

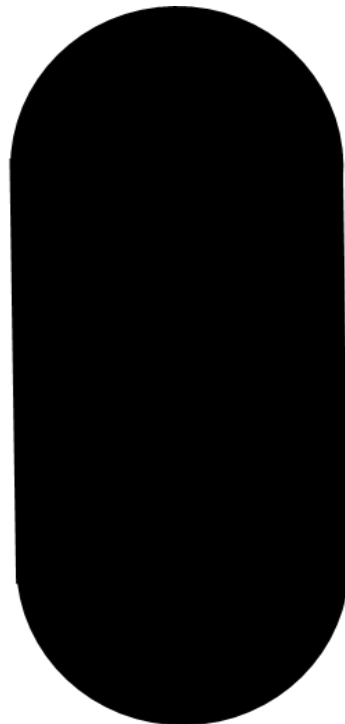
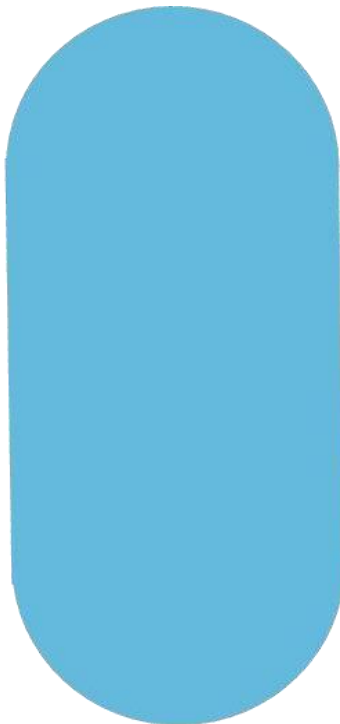
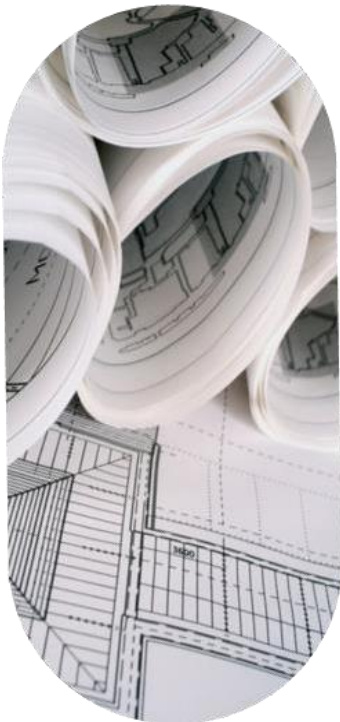


 Part of Shakespeare Martineau

St Albans Local Plan Examination Matter 7 Issue 5 Hearing Statement

Prepared on behalf of
Martin Grant Homes and Kearns Land Ltd

October 2025



Lonsdale Gate, Lonsdale Gardens, Tunbridge Wells
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1. Introduction

- 1.1 This Matter Statement has been prepared on behalf of Martin Grant Homes and Kearns Land Ltd (the Promoters) in respect of Matter 7 Issue 5 relating specifically to Policy M6 – Land south of Harpenden Lane.
- 1.2 The Promoters control land at Land to the East of Redbourn, Redbourn (the Site, HELAA reference R-18-21). The Site is identified within the Plan as part of allocation site M6. Representations have been submitted at earlier stages of Plan preparation through Regulation 18 and 19 consultations, and in response to Stage 1 of this Examination.
- 1.3 This Matter Statement responds to the Inspectors' questions and have been considered in the context of the tests of 'Soundness' as set out at Para 35 of the NPPF (December 2023¹). These require that a Plan is:
- Positively Prepared – providing a strategy which, as a minimum, seeks to meet the area's objectively assessed needs; and is informed by agreements with other authorities, so that unmet need from neighbouring areas is accommodated where it is practical to do so and is consistent with achieving sustainable development;
 - Justified – an appropriate strategy, taking into account the reasonable alternatives, and based on proportionate evidence;
 - Effective – deliverable over the plan period, and based on effective joint working on cross-boundary strategic matters that have been dealt with rather than deferred, as evidenced by the statement of common ground; and
 - Consistent with National Policy – enabling the delivery of sustainable development in accordance with the policies in this Framework and other statements of national planning policy, where relevant.
- 1.4 This Matter Statement is supported by an Illustrative Masterplan (Appendix A) which demonstrates the Site is suitable and deliverable for up to 35no. residential dwellings. The Masterplan is underpinned by detailed technical and environmental work which has been completed to inform an Outline planning application for the Site to be submitted in November 2025. As part of this work, a Flood Risk and Surface Water Drainage Appraisal (Appendix B) has been prepared and is submitted with this Matter Statement.

¹ The Plan is submitted under the transitional arrangements of the NPPF 2024, and as such is to be considered against the NPPF 2023.

- 1.5 It should be noted allocation M6 includes wider land to the east / south-east under the control of other parties.
- 1.6 Further, there is an area of land within allocation M6 between the Site and Harpenden Road which is outside of the red line on the Illustrative Masterplan (Appendix A). This parcel of land, totalling circa. 0.13ha is under the control of the Promoters and is subject to an extant consent for 1no. dwelling (ref. 5/2011/3123). This has been kept separate from the forthcoming application to be submitted on the Site due to the extant consent and vehicular access to this smaller parcel being from Harpenden Lane as opposed to Crown Street. The Promoters envisage submitting a separate detailed application for this parcel in 2026 for circa. 2 – 4 dwellings.
- 1.7 We therefore envisage the part of the M6 allocation under the control of the Promoters can deliver up to 39 dwellings.

2. Issue 5 – Redbourn and Hemel Hempstead Site Allocations

Policy M6 – Land south of Harpenden Lane

Q1 Is the scale of development proposed appropriate and proportionate to the scale, role and function of Redbourn??

2.1 Redbourn is a 'Large Village' at Tier 4 in the settlement hierarchy (Table 1.3 of the Plan). There are only 2no. Large Villages (the other being Wheathampstead) which are identified as relatively self-contained settlements with provision of key services and employment sites. The village sits relatively high in the settlement hierarchy only behind St Albans, Harpenden and London Colney. It is also host to a District Centre as set out in the Centre Hierarchy (Table 6.1).

2.2 The Settlement Hierarchy Study (June 2023) identifies the village as having an approximate population of 5,000 residents. The settlement scoring (Table 6) identifies it to have a 'total settlement hierarchy score' of 13.5, again sitting below St Albans (54.5), Harpenden (31.0) and London Colney (17.8), but ahead of Wheathampstead (10.4). Para 6.39 – 6.40 notes:

Redbourn's score follows London Colney in the quantitative assessment against access, services and facilities and employment factors. However, Redbourn differs significantly from London Colney in terms of heritage and character, but also because of its relatively self-contained local centre. Furthermore, Redbourn does not contain higher order services such as a supermarket or leisure centre and it has fewer employment sites than London Colney. Redbourn is functionally related to Harpenden by road, bus and a cycle route (the Nickey Line), where higher order services may be accessed.

Wheathampstead is relatively similar in character to Redbourn, it has a local centre and contains all key services. Wheathampstead scores slightly less than Redbourn due to its smaller population size and fewer cycle routes linking the settlement to Harpenden. This was a key issue raised by residents and reported through the St Albans Rural Vision, 2009 report.

2.3 The village is therefore a sustainable settlement which scores highly against the Plan 'scoring' for sustainability. It benefits strongly to proximity to higher order settlements by links which do not rely on usage of private vehicles, i.e. by bus, foot or cycle.

- 2.4 The proposed allocation of M6 (South of Harpenden Lane) reflects the scale, role and function of Redbourn. It is located in a highly accessible location, within easy walking distance of the main facilities and services of the settlement and with direct connections to the footway and cycleway network including the Nickey Line.
- 2.5 The delivery of circa. 68 homes on the allocation would be a meaningful contribution towards housing requirements, whilst only representing a modest additional to the existing scale of the village. Assuming 2.3-residents per dwelling, this would result in a population increase of circa. 3% for the village.
- 2.6 The allocation of M6 is therefore justified on the basis of the evidence base, being an appropriate scale when considered against the role and function of Redbourn.

Q2 What is the justification for the proposed alteration to the Green Belt boundary? Is the proposed boundary alteration consistent with paragraph 148 e) and f) of the Framework, which state that Plans should be able to demonstrate that boundaries will not need to be altered at the end of the Plan period, and, define boundaries clearly, using physical features that are readily recognisable and likely to be permanent??

- 2.7 The allocation of M6 is consistent with the criteria as set out in para 148 as set out below:
- a) ensure consistency with the development plan's strategy for meeting identified requirements for sustainable development;*
- 2.8 M6 is located adjoining the sustainable settlement of Redbourn. As noted above, Redbourn is a 'Large Village' sitting relatively high in the settlement hierarchy (Table 1.3) only behind St Albans, Harpenden and London Colney.
- 2.9 Policy SP1 (Spatial Strategy) focuses growth to the most sustainable locations, in the existing urban area and then the surrounding Green Belt, consistent with the settlement hierarchy.
- 2.10 The identification of M6 as an allocation is clearly consistent with the spatial strategy for the Plan, focusing growth in a sustainable location adjacent to the existing urban area of Redbourn.
- b) not include land which it is unnecessary to keep permanently open;*
- 2.11 The Green Belt Review Annex Proforma Report (2023) assessment for M6 (sub-area SA-8, page 50 – 53) highlights the parcel performs poorly against the purposes of the Green Belt assessed. It does not meet purpose 1 (check the unrestricted sprawl of large built-up areas) and is considered its removal from the Green Belt would not result in physical or perceptual merging between neighbouring built-up areas (purpose 2).
- 2.12 Notably, the assessment highlights the parcel has a semi-urban character as set out below:

Approximately 7% of the sub-area is covered by built form (excluding hard standing). However, this does not take into account the land occupied by the plant nursery and the caravan park to the east of the sub-area. The sub-area comprises a caravan park, a nursery and garden centre to the west, some residential properties on the northern and western boundaries and some open fields and the River Ver in the centre of the sub-area, alongside unmanaged woodland and open land. The sub-area also includes the Redbourn MOT centre to the south. The sub-area is very enclosed and does not have any views to the wider countryside and limited views across the sub-area itself.

2.13 In addition to those referenced above, the presence of the A5183 and Nicky Line (former rail-line) to the east of the M6 allocations also add to the semi-urban character of the Site. Beyond these the character is much more open and rural.

2.14 The Proforma Report recognises the sub-area is enclosed in nature and its release from the Green Belt would “regularise the settlement shape of Redbourn”.

2.15 The conclusions of the proforma and presence of a variety of elements of built form on and immediately adjacent to the M6 allocation indicate it is unnecessary to keep the land permanently open.

c) where necessary, identify areas of safeguarded land between the urban area and the Green Belt, in order to meet longer-term development needs stretching well beyond the plan period;

2.16 Not relevant.

d) make clear that the safeguarded land is not allocated for development at the present time. Planning permission for the permanent development of safeguarded land should only be granted following an update to a plan which proposes the development;

2.17 Not relevant.

e) be able to demonstrate that Green Belt boundaries will not need to be altered at the end of the plan period;

2.18 The proforma assessment highlights the development of the sub-area would regularise the settlement shape of Redbourn and would result in “readily recognisable and likely to be permanent boundaries”.

2.19 These boundaries are formed by surrounding road infrastructure with Harpenden Lane to the north and the Nicky Line and A5183 to the east. Beyond these lie agricultural fields which are open in character, especially those to the east.

- 2.20 The boundaries relating to the M6 allocation are firmly drawn in respect of these physical features. These are unlikely to need to be revisited at the end of the proposed Plan period.

f) define boundaries clearly, using physical features that are readily recognisable and likely to be permanent.

- 2.21 As noted above, the boundaries of the sub-area and M6 are physical, recognisable and likely to be permanent.

- 2.22 M6 is well contained within these physical features, notably the road infrastructure and Nicky Line. This will remain the case within perpetuity.

Q3 Do the exceptional circumstances exist to justify amending the Green Belt boundary in this location?

- 2.23 Key relevant case law on 'exceptional circumstances' is *Calverton Parish Council v Greater Nottingham Councils* [2015] EWHC 1078 (Admin). Paragraph 51 of the judgement states:

...the planning judgments involved in the ascertainment of exceptional circumstances in the context of both national policy and the positive obligation located in section 39(2) should, at least ideally, identify and then grapple with the following matters:

- i. the acuteness/intensity of the objectively assessed need (matters of degree may be important);*
- ii. the inherent constraints on supply/availability of land prima facie suitable for sustainable development;*
- iii. (on the facts of this case) the consequent difficulties in achieving sustainable development without impinging on the Green Belt;*
- iv. the nature and extent of harm to this Green Belt (or those parts of it which would be lost if the boundaries were reviewed); and,*
- v. the extent to which the consequent impacts on the purposes of the Green Belt may be ameliorated or reduced to the lowest reasonable practicable extent.*

- 2.24 As detailed in our Matter 3 response, we consider the Council has fully justified its approach to the Green Belt including demonstrating exceptional circumstances exist for altering the Green Belt boundary. This includes those matters as set out in the Calverton tests above.

- 2.25 In respect of site-specific Calverton considerations, the impacts of removal of allocation M6 from the Green Belt would not lead to wider harm to the remaining Green Belt, and the impacts upon any purposes of the Green Belt (which are relatively limited) could be successfully reduced through design.
- 2.26 Further, NPPF para 147 confirms that once exceptional circumstances have been demonstrated, plans should give first consideration to land which has been previously developed and/or is well-served by public transport. The Site is well-served by public transport being located within walking distances of the existing bus services on High Street and Harpenden Lane.
- 2.27 Exceptional circumstances are clearly justified to support amending Green Belt boundaries across the District, including in this location at Redbourn.

Q4 Can a safe and suitable access to the site be achieved? Is it sufficiently clear to users of the Plan what any necessary highway improvements would entail, and where and how they would be delivered?

- 2.28 A safe and suitable vehicular access to the Site can be achieved via Crown Street (as shown on the Illustrative Masterplan, Appendix A). This would serve the residential proposals to the west of the River Ver which dissects allocation M6.
- 2.29 The proposed access into the Site will incorporate pedestrian footways that tie into the existing provision along Crown Street. This, in combination with the established footway network and public rights of way, will facilitate sustainable and direct pedestrian connectivity to the village centre, local amenities, public transport services, and wider leisure destinations. This ensures the site is accessible and supports active travel modes in line with national and local transport policy objectives.
- 2.30 The proposals for the Site would have a limited impact on the operation of the surrounding highway, and it is unlikely that any further changes to the highway, beyond the site access, will be required.
- 2.31 Should any mitigation be deemed necessary, it is expected to be proportionate and focused on traffic calming measures and/or localised safety enhancements, rather than capacity upgrades to existing junctions.

Q5 How have the risks from flooding been considered as part of the site's allocation, having particular regard to fluvial flood risk?

- 2.32 As set out in our Matter 1 (Stage 1) hearing statement we consider the Council has appropriately considered flood risk through its evidence base, including the Strategic Flood

Risk Assessment. This has been supplemented by additional work in the Flood Risk Addendum (July 2025) which is discussed in our response to Matter 1 (Stage 2).

- 2.33 For the reasons as set out in the evidence base, the Council has already taken account of the various sources of flooding through the site selection process, such that the potential capacity of M6 has been reduced to reflect this.
- 2.34 In order to verify this position and aligned with the Promoters intention to submit an Outline planning application for the Site (part of M6) in November 2025, this Matter statement is supported by a Flood Risk and Surface Water Drainage Appraisal (Appendix B).
- 2.35 The Flood Risk and Surface Water Drainage Appraisal summarises the risk posed to the Site (part of M6) from all sources of flooding and identifies mitigation measures which would ensure the emerging proposals for the Site (Appendix A) would remain safe over its lifetime without increasing flood risk elsewhere. This is underpinned by detailed modelling work which helps demonstrate the quantum of development which would be deliverable at the Site.
- 2.36 A site-specific hydraulic model, based on existing modelling work developed by JBA in support of the River Ver Modelling Study on behalf of the Environment Agency, demonstrates the risk of fluvial flooding posed to the Site be significantly lower than that shown by the Environment Agency mapping. The updated model shows the Site to predominantly be subject to a risk of fluvial flooding of less than 0.1%, with isolated areas along the corridor of the River Ver shown to lie within the predicted peak flood extents associated with the 0.1% and 1% annual probability events.
- 2.37 The sequential approach has been adopted to ensure that built development would be located outside of the predicted peak fluvial flood extents for all events tested using the site-specific hydraulic model. Following the adoption of the sequential approach, the risk of fluvial flooding posed to the Proposed Development would be very low and no additional mitigation measures would be required to manage the risk of flooding from this source.
- 2.38 For surface water flood risk, there are pockets of 'Medium' and 'High' risk along the route of an existing flow path associated with existing topographic low spots within the northern part of the Site and parts of the southwestern part of the Site where existing ground levels are at their lowest. Site-specific direct-rainfall modelling has been completed to improve the understanding of surface water flood risk in the vicinity of the Site, this identifies that most of the Site is at low risk.
- 2.39 The proposals for the Site include the remediation of an area to the north of the Site where remediation for identified contaminated soil is required. This would include excavation and removal of contaminated materials, alongside reprofiling of the land. Alongside remediation this has the benefit of allowing this area of the Site to be reprofiled to formalise an existing surface water flow path as it passes through the Proposed Development from north to south

prior to its convergence with the River Ver. The site-specific direct-rainfall model has been utilised to represent the proposed reprofiling, with existing ground levels lowered by approximately 500 mm in this part of the Site.

- 2.40 Following the adoption of the sequential approach and the proposed reprofiling of the northern part of the Site to formalise the existing surface water flow path the risk of surface water flooding posed to the Proposed Development would be very low.
- 2.41 As identified in the Illustrative Masterplan, all attenuation of runoff generated by the Proposed Development would be provided by two shallow attenuation basins located to the east of the developable area and outside of the predicted peak flood extents.
- 2.42 Finished floor levels within the Proposed Development would be set 150mm above finished ground levels to mitigate the risk of groundwater flooding, with flood resistant and/or resilient construction techniques considered for incorporation into the design of the proposed dwellings as appropriate at the detailed design stage. All proposed SuDS features should be lined with an impermeable membrane to prevent groundwater ingress.
- 2.43 The Appraisal concludes that following the incorporation of the proposed mitigation measures identified, the proposed quantum of development at the Site is considered to be deliverable with the Proposed Development remaining safe over its lifetime without increasing flood risk elsewhere.
- 2.44 We therefore consider the Council's allocation of the Site, as part of M6, is justified including in respect of flooding.

Q6 What effect will development have on the Chilterns Beechwoods SAC and how will any adverse impacts on the integrity of the site be avoided and/or mitigated? Can mitigation be provided on site?

- 2.45 Policy M6 allocation is within, but on the edge of, the 12.6km zone of influence around the Chiltern Beechwoods SAC. To address recreational pressures the Council, alongside other affected authorities, have agreed a Chilterns Beechwoods SAC Mitigation Strategy. This includes Strategic Access Management and Monitoring (SAMMS) measures, payable via a per-home contribution, and provision of Suitable Alternative Natural Greenspace (SANG).
- 2.46 Any new residential development at Policy M6 would have to secure these necessary mitigation measures for adverse impacts on the integrity of the SAC to be confirmed as avoided and/or mitigated.
- 2.47 In respect of the Site, the confirmed approach would be to pay the per-home SAMMS contribution and deliver on-site SANG provision.

- 2.48 As shown in the Illustrative Masterplan (Appendix A) the proposals for the Site include a significant provision of open space to the south, east and north of the residential development area. This allow for a variety of spaces to be provided, including amenity greenspace and natural / semi-nature greenspaces. Together this forms the proposed SANG.
- 2.49 The open spaces would be highly accessible to both new and existing residents of Redbourn, alongside visitors to the village who are utilising the services and facilities of the village centre a short walk via existing footways and public rights of way. This aligns with the intention of SANGs to create an attractive location and design which actively encourages uses of open spaces, avoiding trips to the sensitive SAC designation (which is over 11km from the Site).
- 2.50 The proposed SANG includes a circular walk in excess of 1km which utilises the existing crossing within the Site over the River Ver.
- 2.51 The proposed open space provision, including SANG, provides a proportionate on-site response to the need for mitigation to address the Council's adopted SAC Mitigation Strategy.

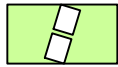
Q7 Is Policy M6 justified, effective and consistent with national planning policy? If not, what modifications are required to make the Plan sound?

- 2.52 We consider the principle of Policy M6 is sound. It has been justified by the evidence base, including in respect of matters relating to the Green Belt and flood risk.
- 2.53 The policy as a whole would be effective in facilitating the delivery of housing in a highly sustainable location which is, currently, poorly performing Green Belt. This would be consistent with national policy and assist in the achievement of the Plan's Vision and objectives.
- 2.54 Noting the M6 site is split between a number of landowners, who are likely to bring forward applications for elements of the allocation individually, we support the Main Modifications suggested by the Council relating to connectivity to the Nickey Line. These would ensure individual parcels within the allocation which are not directly connected to the Nickey Line (i.e. the Site) can successfully come forward in compliance with the policy tests, whilst contributing towards the desired Nickey Line improvements.
- 2.55 Subject to the proposed Council modifications, we consider the policy sound. The policy will successfully facilitate the delivery of high-quality sustainable development adjoining the village of Redbourn.

Appendix A - Illustrative Masterplan



Site Boundary (3.80ha)



Indicative Residential Layout
(0.96ha - 35 dwellings)



Primary Street/Pavement and
Shared Surface



Footpaths



Nickey Line PROW (Shared
Foot/Cycle Path)



Existing PROW



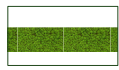
Indicative Mown Grass Path



Proposed Attenuation



Proposed Surface Water Storage



Proposed trees and Woodland



Existing Trees and Woodland to
Retained



Vehicular Access



Pedestrian Access (TBC)



Indicative Location for Play



Potential Location for Electric
Substation



Proposed Footbridge to
Replace Culvert



the environmental
dimension partnership

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project title
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Illustrative Masterplan

Appendix B – Flood Risk and Surface Water Drainage Appraisal



Martin Grant Homes Limited

LAND OFF HARPENDEN LANE, REDBOURN

Flood Risk and Surface Water Drainage Appraisal





Martin Grant Homes Limited

LAND OFF HARPENDEN LANE, REDBOURN

Flood Risk and Surface Water Drainage Appraisal

REPORT (FIRST ISSUE) PUBLIC

PROJECT NO. 70110083

OUR REF. NO. 70110083-WSP-XX-XX-RP-EI-0001

DATE: OCTOBER 2025

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1 INTRODUCTION

1.1 APPOINTMENT AND BRIEF

- 1.1.1. WSP has been appointed by Martin Grant Homes Limited to prepare a Flood Risk and Surface Water Drainage Appraisal in support of a proposed residential development (hereby referred to as the 'Proposed Development') at a greenfield site off Harpenden Lane, Redbourn, Hertfordshire (the 'Site').
- 1.1.2. The Site forms part of the wider draft allocation site M6 in the St Albans City and District Council Draft Local Plan 2041¹ which was submitted to the Secretary of State for Independent Examination on 29 November 2024. This report has been prepared in response to the Matters, Issues and Questions for Stage 2² of the ongoing Albans City and District Local Plan Examination Hearings which states under Matter 7, Issue 5, Policy M6 "[h]ow have the risks from flooding been considered as part of the site's allocation, having particular regard to fluvial flood risk?"

1.2 AIM AND OBJECTIVES

- 1.2.1. The aim of this assessment is to summarise the risk posed to the Site from all potential sources of flooding, identify the mitigation measures that would be required to ensure that the Proposed Development would remain safe over its lifetime without increasing flood risk elsewhere, and demonstrate that the proposed quantum of development at the Site would be deliverable with respect to flood risk.

1.3 LIMITATIONS

- 1.3.1. WSP UK Limited has prepared this report in accordance with the instructions of its client, Martin Grant Homes Limited, for their sole and specific use relating to the Site. Any person who uses any information and recommendations contained herein are limited by the availability of background information and the planned use for the Site.
- 1.3.2. Third party information has been used in the preparation of this report, which WSP UK Limited by necessity assumes is correct at the time of writing. While reasonable checks have been made on data sources and the accuracy of the data, WSP UK Limited accepts no liability in relation to the report should any data, information or condition be incorrect or have been concealed, withheld, misrepresented, or otherwise not fully disclosed to WSP UK Limited. In any event WSP UK Limited shall not be liable for any loss or damages arising under or in connection to the use of this report.
- 1.3.3. This document contains public sector information licensed under the Open Government Licence v3.0.

¹ St Albans City and District Council (2024) *LPCD 02.01/02.02 - Draft Local Plan 2041: Regulation 19 Publication*; accessed September 2025 from <https://www.stalbans.gov.uk/draft-local-plan-publication>

² The Planning Inspectorate (2025) *SADC/ED84 - Examination of the St Albans City and District Local Plan: Matters, Issues and Questions for Stage 2*; obtained September 2025 from <https://www.stalbans.gov.uk/hearing-sessions-0>

2 THE SITE

2.1 LOCATION AND DESCRIPTION

- 2.1.1. The Site is located to the south of Harpenden Lane in Redbourn, Hertfordshire, as shown on the Site Location plan in Appendix A.1. The Ordnance Survey grid reference for the Site is (511113, 212561) and the nearest postcode is AL3 7RQ.
- 2.1.2. The Site covers an area of approximately 3.80 ha and is currently greenfield. It is bound by Harpenden Lane to the north, undeveloped land to the east and south, and existing residential development off Crown Street to the west.

2.2 WATERBODIES AND FLOOD DEFENCES

- 2.2.1. The River Ver, an Environment Agency designated main river, runs through the Site from north to south as shown on the Existing Waterbodies plan in Appendix A.2. The watercourse is culverted beneath Harpenden Lane and forded across Waterend Lane to the north and south of the Site respectively. There are no other waterbodies or formal flood defences in proximity to the Site.

2.3 TOPOGRAPHY

- 2.3.1. Publicly available Light Detection and Ranging (LiDAR) data³ describing existing ground levels at, and in the vicinity of, the Site has been obtained from the Department for Environment, Food and Rural Affairs (DEFRA) for the purposes of this appraisal and is represented on the Existing Topography plan in Appendix A.3.
- 2.3.2. The eastern and western parts of the Site fall from east to west and west to east respectively towards the River Ver which runs through the central part of the Site. Existing ground levels also gently fall from north to south along the river corridor with a highest elevation of approximately 96.6 m Above Ordnance Datum (AOD) in the northeastern corner of the Site and a lowest elevation of approximately 93.5 m AOD in the southwestern part of the Site.
- 2.3.3. A topographical survey of the Site was undertaken in 2023 and is provided in Appendix A.3 for reference. It shows surveyed levels at the Site to be in general accordance with those given by the LiDAR data described above.

2.4 GEOLOGY AND HYDROGEOLOGY

- 2.4.1. British Geological Survey (BGS) mapping⁴, reproduced in Appendix A.4 for reference, shows the Site to be underlain by bedrock comprised of chalk associated with the Lewes Nodular Chalk Formation and Seaford Chalk Formation. The bedrock is likely to be permeable, giving rise to a potential risk of groundwater emergence and low rates of surface water runoff.

³ Department for Environment, Food and Rural Affairs (2025) *DEFRA Survey Data Download*; accessed September 2025 from <https://environment.data.gov.uk/survey>

⁴ British Geological Survey (2025) *GeoIndex (onshore)*; accessed September 2025 from <https://www.bgs.ac.uk/map-viewers/geoindex-onshore/>

- 2.4.2. Superficial deposits of Alluvium (clay, silt, sand and gravel) and River Terrace deposits (sand and gravel) are shown to be present along the corridor of the River Ver as it runs through the Site. The superficial deposits are expected to have mixed permeability, including largely impermeable silt and clay along with coarser sand and gravel.
- 2.4.3. The underlying bedrock at the Site is shown to be a 'Highly Productive' aquifer with the predominant flow mechanism identified as being through fractures and other discontinuities. DEFRA's MAGIC mapping⁵ shows the bedrock underlying the Site to be classified as a "Principal" aquifer which are defined as layers of rock with a high permeability that may support water supply and/or river base flow on a strategic scale.
- 2.4.4. The superficial deposits of Alluvium and River Terrace Deposits shown to be present at the Site are classified as a 'Secondary A' and 'Secondary (undifferentiated)' aquifers respectively which are defined as having a wide range of permeability, with Secondary A aquifers consisting of permeable layers capable of supporting water supplies at a local scale and in some cases forming an important source of base flow to rivers.
- 2.4.5. DEFRA's MAGIC mapping shows that the Site is located within Source Protection Zone 3 (SPZ3) which represents the total catchment for an existing water abstraction.
- 2.4.6. An intrusive ground investigation was undertaken at the Site in December 2023 as part of a Phase 1 and 2 Contamination Investigation and Risk Assessment⁶. The ground investigation found the northern and eastern parts of the Site to be underlain by made ground and gravel whilst the southern part of the Site was found to be underlain by gravelly clay over sandy gravel. Groundwater was observed in most of the exploratory holes at depths ranging from 0.4 m below ground level (bgl) to 1.0 m bgl with the report noting that groundwater depths were generally shallower in the central part of the Site near the River Ver.
- 2.4.7. Infiltration tests were undertaken as part of the ground investigation in four locations at depths ranging from 0.3 m bgl to 0.8 m bgl with infiltration rates ranging from 4.00×10^{-4} m/s to 9.61×10^{-9} m/s. The report concluded that, whilst the infiltration test results ranged from fair to good, the high groundwater levels encountered at the Site would present a constraint on the use of infiltration as a means of disposal of surface water generated by the Proposed Development.
- 2.4.8. The Phase 1 and 2 Contamination Investigation and Risk Assessment identified evidence of contamination in the northern part of the Site which would require remediation to facilitate the Proposed Development.

2.5 DRAINAGE INFRASTRUCTURE

- 2.5.1. Thames Water asset location plans, provided in Appendix A.5 for reference, do not show the presence of any public surface water drainage infrastructure in the immediate vicinity of the Site. An existing 150 mm diameter public foul water sewer is shown to run from Ver Road into the northern part of the Site, at which point it accepts a 100 mm diameter connection from the existing properties

⁵ DEFRA (2025) MAGIC; accessed October 2025 from <https://magic.defra.gov.uk/MagicMap.html>

⁶ Southern Testing (2024) *Updated Phase I and II Contamination Investigation & Risk Assessment Report*



adjoining Harpenden Lane before increasing to a diameter of 225 mm and running from north to south through the Site.

3 THE PROPOSED DEVELOPMENT

- 3.1.1. The Proposed Development is shown on the Parameter Plan (see Figure 3-1 below) and Illustrative Masterplan provided in Appendix B.1 and Appendix B.2 respectively. It consists of the construction of up to 35 dwellings along with associated infrastructure, a formal childrens play space, amenity greenspace and suitable alternative natural greenspace (SANG). Access to the Proposed Development is to be provided off Crown Street in the south-western part of the Site.



Figure 3-1 – Parameter Plan (Extract from edp2974_d054d)

- 3.1.2. The Proposed Development is classified as 'more vulnerable' with respect to flood risk in accordance with Annex 3 of the National Planning Policy Framework (NPPF) and is assumed to have a minimum design life of 100 years in accordance with the requirements of the Flood Risk and Coastal Change Planning Practice Guidance (PPG).

4 CONSULTATION, POLICY AND GUIDANCE

4.1 CONSULTATION

- 4.1.1. Pre-application consultation with the Environment Agency and Hertfordshire County Council, in its role as Lead Local Flood Authority (LLFA), has been undertaken as part of this appraisal and referenced herein where appropriate with full copies of the correspondence provided in Appendix C.

4.2 POLICY AND GUIDANCE

REFERENCES

- 4.2.1. The report has been informed by, and makes reference to where appropriate, the following documents and policies:
- National Planning Policy Framework (NPPF); Ministry of Housing, Communities & Local Government (2024);
 - The NPPF Flood Risk and Coastal Change PPG; Ministry of Housing, Communities & Local Government (2025);
 - National Standards for Sustainable Drainage Systems; DEFRA (2025);
 - Local Flood Risk Management Strategy 2; Hertfordshire County Council (2019);
 - LLFA Summary Guidance for Developers; Hertfordshire County Council (2021);
 - Hertfordshire Minerals and Waste Local Plan 2040 Strategic Flood Risk Assessment Level 1; Hertfordshire County Council (2022);
 - Watford and St Albans Surface Water Management Plan; WSP (2015);
 - South West Hertfordshire Level 1 Strategic Flood Risk Assessment; JBA (2018);
 - South-West Hertfordshire Level 1 Strategic Flood Risk Assessment Level 1: Addendum for St Albans; JBA (2024);
 - St Albans Level 2 Strategic Flood Risk Assessment; JBA (2024); and,
 - The SuDS Manual (C753); CIRIA (2015).

4.3 CLIMATE CHANGE

- 4.3.1. The Environment Agency's guidance on climate change allowances⁷ provides up to date predictions on the changes in peak river flows, peak rainfall intensities, and sea levels that are expected to occur because of climate change. The allowances are considered as part of this appraisal to ensure that the Proposed Development will remain safe and will not increase flood risk elsewhere over its intended design life in accordance with the requirements of the NPPF.

⁷ Environment Agency (2022) *Flood risk assessment: climate change allowances*; accessed September 2025 from <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

4.3.2. The Site lies within the Colne Management Catchment with the associated allowances for climate change that are potentially applicable to the Proposed Development given below.

- Allowances for peak river flow (2080's epoch):
 - Central – 21%;
 - Higher – 35%; and,
 - Upper – 72%.
- Allowances for peak rainfall intensity (2070's epoch) for a 3.3% annual probability storm event:
 - Central – 25%; and,
 - Upper End – 35%.
- Allowances for peak rainfall intensity (2070's) for a 1% annual probability storm event:
 - Central – 25%; and,
 - Upper End – 40%.

5 FLOOD RISK SUMMARY

- 5.1.1. The following section provides an overview of the risks posed to the Site, along with the risks arising to and from the Proposed Development over its lifetime, for all potential sources of flooding in accordance with the requirements of the NPPF Flood Risk and Coastal Change PPG.

5.2 COASTAL AND TIDAL FLOODING

- 5.2.1. Tidal flooding occurs when sea levels rise above the level of the land or beyond the operational level of existing flood defences. As the Site is located inland and is not situated within the vicinity of a tidal estuary the risk of flooding to the Site from these sources is negligible.

5.3 FLUVIAL FLOODING

PUBLISHED FLOOD RISK MAPPING

- 5.3.1. Fluvial flooding occurs when river flow exceeds the capacity of a watercourse and is classified by the NPPF as follows:
- Flood Zone 1 – Areas assessed as having an annual probability of fluvial flooding of less than 0.1%;
 - Flood Zone 2 – Areas assessed as having an annual probability of fluvial flooding of between 1% and 0.1%; and,
 - Flood Zone 3 – Areas assessed as having an annual probability of fluvial flooding of greater than 1%.
- 5.3.2. The Environment Agency's Flood Map for Planning⁸, reproduced in Figure 5-1 and Appendix D.1, shows most of the Site to lie within Flood Zones 1 and 2, with parts of the Site immediately adjacent to the River Ver shown to lie within Flood Zone 3.
- 5.3.3. The Environment Agency's Risk of Flooding from Rivers and Sea mapping⁹, reproduced in Appendix D.2 for reference, shows most of the Site to be subject to a 'Very Low' or 'Low' risk of fluvial flooding with an associated annual probability of fluvial flooding of less than 0.1% and between 0.1% and 1% respectively. Small parts of the Site along the corridor of the River Ver are shown to be subject to a 'Medium' or 'High' risk of fluvial flooding with an associated annual probability of flooding from this source of between 1% and 3.3%, and greater than 3.3%, respectively.

⁸ Environment Agency (2025) *Flood Map for Planning*; accessed September 2025 from <https://flood-map-for-planning.service.gov.uk/>

⁹ Environment Agency (2025) *Risk of Flooding from Rivers and Sea*; accessed September 2025 from <https://www.gov.uk/check-long-term-flood-risk>

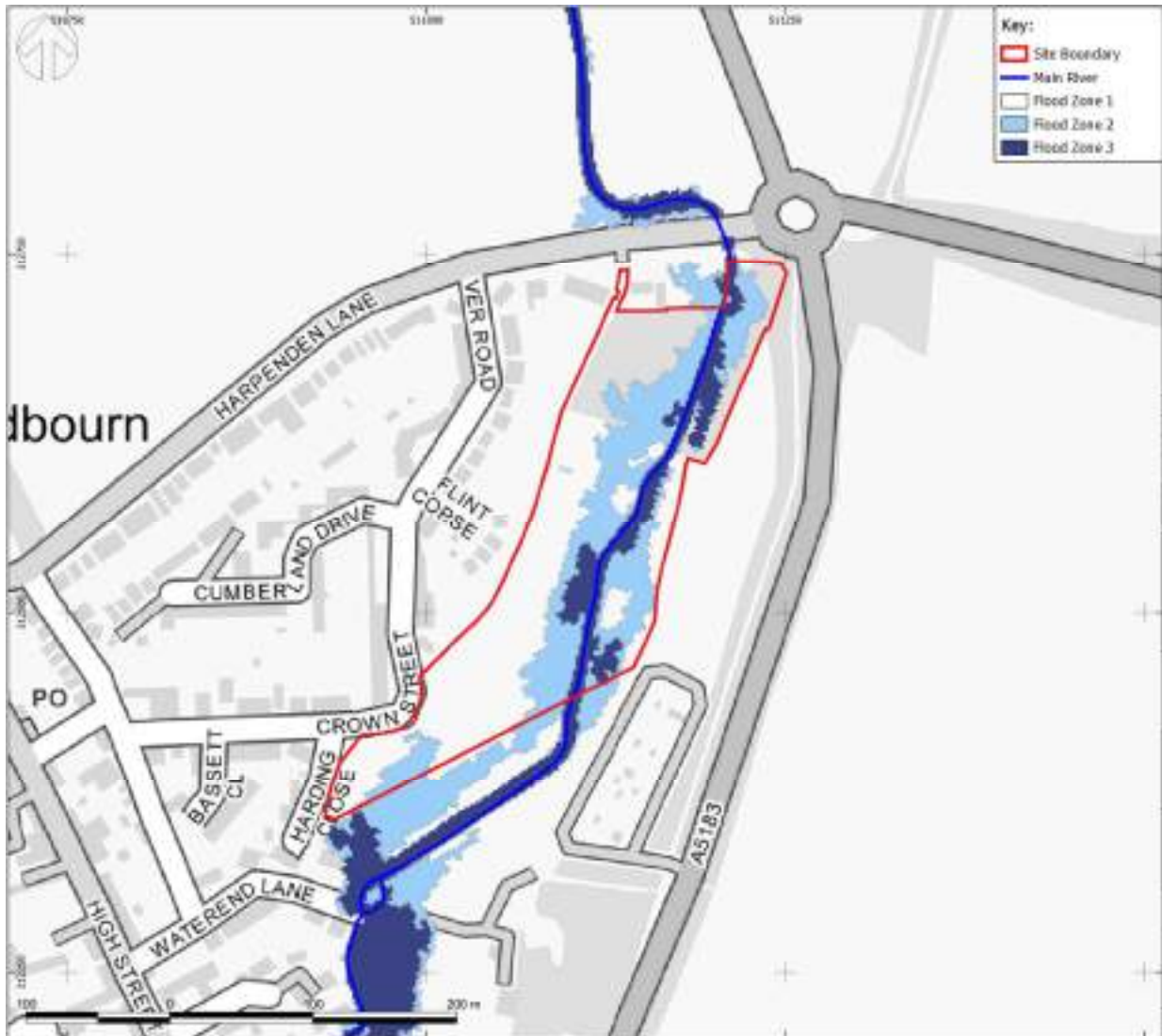


Figure 5-1 – Flood Map for Planning (Environment Agency)

SITE-SPECIFIC HYDRAULIC MODELLING STUDY

- 5.3.4. WSP developed a site-specific hydraulic model of the River Ver to improve our understanding of the fluvial flood risk posed to the Site as part of this appraisal. The hydraulic model is based on an existing model developed by JBA Consulting in support of the River Ver Modelling Study on behalf of the Environment Agency¹⁰.
- 5.3.5. The existing model was supplemented with additional channel survey data and up to date LiDAR data, which define the channel and the floodplain respectively, along with updates to the accompanying hydrological analysis used to determine model inflows.

¹⁰ JBA (2019) *River Ver Modelling Study*

5.3.6. The predicted peak fluvial flood extents given by the updated model are provided in Figure 5-2 and Appendix D.3 which show the risk of fluvial flooding posed to the Site to be significantly lower than that shown by the Environment Agency mapping described in paragraphs 5.3.2 and 0 above.

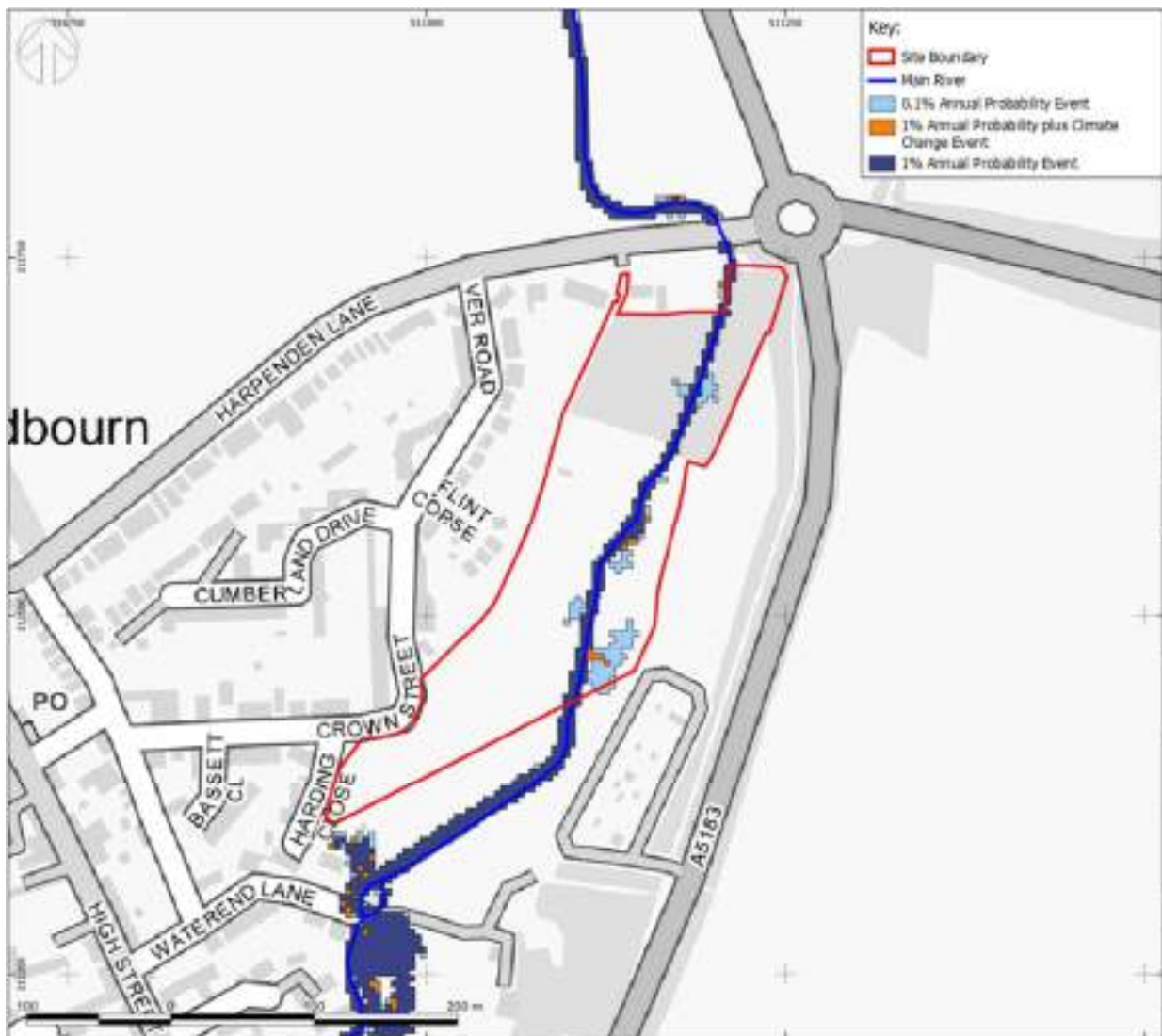


Figure 5-2 - Predicted Peak Fluvial Flood Extents (Site-Specific Hydraulic Model)

- 5.3.7. The updated model shows the Site to predominantly be subject to a risk of fluvial flooding of less than 0.1%, with isolated areas along the corridor of the River Ver shown to lie within the predicted peak flood extents associated with the 0.1% and 1% annual probability events. The predicted peak fluvial flood extents for the 1% annual probability plus climate change event are shown to lie between those for the 0.1% and 1% annual probability present day events.
- 5.3.8. Consequently, the risk of fluvial flooding posed to the Site is considered to be very low, with isolated areas of higher risk immediately adjacent to the watercourse.

5.4 SURFACE WATER FLOOD RISK

PUBLISHED FLOOD RISK MAPPING

- 5.4.1. During extreme storm events ground may become saturated and the overland flows that arise from such conditions may lead to surface water flooding.
- 5.4.2. The Environment Agency's Risk of Flooding from Surface Water mapping¹¹, reproduced in Figure 5-3 and Appendix D.4, shows the Site to be subject to a risk of flooding from this source ranging from 'Very Low' to 'High'.

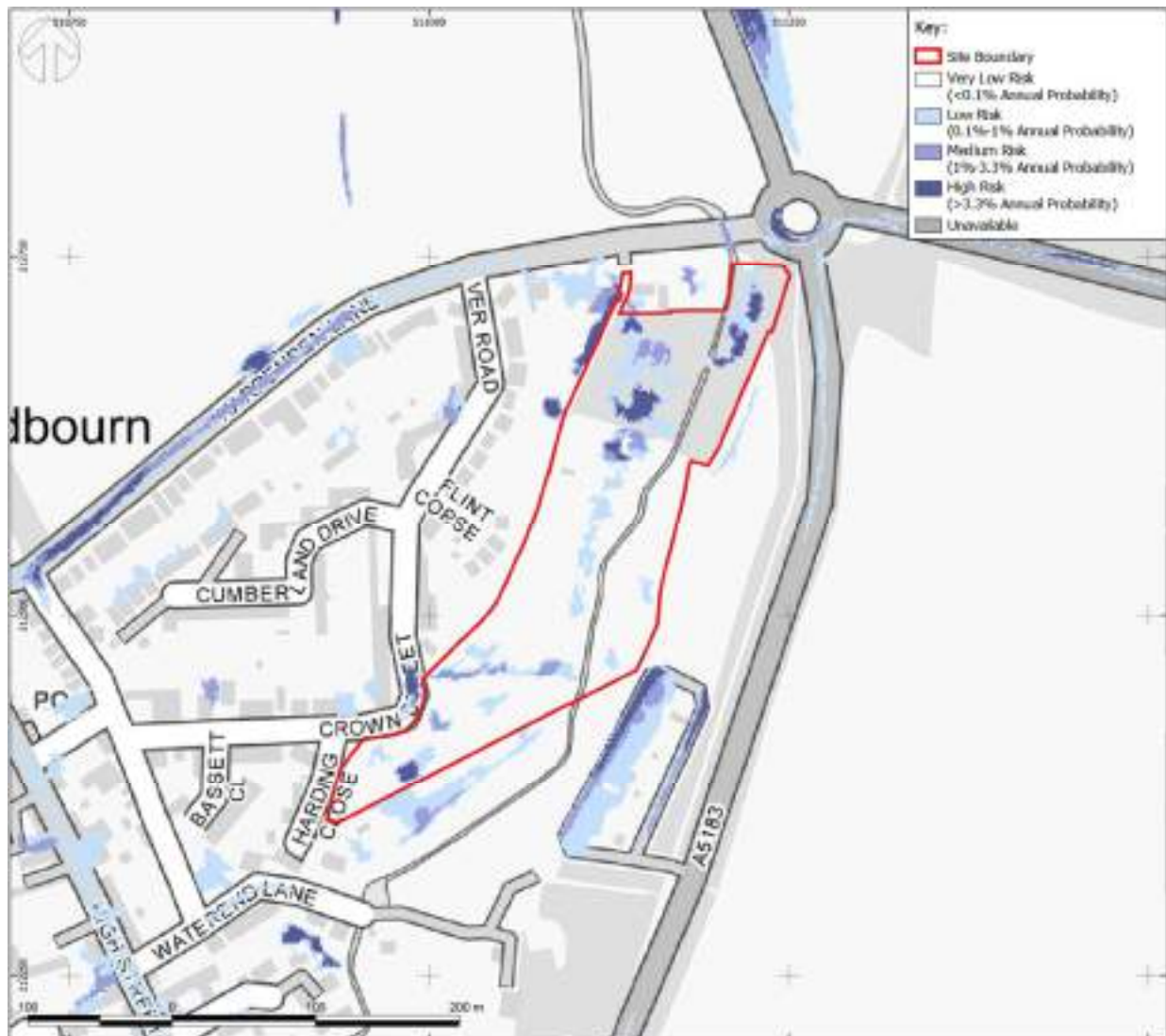


Figure 5-3 – Risk of Flooding from Surface Water (Environment Agency)

¹¹ Environment Agency (2025) Risk of Flooding from Surface Water; accessed September 2025 from <https://www.gov.uk/check-long-term-flood-risk>

- 5.4.3. An existing surface water flow path associated with runoff generated by higher ground to the northwest of the Site is shown to flow from Harpenden Lane into the northwestern corner of the Site before following the natural topography from north to south parallel to the River Ver. The risk of flooding associated with this flow path is shown to be predominantly 'Low' with an associated annual probability of between 0.1% and 1%. Isolated pockets of 'Medium' and 'High' risk associated with existing topographic low spots are shown within the northern part of the Site.
- 5.4.4. Parts of the southwestern part of the Site, where existing ground levels are at their lowest, are shown to be subject to a risk of surface water flooding ranging from 'Low' to 'High'. The risk shown to this part of the Site is understood to be associated with a combination of runoff generated by higher ground to the north of the Site and runoff generated by rainfall falling onto the Site itself.

SITE-SPECIFIC HYDRAULIC MODELLING STUDY

- 5.4.5. WSP developed a site-specific direct-rainfall model to improve our understanding of surface water flood risk in the vicinity of the Site as part of this appraisal. The predicted peak surface water flood extents given by the model are provided in Figure 5-4 and Appendix D.5 which show the risk of surface water posed to the Site to be similar to that given by the Environment Agency mapping described in paragraphs 5.4.1 to 5.4.4 above.
- 5.4.6. Most of the Site is shown to lie outside of the predicted peak flood extents given by the model for all events tested, with an associated annual probability of flooding of less than 0.1%. The northern and southwestern parts of the Site are shown to be subject to an annual probability of surface water flooding ranging from 0.1% to 3.3% associated with the existing flow path off Harpenden Lane and ponding in the lowest-lying part of the Site respectively as described above.
- 5.4.7. The model demonstrates that safe access and egress would be provided via. the proposed access off Crown Street to the west of the Site. The predicted peak surface water flood extents for the 1% annual probability plus climate change event are shown to lie between those for the 0.1% and 1% annual probability present day events.
- 5.4.8. Consequently, the risk of surface water flooding posed to most of the Site is very low, with areas in the northern and southwestern parts of the Site subject to a high risk of surface water flooding.
- 5.4.9. The site-specific direct-rainfall model was utilised to support the preliminary identification of mitigation measures suitable for incorporation into the Proposed Development to manage the risk of surface water flooding as detailed in Section 6.1 of this report.

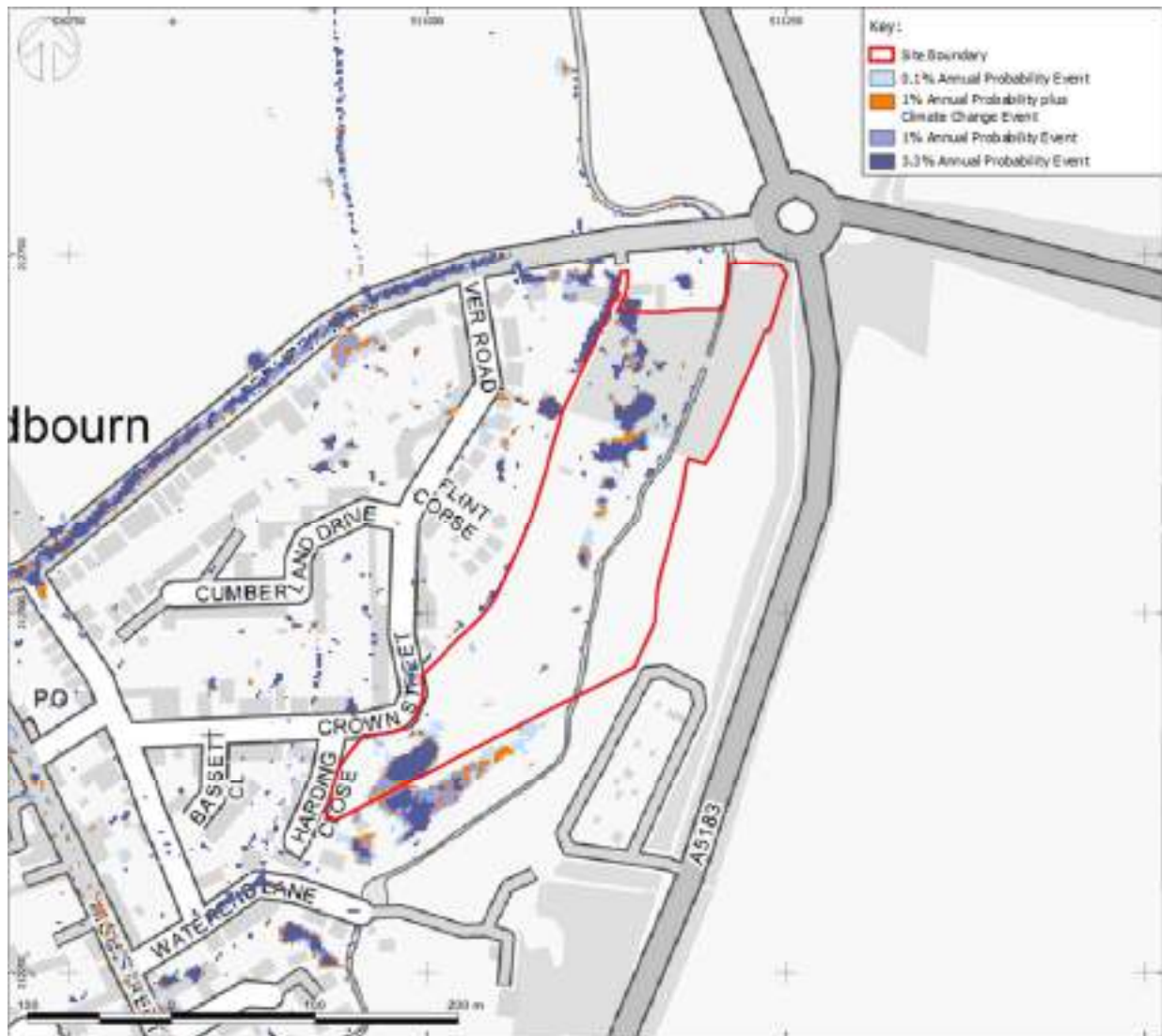


Figure 5-4 - Predicted Peak Surface Water Flood Extents (Site-Specific Hydraulic Model)

5.5 GROUNDWATER FLOODING

- 5.5.1. Groundwater flooding occurs when water stored below ground reaches the surface. It is commonly associated with porous underlying geology, such as chalk, sands, and gravels.
- 5.5.2. The underlying geology shown by the published BGS mapping described in Section 2.4 indicates that there is the potential for groundwater emergence at the Site given the permeable nature of the underlying bedrock combined with the fact that the bedrock and superficial deposits shown to underlie the Site are classified as 'Principal' and 'Secondary' aquifers respectively.
- 5.5.3. The detailed site summary for the wider allocation site M6, in which the Site is located, provided in the St Albans Level 2 Strategic Flood Risk Assessment includes groundwater flood risk mapping which covers the Site. It shows that groundwater at the Site could be expected to lie within 0.025 m below existing ground levels.
- 5.5.4. The intrusive ground investigation undertaken at the Site described in paragraph 2.4.6 encountered groundwater at depths of between 0.4 m bgl and 1.0 m bgl in most of exploratory holes dug, with

shallower depths encountered closer to the River Ver suggesting that groundwater levels at the Site are hydraulically linked to the watercourse.

- 5.5.5. Affinity Water's Water Resources Management Plan 2024¹² (WRMP24) identifies proposed reductions and cessations of groundwater abstraction within the catchment in which the Site is located during Asset Management Period 8 (AMP8), which runs until 2030. The proposed reduction in groundwater abstraction has the potential to impact groundwater levels within the catchment.
- 5.5.6. Affinity Water's WRMP24 confirms that an AMP8 Water Industry National Environment Programme (WINEP) investigation will examine the potential risk of increased groundwater emergence arising from the proposed abstraction reductions and that engagement with the Environment Agency is ongoing.
- 5.5.7. The proposed abstraction reductions are to be carried out on an adaptive basis to ensure that they are undertaken in a manner that ensures risks can be managed, with Affinity Water continuing to investigate, monitor, and engage with stakeholders as the abstraction reduction programme proceeds. Any potential flood risk implications are likely to be managed through licence conditions, with Affinity Water utilising existing abstraction infrastructure to abstract groundwater under high level/flow conditions.
- 5.5.8. Consequently, the risk of groundwater flooding at the Site is considered to be high.

5.6 FLOODING FROM SEWERS AND DRAINAGE INFRASTRUCTURE

- 5.6.1. Sewer and drainage infrastructure flooding can occur after prolonged periods of intense heavy rainfall which can overwhelm sewers, potentially resulting in them being unable to carry the extra water away quickly enough.
- 5.6.2. The Thames Water asset location plans described in paragraph 2.5.1 do not show the presence of any public surface water sewers in the vicinity of the Site. The existing foul water sewer shown to be located at the Site is to be diverted as part of the Proposed Development. The diverted sewer should be aligned with the proposed road network to minimise the risk of flooding posed to people or property during the event of a potential blockage or the ingress of groundwater or surface water within the wider public foul sewer network during an extreme storm event.
- 5.6.3. Consequently, the risk of flooding posed to the Site from this source is considered to be low.

5.7 FLOODING FROM ARTIFICIAL SOURCES

- 5.7.1. Flooding can occur as a result of infrastructure failure, including the breaching and/or overtopping of retaining structures for raised bodies of water such as canals and reservoirs.
- 5.7.2. The Environment Agency's Reservoir Flood Risk mapping, reproduced in Appendix D.6 for reference shows the Site to be at risk of flooding in the event of a reservoir failure during a 'wet day' scenario which considers the risk of a reservoir failure in combination with an extreme natural flood

¹² Affinity Water (2024) *Water Resources Management Plan 2024*; obtained October 2025 from <https://affinitywater.uk/engagement/hq.com/wrmp>

event. Although this data represents a possible worst-case scenario, it does not give an indication of the probability of reservoir flooding occurring.

- 5.7.3. All large reservoirs must be inspected and supervised by reservoir panel engineers in accordance with the Reservoir Act 1975. The Environment Agency serve as the enforcement authority for the Reservoir Act 1975 in England and are required to ensure that reservoirs are inspected regularly, and essential safety work undertaken. Consequently, whilst the Site is shown to be at risk of flooding from this source, it is a residual risk and it is reasonable to assume it does not present a constraint to the Proposed Development.

5.8 HISTORIC FLOODING

- 5.8.1. The Environment Agency's Historic Flood Map, reproduced in Appendix D.7 for reference, does not show the Site to have been affected by a historic flood event. The nearest recorded flood event given by the Environment Agency's mapping is located approximately 1 km downstream of the Site and is attributed to the exceedance of the capacity of the River Ver in October 1993. None of the stakeholders consulted as part of this appraisal provided any records of historic flooding at the Site.

6 FLOOD RISK MANAGEMENT MEASURES

6.1 PROPOSED MITIGATION MEASURES

- 6.1.1. Following the appraisal of the risk posed to the Site from all potential sources of flooding detailed in Chapter 5, the risk of coastal and tidal flooding along with the risks posed by drainage infrastructure and artificial sources are considered to range from negligible to low. Therefore, no mitigation measures are required to manage the risk posed by these sources to the Proposed Development.
- 6.1.2. The risk of fluvial, surface water and groundwater flooding posed to the Site were found to range from very low to high. The mitigation measures proposed to manage the risks posed from these sources to the Proposed Development are presented below.

FLUVIAL FLOODING

- 6.1.3. The Environment Agency's guidance on climate change allowances discussed in Section 4.2 identifies that the central allowance of 21% for the 2080's epoch should be applied to the design flood event as the Proposed Development is classified as 'more vulnerable' with respect to flood risk and the Site is located within Flood Zones 2 and 3.
- 6.1.4. The sequential approach has been adopted throughout the development of the Parameter Plan and Illustrative Masterplan given in Appendix B to ensure that all built-development would be located outside of the predicted peak fluvial flood extents for all events tested using the site-specific hydraulic model, including the 1% annual probability, 1% annual probability plus 21% climate change, and 0.1% annual probability events.
- 6.1.5. Following the adoption of the sequential approach, the risk of fluvial flooding posed to the Proposed Development would be very low and no additional mitigation measures would be required to manage the risk of flooding from this source.

SURFACE WATER FLOODING

- 6.1.6. The sequential approach has been adopted throughout the development of the Parameter Plan and Illustrative Masterplan given in Appendix B to ensure that all built development would be located outside of the predicted peak surface water flood extents as far as is practicable. The southwestern part of the Site, shown to be subject to a risk of surface water flooding ranging from very low to high, is to be utilised as amenity greenspace and SANG whilst the existing flow path described in paragraph 5.4.3 has been incorporated into the layout of the Proposed Development.
- 6.1.7. The proposed remediation strategy for the contamination identified in the northern part of the Site described in paragraph 2.4.8 presents an opportunity to formalise the existing surface water flow path which would both reduce the risk of flooding posed to the Proposed Development and provide resilience during an exceedance event.
- 6.1.8. Following the excavation and removal of contaminated materials from the northern part of the Site, existing ground levels would be reprofiled to formalise the existing flow path as it passes through the Proposed Development from north to south prior to its convergence with the River Ver. The extent of the proposed reprofiling is shown on the Illustrative Masterplan in Appendix B.2.
- 6.1.9. The site-specific direct-rainfall model developed to inform this appraisal has been utilised to represent the proposed reprofiling, with existing ground levels lowered by approximately 500 mm in

this part of the Site within the model. The predicted peak surface water flood extents following the proposed reprofiling described above show that all built-development would be located outside of the predicted peak flood extents for all events tested, up to and including the 1% annual probability plus climate change event.

- 6.1.10. Following the adoption of the sequential approach and the proposed reprofiling of the northern part of the Site to formalise the existing surface water flow path the risk of surface water flooding posed to the Proposed Development would be very low.
- 6.1.11. The Proposed Development has the potential to increase the risk of surface water flooding elsewhere through the introduction of impermeable surfacing at the Site associated with the proposed dwellings and associated infrastructure. An indicative surface water drainage strategy has been developed in accordance with the requirements of the Flood Risk and Coastal Change PPG, the National Standards for Sustainable Drainage Systems and Hertfordshire County Council's LLFA Summary Guidance for Developers to demonstrate that surface water generated by the Proposed Development can be drained sustainably in accordance with national and local policy. A summary of the preliminary surface water drainage strategy can be found in Chapter 7 below.

GROUNDWATER FLOODING

- 6.1.12. The sequential approach has been adopted to locate built development away from the central part of the Site near the River Ver in which the Phase 1 and 2 Contamination Investigation and Risk Assessment discussed in Section 2.4 identified that groundwater depths were generally shallower. No basements or other below ground structures are to be constructed at the Site as part of the Proposed Development.
- 6.1.13. Finished floor levels within the Proposed Development should be set a minimum of 150 mm above finished ground levels to mitigate the risk of groundwater flooding, with flood resistant and/or resilient construction techniques considered for incorporation into the design of the proposed dwellings as appropriate at the detailed design stage.
- 6.1.14. The use of shallow above-ground Sustainable Drainage Systems (SuDS) features has been adopted to provide the required volumes of attenuation detailed in Section 7.3. The proposed SuDS features should be lined with an impermeable membrane to prevent groundwater ingress. Seasonal groundwater monitoring should be undertaken as the project progresses and the detailed design of all proposed SuDS features should consider the potential for floatation.

7 PRELIMINARY SURFACE WATER DRAINAGE STRATEGY

7.1 INTRODUCTION

- 7.1.1. The preliminary surface water drainage strategy presented herein has been developed for the purposes of ensuring sufficient space is accommodated within the Proposed Development for the management of surface water.

7.2 EXISTING DRAINAGE REGIME

- 7.2.1. Surface water runoff generated by the Site currently drains via. a combination of infiltration and overland flow governed by natural topography towards the River Ver.
- 7.2.2. Greenfield runoff rates have been calculated for the Site in its entirety and on a per hectare basis using the Revitalised Flood Hydrograph Method (ReFH2) and Flood Estimation Handbook (FEH) rainfall data obtained from the FEH Web Service¹³. The results are summarised in Table 7-1 below with full copies of the calculations provided in Appendix E.1 for reference.

Table 7-1 – Greenfield Runoff Rates

Storm Event (% Annual Probability)	Site Area (ha)	Greenfield Runoff Rate (l/s)	Greenfield Runoff Rate (l/s/ha)
50 (i.e. a 1 in 2 Return Period)	3.80	4.51	1.19
3.3 (i.e. a 1 in 30 Return Period)		10.47	2.76
1 (i.e. a 1 in 100 Return Period)		13.43	3.53

7.3 PROPOSED DRAINAGE REGIME

DISCHARGE LOCATION

- 7.3.1. The additional surface water runoff that would be generated by the Proposed Development should be discharged to one of the following locations based on the hierarchy given by the NPPF Flood Risk and Coastal Change PPG and the National Standards for Sustainable Drainage Systems. This hierarchy stipulates that surface water runoff not collected for reuse must be discharged to one or more of the following in order of priority:
- Collected for non-potable use;
 - Discharge into ground (via infiltration);
 - Discharge to a surface water body;
 - Discharge to a surface water sewer, highway drain, or another pipe surface water drainage system; or,
 - Discharge to a combined sewer.

¹³ UK Centre for Ecology and Hydrology (2025) *FEH Web Service*; point data obtained January 2025 from <https://fehweb.ceh.ac.uk/>

- 7.3.2. Paragraph 1.15 of the National Standards for Sustainable Drainage Systems states that “[t]he base of infiltration drainage features shall not be within 1m of the maximum likely groundwater level at the site’. Consequently, given the shallow depth of groundwater encountered at the Site during the intrusive site investigation described in 2.4.6, it has been assumed that infiltration of runoff that would be generated by the Proposed Development to ground would not be viable for the purposes of this appraisal.
- 7.3.3. Surface water runoff generated by the Proposed Development would therefore be discharged to the River Ver as the nearest surface water body in accordance with the drainage hierarchy presented above.
- 7.3.4. To ensure that the Proposed Development would not increase flood risk elsewhere through an increase in the peak rate of surface water runoff discharged from the Site, maximum discharge rates from the Proposed Development to the River Ver should be limited to the greenfield runoff rates given in Table 7-1 for all events up to and including the 1% annual probability plus 40% climate change event.
- 7.3.5. To ensure that the Proposed Development would not increase flood risk elsewhere through an increase in the total volume of runoff discharged from the Site, maximum discharge rates should be limited to the greenfield mean annual flood flow (Qbar) event. The greenfield runoff rate calculated for the 50% annual probability event of 1.19 l/s/ha has conservatively been adopted as an equivalent to the Qbar event for the purposes of this appraisal.
- 7.3.6. Peak discharge rates from the proposed net developable area within the Site of 0.96 ha will be restricted to 1.14 l/s for all events up to and including the 1% annual probability event plus a 40% allowance for climate change. Limiting peak discharge rates from the Proposed Development to this rate would provide peak rate control and total volume control in accordance with the requirements of the National Standards for Sustainable Drainage Systems. The maximum allowable discharge rate for runoff generated by the Proposed Development is summarised in Table 7-2 below.

Table 7-2 –Proposed Discharge Rate Summary

Storm Event (% Annual Probability)	Site Area (ha)	Greenfield Runoff Rate (l/s/ha)	Net Developable Area (ha)	Proposed Discharge Rate (l/s)
50	3.80	1.19	0.96	1.14
3.3				
1				

SUDS FEATURES

- 7.3.7. Attenuation of surface water runoff generated by the Proposed Development is required to limit peak discharge rates to the pre-development greenfield runoff rates described above. The required volumes of attenuation have been determined using MicroDrainage for all rainfall events up to the 1% annual probability event, including a 40% allowance for climate change, with the results summarised in Table 7-3.

- 7.3.8. The contributing impermeable area for the Proposed Development has been calculated on the basis of an assumed 60% percentage impermeability plus an urban creep allowance of 10%.
- 7.3.9. These calculations show that approximately 655 m³ of storage would be required to attenuate runoff generated by the Proposed Development to the proposed maximum allowable discharge rate of 1.14 l/s during the design storm event.

Table 7-3 – Estimated Attenuation Volume Requirements

Storm Event (% Annual Probability)	Net Developable Area (ha)	Contributing Impermeable Area (ha)	Proposed Discharge Rate (l/s)	Required Attenuation Volume (m ³)
50	0.96	0.63	1.14	185
3.3 ¹⁴				490
1 ¹⁵				655

- 7.3.10. For the purposes of this appraisal, it has been assumed that all attenuation of runoff generated by the Proposed Development provided using two attenuation basins located to the east of the developable area and outside of the predicted peak fluvial flood extents. The size and location of the proposed attenuation basins are shown on the Illustrative Masterplan and Parameter Plan provided in Appendix B. Flow control would be provided in the form of a vortex flow control device or equivalent with a minimum outlet size of 50 mm to minimise the risk of blockage.
- 7.3.11. The proposed attenuation basins would require a total combined footprint of approximately 2,000 m² based on an assumed maximum total depth of 0.7 m, including a design water depth of 0.4 m and a freeboard of 0.3 m, to ensure that a gravity connection to the River Ver can be provided and to minimise the risk of groundwater ingress.
- 7.3.12. Opportunities to incorporate additional source control SuDS features within the Proposed Development that provide complementary water quantity, water quality, biodiversity and amenity benefits, and satisfy the interception requirements given by the National Standards for Sustainable Drainage Systems, should be sought as the project progresses.

7.4 WATER QUALITY

- 7.4.1. Table 26.1 of The SuDS Manual, an extract of which is reproduced in Table 7-4, identifies that the highest pollution hazard level associated with the Proposed Development would be 'Low' with associated hazard indices for Total Suspended Solids (TSS), metals and hydrocarbons of 0.5, 0.4 and 0.4 respectively.

¹⁴ Plus a 35% allowance for climate change (see paragraph 4.3.2 for details)

¹⁵ Plus a 40% allowance for climate change (see paragraph 4.3.2 for details)

Table 7-4 – Pollution Hazard Level and Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices)	Low	0.5	0.4	0.4

- 7.4.2. Table 26.3 of The SuDS Manual identifies that the mitigation indices for attenuation basins discharging to surface waters are 0.5, 0.5 and 0.6 for TSS, metals, and hydrocarbons respectively. Consequently, sufficient treatment of runoff generated by the Proposed Development would be provided prior to discharge from the Site.

7.5 OPERATION, MAINTENANCE AND MANAGEMENT

- 7.5.1. Regular inspection and maintenance are required to ensure the effective long-term operation of the proposed attenuation features and flow-control devices detailed in paragraph 7.3.1.
- 7.5.2. The general maintenance obligations associated with attenuation basins are included in Table 22.1 of The SuDS Manual. This includes regular inspections to outlets and inlets, removal of litter and management of vegetation.
- 7.5.3. Flow control devices, such as orifice plates and vortex flow control devices should be inspected and maintained every four to six months, and as required after significant leaf fall and significant rainfall events, to minimise the risk of blockages.

8 CONCLUSIONS

- 8.1.1. WSP was appointed by Martin Grant Homes Limited to prepare a Flood Risk and Surface Water Drainage Appraisal in support of the Proposed Development at the Site.
- 8.1.2. The Site forms part of the wider draft allocation site M6 in the St Albans City and District Council Draft Local Plan 2041 which was submitted to the Secretary of State for Independent Examination on 29 November 2024. This report has been prepared in response to the Matters, Issues and Questions for Stage 2 of the ongoing Albans City and District Local Plan Examination Hearings.
- 8.1.3. The Site is located to the south of Harpenden Lane in Redbourn, Hertfordshire, and is currently greenfield. It is bound by Harpenden Lane to the north, undeveloped land to the east and south, and existing residential development off Crown Street to the west. The River Ver, an Environment Agency designated main river, runs through the Site from north to south.
- 8.1.4. The Proposed Development consists of the construction of up to 35 dwellings along with associated infrastructure, a formal children's play space, amenity greenspace and suitable alternative natural greenspace. Access to the Proposed Development is to be provided off Crown Street in the south-western part of the Site.
- 8.1.5. The eastern and western parts of the Site fall from east to west and west to east respectively towards the River Ver which runs through the central part of the Site. Existing ground levels also gently fall from north to south along the river corridor.
- 8.1.6. British Geological Survey mapping shows the Site to be underlain by bedrock comprised of chalk associated with the Lewes Nodular Chalk Formation and Seaford Chalk Formation. Superficial deposits of Alluvium (clay, silt, sand and gravel) and River Terrace deposits (sand and gravel) are shown to be present along the corridor of the River Ver as it runs through the Site. The underlying bedrock at the Site is shown to be classified as an 'Principal' aquifer whilst the superficial deposits of Alluvium and River Terrace Deposits shown to be present at the Site are classified as a 'Secondary A' and 'Secondary (undifferentiated)' aquifers respectively. The Site is shown to be located within a SPZ3 which represents the total catchment for an existing water abstraction.
- 8.1.7. The risk of coastal and tidal flooding, along with the risks posed by drainage infrastructure and artificial sources, are considered to range from negligible to low. Consequently, no mitigation measures are required to manage the risk posed by these sources to the Proposed Development.
- 8.1.8. The Environment Agency's Flood Map for Planning shows most of the Site to lie within Flood Zones 1 and 2, with an associated annual probability of fluvial flooding of less than 0.1% and between 0.1% and 1% respectively. Parts of the Site immediately adjacent to the River Ver are shown to lie within Flood Zone 3 with an associated annual probability of fluvial flooding of greater than 1%.
- 8.1.9. WSP developed a site-specific hydraulic model of the River Ver to improve our understanding of the fluvial flood risk posed to the Site as part of this appraisal. The hydraulic model is based on an existing model developed by JBA Consulting in support of the River Ver Modelling Study on behalf of the Environment Agency.
- 8.1.10. The peak fluvial flood extents given by the updated model show the risk of fluvial flooding posed to the Site be significantly lower than that shown by the Environment Agency mapping. The updated model shows the Site to predominantly be subject to a risk of fluvial flooding of less than 0.1%, with

isolated areas along the corridor of the River Ver shown to lie within the predicted peak flood extents associated with the 0.1% and 1% annual probability events.

- 8.1.11. The sequential approach has been adopted to ensure that all built-development would be located outside of the predicted peak fluvial flood extents for all events tested using the site-specific hydraulic model including the 1% annual probability, 1% annual probability plus 21% climate change, and 0.1% annual probability events. Following the adoption of the sequential approach, the risk of fluvial flooding posed to the Proposed Development would be very low and no additional mitigation measures would be required to manage the risk of flooding from this source.
- 8.1.12. The Environment Agency's Risk of Flooding from Surface Water mapping shows the Site to be subject to a risk of flooding from this source ranging from 'Very Low' to 'High'. An existing surface water flow path associated with runoff generated by higher ground to the northwest of the Site is shown to flow from Harpenden Lane into the northwestern corner of the Site before following the natural topography from north to south parallel to the River Ver. The risk of flooding associated with this flow path is shown to be predominantly 'Low' with an associated annual probability of between 0.1% and 1%. Isolated pockets of 'Medium' and 'High' risk are shown along the route of the existing flow path associated with existing topographic low spots within the northern part of the Site.
- 8.1.13. Parts of the southwestern part of the Site, where existing ground levels are at their lowest, are shown to be subject to a risk of surface water flooding ranging from 'Low' to 'High'. The risk shown to this part of the Site is understood to be associated with a combination of runoff generated by higher ground to the north of the Site and runoff generated by rainfall falling onto the Site itself.
- 8.1.14. WSP developed a site-specific direct-rainfall model to improve our understanding of surface water flood risk in the vicinity of the Site as part of this appraisal. The model shows most of the Site to lie outside of the predicted peak flood extents given by the model for all events tested, with an associated annual probability of flooding of less than 0.1%. The northern and southwestern parts of the Site associated with the existing flow path off Harpenden Lane and ponding in the lowest-lying part of the Site described above are shown to be subject to an annual probability of surface water flooding ranging from 0.1% to 3.3%.
- 8.1.15. The sequential approach has been adopted to ensure that all built development would be located outside of the predicted peak surface water flood extents as far as is practicable. The southwestern part of the Site is to be utilised for amenity greenspace and SANG whilst the existing flow path from Harpenden Lane has been incorporated into the layout of the Proposed Development to ensure that it would not present a risk to people or property.
- 8.1.16. The proposed remediation strategy for the contamination identified in the northern part of the Site presents an opportunity to formalise the existing surface water flow path through the Site which would both reduce the risk of flooding posed to the Proposed Development and provide resilience during an exceedance event. Following the excavation and removal of contaminated materials, existing ground levels would be reprofiled in the northern part of the Site to formalise the existing flow path as it passes through the Proposed Development from north to south prior to its convergence with the River Ver.
- 8.1.17. The site-specific direct-rainfall model developed to inform this appraisal has been utilised to represent the proposed reprofiling, with existing ground levels lowered by approximately 500 mm in this part of the Site within the model. The predicted peak surface water flood extents following the proposed reprofiling described above show that all built development would be located outside of

the predicted peak flood extents for all events tested, up to and including the 1% annual probability plus climate change event.

- 8.1.18. Following the adoption of the sequential approach and the proposed reprofiling of the northern part of the Site to formalise the existing surface water flow path the risk of surface water flooding posed to the Proposed Development would be very low.
- 8.1.19. A preliminary surface water drainage strategy has been developed in accordance with the requirements of the Flood Risk and Coastal Change PPG, the National Standards for Sustainable Drainage Systems and Hertfordshire County Council's LLFA Summary Guidance for Developers to demonstrate that surface water generated by the Proposed Development can be drained sustainably in accordance with national and local policy.
- 8.1.20. Surface water runoff generated by the Site currently drains via a combination of infiltration and overland flow governed by the natural topography towards the River Ver. Surface water runoff generated by the Proposed Development would be discharged to the River Ver as the nearest surface water body in accordance with the drainage hierarchy as infiltration of runoff to ground via infiltration is unlikely to be feasible given the expected groundwater levels at the Site.
- 8.1.21. Peak discharge rates would be restricted to Q_{bar} for all events up to and including the 1% annual probability event, including a 40% allowance for climate change, to provide peak rate control and total volume control in accordance with the requirements of the National Standards for Sustainable Drainage Systems.
- 8.1.22. For the purposes of this appraisal, it has been assumed that all attenuation of runoff generated by the Proposed Development would be provided by two shallow basins located to the east of the developable area and outside of the predicted peak flood extents. Opportunities to incorporate additional source control SuDS features within the Proposed Development that provide complementary water quantity, water quality, biodiversity and amenity benefits, and satisfy the interception requirements presented in the National Standards for Sustainable Drainage Systems should be sought as the project progresses.
- 8.1.23. The sequential approach has been adopted to steer built development away from the central part of the Site, near the River Ver, in which the Phase 1 and 2 Contamination Investigation and Risk Assessment identified that groundwater depths were generally shallower. No basements or other below ground structures are to be constructed at the Site as part of the Proposed Development.
- 8.1.24. Finished floor levels within the Proposed Development should be set a minimum of 150 mm above finished ground levels to mitigate the risk of groundwater flooding, with flood resistant and/or resilient construction techniques considered for incorporation into the design of the proposed dwellings as appropriate at the detailed design stage. Shallow above-ground SuDS features, lined with an impermeable membrane to prevent groundwater ingress, should be utilised to manage surface water generated by the Proposed Development and should be designed to resist the potential risk of floatation.
- 8.1.25. Following the incorporation of the proposed mitigation measures outlined above, the proposed quantum of development at the Site is considered to be deliverable with the Proposed Development remaining safe over its lifetime without increasing flood risk elsewhere in accordance with the requirements of the NPPF and the associated Flood Risk and Coastal Change PPG.

Appendix A

EXISTING SITE PLANS



Appendix A.1

SITE LOCATION PLAN





Do not scale - Use only figured dimensions
The contractor is to check all dimensions on site and report any discrepancies to the site Supervisor
This drawing is to be read in conjunction with other standard documentation

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Note:
This plan is furnished as a general guide only and the Statutory Undertakers concerned state that no warranty as to its correctness is given or implied. It must not be relied upon in the excavations or other works made in the vicinity of each utilities service.

Key:

Site Boundary

P01	14/10/2025	SEK	FIRST ISSUE	MQ	JR
REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS:
S2 - FOR INFORMATION



Matrix House, Basing View, Basingstoke, RG21 4FF
+44 (0)1256 318 800
wsp.com

CLIENT:
MARTIN GRANT HOMES LIMITED

PROJECT:
LAND OFF HARPENDEN LANE, REDBOURN

TITLE:
SITE LOCATION

DRAWN: SEK	CHECKED: MQ	APPROVED: JR
PROJECT No: 70110083	SCALE @A3: 1:2,500	DATE: 14/10/2025

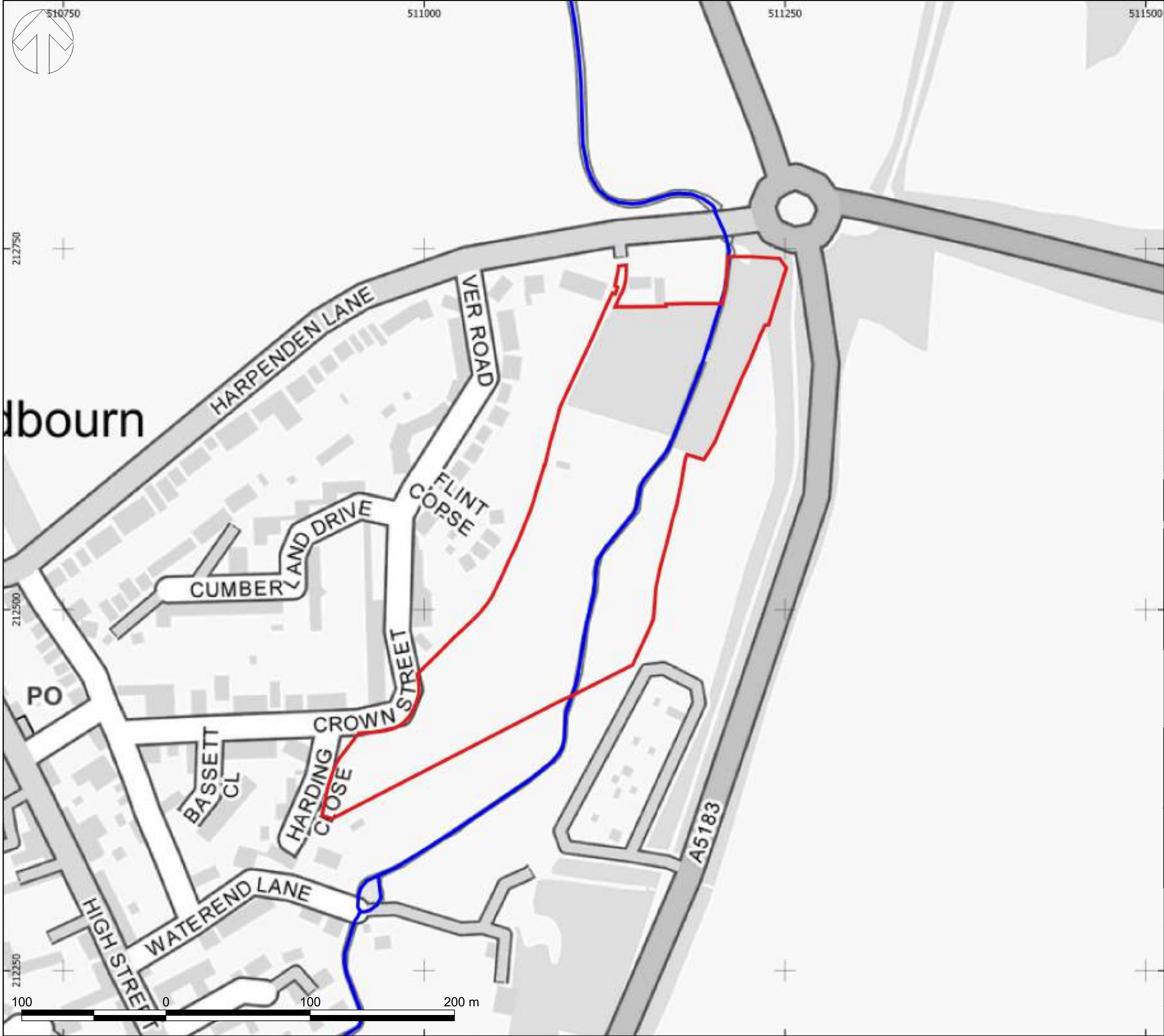
DRAWING No: 70110083-WSP-XX-XX-DR-EI-0001	REV: P01
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Appendix A.2

EXISTING WATERBODIES





Do not scale - Use only figured dimensions
The contractor is to check all dimensions on site and report any discrepancies to the site Supervisor
This drawing is to be read in conjunction with other standard documentation

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Note:
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Key:

- Site Boundary
- Main River

P01	14/10/2025	SEK	FIRST ISSUE	MQ	JR
REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS:
S2 - FOR INFORMATION



Matrix House, Basing View, Basingstoke, RG21 4FF
+44 (0)1256 318 800
wsp.com

CLIENT:
MARTIN GRANT HOMES LIMITED

PROJECT:
LAND OFF HARPENDEN LANE, REDBOURN

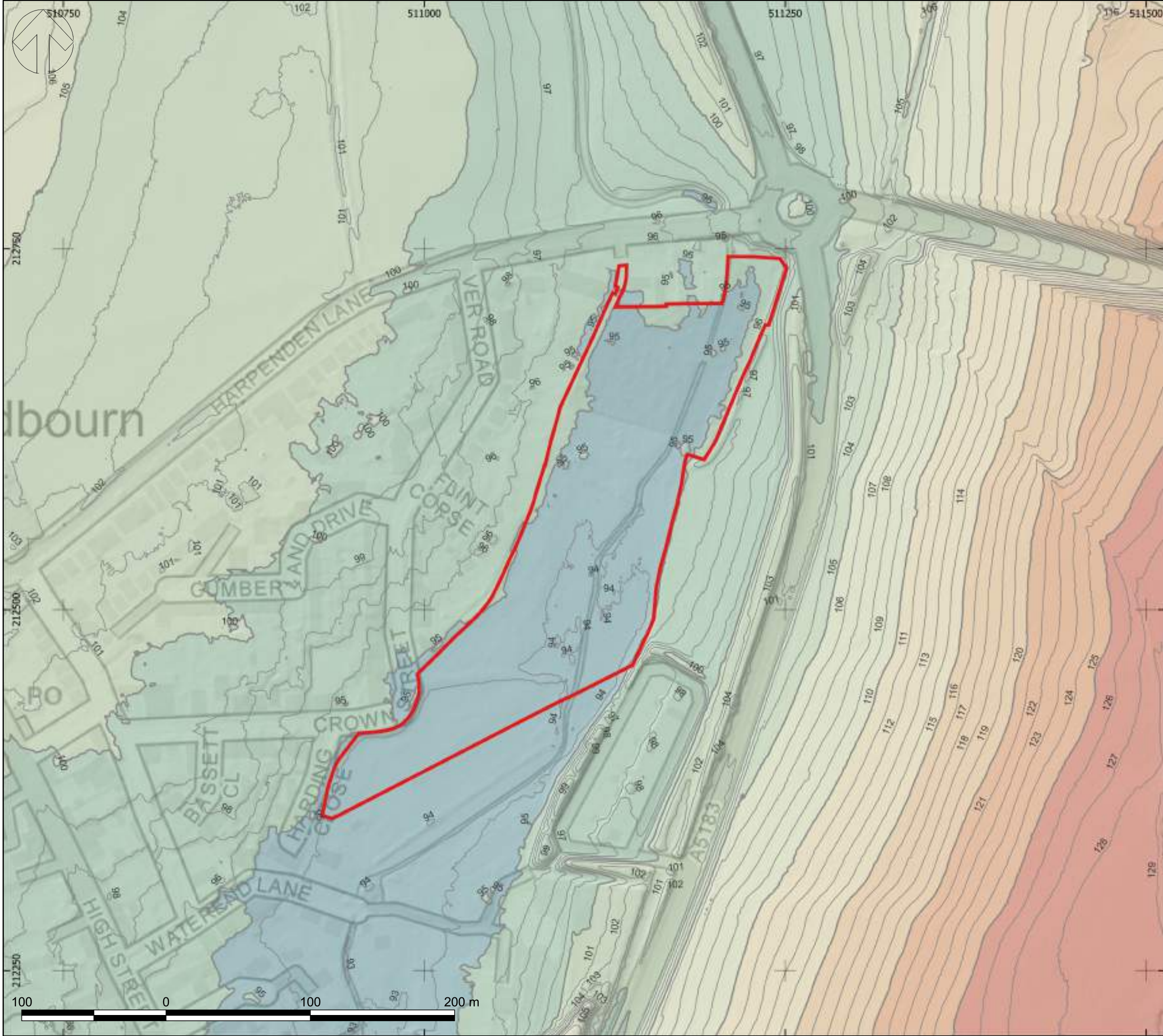
TITLE:
EXISTING WATERBODIES

DRAWN: SEK	CHECKED: MQ	APPROVED: JR
PROJECT No: 70110083	SCALE @A3: 1:2,500	DATE: 14/10/2025
DRAWING No: 70110083-WSP-XX-XX-DR-EI-0002		REV: P01
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Appendix A.3

TOPOGRAPHICAL PLANS





Do not scale - Use only figured dimensions
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This drawing is to be read in conjunction with other standard documentation

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Note:
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Key:

- Site Boundary
- <= 90.0 m AOD
- 90.0 - 95.0 m AOD
- 95.0 - 100.0 m AOD
- 100.0 - 105.0 m AOD
- 105.0 - 110.0 m AOD
- 110.0 - 115.0 m AOD
- 115.0 - 120.0 m AOD
- 120.0 - 125.0 m AOD
- 125.0 - 130.0 m AOD

P01	14/10/2025	SEK	FIRST ISSUE	MQ	JR
REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS:
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+44 (0)1256 318 800
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CLIENT:
MARTIN GRANT HOMES LIMITED

PROJECT:
LAND OFF HARPENDEN LANE, REDBOURN

TITLE:
EXISTING TOPOGRAPHY

DRAWN: SEK	CHECKED: MQ	APPROVED: JR
PROJECT No: 70110083	SCALE @A3: 1:2,500	DATE: 14/10/2025

DRAWING No: 70110083-WSP-XX-XX-DR-EI-0003	REV: P01
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NOTES

Grid: Local Grid orientated to Ordnance Survey Grid (OSTN15)
Datum: Ordnance Survey Datum (OSGM15)
Site Centred Local Scale Factor: 1:000000
Site Centred about station STN12

Name	SURVEY STATIONS		
	Channel	Notching	Height
CGM1	S0000E 146	212422.763	57.440
CGM2	S0000E 169	212443.488	57.381
CGM3	S0000E 168	212443.488	56.300
CGM4	S1214E 121	212608.328	58.202
CGM5	S1144E 130	212744.522	58.202
CGM7	S0000E 133	212444.000	57.381
CGM8	S0000E 104	212460.766	54.875
CGM9	S0000E 104	212460.766	54.875
CGM10	S0000E 171	212504.171	56.412
CGM11	S0000E 171	212504.171	56.412
CGM12	S0000E 171	212504.171	56.412
CGM13	S0000E 171	212504.171	56.412
CGM14	S0000E 171	212504.171	56.412
CGM15	S0000E 171	212504.171	56.412
CGM16	S0000E 171	212504.171	56.412
CGM17	S0000E 171	212504.171	56.412
CGM18	S0000E 171	212504.171	56.412
CGM19	S0000E 171	212504.171	56.412
CGM20	S0000E 171	212504.171	56.412
CGM21	S0000E 171	212504.171	56.412
CGM22	S0000E 171	212504.171	56.412
CGM23	S0000E 171	212504.171	56.412
CGM24	S0000E 171	212504.171	56.412
CGM25	S0000E 171	212504.171	56.412
CGM26	S0000E 171	212504.171	56.412
CGM27	S0000E 171	212504.171	56.412
CGM28	S0000E 171	212504.171	56.412
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CGM99	S0000E 171	212504.171	56.412
CGM100	S0000E 171	212504.171	56.412



CIENT:

DRAWING NAME:
HARPENDEN LANE - REDBOURN
TOPOGRAPHICAL SURVEY
AS OF SEP 2023
SHEET 1 OF 9

70110083-WSP-TOPO-HL-01

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NOTES

Grid: Local Grid orientated to Ordnance Survey Grid (OSTN15)
Datum: Ordnance Survey Datum (OSGM15)
Site Centred Local Scale Factor: 1:000000
Site Centred about station STN12

SURVEY STATIONS				
Name	Conting	Northing	Easting	Height
CM01	50096.440	27342.702	87.480	
CM02	50096.285	27342.819	95.747	
CM03	50096.640	27342.819	95.708	
CM04	57104.812	27360.038	93.202	
CM05	57104.763	27360.038	94.477	
CM07	57101.585	27359.523	97.598	
CM08	50096.333	27359.523	97.598	
CM09	50096.034	27359.700	94.675	
CM10	57104.763	27359.700	94.675	
CM07	57101.585	27359.741	94.688	
CM11	57101.695	27359.741	94.688	
CM12	50096.704	27360.031	95.500	
CM13	50096.840	27360.031	95.626	
CM14	57103.588	27372.999	94.807	
CM15	57103.769	27380.038	94.807	
CM16	57105.671	27380.038	94.807	
CM17	57102.851	27374.464	95.541	
CM18	57103.676	27374.464	95.541	
CM19	57103.485	27364.800	94.644	
CM20	57103.441	27372.303	94.644	
CM20	57104.682	27374.410	95.523	

[illegible]

CLIENT:

PROJECT TITLE:
HARPENDEN LANE - REDBOURN
TOPOGRAPHICAL SURVEY

SCALE: 1:100	SIZE: A0	DATE: 21/09/2023
DRAWN BY: UK/AL	CHECKED BY: UK	APPROVED BY: RH

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Grid: Local Grid orientated to Ordnance Survey Grid (OSTN15)
Datum: Ordnance Survey Datum (OSGM15)
Site Centred Local Scale Factor: 1:000000
Site Centred about station STN12

SURVEY STATIONS			
Name	Easting	Northing	Height
STW01	500960.549	213422.763	57.400
STW02	500980.283	213422.893	57.400
STW03	500980.640	213422.893	57.400
STW04	511044.812	213603.338	58.202
STW05	511442.170	213603.338	58.202
STW06	511442.170	213603.338	58.202
STW07	500980.333	213422.893	57.400
STW08	500980.004	213422.893	57.400
STW09	511044.211	213603.338	58.202
STW10	500980.004	213422.893	57.400
STW11	500980.004	213422.893	57.400
STW12	511044.211	213603.338	58.202
STW13	500980.004	213422.893	57.400
STW14	511044.211	213603.338	58.202
STW15	511044.211	213603.338	58.202
STW16	500980.004	213422.893	57.400
STW17	511044.211	213603.338	58.202
STW18	500980.004	213422.893	57.400
STW19	511044.211	213603.338	58.202
STW20	511044.211	213603.338	58.202
STW21	511044.211	213603.338	58.202
STW22	511044.211	213603.338	58.202
STW23	511044.211	213603.338	58.202
STW24	511044.211	213603.338	58.202
STW25	511044.211	213603.338	58.202
STW26	511044.211	213603.338	58.202
STW27	511044.211	213603.338	58.202
STW28	511044.211	213603.338	58.202
STW29	511044.211	213603.338	58.202
STW30	511044.211	213603.338	58.202
STW31	511044.211	213603.338	58.202
STW32	511044.211	213603.338	58.202
STW33	511044.211	213603.338	58.202
STW34	511044.211	213603.338	58.202
STW35	511044.211	213603.338	58.202
STW36	511044.211	213603.338	58.202
STW37	511044.211	213603.338	58.202
STW38	511044.211	213603.338	58.202
STW39	511044.211	213603.338	58.202
STW40	511044.211	213603.338	58.202
STW41	511044.211	213603.338	58.202
STW42	511044.211	213603.338	58.202
STW43	511044.211	213603.338	58.202
STW44	511044.211	213603.338	58.202
STW45	511044.211	213603.338	58.202
STW46	511044.211	213603.338	58.202
STW47	511044.211	213603.338	58.202
STW48	511044.211	213603.338	58.202
STW49	511044.211	213603.338	58.202
STW50	511044.211	213603.338	58.202
STW51	511044.211	213603.338	58.202
STW52	511044.211	213603.338	58.202
STW53	511044.211	213603.338	58.202
STW54	511044.211	213603.338	58.202
STW55	511044.211	213603.338	58.202
STW56	511044.211	213603.338	58.202
STW57	511044.211	213603.338	58.202
STW58	511044.211	213603.338	58.202
STW59	511044.211	213603.338	58.202
STW60	511044.211	213603.338	58.202
STW61	511044.211	213603.338	58.202
STW62	511044.211	213603.338	58.202
STW63	511044.211	213603.338	58.202
STW64	511044.211	213603.338	58.202
STW65	511044.211	213603.338	58.202
STW66	511044.211	213603.338	58.202

[illegible]

CIENT:

PROJECT / DRAWING TITLE:

DRAWING NAME

SCALE:
1:100

SIZE:	DATE:
-------	-------

AD	21/09/2023
CHECKED BY: UK	APPROVED BY: RH

DRAWING 1

70110083-WSP-TOPO-HL-01

WSP UK Ltd

DO NOT SCALE	
NOTES	
Grid: Local Grid orientated to Ordnance Survey Grid (OSTN15)	
Datum: Ordnance Survey Datum (OSGM15)	
Site Centred Local Scale Factor: 1.000000	
Site Centred about station STN12	

NOTES

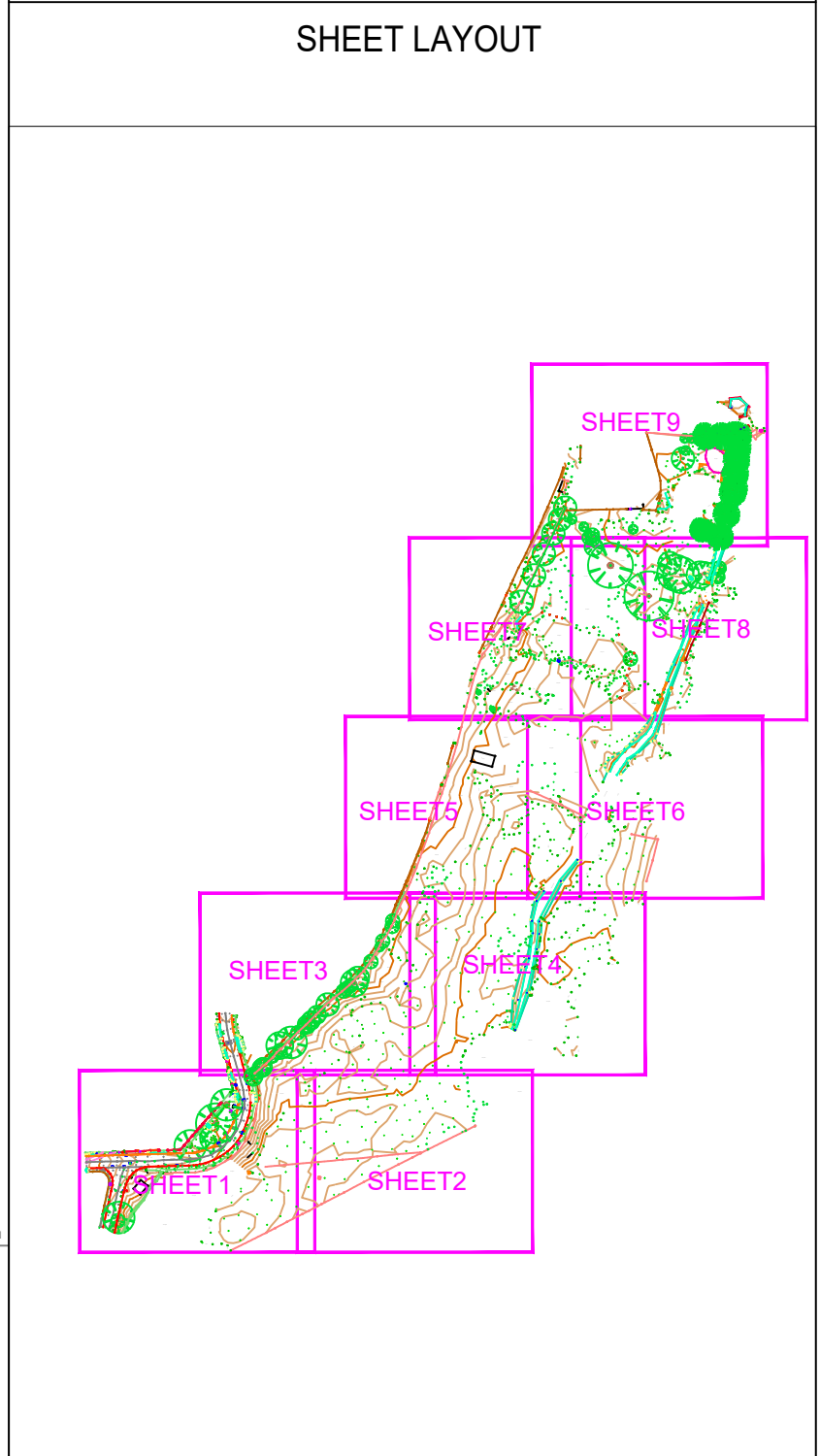
Grid: Local Grid orientated to Ordnance Survey Grid (OSTN15)
Datum: Ordnance Survey Datum (OSGM15)
Site Centred Local Scale Factor: 1.000000
Site Centred about station STN12

STATIONS

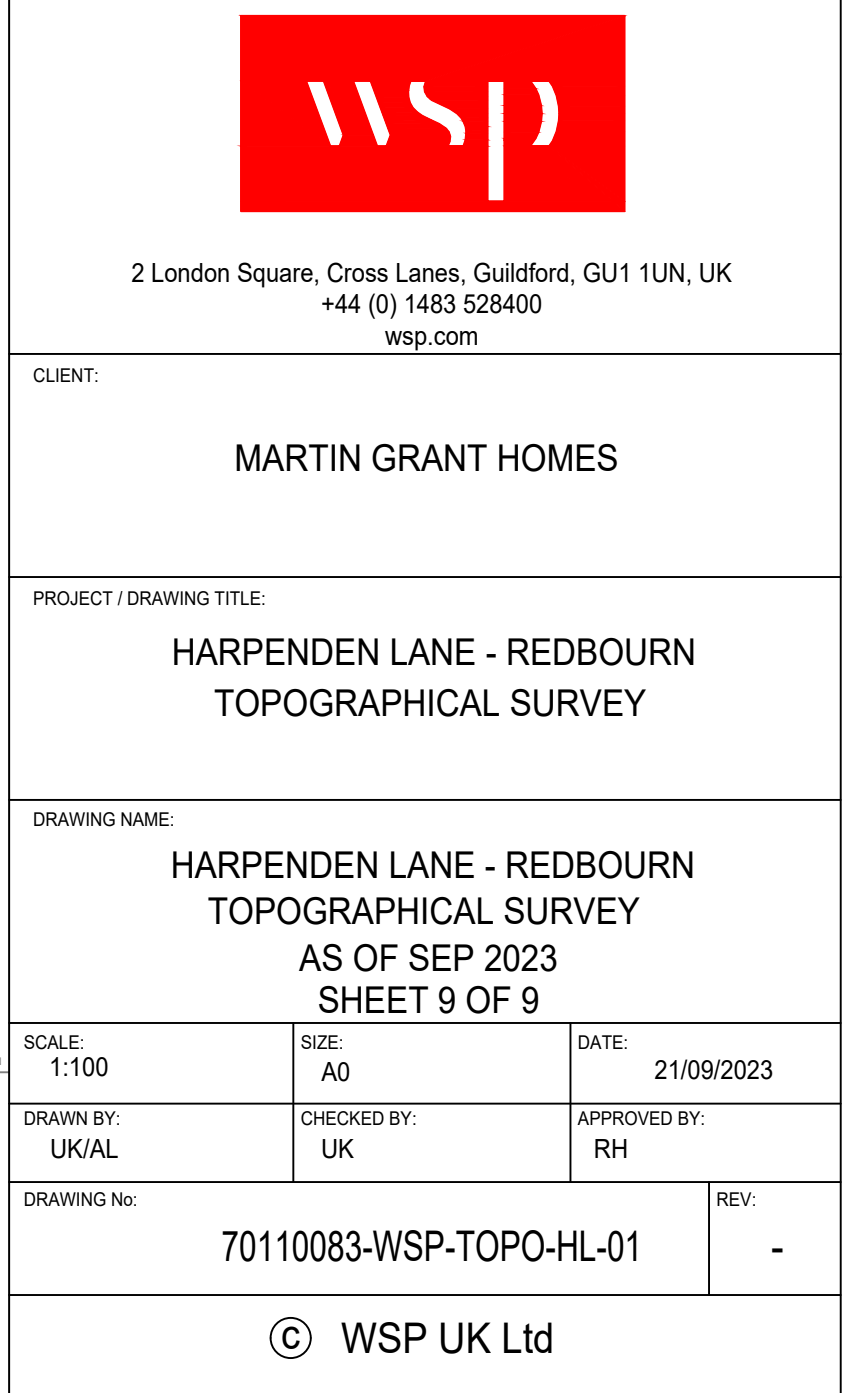
JUPITER STATIONS				
Station	Category	Location	Noting	Height
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STW2	STW	103886.148	274382.763	57.414
STW3	STW	103886.148	274382.763	57.420
STW4	STW	103886.148	274382.763	57.426
STW5	STW	103886.148	274382.763	57.432
STW6	STW	103886.148	274382.763	57.438
STW7	STW	103886.148	274382.763	57.444
STW8	STW	103886.148	274382.763	57.450
STW9	STW	103886.148	274382.763	57.456
STW10	STW	103886.148	274382.763	57.462
STW11	STW	103886.148	274382.763	57.468
STW12	STW	103886.148	274382.763	57.474
STW13	STW	103886.148	274382.763	57.480
STW14	STW	103886.148	274382.763	57.486
STW15	STW	103886.148	274382.763	57.492
STW16	STW	103886.148	274382.763	57.498
STW17	STW	103886.148	274382.763	57.504
STW18	STW	103886.148	274382.763	57.510
STW19	STW	103886.148	274382.763	57.516
STW20	STW	103886.148	274382.763	57.522

[illegible]

- [illegible]



			
2 London Square, Cross Lanes, Guildford, GU1 1UN, UK 444 (0) 1483 528400 wsp.com			
CLIENT: MARTIN GRANT HOMES			
PROJECT / DRAWING TITLE: HARPENDEN LANE - REDBOURN TOPOGRAPHICAL SURVEY			
DRAWING NAME: HARPENDEN LANE - REDBOURN TOPOGRAPHICAL SURVEY AS OF SEP 2023 SHEET 9 OF 9			
SCALE: 1:100	SIZE: A0	DATE: 21/08/2023	
DRAWN BY: UKAL	CHECKED BY: UK	APPROVED BY: RH	
DRAWING No: 70110083-WSP-TOPO-HL-01			REV: -
© WSP UK Ltd			



2 London Square, Cross Lanes, Guildford, GU1 1UN, UK +44 (0) 1483 528400 wsp.com			
CLIENT:			
MARTIN GRANT HOMES			
PROJECT (DRAWING TITLE):			
HARPENDEN LANE - REDBOURN TOPOGRAPHICAL SURVEY			
DRAWING NAME:			
HARPENDEN LANE - REDBOURN TOPOGRAPHICAL SURVEY AS OF SEP 2023 SHEET 9 OF 9			
SCALE:	SIZE:	DATE:	
1:100	A0	21/09/2023	
DRAWN BY:	CHECKED BY:	APPROVED BY:	
UKHL	UK	RH	
DRAWING No:			REV:
70110083-WSP-TOPO-HL-01			-
© WSP UK Ltd			

MARTIN GRANT HOMES			
PROJECT / DRAWING TITLE			
HARPENDEN LANE - REDBOURN TOPOGRAPHICAL SURVEY			
DRAWING NAME			
HARPENDEN LANE - REDBOURN TOPOGRAPHICAL SURVEY AS OF SEP 2023 SHEET 9 OF 9			
SCALE 1:100	SIZE A0	DATE 21/09/2023	
DRAWN BY UK/LAL	CHECKED BY UK	APPROVED BY RH	
DRAWING No:			REV:
70110083-WSP-TOPO-HL-01			-
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MARTIN GRANT HOMES			
PROJECT / DRAWING TITLE:			
HARPENDEN LANE - REDBOURN TOPOGRAPHICAL SURVEY			
DRAWING NAME:			
HARPENDEN LANE - REDBOURN TOPOGRAPHICAL SURVEY AS OF SEP 2023 SHEET 9 OF 9			
SCALE: 1:100	SIZE: A0	DATE: 21/09/2023	
DRAWN BY: UKAL	CHECKED BY: UK	APPROVED BY: RH	REV: -
DRAWING No: 70110083-WSP-TOPO-HL-01			
© WSP UK Ltd			

HARPENDEN LANE - REDBOURN TOPOGRAPHICAL SURVEY			
DRAWING NAME:			
HARPENDEN LANE - REDBOURN TOPOGRAPHICAL SURVEY AS OF SEP 2023 SHEET 9 OF 9			
SCALE: 1:100	SIZE: A0	DATE: 21/09/2023	
DRAWN BY: UKAL	CHECKED BY: UK	APPROVED BY: RH	
DRAWING No:			REV:
70110083-WSP-TOPO-HL-01			-
© WSP UK Ltd			

HARPENDEN LANE - REDBROUN TOPOGRAPHICAL SURVEY			
DRAWING NAME:			
HARPENDEN LANE - REDBROUN TOPOGRAPHICAL SURVEY AS OF SEP 2023 SHEET 9 OF 9			
SCALE 1:100	SIZE A0	DATE: 21/09/2023	
DRAWN BY: UKOL	CHECKED BY: UK	APPROVED BY: RH	
DRAWING No: 70110083-WSP-TOPO-HL-01			REV: -
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SCALE: 1:100	SIZE: A0	DATE: 21/09/2023
DRAWN BY: UK/AL	CHECKED BY: UK	APPROVED BY: RH
DRAWING No: 70110083-WSP-TOPO-HL-01		REV: -
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DRAWING No:	70110083-WSP-TOPO-HL-01	REV:	-
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70110083-WSP-TOPO-HL-01	-
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Appendix A.4

GEOLOGICAL AND HYDROGEOLOGICAL PLANS





Do not scale - Use only figured dimensions
The contractor is to check all dimensions on site and report any discrepancies to the site Supervisor
This drawing is to be read in conjunction with other standard documentation

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Note:
This plan is furnished as a general guide only and the Statutory Undertakers concerned state that no warranty as to its correctness is given or implied. It must not be relied upon in the excavations or other works made in the vicinity of each utilities service.

Key:

- Site Boundary
- Lewes Nodular Chalk Formation and Seaford Chalk Formation (Sand)

P01	14/10/2025	SEK	FIRST ISSUE	MQ	JR
REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS:	S2 - FOR INFORMATION
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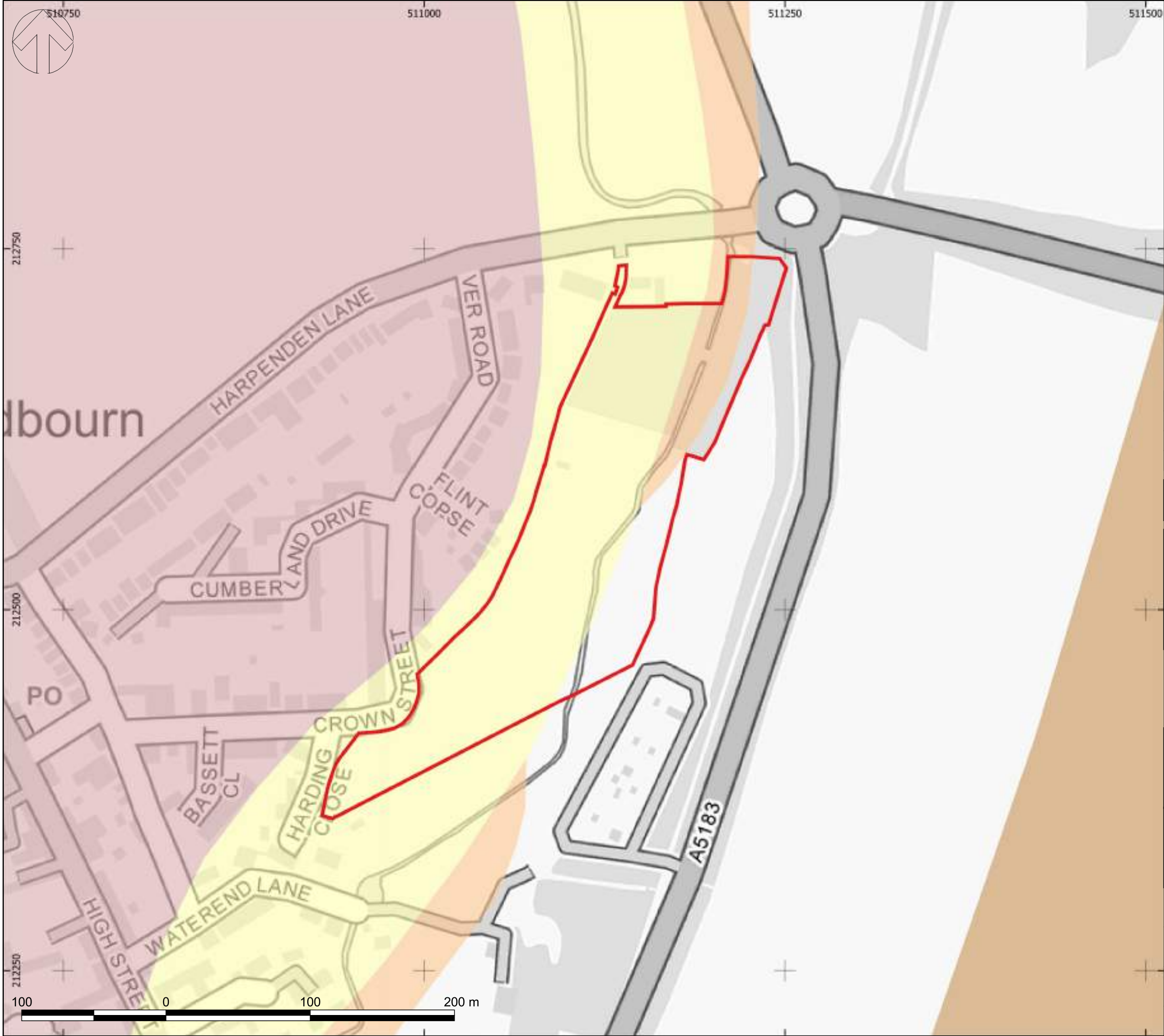
Matrix House, Basing View, Basingstoke, RG21 4FF
+44 (0)1256 318 800
wsp.com

CLIENT:	MARTIN GRANT HOMES LIMITED
---------	----------------------------

PROJECT:	LAND OFF HARPENDEN LANE, REDBOURN
----------	-----------------------------------

TITLE:	BEDROCK GEOLOGY
--------	-----------------

DRAWN: SEK	CHECKED: MQ	APPROVED: JR
PROJECT No: 70110083	SCALE @A3: 1:2,500	DATE: 14/10/2025
DRAWING No: 70110083-WSP-XX-XX-DR-EI-0004		REV: P01
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Note:

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Key:

- Site Boundary
- Alluvium (Clay, Silt, Sand and Gravel)
- Head (Clay, Silt, Sand and Gravel)
- River Terrace Deposits (Sand and Gravel)
- Clay with Flints Formation (Clay, Silt, Sand and Gravel)

P01	14/10/2025	SEK	FIRST ISSUE	MQ	JR
REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS:

S2 - FOR INFORMATION

Matrix House, Basing View, Basingstoke, RG21 4FF

+44 (0)1256 318 800

wsp.com

CLIENT:

MARTIN GRANT HOMES LIMITED

PROJECT:

LAND OFF HARPENDEN LANE, REDBOURN

TITLE:

SUPERFICIAL GEOLOGY

DRAWN:	CHECKED:	APPROVED:
SEK	MQ	JR
PROJECT No:	SCALE @A3:	DATE:
70110083	1:2,500	14/10/2025

DRAWING No:	REV:
70110083-WSP-XX-XX-DR-EI-0005	P01

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Note:
This plan is furnished as a general guide only and the Statutory Undertakers concerned state that no warranty as to its correctness is given or implied. It must not be relied upon in the excavations or other works made in the vicinity of each utilities service.

Key:

- Site Boundary
- Highly Productive Aquifer (Fractures and Other Discontinuities)
- Moderately Productive Aquifer (Fractures and Other Discontinuities)
- Low Productivity Aquifer (Fractures and Other Discontinuities)
- Rocks With Essentially No Groundwater (Fractures and Other Discontinuities)

P01	14/10/2025	SK	FIRST ISSUE	MQ	JR
REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS:
S2 - FOR INFORMATION



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+44 (0)1256 318 800
wsp.com

CLIENT:
MARTIN GRANT HOMES LIMITED

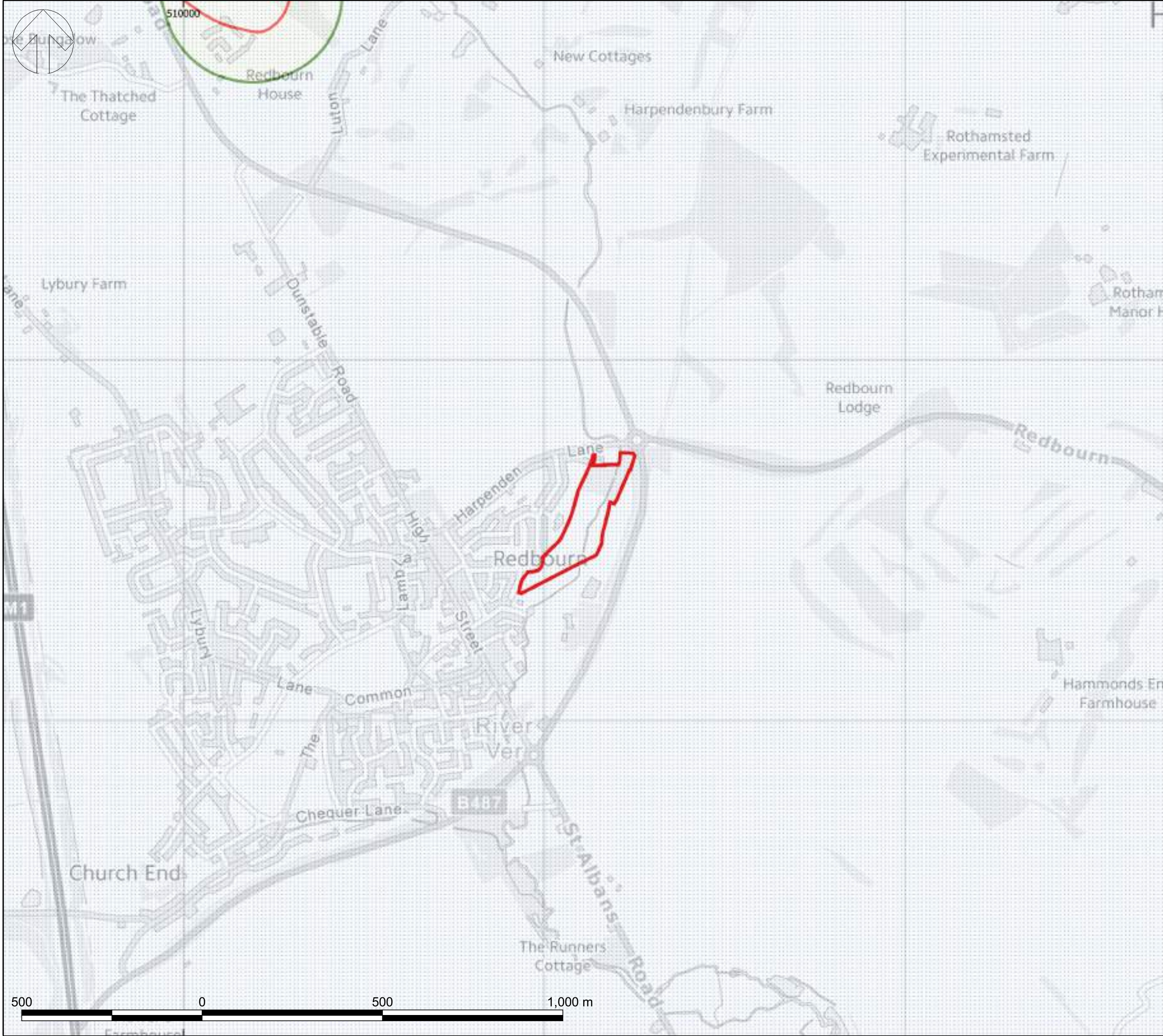
PROJECT:
LAND OFF HARPENDEN LANE, REDBOURN

TITLE:
AQUIFER CLASSIFICATION

DRAWN: SEK	CHECKED: MQ	APPROVED: JR
PROJECT No: 70110083	SCALE @A3: 1:2,500	DATE: 14/10/2025

DRAWING No: 70110083-WSP-XX-XX-DR-EI-0006	REV: P01
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The contractor is to check all dimensions on site and report any discrepancies to the site Supervisor
This drawing is to be read in conjunction with other standard documentation

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Note:
This plan is furnished as a general guide only and the Statutory Undertakers concerned state that no warranty as to its correctness is given or implied. It must not be relied upon in the excavations or other works made in the vicinity of each utilities service.

Key:

-  Site Boundary
-  Zone 1 (Inner Protection Zone)
-  Zone 2 (Outer Protection Zone)
-  Zone 3 (Total Catchment)
-  Zone of Special Interest

P01	14/10/2025	SEK	FIRST ISSUE	MQ	JR
REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS:
S2 - FOR INFORMATION



Matrix House, Basing View, Basingstoke, RG21 4FF
+44 (0)1256 318 800
wsp.com

CLIENT:
MARTIN GRANT HOMES LIMITED

PROJECT:
LAND OFF HARPENDEN LANE, REDBOURN

TITLE:
SOURCE PROTECTION ZONES

DRAWN: SEK	CHECKED: MQ	APPROVED: JR
PROJECT No: 70110083	SCALE @A3: 1:10,000	DATE: 14/10/2025

DRAWING No: 70110083-WSP-XX-XX-DR-EI-0007	REV: P01
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Appendix A.5

DRAINAGE INFRASTRUCTURE PLANS



Atkins Ltd
Stats Enquiries Team The Hub
500 Park Avenue
BRISTOL
BS32 4RZ

Search address supplied Site off Harpenden Lane, Redbourn, St Albans
AL3 7QE

Your reference 207835

Our reference ALS/ALS Standard/2023_4859112

Search date 18 July 2023

Notification of Price Changes

From 1st April 2023 Thames water Property Searches will be increasing the prices of its CON29DW, CommercialDW Drainage & Water Enquiries and Asset Location Searches. Historically costs would rise in line with RPI but as this currently sits at 14.2%, we are capping it at 10%.

Customers will be emailed with the new prices by January 1st 2023.

Any orders received with a higher payment prior to the 1st April 2023 will be non-refundable. For further details on the price increase please visit our website at www.thameswater-propertysearches.co.uk



Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW



searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk



0800 009 4540

Search address supplied: Site off Harpenden Lane, Redbourn, St Albans, AL3 7QE

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This search provides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0800 009 4540, or use the address below:

Thames Water Utilities Ltd
Property Searches
PO Box 3189
Slough
SL1 4WW

Email: searches@thameswater.co.uk
Web: www.thameswater-propertysearches.co.uk

Waste Water Services

Please provide a copy extract from the public sewer map.

The following quartiles have been printed as they fall within Thames' sewerage area:

TL1012SE
TL1012NE
TL1112SW
TL1112NW

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

Following examination of our statutory maps, Thames Water has been unable to find any plans of water mains within this area. If you require a connection to the public water supply system, please write to:

New Connections / Diversions
Thames Water
Network Services Business Centre
Brentford
Middlesex
TW8 0EE

Tel: 0845 850 2777
Fax: 0207 713 3858
Email: developer.services@thameswater.co.uk

The following quartiles have not been printed as they are out of Thames' water catchment area. For details of the assets requested please contact the water company indicated below:

TL1012SE	Affinity Water
TL1012NE	Affinity Water
TL1112SW	Affinity Water
TL1112NW	Affinity Water

Affinity Water Ltd
Tamblin Way
Hatfield
AL10 9EZ

Tel: 0345 3572401

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

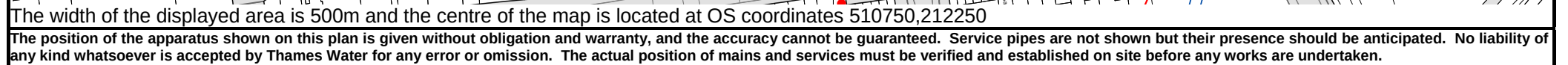
Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk



Based on the Ordnance Survey Map (2020) with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
6403	102.65	101.89
6404	102.24	101.41
6400	101.93	100.33
5401	104.1	102.47
6401	101.35	99.47
5402	105.72	104.75
5403	105.43	104.49
641D	n/a	n/a
641A	n/a	n/a
5404	105.31	n/a
641B	n/a	n/a
6501	102.12	100.27
9400	96.79	95.22
941A	n/a	n/a
941G	n/a	n/a
941F	n/a	n/a
9401	95.41	93.56
941E	n/a	n/a
941H	n/a	n/a
941D	n/a	n/a
9403	95.06	94.11
9404	94.92	93.43
9402	93.7	92.42
6402	100.7	98.89
741C	n/a	n/a
741B	n/a	n/a
741D	n/a	n/a
741E	n/a	n/a
741A	n/a	n/a
741G	n/a	n/a
7400	100.49	98.4
741F	n/a	n/a
7402	100.85	98.7
7401	99.89	97.7
8400	99.44	97.81
5400	104.69	102.99
541C	n/a	n/a
541D	n/a	n/a
5300	103.84	102.54
5301	103.57	102.36
5302	102.85	102.11
5203	101.95	101.37
5204	101.77	99.66
5201	100.67	98.6
5202	100.42	98.31
6300	101.92	99.72
6301	100.55	98.69
6313	n/a	n/a
6100	97.83	96.29
6302	n/a	n/a
6343	n/a	100.8
6345	n/a	100.74
6201	n/a	n/a
6344	n/a	100.74
6357	n/a	n/a
6314	n/a	100.34
6205	n/a	99.25
6307	n/a	99.26
6325	n/a	n/a
6324	n/a	n/a
6303	n/a	99.04
6346	n/a	100.89
6308	n/a	n/a
6315	n/a	100.56
6356	n/a	99.65
7206	97.05	96
7205	96.85	95.86
7204	96.71	96.09
7207	96.6	95.4
8204	95.78	94
8300	98.86	96.78
8200	96.37	94
8301	96.95	95.38
8302	97.12	95.59
8202	95.42	93.98
8203	94.96	93.54
8100	94.3	92.24
8201	95.36	93.43
8303	94.49	92.79
831B	n/a	n/a
931A	n/a	n/a
931B	n/a	n/a
941C	n/a	n/a
941B	n/a	n/a
9405	95.63	94.26
9300	93.63	92.03
9100	93.07	90.84
9201	93.19	90.96
9200	93.42	91.2
921A	n/a	n/a
711B	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
711C	n/a	n/a
6102	97.87	96.23
7202	97.1	96.5
7203	97.02	96.35
7201	98.13	96.77
7200	98.06	97.06
621A	n/a	n/a
721A	n/a	n/a
6204	n/a	98.89
6305	n/a	98.57
6304	n/a	99.21
7301	97.8	95.94
731I	n/a	n/a
731H	n/a	n/a
731J	n/a	n/a
731F	n/a	n/a
631A	n/a	n/a
731G	n/a	n/a
731E	n/a	n/a
731M	n/a	n/a
731B	n/a	n/a
731L	n/a	n/a
731K	n/a	n/a
6355	n/a	n/a
731D	n/a	n/a
731C	n/a	n/a
7300	99.5	97.64
731A	n/a	n/a
5200	101.54	98.97
521A	n/a	n/a
521B	n/a	n/a
6000	99.37	97.62
6101	97.47	95.15
6002	98.95	97.59
6003	98.64	97.2
6001	99	98.05
7006	96.43	94.49
711D	n/a	n/a
7001	98.02	96.42
7002	97.94	96.31
7003	97.96	96.07
711A	n/a	n/a
7004	97.13	94.91
7100	94.63	93.06
8004	95.49	93.53
8005	95.05	93.05
8006	94.89	92.94
811B	n/a	n/a
8009	94	92.7
8007	94.26	92.65
811A	n/a	n/a
8010	93.9	92.45
8011	93.32	91.92
8000	93.48	92.48
8003	92.75	90.28
8001	93.56	92.32
8002	93.48	n/a
9000	92.81	90.43
911A	n/a	n/a
7005	97.15	95.66
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.		



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 510750,212750

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map (2020) with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
5800	111.83	110.32
571A	n/a	n/a
5600	110.68	108.57
5700	110.54	108.66
5602	108.53	106.97
9700	100.12	97.55
971A	n/a	n/a
8512	100.85	100.22
8510	100.8	100.24
851D	n/a	n/a
851C	n/a	n/a
851A	n/a	n/a
851B	n/a	n/a
8601	100.61	98.12
9502	99.79	96.58
961C	n/a	n/a
961B	n/a	n/a
961A	n/a	n/a
9503	99.12	95.93
9504	98.53	95.76
5601	109.65	108.07
561A	n/a	n/a
5501	n/a	n/a
651C	n/a	n/a
651A	n/a	n/a
651B	n/a	n/a
551C	n/a	n/a
651F	n/a	n/a
651E	n/a	n/a
6502	104.25	103.28
6503	103.79	102.9
6500	103.64	101.33
5500	106.98	106.13
651D	n/a	n/a
551A	n/a	n/a
551B	n/a	n/a
561B	n/a	n/a
661A	n/a	n/a
6601	106.43	104.52
8513	100.68	98.43
9500	98.68	97.04
9501	99.04	96.94
751B	n/a	n/a
7500	101.46	99.41
751A	n/a	n/a
7501	101.13	99.32
751C	n/a	n/a
8501	100.51	99.15
8505	100.8	99.94
8502	100.6	99.25
8506	100.63	99.73
8600	101.09	98.79
8507	100.85	100.16
8508	100.85	100.04
8503	100.68	99.33
8511	100.85	100.32
8509	100.7	100.01
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.		



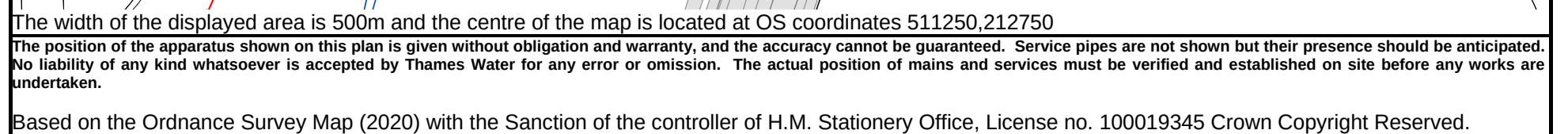
The width of the displayed area is 500m and the centre of the map is located at OS coordinates 511250,212250

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

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NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
0400	94.06	91.7
0500	94.71	92.1
0300	93.8	91.52
021A	n/a	n/a
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.		



NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
0700	98.23	96.16
061A	n/a	n/a
0600	97	94.52
1500	94.62	92.47
1600	94.72	92.68
161A	n/a	n/a
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.		



Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

	Foul Sewer: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.
	Surface Water Sewer: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.
	Combined Sewer: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.
	Storm Sewer
	Sludge Sewer
	Foul Trunk Sewer
	Surface Trunk Sewer
	Combined Trunk Sewer
	Foul Rising Main
	Surface Water Rising Main
	Combined Rising Main
	Vacuum
	Thames Water Proposed
	Vent Pipe
	Gallery

Other Sewer Types (Not operated and maintained by Thames Water)

	Sewer
	Culverted Watercourse
	Proposed
	Decommissioned Sewer
	Content of this drainage network is currently unknown
	Ownership of this drainage network is currently unknown

Notes:

- 1) All levels associated with the plans are to Ordnance Datum Newlyn.
- 2) All measurements on the plan are metric.
- 3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the direction of flow.
- 4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

	Air Valve		Meter
	Dam Chase		Vent
	Fitting		

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

	Ancillary		Drop Pipe
	Control Valve		Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol. Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

	Inlet		Outfall
	Undefined End		

Other Symbols

Symbols used on maps which do not fall under other general categories.

	Change of Characteristic Indicator		Public / Private Pumping Station
	Invert Level		Summit

Areas

Lines denoting areas of underground surveys, etc.

	Agreement
	Chamber
	Operational Site

Ducts or Crossings

	Casement	Ducts may contain high voltage cables. Please check with Thames Water.
	Conduit Bridge	
	Subway	
	Tunnel	

5) 'na' or '0' on a manhole indicates that data is unavailable.

6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology, please contact Property Searches on 0800 009 4540.

Payment Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment within 14 days of the date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service or will be held to be invalid.
4. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
5. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
6. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800.

If you are unhappy with our service, you can speak to your original goods or customer service provider. If you are still not satisfied with the outcome provided, we will refer the matter to a Senior Manager for resolution who will provide you with a response.

If you are still dissatisfied with our final response, and in certain circumstances such as you are buying a residential property or commercial property within certain parameters, The Property Ombudsman will investigate your case and give an independent view. The Ombudsman can award compensation of up to £25,000 to you if he finds that you have suffered actual financial loss and/or aggravation, distress, or inconvenience because of your search not keeping to the Code. Further information can be obtained by visiting www.tpos.co.uk or by sending an email to admin@tpos.co.uk.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0300 034 2222 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	BACS Payment	Telephone Banking
Please Call 0800 009 4540 quoting your invoice number starting CBA or ADS	Account number 90478703 Sort code 60-00-01 A remittance advice must be sent to: Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW. or email ps.billing@thameswater.co.uk	By calling your bank and quoting: Account number 90478703 Sort code 60-00-01 and your invoice number

Thames Water Utilities Ltd Registered in England & Wales No. 2366661 Registered Office Clearwater Court, Vastern Rd, Reading, Berks, RG1 8DB.

Appendix B

PROPOSED DEVELOPMENT PLANS



Appendix B.1

PARAMETER PLAN





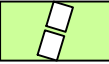
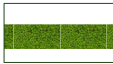
- | | | | | | |
|---|---|---|-------------------------------------|---|---|
|  | Site Boundary (3.80ha) |  | Proposed Attenuation - 0.24ha |  | Nickey Line PROW (Shared Foot/Cycle Path) |
|  | Net Developable Area
(0.96ha - up to 35 dwellings) |  | Proposed Surface Water Storage Area |  | Existing PROW |
|  | Amenity Greenspace - 0.30ha
(including play, informal sport and verge/incidental greens) |  | Vehicular Access |  | Alternative PROW Route |
|  | Suitable Alternative Natural Greenspace - 2.37ha |  | Pedestrian Access |  | Indicative Location for Play |

Appendix B.2

ILLUSTRATIVE MASTERPLAN





	Site Boundary (3.80ha)		Nickey Line PROW (Shared Foot/Cycle Path)		Proposed Surface Water Storage Area		Pedestrian Access (TBC)
	Indicative Residential Layout (0.96ha - 35 dwellings)		Existing PROW		Proposed trees and Woodland		Indicative Location for Play
	Primary Street/Pavement and Shared Surface		Indicative Mown Grass Path		Existing Trees and Woodland to be Retained		Potential Location for Electric Substation
	Footpaths		Proposed Attenuation		Vehicular Access		Proposed Footbridge to Replace Culvert

Appendix C

STAKEHOLDER CONSULTATION



Appendix C.1

ENVIRONMENT AGENCY



[REDACTED]

From: NET Enquiries <HNL enquiries@environment-agency.gov.uk>
Sent: 10 August 2023 16:39
To: [REDACTED]
Subject: HNL320972 RS - Request for Information: Flood Risk Assessment for development in Redbourn, St Albans
Attachments: HNL Guidance on using Product 6 data in a Flood Risk Assessment v5.pdf; Pollution Incidents.xlsx

Dear [REDACTED]

Your reference: WAT-FRA-RFI-003

Enquiry regarding Product 4,5,6 & 8 for a proposed development site at Redbourn, Hertfordshire, nearest postcode AL3 7PD.

Thank you for your enquiry which was received on 20 July 2023.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

In regards to your request for a Product 8 for the above site, these are only supplied in cases where tidal flooding may occur. Our records show that this does not apply in this case.

In regards to any proposed future updates to current modelling information affecting this area that you should be aware of - we do not have any information to provide regarding any updates to the modelling in the future.

Please note that we have recently changed our process for responding to modelled data requests, please read the information within this letter for further details.

Your request for a Product 4 falls under the exemption in provision 6.(1)(a) and (b) of the Environmental Information Regulations 2004 (EIR) which states that '...6.(1) Where an applicant requests that the information be made available in a particular form or format, a public authority shall make it so available, unless—
(a) it is reasonable for it to make the information available in another form or format; or
(b) the information is already publicly available and easily accessible to the applicant in another form or format...'

On this occasion we are not providing the information in the Product 4 format for the following reasons:

- Complying with the preference would incur a significant cost, which the public authority [The Environment Agency] cannot pass on to the requester;
- Providing shapefiles used to create a Product 4 allows us to make the information available at a lower cost; and
- The impact on the available resources of the public authority [The Environment Agency], of supplying shapefiles used to create a Product 4, is therefore much less.
-

We are licensing the supplied data to you under the [Environment Agency Conditional Licence](#). You must first check this supporting information, to determine if the conditions of use are suitable

for your purposes. If the conditions for use are not suitable for your purposes, this information is not provided with a licence for use, and the data is provided for the right to read only.

Product 4 data is derived from the shapefiles supplied below and the following open data sources:

Flood Zone 3 <https://data.gov.uk/dataset/flood-map-for-planning-rivers-and-sea-flood-zone-3>

Flood Zone 2 <https://data.gov.uk/dataset/flood-map-for-planning-rivers-and-sea-flood-zone-2>

Historic Flood Map <https://data.gov.uk/dataset/historic-flood-map1>

Please note, that the Flood Map for Planning is available to view and export maps for your site at: <https://flood-map-for-planning.service.gov.uk/>

Please note that our historic flood event maps may not be comprehensive. We would therefore advise that you make further enquiries locally with specific reference to flooding at your location.

You should consider contacting the relevant Local Planning Authority and/or water/sewerage undertaker for the area.

Please be aware that flooding can come from different sources. Examples of these are:

- from rivers or the sea.
- surface water (i.e. rainwater flowing over or accumulating on the ground before it is able to enter rivers or the drainage system). Please contact the Lead Local Flood Authority, Hertfordshire County Council.
- overflowing or backing up of sewer or drainage systems which have been overwhelmed. Please contact the local Water Company.
- groundwater rising up from underground aquifers.

Currently the Environment Agency can only supply flood risk data relating to the chance of flooding from rivers or the sea.

Please find attached guidance on how to use this data.

The following information is not available under the Open Government Licence but we may be able to license it to you under the Environment Agency Conditional Licence:

P5,6	https://ea.sharefile.com/d-s8bbf4bec9a041ae9
-------------	---

Name	Products 5, 6
Description	Model Name: Ver (JBA, 2019)
Licence	Environment Agency Conditional Licence
Conditions	1.0 You may use the Information for your internal or personal purposes and may only sublicense others to use it if you do so under a written licence which includes the terms of these conditions and the agreement and in particular may not allow any period of use longer than the period licensed to you. 2.0 Notwithstanding the fact that the standard wording of the Environment Agency Conditional Licence indicates that it is perpetual, this Licence has a limited duration of 5 years at the end of which it will terminate automatically without notice.

	3.0 We have restricted use of the Information as a result of legal restrictions placed upon us to protect the rights or confidentiality of others. In this instance it is because of third party data. If you contact us in writing (this includes email) we will, as far as confidentiality rules allow, provide you with details including, if available, how you might seek permission from a third party to extend your use rights. 4.1 The Information may contain some data that we believe is within the definition of “personal data” under the Data Protection Act 1998 but we consider that we will not be in breach of the Act if we disclose it to you with conditions set out in this condition and the conditions above. This personal data comprises names of individuals or commentary relating to property that may be owned by an individual or commentary relating to the activities of an individual. 4.2 Under the Act a person who holds and uses or passes to others personal data is responsible for any compliance with the Act and so we have no option but to warn you that this means you have responsibility to check that you are compliant with the Act in respect of this personal data. 5.0 The location of public water supply abstraction sources must not be published to a resolution more detailed than 1km². Information about the operation of flood assets should not be published. 6.1 Where we have supplied model data which may include model inputs or outputs you agree to supply to the Environment Agency copies of any assessments/studies and related outputs, modifications or derivatives created pursuant to the supply to you of the Information, all of which are hereinafter referred to as “the Data”. 6.2 You agree, in the public interest to grant to the Environment Agency a perpetual royalty free non-exclusive licence to use the Data or any part thereof for its internal purposes or to use it in any way as part of Environment Agency derivative products which it supplies free of charge to others such as incorporation into the Environment Agency's Open Data mapping products.
Information Warnings	Please be aware that model data is not raw, factual or measured but comprises of estimations or modelled results based on the data available to us. This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites within the catchment. Modelled outlines take into account catchment wide defences.

Attribution	Contains Environment Agency information © Environment Agency and/or database rights. May contain Ordnance Survey data © Crown copyright 2017 Ordnance Survey 100024198.
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1. Information on contamination to ground and/or groundwater including any landfills (operational or closed).

There are no landfill sites on your site.

Please find attached a spreadsheet of pollution incidents within the defined area.

The following special conditions relate to the pollution incident data provided.

Conditions:

1. Notwithstanding the fact that the standard wording of the Environment Agency Conditional Licence indicates that it is perpetual, this Licence has a limited duration of one year at the end of which it will terminate automatically without notice.

2.1. The Information contains some data that we believe is within the definition of “personal data” under the Data Protection Act 1998 but we consider that we will not be in breach of the Act if we disclose it to you with conditions set out in this condition and the condition above. This personal data comprises information relating to individuals, or to sites operated by an individual or partnership of individuals.

2.2 Under the Act a person who holds and uses or passes to others personal data is responsible for any compliance with the Act and so we have no option but to warn you that this means you have responsibility to check that you are compliant with the Act in respect of this personal data.

INFORMATION WARNING:

Where these data indicate an incident occurred on a particular site or property no inference should be drawn that the site or property owner necessarily was responsible. Grid references may be derived from third party information and at different map scales and may have tolerances in accuracy and precision. Where there are multiple pollutants an incident will have a row in the data for each.

However, you MUST first check the supporting information and the above link to determine if the conditions on use are suitable for your purposes. If they aren't, this information is not provided with a licence for use, and the data is provided for read right only.

Here is the link to the climate change allowances:

<https://www.gov.uk/government/publications/peak-river-flow-climate-change-allowances-by-management-catchment>

Further details about the Environment Agency information supplied can be found on the GOV.UK website:

<https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather>

If you have requested this information to help inform a development proposal, then you should note the information on GOV.UK on the use of Environment Agency Information for Flood Risk Assessments:

<https://www.gov.uk/planning-applications-assessing-flood-risk>
<https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion>

Data Available Online

Many of our flood datasets are available online:

- **You can view and download flood risk maps from our website at:**
<http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=floodmap#x=357683&y=355134&scale=2>
- **Flood Map For Planning** ([Flood Zone 2](#), [Flood Zone 3](#), [Flood Storage Areas](#), [Flood Defences](#))
- [Risk of Flooding from Rivers and Sea](#)
- [Historic Flood Map](#)
- [Assets and Defences](#)
- [Current Flood Warnings](#)
- [Open data](#)

The following information is provided subject to the [Open Government Licence](#), which you should read :

2. Information on groundwater flood risk including any historical records.

Following the Flood and Water Management Act 2010, Lead Local Flood Authorities are responsible for the management of groundwater and surface water flooding. They also maintain a register of property flooding incidents. You may want to seek further advice from the Lead Local Flood Authority – Hertfordshire County Council who may have further information.

Please use the following link for details of reports for known problems regarding groundwater flooding issues: <https://www.gov.uk/government/collections/groundwater-current-status-and-flood-risk> If there is not one for your site then we have no reports of any problems there in our records.

3. Any other pertinent information at this locality in relation to flood risk and flood risk management, such as any relevant permits for private discharge to the River Ver.

Discharge consent details are available on our public register.

<https://environment.data.gov.uk/public-register/view/search-water-discharge-consents>

Discharge volume data - <https://environment.data.gov.uk/dataset/5fe5ab2e-d465-11e4-8a42-f0def148f590>

4. Water quality or hydrochemistry data for both surface water and ground water.

Our water quality data is available online via open data website - <https://data.gov.uk/dataset/a0e6f23e-d631-4584-9ea2-7053620e4af2/water-quality-archive>

Additionally, you can view the catchment data explorer for Water Framework Directive status and details of the area - <https://environment.data.gov.uk/catchment-planning/>

5. Available hydrometric data (including surface water flows/levels & ground water level monitoring data).

Hydrometry data is available online as open data – [Hydrology Data Explorer](#)

Monitoring points can be found here: <https://data.gov.uk/dataset/0bac3947-c632-47eb-83d5-fff7f1911537/hydrometric-monitoring-points>

6. Available geological logs and/or hydrogeological information.

Details of aquifers are online –

<https://data.gov.uk/search?q=aquifer&filters%5Bpublisher%5D=Environment+Agency&filters%5Btopic%5D=&filters%5Bformat%5D=&sort=best>

For details of the geological stratigraphy of the site, please visit the British Geological Survey's website at: <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>
<http://www.bgs.ac.uk/data/boreholescans/home.html>

7. Highlight any potentially relevant water environment concerns or recommendations.

Additionally, you can view the catchment data explorer for Water Framework Directive status and details of the area: <https://environment.data.gov.uk/catchment-planning/>

Please get in touch if you have any further queries or contact us within two months if you'd like us to review the information we have sent.

Kind Regards,

[Redacted Signature]

Environment Agency, Hertfordshire and North London
Alchemy, Bessemer Road, Welwyn Garden City, Hertfordshire, AL7 1HE

Information in this message may be confidential and may be legally privileged. If you have received this message by mistake, please notify the sender immediately, delete it and do not copy it to anyone else. We have checked this email and its attachments for viruses. But you should still check any attachment before opening it. We may have to make this message and any reply to it public if asked to under the Freedom of Information Act, Data Protection Act or for litigation. Email messages and attachments sent to or from any Environment Agency address may also be accessed by someone other than the sender or recipient, for business purposes.



Environment Agency
Hertfordshire and North London Area Team

Your ref:
Our ref: WAT-FRA-RFI-003
19 July 2023
CONFIDENTIAL

Dear Sir/Madam,

Subject: Redbourn, St Albans – Request for Information

WSP are currently developing a Flood Risk Assessment on behalf of Martin Grant Homes for a proposed development site at Redbourn, Hertfordshire. The Ordnance Survey grid reference for the site is **TL 11138 12746** and the nearest postcode is **AL3 7PD**. Please see site layout plan and red line boundary enclosed.

We have enclosed with this letter a Site Layout and Red Line Boundary plan. We would therefore be most grateful if the Environment Agency could advise and supply us with the following information:

- 1 Product 4: Detailed Flood Risk Assessment Map, including flood zones, defences and storage areas, areas benefiting from defences, statutory main river designations, historic flood event outlines and more detailed information from our computer river models (including model extent, information on one or more specific points, flood levels, flood flows);
- 2 Product 6: Model Output Data, including product 5;
- 3 Product 8: Flood Defence Breach Hazard Map including, maximum flood depth, maximum flood velocity, maximum flood hazard.

Alongside this Product 4, 5, 6 and 8 data request, please can you also provide:

- 4 Summary of mechanism of flooding within the catchment;
- 5 Information regarding flood defence crest levels, formation, standard of protection and current condition (in PDF and GIS format if available);
- 6 Any local flood risk policy relevant to this reach of the River Ver
- 7 Any proposed future updates to current modelling information we should be aware of affecting this area.

We would be grateful if the following information can also be provided if available:

- 8 Information on groundwater flood risk including any historical records;
- 9 Any other pertinent information at this locality in relation to flood risk and flood risk management, such as any relevant permits for private discharge to the River Ver;
- 10 Water quality or hydrochemistry data for both surface water and ground water;
- 11 Available hydrometric data (including surface water flows/levels & ground water level monitoring data);
- 12 Available geological logs and/or hydrogeological information;

Grosvenor House
2 Grosvenor Square
Southampton, Hampshire
SO15 2BE
Tel: +44 238 030 2529
Fax: +44 238 030 2001
wsp.com



- 13 Information on contamination to ground and/or groundwater including any landfills (operational or closed); and
- 14 Highlight any potentially relevant water environment concerns or recommendations.

We look forward to hearing from you. In the meantime, should you have any queries or wish to discuss anything further, please don't hesitate to contact us.

Yours Sincerely



Encl. Site Location Plan/Layout(1); Red Line Boundary

Appendix C.2

LEAD LOCAL FLOOD AUTHORITY



From: [REDACTED]@hertfordshire.gov.uk> on behalf of FRMConsultations
<FRMConsultations@hertfordshire.gov.uk>
Sent: 20 July 2023 14:52
To: [REDACTED]
Cc: [REDACTED] FRMConsultations
Subject: RE: Request for Information: Flood Risk Assessment for development in Redbourn, St Albans

Dear [REDACTED]

Thank you for your email. Please find responses below.

- 1 Do you have any specific information on flooding relevant to the site including relevant sources; **No specific information is held however the site contains large areas of high surface water flood risk, and is partially within flood zones 2 and 3. We would highly recommend the sequential test is considered by the applicant and also the LPA. Development should seek to avoid areas at flood risk but if this is not possible detailed information including pre- and post-development modelling should be submitted to demonstrate the flood risk on site can be managed.**
- 2 Are there any Critical Drainage Area's or specific drainage issues relevant to the site; **HCC do not operate CDAs but do have surface water risk hotspots. This site is not within an identified flood risk hotspot.**
- 3 Do you have historical flood records for this location? **No – the nearest flood records are on High Street around the junction with Fish Street.**

Please note that if this is submitted for planning and we are consulted, WSP will be reviewing the planning application on our behalf. Conflict of interest measures are in place for when WSP are both designing and reviewing drainage strategies.

Best wishes,



[REDACTED] | Flood Risk Management
Growth and Environment
Hertfordshire County Council

County Hall, Pegs Lane, Hertford, SG13 8DN Postal Point: CHN101

E: FRMConsultations@hertfordshire.gov.uk

Working hours: 08:00 – 16:00 Monday - Friday



[Our vision](#) is to create a cleaner, greener and healthier Hertfordshire, guided by our RISE values

We improve
Residents' lives

We work with
Integrity

We act
Sustainably

We champion
Equality & fairness

From: [REDACTED]@wsp.com>
Sent: 20 July 2023 12:00
To: FRMConsultations <FRMConsultations@hertfordshire.gov.uk>



Hertfordshire County Council

Your ref:

Our ref: WAT-FRA-RFI-002

19 July 2023

CONFIDENTIAL

Dear Sir/Madam,

Subject: Redbourn, St Albans – Request for Information

WSP are currently developing a Flood Risk Assessment on behalf of Martin Grant Homes for a proposed development site at Redbourn, Hertfordshire. The Ordnance Survey grid reference for the site is **TL 11138 12746** and the nearest postcode is **AL3 7PD**. Please see site layout plan and red line boundary enclosed.

We have enclosed with this letter a Site Layout and Red Line Boundary plan. We would therefore be most grateful if Hertfordshire County Council as the Lead Local Flood Authority could advise and supply us with the following:

- 1** Do you have any specific information on flooding relevant to the site including relevant sources;
- 2** Are there any Critical Drainage Area's or specific drainage issues relevant to the site;
- 3** Do you have historical flood records for this location?

Please note that we have also consulted the Environment Agency and Thames Water.

We look forward to hearing from you. In the meantime, should you have any queries or wish to discuss anything further, please don't hesitate to contact us.

Yours Sincerely

Encl. Site Location Plan/Layout(1); Red Line Boundary

Appendix D

FLOOD RISK MAPPING



Appendix D.1

ENVIRONMENT AGENCY FLOOD MAP
FOR PLANNING





Do not scale - Use only figured dimensions
The contractor is to check all dimensions on site and report any discrepancies to the site Supervisor
This drawing is to be read in conjunction with other standard documentation

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Note:
This plan is furnished as a general guide only and the Statutory Undertakers concerned state that no warranty as to its correctness is given or implied. It must not be relied upon in the excavations or other works made in the vicinity of each utilities service.

Key:

- Site Boundary
- Main River
- Flood Zone 1
- Flood Zone 2
- Flood Zone 3

P01	14/10/2025	SEK	FIRST ISSUE	MQ	JR
REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS:
S2 - FOR INFORMATION



Matrix House, Basing View, Basingstoke, RG21 4FF
+44 (0)1256 318 800
wsp.com

CLIENT:
MARTIN GRANT HOMES LIMITED

PROJECT:
LAND OFF HARPENDEN LANE, REDBOURN

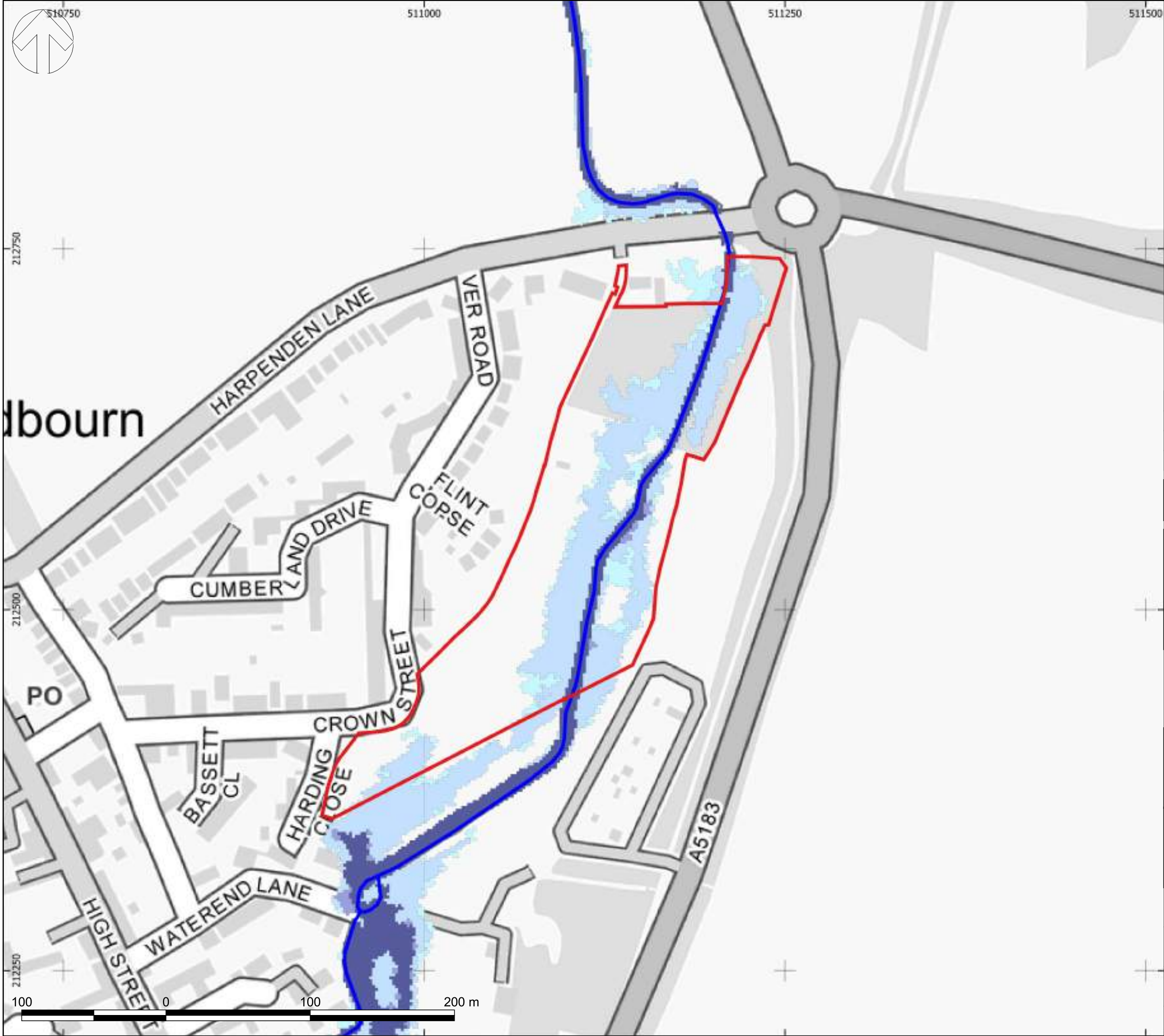
TITLE:
FLOOD MAP FOR PLANNING

DRAWN: SEK	CHECKED: MQ	APPROVED: JR
PROJECT No: 70110083	SCALE @A3: 1:2,500	DATE: 14/10/2025
DRAWING No: 70110083-WSP-XX-XX-DR-EI-0010		
REV: P01		
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Appendix D.2

ENVIRONMENT AGENCY RISK OF
FLOODING FROM RIVERS AND SEA





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Note:
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Key:

- Site Boundary
- Main River
- Very Low Risk (<0.1% Annual Probability)
- Low Risk (0.1%-1% Annual Probability)
- Medium Risk (1%-3.3% Annual Probability)
- High Risk (>3.3% Annual Probability)
- Unavailable

P01	14/10/2025	SEK	FIRST ISSUE	MQ	JR
REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS:
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+44 (0)1256 318 800
wsp.com

CLIENT:
MARTIN GRANT HOMES LIMITED

PROJECT:
LAND OFF HARPENDEN LANE, REDBOURN

TITLE:
RISK OF FLOODING FROM RIVERS AND SEA

DRAWN: SEK	CHECKED: MQ	APPROVED: JR
PROJECT No: 70110083	SCALE @A3: 1:2,500	DATE: 14/10/2025
DRAWING No: 70110083-WSP-XX-XX-DR-EI-0011		
REV: P01		
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Appendix D.3

HYDRAULIC MODELLING STUDY
PEAK FLUVIAL FLOOD EXTENTS





Do not scale - Use only figured dimensions
The contractor is to check all dimensions on site and report any discrepancies to the site Supervisor
This drawing is to be read in conjunction with other standard documentation

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Note:
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Key:

- Site Boundary
- Main River
- 0.1% Annual Probability Event
- 1% Annual Probability plus Climate Change Event
- 1% Annual Probability Event

P01	14/10/2025	SEK	FIRST ISSUE	MQ	JR
REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS:
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CLIENT:
MARTIN GRANT HOMES LIMITED

PROJECT:
LAND OFF HARPENDEN LANE, REDBOURN

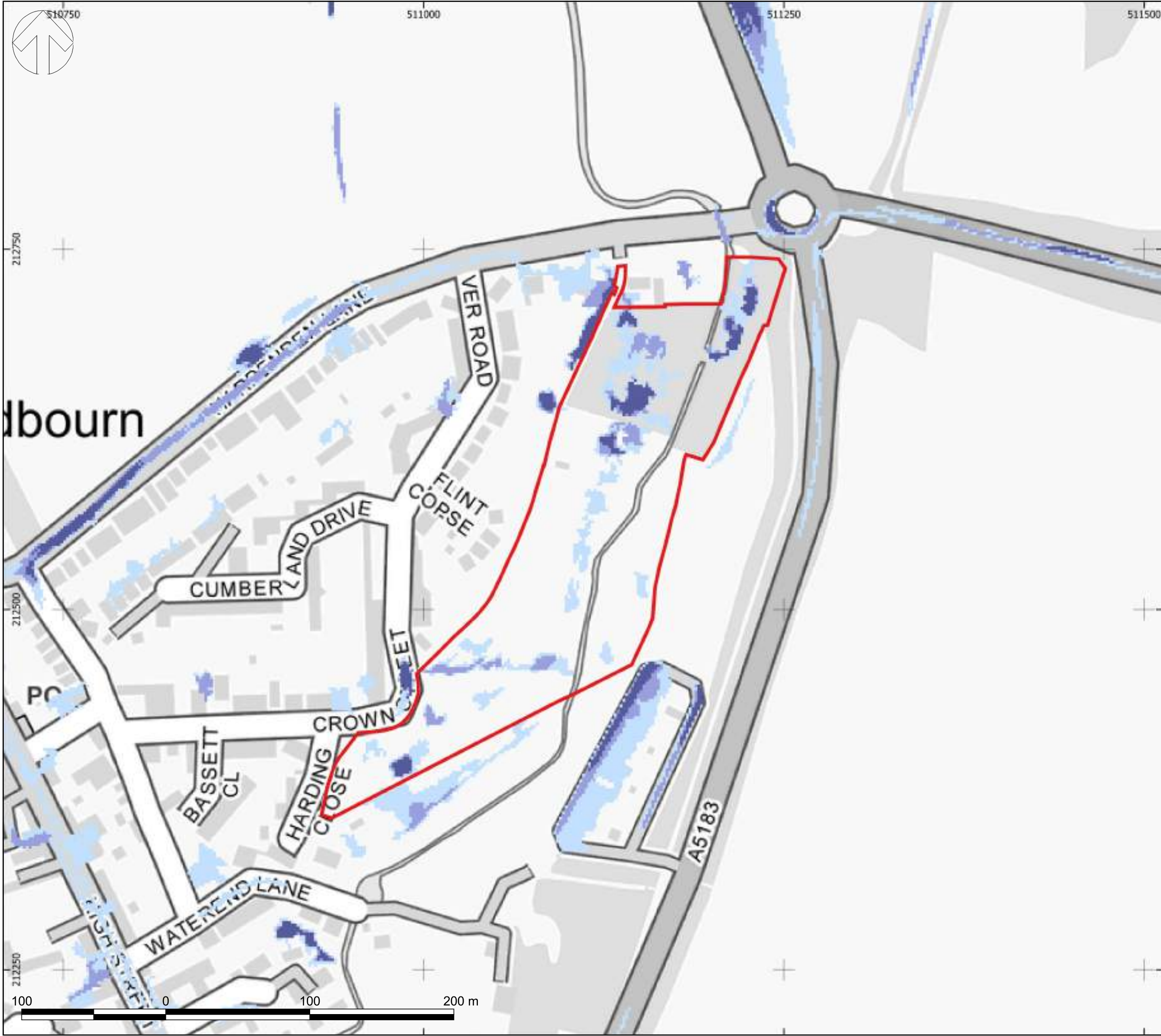
TITLE:
PEAK FLUVIAL FLOOD EXTENTS

DRAWN: SEK	CHECKED: MQ	APPROVED: JR
PROJECT No: 70110083	SCALE @A3: 1:2,500	DATE: 16/10/2025
DRAWING No: 70110083-WSP-XX-XX-DR-EI-0020		
REV: P01		
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Appendix D.4

ENVIRONMENT AGENCY RISK OF
FLOODING FROM SURFACE WATER





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Note:
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Key:

- Site Boundary
- Very Low Risk
(<0.1% Annual Probability)
- Low Risk
(0.1%-1% Annual Probability)
- Medium Risk
(1%-3.3% Annual Probability)
- High Risk
(>3.3% Annual Probability)
- Unavailable

P01	14/10/2025	SEK	FIRST ISSUE	MQ	JR
REV	DATE	BY	DESCRIPTION	CHK	APP

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wsp.com

CLIENT:
MARTIN GRANT HOMES LIMITED

PROJECT:
LAND OFF HARPENDEN LANE, REDBOURN

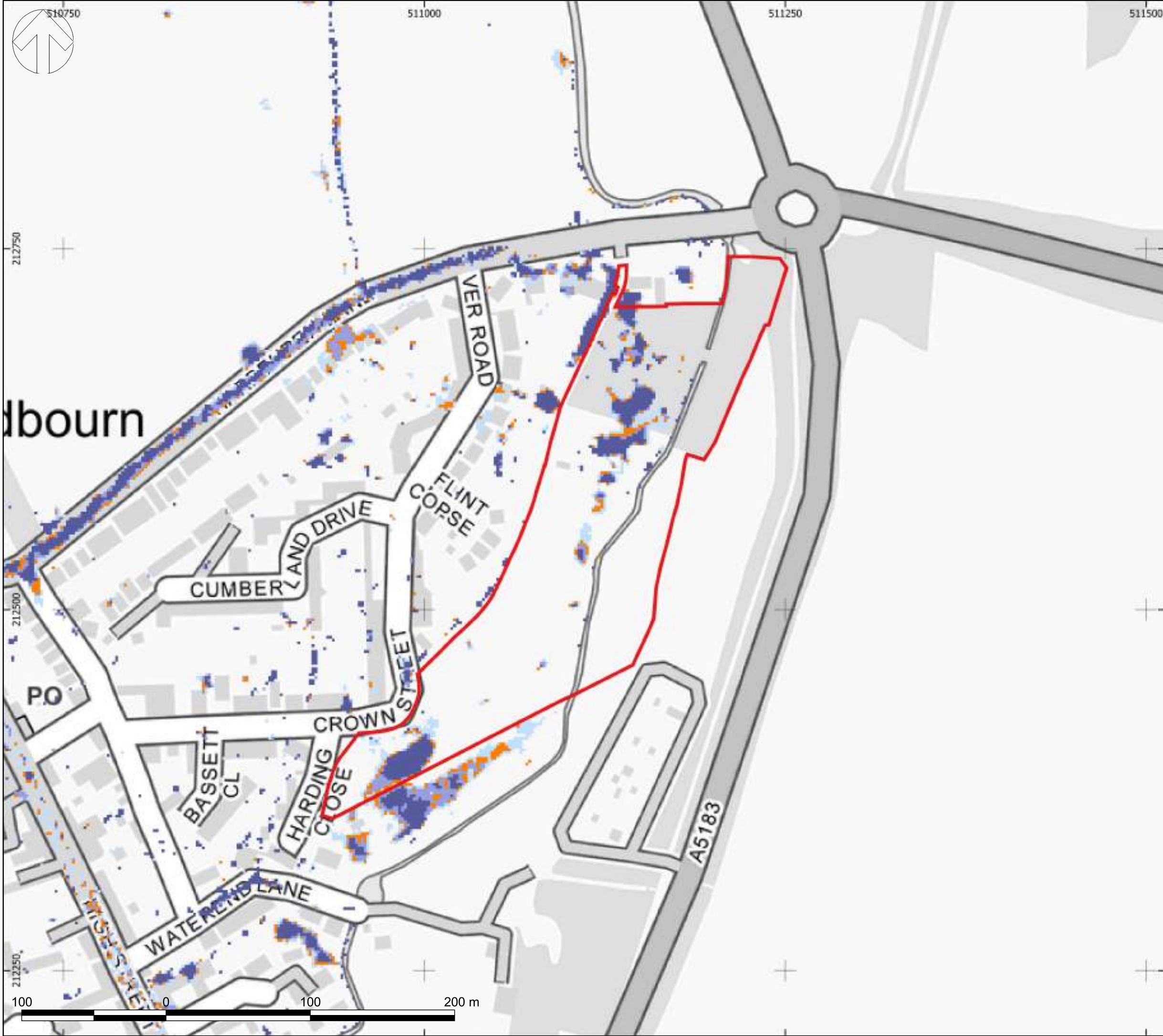
TITLE:
RISK OF FLOODING FROM SURFACE WATER

DRAWN: SEK	CHECKED: MQ	APPROVED: JR
PROJECT No: 70110083	SCALE @A3: 1:2,500	DATE: 14/10/2025
DRAWING No: 70110083-WSP-XX-XX-DR-EI-0012		
REV: P01		
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Appendix D.5

HYDRAULIC MODELLING STUDY
PEAK SURFACE WATER FLOOD
EXTENTS





Do not scale - Use only figured dimensions
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This drawing is to be read in conjunction with other standard documentation

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Note:
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Key:

- Site Boundary
- 0.1% Annual Probability Event
- 1% Annual Probability plus Climate Change Event
- 1% Annual Probability Event
- 3.3% Annual Probability Event

P01	14/10/2025	SEK	FIRST ISSUE	MQ	JR
REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS:
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CLIENT:
MARTIN GRANT HOMES LIMITED

PROJECT:
LAND OFF HARPENDEN LANE, REDBOURN

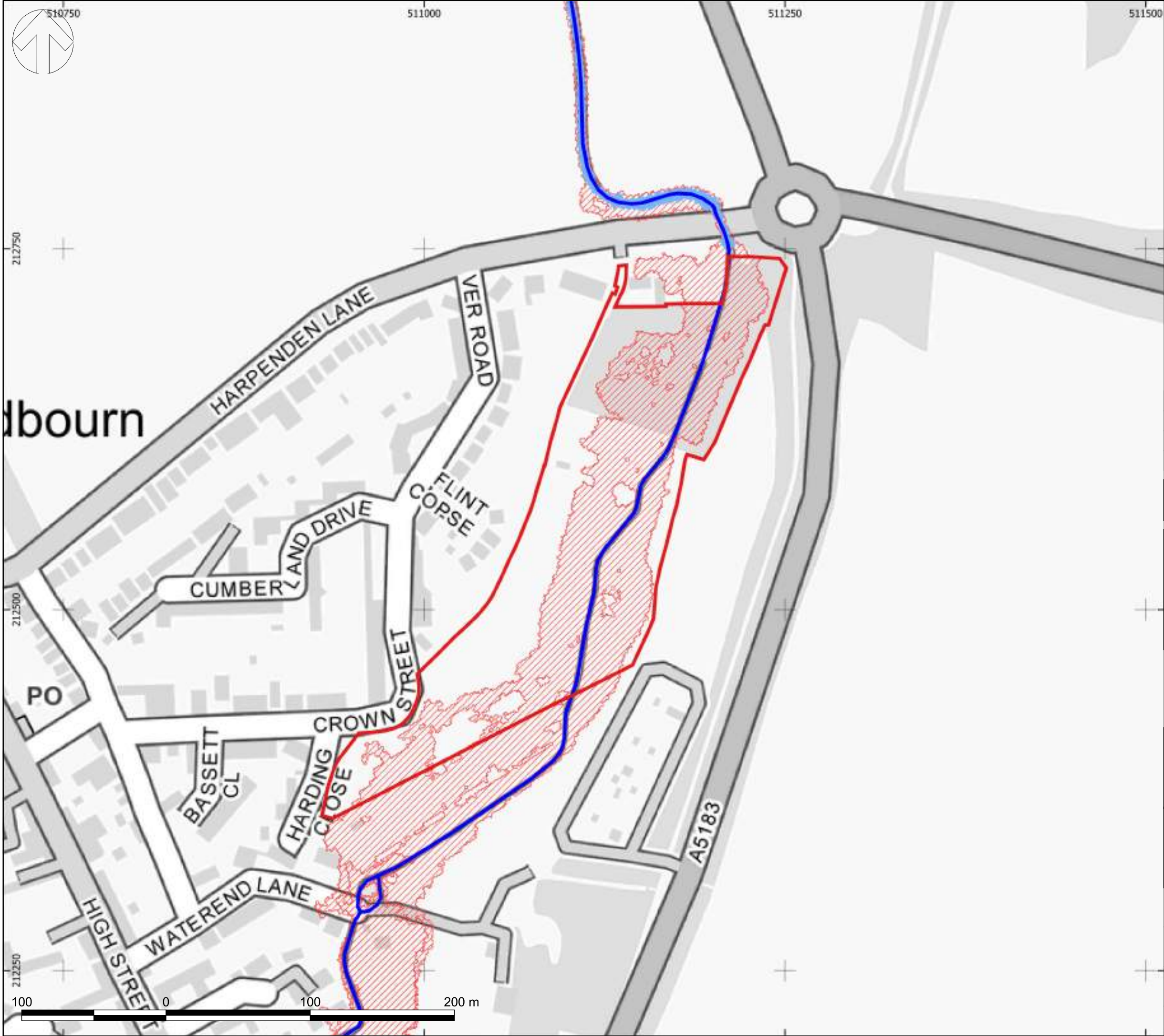
TITLE:
PEAK SURFACE WATER FLOOD EXTENTS

DRAWN: SEK	CHECKED: MQ	APPROVED: JR
PROJECT No: 70110083	SCALE @A3: 1:2,500	DATE: 16/10/2025
DRAWING No: 70110083-WSP-XX-XX-DR-EI-0021		REV: P01
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Appendix D.6

ENVIRONMENT AGENCY RESERVOIR FLOOD EXTENTS





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Note:
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Key:

- Site Boundary
- Main River
- Dry Day
- Wet Day

P01	14/10/2025	SEK	FIRST ISSUE	MQ	JR
REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS:
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wsp.com

CLIENT:
MARTIN GRANT HOMES LIMITED

PROJECT:
LAND OFF HARPENDEN LANE, REDBOURN

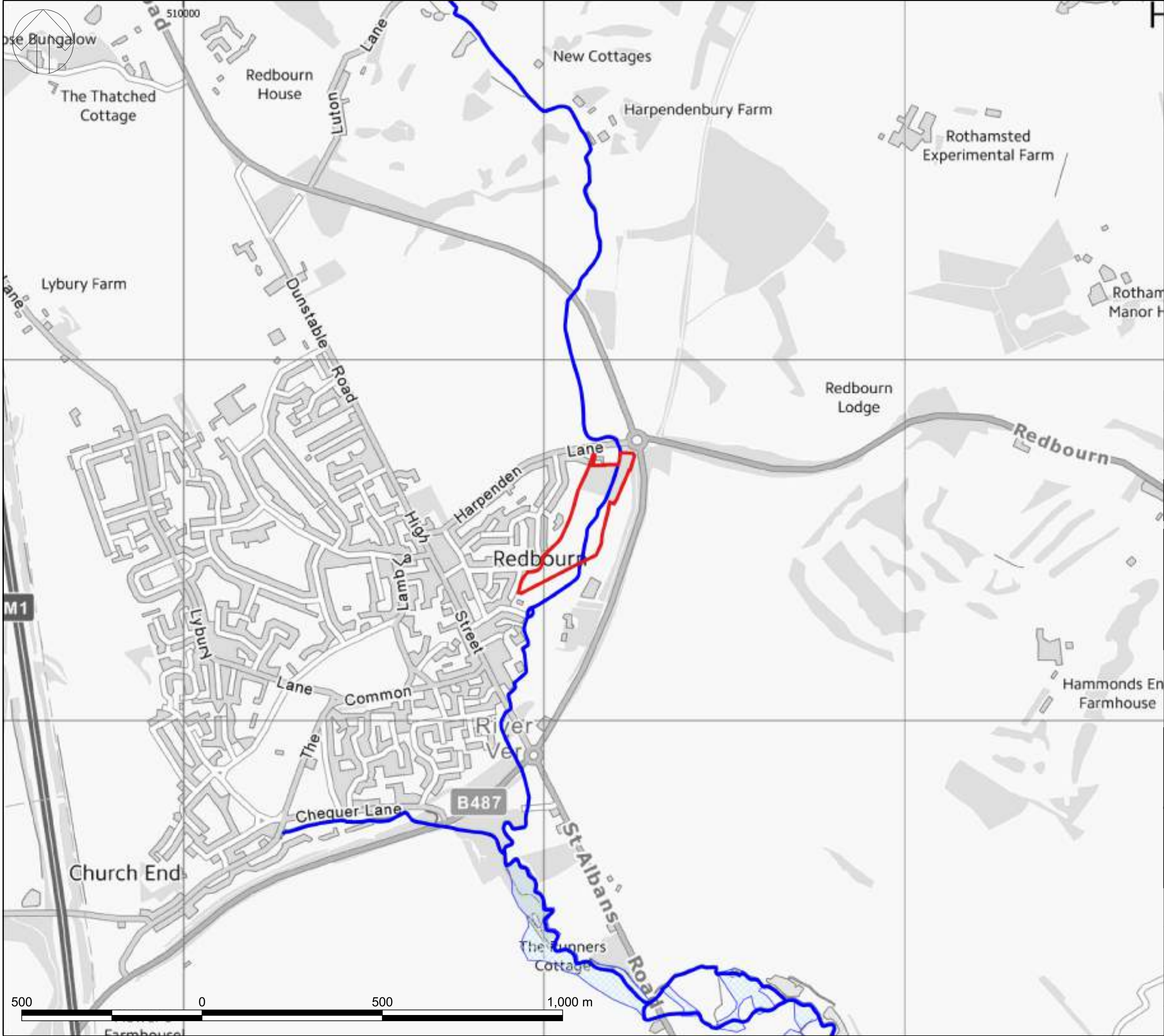
TITLE:
RESERVOIR FLOOD EXTENTS

DRAWN: SEK	CHECKED: MQ	APPROVED: JR
PROJECT No: 70110083	SCALE @A3: 1:2,500	DATE: 14/10/2025
DRAWING No: 70110083-WSP-XX-XX-DR-EI-0013		REV: P01
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Appendix D.7

ENVIRONMENT AGENCY HISTORIC FLOOD MAP





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Note:
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Key:

- Site Boundary
- Main River
- Historic Flood Extents

P01	14/10/2025	SEK	FIRST ISSUE	MQ	JR
REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS:

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wsp.com

CLIENT:

MARTIN GRANT HOMES LIMITED

PROJECT:

LAND OFF HARPENDEN LANE, REDBOURN

TITLE:

HISTORIC FLOOD MAP

DRAWN: SEK	CHECKED: MQ	APPROVED: JR
PROJECT No: 70110083	SCALE @A3: 1:10,000	DATE: 14/10/2025
DRAWING No: 70110083-WSP-XX-XX-DR-EI-0014		
REV: P01		

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Created by: UKSEK001 - 2025-10-14 15:32:38 - \\uk-wspgroup.com\central data\Projects\70110xxx\70110083 - Redbourn 2023\03 WIP\Water01 - Data\GIS\SEK-Master Project.qgz

Appendix E

SURFACE WATER MANAGEMENT



Appendix E.1

GREENFIELD RUNOFF RATE CALCULATIONS



UK Design Flood Estimation

Generated on Thursday, October 9, 2025 10:04:04 AM by UKSEK001
Printed from the ReFH2 Flood Modelling software package, version 4.1.8985.14298

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: DECC-45A8

Site name: FEH_Point_Descriptors_511025_212503_v5_0_1

Easting: 511025

Northing: 212503

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.04 [0.5]*

Using plot scale calculations: Yes

Model: 2.3

Site description: None

Model run: 1 year

Summary of results

Rainfall - FEH22 (mm):	18.57	Total runoff (ML):	0.05
Total Rainfall (mm):	11.99	Total flow (ML):	0.17
Peak Rainfall (mm):	4.05	Peak flow (m ³ /s):	0.00

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.

** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH22)

Name	Value	User-defined?
Duration (hh:mm:ss)	03:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.65	No
ARF (Areal reduction factor)	0.99	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	71.96	No
Cmax (mm)	703.26	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	2.21 [1.07]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m ³ /s)	0	No
BL (hr)	51.17 [42.07]	Yes
BR	2.61	No

Urbanisation parameters

Name	Value	User-defined?
Sewer capacity (m ³ /s)	0	No
Exporting drained area (km ²)	0	No
Urban area (km ²)	0	No
Effective URBEXT2000	0	n/a
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
00:00:00	0.4875	0.0000	0.0500	0.0000	0.000269	0.000269
00:30:00	1.0911	0.0000	0.1132	0.0000	0.000266	0.000284
01:00:00	2.3924	0.0000	0.2542	0.0001	0.000265	0.000358
01:30:00	4.0520	0.0000	0.4491	0.0003	0.000268	0.000565
02:00:00	2.3924	0.0000	0.2761	0.0007	0.000278	0.00103
02:30:00	1.0911	0.0000	0.1286	0.0014	0.000303	0.00175
03:00:00	0.4875	0.0000	0.0580	0.0022	0.000347	0.00257
03:30:00	0.0000	0.0000	0.0000	0.0029	0.000409	0.00333
04:00:00	0.0000	0.0000	0.0000	0.0033	0.000484	0.00381
04:30:00	0.0000	0.0000	0.0000	0.0033	0.000564	0.00385
05:00:00	0.0000	0.0000	0.0000	0.0030	0.000637	0.0036
05:30:00	0.0000	0.0000	0.0000	0.0025	0.0007	0.00321
06:00:00	0.0000	0.0000	0.0000	0.0020	0.000751	0.00279
06:30:00	0.0000	0.0000	0.0000	0.0017	0.000791	0.00245
07:00:00	0.0000	0.0000	0.0000	0.0014	0.000821	0.00217
07:30:00	0.0000	0.0000	0.0000	0.0011	0.000844	0.00193
08:00:00	0.0000	0.0000	0.0000	0.0008	0.000861	0.0017
08:30:00	0.0000	0.0000	0.0000	0.0006	0.00087	0.00147
09:00:00	0.0000	0.0000	0.0000	0.0004	0.000874	0.00125
09:30:00	0.0000	0.0000	0.0000	0.0002	0.000873	0.00107
10:00:00	0.0000	0.0000	0.0000	0.0001	0.000868	0.000945
10:30:00	0.0000	0.0000	0.0000	0.0000	0.000861	0.000885
11:00:00	0.0000	0.0000	0.0000	0.0000	0.000853	0.000857
11:30:00	0.0000	0.0000	0.0000	0.0000	0.000845	0.000845
12:00:00	0.0000	0.0000	0.0000	0.0000	0.000836	0.000836
12:30:00	0.0000	0.0000	0.0000	0.0000	0.000828	0.000828
13:00:00	0.0000	0.0000	0.0000	0.0000	0.00082	0.00082
13:30:00	0.0000	0.0000	0.0000	0.0000	0.000812	0.000812
14:00:00	0.0000	0.0000	0.0000	0.0000	0.000804	0.000804
14:30:00	0.0000	0.0000	0.0000	0.0000	0.000796	0.000796
15:00:00	0.0000	0.0000	0.0000	0.0000	0.000789	0.000789
15:30:00	0.0000	0.0000	0.0000	0.0000	0.000781	0.000781
16:00:00	0.0000	0.0000	0.0000	0.0000	0.000773	0.000773
16:30:00	0.0000	0.0000	0.0000	0.0000	0.000766	0.000766

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
17:00:00	0.0000	0.0000	0.0000	0.0000	0.000758	0.000758
17:30:00	0.0000	0.0000	0.0000	0.0000	0.000751	0.000751
18:00:00	0.0000	0.0000	0.0000	0.0000	0.000744	0.000744
18:30:00	0.0000	0.0000	0.0000	0.0000	0.000737	0.000737
19:00:00	0.0000	0.0000	0.0000	0.0000	0.000729	0.000729
19:30:00	0.0000	0.0000	0.0000	0.0000	0.000722	0.000722
20:00:00	0.0000	0.0000	0.0000	0.0000	0.000715	0.000715
20:30:00	0.0000	0.0000	0.0000	0.0000	0.000708	0.000708
21:00:00	0.0000	0.0000	0.0000	0.0000	0.000701	0.000701
21:30:00	0.0000	0.0000	0.0000	0.0000	0.000695	0.000695
22:00:00	0.0000	0.0000	0.0000	0.0000	0.000688	0.000688
22:30:00	0.0000	0.0000	0.0000	0.0000	0.000681	0.000681
23:00:00	0.0000	0.0000	0.0000	0.0000	0.000675	0.000675
23:30:00	0.0000	0.0000	0.0000	0.0000	0.000668	0.000668
24:00:00	0.0000	0.0000	0.0000	0.0000	0.000661	0.000661
24:30:00	0.0000	0.0000	0.0000	0.0000	0.000655	0.000655
25:00:00	0.0000	0.0000	0.0000	0.0000	0.000649	0.000649
25:30:00	0.0000	0.0000	0.0000	0.0000	0.000642	0.000642
26:00:00	0.0000	0.0000	0.0000	0.0000	0.000636	0.000636
26:30:00	0.0000	0.0000	0.0000	0.0000	0.00063	0.00063
27:00:00	0.0000	0.0000	0.0000	0.0000	0.000624	0.000624
27:30:00	0.0000	0.0000	0.0000	0.0000	0.000618	0.000618
28:00:00	0.0000	0.0000	0.0000	0.0000	0.000612	0.000612
28:30:00	0.0000	0.0000	0.0000	0.0000	0.000606	0.000606
29:00:00	0.0000	0.0000	0.0000	0.0000	0.0006	0.0006
29:30:00	0.0000	0.0000	0.0000	0.0000	0.000594	0.000594
30:00:00	0.0000	0.0000	0.0000	0.0000	0.000588	0.000588
30:30:00	0.0000	0.0000	0.0000	0.0000	0.000583	0.000583
31:00:00	0.0000	0.0000	0.0000	0.0000	0.000577	0.000577
31:30:00	0.0000	0.0000	0.0000	0.0000	0.000571	0.000571
32:00:00	0.0000	0.0000	0.0000	0.0000	0.000566	0.000566
32:30:00	0.0000	0.0000	0.0000	0.0000	0.00056	0.00056
33:00:00	0.0000	0.0000	0.0000	0.0000	0.000555	0.000555
33:30:00	0.0000	0.0000	0.0000	0.0000	0.000549	0.000549
34:00:00	0.0000	0.0000	0.0000	0.0000	0.000544	0.000544

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
34:30:00	0.0000	0.0000	0.0000	0.0000	0.000539	0.000539
35:00:00	0.0000	0.0000	0.0000	0.0000	0.000534	0.000534
35:30:00	0.0000	0.0000	0.0000	0.0000	0.000528	0.000528
36:00:00	0.0000	0.0000	0.0000	0.0000	0.000523	0.000523
36:30:00	0.0000	0.0000	0.0000	0.0000	0.000518	0.000518
37:00:00	0.0000	0.0000	0.0000	0.0000	0.000513	0.000513
37:30:00	0.0000	0.0000	0.0000	0.0000	0.000508	0.000508
38:00:00	0.0000	0.0000	0.0000	0.0000	0.000503	0.000503
38:30:00	0.0000	0.0000	0.0000	0.0000	0.000498	0.000498
39:00:00	0.0000	0.0000	0.0000	0.0000	0.000493	0.000493
39:30:00	0.0000	0.0000	0.0000	0.0000	0.000489	0.000489
40:00:00	0.0000	0.0000	0.0000	0.0000	0.000484	0.000484
40:30:00	0.0000	0.0000	0.0000	0.0000	0.000479	0.000479
41:00:00	0.0000	0.0000	0.0000	0.0000	0.000474	0.000474
41:30:00	0.0000	0.0000	0.0000	0.0000	0.00047	0.00047
42:00:00	0.0000	0.0000	0.0000	0.0000	0.000465	0.000465
42:30:00	0.0000	0.0000	0.0000	0.0000	0.000461	0.000461
43:00:00	0.0000	0.0000	0.0000	0.0000	0.000456	0.000456
43:30:00	0.0000	0.0000	0.0000	0.0000	0.000452	0.000452
44:00:00	0.0000	0.0000	0.0000	0.0000	0.000447	0.000447
44:30:00	0.0000	0.0000	0.0000	0.0000	0.000443	0.000443
45:00:00	0.0000	0.0000	0.0000	0.0000	0.000439	0.000439
45:30:00	0.0000	0.0000	0.0000	0.0000	0.000435	0.000435
46:00:00	0.0000	0.0000	0.0000	0.0000	0.00043	0.00043
46:30:00	0.0000	0.0000	0.0000	0.0000	0.000426	0.000426
47:00:00	0.0000	0.0000	0.0000	0.0000	0.000422	0.000422
47:30:00	0.0000	0.0000	0.0000	0.0000	0.000418	0.000418
48:00:00	0.0000	0.0000	0.0000	0.0000	0.000414	0.000414
48:30:00	0.0000	0.0000	0.0000	0.0000	0.00041	0.00041
49:00:00	0.0000	0.0000	0.0000	0.0000	0.000406	0.000406
49:30:00	0.0000	0.0000	0.0000	0.0000	0.000402	0.000402
50:00:00	0.0000	0.0000	0.0000	0.0000	0.000398	0.000398
50:30:00	0.0000	0.0000	0.0000	0.0000	0.000394	0.000394
51:00:00	0.0000	0.0000	0.0000	0.0000	0.00039	0.00039
51:30:00	0.0000	0.0000	0.0000	0.0000	0.000386	0.000386

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
52:00:00	0.0000	0.0000	0.0000	0.0000	0.000383	0.000383
52:30:00	0.0000	0.0000	0.0000	0.0000	0.000379	0.000379
53:00:00	0.0000	0.0000	0.0000	0.0000	0.000375	0.000375
53:30:00	0.0000	0.0000	0.0000	0.0000	0.000372	0.000372
54:00:00	0.0000	0.0000	0.0000	0.0000	0.000368	0.000368
54:30:00	0.0000	0.0000	0.0000	0.0000	0.000364	0.000364
55:00:00	0.0000	0.0000	0.0000	0.0000	0.000361	0.000361
55:30:00	0.0000	0.0000	0.0000	0.0000	0.000357	0.000357
56:00:00	0.0000	0.0000	0.0000	0.0000	0.000354	0.000354

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.69	No
BFIHOST19	0.7	No
PROPWET	0.3	No
SAAR (mm)	690	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

UK Design Flood Estimation

Generated on Thursday, October 9, 2025 10:04:27 AM by UKSEK001
Printed from the ReFH2 Flood Modelling software package, version 4.1.8985.14298

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: DECC-45A8

Site name: FEH_Point_Descriptors_511025_212503_v5_0_1

Easting: 511025

Northing: 212503

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.04 [0.5]*

Using plot scale calculations: Yes

Model: 2.3

Site description: None

Model run: 2 year

Summary of results

Rainfall - FEH22 (mm):	21.68	Total runoff (ML):	0.06
Total Rainfall (mm):	14.00	Total flow (ML):	0.19
Peak Rainfall (mm):	4.73	Peak flow (m ³ /s):	0.00

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.

** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH22)

Name	Value	User-defined?
Duration (hh:mm:ss)	03:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.65	No
ARF (Areal reduction factor)	0.99	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	71.96	No
Cmax (mm)	703.26	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	2.21 [1.07]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m ³ /s)	0	No
BL (hr)	51.17 [42.07]	Yes
BR	2.61	No

Urbanisation parameters

Name	Value	User-defined?
Sewer capacity (m ³ /s)	0	No
Exporting drained area (km ²)	0	No
Urban area (km ²)	0	No
Effective URBEXT2000	0	n/a
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
00:00:00	0.5692	0.0000	0.0585	0.0000	0.000269	0.000269
00:30:00	1.2739	0.0000	0.1325	0.0000	0.000266	0.000287
01:00:00	2.7932	0.0000	0.2987	0.0001	0.000266	0.000374
01:30:00	4.7308	0.0000	0.5311	0.0003	0.000269	0.000617
02:00:00	2.7932	0.0000	0.3285	0.0009	0.000282	0.00116
02:30:00	1.2739	0.0000	0.1535	0.0017	0.000312	0.00201
03:00:00	0.5692	0.0000	0.0693	0.0026	0.000364	0.00298
03:30:00	0.0000	0.0000	0.0000	0.0034	0.000437	0.00388
04:00:00	0.0000	0.0000	0.0000	0.0039	0.000526	0.00446
04:30:00	0.0000	0.0000	0.0000	0.0039	0.000621	0.00451
05:00:00	0.0000	0.0000	0.0000	0.0035	0.000708	0.00421
05:30:00	0.0000	0.0000	0.0000	0.0030	0.000784	0.00375
06:00:00	0.0000	0.0000	0.0000	0.0024	0.000844	0.00326
06:30:00	0.0000	0.0000	0.0000	0.0020	0.000892	0.00286
07:00:00	0.0000	0.0000	0.0000	0.0016	0.000928	0.00253
07:30:00	0.0000	0.0000	0.0000	0.0013	0.000956	0.00224
08:00:00	0.0000	0.0000	0.0000	0.0010	0.000976	0.00197
08:30:00	0.0000	0.0000	0.0000	0.0007	0.000988	0.0017
09:00:00	0.0000	0.0000	0.0000	0.0004	0.000993	0.00144
09:30:00	0.0000	0.0000	0.0000	0.0002	0.000992	0.00122
10:00:00	0.0000	0.0000	0.0000	0.0001	0.000986	0.00108
10:30:00	0.0000	0.0000	0.0000	0.0000	0.000978	0.00101
11:00:00	0.0000	0.0000	0.0000	0.0000	0.000969	0.000974
11:30:00	0.0000	0.0000	0.0000	0.0000	0.00096	0.00096
12:00:00	0.0000	0.0000	0.0000	0.0000	0.00095	0.00095
12:30:00	0.0000	0.0000	0.0000	0.0000	0.000941	0.000941
13:00:00	0.0000	0.0000	0.0000	0.0000	0.000932	0.000932
13:30:00	0.0000	0.0000	0.0000	0.0000	0.000923	0.000923
14:00:00	0.0000	0.0000	0.0000	0.0000	0.000914	0.000914
14:30:00	0.0000	0.0000	0.0000	0.0000	0.000905	0.000905
15:00:00	0.0000	0.0000	0.0000	0.0000	0.000896	0.000896
15:30:00	0.0000	0.0000	0.0000	0.0000	0.000887	0.000887
16:00:00	0.0000	0.0000	0.0000	0.0000	0.000879	0.000879
16:30:00	0.0000	0.0000	0.0000	0.0000	0.00087	0.00087

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
17:00:00	0.0000	0.0000	0.0000	0.0000	0.000862	0.000862
17:30:00	0.0000	0.0000	0.0000	0.0000	0.000853	0.000853
18:00:00	0.0000	0.0000	0.0000	0.0000	0.000845	0.000845
18:30:00	0.0000	0.0000	0.0000	0.0000	0.000837	0.000837
19:00:00	0.0000	0.0000	0.0000	0.0000	0.000829	0.000829
19:30:00	0.0000	0.0000	0.0000	0.0000	0.000821	0.000821
20:00:00	0.0000	0.0000	0.0000	0.0000	0.000813	0.000813
20:30:00	0.0000	0.0000	0.0000	0.0000	0.000805	0.000805
21:00:00	0.0000	0.0000	0.0000	0.0000	0.000797	0.000797
21:30:00	0.0000	0.0000	0.0000	0.0000	0.000789	0.000789
22:00:00	0.0000	0.0000	0.0000	0.0000	0.000782	0.000782
22:30:00	0.0000	0.0000	0.0000	0.0000	0.000774	0.000774
23:00:00	0.0000	0.0000	0.0000	0.0000	0.000766	0.000766
23:30:00	0.0000	0.0000	0.0000	0.0000	0.000759	0.000759
24:00:00	0.0000	0.0000	0.0000	0.0000	0.000752	0.000752
24:30:00	0.0000	0.0000	0.0000	0.0000	0.000744	0.000744
25:00:00	0.0000	0.0000	0.0000	0.0000	0.000737	0.000737
25:30:00	0.0000	0.0000	0.0000	0.0000	0.00073	0.00073
26:00:00	0.0000	0.0000	0.0000	0.0000	0.000723	0.000723
26:30:00	0.0000	0.0000	0.0000	0.0000	0.000716	0.000716
27:00:00	0.0000	0.0000	0.0000	0.0000	0.000709	0.000709
27:30:00	0.0000	0.0000	0.0000	0.0000	0.000702	0.000702
28:00:00	0.0000	0.0000	0.0000	0.0000	0.000695	0.000695
28:30:00	0.0000	0.0000	0.0000	0.0000	0.000688	0.000688
29:00:00	0.0000	0.0000	0.0000	0.0000	0.000682	0.000682
29:30:00	0.0000	0.0000	0.0000	0.0000	0.000675	0.000675
30:00:00	0.0000	0.0000	0.0000	0.0000	0.000668	0.000668
30:30:00	0.0000	0.0000	0.0000	0.0000	0.000662	0.000662
31:00:00	0.0000	0.0000	0.0000	0.0000	0.000656	0.000656
31:30:00	0.0000	0.0000	0.0000	0.0000	0.000649	0.000649
32:00:00	0.0000	0.0000	0.0000	0.0000	0.000643	0.000643
32:30:00	0.0000	0.0000	0.0000	0.0000	0.000637	0.000637
33:00:00	0.0000	0.0000	0.0000	0.0000	0.00063	0.00063
33:30:00	0.0000	0.0000	0.0000	0.0000	0.000624	0.000624
34:00:00	0.0000	0.0000	0.0000	0.0000	0.000618	0.000618

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
34:30:00	0.0000	0.0000	0.0000	0.0000	0.000612	0.000612
35:00:00	0.0000	0.0000	0.0000	0.0000	0.000606	0.000606
35:30:00	0.0000	0.0000	0.0000	0.0000	0.0006	0.0006
36:00:00	0.0000	0.0000	0.0000	0.0000	0.000594	0.000594
36:30:00	0.0000	0.0000	0.0000	0.0000	0.000589	0.000589
37:00:00	0.0000	0.0000	0.0000	0.0000	0.000583	0.000583
37:30:00	0.0000	0.0000	0.0000	0.0000	0.000577	0.000577
38:00:00	0.0000	0.0000	0.0000	0.0000	0.000572	0.000572
38:30:00	0.0000	0.0000	0.0000	0.0000	0.000566	0.000566
39:00:00	0.0000	0.0000	0.0000	0.0000	0.000561	0.000561
39:30:00	0.0000	0.0000	0.0000	0.0000	0.000555	0.000555
40:00:00	0.0000	0.0000	0.0000	0.0000	0.00055	0.00055
40:30:00	0.0000	0.0000	0.0000	0.0000	0.000544	0.000544
41:00:00	0.0000	0.0000	0.0000	0.0000	0.000539	0.000539
41:30:00	0.0000	0.0000	0.0000	0.0000	0.000534	0.000534
42:00:00	0.0000	0.0000	0.0000	0.0000	0.000529	0.000529
42:30:00	0.0000	0.0000	0.0000	0.0000	0.000524	0.000524
43:00:00	0.0000	0.0000	0.0000	0.0000	0.000518	0.000518
43:30:00	0.0000	0.0000	0.0000	0.0000	0.000513	0.000513
44:00:00	0.0000	0.0000	0.0000	0.0000	0.000508	0.000508
44:30:00	0.0000	0.0000	0.0000	0.0000	0.000503	0.000503
45:00:00	0.0000	0.0000	0.0000	0.0000	0.000499	0.000499
45:30:00	0.0000	0.0000	0.0000	0.0000	0.000494	0.000494
46:00:00	0.0000	0.0000	0.0000	0.0000	0.000489	0.000489
46:30:00	0.0000	0.0000	0.0000	0.0000	0.000484	0.000484
47:00:00	0.0000	0.0000	0.0000	0.0000	0.000479	0.000479
47:30:00	0.0000	0.0000	0.0000	0.0000	0.000475	0.000475
48:00:00	0.0000	0.0000	0.0000	0.0000	0.00047	0.00047
48:30:00	0.0000	0.0000	0.0000	0.0000	0.000466	0.000466
49:00:00	0.0000	0.0000	0.0000	0.0000	0.000461	0.000461
49:30:00	0.0000	0.0000	0.0000	0.0000	0.000457	0.000457
50:00:00	0.0000	0.0000	0.0000	0.0000	0.000452	0.000452
50:30:00	0.0000	0.0000	0.0000	0.0000	0.000448	0.000448
51:00:00	0.0000	0.0000	0.0000	0.0000	0.000443	0.000443
51:30:00	0.0000	0.0000	0.0000	0.0000	0.000439	0.000439

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
52:00:00	0.0000	0.0000	0.0000	0.0000	0.000435	0.000435
52:30:00	0.0000	0.0000	0.0000	0.0000	0.000431	0.000431
53:00:00	0.0000	0.0000	0.0000	0.0000	0.000426	0.000426
53:30:00	0.0000	0.0000	0.0000	0.0000	0.000422	0.000422
54:00:00	0.0000	0.0000	0.0000	0.0000	0.000418	0.000418
54:30:00	0.0000	0.0000	0.0000	0.0000	0.000414	0.000414
55:00:00	0.0000	0.0000	0.0000	0.0000	0.00041	0.00041
55:30:00	0.0000	0.0000	0.0000	0.0000	0.000406	0.000406
56:00:00	0.0000	0.0000	0.0000	0.0000	0.000402	0.000402

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.69	No
BFIHOST19	0.7	No
PROPWET	0.3	No
SAAR (mm)	690	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

UK Design Flood Estimation

Generated on Thursday, October 9, 2025 10:04:44 AM by UKSEK001
Printed from the ReFH2 Flood Modelling software package, version 4.1.8985.14298

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: DECC-45A8

Site name: FEH_Point_Descriptors_511025_212503_v5_0_1

Easting: 511025

Northing: 212503

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.04 [0.5]*

Using plot scale calculations: Yes

Model: 2.3

Site description: None

Model run: 30 year

Summary of results

Rainfall - FEH22 (mm):	46.97	Total runoff (ML):	0.14
Total Rainfall (mm):	30.34	Total flow (ML):	0.41
Peak Rainfall (mm):	10.25	Peak flow (m ³ /s):	0.01

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.

** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH22)

Name	Value	User-defined?
Duration (hh:mm:ss)	03:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.65	No
ARF (Areal reduction factor)	0.99	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	71.96	No
Cmax (mm)	703.26	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	2.21 [1.07]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m ³ /s)	0	No
BL (hr)	51.17 [42.07]	Yes
BR	2.61	No

Urbanisation parameters

Name	Value	User-defined?
Sewer capacity (m ³ /s)	0	No
Exporting drained area (km ²)	0	No
Urban area (km ²)	0	No
Effective URBEXT2000	0	n/a
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
00:00:00	1.2333	0.0000	0.1273	0.0000	0.000269	0.000269
00:30:00	2.7604	0.0000	0.2927	0.0000	0.000267	0.000312
01:00:00	6.0525	0.0000	0.6797	0.0002	0.000268	0.000505
01:30:00	10.2512	0.0000	1.2700	0.0008	0.000278	0.00105
02:00:00	6.0525	0.0000	0.8200	0.0020	0.00031	0.0023
02:30:00	2.7604	0.0000	0.3913	0.0039	0.000383	0.00431
03:00:00	1.2333	0.0000	0.1783	0.0061	0.000506	0.00663
03:30:00	0.0000	0.0000	0.0000	0.0081	0.000682	0.00882
04:00:00	0.0000	0.0000	0.0000	0.0094	0.000898	0.0103
04:30:00	0.0000	0.0000	0.0000	0.0093	0.00113	0.0105
05:00:00	0.0000	0.0000	0.0000	0.0085	0.00134	0.0098
05:30:00	0.0000	0.0000	0.0000	0.0072	0.00153	0.00872
06:00:00	0.0000	0.0000	0.0000	0.0059	0.00168	0.00754
06:30:00	0.0000	0.0000	0.0000	0.0048	0.0018	0.00655
07:00:00	0.0000	0.0000	0.0000	0.0039	0.00189	0.00576
07:30:00	0.0000	0.0000	0.0000	0.0031	0.00196	0.00507
08:00:00	0.0000	0.0000	0.0000	0.0024	0.00201	0.00442
08:30:00	0.0000	0.0000	0.0000	0.0017	0.00204	0.00378
09:00:00	0.0000	0.0000	0.0000	0.0011	0.00206	0.00317
09:30:00	0.0000	0.0000	0.0000	0.0006	0.00206	0.00264
10:00:00	0.0000	0.0000	0.0000	0.0002	0.00205	0.00229
10:30:00	0.0000	0.0000	0.0000	0.0001	0.00204	0.00211
11:00:00	0.0000	0.0000	0.0000	0.0000	0.00202	0.00203
11:30:00	0.0000	0.0000	0.0000	0.0000	0.002	0.002
12:00:00	0.0000	0.0000	0.0000	0.0000	0.00198	0.00198
12:30:00	0.0000	0.0000	0.0000	0.0000	0.00196	0.00196
13:00:00	0.0000	0.0000	0.0000	0.0000	0.00194	0.00194
13:30:00	0.0000	0.0000	0.0000	0.0000	0.00192	0.00192
14:00:00	0.0000	0.0000	0.0000	0.0000	0.0019	0.0019
14:30:00	0.0000	0.0000	0.0000	0.0000	0.00188	0.00188
15:00:00	0.0000	0.0000	0.0000	0.0000	0.00186	0.00186
15:30:00	0.0000	0.0000	0.0000	0.0000	0.00185	0.00185
16:00:00	0.0000	0.0000	0.0000	0.0000	0.00183	0.00183
16:30:00	0.0000	0.0000	0.0000	0.0000	0.00181	0.00181

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
17:00:00	0.0000	0.0000	0.0000	0.0000	0.00179	0.00179
17:30:00	0.0000	0.0000	0.0000	0.0000	0.00178	0.00178
18:00:00	0.0000	0.0000	0.0000	0.0000	0.00176	0.00176
18:30:00	0.0000	0.0000	0.0000	0.0000	0.00174	0.00174
19:00:00	0.0000	0.0000	0.0000	0.0000	0.00172	0.00172
19:30:00	0.0000	0.0000	0.0000	0.0000	0.00171	0.00171
20:00:00	0.0000	0.0000	0.0000	0.0000	0.00169	0.00169
20:30:00	0.0000	0.0000	0.0000	0.0000	0.00167	0.00167
21:00:00	0.0000	0.0000	0.0000	0.0000	0.00166	0.00166
21:30:00	0.0000	0.0000	0.0000	0.0000	0.00164	0.00164
22:00:00	0.0000	0.0000	0.0000	0.0000	0.00163	0.00163
22:30:00	0.0000	0.0000	0.0000	0.0000	0.00161	0.00161
23:00:00	0.0000	0.0000	0.0000	0.0000	0.00159	0.00159
23:30:00	0.0000	0.0000	0.0000	0.0000	0.00158	0.00158
24:00:00	0.0000	0.0000	0.0000	0.0000	0.00156	0.00156
24:30:00	0.0000	0.0000	0.0000	0.0000	0.00155	0.00155
25:00:00	0.0000	0.0000	0.0000	0.0000	0.00153	0.00153
25:30:00	0.0000	0.0000	0.0000	0.0000	0.00152	0.00152
26:00:00	0.0000	0.0000	0.0000	0.0000	0.0015	0.0015
26:30:00	0.0000	0.0000	0.0000	0.0000	0.00149	0.00149
27:00:00	0.0000	0.0000	0.0000	0.0000	0.00148	0.00148
27:30:00	0.0000	0.0000	0.0000	0.0000	0.00146	0.00146
28:00:00	0.0000	0.0000	0.0000	0.0000	0.00145	0.00145
28:30:00	0.0000	0.0000	0.0000	0.0000	0.00143	0.00143
29:00:00	0.0000	0.0000	0.0000	0.0000	0.00142	0.00142
29:30:00	0.0000	0.0000	0.0000	0.0000	0.0014	0.0014
30:00:00	0.0000	0.0000	0.0000	0.0000	0.00139	0.00139
30:30:00	0.0000	0.0000	0.0000	0.0000	0.00138	0.00138
31:00:00	0.0000	0.0000	0.0000	0.0000	0.00136	0.00136
31:30:00	0.0000	0.0000	0.0000	0.0000	0.00135	0.00135
32:00:00	0.0000	0.0000	0.0000	0.0000	0.00134	0.00134
32:30:00	0.0000	0.0000	0.0000	0.0000	0.00132	0.00132
33:00:00	0.0000	0.0000	0.0000	0.0000	0.00131	0.00131
33:30:00	0.0000	0.0000	0.0000	0.0000	0.0013	0.0013
34:00:00	0.0000	0.0000	0.0000	0.0000	0.00129	0.00129

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
34:30:00	0.0000	0.0000	0.0000	0.0000	0.00127	0.00127
35:00:00	0.0000	0.0000	0.0000	0.0000	0.00126	0.00126
35:30:00	0.0000	0.0000	0.0000	0.0000	0.00125	0.00125
36:00:00	0.0000	0.0000	0.0000	0.0000	0.00124	0.00124
36:30:00	0.0000	0.0000	0.0000	0.0000	0.00123	0.00123
37:00:00	0.0000	0.0000	0.0000	0.0000	0.00121	0.00121
37:30:00	0.0000	0.0000	0.0000	0.0000	0.0012	0.0012
38:00:00	0.0000	0.0000	0.0000	0.0000	0.00119	0.00119
38:30:00	0.0000	0.0000	0.0000	0.0000	0.00118	0.00118
39:00:00	0.0000	0.0000	0.0000	0.0000	0.00117	0.00117
39:30:00	0.0000	0.0000	0.0000	0.0000	0.00116	0.00116
40:00:00	0.0000	0.0000	0.0000	0.0000	0.00114	0.00114
40:30:00	0.0000	0.0000	0.0000	0.0000	0.00113	0.00113
41:00:00	0.0000	0.0000	0.0000	0.0000	0.00112	0.00112
41:30:00	0.0000	0.0000	0.0000	0.0000	0.00111	0.00111
42:00:00	0.0000	0.0000	0.0000	0.0000	0.0011	0.0011
42:30:00	0.0000	0.0000	0.0000	0.0000	0.00109	0.00109
43:00:00	0.0000	0.0000	0.0000	0.0000	0.00108	0.00108
43:30:00	0.0000	0.0000	0.0000	0.0000	0.00107	0.00107
44:00:00	0.0000	0.0000	0.0000	0.0000	0.00106	0.00106
44:30:00	0.0000	0.0000	0.0000	0.0000	0.00105	0.00105
45:00:00	0.0000	0.0000	0.0000	0.0000	0.00104	0.00104
45:30:00	0.0000	0.0000	0.0000	0.0000	0.00103	0.00103
46:00:00	0.0000	0.0000	0.0000	0.0000	0.00102	0.00102
46:30:00	0.0000	0.0000	0.0000	0.0000	0.00101	0.00101
47:00:00	0.0000	0.0000	0.0000	0.0000	0.000998	0.000998
47:30:00	0.0000	0.0000	0.0000	0.0000	0.000988	0.000988
48:00:00	0.0000	0.0000	0.0000	0.0000	0.000978	0.000978
48:30:00	0.0000	0.0000	0.0000	0.0000	0.000969	0.000969
49:00:00	0.0000	0.0000	0.0000	0.0000	0.00096	0.00096
49:30:00	0.0000	0.0000	0.0000	0.0000	0.00095	0.00095
50:00:00	0.0000	0.0000	0.0000	0.0000	0.000941	0.000941
50:30:00	0.0000	0.0000	0.0000	0.0000	0.000932	0.000932
51:00:00	0.0000	0.0000	0.0000	0.0000	0.000923	0.000923
51:30:00	0.0000	0.0000	0.0000	0.0000	0.000914	0.000914

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
52:00:00	0.0000	0.0000	0.0000	0.0000	0.000905	0.000905
52:30:00	0.0000	0.0000	0.0000	0.0000	0.000896	0.000896
53:00:00	0.0000	0.0000	0.0000	0.0000	0.000887	0.000887
53:30:00	0.0000	0.0000	0.0000	0.0000	0.000879	0.000879
54:00:00	0.0000	0.0000	0.0000	0.0000	0.00087	0.00087
54:30:00	0.0000	0.0000	0.0000	0.0000	0.000862	0.000862
55:00:00	0.0000	0.0000	0.0000	0.0000	0.000853	0.000853
55:30:00	0.0000	0.0000	0.0000	0.0000	0.000845	0.000845
56:00:00	0.0000	0.0000	0.0000	0.0000	0.000837	0.000837

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.69	No
BFIHOST19	0.7	No
PROPWET	0.3	No
SAAR (mm)	690	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

UK Design Flood Estimation

Generated on Thursday, October 9, 2025 10:05:03 AM by UKSEK001
Printed from the ReFH2 Flood Modelling software package, version 4.1.8985.14298

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: DECC-45A8

Site name: FEH_Point_Descriptors_511025_212503_v5_0_1

Easting: 511025

Northing: 212503

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.04 [0.5]*

Using plot scale calculations: Yes

Model: 2.3

Site description: None

Model run: 100 year

Summary of results

Rainfall - FEH22 (mm):	58.08	Total runoff (ML):	0.18
Total Rainfall (mm):	37.52	Total flow (ML):	0.52
Peak Rainfall (mm):	12.68	Peak flow (m ³ /s):	0.01

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.

** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH22)

Name	Value	User-defined?
Duration (hh:mm:ss)	03:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.65	No
ARF (Areal reduction factor)	0.99	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	71.96	No
Cmax (mm)	703.26	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	2.21 [1.07]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m ³ /s)	0	No
BL (hr)	51.17 [42.07]	Yes
BR	2.61	No

Urbanisation parameters

Name	Value	User-defined?
Sewer capacity (m ³ /s)	0	No
Exporting drained area (km ²)	0	No
Urban area (km ²)	0	No
Effective URBEXT2000	0	n/a
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m³/s)	Net Rain (mm)	Runoff (m³/s)	Baseflow (m³/s)	Total Flow (m³/s)
00:00:00	1.5249	0.0000	0.1577	0.0000	0.000269	0.000269
00:30:00	3.4132	0.0000	0.3649	0.0001	0.000267	0.000322
01:00:00	7.4837	0.0000	0.8581	0.0003	0.000269	0.000564
01:30:00	12.6751	0.0000	1.6350	0.0010	0.000282	0.00125
02:00:00	7.4837	0.0000	1.0726	0.0025	0.000324	0.00283
02:30:00	3.4132	0.0000	0.5156	0.0050	0.000416	0.0054
03:00:00	1.5249	0.0000	0.2357	0.0078	0.000574	0.00838
03:30:00	0.0000	0.0000	0.0000	0.0104	0.0008	0.0112
04:00:00	0.0000	0.0000	0.0000	0.0121	0.00108	0.0131
04:30:00	0.0000	0.0000	0.0000	0.0121	0.00137	0.0134
05:00:00	0.0000	0.0000	0.0000	0.0109	0.00165	0.0126
05:30:00	0.0000	0.0000	0.0000	0.0093	0.00189	0.0112
06:00:00	0.0000	0.0000	0.0000	0.0076	0.00209	0.00967
06:30:00	0.0000	0.0000	0.0000	0.0062	0.00224	0.00839
07:00:00	0.0000	0.0000	0.0000	0.0050	0.00236	0.00737
07:30:00	0.0000	0.0000	0.0000	0.0040	0.00245	0.00649
08:00:00	0.0000	0.0000	0.0000	0.0031	0.00252	0.00565
08:30:00	0.0000	0.0000	0.0000	0.0023	0.00256	0.00483
09:00:00	0.0000	0.0000	0.0000	0.0014	0.00259	0.00403
09:30:00	0.0000	0.0000	0.0000	0.0008	0.00259	0.00335
10:00:00	0.0000	0.0000	0.0000	0.0003	0.00258	0.00289
10:30:00	0.0000	0.0000	0.0000	0.0001	0.00256	0.00265
11:00:00	0.0000	0.0000	0.0000	0.0000	0.00253	0.00255
11:30:00	0.0000	0.0000	0.0000	0.0000	0.00251	0.00251
12:00:00	0.0000	0.0000	0.0000	0.0000	0.00249	0.00249
12:30:00	0.0000	0.0000	0.0000	0.0000	0.00246	0.00246
13:00:00	0.0000	0.0000	0.0000	0.0000	0.00244	0.00244
13:30:00	0.0000	0.0000	0.0000	0.0000	0.00241	0.00241
14:00:00	0.0000	0.0000	0.0000	0.0000	0.00239	0.00239
14:30:00	0.0000	0.0000	0.0000	0.0000	0.00237	0.00237
15:00:00	0.0000	0.0000	0.0000	0.0000	0.00234	0.00234
15:30:00	0.0000	0.0000	0.0000	0.0000	0.00232	0.00232
16:00:00	0.0000	0.0000	0.0000	0.0000	0.0023	0.0023
16:30:00	0.0000	0.0000	0.0000	0.0000	0.00228	0.00228

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
17:00:00	0.0000	0.0000	0.0000	0.0000	0.00225	0.00225
17:30:00	0.0000	0.0000	0.0000	0.0000	0.00223	0.00223
18:00:00	0.0000	0.0000	0.0000	0.0000	0.00221	0.00221
18:30:00	0.0000	0.0000	0.0000	0.0000	0.00219	0.00219
19:00:00	0.0000	0.0000	0.0000	0.0000	0.00217	0.00217
19:30:00	0.0000	0.0000	0.0000	0.0000	0.00215	0.00215
20:00:00	0.0000	0.0000	0.0000	0.0000	0.00213	0.00213
20:30:00	0.0000	0.0000	0.0000	0.0000	0.0021	0.0021
21:00:00	0.0000	0.0000	0.0000	0.0000	0.00208	0.00208
21:30:00	0.0000	0.0000	0.0000	0.0000	0.00206	0.00206
22:00:00	0.0000	0.0000	0.0000	0.0000	0.00204	0.00204
22:30:00	0.0000	0.0000	0.0000	0.0000	0.00202	0.00202
23:00:00	0.0000	0.0000	0.0000	0.0000	0.002	0.002
23:30:00	0.0000	0.0000	0.0000	0.0000	0.00198	0.00198
24:00:00	0.0000	0.0000	0.0000	0.0000	0.00197	0.00197
24:30:00	0.0000	0.0000	0.0000	0.0000	0.00195	0.00195
25:00:00	0.0000	0.0000	0.0000	0.0000	0.00193	0.00193
25:30:00	0.0000	0.0000	0.0000	0.0000	0.00191	0.00191
26:00:00	0.0000	0.0000	0.0000	0.0000	0.00189	0.00189
26:30:00	0.0000	0.0000	0.0000	0.0000	0.00187	0.00187
27:00:00	0.0000	0.0000	0.0000	0.0000	0.00185	0.00185
27:30:00	0.0000	0.0000	0.0000	0.0000	0.00184	0.00184
28:00:00	0.0000	0.0000	0.0000	0.0000	0.00182	0.00182
28:30:00	0.0000	0.0000	0.0000	0.0000	0.0018	0.0018
29:00:00	0.0000	0.0000	0.0000	0.0000	0.00178	0.00178
29:30:00	0.0000	0.0000	0.0000	0.0000	0.00177	0.00177
30:00:00	0.0000	0.0000	0.0000	0.0000	0.00175	0.00175
30:30:00	0.0000	0.0000	0.0000	0.0000	0.00173	0.00173
31:00:00	0.0000	0.0000	0.0000	0.0000	0.00171	0.00171
31:30:00	0.0000	0.0000	0.0000	0.0000	0.0017	0.0017
32:00:00	0.0000	0.0000	0.0000	0.0000	0.00168	0.00168
32:30:00	0.0000	0.0000	0.0000	0.0000	0.00166	0.00166
33:00:00	0.0000	0.0000	0.0000	0.0000	0.00165	0.00165
33:30:00	0.0000	0.0000	0.0000	0.0000	0.00163	0.00163
34:00:00	0.0000	0.0000	0.0000	0.0000	0.00162	0.00162

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
34:30:00	0.0000	0.0000	0.0000	0.0000	0.0016	0.0016
35:00:00	0.0000	0.0000	0.0000	0.0000	0.00159	0.00159
35:30:00	0.0000	0.0000	0.0000	0.0000	0.00157	0.00157
36:00:00	0.0000	0.0000	0.0000	0.0000	0.00155	0.00155
36:30:00	0.0000	0.0000	0.0000	0.0000	0.00154	0.00154
37:00:00	0.0000	0.0000	0.0000	0.0000	0.00152	0.00152
37:30:00	0.0000	0.0000	0.0000	0.0000	0.00151	0.00151
38:00:00	0.0000	0.0000	0.0000	0.0000	0.0015	0.0015
38:30:00	0.0000	0.0000	0.0000	0.0000	0.00148	0.00148
39:00:00	0.0000	0.0000	0.0000	0.0000	0.00147	0.00147
39:30:00	0.0000	0.0000	0.0000	0.0000	0.00145	0.00145
40:00:00	0.0000	0.0000	0.0000	0.0000	0.00144	0.00144
40:30:00	0.0000	0.0000	0.0000	0.0000	0.00142	0.00142
41:00:00	0.0000	0.0000	0.0000	0.0000	0.00141	0.00141
41:30:00	0.0000	0.0000	0.0000	0.0000	0.0014	0.0014
42:00:00	0.0000	0.0000	0.0000	0.0000	0.00138	0.00138
42:30:00	0.0000	0.0000	0.0000	0.0000	0.00137	0.00137
43:00:00	0.0000	0.0000	0.0000	0.0000	0.00136	0.00136
43:30:00	0.0000	0.0000	0.0000	0.0000	0.00134	0.00134
44:00:00	0.0000	0.0000	0.0000	0.0000	0.00133	0.00133
44:30:00	0.0000	0.0000	0.0000	0.0000	0.00132	0.00132
45:00:00	0.0000	0.0000	0.0000	0.0000	0.0013	0.0013
45:30:00	0.0000	0.0000	0.0000	0.0000	0.00129	0.00129
46:00:00	0.0000	0.0000	0.0000	0.0000	0.00128	0.00128
46:30:00	0.0000	0.0000	0.0000	0.0000	0.00127	0.00127
47:00:00	0.0000	0.0000	0.0000	0.0000	0.00125	0.00125
47:30:00	0.0000	0.0000	0.0000	0.0000	0.00124	0.00124
48:00:00	0.0000	0.0000	0.0000	0.0000	0.00123	0.00123
48:30:00	0.0000	0.0000	0.0000	0.0000	0.00122	0.00122
49:00:00	0.0000	0.0000	0.0000	0.0000	0.00121	0.00121
49:30:00	0.0000	0.0000	0.0000	0.0000	0.00119	0.00119
50:00:00	0.0000	0.0000	0.0000	0.0000	0.00118	0.00118
50:30:00	0.0000	0.0000	0.0000	0.0000	0.00117	0.00117
51:00:00	0.0000	0.0000	0.0000	0.0000	0.00116	0.00116
51:30:00	0.0000	0.0000	0.0000	0.0000	0.00115	0.00115

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
52:00:00	0.0000	0.0000	0.0000	0.0000	0.00114	0.00114
52:30:00	0.0000	0.0000	0.0000	0.0000	0.00113	0.00113
53:00:00	0.0000	0.0000	0.0000	0.0000	0.00112	0.00112
53:30:00	0.0000	0.0000	0.0000	0.0000	0.0011	0.0011
54:00:00	0.0000	0.0000	0.0000	0.0000	0.00109	0.00109
54:30:00	0.0000	0.0000	0.0000	0.0000	0.00108	0.00108
55:00:00	0.0000	0.0000	0.0000	0.0000	0.00107	0.00107
55:30:00	0.0000	0.0000	0.0000	0.0000	0.00106	0.00106
56:00:00	0.0000	0.0000	0.0000	0.0000	0.00105	0.00105

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
BFIHOST	0.69	No
BFIHOST19	0.7	No
PROPWET	0.3	No
SAAR (mm)	690	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

Appendix E.2

ATTENUATION CALCULATIONS



WSP Group Ltd					Page 1																																																																																																																																					
.			Redbourn																																																																																																																																							
.			SW Drainage Strategy																																																																																																																																							
.			Preliminary Attenuation Calcs																																																																																																																																							
Date 09/10/2025			Designed by SEK																																																																																																																																							
File 251007-SEK-Preliminary ...			Checked by																																																																																																																																							
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Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	93.354	0.054	0.8	85.0	O K
120 min Winter	93.376	0.076	1.1	119.7	O K
180 min Winter	93.389	0.089	1.1	139.2	O K
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2880 min Winter	93.413	0.113	1.1	177.8	O K
4320 min Winter	93.410	0.110	1.1	172.8	O K
5760 min Winter	93.407	0.107	1.1	167.5	O K
7200 min Winter	93.403	0.103	1.1	162.5	O K
8640 min Winter	93.400	0.100	1.1	157.9	O K
10080 min Winter	93.398	0.098	1.1	153.6	O K
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60 min Winter	13.695	0.0	58.8	64	
120 min Winter	9.792	0.0	89.7	122	
180 min Winter	7.689	0.0	107.3	180	
240 min Winter	6.365	0.0	118.7	240	
360 min Winter	4.761	0.0	132.1	356	
480 min Winter	3.819	0.0	139.4	472	
600 min Winter	3.202	0.0	143.8	588	
720 min Winter	2.766	0.0	146.5	702	
960 min Winter	2.187	0.0	148.8	924	
1440 min Winter	1.571	0.0	146.6	1342	
2160 min Winter	1.137	0.0	224.9	1664	
2880 min Winter	0.912	0.0	236.1	2132	
4320 min Winter	0.682	0.0	248.0	3028	
5760 min Winter	0.564	0.0	324.8	3912	
7200 min Winter	0.492	0.0	352.7	4752	
8640 min Winter	0.444	0.0	378.4	5536	
10080 min Winter	0.409	0.0	400.5	6360	
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<u>Summary of Results for 30 year Return Period (+35%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	93.405	0.105	1.1	164.7	O K
30 min Summer	93.435	0.135	1.1	213.4	O K
60 min Summer	93.467	0.167	1.1	264.2	O K
120 min Summer	93.510	0.210	1.1	335.6	O K
180 min Summer	93.535	0.235	1.1	375.5	O K
240 min Summer	93.551	0.251	1.1	401.7	O K
360 min Summer	93.570	0.270	1.1	433.4	O K
480 min Summer	93.580	0.280	1.1	451.4	O K
600 min Summer	93.587	0.287	1.1	462.9	O K
720 min Summer	93.592	0.292	1.1	470.8	O K
960 min Summer	93.598	0.298	1.1	480.3	O K
1440 min Summer	93.602	0.302	1.1	487.9	O K
2160 min Summer	93.603	0.303	1.1	489.4	O K
2880 min Summer	93.601	0.301	1.1	486.3	O K
4320 min Summer	93.596	0.296	1.1	477.5	O K
5760 min Summer	93.594	0.294	1.1	473.5	O K
7200 min Summer	93.593	0.293	1.1	472.4	O K
8640 min Summer	93.593	0.293	1.1	473.0	O K
10080 min Summer	93.594	0.294	1.1	474.8	O K
15 min Winter	93.405	0.105	1.1	164.7	O K
30 min Winter	93.435	0.135	1.1	213.4	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	104.986	0.0	84.7	19	
30 min Summer	68.160	0.0	93.0	34	
60 min Summer	42.334	0.0	180.2	64	
120 min Summer	27.045	0.0	183.3	124	
180 min Summer	20.284	0.0	179.8	184	
240 min Summer	16.354	0.0	176.5	244	
360 min Summer	11.881	0.0	170.7	364	
480 min Summer	9.368	0.0	165.7	484	
600 min Summer	7.761	0.0	162.0	604	
720 min Summer	6.641	0.0	159.0	722	
960 min Summer	5.180	0.0	153.9	962	
1440 min Summer	3.644	0.0	145.7	1442	
2160 min Summer	2.578	0.0	312.7	2160	
2880 min Summer	2.029	0.0	299.2	2880	
4320 min Summer	1.471	0.0	274.7	3848	
5760 min Summer	1.185	0.0	615.2	4560	
7200 min Summer	1.011	0.0	588.9	5336	
8640 min Summer	0.895	0.0	560.4	6144	
10080 min Summer	0.811	0.0	534.0	7056	
15 min Winter	104.986	0.0	84.7	19	
30 min Winter	68.160	0.0	93.1	34	
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960 min Winter	93.597	0.297	1.1	479.8	O K
1440 min Winter	93.602	0.302	1.1	487.3	O K
2160 min Winter	93.603	0.303	1.1	489.0	O K
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4320 min Winter	93.596	0.296	1.1	477.2	O K
5760 min Winter	93.590	0.290	1.1	467.3	O K
7200 min Winter	93.587	0.287	1.1	462.9	O K
8640 min Winter	93.585	0.285	1.1	459.1	O K
10080 min Winter	93.583	0.283	1.1	455.9	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	42.334	0.0	180.2	64	
120 min Winter	27.045	0.0	183.4	122	
180 min Winter	20.284	0.0	180.0	182	
240 min Winter	16.354	0.0	176.8	242	
360 min Winter	11.881	0.0	171.1	360	
480 min Winter	9.368	0.0	166.3	478	
600 min Winter	7.761	0.0	162.7	596	
720 min Winter	6.641	0.0	159.7	714	
960 min Winter	5.180	0.0	154.9	952	
1440 min Winter	3.644	0.0	147.1	1414	
2160 min Winter	2.578	0.0	315.0	2100	
2880 min Winter	2.029	0.0	302.3	2772	
4320 min Winter	1.471	0.0	279.3	4064	
5760 min Winter	1.185	0.0	621.0	4680	
7200 min Winter	1.011	0.0	598.2	5552	
8640 min Winter	0.895	0.0	572.1	6488	
10080 min Winter	0.811	0.0	548.3	7464	
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<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	93.439	0.139	1.1	218.9	O K
30 min Summer	93.481	0.181	1.1	287.2	O K
60 min Summer	93.524	0.224	1.1	358.2	O K
120 min Summer	93.580	0.280	1.1	450.4	O K
180 min Summer	93.612	0.312	1.1	504.3	O K
240 min Summer	93.633	0.333	1.1	540.1	O K
360 min Summer	93.659	0.359	1.1	583.7	O K
480 min Summer	93.673	0.373	1.1	608.3	O K
600 min Summer	93.682	0.382	1.1	623.9	O K
720 min Summer	93.688	0.388	1.1	634.3	O K
960 min Summer	93.695	0.395	1.1	646.1	O K
1440 min Summer	93.700	0.400	1.1	653.6	O K
2160 min Summer	93.698	0.398	1.1	650.7	O K
2880 min Summer	93.693	0.393	1.1	642.6	O K
4320 min Summer	93.682	0.382	1.1	622.8	O K
5760 min Summer	93.673	0.373	1.1	608.1	O K
7200 min Summer	93.669	0.369	1.1	600.2	O K
8640 min Summer	93.666	0.366	1.1	595.9	O K
10080 min Summer	93.665	0.365	1.1	594.2	O K
15 min Winter	93.439	0.139	1.1	218.9	O K
30 min Winter	93.481	0.181	1.1	287.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	139.422	0.0	93.5	19	
30 min Summer	91.595	0.0	92.6	34	
60 min Summer	57.277	0.0	183.6	64	
120 min Summer	36.163	0.0	173.3	124	
180 min Summer	27.104	0.0	167.0	184	
240 min Summer	21.863	0.0	165.1	244	
360 min Summer	15.885	0.0	165.9	364	
480 min Summer	12.520	0.0	167.8	484	
600 min Summer	10.358	0.0	168.5	604	
720 min Summer	8.849	0.0	168.5	724	
960 min Summer	6.873	0.0	167.3	962	
1440 min Summer	4.789	0.0	162.4	1442	
2160 min Summer	3.338	0.0	324.7	2160	
2880 min Summer	2.593	0.0	318.4	2880	
4320 min Summer	1.840	0.0	302.1	4192	
5760 min Summer	1.458	0.0	631.9	4840	
7200 min Summer	1.228	0.0	608.7	5552	
8640 min Summer	1.075	0.0	587.0	6320	
10080 min Summer	0.966	0.0	569.3	7160	
15 min Winter	139.422	0.0	93.6	19	
30 min Winter	91.595	0.0	92.6	34	
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.		Redbourn				
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.		Preliminary Attenuation Calcs				
Date 09/10/2025		Designed by SEK				
File 251007-SEK-Preliminary ...		Checked by				
XP Solutions		Source Control 2019.1				
<u>Summary of Results for 100 year Return Period (+40%)</u>						
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	
60 min Winter	93.524	0.224	1.1	358.1	O K	
120 min Winter	93.580	0.280	1.1	450.3	O K	
180 min Winter	93.612	0.312	1.1	504.2	O K	
240 min Winter	93.633	0.333	1.1	540.0	O K	
360 min Winter	93.659	0.359	1.1	583.6	O K	
480 min Winter	93.673	0.373	1.1	608.2	O K	
600 min Winter	93.682	0.382	1.1	623.9	O K	
720 min Winter	93.688	0.388	1.1	634.3	O K	
960 min Winter	93.695	0.395	1.1	646.3	O K	
1440 min Winter	93.700	0.400	1.1	654.0	O K	
2160 min Winter	93.699	0.399	1.1	651.9	O K	
2880 min Winter	93.694	0.394	1.1	644.5	O K	
4320 min Winter	93.684	0.384	1.1	627.0	O K	
5760 min Winter	93.673	0.373	1.1	608.4	O K	
7200 min Winter	93.666	0.366	1.1	596.5	O K	
8640 min Winter	93.662	0.362	1.1	589.1	O K	
10080 min Winter	93.659	0.359	1.1	583.3	O K	
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)		
60 min Winter	57.277	0.0	183.7	64		
120 min Winter	36.163	0.0	173.4	124		
180 min Winter	27.104	0.0	167.2	182		
240 min Winter	21.863	0.0	165.3	242		
360 min Winter	15.885	0.0	166.1	360		
480 min Winter	12.520	0.0	168.1	478		
600 min Winter	10.358	0.0	168.8	596		
720 min Winter	8.849	0.0	168.8	716		
960 min Winter	6.873	0.0	167.6	952		
1440 min Winter	4.789	0.0	162.8	1416		
2160 min Winter	3.338	0.0	325.3	2116		
2880 min Winter	2.593	0.0	319.1	2796		
4320 min Winter	1.840	0.0	303.5	4108		
5760 min Winter	1.458	0.0	634.4	5304		
7200 min Winter	1.228	0.0	612.2	5696		
8640 min Winter	1.075	0.0	591.7	6656		
10080 min Winter	0.966	0.0	574.9	7568		
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. . .	Redbourn SW Drainage Strategy Preliminary Attenuation Calcs																																					
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<u>Rainfall Details</u> <table border="0" style="width: 100%;"> <tr> <td style="width: 60%;">Rainfall Model</td> <td style="width: 40%;">FEH</td> </tr> <tr> <td>Return Period (years)</td> <td>100</td> </tr> <tr> <td>FEH Rainfall Version</td> <td>2013</td> </tr> <tr> <td>Site Location</td> <td>GB 511025 212503 TL 11025 12503</td> </tr> <tr> <td>Data Type</td> <td>Point</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> </tr> <tr> <td>Winter Storms</td> <td>Yes</td> </tr> <tr> <td>Cv (Summer)</td> <td>1.000</td> </tr> <tr> <td>Cv (Winter)</td> <td>1.000</td> </tr> <tr> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Climate Change %</td> <td>+40</td> </tr> </table> <u>Time Area Diagram</u> Total Area (ha) 0.630 <table border="0" style="width: 100%; margin-top: 20px;"> <tr> <td style="width: 30%;"></td> <td style="width: 20%; text-align: center;">Time (mins)</td> <td style="width: 20%; text-align: center;">Area</td> <td style="width: 30%;"></td> </tr> <tr> <td></td> <td style="text-align: center;">From:</td> <td style="text-align: center;">To:</td> <td style="text-align: center;">(ha)</td> </tr> <tr> <td></td> <td style="text-align: center;">0</td> <td style="text-align: center;">4</td> <td style="text-align: center;">0.630</td> </tr> </table>			Rainfall Model	FEH	Return Period (years)	100	FEH Rainfall Version	2013	Site Location	GB 511025 212503 TL 11025 12503	Data Type	Point	Summer Storms	Yes	Winter Storms	Yes	Cv (Summer)	1.000	Cv (Winter)	1.000	Shortest Storm (mins)	15	Longest Storm (mins)	10080	Climate Change %	+40		Time (mins)	Area			From:	To:	(ha)		0	4	0.630
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