



MasterDrain
SW

Muir Associates (UK) Limited

www.muir-associates.co.uk

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Job No. 1132-22		
Sheet no. 1		
Date 21/11/22		
By MJ	Checked	Reviewed

Project
Knowsley East Hub

Title
Surface Water Drainage Design 1 in 100 + 40%

Using in-line restrictors
Return period = 100 yrs
Climate change factor = 40

PEAK hydrograph values printed
Storm duration = 15 mins
No offline storage

Mean rain intens. 131.00 mm/hr
Storm profile = Winter
Using FSR data

Peak rain intens. 327.50 mm/hr
Sample period = 7.5 secs.

Entry No.	SECT. No.	MANHOLE REF	PIPE CAPACITY l/s	RATE FLOW l/s	PIPE SIZE mm	CHAMBER DIAM/LxW mm	INVERT LEVEL m	WATER LEVEL m	GRND LEVEL m	SURCHARGE fract.	Depth	EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) :x FACTOR :	STATUS	
1	I	1.01	S-MH-01	42.1	20.7	225	1200	43.85	43.97	44.80	0.49	0.11	0.00	0.000	527	OK
2	I	1.02	S-MH-02	77.8	62.1	300	1200	43.58	43.80	44.80	0.80	0.22	0.00	0.000	1579	OK
3	I	1.03	S-MH-03	78.4	82.8	300	1200	43.43	43.76	44.80	1.06	0.33	4.37	0.000	2106	Surch.
4	I	1.04	S-MH-04	78.0	82.8	300	1500	43.30	43.62	44.60	1.06	0.32	4.76	0.000	2106	Surch.
5	B	2.01	S-MH-09	184.0	41.9	450	1500	43.08	43.21	44.35	0.23	0.13	0.00	0.000	1065	OK
6	B	2.02	S-MH-10	184.9	139.9	450	1500	42.99	43.32	44.35	0.76	0.32	0.00	0.000	3560	OK
7	B	2.03	S-MH-12	398.2	139.9	450	1500	42.87	43.04	44.35	0.35	0.17	0.00	0.000	3560	OK
8	I	1.05	S-MH-05	227.8	222.7	450	1500	42.79	43.22	44.42	0.98	0.42	0.00	0.000	5666	OK
9	B	3.01	S-MH-13	42.1	20.7	225	1200	43.90	44.01	44.80	0.49	0.11	0.00	0.000	527	OK
10	B	3.02	S-MH-14	95.8	62.2	300	1200	43.70	43.89	44.80	0.65	0.19	0.00	0.000	1582	OK
11	B	3.03	S-MH-15	298.4	82.9	300	1200	43.47	43.57	44.92	0.28	0.10	0.00	0.000	2109	OK
12	I	1.06	S-MH-06‡	14.6	4.8	150	1500	42.72	42.77	44.75	0.33	0.05	0.00	0.000	7775	OK
13	I	1.07	S-MH-07	14.6	0.0	150	1200	42.65	42.66	44.35	0.00	0.00	0.00	0.000	0	OK
14	I	1.08	S-MH-08	18.6	0.0	150	1200	42.40	42.40	44.46	0.00	0.00	0.00	0.000	0	OK



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Notes

Printout headings

- | | | |
|---|---|--|
| 1) Entry no - position in file | 2) Section no - pipe identifier | 3) Manhole ref - Manhole identifier |
| 4) Pipe cap - full bore capacity of that pipe | 5) Rate of flow - calculated flow rate (l/s) ± = flow restrictor. | 6) Pipe diam - outlet pipe diameter (mm) |
| 7) Chamber diam - chamber diam. at base of MH | 8) Invert level - invert level of manhole | 9) Water level - calculated peak water level. |
| 10) Grnd level - ground / cover level | 11) Surch. fract - calc.flow/pipe capacity | 12) Surch. depth - surcharge level above soffit |
| 13) Overflow - surcharged flow rate (l/s) | 14) Flooded vol - volume of water above cover | 15) Upstrm Vol - upstream pipe vol to previous manhole(s) |
| 16) Status - OK - outlet not surcharged | 17) Status - Surcharged - outlet surcharged | 18) Status - Warning - water level within 299mm of cover level |
| 19) Status - Flooded - cover over-topped | 20) § against diameter indicates throttle pipe used. | |

Title box

Hydrograph data

- | | | |
|---|--------------------------------------|--|
| 1) Ret. period - that used to calculate profile | 2) Duration - length of storm (mins) | 3) Profile - either Winter (75%) or Summer (50%) |
|---|--------------------------------------|--|

Flow restrictors

Manhole reference - S-MH-06

Restrictor flowrate - 4.83 l/s



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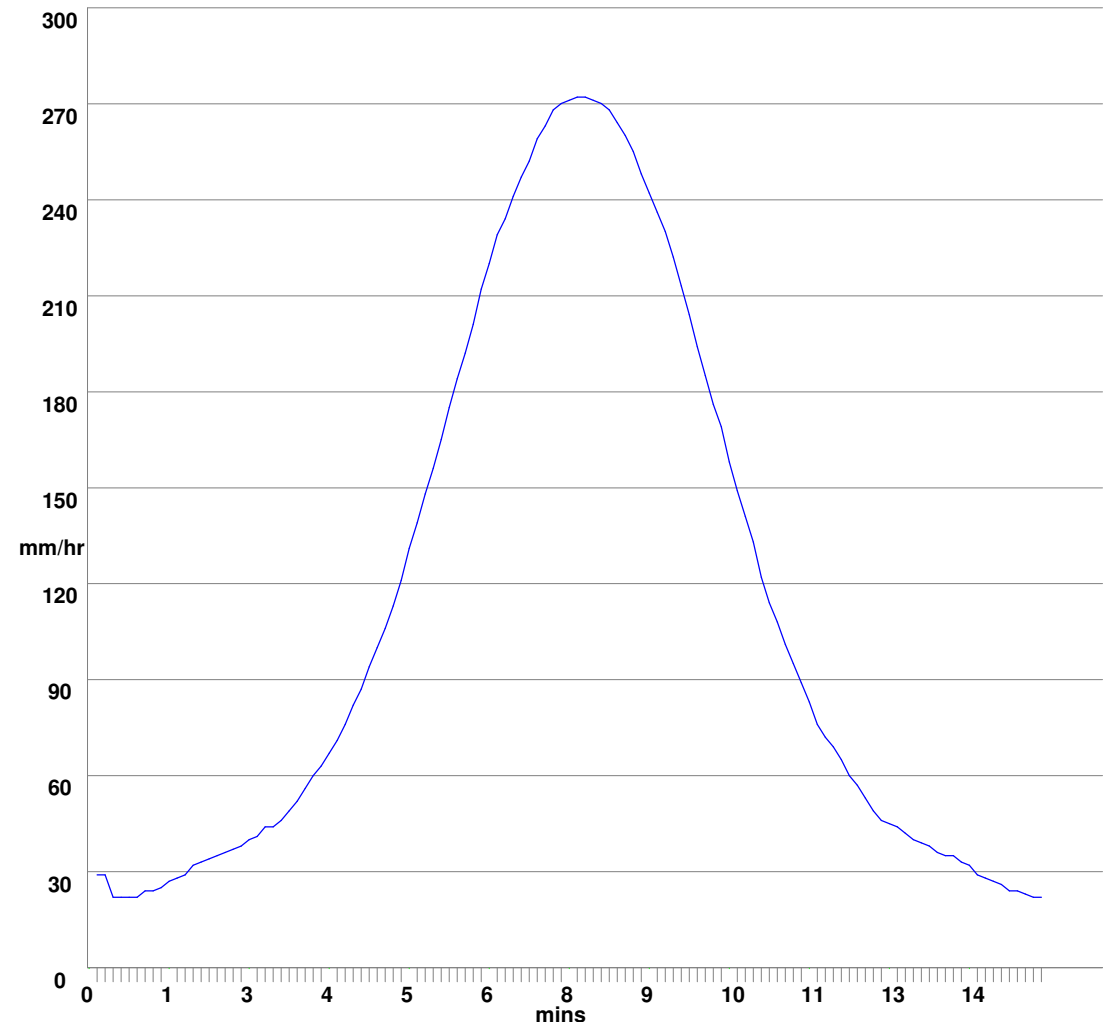
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Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:08	29.38	5:08	139.30	10:08	149.10
0:15	29.38	5:15	148.01	10:15	141.48
0:22	21.77	5:22	155.63	10:22	132.77
0:30	21.77	5:30	165.42	10:30	121.89
0:38	21.77	5:38	175.22	10:38	114.27
0:45	21.77	5:45	183.92	10:45	107.74
0:52	23.94	5:52	191.54	10:52	101.21
1:00	23.94	6:00	201.34	11:00	94.68
1:08	25.03	6:08	212.22	11:08	89.24
1:15	27.21	6:15	219.84	11:15	82.71
1:22	28.30	6:22	228.54	11:22	76.18
1:30	29.38	6:30	233.99	11:30	71.83
1:38	31.56	6:38	240.52	11:38	68.56
1:45	32.65	6:45	247.05	11:45	65.30
1:52	33.74	6:52	252.49	11:52	59.86
2:00	34.83	7:00	259.02	12:00	56.59
2:08	35.91	7:08	263.37	12:08	53.33
2:15	37.00	7:15	267.72	12:15	48.97
2:22	38.09	7:22	269.90	12:22	45.71
2:30	40.27	7:30	270.99	12:30	44.62
2:38	41.36	7:38	272.08	12:38	43.53
2:45	43.53	7:45	272.08	12:45	42.44
2:52	43.53	7:52	270.99	12:52	40.27
3:00	45.71	8:00	269.90	13:00	39.18
3:08	48.97	8:08	267.72	13:08	38.09
3:15	52.24	8:15	264.46	13:15	35.91
3:22	55.50	8:22	260.11	13:22	34.83
3:30	59.86	8:30	254.66	13:30	34.83
3:38	63.12	8:38	248.13	13:38	32.65
3:45	67.48	8:45	241.60	13:45	31.56
3:52	70.74	8:52	236.16	13:52	29.38
4:00	76.18	9:00	229.63	14:00	28.30
4:08	81.62	9:08	222.02	14:08	27.21
4:15	87.06	9:15	213.31	14:15	26.12
4:22	93.59	9:22	203.51	14:22	23.94
4:30	100.12	9:30	193.72	14:30	23.94
4:38	105.57	9:38	185.01	14:38	22.85
4:45	113.18	9:45	176.31	14:45	21.77
4:52	120.80	9:52	168.69	14:52	21.77
5:00	130.60	10:00	157.80	15:00	21.77

Hydrograph profile derived from data in the Flood Studies Report

Return period= 100 yrs Duration= 15 mins Profile - winter





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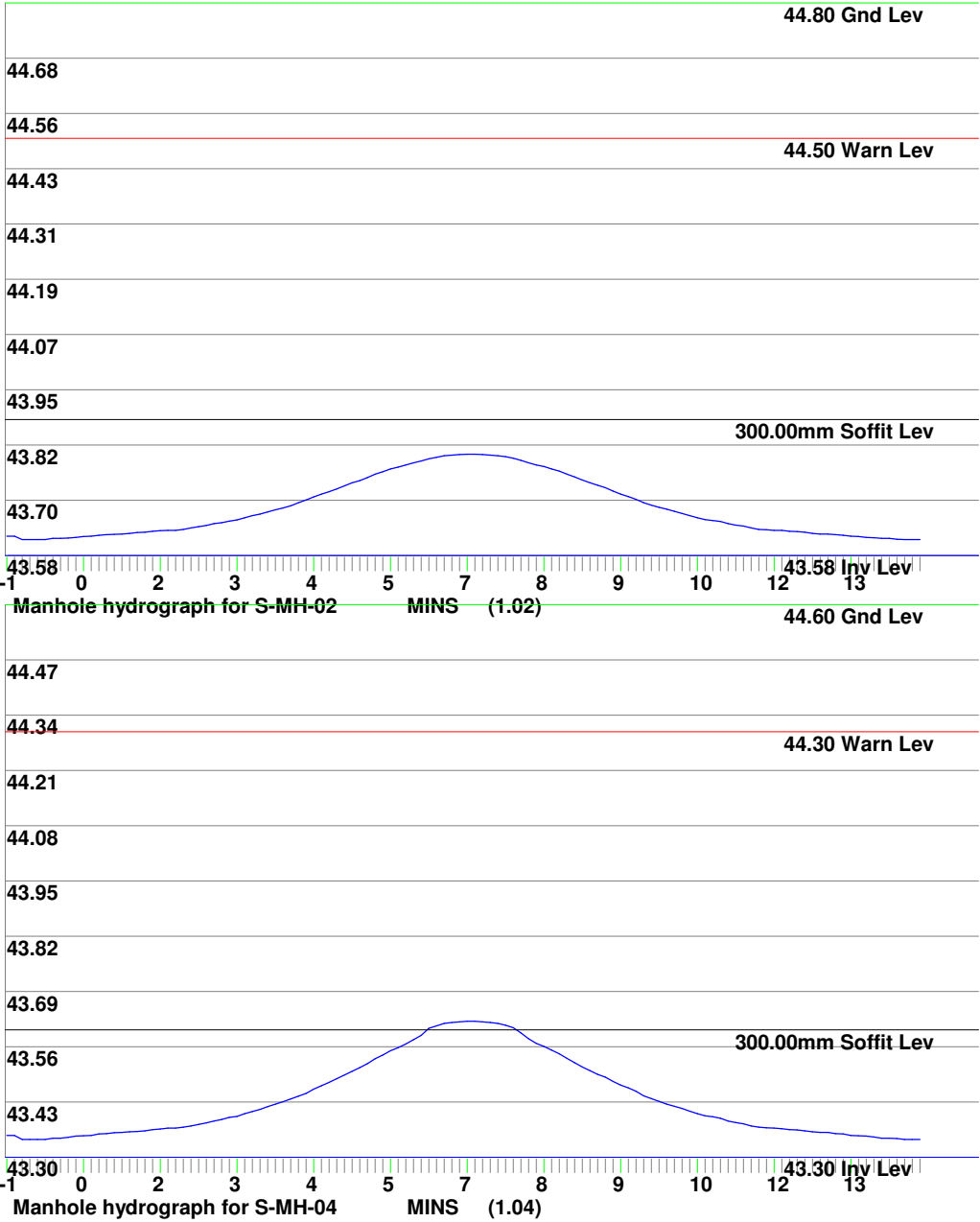
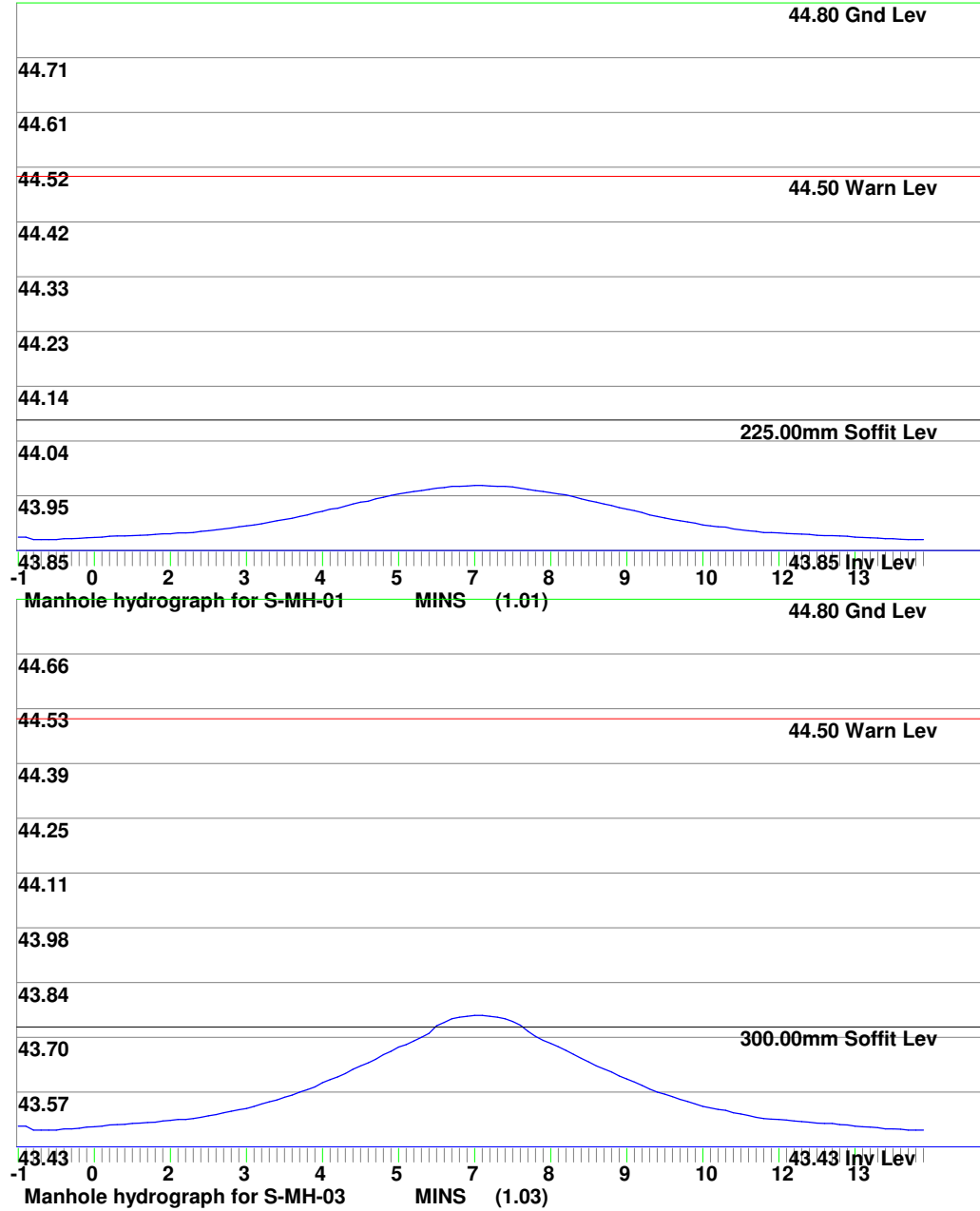
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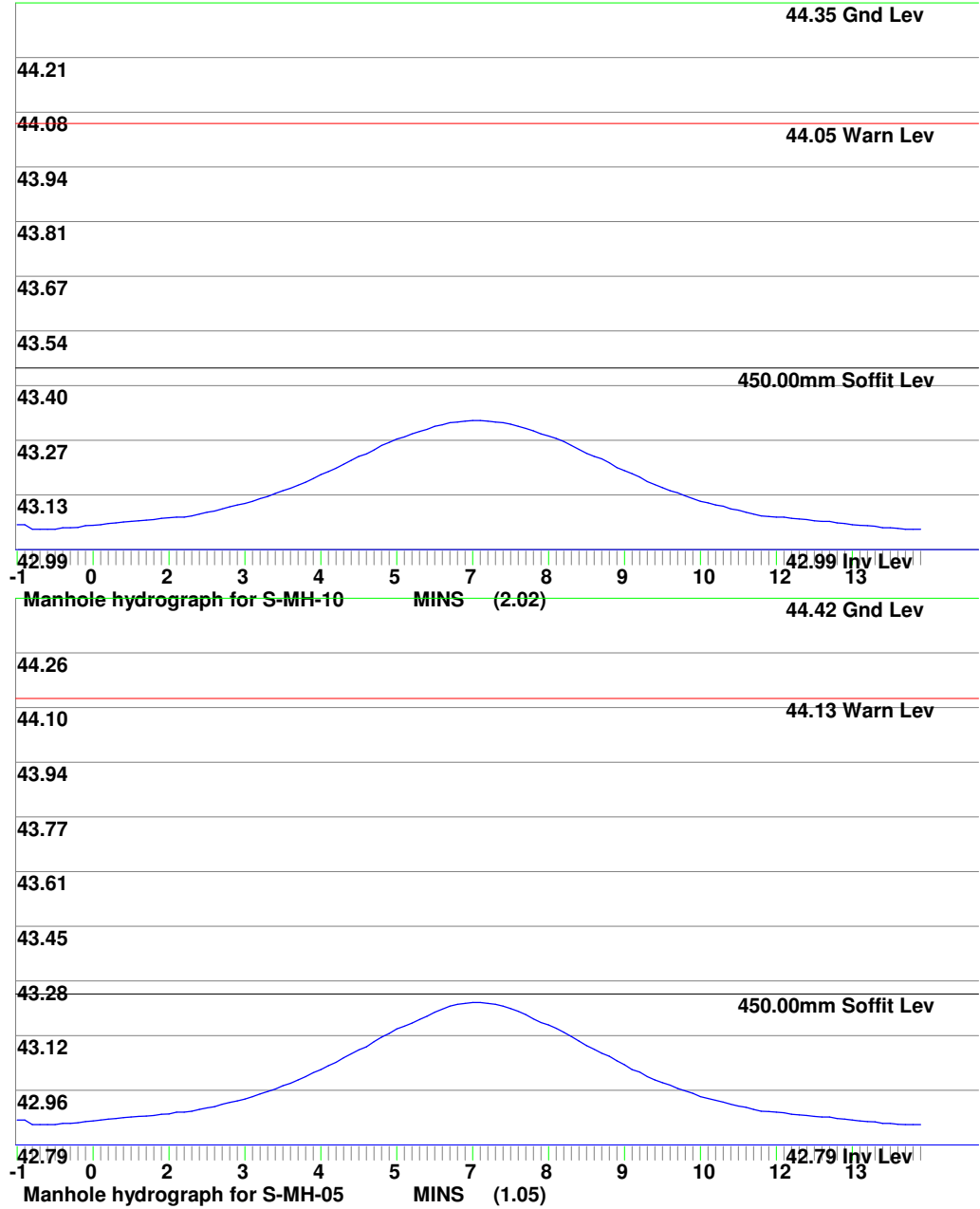
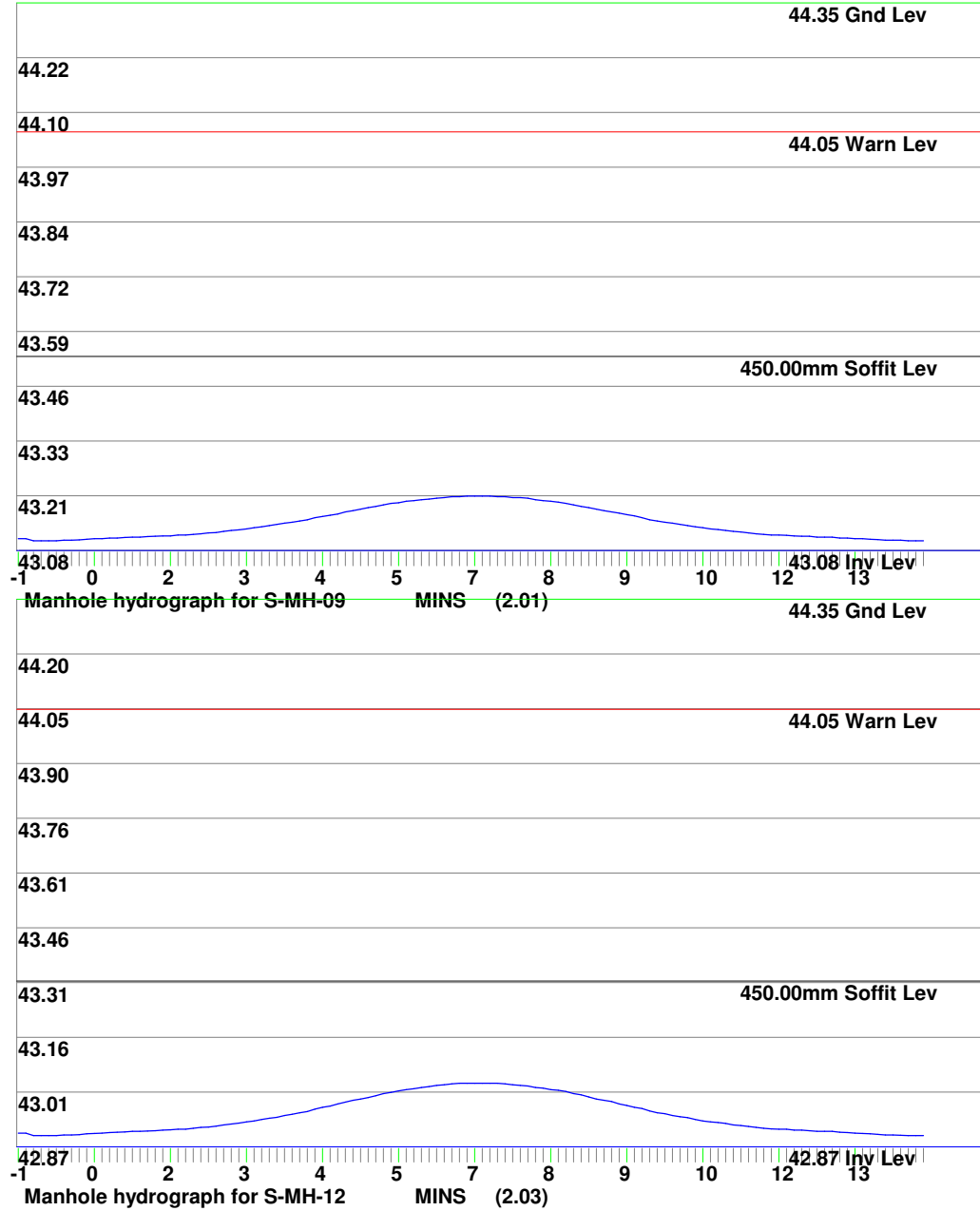
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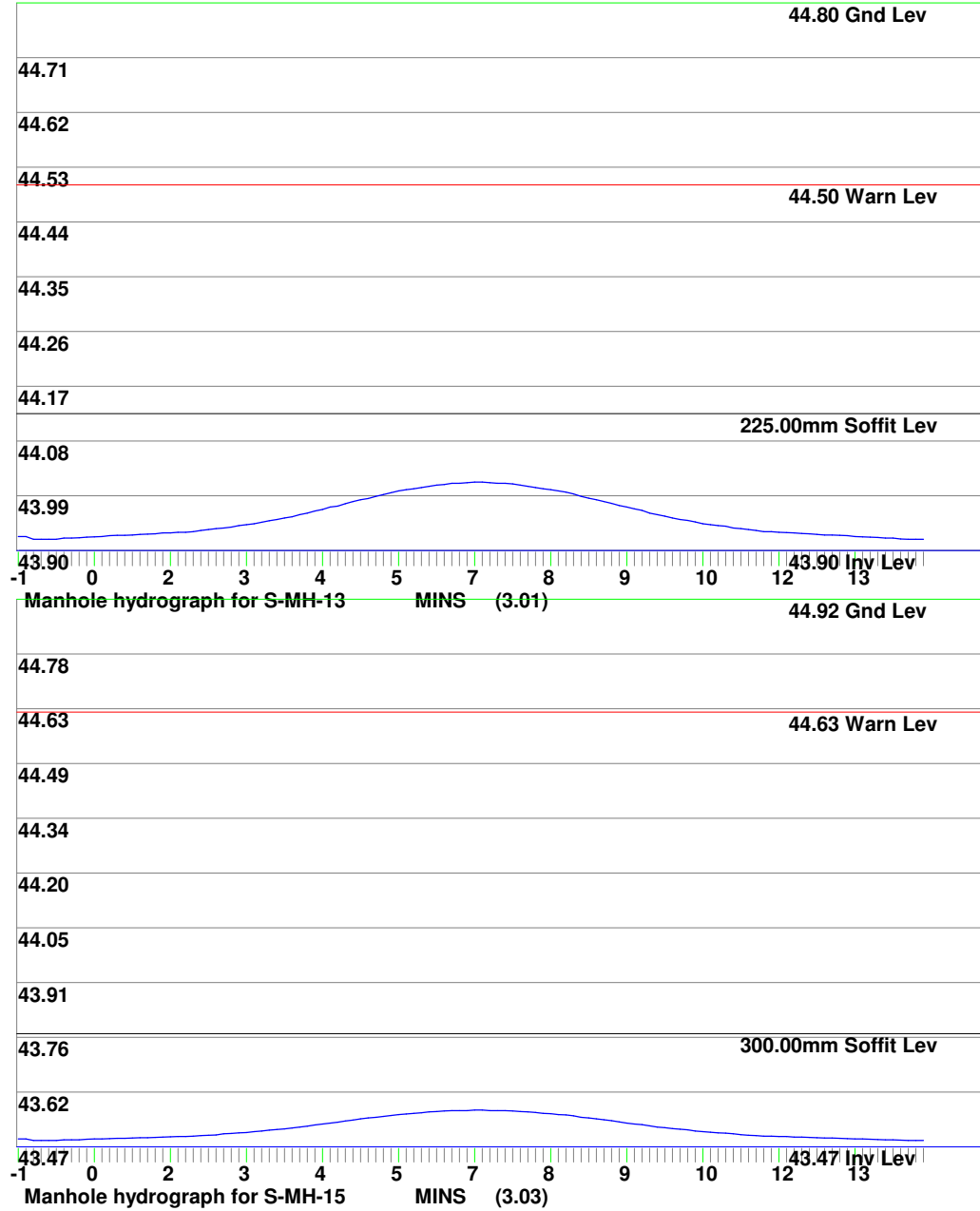
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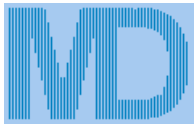
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Manhole hydrograph for S-MH-06

MINS (1.06)



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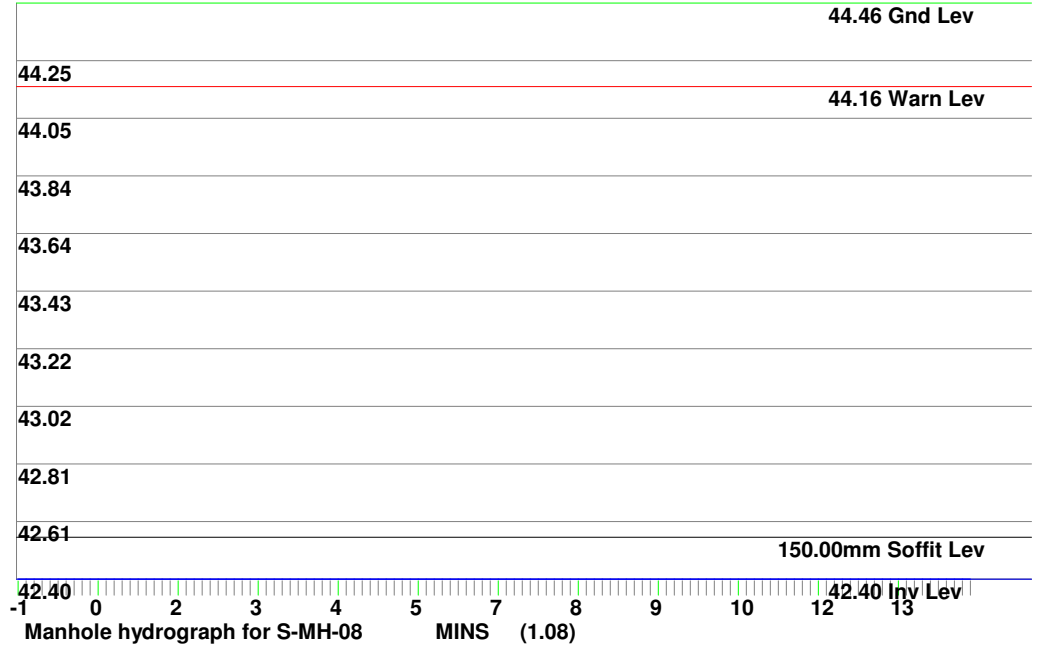
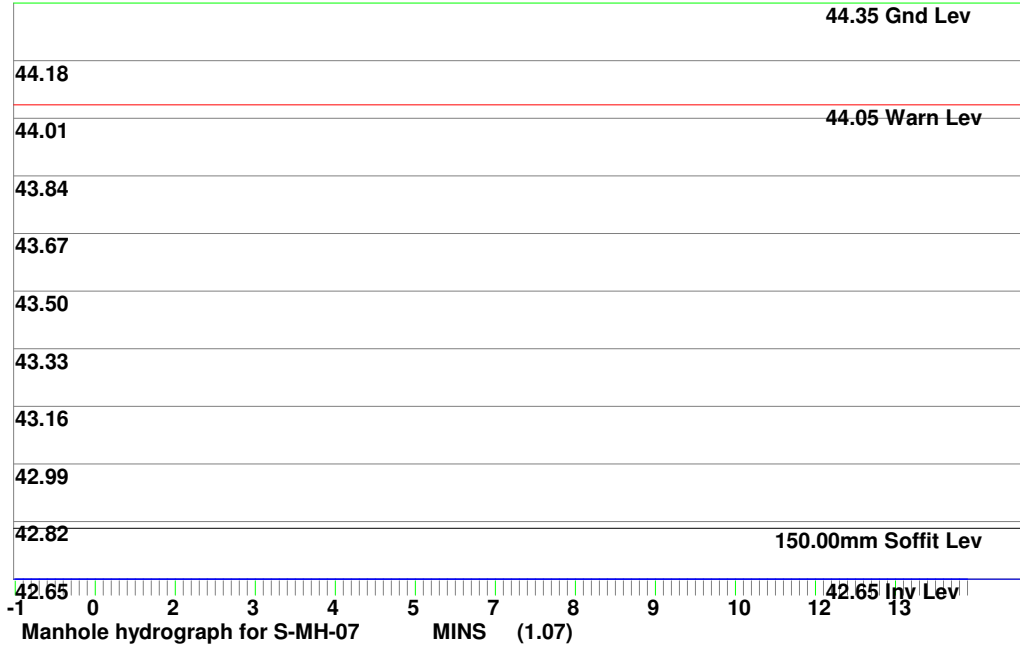
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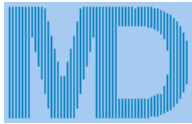
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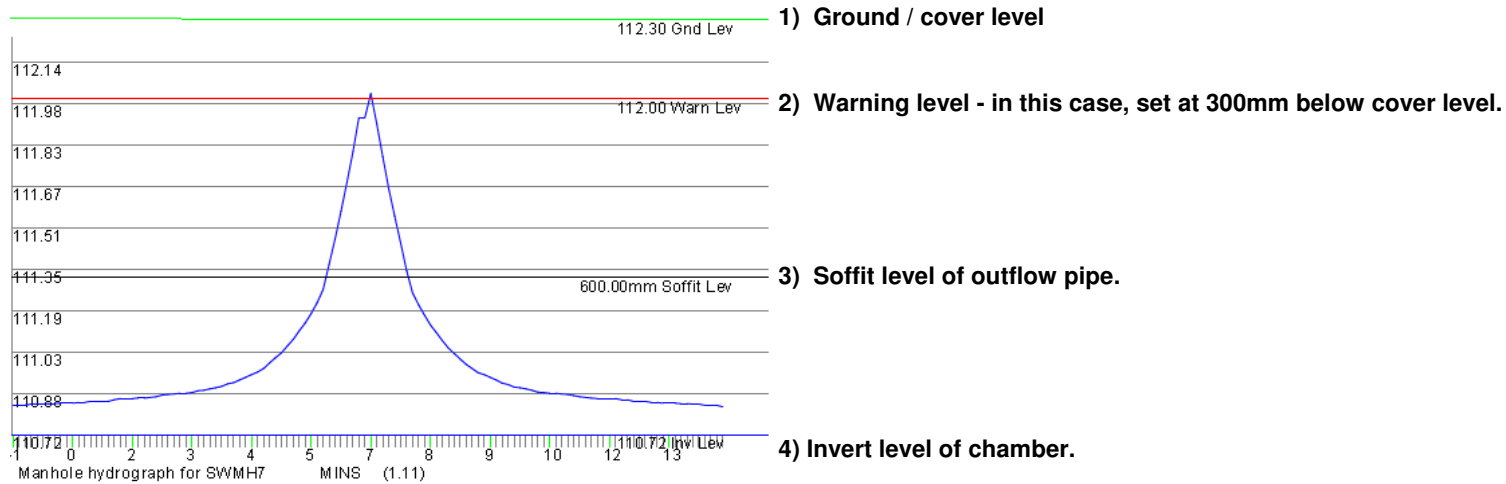
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Notes

- Lower section of the graph shows the water depth filling the channel. Channel is assumed to be a full pipe diameter in depth.
- Upper section of the graph shows the water depth filling the chamber. Chamber has a greater width/diameter than the channel, so increases in depth are proportionally less.
- The top of the graph clips the warning level and would be marked thus on the printout.
- In many cases the invert of the offline storage is required to enter at the channel soffit level, meaning that the pipe will still surcharge but flooding risk reduced.
- The diagram above is a general one and is not part of the current calculation.