# 13 Hydrology (including Flood Risk & Drainage)

## 13.1 Introduction

13.1.1 This chapter considers the outcome of the assessment of the likely environmental effects, which may arise from the Proposed Development:

- Flood Risk and Drainage including fluvial, pluvial and reservoirs
- Water Framework Directive
- Water Resources

13.1.2 This assessment reports the likely environmental effects as a result of the operation and construction of the Proposed Development, and mitigation measures that will be implemented to prevent or reduce the adverse effects or provide beneficial effects.

13.1.3 This Chapter is supported by a Flood Risk Assessment and Drainage Strategy (FRA), produced by Abley Letchford (AL). A copy of the FRA is provided in **Appendix 13.1.** Reference is also made to the Water Framework Directive Assessment produced by RPS Tetra Tech and provided in **Appendix 13.2.**

13.1.4 This Hydrology, Flood Risk and Drainage Chapter has been produced and reviewed by AL staff with membership of CIWEM. It has been checked and approved by an AL Associate Director who is a chartered engineer and chartered member of CIWEM.

13.1.5 The chapter details the methodology followed, a review of the baseline conditions in the defined study area, and the results of the assessment.

## 13.2 Assessment methodology

13.2.1 An Environmental Impact Assessment (EIA) Scoping Report prepared by Savills was published in December 2024 on behalf of outlining the proposed approach to assessing hydrological impacts a on behalf of the University of Reading (UoR), Gleeson Land (Gleeson) and Hatch Farm Land Ltd. The scoping report identified receptors, impact during both construction and operation phases, and outlined methodologies proposed for the ES Chapter. Based on the scoping process, the following have been scoped into and out of the ES Chapter:

- Flood Risk and Drainage including fluvial, pluvial and reservoirs.
- Water Framework Directive.
- Water Resources.

13.2.2 It is noted that groundwater flooding is scoped out.

13.2.3 A drainage scoping opinion was carried out by Wokingham Borough Council to determine the content of the EIA scoping report. The scoping opinion states ‘In summary, the drainage strategy for this proposed development should focus on sustainable, integrated solutions that address both flood risk and water quality. The drainage network should be designed to handle surface water and foul water runoff without exacerbating flood risks in surrounding areas. Careful consideration of flood alleviation, SuDS implementation, sewer capacity, and water

quality control will be essential. Coordination with existing infrastructure and attention to long-term sustainability and maintenance will also be critical for the success of the drainage system'.

## Legislative Context, Technical Guidance and Best Practice – Flood Risk and Drainage

### *Legislative Context*

13.2.4 The National Planning Policy Framework (NPPF), updated most recently in December 2024, sets out the Government's planning policies for England and how they are expected to be applied. In terms of Water Resources and Flood Risk, the NPPF sets strict tests to protect people and property from flooding which all local planning authorities are expected to follow, with a view to achieving sustainable development.

13.2.5 To accompany the updated NPPF, the web-based Planning Practice Guidance (PPG) provides additional technical guidance on flood risk and coastal change. The PPG retains key elements of former Planning Policy Statement (PPS) 25 Development and Flood Risk (withdrawn on adoption of the NPPF) as an interim measure, pending a wider review of guidance to support planning policy. The original technical guidance published in 2012 has also been replaced by this web-based resource.

13.2.6 In terms of the general planning approach to development and flood risk, the Flood Risk and Coastal Change PPG sets out the following main steps to be followed:

- Assess Flood Risk;
- Avoid Flood Risk; and
- Manage and Mitigate Flood Risk.

13.2.7 The guidelines also state that in plan-making, local planning authorities apply a sequential approach to site selection so that development is, as far as reasonably possible, located where the risk of flooding (from all sources) is lowest, taking account of climate change and the vulnerability of future uses to flood risk. In plan-making this involves applying the 'Sequential Test' to Local Plans and, if needed, the 'Exception Test' to Local Plans. Guidance on when and how should the 'Sequential' and 'Exception' Tests be applied to planning applications is also provided in the PPG.

13.2.8 In addition, the guidelines reiterate that local planning authorities and developers should seek flood risk management opportunities (e.g. safeguarding land), and to reduce the causes and impacts of flooding (e.g. through the use of SuDS in developments).

### *Policy*

13.2.9 Wokingham Borough Adopted Core Strategy Development Plan Document, January 2010 sets the broad vision and policies of the adopted Core Strategy (adopted on 29th January 2010) for the Borough having been informed by the views of the community through consultation, the vision of Wokingham Borough Council (WBC) and Community Strategy, together with national policy. The Core Strategy sets out where development will occur within the Borough to 2026, taking account of health, well-being and quality of life.

13.2.10 **Policy CP1** (Sustainable Development) states that:

*'Planning permission will be granted for development proposals that;*

- Limit any adverse effects on water quality (including groundwater);

- Ensure the provision of adequate drainage;
- Incorporate facilities for recycling of water;
- Avoid increasing (and where possible reduce) risks of or from all forms of flooding (including from groundwater).

13.2.11 **Policy CP3** (General Principles for Development) states that: *'Planning permission will be granted for proposals that… have no detrimental impact upon important… water courses;'*

13.2.12 Wokingham Borough Council (WBC) Adopted Managing Development Delivery Local Plan Document, (February 2014) supports the policies within the Adopted Core Strategy and sets out additional detail on where new homes will be delivered within the Borough. The policies ensure that any new housing will be built to a high-quality taking cognisance of sustainable drainage, landscaping and environment factors.

13.2.13 WBC Local Plan Update (LPU) will put into place a new planning strategy for the period to 2040. Once adopted, it will replace the current Core Strategy and Managing Development Delivery Local Plans.

13.2.14 **Policy CC09** (Development and Flood Risk) states:

- 'All sources of flood risk should be considered during the planning application process. Proposals must be consistent with the guidance in the NPPF and the accompanying NPPF Technical Guidance and should demonstrate how the Strategic Flood Risk Assessment (SFRA) has been used to determine the suitability of the proposal.
- Development should be guided towards areas of the lowest flood risks by applying the sequential approach. Development proposals within Flood Zones 2 or 3 must ensure that flood risk is not increased due to the Project and must take into account the vulnerability of the Proposed Development.
- Development will only be considered in areas of flood risk if it can be considered that: the development provides wider sustainability benefits to the community which outweigh flood risk; the development will be safe for its lifetime taking into account the vulnerability of its users and the development will not increase flood risk, and where possible, will reduce flood risk overall.'

13.2.15 **Policy CC10** (Sustainable Drainage) states:

- *'Surface water arising from the Proposed Development must be managed in a sustainable manner, taking into account the effects of climate change.*
- *Where practically possible, development proposals should incorporate SuDS, which must be designed to meet the long-term needs of the development. If a development discharges surface water into a public sewer, adverse impacts to the public sewerage network serving the development should not be experienced.'*

13.2.16 WBC has produced several Supplementary Planning Documents (SPD) that have been adopted for the purposes of development control. Of relevance to hydrology is the Sustainable Design and Construction SPD. The SPD provides an up-to-date and comprehensive approach to considering sustainable design and construction in new development. It is a material planning consideration for all planning applications.

13.2.17 Section 11 sets out expectations in respect to water efficiency and resource management. All developments are expected to include water efficiency measures to reduce overall water consumption in line with requirements such as BREEAM.

13.2.18 Section 12 outlines the approach to flooding, flood resilience, sustainable drainage, and requirement for a site-specific Flood Risk Assessment in support of Policy CP1 within the Adopted Core Strategy.

13.2.19 Shinfield Parish Council has developed a Neighbourhood Development Plan February 2017, which covers the period from 2016 through to 2026.

13.2.20 Policy 8: Flooding states:

- 'Where appropriate, new developments must incorporate the existing open watercourses, points and ditches within the development site, to lessen the risk of flooding to property, fields and roads.
- *Existing open watercourses, ponds and ditches shall be preserved in new developments and substituted only where necessary or otherwise appropriate.*
- *The creation of Sustainable Drainage Systems (SuDS) in new developments should be promoted wherever practicable and should be incorporated into the site layout and landscape design, matching with the requirements of existing adjacent land and with regard to provision of fauna, flora and habitats. Provisions for the maintenance and management of the features must be made by the developer.'*

13.2.21 No development will be permitted which reduces the ability of the site to alleviate flooding, or which results in increases in surface water run-off rates that would have a detrimental effect off-site, unless suitable mitigation is put in place.

***Guidance and Best Practice***

13.2.22 Current best practice guidance on the planning for and design of SuDS treatment is provided by C753 The SuDS Manual36, The Design Manual for Roads and Bridges (DMRB) HA 103/06 Vegetative Treatment Systems for Highway Runoff37, and the DMRB HD 33/06 Surface and Subsurface Drainage Systems for Highways38. In the context of the Proposed Development, the assessment guidance described in the C753 The SuDS Manual34 is the most appropriate method of assessment to determine the risk to the water environment and the need for treatment measures, and this is described in more detail later in this chapter.

## Legislative Context, Technical Guidance and Best Practice – Water Framework Directive

***Legislative Context***

13.2.23 The relevant policies include but are not limited to the legislation below:

- The Water Resources Act (1991)
- Land Drainage Act (1994)
- The Environmental Act (1995)
- Anti-pollution Works Regulations (1999)
- Water Framework Directive (2000)

- The Water Act (2014)
- The Environmental Permitting Regulations (2019)

13.2.24 The Water Framework Directive (Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000) is a European Union Directive which committed member states to achieve good qualitative and quantitative status of all water bodies by 2015. Under the Directive water bodies are defined as all ground and surface waters, including rivers, lakes, transitional waters, and coastal waters (up to one nautical mile from shore).

13.2.25 The regulations require that the impacts of a proposed development on biology, chemistry and hydromorphology are considered in relation to WFD status classes and are reported under a specific WFD section in any Environmental Statement or in a separate WFD compliance report (Environment Agency, 2010).

13.2.26 The WFD is transposed into law in England and Wales by The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (the 2017 Regulations).

13.2.27 The Thames River Basin District Management Plan (2015) sets out the baseline classification for the River Thames and tributaries which include the Loddon together with the statutory objectives for protected areas and these rivers including the River Loddon. The plan also summarises the programme of measures to achieve statutory objectives.

***Policy***

13.2.28 The Site lies within the administrative boundaries of Wokingham Borough Council (WBC). The local planning policy in relation to water quality is outlined below.

13.2.29 The Thames River Basin District Management Plan (2015) sets out the baseline classification for the River Thames and tributaries which include the Loddon together with the statutory objectives for protected areas and these rivers including the River Loddon. The plan also summarises the programme of measures to achieve statutory objectives.

13.2.30 WBC Development Plan Document, February 2014 sets out how the borough will develop up until 2026 and adds additional details to the Wokingham Core Strategy. The document has a section on Water Resource Management which includes the following:

13.2.31 *"2.34: The Borough's water resources and supplies shall be protected by resisting development proposals that would pose an unacceptable threat to surface water. Proposals that seek to increase water availability shall be encouraged."*

## Predicting effects

### *Flood Risk and Drainage*

13.2.32 The following section deals with the methodology to assess the impacts in respect of flood risk and drainage.

13.2.33 A site-specific Flood Risk Assessment (FRA) has been undertaken and is included within **Appendix 13.1.**

13.2.34 In order to assess the significance of any potential impacts, a matrix approach has been adopted to map the potential impacts to the vulnerability of potential receptors. We have adopted the vulnerability categories for flood risk as set out in the NPPG as below.

13.2.35 The assessment methodology stages can be outlined as follows:

**Table 13.1 Value/sensitivity assessment**

| Receptor value / sensitivity | Receptor type |
|---|---|
| High | Highly Vulnerable/Essential Infrastructure |
| Medium | More Vulnerable |
| Low | Less Vulnerable |
| Negligible | Water compatible |

13.2.36 Magnitude of impact is based on an assessment of two factors. Firstly, how flood levels might change as a result of impacts on the fluvial floodplain and secondly, qualitatively how surface water flows might be increased as a result of the proposed drainage strategy.

**Table 13.2 Magnitude of impact**

| Magnitude | Description |
|---|---|
| High | Greater than 100mm increase in fluvial levels/significant increase in SW run off rates |
| Medium | Greater than 50mm increase in fluvial levels/minor increase in SW run off rates |
| Low | 10mm to 50mm increase in fluvial levels/no increase in SW runoff rates |
| Negligible | Less than 10mm increase in fluvial levels/no increase in SW runoff rates |

13.2.37 The predicted level of effect is based upon the consideration of magnitude of impact and sensitivity of the resource/receptor to come to a professional judgement of how important this effect is.

**Table 13.3 Level of effect**

| Receptor Sensitivity | Magnitude of Impact | | | |
|---|---|---|---|---|
| | High | Medium | Low | Negligible |
| High | Substantial | Major | Moderate | Negligible |
| Medium | Major | Moderate | Minor | Negligible |
| Low | Moderate | Minor | Minor | Negligible |
| Negligible | Negligible | Negligible | Negligible | Negligible |

13.2.38 The proposed drainage system for the Proposed Development will be developed and described, including the extent to which Sustainable Drainage Systems (SuDS) will be used.

13.2.39 The outputs are reported within an FRA and overall Drainage Strategy and summarised within the ES chapter.

***Water Framework Directive***

13.2.40 Surface water quality aspects, as referred to in the Scoping Report, are covered by the Water Framework Directive.

13.2.41 The WFD assessment will follow the EA's guidance for completing WFD assessments (Environment Agency, 2023) and the Planning Inspectorate's Advice Note Eighteen (National Infrastructure Planning, 2024).

13.2.42 A three-stage process is recommended by the EA. The three stages are:

- Stage 1 - WFD screening. To determine if parts of the proposed development do not require further consideration, and provide a baseline summary.
- Stage 2 - WFD scoping. To identify risks of the proposed development's activities to receptors based on the baseline environment, and how inherent mitigation may limit impacts.
- Stage 3 - WFD impact assessment. A detailed assessment of water bodies and their quality elements that are likely to be affected by the proposed development, which have not been screened and scoped out.

13.2.43 The screening assessment identifies the WFD water bodies within the vicinity of the Proposed Development. Each component of the Proposed Development has been reviewed in terms of its potential to impact to the water environment (i.e. on surface and groundwater bodies).

13.2.44 The receptor sensitivity criteria for WFD surface waterbodies as a whole is set out in Table 13.4, below.

**Table 13.4 Sensitivity Criteria**

| Magnitude | Description |
|---|---|
| Very High | WFD current overall status of high. The surface water body supports sensitive aquatic ecological receptors and is extensively used for public water supply and large-scale agricultural use. |
| High | WFD current overall status of good. Surface water body may support sensitive aquatic ecological receptors and is used is used for public water supply/medium scale industrial or agricultural use. |
| Medium | WFD current overall status of moderate. The surface water features may be locally important for spawning of salmonid species. Surface water body is used for private water supply or small scale industrial/agricultural use. |
| Low | WFD current overall status of poor. Surface water bodies are not significant in terms of sensitive ecological receptors or fish spawning. Small scale (single residential or commercial use) abstraction licences are present in close proximity. |
| Negligible | WFD current overall status of bad. No sensitive ecological receptors or fish spawning are present within the surface water bodies. No abstraction licences present within the area. |

13.2.45 The magnitude of impact on WFD waterbodies are assessed against the impact on the rating of the WFD elements of a waterbody, and the ability to improve them in the future.

**Table 13.5 Significance of Effect**

| Magnitude | Description |
|---|---|
| Major | Anticipated to result in a permanent increase or decrease of the WFD classification of a waterbody, or prevent the waterbody from reaching a 'Good' rating in the future. |
| Moderate | Substantial effect on one WFD element, or moderate effect on several elements. May result in a temporary increase/decrease of the WFD classification of the body. May prevent the waterbody from reaching 'Good' rating in future. |
| Minor | Minor, localised impact on one or several WFD elements. No effect on the overall classification of the water body. Would not prevent the water body from reaching a 'Good' rating in the future. |
| Negligible | Very minor, local effect. No change to classification of any WFD elements. |
| No Change | No anticipated change in classification of any WFD elements. |

13.2.46 The predicted level of effect is based upon the consideration of magnitude of impact and sensitivity of the resource/receptor to come to a professional judgement of how significant this effect is. Effects may be adverse or beneficial.

**Table 13.6 Level of effect**

| Receptor Sensitivity | Magnitude of Impact | | | |
|---|---|---|---|---|
| | High | Medium | Low | Negligible |
| High | Substantial | Major | Moderate | Negligible |
| Medium | Major | Moderate | Minor | Negligible |
| Low | Moderate | Minor | Minor | Negligible |
| Negligible | Negligible | Negligible | Negligible | Negligible |

13.2.47 The WFD scoping assessment will identify links between the proposed activities and each WFD quality element that could be affected. It is also necessary at this stage to consider the proposed activities and how they could affect the morphological mitigation measures for waterbodies, where applicable.

13.2.48 The scoping phase involves considering each WFD quality element to identify those (if any) where a possible causal link exists. That is, where water body status or environmental objectives could potentially be affected at a water body level by the proposed activities.

13.2.49 Each activity type is examined based on the maximum design scenario. Where potential impacts from proposed activities exist, they will be scoped into the assessment and mitigation measures highlighted for further development as design progresses.

13.2.50 The waterbodies and impacts which are screened and scoped in during Stages 1 and 2 are considered further for specific impacts that may occur as a result of the development. A detailed impact assessment will examine the potential residual impact on water bodies (including cumulative impacts), suggesting further mitigation measures and enhancements where appropriate.

13.2.51 Within the context of the wider Proposed Development, the WFD assessment will provide the opportunity to inform detailed design by avoiding, minimising, mitigating and compensating risks to WFD surface water and groundwater receptors where the risk assessment determined that the proposed activities may have potential impacts.

The sources of information used in the assessment are set out in the table below:

**Table 13.7 Sources for WFD Desk Study**

| Title | Source | Author |
|---|---|---|
| BGS Geology Viewer | https://geologyviewer.bgs.ac.uk/?_ga=2.60345197.172764960.1660052920-1090504202.1660052920 | British Geological Society (BGS) |
| Magic Map Application | https://magic.defra.gov.uk/MagicMap.aspx DEFRA | DEFRA |
| Catchment Data Explorer | https://environment.data.gov.uk/catchment-planning/ | Environment Agency (EA) |
| Geoindex Onshore Mapping | https://www.bgs.ac.uk/map-viewers/geoindex-onshore/ | BGS |
| Soilscapes viewer | http://www.landis.org.uk/soilscapes/ | The National Soils Research Institute |
| Thames River Basin District River Basin Management Plan: Updated 2022 | https://www.gov.uk/government/publications/thames-river-basin-management-plan-updated-2022-habitats-regulation-assessment | EA |

13.2.52 A review of the proposed potential works and the potential impacts to the identified surface water and groundwater bodies has been undertaken by identifying the impacts that could improve or reduce the WFD status or affect the ability of the water bodies to meet the objectives of the WFD.

13.2.53 The following factors have been considered when determining whether the potential effects of the Proposed Development are likely to lead to an improvement / reduction in status or impact on objectives being met:

- Whether the impact is temporary (such as short-term construction impacts) or permanent/long term;
- The characteristics and sensitivity of the specific water features affected by the Proposed Development (which may be different to the designated WFD water body);
- The scale and importance of the specific water features affected by the Proposed Development to the designated WFD water body; and

- The nature, scale, and extent of potential impact in the context of the existing pressures and proposed measures for the water body.

13.2.54 The assessment has been undertaken using the design scenario (as of June 2025), in order to ensure the assessment captures the specific likely affects arising from the development. Should significant changes to the design occur, further assessment may be required.

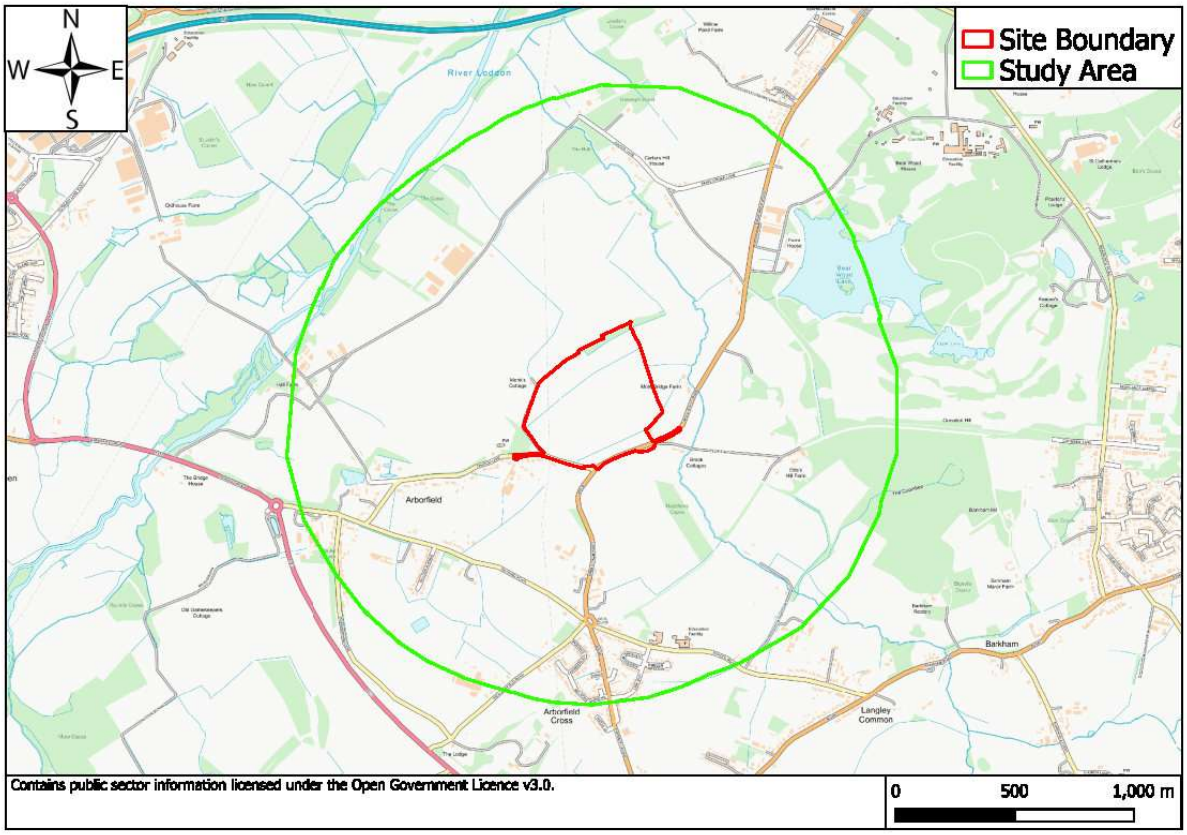
A further cycle of WFD data was released in 2022, however these have not been released for all waterbodies. Therefore, some of the data used in the assessment may not be reflective of the current situation. Once the updated data is released it will further help inform the baseline environment.

### Geographical Scope

13.2.55 The extent of the study area for is 1km from the Site boundary. This area is considered the professional opinion of those carrying out the assessment to encompass the sensitive receptors which may be impacted by the Proposed Development.

13.2.56 **Figure 13.1** shows the extent of the study area. This includes the red line boundary and the 1km study area.

### Figure 13.1 Geographical Scope




13.2.57 Beyond this area, it is deemed that the Proposed Development will have no significant impact on Flood Risk, WFD, Water Supply and treatment.

### Temporal Scope

13.2.58 Typically for a residential development the Flood Risk Assessment will consider the potential changes in risk for a period of 100 years into the future and commercial development would be 60 years into the future.

13.2.59 All aspects of the assessment (flood risk, drainage, water supply and WFD) will be assessed against the 100-year temporal scope.

### Consultation

13.2.60 In addition to the EIA scoping exercise, the overall LVGV area has been considered as part of liaison with WBC, as the LLFA, and the EA.

### Assumptions and Limitations

13.2.61 The assumptions and limitations of the study are listed below:

- The EA flood risk data which includes the Flood Map for Planning, Risk of Flooding from Surface Water, risk of reservoir flooding, historic flood extents, WFD catchments and Main Rivers is representative of the hydrology and flood risk conditions at the Site.

## 13.3 Baseline conditions

### Current Baseline

13.3.1 The types of sensitive receptors are listed below:

- Barkham Brook, tributaries and floodplain
- Ordinary Watercourses and tributaries
- Bear Wood Lake
- Loddon Clay Formation Bedrock Geology
- Site workers
- Occupiers of existing dwellings and commercial premises in proximity to the Site
- Site residents and visitors
- Local Population
- Users of Local Roads and transport
- Surface water and groundwater regimes

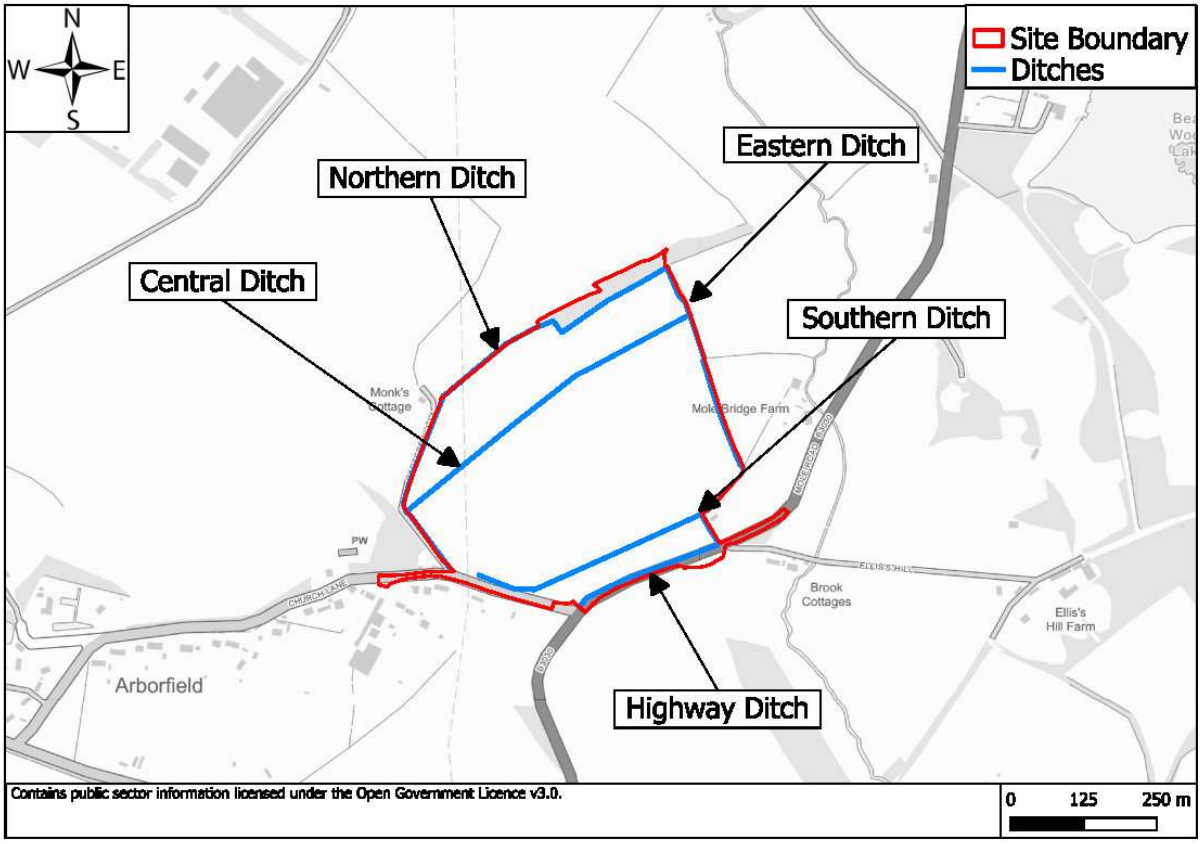
***Watercourses***

13.3.2 The plans in **Figures 13.2** and **13.8** show the Main River and Ordinary Watercourse receptors within the study area.

13.3.3 **Figures 13.3** to **13.7** and **13.9** to **13.10** are photographs showing the general form, setting and condition of the key watercourses in the study area.

**Within the Site Boundary**

**Figure 13.2 Ditch Locations**




13.3.4 A site walkover was undertaken on the 2nd April 2025. Ordinary watercourses and ditches were observed within the Site. This is shown in **Figure 13.2**.

13.3.5 **Figure 13.3 – 13.7** show photos taken during the site walkover.

**Figure 13.3 Central Ditch**

13.3.6 Figure 13.3 shows a well-defined grassy channel within the central part of the Site.

**Figure 13.4 Northern Ditch**

13.3.7 **Figure 13.4** shows a shallow vegetated ditch in the northern part of the Site.

**Figure 13.5 Eastern Ditch**

13.3.8 **Figure 13.5** shows a shallow and narrow hedgerow ditch along the eastern Site boundary.

**Figure 13.6 Southern Ditch**

13.3.9 **Figure 13.6** shows a shallow hedgerow ditch in the southern part of the Site.

**Figure 13.7 Highways Ditch**

**Figure 13.7** shows a grassy channel along Mole Road. The ditch contains a brick headwall with a pipe culvert.

**Within the Wider Study Area**

13.3.10 The nearest Main River is the Barkham Brook, which is located 230m east of the Site. This is a tributary of the River Loddon and it is in the same hydrological catchment as the Site; ie any overland and channel flow form the Site will end up in the Barkham Brook. Other Main Rivers within the wider study area include the Arborfield Brook and River Loddon, although these do not directly receive overland or channel flow from the Site.

13.3.11 The Barkham Brook flows through the wider study area, as shown in **Figure 13.8**.

13.3.12 The Barkham Brook and its tributaries have been observed on various site walkovers, including a site walkover undertaken on 3 April 2025. Here the Barkham Brook was observed in various accessible points. **Figures 13.9** and **13.10** show the Barkham Brook.

**Figure 13.8 Main Rivers within the wider study area**

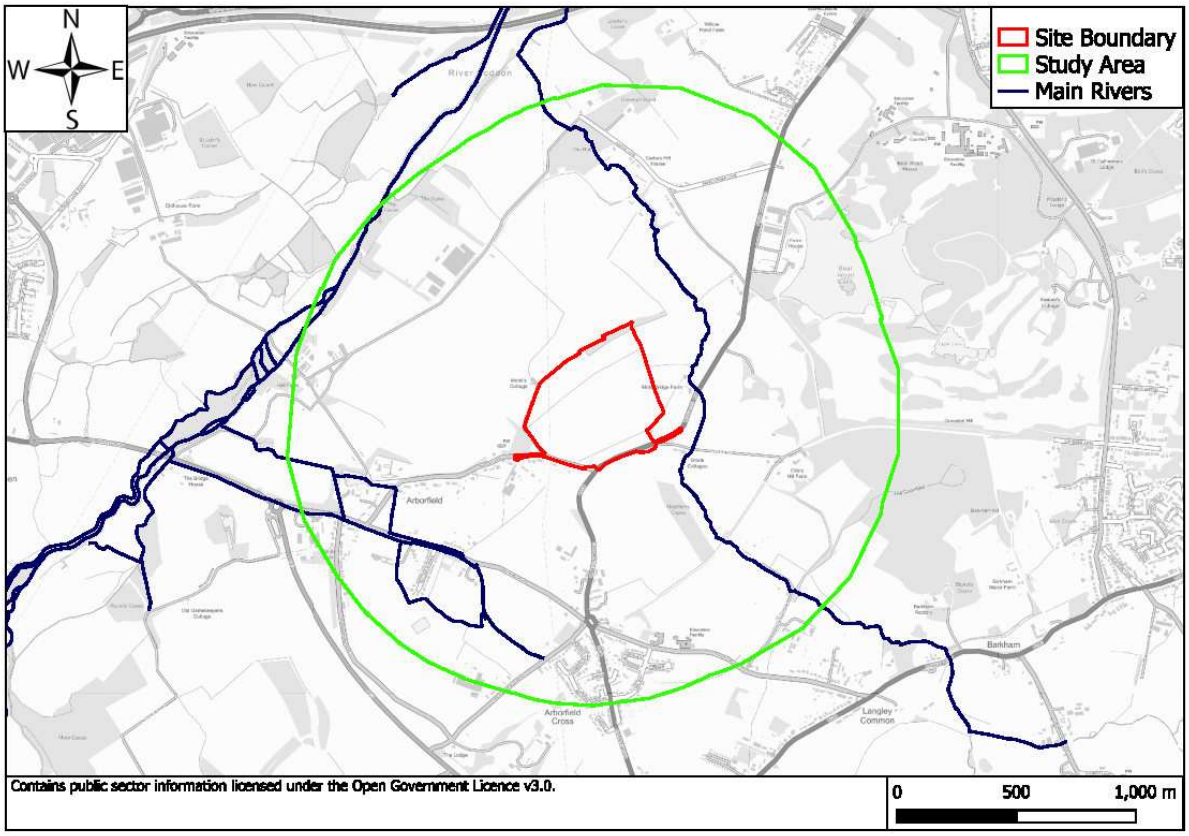
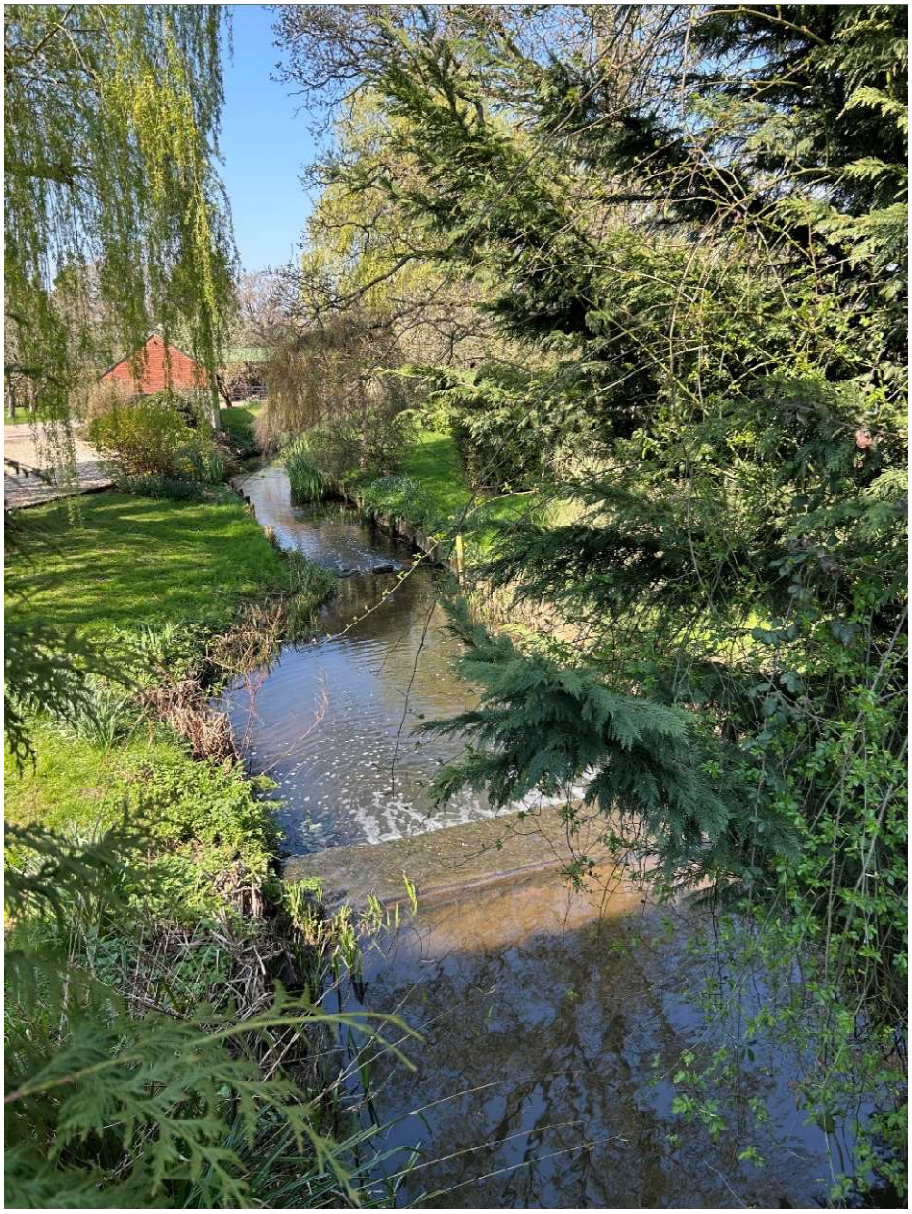


**Figure 13.9 Barkham Brook to the north of the Site**

**Figure 13.10 Barkham Brook from Mole Road Bridge**



***Site Topography***

13.3.13 **Figures 13.11- 13.16**.(Views A - F) show the topography of the Site and study area.

**Figure 13.11 View A – Site Topography**

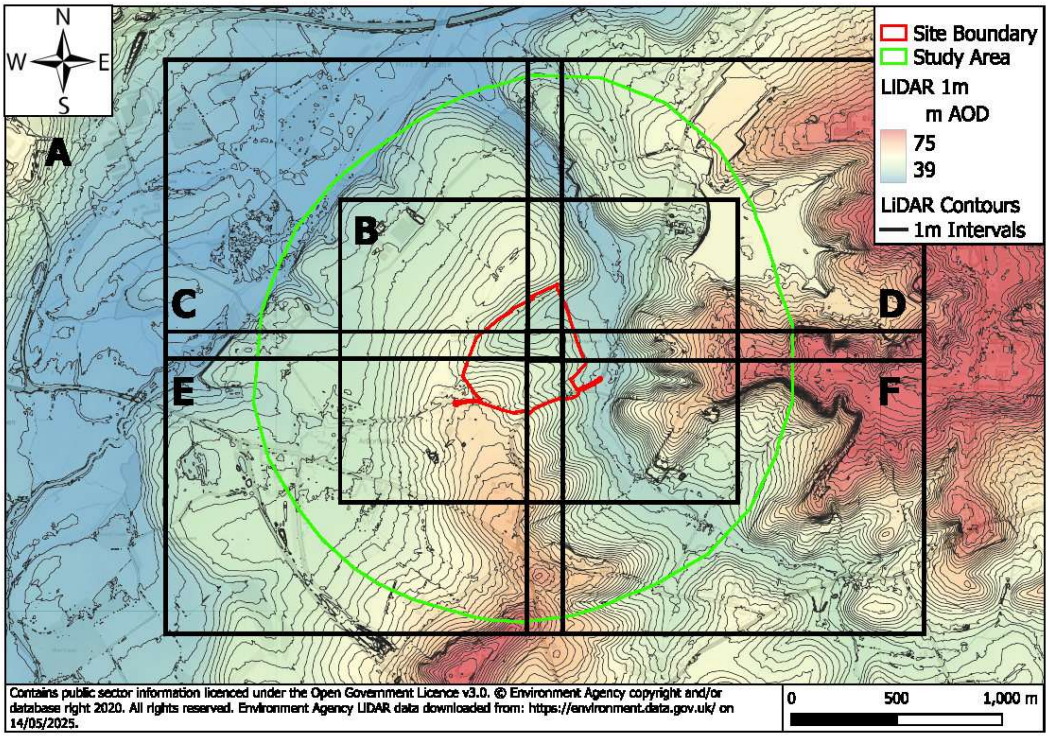
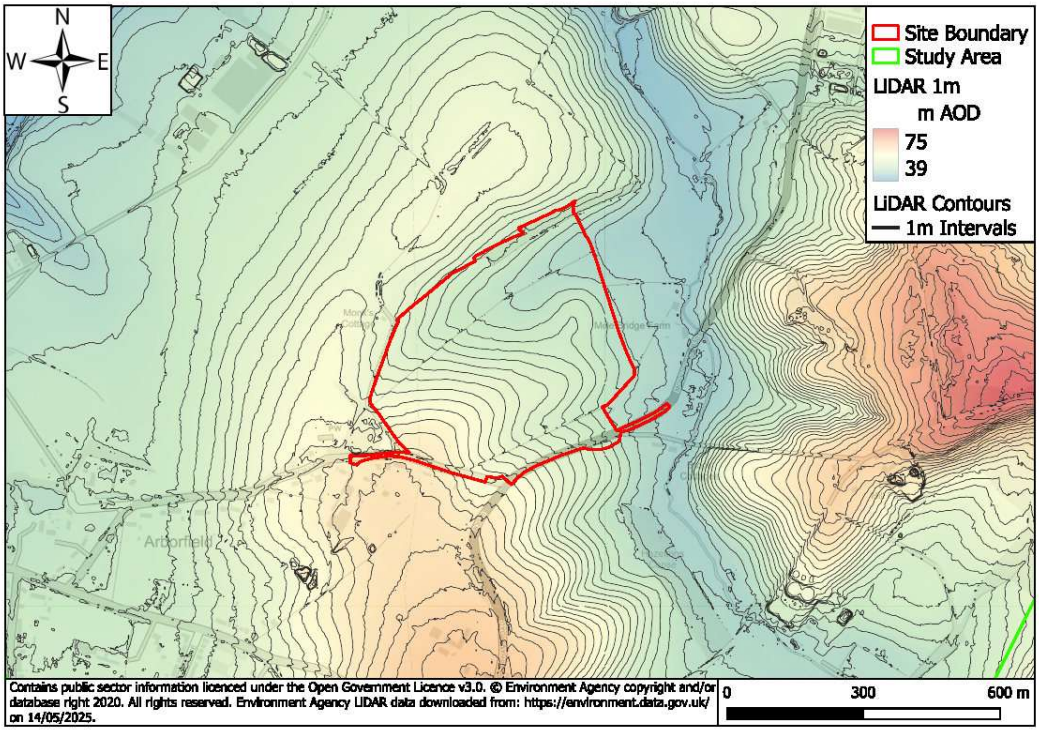
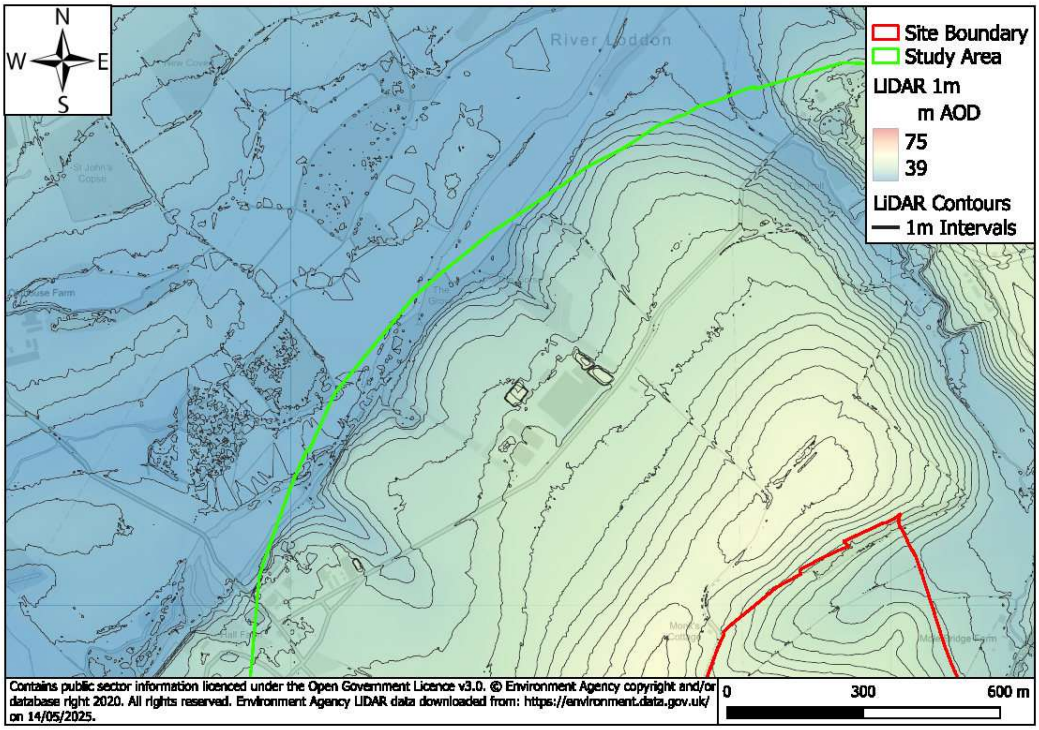


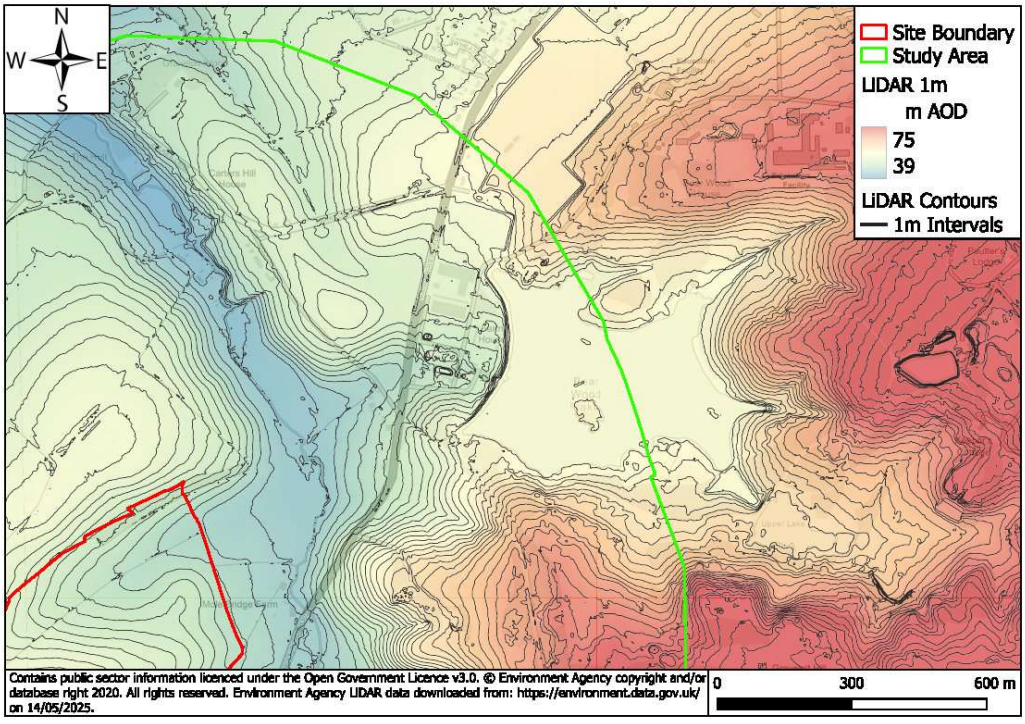

**Figure 13.12 View B – Site Topography**



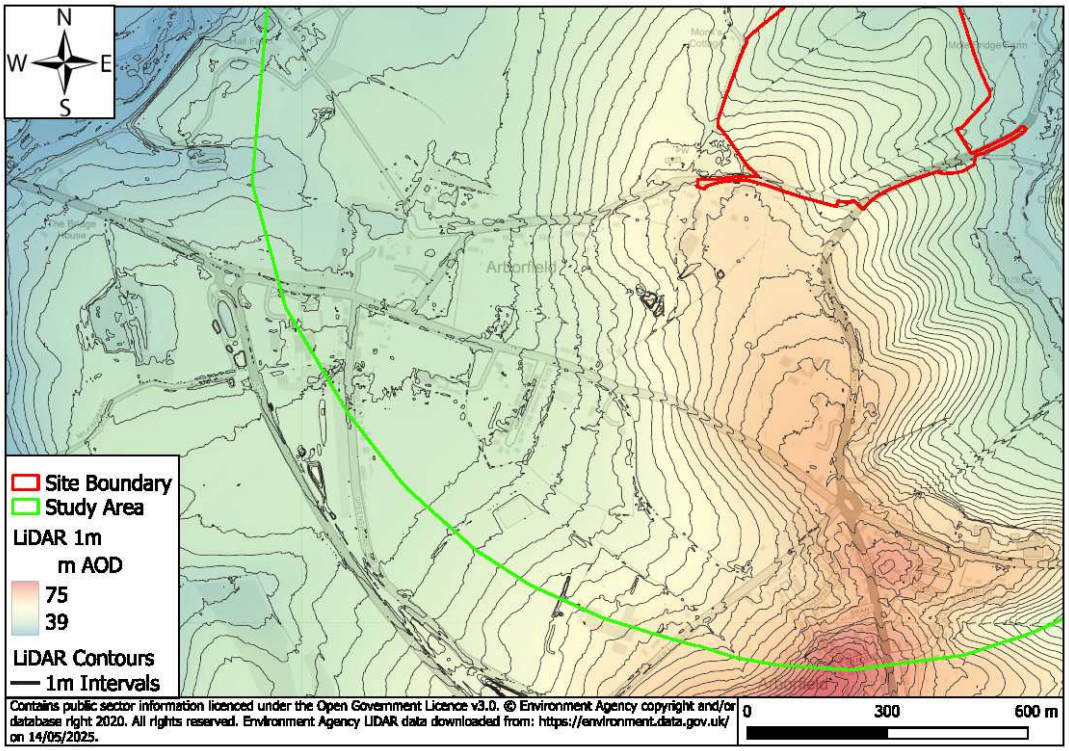
## Figure 13.13 View C - Site Topography



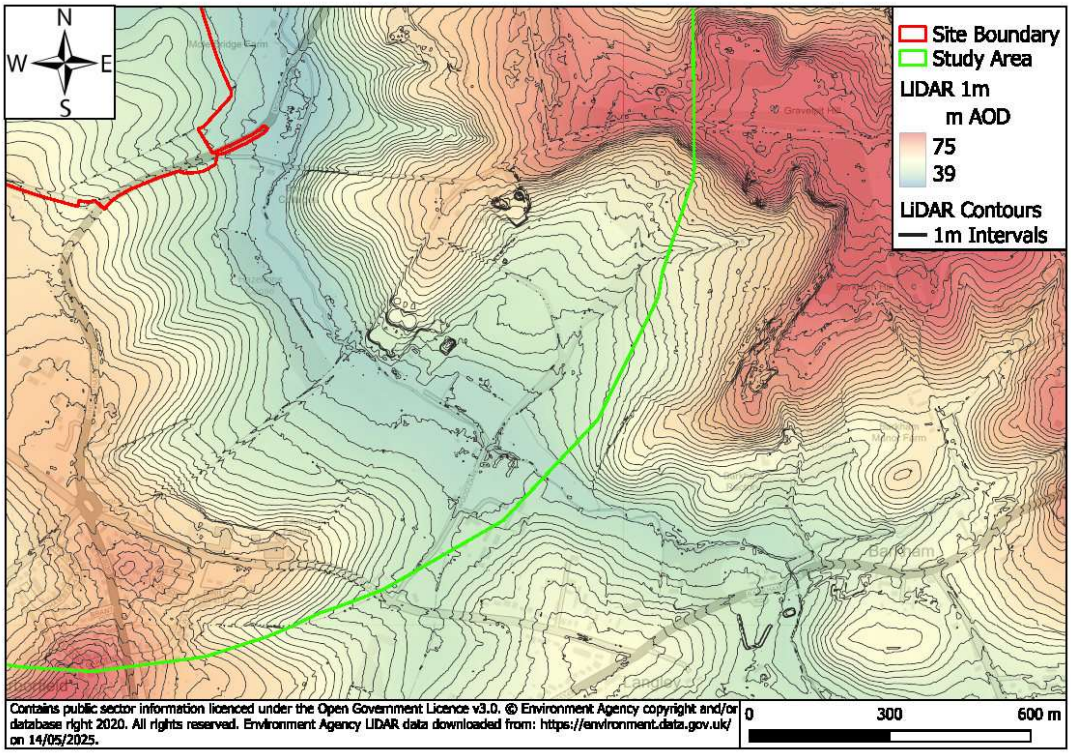

## Figure 13.14 View D - Site Topography



## Figure 13.15 View E - Site Topography




## Figure 13.16 View F - Site Topography



Within the Site Boundary

13.3.14 The LiDAR shows that the site slopes upwards from west to east. Ground levels across the Site are between 45m AOD and 59m AOD. The highest ground levels are within the southwestern part of the Site with an elevation of 59m AOD. The lowest ground levels are within the northeastern part of the Site with an elevation of 45m AOD.

13.3.15 A topographical survey has been carried out. The survey data generally agrees with the LiDAR. A copy of the topographical survey is included **in the FRA report**.

Within the Wider Study Area

13.3.16 The LiDAR shows that the wider study area slopes from west to east.

13.3.17 The lowest topographical LiDAR levels are along the extent of the Barkham Brook, here they range between approximately 39m and 46m AOD. This spans across View C, D and F.

13.3.18 The highest topographical LiDAR levels are in the south of the wider study area, shown in View E. In the very southeast of View E, the ground levels are around 74m AOD.

***Flood Risk and Drainage***

Fluvial Flood Risk

13.3.19 The EA Flood map for planning shows that the majority of the study area is located in Flood Zone 1 (Land less than 1 in 1,0000 annual probability)

13.3.20 The EA's Risk of flooding from rivers and sea mapping, updated in January 2025 shows areas at risk of flooding from rivers and sea taking into account the presence and condition of flood defences. The EA rivers and Sea is based on the following:

- High Risk: 1 in 30 or more (3.3% or greater) annual probability
- Medium Risk: 1 in 100 to 1 in 30 (1% to 3.3%) annual probability
- Low Risk: 1 in 1,000 to 1 in 100 (0.1% to 1%) annual probability
- Very Low Risk: Less than 1 in 1,000 (0.1%) annual probability

***EA Flood Zone Map***

13.3.21 The EA Flood Map for Planning provides an initial indication of the extent of Flood Zones. In the NPPF, Flood Zones are defined as follows:

13.3.22 Flood Zone 1: 'Low Probability' – Land less than 1 in 1,000 (0.1%) annual probability of river or sea flooding.

13.3.23 Flood Zone 2: 'Medium Probability' – Land between 1 in 100 (1%) and 1 in 1,000 (0.1%) annual probability of river flooding, or between 1 in 200 (0.5%) and 1 in 1,000 (0.1%) annual probability of sea flooding.

13.3.24 Flood Zone 3: 'High Probability' – Land at 1 in 100 (1%) or greater annual probability or river flooding, or 1 in 200 (0.5%) or greater annual probability of sea flooding.

13.3.25 **Figures 13.17-13.34** show the EA Flood Zone mapping.

**Figure 13.17 View A Study Area – Flood Zones**

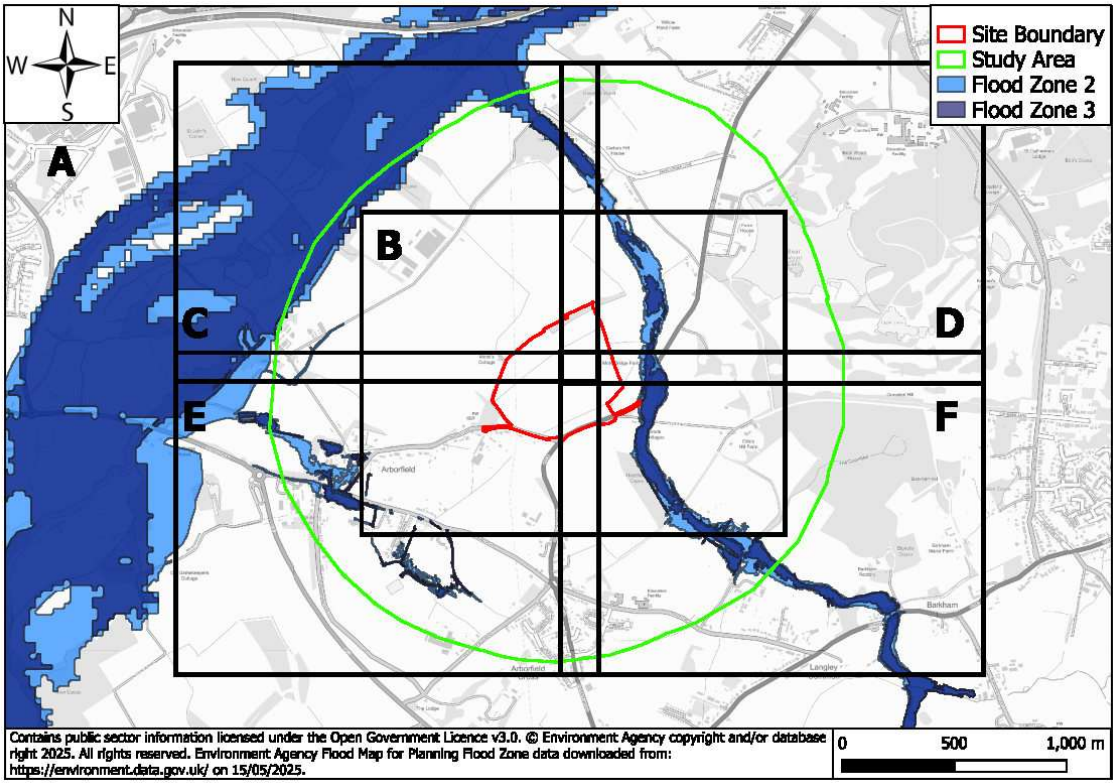
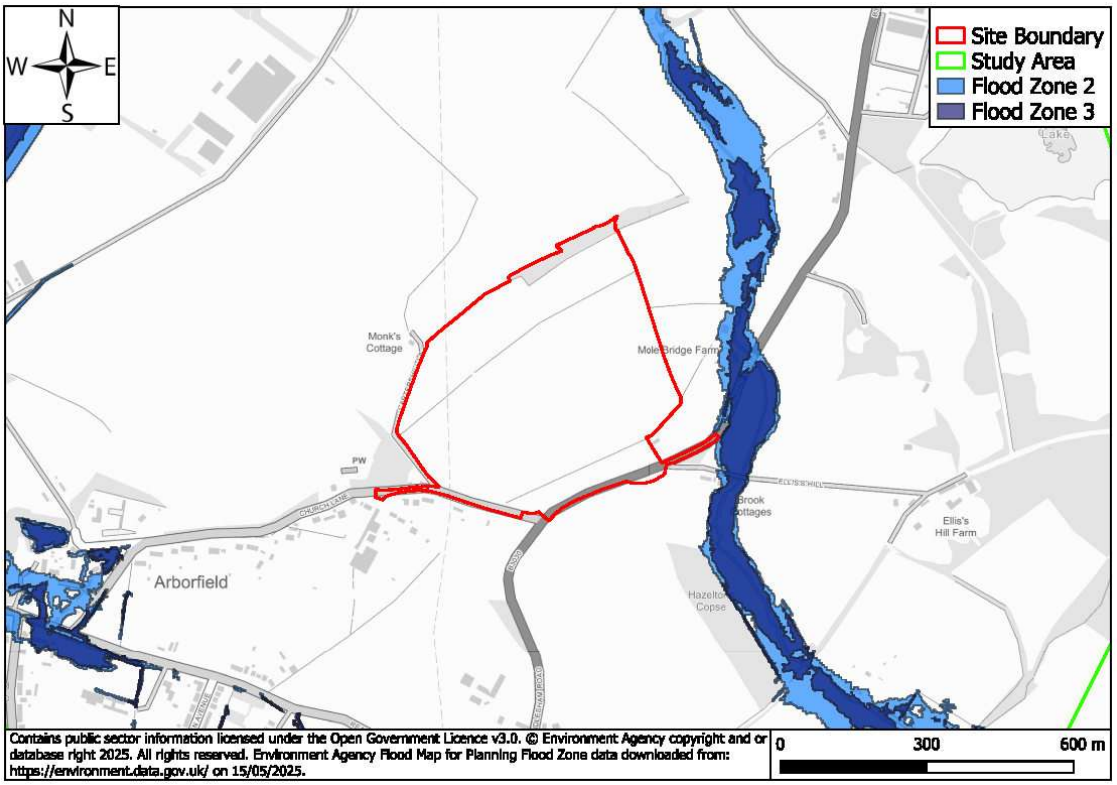
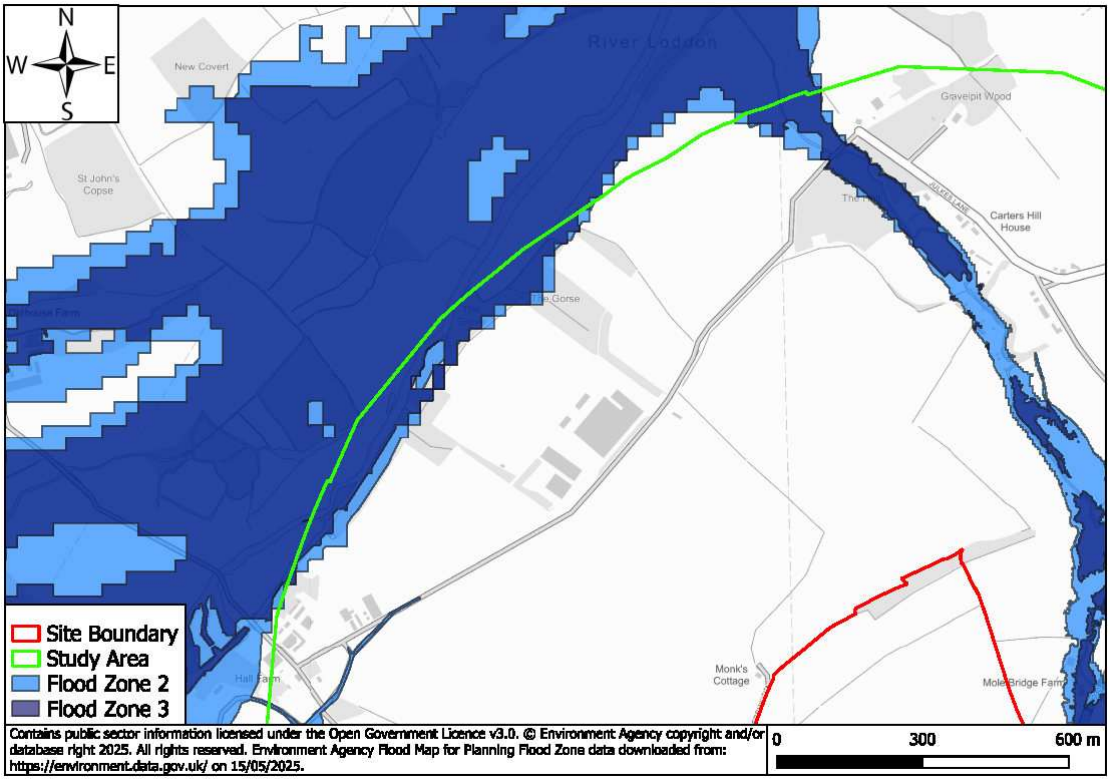


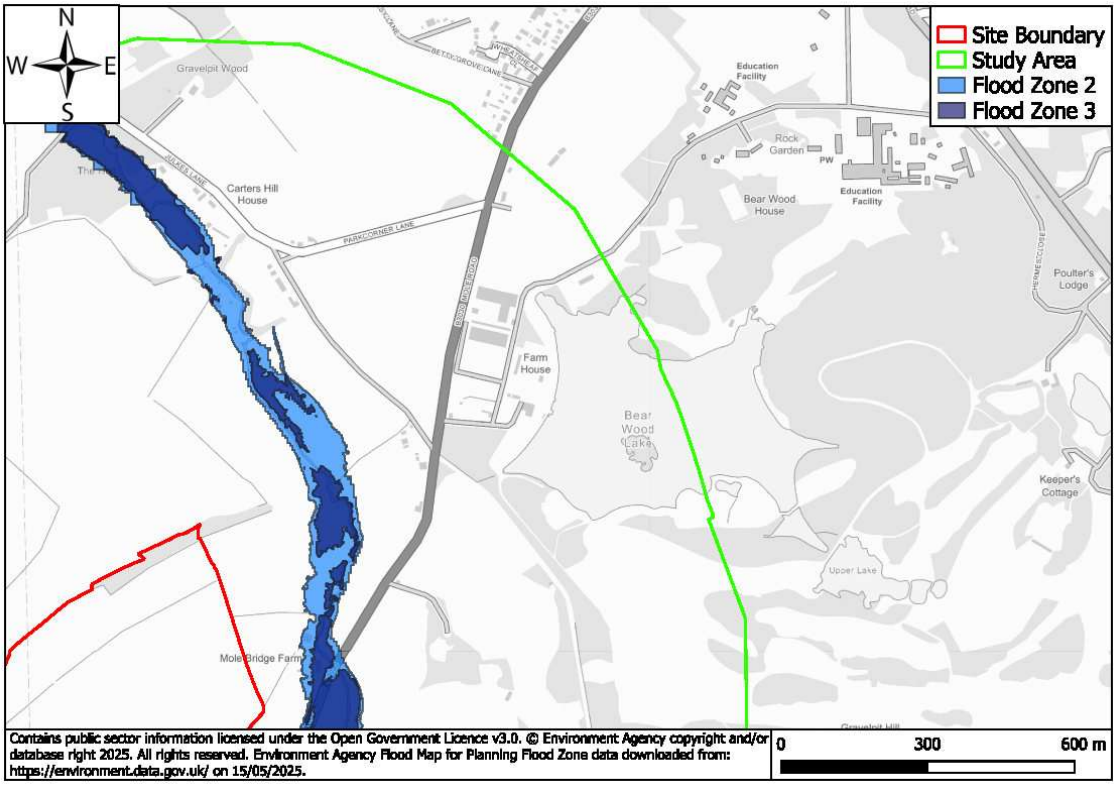

**Figure 13.18 View B – Flood Zones**



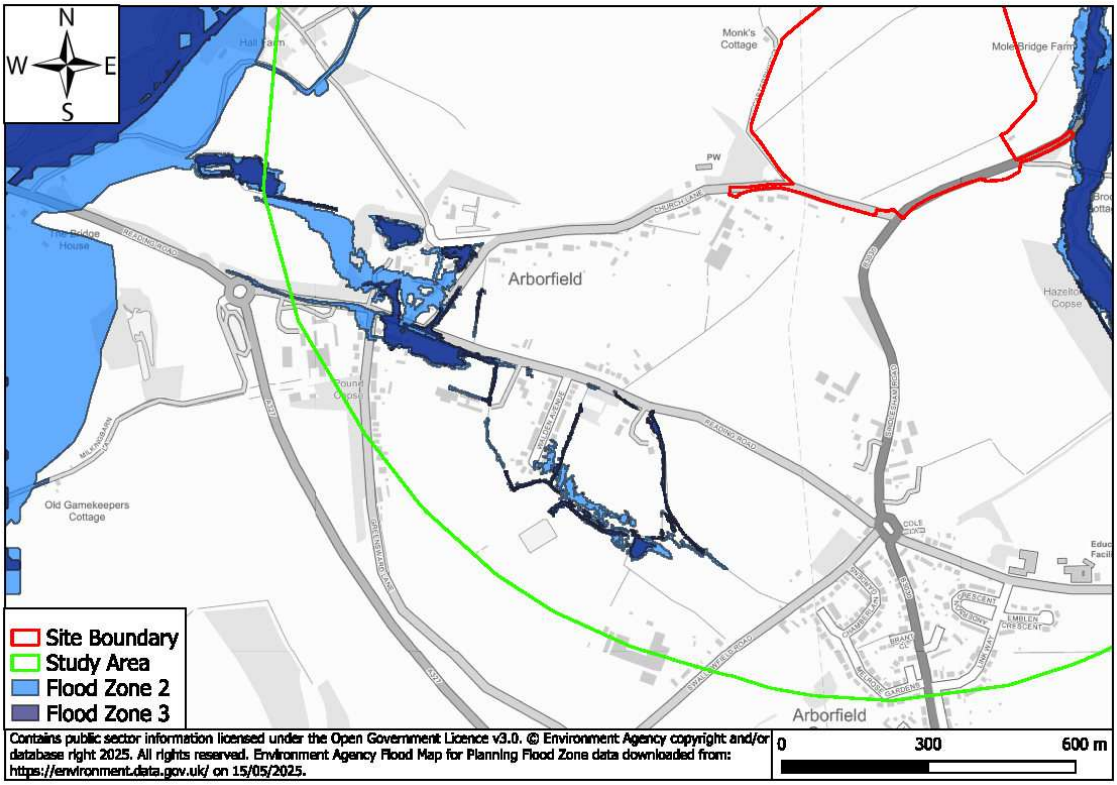
## Figure 13.19 View C– Flood Zones



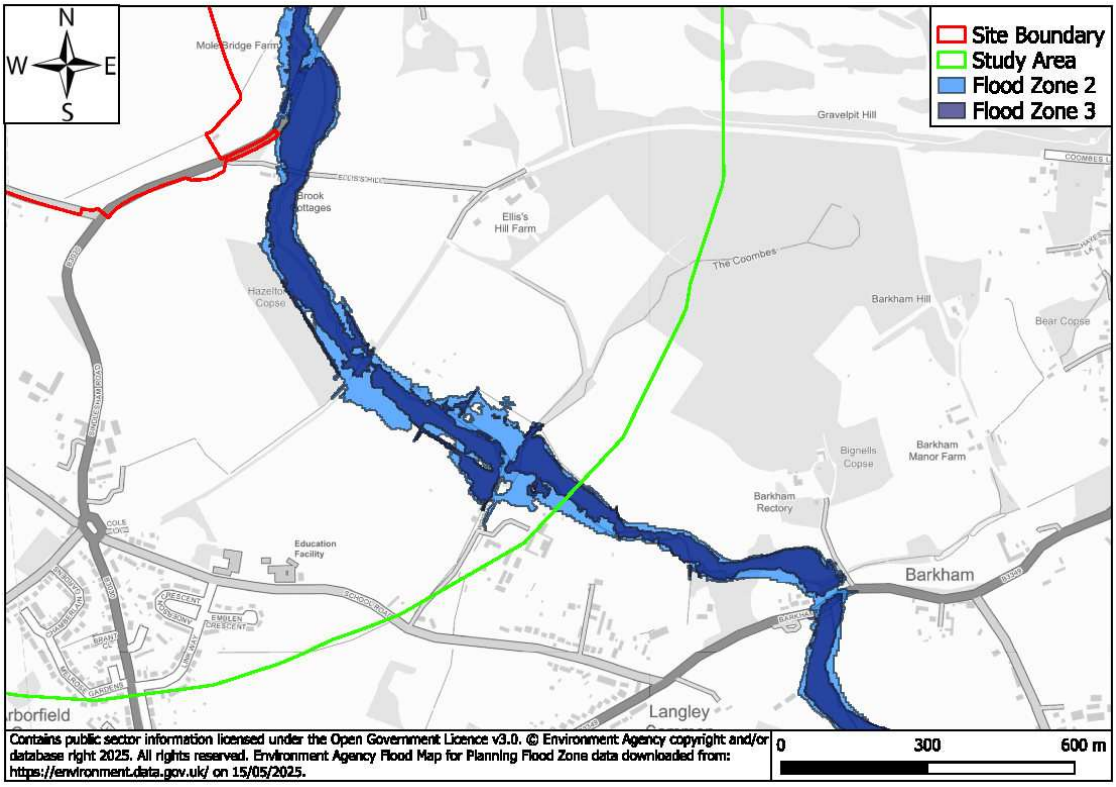

## Figure 13.20 View D – Flood Zones



## Figure 13.21 View E – Flood Zones




## Figure 13.22 View F – Flood Zones



Within the Site Boundary

13.3.26 **Figure 13.18, View B** shows the Site itself. The mapping shows that the entirety of the Site is located within Flood Zone 1.

13.3.27 Therefore, the area within the Site boundary is at low risk from fluvial flood risk.

Within the Wider Study Area

13.3.28 Within the wider area of the study area, there are areas which are located in Flood Zones 2 and 3.

13.3.29 The main area of land that lies within Flood Zones 2 and 3, is where the Barkham Brook flows and the land immediately surrounding it. This is shown in **Figures 13.19 – 13.20, 13.22** (views C, D and F). The mapping shows that it follows the path of the Barkham Brook.

13.3.30 **Figure 13.21** View E shows an area of the study area that is located in Flood Zone 2 and 3. This area is located in the already existing residential area of Arborfield. The area to the southwest, it seems to follow the road channels.

**Surface Water Flood Risk**

13.3.31 The EA's Risk of Flooding from Surface Water mapping indicates areas that could be susceptible to surface water flooding during extreme rainfall events. The EA surface water mapping defines rainfall events based on the following:

- 1 in 30 (3.3%) annual probability 'High Risk'
- 1 in 100 (1%) annual probability 'Medium Risk'
- 1 in 1,000 (0.1%) annual probability 'Low Risk'
- Lower than 1 in 1,000 (0.1%) annual probability 'Very Low Risk'.

**Figure 13.23 View A – NaFRA Surface Water Fooding**

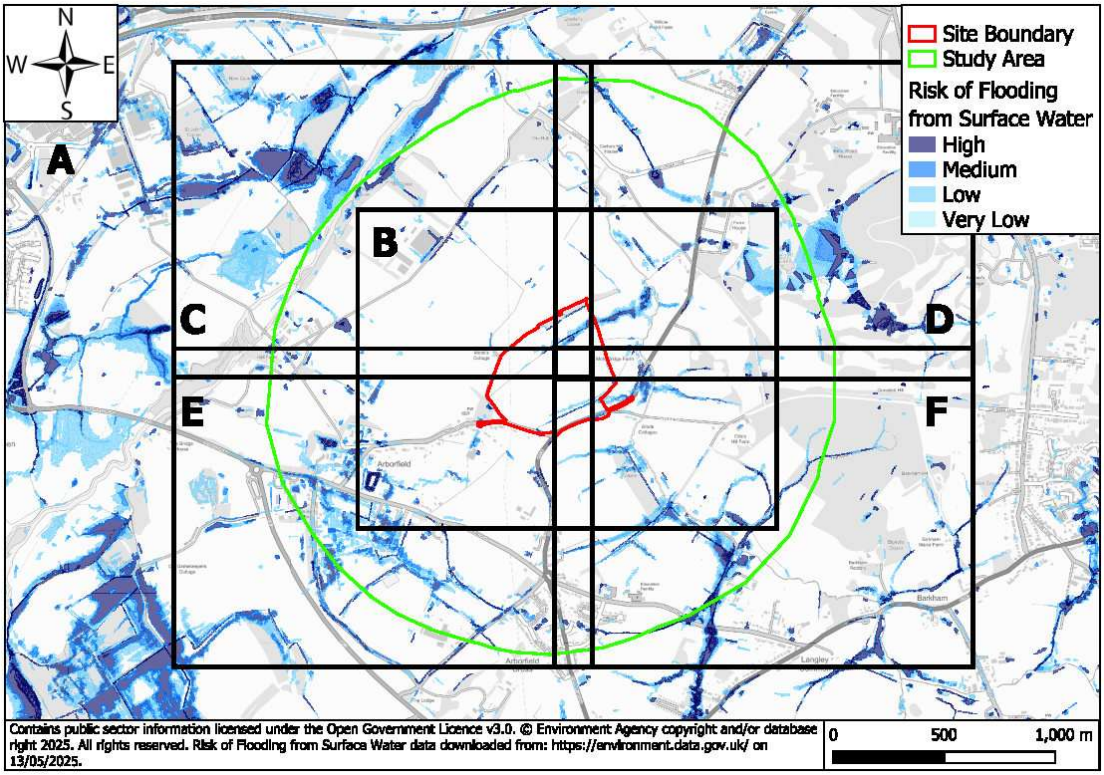



**Figure 13.24 View B - NaFRA Surface Water Fooding**

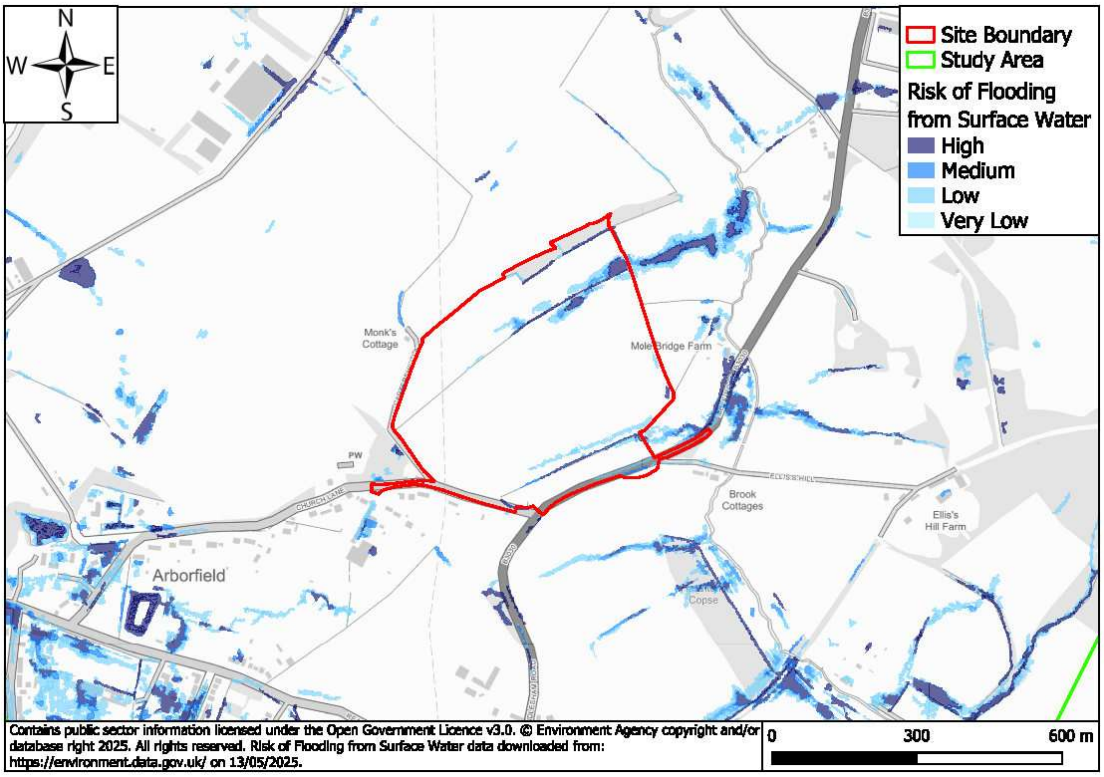


**Figure 13.25 View C - NaFRA Surface Water Fooding**

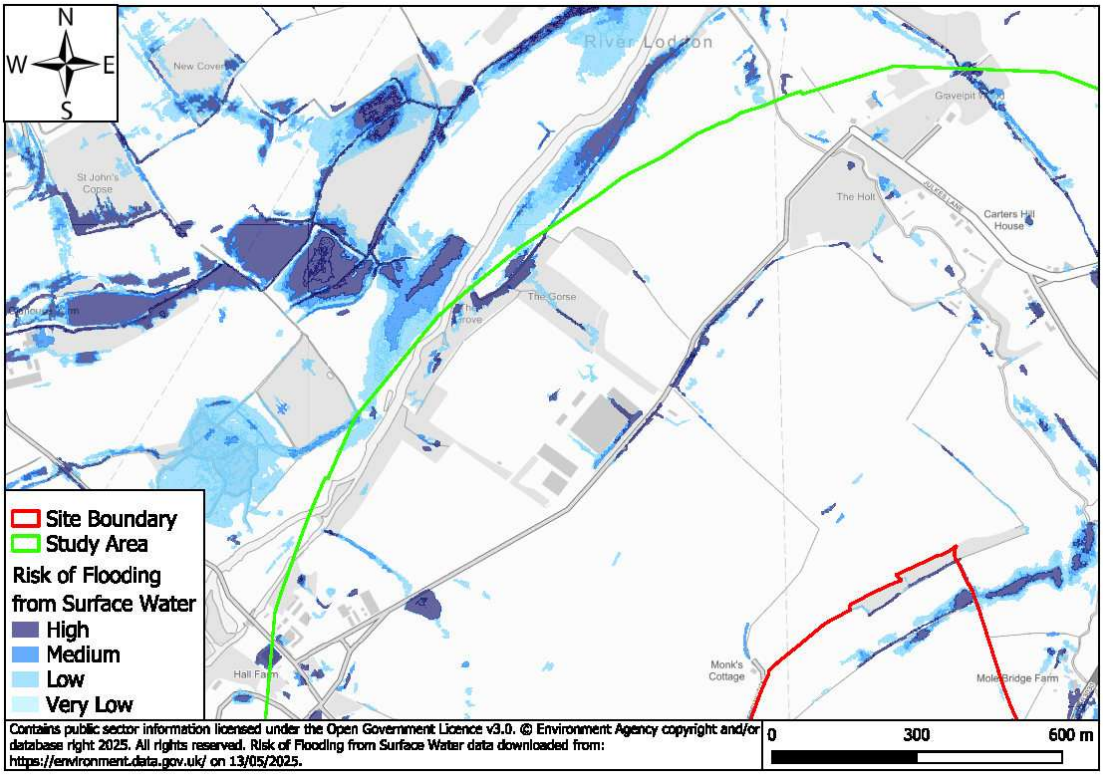
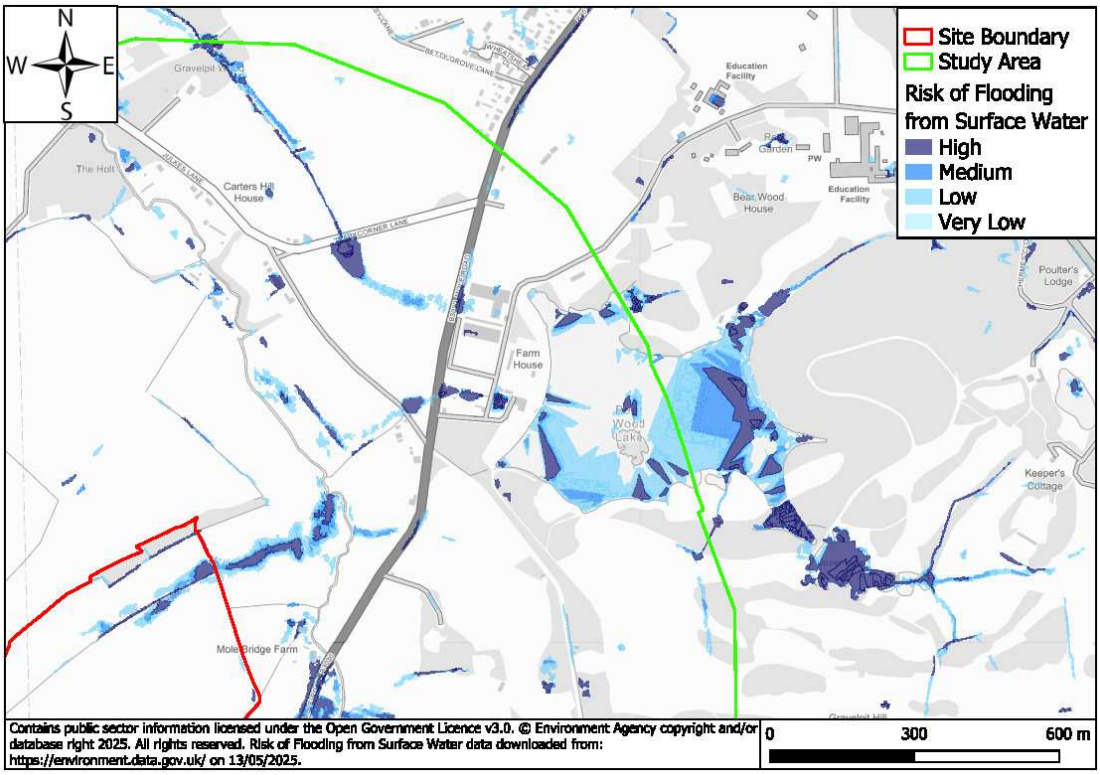
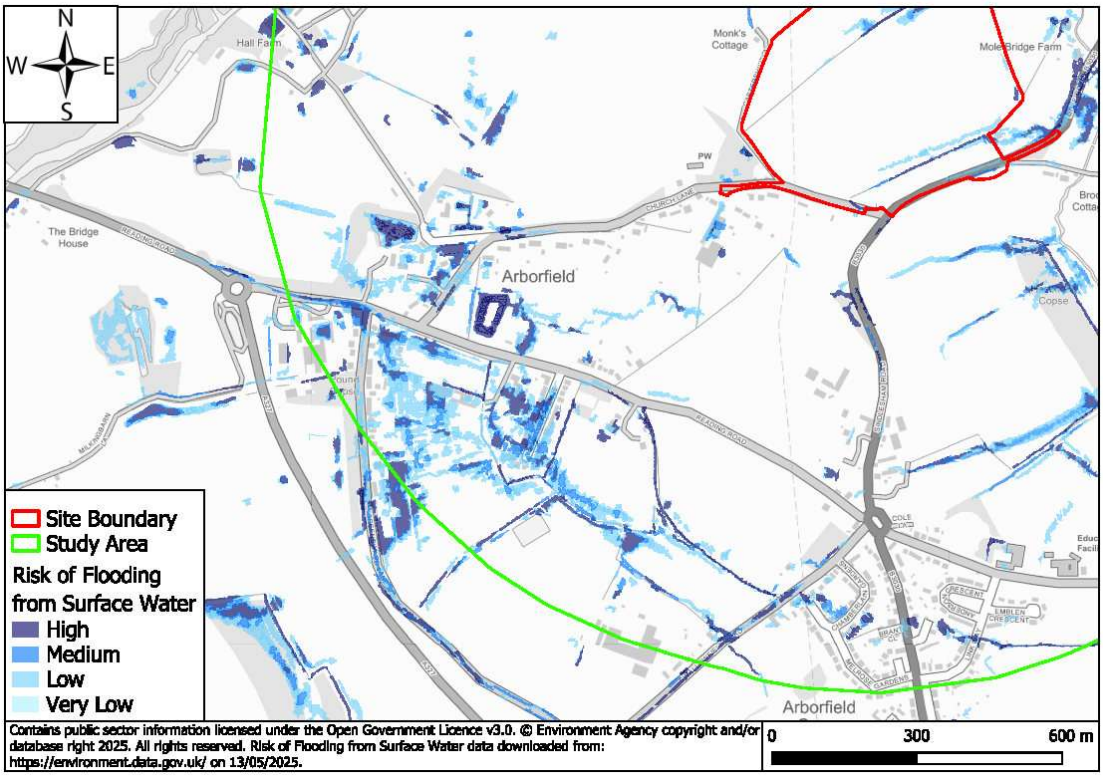


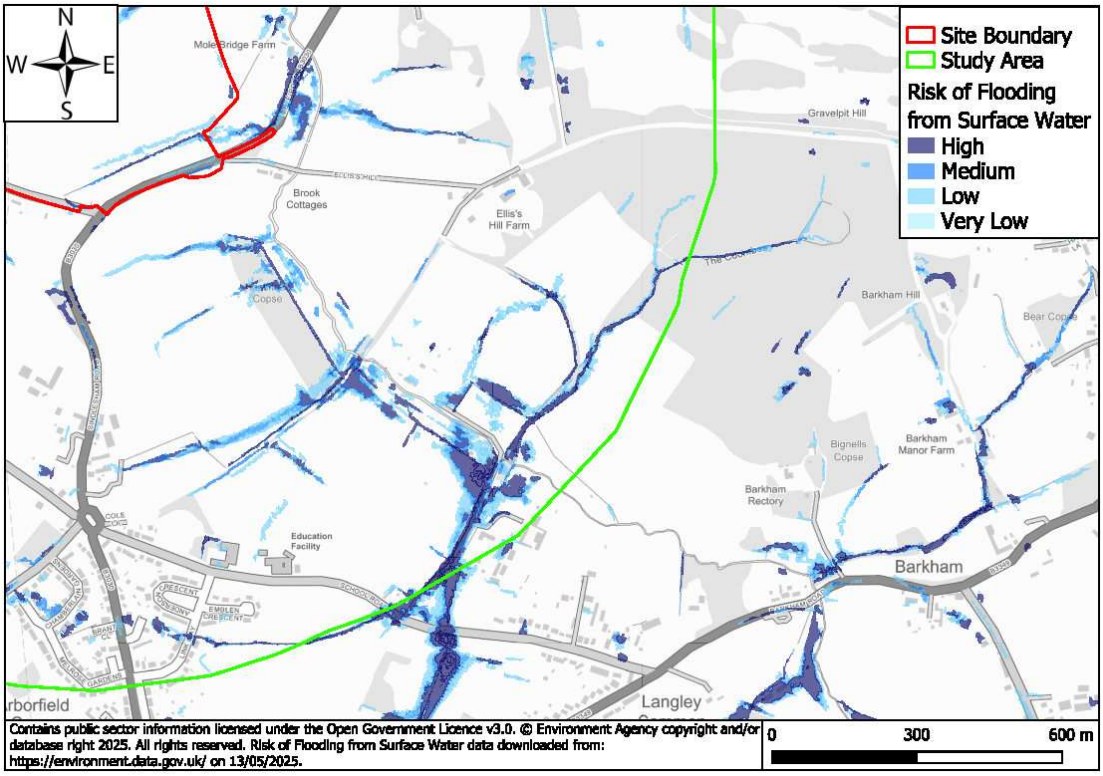

**Figure 13.26 View D - NaFRA Surface Water Fooding**



## Figure 13.27 View E - NaFRA Surface Water Fooding




## Figure 13.28 View F - NaFRA Surface Water Fooding



Within the Site Boundary

13.3.32 Within the Site boundary, as shown in **Figure 13.24, View B**, there are three distinct areas of surface water flow.

13.3.33 The largest of the surface water flow pathways is in the northeast of the Site. Here, there are areas of all the risk categories of 'Very Low', 'Low', 'Medium' and 'High'. The biggest area is on the eastern boundary. Further along the watercourse the surface water flooding is less.

13.3.34 In the northeastern corner of the Site, along the boundary of the wooded area, there is an area of surface water flow. This surface water follows the wooded boundary. From Site observations there is a ditch here.

13.3.35 There is also an area of surface water flow at the south if the Site. In the southern section of the Site there is a surface flow pathway that flows from east to west.

Within the Wider Study Area

13.3.36 **Figure 13.25 View C** shows small areas of surface water ponding. The largest area is located on the flat land of floodplain to the east of the River Loddon. This runs through the wooded area of The Gorse and The Grove. There is also an area of surface water alongside the track between The Holt and Hall Farm.

13.3.37 There is a section **Figure 13.26** View D shows areas of Bear Wood Lake that are potentially impacted by surface water flooding. There is a surface water flow pathway flowing south to north from Mole Road, over Parkcorner Lane and through Gavelpit Wood.

13.3.38 The land surrounding Arborfield has pathways of surface water flow which are categorised as 'low', 'medium' and 'high'

13.3.39 Overall, the flood risk from surface water across the Site and study area is low.

Reservoir Flood Risk

**Figure 13.29 View A – Reservoir Flooding**

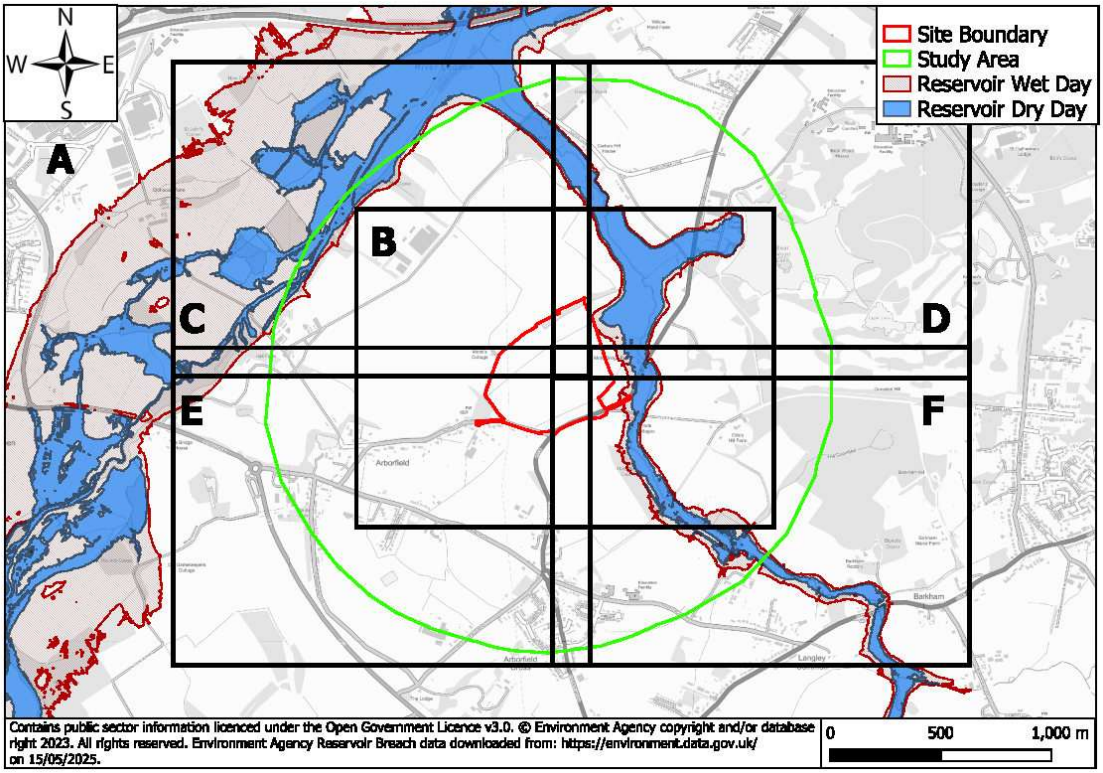
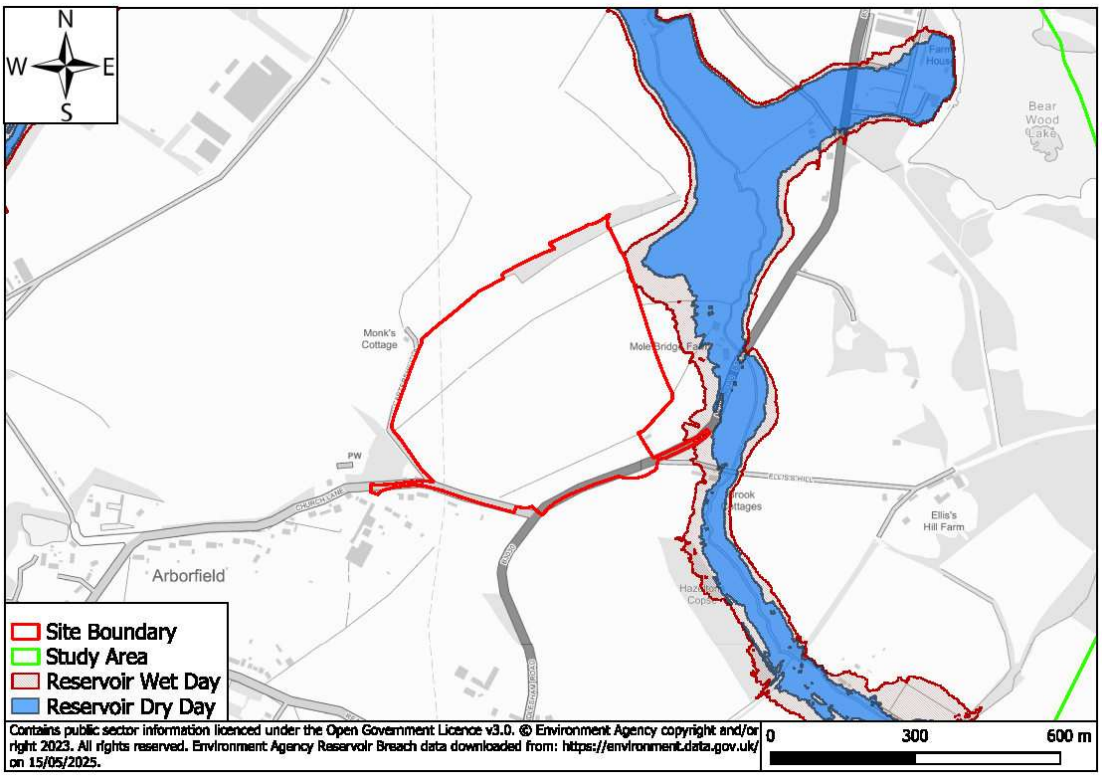
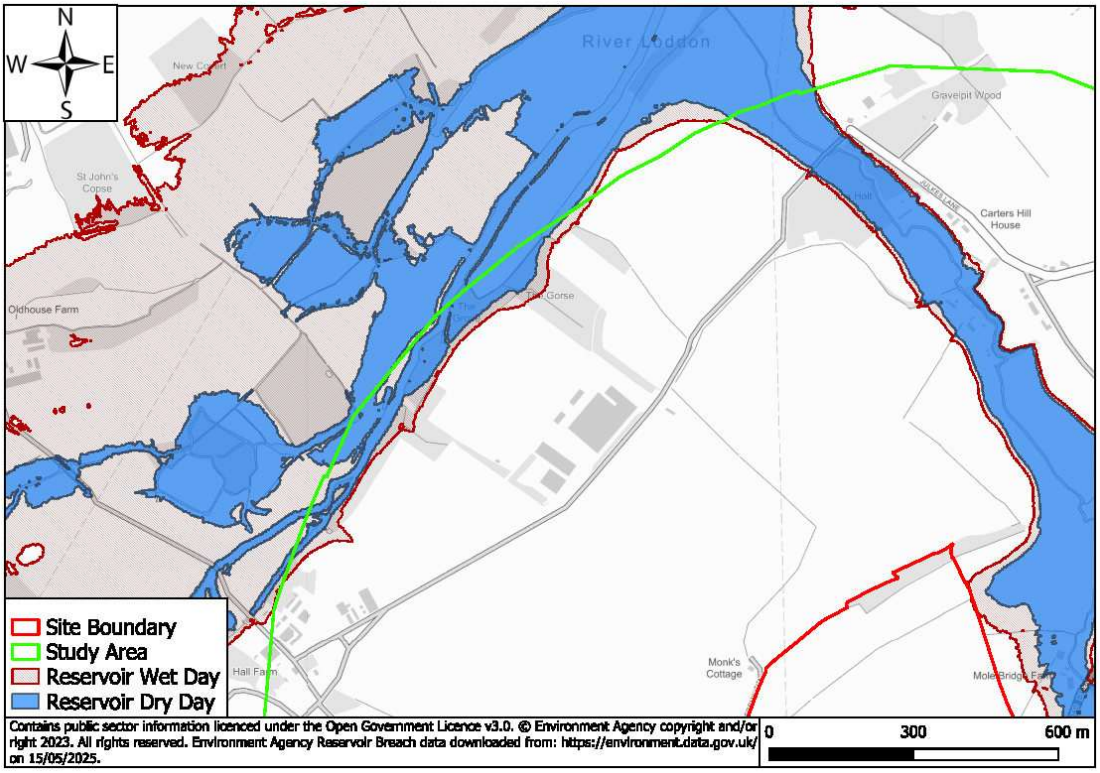


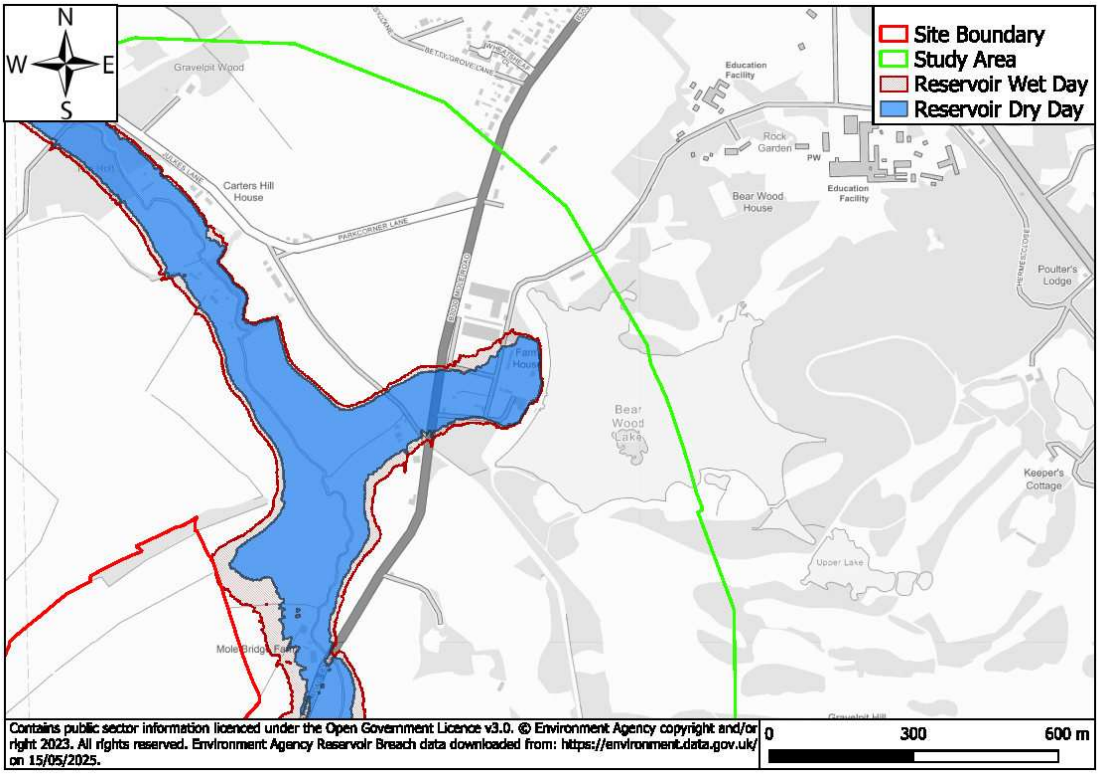

**Figure 13.30 View B – Reservoir Flooding**



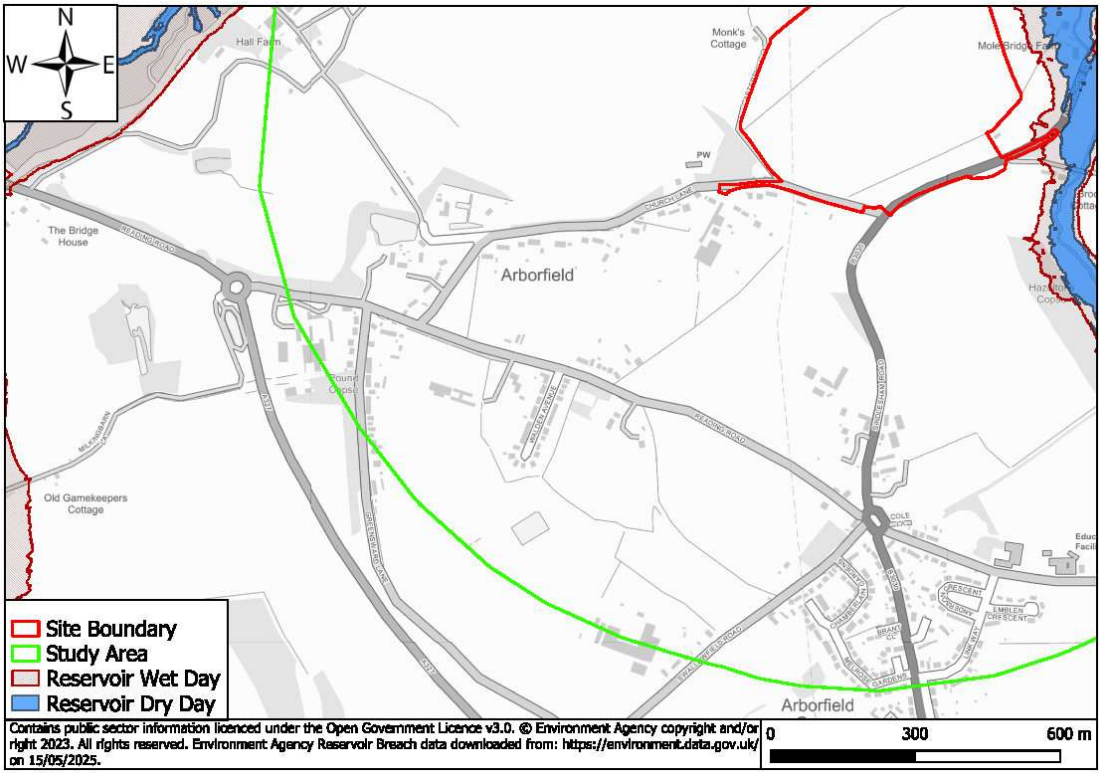
## Figure 13.31 View C – Reservoir Flooding



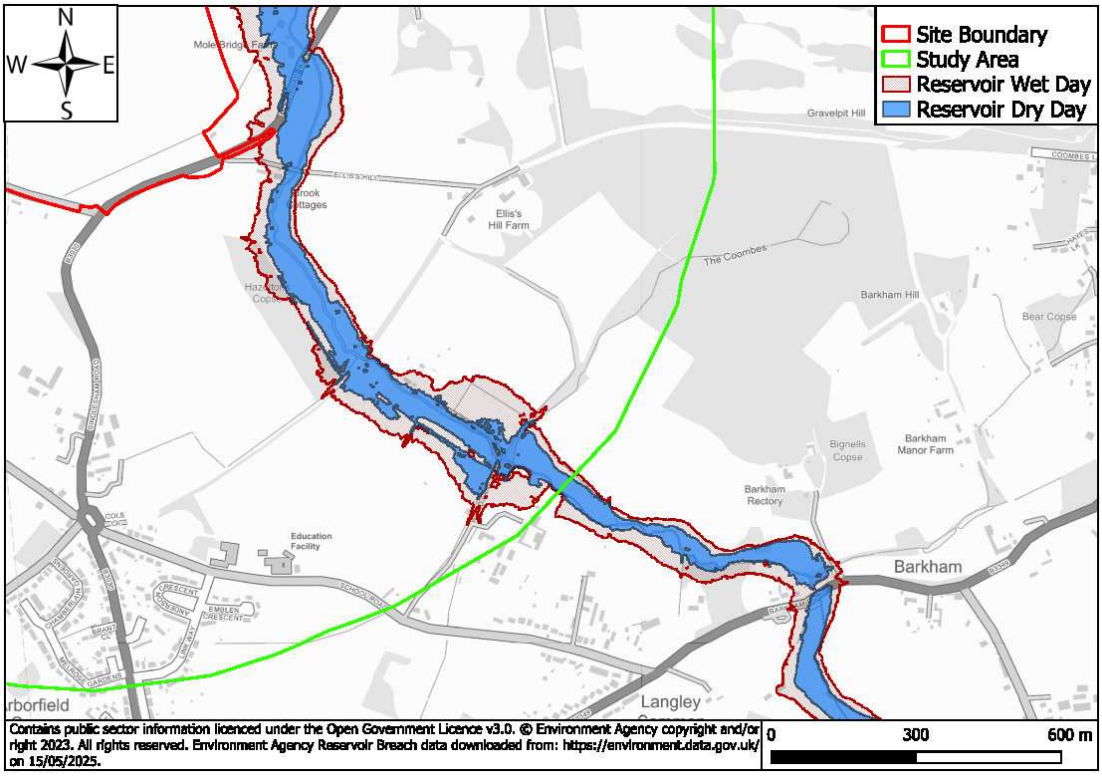

## Figure 13.32 View D – Reservoir Flooding



## Figure 13.33 View E – Reservoir Flooding




## Figure 13.34 View F – Reservoir Flooding



Within the Site Boundary

13.3.40 Bearwood lake is the closest reservoir that is located to the east of the Site.

13.3.41 The mapping shows that there is no potential risk of flooding from reservoir breach events (both in wet and dry day events) within the Site boundary. To the east of the Site there an area that is potentially at risk of flooding from reservoirs in wet and dry day events.

Within the Wider Study Area

13.3.42 Outside the Site boundary, within the study area, areas of reservoir flood risk follow the Barkham Brook and River Loddon corridors.

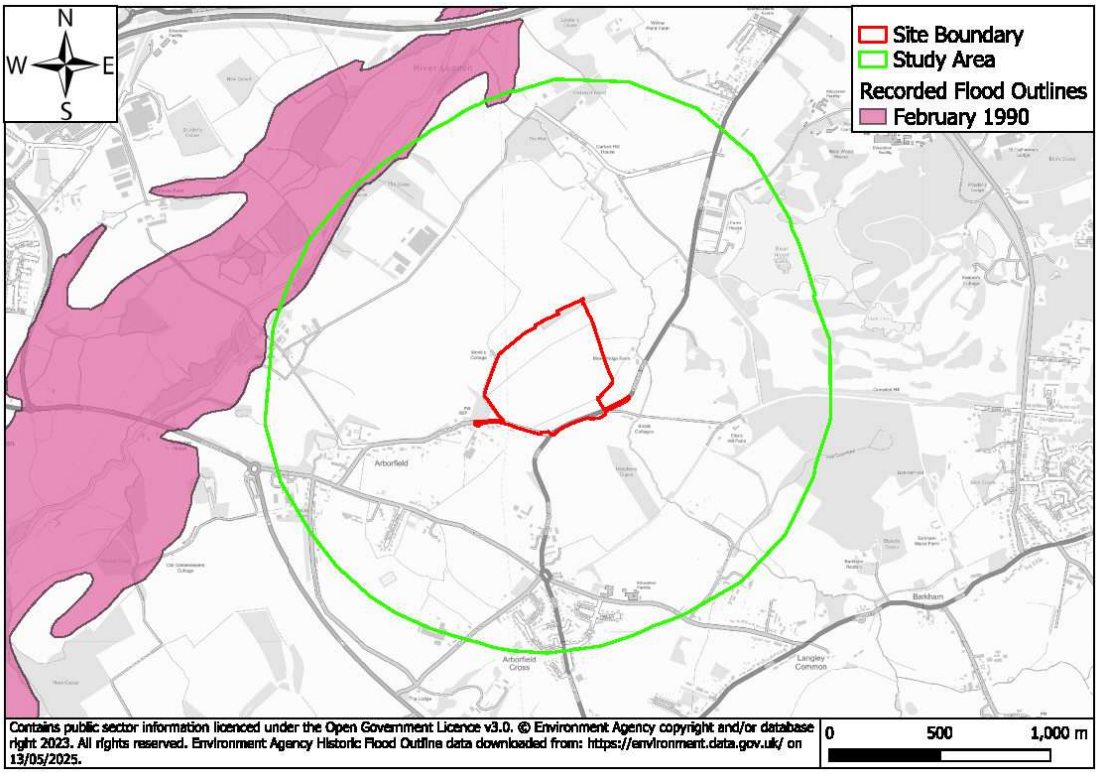
## Historical Flood Risk

13.3.43 **Table 13.5** outlines the dates of recorded historical flood events, which is based on historic flood mapping, EA recorded flood outlines, and LLFA historic flood points. The events are within the areas of Arborfield, Arborfield Green, Barkham, Earley, Shinfield and Swallowfield.

### Table 13.8 Historical Flood Events

| Date | Location | Flood Source | Description |
|---|---|---|---|
| **July 2025** | Western boarder of the River Loddon & Northeast of M4 | Fluvial | Channel capacity exceeded |
| **July 2007** | Western boarder of the River Loddon | Fluvial | Channel Capacity exceeded |
| **February 1991** | Eastern Boarder of the River Loddon, and Blackwater River to the south-east | Fluvial | Channel capacity exceeded |
| **January 1991** | Western boarder of the River Loddon & Northeast of M4 | Fluvial | Channel capacity exceeded |
| **February 1990** | Eastern Boarder of the River Loddon, and Blackwater River to the south-east | Fluvial | Channel capacity exceeded |
| **January 1981** | Northeast of M4 | Fluvial | Channel capacity exceeded |
| **August 1977** | Early & Woodly | Fluvial | Channel Capacity exceeded |
| **January 1974** | Northeast of M4 | Fluvial | Channel capacity exceeded |
| **November 1974** | Eastern Boarder of the River Loddon, and Blackwater River to the south-east | Fluvial | Channel capacity exceeded |
| **September 1968** | Eastern Boarder of the River Loddon, and Blackwater River to the south-east | Fluvial | Channel capacity exceeded |
| **January 1947** | Northeast of M4 | Fluvial | Channel capacity exceeded |

## Figure 13.35 Recorded Flood Outlines – February 1990




## Figure 13.36 Recorded Flood Outlines – February 1991

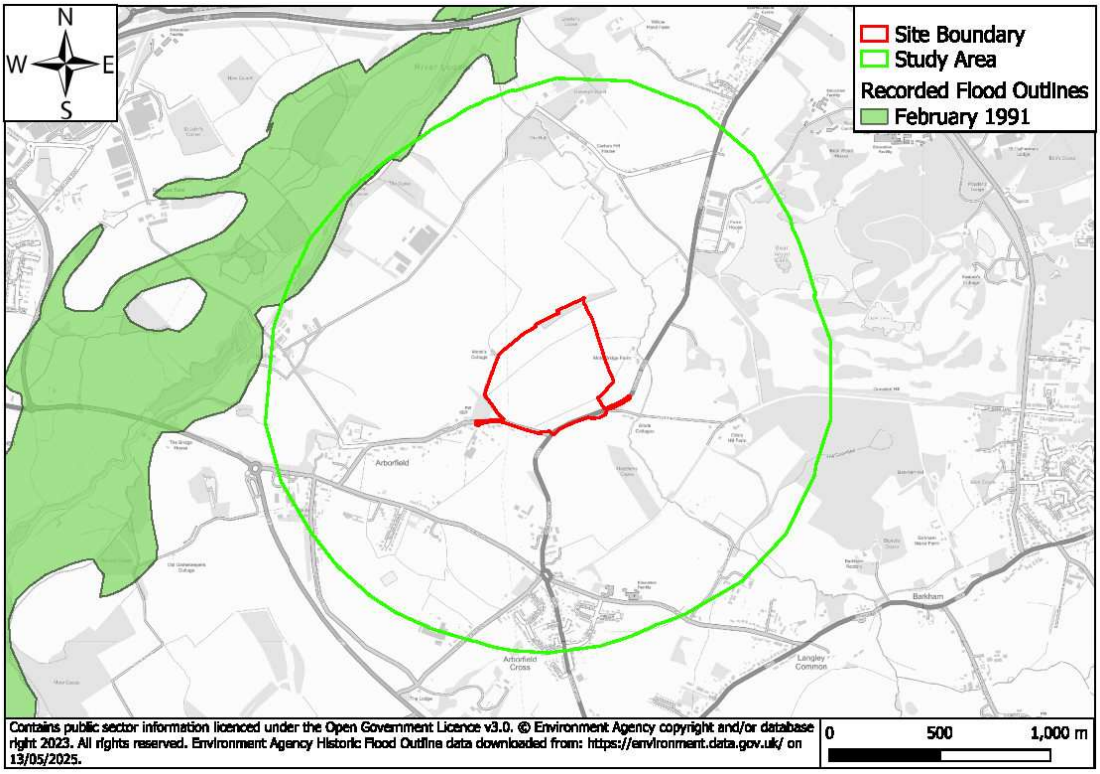
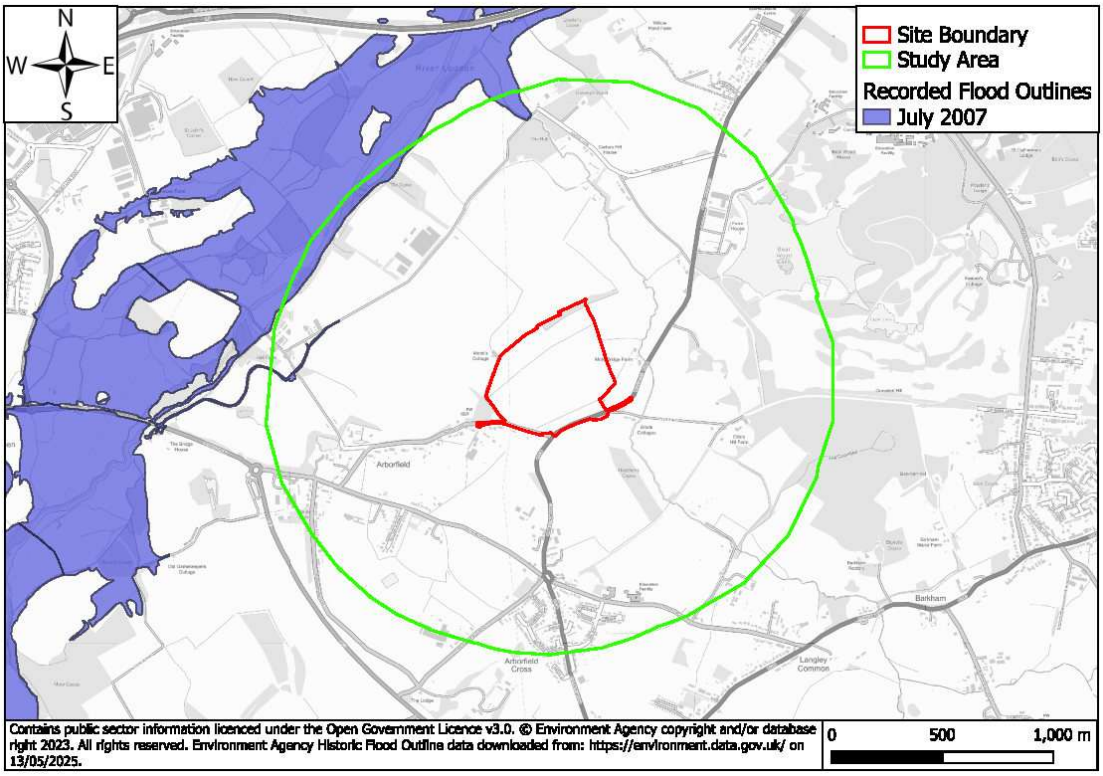


**Figure 13.37 Recorded Flood Outlines – July 2007**




13.3.44 **Figures 13.35 to 13.37** show the recorded flood outlines for February 1990, February 1991 and July 2007.

Within the Site Boundary

13.3.45 The mapping confirms that there are no records of flooding within the Site boundary.

Within the Wider Study Area

13.3.46 The three figures show similar extents, where historic flooding just encroaches into the study area at the northwestern boundary of the Site. This area is the land at the back of The Dairy Research Centre, The Gorse and The Grove and the corridor of the River Loddon.

**Figure 13.38 Typical view of narrow floodplain to the east of the River Loddon**

Sewer Flood Risk

13.3.47 Sewer asset records obtained from Thames Water show that there are no surface or foul sewers within the Site or immediately adjoining.

13.3.48 A copy of the Thames Water asset record is included within the FRA.

13.3.49 When exceeded, surcharged sewer networks can lead to flooding from backed up manholes and gully connections.

13.3.50 Thames Water Asset Location Plans (ALS/ALS/24/2025_5137033) show that there are no surface or foul sewers within the Site or immediately adjoining.

13.3.51 The WBC Level 1 SFRA includes a table of sewer flooding incidents recorded by Thames Water (January 2000-May 2022) for specific postcodes. The postcode areas are shown in **Figure 13.39**. **Table 13.6** shows the number of sewer flooding incidents that have occurred in each postcode.

**Figure 13.39 Postcode areas for the Site and wider study area**

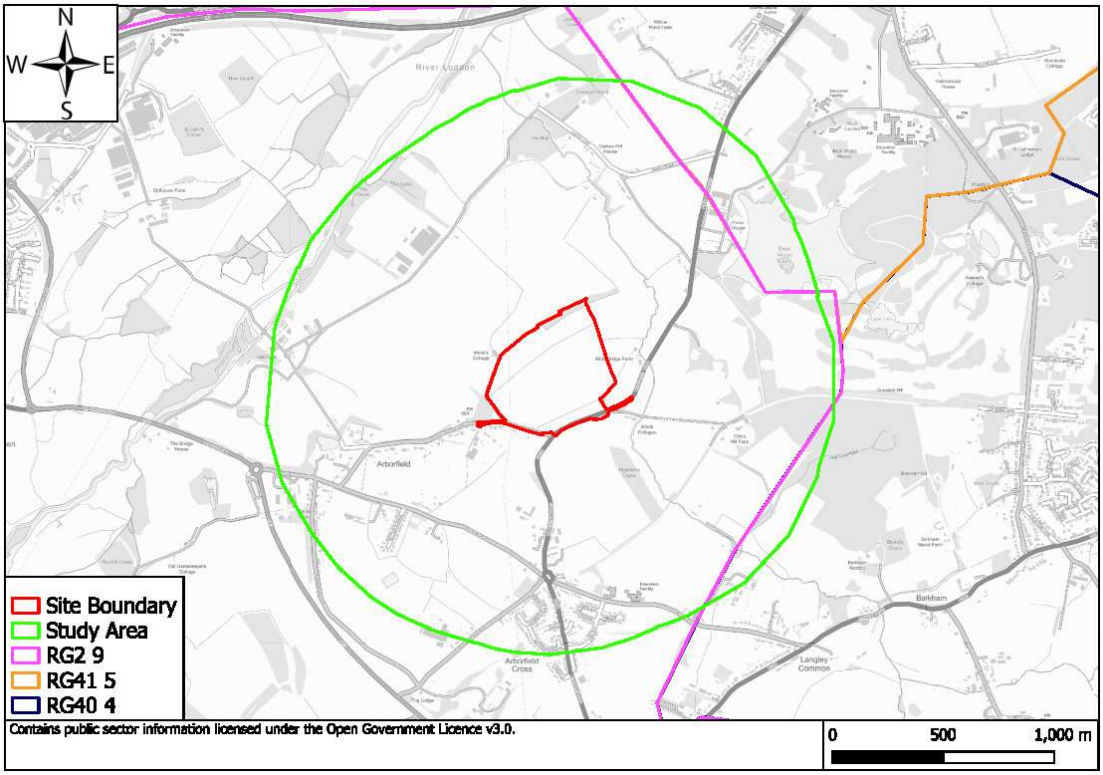



**Table 13.9 Number of recorded sewer flooding incidents for each postcode area during Jan 2000 to May 2022**

| Postcode | Number of Recorded Sewer Flooding Incidents |
|---|---|
| RG2 9 | 172 |
| RG41 5 | 223 |
| RG40 4 | 51 |

13.3.52 The Site itself is within the RG2 9 postcode, where there are 172 recorded sewer flooding incidents. There are urban and residential areas of Arborfield in the southeast and Shinfield to the northwest of the Site. The Site is mainly rural compared to these two areas of residential development. The majority of these incidents with have occurred where the sewers are located, within the urbanised areas.

13.3.53 The wider study area also falls partly within RG41 5 and RG40 4. These have incident numbers of 223 and 51 respectively. Again, these are a large numbers of incidents but the study area only falls within a small area of these postcodes.

13.3.54 Overall, when looking at the numbers of recorded incidents it could be interpreted that the Site has a high risk of flooding from sewers. However, when analysed it is apparent that the incidents will have occurred in the more urban areas of the postcode. Therefore, it can be concluded that the Site has low risk of flooding from sewer incidents.

Drainage

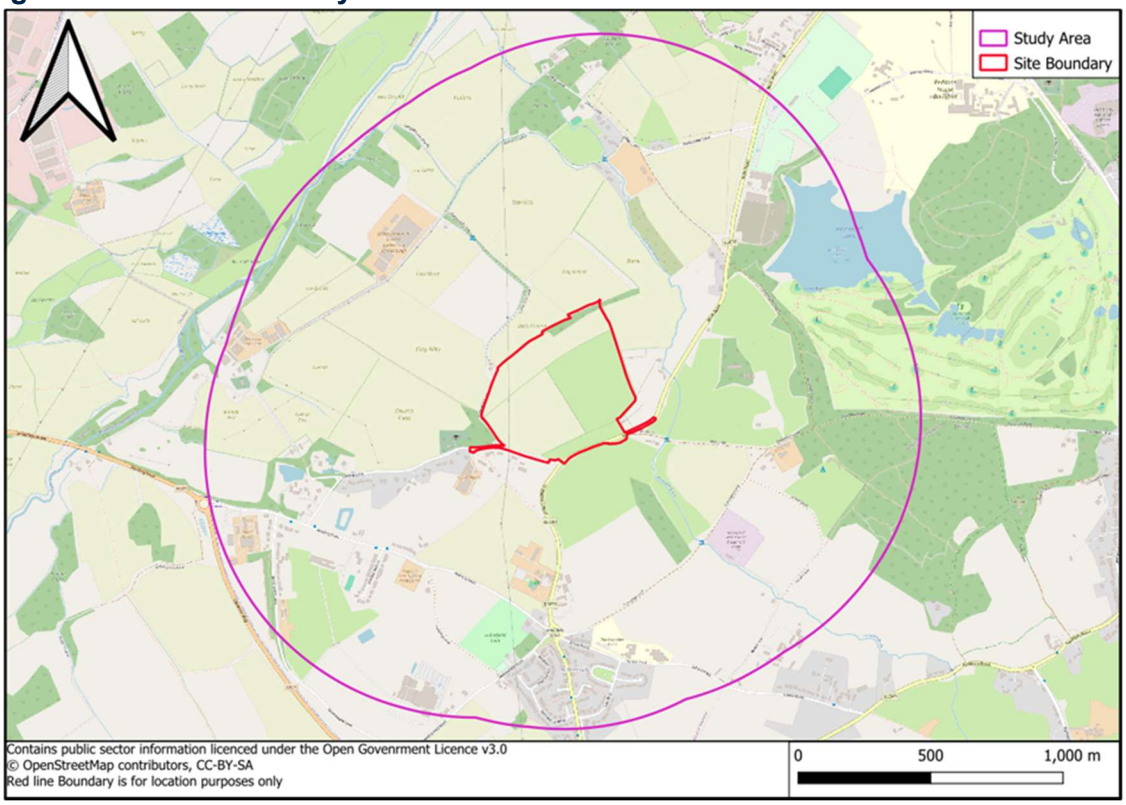
13.3.55 The Site is greenfield in nature and drains naturally by infiltration to ground and overland flow to ditches and onto the Barkham Brook system, eventually joining the River Loddon.

***Baseline Water Framework Directive***

13.3.56 The study area is presented within Error! Reference source not found.**0**, and takes into account the range of potential impacts arising from activities associated with the Proposed Development. The zone of influence is deemed appropriate by the impacts expected to arise from the Proposed Development. Based on the above, the study area is defined as:

- The area of land to be temporarily or permanently occupied during the construction and operation of the Proposed Development in addition to;
- A 1km buffer applied to the Site Boundary.

**Figure 13.40 WFD Study Area**




13.3.57 The development may interact with surface water bodies; therefore, it is vital that the potential impacts of the development on local waterbodies is assessed.

13.3.58 For the purpose of this WFD assessment, water bodies that are within, intersect or are hydrologically connected to the Study Area, have been identified and considered.

13.3.59 The Site and study area are located entirely within the Loddon WFD Operational Catchment. The WFD surface water bodies which overlap with the study area and their WFD status are included in the tables, below.

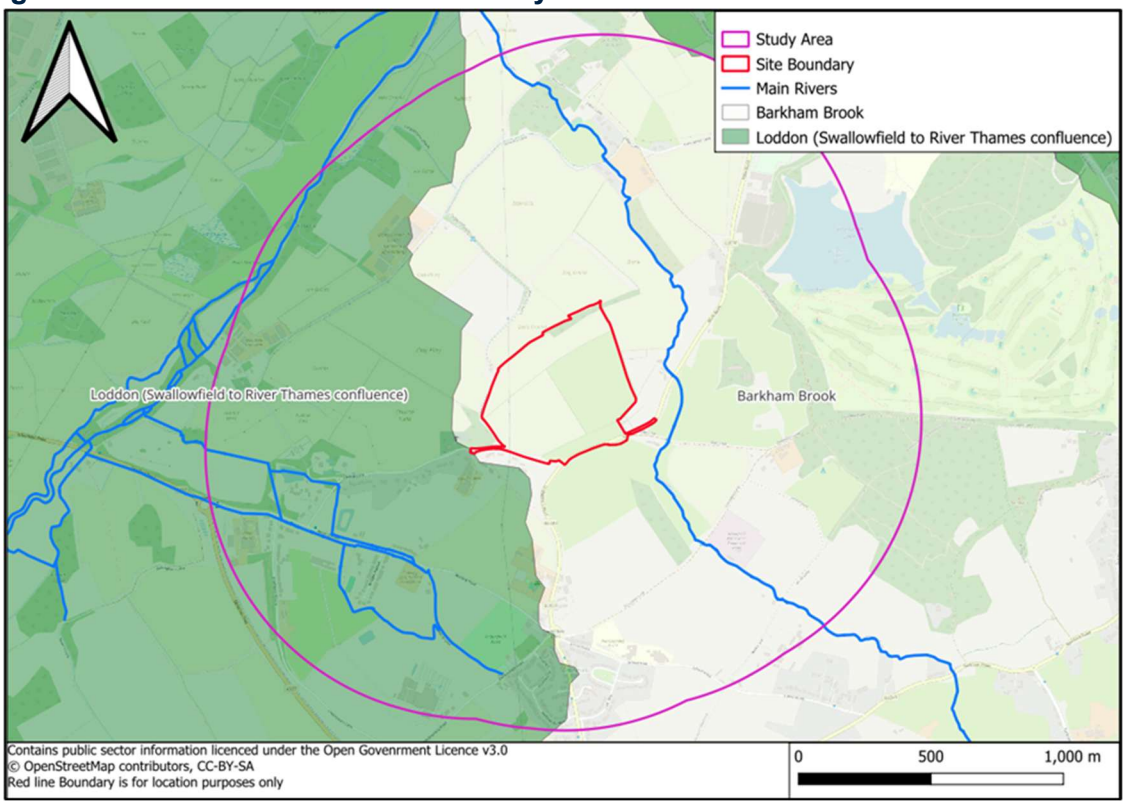
**Table 13.10 WFD ID**

| Name (WFD ID) | Management Catchment | Operational Catchment | Waterbody type |
|---|---|---|---|
| Loddon (Swallowfield to River Thames Confluence) (ID: GB106039023160) | Loddon and Tributaries | Loddon | River (5,189.4 ha catchment area) |
| Barkham Brook (ID: GB106039017400) | Loddon and Tributaries | Loddon | River (1871.46 ha catchment area) |

**Table 13.11 WFD Status**

| Name (WFD ID) | Artificial or Heavily Modified | Overall Classification | Ecological Status | Biological Quality Elements | Hydromorphological Supporting Elements | Specific Pollutants | Chemical Status | Priority Hazardous Substances |
|---|---|---|---|---|---|---|---|---|
| Loddon (Swallowfield to River Thames Confluence) (ID: GB106039023160) | No | Moderate | Moderate (2019/2022) | Moderate (2019/2022) | Supports Good (2019/2022) | High (2019/2022) | Fail (2019)/ Does Not Require Assessment (2022) | Fail (2019)/ Does Not Require Assessment (2022) |
| Barkham Brook (ID: GB106039017400) | No | Moderate | Moderate (2019/2022) | Moderate (2019/2022) | Supports Good (2019/2022) | High (2019/2022) | Fail (2019)/ Does Not Require Assessment (2022) | Fail (2019)/ Does Not Require Assessment (2022) |

**Figure 13.41 WFD Surface Water Body Catchments**




13.3.60 The majority of the Site and its study area is located within the Barkham Brook waterbody catchment, with a slightly smaller area located within the Loddon (Swallowfield to River Thames Confluence) catchment. Barkham Brook is a tributary of the River Loddon, therefore any works on one of the two rivers may have an impact on the WFD status of the other.

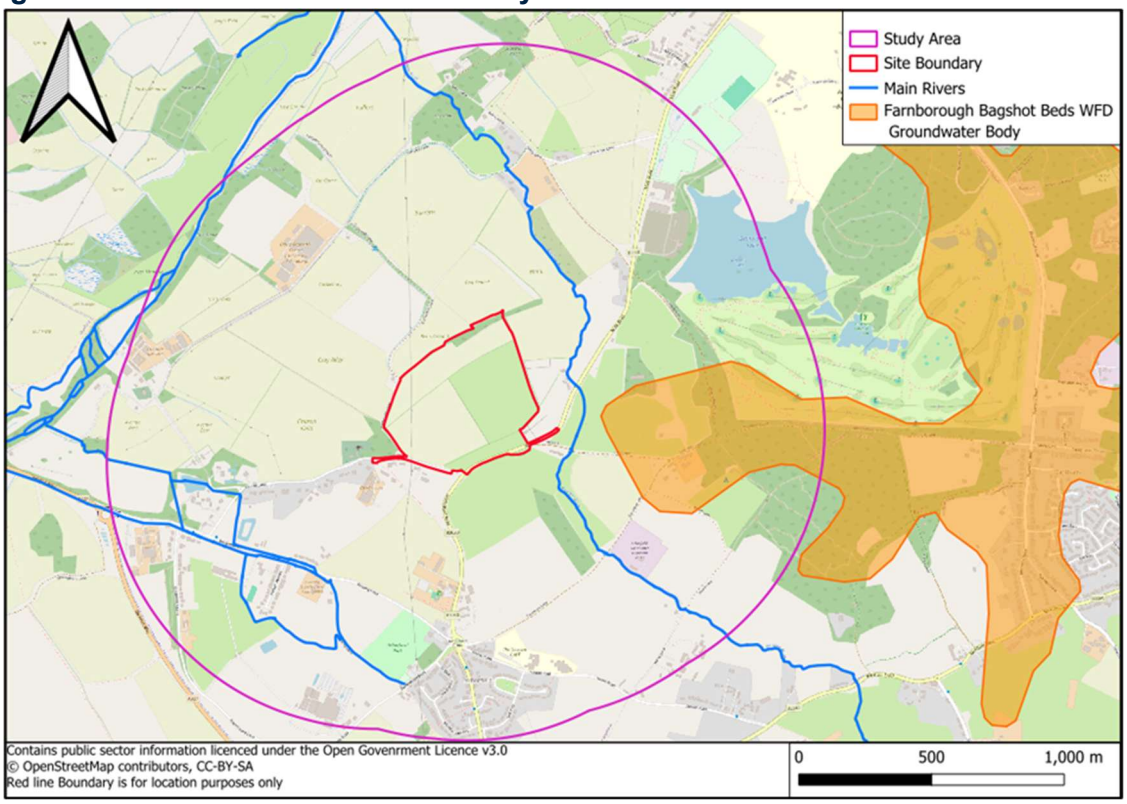
13.3.61 The Site is not within the extent of any WFD designated groundwater bodies. A section on the east of the study area is underlain by the Farnborough Bagshot Beds groundwater body. While the Chalk Group Aquifer (a principal aquifer) is present at depth across the study area, there is a significant cover of London Clay (unproductive strata), therefore WFD effects on this groundwater body have not been considered. Information on the Bagshot Beds groundwater body is included in the table below.

13.3.62 While BGS mapping identifies no superficial deposits within the site boundary, some isolated areas of river terrace deposits were recorded within the site boundary. These deposits are limited in extent and therefore do not form aquifers of any significance to the environment or water supply.

**Table 13.12 WFD ID - Groundwater**

| Name (WFD ID) | Management Catchment | Operational Catchment | Waterbody type |
|---|---|---|---|
| Farnborough Bagshot Beds (ID: GB40602G601300) | Thames GW | Farnborough Bagshot Beds | Groundwater body (22304.293 ha) |

**Figure 13.42 WFD Groundwater Body Catchments**




13.3.63 Watercourses which may be affected by the development were screened based upon the criteria outlined in the table below. The screening criteria have been based upon a conservative approach, to ensure all WFD impacts are given appropriate consideration.

**Table 13.13 Watercourse Screening Criteria**

| Watercourse Category | Criteria | Screening Outcome | Receptor Value |
|---|---|---|---|
| No channel present | No evidence of presence of surface water feature (no defined channel present or evidence of historical channel but is now in filled) | Out | N/A |
| Channel with no baseflow* / Minor Tributary | Ordinary Watercourse<br>Minor tributary (within WFD water body catchment). Artificially created drainage channel or small natural headwater or ephemeral channel.<br>Channel with little or no baseflow. Absence of flowing water for majority of year / limited connection to water table (potential to dry out). Shallow, ponded water present at times.<br>No regular fluvial geomorphological processes or features present<br>Low potential to support freshwater fish, macroinvertebrate, and/or macrophyte species | Out | Low |

| Watercourse Category | Criteria | Screening Outcome | Receptor Value |
|---|---|---|---|
| | Riparian zone typically impacted by land use / regular vegetation management<br>Low overall aquatic habitat and hydromorphological value | | |
| Channel with limited baseflow** / Moderate<br>Tributary | Ordinary Watercourse or Main River that is a tributary of the WFD water body main river line<br>Moderate tributary (within WFD water body catchment). Artificially created drainage channel or small natural channel.<br>Channel with limited baseflow. Typically, shallow low flows.<br>Non-definable morphological flow types, except in localised and isolated reaches.<br>Limited and discrete active fluvial geomorphological processes and features.<br>Limited potential to support freshwater fish, macroinvertebrate, and/or macrophyte species.<br>Riparian zone may be impacted by land use / regular vegetation management in some<br>Cases.<br>Moderate overall aquatic habitat and hydromorphological value. | In | Moderate |
| Channel with limited baseflow** / Moderate<br>Tributary within a Sensitive<br>Area | As above<br>Located within an area Designated SSSI, SAC or SPA | In | High |
| "Modified' channel with<br>permanent baseflow*** /<br>Primary Watercourse | Main River or a significant Ordinary Watercourse.<br>WFD water body main river line.<br>Modified natural channel with permanent baseflow. Likely designated as Heavily Modified<br>Water Body (HMWB) under WFD.<br>Definable flow types (but diversity impacted by modifications)<br>Active fluvial geomorphological processes and features (but functionality and diversity<br>impacted by modifications)<br>Potential to support some freshwater fish, macroinvertebrate, and/or macrophyte species (but habitat value impacted by modifications)<br>Riparian zone typically impacted by land use / regular vegetation management<br>Aquatic habitat and hydromorphological potential (but currently restricted by modifications) | In | High |

| Watercourse Category | Criteria | Screening Outcome | Receptor Value |
|---|---|---|---|
| "Functioning' channel with permanent baseflow*** / Primary Watercourse within a sensitive area | As above<br>Located within an area Designated SSSI, SAC or SPA | In | Very High |
| * Sites typically assessed has having Q95 (the 5 percentile, low flow) flow ≤0.002m3/s<br>** Sites typically assessed has having Q95 flow >0.002m3/s to ≤0.01m3/s<br>*** Sites typically assessed has having Q95 flow >0.01m3/s | | | |

Screening Assessment

13.3.64 The following receptors have been screened against the screening criteria set out above. The receptors were identified during the water feature survey of the Site and are discussed in the RPS Tetra Tech WFD report in Appendix 13.2.

13.3.65 According to the screening criteria set out above, the waterbodies associated with the Site have been screened as follows:

- **River Loddon – Screened In** – The Loddon has been screened in for WFD assessment, with a receptor value of "Very High". Whilst the stretch of river within the study area does not include any designated sites, SSSIs are located upstream and downstream of the Site (Stanford End Mill and River Loddon SSSI and Lodge Wood and Sandford Mill SSSI) which are hydrologically connected to the Loddon on Site.
- **Barkham Brook – Screened In** – Barkham Brook has been screened in for WFD assessment, with a receptor value of "High". Whilst Barkham Brook is affected by agricultural pressures, which have impacted the hydromorphological regime of the river, the watercourse is a Main River and WFD Waterbody Watercourse.
- **"Arborfield Cut" – Screened In** – The "Arborfield Cut" has been categorised as a Main River in EA mapping and has therefore been screened in for assessment. The watercourse appears to act as a seasonally wet flood channel / field drain, and was observed to be dry during a Water Feature Survey undertaken by RPS in June 2025.
- **Seasonal Ditches – Screened Out** – These ditches have no baseflow and as such are screened out.
- **Farnborough Bagshot Beds – Screened Out** – The far extents of the Farnborough Bagshot Beds WFD groundwater body underlies a section of the study area. Water on Site is not hydrologically connected to the Farnborough Bagshot Beds, as surface water flows away from the Beds, and they are separated from the site by the impermeable London Clay Formation.

***Water Resources***

13.3.66 Thames Water is the regional undertaker for foul water and surface water infrastructure. The location of the existing Thames Water infrastructure in relation to the Site is included as part of the Drainage Strategy report.

13.3.67 There are no public foul water sewers within the Site. Localised systems serve the farms and research buildings.

13.3.68 In respect of Potable Water Supply, distribution mains are pipes that domestic connections are supplied from. Trunk mains are pipes carrying water from a source of supply to treatment plant or reservoir or from one treatment plant/reservoir to another. A trunk main can also be a pipe transferring water in bulk to smaller water mains for supplying individual connections.

13.3.69 A 9" diameter trunk main is shown to be located within the A327 Reading Road. This main initially sits to the south of the carriageway, but switches to the northern side of Observer Way Roundabout.

13.3.70 In the south-western corner of the site, this trunk main extends into the site at a 10" diameter main initially on the western side of the River Loddon, before transferring eastwards towards a pump station situated adjacent to a backchannel of the Loddon next to Hall Farm/Arborfield Mill House.

13.3.71 A 3" diameter main is shown emanating out the pump station south-eastwards through Hall Farm on to Church Lane. Small diameter private mains are shown into the site.

13.3.72 A 180mm diameter main is shown to be located to the north of the B3270 Lower Earley Way/Meldreth Way roundabout.

### Future Baseline

13.3.73 Ignoring the effects of climate change, if the Proposed Development was not brought forward, the baseline conditions for the Site would remain similar to present with regards to flood risk, drainage and water resources. This assumes that any existing drainage infrastructure and/or watercourses continue to be well maintained and the current level of protection continues.

13.3.74 The volume and intensity of rainfall events is expected to increase with the effects of climate change. The increase in precipitation volume and intensity may cause an increase in fluvial and surface water flooding and increase the pressure on sewage infrastructure. Groundwater levels could increase with an increase in the overall volume of rainfall. The impact of climate change would occur with or without the Proposed Development.

## 13.4 Inherent design mitigation

***Flood Risk and Drainage***

13.4.1 A sequential approach to the layout of the Proposed Development has been applied during the master planning of the Site. For example, the majority of the built development avoids indicative surface water flow routes, and the built development is set back appropriately from the ordinary watercourses / ditches within the Site.

13.4.2 The implementation of a surface water drainage strategy incorporating SuDS will include infiltration and conveyance, attenuation and controlled discharge surface water runoff, thus mimicking existing greenfield conditions and reducing flood risk both on and off Site.

13.4.3 Finished floor levels will set a suitable freeboard above the design flood event including an appropriate allowance for climate change. This will be subject to detailed design.

***Water Framework Directive***

13.4.4 It is anticipated that potential hydrological impacts from the construction phase can be managed by the implementation of appropriate construction practices.

13.4.5 For the nature of the Proposed Development and potential associated impacts, an Outline Construction Environmental Management Plan (CEMP) will be prepared by the developers or

planners. The CEMP would include industry good practice measures to ensure prevention of contaminated water run-off from all construction areas.

13.4.6 The Construction Drainage Strategy will incorporate pollution prevention and flood response measures to ensure that the potential for any temporary effects on water quality or flood risk are reduced as far as practicable during the construction stage. Such measures would be implemented through the CEMPs and associated Construction Method Statements, including but not limited to the following:

- installation of suitable facilities to remove material (e.g., mud and dust) from wheels;
- use of sediment fences along the existing watercourses/waterbodies when working nearby to reduce sediment load;
- covers for lorries transporting materials to/from site to prevent releases of dust/sediment to watercourses/drains;
- bulk storage areas to be secured and provided with secondary containment (in accordance with the Oil Storage Regulations and best practice);
- storage of oils and chemicals away from existing watercourses, including drainage ditches or ponds;
- concrete to be stored and handled appropriately to prevent release to drains;
- treatment of any runoff water that gathers in the trenches would be pumped via settling tanks or ponds to remove any sediment;
- obtain consent for any works (e.g., discharge of surface water) that may affect an existing watercourse. The conditions of the consent will be specified to ensure that construction does not result in significant alteration to the hydrological regime or an increase in fluvial risk;
- use of a documented spill procedure and use of spill kits kept in the vicinity of chemical/oil storage;
- storage of stockpiled materials on an impermeable surface to prevent leaching of contaminants and use of covers when not in use to prevent materials being dispersed and to protect from rain; and
- stockpiles to be kept to minimum possible size with gaps to allow surface water runoff to pass through.

13.4.7 Following the outline planning application stage, relevant permits will be sought for the proposed works which have the potential to impact the watercourses within the vicinity of the proposed development.

<u>WFD Scoping Assessment</u>

13.4.8 It is necessary to identify the impacts associated with the activities which will take place in relation to the construction and operation of the Proposed Development. The identified impacts will be considered alongside the inherent mitigation of the Proposed Development to scope in impacts that will not be managed by the inherent mitigation and may need further assessment and mitigation.

13.4.9 The scoping assessment has been applied based on the design scenario set out in the parameter plans prepared for submission with the planning application.

Proposed Works

13.4.10 The required works which form part of the Proposed Development have been assessed to determine which have the potential to result in the greatest effect on an identified receptor or receptor group. Therefore, this comprises a conservative assessment of a worst-case scenario. The following works have been identified:

- Enabling works including site clearance, temporary access, erection of fences and security provisions;
- Construction of drainage network and outfalls;
- Movement of materials, waste and people to and from the Site;
- Enhancement of the drainage ditch which runs through the centre of the Site into a public green space;
- Construction of water crossing points across the amenity drainage channel, to facilitate access for footpaths, shared use paths, residential roads and the main distributor road; and,
- Ongoing management measures.

13.4.11 Of these proposed activities, it is considered that the construction of the drainage network and outfalls is the only activity which may have a potential impact after the inherent mitigation.

## 13.5 Potential effects prior to additional mitigation

### Construction Phase

#### *Flood Risk and Drainage*

13.5.1 There are areas of known and potential flood risk within the Site but the Proposed Development avoids these areas in most cases. However there is the potential for construction areas such as compounds and temporary works and facilities to be located in areas of potential flood risk. Workers would be deemed a Medium sensitivity receptor; compound areas a Low sensitivity receptor and the magnitude of impact could be Medium; therefore t his could be a Minor or Moderate effect.

13.5.2 There is the potential for both direct and indirect contamination to local ditches and watercourses from a pollution incident with the use and storage of machinery, equipment and materials on-site during construction. Key potential pollution sources from construction activities include:

- Mobilisation and deposition of fine materials (e.g. silts and clays) from the use of machinery and vehicles (e.g. access routes, construction compounds, storage areas);
- Pollution risk in relation to the use of certain materials (e.g. cement, lubricants);
- Accidental leaks or spills during transportation, storage and maintenance;

- Creation of new access tracks for construction related traffic – and with the movement of vehicles within the Site;
- Soil erosion and increased sediment loading from localised changes to catchment hydrology (e.g. compaction of soil surfaces and the excavation of material);
- Concentrated flows of water and the increased potential from erosion and mobilisation, such as along temporary drains in areas with steep gradients; and/or
- Provision of temporary on-site sanitary facilities for construction site staff could also introduce a source of pollution, which is not currently present in the catchment.

13.5.3 The impacts on watercourses could be adverse and Minor (the receptors are deemed Low sensitivity and Low or Medium magnitude of impact), though with the implementation of the CEMP, this is reduced to Low or negligible magnitude of impact, therefore the effect reduced to Negligible or Minor. Therefore this is not a significant effect.

13.5.4 Construction works on undeveloped areas have the potential to increase surface water runoff rates and volumes, alter drainage patterns and thereby affect localised and catchment-wide flood risk. The introduction of access tracks, construction and storage compounds, permanent and temporary structures, and the laying of infrastructure can all have an effect. Earth movement and ground re-profiling (e.g. with the creation of attenuation basins in the surface water drainage strategy as well as foundation excavation) could introduce a different material to the surface area of parts of the Site, which may have different soil infiltration or water quality properties. In addition, such works could alter the conveyance rate and possibly also the conveyance route of surface water runoff. Changes in the surface water flow regime could result in a Minor to Moderate impact on construction workers and on existing development within the area of interest. However, with the implementation of the CEMP this would be reduced to Negligible to Minor.

13.5.5 Key potential increases in surface water and flood risk from construction activities include:

- Alteration to the rate and route of surface water runoff in temporary drains while the operation surface water drainage system is being constructed;
- Stripping of soil or the import of fill affecting surface water runoff potential and drainage patterns through the compaction and smearing of soils; and/or
- Alteration to the surface water runoff regime through the re-profiling of the ground surface and with the introduction of temporary drainage channels.

13.5.6 The adverse effect on surface water and flood risk is dependent upon rainfall events occurring during the construction phase and will therefore be intermittent. With the implementation of the CEMP, these impacts will be managed to ensure that effects are both short term and are reduced from Minor to Negligible.

***Water Framework Directive***

Scoping of Construction Impacts

13.5.7 The following potential construction impacts have been scoped in or out of further assessment based upon the efficacy of the inherent mitigation. For those which have been scoped in as requiring further assessment, the elements of construction they affect have also been included.

13.5.8 **Temporary dewatering to enable construction – Scoped Out** – The construction of the Proposed Development will adhere to best practice guidance and risk assessment method statements, including measures to avoid and/or minimise disturbance of the water environment. Site investigation and monitoring will also be implemented before, during and after dewatering and excavation activities, in order to protect the integrity of nearby surface water features.

13.5.9 **Footprint (e.g. the area of channel impacted by works in the vicinity of the channel) – Scoped Out** – The footprint of all works within watercourses is limited to the seasonal drainage ditches, which have been screened out of WFD assessment. The construction of the Proposed Development will adhere to best practice guidance and risk assessment method statements which include measures to avoid and/or minimised disturbance to the water environment.

13.5.10 **Pollution risk and altered drainage patterns from general construction activities – Scoped Out** – The construction of the Proposed Development will adhere to best practice guidance and risk assessment method statements which include measures to avoid and/or minimised disturbance to the water environment. Construction activities will be temporary in nature.

13.5.11 **Creating or altering of pathways along which existing poor quality groundwater can migrate – Scoped Out** – The construction of the Proposed Development will adhere to best practice guidance and risk assessment method statements which include measures to avoid and/or minimised disturbance to the water environment. Construction activities will be temporary in nature.

13.5.12 **Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream – Scoped In** – The Proposed Development has sought to reduce hydromorphological impacts as far as reasonably practicable by minimising in-channel works. However, works are proposed within the channel which have the potential to impact the existing situation downstream in Barkham Brook, and hence downstream in the River Loddon.

13.5.13 The construction elements which may require work within the channel, and therefore cause impacts on the water environment via footprint and changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream, are drainage outfalls, open span bridges and bridging culverts.

13.5.14 Drainage System – Drainage outfalls may be construction on all watercourses within the Site. Construction impacts will be managed via best practice method statements, however localised loss of existing river habitats which may extend beyond construction could have an adverse effect and require further mitigation. Removal of sediment or introduction of unnatural substrates during construction may impact the natural sediment regime post-construction.

13.5.15 Based upon the above summary, the following specific impacts have been identified:

- Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream.

Thames River Basin Management Plan

13.5.16 The Thames RBMP states that the Significant Water Management Issues (SWMIs) in the district are: physical modifications, pollution from wastewater, pollution from towns and cities, pollution from metal mines, pollution from rural areas, changes to the natural flow and level of water, and negative effects of non-native invasive species.

13.5.17 The Thames River Basin District Management Plan sets out an overview of the planned improvements for the Thames River Basin District.

13.5.18 The Plan outlines the measures to achieve the priorities for the area. Some of the key measures are detailed below:

13.5.19 Methods to manage physical modifications are the following:

- Habitat restoration or creation;
- River restoration and fish pass improvements;
- Removal of barriers to fish passage;
- Riparian tree planting and fencing.

13.5.20 Methods to manage pollution from wastewater, from towns, cities and transport, and from metal mines are the following:

- Pollution control initiatives.

13.5.21 Methods to manage pollution from rural areas are the following:

- Reduce diffuse pollution at source;
- Mitigate/remediate diffuse pollution impacts on the receptor;
- Reduce diffuse pollution pathways.

13.5.22 Methods to manage natural flow and levels are the following:

- Control pattern/timing of abstractions;
- Water demand management;
- Improvement to condition of channel/bed and/or banks/shoreline;
- Use alternative source/relocate abstraction or discharge.

13.5.23 Methods to manage non-native invasive species are the following:

- Mitigation, control and eradication;
- Building awareness and understanding;
- Early detection, monitoring and rapid response;
- Prevent introduction.

13.5.24 Methods to restore peatland are the following:

- Implementation of tried and tested methodologies in line with the England Peat Action Plan.

13.5.25 Measures from the above list which are relevant to the pressures impacting the waterbodies will be considered within the mitigation/improvements.

***Water Resources***

13.5.26 The provision of on-site welfare facilities for construction staff is a legal requirement. There should be one toilet per 7 persons per 40 hour working week. Any wastewater generation is likely to be routed to a temporary septic tank that will require periodic emptying therefore demand to the existing wastewater network will be nil. This will mitigate any significant effects on the existing wastewater network during the Construction Phase. The impact of this on the existing network is Negligible.

13.5.27 A temporary build supply would normally be required in order to supply clean water to a site compound. This will place a demand on the local Thames Water Potable Water Supply network. The likely impact will be assessed by Thames Water in term of its significance, although given the residential location and the presence of adjacent potable water mains, this is likely to be minor. If a temporary build supply is not possible, the use of bowsers is a last resort. The impact of this is Negligible or, in some cases, Minor adverse but short term.

## Operational Phase

***Flood Risk and Drainage***

13.5.28 The baseline flood risk overview confirms that the vast majority of the Site is at little or no risk of flooding from any source. However, some parts of the Site, may be prone to pluvial flooding. The masterplanning approach for the Proposed Development has been heavily influenced by an understanding of these areas and the nature of the potential flooding.

13.5.29 A sequential approach, as set out in NPPF has been applied across the Site, with more vulnerable uses including residential development located in the areas with lower potential for flooding.

13.5.30 The FRA provides a full assessment of the Proposed Development and impacts on flood risk across the Site. This details the mitigation strategy to address any impacts of the Proposed Development.

13.5.31 Existing pluvial flooding within the development areas will be largely designed out as part of the surface water drainage strategy. Any flood water will be contained within the highway extents of the internal roads and follow the site contour towards the proposed on-site attenuation basin and watercourse.

13.5.32 Changes to the pluvial flooding regime will be fully mitigated such that there is no increase in the runoff rates, deemed a Negligible magnitude of impact, (to be compliant with NPPF and PPG) such that there is a Negligible impact on flood risk to existing properties and residents as well as future properties and residents.

13.5.33 The Proposed Development contains large area of hardstanding over which silt and sediment can collect over time. A build-up of silt and sediment may affect the drainage of surface water from the Site, having an adverse effect on localised flood risk. Given that the receptor sensitivity is Medium or Low and the magnitude of impact is Low, this potential impact on watercourses

and site users is deemed to be Minor adverse, potentially reducing to Negligible with the implementation of good design (and Negligible magnitude of impact).

***Water Framework Directive***

13.5.34 It is anticipated that potential hydrological impacts from the operation phase can be managed by the implementation of drainage management and adhering to the policy requirements of the Environment Agency, Local Planning Authority and Lead Local Flood Authority which inform on Flood Risk and the implementation of SuDS.

13.5.35 The Proposed Development will attenuate runoff and restrict off-site flows with a consideration of climate change events.

13.5.36 It is anticipated that the Proposed Development will accommodate flows via two attenuation basins and their associated conveyance SuDS features across the Site, as described in [Drainage Strategy prepared by Abley Letchford and included in Appendix 13.1.

13.5.37 Additional rural SuDS features (swales, bunds, attenuation features) upstream of the Site and within retained greenspace areas will contain and control greenfield runoff to further reduce the overall site discharge rates from the existing rates.

13.5.38 The SuDS will store water and release it slowly allowing for attenuation. The drainage will be designed in accordance with National and Local Planning Policy.

13.5.39 As laid out in the conceptual drainage strategy, the development will include features to appropriately treat surface water prior to discharge. The SuDS features will provide treatment in a sequential manner, with surface water being conveyed to the attenuation basins via swales and filter drains. The Simple Index Approach (SIA), as outlined within the SuDS Manual (CIRIA C753) will be followed.

Scoping of Operational Effects

13.5.40 The following potential operational impacts have been scoped in or out of further assessment based upon the efficacy of the inherent mitigation. For those which have been scoped in as requiring further assessment, the elements of construction they affect have also been included.

13.5.41 **Footprint (e.g. the area of channel impacted by works in the vicinity of the channel) – Scoped Out** – The design of the proposed development has sought to reduce the length of impacted watercourse channel as far as reasonably practicable. However, scheme components will result in a localised loss of existing watercourse channel habitat. However, the works are limited to the seasonal drainage channels on site, which have been screened out of WFD assessment as insignificant receptors.

13.5.42 **Shading due to the presence of a structure – Scoped Out** – A 10m buffer will be maintained between the banks of ordinary watercourses, water dependent ecosystems, Main Rivers and temporary and permanent built development associated with the proposed development. This will mitigate the effect of shading for all structures outside of the watercourses. There will be permanent shading from water crossing points across the seasonal drainage channels on site, which have been screened out of WFD assessment as insignificant receptors.

13.5.43 **Changes to drainage patterns discharging to surface water body – Scoped Out** – The design of the proposed development will adhere to best practice method statements, including measures to appropriately manage surface water and sediment runoff prior to discharge to the watercourse. The drainage strategy will ensure the incorporation of suitable drainage systems (including attenuation basins) to intercept, attenuate and discharge runoff from the highway and

other proposed infrastructure in a manner that will not significant adversely impact upon the existing flow regime or water quality of receiving watercourse.

13.5.44 **Altering of groundwater processes – Scoped Out** - Whilst there may be minor changes in the existing groundwater regime as a result of the development, due to passive dewatering of the River Terrace Deposits to facilitate construction, the only receptors for this groundwater are Barkham Brook and the River Loddon. The drainage network will be designed to direct all groundwater that has been dewatered to these watercourses, maintaining overall flow.

13.5.45 **Changes to hydrology leading to changes in processes and habitats upstream and downstream – Scoped In** – The proposed development has sought to reduce hydromorphological impacts as far as reasonably practicable by minimising in-channel works. However, works are proposed within the channel which have the potential to impact the existing situation.

13.5.46 The operational elements which may cause impacts on the water environment via footprint, shading, and changes to hydrology leading to changes in river processes and habitats upstream and downstream, are the implementation of a new drainage system.

13.5.47 Drainage System – The implementation of a new drainage system will result in a change to the hydrological regime at the site. The anticipated effect upon flow dynamics, sediment regime, connection to floodplain, general channel structure, turbidity and dissolved oxygen will be dependent upon the detailed design of the drainage system.

***Water Resources***

13.5.48 There are no existing foul sewers within the Site and therefore new points of connection will need to be established. Thames Water sewers are located in Reading Road to the south of the Site. This includes a gravity network discharging to a local pump station with flows ultimately being pumped to the Arborfield Sewage Treatment Works which is located approximately 2km from the Site.

13.5.49 Due to the topography of the Site and location of the public foul sewer network, wastewater from the Site cannot flow entirely by gravity to the receiving public sewer and a pumping station will be required.

13.5.50 Thames Water determines capacity and a suitable point of practical connection to the public sewerage through their Pre-Planning Enquiry process. This includes a high-level internal hydraulic analysis to establish if the development can be accommodated within its sewer network and sewage treatment works, whilst still within their allowable discharge and treatment rates.

13.5.51 This initial Pre-Planning Enquiry to Thames Water has established inadequate sewer capacity within the immediate vicinity and known performance issues at the Arborfield Sewage Treatment Works.

13.5.52 Discussions are ongoing with Thames Water regarding the extent of additional off-site sewers or improvements to existing sewers that will be required to provide sufficient capacity to service the development.

13.5.53 Without inclusion of mitigation measures, the potential effects relate to possible increased demands on water supplies and increased usage of the foul water infrastructure. There may be an increased demand on the end point wastewater treatment plant resulting in a rise of treated effluent discharge. This is considered to be of minor adverse significance due to the medium to low sensitivity and the low magnitude of the effect.

13.5.54 With regards to potable water, discussions are ongoing with Thames Water in respect to the provision of new supplies, and a Deed of Undertaking has been entered into in order to instigate the pre-requisite network modelling needed to establish a solution prior to a planning decision being made.

13.5.55 Thames Water envisage the provision of a Capacity Position Statement during August 2025, although have confirmed that an initial phase of development adjacent to the A327 Reading Road could be served off the existing 9" main without undue effect on supply.

13.5.56 Future mains would be located beneath the proposed footway/cycleway adjacent to the proposed internal access roads serving the Proposed Development. The configuration would reflect the typical NJUG (National Joint Utility Group) profile.

13.5.57 Water reuse, such as rainwater harvesting for toilet flushing, sports pitch irrigation and other non-potable uses can help to reduce the overall water demand. Given the scale of the development, such measures would need to be undertaken with a local, building by building approach rather than through sitewide infrastructure. This could be explored at future stages.

13.5.58 Without inclusion of mitigation measures, the potential effects relate to possible increased demands on water supplies causing detriment to existing users, and the completed Development may require a greater provision of services from Thames Water Utilities Limited than at present. As such, this is considered to be of minor adverse significance due to the medium to low sensitivity and the low magnitude of the effect.

## 13.6 Additional Mitigation

### Construction Phase

#### *Flood Risk and Drainage*

13.6.1 A Flood Management Plan (FMP) will be produced to cover each phase of the development. This will detail the areas of potential flood risk and the availability of flood warnings for these areas. This will provide information and an action plan to ensure the safety of construction workers during the construction phase as well as to ensure that the methods for construction, location of compounds etc do not compromise floodplain functionality. The FMP covers construction works within the areas of flood risk or where there are any construction activities, compounds or storage within those areas.

#### *Water Framework Directive*

13.6.2 As highlighted above, the specific construction impact identified for detailed assessment as part of the WFD assessment is changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream.

13.6.3 The following specific impact has been identified:

- Disturbance to wider hydromorphological processes.

13.6.4 The following specific measures are suggested to mitigate the construction impacts of the drainage system:

13.6.5 Drainage system – Post construction, appropriate detailed design will ensure that any habitat lost due to construction activities will be restored in a like-for-like manner and overall catchment dynamics will be maintained, with flows being directed to Barkham Brook..

***Water Resources***

13.6.6 Appropriate strategies such as provision of an on-site septic tank for the welfare facilities will ensure that there is nil demand on the existing wastewater network and therefore provides sufficient mitigation.

13.6.7 Consideration for the inclusion of measures that improve the efficiency of water use and disposal would be utilised during the construction phase, including rainwater harvesting and measures to reduce water usage, such as efficiency measures.

13.6.8 Notwithstanding this, following the legislation change introduced in April 2018, any capacity improvements necessary as a result of any proposed additional flows/increased demand will be an obligation Thames Water would be required to meet, under the Water Industry Act. As a statutory consultee, Thames Water will be provided the opportunity to determine capacity and their preferred strategy for accommodating the Development.

### Operational Phase

***Flood Risk and Drainage***

13.6.9 The mitigation strategy outlined in the FRA satisfies the NPPF and local policy requirements, and as such ensures no residual impacts. No further mitigation is required.

13.6.10 The surface water drainage strategy is presented in detail in the Drainage Strategy, included in the FRA in Appendix 13.1. By virtue of meeting the requirements under NPPF and for the LLFA, this strategy does not need to be supplemented by any further mitigation.

***Water Framework Directive***

13.6.11 The following specific operational impact has been identified:

- Disturbance to wider hydromorphological processes.

13.6.12 This operational impact is due to the implementation of the drainage system on site. In order to mitigate any effects after the inherent mitigation, open channel style outfalls with inverts graded to channel bed slope and roughened linings will be implemented, to prevent local scour. Overall flows within the Barkham Brook catchment will be maintained.

## 13.7 Residual effects

13.7.1 The residual effects during construction and operation phases are largely the same as pre-mitigation as the effects are mitigated through inherent mitigation measures. Otherwise, the provision of mitigation measures through implementing a Flood Management Plan address the residual effects Therefore, there are No Significant effects in EIA terms linked to hydrology, flood risk and drainage that would preclude the Proposed Development.

### Construction Phase

***Flood Risk and Drainage***

13.7.2 With the implementation of measures outlined in the FRA and Drainage Strategy as well as the requirements within the CEMP and FMP, there will be no residual effects on flood risk and drainage.

***Water Framework Directive***

13.7.3 Provided the mitigation measures outlined in the Water Framework Directive Assessment are implemented, there are no anticipated residual impacts anticipated on Barkham Brook or the River Loddon water bodies.

***Water Resources***

13.7.4 During construction the impacts on potable and foul water networks will be mitigated such that the residual impact is considered to be short term Minor to Negligible.

### Operational Phase

***Flood Risk and Drainage***

13.7.5 With the implementation of measures outlined in the FRA and Drainage Strategy, there will be no residual adverse effects on flood risk and drainage.

***Water Framework Directive***

13.7.6 Provided the mitigation measures outlined in the Water Framework Directive Assessment are implemented, there are no anticipated residual impacts anticipated on Barkham Brook or the River Loddon water bodies.

***Water Resources***

13.7.7 There are no residual effects on the wastewater and potable water scheme, provided the foul water drainage strategy is implemented as designed and through promotion of water efficiency measures respectively. Hence the effect is negligible. Any works required to the wider network will be delivered by Thames Water and their design will be subject to the standard requirements with regards to environmental impacts.

## 13.8 Implications of Climate Change

***Flood Risk and Drainage***

13.8.1 Inherent to the FRA is a requirement to assess the impacts of climate change on flood risk and on drainage, both in assessing the baseline conditions and in assessing the design parameters for the Proposed Development and any mitigation measures.

13.8.2 The EA provides guidance on how climate change allowances should be used in flood risk assessments. This has been applied to flow estimate for the fluvial modelling and to rainfall estimates for surface water flood modelling and for surface water drainage design. Data from has been taken from the EA website for this Site which is within the Loddon and tributaries Management Catchment.

***Water Framework Directive***

13.8.3 The WFD impacts and mitigations proposed in the WFD assessment are not considered sensitive to the effects of climate change. The impacts of climate change are not anticipated to alter the outcome of the WFD assessment undertaken or the effectiveness of the mitigation measures proposed.

***Water Resources***

13.8.4 The development of potable water and foul water drainage strategies will account for any current guidance relating to climate change. This will be addressed through appropriate consideration of climate change impacts and applying a standard approach to the final design.

## 13.9 Cumulative effects

### Hall Farm / Loddon Valley Strategic Development Location

***Flood Risk and Drainage***

13.9.1 Under NPPF and local policy as well as LLFA requirements, each development must ensure no impact on flood risk elsewhere. As such there will be no cumulative effects of the wider LGV development.

***Water Framework Directive***

13.9.2 It is considered that the mitigation proposed will suitably prevent and compensate for any impact on the WFD waterbodies within the Proposed Development. As such there will be no cumulative effects on the wider LGV development.

***Water Resources***

13.9.3 Wastewater and potable water demand is catchment wide as opposed to site specific. Without inclusion of mitigation measures, the potential effects relate to possible increased demands on water supplies and increased usage of the foul water infrastructure. The completed Development may require a greater provision of services, both wastewater and potable water, from Thames Water Utilities Limited than at present, and as such, this is considered to be of minor adverse significance due to the medium to low sensitivity and the low magnitude of the effect.

13.9.4 Notwithstanding this, following the legislation change introduced in April 2018, any capacity improvements necessary as a result of any proposed additional flows/increased demand will be an obligation Thames Water would be required to meet, under the Water Industry Act. As a statutory consultee, Thames Water will be provided the opportunity to determine capacity and their preferred strategy for accommodating the Development. Therefore, the cumulative effects would be same as for the Operational phase.

13.9.5 Based on this assessment, there is likely to be a change of small magnitude on receptors of medium sensitivity without mitigation, leading to a long term slight adverse effect that will not be significant. However, with mitigation such as the implementation of the foul water drainage strategy and the promotion of water use efficiency measures there are no residual cumulative effects anticipated and the significance is therefore considered to be negligible.

### Wider Committed Development

***Flood Risk and Drainage***

13.9.6 Under NPPF and local policy as well as LLFA requirements, each development must ensure no impact on flood risk elsewhere. As such there will be no cumulative effects of the wider developments.

***Water Framework Directive***

13.9.7 Under the Water Framework Directive legislation, developments must not cause a failure to meet surface water 'Good Ecological Status' or 'Good Ecological Potential', or result in a deterioration of surface water Ecological Status/Potential. Nor can it institute changes which will permanently prevent or compromise the Environmental Objectives being met.

13.9.8 The proposed mitigation methods are considered sufficient to suitably offset and detrimental effects on WFD elements during development. It is not anticipated that there will be an impact on the wider WFD environment due to the Proposed Development.

***Water Resources***

13.9.9 Wastewater and potable water demand is catchment wide as opposed to site specific. Without inclusion of mitigation measures, the potential effects relate to possible increased demands on water supplies and increased usage of the foul water infrastructure. The completed Development may require a greater provision of services, both wastewater and potable water, from Thames Water Utilities Limited than at present, and as such, this is considered to be of minor adverse significance due to the medium to low sensitivity and the low magnitude of the effect.

13.9.10 Notwithstanding this, following the legislation change introduced in April 2018, any capacity improvements necessary as a result of any proposed additional flows/increased demand will be an obligation Thames Water would be required to meet, under the Water Industry Act. As a statutory consultee, Thames Water will be provided the opportunity to determine capacity and their preferred strategy for accommodating the Development. Therefore, the cumulative effects would be same as for the Operational Phase.

13.9.11 Based on this assessment, there is likely to be a change of small magnitude on receptors of medium sensitivity without mitigation, leading to a long term slight adverse effect that will not be significant. However, with mitigation such as the implementation of the foul water drainage strategy and the promotion of water use efficiency measures there are no residual cumulative effects anticipated and the significance is therefore considered to be negligible.

## 13.10 Summary

***Flood Risk and Drainage***

13.10.1 The potential flood risk across the Site is well understood and the development strategy has been heavily influenced by this. As such the sequential approach and location of built development and key infrastructure outside areas of potential flood risk has been adopted for the Proposed Development. In the areas where infrastructure is necessary within the floodplain there is suitable mitigation. With regards to flood risk, to be compliant with NPPF the development must have no adverse impact off site.

13.10.2 Likewise, the surface water drainage strategy for the Proposed Development must ensure that there is no adverse impact off site.

13.10.3 Through designing the Proposed Development to satisfy both the flood risk and drainage requirements, the potential effects are negligible as there is no adverse impact off site.

During construction there may be temporary effects, although these can be largely managed and mitigated through the implementation of a CEMP and a FMP.

***Water Framework Directive***

13.10.4 The impacts of the Proposed Development on the WFD elements of Barkham Brook and Loddon (Swallowfield to Thames confluence) water bodies are limited in magnitude, due to the limited value of the receptors on site. By following best practice guidance, selecting environmentally sensitive design options, and introducing protection and enhancement measures it is unlikely that 'Good' status will be prevented in the future.

13.10.5 The proposed development will not cause failure to meet surface water 'Good Ecological Status' or 'Good Ecological Potential', result in a deterioration of surface water Ecological Status/Potential.

13.10.6 There are no changes which will permanently prevent or compromise the Environmental Objectives being met.

***Water Resources***

13.10.7 With respect to wastewater and potable water supply mitigation measures include on site efficiencies and fully implemented Thames water capacity studies to ensure adequate supplies and off site infrastructure.

## 13.11 References


- Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017
- Thames River Basin District River Basin Management Plan (Updated 2022)

## 13.12 Assessor information

### Table 13.14 Assessor Information

| Chapter | Responsibility | Name | Qualifications | Assessor information |
|---|---|---|---|---|
| Hydrology | Abley Letchford | Emma Philpott | CEng C.WEM BEng | Emma has been with Abley Letchford for over 2 years and has over 25 years experience in Hydrology, Flood Risk, Flood Defence, River Processes and Drainage. She leads the Flood and Water Management Team and has completed hundreds of FRAs and provided input to dozens of Environmental Impact Assessments as well as working within both the EA and secondments with a number of LLFAs. |
| Hydrology | Abley Letchford | Katie Bush | BSc | Katie has been with Abley Letchford for 1 year and has experience in Flood Modelling and Flood Risk. She has completed flood modelling and produced FRAs for a number of sites. |
| Hydrology | RPS | Rebekah Rice | BA, MSc (Eng), Dip, MCIWEM | Rebekah has over 20 years of experience in hydrology/hydrometry and project management. She has worked for the Environment Agency and Bristol Water predominantly in water resources planning. Rebekah has worked on hydrological risk assessments for large infrastructure projects, residential developments and new water supply sources. |
| Hydrology | RPS | Tom Hancox | BSc, PGCert, GradCIWEM | Tom has two years of experience in the hydrology sector, with prior research in industrial wastewater treatment. Tom has experience with completing WFD assessments for national infrastructure projects as well as residential developments of varying sizes. |
| Hydrology | RPS | Bryn Kearsey | BSc, MCIWEM, FGS | Bryn has 3 years of experience in hydrology and has completed hydrogeological risk assessments for large infrastructure projects, residential developments and new water supply sources. |

**Table 13.15 Summary of effects**

| Receptor | Receptor sensitivity | Description of potential impact | Proposed mitigation | Residual effect | Significant / not significant |
|---|---|---|---|---|---|
| **Construction Phase** | | | | | |
| Construction workers | Medium | The potential for construction areas such as compounds and temporary works and facilities to be located within an area of potential flood risk. | CEMP and flood management plan | Minor to moderate | Not significant |
| Surface water features | Low | The potential for direct and indirect contamination of watercourses due to the use and storage of machinery and equipment on site. | CEMP and flood management plan | Negligible to low | Not significant |
| Downstream catchment | Low | Construction works to undeveloped areas have the potential to increase surface water runoff rates, volumes and runoff regimes. | CEMP | Negligible to minor | Not significant |
| All surface water features | Low to Very High | Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream | The proposed development has sought to reduce hydromorphological impacts as far as reasonably practicable by minimising in-channel works. However, works are proposed within the drainage channels which have the potential to impact the existing situation. To | Works within and around the channel will result in mobilisation and deposition of sediments, controls will reduce impact to temporary, | Not significant |

| Receptor | Receptor sensitivity | Description of potential impact | Proposed mitigation | Residual effect | Significant / not significant |
|---|---|---|---|---|---|
| | | | mitigate these, sediment and turbidity controls will be implemented to prevent WFD deterioration. | minor negative impact. | |
| Entire Water Environment | Low to Very High | Pollution risk and altered drainage patterns from general construction activities | Installation of suitable facilities to remove material (e.g., mud and dust) from wheels;<br>use of sediment fences along the existing watercourses/waterbodies when working nearby to reduce sediment load;<br>covers for lorries transporting materials to/from site to prevent releases of dust/sediment to watercourses/drains. | No anticipated residual effect. | Not Significant |
| Thames Water portable water supply | Low to Medium | Possible increased demands on water supplies and increased usage on the foul water infrastructure. | Implementation of the foul water drainage strategy and promotion of water use efficiency measures. | Low | Not significant |
| **Operation Phase** | | | | | |
| Residential development | Medium | Some parts of the site are prone to fluvial flooding. | A sequential approach has been applied across the site. Mitigation measures set out in | Negligible | Not significant |

| Receptor | Receptor sensitivity | Description of potential impact | Proposed mitigation | Residual effect | Significant / not significant |
|---|---|---|---|---|---|
| | | | the Flood Risk Assessment and Drainage Strategy. | | |
| All surface water features | Low to Very High | Changes to drainage system, resulting in change to drainage patterns within the water body catchments and change in runoff water quality. | The design of the proposed development will adhere to best practice method statements, including measures to appropriately manage surface water and sediment runoff prior to discharge to the watercourse. The drainage strategy will ensure the incorporation of suitable drainage systems (including attenuation basins) to intercept, attenuate and discharge runoff from the highway and other proposed infrastructure in a manner that will not significant adversely impact upon water quality of receiving watercourse. | No anticipated residual impacts. | Not significant |

## 13.13 Mitigation commitments Summary

**Table 13.16 Summary for Securing Mitigation**

| Identified receptor | Type and purpose of additional mitigation measure (prevent, reduce, offset, enhance) | Means by which mitigation may be secured (e.g. planning condition / legal agreement) | Delivered by | Auditable by |
|---|---|---|---|---|
| **Construction Phase** | | | | |
| Construction workers | Prevent: Implementation of CEMP and flood risk management plan. | Planning Condition | Contractor | Contractor / LPA |
| Surface water features | Prevent: Implementation of CEMP to prevent direct or indirect contamination of watercourses, and to manage any accidental spills. | Planning Condition | Contractor/ Applicant | Contractor/ LPA |
| Downstream catchment | Prevent: Implementation of CEMP and flood management plan to manage surface water flows. | Planning Condition | Contractor/ Applicant | Contractor/ LPA |
| Watercourses – Hydrological Regime | Prevent: Implementation of sediment and turbidity controls during construction and operation. | Planning Condition / S.106 Agreement | Contractor / Applicant | Contractor / LPA |
| **Operation Phase** | | | | |
| Residential Development | Prevent: Sequential approach applied across the site. Mitigation measures set out within the flood risk assessment and drainage strategy. | Planning Condition | Contractor/ Applicant | Contractor/ LPA |
| Watercourses - Hydrological Regime | Prevent: Design of SuDS system will ensure that overall drainage pathways are maintained, and there is no catchment transfer. | Planning Condition | Contractor / Applicant | Contractor / LPA |