

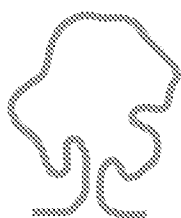
MS JOANNA GOODMAN & MR SALVATORE ARAGONA



**THE CHALET, LITTLEHAMPTON ROAD, FERRING
WEST SUSSEX, BN12 6PG**

Flood Risk & Drainage Assessment

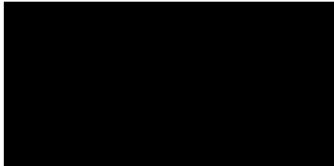
August 2021



eas ltd

Environmental Assessment Services Ltd

REPORT DATA SHEET

Requirement	Data
Report Reference	THE CHALET, LITTLEHAMPTON ROAD, FERRING FR&DA
Date	August 2021
Client	ECE Planning
Report type	Flood Risk & Drainage Assessment
Purpose	Planning Application
Revisions	Revision 1, August 2021, Revision 2, September 2021
Prepared by	Lisa Hawtin BSc (Hons), MIES, MIAQM Signed 
Approved by	Eur Ing Malcolm McKemey BSc (Hons), CEng, CEnv, MICE, MIEAust, MCIWEM, MIEEnvSc  Signed

MS JOANNA GOODMAN & MR SALVATORE ARAGONA

THE CHALET, LITTLEHAMPTON ROAD, FERRING,

WEST SUSSEX BN12 6PG

Flood Risk & Drainage Assessment

August 2021

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MS JOANNA GOODMAN & MR SALVATORE ARAGONA

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WEST SUSSEX BN12 6PG

Flood Risk & Drainage Assessment

August 2021

1. THE SITE AND PROPOSED REDEVELOPMENT

- 1.1 The site comprises a former horticultural nursery with residential dwelling to the north of the A259 Littlehampton Road and Ferring village. The main area of the site is approximately square in shape with an access drive from the main A259, 70 m to the south. The site area is approximately 0.4 ha. The Ordnance Survey (OS) map reference for the site is TQ 09663 03691. The site elevation is approximately +9 m OD. See Appendix A, Figure 1: Site Location Plan.
- 1.2 The site is predominantly occupied by three large blocks of commercial glass houses which are now disused. There is an existing dormer bungalow with private garden and a number of ancillary buildings, including a mobile home adjacent to the site. Land to the south and west of the site is in residential use. Land to the north comprises a business/commercial estate (Highdown Industrial Park) and land to the west is a sports ground (Highdown Football Pitches). The owners propose to demolish the existing glasshouses and redevelop the site to provide a martial arts dojo, a marine workshop, ancillary tool/machinery storage with external boat and vehicle parking plus 37 shipping container storage units. The adjacent residential property, garden and ancillary garage/shed buildings are to be retained as existing.

2. GEOLOGY AND HYDROGEOLOGY

- 2.1 According to the British Geological Survey, the site lies on superficial deposits of Beach and Tidal Flat Deposits (undifferentiated clay, silt, sand and gravel) over bedrock of Lewes Nodular Chalk Formation.
- 2.2 Environment Agency (EA) groundwater mapping identifies the superficial deposits as Secondary A Aquifer and the Chalk bedrock as Principal Aquifer. The site is classified as in a Medium risk Groundwater Vulnerability area but does not lie within a potable groundwater Source Protection Zone. The site would be considered hydrogeologically sensitive.

3. FLOOD RISK ASSESSMENT

- 3.1 According to the Environment Agency (EA) online ‘Flood Map for Planning’, the site lies within Flood Zone 1, defined as land having a less than 1 in 1000 annual probability of river or sea flooding. Part of the site is identified to be at ‘low’ risk of surface water flooding (see Figure 3.1 below). However, as the site is less than one hectare, and the overall flood risk is classified as ‘low’ there is no requirement under the National Planning Policy Framework (NPPF) to provide a full site-specific flood risk assessment. See Appendix B: EA Flood Risk Map.
- 3.2 The EA online ‘Risk of Flooding from Surface Water’ map appears to show a small area at low risk of surface water flooding within the site. See Figure 3.1 below. The map shows surface water moving across the site following the site topography but at a predicted depth of less than 300 mm. Otherwise, the nearest area at risk of surface water flooding is shown around the main watercourse some 250 m to the south of the site. The site is not at risk of flooding from reservoirs. See Appendix B.

**Figure 3.1: Extent of Flooding from Surface Water at Site
(EA online mapping 21/07/21)**



- 3.3 As the site lies within Flood Zone 1 and is not at risk of flooding from external sources, the principal concern will be surface water drainage at the site post-development.
- 3.4 It is required by the local planning authority that all runoff for the 1 in 100-year return period flood event, plus allowance for climate change, will be managed on site, and that the discharge from the proposed development will be restricted to the Greenfield run-off rate.

4. EXISTING DRAINAGE

- 4.1 The site was visited on Monday 19 July 2021 in order to examine the existing drainage at the site and in the vicinity.
- 4.2 The site appears to fall from NNE to SSW, and the overall surface drainage follows that pattern. See Figure 2.
- 4.3 The site has extensive formal surface water drainage to cater for the large roof area of the glasshouses and the surrounding paved areas. The drainage comprises gutters and down pipes, gullies, concrete channels, chambers, and pipes laid in the ground. The surface water appears to discharge to a long informal soakaway on the western edge of the site. This soakaway is partly occupied by the lower trunks and roots of large cypress trees (recently felled). The soakaway is known to surcharge under very heavy rainfall, with excess water running down the driveway to the south of the site.
- 4.4 Foul sewerage is confined to the residence and will be retained as existing post the proposed development.
- 4.5 As stated in 3.4 above, the flow permitted to leave the developed site should not exceed the Greenfield flow rate. The Greenfield runoff rate for the site has therefore been estimated using the UK Sustainable Drainage (UKSUDS) Greenfield Runoff Estimation Tool. The runoff rates are given for scenarios up to (and including) the 1 in 200-year storm event, as summarised in Table 4.1 below and provided in Appendix C.

TABLE 4.1
GREENFIELD RUNOFF RATES

Return period	Flow rates (l/s)
Qbar	0.97
1 in 1 year	0.82
1 in 30 years	2.22
1 in 100 year	3.08
1 in 200 years	3.62

- 4.6 In any case, the maximum discharge permitted to leave the site from the drained area post development should not exceed Q_{bar} (0.97 l/s). Foul sewage should also be allowed for in the permitted off-site discharge flow rate. In this case there will be no foul sewage from the proposed redevelopment discharged directly from the site.
- 4.7 The proposed redevelopment will not result in an increase in impermeable area compared to the existing as the impermeable footprint presently comprising glasshouse roofs and hard cover will probably remain impermeable under the proposed redevelopment.

5. PROPOSED DRAINAGE

- 5.1 The existing surface water drainage includes a sustainable (SuDS) solution as it discharges to soakaway (albeit an informal soakaway, which surcharges under very heavy rainfall).

- 5.2 The SuDS option for the redeveloped site are described below:

5.3 Drain the redeveloped site to soakaway.

- 5.3.1 Drainage to soakaway (infiltration) is the preferred Sustainable Urban Drainage System (SUDS) solution. This requires the underlying ground to be suitably permeable. The underlying geology is described as beach and tidal flat deposits over chalk. Soil exposed in excavations around the site appears to be mainly gravel.
- 5.3.2 From the geology and the existing use of soakaway drainage at the site, it is concluded that drainage to soakaway will be the optimum SuDS solution in this case. Percolation testing will be required in due course to establish an infiltration coefficient (f) for the detailed design of the soakaway.
- 5.3.3 A provisional drainage design for the site based on drainage to soakaway is shown in Figure 3 and the MasterDrain drainage design model output is given in Appendix D.

5.4 Drain the redevelopment to attenuation storage with controlled flow discharge.

- 5.4.1 The alternative to drainage to soakaway would 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. The lowest flow rate practicable is 2 l/s using a vortex valve.

- 5.4.2 The total attenuation storage that would be required (with discharge controlled to a maximum of 2 l/s) has been estimated at 290 m³ using the MasterDrain drainage model. Attenuation storage may be provided in open water bodies, ponds, swales or underground voids created by storage cells, large diameter pipes, etc.
- 5.4.3 Open storage is preferred compared with underground storage; however, the proposed redeveloped site does not include much in the way of suitable areas for ponds or swales.
- 5.4.4 Attenuation storage requires an outlet to a watercourse or sewer. Neither outlet options are available in the immediate vicinity of the site. The nearest significant watercourse is some 250 m to the south on the far side of Littlehampton Road.

5.5 Other Sustainable Urban Drainage System (SUDS) Options

- 5.5.1 Additional SUDS options could include the use of permeable paving in the paved areas. Permeable paving will permit surface water to infiltrate into the underlying soil, delay discharge and reduce peak flows following a rainfall event. The shipping container storage area is to be paved with permeable stone on a geotextile.
- 5.5.2 It is recommended that any permeable paving should be underlain by a shallow drainage blanket of no-fines stone (or similar recycled crushed concrete) enclosed in permeable geotextile. The permeable paving will reduce the surface water flow to the soakaway.
- 5.5.3 Rainwater harvesting could also be practised. Collection of roof water for the irrigation of soft landscaping is the most likely practicable option.
- 5.5.4 A green roof on the proposed new building could be an option. Green roofs reduce the volume and rate of runoff and can be low maintenance, generally requiring only bi-annual maintenance visits.

5.6 Extreme Event

- 5.6.1 If an extreme storm event overwhelmed the surface water drainage system at the site, and/or if the drainage system were to fail, ground levels would indicate that surface water would run-off towards the SSW and down the adjacent property driveway and thence towards Littlehampton Road highway, largely as per the present situation.

5.7 Foul Sewerage

- 5.7.1 The existing site proposed for redevelopment has no foul sewerage, which is confined to the residence (outside the proposed redevelopment area). The redeveloped site will require lavatories, basins, and kitchen/messing facilities in the proposed new building. There will be a requirement for foul sewerage.

- 5.7.2 There are no public foul and surface water sewers within the vicinity of the site. There are no watercourses nearby into which treated sewage effluent could be discharged and there does not appear to be an area within the site which could be set aside to accommodate a drainage field. The only option likely to satisfy the General Binding Rules for Small Sewage Discharge will be to discharge the foul sewage to a cess pit/cess pool with regular removal by road tanker.
- 5.7.3 The minimum recommended size for the cess pit/pool would be 18000 litres.

6. CONCLUSIONS AND RECOMMENDATIONS

- 6.1 The site comprises a former horticultural nursery with residential dwelling to the north of the A259 Littlehampton Road and Ferring village. It is proposed to demolish the existing glasshouses and redevelop the north part of the site to provide a martial arts dojo, a marine workshop, ancillary tool/machinery storage with external boat and vehicle parking plus 37 shipping container storage units.
- 6.2 The site lies on superficial deposits of Beach and Tidal Flat Deposits (undifferentiated clay, silt, sand, and gravel) over bedrock of Lewes Nodular Chalk Formation. The superficial deposits are classified as Secondary A Aquifer and the Chalk bedrock as Principal Aquifer. The site does not lie within a potable groundwater Source Protection Zone. The site would be considered hydrogeologically sensitive.
- 6.3 The site lies within Flood Zone 1 (at low risk of flooding) and is not at significant risk of surface water or groundwater flooding. The site is not at risk of flooding from reservoirs.
- 6.4 The existing site is largely covered with greenhouses and has formal surface water drainage discharging to an informal soakaway along the western site boundary. The existing soakaway surcharges during periods of high rainfall. The recommended surface water disposal strategy for the redeveloped site will be discharge to soakaway. This is the preferred SuDS option and the underlying geology plus evidence from the site visit suggests that this should work well. However, percolation testing will be required to establish an infiltration coefficient for the detailed design of the soakaway. A suggested outline drainage scheme is shown in Figure 4. It is recommended that the scheme should include an interceptor upstream of the soakaway.
- 6.5 The use of permeable paving (stone) in the shipping container storage area of the proposed redevelopment will reduce the volume of water discharged to the soakaway.
- 6.6 There is no foul sewerage within the site. The nearest existing foul sewerage is at the adjacent residence. The redeveloped site will need foul sewerage, and, in the absence of any convenient public foul sewers, watercourses or areas suitable for a drainage field, it is recommended that the foul sewage should be drained to a cess pit with regular emptying by road tanker.

7. MAINTENANCE

- 7.1 New drainage chambers will require occasional maintenance to remove any silt build-up and preserve the efficient function of the drainage system for the life of the development. Chambers immediately upstream from soakaways should include silt traps and will require more frequent maintenance. Interceptors will require regular maintenance to ensure continued efficient operation.
- 7.2 After the end of the contractors' maintenance period, maintenance will be the responsibility of the site freeholder.
- 7.3 The principal concerns addressed by the Maintenance Management Plan (see Appendix F) are siltation, and debris blocking pipes, inlet gratings and filling gulley pots or chambers.
- 7.4 Silt, mainly in the form of grit and dust will wash into the system during rainfall. This may be exacerbated when there are areas of disturbed/unvegetated soil in the catchment.
- 7.5 It is recommended that accumulated litter and debris is removed regularly, especially after most autumn/winter leaf fall has occurred.



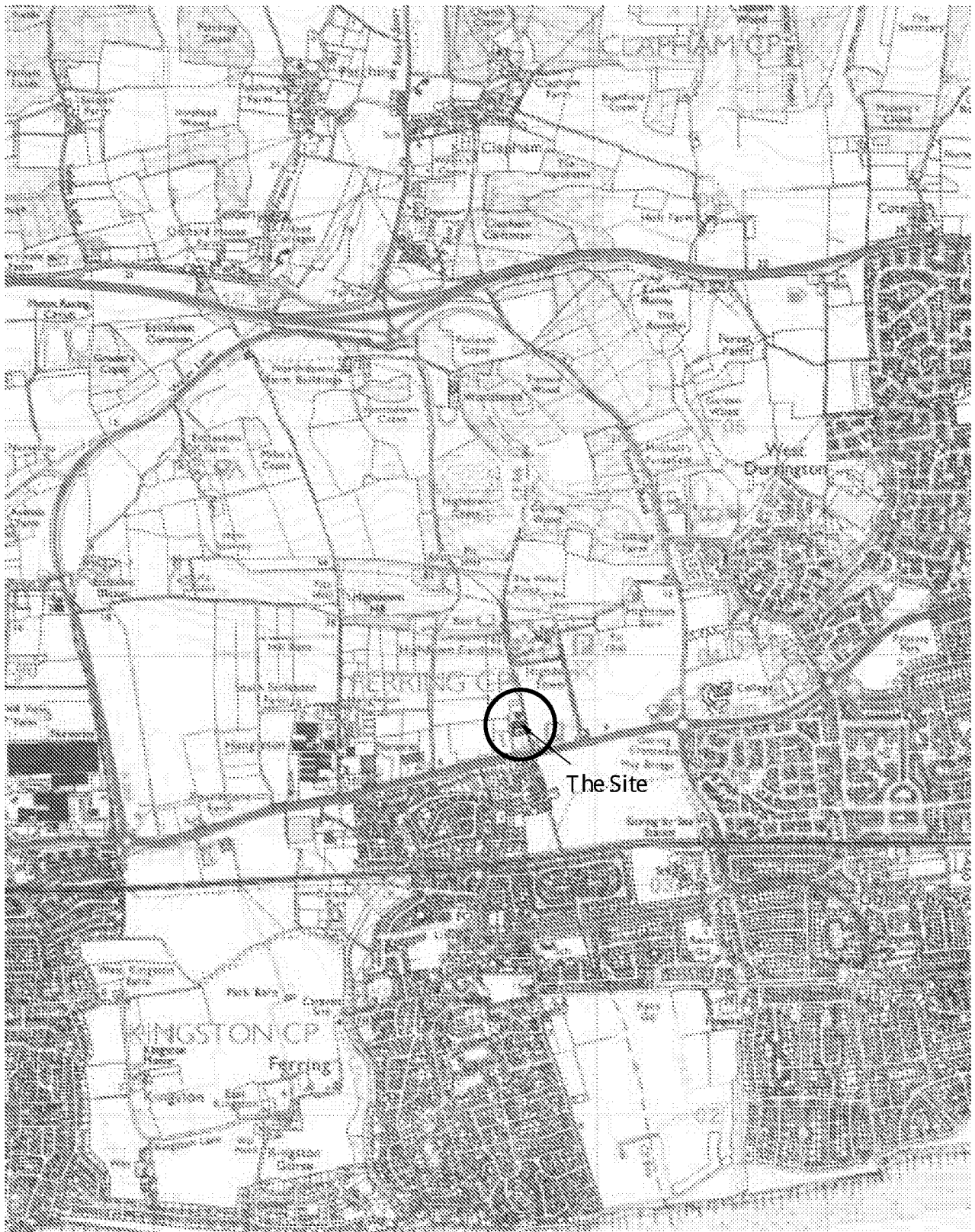
APPENDIX A: FIGURES

Figure 1: Site Location Plan

Figure 2: Existing Site Layout

Figure 3: Proposed Redevelopment

Figure 4: Proposed Drainage Scheme



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Figure 1: Site Location Map

Scale 1:25000

August 2021

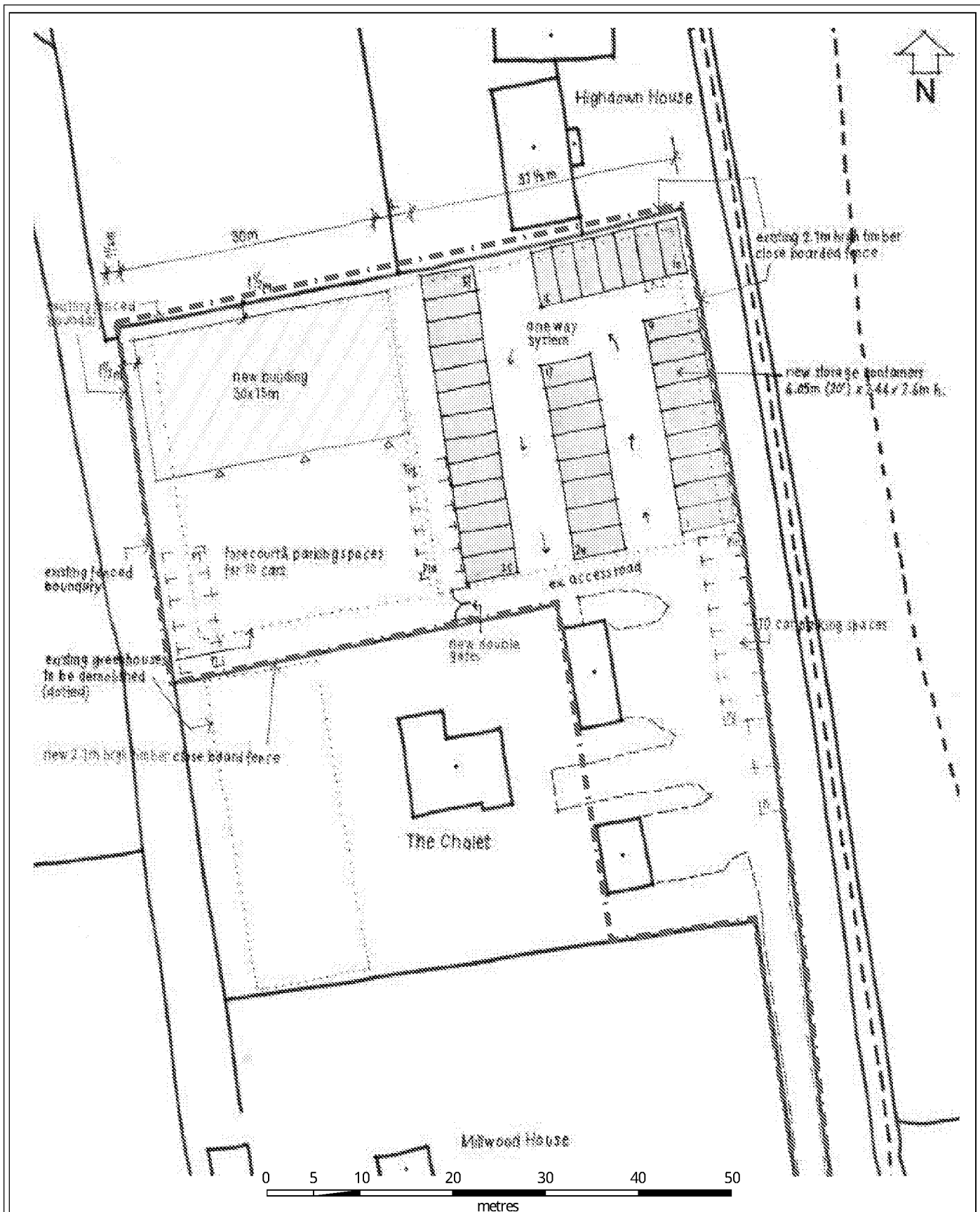


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Figure 2: Existing Site Layout

Scale as shown

August 2021



Scale as shown

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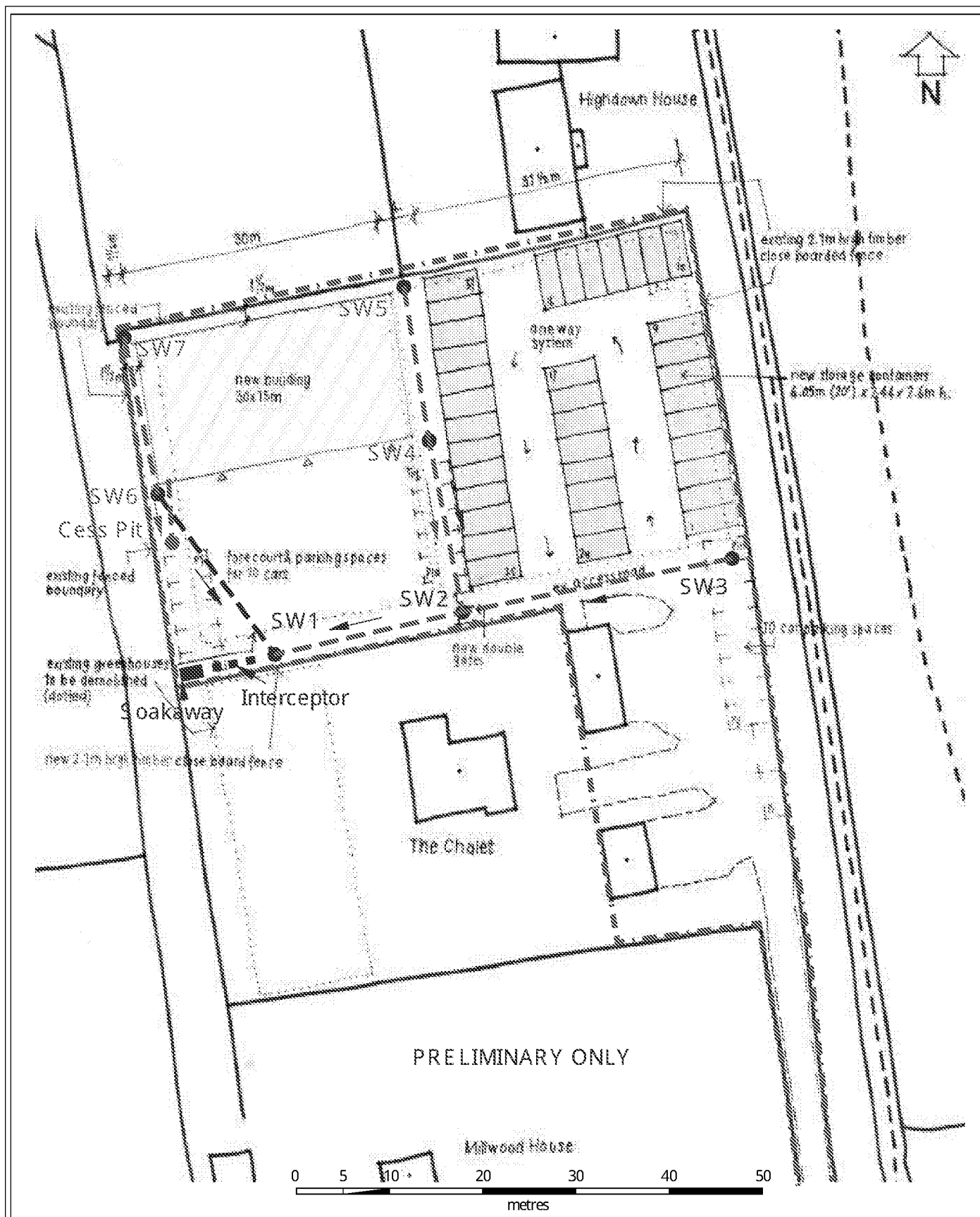
THE CHALET, LITTLEHAMPTON ROAD, FERRING

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Figure 3: Proposed Redevelopment

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Figure 4: Proposed Drainage Scheme

Scale as shown

August 2021

APPENDIX B

Flood Risk Maps

Flood map for planning

Your reference
The Chalet

Location (easting/northing)
509662/103653

Created
1 Sep 2021 11:50

Your selected location is in flood zone 1, an area with a low probability of flooding.

This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence **which** sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2021 OS 100024198. ht

Flood map for planning

Your reference

The Chalet

Location (easting/northing)

509662/103653

Scale

1:2500

Created

1 Sep 2021 11:50



Selected point



Flood zone 3



Flood zone 3: areas
benefitting from flood
defences



Flood zone 2



Flood zone 1



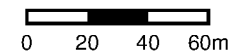
Flood defence



Main river



Flood storage area



Page 2 of 2

APPENDIX C

UK Sustainable Drainage (UKSUDS) Calculations (Greenfield Runoff Rate)

Calculated by:	Malcolm McKemey
Site name:	The Chalet
Site location:	Ferring

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	50.82204° N
Longitude:	0.44462° W
Reference:	1426240028
Date:	Aug 26 2021 17:15

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	0.515
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Methodology

Q _{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	718	718
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q _{BAR} (l/s):	0.97	0.97
1 in 1 year (l/s):	0.82	0.82
1 in 30 years (l/s):	2.22	2.22
1 in 100 year (l/s):	3.08	3.08
1 in 200 years (l/s):	3.62	3.62

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

APPENDIX D

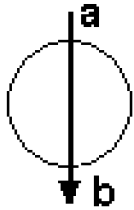
MasterDrain Model Output

Environmental Assessment Services Ltd London Rd, Hickstead Haywards Heath, West Sussex, RH17 5LZ		Job No. 445		
		Sheet no. 1		
		Date 03/09/21 12:00		
Project The Chalet, Ferring		By MDM	Checked	Reviewed
Title Manhole printout for FERRING.SW				

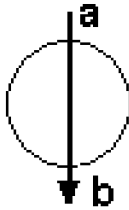
Manhole ref.	X ref	Y ref	Form	Cham diam or length	Rect. width	Chamb. height	Shaft height	MH Volume	Exit Diam	Exit Crown	Exit Invert	Chamb const	Slab level	Cover Level	Dwnstr MH
SW8	73.28	49.85	circ	1200	N/A	1.64		1.85	150	7.935	7.760	N/A	7.710	9.400	SW2
SW5	38.51	77.59	circ	1200	N/A	0.70		0.79	100	8.925	8.800	N/A	8.750	9.500	SW4
SW4	40.88	62.49	circ	1200	N/A	0.82		0.93	150	8.855	8.680	N/A	8.630	9.500	SW2
SW2	44.55	44.26	circ	1200	N/A	1.73		1.96	225	7.720	7.470	N/A	7.420	9.200	SW1
SW7	9.20	71.84	circ	1200	N/A	0.70		0.79	100	9.145	9.020	N/A	8.970	9.720	SW6
SW6	11.91	56.61	circ	1200	N/A	0.50		0.57	150	9.075	8.900	N/A	8.850	9.400	SW1
SW1	24.26	39.26	circ	1200	N/A	0.74		0.84	225	8.610	8.360	N/A	8.310	9.100	Int Soak

All manholes to be as per 'Sewers for Adoption'

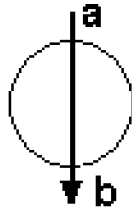
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				Date 03/09/21 12:00		
Project The Chalet, Ferring				By MDM	Checked	Reviewed
Title Manhole printout for FERRING.SW						



MH = SW3
a=head
b = 150

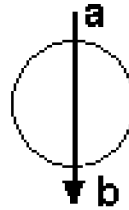


MH = SW5
a=head
b = 100

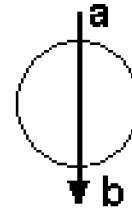


MH = SW4
a= 100
b = 150

MH = SW2
a= 150
b = 225
c = 225



MH = SW7
a=head
b = 100



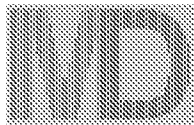
MH = SW6
a= 100
b = 150

MH = SW1
a= 225
b = 225
c = 225

Environmental Assessment Services Ltd h [REDACTED]		London Rd, Hickstead Haywards Heath, West Sussex, RH17 5LZ [REDACTED]		Job No. 445	
				Sheet no. 3	
				Date 03/09/21 12:00	
Project The Chalet, Ferring				By MDM	Checked
Title Manhole printout for FERRING.SW					Reviewed

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) Chamber 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



MasterDrain
SW

Environmental Assessment Services Ltd

London Rd, Hickstead
Haywards Heath,
West Sussex, RH17 5LZ

uk

Job No.	445		
Sheet no.	1		
Date	01/09/21		
By	Checked	Reviewed	
MDM			

Project The Chalet, Ferring

Title Hydrograph storage analysis (Winter profile) for Ferring

Data: -

Location = Ferring Grid reference = TQ0903
 M5-60 (mm) = 20 r = 0.36
 Soil index = 0.40 SAAR (mm/yr) = 720
 Return period = 100 WRAP = 3
 UCI = 0.0 Climate change = +40%

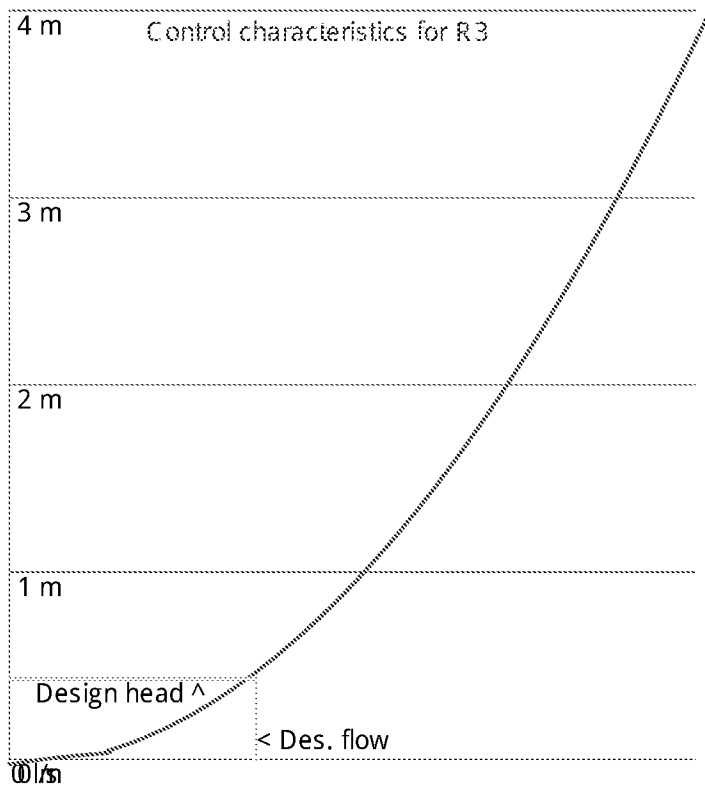
- i) Relatively impermeable soils in boulder and sedimentary clays, and in alluvium especially in eastern England;
- ii) Permeable soils with shallow ground water in low-lying areas;
- iii) Mixed areas of permeable and impermeable soils, in approximately equal proportions.

Percentage runoff = 95.0% (manual setting)

Imperv. area = 3200 m² Pervious area = 0 m²
 Total area = 3200 m² Equiv area = 3040 m² (Tot. area x % runoff).
 Total runoff = 378.5 m³ Discharge rate = 2.000 l/s

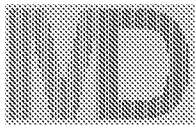
Design Head = 0.5m Peak flow = 2.00 l/s
 Control device = R3 Orifice diam = 47.0 mm
 Max. calc. depth = 0.5 m Available depth = 0.0 m
 Mean discharge = 0.51 l/s

Available system storage = 0.00 m³ under a system plane at the design head level.
 Offline storage = 0.0 m³
 Total storage = 290.0 m³ Peak input flow = 10.95 l/s



Head (m)	Flow (l/s)	Head (m)	Flow (l/s)
0.01	0.04	2.01	4.01
0.05	0.49	2.05	4.05
0.10	0.89	2.10	4.10
0.15	1.10	2.15	4.15
0.20	1.26	2.20	4.20
0.25	1.41	2.25	4.24
0.30	1.55	2.30	4.29
0.35	1.67	2.35	4.34
0.40	1.79	2.40	4.38
0.45	1.90	2.45	4.43
0.50	2.00	2.50	4.47
0.55	2.10	2.55	4.52
0.60	2.19	2.60	4.56
0.65	2.28	2.65	4.60
0.70	2.37	2.70	4.65
0.75	2.45	2.75	4.69
0.80	2.53	2.80	4.73
0.85	2.61	2.85	4.77
0.90	2.68	2.90	4.82
0.95	2.76	2.95	4.86
1.00	2.83	3.00	4.90
1.05	2.90	3.05	4.94
1.10	2.97	3.10	4.98
1.15	3.03	3.15	5.02
1.20	3.10	3.20	5.06
1.25	3.16	3.25	5.10
1.30	3.22	3.30	5.14
1.35	3.29	3.35	5.18
1.40	3.35	3.40	5.22
1.45	3.41	3.45	5.25
1.50	3.46	3.50	5.29
1.55	3.52	3.55	5.33
1.60	3.58	3.60	5.37
1.65	3.63	3.65	5.40
1.70	3.69	3.70	5.44
1.75	3.74	3.75	5.48
1.80	3.79	3.80	5.51
1.85	3.85	3.85	5.55
1.90	3.90	3.90	5.59
1.95	3.95	3.95	5.62
2.00	4.00	4.00	5.66

Calculation data provided by Crown Water Ltd, SL5 7NF



MasterDrain
SW

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Job No.
445

Sheet no. **2**

Date **01/09/21**

Project **The Chalet, Ferring**

Title **Hydrograph storage analysis (Winter profile) for Ferring**

By
MDM

Checked

Reviewed

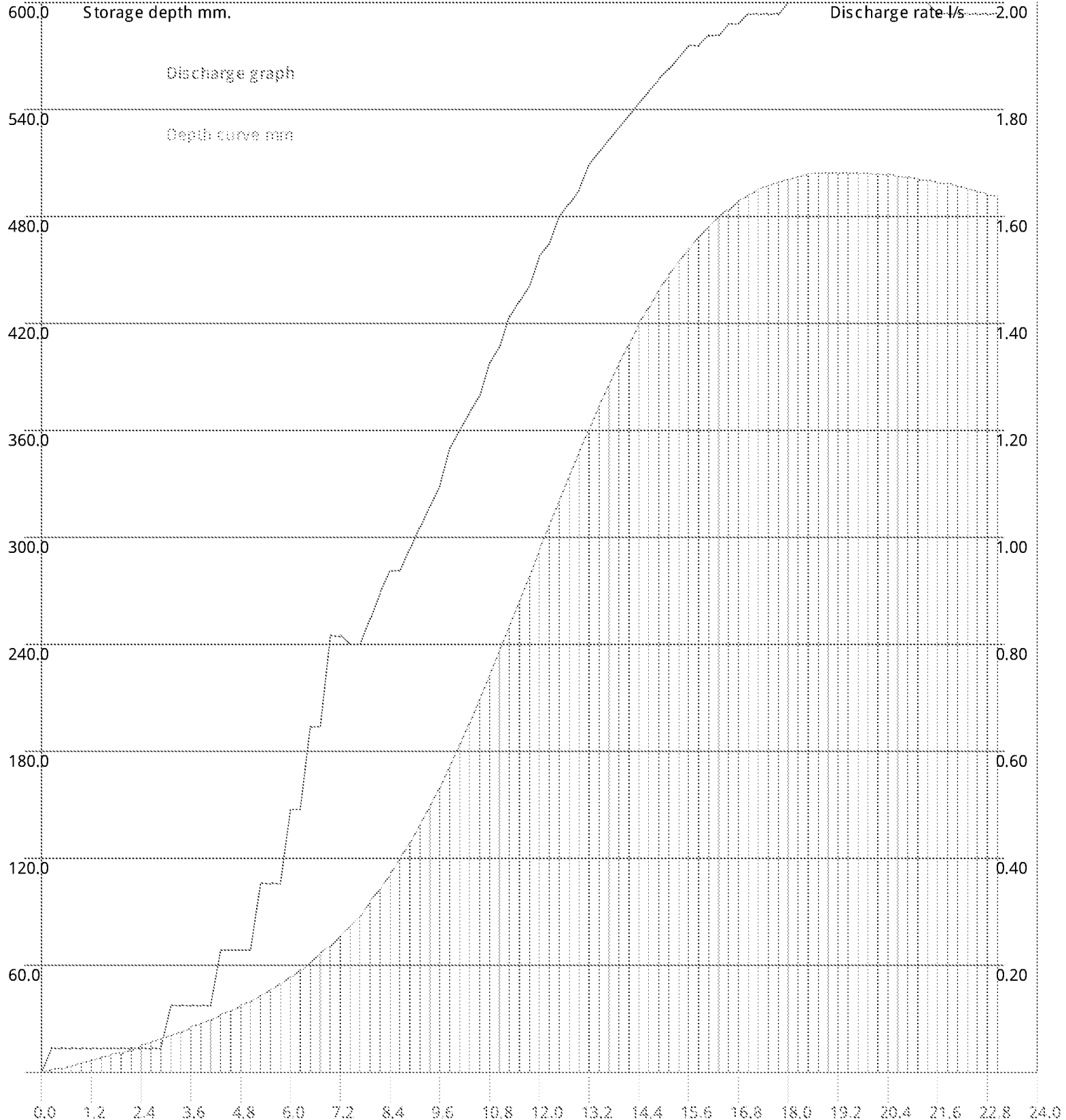
Storage curves for a 24 hours storm.

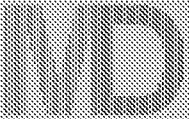
Storage depth mm.

Discharge rate l/s

Discharge graph

Depth curve mm





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Sheet no.

Date	01/09/21
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Project The Chalet, Ferring

Title	Hydrograph storage analysis (Winter profile) for Ferring
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By	MDM
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Checked

Reviewed

Incremental rainfall figures.

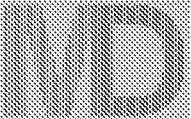
Storm Mins	Storage Depth mm	Control Flow l/s	Storm Mins	Storage Depth mm	Control Flow l/s
14.4	1.3	0.04	734.4	306.4	1.55
28.8	2.5	0.04	748.8	320.3	1.60
43.2	3.8	0.04	763.2	334.1	1.62
57.6	5.2	0.04	777.6	347.6	1.65
72.0	6.5	0.04	792.0	360.8	1.70
86.4	8.0	0.04	806.4	373.4	1.72
100.8	9.5	0.04	820.8	385.6	1.74
115.2	11.1	0.04	835.2	397.3	1.77
129.6	12.8	0.04	849.6	408.5	1.79
144.0	14.6	0.04	864.0	419.2	1.81
158.4	16.6	0.04	878.4	429.1	1.83
172.8	18.6	0.04	892.8	438.3	1.85
187.2	20.7	0.12	907.2	446.9	1.88
201.6	22.7	0.12	921.6	454.8	1.90
216.0	24.9	0.12	936.0	462.0	1.92
230.4	27.2	0.12	950.4	468.5	1.92
244.8	29.5	0.12	964.8	474.4	1.94
259.2	32.0	0.23	979.2	479.7	1.94
273.6	34.4	0.23	993.6	484.2	1.96
288.0	37.0	0.23	1008.0	488.2	1.96
302.4	39.8	0.23	1022.4	491.7	1.98
316.8	42.9	0.35	1036.8	494.6	1.98
331.2	46.1	0.35	1051.2	497.2	1.98
345.6	49.6	0.35	1065.6	499.2	1.98
360.0	53.4	0.49	1080.0	500.9	2.00
374.4	57.3	0.49	1094.4	502.3	2.00
388.8	61.6	0.65	1108.8	503.3	2.00
403.2	66.1	0.65	1123.2	504.1	2.00
417.6	71.1	0.81	1137.6	504.5	2.00
432.0	76.3	0.81	1152.0	504.8	2.00
446.4	81.9	0.80	1166.4	504.7	2.00
460.8	88.2	0.80	1180.8	504.5	2.00
475.2	95.2	0.85	1195.2	504.1	2.00
489.6	102.7	0.89	1209.6	503.7	2.00
504.0	110.7	0.94	1224.0	503.2	2.00
518.4	119.4	0.94	1238.4	502.6	2.00
532.8	128.7	0.98	1252.8	501.8	2.00
547.2	138.5	1.02	1267.2	501.0	2.00
561.6	148.9	1.06	1281.6	500.1	2.00
576.0	160.0	1.10	1296.0	499.1	1.98
590.4	171.7	1.17	1310.4	498.1	1.98
604.8	183.8	1.20	1324.8	496.9	1.98
619.2	196.3	1.23	1339.2	495.6	1.98
633.6	209.2	1.26	1353.6	494.2	1.98
648.0	222.5	1.33	1368.0	492.8	1.98
662.4	236.1	1.36	1382.4	491.3	1.98
676.8	250.0	1.41	1396.8	489.7	1.96
691.2	264.1	1.44	1411.2	488.1	1.96
705.6	278.2	1.47	1425.6	486.5	1.96
720.0	292.3	1.52	1440.0	484.9	1.96

Using the Get Max button causes the program to step through a series of storm durations until a maximum volume is obtained.

Each duration is sampled 600 times and the results recorded. The storm durations (hrs) are:-

0.25, 0.5, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15, 18, 20, 24, 30, 36, 42, 48, 54, 60, 66, 72, 84, 96, 120, 150, 175, 200, 250, 300, 375, 500, 750, 1000, 1250, 1500, 1570, 2000, 2500, 3000, 3500, 4000

It should be noted that the six hour storm frequently requested rarely demonstrates the worst case for storage.



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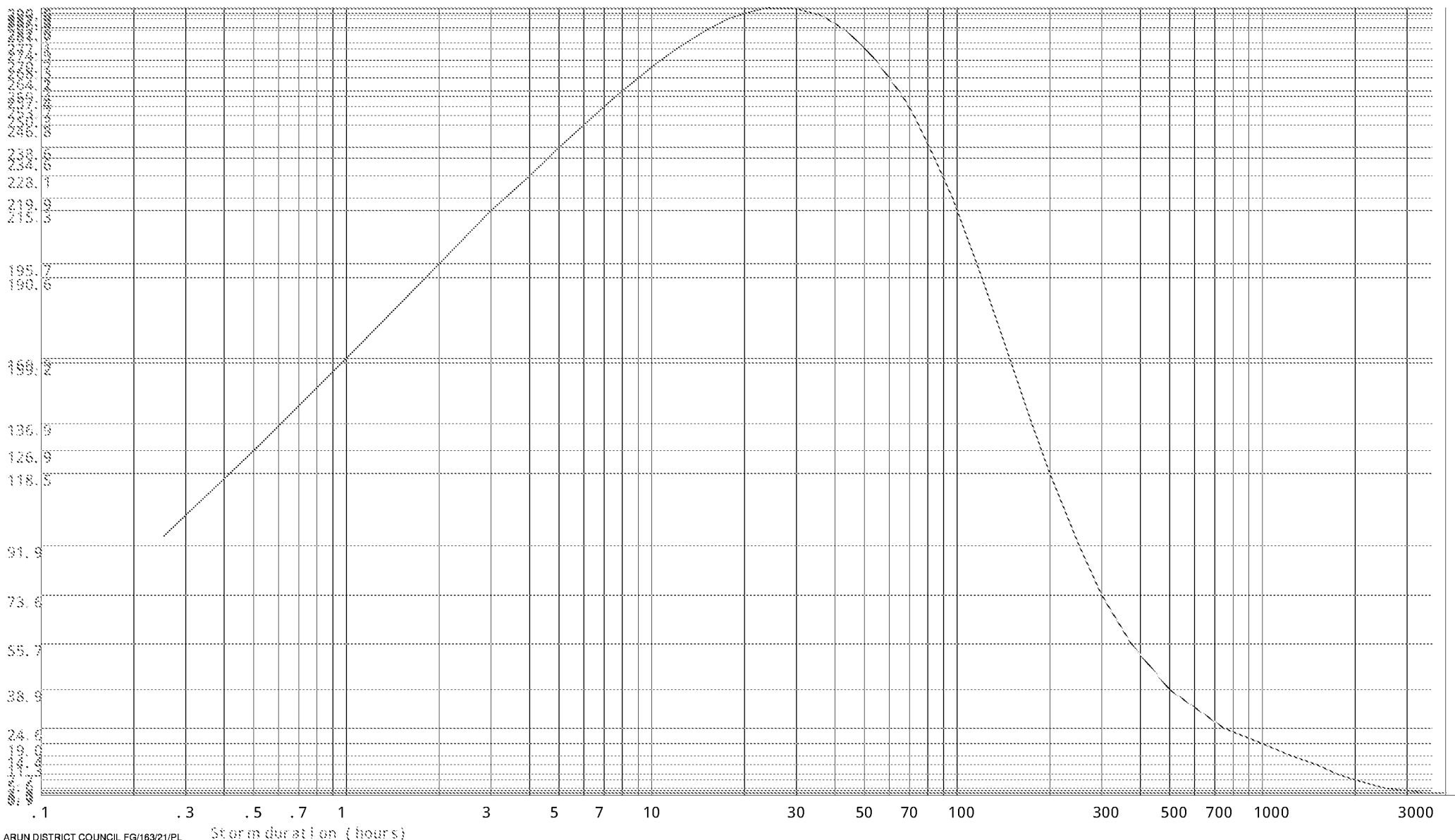
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West Sussex, RH17 5LZ

Job No. 445		
Sheet no. 4		
Date 01/09/21		
By MDM	Checked	Reviewed

Project The Chalet, Ferring
Title Hydrograph storage analysis (Winter profile) for Ferring

Sequential storage volume at specific storm durations.

RE



APPENDIX E

Photographs



Photo 1: The existing nursery glasshouses showing drainage.



Photo 2: Existing informal soakaway on western boundary.



Photo 3: Glasshouse interior.



Photo 4: Concrete gully.

APPENDIX F

Management Maintenance Plan

MAINTENANCE MANAGEMENT PLAN

F1 **Initial maintenance:**

- F1.1 On completion of the development, all chambers and pipework for the surface water drainage should be checked and de-silted as necessary. Any remaining areas of bare ground within the surface water drainage catchment should be planted/seeded or surfaced to minimise loose soil washing into the drainage system.
- F1.2 On the first late November/December following completion of the development (after most leaf fall has occurred), all gullies and chambers should be de-silted and cleared of debris.

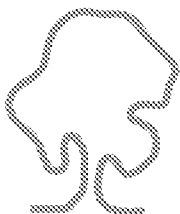
F2 **Annual maintenance:**

- F2.1 Annual maintenance should generally be carried out after late November when most leaf fall will have occurred. If siltation and debris blockage is found to be excessive, more frequent maintenance may be indicated.
- F2.2 Annual maintenance will comprise:
- Checking all chamber covers and frames for damage and fit.
 - Checking all gully gratings for damage and fit.
 - De-silting and removing debris from all chambers and gully pots.
 - Removing oily build-up and sludge from the interceptor.

F3. **Responsibility for carrying out the Maintenance Management Plan:**

- F3.1 The developer/contractor will be responsible for the initial maintenance and the annual maintenance up to the end of any maintenance or guarantee period.
- F3.2 After the end of the maintenance or guarantee period, it will become the responsibility of the hospital management and maintenance organization.
- F3.3 A record of all maintenance work carried out should be kept as part of the Maintenance Management Plan.





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