

ANDREW BARROTT

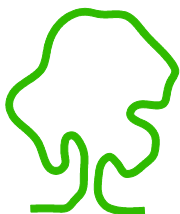


**OREHAM MANOR FARM, OREHAM COMMON, HENFIELD,
WEST SUSSEX, BN5 9SB**

Drainage Design

Planning application No. DC/22/2092

September 2023



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Environmental Assessment Services Ltd

REPORT DATA SHEET

Requirement	Data
Report Reference	574/PRowePlanning/OrehamManorFarm/DS
Date	September 2023
Client	Mr Andrew Barrott
Report type	Drainage Design
Purpose	Planning
Revisions	
Prepared by	Lucy Collins BSc (Hons) MSc, QCIEEM  Signed
Approved by	Eur Ing Malcolm McKemey BSc (Hons), CEng, CEnv, MICE, MCIWEM, MIEEnvSc  Signed

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Drainage Design

September 2023

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Drainage Design

September 2023

1. BACKGROUND, EXISTING SITE & PROPOSED DEVELOPMENT

- 1.1 The site sits within the Oreham Manor Farm complex. The surrounding area is predominately agricultural land, with large residential properties. The site area is approximately 400 sqm. The Ordnance Survey (OS) map reference for the site is TQ 22414 13450. The site elevation is approximately + 20 m OD. See Figure 1 in Appendix A.
- 1.2 It is proposed to remove the existing dwelling known as “The Stables” and other buildings on site and erect a replacement single storey dwelling, with associated parking and soft landscaping areas (Planning application No. DC/22/2092). See Figure 2.

2. DRAINAGE STRATEGY

- 2.1 The Drainage Strategy was subject to investigation and established in the Drainage Strategy Report of February 2023 and is summarised below. Greenfield runoff rate for the site was calculated using the UK SuDS tools.
- 2.2 The official recommendation is that the maximum discharge permitted to leave the site from the drained area post development should not exceed Q_{bar} (0.20 l/s). The foul sewage should also be allowed for in the permitted off-site discharge flow rate. The foul sewage from the proposed development would be 0.046 l/s (based on the Sewers for Adoption recommendations for a single residence).
- 2.3 Drainage to soakaway (infiltration) is the preferred Sustainable Drainage System (SuDS) solution in the SuDS hierarchy. Percolation testing confirmed that the underlying Weald Clay is not a suitable medium for soakaway drainage. However, where there is a significant depth of made ground, infiltration may be practicable.
- 2.4 The alternative to drainage to soakaway would normally be attenuation storage where surface water flows exceeding Q_{bar} are stored and only released at a rate limited to the equivalent Greenfield flow for the site. However, in this case, Q_{bar} is too low for a practicable flow control device (vortex valve or orifice plate).

- 2.5 It is proposed to discharge the surface water from the new residence to the nearby ditch at the western edge of the site via a rain garden to provide some attenuation for peak flows.
- 2.6 There is an existing Klargester sewage treatment plant within the site with adequate spare capacity to accommodate the new residence. It is proposed to discharge foul sewage from the new residence to the existing Klargester sewage treatment plant. Treated effluent from the plant presently discharges to the nearby ditch, however, it is proposed to re-route the effluent to a drainage field to the south of the site as part of the redevelopment.

3. SURFACE WATER DRAINAGE DESIGN

- 3.1 The site presently drains to a ditch immediately to the west of the site. This ditch drains south into the Woodsmill Stream, a tributary of the River Adur.
- 3.2 The proposed redevelopment will decrease the impermeable area of the site as the areas of concrete paving where the pigsties were previously located has been broken up and removed to be replaced by soft landscaping. This will result in a reduction in peak flow following a rainfall event. This will increase the sustainability of the surface water drainage and provide betterment without resort to other measures.
- 3.3 A drainage design has been prepared using the MasterDrain drainage models and the proposed surface water drainage layout is shown in Figure 3.
- 3.4 The drainage arrangement includes a rain garden on the surface water drain upstream of the outfall to the ditch (see Figure 3 and Figure 4). This will provide a damper on peak flows to the outfall. Rainwater harvesting for garden irrigation, comprising water butts on building downpipes will be included as part of this scheme.
- 3.5 The surface water drainage is designed for the 1 in 30 year return period storm plus a 40% climate change allowance and tested for surcharge against the 1 in 100 year return period event plus a 45% climate change allowance. See Appendix B.
- 3.6 Hydrological data for the site as used in the MasterDrain model is given in Appendix B.
- 3.7 The MasterDrain (Surface Water) model output in Appendix B provides the chamber sizes, invert and cover levels plus pipe sizes as summarised below in Table 3.1 below. Please note that levels are based on a local datum established on site.

TABLE 3.1

No.	Type	Dia (mm)	Cover or ground level	Invert level	Pipe dia in (mm)	Pipe dia out (mm)
SW1	Gully	450	12.00	11.60	-	150
SW2	Gully/chamber	450	12.00	11.33	150	150
SW3	Chamber	450	12.00	11.18	150	150
SW4	Gully	450	12.00	11.70	150	150
SW5	Gully/chamber	600	12.00	11.58	150	150
SW6	Chamber	900	12.00	11.07	150/150	225
Outfall	-	-	11.50	10.90	225	225

4. FOUL SEWERAGE DESIGN

- 4.1 The existing Klargester sewage treatment plant presently serves one five-bed residence. The plant is rated for a population of 15 and has adequate capacity to include sewage from the proposed new residence.
- 4.2 It is proposed to drain the effluent from the treatment plant to a drainage field to be located to the south of the site, instead of discharging the effluent to the nearby ditch, as is the present arrangement. The drainage field has been sized for a population of 15.
- 4.3 Percolation testing at the site showed workable infiltration rates in the made ground but generally low permeability in the Weald Clay. The permeability was more practicable in the largely filled southwest corner of the site, where it is proposed to locate the drainage field. A conservative V_p of 50 s/mm has been assumed for the drainage field design. See Appendix B.
- 4.4 The proposed foul drainage layout is shown in Figure 3. The MasterDrain (Foul) model output in Appendix B provides the chamber sizes, invert and cover levels plus pipe sizes as summarised below in Table 4.1.

TABLE 4.1

No.	Type	Dia (mm)	Cover or ground level	Invert level	Pipe dia in (mm)	Pipe dia out (mm)
F1	Chamber	450	12.00	11.70	-	100
F2	Chamber	450	12.00	11.70	-	100
F3	Chamber	450	12.00	11.54	100/100	100
F4	Chamber	450	11.60	11.26	100	100
F5	Chamber	600	11.50	11.06	100	100
STW	Klargester	1800	11.45	10.75	100	100
F6	Chamber	600	11.40	10.15	100	150

Note: STW = sewage treatment works (the Klargester). F6 is the inlet and sampling chamber for the drainage field.

5. SUMMARY

- 5.1 It is proposed to remove the existing dwelling known as “The Stables” and other buildings on site and erect a replacement single storey dwelling, with associated parking and soft landscaping areas (Planning application No. DC/22/2092). See Figure 2. The proposed redevelopment will require surface water and foul sewerage.
- 5.2 The proposed redevelopment will decrease the impermeable area of the site as the areas of concrete paving where the pigsties were previously located will be broken up and removed to be replaced by soft landscaping. This will result in a reduction in peak flow following a rainfall event. This will increase the sustainability of the surface water drainage and provide betterment without resort to other measures.
- 5.3 It is proposed to discharge the surface water from the new residence to the aforementioned nearby ditch via a rain garden to provide some attenuation for peak flows. A surface water drainage design has been produced using the MasterDrain surface water model. See Figure 3
- 5.4 There is an existing Klargester sewage treatment plant within the site with adequate spare capacity to accommodate the new residence. It is proposed to discharge foul sewage from the new residence to the existing Klargester sewage treatment plant. Treated effluent from the plant presently discharges to the nearby ditch, however, it is proposed to re-route the effluent to a drainage field in the southwest corner of the site as part of the redevelopment. A foul sewerage design has been produced using the MasterDrain (Foul) model. See Figure 3.
- 5.5 Additional SuDS features in the design include a rain garden on the surface water drain upstream of the discharge into the ditch and rainwater harvesting of roof water for garden irrigation.

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APPENDIX A

- Figure 1: Site Location
- Figure 2: Drainage Plan / Layout
- Figure 3: Rain Garden



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Scale as shown



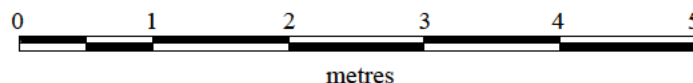
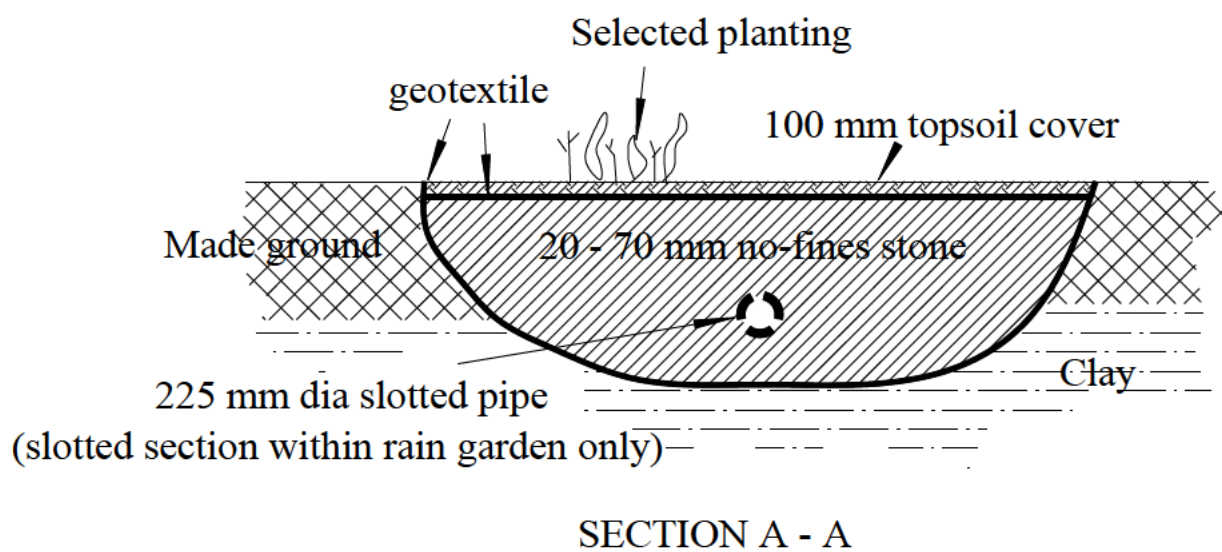
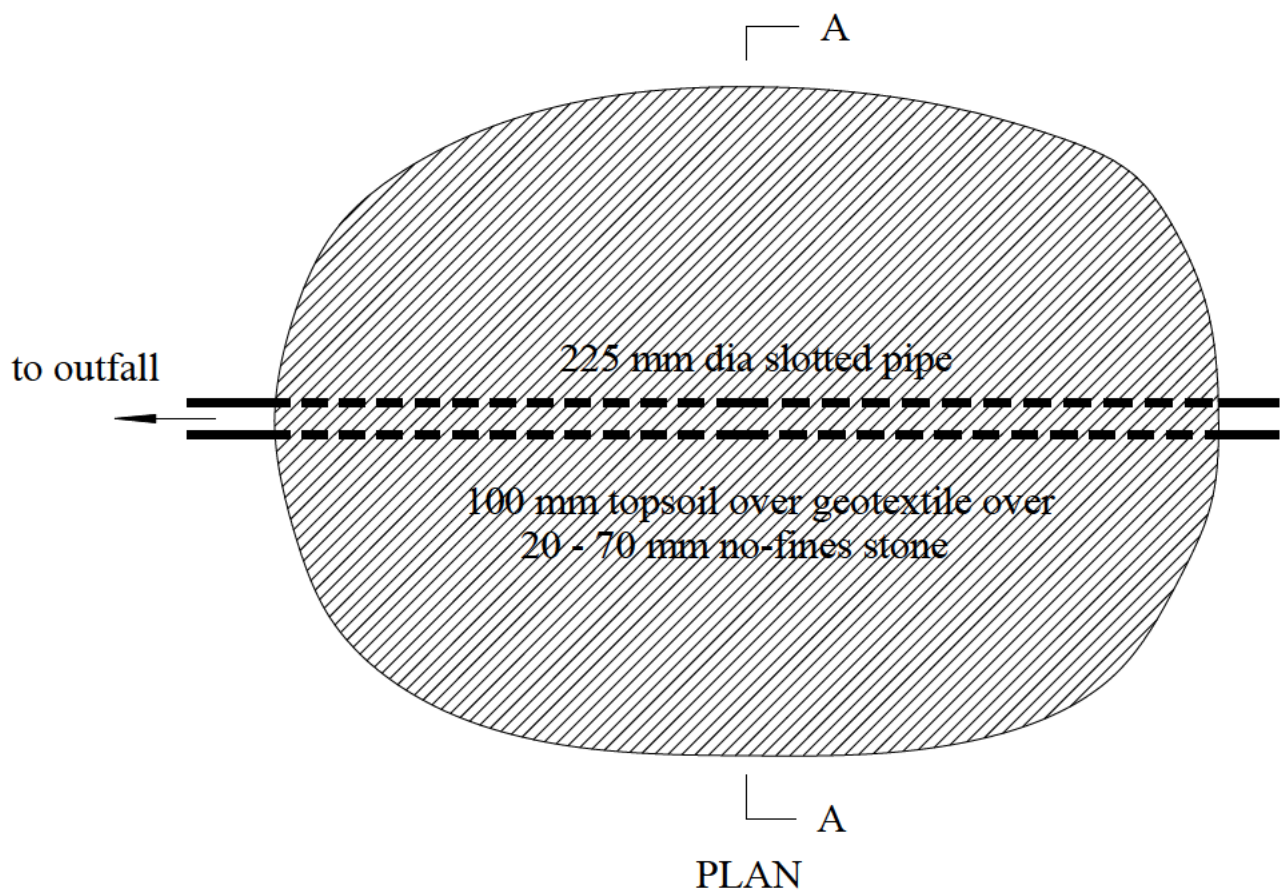
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Figure 1: Site Location

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Drainage Plan / Layout – Figure 2





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Figure 3: Rain Garden Detail

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APPENDIX B

OUTPUT FROM THE DRAINAGE DESIGN MODEL



MasterDrain
HY 11.0

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Job No. 574		
Sheet no. 1		
Date 11/09/23		
By MDM	Checked	Reviewed

Project **Oreham Manor Farm**

Title **Hydrological data for Woodmancote west**

Data:-

FSR values

Location	= Woodmancote west	Grid reference	= TQ2213
M5-60 (mm)	= 20.2	SAAR (mm/yr)	= 860
r	= 0.35	Soil	= 0.45
Long reference	= 522113	Area	= England and Wales
Hydrological area	= 7	Hydrological zone	= 1

Soil classification for WRAP type 4

Clayey, or loamy over clayey soils with an impermeable layer at shallow depth.

FEH values

No FEH data available in this file.



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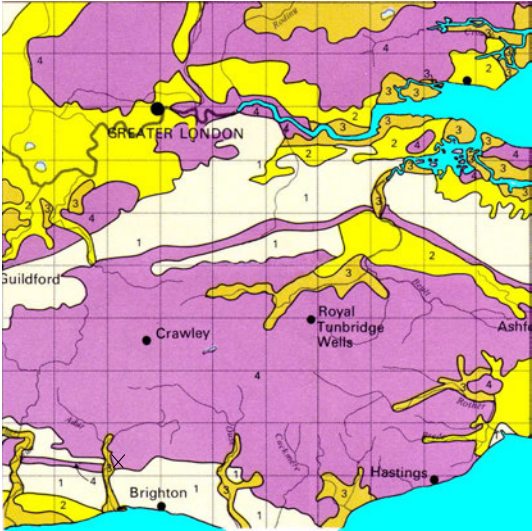
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Project **Oreham Manor Farm**
Title **Hydrological data for Woodmancote west**



<- Soil

M5-60 ->



<- SAAR

r x 100 ->



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		Sheet no. 1		
		Date 11/09/23 10:40		
Project Oreham Manor Farm		By MDM	Checked	Reviewed
Title Manhole printout for OREHAM MANOR FARM.SW				

Manhole ref.	X ref	Y ref	Form	Cham diam. or length	Rect. width	Chamb. height	Shaft height	MH Volume	Exit Diam	Exit Crown	Exit Invert	Chamb const	Slab level	Cover Level	Dwnstr MH
SW1	79.43	87.91	circ	450	N/A	0.40		0.06	150	11.775	11.600	N/A	11.550	12.000	SW2
SW2	67.35	65.14	circ	450	N/A	0.67		0.11	150	11.505	11.330	N/A	11.280	12.000	SW3
SW3	54.13	71.58	circ	450	N/A	0.82		0.13	150	11.355	11.180	N/A	11.130	12.000	SW6
SW4	47.52	103.78	circ	450	N/A	0.30		0.05	150	11.875	11.700	N/A	11.650	12.000	SW5
SW5	58.18	98.02	circ	450	N/A	0.42		0.07	150	11.755	11.580	N/A	11.530	12.000	SW6
SW6	47.94	80.58	circ	900	N/A	0.93		0.59	225	11.320	11.070	N/A	11.020	12.000	Outfall

All manholes to be as per 'Sewers for Adoption'

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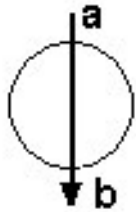
Project
Oreham Manor Farm

Title
Manhole printout for OREHAM MANOR FARM.SW

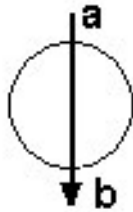
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MDM

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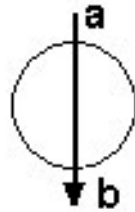
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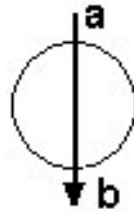
MH = SW1
a=head
b = 150



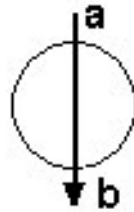
MH = SW2
a= 150
b = 150



MH = SW3
a= 150
b = 150



MH = SW4
a=head
b = 150



MH = SW5
a= 150
b = 150

MH = SW6
a= 150
b = 225
c = 150

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		Date 11/09/23 10:40		
Project Oreham Manor Farm	By MDM		Checked	Reviewed
Title Manhole printout for OREHAM MANOR FARM.SW				

These explanatory notes should be read in conjunction with the Manhole printout

- 1) Manhole ref - the reference for the manhole in question
- 2) Form - either circular or rectangular
- 3) Chamber diam or length - diameter of chamber if circular, or length if rectangular - in metres
- 4) Rectangular width - if form is rectangular, this gives the width of the chamber
- 5) Chamber height - height of chamber from invert
- 6) Shaft height - height of access shaft if applicable, from top of chamber to ground level
- 7) Manhole volume - cubic capacity of manhole chamber
- 8) Exit diameter - diameter of pipe leaving this manhole
- 9) Exit crown - crown level of pipe leaving this manhole
- 10) Exit invert - invert level of pipe leaving this manhole
- 11) Chamb const - manhole construction :-
 - N/A - not specified
 - Conc - concrete rings
 - Poly - polypropylene rings surrounded by selected fill
 - Poly/conc - polypropylene rings surrounded by concrete
 - Brick - brick built with waterproof render
 - In situ - concrete cast in situ
- 12) Slab level - surface level of base slab (if no sump, this is placed at 50mm below exit invert to allow levels manipulation).
- 13) Manhole diameters of 9999 have exceeded the sizes available in SfA
- 14) Manhole diameters may have to be modified due to the number of branches



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SW

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Job No.	574	
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By	MDM	Checked
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Project	Oreham Manor Farm Drainage
Title	Surcharge calcs (Sized at 30 yrs storm) for OREHAM MANOR FARM.SW CCF = 45%

Free flowing outlet
Return period = 100 yrs
Climate change factor = 45

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

Mean rain intens. 138.00 mm/hr
Storm profile = Summer
Using FSR data

Peak rain intens. 540.96 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	SW1	18.2	6.9	150	450	11.60	11.66	12.00	0.38	0.06	0.00	0.000	105	OK
2	I	1.02	SW2	17.9	13.9	150	450	11.33	11.44	12.00	0.78	0.11	0.00	0.000	211	OK
3	I	1.03	SW3	17.8	13.9	150	450	11.18	11.29	12.00	0.78	0.11	0.00	0.000	211	OK
4	B	2.01	SW4	17.6	8.0	150	600	11.70	11.77	12.00	0.45	0.07	0.00	0.000	122	Warning
5	B	2.02	SW5	28.2	20.3	150	600	11.58	11.68	12.00	0.72	0.10	0.00	0.000	308	OK
6	I	1.04	SW6	40.2	37.9	225	900	11.07	11.27	12.00	0.94	0.20	0.00	0.000	575	OK



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Project	Oreham Manor Farm Drainage
Title	Surcharge calcs (Sized at 30 yrs storm) for OREHAM MANOR FARM.SW CCF = 45%

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%) |
|---|--------------------------------------|--|

Flood volumes

Check that the upstream storage of the manhole is adequate to take the flood volume - see Upstrm Vol above.



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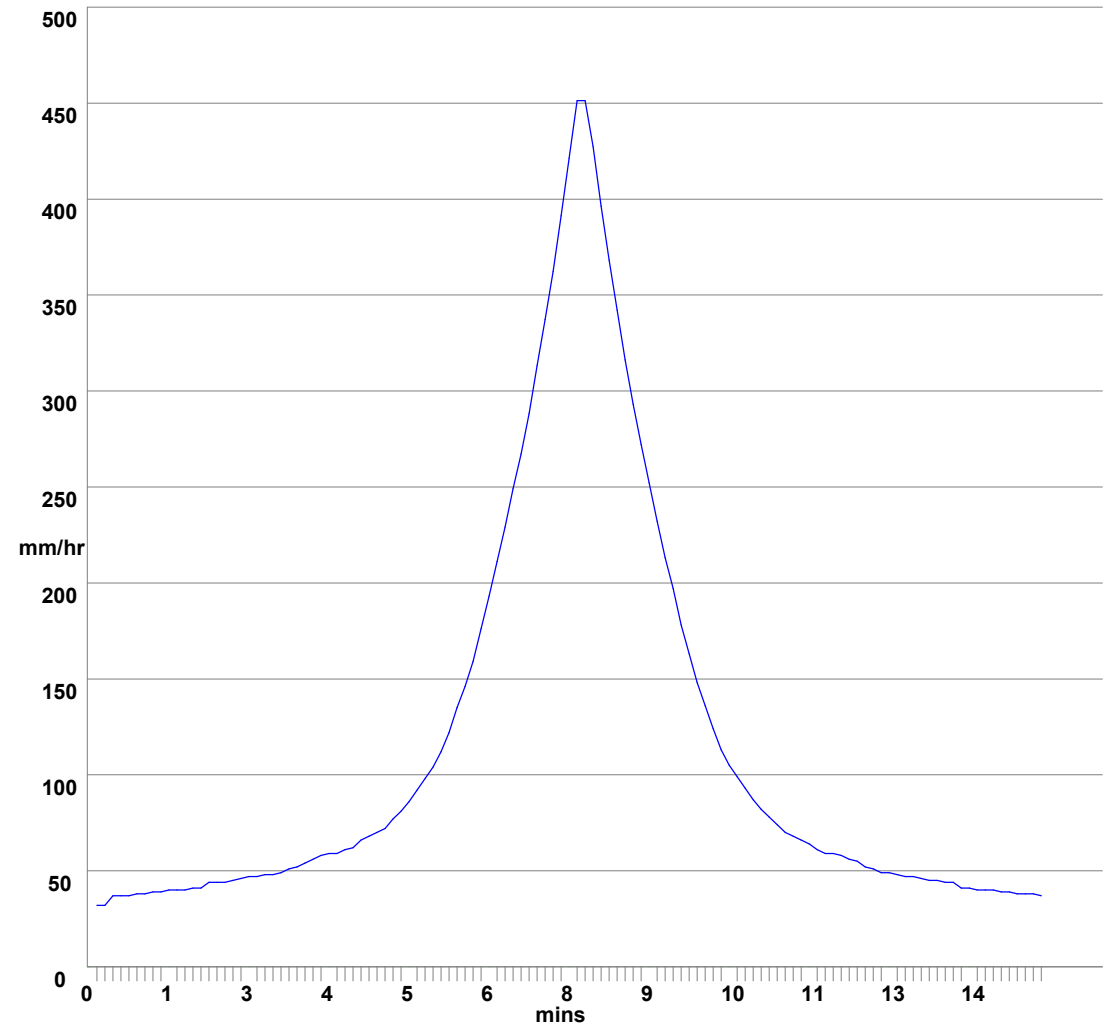
MasterDrain
SW

Project Oreham Manor Farm Drainage
Title Surcharge calcs (Sized at 30 yrs storm) for OREHAM MANOR FARM.SW CCF = 45%

Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:08	32.21	5:08	92.04	10:08	98.94
0:15	32.21	5:15	97.79	10:15	93.19
0:22	36.82	5:22	103.54	10:22	87.44
0:30	36.82	5:30	111.60	10:30	81.68
0:38	36.82	5:38	121.95	10:38	78.23
0:45	37.97	5:45	134.61	10:45	73.63
0:52	37.97	5:52	146.11	10:52	70.18
1:00	39.12	6:00	158.77	11:00	67.88
1:08	39.12	6:08	176.02	11:08	65.58
1:15	40.27	6:15	193.28	11:15	64.43
1:22	40.27	6:22	210.54	11:22	60.98
1:30	40.27	6:30	228.95	11:30	58.67
1:38	41.42	6:38	248.51	11:38	58.67
1:45	41.42	6:45	266.91	11:45	57.52
1:52	43.72	6:52	287.62	11:52	56.37
2:00	43.72	7:00	312.93	12:00	55.22
2:08	43.72	7:08	337.09	12:08	51.77
2:15	44.87	7:15	362.40	12:15	50.62
2:22	46.02	7:22	391.17	12:22	49.47
2:30	47.17	7:30	421.08	12:30	49.47
2:38	47.17	7:38	450.99	12:38	48.32
2:45	48.32	7:45	450.99	12:45	47.17
2:52	48.32	7:52	426.83	12:52	47.17
3:00	49.47	8:00	395.77	13:00	46.02
3:08	50.62	8:08	368.16	13:08	44.87
3:15	51.77	8:15	341.69	13:15	44.87
3:22	54.07	8:22	316.38	13:22	43.72
3:30	56.37	8:30	293.37	13:30	43.72
3:38	57.52	8:38	271.51	13:38	41.42
3:45	58.67	8:45	251.96	13:45	41.42
3:52	58.67	8:52	232.40	13:52	40.27
4:00	60.98	9:00	212.84	14:00	40.27
4:08	62.13	9:08	196.73	14:08	40.27
4:15	65.58	9:15	178.33	14:15	39.12
4:22	67.88	9:22	163.37	14:22	39.12
4:30	70.18	9:30	148.41	14:30	37.97
4:38	72.48	9:38	135.76	14:38	37.97
4:45	77.08	9:45	124.25	14:45	37.97
4:52	80.53	9:52	112.75	14:52	36.82
5:00	86.29	10:00	104.69	15:00	36.82

Hydrograph profile derived from data in the Flood Studies Report

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





MasterDrain
SW

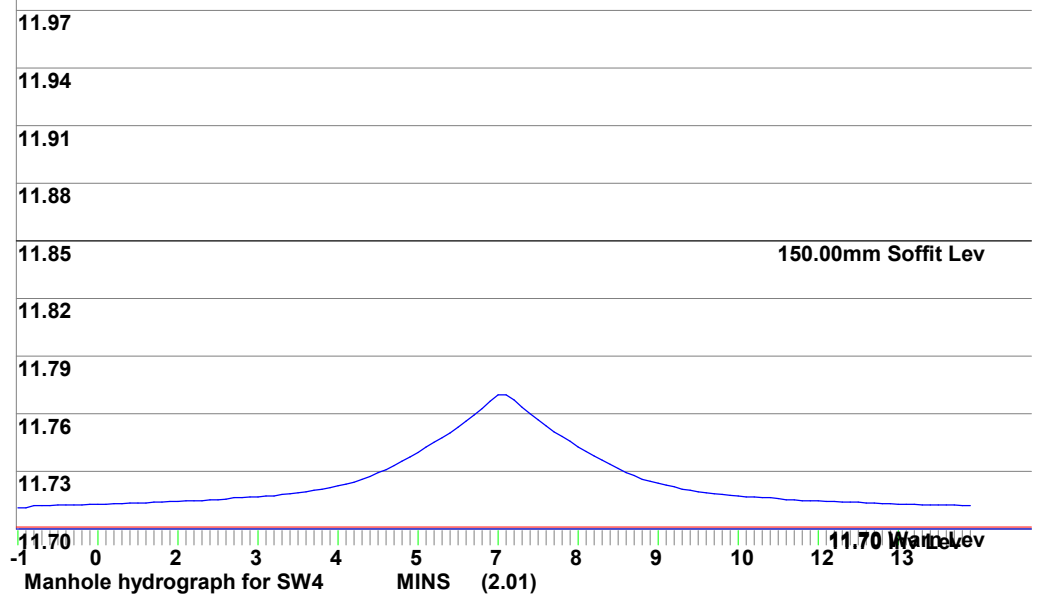
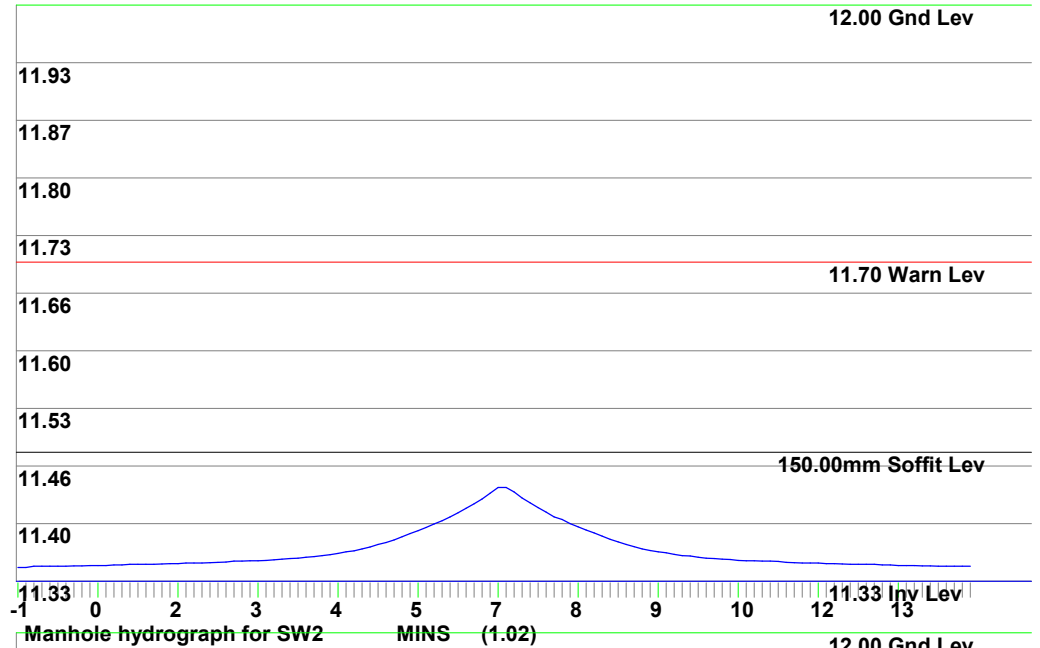
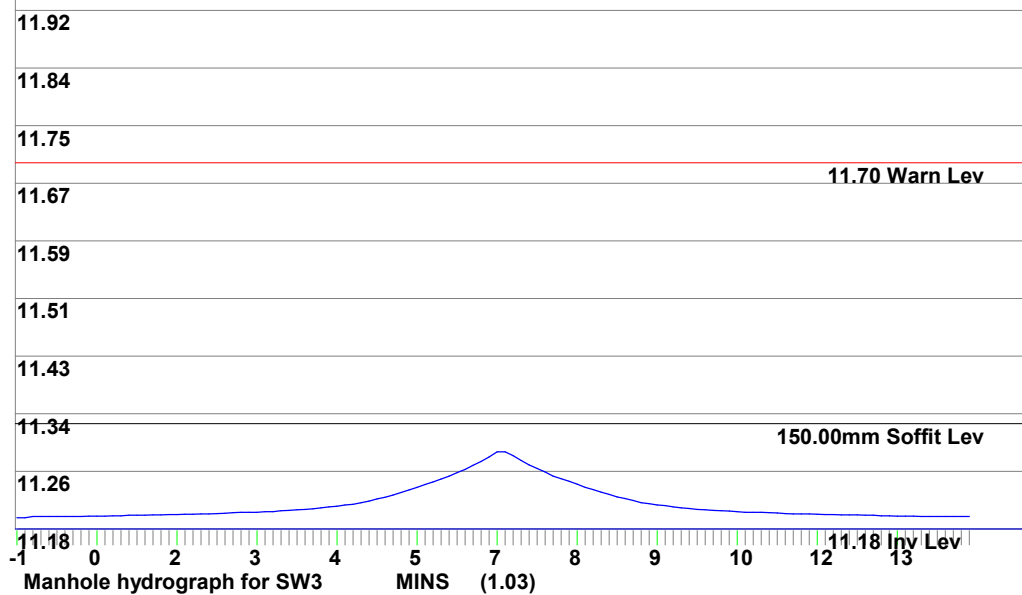
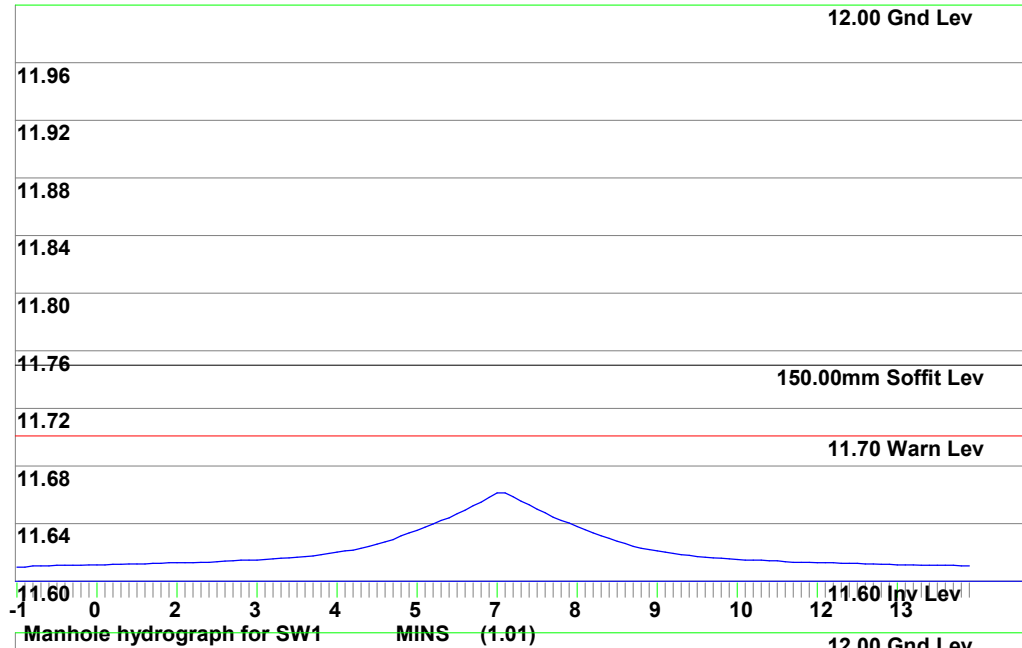
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Project Oreham Manor Farm Drainage	
Title Surcharge calcs (Sized at 30 yrs storm) for OREHAM MANOR FARM.SW CCF = 45%	





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SW

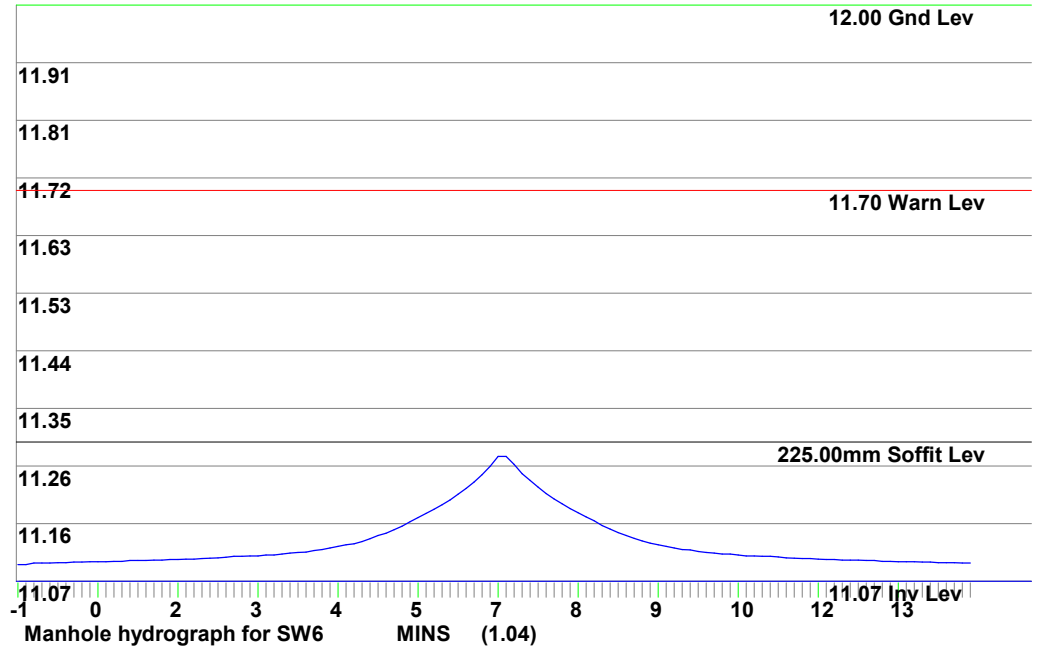
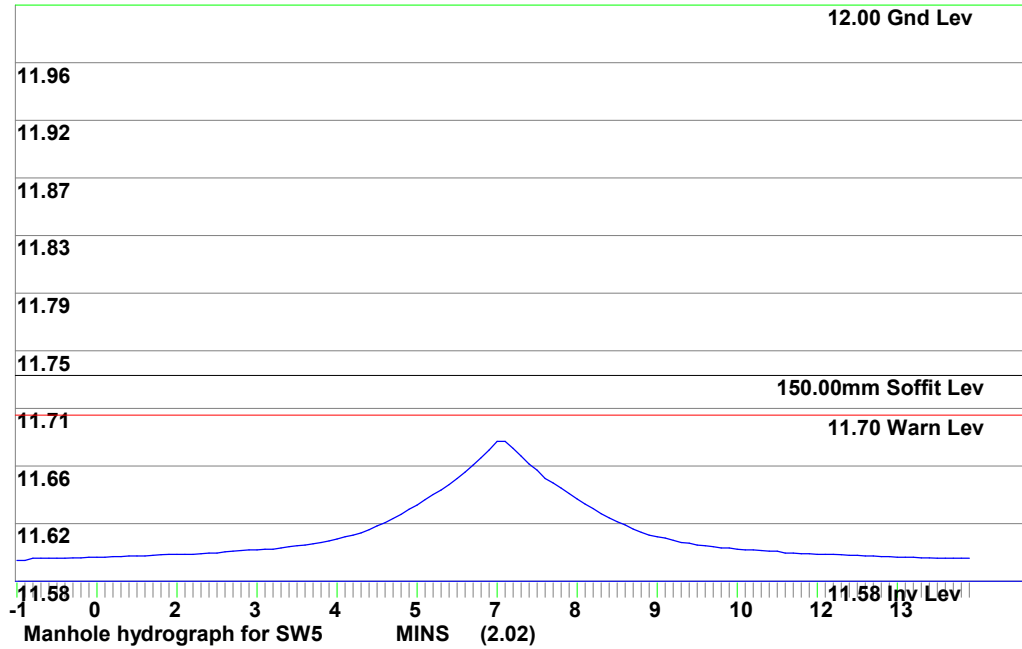
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Project Oreham Manor Farm Drainage	By MDM	Checked	Reviewed
Title Surcharge calcs (Sized at 30 yrs storm) for OREHAM MANOR FARM.SW CCF = 45%			





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Project

Title **Surcharge calcs (Sized at 30 yrs storm) for OREHAM MANOR FARM.SW CCF = 45%**

Free flowing outlet
Return period = 100 yrs
Climate change factor = 45

PEAK hydrograph values printed
Storm duration = 45 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 = 22.5 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	SW1	18.2	6.9	150	450	11.60	11.64	12.00	0.38	0.04	0.00	0.000	105	OK
2	I	1.02	SW2	17.9	13.9	150	450	11.33	11.39	12.00	0.78	0.06	0.00	0.000	211	OK
3	I	1.03	SW3	17.8	13.9	150	450	11.18	11.24	12.00	0.78	0.06	0.00	0.000	211	OK
4	B	2.01	SW4	17.6	8.0	150	600	11.70	11.74	12.00	0.45	0.04	0.00	0.000	122	Warning
5	B	2.02	SW5	28.2	20.3	150	600	11.58	11.64	12.00	0.72	0.06	0.00	0.000	308	OK
6	I	1.04	SW6	40.2	37.9	225	900	11.07	11.18	12.00	0.94	0.11	0.00	0.000	575	OK



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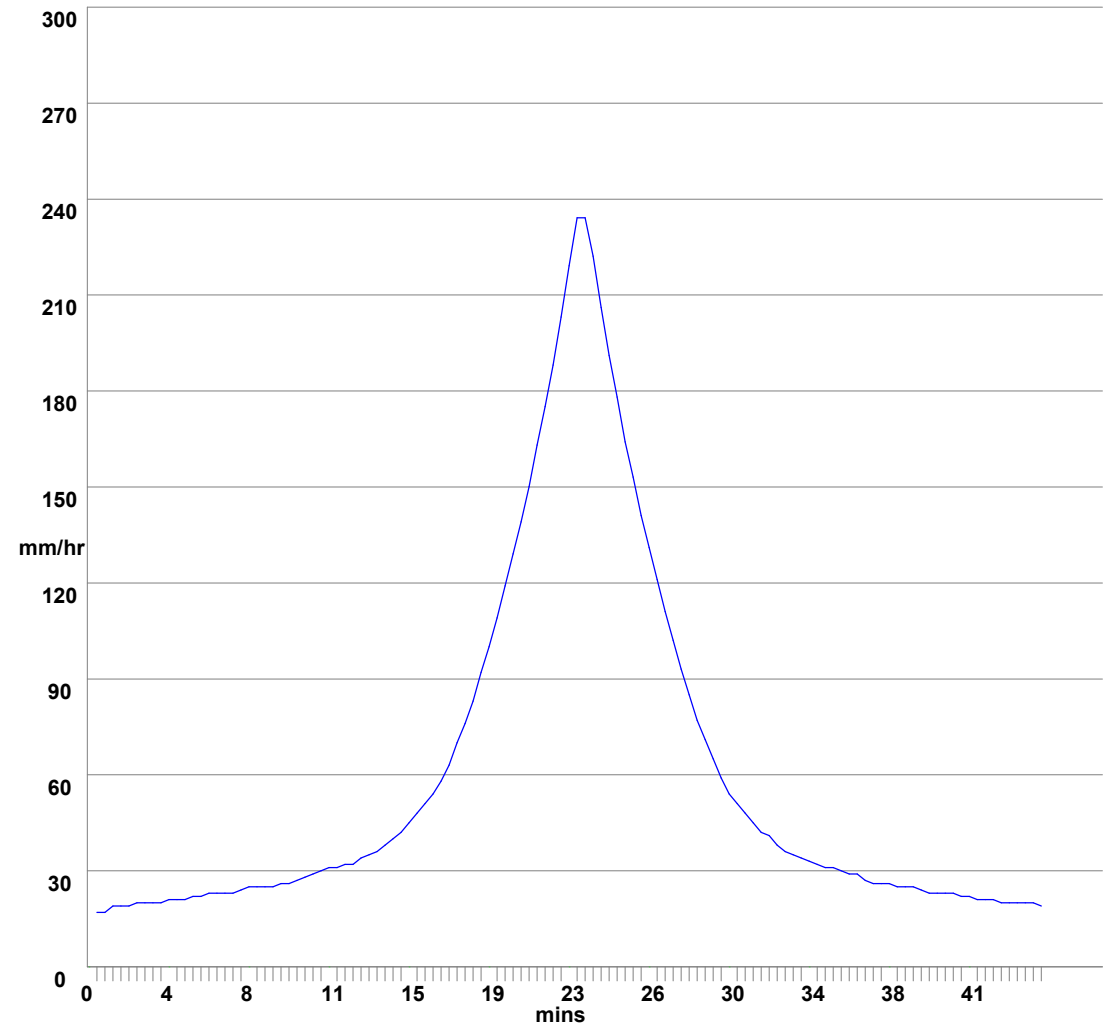
Project

Title **Surcharge calcs (Sized at 30 yrs storm) for OREHAM MANOR FARM.SW CCF = 45%**

Time mins	Rain mm/hr	Time mins	Rain mm/hr	Time mins	Rain mm/hr
0:22	16.75	15:22	47.85	30:22	51.43
0:45	16.75	15:45	50.84	30:45	48.44
1:08	19.14	16:08	53.83	31:08	45.45
1:30	19.14	16:30	58.01	31:30	42.46
1:52	19.14	16:52	63.40	31:52	40.67
2:15	19.74	17:15	69.97	32:15	38.28
2:38	19.74	17:38	75.96	32:38	36.48
3:00	20.33	18:00	82.53	33:00	35.29
3:22	20.33	18:22	91.51	33:22	34.09
3:45	20.93	18:45	100.48	33:45	33.49
4:08	20.93	19:08	109.45	34:08	31.70
4:30	20.93	19:30	119.02	34:30	30.50
4:52	21.53	19:52	129.18	34:52	30.50
5:15	21.53	20:15	138.75	35:15	29.90
5:38	22.73	20:38	149.52	35:38	29.31
6:00	22.73	21:00	162.68	36:00	28.71
6:22	22.73	21:22	175.24	36:22	26.91
6:45	23.32	21:45	188.39	36:45	26.32
7:08	23.92	22:08	203.35	37:08	25.72
7:30	24.52	22:30	218.90	37:30	25.72
7:52	24.52	22:52	234.45	37:52	25.12
8:15	25.12	23:15	234.45	38:15	24.52
8:38	25.12	23:38	221.89	38:38	24.52
9:00	25.72	24:00	205.74	39:00	23.92
9:22	26.32	24:22	191.38	39:22	23.32
9:45	26.91	24:45	177.63	39:45	23.32
10:08	28.11	25:08	164.47	40:08	22.73
10:30	29.31	25:30	152.51	40:30	22.73
10:52	29.90	25:52	141.15	40:52	21.53
11:15	30.50	26:15	130.98	41:15	21.53
11:38	30.50	26:38	120.81	41:38	20.93
12:00	31.70	27:00	110.64	42:00	20.93
12:22	32.30	27:22	102.27	42:22	20.93
12:45	34.09	27:45	92.70	42:45	20.33
13:08	35.29	28:08	84.93	43:08	20.33
13:30	36.48	28:30	77.15	43:30	19.74
13:52	37.68	28:52	70.57	43:52	19.74
14:15	40.07	29:15	64.59	44:15	19.74
14:38	41.87	29:38	58.61	44:38	19.14
15:00	44.86	30:00	54.42	45:00	19.14

Hydrograph profile derived from data in the Flood Studies Report

Return period= 100 yrs Duration= 45 mins Profile - summer





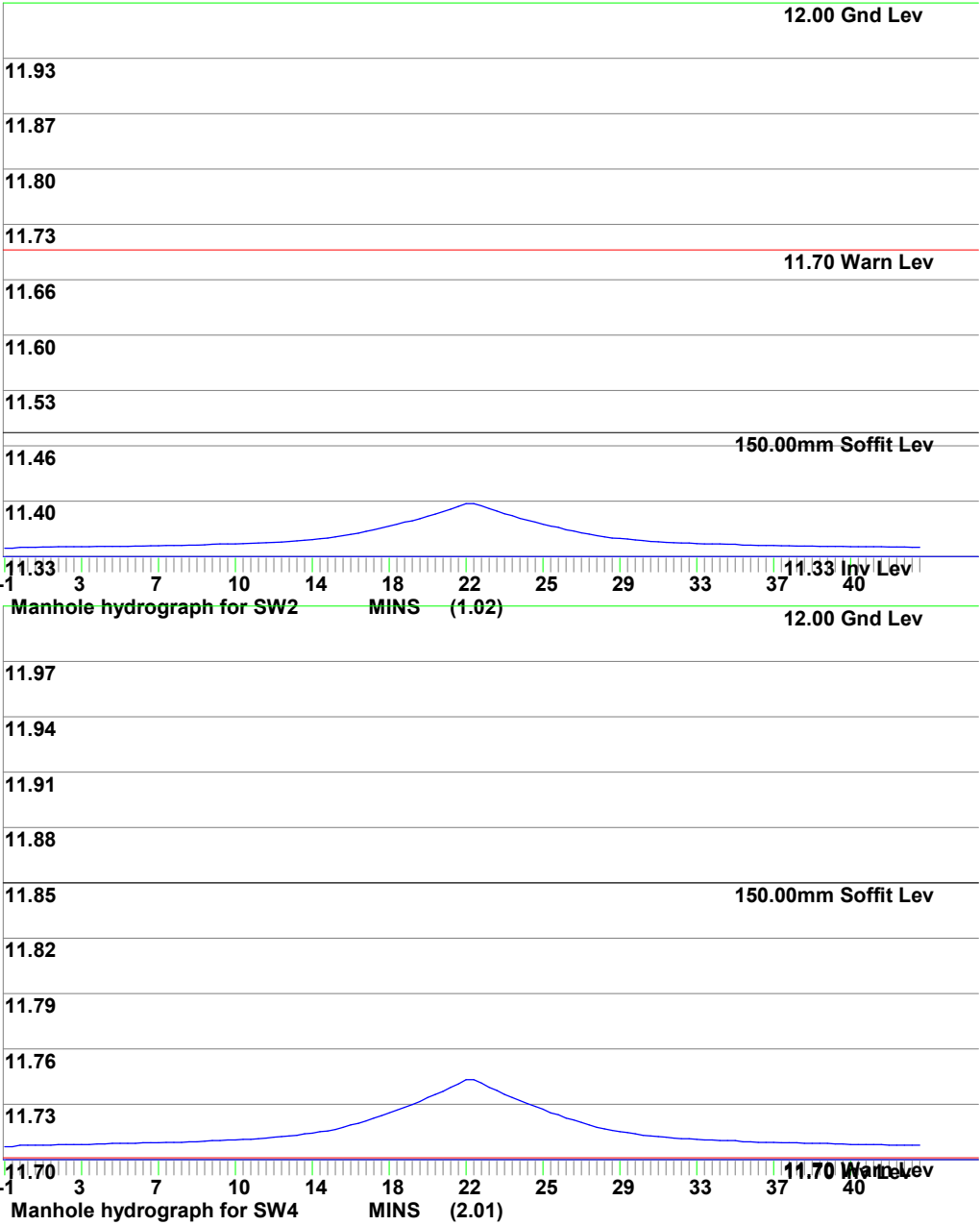
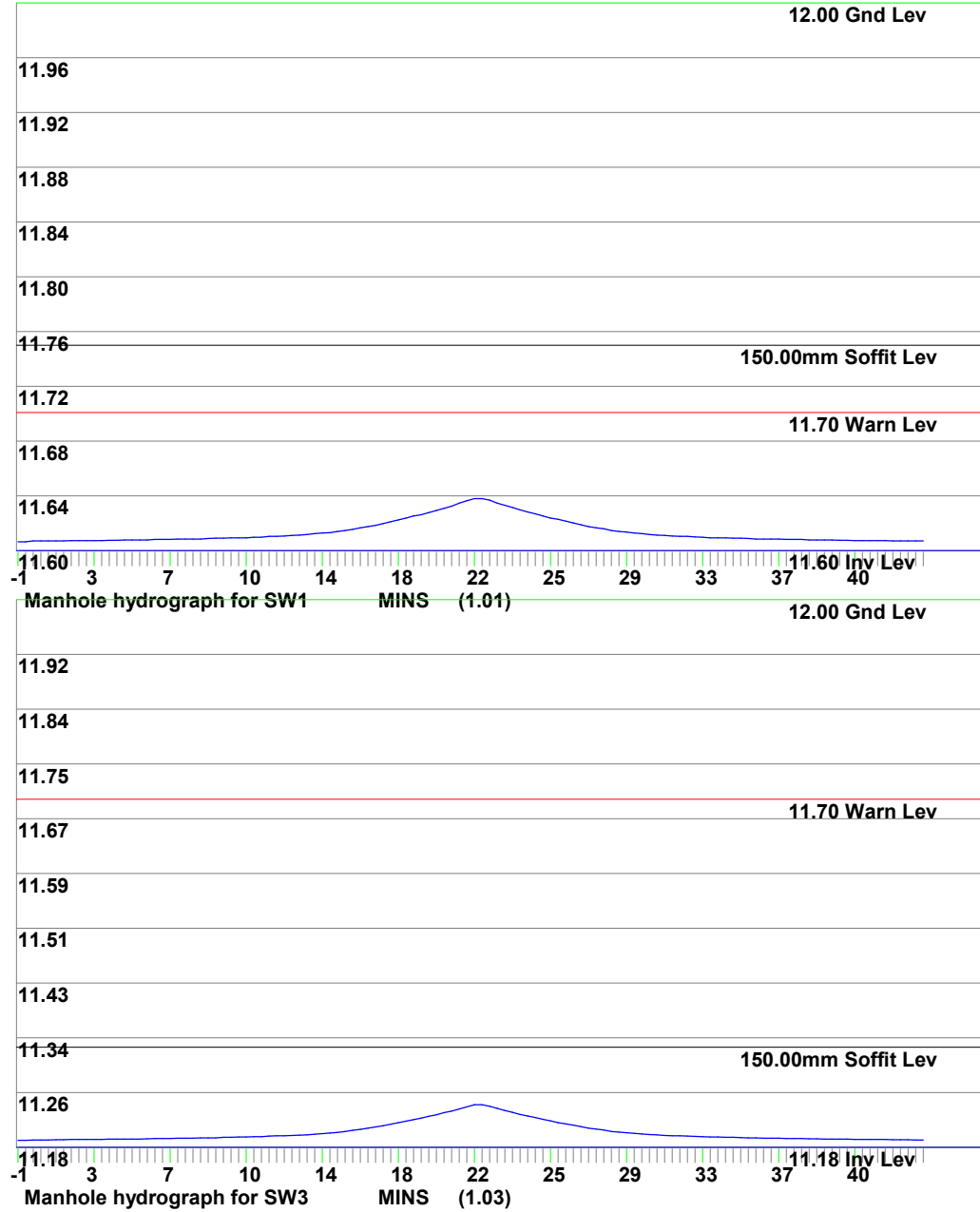
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Project	
Title	Surcharge calcs (Sized at 30 yrs storm) for OREHAM MANOR FARM.SW CCF = 45%





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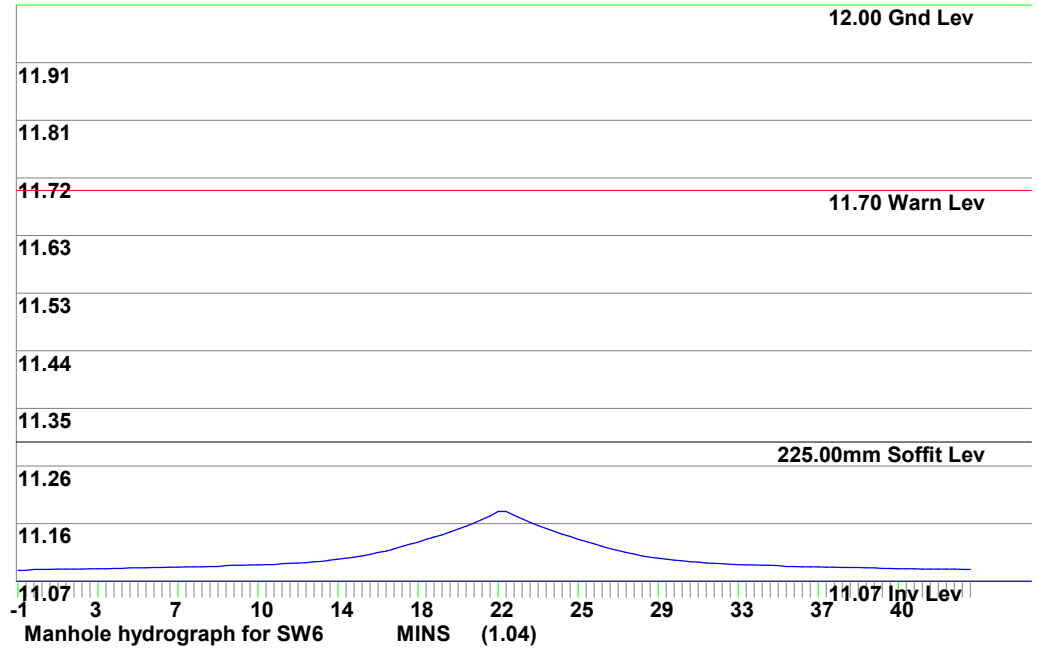
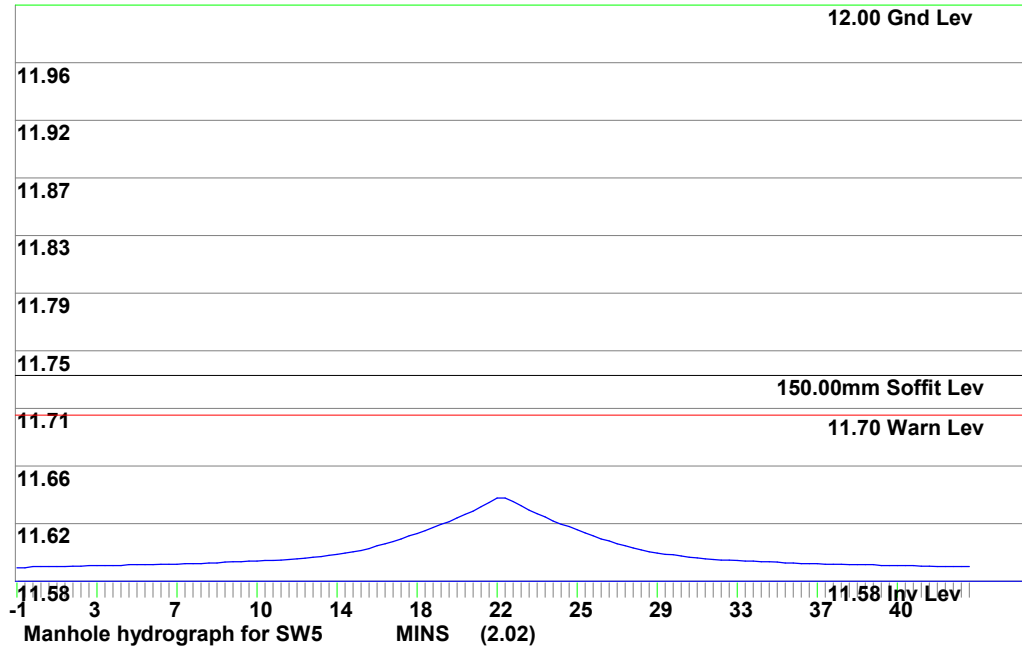
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Project

Title **Surcharge calcs (Sized at 30 yrs storm) for OREHAM MANOR FARM.SW CCF = 45%**





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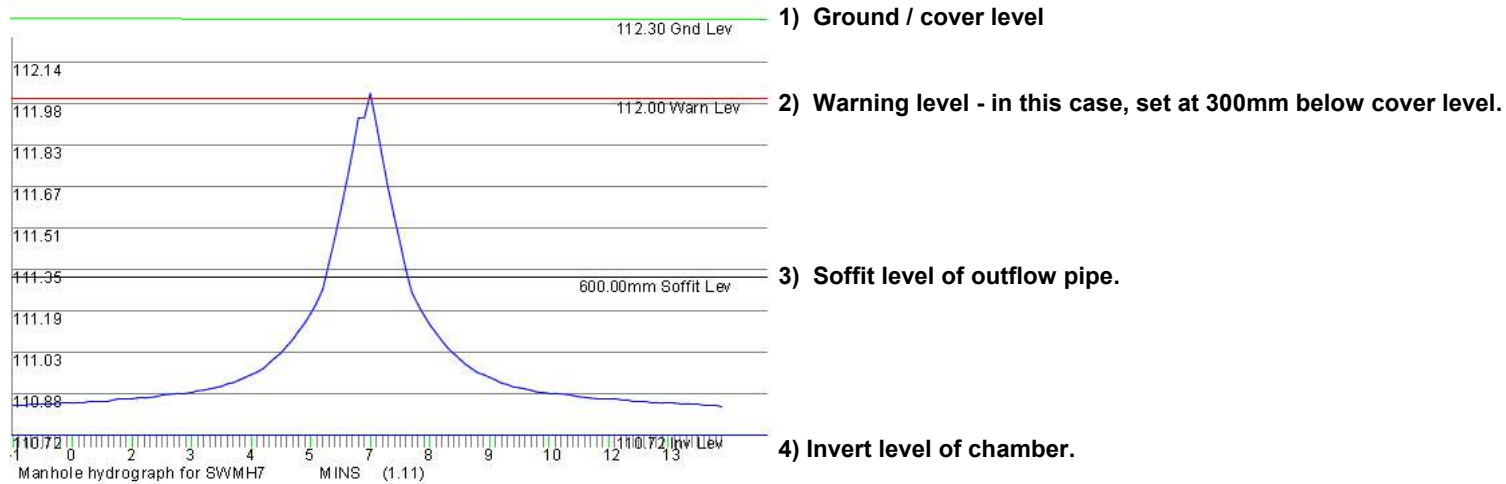
By

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Title **Surcharge calcs (Sized at 30 yrs storm) for OREHAM MANOR FARM.SW CCF = 45%**



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.



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Foul 11.5

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Project
Oreham Manor Farm

Title
Manhole printout for OREHAM MANOR FARM.FL

Manhole ref.	Form	Cham diam. or length	Rect. width	Chamb. height	Shaft height	MH Volume	Ent. Diam	Ent. Crown	Ent. Invert	Exit Diam	Exit Crown	Exit Invert	Chamb const	Cover Level	Dwnstr MH
F1	circ	450	N/A	0.30		0.05	Head	----	----	100	11.825	11.700	N/A	12.000	F3
F2	circ	450	N/A	0.30		0.05	Head	----	----	100	11.825	11.700	N/A	12.000	F3
F3	circ	450	N/A	0.46		0.07	100	0.000	0.000	100	11.665	11.540	N/A	12.000	F4
F4	circ	450	N/A	0.34		0.05	100	0.000	0.000	100	11.385	11.260	N/A	11.600	F5
F5	circ	600	N/A	0.44		0.12	100	0.000	0.000	100	11.185	11.060	N/A	11.500	STW
STW	circ	1800	N/A	0.70		1.78	100	0.000	0.000	100	10.875	10.750	N/A	11.450	F6

All manholes to be as per 'Sewers for Adoption'

Levels calculated for level inverts



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Project
Oreham Manor Farm

Title
Manhole printout for OREHAM MANOR FARM.FL

These explanatory notes should be read in conjunction with the Manhole printout

- 1) Manhole ref - the reference for the manhole in question
- 2) Form - either circular or rectangular
- 3) Chamber diam or length - diameter of chamber if circular, or length if rectangular - in metres
- 4) Rectangular width - if form is rectangular, this gives the width of the chamber
- 5) Chamber height - height of chamber from invert
- 6) Shaft height - height of access shaft if applicable, from top of chamber to ground level
- 7) Manhole volume - cubic capacity of manhole chamber
- 8) Exit diameter - diameter of pipe leaving this manhole
- 9) Exit crown - crown level of pipe leaving this manhole
- 10) Exit invert - invert level of pipe leaving this manhole
- 11) Manhole diameters of 9999 have exceeded the sizes available in Sfa
- 12) Manhole diameters may have to be modified due to the number of branches



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Foul 11.5

Project **Oreham Manor Farm**
Title **Treatment plant calculations**

Percolation Test Data

Trial holes excavated 300mm square as stipulated in Approved Documents Part H
Holes filled to top, and allowed to drain.
Holes refilled and water allowed to drain. Time taken to drain between 75%
and 25% full noted as per Regulation requirements

Trial hole	No.1	No.2	No.3
Initial depth (mm) 75%	225	225	225
Final depth (mm) 25%	75	75	75
Initial time (sec)	0	0	0
Final time (sec)	7500	7560	7440
Ave. time (sec) for 1mm fall	50	50	50
Percolation value	50	50	50
Average Percolation value (Vp) = 50.0			

Occupancy of building based on 15 persons for 12 months of the year.

Area of drainage required:-

$$\begin{aligned} \text{Area} &= \text{Occupancy} \times Vp \times 0.20 \\ \text{Area} &= 15 \times 50.0 \times 0.20 \\ \text{Area} &= 150.0\text{m}^2 \end{aligned}$$

Linear soakaway dimensions = 214.3 (width=0.70)

Comments/Departures from Specified Procedures:

Approved Document H (2001) states that the percolation value should be between 12 and 100

MASTERDRAIN INPUT DATA PLUS PIPE SIZING AND FLOW CALCULATIONS

Surface Water input data & calculated pipe sizing plus flows

No.	Sect.No.	Length	Imp. area	Grad	Up. ref	Up. GL	Up. IL	Dwn. ref	Dwn. GL	Dwn. IL	Pref diam	±Flow	Restrictor	Diam.	Flow l/s	Vel l/s	Prop Vel	Prop A. %
1	1.01	25.77594	130	95	SW1	12.000	11.600	SW2	12.000	11.330				150	6.5	1.03	0.91	35.8
2	1.02	14.70517	130	98	SW2	12.000	11.330	SW3	12.000	11.180				150	12.78	1.01	1.13	71.4
3	1.03	10.92319		99	SW3	12.000	11.180	SW6	12.000	11.070				150	12.62	1.01	1.12	70.8
4	2.01	12.11685	150	101	SW4	12.000	11.700	SW5	12.000	11.580				150	7.63	1.0	0.95	43.2
5	2.02	20.22402	230	40	SW5	12.000	11.580	SW6	12.000	11.070				150	19.02	1.59	1.75	67.5
6	1.04	28.13752	70	166	SW6	12.000	11.070	Outfall	11.500	10.900				225	33.36	1.01	1.15	83.0

Foul Sewerage input data & calculated pipe sizing plus flows

No.	Sect.No.	Length	Dis. Uns	Grad	Up. ref	Up. GL	Up. IL	Dwn. ref	Dwn. GL	Dwn. IL	Pref diam	±Flow	Diam.	Flow l/s	Vel l/s	Prop Vel	Prop A. %
1	1.01	15.64859	8.5	97.8	F1	12.000	11.700	F3	12.000	11.540			100	1.5	0.67	0.54	
2	2.01	16.8268	8.5	105.2	F2	12.000	11.700	F3	12.000	11.540			100	1.5	0.65	0.53	
3	1.02	28.78795	5	102.8	F3	12.000	11.540	F4	11.600	11.260			100	2.3	0.65	0.63	
4	1.03	19.25339		96.3	F4	11.600	11.260	F5	11.500	11.060			100	2.3	0.68	0.65	
5	1.04	3.084445		9.9	F5	11.500	11.060	STW	11.450	10.750			100	2.3	2.12	1.3	
6	1.05	58.03091		96.7	STW	11.450	10.750	F6	11.400	10.150			100	2.3	0.68	0.65	

APPENDIX C

OPERATION & MAINTENANCE MANUAL

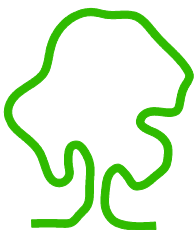
DRAINAGE

OPERATION & MAINTENANCE MANUAL

1. OPERATION OF THE DRAINAGE SYSTEM
 - 1.1 Once the construction of the drainage system is complete, minimal operational input should be required. A schedule of maintenance is given below.
2. SCHEDULE OF MAINTENANCE
 - 2.1 The drainage system will require regular maintenance to ensure that it is operating properly.
 - 2.2 The maintenance should generally follow the following schedule, but this will probably be modified over time as it becomes apparent where more frequent or less frequent maintenance is indicated. Outside of the schedule, a walk-over inspection of the drainage system should be carried out after a very severe storm/extended period of very heavy rainfall.

SCHEDULE OF MAINTENANCE

TIME	ACTION	COMMENT
On completion of construction		
3 months	Check all gullies, strip drains and drainage chambers. Clean out, de-silt and repair as necessary.	Contractor's maintenance period
12 months	Repeat checks and actions described above. Carry out annual maintenance on the Klargester sewage treatment plant. Sample effluent at the drainage field inlet chamber where required.	
In service		
Every year	Check all gullies, strip drains and drainage chambers. Clean out, de-silt and repair as necessary. Check outfall into ditch. Carry out annual maintenance on the Klargester sewage treatment plant. Sample effluent at the drainage field inlet chamber where required.	Work to be carried out in late winter after leaf fall has occurred.



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