

APPENDIX 9.1 - FLOOD RISK ASSESSMENTS

BYWAY 30 APPLICATION

FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

NICHOLAS KING HOMES PLC & LIGHTWOOD STRATEGIC LTD

01 JULY 2024



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1.0 Introduction

Context

- 1.1. This Flood Risk Assessment (FRA) has been prepared by Abley Letchford Partnership Ltd (ALP), on behalf of Nicholas King Homes PLC and Lightwood Strategic Ltd to support an Outline planning application relating to the proposed Byway 30 crossing arrangement relating to a proposed link road connecting the eastern and western parcels of the South Wokingham Master Planning Area extension that crosses the byway which is open to all traffic.

Development Proposals

- 1.2. This FRA relates to a proposed Byway crossing arrangement relating to a proposed Link Road connecting the Eastern and Western parcels of the SDL Extension that crosses the Byway Open to all traffic (WOKW30).

Requirement for a Flood Risk Assessment

- 1.3. The requirement for a FRA is set out in Section 14 of the revised National Planning Policy Framework (NPPF) as revised in December 2023.
- 1.4. The footnote accompanying Paragraph 172 states:

‘A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use..’
- 1.5. The site is a greenfield site that comprises established hedges and tree lined boundaries. The area of the site is approximately 0.2 hectares. As the site area extends greater than 1 hectare, a site-specific flood risk assessment is required. To comply with the requirements of the NPPF, matters related to flood risk and drainage are addressed within this report.

Report Aim and Formation

- 1.6. The principal aims of this report are to demonstrate that the proposed development complies with national and local planning policy in respect to flood risk and to demonstrate that a suitable drainage strategy can be provided as part of development.
- 1.7. This report will also summarise the impacts the development could have on flood risk to the surrounding area and outlines the mitigation strategies that will be implemented to minimise this risk.

Report Structure

- 1.8. This report addresses the requirements of revised NPPF and considers the following aspects:



- Section 2: Policy and Sources of Information – a review of policy relevant to the assessment and sources of information used to inform the assessment.
- Section 3: Site Setting – a description of the site location, topography, geology and hydrology.
- Section 4: Overview of Flood Risk – a review of data for flooding from all sources to determine the baseline flood risk to the site and an assessment of the impacts of the development on flood risk.
- Section 5: Sequential Test and Exception Test – a description of the proposed development and a classification of the vulnerability in the context of the Sequential Test and Exception Test.
- Section 6: Flood Risk Mitigation – the mitigation measures implemented to manage the potential flood risk to the development.
- Sections 7 and 8: Drainage Strategy – a summary of appropriate strategies to manage the surface water and foul water from the site in the post development scenario.
- Section 9: Conclusion – a summary of the development proposals in the context of site vulnerability and the requirements of the NPPF.

2.0 Policy and Sources of Information

Introduction

- 2.1. This chapter provides a review of policy relevant to the assessment and the available information on all sources of flood risk.

National Planning Policy

- 2.2. National Planning Policy in relation to Flood Risk is set out in Section 14 of the National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG) ID: 7 for Flood Risk and Coastal Change. Flood Risk is discussed in Paragraphs 165-175 of the NPPF.
- 2.3. Paragraphs 165-168 discuss the sequential approach. Paragraph 166 refers to a Strategic Flood Risk Assessment (SFRA) that would form the basis of applying the Sequential Test for local authorities to allocate development, whilst Paragraphs 168-169 relates to the Exception Test.
- 2.4. Paragraph 173 discusses the determination of planning applications stating:

‘When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood risk assessment. Development should only be allowed in areas at risk of flooding where, in light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

- a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;*
- b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;*
- c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*
- d) any residual risk can be safely managed; and*
- e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.’*

Environment Agency

- 2.5. The Flood and Water Management Act (2010) provides the Environment Agency (EA) a strategic overview role for all forms of flooding and coastal erosion. They also have direct responsibility for the prevention, mitigation and remediation of flood damage for main rivers and coastal areas. The EA is a statutory consultee in relation to flood risk and planning dependent upon criteria.
- 2.6. The EA Standing Advice has been consulted and reviewed within this FRA.
- 2.7. The EA Flood Map for Planning, EA Long Term Flood Risk Mapping and the Catchment Data Explorer websites have been interrogated in respect to flood risk extents and sources.



Local Authorities

- 2.8. The site lies within the administrative area of Wokingham Borough Council (WBC). WBC is the Local Planning Authority (LPA) and the Lead Local Flood Authority (LLFA).
- 2.9. Planning guidance published by WBC regarding the flood risk was referred to in order to assess the methodology best suited to suit the local area. The following key documents were reviewed:
- WBC Core Strategy policy CP1 'Sustainable development' and CP3 'General Principles for Development' (adapted January 2010);
 - WBC Local Flood Risk Management Strategy (dated April 2015);
 - WBC Preliminary Flood Risk Assessment (PRFA) (dated June 2011) and PRFA addendum (dated 2017);
 - WBC Level 1 Strategic Flood Risk Assessment (SFRA) (dated May 2023 and published in May 2024); and
 - WBC Level 2 SFRA (dated August 2023 and published in May 2024).
- 2.10. WBC became the LLFA under the Flood and Water Management Act 2010. WBC provide guidance to assess, manage and inform flood risk.
- 2.11. WBC has permissive rights over any Ordinary Watercourses including land drainage ditches. If any work is required within the watercourse (improvements or crossings) then approval from the LLFA is required under the Flood and Water Management Act 1991.

Local Water Authority

- 2.12. South East Water (SEW) is responsible for the supply of clean water. Thames Water (TW) is responsible for the disposal of wastewater.
- 2.13. Information with regards to sewer and water main flooding is contained within the WBC Level 1 and Level 2 SFRA and has been reviewed as part of this FRA. All water companies have a statutory obligation to maintain a register of properties and areas which are at risk of flooding from the public sewerage system and is shown on the DG5 Flood Register.

Other Sources of Information

- 2.14. A desktop study of the site was carried out using the following websites to ascertain local features, hydrology and soil characteristics:
- DEFRA's Magic Map portal,
 - British Geological Survey (BGS) 'Geology of Britain' online viewer, and
 - Cranfield University 'Soilscapes' portal.
- 2.15. Site walkovers conducted during October 2020 allowed observation of existing topography, watercourses, and nearby drainage outfalls.

3.0 Site Setting

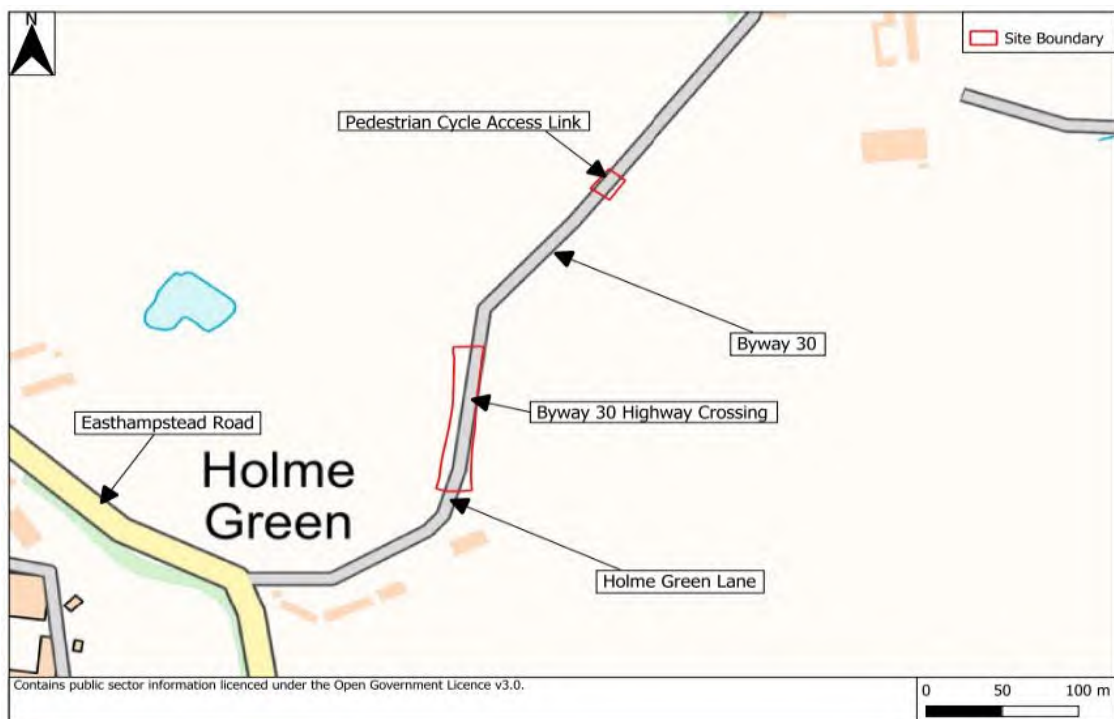
Introduction

- 3.1. This chapter provides a description of the site location, its topography, hydrological context, geology and hydrogeology.

Site Location

- 3.2. The site is located approximately 3km to the east of Wokingham. The nearest postcode is RG40 3BP. The site centre grid reference is: 483071E, 167402N. The site location is shown in Figure 1.

Figure 1 – Site Location



- 3.3. The Nicholas King Homes (NKH) Site is located to the west. The Lightwood Strategic (Lightwood) Site is located to the east. Agricultural fields are located to the north. The village of Holme Green is located to the south.
- 3.4. The site covers an area of approximately of 0.2ha.
- 3.5. The site consists predominantly of Holme Green Lane/ Byway 30. There is a drainage ditch to the east and west of the track. There are trees and hedges either side of the Holme Green Lane/ Byway 30.

Topography

- 3.6. Ground levels across the site are shown by LiDAR data in Figure 2.

Figure 2 – Site Topography



- 3.7. The LiDAR indicates that the ground levels across the site slope downwards from north to south. The elevations across the byway part of the Site are between 63.1m AOD and 65.0m AOD.
- 3.8. The pedestrian/ cycleway has ground levels between 64.5m AOD and 65.5m AOD.
- 3.9. A topographical survey of the Site has been carried out by MK Surveys dated July 2021. A copy of the topographical survey is included in Appendix 1. The detailed survey generally agrees with the LiDAR elevations across the Site. The topographical survey includes the drainage ditches to the east and west of Holme Green Lane/ Byway 30. It shows that the ditches are approximately 0.5m to 1m in deep and between 3m and 4m wide at top of bank.



Watercourses and Ditches

- 3.10. A review of the Ordnance Survey (OS) mapping did not identify any major watercourses with the Site. A review of the topographical survey identified a drainage ditch to both the west and east of Holme Green Lane/ Byway 30 which runs alongside the byway in a north and south direction. The location for the proposed pedestrian/cycleway is not shown on the topographical survey due to the limited coverage. It has been assumed that the drainage ditch continues along Holme Green Lane/ Byway 30. The drainage ditches flow in a southerly direction towards the drainage ditch to the north of Easthampstead Road.
- 3.11. The nearest watercourse is an Ordinary Watercourse which is a tributary of the Emm Brook. It is located approximately 260m to the south of the Site. Emm Brook is the nearest Main River. It is located approximately 540m to the southwest of the Site and flows in a north-easterly direction towards Wokingham.

Surface and Foul Water Sewers

- 3.12. Sewer Asset Records obtained from Thames Water do not indicate the presence of any surface or foul water sewers within the Site. The nearest public asset is a foul sewer located adjacent to the Easthampstead Sewage Treatment Works on Old Wokingham Road to the south-east of the site.
- 3.13. The risk of flooding from sewers is therefore considered to be low.
- 3.14. A copy of Thames Waters Asset Record is included within Appendix 1.

Geology and Hydrogeology

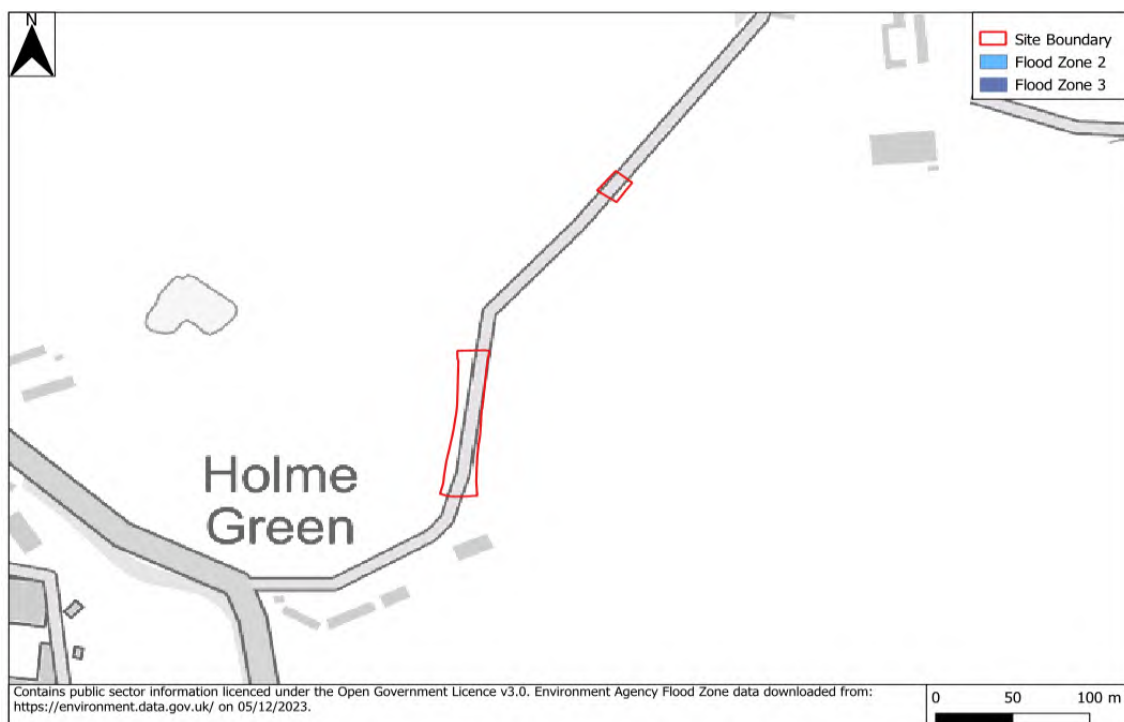
- 3.15. British Geological Survey (BGS) 'Geology of Britain' online viewer indicates that the geology underlying the site is London Clay Formation – Clay, silt and sand. There are superficial deposits to the north of the site of River Terrace Deposits 6 – Sand and gravel.
- 3.16. The Cranfield University 'Soilscapes' online viewer indicates the site overlies slowly permeable seasonally wet slightly acidic but base rich loamy and clayey soils.
- 3.17. The DEFRA Magic Map online viewer indicates that the site lies outside of any Groundwater Source Protection Zone (SPZ), or Principal Aquifer designation. The mapping indicates that the site is located within a Secondary A aquifer.
- 3.18. Minor secondary aquifers are associated with the underlying bedrock and superficial drift layers. These rocks can provide modest amounts of water, but the nature of the rock or the aquifer's structure limits their use. They support water supplies at local rather than strategic scale.

4.0 Overview of Flood Risk

EA Flood Map for Planning

- 4.1. The EA Flood Map for Planning provides an initial indication of the extent of flood zones. This is refined by site-specific modelled flood levels and topographic survey. In the NPPF, Flood zones are defined as follows:
- Flood Zone 1 'Low Probability' – Land less than 1 in 1000 (0.1%) annual probability of river or sea flooding.
 - Flood Zone 2 'Medium Probability' – Land between 1 in 100 (1%) and 1 in 1000 (0.1%) annual probability of river flooding, or between 1 in 200 (0.5%) and 1 in 1000 (0.1%) annual probability of sea flooding.
 - Flood Zone 3 'High Probability' – Land at 1 in 100 (1%) or greater annual probability of river flooding, or 1 in 200 (0.5%) or greater annual probability of sea flooding.
- 4.2. Figure 3 shows the EA flood zone mapping. It confirms that the entire Site is located within Flood Zone 1 'Low Probability' of fluvial flooding.

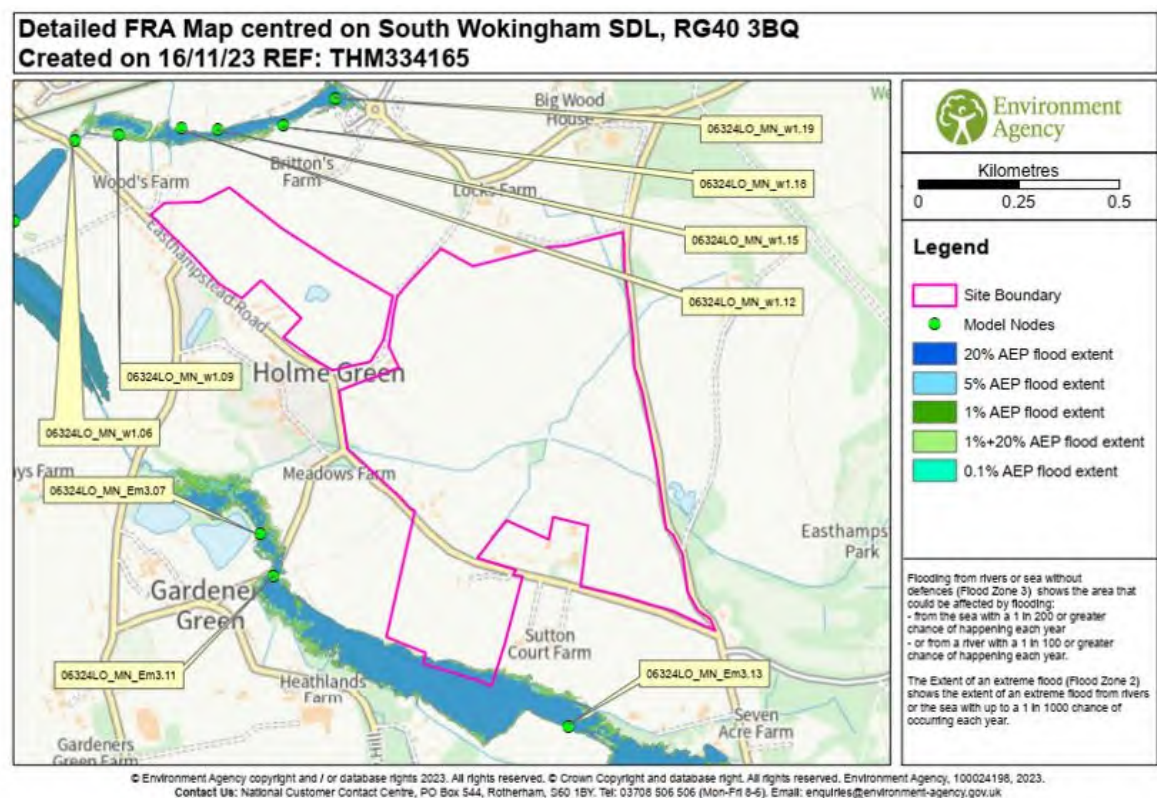
Figure 3 – EA Flood Map for Planning



Flood Risk from Fluvial Sources

- 4.3. The site is shown to be within Flood Zone 1 of the EA Flood Map for Planning. This indicates that the site is not affected by fluvial flooding in the 1 in 1000 annual probability scenario. These maps are based on strategic modelling and do not take into consideration site specific information.
- 4.4. The EA has provided modelled flood levels and extents for the Site as part of their Product 4 'Detailed Flood Risk Assessment Map' dataset (EA reference: THM334165). The modelled data is from the EA River Loddon (Lower) model, dated 2009.
- 4.5. Figure 4 shows an extract from the EA Product 4 dataset.

Figure 4 - EA Product 4 Extract – Detailed FRA Map

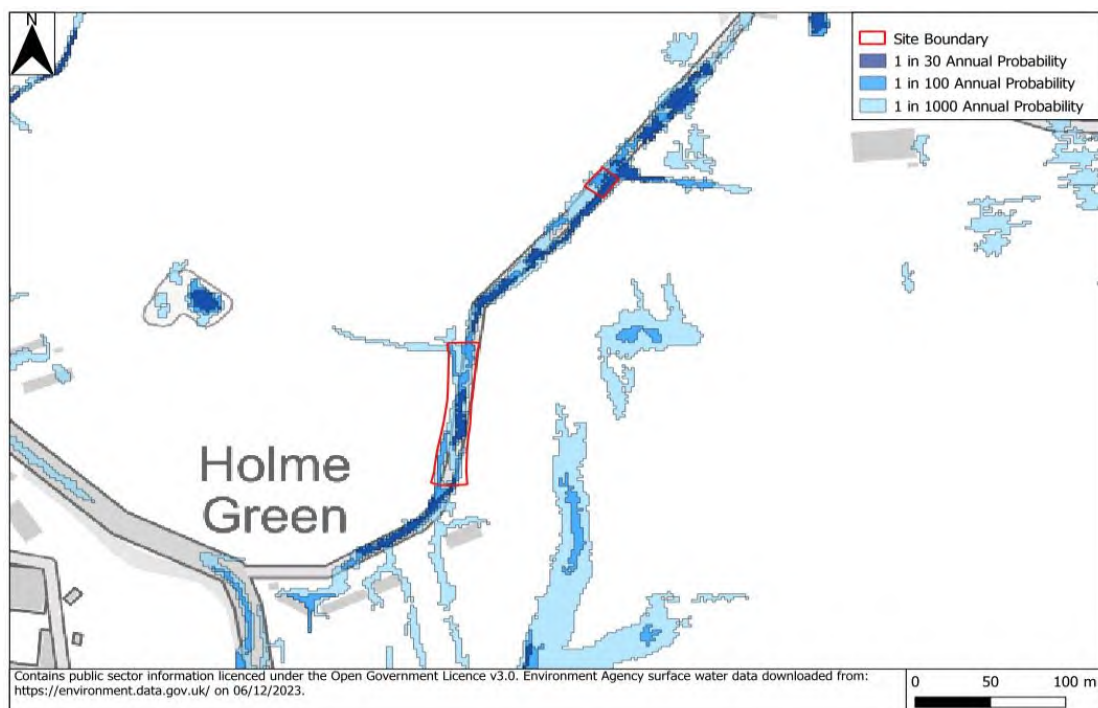


- 4.6. The mapping in Figure 4 confirms that the Site is located within Flood Zone 1.
- 4.7. The wider Site is allocated within the WBC local Plan, and is referred to as the South Wokingham Master Planning Area extension within the Level 2 WBC SFRA Appendix A.
- 4.8. The fluvial flood risk was assessed within the WBC Level 2 SFRA. The WBC Level 2 SFRA shows additional flooding to the north and north-west of the Site, that is not included within the EA Flood Map for Planning, nor Product 4 dataset. The additional flooding does not affect the Site for the byway application. The WBC Level 2 SFRA mapping confirms that the Site is located with Flood Zone 1.
- 4.9. The WBC Level 2 SFRA states 'in the absence of detailed hydraulic modelling, Flood Zones 2 and 3a have been taken from the Environment Agency's Flood Map for Planning.' As such the EA mapping has been taken as the best available data.

Flood Risk from Surface Water

- 4.10. The EA's Risk of Flooding from Surface Water mapping indicates areas that could be susceptible to surface water flooding during extreme rainfall events. The EA surface water mapping defines rainfall events based on the following:
- 1 in 30 (3.3%) annual probability 'High Risk'
 - 1 in 100 (1%) annual probability 'Medium Risk'
 - 1 in 1000 (0.1%) annual probability 'Low Risk'
 - Lower than 1 in 1000 (0.1%) annual probability 'Very Low Risk'.
- 4.11. The NPPF PPG – 'Flood Risk and Coastal Change' includes the 1 in 100 annual probability of surface water flood (including climate change) within the definition of the design flood event to be used to inform a FRA.
- 4.12. Figure 5 shows the flood risk from surface water. The EA Flood Risk from Surface Water mapping indicates that the site is at a 'Low' (0.1% annual probability) 'Medium' (1%) annual probability and 'High' (3.3%) annual probability for surface water flooding.

Figure 5 – EA Flood Risk from Surface Water



- 4.13. The EA surface water mapping is based on a national scale surface water ground surface model. The model does not consider any site-specific local information or below ground drainage infrastructure. The mapping therefore provides a guide to vulnerable areas based on the topography of the area and not a detailed assessment of surface water flooding for a specific site.



- 4.14. Figure 5 shows that the Site has areas of 'Low', 'Medium' and 'High' risk of surface water flooding along Holme Green Lane/ Byway 30. The Site has drainage ditches running either side of Holme Green Lane/ Byway 30. From a review of surveyed levels within the byway and the ditches, it appears that surface water will run off Holme Green Lane/ Byway 30 and flow into these drainage ditches.

Flood Risk from Groundwater

- 4.15. Groundwater flooding has the potential to occur after prolonged periods of unusually high rainfall. During such periods, more water than usual infiltrates through the ground, raising the water table above its normal depth below the surface. Where the water table is at a shallow depth in any case, the water table can reach the surface. This can cause groundwater to merge with rainfall and cause localised flooding.
- 4.16. The WBC Level 1 SFRA includes mapping of the areas susceptible to groundwater flooding. The groundwater mapping for the Site is included within Appendix A, Page D3. The Site is location in a 1km² grid square of which between 25% and 50% of the area is susceptible to groundwater flooding.
- 4.17. The WBC Level 1 SFRA includes mapping of the areas of groundwater emergence flooding which shows the depth below the ground surface. The mapping for the Site included within Appendix A, Page D3. The mapping does not indicate any potential groundwater emergence data for the site.
- 4.18. In assessing the site allocation, the WBC Level 2 SFRA suggests that an appropriate assessment of the groundwater regime may be required. If necessary, this can be completed at detailed design.

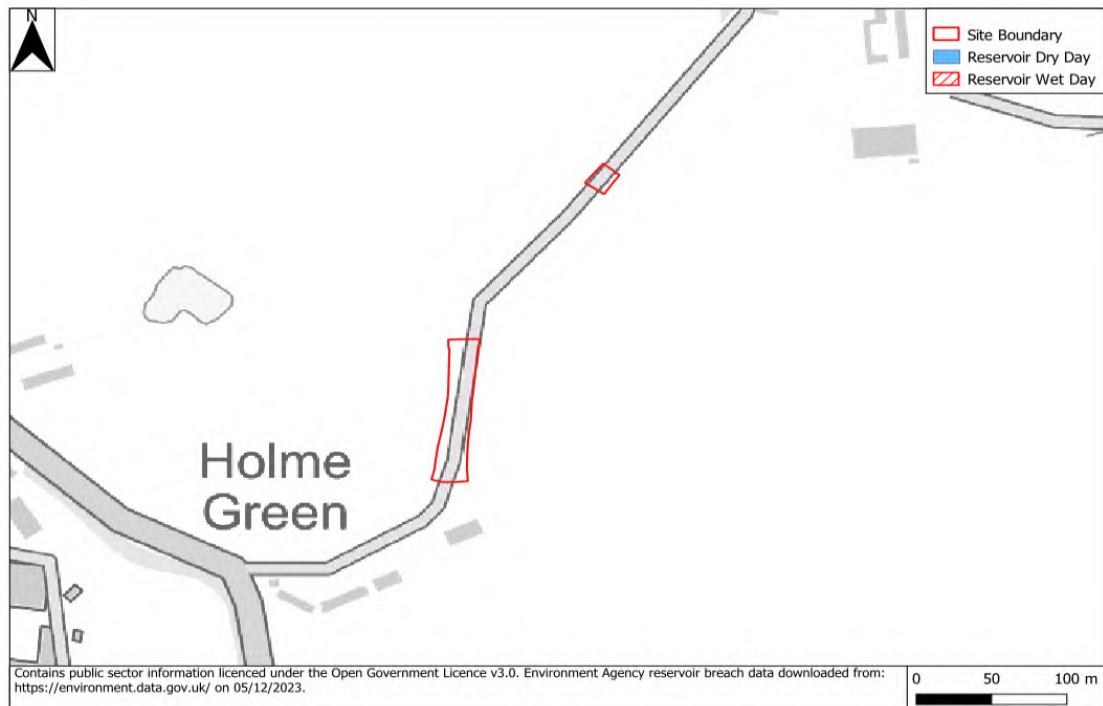
Flood Risk from Sewers

- 4.19. When exceeded, surcharged sewer networks can lead to flooding from backed up manholes and gully connections.
- 4.20. The Thames Water Asset Location Plans (reference 2018_3887954) show that there are no sewers within the Site boundary. A copy of the Thames Water Asset Location Plans is provided in Appendix 1.
- 4.21. The WBC Level 2 SFRA states that the Site *'is in a postcode area (RG40 3) with no recorded historic sewer flooding incidents, according to available incident records from Thames Water (from January 2000 up to 1 May 2022).'*

Flood Risk from Reservoirs

- 4.22. Figure 6 shows the flood risk from reservoirs.

Figure 6 – EA Flood Risk from Reservoirs



- 4.23. The mapping indicates that the Site is not at risk of flooding in the event of a reservoir breach. The Site is therefore at low risk of flooding from reservoirs.

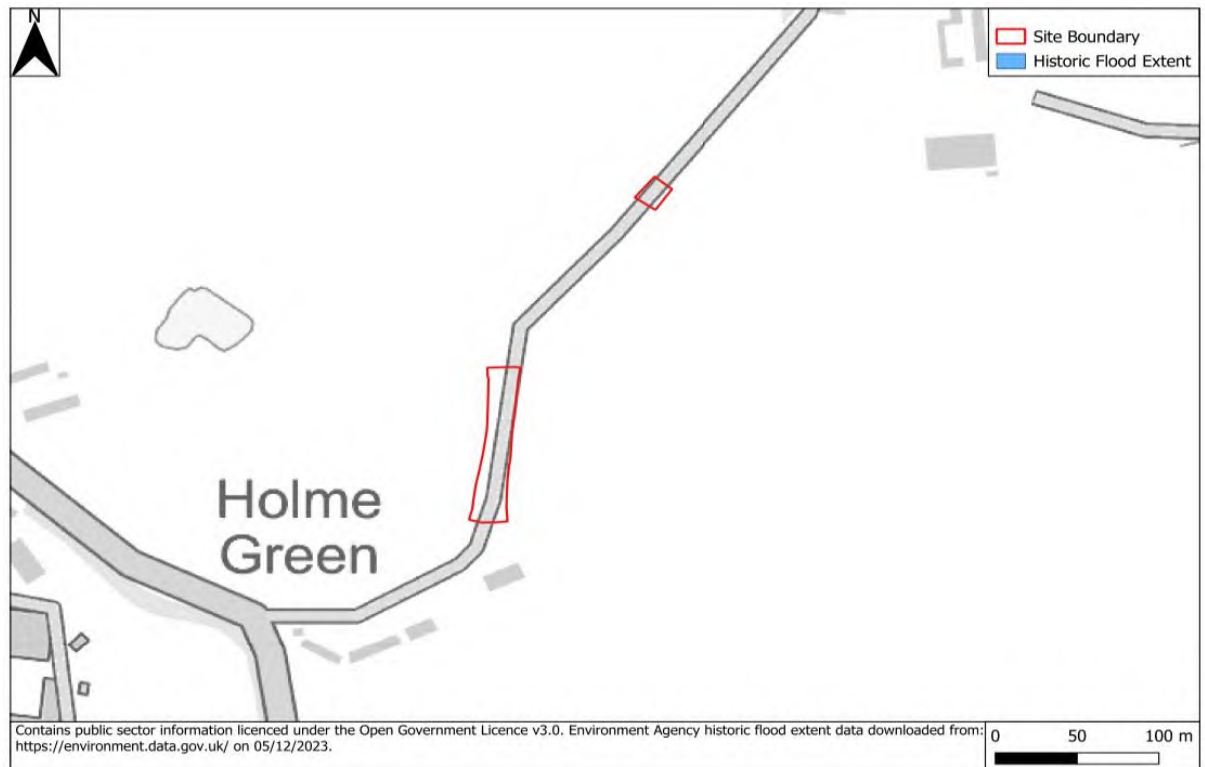
Flood Risk from Other Sources

- 4.24. The EA flood risk maps, WBC PFRA and WBC Level 1 and Level 2 SFRA indicate that the site is not at risk of flooding from canals or other artificial sources.

Historic Flooding

- 4.25. Figure 7 shows the EA Historic Flood Map. The EA Historic Flood Map shows the maximum extent of recorded flood events.

Figure 7 - Historic Flood Extent



4.26. The Site is not shown to have been impacted by a historic flood event.

Flood Risk Summary

4.27. A summary of flooding from all sources is provided in Table 1.

Table 1 – Summary of Flood Risk

Source of Flooding	High	Medium	Low	Comments
Tidal			✓	The site is inland and not influenced by tidal levels.
Fluvial			✓	The entire Site is located within Flood Zone 1 according to all available data including the EA Flood Zone mapping, Product 4 data and the WBC Level 1 and Level 2 SFRA.
Pluvial		✓		The EA Risk of Flooding from Surface Water mapping indicates that the Site is at a 'Low' 'Medium' and 'High' risk of flooding from surface water. It is likely that surface water flow from Holme Green Lane/ Byway 30 would flow into the drainage ditches running alongside the byway.
Groundwater			✓	The risk of groundwater flooding is considered to be low.
Sewers			✓	The Thames Water sewer maps indicate that there are no sewers within the Site boundary and no available data suggests there is a potential for sewer flooding.
Reservoirs, canals and other artificial sources			✓	EA and WBC SFRA Level 1 mapping do not indicate the site to be at risk of flooding from other sources.

- 4.28. The Site is deemed to be at low risk of flooding once an appropriate strategy for managing the surface water runoff within the byway and its ditches is implemented.



5.0 Sequential Test and Exception Test

NPPF Sequential Test

- 5.1. NPPF states that Local Planning Authorities allocating land for development should apply the Sequential Test to demonstrate that there are no reasonably available sites in areas with a lower probability of flooding that would be appropriate to the type of development or land use proposed.
- 5.2. However paragraph 174 of NPPF also states that applications for some minor development and changes of use should not be subject to the sequential or exception tests but should still meet the requirements for site-specific flood risk assessments.
- 5.3. Given the nature of the proposed works paragraph 174 is deemed to be applicable and the Sequential Test and the Exception Test are not required.



6.0 Flood Mitigation Strategy

Sequential Approach

- 6.1. The NPPF encourages a 'sequential approach' in master planning for new development: locating the more vulnerable uses of the development in the areas of lowest flood risk from all sources.
- 6.2. For this site the sequential approach is not applicable, given the nature of the proposed works.

Floodplain Storage

- 6.3. The Site is located outside of the fluvial flood extent.
- 6.4. The byway crossing and pedestrian/cycleway crossing will be designed so that there is no detrimental impact on floodplain storage. At detailed design a further analysis of the flow in the ditches and their capacity will be undertaken and this will inform the design of the crossing, the culverts and any associated ditch channel works. It is unlikely that floodplain storage will be affected as the issue is more of conveyance of surface water flow at this location.

Residual Risk

- 6.5. The NPPF PPG – 'Flood Risk and Coastal Change' defined residual risk as coming from 'flood risk management infrastructure' and the 'residual risk' to a development once any site-specific flood mitigation measures are taken into account'.
- 6.6. Residual risk to the Site includes a breach in the raised flood defences, the failure of a reservoir and a flood event greater than the designed standards.
- 6.7. The EA AIMS dataset, which contains information of flood defences, indicates that the Site does not benefit from raised flood defences. The EA mapping for reservoir breaches indicates that the Site is not located within an area at risk of flooding in the event of a reservoir. The Site is located outside of the 1 in 1000 annual probability flood extent.
- 6.8. The residual risk to the Site is therefore low.

WBC Requirements

6.9. The WBC Level 2 SFRA has considered this Site (South Wokingham Master Planning Area extension) and sets out key criteria to be addressed as part of any development of the Site. These are summarised in Table 2.

6.10. **Table 2 – WBC Level 2 SFRA Key Message for The South Wokingham Master Planning Area Extension.**

WBC Level 2 SFRA Guidance	Summary of Mitigation Measures
The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout its lifetime. It is for the applicant to show that the development meets the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the development, (Para 048 Flood Risk and Coastal Change PPG).	This FRA has been completed and presents a development strategy in accordance with WBC guidelines following data sourced from the WBC PFRA, WBC Level 1 and Level 2 SFRA, alongside using the EA Flood Risk Maps. The Site is entirely located within Flood Zone 1. There will be no development within the fluvial flood extent. The Site has a 'Low', 'Medium' and 'High' risk of surface water flooding. The crossings of the drainage ditches will be designed to ensure that the flow routes are maintained through appropriately sized culverts.
The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates areas close as possible to pre-development greenfield rates.	There is a surface water flow route along Holme Green Lane/ Byway 30. It is likely that the surface water flow will flow into the drainage ditches to the east and west of Holme Green Lane/ Byway 30. The crossings of the drainage ditches will be designed to ensure that the flow routes are maintained through appropriately sized culverts.
Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and rainfall events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.	The Site is located entirely within Flood Zone 1. The proposals are for a byway crossing and a pedestrian/cycleway crossing. No residential development is proposed therefore safe access is not required.
Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.	The proposals are for a byway crossing and a pedestrian/cycleway crossing. No residential development is proposed therefore safe access is not required.
Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels and use of boundary walls. These measures should be assessed to make sure that flooding is not increased elsewhere.	The Site is located outside of the fluvial flood event. The culverts will be appropriately sized to accommodate any extra flow from raising the ground levels which will be designed at detail design.



7.0 Surface Water Drainage

Introduction

7.1. This chapter covers surface water drainage.

Overall Strategy

- 7.2. For the byway crossing arrangement there will be a minimal change to the impermeable area. The new road which connects the western development to the eastern development will have associated highways drainage that will collect any surface water run off from the Site. Levels across the carriageway and may be raised in some locations as part of the proposed works. As such the natural flow regime may be affected. The highway drainage strategy for the roads within the NKH and Lightwood sites will account for this.
- 7.3. The pedestrian/cycle access will have a negligible change in impermeable area given Holme Green Lane/ Byway 30 is currently not permeable. Therefore, there is no requirement to address the surface water drainage for this section of the Site.



8.0 Conclusion

Flood Risk

- 8.1. The EA Flood Risk mapping was reviewed alongside the Wokingham Borough Council (WBC) Preliminary Flood Risk Assessment (PFRA) and WBC Level 1 and Level 2 Strategic Flood Risk Assessment (SFRA).
- 8.2. This Flood Risk Assessment (FRA) concludes that:
- The entire site is located within Flood Zone 1 'Low Probability' (land at less than 1 in 1000 (0.1%) annual probability of river or sea flooding').
 - The Site is located in an area with a 'Low' (land between 1 in 100 and 1 in 1000 annual probability), 'Medium' (land between 1 in 30 and 1 in 100 annual probability) and 'High' (land greater than 1 in 30 annual probability) risk of flooding from surface water. The EA surface water mapping is based off a coarse dataset that doesn't account for site specific features. The drainage ditches that run along either side of Holme Green Lane/ Byway 30 are unlikely to be picked up within the mapping. Surface water flow going along Holme Green Lane/ Byway 30 would likely be picked up in these drainage ditches.
 - The risk of groundwater flooding is considered to be low.
 - The WBC Level 1 SFRA mapping indicates the potential susceptibility to groundwater flooding and also the expected depth to groundwater. In assessing the site allocation, the Level 2 SFRA suggests that an appropriate assessment of the groundwater regime may be required. If necessary this can be completed at detailed design.
 - There are no sewers within the Site boundary therefore the risk of flooding from sewers is considered to be at a low.
 - The site is not at risk of flooding in the event of a reservoir breach.
- 8.3. In summary the Site is at a low risk of flooding from all sources.

Sequential Test and Exception Test

- 8.4. In accordance with NPPF, the Sequential Test and Exception Test are not applicable to the proposed works.

Mitigation Strategy

- 8.5. In the design of the byway crossing the culverts will be sized appropriately to ensure the conveyance of the surface water flow route within the drainage ditches adjacent to Holme Green Lane/ Byway 30.

Summary

- 8.6. This FRA demonstrates that the proposed development complies with national and local planning policy with respect to flood risk and drainage. The risk of flooding is adequately managed, and, with the implementation of a suitable surface water drainage strategy, the offsite flood risk is not increased.



Appendices

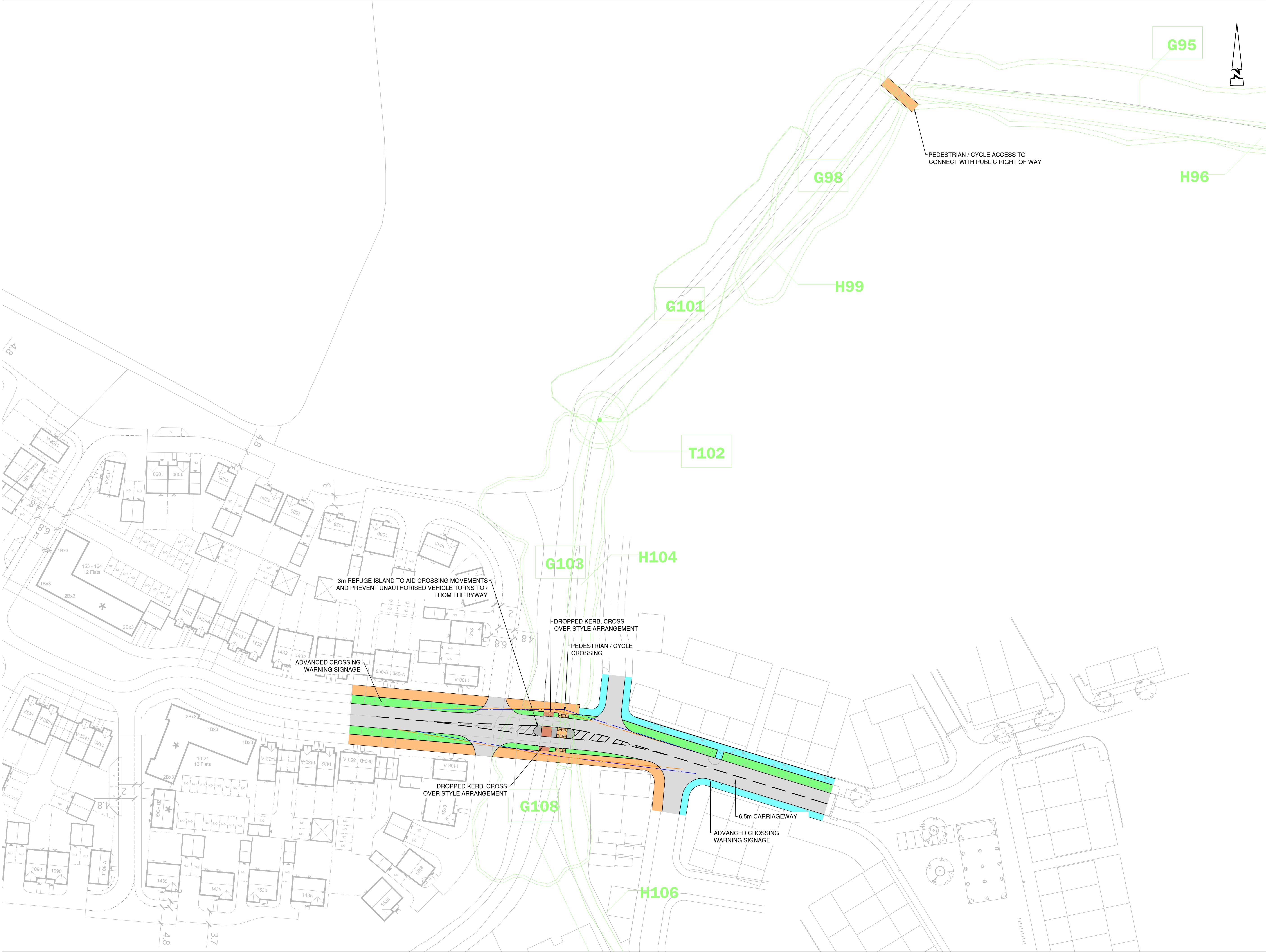


Appendix 1 - Plans

Site Construction Drawings

Topographic Survey

Thames Water Asset Plan



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KEY

- CARRIAGEWAY
- FOOTWAY / CYCLEWAY
- FOOTWAY
- VERGE
- BYWAY
- 2.4m X 43m VISIBILITY SPLAY

P3	01.24	CARRIAGEWAY REALIGNED	TDM	NB
P2	01.24	LIGHTWOOD DETAIL ADDED	TDM	NB
P1	01.24	FIRST ISSUE	TDM	NB
Rev	Date	Description	Drawn	Checked

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Project

**SOUTH WOKINGHAM
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Title

**PROPOSED BYWAY
CROSSING ARRANGEMENT**

Status

PRELIMINARY

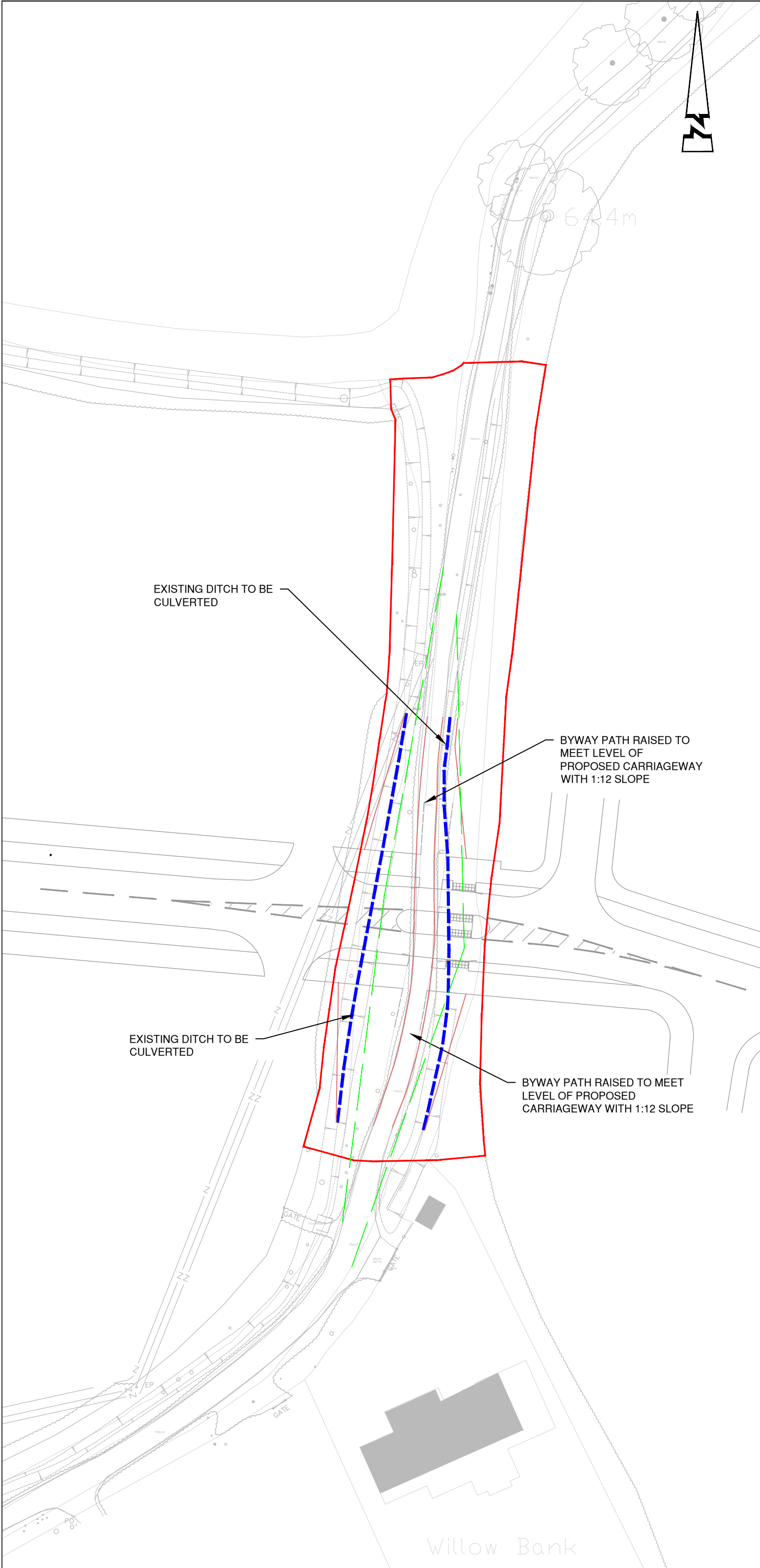
Scale	Date	Drawn	Checked
1:500 @ A1	JAN 2024	TDM	NB

Drawing No

A218-029

Revision

P3



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KEY

- APPLICATION BOUNDARY
- CULVERT
- POTENTIAL EARTHWORKS
- 2.4m X 43m VISIBILITY SPLAY

EXISTING DITCH TO BE CULVERTED

BYWAY PATH RAISED TO MEET LEVEL OF PROPOSED CARRIAGEWAY WITH 1:12 SLOPE

EXISTING DITCH TO BE CULVERTED

BYWAY PATH RAISED TO MEET LEVEL OF PROPOSED CARRIAGEWAY WITH 1:12 SLOPE

P1	02.24	FIRST ISSUE	TDM	NB
Rev	Date	Description	Drawn	Checked



3 Tealgate, Charnham Park
Hungerford, Berkshire RG17 0YT
www.alpce.co.uk Tel: 01488 684390

Client
**NICHOLAS KING
LIGHTWOOD STRATEGIC**

Project
**SOUTH WOKINGHAM SDL
EXTENSION**

Title
**POTENTIAL WORKS ALONG
BYWAY CROSSING**

Status
PRELIMINARY

Scale 1:500 @ A3	Date FEB 2024	Drawn TDM	Checked NB
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Drawing No A218-037	Revision P1
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- Notes:
1. GRID AND LEVELS BASED ON ORDNANCE DATUM, DERIVED FROM THE NATIONAL GRID NETWORK. LOCAL SCALE FACTOR 0.99996 APPLIED.
 2. DRAINAGE INFORMATION HAS BEEN DETERMINED WITHOUT MAN ENTRY INTO CHAMBERS AND WHILST EVERY EFFORT HAS BEEN MADE TO CORRECTLY IDENTIFY THIS INFORMATION, IT SHOULD ALWAYS BE CHECKED IN AREAS THAT ARE CRITICAL TO THE FUTURE PROPOSAL.
 3. ALL SEWERS ARE PRESUMED TO BE STRAIGHT BETWEEN CHAMBERS, WITH ROUTES CONNECTIVITY OBTAINED USING ACOUSTIC METHODS ONLY. THESE ARE TO BE CONSIDERED ASSUMED AND SHOULD BE INVESTIGATED FURTHER IN CRITICAL AREAS.
 4. TREE AND HEDGE SPECIES HAVE BEEN IDENTIFIED AS ACCURATELY AS POSSIBLE BUT SHOULD BE CROSS CHECKED IN CRITICAL AREAS.

Coordinate Table				
Station	Description	Easting	Northing	Level
S6	ROAD NAIL	482750.516	167447.470	63.016
S9	ROAD NAIL	482744.966	167423.024	62.816
S9A	ROAD NAIL	482752.305	167432.907	63.046
S10	ROAD NAIL	482736.968	167399.211	62.263
S19	ROAD NAIL	482927.174	167271.067	62.231
S25	ROAD NAIL	482511.951	167601.989	58.903

TOPOGRAPHICAL KEY

SURVEY STATION 5

BANKING

HEDGE SPREADS

WOODLAND CANOPY

ARROW ON STEPS / RAMP INDICATES DIRECTION UPWARDS

TREES

GATE

KERB CHANNEL

ROAD UNWEARDED

FOOTPATH

CHANGE IN SURFACE

FENCE

WALL

OVERHEAD ELECTRIC

OVERHEAD TELECOM

FOUL SEWER

SURFACE SEWER

P-TRAP

BACK DROP (INTERNAL)

BACK DROP (EXTERNAL)

BUILDING

OPEN SIDED BUILDING

OVERHANG / CANOPY

GLASSHOUSE

CONTOUR

BNP LEVEL

SONAR LEVEL

BONE HOLE

TRIAL HOLE

GENERAL ABBREVIATIONS

FENCE ABBREVIATIONS

Sheet Layout: (Not to Scale)

1

2

0m 5 10 15 20 25 30 35 40 45 50 55

Topographical Survey

Client:

NICHOLAS KING
HOMES

Easthampstead Road
Wokingham
Berkshire
RG40 3BN

Scale: 1:500 Sheet Size: A0 Sheet Number: 1 Date: July 2021
Project Number: 30092 Rev: - Surveyed by: DD Checked by: AJ Approved by: RPE

mksurveys

www.mksurveys.com www.surveys4bin.co.uk
Head Office: Milton Keynes t: 01908 565561 e: mail@mksurveys.co.uk



mk surveys

www.mk-surveys.com www.surveys4bm.co.uk
Head Office: Milton Keynes t: 01908 565561 e: mail@mk-surveys.co.uk

Further contacts:

Waste Water queries

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

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

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

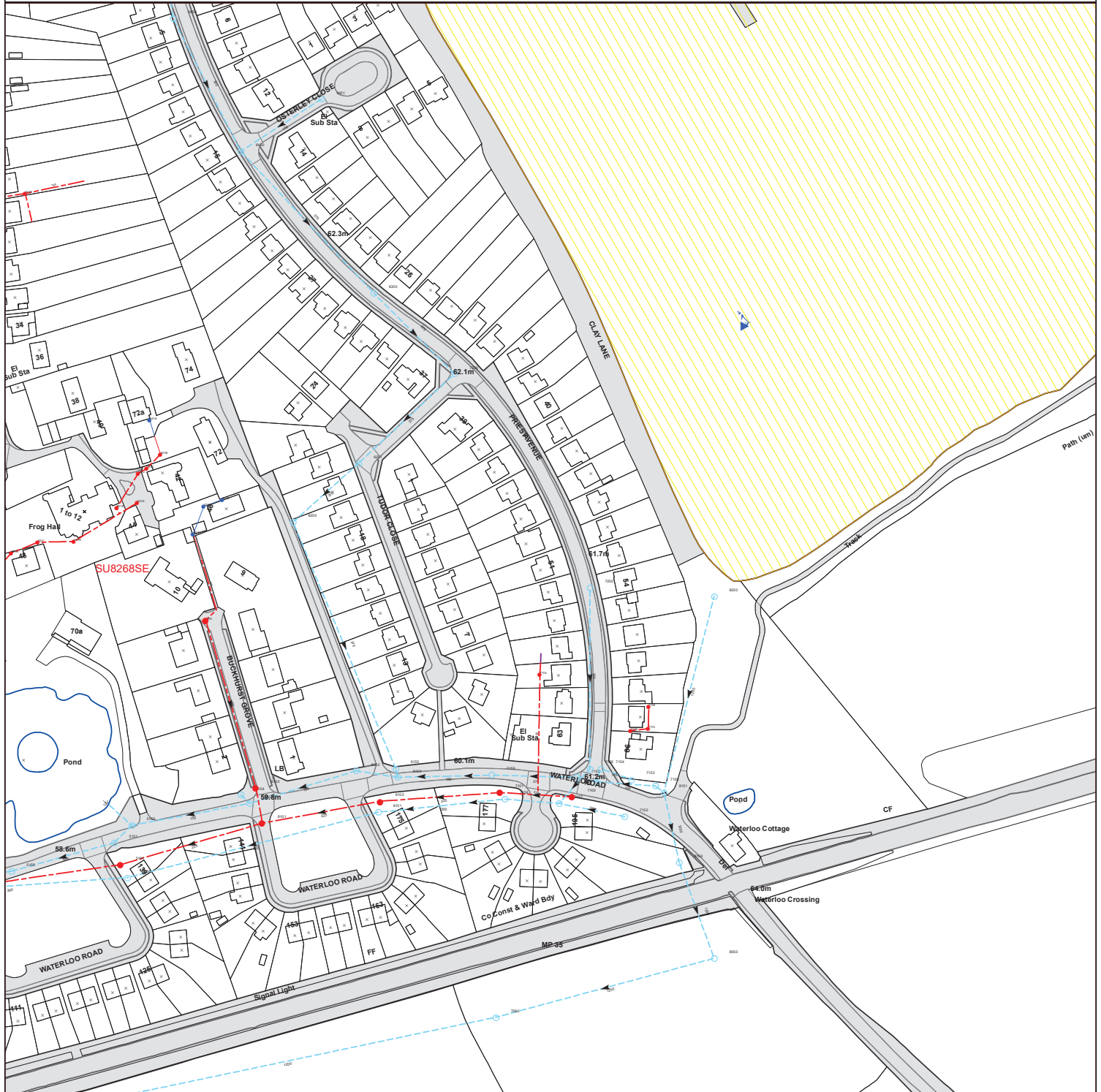
Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Clean Water queries

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

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

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



0 10 20 40 60 80
Meters

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

Scale: 1:1790
Width: 500m
Printed By: SAsirvat
Print Date: 09/10/2018
Map Centre: 482750,168250
Grid Reference: SU8268SE

Comments:

ALS/ALS Standard/2018_3887954

NB: Level quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no Survey information is available.

REFERENCE	COVER LEVEL	INVERT LEVEL
711A		
5450	62.13	60.58
7050	61.15	57.55
6250		
6151	60.28	58.3
6154	59.72	58.72
6251	61.6	59.95
7153	61.64	60.35
8150	62.17	59.12
5152	59.72	57.23
7155	60.99	57.97
6102	59.7	58.4
8050	61.5	58.62
7156	61.2	59.9
7151	61.17	58.77
5101	59.42	57.57
8151	62.05	59.45
6451	62.83	61.34
6155	60.05	59.14
521C		
521K		
521G		
6152	60	58.35
521B		
7157	61.13	58.93
521D		
521F		
711B		
541A		

REFERENCE	COVER LEVEL	INVERT LEVEL
7158	60.72	58.77
7159	60.43	57.69
7101	60.71	58.71
6350	62.38	60.25
6103	60.31	58.31
6450	62.11	60.43
7152	61.62	60.32
7350	62.13	60.07
5050	59.15	57.29
7102	61.15	58.9
6153	59.67	57.92
6101	59.8	58.03
8250		
7250	61.46	60.39
7154	61.22	60.02
7150	62.17	59.4
5151	58.92	56.4
5150	58.25	55.86
6150	60.02	57.2
521J		
521I		
521H		
521A		
531A		
5201	60.15	58.99
521E		
711D		
711C		



0 45 90 180 270 360
Meters

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

Scale: 1:7161
Width: 2000m
Printed By: SAsirvat
Print Date: 09/10/2018
Map Centre: 483465,167688
Grid Reference: SU8367NW

Comments:



Public Sewer Types (Operated & Maintained by Thames Water)

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

Notes:

- 1) All levels associated with the plans are to Ordnance Datum Newlyn.
- 2) All measurements on the plans are metric.
- 3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
- 4) Most private pipes are not shown on our plans. as in the past, this information has not been recorded.
- 5) 'na' or '0' on a manhole level indicates that data is unavailable.

Sewer Fittings

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

	Air Valve
	Dam Chase
	Fitting
	Meter
	Vent Column

Operational Controls

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

	Control Valve
	Drop Pipe
	Ancillary
	Weir

End Items

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

	Outfall
	Undefined End
	Inlet

6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0845 070 9148.

Other Symbols

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

	Public/Private Pumping Station
	Change of characteristic indicator (C.O.C.I.)
	Invert Level
	Summit

Areas
Lines denoting areas of underground surveys, etc.

	Agreement
	Operational Site
	Chamber
	Tunnel
	Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

	Foul Sewer
	Combined Sewer
	Culverted Watercourse
	Surface Water Sewer
	Gully
	Proposed
	Abandoned Sewer

Terms and Conditions

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

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL's terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

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

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

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	BACS Payment	Telephone Banking	Cheque
Call 0845 070 9148 quoting your invoice number starting CBA or ADS / OSS	Account number 90478703 Sort code 60-00-01 A remittance advice must be sent to: Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW. or email ps.billing@thameswater. co.uk	By calling your bank and quoting: Account number 90478703 Sort code 60-00-01 and your invoice number	Made payable to ' Thames Water Utilities Ltd ' Write your Thames Water account number on the back. Send to: Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW or by DX to 151280 Slough 13

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



Search Code

IMPORTANT CONSUMER PROTECTION INFORMATION

This search has been produced by Thames Water Property Searches, Clearwater Court, Vastern Road, Reading RG1 8DB, which is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom
- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practise and quality standards within the industry for the benefit of consumers and property professionals
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports
- act with integrity and carry out work with due skill, care and diligence
- at all times maintain adequate and appropriate insurance to protect consumers
- conduct business in an honest, fair and professional manner
- handle complaints speedily and fairly
- ensure that products and services comply with industry registration rules and standards and relevant laws
- monitor their compliance with the Code

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if he finds that you have suffered actual loss as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs Contact Details

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk

PLEASE ASK YOUR SEARCH PROVIDER IF YOU WOULD LIKE A COPY OF THE SEARCH CODE



Appendix 2 - EA Product 4

Product 4 (Detailed Flood Risk) for South Wokingham SDL, RG40 3BQ

Our Ref: THM334165

Product 4 is designed for developers where Flood Risk Standing Advice FRA (Flood Risk Assessment) Guidance Note 3 Applies. This is:

- i) "all applications in Flood Zone 3, other than non-domestic extensions less than 250 sq metres; and all domestic extensions", and
- ii) "all applications with a site area greater than 1 ha" in Flood Zone 2.

Product 4 includes the following information:

Ordnance Survey 1:25k colour raster base mapping;
Flood Zone 2 and Flood Zone 3;
Relevant model node locations and unique identifiers (for cross referencing to the water levels, depths and flows table);
Model extents showing *defended* scenarios;
FRA site boundary (where a suitable GIS layer is supplied);
Flood defence locations (where available/relevant) and unique identifiers; (supplied separately)
Flood Map flood storage areas (where available/relevant);
Historic flood events outlines (where available/relevant, not the Historic Flood Map) and unique identifiers;

Statutory (Sealed) Main River (where available within map extents);

A table showing:

- i) Model node X/Y coordinate locations, unique identifiers, and levels and flows for *defended* scenarios.
- ii) Flood defence locations unique identifiers and attributes; (supplied separately)
- iii) Historic flood events outlines unique identifiers and attributes; and
- iv) Local flood history data (where available/relevant).

Please note:

If you will be carrying out computer modelling as part of your Flood Risk Assessment, please request our guidance which sets out the requirements and best practice for computer river modelling.

This information is based on that currently available as of the date of this letter. You may feel it is appropriate to contact our office at regular intervals, to check whether any amendments/ improvements have been made. Should you re-contact us after a period of time, please quote the above reference in order to help us deal with your query.

This information is provided subject to the enclosed notice which you should read.

This letter is not a Flood Risk Assessment. The information supplied can be used to form part of your Flood Risk Assessment. Further advice and guidance regarding Flood Risk Assessments can be found on our website at:

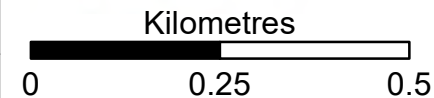
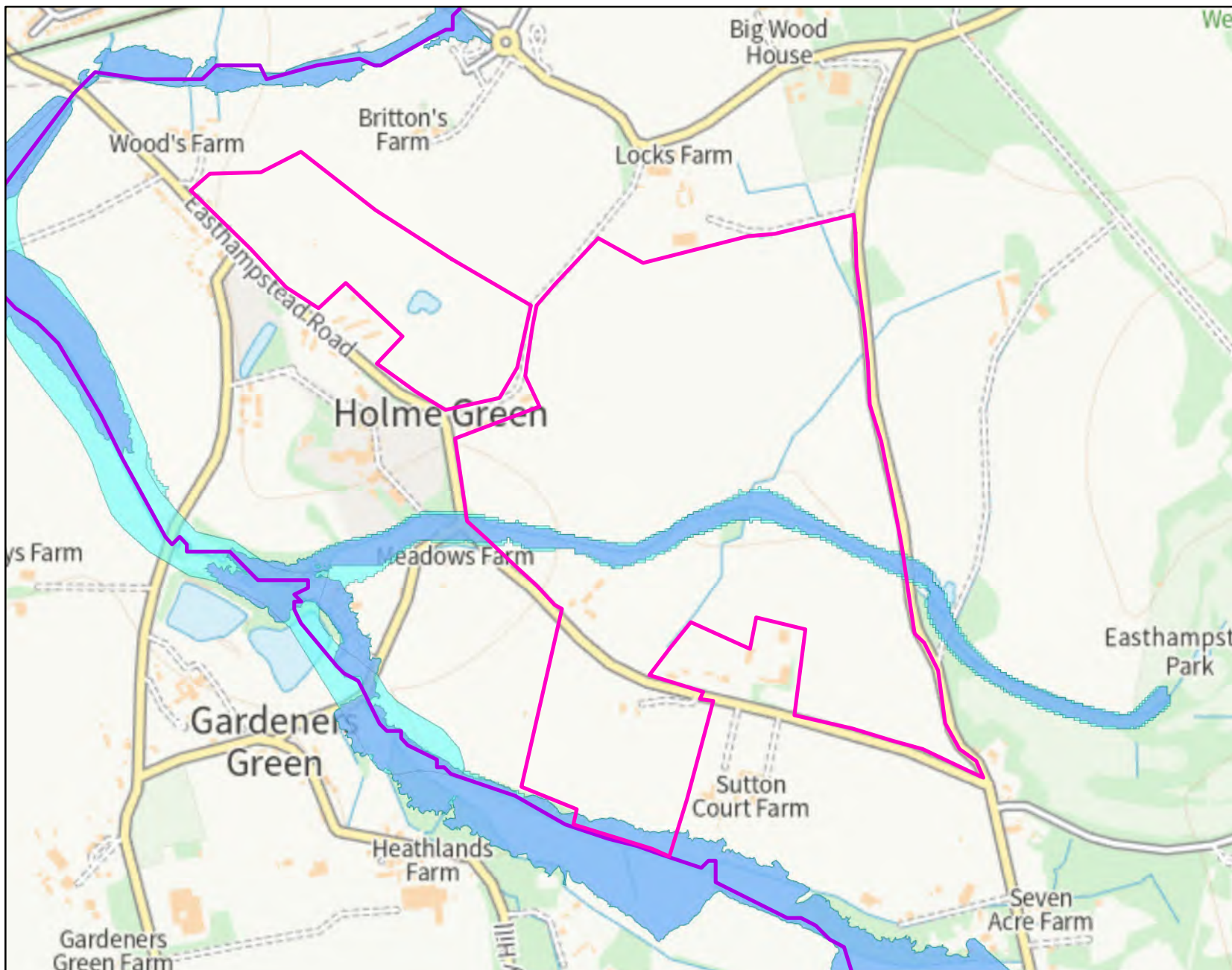
<https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities>

If you would like advice from us regarding your development proposals you can complete our pre application enquiry form which can be found at:

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

Flood Map for Planning centred on South Wokingham SDL, RG40 3BQ

Created on 16/11/23 REF: THM334165



Legend

- Site Boundary
- Main River
- Flood Map - Flood defences
- Flood Map - Flood Storage Areas
- Flooding from rivers or sea (FZ3)
- Extent of extreme flood (FZ2)

Flooding from rivers or sea without defences (Flood Zone 3) shows the area that could be affected by flooding:

- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

The Extent of an extreme flood (Flood Zone 2) shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

Defence information

Defence Location: No defences and NOT on Main River

Description: This location is not on Main River and we do not hold defence information for this area. There may be an ordinary watercourse nearby which could affect the site. Please contact your local authority for further details.

Model information

THM334165

Model: Loddon (Lower) 2009

Description: The information provided is taken from the Lower Loddon Detailed Flood Risk Mapping study which was completed in January 2009. This model is a 1D-2D model using ESTRY-TUFLOW. The model was originally built in 2007 but the hydrology was updated and model rerun in 2009. The model was re-run for more return periods on the main Loddon than on some of the tributaries.

River Channel Model: ESTRY 1D model of Lower Loddon, Old Loddon, St. Patricks Stream, River Thames (from Sonning to Marsh Lock), Twyford Brook, Billingbear Brook and Emm Brook (from Toutley Bridge to Loddon), Barkham Brook, Ashridge Stream, Waterloo Road Stream and Upper Emm Brook (from Nine Mile Ride to Toutley Bridge)

Model design runs (Main River Loddon):

1 in 5 / 20% Annual Exceedance Probability (AEP); 1 in 20 / 5% AEP; 1 in 50 / 2% AEP; 1 in 100 / 1% AEP; 1 in 1000 / 0.1% AEP; and 1 in 100+20% / 1% AEP plus 20% increase in flows

Mapped outputs (main River Loddon):

1 in 5 / 20% AEP; 1 in 20 / 5% AEP; 1 in 50 / 2% AEP; 1 in 100 / 1% AEP, 1 in 100+20% / 1% AEP plus 20% increase in flows, and 1 in 1000 / 0.1% AEP

Model design runs (tributaries – Emm Brook (Wokingham), Emm Brook (Upstream), Ashridge Stream, Waterloo Road Stream, Barkham Brook):

1 in 5 / 20% Annual Exceedance Probability (AEP); 1 in 20 / 5% AEP; 1 in 100 / 1% AEP; and 1 in 100+20% / 1% AEP plus 20% increase in flows

Mapped outputs (tributaries):

1 in 5 / 20% AEP; 1 in 20 / 5% AEP, 1 in 100 / 1% AEP and 1 in 100+20% / 1% AEP plus 20% increase in flows

Model accuracy:

Levels $\pm$ 250mm

Modelled in-channel flood flows and levels

THM334165

The modelled flood levels and flows for the closest most appropriate model node points for your site that are within the river channel are provided below:

				Flood Levels (mAOD)											
Node label	Model	Easting	Northing	20% AEP	5% AEP	3.3% AEP	1% AEP	1% AEP (+10% increase in flows)	1% AEP (+15% increase in flows)	1% AEP (+20% increase in flows)	1% AEP (+25% increase in flows)	1% AEP (+35% increase in flows)	1% AEP (+70% increase in flows)	0.1% AEP	
06324LO MN w1.19	Loddon (Lower) 2009	482934	167954	61.34	61.69		61.73			61.77					
06324LO MN w1.18	Loddon (Lower) 2009	482804	167888	60.32	61.43		61.48			61.51					
06324LO MN w1.15	Loddon (Lower) 2009	482642	167877	58.76	60.39		60.44			60.48					
06324LO MN w1.12	Loddon (Lower) 2009	482551	167881	57.62	58.82		58.87			58.92					
06324LO MN w1.09	Loddon (Lower) 2009	482395	167863	55.57	56.56		56.64			56.69					
06324LO MN w1.06	Loddon (Lower) 2009	482286	167849	54.46	54.54		54.61			54.68					
06324LO MN Em3.07	Loddon (Lower) 2009	482747	166865	55.78	55.88		56.01			56.08					
06324LO MN Em3.11	Loddon (Lower) 2009	482781	166761	56.62	56.71		56.80			56.85					
06324LO MN Em3.13	Loddon (Lower) 2009	483514	166383	61.79	61.90		62.05			62.07					

				Flood Flows (m3/s)											
Node label	Model	Easting	Northing	20% AEP	5% AEP	3.3% AEP	1% AEP	1% AEP (+10% increase in flows)	1% AEP (+15% increase in flows)	1% AEP (+20% increase in flows)	1% AEP (+25% increase in flows)	1% AEP (+35% increase in flows)	1% AEP (+70% increase in flows)	0.1% AEP	
06324LO MN w1.19	Loddon (Lower) 2009	482934	167954												
06324LO MN w1.18	Loddon (Lower) 2009	482804	167888												
06324LO MN w1.15	Loddon (Lower) 2009	482642	167877												
06324LO MN w1.12	Loddon (Lower) 2009	482551	167881												
06324LO MN w1.09	Loddon (Lower) 2009	482395	167863												
06324LO MN w1.06	Loddon (Lower) 2009	482286	167849												
06324LO MN Em3.07	Loddon (Lower) 2009	482747	166865												
06324LO MN Em3.11	Loddon (Lower) 2009	482781	166761												
06324LO MN Em3.13	Loddon (Lower) 2009	483514	166383												

Note:
Due to changes in guidance on the allowances for climate change, the percentage increase in river flows above should no longer to be used for development design purposes. The data included in this Product can be used for interpolation of levels as part of an intermediate level assessment.

For further advice on the new allowances please visit <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

Modelled floodplain flood levels

THM334165

The modelled flood levels for the closest most appropriate model grid cells for your site are provided below:

				flood levels (mAOD)										
2D grid cell reference	Model	Easting	Northing	20% AEP	5% AEP	3.3 AEP	1% AEP	1% AEP (+10% increase in flows)	1% AEP (+15% increase in flows)	1% AEP (+20% increase in flows)	1% AEP (+25% increase in flows)	1% AEP (+35% increase in flows)	1% AEP (+70% increase in flows)	0.1% AEP
No modelled floodplain level data available														

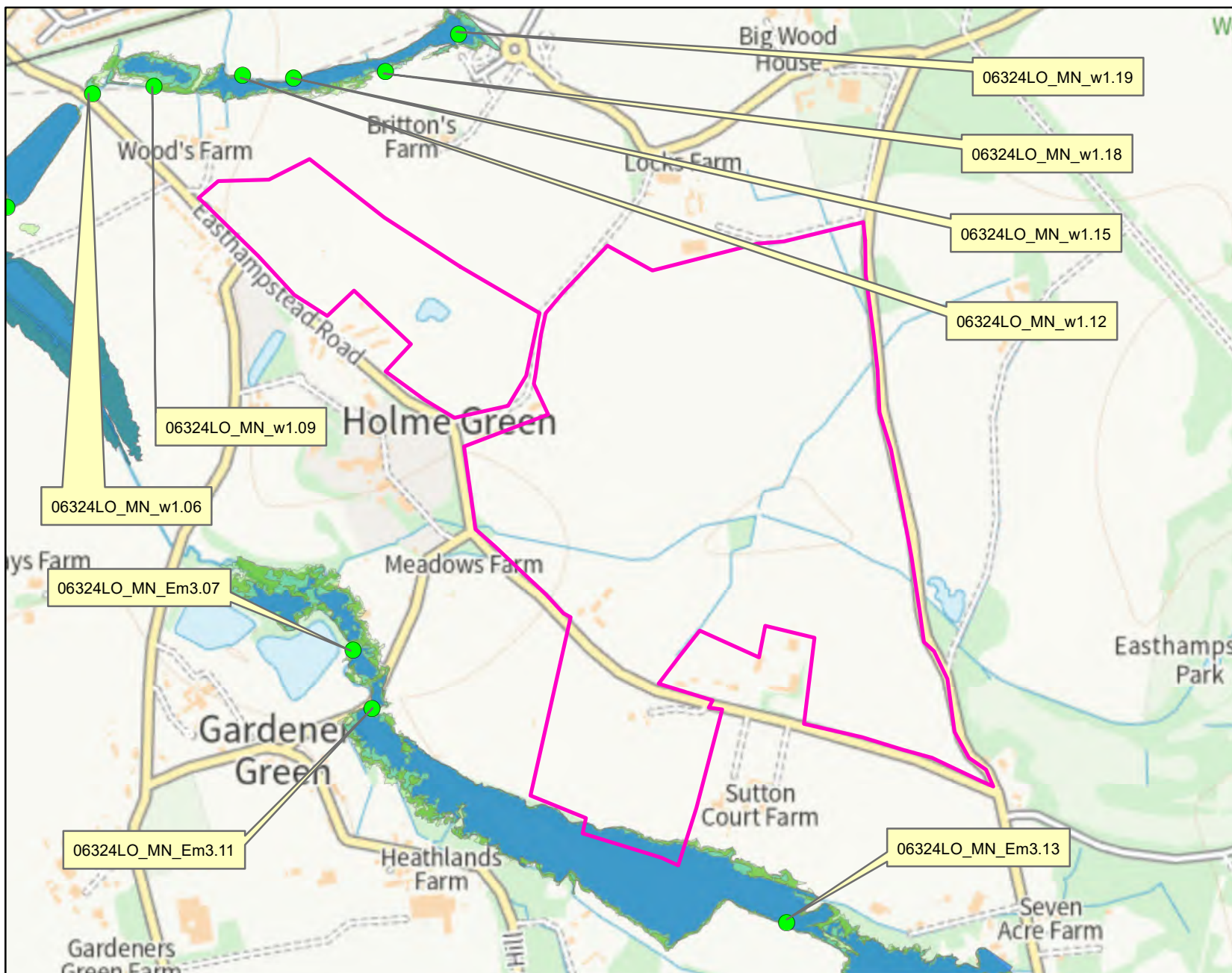
This flood model has represented the floodplain as a grid.
The flood water levels have been calculated for each grid cell.

Note:
Due to changes in guidance on the allowances for climate change, the percentage increase in river flows above should no longer to be used for development design purposes. The data included in this Product can be used for interpolation of levels as part of an intermediate level assessment.

For further advice on the new allowances please visit
<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

Detailed FRA Map centred on South Wokingham SDL, RG40 3BQ

Created on 16/11/23 REF: THM334165



Legend

- Site Boundary
- Model Nodes
- 20% AEP flood extent
- 5% AEP flood extent
- 1% AEP flood extent
- 1%+20% AEP flood extent
- 0.1% AEP flood extent

Flooding from rivers or sea without defences (Flood Zone 3) shows the area that could be affected by flooding:

- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

The Extent of an extreme flood (Flood Zone 2) shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

Historic flood data

THM334165

Our records show that the area of your site has been affected by flooding.
Information on the floods that have affected your site is provided in the table below:

Flood Event Code	Flood Event Name	Start Date	End Date	Source of Flooding	Cause of Flooding
No historic flood data available					

Please note the Environment Agency maps flooding to land not individual properties. Floodplain extents are an indication of the geographical extent of a historic flood. They do not provide information regarding levels of individual properties, nor do they imply that a property has flooded internally.

Start and End Dates shown above may represent a wider range where the exact dates are not available.

Transport
Development Planning
Sustainable
Deliver
Trusted
Enable
Site Appraisal
Hydrology
Highways
Civil Engineering
Successful
Travel Planning
Support
Drainage
Dynamic
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PRIORS FARM

FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

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03 JULY 2024



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1.0 Introduction

Context

- 1.1. This Flood Risk Assessment (FRA) has been prepared by Abley Letchford Partnership Ltd (ALP), on behalf of Lightwood Strategic Ltd to support a Hybrid planning application seeking Outline planning permission for up to 850 units with all matters reserved (except for access to the site) and a full application for SANG land and associated facilities by Lightwood Strategic ("Lightwood Site"). The Site is located on the land to the West of Old Wokingham Road, Wokingham in Berkshire.
- 1.2. The Site is part of the South Wokingham Strategic Development Location (SDL) Extension.

Development Proposals

- 1.3. The proposals are for the provision of up to 850 units, SANG and associated facilities as depicted on the Illustrative Masterplan within Appendix 1.

Requirement for a Flood Risk Assessment

- 1.4. The requirement for a FRA is set out in Section 14 of the revised National Planning Policy Framework (NPPF) as revised in September 2023.
- 1.5. The footnote accompanying Paragraph 172 states:

'A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.'
- 1.6. The Site is a greenfield site that comprises of farmland with established hedges and tree lined boundaries. Priors Farm and associated buildings are located within the site boundary. The area of the Site is approximately 58 hectares. As the Site area extends greater than 1 hectare, a site-specific flood risk assessment is required. To comply with the requirements of the NPPF, matters related to flood risk and drainage are addressed within this report.

Report Aim and Formation

- 1.7. The principal aims of this report are to demonstrate that the proposed development complies with national and local planning policy in respect to flood risk and to demonstrate that a suitable drainage strategy can be provided as part of development.
- 1.8. This report will also summarise the impacts the development could have on flood risk to the surrounding area and outlines the mitigation strategies that will be implemented to minimise this risk.



- 1.9. The drainage design embraces the guiding principles of Sustainable Drainage Systems (SuDS) which are central to the design of the surface water drainage strategy for the proposed development.

Report Structure

- 1.10. This report addresses the requirements of revised NPPF and considers the following aspects:
- Section 2: Policy and Sources of Information – a review of policy relevant to the assessment and sources of information used to inform the assessment.
 - Section 3: Site Setting – a description of the site location, topography, geology and hydrology.
 - Section 4: Overview of Flood Risk – a review of data for flooding from all sources to determine the baseline flood risk to the site and an assessment of the impacts of the development on flood risk.
 - Section 5: Sequential Test and Exception Test – a description of the proposed development and a classification of the vulnerability in the context of the Sequential Test and Exception Test.
 - Section 6: Flood Risk Mitigation – the mitigation measures implemented to manage the potential flood risk to the development.
 - Sections 7 and 8: Drainage Strategy – a summary of appropriate strategies to manage the surface water and foul water from the site in the post development scenario.
 - Section 9: Conclusion – a summary of the development proposals in the context of site vulnerability and the requirements of the NPPF.

2.0 Policy and Sources of Information

Introduction

- 2.1. This chapter provides a review of policy relevant to the assessment and the available information on all sources of flood risk.

National Planning Policy

- 2.2. National Planning Policy in relation to Flood Risk is set out in Section 14 of the National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG) ID: 7 for Flood Risk and Coastal Change. Flood Risk is discussed in Paragraphs 165-175 of the NPPF.

- 2.3. Paragraphs 165-168 discuss the sequential approach. Paragraph 166 refers to a Strategic Flood Risk Assessment (SFRA) that would form the basis of applying the Sequential Test for local authorities to allocate development, whilst Paragraphs 169-170 relates to the Exception Test.

- 2.4. Paragraph 173 discusses the determination of planning applications stating:

‘When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood risk assessment. Development should only be allowed in areas at risk of flooding where, in light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

- a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;*
- b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;*
- c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*
- d) any residual risk can be safely managed; and*
- e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.’*

- 2.5. The proposed development comprising of up to 900 units would be classed as a Major development providing more than 10 homes and the site is greater than 0.5 hectares. Paragraph 175 states:

‘Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

- a) Take account of advice from the lead local flood authority;*
- b) Have appropriate proposed minimum operational standards;*
- c) Have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and*



d) *Where possible, provide multifunctional benefits.'*

Environment Agency

- 2.6. The Flood and Water Management Act (2010) provides the Environment Agency (EA) a strategic overview role for all forms of flooding and coastal erosion. They also have direct responsibility for the prevention, mitigation and remediation of flood damage for main rivers and coastal areas. The EA is a statutory consultee in relation to flood risk and planning dependent upon criteria.
- 2.7. The EA Standing Advice has been consulted and reviewed within this FRA.
- 2.8. The EA Flood Map for Planning, EA Long Term Flood Risk Mapping and the Catchment Data Explorer websites have been interrogated in respect to flood risk extents and sources.

Local Authorities

- 2.9. The Site lies within the administrative area of Wokingham Borough Council (WBC). WBC is the Local Planning Authority (LPA) and Lead Local Flood Authority (LLFA).
- 2.10. Planning guidance published by WBC regarding the flood risk was referred to in order to assess the methodology best suited to suit the local area. The following key documents were reviewed:
 - WBC Core Strategy, Core Policy CP1 'Sustainable Development' and CP3 'General Principles for Development' (adopted January 2010),
 - WBC Local Plan (dated February 2014),
 - WBC Local Flood Risk Management Strategy (dated April 2015),
 - WBC Preliminary Flood Risk Assessment (PFRA) (dated June 2011) and PFRA addendum (dated 2017),
 - WBC Level 1 Strategic Flood Risk Assessment (SFRA) (dated May 2023 and published May 2024), and
 - WBC Level 2 SFRA (dated August 2023 and published May 2024).
- 2.11. WBC became the LLFA under the Flood and Water Management Act 2010. WBC provide guidance to assess, manage and inform flood risk.
- 2.12. As LLFA, WBC's Flood and Water Management Team provide a Planning Application Drainage Checklist to assist developers seeking planning permission for new sites by setting criteria to be met as part of the design of the drainage strategy and a list of documentation to be presented in the associated Flood Risk Assessment. A completed Planning Application Drainage Checklist is included within Appendix 3.
- 2.13. WBC has permissive rights over any Ordinary Watercourses including land drainage ditches. If any work is required within the watercourse (improvements or crossings) then approval from the LLFA is required under the Flood and Water Management Act 1991.



Local Water Authority

- 2.14. South East Water is responsible for the supply of clean water in the South Wokingham area. Thames Water is responsible for the disposal of wastewater for the South Wokingham area.
- 2.15. Information with regards to sewer and water main flooding contained within the SFRA has been reviewed as part of this FRA. All Water Companies have a statutory obligation to maintain a register of properties and areas which are at risk of flooding from the public sewerage system and is shown on the DG5 Flood Register.

Other Sources of Information

- 2.16. A desktop study of the Site was carried out using the following websites to ascertain local features, hydrology and soil characteristics:
- DEFRA's Magic Map portal,
 - British Geological Survey (BGS) 'Geology of Britain' online viewer, and
 - Cranfield University 'Soilscapes' portal.
- 2.17. Guidance with respect to Sustainable Drainage Systems (SuDS) is contained within DEFRA document Sustainable Drainage Systems, Non-statutory technical standards for sustainable drainage systems March 2015, CIRIA C753 The SuDS Manual and within the NPPF Planning Practice Guidance (PPG) – 'Flood Risk and Coastal Change'.
- 2.18. Additional guidance on development and flood risk is contained within CIRIA C624 Development and Flood Risk – Guidance for the Construction Industry which identifies several key aims for a development to ensure it is sustainable in flood risk terms.

3.0 Site Setting

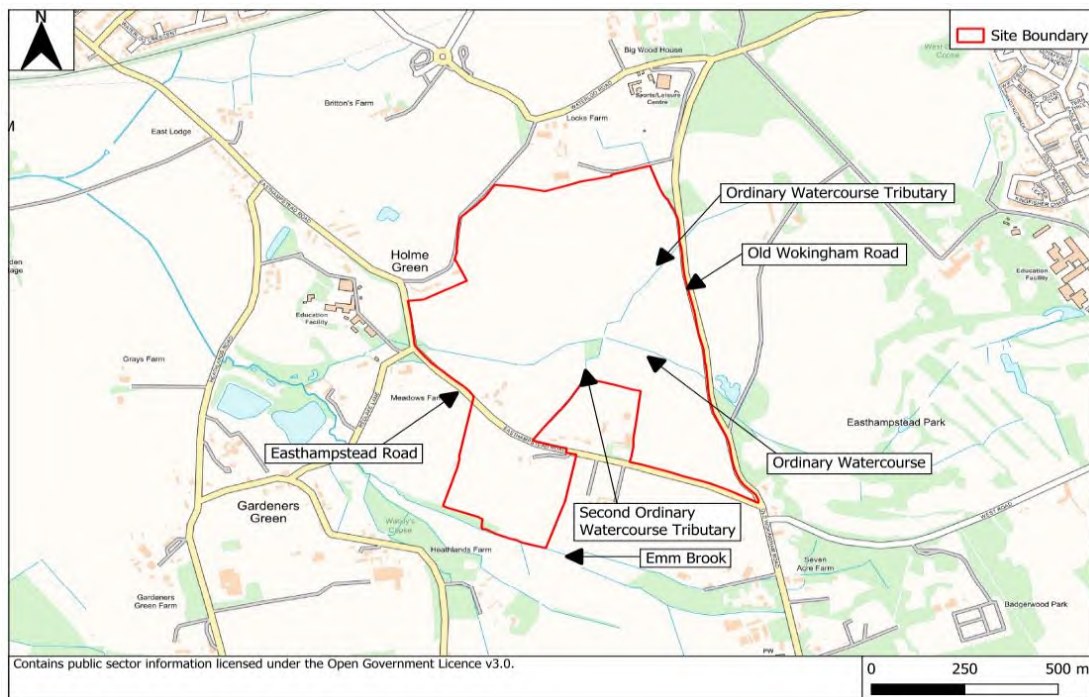
Introduction

- 3.1. This chapter provides a description of the site location, its topography, hydrological context, geology and hydrogeology.

Site Location

- 3.2. The Site is located at land to the west of Old Wokingham Road, located approximately 2.1km to the south of Wokingham in Berkshire. The nearest postcode is RG40 3BF. The Site centre grid reference is 483,390E, 167,180N. The Site location is shown in Figure 1.

Figure 1 – Site Location

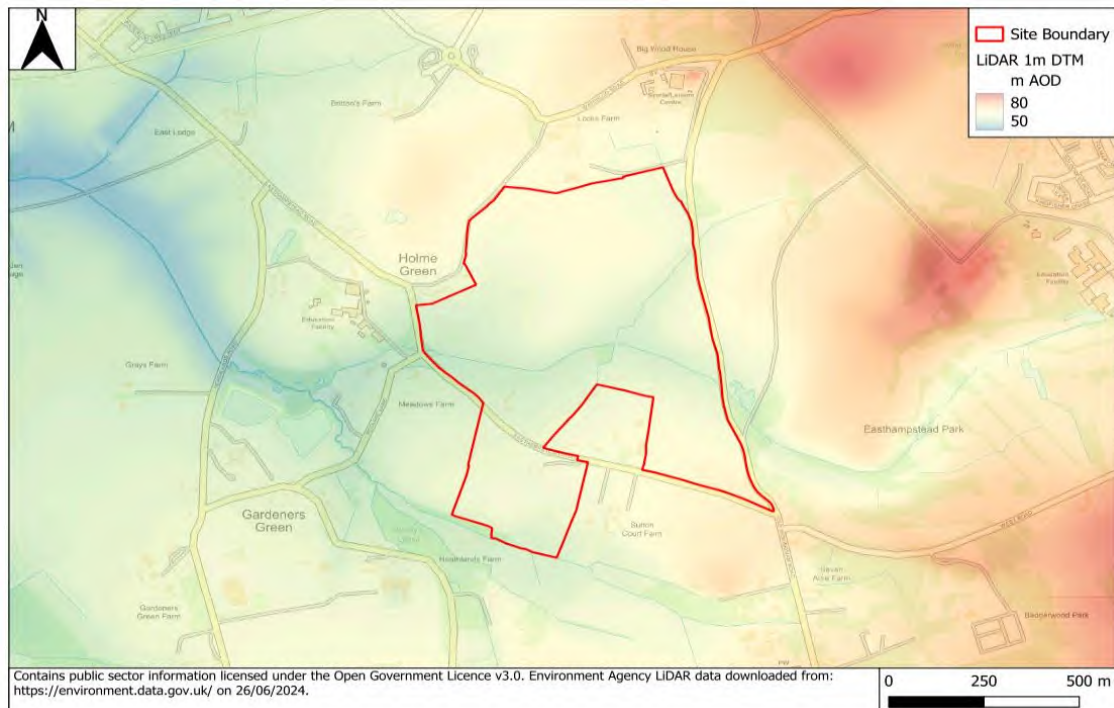


- 3.3. The northern part of the Site is located to the west of Old Wokingham Road and north of Easthampstead Road. The northern part of the Site is bounded by Locks Farm to the north. Holme Green village, Pearce's Farm and Meadows Farm are located to the west of the Site. The southern parcel is bound by Easthampstead Road to the north and Emm Brook to the south. Sutton Court Farm is located to the east of the southern parcel. Meadows Farm is located to the west of the southern parcel.
- 3.4. The Site consists predominantly of farmland, enclosed by mature hedgerow and tree boundaries. Priors Farm is located within the Site.
- 3.5. The Site covers an area of approximately 58 hectares.

Topography

- 3.6. The ground levels across the site are shown by LiDAR in Figure 2.

Figure 2 – Site Topography



- 3.7. The LiDAR indicates that the ground levels across the Site slope downwards from north and south towards an Ordinary Watercourse that flows through the Site. Ground levels across the Site are between 56.7m AOD and 67.1m AOD. The highest ground level near the northern boundary of the Site is 65.2m AOD. The highest ground level in the southern part of the Site is 67.1m AOD.
- 3.8. A topographical survey of the Site has been carried out. A copy of the topographical survey is included in Appendix 1. It confirms that ground levels across the Site slope down from the north and south to a low area along the Ordinary Watercourse. The highest parts of the Site are near the northern boundary of the Site with an elevation of 65.3m AOD and in the south-east corner of the Site with an elevation of 66.8m AOD. The lowest part of the Site is in the south-east corner of the Site with an elevation of 57.2m AOD.
- 3.9. The topographical survey shows that ground levels along the northern bank of the Ordinary Watercourse are up to 1m higher than the ground levels along the southern bank.
- 3.10. Observations from the site walkover carried out in February 2023 support the difference between the ground levels to the north and south of the Ordinary Watercourse.

Watercourses and Ditches

- 3.11. An Ordinary Watercourse flows from in a westerly direction through the centre of the Site. An Ordinary Watercourse tributary flows from the north-eastern part of the Site in a southerly direction towards the Ordinary Watercourse. A second tributary of the Ordinary Watercourse flows from the southern boundary of the Site in a northerly direction towards the Ordinary Watercourse. These are shown on Figure 1.

- 3.12. Figures 3 and 4 shows photographs of the Ordinary Watercourse taken during the Site walkover which was carried out in February 2023.

Figure 3 – Photograph of the Ordinary Watercourse



Figure 4 – Photograph of the Ordinary Watercourse



- 3.13. The photographs in Figures 3 and 4 show that the Ordinary Watercourse channel is well defined, with steep sides. The flow was well contained within the banks of the channel during the site walkover.
- 3.14. There are three existing crossing of the Ordinary Watercourse within and leading onto the Site. These are shown in Figure 5 The crossings are field access tracks with culverts, as shown in Figures 6, 7 and 8. The culverts are 900mm in diameter. There is between 500mm cover for the western and eastern culverts and 900mm cover for the central culvert. Photographs and measurements of the culverts were taken during a site walkover in February 2023.

Figure 5 Ordinary Watercourse Crossings

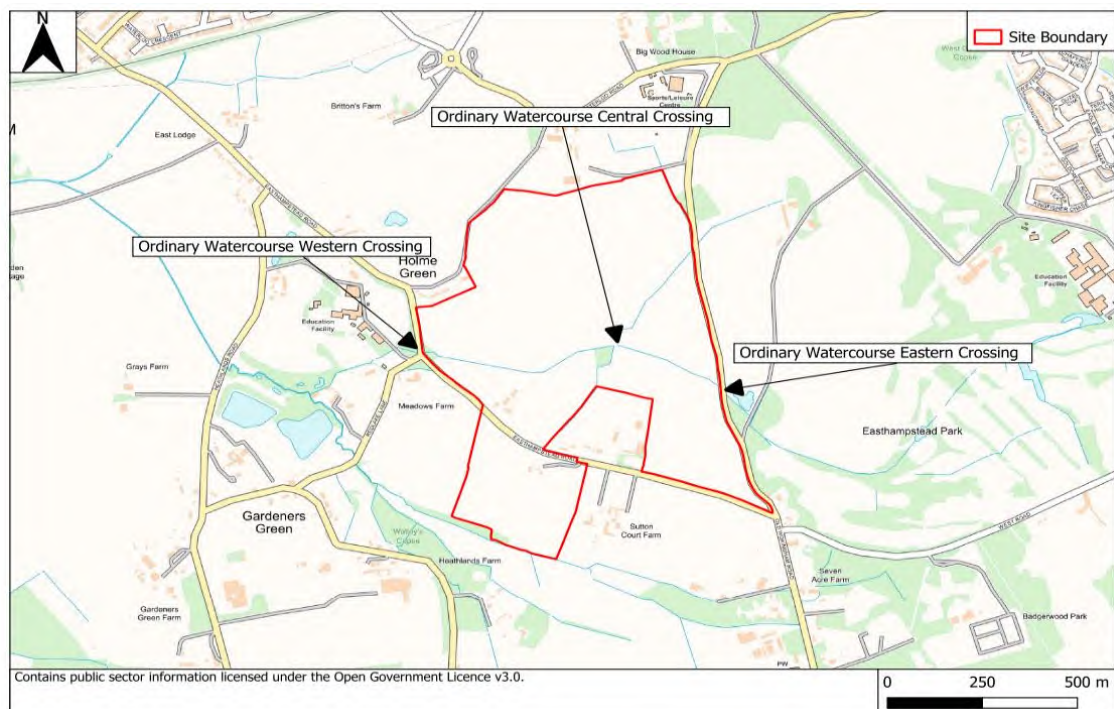


Figure 6 – Ordinary Watercourse Western Crossing



Figure 7 – Ordinary Watercourse Central Crossing



Figure 8 – Ordinary Watercourse Eastern Crossing



- 3.15. Emm Brook flows along the southern parcel's southern boundary. Emm Brook is classed as an Ordinary Watercourse in this location.



- 3.16. The nearest EA Main River is the downstream reach of the Emm Brook. Emm Brook flows as an Ordinary Watercourse from the Site's southernmost boundary in a north westerly direction and is designated as Main River approximately 1.4km to the north-west of the Site. The Ordinary Watercourse flows into Emm Brook at Chapel Green, at the point where the Emm Brook becomes a Main River.

Surface and Foul Water Sewers

- 3.17. Sewer Asset Records obtained from Thames Water do not indicate the presence of any surface or foul water sewers within the Site or within the road network immediately adjoining the Site. The nearest public asset is a foul sewer located adjacent to the Easthampstead Sewage Treatment Works on Old Wokingham Road to the south-east of the Site.
- 3.18. A copy of Thames Waters Asset Record is included within Appendix 1.

Geology and Hydrogeology

- 3.19. The British Geological Survey (BGS) 'Geology of Britain' online viewer indicates that the geology underlying the Site predominantly London Clay Formation. There is some Bagshot Formation – Sand in the south-west corner of the Site. There are superficial deposits of Head – clay, silt, sand and gravel adjacent to the Ordinary Watercourse. There are some areas of superficial deposits – sand and gravel across the Site. There are no superficial deposits across the rest of the Site.
- 3.20. The Cranfield University 'Soilscapes' online viewer indicates that the majority of the Site overlies slowly permeable seasonally wet slightly acidic but base rich loamy and clayey soils. There is an area in the south-west corner of the site which overlays freely draining slightly acid loamy soils.
- 3.21. The DEFRA Magic Map online viewer indicates that the Site lies outside of any Groundwater Source Protection Zone (SPZ). The majority of the Site is not underlain by a bedrock aquifer. The south-west corner of the Site is underlain by a Secondary A bedrock aquifer. Parts of the Site are underlain by a Secondary A superficial aquifer. The area adjacent to the Ordinary Watercourse is underlain by a Secondary (undifferentiated) bedrock aquifer.
- 3.22. A Secondary A aquifer is described by the BGS as 'permeable layers capable of supporting water supplied at a local rather than strategic scale, and in some areas forming an importance source of base flow to rivers. There are generally aquifers formerly classed as minor aquifers'.

4.0 Overview of Flood Risk

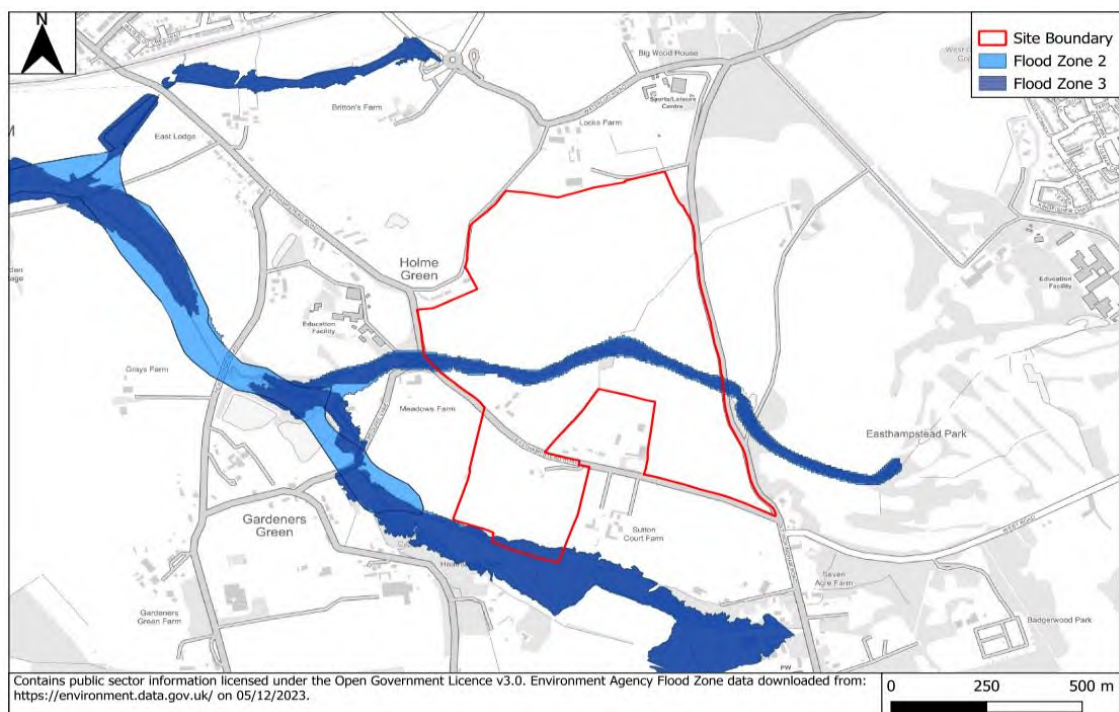
EA Flood Zone Map

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

- Flood Zone 1 'Low Probability' – Land less than 1 in 1000 (0.1%) annual probability of river or sea flooding.
- Flood Zone 2 'Medium Probability' – Land between 1 in 100 (1%) and 1 in 1000 (0.1%) annual probability of river flooding, or between 1 in 200 (0.5%) and 1 in 1000 (0.1%) annual probability of sea flooding.
- Flood Zone 3 'High Probability' – Land at 1 in 100 (1%) or greater annual probability of river flooding, or 1 in 200 (0.5%) or greater annual probability of sea flooding.

4.2. Figure 9 shows the EA Flood Zone mapping. It confirms that the majority of the Site is located within Flood Zone 1 'Low Probability' of fluvial (or tidal) flooding. According to the mapping, the area adjacent to the Ordinary Watercourse is located within Flood Zone 2 'Medium Probability' of fluvial (or tidal) flooding and Flood Zone 3 'High Probability' of fluvial (or tidal) flooding.

Figure 9 – EA Flood Zone Map



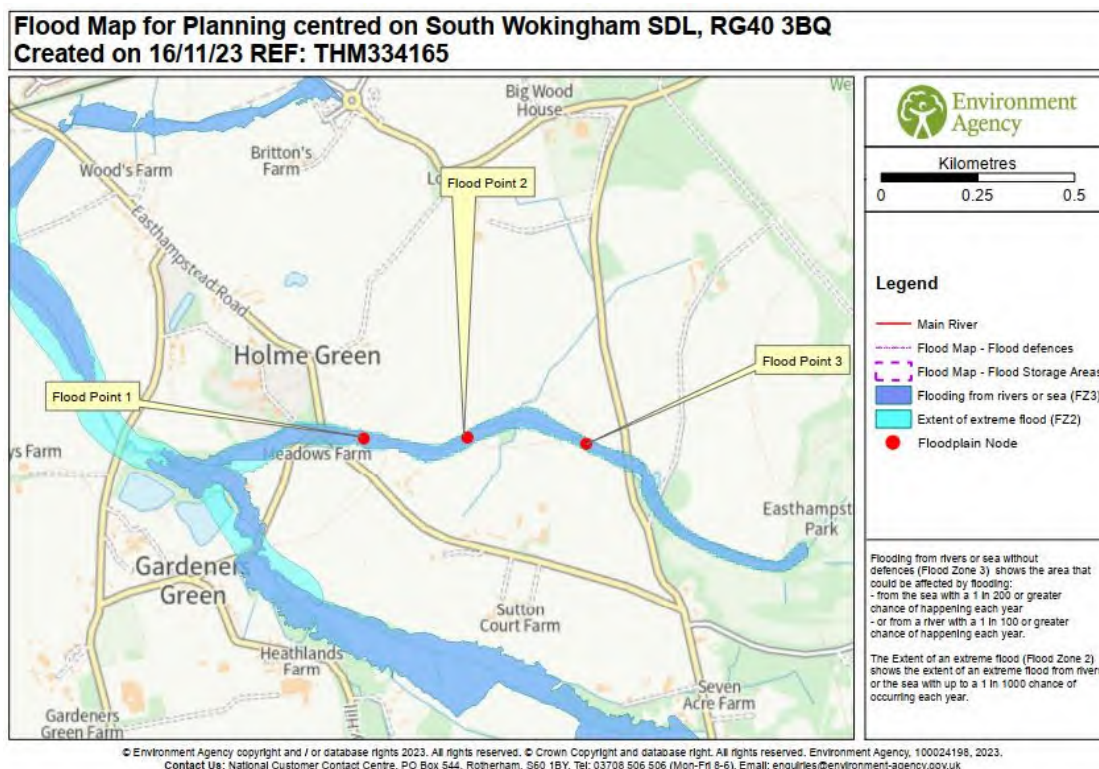


- 4.3. The floodplain for the Ordinary Watercourse is shown to be between 25m and 55m in width. This does not tie in with observations during the site walkover, or the topographical survey. The Ordinary Watercourse channel is well defined with ground levels rising quickly beyond the channel banks. Furthermore, the nature of the vegetation within the channel indicates that that channel is not frequently full.
- 4.4. The three culverts observed during the site walkover, are shown in Figures 6-8. The EA Flood Zone mapping is a strategic model therefore site specific features such as these culverts are not included within in. In reality, flow would back up behind the 900mm diameter culvert under Old Wokingham Road and the culvert would act as a control for flow entering the Site.
- 4.5. Therefore it is concluded that the fluvial flood extents in reality across the Site are likely to be smaller than those shown in the Flood Map for Planning. In the absence of detailed modelling, the EA Flood Zone data as been taken to inform the masterplan and this is deemed to be a precautionary approach. A detailed modelling study may be completed at a later stage to inform detailed design.

Flood Risk from Fluvial Sources

- 4.6. The majority of the Site is shown to be within Flood Zone 1 of the EA Flood Map for Planning. The area adjacent to the Ordinary Watercourse and the area adjacent to Emm Brook in the Site's southern parcel are shown to be located within Flood Zone 2 and 3 of the EA Flood Map for Planning. This indicates that the area adjacent to Ordinary Watercourse and the southern part of the Site's southern parcel is affected by fluvial flooding in the 1 in 100 and 1 in 1000 annual probability scenarios respectively. These maps are based on strategic modelling and do not take into consideration Site specific information.
- 4.7. The EA has provided modelled flood levels and extents for the Site as part of their Product 4 'Detailed Flood Risk Assessment Map' dataset (EA reference: THM334165). A copy of this is provided in Appendix 2. The model is a strategic JFLOW model of the Site. An extract of this Product 4 data is shown in Figure 10.

Figure 10 – EA Product 4 Extract – EA Flood Zone Flood Extents with Flood Points Labeled on Identifying the Location of the JFLOW Flood Levels in Table 1



4.8. Figure 10 shows the Flood Zone 2 and 3 extents from the EA Flood Map for Planning and shows the locations where model data has been provided.

Table 1 summarises the modelled flood levels at the nearest EA model nodes.

Table 1 – EA Modelled JFLOW Levels for the Ordinary Watercourse

Flood Event	Flood Point 1 Modelled Flood Level, m AOD	Flood Point 2 Modelled Flood Level, m AOD	Flood Point 3 Modelled Flood Level, m AOD
1 in 100 Annual Probability (1%)	56.27	58.30	59.59
1 in 100 Annual Probability +20% Climate Change Allowance	56.27	58.30	59.59
1 in 1000 (0.1%) Annual Probability	56.34	58.45	59.79

4.9. The EA has provided this data. However, in this case, the outputs from the JFLOW model will not be used to inform the FRA because, according to the EA, the level data from the model is not considered to be suitable for use in Site specific FRAs. Furthermore, a review of ground levels at Flood Points 1 to 3 indicates that the modelled levels are below bank level.

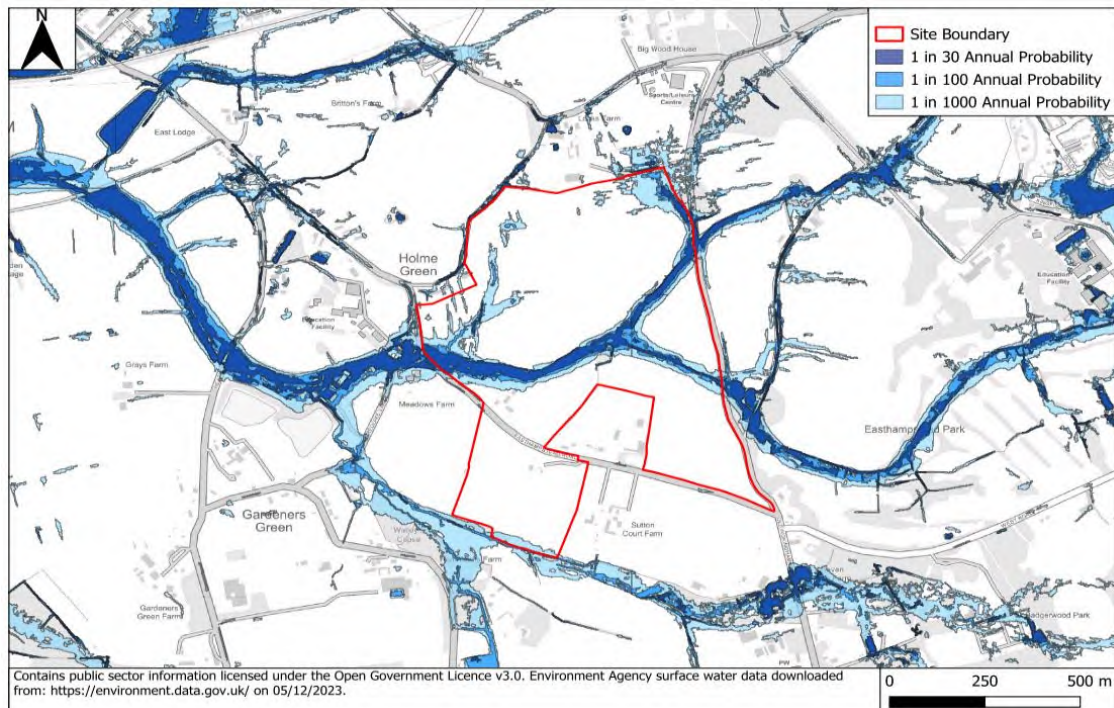


- 4.10. Instead, the EA Flood Map for Planning flood extents will be used to inform the masterplan at this stage and as a precautionary approach in the absence of a detailed model.
- 4.11. The Wokingham Borough Council Level 1 and 2 SFRA (dated August 2023) includes fluvial flood risk mapping. This confirms the EA Flood Zone mapping.
- 4.12. The Site is allocated within the WBC local Plan, this is referred to as the South Wokingham Master Planning Area extension within the Level 2 WBC SFRA Appendix A.
- 4.13. The Level 2 SFRA *Appendix A* states within the site specific summary table for the South Wokingham Master Planning Area extension *'in the absence of detailed hydraulic modelling, Flood Zones 2 and 3a have been taken from the Environment Agency's Flood Map for Planning.'* As such the EA mapping has been taken as the best available data.
- 4.14. The residential development will be located to avoid the fluvial flood extents shown on the Flood Map for Planning. A more detailed analysis will need to be carried out at the detailed design phase to inform the crossings of the Ordinary Watercourses at the detailed design phase.

Flood Risk from Surface Water

- 4.15. The EA's Risk of Flooding from Surface Water mapping indicates areas that could be susceptible to surface water flooding during extreme rainfall events. The EA surface water mapping defines rainfall events based on the following:
 - 1 in 30 (3.3%) annual probability 'High Risk'
 - 1 in 100 (1%) annual probability 'Medium Risk'
 - 1 in 1000 (0.1%) annual probability 'Low Risk'
 - Lower than 1 in 1000 (0.1%) annual probability 'Very Low Risk'.
- 4.16. The NPPF PPG – 'Flood Risk and Coastal Change' includes the 1 in 100 annual probability of surface water flood (including climate change) within the definition of the design flood event to be used to inform a FRA.
- 4.17. Figure 11 shows the potential flood risk from surface water. The EA Flood Risk from Surface Water mapping indicates that majority of the Site is at a 'Very Low' (less than 0.1% annual probability) of surface water flooding. There is a flow route with 'Low' (between 1% and 0.1% annual probability), 'Medium' (between 3.3% and 1% annual probability) and 'High' (greater than 3.3% annual probability) of surface water flooding which is associated with the flow route of the Ordinary Watercourse.

Figure 11 - EA Flood Risk from Surface Water



- 4.18. There is an Ordinary Watercourse tributary which flows from the north-east part of the Site towards the Ordinary Watercourse. There is an area of 'High', 'Medium' and 'Low' risk associated with this watercourse and follows its flow route.
- 4.19. The channels of the Ordinary Watercourse and Ordinary Watercourse tributary appear to be poorly defined within the surface water mapping. This is overestimating the width of the surface water flow route. The EA surface water mapping is strategic scale which does not pick-up site-specific detail or small features due to the resolution of the modelling. The flow routes will be further analysed at the detailed design phase.
- 4.20. One key feature that hasn't been represented in this mapping is a ditch that runs along the northern boundary of the Site. This ditch was noted during the site walkover. It would effectively intercept overland flow from the north and direct it to the north-eastern corner of the Site where flows would continue along the ditch line and into the Ordinary Watercourse tributary. The extent of surface water flooding in the north-eastern corner of the Site has been overestimated by the mapping.
- 4.21. Furthermore, the surface water flood mapping does not tie in with the topographical survey and Site observations. As shown in Figures 3 – 8, the Ordinary Watercourse and Ordinary Watercourse tributary are well defined channels with ground levels generally sloping quite steeply from the channel banks and into the Site. The land to the north of the Ordinary Watercourse is approximately 1m higher than the land to the south of the watercourse. There is also a 900mm diameter culvert under Old Wokingham Road as the Ordinary Watercourse and Ordinary Watercourse tributary enters the Site which is not represented within the surface water modelling. This would hold back high flows flowing from east of Old Wokingham Road to the west of Old Wokingham Road, therefore controlling the flow coming into the Site.



- 4.22. There is a surface water flow route in the north-east corner of the Site which flows down through the eastern part of the Site where it joins the Ordinary Watercourse tributary. The flow route here begins to the north of the Site, within Lock's Farm. Site observations carried out during a Site walkover confirmed that there is a ditch along the boundary of Lock's Farm and land to the west of Old Wokingham Road which collects surface water flow flowing in a southerly direction and channels it in an easterly direction towards the north-eastern corner of the Site. This detail is not picked up within the strategic scale EA surface water modelling due to resolution of the ground model used. The EA mapping therefore does not represent the reality of the Site.
- 4.23. There is a flow route in the western part of the Site which flows in a southerly direction into the Ordinary Watercourse. The catchment for this flow route is entirely within the Site boundary.
- 4.24. There is an area of 'Low' and 'Medium' risk of surface water flooding along the Site's southern parcel's southern boundary, associated with Emm Brook which flows to the south of the Site.
- 4.25. There are a few isolated areas which have a 'Low' risk of surface water flooding. These areas are associated with localised low ground where surface water would potentially pond.
- 4.26. The EA surface water mapping is based on a national scale surface modelling. The model does not consider any site-specific local information or below ground drainage infrastructure. The mapping therefore provides a guide to vulnerable areas based on the topography of the area and not a detailed assessment of surface water flooding for a specific site.
- 4.27. Appendix A states that the EA Risk of Surface Water mapping is used as its data set. The WBC Level 2 SFRA indicates that there have been no incidents of surface water flooding within the Site boundary.

Flood Risk from Groundwater

- 4.28. Groundwater flooding has the potential to occur after prolonged periods of unusually high rainfall. During such periods, more water than usual infiltrates through the ground, raising the water table above its normal depth below the surface. Where the water table is at a shallow depth in any case, the water table can reach the surface. This can cause groundwater to merge with rainfall and cause localised flooding.
- 4.29. The WBC Level 1 SFRA assesses the area for susceptibility to groundwater flooding this has been undertaken using the EA areas susceptible to groundwater flooding mapping. The relevant mapping is provided in Appendix A of the SFRA, Pages D3 and E3 and is described below.
- 4.30. The areas susceptible to groundwater flooding mapping indicates that the northern part of the Site is located within a 1km² grid square of which between 25% and 50% of the grid square is susceptible to groundwater flooding. The area to the south of the Ordinary Watercourse is shown to be located within a 1km² grid square of which between 50% and 75% of the grid square area is susceptible to groundwater flooding. There is an area in the western part of the Site that is located within a 1km² grid square of which less than 25% of the grid square is susceptible to groundwater flooding.



- 4.31. The WBC Level 1 SFRA includes areas of groundwater emergence flooding which shows the depth below the ground surface. The mapping is included within Appendix A, Pages D3 and E3. The mapping indicates that there is an area to the north of the Ordinary Watercourse there is an area where groundwater is between 0.025m and 0.5m below the ground surface and less than 0.025m below the ground surface. The area to the south of Easthampstead Road and south-eastern corner of the site is shown to have a groundwater level of between 0.025m and 0.5m below the ground surface and less than 0.025m below the ground surface. The mapping does not include data for the rest of the Site.
- 4.32. The risk of groundwater flooding across the majority of the Site is therefore considered to be medium. The risk of groundwater flooding is likely to be higher in the areas adjacent to the Ordinary Watercourse.
- 4.33. In assessing the site allocation, the WBC Level 2 SFRA suggests that an appropriate assessment of the groundwater regime may be required. If necessary this can be completed at detailed design.

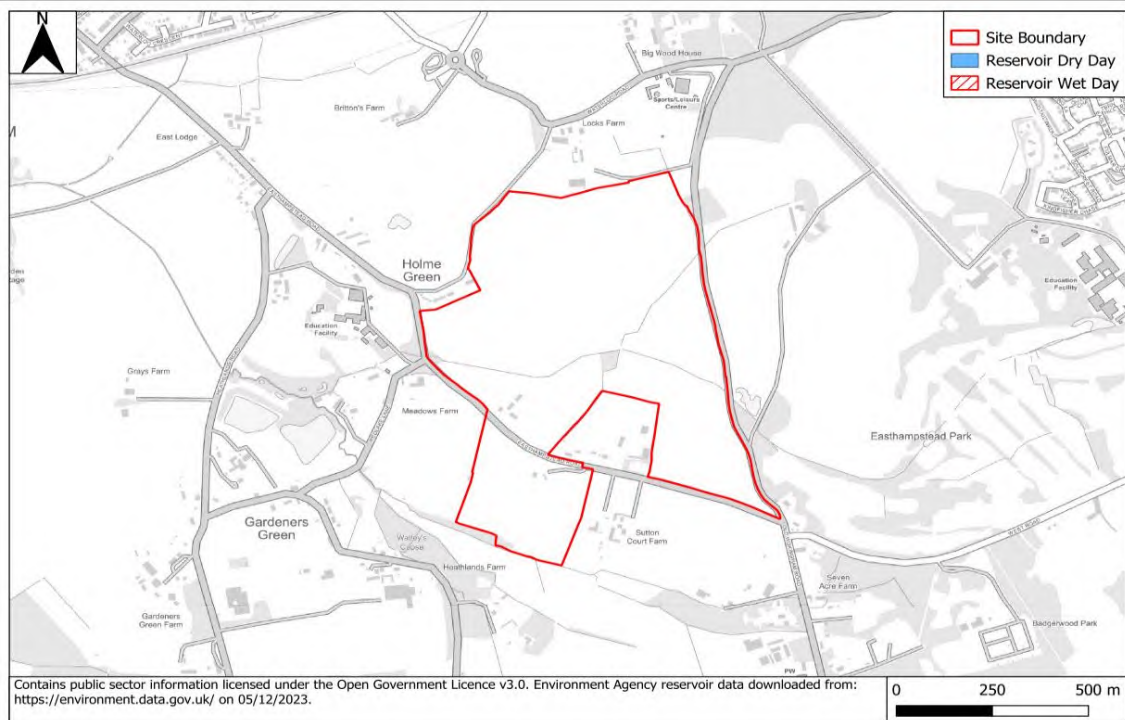
Flood Risk from Sewers

- 4.34. When exceeded, surcharged sewer networks can lead to flooding from backed up manholes and gully connections.
- 4.35. Thames Water Asset Location Plans (reference 2018_3887954) show that there are no sewers within the Site boundary. A copy of the Thames Water Asset Plans is included within Appendix 1.
- 4.36. The WBC Level 2 SFRA states that the Site *'is in a postcode area of (RG40 3) with no recorded historic sewer flooding incidents, according to available incident records from Thames Water (from 2000 up to 1 May 2022)'*.

Flood Risk from Reservoirs

- 4.37. The EA flood risk from reservoirs mapping indicates areas that would be at risk of flooding in the event of a reservoir breach.
- 4.38. Figure 12 shows the flood risk from reservoirs.

Figure 12 – EA Flood Risk from Reservoirs



- 4.39. The mapping indicates that the Site is not at risk of flooding in the event of a reservoir breach. The Site is therefore at low risk of flooding from reservoirs.

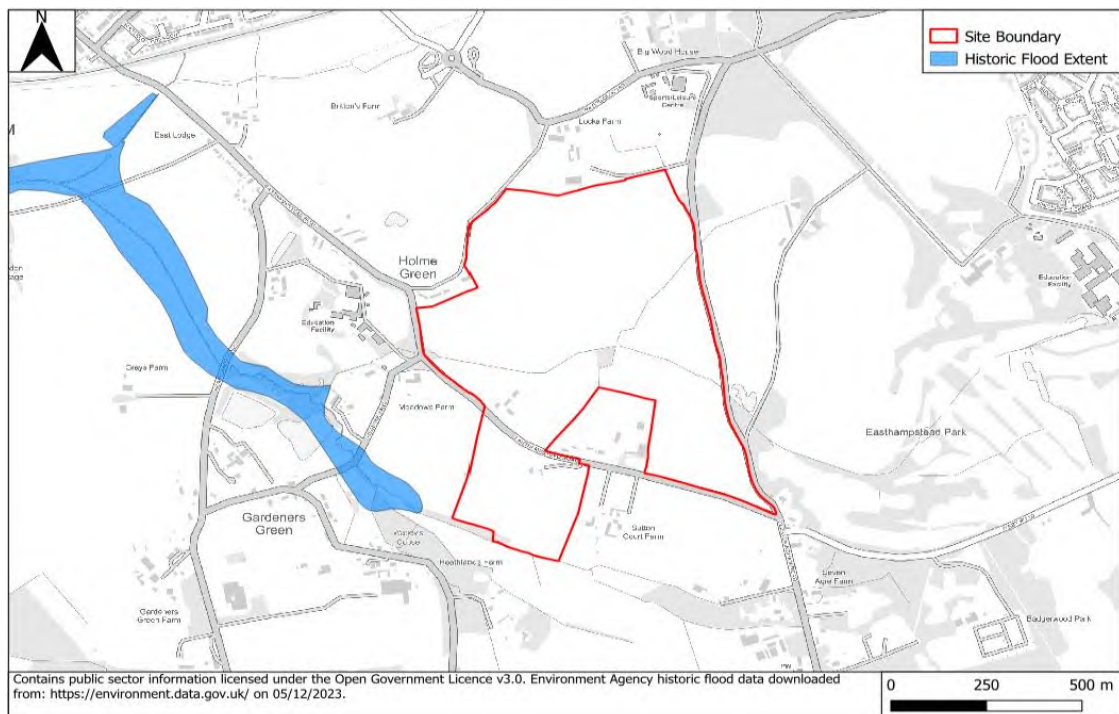
Flood Risk from Other Sources

- 4.40. The EA flood risk maps, WBC PFRA and WBC Level 1 and Level 2 SFRA indicate that the Site is not at risk of flooding from canals or other artificial sources.

Historic Flooding

- 4.41. Figure 13 shows the historic flood extent records held by the EA. The EA Historic Flood Map shows the maximum extent of recorded flood events.

Figure 13 – Historic Flood Extents



- 4.42. The EA historic flood outlines dataset indicates that land to the west of the Site was impacted by fluvial flooding from the Emm Brook in March 1947. Flooding occurred when the channel capacity was exceeded.

Flood Risk Summary

- 4.43. A summary of flooding from all sources is provided in Table 2.

Table 2 – Summary of Flood Risk

Source of Flooding	High	Medium	Low	Comments
Tidal			✓	The Site is inland and not influenced by tidal levels.
Fluvial		✓		The majority of the Site is located within Flood Zone 1. The areas adjacent to the Ordinary Watercourses are located within Flood Zones 2 and 3. The WBC Level 1 and Level 2 SFRA's confirm the EA Flood Zones. The WBC Level 2 SFRA states that the Flood Zones should be used in the absence of detailed modelling.
Pluvial		✓		The EA Flood Risk from Surface Water mapping indicates that majority of the Site is at a 'Very Low' of surface water flooding. There are a few surface water flows route within the Site with a 'Low', 'Medium' and 'High' of surface water flooding. These are associated with the watercourse corridors of the Ordinary Watercourses. There are a few isolated areas which have a 'Low' risk of surface water flooding. These areas are associated with low ground where surface water is ponding.
Groundwater		✓		The risk of groundwater flooding across the majority of the Site is considered to be medium.
Sewers			✓	There are no sewers within the Site boundary.
Reservoirs, canals and other artificial sources			✓	EA and WBC Level 1 and Level 2 SFRA mapping do not indicate the Site to be at risk of flooding from other sources.

- 4.44. The Site is deemed to be at low risk of flooding except for the Ordinary Watercourses corridors which are shown in the EA mapping to be affected by fluvial and surface water flooding and have a higher risk of groundwater flooding. Some other parts of the Site also provide flow routes for surface water.
- 4.45. For the purposes of this FRA, the fluvial flooding design flood event should be taken as the floodplain extent and flood levels derived in the fluvial 1 in 100 annual probability scenario plus an allowance for climate change for the tributary of the Emm Brook. In this instance the relevant fluvial climate change allowance is 14% which is the Central allowance for the Loddon and Tributaries Management Catchment.



- 4.46. The surface water flooding design flood event should be informed by the surface water 1 in 100 annual probability scenario plus an allowance for climate change. The 2070 Upper End allowance of 40% has been used for the design of the surface water drainage strategy. The is from the Loddon and Tributaries Management Catchment peak rainfall allowances.
- 4.47. The available data does not include the 1 in 100 annual probability plus climate change scenario modelling for either fluvial or surface water flooding. The EA Flood Map for Planning has therefore been used to inform the masterplan and a detailed site specific analysis will be undertaken at detailed design stage as necessary. This is deemed to be a precautionary approach at this stage.

5.0 Sequential Test and Exception Test

NPPF Sequential Test

- 5.1. NPPF states that Local Planning Authorities allocating land for development should apply the Sequential Test to demonstrate that there are no reasonably available sites in areas with a lower probability of flooding that would be appropriate to the type of development or land use proposed.
- 5.2. The majority of the Site is located within Flood Zone 1. The areas adjacent to the Ordinary Watercourses are located within Flood Zones 2 and 3.
- 5.3. The majority of the Site is located within an area with a 'Very Low' risk of surface water flooding. There are therefore areas of 'High', 'Medium' and 'Low' flooding along the Ordinary Watercourse corridors.
- 5.4. The flood risk from other sources is low.
- 5.5. The proposed development is for a residential use. It is classed within the NPPF as 'More Vulnerable' development.
- 5.6. All of the built residential development will be located within Flood Zone 1 and areas of a 'Very Low' risk of surface water flooding, once the surface water drainage strategy is in place.
- 5.7. The Site is allocated with the WBC Local Plan. As the Site is allocated with the WBC Local Plan, the Sequential Test is deemed to have been passed as part of this. Reg19 evidence shows that development in this part of the site land is justified for development compared to alternatives. safe

Exception Test

- 5.8. The built residential development is located within Flood Zone 1. The vulnerability of the development is 'More Vulnerable'. Table 2 in the NPPF PPG sets out when the Exception Test is required.
- 5.9. The WBC Level 2 SFRA states '*the exception test is required for this site because the development classified as 'More Vulnerable' is within Flood Zone 3a or at significant risk of surface water flooding.*'
- 5.10. Paragraph 170 of the NPPF states that to pass the exception test it should be demonstrated that:
- 5.11. *a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and*
- 5.12. *the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.*
- 5.13. *Both elements of the exception test should be satisfied for development to be allocated or permitted.*



6.0 Flood Mitigation Strategy

Sequential Approach

- 6.1. The NPPF encourages a 'sequential approach' in master planning for new development: locating the more vulnerable uses of the development in the areas of lowest flood risk from all sources.
- 6.2. The masterplan reflects this sequential approach with all residential development located in Flood Zone 1. Whilst the surface water flood maps indicate some areas within the Site to be potentially affected by surface water flooding, further analysis and site observations have confirmed the risk is actually low or will be managed through the surface water drainage strategy. The parcels for development are therefore within areas of low surface water flood risk.

Ground Floor Levels

- 6.3. The requirements for setting ground floor levels for new developments are set out in BS8533:2017 'Assessing and Managing Flood Risk in New Developments – Code of Practice'. A finished floor level of at least 300mm above the modelled level for the 1 in 100 annual probability plus climate change allowance is recommended in the WBC Level 1 SFRA.
- 6.4. The built residential development will be located outside of the fluvial floodplain for the design event, as defined by the EA Flood Map for Planning. Where required, finished floor levels will be set with an appropriate freeboard, according to WBC guidance, above the potential flood levels determined at the detailed design phase.
- 6.5. In addition, ground floor levels should be set a minimum of 150mm above the surrounding ground level to mitigate the residual flood risk from surface water runoff events. It is recommended that surrounding ground levels are appropriately contoured to direct surface water away from the development.

Floodplain Storage and Flow Routing

- 6.6. The proposed built residential development areas are located outside of the fluvial flood extents for the design event. There is therefore no impact on fluvial floodplain storage or conveyance as a result of the proposed built residential development.
- 6.7. Due to the nature of the crossings, some parts of the crossings may be located within the fluvial floodplain. The proposed crossings of the Ordinary Watercourse and Ordinary Watercourse tributary will be designed as part of the detailed design phase. The crossings will be designed to ensure no detrimental offsite impact and no significant impact on fluvial floodplain storage or flow routes. If necessary, floodplain compensation will be provided for any part of the crossings within the floodplain for the design flood event.
- 6.8. Some areas of the residential development are located within areas of 'High', 'Medium' and 'Low' risk of surface water flooding. The surface water flooding will be dealt with within the surface water drainage strategy and through Ordinary Watercourse corridors within the development to allow the storage and conveyance of flow.



- 6.9. As discussed in paragraphs 4.17 to 4.20, the surface water flow routes do not tie in with the topographical data and Site observations. A more detailed analysis of flows will be carried out at the detailed design phase to ensure that there are no detrimental offsite impacts.
- 6.10. The surface water flow in the Ordinary Watercourse and Ordinary Watercourse tributary will be managed within a watercourse corridor. The flows will be further analysed at the detailed design phase.
- 6.11. There is an existing ditch along the northern boundary of the Site. This ditch collects surface water from the land to the north of the Site. The ditch channels flow to the north-east corner of the Site where it flows along the eastern boundary of the Site where it joins the Ordinary Watercourse tributary.
- 6.12. The flow route in the western part of the Site will be managed by the surface water mitigation strategy. The flow originates from within the Site, therefore the flow accommodated within the surface water drainage strategy.
- 6.13. Once implemented, the built residential development will have no detrimental offsite impact on surface water floodplain storage or flow routes.
- 6.14. As with fluvial flooding, the crossings will be designed so that they have no detrimental offsite impact on surface water floodplain storage or flow routes.

Safe Access

- 6.15. The residential development areas are located outside of the fluvial flood extent. Continuous safe access for the development to the north of the Ordinary Watercourse will be via Old Wokingham Road to the east of the Site. This is located outside of the fluvial extent.
- 6.16. Vehicular access to/from the parcel to the south of the Ordinary Watercourse requires crossing of the floodplain. Subject to detailed design, the carriageway will be set above the design flood level and safe access will be available using the new crossing. The parcel to the south of the Ordinary Watercourses will also have a number of footpaths which connect the site to Easthampstead Road and which are outside the potential floodplain extent. Safe pedestrian access is available to the south of the Site.

Residual Risk

- 6.17. The NPPF PPG – ‘Flood Risk and Coastal Change’ defined residual risk as coming from ‘flood risk management infrastructure’ and the ‘residual risk to a development once any site-specific flood mitigation measures are taken into account’.
- 6.18. Residual risk to the Site includes a breach in the raised flood defences, the failure of a reservoir and a flood event greater than the designed standards.
- 6.19. The residual risk to the Site is low. The EA AIMS dataset which contains information of flood defences indicates that the Site does not benefit from raised flood defences. The EA mapping for reservoir breaches indicates that the Site is not located within an area at risk of flooding in the event of a reservoir. The ‘More Vulnerable’ residential development is located outside of the 1 in 1000 annual probability flood extent.

WBC Requirements

- 6.20. As part of the WBC Level 2 SFRA there is a site specific guidance for the South Wokingham Master Planning Area extension allocation that sets out what is required for site design and making development safe. This has been used to inform this FRA. This guidance and how this FRA demonstrates this is set out below in Table 3.

Table 3 – WBC Level 2 SFRA Guidance

WBC Level 2 SFRA Guidance	Summary of Mitigation Measures
The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout its lifetime. It is for the applicant to show that the development meets the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the development. (Para 048 Flood Risk and Coastal Change PPG).	This FRA has been completed and presents a development strategy in accordance with WBC guidelines within the WBC Level 1 and Level 2 SFRA using flood risk datasets from the WBC Level 1 and Level 2 SFRA, alongside using the EA flood risk mapping. Residential development will be located within Flood Zone 1 and at a 'Very Low' risk of surface water flooding. A finished floor level of 300mm above the 1 in 100 annual probability plus climate change allowance will be applied to development which is adjacent to areas of potential fluvial flooding. Development away from areas of fluvial flood risk will have a finished floor level of 150mm above the finished ground level to mitigate the residual risk of surface water flooding. The ground will be contoured away from buildings to mitigate the residual risk of surface water flooding. All crossings of the watercourses will be designed to provide a suitable freeboard above the design flood level. Floodplain compensation will be provided, if required. The detailed design phase will include a further site specific assessment of fluvial flood risk to inform these measures.
The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, so runoff magnitudes from the development are not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates areas close as possible to pre-development greenfield rates.	There are a few surface water flow routes through the site. There is no residential development within the watercourse corridors. The surface water drainage strategy has been designed to restrict the discharge to pre development greenfield run off rates.
Arrangements for safe access and egress will need to be provided for the 1% AEP fluvial and rainfall events with an appropriate allowance for climate change, considering depth, velocity, and hazard. Design and access arrangements will need to incorporate measures, so development and occupants are safe.	Safe access is available to the north of the Ordinary Watercourse via Old Wokingham Road, which is dry during the fluvial flood event. Safe access is available to the parcel to the south of the Ordinary Watercourse via pedestrian footpaths



	which connect the development to Easthampstead Road. All built residential development will be located outside of the fluvial extent.
Provisions for safe access and egress should not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk.	Safe access to the site is located within Flood Zone 1. Therefore, there is no loss of floodplain storage.
Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels and use of boundary walls. These measures should be assessed to make sure that flooding is not increased elsewhere.	All residential properties are located outside of the fluvial flood extent. However, some properties are located adjacent to the potential floodplain. The finished flood levels at these properties should be set 300mm above the 1 in 100 annual probability plus appropriate climate change allowance. The properties that are located away from the fluvial floodplain should have a finished flood levels set at a minimum of 150mm above the finished ground level to mitigate for residual risk of surface water flooding.



7.0 Surface Water Drainage

Introduction

- 7.1. This chapter provides details on the surface drainage strategy and includes measures to drain the proposed development site.

Overall Strategy

- 7.2. The proposed drainage strategy has been designed to the requirements of the NPPF by providing a comprehensive drainage system which embraces the SuDS philosophy and key principals. The utilisation of Sustainable Drainage Systems (SuDS) not only provides the benefit of controlling waters at source and online treatment of collected surface water but also allows enhanced aesthetics through improved landscaping, biodiversity, and ecological opportunities.
- 7.3. These features offer a holistic treatment train and management system to the benefit of new residents, members of the wider community, downstream receptors and the environment.
- 7.4. The alteration of natural surface water flow patterns through developments can lead to problems elsewhere in the catchment, particularly flooding downstream. Changes of land uses can have significant downstream impacts where existing drainage systems may not have sufficient capacity for any additional surface water flow.
- 7.5. A surface water management strategy is therefore required to manage and reduce the flood risk posed by the surface water runoff from the site. The surface water drainage arrangements for any development site should be such that the volumes and peak flow rates of surface water leaving a developed site are no greater than the rates to the pre-development scenario, unless specific off-site arrangements are made and result in the same net effect.
- 7.6. Sustainable water management measures (SuDS) should be introduced to control the surface water runoff from the proposed development site therefore, managing the flood risk to the site and surrounding areas from the surface water runoff.
- 7.7. The Construction Industry Research and Information Association, CIRIA's C690 states the following:
- **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 surfaces)
 - **Source Control** – control of runoff at or very near its source (such as the use of rainwater harvesting)
 - **Site Control** – management of water from several sub-catchments (including routing water from roofs and car parks to one or several soakaways for the entire site)
 - **Regional Control** – management of runoff from several sites, typically in a detention basin or wetland.



- 7.8. The SuDS Manual 2015 (C753) provides best practice guidance on the planning, design, construction, operation and maintenance of SuDS. This document provides guidance to ensure that SuDS are planned and designed to maximise the opportunities and benefits of surface water management.
- 7.9. The four main categories of benefits that can be achieved by SuDS, referred to as the four pillars of SuDS design, are:
- **Water quantity** – control the quantity of runoff to support the management of flood risk, and maintain and protect the natural water cycle;
 - **Water quality** – manage the quality of the runoff to prevent pollution
 - **Amenity** – create and sustain better places for people
 - **Biodiversity** – create and sustain better places for nature.
- 7.10. Supplemental to CIRIA guidance, Document H of the Building Regulations 2015 sets out three possible options to discharge surface water runoff. Rainwater shall discharge to one of the following, listed in order of priority:
- An adequate soakaway or some other adequate infiltration system; or where that is not reasonably practicable,
 - A watercourse; or where that is not reasonably practicable
 - A sewer.
- 7.11. As the underlying geology is not conducive to the use of infiltration type techniques (Ref: Para 3.19 above), the surface water drainage proposals will be designed to attenuate runoff with controlled discharge to the existing local watercourses i.e. the existing open field ditch on site which would be feasible point of discharge.
- 7.12. Implementation of SuDS will ensure that flood risk downstream is not increased due to the proposed development. These features will also provide positive improvements to the quality of surface water runoff.
- 7.13. The following SuDS components are deemed applicable to the site:
- Pervious surfacing systems – structural surfaces that allow water to penetrate into a granular layer thus providing storage and treatment, e.g. pervious paving.
 - Conveyance systems – components that convey flows to downstream storage systems, e.g. swales and filter drains.
 - Storage systems – components that control flow, and possibly volumes, by storing water and releasing it slowly, e.g. geocellular units, attenuation basins and wetlands.
 - Treatment systems – components that remove or facilitate the degradation of contaminants present in runoff, e.g. filter strips and proprietary treatment systems.

Pre and Post Development Areas/Rates

- 7.14. To quantify any potential increase in surface water runoff, the existing Greenfield/Pre-Development runoff rate from the site must be determined. The rates of runoff have been determined using the current 'industry best practice' guidelines as outlined in the Interim Code of Practice for SuDS. The recommended methodology for sites up to 50 hectares in area is the ICP SuDS method.
- 7.15. An assessment of existing surface water runoff has been undertaken, to determine the potential surface water options and attenuation requirements for the site utilising the following parameters taken from the UK Centre for Ecology & Hydrology Flood Estimation Handbook Web Service:
- NGR: SU 83354 671164
 - BFIHOST: 0.395
 - BFIHOST19: 0.389
 - PROPWET: 0.29
 - SAAR6190: 662mm
 - Q_{BAR} / Q_{MED} Factor: 1.14
- 7.16. The calculated Greenfield run off discharge rates, based on a discharge rate per hectare of impermeable area, are as presented in Figure 13. The corresponding runoff outputs created with H R Wallingford Greenfield runoff rate estimation tool can be found within Appendix 4.

Table 4 – Pre-Development Runoff Rates/Volumes per Hectare

Annual Probability	Greenfield/Pre-Development Runoff Rate per hectare (l/s)	Greenfield/Pre-Development Volume 360 minute storm (m ³)
1 in 2 year event	3.3	106
QBar	3.9	-
1 in 30 year event	8.9	253
1 in 100 year event	12.4	328

- 7.17. Based on the Illustrative Masterplan, it has been conservatively estimated that the impermeable surfaces will be approximately 60% of the developable area. Depending upon how future Reserved Matters Site Layouts evolve, this percentage typically reduces slightly to around 50-55%.
- 7.18. The use of 60% therefore provides for a robust assessment which allows for fluctuations in residential density, and future urban creep of up to 10% on private curtilage areas, which typically results in approximately 5% of the total area, in accordance with The SuDS Manual (CIRIA 753).
- 7.19. In order to comply with best practice as stipulated in EA Report SC030219 'Rainfall Runoff Management for Developments', proposed discharge rates should be restricted to one of two methods for all storms up to and including the 1 in a 100 year storm event plus a 40% allowance for climate change.

1. Variable Greenfield discharge rates

- 7.20. This would require traditional on-site attenuation to hold back flows controlled by a complex control device, such as multiple vortex control devices. Discharge rates would be set so as not to exceed the pre-development 1in1, 1in30 and 1in100 year runoff rates set out in Figure 13 based upon the appropriate catchment area.
- 7.21. In addition to this onsite attenuation, consideration of Long Term Storage would also be necessary given the increase in discharge volume generated by the proposed development, over and above that pre-development. This storage would need to be release into the surrounding watercourses at a low rate of 2.0 l/s/ha. This would normally be controlled by a secondary attenuation area and supplemental control device.
- 7.22. The Long Term Storage (LTS) requirement calculations based upon CIRIA EQ 24.10, have been included in Appendix 4 with the calculated value being 42.4m³/ha.
- 7.23. The drainage simulation software Causeway Flow has been used to determine the combined 100 + 40% Climate Change Long Term and basic attenuation requirements per hectare of impermeable catchment. The output of this model can be seen within Appendix 4.

Table 5 – Variable Rate Discharge Attenuation Storage Volumes

Attenuation	Volume requirements (per hectare of impermeable catchment)
Attenuation Volume	857.6 m ³
Long Term Storage (Discharged at 2 l/s/ha)	42.4 m ³
Total Attenuation Required	890 m³

2. Qbar Greenfield discharge rate

- 7.24. Alternatively, all discharge flows could be restricted to Qbar. This would negate the requirement for Long Term Storage and again flows would be attenuated on site and discharged utilising an onsite control device, such as a vortex control device. This normally requires a greater volume of attenuation.
- 7.25. For the purposes of this report and to provide a robust analysis, all attenuation requirements have been calculated utilising all discharge flows restricted to Qbar, as this is normally the worst case scenario. Appendix 4 establishes the 'per hectare' calculation of Qbar as being 3.9 litres/second.
- 7.26. The use of Qbar gives a value for the average annual peak runoff rate, this provides a comprehensive SuDS scheme with the volume runoff being reduced for intense storms. However, either method described above is viable and will be investigated further during detailed design.
- 7.27. With the above in mind, and having assessed limiting the offsite discharge rate to Qbar, the anticipated attenuation volumes for a 100 year storm with a 40% allowance for climate change are as follows:

Table 6 – Calculated Attenuation Volumes based upon Qbar

Attenuation	Volume requirements (per hectare of impermeable catchment)
Total Attenuation Required	990 m³



- 7.28. It likely that at the detailed design a mixture of both strategies may be beneficial as complexities can lie within the use of the variable discharge rates especially when used at source but the reduction of the required storage volumes can have other benefits for the use of the development such as dedicated green space areas and play areas.

Surface Water Proposals

- 7.29. It is proposed to provide a network of trapped gullies, pipes and Sustainable Drainage (SuDS) features to collect the surface water runoff from impermeable areas such as roads, roofs and driveways. The traditional system will work in combination with such features as permeable paving, roadside swales and filter drains, within the residential parcels and Green Blue corridors, to filtrate, store and transport water to attenuation basins to provide attenuation storage and high-quality water benefits.
- 7.30. The final attenuation basins will drain, with a controlled discharge into the existing ordinary watercourse which traverses the site and flows under Easthampstead Road to the west.
- 7.31. The end point attenuation basins located across the site will not provide the full storage requirements on their own to attenuate the flows at the proposed discharge rate. It will therefore be necessary to provide storage features upstream of these basins to facilitate the function of the surface water drainage system. These features may come in the form of permeable paving, swales, filter drains, crate storage or even smaller attenuation basins and provide filtration at source and on plot SuDS to mimic the existing Greenfield conditions as well as enhance the Green Blue corridors through the site.
- 7.32. Drawing A218-025, a copy of which is included within Appendix 4, provides a high level overview of the drainage proposals together with the estimated requirements for the required storage and SuDS features for the parcels within the various zones of the proposed development.
- 7.33. The banks of the SuDS basins will be designed in accordance with the SuDS Manual C753 in respect to having a maximum gradient of 1 in 4 and an appropriate freeboard above the maximum water level. This allows landscaping of both wetland and wildflower mixes to provide an appropriate landscape context in the vicinity of the features through the provision of an aquatic shelf.
- 7.34. Open SuDS features will be designed so as not to compromise the safety of residents, visitors and their property. Generally open boundaries are provided, and perimeter planting could be utilised to define the extents of the features.
- 7.35. Proposed discharge rates will be restricted to QBAR for all storm events up to and including the 1 in 100 year storm event plus 40% allowance for climate change. This would negate the requirement for Long Term Storage and flows would be attenuated on site and discharged utilising an on-site flow control device such as a Hydrobrake.
- 7.36. All conveyance systems will be designed to cater for the 1:30 year storm event, in accordance with industry standard, with all attenuation features designed to allow for the 1 in 100 year storm event plus 40% climate change allowance.
- 7.37. The proposals draw reference to the DEFRA document Sustainable Drainage Systems, Non-statutory technical standards for sustainable drainage systems March 2015, as well as CIRIA C753 The SuDS Manual.



- 7.38. Current uncontrolled pluvial runoff exhibited onsite during high rainfall events will be mitigated as a result of the Development. This will occur by virtue of the change in surface from greenfield to positively drained impermeable areas, which will serve to capture, attenuate and delay surface water runoff eastwards beyond Green Lane. This will be a benefit to downstream receptors.
- 7.39. This proposal identifies the principal components of the surface water strategy and is subject to further detailed localised investigations as part of the subsequent Reserved Matters applications. These assumptions are subject to evolution as the design develops and the individual parcels are further realised.
- 7.40. There is scope to utilise source control techniques (such as swales, granular strips and permeable paving) which will assist with the reduction of larger attenuation storage features. This should be embraced and investigated as the project progresses.
- 7.41. Subject to the provision of additional geotechnical information, the attenuation basins may require partial lining to protect against the ingress of natural groundwater. Such lining provides the ability to create localised, small permanent bodies of water which adds landscaping and biodiversity opportunities to the scheme.

Exceedance Flood Routing

- 7.42. Flows in excess of the above design storms, which may flood from the network for storms in excess of the 1 in 100 year storm plus 40% climate change, will be kept within the internal road network, until such time as they can be directed into adjacent landscaping areas or existing vegetation/woodland. This ensures that no onsite or offsite residential units are afforded an increased level of protection from flood waters until such time as the rain events become significant.
- 7.43. The attenuation basins along the eastern edge of the Development are designed to provide 300mm freeboard and therefore can accept additional flood water from manholes upstream.

Water Quality Improvements

- 7.44. CIRIA report C753 The SuDS Manual outlines the methodology for assessing water quality risks associated with new development. This is a simple index approach which provides a high level scoping analysis of the land usage and gives guidelines for appropriate treatment stages.
- 7.45. This process identifies features necessary to provide adequate substance removal in line with Environment Agency requirements. This is a three step process of Allocation, Mitigation and Review.
- 7.46. Surfaces generating runoff are 'graded' on their potential to contribute to various harmful pollutants and gives each surface a risk of pollution from each element. An extract of Table 26.2 within the SuDS Manual is set out overleaf.

Table 7 – Extract from Table 26.2 SuDS Manual

Land Use	Pollution Hazard Level	Total Suspended Solids	Metals	Hydrocarbons
Residential Roofs	Very Low	0.2	0.2	0.05
Other Roofs	Low	0.3	0.2-0.8	0.05
Low traffic residential roads and non-residential parking with infrequent change.	Low	0.5	0.4	0.4
Commercial yard, parking with frequent change, other roads,	medium	0.7	0.6	0.7
Sites with heavy pollution	High	0.8	0.8	0.9

- 7.47. Historically, PPG3 documentation would recommend that pollutants were removed utilising oil separators, but since its superseding, more recent guidance has shifted to the use of SuDS features to remove pollutants; thereby providing significant improvements in treatment.
- 7.48. The use of non-mechanical features decreases the requirements for maintenance and increase natural biodiversity. That said, the SuDS Manual does not remove the possibility of utilising separators, so long as they are considered in partnership with a comprehensive overall SuDS regime.
- 7.49. Without adequate treatment, the pollutants would cause damage if they were to enter the watercourse or water table in large volumes. The use of SuDS features to slow down and degrade these pollutants is critical to the provision of an acceptable discharge.
- 7.50. The respective cleansing abilities of common SuDS features are given by corresponding mitigation indices within the SuDS Manual. An extract of Table 26.3 is set out below.

Table 8 – Extract from Table 26.3 SuDS Manual

Type of SuDS component	Total Suspended Solids	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter Drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable Paving	0.7	0.6	0.7
Detention Basin	0.5	0.5	0.6

Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8

- 7.51. The individual pollution indices are totalled, with the first SuDS component utilising its full value and subsequent downstream SuDS features acting with 50% efficiency. This provides a realistic strategy which mimics the reduced cleansing effectiveness as the concentration of a pollutant decreases along the SuDS train.
- 7.52. In line with Environment Agency guidance, before the design phase is concluded, the proposals are reviewed and analysed in order to identify potential shortcomings and to ensure that adequate volume of SuDS features are provided to mitigate the risk of pollution from each source.

SuDS Maintenance Strategy

- 7.53. For the water treatment effects of SuDS features to remain effective, a comprehensive maintenance strategy should be implemented.
- 7.54. During construction, maintenance of SuDS features should be undertaken by the Contractor. Upon completion, the assets should be passed over to the Management Company, statutory authority, or community group commissioned to maintain the features in perpetuity.
- 7.55. As part of the strategy, a regular maintenance regime will be created, which consists of several primary measures required to ensure the longevity of the system. These should be undertaken on a regular basis to ensure consistent performance. Typical maintenance activities consist of:
- Inspecting and reporting; relatively regular review of the condition identifying issues and providing resolutions. Periodic review from the maintenance contractor;
 - Litter and debris removal;
 - Grass trimming, overall cutting and localised strimming preventing blockages;
 - Weed and evasive plant control;
 - Shrub management;
 - Aquatic and shoreline vegetation management;
 - Sweeping pervious surfaces; and
 - Oil removal from proprietary systems.
- 7.56. A remedial maintenance schedule would be recommended as part of the handover of the SuDS features, remedial maintenance is required to provide repairs to the system and monitor long term damage ensuring the system remains consistently productive. The schedule could consist of;
- Structure rehabilitation and repair;
 - Infiltration surface rehabilitation;
 - Scarifying to remove "Thatch";



- Spiking or Tining the soil;
 - Air pressure treatment.
- 7.57. The maintenance schedule contents and timing will depend upon multiple factors including usage, contents of water utilising the system, location and biology. To this end, it is suggested that the schedule be finalised as part of detailed design; ensuring the most comprehensive maintenance schedule is incorporated for the phase in hand.
- 7.58. Community outreach can be undertaken as part of the development, which will raise awareness on the importance of SuDS to both flood risk and water quality in the local area. Imparting the new residents with knowledge on the risks associated with pollution to the surface water drainage system is key, as is the direct effect their actions may have on water quality and biodiversity in the area.

Adoption and Ownership

- 7.59. The drainage system is designed to the appropriate standards including the new Sewerage Sector Guidance (SSG), the Building Regulations and the requirement of the National Planning Policy Framework.
- 7.60. The intention of adoption and ownership of drainage and SuDS is as follows:
- Surface water sewers within development parcels to be offered for adoption to Thames Water under the Section 104 process of the Water Industry Act.
 - Surface water highway drains, gullies and leads within adopted roads to be maintained by the Highway Authority.
 - Above ground attenuation (i.e. swales and basins) to be maintained by a private maintenance company funded by residential properties or subject to agreement with the Local Authority.
 - SuDS features serving single properties, for example, permeable paved driveways to single dwellings, will be owned and maintained by the owner of that property.
- 7.61. Suitable adoption and maintenance regimes for SuDS should be submitted in support of the Reserved Matters application.

8.0 Foul Water Drainage

Introduction

- 8.1. This chapter provides details on the proposed foul water drainage strategy and measures to convey effluent.

Overall Strategy

- 8.2. Due to the topography of the Site and location of the existing foul sewer point of connection, wastewater from the Site will require pumping to the receiving public sewer.
- 8.3. There are currently no public sewers located within the adjacent roads bordering the Site, therefore construction of the infrastructure necessary to service the Site will be required.
- 8.4. Discussions are currently ongoing with Thames Water as to the best possible location for the final connection for the foul water coming from the Site depending on capacity of the sewage treatment works and incoming pipework.
- 8.5. Two possibilities for the general direction of the ultimate foul discharge point currently exist. Option one is to pump flows North, to the strategic pump station located on the SDL which pumps flows underneath the existing railway line eventually discharging to the Sewage Treatment plant to the North of Dalley Road in Wokingham. The alternative option is to pump flows South, eventually discharging to the Easthampstead Sewage Treatment works located to the East of Old Wokingham Road.
- 8.6. The topography of the Site and the location and invert of the existing foul sewers in either direction will requires wastewater from the development to be pumped as it cannot drain by gravity.
- 8.7. Discussions are ongoing with Thames Water regarding the exact location(s) and specifications of possible pump stations that will be required to provide sufficient capacity to service the development.
- 8.8. Notwithstanding this, the delivery of the proposed on-site foul water sewers will be designed in collaboration with Thames Water as approving body in accordance with the new Sewerage Sector Guidance (SSG) and will be offered to Thames Water for adoption under S104 Agreement of the Water Industry Act. The connection to the existing public sewer system will be made via a S106 Agreement of the Water Industry Act with Thames Water as part of the overall adoption process.

Adoption and Ownership

- 8.9. The drainage system is designed to the appropriate standards including the new Sewerage Sector Guidance (SSG), the Building Regulations and British Standards.
- 8.10. Foul water sewers within development parcels and offsite to the point of connection are to be offered for adoption to Southern Water under the Section 104 process of the Water Industry Act.



9.0 Conclusion

Flood Risk

- 9.1. The EA Flood Risk mapping has been reviewed alongside the Wokingham Borough Council (WBC) Preliminary Flood Risk Assessment (PFRA) and Level 1 and Level 2 Strategic Flood Risk Assessment (SFRA).
- 9.2. This Flood Risk Assessment (FRA) concludes that:
- The majority of the Site is shown to be within Flood Zone 1 according to the EA Flood Map for Planning. The areas adjacent to the Ordinary Watercourse and Emm Brook are shown to be located within Flood Zones 2 and 3. As there is no detailed modelling the EA Flood Map for Planning extent has therefore been used to inform the masterplan, with all residential built development located outside of the flood extents.
 - The EA Flood Risk from Surface Water mapping indicates that majority of the Site is at a 'Very Low' of surface water flooding. There are flow routes of 'Low', 'Medium' and 'High' risk of surface water flooding which is associated with the Ordinary Watercourses through the Site. However further analysis and site observations suggest that these flow routes would not actually be realised on Site given the physical features at the Site boundaries.
 - The WBC Level 1 SFRA mapping indicates the potential susceptibility to groundwater flooding and also the expected depth to groundwater. In assessing the site allocation, the Level 2 SFRA suggests that an appropriate assessment of the groundwater regime may be required. If necessary this can be completed at detailed design.
 - Thames Water asset maps show no sewers within the Site boundary. The Site is considered to be at low risk of flooding from sewers.
 - The Site is not at risk of flooding in the event of a reservoir breach.
- 9.3. In summary the majority of the Site is at a low risk of flooding from all sources although there are some areas particularly along the Ordinary Watercourse and Emm Brook where further assessment may be required at a detailed design stage.

Sequential Test and Exception Test

- 9.4. The majority of the Site is located within Flood Zone 1. The areas adjacent to Emm Brook and the Ordinary Watercourses are located within Flood Zones 2 and 3 as shown from EA strategic mapping.
- 9.5. The Site forms part of the South Wokingham Strategic Development Land which is allocated within the WBC Local Plan. The Sequential Test is deemed to have been carried out as part of this.
- 9.6. The WBC Level 2 SFRA states '*The Local Authority will need to confirm that the sequential test has been carried out in line with national guidelines. The sequential test will need to be passed before the exception test is applied*'.



- 9.7. The residential development is classed as 'More Vulnerable'. The WBC Level 2 SFRA states '*The exception test is required for this site because the development classified as 'More Vulnerable' is within Flood Zone 3a or at significant risk from surface water flooding*'.

Mitigation Strategy

- 9.8. For any dwellings located close to the floodplain for the design event, finished floor levels will be set 300mm above the modelled level for the 1 in 100 annual probability plus climate change allowance in line with the WBC Level 1 SFRA.
- 9.9. Where the Site is located away from the edge of the extent of the fluvial design flood, ground floor levels should be set a minimum of 150mm above the surrounding ground level to mitigate the residual flood risk from surface water runoff events. Surrounding ground levels should also be appropriately contoured to direct surface water away from houses.
- 9.10. The watercourse crossings will be designed at the detailed design phase. The design will ensure that there are no negative off-site impacts. If necessary, floodplain compensation will be provided.
- 9.11. The surface water flow along the Ordinary Watercourses will be managed through watercourse corridors which maintain the conveyance of flow. Flow coming from the north onto the Site is collected by a drain to the north of the northern boundary of the Site and channelled in an easterly direction within the extending drainage ditch network. The western flow route will be managed through the surface water drainage strategy.
- 9.12. The proposed surface water drainage strategy will manage the flood risk posed by uncontrolled surface water runoff from the Site. Any increase in surface water run-off can be managed using SuDS source control techniques as well as attenuation features to provide storage in extreme storm events. This provides the minimum of two treatment storage stages which is in accordance with the recommendations of CIRIA C753. All surface water drainage systems will be designed to restrict drainage discharge rates to QBAR runoff rates and store the balance of water for all events up to and including the 1 in 100 year event including an allowance for a 40% increase in rainfall intensities as a result of climate change and urban creep.
- 9.13. The WBC Level 2 SFRA has considered this Site (South Wokingham Master Planning Area extension) and sets out key criteria to be addressed as part of any development of the Site. These are summarised in Table 9.

Table 9 - WBC Level 2 SFRA Key Message For The South Wokingham Master Planning Area Extension

Key Message	The FRA Demonstrates That
Development is steered away from the south border of the Site as this affected by both fluvial flooding and surface water flooding.	The residential areas of the Site are located away from the south border of the wider allocated development site.
A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with development to be steered away from the areas identified to be at risk from both fluvial and surface	Residential areas of the Site are located away from the south border and south-east corner of the wider allocated site.

water flooding, particularly along the southern border and south east corner of the site.	The residential development will be located outside of the fluvial floodplain and an area of 'Very Low' risk of surface water flooding.
Safe access and egress can be demonstrated in the 1% AEP plus 40% climate change surface water event. This includes measures to reduce flood risk along these routes such as raising access, but not displacing flood water elsewhere. A detailed hydraulic model of Emm Brook along the southern border of the site and the unnamed watercourse within the site may be required at FRA stage to accurately represent the risk from these watercourses.	The majority of the Site is located within Flood Zone 1. To the centre of the Site there is an Ordinary Watercourse with an area of Flood Zone 2 and Flood Zone 3 associated with this. To the north of the Ordinary Watercourse, safe access and egress during a fluvial flood event can be achieved via Old Wokingham Road. This is outside the fluvial extent. The parcel to the south of the Ordinary Watercourses has a number of pedestrian footpaths which connect the Site to Easthampstead Road. A more detailed assessment of fluvial flooding for the Site will be undertaken as part of the detailed design.
A site-specific FRA demonstrates that the site is not at an increased risk of flooding in the future and that development of the site does not increase the risk of surface water flooding on the site and to neighbouring properties.	This FRA has reviewed all sources of flooding. The residential development is located outside of the fluvial and surface water flood extents. There will be no increase in offsite flood risk as a result of the Proposed Development.
If any flood mitigation measures implemented are tested to check they will not displace water elsewhere (for example if land is raised to permit development on one area, compensatory flood storage will be required in another.	The crossings of the watercourses will be designed a suitable freeboard above the design flood event and in line with local guidance. If required, floodplain compensation will be provided.
The development reviews the suitability of the Emm Brook model to inform this site and carries out any further modelling work deemed necessary.	Crossings of the Emm Brook will be set a suitable freeboard above the design flood event. If further modelling work or other detailed assessment is required to inform this, it will be carried out at the detailed design stage.

Summary

- 9.14. This FRA demonstrates that the proposed development complies with national and local planning policy with respect to flood risk and drainage. The risk of flooding is adequately managed, and, with the implementation of a suitable surface water drainage strategy, the offsite flood risk is not increased.



Appendices



Appendix 1 - Plans

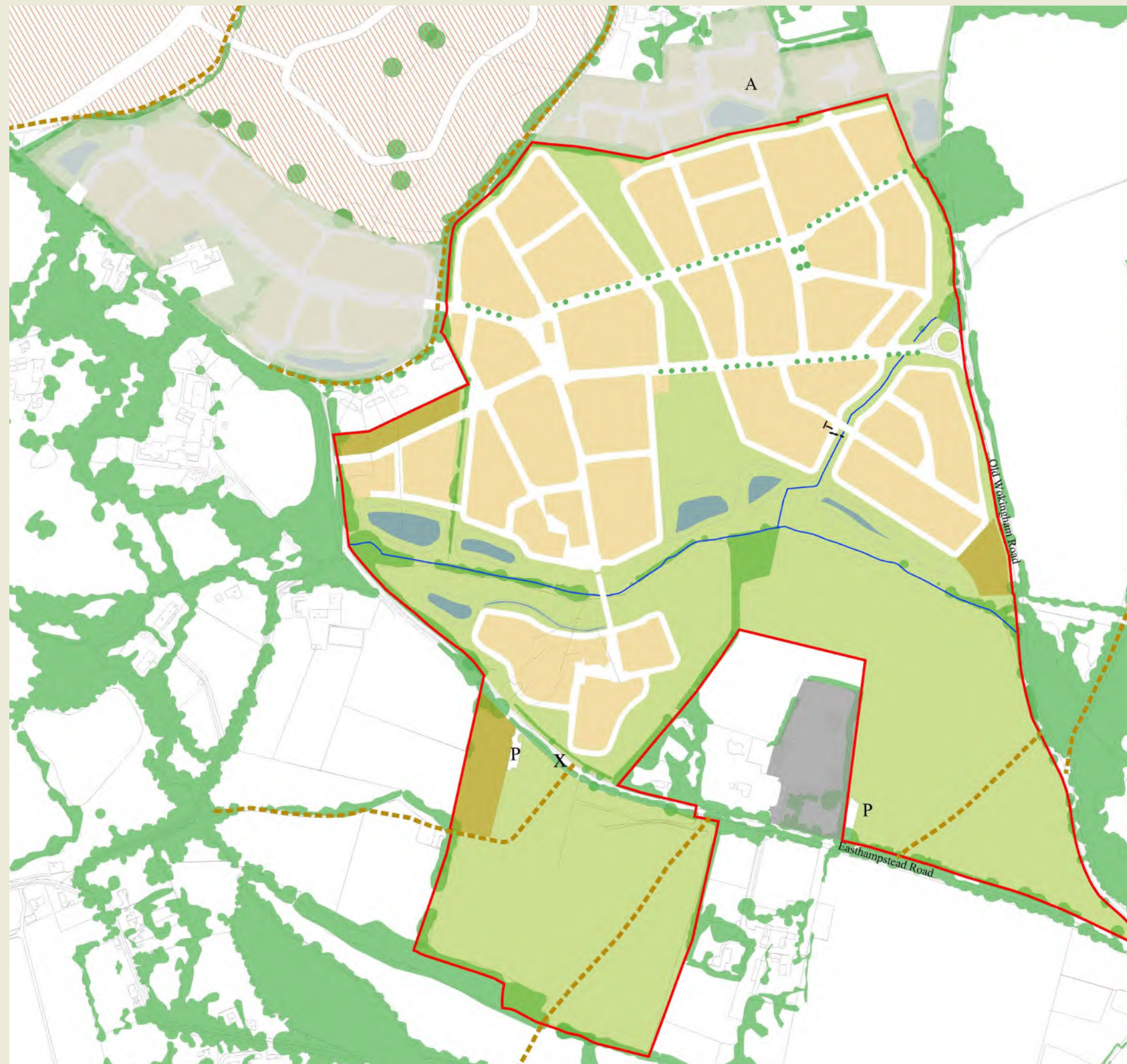
Illustrative Masterplan

Topographical Survey

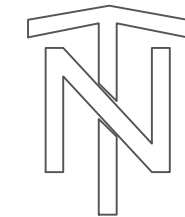
Thames Water Pre-Planning Capacity Enquiry

Thames Water Sewer Asset Plan

MASTERPLAN AND URBAN BLOCK STRUCTURE



Key	
	Public Right of Way
	Urban Blocks
	SuDS
	Green Open Spaces
	Allotments
	Potential for Intensification of Commerical Use
	Indicative Trees
	Ordinary watercourses
	Application ref: 191068 (resolution to permit subject to S106)
A	Application 211033 (being determined)
P	SANG parking
x	Point closure



1. This drawing is copyright and its use or reproduction without the written permission of Usk Land Survey is prohibited
2. Due to unavoidable inaccuracies during the reproduction process these drawings should not be scaled. Where dimensions are critical Usk Land Survey should be requested to confirm dimensions based on survey information. Scales appearing at the base of this plan are for indicative purposes only.
3. This plan has been prepared in accordance with B.S. 1192, Part 1 in relation to scale and dimension. Tolerances permitted within the British Standard should be observed.
4. All dimensions and particulars should be checked on site. Any discrepancies should be reported to Usk Land Survey before any work commences.

SURVEY LEGEND			
AB	AR BRICK	LP	LAMP POST
AV	B	MB	MOORING BOLLARD
BB	BOLLARD	MF	MISCELLANEOUS FENCING
BC	BLOCK	MM	MANHOLE
BDY	BOUNDARY	MR	MARKER
BE	BELT	MP	MOORING PILE
BF	BELT BELLY	MRP	MOOR PILING FENCE
BH	BANK	MS	MILE STONE
BK	BUS STOP	NB	NOTICE BOARD
BG	BARRIER MARK	NH	NATIONAL PARKS AUTHORITY
BO	BOLLARD	OH	OVERHEAD CABLE
BOF	BURIED FENCE	OS	ORNAMENCE SURVEY
BR	BURIED RAIL FENCE	OP	OPEN SITE BALANCE
CBF	CORRUGATED IRON FENCE	P	PILE
CC	CHAIN LINK FENCE	PR	PILLAR BOX
CLF	CHAIN LINK POST	PM	PARKING METER
CM	CONCRETE	PP	POST & RAIL FENCE
CP	CHESTNUT PALING FENCE	PTM	PARKING TRUCK MACHINE
CT	CITY	PS	POST & RAIL FENCE
CTV	CABLE T.V. MANHOLE	RB	RIGHT BANK
CR	CORNER	RR	RR CROSSING ELEV
DK	DOWN KERB	RS	ROAD SIGN
DL	DOWN	RT	RETAINING WALL
DP	DOWNPIPE	RWP	RAINWATER PIPE
DS	DOWN ST. PROOF COURSE	SD	SOFT DOCK
DR	DRAIN	SDP	STAND PIPE
DRB	DOCK WASTE BIN	SK	SKOWAY
EW	ENVIRONMENT AGENCY	SL	SLOTTI LEAF
ED	ELECTRICITY BOX	SN	SNAP
EE	ELECTRICITY CABLE	SP	SURFACE WATER MANHOLE
ECP	ELECTRICITY CABLE PIT	SH	SHEET METAL MANHOLE
EMH	ELECTRICITY MANHOLE	SP	SP SIGN POST
EP	ELECTRICITY POLE	STN	STATION
ET	ELECTRICITY TRANSMISSION LINE	SV	SLUICE WAIVE
ETL	ELECTRICITY TRANSMISSION LINE	SV	SLUICE VEINT PIPE
FL	FLOWER BED	SWF	SWEEP WIRE FENCE
FLR	FLOOR	TBW	TEMPORARY BENCH MARK
FR	FIRE	TC/TP	TELEPHONE CABLE BOX/POST
FRH	FIRE HYDRANT	TC	TELEPHONE CABINET
FM	FLOOD MARKER	TL	THRESHOLD LEVEL
FL	FLOOR LEVEL	TR	TRAFFIC LIGHT
FLR	FLOOR	TLB	TRAFFIC LIGHT BOX
FWM	FLOOD WATER MANHOLE	TR	TRAFFIC LIGHT
GL	GROUND LEVEL	TR	TIMBER RUBBING STRIP
GS	GATE POST	TS	TREE STUMP
GR	GRASS	TUB	TUBULAR STEEL RAILINGS
GV	GRASS	VP	VENT PIPE
IC	INSPECTION CHAMBER	WL	WATER LEVEL
IN	INLET	WLW	WATER LEVEL/WATER LINE
IRF	IRON RAILING FENCE	W	WATER WAY
IRW	IRON RAILING FENCE	WMP	WIRE MESH FENCE
J	JUNCTION	WO	WOODEN POST
JN	JUNCTION BOX	WOP	WOODEN POST & RAIL FENCE
K	KENT INLET GULLY	WV	WATER VALVE
KB	KENT INLET GULLY	WY	WARD GULLY
LF	LEAFY		

(Abbreviations apply to survey data only)

STN	CO-ORDINATES	LEVEL	STN	CO-ORDINATES	LEVEL
NATIONAL GRID.			CONTROL USED:		
			TYPE		VALUE(M)
ALL LEVELS RELATE TO ORDNANCE DATUM NEWLYN.					

 **Usk** Land Survey
No.40 ABERGAVENNY ROAD, USK, NP15 1SB
TEL: 01291 673491 MOB: 0787 2560386
EMAIL jonbarton@usklandsurvey.co.uk

Site Easthampstead Road
Wokingham
RG40 3BQ

Drawing No.	Revision
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Sheet 5 | —

Drawing Scale: 1:1250 Job Ref 1328

CAD Filename: 1328.dwg Plot Scale: 1=1

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Jonathan Shuttleworth

Abley Letchford Partnership
3 Tealgate
Charnham Park
Hungerford
RG17 0YT



29th November 2023

Pre-planning enquiry: Capacity concerns

Site: Land to the East of Easthampton Road and West of Old Wokingham Road, Priors Farm, Wokingham, Berkshire, RG40 3BQ

Dear Jonathan

Thank you for providing the information on your proposal, the construction of 5250 general houses over a 10-year period. The preferred ultimate connection point would be to the Waste Treatment Works to the south, located at co-ordinates 484171, 166256. This would reduce pumping or eliminate the need for it entirely. A more complex alternative would be to utilise multiple pump stations to join the infrastructure located to the north passing through the railway line with the ultimate destination being the waste water treatment works located at co-ordinates 481346, 169950.

We have completed the assessment of the foul water flows based on the information submitted in your application with the purpose of assessing sewer capacity within the existing Thames Water sewer network.

Foul Water

We've assessed your **foul water** proposals and concluded from our initial review, that our sewerage network may not have sufficient capacity to meet your requirements.

In order to ensure we make the appropriate upgrades – or 'off-site reinforcement' – to serve your development, we'll need to carry out modelling work and, if required, design a solution and build the necessary improvements. This work is done at our cost. Once we've begun modelling, we may need to contact you to discuss changing the connection point for capacity reasons. Please note that we'll pay the cost of covering any extra distance if the connection needs to be made at a point further away than the nearest practicable point of at least the same diameter.

How long could modelling and reinforcement take?

Typical timescales for a development of your size are:

Modelling: 8 months

Design: 6 months

Construction: 6 months

Total: 20 months

If the time you're likely to take from planning and construction through to first occupancy is longer than this, we'll be able to carry out the necessary upgrades in time for your development. If it's shorter, please contact me on the number below to discuss the timing of our activities.

What do you need to tell us before we start modelling?

We're responsible for funding any modelling and reinforcement work. We need, though, to spend our customers' money wisely, so we'll only carry out modelling once we're confident that your development will proceed.

To have this confidence, we'll need to know that you **own the land and have either outline or full planning permission. The proposed build programme will also be useful.** Please provide this information to us as soon as you have it.

If the modelling shows we need to carry out reinforcement work, then before we start construction, we'll need you to supply us with notification that you've confirmed your F10 – Notification of construction project - submission to the Health and Safety Executive.

Surface Water

Where disposal of surface water is other than to a public sewer, the applicant shall ensure that approval for the discharge has been obtained from the appropriate authorities.

Please Note

All connection requests are subject to a full Section 106 (Water Industry Act 1991) application before the Company can confirm approval to the connection itself. Please also note that capacity in the public sewerage system cannot be reserved. Please make sure you submit your connection application giving us at least 21 days' notice of the date you wish to make your new connection/s.

The discharge of non-domestic is not permitted until a consent has been issued by Thames Water. If anything, other than domestic sewage is discharged into the public sewers without the above agreement an offence is committed, and the applicant will be liable to the penalties contained in Section 109(1) (WIA 1991).

If discharge of effluent from trade processes is sort applicants should contact Trade Effluent prior to seeking a connection approval, to discuss trade effluent consent and conditions of discharge. For Trade Effluent queries and to apply for Discharge Consents please call 0203 577 9200 or email trade.effluent@thameswater.co.uk.

The views expressed by Thames Water in this letter are in response to this pre-development enquiry at this time and do not represent our final views on any future planning applications made in relation to this site.

Regards

Steve Knight

Developer Services – Adoptions Engineer

0800 009 3921 – Help Desk

Further contacts:

Waste Water queries

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

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

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

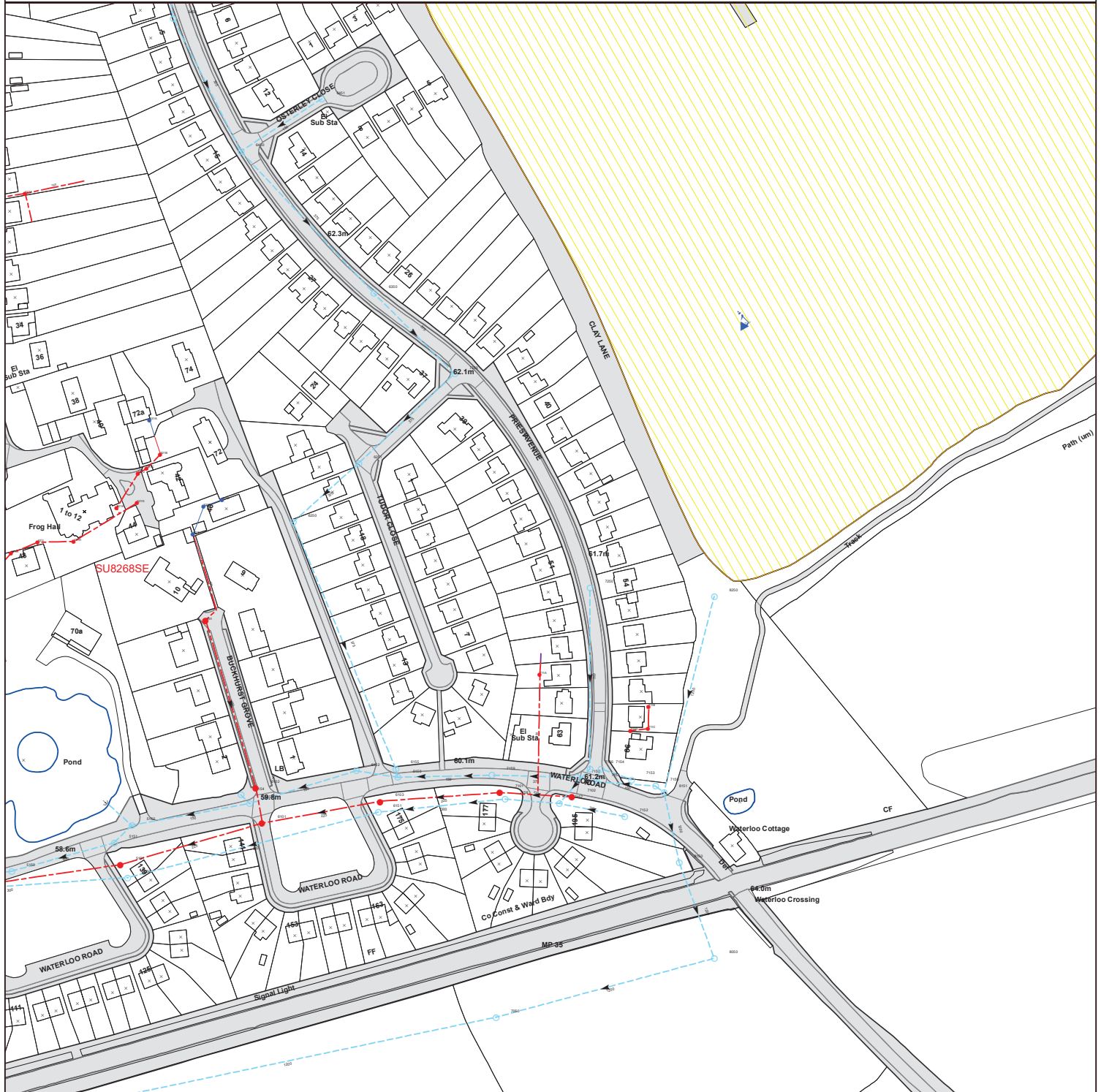
Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Clean Water queries

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

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

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



0 10 20 40 60 80
Meters

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

Scale: 1:1790
Width: 500m
Printed By: SAsirvat
Print Date: 09/10/2018
Map Centre: 482750,168250
Grid Reference: SU8268SE

Comments:

ALS/ALS Standard/2018_3887954

NB: Level quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no Survey information is available.

REFERENCE	COVER LEVEL	INVERT LEVEL
711A		
5450	62.13	60.58
7050	61.15	57.55
6250		
6151	60.28	58.3
6154	59.72	58.72
6251	61.6	59.95
7153	61.64	60.35
8150	62.17	59.12
5152	59.72	57.23
7155	60.99	57.97
6102	59.7	58.4
8050	61.5	58.62
7156	61.2	59.9
7151	61.17	58.77
5101	59.42	57.57
8151	62.05	59.45
6451	62.83	61.34
6155	60.05	59.14
521C		
521K		
521G		
6152	60	58.35
521B		
7157	61.13	58.93
521D		
521F		
711B		
541A		

REFERENCE	COVER LEVEL	INVERT LEVEL
7158	60.72	58.77
7159	60.43	57.69
7101	60.71	58.71
6350	62.38	60.25
6103	60.31	58.31
6450	62.11	60.43
7152	61.62	60.32
7350	62.13	60.07
5050	59.15	57.29
7102	61.15	58.9
6153	59.67	57.92
6101	59.8	58.03
8250		
7250	61.46	60.39
7154	61.22	60.02
7150	62.17	59.4
5151	58.92	56.4
5150	58.25	55.86
6150	60.02	57.2
521J		
521I		
521H		
521A		
531A		
5201	60.15	58.99
521E		
711D		
711C		



0 45 90 180 270 360
Meters

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

Scale: 1:7161
Width: 2000m
Printed By: SAsirvat
Print Date: 09/10/2018
Map Centre: 483465,167688
Grid Reference: SU8367NW

Comments:



Public Sewer Types (Operated & Maintained by Thames Water)

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

Notes:

- 1) All levels associated with the plans are to Ordnance Datum Newlyn.
- 2) All measurements on the plans are metric.
- 3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
- 4) Most private pipes are not shown on our plans. as in the past, this information has not been recorded.
- 5) 'na' or '0' on a manhole level indicates that data is unavailable.

Sewer Fittings

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

	Air Valve
	Dam Chase
	Fitting
	Meter
	Vent Column

Operational Controls

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

	Control Valve
	Drop Pipe
	Ancillary
	Weir

End Items

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

	Outfall
	Undefined End
	Inlet

6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0845 070 9148.

Other Symbols

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

	Public/Private Pumping Station
	Change of characteristic indicator (C.O.C.I.)
	Invert Level
	Summit

Areas

Lines denoting areas of underground surveys, etc.

	Agreement
	Operational Site
	Chamber
	Tunnel
	Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

	Foul Sewer
	Combined Sewer
	Culverted Watercourse
	Surface Water Sewer
	Gully
	Proposed
	Abandoned Sewer

Terms and Conditions

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

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL's terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

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

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

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	BACS Payment	Telephone Banking	Cheque
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Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Email: admin@tpos.co.uk

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Appendices

Appendix 1 - Plans

Appendix 2 - EA Product 4 Data

Appendix 3 - LLFA Developer Checklist

Appendix 4 - Drainage Strategy



Appendix 2 - EA Product 4 Data

EA Product 4 Data

**National generalised (JFLOW) flood levels for
Our Ref: THM334165**

JFLOW includes the following information:

Ordnance Survey 1:25k colour raster base mapping;
Flood Zone 2 and Flood Zone 3;
Unique identifiers (for cross referencing to the water levels);

Flood defence locations (where available/relevant) and unique identifiers;
Flood Map flood storage areas (where available/relevant);
Statutory (Sealed) Main River (where available within map extents);

A table showing:

i) X/Y coordinate locations, unique identifiers and levels for *undefended* scenarios.

South Wokingham SDL, RG40 3BQ

Please note:

If you will be carrying out computer modelling as part of your Flood Risk Assessment, please request our guidance which sets out the requirements and best practice for computer river modelling.

This information is based on that currently available as of the date of this letter. You may feel it is appropriate to contact our office at regular intervals, to check whether any amendments/improvements have been made. Should you re-contact us after a period of time, please quote the above reference in order to help us deal with your query.

This information is provided subject to the enclosed notice which you should read.

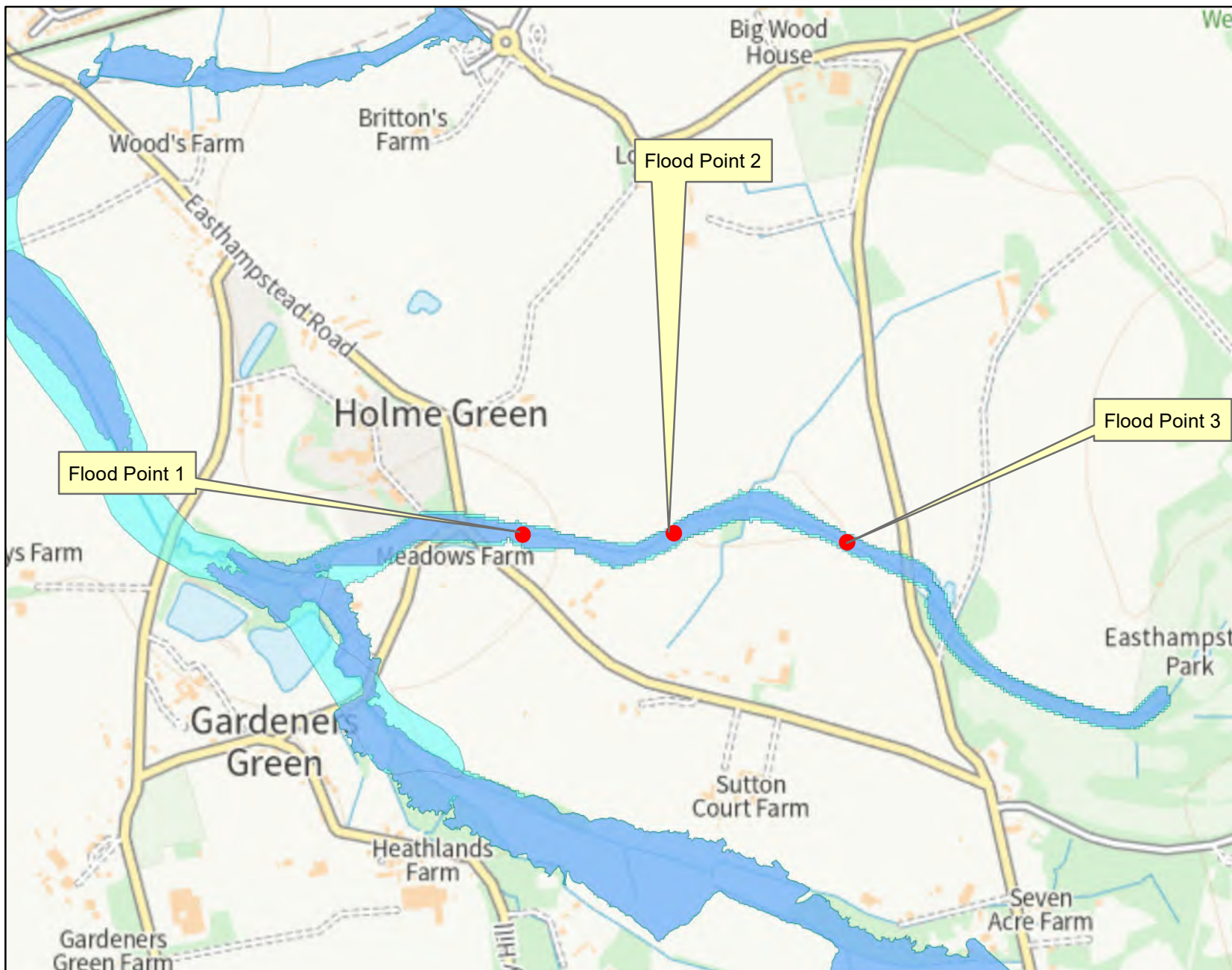
This letter is not a Flood Risk Assessment. The information supplied can be used to form part of your Flood Risk Assessment. Further advice and guidance regarding Flood Risk Assessments can be found on our website at:

<https://www.gov.uk/guidance/flood-risk-assessment-local->

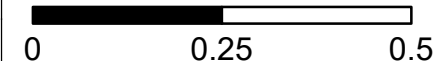
If you would like advice from us regarding your development proposals you can complete our pre application enquiry form [application-enquiry-form-preliminary-opinion](#)

Flood Map for Planning centred on South Wokingham SDL, RG40 3BQ

Created on 16/11/23 REF: THM334165



Kilometres



Legend

- Main River
- Flood Map - Flood defences
- Flood Map - Flood Storage Areas
- Flooding from rivers or sea (FZ3)
- Extent of extreme flood (FZ2)
- Floodplain Node

Flooding from rivers or sea without defences (Flood Zone 3) shows the area that could be affected by flooding:

- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

The Extent of an extreme flood (Flood Zone 2) shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

National generalised (JFLOW) flood levels

THM334165

The modelled flood levels for the closest most appropriate points for your site that are provided below:

Grid cell reference	Easting	Northing	Maximum Depths (m)		
			1% annual probability	1% annual probability + (20%)	0.1% annual probability
Flood Point 1	483060	167055	1.10	1.10	1.37
Flood Point 2	483333	167043	0.19	0.19	0.34
Flood Point 3	483637	167035	0.50	0.50	0.70

Grid cell reference	Easting	Northing	Maximum Levels (mAOD)		
			1% annual probability	1% annual probability + (20%)	0.1% annual probability
Flood Point 1	483060	167055	56.27	56.27	56.34
Flood Point 2	483333	167043	58.30	58.30	58.45
Flood Point 3	483637	167035	59.59	59.59	59.79



Appendix 3 - LLFA Developer Checklist

Wokingham Borough Council Developer Checklist

Planning Application Drainage Checklists

Major Development Outline Applications

Outline planning applications for Major Developments must include the following information and details on the proposed drainage strategy and system(s).

Ref.	Documentation required	Requirement met/included
	The applicant shall submit a description of the proposed drainage system(s) with an explanation of key operating principles and design decisions including but not necessarily limited to: ■ Identification of the destination of discharge (in accordance with Building Regulation Part H hierarchy) with appropriate justification for the selection; ■ Identification of proposed points of connection(s) to water bodies, sewers, public surface water sewers or highway drains etc.; ■ Evidence of agreement in principal from key third parties whose systems the proposed drainage system will need to connect / impact (Environment Agency, Lead Local Flood Authority, Thames Water or adjacent landowner); ■ Identification of the SuDS techniques that will be applied at the site with appropriate justification for the selection; ■ A description of how water will be collected and dealt with across the site by the proposed SuDS techniques including what volumes are to be stored where; ■ A description of the water quality treatment measures applied to surface water as it drains the site; ■ Where necessary a description of how the proposed system(s) will deal with surface water overland flow flooding originating from off-site areas; ■ Where necessary, an explanation of why it is not reasonably practicable to achieve any of the non-statutory technical standards for sustainable drainage systems (March 2015); ■ Where proposing discharge to ground; evidence to support proposed infiltration rates used in initial calculations. This should include nearby borehole logs, geological mapping and if available any geotechnical investigations, infiltration tests and records of groundwater monitoring. Consideration shall also be given to the implications of any local Source Protection Zones; ■ Where necessary, identification of any mechanical or electrical features necessary for the effective operation of the drainage strategy; and; ■ Proposals for the adoption and maintenance of the entire drainage system(s), including a schedule, with written agreement in principal from the adopting/maintaining body.	
	Plans & Drawings Required	

	The applicant shall submit plans defining the proposed drainage system including but not necessarily limited to: ■ Topographic survey of the site including local surface water drainage features; ■ Position of the site relative to surrounding flood sources, including where necessary identification of surface water/groundwater flows entering the development from adjacent land; ■ Where necessary definition of sub-catchments within the site; ■ A conceptual plan of the proposed drainage system(s) identifying the proposed point(s) of outfall, position of SuDS techniques / drainage features, the attenuation features, conveyance routes (including exceedance routes) comprising the drainage system(s); and ■ A thematic plan of the existing and proposed developments identifying land uses / coverings significant in informing discharge rates.	
	Calculations Required	
	Overview design calculations and design parameters to demonstrate conformity with the design criteria for the site. These should include: ■ Demonstration through calculation of the existing and proposed (unmitigated) development discharge rates for the 1, , 30 and 100 year (including allowance for the effects of climate change) design storm events; ■ Demonstration through calculation(s) of the volumes of surface water storage required to attenuate site discharges to pre-development / agreed discharge rates; ■ Demonstration through calculation(s) that the proposed drainage system(s) will not result in flooding off site under the 100 year return period design storm including allowance for climate change; and ■ Demonstration through calculation(s) that provision is made to meet long term storage volumes required for the site, unless discharge rates have been restricted to QBar for all storm events up to and including the 1 in 100 year including allowance for climate change	

Additional requirements for a large site or multi-plot development (including Strategic Development Locations).

Ref.	Detail required	Requirement met/included
	■ Plans demonstrating the phasing of drainage infrastructure (in keeping with wider development phasing proposals, demonstrating how flood risks and drainage will be managed throughout and on completion of the development.	



Appendix 4 - Drainage Strategy

Drainage Strategy Plan

Greenfield Runoff Rates

Long Term Storage Calculations

Per Hectare Storage Calculations

Storage Calculator