Lindenwood
Chineham Business Park, Basingstoke

Flood Risk Assessment and Drainage Strategy

For

Aviemore Trustee Ltd

motion

Document Control Sheet

Lindenwood

Chineham Business Park, Basingstoke

Aviemore Trustee Ltd

This document has been issued and amended as follows:

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8th December 2023	Final	Laura Jagiela	Chris Gray
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1.0 Introduction

1.1 This flood risk assessment (FRA) and drainage strategy has been produced by Motion on behalf of Aviemore Trustee Ltd to support the planning application for four commercial units at Lindenwood, Chineham Business Park. A layout of the proposed redevelopment can be seen in **Appendix A**.

1.2 The site location plan can be seen in **Appendix B**.

1.3 The 1.6 ha site is located within Flood one 1 according to the Environment Agency's (EA's) Flood Map for Planning (**Appendix C**).

1.4 The EA's Risk of Flooding from Surface Water (RoFSW) map for the site can be found in **Appendix D**. This shows that the majority of the site is in an area at very low surface water flood risk (less than a 1 in 1,000-year annual exceedance probability (AEP) of flooding). There are comparatively small areas of low surface water flood risk (between 1 in 100 and 1 in 1,000-year AEP of flooding) within the site.

1.5 As the buildings where the floor space is to be created are 1,000 square metres or greater, the development is classified as major. A major development has the potential to generate surface water runoff and increase flood risk in an area, and as such, a drainage strategy is required to demonstrate how the development will manage and discharge surface water generated in all rainfall events up to and including the 1 in 100-year □40□ storm.

1.6 Therefore this FRA and drainage strategy has been produced to discuss the flood risks to the proposed development, from all sources. This FRA and drainage strategy will also define how the site will manage its surface water so that the development does not increase flood risk in the area or to neighbouring properties/land.

1.7 This FRA and drainage strategy follows the guidance set out in:

- National Planning Policy Framework (NPPF)
- Planning Practice Guidance (PPG) to the National Planning Policy Framework
- CIRIA SuDS Manual 2015 (C753)
- Environment Agency Rainfall Runoff Management for Developments
- Non-Statutory Technical Standards for SuDS (NSTS)

1.8 This FRA and drainage strategy report pertains only to the design of the drainage system for the built site. It does not provide details of how the site will be drained during the construction phase. This is considered to be temporary works and can only be prescribed and provided by the eventual appointed contractor.

1.9 Similarly, this report does not provide information on how the drainage infrastructure will be protected during the construction phase of the project. The provision of this information is, again, the responsibility of the appointed contractor.

2.0 Site Description

Table 2.1 – Site Summary

Site Name	Lindenwood
Location	Chineham Business Park, Basingstoke
Grid Reference	SU 65013 55579
Site Area	The red line boundary of the development is 16,022 m^2 (1.6 ha)
Development Type	Redevelopment the site to provide four commercial units.
Flood Zone	Flood □one 1
Flood Risk Vulnerability Classification	Less Vulnerable
Surface Water Flood Risk	Very Low Risk
Local Water Authority	Thames Water
Local Planning Authority	Basingstoke and Deane Borough Council
Lead Local Flood Authority	Hampshire County Council

Site Location and Description

2.1 The red line boundary of the site is around 1.6 hectares, and the existing site is accessible from Crockford Lane. The site location plan can be seen in **Appendix B**.

2.2 The site currently consists of five buildings, providing office spaces across seven units.

2.3 The proposed redevelopment of the site will provide four commercial units. The proposed site plan can be seen in **Appendix A**.

Topography

2.4 A topographic survey has been carried out for the site and can be seen in **Appendix E**.

2.5 The site appears to have a high point of around 72.80 metres Above Ordnance Datum (m AOD) at the south west corner of the site and a low point of around 71.50 m AOD at the north east corner of the site.

Geology

2.6 The British Geological Survey (BGS) online 1:50,000 GeoIndex[1] mapping identifies the underlying bedrock geology as London Clay Formation – Clay, Silt and Sand. This is described as bioturbated or poorly laminated, blue-grey or grey-brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt with some layers of sandy clay[2]. There is no listed superficial geology.

2.7 Defra's Magic Map application[3] lists the soil as being slowly permeable seasonally wet slightly acid but base-rick loamy and clayey soils.

[1] https://www.bgs.ac.uk/map-viewers/geoindex-onshore/
[2] https://webapps.bgs.ac.uk/lexicon/lexicon.cfm□pub□LC
[3] Magic Map Application (defra.gov.uk)

2.8 The nearest borehole log in the BGS Geoindex website (SU65NE73) is around 645m to the south-east of the site. The borehole encountered topsoil to around 0.40m below ground level (m bgl)□medium dense chalk, broken brick, general builders waste' to between 0.40 and 0.60 m bgl□and firm brown grey mottled silty clay' between 0.60 and 2.00 m bgl. The trial pit was recorded to have remained dry.

Hydrogeology

2.9 Groundwater Source Protection ones (SP s) are defined around groundwater abstraction sources such as wells, boreholes and springs that are used for public drinking water supply.

2.10 SP 's show the risk of contamination to groundwater from any activities that might cause pollution in the area. The closer the activity to the source of abstraction, the greater the risk. The maps show three main □ones□inner – □one 1□outer – □one 2□and total catchment – □one 3.

2.11 Defra's Magic Map was reviewed to see where the site is in relation to the Groundwater SP 's, and the site is not within any SP 's.

2.12 Defra's Magic Map application lists the solid geology as an unproductive aquifer. The Groundwater Vulnerability Map (England) classification is unproductive.

Infiltration Potential

2.13 The desk-based geology information in the section above indicates that infiltration is not feasible at the site.

2.14 Infiltration testing could be undertaken in line with BRE Digest 365 to obtain site-specific infiltration rates. However, in the event such details are required at the planning stage, this can be appropriately secured and controlled by way of condition (on the basis infiltration is unlikely to be feasible due to the presence of London Clay and the principle of surface water drainage by an alternative method has been demonstrated to be achievable).

Existing Drainage Regime

2.15 The ADP Utility Survey of the site in **Appendix F** shows that there is an extensive below ground surface water drainage system that diverts surface water from the roofs, roads and shared parking areas to an off-site outfall to the north of the site. This outfall was identified during a site visit on the 4 December 2023 to discharge into the ordinary water course (Petty Brook) that is located around 50m north of the site.

2.16 An asset location plan obtained from Thames Water can be seen in **Appendix G** and shows there are foul and surface water sewers located on the east side of Crockford Lane. From the ADP Utility Survey in **Appendix F** it can be expected that the foul water from the site discharges to TW manhole 0603.

Brownfield Runoff Rate

2.17 Brownfield runoff rates for the 1 in 1, 30 and 100 year 15-minute rainfall return periods have been estimated for the existing impermeable area indicated to be draining to the off-site outfall using the Modified Rational Method expressed as □ □ 2.78iA - 2.78 x rainfall intensity (mm/hr) x Area (ha). Based on rainfall intensities of 30.54, 76.30 and 95.62 mm/hr and an estimated impermeable area of 1.167ha, the 1 in 1, 30 and 100 year brownfield runoff rates to the surface water sewer are estimated to be around 99, 247 and 310 l/s.

Hydrology

2.18 An ordinary watercourse is located around 50m north/north east of the site, the Petty Brook.

2.19 The Petty Brook appears to become a main river around 800m east of the site[4].

[4] https://www.arcgis.com/apps/webappviewer/index.html?id=17cd53dfc524433980cc333726a56386

3.0 Legislative and Policy Framework

3.1 The Flood and Water Management Act 2010 (FWMA) received Royal Assent on 8th April 2010. The Act was introduced to enforce some of the key proposals set out within U☐ Government flood and water strategies along with U Government's response to the Sir Michael Pitt's Review of the summer 2007 floods.

3.2 LLFA's have a responsibility under the FWMA to develop, maintain, apply and monitor the application of a strategy for local flood risk in their area. Local flood risk is defined as flood risk arising from local sources, such as surface run-off, groundwater and ordinary watercourses (i.e. non-main rivers). The EA plays a role in managing, maintaining and regulating activity around the watercourses designated as main-rivers'.

3.3 Relevant to the site, the FWMA encourages the uptake of SuDS by removing the automatic right to connect to sewers and providing for LLFA's to adopt SuDS for new developments.

3.4 This report will provide a review of SuDS opportunities and constraints for the development and recommend a sustainable drainage strategy that will employ the highest available tiers of the drainage hierarchy. Thus, this report will adhere to the Act through looking to use SuDS as a fundamental element of the surface water drainage system.

The Environment Agency Flood Map for Planning

3.5 The EA's Flood Map for Planning gives an indicative prediction of areas at risk of fluvial and tidal flooding. The mapping is an amalgamation of modelled flood outlines and historical flood events outlines.

3.6 The Flood Map is split into Flood ones', which demarcate the extent of flooding from rivers or the sea for different return periods. The Flood Map for Planning shows the extent of the natural floodplain if there were no defences or other man-made structures in place.

3.7 Table 3.1, below, lists the flood ☐one categories and explains the flood risk probabilities they represent.

Table 3.1 – Flood Zone Categories

Flood Zone	Definition
☐one 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as clear' on the Flood Map – all land outside ☐ones 2 and 3)
☐one 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding☐or land having between a 1 in 200 and 1 in 1,000 annual probability of tidal flooding. (Land shown in light blue on the Flood Map)
☐one 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding☐or Land having a 1 in 200 or greater annual probability of tidal flooding. (Land shown in dark blue on the Flood Map)
☐one 3b The Functional Floodplain	This ☐one comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their SFRAs areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from ☐one 3a on the Flood Map, but may be distinguished in Product 4 information, for example). Following the 2022 update to the NPPF, Flood ☐one 3b is considered to be anywhere within the 1 in 30-year flood event outline.

The National Planning Policy Framework

3.8 The NPPF sets out the Government's national policies on different aspects of land use planning in England in relation to flood risk. The Planning Practice Guidance (PPG) to the NPPF provides further information

on the policies set out in the NPPF. It encourages development to take place in areas of lower flood risk wherever possible and stresses the importance of preventing increases in flood risk off-site to the wider catchment area. This includes ensuring that flood risk is taken into account at all stages of the planning process, avoiding inappropriate development in areas at risk of flooding and directing development away from those areas where risks are the highest.

3.9 A site-specific FRA is required for proposals of 1ha or greater in Flood □one 1, all proposals for development in Flood □ones 2 and 3, or in an area within Flood □one 1 that has critical drainage problems (as notified to the local planning authority by the EA).

3.10 The FRA should identify and assess the risks of all forms of flooding to and from the development and demonstrate how these flood risks will be managed so that the development remains safe throughout its lifetime, taking climate change into account.

3.11 Within each Flood □one, a key factor in determining planning applications for development is the flood risk vulnerability of a development. The PPG to the NPPF categorises different development types according to their vulnerability to flooding. These categories are:

- Essential infrastructure□
- Highly vulnerable development□
- More vulnerable development□
- Less vulnerable development□and□
- Water-compatible development.

3.12 The proposed development at Lindenwood is considered to be ‘less vulnerable’ development.

3.13 Within the different Flood □ones each of the above development categories are considered appropriate or not permissible. The PPG to the NPPF lists these as:

Flood Zone 1:

- All the development categories listed above are appropriate.

Flood Zone 2:

- Water-compatible, less vulnerable development, more vulnerable development and essential infrastructure is appropriate in this □one.

Flood Zone 3a:

- Water-compatible and less vulnerable development is appropriate in this □one. Highly vulnerable development should not be permitted in this □one.

Flood Zone 3b:

- Only water-compatible development and essential infrastructure that has to be there should be permitted in this □one.

3.14 The above information sets out the basis by which developments must be assessed in terms of flood risk. Later in this report, the development proposals at Lindenwood will be reviewed against the Flood □one in which they are located, and an assessment will be made of the appropriateness of the development, as per the advice within the PPG to the NPPF.

Lead Local Flood Authority

3.15 As of April 2015, the LLFA became a statutory consultee on all major planning applications. The LLFA is required to assess planning applications in respect of surface water drainage and sustainable drainage systems. Hampshire County Council is the LLFA for Lindenwood, Chineham Business Park.

4.0 Current Flood Risk

4.1 Flooding can arise from a variety or combination of sources. These may be natural, or artificial and may be affected by climate change. These are discussed, below, in the following two sections and are summarised in Table 6.1, which is in Chapter 6.

Tidal Flooding

4.2 The site is not in proximity of a tidally influenced river, therefore Lindenwood cannot be considered at risk of tidal flooding.

Fluvial Flooding

4.3 The EA's Flood Map for Planning (**Appendix C**) shows that Lindenwood is within Flood Zone 1, which means it is outside the 1 in 1,000-year flood event outline (Flood Zone 2).

Flood Risk and Appropriateness of the Proposed Development

4.4 According to the classifications in the NPPF the site is considered to be 'less vulnerable'.

4.5 Table 3 of the PPG to the NPPF (see below) states that 'less vulnerable' development is appropriate in Flood Zone 1, thus the proposed development is appropriate in this location.

Table 3 of the NPPF – Flood Risk Vulnerability and Flood Zone Compatibility

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Key:

✓ Development is appropriate

✗ Development should not be permitted.

Surface Water Flooding

4.6 Surface water, or pluvial flooding, results from rainfall-generated overland flow, where rainwater has not yet reached a watercourse or sewer and where the local drainage systems become overwhelmed. Pluvial flooding often occurs during short, very intense storms, but can also occur during longer periods of rainfall when the ground is already saturated, or where land has low permeability due to development.

4.7 In these conditions surface water can build up where the topography allows it to converge or pond. Where it gathers it will travel down prevailing gradients. Pluvial flooding then occurs at locations where significant surface water flow paths converge, at localised low points and/or due to overland obstructions. In urban areas pluvial flooding often occurs where the built environment channels overland flow routes (down roads that are bounded by kerbs, for example) or where there are obstacles to the natural overland flow routes. Boundary walls and buildings are often the main causes and, hence, the likelihood of pluvial flooding to impact property and built-up areas.

4.8 Pluvial flooding is exacerbated in many cases by the mistreatment or failure of the below ground infrastructure (including partial or full blockages of gullies and/or within the combined sewers and the accumulation of fats, oils and greases within the sewer networks).

4.9 The EA's Risk of Flooding from Surface Water (RoFSW) map for the site can be found in **Appendix D**. This shows that the majority of the site is in an area at very low surface water flood risk (less than a 1 in 1,000-year annual exceedance probability (AEP) of flooding). There are comparatively small areas of low surface water flood risk (between 1 in 100 and 1 in 1,000-year AEP of flooding) within the site.

4.10 Therefore, the site can be concluded as having a low risk of surface water flooding.

Groundwater Flooding

4.11 There are no flood risk maps for groundwater, as stated by the Environment Agency in their 2011 guidance note flooding from groundwater'. Mapping products currently available only show areas where the geological and hydrogeological conditions may combine to cause groundwater flooding, but they should not be considered as groundwater flood risk maps. They only show susceptibility to groundwater flooding.

4.12 There are several mapping products that depict areas that may be susceptible to groundwater flooding, but they are not comparable in detail to the risk maps developed for fluvial, tidal and surface water, such as those used by practitioners and risk management authorities to support planning decisions. The mapping does not show the likelihood of groundwater flooding occurring and can only be considered as a ha□ard, but not a risk-based dataset.

4.13 BGS mapping has identified that the development site is underlain by London Clay Formation – Clay, Silt and Sand and the Groundwater Vulnerability Map (England) classification is unproductive.

4.14 Figure 8[5] in the Basingstoke and Deane Borough Council Level 1 Strategic Flood Risk Assessment Revision 4 dated July 2021 (Level 1 SFRA) also indicates that the site is not in an area with susceptibility to groundwater flooding.

4.15 Therefore, the site can be concluded as having a low risk of groundwater flooding.

Flooding from Infrastructure Failure

4.16 Sewer flooding can occur when the capacity of the infrastructure is exceeded by excessive flows, or because of a reduction in capacity due to collapse, siltation, blockage, or if the downstream system becomes surcharged. This can lead to the sewers flooding onto the surrounding ground via manholes and gullies, which can generate overland flows.

4.17 Typically, sewer systems are constructed to accommodate rainstorms with a 30-year return period or less, depending on their age. Consequently, rainstorm events greater than 1 in 30-years would be expected to result in surcharging of some parts of the sewer system. In fact, due to most gullies being

[5] https://www.basingstoke.gov.uk/content/page/67633/Figure□208□20Susceptibility□20to□20Groundwater□20flooding.pdf

poorly maintained and often partially blocked with silt, leaves and other debris, their capacity is often estimated to be closer to the 1 in 10-year storm.

4.18 With reference to Figures 7a[6] and 7b[7] of the Level 1 SFRA that show the internal and external sewer flood incident records from the Flooding Database register supplied by Thames Water and Southern Water, the site is located in an area with no records of external flooding from sewers but within an area with four records of internal flooding from sewer.

4.19 On the basis surface water runoff from the proposed development site will continue to discharge into the ordinary water course (Petty Brook) at a controlled rate post development, it can be concluded the site has a low risk of infrastructure failure flooding.

4.20 Looking forward, the development's drainage must be designed in accordance with Sewers for Adoption, The Design and Construction Guidance (DCG), Building Regulations Approved Document Part H and BS EN 752 as appropriate. This will further minimise the future risk of flooding due infrastructure failure.

Flooding from Artificial Sources

4.21 The EA Maximum extent of flooding from reservoir map shows in **Appendix H** shows the site is not at risk of reservoir flooding.

4.22 There are no other artificial sources of flooding (such as canals) in the vicinity of the site that could cause flooding.

Historic Flood Risk

4.23 Figure 5[8] of the Level 1 SFRA indicates the site is not in an area with records of historic flooding.

[6] https://www.basingstoke.gov.uk/content/page/67631/Figure□207a□20-□20External□20Sewer□20Flooding.pdf
[7] https://www.basingstoke.gov.uk/content/page/67632/Figure□207b□20-□20Internal□20Sewer□20Flooding.pdf
[8] https://www.basingstoke.gov.uk/content/page/67625/Figure□205-□20Historic□20Flooding.pdf

5.0 Future Flood Risk & Climate Change

5.1 The NPPF and the supporting Technical Guidance document sets out how flood risk should be considered over the lifetime of a development. This requires an increase in flood risk due to climate change to be taken into account. Both peak river flows and rainfall intensity should be assessed.

Peak River Flows

5.2 Because the site is in Flood □one 1, increases in future peak river flows do not need to be considered.

Peak Rainfall Intensity and Climate Change

5.3 As of May 2022, the NPPF's climate change rainfall increase predictions for developments was updated and is to be used with immediate effect. Whereas previous climate change parameters for rainfall increases used set values (20□ or 40□) across the U□ depending on the probable lifetime of a development, the latest climate change advice is determined by which catchment the development is within and every river catchment in the U□has different climate change rainfall increase predictions.

5.4 This is because the southeast of England tends to see heavier, stormier rainfall than the northwest, which tends to see longer rainfall events with less intensity. This, in combination with the prevailing geoenvironmental characteristics of each catchment, has determined the climate change increases that are to be used.

5.5 The other major change to the 2022 climate change rainfall predictions is that climate change increases should also be applied to the 1 in 30-year rainfall event, whereas previously it was only applied to the 1 in 100-year event. As such, the hydraulic modelling for the proposed development will also apply a climate change increase to the 1 in 30-year rainfall event.

5.6 The site lies within the Loddon and Tributaries Management Catchment[9]. The 2022 peak rainfall climate change allowances are as follows in Table 5.1, below:

Table 5.1 – Climate Change Predictions for Loddon and Tributaries Management Catchment

1 in 30-year Rainfall Event	**Central Allowance**	**Upper End Allowance**
2050's epoch	20□	35□
2070's epoch	25□	35□
1 in 100-year Rainfall Event	**Central Allowance**	**Upper End Allowance**
2050's epoch	20□	40□
2070's epoch	25□	40□

5.7 For non-residential developments, which could have a lifespan of at least 75 years[10], the 2070's epoch should be used and the NPPF advises that for developments with a lifetime beyond 2100, flood risk assessments should assess the upper end allowances for both the 1□ and 3.3□ annual exceedance probability events.

[9] https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall□mgmtcatid□3048
[10] https://www.gov.uk/guidance/flood-risk-and-coastal-change

5.8 Therefore, for the proposed development site, the climate change increase predictions that should be applied to the hydraulic model are 35☐ for the 1 in 30-year rainfall event and 40☐ for the 1 in 100-year event.

5.9 The site is currently in an area of very low surface water flood risk and, as such, even with the climate change increase predictions outlined above, it is very unlikely that surface water flood risk will increase on the site to the extent that the development would become inappropriate. Additionally, the drainage strategy for the development will take these latest climate change predictions into account so that the surface water generated in the 1 in 100-year ☐40☐ rainfall event will be attenuated on site and will not cause flooding locally or to neighbouring areas.

Residual Flood Risk

5.10 It is important to recognise that flood risk can never be fully mitigated and there will always be a residual risk of flooding. The residual risk is associated with several potential risk factors, including (but not limited to):

- A flood event that exceeds that for which the local flood defences or local drainage systems have been designed to withstand.
- A residual danger posed to property and life because of flood defences failure through overtopping or structural collapse.
- General uncertainties inherent in the prediction of flooding.

5.11 Modelling of flood events is not an exact science. Therefore, there is an inherent uncertainty in the prediction of flood levels and extents used in the assessment of flood risk. EA's Flood Map for Planning is largely based upon detailed modelling within the area. However, other mapping products require numerous assumptions to be made. Whilst they all provide a good depiction of flood risk for specific modelled conditions, all modelling requires the making of core assumptions and these might not occur in the open dynamic environment of a flood event. Also, the EA's Flood Map for Planning and other flood modelling is updated regularly. Interested parties are recommended to keep abreast of this so that a significant change or increase in flood risk can be determined.

The sequential and Exception Tests

5.12 The NPPF specifies that the suitability of all new development in relation to flood risk should be assessed by applying the Sequential Test to demonstrate that there are no reasonably alternative sites available in areas with a lower probability of flooding that would be appropriate to the type of proposed development.

5.13 As the site is within an area at low risk from all sources of flooding both now and in the future, the Sequential Test does not apply.

6.0 Summary of Flood Risk

6.1 Historic, current and future flood risk, from all sources, has been reviewed in the context of the proposed development at Lindenwood. A summary of these flood risks is summarised in Table 6.1, below.

Table 6.1: Summary of Flood Risk From All Sources

Flood Source	Risk Level				Comment
	High	Medium	Low	Very Low	
Fluvial				☐	Shown as Flood □one 1 on EA Flood Map.
Tidal				☐	In Tidal F□1.
Groundwater				☐	Not in an area with any susceptibility to groundwater flooding.
Surface Water			☐	☐	In an area of very low' to low' surface water flood risk.
Canals				☐	No canals in the local area.
Reservoirs				☐	The Reservoir Flood Risk Map shows that there are no reservoirs in the vicinity.
Infrastructure Failure				☐	No indication that local drainage infrastructure would cause elevated levels of flood risk.
Increase due to Climate Change			☐		Increased peak rainfall intensities are not expected to affect any infrastructure or properties.

7.0 Proposed Surface Water Drainage Strategy

Sustainable Drainage Strategy

7.1 Current planning policy and EA guidance requires developments to employ SuDS (Sustainable Drainage Systems) techniques wherever feasible. Careful design of SuDS features can ensure that a development's surface water drainage closely reflects the natural hydrology of the pre-developed site.

7.2 SuDS will attenuate and treat surface water run-off quantities at the source (source control) in line with NPPF and EA policies.

7.3 Source control systems treat surface water close to the point of origin, in features such as soakaways, permeable paving and swales, to name a few.

7.4 The key benefits of SuDS are as follows:

- Improving water quality over a conventional piped system by removing pollutants from diffuse pollutant sources (e.g., roads)☐
- Improving amenity through the provision of open green space☐
- Improving biodiversity through increased areas for wildlife habitat☐and
- Enabling a natural drainage regime that recharges groundwater (where possible).

7.5 SuDS provide a flexible approach to drainage, with a wide range of components from soakaways to large-scale basins or ponds. The individual techniques should be used where possible in a management train that mimics the natural pre-developed pattern of drainage.

Site Areas

7.6 The site areas to undergo development are to be assessed are as follows in Table 7.1:

Table 7.1 – Site Areas

Breakdown of site areas	Existing (ha)	Proposed (ha)	Increase / Decrease
Total Area	1.602	1.602	☐/ - 0
Dwellings / Buildings	0.279	0.508	☐0.229
Roads, Shared Parking and Hard Landscaping	0.888	0.721	- 0.167
Soft Landscaping	0.435	0.373	- 0.062
Total impermeable areas	**1.167**	**1.229**	**+ 0.062**
Total permeable areas	**0.435**	**0.373**	**- 0.062**

Greenfield Runoff Rate

7.7 The greenfield runoff rates have been calculated using HR Wallingford's U SuDS online calculator and are presented in Table 7.2, below. The greenfield runoff rates have been calculated from the proposed impermeable areas (1.229 ha), as these are the parts of the site that will positively drain into the on-site drainage infrastructure. For the purpose of the drainage design and hydraulic modelling, it has been assumed that the undeveloped parts of the site (gardens, verges, beds, etc.) will drain naturally by infiltration or that rainwater will be intercepted by vegetation.

7.8 The full greenfield runoff calculations can be seen in **Appendix I**.

Table 7.2 – Greenfield Runoff Rate/Volume – Total Impermeable Areas

Return Period	1 in 1	1 in 30	1 in 100	QBAR
Discharge Rate (l/s)	5.16	13.96	19.37	6.08

7.9 The calculated □BAR greenfield runoff rate is 6.08 l/s.

7.10 However, as discussed in Section 2.15, the ADP Utility Survey of the site in **Appendix F** shows that there is an extensive below ground surface water drainage system that diverts surface water from the roofs, roads and shared parking areas to an off-site outfall to the north of the site. This outfall discharges into the ordinary water course (Petty Brook) that is located around 50m north of the site.

7.11 Section 6 of the Level 1 SFRA states with regards to Basingstoke and Deane Borough Councils review of the Local Plan looking ahead to 2038 and part e) of Policy EM7 – Managing Flood Risk in the Local Plan (2011 to 2029) Adopted May 2016:

- part e)- It is recommended that this is reworded as follows: To attenuate surface water run-off on the site so that the run-off rate is no greater than existing for a greenfield site or if the site is previously developed, development actively reduces run-off rates and volumes as close as practicably possible to greenfield rates.

7.12 Based on proposed development constraints such as the invert level of the existing below ground surface water drainage system / outfall to the ordinary water course (Petty Brook)□tree root protection □ones□ and the expected larger operational vehicles (LGV/HGVs), the provision of attenuation and long term storage post development has been maximised. However, without increasing the proposed discharge rate from the estimated greenfield □BAR for all events up to the 100 year □40□ climate change critical rainfall event, it is not possible to demonstrate the development will manage and discharge surface water generated in all rainfall events. Therefore, a controlled discharge rate of 19.4 l/s based on the 1 in 100 year greenfield runoff rate is proposed for all events up to the 100 year □40□ climate change critical rainfall event. This discharge rate is around 20□ of the estimated 1 in 1 year 15-minute brownfield rainfall return period in Section 2.17.

7.13 The drainage strategy in **Appendix J** of this report proposes a New Surface Water HydroBrake Flow Control Chamber that will control discharge to 19.4 l/s for up to the 100 year □40□ climate change critical rainfall event to the existing below ground surface water drainage system / outfall to the ordinary water course (Petty Brook).

The Drainage Hierarchy

7.14 The NPPF states that opportunities to reduce overall flood risk should be sought and achieved through sustainable development and careful drainage design. This can be achieved through the layout and form of development, including green infrastructure and the appropriate application of sustainable drainage systems (SuDS). SuDS are designed to control surface water runoff close to where it falls and mimic natural drainage as closely as possible. They provide opportunities to:

- Reduce the causes and impacts of flooding□
- Remove pollutants from urban run-off at source□
- Combine water management with green space with benefits for amenity, recreation and biodiversity.

7.15 To deliver SuDS benefits and ensure that a development reduces overall flood risk, there is an established hierarchy of surface water drainage methods that should be considered. The most preferable and sustainable are at the top and the least preferable and least sustainable at the bottom.

7.16 The drainage hierarchy is a sequential check that intends to ensure that all practical and reasonable measures are taken to manage surface water as high up the hierarchy (with 1' being the highest) as possible, and that the amount of surface water managed at the bottom of the hierarchy is minimised. The Planning Practice Guidance to the National Planning Policy Framework (NPPF) states that ***"Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable".***

7.17 The drainage hierarchy presented in the NPPF presents only four tiers of drainage options. This has been expanded on and adopted by others and now can be viewed as the following:

1. Store rainwater for later use
2. Use infiltration techniques, such as porous surfaces in non-clay areas
3. Attenuate rainwater in ponds or open water features for gradual release
4. Attenuate rainwater by storing in tanks or sealed water features for gradual release
5. Discharge rainwater direct to a watercourse
6. Discharge rainwater to a surface water sewer/drain
7. Discharge rainwater to the combined sewer
8. Discharge rainwater to the foul sewer

7.18 Developers should not choose the method that is the most convenient or represents the lowest cost. LPA's, LLFA's and Water Authorities may enforce the surface water drainage hierarchy and demand that the highest practicable tier of the hierarchy is used.

7.19 The first two tiers of the drainage hierarchy ensure that surface water is retained within the site boundary and does not increase flood risk to others. This is always the most preferable method of surface water management.

7.20 The next six tiers of the hierarchy provide regional control, but with decreasing levels of pollution removal and reduced potential for amenity and habitat creation.

7.21 Within the lower six tiers of the drainage hierarchy, there must be some form of flow restriction, so that off-site surface water discharge resembles greenfield runoff rates, as much as is reasonably practicable. This requires on-site storage facilities, which may include ponds, swales, subsurface storage tanks and System C (non-infiltration) permeable paviours with flow control devices. Again, methods that provide the most potential for amenity and pollution removal should be favoured.

Drainage Strategy Overview

7.22 As discussed in Sections 2.13-2.14 of this report, site specific information indicates that infiltration is not feasible at the site. The drainage strategy for the site has been developed on the premise infiltration of surface water will not be viable.

7.23 Infiltration testing could be undertaken in line with BRE Digest 365 to obtain site-specific infiltration rates. However, in the event such details are required at the planning stage, this can be appropriately secured and controlled by way of condition (on the basis infiltration is unlikely to be feasible due to the presence of London Clay and the principle of surface water drainage by an alternative method has been demonstrated to be achievable).

7.24 Therefore, the drainage strategy for the development will look to use System C' no infiltration pervious pavements and geocellular attenuation storage for the discharge of surface water from the roofs, roads and parking areas. In the yard to the rear of the proposed buildings the surface water will drain to geocellular attenuation storage before passing thought a proprietary treatment device. All surface water

from the site will discharge to the water course north of the site at a controlled rate of 19.4 l/s for all events up to the 100 year □40□ climate change critical rainfall event.

7.25 It is proposed to use pervious pavements in all parking spaces. The Topographical Survey in **Appendix E** indicates that slopes with □5□ grade are achievable, which is suitable for pervious pavements.

7.26 The proposed layout of the drainage strategy can be seen in **Appendix J** of this report. This outlines the proposed drainage strategy for the development. With specific reference to each tier of the drainage hierarchy, the proposed drainage strategy is discussed, below.

Tier 1 – Store rainwater for later use

7.27 There is not the opportunity to store rainwater for later use at this site.

Tier 2 – Use Infiltration techniques, such as porous surfaces in non-clay areas

7.28 As discussed in Sections 2.13-2.14 of this report, site specific information indicates that infiltration is not feasible at the site. The drainage strategy for the site has been developed on the premise infiltration of surface water will not be viable.

7.29 Infiltration testing could be undertaken in line with BRE Digest 365 to obtain site-specific infiltration rates. However, in the event such details are required at the planning stage, this can be appropriately secured and controlled by way of condition (on the basis infiltration is unlikely to be feasible due to the presence of London Clay and the principle of surface water drainage by an alternative method has been demonstrated to be achievable).

Tier 3 – Attenuate rainwater in ponds or open water features for gradual release

7.30 It is anticipated that this tier of the drainage hierarchy will not be needed for surface water discharge.

Tier 4 – Attenuate rainwater by storing in tanks or sealed water features for gradual release

7.31 The drainage strategy for the development will look to use System C' no infiltration pervious pavements and geocellular storage for the attenuation and controlled discharge of surface water.

7.32 It is intended to use System C permeable pavements predominantly underlain by geocellular attenuation storage for the impermeable areas. The design features of the permeable paving / geocellular attenuation storage are as follows:

- Area: 795m^2
- 80mm Concrete Block Permeable Paviours (CBPP)
- 50mm Type 2/6mm Sharp Grit or Clean Sand
- Separating Geotextile
- 300mm Type 4/20 Coarse Graded Aggregate (CGA) Subbase (nominal porosity □30□)
- minimum 220mm Type 4/20 CGA Subbase / Separating Geotextile / 400-800mm geocellular storage suitable for minimum 650mm cover (**Appendix J**)
- Impermeable Separating Geomembrane at the Sides and Base (except where System B permeable pavements for the shared parking within the tree root protection □ones convey water to adjacent System C permeable pavements sub base)
- Sand blinding / bedding layer' external to the separating geomembrane at the base (Figure 21.4 of the CIRIA SuDS Manual)

7.33 Please note that the above depth of CGA has been designed on its hydraulic requirements and surface water storage capacity. At the detailed stage, the depth of the CGA, which forms the foundation of the pavement, may need to be refined once the bearing capacity of the sub-grade is known.

7.34 Surface water falling directly onto the permeable paviours will drain into the sub-base, percolating through the joints in the paviours and then through the sharp grit and the geotextile.

7.35 The System C permeable paviours will discharge to the existing below ground surface water drainage system via the geocellular storage suitable for a minimum 650mm cover.

7.36 On the basis more attenuation storage is required than what can be provided by the Type C pervious pavements, it will be necessary for additional geocellular attenuation storage suitable for minimum 900mm cover in the yard to the rear of the proposed buildings. The design features of the geocellular attenuation storage suitable for minimum 900mm cover are as follows:

- Dimensions: 11.5 x 32.0 x 0.4m (L x W x D)
- Completely wrapped by impermeable separating geomembrane
- Sand blinding / bedding layer' external to the separating geomembrane at the base (Figure 21.4 of the CIRIA SuDS Manual)

7.37 It is also intended to use System B permeable pavements for the shared parking within the tree root protection □ones. The design features for permeable paving are as follows:

- Area: 325m^2
- 80mm Concrete Block Permeable Paviours (CBPP) or similar
- 50mm Type 2/6mm Sharp Grit or Clean Sand or similar
- Separating Geotextile
- 100mm Type 4/20 CGA Subbase (nominal porosity □ 30□) with Terram Geocell or similar in tree root protection □one
- Separating Terram RootGuard or similar approved root protection geotextile to be laid along formation of coarse aggregate sub-base to prevent root ingress

Tier 5 – Discharge rainwater direct to a watercourse

7.38 The drainage strategy in Appendix J of this report proposes a New Surface Water HydroBrake Flow Control Chamber that will control discharge to 19.4 l/s for up to the 100 year □ 40□ climate change critical rainfall event to the existing below ground surface water drainage system / outfall to the ordinary water course (Petty Brook).

Tier 6 – Discharge rainwater to a surface water sewer/drain

7.39 It is anticipated that this tier of the drainage hierarchy will not be needed for surface water discharge.

Tier 7 – Discharge rainwater to the combined sewer

7.40 It is anticipated that this tier of the drainage hierarchy will not be needed for surface water discharge.

Tier 8 – Discharge rainwater to the foul sewer

7.41 It is anticipated that this tier of the drainage hierarchy will not be needed for surface water discharge.

Micro Drainage Hydraulic Modelling

7.42 The drainage system outlined above has been tested in MicroDrainage's Network hydraulic modelling module.

7.43 The results of the MircoDrainage hydraulic modelling for the proposed development can be seen in **Appendix K**.

7.44 The results of the hydraulic modelling show that the drainage strategy as outlined above can attenuate and discharge surface water generated in the 1 in 100-year □40□ rainfall event with flooding contained in the commercial yard / soft landscaped area to the north of the site. This manages flood risk on- and off-site and reduces overall local flood risk.

7.45 The impermeable areas will be constructed as pervious pavements. The Interpave document Guide to the Design, Construction and Maintenance of Concrete Block Permeable Pavements edition 6 states Concrete block permeable pavements reduce the volume of rainfall that flows out from them significantly and the time it takes for the water to flow out is much longer than for conventional drainage systems. Studies reported in CIRIA report C 582 (CIRIA, 2001) have shown that some 11□ to 45□ of rainfall flows out from the pavement during a rainfall event. Subsequently over the 2 to 4 days after an event, more water flows out to give a total outfall of between 55 and 100 '. On this basis, it is concluded that the long-term storage volumes provided by pervious pavements are likely to be more than what is indicated by the half drain times in the hydraulic calculations.

7.46 Adjacent areas of hardstanding will comply with building regulations and divert water away from the proposed buildings. The top surface of the pervious pavement should finish at least 150mm below any adjoining DPC level. Advice should always be sought from the manufacturer.

7.47 Therefore, this proposal is considered appropriate because the surface water drainage system manages flood risk on- and off-site and reduces overall local flood risk for the 1 in 100-year □40□ cc critical rainfall event.

8.0 Surface Water Runoff Quality

8.1 The NPPF states that the development should not have a detrimental impact on the environment, including the water environment. The technical guidance to the NPPF provides further advice on the benefits of ensuring runoff quality is to an appropriate standard.

8.2 The CIRIA SuDS Manual provides guidance on the treatment of surface water runoff. With regards to the proposed development, Table 4.3 of the CIRIA SuDS Manual rates the pollution ha□ard from roof water runoff as very low'. The only requirement for roof water runoff is the removal of gross solids and sediments, which would be achieved using catchpits and silt traps upstream of the permeable paviours and geocellular attenuation storage.

8.3 With regards to the remaining impermeable areas, Table 4.3 of the CIRIA SuDS Manual rates the pollution ha□ard from roads and shared car parking as low'. To mitigate a low' pollution ha ard, the CIRIA SuDS Manual recommends using a simple index approach in line with Section 26.7.1. This is discussed, below.

8.4 With regards to the commercial yard, Table 4.3 of the CIRIA SuDS Manual rates the pollution ha□ard from commercial yards as medium'. To mitigate a medium' pollution ha□ard, the CIRIA SuDS Manual recommends using a simple index approach in line with Section 26.7.1. This is discussed below.

8.5 Table 26.2 of the CIRIA SuDS Manual provides pollution ha□ard indices for different land use classifications. The land use classifications that require consideration for the proposed development site are in Table 8.1 below.

Table 8.1: Excerpt from Table 26.2 of CIRIA SuDS Manual

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-Carbons
Individual property driveways, residential car parks, low traffic roads (e.g. cul-de-sacs, home□ones and general access roads) with less than 300 traffic movements per day.	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g. hospitals, retail), all roads except lo traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7

8.6 To deliver adequate pollution treatment and mitigation, the CIRIA SuDS Manual recommends using a SuDS component that has a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution ha□ard index (for each contaminant type).

8.7 Table 26.3 of the CIRIA SuDS Manual provides indicative SuDS mitigation indices for each SuDS type when discharging to surface water. Table 8.2, below, which is an excerpt from Table 26.3, shows the mitigation index for Permeable pavement.

Table 8.2: Pollution Mitigation Indices for Permeable Pavements

Type of pollution removal component	Total Suspended Solids (TSS)	Metals	Hydro-Carbons
Permeable Pavement	0.7	0.6	0.7

8.8 The mitigation indices for a permeable pavement exceed those of the highest pollution hazard index figures from Table 8.1 for the low pollution hazard level.

8.9 The above evidence shows the permeable pavements will provide sufficient pollution mitigation, prior to discharge to surface water.

8.10 A proprietary treatment device will be provided downstream of the additional geocellular attenuation storage suitable for minimum 900mm cover in the yard to the rear of the proposed buildings to provide treatment for the medium pollution hazard level.

9.0 Urban Creep

9.1 An appropriate allowance should be made for urban creep throughout the lifetime of the development as per BS 8582:2013 Code of Practice for Surface Water Management for Developed Sites'.

9.2 In terms of impermeable areas, an uplift of 10□ should be applied to the proposed impermeable areas to account for future development that may increase areas of hardstanding.

9.3 However, the layout of the proposed redevelopment in **Appendix A** and Table 7.1 show that the proposed impermeable area will be around 75□ of the planning application site area. Once constraints such as tree root protection □ones and the new relocated bus layby are taken into account, it does not appear to be appropriate to uplift the impermeable areas, as urban creep will not occur on this development and the results of the MircoDrainage hydraulic modelling for the proposed development in **Appendix K** are considered worst case.

9.4 It is also noted that the Surface Water Checklist Guidance in Appendix M states Urban Creep is only applicable for residential developments and excludes flats or apartments'.

10.0 Residual Risk

10.1 Whilst the drainage strategy for the site has been designed to current standards, there would remain a small residual risk of flooding due to blockage or failure of on-site infrastructure. Therefore, appropriate and regular maintenance of the drainage infrastructure should be undertaken by the site management company or their agents (and the residents, where applicable).

10.2 To assist with this process, a Drainage Management and Maintenance plan has been prepared, which sets out the principles for the long-term management and maintenance of the proposed surface water drainage system on the development. The Drainage Management and Maintenance Plan can be seen in **Appendix L**.

10.3 The purpose of this document is to ensure that those responsible for site maintenance have a robust inspection and maintenance plan going forewords. This will help ensure the optimum operation of the surface water drainage system and that it will be regularly maintained for the lifetime of the development. This will contribute to reducing the risk of surface water flooding both on- and off-site.

10.4 Adjacent areas of hardstanding will comply with building regulations and divert water away from the proposed buildings. The top surface of the pervious pavement should finish at least 150mm below any adjoining DPC level. Advice should always be sought from the manufacturer.

11.0 Summary and Conclusion

11.1 This FRA and drainage strategy has been produced by Motion on behalf of Aviemore Trustee Ltd to support the planning application for four commercial units at Lindenwood, Chineham Business Park. A layout of the proposed redevelopment can be seen in **Appendix A**.

11.2 The 1.6 ha site is located within Flood one 1 according to the EA's Flood Map for Planning (**Appendix C**).

11.3 The EA's Risk of Flooding from Surface Water (RoFSW) map for the site can be found in **Appendix D**. This shows that the majority of the site is in an area at very low surface water flood risk (less than a 1 in 1,000-year annual exceedance probability (AEP) of flooding). There are comparatively small areas of low surface water flood risk (between 1 in 100 and 1 in 1,000-year AEP of flooding) within the site.

11.4 BGS mapping has identified that the development site is underlain by London Clay Formation – Clay, Silt and Sand and the Groundwater Vulnerability Map (England) classification is unproductive.

11.5 Figure 8[11] in the Basingstoke and Deane Borough Council Level 1 Strategic Flood Risk Assessment Revision 4 dated July 2021 (Level 1 SFRA) also indicates that the site is not in an area with susceptibility to groundwater flooding.

11.6 Therefore, the site can be concluded as having a low risk of groundwater flooding.

11.7 On the basis surface water runoff from the proposed development site will continue to discharge into the ordinary water course (Petty Brook) at a controlled rate post development, it can be concluded the site has a low risk of infrastructure failure flooding.

11.8 The EA Maximum extent of flooding from reservoir map shows in **Appendix H** shows the site is not at risk of reservoir flooding.

11.9 As discussed in Section 2.15, the ADP Utility Survey of the site in **Appendix F** shows that there is an extensive below ground surface water drainage system that diverts surface water from the roofs, roads and shared parking areas to an off-site outfall to the north of the site. This outfall discharges into the ordinary water course (Petty Brook) that is located around 50m north of the site.

11.10 Section 6 of the Level 1 SFRA states with regards to Basingstoke and Deane Borough Councils review of the Local Plan looking ahead to 2038 and part e) of Policy EM7 – Managing Flood Risk in the Local Plan (2011 to 2029) Adopted May 2016:

- part e)- It is recommended that this is reworded as follows: To attenuate surface water run-off on the site so that the run-off rate is no greater than existing for a greenfield site or if the site is previously developed, development actively reduces run-off rates and volumes as close as practicably possible to greenfield rates.

11.11 Based on proposed development constraints such as the invert level of the existing below ground surface water drainage system / outfall to the ordinary water course (Petty Brook)□tree root protection □ones□ and the expected larger operational vehicles (LGV/HGVs), the provision of attenuation and long term storage post development has been maximised. However, without increasing the proposed discharge rate from the estimated greenfield □BAR for all events up to the 100 year □40□ climate change critical rainfall event, it is not possible to demonstrate the development will manage and discharge surface water generated in all rainfall events. Therefore, a controlled discharge rate of 19.4 l/s based on the 1 in 100 year greenfield runoff rate is proposed for all events up to the 100 year □40□ climate change critical

[11] https://www.basingstoke.gov.uk/content/page/67633/Figure□208□20Susceptibility□20to□20Groundwater□20flooding.pdf

rainfall event. This discharge rate is around 20□ of the estimated 1 in 1 year 15-minute brownfield rainfall return period in Section 2.17.

11.12 As discussed in Sections 2.13-2.14 of this report, site specific information indicates that infiltration is not feasible at the site. The drainage strategy for the site has been developed on the premise infiltration of surface water will not be viable.

11.13 Infiltration testing could be undertaken in line with BRE Digest 365 to obtain site-specific infiltration rates. However, in the event such details are required at the planning stage, this can be appropriately secured and controlled by way of condition (on the basis infiltration is unlikely to be feasible due to the presence of London Clay and the principle of surface water drainage by an alternative method has been demonstrated to be achievable).

11.14 Therefore, the drainage strategy for the development will look to use System C' no infiltration pervious pavements□and geocellular attenuation storage for the discharge of surface water from the roofs, roads and parking areas. In the yard to the rear of the proposed buildings the surface water will drain to geocellular attenuation storage before passing thought a proprietary treatment device. All surface water from the site will discharge to the water course north of the site at a controlled rate of 19.4 l/s for all events up to the 100 year □40□ climate change critical rainfall event.

11.15 It is intended to use System C permeable pavements predominantly underlain by geocellular attenuation storage for the impermeable areas. The design features of the permeable paving / geocellular attenuation storage are as follows:

- Area: 795m^2
- 80mm Concrete Block Permeable Paviours (CBPP)
- 50mm Type 2/6mm Sharp Grit or Clean Sand
- Separating Geotextile
- 300mm Type 4/20 Coarse Graded Aggregate (CGA) Subbase (nominal porosity □30□)
- minimum 220mm Type 4/20 CGA Subbase / Separating Geotextile / 400-800mm geocellular storage suitable for minimum 650mm cover (**Appendix J**)
- Impermeable Separating Geomembrane at the Sides and Base (except where System B permeable pavements for the shared parking within the tree root protection □ones convey water to adjacent System C permeable pavements sub base)

11.16 On the basis more attenuation storage is required than what can be provided by the Type C pervious pavements, it will be necessary for additional geocellular attenuation storage suitable for minimum 900mm cover in the yard to the rear of the proposed buildings. The design features of the geocellular attenuation storage suitable for minimum 900mm cover are as follows:

- Dimensions: 11.5 x 32.0 x 0.4m (L x W x D)
- Completely wrapped by impermeable separating geomembrane
- Sand blinding / bedding layer' external to the separating geomembrane at the base (Figure 21.4 of the CIRIA SuDS Manual)

11.17 It is also intended to use System B permeable pavements for the shared parking within the tree root protection □ones. The design features for permeable paving are as follows:

- Area: 325m^2
- 80mm Concrete Block Permeable Paviours (CBPP) or similar

- 50mm Type 2/6mm Sharp Grit or Clean Sand or similar
- Separating Geotextile
- 100mm Type 4/20 CGA Subbase (nominal porosity □ 30□) with Terram Geocell or similar in tree root protection □one
- Separating Terram RootGuard or similar approved root protection geotextile to be laid along formation of coarse aggregate sub-base to prevent root ingress

11.18 The drainage strategy in **Appendix J** of this report proposes a New Surface Water HydroBrake Flow Control Chamber that will control discharge to 19.4 l/s for up to the 100 year □ 40□ climate change critical rainfall event to the existing below ground surface water drainage system / outfall to the ordinary water course (Petty Brook).

11.19 The results of the hydraulic modelling show that the drainage strategy as outlined above can attenuate and discharge surface water generated in the 1 in 100-year □40□ rainfall event with flooding contained in the commercial yard / soft landscaped area to the north of the site. This manages flood risk on- and off-site and reduces overall local flood risk.

11.20 Adjacent areas of hardstanding will comply with building regulations and divert water away from the proposed buildings. The top surface of the pervious pavement should finish at least 150mm below any adjoining DPC level. Advice should always be sought from the manufacturer.

11.21 Therefore, this proposal is considered appropriate because the surface water drainage system manages flood risk on- and off-site and reduces overall local flood risk for the 1 in 100-year □ 40□ cc critical rainfall event.

11.22 The proposed surface water drainage strategy is also able to mitigate all pollution ha□ards created on site using SuDS features with a proprietary treatment device provided downstream of the additional geocellular attenuation storage suitable for minimum 900mm cover in the yard to the rear of the proposed buildings to provide treatment for the medium pollution ha□ard level.

11.23 Residual risk has been addressed through the development of a drainage management and maintenance plan that provides a framework through which the site's drainage system should be managed in perpetuity.

11.24 In conclusion, the site is within an area at low risk from all sources of flooding both now and in the future and the surface water drainage system can manage flooding for the 1 in 100-year □ 40□ cc critical rainfall event. As such, flood risk and surface water management should not form an impediment to the progress of the planning application for the proposed development.

11.25 The completed LLFA Surface Water Checklist is included in **Appendix M**.

Appendix A

Proposed Site Plan

Rev	Date	Description	Drawn	Chk'd
A	21.11.23	Boundaries Amended	KO	CS
B	22.11.23	Lay-by amended	KB	CB

NORTH

0 2.5 5 7.5 10 12.5m

SCALE 1:250

Existing tree line to the boundary of the site and the adjacent woodland retained. Existing kerb line retained and reused as the edge of the new hardstanding area to mitigate any disruption to trees.

Existing trees and tree protection areas retained. The line of the new yard is defined to mitigate any impact on tree positions.

Existing parking area resurfaced and included as part of new yard for turning.

Existing block paving to car park retained as an area for refuse storage. Lightweight timber refuse stores to be included.

New fence line and gates to yard area

Tree preservation area from Arboricultural Report

Surveyed tree canopy line

Crockford Lane

New access on Crockford Lane subject to highway authority approval.

New relocated bus layby. Existing trees removed replaced as part of landscape enhancement works.

Site sign

Pedestrian link

Existing trees and perimeter landscape retained and enhanced. See separate landscape design information for details.

VeloSafe cycle storage lockers. Long Stay. 11 Lockers

Provision for 10 short stay cycle spaces. (5 cycle hoops)

Unit 1

Unit 2

Unit 3

Unit 4

90 Car park spaces

All entrance doors recessed to create clear circulation around the building.

Existing access into the site to be stopped up and new landscape included

Existing access retained. Radius of kerb modified to improve circulation.

New paving to pedestrian routes

G15 Thorn/Holly C2

13 Oak U

26 Oak C3

28 Ash C2

11 Ash U

G32 Shrubs C2

37 Lime C2

29 Oak C1

G3 Shrubs C2

G51 Box hedge C2

G1

G52 Shrubs C2

G54 Box hedge C2

STN2 E=465029.217 N=155624.557 HST=187

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Client

FRASERS PROPERTY

Project Title

Lindenwood Workshops

Chineham Business Park
Basingstoke

Drawing Title

Proposed Site Plan

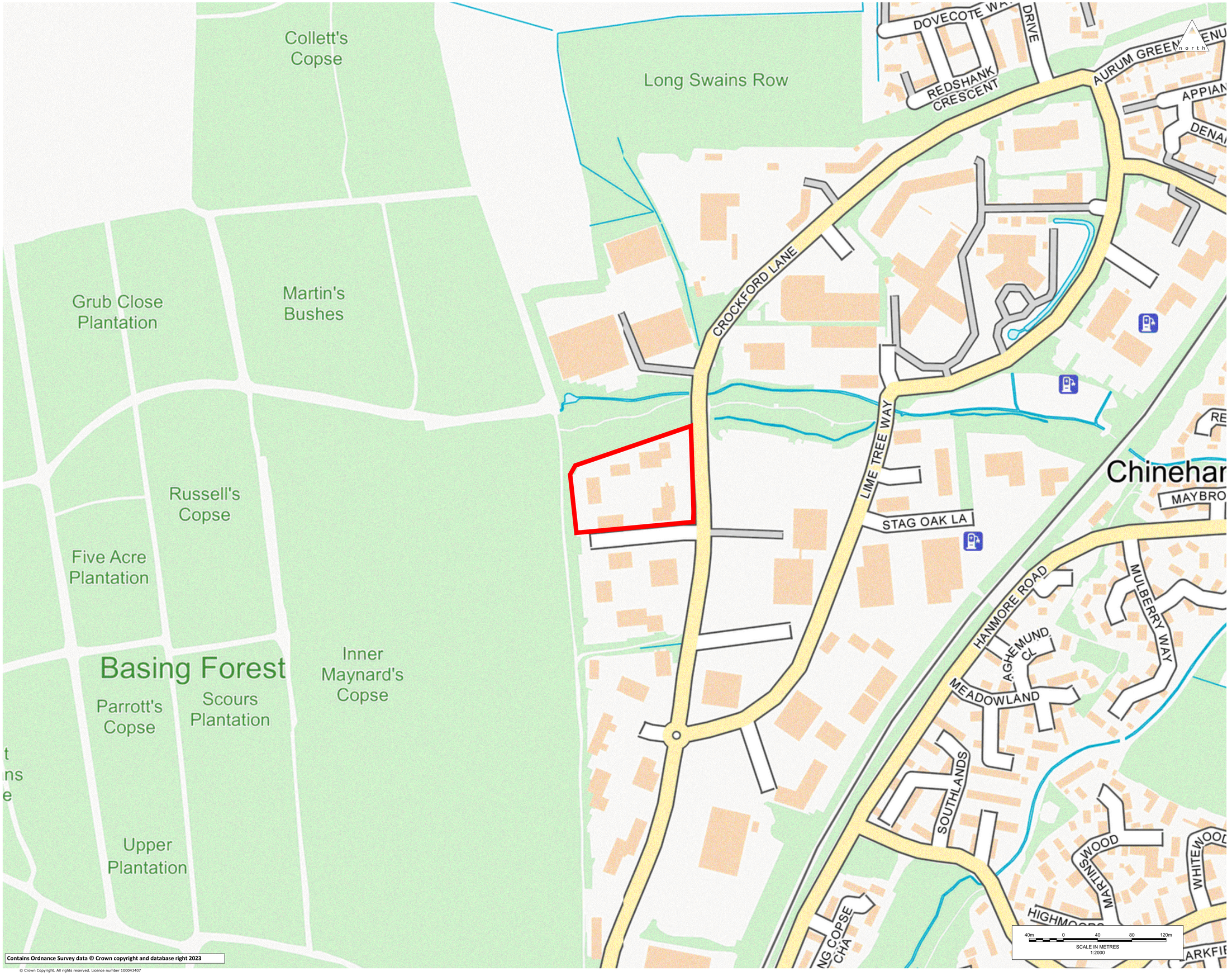
Drawn	Checked	Scale @A1	Status	Date
CC	CB	250	NA	12.23

Drawing Status	Rev.	THP Project No
Stage 3 Planning	C	18817

Project No.	Originator	Volume	Level	Type	Role	Number
18817	THPW	XX	XX	DR	A	106

Appendix B

Site Location Plan



C:\Users\LauraJagiela\Motion\Staff\Site - Frch4 2210020\Drawings\2210020-0010-01 [Location Plan].dwg

Revision	Notes	Drn	Chk	App	Date
A	First Issue	LJ	CG	JM	08/12/23

Drawing Status:
FINAL
FOR PLANNING

motion
Guildford - Reading - London
www.motion.co.uk

Client:
Aviemore Trustee Limited

Project:
Lindenwood, Chineham Business Park

Title:
Location Plan

Scale:	Size:	Project No:
1:2000	A1	2210020

Drawing: 2210020-0010-01

Revision: A

Appendix C

Environment Agency Flood Map for Planning

Flood map for planning

Your reference	Location (easting/northing)	Created
<Unspecified>	**465013/155591**	**16 Nov 2023 13:33**

Your selected location is in flood zone 1, an area with a low probability of flooding.

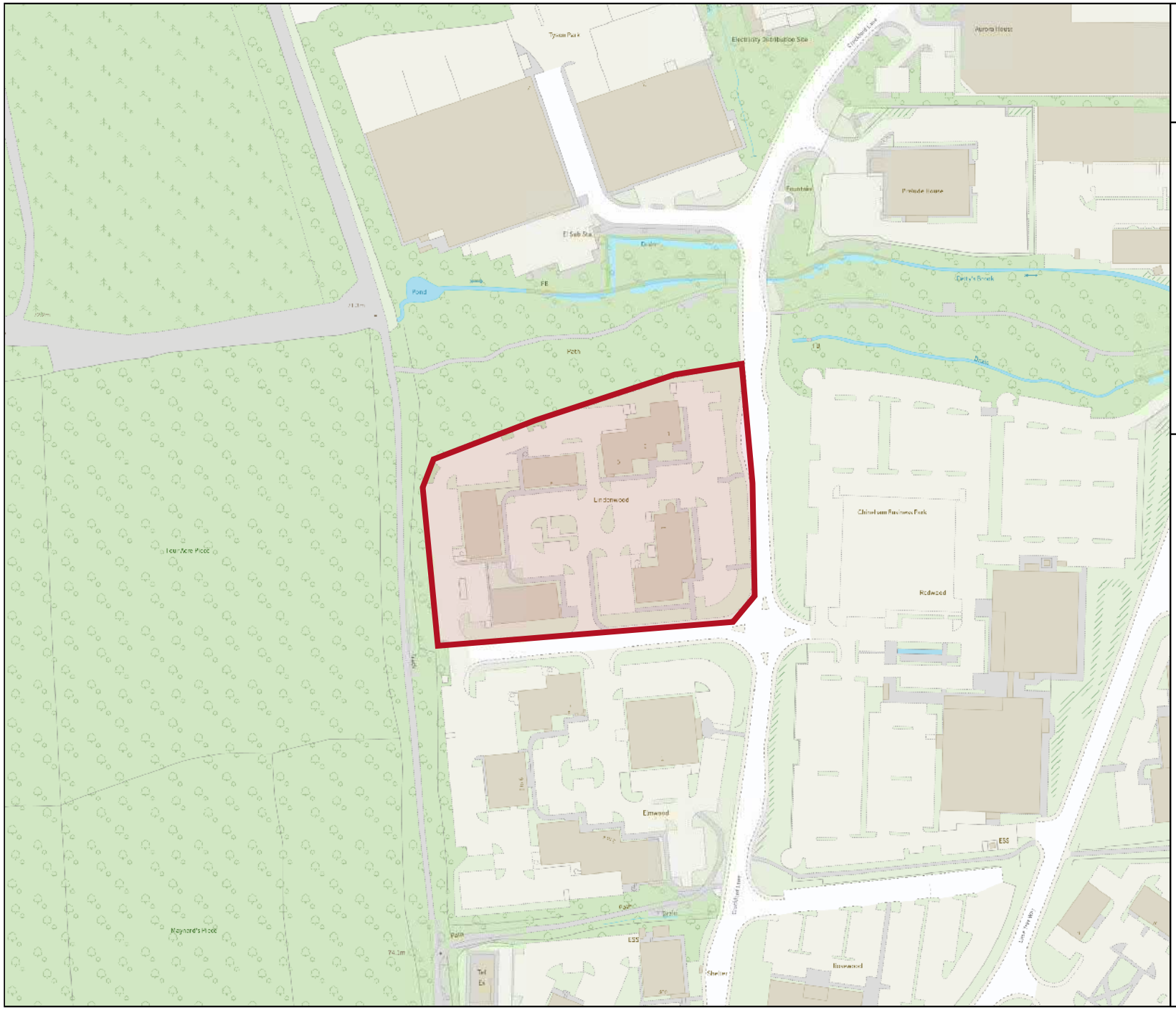
You will need to do a flood risk assessment if your site is **any of the following:**

- bigger that 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.



Environment Agency

Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
465013/155591

Scale
1:2500

Created
16 Nov 2023 13:33

- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 20 40 60m

Chris Gray

From: Enquiries_THM <enquiries_THM@environment-agency.gov.uk>
Sent: 22 November 2023 09:35
To: Laura Jagiela
Subject: THM 335284 Product 4 Flood Risk Assessment Data Request - Lindenwood

Follow Up Flag: Follow up
Flag Status: Completed

Dear Laura,

Thank you for your email requesting Product 4 data.

We unfortunately do not have any detailed flood risk modelling in this location. We are sorry that we are therefore unable to provide modelled flood levels and extents for your site.

The Flood Map for Planning in this location is likely to be based on JFLOW data which is not suitable for use in site specific Flood Risk Assessments. Please advise if you would like to request JFLOW data for this location.

You can access our flood map for planning on our website:

https://flood-map-for-planning.service.gov.uk/

You can find more information on the long term risk of flooding for this location on our website:

https://flood-warning-information.service.gov.uk/long-term-flood-risk

You can find recorded flood outlines for this location via the link below:

https://data.gov.uk/dataset/recorded-flood-outlines1

You can find out the risk of flooding from surface water for this location via the link below:

https://data.gov.uk/dataset/d5ca01ec-e535-4d3f-adc0-089b4f03687d/risk-of-flooding-from-surface-water-suitability

You may be interested in the following guidance / information publically available:

- 'Planning Practice Guidance' - provides information about planning considerations in areas at risk of flooding. https://www.gov.uk/government/collections/planning-practice-guidance
- 'Planning applications: assessing flood risk' - information about completing Flood Risk Assessments. https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications
- 'Site specific flood risk assessment: Checklist' – a checklist to help ensure you have considered all the relevant factors in your flood risk assessment. https://www.gov.uk/guidance/flood-risk-and-coastal-change#Site-Specific-Flood-Risk-Assessment-checklist-section

Please be aware that from 20th July 2021 the climate change allowances required in flood risk assessments have been updated. Please see https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#contents for more information.

I hope that we have correctly interpreted your request. Please refer to our Open Government Licence for the permitted use of the supplied data: http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

Please be aware that many of our datasets are now available online. Simply visit environment.data.gov.uk

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

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

Yours sincerely,

Customers & Engagement Team - Thames

(External: 0203 0259 804

8 enquiries_THM@environment-agency.gov.uk

+ Environment Agency | Red Kite House, Howbery Park, Wallingford, OX10 8BD

From: Laura Jagiela <ljagiela@motion.co.uk>
Sent: Thursday, November 16, 2023 1:35 PM
To: Enquiries_THM <enquiries_THM@environment-agency.gov.uk>
Subject: Product 4 Flood Risk Assessment Data Request - Lindenwood

Hi,

I would like to request a Product 4: Flood Risk Assessment Data request for a site.

Address: Lindenwood at Chineham Business Park, Basingstoke, RG24 8QY

Red line boundary see screen shot below.
Grid Reference: SU 65013 55581
What3words: raking.couriers.sprain

Kind Regards,

Laura Jagiela | Assistant Engineer

motion | 84 North Street, Guildford, GU1 4AU
t 01483 531300 | e ljagiela@motion.co.uk | w www.motion.co.uk
LinkedIn | Twitter

Appendix D

Risk of Flooding from Surface Water (RoFSW) Maps

Surface Water Flood Risk Map

Extent of flooding from surface water

High Medium Low Very low Location you selected

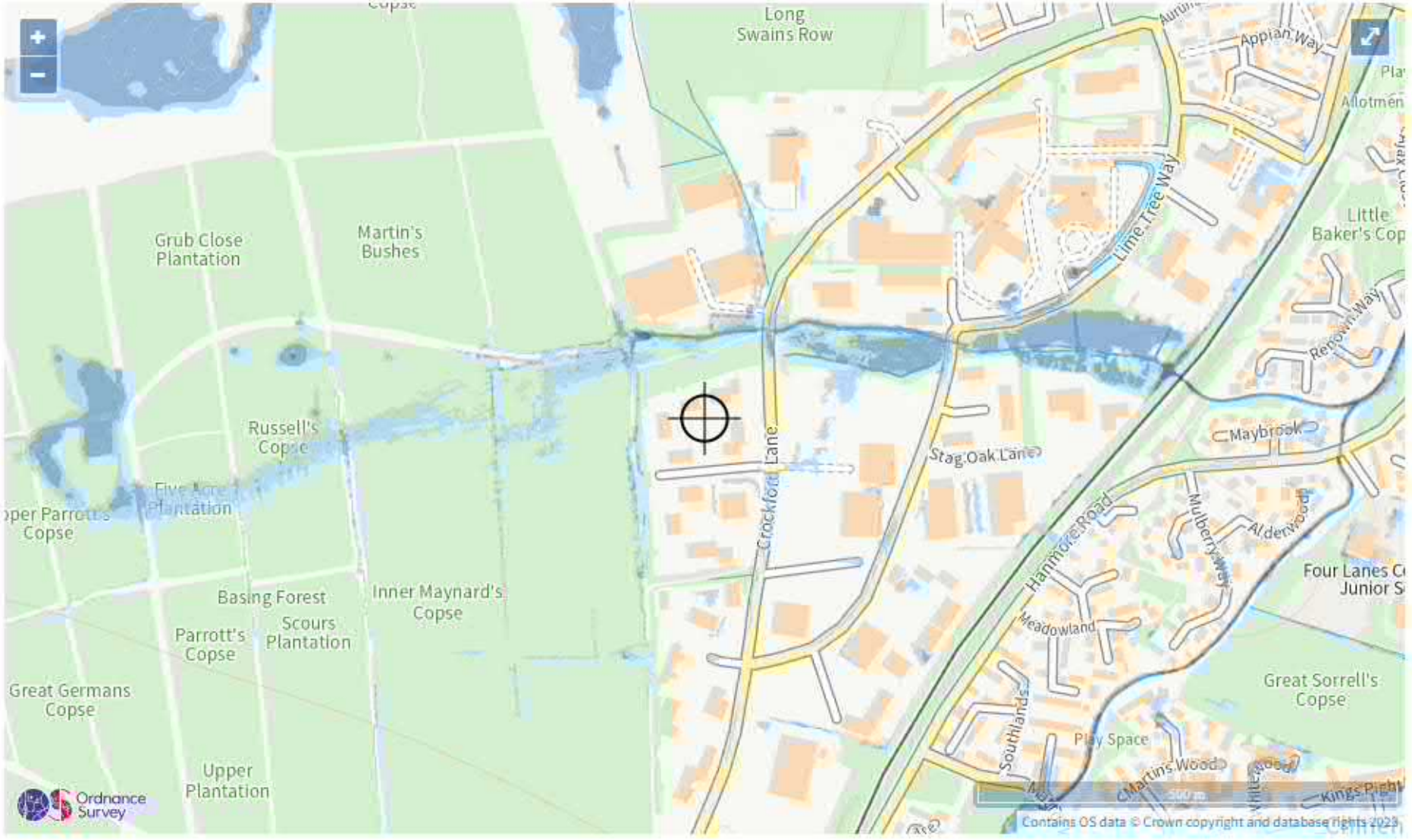
Surface Water Flood Risk: Water Depth in a Low Risk Scenario

Surface water flood risk: water depth in a low risk scenario

Flood depth (millimetres)

Over 900mm | 300 to 900mm | Below 300mm | Location you selected

Surface Water Flood Risk: Water Depth in a Medium Risk Scenario

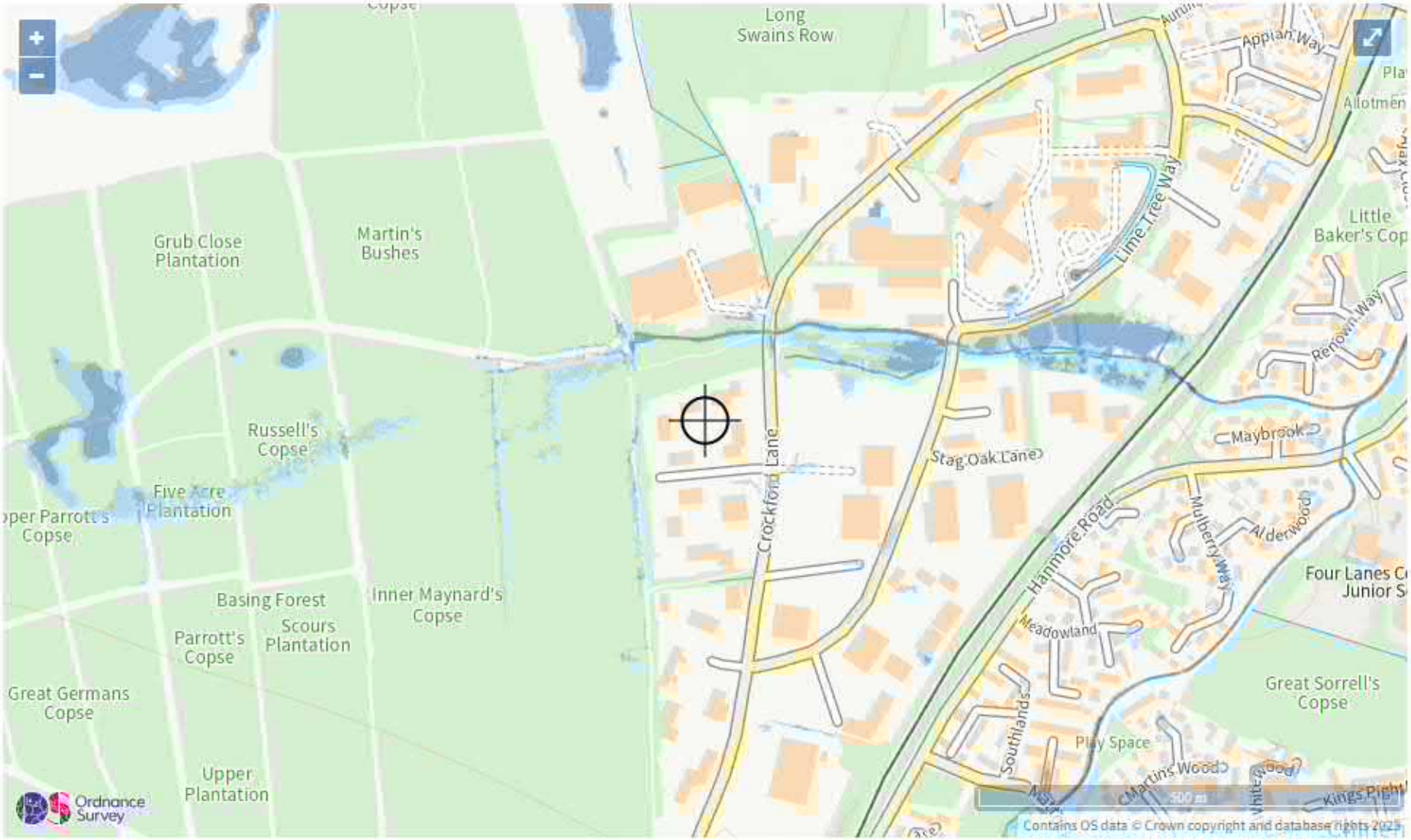


Surface water flood risk: water depth in a medium risk scenario

Flood depth (millimetres)

Over 900mm | 300 to 900mm | Below 300mm | Location you selected

Surface Water Flood Risk: Water Depth in a High Risk Scenario



Surface water flood risk: water depth in a high risk scenario

Flood depth (millimetres)

Over 900mm | 300 to 900mm | Below 300mm | Location you selected

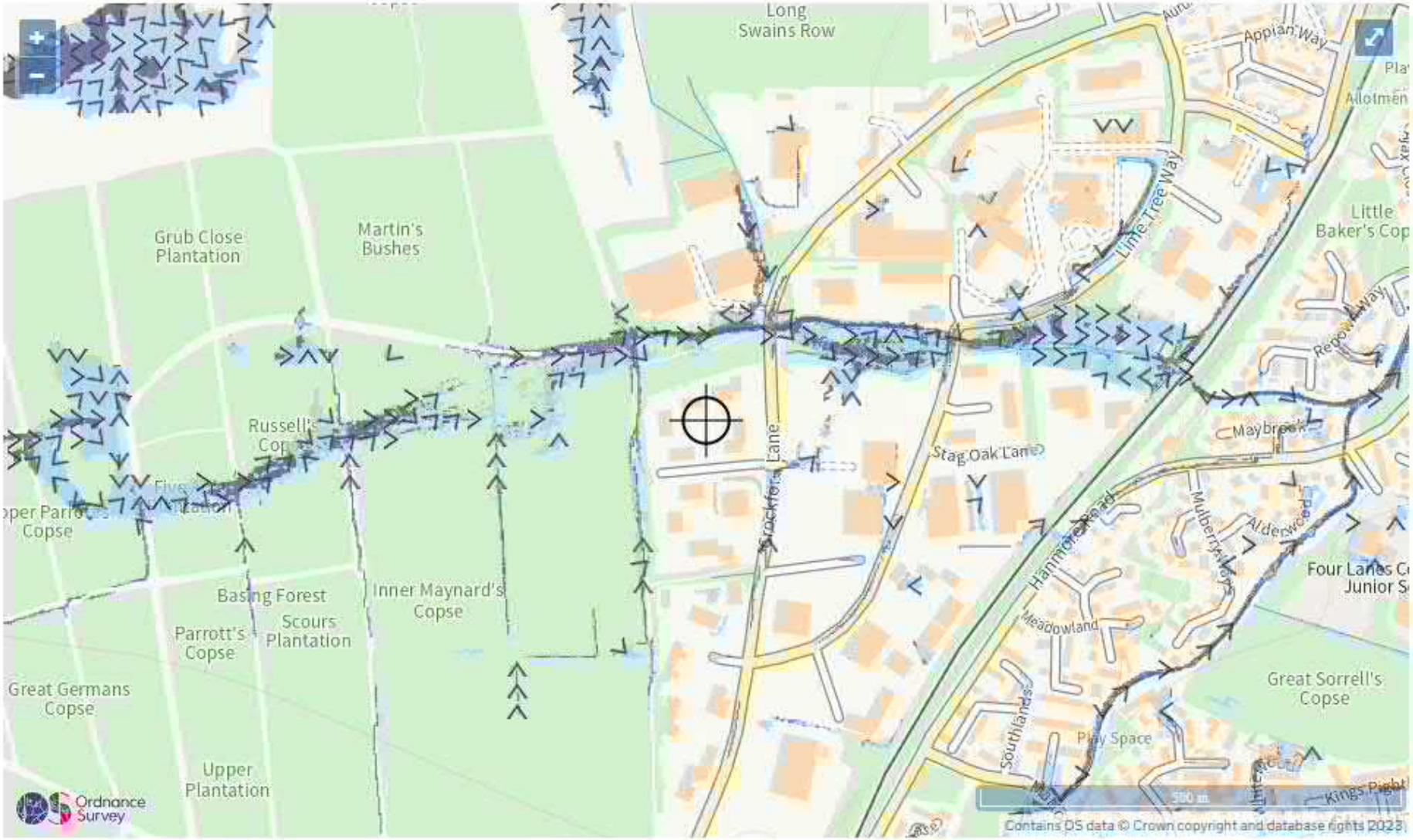
Surface Water Flood Risk: Water Velocity in a Low Risk Scenario

Surface water flood risk: water velocity in a low risk scenario

Flood velocity (metres/second)

Over 0.25 m/s | Less than 0.25 m/s | Direction of water flow | Location you selected

Surface Water Flood Risk: Water Velocity in a Medium Risk Scenario

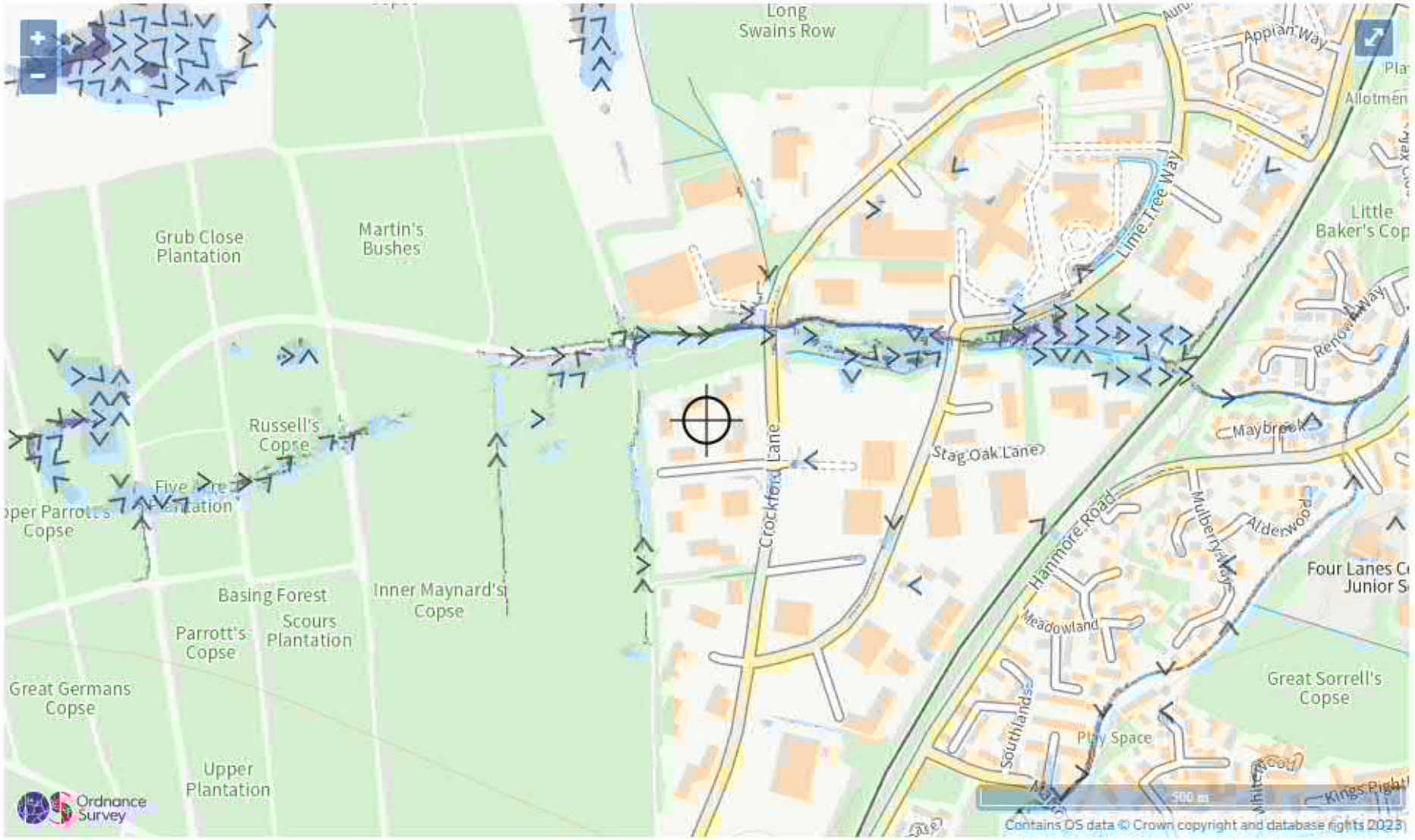


Surface water flood risk: water velocity in a medium risk scenario

Flood velocity (metres/second)

Over 0.25 m/s | Less than 0.25 m/s | Direction of water flow | Location you selected

Surface Water Flood Risk: Water Velocity in a High Risk Scenario



Surface water flood risk: water velocity in a high risk scenario

Flood velocity (metres/second)

Over 0.25 m/s Less than 0.25 m/s Direction of water flow Location you selected

Appendix E

Topographic Survey