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# **Drainage Strategy Report**

LAND ADJACENT TO SCHOOL HOUSE, ST BEES

16630

July 22

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#### **INTRODUCTION**

A L Daines & Partners LLP (ALD) have been instructed to undertake a Surface and Foul Water Drainage Strategy, in accordance with the National Planning Policy Framework (NPPF) [1], for the proposed housing development on land adjacent to school House, St Bees.

The purpose of this report is to provide a strategy to manage surface and foul water flows from the site, in support of the planning application, while fulfilling the requirements of the Local Planning Authority (LPA) and the Lead Local Flood Authority (LLFA).

#### PLANNING POLICY

NPPF footnote 55 states that "a site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use."

Paragraph 169 reads "Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

a) take account of advice from the lead local flood authority;
b) have appropriate proposed minimum operational standards;
c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and
d) where possible, provide multifunctional benefits."

A major development, as per The Town and Country Planning Order 2015, is partly, buy not wholly, categorised as development involving the provision of dwellinghouses where the number of dwellinghouses to be provided is 10 or more and a development carried out on a site having an area of 1 hectare or more.

The Cumbria Minerals and Local Waste Plan – Strategic Flood Risk Assessment (June 2018) references the same criteria for local planning policy.

The site is therefore not classed as a major development under the above criteria due to the proposals having fewer than 10 dwellinghouses and a site area of less than 1 hectare.

#### PLANNING POLICY IN SITE CONTEXT

The site covers 0.244ha of greenfield site, and according to the most recent Environment Agency (EA) flood risk maps, lies entirely within Flood Zone 1.

The NPPF site categorisation Table 1.1 puts a residential development of this nature within the 'More vulnerable' category. Developments in the 'More vulnerable' category are acceptable within Flood Zone 1 and therefore the site-specific Flood Risk Assessment (FRA) need only be brief.

#### SITE PLAN

The proposed development is located on an existing area of greenfield land to the Northwest of St Bees School, St Bees, Cumbria as shown on red line bordered plan in Figure 1.



Figure 1: Aerial photo of site - Google Maps

#### **DEVELOPMENT DESCRIPTION**

The proposed development will see one new access created off the adopted highway network, leading to 3 dwellings to be built on the existing greenfield site.

The existing ground is generally open grassed landscape. The site is approximately 0.244ha in land area. The proposed development hardstanding areas are split as follows:

0.065ha for 3 dwellings + 10% urban creep = 0.072ha.

Total hardstanding area = 0.072ha

The remaining land is to remain as garden to the residential properties and permeable paved areas are provided for the access onto the adopted highway network along with areas designated for parking and driveways.

The land generally runs in a South-westerly direction, with the high point located in the Northwest corner of the site at 29.266m AOD.

#### PERMEABILITY AND SOIL PROFILE

British Geological Survey (BGS) and Land Information Systems (LandIS) mapping services have been used determine the following land make-up:

Bedrock: St Bees Sandstone

Superficial drift: Clay, silt, sand, and gravel

Soil: Soilscape 10 – Loamy and clayey soils with naturally high groundwater

#### **CURRENT FOUL AND SURFACE WATER DRAINAGE PROVISION**

#### Existing watercourses

A culverted watercourse was discovered during site investigations for the development site which flows along the Western boundary. The culvert flows Eastwards towards St Bees School and is known as a contributory factor towards flooding downstream due to exceedance.

#### Combined surface and foul water

There is an existing combined foul and surface water sewer adjacent to the site within the adopted highway network. The development is proposing to connect into the combined sewer as the preferred method of surface water disposal.

#### FLOOD RISK ASSESSMENT (FRA)

As described earlier in the report, the current Environment Agency Flood Map for Planning shows the site to be located wholly within Flood Zone 1.



Figure 2: Flood map for planning

A full FRA is therefore not required, although the Environment Agency long term flood risk maps are included below to further inform this report.



Figure 3: EA long term flooding from surface water

The long-term flood risk from surface water is very low (0.1%) with no areas of the site showing any form of heightened flood risk.



Figure 4: EA long term flood risk from river or sea

The long-term flood risk from rivers or sea is very low (0.1%) with no areas of the site showing any form of heightened flood risk. Therefore, the risk to the new development is seen to be negligible.

#### SURFACE WATER DRAINAGE STRATEGY

The aim of the strategy is to provide a design which will avoid, reduce, and delay the discharge of surface water flows into public sewers and watercourses. This will aid in the protection of watercourses but will also ensure that no knock-on effects are seen beyond the site and that the risk of localised flooding and pollution within the site are reduced as far as possible.

To satisfy these criteria, surface water flows shall be subject to assessment via the hierarchy of drainage in accordance with the LASOO Non-Statutory Technical Standards for Sustainable Drainage: Practice Guidance. The hierarchy is as follows:

#### Hierarchy options:

- 1. Drain into the ground (infiltration);
- 2. To a surface water body;
- 3. To a surface water sewer, highway drain or another drainage system;
- 4. To a combined sewer.

The drainage strategy for the site is to be developed using the third level on the above hierarchy for the following reasons:

#### Drain into the ground (infiltration) – highest viable drainage option route.

Trial holes in accordance with the BRE 365 method have shown that the site is not suitable for infiltration as the method of surface water disposal. Three trial holes were dug on site, as shown in Appendix A, all of which illustrated that soakaways are not a viable method of surface water disposal.

#### Surface Water Body

A culverted ordinary watercourse has been identified on the Western boundary of the site running in parallel to the adopted highway network. Following on from discussions with St Bees School regarding the culvert, the culvert is known to be a contributory factor towards flooding to the South of the site and could not accommodate an additional three dwellings. As such, and to prevent flooding from being exacerbated in the area, it is proposed to not discharge surface water into the culverted watercourse.

#### Surface water sewer, highway drain or another drainage system

No surface water sewers, highway drains or other drainage systems are known to be located at the boundary of the site. As such this method of surface water discharge is not viable.

#### To a combined sewer

A combined sewer is located on the Western boundary of the site, and it is proposed to connect into this system at a maximum of the greenfield runoff rate of 3l/s.

#### SURFACE WATER PROPOSED DESIGN

The greenfield run off calculations, via the ICP SuDS Mean Annual Flood method, for the site are summarised below:

Event	Run off rate (I/s)
Q1	2.6
QBAR	3
Q30	5.1
Q100	6.2

In accordance with the earlier mentioned hierarchy of drainage options, the system has been designed to utilise permeable paving to treat surface water prior to discharge into the combined sewer network.

As per the LASOO guidance, the peak runoff rate from the development for the 1 in 1yr rainfall event and the 1 in 100yr rainfall event should not exceed the peak greenfield runoff for the same event.

The design is also required to prevent flooding to any part of the site for storms up to and including the 1:30yr rainfall event, while any exceedance for the 6 hour 1:100yr event should be controlled within the site and should not flood any properties or service areas.

#### Consideration of SuDS components

A range of SuDS components are available and have been considered for use. Their applicability to the site has been addressed below:

- Rainwater harvesting suitable for use on the site, however there is no guarantee the systems will be able to capture flows if already full of previous events. Discounted for site flow calculations.
- Green roofs suitable for use on the site, however not considered appropriate from a planning perspective and would not fit the character of the site. Discounted for site flow calculations.
- Soakaways not suitable for use on site. Not viable.
- Water butts suitable for use but their effectiveness is dependent on homeowner maintenance which cannot be enforced. Discounted for site flow calculations.

- Permeable paving underlying ground conditions make this unsuitable for use as direct filtration; however permeable paving is being utilised to treat surface water and for attenuation.
- Swales Due to the narrow nature of the site towards the outfall position, there is not the available space to provide swales throughout the site. Discounted due to a lack of available space.
- Filter drains could be used but would require land uptake from plots and often do not provide volume control. Discounted.
- Detention basins Not considered viable due to large area of open space required. Discounted.
- Ponds/wetlands Not considered viable due to large area of open space required. Discounted.
- Underground closed storage crate/tank systems Considered viable for use

#### Climate change

Environment Agency guidance issued in 2016 estimates that peak rainfall intensity will increase due to climate change over the next 100 years. There is therefore an allowance of 40% attributed to the 30yr and 100yr storm event calculations in line with the Upper End estimate of rainfall increases for small and urban catchments.

#### Surface water quality

The SuDS Manual provides best industry practice for assessing the pollutant potential of developments and providing mitigation methods to increase run off water quality using SuDS components.

The simple index approach has been utilised here to assess the pollutant hazard indices and proposed treatment components. Note, this has been carried out in conjunction with the above SuDS component suitability assessment for the site and as such many features have already been discounted.

Table 26.2 from The SuDS Manual below outlines the pollution hazard indices for different land uses.

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro- carbons	
Residential roofs	Very low	0.2	0.2	0.05	
Other roofs (typically commercial/ ndustrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05	
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non- residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4	
Commercial yard and delivery areas, non-residential car parking with requent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways <sup>1</sup>	Medium	0.7	0.6	0.7	
Sites with heavy pollution (eg haulage ards, lorry parks, highly frequented prry approaches to industrial estates, vaste sites), sites where chemicals and uels (other than domestic fuel oil) are o be delivered, handled, stored, used or manufactured; industrial sites; trunk oads and motorways <sup>1</sup>	High	0.8²	0.8 <sup>2</sup>	0.9²	

Figure 5 SuDS Manual Table 26.2 Pollution hazard indices

This development is to be classed as a mix of 'Very low' and 'low' risk land uses due to the presence of residential roofs and individual property driveways and access roads.

This level of risk demands the following level of pollution control:

Land use	Suspended solids	Metal	Hydrocarbons
Residential roofs	0.2	0.2	0.05
Parking/access road	0.5	0.4	0.4

As per section 26.7.1 each SuDS component should be included in the total mitigation with a reduction of 50% for every additional component after the first.

Land use	Suspended solids	Metal	Hydrocarbons
Pollution hazard	0.5	0.4	0.4
Permeable Paving	0.7	0.6	0.7

In this case there is only one component included. Standard gully and pipe systems are not classed as having a mitigation index and have not been included above.

The above table shows that permeable paving would provide sufficient pollutant removal for the highest risk categories on the development. The introduction of further treatment would be deemed inappropriate for a development of this scale.

TAB 26.

#### Surface water drainage proposals

Based on the above assessments, it is proposed that drainage system will convey flows from the three plots via gravity, to the combined sewer network. The system will accept all storm events up to 1:100yr + 40% allowance for climate change.

#### MAINTENANCE

All components shall be maintained in accordance with the relative requirements shown in the SuDS Manual. These intervals should be deemed as a minimum frequency and reference should also be made to the manufacturers and landscape designers' guidance to ensure all components are maintained correctly.

Table 21.3 from the SuDS Manual for attenuation tanks has been included below for reference.

Maintenance schedu	e Required action	Typical frequency	
Regular maintenance	Inspect and Identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually	
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly	
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually	
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required	
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required	
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed		
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as require	

Figure 7 SuDS Manual table 21.3 Attenuation storage maintenance

#### FOUL WATER DRAINAGE STRATEGY

All foul water from the plots will be positively drained towards the combined sewer network within the adopted highway network to the West of the development site.

#### MANAGEMENT

All separate surface and foul water drainage systems within the site are proposed to remain private and be maintained by a newly formed management company.

Test	Time	Level at	Time of	Level at	Time of	Level of	Time of
	Started	first	first	second	second	third	third
		reading	reading	reading	reading	reading	reading
1	12.05	0.7m	12.41	0.65m	14.30	0.6m	16.30
2	12.15	0.8m	12.46	0.75m	12.46	0.7m	16.30
3	12.27	0.75m	12.48	0.65m	13.05	0.55m	16.30
4	12.27	0.75m	12.54	0.6m	13.05	0.5m	16.30
5	13.22	0.75m	13.42	0.65	16.37		

#### **Appendix A – Infiltration Testing**

Infiltration testing failed on site as only one test reached 50% of the trial hole capacity in 3-4 hours. Therefore, infiltration tests were not in accordance with the requirements of the BRE 365 methodology and were deemed not viable.



Figure A1: Photograph of infiltration testing undertaken on site



Figure A2: Photograph of a trial hole dug on site

### Appendix B – Greenfield Runoff Rate Calculations

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Date 20/06/2022 11:23	Designed by petera	MILIU
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Micro Drainage	Source Control 2020 1 3	<b>C</b>
IH 1	24 Mean Annual Flood	
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	Input	
Baturn Baried (a	(arc) 100 Soil 0 450	
Area	(ha) 0.246 Urban 0.000	
SAUR	(mm) 1016 Region Number Region 10	
	Paralles 1/2	
	Results 1/s	
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	QBAR Urban 3.0	
	Q100 years 6.2	
	Q1 year 2.6	
	Q2 years 2.8	
	Q10 years 4.1	
	Q20 years 4.7	
	Q25 years 4.9	
	Q30 years 5.1	
	Q50 years 5.5	
	0200 years 7.1	
	Q250 years 7.3	
	Q1000 years 9.1	
Warning: It is unusual to use the	IH124 method with an area < 50ha. T	be Interim Code of
Practice recommends that the IH124	method is applied with 50ha and the	resulting discharge
is linearly interpolated for	the required area. The ICP SUDS tak	will do this
	automatically.	
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#### Appendix C – Micro Drainage Calculations

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		Hot Star	t (mins)	0	MAD	D Factor *	10mª/ha	Storag	a 2.000
	F	lot Start Le	vel (mm)	0		In	let Coef	fiecien	t 0.800
Manho	le Head	iloss Coeff	(Global)	0.500 1	flow per	Person per	Day (1/	per/day	) 0.000
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1.002	4 15	Winter	1	105					24.606
2.000	7 15	Winter	1 .	10%					24.383
3.000	6 15	Winter	1 .	101					24.375
1.004	5 30	Winter	1	+0% 30/1	5 Summer				23.429
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1.000	1	-0.106	0.000	0.18			1.9	OK	
1.001	2	-0.101	0.000	0.24			1.9	OK	
1.002	3	-0.119	0.000	0.10			1.9	OK	
2.000	7	-0.117	0.000	0.11			2.0	OK	
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1.002	з	15 Winter	30	+40%					24.634
1.003	4	15 Winter	30	+40%					24.490
3.000	6	15 Winter	30	+405					24.398
1.004	5	60 Winter	30	+40% 3	0/15 Summer	-			23.714
1.005	8	60 Winter	30	+40% 3	0/15 Summer	-			23.756
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		Number of	Offline	Control	s 0 Number	of Real T	ime Cont	rams 0	
			Sy	nthetic	Rainfall	Details			
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		M	5-60 (mm)		16.40	Cv (Wint	er) 0.8	40	
		Margin for	Flood R	isk Warn	ing (mm) 3	00.0	DVD Stat	US OFF	
			A.	DT	S Status	ON	LIN DUNL	us orr	
		P	rofile (s)				Summor	and Wint	or
		Duration (	s) (mins)	15	, 30, 60, 1	120, 180,	240, 360	, 480, 60	00,
					720, 960, 1	1440, 2160	, 2880,	4320, 576	50,
	Rotu	rn Period(s	(voars)				7200,	1, 30, 1	100
		Climate C	hange (%)					0, 40,	40
									Wator
0	S/MH	1	Neturn Cl	imate	First (X)	First ()	) First	(Z) Over	flow Level
PN 1	Name	Storm H	eriod C	hange	Surcharge	Flood	Overi	low Ac	t. (m)
1 000	1	15 Mintor	100	+405					24 767
1.001	2	15 Winter	100	+40%					24.739
1.002	3	15 Winter	100	+40%					24.642
1.003	4	15 Winter	100	+40%					24.495
3,000	6	15 Winter	100	+40%					24.422
1.004	5 1	20 Winter	100	+40% 3	0/15 Summe:	r			23.891
1.005	8 1	120 Winter	100	+40% 3	0/15 Summe:	E .			23.904
		Surcharged	Flooded			alf Drain	Pipe		
	US/ME	Depth	Volume	Flow /	Overflow	Time	Flow		Level
PN	Name	(m)	(m <sup>3</sup> )	Cap.	(1/s)	(mins)	(1/s)	Status	Exceeded
1.000		-0.033	0.000	0.78			8.2	0	s
1.001	2	-0.026	0.000	1.00			8.1	0	ĸ
1.002	3	-0.083	0.000	0.41			8.1	0	ĸ
1.003	4	-0.105	0.000	0.20			8.2	01	K.
2.000		0.070	0.000	01000	2020 700-	111170	0.0	0	
				@1962-	2020 1000	vyze			

A L Dai	nes a l	Partners		101					Page 6
28 Cast	le Stre	eet							
Carlisle	e								Le la
CA3 8TP				- 2					Micro
ate 14	/07/20:	22 14:54		De	esigned by	petera			Drainage
file MD	CALCS	. MDX		Ch	necked by				brainiage
dicro D	rainage	e		Ne	etwork 20	20.1.3		A.	
100 ye	ar Ret	urn Perio	od Summ	ary of	Critical	Results	by M	aximum Le	vel (Rank
Monte - Alle	1993 (C. 1993) - All			1)	for Stor	m			
	100/100	Burcharged	Flooded	-		Half Drain	Pipe		* 1
PN	Name	(m)	(m <sup>3</sup> )	Cap.	(1/s)	(mins)	(1/s)	Status	Exceeded
2 000		0.000		0.00					
3.000	6	-0.096	0.000	0.28		72	8.5	SURCHARCED	1
1.005	8	0.434	0.000	0.08			2.9	SURCHARGED	2
				- <u>2000 (0</u> .					

#### Appendix D – United Utilities Sewer Records





#### Commercial drainage and water enquiry

Responses to a drainage and water enquiry for commercial premises or development sites.

Client ref: 384323

Order number: UUPS-ORD-323940 Received date: 07/09/2021

Response date: 10/09/2021

Legal Bricks Searches

T2 **Dudiey Court North, Waterfront East** Dudley, West Midlands DY5 1XP

EAO-

Client

The following records were searched in compiling this report:

The map of public sewers The map of waterworks Water and sewerage billing records Adoption of public sewers records Building over public sewer records Adoption of public water mains records Water supply clarification

Property address: Land at St Bees St Bees, Cumbria, Ca27 0ds

Please Note - We must make you aware that due to the introduction of the open market with effect from 1st April 2017 for commercial customers, Property Searches will no longer be able to resolve issues regarding some discrepancies within the report. Due to the change in the structure of the market the retailer is now responsible for taking ownership of certain issues, particularly relating to biling/tariff charges as well as, but not limited to change of usage of a property.

Enquiries and Responses The records were searched by Nathan Vaughan for United Utilities who does not have, nor is likely to have, any personal or business relationship with any person involved in the sale of the property.

This search report was prepared by Nathan Vaughan for United Utilities who does not have, nor is likely to have, any personal or business relationship with any person involved in the sale of the property.

How to contact us:

United Utilities Water Limited **Property Searches** Haweswater House Lingley Mere Business Park Great Sankey Warrington WA5 3LP

Telephone: 0370 7510101

E-mail: propertysearches@uupic.co.uk

#### What is included:

- 1. Summary of findings and key
- 2. Detailed findings of the CON29DW 3. Guidance for Interpretation
- 4. Terms and conditions
- 5. Complaints policy

If you are planning works anywhere in the North West, please read our access statement before you start work to check how it will affect our network. http://www.unitedutilities.com/work-near-asset.aspx .

United Utilities Water Limited Registered In England & Wales No. 2366678 Registered Office Haweswater House, Lingley Mere Business Park, Lingley Green Avenue, Great Sankey, Warrington, WA5 3LP







The position of underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. The actual positions may be different from those shown on the plan and private pipes, sewers or drains may not be recorded. United Utilities Water PLC will not accept any liability for any damage caused by the actual positions being different from those shown.

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Received Date: 07/09/2021 Response Date: 10/09/2021

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UU Reference:UUPS-ORD-323940







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