

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal

JBA
consulting

1 Terms of Reference

JBA Consulting have been commissioned to prepare a high-level flood risk statement and drainage strategy in support of a candidate site submission along the A466, near to Leasbrook Lane, in Monmouthshire for inclusion within the upcoming Local Development Plan (LDP) for Monmouthshire County Council. This Technical Note will be used to understand the appropriateness of development in accordance with Welsh Government policy as set out in Technical Advice Note 15 (TAN-15) and the statutory standards for SuDS in Wales.

2 The Site

2.1 Site Description

The proposed development site is located to the north of the A466 (Dixton Road) in Monmouthshire, as shown in Figure 2-1 below. Land to the east and north-east of the site is greenfield in nature and bound by Leasbrook Lane. To the west and north-west of the site lies existing residential development. Monmouthshire School for Girls is adjacent to the western boundary of the site. The south of the site is bound by the A466, which joins with the A40 to the east.

There is an ordinary watercourse to the east of the site which flows in a general south easterly direction. The watercourse is culverted under the A466 before discharging into the River Wye.

An ordinary watercourse is present to the south of the A446, near to the southern boundary of the proposed development site. This watercourse flows into the River Wye, a Natural Resources Wales (NRW) designated Main River, Approximately 260m to the south of the site.

It is understood that the site is being put forward as a proposed residential allocation site in the Preferred Strategy for the update to the Monmouthshire County Council LDP.

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal

JBA
consulting

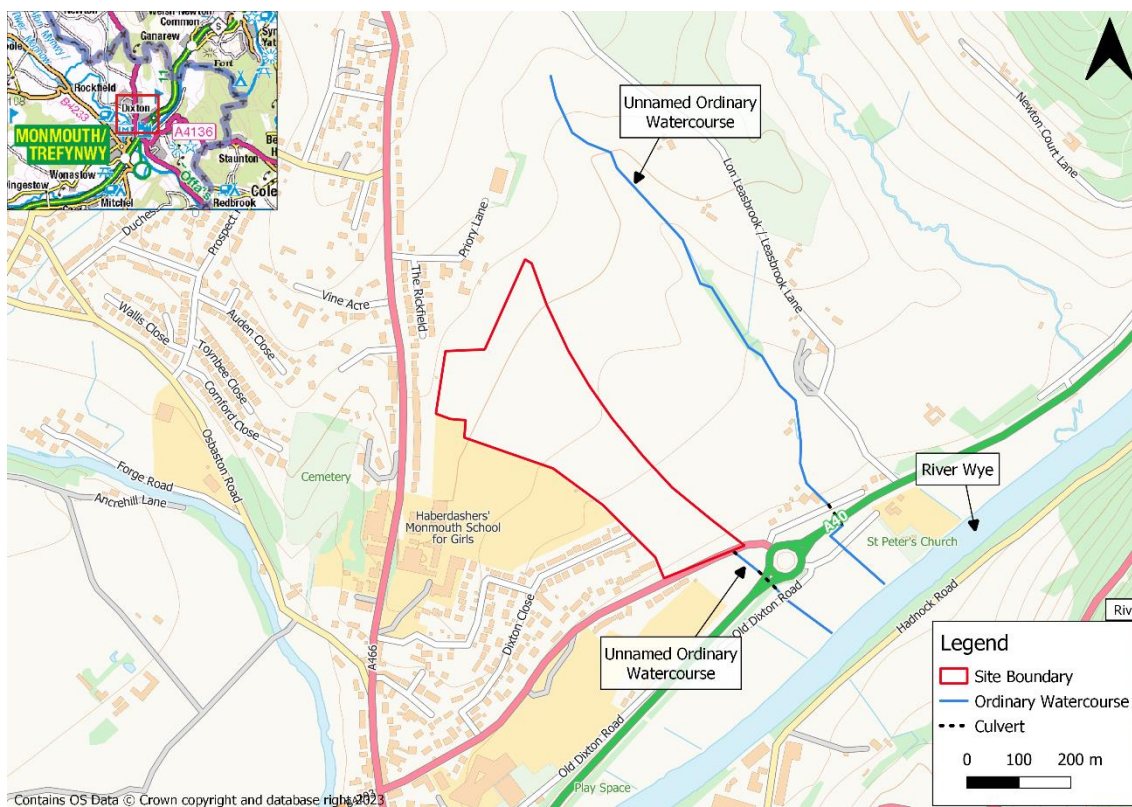


Figure 2-1 Site location

2.2 Site Topography and Existing Land-Use

Natural Resources Wales (NRW) 1m LiDAR data has been used to illustrate the topography of the site, as shown in Figure 2-2. The LiDAR data shows that the site declines steeply in a south easterly direction. Highest ground levels in the north-west of the site are approximately 59.10mAOD, with the lowest ground levels in the south-western corner at approximately 18.63mAOD.

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal

JBA
consulting

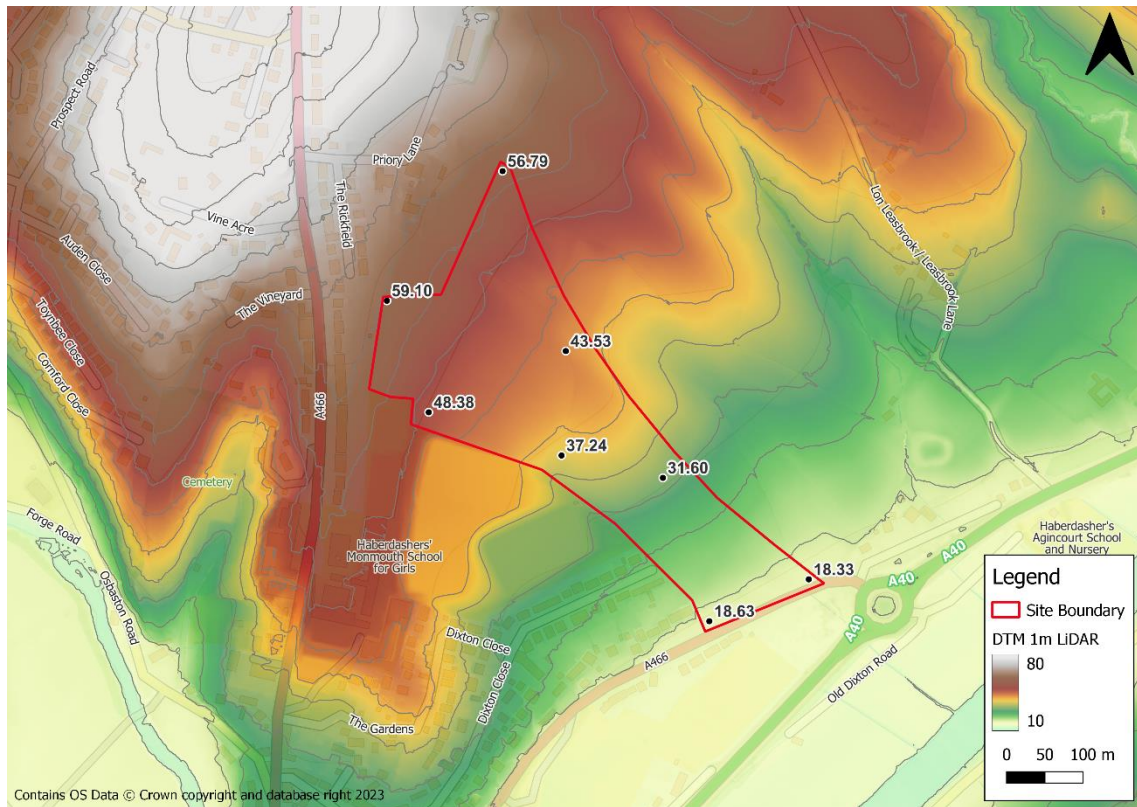


Figure 2-2 DTM 1m LiDAR

3 Current TAN-15 Planning Policy overview

The following chapter provides a summarised overview of the requirements of the current TAN-15. An update for TAN-15 was released in October 2021 and was due to come into force on the 1st June 2023. However, Welsh Government subsequently suspended the implementation of the new TAN-15, and it is uncertain as to when this shall now come into force. Therefore, the current TAN-15 is being used to assess planning applications at this time.

Further guidance on the latest consultation draft of the new TAN-15 is provided in Section 4.

3.1 Planning Context

TAN-15 reflects the core principles of the National Strategy for Flood and Coastal Erosion Risk Management in Wales to adopt a risk-based approach in respect of new development in areas at risk of flooding and coastal erosion. TAN-15 comprises technical guidance related to development planning and flood risk and provides a framework within which the flood risks arising from rivers, the sea and surface water, and the risk of coastal erosion can be assessed.

Its initial requirement is to identify the flood zones and vulnerability classification relevant to the proposed development, based on an assessment of current and future conditions. An indicative sequence to negotiating the various elements of TAN-15 is provided below in Figure 3-1.



Figure 3-1 Navigating TAN-15

3.2 Development Advice Map

The Development Advice Map (DAM) published by Natural Resources Wales is used to trigger different planning actions based on a precautionary assessment of flood risk. As shown in Figure 3-2, most of the site is located within Zone A, which is considered to be at little or no risk of fluvial or tidal/coastal flooding.

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal

JBA
consulting

The south of the proposed development site is located within Zone C1. Zone C1 is defined as "Areas of the floodplain which are developed and served by significant infrastructure, including flood defences". All forms of development are permissible in Zone C1, subject to the application of the justification test, including the acceptability of consequences.

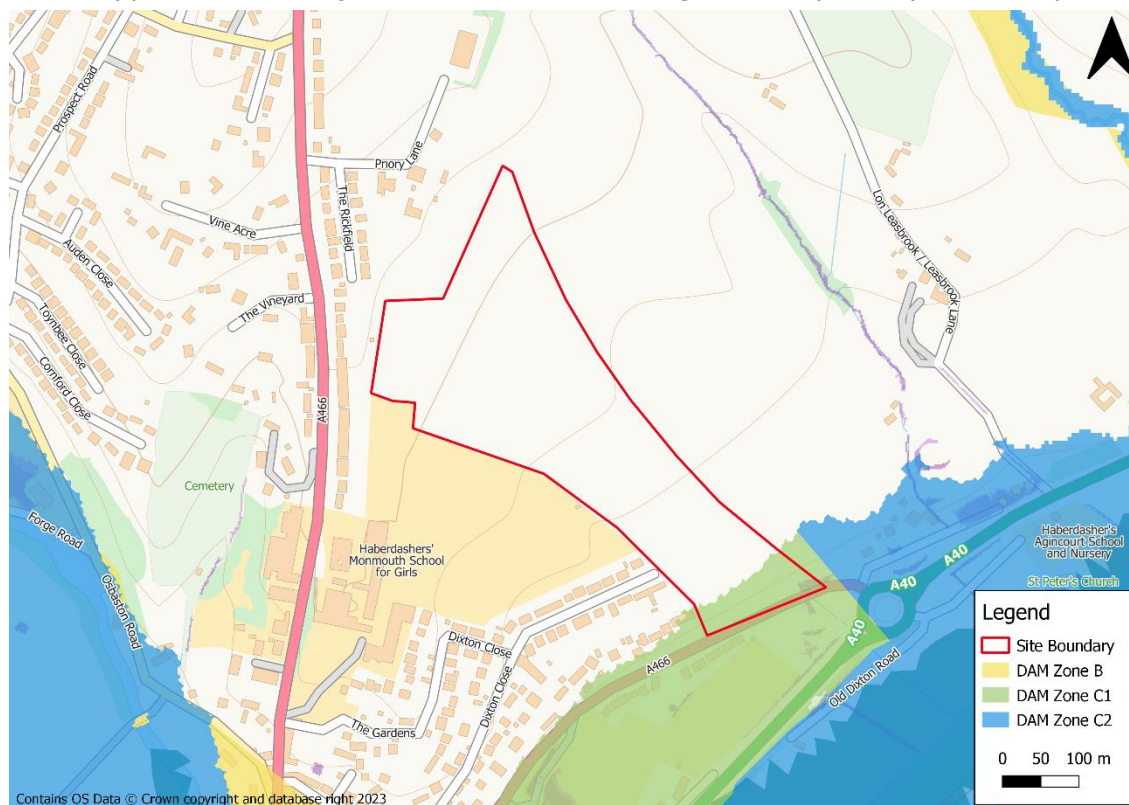


Figure 3-2 Development Advice Map

3.3 Vulnerability Classification

TAN-15 assigns one of three flood risk vulnerabilities to a development as shown in Table 3-1. As the proposed use for the site is for residential development it is classified as highly vulnerable development.

Table 3-1 Development categories as defined by TAN-15

Development category	Type
Emergency services	Hospitals, ambulance stations, fire stations, police stations, coastguard stations command centres, emergency depots and buildings used to provide emergency shelter in time of flood.
Highly vulnerable development	All residential premises (including hotels and caravan parks), public buildings (e.g. schools, libraries, leisure centres), especially vulnerable industrial (e.g. power

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal

JBA
consulting

	stations, chemical plants, incinerators) and waste disposal sites.
Less vulnerable development	General industrial, employment, commercial and retail development, transport and utilities infrastructure, car parks, mineral extraction sites and associated processing facilities, excluding waste disposal sites.

3.4 Lifetime of development

The Welsh Government latest technical guidance for climate change states:

When considering new development proposals, Technical Advice Note 15: Development, Flooding and Coastal Erosion (TAN-15) states that it is necessary to take account of the potential impact of climate change over the lifetime of development. A rule of thumb is that residential development has a lifetime of 100 years while a lifetime of 75 years is assumed for all other developments.

As the proposals are for residential use, a 100-year lifetime of development has been considered in this assessment based on residential development use.

3.5 Justification Test and Acceptability Criteria

TAN-15 states that "new development should be directed away from Zone C and towards suitable land in Zone A, otherwise to Zone B, where river or coastal flooding will be less of an issue."

In Zone C1, highly vulnerable development is required to comply with the Justification Test:

Its location in Zone C is necessary to assist, or be part of, a local authority regeneration initiative or a local authority strategy required to sustain an existing settlement;

Or

Its location in Zone C is necessary to contribute to key employment objectives supported by the local authority, and other key partners, to sustain an existing settlement or region;

And

It concurs with the aims of Planning Policy Wales and meets the definition of previously developed land;

And

The potential consequences of a flooding event for the particular type of development have been considered and found to be acceptable.

3.6 Acceptability Criteria

If the planning authority is satisfied that proposed development is justified in a flood risk area, this justification will be in the knowledge that development may experience flooding and will need to be planned accordingly. A full understanding of the potential risks and consequences will be required to inform the planning authority in its decision making and to demonstrate that the criteria set out in the justification tests have been satisfied. This

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal

JBA
consulting

should be demonstrated through the production of a Flood Consequence Assessment (FCA), which is appropriate to the nature and scale of the proposal.

Accordingly, the planning authority will need to arrive at a judgement on the acceptability of the flooding consequences and they should only permit development where the developer has demonstrated that the risks and consequences of flooding are manageable and meet the 'Acceptability Criteria'.

There are three principal aspects to the Acceptability Criteria:

1 Flood frequency requirements. The frequency at which flooding is regarded to be acceptable. TAN-15 states that all development must be designed to be flood free during the 1% river flood and 0.5% flooding from the sea events, with an allowance for climate change over the lifetime of development. See Table 3-2 for frequency thresholds for residential development.

2 Tolerable conditions. The flood conditions that are regarded to be acceptable during an extreme flood event with an allowance for climate change. See Table 3-3 for the flood conditions for residential development.

3 Avoidance of third-party impacts. Development must not cause or exacerbate the nature and frequency of flood risk elsewhere up to and including the 0.1% extreme flood event plus climate change over the lifetime of development.

Table 3-2 Flood frequency requirements

Type of development	Flood event types	
	Rivers	Sea
Residential	1% plus climate change (1 in 100)	0.5% plus climate change (1 in 200)

Table 3-3 Tolerable conditions in extreme flood event

Type of development	Maximum depth of flooding (mm)	Maximum velocity of flood water (m/s)
Residential	600	0.15

3.7 Summary of policy position

Based on NRW's DAM map, most of the proposed development site is located within Zone A, which is considered to be at little or no risk of flooding. However, the south of the proposed development site is shown to be partially located within Zone C1. Highly vulnerable development is permissible in Zone C1 providing it satisfies the requirements of the Justification Test and Acceptability Criteria. All proposed residential development is located within Zone A, with only the access road to the site crossing Zone C1.

An assessment of flood risk is contained in Section 5.

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal

JBA
consulting

4 Consultation draft of new TAN-15

The following chapter provides a summarised overview of the requirements set out in the consultation draft of the revised TAN-15, published January 2023. Whilst this policy has not been finalised or enacted it provides an indication as to whether development of the site could occur in the future under the new TAN-15 when implemented.

4.1 Flood Map for Planning

The initial requirement of TAN-15 is to identify the flood zones and vulnerability classification relevant to the proposed development. Table 4-1 summarises the flood zones and their definitions.

Table 4-1 TAN-15 definition of FMfP flood zones

Zone	Flooding from rivers	Flooding from the sea	Flooding from surface water and small watercourses
1	Less than 1 in 1000 (0.1%) (plus climate change) chance of flooding in a given year.		
2	Less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.	Less than 1 in 200 (0.5%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.	Less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.
3	A greater than 1 in 100 (1%) chance of flooding in a given year, including climate change.	A greater than 1 in 200 (0.5%) chance of flooding in a given year, including climate change.	A greater than 1 in 100 (1%) chance of flooding in a given year, including climate change.
TAN-15 Defended Zone	Areas where flood risk management infrastructure provides a minimum standard of protection against flooding from rivers of 1:100 (plus climate change and freeboard)	Areas where flood risk management infrastructure provides a minimum standard of protection against flooding from the sea of 1:200 (plus climate change and freeboard)	Not applicable.

4.2 FMfP: Flood Risk from Rivers

The Flood Map for Planning – Flood Risk from Rivers identifies that the site is predominantly located within Flood Zone 1, as shown in Figure 4-1. Flood Zone 1 is defined as a less than 1 in 1000 (0.1%) (plus climate change) chance of flooding in a given year.

JBA
consulting

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal

JBA
consulting

Table 4-2 Justification Test

Zone 1	TAN-15 Defended Zone	Zone 2 (Rivers and Sea)	Zone 3 (Rivers and Sea)
All types of development are acceptable in principle. Planning authorities should develop locally specific planning policies for localised areas at risk of flooding.	Development will be justified in the TAN-15 Defended Zones:	Development will be justified in Zone 2 if:	Development will be justified in Zone 3 if:
	Where there is an agreed Community Adaptation and Resilience Plan in place supporting development forming part of a strategic regeneration scheme Or	It will assist, or be part of, a strategy supported by the Development Plan to regenerate an existing settlement of achieve key economic or environmental objectives; And	There are exceptional circumstances that require its location in Zone 3, such as the interests of national security, energy security, public health, or to mitigate the impacts of climate change; And
		Its location meets the definition of previously developed land; And	Its location meets the definition of previously developed land; And
	The potential consequences of a flooding event for the particular type of development have been considered and found to be acceptable in accordance with the criteria contained in Section 11 of TAN-15.		

The site is predominantly located within Flood Zone 1 of the Flood Map for Planning for all flood risk sources therefore all types of development are acceptable in principle. The Justification Test requirements for Flood Zone 2 would apply to the development site. Highly Vulnerable development is not permitted in Flood Zone 3.

4.6 Acceptability Criteria

If the planning authority is satisfied that the proposed development is justified in a flood risk area, it must next be considered if the risks and consequences of flooding can be managed safely which can be demonstrated through the 'Acceptability Criteria'. As with the current TAN-15, there are three principal aspects to the Acceptability Criteria:

1 Flood frequency requirements. The frequency at which flooding is regarded to be acceptable, depending on the primary source of flooding (Table 4-3).

2 Tolerable conditions. The flood conditions that are regarded to be acceptable during an extreme flood event, depending on the type of development (Table 4-4).

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal

JBA
consulting

3 Avoidance of third-party impacts. Development must not cause or exacerbate the nature and frequency of flood risk elsewhere.

Table 4-3 Flood frequency requirements

Vulnerability categories		Flood event types	
		Rivers	Sea
Highly Vulnerable development	Emergency services (command centres and hubs)	0.1% +CC (1 in 1000)	0.1% +CC (1 in 1000)
	All other types	1% +CC (1 in 100)	0.5% +CC (1 in 200)
Less Vulnerable development Water compatible development (limited to those built elements that may be occupied by people)		1% +CC (1 in 100)	0.5% +CC (1 in 200)

Table 4-4 Tolerable conditions in extreme flood event

Type of development	Maximum depth of flooding (mm)	Maximum velocity of flood waters (m/s)
Highly Vulnerable development	600	0.15
Less Vulnerable development Infrastructure associated with highly vulnerable development e.g. car parks, access, paths, and roads. Water compatible development (limited to those built elements of development that may be occupied by people)	600	0.3

4.7 Summary of policy position

The site is predominantly located within Flood Zone 1 of the Flood Map for Planning for all development sources. Therefore, all types of development are deemed to be acceptable.

The south of the site, which is partially located within Flood Zone 2 and a small area in the south-east corner within Flood Zone 3 of the Flood Map for Planning for Rivers. No residential development shall be permitted within areas of Flood Zone 3. However areas of development within Flood Zone 2 will need to satisfy the requirements of the Justification Test and Acceptability of Consequences to allow development to take place.

An assessment of flood risk is contained in Section 5.

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal

JBA
consulting

5 Assessment of Flood Risk

A review of the existing data on flood risk from all sources has been undertaken based on publicly available data and is summarised below.

5.1 Flood Risk from Rivers

The NRW Flood Risk Assessment Wales (FRAW) Flood Risk from Rivers map illustrates that the site is predominantly at very low risk of flooding from rivers. The south of the site is shown to be at low risk of flooding from rivers, meaning that there is between a 1 in 1000 and 1 in 100 (0.1% - 1% AEP) chance of flooding. A small area in the south-eastern corner of the site is indicated to be at medium risk of flooding. This means that there is between a 1 in 100 and 1 in 30 (1% - 3.3% AEP) chance of flooding from fluvial sources.

It is recommended that residential development should be avoided within these areas of flood risk identified in the NRW Flood Map for Planning -Risk of Flooding from Rivers. An initial plan for the development indicates that no built development shall be placed within flood risk zones.

However, the main access point into the site, via the A466 Dixon Road, is located within an area of flood risk. Using the FMfP as the most up to date source of publicly available information, the access to the site is located within Flood Zone 2, indicating a risk of flooding in 0.1% AEP event, with an allowance for climate change. This indicates that the proposed access shall be flood free in the 1% AEP plus climate change event, in line with the requirements of TAN-15.

In addition, consideration should be given to the risk of displacement of flood waters as a result of the proposed development. There are no proposals to amend ground levels across the area of the site which lies within the flood zone as a result of the development, with the proposed access road to be retained at current ground level and permitted to flood during the extreme event. Consequently, it is considered that the proposed development shall not have a detrimental impact on flood risk to third parties, no there is no requirement for further analysis or mitigation as a consequence of the development.

During the extreme 0.1% AEP event plus climate change, access and egress to the proposed development site may be restricted along the A466 as a consequence of the associated flood risk. Consequently, emergency access is to be provided to the site via Priory Lane to the north, which is predicted to be flood free in all design events, in line with the requirements of TAN-15. Full details of operation of the emergency access shall be provided at detailed planning stage, including details of design, access, and operation of the emergency access point.

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal

JBA
consulting

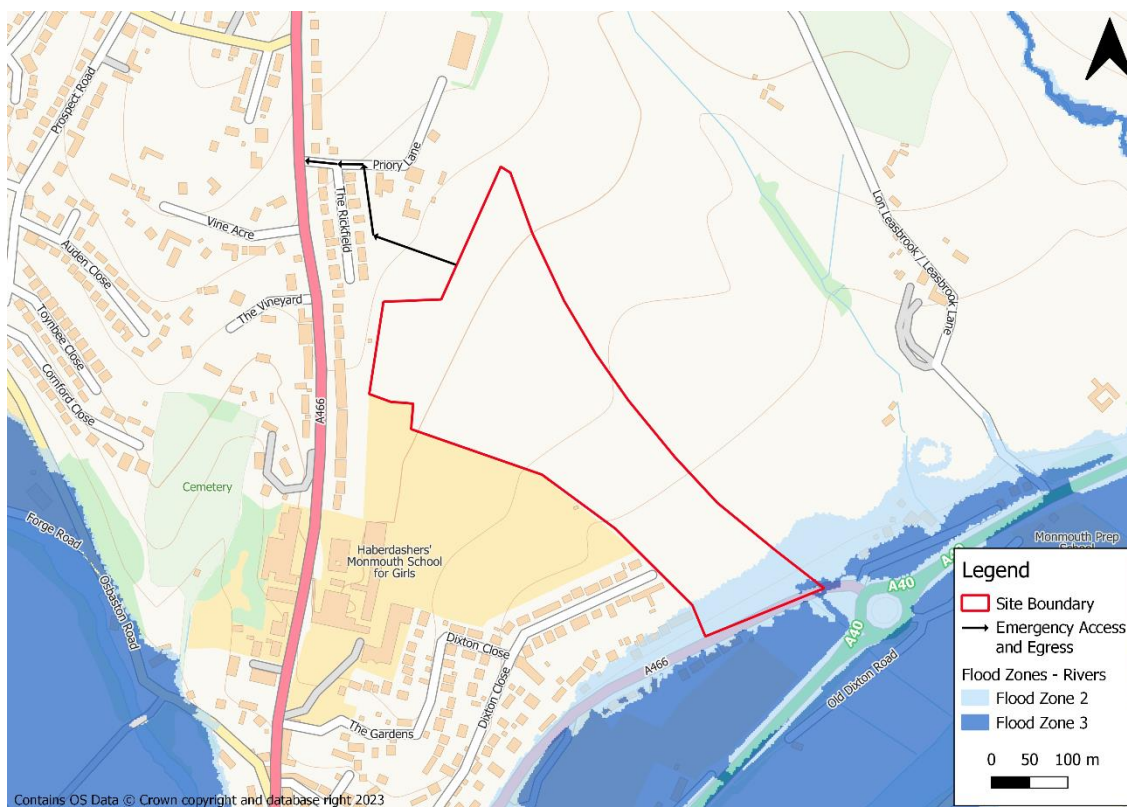


Figure 5-1 FRAW - Risk of flooding from Rivers

5.2 Flood Risk from the Sea

The NRW FRAW flood risk from the Sea map shows that the proposed development site is at very low risk of tidal flooding. As this layer is shown as transparent on the FRAW mapping, a figure is not included.

5.3 Flood Risk from Surface Water and Small Watercourses

The NRW FRAW flood risk from Surface Water and Small Watercourses map indicates that the site is predominantly at very low risk of flooding, as shown in Figure 5-2. A small area in the south-eastern corner of the site is shown to be at medium risk of flooding from surface water and small watercourses, meaning that there is a between a 1 in 100 and 1 in 30 (1% - 3.3% AEP) chance of flooding in any given year.

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal

JBA
consulting

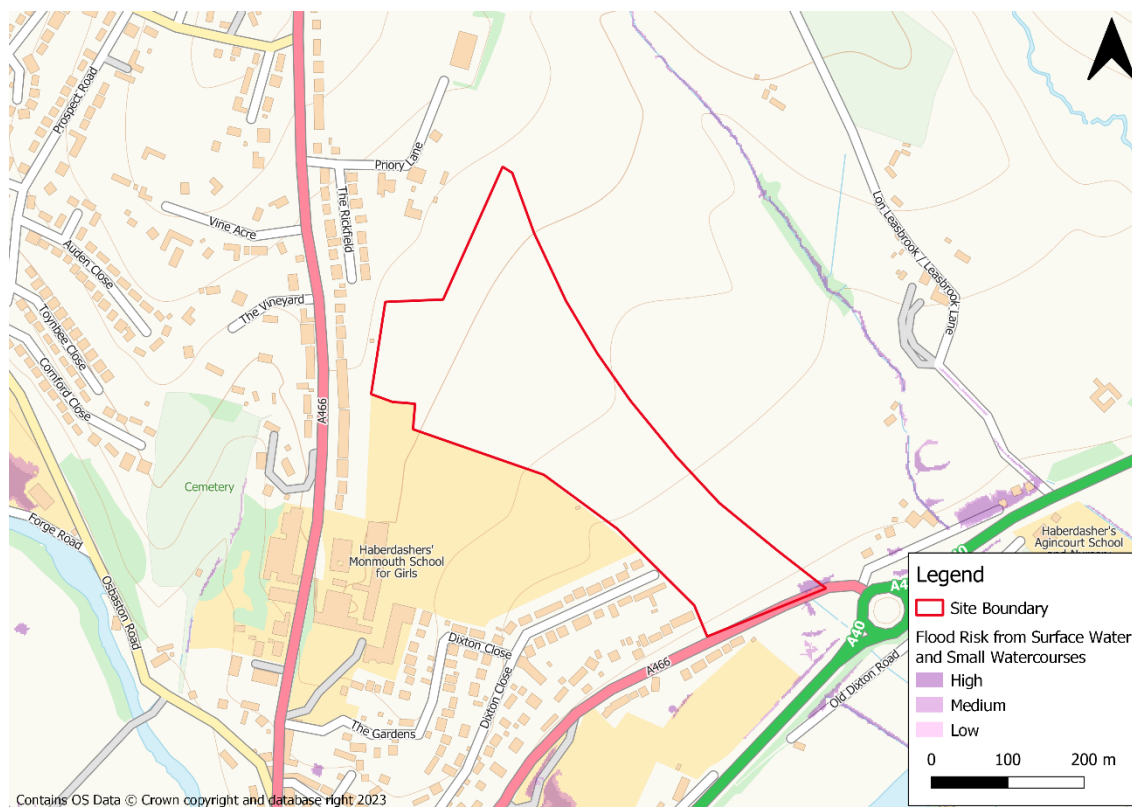


Figure 5-2 FRAW Surface Water and Small Watercourse risk

5.4 Flood Risk from Groundwater

Groundwater flooding is caused by unusually high groundwater levels. It occurs as excess water emerges at the ground surface or within manmade structures such as basements. Groundwater flooding tends to be more persistent than surface water flooding, in some cases lasting for weeks or months, and can result in damage to property. This risk of groundwater flooding depends on the nature of the geological strata underlying the site and the local topography.

The Monmouthshire County Council Preliminary Flood Risk Assessment (2011)¹, states that the risk of groundwater flooding is considered to be low, and it is not considered to be a significant issue within the catchment.

5.5 Flood Risk from Reservoirs

The NRW FRAW Flood Risk from Reservoirs map illustrates that the proposed development site is at very low risk of flooding, shown as a transparent layer on the FRAW mapping and therefore not presented graphically below.

¹ <https://www.monmouthshire.gov.uk/app/uploads/2018/02/Preliminary-Flood-Risk-Assessment-2011.pdf>

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal



5.6 Flood Risk from Sewers

The Monmouthshire County Council Preliminary Flood Risk Assessment does not indicate flood risk at or near to the site. Therefore, it is concluded that there is a low risk of sewer flooding.

6 Surface Water Management Approach

6.1 Sustainable drainage systems

Sustainable Drainage Systems (SuDS) aim to mimic the natural processes of Greenfield surface water drainage by allowing water to flow along natural flow routes and also aims to reduce the runoff rates and volumes during storm events, whilst providing water treatment benefits. SuDS also have the advantage of providing Blue and Green Infrastructure and ecology and recreational benefits when designed and maintained properly.

Schedule 3 of the Flood and Water Management Act 2010 was enacted in Wales in January 2019, leading to the requirement for all new developments to incorporate the four pillars of SuDS design, shown in Figure 6-1.

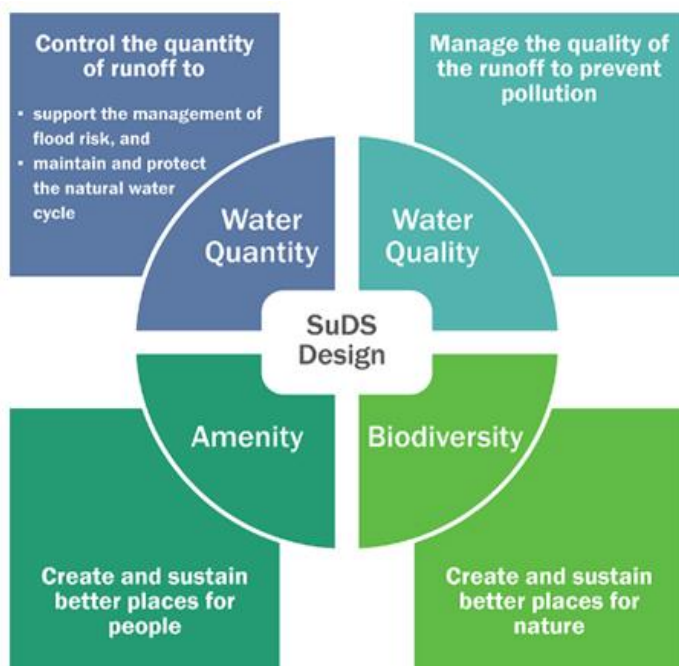


Figure 6-1 The Four Pillars of SuDS Design (Ciria 2015)

6.2 Design criteria

The following national guidance documents and design standards have been considered when developing this outline surface water drainage strategy:

- C753 The SuDS Manual (Ciria 2015)
- Statutory Standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems (Welsh Government 2018)
- Planning Policy Wales – Edition 11, February 2021
- The Building Regulations 2010 Part H: Drainage and Waste Disposal
- Sewers for Adoption 7th Edition

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal

JBA
consulting

Monmouthshire County Council does not have any specific guidance related to SuDS. Should guidance be developed during the outline or detailed drainage design this should be consulted.

6.3 Existing discharge location

Given the underlying geology and assumed soil type for the site, it is assumed that currently surface water mostly drains via evapo-transpiration losses, slow infiltration into the underlying soils, and runoff towards the River Wye and its tributaries that are present to the south of the site.

JBA staff visited the proposed development site in August 2023 to undertake a site walkover and understand the local drainage features. The National Library of Scotland provides an online service which contains historic Ordnance Survey Maps across the UK. These maps² (OS Six Inch, 1888-1913) indicate that there were previously two ponds located on the site, which have since been filled in with soils and are now present as shallow localised depressions. It is assumed that when these ponds existed, they infiltrated to ground. The landowner reported that these depressions do not presently hold water during high rainfall events.

The site drains towards a culvert in the south-west of the site, known to be concrete and 600mm in diameter. Surface water is conveyed under the A466 and then discharged into an ordinary watercourse which flows into the River Wye.

There is a second culvert in the south-east of the site which collects surface water runoff from the proposed development site. This culvert is concrete and approximately 375mm in diameter. Surface water is similarly conveyed under the A466 and flows into a second ordinary watercourse which is then culverted under the A40 before discharging into the River Wye. Figure 6-3 shows NRW LiDAR data which clearly depicts the open channel watercourse crossing private land between culverts under the A466 and A40.

It is understood that there is an existing surface water pipe that runs in a south westerly direction from Monmouth Girls School to the 600mm diameter culvert in the south-western corner of the proposed development site. The pipe was constructed to manage surface water flooding of the houses to the south-east of the proposed site, along The Gardens and Dixon Close, from the school site. The pipe is concrete and 600mm in diameter.

Figure 6-2 displays the local drainage features outlined above and indicates the indicative flow paths of the proposed development site.

Greenfield runoff rates have been calculated which will form a key design criterion for the development of a surface water drainage system across the site.

² <https://maps.nls.uk/>

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal

JBA
consulting

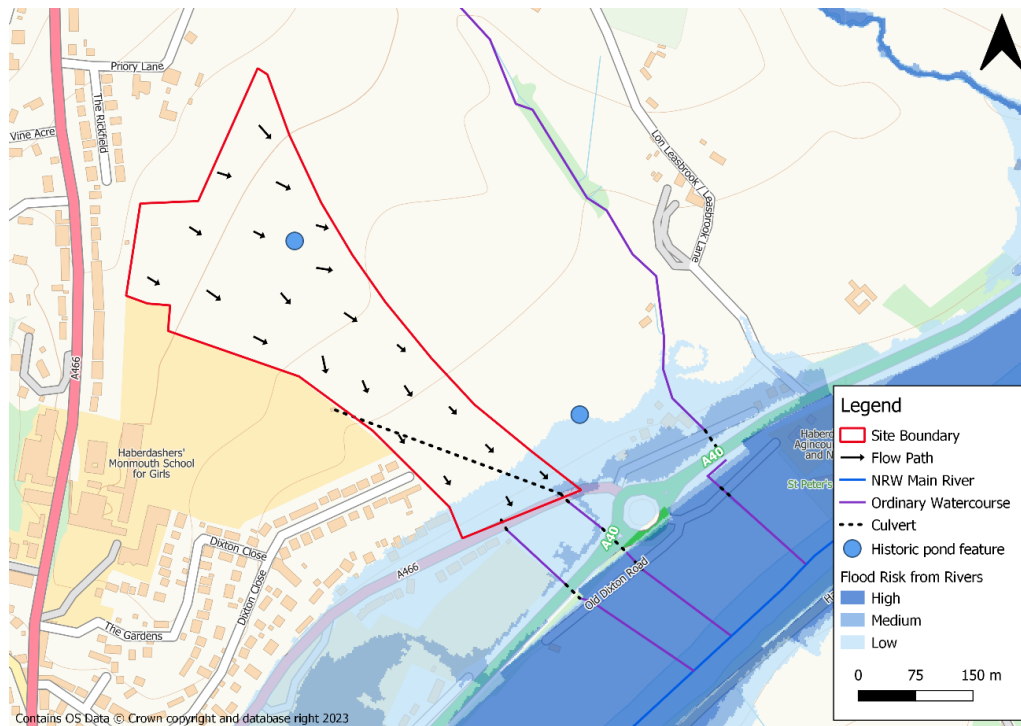


Figure 6-2 Local drainage features

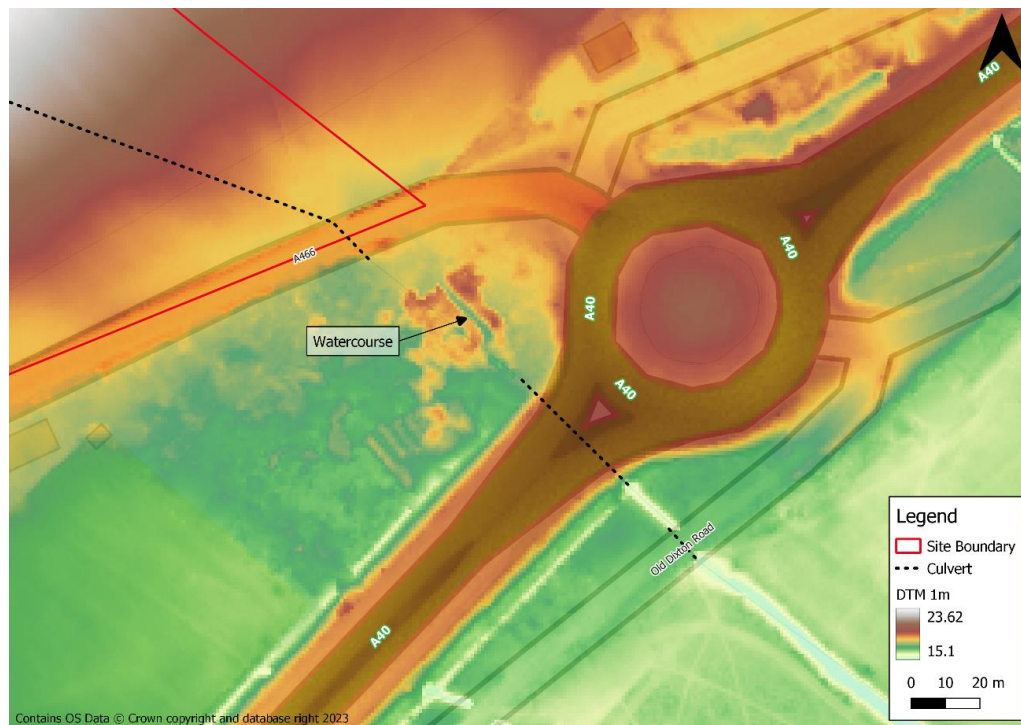


Figure 6-3 Local drainage to south-east of site

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal

JBA
consulting

Greenfield Runoff Rates

Table 24.1 of Ciria C753 The SuDS Manual indicates that the FEH methods (FEH Statistical and REFH) should be the preferred methods for calculating peak Greenfield Runoff Rates. This is supported by Natural Resources Wales GN008 Flood Estimation: Technical Guidance and Environment Agency research by Faulkner et al which concluded that FEH methods are applicable across a range of catchment sizes and that they should be used in place of outdated methods such as IH124 and ADAS 345 where possible.

The UKSuDS Tool was used to calculate peak Greenfield runoff rates for the site. Catchment descriptors were extracted from the FEH Web Service. The calculated Greenfield runoff rates are shown in Table 6-1 below, and the UKSuDS calculation record is found in Appendix A.

Table 6-1 Greenfield Runoff Rates

Return Period	Specific Runoff (l/s/ha)	Peak Runoff Rate (l/s)
1	6.75	84.47
QBAR	7.94	99.37
30	15.50	193.78
100	19.71	246.44

Greenfield Runoff Volume

Greenfield runoff volumes were calculated for a six-hour storm event at the site using the FSSR16 method as shown in Equation 1 below:

$$\text{Equation 1: Site Area} \times \text{Rainfall Depth} \times \text{Percentage Runoff}$$

Percentage runoff was calculated using the FSSR16 methodology which accounts for soil type, catchment wetness and storm intensity. The rainfall depths for a six-hour 100-year storm event were extracted from the FEH Web Service and are summarised in Table 6-2 with the calculated Greenfield runoff volumes.

Table 6-2 Greenfield Runoff Volumes

Return Period	Rainfall (mm)	Greenfield Runoff Volume (m3)
30	53.2	2553
100	64.2	3196

6.4 Surface Water Runoff Destination (Discharge Hierarchy)

The statutory standards for SuDS in Wales address the use of surface water by the development and where it should be discharged. It has developed a destination hierarchy which sets out the preferred routes for discharge of runoff from the site:

- Priority Level 1: Surface water runoff is collected for use.
- Priority Level 2: Surface water runoff is infiltrated to ground.

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal

JBA
consulting

- Priority Level 3: Surface water runoff is discharged to a surface water body.
- Priority Level 4: Surface water runoff is discharged to a surface water sewer, highway drain, or another drainage system.
- Priority Level 5: surface water runoff is discharged to a combined sewer.

Priority Level 1 is the preferred (highest priority) and 4 and 5 should only be used in exceptional circumstances. The following outlines how the proposed development adheres to the drainage hierarchy.

Priority Level 1 – water for reuse

As per the principles of the Statutory Standards for SuDS in Wales, the increase in surface water runoff from the proposed development (as a result of an increase in impermeable surfaces) should primarily be collected for re-use – Priority Level 1 of the discharge hierarchy. The yield: use ratio is unlikely to be sufficient for this site to allow for disposal of surface water via rainwater harvesting alone, however water butts should be provided at each proposed dwelling to allow for the potential re-use of rainwater across the site.

Priority Level 2 – infiltration

Priority Level 2 of the drainage hierarchy is to dispose of surface water via infiltration. Ground investigations have not yet been undertaken at the site; however, the underlying bedrock is comprised of St Maughan's Formation – argillaceous rocks and sandstone, interbedded. The soils are shown to be loamy and clayey soils with impeded drainage. This suggests that infiltration rates are unlikely to be acceptable in the surface material, but may be possible at depth.

Infiltration testing shall be required to demonstrate the suitability of infiltration across the site.

Priority Level 3 – discharge to a surface water body

Should infiltration be an unsuitable method of surface water discharge, Priority Level 3 of the discharge hierarchy is to discharge to a surface water body.

Further assessment on the condition of the culvert from the development site shall be required prior to outline design. Additionally, assessment on the form of the existing open watercourse downstream of this culvert, as detailed in Section 6.3, shall be required to confirm that this is a viable route for surface water discharge. Further work using InfoDrainage (or similar software) is likely to be required to confirm that there is sufficient capacity for the system to take the greenfield runoff rate from the site, and to assess the likelihood and attenuation requirements of a surcharged outfall due to the presence of the floodplain.

6.5 S2: Surface Water Runoff Hydraulic Control

There are typically three design storm events which should be considered when designing the SuDS system for managing flows and volumes:

- A 1 in 1-year event, on sloping sites without basements, where surcharging above soffits of any surface water drainage pipe is not permitted.
- 1 in 30-year storm event, where surface water flooding of the site is not permitted at this frequency.

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal

JBA
consulting

- 1 in 100-year storm event with allowances for future climate change, where runoff should be managed within the extents of the development site, ensuring that it cannot affect people or properties either within the development or surrounding developments.

Allowance for Climate Change

The Welsh Government has produced Adapting to Climate Change guidance which contains updated representative climate change allowances for Wales peak flows. The guidance contains indicative sensitivity ranges for peak rainfall intensity. As the proposed site is for residential purposes, the assumed lifetime of development at the site is 100 years, and as such the 2070-2115 estimate should be used. The recommended climate change factor for small catchments using the Central estimate for the 2070-2115 epoch is 20%. However, a sensitivity check should be undertaken on the Upper estimate value of 40%.

Discharge Limits and Attenuation Volume

Should infiltration not be viable, the discharge limit for the site should be set to the Greenfield QBAR rate of 7.94 l/s/ha.

Currently, the impermeable surfaced proportion of the proposed development site is unknown and so the exact required attenuation volume cannot be calculated. The proposed site layout and indicative attenuation basins have been based on a rule of thumb of 60% of the developable area being impermeably surfaced and positively drained. Attenuation should be considered at all stages of master planning and site design to facilitate the implementation of SuDS across the site through Blue-Green Corridors and source control techniques wherever possible.

6.5.1 Interception

When rainfall takes place on greenfield sites there is, for the majority of rainfall events no runoff due to evapotranspiration or groundwater recharge. Therefore, interception mechanisms are based on runoff volume reduction using evapotranspiration and infiltration processes. Table G2.1 of the Statutory Standards for SuDS in Wales lists the interception drainage components which have assumed compliance. At project stage of the master planning, SuDS components will be proposed at source across the site. Components which are likely to be suitable and are deemed to be compliant as interception mechanisms include permeable paving, swales, basins, and rain gardens. These are outlined below in Table 6-3.

Table 6-3 Interception mechanisms with assumed compliance

SuDS Component	Requirement
Bioretention areas and rain gardens	Areas of the site drained to unlined bioretention components can be assumed to comply where the impermeable surface area is less than 5 times the vegetated surface area receiving the runoff.
Swales	Where the longitudinal gradient of the swale is less than 1:100, they are suitable for interception delivery for

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal

JBA
consulting

	impermeable surface areas up to 5 times the base of the vegetated surface area receiving runoff.
Permeable paving	All permeable surfaces, whether lined or not, can be assumed to comply provided there is no additional area drained to the permeable pavement.
Basin	Areas drained to detention basins with a flat unlined base can be assumed to comply where the drained impermeable area is less than 5 times the vegetated surface area receiving runoff.

6.6 S3: Water Quality

The surface water drainage system should provide a sufficient level of water quality treatment to prevent pollution of receiving waterbodies. During the water treatment design event (5mm rainfall across the entire site) no runoff should leave the site. This is usually achieved through source control techniques such as permeable pavements and rain gardens.

Table 4.3 of the SuDS Manual advocates the use of the "simple index approach" to determine an appropriate level of pollution mitigation for the development sites. This splits pollution into three contaminant types (Total Suspended Solids, Metals, and Hydrocarbons) and assigns a "pollution hazard index" to each type. Different SuDS features are then assigned a "SuDS Mitigation Index" and sufficient treatment is deemed to be provided if the "SuDS Mitigation Index" is equal to or greater than the "pollution hazard index" for each pollutant type. When more than one SuDS component is required a multiplication factor of 0.5 is applied to mitigation indices for secondary and tertiary components to account for reduced performance.

The proposed development is for residential development with low traffic roads. Low traffic roads have a "low" pollution hazard level. The "pollution hazard indices" for a low pollution hazard site is given in Table 6-4.

Table 6-4 Pollution hazards for the site

Total Suspended Solids (TSS)	Metals	Hydrocarbons
0.5	0.4	0.4

6.7 S4: Amenity & S5 biodiversity

The design of the surface water management system should maximise amenity benefits across the site. SuDS components can enhance the provision of high quality, attractive public space which can help to provide health and well-being benefits, they improve the liveability of local communities, and they contribute to improving the climate resilience of new developments.

The aim of Standard 4 is to ensure that wherever possible and having regard to the need to prioritise drainage, the SuDS scheme makes the best contribution towards maximising benefits for amenity.

Across the development site, SuDS components such as rain gardens and vegetated swales/rills would provide open and accessible areas, creating a pleasant place to live and promoting the wellbeing of residents across the site. Rain gardens and swales would also assist in the climate resilience of the development, promoting carbon sequestration, and permeable paving would provide amenity benefits from its multifunctionality.

The surface water drainage system should seek to enhance habitats within the site and complement neighbouring habitats. The ecological potential of the SuDS system can be maximised by utilising local planting, locating SuDS adjacent to existing features and utilising the known surface water flow paths across the site. The strategy should create a range of habitats and provide varied water depths within the SuDS features, which should be sustained by ensuring that an effective management regime is implemented.

6.8 S6: Design of Drainage for construction, operation, and maintenance

The national SuDS standards state that components must be designed to ensure the structural integrity of the drainage system and any adjacent structures or infrastructure under anticipated loading conditions over the design life of the development, taking into account the requirement for reasonable levels of maintenance.

Health and safety

The surface water drainage system should be designed so that it minimises health and safety risks to the site occupants. SuDS are sometimes perceived as unsafe structures with fears of drowning and overturning cars, but with the correct design, these risks can be mitigated. A CDM Designers Risk Assessment should be undertaken demonstrating that any proposed surface water drainage system is fit for purpose, with risks designed out of the proposal, or mitigated wherever necessary.

Adoption and Maintenance

Schedule 3 of the Flood and Water Management Act 2010 was implemented in Wales on the 7th of January 2019. Under this legislation, SuDS that serve multiple properties must be approved and adopted by the SuDS Approval Body (SAB) – a function performed by the Lead Local Flood Authority (LLFA) at Monmouthshire County Council.

During the detailed design phase, a detailed maintenance plan should be developed to demonstrate the maintenance required to ensure the proposed drainage systems function to optimal capacity in perpetuity.

6.9 Site Opportunities and Constraints

A range of SuDS components should be used within the development site in an interconnected system designed to manage, treat, and make the best use of surface water runoff. The proposed development site provides many opportunities and constraints for the disposal of surface water via the use of SuDS. A map of these is shown in Appendix B.

Opportunities

In order to manage surface water, the proposed development site has been divided into sub-catchments, based on the natural topography of the site and a preliminary development plan. Due to the location of lowest ground levels and waterbodies in and

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal

JBA
consulting

adjacent to the south of the site, surface water shall naturally drain in a general south easterly direction.

As discussed in Section 6.4.1, the desktop study indicates that the underlying soils and geology of the site would result in infiltration not being a viable means of surface water discharge for the development. However, infiltration tests are required to determine infiltration rates across the site prior to outline design stage.

Due to the likely unsuitability for the use of infiltration SuDS, a connection to the ordinary watercourse at the south of the site may be available. An existing culvert, with a 600mm diameter in the south-western corner of the site currently conveys water from the site underneath the A466, into the ordinary watercourse before discharging into the River Wye. Further assessment on the route and condition of the culvert from the development site will need to be confirmed prior to outline design stages.

Alternatively, the construction of a new outlet under the highway can be investigated. Further investigation of this discharge location should be undertaken to ensure that there is capacity for the system to take the greenfield runoff rate from the site, and to certify any connections are located above the water level under a 1% AEP scenario to ensure hydraulic locking does not occur. In order to further assess the likelihood for a surcharged outfall during fluvial flood events, modelling may be required at outline design stage to ensure that sufficient surface water attenuation is provided across the site.

The current strategic masterplan includes areas of open space and landscaping which can be utilised for surface water attenuation and conveyance. Green corridors should be provided across the site to store and convey flow. Provision of green corridors will enhance wildlife and aid habitat connectivity. Due to the steep topography from the north-east to south-west of the site, check dams may be required to reduce the velocity of flow in conveyance structures, also managing the risk of erosion.

Cross slope features should be considered across the development layout to intercept overland flow and promote above-ground conveyance of surface water towards the recommended green corridors. Incorporating these features across the site will aid habitat connectivity, promoting biodiverse ecosystems across the site.

Multifunctional uses across the site should also be considered in areas of open and green space. SuDS can be incorporated into play areas and areas of public open spaces to promote the multifunctional benefits of SuDS. During the design stage of multifunctional features, considerations towards the speed of inundation and drain time will need to be considered to maximise the practicability and safety of SuDS features across the site.

Within residential areas and along highways of the proposed development rain gardens can be utilised to encourage attenuation of flow at the source. These bioretention features shall also increase the amenity, biodiversity, and water quality benefits of SuDS. Consideration needs to be given to the proximity of the SuDS assets in relation to proposed buildings and existing vegetation across the boundary of the site. Retention of existing vegetation should be encouraged, and any proposed SuDS assets should seek to enhance existing habitats in these areas.

Constraints

It is known that a surface water connection crosses the proposed development site from Monmouthshire School for Girls to the south-western corner of the site, discharging into the existing 600mm diameter culvert at this location. It is currently unknown as to the

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal

JBA
consulting

exact route and condition of this surface water connection. It is recommended that additional information is sought prior to outline design and masterplanning of the proposed development. Should the surface water connection require re-routing, it should be demonstrated that the proposals do not result in a detriment to flood risk.

No further utility information is held for the proposed development site.

In line with the Ciria SuDS manual, it is recommended that SuDS features are located outside of the 1% AEP (1 in 100) plus climate change flood extent, as represented by Flood Zone 3 in the Flood Map for Planning - Rivers. Engagement with the SAB indicates that SuDS should also be located outside of the 0.1% AEP extent, demarked by Flood Zone 2 on the FMfP. This is due to the risk of inundation posed to SuDS assets in the south of the site if they were to be located within an area at risk of fluvial flooding.

6.10 Summary of SuDS Viability

Given the design criteria above, and the opportunities and constraints across the site, consideration has been given to various SuDS components and their viability for use across the proposed development site. Table 6-5 provides a summary of the SuDS component and their viability, along with an indication of the additional benefits they can provide, such as amenity, biodiversity, and water quality benefits. This demonstrates that there are a wide range of SuDS options that could potentially be deployed at the site. Such SuDS options would be deployed in combination to form a SuDS 'management train' to achieve the multiple requirements and objectives of the SuDS standards.

Table 6-5 Viability of SuDS components on site

SuDS component	Site Viability	Amenity Benefits	Biodiversity Benefits	Water Quality Benefits	Comments
Rainwater Harvesting	x	✓	x	x	Unlikely to establish the yield: use ratio
Green Roofs	x	✓	✓	✓	Prohibitively costly on general housing sites. Significant structural and maintenance requirements with modest surface water attenuation provided.
Infiltration Systems and Soakaways	TBC	x	x	✓	There is potential for infiltration to be a viable option for the site. Testing is required to determine whether infiltration rates are suitable.

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal

JBA
consulting

Filter Strips	✓	✓	✓	✓	Opportunities to link habitats to adjacent land and wildlife corridors on the site.
Filter Drain	✓	✗	✗	✓	Opportunities to be used to intercept flows in the north of the development to intercept flows entering the site. However, greener alternatives are preferable.
Swale	✓	✓	✓	✓	Conveyance of water across the site and for source control purposes. Check dams may be required according to the site topography.
Bioretention Systems and Rain Gardens	✓	✓	✓	✓	Beneficial for use within treatment trains and for implementation of SuDS at source. Proposed for enhancement of streets.
Pervious Pavements	✓	✗	✗	✓	Pervious pavements can be utilised for attenuation purposes on driveways and shared roads.
Attenuation Storage Tanks	✓	✗	✗	✗	Above ground SuDS should be considered prior to the use of below ground storage.
Detention Basin	✓	✓	✓	✓	Opportunities for habitat creation and inclusion

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal



					within areas of public open space.
Ponds and Wetlands	✖	✓	✓	✓	There are opportunities to utilise shallow and gently sloping wet grasslands to maximise ecological benefits outside of the red line boundary.

7 Conclusion

JBA Consulting have been commissioned by Redrow Homes Ltd to prepare a flood risk and high-level drainage strategy in support of a site they wish to develop for residential purposes in in Monmouth, Monmouthshire.

The proposed development site is currently greenfield in nature. The River Wye, an NRW Main River, flows approximately 260m to the south of the development site. There is an ordinary watercourse at the southern boundary which currently drains surface water from the proposed land and discharges into the River Wye.

Flood Risk

The proposed development site is at very low risk of flooding from groundwater, sewer, reservoir, and tidal sources.

The residential nature of the development proposal is classified as highly vulnerable development.

Under the current TAN-15, the majority of the development site is located within Zone A of the DAM map. The south of the site is shown to be located within Zone C1.

The proposed development site generally has a very low risk of surface water and small watercourse flooding. A small area in the south-eastern corner of the site is shown to be at medium risk of flooding. This means that there is a between a 1 in 100 and 1 in 30 (1% - 3.3% AEP) chance of flooding in any given year.

The site is predominantly at very low risk of flooding from fluvial sources. However, the south of the site is shown to be at low risk of flooding from rivers, meaning that there is between a 1 in 1000 and 1 in 100 (0.1% - 1% AEP) chance of flooding. A small area in the south-eastern corner of the site is indicated to be at medium risk of flooding (.1% - 3.3% AEP) from fluvial sources.

Under the draft TAN-15, the site is located within Flood Zone 2 of the Flood Map for Planning – Rivers. Flood Zone 2 shows areas which have a less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change. A small area in the south-east corner of the site is shown to be located within Flood Zone 3, indicating a greater than 1 in 100 (1%) chance of flooding in a given year, including climate change.

The development of the site will need to be justified and is required to satisfy the Acceptability Criteria of TAN-15.

It is recommended that residential development should be avoided within areas of Flood Zone 2. An initial plan for the development indicates that no built development shall be placed within flood risk zones.

However, the main access point into the site, via the A466 Dixon Road, is located within an area of flood risk. Using the FMfP as the most up to date source of publicly available information, the access to the site is located within Flood Zone 2, indicating a risk of flooding in 0.1% AEP event, with an allowance for climate change. This indicates that the proposed access shall be flood free in the 1% AEP plus climate change event, in line with the requirements of TAN-15.

During the extreme 0.1% AEP event plus climate change, access and egress to the proposed development site may be restricted along the A466 as a consequence of the

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal

JBA
consulting

associated flood risk. Consequently, safe, dry emergency and pedestrian access is to be provided on the northern boundary via Priory Lane.

Surface Water Drainage

The soil type beneath the site is described as having impeded drainage. As a result, it is unlikely that the site will have sufficient infiltration rates to discharge surface water to the ground. However, infiltration testing will be required, and it is advised that this is completed prior to outline design.

There is no known surface water infrastructure across the proposed development site, and it is therefore assumed that surface water is partially discharged via evapo-transpiration, and predominantly runs off in a general south-easterly direction towards the River Wye and its tributary at the southern boundary.

A site visit in August 2023 by JBA staff to assess local drainage features found that there are two existing culverts that convey surface water runoff from the south of the site under the A466. Surface water is then discharged into two ordinary watercourses which then flow into the River Wye.

Further assessment on the route and condition of the culvert from the development site shall be required prior to outline design. Additionally, further work including modelling using InfoDrainage (or similar software) is likely to be required to assess the likelihood of a surcharged outfall, and to ensure that sufficient attenuation is provided across the site during the 1% AEP scenario.

There is a surface water pipe that is associated with Monmouth Girls School which crosses the site via the western boundary to the south-eastern corner of the site and conveys surface water flows from the school to the existing culvert.

Historic maps indicate that there were two ponds located at the site, which have since been filled. They are now present as shallow, localised depressions. These areas on the proposed development site are not known to hold water during high rainfall events and it is assumed that rainwater infiltrates to ground.

Greenfield runoff rates have been calculated as 7.94 l/s/ha for the QBAR event.

The surface water drainage system should reduce post development runoff rates and volumes as close to Greenfield runoff rates as possible, in line with the statutory standards for SuDS in Wales. The drainage strategy should provide multiple benefits and ensure water quality downstream is not adversely affected as a result of the proposed development.

The topography of the proposed development site will need to be accounted for within the SuDS design. Check dams may be required to reduce the velocity of flow in conveyance structures and promote attenuation across the site.

It is advised that SuDS features should be located outside of the 1 in 100 plus climate change events, as represented by Flood Zone 2 of the Flood Map for Planning – Rivers. This is due to the risk of inundation posed to SuDS assets in a flood zone.

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal



A UKSuDS Tool – Greenfield Runoff Rates



Calculated by:	CHARLOTTE LICKMAN
Site name:	Leasbrook
Site location:	Leasbrook

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

Site Details

Latitude:	
Longitude:	
Reference:	1078206553
Date:	Jul 19 2023 15:55

Runoff estimation approach

FEH Statistical

Site characteristics

Total site area (ha):	12.5
-----------------------	------

Methodology

Q _{MED} estimation method:	Calculate from BFI and SAAR
BFI and SPR method:	Specify BFI manually
HOST class:	N/A
BFI / BFIHOST:	0.486
Q _{MED} (l/s):	
Q _{BAR} / Q _{MED} factor:	1.11

Hydrological characteristics

	Default	Edited
SAAR (mm):	0	1025
Hydrological region:	1	1
Growth curve factor 1 year:	-	0.85
Growth curve factor 30 years:	-	1.95
Growth curve factor 100 years:	-	2.48
Growth curve factor 200 years:	-	2.84

Notes

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

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

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

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

(3) Is $SPR/SPRHOST \leq 0.3$?

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

Q_{BAR} (l/s):		99.37
1 in 1 year (l/s):		84.47
1 in 30 years (l/s):		193.78
1 in 100 year (l/s):		246.44
1 in 200 years (l/s):		282.22

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

Flood Risk and Drainage

JBA Project Code
Contract
Client
Date
Author
Reviewer
Subject

2023s0943
Leasbrook, Monmouthshire
Redrow Homes Ltd
April 2024
Charlotte Lickman BSc (Hons)
Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM
Leasbrook, Monmouthshire - Candidate Site Flood Risk and Drainage
Appraisal



B Site Opportunities and Constraints



This drawing is for high-level purposes only. During the master planning stage of the project, SuDS assets will be used at source across the site and proposed in detail.

Cross slope features will intercept surface water flows across the site, whilst providing biodiversity and amenity benefits.

Restricted emergency vehicle and pedestrian access will be provided via Priory Lane.

Detention basins will provide surface water storage and flow control facilities through the attenuation of stormwater runoff. They can also offer amenity benefits. Basins can also be utilised as multifunctional spaces in proposed play areas and public open spaces.

Basin 1

Land within the blue line boundary has the potential to be utilised as a green corridor, depending on ecological requirements.

Basin 2

Due to the steep topography of the site, it is likely that slope features will need to be stepped or contain check dams to control flows.

Green corridors are located along the edge of sub catchments, in order to convey water across the site whilst providing water quality, biodiversity, and amenity benefits.

Basin 3

SuDS features are required to be located outside of Flood Zone 2 of the FMfP which encroaches into a small area of the south eastern corner of the site.

Basin 5

Basin 4

An ordinary watercourse is located across the A66 which then discharges into the River Wye. This could be incorporated within the proposed drainage system in order to discharge of surface water into a surface water body if infiltration is not viable.

Leasbrook Bungalow

Legend

- Site Boundary
- Blue Line Boundary

- Access Point
- Detention Feature
- Cross Slope Feature
- Green Corridor

- Catchment 1
- Catchment 2
- Catchment 3
- Catchment 4
- Catchment 5
- Catchment 6

Flood Map for Planning - Rivers

- Flood Zone 2
- Flood Zone 3

0 100 200 Meters