Appendix G Attenuation Storage Modelling Output Summary

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	81.962	0.362	3.5	0.0	3.5	10.9	O K
30 min Summer	82.057	0.457	3.5	1.0	4.3	13.7	O K
60 min Summer	82.119	0.519	3.6	1.5	5.1	15.6	O K
120 min Summer	82.136	0.536	3.6	1.5	5.1	16.1	O K
180 min Summer	82.110	0.510	3.5	1.5	5.0	15.3	O K
240 min Summer	82.085	0.485	3.5	1.4	4.9	14.5	O K
360 min Summer	82.044	0.444	3.5	0.7	4.0	13.3	O K
480 min Summer	81.998	0.398	3.5	0.0	3.5	11.9	O K
600 min Summer	81.932	0.332	3.5	0.0	3.5	10.0	O K
720 min Summer	81.853	0.253	3.5	0.0	3.5	7.6	O K
960 min Summer	81.756	0.156	3.5	0.0	3.5	4.7	O K
1440 min Summer	81.702	0.102	3.1	0.0	3.1	3.1	O K
2160 min Summer	81.678	0.078	2.4	0.0	2.4	2.3	O K
2880 min Summer	81.667	0.067	1.9	0.0	1.9	2.0	O K
4320 min Summer	81.656	0.056	1.4	0.0	1.4	1.7	O K
5760 min Summer	81.649	0.049	1.2	0.0	1.2	1.5	O K
7200 min Summer	81.645	0.045	1.0	0.0	1.0	1.3	O K
8640 min Summer	81.642	0.042	0.9	0.0	0.9	1.2	O K
10080 min Summer	81.639	0.039	0.8	0.0	0.8	1.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	115.911	0.0	13.0	0.0	17
30 min Summer	82.469	0.0	18.5	0.7	27
60 min Summer	56.129	0.0	25.2	2.4	44
120 min Summer	36.602	0.0	32.9	3.1	78
180 min Summer	27.845	0.0	37.6	2.9	112
240 min Summer	22.910	0.0	41.2	2.4	144
360 min Summer	17.340	0.0	46.8	1.0	214
480 min Summer	14.195	0.0	51.1	0.0	286
600 min Summer	12.137	0.0	54.6	0.0	352
720 min Summer	10.670	0.0	57.6	0.0	404
960 min Summer	8.694	0.0	62.6	0.0	510
1440 min Summer	6.492	0.0	70.1	0.0	736
2160 min Summer	4.832	0.0	78.3	0.0	1100
2880 min Summer	3.925	0.0	84.8	0.0	1456
4320 min Summer	2.930	0.0	94.9	0.0	2184
5760 min Summer	2.385	0.0	103.0	0.0	2928
7200 min Summer	2.037	0.0	110.0	0.0	3624
8640 min Summer	1.794	0.0	116.2	0.0	4304
10080 min Summer	1.613	0.0	121.9	0.0	5008

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Winter	82.011	0.411	3.5	0.1	3.5	12.3	O K
30 min Winter	82.112	0.512	3.5	1.5	5.0	15.4	O K
60 min Winter	82.187	0.587	3.8	1.5	5.2	17.6	O K
120 min Winter	82.189	0.589	3.8	1.5	5.2	17.7	O K
180 min Winter	82.140	0.540	3.6	1.5	5.1	16.2	O K
240 min Winter	82.095	0.495	3.5	1.5	5.0	14.8	O K
360 min Winter	82.037	0.437	3.5	0.5	3.8	13.1	O K
480 min Winter	81.946	0.346	3.5	0.0	3.5	10.4	O K
600 min Winter	81.810	0.210	3.5	0.0	3.5	6.3	O K
720 min Winter	81.734	0.134	3.5	0.0	3.5	4.0	O K
960 min Winter	81.700	0.100	3.0	0.0	3.0	3.0	O K
1440 min Winter	81.676	0.076	2.3	0.0	2.3	2.3	O K
2160 min Winter	81.662	0.062	1.7	0.0	1.7	1.9	O K
2880 min Winter	81.655	0.055	1.4	0.0	1.4	1.6	O K
4320 min Winter	81.646	0.046	1.0	0.0	1.0	1.4	O K
5760 min Winter	81.641	0.041	0.8	0.0	0.8	1.2	O K
7200 min Winter	81.637	0.037	0.7	0.0	0.7	1.1	O K
8640 min Winter	81.635	0.035	0.6	0.0	0.6	1.0	O K
10080 min Winter	81.633	0.033	0.6	0.0	0.6	1.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Winter	115.911	0.0	14.6	0.0	17
30 min Winter	82.469	0.0	20.8	1.5	28
60 min Winter	56.129	0.0	28.3	3.2	46
120 min Winter	36.602	0.0	36.9	4.5	84
180 min Winter	27.845	0.0	42.1	4.2	120
240 min Winter	22.910	0.0	46.2	3.5	152
360 min Winter	17.340	0.0	52.4	0.9	228
480 min Winter	14.195	0.0	57.2	0.0	306
600 min Winter	12.137	0.0	61.2	0.0	354
720 min Winter	10.670	0.0	64.5	0.0	392
960 min Winter	8.694	0.0	70.1	0.0	498
1440 min Winter	6.492	0.0	78.5	0.0	736
2160 min Winter	4.832	0.0	87.7	0.0	1104
2880 min Winter	3.925	0.0	94.9	0.0	1456
4320 min Winter	2.930	0.0	106.3	0.0	2140
5760 min Winter	2.385	0.0	115.4	0.0	2872
7200 min Winter	2.037	0.0	123.2	0.0	3544
8640 min Winter	1.794	0.0	130.2	0.0	4376
10080 min Winter	1.613	0.0	136.6	0.0	5136

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)	19.800	Shortest Storm (mins)	15
Ratio R	0.250	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.060

Time (mins) From:	To:	Area (ha)
0	4	0.060

Model Details

Storage is Online Cover Level (m) 82.500

Tank or Pond Structure

Invert Level (m) 81.600

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	30.0	0.400	30.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SCL-0089-3500-0500-3500
Design Head (m)	0.500
Design Flow (l/s)	3.5
Flush-Flo™	Calculated
Objective	Minimise blockage risk
Application	Surface
Sump Available	Yes
Diameter (mm)	89
Invert Level (m)	81.600
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	3.5	Kick-Flo®	0.319	2.9
Flush-Flo™	0.124	3.5	Mean Flow over Head Range	-	2.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.0	1.200	5.2	3.000	8.0	7.000	12.1
0.200	3.4	1.400	5.6	3.500	8.6	7.500	12.5
0.300	3.0	1.600	6.0	4.000	9.2	8.000	12.9
0.400	3.2	1.800	6.3	4.500	9.7	8.500	13.3
0.500	3.5	2.000	6.6	5.000	10.2	9.000	13.7
0.600	3.8	2.200	6.9	5.500	10.7	9.500	14.1
0.800	4.3	2.400	7.2	6.000	11.2		
1.000	4.8	2.600	7.5	6.500	11.6		

Hydro-Brake® Optimum Overflow Control

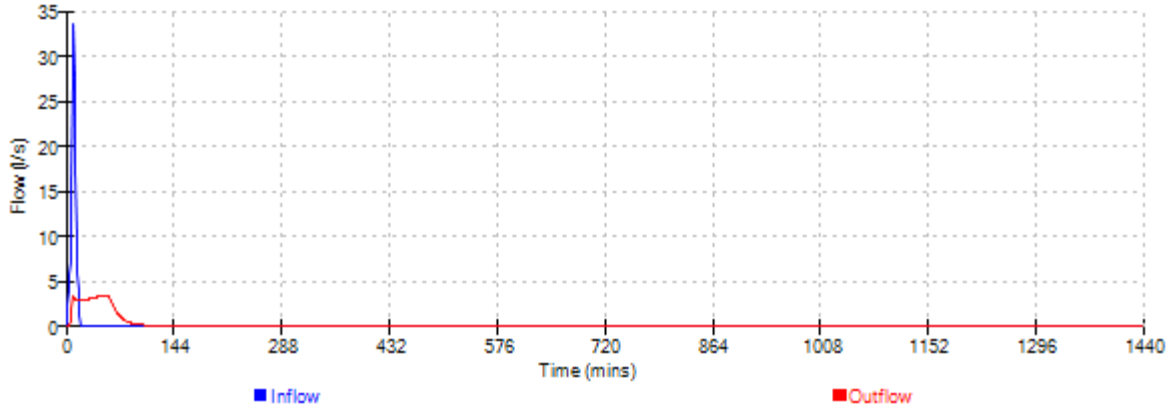
Unit Reference	MD-SCL-0061-1500-0500-1500
Design Head (m)	0.500
Design Flow (l/s)	1.5
Flush-Flo™	Calculated
Objective	Minimise blockage risk
Application	Surface
Sump Available	Yes
Diameter (mm)	61
Invert Level (m)	82.000
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

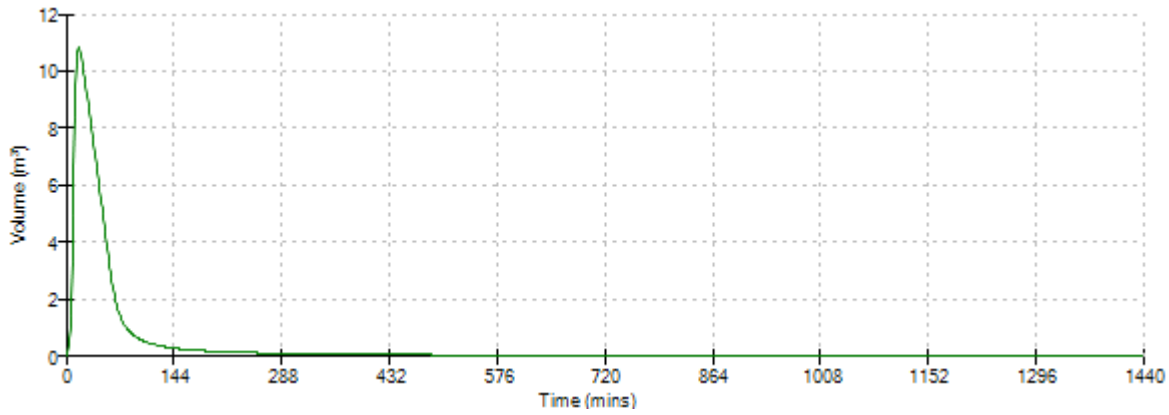
Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	1.5	Kick-Flo®	0.308	1.2
Flush-Flo™	0.122	1.5	Mean Flow over Head Range	-	1.3

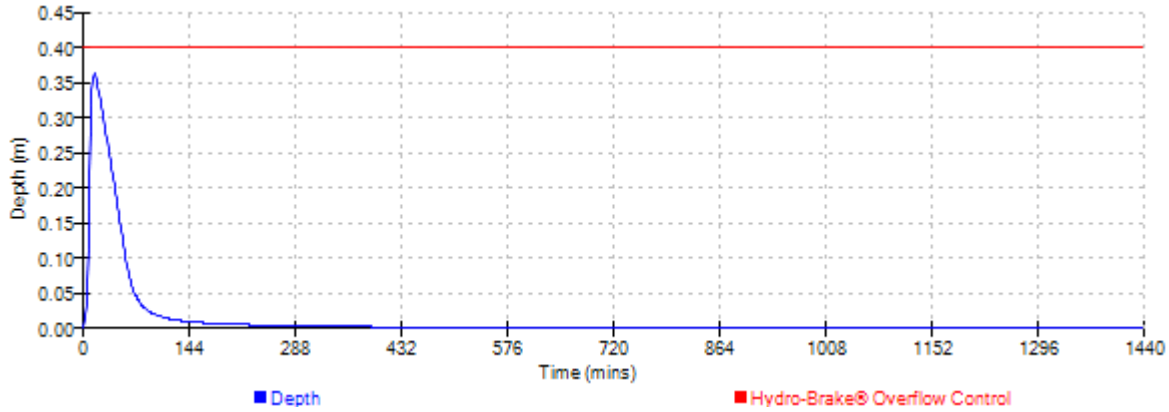
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.5	1.200	2.2	3.000	3.4	7.000	5.1
0.200	1.4	1.400	2.4	3.500	3.6	7.500	5.2
0.300	1.3	1.600	2.5	4.000	3.9	8.000	5.4
0.400	1.4	1.800	2.7	4.500	4.1	8.500	5.6
0.500	1.5	2.000	2.8	5.000	4.3	9.000	5.7
0.600	1.6	2.200	2.9	5.500	4.5	9.500	5.9
0.800	1.8	2.400	3.0	6.000	4.7		
1.000	2.0	2.600	3.2	6.500	4.9		

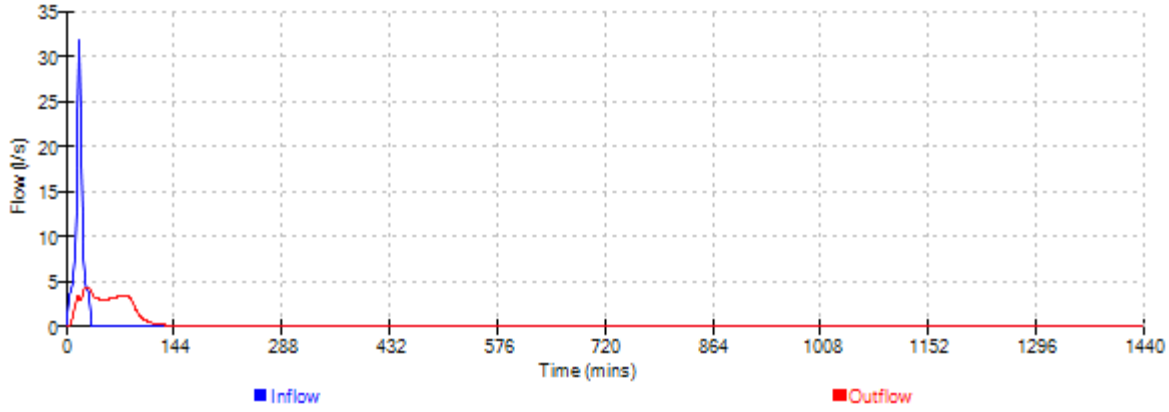
Event: 15 min Summer

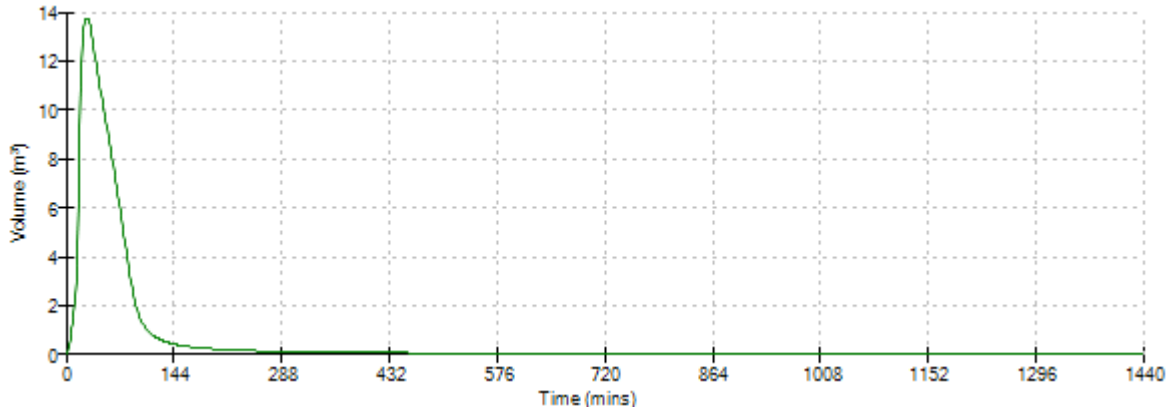


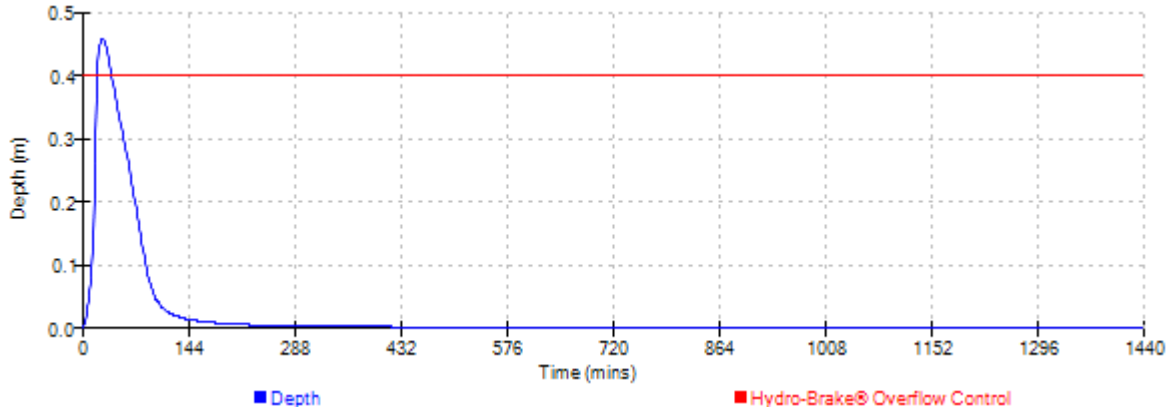




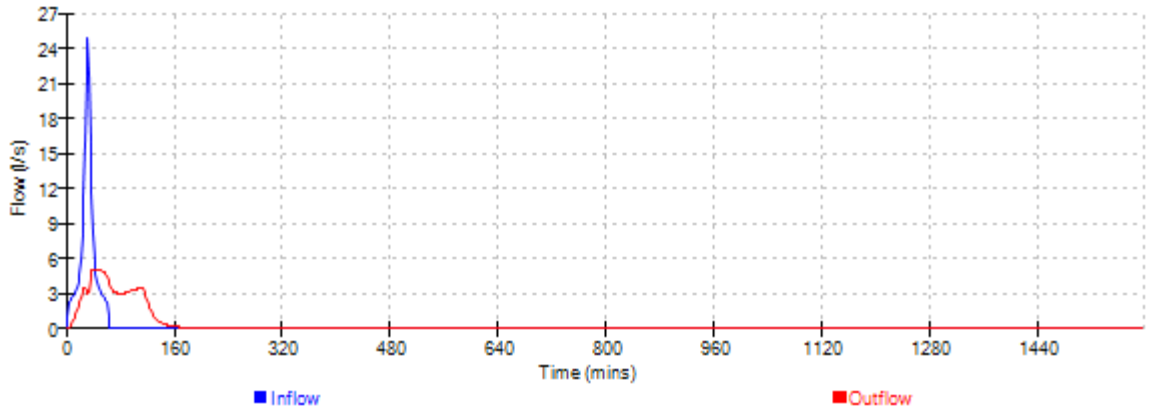
Event: 30 min Summer

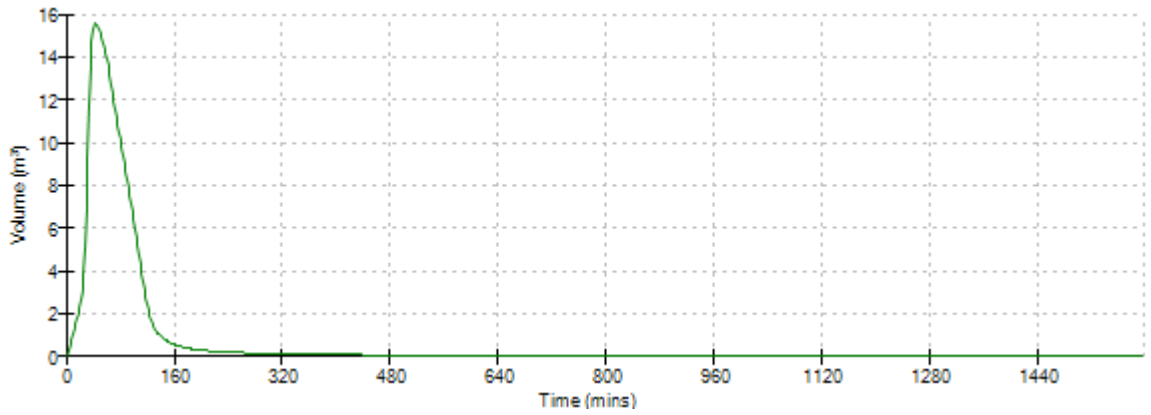


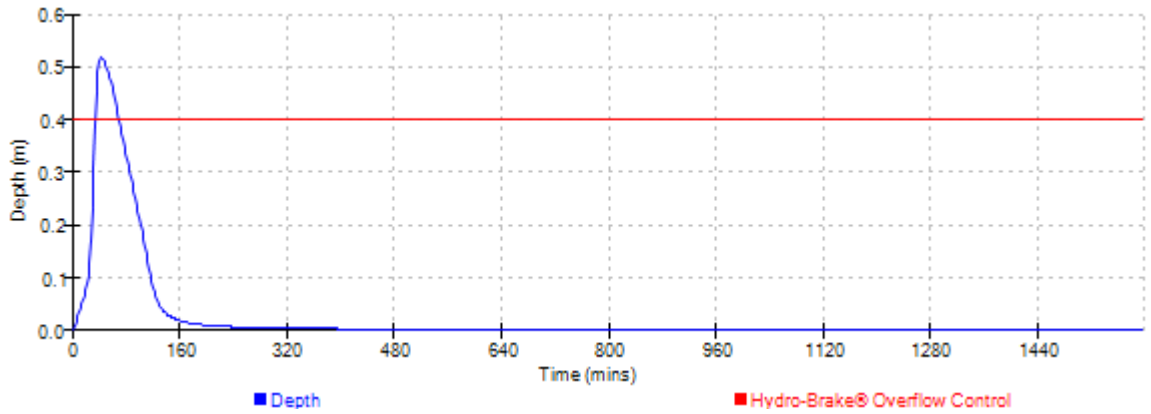




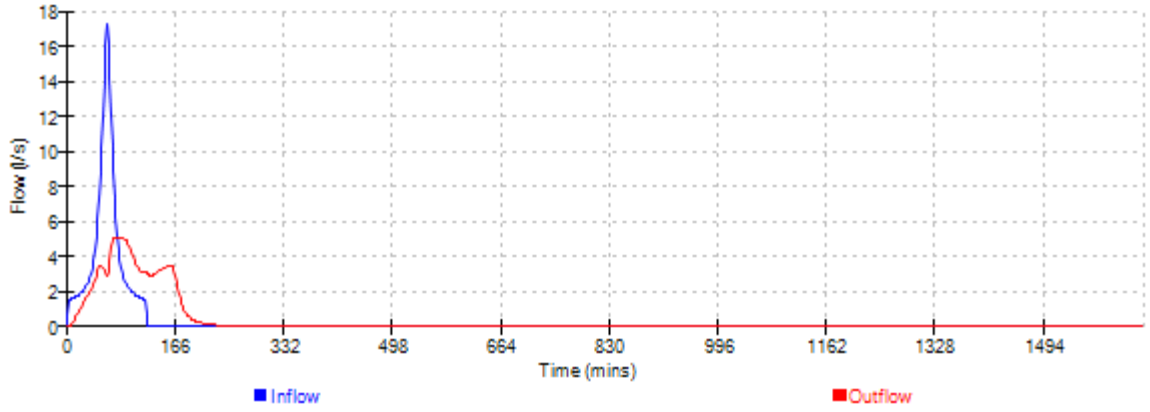
Event: 60 min Summer

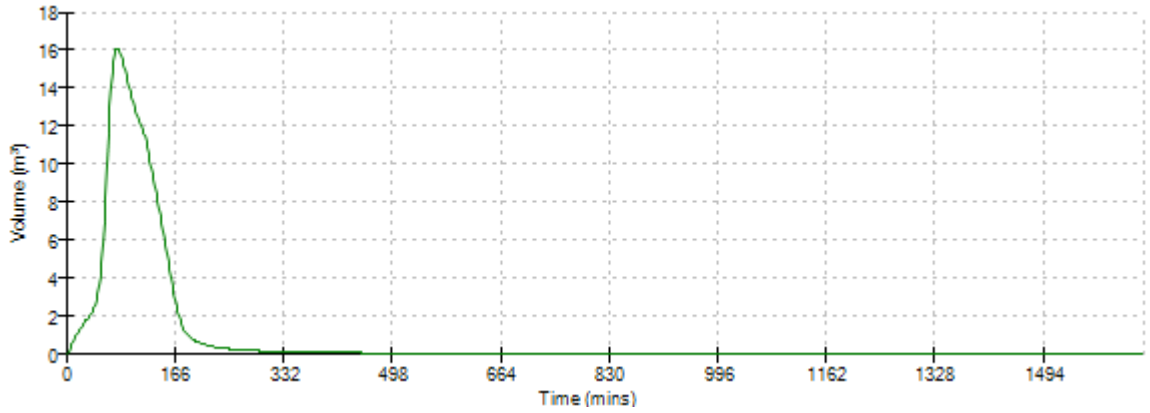


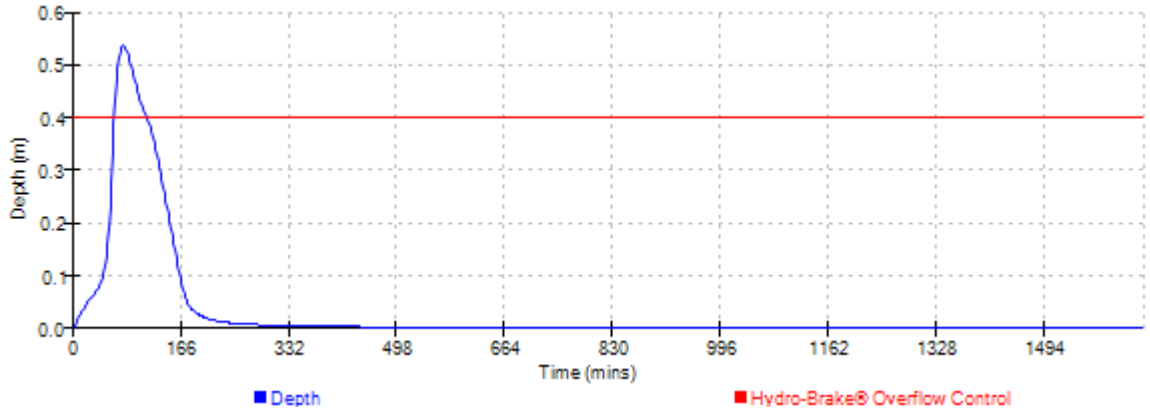




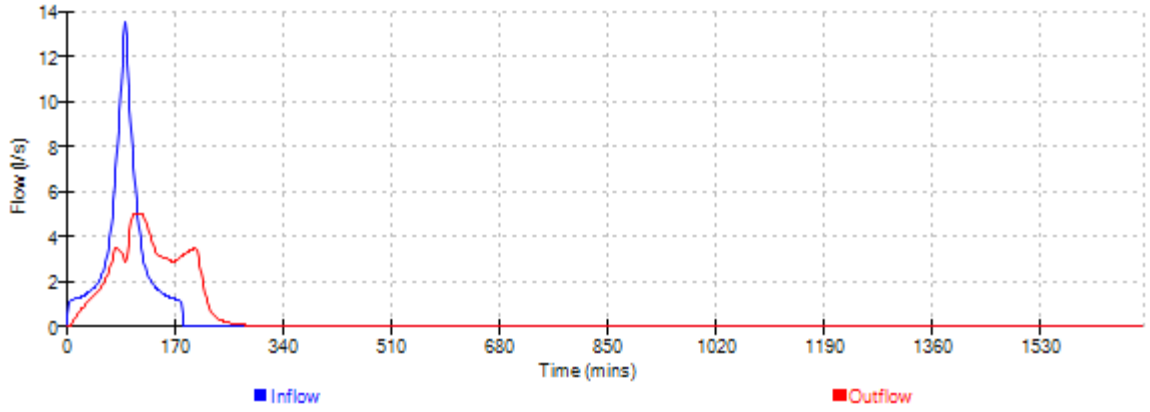
Event: 120 min Summer

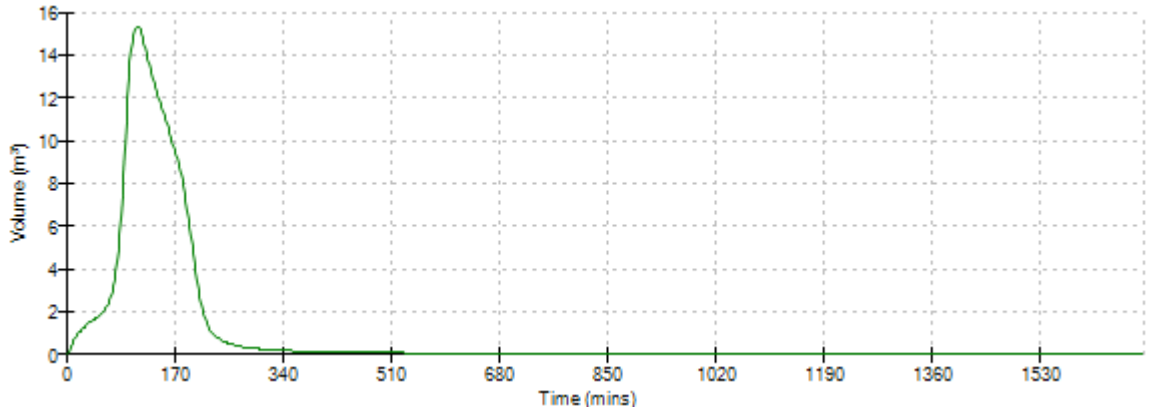


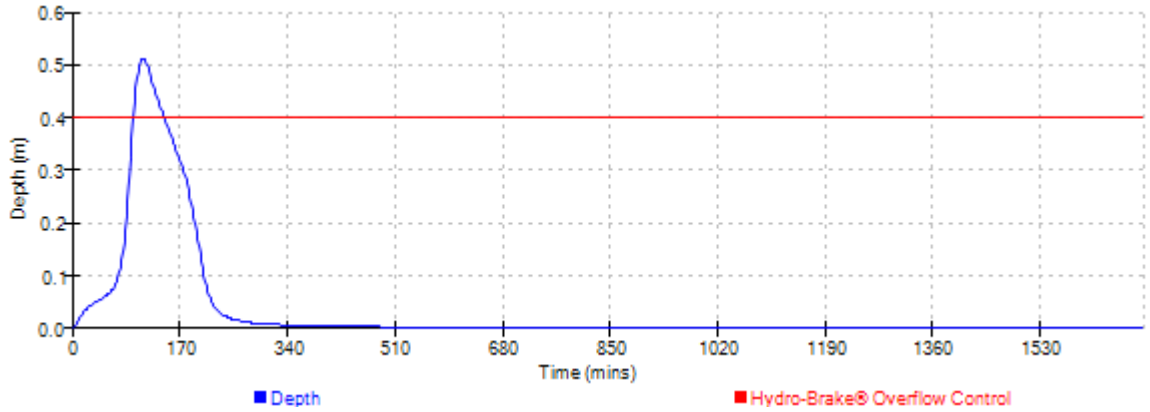




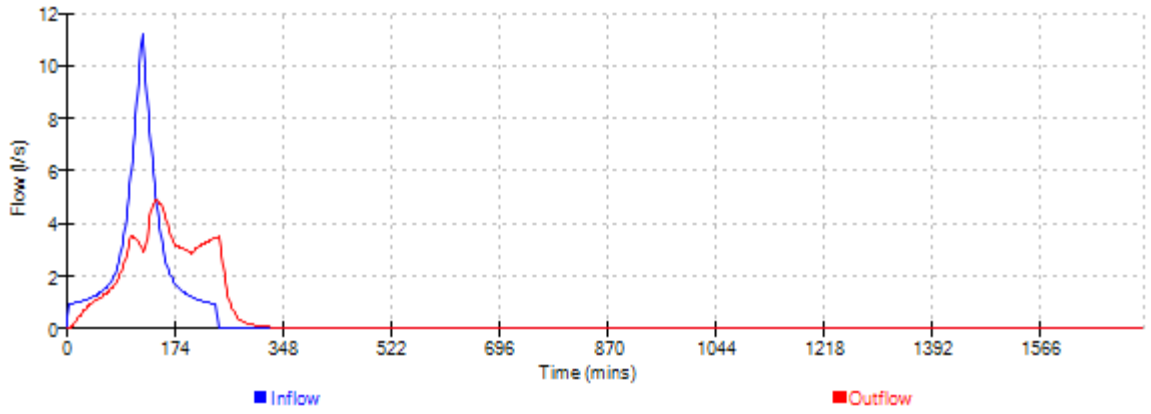
Event: 180 min Summer

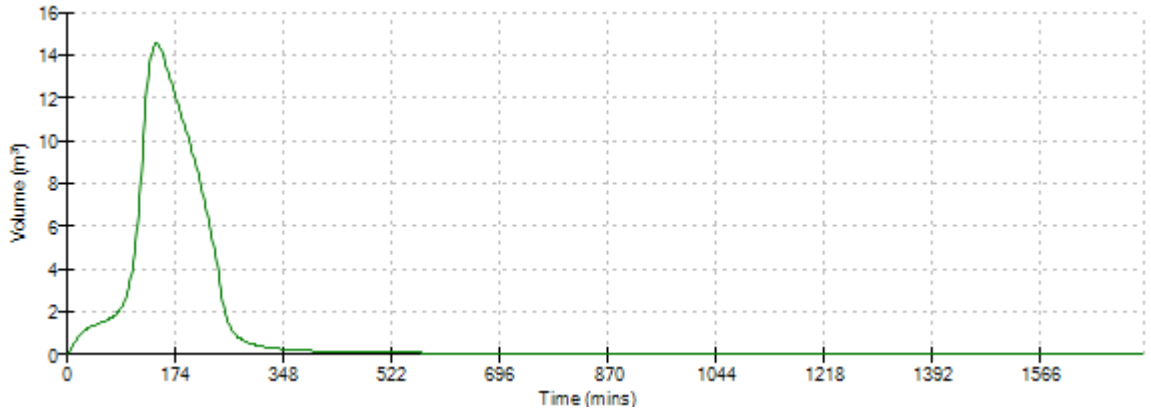


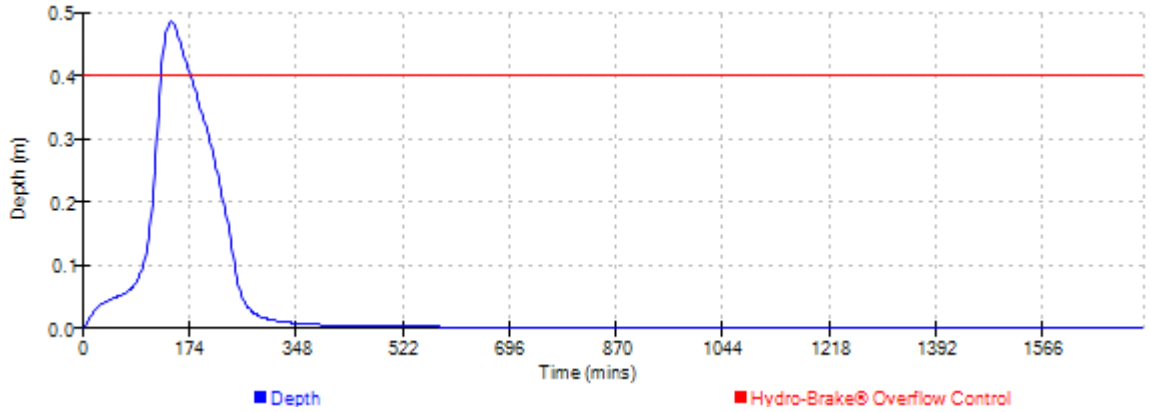




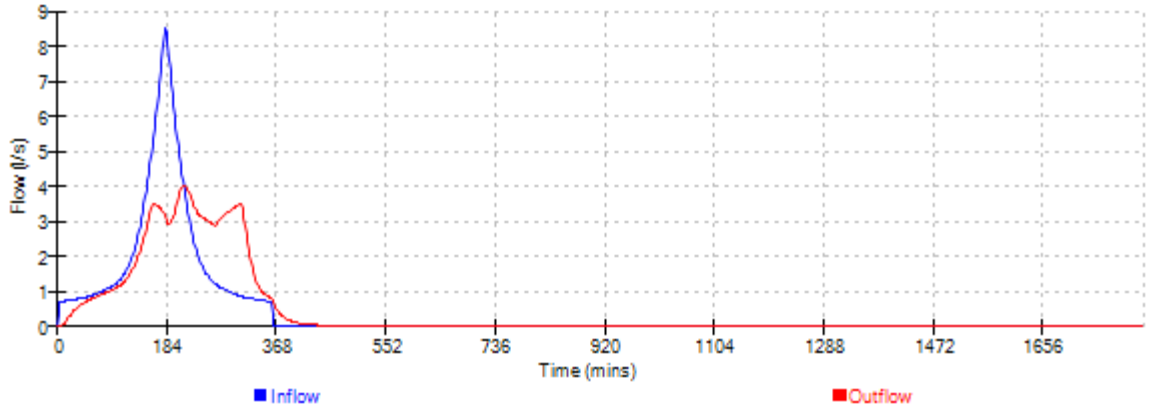
Event: 240 min Summer

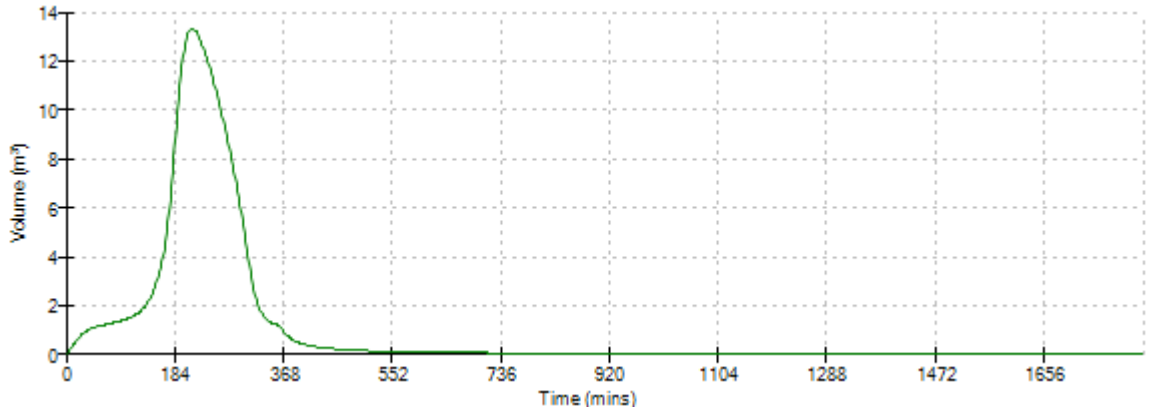


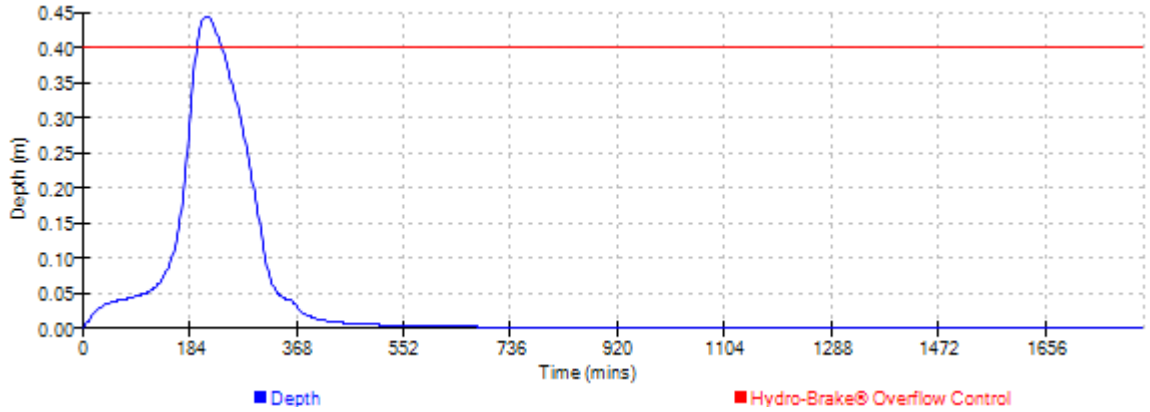




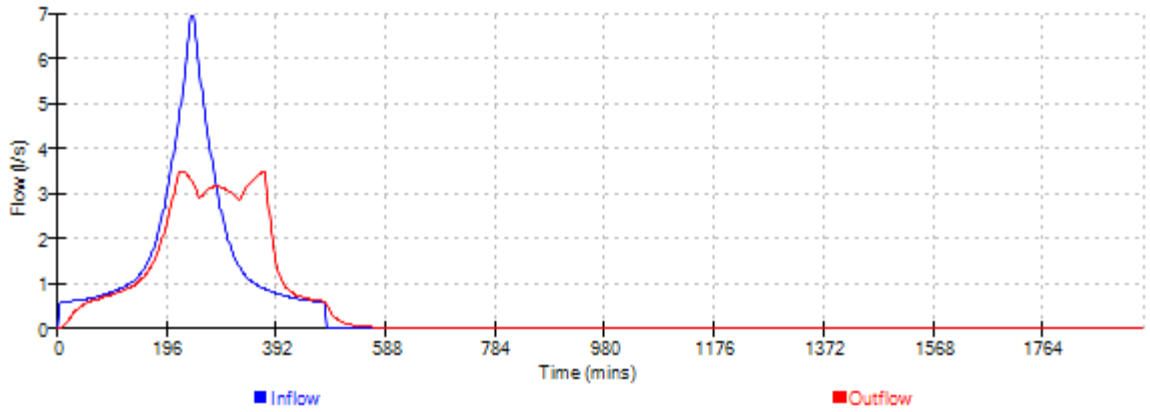
Event: 360 min Summer

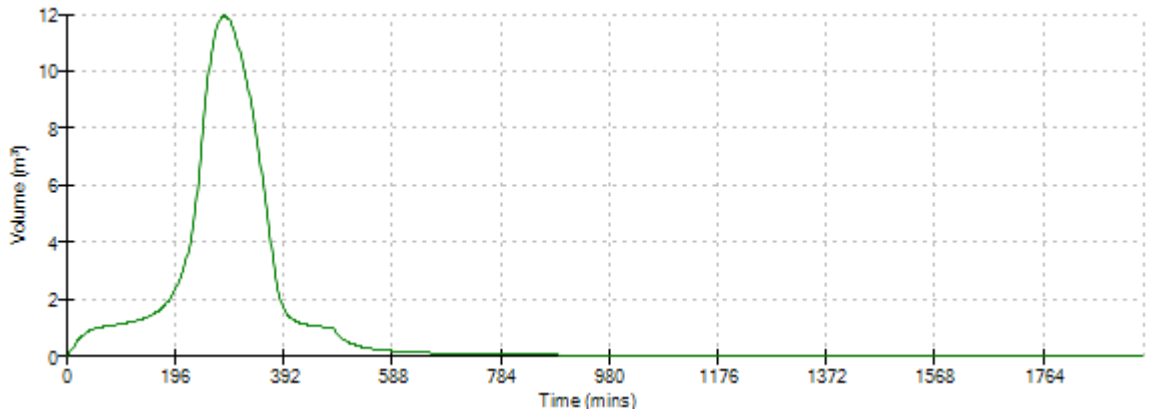


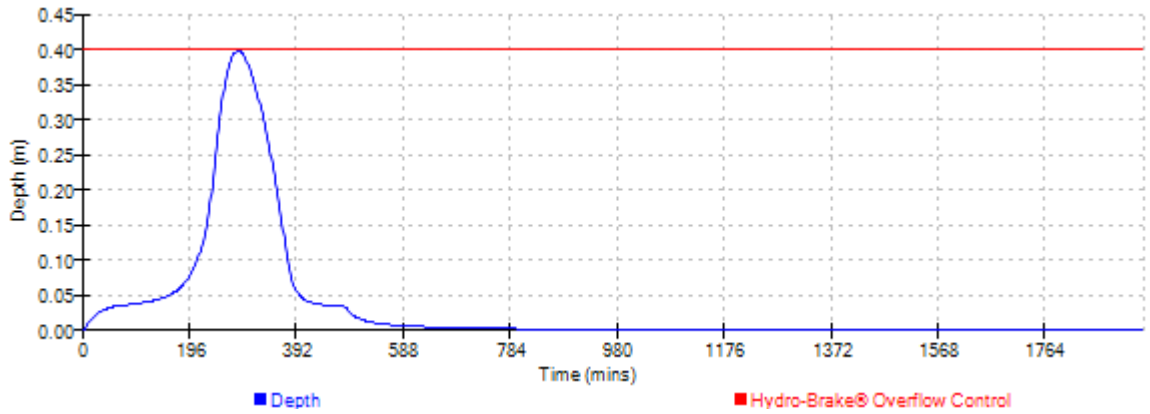




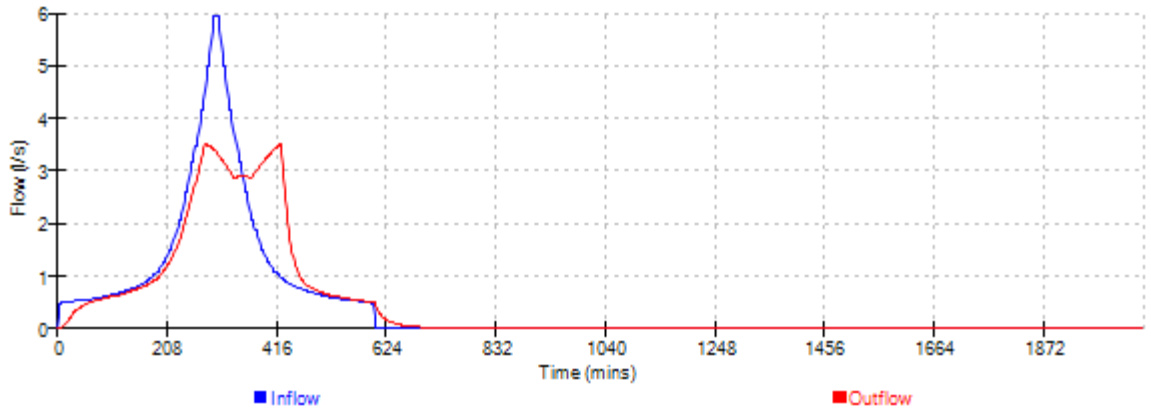
Event: 480 min Summer

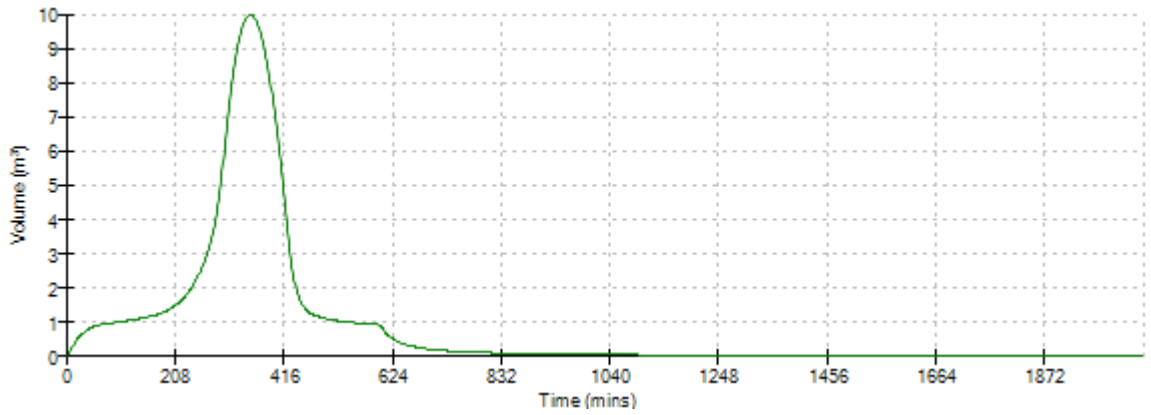


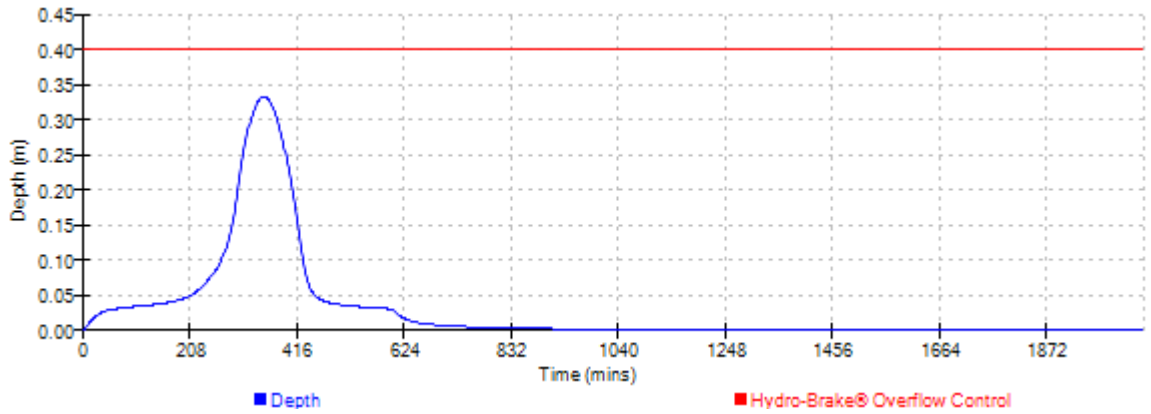




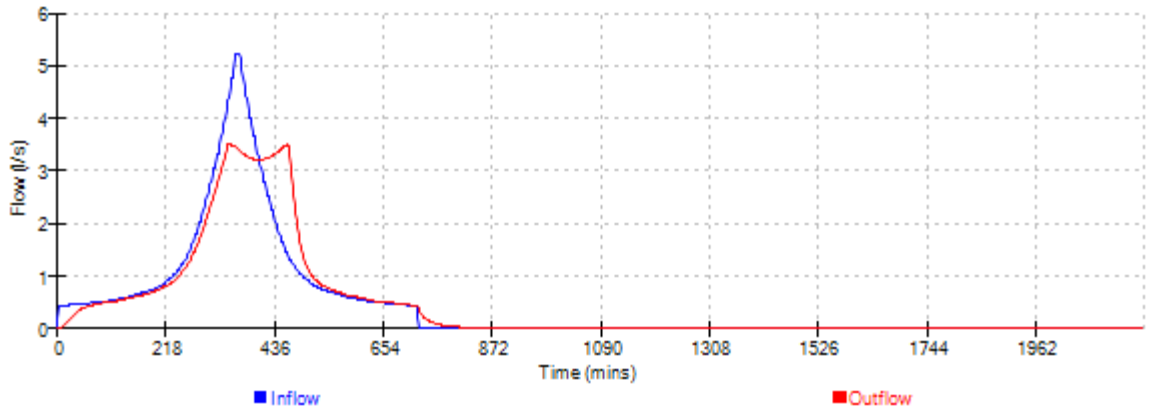
Event: 600 min Summer

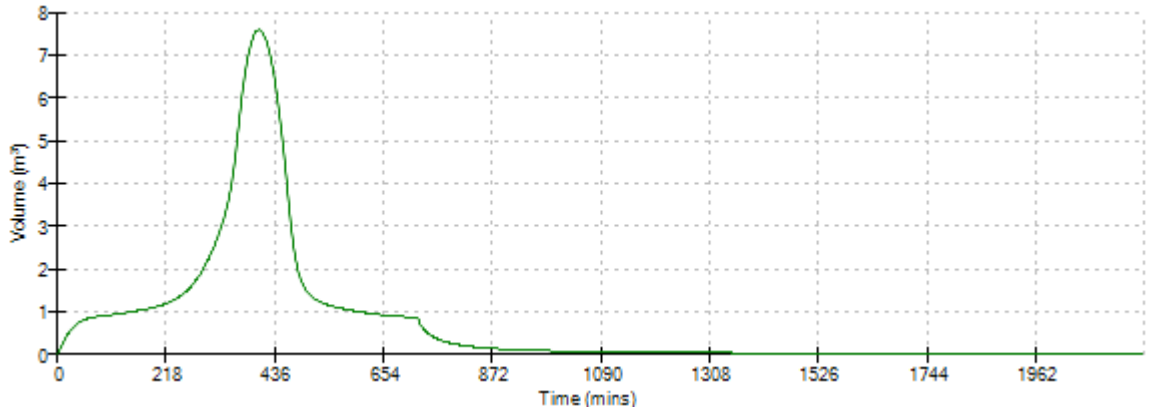


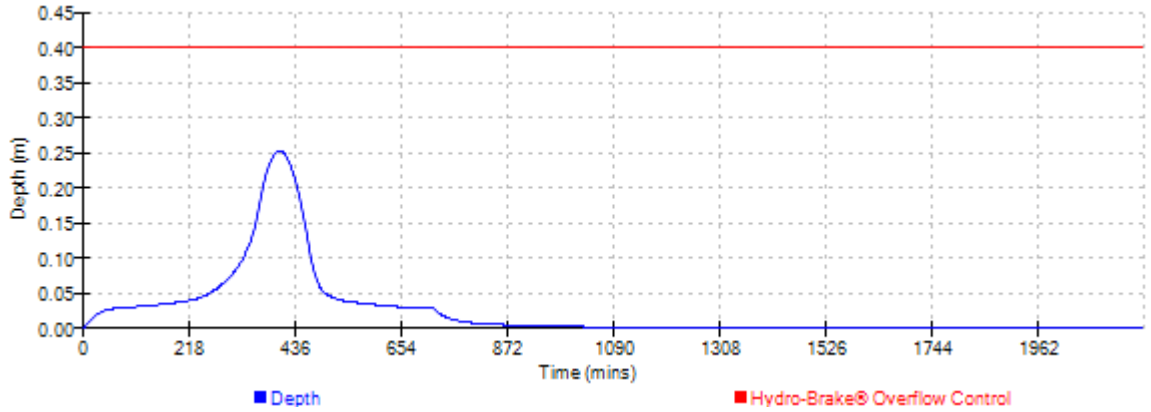




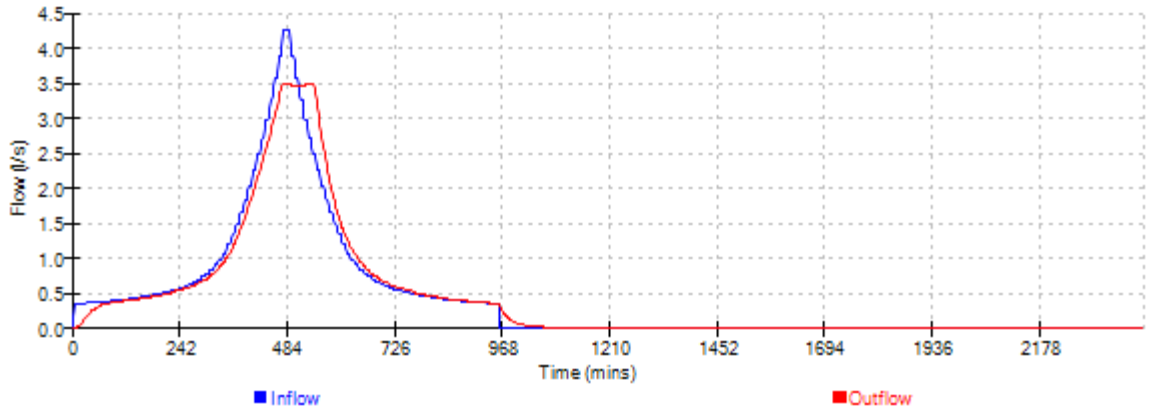
Event: 720 min Summer

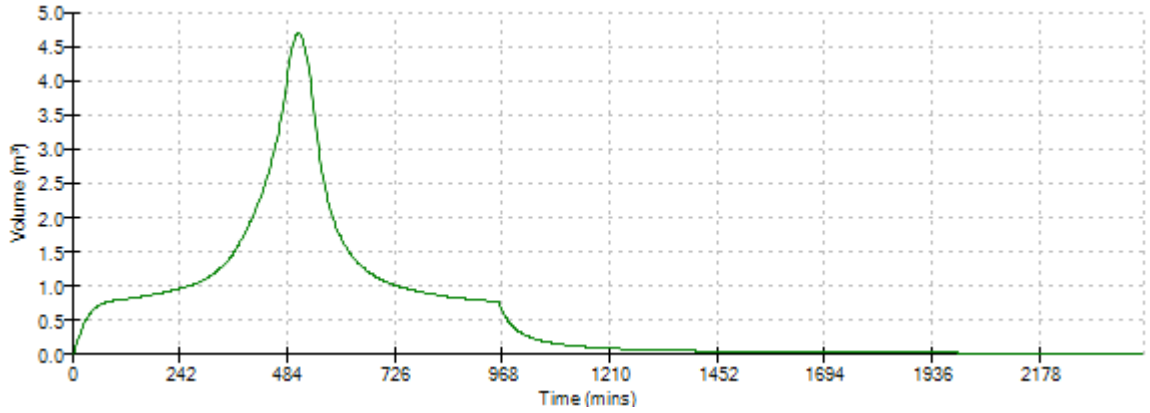


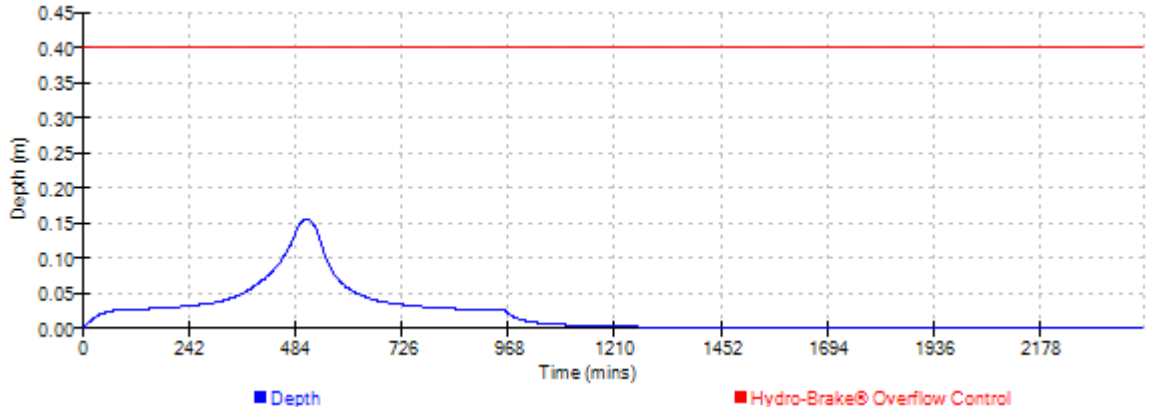




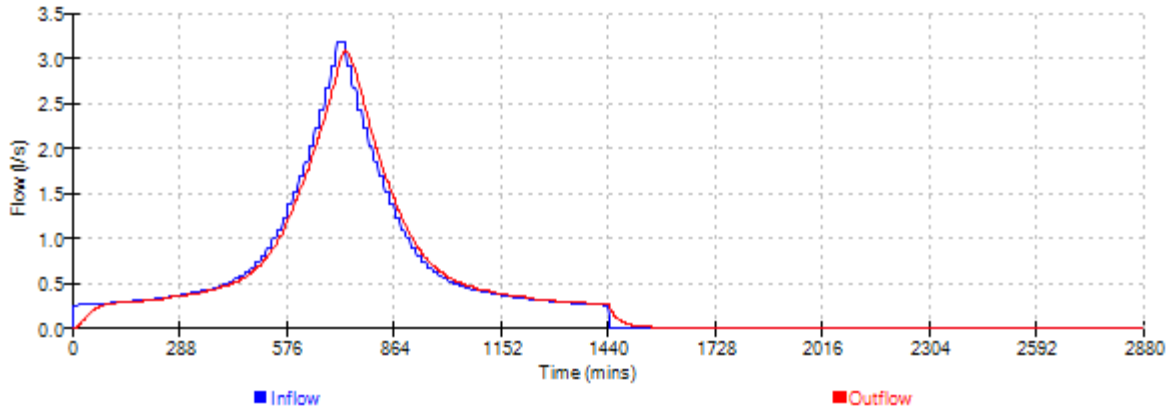
Event: 960 min Summer

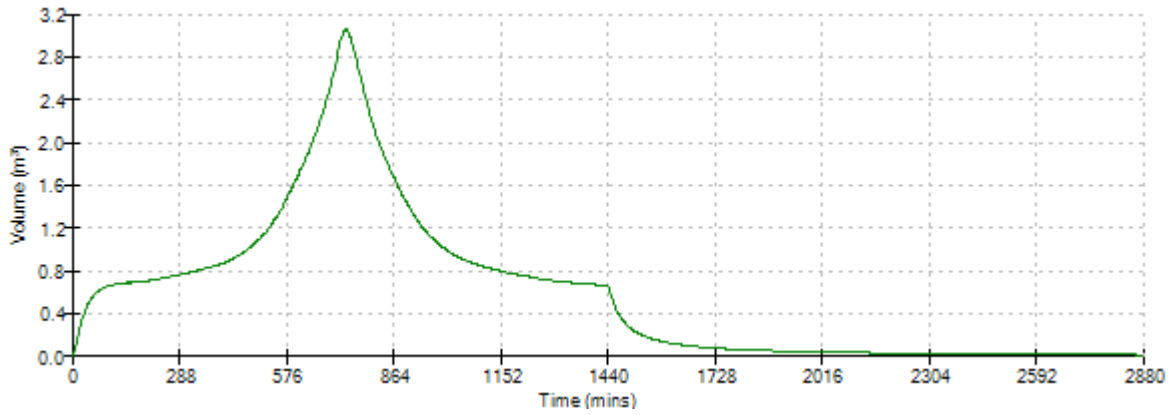


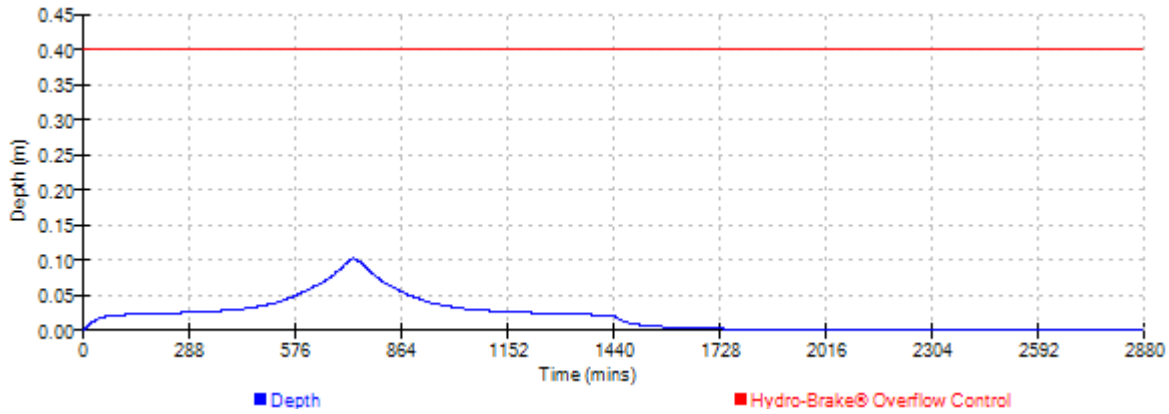




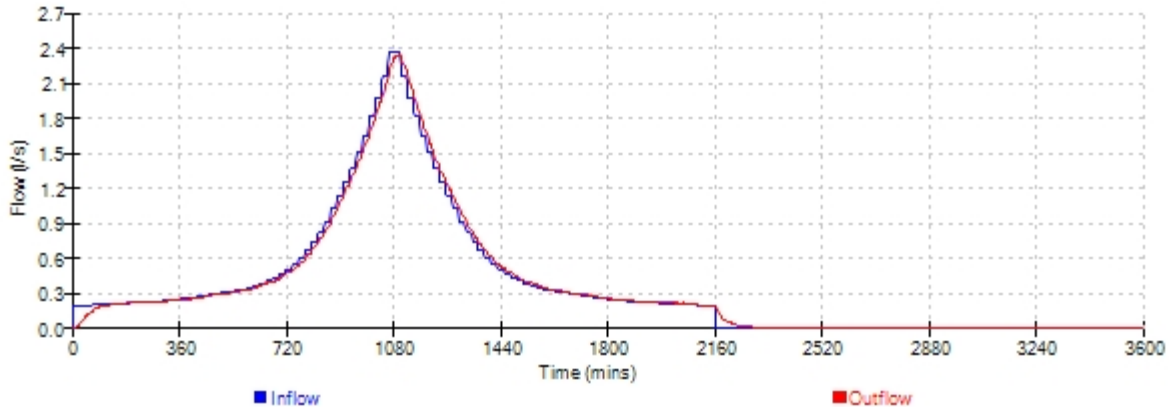
Event: 1440 min Summer

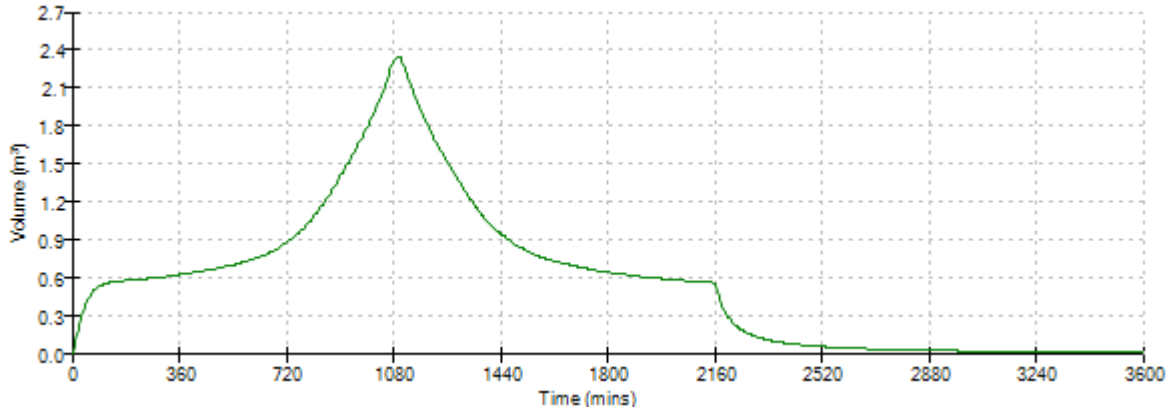


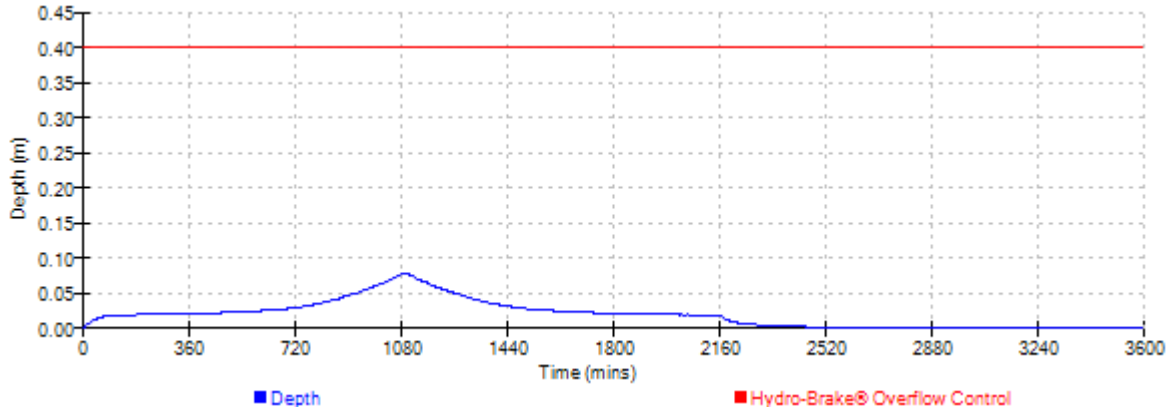




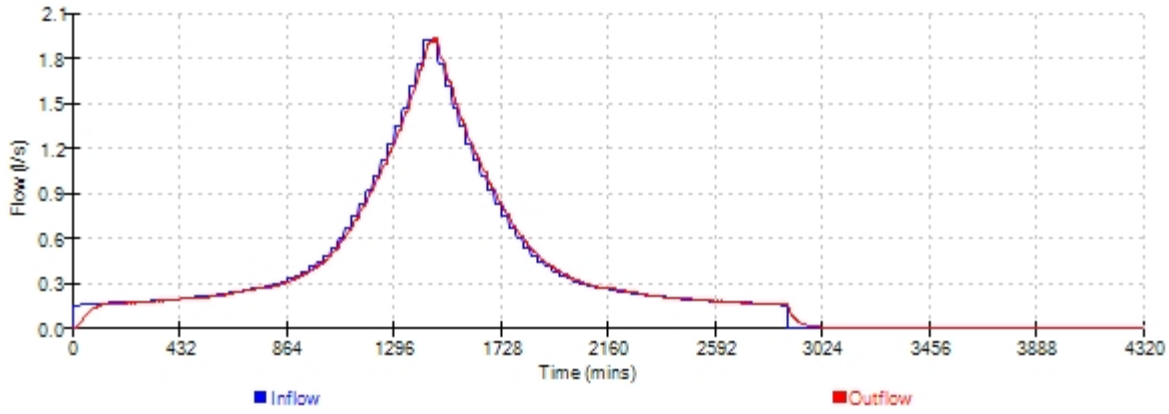
Event: 2160 min Summer

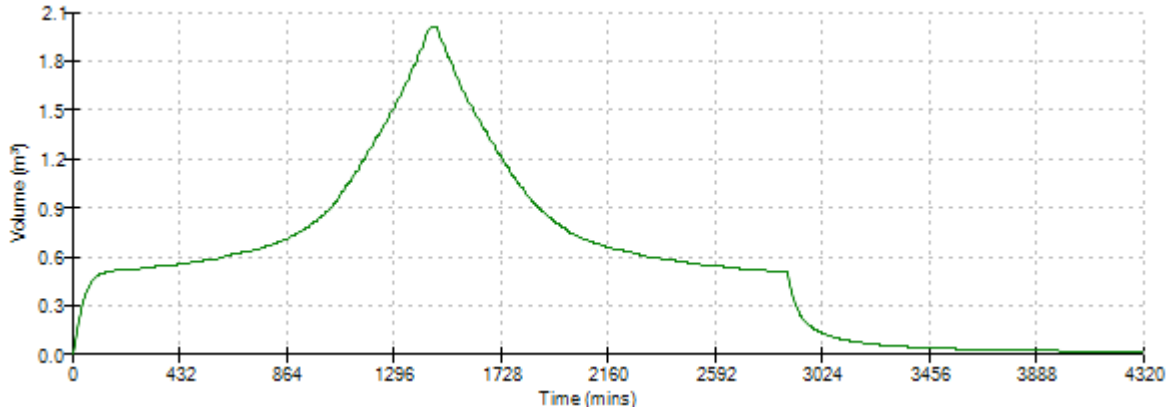


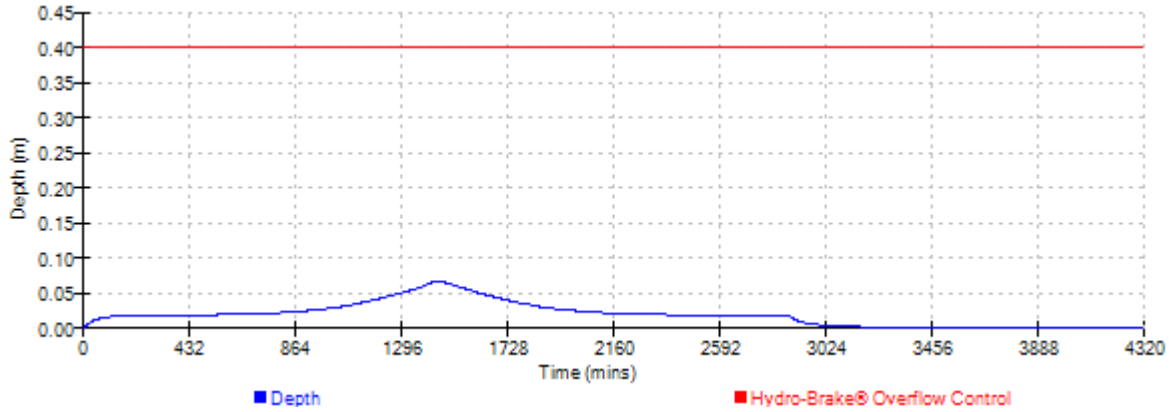




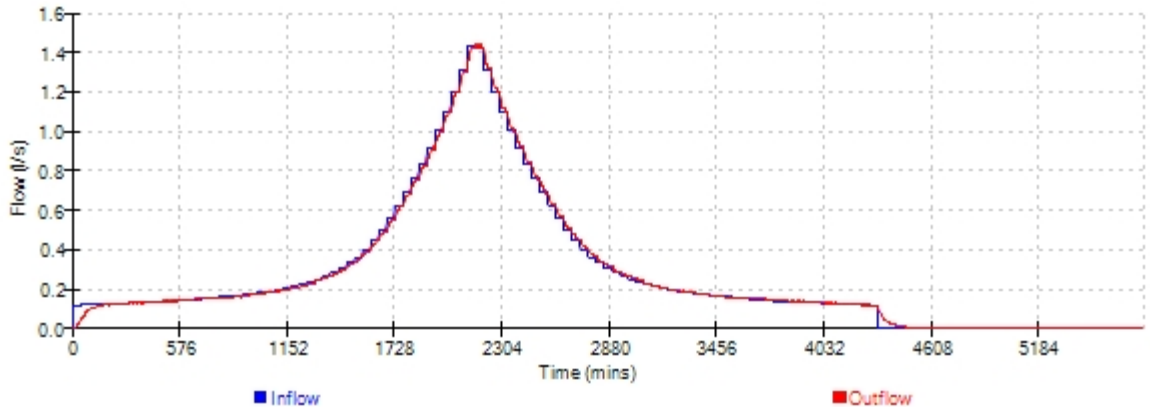
Event: 2880 min Summer

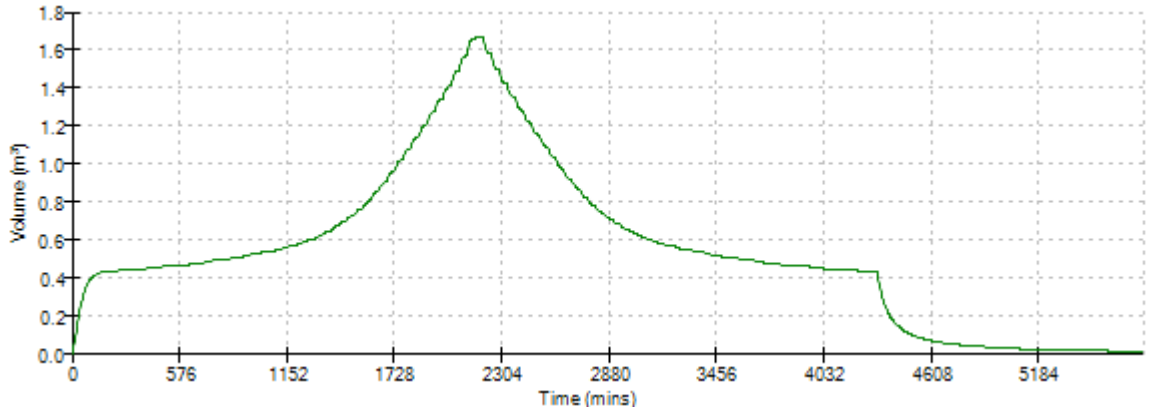


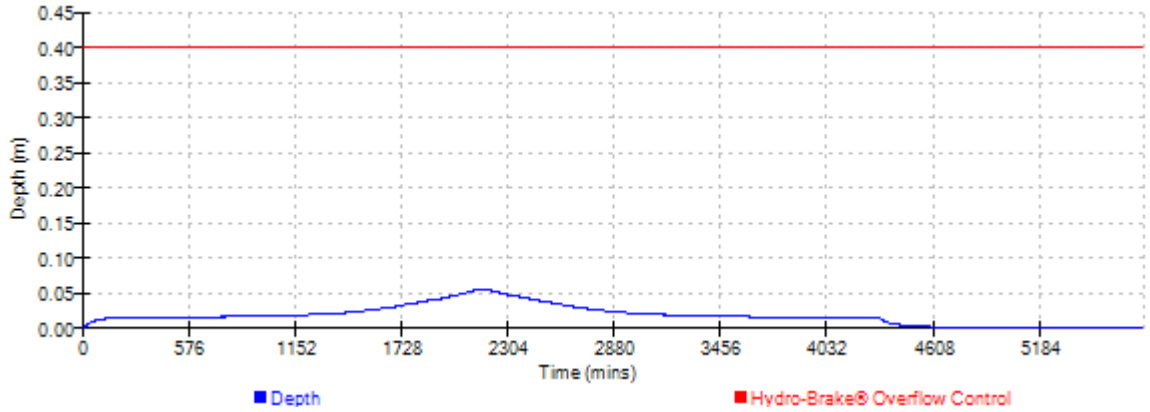




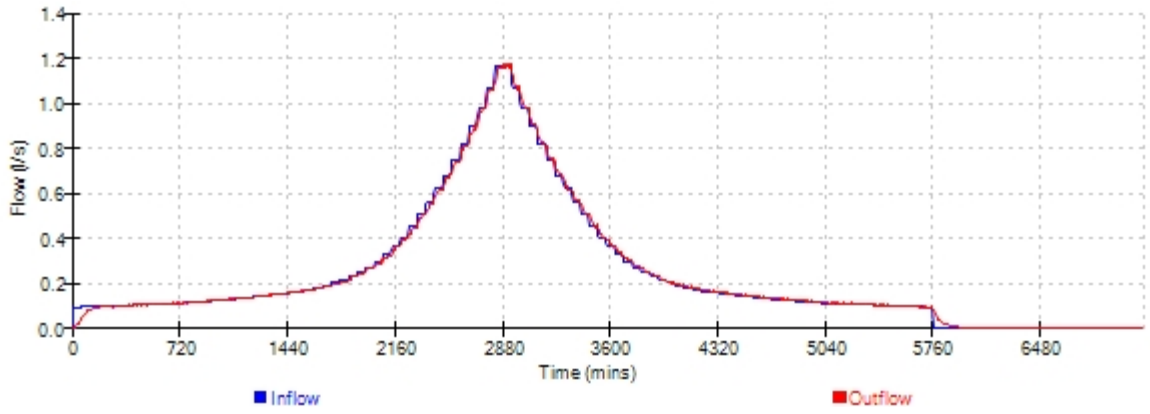
Event: 4320 min Summer

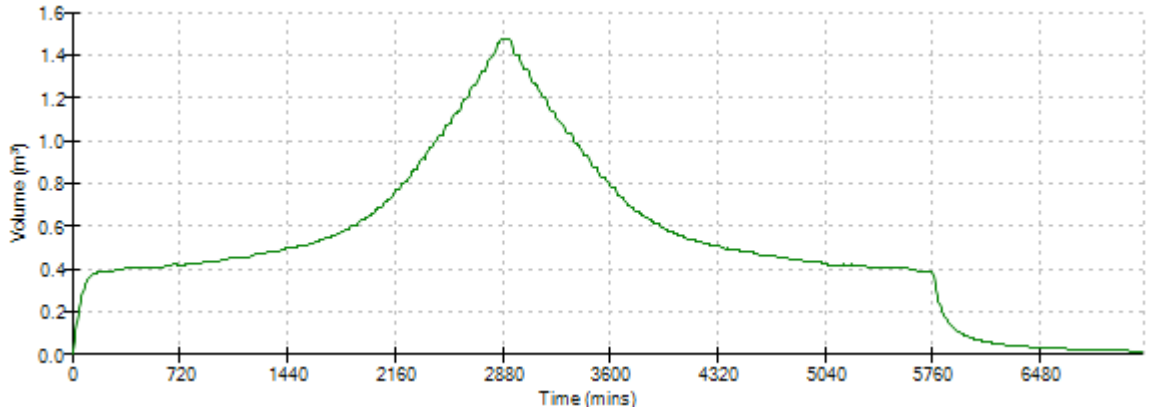


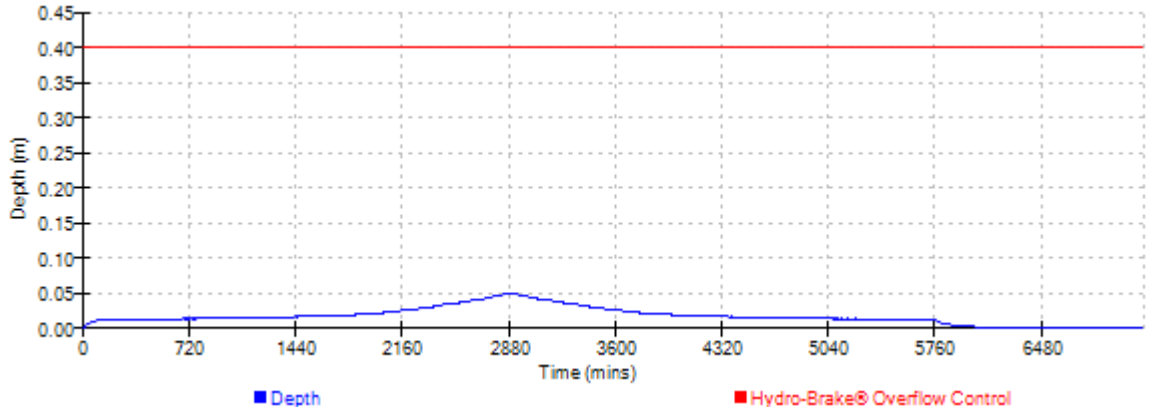




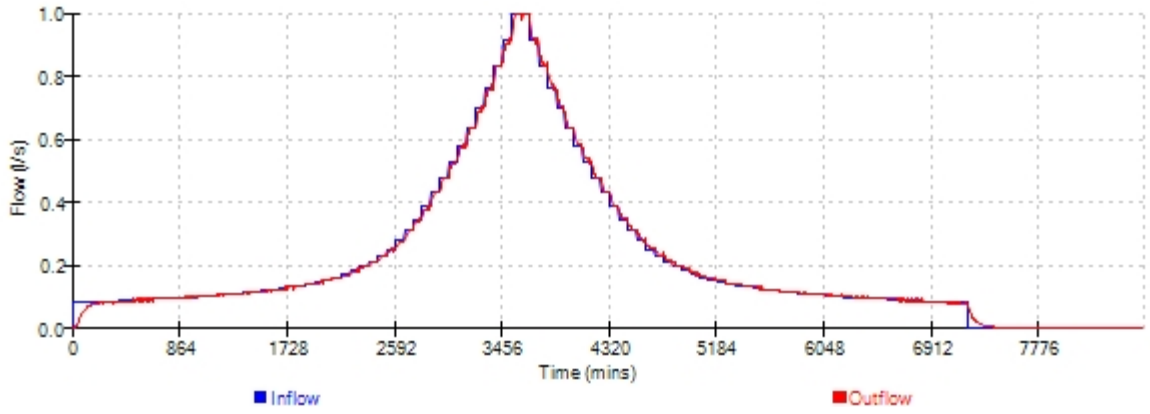
Event: 5760 min Summer

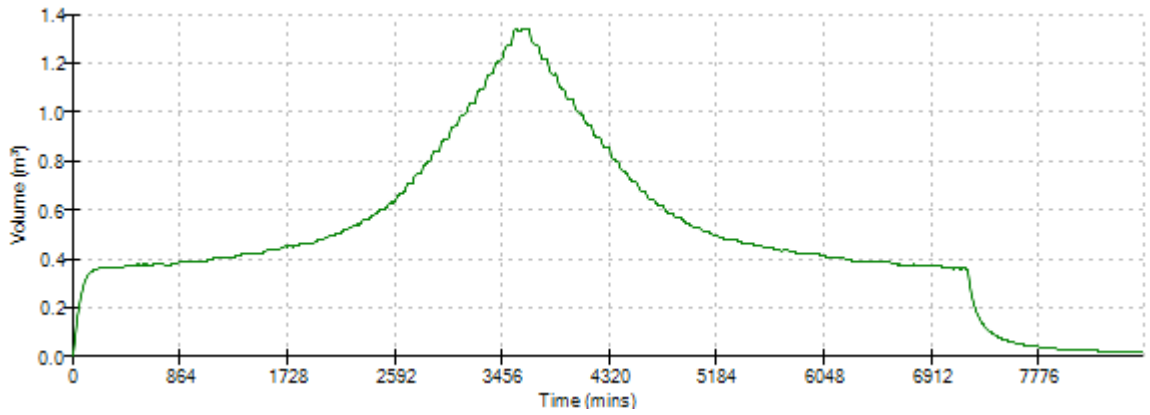


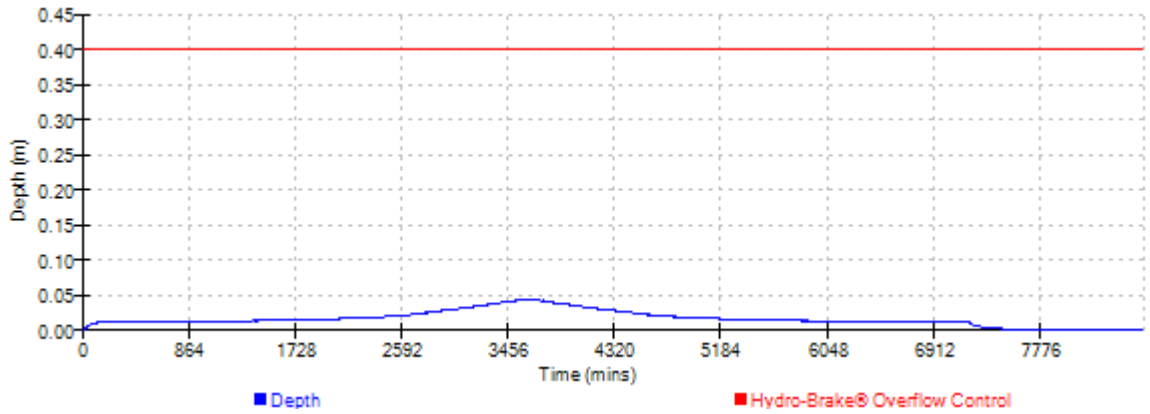




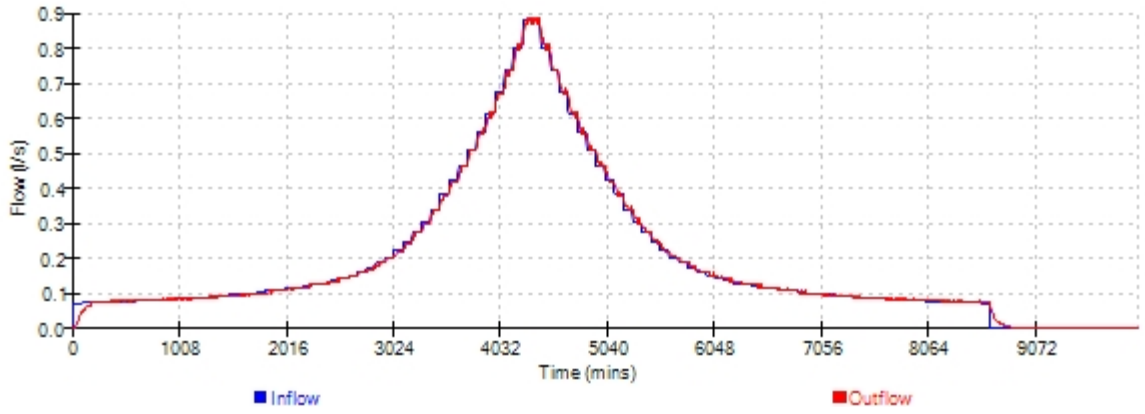
Event: 7200 min Summer

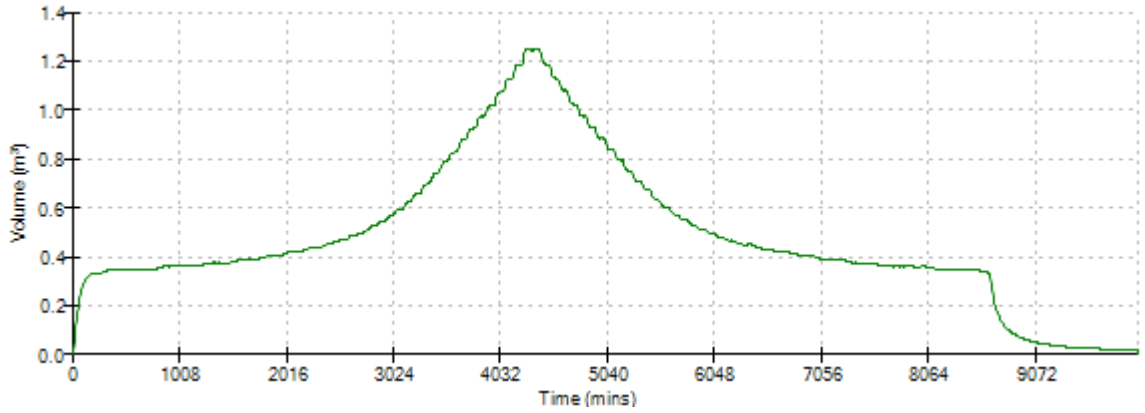


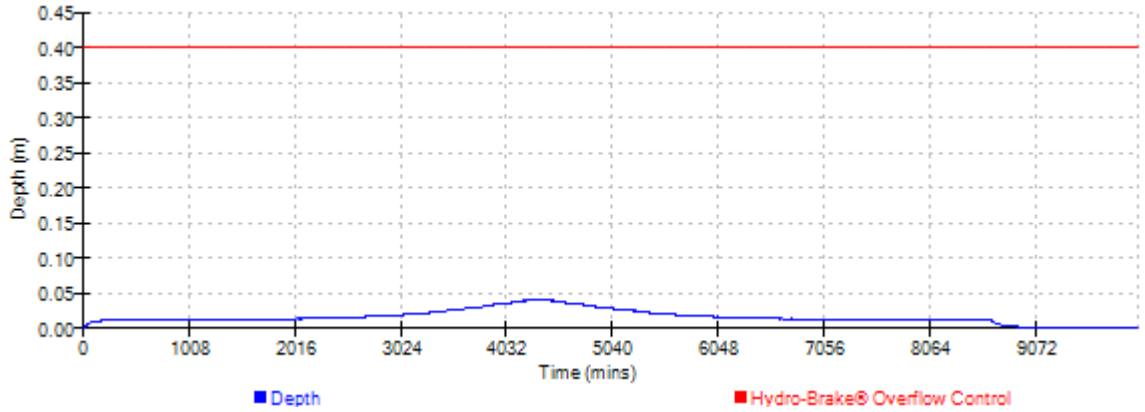




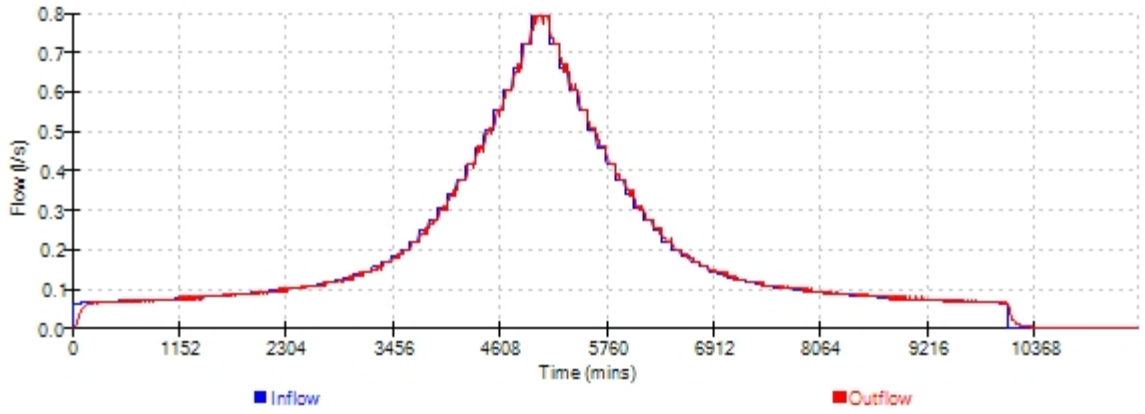
Event: 8640 min Summer

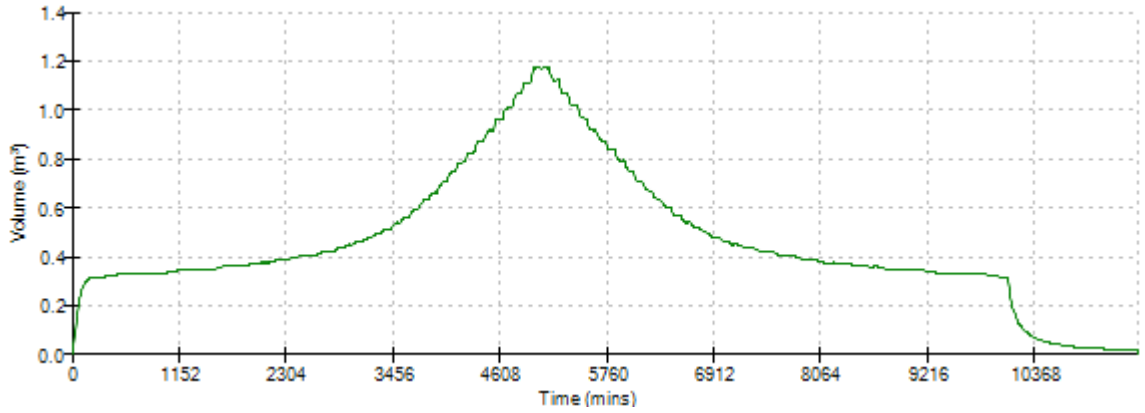


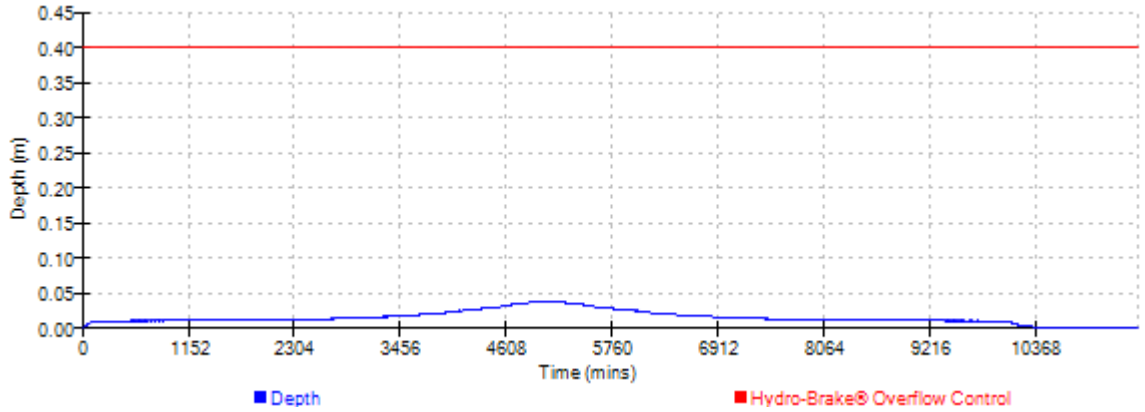




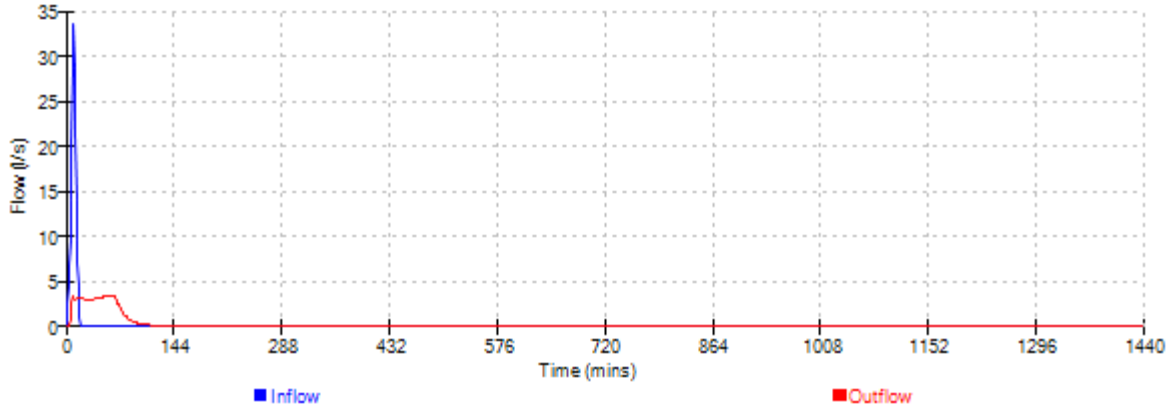
Event: 10080 min Summer

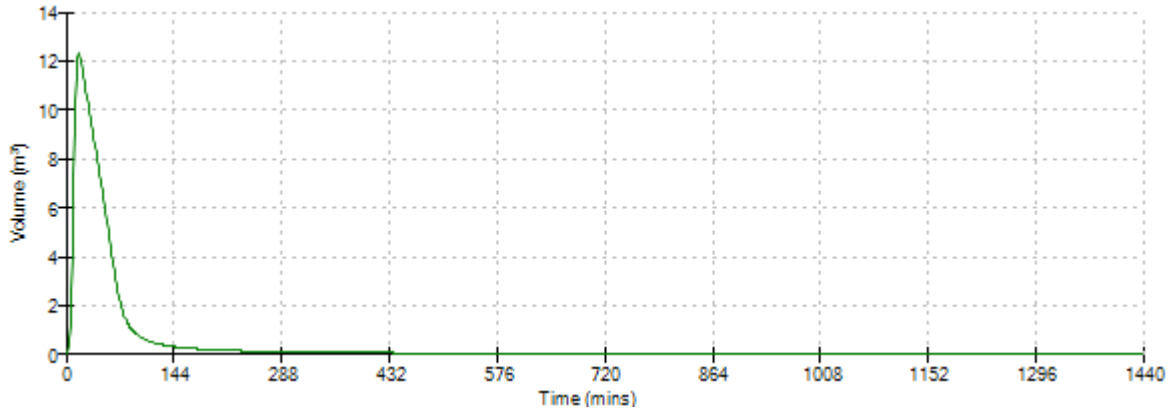


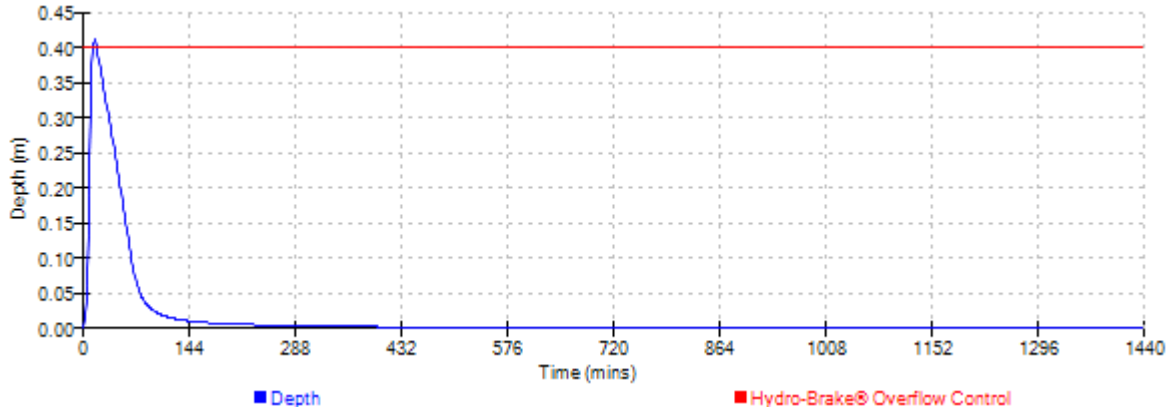




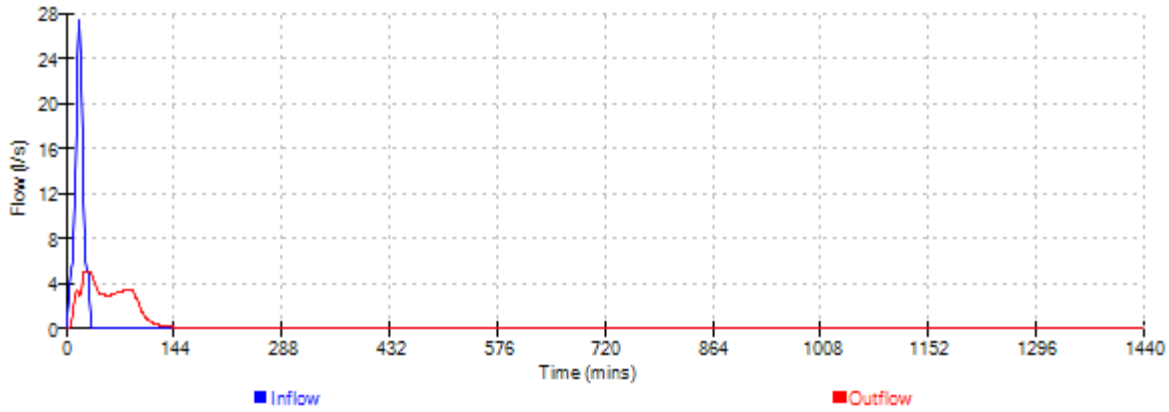
Event: 15 min Winter

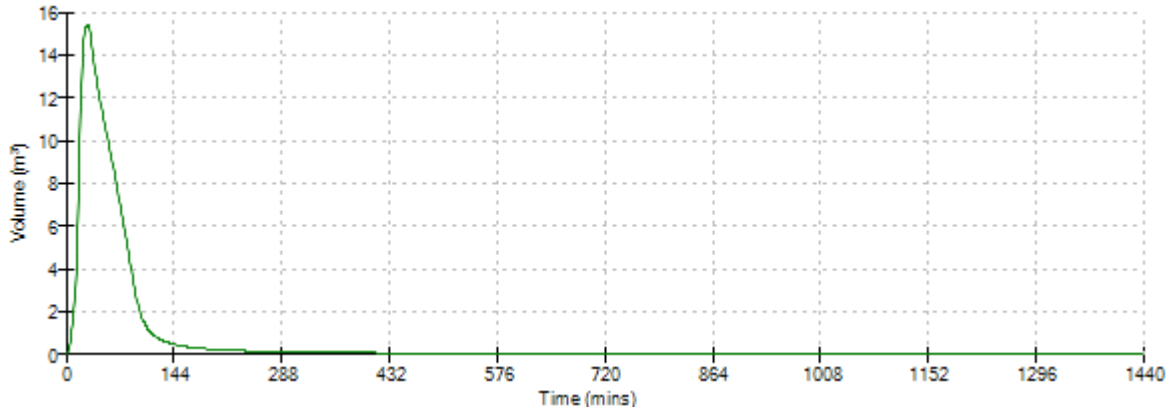


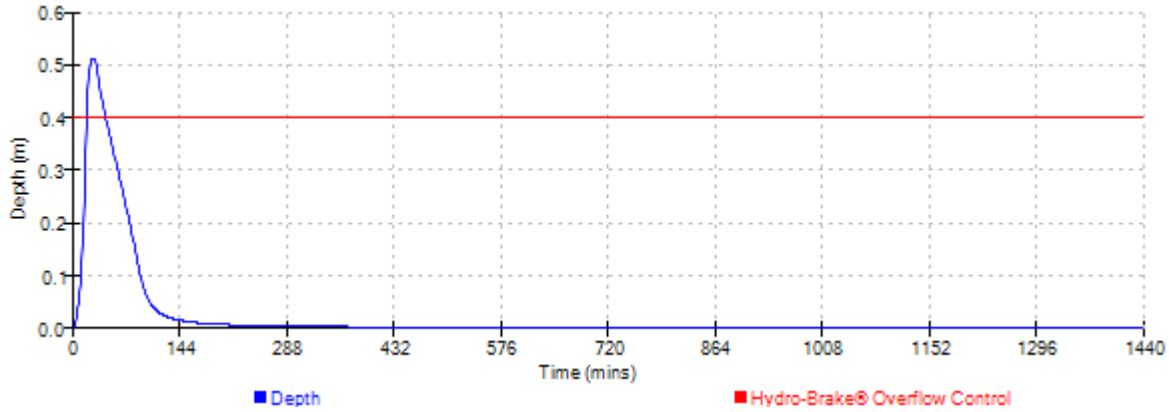




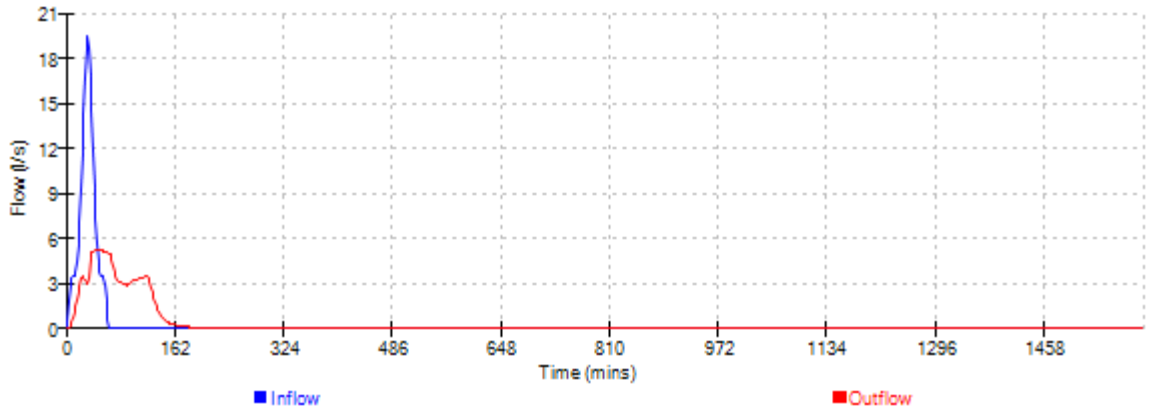
Event: 30 min Winter

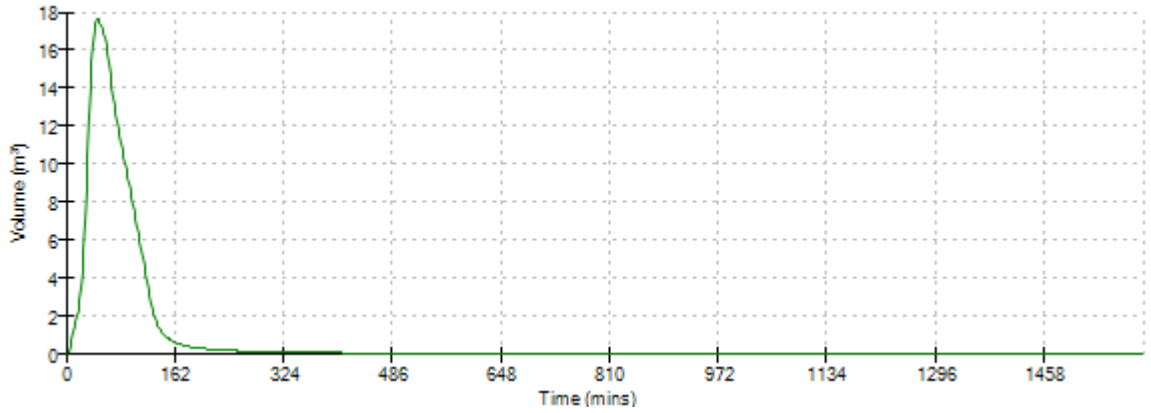


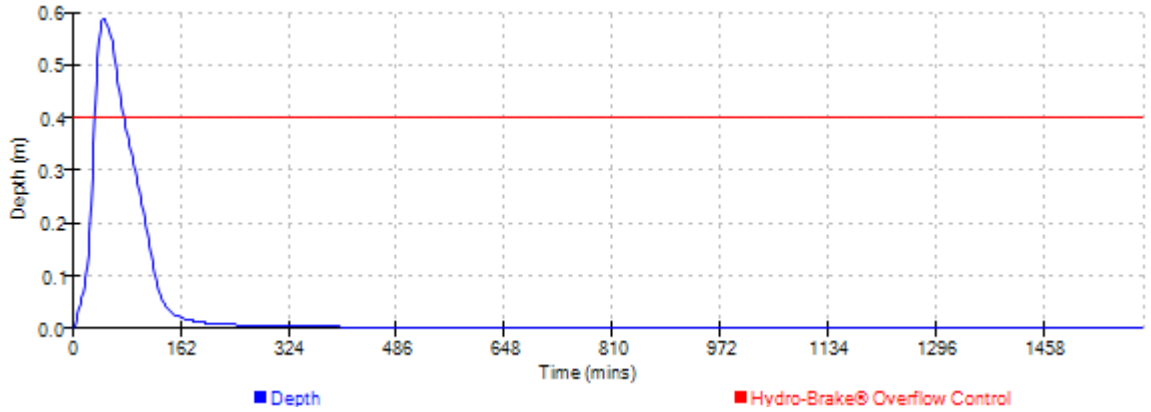




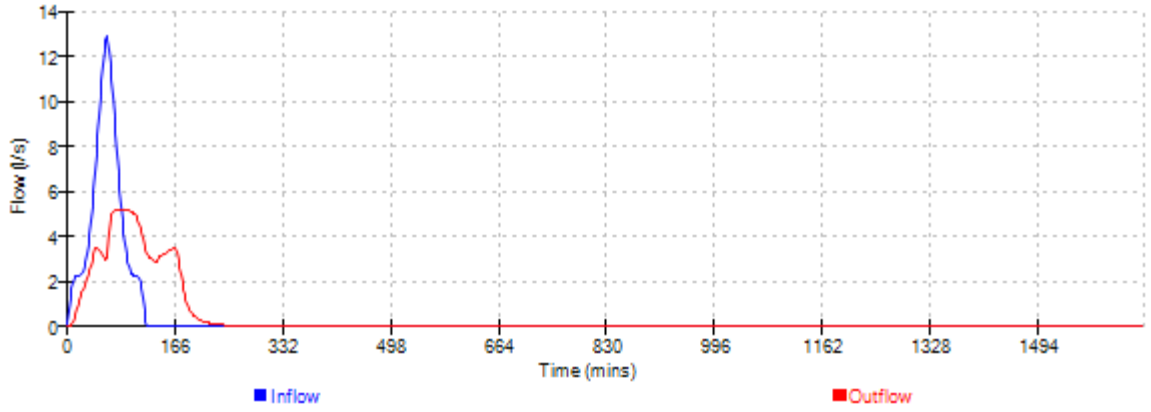
Event: 60 min Winter

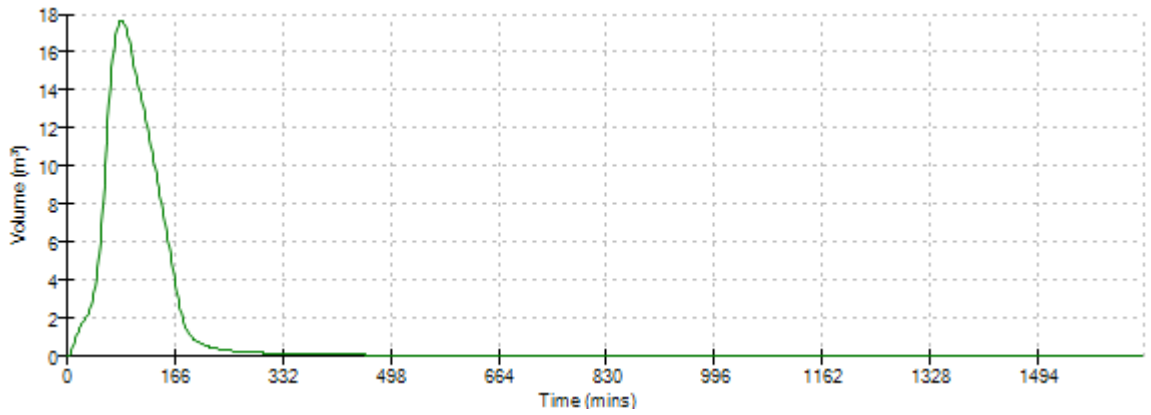


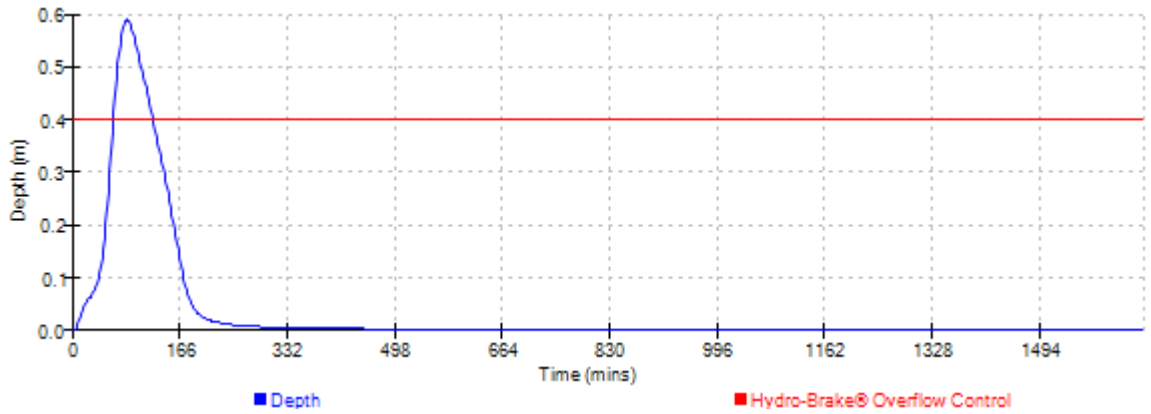




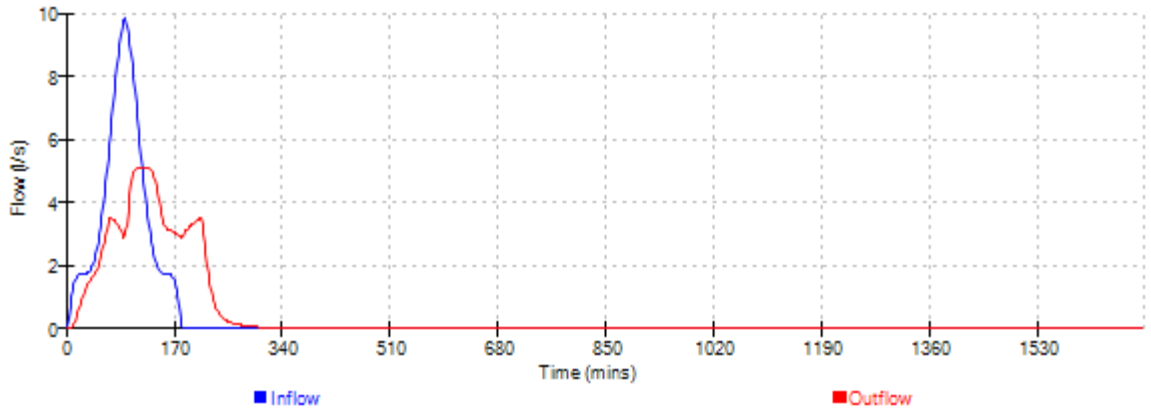
Event: 120 min Winter

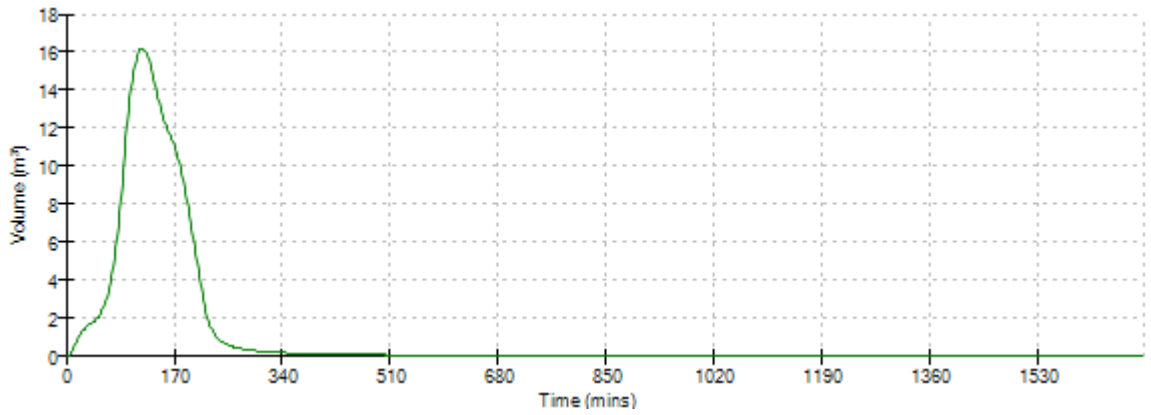


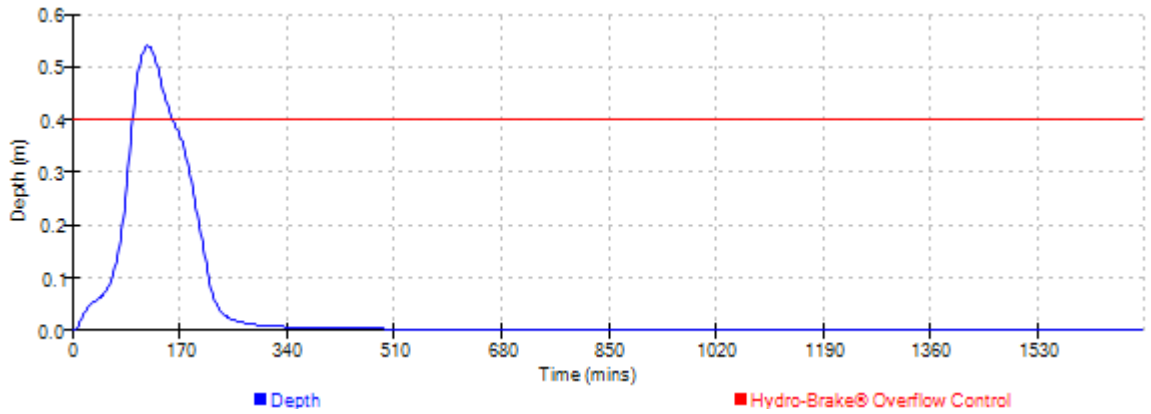




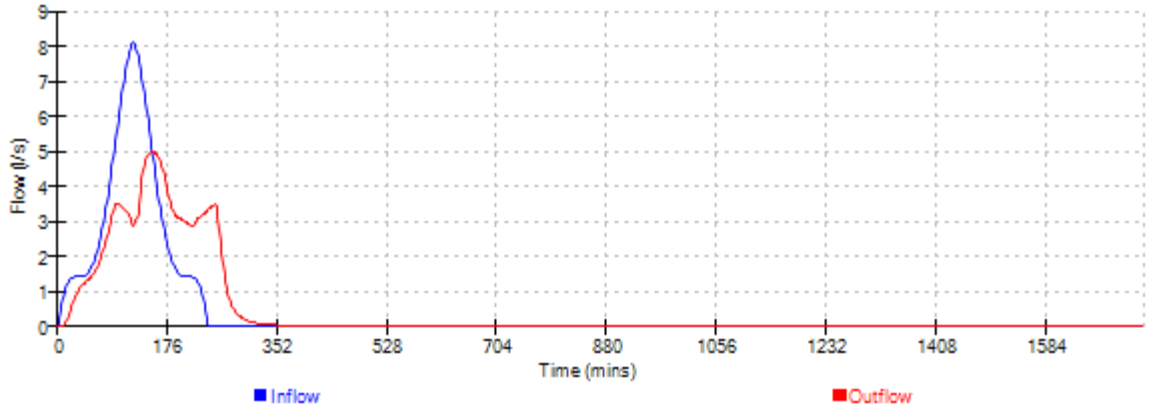
Event: 180 min Winter

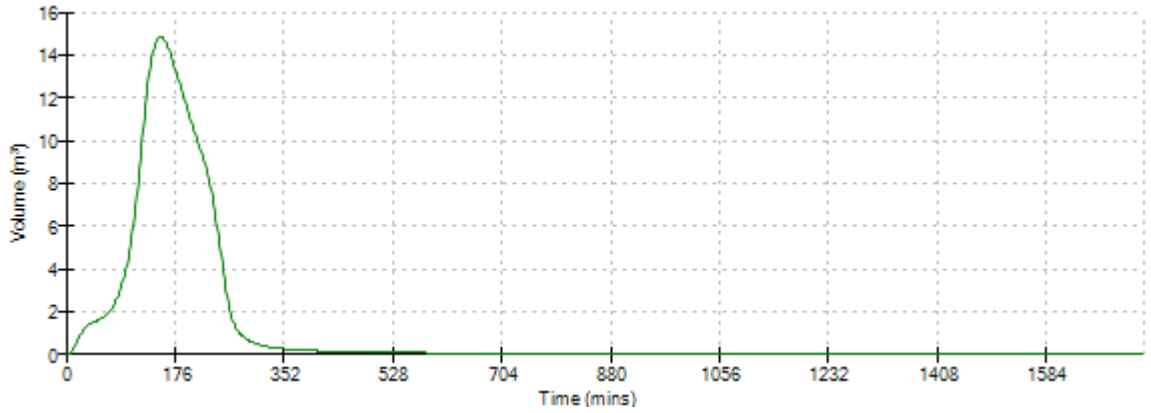


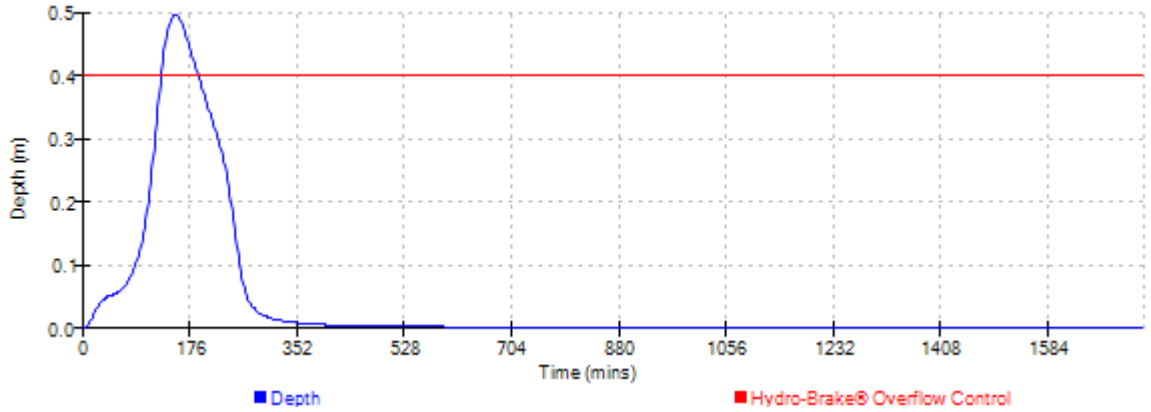




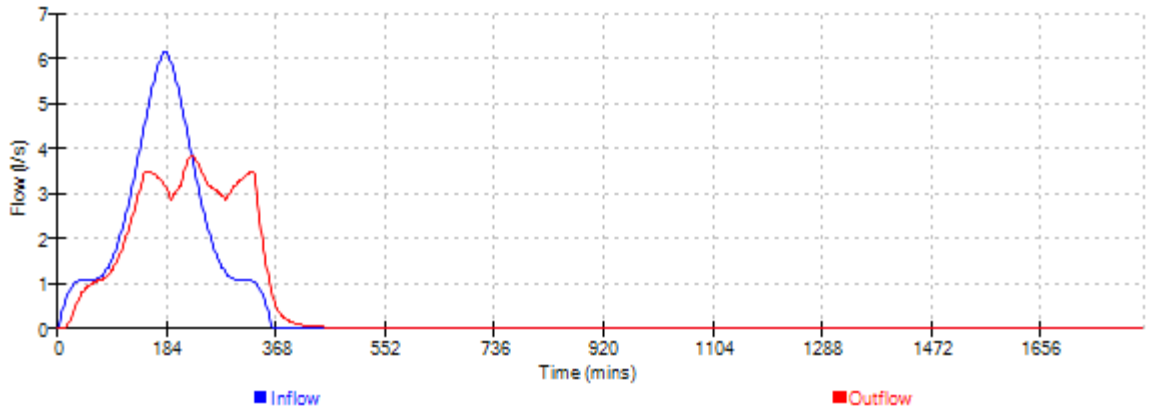
Event: 240 min Winter

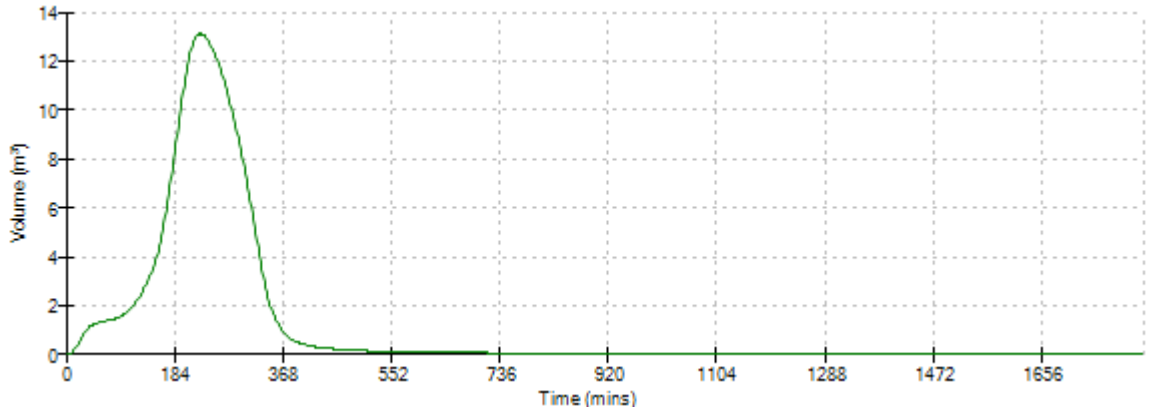


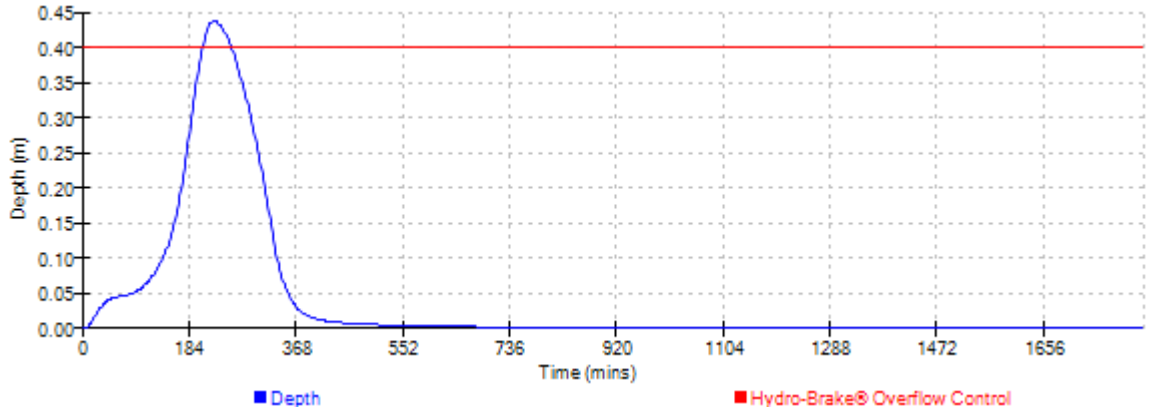




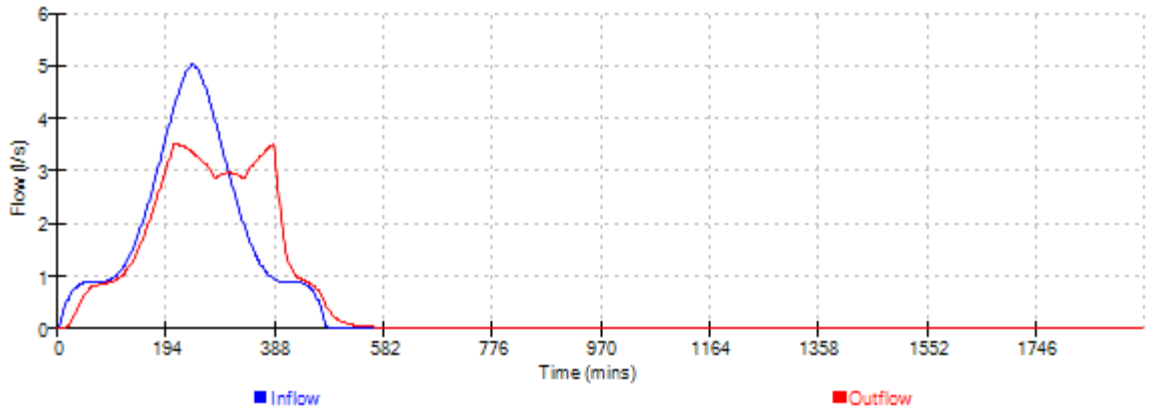
Event: 360 min Winter

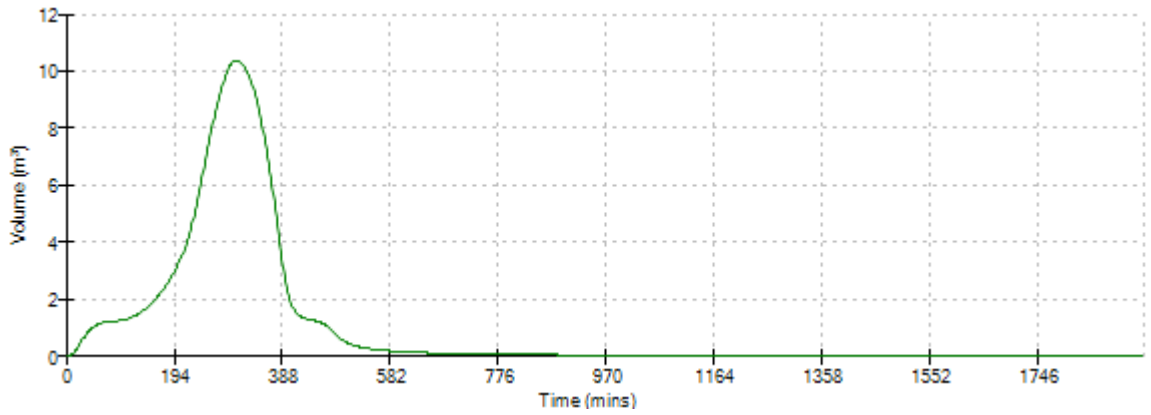


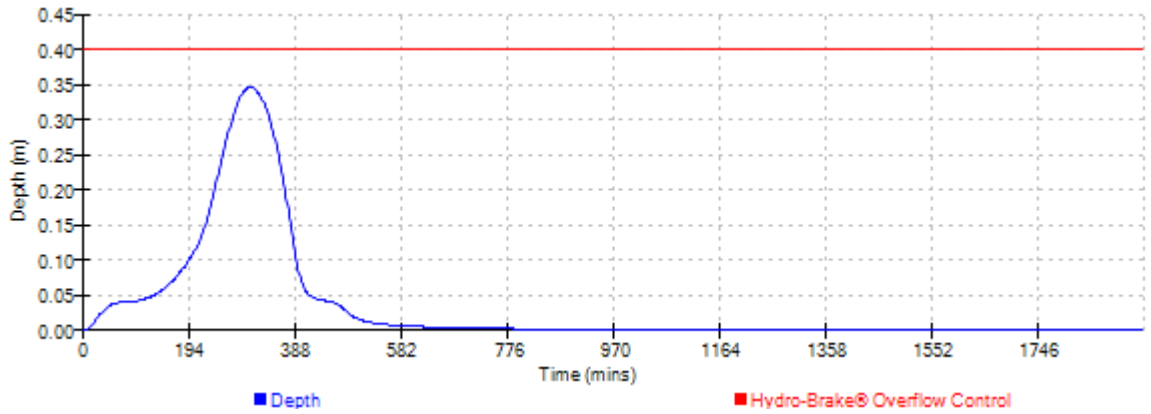




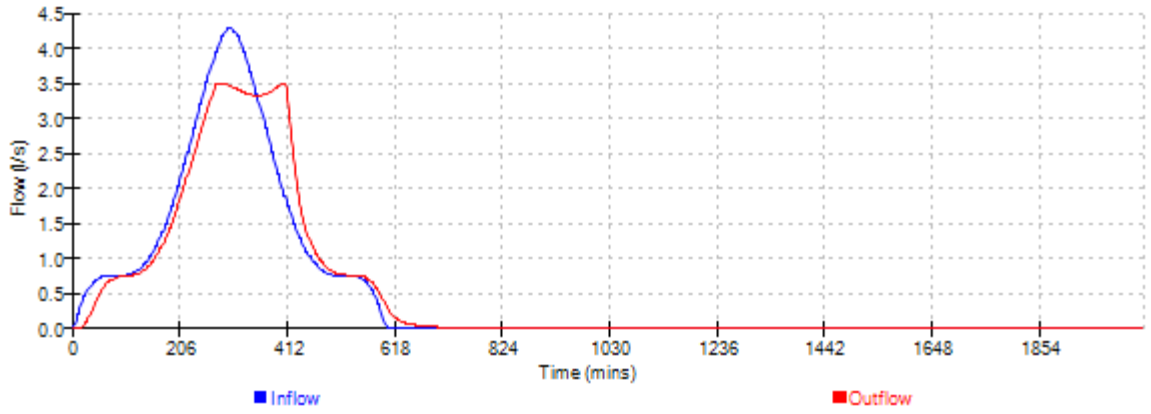
Event: 480 min Winter

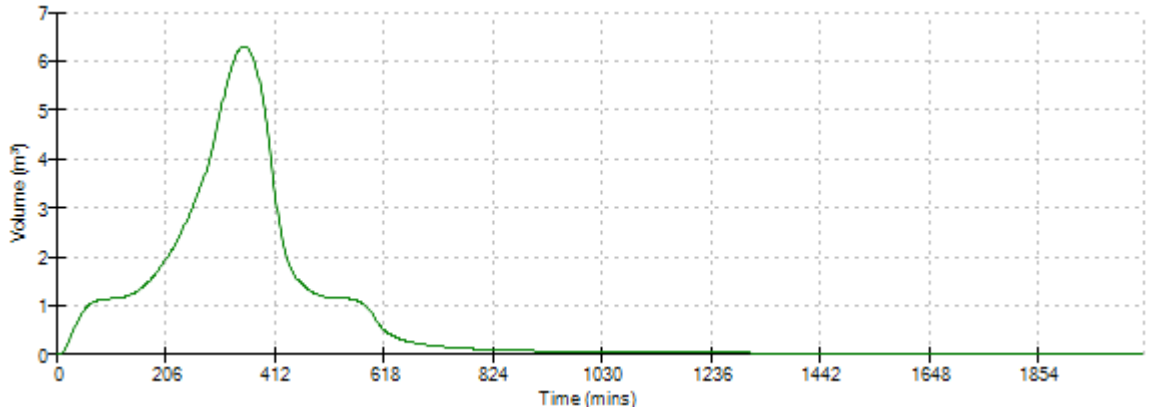


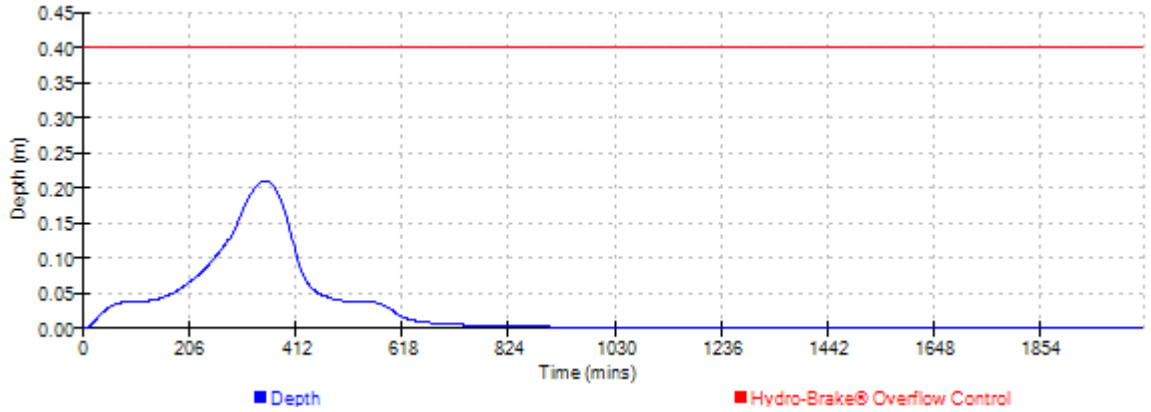




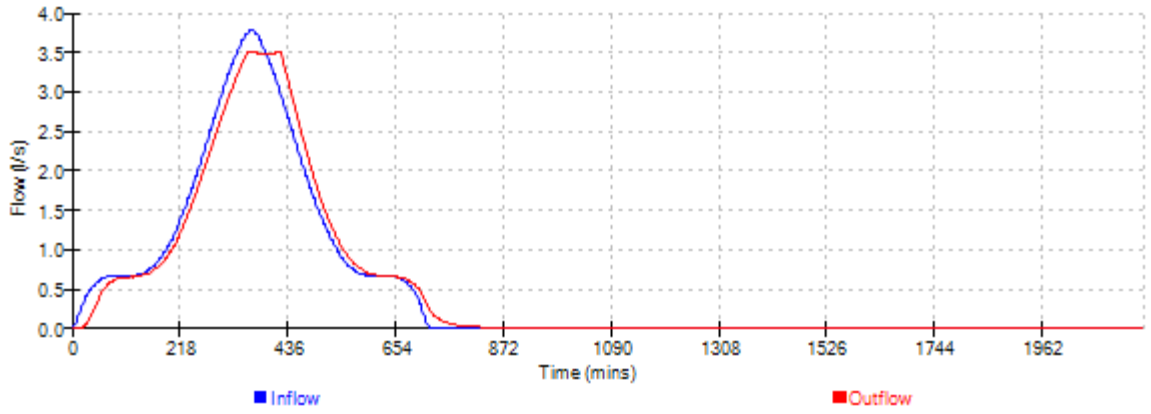
Event: 600 min Winter

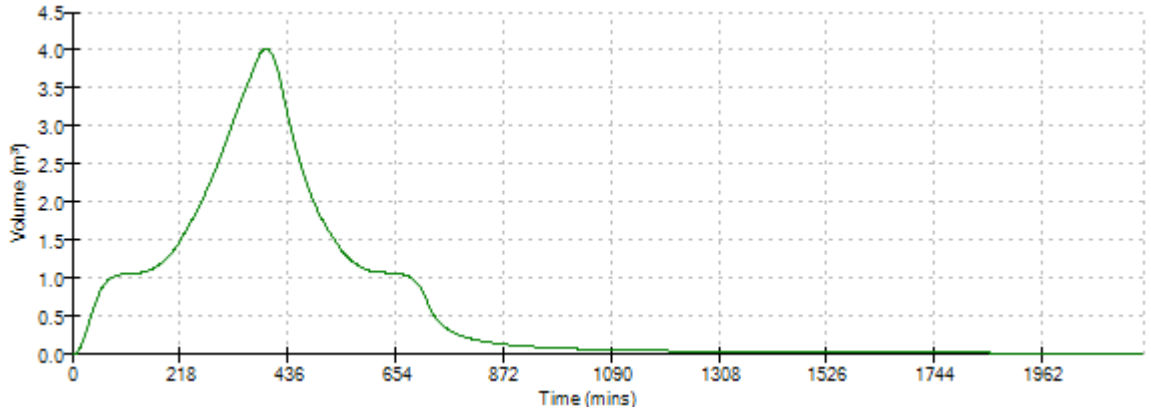


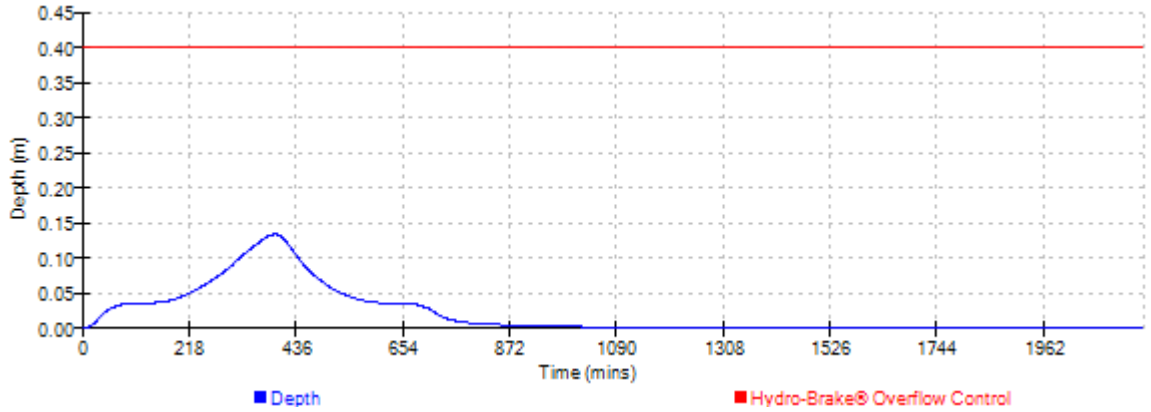




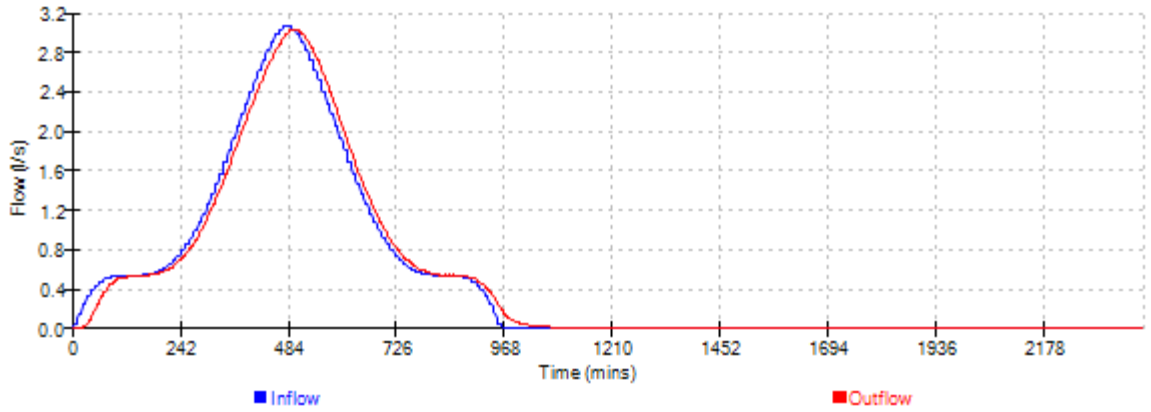
Event: 720 min Winter

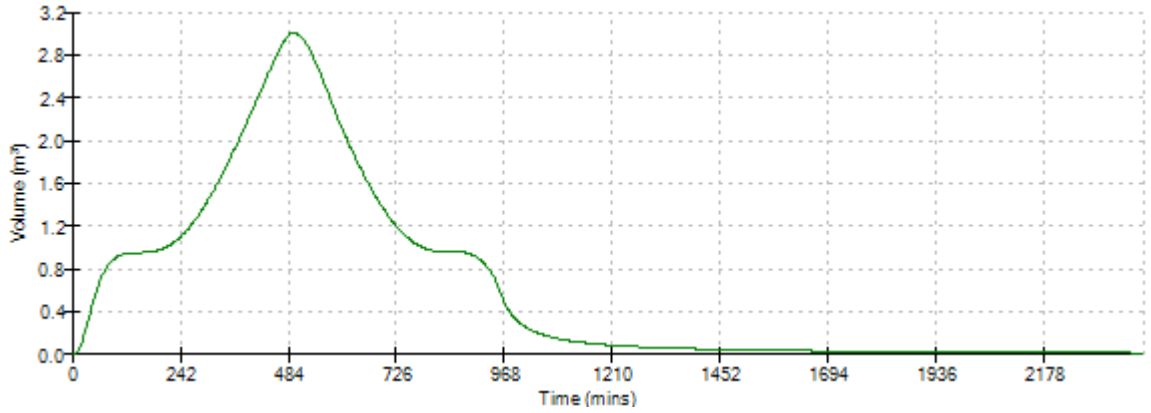


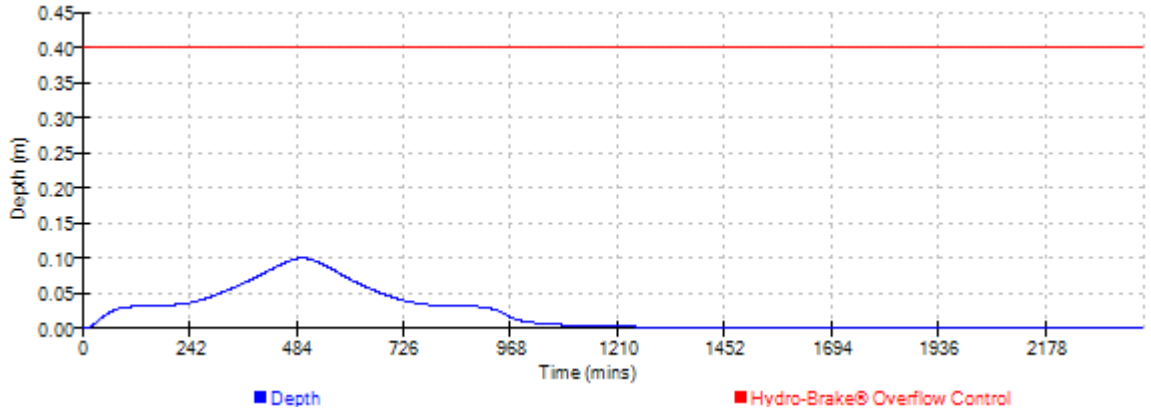




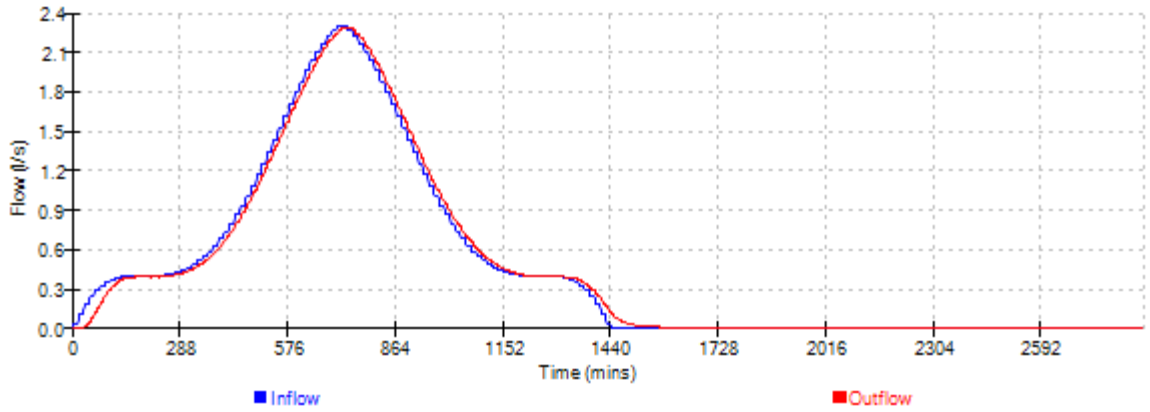
Event: 960 min Winter

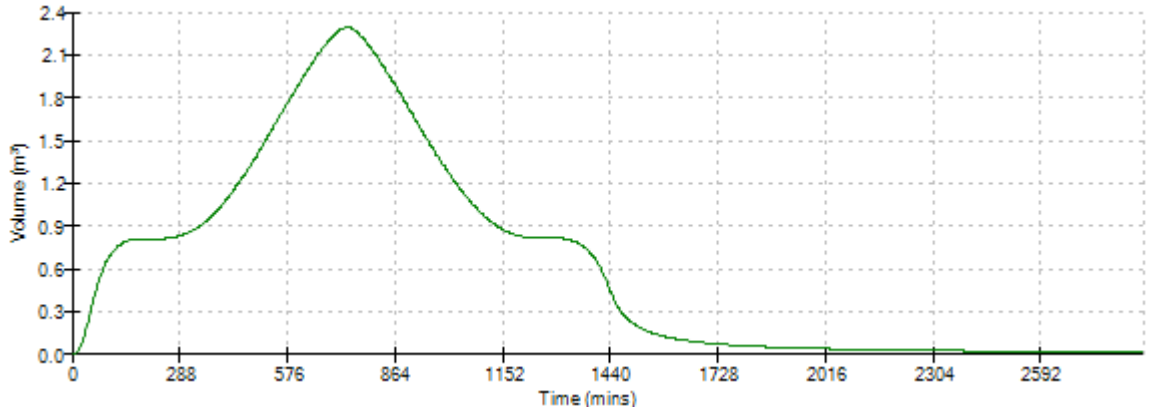


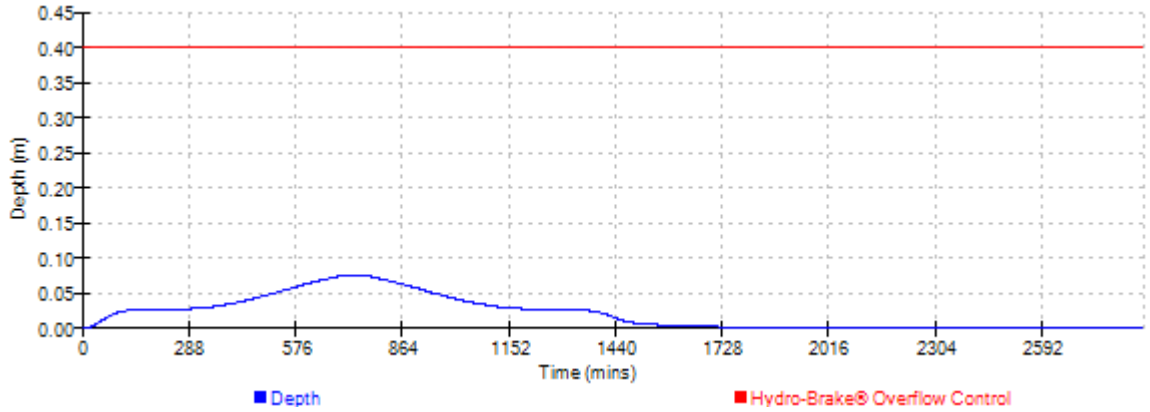




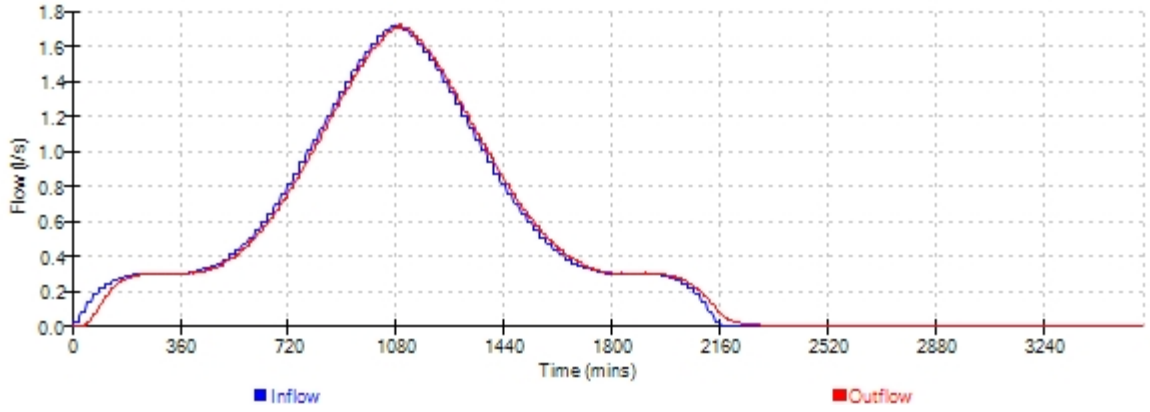
Event: 1440 min Winter

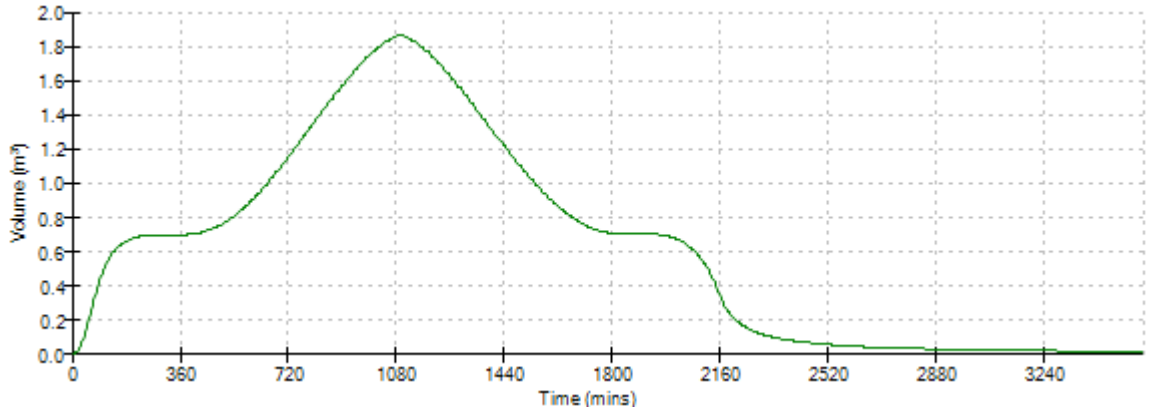


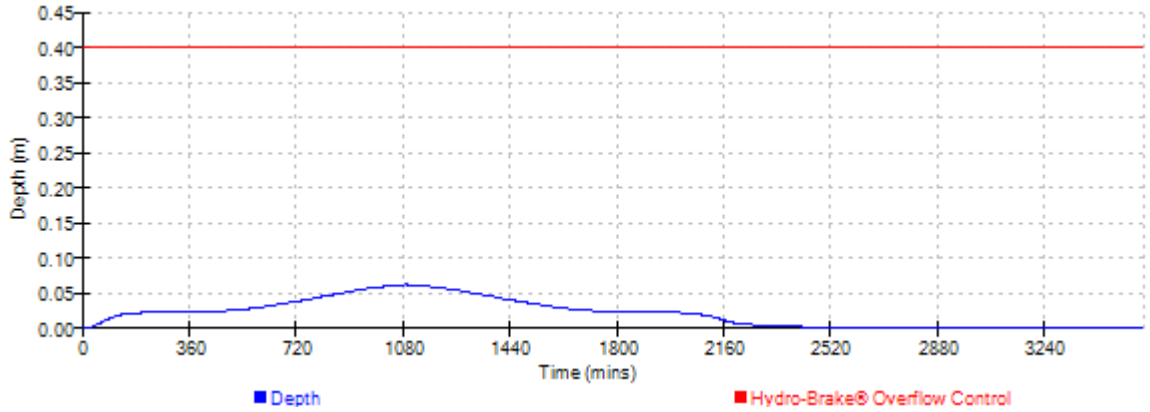




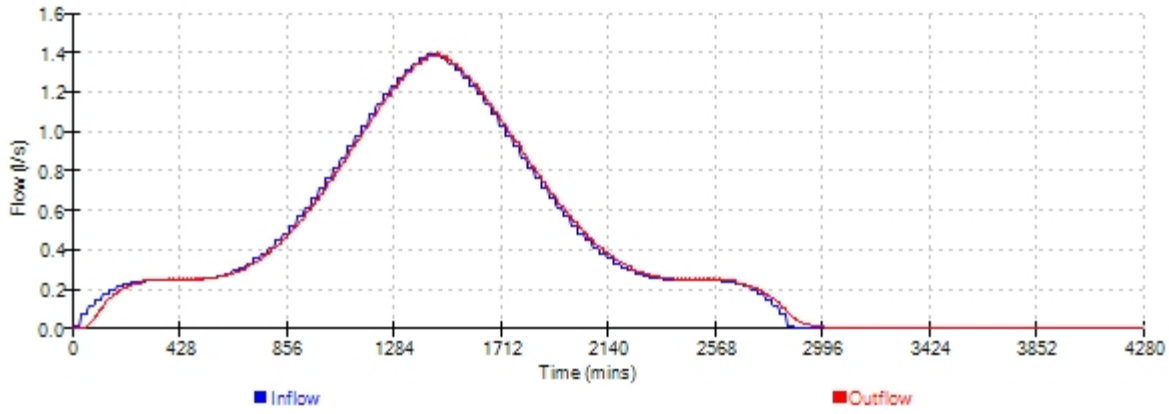
Event: 2160 min Winter

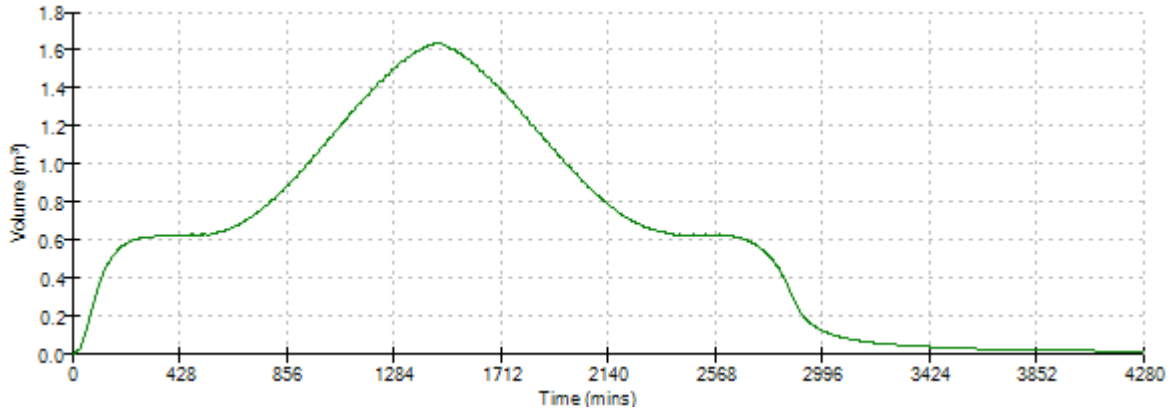


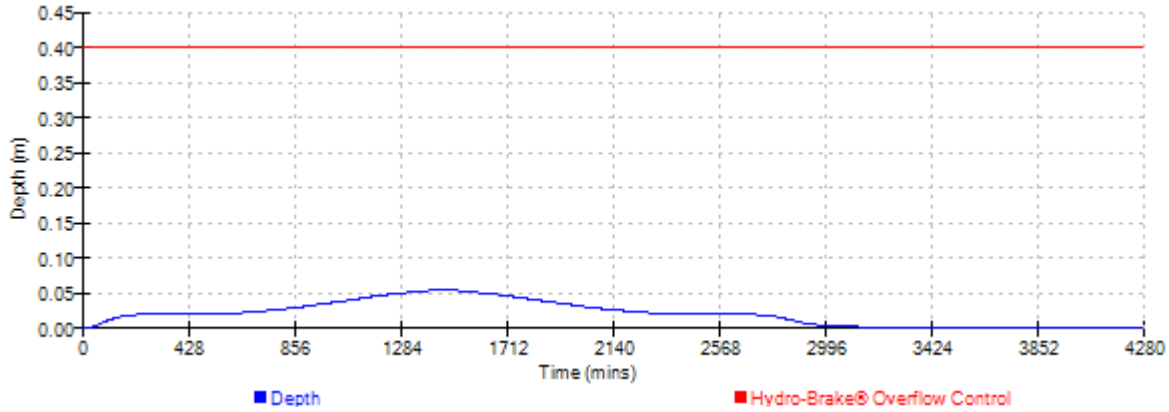




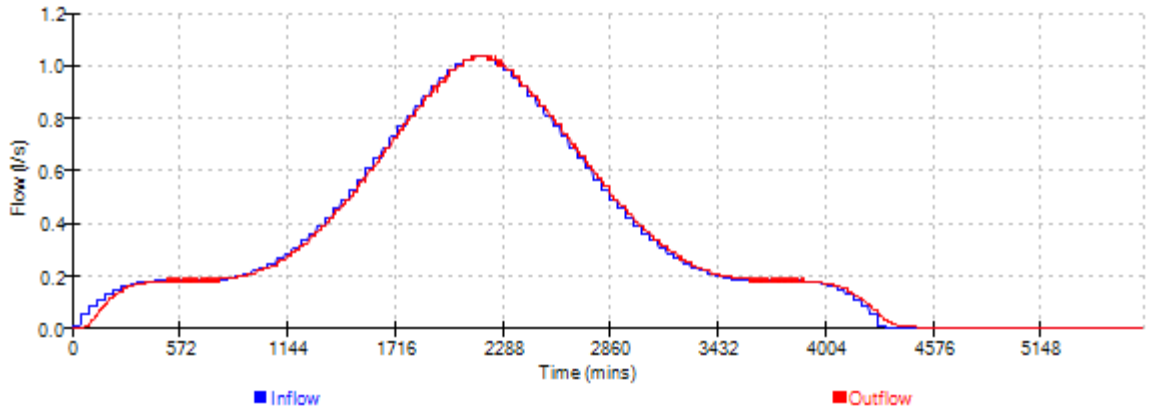
Event: 2880 min Winter

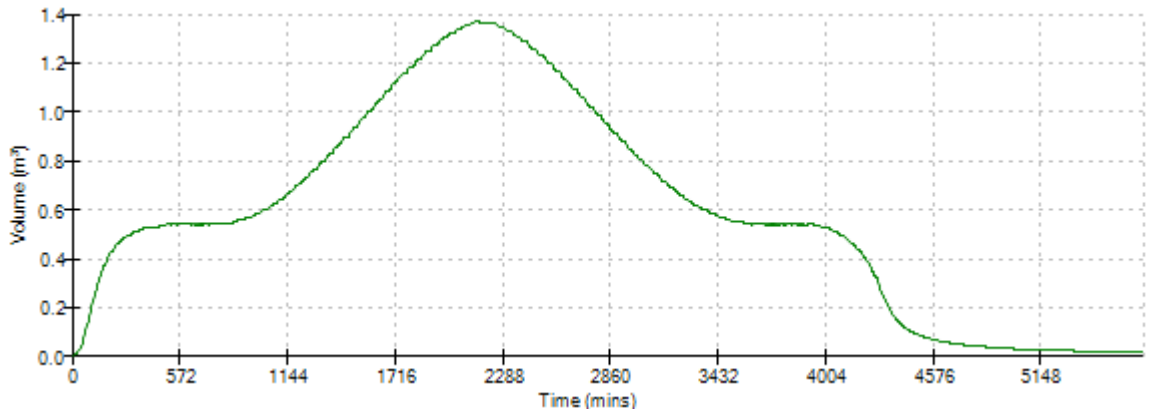


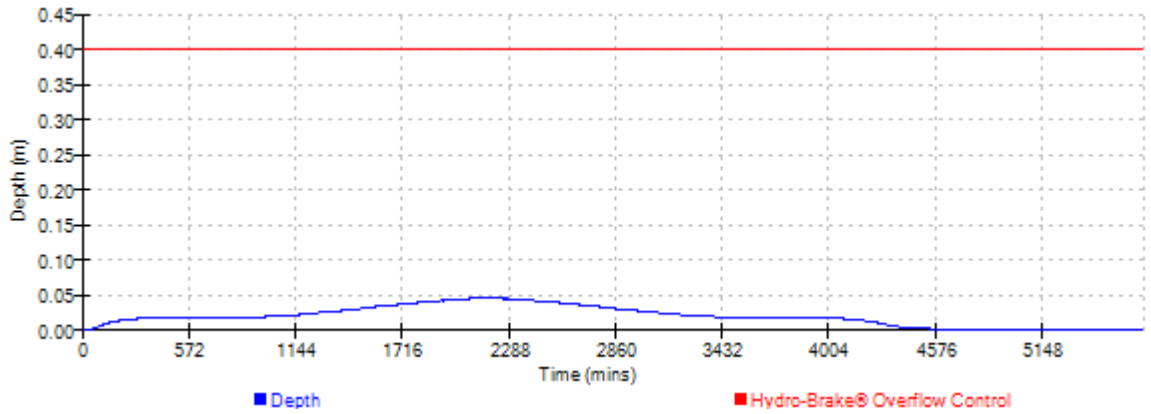




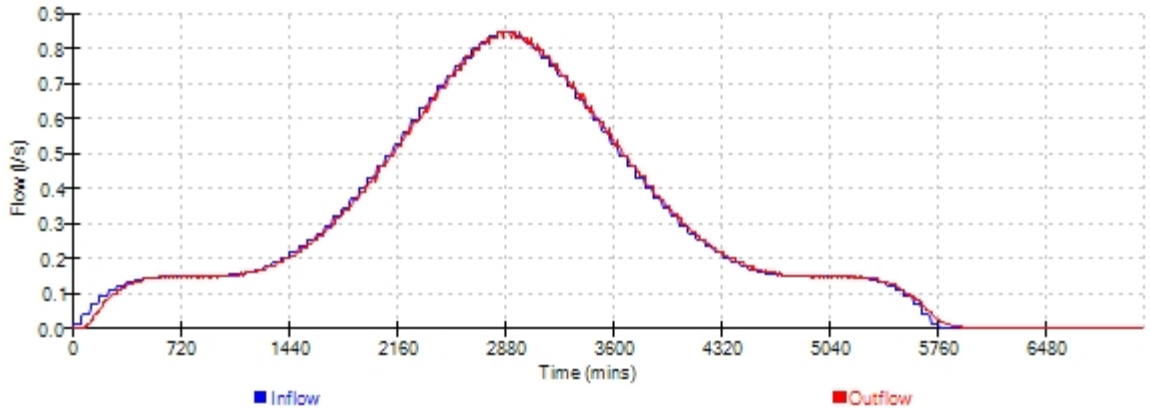
Event: 4320 min Winter

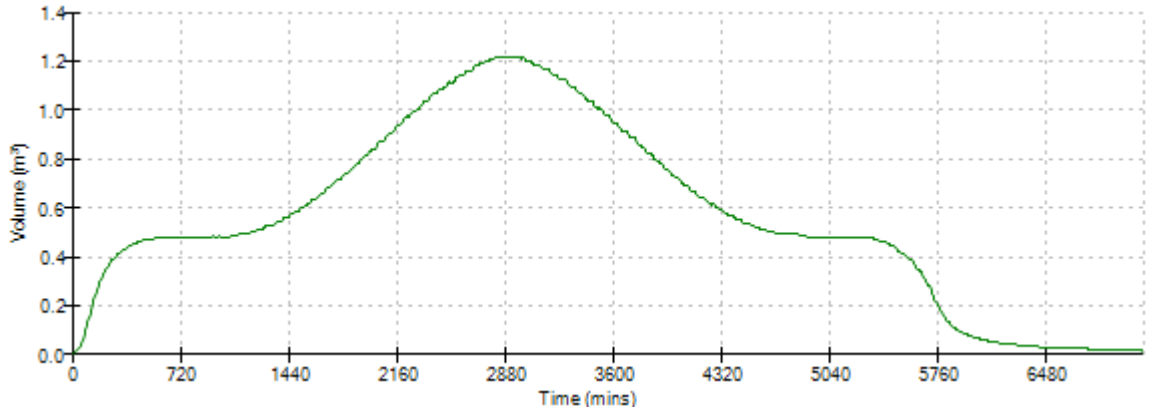


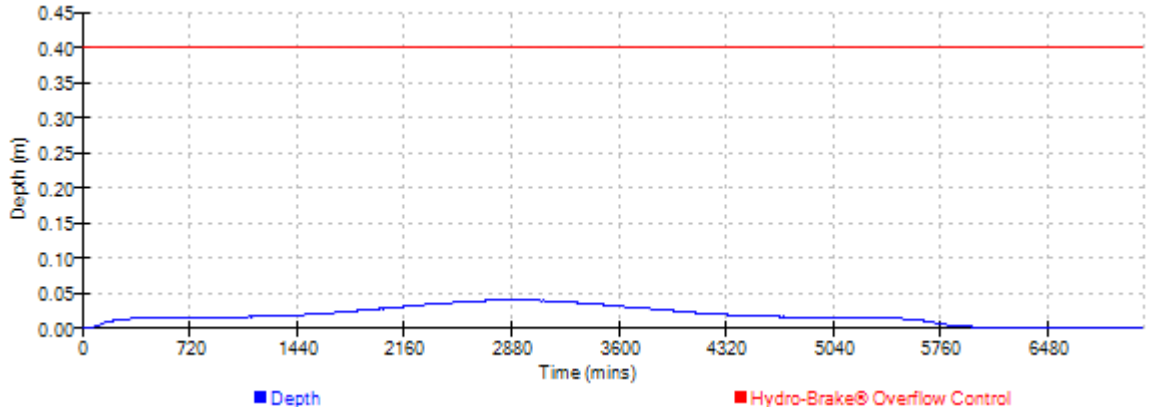




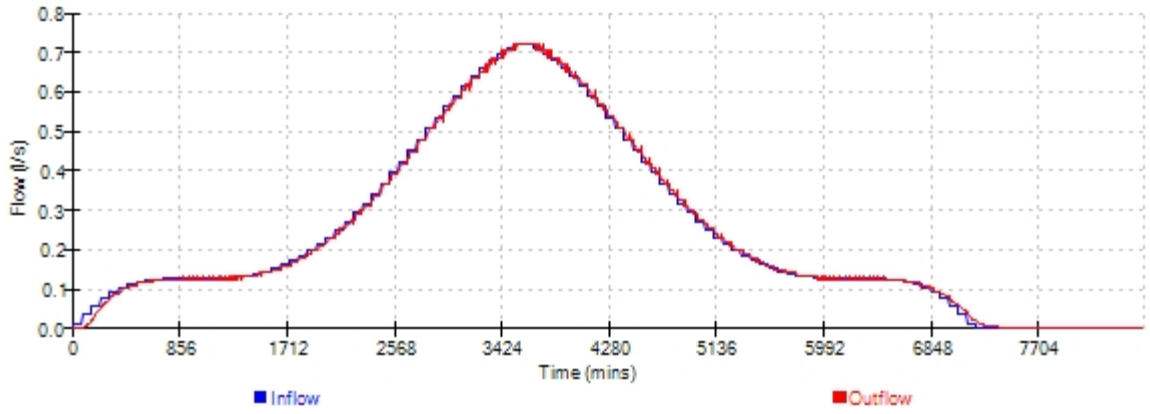
Event: 5760 min Winter

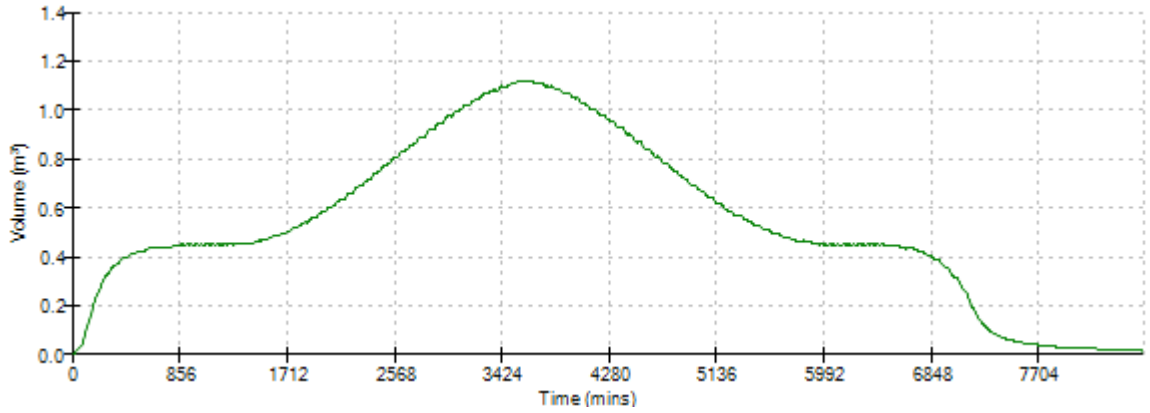


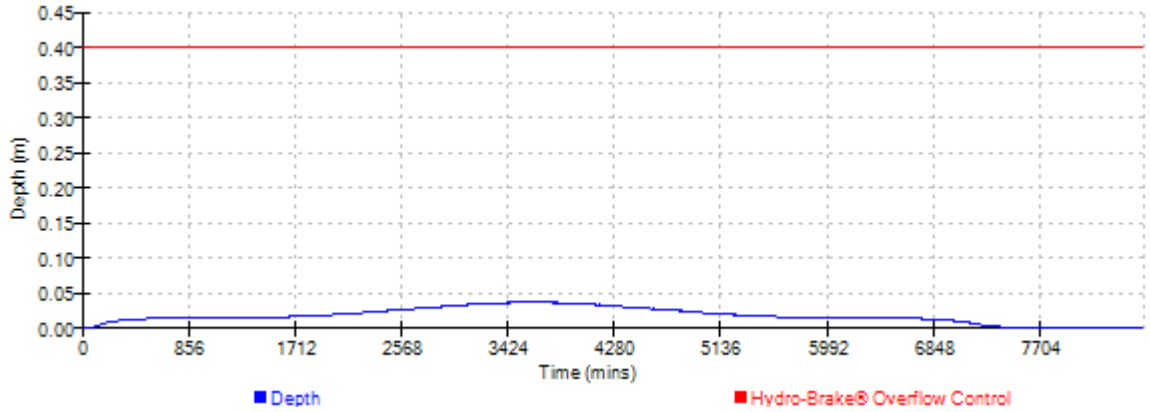




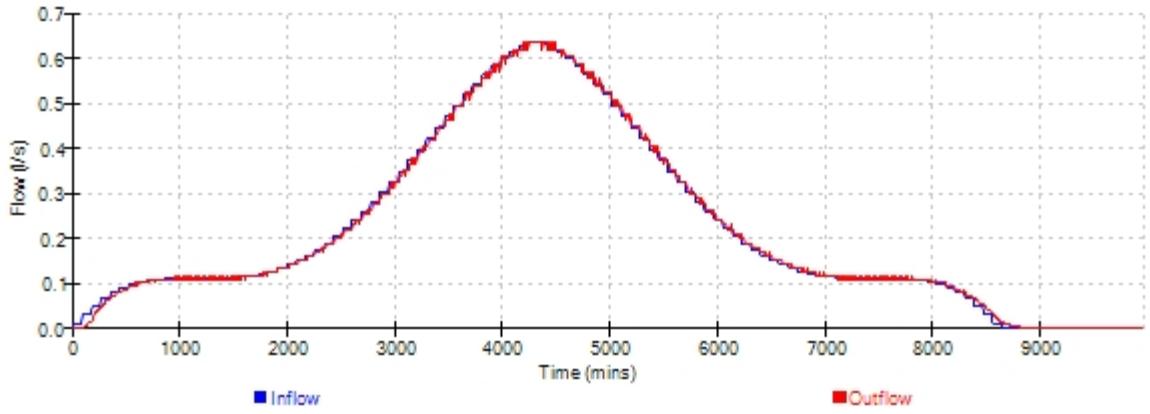
Event: 7200 min Winter

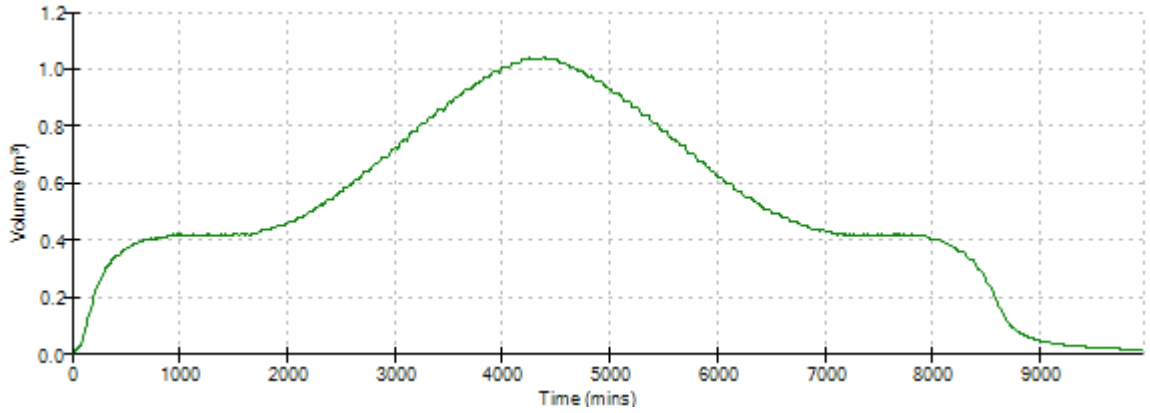


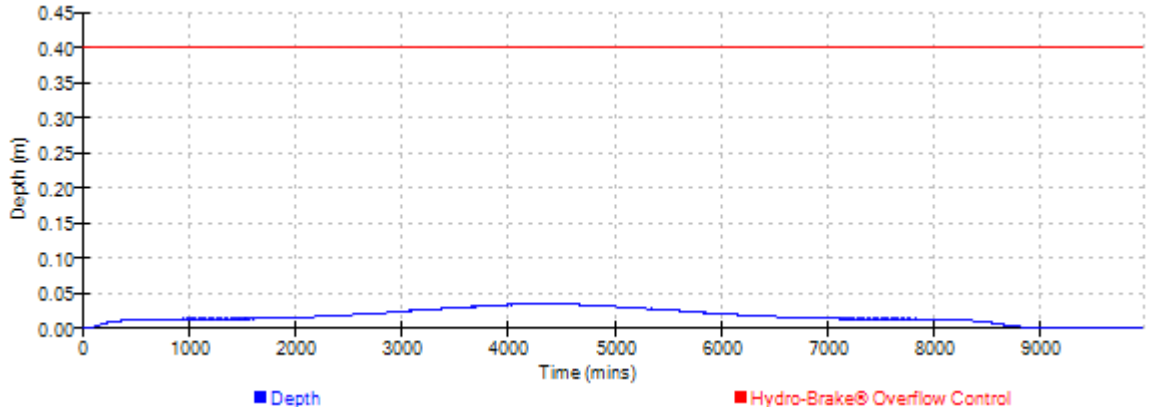




Event: 8640 min Winter







Event: 10080 min Winter