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# LAND AT FOXHOLE FARM BOLNEY DRAINAGE STRATEGY

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Prepared by **David Major**  
Checked by **Anthony Guay**  
Approved by **Anthony Guay**  
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Ramboll  
Twenty3 Brunswick Place  
Southampton  
SO15 2AQ  
United Kingdom

T +44 23 8081 7500  
<https://uk.ramboll.com>

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Ramboll UK Limited  
Registered in England & Wales  
Company No: 03659970  
Registered office:  
240 Blackfriars Road  
London  
SE1 8NW

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## EXECUTIVE SUMMARY

Ramboll UK Limited ('Ramboll') has been commissioned by Wates Developments Limited (the 'Applicant') to develop both surface water and foul water drainage strategies for the Proposed Development at 'Land at Foxhole Farm Bolney'. The site is located at approximate coordinates 525911E, 122766N, at postcode RH17 5NB.

The Proposed Development is for an outline planning application (appearance, landscaping, layout and scale reserved), for the erection of up to 200 dwellings; a community building (use class F1) encompassing land for education provision, together with associated access, ancillary parking and landscaping; the creation of a vehicular access point from the A272 Cowfold Road, and pedestrian and cycle only access to The Street; and creation of a network of roads, footways, and cycleways through the site; together with the provision of countryside open space, children's play areas, community orchard, and allotments; sustainable drainage systems and landscape buffers.

The proposed surface water drainage strategy consists of a series of swales and surface water attenuation areas that have been strategically located across the site.

In the northern development parcel, a connecting network of swales, surface water attenuation areas, and gravity driven surface water sewers, have been strategically located within the development, to collect and subsequently direct surface water toward the west into an existing watercourse that is culverted beneath Foxhole Lane. Across the eastern part of the northern development area, the existing drainage that would otherwise flow toward The Street will be intercepted and captured and subsequently directed west by the proposed SuDS features. Surface water will ultimately be transported away from this location and released at a controlled rate toward the west. This represents a significant betterment to the present situation where the properties adjacent to The Street are vulnerable to surface water runoff from the site.

In the southern development parcel and across the central part of the site where the proposed access road is located, a separate network of swales, surface water attenuation areas, and gravity driven surface water sewers, have been strategically located within the development, to collect and subsequently direct surface water into the existing east to west ditch running adjacent to Cowfold Road in the south of the site. Across the eastern part of the central development area, where the proposed access road is proposed to connect the northern and southern developments, the existing drainage that would otherwise flow toward The Street will be intercepted and captured and subsequently directed west and then south by the proposed SuDS features. Surface water will ultimately be transported away from this location and released at a controlled rate toward the south. This represents a significant betterment to the present situation where the properties adjacent to The Street are vulnerable to surface water runoff from the site.

Discharge rates emanating from the proposed surface water attenuation features will be released at the mean annual flood return period which represents a considerable reduction in the peak flows presently emanating from the site during high return period flooding events. The strategy will therefore improve upon the current situation with regard to surface water management and flood risk.

The proposed foul strategy is for connection into the existing network in Cowfold Road to the south of the site. Southern Water have confirmed that there is adequate capacity in the local sewerage network to accommodate a foul flow of 1.8 L/s in this location.

The overall drainage strategy is presented in the Drainage Layout sketches in Appendix A at the rear of the report.

# 1. INTRODUCTION

## 1.1 Background

1.1.1 Ramboll UK Limited ('Ramboll') has been commissioned by Wates Developments Limited (Wates) to develop both surface water and foul water drainage strategies for the Proposed Development at 'Land at Foxhole Farm Bolney'. The site is located at approximate coordinates 525911E, 122766N, at postcode RH17 5NB.

1.1.2 The Proposed Development is for an outline planning application (appearance, landscaping, layout and scale reserved), for the erection of up to 200 dwellings; a community building (use class F1) encompassing land for education provision, together with associated access, ancillary parking and landscaping; the creation of a vehicular access point from the A272 Cowfold Road, and pedestrian and cycle only access to The Street; and creation of a network of roads, footways, and cycleways through the site; together with the provision of countryside open space, children's play areas, community orchard, and allotments; sustainable drainage systems and landscape buffers.

1.1.3 The Site Masterplan is presented in Appendix A at the rear of the report.

## 1.2 Scope of Works/Objectives

1.2.1 The aim of this report is to provide a detailed overview of the surface water and foul water drainage strategies for the Proposed Development. This includes the proposed management and disposal of surface water, and how calculated surface discharge rates are to be controlled and discharged. This report includes the following:

- Review of existing drainage conditions at the site;
- Review of site topography;
- Determination of existing surface water runoff rates at the site and required storage volumes;
- High level calculation of anticipated foul water generation from the Proposed Development;
- Review of existing sewer records for the site and its surrounds;
- Options appraisal of SuDS and their suitability for the Proposed Development; and
- Proposals for measures to mitigate the generation of surface water runoff from the Proposed Development.

### **1.3 Ramboll and Climate Change**

- 1.3.1 Ramboll UK Ltd is a Partner for Sustainable Change, and as such sustainability is central to our assessments and reporting. We have made specific considerations for climate change throughout this report, to ensure that our planning and design advice is supportive of an approach to ensure robust and sustainable societies.

### **1.4 Consultation**

- 1.4.1 As part of the Ramboll scope of works, a new connection enquiry was sent to Southern Water in September 2024. This has requested confirmation of a suitable location and rate for the connection of foul water emanating from the development. Southern Water have confirmed that there is adequate capacity in the local sewerage network to accommodate a foul flow of 1.8 L/s in this location.
- 1.4.2 A previous wastewater enquiry was issued in February 2024 with a similar proposal but for two separate discharges for the two different parcels of the development, with the Southern Parcel proposed to connect into the existing network on Cowfold Road, and the Northern Parcel proposed to connect into the existing network on The Street. This proposal was approved by Southern Water but was ultimately decided against following a meeting with Southern Water representatives who stated that due to the narrow corridor by which the proposed discharge to The Street was proposed to be routed, the proposed sewer would not be adoptable. The new connection enquiry proposes a single discharge point on Cowfold Road for the entire site.
- 1.4.3 Pre-application consultations with West Sussex County Council acting as the Lead Local Flood Authority (LLFA), were undertaken on 29/11/2024 and on 14/02/2025. The first dated to the 29/11/2024 was regarding a draft Flood Risk Assessment and Drainage Strategy submission. The overall strategy was positively received but further detail was requested by the LLFA. The second dated to the 14/02/2025 was regarding the updated Environment Agency surface water risk mapping, its implications on the surface water drainage strategy, and the proposed solutions. In response to the updated mapping, the new areas of risk were considered and the site layout was updated accordingly.

### **1.5 General Limitations and Reliance**

- 1.5.1 This report has been prepared by Ramboll exclusively for the intended use by the client in accordance with the agreement between Ramboll and the client defining, among others, the purpose, the scope and the terms and conditions for the services. No other warranty, expressed or implied, is made as to the professional advice included in this report or in respect of any matters outside the agreed scope of the services or the purpose for which the report and the associated agreed scope were intended, or any other services provided by Ramboll.
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- 1.5.3 Ramboll's services are not intended as legal advice, nor an exhaustive review of site conditions and/or compliance. This report and accompanying documents are intended solely for the use and benefit of the client for this purpose only and may not be used by or disclosed to, in whole or in part, any other person without the express written consent of Ramboll. Ramboll neither owes nor accepts any duty to any third party, unless formally agreed by Ramboll through that party entering into, at Ramboll's sole discretion, a written reliance agreement.
- 1.5.4 Unless otherwise stated in this report, the scope of services, assessment and conclusions made assume that the site will continue to be used for its proposed end-use without further significant changes onsite. Unless stated otherwise, the geological information provided is for general environmental interpretation and should not be used for geotechnical and/or design purposes.

## 2. SITE DETAILS

### 2.1 Site Location and Surroundings

2.1.1 The site is located at Foxhole Farm, Bolney, on land immediately east of Foxhole Lane. The site is centred at approximately 525911E, 122766N, at an approximate postcode of RH17 5NB. The site will be developed in two parcels, with the southern development designated as the Southern Parcel and the northern development designated as the Northern Parcel. The Northern Parcel is the smaller of the two developments with approximately 92 dwellings and a community facility proposed. The Southern Parcel proposes approximately 108 dwellings. The total site area measures 16.89 ha. The proposed site access will be from Cowfold Road to the south of the site and will lead into the proposed Southern Parcel.

2.1.2 Adjacent and surrounding land uses to the site area are as follows:

- North: Existing wooded areas, green space, and some housing. Lodge Lane is located approximately 250 m from the site;
- East: The Street and adjacent housing. The A23 is located approximately 360 m from the site;
- South: A272 Cowfold Road and adjacent housing/green space; and
- West: Foxhole Lane and adjacent green space/agricultural land. The Bolney Wine Estate is located approximately 120 m from the site.

2.1.3 The village of Bolney is located immediately east/northeast of the site. The closest town is Haywards Heath, located approximately 6 km east of the site.

2.1.4 The Site Location Plan is presented in Figure 2.1 at the rear of the report.

### 2.2 Site Topography

2.2.1 A site topographical survey<sup>1</sup> was previously undertaken at the site. A description of the topography is summarised as follows:

#### Southern Parcel

2.2.2 Levels in the southern development are shown to fall from north to south. The survey indicates that levels at the northern end of the Proposed Development area are between approximately 34.3 and 35 m Above Ordnance Datum (AOD) at their highest, falling to approximately 22.2 m AOD at the southern end of the site, adjacent to the Cowfold Road (A272).

<sup>1</sup> CD Surveys Ltd, Topographical Survey, Foxhole Farm, Bolney, Haywards Heath, WD/2309028/1, December 2023.

### Northern Parcel

2.2.3 Levels in the northern development are indicated to fall from a high of approximately 42 m AOD in the southeast of the Proposed Development area, to approximately 30.1 m AOD in the west. Levels are additionally shown to fall toward the north and east. Furthermore, levels are shown to fall from a high of approximately 37 m AOD in the north of the Proposed Development area toward the south, east and west. Together, these two high points are shown to connect to form a watershed running approximately north to south in the eastern half of the Proposed Development area, with land falling away more steeply toward both the east and west. The low point in the east of the site is recorded at approximately 34.2 m AOD.

### Central Areas

2.2.4 Central areas of the site are typically shown to fall from west to east and north to south, with the highest level at the site (approximately 43 m AOD) located approximately 25 m south of the proposed northern development area.

2.2.5 Dividing the Central Areas into their eastern and western sections, in the east the survey shows how the land falls from a high of approximately 43 m AOD in the northwest to a low of approximately 31.8 m AOD in the southeast. In the west the survey shows how the land falls from a high of between approximately 39.1 and 40.1 m AOD to the levels shown at the northern end of the Proposed Development area for the Southern Parcel (i.e., between approximately 34.3 and 35 m AOD).

### Summary and Surrounding Area

2.2.6 The site topographical survey is presented in Appendix B at the rear of the report.

2.2.7 A site visit was undertaken in February 2024 by representatives from both Ramboll and Wates. The topography was observed to be in line with that shown by the topographical survey. A series of photographs taken while onsite are presented in Appendix C at the rear of the report.

2.2.8 Light Detection and Ranging (LiDAR) data<sup>2</sup>, acquired from the Environment Agency (EA), is shown to broadly agree with the findings of both the topographical survey and the site visit. Outside the site boundary, the topography is as follows:

<sup>2</sup> Department for Environment Food & Rural Affairs, Data Services Platform, LiDAR Composite Digital Terrain Model (DTM) – 1m [online]. Available at: <https://environment.data.gov.uk/dataset/13787b9a-26a4-4775-8523-806d13af58fc>. Accessed September 2024.

- North: Land is shown to rise more steeply with levels of approximately 50 m AOD shown to be present approximately 160 m from the site;
- East: Land is shown to rise to a high of approximately 43 m AOD before falling away again toward the A23;
- South: Land is shown to typically be lower than the site and to fall away toward local watercourses; and
- West: Land is shown to fall away toward local watercourses.

2.2.9 LiDAR Topography is presented in Figure 2.2 at the rear of the report.

## 2.3 Hydrological Setting

2.3.1 A review of the EA Statutory Main River Map<sup>3</sup> indicates there are no EA Main Rivers located within the boundary of the site. Ordnance Survey (OS) mapping<sup>4</sup> does suggest the presence of an ordinary watercourse in the northwest corner of the site, located adjacent to the western site boundary, which it indicates is directed into a culvert beneath Foxhole Lane and subsequently into another watercourse flowing away from the site toward the west. This latter watercourse is shown in the mapping to flow into the Rout Gill approximately 260 m west of the site. The Rout Gill (another ordinary watercourse) is shown to be flowing approximately north to south and joins the Holmbush Gill/River Adur (EA Main River) approximately 1.8 km to the south of the site. The Holmbush Gill/River Adur is the closest EA Main River to the site.

2.3.2 Furthermore, there is an extensive network of ponds, streams and larger watercourses draining the surrounding area. These are typically shown to be draining toward the Rout Gill either to the west or to the south of the site. In addition, the OS mapping indicates a watercourse is present approximately 70 m south of the site on the south side of Cowfold Road.

2.3.3 The Hydrological Setting is presented in Figure 2.3 at the rear of the report.

### February 2024 Site Visit – Observations

2.3.4 During the site visit a culvert was observed taking flow from the northwest of the site beneath Foxhole Lane and into the subsequent watercourse flowing toward the west (as identified from OS mapping). A discernible watercourse in the northwest of the site, located adjacent to the western site boundary, was not identified. However, pooling was identified in the area prior to delivery into the culvert.

2.3.5 In the northeast of the site, saturated ground and standing water was observed in low lying areas. A watercourse (not identified in OS mapping) was also observed immediately to the northeast of the site flowing from north to south, with another branch flowing from west to east running parallel to the northern boundary of the site.

<sup>3</sup> Department for Environment Food & Rural Affairs, Data Services Platform, Statutory Main River Map [online]. Available at: <https://environment.data.gov.uk/dataset/25dde009-ba7d-40de-8380-c5c3bb32ccdc>. Accessed September 2024.

<sup>4</sup> Ordnance Survey, Data Hub, OS OpenMap – Local [online]. Available at: <https://osdatahub.os.uk/downloads/open/OpenMapLocal>. Accessed September 2024.

- 2.3.6 In the southern development area, two ditches were observed to be oriented in an east to west alignment, one adjacent to the southern boundary and Cowfold Road, and another approximately halfway up the Proposed Development area. The latter ditch was observed to be flowing from west to east. The former ditch was observed to be collecting flows from the site which were ultimately directed toward a manhole in the central area of the ditch. Further ditches were observed along the western and eastern boundaries of the proposed southern development area, with the eastern ditch partially culverted. Both were draining north to south.
- 2.3.7 A confluence of ditches was observed outside the southwest corner of the site on the west side of the entrance to Foxhole Lane. The ditch in the field to the west of the site was shown to be flowing from west to east. Observations made during a subsequent site visit in March 2025 revealed a culvert and headwall in this location on the west side of the entrance to Foxhole Lane that appeared to be directing flows into the main sewer network in Cowfold Road.
- 2.3.8 A number of manholes and surface water drains were observed along Cowfold Road as well as an open watercourse approximately 70 m south of the site (previously identified in OS mapping), flowing from north to south.

## 2.4 Geological and Hydrogeological Setting

- 2.4.1 Geology and ground conditions at the site were investigated by Geo-Environmental<sup>5</sup> in November 2023. A generalised summary of the ground conditions encountered at the site is presented in Table 2.1.

**Table 2.1: Summary of Ground Conditions**

Top (m BGL)	Base (m BGL)	Generalised Geology	Locations
0.00	0.30-0.41	<b>TOPSOIL:</b> Brown slightly silty clay with rootlets. Gravelly silty clay encountered within WS18 (southern development) only.	ALL
0.30-0.41	1.40-4.45	<b>UPPER TUNBRIDGE WELLS SAND FORMATION:</b> Soft to very stiff sandy CLAY and slightly gravelly sandy CLAY. Gravels are of fine to coarse, sub-angular of flint, sandstone and mudstone.	ALL
0.95-3.05	1.40-3.10	<b>UPPER TUNBRIDGE WELLS SAND FORMATION:</b> Orange brown gravelly SAND, very clayey SAND and SAND.	WS12 (central area), WS18

- 2.4.2 Groundwater monitoring investigations<sup>6</sup> undertaken between November 2023 and April 2024 across the site indicate a site-wide groundwater level typically shallower than 2 m Below Ground Level (BGL). In many areas of the site the level is shallower than 1 m BGL.

<sup>5</sup> Geo-Environmental, Land at Foxhole Farm, Bolney, West Sussex, RH17 5NB – Preliminary Report, GE22035/AP01/231115.

<sup>6</sup> Geo-Environmental, Land at Foxhole Farm, Bolney, West Sussex, RH17 5NB – Ground Gas Assessment & Winter Groundwater Monitoring, GE22035 – LRv1AP240501.

- 2.4.3 According to the Cranfield University LandIS soils map<sup>7</sup>, the soil at the site is described as 'slightly acid loamy and clayey soils with impeded drainage'.
- 2.4.4 According to British Geological Survey (BGS) GeoIndex Onshore data<sup>8</sup>, the underlying rock unit beneath the site is defined as a moderately productive aquifer and is summarised as sandstones of the Ashdown Formation yielding up to 60 L/s and Tunbridge Wells Sand yielding up to 10 L/s; separated by Wadhurst Clay.
- 2.4.5 According to the BGS Geology Viewer<sup>9</sup>, the underlying geology beneath the site is divided between the Weald Clay Formation, described as mudstone, in the northern development area, and the Upper Tunbridge Wells Sand, described as sandstone and siltstone, across the rest of the site. No superficial geology layers are recorded. It is noted that the November 2023 site investigations<sup>5</sup> found the Upper Tunbridge Wells Formation across the entire site, including in the north where Weald Clay was anticipated.

## 2.5 Existing Drainage

- 2.5.1 At present, the site is comprised of undeveloped, greenfield land with no impermeable surfaces and therefore no areas which are positively drained (i.e., by conventional underground pipes, gullies, manholes etc.).

### Surface Water

- 2.5.2 According to the LandIS soils map<sup>7</sup>, the site is stated to drain to the 'stream network'. This statement is backed up by observations made during the site visit undertaken in February 2024, where saturated ground and pooling of water were observed in many places across the site, as well as the drainage of surface water to existing watercourses both on and offsite.
- 2.5.3 During the February 2024 site visit, surface water drainage was identified in Cowfold Road to the south of the site. Formal drainage features were observed adjacent to the road as well as another watercourse approximately 70 m to the south of the site which was observed to be taking surface water drainage from Cowfold Road and the site and directing it south.
- 2.5.4 In the northwest of the site, surface water was observed to drain toward an existing culvert which directed flows beneath Foxhole Lane and into an existing watercourse to the west of the site.
- 2.5.5 Saturated ground and pooling were observed across the east of the site where the terrain was observed to slope down toward the east.

<sup>7</sup> LandIS, Soilscales Viewer [online]. Available at: <https://www.landis.org.uk/soilscales/>. Accessed September 2024.

<sup>8</sup> BGS British Geological Survey, GeoIndex Onshore [online]. Available at: <https://mapapps2.bgs.ac.uk/geoindex/home.html>. Accessed September 2024.

<sup>9</sup> BGS Geology Viewer [online]. Available at: <https://geologyviewer.bgs.ac.uk>. Accessed September 2024.

- 2.5.6 In the south of the site, water was observed to be directed toward an existing ditch oriented approximately east to west adjacent to the southern boundary of the site, via a network of existing ditches to the north, east and west. Water was observed in a similarly oriented east to west ditch located approximately halfway up the southern development area as well as in separate ditches running from north to south along both the eastern and western site boundaries in this part of the site.
- 2.5.7 Observations made onsite suggested that water collecting in the ditch at the southern boundary was directed into the existing surface water network in Cowfold Road.

#### Foul Water

- 2.5.8 Southern Water sewer records are presented in Appendix D at the rear of the report. They show the presence of existing wastewater sewer networks in both The Street to the east of the site and in Cowfold Road to the south. To the south of the site where the proposed foul discharge from the site is intended, the sewer is sized at a 225 mm diameter. Observations made while onsite, combined with a detailed review of the Southern Water sewer records, indicate that these wastewater sewers are in reality combined sewers. While they are identified as wastewater sewers on the sewer records presented in Appendix D, no separate surface water sewers are marked on the sewer records. Furthermore, a separate overflow 'wastewater' sewer is observed on the sewer records adjacent to The Street measuring approximately 1,200 mm in diameter. A sewer this size is considered to far exceed the typical diameter required for foul sewers. Furthermore, road gullies were observed on both The Street to the east of the site and along Cowfold Road to the south with little other route for discharge other than to the foul/combined sewer.
- 2.5.9 The wastewater (combined) sewer network running south and southwest from The Street is shown on the sewer records to be disconnected from the sewer network running approximately east to west adjacent to the southern boundary of the site and Cowfold Road.
- 2.5.10 While onsite in February 2024, a foul pumping station was observed approximately 460 m south of the site and was considered to be the destination of the wastewater (combined) sewer network observed in the Southern Water sewer records.

## **2.6 Surface Water and Sewer Flood Risk**

- 2.6.1 The topography of the site and the surrounding area is detailed in Section 2.2 and states how levels at the site are shown to fall away to the east, south and west from higher areas in the north and centre of the site. It also describes how higher levels are present to the north and east of the site.

2.6.2 The EA long term flood risk mapping<sup>10</sup> presents two scenarios for the yearly chance of flooding from surface water. The first is a present-day scenario and the second is a future scenario that presents a yearly chance of flooding between 2040 and 2060, the same as the present-day scenario but with an additional allowance for the impacts of climate change. According to the mapping under both scenarios, approximately 90% of the site is located in areas considered to be at a less than 0.1% risk from surface water flooding in any given year. Areas at High risk are present in the northeast and northwest of the site, as well as adjacent to the southern boundary, and are surrounded by areas at Medium and Low risk. Further areas of High, Medium and Low risk are present in the central part of the southern development area. The different surface water risk categories are defined below:

- High Chance – Greater than a 1 in 30 (3.3%) annual probability;
- Medium Chance – Between a 1 in 30 and 1 in 100 (3.3% to 1%) annual probability; and
- Low Chance – Between a 1 in 100 and a 1 in 1,000 (1% to 0.1%) annual probability.

2.6.3 Surface water flood risk under the future scenario is presented in Figure 2.4.



**Figure 2.4: EA Surface Water Flood Risk Future Scenario**

<sup>10</sup> GOV.UK, Check the long term flood risk for an area in England [online]. Available at: <https://www.gov.uk/check-long-term-flood-risk>. Accessed April 2025.

- 2.6.4 It is noted that the EA mapping<sup>10</sup> indicates areas at risk of flooding from surface water in addition to flood risk from rivers or the sea. It does not however account for building removal, ground raising, or site levelling. In addition, it does not consider specific drainage assets such as sewers, drains or ditches when calculating extents.
- 2.6.5 The EA state that the mapping may help to inform risk assessments<sup>11</sup>. However, it is further stated that further assessment is likely to be needed to assess planned development.
- 2.6.6 Whilst the surface water mapping indicates where there could be heightened surface water flood risks in some surrounding areas, this does not account for public surface water drainage measures which would be expected to significantly reduce surface water flood risks from that assumed and presented by the mapping.
- 2.6.7 The EA state that the Risk of Flooding from Surface Water map is an assessment of where surface water flooding may occur when rainwater does not drain away through the normal drainage systems or soak into the ground but lies on or flows over the ground instead<sup>12</sup>. It is further stated that it includes information about flooding extents and depths and that it is produced using national scale modelling and enhanced with compatible, locally produced modelling from lead local flood authorities.
- 2.6.8 The EA state that the mapping<sup>10</sup> may help to inform risk assessments<sup>13</sup>. However, it is additionally stated that further assessment is likely to be needed to assess planned development.
- 2.6.9 EA Surface Water Flood Risk is additionally presented in Figures 2.5 and 2.6 at the rear of the report.
- 2.6.10 No potential overland flow paths are shown in the mapping<sup>10</sup> to be leading onto the site. The mapping does however indicate the presence of potential surface water flow paths to the west and south of the site, that could potentially be exacerbated by the Proposed Development. Existing potential flow paths are apparent along the tributary watercourse of the Rout Gill taking flows from the northwest of the site, along parts of The Street to the east of the site, along parts of Cowfold Road to the south of the site, and along the existing watercourse located approximately 70 m south of the site that is assumed to be taking surface water drainage from Cowfold Road.

<sup>11</sup> GOV.UK, Check your long term flood risk, Are you looking for information to support a planning application? [online]. Available at: <https://check-long-term-flood-risk.service.gov.uk/information-for-planning>. Accessed March 2025.

<sup>12</sup> Department for Environment Food & Rural Affairs, Data Services Platform [online]. Available at: <https://environment.data.gov.uk/dataset/b5aaa28d-6eb9-460e-8d6f-43caa71f8e0e>. Accessed April 2025.

<sup>13</sup> GOV.UK, Check your long term flood risk, Are you looking for information to support a planning application? [online]. Available at: <https://check-long-term-flood-risk.service.gov.uk/information-for-planning>. Accessed March 2025.

- 2.6.11 It is noted that the proposed surface water drainage strategy, as visualised in the Drainage Layout sketches presented in Appendix A at the rear of the report, has been designed and sized to accommodate the expected runoff from the site with a suitable allowance included for the potential impacts of climate change and urban creep. Surface water from the site will be released at separate locations along the western and southern site boundaries and will be released at low return period runoff rates.
- 2.6.12 In the east of the site where the land is shown to slope down toward The Street, the proposed surface water drainage strategy captures and diverts surface water away from The Street and provides significant betterment to the present situation. This is detailed in Section 5.
- 2.6.13 Sewer assets previously identified in Section 2.5 have the potential to surcharge and overflow should the site drainage strategy not be suitably designed to accommodate the additional flows expected from the Proposed Development. In the event of sewer overflow the excess water would be expected to flow downslope and would likely remain broadly in line with the potential overland flow paths described above. As such, sewer flooding leading onto the site is not expected to be an issue.

## 3. SURFACE WATER DRAINAGE STRATEGY

### 3.1 Overview

- 3.1.1 The following section sets out a high-level strategy for the management of surface water emanating from the new development. The strategy has been developed through use of the sustainable drainage guidance for the South East of England<sup>14</sup>, along with the National Statutory guidance outlined in the Non-Statutory Technical Standards for Sustainable Drainage Systems<sup>15</sup>.
- 3.1.2 The Drainage Layout sketches as presented in Appendix A at the rear of the report should be read in conjunction with Section 3.

### 3.2 Disposal of Surface Water

- 3.2.1 Part H of the Building Regulations<sup>16</sup> establishes a hierarchy for surface water disposal, which encourages a SuDS approach. The hierarchy is that surface runoff must be discharged to one or more of the following in the following order of priority:
1. To ground via an adequate soakaway or some other adequate infiltration system; or where that is not reasonably practicable,
  2. To a watercourse; or where that is not reasonably practicable,
  3. To a sewer.
- 3.2.2 A review of the existing drainage, hydrology, and underlying ground conditions at the site (as described in Section 2), indicates that permeability is likely to be low across the site, and as such infiltration is unlikely to be a feasible option for the disposal of surface water.
- 3.2.3 On the assumption that infiltration is not a viable option, the most convenient points of connection for surface water would be as follows:
- Southern Parcel – Connection into the existing ditch oriented approximately east to west and located adjacent to Cowfold Road and the southern boundary of the site, with subsequent discharge into the existing sewer network in Cowfold Road;
  - Northern Parcel – Connection into the existing culvert (and subsequent watercourse) beneath Foxhole Lane to the west of the Proposed Development area.

<sup>14</sup> AECOM, Water. People. Places. A guide for master planning sustainable drainage into developments. Prepared by the Lead Local Flood Authorities of the South East of England [online]. Available at: [https://www.westsussex.gov.uk/media/2270/suds\\_design\\_guidance.pdf](https://www.westsussex.gov.uk/media/2270/suds_design_guidance.pdf). Accessed September 2024.

<sup>15</sup> Department for Environment, Food and Rural Affairs [online]. Available at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/415773/sustainable-drainage-technical-standards.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf). Accessed September 2024.

<sup>16</sup> GOV.UK, Statutory guidance, Drainage and waste disposal: Approved Document H, 2010 [online]. Available at: <https://www.gov.uk/government/publications/drainage-and-waste-disposal-approved-document-h#:~:text=The%20current%20edition%20covers%20details%20of.> Accessed September 2024.

- 3.2.4 As per the pre-application consultations noted in Section 1.4.3, the LLFA have agreed in principle to the discharge points noted above.

### 3.3 Runoff Rates and Storage

- 3.3.1 The site is entirely greenfield in its current state, and as such runoff from the site post-development will need to be controlled to the equivalent low return period greenfield rate as agreed with WSCC acting as the LLFA. Surface water storage, attenuation and flow control will need to be of sufficient design and capacity to ensure the 1 in 100 year plus 45% climate change event can be attenuated within the site, restricting onward flow to the mean annual flood return period, considered a 1 in 2.33 year event.
- 3.3.2 Greenfield runoff rates for the site and required storage volumes have been determined and are recorded below:
- Southern Parcel (Southern and Central development areas) – Outfall into existing watercourse restricted to FEH greenfield rate at flow restriction of 46.3 L/s. Total storage volume within all areas of swales, attenuation basins, and permeable paving is 4,456 m<sup>3</sup>.
  - Northern Parcel (Northern development area) – Outfall into existing watercourse restricted to FEH greenfield rate at flow restriction of 44.2 L/s. Total storage volume within all areas of swales, attenuation basins, and permeable paving is 4,184 m<sup>3</sup>.
- 3.3.3 The arrangement of all proposed storage is indicated on the Drainage Layout sketches as presented in Appendix A at the rear of the report. Relevant calculation sheets are additionally presented in Appendix A at the rear of the report.

### 3.4 SuDS Options

- 3.4.1 Table 3.1 provides an overview of potentially suitable SuDS options available for attenuating surface water runoff.
- 3.4.2 In the Drainage Layout sketches as presented in Appendix A at the rear of the report, the larger attenuation basin areas proposed at the site, at detailed design, could alternatively form balancing ponds, detention basins or wetlands, depending on which is most appropriate to each individual location. In addition, permeable paving is proposed to form part of the surface water storage strategy. The extent to which this is presently proposed to cover the site could increase where required at detailed design. Where permeable paving is indicated on the Drainage Layout sketches is where it is required for surface water storage. For the purposes of surface water treatment this could be extended to other internal roads and driveways.

**Table 3.1: Sustainable Drainage Options**

SUDS Group	Technique	Image	Description	Advantages	Disadvantages	Suitable for Use at Site?
Retention	Balancing pond		Provides both storm water attenuation and treatment. Runoff from each rain event is detained and treated in the pool. The retention time promotes pollutant removal through sedimentation.	Good removal of pollutants, can be used where groundwater is vulnerable, good community acceptability, high ecological, and amenity benefits.	No reduction in runoff volume, land take may limit use in high density sites.	✓ Potential for inclusion in lower-lying areas before discharge from the site.
	Sub-surface storage		Oversized pipes, tank systems and modular geocellular systems that can be used to create a below ground storage structure.	Modular and flexible, dual usage (infiltration/storage, high void ratios), can be installed beneath trafficked and soft landscaped areas.	No water quality treatment.	✗ Better options available considering nature and character of the development.
Wetland	Shallow wetland		Wetlands provide stormwater attenuation and treatment. They comprise shallow ponds and marshy areas, covered in aquatic vegetation. Wetlands detain flows for an extended period to allow sediments to settle and to remove contaminants. They can provide significant ecological benefits.	Good pollutant removal and if lined can be used where groundwater is vulnerable. Good community acceptability, ecological and amenity benefits.	Land take is high, requires baseflow, little reduction in runoff volume, not suitable for steep sites.	✓ Potential for inclusion in lower-lying areas before discharge from the site. Impermeable ground would be well suited to wetlands.
	Extended detention wetland					
	Pond wetland					
	Pocket wetland					
	Submerged gravel wetland					
	Wetland channel					

SUDS Group	Technique	Image	Description	Advantages	Disadvantages	Suitable for Use at Site?
Infiltration	Infiltration trench		Surface water runoff can be discharged directly to ground for infiltration by soakaways, basins, or trenches. A prerequisite is that both groundwater and ground conditions are appropriate to receive the quality and quantity of water generated.	Reduces the volume of runoff, effective at pollutant removal, contributes to groundwater recharge, simple and cost-effective, easy performance observation.	Requires appropriate pre-treatment, basins require a large flat area, offset from foundations.	<p style="text-align: center;">✘</p> <p>Not considered viable due to nature of underlying ground.</p>
	Infiltration basin					
	Soakaway					
	Porous paving		Block or porous paving allows runoff to infiltrate through to sub-base layer. Water can then be infiltrated into ground or conveyed into storage or drainage systems.	Reduces the volume of runoff and if designed for infiltration contributes towards groundwater recharge. Easy to install and retrofit. Simple to manage. If lined can be used where groundwater is sensitive.	Not suitable for heavily trafficked areas or adoptable roads. Requires regular sweeping to prevent clogging with dirt.	<p style="text-align: center;">✔</p> <p>Could be incorporated in all parking areas and access roads where appropriate.</p>
Permeable paving						
Filtration	Surface sand filter		Structures designed to treat surface water runoff through filtration using a sand bed filter medium. The filters can be designed with or without infiltration. Temporary storage of runoff is achieved through ponding above the filter layer. They are used where particularly high pollutant removal is required.	Flexibility of design, efficient in removing pollutants, suitable for retrofits and in tightly constrained urban locations.	Not for high sediment content, detention times can support algae growth, minimum hydraulic head of 1.2 m required, possible odour problems, high capital and maintenance cost.	<p style="text-align: center;">✘</p> <p>Unlikely to be viable due to impermeable nature of the site.</p>
	Sub-surface sand filter					
	Perimeter sand filter					
	Bioretention/filter swale		Vegetated strips of land designed to accept runoff as overland sheet flow between a hard-surfaced area and a receiving system.	Landscaping features, effective in removing pollutants, flexible layout to fit into landscape, suited for highly impervious areas, good retrofit capability, effective pre-treatment option.	Requires landscaping and management, large land requirement, not suitable for steep sites; no significant attenuation or reduction of flows.	<p style="text-align: center;">✔</p> <p>Could be used alongside highway areas for treatment of highway runoff.</p>

SUDS Group	Technique	Image	Description	Advantages	Disadvantages	Suitable for Use at Site?
	Filter trench/drain		Shallow excavations filled with rubble or stone that create temporary subsurface storage for filtration of storm water runoff. Receive lateral inflow from an adjacent impermeable surface.	Hydraulic benefits achieved with filter trenches, trenches can be incorporated into site landscaping and fit well beside roads and car parks.	High clogging potential without effective pre-treatment, limited to small catchments, high cost of replacing filter material.	✗ Better options available considering nature and character of the development.
Detention	Detention basin		Surface storage basins that provide flow control through attenuation. Normally dry and in certain situations the land may also function as a recreational facility.	Cater for a wide range of rainfall events, can be used where groundwater is vulnerable, potential for dual land use, easy to maintain.	Land take, little reduction in runoff volume, detention depths constrained by levels.	✓ Potential for inclusion in lower-lying areas before discharge from the site.
	Enhanced dry swale		Swales are linear vegetated drainage features in which surface water can be stored or conveyed. They can be designed to allow infiltration, where appropriate.	Incorporate into landscaping, good removal of pollutants, reduces runoff rates and volumes, low cost.	Not suitable for steep areas, significant land take, not suitable in areas with roadside parking.	✓ Should be used to form the spine of the blue-green network.
	Enhanced wet swale					
Conveyance	Conveyance swales		Formal linear drainage features in which surface water can be stored or conveyed. They can be incorporated with water features such as ponds or waterfalls where appropriate.	Negate the need for underground pipework. Can provide some attenuation. Possible reduction in runoff volume via plant uptake and infiltration.	Potential trip/wheel hazard, disabled access issues.	✗ Better options available considering nature and character of the development.
	Rills					
Source control	Green/blue roof		Multi-layered system that covers the roof of a building with vegetation cover/landscaping over a drainage layer. Designed to intercept and retain precipitation, reducing the volume of runoff and attenuating peak flows.	Mimics greenfield state of building footprint for high density developments, good removal of pollutants, ecological benefits, insulates buildings, sound absorption.	Additional weight, not appropriate for steep roofs, maintenance of roof vegetation.	✗ Not suitable for private dwellings.

### 3.5 Preferred SuDS Options

- 3.5.1 Table 3.1 outlines briefly the suitability of each of the SuDS options in consideration of the site conditions. The following section provides more detail on the preferred SuDS options, and how these will combine to form the overall strategy for managing surface water.
- 3.5.2 SuDS are a suitable option for the site, due to the relatively low density of housing proposed, the large amount of amenity and open-space (which is highly suitable for 'doubling up' as SuDS storage), and the good drainage falls across both development areas.
- 3.5.3 The most value can be added by SuDS through adoption of a hierarchical model, whereby measures are incorporated at each level of the development, forming a tiered approach to managing surface water. Table 3.2 below summarises how this approach could work at the site.

**Table 3.2: Proposed SuDS Hierarchy**

Hierarchy	Measures	Flow Control Detail	Design Considerations
<b>Street Level</b>	Permeable paving for driveways.	Check dams, small diameter pipes, low gradients, flow baffles.	Parking areas and driveways are particularly suitable for permeable paving.
	Permeable tarmac for internal roads.	Hydrobrakes should be avoided for street level flow control.	Rain gardens can be easily incorporated into grass verges and provide enhancement to green open space.
	Rain Gardens, each serving 2-6 properties as a destination for roof water.		
<b>Neighbourhood Level</b>	Swales to form the basis of connectivity for blue-green corridors.	Flow to be controlled through a system of regular check dams, orifices, natural weirs/informal overflows, and engineered levels.	Swales would be especially suitable for the controlled transmission of surface water through the site.  Drop kerbs can be used to facilitate movement of surface water off highway areas towards SuDS/green infrastructure.
	Small storage ponds.	Formal/engineered flow control should be avoided at this stage.	Blue-green corridor routes should be used in parallel as overland flow routes for extreme surface water events.
<b>Parcel Level</b>	Wetlands, larger storage ponds.	Controlled via formal flow control, either hydrobrake or overflow weir.	Large amenity areas would be suitable for storage ponds and could be used to provide biodiversity net gain.  Overland flow routes for exceedance events should be engineered to naturally flow to these areas.

3.5.4 The preferred configuration of the SuDS/blue-green infrastructure design has been agreed as part of the detailed site master-planning to be submitted as part of the planning application. The drainage strategy has been informed by the site masterplan and is illustrated in the Drainage Layout sketches as presented in Appendix A at the rear of the report. The strategy proposes the use of swales and larger storage or attenuation areas across the site, connected via surface water sewers where appropriate to do so. The intention is for ultimate disposal of surface water to the locations as stated in Section 3.2.

### 3.6 Biodiversity Net Gain

3.6.1 Biodiversity net gain (BNG) is an approach to development. It makes sure that habitats for wildlife are left in a measurably better state than they were before the development<sup>17</sup>. In England, BNG is mandatory under Schedule 7A of the Town and Country Planning Act 1990<sup>18</sup>, unless exempt.

3.6.2 The benefit of including SuDS measures across an effective hierarchy is that much of the BNG requirements can be fulfilled through the implementation of certain SuDS measures. The use of wetlands, rain gardens, swales and blue-green corridors in particular, are full in value in BNG, and their inclusion can reduce the onus elsewhere in the site.

### 3.7 Treatment of Runoff

3.7.1 The proposed treatment of runoff and removal of contaminants is summarised in Table 3.3.

**Table 3.3: Treatment of Runoff**

Development Component	Existing Contaminant Profile	Primary Treatment	Secondary Treatment
Low Traffic Roads/Individual Property Driveways	<p>Runoff likely to have light hydrocarbon contamination.</p> <p>Using the CIRIA Report C753<sup>19</sup> indices, the pollutant loading profile will be as follows:</p> <ul style="list-style-type: none"> <li>TSS = 0.5</li> <li>Metals = 0.4</li> <li>Hydrocarbons = 0.4</li> </ul>	<p><b>Permeable Paving</b></p> <p>Will treat surface water through filtration of silt and the attached pollutants; biodegradation of organic pollutants like petrol and diesel; adsorption of pollutants; and settlement and retention of solids.</p> <p><b>Storage Ponds/Swales</b></p>	<p><b>Storage Ponds/Wetlands</b></p> <p>Will provide treatment of surface water runoff through settling and biological uptake. Dense stands of vegetation facilitate the adhesion of contaminants to vegetation, aerobic decomposition of pollutants and can help stabilise settled sediment and prevent resuspension.</p>

<sup>17</sup> GOV.UK, Guidance, Understanding biodiversity net gain, 2024 [online]. Available at: <https://www.gov.uk/guidance/understanding-biodiversity-net-gain>. Accessed September 2024.

<sup>18</sup> Legislation.gov.uk, Environment Act 2021, Schedule 14, Biodiversity Gain as Condition of Planning Permission [online]. Available at: <https://www.legislation.gov.uk/ukpga/2021/30/schedule/14/enacted>. Accessed September 2024.

<sup>19</sup> CIRIA, The SuDS Manual (C753F), 2015 [online]. Available at: [https://www.ciria.org/CIRIA/Item\\_Detail.aspx?iProductCode=C753F&Category=FREEPUBS&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91&OrderLineId=315a5390-84ff-4072-9e87-0a360394b238](https://www.ciria.org/CIRIA/Item_Detail.aspx?iProductCode=C753F&Category=FREEPUBS&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91&OrderLineId=315a5390-84ff-4072-9e87-0a360394b238). Accessed September 2024.

Residential Roof Areas	Using the CIRIA Report C753 <sup>19</sup> indices, the pollutant loading profile will be as follows: <ul style="list-style-type: none"> <li>• TSS = 0.2</li> <li>• Metals = 0.2</li> <li>• Hydrocarbons = 0.05</li> </ul>	Will treat surface water runoff through pollutant retention. Will help to reduce the contaminant load discharged to surface waters. Coarse to medium sediments and associated pollutants can be removed by filtration through surface vegetation and groundcover. Fine particulates and associated contaminants can be removed by infiltration.
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### 3.8 Drainage System Performance

3.8.1 The storage values calculated at this stage are indicative and are intended to provide enough detail to inform the next stage of development. When the detailed layout of each site is being undertaken, the performance of the SuDS system should be modelled, with adequate storage within the system being provided to ensure flooding does not occur:

- On any part of the site for a 1 in 30-year rainfall event.
- During a 1 in 100-year rainfall event in any part of:
  - a building (including a basement); or
  - a utility plant susceptible to water (e.g., a pumping station or electricity sub-station).
- On neighbouring sites during a 1 in 100-year rainfall event.

3.8.2 The performance of the system should also consider the occurrence of an extreme storm event over and above that for which the system was designed (i.e., the 1 in 100-year plus climate change storm event).

### 3.9 Adoption and Maintenance

3.9.1 At this stage, no definitive plan or agreement has been entered regarding the future adoption of surface water drainage. All SuDS features situated in private land (i.e., permeable paving, small rain gardens etc.) would be the responsibility of the homeowner. Surface water drainage in the form of sewers and SuDS features, located in public areas, are proposed to be placed under the responsibility of a private management company. Sufficient access space for maintenance has been provided in the design and is indicated on the Drainage Layout sketches presented in Appendix A at the rear of the report.

3.9.2 All drainage should be constructed in accordance with the following technical guidance:

- Sewers for Adoption 8<sup>th</sup> Edition<sup>20</sup>; and
- CIRIA report C753 The SuDS Manual<sup>19</sup>.

3.9.3 Irrespective of eventual ownership, in order to ensure the long-term performance of the site drainage all aspects of the system should be periodically inspected and maintained with the indicative schedule outlined below. The following provides a summary of the typical maintenance activities associated with the different drainage features:

- **Permeable Paving** - Brushing and vacuuming three times per year; removal of weeds, repair of any broken blocks/damaged areas; maintenance of vegetation; three monthly inspection for poor operation and/or weed growth; annual inspection of inspection chambers; annual inspection for silt accumulation.
- **Swales/Rain Gardens** - Monthly removal of litter, grass cutting and vegetation management; annual re-seeding and pruning; repairs due to erosion, reinstatement of design levels, scarification and spiking of topsoil, removal of sediment, and removal of oils or petrol residues as required; monthly inspection for blockages, ponding, compaction and silt accumulation; monthly inspection for blockages and physical damage; six monthly inspection for silt accumulation and functioning of mechanical devices (where necessary).
- **Flow Control Devices** – To be inspected every three - six months, after a large storm event, or after an observed deterioration in system performance.
- **Attenuation Basins** – Main requirements include mowing along maintenance access routes, amenity areas and across any formed embankments. The remaining areas can be managed as 'meadow'. Grass clippings should be disposed of offsite to remove nutrients and pollutants. Sediment will occasionally require removal when reaching 25 mm depth.
- **Wetlands** – Monthly removal of litter and debris, cutting of grass in public areas; monthly inspection of inlets, outlets, banksides, structures, pipework etc. for evidence of blockage and/or physical damage; monthly inspection of waterbody for signs of poor water quality (May – October); six monthly cutting of meadow grass; six monthly inspection of silt accumulation rates; six monthly inspection of any mechanical devices; annual hand cut of submerged and emergent aquatic plants; annual removal of bank vegetation and tidying of dead growth; remedial repair, replanting, aeration, and realignment as required.

3.9.4 The above represents a typical maintenance schedule; a site-specific schedule should be fully developed and agreed upon detailed design of the site drainage.

### 3.10 Management of Runoff from Construction

3.10.1 During the stages of site preparation, earthworks, and construction there is the potential for contaminants and/or suspended sediments in surface water runoff entering the surrounding watercourses and existing drainage.

<sup>20</sup> Water UK, Sewers for Adoption, A Design and Construction Guide for Developers, 2018 [online]. Available at: <https://www.water.org.uk/wp-content/uploads/2018/10/SfA-8-Master-2.pdf>. Accessed September 2024.

3.10.2 A strategy for managing surface water runoff during the construction phase, including specific measures tailored to the level of risk should be developed and agreed with West Sussex County Council. The extent of sediment/contaminant runoff will vary across the construction cycle, and a strategy should be developed to encompass potential pollution from all stages of construction.

3.10.3 The strategy should include details of how during the earthworks and site preparation stages the contracting engineer will employ the approaches outlined in CIRIA C532 Control of Water Pollution from Construction Sites<sup>21</sup>. This will require a proper understanding of the sensitivity of the downstream watercourses in terms of existing water quality and the potential impact of change. It is expected potential mitigation measures will include:

- Avoiding mass overburden stripping at the site; exposing only that part of the site essential for operation;
- Placing silt fences of geo-fabric or similar material around open or exposed ground and stockpiles; and
- Re-seeding any exposed ground and stockpiles to stabilise the ground and reduce erosion and gullyng of such features.

3.10.4 The strategy should be developed and agreed during detailed design and should be implemented prior to the commencement of any enabling and/or construction works onsite.

3.10.5 A strategy for managing surface water runoff during the construction phase, including specific measures tailored to the level of risk at the site should be developed and agreed with West Sussex County Council during detailed design.

3.10.6 It is noted that all watercourses/ditches within the red line boundary must not be infilled as part of the development proposals. The landowner (riparian owner) must maintain all watercourses/ditches now and as the development progresses, to ensure there are no blockages and that they are free-flowing.

<sup>21</sup> CIRIA, Control of water pollution from construction sites. Guidance for consultants and contractors (C532D), 2001 [online]. Available at: <https://www.ciria.org/ItemDetail?iProductCode=C532D&Category=DOWNLOAD>.

## 4. SURFACE WATER FLOODING MITIGATION

4.1.1 As part of our development of mitigation options, and in consideration of future site development, Ramboll has considered climate change in the following ways:

- Consideration of climate change allowances when considering peak fluvial flood levels – this is also a policy requirement of the EA for all NPPF-compliant FRAs;
- Consideration of greater frequency and higher magnitude of surface water flooding events and overland flow, and assessing how a site and building layout can be designed to manage this risk; and
- Consideration of the likely increased risk of seasonal groundwater flooding as a result of wetter winters.

4.1.2 Each of the above will be considered when assessing the mitigation measures, which are summarised as follows:

- Finished Floor Levels (FFLs) – All FFLs and threshold levels should be at least 150 mm above the surrounding ground to manage future risk from surface water flooding and overland flow.
- Site Access –As detailed in Appendix E of the Flood Risk Assessment<sup>22</sup>, the existing ditch, oriented east to west adjacent to the southern boundary of the site, that the proposed access road is proposed to cross, is proposed to be cleared and lowered as part of the proposed drainage improvement works. The existing ditch will be culverted at the location of the proposed access and the proposed road level will be designed to provide at least 0.75 m of cover above the top of the culvert. Any surface water pooling upon the proposed access road is therefore considered to be negligible in terms of depth of water. The Hazard Rating at the proposed access location has been determined to be below the lowest threshold of 0.75 and as such is not even considered a “danger for some”. The proposed access is therefore considered suitable for emergency access/egress.
- Planning for Exceedance Events - This risk relates to the occurrence of intensive rainfall events (expected to become more frequent with the advent of climate change) which could cause overland flow and surface water flooding or cause the capacity of the site drainage system to be exceeded and result in flooding. To manage this risk, the development should consider exceedance overland flow routes during extreme flood events, adopting the principles set out in CIRIA C634, Designing for Exceedance in Urban Drainage<sup>23</sup>. The design of exceedance routes should correlate with the proposed swales/surface water attenuation areas, which will make highly suitable exceedance flow paths.

As noted in more detail in Section 5, excess runoff from the site will be released at the mean annual flood return period which represents a considerable reduction in the peak flows presently emanating from the site during high return period flooding events. As such the proposed surface water drainage strategy will provide betterment offsite.

<sup>22</sup> Ramboll, Land at Foxhole Farm Bolney, Flood Risk Assessment, April 2025 (RUK2021N00014-RAM-RP-00132).

<sup>23</sup> CIRIA, Management of accelerated low water corrosion in steel maritime structures (C634), 2005 [online]. Available at: [https://www.ciria.org/CIRIA/CIRIA/Item\\_Detail.aspx?iProductCode=C634&Category=BOOK](https://www.ciria.org/CIRIA/CIRIA/Item_Detail.aspx?iProductCode=C634&Category=BOOK).

- External Gradients - Along with the planning of exceedance routes, external gradients where possible, are to be designed to fall away from buildings, so that any overland flow resulting from extreme events would be channelled away from building entrances. Where this is not possible, linear interceptor drains should be located at all building entrances towards which there is a positive gradient for surface water to flow.
- Management of Flood Extents - Areas at risk from surface water were investigated during the February 2024 site visit and have been accounted for in the proposed surface water drainage strategy. Proposed surface water attenuation areas, connected by a network of proposed swales to convey surface water runoff, have been strategically located across the site.

## 5. SURFACE WATER RUNOFF BETTERMENT

- 5.1.1 It is noted that as part of the proposed surface water drainage strategy for the Proposed Development, excess runoff from the site will be released at the mean annual flood return period, considered a 1 in 2.33 year event, which represents a considerable reduction in the peak flows presently emanating from the site during high return period flooding events.
- 5.1.2 Across the eastern part of the northern development area, the existing drainage that would otherwise flow toward The Street will instead be collected by the proposed swale located adjacent to the eastern boundary of the site. The surface water will ultimately be transported away from this location and discharged at a controlled rate toward the west.
- 5.1.3 This therefore represents a significant betterment to the present situation where the properties adjacent to The Street are subject to surface water flood risk from the surface water runoff flowing downslope off the site. This is illustrated in Figures 5.1 and 5.2 below.

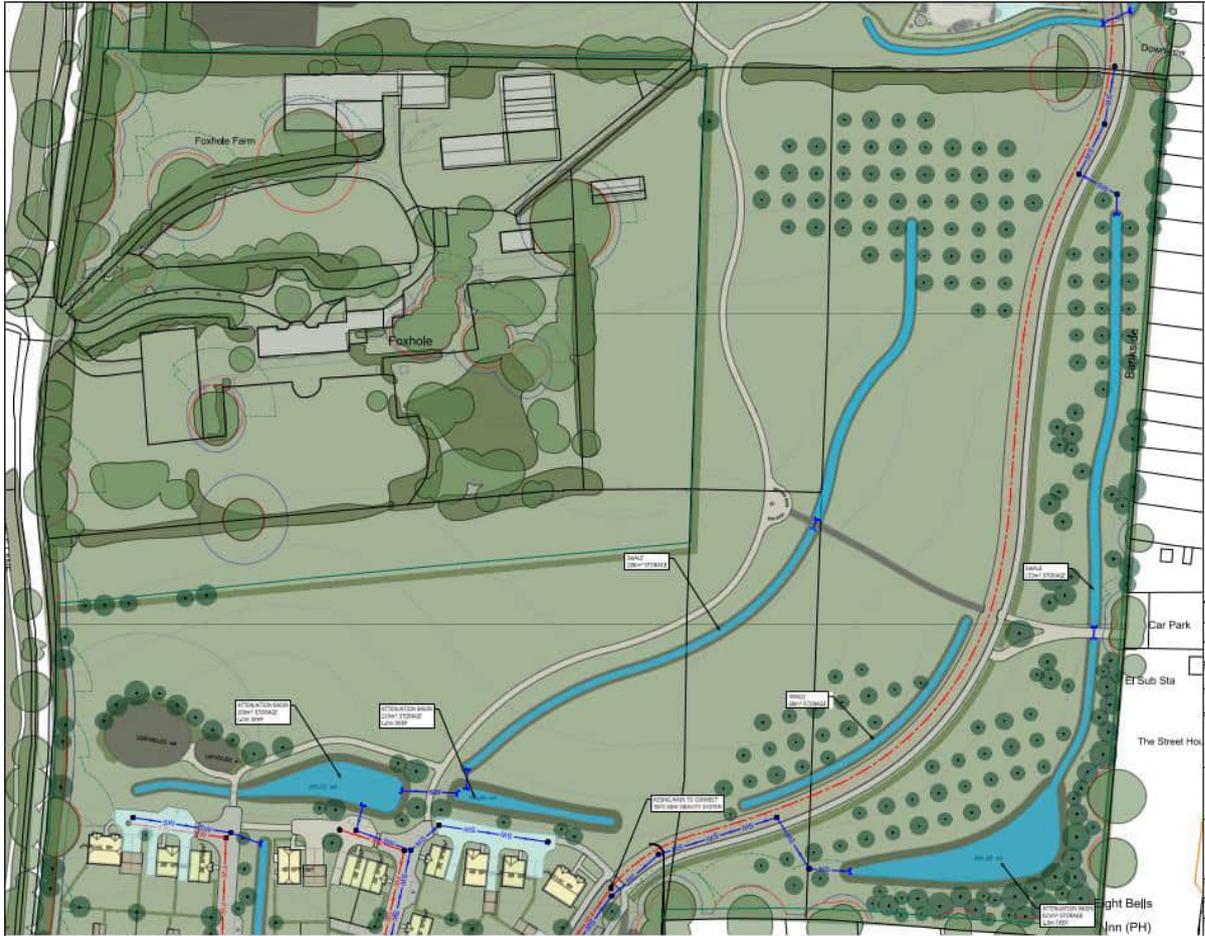


Figure 5.1: Surface Water Betterment in Northern Development – Pre-Development Drainage





Figure 5.3: Surface Water Betterment in Central Development – Pre-Development Drainage



**Figure 5.4: Surface Water Betterment in Central Development – Post-Development Drainage**

5.1.7 The total storage volume required for the proposed southern development area (including central development area) would be approximately 4,500 m<sup>3</sup>. The area will be required to discharge at a greenfield runoff rate of 46.3 L/s. Surface water within the northern area of the site will be collected and transported via a network of strategically located swales, surface water attenuation areas, permeable paving, and gravity driven surface water sewers.

## 6. FOUL DRAINAGE

- 6.1.1 No foul drainage is currently present at the site. The site will therefore be served by new foul drainage infrastructure, developed from first principles.
- 6.1.2 An initial wastewater enquiry was issued to Southern Water in February 2024 with a proposal for two separate discharges for the two different parcels of the development. The Southern Parcel was proposed to connect into the existing network on Cowfold Road, and the Northern Parcel was proposed to connect into the existing network on The Street. Southern Water approved this proposal, but it was ultimately decided against following a meeting with Southern Water representatives who stated that due to the narrow corridor by which the proposed discharge to The Street was proposed to be routed, the proposed sewer would not be adoptable.
- 6.1.3 A new wastewater enquiry was issued in September 2024 with a proposal for a single discharge for the entire site, proposed to connect into the existing network on Cowfold Road. Southern Water have confirmed that there is adequate capacity in the local sewerage network to accommodate a foul flow of 1.8 L/s in this location. It is proposed that this flow rate acts as a design rate for when the development progresses to detailed design stage.
- 6.1.4 The letters of confirmation and related communications are presented in Appendix E at the rear of the report. In addition, Southern Water have provided a detailed response regarding concerns about the capacity in the local sewer network and combined storm overflows. This can additionally be found in Appendix E.
- 6.1.5 The intended foul strategy for the site proposes the collection of foul sewage by conventional gravity sewers. For the Southern Parcel, the proposal is to collect the foul sewage and direct it into the existing network in Cowfold Road to the south of the site. For the Northern Parcel, the proposal is to collect the foul sewage and direct it toward a proposed foul pumping station in the northwest corner of the site which will subsequently direct flows at a controlled rate via a rising main along the route of the proposed adoptable road. Upon reaching the Southern Parcel, the rising main will connect into a proposed gravity sewer within the main access road serving the Southern Parcel.
- 6.1.6 It is intended that the foul pumping station proposed in the northwest of the site, and the foul water sewers as indicated on the Drainage Layout sketches presented in Appendix A at the rear of the report, are adopted by Southern Water. It is intended that the Northern Parcel foul pumping station be a Type 3 adoptable pumping station.
- 6.1.7 Furthermore, it is noted that the proposed surface water drainage strategy will capture and divert surface water away from The Street which will significantly reduce the peak flow and volume of surface water reaching the existing foul/combined sewer network in The Street, and will hence reduce the risk of sewer flooding by increasing capacity locally.

## 7. SUMMARY

- 7.1.1 The site at Foxhole Farm, Bolney is to be brought forward for development. The Proposed Development will consist of 200 residential dwellings split across two parcels, with a single new access from Cowfold Road leading into the south of the site.
- 7.1.2 The site is currently undeveloped, greenfield land, and as such a drainage strategy is required to demonstrate how newly introduced impermeable areas will collect, treat, and discharge runoff in a manner which does not cause a detrimental impact downstream, in terms of both water quality and quantity (i.e., not increase flood risk).
- 7.1.3 The development is split between two parcels, and surface water will be managed separately across these two areas, ultimately draining independently.
- 7.1.4 The ultimate disposal of surface water is intended to remain separate for each of the two parcels of development. For the Southern Parcel, the intent is to discharge to an existing ditch running adjacent to the southern boundary of the site. For the Northern Parcel, the intent is to discharge via an existing culvert that runs beneath Foxhole Lane to the west of the site, and subsequently into an existing unnamed watercourse located to the west of the site flowing approximately east to west. The mean annual flood return period, considered a 1 in 2.33 year event, to which discharge from the Proposed Development intends to be limited, is calculated at 46.3 L/s for the Southern Parcel, and 44.2 L/s for the Northern Parcel. This represents a considerable reduction in the peak flows presently emanating from the site area. The strategy will therefore improve upon the current situation with regard to surface water management and flood risk.
- 7.1.5 Foul water will be collected via conventional means and discharged to an existing Southern Water sewer within Cowfold Road. The proposal intends for foul water from the Northern Parcel to be brought south via a pumping station and rising main and to connect into the proposed foul network for the Southern Parcel. Southern Water have confirmed that there is adequate capacity in the local sewerage network to accommodate a foul flow of 1.8 L/s in this location. It is proposed that this flow rate acts as a design rate for when the development progresses to detailed design stage.

## **FIGURES**

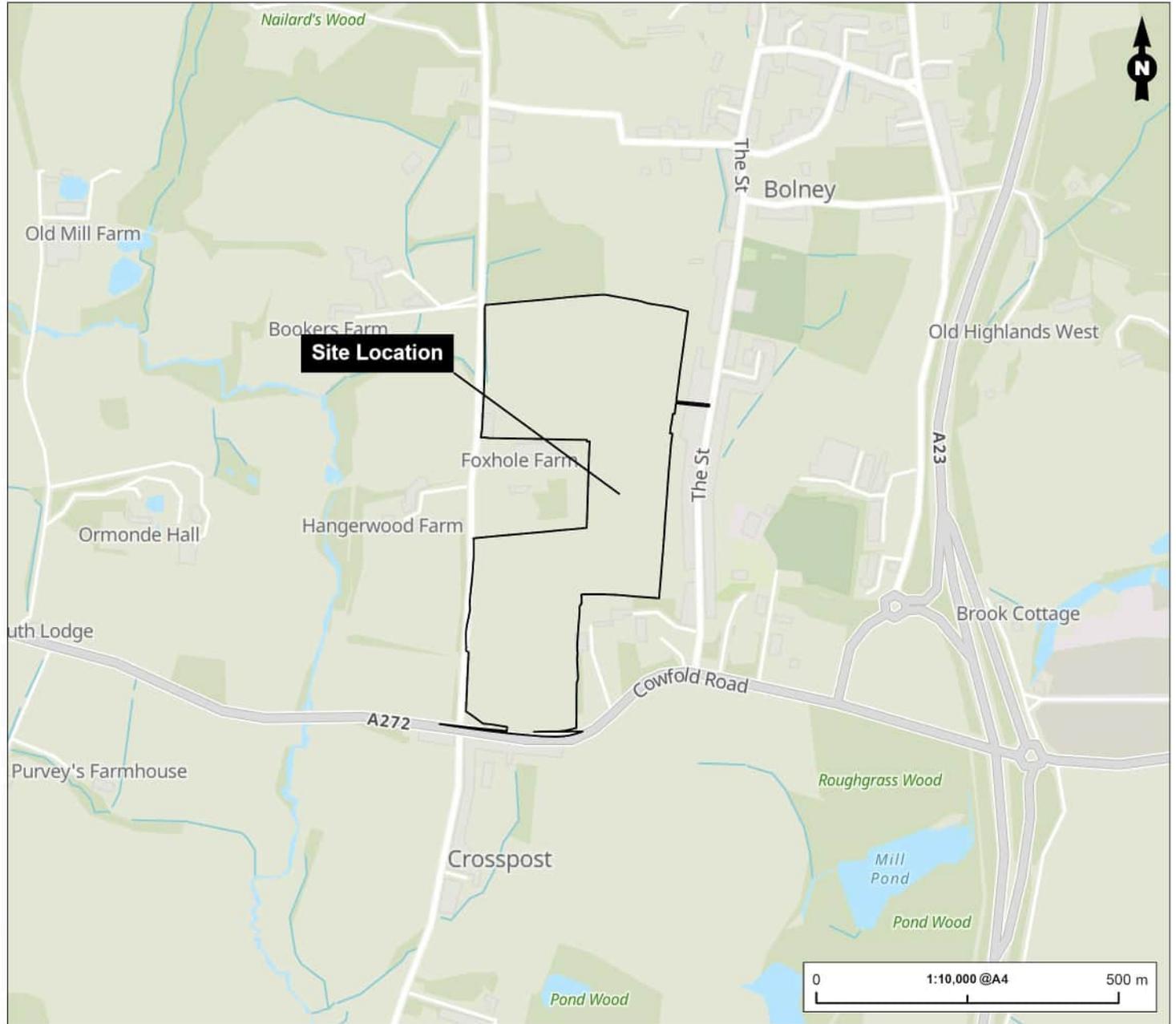
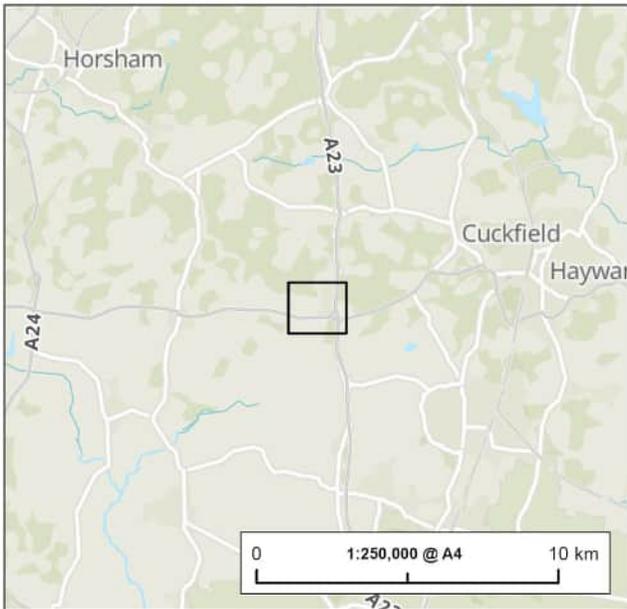
Figure 2.1 – Site Location Plan

Figure 2.2 – LiDAR Topography

Figure 2.3 – Hydrological Setting

Figure 2.5 – EA Surface Water Flood Risk Present Day

Figure 2.6 – EA Surface Water Flood Risk Future Scenario



Site Location Plan.paxx



<b>Figure Title</b> Site Location Plan	<b>Project Name</b> Land at Foxhole Farm, Bolney	<b>Date</b> April 2025	
		<b>Prepared By</b> DM	<b>Figure No.</b> 2.1
<b>Client</b> Wates Developments Ltd	<b>Project No./Filey ID</b> 1620011691-012 / RUK2021N00014	<b>Scale</b> As Shown	<b>Revision</b> 2.0



**Legend**

Site Boundary

**LiDAR 1m DTM / m AOD**

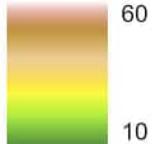


Figure Title  
LiDAR Topography

Project Name  
Land at Foxhole Farm, Bolney

Project No./Filey ID  
1620011691-012 / RUK2021N00014

Date	Figure No.	Revision
April 2025	2.2	2.0

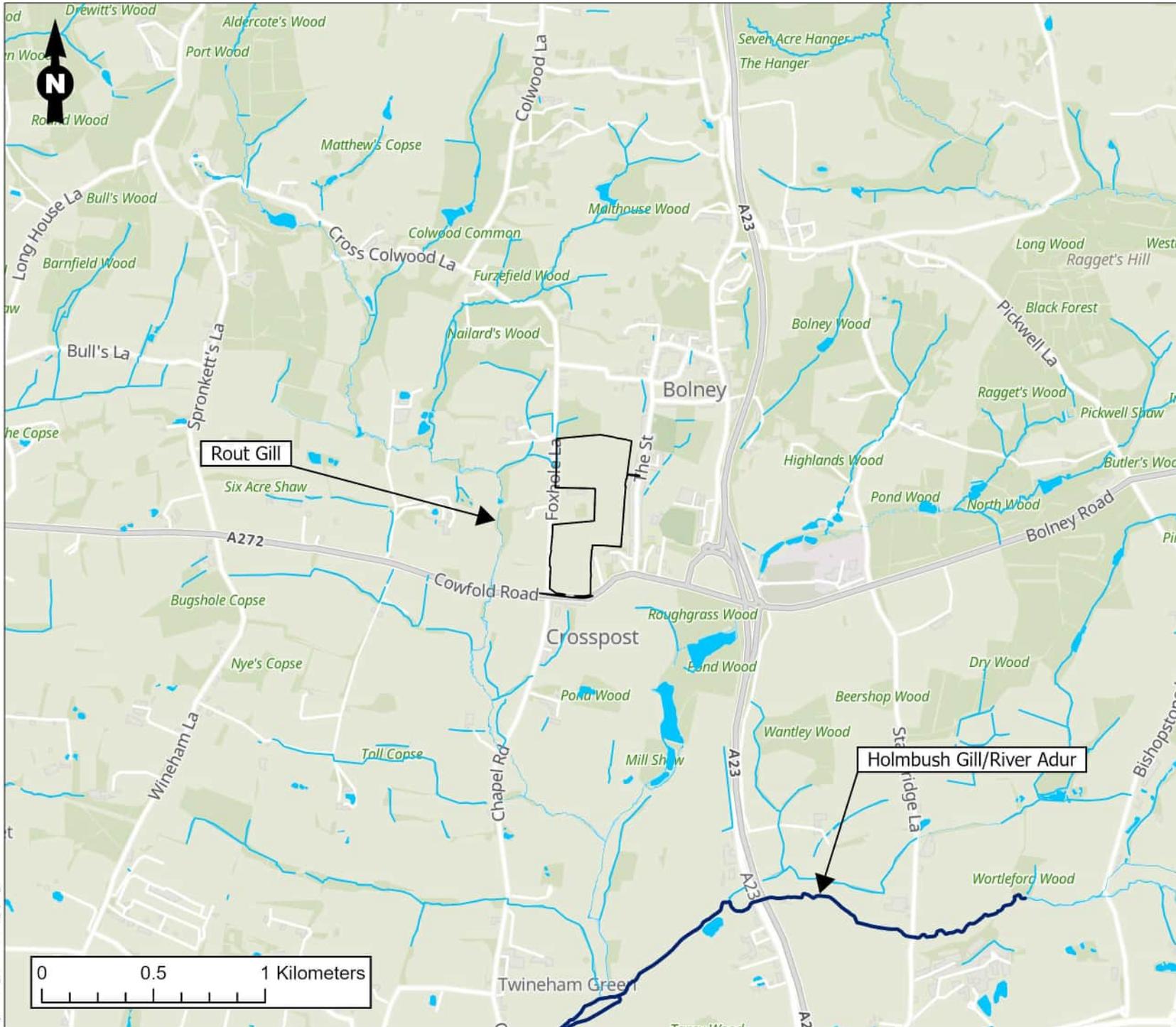
Prepared By	Scale
DM	1:7,500 @A4

Client  
**Wates Developments Ltd**



LiDAR Topography.pagx





### Legend

- Site Boundary
- Watercourses**
- EA Main River
- OS Watercourses
- OS Waterbodies

Figure Title  
Hydrological Setting

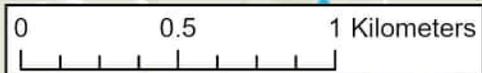
Project Name  
Land at Foxhole Farm, Bolney

Project No./Fility ID  
1620011691-012 / RUK2021N00014

Date	Figure No.	Revision
April 2025	2.3	2.0

Prepared By	Scale
DM	1:24,000 @A4

Client  
**Wates Developments Ltd**





**Legend**

- Site Boundary
- Surface Water Flood Risk**
- Yearly chance of flooding**
- High (Greater than 3.3% AEP)
- Medium (Between 1% and 3.3% AEP)
- Low (Between 0.1% and 1% AEP)

Figure Title  
**EA Surface Water Flood Risk Present Day**

Project Name  
**Land at Foxhole Farm, Bolney**

Project No./Filey ID  
**1620011691-012 / RUK2021N00014**

Date	Figure No.	Revision
April 2025	2.5	1.0

Prepared By	Scale
DM	1:5,000 @A4

Client  
**Wates Developments Ltd**



EA Surface Water Flood Risk.pdpx



**Legend**

- Site Boundary
- Surface Water Flood Risk**
- Yearly chance of flooding between 2040 and 2060**
- High (Greater than 3.3% AEP)
- Medium (Between 1% and 3.3% AEP)
- Low (Between 0.1% and 1% AEP)

Figure Title  
EA Surface Water Flood Risk Future Scenario

Project Name  
Land at Foxhole Farm, Bolney

Project No./Filey ID  
1620011691-012 / RUK2021N00014

Date	Figure No.	Revision
April 2025	2.6	1.0

Prepared By	Scale
DM	1:5,000 @A4

Client  
**Wates Developments Ltd**



EA Surface Water Flood Risk.pptx

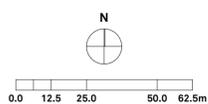
**APPENDIX A - SITE MASTERPLAN AND PROPOSED DRAINAGE LAYOUT  
PLANS AND SUPPORTING CALCULATIONS**



**KEY**

- |   |   |  |
|---|---|--|
| 1. New vehicular access from Cowfold Road         | 7. Viewpoint with seating area and interpretation | 13. Outdoor educational space                          |
| 2. New pedestrian / cycle links to The Street     | 8. Community orchard                              | 14. SuDS basins  |
| 3. New pedestrian link to existing PRow           | 9. Community hub building                         | 15. Foul water pumping station                         |
| 4. Primary tree-lined access roads                | 10. Children's play areas (LEAPs and LAPs)        | 16. Electricity Substation                             |
| 5. Secondary informal 'rural' lanes / mews        | 11. Outdoor gym                                   | 17. New woodland planting                              |
| 6. New publicly accessible countryside open space | 12. Community allotments                          | 18. Country estate road through countryside open space |

rev.	date	changes description	status	issued by
P07	10/04/2025	Drawing updated to incorporate comments from pre-app	S4	DM
P06	07/01/2025	Drawing updated for planning; annotation added	S4	DM



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www.re-format.co.uk  
mail@re-format.co.uk  
+44 (0)1730 778778

drawn by  
**DM**  
checked by  
**MS**

date created  
**Aug 2024**  
scale at A1  
**1:1250**

project title  
**Foxhole Farm, Bolney**  
document title  
**Illustrative Masterplan**

project	originator	volume	level	type	role	number
<b>P20074</b>	<b>RFT</b>	<b>XX</b>	<b>XX</b>	<b>DR</b>	<b>A</b>	<b>0101</b>
<small>status</small> <b>S4</b>	<small>suitability description</small> <b>For Planning</b>					<small>revision</small> <b>P07</b>

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- KEY:
- ExFW — EXISTING FOUL WATER DRAINAGE
  - FW — PROPOSED FOUL WATER DRAINAGE
  - Proposed Foul Water Rising Main
  - Public Sewer Foul Water Drainage
  - Proposed Foul Water Manhole/Inspection Chamber
  - Proposed Surface Water Manhole/Inspection Chamber
  - Flow Control Chamber
  - SW — PROPOSED SURFACE WATER DRAINAGE
  - Existing Ditch Retained
  - Existing Culvert
  - Headwall (Existing & Proposed)
  - Permavoid Storage Crates
  - Permeable Paving
  - Swale / Attenuation Basin
  - Foul Pumping Station

P02	FIRST ISSUE	AP	DF	CL	11/04/2025
P01	FIRST ISSUE	AP	DF	CL	21/01/2025
Rev	Description	Drawn	Checked	Approved	Date

Purpose of Issue: **PURPOSE OF ISSUE**

Status: **SUITABILITY**

**FOXHILLS FARM BOLNEY**



**DRAINAGE LAYOUT SKETCH**

Project No:	1620011691	Scale (8A1):	SCALE	Date:	JAN 25
Drawn:	AP	Designed by:	DF		
Drawing No:	11691-RAM-HDG-XX-SK-C-00001	Rev:	P02		



E: 525,780,000.0  
N: 123,140,000.0

E: 526,100,000.0  
N: 123,140,000.0

**SURFACE WATER ATTENUATION PROVISION:**  
1. 477m³ STORAGE WITHIN 250mm PERMEABLE PAVING  
2. 248m³ STORAGE IN SWALES  
3. 2260m³ STORAGE IN ATTENUATION BASINS (1.5m DEEP)

**Pond**  
OUTFALL INTO EXISTING WATER COURSE RESTRICTED TO FEH GREENFIELD RATE. FLOW RESTRICTION: 44.2l/s

**SURFACE WATER ATTENUATION PROVISION:**  
1. 293m³ STORAGE IN SWALES  
2. 906m³ STORAGE IN ATTENUATION BASINS (1.5m DEEP)

Ruin  
Allotments 1,504.82 m²  
Outdoor Learning 90.52 m²

LEAP 430.60 m²  
IAP 104.77 m²  
Outdoor Gym 114.77 m²

COACH  
Community Building 425 m²  
Outdoor Space 17.72 m²  
Playing Field 507 m²  
Car (no spaces) (12 no. spaces)

Downland  
Little Foxhole  
Highgate  
Downview

Foxhole Farm