



MasterDrain
SW

Muir Associates (UK) Limited

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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 30 + 0%

Using in-line restrictors
Return period = 30 yrs
Climate change factor = 0

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

Mean rain intens. 72.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 282.24 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		EXCESS FLOW l/s	FLOODED VOL m³	DRAINED AREA (m²) :x FACTOR	STATUS	
										fract.	Depth					
1	I	1.01	S-MH-01	42.1	17.9	225	1200	43.85	43.95	44.80	0.43	0.10	0.00	0.000	527	OK
2	I	1.02	S-MH-02	77.8	53.7	300	1200	43.58	43.78	44.80	0.69	0.20	0.00	0.000	1579	OK
3	I	1.03	S-MH-03	78.4	71.6	300	1200	43.43	43.69	44.80	0.91	0.26	0.00	0.000	2106	OK
4	I	1.04	S-MH-04	78.0	71.6	300	1500	43.30	43.56	44.60	0.92	0.26	0.00	0.000	2106	OK
5	B	2.01	S-MH-09	184.0	36.2	450	1500	43.08	43.19	44.35	0.20	0.11	0.00	0.000	1065	OK
6	B	2.02	S-MH-10	184.9	121.0	450	1500	42.99	43.28	44.35	0.65	0.28	0.00	0.000	3560	OK
7	B	2.03	S-MH-12	398.2	121.0	450	1500	42.87	43.02	44.35	0.30	0.16	0.00	0.000	3560	OK
8	I	1.05	S-MH-05	227.8	192.5	450	1500	42.79	43.15	44.42	0.85	0.36	0.00	0.000	5666	OK
9	B	3.01	S-MH-13	42.1	17.9	225	1200	43.90	44.00	44.80	0.43	0.10	0.00	0.000	527	OK
10	B	3.02	S-MH-14	95.8	53.7	300	1200	43.70	43.87	44.80	0.56	0.17	0.00	0.000	1582	OK
11	B	3.03	S-MH-15	298.4	71.7	300	1200	43.47	43.56	44.92	0.24	0.09	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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Job No.
1132-22

Sheet no.
3

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21/11/22

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Knowsley East Hub

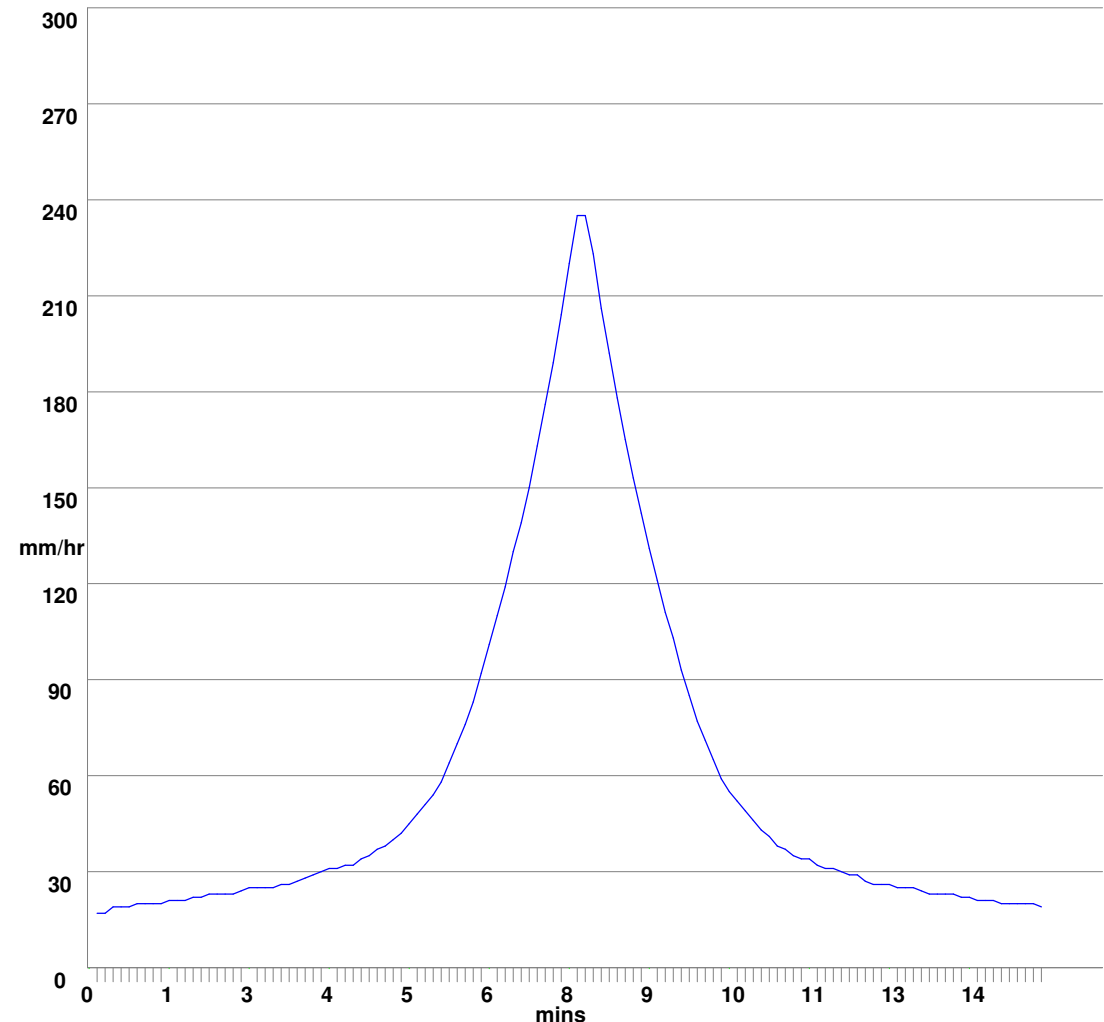
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Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:08	16.80	5:08	48.01	10:08	51.61
0:15	16.80	5:15	51.01	10:15	48.61
0:22	19.20	5:22	54.01	10:22	45.61
0:30	19.20	5:30	58.21	10:30	42.61
0:38	19.20	5:38	63.61	10:38	40.81
0:45	19.80	5:45	70.21	10:45	38.41
0:52	19.80	5:52	76.22	10:52	36.61
1:00	20.40	6:00	82.82	11:00	35.41
1:08	20.40	6:08	91.82	11:08	34.21
1:15	21.00	6:15	100.82	11:15	33.61
1:22	21.00	6:22	109.82	11:22	31.81
1:30	21.00	6:30	119.42	11:30	30.61
1:38	21.60	6:38	129.63	11:38	30.61
1:45	21.60	6:45	139.23	11:45	30.01
1:52	22.80	6:52	150.03	11:52	29.41
2:00	22.80	7:00	163.23	12:00	28.81
2:08	22.80	7:08	175.83	12:08	27.01
2:15	23.40	7:15	189.04	12:15	26.41
2:22	24.00	7:22	204.04	12:22	25.81
2:30	24.60	7:30	219.64	12:30	25.81
2:38	24.60	7:38	235.25	12:38	25.20
2:45	25.20	7:45	235.25	12:45	24.60
2:52	25.20	7:52	222.64	12:52	24.60
3:00	25.81	8:00	206.44	13:00	24.00
3:08	26.41	8:08	192.04	13:08	23.40
3:15	27.01	8:15	178.24	13:15	23.40
3:22	28.21	8:22	165.03	13:22	22.80
3:30	29.41	8:30	153.03	13:30	22.80
3:38	30.01	8:38	141.63	13:38	21.60
3:45	30.61	8:45	131.43	13:45	21.60
3:52	30.61	8:52	121.22	13:52	21.00
4:00	31.81	9:00	111.02	14:00	21.00
4:08	32.41	9:08	102.62	14:08	21.00
4:15	34.21	9:15	93.02	14:15	20.40
4:22	35.41	9:22	85.22	14:22	20.40
4:30	36.61	9:30	77.42	14:30	19.80
4:38	37.81	9:38	70.81	14:38	19.80
4:45	40.21	9:45	64.81	14:45	19.80
4:52	42.01	9:52	58.81	14:52	19.20
5:00	45.01	10:00	54.61	15:00	19.20

Hydrograph profile derived from data in the Flood Studies Report

Return period= 30 yrs Duration= 15 mins Profile - summer





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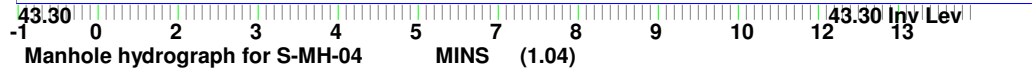
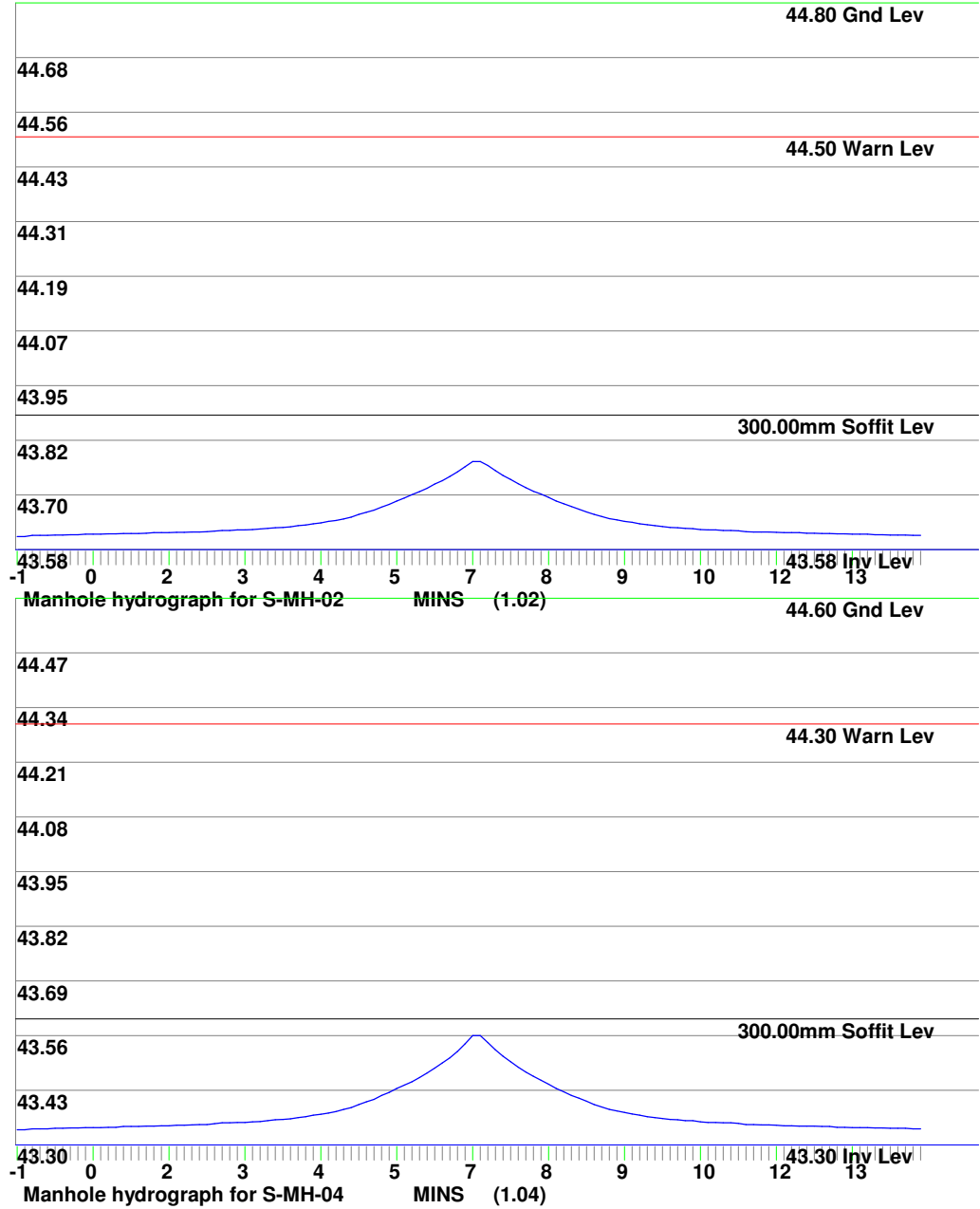
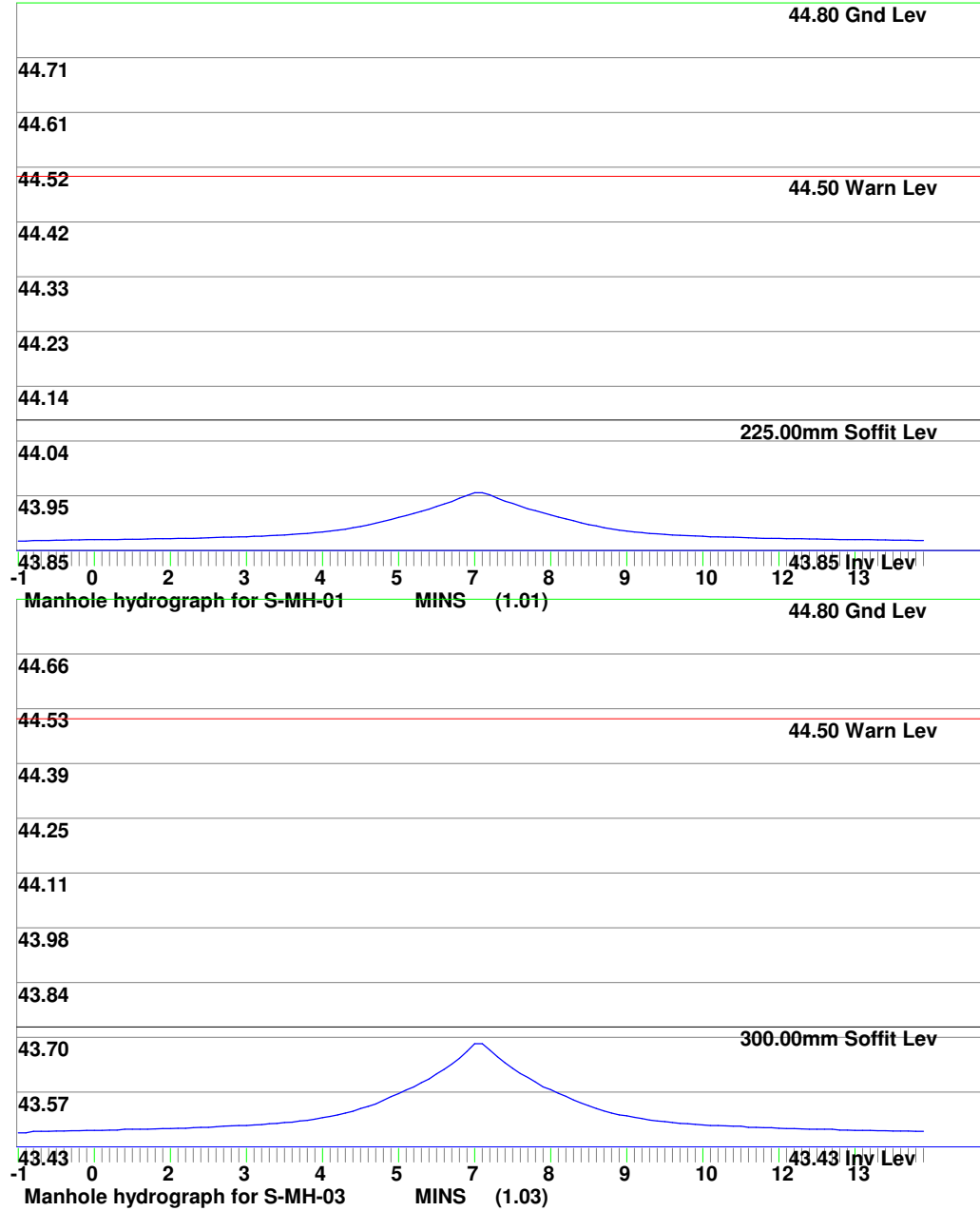
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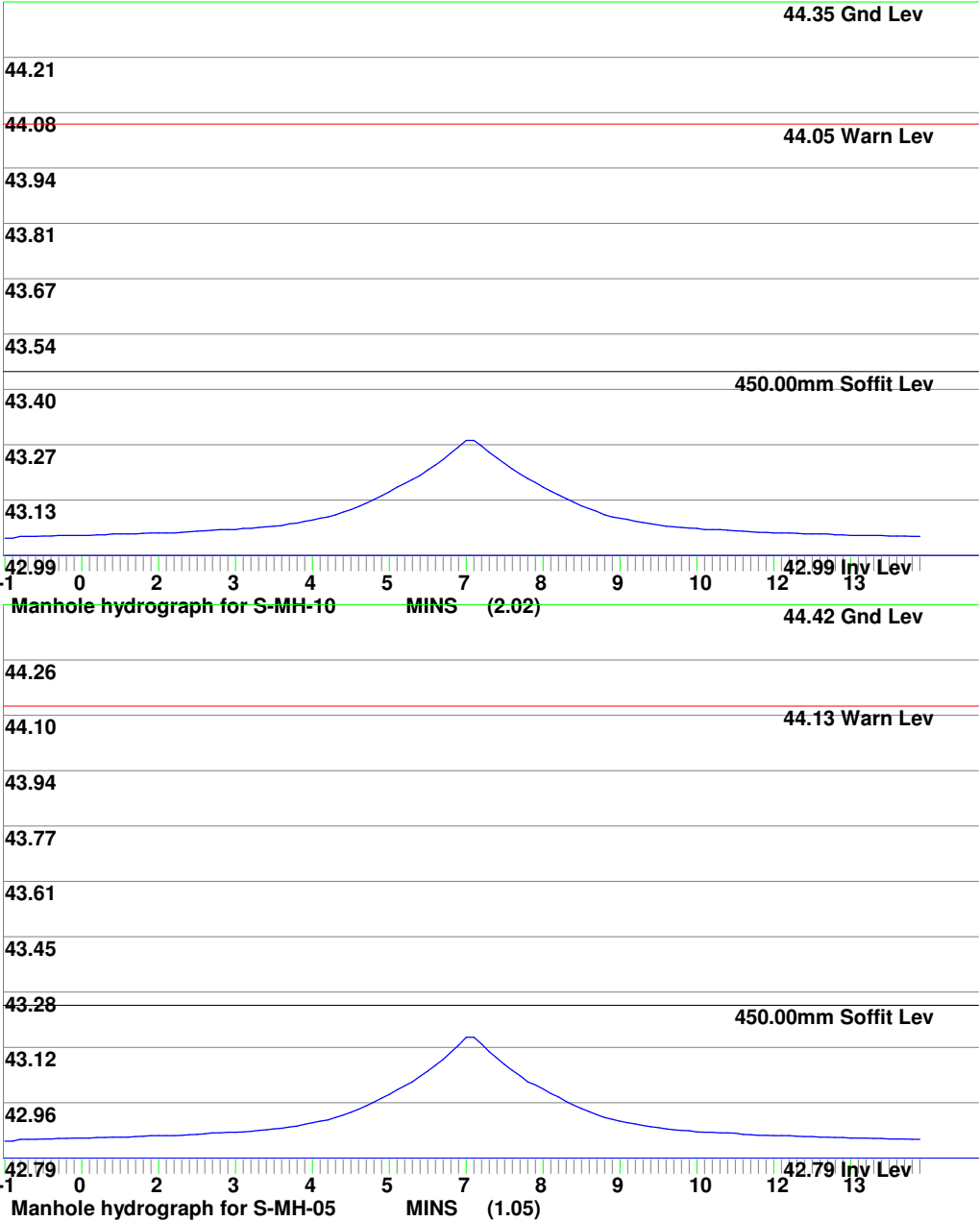
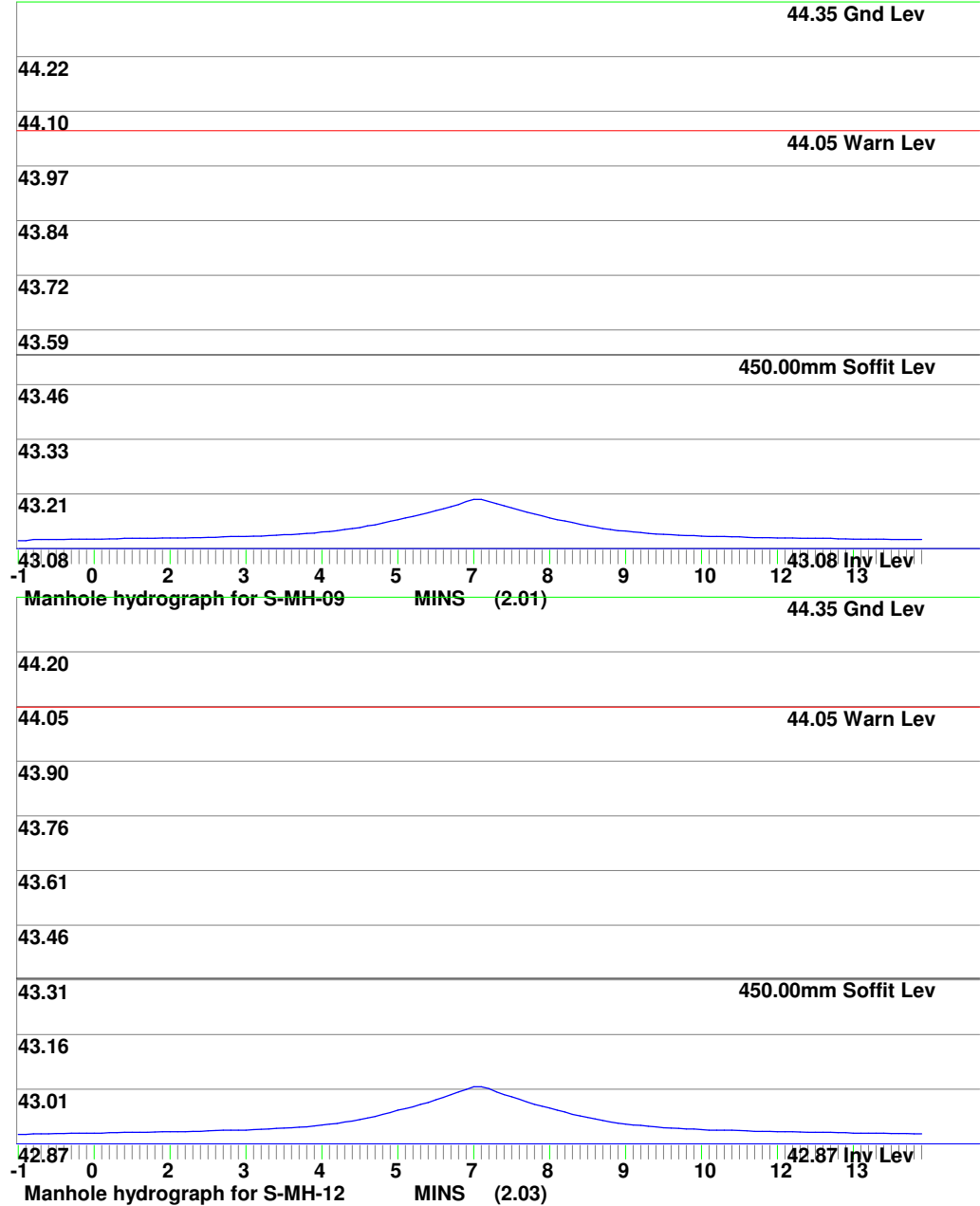
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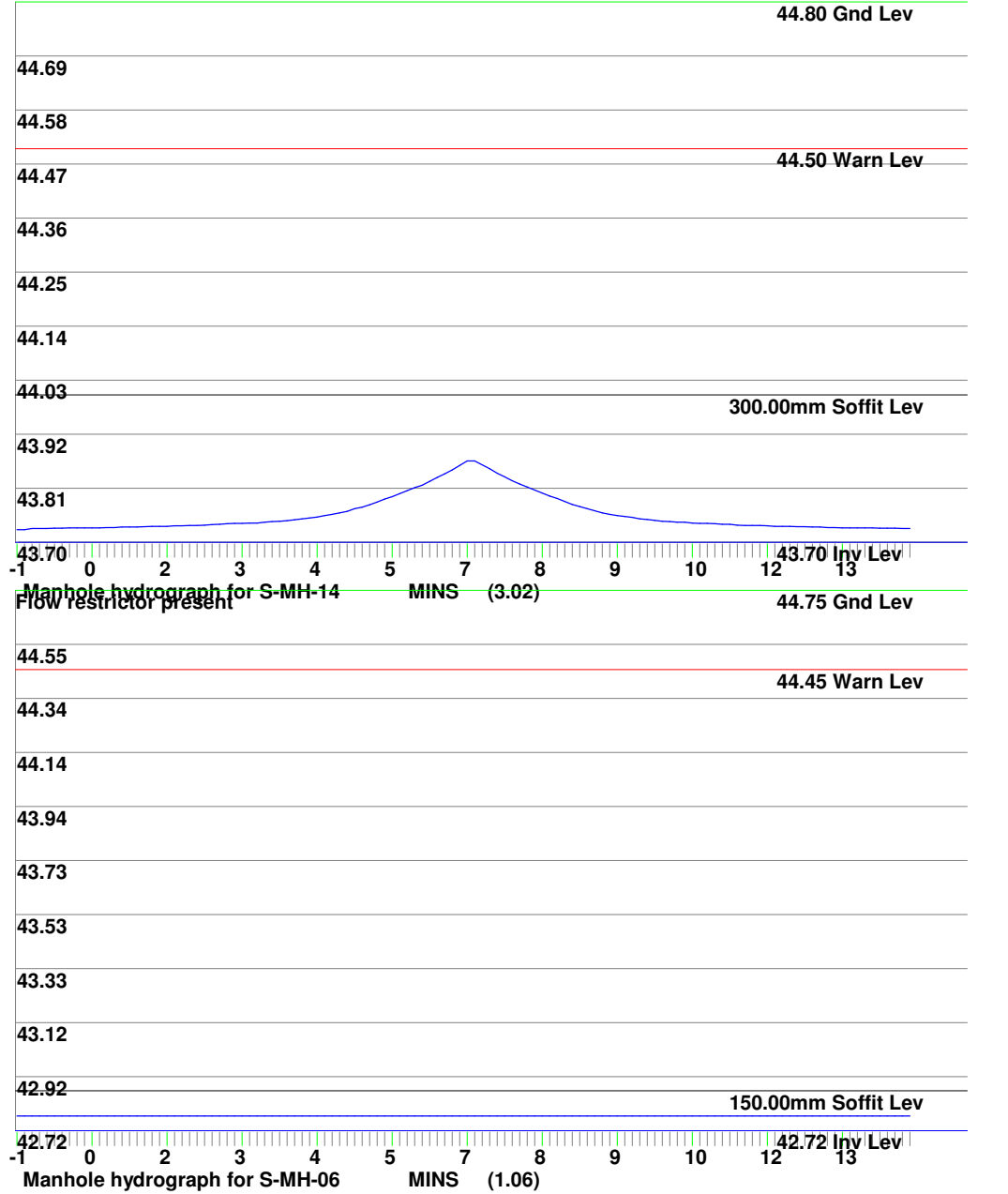
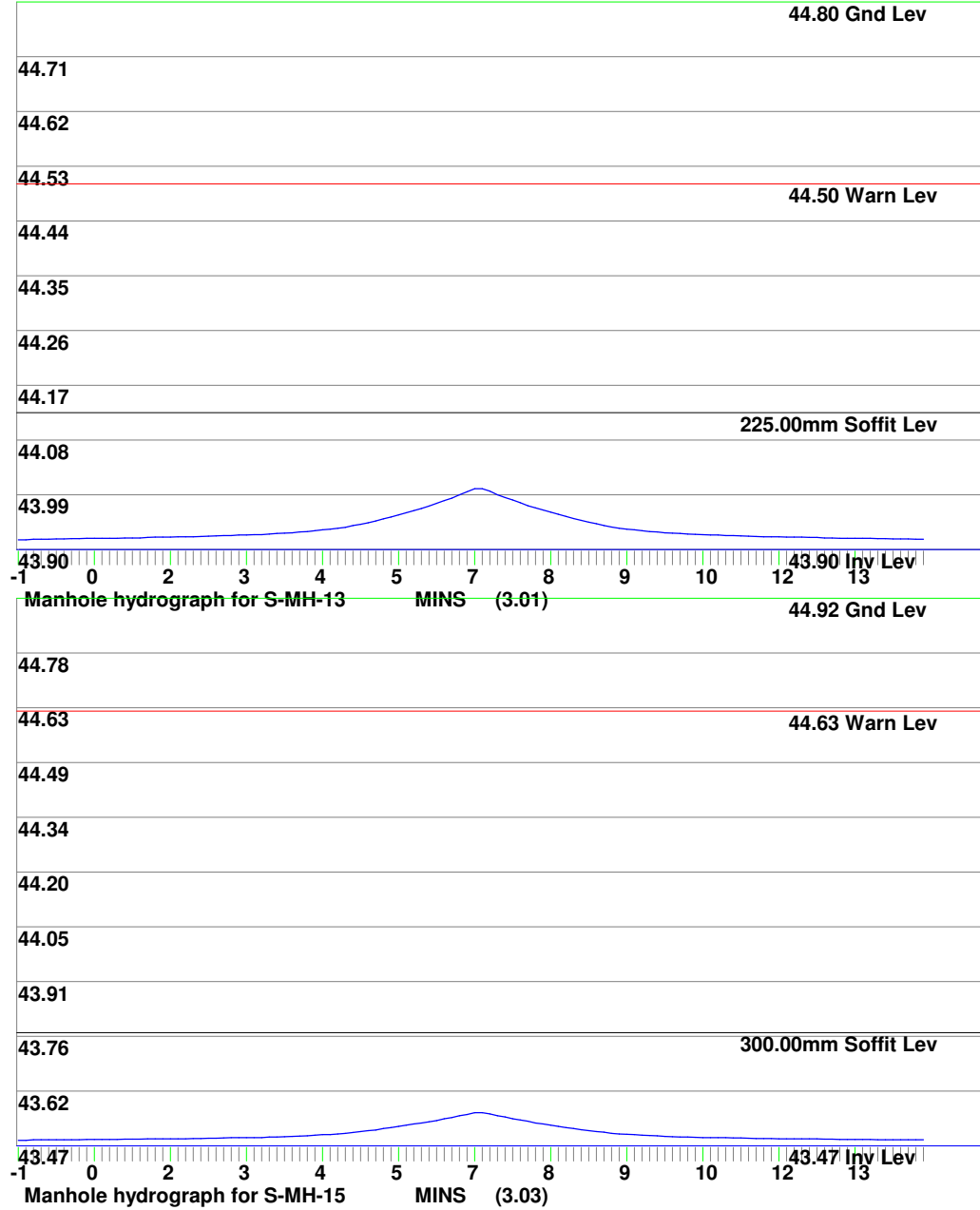
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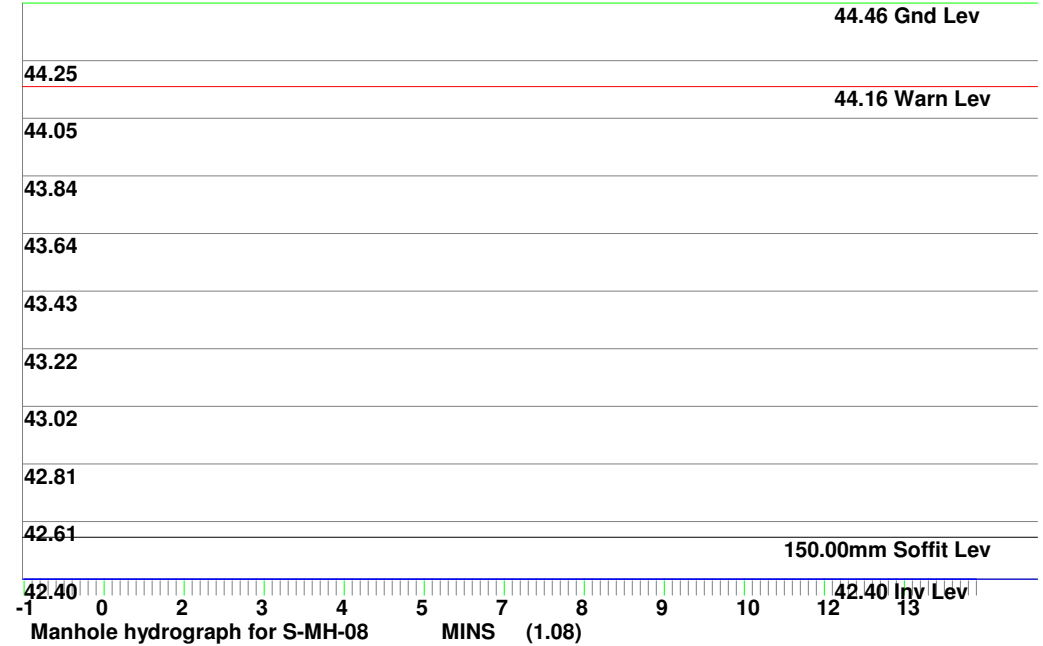
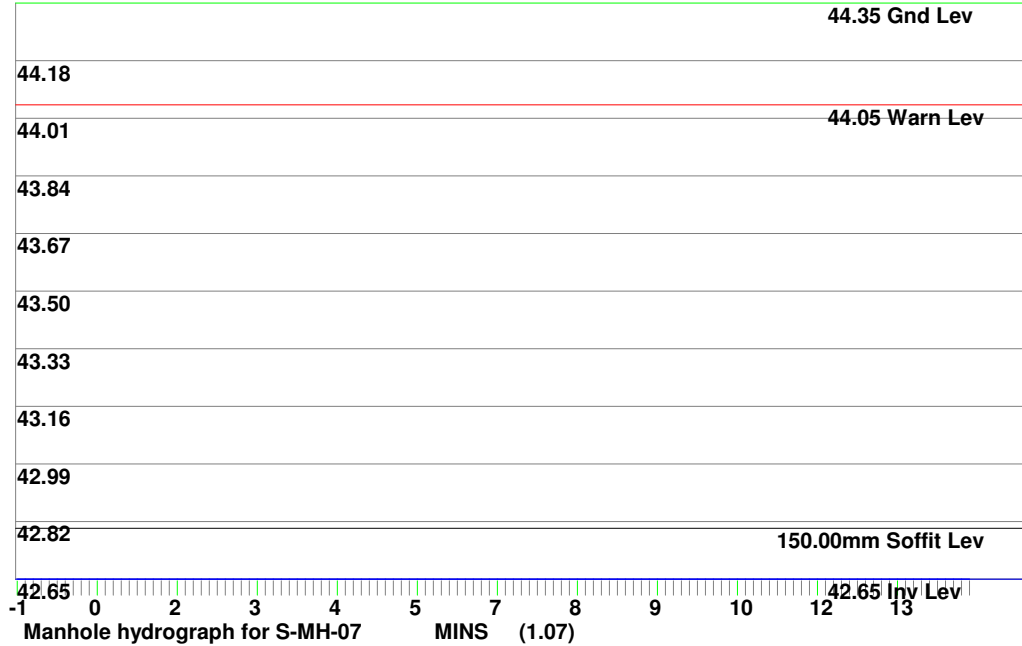
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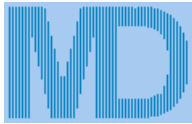
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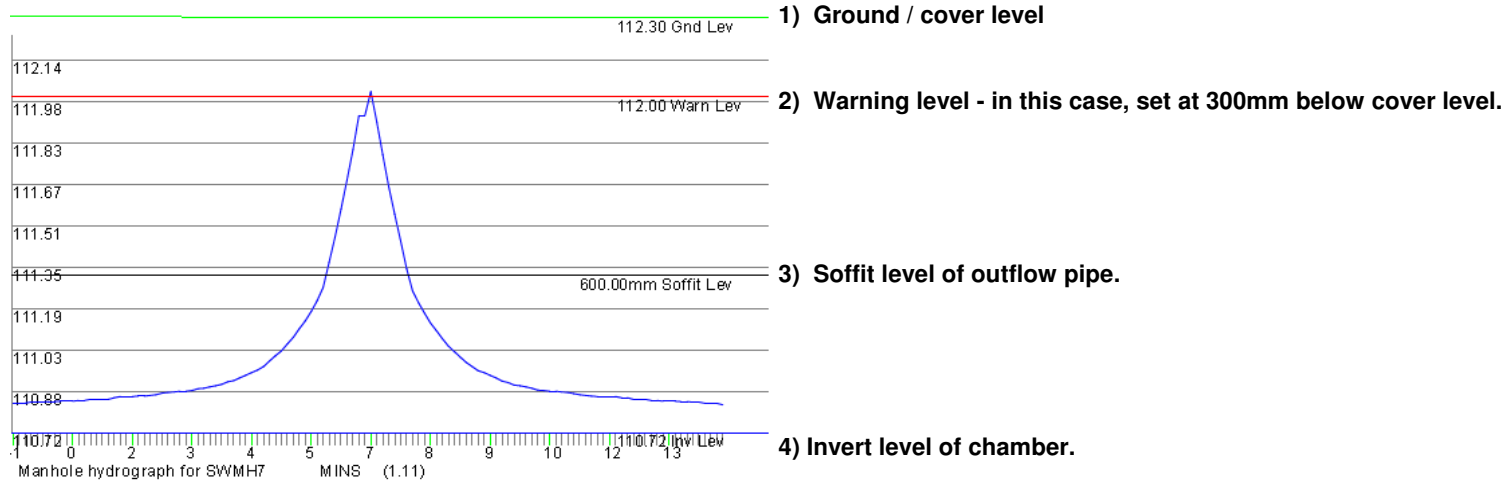
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- Notes**
- a) Lower section of the graph shows the water depth filling the channel. Channel is assumed to be a full pipe diameter in depth.
 - b) Upper section of the graph shows the water depth filling the chamber. Chamber has a greater width/diameter than the channel, so increases in depth are proportionally less.
 - c) The top of the graph clips the warning level and would be marked thus on the printout.
 - d) 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.
 - e) The diagram above is a general one and is not part of the current calculation.