



FLOOD RISK ASSESSMENT AND SURFACE WATER DRAINAGE STRATEGY

FOR

PROPOSED RESIDENTIAL DEVELOPMENT

AT

WEST WALBERTON LANE

WALBERTON

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1.0 Introduction

1.1 Brief

- 1.1.1 WFBA have been instructed by Macra Ltd to undertake a Flood Risk Assessment (FRA) and prepare a surface water drainage strategy for the proposed residential development in West Walberton Lane, Walberton.
- 1.1.2 The site is currently undeveloped.
- 1.1.3 This FRA outlines the flood risk and drainage issues in relation to the proposed development.
- 1.1.4 The purpose of this report is to demonstrate how the proposed development complies with planning policy on flood risk and drainage (National Planning Policy Framework and the supporting Planning Practice Guidance; and local plan policy).
- 1.1.5 The structure of this report is summarised as follows:
 - ⌘ Section 2: Describes the existing conditions with respect to flooding and drainage;
 - ⌘ Section 3: Provides commentary on how flood risk from a range of potential sources may or may not constrain development proposals;
 - ⌘ Section 4: Describes how surface water from the development area can be drained in a sustainable manner, without increasing the risk of flooding elsewhere;
 - ⌘ Section 5: Presents a summary of the report and identifies the main conclusions that can be drawn.

2.0 Site Description and Proposed Development

2.1 Site Location

- 2.1.1 The site is located on West Walberton Lane, as shown in **Figure 1**. The boundary of the site encloses an area of about 2.2ha that is roughly triangular in shape. The site is approximately centred on OS grid reference 49647, 106188.

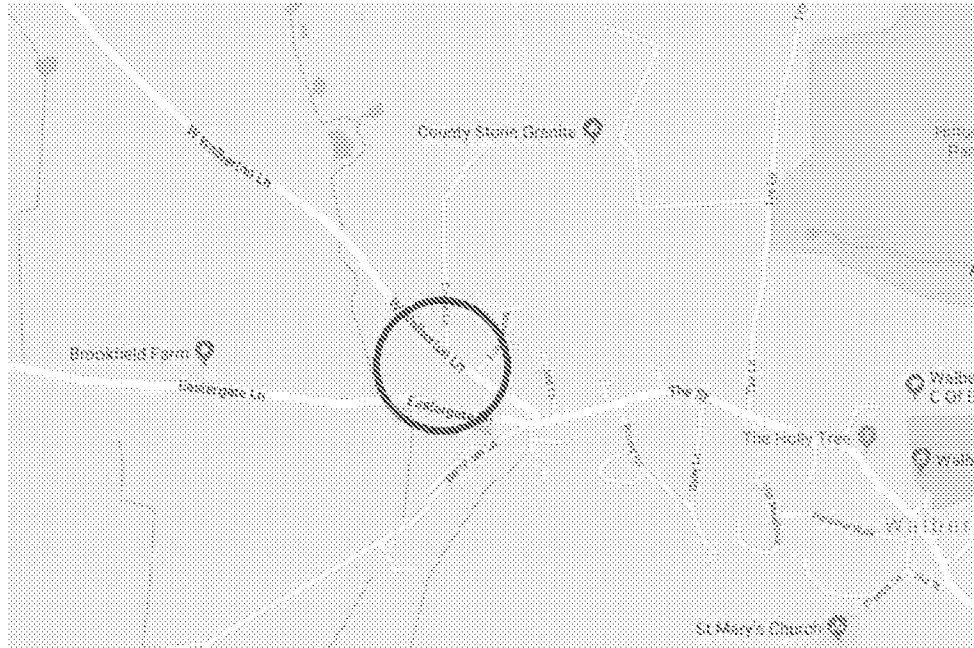


Figure 1. Site Location

- 2.1.2 The site is located in between West Walberton Lane and Eastergate Lane, Walberton. To the west and south of the site is farmland, to the north and east of the site is the village Walberton.
- 2.1.3 The site is currently undeveloped.

2.2 Site Topography

- 2.2.1 The topography of the site can affect the movement of water through soil. This is as a result of gravity, which along with site gradients and permeability, directly influences water movement. It is a major factor in determining how much water enters the soil, how much water is stored in the soil and how water moves through the soil.
- 2.2.2 Site levels are consistent across the site. They range between 12.27m AoD and 15.09m AoD. The site gently slopes in a south eastly direction. It has a fall of roughly 1:90. A copy of the Topographical Survey for the site can be found in **Appendix A**.

2.3 Site Hydrology

- 2.3.1 The Environment Agency (EA) Flood Maps for Planning show the majority of the site to be within Flood Zone 1. Flood Zone 1 means the risk of flooding from river and sea sources is less than 1 in 1000. The EA Long Term Flood Risk Map for England does not consider the site to be at risk from flooding from reservoirs, rivers, the sea, or surface water.
- 2.3.2 Along the line of the adjoining watercourse down the western side of the site there are instances of Flood Zone 2 and 3. There is an additional area of Flood Zone 3 in what appears to be a depression in the south west corner of the site.
- 2.3.3 A copy of the flood map from the EA is included within **Appendix B**.
- 2.3.4 The Barnham Rife, an EA main watercourse borders along the western and eastern boundaries of the site.

2.4 Site Hydrogeology

- 2.4.1 The bedrock consists of London Clay Formation – Clay, Silt and Sand, according to maps from the British Geological Society (BGS). Their online database of historical boreholes from the surrounding area agrees with this.

2.5 Proposed Development

- 2.5.1 The proposed development comprises of up to 30 two storey dwellings containing a mix of larger detached, semi, occasional terrace properties and flats. The proposed development layout can be found in **Appendix C**.

3.0 Flooding

3.1 National Planning Policy Framework

3.1.1 The National Planning Policy Framework (2018) sets out the Government's planning policies for England and how these are expected to be applied.

3.1.2 Flooding is addressed in Section 14 'Meeting the Challenge of Climate Change, Flooding and Coastal Change' of the NPPF. Footnote 50 to the NPPF states:

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

3.1.3 **Figure 2**, below, shows Table 3 of the 'Flood Risk and Coastal Change' section of the Planning Practice Guidance states that all uses of land are appropriate in Flood Zones 1, 2 and 3.

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Key:

✓ Development is appropriate

✗ Development should not be permitted.

Figure 2. Table 3 of the 'Flood Risk and Coastal Change'

- 3.1.4 The proposed development is classed as more vulnerable – *“Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.”*
- 3.1.5 Notes to Table 3:
- ⌘ This table does not show the application of the Sequential Test which should be applied to guide development to Flood Zone 1, then Zone 2, and then Zone 3; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;
 - ⌘ The Sequential and Exception Tests do not need to be applied to minor developments and changes of use, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site;
 - ⌘ Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

3.2 Non-statutory Technical Standards for Sustainable Drainage Design

- 3.2.1 On 23rd March 2015 the Planning Policy Guidance (PPG) was updated to include non-statutory technical standards for sustainable drainage. These standards set the framework to work towards in the design of sustainable drainage systems and include topics such as peak flow control, volume control and maintenance.
- 3.2.2 The update also provided guidance on the circumstances for when the use of SuDS is appropriate.

3.3 Local Planning Policy

- 3.3.1 On 6th April 2015 DEFRA updated the guidance for Local Authorities in relation to water drainage management. The aim of the new guidance is to ensure that for residential, equivalent non-residential or mixed developments, sustainable drainage systems are put in place to ensure the effective management of surface water, unless demonstrated to be inappropriate.
- 3.3.2 In 2016, Arun District Council published their SFRA report which includes the town of Walberton.

3.4 Sources of Flooding

- 3.4.1 Most of the site is located within Environment Agency Flood Zone 1, at little or no risk of flooding, and current policy is to locate all development in this zone.
- 3.4.2 However, parts of the site lie within Flood Zone 2, land with a medium probability of flooding. In this zone, opportunities should be sought to reduce

the overall level of flood risk in the area through the layout and form of the development as well as the appropriate application of sustainable drainage systems.

- 3.4.3 Parts of the site also lie within Flood Zone 3a, land with a high probability of flooding. For these areas, alternative storage should be created for flooding to occur by restoring functional floodplain and flow pathways and by identifying, allocating and safeguarding open space for flood storage if they are to be constructed within.
- 3.4.4 There are a wide range of potential flooding mechanisms which can cause flooding. Each potential source of flooding is discussed individually below:

3.5 Tidal Flooding

- 3.5.1 Tidal flooding occurs through inundation from the sea or estuarine waters.
- 3.5.2 The site lies approximately 6.3km inshore and the Arun District Council SFRA does not consider tidal flooding a risk.

3.6 Fluvial Flooding

- 3.6.1 Fluvial flooding occurs through the inundation from rivers and watercourses.
- 3.6.2 The Arun District Council SFRA does not consider the site to be within an area at risk of fluvial flooding.
- 3.6.3 The EA Flood Maps consider the western boundary and the south western corner of the site, where there is a depression in the land, to be at medium to high risk of fluvial flooding.
- 3.6.4 There have been historic events of fluvial flooding in the nearby area.
- 3.6.5 EA flood maps show the site max depth of flooding in the south east corner of the site to be 12.98m AoD from a defended fluvial event. Due to this, all FFLs on the site should be sited at a minimum level of 13.60m AoD. This would provide them with a 600mm freeboard above the maximum flood level. This would remove the plots from being at risk of fluvial flooding.

3.7 Surface Water Flooding

- 3.7.1 This form of flooding can occur during high intensity rainfall events as sheet runoff from fields or large hard paved areas.
- 3.7.2 The EA Flood Maps show a line of surface water flooding along the western boundary and in the south western corner of the site where there is a depression in the land.

3.7.3 The Arun District Council SFRA considers the site to be at low to medium risk of flooding.

3.7.4 There have been historic events of surface water flooding nearby to the site.

3.8 Sewer Flooding

3.8.1 No evidence of any incidences of sewer flooding could be found for the site, and as such, sewer flooding is not considered to be a risk.

3.9 Groundwater Flooding

3.9.1 Groundwater flooding can occur when the water table rises and emerges above the ground level.

3.9.2 The maps provided as part of the Arun District Council SFRA show the site to be in an area that is at medium risk of groundwater flooding.

3.10 Flood Risk from other Sources

3.10.1 On rare occasions a development may be subject to flood risk from upstream features such as reservoirs, where there is a theoretical risk of failure. At this development, this is not considered to be a risk.

4.0 Surface Water Drainage Strategy

4.1 Policy

- 4.1.1 One objective for the proposed development is to ensure that the development does not increase the potential for flooding elsewhere, and if the opportunity arises, to reduce the potential for flooding off site. This objective can be achieved by designing a drainage strategy for the proposed development which will set a strict framework within which the designers of the detailed drainage system will ultimately have to work within.
- 4.1.2 Because parts of the site lie with Flood Zone 2 and, more significantly, Flood Zone 3, extra consideration needs to be taken as to how to create space so that flooding can occur by identifying, allocating and safeguarding open space for flood storage, and by restoring functional floodplain and flood flow pathways.
- 4.1.3 A further objective is to ensure that the risk of overland flows (surface water flooding) is managed so that there is an acceptable level of protection to both new and existing developments downstream of the site.
- 4.1.4 The surface water drainage strategy will be delivered in accordance with prevailing local and national planning policy. Currently, the most significant factors influencing the design of the drainage strategy are the Flood and Water Management Act 2010, Arun District Council SFRA, the SFRA produced by the LLFA, the National Planning Policy Framework (NPPF), and relevant chapters of the Planning Practice Guidance (PPG).
- 4.1.5 This drainage strategy sets the guidelines for future detailed design, but more importantly, it demonstrates that a sustainable drainage solution is deliverable at the site, complying with all relevant planning and legislative criteria. The most important function of this drainage strategy is to demonstrate that the development will not increase flood risk elsewhere.
- 4.1.6 The method of discharge of surface water is critical to ensuring that flood risk will not be increased elsewhere. Planning Practice Guidance and Building Regulations dictate the hierarchy for discharge options. In order of preference these are:
- ※ To the ground (infiltration);
 - ※ To a surface water body;
 - ※ To a surface water sewer, highway drain or another drainage system;
 - ※ To a combined sewer.

- 4.1.7 Ground water monitoring was undertaken between November 2019 and March 2020 to record the ground water depths below the existing ground level. This revealed the low lying south-western area generally had standing water whilst on the higher areas along the north east boundary adjacent to Walberton Lane, the depth below existing ground level ranged from 0.970m to 0.940m reducing to 0.225m to the far south east corner. A ground Investigation carried out on the 16th/17th February 2021 suggests an infiltration rate of 1.35×10^{-5} m/s along the north east boundary adjacent to Walberton Lane.
- 4.1.8 The existing site is open space and as such there is no existing drainage system within the proposed development area. A new surface water network will be required.

4.2 Greenfield Runoff and Volume

- 4.2.1 As runoff from the site is discharged into the surface water network, it is essential to avoid increasing flood risk downstream. This objective can be achieved by limiting the rate of runoff from the site to the existing greenfield runoff rate. This runoff rate will be used by all storms up to and including 1 in 100 year plus 40% climate change. This provides betterments in all storm events, in addition to mitigating the risk of flooding downstream of the site.
- 4.2.2 The outfall rate is yet to be agreed with Arun District Council. An outfall rate of 4.4l/s has been proposed. This is based on a figure of 2/l/s/ha.

4.3 Attenuation

- 4.3.1 The attenuation structure type is yet to be confirmed. An open attenuation pond/basin will provide the cost-effective form of attenuation but will also take up the most room within a constrained development space. Closed attenuation such as cellular storage crates, culverts or oversized pipes could be located underneath roads and parking areas and allow more of the site to be developed.
- 4.3.2 For the illustrative strategy, a combination of permeable paving and culvert storage has been proposed as the attenuation methods. The permeable paving will act as the main collection point for all surface water, including roof and highway drainage. This will then discharge into the proposed attenuation structure/culvert at a controlled rate and then into the nearby stream at a proposed restricted rate of 4.4l/s.
- 4.3.3 Modelling shows the depth of permeable paving storage to be 450mm of type 3 sub-base providing 263m³. The culvert will provide an additional 168m³ of storage. The banks of the pond should be at a level greater than 12.98mAOD to provide freeboard and prevent flood water from entering the drainage network.

4.4 Outfall

- 4.4.1 The outfall for the site will be the ditch that flows alongside the southern boundary of the site.

4.5 Future Responsibility and Maintenance

- 4.5.1 The ownership and maintenance of the surface water network shall remain private and be managed by a contracted maintenance company.

4.6 Foul Water

- 4.6.1 The foul water from the site will discharge into the existing foul water network maintained by Southern Water. The site will utilise a new connection into the network.

5.0 Conclusions and Summary

- 5.1.1 WFBA have been appointed by Macra Ltd to prepare a Flood Risk Assessment (FRA) in support of a full planning application for the proposed development at West Walberton Lane, Walberton.
- 5.1.2 The developable area is located within Flood Zone 1 and at little or no risk of fluvial or tidal flooding. The EA Risk of Surface Water Flooding Map shows there is very low risk of flooding within the site. Along the line of the adjoining watercourse down the western side of the site there are instances of Flood Zone 2 and 3. There is an additional area of Flood Zone 3 in what appears to be a depression in the south west corner of the site.
- 5.1.3 The FFLs of the site should be at a minimum of 13.60mAOD to prevent the plots from being at fluvial flood risk. The adjacent hard paved areas shall be minimum 150mm below FFL except at flush thresholds where a fall away from the threshold at 1 in 40 to 1 in 20 shall be used.
- 5.1.4 Planning policy in England encourages development in Flood Zone 1, and this FRA proves that the site will not increase risk of flooding elsewhere.
- 5.1.5 The drainage strategy proposes a restricted outfall rate from the site into a nearby ditch. The attenuation will be in the form of permeable paving and culvert storage.
- 5.1.6 Separate foul and surface water networks will be utilised by this development.
- 5.1.7 The development proposals are duly presented in terms of flood risk and in line with the guidance set out in the TGNPPF and the requirements of the Environment Agency and Lead Local Flood Authority.