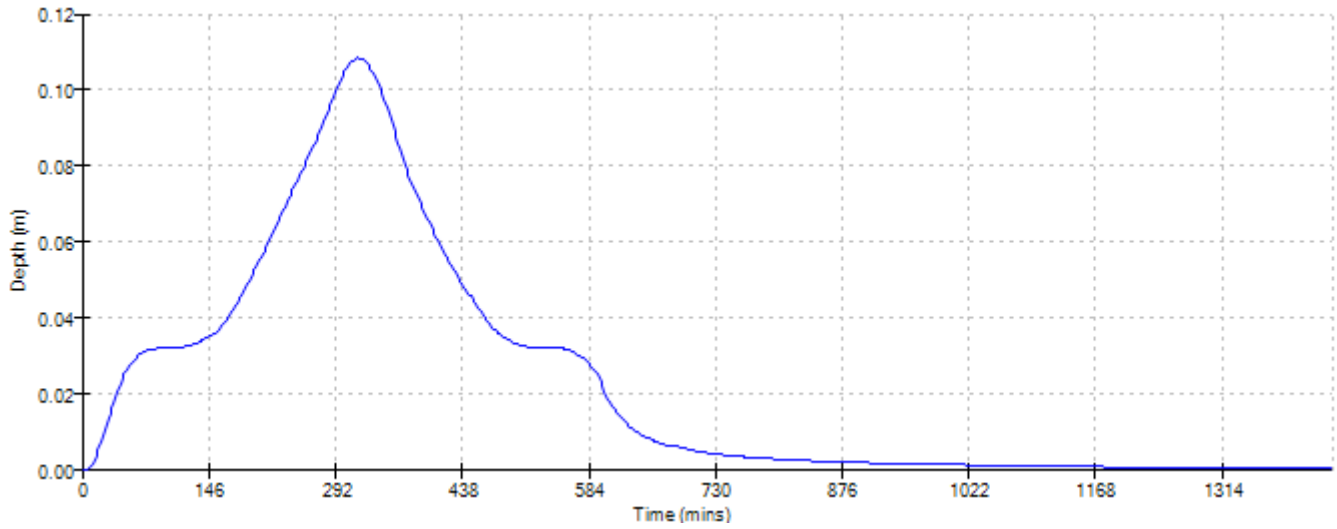
Event: 600 min Winter







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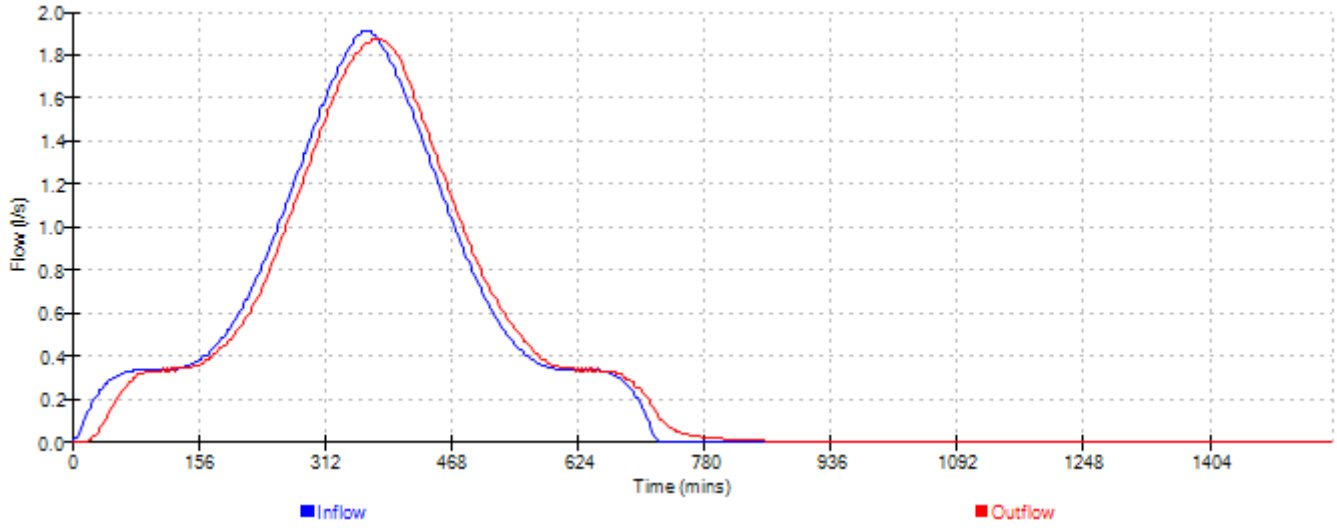
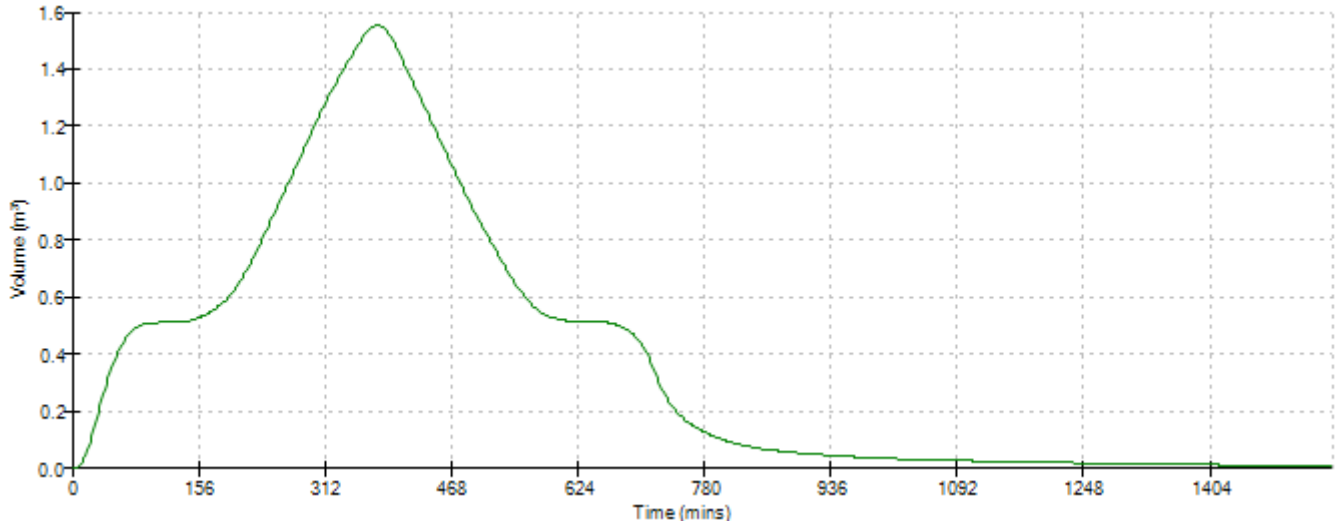
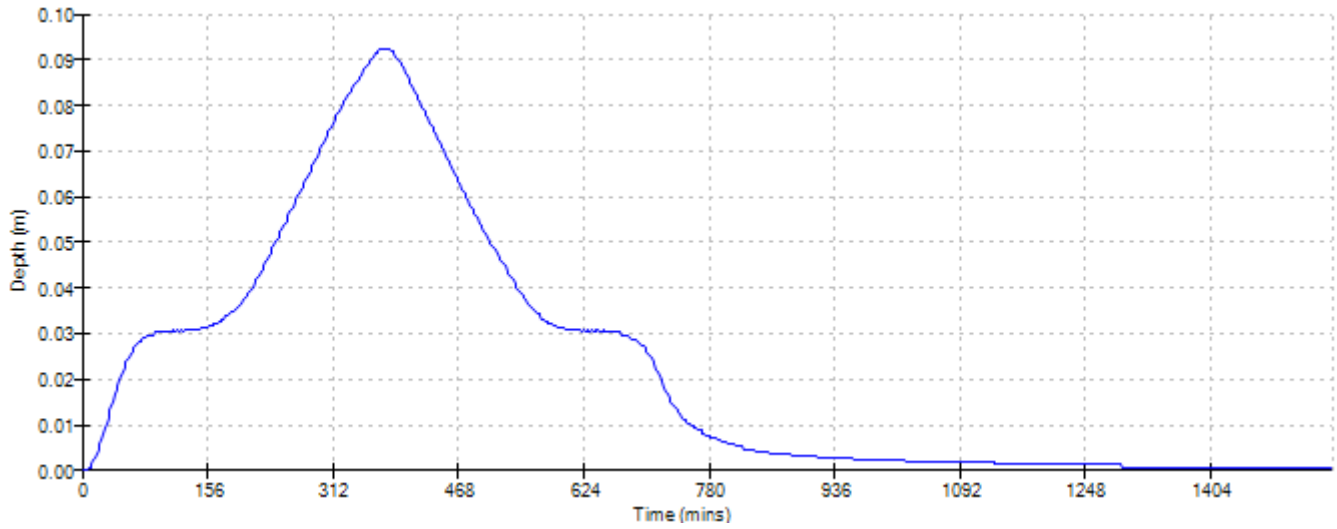
Event: 720 min Winter







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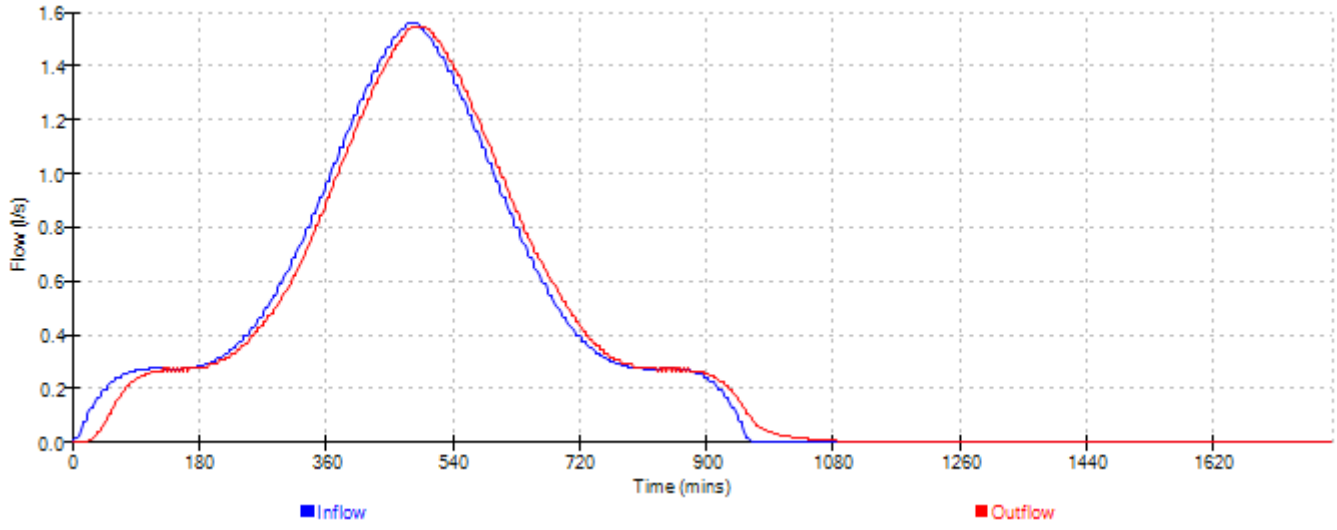
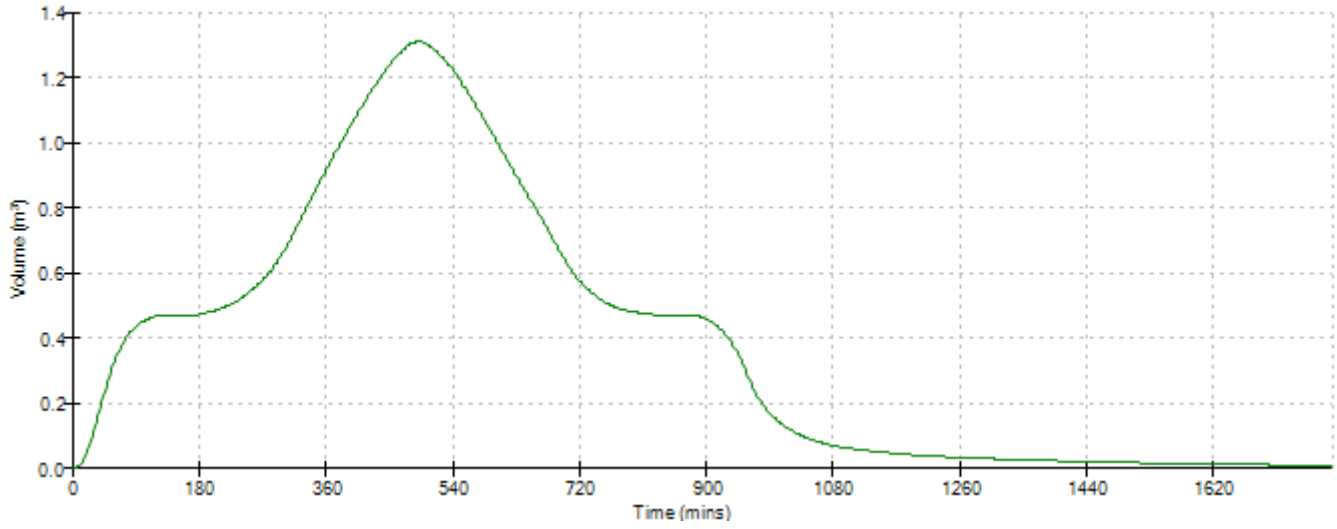
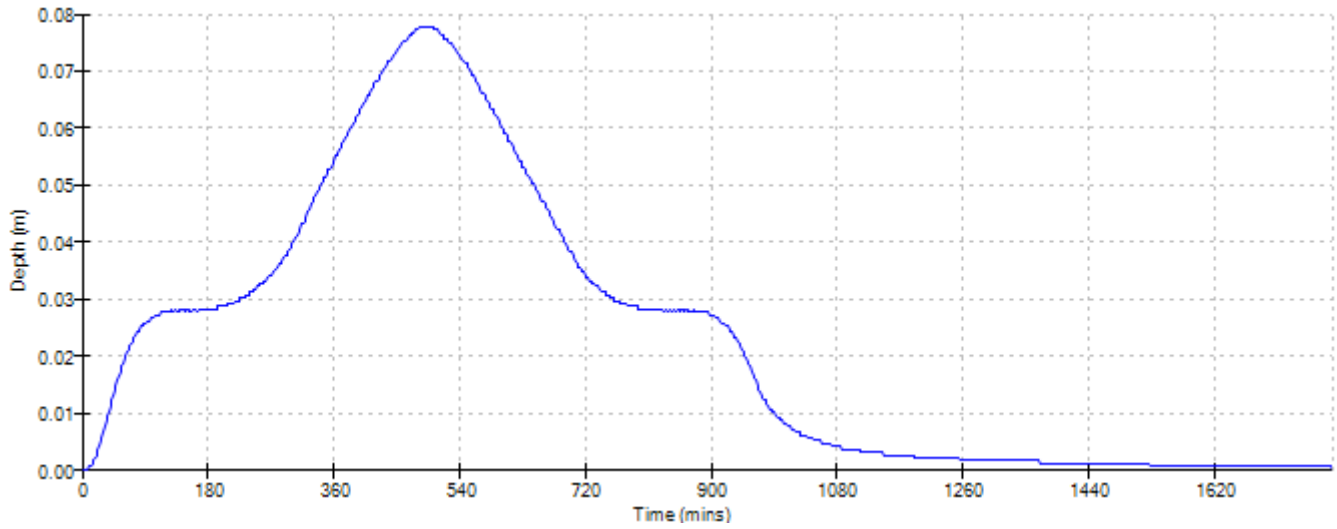
Event: 960 min Winter







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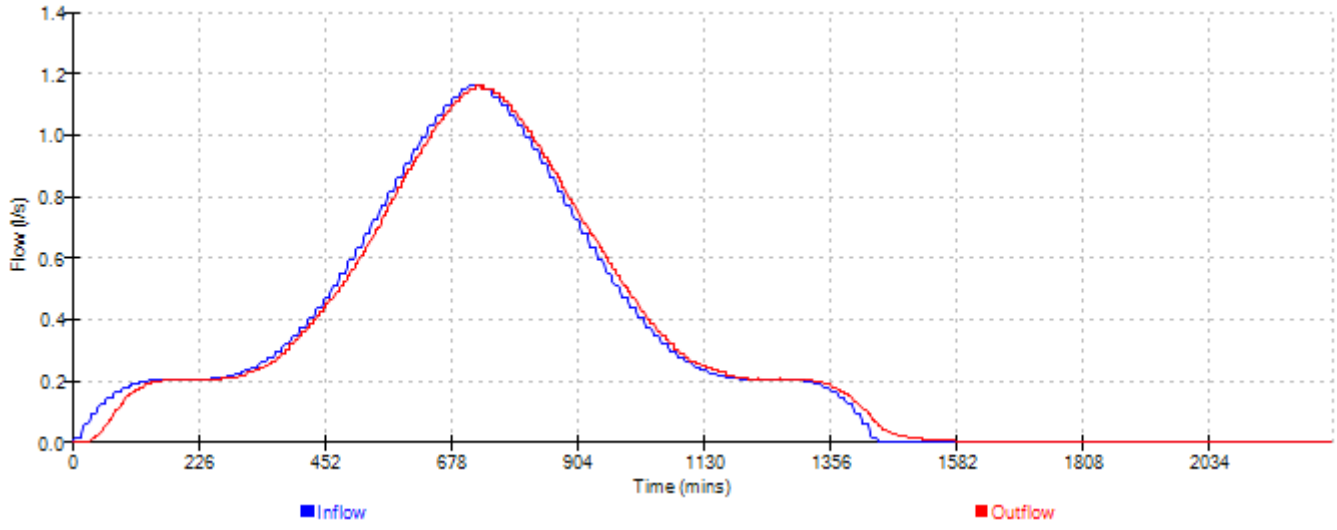
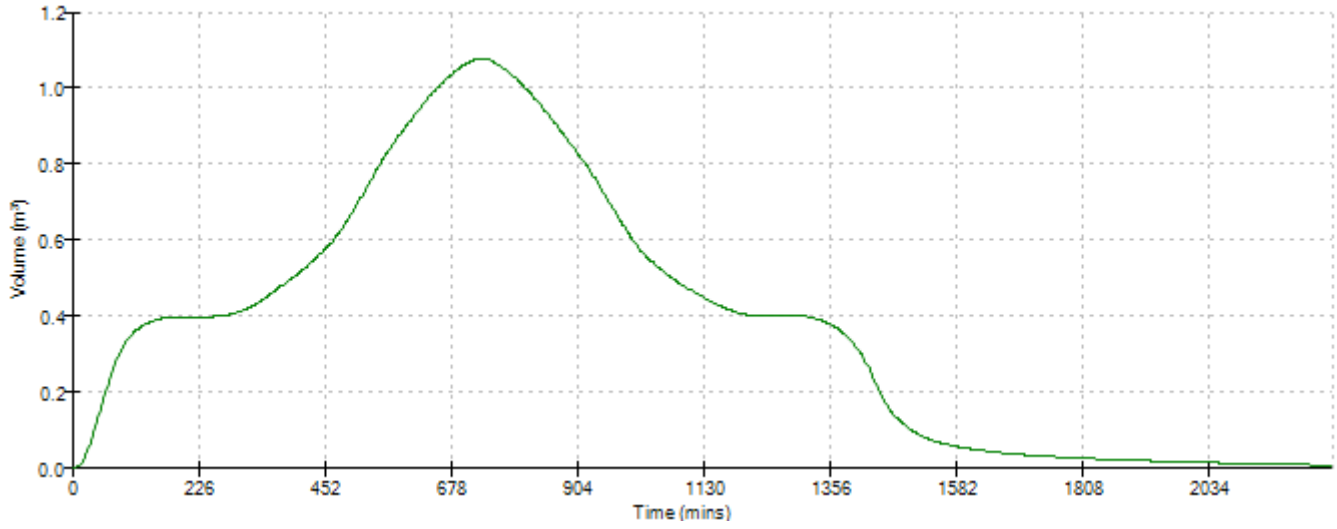
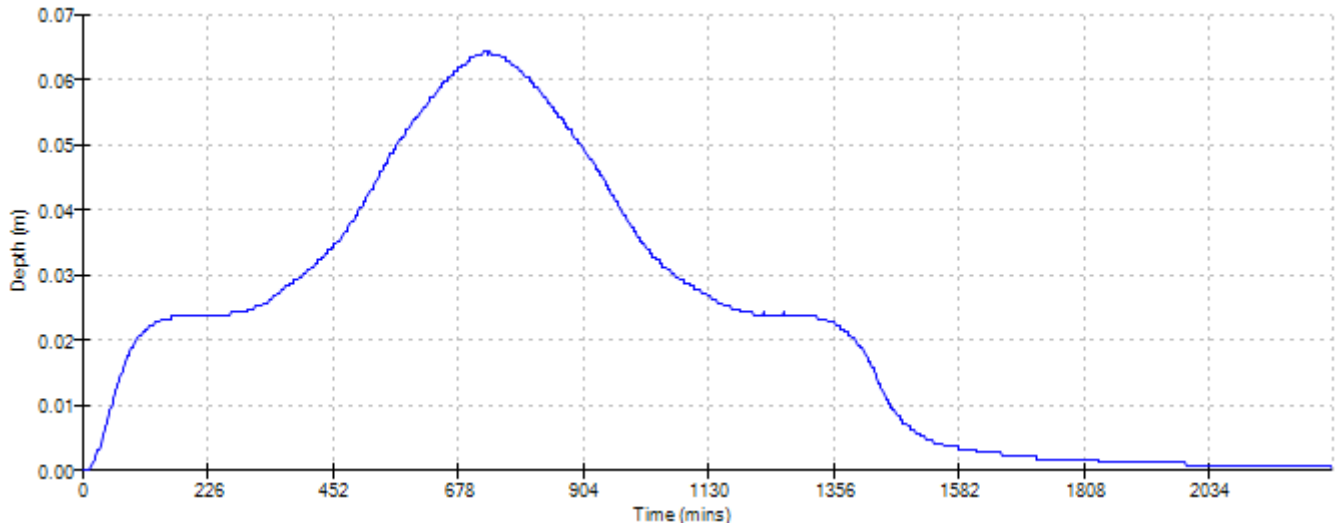
Event: 1440 min Winter







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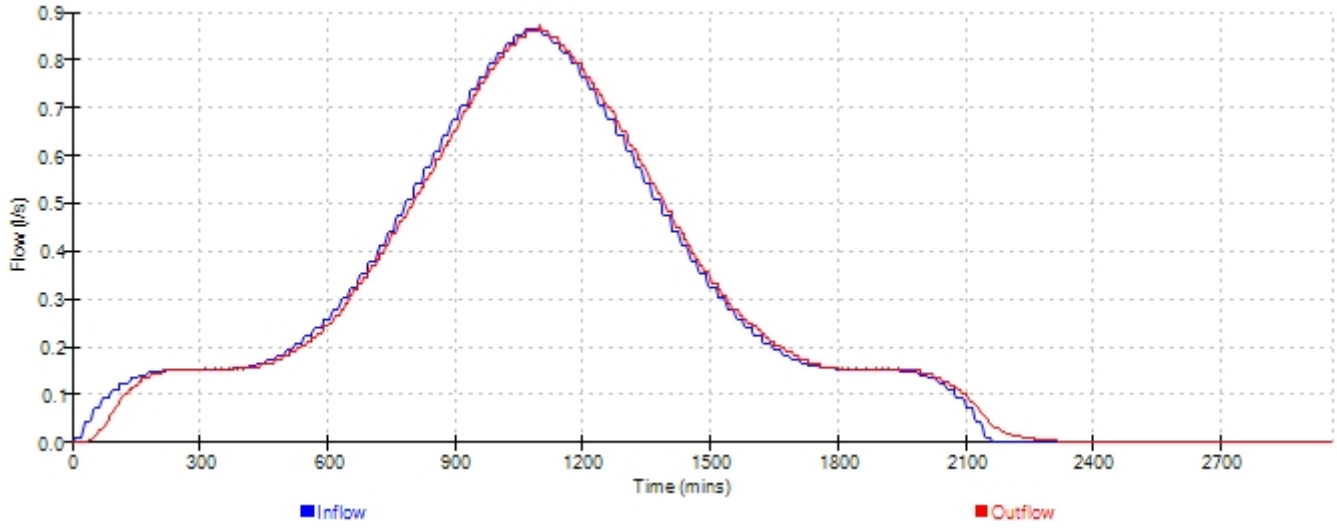
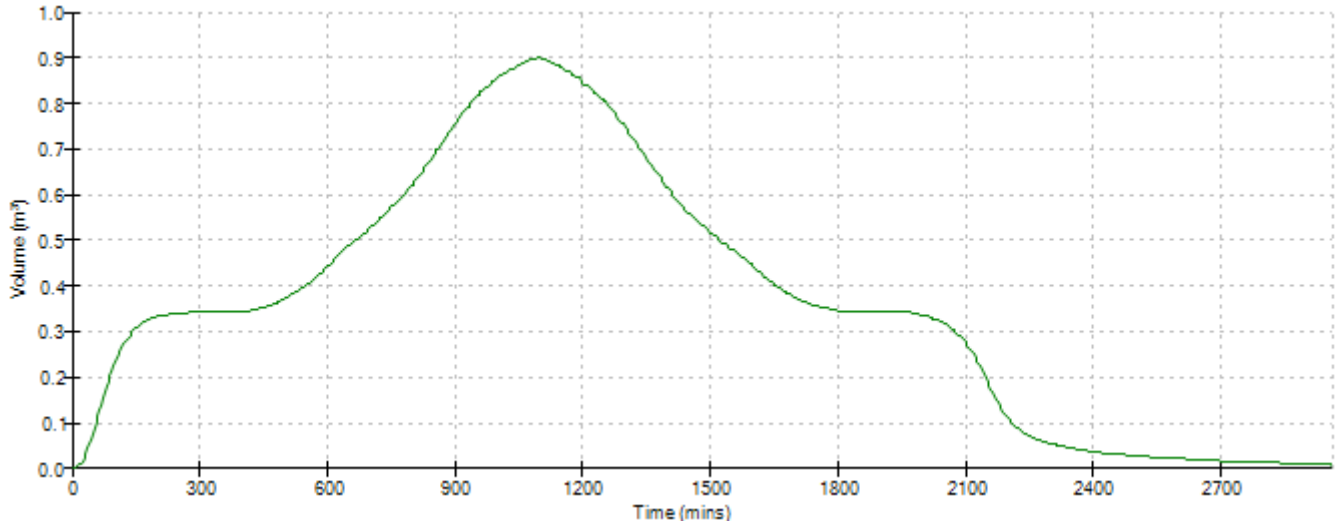
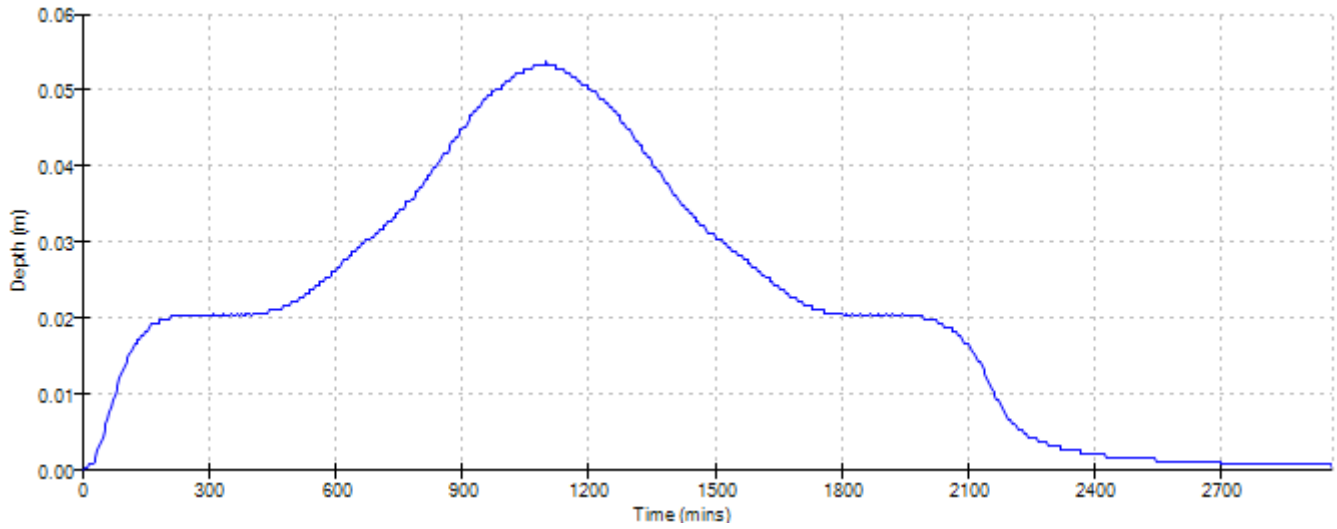
Event: 2160 min Winter







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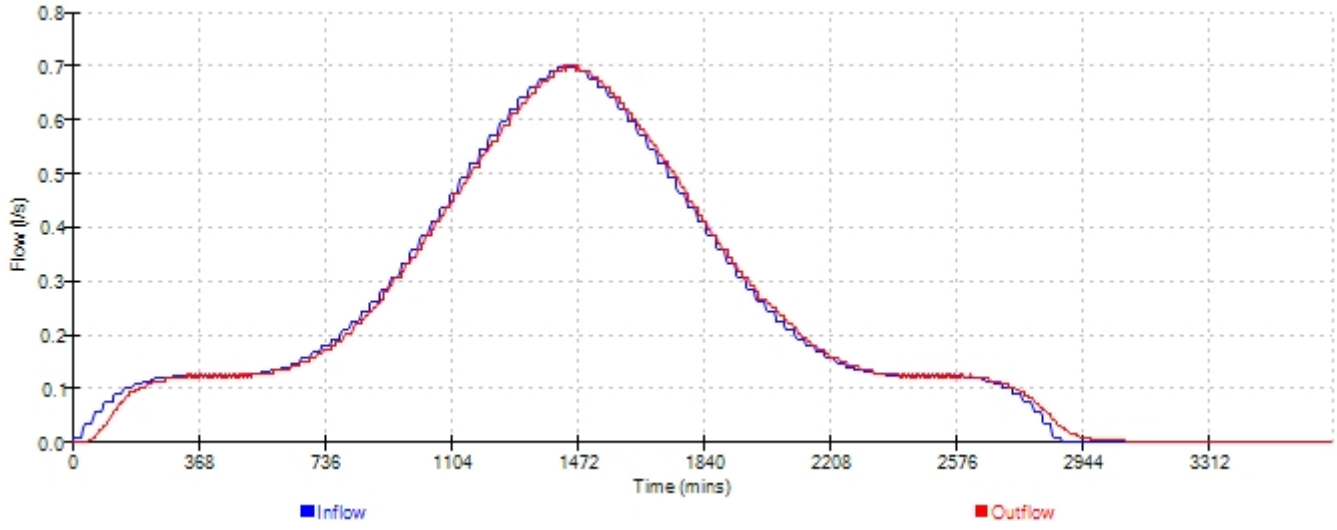
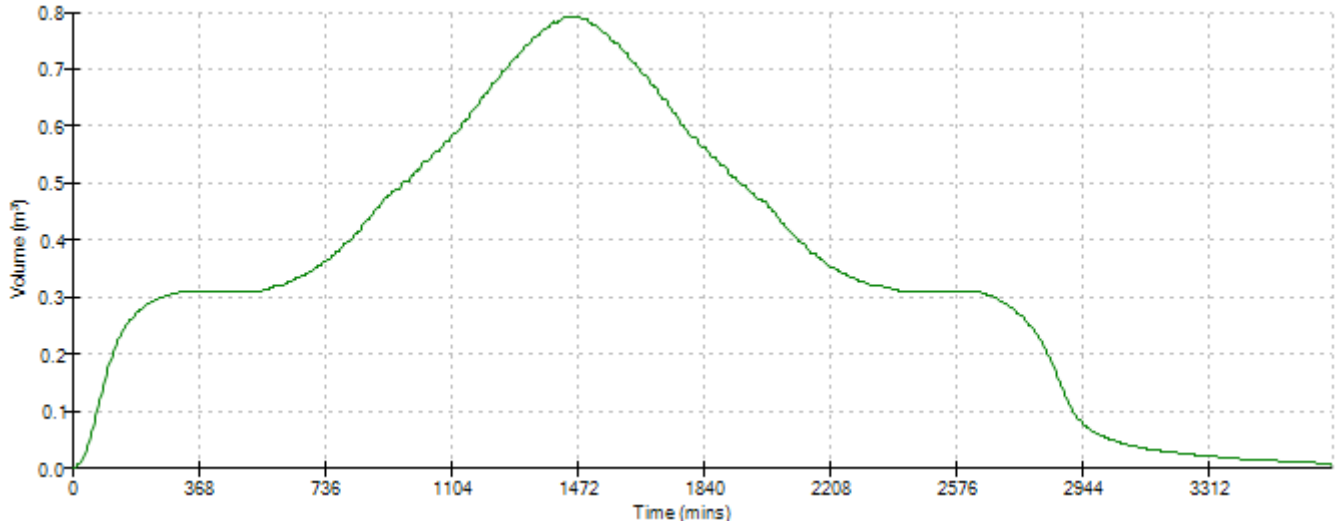
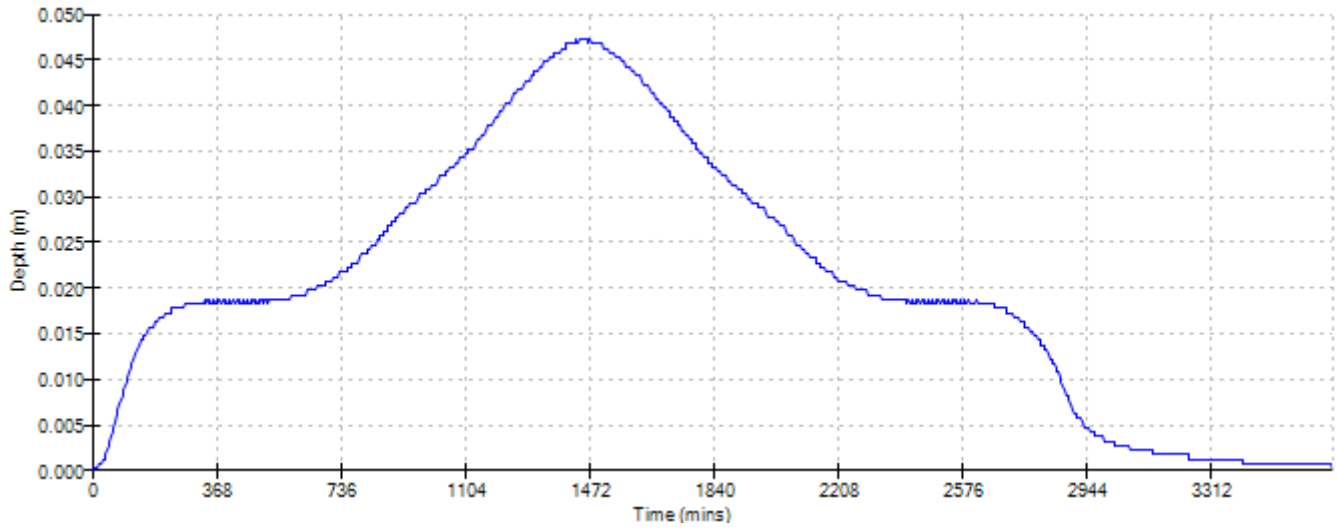
Event: 2880 min Winter







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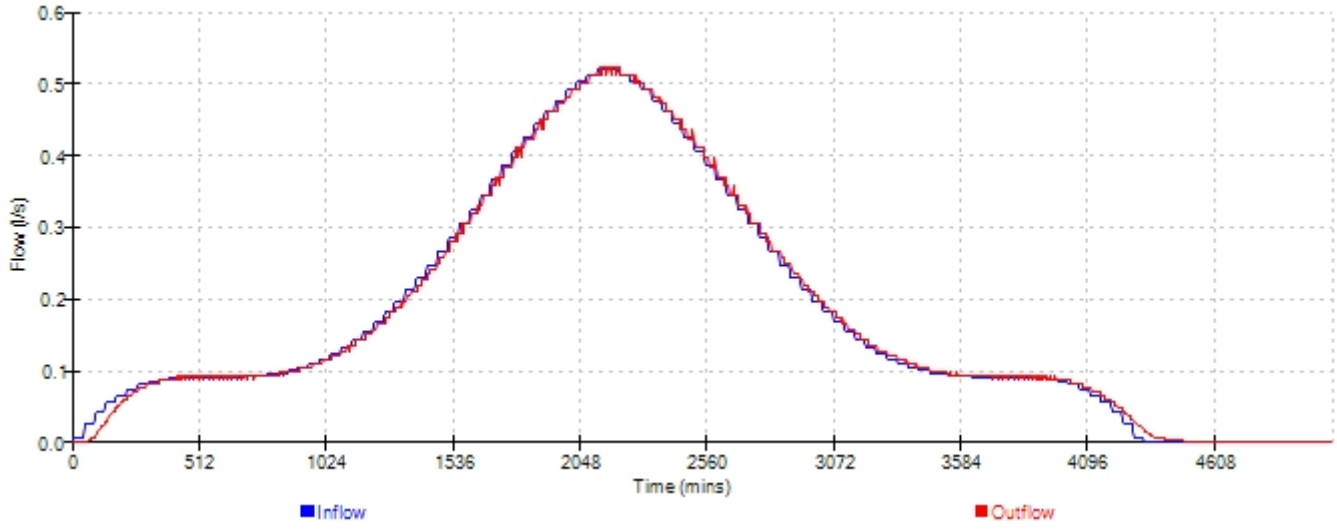
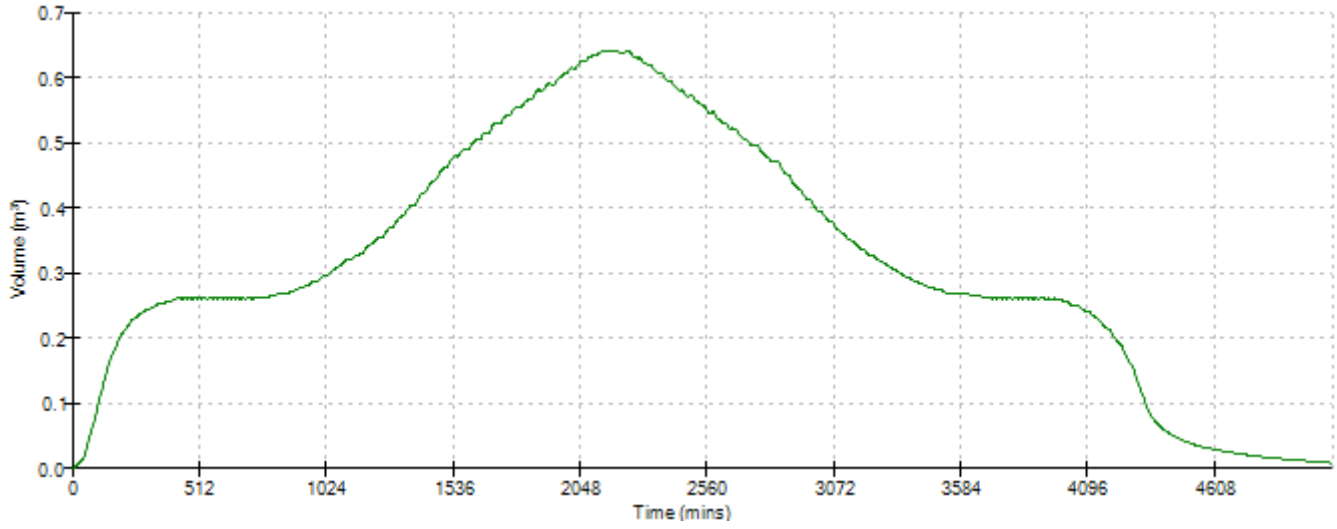
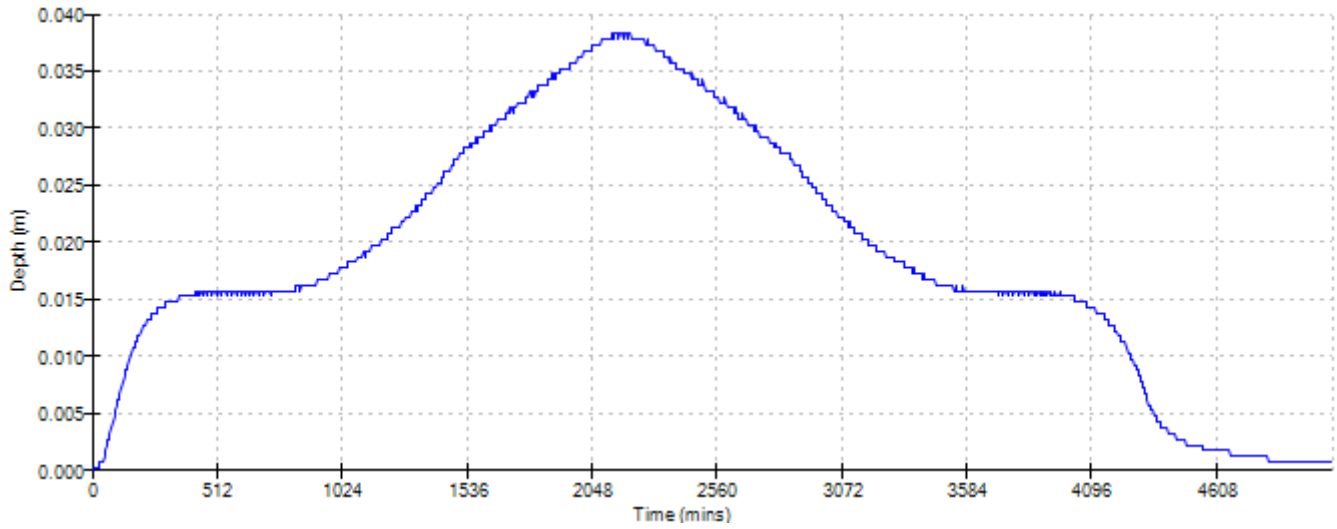
Event: 4320 min Winter







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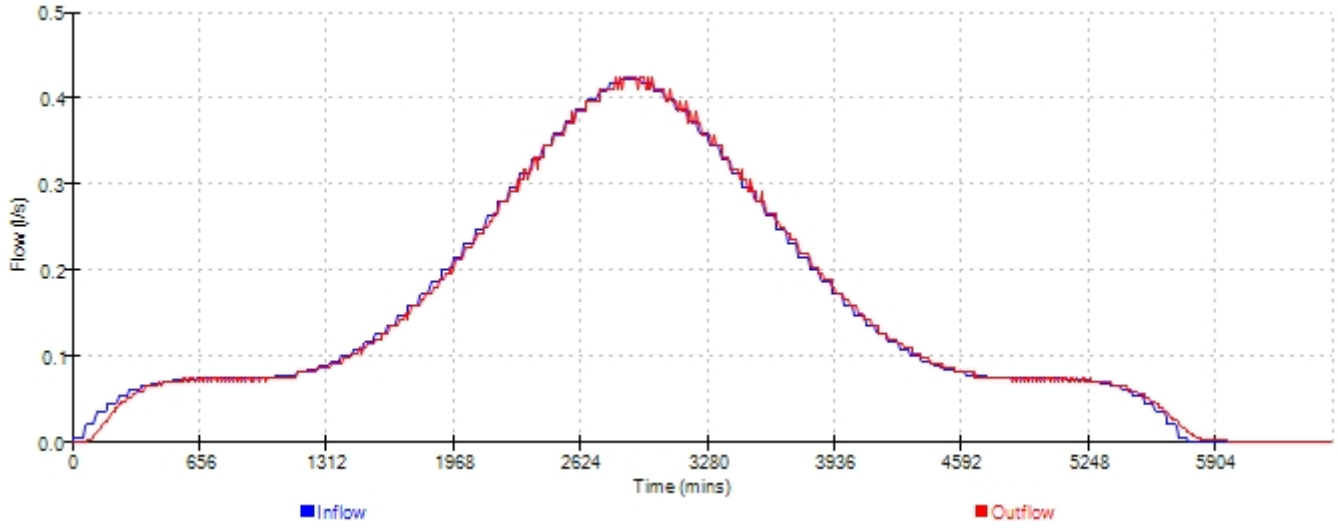
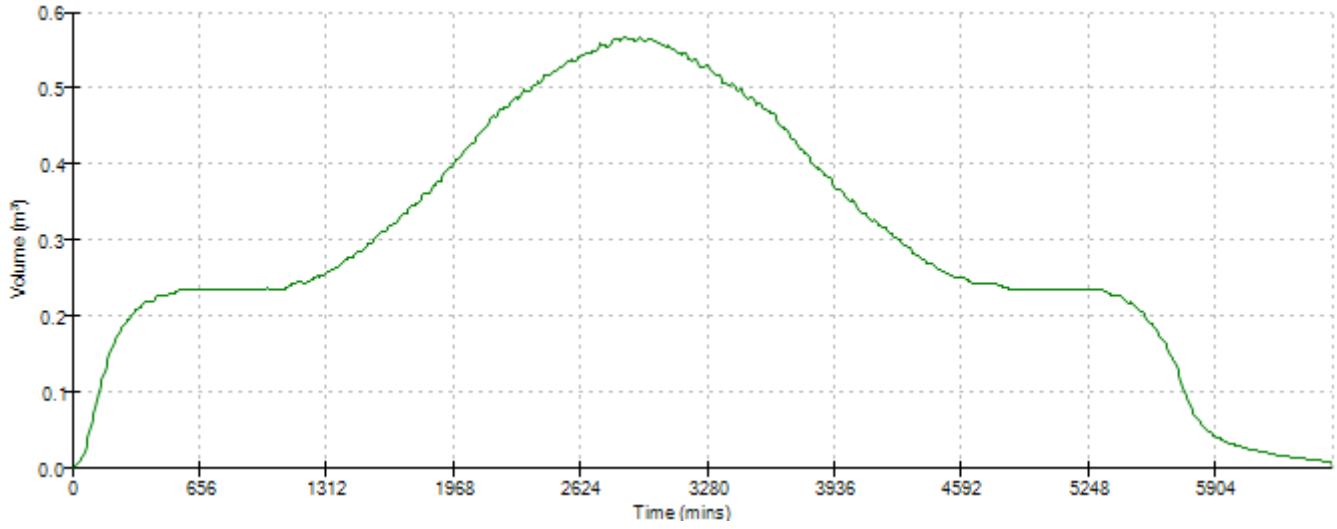
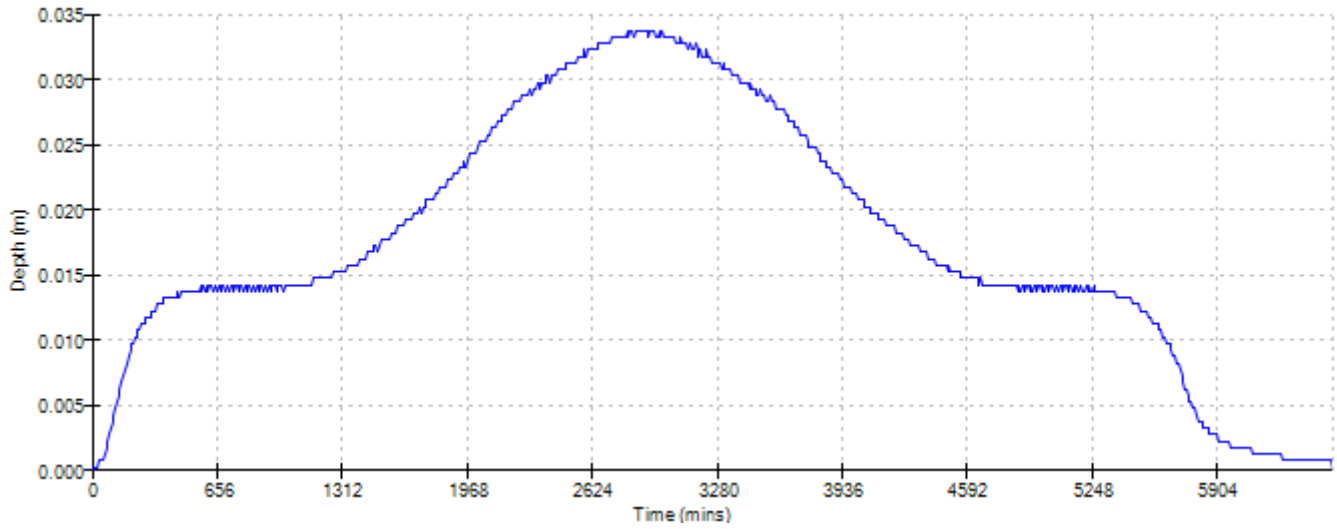
Event: 5760 min Winter







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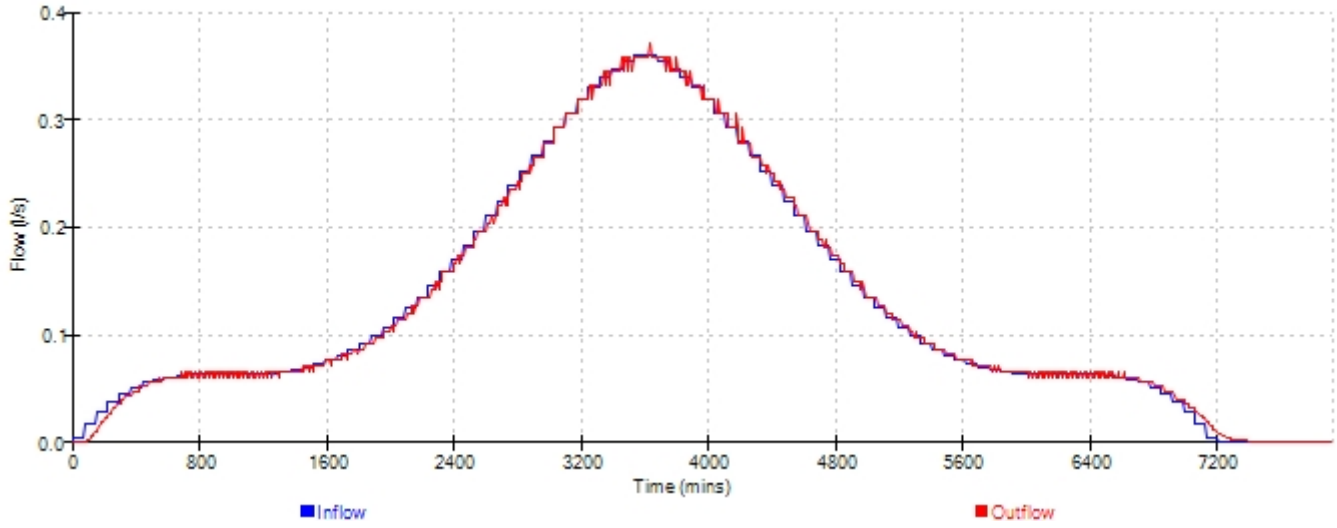
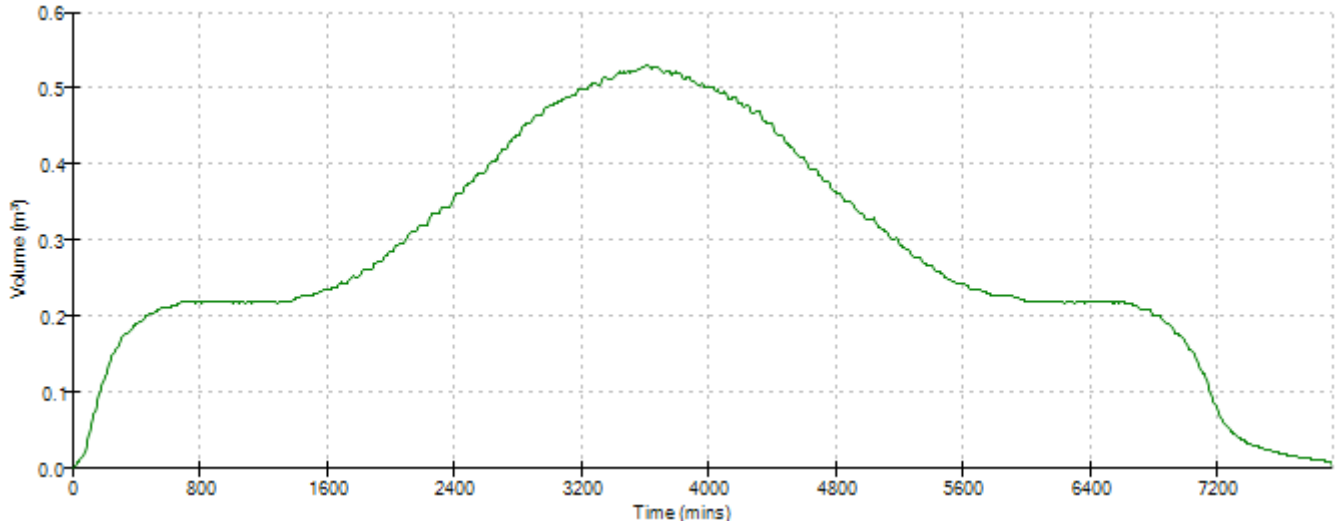
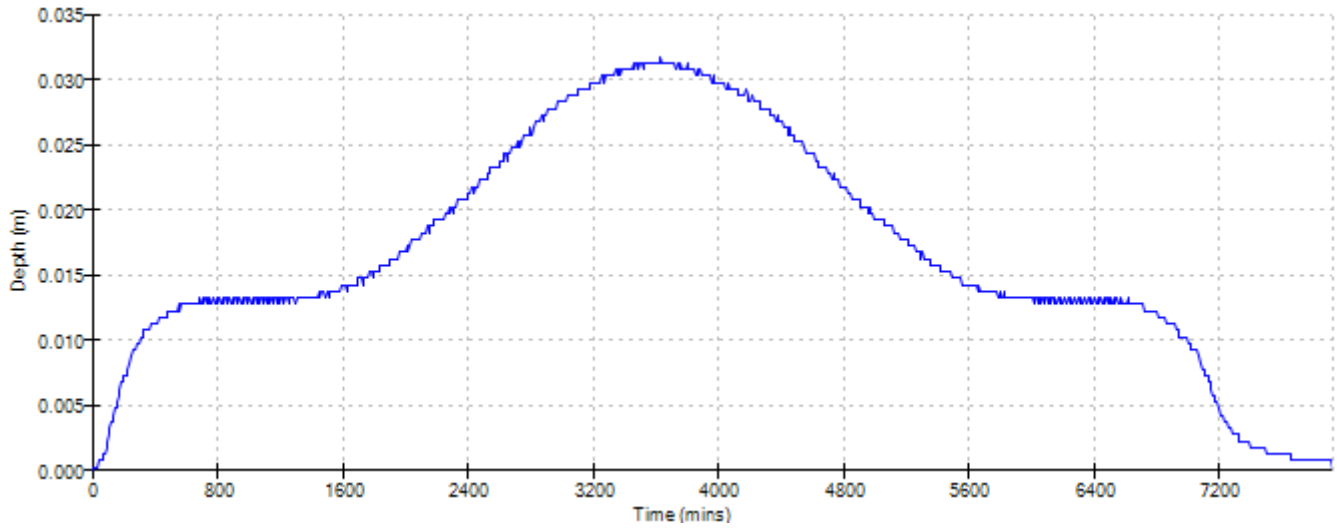
Event: 7200 min Winter







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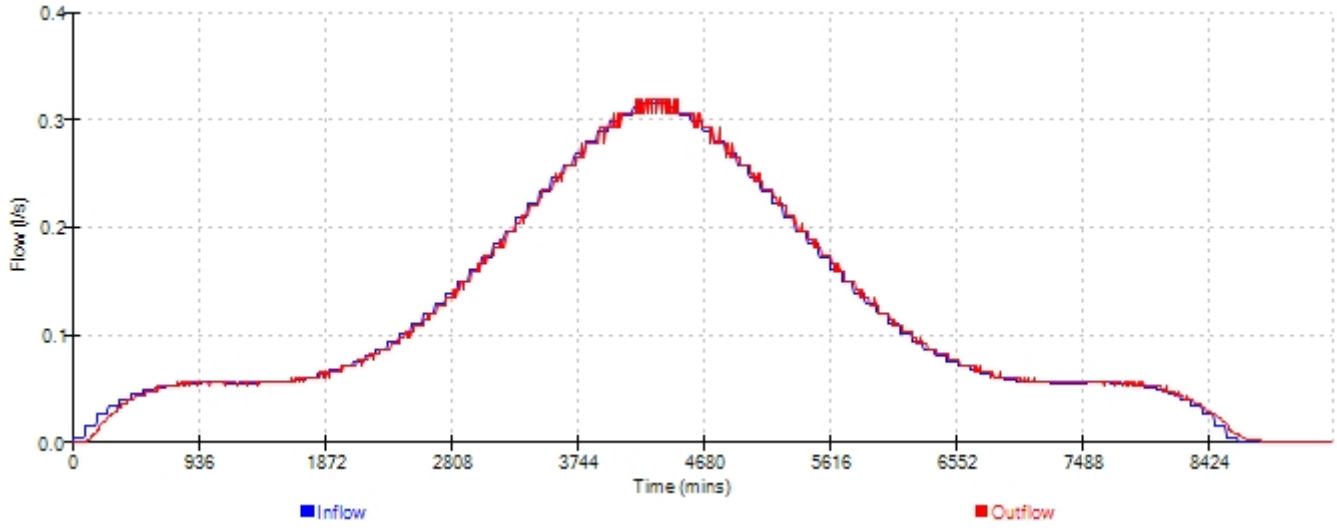
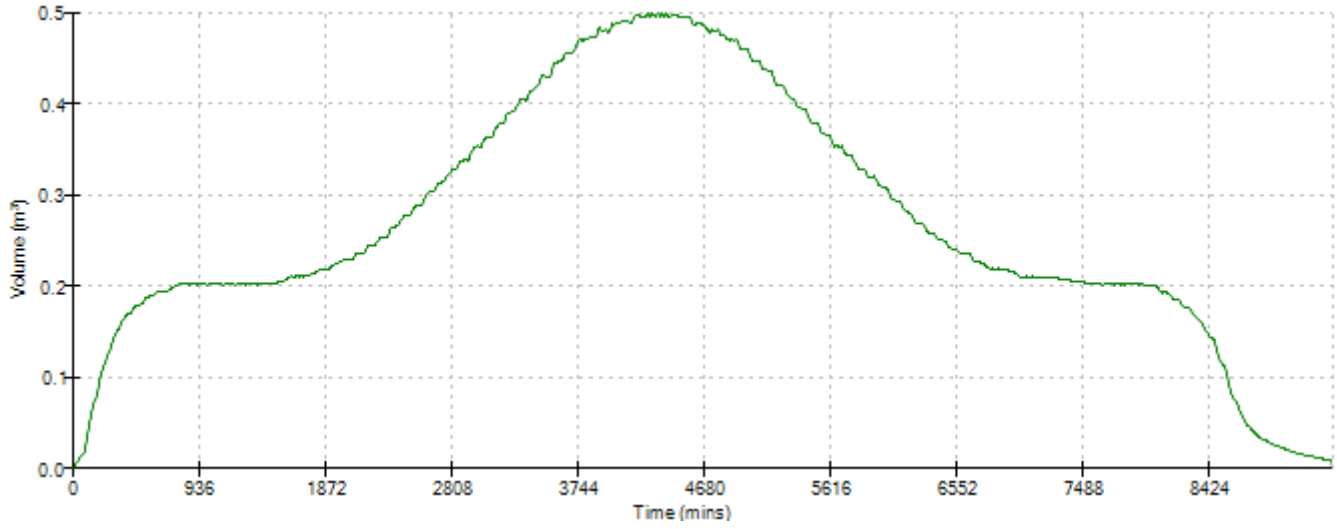
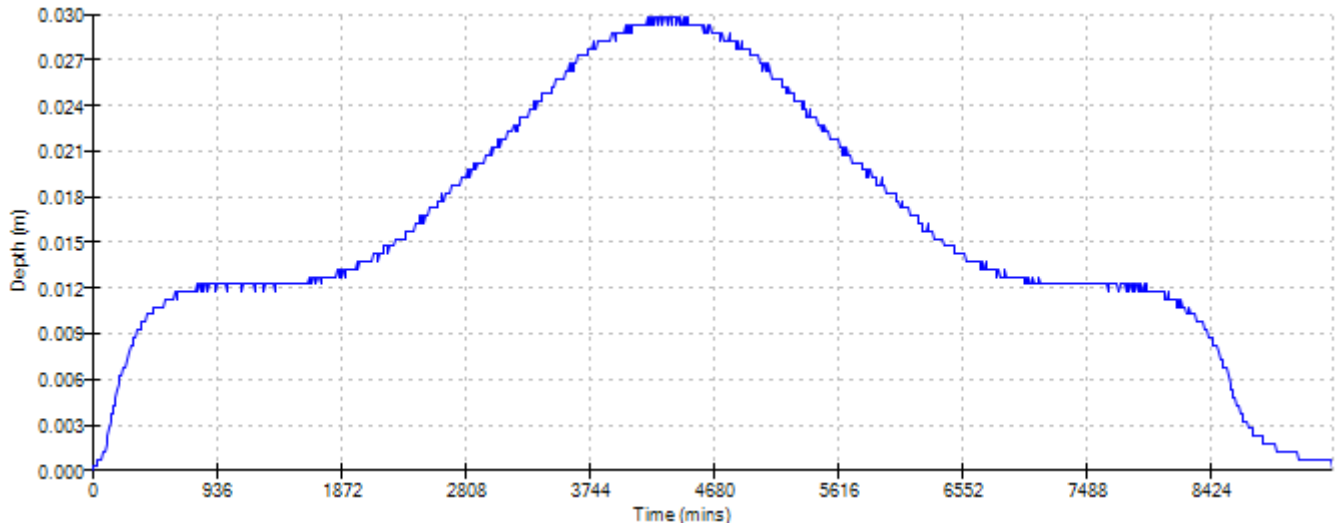
Event: 8640 min Winter







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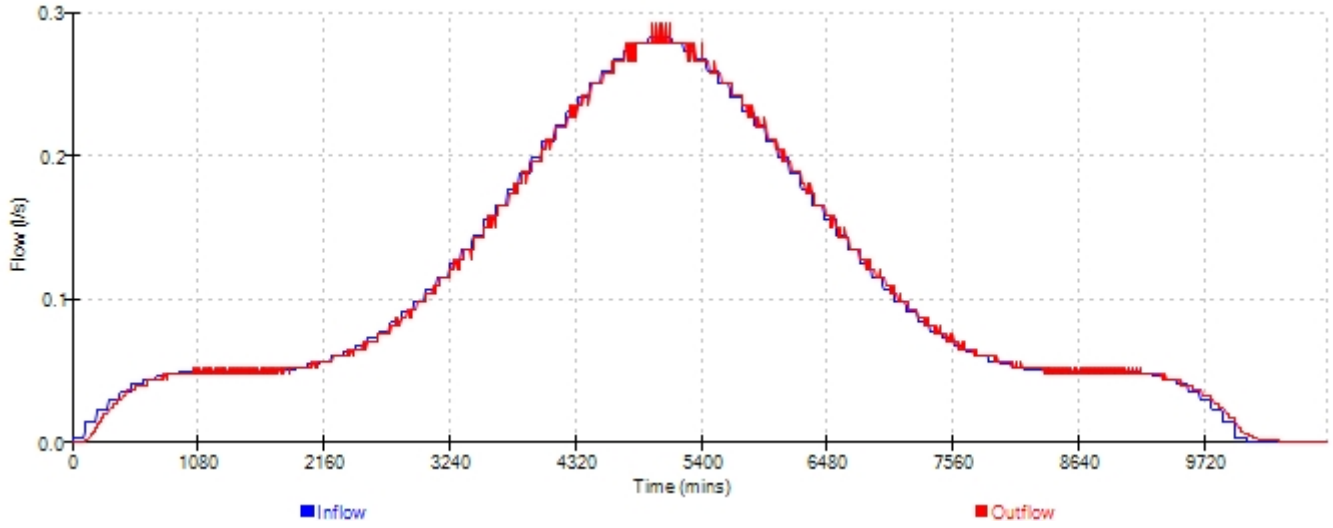
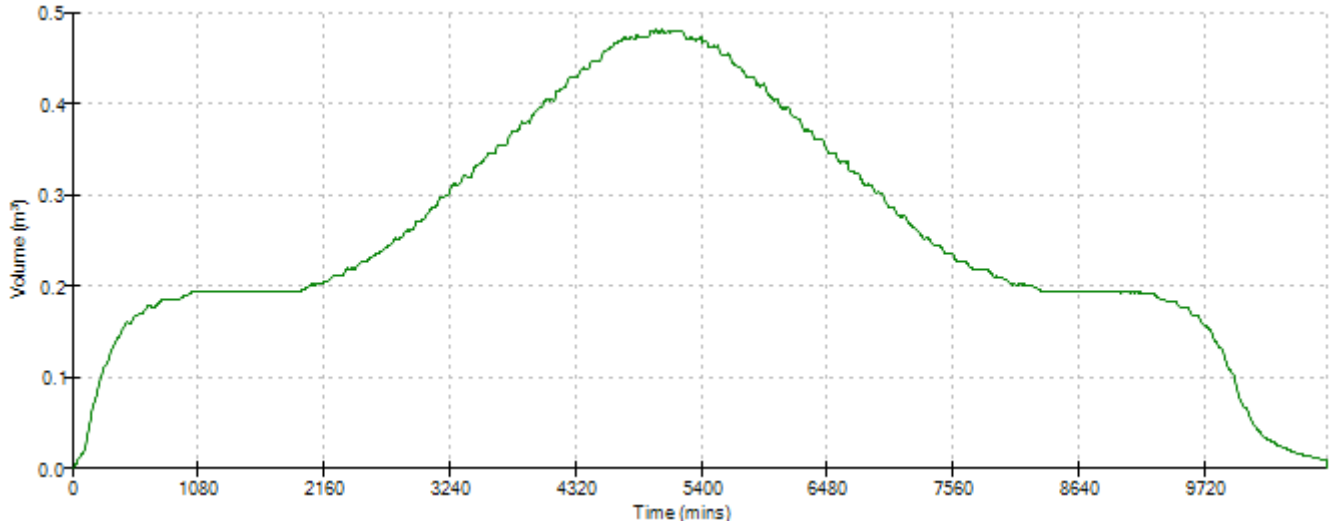
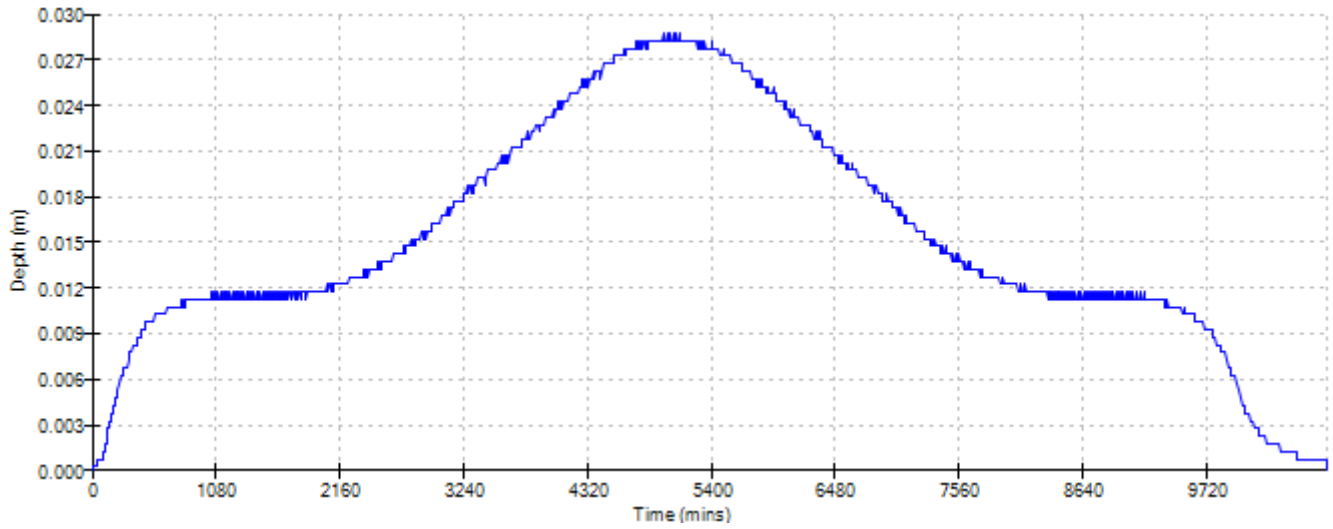
Event: 10080 min Winter







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