FLOOD RISK ASSESSMENT
THE PADDOCKS
HASSOCKS, WEST SUSSEX
COLIN BRACE & HARRIS HASSOCKS LIMITED
FRA-19978-16-74
APRIL 2016

idom merebrook

AN idom GROUP COMPANY

FLOOD RISK ASSESSMENT
THE PADDOCKS
HASSOCKS, WEST SUSSEX
COLIN BRACE & HARRIS HASSOCKS LIMITED
FRA-19978-16-74
APRIL 2016

Current Document Details

Authors

K Nicholls

Issued by

K Nicholls

Approved by

P Daykin

Document Revisions

Rev	Date	Author	Checked	Approved	Remarks
R0	21/04/16	KN	PRD	PRD	First issue/PRELIMINARY

Report issued from

DERBYSHIRE East Mill, Bridgefoot, Belper, Derbyshire. DE56 2UA Tel: 01773 829988

TABLE OF CONTENTS

APPENDIX 5

- Proposed Layout Plan with Flood Zones 2 & 3

EXECUTIVE SUMMARY

A Flood Risk Assessment was requested by Colin Brace & Harris Hassocks Limited. The purpose of this report is to present the findings of the assessment, which includes flood risk from all sources both to the site, and as a result of the development. Where flood risks are present, or where they cannot be clearly established, further actions or mitigations are outlined.

SITE DETAILS	
Approximate Site Area	2.38 ha, gross site area, 1.2 ha development area and 0.5 ha development impermeable area.
Current/Previous Use	Occupied by two existing properties, with an undeveloped field to the north and a cricket ground to the south.
Proposed Use	Residential housing for 18 dwellings.

FLOOD RISK ASSESSMENT	
Fluvial Flood Zone	Zones 1, 2 and 3, however, the proposed development lies entirely within Flood Zone 1.
NPPF Vulnerability	'More Vulnerable'.
Compatibility	Compatible – 'More Vulnerable' development is considered appropriate in Flood Zone 1. Sequential Test applied, Exception Test is therefore not required.
Flood Risks to the Site	A **moderate risk** of fluvial flooding.
Flood Risk as a Result of the Development	Fluvial and surface water flooding – **moderate risk**, due to increased runoff; foul/combined sewer flooding unknown, therefore categorised as a **moderate risk**.

ACTIONS AND MITIGATIONS	
Off-site Surface Water	Managed by on-site surface water mitigations, see below.
On-site Surface Water and Fluvial	Reduce run-off from impermeable areas to greenfield rates, with attenuation pond/flow control. Drainage to be designed to 1% (1 in 100) AEP with 30% allowance for climate change.
Sewers and Drains	Obtain capacity check and DG5 Register information in relation to any historic sewer flooding.
Groundwater	Refer to further investigation/further study.
Water Management Infrastructure	There is no existing water management infrastructure on or near the site. The recommended drainage strategy to be developed for the site has highlighted the need for an attenuation pond to manage surface water. The mitigations and actions described mean there should be no increased flood risk on site or to adjacent areas off site.
Further Investigation, Further Study	Obtain the Environment Agency's Product 7 to provide a more accurate definition of flood extents; obtain a topographic survey of the site to correlate flood levels with actual site levels; undertake full ground investigation, including groundwater levels and monitoring and infiltration testing to assess viability of partial infiltration in combination with attenuation and discharge to the main river.

SECTION 1 INTRODUCTION

1.1 IDOM Merebrook Limited (Merebrook) has been instructed by Colin Brace & Harris Hassocks Limited (CB & HHL) to undertake a Flood Risk Assessment (FRA) in support of an anticipated planning application to be submitted by CB & HHL for a site identified as The Paddocks, located in Hassocks in West Sussex.

1.2 It is anticipated that Client intends to obtain planning permission for the construction of 18 residential houses.

1.3 The purpose of this report is to present the results of a FRA undertaken on the site proposals. The information does not purport to be a detailed design and a quantitative assessment cannot be undertaken at this time.

1.4 This report has been prepared for the sole purpose described above and no extended duty of care to any third party is implied or offered. Third parties making reference to this report should consult CB & HHL and Merebrook as to the extent to which findings may be appropriate for their use.

SECTION 2 DESCRIPTION OF THE PRE-DEVELOPMENT SITE

2.1 GENERAL

2.1.1 The site is located to the east of the A 273 London Road, approximately 1.1 km to the north-north-west of the centre of Hassocks, at approximate National Grid Reference E 530282, N 116620 (TQ 302 166) and post code BN6 9NA, site centred. In plan, the site presents itself as a broadly rectangular parcel of land occupying approximately 2.38 ha total area.

2.1.2 The site is situated to the north of the Friar's Oak public house, to the east of the A 273 London Road, with the Herrings Stream forming the site's irregular eastern boundary. Ordnance Survey mapping indicates that the site is currently occupied by two existing properties, 'Evergreen' and 'The Paddock', with an undeveloped field to the north and a cricket ground to the south.

2.1.3 There was no topographic survey of the site provided by CB & HHL however, Merebrook has obtained Ordnance Survey LIDAR data from which contours have been generated, a copy of which is included in **Appendix 1**. The LIDAR data indicates that site levels are generally in the approximate range 35 m AOD in the north-west to 32.6 m AOD in the north-east, with an approximate overall falling gradient west to east of 1 in 47; and 36.1 m AOD in the south-west to 33.9 m AOD in the south-east, with an approximate overall falling gradient west to east of 1 in 49.

2.1.4 A site location plan is included in **Appendix 1**.

2.2 SITE AREA

2.2.1 The total site area is approximately 2.38 ha, as measured in AutoCAD, and the total development area (excluding any areas of green public open space) is

approximately 1.2 ha (measured in AutoCAD). The development impermeable area was measured in AutoCAD from drawing 16911/PA/001 (**Appendix 1**) by measuring all estate roads, building footprints and an allowance for driveways/hard paved areas, as these were not shown, at a total of 0.5 ha. This means a relatively low density development at 21% impermeable (relative to the total site area) and 42% impermeable (relative to the total development area).

2.3 HYDROLOGY

2.3.1 A study of Ordnance Survey and Environment Agency online mapping indicates that a watercourse known as Herrings Stream is present on the eastern boundary of the site, flowing from south to north. The online Environment Agency mapping indicates that this is an ordinary watercourse to the south of the site, and is enmained south of the Friar's Oak public house and Hassocks Golf Club where it is joined by another ordinary watercourse. Therefore to the north the Herrings Stream is main river.

2.3.2 There are several ponds noted on the Ordnance Survey mapping to the west of the site, many of which appear to be associated with Hassocks Golf Course. There are also several ponds associated with the ordinary watercourse which joins the Herrings Stream south of the Friar's Oak public house and Hassocks Golf Club. All of these ponds are located on the opposite site of London Road in relation to the site.

2.3.3 North of the site there a large pond which may be associated with the Herrings Stream near New Close Farm.

2.3.4 There is a drain on site indicated on the Ordnance Survey mapping between the existing property called 'The Paddock' and the cricket ground to the south, this is shown flowing into the Herrings Stream. It is believed that this watercourse takes drainage from the Golf Course on the west side of London Road, refer to **Section 6.2**. The Herrings Stream is likely to be the main control over the hydrology in the area.

2.3.5 There are no licenced surface water abstractions indicated within 1 km of the site.

2.4 GEOLOGY

2.4.1 The inferred geology of the site, from the British Geological Survey 1:50,000 mapping, (via the Geology of Britain on-line viewer) is summarised as follows:

Drift Geology

River Terrace Deposits, 2 (Adur) – comprising Sand & Gravel; western part of the site adjacent to London Road.

Alluvium – comprising Clay, Silt, Sand & Gravel; eastern part of the site adjacent to the Herrings Stream.

Solid Geology

Weald Clay Formation – comprising Mudstone.

2.5 **HYDROGEOLOGY**

2.5.1 The Environment Agency online groundwater mapping indicates that the site is located within an area classified as 'Secondary A Aquifer', this is likely to be associated with the River Terrace Deposits, since the Weald Clay Formation are described as 'rocks with essentially no groundwater'. The Environment Agency online groundwater vulnerability map indicates that the site lies within an area which falls within the 'Minor Aquifer Low' groundwater vulnerability zone.

2.5.2 The Environment Agency groundwater mapping indicates that the site is not within a Source Protection Zone (SPZ).

2.5.3 There are no licenced groundwater abstractions indicated on the Environment Agency online mapping within 1 km of the site.

SECTION 3 DESCRIPTION OF THE PROPOSED DEVELOPMENT

3.1 The outline proposals comprise the construction of 18 residential houses adjacent to the A 273 London Road with a site access and internal residential estate roads.

SECTION 4 PLANNING FRAMEWORK

4.1 **GENERAL**

4.1.1 Flood Risk Assessment in England is assessed using the National Planning Policy Framework (NPPF), and 'Planning practice Guide – Flood Risk and Coastal Change' produced by Communities and Local Government, in addition to the details set out in BS 8533:2011 'Assessing and managing flood risk in development - Code of practice'.

4.1.2 The NPPF provides guidance in relation to development and flooding. It provides a framework within which risks arising from both river and coastal flooding, and additional runoff from development in any location, can be assessed. Paragraph 100 in the NPPF outlines that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere. This is achieved through applying the Sequential Test to development sites, as described below in **Section 4.2**.

4.2 **THE SEQUENTIAL TEST**

4.2.1 The Sequential Test is a decision making tool designed to direct development away from areas at high risk of flooding from rivers and the sea. The aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding. Development should not be allocated or permitted if there are reasonably available

sites appropriate for the proposed development in areas with a lower probability of flooding. In Table 1, Paragraph 065 of 'Planning Practice Guide – Flood Risk and Coastal Change', land is divided into three basic zones:

i. Zone 1 (Low Probability) - land assessed as having a less than 0.1% (1 in 1000) annual probability of river or sea flooding;

ii. Zone 2 (Medium Probability) - land assessed as having between a 1% (1 in 100) and 0.1% (1 in 1000) annual probability of river flooding; or between a 0.5% (1 in 200) and 0.1% (1 in 1,000) annual probability of sea flooding;

iii. Zone 3a (High Probability) - land assessed as having a 1% (1 in 100) or greater annual probability of river flooding or a 0.5% (1 in 200) or greater annual probability of flooding from the sea;

iv. Zone 3b (The Functional Floodplain) - land where water has to flow or be stored in times of flood.

4.2.2 The Sequential Test is not normally required for developments in Flood Zone 1 (Low Probability) and it is considered to have been 'applied' by virtue of the site being in the zone of lowest probability of flooding, unless there are flooding issues in the area of the development.

4.2.3 The Sequential Test is also not normally required for developments which are proposed on sites which have been 'allocated' by the local planning authority in their local plan and the development proposed is consistent with the land use allocation. For example, proposed residential development on land allocated for residential use. Where sites have been allocated the Sequential Test will have already been carried out by the local planning authority as part of the land allocation process.

4.2.4 However, if the site has not been allocated, it is likely that the Sequential Test will be required even if the site is in Flood Zone 1. It is recommended that checks are made with the local planning authority to establish if the site has been allocated and if so the site allocation reference in the local plan should be obtained and included in the planning application. If the local plan has not been adopted, the draft local plan should be checked.

4.3 LAND USE AND DEVELOPMENT

4.3.1 Whilst it may sometimes not be possible to direct developments into low flood risk areas, particular flooding consequences may not be acceptable for certain land use types. Table 2, Paragraph 066 of 'Planning Practice Guide – Flood Risk and Coastal Change' identifies the vulnerability of land uses to flooding by dividing land use into five distinct categories:

i. Essential infrastructure

ii. Highly vulnerable

iii. More vulnerable

iv. Less vulnerable

v. Water-compatible development

4.3.2 Table 3, Paragraph 067 of 'Planning Practice Guide – Flood Risk and Coastal Change' sets out the appropriateness of development, in terms of the compatibility of the Flood Zone classification and the flood risk vulnerability classification of a site, as shown in Table 4.1.

Flood risk vulnerability classification	Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
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					

Table 4.1 Land use and flood risk vulnerability classification compatibility

4.4 THE EXCEPTION TEST

4.4.1 If, following application of the Sequential Test, it is not possible, consistent with wider sustainability objectives, for the development to be located in zones with a lower probability of flooding; the Exception Test can be applied if appropriate. For the Exception Test to be passed:

i. it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared; and

ii. a site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

4.4.2 Both elements of the test will have to be passed for development to be allocated or permitted.

4.5 PLANNING POLICY & THE PROPOSED DEVELOPMENT SITE

4.5.1 Based on the Environment Agency fluvial flood map as described further in **Sections 6.1 and 8.1**:

i. The western part of the site adjacent to the A 273 London Road, lies within Flood Zone 1, that is land assessed as having a less than 0.1% (1 in 1000) annual probability of river or sea flooding.

ii. The eastern part of the site adjacent to the Herrings Stream lies within Flood Zone 2, that is land assessed as having between a 1% (1 in 100) and 0.1% (1 in 1000) annual probability of river flooding; or between a 0.5% (1 in 200) and 0.1% (1 in 1,000) annual probability of sea flooding, and

iii. A smaller portion of eastern part of the site also lies within Flood Zone 3, that is land assessed as having a 1% (1 in 100) or greater annual probability of river flooding or a 0.5% (1 in 200) or greater annual probability of flooding from the sea.

iv. The two existing properties, 'Evergreen' and 'The Paddock', are shown to be within Flood Zone 1.

4.5.2 With regards to the flood risk vulnerability classification, as described in **Section 4.3**, the proposed land use for the site, i.e., residential development, is considered to be **'More Vulnerable'**.

4.5.3 Referring to Table 4.1, **'More Vulnerable'** development is considered appropriate in Flood Zones 1 and 2. However, **'More Vulnerable'** development in Flood Zone 3a would require the application of the Exception Test.

4.5.4 Based upon the Sequential Test criteria, those parts of the site within Flood Zones 1 and 2 are not considered to be at risk as a result of fluvial means, therefore the application of the Exception Test is not required for those parts of the site within Flood Zones 1 and 2. However, as noted in paragraph 4.5.3, the application of the Exception Test would be required if **'More Vulnerable'** development is proposed in Flood Zone 3a.

SECTION 5 EXISTING REFERENCES AND/OR REPORTS

5.1 GEO-ENVIROMENTAL ASSESSMENT/SI/DESK STUDY

5.1.1 Merebrook has not been provided with any previous geo-environmental reports, site investigation or desk studies in relation to the site, nor is Merebrook aware of any such studies having been carried out in the past.

5.1.2 Such desk study, geo-environmental site investigation and reporting will be required in the event that the proposals are to be developed further to the detailed design stage.

5.2 STRATEGIC FLOOD RISK ASSESSMENT LEVEL 1

5.2.1 The Strategic Flood Risk Assessment Level 1 (SFRA-1) is intended to provide sufficient detail for the sequential test to be applied and is produced either by the local planning authority, or is commissioned by them from a flood consultancy to produce the SFRA. The SFRA-1 should have maps which show the entire area that the local planning authority covers, which should include:

i. Main rivers. (Environment Agency responsibility).

ii. Any other rivers and streams (ordinary watercourses - local planning authority responsibility).

iii. Development sites that have been allocated in the local plan and any under consideration for future allocation.

iv. Flood zones including the functional floodplain.

5.2.2 The SFRA-1 should include an assessment of the risk of flooding in the local planning authority area from all sources and should detail the following:

i. Areas at risk from other sources of flooding.

ii. Existing measures in use in the local planning authority area to manage flood risk (e.g., flood gates), including their effectiveness.

iii. Areas that are covered by flood warnings.

iv. Critical drainage areas as notified by the Environment Agency.

v. Areas that may need surface water management plans.

vi. Locations that may have an increased flood risk if there is additional development.

5.2.3 The SFRA-1 should contain advice for applicants carrying out site-specific flood risk assessments (such as this FRA) and should identify if there is anything specific they need to do to manage flood risk, e.g., sustainable urban drainage systems (SuDS). Site-specific flood risk assessments are required for developments which are more than 1 hectare.

5.2.4 The foregoing summary has been based on information provided on the DEFRA website.

5.2.5 A draft SFRA-1, dated June 2015, was produced Mid Sussex District Council, this was downloaded from the Mid Sussex District Council website.

5.2.6 The following extracts are of relevance to the subject site:

'The implications of flooding to properties has been recently demonstrated locally and nationally in flood events in early 2014, where properties were flooded across Sussex, including in parts of Copthorne and Hassocks.' (Page 13).

'West Sussex County Council plan to undertake a Surface Water Management Plan for Hassocks in 2015/16 with a Grant-in-Aid for £425,000 between 2016 and 2019.' (Page 34).

'Generally Mid Sussex is an area of low flood risk however there are areas affected by specific issues and careful management is necessary to ensure flood risk is not increased now or in the future. Analysis undertaken for the West Sussex Local Flood Risk Management Strategy identifies 'wet spots' where a limited number of properties are considered to be at risk. These are Burgess Hill, East Grinstead, Haywards Heath/Lindfield and Sayers Common (mostly surface water flood risk) and Copthorne and Hassocks (both surface water and fluvial flood risk).' Page 35.

'The Burgess Hill and Hassocks area is identified within the CFMP as being an "area of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change" (CFMP Policy 4). The Plan also predicts that the number of properties in Burgess Hill and Hassocks at risk will increase from 13 to 250 by 2100. The proposed actions for Burgess Hill and Hassocks include strengthening development management advice, increasing the use of SuDS through local development framework policies, and developing a Surface Water Management Plan for Burgess Hill.' Page 54.

'….the settlements of Burgess Hill, Hassocks, Hurstpierpoint, Albourne and Sayers Common, as well as countryside areas to the west are considered to be in an area of low potential for groundwater flooding.' Page 56.

5.2.7 The SFRA makes reference to the West Sussex Flood Risk Management Strategy, which details that there are 53 'wet spots' in West Sussex. Six of these are in Mid Sussex, one of which is in Hassocks. Within this 'wet spot' 525 properties are outlined as being at risk of surface water flooding, 105 from fluvial flooding and 55 from combined sources, however there is no detail on the specific location of these properties.

5.2.8 Details of flood history in the SFRA highlights an instance of three shops being flooded on Keymer Road in Hassocks due to blocked drains in 2008, an area located approximately 1 km to the south of the site. A second record details an instance where a garden in Parklands Road (again, approximately 1 km to the south of the site) was flooded from fluvial sources and downstream culvert capacity issues in 2014.

5.2.9 Appendix B of the SFRA-1 details flood improvement alleviation measures undertaken by Mid Sussex District Council. This includes details of stream and bank

clearance and de-silting of a culvert on Herrings Stream, Hassocks, however the exact location of these works is not highlighted.

5.2.10 Appendix C of the SFRA-1 details the following information with regards to Hassocks:

'Areas of Flood Zone 2 and 3 (fluvial flood risk from the Herring Stream) would need to be considered if applications are within these areas (a FRA would need to accompany any application for development in such areas).

Proposals in and around Damian Way, Newlands Close, Pattendens Nursery, Adastra Avenue, Queens Drive and the Quadrant would need to consider the historical fluvial flood events and the current risk (areas are not covered by Flood Zones). A number of minor drainage ditches/streams pass through and around the settlement - the risk of flooding from these ditches/streams will need to be considered in any FRA for a development proposal in their vicinity.

On the southern periphery of the settlement and the land immediately to the south, ground conditions (mudstone) will mean that infiltration systems are unlikely to be suitable and therefore attenuation systems, such as balancing ponds, should be considered as the preferred SuDS. This also applies on land to the north of the settlement, where the geology is generally Weald Clay with poorly drained soils. Within the majority of the settlement itself, ground conditions are slightly more permeable (sandstone) and should allow for infiltration systems or a combined infiltration/attenuation system. Land in this location overlies a major aquifer and therefore high groundwater vulnerability will need to be addressed in any SuDS design. As flow attenuation in the form of ponds appear to be the critical features for reducing the impact of runoff from development through most of Mid Sussex.'

5.2.11 Table 4 'Flood Zones' as featured on page 13 of the SFRA-1 outlines policy aims for specific flood zones, as follows:

i. **Flood Zone 1** – *'Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of new development, and in particular the appropriate application of sustainable drainage systems (i.e. reduce surface water run-off from new development)'*.

ii. **Flood Zone 2** – *'Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of new development, and in particular the appropriate application of sustainable drainage systems (i.e. reduce surface water run-off from new development).'*

iii. **Flood Zone 3a** – *'Developers and local authorities should seek opportunities to reduce overall level of flood risk in the area, through the layout and form of development (including application of SuDS), and relocate existing development to land with a lower probability of flooding. Opportunities should*

also be sought to create space for flooding to occur by restoring functional floodplains and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage.'

Sequential Flood Risk Test

5.2.12 A 'Sequential Flood Risk Test for the Mid Sussex District Plan' document was also produced by Mid Sussex District Council in May 2013. This document relates to the allocations for new development in Mid Sussex within the proposed submission District Plan. This document relates to three specific development areas at Cuckfield Road, Kings Way and Burgess Hill, and as such is not considered relevant to the subject site. This document appears to have been revised in June 2015, as the 'Sequential Flood Risk Test for the Mid Sussex District Plan 2014 – 2031', however, as it also relates to the three specific development areas referred to in the earlier document, it too is not considered relevant to the subject site.

5.3 STRATEGIC FLOOD RISK ASSESSMENT LEVEL 2

5.3.1 The Strategic Flood Risk Assessment Level 2 (SFRA-2) is intended to provide sufficient detail for the exception test to be applied and is produced either by the local planning authority, or is commissioned by them from a flood consultancy to produce the SFRA. The SFRA-2 will follow up on any issues raised in the SFRA-1.

5.3.2 The SFRA-2 should assess existing flood defence infrastructure (e.g., flood barriers). The assessment should state where the flood defence infrastructure is located and what condition it is in, by reference to the organisations which operate and maintain the flood defence infrastructure, e.g., local authority or Internal Drainage Board (IDB).

5.3.3 The SFRA-2 should assess the risk of flood defence infrastructure failing during the lifetime of any developments, and should include an allowance for climate change as well as wave height and direction for assessments in coastal areas. Consideration should be given to the consequences of failed flood defences in the local planning authority area.

5.3.4 The SFRA-2 should identify anything specific which planning applicants need to do to meet the requirements of the exception test.

5.3.5 The foregoing summary has been based on information provided on the DEFRA website.

5.3.6 There was no SFRA-2 available to download from the Mid Sussex District Council website. Given the fact that the SFRA-1 was only released as a draft document in June 2015, it is considered that Mid Sussex District Council has yet to produce the SFRA-2.

5.4 PRELIMINARY FLOOD RISK ASSESSMENT

5.4.1 The Preliminary Flood Risk Assessment (PFRA) is produced either by the local planning authority, or is commissioned by them from a flood consultancy to produce the PFRA. PFRAs are intended as a high-level screening exercise to address local sources of flood risk, primarily from surface water runoff, groundwater and ordinary watercourses, which are the responsibility of the local planning authority (the Lead Local Flood Authority – LLFA).

5.4.2 A PFRA is an assessment of:

i. Floods that have taken place in the past.

ii. Floods that could take place in the future.

5.4.3 The PFRA considers flooding from surface water runoff, groundwater and ordinary watercourses and is used to identify areas that are at risk of significant flooding, these areas are called flood risk areas. LLFAs are responsible for and prepare the PFRAs and identify the flood risk areas.

5.4.4 The foregoing summary has been based on information provided on the DEFRA website.

5.4.5 A PFRA, dated May 2011, was produced by West Sussex County Council, this was downloaded from the West Sussex County Council website.

5.4.6 There is limited information related to Hassocks in the PFRA, other than a general overview of the characteristics of the district and catchments.

5.4.7 Also included in the PFRA are records of historic flooding. However, there are no references to Hassocks and the area is not included in the table of West Sussex's flood risk clusters.

5.4.8 The maps reproduced in the West Sussex PFRA are at too low a resolution to permit any meaningful evaluation.

5.5 SURFACE WATER MANAGEMENT PLAN

5.5.1 A Surface Water Management Plan (SWMP) is defined by DEFRA in its SWMP technical guidance, which has been written for local authorities to assist them co-ordinate and lead local flood risk management activities, as a plan which outlines the preferred surface water management strategy in a given location, (DEFRA, March 2010, Surface Water Management Plan Technical Guidance).

5.5.2 The DEFRA technical guidance emphasises that SWMPs may not be required in all locations and that studies should be prioritised in areas considered to be at greatest risk of surface water flooding or where partnership working is essential to both understand and subsequently address surface water flooding issues.

5.5.3 There was no SWMP available to download from the Mid Sussex District Council website.

5.5.4 SWMPs have been produced by West Sussex County Council which are available to download from their website, however, these only cover the following areas:

i. Easebourne.

ii. Lancing.

iii. Upper Lavant Valley.

iv. Lidsey.

v. Manhood Peninsular.

5.5.5 There was no SWMP available for Hassocks.

5.6 CATCHMENT FLOOD MANAGEMENT PLAN

5.6.1 Catchment Flood Management Plans (CFMPs) consider all types of inland flooding, from rivers, groundwater, surface water and tidal flooding. Shoreline management plans consider flooding from the sea.

5.6.2 CFMPs also include:

i. The likely impacts of climate change.

ii. The effects of how land is used and managed.

iii. How areas could be developed to meet present day needs without compromising the ability of future generations to meet their own needs.

5.6.3 CFMPs help the Environment Agency and their partners to understand the scale and extent of flooding now and to plan and agree the most effective way to manage flood risk in the future. This is achieved by setting policies for managing flood risk within the catchment.

5.6.4 CFMPs are used to inform planning and decision making by, *inter alia,* the Environment Agency, local authorities, internal drainage boards and transportation planners. CFMPs aim to promote more sustainable approaches to managing flood risk. CFMPs are grouped by river basin district.

5.6.5 The foregoing summary has been based on information provided on the DEFRA and Environment Agency websites.

5.6.6 A CFMP, dated December 2009, was produced by the Environment Agency for the River Adur Catchment, which includes the area of the subject site. The CFMP was downloaded from the Environment Agency website.

5.6.7 The catchment is described in the CFMP as *'….an area of 600 square kilometres'* and includes the main urban centres of *'Worthing, Shoreham, the city of Brighton and Hove, Burgess Hill, Steyning and Upper Beeding, as well as smaller settlements, such as Hassocks, Henfield, and Partridge Green'*. Also '*The catchment topography and geology both have a significant influence on the flooding characteristics of the catchment.'*

5.6.8 Burgess Hill and Hassocks form a sub-area, which is described as having a relatively low risk from river flooding, however a combination of surface water flooding, urban drainage problems and under capacity of local streams causes localised areas of combined fluvial and urban flooding. It is also noted that there is significant pressure for urban expansion and development in the sub-area and that this development pressure combined with a future predicted increase in river flooding resulting from climate change are likely to cause a significant increase in flood risk.

5.6.9 The Environment Agency policy option for this sub-area (Policy Option 4) states that this comprises *'areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change.'* It is also stated that '*The implementation of this policy will reduce the likelihood of an increase in flood risk. The proposed measures will prevent an increase in the frequency of flooding resulting from climate change and/or urban growth, or an increase in the impact of flooding.'*

5.6.10 There are no particular references to historical flooding in the CFMP in relation to the subject site and surrounding areas, however, the number of properties at risk is predicted to increase from the current 13 (in 2009) to 250 in the future (2100).

5.6.11 In relation to SuDS guidance, the Environment Agency 'proposed actions to implement the preferred approach' include strengthening development control advice to the local planning authority, including the use of Sustainable urban Development Systems (SuDS), through local develop framework policies. It is also stated that polices should promote no increase in run-off from new developments and seek opportunities to reduce current run-off rates, where possible.

5.6.12 Details from the CFMP are also summarised in **Section 5.2** as part of the SFRA-1 review.

5.7 LOCAL FLOOD RISK MANAGEMENT STRATEGY

5.7.1 A Local Flood Risk Management Strategy (LFRMS) is a requirement for all Lead Local Flood Authorities (LLFAs) to set out:

i. How local flood risks will be assessed and;

ii. Objectives for managing local flooding.

5.7.2 The LFRMS should also set out the costs and benefits of the measures proposed to meet the objectives, who will deliver them and how they will be funded. Local flooding is defined as flooding that is caused by the following principal sources:

i. Surface water.

ii. Groundwater.

iii. Ordinary Watercourses.

5.7.3 The foregoing summary has been based on information provided on the DEFRA and Environment Agency websites.

5.7.4 A LFRMS, dated May 2014, was produced by West Sussex County Council, this was downloaded from the West Sussex County Council website.

5.7.5 The LFRMS was reviewed and there were no additional references to the site in addition to those detailed in the context of the SFRA-1 detailed in **Section 5.2**.

5.7.6 The West Sussex County Council website was reviewed for Section 19 Flood Investigation Reports relevant to the site, and none were identified.

5.7.7 Similarly, a review of relevant surface water management plans was conducted and none were available to cover the Hassocks area (refer to **Section 5.5**), however although the SFRA-1 states that West Sussex County Council are due to complete a SWMP for Hassocks in 2015/16, there was no SWMP available to download for Hassocks at the time of the preparation of this FRA. It is concluded that the SWMP for Hassocks is still in preparation.

5.7.8 A 'Hassocks West Spot' map produced by West Sussex County Council, was found however and downloaded for review. The 'Hassocks West Spot' map which shows areas at risk from flooding from fluvial and surface water indicates a greater fluvial flood extent than that shown by the Environment Agency online fluvial flood mapping.

5.8 SUDS GUIDANCE

5.8.1 The principal SuDS guidance is provided in the SFRA-1, as detailed in **Section 5.2**, but guidance is also included in CFMP and on the Mid Sussex District Council website through the guidance for sustainable drainage entitled 'Water. People. Places', produced by AECOM for the Lead Local Flood Authorities of the South East of England, dated September 2013.

SECTION 6 CONSULTATION RESPONSES: SUMMARY

6.1 ENVIRONMENT AGENCY

6.1.1 The Environment Agency were consulted regarding the site via an email pre-planning enquiry dated 29 January, and responded on 15 February 2016. The Environment Agency suggested that in the first instance a visit to a number of

website links be made in order to consult advice and guidance to take the project forward. The links were as follows:

i. Flood risk assessment for planning applications; (https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications), this site provides information with which Merebrook is familiar and currently uses in the preparation of FRAs.

ii. Catchment flood management plans; (https://www.gov.uk/government/collections/catchment-flood-management-plans), Merebrook has reviewed the appropriate CFMP in **Section 5.6**.

iii. Pre-planning application enquiry form; (https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion), this site provides information with which Merebrook is familiar and currently uses in the preparation of FRAs.

6.1.2 Merebrook also consulted the Environment Agency online mapping, which is reported in the following sections. A copy of the Environment Agency's email response is included in **Appendix 2**.

Fluvial Flood Map

6.1.3 The fluvial flood map consulted online indicates the following:

i. The western part of the site adjacent to the A 273 London Road, lies within Flood Zone 1, that is land assessed as having a less than 0.1% (1 in 1000) annual probability of river or sea flooding.

ii. The eastern part of the site adjacent to the Herrings Stream lies within Flood Zone 2, that is land assessed as having between a 1% (1 in 100) and 0.1% (1 in 1000) annual probability of river flooding; or between a 0.5% (1 in 200) and 0.1% (1 in 1,000) annual probability of sea flooding, and

iii. A smaller portion of eastern part of the site also lies within Flood Zone 3, that is land assessed as having a 1% (1 in 100) or greater annual probability of river flooding or a 0.5% (1 in 200) or greater annual probability of flooding from the sea.

iv. The two existing properties, 'Evergreen' and 'The Paddock', are shown to be within Flood Zone 1.

Surface Water Flood Map

6.1.4 The surface water flood map consulted online indicates that the western part of the site adjacent to the A 273 London Road is at very low risk of flooding from surface water, with parts of London Road at low and medium risk.

6.1.5 The eastern part of the site adjacent to the Herrings Stream is shown to be at low, medium and high risk of flooding from surface water; these areas generally correspond to the higher fluvial flood risk areas (Flood Zones 2 and 3).

Groundwater

6.1.6 The Environment Agency online groundwater mapping indicates that the site is located within an area classified as 'Secondary A Aquifer', this is likely to be associated with the River Terrace Deposits, since the Weald Clay Formation are described as 'rocks with essentially no groundwater'. The Environment Agency online groundwater vulnerability map indicates that the site lies within an area which falls within the 'Minor Aquifer Low' groundwater vulnerability zone.

6.1.7 The Environment Agency groundwater mapping indicates that the site is not within a Source Protection Zone (SPZ).

6.1.8 There are no licenced groundwater abstractions indicated on the Environment Agency online mapping within 1 km of the site.

Infrastructure

6.1.9 The Environment Agency online mapping does not indicate that the site is at risk from flooding from reservoirs.

6.2 LEAD LOCAL FLOOD AUTHORITY

6.2.1 The Lead Local Flood Authority (LLFA) for the area is West Sussex County Council. West Sussex County Council and Mid Sussex District Council were consulted by an email dated 29 January 2016, in relation to the surface water flood risk to the site, and any site specific flood history.

6.2.2 An email response dated 10 March 2016, was provided by Mid Sussex District Council, which outlined that:

i. West Sussex County Council is the LLFA and is currently carrying out a SWMP for Hassocks and the draft results are soon to be published. It is believed there is also a CFMP for the River Adur into which the Herrings Stream (which is Main River) flows. The CFMP will be available on the Environment Agency's website. The CFMP has been reviewed in **Section 5.6**.

ii. The SFRA mapping is available from Mid Sussex District Council (web-link provided) and this will contain up-to-date Flood Zone Maps and also the updated Flood Map for Surface Water. The site is bounded by the Herrings Stream to the east. There have been recent flooding events to the Herrings Stream and the Friars Oak Fields Residents Association have a very useful website which also contains a Flood Toolkit detailing actual flooding. The SFRA-1 has been reviewed in **Section 5.2**.

iii. There is a watercourse running through the site west to east (marked on Ordnance Survey mapping as 'drain') and it is believed that this watercourse takes drainage from the Golf Course on the west side of London Road. Flows in this watercourse would need to be maintained.

iv. There may also be a watercourse running to the north of the property 'Evergreen'.

6.2.3 Mid Sussex District Council also provided a copy of their pre-application drainage advice, this is currently draft as it is undergoing improvement. It was noted that it is likely that this information will be included on the Mid Sussex District Council website.

6.2.4 West Sussex County Council responded on 14 March 2016, confirming Mid Sussex District Council's comments that they do not have any further information to add with regards to Section 19 investigations or historical events at the site.

6.2.5 A copy of the West Sussex County Council and Mid Sussex District Council correspondence is included in **Appendix 2**.

6.2.6 The West Sussex County Council Preliminary Flood Risk Assessment (PFRA), is reviewed in **Section 5.4**.

6.3 STATUTORY DRAINAGE UNDERTAKER

6.3.1 Since Merebrook holds sewer records for this part of Hassocks, (dated 25 April 2014), Southern Water was not specifically consulted in relation to this FRA.

6.3.2 There are no public sewers indicated within the proposed development site boundary. Two sewers are indicated in and adjacent to London Road to the west of the site. These are coloured red and it is assumed that they are combined sewers, however a legend is not included on the plan. It is normal practice to show foul sewers coloured brown, surface water sewers coloured blue and combined sewers coloured red.

6.3.3 A small section of what is surmised to be a surface water sewer, coloured blue, is present close to Belmont Close to the south of the site. This connects with the combined sewer system immediately to the north.

6.3.4 In summary:

Surface Water Sewers

There are no surface water sewers present on or near the site. The nearest surface water sewer is close to Belmont Close to the south of the site. This is a short section of surface water sewer and connects with the combined sewer system immediately to the north.

Foul Water Sewers

There are no foul water sewers present on or near the site.

Combined Sewers

There are two sewers considered to be combined sewers (coloured red) indicated in and adjacent to London Road to the west of the site.

Capacity Check

No capacity check enquiry has been made in relation to this FRA, it is recommended that such an enquiry is made at the earliest opportunity and in any event before the proposals reach a more detailed stage.

6.3.5 The Southern Water sewer records are included in **Appendix 3**.

SECTION 7 POTENTIAL SOURCES OF FLOODING

7.1 GENERAL

7.1.1 BS 8533: 2011 'Assessing and managing flood risk in development – Code of practice' details recommendation and guidance on the appropriate assessment and management of flood risk where development is proposed in the UK. It is intended to provide developers with practical assistance for dealing with flood risk in and around their development.

7.1.2 It outlines that an assessment should be made of flood risk both **to** the development site and **as a result of** the development site in relation to the following sources of flooding:

i. Tidal and fluvial flooding – flooding from main rivers, ordinary watercourses and the sea.

ii. Surface water flooding – flooding from overland flow due to rainfall.

iii. Flooding from sewers and drains – flooding from surcharging of below ground drainage systems.

iv. Groundwater flooding – flooding related to the water table, where ground water levels rise above surface levels.

v. Flooding caused by the failure of infrastructure – flooding from reservoir, canal or land drainage infrastructure, usually as a result of catastrophic failure.

Sections 8 and 9 summarise the significant potential sources of flooding identified from a desk based appraisal. These potential sources have been used to inform further actions or mitigations, as described later in **Section 10**.

SECTION 8 ASSESSMENT OF FLOOD RISK TO THE DEVELOPMENT

8.1 FLUVIAL FLOOD RISK TO THE SITE

8.1.1 The site is located in the following flood zones:

i. The western part of the site adjacent to the A 273 London Road, lies within Flood Zone 1, that is land assessed as having a less than 0.1% (1 in 1000) annual probability of river or sea flooding. This includes the two existing properties, 'Evergreen' and 'The Paddock'.

ii. The eastern part of the site adjacent to the Herrings Stream lies within Flood Zone 2, that is land assessed as having between a 1% (1 in 100) and 0.1% (1 in 1000) annual probability of river flooding; or between a 0.5% (1 in 200) and 0.1% (1 in 1,000) annual probability of sea flooding, and

iii. A smaller portion of eastern part of the site also lies within Flood Zone 3, that is land assessed as having a 1% (1 in 100) or greater annual probability of river flooding or a 0.5% (1 in 200) or greater annual probability of flooding from the sea.

8.1.2 This was confirmed by a review of the Environment Agency online fluvial flood mapping as discussed in **Section 6.1**.

8.1.3 The 'Hassocks West Spot' map produced by West Sussex County Council (**Section 5.7**), indicates a greater fluvial flood extent than that shown by the Environment Agency online fluvial flood mapping. However, this is likely to be based on high level coarse data rather than actual modelled flood outlines related to accurate topographic levels.

8.1.4 There is an ordinary watercourse on the site, based on a review of Ordnance Survey current and historic mapping and the Environment Agency online mapping, this is the drain between the existing property called 'The Paddock' and the cricket ground to the south; the drain is shown flowing into the Herrings Stream. It is believed that this watercourse takes drainage from the Golf Course on the west side of London Road. This drain is not shown on the Environment Agency online mapping to be associated with Flood Zones 2 and 3, i.e., it is in Flood Zone 1 before joining the Herrings Stream.

8.1.5 The nearest main river is the Herrings Stream which is present on the eastern boundary of the site, flowing from south to north. The Herrings Stream is enmained south of the Friar's Oak public house and Hassocks Golf Club where it is joined by an ordinary watercourse.

8.1.6 There are known instances of historic flooding associated with the Herrings Stream to the south and east of the site, however it is not clear to what extent, if any, these incidents of historic flooding have impacted the subject site. (Source; Friars Oak Fields Residents Association [FOFRA] website Flood Toolkit).

8.1.7 The risk to the undeveloped site from fluvial flooding is considered to be **moderate** specifically in areas which fall within Flood Zones 2 and 3 and mitigation is considered to be required in order to manage the fluvial flood risk. This is discussed in **Section 10**.

8.2 **SURFACE WATER FLOOD RISK TO THE SITE**

8.2.1 Surface water flooding is generally associated with either sloping land with poor permeability, or land that is topographically low relative to its surroundings, known as a 'low spot'.

8.2.2 Review of local topography based on the LIDAR data indicates that site levels are generally in the approximate range 35 m AOD in the north-west to 32.6 m AOD in the north-east, with an approximate overall falling gradient west to east of 1 in 47; and 36.1 m AOD in the south-west to 33.9 m AOD in the south-east, with an approximate overall falling gradient west to east of 1 in 49.

8.2.3 The topography at the site means that surface water and overland flows will tend to flow from west to east towards the Herrings Stream, rather than pond on site.

8.2.4 Review of the Environment Agency online mapping for surface water flood risk indicates that the western part of the site adjacent to the A 273 London Road is at very low risk of flooding from surface water, with parts of London Road at low and medium risk.

8.2.5 The eastern part of the site adjacent to the Herrings Stream is shown to be at low, medium and high risk of flooding from surface water; these areas generally correspond to the higher fluvial flood risk areas (Flood Zones 2 and 3).

8.2.6 The Environment Agency online mapping for surface water flood risk generally correlates with the surface water flood risk shown on the 'Hassocks West Spot' map, although the former shows a greater extent of surface water flood risk on London Road.

8.2.7 There is known history of surface water flooding in the vicinity of the site on London Road and at the entrance to the golf club. (Source; Friars Oak Fields Residents Association [FOFRA] website Flood Toolkit). However, there is no specific evidence of surface water flooding on the subject site. This may be due to events not having occurred, or may be due to instances not having any significant consequences based on the current land use.

8.2.8 The risk to the undeveloped site from surface water flooding in Flood Zone 1 is considered to be **low** and mitigation is not considered to be required. Surface water flood risk in Flood Zones 2 and 3 is likely to be controlled by fluvial flooding which is considered in **Section 8.1**.

8.3 FLOOD RISK TO THE SITE FROM SEWERS & DRAINS

8.3.1 As discussed in **Section 6.2**, there are no foul or surface sewers present on or near the site. There are two combined sewers indicated in and adjacent to London Road to the west of the site.

8.3.2 Whilst the LFRMS comments on sewer flooding in West Sussex, Hassocks is not included in the areas previously known to have experienced regular sewer flooding, these being Worthing and Durrington, the Manhood Peninsula, Barnham, North Lancing, Shoreham and Burgess Hill. There are no known instances of foul sewer flooding in the vicinity of the site.

8.3.3 The surface water flooding in the vicinity of the site on London Road and at the entrance to the golf club as noted in **Section 8.2**, may be linked to problems with highway drainage and blocked gullies, however, this is not thought to have impacted the site. Highway drainage and road gullies is a maintenance matter for West Sussex County Council, which is also the LLFA. As LLFA, West Sussex County Council confirmed Mid Sussex District Council's comments that they do not have any further information to add with regards to Section 19 investigations or historical flood events at the site, (**Section 6.2**).

8.3.4 A capacity assessment of the existing sewer network has not been undertaken, it is recommended that such an enquiry is made at the earliest opportunity and in any event before the proposals reach a more detailed stage; this should include a request to Southern Water to confirm whether they have any records of sewer flooding in the area, (DG5 Register).

8.3.5 The risk to the undeveloped site from flooding from existing sewers and drains is considered to be **low** and mitigation is not considered to be required. (Based on currently available information). The risk should be reviewed when the capacity check information and DG5 Register have been provided.

8.4 GROUNDWATER FLOOD RISK TO THE SITE

8.4.1 Groundwater flooding occurs where groundwater levels rise above the ground surface level. Flooding can also occur due to seepage from higher ground where land is low-lying relative to its surroundings, or in locations where there is superficial clay geology with 'lenses' of sand which fill with water. Groundwater flooding can also occur when the water table elevation in Chalk aquifers rises above ground surface.

8.4.2 As described in **Section 2** the geology at the site comprises superficial deposits of sand and gravel, in the western part of the site, (river terrace deposits); clay, silt, sand and gravel, in the eastern part of the site adjacent to the Herrings Stream, (alluvium); with the underlying solid geology of mudstone, (Weald Clay Formation).

8.4.3 The Environment Agency online groundwater mapping indicates that the site is located within an area classified as 'Secondary A Aquifer', this is likely to be

associated with the River Terrace Deposits, since the Weald Clay Formation are described as 'rocks with essentially no groundwater'.

8.4.4 As described in **Section 5** the SFRA-1 notes that the settlements of Burgess Hill, Hassocks, Hurstpierpoint, Albourne and Sayers Common, as well as countryside areas to the west are considered to be in an area of low potential for groundwater flooding. However, the SFRA-1 is not specific in terms of the areas of Hassocks which are judged to have a low potential groundwater flood risk.

8.4.5 The Environment Agency online groundwater vulnerability map indicates that the site lies within an area which falls within the 'Minor Aquifer Low' groundwater vulnerability zone. The boundary between the above groundwater vulnerability zone and the adjacent 'Major Aquifer High' groundwater vulnerability zone is just to the south of the site near the golf club. The boundary between the two groundwater vulnerability zones corresponds with the boundary between the Weald Clay Formation (non-aquifer) to the north and on which the site is situated and the Lower Greensand Group to the south (Principal Aquifer). It is concluded therefore that the site is only likely to be exposed to a small relatively low risk from groundwater flooding from the River Terrace Deposits rather than from the Principal Aquifer.

8.4.6 Given the topography of the site falling from west to east at an approximate gradient in the range 1 in 47 to 1 in 49, it is likely that any groundwater emerging from the River Terrace Deposits will flow towards the Herrings Stream and away from the higher parts of the site.

8.4.7 The Environment Agency groundwater map consulted online does not indicate that the site is at risk from groundwater flooding.

8.4.8 The risk to the undeveloped site from groundwater flooding is considered to be **low** and mitigation is not considered to be required. However, a ground investigation should be undertaken in order to inform ground conditions and groundwater levels.

8.5 FLOOD RISK FROM INFRASTRUCTURE FAILURE

8.5.1 There are no canals in the vicinity of the subject site.

8.5.2 There is a drainage ditch (indicated as a 'drain') which passes through the site. This is discussed under the heading of fluvial flood risk, in **Section 8.1**.

8.5.3 The Environment Agency mapping consulted online does not indicate that the site is at risk from reservoir flooding.

8.5.4 The risk to the undeveloped site from the failure of infrastructure is considered to be **low** and mitigation is not considered to be required.

8.6 SUMMARY OF FLOOD RISK TO THE DEVELOPMENT

Flood Risk	Summary of risk to the proposed development	Notes	* Further action or mitigation potential
Fluvial	**Moderate**	Specific mitigation required.	✓
Surface water	**Low**	Specific mitigation unlikely.	×
Sewers and drains	**Low**	Specific mitigation unlikely. To be reviewed when capacity check and DG5 Register have been provided.	✓
Groundwater	**Low**	Specific mitigation unlikely. However, a ground investigation should be undertaken in order to inform ground conditions and groundwater levels.	✓
Failure of infrastructure	**Low**	Specific mitigation unlikely.	×

* For proposed action(s) and/or mitigation refer to **Section 10**.

SECTION 9 ASSESSMENT OF FLOOD RISK FROM THE DEVELOPMENT

9.1 IMPACT ON FLUVIAL FLOODING

9.1.1 Loss of Floodplain

As discussed in **Section 4.5**, the site is located as follows:

i. The western part of the site adjacent to the A 273 London Road, lies within Flood Zone 1, that is land assessed as having a less than 0.1% (1 in 1000) annual probability of river or sea flooding.

ii. The eastern part of the site adjacent to the Herrings Stream lies within Flood Zone 2, that is land assessed as having between a 1% (1 in 100) and 0.1% (1 in 1000) annual probability of river flooding; or between a 0.5% (1 in 200) and 0.1% (1 in 1,000) annual probability of sea flooding, and

iii. A smaller portion of eastern part of the site also lies within Flood Zone 3, that is land assessed as having a 1% (1 in 100) or greater annual probability of river flooding or a 0.5% (1 in 200) or greater annual probability of flooding from the sea.

There is a drain between the existing property called ‘The Paddock’ and the cricket ground to the south; the drain is flows into the Herrings Stream. It is believed that this ordinary watercourse takes drainage from the Golf Course on the west side of London Road. This drain is not shown on the Environment Agency online mapping

to be associated with Flood Zones 2 and 3, i.e., it is in Flood Zone 1 before joining the Herrings Stream.

The proposed development lies entirely within Flood Zone 1, and although the preliminary layout does not detail how the drain/ordinary watercourse is accommodated, it is assumed that it will be retained in some form. The proposed development does not therefore impact on the floodplain of the main river (Herrings Stream), or the drain/ordinary watercourse; consequently there should be no loss of fluvial floodplain.

The impact of the proposed development on the fluvial floodplain is expected to be **low** and mitigation is not considered to be required.

9.1.2 Increase in Fluvial Flows

The nature of the proposed development (residential housing replacing largely undeveloped land) means that new impermeable areas will be created.

If left unmanaged, this increase in impermeable area will lead to an increase in the volume of flow entering the Herrings Stream, and may also alter the response time of the fluvial catchment. This could increase the risk of fluvial flooding downstream.

The potential impact of the proposed development on fluvial flows is considered to be **moderate** and mitigation is considered to be required in order to manage the risk of increased fluvial flows and the risk of fluvial flooding downstream. This is discussed in **Section 10**.

9.2 IMPACT ON SURFACE WATER FLOODING

9.2.1 It is anticipated that the development will increase surface water run-off due to the creation of new impermeable areas on site. If left unmanaged, this run-off is likely to dissipate to areas adjacent to the site via overland flow routes, increasing the risk of surface water flooding in other areas.

9.2.2 The impact of the proposed development on surface water is considered to be **moderate** and further action or mitigation is considered to be required in order to manage the risk of surface water flooding on site and in adjacent areas. This is discussed in **Section 10**.

9.3 IMPACT ON SEWER FLOODING

9.3.1 Surface Water Sewers

9.3.1.1 As discussed in **Section 6.3**, there are no surface water sewers present on or near the site; therefore it is considered that there will be no impact on the existing surface water sewer system, where this exists.

9.3.1.2 New surface water sewers are proposed as part of the development, which could introduce a source of flood risk to the site and surrounding areas via surcharging.

However, surface water and surface water sewers will be managed on site by mitigations to restrict run-off to pre-development Greenfield rates, this is discussed in **Section 10**.

9.3.1.3 The impact of the proposed development on surface water sewer flooding is considered be **low** provided that the mitigations outlined in paragraph 9.3.1.2 and discussed in **Section 10** are undertaken and further action or mitigation is not considered to be required.

9.3.2 Foul Water Sewers

9.3.2.1 As discussed in **Section 6.3**, there are no foul water sewers present on or near the site, there are however, two combined sewers in and adjacent to London Road to the west of the site, and it is likely that a foul connection for the site will be sought to one of these two sewers.

9.3.2.2 The nature of the development means that foul flows will be generated from the 18 residential houses and new foul water sewers are proposed as part of the development.

9.3.2.3 A capacity assessment of the existing sewer network has not been undertaken, it is recommended that such an enquiry is made at the earliest opportunity and in any event before the proposals reach a more detailed stage; this should include a request to Southern Water to confirm whether they have any records of historic sewer flooding in the area.

9.3.2.4 The impact of the proposed development on foul water sewer flooding is therefore considered be **moderate** and further action or mitigation is considered to be required in order to manage the risk of sewer flooding as a result of the development. This is discussed in **Section 10**. The risk should be reviewed when the capacity check information and DG5 Register (records of any historic sewer flooding in the area) have been provided.

9.4 IMPACT ON GROUNDWATER FLOODING

9.4.1 As described in **Section 8.4**, the provided/available information suggests that the site has a low potential for flooding from groundwater.

9.4.2 An increase in the likelihood of groundwater flooding is generally related to changes in sub-surface flow paths as a result of underground structures, such as basements or sheet piling. Such structures are not proposed as part of the development.

9.4.3 Provided that significant below-ground structures are not proposed, the impact on groundwater flooding to adjacent areas is expected to be **low** and further action or mitigation is not considered to be required. However, it is identified that a ground investigation should be undertaken in order to inform ground conditions and groundwater levels.

9.5 IMPACT ON FLOOD RISK FROM INFRASTRUCTURE FAILURE

9.5.1 As discussed in paragraph 8.5.1 there are no canals indicated within the vicinity of the site.

9.5.2 Impacts on an ordinary watercourse (indicated as a 'drain') which passes through the site are considered under the heading of fluvial flood risk, in **Section 9.1**.

9.5.3 As discussed in Section 8.5.3 there are no reservoirs in the vicinity of the site.

9.5.4 The impact of the proposed development on flood risk related to the failure of infrastructure is considered to be **low**, and mitigation is unlikely to be required.

9.6 SUMMARY OF FLOOD RISK FROM THE DEVELOPMENT

Flood Risk	Summary of risk from the proposed development	Notes	* Further action or mitigation potential
Fluvial	Loss of Floodplain - **Low**	Specific mitigation unlikely.	×
	Increase in fluvial flows - **Moderate**	Specific mitigation required.	✓
Surface water	**Moderate**	Specific mitigation required.	✓
Sewers and drains	Surface water **Low**	Specific mitigation unlikely, provided mitigations to restrict run-off to pre-development Greenfield rates is undertaken.	✓
	Foul water **Moderate**	Specific mitigation required. Obtain capacity check and DG5 Register information.	✓
Groundwater	**Low**	Specific mitigation unlikely. Undertake ground investigation to inform ground conditions and groundwater levels.	✓ **
Failure of infrastructure	**Low**	Specific mitigation unlikely.	×

***** For proposed action(s) and/or mitigation refer to **Section 10**.

** Subject to there being no significant below-ground structures (e.g., basements, sheet piling etc.) proposed as part of the development.

SECTION 10 ACTIONS & MITIGATION

10.1 OVERVIEW

10.1.1 As discussed in **Sections 8 and 9**, further action and/or mitigation may be required in order to assess and manage any flood risks as a result of the development.

10.1.2 A sequential, risk-based approach to managing flood risk has been taken, as detailed in BS 8533:2011 'Assessing and managing flood risk in development – Code of practice', with mitigation stages in order of preference as follows:

i. Assessing and understanding the flood risk – achieving a sound understanding of risk, filling in gaps in understanding where practicable;

ii. Avoiding the risk – Avoid building in areas of the site that are likely to be affected by flooding;

iii. Substitution – allocating land uses within the site so that those most vulnerable to flooding are at lowest risk;

iv. Control – incorporating flood risk management infrastructure such as barriers, water storage, surface and/or groundwater management, and safe overland flow pathways;

v. Mitigation – where the risk of flooding cannot be avoided, the residual risks should be safely managed, by raising floor levels, or where appropriate, with the use of resistant/resilient building techniques to minimise the damage and disruption caused by flooding;

vi. Public safety – public safety should be considered in all aspects of managing flood risk, and includes consideration of safe routes of access and egress, both within and outside of any proposed development, in addition to emergency planning.

10.2 FLOOD RISK TO THE PROPOSED DEVELOPMENT

10.2.1 An assessment of flood risk to the site has indicated the risk from the following sources as:

i. Fluvial; Flood Zones 1, 2 & 3 – moderate risk.

ii. Surface water – low risk.

iii. Sewers and drains – low risk.

iv. Groundwater – low risk.

v. Infrastructure failure – low risk.

10.2.2 The mitigation required in order to manage these impacts, is as described in the following sections:

10.3 FLUVIAL FLOODING

10.3.1 Although the proposed development lies entirely within Flood Zone 1, it is recommended that the Environment Agency's Product 7 (Calibrated and Verified Model Input Data, including reports, flood modelling and hydrology reports and modelling guidelines) be purchased in order to provide a more accurate definition of flood extents relative to the development. A topographic survey of the site should also be undertaken in order that modelled flood levels can be related to actual ground levels.

10.3.2 The mitigation for the impact from fluvial flooding is therefore 'assessing and understanding the flood risk'.

10.4 SURFACE WATER FLOODING

10.4.1 No specific mitigation is anticipated in relation to surface water flood risk to the proposed development.

10.5 SEWER FLOODING

10.5.1 Although assessed as a low risk, it is recommended that a capacity assessment of the existing sewer network be obtained from Southern Water, together with the DG5 Register in relation to records of any historic sewer flooding in the area.

10.5.2 The mitigation for the impact from sewer flooding is therefore 'assessing and understanding the flood risk'.

10.6 GROUNDWATER FLOODING

10.6.1 Although assessed as a low risk, it is recommended that a ground investigation should be undertaken in order to inform ground conditions and groundwater levels. The scope of the ground investigation should include all requirements identified in this FRA, together with other requirements needed to inform the design process for the development, including foundation design.

10.6.2 The mitigation for the impact from groundwater flooding is therefore 'assessing and understanding the flood risk'.

10.7 FLOODING FROM INFRASTRUCTURE FAILURE

10.7.1 No specific mitigation is anticipated in relation to flood risk from infrastructure failure to the proposed development.

10.8 FLOOD RISK FROM THE PROPOSED DEVELOPMENT

10.8.1 An assessment of the impact of the development on flood risk elsewhere has indicated that the proposed development has the potential to impact flood risk in the vicinity of the site, as follows:

i. Increase in the risk of fluvial and surface water flooding, due to an increase in impermeable area and surface water run-off volumes.

ii. Increase in the risk of foul sewer flooding as a result of increased foul flows from the development. Capacity of sewer network currently unknown.

10.8.2 Mitigation is required in order to manage these impacts, as described below.

10.9 LOSS OF FLUVIAL FLOODPLAIN

10.9.1 As discussed in **Section 9.1**, the proposed development lies entirely within Flood Zone 1, consequently there should be no loss of fluvial floodplain. Therefore no specific mitigation is anticipated in relation to the loss of fluvial floodplain as a result of the proposed development. Drawing 19978-300-001 shows the relationship between the proposed development layout and Flood Zones 2 and 3, (**Appendix 5**).

10.10 SURFACE WATER MANAGEMENT

10.10.1 Adequate surface water management is required for the proposed development in order to control the risk of flooding associated with an increase in the amount of surface water runoff which must be managed through collection, and storage in times of high flows.

10.10.2 In order to establish the likely attenuation requirements for the site, and to demonstrate adequate mitigation for the increase in runoff, the pre-development Greenfield runoff must be assessed.

10.11 PRE-DEVELOPMENT GREENFIELD RUNOFF ASSESSMENT

10.11.1 A Greenfield runoff assessment was completed for the 0.5 ha development impermeable area. (**Section 2**) using the ICP SuDS Mean Annual Flood method, the results of which are included in **Table 10.1**. Outputs from the Microdrainage Source Control software are included in **Appendix 4**.

10.11.2 A Greenfield runoff assessment was also completed for the 2.38 ha gross undeveloped site area, for comparison, the outputs from the Microdrainage Source Control software are also included in **Appendix 4**.

Design Event	Runoff (l/s)
Development mean annual peak flow (Q_{BAR})	2.9
100% (1 in 1) annual event probability (Q_{1yr})	2.5
33.3% annual event probability (Q_{30yr})	6.6
1% annual event probability (Q_{100yr})	9.3

Table 10.1 Greenfield Runoff Assessment

10.11.3 This equates to a mean annual Greenfield runoff rate per hectare at 5.8 litres/second, (Q_{BAR} divided by area).

10.12 METHOD OF DISPOSAL OF SURFACE WATER

10.12.1 Current national guidance including but not limited to Requirement H3 of the Building Regulations Approved Document H 'Drainage and Waste Disposal' (2000) indicates the following surface water management options should be considered (listed in order of preference):

i. Disposal via on-site infiltration system (source control)

ii. Disposal to off-site watercourse; or,

iii. Disposal to off-site sewer.

10.12.2 An assessment the appropriateness of each of these solutions for the site is detailed below.

10.13 DISPOSAL BY INFILTRATION

10.13.1 As discussed in **Section 5** the SFRA-1 highlights the requirement for the incorporation of SuDS into surface water drainage.

10.13.2 Given the current outline nature of the proposals, a ground investigation, including infiltration testing and groundwater level monitoring has yet to be carried out; a ground investigation is recommended elsewhere in this FRA.

10.13.3 The nature of the site geology as discussed in **Section 2.4**, is highly likely to preclude full reliance upon infiltration for the disposal of surface water. The solid geology – the Weald Clay Formation comprises mudstone which is a non-aquifer and the superficial geology – river terrace deposits and alluvium may provide limited potential for infiltration due to poor permeability and elevated groundwater levels in close proximity to the Herrings Stream, with which they are likely to be in hydraulic continuity.

10.13.4 Given the unsuitable geology, it is suggested that source control techniques may be incorporated through the use of non-infiltration systems, such as Type C (BS 7533-

13:2009) permeable pavements, or partial infiltration systems, such as Type B (BS 7533-13:2009) permeable pavements to reduce and/or attenuate flows prior to final discharge from the site. The potential location of these systems would need to be studied further when the proposals are at a more detailed stage.

10.13.5 As part of any future intrusive site investigation and detailed drainage design, infiltration testing should be carried out to establish whether these systems may achieve outflows through partial infiltration, dependent on percolation and groundwater levels.

10.13.6 The Environment Agency groundwater mapping indicates that the site is not within a Source Protection Zone (SPZ).

10.13.7 The Environment Agency online groundwater vulnerability map indicates that the site lies within an area which falls within the 'Minor Aquifer Low' groundwater vulnerability zone.

10.13.8 Given the unsuitable geology, disposal of surface water by infiltration does not currently form the basis of the recommended drainage strategy to be developed for the site when the proposals are at a more detailed stage.

10.14 DISPOSAL TO WATERCOURSE

10.14.1 Given the close proximity of the site to the Herrings Stream, it is likely to be preferable to discharge surface water to the main river. This is the premise of the recommended drainage strategy to be developed for the site when the proposals are at a more detailed stage.

10.14.2 In order to adequately manage risk associated with an increase in the impermeable areas on site, the discharge rate into the main river must be restricted to the value of the mean annual peak flow (Qbar), at 2.9 litres/second (**Section 10.11**), for all events up to and including the 1% (1 in 100) AEP as detailed in Environment Agency Report SC030219 'Rainfall runoff management for developments' (2013). This requires attenuation of runoff volumes, as detailed in **Section 10.15**.

10.14.3 Consent to discharge will be required from the Environment Agency.

10.15 SURFACE WATER ATTENUATION

10.15.1 The SFRA-1, CFMP and the 'Water. People. Places', document suggests that SuDS techniques should be designed to provide attenuation, or combined attenuation and infiltration.

10.15.2 The recommended drainage strategy to be developed for the site when the proposals are at a more detailed stage indicates that attenuation should be provided by way of an attenuation pond fitted with a flow control device with a volume in the range of 396 m^3 to 544 m^3.

10.15.3 Design calculations for the attenuation storage volume, were completed using the MicroDrainage Source Control Quick Storage Estimate tool, included in **Appendix 4**, demonstrate no flooding occurs up to the 1% (1 in 100) Annual Exceedance Probability with 30% allowance on inflows for climate change (**Section 10.18**).

10.15.4 The maximum outflow from the proposed attenuation pond is 2.9 litres/second, in line with the value for Qbar detailed in **Section 10.11**. This demonstrates that the peak discharge rate for all events up to and including the 1% (1 in 100) Annual Exceedance Probability with 30% allowance on inflows for climate change (**Section 10.18**), will not exceed that of the existing site.

10.16 IMPACT ON SEWERS AND DRAINS

10.16.1 The nature of the proposed development means that residential foul flows will be generated from the 18 dwellings. Southern Water has yet to confirm whether the combined sewers in London Road have capacity to receive foul flows from the proposed development.

10.16.2 Based on 'Sewers for Adoption' (WRC), the design flow for gravity sewers for residential developments should be 4000 litres/unit dwelling/per 24 hours. Based on 18 dwellings, this equates to 0.83 litres/second. Since the capacity of the combined sewers in London Road is currently unknown, it is not possible to determine whether flood risk from foul/combined sewers will be increased as a result of the development. As recommended elsewhere in this FRA, a capacity check enquiry should be made with Southern Water at the earliest opportunity and in any event before the proposals reach a more detailed stage.

10.17 GROUNDWATER FLOODING

10.17.1 As detailed in **Section 9.4**, the risk of groundwater flooding as a result of the development is thought to be low, however verification is required in order to confirm this and groundwater levels.

10.17.2 The results of on-site investigations should be assessed in order to further understand the level of risk. Where this risk is low, no further action is required, however if groundwater levels are found to be at, or near the surface, mitigation may be required, as described in **Section 10.1**.

10.18 CLIMATE CHANGE GUIDANCE

10.18.1 The frequency and intensity of rainfall is predicted to increase as a result of climate change. Allowance for how this will affect the development proposals will need to be factored into the design. The Environment Agency's guidance note 'Climate change allowance for planners' (September 2013) suggests that a 30% precautionary sensitivity range should be added to the peak rainfall intensity.

10.19 **SCOPE**

10.19.1 Given the outline nature of the development, the actions and mitigations detailed in the preceding sections are intended as guidance for the next stages of the development in relation to flood risk, and not as a definitive list of the requirements. These actions and mitigations should be developed as additional information becomes available.

10.20 **SUMMARY**

10.20.1 This FRA is intended as a qualitative study based upon a desk-based assessment, readily available information, and where applicable, responses from consultees.

10.20.2 The proposals comprise the construction of a residential development of 18 dwellings.

10.20.3 The site is located in Environment Agency Flood Zones 1, 2 and 3, namely, areas with a low, medium and high probability of flooding from main rivers. However, the proposed development lies entirely within Flood Zone 1.

10.20.4 The proposed development is classed as having 'More Vulnerability' to flooding, as outlined in 'Planning practice Guide – Flood Risk and Coastal Change'.

10.20.5 Development of 'more vulnerable' uses is compatible with Flood Zone 1, and it is considered that the Sequential Test has been applied. The Exception Test is not required.

10.20.6 A review of relevant planning documents outline the guidance and recommendations in relation to the use of SuDS techniques and also highlights guidance relating to Greenfield run-off and climate change.

10.20.7 An assessment of flood risk to the development site highlighted that there is potentially a moderate risk of fluvial flooding. Proposed mitigation for these risks is based on the hierarchical approach detailed in BS 8533:2011 'Assessing and managing flood risk in development – Code of practice'. The mitigation includes obtaining the Environment Agency's Product 7 to provide a more accurate definition of flood extents relative to the development, together with a topographic survey of the site in order that modelled flood levels can be related to actual ground levels. This should ensure that the development is clear of predicted flood outlines and is located in areas at lowest risk.

10.20.8 An assessment of flood risk as a result of the development suggests that an increase in impermeable area, if left unmanaged could impact on fluvial flows in the adjacent main river, and could to lead to an increased risk of surface water flooding. Mitigations are proposed to manage runoff from the site to pre-development (Greenfield) rates, meaning that there will be no increase in volumes up to and including the 1% (1 in 100) annual exceedance probability event. In addition, it is recommended that a capacity check be obtained from Southern Water in relation to

the nearby combined sewers into which it is proposed to discharge foul flows from the site; and a check made on the DG5 Register in relation to any historic sewer flooding.

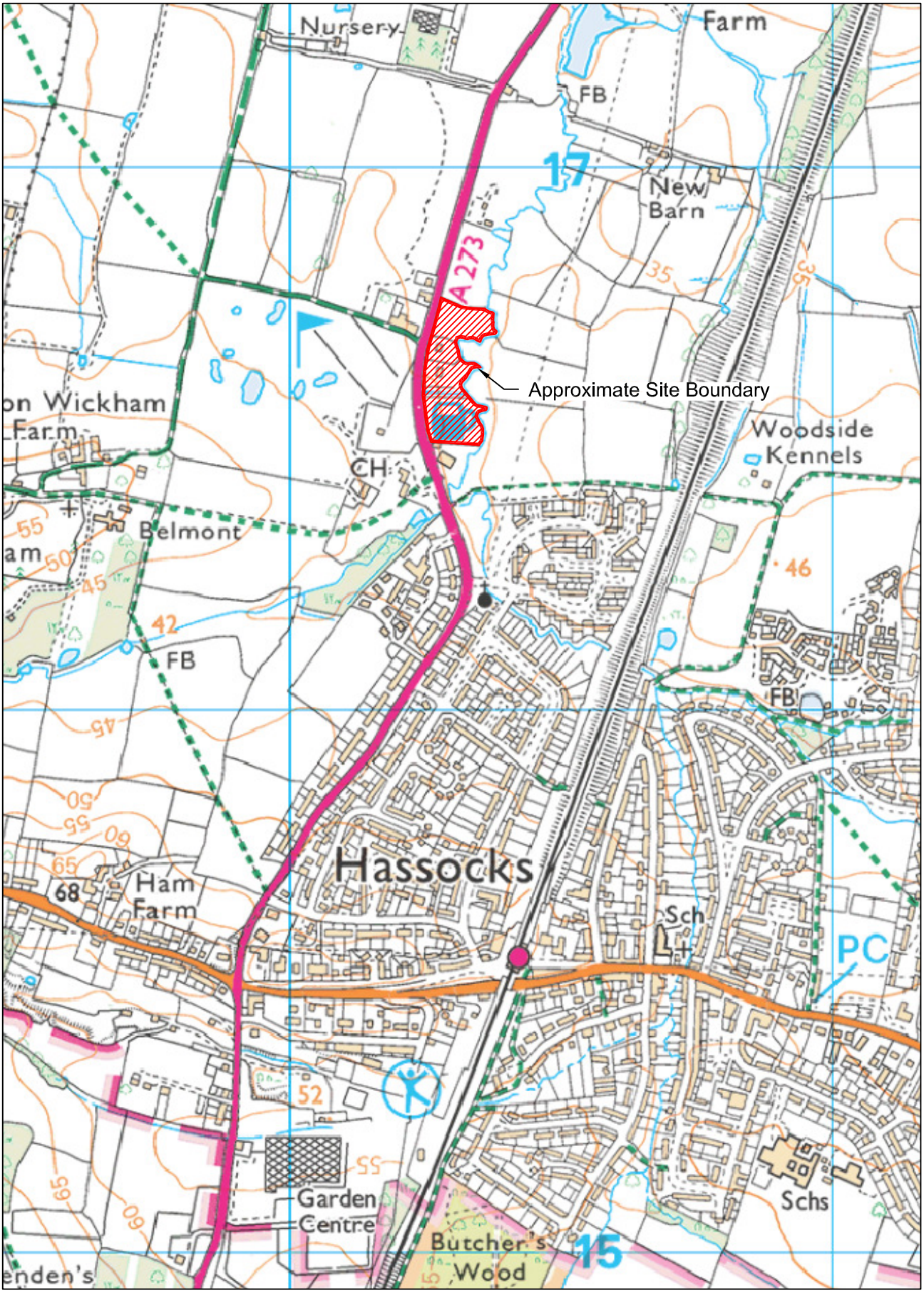
10.20.9 It is recommended that a ground investigation should be undertaken in order to inform ground conditions and groundwater levels. The scope of the ground investigation should include all requirements identified in this FRA, together with other requirements needed to inform the design process for the development, including foundation design and infiltration testing in order to gauge whether the disposal of surface water may be achieved through partial infiltration in combination with attenuation and discharge to the main river.

10.21 CONCLUSION

10.21.1 The flood risk assessment highlights that there are some potential flood risks related to the site. However it is considered likely that risks and impacts can be managed to an appropriate level with the adoption of mitigation measures employed as part of the proposed development.

APPENDIX 1

- Site Location Plan
- Existing Site Plan/Topographic Survey
- Proposed Layout Plan



Issue Details	Dwn	Chd	App'd
Based on OS data	RH	PRD	PRD
	29-01-2016		-

idom merebrook
East Mill, Bridgefoot, Belper, Derbyshire, England. DE56 2UA
tel +44(0)1773 829988 email info@merebrook.co.uk

Colin Brace
The Paddock, Hassocks
Site Location Plan

Job No.	Dwg No.	Revision
19978	001-001	-
Scale	**Date**	**Frame Dimensions mm**
N.T.S.	January 2016	(A4) 250x181
Drawn	**Checked**	**Approved**
RH	PRD	PRD

Friar's Oak Cottages

A273 London Road

Friar's Oak House

Crofton

Grass field

Herrings Stream

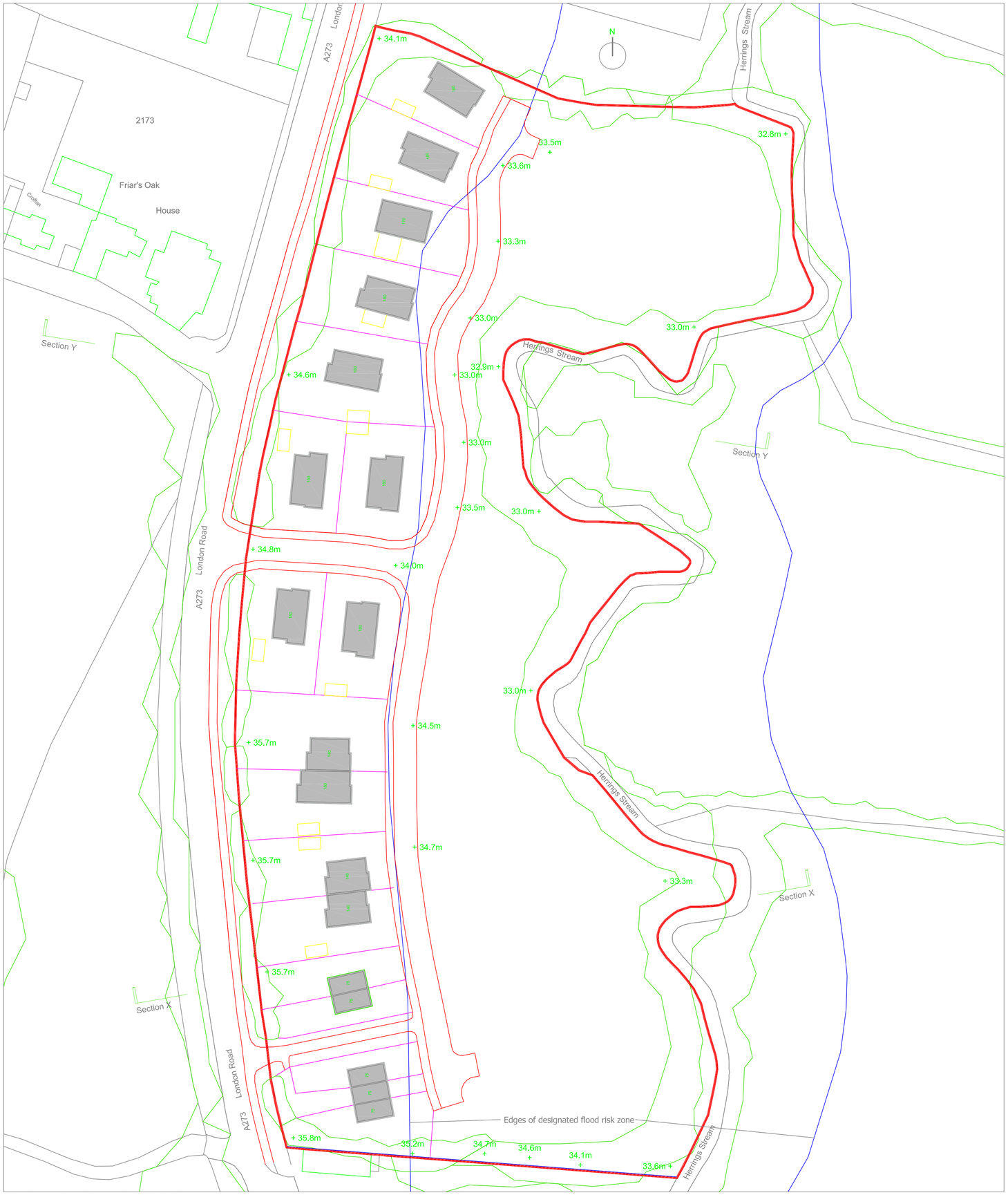
Evergreen

The Paddock

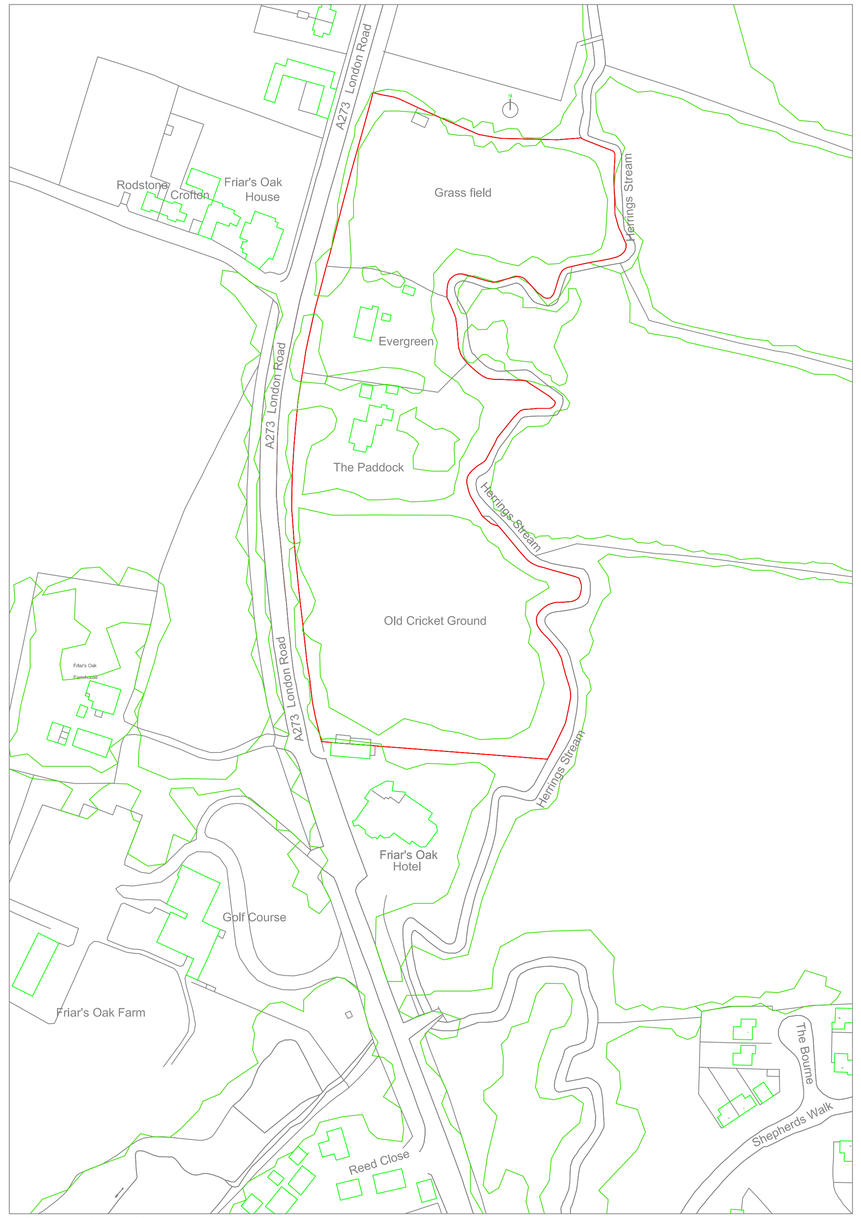
Old Cricket Ground

Friar's Oak Hotel

Golf Course



Site Location Plan 1:500@A1



Site Location Plan 1:1250@A1

revision	date	description	dwn	chkd

LCE Architects
design management consultancy

164-165 western road brighton BN1 2BB t 01273 206710 f 01273 206891
e LCE.brighton@LCEarch.com w LCEarch.com ISO 9001:2000 certified

project
The Paddock
Hassocks

scale
as shown

date
09.05.14

client
Phillip Harris, Julie Neary & Colin Brace

drawn
AW

checked
..

drawing
Site Location Plan and Block Plan

drawing number
16911/PA/001

revision
.

APPENDIX 2

- Environment Agency Consultation
- Lead Local Flood Authority Consultation

From: SSD Enquiries <SSDEnquiries@environment-agency.gov.uk>
Sent: 15 February 2016 10:10
To: Robert Hopkinson
Subject: 160215 SSD3476 Proposed Development: The Paddock, Hassocks BN6 9FB
Attachments: 001-001.pdf; Paddock preliminary scheme 11-01-16.pdf

Dear Rob
Thank you for your enquiry and please accept our apologies for the delay in contacting you. We would suggest in the first instance to visit following links where you are able to look at advice and guidance to take your project forward.

https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications

https://www.gov.uk/government/collections/catchment-flood-management-plans

https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion

Download Environmental Data
https://www.gov.uk/guidance/download-environmental-data

We can provide any historical events as part of any further data or pre planning application request.

Please contact us again if you have further queries.

Regards

Cherry Weeks
Customers & Engagement | Solent and South Downs Area | Environment Planning and Engagement
Environment Agency | Guildbourne House | Chatsworth Road | Worthing| West Sussex | BN11 1LD
Tel: 01903 703831 IMPORTANT as from January 2016 please note new tel number **02030257046**
email: ssdenquiries@environment-agency.gov.uk

www.gov.uk/floodsdestroy

DO YOU KNOW WHAT TO DO? FLOODS DESTROY BE PREPARED

From: Enquiries, Unit
Sent: 04 February 2016 10:43
To: rhopkinson@merebrook.co.uk
Subject: 160204/DP15 - Proposed Development: The Paddock, Hassocks BN6 9FB

Dear Rob

I have passed your enquiry to our customer team for the relevant area and they will be in touch with you shortly.

The Freedom of Information Act and Environmental Information Regulations state that a public authority must respond to requests for information within 20 working days, but we aim to respond to all enquiries as quickly as we can.

You can find more information about our service commitment by clicking on the link below:

https://www.gov.uk/government/publications/environment-agency-customer-service-commitment

Should you wish to contact the customer team directly, please use the contact details below. Please quote your Enquiry Reference 160204/DP15 in any correspondence with us regarding this matter.

Customer and Engagement
Environment Planning & Engagement
Environment Agency
Solent and South Downs Area
Guildbourne House
Chatsworth Road
Worthing
West Sussex
BN11 1LD

Tel 03708 506506

Regards

David Powell

Customer Service Advisor
National Customer Contact Centre - Part of National Operations Services

Tel: 03708 506 506
Web Site: www.gov.uk/environment-agency

Click an icon to keep in touch with us:-

So how did we do...?

Our National Customer Contact Centre relies on customer feedback, so we really value your thoughts on how we are doing. We will always make changes where we can to improve our service. This will only take three minutes to complete:

http://www.smartsurvey.co.uk/s/NCCCcustomer/

From: Robert Hopkinson [mailto:rhopkinson@merebrook.co.uk]
Sent: 29 January 2016 13:34
To: Enquiries, Unit
Subject: Proposed Development: The Paddock, Hassocks BN6 9FB

PROPOSED DEVELOPMENT: THE PADDOCK, HASSOCKS BN6 9FB
FLOOD RISK ASSESSMENT: PRE PLANNING ENQUIRY

Our Client is pursuing the above development and we have been instructed to undertake a Flood Risk Assessment and are currently in the process of canvassing consultees.

Based on the site area being greater than 1 hectare, we intend to follow your Guidance Note 1 issued April 2012 in completion of the Flood Risk Assessment.

We would be grateful if you could advise whether this is considered appropriate for planning purposes by yourselves, and also whether there is any specific information or any issues related to the site, such as historical flooding events, IDB management areas, relevant catchment or flood management plans.

If you have any queries or if this site is known to you and you would like to discuss things on either a formal or informal basis please do not hesitate to telephone me on 01773 829988.

Kind Regards

Rob Hopkinson
Junior Civil Engineer

E: rhopkinson@merebrook.co.uk

Idom Merebrook Ltd, East Mill, Bridgefoot, Belper, Derbyshire, DE56 2UA
t +44 (0)1773 829 988 **f** +44 (0)1773 829 393 **e** consulting@merebrook.co.uk
merebrook.co.uk idom.com

AN idom GROUP COMPANY

Work sustainably - Do you really need to print this e-mail?

From: Fiona Bishop <Fiona.Bishop@midsussex.gov.uk>
Sent: 10 March 2016 16:52
To: Robert Hopkinson
Cc: 'frm@westsussex.gov.uk'; Joseph Pearson
Subject: RE: Proposed Development: The Paddock, Hassocks BN6 9FB
Attachments: Pre-App advice - Drainage.docx

Dear Rob,

Thank you for your email regarding the above site. I apologise for the delay in my response.

Mid Sussex is not the LLFA as this is WSCC for our area and I have therefore copied the Flood Risk Management Team into this email. WSCC can reply to the Section 19 question and provide you with any standing advice that they may have, however, I do not think that they will have anything to add to the information I have provided below.

WSCC are also currently carrying out a SWMP for Hassocks and the draft results are soon to be published. I believe there is also a CMP for the River Adur into which the Herring Stream (which is Main River) flows. The CMP will be available on the Environment Agency's website.

The SFRA mapping is available from MSDC via Joseph Pearson (email address above) and this will contain up-to-date Flood Zone Maps and also the updated Flood Map for Surface Water. The site is bounded by the Herring Stream to the east. There have been recent flooding events to the Herring Stream and the Friars Oak Fields Residents Association have a very useful website which also contains a Flood Toolkit detailing actual flooding.

There is a watercourse running through the site west to east and I believe this watercourse takes drainage from the Golf Course on the West side of the London Road. Flows in this watercourse would need to be maintained.

There may also be a watercourse running to the north of the property Evergreen.

Please find attached our pre-app drainage advice that is currently draft as we are improving it. It is likely that this will be the information going onto our website.

Kind Regards
Fiona

Mrs Fiona Bishop BEng (Hons)
Senior Drainage Engineer P/T (Tues, Wed, Thurs in term-time)
Corporate Estates & Facilities
t:01444 477074
e:fiona.bishop@midsussex.gov.uk
www.midsussex.gov.uk

Working together for a **Better Mid Sussex**

From: Robert Hopkinson [mailto:rhopkinson@merebrook.co.uk]
Sent: 29 January 2016 13:31
To: enquiries
Subject: Proposed Development: The Paddock, Hassocks BN6 9FB

Good afternoon,

Our client is currently preparing a detailed planning application for 22 dwellings for a proposed site at approximate NGR 530279,116605, postcode BN6.

We are commissioned with preparing a Flood Risk Assessment and Drainage Strategy. We'd be grateful if you could provide any relevant information (advising on any charges where appropriate) as follows:

- Section 19 Flood Investigation Reports relevant to the site;
- Known ordinary watercourses in proximity to the site;
- Known surface water or groundwater flooding issues relevant to the site (with mapping where available);
- Guidance or advice documents on SuDS Policies (we note from your website that you are due to publish additional documents soon, we'd be grateful if you could advise on timescales for this);
- Information on specific documents (other than PFRA and SFRA) that may be relevant to the site, such as SWMPs, CMPs;
- LLFA standing advice on flood risk or SuDS.

With regards the proposed drainage strategy, we would be grateful if you could advise on the level of detail of information required in the supporting documents, for example the format of any drainage calculations and drawings (required scales etc).

Do not hesitate to contact me if you require any further information in order to process my request.

Kind Regards

Rob Hopkinson
Junior Civil Engineer

E: rhopkinson@merebrook.co.uk

idom merebrook

Idom Merebrook Ltd, East Mill, Bridgefoot, Belper, Derbyshire, DE56 2UA
t +44 (0)1773 829 988 **f** +44 (0)1773 829 393 **e** consulting@merebrook.co.uk
merebrook.co.uk idom.com

AN idom GROUP COMPANY

Work sustainably - Do you really need to print this e-mail?

Pre-App Drainage and Flood Risk advice for developers (Draft)

Both the District Council (a Risk Management Authority under the Flood and Water Management Act 2010) and West Sussex County Council (as Lead Local Flood Authority) are available to attend pre-app meetings, however, I do not know if WSCC charge for this.

FRA's should be prepared in line with the NPPF and the Planning Practice Guidance on Flood Risk and Coastal Change. All forms of flooding should now be treated consistently with river flooding in mapping probability and assessing vulnerability to apply the Sequential Test (if necessary) and the sequential approach across all flood risk areas. New development should be directed to areas with the lowest probability of flooding. Section 10 of the PPG deals with site-specific flood risk assessments and provides a list of objectives which should be met.

MSDC has prepared a Strategic Flood Risk Assessment and this is available from the Council's website and the South East England authorities have also prepared a guidance document for Sustainable Drainage entitled Water.People.Places.

It is useful to Drainage Officers if the location of the drainage information can be listed on one piece of paper so that it is easier to find the relevant documents within the planning submission.

If the site is bounded by (or has running through it) Main River you will need to liaise with the Environment Agency regarding their requirements to ensure that they are satisfied. We will need to know what the arrangements for the management and maintenance of the river and any watercourses will be in the future and this should be included in the Drainage Management and Maintenance Plan.

As well as considering the flood plain to the Main River your development will need to consider the flood plain from the ordinary watercourses shown on the Updated Flood Map for Surface Water. Consideration of the overland flow routes for the undeveloped site should be given when developing any site and of course, protection to the downstream properties.

Suds should be constructed in areas where they will be accessible for future maintenance and should be designed to current best practice guidance such as the Suds Manual and the Practice Guidance English Non-Statutory Suds Standards **Page 9 of this document contains a very useful table to give an indication of the level of information that will be required during each part of the planning process.**

Where a discharge into the stream or river is proposed the Ordinary Watercourse or Flood Defence Consent will be required as changes may affect the flow in the river/watercourse.

Evidence of capacity within sewers should also be provided along with discharge rates if connections to the public sewers are proposed.

As infiltration is usually poor within the District, attenuation systems are most likely. They are best designed to be above ground where they can be seen and most easily maintained and space should be made available on the site to enable practical maintenance in perpetuity.

The discharge from the site is likely to be limited to the QBar Greenfield Runoff rate as there is unlikely to be infiltration so the volume of site runoff cannot be reduced.

Useful links:

Planning Practice Guidance – Flood Risk and Coastal Change

Flood Risk Assessment: Climate Change Allowances

Flood Risk Assessment for Planning Applications

Sustainable drainage systems technical standards

Water.People.Places.- A guide for master planning sustainable drainage into developments

The updated SuDS Manual - latest technical advice and adaptable processes to assist in the planning, design, construction, management and maintenance of good SuDS

Submission of Drainage and Flood Risk Information

The level of drainage information necessary for submission at each stage within the planning process will vary depending on the size of the development, flood risk, site constraints, proposed sustainable drainage system etc. The table below provides a guide and is taken from the Practice Guidance for the English non-statutory SuDS Standards

Pre-app	Outline	Full	Reserved	Discharge	Document submitted
√	√	√			Flood Risk Assessment / Statement (checklist)
√	√	√			Drainage Strategy / Statement & sketch layout plan (checklist)
	√				Preliminary layout drawings
	√				Preliminary “Outline” hydraulic calculations
	√				Preliminary landscape proposals
	√				Ground investigation report (for infiltration)
	√	√			Evidence of third party agreement for discharge to their system (in principle / consent to discharge)

		√		√	Maintenance program and on-going maintenance responsibilities
		√	√		Detailed development layout
		√	√	√	Detailed flood and drainage design drawings
		√	√	√	Full Structural, hydraulic & ground investigations
		√	√	√	Geotechnical factual and interpretive reports, including infiltration results
		√	√	√	Detailing landscaping details
		√	√	√	Discharge agreements (temporary and permanent)
		√	√	√	Development Management & Construction Phasing Plan

Additional information may be required under specific site conditions or development proposals

Guidance for the level of information required is set out below:

For a development located within Flood Zone 2, Flood Zone 3, which is greater than 1 hectare in area, or where a significant flood risk has been identified:

A Flood Risk Assessment [(1)] will need to be submitted that identifies what the flood risks are and how they will change in the future. Also whether the proposed development will create or exacerbate flood risk, and how it is intended to manage flood risk post development.

[(1)]This level of assessment will need to be carried out to our satisfaction by a suitably qualified person.

For the use of SuDS *[(1) (2) (3)]:*

Written Statement (HCWS 161) – Department for Communities and Local Government – sets out the expectation that sustainable drainage systems will be provided to new developments wherever this is appropriate.

Percolation tests, calculations, plans and details will need to be submitted to demonstrate that the development will be able to cater for the 1 in 100 year storm event plus have 30% capacity for climate change[(4)]. A maintenance and management plan will also need to be arranged and submitted that shows how all SuDS infrastructure is kept to operate at its optimum for the lifetime of the development. This will need to identify who will undertake this work and how it will be funded. Also, measures and arrangements in place to ensure perpetuity and demonstrate the serviceability requirements, including scheduled maintenance, inspections, repairs and replacements, will need to be submitted. A clear timetable for the schedule of maintenance can help to demonstrate this.

[(1)]Suitable SuDS Guidance can be found using CIRIA Guidance Document C697 "SuDS Manual"

[(2)]20% climate change for industrial and commercial development proposals

[(3)]Approved method of soakaway design include BRE – Digest 365 "Soakaway Design"

[(4)]Submitted SuDS designs will need to be undertaken by a suitably qualified person

For the use of attenuation, swales and soakaways[(1)]:

Percolation tests, calculations, plans and details will need to be submitted to demonstrate that the development will be able to cater for the 1 in 100 year storm event plus have 30% capacity for climate change[(2)].

[(1)] Approved method of soakaway design include BRE – Digest 365 "Soakaway Design"

[(2)]20% climate change for industrial and commercial development proposals

For the use of Public Sewers[(1)]:

Copies of the approval of the adoption of foul and surface water sewers and/or the connection to foul and surface water sewers from the sewerage undertaker, which agrees a rate of discharge, will need to be submitted.

[(1)]Any design and construction of sewers should follow the standards of the WRC guidance "Sewers for Adoption" – currently 7th edition.

For the proposal of works to an Ordinary Watercourse:

If works are undertaken within, under, over or up to an Ordinary Watercourse, even if this is temporary, an Ordinary Watercourse Consent (OWC) may need to be applied for. OWC applications can be discussed and made with Mid Sussex District Council, Scott Wakely, 01444 477 005.

For the use of watercourse to discharge surface water [(1)]:

Calculations, plans and details will need to be submitted that demonstrate that discharge from the proposed development will be restricted to Greenfield run-off rate or QBar run-off rate, whichever provides the better rate of discharge [(2)]. This will need to be for up to the 1 in 100 year storm event plus 30% capacity for climate change.

[(1)]In accordance with The Land Drainage Act 1991.

[(2)]Approved methods to calculate this include:

Institute of Hydrology - Report 124 – "Flood Estimation for Small Catchments"
Centre for Ecology & Hydrology 1999 – "Flood Estimation Handbook" - (FEH)
WinDes Software – Generated FEH Output
(For Highway) DMBR Standards HA106/04 – "Drainage of Runoff From Natural Catchments"

For the presence of an Ordinary Watercourse running through or adjacent to the site:

Consultation will need to be made with Mid Sussex District Council if there is a watercourse running through or adjacent to the proposed development. It is common practice to require the development to leave a strip of land, at least 5 to 8 metres wide, in order to provide access for future maintenance.

For the presence of a Public Sewer running under or adjacent to the proposed development:

Consultation will need to be made with the sewerage undertaker as there is a Public Sewer running under or adjacent to the proposed development. Building any structure over or within close proximity to such sewers will require prior permission from the sewerage undertaker [(1)]. Evidence of approvals to build over or within close proximity to such sewers will need to be submitted.

[(1)]Southern Water and Thames Water provide suitable online guidance notes for the building over or near Public Sewers.

For the presence of a Mid Sussex District Council (MSDC) owned culvert running under or adjacent to the site:

Consultation will need to be made with Mid Sussex District Council if there is a MSDC owned culvert running under or adjacent to the proposed development. Building any structure over or within close proximity to such culverts will require prior permission from Mid Sussex District Council. Normally it will be required that an "easement" strip of land, at least 5 to 8 metres wide, is left undeveloped to ensure that access can be made in the event of future maintenance and/or replacement. This matter can be discussed with Mid Sussex District Council, Scott Wakely, 01444 477 055.

From: Kevin Brook <kevin.brook@westsussex.gov.uk> on behalf of Flood Risk Management <FloodRiskManagement@westsussex.gov.uk>
Sent: 14 March 2016 11:18
To: Fiona Bishop; Robert Hopkinson
Cc: Joseph Pearson
Subject: RE: Proposed Development: The Paddock, Hassocks BN6 9FB

Dear Rob,

Yes, Fiona is correct that we wouldn't have any further information to add with regards to Section 19 investigations or historical events at this site.

Many thanks

Kevin Brook
Flood Risk Management Engineer
Residents' Services – Highways and Transport
West Sussex County Council

From: Fiona Bishop [mailto:Fiona.Bishop@midsussex.gov.uk]
Sent: 10 March 2016 16:52
To: 'Robert Hopkinson'
Cc: Flood Risk Management; Joseph Pearson
Subject: RE: Proposed Development: The Paddock, Hassocks BN6 9FB

Dear Rob,

Thank you for your email regarding the above site. I apologise for the delay in my response.

Mid Sussex is not the LLFA as this is WSCC for our area and I have therefore copied the Flood Risk Management Team into this email. WSCC can reply to the Section 19 question and provide you with any standing advice that they may have, however, I do not think that they will have anything to add to the information I have provided below.

WSCC are also currently carrying out a SWMP for Hassocks and the draft results are soon to be published. I believe there is also a CMP for the River Adur into which the Herring Stream (which is Main River) flows. The CMP will be available on the Environment Agency's website.

The SFRA mapping is available from MSDC via Joseph Pearson (email address above) and this will contain up-to-date Flood Zone Maps and also the updated Flood Map for Surface Water. The site is bounded by the Herring Stream to the east. There have been recent flooding events to the Herring Stream and the Friars Oak Fields Residents Association have a very useful website which also contains a Flood Toolkit detailing actual flooding.

There is a watercourse running through the site west to east and I believe this watercourse takes drainage from the Golf Course on the West side of the London Road. Flows in this watercourse would need to be maintained.

There may also be a watercourse running to the north of the property Evergreen.

Please find attached our pre-app drainage advice that is currently draft as we are improving it. It is likely that this will be the information going onto our website.

Kind Regards
Fiona

Mrs Fiona Bishop BEng (Hons)

Senior Drainage Engineer P/T (Tues, Wed, Thurs in term-time)
Corporate Estates & Facilities
t:01444 477074
e:fiona.bishop@midsussex.gov.uk
www.midsussex.gov.uk

Working together for a **Better Mid Sussex**

From: Robert Hopkinson [mailto:rhopkinson@merebrook.co.uk]
Sent: 29 January 2016 13:31
To: enquiries
Subject: Proposed Development: The Paddock, Hassocks BN6 9FB

Good afternoon,

Our client is currently preparing a detailed planning application for 22 dwellings for a proposed site at approximate NGR 530279,116605, postcode BN6.

We are commissioned with preparing a Flood Risk Assessment and Drainage Strategy. We'd be grateful if you could provide any relevant information (advising on any charges where appropriate) as follows:

- Section 19 Flood Investigation Reports relevant to the site;
- Known ordinary watercourses in proximity to the site;
- Known surface water or groundwater flooding issues relevant to the site (with mapping where available);
- Guidance or advice documents on SuDS Policies (we note from your website that you are due to publish additional documents soon, we'd be grateful if you could advise on timescales for this);
- Information on specific documents (other than PFRA and SFRA) that may be relevant to the site, such as SWMPs, CMPs;
- LLFA standing advice on flood risk or SuDS.

With regards the proposed drainage strategy, we would be grateful if you could advise on the level of detail of information required in the supporting documents, for example the format of any drainage calculations and drawings (required scales etc).

Do not hesitate to contact me if you require any further information in order to process my request.

Kind Regards

Rob Hopkinson
Junior Civil Engineer

E: rhopkinson@merebrook.co.uk

idom merebrook

Idom Merebrook Ltd, East Mill, Bridgefoot, Belper, Derbyshire, DE56 2UA
t +44 (0)1773 829 988 **f** +44 (0)1773 829 393 **e** consulting@merebrook.co.uk
merebrook.co.uk idom.com

AN idom GROUP COMPANY

From: Fiona Bishop <Fiona.Bishop@midsussex.gov.uk>
Sent: 15 March 2016 11:01
To: Robert Hopkinson
Subject: RE: Proposed Development: The Paddock, Hassocks BN6 9FB

Dear Rob,

Further to my email please follow the link below to get a copy of the SFRA mapping.

http://www.midsussex.gov.uk/planning-licensing-building-control/planning-policy/historical-flooding-and-flood-risk/

Kind Regards

Mrs Fiona Bishop BEng (Hons)
Senior Drainage Engineer P/T (Tues, Wed, Thurs in term-time)
Corporate Estates & Facilities
t:01444 477074
e:fiona.bishop@midsussex.gov.uk
www.midsussex.gov.uk

Working together for a **Better Mid Sussex**

From: Kevin Brook [mailto:kevin.brook@westsussex.gov.uk] **On Behalf Of** Flood Risk Management
Sent: 14 March 2016 11:18
To: Fiona Bishop; 'Robert Hopkinson'
Cc: Joseph Pearson
Subject: RE: Proposed Development: The Paddock, Hassocks BN6 9FB

Dear Rob,

Yes, Fiona is correct that we wouldn't have any further information to add with regards to Section 19 investigations or historical events at this site.

Many thanks

Kevin Brook
Flood Risk Management Engineer
Residents' Services – Highways and Transport
West Sussex County Council

From: Fiona Bishop [mailto:Fiona.Bishop@midsussex.gov.uk]
Sent: 10 March 2016 16:52
To: 'Robert Hopkinson'
Cc: Flood Risk Management; Joseph Pearson
Subject: RE: Proposed Development: The Paddock, Hassocks BN6 9FB

Dear Rob,

Thank you for your email regarding the above site. I apologise for the delay in my response.

Mid Sussex is not the LLFA as this is WSCC for our area and I have therefore copied the Flood Risk Management Team into this email. WSCC can reply to the Section 19 question and provide you with any standing advice that they may have, however, I do not think that they will have anything to add to the information I have provided below.

WSCC are also currently carrying out a SWMP for Hassocks and the draft results are soon to be published. I believe there is also a CMP for the River Adur into which the Herring Stream (which is Main River) flows. The CMP will be available on the Environment Agency's website.

The SFRA mapping is available from MSDC via Joseph Pearson (email address above) and this will contain up-to-date Flood Zone Maps and also the updated Flood Map for Surface Water. The site is bounded by the Herring Stream to the east. There have been recent flooding events to the Herring Stream and the Friars Oak Fields Residents Association have a very useful website which also contains a Flood Toolkit detailing actual flooding.

There is a watercourse running through the site west to east and I believe this watercourse takes drainage from the Golf Course on the West side of the London Road. Flows in this watercourse would need to be maintained.

There may also be a watercourse running to the north of the property Evergreen.

Please find attached our pre-app drainage advice that is currently draft as we are improving it. It is likely that this will be the information going onto our website.

Kind Regards
Fiona

Mrs Fiona Bishop BEng (Hons)
Senior Drainage Engineer P/T (Tues, Wed, Thurs in term-time)
Corporate Estates & Facilities
t:01444 477074
e:fiona.bishop@midsussex.gov.uk
www.midsussex.gov.uk

Working together for a **Better Mid Sussex**

From: Robert Hopkinson [mailto:rhopkinson@merebrook.co.uk]
Sent: 29 January 2016 13:31
To: enquiries
Subject: Proposed Development: The Paddock, Hassocks BN6 9FB

Good afternoon,

Our client is currently preparing a detailed planning application for 22 dwellings for a proposed site at approximate NGR 530279,116605, postcode BN6.

We are commissioned with preparing a Flood Risk Assessment and Drainage Strategy. We'd be grateful if you could provide any relevant information (advising on any charges where appropriate) as follows:

- Section 19 Flood Investigation Reports relevant to the site;
- Known ordinary watercourses in proximity to the site;
- Known surface water or groundwater flooding issues relevant to the site (with mapping where available);
- Guidance or advice documents on SuDS Policies (we note from your website that you are due to publish additional documents soon, we'd be grateful if you could advise on timescales for this);
- Information on specific documents (other than PFRA and SFRA) that may be relevant to the site, such as SWMPs, CMPs;
- LLFA standing advice on flood risk or SuDS.

With regards the proposed drainage strategy, we would be grateful if you could advise on the level of detail of information required in the supporting documents, for example the format of any drainage calculations and drawings (required scales etc).

Do not hesitate to contact me if you require any further information in order to process my request.

Kind Regards

Rob Hopkinson
Junior Civil Engineer

E: rhopkinson@merebrook.co.uk

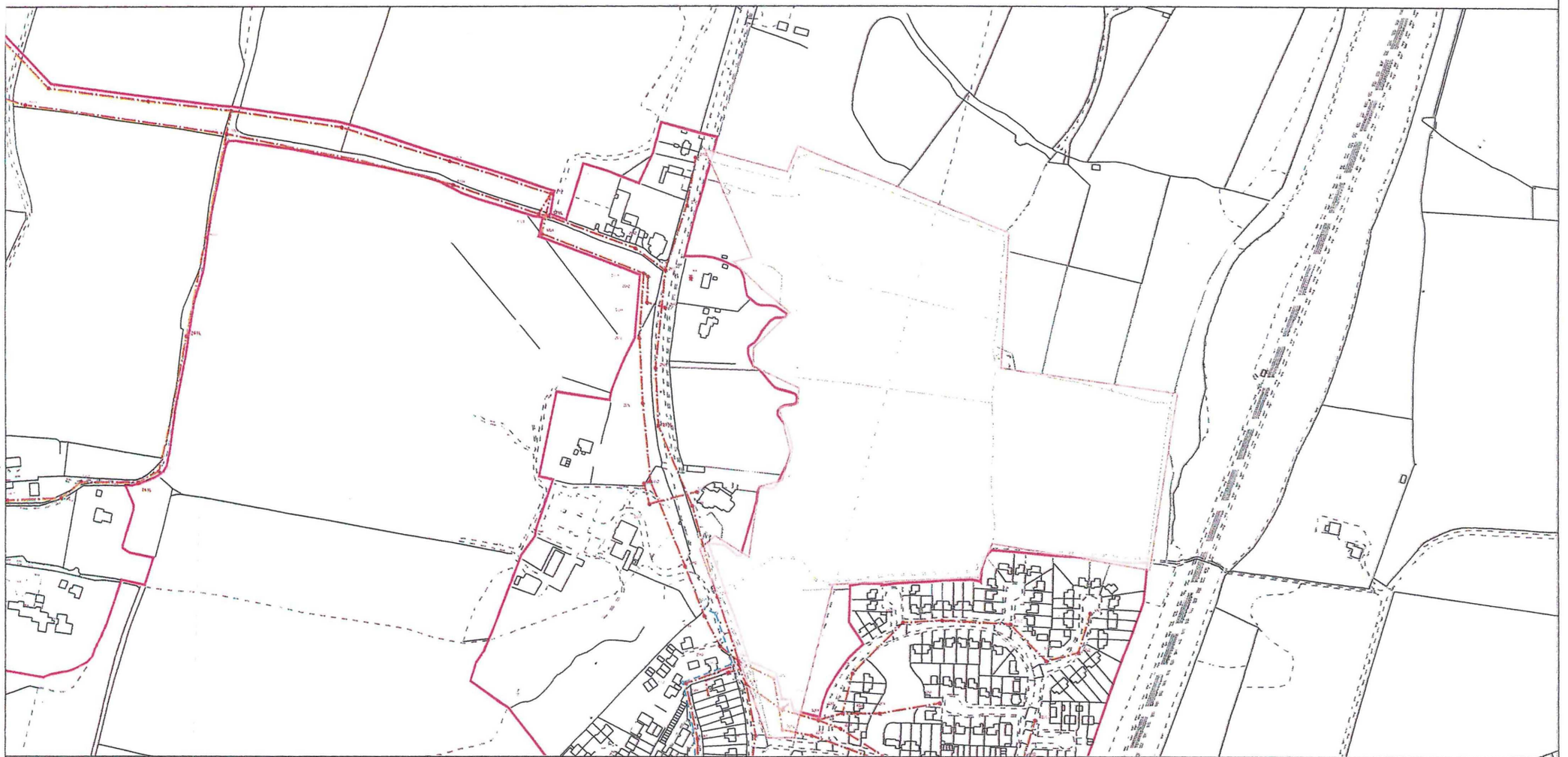
Idom Merebrook Ltd, East Mill, Bridgefoot, Belper, Derbyshire, DE56 2UA
t +44 (0)1773 829 988 f +44 (0)1773 829 393 e consulting@merebrook.co.uk
merebrook.co.uk idom.com

AN idom GROUP COMPANY

Work sustainably - Do you really need to print this e-mail?

APPENDIX 3 ▪ Sewer Records

SOUTHERN WATER



The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site.

Southern Water

O.S. REF: TQ3016NW	Scale: 1:5000	Printed By: AB	Date: 25-4-2014
Sewer Plot		Land on the East Side of London Road	
WARNING: BAC pipes are constructed of Bonded Asbestos Cement		Requested By:	

N

APPENDIX 4 ▪ MicroDrainage Outputs

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.500	Urban	0.000
SAAR (mm)	891	Region Number	Region 7

Results l/s

QBAR Rural	2.9
QBAR Urban	2.9
Q100 years	9.3
Q1 year	2.5
Q30 years	6.6
Q100 years	9.3

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	2.380	Urban	0.000
SAAR (mm)	891	Region Number	Region 7

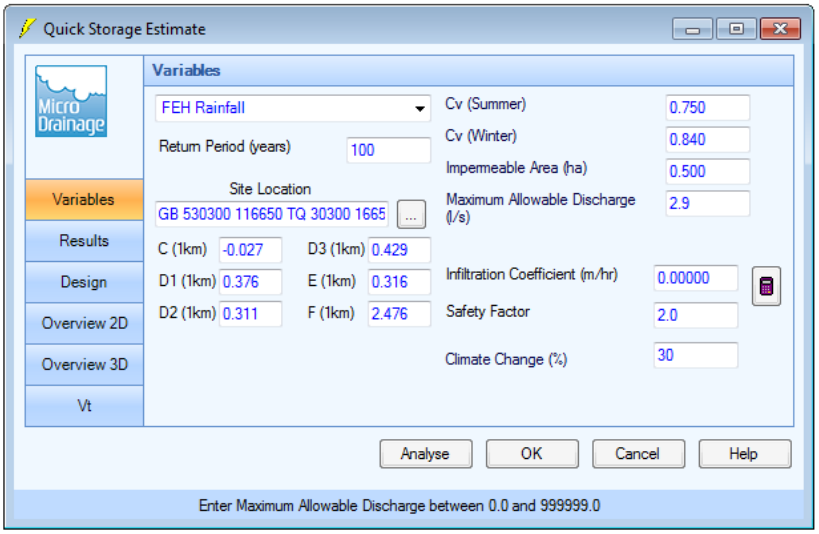
Results l/s

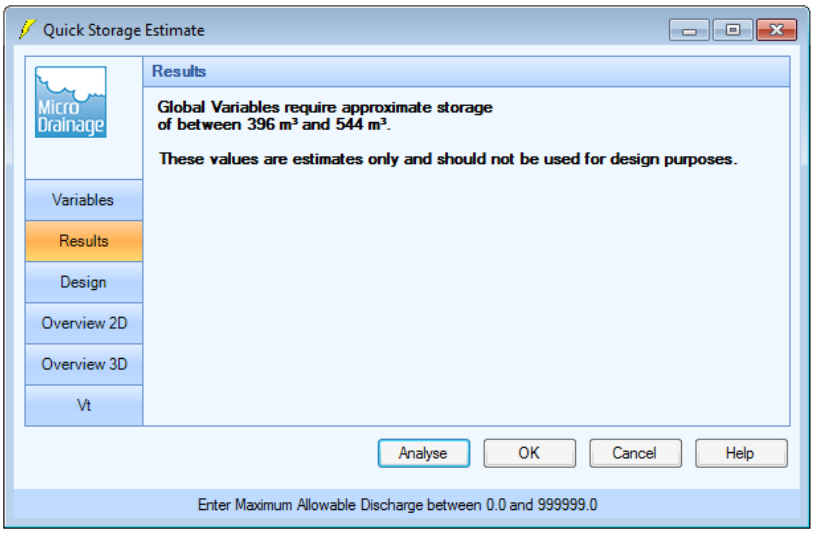
QBAR Rural	13.9
QBAR Urban	13.9
Q100 years	44.2
Q1 year	11.8
Q30 years	31.4
Q100 years	44.2

The Paddock, Hassocks

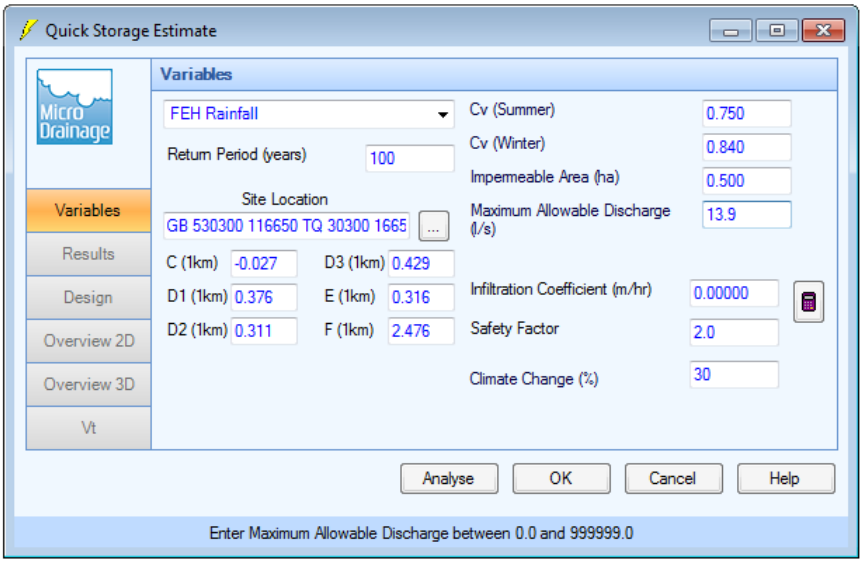
Quick Storage Estimate: 100 year+30%

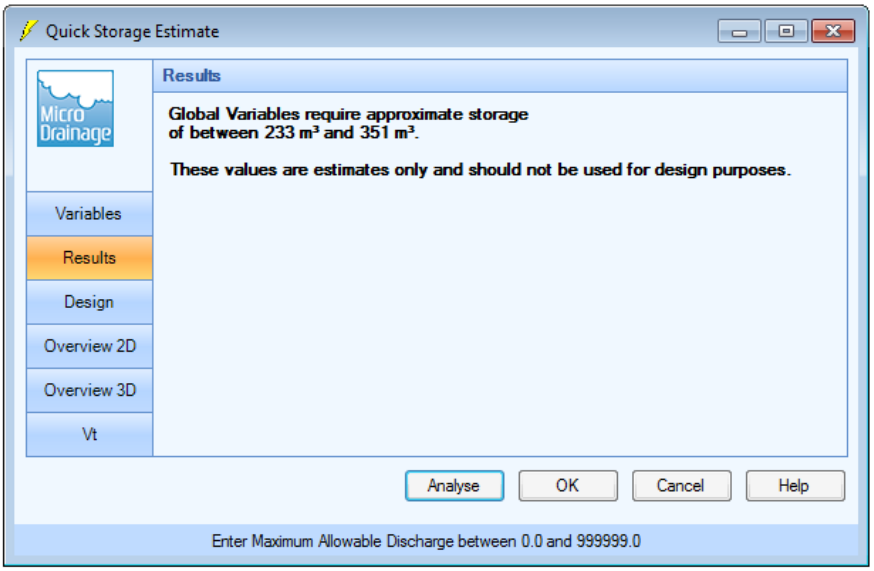
2.9 l/s Outfall



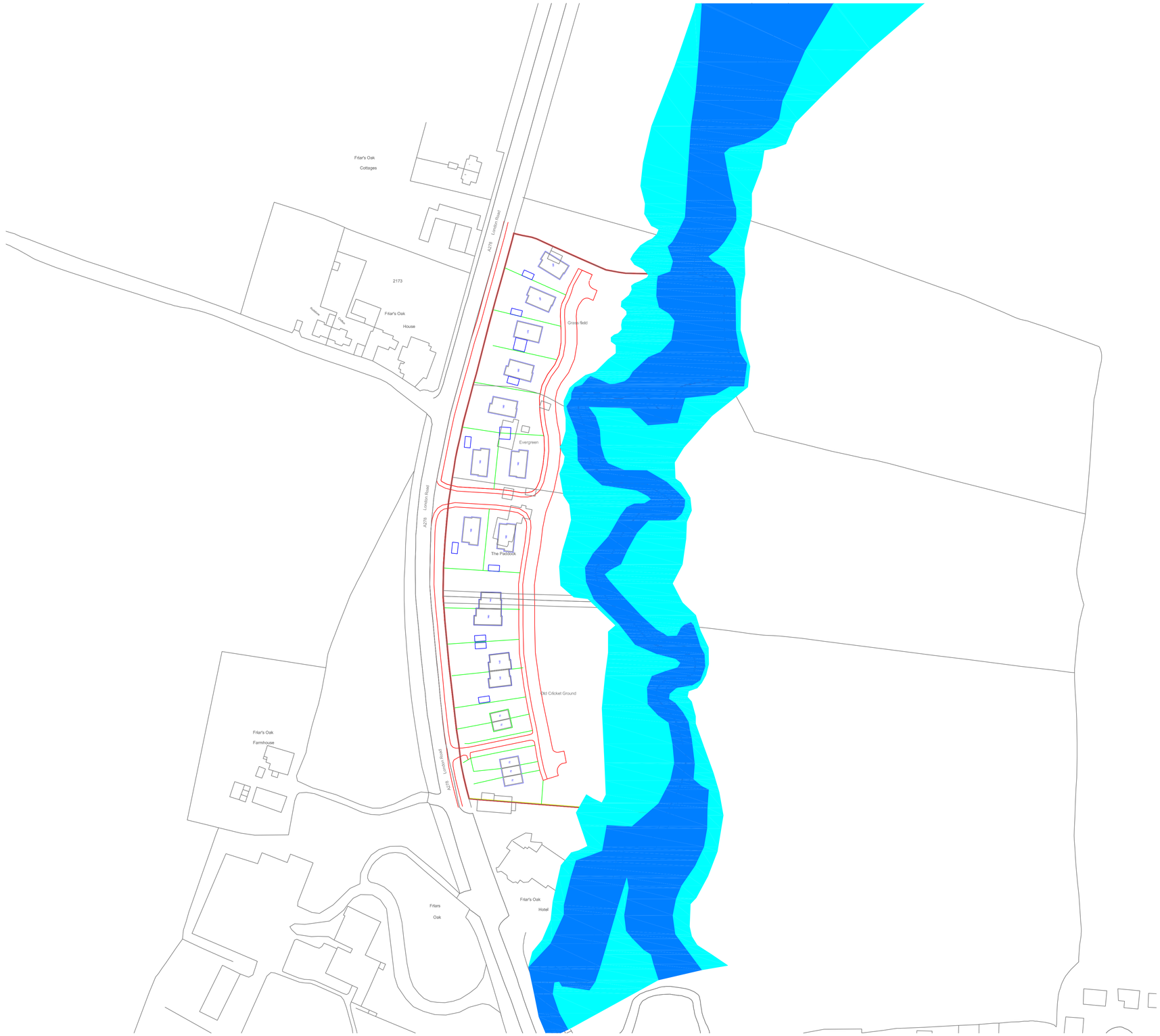


13.9 l/s outfall





APPENDIX 5 ▪ Proposed Layout Plan with Flood Zones 2 & 3



Legend

———	Indicative site boundary
GREY	Existing generally shown in GREY
BLACK	Proposed generally shown in BLACK
	Flood Zone 3: Envelope of an event with a 1% (in 100) or greater chance of happening each year
	Flood Zone 2: Envelope of a major flood, with up to a 0.1% (1 in 1000) chance of occurring each year.

Notes

1. The purpose of this drawing is to illustrate the proposed development in relation to the floodplain.
2. The information shown is schematic only.
3. The Flood Zone information has been digitised from the Environment Agency's floodplain maps. Minor discrepancies may therefore exist.

First Issue	18-04-2016		-
	PRD	KN	MB
Issue Details	Dwn	Chd	App'd

Client

Colin Brace
&
Harris Hassocks Limited

Project

Residential Development
The Paddocks
Hassocks, West Sussex

Dwg Title

General Arrangement

Topography & Floodplain

Job No.	Dwg No.	Revision
19978	300-001	-
Scale: 1:1000	Date: April 2016	Frame Dimensions mm: (A1) 791 x 544
Drawn: PRD	Checked: KN	Approved: MB

London
Kent
Derby
Cardiff
Manchester

idom merebrook

East Mill, Bridgefoot, Belper, Derbyshire, England. DE56 2UA
tel +44(0)1773 825988 fax +44(0)1773 829393 email info@merebrook.co.uk

THIS PAGE IS INTENTIONALLY LEFT BLANK

AN idom GROUP COMPANY

Idom Merebrook Ltd East Mill, Bridgefoot, Belper, Derbyshire, DE56 2UA
t +44 (0)1773 829 988 **f** +44 (0)1773 829 393 **e** consulting@merebrook.co.uk **merebrook.co.uk** **idom.com**
Registered in England No. 02740216 Registered office: Belper
offices London Kent Derby Cardiff Manchester Moray