

OUTLINE DRAINAGE STRATEGY

PROJECT REFERENCE:

C15610

PROJECT:

Proposed Intake & Isolation Building

CLIENT:

Bleakholt Animal Sanctuary

ISSUE DATE / REV:

Mar 2026 / Rev A

ENGINEER:

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1. INTRODUCTION / BRIEF

This report details the outline drainage strategy for proposed additional buildings at Bleakholt Animal Sanctuary.

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This report is a desk study based on information available at the time of issue and describes and demonstrates how the surface water run-off rates and volume from the site will be managed to adhere to National planning policies, regulations, and relevant design guidance.



2. SITE SETTING AND DESCRIPTION

2.1. Site Location

Bleakholt Animal Sanctuary lies south east outside the village of Edenfield, approximately 7km North of Bury town centre. The site is bound by Bury Old Road to the east, and agricultural land to the remaining three sides. The full site address is Bleakholt Animal Sanctuary, Bury Old Road, Edenfield, Ramsbottom, Bury, BL0 0RX.

A site location plan can be found in Appendix A

2.2. Existing Site and Topography

The wider site is currently extensively developed and comprises predominantly low rise agricultural buildings with bound and unbound surfacing for parking. The area within the planning red line boundary consists of a predominantly grassed area with some hardstanding paths through.

The site within the planning red line boundary falls from east to west with levels adjacent Bury Old Road approximately 222.50m AOD falling to 220.50m AOD at the western extent of the boundary.

A topographical survey of the site can be found in Appendix B

2.3. Proposed Development

In brief, the proposed development is for the construction of 2No. low-rise buildings for the use of intake and isolation of animals. There will be a small amount of additional hardstanding between the buildings

The proposed site plan can be found in Appendix C

2.4. Ground Conditions

The BGS mapping shows the superficial deposits to be Devensian Till. There are no publicly available borehole records within the immediate vicinity of the site, borehole records for the wider surrounding area indicate predominantly clays.

A trial pit investigation has been undertaken in January 2026 on the land to inform the foundation design for the structure. These indicated a thick clay beneath the topsoil. Standing water was present within the pits which did not drain down during the works.





2.5. Waterbodies

The closest watercourse is Brook Bottom Brook which passes under Bury Old Road 270m to the north. There is an unnamed ditch feature 300m to the west where water issues from below ground and passes along the ditch before sinking. This is possibly an open section of culvert heading towards the river Irwell which is circa 1.4km west.

2.6. Existing Drainage / Sewers

There is a 300mm diameter culverted watercourse passing through the site from east to west. This currently accepts drainage for a large portion of the wider site and is assumed to ultimately discharge into the River Irwell based on previous investigations.

There are no public foul sewers within the immediate area.

2.7. Development Surface Water Management Areas

The site within the planning red line boundary has an overall area of circa **725m²**. The total positively drained area will be circa **135m²** comprising 130m² of roof and 5m² of additional path.



3. SURFACE WATER MANAGEMENT PRINCIPLES

The surface water for the site is to be managed so that it adheres to the current national regulations and local authority requirements.

3.1. Run-off Destination

Surface water run-off is to discharge to one or more of the following in the order of priority shown:

- 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.

3.2. The Management Train

The A concept fundamental to implementing a successful SuDS scheme is the management train. This is a sequence of SuDS components that serve to reduce run-off rates and volumes and reduce pollution. The hierarchy of techniques that are to be used for the surface water management of the development are:

- Prevention - Prevention of run-off by good site design and reduction of impermeable areas;
- Source Control - Dealing with water where and when it falls (e.g. infiltration techniques);
- Site Control - Management of water in the local area (e.g. swales, detention basins);
- Regional Control - Management of run-off from sites (e.g. balancing ponds, wetlands).



3.3. Design Principles

The design principles for the surface water management of the development will be to:

- Ensure that people, property, and critical infrastructure are protected from flooding;
- Ensure that the development does not increase flood risk off site;
- Ensure that SuDS can be economically maintained for the development.

3.4. Peak Surface Water Flow

DEFRA Non-Statutory Technical Standards for Sustainable Drainage Systems states:

***S3** For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1-year rainfall event and the 1 in 100-year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event'.*

3.5. Volume Control

DEFRA Non-Statutory Technical Standards for Sustainable Drainage Systems states:

***S5** Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100-year, 6-hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.*

***S6** Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with S5 above, the runoff volume must be discharged at a rate that does not adversely affect flood risk'.*



3.6. Flood Risk within Development

DEFRA Non-Statutory Technical Standards for Sustainable Drainage Systems states:

S7 *The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30-year rainfall event.*

S8 *The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100-year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.*

S9 *The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100-year rainfall event are managed in exceedance routes that minimise the risks to people and property'.*



4. SURFACE WATER RUN-OFF DESTINATION

The destination of the surface water run-off from the development areas of the site has been assessed against the prioritisation set by Approved Document H (2010). The feasibility of the surface water run-off to the priority receptors are as follows:

Run-Off Destination	Feasible	Description
Discharge to Ground	No	From a review of the BGS maps and the trial pit information provided for the site indicating impermeable clays, soakaways are not deemed to be a suitable method.
Discharge to Surface Water Body	Yes	It is proposed to discharge to the River Irwell via the existing surface water culvert passing through the site.
Discharge to Surface Water Sewer	No	There are no known surface water sewers available within the vicinity of the site
Discharge to Highway Drain or Other	No	There are no known dedicated Highway Drains available within the vicinity of the site.
Discharged to Combined Water Sewer	No	There are no known dedicated Highway Drains available within the vicinity of the site.

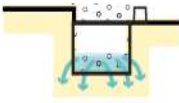
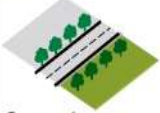
A below ground drainage plan drawing can be seen in Appendix D detailing some of the above measures.



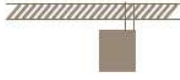
5. SuDS FEASIBILITY

To reduce the surface water run-off to as low as possible, SuDS methods are to be introduced to the post development design.

SuDS methods as per the Sustainable Drainage System (SuDS) hierarchy, and the Non-Statutory Technical Standards for Sustainable Drainage Systems – March 2015, that can be used are detailed below:

	Description	Setting	Required area
 Green roofs	A planted soil layer is constructed on the roof of a building to create a living surface. Water is stored in the soil layer and absorbed by vegetation.	 Building	Building integrated.
 Rainwater harvesting	Rainwater is collected from the roof of a building or from other paved surfaces and stored in an overground or underground tank for treatment and reuse locally. Water could be used for toilet flushing and irrigation.	 Building	Water storage (underground or above ground).
 Soakaway	A soakaway is designed to allow water to quickly soak into permeable layers of soil. Constructed like a dry well, an underground pit is dug filled with gravel or rubble. Water can be piped to a soakaway where it will be stored and allowed to gradually seep into the ground.	 Open space	Dependant on runoff volumes and soils.
 Filter Strip	Filter strips are grassed or planted areas that runoff is allowed to run across to promote infiltration and cleansing.	 Open space	Minimum length 5 metres.
 Permeable paving	Paving which allows water to soak through. Can be in the form of paving blocks with gaps between solid blocks or porous paving where water filters through the block itself. Water can be stored in the sub-base beneath or allowed to infiltrate into ground below.	 Street/open space	Can typically drain double its area.
 Bioretention area	A vegetated area with gravel and sand layers below designed to channel, filter and cleanse water vertically. Water can infiltrate into the ground below or drain to a perforated pipe and be conveyed elsewhere. Bioretention systems can be integrated with tree-pits or gardens.	 Street/open space	Typically surface area is 5-10% of drained area with storage below.



	Description	Setting	Required area
 Swale	Swales are vegetated shallow depressions designed to convey and filter water. These can be 'wet' where water gathers above the surface, or 'dry' where water gathers in a gravel layer beneath. Can be lined or unlined to allow infiltration.	 Street/open space	Account for width to allow safe maintenance typically 2-3 metres wide.
 Hardscape storage	Hardscape water features can be used to store run-off above ground within a constructed container. Storage features can be integrated into public realm areas with a more urban character.	 Open space	Could be above or below ground and sized to storage need.
 Pond / Basin	Ponds can be used to store and treat water. 'Wet' ponds have a constant body of water and run-off is additional, while 'dry' ponds are empty during periods without rainfall. Ponds can be designed to allow infiltration into the ground or to store water for a period of time before discharge.	 Open space	Dependant on runoff volumes and soils.
 Wetland	Wetlands are shallow vegetated water bodies with a varying water level. Specially selected plant species are used to filter water. Water flows horizontally and is gradually treated before being discharged. Wetlands can be integrated with a natural or hardscape environment.	 Open space	Typically 5-15% of drainage area to provide good treatment.
 Underground storage	Water can be stored in tanks, gravel or plastic crates beneath the ground to provide attenuation.	 Open space	Dependant on runoff volumes and soils.



The feasibility of the above SuDS methods for the development areas of the site are summarised in the table below:

SuDS Method	Feasible / Required?	Comments
Living Roofs	No	The lightweight construction of the units do not lend themselves to incorporating living roofs.
Rainwater Harvesting	Yes	If external downpipes are used, rainwater harvesting in the form of a water butt could be installed to assist maintenance of the external landscaped areas.
Soakaway	No	The ground conditions are not suitable for the use of concentrated soakaways
Filter Drain	Yes	Filter drains can be used to intercept run-off from the pathways around the buildings
Permeable Surfacing	Yes	Permeable surfacing can be used to intercept rainfall at source. This would be connected into the drainage system but would encourage low levels of infiltration where possible
Hardscape Storage	No	Ruled out due to site layout and topography
Swale	No	Ruled out due to site layout, spatial constraints, and topography
Bioretention	Yes	Small scale bioretention can be provided in the form of planters on rainwater downpipes
Pond	No	Insufficient external space for a pond
Underground Storage	Yes	A degree of underground storage will be required to protect against higher intensity storm events and limit run-off to as close as practical to greenfield rates.

A below ground drainage plan drawing can be seen in Appendix D detailing some of the above measures.



6. DEVELOPMENT RUN-OFF RATES AND VOLUMES

6.1. Existing Greenfield Run-Off Rate

The pre-development site (725m²) is predominantly undeveloped therefore the greenfield run-off rate should be used when calculating drainage discharges from the site. The greenfield run-off rate (QBar) is 1.0 l/s. The 1in100 year flow rate is 2.0 l/s.

Calculations for the greenfield run-off rate can be found in Appendix E

6.2. Proposed Run-Off Rate

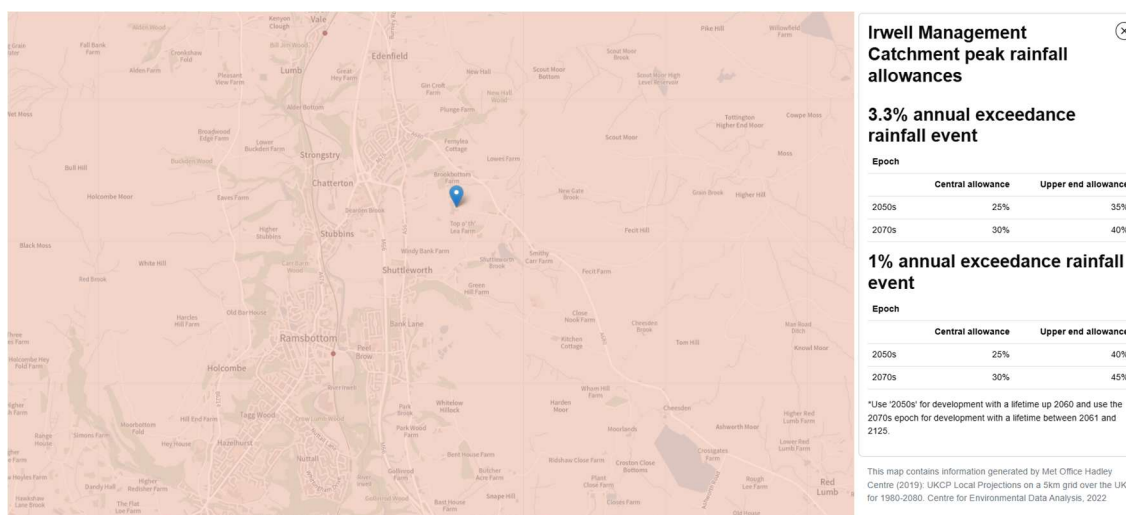
The requirement is to restrict run-off to as close to the greenfield run-off rate as is practical, therefore a flow control and storage will be required.

It is proposed to restrict flows to **2.0l/s** which is the lowest practical flow restriction without creating maintenance issues. This results in flows being restricted as close as possible to the greenfield runoff rate up to the 1in100 year event and restricted to greenfield runoff rates for the 1in100 year event and higher.



6.3. Climate Change

The NPPF makes it a planning requirement to account for climate change in the proposed design. The recommended allowances are taken from the Environment Agency guidance summarised in the below figure:



The lifetime of the building will be beyond 2070, and therefore the upper epoch along with the upper end allowance should be used. The climate change allowances for the rainfall intensity will therefore be 40% and 45% for the 30-year and 100-year storm respectively.

6.4. Attenuation Volume

The following table contains the proposed attenuation volumes. These volumes are preliminary and subject to detailed design. Preliminary calculations can be found in Appendix F

Impermeable Area (m ²)	Proposed Discharge Rate (l/s)	1 in 30 year + 40% attenuation (m ³)	1 in 100 year + 45% attenuation (m ³)
135	2.0	3.2	4.4



7. OUTLINE DRAINAGE STRATEGY

7.1. Surface Water

The strategy is based on the discharge method highlighted in section 4 and the SuDS assessment highlighted in section 5.

The outline strategy is to collect run-off from the building roofs and external path areas and divert it into a new on-site drainage network that will in turn discharge to the culverted watercourse below the site at a restricted rate. Attenuation will need to be designed to accommodate the 1in100+45% climate change storm event.

Interception controls should be provided by the use of permeable finishes on external areas or filter drains to intercept run-off from impermeable patio finishes.

Rainwater harvesting should be utilised on at least one downpipe per building

An outline drainage strategy plan can be seen in Appendix D

7.2. Pollution Prevention

Solids/Silt is prevented from entering the system by the use of trapped gullies or channel sumps. SuDS provision on the external areas, either permeable paving or filter drains provides a degree of filtration and clean-up to flows.

7.3. Foul Drainage

Foul drainage will served by the existing on-site septic tank system.



8. MAINTENANCE / MANAGEMENT

8.1. Off-Site Surface Water Flood Risk

The use of SuDS, flow control measures, and on-site storage up to the 1in100+45% climate change event will minimise the off-site flood risk impact from the development.

In the event of a failure of the proposed drainage system or an exceedance event, the overland exceedance route is along the existing paths and roadways within the wider site, before passing over agricultural land to the drainage ditch in the adjacent field.

8.2. Management

A management company will be responsible for maintaining all drainage elements on site. As part of the detailed drainage design, a detailed management and maintenance plan should be developed to inform the management company of the ongoing maintenance requirements and allow them to correctly allocate resources. This will ensure there are no residual flood related risks after the development is completed



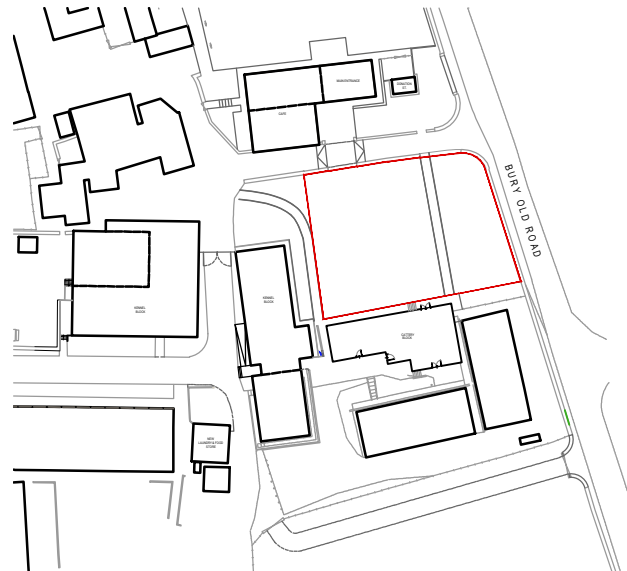
APPENDIX A – SITE LOCATION PLAN



Key

Site Boundary

AREA: 729m²



Site Location Plan

Scale: 1:1250

Scale Bar 1:1250



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CLIENT	BLEAKHOLT ANIMAL SANCTUARY		
JOB NUMBER	932	DATE	18.11.2025
DRAWING NAME	SITE LOCATION PLAN		
SCALE DRAWN:	AS SHOWN	PAGE SIZE	A4
REVISION	-	DRAWING NUMBER	01
ADDRESS	BURY OLD RD, EDENFIELD, RAMSBOTTOM, BURY BL0 0RX		
NOTES			
DRAWN BY:	TH	CHECKED BY:	



APPENDIX B – TOPOGRAPHICAL SURVEY

B28

SITE PLAN

Scale :: 1:350 @ A1

Bleakholt Animal Sanctuary

BL0 ORX

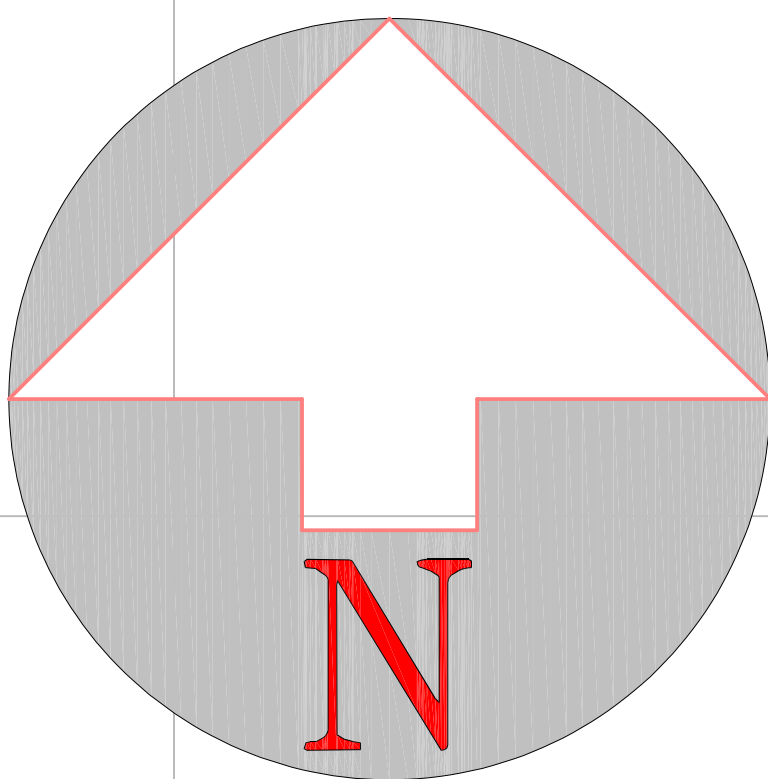
Registered Charity no. 1110503

Co. registered in England: 5434781

01706 822577

"Caring for those who have no-one"

0 10 20 30 40
Scale in Meters

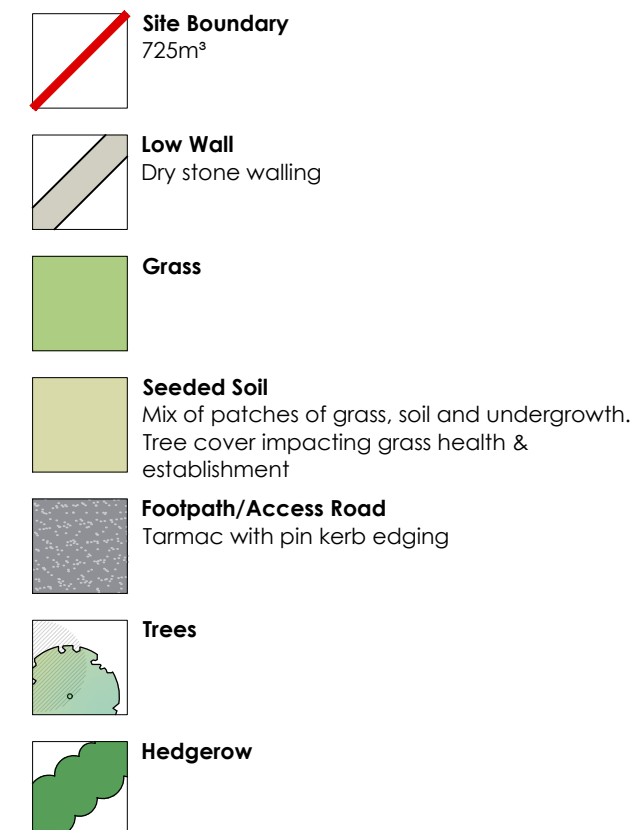
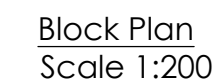


LEGEND:

- | Ref | Name |
|------|-------------------------------|
| B1 | Office / Shop |
| B2 | Cafe |
| B3 | Toilets |
| B4 | Bookshop |
| B5a | Goat Shed |
| B5b | Goat Shed store |
| B5c | (cats and general materials) |
| B5d | Rabbits |
| B6 | Farm Office |
| B7 | Assessment Room |
| B8a | Barn |
| B8b | Staff Room (stables and farm) |
| B8c | Workshop |
| B9 | Hay Store |
| B10a | Stables |
| B10b | Stables |
| B10c | Stables |
| B11 | Stables Store |
| B12 | Donkey Shed |
| B13 | Sheep/Pig Shed |
| B14a | Walsh Kennel Block |
| B15 | Cattery |
| B16a | Cat Pens |
| B16b | Cat Pens |
| B17 | Laundry |
| B18 | Hospital |
| B19 | H Block |
| B20 | Richard Bailey Puppy Unit |
| B21 | Old Woofs |
| B22a | Keller |
| B22b | Isolation |
| B23 | Waddington |
| B24 | Donations Shed |
| B25 | Chicken Shed |
| B26 | Rabbit Shed |
| B27 | Pig Sty |
| B28 | New Hay Storage Barn |
| B29 | Field Shelters |



APPENDIX C – PROPOSED SITE PLAN



Rev.	Notes.	Date.	By.
B	added drainage indications	16.01.25	TH
A	updated shielding notes	15.12.25	TH

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CLIENT BLEAKHOLT ANIMAL SANCTUARY

JOB NUMBER 932 DATE 18.11.2025

DRAWING NAME PROPOSED BLOCK PLAN

SCALE DRAWN: 1:200 PAGE SIZE A3

REVISION	B	DRAWING NUMBER	05
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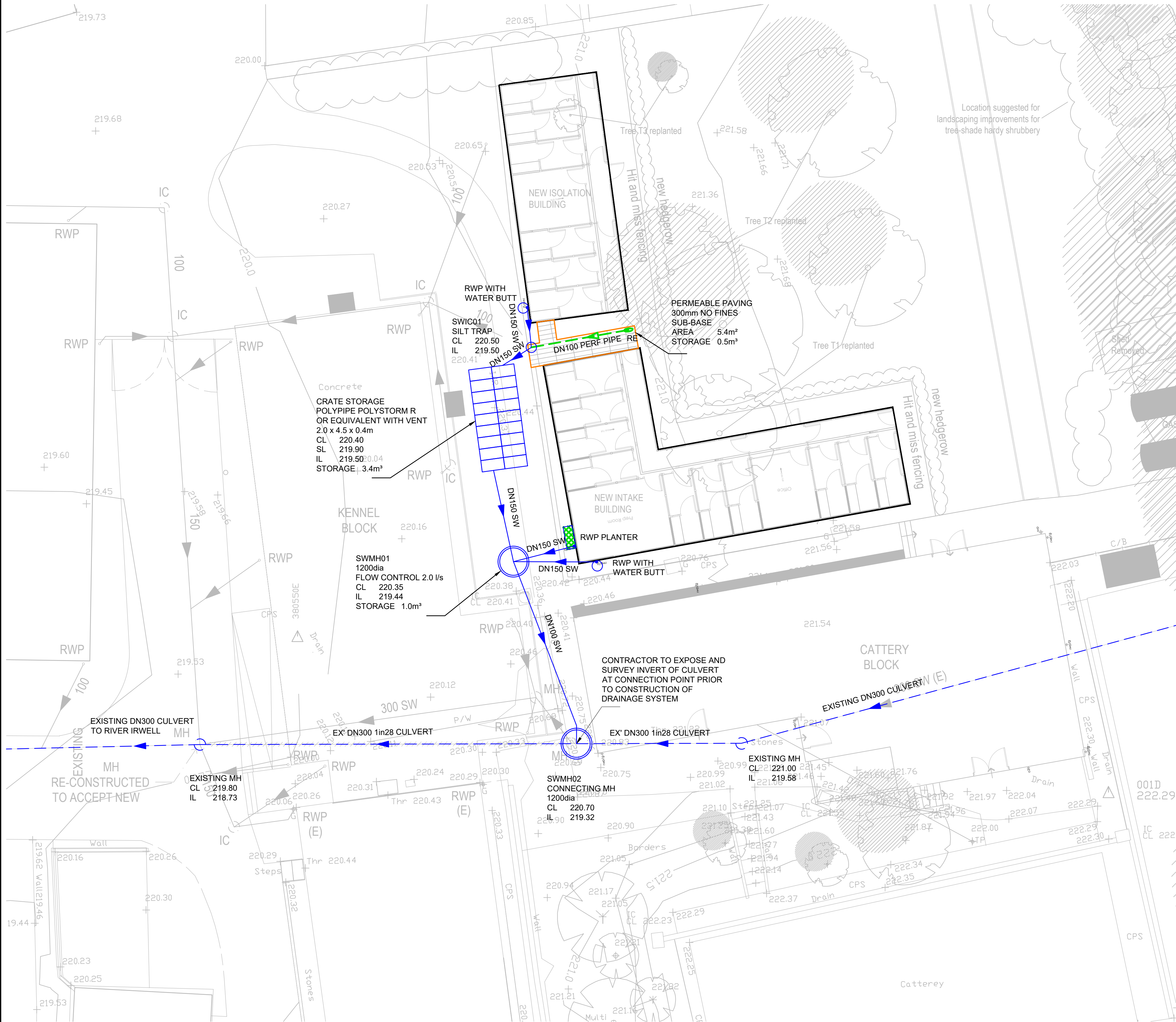
ADDRESS BURY OLD RD,
EDENFIELD,
RAMSBOTTOM, BURY
BL0 0RX

NOTES

DRAWN BY: TH CHECKED BY:



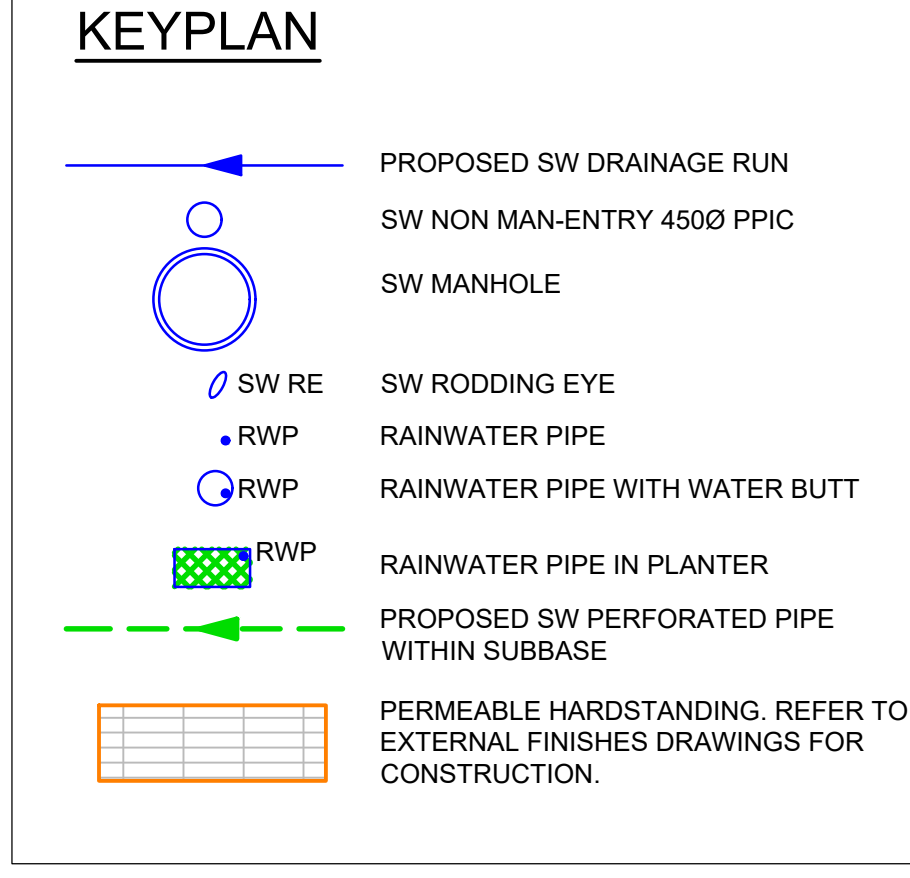
APPENDIX D – PROPOSED SURFACE WATER DRAINAGE



- DRAINAGE ARRANGEMENT SUBJECT TO LLFA/UU APPROVAL
- FINAL RWP'S / SVP'S POSITIONS TO BE CONFIRMED
- FINAL STRATEGY SUBJECT TO RESULTS OF EXISTING DRAINAGE SURVEY
- CONTRACTOR TO ALLOW FOR UNDERTAKING GPR SURVEY TO ENSURE NEW DRAINAGE DOES NOT CLASH WITH EXISTING BURIED SERVICES

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 - ANY CONSTRUCTION WORK CARRIED OUT PRIOR TO RECEIVING ALL NECESSARY APPROVALS FOR PLANNING AND/OR BUILDING REGULATIONS, PARTY WALL NOTICES, WATER AUTHORITY APPROVALS ETC. IS ENTIRELY AT THE CLIENT'S / HOUSEHOLDER'S RISK.
 - THE CLIENT AND CONTRACTOR TO BE AWARE OF THEIR RESPECTIVE DUTIES WITH REGARD TO CDM 2015. WHERE CLIENT / CONTRACTOR REQUIRES ADVICE OR IS IN DOUBT PLEASE DO CONTACT HSE (www.hse.gov.uk/construction/cdm) OR NORTHERN STRUCTURAL SERVICES. NORTHERN STRUCTURAL SERVICES ARE NOT APPOINTED AS THE PRINCIPAL DESIGNER UNLESS SPECIFICALLY AGREED OTHERWISE.
 - THE CONTRACTOR SHALL INSPECT ALL ADJOINING PROPERTIES - WHEN APPLICABLE - WHICH MAY BE AFFECTED BY THE WORKS PRIOR TO COMMENCEMENT AND MUST REPORT ANY DEFECTS TO THE OWNER.
 - IT IS THE CLIENT'S RESPONSIBILITY TO FORMALLY NOTIFY ADJOINING OWNERS OF ANY POTENTIAL WORK THAT MAY AFFECT THEM UNDER THE PARTY WALL ACT 1996.

- DRAINAGE NOTES
- ALL DRAINAGE PIPES TO BE POLYPIPE ADAPTABLE DRAINAGE SYSTEM OR SIMILAR APPROVED
 - ALL ROAD GULLIES TO HAVE GRADE D400 GRATINGS TO BS EN 124 WITH 450DIA x 900 DEEP PRE-CAST POTS
 - MANHOLES TO BE PRECAST CONCRETE RINGS TO BS5911 MIN 1200DIA U.N.O.
 - ALL MANHOLE COVERS TO BE GRADE B125 IN FOOTPATHS / SOFT AREAS OR D400 IN TRAFFICKED AREAS TO BS EN 124
 - INSPECTION CHAMBERS TO BE TYPICALLY 450mm DIA NON MAN ENTRY PPIC'S
 - INVERT LEVELS QUOTED ARE EXIT INVERTS
 - ALL RWP'S AND SVP'S TO HAVE ABOVE GROUND RODDABLE ACCESS COVERS
 - INSTALLATION OF MANHOLES, ROAD GULLIES, PIPES, CHANNELS ETC TO BE AS PER THE MANUFACTURERS INSTRUCTIONS AND RECOMMENDATIONS
 - DRAINAGE CHANNELS TO BE ACO OR SIMILAR APPROVED. DESIGN / SPEC / INSTALLATION TO BE IN ACCORDANCE WITH MANUFACTURERS DETAILS
 - PIPES WITH COVER LESS THAN 1200mm UNDER HARD AREAS AND 600mm UNDER SOFT AREAS TO BE ENCASED IN CONCRETE BEDDING CLASS S
 - ALL DRAINAGE IS TO COMPLY WITH THE REQUIREMENTS OF BS EN 752
 - MINIMUM FALLS ON FOUL DRAINAGE TO COMPLY WITH APPROVED DOCUMENT PART H



P2	10.03.26	DM	CONNECTION POINT UPDATES
P1	06.03.26	DM	ISSUED FOR COMMENT
REV	DATE	INT'L	COMMENT

PROPOSED DEVELOPMENT
BLEAKHOLT ANIMAL SANCTUARY
BURY OLD ROAD, EDENFIELD
RAMSBOTTOM

Scale:	1:100 @ A1	Drawing No.:	14610/91	Rev:	P2
Drawn by:	DM				
Date:	MAR '26				

BELOW GROUND DRAINAGE PLAN

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PRELIMINARY - FOR DISCUSSION



APPENDIX E – GREENFIELD RUN-OFF RATE

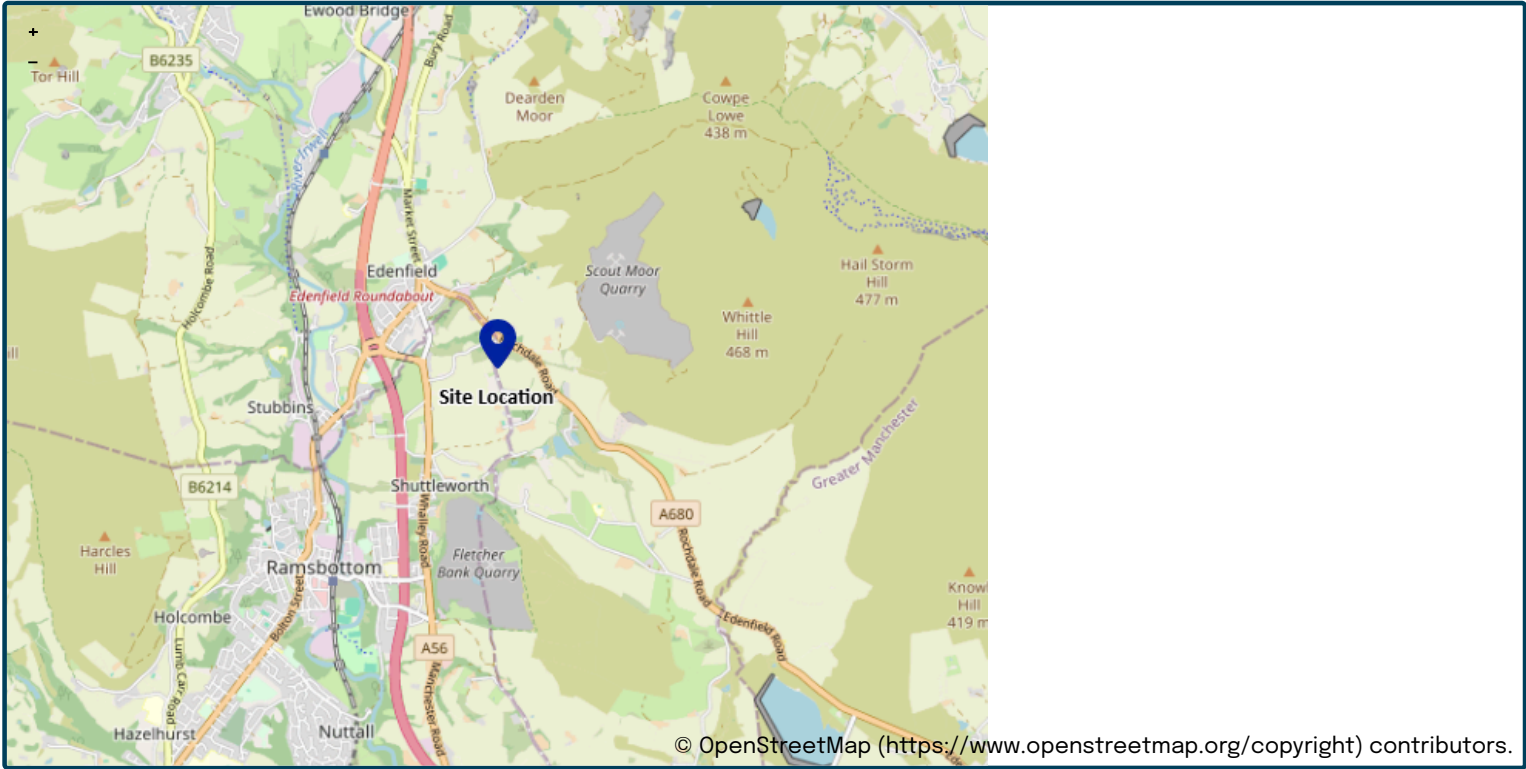
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015).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

Project details

Date	05/03/2026
Calculated by	D. Mason
Reference	C15610
Model version	2.2.3

Location

Site name	Bleakholt Animal Sanctuary
Site location	Edenfield



Site easting (British National Grid)	380565
Site northing (British National Grid)	418272

Site details

Total site area (ha)	0.0725	ha
----------------------	-------------------------------------	----

Greenfield runoff

Method

Method	IH124
--------	-------

IH124

	<u>My value</u>		<u>Map value</u>
SAAR (mm)	1348	mm	1348
How should SPR be derived?	WRAP soil type		
WRAP soil type	5		5
SPR	0.53		
QBar (IH124) (l/s)	1	l/s	

Growth curve factors

	<u>My value</u>		<u>Map value</u>
Hydrological region	10		10
1 year growth factor	0.87		
2 year growth factor	0.93		
10 year growth factor	1.38		
30 year growth factor	1.7		
100 year growth factor	2.08		
200 year growth factor	2.37		

Results

Method	IH124	
Flow rate 1 year (l/s)	0.9	l/s
Flow rate 2 year (l/s)	0.9	l/s
Flow rate 10 years (l/s)	1.3	l/s
Flow rate 30 years (l/s)	1.7	l/s
Flow rate 100 years (l/s)	2.0	l/s
Flow rate 200 years (l/s)	2.3	l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent ‘zero’ figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.3) developed by HR Wallingford and available at [uksuds.com](https://www.uksuds.com/) (<https://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 [uksuds.com/terms-conditions](https://www.uksuds.com/terms-conditions) (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate 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, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.



APPENDIX F – ATTENUATION STORAGE ESTIMATE

This is an estimation of the storage volume requirements that are needed 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). It is recommended that the total storage volume for the site is distributed across the site using multiple SuDS and that hydraulic modelling software is used to undertake and finalise the detailed design of the drainage system.

Project details

Date	05/03/2026
Calculated by	D. Mason
Reference	C15610
Model version	2.2.3

Location

Site name	Bleakholt Animal Sanctuary
Site location	Edenfield



Site easting (British National Grid)	380551
Site northing (British National Grid)	418292

Site areas

Total site area (ha)	0.0725	ha
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Roof area

Total roof area (ha)	0.013	ha
Contributing roof area (ha)	0.013	ha
Non-contributing roof area (ha)	0	ha

Paved area

Total paved area (ha)	0.0005	ha
Contributing paved area (ha)	0.0005	ha
Non-contributing paved area (ha)	0	ha

Grass / vegetated area

Total grass / vegetated area (ha)	0.058	ha
Contributing grass / vegetated area (ha)	0	ha
Non-contributing grass / vegetated area (ha)	0.058	ha

Total area

Total contributing area (ha)	0.0135	ha
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Contributing areas with urban creep allowance

Urban creep allowance factor	+0% (no creep)
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Storage design parameters

Storage base shape	Rectangular / square
Storage base length to width ratio	3:1
Storage design depth (m)	0.8 m
Storage side slope (1 in x)	Vertical sided
Storage voids ratio (%)	100% (all voids)
Storage volume design return period (years)	1:100 years

Discharge flow rate from the site

Method

Type of site	Greenfield
Specify the method	IH124

IH124

	<u>My value</u>		<u>Map/default value</u>
SAAR (mm)	1348	mm	☐ 1348
How should SPR be derived?	WRAP soil type		
WRAP soil type	5		☐ 5
SPR	0.53		
Total area for greenfield runoff calculation (ha)	0.0715	ha	☐ 0.0715
QBar (l/s)	1	l/s	
Hydrological region	10		☐ 10
Return period (years)	Qbar (1:2.3 years)		
Growth curve factor	1		
Flow rate (IH124) (l/s)	1	l/s	

Final discharge rate

Runoff calculation method	IH124	
Design flow rate (l/s)	1	l/s

Blockage risk

Specify the method	Orifice diameter		
Minimum orifice diameter to prevent blockage (mm)	33	mm	
	<u>My value</u>		<u>Calculated value</u>
Design orifice diameter (mm)	33	mm	☐ 33
Flow rate of orifice (l/s)	2.02	l/s	

Rainfall and runoff

Rainfall input type	Generic rainfall CSV file		
	design_rainfall_grid (1) for UK SUDS 20 0.45.csv		
Climate change allowance factor	145%		
Specify the runoff method from grass / vegetated areas	Fixed percentage - based on rainfall event depth and SPR		
	<u>My value</u>		<u>Map value</u>
How should SPR be derived?	WRAP soil type		
WRAP soil type	5		☐ 5
SPR	0.53	Model run complete.	

Model results

- **Maximum discharge flow rate:** 2.0 (l/s)
- **Outflow orifice diameter:** 33 (mm)
- **Storage base length:** 4.1 (m)
- **Storage base width:** 1.4 (m)
- **Storage base area:** 5.5 (m²)
- **Storage total volume:** 4.4 (m³)
- **Storage total water volume:** 4.4 (m³)
- **Storm return periods run:** 1, 2, 5, 10, 30, 100, 200 (years)
- **Storm durations run:** 15, 30, 60, 120, 180, 240, 360, 540, 720, 900, 1080, 1440, 1800, 2160, 2880 (minutes)

Return Period (years)	Critical Duration (minutes)	Peak Flow Rate (l/s)	Max Depth (m)	Max water volume (m ³)	Max storage volume (m ³)
1	30	1.1	0.24	1.3	1.3
2	30	1.2	0.29	1.6	1.6
5	30	1.4	0.36	2.0	2.0
10	30	1.5	0.44	2.4	2.4
30	30	1.7	0.58	3.2	3.2
<u>100</u>	<u>30</u>	<u>2.0</u>	<u>0.80</u>	<u>4.4</u>	<u>4.4</u>
200	30	2.2	0.96	5.2	5.2

Please note runoff estimation and storage volume estimation are subject to uncertainty. Storage volume results are therefore reported to the nearest 1 m³ value, unless storage volumes are less than 10 m³, in which case, storage volumes are provided to 1 decimal place.

Disclaimer

This report was produced using the surface water storage volume design tool (2.2.3) developed by HR Wallingford and available at [uksuds.com](https://www.uksuds.com) (<https://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 [uksuds.com/terms-conditions](https://www.uksuds.com/terms-conditions) (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate surface water storage volumes for the whole site based on a limiting discharge rate from the site. 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, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

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Appendix A - Rainfall Depths

Rainfall depths (mm) with climate change

Duration (minutes)	Duration (hours)	1 years	2 years	5 years	10 years	30 years	100 years	200 years
15	0.25	13.67	15.91	19.42	22.58	28.68	37.28	43.34
30	0.5	17.10	19.97	24.52	28.64	36.63	47.97	56.03
60	1	20.62	24.14	29.72	34.80	44.67	58.74	68.76
120	2	24.43	28.61	35.22	41.24	52.92	69.57	81.43
180	3	26.90	31.45	38.66	45.18	57.87	75.89	88.71
240	4	28.78	33.60	41.21	48.08	61.42	80.33	93.74
360	6	31.70	36.87	45.01	52.34	66.50	86.42	100.50
540	9	34.79	40.35	49.10	56.96	72.08	93.29	108.21
720	12	37.15	43.01	52.20	60.42	76.21	98.30	113.80
900	15	39.09	45.18	54.71	63.23	79.55	102.30	118.25
1080	18	40.74	47.04	56.85	65.63	82.36	105.66	121.96
1440	24	43.51	50.11	60.39	69.54	86.97	111.13	127.98
1800	30	45.79	52.63	63.28	72.73	90.70	115.52	132.78
2160	36	47.73	54.78	65.73	75.43	93.83	119.19	136.79
2880	48	50.98	58.36	69.79	79.88	98.98	125.16	143.29

Rainfall depths (mm) without climate change

Duration (minutes)	Duration (hours)	1 years	2 years	5 years	10 years	30 years	100 years	200 years
15	0.25	9.43	10.97	13.39	15.57	19.78	25.71	29.89
30	0.5	11.79	13.77	16.91	19.75	25.26	33.08	38.64
60	1	14.22	16.65	20.50	24.00	30.81	40.51	47.42
120	2	16.85	19.73	24.29	28.44	36.50	47.98	56.16
180	3	18.55	21.69	26.66	31.16	39.91	52.34	61.18
240	4	19.85	23.17	28.42	33.16	42.36	55.40	64.65
360	6	21.86	25.43	31.04	36.10	45.86	59.60	69.31
540	9	23.99	27.83	33.86	39.28	49.71	64.34	74.63
720	12	25.62	29.66	36.00	41.67	52.56	67.79	78.48
900	15	26.96	31.16	37.73	43.61	54.86	70.55	81.55
1080	18	28.10	32.44	39.21	45.26	56.80	72.87	84.11
1440	24	30.01	34.56	41.65	47.96	59.98	76.64	88.26
1800	30	31.58	36.30	43.64	50.16	62.55	79.67	91.57
2160	36	32.92	37.78	45.33	52.02	64.71	82.20	94.34
2880	48	35.16	40.25	48.13	55.09	68.26	86.32	98.82