Technical Note

Preliminary Drainage Strategy for Proposed Residential Development at 74 Old Shoreham Road (SA51464_TN1)

Issue 1.0 – 09.05.25
Issue 1.1 – 20.02.26

1. Introduction

1.1 This Preliminary Drainage Strategy will set out the proposed measures to collect, treat, convey, attenuate, and discharge surface water for the proposed development using Sustainable Urban Drainage (SuDS) principles and methods, along with discussing the proposed foul drainage system. The current proposals comprise of constructing a new residential development for ten dwellings on land laying to the rear of 74 Old Shoreham Road, Lancing, BN15 0QZ.

1.2 This revised edition of the Preliminary Drainage Strategy has been prepared due to minor changes made to the preliminary drainage design to accommodate the latest Biodiversity Net Gain metrics calculations. The proposed SuDS and flood risk management scheme has now been amended to replace some of the flood risk filter drains to open ditches within open space areas of the site, and to replace the piped outfall from the SuDS to a reed bed swale type structure. These interventions have been made to enhance the provision of wetland habitat on the development. A slight change has been made to the attenuation tank location in order to accommodate these changes.

1.3 The preliminary drainage strategy has been produced to demonstrate how the drainage for the proposed development will be designed, constructed, and maintained, in accordance with national policy, the Adur & Worthing Councils Supplementary Requirements for Surface Water Drainage Proposals, the West Sussex County Council SuDS design guidance, and CIRIA C753 The SuDS Guide.

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1.4 This Technical Note (including any attachments) has been prepared with care and due diligence in relation to the drainage strategy for the phase 2 development at 74 Old Shoreham Road and solely for the purpose for which it is provided. Unless we provide express prior written consent, no part of this report should be reproduced, distributed or communicated to any third party. We do not accept any liability if this report is used for an alternative purpose from which it is intended, nor to any third party in respect of this report.

1.5 The proposed development is located on greenfield land which appears to have been used as a livestock paddock in past years. Ordinary watercourses pass along the southern and eastern site boundaries. The land sits on the outer edge of a coastal lowland area, so the watercourses provide drainage for surface water and groundwater flows. The site is located within an area which is protected by two separate systems of coastal flood defences and also in an area with groundwater pumping. Refer to the FRA by Herrington for further details. Existing site levels range between approximately 1.44mAODN at the lowest recorded water level of the watercourse, up to a level of 2.5mAODN at Old Shoreham Road.

1.6 Access to the site is being gained through a corridor of land which is proposed to be created via the demolition of the existing dwelling at 74 Old Shoreham Road.

1.7 This preliminary drainage strategy is intended to demonstrate to the local planning authority (LPA) and to the lead local flood authority (LLFA) that surface water and foul wastewater from the development can be disposed of to meet local and national policy requirements. This report will discuss the known potential options available for suitable drainage systems. We will also discuss the measures proposed to manage off-site surface water flood exceedance flows. Through our investigations we are satisfied that the site can be drained via routes of connection within the applicant's control and all flood risk issues have been considered and appropriately managed. Therefore, all material issues with regards to drainage have been dealt with. Provided that the application is approved, further work will be carried out at the detailed design stage to determine the detail of the most appropriate system to drain the development and we anticipate that approval of the development proposals would be subject to a pre-commencement detailed drainage condition.

Desktop Study

1.5 A site desktop study has been undertaken to ascertain the nature of the existing underlying ground at the site. Publicly available data from the British Geological Survey (BGS) mapping services has been used to obtain details of the underlying bedrock and superficial deposits. The Defra Magic Map has been consulted to check for any groundwater designations. The LandIS Soilscapes viewer has also been reviewed to check information held of the upper ground layer. Extracts of the data reviewed have been referenced in Appendix A.

1.6 BGS mapping indicates the bedrock geology data as Newhaven Chalk Formation – chalk. Within the BGS Lexicon of Named Rock Units this is described as *'Composed of soft to medium hard, smooth white chalks with numerous marl seams and flint bands, including abundant Zoophycos flints (notably at levels near the base). The formation is known to contain distinct phosphatic chalks of limited lateral extent. Equivalent beds, the Margate Chalk of north Kent, are marl-free and contain little flint.'* The bedrock layer is identified as a Principal aquifer on the Magic Map and is therefore considered to have high permeability and water storage capacity. The recorded superficial deposits by the BGS are Alluvium – clay, silt, sand and peat. Alluvium is a general term for clay, silt, sand and gravel. The Soilscapes map records the upper ground layer as Soilscapes 21: Loamy and clayey soils of coastal flats with naturally high groundwater.

1.7 In reviewing the above desktop assessment, this indicates that the ground underlying the site consists of a likely relatively permeable upper layer of soils and superficial deposits, with the chalk layer below having a lower level of permeability, yet still supporting groundwater storage and flows. We are aware that groundwater levels within the locality have previously breached the surface during wet winters, where the upper superficial ground layers become saturated. It is understood that this occurred due to a combination of the area sitting below the South Downs located to the north and being within the area of tidal influence. Both the bedrock and the superficial ground layer acts as a pathway for groundwater flows towards the coast. However, recent interventions have been made as part of the adjacent New Monks Farm development site to manage local groundwater levels. Groundwater pumping systems have been constructed, along with improvements having been made to the Lancing Ditches network of surface drains and watercourses. The watercourses immediately adjacent to the site connect with this system and therefore benefit directly from the local groundwater control system. Informal anecdotal feedback gained from the system designer is that the interventions are working as expected and the observed local groundwater levels are well below the previous levels recorded, despite near record levels of rainfall observed through the 2022/23 winter.

1.8 Mitigation measures for this development have been proposed within the FRA with regards to groundwater flood risk, with all property flood levels being recommended to be located at a level of at least 3.15mAODN. The levels of groundwater at the site will have an influence on the detailed design of the site SuDS and potential infiltration components, so groundwater level monitoring through the winter months will be required prior to the detailed design stage. This is to check if the winter groundwater levels will reach a critical level of 1m to the invert level of any infiltration components. If this height distance is less than 1m, best practice recommends that an alternative approach should be found to protect water quality. We consider that this is not a material issue at the present planning stage, as an alternative method of surface water disposal is available, as will be discussed further in the report.

1.9 Ring Infiltrometer testing has been conducted at the site by Peter Baxter Associates, which is referred within the FRA. This testing indicates a potential for good rates of infiltration at the site. However, this method of testing is not suitable for informing the design of SuDS infiltration components and therefore BRE Digest 365 testing is required alongside the groundwater monitoring at the detailed design stage. Whilst we consider that the site does have the potential to support drainage of surface water to soakaways and unlined permeable surfaces, a drainage strategy has been based upon a worst-case scenario of high levels of groundwater and/or poor infiltration rates.

Existing Drainage and Hydrology

1.10 The existing site does not have any known systems of drainage, with exception to the dwelling which has a foul sewer connection and is assumed to drain surface water to soakaways. These systems are to be abandoned and disconnected when the dwelling is demolished. Within the main site area surface water is believed to drain via a combination of infiltration to groundwater and surface flows to the watercourses.

1.11 The local area is mapped by the Environment Agency as being at risk of surface water flooding, which is explored further in the FRA. Site-specific modelling of surface water flood risk has been carried out. To manage both on site and off site surface water flood risk, measures are required to be provided on site in the form of a network of filter drains to intercept and convey flows to the watercourses. The proposals have been modelled by Herrington and the results of this demonstrate local betterment to surface water flood risk. The proposed surface water flood risk measures are shown on the drawing in Appendix B.

2. Surface Water Drainage

2.1 The proposed SuDS have been assessed in accordance with the drainage discharge hierarchy. The national SuDS standards, CIRIA C753 The SuDS Manual and West Sussex Country Council's SuDS guidance sets out the following hierarchy for discharge of surface water:

- Capture water for reuse
- Discharge into the ground (infiltration)
- Discharge to a surface water body;
- Discharge to a surface water sewer, highway drain or other drain;
- Discharge to combined sewer.

2.2 The opportunity of capturing rainwater through harvesting is to be reviewed at detailed design. As a minimum water butts will be provided for a supply of water for external landscaping. Other potential uses will be explored. Overflows will be provided to the drainage system. At this stage it appears feasible that drainage of surface water via infiltration features may be possible, subject to groundwater level monitoring and BRE Digest 365 soakaway testing prior to detailed design. Provided that winter ground water levels are sufficiently lower than the invert level of soakaway structures (as least 1m clearance is required) and infiltration rates are sufficient, then surface water will be drained via permeable pavements and shallow soakaway structures. However, we consider it possible that due to local elevated groundwater levels that it may not be possible to design a complaint system based wholly around infiltration. Therefore at this stage, a preliminary design has been based around the worst-case scenario of requiring a controlled discharge to the watercourse on site. The system has been designed with under-drained permeable pavements, which can be lined or unlined, depending upon the findings of the groundwater monitoring. Therefore, a hybrid system is possible.

2.3 The proposed SuDS preliminary design is provided in Appendix B.

2.4 The proposed SuDS components have been selected to maximise the opportunities for upstream treatment of surface water, whilst working with the site constraints. Permeable surfaces will be provided for the private access road and the parking bays, providing source control and treatment at source. We point out that the level of fall available across the site is relatively shallow and therefore the system has been designed with filter drains below permeable road and parking bay construction. The advantages of using filter drains for the conveyance of surface water is that these can be laid to very flat gradients, which provide water treatment benefits and provide upstream attenuation storage. Furthermore, this system can utilise partial infiltration provided that groundwater levels allow this. This will mean that interception for short duration rainfall events will convey surface water to groundwater and only longer duration events will result in runoff via the piped system. This will be assessed and corroborated further at detailed design.

2.5 Connection points have been indicated for the plot drainage, but further consideration of the plot systems is needed at the detailed design stage. There could be an opportunity to provide rain gardens to manage roof water. Note that sumps will be need to be provided upstream of any entry points to the filter drain network to manage silt and debris. It is intended that the plot private drives will be permeable paving, discharging to groundwater or an under drain, pending further testing at detailed design.

2.6 The proposed system of carrier drains connect with a vortex flow control chamber which is to be constructed with a central weir wall with a level set below the lowest cover level of the system, but above the modelled 1 in 100 year plus climate change water level. The weir wall provides a system of internal exceedance control, allowing flows to bypass the flow control system and therefore providing a failsafe against flood risk and blockage.

2.7 Attenuation has been provided in the form of the filter drains and an offline attenuation cell. The system is proposed to discharge to the Lancing Ditches watercourse running along the southern site boundary, which is within riparian ownership of the applicant. A reed bed swale/channel is to be constructed to convey flows from the flow control chamber to the Lancing Ditches watercourse, providing a further level of treatment to the system. Note that a flap valve will be required on the outlet of the flow control device to prevent backflows of floodwater into the system. Further assessment of downstream flood levels is to be carried out at the detailed design stage, but we are satisfied that this can be managed.

2.8 Note that the above detailed are to be reviewed at the detailed design stage following the groundwater level assessment and the BRE Digest 365 testing. Where possible, the drainage of surface water will be to infiltration components as a priority.

Hydraulic Calculations

2.9 The proposed SuDS network has been assessed and modelled using Causeway Flow hydraulic modelling software. IH124 rainfall methodology has been used. Modelling has been carried out to ensure all drainage features convey the following storm periods without any flooding:

- 1 in 1
- 1 in 30
- 1 in 100 + 45% climate change

2.10 Impermeable areas for the proposed development have been assessed, with an allowance for 10% urban creep applied to the plot roof areas. The total drained area of the site is calculated to be 2,150m2, with an overall site area of 5,965m2. These calculations can be found in Appendix C. Greenfield runoff rates have been calculated in Flow software based around the positively drained area using the IH124 method, as shown in Figure 1 below.

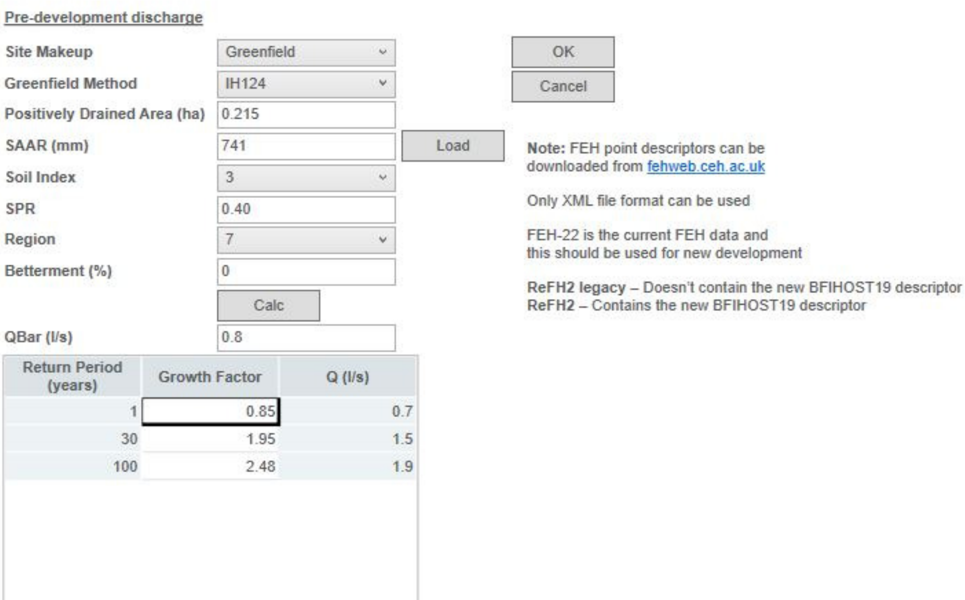

Figure 1: calculated greenfield runoff rates using the IH124 Method in Flow software.

2.11 Taking the above calculated flows, the system has been designed using a 1.9l/s 1.0m head depth Hydrobrake flow control device, as we consider this to be lowest practical rate of discharge. The rates of discharge require further review at detailed design. The hydraulic model for the preliminary system can be found in Appendix D. The system has been designed to manage all flows without flooding up to and including the 1 in 100 year plus 45% climate change event.

2.12 Note that the lead local flood authority (LLFA) SuDS proforma has been completed and is included in Appendix E.

Exceedance Flows

2.13 Exceedance routing is shown on the drainage strategy drawing. Infrastructure is proposed to manage off site exceedance flows in the form of filter drains placed at appropriate points to intercept flows. On site exceedance flows will be managed in the form of site level designs to convey surface flows towards the watercourses and via internal exceedance routing, as discussed in paragraph 2.6.

SuDS Management and Maintenance

2.14 A single management company (owned and managed by the property owners) will own and manage the site communal areas, the shared surface water drain, and the surface water flood risk filter drains. Therefore, the respective SuDS maintenance will fall under the control of the management company. A sinking fund will be required to be set up to provide a budget for the maintenance costs.

2.15 Correct maintenance of the drainage system is key to reducing flood risk and ensuring the drainage system operates efficiently, whilst sufficiently treating surface water run-off. The proposed SuDS have been designed to minimise maintenance liabilities, which will therefore reduce local flood risk. Refer to the below list for maintenance matters, referencing each SuDS type:

- Permeable paving, annual visual inspection of paving for debris, silt and vegetation, which is to be removed as required. In the unlikely event that ponding occurs, cleaning with specialist high pressure water jetting or vacuuming will be required. Paving to be brushed a minimum of once annually, this activity should normally be carried out following the autumn. If the surface is clogged a more specialist sweeper with water jetting and oscillating brushes may be required. Jointing grit shall be replenished as required to maintain filtration potential and structural integrity of the paving.

- Sump chambers, to be checked initially at 3 monthly periods to determine the depth of silt. If silt build-up is low, then the checks can be twice annually (silt to be emptied upon inspection).

- Flow control 'Hydro-Brake', monthly inspection within the chambers to ensure features are operational and clear of litter and debris. 6 monthly inspections will likely see the removal of sediment.

- Surface filter drains, clearance of debris and inspection for siltation annually. If siltation occurs at upper surface level, stone to be removed and replaced.

- Ditches and reed beds, a clear maintenance and management schedule will be produced by working in collaboration with the ecology consultant. This is required to ensure that biodiversity opportunities and objectives are achieved, whilst ensuring that flood risk is manged at an appropriate level.

Riparian Ownership and Management

2.16 The applicant has riparian rights for the watercourses running along the southern and eastern site boundaries. Rights therefore exist for the discharge of surface water to these watercourses. Riparian duties require the owners of a watercourse to ensure that the banks and channel are maintained and cleared of any obstructions. A 5m buffer zone has been allowed for within the site layout to allow the watercourse to be maintained. The sections of watercourse owned by the applicant and the corresponding buffer zones will be transferred to the management company. Therefore, riparian duties will transfer to the management company.

3. Foul Drainage

3.1 A Southern Water foul sewer is located in Old Shoreham Road, details of which can be viewed in Appendix F. The preliminary drainage strategy design shown in Appendix B includes a new Section 104 adoptable sewer passing below the site access road, with private lateral drains serving the plots. Note that Section 104 and Section 106 sewer agreements will be required from Southern Water prior to construction.

3.2 We are aware of local sewer flooding issues believed to be a result of groundwater ingress, due to leaks within the system. However, this is not a material consideration for the developer, as a statutory right exists under the Water Industry Act 1991 to communicate with the public sewer. Note that any capacity or other issues with the public sewer network fall under the statutory duties of Southern Water. However, early discussions with Southern Water are advisable prior to commencement of the detailed design process to allow them to plan and implement any improvement works. A developer's enquiry will be submitted during the planning process.

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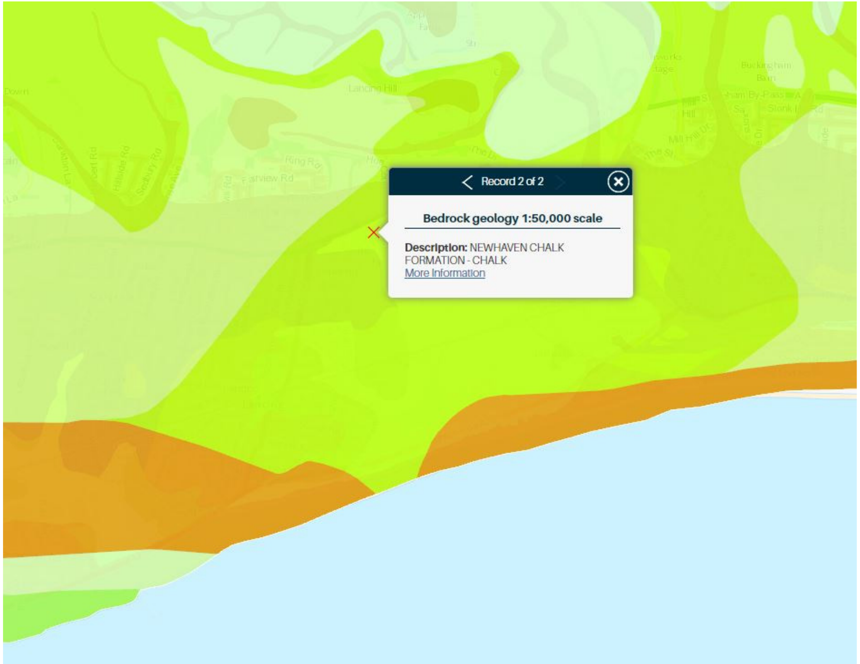
Appendix A – Desktop Assessment Data

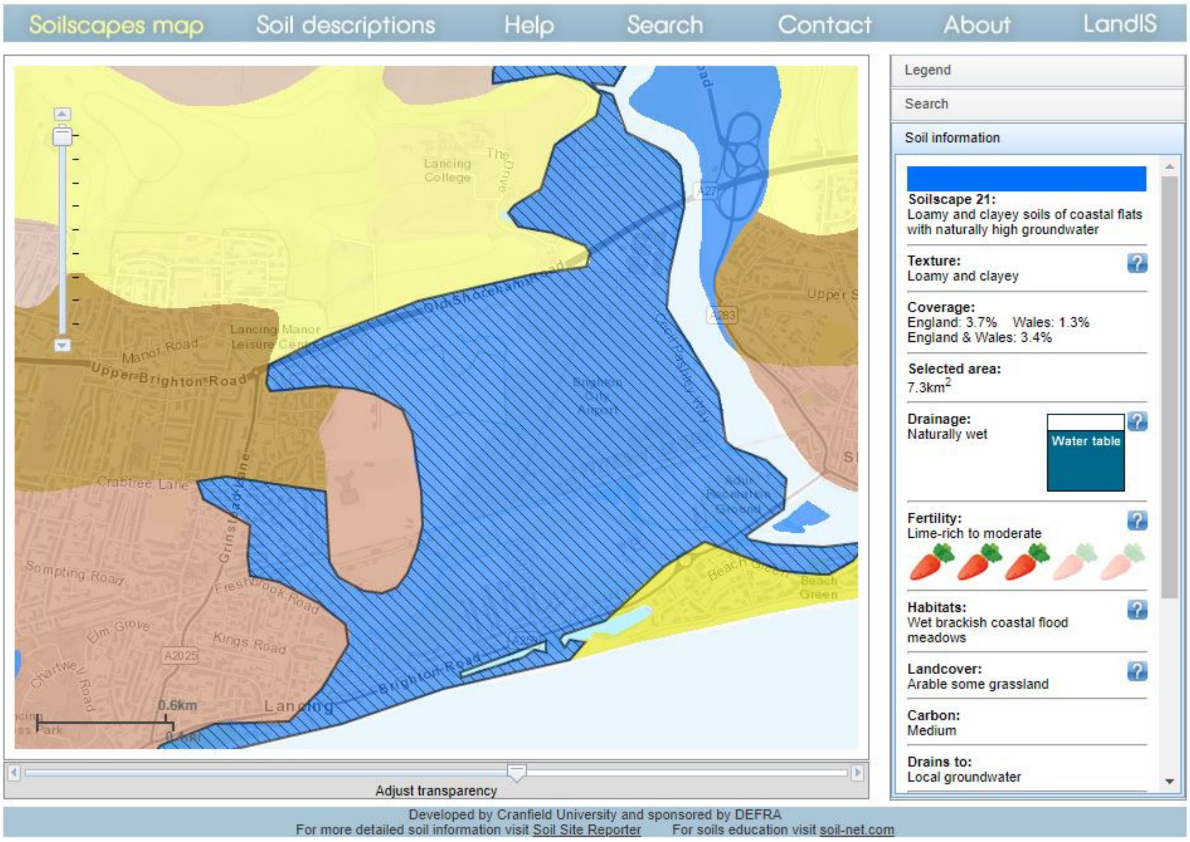
British Geological Society (BGS) https://www.bgs.ac.uk/map-viewers/geoindex-onshore/



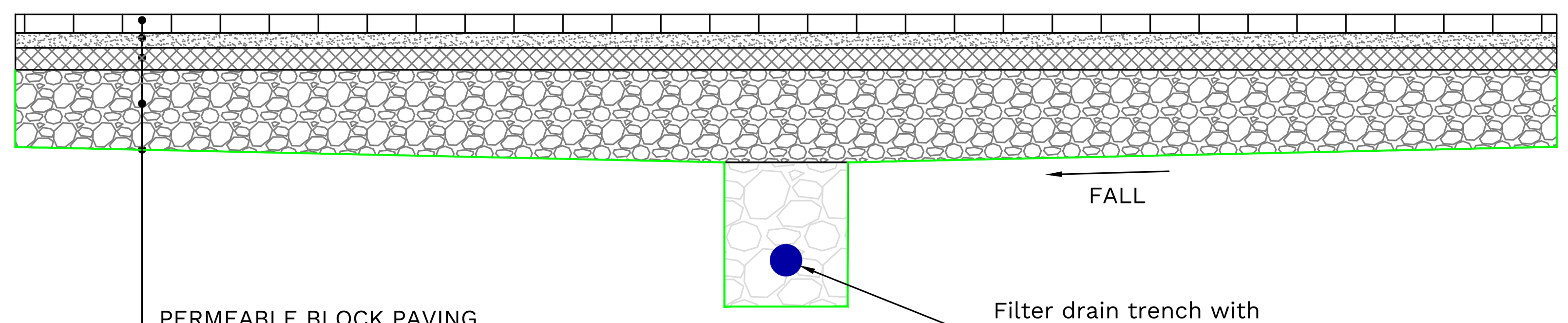
Bedrock geology.

Superficial deposit geology.

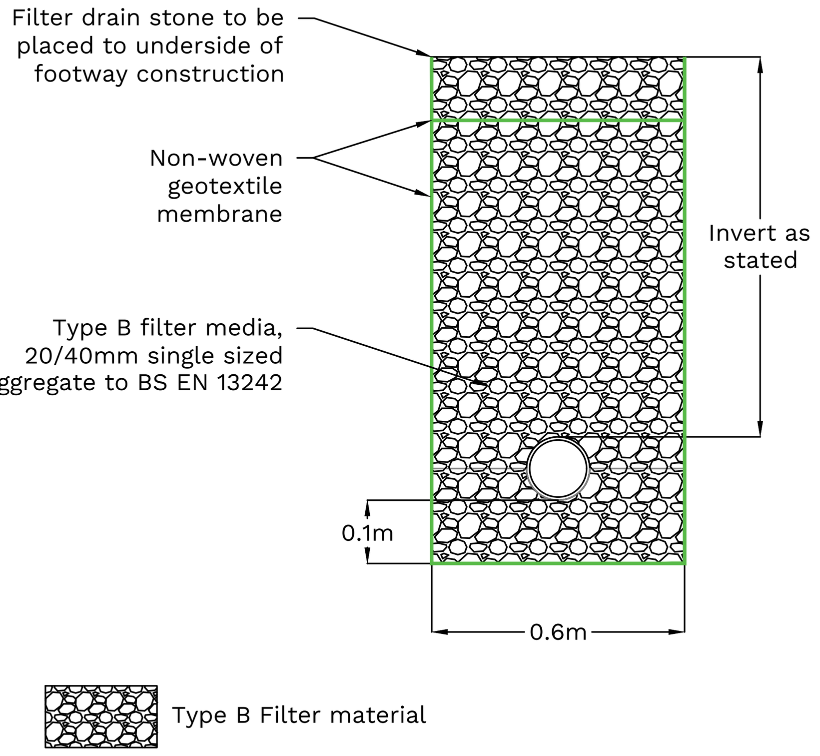
LandIS Soilscapes https://www.landis.org.uk/soilscapes/



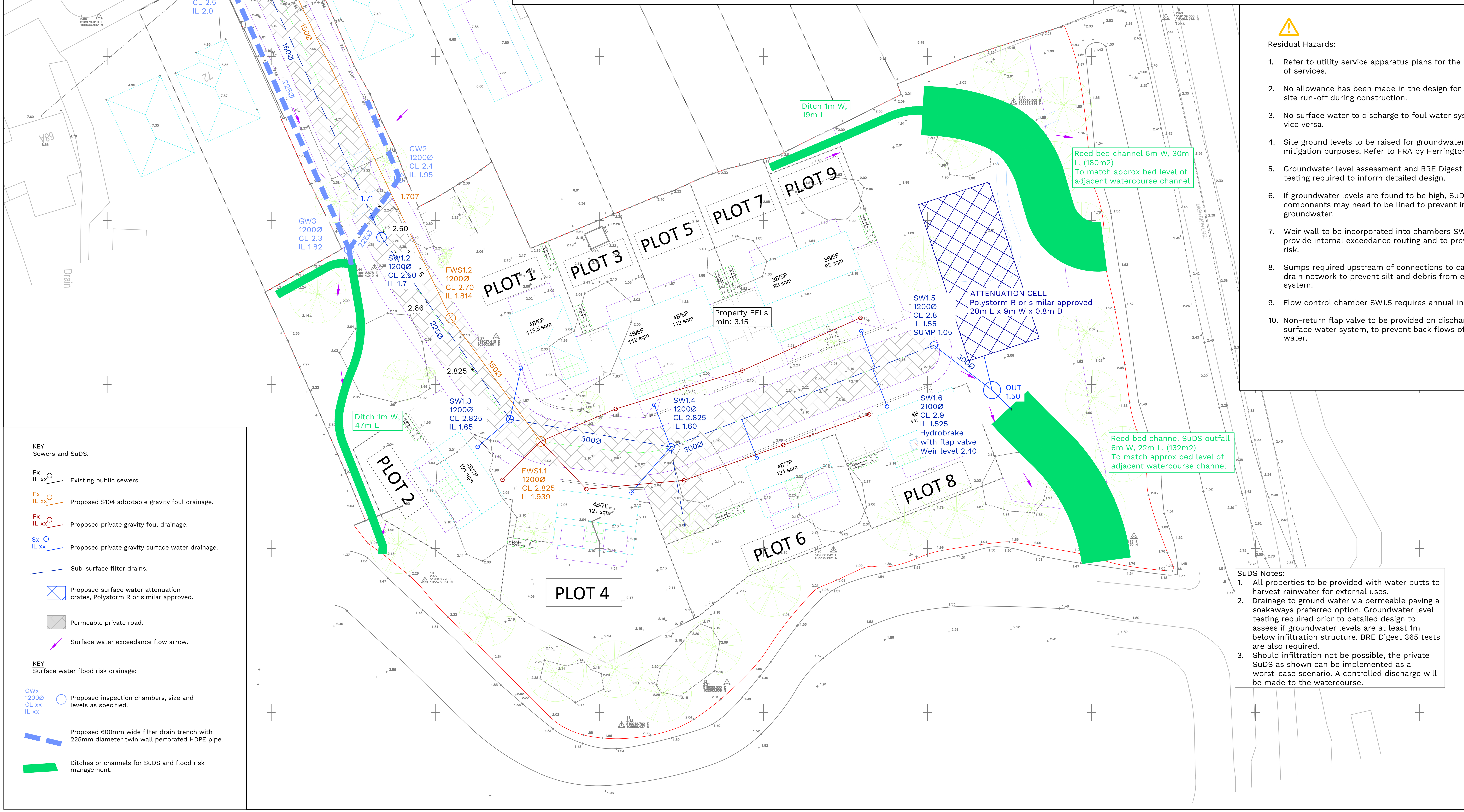
Appendix B – Preliminary Drainage Design



Under-Drained Permeable Access Road
Not to scale



Filter Drain for Surface Water Interception
Not to scale



KEY
Sewers and SuDS:

- Existing public sewers.
- Proposed S104 adoptable gravity foul drainage.
- Proposed private gravity foul drainage.
- Proposed private gravity surface water drainage.
- Sub-surface filter drains.
- Proposed surface water attenuation crates, Polystorm R or similar approved.
- Permeable private road.
- Surface water exceedance flow arrow.

KEY
Surface water flood risk drainage:

- Proposed inspection chambers, size and levels as specified.
- Proposed 600mm wide filter drain trench with 225mm diameter twin wall perforated HDPE pipe.
- Ditches or channels for SuDS and flood risk management.

Residual Hazards:

1. Refer to utility service apparatus plans for the locations of services.
2. No allowance has been made in the design for managing site run-off during construction.
3. No surface water to discharge to foul water system and vice versa.
4. Site ground levels to be raised for groundwater flood risk mitigation purposes. Refer to FRA by Herrington.
5. Groundwater level assessment and BRE Digest 365 testing required to inform detailed design.
6. If groundwater levels are found to be high, SuDS components may need to be lined to prevent inflows of groundwater.
7. Weir wall to be incorporated into chambers SW1.6 to provide internal exceedance routing and to prevent flood risk.
8. Sumps required upstream of connections to carrier filter drain network to prevent silt and debris from entering system.
9. Flow control chamber SW1.5 requires annual inspections.
10. Non-return flap valve to be provided on discharge from surface water system, to prevent back flows of flood water.

SuDS Notes:

1. All properties to be provided with water butts to harvest rainwater for external uses.
2. Drainage to ground water via permeable paving a soakaways preferred option. Groundwater level testing required prior to detailed design to assess if groundwater levels are at least 1m below infiltration structure. BRE Digest 365 tests are also required.
3. Should infiltration not be possible, the private SuDS as shown can be implemented as a worst-case scenario. A controlled discharge will be made to the watercourse.

SCALE BAR & NORTH POINT:

SCALE 1:250

N

General notes:

1. Preliminary drainage strategy, not fit for construction.
2. Refer to supporting Flow drainage model report and Drainage Strategy TN.
3. S104 and S106 agreements needed for foul sewers.
4. Ordinary Watercourse Consent required for construction of proposed discharge swale.
5. Design based around worst-case scenario of elevated groundwater levels and/or low rates of infiltration. Groundwater level assessment and BRE Digest 365 testing required prior to detailed design.

REV	DESCRIPTION	DATE	BY	CHKD
A	SuDS and flood drains updated to provide additional habitat	27.01.26	RH	RH

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ORIGINATING OFFICE:

BERRYS

STATUS: PLANNING

CLIENT: AY Developers Ltd

PROJECT: 74 Old Shoreham Road

DRAWING: Preliminary Drainage Strategy

SCALE @ A1:	DRAWN BY:	CHKD BY:	DATE:
1:250	RH	RH	9.5.25

DRAWING No: SA51464 -BRY-ST -PL- C - 0501 REVISION: A

Appendix C – Preliminary Contributing Area Calculations

CALCULATION SHEET

BERRYS

Project Number:	SA51464	Site:	74 Old Shoreham Rd
Calcs by:	R.Harman	Status (Prelim/Final)	Prelim
Checked by:	R.Harman	Date:	9.5.25

Page X of Y:

Design Element: Preliminary Impermeable Area Calculations

Ref	Calculations	Remarks/Output
	10 no plots. Urban creep factor of 10% to apply to plot roof areas.	
	Roof areas including additional 10% area: 1 x 72m2 - 72m2 4 x 67.8m2 = 271.2m2 4 x 72.7m2 = 290.8m2	**634m2**
	Parking and external paved areas: North plots: 36 + 17 + 53 + 47.8 + 48.6 + 48.9 = 251.3m2 South plots: 50.5 + 53 + 45.8 + 39 = 188.3m2	**439.6m2**
	Private access road and footways: 290 + 234.6 + 150 + 401.7 = 1076.3m2	**1076.3m2**
	Total contributing areas:	**2149.9m2**
	Total site area:	**5965m2**

BERRYS

Appendix D – Flow Hydraulic Model Report

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.300	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
SW1.1	0.029	5.00	2.480	1200	518998.494	105650.404	0.680	1.800
SW1.2	0.000		2.500	1200	519013.437	105617.957	0.800	1.700
SW1.3	0.048	5.00	2.825	1200	519029.112	105595.775	1.175	1.650
SW1.4	0.051	5.00	2.825	1200	519050.065	105592.712	1.225	1.600
SW1.5	0.087	5.00	2.825	1200	519080.773	105604.777	1.275	1.550
SW1.6	0.000		2.900	2100	519087.876	105599.319	1.375	1.525
OUT	0.000		2.000	1350	519090.218	105597.005	0.500	1.500

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)
1.000	SW1.1	SW1.2	35.723	0.600	1.800	1.700	0.100	357.2	150	6.13	43.5
1.001	SW1.2	SW1.3	27.161	0.600	1.700	1.650	0.050	543.2	225	6.95	41.2
1.002	SW1.3	SW1.4	21.176	0.600	1.650	1.600	0.050	423.5	300	7.42	40.0
1.003	SW1.4	SW1.5	32.993	0.600	1.600	1.550	0.050	659.9	300	8.32	37.9
1.004	SW1.5	SW1.6	8.958	0.600	1.550	1.525	0.025	358.3	300	8.51	37.5
1.005	SW1.6	OUT	3.292	0.600	1.525	1.500	0.025	131.7	150	8.57	37.4

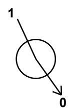
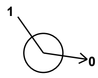
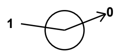
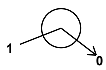
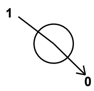
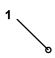
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.000	0.526	9.3	3.4	0.530	0.650	0.029	0.0
1.001	0.554	22.0	3.2	0.575	0.950	0.029	0.0
1.002	0.758	53.5	8.3	0.875	0.925	0.077	0.0
1.003	0.605	42.7	13.1	0.925	0.975	0.128	0.0
1.004	0.825	58.3	21.9	0.975	1.075	0.215	0.0
1.005	0.874	15.4	21.8	1.225	0.350	0.215	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)
1.000	35.723	357.2	150	Circular	2.480	1.800	0.530	2.500	1.700	0.650
1.001	27.161	543.2	225	Circular	2.500	1.700	0.575	2.825	1.650	0.950
1.002	21.176	423.5	300	Circular	2.825	1.650	0.875	2.825	1.600	0.925
1.003	32.993	659.9	300	Circular	2.825	1.600	0.925	2.825	1.550	0.975
1.004	8.958	358.3	300	Circular	2.825	1.550	0.975	2.900	1.525	1.075
1.005	3.292	131.7	150	Circular	2.900	1.525	1.225	2.000	1.500	0.350

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	SW1.1	1200	Manhole	Adoptable	SW1.2	1200	Manhole	Adoptable
1.001	SW1.2	1200	Manhole	Adoptable	SW1.3	1200	Manhole	Adoptable
1.002	SW1.3	1200	Manhole	Adoptable	SW1.4	1200	Manhole	Adoptable
1.003	SW1.4	1200	Manhole	Adoptable	SW1.5	1200	Manhole	Adoptable
1.004	SW1.5	1200	Manhole	Adoptable	SW1.6	2100	Manhole	Adoptable
1.005	SW1.6	2100	Manhole	Adoptable	OUT	1350	Junction	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
SW1.1	518998.494	105650.404	2.480	0.680	1200		0	1.000	1.800	150
SW1.2	519013.437	105617.957	2.500	0.800	1200		1	1.000	1.700	150
							0	1.001	1.700	225
SW1.3	519029.112	105595.775	2.825	1.175	1200		1	1.001	1.650	225
							0	1.002	1.650	300
SW1.4	519050.065	105592.712	2.825	1.225	1200		1	1.002	1.600	300
							0	1.003	1.600	300
SW1.5	519080.773	105604.777	2.825	1.275	1200		1	1.003	1.550	300
							0	1.004	1.550	300
SW1.6	519087.876	105599.319	2.900	1.375	2100		1	1.004	1.525	300
							0	1.005	1.525	150
OUT	519090.218	105597.005	2.000	0.500	1350		1	1.005	1.500	150

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
Rainfall Events	Singular	Additional Storage (m³/ha)	20.0
FSR Region	England and Wales	Starting Level (m)	
M5-60 (mm)	20.000	Check Discharge Rate(s)	✓
Ratio-R	0.300	1 year (l/s)	0.7
Summer CV	0.750	30 year (l/s)	1.5
Winter CV	0.840	100 year (l/s)	1.9
Analysis Speed	Detailed	Check Discharge Volume	x
Skip Steady State	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

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)	0.215	Betterment (%)	0
SAAR (mm)	741	QBar	0.8
Soil Index	3	Q 1 year (l/s)	0.7
SPR	0.40	Q 30 year (l/s)	1.5
Region	7	Q 100 year (l/s)	1.9
Growth Factor 1 year	0.85		

Node SW1.6 Online Hydro-Brake® Control

Flap Valve	✓	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	1.525	Product Number	CTL-SHE-0065-1900-1000-1900
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	1.9	Min Node Diameter (mm)	1200

Node SW1.6 Online Weir Control

Flap Valve	x	Invert Level (m)	2.400	Discharge Coefficient	0.590
Replaces Downstream Link	✓	Width (m)	2.100		

Node SW1.2 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	1.700	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)		Diameter (mm)	500

Node SW1.3 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.001
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	1.650	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)		Diameter (mm)	600

Node SW1.4 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.002
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	1.600	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)		Diameter (mm)	600

Node SW1.5 Link Surround Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Link	1.003
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	1.550	Surround Shape	(Trench)
Safety Factor	2.0	Time to half empty (mins)		Diameter (mm)	500

Node SW1.6 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.525
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	180.0	180.0	0.800	180.0	218.0	0.801	0.0	218.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SW1.1	10	1.867	0.067	3.7	0.1324	0.0000	OK
15 minute winter	SW1.2	12	1.801	0.101	5.0	0.3175	0.0000	OK
15 minute winter	SW1.3	11	1.780	0.130	9.9	0.6182	0.0000	OK
15 minute winter	SW1.4	11	1.779	0.179	16.8	0.7073	0.0000	OK
15 minute winter	SW1.5	10	1.759	0.209	26.2	0.9849	0.0000	OK
360 minute winter	SW1.6	264	1.671	0.146	5.2	25.5531	0.0000	OK
15 minute summer	OUT	1	1.500	0.000	1.0	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 winter	SW1.1	1.000	SW1.2	3.8	0.536	0.404	0.3454	
15 minute winter	SW1.2	1.001	SW1.3	6.4	0.374	0.288	0.5412	
15 minute winter	SW1.3	1.002	SW1.4	12.0	0.424	0.225	0.7749	
15 minute winter	SW1.4	1.003	SW1.5	19.0	0.572	0.445	1.5538	
15 minute winter	SW1.5	1.004	SW1.6	31.9	1.691	0.548	0.2362	
360 minute winter	SW1.6	Hydro-Brake®	OUT	1.7				39.1
360 minute winter	SW1.6	Weir	OUT	0.0				0.0

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SW1.1	11	2.003	0.203	9.1	0.4024	0.0000	SURCHARGED
15 minute winter	SW1.2	10	1.914	0.214	15.7	0.9488	0.0000	OK
15 minute winter	SW1.3	10	1.895	0.245	25.2	1.2436	0.0000	OK
360 minute winter	SW1.4	336	1.872	0.272	6.3	1.0820	0.0000	OK
360 minute winter	SW1.5	336	1.872	0.322	10.4	1.5892	0.0000	SURCHARGED
360 minute winter	SW1.6	336	1.872	0.347	9.9	60.4878	0.0000	SURCHARGED
15 minute summer	OUT	1	1.500	0.000	1.7	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 winter	SW1.1	1.000	SW1.2	8.8	0.595	0.952	0.6289	
15 minute winter	SW1.2	1.001	SW1.3	11.6	0.381	0.525	1.0699	
15 minute winter	SW1.3	1.002	SW1.4	27.3	0.486	0.511	1.3622	
360 minute winter	SW1.4	1.003	SW1.5	5.8	0.318	0.136	2.2686	
360 minute winter	SW1.5	1.004	SW1.6	9.9	0.727	0.170	0.6308	
360 minute winter	SW1.6	Hydro-Brake®	OUT	1.8				54.7
360 minute winter	SW1.6	Weir	OUT	0.0				0.0

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.95%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SW1.1	11	2.419	0.619	17.1	1.2290	0.0000	FLOOD RISK
720 minute winter	SW1.2	690	2.308	0.608	1.6	3.4903	0.0000	FLOOD RISK
720 minute winter	SW1.3	690	2.308	0.658	4.1	4.0547	0.0000	SURCHARGED
720 minute winter	SW1.4	690	2.308	0.708	6.8	3.5472	0.0000	SURCHARGED
720 minute winter	SW1.5	690	2.308	0.758	11.7	4.8218	0.0000	SURCHARGED
720 minute winter	SW1.6	690	2.308	0.783	11.3	136.6649	0.0000	SURCHARGED
15 minute summer	OUT	1	1.500	0.000	1.8	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 winter	SW1.1	1.000	SW1.2	14.8	0.840	1.591	0.6289	
720 minute winter	SW1.2	1.001	SW1.3	1.2	0.212	0.057	1.0802	
720 minute winter	SW1.3	1.002	SW1.4	3.8	0.265	0.071	1.4912	
720 minute winter	SW1.4	1.003	SW1.5	6.5	0.257	0.151	2.3233	
720 minute winter	SW1.5	1.004	SW1.6	11.3	0.687	0.193	0.6308	
720 minute winter	SW1.6	Hydro-Brake®	OUT	1.8				84.0
720 minute winter	SW1.6	Weir	OUT	0.0				0.0

Appendix E – LLFA SuDS Proforma

Surface Water Drainage Proforma

West Sussex County Council (WSCC) as Lead Local Flood Authority recommends this proforma is completed and submitted to support any planning application for a major development. The information contained in this form will be used by WSCC officers in their role as 'statutory consultee' on surface water drainage. The proforma should accompany the site-specific Flood Risk Assessment and Drainage Strategy submitted as part of the planning application.

1. Site Details

No.	Requirement	Answer	Application Type
1.1	Address including postcode	74 Old Shoreham Road, Lancing, BN15 0QZ	Outline & Full
1.2	OS grid reference (easting and northing)	519055 , 105602	Outline & Full
1.3	Planning application reference	TBC	Outline & Full
1.4	Total site area (hectares)	0.59	Outline & Full
1.5	Pre-development use	Greenfield	Outline & Full
1.6	Proposed design life	100 years	Outline & Full
1.7	Have agreements in principle for discharge been provided (where applicable)? (YES/NO)	N/A, riparian ownership	Outline & Full
1.8	Topographic Survey Plan showing existing site layout, site levels and drainage system	See prelim drainage strategy	Outline & Full

2. Discharge Hierarchy/Methods of Discharge[1]

No.	Requirement	Answer	Application Type
2.1	Store rainwater for later use (reuse) (YES/NO)	Yes, water butts as a minimum	Full
2.2	Infiltration techniques such as soakaways, permeable paving, etc (YES/NO)	Yes, either full infiltration or hybrid	Outline & Full
2.3	Hybrid (YES/NO)	Possible hybrid, pending groundwater levels	Outline & Full

[1] Runoff may be discharged via one or multiple methods.

No.	Requirement	Answer	Application Type
2.4	Attenuation with restricted discharge to watercourse (YES/NO)	Backup of positive discharge	Outline & Full
2.5	Attenuation with restricted discharge to surface water sewer (YES/NO)	N/A	Outline & Full
2.6	Attenuation with restricted discharge to combined sewer (YES/NO)	N/A	Outline & Full

3. Calculation Inputs

No.	Requirement	Answer	Application Type
3.1	Area within site which is drained by SuDS[2] (hectares)	0.22	Outline & Full
3.2	Impermeable area drained pre-development[3] (hectares)	0.01	Outline & Full
3.3	Impermeable area drained post-development[3] (hectares)		Outline & Full
3.4	Urban Creep (hectares)	0.006	Outline & Full
3.5	Climate change factor applied (1 in 30 and 1 in 100) (percentage)	45%	Outline & Full

4. Infiltration Feasibility/Ground Investigations

No.	Requirement	Answer	Application Type
4.1	Has winter groundwater monitoring and infiltration been undertaken? (YES/NO)	No - to be carried out at DD	Outline & Full
4.2	Period of winter groundwater monitoring (from/to)	TBC	Outline & Full
4.3	Depth to highest recorded groundwater level (mAOD)	TBC	Full
4.4	Infiltration rate	TBC	Outline & Full

[2] Impermeable area should be measured pre and post development. Impermeable surfaces include roofs, pavements, driveways and paths, where runoff is conveyed to the drainage system.

[3] 10% Urban Creep should be added to the volumes required for storage and not increase discharge rates.

No.	Requirement	Answer	Application Type
4.5	Depth of infiltration structure (mAOD)	TBC	Full
4.6	Safety factor used for sizing infiltration storage	2	Outline & Full

5. Calculation Outputs: Greenfield Runoff Rates[4]

No.	Requirement	Answer	Application Type
5.1	Qbar (l/s)	0.8	Outline & Full
5.2	1 in 1 year rainfall (l/s)	0.7	Outline & Full
5.3	1 in 30 year rainfall (l/s)	1.5	Outline & Full
5.4	1 in 100 year rainfall (l/s)	1.9	Outline & Full

6. Calculation Outputs: Brownfield Runoff Rates (including Urban Creep) (if applicable)

No.	Requirement	Answer	Application Type
6.1	1 in 1 year rainfall (l/s)	N/A	Outline & Full
6.2	1 in 30 year rainfall (l/s)	N/A	Outline & Full
6.3	1 in 100 year rainfall (l/s)	N/A	Outline & Full

7. Calculation Outputs: Volume Control/Infiltration Provision

No.	Requirement	Answer	Application Type
7.1	Infiltration (m^3)	TBC at DD	Outline & Full
7.2	Attenuation (m^3)	TBC at DD	Outline & Full
7.3	Separate volume designated as long-term storage[5] (m^3)	TBC at DD	Full
7.4	Total volume control (sum of inputs for 7.1 to 7.3) (m^3)	TBC at DD	Full

[4] Flows within long term storage areas should be infiltrated to the ground or discharged at low flow rate of maximum 2 litres per second per hectare (l/s/ha).

[5] In calculations and for the avoidance of doubt FEH shall be used FSR is not acceptable, and CV values must equal 1.

8. Calculation Outputs: Attenuation/Restricted Discharge

No.	Requirement		Answer	Application Type
8.1	Proposed discharge rate (critical storm)	1 in 1 (100%) AEP (m/s)	1.7 (worst case scenario)	Outline & Full
		1 in 30 (3.33%) AEP (m/s)	1.8 (worst case scenario)	Outline & Full
		1 in 30 (3.33%) AEP plus climate change (m/s)	1.8 (worst case scenario)	Outline & Full
		1 in 100 (1%) AEP (m/s)	1.8 (worst case scenario)	Outline & Full
		1 in 100 (1%) AEP plus climate change (m/s)	1.8 (worst case scenario)	Outline & Full
8.2	Calculations show critical storm durations (both by max height and max discharge) for 1 in 1, 1 in 30, 1 in 30 plus climate change, 1 in 100 and 1 in 100 year plus climate change allowance can be accommodated on site (YES/NO)		Yes, refer to Flow model	Outline & Full
8.3	Has treatment of potential contaminants been considered? (YES/NO)		Yes, permeable paving	Outline & Full
8.4	Demonstration of source control features with substantive evidence why these cannot be used if not (YES/NO)		Yes, permeable paving	Full
8.5	If discharging into a watercourse, piped system or the sea, has the proposed drainage network been modelled against predicted top water levels for the 1 in 100 year storm event plus climate change allowance, within the existing system? (YES/NO)		No, TBC at detailed design	Full

9. Other Supporting Details

No.	Requirement	Answer	Application Type
9.1	Plan detailing location of groundwater monitoring and infiltration testing	TBC at detailed design	Outline & Full
9.2	Detailed drainage design layout	Preliminary, TBC at detailed design	Full
9.3	Maintenance strategy	Yes, refer to Prelim Strategy	Full

No.	Requirement	Answer	Application Type
9.4	Detailed development layout	To follow at detailed design	Full
9.5	Impermeable area plan	To follow at detailed design	Full
9.6	Phasing plan?	N/A	Full
9.7	If ground levels are being raised over 300mm above existing levels and is unavoidable, have detailed plans been provided, together with drainage proposals, to address any potential drainage related issues?	Yes, refer to FRA and drainage strategy. Flood modelling carried out to assess proposed filter drain system to manage off site SW exceedance flows.	Full

The above form should be completed using evidence from information which should be appended to this form. The information being submitted should be proportionate to the site conditions, flood risks and magnitude of development. It should serve as a summary of the drainage proposals and should clearly show that the proposed discharge rate and volume as a result of development will not be increasing. Where there is an increase in discharge rate or volume, then the relevant section of this form must be completed with clear evidence demonstrating how the requirements will be met.

This form is completed using factual information and can be used as a summary of the surface water drainage strategy on this site.

Form completed by	Richard Harman
Qualification of person responsible for signing off this proforma	IEng FIHE
Company	Berrys
On behalf of (client's details)	AY Developers Ltd
Date	9.5.25