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Flood Risk Assessment

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Contents

Executive Summary	2
1. Introduction	3
1.1 Appointment and Brief	3
1.2 Scope and Objectives	3
1.3 General Limitations and Reliance	3
2. Site Description	5
2.1 Site Location and Surroundings	5
2.2 Proposed Development	5
2.3 Site Topography	6
2.4 Existing Drainage	8
3. Policy Framework	9
3.1 National Planning Policy Framework, 2024	9
3.2 Mid Sussex District Council, District Plan, 2018	9
3.3 Mid Sussex District Plan 2021 – 2039, Submission Draft (Regulation 19)	10
3.4 Crawley Down Neighbourhood Plan, January 2016	10
3.5 Mid Sussex District Council, Level 1 Strategic Flood Risk Assessment, 2024	10
3.6 Mid Sussex District Council, Level 2 Strategic Flood Risk Assessment, 2024	11
3.7 MSDC response to Action Point AP-020, November 2024	11
3.8 West Sussex County Council, Local Flood Risk Management Strategy, 2014	11
4. Review of Baseline Flood Risk Data	13
4.1 Hydrological Setting	13
4.2 EA Flood Zone Designation (Fluvial and Tidal Flood Risk)	14
4.3 Surface Water and Sewer Flood Risk	14
4.4 Geological and Hydrogeological Setting	16
4.5 Risks from Reservoirs, Canals, and Other Artificial Sources	17
4.6 Historic Flooding	17
4.7 Baseline Flood Risk Summary	18
5. Assessment of Flood Risk	19
5.1 Fluvial	19
5.2 Surface Water	19
5.3 Groundwater	20
5.4 Flood Risk Vulnerability	21
5.5 Sequential Test	21
5.6 Further Mitigation/Assessment of Residual Risk	21
5.7 Summary	24
6. Conclusions	25

Executive Summary

Ramboll UK Limited ('Ramboll') has been commissioned by Wates Developments Limited (Wates) to produce a Flood Risk Assessment for the site at 'Land West of Crawley Down', at Turners Hill Road, Crawley Down, Crawley. The site is located at approximate coordinates 533813E, 137310N, at postcode RH10 4HB. The Proposed Development is for a mixed residential scheme of up to 200 dwellings.

A review of all available information relating to flood risk has been undertaken, and an assessment has been made of the existing baseline flood risk and potential future risk to the development. A summary of the flood risk from each source is as follows:

- Fluvial/Tidal – Site is located in Flood Zone 1, and as such there is a low risk from fluvial/tidal flooding;
- Surface Water – While there are areas considered to be at a High risk from surface water flooding present in the southwest of the site, and adjacent to the existing east to west watercourse in the centre of the site, approximately 75% of the site is located in an area considered to be at a Very Low risk from surface water flooding. No built development is located in areas considered to be at risk of flooding from surface water. Furthermore, the areas of the site designated at High to Low risk across the site were typically observed to be inaccurate during the March 2024 site visit. High risk areas are nevertheless expected to be managed as part of the surface water drainage strategy;
- Groundwater - A review of baseline site conditions indicates a moderate groundwater flood risk at the site but upon review of the proposed layout and the proposed surface water drainage strategy, the overall risk to the Proposed Development is considered to be low; and

The increase in impermeable area resulting from the Proposed Development over existing permeable surfaces will increase the surface water discharge generated at the site. In managing this risk, a surface water drainage strategy has been prepared and is presented in the Drainage Strategy report (RUK2021N00014-RAM-RP-00169). In addition, it is proposed to engineer site levels, where possible, so that external areas fall away from building entrances. Should this not be feasible, linear interceptor drains are proposed to be located at all building entrances towards which there is a positive gradient for surface water to flow.

Discharge rates will be limited to the 1 in 1 year greenfield runoff rate, thereby considerably reducing the peak flows presently emanating from the site area. The strategy will therefore improve upon the current situation with regard to surface water management and flood risk.

The site's location in Flood Zone 1 means it is considered to have passed the Sequential Test. An Exception Test is therefore not required.

Subject to inclusion of the proposed mitigation measures, and adherence to the proposed surface water drainage strategy, it is expected that flood risk at the site can be managed in a safe and sustainable manner.

1. Introduction

1.1 Appointment and Brief

1.1.1 Ramboll UK Limited ('Ramboll') has been commissioned by Wates Developments Limited (Wates) to produce a Flood Risk Assessment (FRA) for the site at 'Land West of Crawley Down', at Turners Hill Road, Crawley Down, Crawley. The site is located at approximate coordinates 533813E, 137310N, at postcode RH10 4HB.

1.1.2 The Proposed Development is for a mixed residential scheme of up to 200 dwellings.

1.2 Scope and Objectives

1.2.1 This report considers the risks of various sources of flooding to the site and has been carried out in accordance with the National Planning Policy Framework (NPPF)¹. It is to be used to assist the Local Planning Authority (LPA) and relevant statutory consultees when considering the flooding issues of the Proposed Development, as part of a planning application.

1.2.2 The report provides the following information:

1. A review of the flood risk to the site based upon flood data and the flood maps provided by the Environment Agency (EA) and the relevant Strategic Flood Risk Assessment (SFRA);
2. An assessment of flood risk from all sources including tidal, fluvial, pluvial, groundwater and other artificial sources;
3. An assessment of the potential for flood risk to arise as a result of the introduction of the Proposed Development including an assessment of whether the Proposed Development is likely to be affected by current or future flooding, and whether it will increase flood risk elsewhere; and
4. Proposals to mitigate any residual flood risks to the development.

1.3 General Limitations and Reliance

1.3.1 This report has been prepared by Ramboll exclusively for the intended use by the client in accordance with the agreement between Ramboll and the client defining, among others, the purpose, the scope and the terms and conditions for the services. No other warranty, expressed or implied, is made as to the professional advice included in this report or in respect of any matters outside the agreed scope of the services or the purpose for which the report and the associated agreed scope were intended, or any other services provided by Ramboll.

¹ GOV.UK, National Planning Policy Framework, 2024 [online]. Available at: <https://www.gov.uk/government/publications/national-planning-policy-framework--2>. Accessed December 2024.

- 1.3.2 In preparation of the report and performance of any other services, Ramboll has relied upon publicly available information, information provided by the client and information provided by third parties. Accordingly, the conclusions in this report are valid only to the extent that the information provided to Ramboll was accurate, complete, and available to Ramboll within the reporting schedule.
- 1.3.3 Ramboll's services are not intended as legal advice, nor an exhaustive review of site conditions and/or compliance. This report and accompanying documents are intended solely for the use and benefit of the client for this purpose only and may not be used by or disclosed to, in whole or in part, any other person without the express written consent of Ramboll. Ramboll neither owes nor accepts any duty to any third party, unless formally agreed by Ramboll through that party entering into, at Ramboll's sole discretion, a written reliance agreement.
- 1.3.4 Unless otherwise stated in this report, the scope of services, assessment and conclusions made assume that the site will continue to be used for its proposed end-use without further significant changes onsite. Unless stated otherwise, the geological information provided is for general environmental interpretation and should not be used for geotechnical and/or design purposes.

2. Site Description

2.1 Site Location and Surroundings

2.1.1 The site is located on land to the west of Crawley Down, a village in the Mid Sussex district of West Sussex, England. The site is located at approximate coordinates 533813E, 137310N, at postcode RH10 4HB. The Proposed Development is for up to 200 dwellings.

2.1.2 The site currently consists of undeveloped greenfield land, with adjacent and surrounding land uses as follows:

- North: Intermittent woodland and greenspace, and Huntsland (private road);
- East: Turners Hill Road and immediately beyond the wider residential area of Crawley Down;
- South: Worth Way, a footpath and bridleway linking the West Sussex towns of Crawley and East Grinstead via the village of Crawley Down. Most of the route follows the track bed of a disused railway. It is part of the National Cycle Network and is surrounded by multiple areas of woodland and greenspace; and
- West: Intermittent woodland and a series of farms/smallholdings and cottages. Rowfant Vineyard is located approximately 150 m west of the site. The 'Fish Ponds' are located approximately 290 m west of the site.

2.1.3 The wider residential area of Crawley is located approximately 3.1 km west of the site.

2.1.4 The Site Location Plan is presented in Figure 2.1 at the rear of the report. The Plan includes labels of the five different 'Fields' that presently form the site.

2.1.5 The Site Setting is presented in Figure 2.2 at the rear of the report.

2.2 Proposed Development

2.2.1 The Proposed Development is for an Outline planning application (appearance, landscaping, layout and scale reserved) for the erection of up to 200 dwellings, and associated infrastructure including new access points off of Turners Hill Road with associated spine roads and car and cycle parking; the provision of open space and associated play facilities; utilities infrastructure, surface water drainage features, and associated features, on land west of Turners Hill Road and south of Huntsland, Crawley Down, West Sussex.

2.2.2 The Site Illustrative Masterplan is presented in Appendix A at the rear of the report.

2.3 Site Topography

2.3.1 A site topographical survey² was previously undertaken at the site. A description of the topography is summarised as follows:

Field 3

2.3.2 The levels within Field 3 are shown to fall steeply from north to south, toward an existing watercourse that marks the southern boundary of the field. Levels are shown to fall from approximately 118.8 m AOD in the northwest of the field to approximately 99.9 m AOD adjacent to the watercourse.

Field 4

2.3.3 Field 4 is located on the south side of the watercourse that marks the southern boundary of Field 3. It is bounded by the same watercourse to the west and by existing hedgerows/trees to the south and east. The field is shown to fall approximately east to west with the highest level of approximately 115.1 m AOD shown to be present adjacent to the eastern boundary of the field. Levels are shown to fall away to the north, south and west from this high point approximately midway up the eastern boundary. The lowest level of approximately 102.4 m AOD is located in the far west of the field.

Field 5

2.3.4 Field 5 is located to the northeast of Field 4, on the north side of the watercourse and west of Turners Hill Road to the east of the site. The levels within Field 5 are shown to typically fall from north to south toward the existing watercourse, with the fall steadier across the northernmost 200 m of the site, and steeper for the remaining (approximately) 50 m before the watercourse. The maximum level in the north of the field is approximately 123.6 m AOD. At the southern end of the field levels are at approximately 113.9 m AOD at a minimum. Approximately 50 m north of this point levels are at approximately 119 m AOD. A ditch network is indicated to be present in the wooded area to the east of Field 5 and is presumed to be collecting surface water runoff from Turners Hill Road and transferring it into the existing watercourse at the southern end of the field.

Field 6

2.3.5 Field 6 is located to the east of Field 4, on the south side of the watercourse and west of Turners Hill Road to the east of the site. The levels within Field 6 are shown to typically fall from east to west from a high of approximately 127.5 m AOD in the far east of the field to a low of approximately 110.2 m AOD in the southwest. The field also falls toward a low of approximately 112.8 m AOD in the northwest.

Field 7

2.3.6 Field 7 is located in the far south of the site, to the south of Fields 4 and 6. Levels are shown to fall from a high of approximately 118.5 m AOD in the east, to a low of approximately 99.2 m AOD in the southwest. Levels are shown to typically fall toward the existing watercourse/ditch network to the west of the field.

Existing Watercourse

- 2.3.7 An existing watercourse is located in the south of the site flowing approximately east to west, dividing Fields 3 and 4, and Fields 5 and 6. The watercourse is indicated in the survey to be fed by an existing ditch network to the east of Field 5, which is indicated to be taking runoff from Turners Hill Road. Between Fields 3 and 5, the watercourse passes through a pond located at the southern end of the property boundary of Huntsland House. The watercourse then flows west and south where it separates Field 3 from Fields 4 and 7.
- 2.3.8 At the upstream end of the ditch network to the east of Field 5, levels are at approximately 125 m AOD. At the downstream end where the ditch joins the main watercourse, levels are at approximately 111.7 m AOD.
- 2.3.9 Where the watercourse emerges from the west side of the pond to the south of Huntsland House, levels are at approximately 106.3 m AOD at the channel centre. At the downstream end of the watercourse where it leaves the site in the west, levels are at approximately 96.5 m AOD.
- 2.3.10 Please see Appendix E for further information/figures.

Summary and Surrounding Area

- 2.3.11 The site topographical survey is presented in Appendix B at the rear of the report.
- 2.3.12 A site visit was undertaken in March 2024 by representatives from both Ramboll and Wates. The topography was observed to be in line with that shown by the topographical survey. A series of photographs taken while onsite are presented in Appendix C at the rear of the report.
- 2.3.13 Light Detection and Ranging (LiDAR) data³, is shown to broadly agree with the findings of both the topographical survey and the site visit. Outside the site boundary, the topography is as follows:
- North: Land is shown to rise approximately 5 – 6 m AOD over approximately 150 m toward the north before steadily falling again;
 - East: Land is shown to rise steadily within residential areas of Crawley Down to the east of Field 5. Levels are indicated to rise approximately 3 m AOD over approximately 200 m;
 - South: Land is shown to rise approximately 6 – 10 m AOD toward the south and southeast, with a steep rise and fall present at the location of Worth Way approximately 20 to 30 m south of the site; and
 - West: Land is typically shown to fall toward the west. Land is shown to fall approximately 1 to 2 m AOD over approximately 200 m.

³ Department for Environment Food & Rural Affairs, Data Services Platform, LiDAR Composite Digital Terrain Model (DTM) – 1m [online]. Available at: <https://environment.data.gov.uk/dataset/13787b9a-26a4-4775-8523-806d13af58fc>. Accessed September 2024.

2.3.14 LiDAR Topography is presented in Figure 2.3 at the rear of the report.

2.4 Existing Drainage

2.4.1 At present, the site is comprised of undeveloped, greenfield land with no impermeable surfaces.

Surface Water

2.4.2 According to the LandIS soils map⁴, the site is stated to drain to the 'stream network'. This statement is backed up by observations made during the site visit undertaken in March 2024, where saturated ground and pooling of water were observed in many places across the site, as well as the drainage of surface water to existing watercourses both on and offsite.

2.4.3 During the March 2024 site visit, surface water was observed to flow into the existing east to west watercourse running across the site. This was either directly or via a tributary ditch or watercourse. In Field 5 flow was observed in the tributary ditch located adjacent to the eastern boundary of the field. In the southwest of Field 7, surface water was observed flowing from south to north in a shallow ditch that was directed into the existing east to west watercourse where it leaves the site.

2.4.4 Thames Water sewer records are presented in Appendix D at the rear of the report. While no formal surface water sewers are indicated to be present at the site, the records do indicate the presence of a sewer that crosses Turners Hill Road and discharges into the ditch adjacent to the eastern boundary of Field 5. Observations made onsite of the culvert and headwall in this location, and of a manhole further upstream within the wooded area evidence the presence of this sewer.

Foul Water

2.4.5 The Thames Water sewer records indicate the presence of a 225 mm diameter wastewater sewer crossing the site from south to north and from east to west. Within the site, the sewer crosses Fields 7, 6, 4 and 3. Foul manholes were observed onsite along the route of the existing sewer at the locations indicated by the sewer records. The sewer is gravity driven and is joined by another smaller 100 mm diameter sewer flowing north to south from Huntsland House.

⁴ LandIS, Soilscales Viewer [online]. Available at: <https://www.landis.org.uk/soilscales/>. Accessed September 2024.

3. Policy Framework

3.1 National Planning Policy Framework, 2024

3.1.1 The NPPF¹ was most recently updated in December 2024, with flood risk remaining primarily regulated through planning policy. The NPPF requires that a site-specific FRA be provided for all development in Flood Zones 2 and 3; all development sites over 1 ha in area; land which has been identified by the EA as having critical drainage problems; land which has been identified in an SFRA as being at increased flood risk in the future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.

3.1.2 In terms of flood risk, the NPPF classifies land uses according to vulnerability as follows:

- Essential Infrastructure;
- Highly Vulnerable;
- More Vulnerable;
- Less Vulnerable; and
- Water-Compatible Development.

3.1.3 The Planning Practice Guidance⁵ to the NPPF, advises on how to take account of and address the risks associated with flooding and coastal change in the planning process. This includes detail on when and how the Sequential and Exception Tests need be applied.

3.2 Mid Sussex District Council, District Plan, 2018

3.2.1 The Mid Sussex District Plan⁶ sets out a vision for how Mid Sussex wants to evolve and a delivery strategy for how that will be achieved. It sets out broad guidance on the distribution and quality of development in the form of 'higher level' strategic policies.

3.2.2 Policy DP41 (Flood Risk and Drainage) states the following:

- Proposals for development will need to follow a sequential risk-based approach, ensure development is safe across its lifetime and not increasing the risk of flooding elsewhere. The District Council's SFRA should be used to identify areas at present and future flood risk from a range of sources including fluvial, surface water, groundwater, infrastructure, and reservoirs.

⁵ GOV.UK, Guidance, Flood risk and coastal change [online]. Available at: <https://www.gov.uk/guidance/flood-risk-and-coastal-change>. Accessed December 2024.

⁶ Mid Sussex District Council, Mid Sussex District Plan, 2018 [online]. Available at: <https://www.midsussex.gov.uk/planning-building/mid-sussex-district-plan/>. Accessed October 2024.

- Particular attention will be paid to those areas of the District that have experienced flooding in the past and proposals for development should seek to reduce the risk of flooding by achieving a reduction from existing runoff rates.
- Land that is considered to be required for current and future flood management will be safeguarded from development and proposals will have regard to relevant flood risk plans and strategies.

3.3 Mid Sussex District Plan 2021 – 2039, Submission Draft (Regulation 19)

3.3.1 The District Plan 2021 – 2039⁷ comprises an updated vision and strategy, along with new site allocations and policies, and will supersede the 2018 District Plan upon its adoption. This emerging local plan details Policy DPS4 (Flood Risk and Sustainable Drainage) which includes the following:

- Proposals for development will need to follow a sequential risk-based approach directing development away from areas at highest (flood) risk.
- Development should consider flood risk in line with latest national guidance. The cumulative impacts of all sources of flooding should be considered.
- Surface water drainage schemes must be implemented in all new development.

3.3.2 The site forms part of a proposed allocation pursuant to Policy DPA9: Land to the west of Turners Hill Road, Crawley Down, which provides a site plan and details of proposed onsite infrastructure.

3.4 Crawley Down Neighbourhood Plan, January 2016

3.4.1 The Neighbourhood Plan⁸ sets out a number of policies which together with the NPPF and the Local Plan ensure that new development in the Crawley Down Neighbourhood Plan Area will be sustainable and in accordance with the vision.

3.5 Mid Sussex District Council, Level 1 Strategic Flood Risk Assessment, 2024

3.5.1 As set out in the emerging local plan⁷, the Mid Sussex Level 1 SFRA⁹ aims to provide the Council with a robust evidence base to inform the application of the Sequential and, if necessary, Exception Tests to inform the future development strategy for the district. The objectives of the Level 1 SFRA are as follows:

- Inform the sustainability appraisal of the Local Plan (Mid Sussex District Plan), so that flood risk is fully taken into account when considering allocation options and in the preparation of Plan policies;
- Apply the Sequential Test and, where necessary, the Exception Test when determining land use allocations;

⁷ Mid Sussex District Council, Mid Sussex District Plan 2021 – 2039, Submission Draft (Regulation 19), December 2023.

⁸ Crawley Down Neighbourhood Plan, 2014 – 2031, January 2016, Worth Parish Council.

⁹ Aegaea, Mid Sussex District Council, 2024 [online]. Available at: <https://www.midsussex.gov.uk/media/sl2jkh0z/env11-strategic-flood-risk-assessment-level-1-2024.pdf>. Accessed October 2024.

- Inform the allocation of land to safeguard it for flood risk management infrastructure;
- Inform policies for change of use and reducing the causes and impacts of flooding;
- Identify the requirements for site-specific flood risk assessments in particular locations, including those at risk from sources other than river and sea flooding;
- Determine the acceptability of flood risk in relation to emergency planning capability; and
- Help demonstrate how the adaptation to climate change has been met.

3.6 Mid Sussex District Council, Level 2 Strategic Flood Risk Assessment, 2024

3.6.1 The Mid Sussex Level 2 SFRA¹⁰ provides a Level 2 assessment of sites identified for proposed allocation within the emerging Mid Sussex District Plan. The objectives of the Level 2 SFRA are as follows:

- Assess the flood risk to proposed sites using the latest available flood risk data and climate change uplifts where available;
- Provide information and mapping to show flood risk from all sources for each site option;
- Provide recommendations for making the site safe from flooding throughout its lifetime where the Exception Test is required; and
- Take into account, as far as practically possible the most recent policy and legislation in the NPPF, Planning Practice Guidance (PPG) and Lead Local Flood Authority (LLFA) SuDS guidance.

3.7 MSDC response to Action Point AP-020, November 2024¹¹

3.7.1 In terms of flood risk the Council have set out a general note explaining the implications of the latest FRAs in the context of the Framework and the previous work which informed the submitted Plan. In commenting upon policy DPA9 this note advises that the site is Neutral in terms of combined fluvial and surface water flood risk

3.8 West Sussex County Council, Local Flood Risk Management Strategy, 2014

3.8.1 The Local Flood Risk Management Strategy¹² sets out how the Council intends to carry out its flood risk responsibilities as LLFA. The overall aim is to ensure the risk from flooding and erosion is properly managed by using the full range of options in a coordinated way. The aim is for local authorities, communities, individuals, and voluntary groups to work together to:

1. Manage the risk to people and their property;
2. Achieve environmental, social, and economic benefits, consistent with the principles of sustainable development; and

¹⁰ Mid Sussex District Council, Mid Sussex District Council Level 2 Strategic Flood Risk Assessment, 2024 [online]. Available at: <https://www.midsussex.gov.uk/media/xtgdydna/env15-strategic-flood-risk-assessment-level-2-main-report.pdf>. Accessed October 2024.

¹¹ MSDC response to Action Point AP-020, November 2024.

¹² West Sussex County Council, Local Flood Risk Management Strategy, 2014 [online]. Available at: https://www.westsussex.gov.uk/media/1595/local_flood_risk_management_strategy.pdf. Accessed October 2024.

3. Facilitate decision-making and action at the appropriate level – individual, community, or local authority, river catchment, coastal cell or national.

3.8.2 To reflect national strategic objectives in the local context, the partners in West Sussex have agreed to guide local focus and progress. These are to:

- Understand the areas that flood;
- Manage the flood risk in West Sussex;
- Enable people, communities, business, and public bodies to work together more effectively; and
- Put communities at the heart of what we do and help West Sussex residents during flood events and recover as quickly as possible after incidents.

4. Review of Baseline Flood Risk Data

4.1 Hydrological Setting

- 4.1.1 A review of the EA Statutory Main River Map¹³ indicates there are no EA Main Rivers located within the boundary of the site. The nearest is located approximately 1.9 km northwest of the site. Ordnance Survey (OS) mapping¹⁴ does identify the existing ordinary watercourse located within the south of the site flowing approximately east to west that was previously identified in the topographical survey² and observed during the March 2024 site visit. The tributary ditch located adjacent to Field 5 is also identified in the mapping.
- 4.1.2 The site drains to the existing watercourse flowing approximately east to west through the site. This watercourse ultimately drains northwards to become a tributary of the River Mole. The Mole then flows northwest through Surrey for approximately 80 km (approximately 50 miles) to the River Thames at Hampton Court Palace.
- 4.1.3 The existing watercourse flowing from east to west is indicated to serve a catchment area upstream, which constitutes the westernmost extent of Crawley Down. The catchment upstream is largely urban.
- 4.1.4 The Hydrological Setting is presented in Figure 4.1 at the rear of the report.

March 2024 Site Visit - Observations

- 4.1.5 Flow within the main channel of the existing east to west watercourse was observed to be restricted at crossing points between Fields 3 and 4, and between Fields 5 and 6.

¹³ Department for Environment Food & Rural Affairs, Data Services Platform, Statutory Main River Map [online]. Available at: <https://environment.data.gov.uk/dataset/25dde009-ba7d-40de-8380-c5c3bb32ccd6>. Accessed September 2024.

¹⁴ Ordnance Survey, Data Hub, OS OpenMap – Local [online]. Available at: <https://osdatahub.os.uk/downloads/open/OpenMapLocal>. Accessed September 2024.

- 4.1.6 In the northeast corner of Field 5 within the existing ditch network located adjacent to the field's eastern boundary, flow was observed to be restricted. The ditch network in the area was observed to be shallow and heavily silted. Approximately 40 to 50 m downstream the ditch widened and deepened. At this location a culvert and headwall were observed. These were considered to be from another ditch coming off Turners Hill Road that was previously identified in the topographical survey².

4.2 EA Flood Zone Designation (Fluvial and Tidal Flood Risk)

- 4.2.1 According to the EA Flood Map for Planning¹⁵, the site is located within Flood Zone 1. The nearest area of Flood Zone 2 or 3 is located approximately 1 km west of the site. The Flood Zones are defined as follows:

- Flood Zone 1 – Land defined as having a less than 0.1% annual probability of river or sea flooding;
- Flood Zone 2 – Land defined as having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding; and
- Flood Zone 3 – Land defined as having a 1% or greater annual probability of river flooding; or land having a 0.5% or greater annual probability of sea flooding.

- 4.2.2 The EA Flood Map for Planning is presented in Figure 4.2 at the rear of the report.

4.3 Surface Water and Sewer Flood Risk

- 4.3.1 The topography of the site and surrounding area is detailed in Section 2.3. Levels across the site and in the surrounding area are suggestive of a typical east to west sloping pattern, with the fall more apparent across the south of the site. The topography of the site and surrounds is therefore suggestive of the potential for overland flow paths leading onto the site from the east.

- 4.3.2 The EA publishes geo-spatial data¹⁶ describing the suitability of the modelling for a range of types of assessment for given locations. At the site location it is confirmed that the mapping was produced by the JFlow National Surface Water model, which was run in March 2013 at a 2 m resolution. It is stated that the assumption at this location was that any drainage systems are at capacity. Therefore, the model does not allow for losses (departure) of surface water runoff during the modelled storm event via the natural drainage at the site and in the vicinity of the site.

¹⁵ GOV.UK, Flood map for planning, Get flood risk information for planning in England [online]. Available at: <https://flood-map-for-planning.service.gov.uk>. Accessed October 2024.

¹⁶ Department for Environment Food & Rural Affairs, Data Services Platform, Risk of Flooding from Surface Water Input Model Details [online]. Available at: <https://environment.data.gov.uk/dataset/926e600f-d465-11e4-95fe-f0def148f590>. Accessed September 2024.

- 4.3.3 The Suitability¹⁷ of the results at this location are stated to be 'National to County'. This suggests that whilst suitable for identifying which parts of countries or counties are at risk, or which countries or counties have the most risk, the results at this location are *"Very unlikely to be reliable for a local area"* and *"Extremely unlikely to be reliable for identifying individual properties at risk"*.
- 4.3.4 According to the EA long term flood risk mapping¹⁸, approximately 75% of the site is located in an area considered to be at a Very Low risk from surface water flooding. Areas at High risk are present in the southwest of the site and are surrounded by areas at Medium and Low risk. Further areas at Medium and Low risk are present in Field 5 and adjacent to the existing east to west watercourse running across the centre of the site. The different surface water risk categories are defined below:
- High – Greater than a 1 in 30 (3.3%) annual probability;
 - Medium – Between a 1 in 30 and 1 in 100 (3.3% to 1%) annual probability;
 - Low – Between a 1 in 100 and a 1 in 1,000 (1% to 0.1%) annual probability; and
 - Very Low – Less than a 1 in 1,000 (0.1%) annual probability.
- 4.3.5 It is noted that the EA mapping indicates areas at risk of flooding from surface water in addition to flood risk from rivers or the sea. It does not however account for building removal, ground raising, or site levelling. In addition, it does not consider specific drainage assets such as sewers, drains or ditches when calculating extents.
- 4.3.6 Whilst the surface water mapping indicates where there could be heightened surface water flood risks in some surrounding areas, this does not account for public surface water drainage measures which would be expected to significantly reduce surface water flood risks from that assumed and presented by the mapping. The EA's data confirms that the mapping at this location should not be used for site-specific assessment of risk.
- 4.3.7 EA Surface Water Flood Risk is presented in Figure 4.3 at the rear of the report.
- 4.3.8 In Field 5, the overland flow path shown in the surface water mapping to be running across the field is considered to be the result of flow within the existing (tributary) ditch in the northeast corner of the field spilling over into the main part of the field under heavy rainfall conditions. While clearance works and subsequent maintenance are being undertaken in this area, the reality is that no significant overland flow path was observed onsite, and it is considered that the majority of surface water runoff falling on the field is likely to be directed into the existing ditch network by the existing topography.

¹⁷ Department for Environment Food & Rural Affairs, Data Services Platform, Risk of Flooding from Surface Water Suitability [online]. Available at: <https://environment.data.gov.uk/dataset/92912a4f-d465-11e4-8687-f0def148f590>. Accessed September 2024.

¹⁸ GOV.UK, Check the long term flood risk for an area in England [online]. Available at: <https://check-long-term-flood-risk.service.gov.uk>. Accessed September 2024.

- 4.3.9 The mapping also indicates a potential flow path running adjacent to the existing east to west watercourse on its south side. This was not observed during the site visit. Water was generally observed to remain confined to the existing channels. Large areas of the watercourses present at the site were covered by dense woodland which likely meant that the surface water model was unable to accurately map the underlying channels. Furthermore, culverts were observed to be present beneath the crossings that joined Fields 3 and 4, and Fields 5 and 6. Given the very low likelihood that the modelling would have identified these features, their presence is considered to be another factor contributing to the incorrect surface water flow paths indicated by the mapping.
- 4.3.10 Surface water in the southwest of Field 7 was observed to be flowing from south to north directly into the existing watercourse and was not observed to be part of the indicated flow path shown in the EA mapping¹⁸. Outside the site boundaries, the flow path is indicated by the mapping to be directed onto the site via three separate tributary flow paths, located both on and to the south of Worth Way to the south of the site.
- 4.3.11 On a subsequent site visit undertaken in June 2024, roadside ditches on the southeast side of Huntsland, adjacent to Field 5, were inspected. It was determined that previous works, undertaken with the intent to divert surface water away from Huntsland House, had led to the possibility of surface water being diverted onto Field 5 under heavy rainfall conditions.

4.4 Geological and Hydrogeological Setting

- 4.4.1 Geology and ground conditions at the site were investigated by Geo-Environmental¹⁹ in November 2023. The ground conditions typically encountered across the boreholes comprised a mantle of Topsoil overlying the Upper Tunbridge Wells Sand Formation.
- 4.4.2 Groundwater monitoring investigations were previously undertaken by Geo-Environmental²⁰ between November 2023 and April 2024. They indicate a site-wide groundwater level typically shallower than 2 m Below Ground Level (BGL). In many areas of the site the level is shallower than 1 m BGL.
- 4.4.3 According to the Cranfield University LandIS soils map⁴, the soil at the site is described as 'slightly acid loamy and clayey soils with impeded drainage'.

¹⁹ Geo-Environmental, Ground Appraisal Report, Land Off Turners Hill Road, Crawley Down, West Sussex, RH10 4HB, January 2024, GE21953-GAR-JAN24.

²⁰ Geo-Environmental, Land off Turners Hill Road, Crawley Down, West Sussex, RH10 4HB – Ground Gas Assessment & Winter Groundwater Monitoring, May 2024, GE21953 – LRV1AP240203.

4.4.4 According to British Geological Survey (BGS) GeoIndex Onshore data²¹, the underlying rock unit beneath the site is defined as a moderately productive aquifer and is summarised as sandstones of the Ashdown Formation yielding up to 60 L/s and Tunbridge Wells Sand yielding up to 10 L/s; separated by Wadhurst Clay.

4.4.5 According to the BGS Geology Viewer²², the underlying geology beneath the site is defined as the Upper Tunbridge Wells Sand. This is typically described as interbedded sandstone and siltstone, with a narrow band described as mudstone indicated to be running through the centre of the site. No superficial geology layers are recorded.

4.5 Risks from Reservoirs, Canals, and Other Artificial Sources

4.5.1 According to EA mapping¹⁸, the site is not shown to be at risk of flooding following a reservoir failure.

4.5.2 Dams in England are regulated by the Reservoirs Act 1975²³ which sets out stringent conditions for the operation of reservoirs to ensure high levels of safety. The EA routinely visits reservoirs across the country to assess risk, monitor progress and serve enforcement notices requiring operators to complete specific actions.

4.5.3 No other artificial sources have been identified that presently pose a flooding risk to the site.

4.6 Historic Flooding

4.6.1 According to the EA's Recorded Flood Outlines dataset²⁴, there are no records of historical flooding at the site. The nearest of which, dated to 1968, is located approximately 2.8 km northeast of the site and was attributed to channel capacity exceedance.

²¹ BGS British Geological Survey, GeoIndex Onshore [online]. Available at: <https://mapapps2.bgs.ac.uk/geoindex/home.html>. Accessed September 2024.

²² BGS Geology Viewer [online]. Available at: <https://geologyviewer.bgs.ac.uk>. Accessed September 2024.

²³ Legislation.gov.uk, Reservoirs Act 1975 [online]. Available at: <https://www.legislation.gov.uk/ukpga/1975/23/contents>. Accessed September 2024.

²⁴ Department for Environment Food & Rural Affairs, Data Services Platform, Recorded Flood Outlines [online]. Available at: <https://environment.data.gov.uk/dataset/8c75e700-d465-11e4-8b5b-f0def148f590>. Accessed October 2024.

4.6.2 Historical Flooding is presented in Figure 4.4 at the rear of the report.

4.7 Baseline Flood Risk Summary

4.7.1 Table 4.1 should be considered in the assessment of flood risk for any proposed development at the site:

Table 4.1: Baseline Flood Risk Summary

Flood Risk	High	Medium	Low	Comment
Fluvial/Tidal			X	Site is located in Flood Zone 1.
Surface Water	X			Areas considered to be at a High risk from surface water flooding are present in the southwest of the site, and adjacent to the existing east to west watercourse in the centre of the site.
Groundwater		X		Shallow groundwater levels observed at the site, along with visibly poor infiltration, and a review of underlying geology, are suggestive of a moderate groundwater risk at the site, especially in low lying areas.
Reservoirs, Canals, and Other Artificial Sources			X	The site is not shown to be at risk following a reservoir failure.

5. Assessment of Flood Risk

5.1 Fluvial

- 5.1.1 The site is shown to be located in Flood Zone 1 and is therefore considered to be at a Low risk from fluvial (and tidal) flooding. The nearest area in Flood Zone 2 (Medium risk) is located approximately 1 km to the west of the site. The nearest area in Flood Zone 3 (High risk) is located approximately 1.5 km northeast of the site.

5.2 Surface Water

- 5.2.1 As shown in Figure 4.3, potential overland flow paths are indicated to be present both at and leading onto the site. A potential flow path is shown to be present in the southwest of the site and is indicated by EA mapping¹⁸ to be originating both along and to the south of Worth Way, located adjacent to the south of the site. This flow path is shown to be made up of three separate branches, two of which are shown to meet immediately to the south of Worth Way, with the third joining from the east as the flow path meets the site boundary, having crossed over from Worth Way approximately 250 m further east. This flow path is indicated to pass across the southwest corner of the site before being directed west, flowing away from the site. Within the site boundary this flow path is indicated to be met by another running adjacent to the existing east to west watercourse on its south side. A flow path is also indicated to be present in Field 5 running across the field from northeast to southwest. The mapping indicates that it joins the flow path on the south side of the existing east to west watercourse after passing through the boundary of Huntsland House.
- 5.2.2 None of the potential flow paths indicated by the mapping (within the site boundary) were observed during the March 2024 site visit to be present at the site. Heavy rainfall conditions were notable during the day, yet surface water was generally observed to remain confined to existing watercourses and ditches. In Field 5, the existing tributary ditch running adjacent to the field's eastern boundary was observed to be heavily silted and it was considered that the surface water flooding indicated by the EA mapping¹⁸ was the result of an assumption that the ditch in this area overflowed, with the resultant runoff spilling over into the main part of the field under heavy rainfall conditions. The reality observed onsite was that no significant flow path was observed along the route indicated by the mapping.

- 5.2.3 It is likely that there are a number of contributing factors as to why the risk indicated by the EA mapping did not align with observations made onsite. Firstly, as noted in Section 4.3, the surface water modelling employed by the EA does not account for building removal, ground raising, or site levelling and does not consider specific drainage assets such as sewers, drains or ditches when calculating extents, of which many are known to be present either at or adjacent to the site, such as the existing watercourses and ditches observed during the site visit. In addition to these watercourses, multiple culverts were observed to be present along the existing east to west watercourse between both Fields 3 and 4, and Fields 5 and 6. When not accounted for in the model, this can lead to the culverts potentially being modelled as blockages (as only the crossing is identified), leading to potential errors in the final output. Furthermore, many of the watercourses present at the site were observed to be covered by dense woodland areas which likely meant that the surface water model was unable to accurately map the underlying channels. In some cases, it appears as if the woodland was so dense that it was ignored completely by the model, hence the flow paths shown to be running adjacent to these areas and the areas where watercourses were observed to be present while onsite but were not picked up by the modelling at all. The resolution of the EA model is unlikely to have been fine enough to accurately identify the different watercourses even if there were no tree cover and it is noted that the suitability of the results of the EA mapping at this location are considered to be *"Very unlikely to be reliable for a local area"* and *"Extremely unlikely to be reliable for identifying individual properties at risk"*.
- 5.2.4 A proposed surface water drainage strategy has been developed for the site. The strategy has proposed a network of surface water attenuation areas and swales across the site that have been sized sufficiently to accommodate additional surface water runoff under a 1 in 100-year flooding event with a 40% increase in flows to account for the potential impacts of climate change. Proposed swales and new surface water sewer connections (where required) have been strategically located within the drainage strategy plan to direct surface water runoff toward lower lying areas where the proposed surface water attenuation areas will collect and store additional runoff from the Proposed Development. The strategy will ensure the satisfactory management of surface water falling on the site. Further details/mitigation measures are detailed in Section 5.6.
- 5.2.5 Of critical importance and in addition to the above reasoning as to the incorrect nature of the EA mapping, a series of long sections based on EA LiDAR data³ have been taken at key locations within the site where surface water is identified as a risk. This has been undertaken with the intention of making it clear that the areas of surface water risk as shown on the EA mapping, do not align with local topography. The sections, along with explanations, are presented in Appendix E at the rear of the report.
- 5.2.6 The overall risk to the Proposed Development is considered to be low.
- 5.3 Groundwater
- 5.3.1 While a moderate groundwater flood risk has been determined at the site, groundwater flooding is not considered to pose a significant risk to the Proposed Development.

5.3.2 No basement levels are being proposed as part of the Proposed Development. The risk therefore from groundwater to internal areas of the site is considered to be minimal. Furthermore, any groundwater emerging in external areas of the site would be expected to be managed by the proposed surface water drainage strategy.

5.3.3 The overall risk to the Proposed Development is considered to be low.

5.4 Flood Risk Vulnerability

5.4.1 According to Annex 3²⁵ (Flood risk vulnerability classification) in the Planning Practice Guidance⁵ to the NPPF, buildings used for dwelling houses should be classified as 'More vulnerable'.

5.4.2 Table 2 (Flood risk vulnerability and flood zone 'incompatibility') in the Planning Practice Guidance states that a 'More vulnerable' use is appropriate in Flood Zone 1 and that an Exception Test is not required.

5.5 Sequential Test

5.5.1 The aim of the Sequential Test, as defined by the Technical Guidance to the NPPF¹, is to steer new development to areas with the lowest probability of flooding. Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 be considered.

5.5.2 As the Proposed Development is located entirely within Flood Zone 1, it is considered to have passed the Sequential Test.

5.6 Further Mitigation/Assessment of Residual Risk

5.6.1 As part of our development of mitigation options, and in consideration of future site development, Ramboll has considered climate change in the following ways:

- Consideration of climate change allowances when considering peak fluvial flood levels – this is also a policy requirement of the EA for all NPPF-compliant FRAs;
- Consideration of greater frequency and higher magnitude of surface water flooding events and overland flow, and assessing how a site and building layout can be designed to manage this risk; and
- Consideration of the likely increased risk of seasonal groundwater flooding as a result of wetter winters.

²⁵ GOV.UK, National Planning Policy Framework, Annex 3: Flood risk vulnerability classification [online]. Available at: <https://www.gov.uk/guidance/national-planning-policy-framework/annex-3-flood-risk-vulnerability-classification>. Accessed October 2024.

- 5.6.2 Each of the above will be considered when assessing the mitigation measures, which are summarised in the remainder of Section 5.6.

Fluvial Flooding

- 5.6.3 The site has not been identified as being at risk from fluvial (or tidal) flooding and therefore no mitigation against this type of flooding is proposed.

Surface Water Management

- 5.6.4 The increase in impermeable area resulting from the Proposed Development will increase the surface water discharge generated at the site. To mitigate this, a surface water drainage strategy has been prepared by Ramboll and is detailed within the Drainage Strategy report. The strategy is summarised as follows:

- The intention is for the site to discharge via a series of swales, surface water attenuation areas, and gravity driven surface water sewers to multiple locations within the boundaries of the site.
- The intention is for discharge into the existing east to west watercourse flowing between Fields 3 and 4, and Fields 5 and 6. This will either be directly or via one of its tributary ditches. For Field 5, two swales are proposed down the east side of the development area, discharging at separate locations. In addition, three separate surface water attenuation areas are proposed in Field 5, one halfway up the field on its east side which discharges into the existing tributary ditch flowing approximately north to south, and two at the southern end of the field which are proposed to be connected via a surface water sewer that is proposed to discharge to the existing east to west watercourse to the south via a deeper, directional drilled sewer which will be directed beneath the Ancient Woodland and tree roots in the area. Furthermore, existing roadside ditches alongside Huntsland on the northwest side of Field 5 are proposed to be cleared and a surface water sewer installed at their downstream end to pass down the west side of Field 5 and join the proposed directional drilled sewer in the south of the field²⁶. The development of a regular maintenance regime for these roadside ditches is recommended as part of the Proposed Development. A larger network of strategically located swales, surface water attenuation areas, and gravity driven surface water sewers are additionally proposed across Fields 3, 4, 6 and 7 to collect and transport runoff to intended discharge locations. Runoff from Field 3 will connect directly into the existing east to west watercourse via swales and a single surface water attenuation area proposed in the south of the field. Across Fields 4, 6 and 7, runoff will be directed via a series of swales and surface water attenuation areas to a larger surface water attenuation area in the southwest of Field 7 where it will then discharge to a small tributary ditch flowing directly into the main east to west watercourse as it leaves the site.
- The total storage volume required for the proposed southern development area would be approximately 4,900 m³. This is based on a calculation that the overall area will be required to discharge at the 1 in 1-year greenfield runoff rate of 89.4 L/s.

²⁶ The roadside ditches alongside Huntsland constitute very shallow depressions that are limited in extent and intended solely to capture runoff from Huntsland and are not considered substantial enough to be considered Ordinary Watercourses. The proposed works therefore should not be subject to an Ordinary Watercourse Application.

- It is further noted regarding the proposed surface water strategy for Field 5, that clearance works are being undertaken in the existing tributary ditch on the east side of the field that was identified during the March 2024 site visit as being heavily silted in certain areas. A regular inspection and maintenance regime for all the ditches in this area has been recommended as part of the development proposals. The swale/surface water attenuation area network proposed in Field 5 has been strategically located to capture any overland flow in the event that flows within the existing ditches come out of bank.
- 5.6.5 Climate change has the potential to increase the risk of flooding in the future. As such, an allowance of 40% has been made when considering runoff volumes and associated attenuation storage, as noted in the Drainage Strategy report. The residual risk is therefore considered to have been managed through design.
- 5.6.6 Full details regarding street, neighbourhood, and catchment level measures, and surface water mitigation, are presented in the Drainage Strategy report and the associated Indicative Drainage Strategy Plan. If followed, the strategy would be expected to prevent any potential increase in flood risk associated with surface water runoff, both onsite and elsewhere/downstream.
- 5.6.7 Further to the above the following mitigation measures are recommended:
- Finished Floor Levels (FFLs) – All FFLs and threshold levels should be at least 150 mm – 200 mm above the surrounding ground to manage future risk from surface water flooding and overland flow.
 - Planning for Exceedance Events - This risk relates to the occurrence of intensive rainfall events (expected to become more frequent with the advent of climate change) which could cause overland flow and surface water flooding or cause the capacity of the site drainage system to be exceeded and result in flooding. To manage this risk, the development should consider exceedance overland flow routes during extreme flood events, adopting the principles set out in CIRIA C634, Designing for Exceedance in Urban Drainage²⁷. The design of exceedance routes should correlate with the proposed swales/surface water attenuation areas, which will make highly suitable exceedance flow paths. The overall volumes for the various surface water attenuation features proposed across the site have been determined based on calculations where an allowance for the potential impacts of climate change was made.
 - External Gradients - Along with the planning of exceedance routes, external gradients where possible, are to be designed to fall away from buildings, so that any overland flow resulting from extreme events would be channelled away from building entrances. Where this is not possible, linear interceptor drains should be located at all building entrances towards which there is a positive gradient for surface water to flow.
 - Management of Flood Extents – Areas at risk from surface water were investigated during the March 2024 site visit and have been accounted for in the proposed surface water drainage strategy. Proposed surface water attenuation areas, connected by a network of

²⁷ CIRIA, Management of accelerated low water corrosion in steel maritime structures (C634), 2005 [online]. Available at: https://www.ciria.org/CIRIA/CIRIA/Item_Detail.aspx?iProductCode=C634&Category=BOOK.

proposed swales to convey surface water runoff, have been strategically located across the site.

Groundwater Flood Risk Management

5.6.8 In the event of groundwater emergence at the site, it is considered unlikely this would lead to flooding of the Proposed Development.

5.6.9 No basement levels are being proposed as part of the Proposed Development. This is considered to negate the groundwater flood risk to internal areas of the site.

5.6.10 Any groundwater emergence outside the site would be expected to follow existing overland flow routes observed during the March 2024 site visit. Where these are located within the site these would be expected to be managed by the proposed surface water drainage strategy.

5.7 Summary

5.7.1 In summary, the Proposed Development is considered to be appropriate development for the site and as such no specific mitigation measures beyond those already detailed are proposed.

5.7.2 The site is considered safe for the lifetime of the development.

6. Conclusions

- 6.1.1 Based on the findings of this Flood Risk Assessment, and in consideration of the recommendations made, it is concluded that any flood risk at the site would be appropriately managed by the development proposals over the lifetime of the development, taking climate change into account and fittingly for the vulnerability of proposed users.
- 6.1.2 No further flood risk assessment is deemed necessary.

Figures

Figure 2.1 – Site Location Plan

Figure 2.2 – Site Setting

Figure 2.3 – LiDAR Topography

Figure 4.1 – Hydrological Setting

Figure 4.2 – EA Flood Map for Planning

Figure 4.3 – EA Surface Water Flood Risk

Figure 4.4 – Historical Flooding

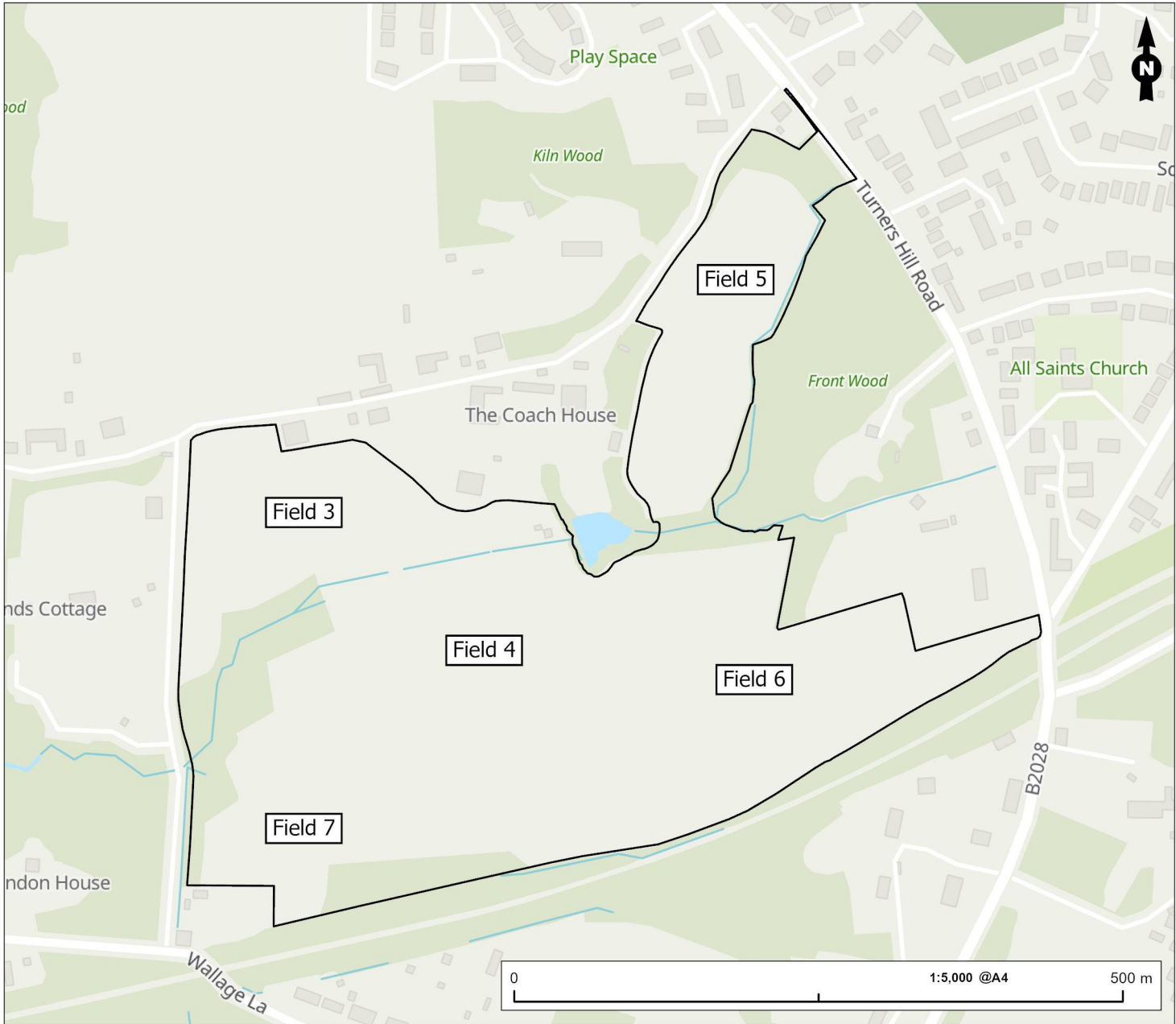
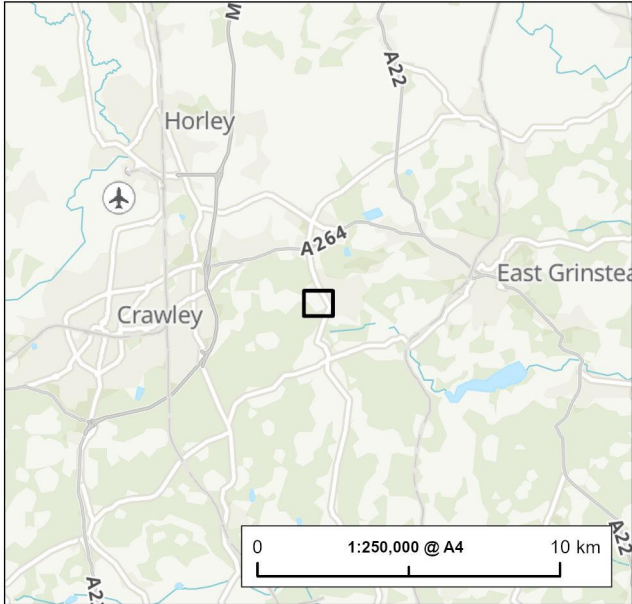


Figure Title
Site Location Plan

Project Name
Land West of Crawley Down

Date
January 2025

Prepared By
DM

Figure No.
2.1

Client
Wates Developments Ltd

Project No./File ID
162001691-014 / RUK2021N00014

Scale
As Shown

Revision
2.0



Legend

 Site Boundary

Figure Title
Site Setting

Project Name
Land West of Crawley Down

Project No./Filery ID
1620011691-014 / RUK2021N00014

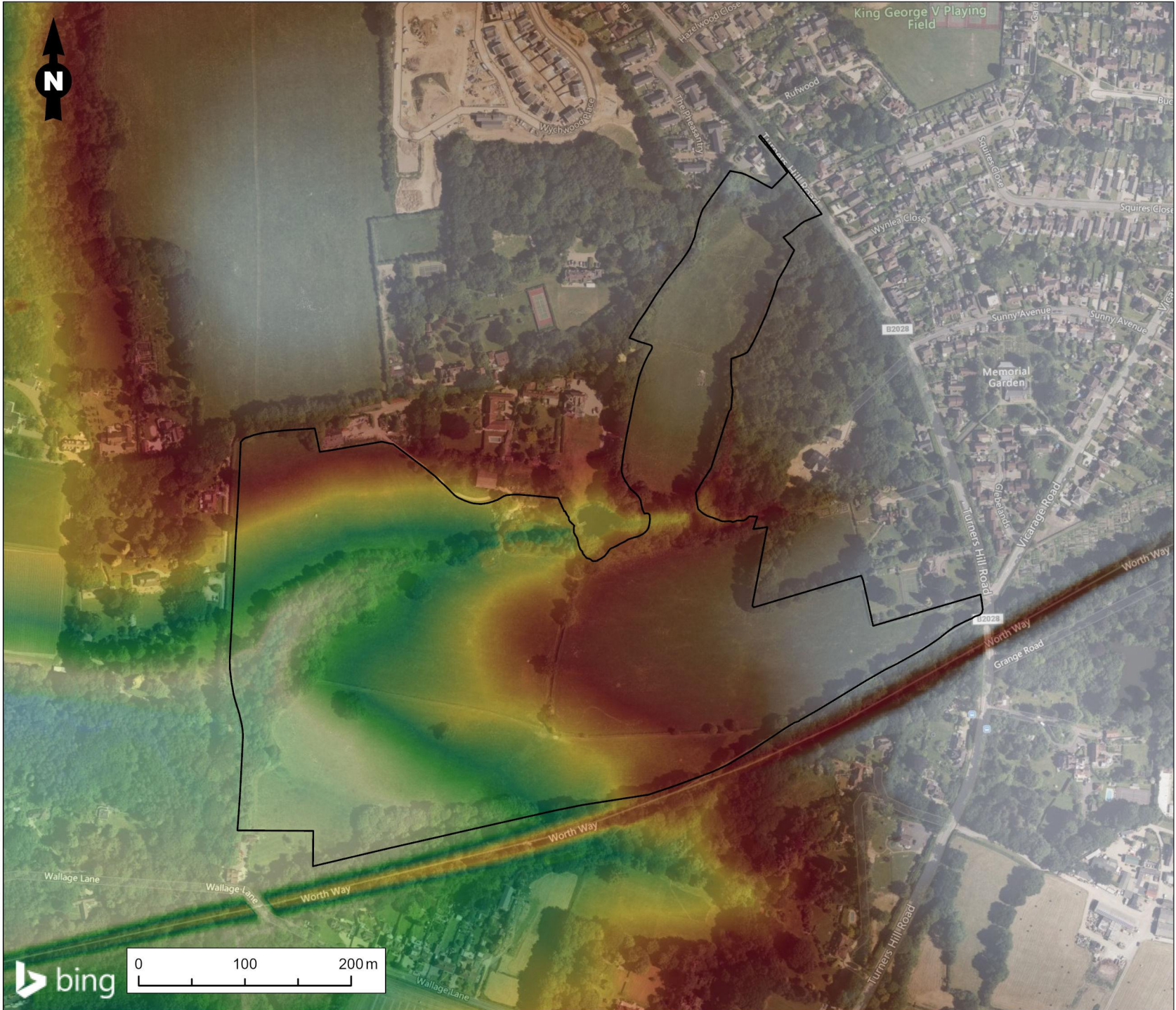
Date	Figure No.	Revision
January 2025	2.2	2.0

Prepared By	Scale
DM	1:5,000 @A4

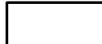
Client
Wates Developments Ltd



Fig2.2_SiteSetting.pax



Legend

 Site Boundary

LiDAR 1m DTM / m AOD

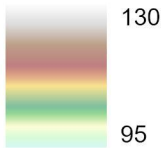


Figure Title
LiDAR Topography

Project Name
Land West of Crawley Down

Project No./Filery ID
1620011691-014 / RUK2021N00014

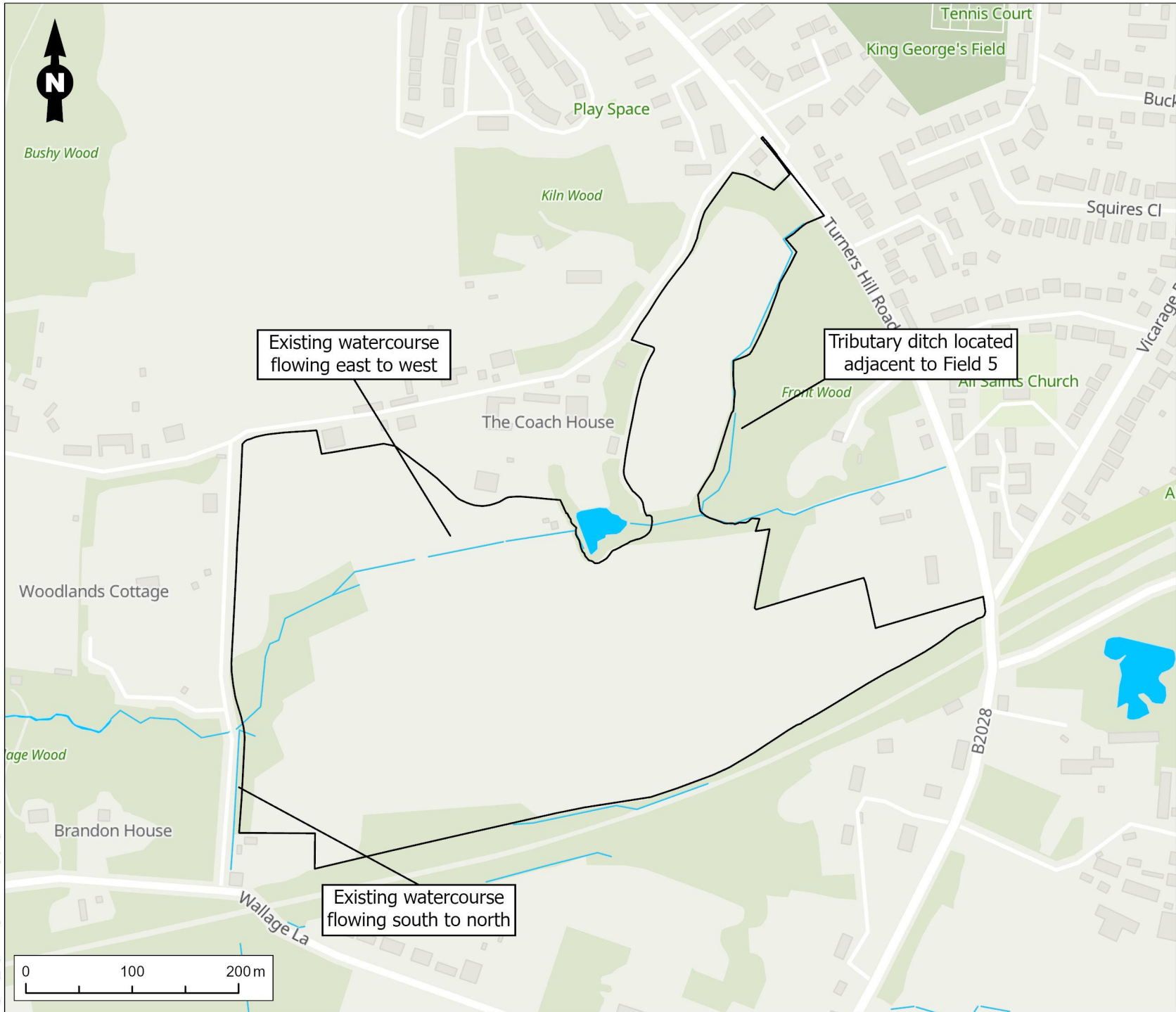
Date	Figure No.	Revision
January 2025	2.3	2.0

Prepared By	Scale
DM	1:5,000 @A4

Client
Wates Developments Ltd



Fig2.3_LiDAR Topography.png

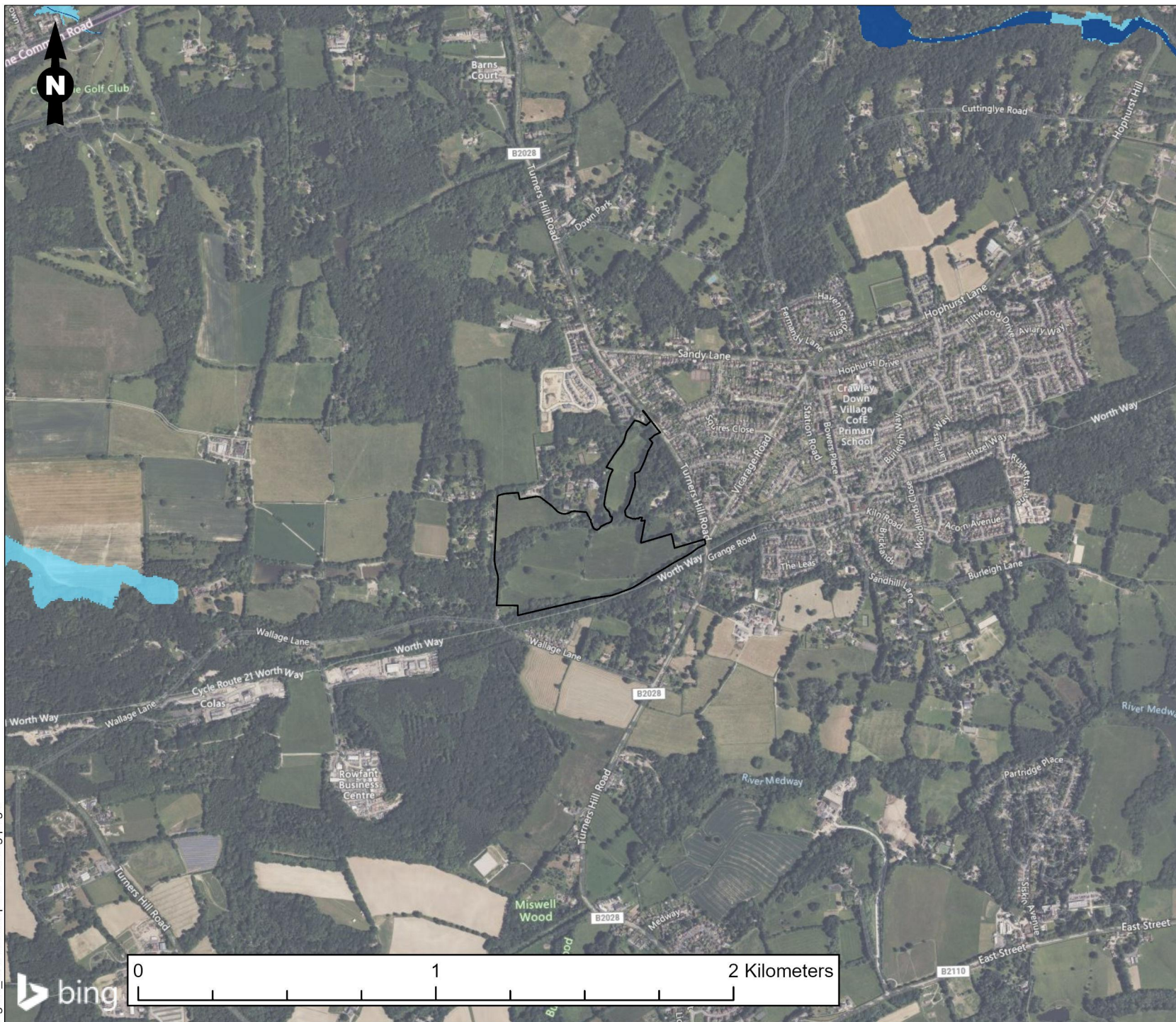


Legend

-  Site Boundary
-  OS Watercourses
-  OS Waterbodies

Figure Title Hydrological Setting		
Project Name Land West of Crawley Down		
Project No./Filery ID 1620011691-014 / RUK2021N00014		
Date January 2025	Figure No. 4.1	Revision 2.0
Prepared By DM	Scale 1:5,000	@A4
Client Wates Developments Ltd		
		

Fig4.1_HydrologicalSetting.pagx



Legend

-  Site Boundary
-  EA Flood Zone 3 (High Probability)
-  EA Flood Zone 2 (Medium Probability)

Figure Title
EA Flood Map for Planning

Project Name
Land West of Crawley Down

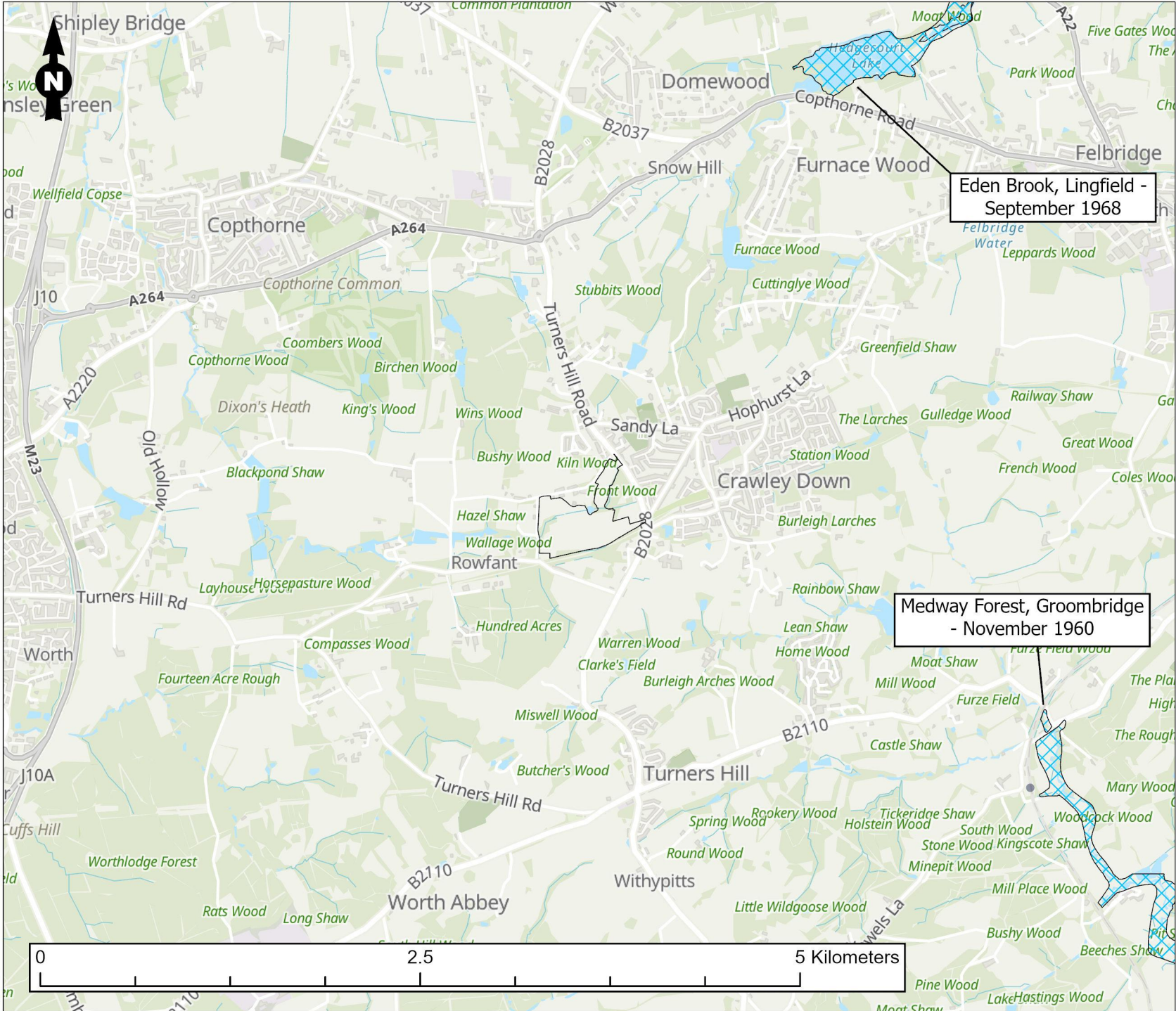
Project No./File ID
1620011691-014 / RUK2021N00014

Date	Figure No.	Revision
January 2025	4.2	2.0

Prepared By DM	Scale 1:18,000 @A4
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Wates Developments Ltd





Legend

- Site Boundary
- Historic Flooding

Figure Title Historic Flooding		
Project Name Land West of Crawley Down		
Project No./Filery ID 1620011691-014 / RUK2021N00014		
Date January 2025	Figure No. 4.4	Revision 2.0
Prepared By DM	Scale 1:35,000 @A4	
Client Wates Developments Ltd		
		

Fig4.4_HistoricFlooding.pagx

Appendix A

Site Illustrative Masterplan



- | | | |
|--|--|---|
| <ul style="list-style-type: none"> □ Application site 01 Vehicular/pedestrian and cycle access point 02 Sustainable drainage system including swales 03 Retained and enhanced vegetation 04 Tree belt planting 05 Community orchard/garden | <ul style="list-style-type: none"> 06 Meadow planting and species-rich landscapes 07 Pedestrian connection points 08 Shared cycle/footpath 09 Local Area for Play 10 Local Equipped Area for Play 11 Pumping station | <ul style="list-style-type: none"> 12 Substation 13 Emergency, Cycle and pedestrian link 14 Mown paths 15 Cycle and pedestrian connection point 16 Countryside open space — Public right of way: Footpath |
|--|--|---|



Not to scale

CLIENT: WATES DEVELOPMENTS

PROJECT: LAND WEST OF CRAWLEY DOWN

DRAWING: ILLUSTRATIVE MASTERPLAN SOUTH 200 UNITS

PROJECT NUMBER: 1314

DRAWING NUMBER: SK001-01

REVISION: V14

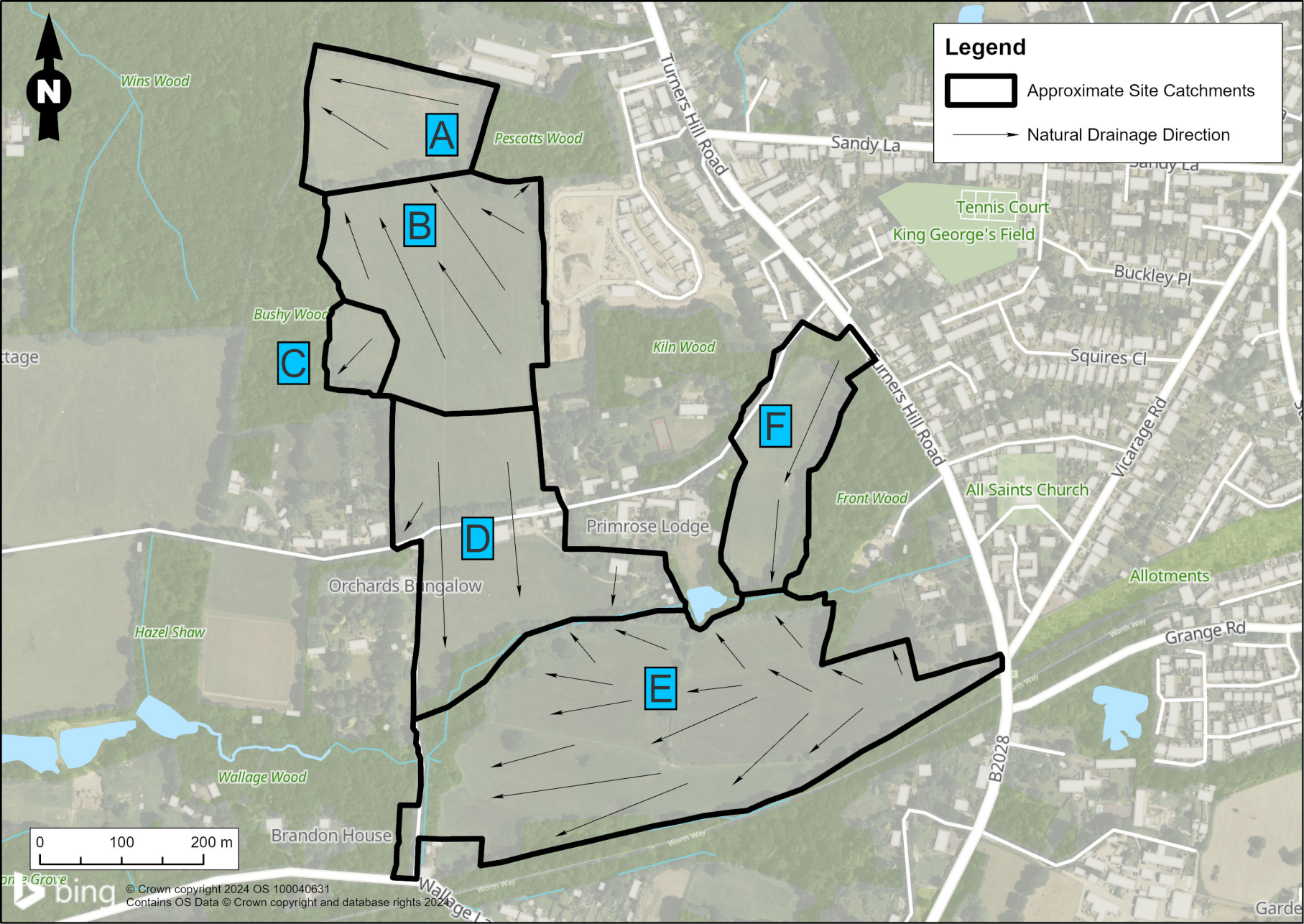
DATE: 15.01.2025

Appendix B

Site Topographical Survey

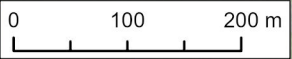
Appendix C

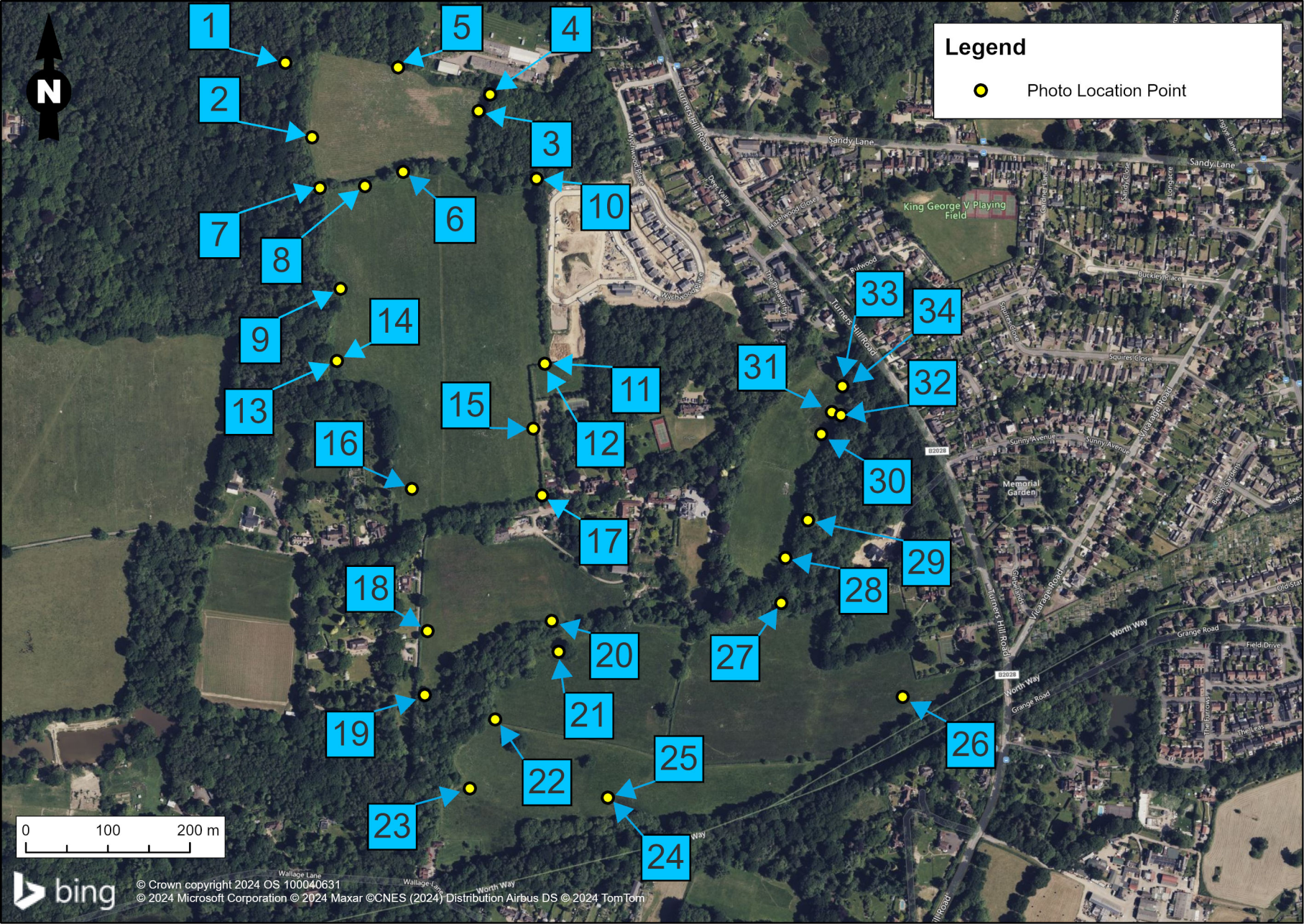
Site Visit Photographs and Accompanying Figures



Legend

-  Approximate Site Catchments
-  Natural Drainage Direction

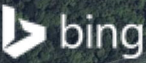




Legend

● Photo Location Point

0 100 200 m



Catchment A

Photographs for Catchment A are presented in Table 3.1 below.

Table 3.1: Catchment A Photographs



1. View of watercourse to the northwest of the site looking west. Watercourse shown to take flows from north of site and direct them westward. Topography visibly sloping from east to west.



2. View of Catchment A looking north along western boundary. Standing water visible in west of site. Topography visibly sloping from east to west.



3. View of Catchment A in the northeast of the site looking west. Topography typically sloping from east to



4. Surface water flooding in the northeast corner of the site.

west although another low point is present in the northeast corner of the catchment.	
 5. Surface water flooding in the north of the site. Looking west. Flow observed to be east to west.	 6. View of Catchment A looking northwest from the south of the catchment. Land shown to be sloping from southeast to northwest.

Catchment B

Photographs for Catchment B are presented in Table 3.2 below.

Table 3.2: Catchment B Photographs



7. View of watercourse flowing from east to west. View looking west. Watercourse shown to take flows from ditch separating Catchments A and B. Topography sloping from east to west.



8. View looking south from north of catchment. Topography visibly sloping from south to north.



9. View of Catchment B looking north from the west of the catchment. Topography visibly sloping from south to north and east to west.



10. View of Catchment B looking west from the northeast of the catchment. Topography visibly sloping from south to north leaving localised low point in northeast of catchment.



11. View of Catchment B looking west from southeast of catchment. Topography visibly sloping from west to east in the east of the catchment.



12. View of Catchment B looking north from southeast of catchment. Topography sloping from west to east in the east of the catchment.

Catchment C

Photographs for Catchment C are presented in Table 3.3 below.

Table 3.3: Catchment C Photographs

	
13. View of Catchment C looking north along western boundary of site. Topography sloping from east to west and northeast to southwest.	14. View of Catchment C looking east. Topography sloping from east to west. Likelihood is that any potential swale will need to be placed further from the site boundary to ensure a massive depth is not needed.

Catchment D

Photographs for Catchment D are presented in Table 3.4 below.

Table 3.4: Catchment D Photographs



15. View of Catchment D looking west from northeast of catchment. Topography visibly sloping from west to east.



16. View of Catchment D looking north from northwest of catchment. Topography visibly sloping from north to south.



17. View of Catchment D looking northwest from the east of the catchment. Topography visibly sloping from north to south.



18. View of Catchment D looking south along the western boundary. Topography visibly sloping from north to south.

	north to south down toward existing watercourse that separates Catchments D and E.
 19. View of Catchment D looking east from the southwest of the catchment. Topography visibly sloping from north to south.	 20. View of Catchment D looking east from the south of the catchment. Bridge over watercourse visible in top right of image. EA Surface Water Flood Risk mapping suggests a surface water flow path is present to the south of this watercourse in Catchment E. The EA mapping does not account for culverts (like the one beneath this bridge) and the indication therefore is that the surface water flow path shown to the south of the existing watercourse is the result of the EA model assuming a blockage in the watercourse at this location.

Catchment E

Photographs for Catchment E are presented in Table 3.5 below.

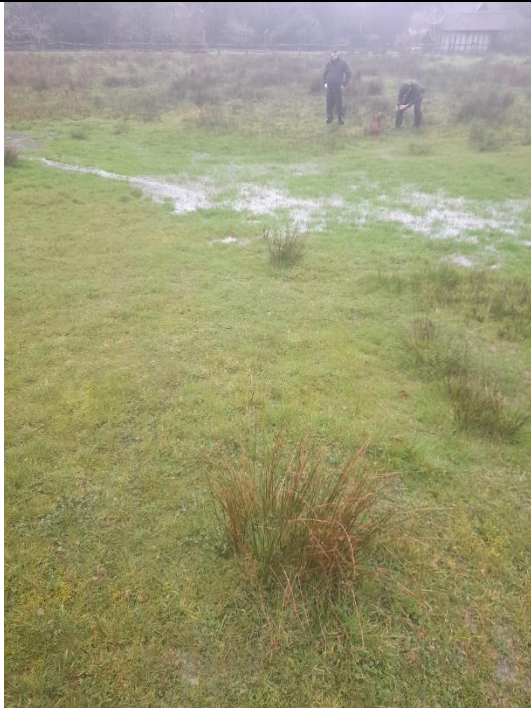
Table 3.5: Catchment E Photographs



21. View of Catchment E looking northwest from north of catchment, towards existing watercourse. Topography sloping down toward watercourse. Marshy ground ideally suited for an attenuation feature.



22. View of Catchment E looking southeast from west of catchment. Topography sloping from east to west and south to north, toward the existing watercourse.



23. Overland surface water flow path flowing from north to south toward the existing watercourse. View looking west.



24. View of Catchment E looking northwest from the south of the site. Topography sloping from east to west and southeast to northwest toward existing watercourse.



25. View of Catchment E looking east from the south of the site. Topography sloping from north to south toward the south of the site.



26. View of Catchment E looking west from the southeast of the site. Topography shown to be sloping from east to west but is gentle at location photograph was taken.

Catchment F

Photographs for Catchment F are presented in Table 3.6 below.

Table 3.6: Catchment F Photographs



27. View of watercourse between Catchments E and F flowing from east to west. View looking west from atop existing footbridge.



28. View of Catchment F looking south from the south of the catchment. View looking toward existing watercourse. Steeply sloping toward existing watercourse apparent.



29. Existing tributary watercourse flowing from north to south along eastern boundary of site. View looking north/upstream from atop existing footbridge.



30. View of tributary watercourse flowing from northeast to southwest along eastern boundary of site. Adjacent ground very saturated. View looking south.



31. View of Catchment F looking northwest from east of catchment. Ground very saturated. Topography gently sloping from north to south.

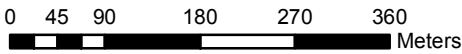
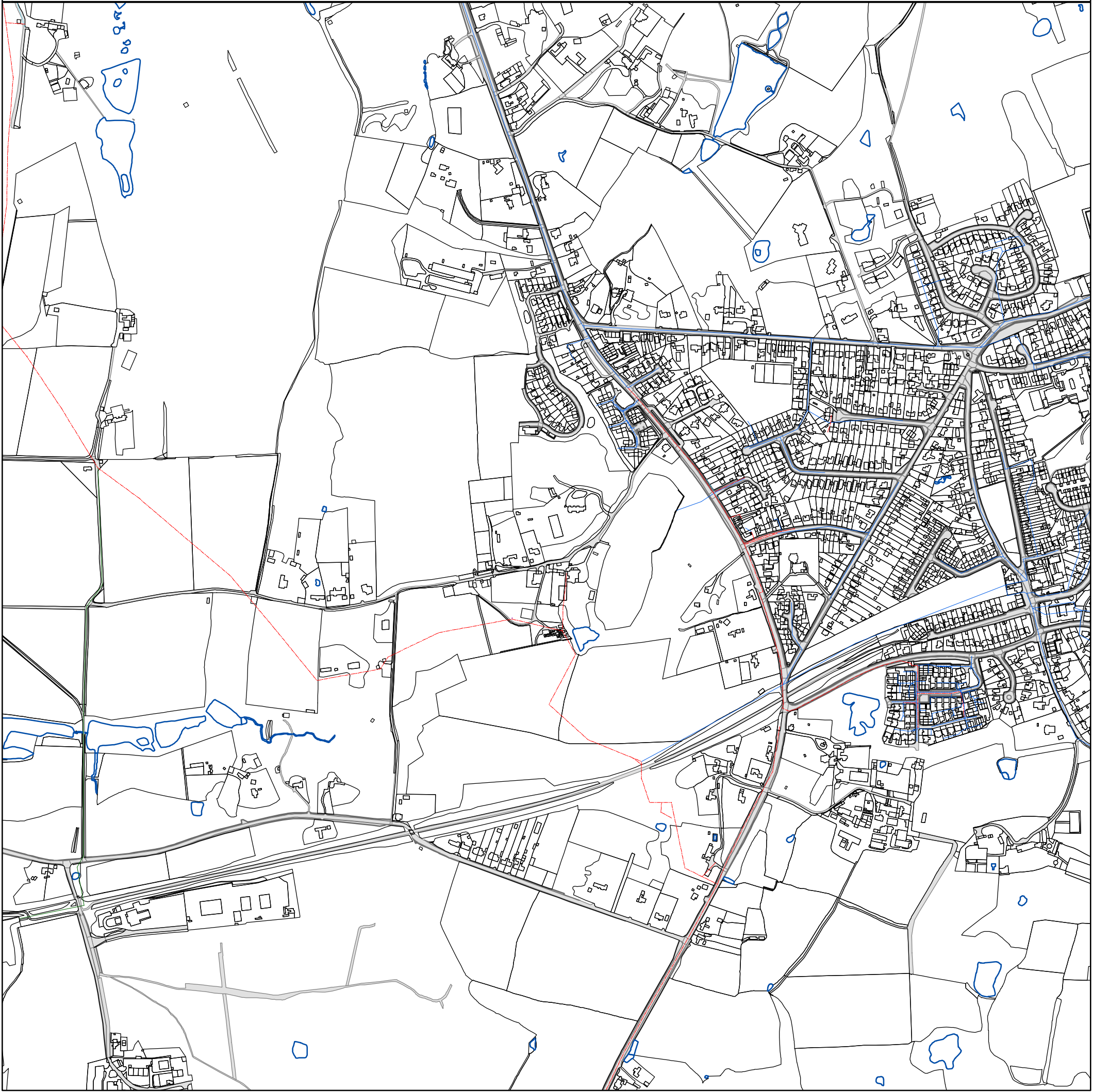


32. View of headwall and culvert along tributary watercourse flowing from northeast to southwest along

		eastern boundary of site. Further tributary ditch visible in top of image.
		
33. View of Catchment F looking approximately west from the northeast of the catchment. Ground very saturated and topography indicative of potential surface water flow path in part due to lowered edge of small ditch ("tributary watercourse"). See Photo 34 for source of overland flow.		34. View of the tributary watercourse in the northeast of the catchment, beneath tree cover. Backing up and overspill of watercourse onto main catchment area visible. Local land management and potential localised ground raising required to ensure flow remains in the tributary watercourse and is not directed through centre of catchment.

Appendix D

Thames Water Sewer Records



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: TSOMASUN
Print Date: 26/02/2024
Map Centre: 533768,137565
Grid Reference: TQ3337NE

Comments:

Appendix E

Long Sections and Additional Information/Figures

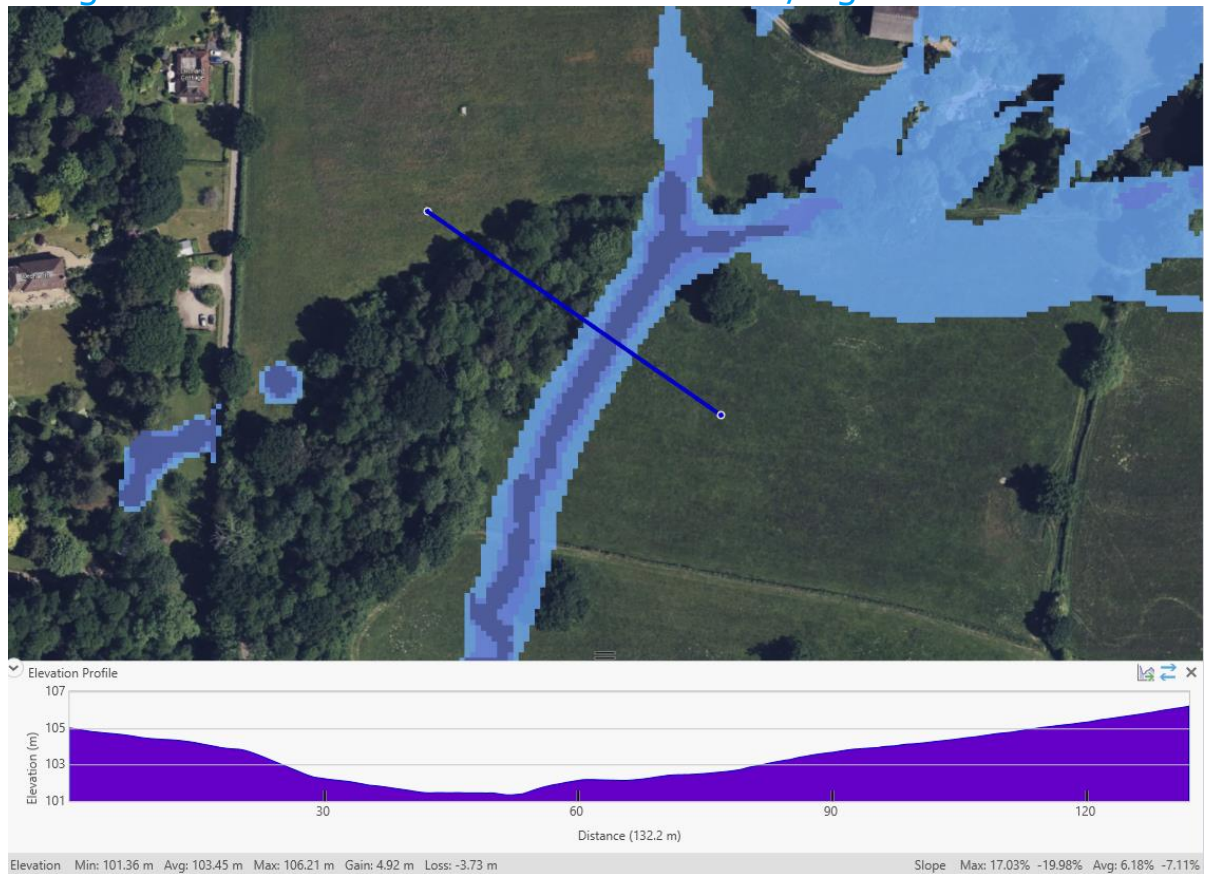


Figure AE.1: Fields 3 & 4 Long Section

The cross section profile presented in Figure AE.1 shows the topography of the dark blue line drawn in the above related image, as it moves across the land from approximately northwest to southeast.

The dark blue line measures approximately 132 m in length. At a chainage of 0 m, at its northwestern most point, the elevation stands at approximately 105 m AOD. At a chainage of approximately 52 m, where the existing east to west watercourse is located beneath the tree cover, the elevation stands at approximately 101 m AOD. At a chainage of approximately 81 m, where an area at a High risk of surface water flooding is located, the elevation stands at approximately 103 m AOD.

Hence, it is not possible for the area part way up the southeastern slope to be at a higher surface water flood risk than that to the northwest where the existing watercourse is located.

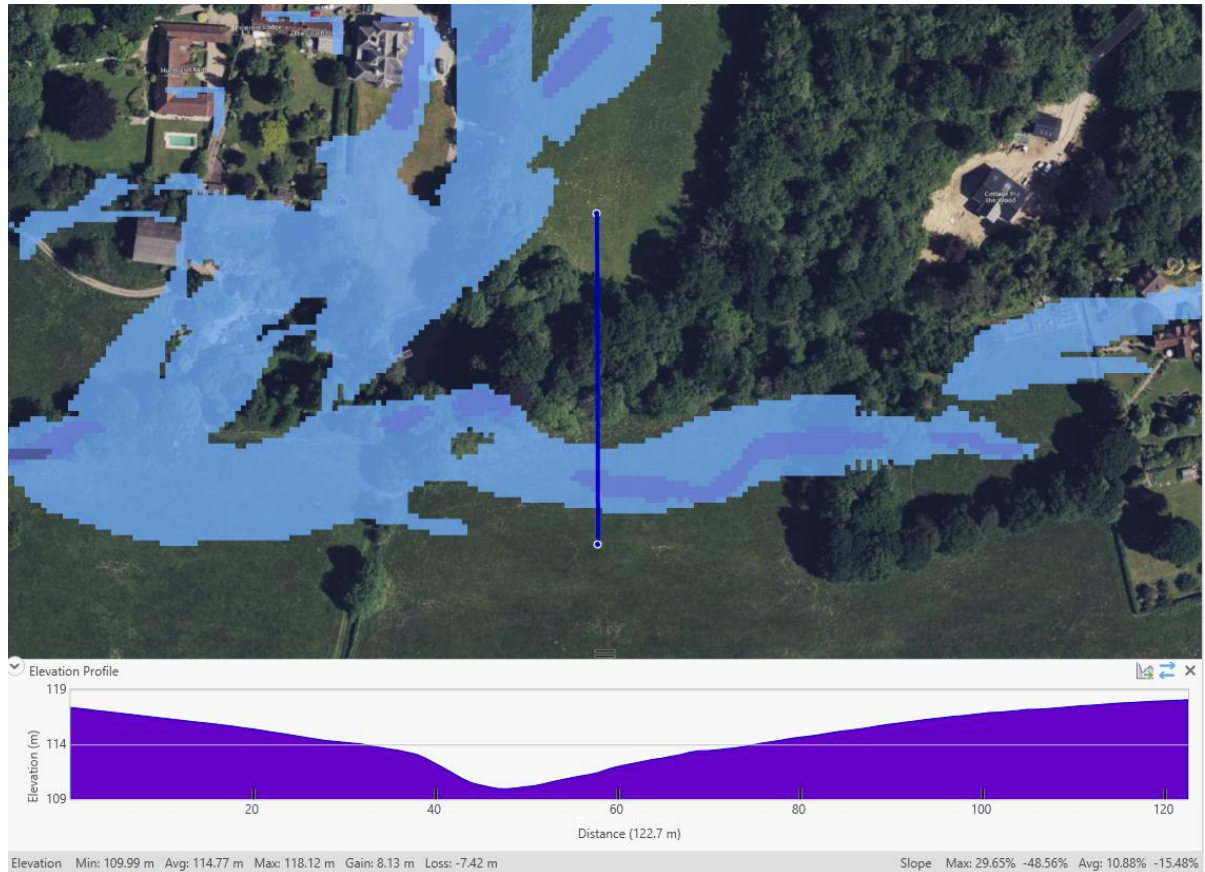


Figure AE.2: Fields 5 & 6 Long Section

The cross section profile presented in Figure AE.2 shows the topography of the dark blue line drawn in the above related image, as it moves across the land from approximately north to south.

The dark blue line measures approximately 123 m in length. At the northernmost point, at a chainage of 0 m, the elevation stands at approximately 117 m AOD. At a chainage of approximately 48 m, where the existing east to west watercourse is located beneath the tree cover, the elevation stands at approximately 110 m AOD. At a chainage of approximately 99 m, where an area at a Medium risk of surface water flooding is located, the elevation stands at approximately 117 m AOD.

Hence, it is not possible for the area part way up the southern slope to be at a higher surface water flood risk than that to the north where the existing watercourse is located.

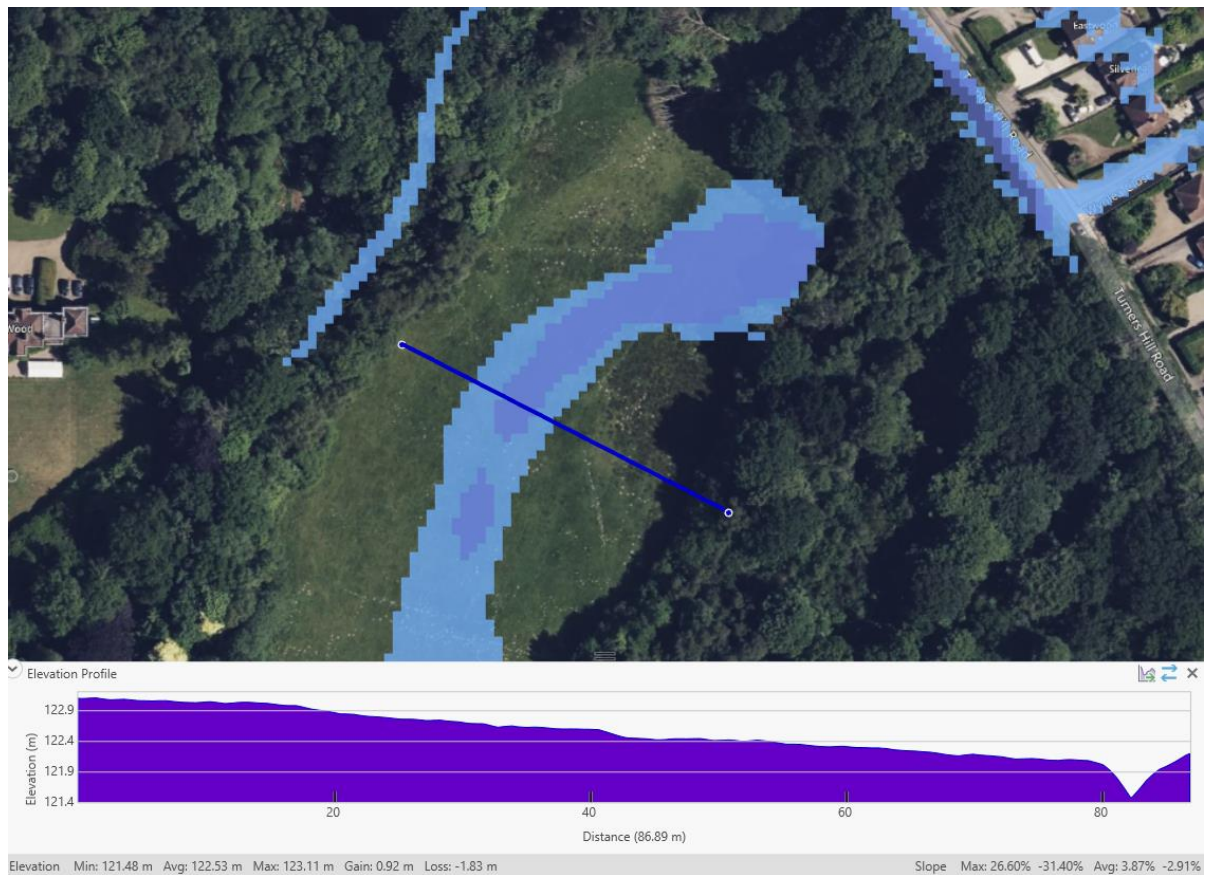


Figure AE.3: Field 5 Long Section

The cross section profile presented in Figure AE.3 shows the topography of the dark blue line drawn in the above related image, as it moves across the land from approximately northwest to southeast.

The dark blue line measures approximately 87 m in length. At the western edge of Field 5, at a chainage of 0 m, the elevation stands at approximately 123.1 m AOD. At a chainage of approximately 32 m, where an area at a Medium risk of surface water flooding is located, the elevation stands at approximately 122.7 m AOD. At the eastern edge of Field 5, at a chainage of approximately 75 m, the elevation stands at approximately 122.1 m AOD.

Hence, while the land is inclined to fall from north to south across Field 5, as indicated by the surface water flow path, the reality is that surface water would also fall toward the east where levels are lower, outside the area of proposed dwellings.

Furthermore, the ditch that is shown on the long section profile at an approximate chainage of 83 m is not identified as an area at risk from surface water flooding despite a base elevation of

approximately 121.5 m AOD, over 1 m lower than the area of Medium surface water flood risk located approximately 50 m to the northwest.

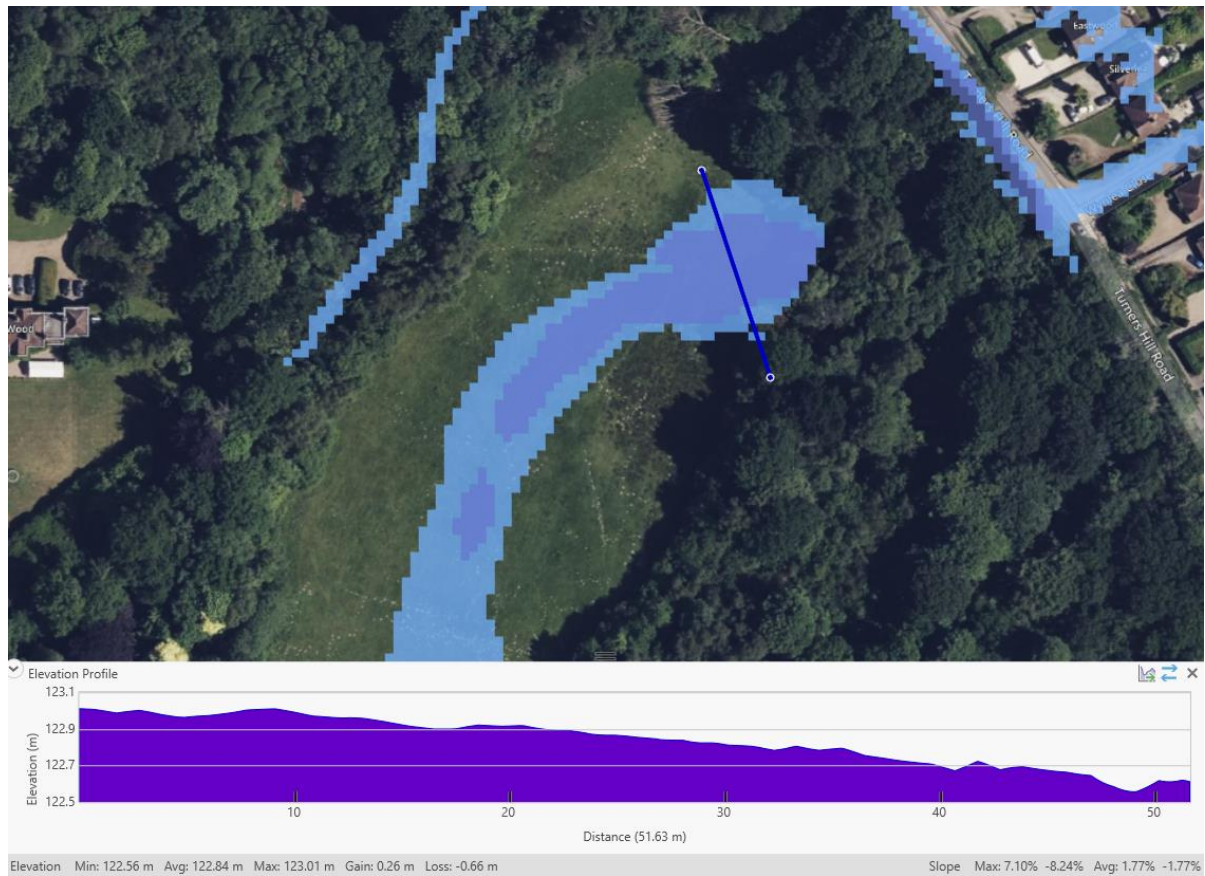


Figure AE.4: Field 5 Long Section 2

The cross section profile presented in Figure AE.4 shows the topography of the dark blue line drawn in the above related image, as it moves across the land from approximately north to south.

The dark blue line measures approximately 52 m in length. At the northernmost point, at a chainage of 0 m, the elevation stands at approximately 123 m AOD. At a chainage of approximately 25 m, where an area at a Medium risk of surface water flooding is located, the elevation stands at approximately 122.9 m AOD. At a chainage of approximately 49 m, where an existing ditch is located and no surface water flood risk is identified by the mapping, the elevation stands at approximately 122.6 m AOD.

Hence, it is not considered feasible for the area at a higher elevation to be at a higher surface water flood risk than the area of the existing ditch approximately 25 m to the south which is shown to be approximately 300 mm lower.

Furthermore, maintenance works have been undertaken in this area of the site to de-silt the existing ditch network where this was observed onsite to be full of silt. This will increase future capacity for surface water runoff from Turners Hill Road. A regular maintenance regime has been

recommended as part of the site wide surface water drainage strategy to ensure no silt build-up in the future.

Furthermore, as part of the surface water drainage strategy, a new network of swales and surface water attenuation areas have been proposed for Field 5 along the entire eastern corridor which will capture any overland runoff from the existing ditches in the event these were to overflow.

Furthermore, among mitigation measures recommended for the management of surface water, all Finished Floor Levels and threshold levels are proposed to be raised between 150 mm and 200 mm above surrounding ground levels.

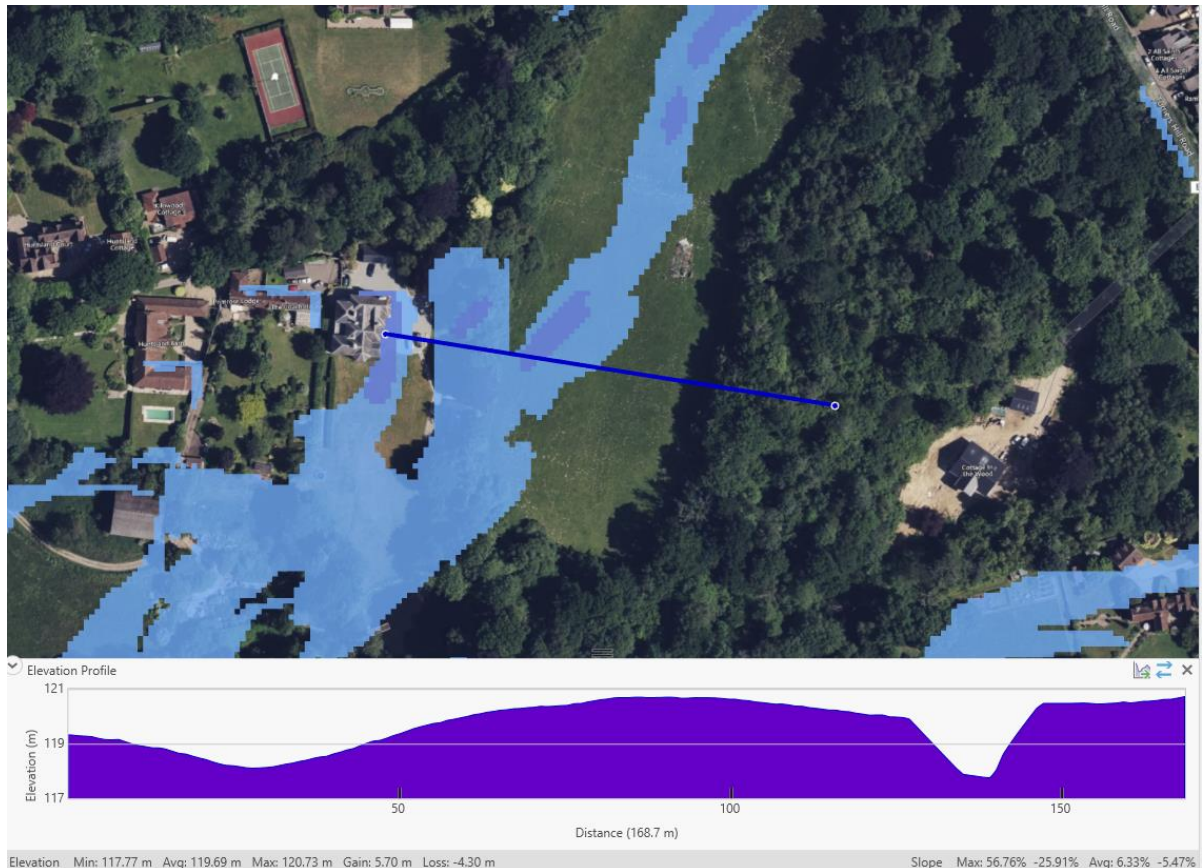


Figure AE.5: Field 5 Long Section 3

The cross section profile presented in Figure AE.5 shows the topography of the dark blue line drawn in the above related image, as it moves across the land from approximately west to east.

The dark blue line measures approximately 170 m in length. At a chainage of approximately 55 m, where an area at a Medium risk of surface water flooding is located, the elevation stands at approximately 119.7 m AOD. At a chainage of approximately 42 m, where an area at a Low risk of surface water flooding is located, the elevation stands at approximately 118.8 m AOD.

It is not considered realistic for the area at a higher elevation to be at a higher surface water flood risk. Furthermore, were surface water to follow the topography as indicated in Figures AE.3, AE.4, AE.6, and AE.7, any surface water that reached this part of Field 5 from the north and east would

naturally drain into the existing ditch network located to the east of Field 5. This is indicated on Figure AE.5 between approximate chainages 126 m and 148 m.

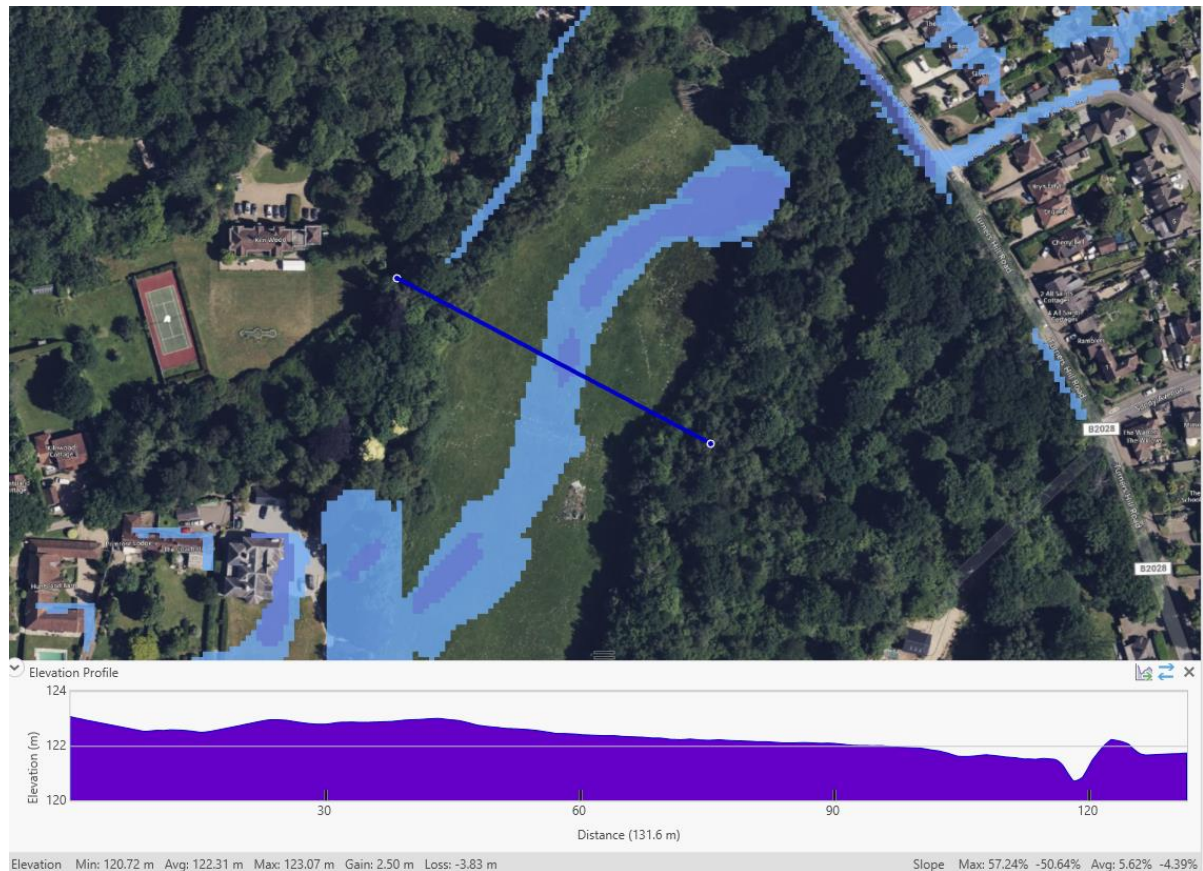


Figure AE.6: Field 5 Long Section 4

The cross section profile presented in Figure AE.6 shows the topography of the dark blue line drawn in the above related image, as it moves across the land from approximately northwest to southeast.

The dark blue line measures approximately 132 m in length. Toward the southeast end of the line, at a chainage of approximately 119 m, the elevation stands at approximately 120.7 m AOD. This is at the base of the existing ditch to the east of Field 5 toward which the topography is shown to fall. The area is not shown to be at risk. At a chainage of approximately 73 m, where the area at a Medium risk of surface water flooding is met, the elevation stands at approximately 122.3 m AOD.

It is not considered realistic for the area at a higher elevation to be at a higher surface water flood risk than that further southeast along the line.

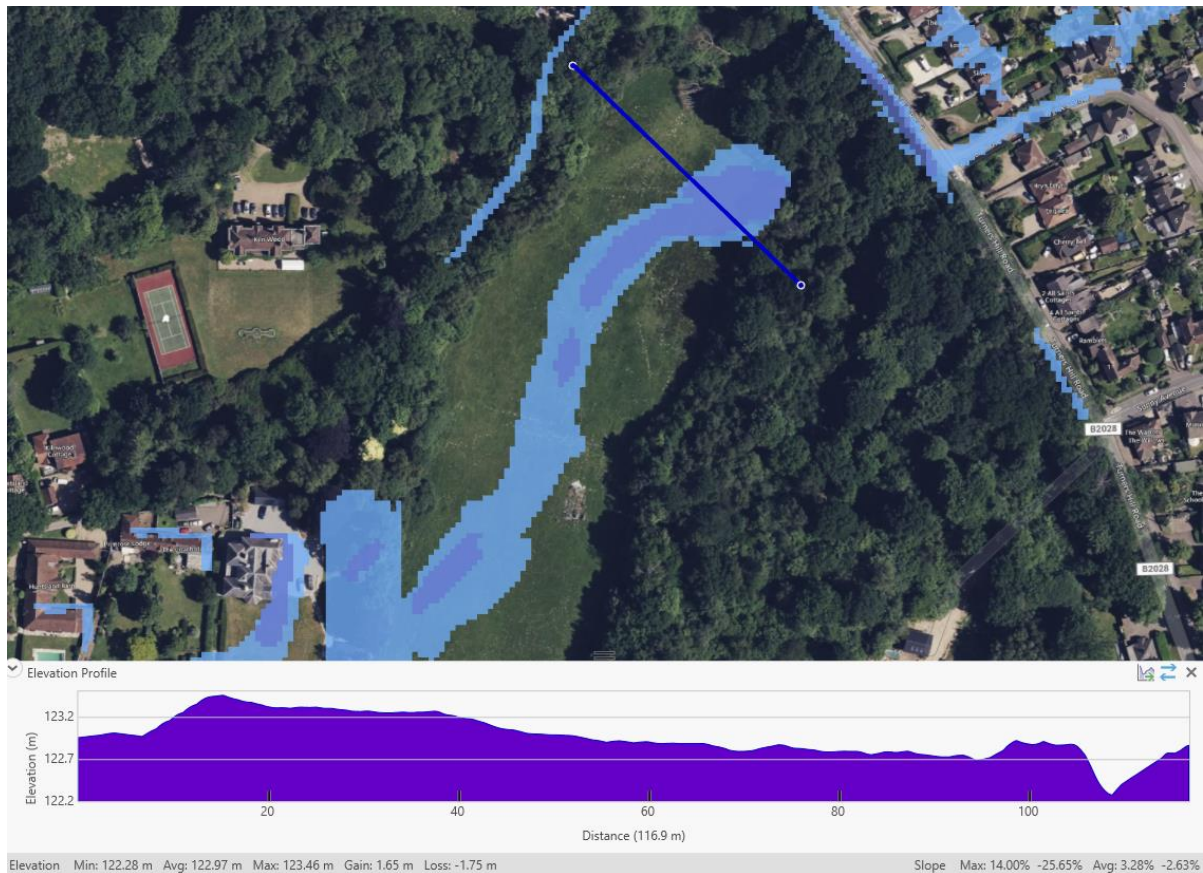


Figure AE.7: Field 5 Long Section 5

The cross section profile presented in Figure AE.7 shows the topography of the dark blue line drawn in the above related image, as it moves across the land from approximately northwest to southeast.

The dark blue line measures approximately 117 m in length. Toward the southeast end of the line, at a chainage of approximately 95 m, the elevation stands at approximately 122.7 m AOD. At a chainage of approximately 86 m, where the area at a Medium risk of surface water flooding is met, the elevation stands at approximately 122.8 m AOD.

It is not considered realistic for the area at a higher elevation to be at a higher surface water flood risk than that further southeast along the line. The existing ditch to the east of Field 5, indicated on Figure AE.7 at a chainage of approximately 109 m, stands at its base at an elevation of approximately 122.3 m AOD. This ditch is not shown to be at risk of surface water flooding despite its low level.

In addition to the above, maintenance and debris removal works have been undertaken in this area of the site to de-silt the existing ditch network as this was observed onsite to be silted up to a significant level. This will increase future capacity for surface water runoff from Turners Hill

Road. A regular maintenance regime has been recommended as part of the site wide surface water drainage strategy to ensure no silt build-up in the future.

Furthermore, as part of the surface water drainage strategy, a new network of swales and surface water attenuation areas have been proposed for Field 5 along the entire eastern corridor which will capture any overland runoff from the existing ditches in the event these were to overflow.

Furthermore, among mitigation measures recommended for the management of surface water, all Finished Floor Levels and threshold levels are proposed to be raised between 150 mm and 200 mm above surrounding ground levels.



Figure AE.8: Existing Watercourses



Figure AE.9: Existing Watercourses Banks with 3m Buffers Indicated