Newlands Farm

Water Framework Directive Assessment

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REPORT

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1 Introduction

1.1 Introduction

This Water Framework Directive (WFD) Assessment presents the baseline hydrological environment and potential development impacts from a WFD perspective for the Proposed Development at Newlands Farm.

Data has been collated through a detailed desktop study and survey of existing resources available for WFD waterbodies and subsequent water features to capture hydrological receptors, which may be affected by impacts from the Proposed Development.

The information from this WFD Screening and Scoping Assessment provides a baseline for the WFD waterbodies within the Study Area, and will be used to determine the likelihood of effects of the Proposed Development on WFD waterbodies.

The aim of the WFD Assessment is to assess the impacts of the proposed works associated with the Proposed Development against the WFD parameters for the local waterbodies. The assessment includes a summary of the current local conditions, the potential for the Proposed Development to contribute towards WFD objectives and any likely alterations to the WFD classifications that could arise from the Proposed Development.

The WFD Assessment is required to demonstrate that the Proposed Development would not result in deterioration of the current quality status of the relevant WFD water body, and could provide improvements to the current status, in accordance with the objectives and measures set out in the Thames River Basin Management Plan (RBMP).

1.2 Project Location

The Site is centred at National Grid Reference SU 76197 67970 and its nearest postcode is RG2 9JF, which is approximately seven miles from the centre of Reading. The Site is roughly square in shape and occupies an area of approximately 23.4 hectares (ha). The Site location is presented in Figure 1.

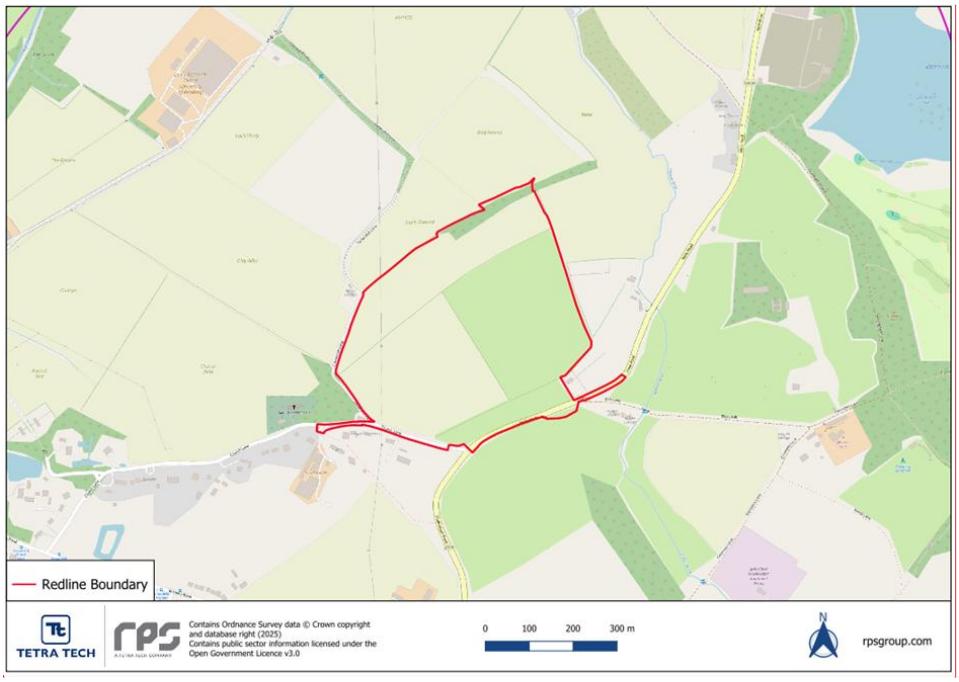

Figure 1: Site Location

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The Site is comprised entirely of greenfield land used for agricultural purposes. The large part of this is arable agricultural land, and a small section of woodland in the north.

There are a number of water features located within the Site and within the 1 km study area buffer. Notably, three Environment Agency (EA) designated Main Rivers are located within the study area. The closest of these is Barkham Brook, at approximately 150 m from the Site at its closest point. Barkham Brook runs from southeast to northwest, broadly parallel to the Site's northeast edge. The drainage network on Site directs surface water towards this watercourse.

A small section of the River Loddon is located within the study area, approximately 950 m from the Site's northwestern edge. Barkham Brook is a tributary of the River Loddon, and therefore, surface water generated on Site is also liable to affect the Loddon.

An unnamed main river, hereon referred to as "Arborfield Cut", is located to the southwest of the Site. Arborfield Cut is also a tributary of the Loddon. A rise in the topography exists between the Site and the Arborfield Cut, presenting a barrier to surface water on Site interacting with the watercourse.

There are also a number of other surface water features located within the study area, including a spring, ponds, a wetland and a number of smaller drainage ditches. The locations of these water features are presented in Figure 2, and the water features are discussed in more detail in Section 3.

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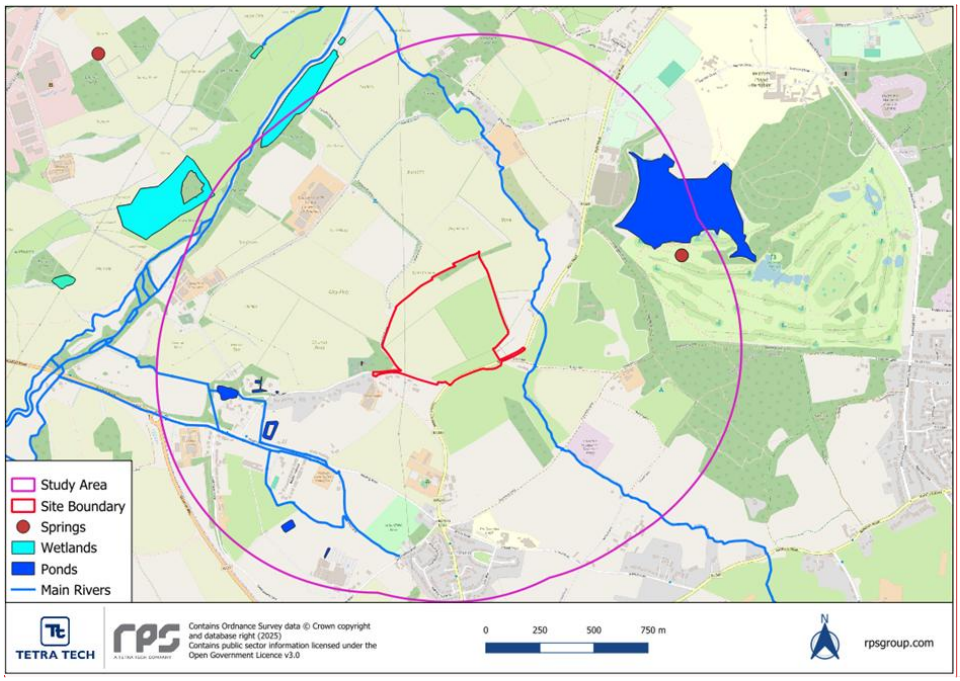

Figure 2: Water Feature within the study area

1.2.1 Proposed Development

The proposed works are for a mixed-use development, which is to be comprised of up to 430 dwellings and associated infrastructure, including a road and active travel route network and sustainable drainage systems.

1.3 Legislative Context

1.3.1 Water Framework Directive Legislation

The WFD (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).

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).

The WFD requires the prevention of deterioration and the protection enhancement, and restoration of all bodies of water. It was not possible to achieve good status of all water bodies by 2015 and therefore the outstanding water bodies have objectives set for 2021 or 2027.

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).

Consideration of the WFD is required for development which have the potential to detrimentally impact the chemical and/or ecological status of a waterbody or to prevent improvements that may otherwise result in a waterbody meeting its WFD objectives.

The following objectives (derived from the Environmental Objectives of the Directive) are used to determine whether the Proposed Development, in and around the water environment, which is affected by the Proposed Development, comply with the overarching objectives of the WFD:

- Objective 1: To prevent deterioration in the ecological status of the water body;
- Objective 2: To prevent the introduction of impediments to the attainment of good WFD status for the water body;
- Objective 3: To ensure that the attainment of the WFD objectives for the water body are not compromised; and
- Objective 4: To ensure the achievement of the WFD objectives in other water bodies within the same catchment are not permanently excluded or compromised.

1.3.2 Study Area

The study area is presented within **Figure 2**, 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 1 km buffer applied to the Site Boundary.

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

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 as relevant water bodies.

2 Methodology

2.1 Directive Assessment Methodology

2.1.1 Determination of Good Status

2.1.1.1 Surface Water

Good status is determined from the ecological and chemical status of surface waters. These statuses are assessed according to the following criteria:

- Biological quality (fish, benthic invertebrates, aquatic flora);
- Hydromorphological quality (e.g., riverbank structure, river continuity and substrate of the riverbed); and
- Physico-chemical quality (e.g., temperature, oxygenation, and nutrient conditions).

The chemical quality refers to environmental quality standards for river basin specific pollutants. These standards specify maximum concentrations for specific water pollutants. The WFD operates on a 'one out, all out' basis, so if one such concentration is exceeded, then the water body will not be classed as having a good status. The pure chemical status of surface waters is therefore classified as either good or fail with the physical-chemical quality indicators being classified as either high, good, moderate, poor, or bad.

The ecological status of surface waters is classified as being high, good, moderate, poor, or bad, whilst water bodies that have been modified (e.g., canals or contain significant flood defences) are classed as 'Heavily Modified Water bodies' (HMWB) and have to reach at least good potential by their objective year.

2.1.1.2 Groundwater

The WFD stipulates that groundwater must achieve good quantitative status and good chemical status by their objective year. Groundwater bodies are classified as either good or poor. The quantity status considers elements such as impacts of saline intrusion, ability to serve groundwater and surface water abstractions, and ability to support groundwater dependent terrestrial ecosystems. The chemical status refers to the environmental quality standards for river basin specific pollutants and the priority substances specified under the WFD.

2.1.1.3 River Basin Management Plans

The WFD introduced River Basin Districts (RBDs) to better manage watercourses without administrative and political boundaries. Each river basin is managed to achieve at least good status according to RBMPs, which provide a clear indication of how the objectives set for the river basin are to be reached within the required timescale.

2.2 Water Framework Directive Assessments

2.2.1 Assessment Guidance

Within a WFD assessment, consideration must be shown if an activity will:

- Cause or contribute to deterioration of status; and / or
- Jeopardise the waterbody achieving good status in the future.

The 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).

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 embedded 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.

A flow chart, taken from the Planning Inspectorate Advice Note 18 for assessing activities for compliance with the WFD (Planning Inspectorate, 2017) has been included below in **Figure 3**. This provides an overview of the recommended process to address the WFD considerations.

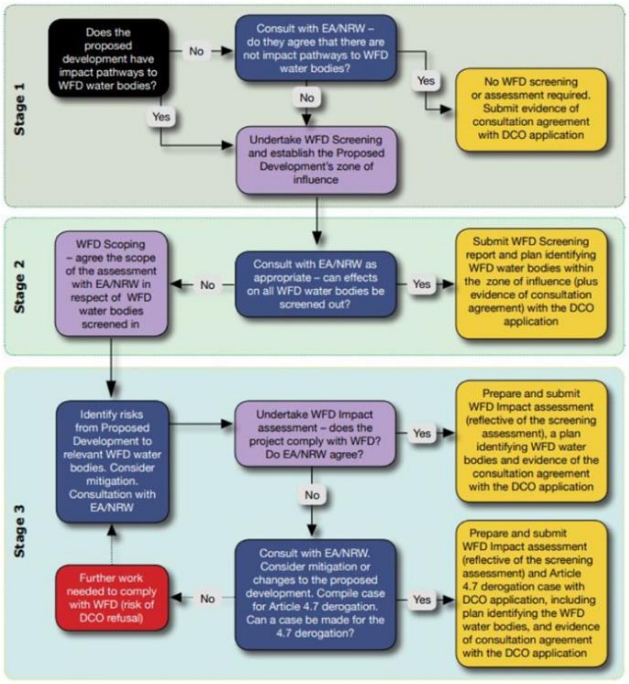

Figure 3: Flow chart illustrating the WFD compliance assessment process

2.2.2 Stage 1 - Screening Assessment

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).

2.2.3 Stage 2 - Scoping Assessment

The WFD scoping assessment will identify links between the proposed onshore 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.

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.

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.

2.2.4 Stage 3 – Detailed Impacts Assessment

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.

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.

2.2.5 Data Sources

Information used in the preparation of the report is set out in **Table 1** below.

Table 1 - Information sources consulted during the preparation of the WFD assessment

Information	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

2.2.6 Potential Impacts

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.

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.

2.2.7 Limitations of Assessment

The assessment has been undertaken using the design scenario (as of August 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.

2.2.8 Thames River Basin District

The RBMP system provides a catchment-based approach to managing water bodies, in accordance with the WFD.

The proposed development is located within the overarching Thames RBD, which covers 16,200 km^2. The Thames RBD comprises 20 management catchments, 85 surface water operational catchments and contains 548 water bodies.

In 2019, 100% of the districts surface water bodies were classified as fail for chemical status and 6% of the districts surface water bodies were assessed as being in good or better condition for ecological status.

In 2019, 62% of the districts ground water bodies were classified as poor for chemical status and 63% of the districts ground water bodies were assessed as having good quantitative status.

3 Baseline Conditions

3.1 Geology and Hydrogeology

Recorded superficial deposits in the study area include Alluvium, River Terrace Deposits and Head. There are no recorded superficial deposits within the site boundary according to BGS mapping, however some areas of River Terrace Deposits were recorded during ground investigations[1]. All superficial deposits in the study area are designated as Secondary A aquifers which can support local water supplies and provide baseflow to rivers. Alluvium in the study area follows the floodplains of the nearby Barkham Brook and River Loddon. River Terrace Deposits and Head are isolated and sporadic in distribution. Superficial deposits within the survey area are presented in **Figure 4.**

Bedrock geology within the Site boundary is comprised entirely of the London Clay Formation which is also predominant across the survey area apart from in some isolated area to the south and east of the site where it is overlain above around 58 mAOD by the Bagshot Beds Formation of sands, The Bagshot Beds Formation is designated as a Secondary A aquifer. Bedrock geology within the survey area is presented in **Figure 5.**

Ground investigations on site including trial pits and window sample boreholes encountered some limited, isolated groundwater in granular horizons of the London Clay, likely representative of perched groundwater. No water was encountered in the River Terrace deposits.

Units of the Chalk Group, which forms a principal aquifer for much of Southern England are encountered at depth and are utilised by several private water supplies in the study area, however a significant cover of London Clay means there is no hydraulic connection with surface hydrology.

[1] Geo-Environmental Site Investigation, BRD Environmental Ltd (September 2025)

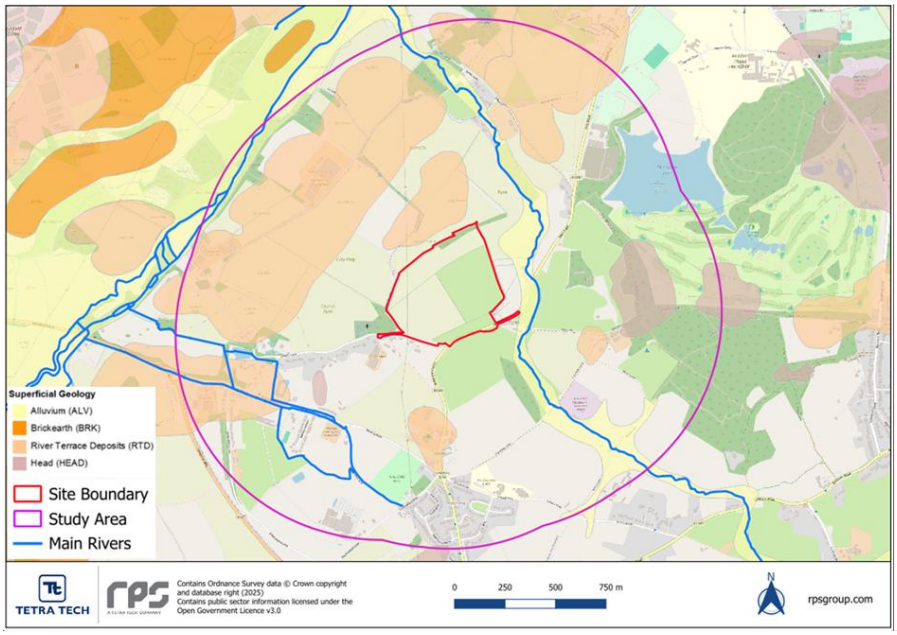

Figure 4: Superficial Geology

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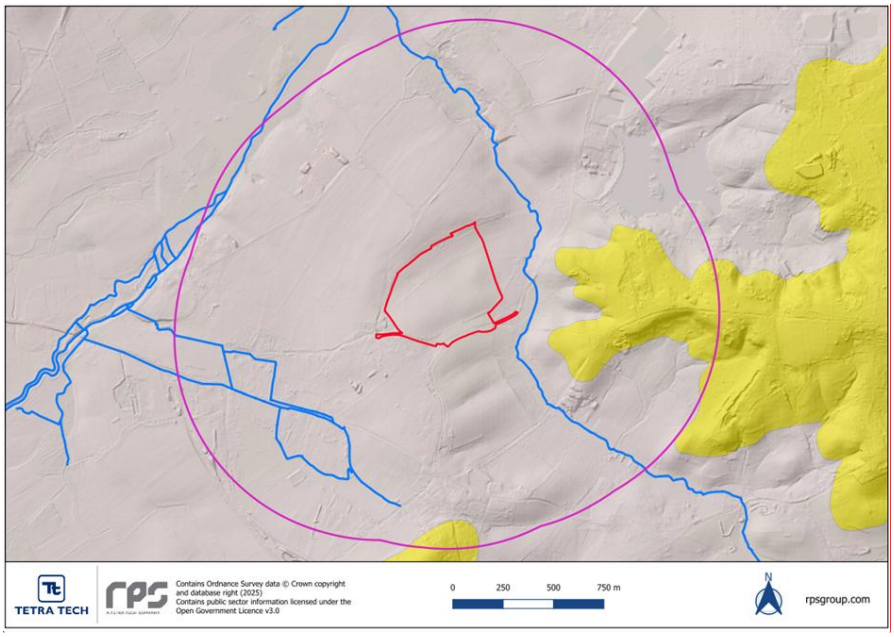

Figure 5: Bedrock Geology

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3.2 Local Hydrology

Three EA designated “Main Rivers” are located within the study area. These are:

- The River Loddon – A major tributary of the Thames, which runs from south-west to north-east approximately 950m from the Site’s western edge. The Loddon is a lowland meandering river with, as it passes through the study area, good volume and variety of hydromorphological features. Pressures on the Loddon include agricultural runoff, invasive species and historic modifications primarily to support the local milling industry. As it passes through the study area, the Loddon is a large river with a Q95 low flow of approximately 2 m^3/s, derived from the addition of two EA monitoring stations – Loddon at Sheepbridge (Station ID: 39022[2]) and Blackwater at Swallowfield (Station ID: 39007[3]), which meet shortly upstream of the site. Surface water generated on site drains to the Loddon, via Barkham Brook. The drainage catchment on site, being composed of field drains with ephemeral flows, is minor compared to the overall flows of the Loddon.
- Barkham Brook – A tributary of the Loddon, which enters the study area from the southeast and passes along the Site’s northeastern edge, before exiting the study area in the north, shortly before its confluence with the River Loddon. Barkham Brook is heavily affected by agricultural pressures. The channel is choked by vegetation, including invasive species. Large volumes of filamentous algae are present and historic channelisation has reduced connectivity to the flood plain. The surface water drainage network on site directs all captured surface water towards Barkham Brook. This drainage catchment is representative of much of the overall Barkham Brook catchment, though it is responsible for relatively minor flows, compared to the overall catchment.
- Unnamed Watercourse 2 – referred to as ‘Arborfield Cut’. A set of connected channels which rise within the study area, to the south of the Site, at Arborfield. Flowing northwest towards the Loddon, before leaving the study area again approximately 500 m prior to their confluence. ‘Arborfield Cut’ functions as seasonal field drains/flood channels with no permanent baseflow.

The Site is home to a small network of field drains. These are only seasonally wet and act as flood channels during high rainfall events to channel surface water towards Barkham Brook.

The study area contains a number of similar drainage networks which drain towards the Loddon, Barkham Brook or Arborfield Cut. These features are not hydrologically connected to the site, as the runoff generated on site is separated from them by elevation and/or geographical features.

3.3 Surface Water WFD Status

The WFD runs in 6-year cycles, and is currently within the third cycle, which runs from 2022 – 2027. The Cycle 3 interim classification has not yet been published; however, a classification update was published in 2022. The 2019 and 2022 data has been presented for the waterbodies in the study area below in Tables 2 and 3.

It should also be noted, for the 2019 chemical status assessment, methods and evidence base were updated. Due to this change, all waterbodies now fail chemical status and cannot be compared to previous years.

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 are included in Table 2, below. Further details of the waterbodies are included as **Appendix A.**

[2] https://nrfa.ceh.ac.uk/data/station/meanflow/39022
[3] https://nrfa.ceh.ac.uk/data/station/meanflow/39007

Table 2 - WFD Surface Water Bodies

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 3 - WFD Classification Summary - Surface Water

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)[4]	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)[5]	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)

The Site and the majority the study area is located within the Barkham Brook waterbody catchment. The western third of the study area is located in the Loddon (Swallowfield to River Thames Confluence) catchment. Barkham Brook is a tributary of the River Loddon, therefore any works which affect Barkham Brook may have an impact on the WFD status of the Loddon.

3.4 Groundwater WFD Status

Superficial deposits in the study area are isolated and disconnected from the small area of River Terrace Deposits at the site, they show no evidence of supporting regional groundwater flow or sensitive receptors and therefore there is no reasonable pathway for impact to Groundwater WFD status.

The site is not located within a designated WFD groundwater body, however the outcrops of Bagshot Beds within the survey area are with a groundwater body (Table 4). The southern outcrop of the Bagshot Beds is situated over 800 meters from the site boundary and approximately 10 meters higher in elevation. The eastern outcrop is around 200 meters from the site boundary and approximately 12 meters higher in elevation, there is also a hydraulic separation provided by Barkham Brook. There is therefore no reasonable pathway for impact to the Bagshot Beds from the proposed works.

The Chalk Group units located at depth would generally need to be considered in the WFD assessment however the significant cover of London Clay means there is no reasonable pathway for impact from the proposed works.

Table 4 - WFD Classification Summary - Groundwater Bodies

Name (WFD ID)	Management Catchment	Operational Catchment	Waterbody type
Farnborough Bagshot Beds (ID: GB40602G601300)[6]	Thames GW	Farnborough Bagshot Beds	Groundwater body (22304.293 ha)

[4] Loddon (Swallowfield to River Thames confluence) | Catchment Data Explorer | Catchment Data Explorer
[5] Barkham Brook | Catchment Data Explorer | Catchment Data Explorer
[6] Farnborough Bagshot Beds | Catchment Data Explorer | Catchment Data Explorer

4 WFD Impact Assessment

4.1 Screening Assessment

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 5 – Screening criteria for WFD watercourses

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 Minor tributary (within WFD water body catchment). Artificially created drainage channel or small natural headwater or ephemeral channel. 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. No regular fluvial geomorphological processes or features present Low potential to support freshwater fish, macroinvertebrate, and/or macrophyte species Riparian zone typically impacted by land use / regular vegetation management Low overall aquatic habitat and hydromorphological value	Out	Low
Channel with limited baseflow** / Moderate Tributary	Ordinary Watercourse or Main River that is a tributary of the WFD water body main river line Moderate tributary (within WFD water body catchment). Artificially created drainage channel or small natural channel. Channel with limited baseflow. Typically, shallow low flows. Non-definable morphological flow types, except in localised and isolated reaches. Limited and discrete active fluvial geomorphological processes and features. Limited potential to support freshwater fish, macroinvertebrate, and/or macrophyte species. Riparian zone may be impacted by land use / regular vegetation management in some Cases. Moderate overall aquatic habitat and hydromorphological value.	In	Moderate
Channel with limited baseflow** / Moderate Tributary within a Sensitive Area	As above Located within an area Designated SSSI, SAC or SPA	In	High
"Modified' channel with permanent baseflow*** / Primary Watercourse	Main River or a significant Ordinary Watercourse. WFD water body main river line. Modified natural channel with permanent baseflow. Likely designated as Heavily Modified Water Body (HMWB) under WFD. Definable flow types (but diversity impacted by modifications) Active fluvial geomorphological processes and features (but functionality and diversity impacted by modifications)	In	High

Watercourse Category	Criteria	Screening Outcome	Receptor Value
	Potential to support some freshwater fish, macroinvertebrate, and/or macrophyte species (but habitat value impacted by modifications) Riparian zone typically impacted by land use / regular vegetation management Aquatic habitat and hydromorphological potential (but currently restricted by modifications)		
"Functioning' channel with permanent baseflow*** / Primary Watercourse within a sensitive area	As above 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

** Sites typically assessed has having Q95 flow >0.002m3/s to ≤0.01m3/s

*** Sites typically assessed has having Q95 flow >0.01m3/s

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.

4.2 Achievement of the WFD Objectives

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.

The Thames River Basin District Management Plan [7] sets out an overview of the planned improvements for the Thames River Basin District.

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

Physical Modifications

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.

[7] River basin management plan for the Thames River Basin District HRA (September 2022)

Managing Pollution from Wastewater, from Towns, Cities and Transport, from Metal Mines

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

- Pollution control initiatives.

Managing Pollution from Rural Areas

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.

Changes to Natural Flow and Levels

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.

Manage Non-Native Invasive Species

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.

Peatland Restoration

Methods to restore peatland are the following:

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

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

5 Stage 2 – SCOPING ASSESSMENT

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 embedded mitigation of the proposed development to scope in impacts that will not be managed by the embedded mitigation and may need further assessment and mitigation.

The scoping assessment has been applied based on the maximum design. The identified impacts will be considered alongside the embedded mitigation of the proposed development to scope in impacts that will not be managed by the embedded mitigation and may need further assessment and mitigation.

5.1 Proposed Works

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.

5.2 Mitigation Measures Adopted as Part of the Proposed Development

Mitigation measures are generally broken down into the following categories:

- Embedded mitigation. This includes the following.
    - Primary (inherent) mitigation - measures included as part of the Proposed Development design. The Institute of Environmental Management and Assessment (IEMA) describes these as ‘modifications to the location or design of the development made during the pre-application phase that are an inherent part of the proposed development and do not require additional action to be taken’. This includes modifications arising through the iterative design process. These measures will be secured through consent. For example, a reduction in footprint or height.
    - Tertiary (inexorable) mitigation. IEMA describes these as ‘actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects.’

- Secondary (foreseeable) mitigation. IEMA describes these as '*actions that will require further activity in order to achieve the anticipated outcome'*. These include measures required to reduce the significance of environmental effects (such as lighting limits).

5.2.1 Inherent Mitigation – Construction Phase

It is anticipated that potential hydrological impacts from the construction phase can be managed by the implementation of appropriate construction practices which are embedded into the ways of working.

For the nature of the Proposed Development and potential associated impacts, an Outline Construction Environmental Management Plan (CEMP) will need to be prepared by the appointed principal contractor, and submitted as a condition of the outline planning permission. The CEMP would include industry good practice measures to ensure prevention of contaminated water run-off from all construction areas.

It is anticipated that an Outline Pollution Prevention Plan (PPP) will need to be prepared by the appointed environmental consultant or developer, and submitted as part of the CEMP. The PPP will include details of emergency spill procedures. Good practice guidance detailed in the EA's Pollution Prevention Guidance will be followed where appropriate, or the latest relevant available guidance.

The associated 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 is 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.

Relevant permits will also be sought for the proposed works which have the potential to impact the watercourses within the vicinity of the proposed development.

5.2.2 Inherent Mitigation – Operation Phase

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

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

It is anticipated that the Proposed Development will accommodate flows via attenuation basins across the Site.

Additional rural SuDS features (swales, bunds, attenuation features) upstream of the Site and within retained greenspace areas will contain and control runoff to maintain greenfield rates.

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.

It is anticipated that the drainage strategy for the development will include features to appropriately treat surface water prior to discharge. The Simple Index Approach (SIA), as outlined within the SuDS Manual (CIRIA C753) should be followed.

5.3 Impacts as Part of the Proposed Development

With consideration of the above embedded mitigation, the below impacts have been identified as part of the proposed works which are likely to affect the hydrological environment in **Table 6** below. It is worth noting that the drainage network on site doesn't direct any runoff towards Arborfield Cut or the River Loddon. The Loddon does have potential to be affected as it is downstream of Barkham Brook. Arborfield Cut and the Loddon must be screened in as they are Main Rivers within the study area. Arborfield Cut, however, is insensitive to the works and should be scoped out and has not been considered as a potential receptor to the Site activities.

Table 6 - Scoping of Potential Impacts

Potential Impact	Scoped In/Out	Justification
Construction		
Temporary dewatering to enable construction	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.
Footprint (e.g. the area of channel impacted by works in the vicinity of the channel)	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.
Pollution risk and altered drainage patterns from general construction activities	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.
Creating or altering of pathways along which existing poor quality groundwater can migrate	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.
Changes to water body hydromorphology leading to changes in river processes and habitats upstream and downstream	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.
Operation		
Footprint (e.g. the area of channel impacted by works in the vicinity of the channel)	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.
Shading due to the presence of a structure	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.

Potential Impact	Scoped In/Out	Justification
Changes to drainage patterns discharging to surface water body	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.
Altering of groundwater processes	Out	It is not anticipated that any changes will take place to the existing groundwater regime on site, as the development is not located on any groundwater bearing superficial geologies. Should any passive dewatering of groundwater take place, it will be directed towards Barkham Brook, by the drainage network on site, maintaining overall flow within the catchment.
Changes to hydrology leading to changes in processes and habitats upstream and downstream	In	The proposed development has sought to reduce hydromorphological impacts as far as reasonably practicable by minimising in-channel works and changes to river morphology. However, works are proposed within the channel which have the potential to impact the existing situation.

The detailed assessment is based upon the below impacts identified as potentially posing a risk to WFD quality elements in the scoping assessment:

Construction

- Changes to the waterbody hydromorphology leading to changes in river processes and habitats upstream and downstream of the receiving waterbody.

Operation

- Changes to hydrology leading to changes in processes and habitats upstream and downstream of the receiving waterbody..

6 Stage 3 – Detailed Impact Assessment

6.1 Introduction

As highlighted in the above, the following impacts have been brought forward to the detailed impact assessment:

Construction

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

Operation

- Changes to hydrology leading to changes in processes and habitats upstream and downstream.

It has been determined that the above impacts are associated with the following activities:

- Introduction of a sustainable urban drainage system.

These activities will be assessed in further detail to determine the extent of the potential impact upon WFD waterbodies.

6.2 Detailed Impacts

Components of the proposed development have been assessed against the key parameters of the WFD (biological, hydro-morphological, physicochemical, chemical). **Table 7** below summarises potential impacts of the scheme components previously highlighted.

Table 7 - Impacts of Proposed Works

Element of Proposed Works	WFD Element Impact			
	Biological	Hydro-morphological supporting elements	Physicochemical supporting elements	Chemical
Drainage System	Construction impacts will be managed via best practice method statements. The operation of the new drainage system is not anticipated to have an impact on the downstream Barkham Brook's biological WFD elements.	The anticipated effect upon flow dynamics, connection to floodplain and general channel structure will be dependent upon the dimensions, technique used and hydromorphological baseline within the locality of the outfall of the drainage system. There is potential for construction activities and the change in land use type to cause a change in the sediment regime in Barkham Brook downstream of the Site.	The outfalls from the proposed drainage system may cause a localised change in the downstream hydromorphological regime. The potential for alterations to river processes and effects on sediment transfer, turbidity, flows and dissolved oxygen are dependent upon the dimensions of the outfall, elements of the drainage system and hydromorphological baseline within the locality of the outfall.	No anticipated effects

Based upon the above summary, the following specific impact has been identified:

- Disturbance of wider hydromorphological processes.

6.3 Additional WFD Mitigation / Enhancement

The specific impacts identified relate to the disturbance of floodplain/riparian habitats and processes, disturbance of in-channel habitats/processes, disturbance of wider hydromorphological processes, and alterations to groundwater processes. WFD mitigation for each of the specific proposed work elements have been included in **Table 8**.

Table 8 - Specific Additional Mitigation Measures

Element of Proposed Works	WFD Element Mitigation			
	Biological	Hydro-morphological supporting elements	Physicochemical supporting elements	Chemical
Drainage System	No mitigation required.	Utilise open channel style outfalls with inverts graded to channel bed slope and roughened linings to prevent local scour.	Pre-treatment of runoff during the SuDS train to treat suspended solids is anticipated to mitigate impact on physico-chemical elements.	No mitigation required.

6.4 WFD Impact Post Mitigation

Based upon implementation of the above proposed measures, the proposed impacts on WFD are as follows:

> **Drainage System** – It is anticipated that the integration of a sustainable drainage network on the site will not have an impact on the WFD elements of Barkham Brook, and the River Loddon downstream. Using proper construction methods, construction impacts will be suitably mitigated and appropriate pre-treatment of surface water runoff in the SuDS network and a HydroBrake maintaining greenfield runoff rates will mitigate any impact on the physiochemical, chemical and hydromorphological WFD elements of the waterbody.

Overall, with best practice construction and targeted ecological and hydromorphological mitigation, the remaining impacts on WFD elements are anticipated to not result in a downgrading of WFD classification of the water body, and will not prevent reaching “Good” ecological rating in the future.