Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	5	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	0.75
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.840	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Add Inflow (l/s)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
15		5.00	0.5	37.470	600	384646.445	397687.325	1.370
14			0.5	37.470	600	384643.057	397693.615	1.489
13		5.00	0.6	37.470	450	384669.242	397720.523	0.947
12	0.013	5.00		38.240	1200	384648.489	397678.805	0.770
11	0.003	5.00	0.6	41.300	450	384687.280	397725.639	1.100
10			0.8	41.300	450	384689.131	397719.779	1.294
9			0.6	41.300	450	384691.895	397712.106	1.376
8				41.300	450	384682.137	397708.705	1.479
7	0.021	5.00	0.1	41.300	1200	384685.761	397697.568	3.100
5	0.013	5.00	0.0	38.460	1200	384667.088	397685.876	1.368
4	0.014	5.00	0.7	37.470	1200	384661.488	397702.886	0.900
3	0.003	5.00	0.7	37.470	1200	384657.820	397716.004	1.070
2			0.6	37.470	2400	384637.709	397709.338	1.655
1				41.300	450	384632.612	397721.520	5.605
16				39.659	1200	384687.726	397692.926	1.709
17	0.012	5.00		40.000	450	384712.689	397701.962	0.600
18		5.00		41.300	450	384702.568	397723.724	0.829
6		5.00		41.300	450	384705.032	397704.258	1.134
19				41.300	450	384697.812	397702.289	1.277

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
2	2	1	13.205	0.600	35.815	35.695	0.120	110.0	150	6.53	50.0
14	14	2	16.608	0.600	35.981	35.815	0.166	100.0	225	5.28	50.0
3	3	2	21.187	0.600	36.400	36.135	0.265	80.0	300	6.30	50.0
4	4	3	13.621	0.600	36.570	36.400	0.170	80.1	300	6.10	50.0
13	13	3	12.283	0.600	36.523	36.400	0.123	99.9	150	5.20	50.0
5	5	4	17.908	0.600	37.092	36.570	0.522	34.3	300	5.97	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
2	0.957	16.9	17.7	1.505	5.455	0.079	5.7
14	1.307	52.0	1.0	1.264	1.430	0.000	1.0
3	1.759	124.3	16.1	0.770	1.035	0.079	4.1
4	1.758	124.2	14.3	0.600	0.770	0.076	2.8
13	1.005	17.8	0.6	0.797	0.920	0.000	0.6
5	2.693	190.3	11.5	1.068	0.600	0.062	2.1

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
16	16	5	21.809	0.600	37.950	37.167	0.783	27.9	225	5.86	50.0
12	12	5	19.898	0.600	37.470	37.167	0.303	65.7	225	5.21	50.0
7	7	16	5.041	0.600	38.200	37.950	0.250	20.2	150	5.71	50.0
8	8	7	11.712	0.600	39.821	39.700	0.121	96.8	150	5.67	50.0
9	9	8	10.334	0.600	39.924	39.821	0.103	100.3	150	5.48	50.0
10	10	9	8.156	0.600	40.006	39.924	0.082	99.5	150	5.31	50.0
11	11	10	8.980	0.600	40.200	40.006	0.194	46.3	150	5.10	50.0
15	15	14	7.144	0.600	36.100	35.981	0.119	60.0	225	5.07	50.0
4.000	17	16	26.548	0.600	39.400	37.950	1.450	18.3	150	5.19	50.0
1.000	18	10	11.800	0.600	40.471	40.323	0.148	79.7	150	5.17	50.0
3.000	6	19	7.484	0.600	40.166	40.023	0.143	52.3	150	5.09	50.0
3.001	19	7	12.943	0.600	40.023	39.700	0.323	40.1	150	5.22	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
16	2.488	98.9	7.6	1.484	1.068	0.036	2.1
12	1.616	64.3	2.0	0.545	1.068	0.013	0.0
7	2.253	39.8	5.7	2.950	1.559	0.024	2.1
8	1.021	18.0	2.5	1.329	1.450	0.003	2.0
9	1.003	17.7	2.5	1.226	1.329	0.003	2.0
10	1.007	17.8	1.9	1.144	1.226	0.003	1.4
11	1.482	26.2	1.1	0.950	1.144	0.003	0.6
15	1.691	67.2	0.5	1.145	1.264	0.000	0.5
4.000	2.365	41.8	1.8	0.450	1.559	0.012	0.0
1.000	1.127	19.9	0.0	0.679	0.827	0.000	0.0
3.000	1.393	24.6	0.0	0.984	1.127	0.000	0.0
3.001	1.594	28.2	0.0	1.127	1.450	0.000	0.0

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
2	13.205	110.0	150	Circular	37.470	35.815	1.505	41.300	35.695	5.455
14	16.608	100.0	225	Circular	37.470	35.981	1.264	37.470	35.815	1.430
3	21.187	80.0	300	Circular	37.470	36.400	0.770	37.470	36.135	1.035
4	13.621	80.1	300	Circular	37.470	36.570	0.600	37.470	36.400	0.770
13	12.283	99.9	150	Circular	37.470	36.523	0.797	37.470	36.400	0.920
5	17.908	34.3	300	Circular	38.460	37.092	1.068	37.470	36.570	0.600
16	21.809	27.9	225	Circular	39.659	37.950	1.484	38.460	37.167	1.068
12	19.898	65.7	225	Circular	38.240	37.470	0.545	38.460	37.167	1.068

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
2	2	2400	Manhole	Adoptable	1	450	Manhole	Adoptable
14	14	600	Manhole	Adoptable	2	2400	Manhole	Adoptable
3	3	1200	Manhole	Adoptable	2	2400	Manhole	Adoptable
4	4	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
13	13	450	Manhole	Adoptable	3	1200	Manhole	Adoptable
5	5	1200	Manhole	Adoptable	4	1200	Manhole	Adoptable
16	16	1200	Manhole	Adoptable	5	1200	Manhole	Adoptable
12	12	1200	Manhole	Adoptable	5	1200	Manhole	Adoptable

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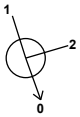
Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
7	5.041	20.2	150	Circular	41.300	38.200	2.950	39.659	37.950	1.559
8	11.712	96.8	150	Circular	41.300	39.821	1.329	41.300	39.700	1.450
9	10.334	100.3	150	Circular	41.300	39.924	1.226	41.300	39.821	1.329
10	8.156	99.5	150	Circular	41.300	40.006	1.144	41.300	39.924	1.226
11	8.980	46.3	150	Circular	41.300	40.200	0.950	41.300	40.006	1.144
15	7.144	60.0	225	Circular	37.470	36.100	1.145	37.470	35.981	1.264
4.000	26.548	18.3	150	Circular	40.000	39.400	0.450	39.659	37.950	1.559
1.000	11.800	79.7	150	Circular	41.300	40.471	0.679	41.300	40.323	0.827
3.000	7.484	52.3	150	Circular	41.300	40.166	0.984	41.300	40.023	1.127
3.001	12.943	40.1	150	Circular	41.300	40.023	1.127	41.300	39.700	1.450

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
7	7	1200	Manhole	Adoptable	16	1200	Manhole	Adoptable
8	8	450	Manhole	Adoptable	7	1200	Manhole	Adoptable
9	9	450	Manhole	Adoptable	8	450	Manhole	Adoptable
10	10	450	Manhole	Adoptable	9	450	Manhole	Adoptable
11	11	450	Manhole	Adoptable	10	450	Manhole	Adoptable
15	15	600	Manhole	Adoptable	14	600	Manhole	Adoptable
4.000	17	450	Junction		16	1200	Manhole	Adoptable
1.000	18	450	Manhole	Adoptable	10	450	Manhole	Adoptable
3.000	6	450	Manhole	Adoptable	19	450	Manhole	Adoptable
3.001	19	450	Manhole	Adoptable	7	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
15	384646.445	397687.325	37.470	1.370	600				
						0	15	36.100	225
14	384643.057	397693.615	37.470	1.489	600		1	15	35.981	225
						0	14	35.981	225
13	384669.242	397720.523	37.470	0.947	450				
						0	13	36.523	150
12	384648.489	397678.805	38.240	0.770	1200				
						0	12	37.470	225
11	384687.280	397725.639	41.300	1.100	450				
						0	11	40.200	150
10	384689.131	397719.779	41.300	1.294	450		1	11	40.006	150
							2	1.000	40.323	150
						0	10	40.006	150

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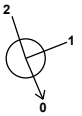
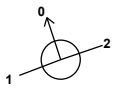
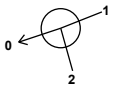
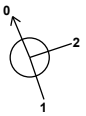
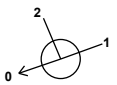
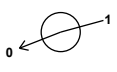
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
9	384691.895	397712.106	41.300	1.376	450	1	10	39.924	150
						0	9	39.924	150
8	384682.137	397708.705	41.300	1.479	450	1	9	39.821	150
						0	8	39.821	150
7	384685.761	397697.568	41.300	3.100	1200	1	3.001	39.700	150
						 2	8	39.700	150
						0	7	38.200	150
5	384667.088	397685.876	38.460	1.368	1200	 1	12	37.167	225
						2	16	37.167	225
						0	5	37.092	300
4	384661.488	397702.886	37.470	0.900	1200	1	5	36.570	300
						0	4	36.570	300
3	384657.820	397716.004	37.470	1.070	1200	1	13	36.400	150
						 2	4	36.400	300
						0	3	36.400	300
2	384637.709	397709.338	37.470	1.655	2400	 1	14	35.815	225
						2	3	36.135	300
						0	2	35.815	150
1	384632.612	397721.520	41.300	5.605	450	1	2	35.695	150
16	384687.726	397692.926	39.659	1.709	1200	 1	4.000	37.950	150
						2	7	37.950	150
						0	16	37.950	225
17	384712.689	397701.962	40.000	0.600	450				
						0	4.000	39.400	150
18	384702.568	397723.724	41.300	0.829	450				
						0	1.000	40.471	150
6	384705.032	397704.258	41.300	1.134	450				
						0	3.000	40.166	150
19	384697.812	397702.289	41.300	1.277	450	1	3.000	40.023	150
									
						0	3.001	40.023	150

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Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	45	0	0

Node 2 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	35.815	Product Number	CTL-SHE-0138-1080-1900-1080
Design Depth (m)	1.900	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	10.8	Min Node Diameter (mm)	1500

Node 7 Online Orifice Control

Flap Valve	x	Design Depth (m)	2.300	Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Flow (l/s)	4.0		
Invert Level (m)	38.200	Diameter (m)	0.035		

Node 7 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	41.070
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	40.0	0.0	0.150	40.0	0.0	0.151	0.0	0.0

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Results for 1 year Critical Storm Duration. Lowest mass balance: 99.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	15	5	36.114	0.014	0.5	0.0039	0.0000	OK
15 minute winter	14	15	36.087	0.106	2.4	0.0299	0.0000	OK
15 minute summer	13	6	36.542	0.019	0.6	0.0030	0.0000	OK
15 minute winter	12	10	37.496	0.026	1.8	0.0379	0.0000	OK
15 minute winter	11	11	40.220	0.020	1.0	0.0043	0.0000	OK
15 minute summer	10	11	40.039	0.033	1.8	0.0052	0.0000	OK
15 minute winter	9	11	39.962	0.038	2.4	0.0061	0.0000	OK
15 minute summer	8	11	39.859	0.038	2.4	0.0060	0.0000	OK
60 minute winter	7	41	39.682	1.482	3.8	1.8766	0.0000	SURCHARGED
15 minute winter	5	11	37.132	0.040	7.5	0.0535	0.0000	OK
15 minute winter	4	11	36.629	0.059	10.1	0.0858	0.0000	OK
15 minute winter	3	11	36.464	0.064	11.8	0.0759	0.0000	OK
15 minute winter	2	15	36.091	0.276	12.6	1.2464	0.0000	SURCHARGED
15 minute summer	1	1	35.695	0.000	9.8	0.0000	0.0000	OK
15 minute winter	16	11	37.982	0.032	4.1	0.0357	0.0000	OK
15 minute winter	17	10	39.421	0.021	1.7	0.0082	0.0000	OK
15 minute summer	18	1	40.471	0.000	0.0	0.0000	0.0000	OK
15 minute summer	6	1	40.166	0.000	0.0	0.0000	0.0000	OK
15 minute summer	19	1	40.023	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	15	15	14	0.5	0.385	0.007	0.0561	
15 minute winter	14	14	2	2.4	0.499	0.047	0.4822	
15 minute summer	13	13	3	0.6	0.453	0.034	0.0508	
15 minute winter	12	12	5	1.7	0.702	0.027	0.0494	
15 minute winter	11	11	10	1.0	0.480	0.038	0.0190	
15 minute summer	10	10	9	1.8	0.563	0.101	0.0261	
15 minute winter	9	9	8	2.4	0.733	0.135	0.0364	
15 minute summer	8	8	7	2.4	0.700	0.133	0.0401	
60 minute winter	7	7	16	3.1	1.274	0.077	0.0124	
15 minute winter	5	5	4	7.5	0.976	0.039	0.1391	
15 minute winter	4	4	3	10.1	0.972	0.082	0.1419	
15 minute winter	3	3	2	11.7	1.098	0.095	0.2267	
15 minute winter	2	Hydro-Brake®	1	9.9				89.9
15 minute winter	16	16	5	4.1	1.221	0.041	0.0727	
15 minute winter	17	4.000	16	1.7	0.841	0.040	0.0544	
15 minute summer	18	1.000	10	0.0	0.000	0.000	0.0000	
15 minute summer	6	3.000	19	0.0	0.000	0.000	0.0000	
15 minute summer	19	3.001	7	0.0	0.000	0.000	0.0000	

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	15	27	36.547	0.447	2.6	0.1266	0.0000	SURCHARGED
30 minute winter	14	27	36.547	0.566	3.9	0.1603	0.0000	SURCHARGED
30 minute winter	13	28	36.550	0.027	0.6	0.0042	0.0000	OK
15 minute winter	12	10	37.511	0.041	4.5	0.0596	0.0000	OK
15 minute winter	11	11	40.225	0.025	1.6	0.0054	0.0000	OK
60 minute winter	10	46	40.137	0.131	1.9	0.0208	0.0000	OK
60 minute winter	9	46	40.136	0.212	2.5	0.0337	0.0000	SURCHARGED
60 minute winter	8	46	40.134	0.313	2.6	0.0497	0.0000	SURCHARGED
60 minute winter	7	46	40.131	1.931	5.8	2.4451	0.0000	SURCHARGED
15 minute winter	5	11	37.150	0.058	15.9	0.0768	0.0000	OK
15 minute winter	4	11	36.659	0.089	21.3	0.1278	0.0000	OK
30 minute winter	3	26	36.550	0.150	19.9	0.1776	0.0000	OK
30 minute winter	2	27	36.548	0.733	20.9	3.3147	0.0000	SURCHARGED
15 minute summer	1	1	35.695	0.000	10.8	0.0000	0.0000	OK
15 minute winter	16	11	37.992	0.042	7.3	0.0475	0.0000	OK
15 minute winter	17	10	39.432	0.032	4.2	0.0128	0.0000	OK
15 minute summer	18	1	40.471	0.000	0.0	0.0000	0.0000	OK
15 minute summer	6	1	40.166	0.000	0.0	0.0000	0.0000	OK
60 minute winter	19	46	40.132	0.109	1.0	0.0173	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	15	15	14	-2.1	0.385	-0.031	0.2841	
30 minute winter	14	14	2	-3.4	0.499	-0.065	0.6605	
30 minute winter	13	13	3	0.9	0.453	0.053	0.1205	
15 minute winter	12	12	5	4.4	0.918	0.068	0.0950	
15 minute winter	11	11	10	1.6	0.590	0.061	0.0308	
60 minute winter	10	10	9	1.9	0.587	0.109	0.1382	
60 minute winter	9	9	8	2.6	0.733	0.148	0.1819	
60 minute winter	8	8	7	2.9	0.697	0.159	0.2062	
60 minute winter	7	7	16	3.5	1.348	0.089	0.0148	
15 minute winter	5	5	4	15.8	1.190	0.083	0.2412	
15 minute winter	4	4	3	21.3	1.203	0.172	0.2413	
30 minute winter	3	3	2	20.3	1.252	0.163	1.1178	
30 minute winter	2	Hydro-Brake®	1	10.8				106.4
15 minute winter	16	16	5	7.3	1.445	0.074	0.1098	
15 minute winter	17	4.000	16	4.1	1.243	0.099	0.0890	
15 minute summer	18	1.000	10	0.0	0.000	0.000	0.0000	
15 minute summer	6	3.000	19	0.0	0.000	0.000	0.0000	
60 minute winter	19	3.001	7	-1.0	-0.091	-0.034	0.2022	

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Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	15	60	37.369	1.269	1.9	0.3591	0.0000	FLOOD RISK
60 minute winter	14	60	37.369	1.388	2.8	0.3928	0.0000	FLOOD RISK
60 minute winter	13	60	37.370	0.847	1.9	0.1347	0.0000	FLOOD RISK
15 minute winter	12	10	37.526	0.056	8.5	0.0827	0.0000	OK
60 minute winter	11	49	40.641	0.441	1.6	0.0944	0.0000	SURCHARGED
60 minute winter	10	49	40.641	0.635	2.4	0.1009	0.0000	SURCHARGED
60 minute winter	9	49	40.640	0.716	2.8	0.1138	0.0000	SURCHARGED
60 minute winter	8	49	40.638	0.817	3.0	0.1298	0.0000	SURCHARGED
60 minute winter	7	49	40.635	2.435	7.3	3.0829	0.0000	SURCHARGED
60 minute winter	5	60	37.371	0.279	16.5	0.3689	0.0000	OK
60 minute winter	4	60	37.371	0.801	21.9	1.1547	0.0000	FLOOD RISK
60 minute winter	3	60	37.370	0.970	23.4	1.1515	0.0000	FLOOD RISK
60 minute winter	2	60	37.369	1.554	21.9	7.0288	0.0000	FLOOD RISK
15 minute summer	1	1	35.695	0.000	10.8	0.0000	0.0000	OK
15 minute winter	16	10	38.002	0.052	11.2	0.0589	0.0000	OK
15 minute winter	17	10	39.444	0.044	7.8	0.0175	0.0000	OK
60 minute winter	18	49	40.641	0.170	1.1	0.0270	0.0000	SURCHARGED
60 minute winter	6	49	40.635	0.469	1.7	0.0746	0.0000	SURCHARGED
60 minute winter	19	49	40.635	0.612	2.4	0.0974	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	15	15	14	1.4	0.385	0.021	0.2841	
60 minute winter	14	14	2	3.3	0.499	0.063	0.6605	
60 minute winter	13	13	3	2.0	0.453	0.114	0.2162	
15 minute winter	12	12	5	8.3	1.101	0.130	0.1508	
60 minute winter	11	11	10	1.6	0.570	0.061	0.1581	
60 minute winter	10	10	9	2.2	0.603	0.123	0.1436	
60 minute winter	9	9	8	3.0	0.733	0.169	0.1819	
60 minute winter	8	8	7	3.2	0.697	0.176	0.2062	
60 minute winter	7	7	16	4.0	1.405	0.100	0.0172	
60 minute winter	5	5	4	16.5	1.272	0.086	1.2422	
60 minute winter	4	4	3	21.7	1.200	0.174	0.9592	
60 minute winter	3	3	2	21.3	1.194	0.171	1.4920	
60 minute winter	2	Hydro-Brake®	1	10.8				139.4
15 minute winter	16	16	5	11.1	1.631	0.112	0.1484	
15 minute winter	17	4.000	16	7.7	1.599	0.185	0.1288	
60 minute winter	18	1.000	10	-1.1	-0.089	-0.053	0.2077	
60 minute winter	6	3.000	19	-1.7	-0.141	-0.068	0.1318	
60 minute winter	19	3.001	7	-2.4	-0.136	-0.085	0.2279	

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