

12 Water Resources, Flood Risk and Drainage

12.1 Introduction

12.1.1 This chapter was prepared by RPS and presents an assessment of the likely significant effects of the Development on Water Resources, Flood Risk and Drainage during both the construction and completed Development stages of the project. Mitigation measures are identified, where appropriate, to avoid, reduce or offset any significant adverse effects identified and / or enhance likely beneficial effects. The nature and significance of the likely residual effects are then reported. An assessment of the cumulative effects of the project with other cumulative Developments (as identified in Chapter 3: EIA Methodology and Appendix 3.4 is also presented.

12.1.2 The chapter is supported by the following figures and appendices:

- Figure 12.1: WFD Surface Water Catchments;
- Figure 12.2: WFD Groundwater Catchments;
- Figure 12.3: Flood Modelling Outputs;
- Figure 12.4: Sensitive Receptors;
- Appendix 12.1: Legislation, Policy and Guidance;
- Appendix 12.2: Flood Risk Assessment and Drainage Strategy; and
- Appendix 12.3: RPS Hydrology Site Visit Photographs.

Competence

12.1.3 This chapter was prepared by Jessica Grady who has BSc in Geography and MSc in MSc River Environments and their Management. Jessica has over four years' experience undertaking hydrological assessments. Jessica provides hydrological and flood risk technical support and advice for a wide range of Development proposals including; residential, commercial, renewable energy and Nationally Significant Infrastructure Projects (NSIPs). During the course of supporting planning applications and associated EIAs, Jessica has both authored and reviewed technical inputs regarding Water Resources, Flood Risk and Drainage.

12.1.4 This chapter was reviewed by Chris Patmore. As a Technical Director with over 30 years' experience, CEnv, DipEIA, CEng, Chris specialises in flood risk and sustainable drainage design for major infrastructure projects for residential Developments, rail, highways, petrochemical and energy installations. Including a role as expert witness on flood risk and drainage issues. Project work includes conducting sustainable drainage design and flood risk assessments for new Developments, critical infrastructure, traffic studies, feasibility design, the environmental analysis of hydrology and traffic. Chris' role spans the planning design of SuDS flood mitigation through to the detailing and assessment of SuDS solutions. As part of CIRIA steering groups, Chris was involved in both iterations of the SuDS Design Manual as well as the SUSDRAIN website and the preparation of the DCG (Design and Construction Guidance).

12.2 Legislation, Planning Policy and Guidance

- 12.2.1 The following sections provide a summary of the legislation, planning policy and guidance that is of relevance to this assessment and the Development. For a detailed review, please refer to Appendix 12.1.

Legislation Context

- 12.2.2 The following legislation is relevant to the Development:

- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017¹;
- The Flood Directive 2007/60/EC (2007)²;
- Drinking Water Directive (2015)³;
- The Water Resources Act (1991)⁴;
- The Land Drainage Act (1991)⁵;
- The Environment Act (2021)⁶;
- The Water Act (2003)⁷;
- The Groundwater (England and Wales) Regulations (2009)⁸;
- The Flood Risk Regulations (2009)⁹;
- The Flood and Water Management Act (2010)¹⁰;
- The Water Act (2014)¹¹;
- The Environmental Permitting (England and Wales) Regulations 2016)¹²; and
- The Reservoirs Act (1975)¹³.

Planning Policy Context

National

- 12.2.3 The following national planning policy is relevant to the Development:

- National Planning Policy Framework (2025)¹⁴.

Local

- 12.2.4 The following local planning policy is relevant to the Development:

- HGC Framework & Transformation SPD¹⁵;
- HGC Stewardship & Placemaking SPD¹⁶; and
- Draft SADC Local Plan – Draft Local Plan 2041 ('Emerging Local Plan')¹⁷.

Guidance

- 12.2.5 The following guidance is relevant to the Development:

- Planning Practice Guidance (PPG) (Live Document)¹⁸;
- Flood Risk Assessments: Climate Change Allowances¹⁹;

- Flood risk assessments: applying for planning permission²⁰; and
- National standards for sustainable drainage systems (SuDS)²¹.

12.3 Assessment Methodology

Consultation

EIA Scoping Opinion

- 12.3.1 A request for a Scoping Opinion was submitted by the Applicant to SADC on 27 March 2025. The Scoping Report accompanied the request (Appendix 3.2). The Scoping Opinion (Appendix 3.3) was issued by SADC on 23 May 2025 which included comments from statutory consultees. Table 12.1 summarises key comments raised by consultees of relevance to this assessment during the EIA Scoping study and how the assessment responded to them.

Table 12.1: EIA Scoping Response Summary

Consultee and Comment	Response
<i>St Albans City and District Council – Scoping Opinion</i>	
The scope of the Water Resources and Flood Risk chapter is considered broadly acceptable. The Environment Agency comments must be taken into consideration. It should be noted that Affinity Water have no comments to make. The requirements listed by Thames Water should be noted, and taken account of as part of the ES or the Planning Application The Comments of the Local Lead Flood Authority and the SADC Contaminated Land Officer must be taken into account in full. Comments made by Hemel Garden Community, referenced in ‘other matters’ below should be taken into account.	Comments received from the Environment Agency, Thames Water, the Local Lead Flood Authority and the SADC Contaminated Land Officer are addressed as detailed in other sections of this table. Relevant comments made by HGC are also taken into account (See below).
<i>Environment Agency – Scoping Response</i>	
Use of Sustainable Drainage Systems (SuDS) - Surface water run-off should be controlled as near to its source as possible through a sustainable drainage approach to surface water management (SuDS).	Consideration of the use of SuDS is provided within the Flood Risk Assessment and Drainage Strategy within Appendix 12.2. This demonstrates that the drainage hierarchy was considered, and SuDS have been used to implement this.
Water Resources - water efficient technology, fixtures and fittings should be all considered as an integral part of new Developments and/or refurbishments. The technology used to achieve improved water efficiency (e.g. efficient fittings, greywater recycling, etc) is also an attractive feature for many prospective building owners and tenants.	A pre-Development enquiry was undertaken with Affinity Water to establish capacity to provide potable water to the Development. Affinity Water have confirmed (21/01/2025) ability to supply water

Consultee and Comment	Response
Residential Developments - The supply of water in the area is under serious water stress (as identified in our report: Water stressed areas – 2021 classification). All residential Developments must therefore achieve the higher water consumption efficiency standard of 110 litres per person per day, as set out within the Building Regulations &c. (Amendment) Regulations 2015. This standard or higher may already be a requirement of the local planning authority. Commercial / Industrial Developments We recommend that all new non-residential Developments of 1000sqm gross floor area or more (i.e. 'major' Developments) should achieve the BREEAM 'excellent' standard for water consumption (category 'WAT 01'), or equivalent. This standard may already be a requirement of the local planning authority.	to the scheme. This would be via a connection on the 400mm main along Redbourn Road Bessemer Drive and laying approximately 305m of 180mm ALPE (Barrier) pipe to the Site boundary. It is proposed that indoor water consumption will be minimised via the use of water-efficient fittings. Flow restrictions and efficient water-use white goods will be utilised to meet requirements. Water efficiency measures are highlighted within the Energy and Sustainability Statement which accompanies the ES and are outlined in Chapter 5: Description of the Development.

Thames Water – Scoping Response

The following issues should be considered and covered in either the EIA or planning application submission: 1. The Developments demand for Sewage Treatment and network infrastructure both on and off Site and can it be met; 2. The surface water drainage requirements and flood risk of the Development both on and off Site and can it be met; 3. Build – out / phasing details to ensure infrastructure can be delivered ahead of occupation; and 4. Any piling methodology and will it adversely affect neighbouring utility services.	A pre-Development enquiry was undertaken with Thames Water to establish capacity within the existing network. The consultation response is included within the Flood Risk Assessment and Drainage Strategy within Appendix 12.2. Thames Water confirmed they were unable to meet the needs for the full Development at this time, and that appropriate upgrades would be required to meet the demand of the Development. Outline or full planning permission must be granted in order for Thames Water to commence network modelling. The Drainage Strategy (Appendix 12.2) confirms that surface water will be attenuated on-Site and discharged without increasing flooding risk off-Site. This was addressed, as appropriate, within this chapter.
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Consultee and Comment	Response
	It is anticipated that Points 3 and 4 will be dealt with at detailed design stage, at which point, detailed construction methodologies will be confirmed, along with more detailed information regarding phasing and infrastructure delivery.
<i>HCC Lead Local Flood Authority (LLFA) - Scoping Response</i>	
The surface water flood map highlights three flow paths impacting the Site. These must be investigated and avoided, and mitigation or management measures should be incorporated where required. Other sources of flooding, such as from groundwater, should also be investigated.	Consideration of flow paths and all other sources of flooding impacting the Site is provided within the Flood Risk Assessment and Drainage Strategy within Appendix 12.2.
The latest climate change allowances are required to be applied at the time of the assessment and ordinary watercourses (less than 3km²) that need to be assessed for flood risk can use the appropriate rainfall climate change allowances. The latest FEH rainfall data (FEH13 or FEH22) should be applied in all hydraulic modelling calculations at the time of any calculations and assessment (flood risk or surface water drainage).	Consideration of the latest climate change allowances and FEH-22 rainfall data is applied to all hydraulic modelling calculations and forms the basis of the drainage strategy within Appendix 12.2.
All SuDS must demonstrate that there will be sufficient surface water quality treatment by implementing an appropriate amount of water quality treatment stages using SuDS. An appropriate water quality assessment specific to and for each of the proposed surface water drainage networks is required to demonstrate the suitable water quality management arrangements are in place to prevent pollution from any potential contaminants.	Within the Flood Risk Assessment and Drainage Strategy (Appendix 12.2), the proposed pollution indices arising from the Development are assessed alongside the mitigation indices provided by the SuDS features proposed within the Drainage Strategy. This is in line with the Simple Index Approach and will ensure sufficient treatment of surface water flows is provided.
The Site is in Groundwater Source Protection Zone III (Total Catchment Zone); and hence surface water quality runoff should be considered in the proposed drainage for the Site, potentially requiring measures to prevent pollutants prior to any discharge to ground.	Within the Flood Risk Assessment and Drainage Strategy (Appendix 12.2), the proposed pollution indices arising from the Development are assessed alongside the mitigation indices provided by the SuDS features proposed within the Drainage Strategy. This is in line with

Consultee and Comment	Response
	the Simple Index Approach and will ensure sufficient treatment of surface water flows is provided, to limit the potential for groundwater contamination.
Phasing of the Development should match any phasing of the supply of flood risk mitigation and drainage infrastructure. So, each phase can be completed with an independent flood risk mitigation and drainage strategy.	The phasing of the Development is not known at this stage as this will be dependent on market conditions. However, the principles of phasing are considered within the Drainage Strategy Drainage Strategy (Appendix 12.2). It is expected that each phase will require a standalone Flood Risk Assessment and Drainage Strategy addendum to ensure infrastructure and mitigation is also phased appropriately.
A high-level assessment of a timeline of how each flood mitigation or drainage scheme needs to be implemented prior to the phasing of each Development parcel should be provided.	The phasing of the Development is not known at this stage as this will be dependent on market conditions. However, the principles of phasing are considered within the Drainage Strategy (Appendix 12.2). It is anticipated that each phase of the Development will require a Flood Risk Assessment and Drainage Strategy addendum in line with Reserved Matters and Conditions associated with the application.
Details of the required maintenance of any blue green infrastructure for flood risk management or SuDS features / structures and who will be adopting these features for the lifetime of the Development must be provided in accordance with NPPF. Early engagement with adopting authorities is highly recommended to consider any specific requirements which may not be immediately apparent in the planning process.	Principles of maintenance of the proposed SuDS are outlined within the Flood Risk Assessment and Drainage Strategy (Appendix 12.2) in accordance with NPPF. Engagement was undertaken with Thames Water and Lead Local Flood Authority to establish requirements for Drainage. It is anticipated that agreements will be reached for the long term maintenance and adoption of Drainage at detailed design stage.
The LLFA also requires the applicant to submit information and drawings for full planning applications	The Applicant was submitted an outline application with all matters

Consultee and Comment	Response
which clearly shows the exceedance flood flow routes for all areas of the Development.	reserved apart from details of access (B487 Hemel Hempstead Road / Redbourn Road) Flood Exceedance Plans are included within the Flood Risk Assessment and Drainage Strategy (Appendix 12.2). Details of drainage for these access junctions will be subject to reserved matters applications.
Details of the construction phase temporary drainage arrangements are required by the LLFA to ensure there will be no increase in flood risk due to the construction works of the Development either on Site or elsewhere.	Details of CEMPs and associated documents are provided in Appendix 6.1: Outline CEMP.
<i>HGC – Scoping Response</i>	
Chalk Streams are protected through the EU Water Framework Directive and wider Government Regulations/ Act. There are two Chalk Streams in Hemel Hempstead. The Rivers Gade and Bulbourne that should be referenced, considered and mitigation considered.	It is acknowledged that the Site sits within the River Ver WFD Catchment, which is designated as a Chalk Stream. The Site sits outside of the River Gade and River Bulbourne. The direct, indirect and cumulative effects upon Chalk Streams have been considered within this assessment.
<i>East of England Ambulance Service NHS Trust (EEAST) – Scoping Response</i>	
In Flood Zones 2 and 3 EEAST request the appropriate the use of swales and other drainage measures to absorb any flood waters and would urge developers ensure measures are taken to minimise the risk of flooding in surrounding areas as well as flood proofing homes, garages and other infrastructure.	No dwellings or other ‘vulnerable’ uses are sited in Flood Zones 2 or 3. Consideration of the use of SuDS and flood risk avoidance and mitigation measures are provided within the Flood Risk Assessment and Drainage Strategy (Appendix 12.2).

Pre-Application Consultation

- 12.3.2 In addition to consultation undertaken via the EIA Scoping process, consultation was also undertaken with the Environment Agency, Thames Water, Affinity Water, SADC, and the HCC as the LLFA by email correspondence. The purpose was to obtain information on flood risk, drainage and water supply in the vicinity of the Site and to discuss the emerging drainage strategy and capacity within existing networks for the Development. Further details of consultation are included below in Table 12.2.

Table 12.2: Pre-Application Consultation Response Summary

Consultee and Comment	Response
<i>Environment Agency – 21 May 2025</i> Based upon a review of the submitted information, the proposed Development raises no environmental concerns within our remit. We therefore have no comments to make. Support for the use of SuDS to ensure Development does not increase flood risk elsewhere is set out in paragraph 181 of the National Planning Policy Framework. Increased water efficiency in new Developments potentially enables more growth to be realised without an increased availability of water resources. Developers can highlight responsible water use as a positive corporate social responsibility message that will boost the commercial appeal of the Development. For the homeowner / tenant, lower water usage also reduces water and energy bills. The supply of water in the area is under serious water stress (as identified in our report: Water stressed areas – 2021 classification). All residential Developments must therefore achieve the higher water consumption efficiency standard of 110 litres per person per day, as set out within the Building Regulations &c. (Amendment) Regulations 2015. This standard or higher may already be a requirement of the local planning authority. We recommend that all new non-residential Developments of 1000sqm gross floor area or more (i.e. ‘major’ Developments) should achieve the BREEAM ‘excellent’ standard for water consumption (category ‘WAT 01’), or equivalent. This standard may already be a requirement of the local planning authority.	See Response to Environment Agency Scoping Response in Table 12.1.
<i>Thames Water – 7 May 2025</i> We have completed the assessment of the foul water flows and surface water run-off based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.	See Response to Thames Water Scoping Response in Table 12.1.

Consultee and Comment	Response
We've assessed your foul water proposals and concluded that unfortunately we're unable to meet the needs of your full Development at this time. In order to ensure we make the appropriate upgrades – or 'off-Site reinforcement' – to serve the remainder of your Development, we'll need to carry out modelling work, design a solution and build the necessary improvements. This work is done at our cost.	
<i>Affinity Water – 21 January 2025</i> Water Pre-Development Report provided details for how a new water supply to the proposed Development can be achieved and that capacity is available. In order to receive a detailed design and cost advice for the Development, the full application and supporting information should be completed.	See Response from Affinity Water pre-development report in Table 12.1 Consideration is being given to water efficiency measures within the Development, including rainwater harvesting and greywater re-use.
<i>HCC – 24 February 2025</i> Please note the various surface water flow paths across the Site. If built Development (including access / egress routes, land raising or other vulnerable elements) will be located in the flow paths, a flood risk sequential test may be required. We would anticipate the discharge hierarchy being explored (with preference for shallow infiltration) as far as possible, before considering discharge to river / watercourse and then surface water sewer. Discharge rates should be restricted to greenfield runoff rates, we would accept 1:1 or the QBAR rate. The application should show a commitment to source control SuDS to be located at the plot / street-level to distribute benefits throughout the Site before resorting to oversized attenuation features / the "pipe to pond" approach. Please use FEH 2022 rainfall data and CV parameters set to 1. In general, we expect new applications to comply with the National Standards for SuDS (June 2025), including the principles and individual standards. These should be demonstrated throughout the design. The Hertfordshire County Council LLFA Validation List shows the information we expect in support of a planning application – located under Policies and guidance at the	See Response to HCC Scoping Response in Table 12.1.

Consultee and Comment	Response
following link Surface water drainage Hertfordshire County Council Our SuDS proforma is available at the same link. Please submit this alongside your planning application to aid our review. Both FEH13 and FEH22 are currently accepted to support drainage modelling calculations. For the avoidance of doubt the use of FSR and FEH1999 data was superseded and therefore, use in rainfall simulations are not accepted.	

Summary of Assessment Scope

- 12.3.3 The scope of the construction assessment within this chapter is limited to the following potential impacts and assessment of effects:

Construction

- 12.3.4 For the construction phase of the Development, the following potential effects have been assessed:

- Foul water – potential disruption to the existing network during construction;
- Potable water – potential disruption to the existing network during construction;
- Effects on water quality of water bodies including local watercourse network and groundwater; and
- Localised effects on groundwater flow and stream base flow, including groundwater flooding.

Completed Development

- 12.3.5 For the completed Development, the following potential effects have been assessed:

- Flood risk – changes in flood risk from all sources (factoring in climate change allowances and the latest rainfall data), including changes to topography as appropriate;
- Groundwater – potential changes in hydrogeology and the flow of groundwater beneath the Site resulting from the completed Development;
- Surface water (quantity) – the effects of the completed Development on the volume and rate of surface water runoff taking account of the proposed ground level and sustainable drainage systems;
- Surface water (quality) – the potential risk of the completed Development resulting in pollutants and their effects on the water environment;
- Foul water – additional demand for foul water treatment and networks from the completed Development. The assessment will include consideration of any potential infrastructure capacity issues; and

- Potable water – demand on potable water supply resulting from the Development. This assessment will include consideration of the potential impact of such demand on water resource availability and management.

Cumulative Assessment:

- 12.3.6 The cumulative assessment will consider the same potential likely effects (where possible and where the necessary information is available) as identified for the Development (outlined above).

Non-Significant Effects

- 12.3.7 All other Water Resources, Flood Risk and Drainage effects were scoped out of further assessment within this ES. This includes:
- Potential changes in rate and volumes of surface water runoff and demand and supply of the local drainage and water supply network during construction – these would be effectively mitigated through standard good practice Site measures outlined within the Outline CEMP; and
 - Risks to groundwater quality from the completed Development are not considered likely due to the nature of the proposals.

Study Area

- 12.3.8 The Study Area comprises the Site and a 1 km search area from the Site boundary. The 1 km search area has been determined using professional judgement and is considered appropriate for data collection considering the nature and timescale of the Development, and the potential zone of influence on hydrological receptors. Given the landscape surrounding the Site and adjacent land uses, it is difficult to ascertain the exact source of any impacts on water quality beyond 1 km.

Baseline Characterisation Approach

Existing Baseline

- 12.3.9 The approach to defining the baseline conditions within the study area for the assessment involved a combination of Site surveys and desk-based research, as set out below.

Site visit / surveys

- 12.3.10 A hydrology Site visit was undertaken on the 7 March 2025 to further understand the topography of the Site and surrounding land. The Site visit was conducted by 2no. RPS hydrologists. For the days prior to the Site visit, the weather was sunny and the temperature approximately 14 degrees. The ground at the Site was not waterlogged.
- 12.3.11 Large topographic dips were seen in the Site, correlating to where the EA RoFSW mapping identified areas of risk. Ponding was seen in the northern flow pathway, associated with a topographic dip in the field.
- 12.3.12 No structures were identified on Site (i.e. culverts / bridges). Ditches along field boundaries were seen and matched what was shown in LiDAR.
- 12.3.13 No manhole covers were seen within the Site during the visit.

12.3.14 Site visit photographs are included in Appendix 12.3.

Desk Study

12.3.15 The baseline conditions for the study area was informed by a review of the following information sources:

- Defra Lidar Data²²;
- Site Topographic Survey (ref 23638se-27);
- BGS Geology of Britain Viewer: 1:50,000 Geological Mapping²³;
- Catchment Data Explorer²⁴;
- Flood Map for Planning²⁵;
- Long Term Flood Risk Maps²⁶;
- The Flood Estimation Handbook²⁷;
- Climate change allowances for peak river flow in England²⁸;
- Climate change allowances for peak rainfall in England²⁹; and
- Defra MAGIC Mapping³⁰.

Flood Modelling

12.3.16 RPS developed a surface water flood model to consider the Site in more detail and the Development masterplan. The aim of the modelling was to provide a greater understanding of the Site and wider catchment baseline conditions in more depth than is shown in the EA Risk of Flooding from Surface Water Flood Map (RoFSW). The approach includes building a new 2Dimensional (2D) rain on grid surface water model using TUFLOW version: 2023-03-AF-iDP-w64 which is the industry standard modelling software. Further details of the modelling parameters and approach is provided in Appendix G of the FRA (Appendix 12.2).

Future Baseline

12.3.17 The main change to the hydrology and flood risk baseline in future is likely to be associated with the potential effects of climate change, which may impact on future peak river flow rates and rainfall intensity. The EA produced 'Flood Risk Assessments: climate change allowances' in May 2022 advice and this was undertaken in accordance with information generated by UK Centre for Ecology and Hydrology (CEH).

12.3.18 A 'Proposed Scenario' was undertaken within the surface water modelling exercise. This included an allowance for climate change in line with aforementioned EA guidance, the introduction of surface water flood mitigation measures, and Development parcels in line with the current masterplan. The main flow pathway is crossed by the spine road and an access road between parcels. The flow path was lowered to create a channel to contain the flows, and the crossings have been designed to have minimal impact on the natural pathway of the flow. Depth difference mapping shows no impact on flood risk off-Site and in some places resulted in a betterment. Further details of the modelling parameters and approach is provided in Appendix G of the FRA.

Assessment Method

12.3.19 The ES was prepared in compliance with the EIA Regulations. The assessment of likely effects on hydrology, flood risk, water quality and water resources takes account of the

impacts from the Development on the prevailing hydrological, surface water drainage, flooding and water quality environments.

- 12.3.20 Local and national planning policy was reviewed, including the South West Herts Strategic Flood Risk Assessment (SFRA)³¹ and Addendum produced by the LLFA for the emerging Draft SADC Local Plan. The baseline was established through a desk study assessment, review of regulatory data and mapping.
- 12.3.21 The potential impacts of the Development during the construction and operational phase have been established using the professional judgement of the assessor. The impacts have been assessed over the design life of the Development, including consideration of the effects of climate change. An assessment was made of the potential impacts of the identified effects on the baseline conditions. The significance of the effects was determined through consideration of the sensitivity of the receptor and the magnitude of the effect.
- 12.3.22 Appropriate mitigation in line with this was included in line with NPPF and local planning policy. The residual effects have subsequently been assessed following the implementation of these mitigation measures.

Construction

- 12.3.23 As outlined above, likely effects are assessed for the construction phase by reviewing the Development proposals and receptors within 1km of the Site. This is undertaken for the construction phase with a view for the proposed activities ongoing in phases from 2028 until 2041 with a peak year of construction assumed to be 2033.
- 12.3.24 It is assumed that during construction, the extent of active phases would include extents of temporarily impermeable areas as each phase is built out. Rochdale Envelope for impermeable areas arising as a result of construction will include the proposed development platforms. It is expected this area will be refined throughout the detailed design process.

Completed Development

- 12.3.25 As outlined above, likely effects are assessed for the completed Development phase by reviewing the Development proposals and receptors within 1km of the Site. This is undertaken for the completed Development phase with a view towards the year of first occupation being 2030.
- 12.3.26 During the operational phase, the Rochdale Envelope for impermeable areas was assessed as no greater than 26ha, in line with the conceptual drainage strategy. It is understood that the development will be undertaken in phases, leading to a likely staggered changes and increases in the amount of impermeable area.

Cumulative Effects

- 12.3.27 The cumulative schemes that have been agreed with SADC for assessment have been reviewed to determine their potential to interact cumulatively with the Development during the construction and completed Development phases. Table 12.3 presents a summary of a screening exercise applied to the long list of schemes and identifies those that have been taken forward within this assessment for cumulative assessment. Several schemes have been scoped out; this is due to them being located over 1km from the Development. Given

the landscape surrounding the Site and adjacent land uses, it is difficult to ascertain the exact source of any impacts on water quality beyond 1km.

- 12.3.28 With regards to potable and foul water capacity, it is understood that Water Authorities are required to provide updates to their networks to support new Development. Due to the fluctuating nature of many Water Authority networks, there is limited guarantee of reservation of network capacity. Therefore, it is not feasible to determine cumulative effect on potable and foul water capacity as this is at the discretion of the Water Authority and the assessed capacity at time of a Development coming forward.

Table 12.3: List of Cumulative Schemes Scoped In

No.	Planning Ref.	Location
<i>St Albans City and District Council</i>		
1	5/2016/2845	Land Between Three Cherry Trees Lane and Cherry Tree Lane, Hemel Hempstead Phase 2 - Spencers Park Phase 2 West Outline planning application to include up to 600 dwellings (C3), land for primary school (D1), land for local centre uses (A1, A3, A4, A5, D1, D2), land for up to 7,500 square metres of employment uses (B1, B2, B8), landscaping, open space and play area.
2	5/2021/3631	Land At Gaddesden Lane, Redbourn Construction of up to 300 new homes including 35% affordable new homes, new landscaping, public open space and associated infrastructure works.
3	5/2024//2171	Land to East of Hemel Hempstead, Hemel Hempstead Road, Redbourn (SADC Site Allocations H2, H3, H4) Construction of up to 4,000 new dwellings (to include 40% affordable housing, 5 extra-care facilities each comprising 70-80 self-contained units, 3 nursing homes (each of 70-80 beds) and 16 supporting living units); up to 53ha of employment.
<i>SADC Site Allocations</i>		
B3	West Redbourn	Residential-led scheme of approximately 545 units and a new 2FE Primary school.
<i>Dacorum Borough Council Site Allocations (Draft DBC Local Plan)</i>		
Hm01	North Hemel Hempstead Growth Area	Around 1,500 dwellings by 2041, with up to 3,500 additional homes (to include provision for older people) to be delivered beyond the plan period subject to master planning; three 3FE and one 2FE primary schools (including nursery provision on three); and one 8FE secondary school. Gypsy and Traveller Site for 8 pitches

Assessment Criteria

Sensitivity of Receptor

- 12.3.29 The criteria used for determining the sensitivity of the receptor in this assessment, based on professional judgement, are presented in Table 12.4.

Table 12.4: Receptor Sensitivity Descriptors

Value (Sensitivity)	Descriptor
High	Receptor with a low capacity to accommodate change, is of high value with high contribution to the local, regional or national economy. Receptor is vulnerable to impacts that may arise from the Development and / or has low recoverability. Examples include: ▪ Surface water: Receiving watercourse or groundwater classified as High or Good Ecological status / potential under the Water Framework Directive (WFD). ▪ Groundwater: Site located within a Groundwater Source Protection Zone (SPZ) inner or outer protection zone (Zone 1), ▪ Regional sewer or water supply networks, or networks with very limited resources or capacity ▪ Flood Risk: Land is within a high to medium risk flood zone or locally significant infrastructure is present which is protected from flooding by natural floodplain storage. ▪ Human receptors: Construction workers and future residents.
Medium	Receptors with a moderate capacity to accommodate change, is of minor value with small levels of contribution to the local, regional and national economy. Receptor is somewhat vulnerable to impacts that may arise from the Development and has moderate to high levels of recoverability. Examples include: ▪ Surface water: Receiving watercourse or groundwater classified as Good or Moderate Ecological status / potential under WFD. ▪ Groundwater: Groundwater body supports private water supply or medium scale agricultural / industrial abstractions, including drinking water protected areas. ▪ Local sewer or water supply networks, or networks with some limited resources or capacity ▪ Flood Risk: Land is within a medium risk flood zone. NPPF Flood Risk Classification 'More Vulnerable'.
Low	Receptor with a high capacity to accommodate change, is of low value with little contribution to the local, regional or national economy. Receptor is not generally vulnerable to impacts that may arise from the development and/or has high recoverability. Examples include: ▪ Surface water: Receiving watercourse or groundwater classified as Poor Ecological status / potential under WFD. ▪ On-Site sewer or water supply networks, or networks with no resource or capacity issues ▪ Groundwater: Low or very low productivity aquifer with no abstraction licences. ▪ Flood Risk: Land within a low-risk flood zone. NPPF Flood Risk Vulnerability Classification 'Less Vulnerable.'
Negligible	Receptor with a very high capacity to accommodate change, is of negligible value with no contribution to local, regional or national economy. Receptor is not vulnerable to impacts that may arise from the Development and / or has high recoverability. ▪ Surface water: Receiving watercourse or groundwater classified as Bad Ecological status / potential under WFD. ▪ Groundwater: Very low productivity aquifer with no abstraction licences.

Value (Sensitivity)	Descriptor
	Flood Risk: Land is within a little to no flood risk zone and no major flood risk areas are present within a 250 m radius of the Site. Floodplain essentially rural in nature, characterised by agricultural land use NPPF Flood Risk Vulnerability Classification 'Water Compatible.'

Magnitude of Impact

12.3.30 Table 12.5 sets out the magnitude of impact descriptors typically used in the assessment.

Table 12.5: Magnitude of Impact Descriptors

Impact Magnitude	Descriptors – Adverse	Descriptors – Beneficial
High	Loss of resource and / or quality and integrity of resource; severe damage to key characteristics, features or elements	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality
Medium	Loss of resource, but not adversely affecting the integrity; partial loss of / damage to key characteristics, features or elements	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality
Low	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements	Very minor benefit to or positive addition of one or more characteristics, features or elements

Assessing Significance

12.3.31 Table 12.6 sets out the approach to determining the scale of effect. Determining the scale of socio-economic effects requires professional judgement therefore the matrix includes a degree of flexibility when considering the magnitude of an impact in the context of the sensitivity of the receptor.

12.3.32 Effects classified as moderate or major in scale are considered 'Significant.' Effects classified as minor or negligible in scale are considered 'Not Significant.'

Table 12.6: Significance of Effect Matrix

Sensitivity / Value of Receptor	Magnitude of Impact			
	High	Medium	Low	Negligible
High	Major	Major / Moderate	Moderate	Negligible
Medium	Major / Moderate	Moderate	Moderate / Minor	Negligible

Sensitivity / Value of Receptor	Magnitude of Impact			
	<i>High</i>	<i>Medium</i>	<i>Low</i>	<i>Negligible</i>
<i>Low</i>	Moderate	Moderate / Minor	Minor	Negligible
<i>Negligible</i>	Negligible	Negligible	Negligible	Negligible

Assumptions and Limitations

- 12.3.33 The following assumptions and limitations have informed this assessment.
- 12.3.34 It is assumed that during construction, the Rochdale Envelope for impermeable areas arising as a result of construction will include the proposed development platforms. It is expected this area will be refined throughout the detailed design process and will be undertaken in a phased approach.
- 12.3.35 During the operational phase, the Rochdale Envelope for impermeable areas was assessed as no greater than 26ha, in line with the conceptual drainage strategy. It is understood that the development will be undertaken in phases, leading to a likely staggered increase in the amount of impermeable area.
- 12.3.36 The report is based on publicly available hydrological and flood risk data extracted from the EA website and the SFRA. Additional information was also supplied by stakeholders during the consultation (see Table 12.2).
- 12.3.37 The characterisation of the baseline environment could further benefit from further detailed information on:
- Site-specific flow data for surrounding watercourses and drainage channels – No publicly available data is available via the National River Flow Archive. It is noted that the Site is located within the ‘Ver’ WFD Surface Water Catchment; and
 - Site-specific detailed groundwater flow information - data may be obtained via ongoing groundwater monitoring and modelling. It is noted that the Site is located within the ‘Mid-Chilterns Chalk’ WFD Groundwater Body.
- 12.3.38 Overall, however there is a high level of certainty associated with details of the baseline environment and with the findings of the assessment presented in this chapter. The available information is considered sufficient to establish baseline within the hydrological and hydrogeological Study Area for the purposes of EIA. Therefore, there are no data limitations that affect the robustness of the conclusions of this assessment.

12.4 Baseline Conditions

Existing Baseline

- 12.4.1 This section describes Water Resources, Flood Risk and Drainage baseline conditions within the Study Area which includes the Site and Study Area. Observations have been summarised from the baseline of the FRA available as detailed in Appendix 12.2. A brief description of the Site is set out in Chapter 2: Site and Setting.

Site Description and Topography

- 12.4.2 The Site generally falls from northwest to southeast, with slight undulation. Two shallow ‘valley’ features follow the topography towards the southeast and Hemel Hempstead Road. Hemel Hempstead Road is slightly elevated from the Site by approximately 500mm along the southern boundary of the Site. The topographic survey of the Site is included as Appendix D of the FRA (Appendix 12.2).

Hydrological Setting

- 12.4.3 OS Mapping indicates that no surface waterbodies are located within the Site boundary. The nearest surface water features are several ponds which are located within 1km of the Site.
- 12.4.4 Ecology surveys undertaken for the Development, details of which can be found in Chapter 13: Biodiversity, identified a single pond located in the centre of the Site. It was determined to have limited water and be of poor water quality.
- 12.4.5 During the Hydrology Site Walkover in March 2025, the pond feature was observed, with raised ‘banks’ and vegetation indicating the presence of water at times. Ditches were present at the Site boundary, which were dry at the time of the visit.
- 12.4.6 It is anticipated that highway drainage systems associated with the B487 will be present; however, details of these are unknown. It is proposed that the implemented drainage strategy for the realigned Hemel Hempstead Road will replace the existing highways drainage.
- 12.4.7 The nearest EA designated Main River is approximately 1.5km east of the Site, which is a tributary of the River Ver.
- 12.4.8 Several ponds are located with 1km of the Site. Satellite imagery shows the ponds as dry suggesting they may be surface water attenuation features that allow infiltration into the underlying Chalk.
- 12.4.9 OS Mapping indicates no further surface water features (e.g. ordinary watercourses, canals, reservoirs) are present within 1km of the Site.

Surface Water Body Status

- 12.4.10 River Basin Management Plans have been drawn up for river basin districts across England and Wales under the Water Framework Directive (WFD). Hydrological features often contribute either directly or indirectly to the overall framework designation. The Site is located within the Ver Catchment.
- 12.4.11 WFD River Catchments are included in Figure 12.1 and the classification of these waterbodies relevant to the Site is included in Table 12.7.

Table 12.7: River Catchments

Catchment	Waterbody Feature	Classification
Ver (ID: GB106039029920)	River (Catchment Area 146.351 km ²)	Moderate Ecological Status

12.4.12 The River Ver is designated as a Chalk Stream. The River Gage and River Bulbourne are also designated as Chalk Streams; however, the Site is located outside of the catchments for both of these waterbodies. Therefore, consideration of the River Ver only and its Chalk Stream status will be considered within this assessment.

Hydrogeological Setting

Geology and Groundwater

12.4.13 Intrusive trial pits and BRE365 soakaway tests were carried out on Site by EPS (in September 2019 for the southern part of the Site and May 2025 for the northern part of the Site).

12.4.14 The intrusive Site investigations and BGS geological mapping indicate the Site to be underlain by the bedrock geology of Lewes Nodular Chalk Formation and Seaford Chalk Formation. There are superficial deposits of Clay-with-Flints Formation mapped as clay, silt, sand, and gravel over certain areas of the Site, coming through in two main sections, trending roughly northwest to southeast. The more clay based superficial deposits are located towards the north-west.

12.4.15 Groundwater was monitored through a series of boreholes located in the southern portion of the Site. Groundwater was only encountered in some of the boreholes and at considerable depth. Further details on the Trial Pits and Soakaway Tests are provided within Appendix H of the FRA (Appendix 12.2). Additional details of Geology and Soils at the Site are provided within Chapter 16: Agricultural Land and Soil.

Groundwater Body Status

12.4.16 The EA Catchment Data Explorer mapping indicates that the Study Area falls within the ‘Mid-Chilterns Chalk’ WFD Groundwater body. WFD Groundwater Catchments are shown in Figure 12.2. Classifications for the water body is presented below within Table 12.8.

Table 12.8: Groundwater Bodies

Catchment			Waterbody Feature		Classification
Mid-Chilterns	Chalk	(ID: GB106039029920)	Groundwater (Catchment 72974.352 ha)	Body Area	Poor Overall Status

Environmental Designations

12.4.17 Impacts upon Water Resources and Flood Risk can have detrimental effects to ecologically designated Sites. There are no designated sensitive areas (e.g. Special Area of Conservation (SAC), Special Protection Area (SPA) or Site of Special Scientific Interest (SSSI), Local Nature Reserves, National Nature Reserves, Ramsar Sites, Special Areas of Conservation (SAC), Biosphere Reserves) within the Study Area.

12.4.18 The entire Site area lies within a Total Catchment (Zone 3) Source Protection Zone for local groundwater abstraction; therefore, groundwater has been considered as a sensitive receptor to contaminants.

- 12.4.19 As outlined by the SFRA, the River Ver is a groundwater-fed chalk stream, which are considered to provide globally rare habitats, and support diverse wildlife species. However, these chalk streams are fragile hydrological systems, which are dependent on seasonal rainfall patterns and therefore prone to low flow conditions. This, alongside over abstraction of aquifers and the watercourses themselves, poses a threat to chalk stream habitats.

Water Resources

- 12.4.20 The Water Stress Map³², produced by the Environment Agency and published 1 July 2021, identifies the Site within an area deemed to be under 'Serious' water stress, where water resources are being or are likely to be exploited to a degree which may result in pressure on the environment or water supplies both now and in future. The Site is shown on the map as within Area 1 – Affinity Water.

Flood Risk

Fluvial

- 12.4.21 Fluvial flooding is caused by high flows in rivers or streams exceeding the capacity of the river channel and spilling onto the floodplain, usually after periods of heavy rainfall. EA Flood Maps for Planning show the Site is situated entirely within Flood Zone 1 (0.1% chance of annual flooding) for rivers and coastal flooding sources. The closest Flood Zones 2 and 3 are located over 2km to the east of the Site, associated with the River Ver. The Site is not located within a Flood Warning or Flood Alert Area.

Surface Water

- 12.4.22 Flooding from surface water runoff (or 'pluvial' flooding) is usually caused by intense rainfall that may only last a few hours and usually occurs in lower lying areas, often where the natural (or artificial) drainage system is unable to cope with the volume of water.
- 12.4.23 The EA Flood Map for Surface Water indicates that large areas of the Site are at a 'Very Low' (chance of flooding less than 0.1% (1 in 1000)) risk of surface water flooding. There are isolated areas of 'Low' (chance of flooding between 0.1% and 1% (1 in 100 and 1 in 1000)) to 'High' (chance of flooding greater than 3.3% (1 in 30)) surface water risk and several areas are present which may be associated with flow paths are present within the Site boundary. Surface water flow paths generally extend from the north west of the site, to the south east of the Site, adjacent to the B487.
- 12.4.24 As of January 2025, the EA also provides data for Flood Map for Surface Water including climate change extents, which consider the 'Central' climate change allowance for the 2050s epoch (2040-2060). This dataset presents the risk which takes account of the following climate change allowances based on the latest UK Climate Projections (UKCP18) from the Met Office, using the Representative Concentration Pathway (RCP) 8.5: - the 'Central' allowance for the 2050s epoch (2040-2060) for risk of flooding from surface water. These allowances include anticipated changes to peak rainfall intensity. Within the climate change scenario, 'Low' to 'High' risk areas of surface water flood risk have larger extents.
- 12.4.25 The baseline outputs from the flood modelling are shown in Figure 12.3 RPS used a 2D rain on grid model to provide Site specific results for surface water flooding at the Site. This was done using Site specific topography of higher resolution than LiDAR used in the EA online RoFSW mapping. The RPS baseline model was run for the 1 in 30 year, 1 in 100 year, 1 in 100 year +45% Climate Change and 1 in 1000 year events. The flow mechanisms

through all events were similar, with 2no. significant flow paths in the Site heading southeast. Results presented very similar extents to that presented in online EA surface water flood maps.

Other Sources

- 12.4.26 The EA Flood Risk from Reservoirs mapping indicates that flooding from reservoir sources is indicated along Hemel Hempstead Road. This emanates from the Thames Water owned Cherry Tree Lane Reservoir to the southwest of the Site, adjacent to the Nickley Line.
- 12.4.27 Groundwater was monitored through a series of boreholes located in the southern portion of the Site. Groundwater was only encountered in some of the boreholes and at considerable depth. It is therefore considered unlikely the Site would be impacted by groundwater flooding.
- 12.4.28 Consultation was undertaken with Thames Water for the Site. The sewer records are included within Appendix 12.2. Thames Water sewer records show foul and surface drainage within the urban areas to the immediate west of the Site. There are no on-Site watercourses, significant field drainage or sewers on-Site. The B487 is present along the southern area of the Site. It is anticipated that highway drainage is associated with the road, however details are not known.

Discharge Consents

- 12.4.29 A number of discharge consents are held within the surrounding area, with the closest of these being located adjacent to the Site's northern corner. The nearest entry relates to final/ treated effluent being released to land via a soakaway. Details are provided within the Phase 1 Geoenvironmental Study.

Water Abstraction

- 12.4.30 No surface water abstractions are recorded within 1km. Two groundwater abstractions where groundwater is reported to be abstracted from a borehole for general farming and agricultural use, are located within the Study Area. Details are provided within the Phase 1 Geoenvironmental Study.
- 12.4.31 Two groundwater abstractions where groundwater is abstracted for general agriculture and for private household use, are located within the Study Area. Details are provided within the Phase 1 Geoenvironmental Study.

Pollution Incidents to Controlled Waters

- 12.4.32 Several pollution incidents have been recorded within 1km of the Site. Details are provided within the Phase 1 Geoenvironmental Study and summarised below in Table 12.9.

Table 12.9: Groundwater Bodies

Pollutant, Receiving Water & Date of Incident	Approximate Distance and Direction from Site	Incident Severity / Category
Oils (unknown), unknown / not given, April 1990	250m south	Category 3 (minor)

Pollutant, Receiving Water & Date of Incident	Approximate Distance and Direction from Site	Incident Severity / Category
		Incident
Oils (unknown), unknown / not given, October 1992	520m east	Category 3 (minor) Incident
Chemicals (unknown), Unknown / not given, October 1995	780m southwest	Category 3 (minor) Incident

Future Baseline

- 12.4.33 The main change to the hydrology and flood risk baseline in future is likely to be associated with the potential effects of climate change, which may impact on future peak river flow rates and rainfall intensity. The EA produced advice on climate change allowances to support the NPPF (2023) this was undertaken in accordance with information generated by UK Centre for Ecology and Hydrology.
- 12.4.34 RPS undertook hydraulic modelling for the Site in 2025. Current climate change guidance requires a climate change allowance of 40% to be assessed for the Colne Management Catchment. The modelled 100 year +40% climate change flood extents have been. Results of the modelling exercise are provided within Appendix 12.2.

Summary of Receptors and Sensitivity

- 12.4.35 Table 12.10 and Figure 12.4 provide a summary of the sensitive receptors.

Table 12.10: Summary of Receptor Sensitivity

Receptor	Sensitivity (Value)	Rationale
<i>Existing</i>		
Waterbodies (main rivers and ordinary watercourses and catchments)	High	All watercourses seek to achieve 'Good' status. Surface water flows from the Site will discharge into the local water environment. It is key to ensure that the Development will not impact this detrimentally and prevent 'Good' status from being achieved. The nature of the receptor means they have a moderate recoverability. Their contribution to the local environment means they have high value. The River Ver is a groundwater-fed chalk stream, which again may feed into wider environmental impacts should the wider catchment functioning be impacted.
Groundwater	High	The underlying groundwater WFD status is 'Poor.' The Site is located within a SPZ III area.

Receptor	Sensitivity (Value)	Rationale
		Effects to this could be highly detrimental to the wider groundwater catchment and dependent ecosystems.
Adjacent land	High	The Study Area comprises areas of residential, commercial and agricultural land use. Agricultural land in particular has high vulnerability to contamination and flood events.
Water supply and drainage infrastructure	High	Water supply and drainage infrastructure operated by Thames Water and Affinity Water The water infrastructure has a high vulnerability due to the costs associated with repair. Despite the high cost, the water infrastructure has high recoverability. There is also water stress and capacity issues within the area. Although consideration of the infrastructure is on a local scale, pressures on existing networks and water stress are considered a regional issue.
Human Receptors	High	Site occupants during the construction stage comprise of construction workers who are expected to be present on Site during working hours. Residents of the Site and Site visitors during the operational phase may be affected.

Future

No additional receptors were identified

12.5 Embedded Mitigation (Scheme Design and Management)

- 12.5.1 Table 12.11 summarised the embedded mitigation measures that have been accounted for within this assessment. As set out in Chapter 3: EIA Methodology, and in line with IEMA guidance, this includes both primary and tertiary mitigation measures.

12.6 Assessment of Effects - Construction

Potable Water

- 12.6.1 The construction of the Development would result in an increase in potable water demand. No existing potable water assets have been located within the Site boundary; however existing potable assets are present within the vicinity of the Site. Provision of potable water will include amendments to existing infrastructure as well as the temporary requirement of potable water resources during construction, which place an increased demand upon Affinity Water.

Sensitivity of Receptor

- 12.6.2 In order to provide potable water to the Development, works to the existing network may be required. These works will be the direct responsibility of Affinity Water. As the region is considered 'water stressed' impacts during construction such as leaks or burst mains, have the potential to waste already limited potable water, therefore, the receptor sensitivity is classified as High.

Magnitude of Impact

- 12.6.3 It is anticipated that any new mains will run along existing roads to the Development (noting that this will be the responsibility of Affinity Water), thereby limiting any environmental impacts, as per industry practice. Works will be undertaken to minimise the risk of damage to the existing network and arrangements for water required during development will be agreed to minimise impacts to current availability. The proposed route for any on-Site mains have not been identified at this stage, due to the planning application being at outline stage and layout being a Reserved Matter. The impact magnitude is therefore considered to be negligible.

Significance of Effect

- 12.6.4 Overall, the magnitude of the impact is deemed to be negligible, the sensitivity of the receptor is considered to be High. The effect will, therefore, be of minor significance, which is not considered significant.

Foul Water

- 12.6.5 The Development would introduce new land uses resulting in an increase of foul water flows. No existing foul water assets have been located within the Site boundary; however existing foul assets are present within the vicinity of the Site. Provision of foul water will include amendments to existing infrastructure.

Sensitivity of Receptor

- 12.6.6 In order to accommodate flows from the Development, works to the existing network may be required. These works will be the direct responsibility of Thames Water. Due to the existing network having limited capacity, works undertaken during construction have the potential to place additional pressure upon elements of the existing network, therefore, the receptor sensitivity is classified as High.

Magnitude of Impact

- 12.6.7 It is anticipated that any new mains will run along existing roads to the Development (noting that this will be the responsibility of Thames Water), thereby limiting any environmental impacts, as per industry practice. The proposed route for any on-Site mains have not been identified at this stage, due to the planning application being at Outline stage and layout being a Reserved Matter. The impact magnitude is therefore considered to be negligible.

Significance of Effect

- 12.6.8 Overall, the magnitude of the impact is deemed to be negligible, the sensitivity of the receptor is considered to be high. The effect will, therefore, be of minor significance, which is not considered significant.

Water quality of water bodies (including local watercourse network and groundwater)

- 12.6.9 The disturbance of ground and earthworks during the construction phase may lead to the mobilisation of sediments and pollutants. The contaminated runoff may enter watercourses in the vicinity of the Site and potentially have a detrimental effect on water quality. Due to the nature of the hydrological environment in the region, there is the potential for this to affect groundwater bodies. Construction activities have the potential to disturb any existing areas of ground / groundwater contamination. Water quality in the underlying bedrock aquifer could be affected by mobilisation of contaminants during construction.

Sensitivity of Receptor

- 12.6.10 Several drainage ditches are located within the boundary of the Site as well as an identified pond feature. There are several pond features located within 1km of the Site. The nature of the local hydrology features means they have a moderate recoverability. Their current condition and likely role within the wider catchment mean they have low value. The sensitivity of the local hydrology receptors is therefore, considered to be low.
- 12.6.11 The Site is located within the 'Ver' WFD Surface Water Catchment and within the 'Mid-Chilterns Chalk' WFD Groundwater Body.
- 12.6.12 The nature of the River Ver and Mid-Chilterns Chalk means they have a moderate recoverability. Their contribution to the local environment means they have high value. The sensitivity of the receptors is therefore, considered to be high.

Magnitude of Impact

- 12.6.13 Activities associated with the use of machinery during construction could lead to an increase in contaminated run-off resulting from the spillage / leak of fuel, oil etc. that could affect nearby surface water and groundwater bodies, potentially impact on water quality and cause a reduction in waterbody WFD classification.
- 12.6.14 Assuming that best practice construction measures are implemented, as secured and set out within the CEMP, there is unlikely to be any observable degradation in water quality and associated degradation of WFD classification. The magnitude of impact is predicted to be indirect, of local spatial extent, short term duration and intermittent. The impact magnitude is therefore considered to be negligible.

Significance of Effect

- 12.6.15 Overall, the magnitude of the impact is deemed to be negligible, the sensitivity of the receptor is considered to be high. The effect will, therefore, be negligible, which is not considered significant.

Localised effects on groundwater flow and stream base flow, including groundwater flooding

- 12.6.16 Modifications of groundwater pathways may occur as a result of construction works. Cut and fill activities have the potential to intersect the water table, lower the water table, interrupt lateral flow, all of which may disrupt wider groundwater flows and affect receiving groundwater bodies. Details have not yet been confirmed; however it is expected that piled foundations may be required, which have the potential to interact with groundwater. This

may also lead to the potential for groundwater ingress to excavations and may require pumping.

Sensitivity of Receptor

- 12.6.17 The groundwater body within the study area is currently assessed to 'poor' overall WFD status. Taking a precautionary approach in assuming the waterbody has achieved 'good' status at the time when construction begins, the groundwater body within the study area has been assessed with a WFD status of 'good'.
- 12.6.18 The entire Site area also lies within a Total Catchment (Zone 3) SPZ for local groundwater abstraction. Four groundwater abstractions are recorded within the Study Area for agricultural and private household use.
- 12.6.19 The River Ver is designated as a groundwater-fed chalk stream, which would therefore be impacted by changes to groundwater mechanisms.
- 12.6.20 The groundwater bodies and associated groundwater-fed waterbodies are therefore considered to be highly vulnerable in relation to WFD classification status, and of moderate value in relation to the local economy. The sensitivity of the receptor is therefore, considered to be high.
- 12.6.21 The vulnerability of aquifers is considered to be high, and the recoverability of receptors is considered to be low due to time required for receptors to recover from aforementioned impacts. The sensitivity of the receptor is therefore, considered to be high.

Magnitude of Impact

- 12.6.22 It is anticipated that a phased approach will be taken to the Development, which will therefore reduce the scale of engineering works affecting the Site at any one time. The groundwater beneath the Site is also at depth and earthworks are not extensive enough to interact directly with the groundwater. This therefore will minimise the impacts upon groundwater mechanisms. Surface Water and Groundwater Management Plan measures included in the CEMP will be used to ensure groundwater is monitored and managed during construction. Due to the nature of the works likely to be undertaken, groundwater levels are likely to recover after construction
- 12.6.23 Considering the mitigation measures secured through the CEMP, the impact upon groundwater pathways, and associated base flow to watercourses is predicted to be direct, of local spatial extent, short term duration, intermittent and medium reversibility. The magnitude is therefore, considered to be negligible adverse.

Significance of Effect

- 12.6.24 On the basis that the sensitivity of the receptor is high, and the magnitude of the impact is negligible adverse with mitigation measures, it is assessed that there will be a minor adverse effect, which not significant in EIA terms.

Additional Mitigation, Monitoring and Residual Effects

- 12.6.25 It would be pertinent to undertake a Preliminary and Foundation Works Risk Assessment (PFWRA) ahead of any works taking place. This would allow the production of an initial Site conceptual model to determine any potential pollution scenarios related to groundworks.

Alongside this, it would be recommended to undertake a study of the groundwater regime at the Site including groundwater monitoring to determine the nature of groundwater at the Site. This will aid in ensuring groundwater is not detrimentally impacted before, during and post construction.

- 12.6.26 In relation to potable and foul water assets, it may also be suitable to ensure relevant surveys are undertaken to ensure all existing utilities assets are identified to reduce risk of damaging existing water infrastructure

12.7 Assessment of Effects - Completed Development

Flood Risk

- 12.7.1 This section considers changes in flood risk from all sources (factoring in climate change allowances and the latest rainfall data), including changes to topography as appropriate. During the operational phase of the Development, new impermeable areas have the potential to result in an increased flood risk. These areas may alter drainage patterns and surface water runoff rates on Site, increasing the risk of flooding posed to the surrounding area.

Sensitivity of Receptor

- 12.7.2 Adjacent land within the study area, including associated infrastructure is of high vulnerability, low recoverability and high value. The sensitivity of the receptor is therefore, considered to be high.
- 12.7.3 Human receptors during this phase of the Development will be on-Site and off-Site residents or individuals present within the vicinity of the development who are assessed to be highly vulnerable, low recoverability, high value and have an overall high sensitivity.

Magnitude of Impact

- 12.7.4 The FRA and Drainage Strategy for the Development outlines that surface water at the Site will be accommodated at the 1 in 1 greenfield runoff rate¹ up to the 100 year plus 40% climate change events. Flows will be attenuated within the Site and discharged from the Site via infiltration through a range of SuDS measures, including:
- Local soakaways where space allows;
 - Permeable paving where space allows, and end use / adoption permits;
 - Local bio-retention / raingardens in greenspace and alongside roads;
 - Swales, either locally or strategic conveyance swales. These will be designed to allow infiltration where possible;
 - Parcel specific infiltration basins; and
 - Strategic infiltration basins.

¹ The "1 in 1 greenfield rate" is the pre-Development peak rate of surface water runoff from a Site in its undeveloped state, calculated for a 1-year return period rainfall event.

- 12.7.5 When compared to the baseline, the introduction of the proposed drainage systems will likely lead to a reduction in flood risk to areas within the vicinity of the Development. This may introduce a low beneficial effect, as surface water flows generated from development within the Site will be managed sustainably by attenuating and discharging to ground thus reducing the flows off-Site.
- 12.7.6 Existing overland flood flow pathways will be modified to allow for the new main Site access and compensation measures designed such that additional controls can result in a reduction in off-Site flood risk along Hemel Hempstead Road. It should be noted that highway areas will operate under a separate drainage design from that of the main part of the Site.
- 12.7.7 It is proposed to alter ground levels at the Site to create Development platforms, as described in Chapter 6: Construction. Hydraulic modelling was undertaken of the Development, which takes into account the maximum extent of built Development and indicative ground level changes. The main flow pathway is crossed by the spine road and an access road between parcels. The flow path was lowered to create a channel to contain the flows, and the crossings have been designed to have minimal impact on the natural pathway of the flow. Depth difference mapping shows no impact on flood risk off-Site and in some places resulted in a betterment. Further details of the modelling parameters and approach is provided in Appendix G of the FRA.
- 12.7.8 The possibility of groundwater flooding will be taken into account in the detailed drainage design. The drainage design will incorporate and develop further the proposals set out in Appendix 12.2.
- 12.7.9 It is not anticipated that there are currently any emergent groundwater discharges to surface water through the existing land drainage when groundwater levels are high. If any are identified during construction, this will be replicated within the proposed drainage strategy, however, as infiltration methods of surface water discharge are proposed for the Site, any emergent groundwater flows would be redirected back to ground.
- 12.7.10 The magnitude of impact is predicted to be of local spatial extent and long term duration. The impact magnitude is therefore predicted to be medium beneficial.

Significance of Effect

- 12.7.11 Overall, the magnitude of the impact is deemed to be low beneficial, the sensitivity of the receptor is considered to be high. The effect will, therefore, be minor beneficial (not significant).

Groundwater

- 12.7.12 Within the design of the Development, it is likely that foundations for many above ground structures are likely to penetrate well below the groundwater level. This may create a potential pathway for pollution to reach groundwater bodies.

Sensitivity of Receptor

- 12.7.13 The groundwater body within the study area is currently assessed to have 'poor' overall WFD status. A precautionary assessment was undertaken which assumes that by the time that construction begins, the groundwater body within the study area will have been re-assessed with a WFD status of 'good'.

- 12.7.14 The entire Site area also lies within a Total Catchment (Zone 3) SPZ for local groundwater abstraction. Four groundwater
- 12.7.15 The River Ver is designated as a groundwater-fed chalk stream, which may also be impacted by changes to groundwater mechanisms.
- 12.7.16 The groundwater bodies and associated groundwater-fed waterbodies are therefore considered to be highly vulnerable in relation to WFD classification status, and moderate value in relation to the local economy. The sensitivity of the receptor is therefore, considered to be high.
- 12.7.17 The vulnerability of aquifers is considered to be high, and the recoverability of receptors is considered to be low due to time required for receptors to recover from aforementioned impacts. The sensitivity of the receptor is therefore, considered to be high.

Magnitude of Impact

- 12.7.18 As the Site is currently greenfield and therefore comprised of permeable land cover, there is the potential for recharge of groundwater to be altered with the introduction of impermeable surfacing. However, as infiltration methods of surface water discharge are proposed for the Site, surface water flows will be directed to ground, therefore recharging groundwater.
- 12.7.19 The drainage design will incorporate and develop further the proposals set out in Appendix 12.2. The drainage strategy outlines the water treatment provided by the SuDS features, to ensure they are sufficiently treated based upon the pollution indices arising from the Development type.
- 12.7.20 Considering the above mitigation measures, the impact is predicted to be direct, of local spatial extent, short term duration, intermittent and medium reversibility. The magnitude is therefore, considered to be negligible adverse.

Significance of Effect

- 12.7.21 On the basis that the sensitivity of the receptor is high, and the magnitude of the impact is negligible adverse with mitigation measures, it is assessed that there will be a minor adverse effect, which not significant in EIA terms.

Surface Water (quality and quantity)

- 12.7.22 Water quality impacts during the operational phase of the Development are anticipated to be limited to minor hydrocarbon releases from vehicles and pollution associated with maintenance activities of the on-Site private drainage systems or other privately stored pollutants. These activities may present a risk of water quality effects on the surrounding surface watercourses. Due to the increase in impermeable area, it is likely that increased volumes of surface water will run-off the Site. Therefore, the quality and quantity of surface water from the Site must be considered.

Sensitivity of Receptor

- 12.7.23 Several drainage ditches are located within the boundary of the Site as well as an identified pond feature. There are several pond features located within 1km of the Site.

- 12.7.24 The Study Area does not include any Ecologically Designated Sites; however the Site is located within the 'Ver' WFD Surface Water Catchment. As all watercourses seek to achieve 'Good' status the water environment surrounding the Site has high vulnerability. The River Ver is designated as a groundwater-fed chalk stream, which are considered to provide globally rare habitats, and support diverse wildlife species.
- 12.7.25 As all watercourses seek to achieve 'Good' status the water environment surrounding the Site has high vulnerability. The nature of the receptors means they have a moderate recoverability. Their contribution to the local environment means they have high value. The sensitivity of the receptor is therefore, considered to be high.
- 12.7.26 There are no surface water abstraction licenses active within 1km of the Site. The sensitivity of the receptor is therefore, considered to be low.
- 12.7.27 Human receptors during this phase of the Project will be Site users and permanent residents who are assessed to be highly vulnerable, low recoverability, high value and an overall high sensitivity.

Magnitude of Impact

- 12.7.28 Pollutants may be present as a result of normal operations, traffic and emergency or accidental spillage. These activities could lead to an increase in contaminated run-off and spillages / leaks of fuel, oil that could runoff to surface waterbodies and infiltrate to superficial deposits and solid geology underlying the Site.
- 12.7.29 The FRA and Drainage Strategy for the Development include principles of the SuDS features which will provide both storage of surface water and mitigation (i.e. water treatment) for pollutants arising from the operation of the Development. Flows will be attenuated within the Site and infiltrated to ground. This may introduce a medium beneficial effect due to the treatment of previously untreated surface water flows.
- 12.7.30 Regular inspection and maintenance will be required following construction to allow effective operation of the proposed surface water drainage network and SuDS features. A SuDS maintenance plan for the proposed SuDS features is included within the conceptual drainage strategy.
- 12.7.31 The magnitude of impact is predicted to be of local spatial extent and long-term duration. The impact magnitude is therefore predicted to be low beneficial.

Significance of Effect

- 12.7.32 Overall, the magnitude of the impact is deemed to be low beneficial, the sensitivity of the receptor is considered to be high. The effect will, therefore, be of minor significance, which is not considered significant.

Potable Water

- 12.7.33 The Development would introduce new land uses resulting in an increase in potable water demand.

Sensitivity of Receptor

- 12.7.34 The Site is located within an area of water stress; therefore, receptor sensitivity is classified as High.

Magnitude of Impact

- 12.7.35 Should the Development proceed, Affinity Water have advised they have capacity to support provision of potable water to the Development. The Development will seek to limit its potable water demand through the extensive use of controlled flow restrictions and highly efficient white goods will be required to meet water requirements. The magnitude of impact is therefore considered to be negligible.

Significance of Effect

- 12.7.36 Overall, the magnitude of the impact is deemed to be negligible, the sensitivity of the receptor is considered to be high. The effect will, therefore, be negligible, which is not considered significant.

Foul Water

- 12.7.37 The Development would introduce new land uses resulting in an increase in foul water provision and demand upon the existing Thames Water network.

Sensitivity of Receptor

- 12.7.38 At present, Thames Water have confirmed that they do not have the capacity to fully accommodate the Development. This suggests that the existing network is under pressure and upgrades are required. Therefore, receptor sensitivity is classified as High.

Magnitude of Impact

- 12.7.39 The proposed drainage strategy will utilise infiltration SuDS methods to discharge surface water from the Development. Therefore, surface water flows will not be discharged to the Thames Water network. The possible introduction of greywater reuse and low-water flush toilets is being considered to further reduce the inflows to the Thames Water system. The impact magnitude is therefore considered to be low.

Significance of Effect

- 12.7.40 Overall, the magnitude of the impact is deemed to be low, the sensitivity of the receptor is considered to be high. The effect will, therefore, be of minor adverse significance, which is not considered significant.

12.8 Additional Mitigation, Monitoring and Residual Effects

- 12.8.1 No significant adverse effects were identified and therefore no additional mitigation is required, and the residual effects remain as presented above.

12.9 Cumulative Effects

Construction

Assessment

- 12.9.1 The five developments that have been identified as falling within 1km of the Site, are of a similar nature to the Development for the Site.
- 12.9.2 There are no direct linkages of surface water, watercourses or flood risk related to these developments that interacts with the Site. The Site is hydrologically upgradient of any of the identified developments. The mitigation for surface water and surface water flows pathways has a low, but beneficial impact, on off-Site areas downstream of the Site.
- 12.9.3 It is understood all identified projects are Town and Country Planning Act applications subject to planning approval by the respective Local Planning Authority (LPA). This requires all projects to be undertaken in accordance with national and local policy. Under these policies, the developments would be required to demonstrate that the construction phase have a limited effect on surface water quality and quantity, groundwater quality and quantity and would not increase flood risk elsewhere. This includes the production of an FRA where applicable and production of surface water management and treatment strategies, and adherence to best practice construction techniques and mitigation measures (secured via CEMPs). Without this, the above developments would not achieve planning permission and therefore never be in operation, thus reducing the potential for cumulative impacts to occur.

Mitigation, Monitoring and Residual Effects

- 12.9.4 No additional secondary mitigation measures would be required to avoid, prevent, reduce or offset any significant adverse cumulative effects.

Completed Development

Assessment

- 12.9.5 The five developments that have been identified as falling within 1km of the Site, are of a similar nature to the Development.
- 12.9.6 As stated above, there are no direct linkages of surface water, watercourses or flood risk related to these developments that interacts with the Site.
- 12.9.7 It is understood all identified projects are Town and Country Planning Act applications subject to planning approval by the respective Local Planning Authority (LPA). This requires all projects to be undertaken in accordance with national and local policy. Under these policies, the Developments would be required to demonstrate that the operational phase have a limited effect on surface water quality and quantity, groundwater quality and quantity and would not increase flood risk elsewhere. This includes the production of an FRA where applicable and production of surface water management and treatment strategies, and associated construction methodologies. Without this, the cumulative schemes would not achieve planning permission and therefore never be in operation, thus reducing the potential for cumulative impacts to occur.

Mitigation, Monitoring and Residual Effects

- 12.9.8 No additional secondary mitigation measures would be required to avoid, prevent, reduce or offset any significant adverse cumulative effects.

12.10 Summary

- 12.10.1 A summary of the residual effects is provided in Table 12.12.

Table 12.12: Summary of Residual Effects

Effect	Receptor (Sensitivity)	Magnitude Impact	of Scale of Effect	Additional Mitigation and Monitoring	Residual Effect
Development Scenarios					
Construction Phase					
Water quality of water bodies (including local watercourse network and groundwater)	Waterbodies (main rivers, ordinary watercourses and catchments) (High) Groundwater bodies (High) Human Receptors (High) Adjacent land (High)	Negligible, Local, Short Term	Negligible	Undertake a PFWRA prior to works starting to understand contamination pathways	Negligible (not significant)
Localised effects on groundwater flow and stream base flow, including groundwater flooding	Groundwater bodies (High) Human Receptors (High) Adjacent land (High)	Negligible, Local, Short Term	Minor Adverse	Undertake a PFWRA prior to works starting to understand contamination pathways Undertake Groundwater regime study to understand nature of groundwater at the Site	Negligible (not significant)
Potable Water	Water supply and drainage infrastructure (High) Human Receptors (High)	Negligible, Local, Short Term	Negligible	Undertake full surveys to determine location of existing water infrastructure	Negligible (not significant)

Effect	Receptor (Sensitivity)	Magnitude Impact	of Scale of Effect	Additional Mitigation and Monitoring	Residual Effect
	Adjacent land (High)				
Foul Water	Water supply and drainage infrastructure (High) Human Receptors (High) Adjacent land (High)	Negligible, Local, Short Term	Negligible	Undertake full surveys to determine location of existing water infrastructure	Negligible (not significant)

Completed Development

Flood Risk	Human Receptors (High) Adjacent land (High)	Medium Beneficial, Local, Long Term	Minor Beneficial	None	Minor Beneficial (not significant)
Groundwater	Groundwater bodies (High)	Low Beneficial, Local, Long Term	Minor Beneficial	None	Minor Beneficial (not significant)
Surface Water (quality and quantity)	Waterbodies (main rivers, ordinary watercourses and catchments) (High)	Low Beneficial, Local, Long Term	Minor Beneficial	None	Minor Beneficial (not significant)
Potable Water	Water supply and drainage infrastructure (High) Human Receptors (High)	Negligible, Local, Long Term	Negligible	None	Negligible (not significant)

Effect	Receptor (Sensitivity)	Magnitude Impact	of Scale of Effect	Additional Mitigation and Monitoring	Residual Effect
	Adjacent land (High)				
Foul Water	Water supply and drainage infrastructure (High)	Negligible, Local, Long Term	Minor Adverse	None	Minor Adverse (not significant)
	Human Receptors (High)				
	Adjacent land (High)				

Cumulative Assessment

Construction

No cumulative effects during the construction of the Development

Completed Development

No cumulative effects during the operation of the Development

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- 1km Study Area
- Site Boundary
- WFD Surface Water Body Catchments
- Bulbourne
 - Gade (from confluence with Bulbourne to Chess)
 - Gade (Upper stretch Great Gaddesden to confluence with Bulbourne)
 - Lee (from Luton Hoo Lakes to Hertford)
 - Upper Colne and Ellen Brook
 - Ver

20 Farringdon Street
London, EC4A 4AB
E:rpshydrologyservices@rpsgroup.com

Client: Bloor Homes

Title:WFD Surface Water Body Catchments

Site: Hemel North

Date: 07-11-2025

Scale:1:70,000

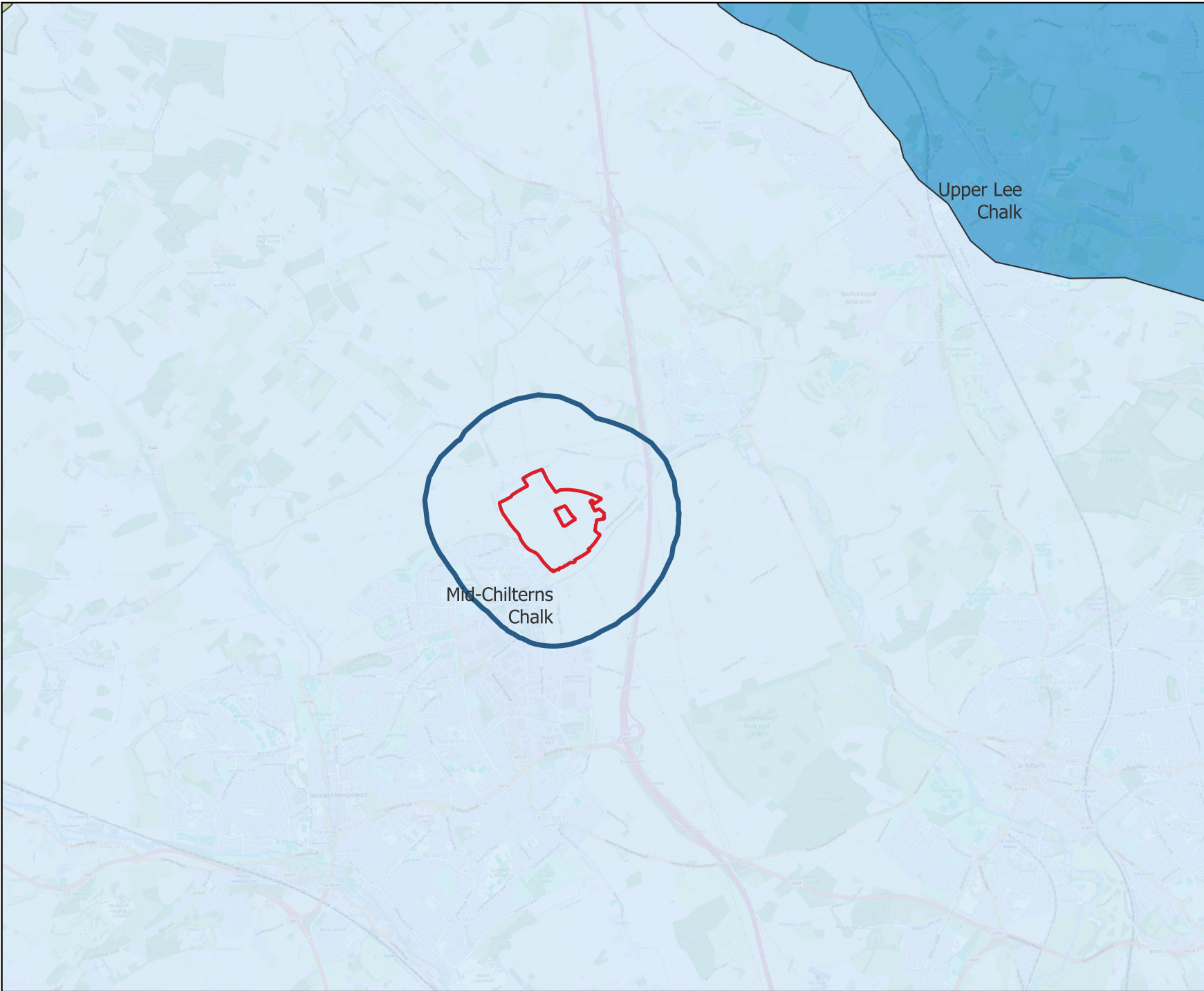
Size: A4

Job Ref: HYD-21786

Rev: 01

Drawn JG	Checked CP	Approved CP
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-  1km Study Area
 Site Boundary
- WFD Groundwater Body Catchments**
 Mid-Chilterns Chalk
 Upper Lee Chalk

  20 Farringdon Street
London, EC4A 4AB
E:rpshydrologyservices@rpsgroup.com

Client: Bloor Homes

Title:WFD Groundwater Body Catchments

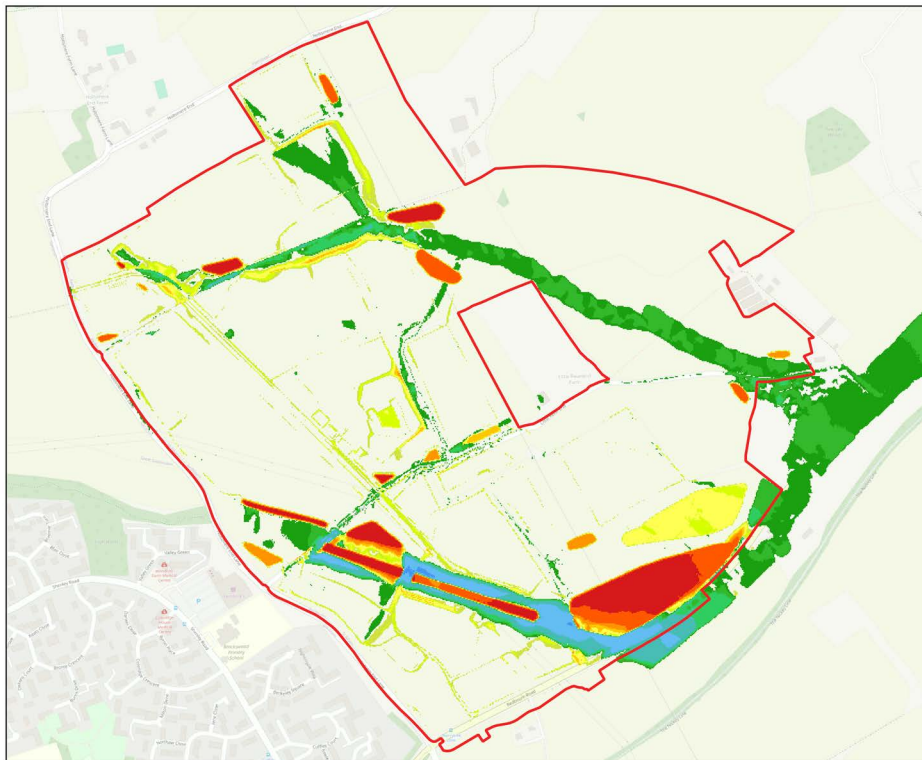
Site: Hemel North

Date: 07-11-2025

Scale:1:70,000 Size: A4

Job Ref: HYD-21786 Rev: 01

Drawn JG	Checked CP	Approved CP
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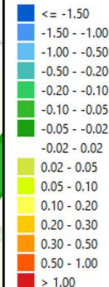


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— Site Boundary

Depth Difference (m)



20 Farringdon Street
London, EC4A 4AB
E: rps@hydrologyservices
@rpsgroup.com

Client: Bloor Homes & Pigeon

Title: Depth Difference between
Baseline and Option (1 in 100 year
+40% Climate Change Event)

Site: Hemel North

Date: 06-11-2025

Scale: 1:7,500

Size: A4

Job Ref: HYD-21786

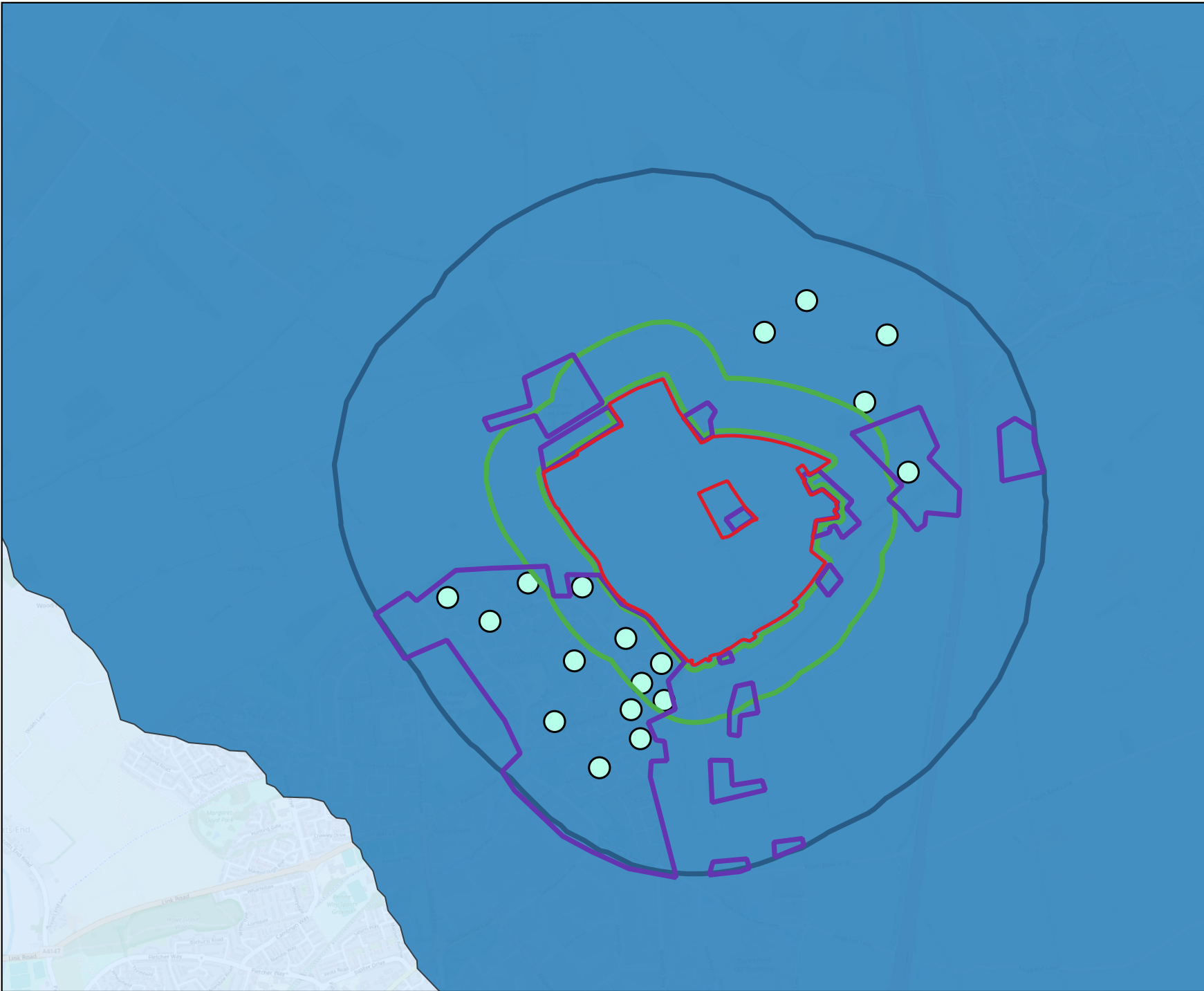
Rev: 01

Drawn
CE

Checked
MM

Approved
CP





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- 1km Study Area
 - Site Boundary
 - Adjacent Land Buffer
 - Human Receptors
 - Approximate Locations of Existing Water Services Infrastructure
- WFD Surface Water Body Catchments
- Ver
- WFD Groundwater Body Catchments
- Mid-Chilterns Chalk

20 Farringdon Street
London, EC4A 4AB
E:rpshydrologyservices@rpsgroup.com

Client: Bloor Homes

Title: Sensitive Receptors

Site: Hemel North

Date: 07-11-2025

Scale: 1:25,000

Size: A4

Job Ref: HYD-21786

Rev: 01

Drawn JG	Checked CP	Approved CP
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