

Hydro-Logic Services
Unit 6 Commerce Park
Brunel Road
Theale
Berkshire
RG 7 4AB

Maes Y Ffynnon
Penrhosgarnedd
Bangor
Gwynedd
LL57 2DW
15th September 2021

Planning Reference: P/2021/0058
Your Ref: P/2021/0058

Proposal: Erection of Polytunnels and Associated Works

Location: Maelor Forest Nurseries Ltd, Whitchurch, Wrexham

To whom it may concern

Please find a response to your letter of the 27th August 2021. This response pertains to the following paragraph within your letter. It is shown in *italics* below:

A drainage plan for the site should also be submitted in order to address the run-off issues referred to above. It is also stated that there will be no trade effluent involved with site operations.

Please find below the drainage plan and methodology behind it. We confirm there will be no trade effluent coming from the site.

In accordance with building regulations the site should first drain to the soil. If this is not acceptable then the development should drain to a watercourse; if this is not feasible, the site should drain to either a highway drain or a surface water public sewer. If none of these are possible then the site can drain to a combined sewer.

According to British Geological Survey website the ground is Mudstone and according to the soilscape website drainage is impeded at the site, therefore it is likely that infiltration is not feasible.

There is a watercourse to the south west of the site. The site will discharge at Qbar greenfield rates in accordance with national guidance, (Appendix A). The watercourse is within our client ownership. The watercourse is lower than the site so can drain via gravity.

The site impermeable area is 4.6ha. The site is attenuated up to and including the 1 in 100 year event plus climate change of 40% of 3223m³ in accordance with TAN15. Please see appendix B for the calculations.

Due to the requirement of storage and that infiltration cannot be use, an attenuation basin has been designed. This will include biodiversity and planting to enable improvements in water quality and biodiversity. The attenuation basin will have 1 in 3 sides and a top ground area of 2500m³. Please see the drainage plan (Appendix C).

I trust this is satisfactory but if you have any comments, please do not hesitate to contact me. on 07786912617.

Yours sincerely,



Charles Townsend BSc (Hons), CSci, CIWEM
Principal Consultant Flood Risk, Hydro-Logic Services
Enclosed:

Appendix A: Greenfield runoff Calculations

Appendix B: Microdraiange calculations

Appendix C: Drainage Plan.

APPENDIX A

Hydrologic Services		Page 1
Unit 6, Commerce Park Brunel Way Theale RG7 4AB		
Date 10/09/2021 16:33 File	Designed by dgoukos Checked by	
Innovyze	Source Control 2017.1	
<u>ICP SUDS Mean Annual Flood</u> Input Return Period (years) 100 SAAR (mm) 708 Urban 0.000 Area (ha) 4.641 Soil 0.450 Region Number Region 4 Results 1/s QBAR Rural 20.7 QBAR Urban 20.7 Q100 years 53.1 Q1 year 17.1 Q30 years 40.5 Q100 years 53.1		
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APPENDIX B

Hydrologic Services				Page 1	
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Date 13/09/2021 13:24 File L0377_ATTENUATION BASIN....		Designed by dgoukos Checked by			
Innovyze		Source Control 2017.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.628	0.628	20.7	1059.2	O K
30 min Summer	0.815	0.815	20.7	1407.0	O K
60 min Summer	1.004	1.004	20.7	1776.4	O K
120 min Summer	1.188	1.188	20.7	2152.6	O K
180 min Summer	1.285	1.285	20.7	2357.2	O K
240 min Summer	1.345	1.345	20.7	2486.0	O K
360 min Summer	1.414	1.414	20.7	2636.2	O K
480 min Summer	1.454	1.454	20.7	2724.9	O K
600 min Summer	1.476	1.476	20.7	2774.1	O K
720 min Summer	1.487	1.487	20.7	2798.0	O K
960 min Summer	1.487	1.487	20.7	2797.8	O K
1440 min Summer	1.454	1.454	20.7	2724.3	O K
2160 min Summer	1.396	1.396	20.7	2597.6	O K
2880 min Summer	1.337	1.337	20.7	2468.4	O K
4320 min Summer	1.216	1.216	20.7	2211.0	O K
5760 min Summer	1.087	1.087	20.7	1944.6	O K
7200 min Summer	0.941	0.941	20.7	1651.7	O K
8640 min Summer	0.814	0.814	20.7	1405.8	O K
10080 min Summer	0.702	0.702	20.7	1195.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	123.439	0.0	1014.2	23	
30 min Summer	82.459	0.0	1344.7	38	
60 min Summer	52.595	0.0	1799.4	68	
120 min Summer	32.440	0.0	2216.0	128	
180 min Summer	24.120	0.0	2465.4	188	
240 min Summer	19.422	0.0	2639.3	246	
360 min Summer	14.219	0.0	2876.3	366	
480 min Summer	11.402	0.0	3037.6	486	
600 min Summer	9.600	0.0	3129.3	606	
720 min Summer	8.337	0.0	3146.6	724	
960 min Summer	6.667	0.0	3095.8	964	
1440 min Summer	4.857	0.0	2958.4	1228	
2160 min Summer	3.531	0.0	4396.6	1604	
2880 min Summer	2.813	0.0	4662.3	2020	
4320 min Summer	2.039	0.0	5017.4	2856	
5760 min Summer	1.620	0.0	5405.3	3688	
7200 min Summer	1.355	0.0	5648.7	4400	
8640 min Summer	1.170	0.0	5850.2	5104	
10080 min Summer	1.034	0.0	6018.7	5848	
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Innovyze		Source Control 2017.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	0.698	0.698	20.7	1187.6	O K
30 min Winter	0.904	0.904	20.7	1578.8	O K
60 min Winter	1.112	1.112	20.7	1996.2	O K
120 min Winter	1.315	1.315	20.7	2420.8	O K
180 min Winter	1.422	1.422	20.7	2654.9	O K
240 min Winter	1.489	1.489	20.7	2804.1	O K
360 min Winter	1.569	1.569	20.7	2983.1	O K
480 min Winter	1.617	1.617	20.7	3094.0	O K
600 min Winter	1.646	1.646	20.7	3161.0	O K
720 min Winter	1.663	1.663	20.7	3199.8	O K
960 min Winter	1.673	1.673	20.7	3223.8	O K
1440 min Winter	1.645	1.645	20.7	3158.1	O K
2160 min Winter	1.572	1.572	20.7	2990.5	O K
2880 min Winter	1.495	1.495	20.7	2816.7	O K
4320 min Winter	1.326	1.326	20.7	2444.6	O K
5760 min Winter	1.141	1.141	20.7	2054.9	O K
7200 min Winter	0.911	0.911	20.7	1593.3	O K
8640 min Winter	0.720	0.720	20.7	1227.7	O K
10080 min Winter	0.561	0.561	20.7	937.3	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Winter	123.439	0.0	1135.1	23	
30 min Winter	82.459	0.0	1489.1	37	
60 min Winter	52.595	0.0	2014.4	68	
120 min Winter	32.440	0.0	2476.2	126	
180 min Winter	24.120	0.0	2748.2	184	
240 min Winter	19.422	0.0	2931.5	244	
360 min Winter	14.219	0.0	3150.6	360	
480 min Winter	11.402	0.0	3216.3	476	
600 min Winter	9.600	0.0	3201.6	592	
720 min Winter	8.337	0.0	3176.7	706	
960 min Winter	6.667	0.0	3122.3	928	
1440 min Winter	4.857	0.0	3019.3	1358	
2160 min Winter	3.531	0.0	4920.3	1692	
2880 min Winter	2.813	0.0	5212.8	2164	
4320 min Winter	2.039	0.0	5512.2	3076	
5760 min Winter	1.620	0.0	6054.3	3984	
7200 min Winter	1.355	0.0	6327.9	4688	
8640 min Winter	1.170	0.0	6554.6	5368	
10080 min Winter	1.034	0.0	6745.9	6048	
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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)	18.600	Shortest Storm (mins)	15
Ratio R	0.364	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 4.641

Time (mins)	Area	Time (mins)	Area
From: To: (ha)		From: To: (ha)	
0 4 0.000		4 8 4.641	

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Model Details

Storage is Online Cover Level (m) 2.000

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	1550.0	2.000	2500.5

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0191-2070-1700-2070
Design Head (m)	1.700
Design Flow (l/s)	20.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	191
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

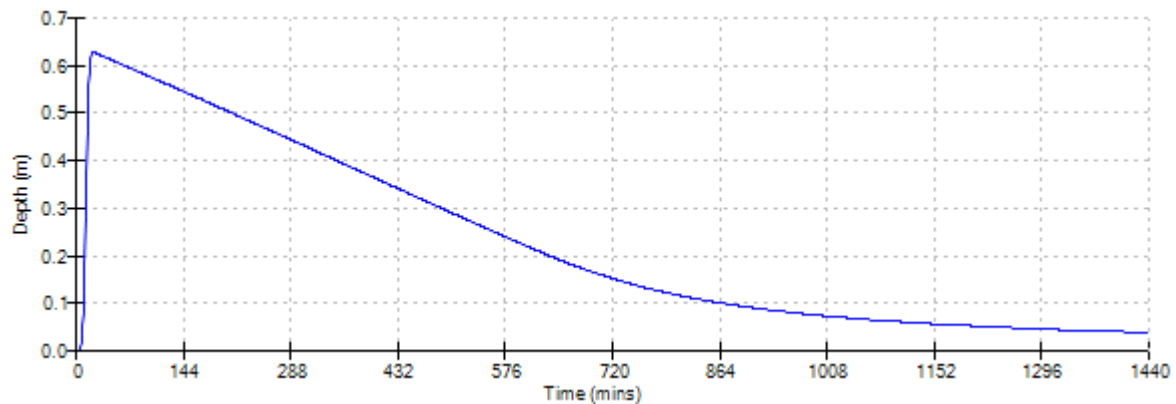
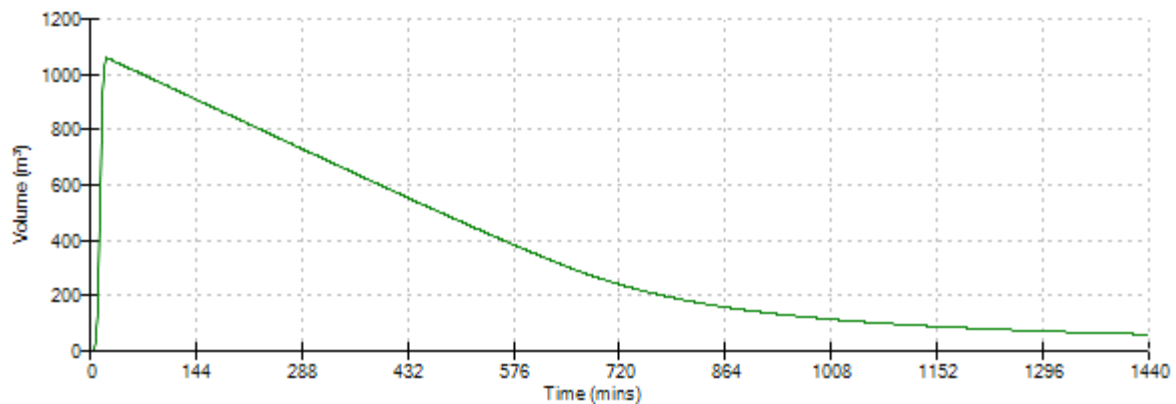
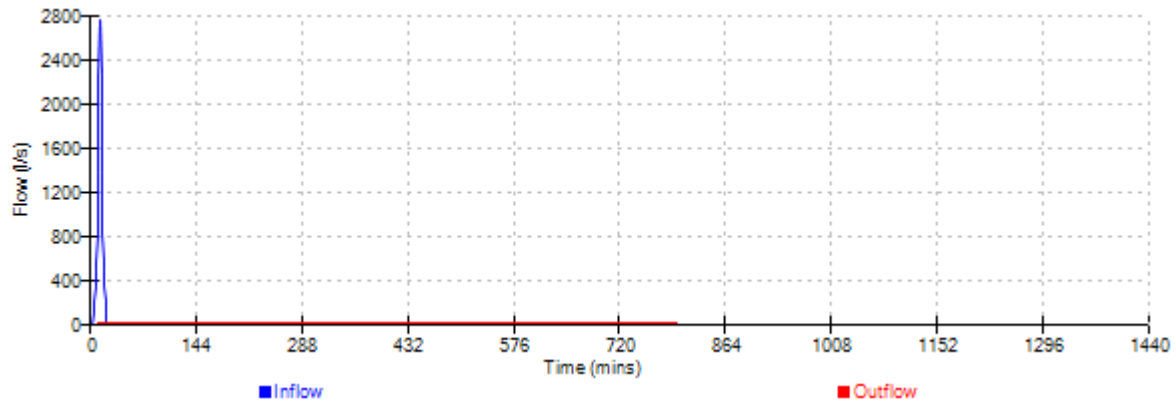
Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	20.7	Kick-Flo®	1.081	16.7
Flush-Flo™	0.498	20.7	Mean Flow over Head Range	-	17.9

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	6.7	1.200	17.5	3.000	27.1	7.000	40.8
0.200	17.7	1.400	18.9	3.500	29.2	7.500	42.2
0.300	19.8	1.600	20.1	4.000	31.2	8.000	43.5
0.400	20.5	1.800	21.3	4.500	33.0	8.500	44.8
0.500	20.7	2.000	22.4	5.000	34.7	9.000	46.1
0.600	20.6	2.200	23.4	5.500	36.3	9.500	47.3
0.800	19.9	2.400	24.4	6.000	37.9		
1.000	18.1	2.600	25.3	6.500	39.4		

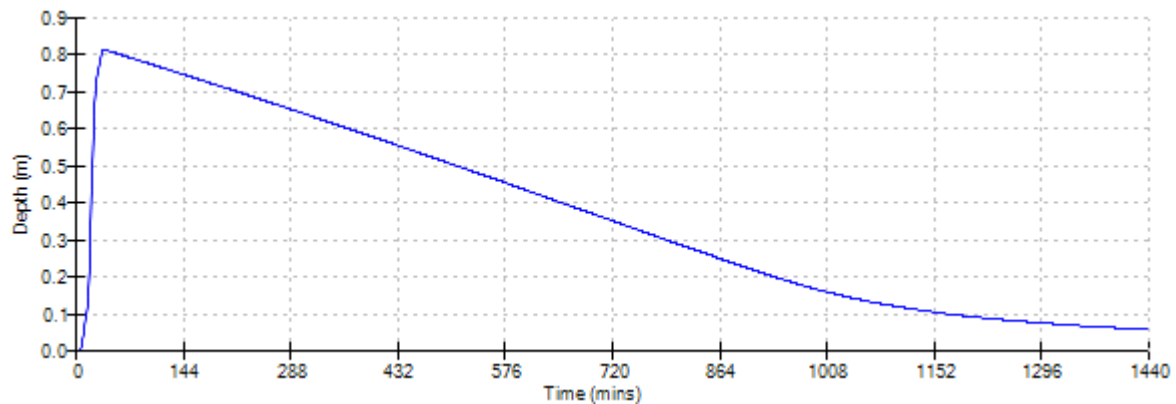
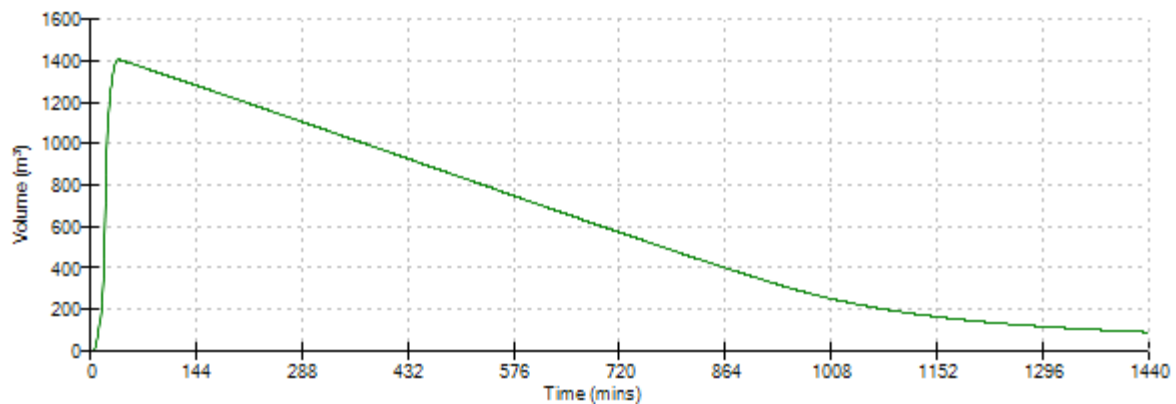
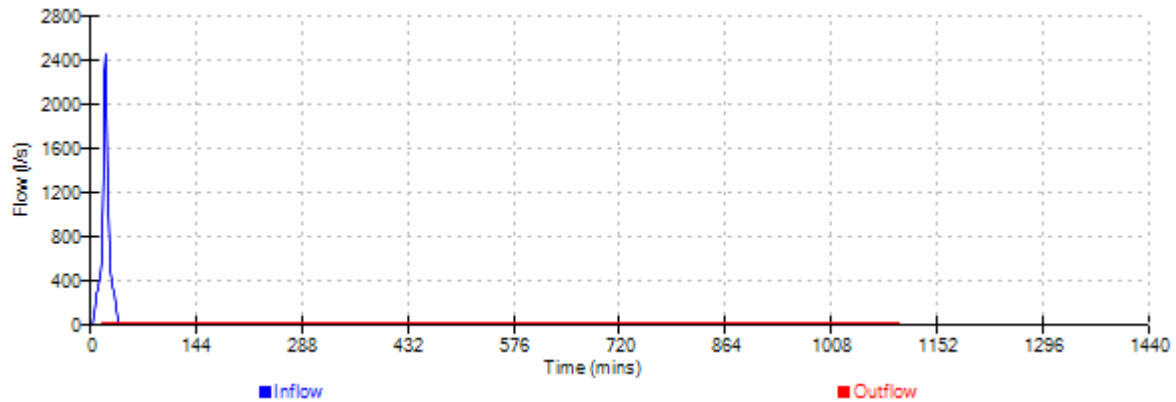
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Event: 15 min Summer



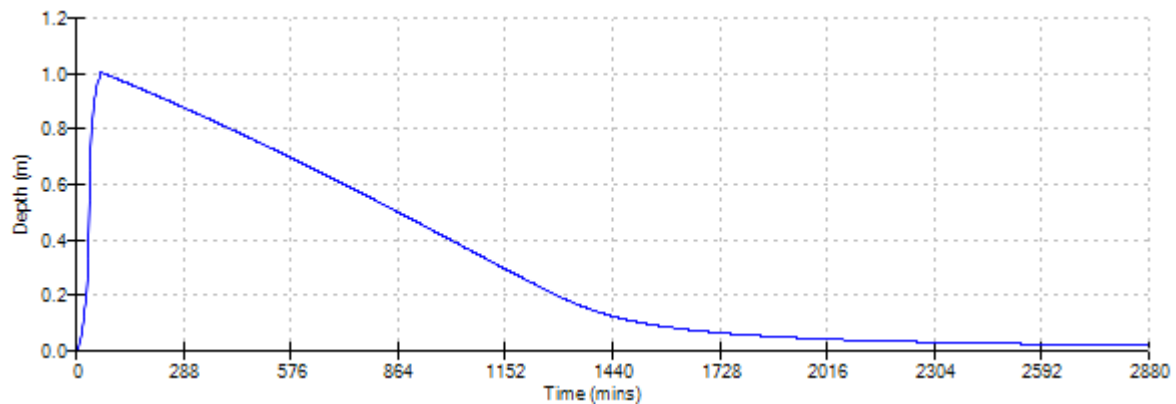
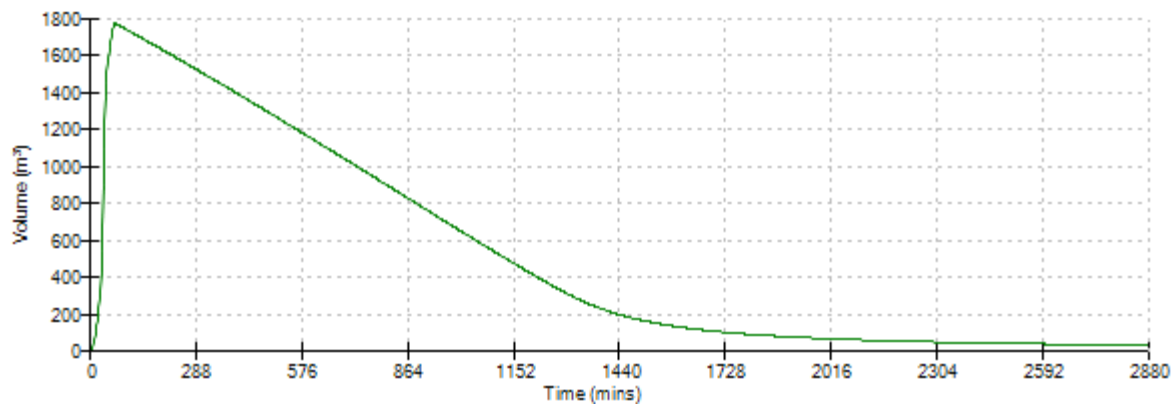
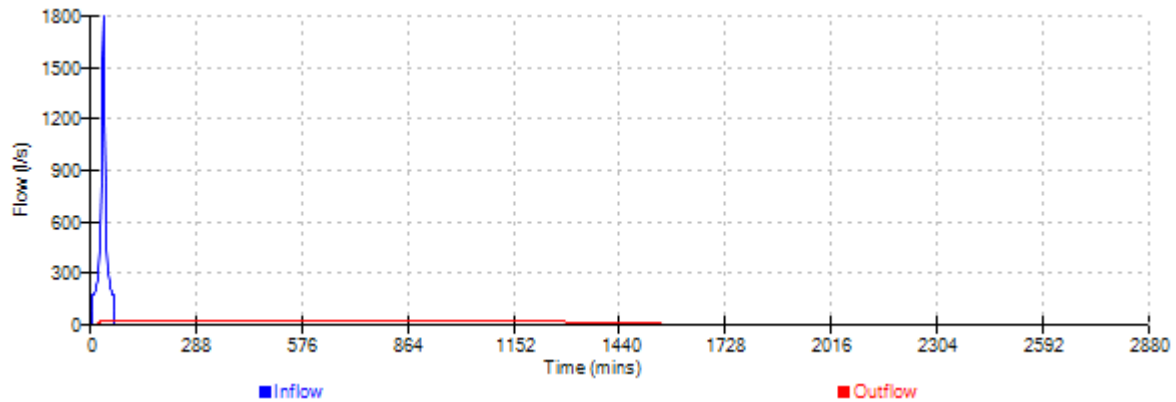
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Event: 30 min Summer



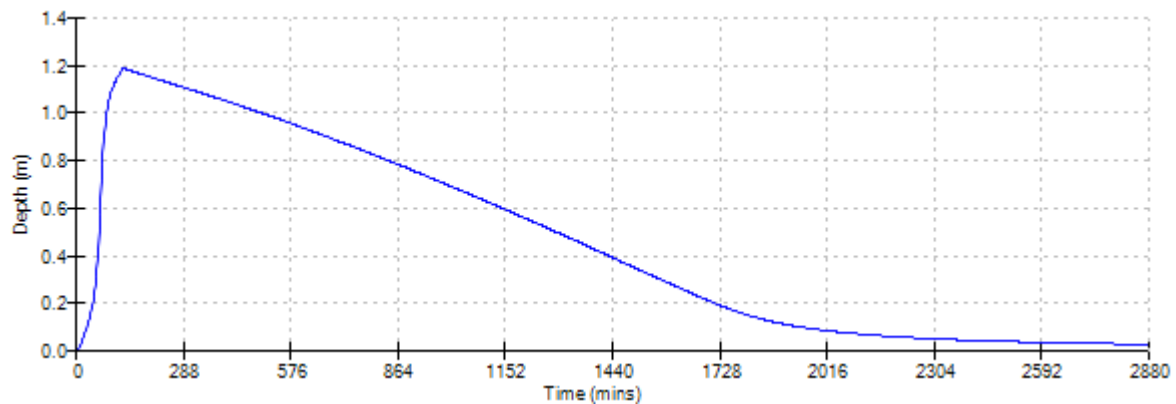
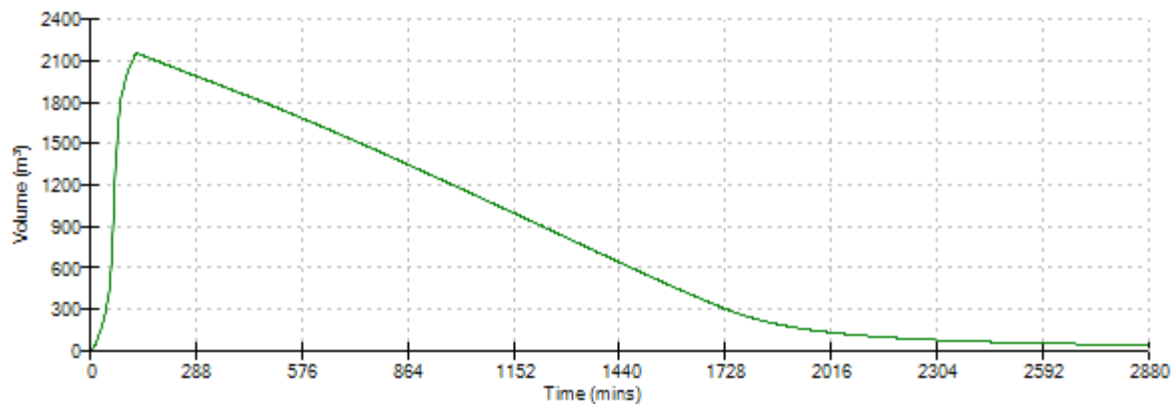
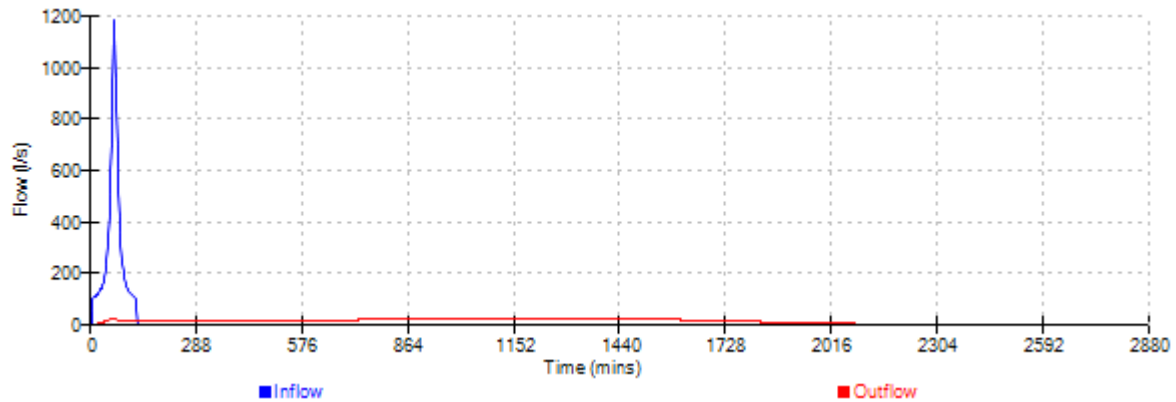
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Event: 60 min Summer



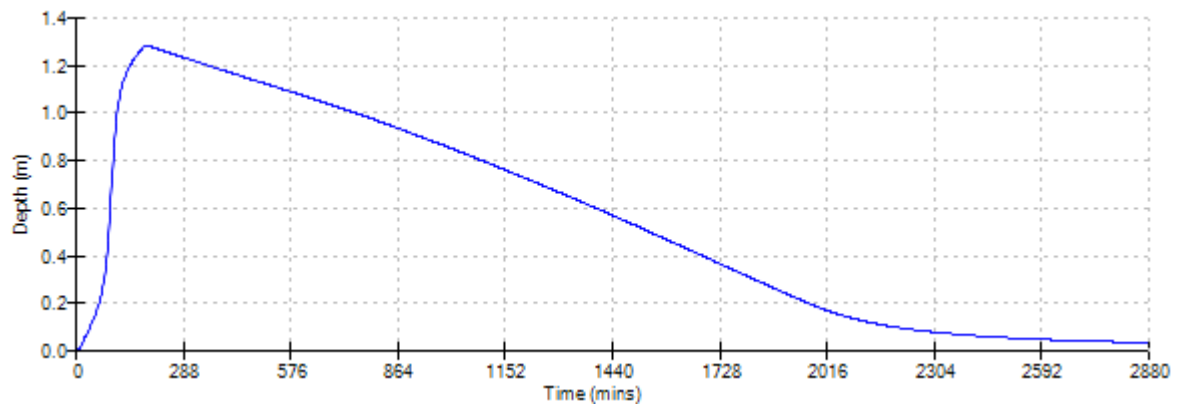
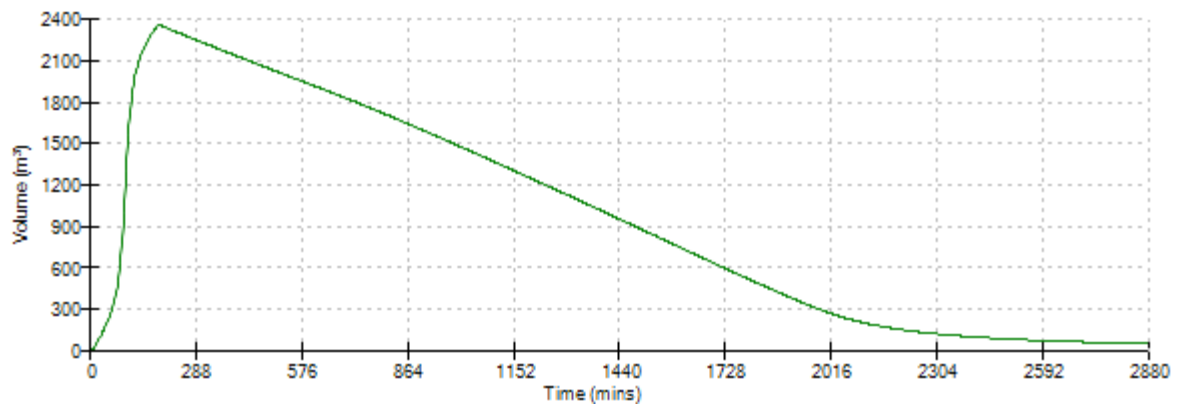
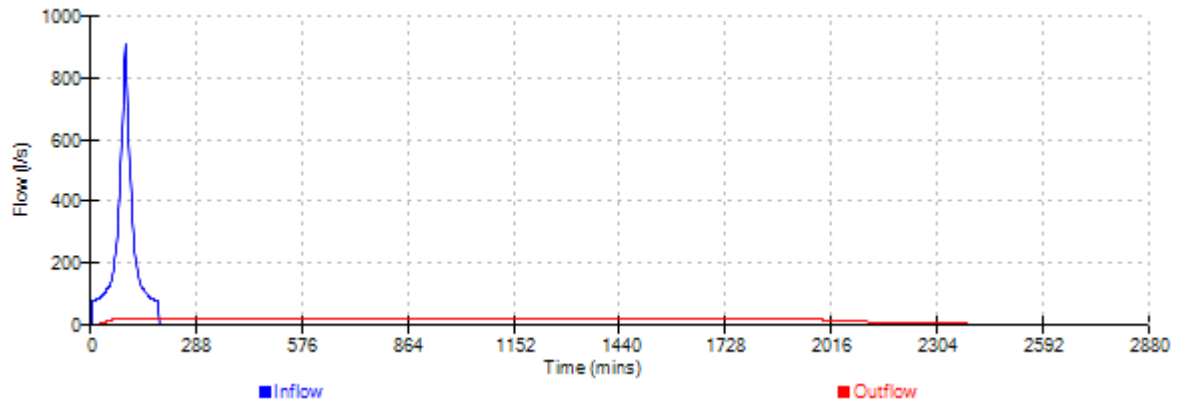
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Event: 120 min Summer



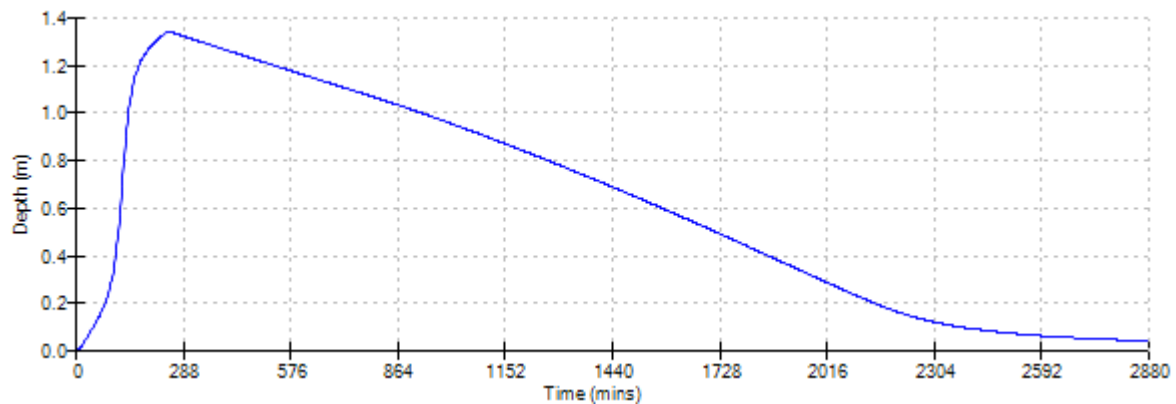
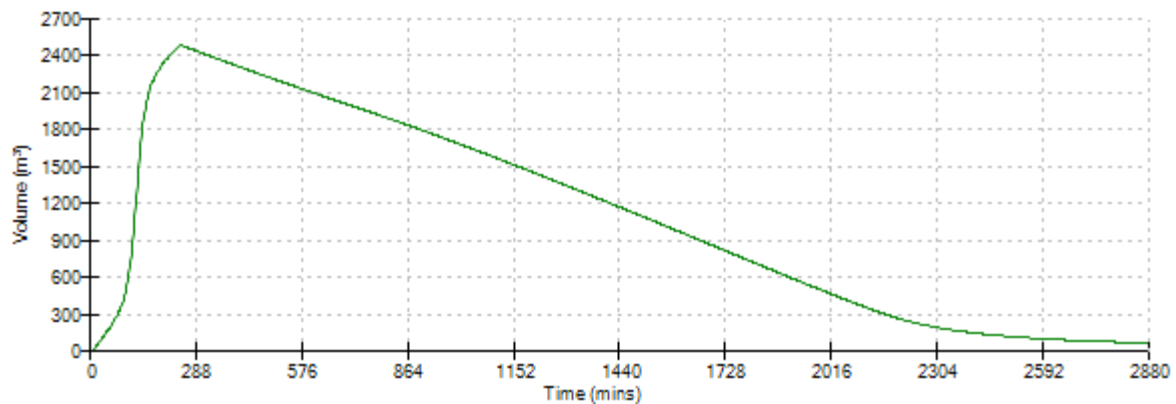
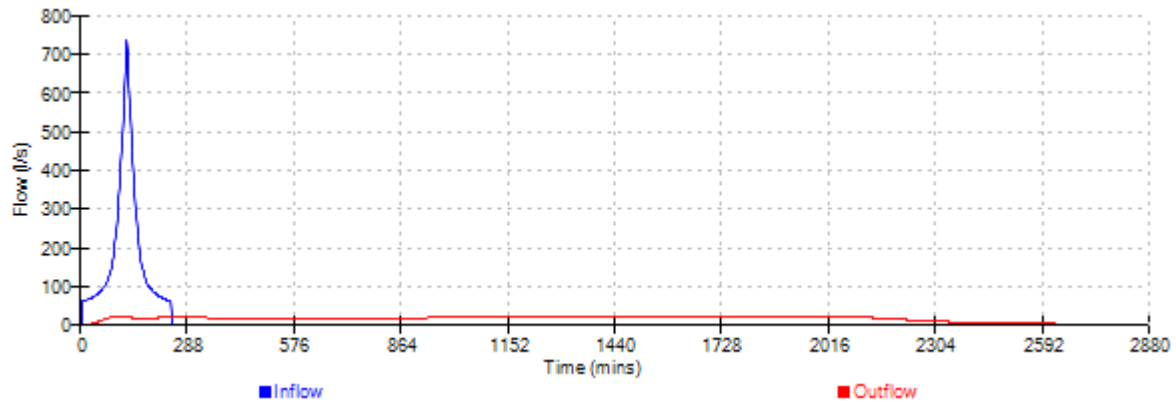
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Event: 180 min Summer



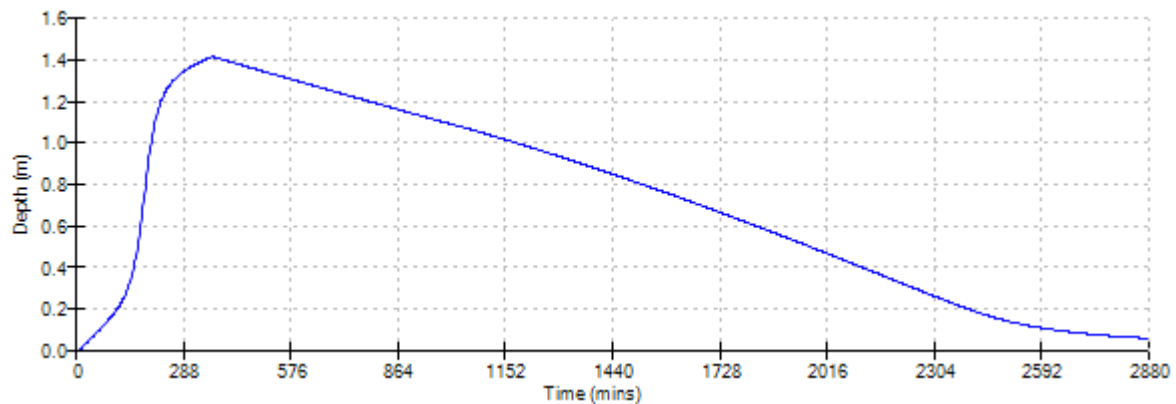
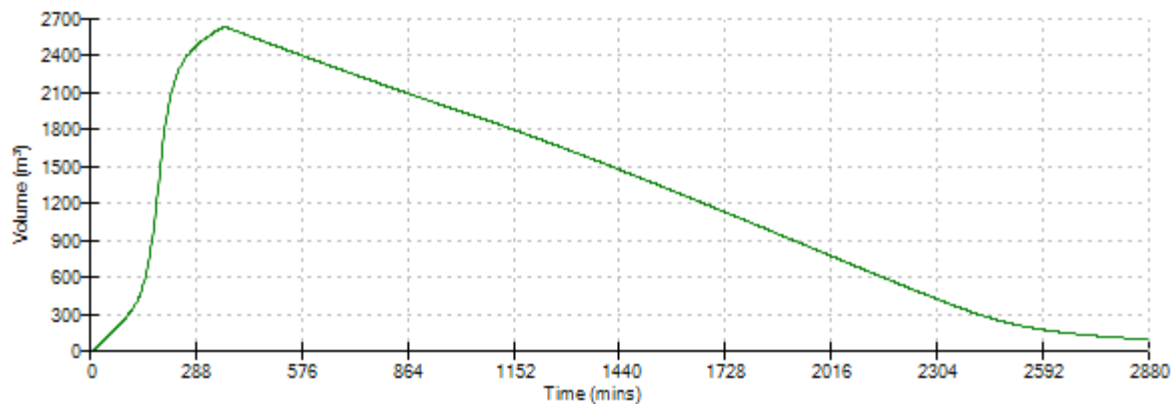
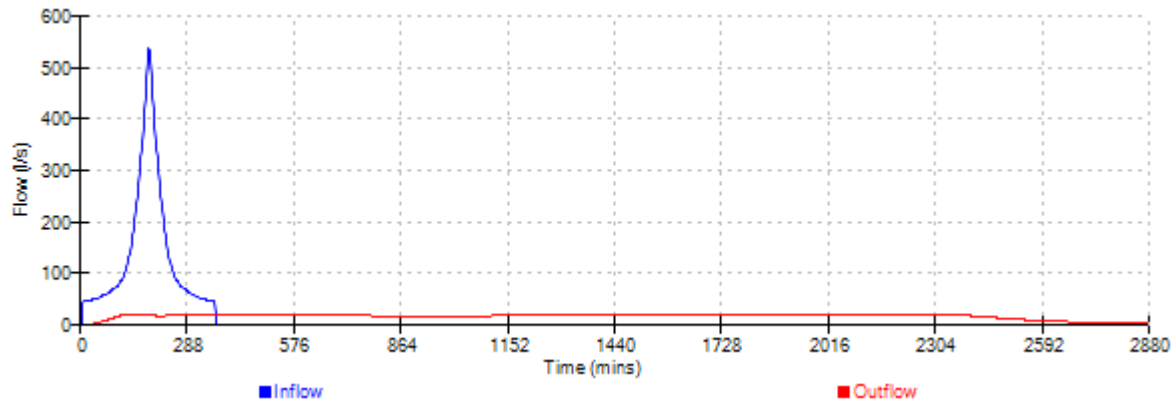
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Event: 240 min Summer



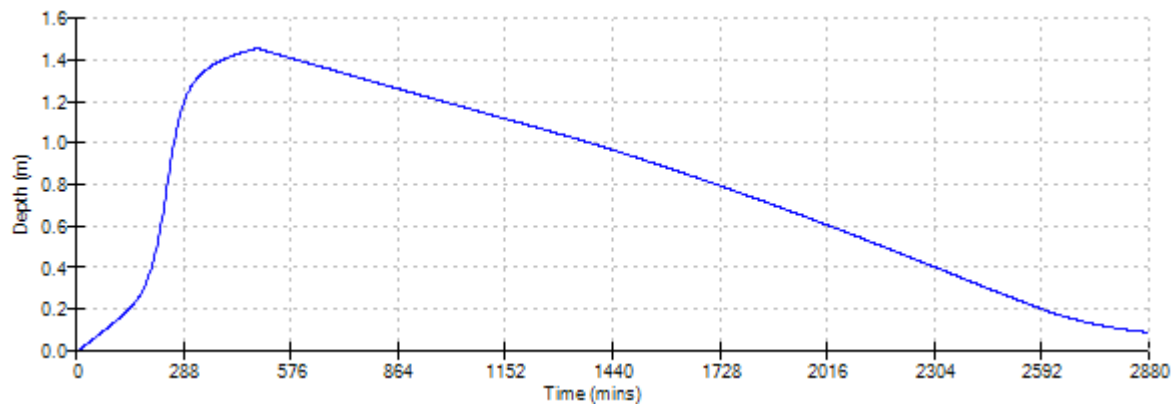
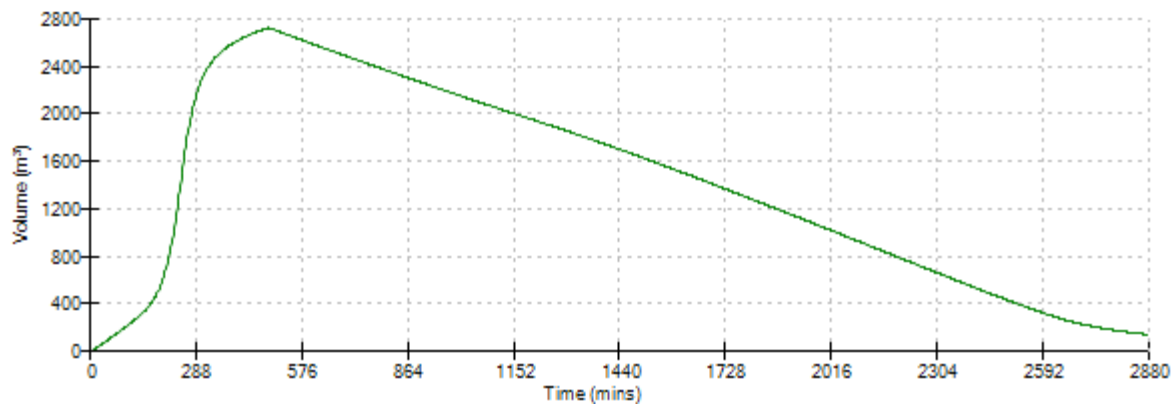
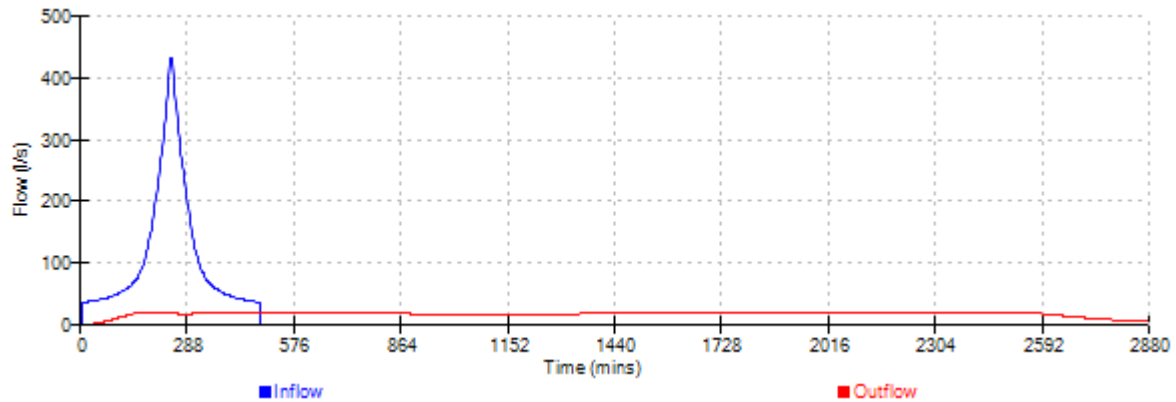
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Event: 360 min Summer



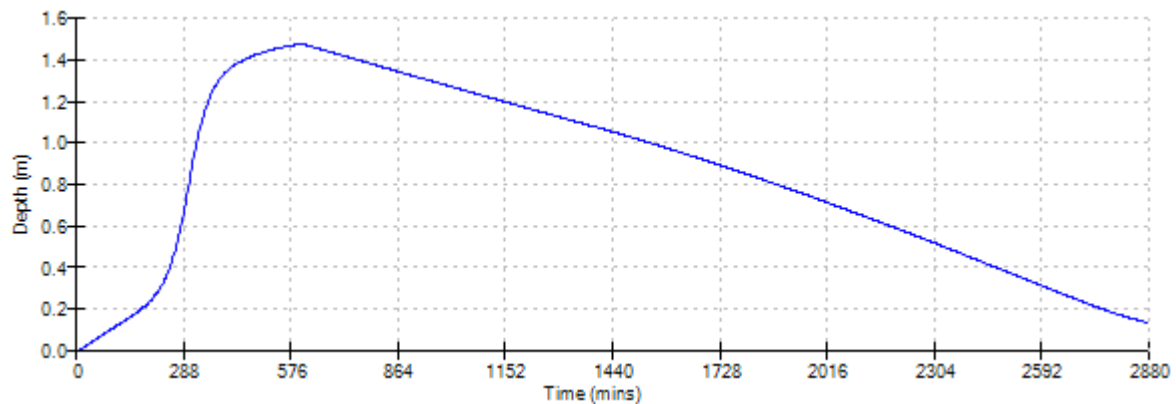
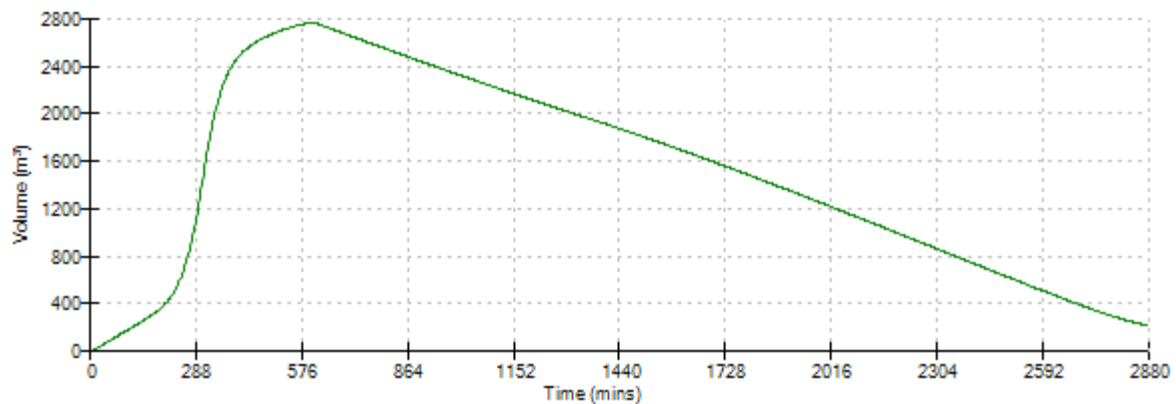
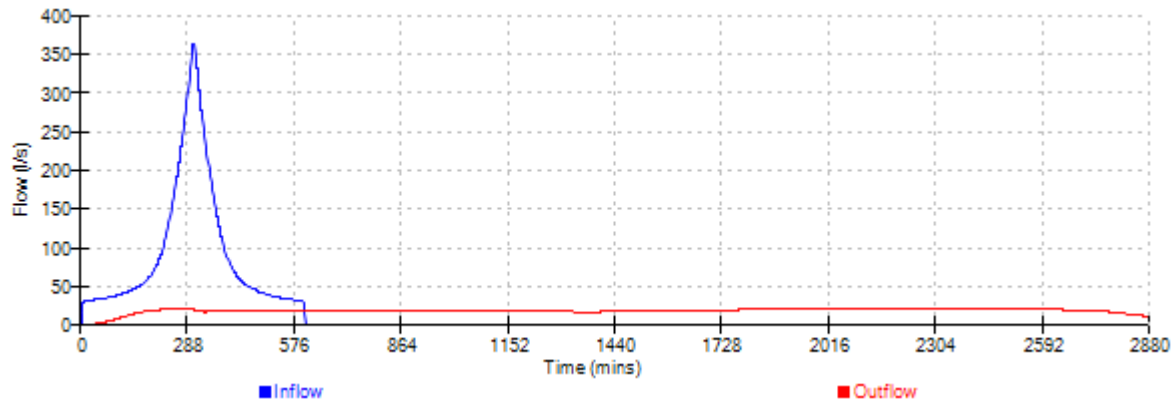
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Event: 480 min Summer



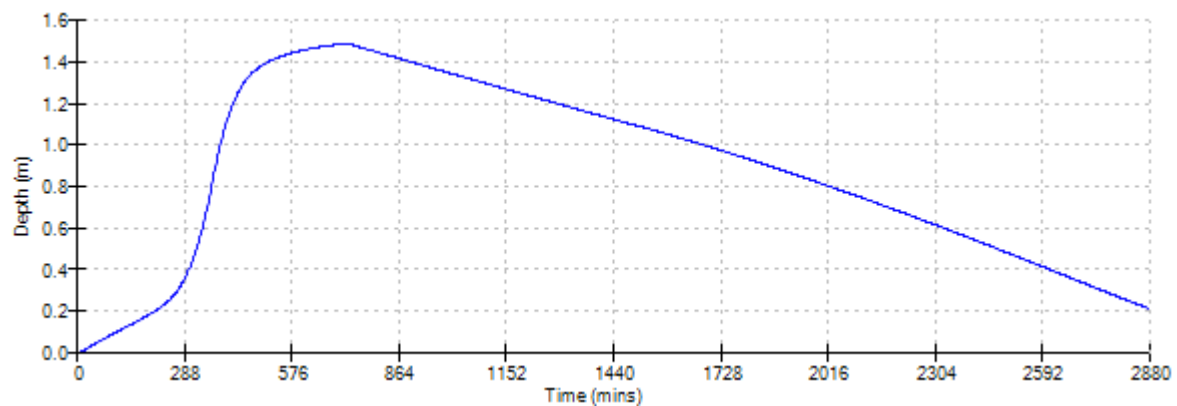
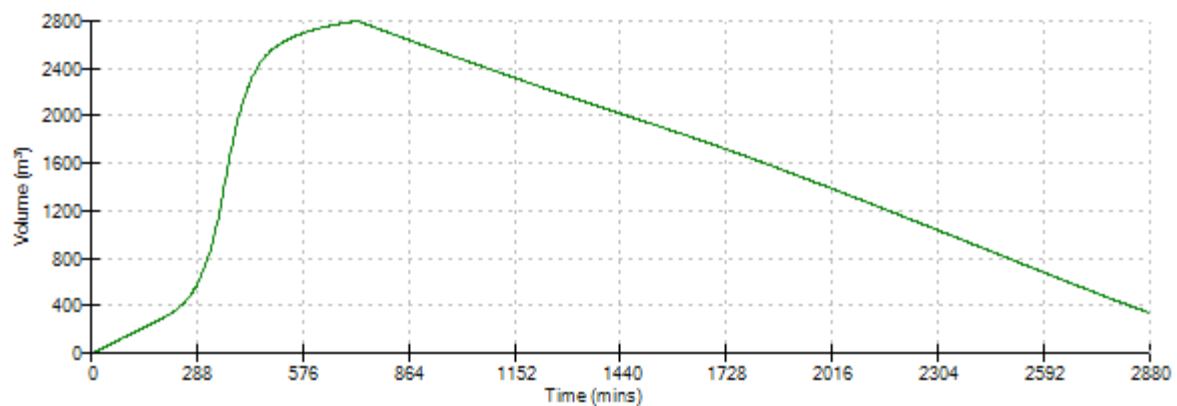
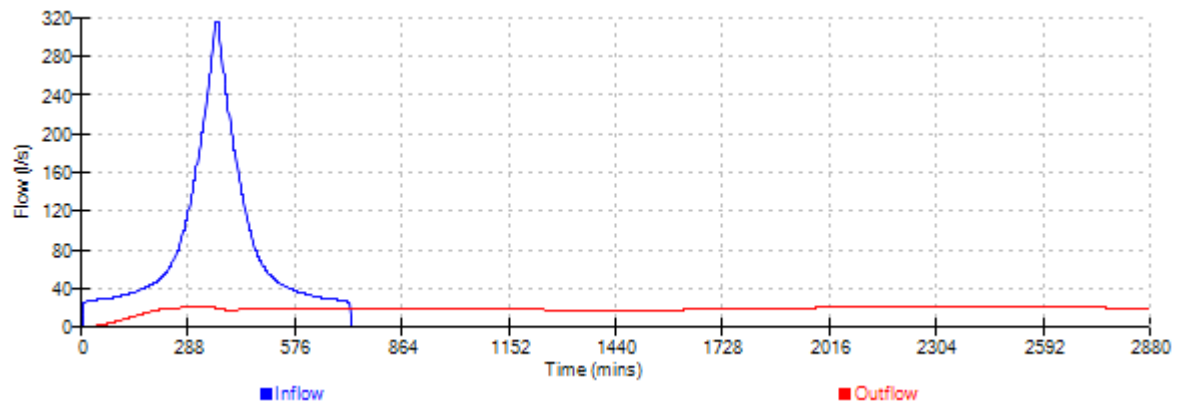
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Event: 600 min Summer



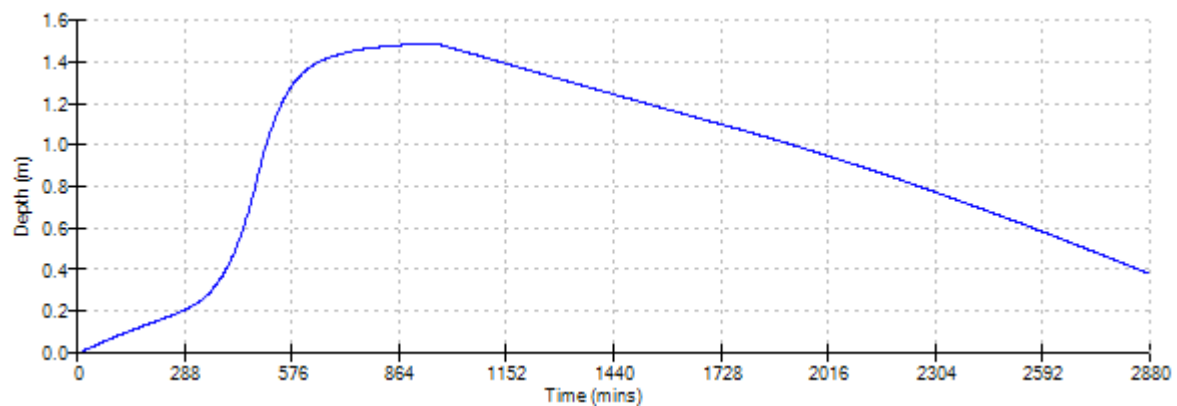
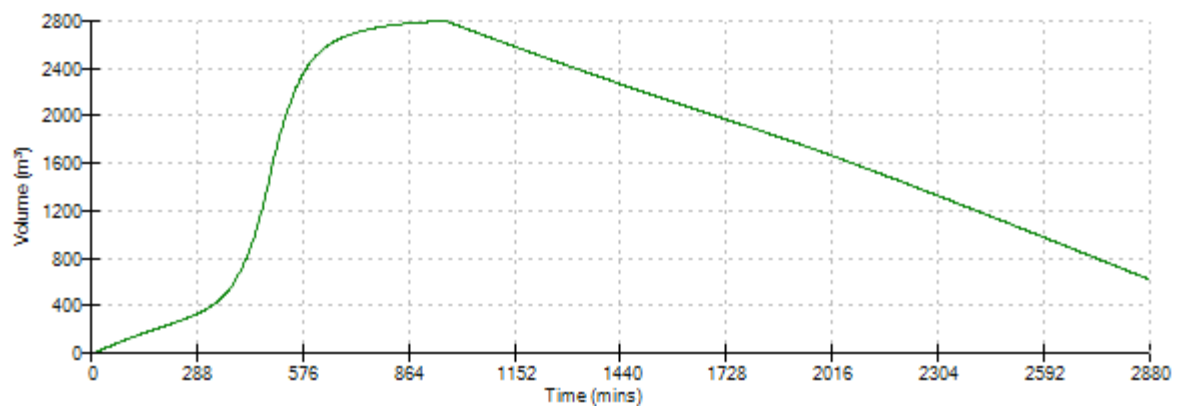
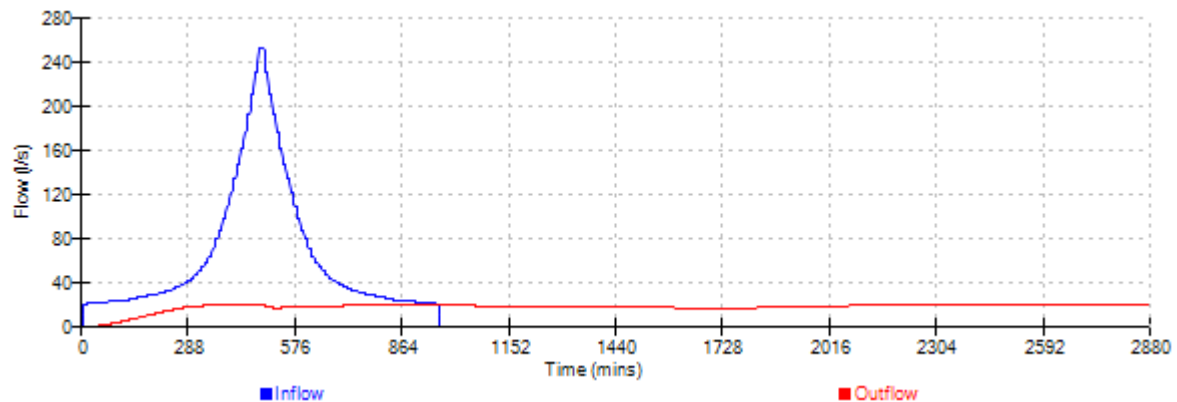
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Event: 720 min Summer



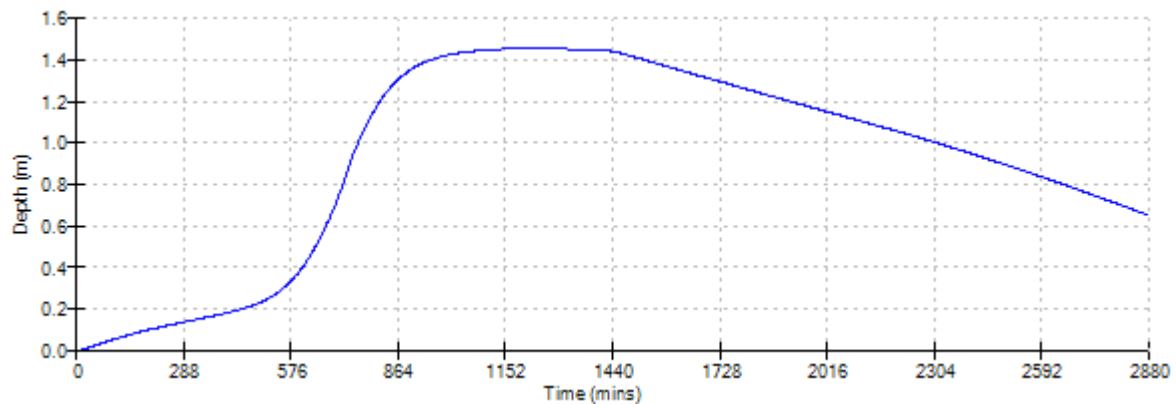
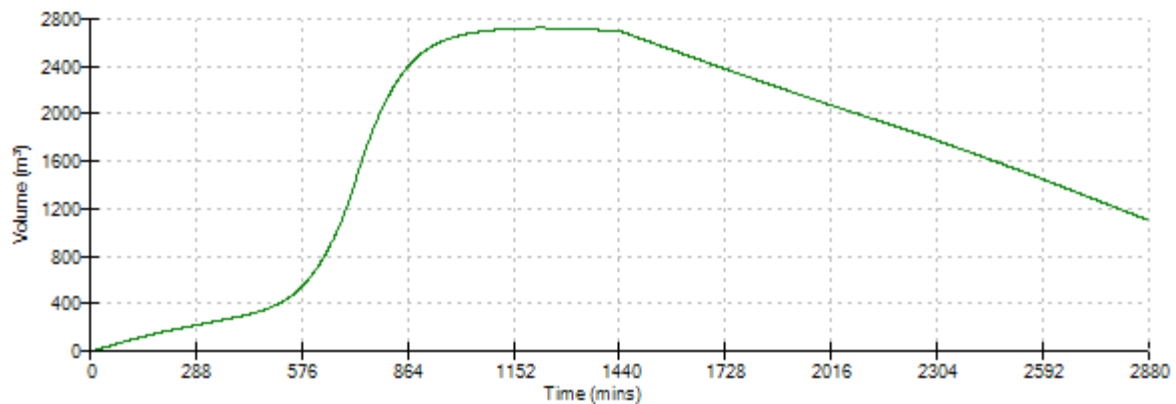
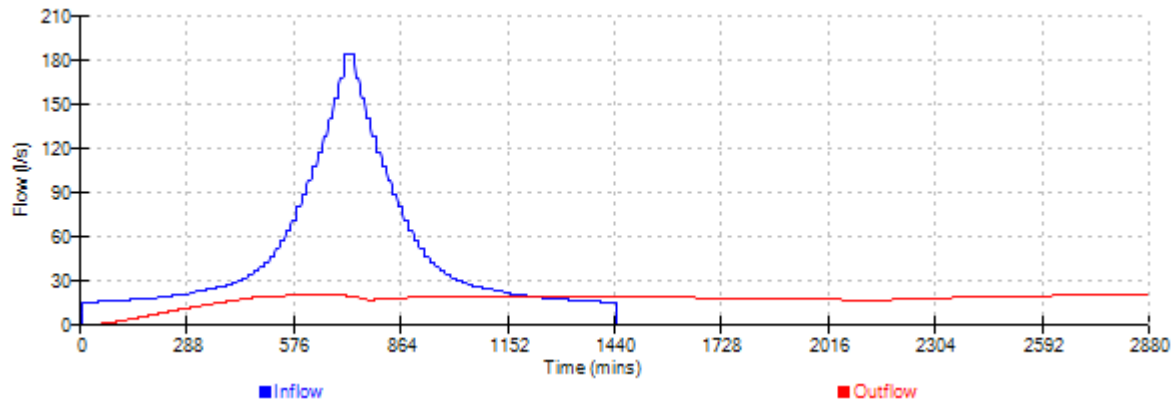
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Event: 960 min Summer



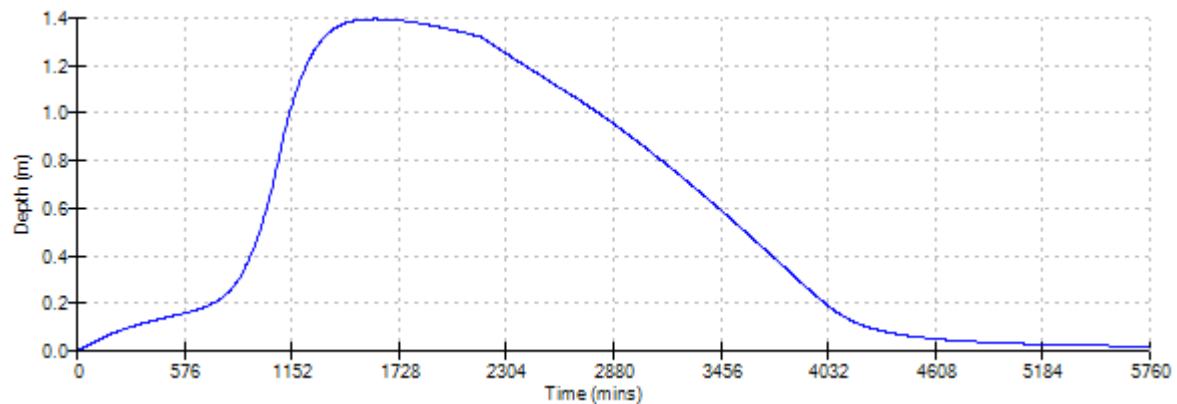
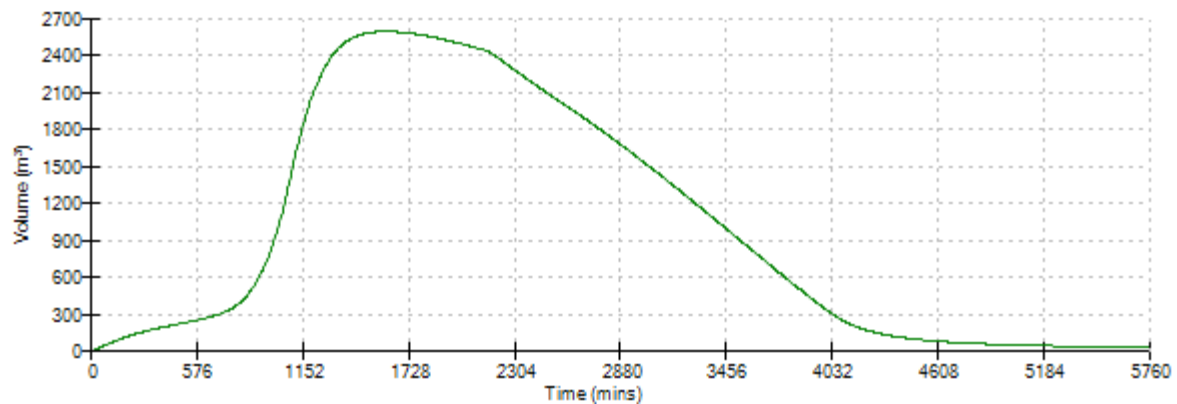
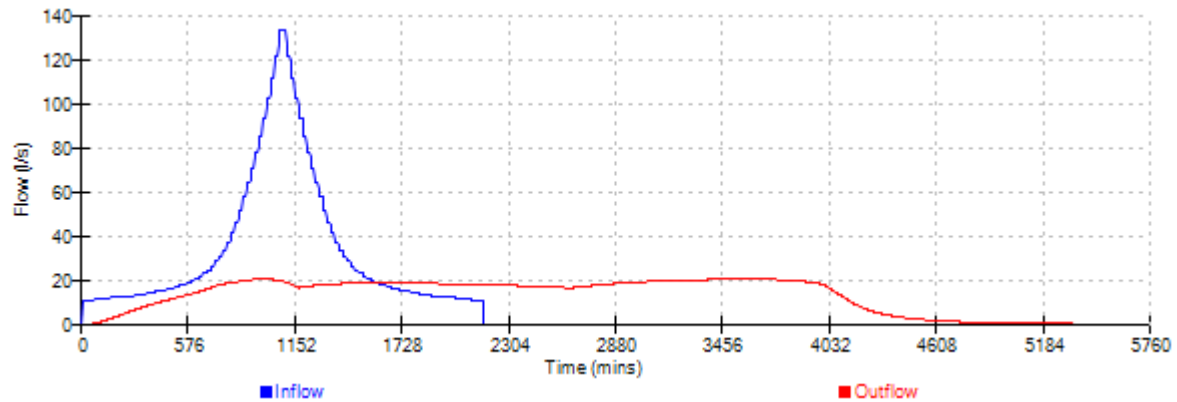
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File L0377_ATTENUATION BASIN....	Checked by	
Innovyze		Source Control 2017.1

Event: 1440 min Summer



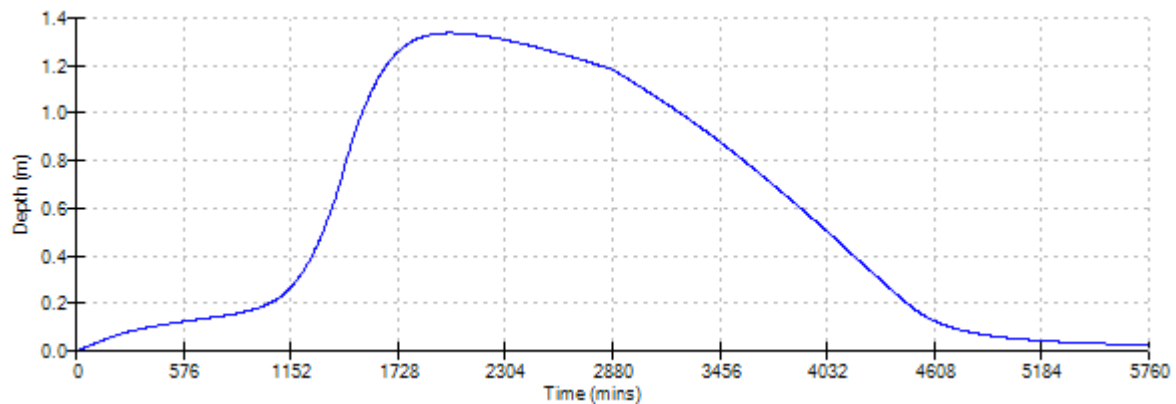
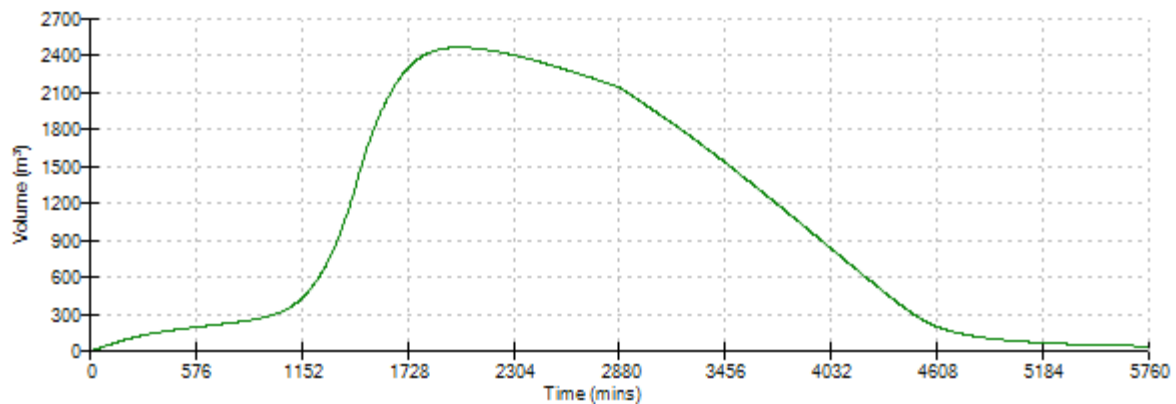
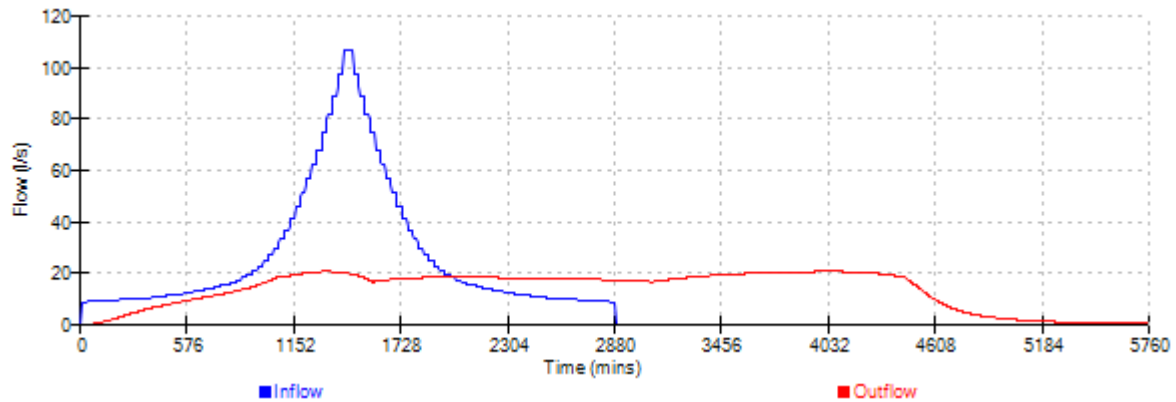
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File L0377_ATTENUATION BASIN....	Checked by	
Innovyze		Source Control 2017.1

Event: 2160 min Summer



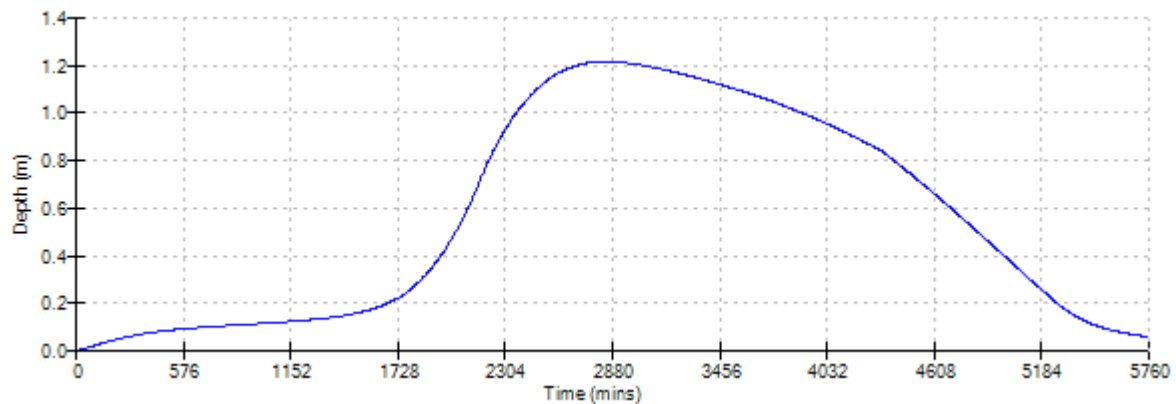
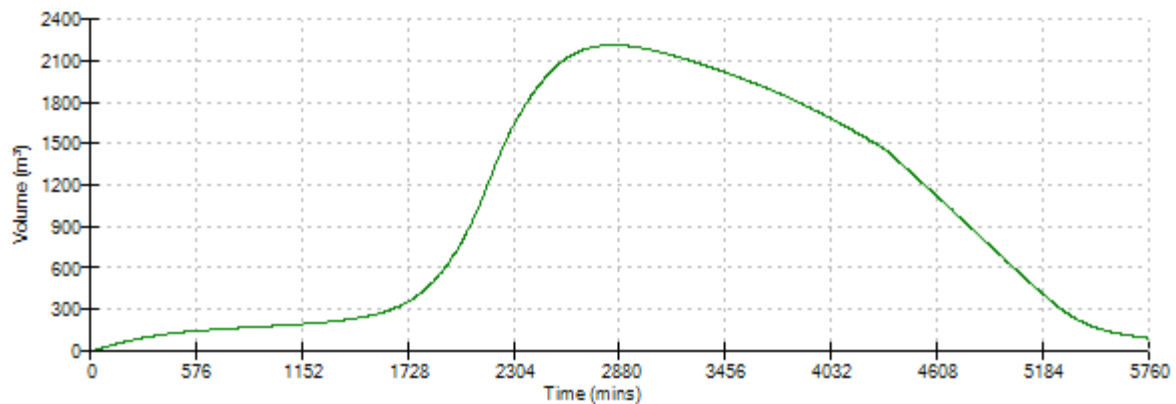
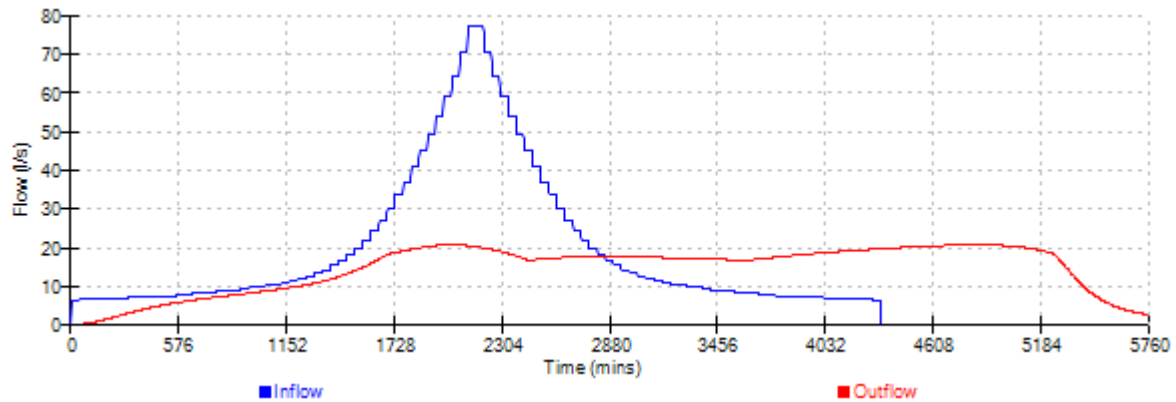
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Date 13/09/2021 13:24	Designed by dgoukos	
File L0377_ATTENUATION BASIN....	Checked by	
Innovyze	Source Control 2017.1	

Event: 2880 min Summer



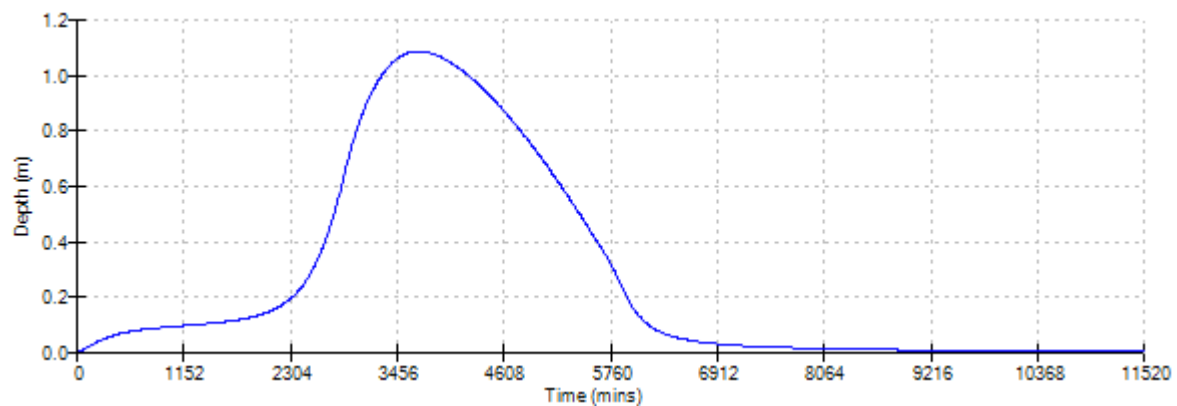
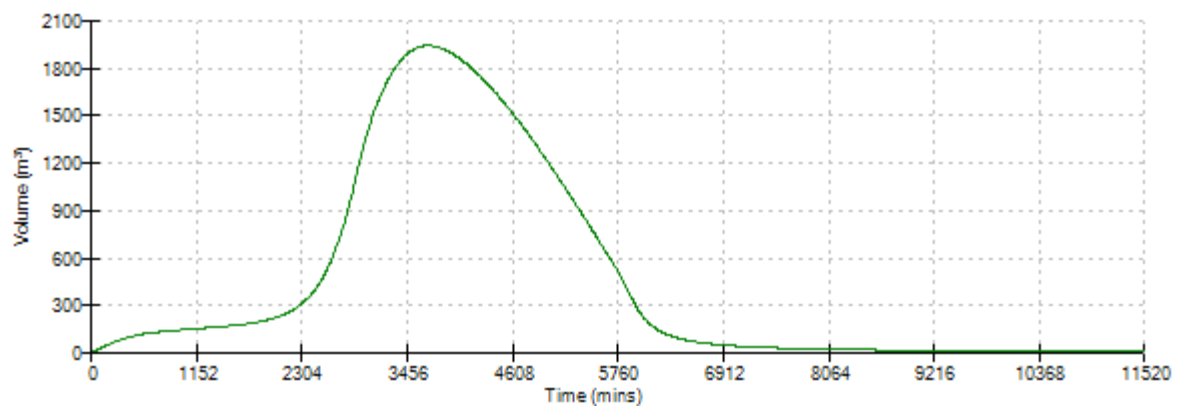
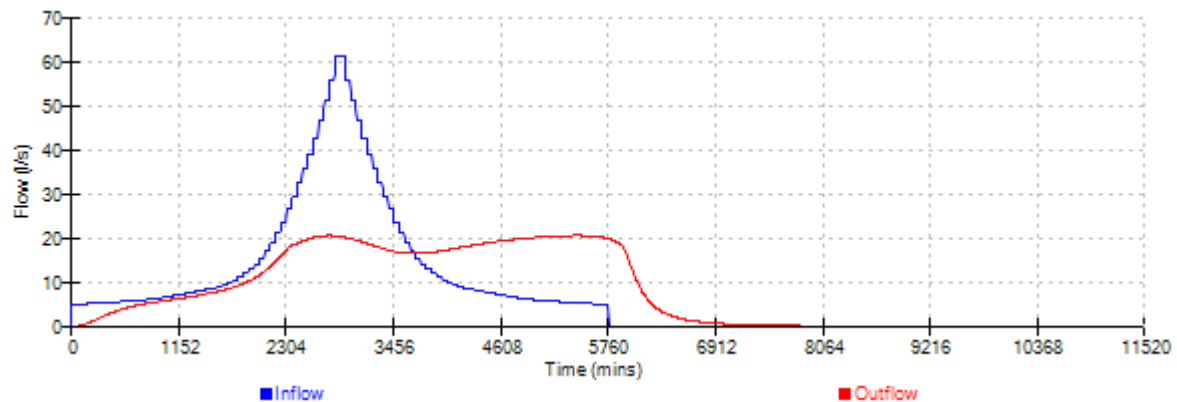
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Innovyze	Source Control 2017.1	

Event: 4320 min Summer



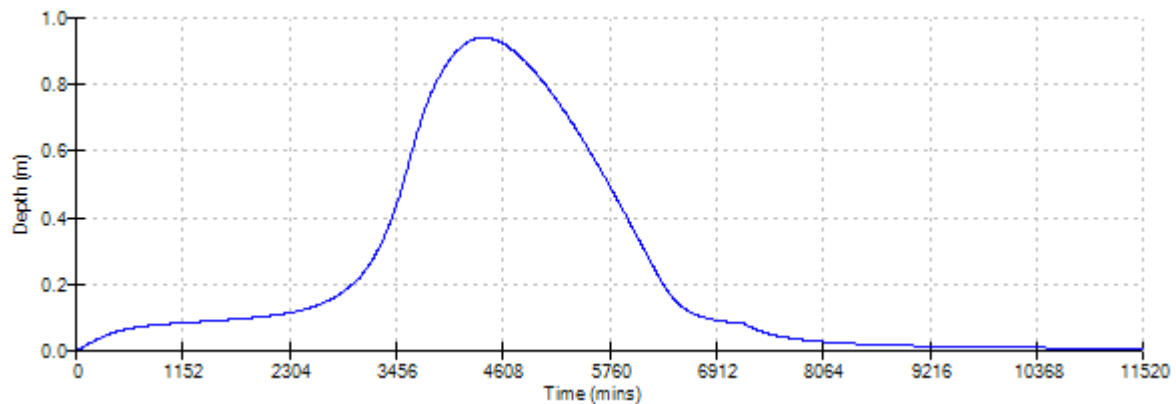
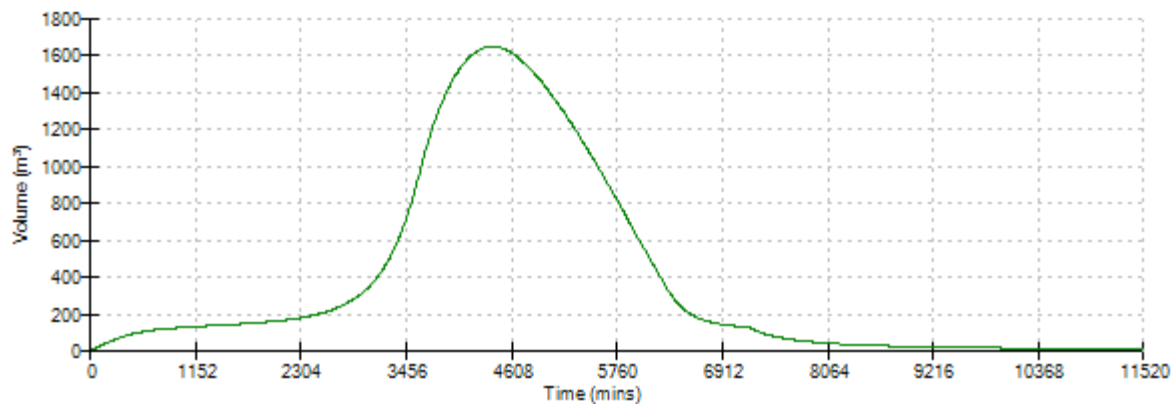
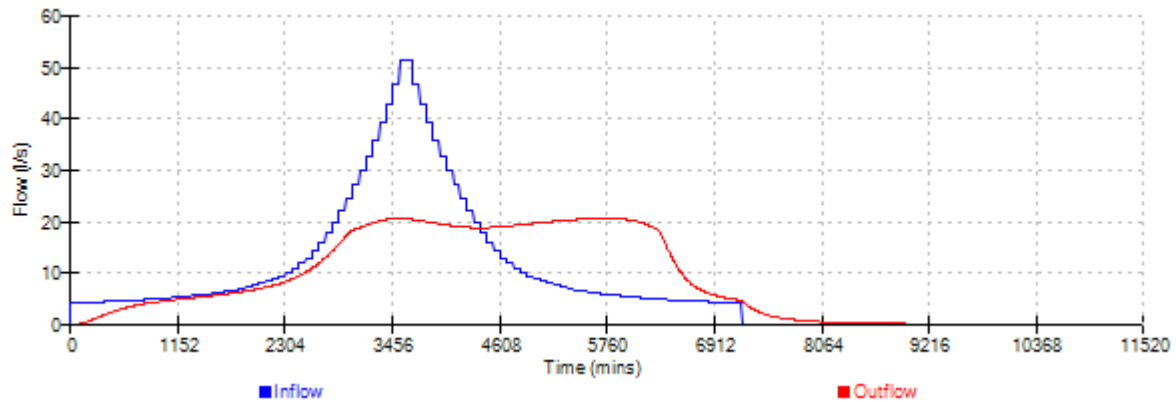
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File L0377_ATTENUATION BASIN....	Checked by	
Innovyze	Source Control 2017.1	

Event: 5760 min Summer



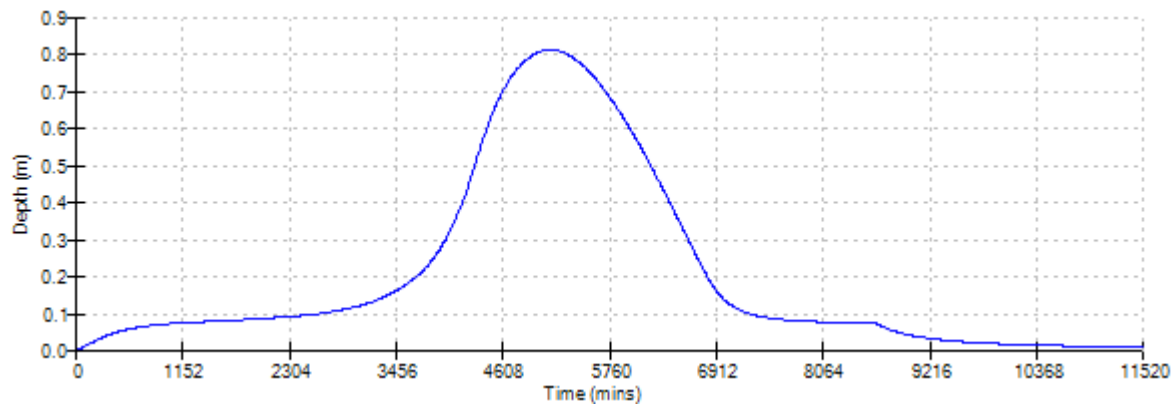
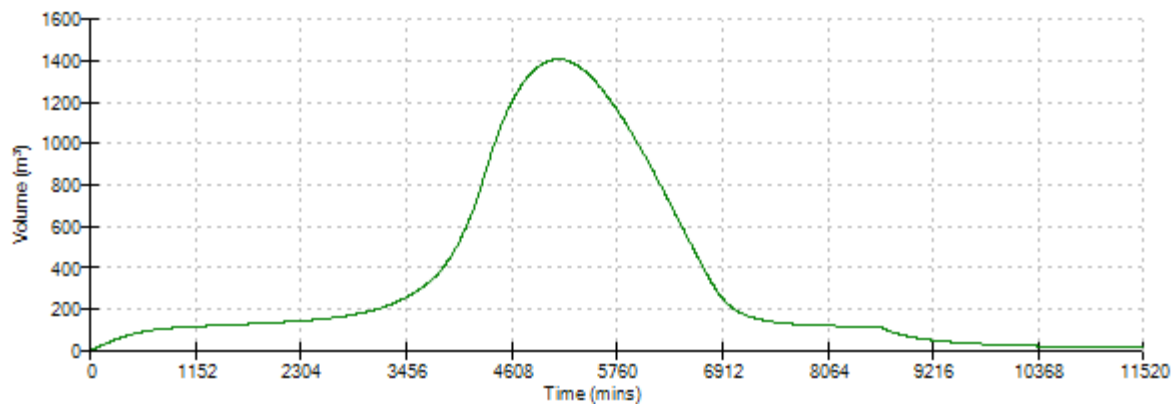
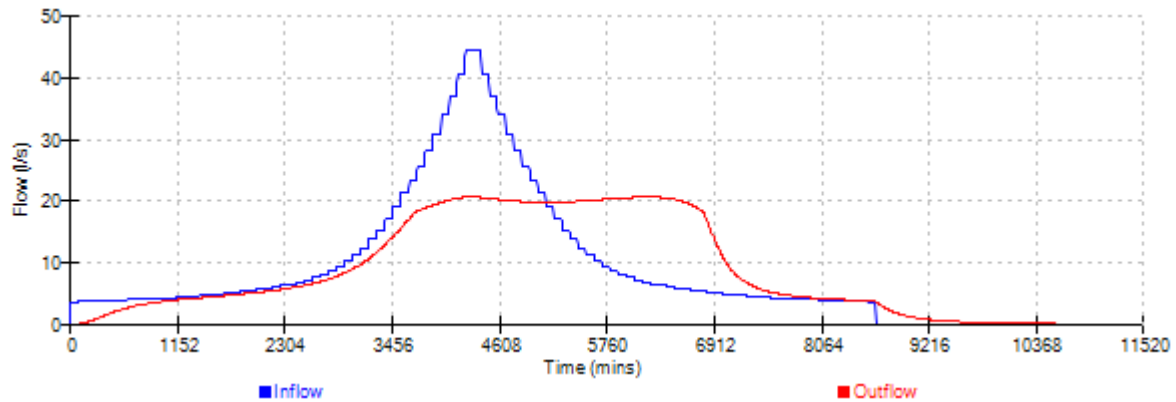
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Innovyze		Source Control 2017.1

Event: 7200 min Summer



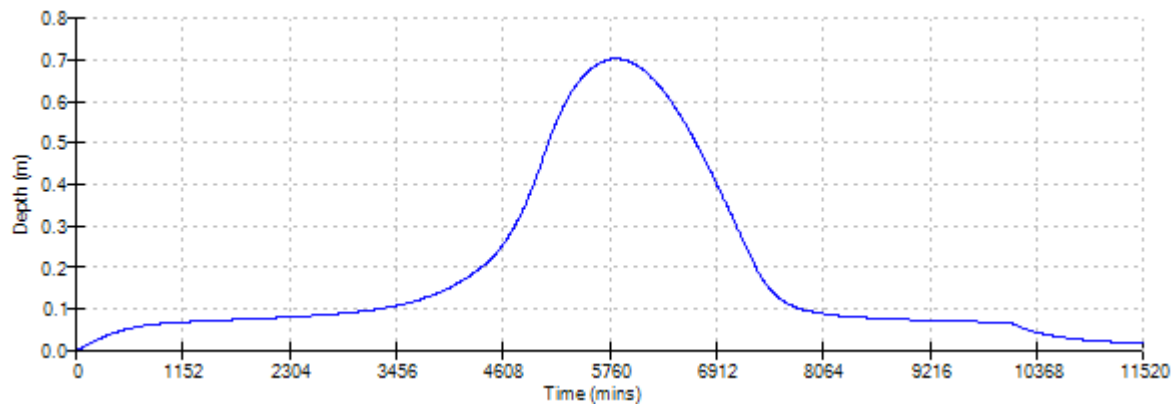
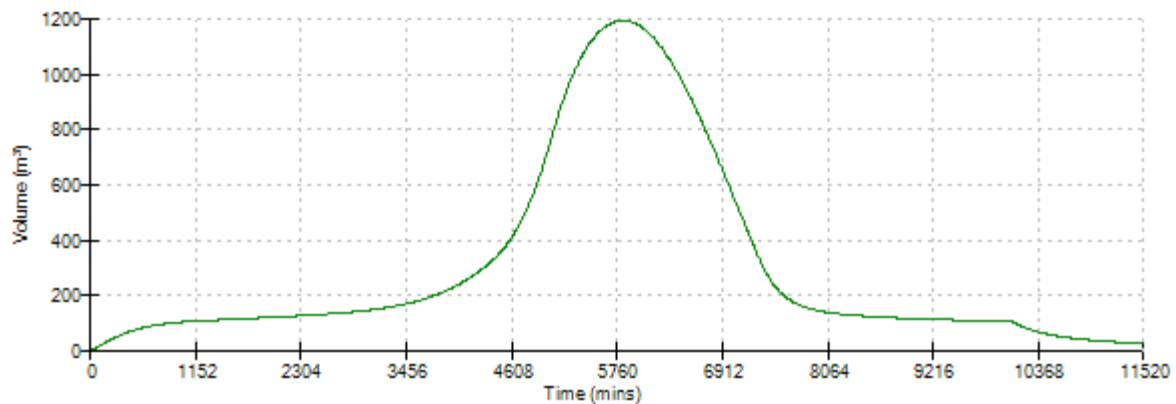
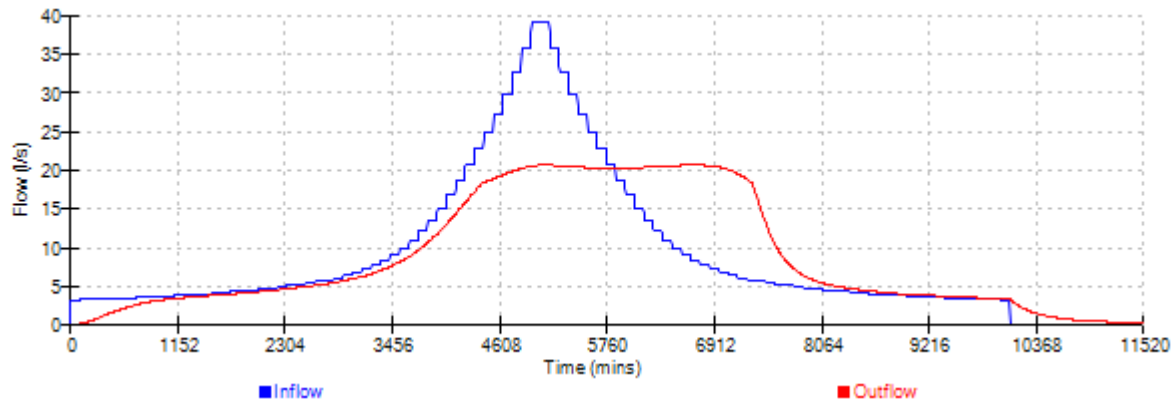
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Innovyze	Source Control 2017.1	

Event: 8640 min Summer



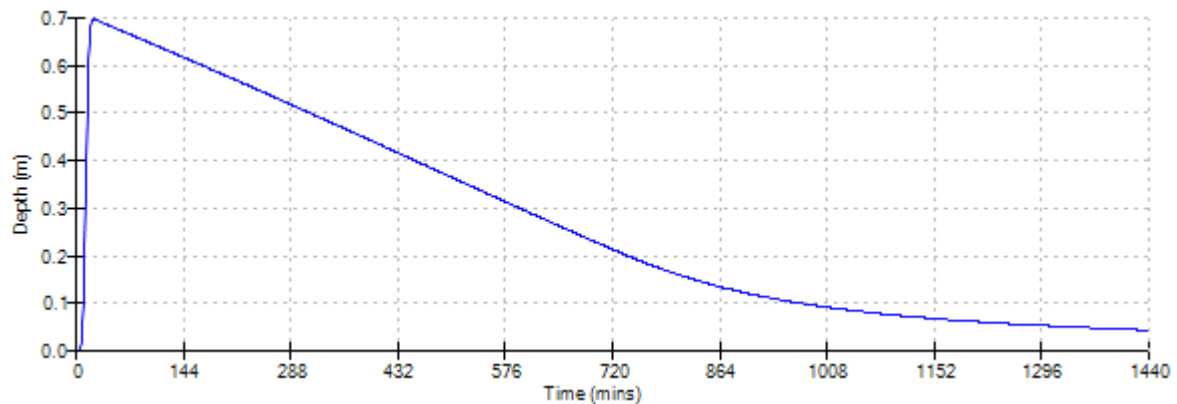
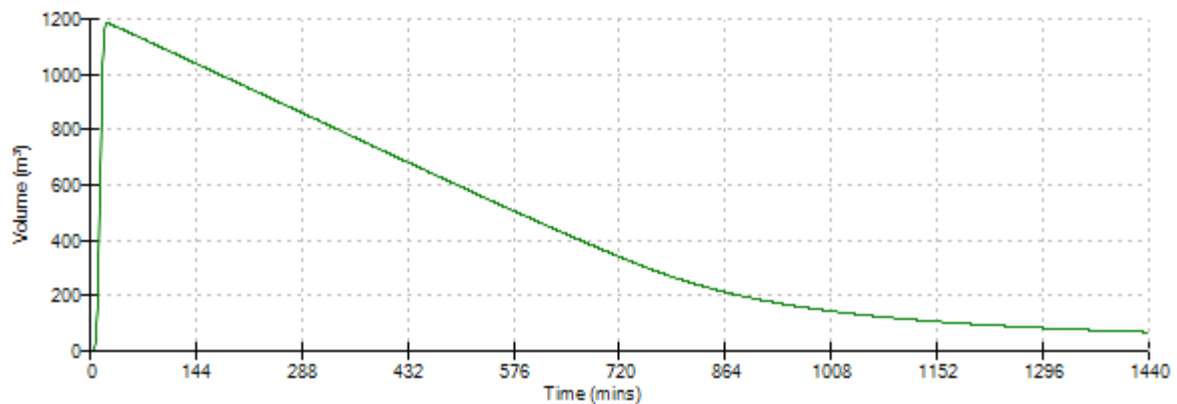
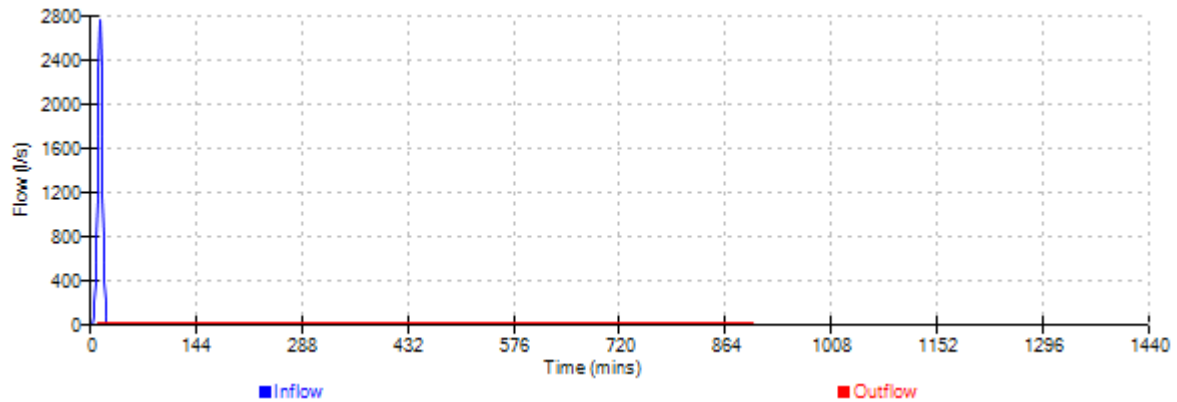
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Event: 10080 min Summer



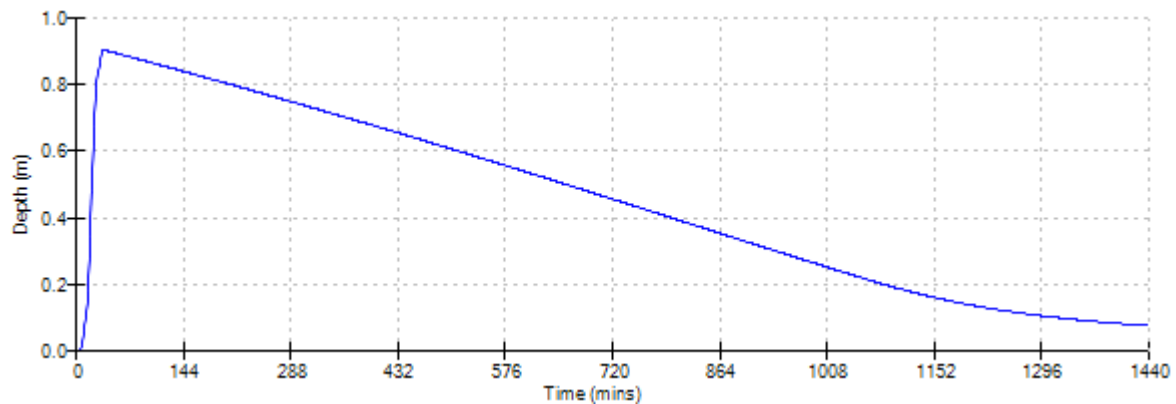
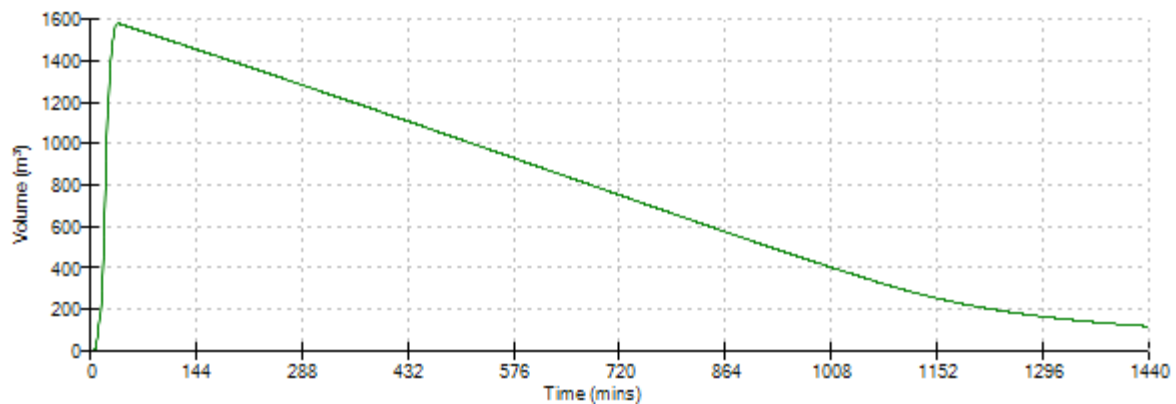
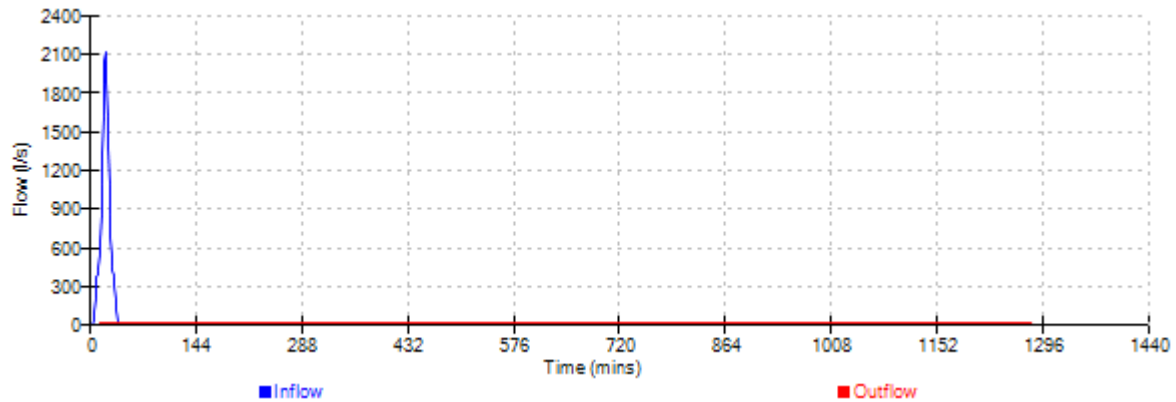
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Event: 15 min Winter



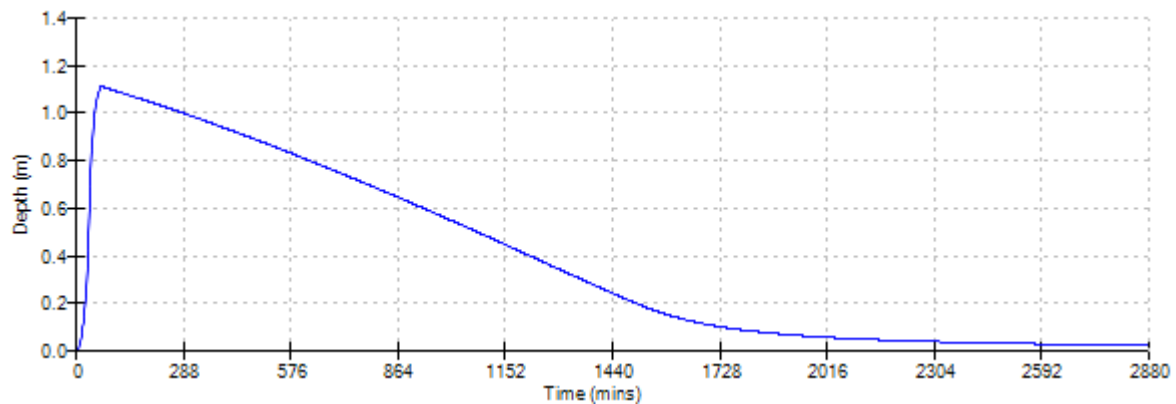
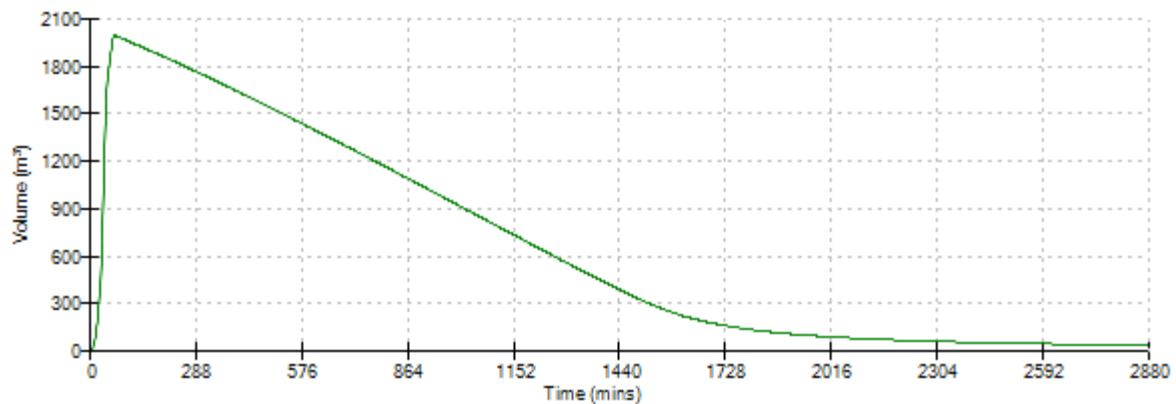
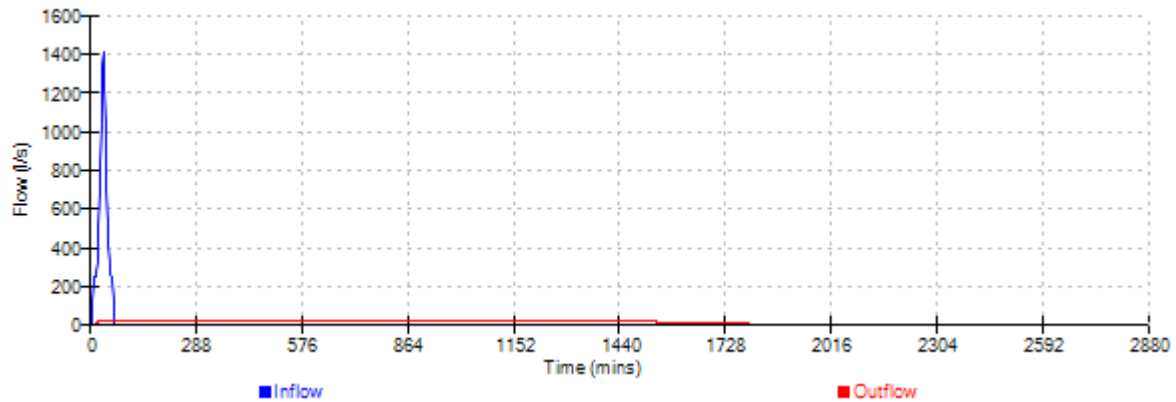
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Innovyze		Source Control 2017.1

Event: 30 min Winter



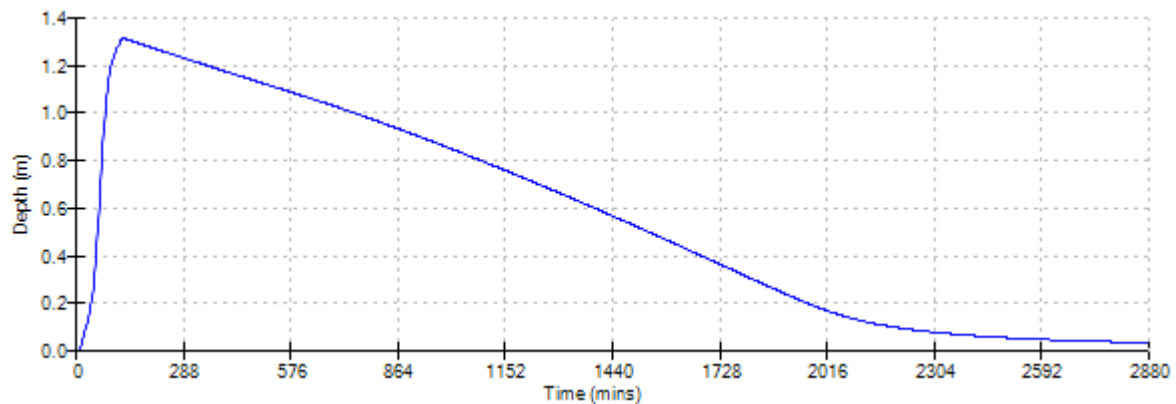
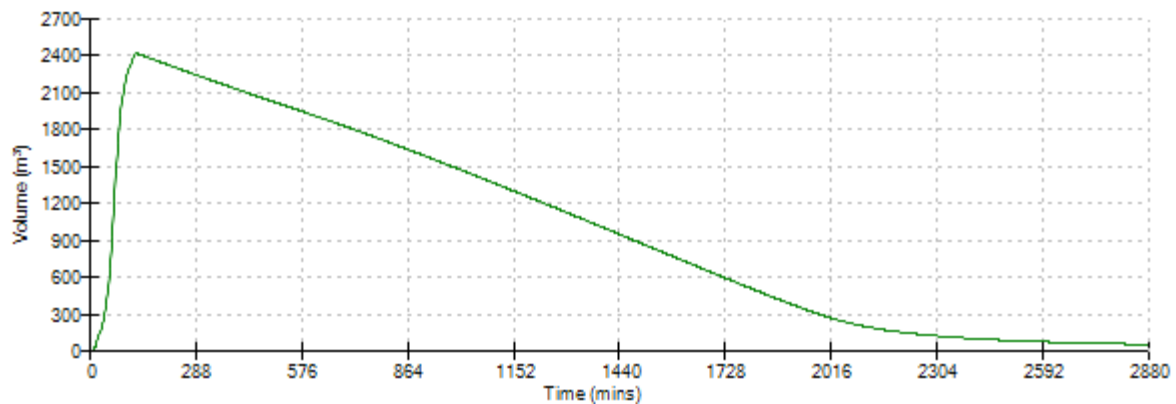
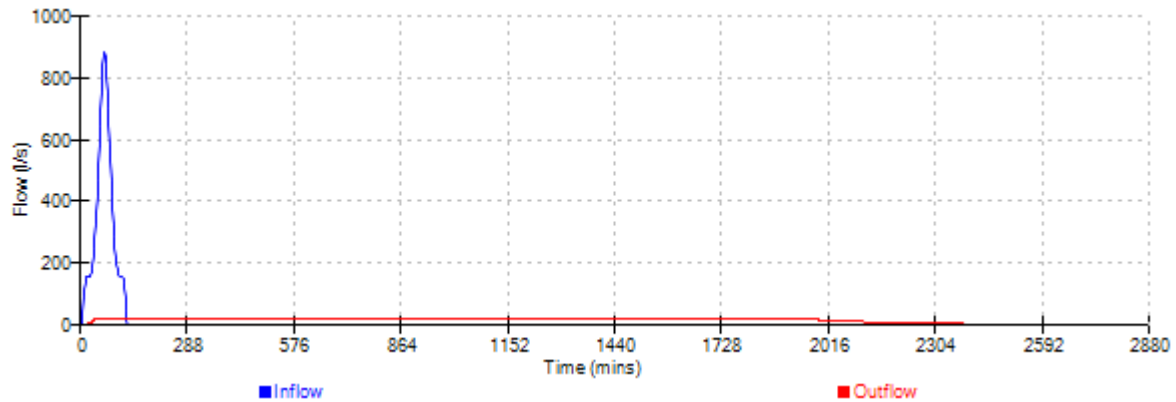
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Event: 60 min Winter



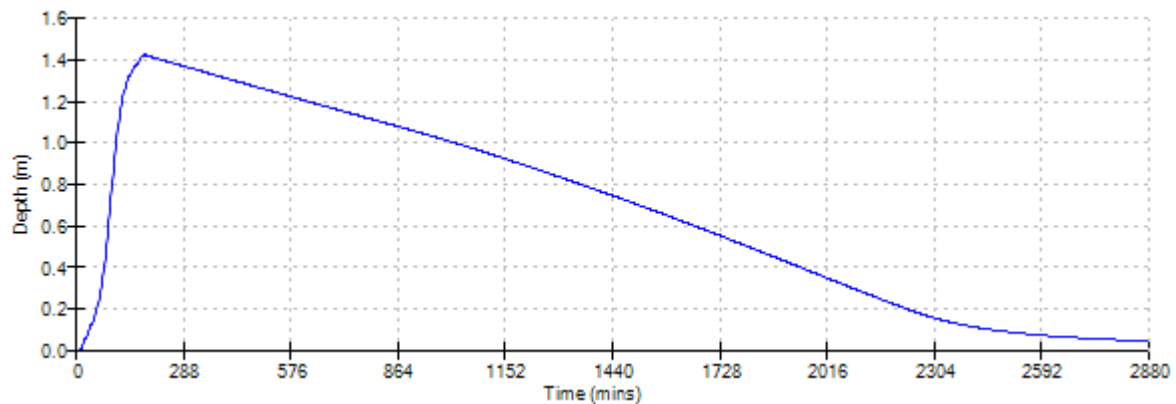
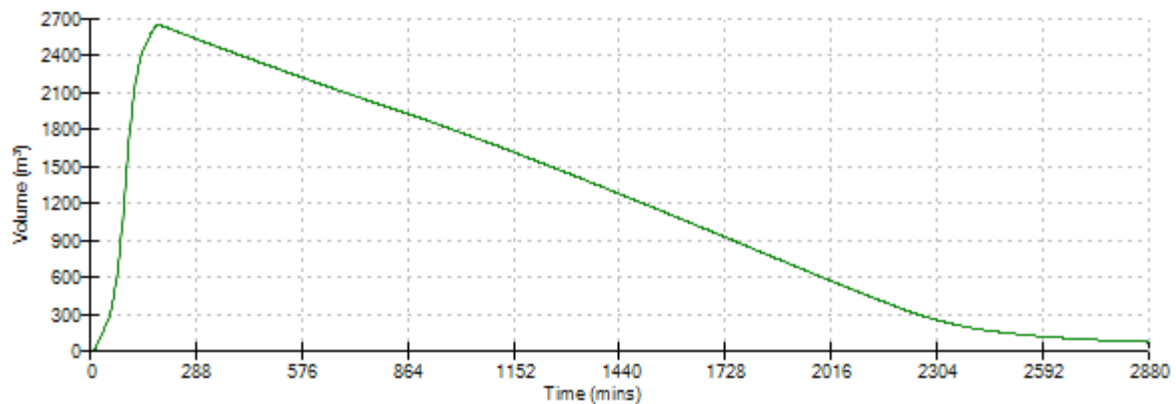
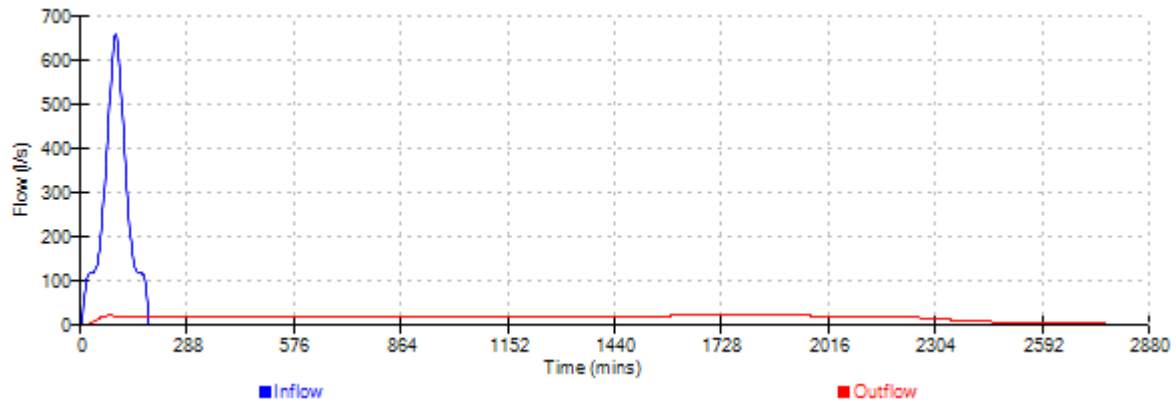
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Innovyze	Source Control 2017.1	

Event: 120 min Winter



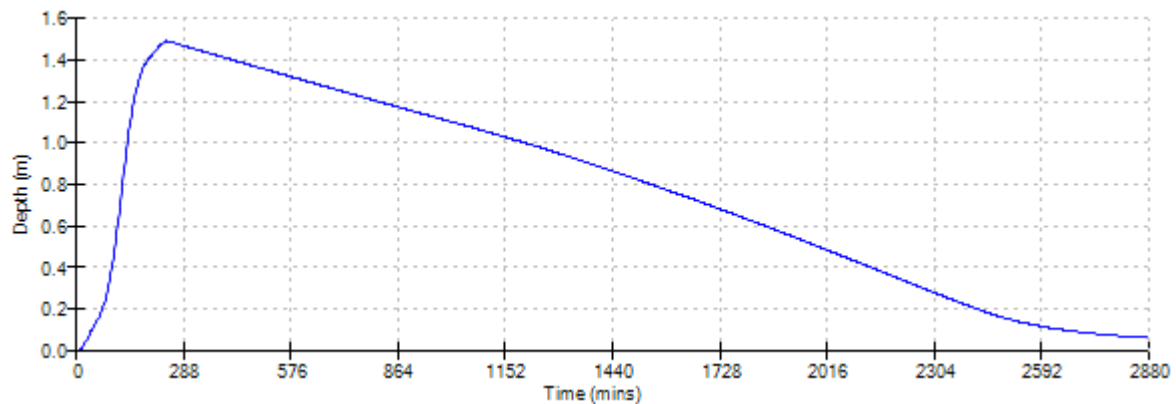
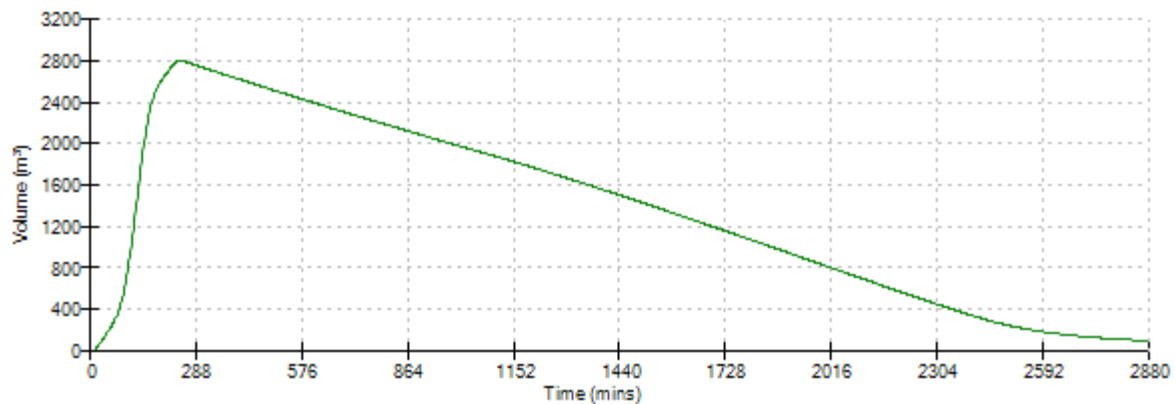
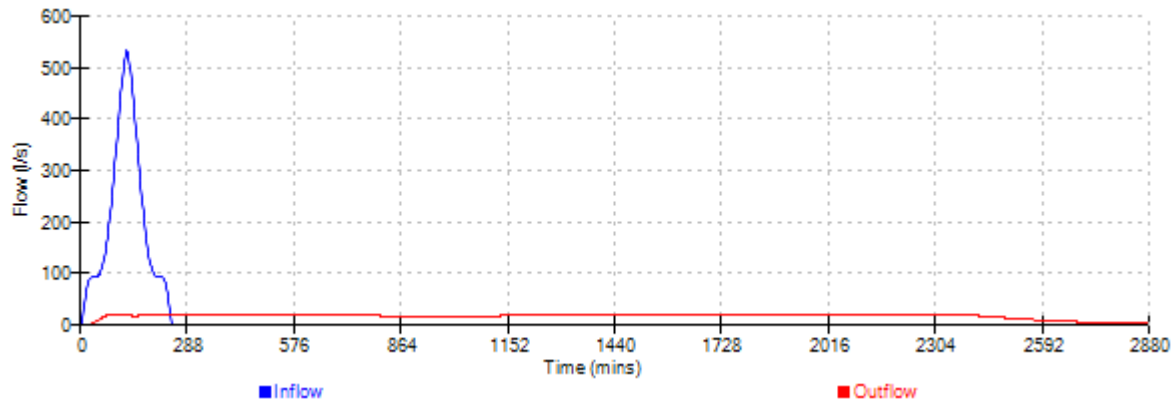
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Innovyze	Source Control 2017.1	

Event: 180 min Winter



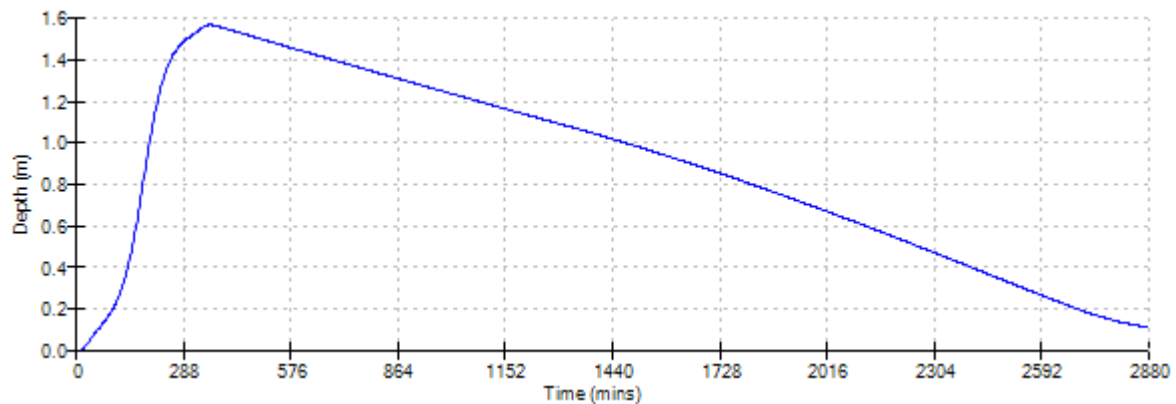
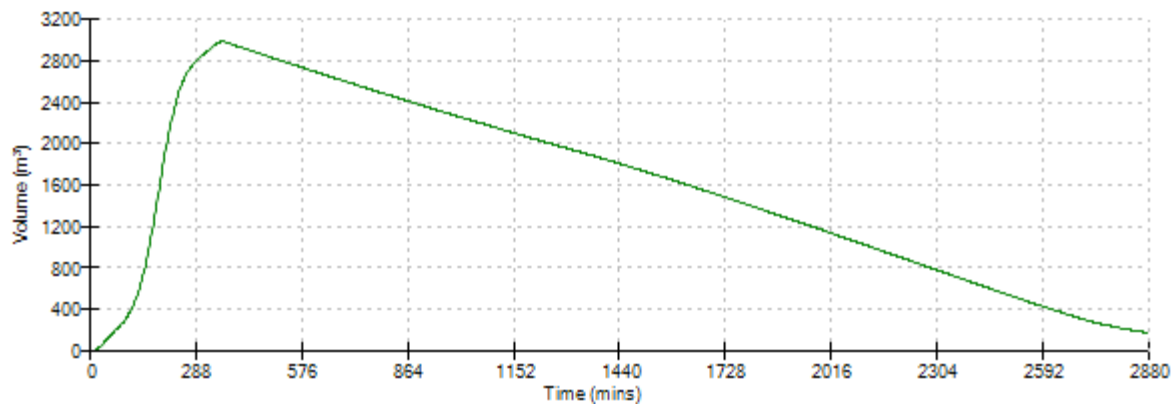
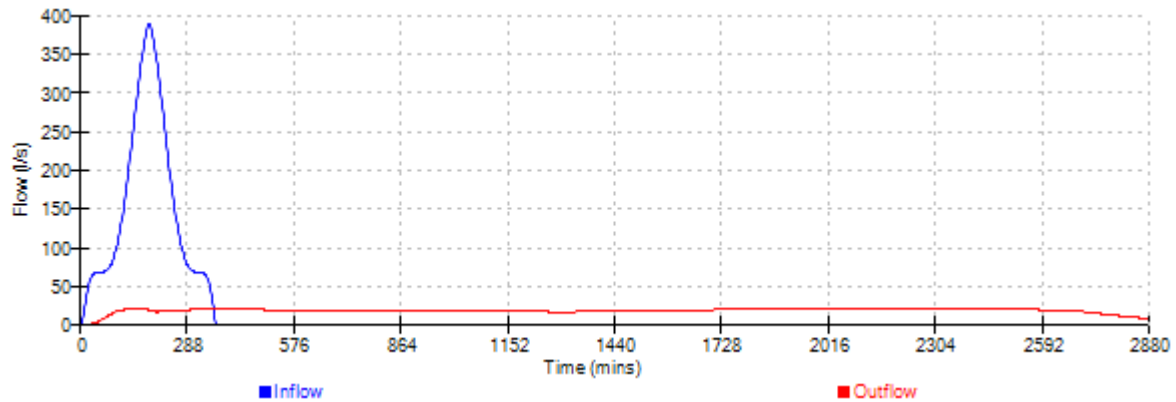
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Event: 240 min Winter



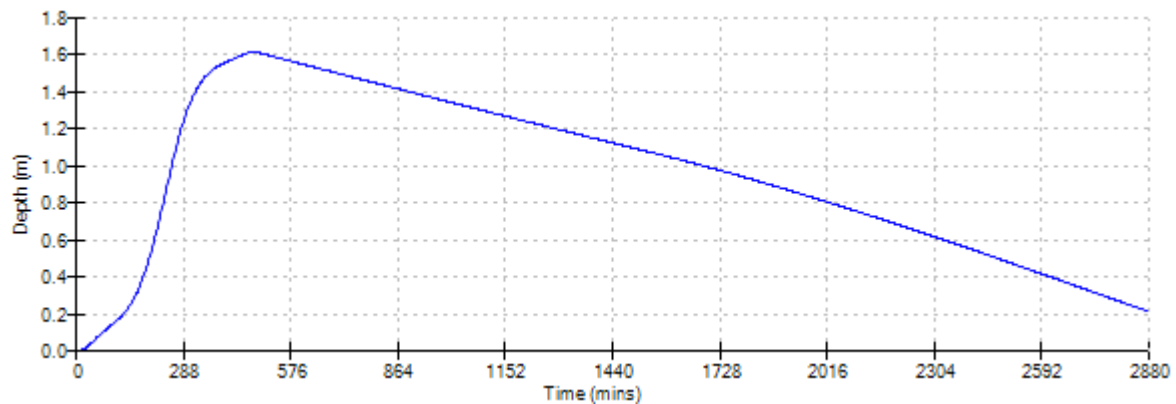
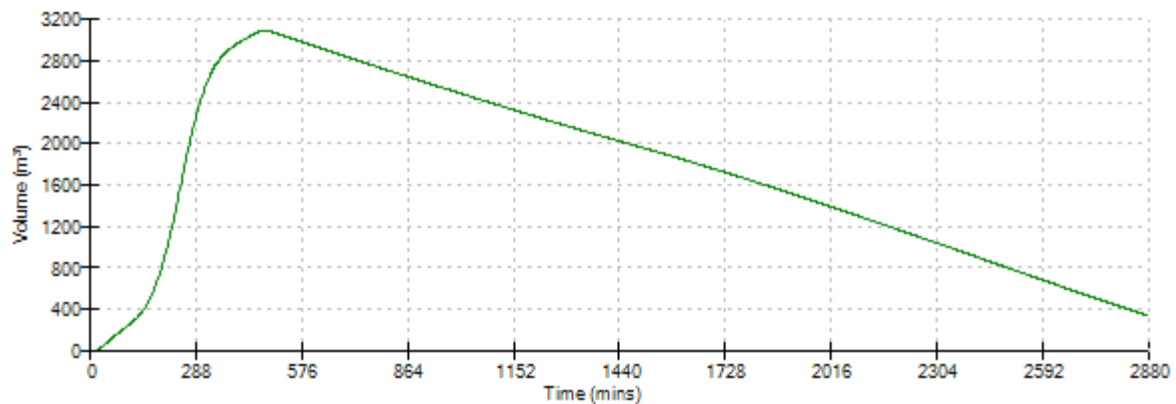
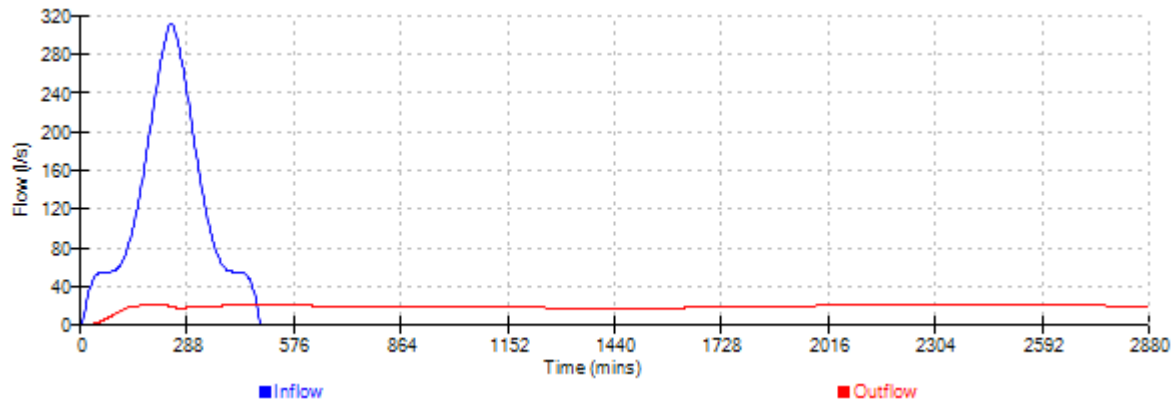
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Event: 360 min Winter



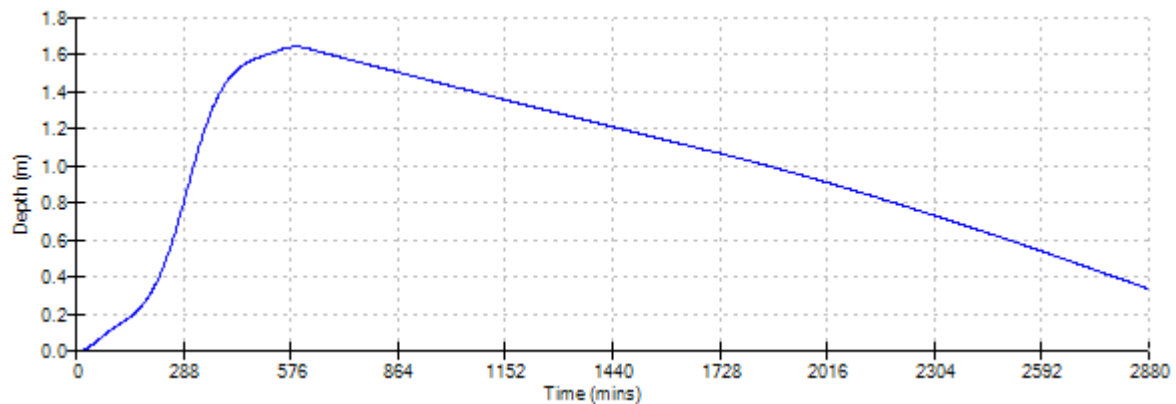
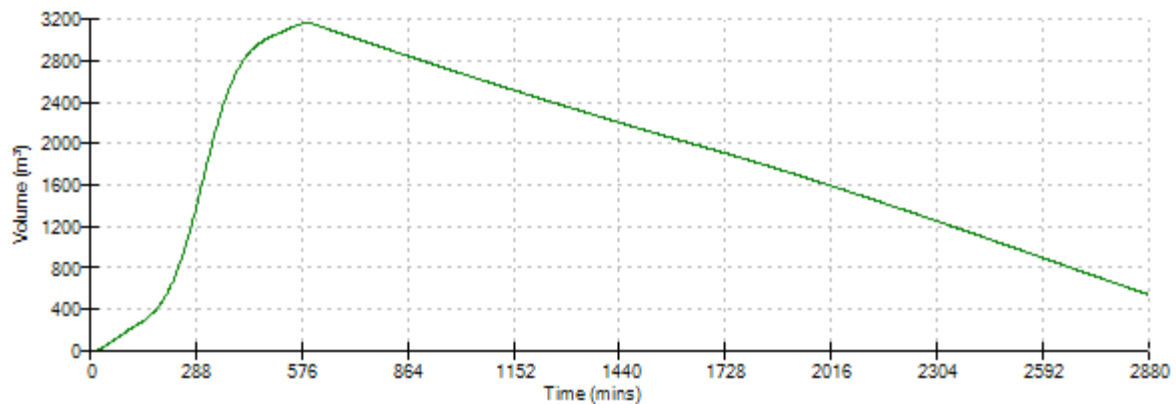
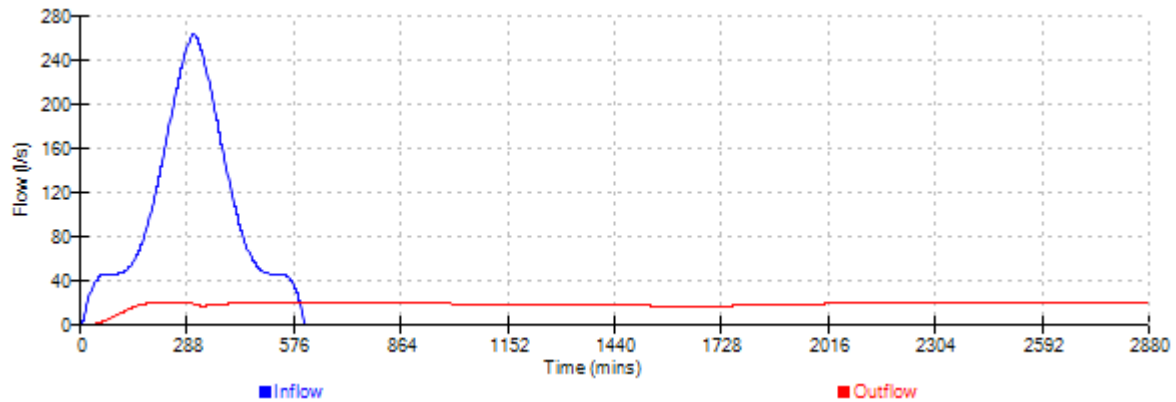
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Event: 480 min Winter



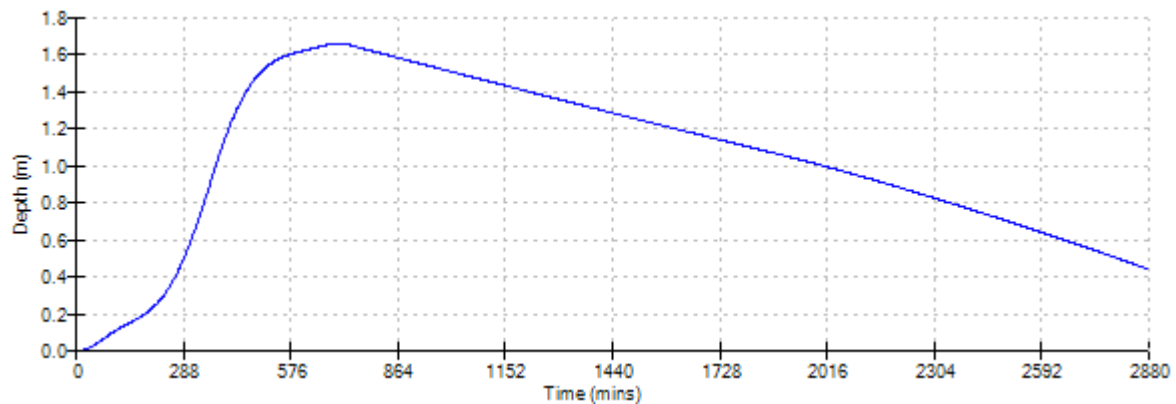
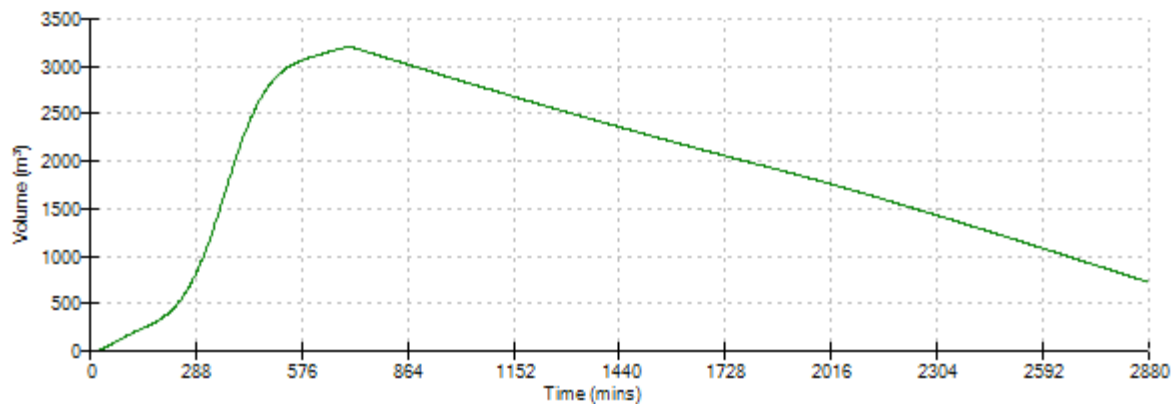
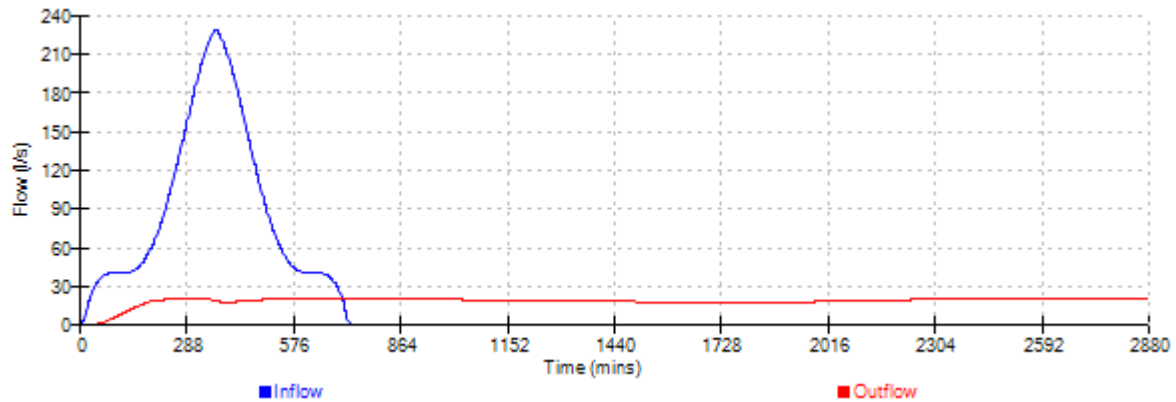
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Event: 600 min Winter



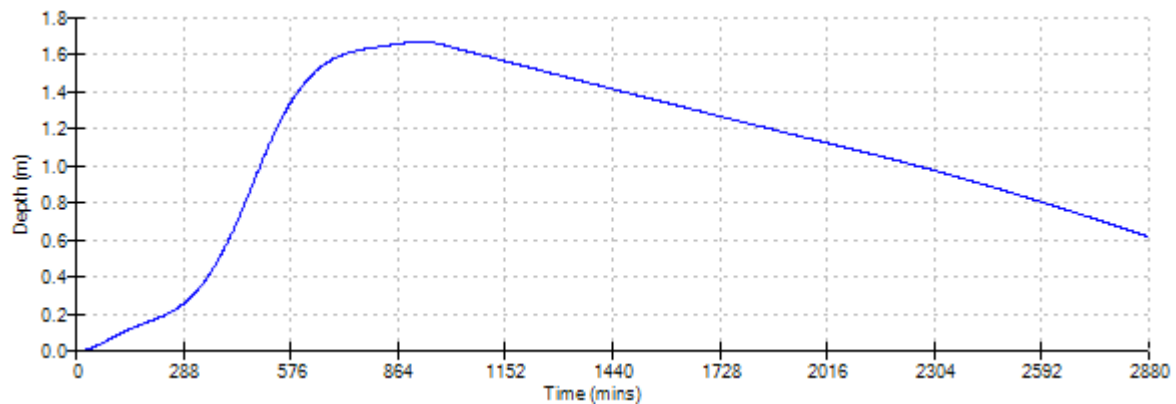
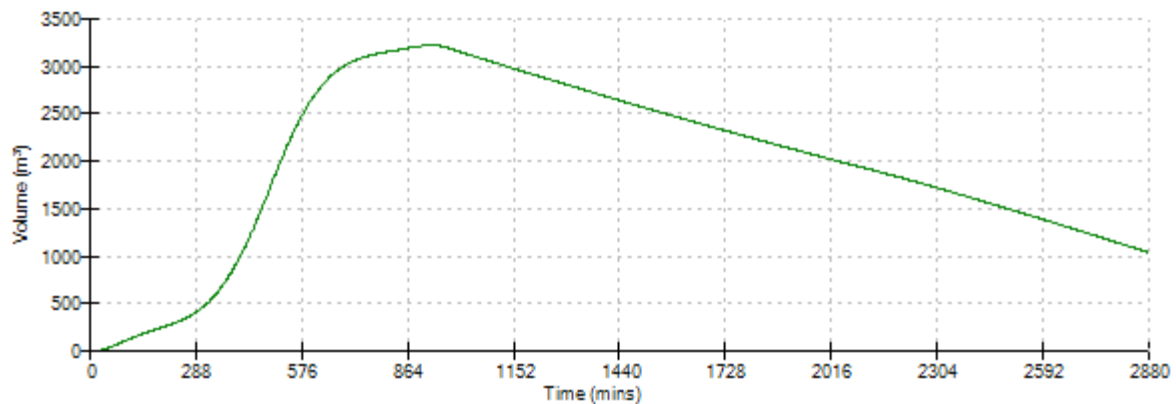
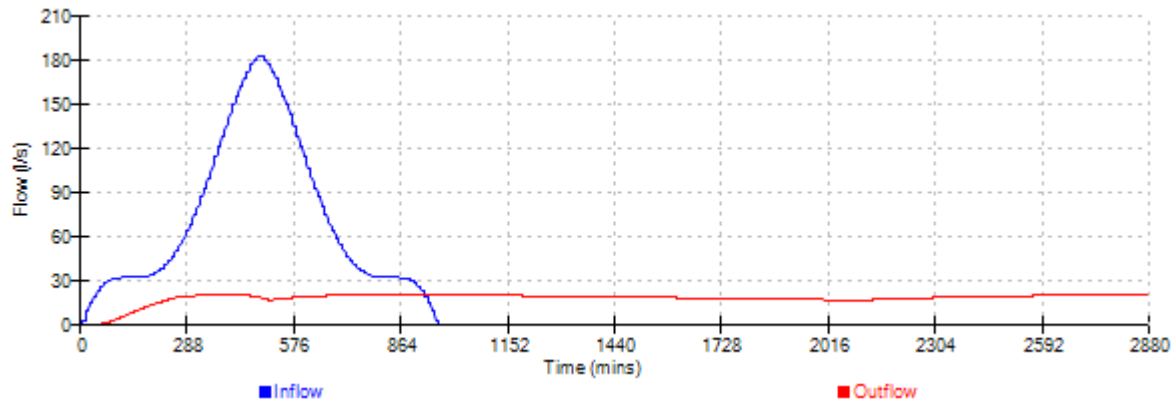
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Event: 720 min Winter



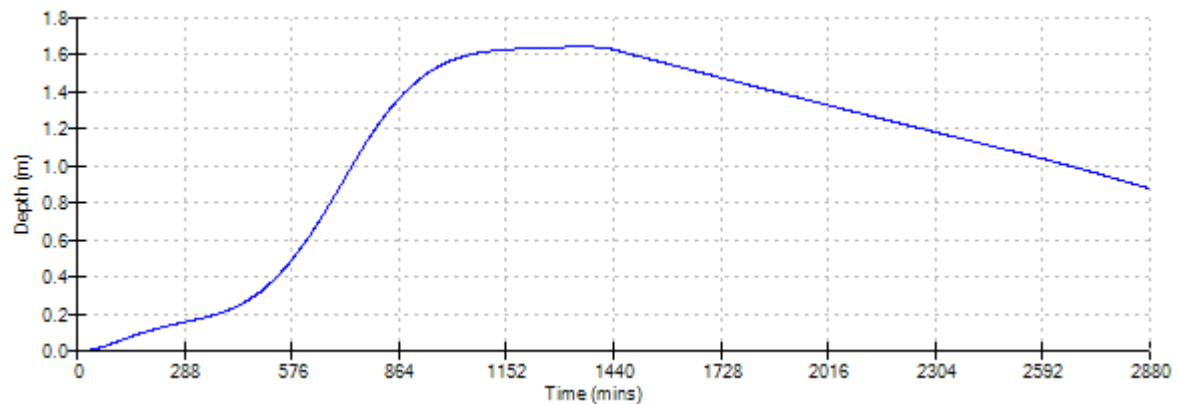
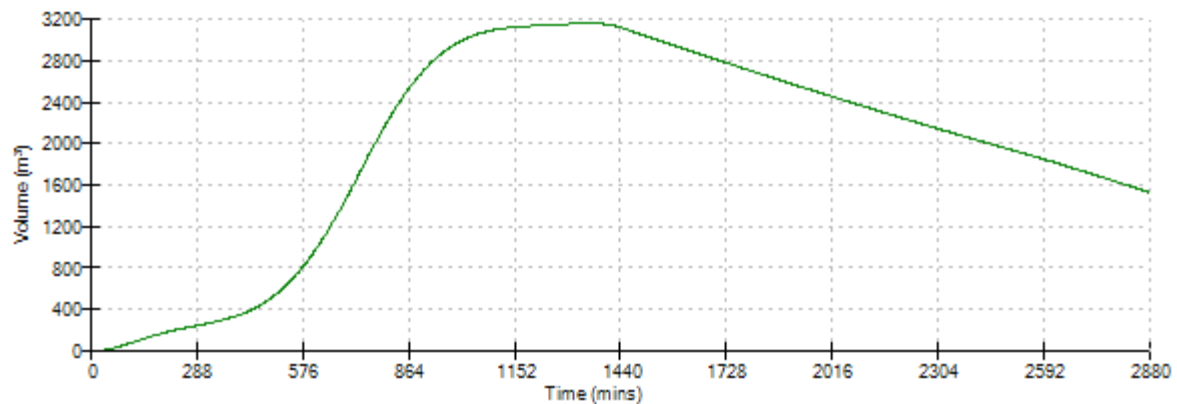
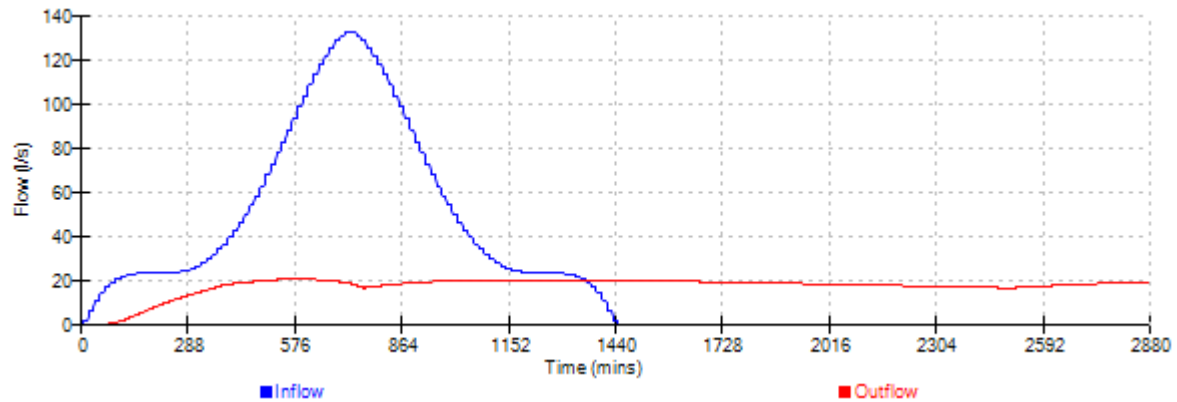
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Event: 960 min Winter



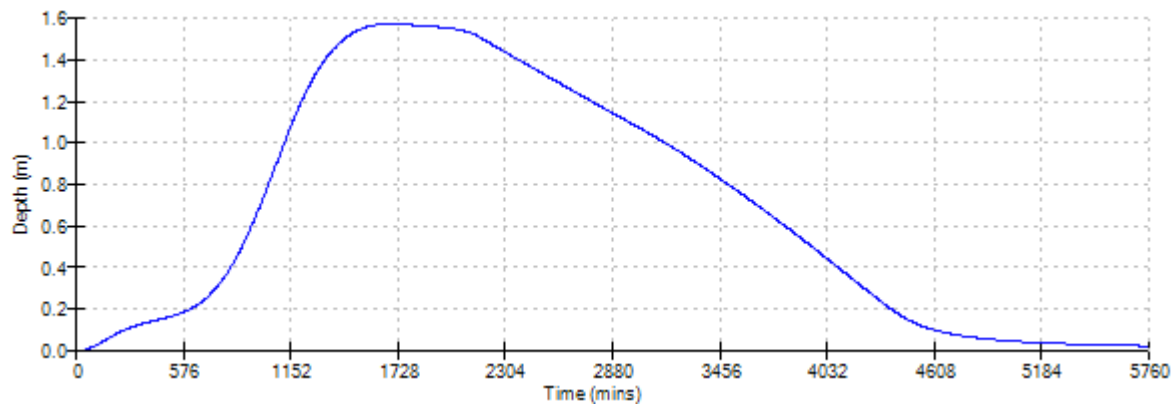
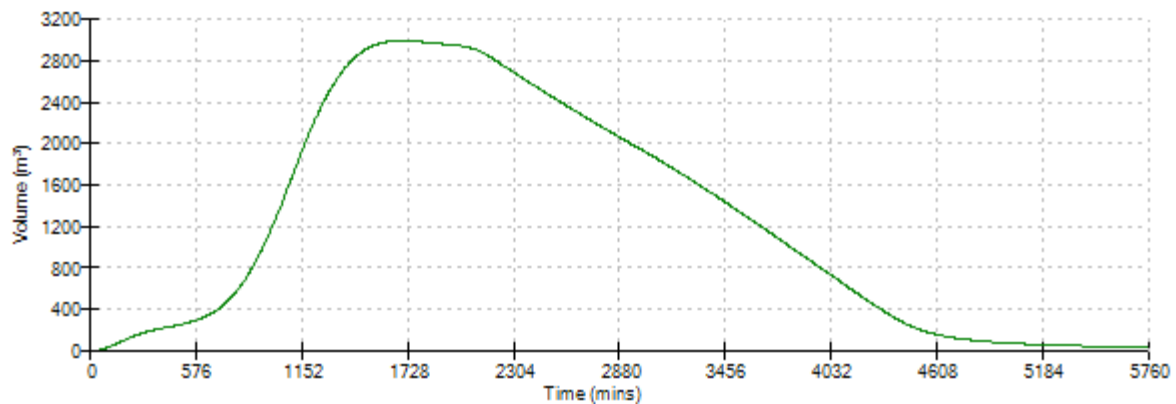
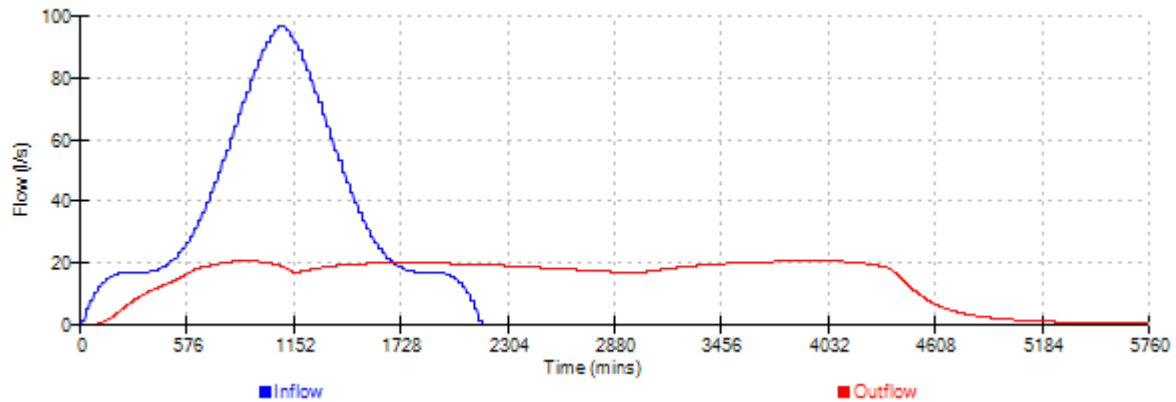
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Innovyze	Source Control 2017.1	

Event: 1440 min Winter



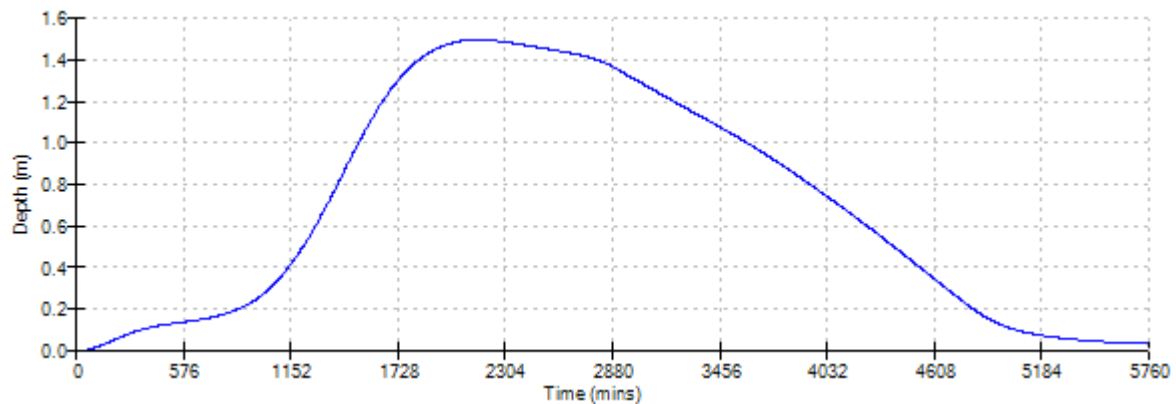
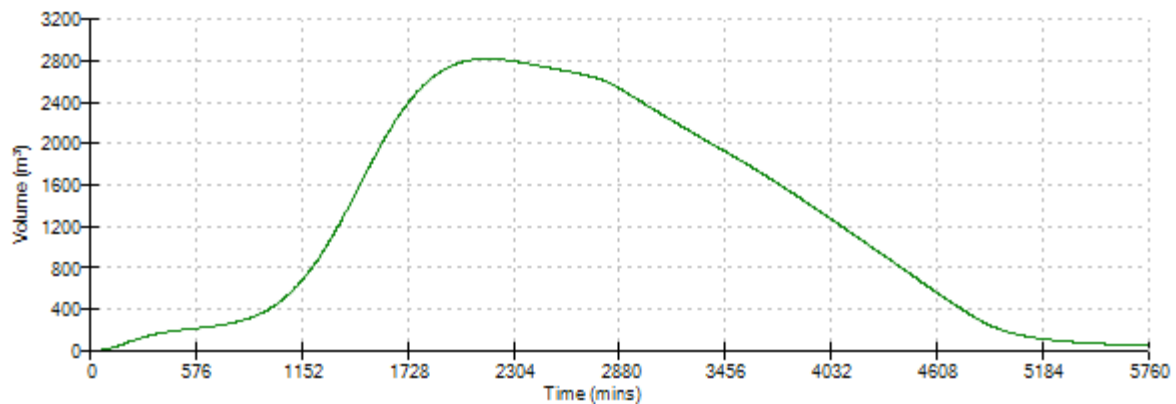
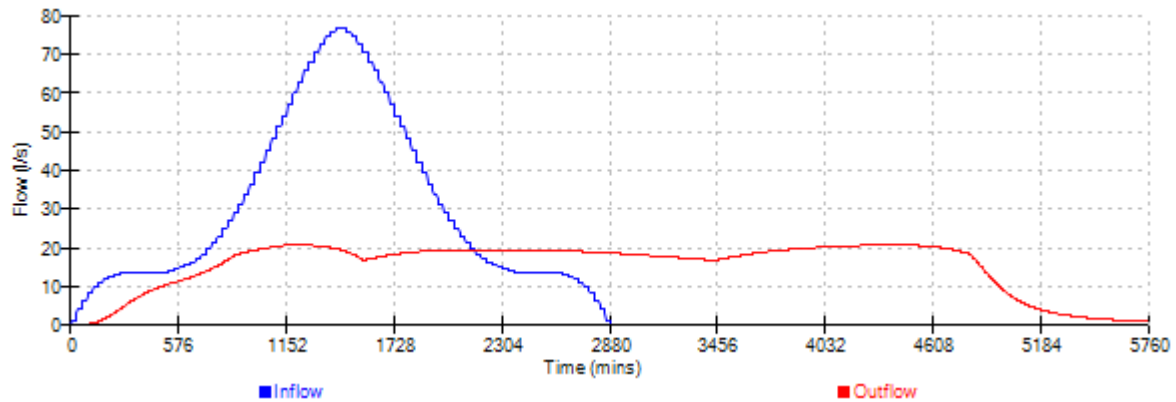
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Event: 2160 min Winter



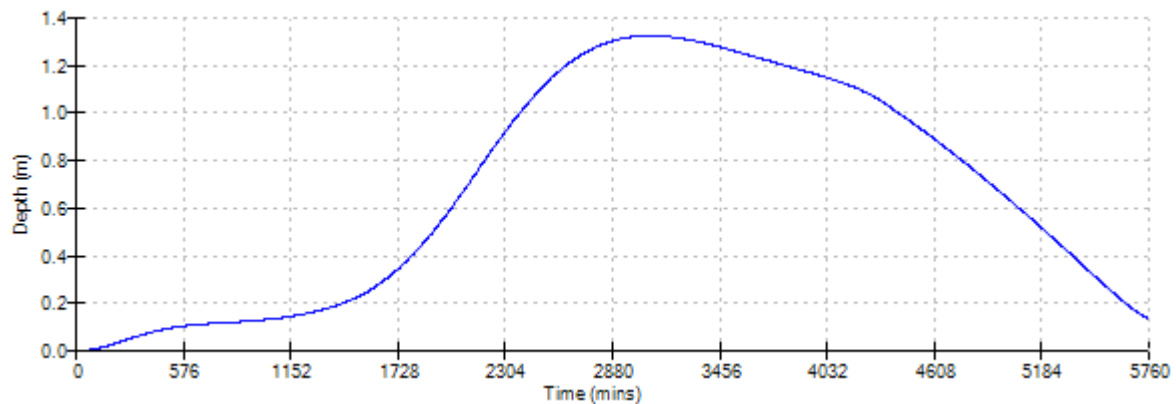
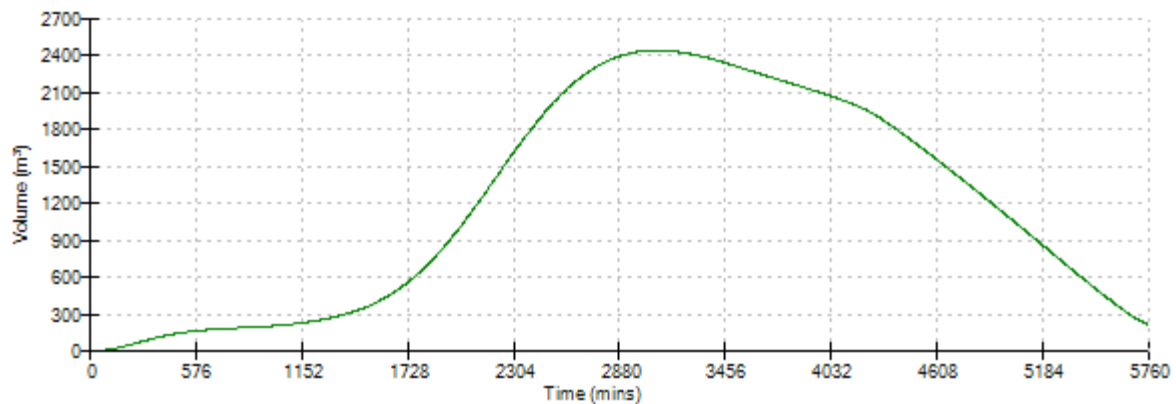
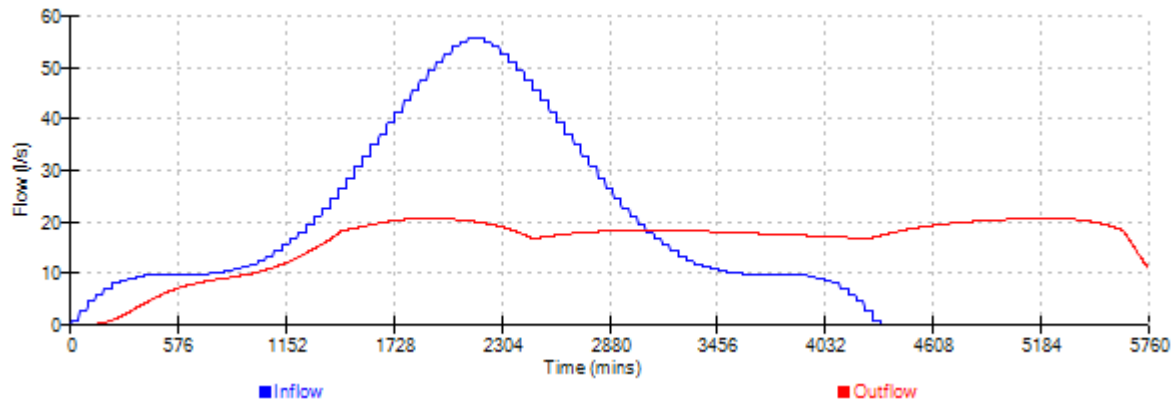
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Event: 2880 min Winter



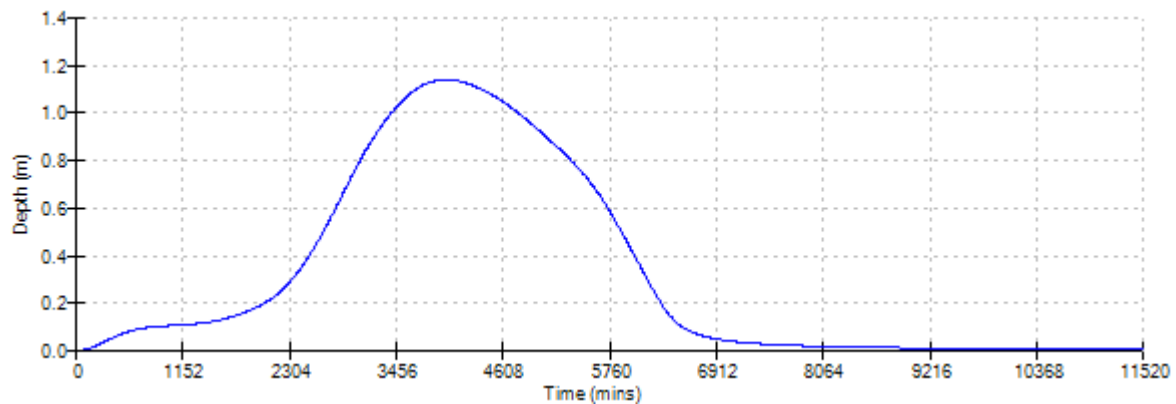
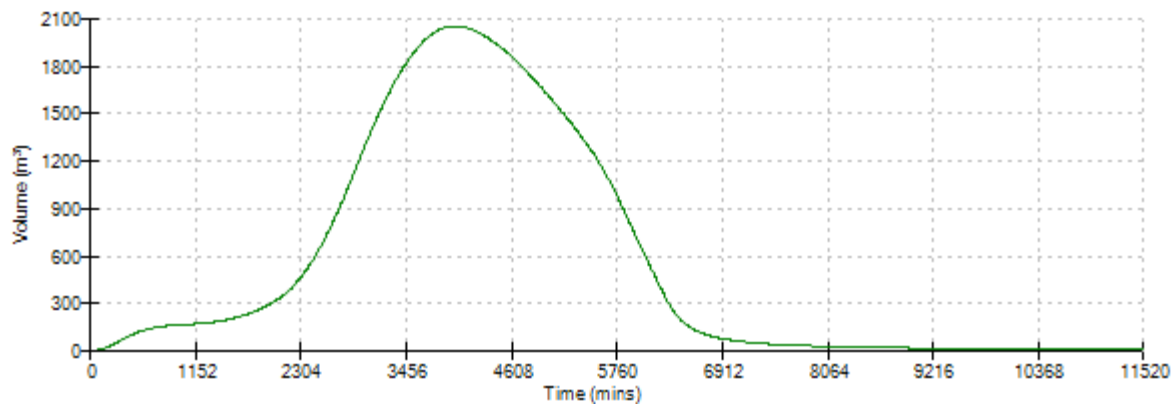
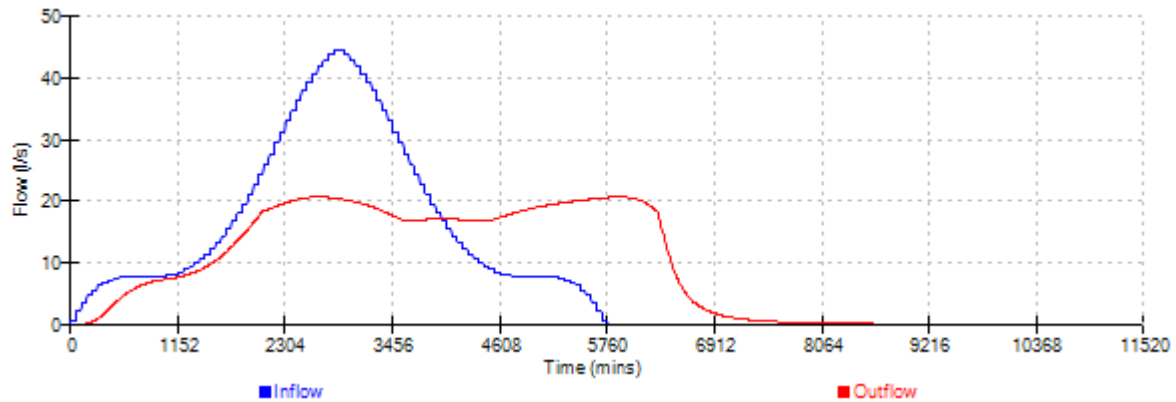
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Event: 4320 min Winter



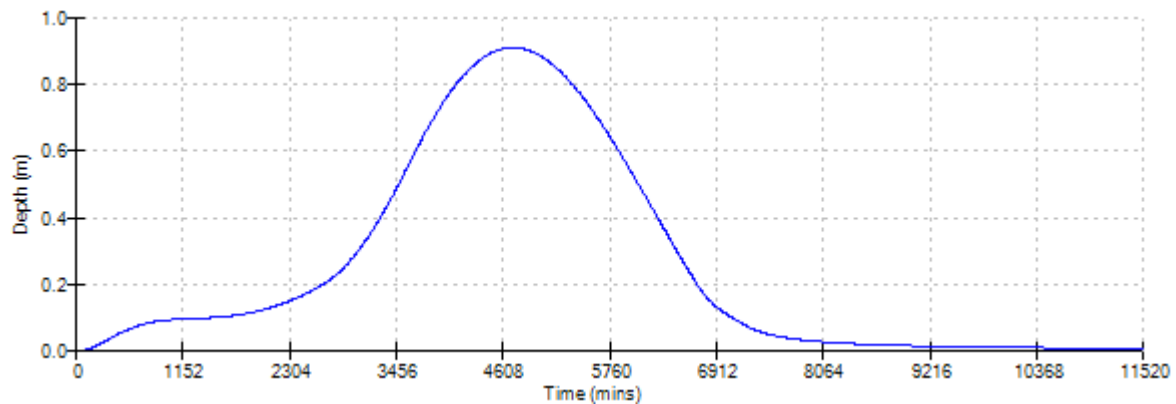
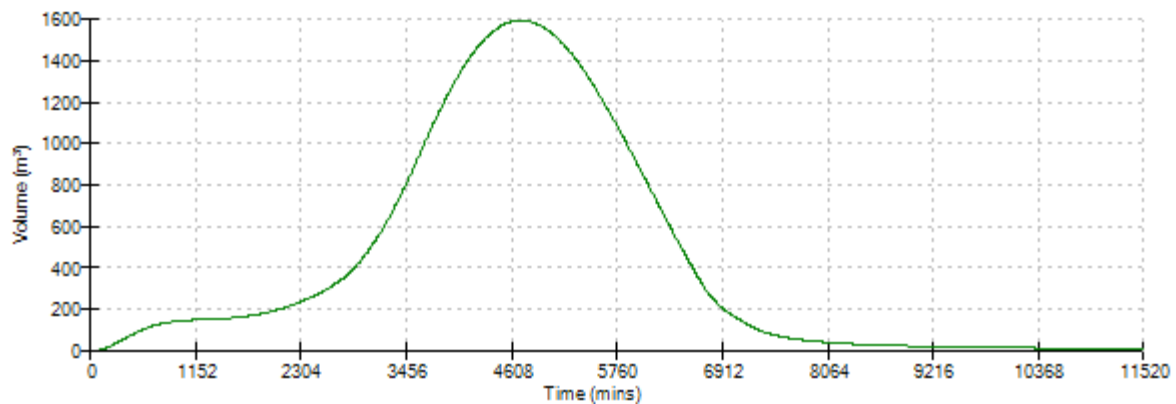
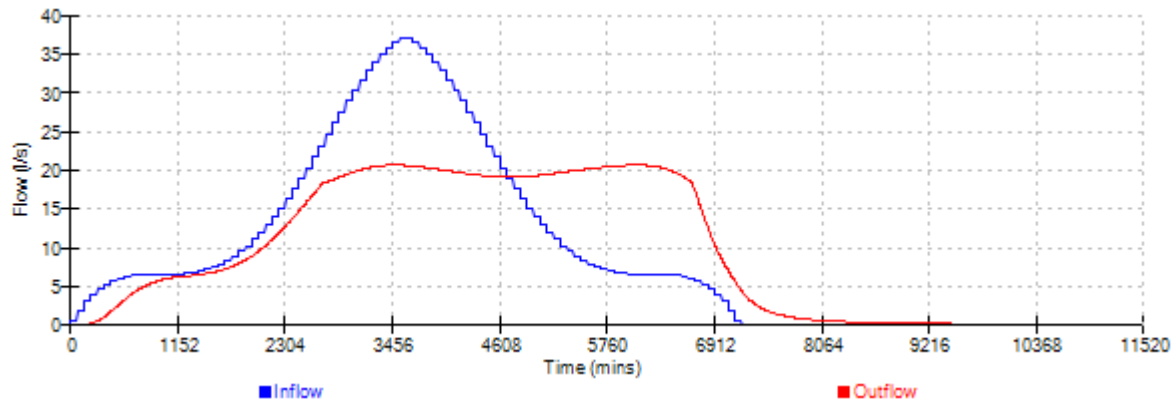
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Event: 5760 min Winter



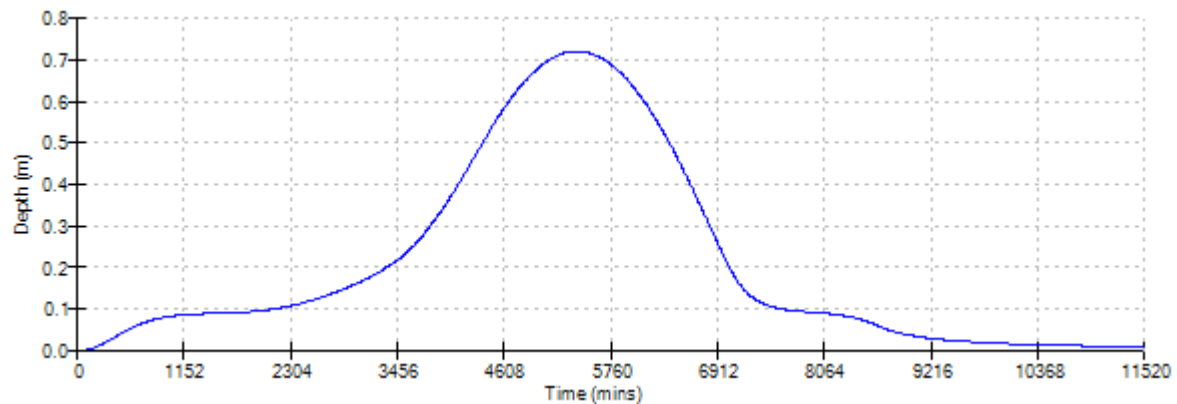
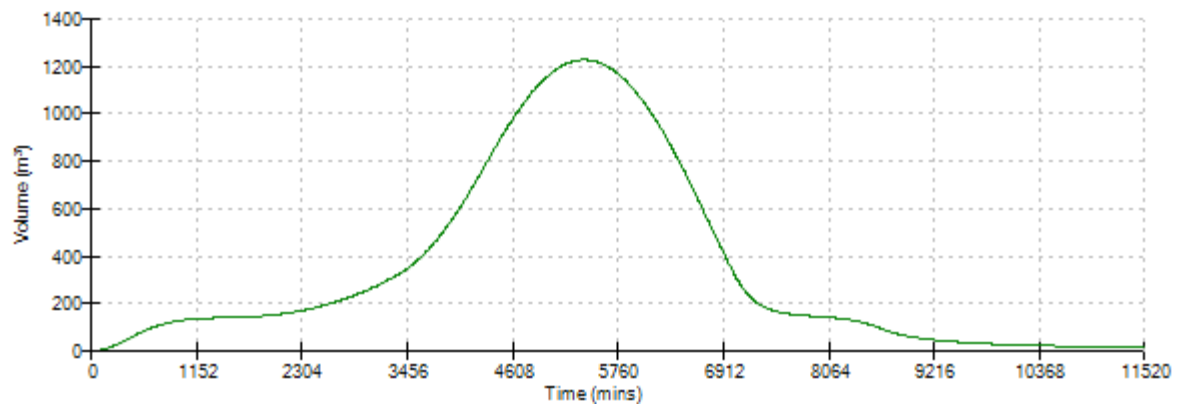
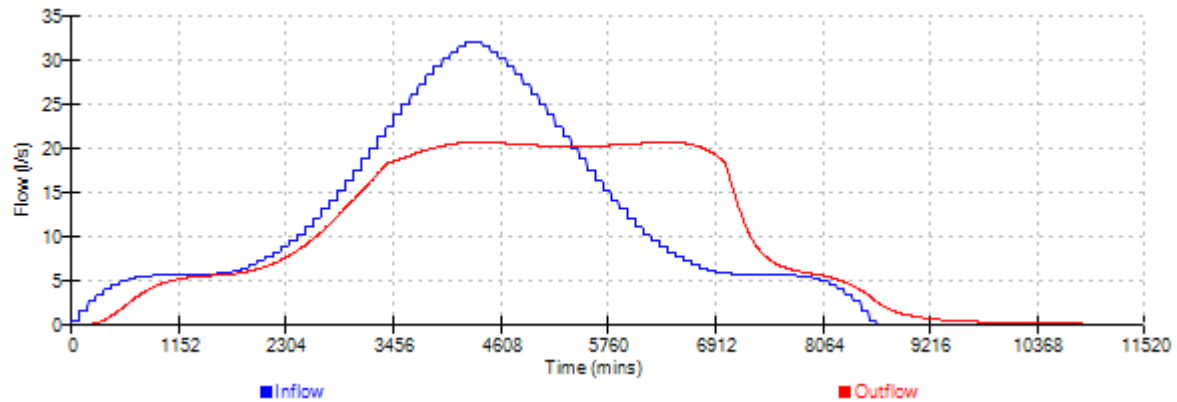
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Innovyze		Source Control 2017.1

Event: 7200 min Winter



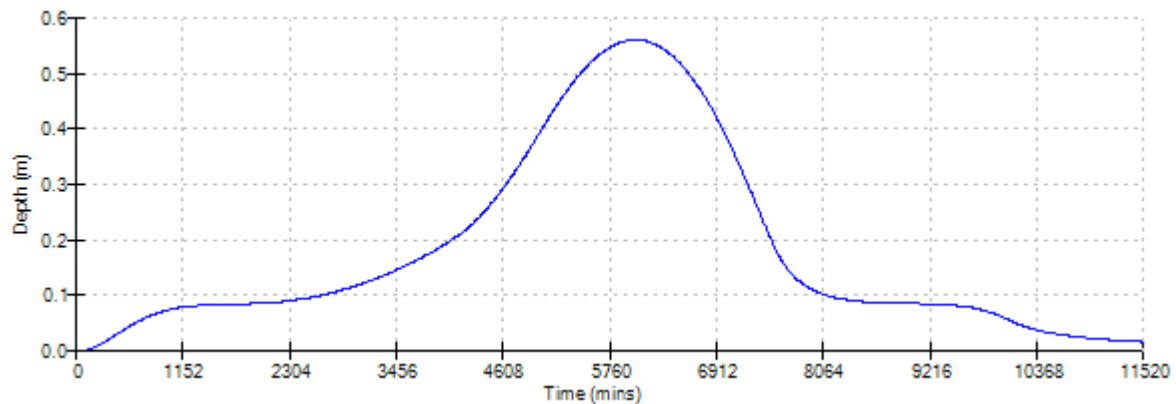
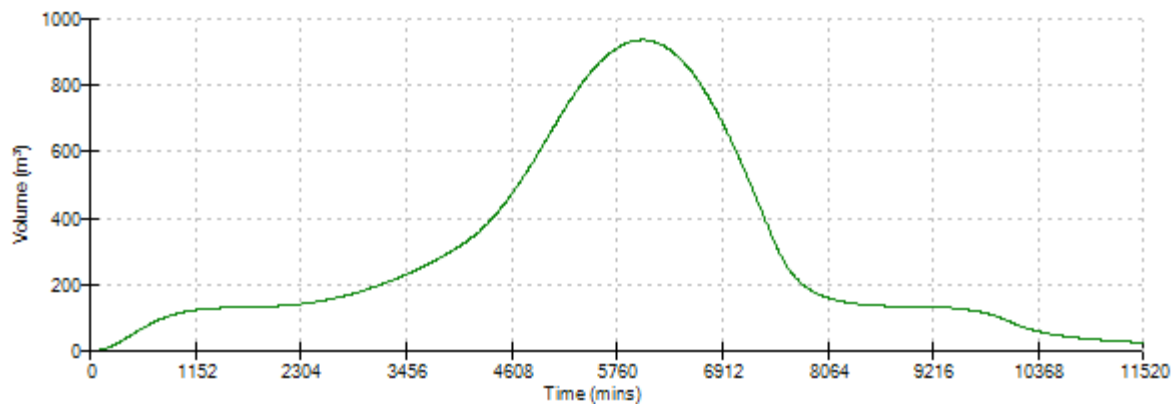
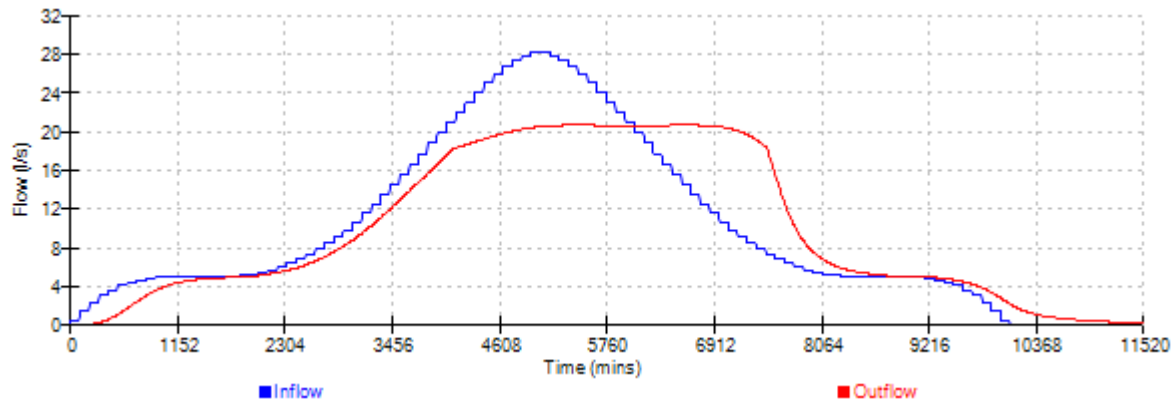
Hydrologic Services		Page 41
Unit 6, Commerce Park Brunel Way Theale RG7 4AB		
Date 13/09/2021 13:24	Designed by dgoukos	
File L0377_ATTENUATION BASIN....	Checked by	
Innovyze	Source Control 2017.1	

Event: 8640 min Winter



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Unit 6, Commerce Park Brunel Way Theale RG7 4AB		
Date 13/09/2021 13:24	Designed by dgoukos	
File L0377_ATTENUATION BASIN....	Checked by	
Innovyze	Source Control 2017.1	

Event: 10080 min Winter



APPENDIX C

Drawing key:

- Manhole chamber
- Flow control chamber
- - - Surface water pipework
- > Inlet/Outlet
- - - Receiving water course

Attenuation Basin

Top Area: 2500m²
Bottom Area: 1550m²
Side Slope: 1/3
Depth: 2m
CL: 92.5mAOD

mh : 7 (D/S pipe: 1004)

D/S Pipe Diameter: 225mm
D/S Pipe Length: 60m
Slope: 1/225
IL: 90.5mAOD
CL: 92.5mAOD
D/S Fall: 0.27m
D/S Capacity: 30l/s

Outfall to the Drainage Ditch

Ditch Bottom level: 90mAOD
(assumed level – needs to be confirmed)
Ditch Ground level: 92.3mAOD
Incoming at Drainage Ditch:
90.23mAOD

mh : 6 (D/S pipe: 2001)

D/S Pipe Diameter: 375mm
D/S Pipe Length: 189.4m
Slope: 1/300
IL: 93.8mAOD
CL: 95.0mAOD
D/S Fall: 0.63m
D/S Capacity: 102l/s

mh : 4 (D/s pipe 1003)

D/S Pipe Diameter: 375mm
D/S Pipe Length: 25m
Slope: 1/30
IL: 93.17mAOD
CL: 95.0mAOD
D/S Fall: 0.84m
D/S Capacity: 324l/s
Incoming at Attenuation Basin: 92.33mAOD

mh : 3 (D/S pipe: 1002)

D/S Pipe Diameter: 375mm
D/S Pipe Length: 25.6m
Slope: 1/300
IL: 93.65mAOD
CL: 95.0mAOD
D/S Fall: 0.085m
D/S Capacity: 102l/s

mh : 2 (D/S pipe: 1001)

D/S Pipe Diameter: 300mm
D/S Pipe Length: 71.59m
Slope: 1/300
IL: 93.89mAOD
CL: 95.0mAOD
D/S Fall: 0.24m
D/S Capacity: 56l/s

mh : 5 (D/S pipe: 2000)

D/S Pipe Diameter: 300mm
D/S Pipe Length: 179.2m
Slope: 1/300
IL: 94.4mAOD
CL: 95.0mAOD
D/S Fall: 0.6m
D/S Capacity: 56l/s

mh : 1 (D/S pipe: 1000)

D/S Pipe Diameter: 300mm
D/S Pipe Length: 153.6m
Slope: 1/300
IL: 94.4mAOD
CL: 95.0mAOD
D/S Fall: 0.512m
D/S Capacity: 56l/s

