A CAF GROUP COMPANY

ENVIRONMENT

Bloor Homes Western
Land South of Banbury Rise
Banbury
Sustainable Drainage Statement

www.bwbconsulting.com

ENVIRONMENT

Bloor Homes Wester
Land South of Banbury Rise
Banbury
Sustainable Drainage Statement

Birmingham
Livery Place, 35 Livery Street, Colmore Business District, Birmingham, B3 2PB
T: 0121 233 3322

Cambridge
14-16 High Street, Histon, Cambridge
CB24 9JD
T: 01223 235 173

Leeds
Whitehall Waterfront, 2 Riverside Way, Leeds
LS1 4EH
T: 0113 233 8000

London
11 Borough High Street
London, SE1 9SE
T: 0207 407 3879

Manchester
11 Portland Street, Manchester, M1 3HU
0161 233 4260

Market Harborough
12a Woodcock House, Compass Point Market Harborough, Leicestershire, LE16 9HW
T: 01858 455020

Nottingham
Waterfront House, Station Street, Nottingham NG2 3DQ
T: 0115 924 1100

July 2022

DOCUMENT ISSUE RECORD

Document Number:	WFB-BWB-ZZ-XX-RP-CD-0001_SDS
BWB Reference:	BMP-2135-SDS

Revision	Date of Issue	Status	Author:	Checked:	Approved:
P01	20/06/22	S2	Ryan Davies BSc (Hons), MSc, GradCIWEM	Matthew Bailey BSc (Hons)	Keith Alger BSc (Hons) MSc
P02	08/07/22	S2	Jagjit Degun	Matthew Bailey BSc (Hons)	Keith Alger BSc (Hons) MSc

Notice

All comments and proposals contained in this report, including any conclusions, are based on information available to BWB Consulting during investigations. The conclusions drawn by BWB Consulting could therefore differ if the information is found to be inaccurate or misleading. BWB Consulting accepts no liability should this be the case, nor if additional information exists or becomes available with respect to this scheme.

Except as otherwise requested by the client, BWB Consulting is not obliged to and disclaims any obligation to update the report for events taking place after: -

(i) The date on which this assessment was undertaken, and
(ii) The date on which the final report is delivered

BWB Consulting makes no representation whatsoever concerning the legal significance of its findings or the legal matters referred to in the following report.

All Environment Agency mapping data used under special license. Data is current as of July 2022 and is subject to change.

The information presented, and conclusions drawn, are based on statistical data and are for guidance purposes only. The study provides no guarantee against flooding of the study site or elsewhere, nor of the absolute accuracy of water levels, flow rates and associated probabilities.

CONTENTS

FIGURES

TABLES

APPENDICES

1. INTRODUCTION

1.1 A Sustainable Drainage Statement (SDS) sets out the principles of drainage design for a development and summarises the reasoning behind the chosen design. This includes consideration of national and local guidance, justification of specific flow rates, volumes of attenuated storage, as well as the appropriate level of treatment to be provided to surface water runoff.

1.2 This SDS has been produced by BWB Consulting on behalf of Bloor Homes Wester, in respect of an outline planning application for a residential development comprising up to 250 dwellings (with up to 30% affordable housing), public open space, landscaping and associated supporting infrastructure. Means of vehicular access to be determined via Edinburgh Way, with additional pedestrian and cycle connections via Dover Avenue and Balmoral Avenue. Emergency access provision also via Balmoral Avenue. All other matters reserved.

1.3 The site is located to the western extent of Banbury, Oxfordshire approximately 2km west of the town centre. The site is surrounded by residential development to the east (Balmoral Avenue) and agricultural fields to the south and west. The applicant, Bloor Homes, has recently had a scheme consented to the north of the site, known as Banbury Rise. This site is under the control of the applicant. Withycombe Farm is located immediately west of the site boundary.

1.4 Immediately south of the site is a recently consented development which consists of 49 residential dwellings (ref:21/03644/OUT)

1.5 A full planning application for residential use has been obtained on the land to the north of the site (ref: 17/00189/F). This is understood to be a Bloor Homes Western site.

1.6 A Flood Risk Assessment (FRA) has been developed for the subject site (ref: WFB-BWB-ZZ-XX-RP-YE_0002) and this SDS accompanies this overarching document.

1.7 This SDS is intended to support an outline planning application and as such the level of detail included is commensurate and subject to the nature of the proposals.

1.8 The location of the site is illustrated within **Figure 1.1**, with contextual information provided within **Table 1.1**. An indicative site layout plan is included as **Appendix 1**.

Figure 1.1: Site Location

Table 1.1: Site Details

Site Name	Land South of Banbury Rise
Location	Banbury
NGR (approx.)	SP 43419 40196
Application Site Area (ha)	14.09 (approximately)
Development Area (ha)	6.95 (approximately)
Development Type	Residential
Lead Local Flood Authority	Oxfordshire County Council
Local Planning Authority	Cherwell District Council
Sewerage Undertaker	Thames Water

Sustainable Drainage Guidance

1.9 Sustainable Drainage Systems (SuDS) aim to reduce the impact of development by replicating the natural runoff regime in a sustainable, cost-effective manner, whilst protecting water quality and reducing pollution. The four key objectives of SuDS design are to achieve improvements in water quantity, water quality, amenity provision and biodiversity.

1.10 Oxfordshire County Council (OCC) have produced local SuDS guidance[1] which new development must abide by. The more pertinent requirements for an outline planning application are outlined below:

i. New development should restrict runoff rates to the equivalent greenfield runoff rate for events up to and included the 1 in 100-year event plus an allowance for climate change.

ii. An additional 10% allowance in impermeable surface area for urban creep should be made for all developments.

iii. Storage features must be designed to accommodate the 1 in 100-year event plus a 40% allowance for climate change.

iv. 300mm of freeboard must be provided for above ground storage features.

v. A minimum allowable discharge of 5l/s does not apply.

vi. Consideration of the drainage hierarchy must be made in the selection of an appropriate outfall.

1.11 Alongside the local guidance, the Non-Statutory Technical Standards for Sustainable Drainage Systems[2] as published by DEFRA, as well as the CIRIA SuDS Manual[3] have been utilised to inform the strategy.

1.12 A 40% allowance for the potential implications of climate change has been applied, in accordance with local guidance and the Environment Agency's (EA) guidance[4] (most recently updated in May 2022).

[1] Oxfordshire County Council Local Standards and Guidance for Surface Water Drainage on Major Development in Oxfordshire (Oxfordshire County Council, November 2018)
[2] 2015, DEFRA. Non-statutory technical standards for sustainable drainage systems
[3] The SuDS Manual (C753). CIRIA 2015.
[4] Environment Agency, Flood risk assessments: climate change allowances: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

2. EXISTING CONDITIONS

2.1 A topographical survey has been carried out and is included as **Appendix 2**. This shows the site to generally fall from south-east to north-west within the southern half of the site with the land then falling towards the north-east. The site has a maximum level of approximately 161.0m Above Ordnance datum (AOD) in the south-east corner and a low point of approximately 148.1m AOD at the north-east of the boundary.

2.2 Mapping provided by the British Geological Survey (BGS), as shown in **Figure 2.1** indicates that the site is underlain predominantly by Ferruginous Limestone and Ironstone of the Marlstone Rock Formation. Towards the south, the site is underlain by a mixture of Whitby Mudstone Formation (Mudstone), 'Northampton Sand Formation (Sandstone, Limestone and Ironstone), 'Horsehay Sand Formation (Sandstone) and the (Chipping Norton Limestone Formation - Limestone).

2.3 A site investigation has been undertaken (ref: 12692/FG/21/SI), extracts of the ground investigation data and soakaway test results are included as **Appendix 3.** Tests have been undertaken at a number of locations throughout the site, which is illustrated within **Figure 2.1**. Results have been summarised within **Table 2.1**. Trial Pit 10 did not measure a rate due to the amount of time taken for water levels within the pit to fall.

Table 2.1; Summary of Trial Pit Soakaway Test Results

Trial Pit	Lowest Recorded Infiltration Rate (m/s)
1	7.8×10^{-6}
2	1.3×10^{-4}
3	1.4×10^{-4}
10	N/A
12	5.3×10^{-6}
18	2.2×10^{-4}

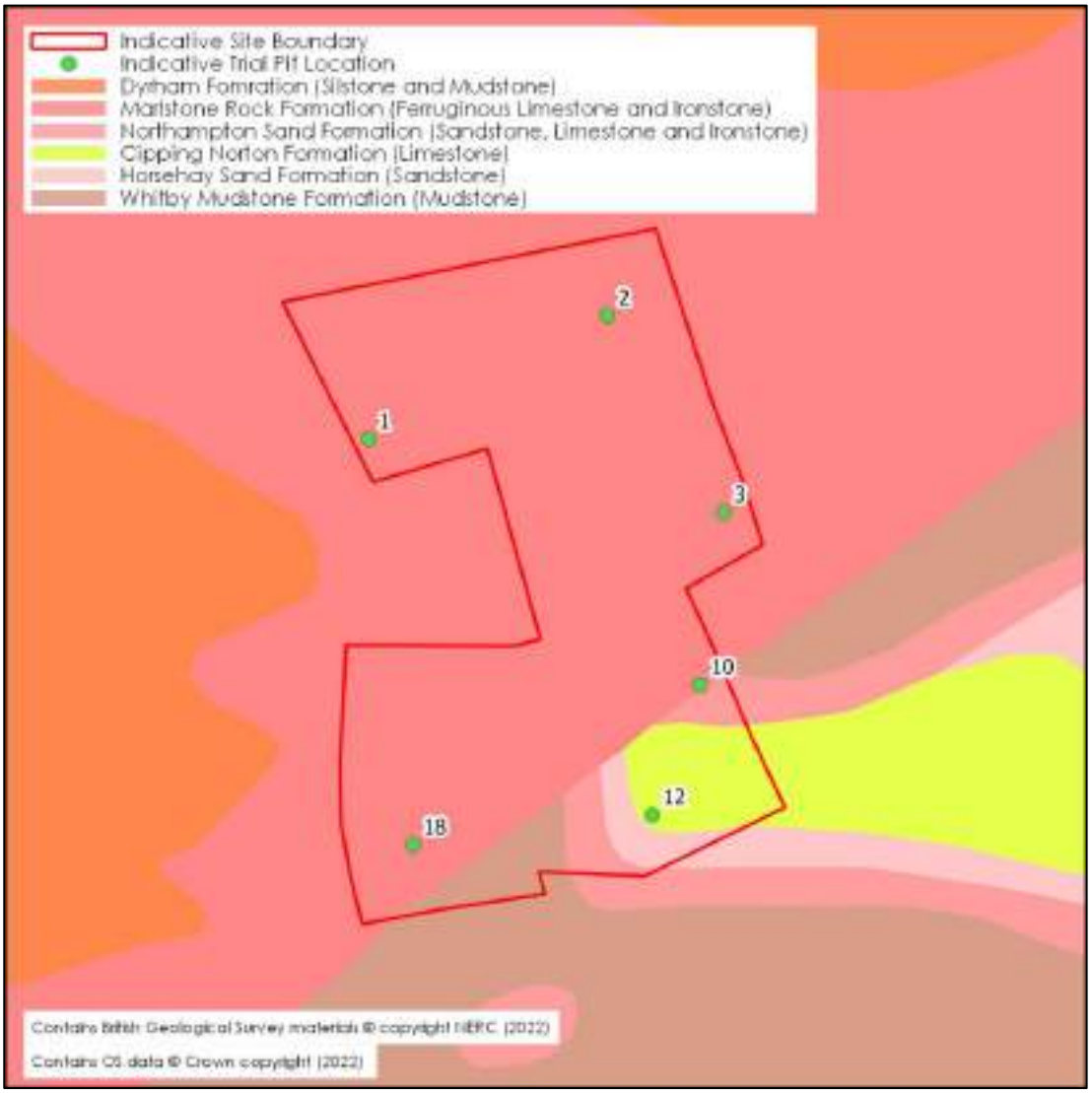

Figure 2.1: BGS Mapping of Bedrock Geology and Indicative Trial Pit Locations

2.4 Thames Water sewer records, included as **Appendix 4**, demonstrate the presence of a foul and surface water sewer network serving the existing residential development to the east of the site. There are no public sewers shown to be present immediately north of the site.

2.5 The current drainage regime of the site is expected to be predominantly infiltration which becomes overland flows once the capacity of the soil exceeded. Overland flows are expected to be conveyed eastwards, following the local topography. Flows will then be received by existing residential development to the east and highway drainage.

Existing Runoff Rates

2.6 A developable area of 6.95ha has been taken from the proposed site layout plan. An assessment of the existing surface water runoff rates from this area has been undertaken and is summarised within **Table 2.2**. Calculations are included within **Appendix 5**.

2.7 The runoff rates have been estimated using the IH124 method, with appropriate prorated adjustments for a site of less than 50ha, as recommended in Interim Code of Practice for Sustainable Drainage[5]. This was undertaken within Micro Drainage, which makes the necessary adjustments for small sites automatically.

Table 2.2: Existing Runoff Rate from the Site

Return Period (Yrs.)	Runoff Rate (l/s)
1	2.4
Mean Annual Flow Rate (QBAR)	2.8
30	6.4
100	9.0

2.8 Such low runoff rates are indicative of a site where infiltration is likely to be a viable strategy.

Existing Runoff Volume

2.9 An assessment of the existing surface water runoff rates from the area proposed for development has been made for a 1 in 100-year, 6-hour storm.

2.10 As the existing site is permeable, the runoff volume has been calculated using the Source Control module within Micro Drainage to be **1580m³**, results are included within **Appendix 6**.

[5] The National SUDS Working Group (2004), Interim Code of Practice for Sustainable Drainage

3. SURFACE WATER DRAINAGE STRATEGY

3.1 After considering the site constraints and development aspirations, it is suggested that the site is split up into three sub-catchments which will each be drained by an infiltration basin. The necessary surface water storage is located at the lowest elevation of the site, between the proposed development and the outfall location. The surface water strategy on the Banbury Rise development to the north of the site follows the same principle.

Drainage Hierarchy

3.2 The Planning Policy Guidance[6] and the SuDS Manual[3] identify that surface water runoff from a development should be disposed of as high up the following hierarchy as reasonably practicable:

i. into the ground (infiltration);
ii. to a surface water body;
iii. to a surface water sewer, highway drain, or another drainage system;
iv. to a combined sewer.

3.3 The aim of this is approach is to manage surface water runoff close to where it falls and mimic natural drainage as closely as possible.

Infiltration

3.4 As shown in **Table 2.1**, there are areas of the site where an infiltration solution is considered to be feasible. It is therefore proposed to manage surface water runoff with the use of soakaways.

3.5 The infiltration rate used to size the basin for each catchment is summarised within **Table 3.1**.

Table 3.1: Chosen Infiltration Rates for Attenuation within each Sub-Catchment

Sub-Catchment	Trial Pit	Infiltration Rate (m/s)
1	1	7.8×10^{-6}
2	2	1.3×10^{-4}
3	18	2.2×10^{-4}

3.6 Based on a review of the borehole logs undertaken within the site investigation, the inflation rate for Trial Pit 2 is considered to be more suitable for use for Catchment 1, due to the similar geology encountered within Trial Pits 2, 8 and 9, compared with Trial Pit 1, the latter of which is geographically closer to the proposed basin, within catchment 1.

[6] Planning Practice Guidance. http://planningguidance.planningportal.gov.uk/.

However, we used the more conservative rate of infiltration identified through investigations, to provide an additional factor of safety.

3.7 During the detailed design phase, further infiltration testing is proposed in the exact locations of the proposed infiltration basins.

Attenuated Storage

3.8 Sufficient attenuated storage is required to be provided in order to balance the excess volume in a safe manner within the site, in line with the measured site-specific infiltration rates.

3.9 The surface water storage should be located within the site in a position where it can receive runoff from the development and discharge from the site by gravity, and also is a position where it is hydraulically isolated from any fluvial floodplain or external surface water floodplain / overland flow route that may be present in the site.

3.10 Sufficient storage for events up to the 1 in 100-year storm with a 40% allowance for climate change should be provided, and a 10% allowance should be applied to the current proposed development area to allow for urban creep over the lifetime of the development, in accordance with the local SuDS guidance.

3.11 The basins have been designed with a depth of 1.3m, side slopes of 1 in 4 and 300mm of freeboard.

3.12 Due to the levels within the northern most corner of the site, based on the current masterplan (**Appendix 1**) it will be necessary to deliver land raising to ensure this area can be drained by gravity appropriately, whilst also providing an adequate level of cover to the pipe network.

3.13 For the purpose of this outline assessment, it has been assumed that the basins will accommodate all of the necessary storage, but it may be possible to redistribute a portion of the storage within other drainage components during the detailed design of the development (e.g.: in the pipe network, swales, filter drains, etc).

3.14 A simulation has been run using Micro Drainage 'Source Control' to identify the necessary storage provision for each sub-catchment. Infiltration test results from trial pits nearest infiltration basins have been used to calculate the necessary storage, as summarised within **Table 3.1**. The results are summarised in **Table 3.2** and calculations are included as **Appendix 7 and 8**.

Table 3.2: Outline Attenuated Storage Requirements

Sub-Catchment	Rainfall Method	Critical Storm	Maximum Volume (m^3)
1	FSR	600 min Winter	560
	FEH	600 min Winter	633
2	FSR	60 min Winter	670
	FEH	60 min Winter	769
3	FSR	60 Min Winter	456
	FEH	60 min Winter	528
Total	**FSR**	-	**1,760**
	FEH	-	**1,861**

3.15 At this conceptual stage, it is expected that a minimum of **1861m³** of attenuated storage will be provided to cater for the maximum anticipated runoff volume for all storm durations up to the 1 in 100-year return period storm, including a 40% climate change allowance and future urban creep.

3.16 It is envisaged that the final required attenuated storage volume will be determined during the detailed design stage, once the development layout and drainage areas are fixed.

Sustainable Drainage Systems

3.17 Sustainable Drainage Systems (SuDS) aim to reduce the impact of development by replicating the natural runoff regime in a sustainable, cost-effective manner, whilst protecting water quality and reducing pollution. The four key objectives of SuDS design are to achieve improvements in water quantity, water quality, amenity provision and biodiversity.

3.18 As the development is utilising infiltration, surface water runoff will not be leaving site. Therefore, the entire interception volume will be kept within the site.

3.19 It is recommended that opportunities to provide multiple stages of treatment within the development are maximised. The arrangement of SuDS within a management train, where at least two stages of treatment are provided is recommended.

3.20 The use of SuDS features such as permeable pavements, tree pits and swales should be explored as the proposed layout progresses.. These will provide a level of treatment to flows at source.

3.21 Further stages of treatment will be provided within the infiltration basins themselves which can be enhanced with additional features such as sediment forebays.

3.22 It should be explored whether the basins can provide additional amenity benefits. This can be achieved through a number of means including planting with local flower species or through provision of cycle/footpaths.

3.23 Increasing the vegetation present within the basin will also provide additional biodiversity benefits through provision of food sources and habitats for wildlife.

3.24 An indicative surface and foul water layout (ref: WFB-BWB-ZZ-XX-DR-CD-0001) for the development is included as **Appendix 9**.

Residual Risk and Designing for Exceedance

3.25 The freeboard of 300mm will provide an element of additional storage above the 1 in 100+40% modelled volume.

3.26 In the event that the capacity of the attenuated storage is exceeded, ground levels should be profiled to direct overland flows towards lower vulnerability areas of the development such as car parking or public open space. It is recommended that the final layout uses the proposed road infrastructure to provide drainage exceedance (overland flood flow) routes through the development and towards the infiltration basins for events in excess of the capacity of the drainage system.

4. MAINTENANCE

4.1 The drainage should be designed in accordance with the Design and Construction Guidance (DCG) and offered up for adoption by Thames Water. Any features which remain unadopted, or until the point that they are, should be maintained by a private management company. The maintenance of the private drainage system located within residents cultivate will be the responsibility of the respective homeowner.

4.2 Requirements for ongoing maintenance of the drainage network should form part of the Operation and Maintenance manual for the site and should be undertaken by the site management. Any specialist or proprietary products that are specified at detailed design should have a manufacturer specific maintenance regime which should be included within the document.

4.3 It is envisaged that the Operation and Maintenance manual will be developed at the detailed design stage, but some examples are included below.

i. All drainage features should be located in open areas which are readily accessible.
ii. Gullies should be inspected and de-silted at least once a year, where necessary.
iii. Pipes, manholes and silt traps should be inspected and de-silted at least once a year, where necessary.
iv. If permeable paving is incorporated within the layout, it should be swept a minimum of every six months to maintain flow capacity of the joints between blocks.
v. The infiltration basins will be predominantly dry, and the base will be seeded with a wildflower grass seed mix that can tolerate wet ground conditions.
vi. Regular inspections of the infiltration basins should be undertaken to remove litter/debris, invasive/colonising vegetation and silt build up as necessary. Inlet and outlet structures to be regularly inspected, with remedial work as required to maintain water flows and prevent silt/vegetation build up.
vii. Vegetation/grass with the infiltration basins should be maintained appropriately to allow establishment and promote habitat formation, without impeding the operation of the inlet and outlet structure.

5. FOUL WATER DRAINAGE

5.1 It is proposed to drain used water from the development separately to surface water.

5.2 The applicant, Bloor Homes, is currently developing the land to the north of the site, known as Banbury Rise. This site is under the control of the applicant.

5.3 Consultations with Thames Water are ongoing and it will need to be confirmed whether the foul sewer network will have capacity to accept additional flows from the development.

5.4 The drainage system of the development site to the north will be utilised to drain the site via gravity.

6. SUMMARY

6.1 This statement and supporting appendices demonstrate that the drainage design for the development will comply with the relevant local and national standards, specifically the hierarchy of discharge, runoff rate and volume criterion.

6.2 This SDS is intended to support an outline planning application and as such the level of detail included is commensurate and subject to the nature of the proposals.

Table 6.1: Sustainable Drainage Statement Summary

		Existing Site	Proposed Development
Site Area (Ha)		13.7 (approx.)	
Impermeable Area (Ha)		0	4.52
Outfall Location		Infiltration	Infiltration
Peak Runoff Rate (l/s)	**QBAR**	2.8	N/A
	1 in 30-Year	6.4	
	1 in 100-Year	9.0	
	1 in 100-Year + CC	-	
Infiltration Rate (m/s)	**Catchment 1**	7.8×10^{-6}	
	Catchment 2	1.3×10^{-4}	
	Catchment 3	2.2×10^{-4}	
Proposed Storage Volume (m^3)	**Catchment 1**	-	633
	Catchment 2	-	770
	Catchment 3	-	529
SuDS Features		-	Infiltration Basins Further SuDS to be explored at detailed design
Maintenance Responsibility		-	Management Company/ Sewerage Company

6.3 It is envisaged that the final drainage strategy will be determined during the detailed design stage, as the development layout is finalised.

APPENDICES

Appendix 1: Indicative Site Layout Plan

WILSON ROAD

LUNNUN ROAD

DEVELOPMENT UNDER CONSTRUCTION

EXISTING ALLOTMENTS

WITHYCOMBE FARM

LEAP

CONSENTED DEVELOPMENT

KEY

- SITE LOCATION
- EXISTING VEGETATION
- PUBLIC RIGHT OF WAY
- PROPOSED FOOT & POTENTIAL CYCLE LINKS
- PRIMARY VEHICULAR ACCESS
- PEDESTRIAN/CYCLIST ACCESS
- PEDESTRIAN/CYCLIST/EMERGENCY ONLY ACCESS
- INDICATIVE PLANTING
- PRELIMINARY DRAINAGE LOCATIONS
- HOUSING (up to 250 Dwellings)
- POTENTIAL FUTURE LINK TO WITHYCOMBE FARM (RESIDENTIAL TRAFFIC ONLY)
- NODAL SQUARE
- LOCALLY EQUIPPED AREA FOR PLAY

N W E S

0 20 50 100m

LAND SOUTH OF BANBURY RISE, BANBURY - **INDICATIVE MASTERPLAN**

Pegasus Design

PLANNING | DESIGN | ENVIRONMENT | ECONOMICS | WWW.PEGASUSGROUP.CO.UK | TEAM/DRAWN BY: HW | APPROVED BY P.M: MC | DATE: 22/06/22 | SCALE: 1:1250 @ A1 | DRWG: **P20-1853**_04 SHEET NO: _ REV: B | CLIENT: **BLOOR HOMES** |

Appendix 2: Topographical Survey