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NPPF: Flood Risk Assessment & Outline Drainage Strategy

Land East of Boscobel Lane, Bishops Wood

Boningale Homes Ltd

SHF.710.013.HY.R.001.A

'Experience and expertise working in union'

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Executive Summary

This report presents a Flood Risk Assessment in accordance with the National Planning Policy Framework and National Planning Practice Guidance: Flood Risk and Coastal Change ID: 7 guidance[1], for a proposed residential development located on land east of Boscobel Lane, Bishops Wood, Stafford, ST19 9AA.

The report assesses the flood risk and how this could be managed to allow the Site to be developed in support of the outline planning application. The FRA also includes an assessment of the surface water and foul drainage requirements.

A summary of the baseline Site condition is included below:

- The 5.24-hectare (ha) Site is comprised of agricultural (arable) land, underlain by slightly acid loamy and clayey soils with impeded drainage soils and mudstone bedrock.

The Site slopes in two directions from the topographic highpoint in the northwest corner, towards the eastern and southern boundaries. Therefore, the Site has two sub catchments. The risk of flooding is assessed as follows:

  - The risk of surface water flooding is assessed as negligible for most of the Site, with no flooding associated with highway access with only a small low chance area of flooding along the eastern boundary of the Site.
  - Flood risk from all other sources is assessed as negligible.

Flood risk from identified sources can be reduced to a negligible or low and acceptable level through the following approach:

Subject to the proposed avoidance measures, the Sequential Test is not required:

  - Set finished floor levels above external levels.
  - Adoption of a surface water management strategy to manage low risk surface water flooding generated within the Site boundary (see Section 6).
  - Fit the outfall to the identified ditch with backflow prevention and provide a high level overflow.

Further to the above, the FRA has recommended further measures in line with statutory requirements / following best practice. The FRA has explored control, mitigate and management measures. A summary is included in the table below.

The proposed residential use is classified as more vulnerable. More vulnerable uses are considered acceptable in flood risk in Flood Zone 1 (low risk). There is, however, a low risk of flooding from surface water flooding. Subject to the implementation of the above avoidance measures, the Sequential Test and Exception Test need not be applied.

[1] https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities

Source of Flooding	Risk of Flooding	Risk Without Measures	Recommended Measures	Risk to Development with Measures
Fluvial – None identified	Negligible	Negligible	N/A	Negligible
Tidal – None identified	Negligible	Negligible	N/A	Negligible
Groundwater - Secondary B (bedrock), Secondary A and secondary (undifferentiated) (superficial)	Negligible	Negligible	N/A	Negligible
Surface Water – Surface Water Flow Pathways	Negligible for most of the Site. There is a small low chance area of flooding along the eastern boundary.	Negligible for most of the Site. There is a small low chance area of flooding along the eastern boundary.	Avoid and control	Negligible
Sewers and Mains – None identified	Negligible.	Negligible	N/A	Negligible
Infrastructure Failure – None identified	Negligible	Negligible	N/A	Negligible

- The FRA has considered the potential impact of the development on surface water runoff rates, given the increase in impermeable areas post-development. These rates have been calculated, and it has been demonstrated that surface water can be managed, such that flood risk to and from the Site following development will not increase. This will be achieved through restricted discharge rates (i.e. calculated greenfield [QBAR]) and appropriately sized detention basin, with an outfall Watercourse 1 within the wider land ownership.
- The foul flow discharge location will be agreed with Severn Trent Water once planning permission has been granted.

The FRA demonstrates the proposed development would be operated with minimal risk from flooding and would not increase flood risk elsewhere. The development should therefore not be precluded on the grounds of flood risk, as well as surface water and foul drainage.

1.0 Introduction

1.1 Background

1.1.1 Enzygo Ltd was commissioned by Boningale Homes Ltd to carry out a site-specific Flood Risk Assessment (FRA), including an outline surface water and foul drainage strategy, in support of an outline planning application for a proposed residential development. The Site is located on land east of Boscobel Lane, Bishops Wood, Stafford, ST19 9AA (the 'Site').

1.1.2 The proposal is for a residential development, with associated public open space and shop on the 5.24-hectare (ha) Site. A copy of the indicative layout is included in Appendix 1.

1.1.3 A site-specific FRA assesses the current and future flood risk to and from a development site. It demonstrates how flood risk will be managed now and over the development's lifetime, taking climate change, drainage, and the vulnerability of its intended users into account.

1.1.4 The objectives of a site-specific FRA are to:

- Assess whether a proposed development is likely to be affected by current or future flooding from a range of sources.
- Assess whether the development will increase flood risk elsewhere.
- Decide on measures to deal with these effects and risks and assess their appropriateness.
- Provide enough evidence for the local planning authority to apply (if necessary) the Sequential Test.
- Decide whether the development will be safe and will pass the Exception Test if applicable.

1.1.5 In England, planning applications for development need an FRA[2] for most developments including:

- In Flood Zones 2 and 3 including minor development and change of use.
- Sites of 1ha or larger in Flood Zone 1.
- Sites of less than 1ha in Flood Zone 1, including change of use to a more vulnerable class (for example from commercial to residential), and where they could be affected by sources of flooding other than rivers and the sea.
- Land in Flood Zone 1 in a Critical Drainage Area (CDA) as notified by the Environment Agency (EA).
- Land in Flood Zone 1 identified in a Strategic Flood Risk Assessment (SFRA) as being at increased flood risk in future.

1.1.6 An FRA is required for this development, as initial screening using EA online indicative flood mapping shows the Site is in Flood Zone 1 (low risk) but is more than 1ha and is at risk of surface water flooding.

1.1.7 The purpose of this FRA is to assess the risk of flooding to the proposed development and where possible recommend measures to demonstrate that future users of the development

[2] Department for Environment, Food & Rural Affairs and Environment Agency (published March 2014 and update February 2017). Flood Risk Assessments if You're Applying for Planning Permission [https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications].

would remain safe throughout its lifetime, that the development would not increase flood risk on Site and elsewhere and, where practicable, would reduce flood risk overall.

1.2 Scope

1.2.1 Government policy on development and flood risk is set out in the National Planning Policy Framework (NPPF)[3] and is supported by National Planning Practice Guidance: Flood Risk and Coastal Change [NPPG ID7][4].

1.2.2 NPPF paragraphs 161-186 set out the need for an appropriate assessment of flood risk at all levels of the planning process and require the application of a sequential risk-based approach to assess the suitability of land for development in flood risk areas[5].

1.2.3 The FRA should also make allowances for climate change[6] to minimise vulnerability and provide resilience to flooding and coastal change in the future. The allowances are predictions of anticipated change in:

- Peak river flow by river basin district.
- Peak rainfall intensity.
- Sea level rise.
- Offshore wind speed and extreme wave height.

1.2.4 The allowances are based on climate change projections and different scenarios of carbon dioxide emissions to the atmosphere. There are different allowances for different periods of time over the next century.

1.2.5 Site-specific FRAs are categorised according to level[7]. Simple Level 1 Screening studies give a general indication of the potential flood risk to a site and identify whether more detailed Level 2 assessment is required or not. A Level 2 assessment is a qualitative appraisal to develop understanding of flood risk to a site and the effects of the site on flooding elsewhere including recommended measures (see Section 5 - Avoid, Control, Mitigate, Manage). Level 3 assessments are more detailed quantitative studies, for example modelling to establish flood levels at a site in the absence of EA or other data or providing detailed outline drainage designs.

1.2.6 This report is a Level 2 qualitative FRA, which includes a Level 3 assessment of the surface water and foul drainage requirements for the proposed development.

1.3 Aims

1.3.1 This FRA aims to provide enough flood risk information to satisfy the requirements of the NPPF, PPG ID7 and regional/local government plans and policies. It describes the potential for the Site to be impacted by flooding, the impacts of the proposed development on flooding

[3] Ministry of Housing, Communities & Local Government (published March 2012 and updated December 2024). National Planning Policy Framework [https://www.gov.uk/government/publications/national-planning-policy-framework--2].
[4] Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government (published March 2014 and updated August 2022). Planning Practice Guidance ID7-020-20220825; Flood Risk & Coastal Change [https://www.gov.uk/guidance/flood-risk-and-coastal-change].
[5] https://www.gov.uk/guidance/national-planning-policy-framework/14-meeting-the-challenge-of-climate-change-flooding-and-coastal-change#footnote59
[6] Environment Agency (published February 2016 and updated May 2022). Flood Risk Assessments: Climate Change Allowances [https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances].
[7] CIRIA (October 2004) CIRIA C624 - Part C, Chapter 6, Section 6.1 to 6.3.

elsewhere near the Site, and the recommended measures that could be incorporated into the development to manage the identified risks.

1.4 Planning Context

National Policy

1.4.1 The FRA was prepared in accordance with the NPPF and NPPG ID7.

Regional/Local Policy

1.4.2 This FRA considers the following policies within the South Staffordshire Core Strategy[8] from the South Staffordshire Local Plan:

- Core Policy 3: Sustainable Development and Climate Change
- Core Policy EQ7: Water Quality

Strategic Flood Risk Assessment (SFRA)

1.4.3 The FRA has reviewed the guidance within the South Staffordshire Strategic Flood Risk Assessment (SFRA) report and associated mapping[9].

1.4.4 SFRA mapping is included in Appendix 2.

- Level 1 SFRA: Southern Staffordshire Councils Level 1 Strategic Flood Risk Assessment Final Report (August 2019)[10].
- Level 2 SFRA: South Staffordshire Council Level 2 Strategic Flood Risk Assessment Final Report (November 2022)[11].

1.4.5 Below is a summary of our review which justifies the requirement of site-specific assessment of all sources of flooding as part of this FRA (refer to Section 4):

- The SFRA is a Level 1 Screening study. One of the aims of the SFRA (Section 1) is to "*provide an understanding of the risk from all types of flooding across Southern Staffordshire and [present] clear and robust evidence. It also provides useful information to inform future Infrastructure Planning and Neighbourhood Plans.*"
- The Site is not within the assessed area of the Level 2 SFRA.
- The mapping of key flooding sources (fluvial/tidal, groundwater, surface water) is based on the following data sources[12], with caveats on limitations detailed below:
  - Fluvial/Tidal - Flood Map for Planning (Rivers and Sea)[13]

    Flood Zones 2 and 3a, as shown in Appendix A, were produced from the Environment Agency's Flood Maps (which match the online Environment Agency's Flood Map for Planning), and the

[8] https://www.sstaffs.gov.uk/sites/default/files/2023-02/Core%20Strategy%20Dev%20Plan%20Doc.pdf
[9] https://www.sstaffs.gov.uk/sites/default/files/2023-02/geopdf_e2_south_staffs_district_central_-_codsall_brewood_and_coven.pdf
[10] https://www.staffordbc.gov.uk/sites/default/files/cme/DocMan1/Planning%20Policy/Water%20Management%20and%20Flooding/2018s1642%20-%20Southern%20Staffordshire%20SFRA%20Final%20Report%20v1.0.pdf
[11] https://www.sstaffs.gov.uk/sites/default/files/2023-02/sfra_2022_report.pdf
[12] https://www.sstaffs.gov.uk/sites/default/files/2023-02/appendix_b_-_data_sources_used_in_the_sfra.pdf
[13] https://www.data.gov.uk/dataset/cf494c44-05cd-4060-a029-35937970c9c6/flood-map-for-planning-rivers-and-sea-flood-zone-2
https://www.data.gov.uk/dataset/bed63fc1-dd26-4685-b143-2941088923b3/flood-map-for-planning-rivers-and-sea-flood-zone-3

1,000-year and 100-year fluvial model outputs, where they differ from Flood Map for Planning. The model outlines were compared with the Flood Map for Planning to determine whether the latest modelling results should be used, and this is shown in Appendix E.

Over time, the online mapping is likely to be updated more often than the SFRA, so SFRA users should check there are no major changes in their area.

- Groundwater - BGS Groundwater Flooding[14]

  Mapping of groundwater flood risk has been based on the Areas Susceptible to Groundwater Floding (AStGWF) dataset.

  The AStGWF dataset is a strategic-scale map showing groundwater flood areas on a 1km square grid. It shows the proportion of each 1km grid square, where geological and hydrological conditions indicate that groundwater might emerge. It does not show the likelihood of groundwater flooding occurring and does not take into account the change of flooding from groundwater rebound (e.g. following cessation of mining or industrial activity). This dataset covers a large area of land, and only isolated locations within the overall susceptible area are likely to suffer the consequences of groundwater flooding.

  The AStGWF data should be used only in combination with the other information, for example local data or historical data. It should not be used as sole evidence for any specific flood risk management, land use planning or other decisions at any scale. However, the data can help to identify areas for assessment at a local scale.

- Surface Water - Risk of Flooding from Surface Water Extent[15]

  Mapping of surface water flood risk in study area has been taken from the Risk of Flooding from Surface Water (RoFfSW) Maps published online by the Environment Agency. These maps are intended to provide a consistent standard of assessment for surface water flood risk across England and Wales in order to help LLFAs, the Environment Agency and any potential developers to focus their management of surface water flood risk.

  The RoFfSW is derived primarily from identifying topographical flow paths of existing watercourses or dry valleys that contain some isolated ponding locations in low lying areas. They provide a map which displays different levels of surface water flood risk depending on the annual probability of the land in question being inundated by surface water.

  Although the RoFfSW offers improvement on previously available datasets, the results should not be used to understand flood risk for individual properties. The results should be used for high level assessments such as SFRAs for local authorities. If a site is indicated in the Environment Agency mapping to be at risk from surface water flooding, a more detailed assessment should be considered to more accurately illustrate the flood risk at a site-specific scale.

1.4.6 In summary, the SFRA uses macro-scale data, which is broad-brush indicator of potential flood risk sources. A site-specific FRA is undertaken to understand the micro-scale data for a review of more detailed / refined data sources (see Section 2.1-2.2 and Section 4).

[14] https://www.bgs.ac.uk/datasets/groundwater-flooding/
[15] https://www.data.gov.uk/dataset/95ea1c96-f3dd-4f92-b41f-ef21603a2802/risk-of-flooding-from-surface-water-extent-3-3-percent-annual-chance

Guidance Documents / Best Practice

1.4.7 This FRA also considers the following flood risk and drainage guidance documents:

- Staffordshire SuDS Handbook[16]
- Staffordshire Local Flood Risk Management Strategy[17]

1.5 Report Structure

1.5.1 This report is structured as follows:

- Section 2 identifies the sources of information that were consulted.
- Section 3 describes the existing Site.
- Section 4 outlines the baseline flood risk from all sources.
- Section 5 details the recommended measures against identified flood risk sources.
- Section 6 assesses the surface water drainage requirements of the proposed development.
- Section 7 assesses the foul drainage requirements of the proposed development.
- Section 8 presents a summary and conclusions.

[16] Information for Planners and Developers - Staffordshire County Council

[17] https://www.staffordshire.gov.uk/Environment/Flood-Risk-Management/Documents/Updates-2024/Local-Flood-Risk-Management-Strategy-Action-Plan.pdf

2.0 Sources of Information

2.1 Sources of Information

2.1.1 The following information was consulted:

- Ordnance Survey mapping (Drawings 0001 and 0002).
- Detailed topographic survey (Appendix 3).
- EA online mapping (Flood Map for Planning[18], Long Term Flood Risk Assessment for Locations in England[19], Catchment Data Explorer[20] and Main River Map[21]).
- EA Reduction in Risk of Flooding from Rivers and Sea online mapping[22].
- Online mapping for Climate Change Allowances for Peak River Flow and Peak Rainfall in England online mapping[23].
- National Soils Resources Institute (NSRI): Soilscapes online mapping[24].
- British Geological Survey [BGS] Geology Viewer online mapping[25].
- British Geological Survey [BGS] Borehole Records online mapping[26].
- Landmark's Promap: Flood Data package (see Drawings).
- Geosmart 1 in 100-year groundwater flood risk map (see Drawings).
- DEFRA's Magic Map for identifying Designated Sites[27].
- River Levels UK for identifying Flood Alert and Flood Warning areas[28].

2.2 Consultation and Discussion with Regulators

2.2.1 Consultation and discussions were undertaken with the relevant water regulators.

Environment Agency

2.2.2 The Environment Agency (EA) is a statutory consultee on flood risk and planning and is directly responsible for the prevention, mitigation, and remediation of flood damage for main rivers and coastal areas; and it has a strategic overview for all forms of flooding.

2.2.3 EA Standing Advice[29] and the NPPF/PPG ID: 7 was consulted and reviewed.

2.2.4 Correspondence with the EA is included in Appendix 4.

[18] https://flood-map-for-planning.service.gov.uk/
[19] https://flood-warning-information.service.gov.uk/long-term-flood-risk/
[20] http://environment.data.gov.uk/catchment-planning/
[21] https://environment.maps.arcgis.com/apps/webappviewer/index.html?id=17cd53dfc524433980cc333726a56386
[22] ArcGIS - My Map
[23] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances
[24] https://www.landis.org.uk/soilscapes/
[25] https://www.bgs.ac.uk/map-viewers/bgs-geology-viewer/
[26] https://www.bgs.ac.uk/information-hub/borehole-records/
[27] https://magic.defra.gov.uk/magicmap.aspx
[28] https://riverlevels.uk/flood-map#.XclKwPn7RPZ
[29] Environment Agency and Department for Environment, Food & Rural Affairs (published April 2012 and updated February 2022). Preparing a Flood Risk Assessment: Standing Advice [https://www.gov.uk/guidance/flood-risk-assessment-standing-advice].

Lead Local Flood Authority

2.2.5 Staffordshire County Council as the Lead Local Flood Authority (LLFA) is responsible for local flood risk management in their area and for maintaining a register of flood risk assets. They also have lead responsibility for managing the risk of flooding from surface water, groundwater, and ordinary watercourses.

2.2.6 Correspondence with the LLFA is included in Appendix 5.

2.2.7 The document of Refusal of Outline Planning Permission from the LLFA for the previously submitted application is also included in Appendix 5.

Water Utility

2.2.8 Drainage and sewerage services in the UK are provided by a number of water and sewerage companies. Severn Trent Water is responsible for sewerage within the area of the Site.

2.2.9 All sewerage undertakers maintain the 'DG5 register' of properties and external areas (such as gardens, highways, open spaces) which have suffered flooding from public foul/combined sewers. It does not include flooding caused by blockages.

2.2.10 Severn Trent Water asset plans and the pre-development enquiry response from the previous development application are included in Appendix 6.

2.3 Site Walkover

2.3.1 Enzygo staff carried out a walkover of the Site during November 2024. Observations made were used to inform the Site description.

3.0 Site Location and Description

3.1 Location

3.1.1 The Site is located on land east of Boscobel Lane, Bishops Wood, Stafford, ST19 9AA.

3.1.2 The Site is centred on National Grid Reference (NGR) 383792, 309215.

3.1.3 The 5.24ha Site location is shown in Drawing 0001 and in more detail in Drawing 0002.

3.2 Land Use

3.2.1 The land use is comprised of agricultural (arable) land (Figures 3.1 and 3.2).

3.2.2 The Site is bounded by Tong Road and Kiddemore Green Road to the north, with residential buildings, St Johns Church, and agricultural fields beyond; an orchard to the east; agricultural land to the south; and Boscobel Lane to the west; with an agricultural field beyond.

3.2.3 Vehicle access is currently off of Boscobel Lane to the west of the Site.

Figure 3.1: Images of the Site

Left: View looking east across the Site. Right: View looking west across the Site.

Figure 3.2: Aerial Photograph of the Site

Image © 2025 Digital Globe.

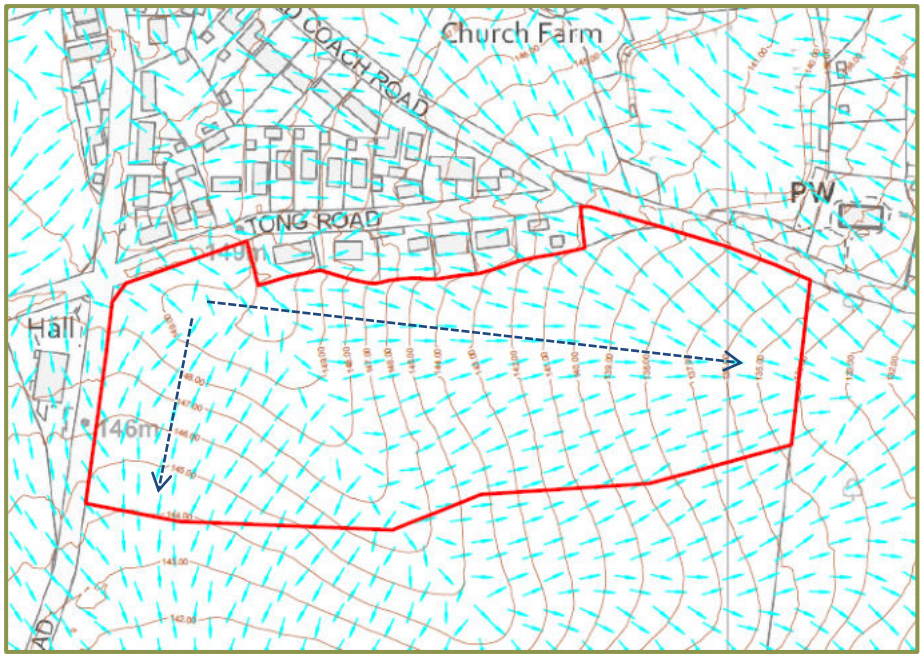
3.3 Topographic Information

3.3.1 A detailed topographic survey was carried out during March 2024 and a copy is included in Appendix 3.

3.3.2 Flow pathway analysis was undertaken in KeyTERRA-FIRMA (KTF) software to understand watershed catchments (Drawing 0007). A summary of the Site topography is included in Figure 3.3 and described below.

3.3.3 The topographic highpoint of the Site is 150.45 metres Above Ordnance Datum (m AOD) in the northwestern corner. It falls east to 134.23m AOD at the eastern boundary, and south to 144.21m AOD at the southern boundary. The eastern topographic fall of 16.22m over 315m gives a gradient of 1:19. The southern topographic fall of 6.24m over 125m gives a gradient of 1:20.

Figure 3.3: Summary of Site Topography



3.4 Soils and Geology

Soils Mapping

3.4.1 The online NSRI Soilscapes mapping (Figure 3.4) shows the Site is underlain by slightly acid loamy and clayey soils with impeded drainage. The soils mapping is indicative and there may be localised variation.

Figure 3.4: Soils Mapping

Soils Data © Cranfield University (NSRI) and for the Controller of HMSO [2025].

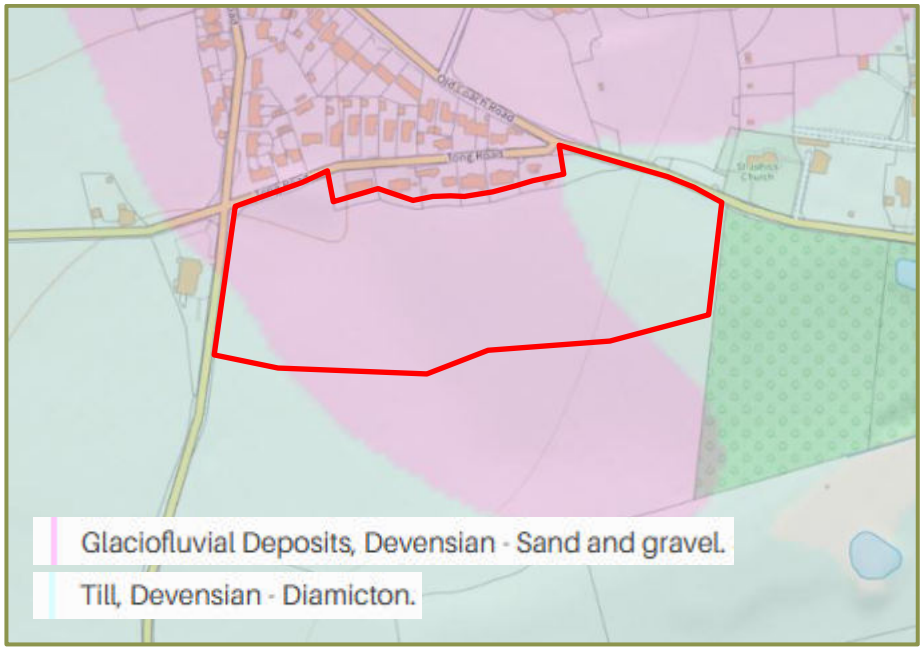
Geology Mapping

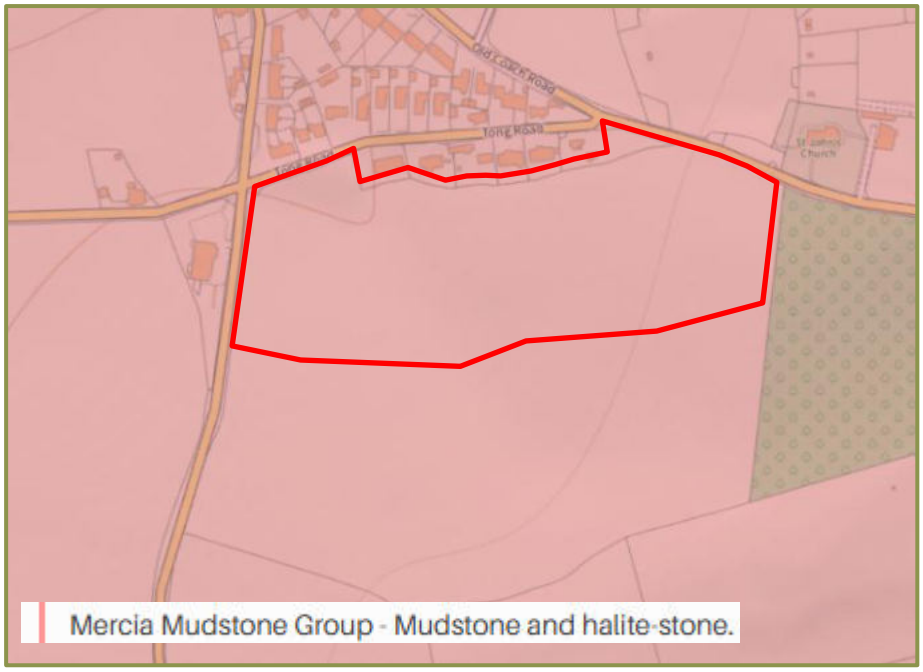
3.4.2 The online BGS Geology Viewer (Figure 3.5) shows most of Site is underlain by Glaciofluvial Deposits, Devensian – Sand and gravel. The southwestern corner and eastern extents of the Site are underlain by Till, Devensian – Diamicton (superficial deposits).

3.4.3 The bedrock beneath the Site is Mercia Mudstone Group – Mudstone and halite-stone.

3.4.4 The geology mapping is indicative and there may be localised variation.

Figure 3.5: Geology Mapping (continues over page)





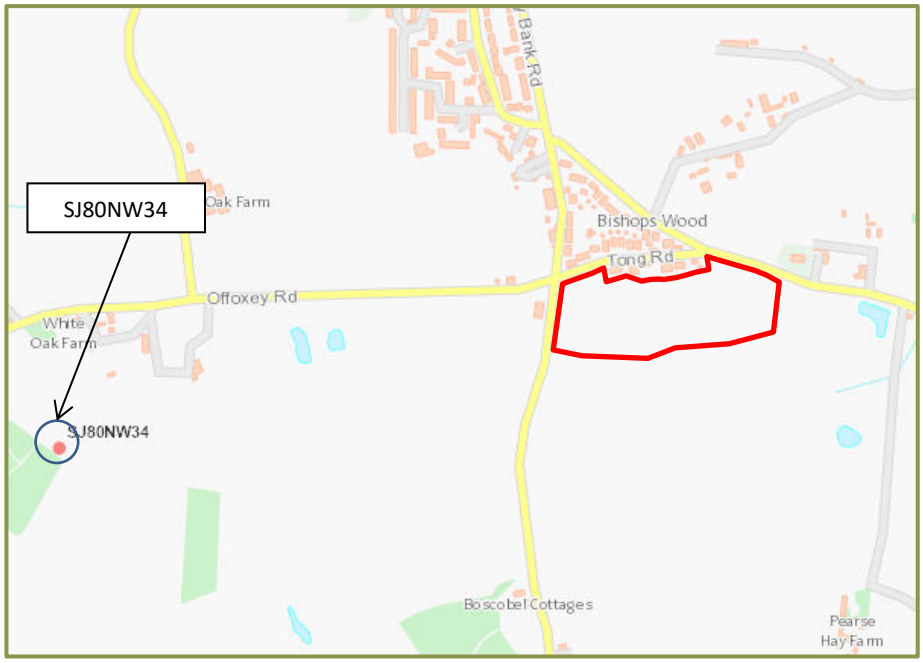
Top: Superficial deposits. Bottom: Bedrock geology. Contains British Geological Survey materials © NERC [2025].

BGS Borehole Records

3.4.5 The BGS Borehole Records online mapping (Figure 3.6) shows no borehole records located in the extent of the Site. There is one borehole record (SK80NW34) approximately 870m west of the Site.

3.4.6 The borehole records (Appendix 7) confirm the geology as depicted by the Geology of Britain mapping (Table 3.1).

Figure 3.6: Borehole Mapping



Contains British Geological Survey materials © NERC [2025].

Table 3.1: BGS Borehole Data

Reference	Summary of Strata	Depth (m bgl)	Groundwater Depth (m bgl)
SJ80NW34	0.00 - 0.30m = Turf and soil 0.30 - 1.52m = Clay 1.52 – 3.00m = Sand 3.00 – 6.10m = Brown Clay 6.10 – 46.63m = Red Marl and Light Gray Marl 46.63 – 47.55m = Loamy Sands 47.55 – 52.73m = Loamy Sands and bands of Marl 52.73 – 53.00m = Sand Clay 53.00 – 61.00m = Red Marl	61.00	Encountered between 1.52m and 3.00m. Resting level encountered at 16.15m

Contains British Geological Survey materials © NERC [2025].

Soakaway Testing

3.4.7 Soakaway testing was undertaken on the 28th November 2024 by Hexa Consulting Ltd. A copy of Soakaway Testing Results is included in Appendix 8.

3.4.8 Three locations were tested across/near the Site (Figure 3.7). All infiltration tests were advanced to 1.10 m bgl (d) 0.22m (w) 0.22 (l) as a hand excavated pit due to excessive water logging preventing machine access. Pits were filled with water to the base of the topsoil. Tests were monitored for a period ranging from 3 to 5 hours.

3.4.9 At each soakaway test location, only one rate was measured, whereas the DG365 'Soakaway Design' methodology guidance requires three measurements per location. Therefore, to expand the dataset to estimate a third test result, data extrapolation was applied by calculating two additional expected rates for each test pit from the initial measured rate – this is shown in Table 3.2 under 'expected rate'. CIRIA C753 guidance, Section 25.3 describes a reduction of infiltration between test 1 and 2 as half an order of magnitude and a full order of magnitude reduction in rates between test 1 and test 3.

3.4.10 Soakaway testing confirms the soils and geology as depicted by the soils and geology mapping.

Figure 3.7: Soakaway Pit Location Plan

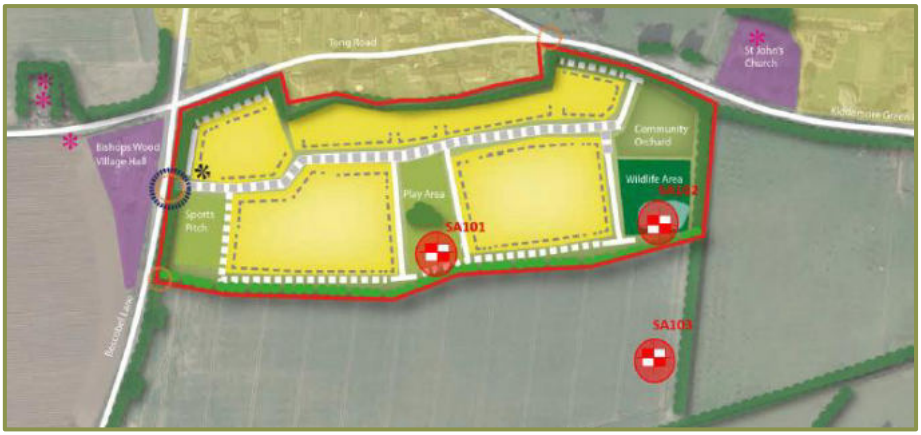


Table 3.2: Infiltration Rates

Soakaway Test	Depth (M bgl)	Soil	Measured / Expected Rate	Soil Infiltration Rate (m/s)
SA101 (5 hours)	1.1	Sandy gravel	Measured	8.67E-06
			Expected	4.34E-06
			Expected	8.67E-07
SA102 (3 hours)		Gravelly clay	No infiltration recorded	No infiltration recorded
SA103 (3 hours)		Sandy gravel	Measured	5.22E-06
			Expected	2.61E-06
			Expected	5.22E-07

3.5 Hydrogeology

Infiltration Potential

3.5.1 The SuDS Infiltration Potential Mapping (Drawing 0005) shows most of the Site is in the mapped extent indicative of high potential. The southwest corner and eastern extent of the Site is indicative of moderate potential, which is likely to be associated with the underlying superficial deposits.

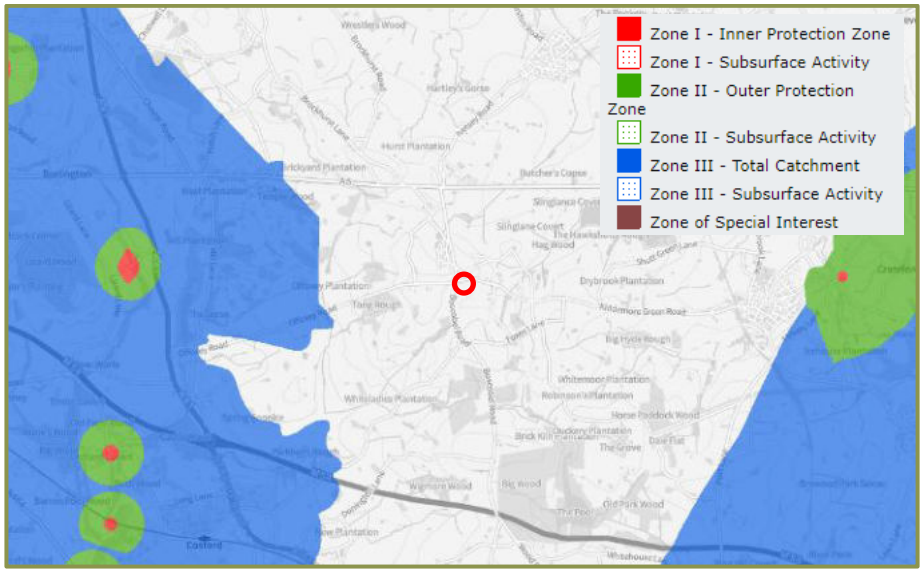
3.5.2 Groundwater was not encountered in any soakaway excavation pits although a slight seepage was noted at the base of the sandy gravel in SA102. However, borehole records show groundwater was encountered between 1.52m and 3.00m, with the resting groundwater level encountered at 16.15m. However, no DG365 compliant infiltration rates have been established by the testing undertaken. SA102 is located in the vicinity of proposed SuDS features and this demonstrated infiltration that was insufficient to calculate an infiltration rate.

3.5.3 SA101 located on the central southern boundary of the Site is the only test pit that had a full test run completed (and as mentioned lacks three complete repeat tests). Extrapolated with the CIRIA C753 mentioned above, the lowest infiltration rate for the Site could be estimated to be 8.67 x 10^{-7} m/s or 0.003 m/hr. Such a rate would be too low to propose infiltration SuDS that can successfully half-drain within 24 hours. Therefore, based on the existing infiltration test data, soakaways/infiltration is not a viable drainage solution for the proposed development.

Defra Magic Map

3.5.4 The online Defra Magic Map mapping (Figure 3.8) shows the Site is not located in a groundwater Source Protection Zone (SPZ).

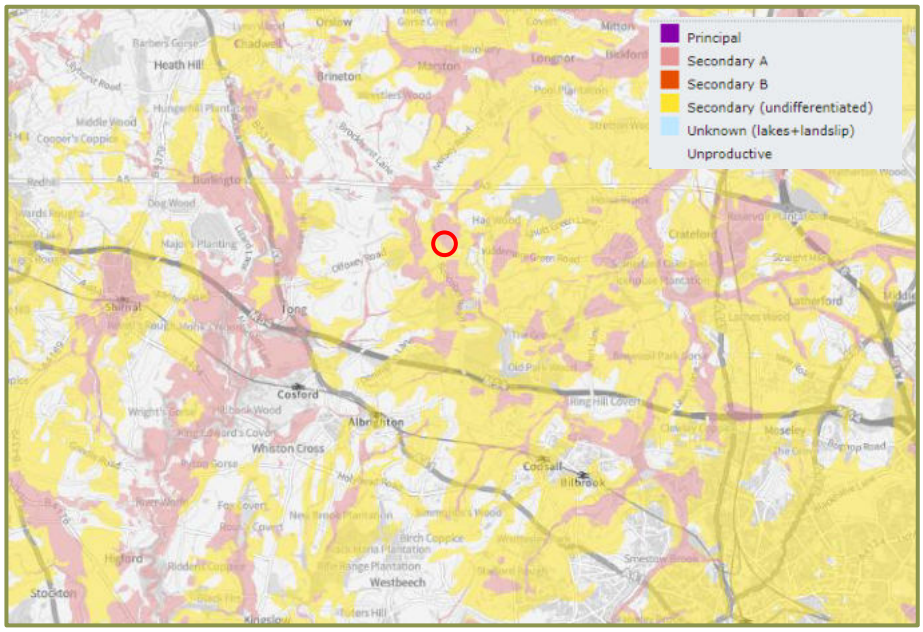
Figure 3.8: Source Protection Zone Map

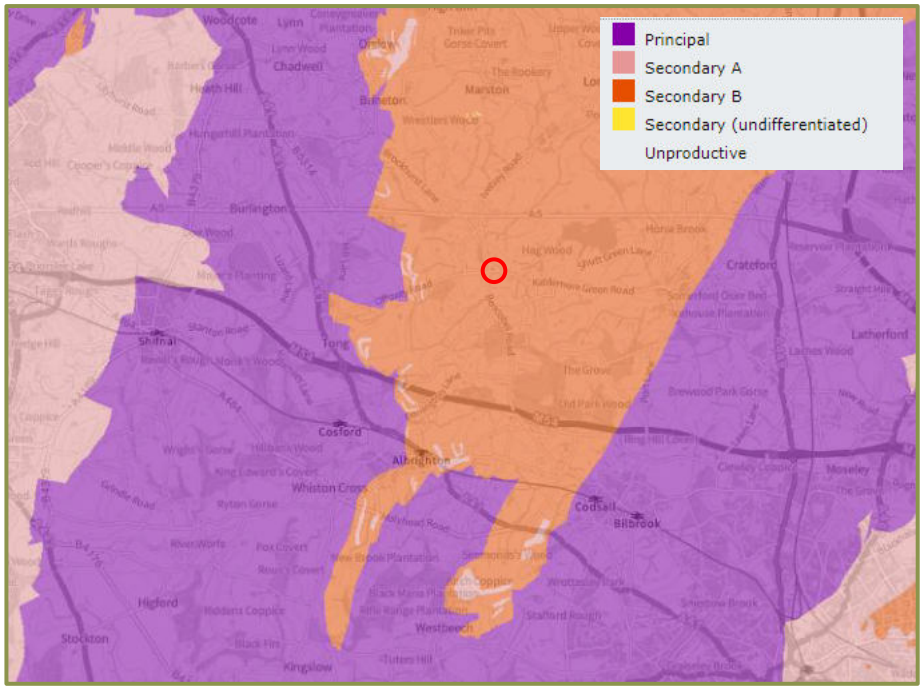


From Magic Map. Contains EA information © EA and database right [2025].

3.5.5 The Site is located above a Secondary B aquifer (bedrock designation). Most of the Site is also located above a Secondary A Aquifer, however the southwest corner and the eastern extent of the Site is located above a Secondary (undifferentiated) Aquifer (superficial designation) (Figure 3.9).

Figure 3.9: Aquifer Designation Map (continues over page)





Top: Aquifer Designation (superficial deposits). Bottom: Aquifer Designation (bedrock). From Magic Map. Contains EA information © EA and database right [2025].

3.6 Catchment Hydrology

OS Mapping and Site Walkover Observations

3.6.1 OS mapping (Figure 3.10) shows the no watercourses flowing through the Site or along any of the Site boundaries. Watercourse 1 flows to the east approximately 130m southeast of the Site. It flows along a field boundary before passing underneath a dirt track, and then flows northeast before passing underneath Tong Road. Watercourse 1 is located within the wider land ownership.

Figure 3.10: Map of Watercourses

Watercourse 1

3.6.2 The Site walkover observed Watercourse 1 (Figure 3.11). The channel was free flowing and free from blockages. Watercourse 1 is classified as 'an ordinary watercourse', where flood risk work is carried out by the local drainage authority/riparian landowner.

Figure 3.11: Watercourse 1

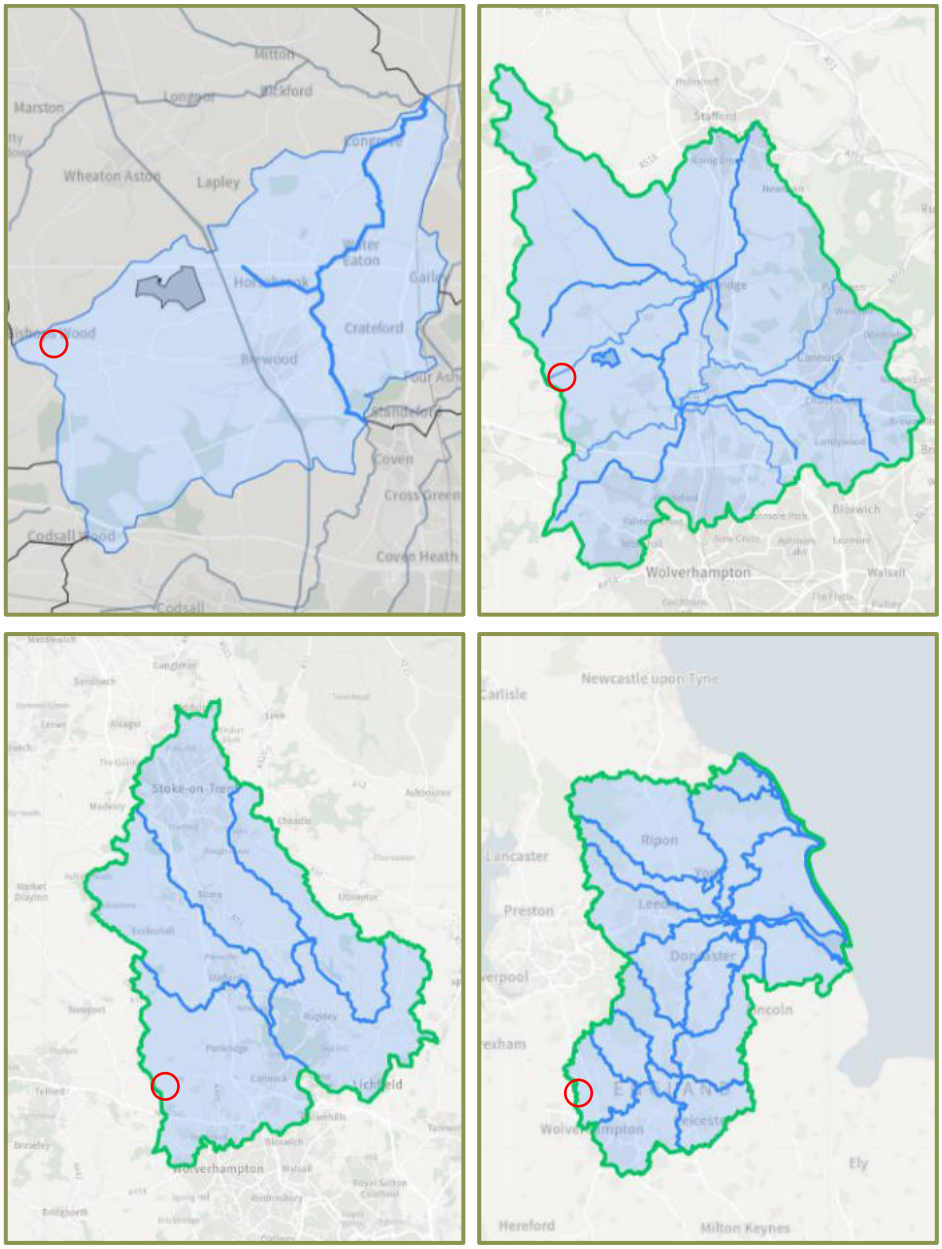
Main River Map

3.6.3 The EA online main river map identifies no main rivers within, or in the vicinity of the Site. A 'main river' is a watercourse where flood risk work is carried out by the EA.

EA Catchment Data Explorer Mapping

3.6.4 The Site resides within the Penk – Saredon Brook to Whiston Brook Water Body (Figure 3.12), which is in the Penk Rivers and Lakes Operational Catchment, Trent Valley Staffordshire Management Catchment, and Humber River Basin District.

Figure 3.12: Catchment Data Explorer



Top Left: Penk – Saredon Brook to Whiston Brook Waer Body. Top Right: Penk Rivers and Lakes Operational Catchment. Bottom Left: Trent Valley Staffordshire Management Catchment. Bottom Right: Humber River Basin District. Contains EA information © EA and database right [2025].

3.7 Sewerage Assets

Public Assets

3.7.1 Severn Trent Water asset plans (Appendix 6) show there are no public assets beneath the Site. The closest mapped assets are three Ø150mm public foul gravity/lateral drains beneath the residential buildings to the north of Tong Road. There is also a Ø150mm public foul gravity/lateral drains sewer– originating approximately 50m north of the northwestern corner of the Site along Ivetsey Bank Road and flows north.

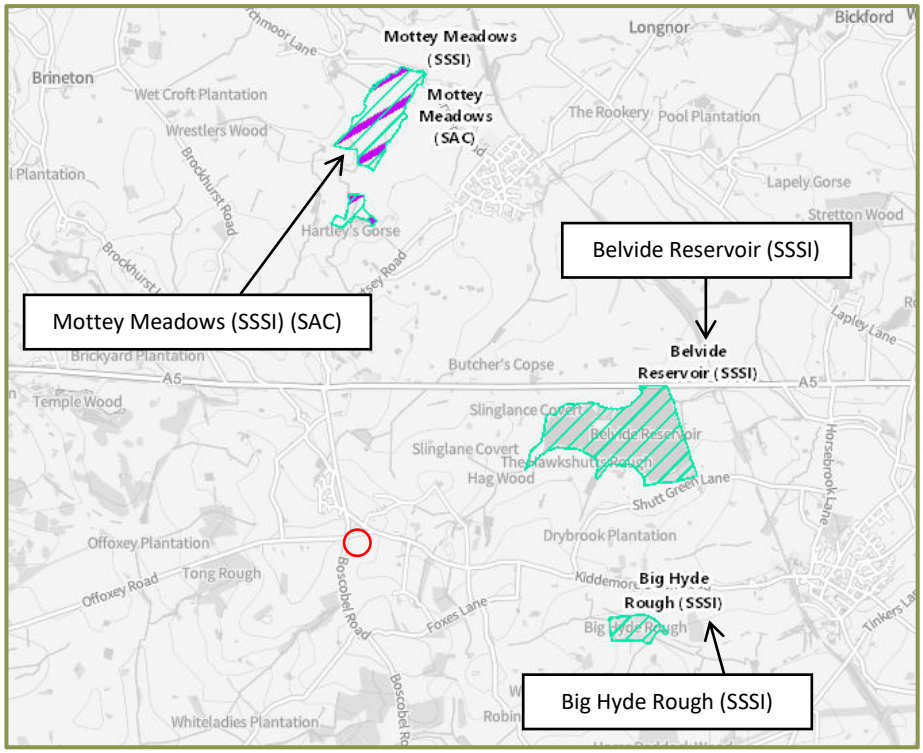
3.8 Designated Sites

3.8.1 The online Defra Magic Map mapping (Figure 3.13) shows the nearest designated site is Belvide Reservoir (Site of Special Scientific Interest [SSSI]), located approximately 1.6km to the northeast of the Site. Big Hyde Rough is also an SSSI and is located approximately 2.5km southeast of the Site. Mottey Meadows Special Area of Conservation (SAC) and SSSI is located approximately 3.1km north of the Site.

3.8.2 The Site is in a SSSI impact risk zone for Belvide Reservoir SSSI and Big Hyde Rough SSSI. This is confirmed by EA correspondence (Appendix 4).

3.8.3 The Belvide Reservoir (SSSI) is hydrologically connected to the Site from a drainage perspective, via Watercourse 1. Consequently, it is proposed that surface water quality is improved through the utilisation of SuDS features (see Section 6).

Figure 3.13: Designated Sites



From Magic Map. Contains EA information © EA and database right [2025].

4.0 Assessment of Flood Risk Sources

4.1 Potential Sources of Flooding

4.1.1 A summary of the potential sources of flooding and source is summarised in Table 4.1. Each source of flooding and level of risk is then assessed in further detail below.

Table 4.1: Potential Risk Posed by Flooding Sources

Flooding Source	Potential Flood Risk at Application Site (Yes/No)	Potential Source	Data Sources
Fluvial	No	None identified	EA consultation response (Appendix 4) and EA Flood Zone mapping (Drawing 0003).
Tidal	No	None identified	EA consultation response (Appendix 4) and EA Flood Zone mapping (Drawing 0003).
Groundwater	Yes	Secondary B (bedrock), Secondary A and secondary (undifferentiated) (superficial)	Geosmart Groundwater (Drawing 0004), BGS Borehole Records (Appendix 7), and SFRA extracts (Appendix 2)
Surface Water	Yes	Poor permeability and Site topography	EA Complex Surface Water Flood Mapping (Drawings 0006.1 to 0006.4), EA Online Surface Water Flood Map 2025 (Figure 4.1), and SFRA extracts (Appendix 2).
Sewers and Mains	No	None identified	Severn Trent Water asset plans and pre development response (Appendix 6), and topographic survey (Appendix 3).
Infrastructure Failure	No	None identified	OS mapping (Drawings 0001 to 0002) and EA online mapping: Long Term Flood Risk Assessment for Locations in England.

4.2 Flood History

Flood History

4.2.1 Correspondence with the EA (Appendix 4) reports no records of flooding within the Site boundary or immediate vicinity.

4.3 Fluvial Flooding

EA Flood Zone Mapping

4.3.1 The EA Flood Zones are the current best information on the extent of the extremes of flooding from rivers or the sea that would occur without the presence of flood defences, since these can be breached, overtopped and may not be in existence for the lifetime of a development.

4.3.2 The EA Flood Zone mapping (Drawing 0003) shows the Site is in Flood Zone 1, which is land outside the 1 in 1000-year 0.1% Annual Exceedance Probability [AEP]) extent of fluvial (river) flooding, at 'low' risk.

Flood Risk Summary

4.3.3 The risk of fluvial flooding is assessed as negligible.

4.4 Tidal Flooding

EA Flood Zone Mapping

4.4.1 OS mapping (Drawings 0001 to 0002) shows the Site is not located close to tidally affected flooding sources.

Flood Risk Summary

4.4.2 The risk of tidal flooding is assessed as negligible.

4.5 Groundwater Flooding

Introduction

4.5.1 Groundwater flooding occurs when subsurface water emerges either at surface or in made ground or in subsurface structures such as basements and services ducts. It occurs as diffuse seepage, emergence from new point source springs or an increase in flow from existing springs. It results from aquifer recharge from infiltrating rainfall, from sinking streams entering aquifers from adjacent non-aquifers, or from high river levels or tides driving water through near surface deposits. It tends to occur with a delay following rainfall and can last for several weeks or months. Groundwater flooding or shallow water tables also prevent or reduce infiltration and so can worsen surface water flooding.

Geosmart Groundwater Flood Risk Map

4.5.2 The Geosmart 1 in 100-year groundwater flood risk map (Drawing 0004) shows the Site is at negligible risk of groundwater flooding and falls within Risk Class 4 (Table 4.2).

4.5.3 Mapped classes combine understanding of likelihood, model and data uncertainty, and possible severity. Likelihood is ranked according to whether we expect groundwater flooding at a site due to extreme elevated groundwater levels with an annual probability of occurrence greater than 1%, considering model and data uncertainty. Severity relates to expectations of the amount of property damage or other harm that groundwater flooding at that location might cause (Table 4.2).

Table 4.2: Groundwater Flood Risk Classification

Risk Class	Probability of Groundwater Flooding	Effect
4: Negligible	Annual probability less than 1%.	Negligible unless unusually sensitive use.
3: Low	Annual probability greater than 1%.	Remote possibility of damage to property or harm to sensitive receptors Flooding likely to be limited to seepages and waterlogged ground, damage to basements and subsurface infrastructure, and should pose no significant risk to life. Surface water flooding may be worsened.
2: Moderate	Annual probability greater than 1%.	Significant possibility of damage to property or harm to other sensitive receptors at or near this location. flooding is likely to be in the form of shallow pools or streams. Surface water flooding and failure of drainage systems may be worsened when groundwater levels are high.
1: High	Annual probability greater than 1%.	Groundwater flooding will occur which could lead to damage to property or harm to other sensitive receptors at or near this location. Flooding may result in damage to property, road, or rail closures and, in exceptional cases, may pose a risk to life. Surface water flooding and failure of drainage systems may be worsened when groundwater levels are high.

Borehole Records and Soakaway Testing Results

4.5.4 Groundwater was not encountered in any soakaway excavation pits although a slight seepage was noted at the base of the sandy gravel in SA102.

4.5.5 Borehole records show groundwater was encountered between 1.52m and 3.00m, with the resting groundwater level encountered at 16.15m.

SFRA Mapping

4.5.6 SFRA mapping shows the Site is within an area susceptible to groundwater flooding by <25% (Appendix 2).

Flood Risk Summary

4.5.7 The risk of groundwater flooding is assessed as negligible.

4.6 Surface Water Flooding

Introduction

4.6.1 Surface water flooding occurs following rainfall on ground where infiltration rates are less than the rainfall precipitation rate. This can occur when either:

- Soils or ground materials are naturally of low permeability or have been compacted (infiltration excess runoff).
- Soils or ground materials are saturated from previous rainfall either directly or from upslope (saturation excess runoff and return flow) or from high groundwater levels.

EA Complex Surface Water Flood Mapping

4.6.2 The EA Complex Surface Water Flood Mapping (Drawings 0006.1 to 0006.4) shows most of the Site is located outside the mapped extent of surface water flooding. There are two small flow pathways in the southwest corner, and east extent of the Site. Both of the areas of flooding are generated by water falling in the site boundary.

4.6.3 The flood outlines are associated with the low risk 1000-year events. Flood depths are 0.15m or less during the extreme 1 in 1000-year event. In the southwest the velocity is 1.00m/s or less, and in the east it is up to 2.00m/s. The mapped flood hazard is 'low' (0.50-0.75) for both areas.

4.6.4 The highway access point also has mapped low risk surface water ponding, with depths of 0.15m or less and a low hazard classification. This will not present issues for access and egress of emergency vehicles if the event occurs. The mapping does not account for any existing drainage infrastructure of highways, thus the actual risk may be lower than shown in the complex surface water risk mapping.

4.6.5 Since these drawings have been created, the Environment Agency released new mapping, and therefore these drawings are superseded by the data shown below.

EA Online Surface Water Flood Map 2025

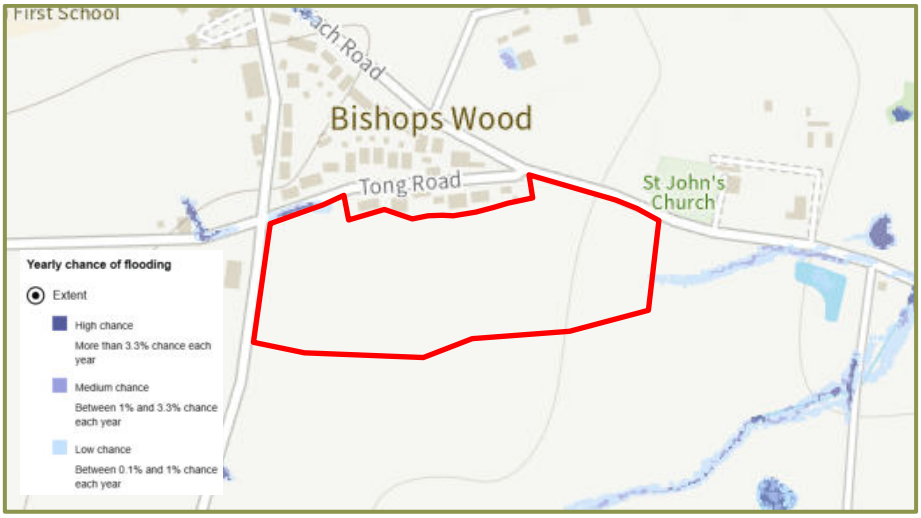
4.6.6 On the 28th January 2025 the EA released new data showing the risk of flooding from rivers, the sea and surface water. This data is presented on the new Online Surface Water Flood Map[30] (Figure 4.1). This mapping supersedes the information presented in Drawings 006.1 to 006.4.

4.6.7 The new mapping shows most of the Site is outside the mapped extent of surface water flooding, with only a small area of low chance flooding on the eastern boundary.

4.6.8 It also shows no ponding associated with the highway access point along Boscobel Lane – contrary to that of Drawings 0006.1 – 0006.4 that uses older data. This improves the highway flooding at the entrance and allows a clear egress route without any predicted flooding.

[30] https://check-long-term-flood-risk.service.gov.uk/map

Figure 4.1: EA Online Surface Water Flood Map 2025



EA Online Surface Water Map. Contains OS data © Crown copyright and database rights [2025].

LLFA correspondence

4.6.9 Correspondence with the LLFA confirms the risk of flooding as represented in Drawings 0006.1 to 0006.4, and shows the site is at low risk (Appendix 5).

SFRA mapping

4.6.10 The SFRA mapping shows the Site is within the extent of the surface water flooding RoFfSW 0.1% AEP (Appendix 2).

Flood Risk Summary

4.6.11 The risk of surface water flooding is assessed as negligible for most of the Site, with no flooding associated with highway access with only a small low chance area of flooding along the eastern boundary of the Site.

4.6.12 Measures required for surface water flooding are discussed in Section 5.

4.7 Sewer Flooding

Introduction

4.7.1 Sewer flooding occurs when urban drainage networks become overwhelmed after heavy or prolonged rainfall due to restrictions or blockage in the sewer network or if the volume of water draining into the system exceeds the sewer design capacity.

4.7.2 New adoptable sewers are built to have a minimum design standard up to and including the 1 in 30-year rainfall event. Older sewers were not designed to any standard. Modern sewer systems will only surcharge during rainstorm events with a return period greater than 1 in 30-years (e.g. 1 in 100-years).

Asset Plans

4.7.3 Severn Trent Water asset plans (Appendix 6) show there are no public assets beneath the Site. The closest mapped assets are three Ø150mm public foul gravity/lateral drains beneath the

residential buildings to the north of Tong Road. There is also a Ø150mm public foul gravity/lateral drains sewer which originates approximately 50m north of the northwestern corner of the Site along Ivetsey Bank Road and flows north.

Flood Risk Summary

4.7.4 The risk of flooding from sewers is assessed as negligible.

4.8 Flooding from Infrastructure Failure

Reservoir Failure

4.8.1 The EA online flood mapping shows the Site is outside the extent of flooding sourced from reservoirs. The risk of flooding from reservoirs is assessed as negligible.

Flood Risk Summary

4.8.2 The risk of flooding from reservoir failure is assessed as negligible.

5.0 Planning and Flood Risk

5.1 Introduction

5.1.1 The main steps to be followed in addressing flood risk are set out below:

5.2 Assess

5.2.1 As per Paragraph: 003 Reference ID: 7-003-20220825 (Revision date: 25 08 2022) of NPPG ID7, we have prepared a site-specific FRA to assess flood risk from all sources to the Development. A summary is included below:

- The risk of surface water flooding is assessed as negligible for most of the Site, with no flooding associated with highway access with only a small low risk area of ponding along the eastern boundary of the Site.
- Flood risk from all other sources is assessed as negligible.

5.3 Decision Making Process

5.3.1 As per Paragraph: 004 Reference ID: 7-004-20220825 (Revision date: 25 08 2022) of NPPG ID7, where an assessment shows that flood risk is a consideration for a plan or development proposal, the process is set out below:

Avoid

5.3.2 The approach is designed to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk. This means avoiding, so far as possible, development in current and future medium and high flood risk areas considering all sources of flooding including areas at risk of surface water flooding.

5.3.3 As per the National flood risk standing advice for local planning authorities ('*When development is exempt from the sequential test'*)[31],

"A development is exempt from the sequential test if it is a:

- *Householder development like residential extensions, conservatories or loft conversions*
- *Small non-domestic extensions with a footprint of less than 250 square metres*
- *Change of use (except changes of use to a caravan, camping or chalet site, or to a mobile home or park home site)*

A development is also exempt from the sequential test if it is a development on a site allocated in the development plan through the sequential test and:

- *The proposal is consistent with site's allocated use*
- *There have been no significant changes to the known level of flood risk to the site, now or in the future, which would have affected the outcome of the test*

[31] https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities#:~:text=A%20development%20is%20exempt%20from,extensions%2C%20conservatories%20or%20loft%20conversions

You may not need a sequential test if development can be laid out so that only elements such as public open space, biodiversity and amenity areas are located in areas at risk of any source of current or future flooding."

5.3.4 Subject to the below avoidance measures, the Sequential Test is not required:

- Set finished floor levels above external levels to manage residual risk.

Control

5.3.5 We recommend the following control measures to manage the risk of flooding to and from the development:

- Adoption of a surface water management strategy (see Section 6).
- Fit the outfall with backflow prevention and provide a high level overflow.

5.4 Summary

5.4.1 Table 5.1 summarises the risk of flooding, both without and with recommended measures.

Table 5.1: Risk of Flooding and Recommended Measures

Source of Flooding	Risk of Flooding	Risk Without Measures	Recommended Measures	Risk to Development with Measures
Fluvial – None identified	Negligible	Negligible	N/A	Negligible
Tidal – None identified	Negligible	Negligible	N/A	Negligible
Groundwater - Secondary B (bedrock), Secondary A and secondary (undifferentiated) (superficial)	Negligible	Negligible	N/A	Negligible
Surface Water – Surface water flow pathways	Negligible for most of the Site. There is a small low chance area of flooding along the eastern boundary.	Negligible for most of the Site. There is a small low chance area of flooding along the eastern boundary.	Avoid and control	Negligible
Sewers and Mains – None identified	Negligible.	Negligible	N/A	Negligible
Infrastructure Failure – None identified	Negligible	Negligible	N/A	Negligible

Key: Green - Negligible, Yellow - Low, Orange - Medium and Red - High; based on risk with without/with recommended measures from each flooding source.

5.5 Flood Guidance and Sequential Test

5.5.1 The proposal is for a residential development. The PPG ID: 7 (not included in this report) classifies the proposed use as 'more vulnerable'.

5.5.2 The EA Flood Zones and acceptable development types are listed in Table 5.2. All development types (including residential uses) are acceptable in Flood Zone 1 (low risk). Subject to the above measures, the Sequential Test and the Exception Test would not be required as indicated in Table 5.3.

Table 5.2: EA Flood Zones and Appropriate Land Use

Flood Zone	Probability	Explanation	Appropriate Land use
Zone 1	Low	Less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).	All development types generally acceptable.
Zone 2	Medium	Between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% 0.1%) in any year.	Most development type are generally acceptable.
Zone 3a	High	A 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.	Some development types not acceptable.
Zone 3b	'Functional Floodplain'	Land where water must flow or be stored in times of flood. SFRAs should identify this zone (land which would flood with an annual probability of 1 in 30 (3.33%) or greater in any year or is designed to flood in an extreme (0.1% flood, or at another probability to be agreed between the LPA and the EA, including water conveyance routes).	Some development types not acceptable.

Note: The Flood Zones are the current best information on the extent of the extreme flood from rivers or the sea that would occur without the presence of flood defences, because these can be breached, overtopped and may not be in existence for the lifetime of the development. The identified risk of fluvial flooding is highlighted green.

Table 5.3: Vulnerability and Flood Zone 'Compatibility' as Identified in Table 2 of PPG ID: 7

Flood Risk Vulnerability classification (see Table 1 of PPG ID: 7)	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	Yes	Yes	Yes	Yes	Yes
Zone 2	Yes	Yes	Exception test required	Yes	Yes
Zone 3a	Exception test required	Yes	No	Exception test required	Yes
Zone 3b 'Functional Floodplain'	Exception test required	Yes	No	No	No

Key: Yes: Development is appropriate, No: Development should not be permitted. The identified risk of fluvial flooding is highlighted green.

6.0 Surface Water Drainage

6.1 Introduction

6.1.1 Consideration of flood issues is not confined to the floodplain. This is recognised in the NPPF and associated guidance where all proposed development of 1ha or more in Flood Zone 1 and so outside the floodplain nevertheless requires an FRA. The alteration of natural surface water flow patterns through development can lead to problems elsewhere in a catchment, particularly flooding downstream, and the replacement of permeable vegetated areas by low-permeability roofs, roads and other paved surfaces will increase the speed, volume, and peak flow of surface water runoff. So, the NPPF and associated guidance require an FRA for all proposed development of 1ha or more outside the floodplain in Flood Zone 1.

6.1.2 A surface water management strategy for the development is proposed to manage and reduce the flood risk posed by surface water runoff from the Site. The developer will be required to ensure that any scheme for surface water management should build in enough capacity for the entire Site.

6.1.3 The surface water drainage arrangements for any development Site should be such that the volume and peak flow rates of surface water leaving a developed Site are no greater than the rates prior to the proposed development unless specific off-Site arrangements are made and result in the same net effect.

6.1.4 An assessment of the surface water runoff rates was undertaken to determine the surface water options and attenuation requirements for the Site.

6.2 Existing Drainage System

6.2.1 The land use is comprised of agricultural (arable) land.

6.2.2 The Site is underlain by slightly acid loamy and clayey soils with impeded drainage soils and mudstone bedrock. Drainage is predominantly via overland flow falling in two directions, following the topography of the Site (150.45m AOD in the northwest corner) to the topographic low point of the east (134.23m AOD), and the topographic low point of the southwest corner (144.21m AOD).

6.3 Developable and Impermeable Areas

6.3.1 An allowance of 55% impermeable area (inclusive of 10% for urban creep) was applied to the developable area.

6.3.2 The proposed development will increase the impermeable surfaces and so increase the amount of runoff with controls implemented.

6.4 Greenfield Runoff Rates

6.4.1 An assessment of greenfield runoff rates was undertaken to determine the attenuation requirements for the proposed development.

6.4.2 The runoff rates were calculated using the HRWallingford UKSuDS online tool, with FEH method inputs (descriptors obtained from the FEH webservice[32]). This is a recommended methodology for Sites up to 50ha in area and the approach is in line with the current 'industry

[32] Centre for Ecology and Hydrology, Flood Estimation Handbook Web Service [https://fehweb.ceh.ac.uk/].

best practice' guidelines as outlined in the Interim Code of Practice for SuDS[33], and EA Report SC030219 - Rainfall runoff management for developments.

6.4.3 The following parameters were used in the runoff calculations:

- Impermeable Area: 2.01ha
- Average Annual Rainfall (SAAR): 701mm/year
- Region No.: 4
- BFIHOST19: 0.22

6.4.4 BFIHOST was updated to BFIHOST19 (November 2019) since a number of issues were identified with BFIHOST, which including a tendency to underestimate BFI in clay-dominated catchments.

6.4.5 BFIHOST19 is the baseflow index developed using the Hydrology of Soil Types (HOST) classification and is the baseflow proportion of the flow on average. It is estimated based on the daily mean flow data. Baseflow comprises water entering the watercourse through shallow subsurface flow and groundwater flow (mechanisms other than direct surface runoff); hence permeable soils and geology tend to yield a higher baseflow.

6.4.6 The Soilscapes online soils map viewer and Geology of Britain online map viewer identified the following.

- Soils: slightly acid loamy and clayey soils with impeded drainage
- Superficial Deposits: Glaciofluvial Deposits, Devensian – Sand and gravel; and Till, Devensian - Diamicton
- Bedrock: Mercia Mudstone Group – Mudstone and halite-stone

6.4.7 BFIHOST19 value assigned by the FEH webservice is considered to replicate on-site conditions.

6.4.8 Table 6.1 shows the calculated greenfield runoff rates. Runoff calculations are included in Appendix 9.

6.4.9 This Site drainage needs to take into account the Trent Valley Staffordshire Management Catchment peak rainfall allowances[34]. For the 1% annual exceedance rainfall event, using the upper end allowance for the 2070s approach, climate change is +40%.

Table 6.1: Greenfield Runoff Rates

Annual Probability (Return Period, Years)	Greenfield Runoff (l/s)
QBAR	12.38
100% (1)	10.28
3.33% (30)	24.77
1% (100)	31.83
1% Plus Climate Change	44.56

Note: 40% climate change added. The 1 in 1-year, 30-year and 100-year annual probability events are of importance to the Water Companies and the EA when looking at sewage discharge and flood risk.

[33] Office of the Deputy Prime Minister, National SuDS Working Group (July 2004) Interim Code of Practice for Sustainable Drainage Systems [https://www.susdrain.org/files/resources/other-guidance/nswg_icop_for_suds_0704.pdf].
[34] https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall

6.5 Surface Water Management Strategy

Hierarchy of Discharge

6.5.1 In accordance with requirement H3 of the Building Regulations 2010[35] rainwater runoff must discharge to one of the following, listed in order of priority:

1. ***An adequate soakaway or some other adequate infiltration system:*** The use of infiltration-based SuDS is not feasible due to low infiltration potential. This was demonstrated during infiltration testing.
2. ***A watercourse:*** Watercourse 1 flows to the east, passes underneath a dirt track, and then flows northeast. It is approximately 130m southeast of the Site, but within the wider land ownership.
3. ***A sewer:*** There are no public surface water sewers located within the immediate vicinity of the Site.

6.5.2 The potential route to discharge surface water from the proposed development will be by outfall to Watercourse 1.

6.6 Sustainable Drainage Options (SuDS)

Choice of SuDS Options

6.6.1 Sustainable water management measures should be used to control the surface water runoff from the proposed development Site, thereby managing the flood risk to the Site and surrounding areas from surface water runoff. These measures will also improve the quality of water discharged from the Site.

6.6.2 Current guidance promotes sustainable water management using SuDS. Options applicable to this Site are identified in Table 6.2.

Table 6.2: SuDS Options

Green roofs	Infiltration basins
Water butts	Detention basins
Permeable paving	Oversized pipes
Rainwater harvesting	Brown roofs
Filter strips	Swales
Wetland Areas	Cellular Storage

Note: *SuDS appropriate to the development are highlighted green.*

6.6.3 A hierarchy of SuDS techniques is identified[36]:

1. **Prevention** - the use of good Site design and housekeeping measures on individual Sites to prevent runoff and pollution (e.g. minimise areas of hard standing).

[35] Office of the Deputy Prime Minister, The Building Regulations 2010, amended 2021 [https://www.gov.uk/government/publications/drainage-and-waste-disposal-approved-document-h]
[36] CIRIA (2004) Report C609, Sustainable Drainage Systems – Hydraulic, Structural and Water Quality advice.

2. **Source Control** - control of runoff at or very near its source (such as the use of rainwater harvesting).
3. **Site Control** - management of water from several sub-catchments (including routing water from roofs and car parks to one/several large soakaways for the whole Site).
4. **Regional Control** - management of runoff from several Sites, typically in a detention pond or wetland.

6.6.4 Using SuDS as opposed to conventional drainage systems provides several benefits by:

- Reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream.
- Reducing the volumes and frequency of water flowing directly to watercourses or sewers from developed Sites.
- Improving water quality over conventional surface water sewers by removing pollutants from diffuse pollutant sources.
- Reducing potable water demand through rainwater harvesting.
- Improving amenity through the provision of public open spaces and wildlife habitat.
- Replicating natural drainage patterns, including the recharge of groundwater so that base flows are maintained.

SuDS Maintenance

6.6.5 A detention basin will form the main attenuation feature within the development Site.

6.6.6 Maintenance of the SuDS features would be in line with the SuDS Manual (CIRIA C753, 2015), as detailed in Figure 6.1. It is standard for SuDS features within a new development to be maintained by a private maintenance company unless the council adopt it. If the maintenance company goes into administration, the Site will be contracted to a new maintenance company. Residents will pay a surcharge to the maintenance company and a number of them would be appointed to its board. This will ensure maintenance throughout the lifetime of the development.

6.6.7 Details of other SuDS features and maintenance would be considered further at detailed design when a detailed layout has been produced. The level of detailed provided within this FRA should be sufficient at outline stage to demonstrate that SuDS would be deliverable.

Figure 6.1: Detention Basin Operation and Maintenance Requirements (Table 22.1 of the SuDS Manual)

TABLE 22.1 Operation and maintenance requirements for detention basins

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually (as set out in Chapter 23)
Occasional maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

Drainage Design Summary

6.6.8 Surface water runoff would be directed to the drainage system through drainage gullies located around the perimeter of the buildings and through contouring of the hardstanding areas.

6.6.9 Landscaped areas should be incorporated into the layout where possible, and the associated gardens of each unit will allow a proportion of the rainfall to infiltrate into the soil substrate.

6.6.10 Surface water will be directed to an onsite detention basin, positioned to achieve a gravity fed connection to Watercourse 1.

6.6.11 An outline surface water drainage layout is in Drawing SHF710013-ENZ-XX-XX-DR-D-0001.

Attenuation Requirements

6.6.12 Attenuation storage is required to reduce the post-application surface water runoff from the Site to calculated greenfield runoff rates, up to and including the 1 in 100-year (+40%CC) rainfall event, assuming no infiltration losses.

6.6.13 The following input parameters were assumed in the calculations:

- Impermeable Area: 2.01ha;
- Cv (proportion of rainfall forming surface water runoff): 100% summer, 100% winter;
- With outfall: using QBAR (Table 6.1).

6.6.14 The attenuation volume for the 1 in 100-year event (plus climate change) is 1670m^3.

6.6.15 Attenuation calculations are included in Appendix 9. The calculated runoff rates and attenuation volumes will be reviewed at detailed design stage.

6.6.16 By using a QBAR discharge rate, a betterment from existing conditions is being provided. Therefore, the culvert where Watercourse 1 flows beneath Kiddemore Green Road should not be under any additional flow pressures after the Site has been developed.

6.7 Water Quality

6.7.1 Water quality improvements are achieved by decreasing flow rates, which in turn traps silt, sediment, and pollutants before discharging to the Watercourse 1.

6.7.2 The online Simple Index Approach [SIA] Tool[29] has been used to demonstrate the effectiveness of the proposed strategy to manage surface water discharging to Watercourse 1.

6.7.3 The use of permeable paving and a detention basin would provide a sufficient level of treatment. A copy of the calculations is included in Appendix 10, and a summary of the results are included in Table 6.3.

Table 6.3: Simple Index Approach Results Summary

	Total Suspended Solids	Metals	Hydrocarbons
Pollution Hazard Score	0.7	0.6	0.7
Pollution Mitigation Score	0.85	0.8	0.95
Sufficiency of SuDS	Sufficient	Sufficient	Sufficient

6.8 Exceedance Routes

6.8.1 The detention basin will be designed with a capacity up to a 1 in 100-year (plus 40% climate change) event, with a +300mm freeboard allowance, based on the 12.38l/s (QBAR) restricted discharge rate. This provides a betterment (reduction) in runoff when compared to existing undeveloped conditions, where runoff is uncontrolled across all return periods.

6.8.2 A storm event in excess of this design standard would be extreme and would cause the detention basin to overtop (with no sudden deluge) and would then shed overland following the topography (east) towards Watercourse 1, as per existing conditions (Drawing 0007).

6.8.3 Finished floor levels of new dwellings will be set above external levels, which will manage the residual risk of overtopping.

6.9 SuDS Proforma

6.9.1 A copy of the Drainage Proforma – Outline Surface Water for Strategic Land is included in Appendix 11.

7.0 Foul Drainage Strategy

7.1 Proposed Strategy

7.1.1 Severn Trent Water asset plans and the pre-development enquiry response from the previous development application are included in Appendix 6. They discuss connecting via a pumped solution into a manhole with the reference 6302, but describe it being to the south of the Site, below Doles Lane. We assume this is referring to the manhole beneath Ivetsey Bank Road to the north of the Site (with the same reference).

7.1.2 The foul flow discharge location will be clarified and agreed with Severn Trent Water once planning permission has been granted, and a detailed drainage strategy has been designed.

7.1.3 In accordance with the Design and Construction Guidance[37] document, peak foul water discharge from a residential development is 4,000 litres per property per day. Using this method, peak foul flows are estimated to be 4.6l/s from the 100-unit residential development. The calculated foul flow rate will be reviewed at detailed design stage.

7.1.4 All foul sewerage should be designed in accordance with Building Regulations Part H38. In areas where sewers are to be adopted by Severn Trent Water, sewerage should be designed in accordance with Design and Construction Guidance document and supplemented with additional standards provided by Severn Trent Water. An application to enter into a Section 104 agreement for sewer adoption must be made in writing to Severn Trent Water prior to any works commencing on Site. A connection point should be agreed with Severn Trent Water.

[37] Water UK (published October 2019 and update May 2021). Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England ("the Code") [SSG-App-C-Des-Con-Guide.pdf (water.org.uk)]

[38] HM Government (published 2002 and updated October 2015) The Buildings Regulations 2010 - Drainage and Waste Disposal: Part H [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/442889/BR_PDF_AD_H_2015.pdf].

8.0 Summary and Conclusions

8.1 Introduction

8.1.1 A site-specific Flood Risk Assessment (FRA) has been undertaken for a proposed residential development, located on a 5.24ha Site on land east of Boscobel Lane, Bishops Wood, Stafford, ST19 9AA.

8.2 Flood Risk

8.2.1 The risk of flooding is assessed as follows:

- The risk of surface water flooding is assessed as negligible for most of the Site, with no flooding associated with highway access with only a small low chance area of flooding along the eastern boundary of the Site.
- Flood risk from all other sources is assessed as negligible.

8.3 Measures

8.3.1 Flood risk from identified sources can be reduced to a negligible or low and acceptable level through the following approach:

8.3.2 Subject to the proposed avoidance measures, the Sequential Test is not required:

- Set finished floor levels above external levels.
- Adoption of a surface water management strategy (see Section 6).
- Fit the outfall with backflow prevention and provide a high level overflow.

8.3.3 Further to the above, the FRA has recommended further measures in line with statutory requirements / following best practice. The FRA has explored control, mitigate and management measures.

8.4 Flood Guidance

8.4.1 The proposed residential use is classified as more vulnerable. More vulnerable uses are considered acceptable in terms of flood risk in Flood Zone 1 (low risk). There is, however, a low risk of flooding from surface water flooding. Subject to the implementation of the above measures, the Sequential Test and Exception Test would not be required.

8.5 Site Drainage

Surface Water

8.5.1 The proposed development will increase the area of impermeable surfaces and therefore increase the amount of runoff without appropriate management.

8.5.2 Surface water runoff from the Site will be restricted to greenfield rate (QBAR/complex controls), which offers a betterment to existing conditions with uncontrolled runoff across all return periods.

8.5.3 Surface water runoff from the proposed development would be attenuated on-site up to and including the 1 in 100-year event, plus 40% climate change.

8.5.4 A SuDS drainage scheme is proposed to manage excess runoff from the development, comprising a detention basin designed to maintain runoff at pre-development rates, with an outfall to a Watercourse 1 within the wider land ownership.

Foul Water

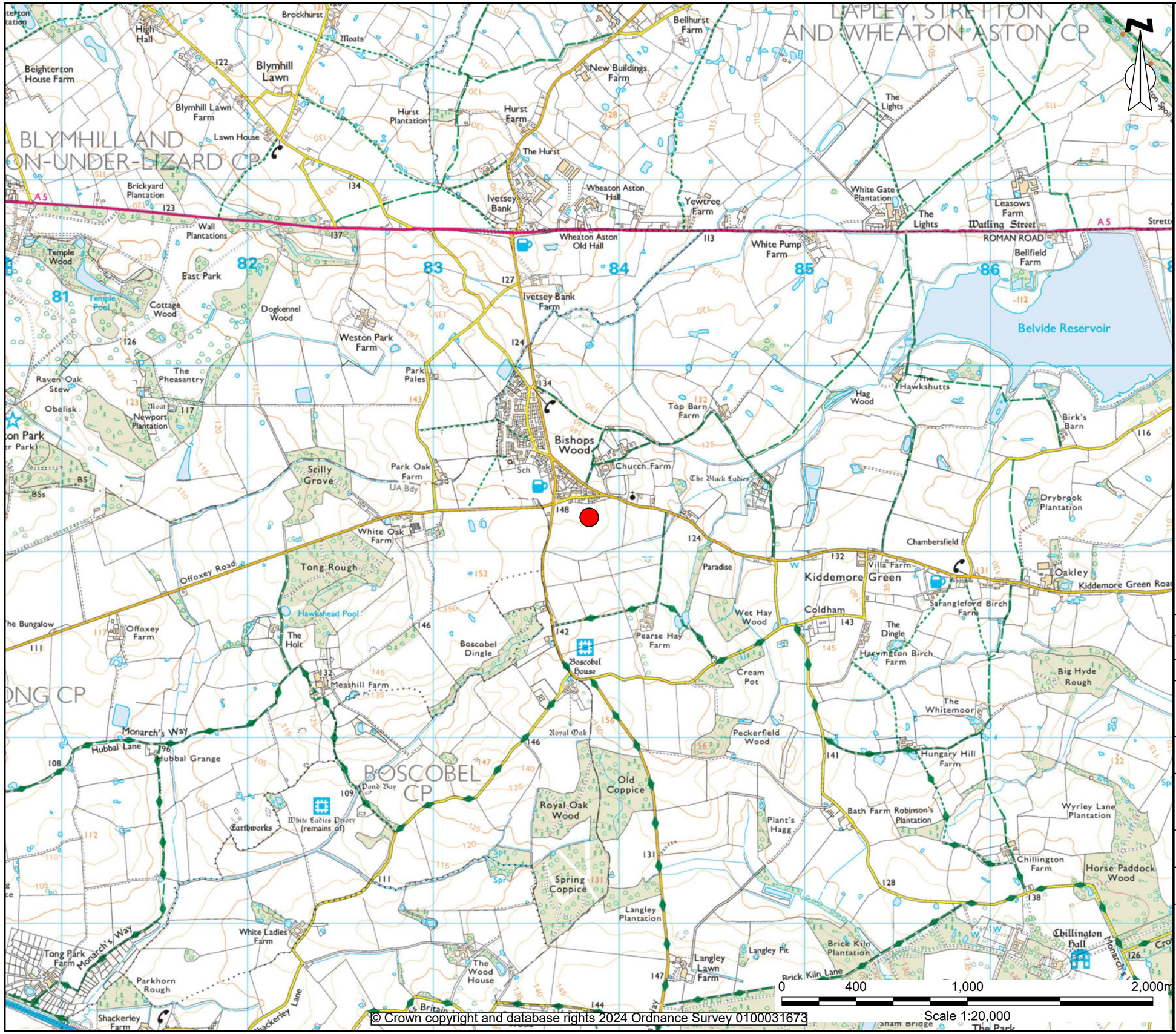
8.5.5 The foul flow discharge location will be agreed with Severn Trent Water once outline planning permission has been granted.

8.6 Conclusion

8.6.1 This FRA demonstrates the proposed development would be operated with minimal risk from flooding, would not increase flood risk elsewhere and is compliant with the requirements of national policy and guidance.

8.6.2 The development should therefore not be precluded on the grounds of flood risk, as well as surface water and foul drainage.

DRAWINGS



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KEY:

Site Location

Rev	Date	Description			
P01	07/11/24	Issued for comment / approval	LW	CW	CW

Project
Land East of Boscobel Lane, Bishops Wood

Client
Boningale Homes Ltd

Drawing Title
Site Location Plan

Scale	Date	Status
1:20,000@A3	07/11/24	Preliminary

DWG No. SHF710013-ENZ-XX-XX-DR-Y-0001 **Revision** P01

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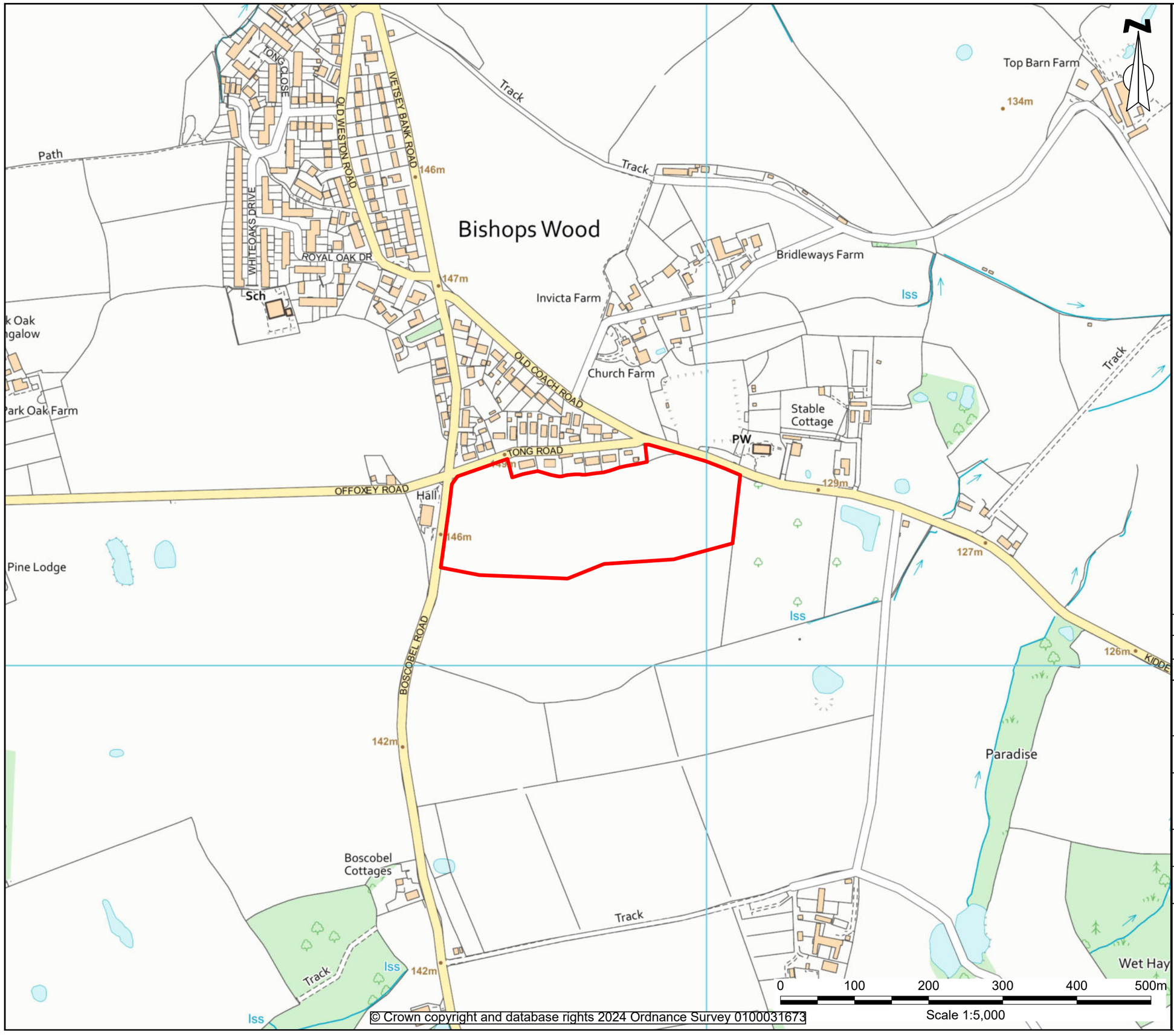

Rev	Date	Description	DRA	CHK	APP
P01	07/11/24	Issued for comment / approval	LW	CW	CW

Project
Land East of Boscobel Lane, Bishops Wood

Client
Boningale Homes Ltd

Drawing Title
Surface Water Features

Scale	Date	Status
1:5000@A3	07/11/24	Preliminary

DWG No. SHF710013-ENZ-XX-XX-DR-Y-0002 **Revision** P01

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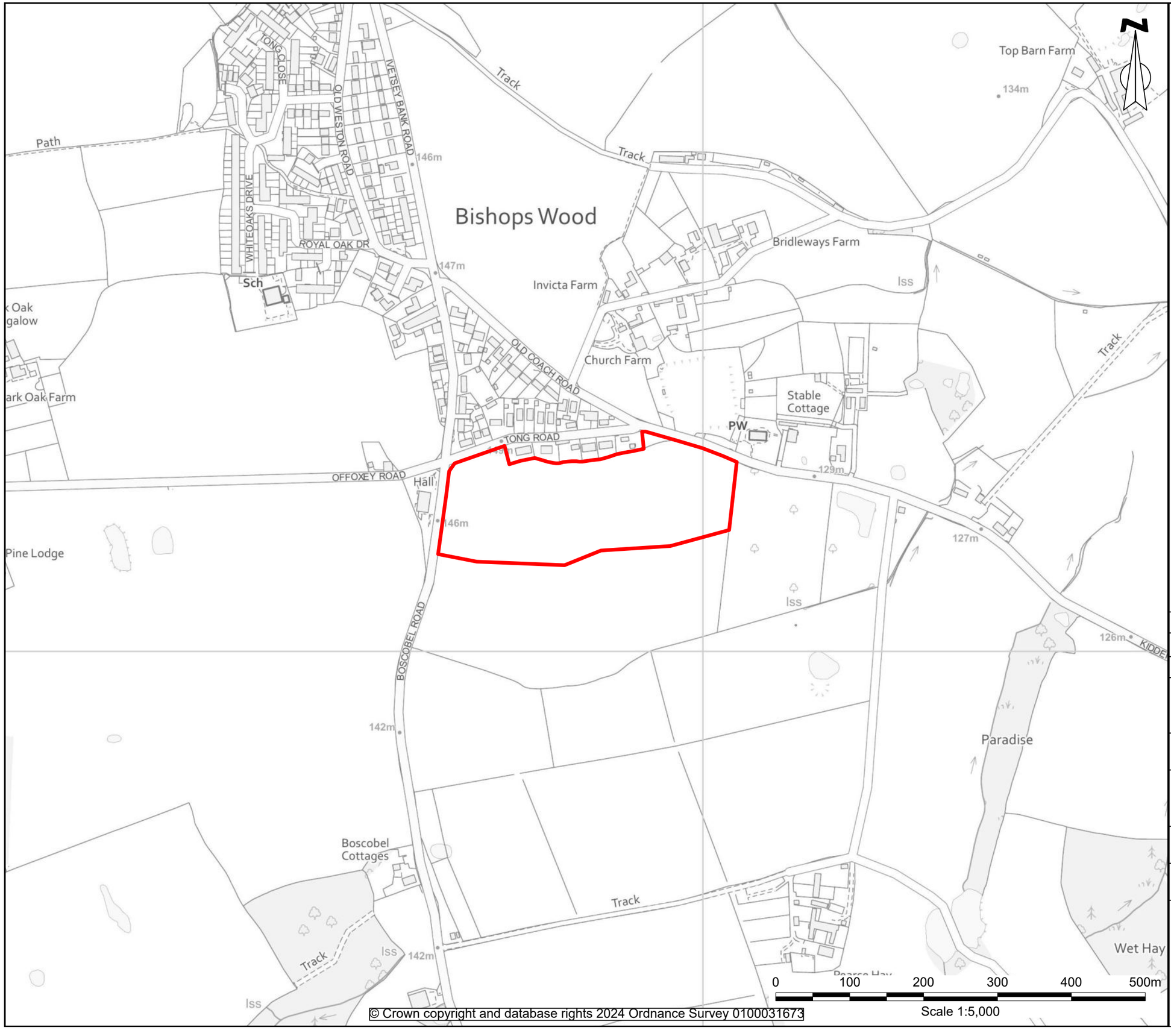

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KEY:

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

Rev	Date	Description	DRA	CHK	APP
P01	07/11/24	Issued for comment / approval	LW	CW	CW

Project
Land East of Boscobel Lane, Bishops Wood

Client
Boningale Homes Ltd

Drawing Title
EA Flood Zones

Scale	Date	Status
1:5000@A3	07/11/24	Preliminary

DWG No. SHF710013-ENZ-XX-XX-DR-Y-0003 **Revision** P01

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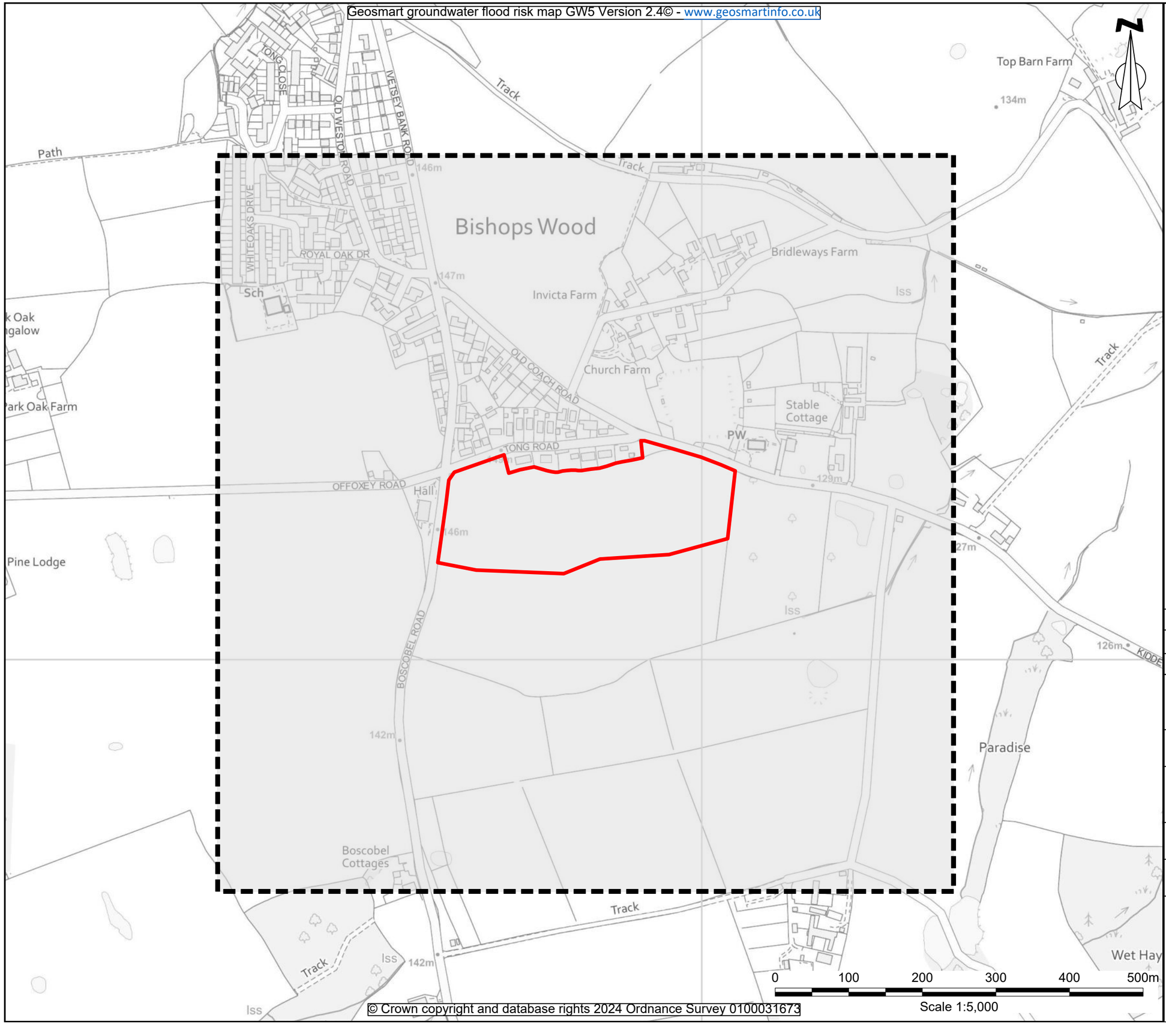
Geosmart groundwater flood risk map GW5 Version 2.4© - www.geosmartinfo.co.uk



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KEY:

- Site Boundary
- Class 1 - High Risk
- Class 2 - Moderate Risk
- Class 3 - Low Risk
- Class 4 - Negligible Risk
- Search Extent

Rev	Date	Description	DRA	CHK	APP
P01	07/11/24	Issued for comment / approval	LW	CW	CW

Project
Land East of Boscobel Lane, Bishops Wood

Client
Boningale Homes Ltd

Drawing Title
Groundwater Flood Risk

Scale	Date	Status
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DWG No. SHF710013-ENZ-XX-XX-DR-Y-0004 **Revision** P01

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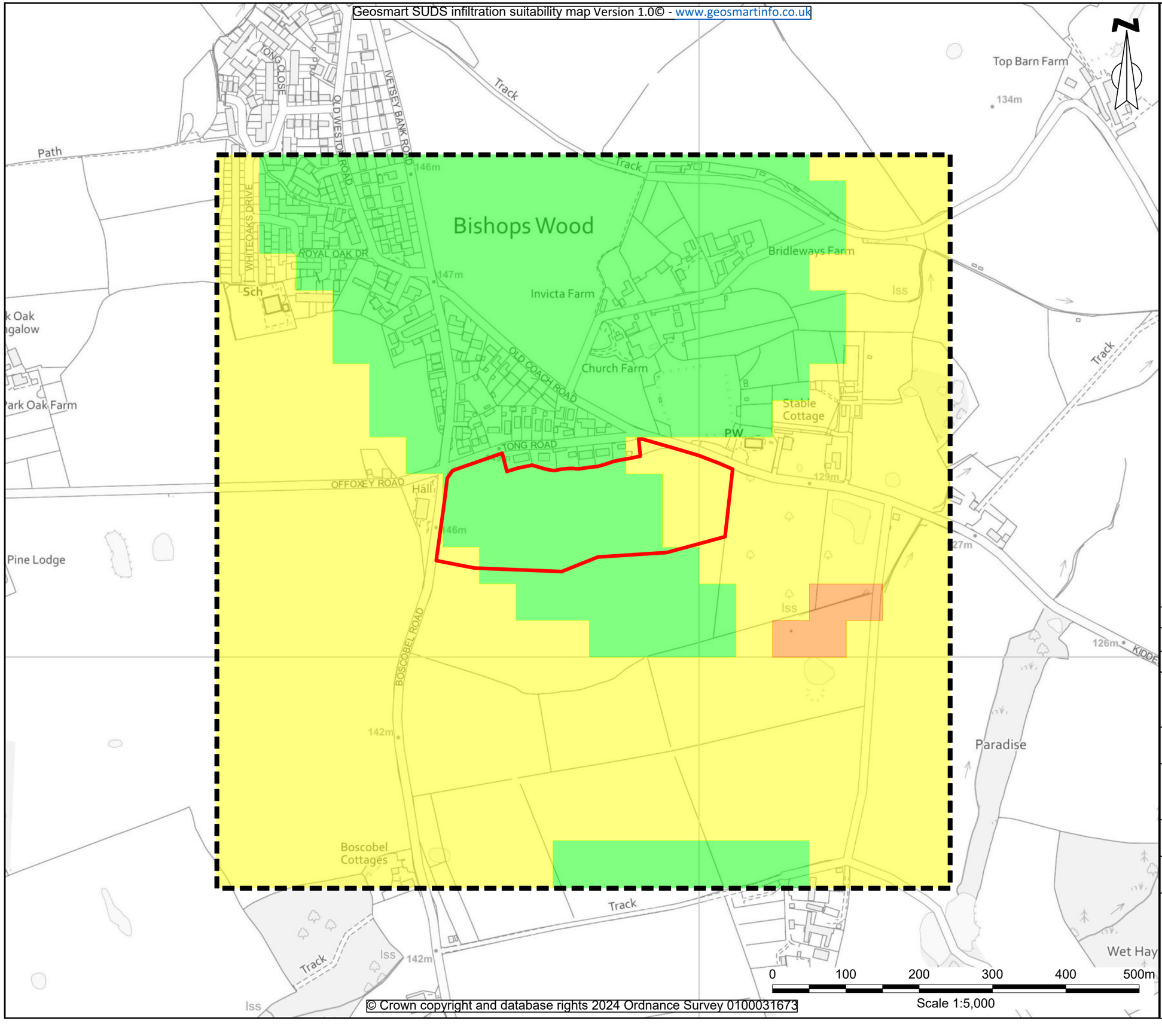
Geosmart SUDS infiltration suitability map Version 1.0© - www.geosmartinfo.co.uk



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KEY:

- Site Boundary
- High Potential
- Moderate Potential
- Low Potential
- Search Extent

Rev	Date	Description	DRA	CHK	APP
P01	07/11/24	Issued for comment / approval	LW	CW	CW

Project
Land East of Boscobel Lane, Bishops Wood

Client
Boningale Homes Ltd

Drawing Title
SuDS Infiltration Potential

Scale	Date	Status
1:5000@A3	07/11/24	Preliminary

DWG No. SHF710013-ENZ-XX-XX-DR-Y-0005 **Revision** P01

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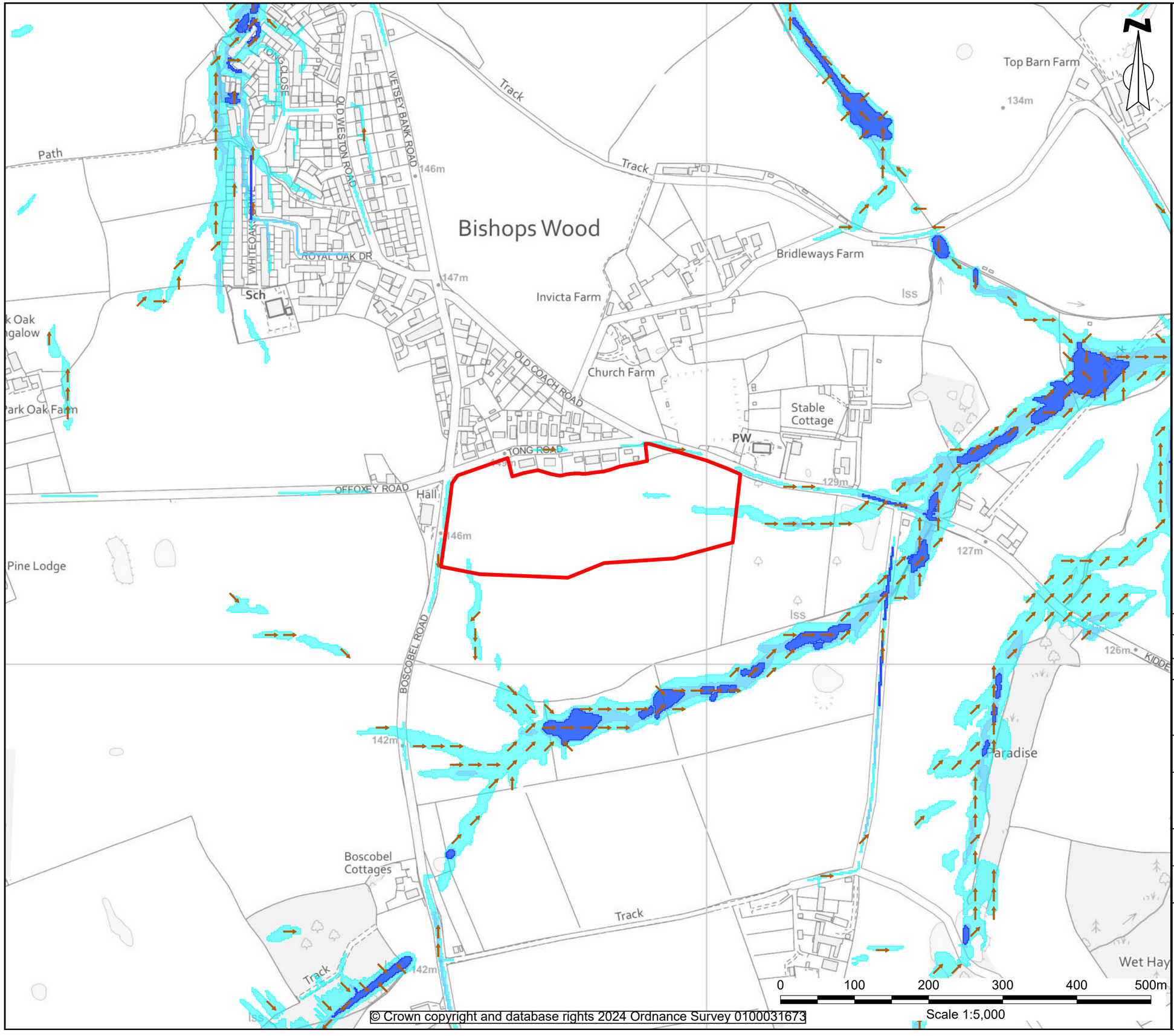

Rev	Date	Description	DRA	CHK	APP
P01	07/11/24	Issued for comment / approval	LW	CW	CW

Project
Land East of Boscobel Lane, Bishops Wood

Client
Boningale Homes Ltd

Drawing Title
EA Surface Water Flow Paths

Scale	Date	Status
1:5000@A3	07/11/24	Preliminary

DWG No. SHF710013-ENZ-XX-XX-DR-Y-0006.1 **Revision** P01

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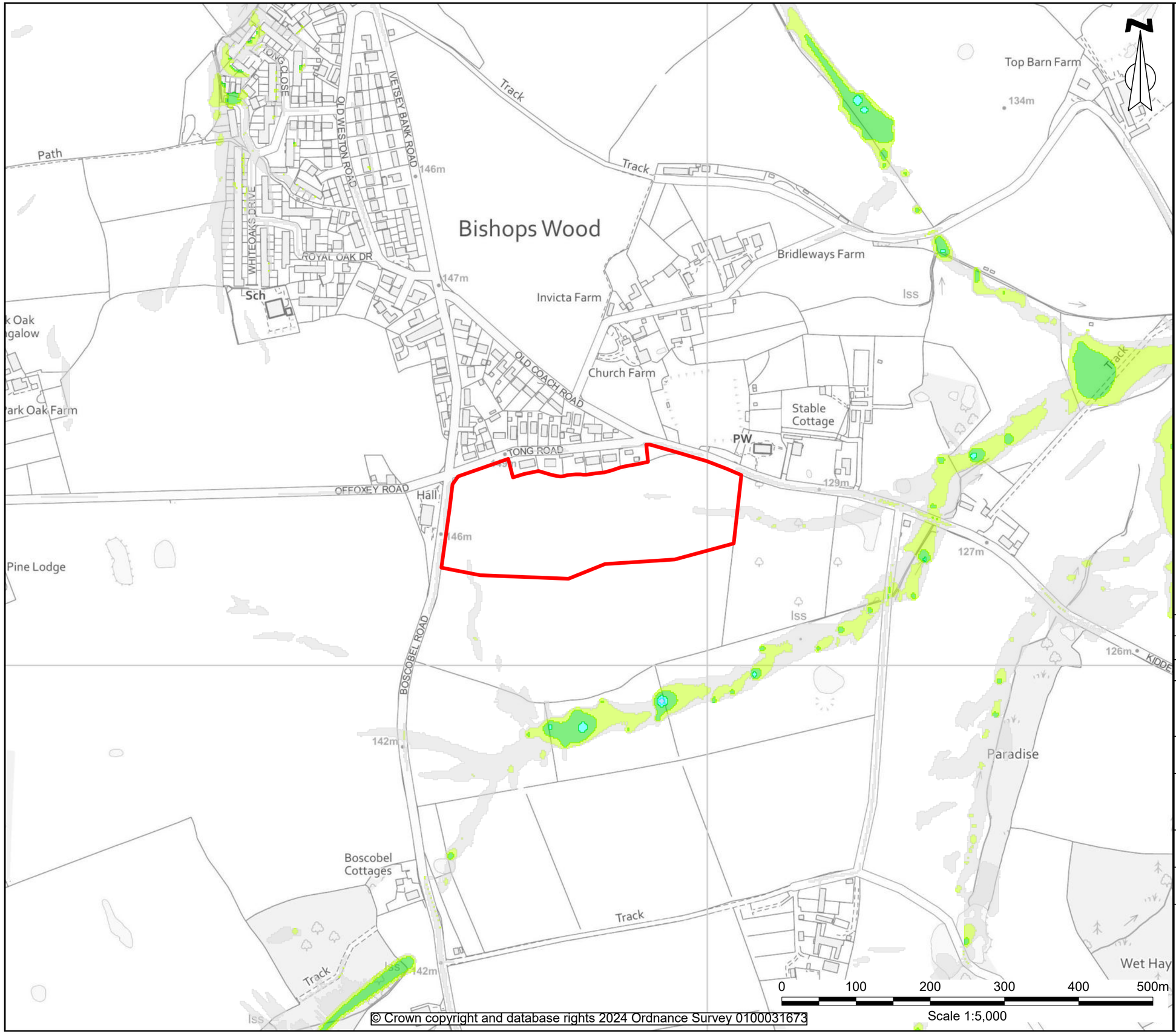

KEY:

- Site Boundary
- Depth greater than 1.20 (m)
- Depth 0.90 - 1.20 (m)
- Depth 0.60 - 0.90 (m)
- Depth 0.30 - 0.60 (m)
- Depth 0.15 - 0.30 (m)
- Depth 0.0 - 0.15 (m)

Rev	Date	Description	DRA	CHK	APP
P01	07/11/24	Issued for comment / approval	LW	CW	CW

Project
Land East of Boscobel Lane, Bishops Wood

Client
Boningale Homes Ltd

Drawing Title
EA 1 in 1000 Year Surface Water Depth

Scale	Date	Status
1:5000@A3	07/11/24	Preliminary

DWG No. SHF710013-ENZ-XX-XX-DR-Y-0006.2 **Revision** P01

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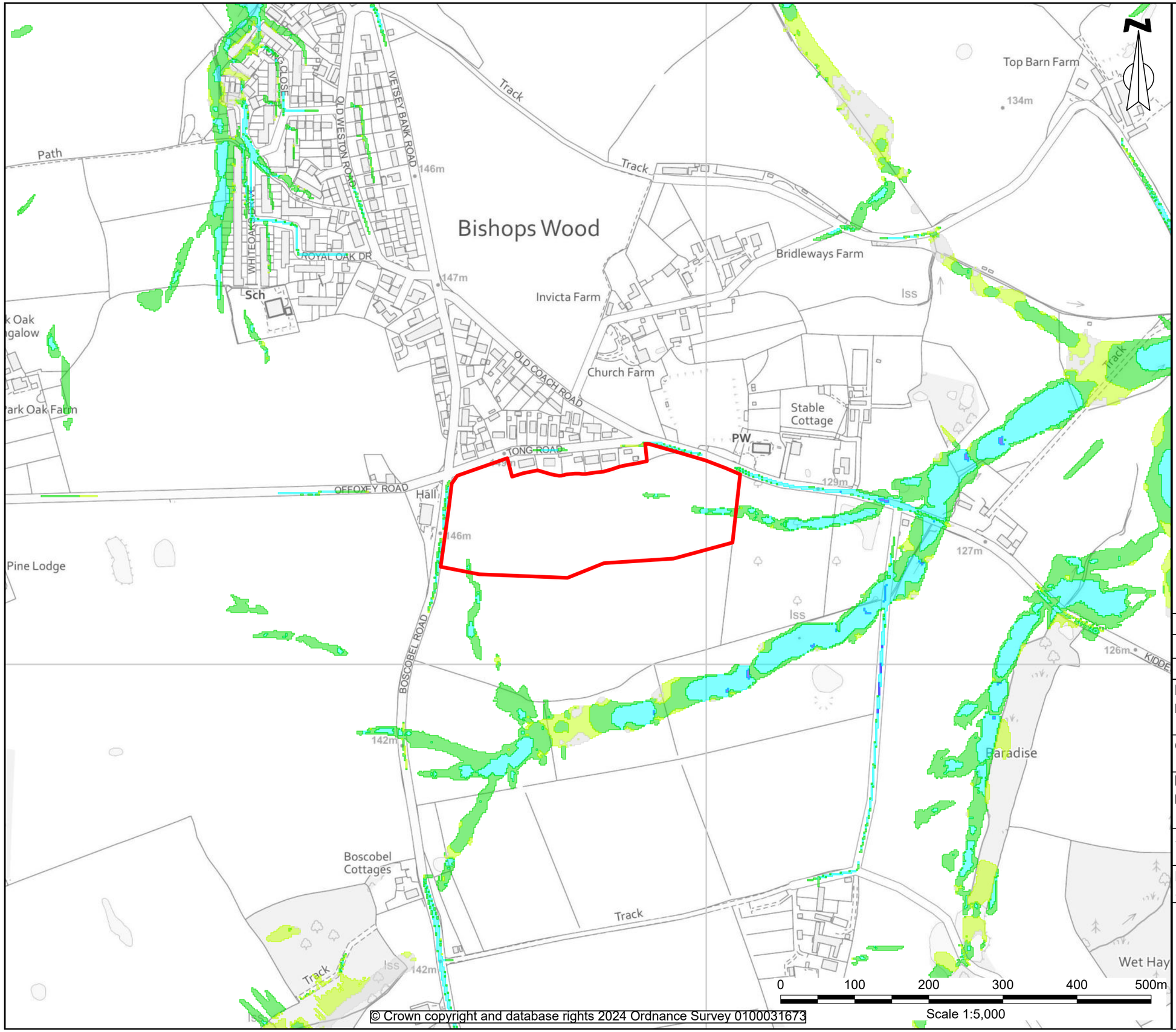

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KEY:

- Site Boundary
- Velocity 2.00 or greater (m/s)
- Velocity 1.00 - 2.00 (m/s)
- Velocity 0.50 - 1.00 (m/s)
- Velocity 0.25 - 0.50 (m/s)
- Velocity 0.00 - 0.25 (m/s)

Rev	Date	Description	DRA	CHK	APP
P01	07/11/24	Issued for comment / approval	LW	CW	CW

Project
Land East of Boscobel Lane, Bishops Wood

Client
Boningale Homes Ltd

Drawing Title
EA 1 in 1000 Year Surface Water Velocity

Scale	Date	Status
1:5000@A3	07/11/24	Preliminary

DWG No. SHF710013-ENZ-XX-XX-DR-Y-0006.3 **Revision** P01

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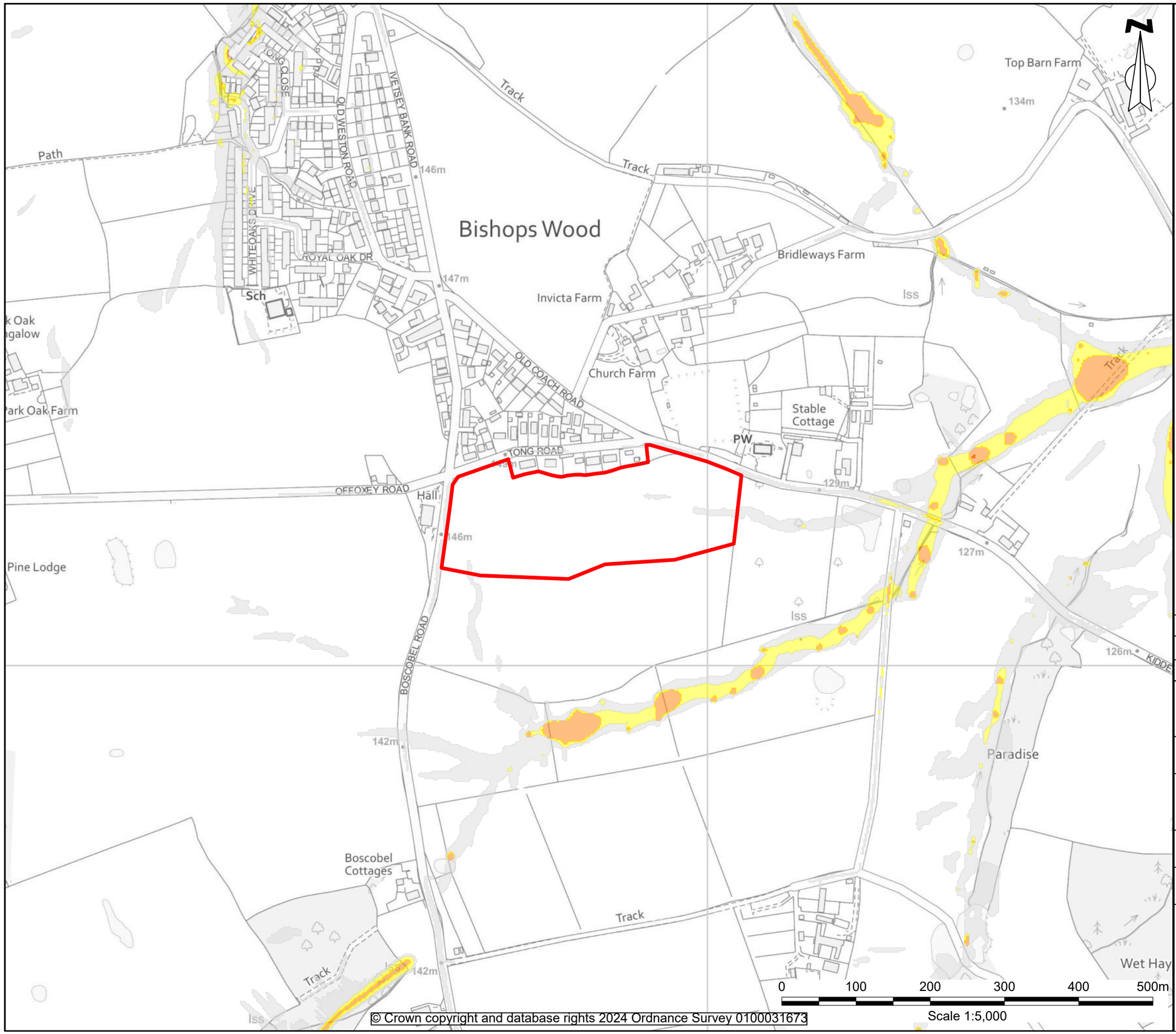

KEY:

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- Extreme Hazard (> 2.0)
- Significant Hazard (1.25 - 2.00)
- Moderate Hazard (0.75 - 1.25)
- Low Hazard (0.50 - 0.75)

Rev	Date	Description	DRA	CHK	APP
P01	07/11/24	Issued for comment / approval	LW	CW	CW

Project
Land East of Boscobel Lane, Bishops Wood

Client
Boningale Homes Ltd

Drawing Title
EA 1 in 1000 Year Surface Water Hazard

Scale	Date	Status
1:5000@A3	07/11/24	Preliminary

DWG No. SHF710013-ENZ-XX-XX-DR-Y-0006.4 **Revision** P01

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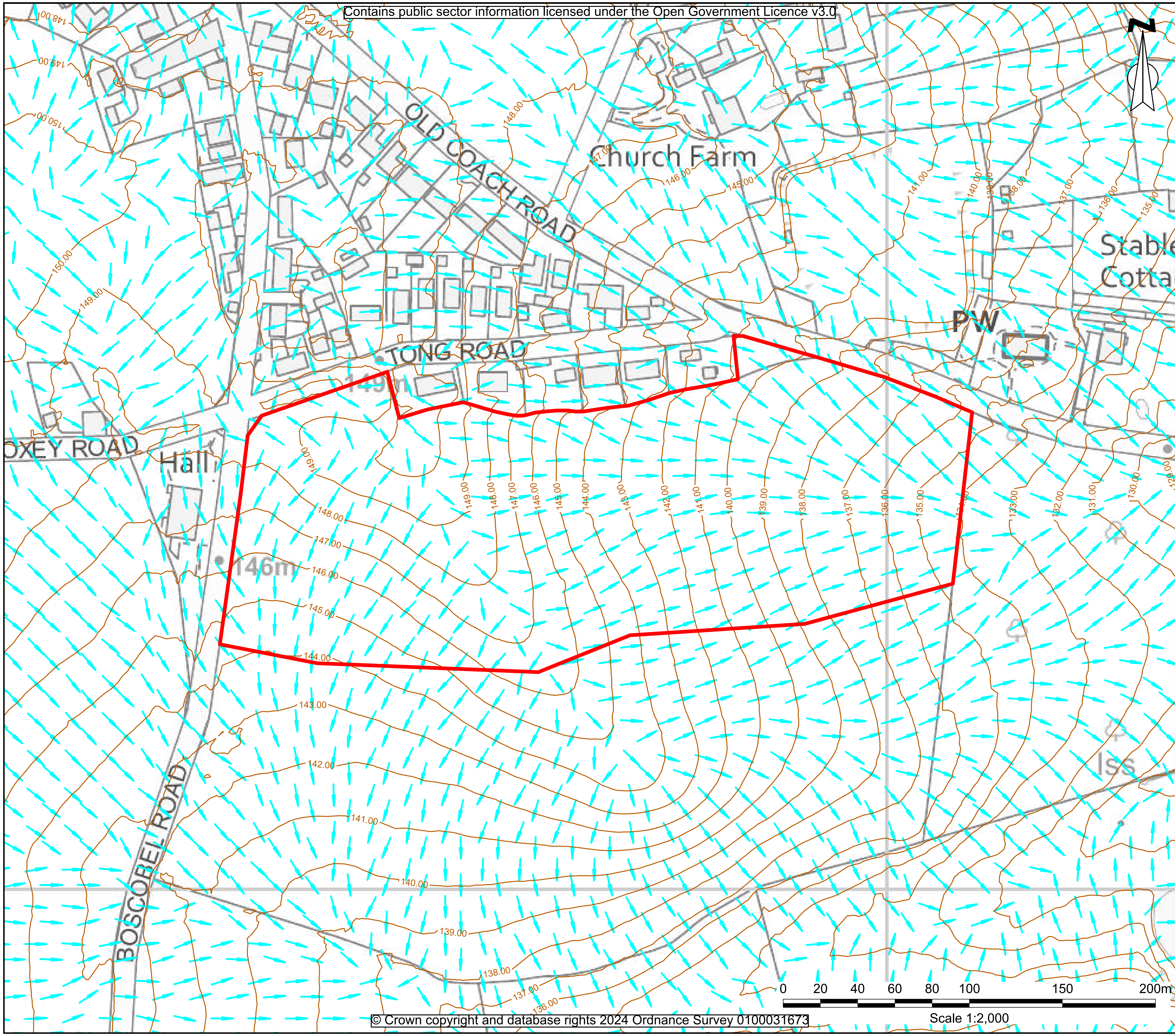

KEY:

- Site Boundary
- Contours
- Surface Water Flow Path

Rev	Date	Description	DRA	CHK	APP
P01	07/11/24	Issued for comment / approval	LW	CW	CW

Project
Land East of Boscobel Lane, Bishops Wood

Client
Boningale Homes Ltd

Drawing Title
Flow Pathway Analysis

Scale	Date	Status
1:2000@A3	07/11/24	Preliminary

DWG No. SHF710013-ENZ-XX-XX-DR-Y-0007
Revision P01

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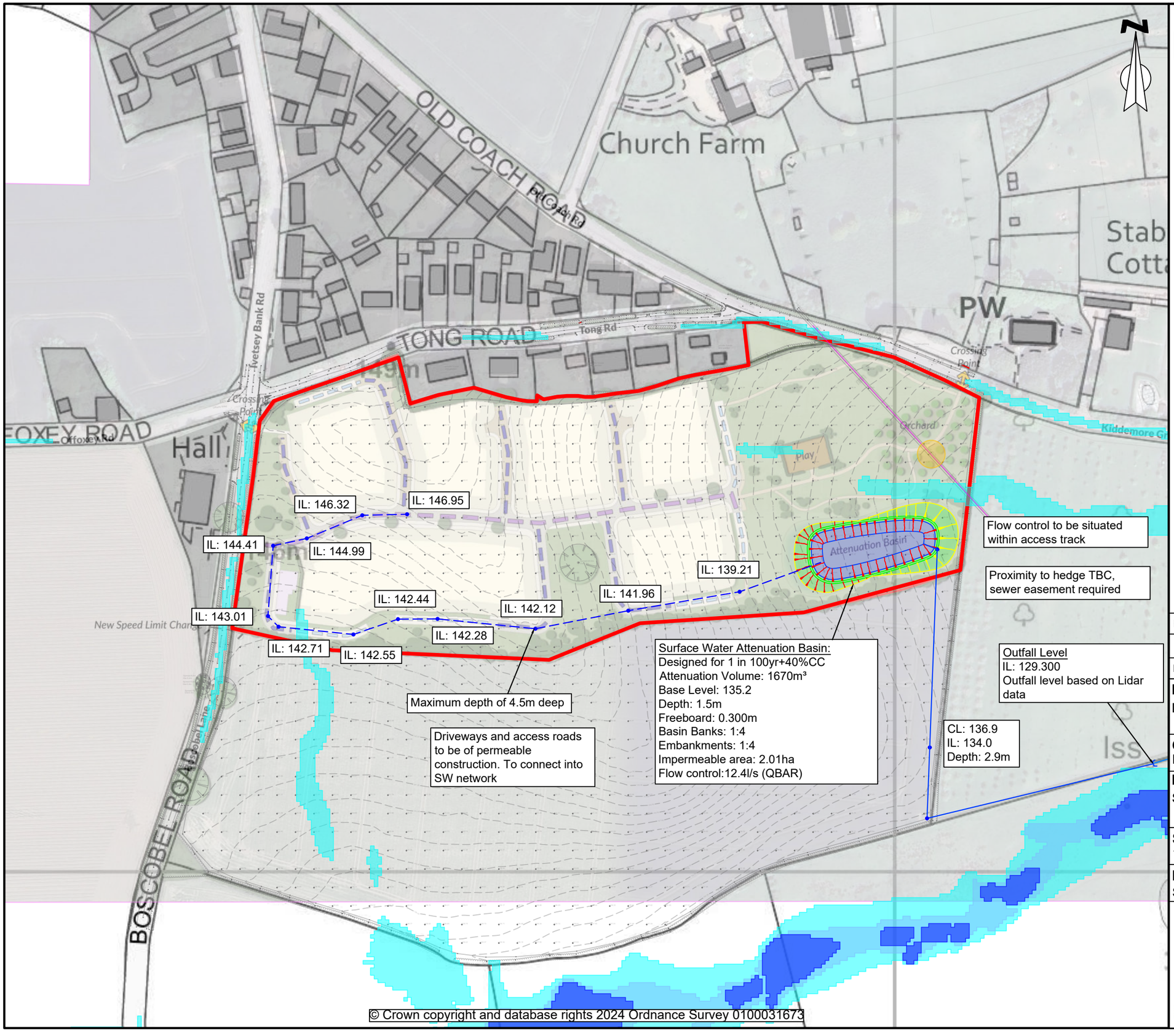

KEY:

- Site Boundary
- 30 Year Extent
- 100 Year Extent
- 1000 Year Extent
- Watercourse
- Outfall Route
- Overhead Power Lines
- Electricity Pylon Easement (15m)
- Attenuation Basin
- Indicative Surface Water Pipe And Manhole

Rev	Date	Description			
P02	24/01/25	Updated Layout	BD	RB	SD
P01	27/11/24	Issued for comment / approval	DL	RB	SD

Project
Land East of Boscobel Lane, Bishops Wood

Client
Boningale Homes Ltd

Drawing Title
Surface Water Drainage Strategy

Scale	Date	Status
1:2000@A3	24/01/25	Preliminary

DWG No. SHF710013-ENZ-XX-XX-DR-D-0001 **Revision** P02

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APPENDICES

Appendix 1 - Indicative Layout

Key

- Site Boundary
- Proposed Vehicular Access
- Proposed Pedestrian / Cycle Access
- Proposed Residential Blocks
- Proposed Local Shop
  (Site to include unit and parking / servicing area)
- Proposed Primary Route
- Proposed Secondary Route
- Proposed Private Drive
- Indicative Attenuation Basin
- Indicative Retained and Enhanced Landscaping
- Indicative Play Provision
- Indicative Orchard

Old Coach Rd
Ivetsey Bank Rd
Tong Rd
Crossing Point
Crossing Point
Offoxey Rd
Kiddemore Green Rd
Orchard
Play
Attenuation Basin
New Speed Limit Change
Boscobel Lane

0 25m 50m 75m 100m

Status: Final

Notes:
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This drawing is for planning purposes only and is not to be used as a basis for construction.
Do not scale from this drawing - use figured dimensions only.

Client:	Boningale Development Ltd
Project title:	Boscobel Lane, Bishops Wood
Drawing title:	Indicative Framework Plan
Scale:	1:2000 (A3)
Date:	January 2025
Drawn by:	JMP
Checked by:	LH
Drawing no.:	2503213.32.02
Revision:	A

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Temple Back East, BS1 6DZ
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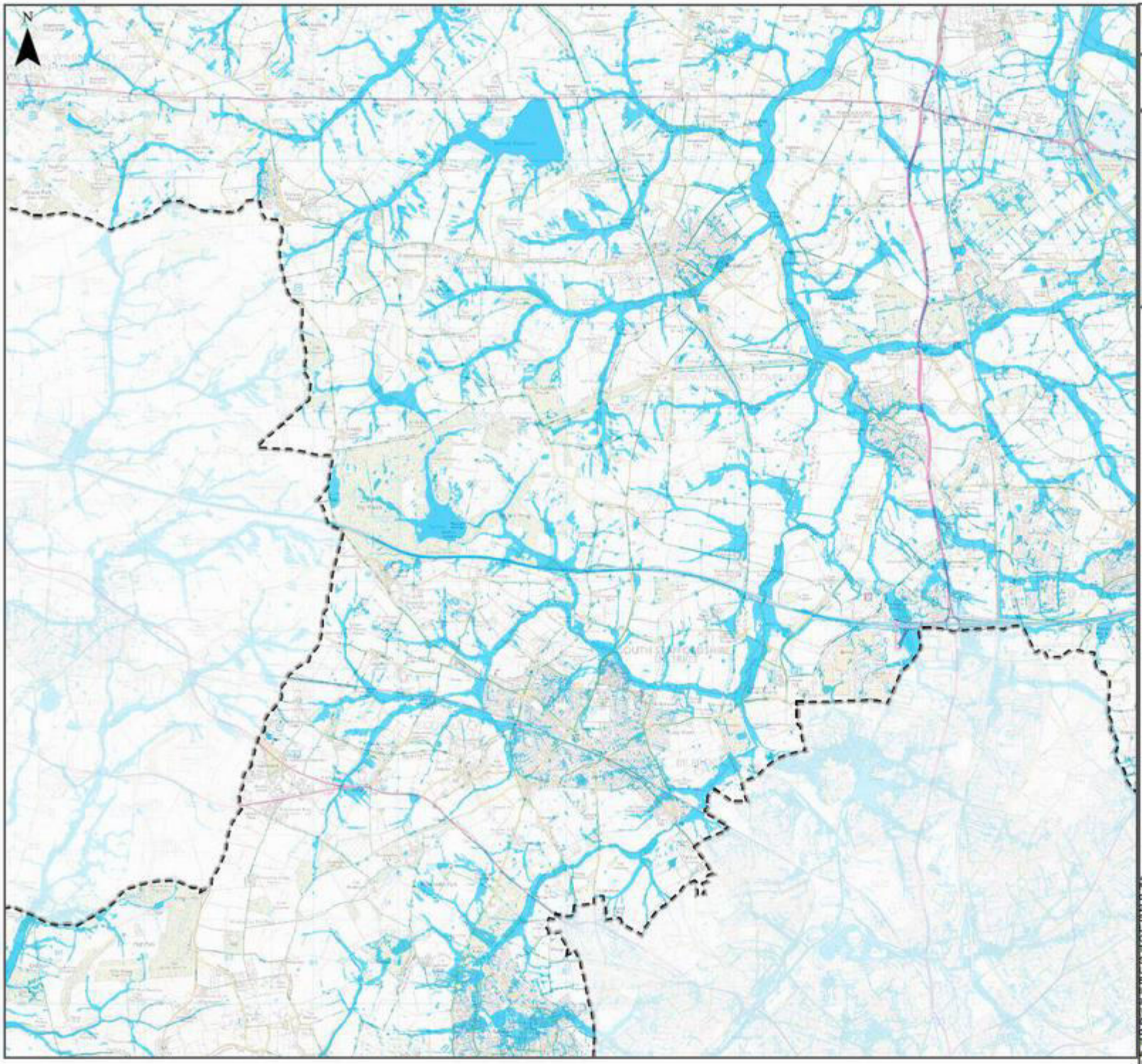
w: www.marrons.co.uk
e: info@marrons.co.uk

Appendix 2 - SFRA Mapping Extracts



SOUTHERN STAFFORDSHIRE COUNCILS LEVEL 1 STRATEGIC FLOOD RISK ASSESSMENT

APPENDIX A: GEO PDF FLOOD RISK MAPPING

INDEX GRID: E2

Note: All layers are turned off by default. Click the box next to the layer of interest to turn on.

Authority Information
- Council Boundary
- Detailed River Network
- Main Rivers

Flood Zones
- Flood Zone 3b
- Indicative Flood Zone 3b
- Flood Zone 3a
- Flood Zone 2

Surface Water
- RoFfSW 3.3% AEP
- RoFfSW 1% AEP
- RoFfSW 0.1% AEP

Historical Flooding
- Historic Flooding

Emergency Planning
- Flood Warning Areas
- Flood Alert Areas

Climate Change
- Climate Change Central
- Climate Change Higher Central
- Climate Change Upper End
- Indicative Climate Change

Areas Susceptible to Groundwater Flooding
- >= 75%
- >= 50% <75%
- >= 25% <50%
- < 25%

Culvert Blockage Results
- Culverts assessed
- 100 year event with 33% blockage
- 100 year event with 66% blockage

Defences
- Demountable Defence
- Embankment
- Flood Gate
- Wall

0 0.5 1 2 3 4 Km

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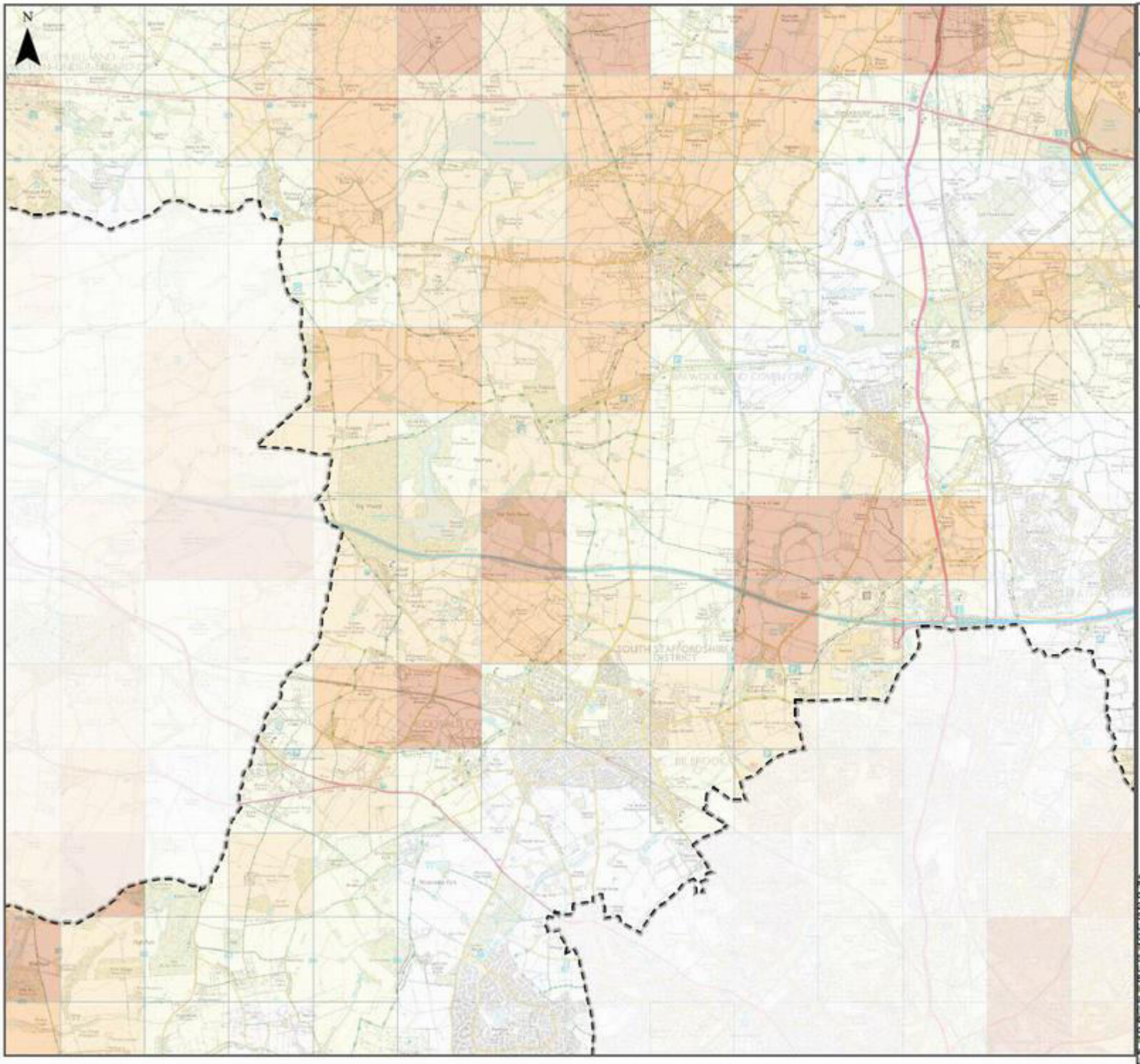

SOUTHERN STAFFORDSHIRE COUNCILS LEVEL 1 STRATEGIC FLOOD RISK ASSESSMENT

APPENDIX A: GEO PDF FLOOD RISK MAPPING

INDEX GRID: E2

Note: All layers are turned off by default. Click the box next to the layer of interest to turn on.

Authority Information
- Council Boundary
- Detailed River Network
- Main Rivers

Flood Zones
- Flood Zone 3b
- Indicative Flood Zone 3b
- Flood Zone 3a
- Flood Zone 2

Surface Water
- RoFfSW 3.3% AEP
- RoFfSW 1% AEP
- RoFfSW 0.1% AEP

Historical Flooding
- Historic Flooding

Emergency Planning
- Flood Warning Areas
- Flood Alert Areas

Climate Change
- Climate Change Central
- Climate Change Higher Central
- Climate Change Upper End
- Indicative Climate Change

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- Demountable Defence
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0 0.5 1 2 3 4 Km

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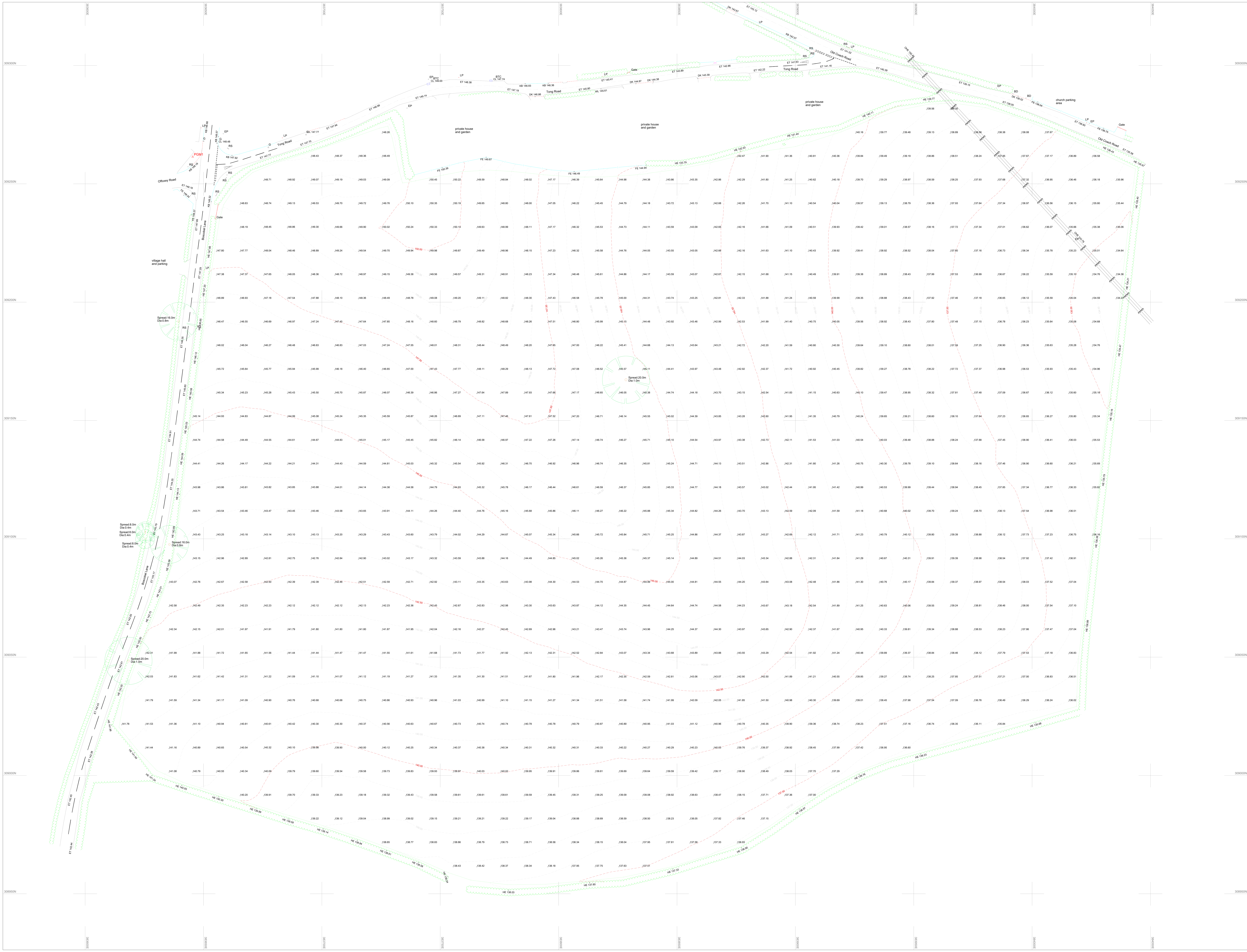
Appendix 3 - Topographic Survey



n4ce Project: 24013-BPW.sdb

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ALL LEVELS ARE IN METRES DERIVED FROM GPS TRANSFORMATION.

SERVICE COVERS INDICATED WHERE VISIBLE.
PIPE INVERTS / DETAILS SURVEYED FROM SURFACE
GENERALLY DAMAGED COVERS AND COVERS WITHIN HIGHWAYS WILL NOT BE LIFTED
BURIED SERVICE COVERS WILL NOT BE INDICATED.
SERVICE COVERS LOCATED UNDER IMMOVABLE OBJECTS MAY BE OMITTED

TREE SPECIES SHOULD BE CONFIRMED BY TREE SPECIALIST IF CRITICAL.

OVERHEAD CABLES ARE INDICATED USING REMOTE SURVEY METHODS AND ARE SUBJECT TO SEASONAL VARIATION, AND SHOULD BE TREATED AS APPROXIMATE.

KEY - GENERAL

AR	Armco Barrier	KB	Kerb Line
AV	Air Valve	KO	Kerb Drain
BA	Lifting Barrier	KT	Top of Kerb
BB	Bottom Of Bank	LA	Ladder
BD	Bollard	LP	Lamp Post
BH	Borehole	MH	Manhole
BR	Bottom Of Ramp	MKR	Marker Post
CN	Concrete	OHE	Overhead Electric Line
COL	Column	OHP	Overhead Pipeline
CS	Change of Surface	OHT	Overhead Telegraph Line
CTV	Cable TV Cover	PA	Edge of Path
DK	Drop Kerb	PO	Post
DP	Drain Pipe	RD	Ridge Line
DR	Drain Line	RE	Rodding Eye
EAVE	Eave Height	RS	Road Sign
EP	Electric Pole	RG	Railing/Handrail
ER	Earth Rod	RW	Retaining Wall
ET	Edge Tarmac	SC	Security Camera
FE	Fence (Annotation for type)	SD	Slot Drain
FFL	Finished Floor Level	SOF	Soffit Level
FH	Fire Hydrant	SP	Sheet Piling
FL	Flood Light	SW	Stay Wire
FP	Flag Pole	TB	Top Of Bank
G	Gulley	TL	Threshold Level
GD	Girder	TP	Telegraph Pole
GP	Gate Post	TM	Ticket Machine
GT	Gate	TR	Top Of Ramp
GSV	Gas Stop Valve	TS	Tree Stump
HE	Hedge Line	VE	Verge Line
IC	Inspection Cover	WE	Waters Edge
IL	Invert Level	WL	Wall
		WM	Water Meter

SURVEY STATIONS

Name	Easting	Northing	Height
PGM1	383645.448	309261.435	148.395

Amendments:

Rev	Date	Description

GRID Ordnance Survey
Derived from observations to Ordnance Survey active GNSS network

Presented with a Scale Factor of 1 about PGM1

DATUM Newlyn Datum
Derived from observations to Ordnance Survey active GNSS network

ADVANTAGE GEOMATICS

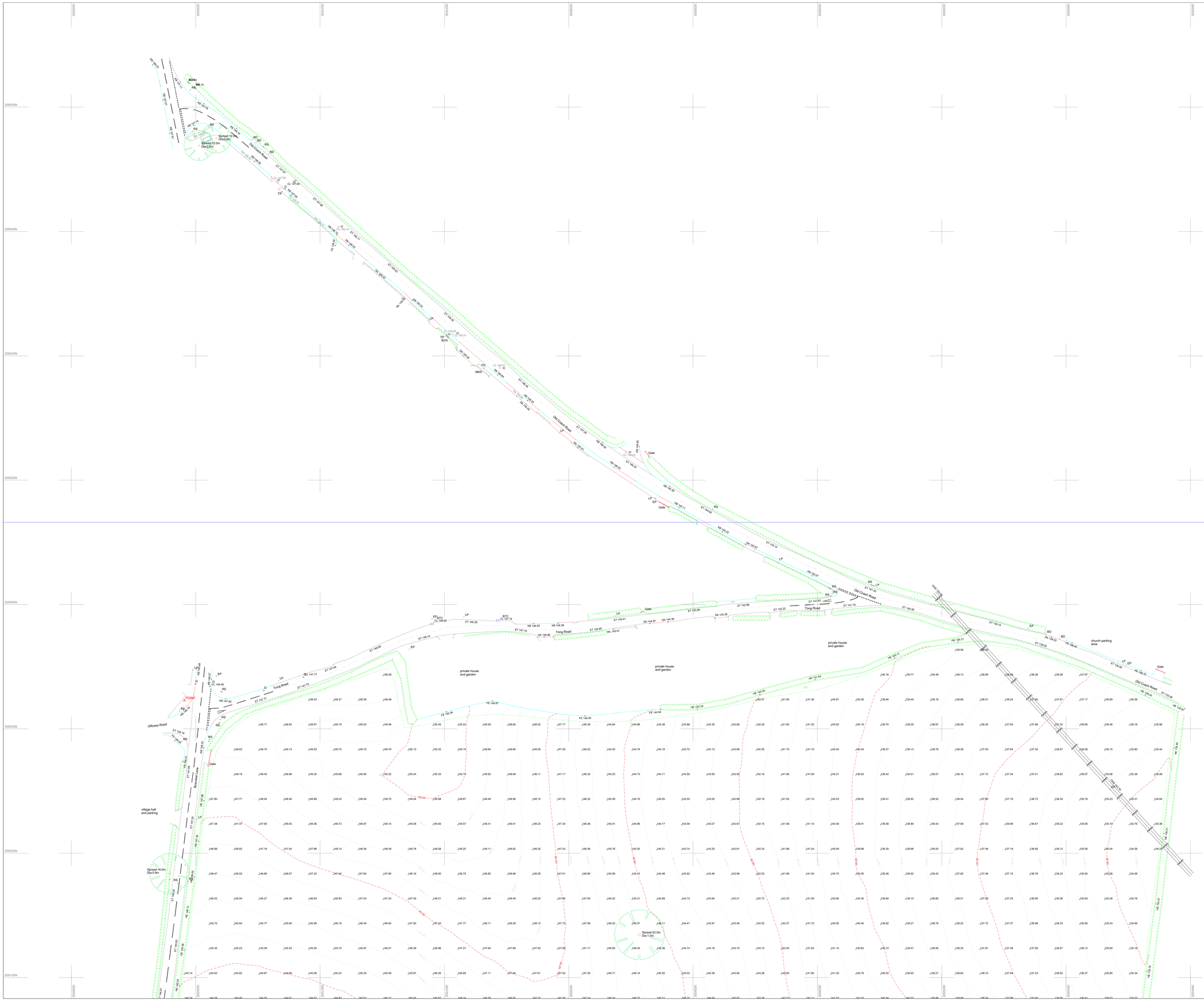
Client:
Boningale Homes

Project:
Bishops Wood, Tong Road, ST19 9AB

Description:
Topographic Survey

Date: 19/03/24 Scale: 1:500 @ A0

Drg. No: 24013-P-1



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PIPE INVERTS / DETAILS SURVEYED FROM SURFACE
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BURIED SERVICE COVERS WILL NOT BE INDICATED.
SERVICE COVERS LOCATED UNDER IMMOVABLE OBJECTS MAY BE OMITTED

TREE SPECIES SHOULD BE CONFIRMED BY TREE SPECIALIST IF CRITICAL.

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KEY - GENERAL

AR	Armco Barrier	KB	Kerb Line
AV	Air Valve	KO	Kerb Drain
BA	Lifting Barrier	KT	Top of Kerb
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BD	Bollard	LP	Lamp Post
BH	Borehole	MH	Manhole
BR	Bottom Of Ramp	MKR	Marker Post
CN	Concrete	OHE	Overhead Electric Line
COL	Column	OHP	Overhead Pipeline
CS	Change of Surface	OHT	Overhead Telegraph Line
CTV	Cable TV Cover	PA	Edge of Path
DK	Drop Kerb	PO	Post
DP	Drain Pipe	RD	Ridge Line
DR	Drain Line	RE	Rodding Eye
EAVE	Eave Height	RS	Road Sign
EP	Electric Pole	RG	Railing/Handrail
ER	Earth Rod	RW	Retaining Wall
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IL	Invert Level	WL	Wall
		WM	Water Meter

SURVEY STATIONS

Name	Easting	Northing	Height
PGM1	383645.448	309261.435	148.395

Amendments:

Rev	Date	Description

GRID Ordnance Survey
Derived from observations to Ordnance Survey active GNSS network

Presented with a Scale Factor of 1 about PGM1

DATUM Newlyn Datum
Derived from observations to Ordnance Survey active GNSS network

ADVANTAGE
GEOMATICS

Client:
Boningale Homes

Project:
Bishops Wood, Tong Road,
ST19 9AB

Description:
Topographic Survey

Date: 19/03/24
Scale: 1:500 @ A0

Drg. No: 24013-P-2

Appendix 4 - EA Correspondence

Charlotte Whitham

From: Enquiries_Westmids <Enquiries_Westmids@environment-agency.gov.uk>
Sent: 12 November 2024 14:44
To: Charlotte Whitham
Subject: Our Ref 382617 - SHF.710.013 - Land East of Boscobel Lane, Bishops Wood (EA)

Dear Charlotte

Enquiry regarding: Land East of Boscobel Lane, Bishops Wood

Thank you for your enquiry which was received on 23 October.

We respond to requests for information that we hold under the Freedom of Information Act 2000 (FOIA) and Environmental Information Regulations 2004 (EIR).

- **Can you confirm the Flood Zone within the Site boundary as described above?**
There are no main rivers in the vicinity of the site. Our modelling shows the site is currently at ***very low*** *risk from flooding from rivers and seas. The Environment Agency is only responsible for statutory main rivers, all other watercourses are the remit of your Lead Local Flood Authority (LLFA), which is this instance is Staffordshire County Council. For information and modelling regarding ordinary watercourse please contact your LLFA.* The site is in flood zone 1.

The information on Flood Zones in the area relating to this address is as follows:

The property is in an area located within Flood Zone 1 shown on our Flood Map for Planning (Rivers and Sea).

Note - This information relates to the area that the above-named property is in and is not specific to the property itself as it is influenced by factors such as the height of door steps, air bricks or the height of surrounding walls. We do not have access to this information and is not currently used in our flood modelling.

Flood Zone definitions can be found at www.gov.uk/guidance/flood-risk-and-coastal-change#Table-1-Flood-Zones

Please find attached a copy of the Flood Map for Planning (Rivers and Sea) for the area relating to your address.

More information can be found on the website at: https://flood-map-for-planning.service.gov.uk/ You can draw your development extent and the service then provides details on what level of Flood Risk Assessment you would require and the reasons why.

Data Available Online
Many of our flood datasets are available online:

- Flood Map For Planning (Flood Zone 2, Flood Zone 3 ,Flood Storage Areas, Flood Defences, Areas Benefiting from Defences)
- Risk of Flooding from Rivers and Sea
- Historic Flood Map
- Current Flood Warnings

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

- **Do you agree with our above interpretation of surface water flooding?**

The Risk of Flooding from Surface Water Flood Map shows the site is at **low** risk. Surface water flooding is also the remit of your Local Lead Flood Authority (LLFA). We create the Surface Water Flood Map on behalf of LLFAs using data they have provided. Please contact Staffordshire County Council for more information.

- **Do you have any records of historic flooding events on this Site, either from fluvial, surface water, groundwater, sewers or infrastructure failure sources? If you are aware of historical flooding at the Site, can you please provide us with details of these historical flood events where it is available, including flood levels, estimated return periods, photographs, and other such data as may be relevant to our study?**

The Environment Agency only hold historic flooding records for fluvial and tidal flooding from rivers and seas. We have no records of flooding in this area. Please note our records are not comprehensive and this does not mean the site has never flooded just that we hold no record of it. Your LLFA may have more information.

- **Do you have any information on drainage within the Site and in the local area, including any known drainage problems?**

Please contact you LLFA for any surface water enquiries.

- **What level of allowance for climate change would be required when considering surface water attenuation?**

Please contact you LLFA for any surface water enquiries.

- **Please can you also indicate to us whether you are aware of any relevant environmentally sensitive receptors [such as aquatic wildlife in receiving watercourses, etc.] in the area around the Site that we should be aware of when preparing the surface water drainage strategy?**

We do not hold any fish data for the adjacent watercourse. The closest survey location is circa 8km d/s on the Burlington Bk, where the fish assemblage consists of rheophilic coarse fish species such as Dace, Chub and Roach with the occasional Brown Trout.

Please refer to Open Government Licence which explains the permitted use of this information.

Rights of appeal
If you are not satisfied you can contact us within 2 calendar months to ask for our decision to be reviewed.

Our ref 382617

Yours sincerely

Diane Edwards
Customers and Engagement Officer
West Midlands Customers and Engagement Team

Environment Agency

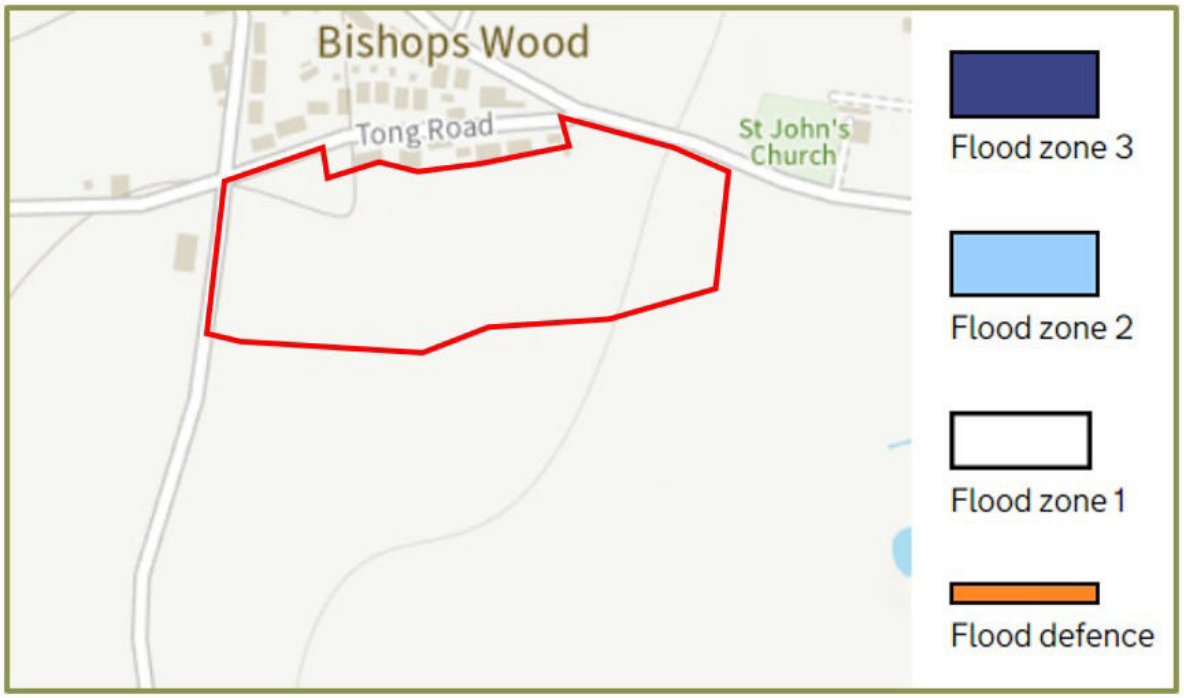
Enquiries Team: 02084 747856
Enquiries_Westmids@environment-agency.gov.uk
Environment Agency, 9 Wellington Crescent, Fradley Park, Lichfield, Staffordshire, WS13 8RR

From: Charlotte Whitham <charlotte.whitham@enzygo.com>
Sent: 23 October 2024 16:38
To: Enquiries_Westmids <Enquiries_Westmids@environment-agency.gov.uk>
Cc: Scott Dawson <scott.dawson@enzygo.com>
Subject: Our Ref 382617: SHF.710.013 - Land East of Boscobel Lane, Bishops Wood (EA)

Our Reference: SHF.710.013 - Land East of Boscobel Lane, Bishops Wood
Location: Land East of Boscobel Lane, Bishops Wood, ST19 9AA [NGR: 383832, 309190]

To whom it may concern,
Enzygo have been commissioned to undertake a Flood Risk Assessment [FRA] for a proposed planning application for a residential development, located on land east of Boscobel Lane, Bishops Wood.
Ordnance Survey mapping shows there are no watercourses within or bounding the Site.
Environment Agency online mapping flood map [Figure 1] shows the Site is located in Flood Zone 1; which is land outside the 1 in 1000-year [0.1% Annual Exceedance Probability [AEP]] extent of fluvial [river] flooding, at 'low' risk.

Figure 1: Flood Map for Planning



Environment Agency online surface water mapping [Figure 2] shows the Site is mainly located outside the extent of surface water flooding. There are however low risk surface water flow paths in the east and southwest of the Site.

Figure 2: Surface Water Mapping

Could you provide us with flooding data? In relation to the Site we would require clarification on the following points. Please note we are consulting with both the Environment Agency and Lead Local Flood Authority [LLFA].

- Can you confirm the Flood Zone within the Site boundary as described above?
- Do you agree with our above interpretation of surface water flooding?
- Do you have any records of historic flooding events on this Site, either from fluvial, surface water, groundwater, sewers or infrastructure failure sources? If you are aware of historical flooding at the Site, can you please provide us with details of these historical flood events where it is available, including flood levels, estimated return periods, photographs, and other such data as may be relevant to our study?
- Do you have any information on drainage within the Site and in the local area, including any known drainage problems?
- What level of allowance for climate change would be required when considering surface water attenuation?
- Please can you also indicate to us whether you are aware of any relevant environmentally sensitive receptors [such as aquatic wildlife in receiving watercourses, etc.] in the area around the Site that we should be aware of when preparing the surface water drainage strategy?

We trust that the details presented herein are self-explanatory and clear. If, for any reason you should have any queries or comments, please do not hesitate to contact me.

Many Thanks,

Charlotte Whitham BSc (Hons), MCIWEM
Hydrology Consultant

Phone: 0114 321 5151
Email: charlotte.whitham@enzygo.com
Web: enzygo.com

Air Quality | Landscape | Hydrology | Permitting | Ecology | Geo-environmental | Noise |Transport | Planning | Arboriculture

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Offices in Bristol, Cardiff, Cambridge, Sheffield & Manchester

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Appendix 5 - South Staffordshire Council Correspondence

Charlotte Whitham

From: Flood Risk Management Team <flood.team@staffordshire.gov.uk>
Sent: 24 October 2024 08:36
To: Charlotte Whitham
Cc: Contact Us
Subject: FW: SHF.710.013 - Land East of Boscobel Lane, Bishops Wood (LLFA)

You don't often get email from flood.team@staffordshire.gov.uk. Learn why this is important

Good morning Charlotte,

Thank you for your enquiry regarding a request for flood risk information for land east of Boscobel Lane, Bishops Wood.

We direct you to the following links which provide information to assist with your query:-

Staffordshire SuDS Handbook

Information for planners and developers - Staffordshire County Council

This contains policies and general guidance relating to SuDS within our SuDS Handbook.

Strategic Flood Risk Assessment Information

The Strategic Flood Risk Assessment (SFRA) for Staffordshire and its appendices which is available at:

https://www.lichfielddc.gov.uk/downloads/download/175/strategic-flood-risk-assessment

Flood Risk Data Information

Our team also provides a pre-application advice service for developments within Staffordshire.

Our pre-application advice service covers flood risk data requests and the review of draft drainage strategies. This service is accessed through our online payment system.

To request pre-application advice, please place an order using the Developer Advice Online Form.

Developer Advice Online Form - Order Online - Staffordshire County Council

Section 3 of the form allows you to choose Flood Risk Advice and Section 4 allows you to upload documents up to 8mb in size.

Once you pick the Flood Risk option, the next part of the form will ask you to opt for either pre-application advice service or land drainage consent. Your query would be the pre-application advice option (flood risk data request).

We trust this is of assistance.

Kind regards,

Flood Risk Management Team

Flood Risk Management
Economy, Infrastructure and Skills
Third Floor, Staffordshire Place 1
Tipping Street, Stafford, ST16 2DH
E-mail: **flood.team@staffordshire.gov.uk**
www.staffordshire.gov.uk

Providing a Flood Risk Management service for Staffordshire County, Dudley, Sandwell, Walsall and Wolverhampton Councils.

Staffordshire County Council now charges for their Pre-Application Advice Service. Pre-Application Advice and Consent for ordinary watercourse works for sites in Staffordshire can be ordered through our Developer Advice online form. Please see details and links on our website

---

From: Charlotte Whitham <charlotte.whitham@enzygo.com>
Sent: 23 October 2024 16:42
To: Contact Us <contactus@staffordshire.gov.uk>
Cc: Scott Dawson <scott.dawson@enzygo.com>
Subject: SHF.710.013 - Land East of Boscobel Lane, Bishops Wood (LLFA)

You don't often get email from charlotte.whitham@enzygo.com. Learn why this is important

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FAO – Lead Local Flood Authority (LLFA)

Our Reference: SHF.710.013 - Land East of Boscobel Lane, Bishops Wood
Location: Land East of Boscobel Lane, Bishops Wood, ST19 9AA [NGR: 383832, 309190]

To whom it may concern,
Enzygo have been commissioned to undertake a Flood Risk Assessment [FRA] for a proposed planning application for a residential development, located on land east of Boscobel Lane, Bishops Wood.
Ordnance Survey mapping shows there are no watercourses within or bounding the Site.
Environment Agency online mapping flood map [Figure 1] shows the Site is located in Flood Zone 1; which is land outside the 1 in 1000-year [0.1% Annual Exceedance Probability [AEP]] extent of fluvial [river] flooding, at 'low' risk.

Figure 1: Flood Map for Planning

Environment Agency online surface water mapping [Figure 2] shows the Site is mainly located outside the extent of surface water flooding. There are however low risk surface water flow paths in the east and southwest of the Site.

Figure 2: Surface Water Mapping

Could you provide us with flooding data? In relation to the Site we would require clarification on the following points. Please note we are consulting with both the Environment Agency and Lead Local Flood Authority [LLFA].

- Can you confirm the Flood Zone within the Site boundary as described above?
- Do you agree with our above interpretation of surface water flooding?
- Do you have any records of historic flooding events on this Site, either from fluvial, surface water, groundwater, sewers or infrastructure failure sources? If you are aware of historical

flooding at the Site, can you please provide us with details of these historical flood events where it is available, including flood levels, estimated return periods, photographs, and other such data as may be relevant to our study?

- Do you have any information on drainage within the Site and in the local area, including any known drainage problems?
- The proposal is for a development of a greenfield Site. Please could you indicate the maximum allowable discharge rate?
- What level of allowance for climate change would be required when considering surface water attenuation?
- Please can you also indicate to us whether you are aware of any relevant environmentally sensitive receptors [such as aquatic wildlife in receiving watercourses, etc.] in the area around the Site that we should be aware of when preparing the surface water drainage strategy?

We trust that the details presented herein are self-explanatory and clear. If, for any reason you should have any queries or comments, please do not hesitate to contact me.

Many Thanks,

Charlotte Whitham BSc (Hons), MCIWEM
Hydrology Consultant

Phone: 0114 321 5151
Email: charlotte.whitham@enzygo.com
Web: enzygo.com

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Offices in Bristol, Cardiff, Cambridge, Sheffield & Manchester

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Registered in England & Wales registered number: 06525159 VAT number: 283 2596 77

ISO 9001 Registered Certificate GB2004416 | Association of Geotechnical & Geoenvironmental Specialists | Constructionline | SSIP Safety Schemes in Procurement Acclaim Accreditation | CIEEM Registered Practice 2023-2024 | Building with Nature Approved Assessor

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South Staffordshire Council

Town and Country Planning (Development Management Procedure) (England) Order 2015 (as amended)

REFUSAL OF OUTLINE PLANNING PERMISSION

Application Number:	24/00467/OUTM
Proposed:	Outline planning permission for up to 100 residential dwellings, a local Use Class E(a) shop and associated drainage. Details of access provided, all other matters reserved for subsequent approval.
At:	Land At Boscobel Lane Bishops Wood

In pursuance of their powers under the above mentioned Act, South Staffordshire Council, hereby **REFUSE** permission for the development described in the above application,

Reasons for refusal:

1. The proposed development fails to comply with Core Policy 1 of the South Staffordshire District Core Strategy. CP1 identifies that growth within the District should be located at the most accessible and sustainable locations in accordance with the Council's settlement hierarchy, to ensure that adequate infrastructure services and villages are available to support growth. Bishops Wood is identified as a 'Small Service Village' and is not identified for housing growth under CP1. The proposal is functionally isolated from the nearest main service village with no safe pedestrian links, public transport and range of everyday services or facilities to support the development. The occupants of the proposed dwellings would therefore be dependent on the use of a private car to gain access to everyday facilities. The proposal therefore results in an unsustainable development, contrary to the aims of the National Planning Policy Framework (2023) and Core Policy 1 and Policy H3 of the Core Strategy.

2. The proposal is within the Green Belt and is considered to be inappropriate development as set out in policy GB1 of the adopted Core Strategy and paragraph 154 of the National Planning Policy Framework. The development is therefore harmful to the Green Belt, contrary to policy GB1 of the adopted Core Strategy and Section 13 of the National Planning Policy Framework (2023).

3. The Local Planning Authority has considered the reasons advanced, but does not consider that these reasons constitute the very special circumstances required to clearly outweigh the harm to the Green Belt by reason of inappropriateness, visual and spatial harm, conflict with the purposes of the Green Belt and other harm resulting from the proposal, contrary to policy GB1 of the adopted Core Strategy and Section 13 of the National Planning Policy Framework (2023).

4. Insufficient information has been provided by way of an acceptable Transport Assessment and a Travel Plan to demonstrate that the proposal would not result in a risk to highway safety due to the history of speeding along Boscobel Lane and the position close to the crossroads junction, resulting in substandard visibility. As such, the proposal is contrary to the National Planning Policy Framework (2023), and the Council's Core Strategy.

5. Insufficient information has been provided to demonstrate there would be no detrimental impact on protected species, with specific regard to Gret Crested Newts and wintering birds, in line with the requirements of the National Planning Policy Framework (2023), Policy EQ1 of the Council's Core Strategy and the ODPM Circular 06/2005 or the Conservation of Habitats and Species Regulations 2017 (as amended).

6. Insufficient information has been provided to demonstrate there would be no adverse impacts on the Mottey Meadows Special Area of Conservation (SAC) the Belvide Reservoir and Big Rough Sites of Special Scientific Interest (SSSI) as a result of surface water run off/drainage matters. Given this the development would be contrary to the requirement of the National Planning Policy Framework (2023).

7. The Local Planning Authority, as Competent Authority, has not been provided with sufficient information to demonstrate that there would be no detrimental impact on Cannock Chase SAC and/or Cannock Extension Canal SAC by way of nitrogen deposition from road traffic emissions associated with the proposed development and other plans and projects 'in-combination'. Given this the Local Planning Authority as Competent Authority has been unable to either screen out or complete a Habitat Regulations Assessment for these specific impacts on these European Protected sites contrary to the requirement of regulation 63 of the Conservation of Species and Habitats Regulations 2017 (as amended) and Paragraph 188 of the National Planning Policy Framework (2023).

8. Insufficient information has been provided to demonstrate there is no risk of flooding, or appropriate flood mitigation measures, contrary to the National Planning Policy Framework, Core Policy 3 and Policy EQ7 of the Core Strategy.

9. In the absence of a completed Section 106 agreement, the proposal fails to secure appropriate provision for:
- Affordable housing (40%) - 25% First Homes, 50%, Social Rent, and 25% Shared Ownership.
- Open space contribution (in line with Policy SAD7 of the Site Allocations Document 2018)
- Contribution to the Integrated Care Board (£89,657)
- Education Contribution (£307,776.00)
- Securing 30-year biodiversity net gain habitat management, and monitoring fee for any significant on-site habitat gains.
Contrary to policy EQ13 of the Local Plan.

Proactive Statement - Whilst paragraph 38 of the National Planning Policy Framework (2023) requires the Local Planning Authority to work with applicants in a positive and proactive manner to resolve issues arising from the proposed development; in this instance a positive solution could not be found, and the development fails to accord with the adopted Core Strategy (2012) and the National Planning Policy Framework (2023).

Signed Dated: 9 October 2024

Helen Benbow
Development Management Team Manager

Boningale Homes Limited
C/O Megan Wilson
Marrons
Waterfront House
Waterfront Plaza
35 Station Street
Nottingham
NG2 3DQ

NOTES

APPEALS

If you are aggrieved by the decision of your local planning authority to refuse permission for the proposed development or to grant it subject to conditions, then you can appeal to the Secretary of State under section 78 of the Town and Country Planning Act 1990.

If this is a decision on a planning application relating to the same or substantially the same land and development as is already the subject of an enforcement notice [reference], if you want to appeal against your local planning authority's decision on your application, then you must do so within 28 days of the date of this notice.

If an enforcement notice is served relating to the same or substantially the same land and development as in your application and if you want to appeal against your local planning authority's decision on your application, then you must do so within 28 days of the date of service of the enforcement notice, or within 6 months [12 weeks in the case of a householder appeal] of the date of this notice, whichever period expires earlier.

If this is a decision to refuse planning permission for a householder application, if you want to appeal against your local planning authority's decision then you must do so within 12 weeks of the date of this notice.

If this is a decision to refuse planning permission for a minor commercial application, if you want to appeal against your local planning authority's decision then you must do so within 12 weeks of the date of this notice.

Otherwise, if you want to appeal against your local planning authority's decision then you must do so within 6 months of the date of this notice.

However, if you are not sure which of these time limits applies to your decision please contact the Planning Inspectorate

Appeals can be made online at: https://www.gov.uk/planning-inspectorate.
If you are unable to access the online appeal form, please contact the Planning Inspectorate to obtain a paper copy of the appeal form on 0303 444 5000.

The Secretary of State can allow a longer period for giving notice of an appeal but will not normally be prepared to use this power unless there are special circumstances which excuse the delay in giving notice of appeal.

The Secretary of State need not consider an appeal if it seems to the Secretary of State that the local planning authority could not have granted planning permission for the proposed development or could not have granted it without the conditions they imposed, having regard to the statutory requirements, to the provisions of any development order and to any directions given under a development order.

If you intend to submit an appeal that you would like examined by inquiry then you must notify the Local Planning Authority and Planning Inspectorate (inquiryappeals@planninginspectorate.gov.uk) at least 10 days before submitting the appeal. Further details are on GOV.UK.

PURCHASE NOTICE

If permission to develop land is refused or granted subject to conditions, whether by the Local Planning Authority or the Secretary of State for Communities and Local Government, and the owner of the land claims that the land has become incapable of reasonably beneficial use in its existing state and cannot be rendered capable of reasonably beneficial use by the carrying out of any development which has been or would be permitted, he may serve on the Borough Council or District Council or County Council in which the land is situated, as the case may be, a purchase notice requiring that Council to purchase his interest in the land in accordance with the provisions of Part VI of the Town and Country Planning Act 1990.

COMPENSATION

In certain circumstances, a claim may be made against the Local Planning Authority for compensation, where permission is refused or granted subject to conditions by the Secretary of State on appeal or on a reference of the application to him. The circumstances in which such compensation is payable are set out in Section 114 of the Town and Country Planning Act 1990.

Appendix 6 - Severn Trent Water Asset Plans and Pre-development Enquiry

(c) Crown copyright and database rights 2024 Ordnance Survey 100031673

Date: 29/02/24

Scale: 1:1250

Map Centre: 383797,309156

Data updated: 14/02/24

Our Ref: 1408764 - 1

Wastewater Plan A2

Do not scale off this map. The plan and any information supplied with it is furnished as a general guide, is only valid at the date of issue and no warranty as to its correctness is given or implied. In particular this plan and any information shown on it must not be relied upon in the event of any development or works (including but not limited to excavations) in the vicinity of SEVERN TRENT WATER assets or for the purposes of determining the suitability of a point of connection to the sewerage or distribution systems. Reproduction by permission of Ordnance Survey on behalf of HMSO. ©Crown Copyright and database rights 2024 All rights reserved. Ordnance Survey licence number 100031673. Document users other than SEVERN TRENT WATER business users are advised that this document is provided for reference purpose only and is subject to copyright, therefore, no further copies should be made from it.

- Public Foul Gravity/Lateral Drain
- Public Combined Gravity/Lateral Drain
- Public Surface Water Gravity/Lateral Drain
- Pressure Foul
- Pressure Combined
- Pressure Surface Water
- Highway Drain
- Overflow Pipe
- Disposal Pipe
- Culverted Water Course
- Pumping Station
- Fitting
- Manhole Foul
- Manhole Surface
- Abandoned Pipe
- Chamber

Section 104 sewers are shown in green

Private sewers are shown in magenta

prenisha.govender@hexaconsulting.co.uk

Tong Road

SEVERN TRENT

GENERAL CONDITIONS AND PRECAUTIONS TO BE TAKEN WHEN CARRYING OUT WORK ADJACENT TO SEVERN TRENT WATER'S APPARATUS

Please ensure that a copy of these conditions is passed to your representative and/or your contractor on site. If any damage is caused to Severn Trent Water Limited (STW) apparatus (defined below), the person, contractor or subcontractor responsible must inform STW immediately on:
0800 783 4444 (24 hours)

a) These general conditions and precautions apply to the public sewerage, water distribution and cables in ducts including (but not limited to) sewers which are the subject of an Agreement under Section 104 of the Water Industry Act 1991(a legal agreement between a developer and STW, where a developer agrees to build sewers to an agreed standard, which STW will then adopt); mains installed in accordance with an agreement for the self-construction of water mains entered into with STW and the assets described at condition b) of these general conditions and precautions. Such apparatus is referred to as "STW Apparatus" in these general conditions and precautions.

b) Please be aware that due to The Private Sewers Transfer Regulations June 2011, the number of public sewers has increased, but many of these are not shown on the public sewer record. However, some idea of their positions may be obtained from the position of inspection covers and their existence must be anticipated.

c) On request, STW will issue a copy of the plan showing the approximate locations of STW Apparatus although in certain instances a charge will be made. The position of private drains, private sewers and water service pipes to properties are not normally shown but their presence must be anticipated. This plan and the information supplied with it is furnished as a general guide only and STW does not guarantee its accuracy.

d) STW does not update these plans on a regular basis. Therefore the position and depth of STW Apparatus may change and this plan is issued subject to any such change. Before any works are carried out, you should confirm whether any changes to the plan have been made since it was issued.

e) The plan must not be relied upon in the event of excavations or other works in the vicinity of STW Apparatus. It is your responsibility to ascertain the precise location of any STW Apparatus prior to undertaking any development or other works (including but not limited to excavations).

f) No person or company shall be relieved from liability for loss and/or damage caused to STW Apparatus by reason of the actual position and/or depths of STW Apparatus being different from those shown on the plan.

In order to achieve safe working conditions adjacent to any STW Apparatus the following should be observed:

1. All STW Apparatus should be located by hand digging prior to the use of mechanical excavators.

2. All information set out in any plans received from us, or given by our staff at the site of the works, about the position and depth of the mains, is approximate. Every possible precaution should be taken to avoid damage to STW Apparatus. You or your contractor must ensure the safety of STW Apparatus and will be responsible for the cost of repairing any loss and/or damage caused (including without limitation replacement parts).

3. Water mains are normally laid at a depth of 900mm. No records are kept of customer service pipes which are normally laid at a depth of 750mm; but some idea of their positions may be obtained from the position of stop tap covers and their existence must be anticipated.

4. During construction work, where heavy plant will cross the line of STW Apparatus, specific crossing points must be agreed with STW and suitably reinforced where required. These crossing points should be clearly marked and crossing of the line of STW Apparatus at other locations must be prevented.

5. Where it is proposed to carry out piling or boring within 20 metres of any STW Apparatus, STW should be consulted to enable any affected STW Apparatus to be surveyed prior to the works commencing.

6. Where excavation of trenches adjacent to any STW Apparatus affects its support, the STW Apparatus must be supported to the satisfaction of STW. Water mains and some sewers are pressurised and can fail if excavation removes support to thrust blocks to bends and other fittings.

7. Where a trench is excavated crossing or parallel to the line of any STW Apparatus, the backfill should be adequately compacted to prevent any settlement which could subsequently cause damage to the STW Apparatus. In special cases, it may be necessary to provide permanent support to STW Apparatus which has been exposed over a length of the excavation before backfilling and reinstatement is carried out. There should be no concrete backfill in contact with the STW Apparatus.

8. No other apparatus should be laid along the line of STW Apparatus irrespective of clearance. Above ground apparatus must not be located within a minimum of 3 metres either side of the centre line of STW Apparatus for smaller sized pipes and 6 metres either side for larger sized pipes without prior approval. No manhole or chamber shall be built over or around any STW Apparatus.

9. A minimum radial clearance of 300 millimetres should be allowed between any plant or equipment being installed and existing STW Apparatus. We reserve the right to increase this distance where strategic assets are affected.

10. Where any STW Apparatus coated with a special wrapping is damaged, even to a minor extent, STW must be notified and the trench left open until the damage has been inspected and the necessary repairs have been carried out. In the case of any material damage to any STW Apparatus causing leakage, weakening of the mechanical strength of the pipe or corrosion-protection damage, the necessary remedial work will be recharged to you.

11. It may be necessary to adjust the finished level of any surface boxes which may fall within your proposed construction. Please ensure that these are not damaged, buried or otherwise rendered inaccessible as a result of the works and that all stop taps, valves, hydrants, etc. remain accessible and operable. Minor reduction in existing levels may result in conflict with STW Apparatus such as valve spindles or tops of hydrants housed under the surface boxes. Checks should be made during site investigations to ascertain the level of such STW Apparatus in order to determine any necessary alterations in advance of the works.

12. With regard to any proposed resurfacing works, you are required to contact STW on the number given above to arrange a site inspection to establish the condition of any STW Apparatus in the nature of surface boxes or manhole covers and frames affected by the works. STW will then advise on any measures to be taken, in the event of this a proportionate charge will be made.

13. You are advised that STW will not agree to either the erection of posts, directly over or within 1.0 metre of valves and hydrants,

14. No explosives are to be used in the vicinity of any STW Apparatus without prior consultation with STW.

TREE PLANTING RESTRICTIONS

There are many problems with the location of trees adjacent to sewers, water mains and other STW Apparatus and these can lead to the loss of trees and hence amenity to the area which many people may have become used to. It is best if the problem is not created in the first place. Set out below are the recommendations for tree planting in close proximity to public sewers, water mains and other STW Apparatus.

15. Please ensure that, in relation to STW Apparatus, the mature root systems and canopies of any tree planted do not and will not encroach within the recommended distances specified in the notes below.

16. Both Poplar and Willow trees have extensive root systems and should not be planted within 12 metres of a sewer, water main or other STW Apparatus.

17. The following trees and those of similar size, be they deciduous or evergreen, should not be planted within 6 metres of a sewer, water main or other STW Apparatus. E.g. Ash, Beech, Birch, most Conifers, Elm, Horse Chestnut, Lime, Oak, Sycamore, Apple and Pear. Asset Protection Statements Updated May2014

18. STW personnel require a clear path to conduct surveys etc. No shrubs or bushes should be planted within 2 metre of the centre line of a sewer, water main or other STW Apparatus.

19. In certain circumstances, both STW and landowners may wish to plant shrubs/bushes in close proximity to a sewer, water main of other STW Apparatus for screening purposes. The following are shallow rooting and are suitable for this purpose: Blackthorn, Broom, Cotoneaster, Elder, Hazel, Laurel, Privet, Quickthorn, Snowberry, and most ornamental flowering shrubs.

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
6301	F	150.21	146.27	3.94
6302	F	149.88	146.76	3.12

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

WONDERFUL ON TAP

SEVERN TRENT

12th March 2023

Prenisha Govender
Hexa Consulting
4 St Mary's Place
Nottingham
NG1 1PH

Severn Trent Water Ltd
Oxley Moor Road
Wolverhampton
WV9 5HN

www.stwater.co.uk

Email:
Network.Solutions@SevernTrent.co.uk

Our ref: 1110110

Dear Prenisha

Proposed Development: Tong Rd Bishops Wood

I refer to your 'Development Enquiry Request' of 90 houses and school and commercial sites in respect of the above named site. Please find enclosed the sewer records that are included in the fee together with the Supplementary Guidance Notes (SGN) which refer to surface water disposal from development sites.

Protective Strip

Due to a change in legislation on 1 October 2011, there may be former private sewers on the site which have transferred to the responsibility of Severn Trent Water Ltd, which are not shown on the statutory sewer records, but are located in your client's land. These sewers would also have protective strips that we will not allow to be built over. If such sewers are identified to be present on the site, please contact us for further guidance.

Foul Water Drainage

A foul connection into highway Boscobel Lane Ln into the 150mm m/h 6302 in Doles Ln(further south) for the overall site@ 1.4l/s 2xdwf(gravity flows), expected pumped flows 4l/s, but due to surcharge levels and the expected additional flows into the network downstream then additional investigation/modelling will be required.
Due to the performance of the downstream network, modelling will be required to better understand the impact of the additional properties on the public network..

In a change to our previous process, we no longer charge developers for the hydraulic modelling service. We will liaise with you over time with regards to the outcome of our investigations and any impact that may have on the planning status, occupation,

or phasing of the site. However, while we can provide a brief summary of our findings if you need us to, we will no longer provide the full external capacity assessment report.

From the application you have submitted, I am assuming that the development has not been granted planning approval. In the meantime, the site will be added to our modelling tracker and reviewed regularly until the site can be progressed for sewer modelling. I would therefore be grateful if you would forward as soon as possible the following details:

- Confirmation whether a pumped solution is required (please provide pump rate and frequency, if available)
- Anticipated flow rate from the site
- Proposed planned start and completion date
- Any phasing details of the proposed development
- Confirm how many properties will discharge into each of the connections to the public sewer.
- Planned occupation date

Surface Water Drainage

Under the terms of Section H of the Building Regulations 2000, the disposal of surface water by means of soakaways should be considered as the primary method. If these are found to be unsuitable, satisfactory evidence will need to be submitted. The evidence should be either percolation test results or by the submission of a statement from the SI consultant (extract or a supplementary letter).

Subject to above Severn Trent Water expects all surface water from the development to be drained in a sustainable way to the nearest watercourse or land drainage channel, including highway drainage etc. subject to the developer discussing all aspects of the developments surface water drainage, with the Local Lead Flood Authority (LLFA). Any discharge rate to a watercourse or drainage ditch will be determined by the LLFA / EA.

New Connections

For any new connections (including the re-use of existing connections) to the public sewerage system, the developer will need to submit a Section 106 application form. Our Developer Services department are responsible for handling all new connections enquiries and applications. To contact them for an

application form and associated guidance notes please call 0800 707 6600 or download from www.stwater.co.uk.

Please quote the reference 1110110 in any future correspondence (including e-mails) with STW Limited. Please note that Developer Enquiry responses are only valid for 6 months from the date of this letter.

Yours sincerely,

Michael Taylor
Network Solutions
Developer Services

Appendix 7 - BGS Borehole Records

British Geological Survey
BGS ID: 649295 : BGS Reference: SJ80NW34
British National Grid (27700) : 382790,308960

8279. 0898 SJ80NW/34 53/15/34

SHROPSHIRE 44 - NE-E

RECORD OF WELL (SHAFT OR BORE)

1" N.S. 153
1" O.S. 153
Grid Ref.

At Mosshill Farm Bradford Estate
Town or Village Bishops Wood, Staffs County SALOP Six-inch quarter sheet 44 NE E
Exact site (Postal address Staffs: farm and well actually in Salop.) in parish of (A rough or a tracing map is very)

Level of ground surface above sea-level (O.D.) ft. If well starts below ground surface, state how far ft.
Shaft ft., diameter ft. Bore 200 ft. Diameter of bore: at top ins.; at bottom ins.
Details of permanent lining tubes (internal diameters preferred) 155 ft of tubing (no other details available)
Water struck at depths of (feet) a certain quantity of water met with in the shallow bed between 5 & 10 ft, subject to surface contamination
Rest-level of water below top of well 53 feet. Suction at feet. Yield on hours' test 2,880 gallons per hour (with pump of capacity g.p.h.); depressing water level to feet below top. Time of recovery hrs. Amount normally pumped daily g.p.h. for hours.
Quality (attach copy of analysis if available)
Sunk by G. H. York & Co. for Mr. Lord Bradford Date of well June 1939
Information from [illegible] Wyatt Esq.

(For Survey use only). GEOLOGICAL CLASSIFICATION.	NATURE OF STRATA (and any additional remarks).	THICKNESS Feet.	THICKNESS Inches	DEPTH Feet.	DEPTH Inches.
Drift	Soil			1	0
	Yellow			5	0
	Sand & gravel			10	0
	Brown clay			20	0
Keuper Marl	Red marl and bands of light grey marl			153	0
Lower Keuper Sandstone	Loamy sand-stone			156	0
	Loamy sand-stone with bands of marl			173	0
	Sandy clay			177	0
	Red marl with thin bands of sst.			200	0
MGS 1976					
	no drop in water-level was noted during test.				
	Visited: sited on Salop 44 NE/E				
	Owned by Lord Bradford (Bradford Estate Office, Weston-under-Lizard)				
	Pumps about 20 hrs per day, 7 days per week				
	Supplies Weston Park Farm, White Oak Farm, Mosshill Farm, Bellevue and cottages.				
	Looked after by son of keeper who lives at Bellevue				
	20.c.475			31.3.49 Rin.	

REMARKS

The total length of Lining Tube in borehole is 158 feet. A certain quantity of water was met in the shallow bed between 5 & 10 ft, but quantity low and probably falling off in dry weather, also subject to surface contamination.
The yield (2.880 G.P.H.) was tested by "Air-Lift" system, and the testing pipes used were only capable of this quantity. No drop whatever in water level was noted during the test, and it is probable that the bore will stand pumping at a higher rate if necessary at any time. The bore is in the Keuper Marl, and although the sandstone probably underlies this, it was considered that the salinity of the water may increase considerably if boring proceeds deeper.

G. H. York & Co.

Contact BGS: ngdc@bgs.ac.uk

British Geological Survey

SJ 80 NW/34 153/15

Survey No. 159
1" N.S. 153
1" O.S.

RECORD of ~~WELL or~~ BORING

at (house or farm) Meeshill Farm / White Oak Fm. Lord Bradford's Estate

Six-inch map 44 N.E.

Town, Village, &c. Tong   County Shropshire

Exact site (unless a tracing from a map is supplied, give distance and direction from parish church, cross-roads, or other object shown on maps): "In field No. 182 ... from the N.E. corner of Tong Rough" [... marked on 1"] [and ... 250 yds SSW of the farm.]

Popular Edition one-inch map. Sheet Square

Surface level of ground 470 ft. above Ordnance Datum. Well or Bore commenced at ~~ft. below~~ surface level of ground.

Sunk ...ft., diameter ...ft.   Bored 200 ft.; diameter of boring: at top 6 in., at bottom 6 in.

Details of lining tubes (internal diameters preferred) 5 5/8" I/d (6 1/8" o/d) unperforated lining tubes, total length 155 ft.

Water struck at depths of (feet) 5 & 10 ft (see below); 53 ft

Rest-level of water below top of well or bore 53 ft. Pumping level No depression noticed at test ft. Time of recovery — hours.

Suction at ...ft. depth. Yield: (i) on 6 hour test 2,880 — galls. per hr. (ii) normal ... galls. per ... (= pump capacity; see below)

Quality (attach copy of analysis if available) See below.

Made by G. H. York & Co   for Lord Bradford   Date of boring 1936 May–June

Information from G. H. York & Co, Artesian Engineers, 32–38 New Street, Wellington, Salop. [First record received is their own ... (and ...) record form]

(For Survey use only). GEOLOGICAL CLASSIFICATION.	NATURE OF STRATA. (and any additional remarks)	THICKNESS. Feet.	THICKNESS. Inches.	DEPTH. Feet.	DEPTH. Inches.
Drift	Turf & Soil	1	—	1	—
	Clay	4	—	5	—
	Sand exposed [with water, see below]	5	—	10	—
	Brown clay	10	—	20	—
K.M.	Red Marl & bands of light Grey Marl	133	—	153	—
	Loamy Sandstone	3	—	156	—
	Loamy Sandstone and bands of Marl [skerries]	17	—	173	—
	Sandy clay	1	—	174	—
[illegible]	Red Marl with very thin bands of Sandstone	26	—	200	—

Remarks:– ..... water in the shallow bed between 5 & 10 ft, quantity low and probably affected by dry weather, also subject to surface contamination. "The yield ... was tested by Air-Lift system, and the testing pipes used were only capable of this quantity. No drop whatever in water level during test; probably "the ... would stand pumping at a higher rate if necessary during ..." "The bore is in the Keuper Marl, and although the sandstone probably ... ... , it was considered that the salinity of the water may increase considerably if boring proceeded deeper."

Analysis (Lab. Ref. B.148) Pts. per 100,000

Free Ammonia	0.0004
Albuminoid do.	0.0003
Chlorine as chloride	2.7
Nitrites	Absent
Nitrates	0.075
Temp. Hardness	23.5 parts $CaCO_3$
Perm. "	18.0

"The sample was slightly turbid, but had no objectionable taste or smell." "Above results show that the supply is very suitable for drinking purposes." [Analyst's name ... ?? ...]

Sites from tracing on Salop 44 NE/E

P.T.O.

For Survey use only.

Date received.	G.S.M.	M. of H. notified.	Site marked on 1" map.
	6740		

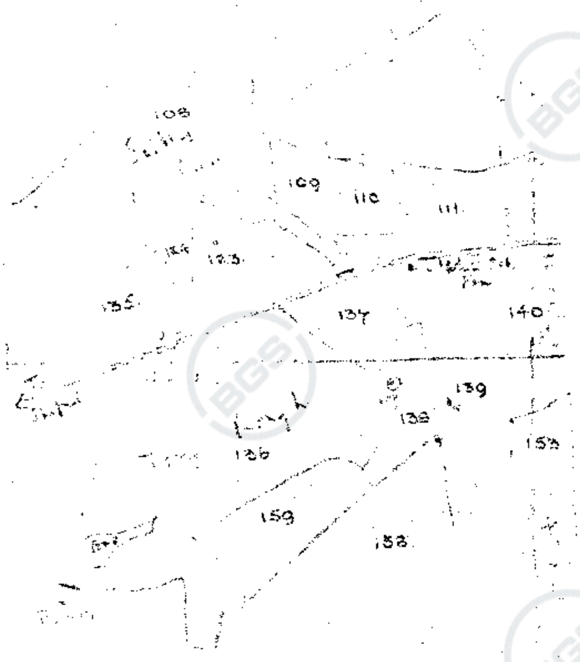
Geological Survey and Museum, South Kensington, London, S.W.7.

153/15

SJ 80 NW/34

In reply to a further letter about certain discrepancies in their record [water entry versus lining tubes!] Messrs York write (6.vii.36):—

"We have now had a talk with our foreman on this work re "the water levels, and the information as given in our records is "certainly rather misleading. It appears that water (a "small quantity) was first met in the sand & gravel bed at "5-10 ft. The boring (unlined) was continued through the "marl beds & water level stood at 43 ft below G/L. The "quantity of water was very small indeed and could be "pumped out in a few ~~minutes~~ moments. The lining tubes "were driven down about 158 ft or so level, and as the boring "continued the water level dropped to 53 ft below G/L. The "foreman states that the water entered at about 158-170 ft, "and we think this is correct."



British Geological Survey

RECORD of ~~WELL or~~ BORING

153/15

Survey No. 159 | 1" N.S. 153 | 1" O.S. | Six-inch 44 NE | Popular Edition Sheet of one-inch map. 15

at (house or farm) Meeshill Farm ~~White Oak~~ Lord Bradford's Estate

Town, Village, &c. Tong County Shropshire

Exact site (unless a tracing from a map is supplied, give distance and direction from parish church, cross-roads, or other object shown on maps). "In field N. W. of, abt. 500 ft. from N.E. corner of Tong Rough" [Ks. fm. ← Tong Rough both marked on 1"] and [fm. tracing] 250 yds S.S.W. of the farm.

Surface level of ground abt. 470 ft. above Ordnance Datum. Well or Bore commenced at ... ft. ~~below~~ surface level of ground.

Sunk ... ft., diameter ... ft. Bored 200 ft.; diameter of boring: at top 6 in., at bottom 6 in.

Details of lining tubes (internal diameters preferred) 5 5/8" 1/2 (6 1/4" 0/d) unperforated lining tube, held top of 158 ft. SJ8279 0896 SJ80/11

Water struck at depths of (feet) 5 to 10 ft (see below); 53 ft*

Rest-level of water below ~~above~~ top of well or bore 53 ft. Pumping level No depression noticed at test ft. Time of recovery — hours.

Suction at ... ft. depth. Yield: (i) on 6 hr test 2,800 — galls. per hr. Y (ii) normal ... galls. per ...

Quality (attach copy of analysis if available) See below. (= pump capacity, see below)

Made by Geo. H. York & Co. for ~~Mr~~ Lord Bradford Date of boring 1936 May–June

Information from G. H. York & Co., Artesian Engineers, 32–38 New Street, Wellington, Salop. [First record received in ~~...~~ ... (or part) record from ...]

(For Survey use only). GEOLOGICAL CLASSIFICATION.	NATURE OF STRATA. (and any additional remarks)	THICKNESS Feet.	THICKNESS Inches.	DEPTH Feet.	DEPTH Inches.
Drift	Turf & Soil	1	—	1	—
	Clay	4	—	5	—
	Sand & gravel [with water, see below]	5	—	10	—
	Brown clay	10	—	20	—
K.M.	Red Marl & bands of Light Grey Marl	133	—	153	—
	Loamy Sandstone	3	—	156	—
	Loamy Sandstone and bands of Marl [skerries]	17	—	173	—
	Sandy clay	1	—	174	—
[Ks.assumption]	Red Marl with very thin bands of Sandstone	26	—	200	—

Remarks:– ".... water in the Drift bed between 5–10 ft, quantity low and poor, failing often dry weather, also subject to surface contamination."
"The yield .. was tested by Air-Lift system, and the testing plant used was only capable of this quantity. No drop whatever" in water level during test; probably "the bore would stand pumping at a higher rate if necessary at any time."
"The bore is in the Keuper Marl, and although the sandstone probably underlies this it was considered that the salinity of the water may increase considerably if boring proceeded deeper."

Analysis (Lab. Ref. B. 148) Pts. per 100,000

Free Ammonia	0.0004
Albuminoid do.	0.0003
Chlorine as chloride	2.7
Nitrites	Absent
Nitrates	0.075
Temp. Hardness	13.5 parts $CaCO_3$
Perm.	18.0

"The sample was slightly turbid, but had no objectionable taste or smell. The "above results show that the supply is very suitable for drinking purposes." [Analyst name ?? (not given)]

* Site from tracing on Salop 44 NE/E

PTO

Data Bank

Geological Survey and Museum, South Kensington, London, S.W.7.

For Survey use only.

Date received.	O.S.M.	M. of H. notified.	Site marked on 1" map.
29.vi.36	6748		+ library, C. S.H.B. ✓

(68237B) Wt 28270/58 2,500 2/36 H, J. R & L, Ld Gp 616

In reply to a further letter about [illegible] in their record [what entry [illegible] boring hole?] Messrs Young wrote (6.vii.36):—

"We have now had a talk with our foreman on this work re
"the water levels, and the information we gave in our records is
"certainly rather misleading. The upper level water (a
"small quantity) was first met in the sand + gravel bed at
"5–10 ft. The boring (unlined) was continued through the
"marl into a [illegible] level [illegible] at 43 ft below G/L. The
"quantity of water was very small indeed and with no
"proper [illegible]. A few ~~[illegible]~~ moments. The boring when
"[illegible] down about 158 ft [illegible] level, and as the boring
"continued the water level dropped to 55 ft below G/L. The
"foreman thinks that the water [illegible] about 158–170 ft,
"and no [illegible] [illegible] is correct."

Date

British Geological Survey

BGS ID: 649295 : BGS Reference: SJ80NW34
British National Grid (27700) : 382790,308960

SHROPSHIRE 44 - NE-E

159

6" N.S. 153
1" O.S. 153
Grid Ref. [illegible]

RECORD OF WELL (SHAFT OR BORE)

At Moreshill [illegible] Bradford Estate

Town or Village Bishops Wood Staffs County Salop Six-inch quarter sheet 44 NE

Exact site (Postal address Staffs. [illegible] well actually in Salop) (A rough sketch or a tracing from a map is useful)

in parish of

75

Level of ground surface above sea-level (O.D.) ft. If well starts below ground surface, state how far ft.

Shaft ft., diameter ft. Bore 200 ft. Diameter of bore: at top ins.; at bottom ins.

Details of permanent lining tubes (internal diameters preferred) [illegible]

Water struck at depths of (feet) [illegible]

Rest-level of water below/above top of well 53 feet. Suction at feet. Yield on hours'/days' test

2,300 gallons per hour (with pump of capacity g.p.h.); depressing water level to feet below top. Time of recovery hrs. Amount normally pumped daily g.p.h. for hours.

Quality (attach copy of analysis if available)

Sunk by Messrs G. H. York & Co. for Mr. [illegible] Bradford Date of well [illegible] 1939

Information from [illegible]

(For Survey use only) GEOLOGICAL CLASSIFICATION.	NATURE OF STRATA (and any additional remarks).	THICKNESS Feet	THICKNESS Inches	DEPTH Feet	DEPTH Inches
	Soil			1	0
	Clay			5	0
	Sand & gravel			10	0
	Brown clay			20	0
	Red marl [illegible] bands of light grey marl			103	0
	[illegible]			170	0
	[illegible]			172	0
	[illegible] clay			177	0
	[illegible]			200	0
	[illegible] was noted [illegible]				
	[illegible]				
	[illegible] Salop 44 NE/E				
	[illegible] Bradford Estate Office, [illegible]				
	[illegible] days per week.				
	Supplies [illegible] Moreshill Farm,				
	[illegible] and cottages				
	[illegible] at Bellevue				
	22.c.47S			3.2.[illegible]	[illegible]

REMARKS

The total length of Lining Tube in borehole is 158 feet. A certain quantity of water was got in the shallow bed between 5 & 10 ft, but quantity low and probably falling off in dry weather, also subject to surface contamination. The yield (2.300 G.P.H.) was tested by "Air-Lift" system, and the testing pipes used were only capable of this quantity. No drop whatever in water level was noted during the test, and it is probable that the bore will stand pumping at a higher rate if necessary at any time. The bore is in the Keuper Marl, and although the sandstone probably underlies this, it was considered that the salinity of the water may increase considerably if boring proceeds deeper.

G. H. York & Co.

Contact BGS: ngdc@bgs.ac.uk

British Geological Survey
BGS ID: 649295 : BGS Reference: SJ80NW34
British National Grid (27700) : 382790,308960

ADDITIONAL INFORMATION SHEET

Licence No. ....

SJ 80/11

153/15

Date of completion of well catalogue ....

Date of publication ....

Additional Sheet No. ....

DATE	*	ADDITIONAL INFORMATION	Thickness	Depth (FT)	INIT.
April 1976					
		Soil and Drift		·20	
Trias		Keuper Marl		153	
		Lower Keuper Sandstone seen to		200	MCS
		Data Bank			

FILMED

* Insert Well Reference Letter, If More Than One Well At Site

P.T.O.

Section 6	Pumping test	Observ. well	Recorder	E.R. log	Geological Survey. Water Department South Kensington, London, S.W.7.

(1930) Wt.14934/P.S.127 5m 9/63 O.W.B.Ltd. Gp.863

Contact BGS: ngdc@bgs.ac.uk

British Geological Survey

BGS ID: 649295 : BGS Reference: SJ80NW34
British National Grid (27700) : 382790,308960

DATE	*	ADDITIONAL INFORMATION	INIT.

FILMED

INSERT WELL REFERENCE LETTER, IF MORE THAN ONE WELL AT SITE

Additional Information Sheet No..... Commenced.....

Contact BGS: ngdc@bgs.ac.uk

British Geological Survey
BGS ID: 649295 : BGS Reference: SJ80NW34
British National Grid (27700) : 382790,308960

ADDITIONAL INFORMATION SHEET

Date of completion of well catalogue: Meashill Farms

Date of publication: Tong
Shropshire

Licence No. 153/13 SJ80/11

Additional Sheet No.

DATE	*	ADDITIONAL INFORMATION	INIT.
		Visited and sited on O.S. 6" SJ 80 NW	
		Owned by Bradford Estate	
		Bore head in locked building not accessible	
		More information available from Bradford Estate Office	
		O.D. 449 ft	
		May 1977	
		RA	
FILMED		* Insert Well Reference Letter, If More Than One Well At Site	P.T.O.

Section 6	Pumping test	Observ. well	Recorder	E.R. log	Geological Survey, Water Department, South Kensington, London, S.W.7.

(4130) Wt.34984/P.S.127 5m. 9/63 G.W.B.Ltd. Gp.803

Contact BGS: ngdc@bgs.ac.uk

British Geological Survey

BGS ID: 649295 : BGS Reference: SJ80NW34
British National Grid (27700) : 382790,308960

DATE	*	ADDITIONAL INFORMATION	INIT.

FILMED

INSERT WELL REFERENCE LETTER, IF MORE THAN ONE WELL AT SITE

Additional Information Sheet No. ..... Commenced .....

Contact BGS: ngdc@bgs.ac.uk

Appendix 8 - Soakaway Testing Results

Technical Note

Subject: Soakaway testing

Project: Tong Road, Bishops Wood

Reference: 600957-HEX-00-XX-RP-GE-0002

Date: 18 December 2024

1.0 Introduction and Scope

Hexa has been commissioned by Boningale Homes, to undertake soakaway and infiltration testing at the proposed residential site to the of south of Tong Road, Bishops Wood, Stafford, ST19 9AB. The approximate Grid Reference for the centre of the site is SJ 83835 09212

Tests were undertaken at each the location and elevation according the positioning and the invert level based on preliminary drainage design.

2.0 Works Undertaken

The soakaway tests were undertaken on the 28th November 2024.

Three locations were tested across the site. Owing to recent heavy rain in the days prior to the test the near surface was extremely soft and boggy with areas of standing water. This prevented access across the site for plant and the bowser which became stuck. Therefore due to access issues noted above, all infiltration test were undertaken within hand dug pits.

Figure 1 – Test Locations

All infiltration test were advanced to 1.10 m bgl (d) 0.22m (w) and 0.22m (l) as a hand excavated pit. Pits were filled with water to the base of topsoil.

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3.0 Encountered Ground Conditions

Ground conditions across the site comprised of a topsoil, encountered to c. 0.30 m bgl generally underlain by natural soils comprising of a sandy gravel (SA101 and SA103) to a maximum confirmed depth of 1.10 m bgl. In SA102 the natural soils were recorded to be a gravely clay underlying the topsoil.

Groundwater was not encountered in any excavation advanced although a slight seepage was noted at the base of the sandy gravel in SA102.

4.0 Results

As stated above, given access issues due to wet weather, the site was too waterlogged for the site plant and water bowser to reach the soakaway locations. Infiltration test were therefore undertaken within hand dug inspection test.

All pits were filled to the base of topsoil. Tests were monitored for a period ranging from 3 to 5 hours. Infiltration rates have been calculated, in general accordance with the methodology within BRE365.

SA101 was monitored for a period of 5 hours with water levels falling 500mm in that period. As soakage was not observed to 25% of the effective depth of the pit calculations have been undertaken based in the effective depth across the 500mm of soakage observed.

SA102 was monitored for 3 hours no with no measurable soakage observed.

SA103 was monitored for 3 hours with a total fall of 140mm recorded. Given the limited soakage observed calculations have been made based on the soakage observed and also through linear extrapolation to the full theoretical soakage.

Table 1 – SA101 infiltration Summary

Test	Infiltration Rate
SA101 (5 Hours)	8.67E-06 m/s
SA102 (3 Hours)	No infiltration recorded
SA103 (3 Hours)	5.22E-06 m/s
SA103 (Extrapolated)	1.57E-06m/s

5.0 Conclusions

Ground conditions across the locations tested were variable with infiltration only noted in two locations tested. Given the variability in ground conditions, the adoption of soakaways as part of sustainable drainage should be adopted with caution and the infiltration rates presented above should be adopted for preliminary design purposes only.

In the event that soakaways are adopted it is therefore important that when formed, the ground conditions are inspected by a qualified engineer given the variability noted in clay content to date. In addition confirmatory testing should be undertaken in the exact location of the soakaway to confirm the design infiltration rate.

Yours sincerely,

James Elliott

Geotechnical Engineer

For and on behalf of Hexa Consulting Ltd

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VAT Number
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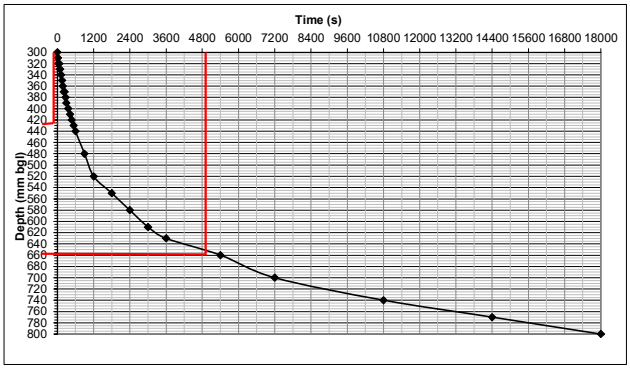
CALCULATION SHEET - SOIL INFILTRATION RATE

Project:	Tong Road, Bishops Wood, Boscobel Lane
Job Number:	600957
Author:	JE

Hole Ref.:	SA101
Test Date:	28/11/2024
Test No.:	1

0.22	m	Length of trial pit
0.22	m	Width of trial pit
1.10	m	Depth (total) of trial pit
0.05	m^2	Area of trial pit base
0.300	m bgl	Water level at start of test (approximate invert level)
0.800	m bgl	Water level at end of test
0.500	m	Effective storage depth
0.425	m bgl	Effective storage depth (75% full)
0.675	m bgl	Effective storage depth (25% full)
0.012	**m^3**	**Effective storage volume (V_{75-25})**
0.268	**m^2**	**Internal surface area (50% effective depth) (a_{50})**
5200	**s**	**Time for head to fall from 75% to 25% effective depth (t_{75-25})**

8.67E-06	**m/s**	**Soil infiltration rate (f)**



Note 1: No gravel backfill

Note 2 : Due to access issues, soakaways undertaken in hand pits.

RAW DATA

Project:	Tong Road, Bishops Wood, Boscobel Lane
Job Number:	600957
Author:	JE

Hole Ref.:	SA101
Test Date:	28/11/2024
Test No.:	1

Time (min)	Time (s)	Depth (mm bgl)	Stratum
0	0	300	
0.25	15	310	
0.5	30	320	
0.75	45	320	
1	60	320	
1.5	90	330	
2	120	340	
2.5	150	350	
3	180	360	
3.5	210	370	
4	240	370	
4.5	270	380	
5	300	390	
6	360	400	
7	420	410	
8	480	420	
9	540	430	
10	600	440	
15	900	480	
20	1200	520	
30	1800	550	
40	2400	580	
50	3000	610	
60	3600	630	
90	5400	660	
120	7200	700	
180	10800	740	
240	14400	770	
300	18000	800	

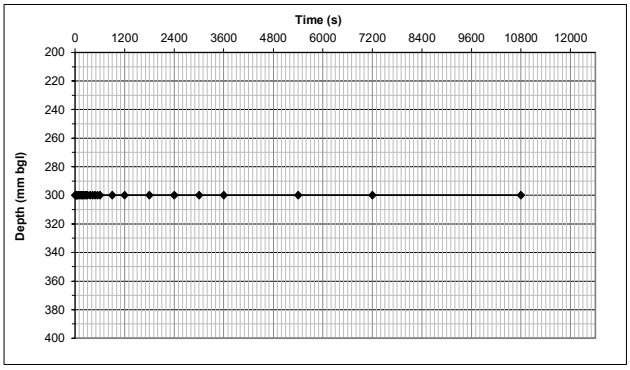
CALCULATION SHEET - SOIL INFILTRATION RATE

Project:	Tong Road, Bishops Wood, Boscobel Lane
Job Number:	600957
Author:	JE

Hole Ref.:	SA102
Test Date:	28/11/2024
Test No.:	1

0.22	m	Length of trial pit
0.22	m	Width of trial pit
1.10	m	Depth (total) of trial pit
0.05	m^2	Area of trial pit base
0.300	m bgl	Water level at start of test (approximate invert level)
0.300	m bgl	Water level at end of test
0.000	m	Effective storage depth
0.300	m bgl	Effective storage depth (75% full)
0.300	m bgl	Effective storage depth (25% full)
0.000	**m^3**	**Effective storage volume (V_{75-25})**
0.048	**m^2**	**Internal surface area (50% effective depth) (a_{50})**
N/A	**s**	**Time for head to fall from 75% to 25% effective depth (t_{75-25})**

N/A	**m/s**	**Soil infiltration rate (f)**



Note 1: No gravel backfill

Note 2 : Due to access issues, soakaways undertaken in hand pits.

RAW DATA

Project:	Tong Road, Bishops Wood, Boscobel Lane
Job Number:	600957
Author:	JE

Hole Ref.:	SA102
Test Date:	28/11/2024
Test No.:	1

Time (min)	Time (s)	Depth (mm bgl)	Stratum
0	0	300	
0.25	15	300	
0.5	30	300	
0.75	45	300	
1	60	300	
1.5	90	300	
2	120	300	
2.5	150	300	
3	180	300	
3.5	210	300	
4	240	300	
4.5	270	300	
5	300	300	
6	360	300	
7	420	300	
8	480	300	
9	540	300	
10	600	300	
15	900	300	
20	1200	300	
30	1800	300	
40	2400	300	
50	3000	300	
60	3600	300	
90	5400	300	
120	7200	300	
180	10800	300	

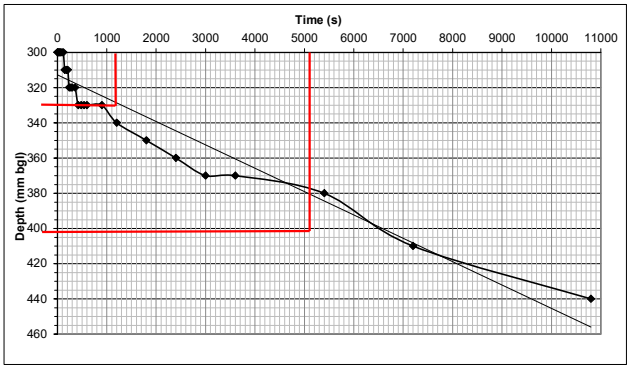
CALCULATION SHEET - SOIL INFILTRATION RATE

Project:	Tong Road, Bishops Wood, Boscobel Lane
Job Number:	600957
Author:	JE

Hole Ref.:	SA103
Test Date:	28/11/2024
Test No.:	1

0.22	m	Length of trial pit
0.22	m	Width of trial pit
1.10	m	Depth (total) of trial pit
0.05	m^2	Area of trial pit base
0.300	m bgl	Water level at start of test (approximate invert level)
0.440	m bgl	Water level at end of test
0.140	m	Effective storage depth
0.335	m bgl	Effective storage depth (75% full)
0.405	m bgl	Effective storage depth (25% full)
0.003	**m^3**	**Effective storage volume (V_{75-25})**
0.110	**m^2**	**Internal surface area (50% effective depth) (a_{50})**
5400	**s**	**Time for head to fall from 75% to 25% effective depth (t_{75-25})**

5.70E-06	**m/s**	**Soil infiltration rate (f)**



Note 1: No gravel backfill

Note 2 : Due to access issues, soakaways undertaken in hand pits.

RAW DATA

Project:	Tong Road, Bishops Wood, Boscobel Lane
Job Number:	600957
Author:	JE

Hole Ref.:	SA103
Test Date:	28/11/2024
Test No.:	1

Time (min)	Time (s)	Depth (mm bgl)	Stratum
0	0	300	
0.15	15	300	
0.3	30	300	
0.45	45	300	
1	60	300	
1.3	90	300	
2	120	300	
2.3	150	310	
3	180	310	
3.3	210	310	
4	240	320	
4.3	270	320	
5	300	320	
6	360	320	
7	420	330	
8	480	330	
9	540	330	
10	600	330	
15	900	330	
20	1200	340	
30	1800	350	
40	2400	360	
50	3000	370	
60	3600	370	
90	5400	380	
120	7200	410	
180	10800	440	

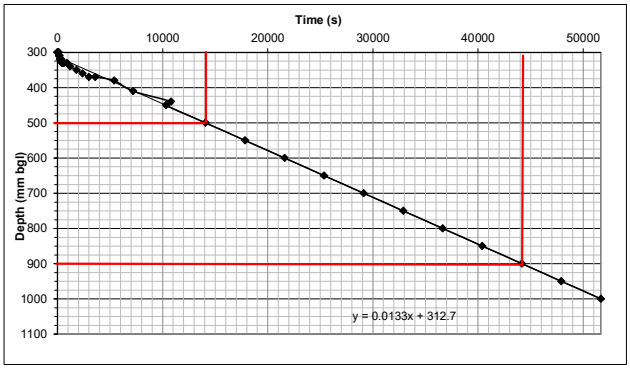
CALCULATION SHEET - SOIL INFILTRATION RATE

Project:	Tong Road, Bishops Wood, Boscobel Lane
Job Number:	600957
Author:	JE

Hole Ref.:	SA103 (Extrapolated)
Test Date:	28/11/2024
Test No.:	1

0.22	m	Length of trial pit
0.22	m	Width of trial pit
1.10	m	Depth (total) of trial pit
0.05	m^2	Area of trial pit base
0.300	m bgl	Water level at start of test (approximate invert level)
1.100	m bgl	Water level at end of test (extrapolated)
0.800	m	Effective storage depth
0.500	m bgl	Effective storage depth (75% full)
0.900	m bgl	Effective storage depth (25% full)
0.019	**m^3**	**Effective storage volume (V_{75-25})**
0.400	**m^2**	**Internal surface area (50% effective depth) (a_{50})**
30705	**s**	**Time for head to fall from 75% to 25% effective depth (t_{75-25})**

1.57E-06	**m/s**	**Soil infiltration rate (f)**



Note 1: No gravel backfill

Note 2 : Due to access issues, soakaways undertaken in hand pits.

RAW DATA

Project:	Tong Road, Bishops Wood, Boscobel Lane
Job Number:	600957
Author:	JE

Hole Ref.:	SA103 (Extrapolated)
Test Date:	28/11/2024
Test No.:	1

Time (min)	Time (s)	Depth (mm bgl)	Stratum
0.00	0	300	
0.25	15	300	
0.50	30	300	
0.75	45	300	
1.00	60	300	
1.50	90	300	
2.00	120	300	
2.50	150	310	
3.00	180	310	
3.50	210	310	
4.00	240	320	
4.50	270	320	
5	300	320	
6	360	320	
7	420	330	
8	480	330	
9	540	330	
10	600	330	
15	900	330	
20	1200	340	
30	1800	350	
40	2400	360	
50	3000	370	
60	3600	370	
90	5400	380	
120	7200	410	
180	10800	440	
172	10320	450	
235	14080	500	
297	17839	550	
360	21598	600	
423	25358	650	
485	29117	700	
548	32877	750	
611	36636	800	
673	40395	850	
736	44155	900	
799	47914	950	
861	51674	1000	
924	55433	1050	
987	59192	1100	

MCD Ground Solutions

Permeability Test BS 5930:1999

MCD Trial Pit Permeability Test Record	Site: Essex	Location:Boscobel Ln
	Job No:	Trial Pit No:SA101
Trial Pit Width: 220mm	Date: 28-11-24	Sheet: 1 of: 1
Trial Pit Length: 220mm	Ground level	Operator: JS
Trial Pit Depth: 1.1m	Weather: Clear	
	Type of test: Rising/Falling Head	
Any pit collapses? Y/N		
Water level (if present before fill)	Water level at start of test (after fill)	

Test Record

Time	**Time Elapsed min:sec**	**Depth to water level m**	**Time**	**Time Elapsed min:sec**	**Depth to water level m**
	0:00	0.30		20:00	0.52
	0:15	0.31		30:00	0.55
	0:30	0.32		40:00	0.58
	0:45	0.32		50:00	0.61
	1:00	0.32		60:00	0.63
	1:30	0.33		90:00	0.66
	2:00	0.34		120:00	0.70
	2:30	0.35		180:00	0.74
	3:00	0.36		240:00	0.77
	3:30	0.37		300:00	0.80
	4:00	0.37		360:00	
	4:30	0.38			
	5:00	0.39			
	6:00	0.40			
	7:00	0.41			
	8:00	0.42			
	9:00	0.43			
	10:00	0.44			
	15:00	0.48			

Remarks: Handpit

NOTE: Depth to water level measured from top of Pit edge / Marker point across pit*

* Delete as appropriate

MCD Ground Solutions

Permeability Test BS 5930:1999

MCD Trial Pit Permeability Test Record	Site:	Location:Boscobel Ln
	Job No:	Trial Pit No:SA102
Trial Pit Width: 220mm	Date: 28-11-24	Sheet: 1 of: 1
Trial Pit Length: 220mm	Ground level	Operator: JS
Trial Pit Depth: 1.1m	Weather: Clear	
	Type of test: Rising/Falling Head	
Any pit collapses? Y/N		
Water level (if present before fill)	Water level at start of test (after fill)	

Test Record

Time	**Time Elapsed min:sec**	**Depth to water level m**	**Time**	**Time Elapsed min:sec**	**Depth to water level m**
	0:00	0.30		20:00	0.30
	0:15	0.30		30:00	0.30
	0:30	0.30		40:00	0.30
	0:45	0.30		50:00	0.30
	1:00	0.30		60:00	0.30
	1:30	0.30		90:00	0.30
	2:00	0.30		120:00	0.30
	2:30	0.30		180:00	0.30
	3:00	0.30		240:00	
	3:30	0.30		300:00	
	4:00	0.30		360:00	
	4:30	0.30			
	5:00	0.30			
	6:00	0.30			
	7:00	0.30			
	8:00	0.30			
	9:00	0.30			
	10:00	0.30			
	15:00	0.30			

Remarks: Handpit

NOTE: Depth to water level measured from top of Pit edge / Marker point across pit*

* Delete as appropriate

MCD Ground Solutions

Permeability Test BS 5930:1999

MCD Trial Pit Permeability Test Record	Site: Essex	Location:Boscobel Ln
	Job No:	Trial Pit No:SA103
Trial Pit Width: 220mm	Date: 28-11-24	Sheet: 1 of: 1
Trial Pit Length: 220mm	Ground level	Operator: JS
Trial Pit Depth: 1.1m	Weather: Clear	
	Type of test: Rising/Falling Head	
Any pit collapses? Y/N		
Water level (if present before fill)	Water level at start of test (after fill)	

Test Record

Time	**Time Elapsed min:sec**	**Depth to water level m**	**Time**	**Time Elapsed min:sec**	**Depth to water level m**
	0:00	0.30		20:00	0.34
	0:15	0.30		30:00	0.35
	0:30	0.30		40:00	0.36
	0:45	0.30		50:00	0.37
	1:00	0.30		60:00	0.37
	1:30	0.30		90:00	0.38
	2:00	0.30		120:00	0.41
	2:30	0.31		180:00	0.44
	3:00	0.31		240:00	
	3:30	0.31		300:00	
	4:00	0.32		360:00	
	4:30	0.32			
	5:00	0.32			
	6:00	0.32			
	7:00	0.33			
	8:00	0.33			
	9:00	0.33			
	10:00	0.33			
	15:00	0.33			

Remarks: Handpit

NOTE: Depth to water level measured from top of Pit edge / Marker point across pit*

* Delete as appropriate

Appendix 9 - Drainage Calculations

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Ben Davies
Site name:	Boscobel Lane
Site location:	Bishops Wood

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	52.67990° N
Longitude:	2.23951° W
Reference:	1651042779
Date:	Jan 24 2025 14:13

Runoff estimation approach

FEH Statistical

Site characteristics

Total site area (ha):	2.01

Methodology

Q_{MED} estimation method:	Calculate from BFI and SAAR
BFI and SPR method:	Specify BFI manually
HOST class:	N/A
BFI / BFIHOST:	0.22
Q_{MED} (l/s):	
Q_{BAR} / Q_{MED} factor:	1.12

Hydrological characteristics

	Default	Edited
SAAR (mm):	701	701
Hydrological region:	4	4
Growth curve factor 1 year:	0.83	0.83
Growth curve factor 30 years:	2	2
Growth curve factor 100 years:	2.57	2.57
Growth curve factor 200 years:	3.04	3.04

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited

Q_{BAR} (l/s):		12.38
1 in 1 year (l/s):		10.28
1 in 30 years (l/s):		24.77
1 in 100 year (l/s):		31.83
1 in 200 years (l/s):		37.65

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.743	0.743	12.3	661.1	O K
30 min Summer	0.911	0.911	12.3	853.6	O K
60 min Summer	1.065	1.065	12.3	1044.9	O K
120 min Summer	1.262	1.262	12.3	1312.5	O K
180 min Summer	1.363	1.363	12.3	1458.7	O K
240 min Summer	1.421	1.421	12.3	1546.4	O K
360 min Summer	1.475	1.475	12.3	1630.8	O K
480 min Summer	1.491	1.491	12.3	1655.2	O K
600 min Summer	1.488	1.488	12.3	1651.0	O K
720 min Summer	1.475	1.475	12.3	1630.9	O K
960 min Summer	1.433	1.433	12.3	1564.5	O K
1440 min Summer	1.344	1.344	12.3	1431.5	O K
2160 min Summer	1.244	1.244	12.3	1286.5	O K
2880 min Summer	1.165	1.165	12.3	1176.8	O K
4320 min Summer	1.033	1.033	12.3	1003.8	O K
5760 min Summer	0.905	0.905	12.3	846.5	O K
7200 min Summer	0.798	0.798	12.3	723.0	O K
8640 min Summer	0.713	0.713	12.3	628.9	O K
10080 min Summer	0.642	0.642	12.3	553.8	O K
15 min Winter	0.743	0.743	12.3	661.2	O K
30 min Winter	0.911	0.911	12.3	853.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	134.717	0.0	659.3	30
30 min Summer	87.146	0.0	844.7	45
60 min Summer	53.854	0.0	1074.4	74
120 min Summer	34.487	0.0	1374.6	134
180 min Summer	26.040	0.0	1554.0	192
240 min Summer	21.095	0.0	1674.7	252
360 min Summer	15.394	0.0	1820.9	370
480 min Summer	12.164	0.0	1897.1	488
600 min Summer	10.079	0.0	1926.3	606
720 min Summer	8.618	0.0	1922.5	724
960 min Summer	6.697	0.0	1893.1	960
1440 min Summer	4.674	0.0	1811.8	1166
2160 min Summer	3.276	0.0	2364.8	1544
2880 min Summer	2.559	0.0	2462.3	1960
4320 min Summer	1.829	0.0	2634.7	2776
5760 min Summer	1.459	0.0	2813.5	3584
7200 min Summer	1.244	0.0	2999.0	4328
8640 min Summer	1.102	0.0	3186.3	5024
10080 min Summer	1.001	0.0	3372.1	5752
15 min Winter	134.717	0.0	659.4	30
30 min Winter	87.146	0.0	844.7	44

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	1.065	1.065	12.3	1045.1	O K
120 min Winter	1.263	1.263	12.3	1314.1	O K
180 min Winter	1.365	1.365	12.3	1461.6	O K
240 min Winter	1.424	1.424	12.3	1550.7	O K
360 min Winter	1.480	1.480	12.3	1637.5	O K
480 min Winter	1.497	1.497	12.4	1664.1	O K
600 min Winter	1.495	1.495	12.4	1662.0	O K
720 min Winter	1.484	1.484	12.3	1644.1	O K
960 min Winter	1.444	1.444	12.3	1582.7	O K
1440 min Winter	1.346	1.346	12.3	1433.6	O K
2160 min Winter	1.228	1.228	12.3	1264.2	O K
2880 min Winter	1.121	1.121	12.3	1117.8	O K
4320 min Winter	0.900	0.900	12.3	840.2	O K
5760 min Winter	0.688	0.688	12.3	602.5	O K
7200 min Winter	0.533	0.533	12.3	444.8	O K
8640 min Winter	0.416	0.416	12.3	333.8	O K
10080 min Winter	0.330	0.330	12.2	258.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	53.854	0.0	1074.4	74
120 min Winter	34.487	0.0	1374.6	130
180 min Winter	26.040	0.0	1554.0	188
240 min Winter	21.095	0.0	1674.6	246
360 min Winter	15.394	0.0	1820.6	362
480 min Winter	12.164	0.0	1896.1	478
600 min Winter	10.079	0.0	1923.7	592
720 min Winter	8.618	0.0	1918.8	704
960 min Winter	6.697	0.0	1889.1	924
1440 min Winter	4.674	0.0	1811.2	1198
2160 min Winter	3.276	0.0	2364.8	1632
2880 min Winter	2.559	0.0	2462.5	2092
4320 min Winter	1.829	0.0	2636.8	2980
5760 min Winter	1.459	0.0	2813.6	3688
7200 min Winter	1.244	0.0	2999.0	4392
8640 min Winter	1.102	0.0	3186.4	5024
10080 min Winter	1.001	0.0	3372.7	5656

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 508215 236542 TL 08215 36542
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 Area Diagram

Total Area (ha) 2.010

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.500	4	8	0.500	8	12	0.500	12	16	0.510

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Model Details

Storage is Online Cover Level (m) 1.800

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	700.9	1.500	1584.4	1.501	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0153-1240-1500-1240
Design Head (m)	1.500
Design Flow (l/s)	12.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	153
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	12.4
Flush-Flo™	0.441	12.3
Kick-Flo®	0.942	9.9
Mean Flow over Head Range	-	10.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.5	1.200	11.1	3.000	17.2	7.000	25.8
0.200	11.1	1.400	12.0	3.500	18.5	7.500	26.7
0.300	12.0	1.600	12.8	4.000	19.7	8.000	27.5
0.400	12.3	1.800	13.5	4.500	20.9	8.500	28.4
0.500	12.3	2.000	14.2	5.000	22.0	9.000	29.2
0.600	12.1	2.200	14.8	5.500	23.0	9.500	29.9
0.800	11.4	2.400	15.5	6.000	24.0		
1.000	10.2	2.600	16.1	6.500	24.9		

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Appendix 10 - Simple Index Approach Calculations

SUMMARY TABLE		DESIGN CONDITIONS			
		1	2	3	4
Land Use Type	Roads (excluding low traffic roads, highly frequented lorry approaches to industrial estates, trunk roads/motorways)				
Pollution Hazard Level	Medium				
Pollution Hazard Indices					
TSS	0.7				
Metals	0.6				
Hydrocarbons	0.7				
SuDS components proposed					
Component 1	Detention basin	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B	Detention basins should be designed to ensure the effective retention and management of sediment, such that the sediment will not be re-suspended and washed out in subsequent events		
Component 2	Pervious pavement (where the pavement is not designed as an infiltration component)	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B			
Component 3	None				
SuDS Pollution Mitigation Indices					
TSS	0.85				
Metals	0.8				
Hydrocarbons	0.95				
Groundwater protection type	None				
Groundwater protection Pollution Mitigation Indices					
TSS	0				
Metals	0				
Hydrocarbons	0				
Combined Pollution Mitigation Indices					
TSS	0.85	**Note: In order to meet both Water Quality criteria set out in the SuDS Manual (Chapter 4), Interception should be delivered for all impermeable areas wherever possible. Interception delivery and treatment may be met by the same components, but Interception requires separate evaluation.**	Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England		
Metals	0.8				
Hydrocarbons	0.95				
Acceptability of Pollution Mitigation					
TSS	Sufficient				
Metals	Sufficient				
Hydrocarbons	Sufficient				

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