



HOGMOOR LANE

Hurst, Berkshire

FLOOD RISK ASSESSMENT

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Control Sheet

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1 INTRODUCTION

1.1 Background

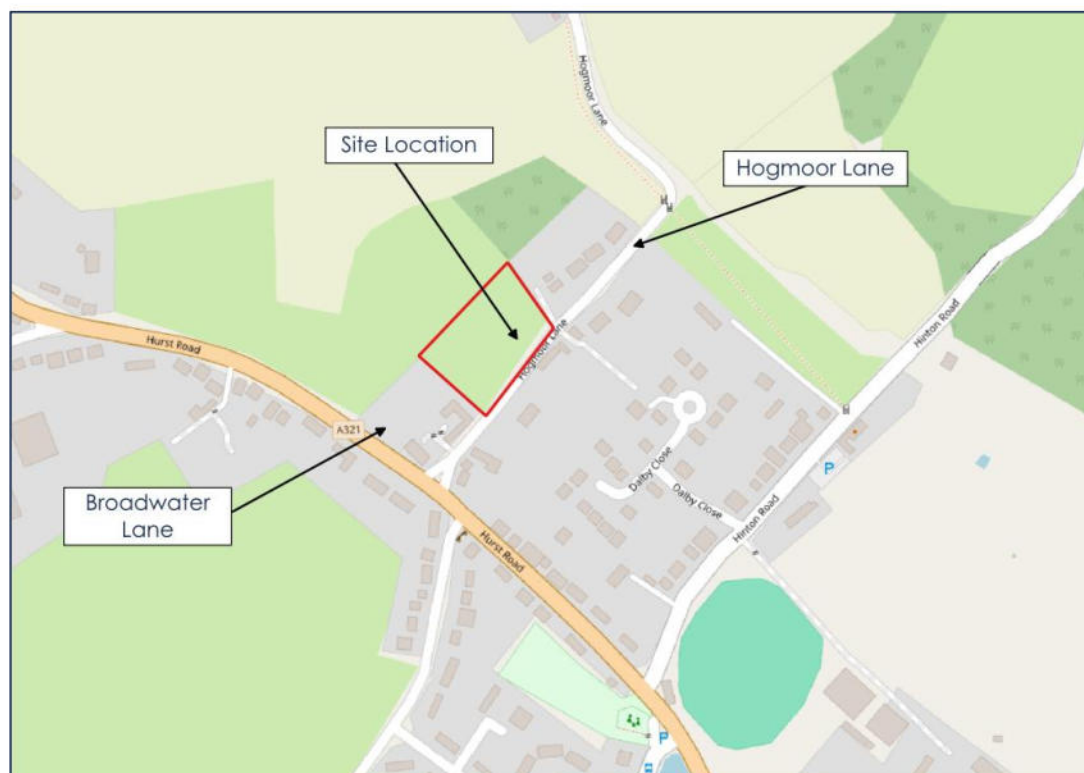
- 1.1.1 Calibro has been appointed to undertake a Flood Risk Assessment (FRA) to support a Planning in Principle (PIP) application for a residential development of two dwellings on land to the northwest of Hogmoor Lane, Hurst.
- 1.1.2 The National Planning Policy Framework (NPPF) requires that the planning system takes full account of flood risk. This requires that:
- Within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;
 - The development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;
 - It incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;
 - Any residual risk can be safely managed;
 - Safe access and escape routes are included where appropriate, as part of an agreed emergency plan.
- 1.1.3 Footnote 63 of the NPPF states that a site-specific FRA will be required for proposals:
- a) that are greater than 1 hectare (ha) in area within Flood Zone 1;
 - b) that are located in Flood Zones 2 and 3;
 - c) in an area within Flood Zone 1 which has critical drainage problems;
 - d) in an area within Flood Zone 1 identified in a Strategic Flood Risk Assessment (SFRA) as being at flood risk now or in the future;
 - e) in an area in Flood Zone 1 that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.
- 1.1.4 The site is located in Flood Zone 1, however there is a mapped area of surface water flooding at the site. Therefore, a proportional FRA is required.
- 1.1.5 This assessment considers the risks of all types of flooding to the proposed site for the lifetime of the development and assesses if there would be an impact of flooding to third parties.

2 EXISTING SITE AND HYDROLOGY CHARACTERISTICS

2.1 Description

- 2.1.1 The site is located to the northwest of Hogmoor Lane in Hurst, Berkshire. The approximate coordinates at the centre of the site are 479755, 174100 and the nearest postcode is RG10 0DH.
- 2.1.2 The location of the proposed development is currently greenfield, comprising open grassland. There are existing residential houses to the east, south and west of the site, and open grassland to the north of the site.
- 2.1.3 Figure 2-1 shows the site location.

Figure 2-1 Site Location

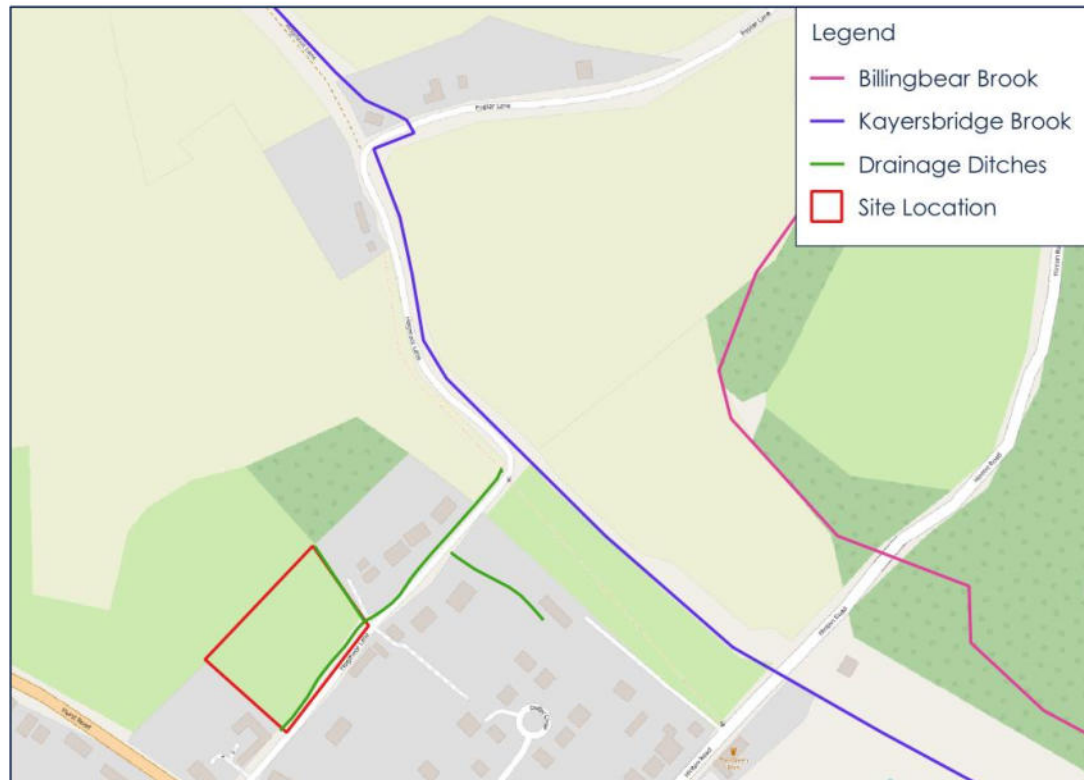


2.2 Hydrology and Topography

- 2.2.1 As shown in Figure 2-2, Kayersbridge Brook is located approximately 150m north of the site, with the Billingbear Brook being located approximately 270m north of the site. Both of these watercourses are classified as Environment Agency (EA) Main Rivers and both flow from south to north.

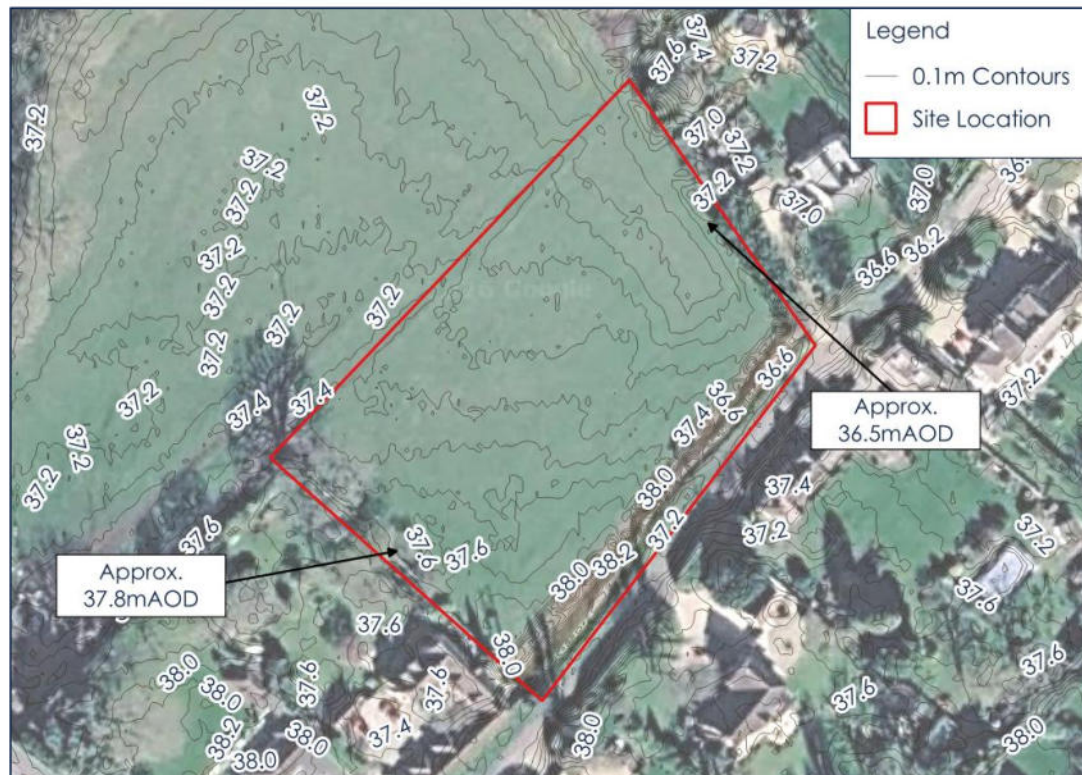
- 2.2.2 In addition to the Main Rivers, a ditch runs parallel to Hogmoor Lane and intersects the site boundary. This ditch conveys water northwards towards Kayersbridge Brook. There are a number of culverted crossings along its length that provide access to the existing properties off Hogmoor Lane. The location of this ditch is shown in Figure 2-2.
- 2.2.3 Mapping and site observations also show the presence of ditches to the north of the site, including along the northern boundary of the site, understood to drain to the ditch which runs along Hogmoor Lane. The location of these is also shown in Figure 2-2.

Figure 2-2 Hydrology



- 2.2.4 A topographic survey of the site has been conducted and is provided in Appendix A. This has been augmented by readily available LiDAR data to establish the topography at the site.
- 2.2.5 As shown in Figure 2-3 and the topographic survey, the site slopes gently from south to north, towards the residential dwellings and the ditch along the northern site boundary, and the Kayersbridge Brook. The highest elevation of the site is at approximately 37.8mAOD near the southern border, and the lowest elevation is at approximately 36.5mAOD near the northern boundary of the site.

Figure 2-3 Topography



2.3 Geology and Soils

- 2.3.1 Geological data held by the British Geological Survey (BGS) shows the entire site and surrounding area is underlain by a bedrock geology of 'Lambeth Group – Clay, silt and sand'. The superficial deposits underlying the site and surrounds are the 'Kempton Park Gravel Member – sand and gravel'.
- 2.3.2 In accordance with the BGS Hydrogeology aquifer classification (625k), the entire site and the surrounds have a classification of a 'Low Productivity Aquifer'.
- 2.3.3 There are no borehole logs at or in the vicinity of the site.
- 2.3.4 No springs have been identified on Ordnance Survey mapping at or in the vicinity of the site.
- 2.3.5 SoilScapes mapping records the soil type beneath the site as being 'Loamy soils with naturally high groundwater'.
- 2.3.6 According to BGS Parent Material European Soil Bureau Description mapping, the site has soils which are described as being 'Sand to Sandy loam' with depths that are classified as deep, likely to be over 1m, which is the deepest of the classifications.

2.4 Recorded Flooding

- 2.4.1 The Environment Agency's (EA) 'Recorded Flood Outlines' dataset records no historic flood events in the vicinity of the site.
- 2.4.2 A search of British Hydrological Society's Chronology of British Hydrological Events yielded no relevant flood records.

2.5 Proposed Development

- 2.5.1 The proposal is for a PIP application for two detached houses and garages. The vehicular access to the site will be from Hogmoor Lane to the east of the site.
- 2.5.2 In accordance with the Flood Risk and Coastal Change Planning Practice Guidance (PPG), the lifetime of residential developments is assumed to be 100 years, ending in the year 2126.
- 2.5.3 As the site is currently comprised of open undeveloped land, there will be a change in the permeable and impermeable surfaces across the site.
- 2.5.4 The proposals for the site are provided in Appendix B.

3 FLOOD RISK

3.1 National Planning Policy Framework

3.1.1 In accordance with the NPPF, this FRA considers the following sources of flooding:

1. Tidal Flooding – from the sea;
2. Fluvial Flooding – from rivers and streams;
3. Surface Water Flooding – from intense rainfall events;
4. Groundwater Flooding – from elevated groundwater levels or springs;
5. Flooding from Sewers – from existing sewer systems; and
6. Artificial Sources – from reservoirs, canals etc.

3.2 Flood Zones

3.2.1 The Flood Zones are based on the assessed probability of flooding from rivers and the sea, ignoring the presence of flood defences. The flood zone classifications from the PPG are presented in Table 3-1 below.

Table 3-1 Flood Zone Classification

Flood Zone	Risk	Fluvial Flooding Chance	Tidal Flooding Chance
1	Low	< 1 in 1,000 year	
2	Medium	Between 1 in 100 and 1 in 1,000 year	Between 1 in 200 and 1 in 1,000 year
3	High	Up to 1 in 100 year	Up to 1 in 200 year
3b	Functional Floodplain	Land where water has to flow or be stored in times of flood. This is defined in the relevant SFRA.	

3.2.2 The Flood Map for Planning defines site as falling entirely within Flood Zone 1, meaning at **Low** risk of fluvial flooding.

3.2.3 The site is at a minimum elevation of 36.5mAOD and is therefore well beyond any tidal limits.

3.3 Development Vulnerability

3.3.1 Table 2 of the Flood Risk and Coastal Change PPG defines which types of development are acceptable in each flood zone and is reproduced in Table 3-2. In accordance with Annex 3 of the NPPF, the proposals are considered to be More Vulnerable.

- 3.3.2 All forms of development, including More Vulnerable, are appropriate in Flood Zone 1.

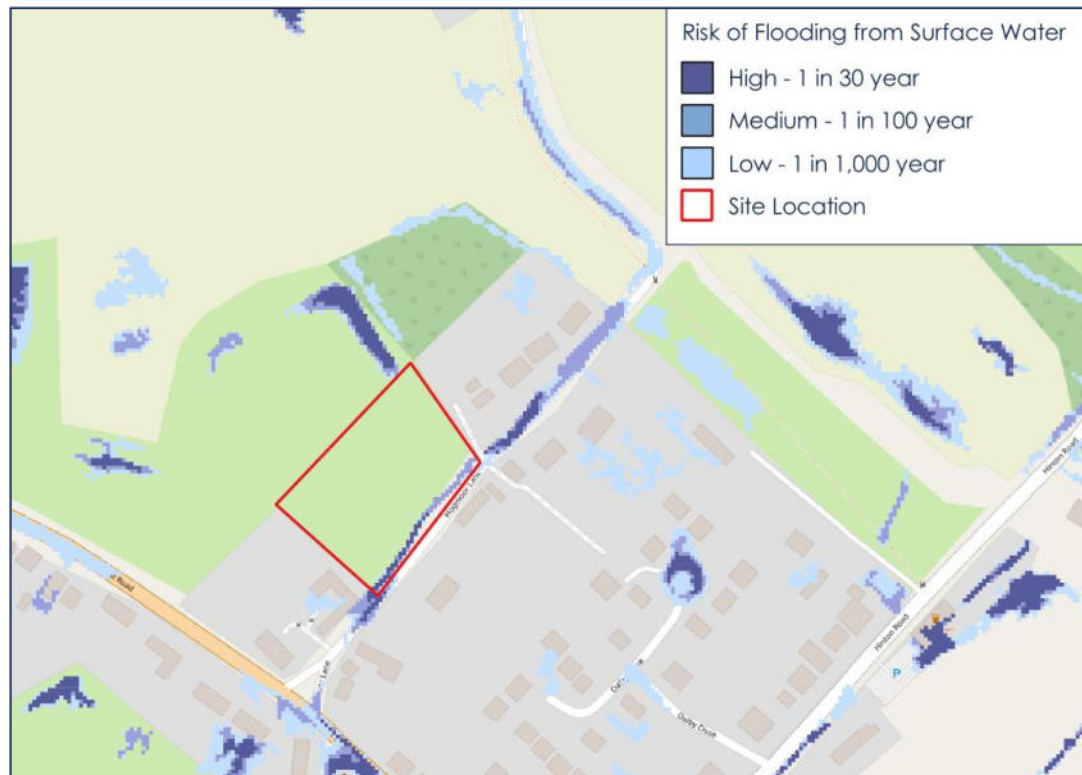
Table 3-2 Flood Risk Vulnerability

Flood Zone	Flood Risk Vulnerability				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
1	✓	✓	✓	✓	✓
2	✓	Exception Test Required	✓	✓	✓
3a	Exception Test Required	✗	Exception Test Required	✓	✓
3b	Exception Test Required	✗	✗	✗	✓

3.4 Surface Water Flooding

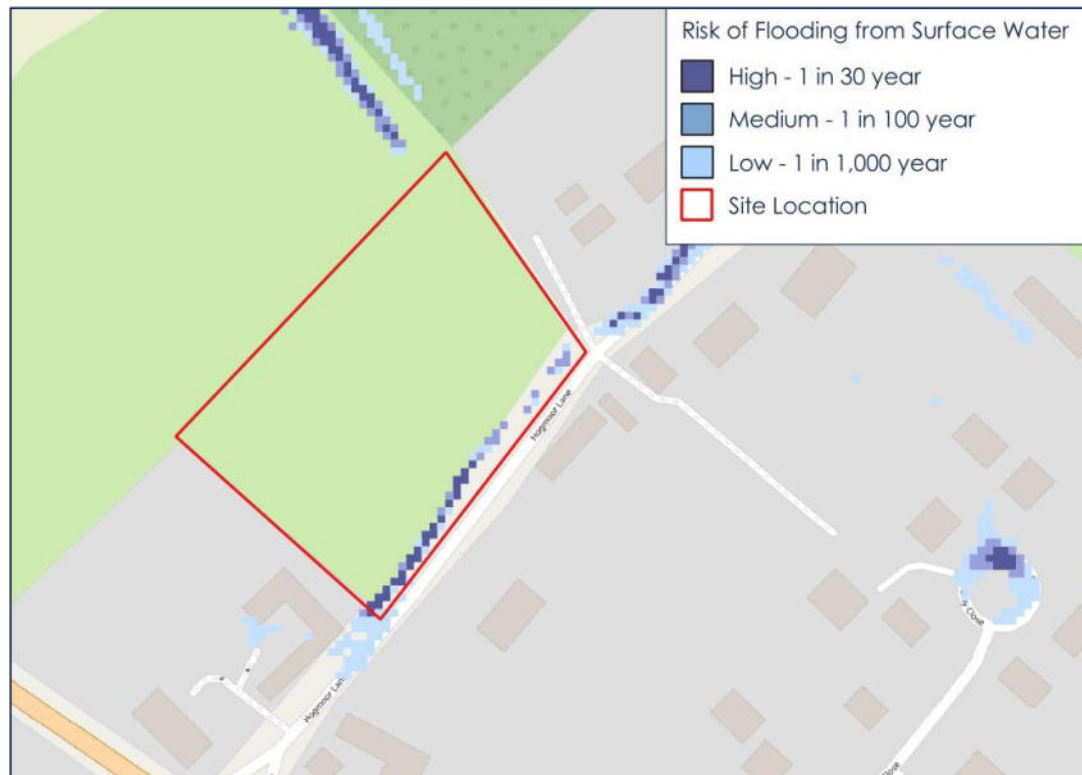
- 3.4.1 The Risk of Flooding from Surface Water (RoFSW) mapping indicates areas where water would tend to flow and accumulate during extreme rainfall events. The mapping is derived by simulating the 1 in 30, 1 in 100 and 1 in 1,000 year rainfall events to define areas at High, Medium and Low risk of surface water flooding respectively, and includes an uplift to account for climate change.
- 3.4.2 The mapping is derived by the simulation of the above rainfall events over a DTM. The DTM is defined on a 2m square grid and as a result, localised topographic or drainage features are often poorly defined.
- 3.4.3 The RoFSW mapping indicates there is a mapped risk of flooding running along the eastern boundary of the site which is clearly associated with the ditch in this location, as shown in Figure 3-1.
- 3.4.4 No other locations within the site boundary are at a mapped risk of surface water flooding.

Figure 3-1 RoFSW with Climate Change Extents



- 3.4.5 The RoFSW dataset also indicates the predicted flood depths which would occur during the extreme rainfall events. The flood risk is categorised into depth bands including 0.2m, 0.3m, 0.6m, 0.9m and 1.2m. It should be noted that depths below 0.075m are removed from the dataset as most land is covered by some water as rain falls across the area in surface water flood modelling.
- 3.4.6 Assessment of the depth bands show the area of predicted surface water flooding is present in the 0.3m depth band but not in the 0.6m depth band. This indicates the flooding predicted by the model to be between 0.3m and 0.6m deep and is restricted to the southern section of the ditch.
- 3.4.7 In the north of the site, the RoFSW mapping also predicts an area of surface water flooding. However, this is associated where the RoFSW dataset is not representing the ditch along the northern boundary of the site. Therefore, this area of mapped flooding is not considered to impact the site.

Figure 3-2 RoFSW with Climate Change Extents – 0.2m depth band



- 3.4.8 Analysis of the available topographic data indicates that the drainage ditch has an approximate depth ranging between approximately 0.52m and 1.03m. Therefore, the RoFSW predicts that the surface water is contained within the ditch and should not impact the site.
- 3.4.9 It is noted that LiDAR data provides a relatively poor representation of the ditch due to the vegetated nature of its banks as shown in Figure 3-3, which are typically filtered out during processing. As a result, the EA RoFSW modelling is likely to under-represent the presence and conveyance capacity of the ditch. It is therefore considered that surface water flows would be contained within the ditch channel.
- 3.4.10 It should also be noted that the surface water depth mapping does not identify a continuous flow route along the ditch alignment as shown in Figure 3-2. Instead, isolated pockets of flooding are shown within the channel. This discontinuous representation provides further evidence that the ditch is not accurately captured within the EA's RoFSW modelling.
- 3.4.11 The assessment presented later in this section of the report provides evidence that the existing culverted crossings present a restriction to the flow of water in the ditch. However, the 'breaks' in the RoFSW mapping shown in Figure 3-2 demonstrate that the modelling presumes blockages to the flow that would, in reality, not be present. This provides evidence that the risk is overestimated.

- 3.4.12 Given the above, it is proposed that the site access should be located in the northeast corner of the site. The site is also assessed as having a **Low** risk of flooding from surface water.

Figure 3-3 Ditch and Vegetation



Safe Access and Escape

- 3.4.13 The WBC SFRA states that '*consideration of safe access and egress during a flood event must be demonstrated for the 1 in 100 year return period plus climate change event*'.
- 3.4.14 The safe access route off the site would be to the south of the site, down Hogmoor Lane and towards Broadwater Lane. Mapping for the medium surface water flood risk, which is equivalent to the 1 in 100 year event including an allowance for climate change, shows an area of flooding on Hogmoor Lane along this safe access route, as shown in Figure 3-1. However, as explained above, it is assessed that the flooding would, in reality, be contained within the ditch alongside Hogmoor Lane.
- 3.4.15 Consequently, providing an access across the ditch, as is already present in multiple locations along the ditch, would provide safe access and egress from the site.
- 3.4.16 A calculation of the likely capacity of the ditch, and therefore crossing location, is presented in the following subsection.

Capacity Assessment

- 3.4.17 To facilitate safe access to the site, culverting of the ditch which runs parallel to Hogmoor Lane would be required. Therefore, an indicative capacity assessment of the ditch has been undertaken using Manning's equation. The calculated capacity of the ditch has been compared to the calculated full-bore discharge capacity of existing crossings and a proposed culvert to promote unimpeded flow of water.
- 3.4.18 The values used for the capacity assessment for the ditch are presented in Table 3-3.

- 3.4.19 The base width of the channel has been taken from the topographic survey, with the side slopes and slope of the channel taken from 1m DTM LiDAR data. The flow depth has been taken from the likely depth of flooding shown in the EA RoFSW mapping, which is conservative given the non-contiguous nature of the flowpath in the ditch. The Manning's value has been taken from site observations.

Table 3-3 Channel capacity details

Parameter	Ditch Details
Base width (m)	0.91
Side slope (1:X)	3
Flow depth (m)	0.3
Slope (m/m)	0.004
Manning's n	0.05
Area (m ²)	0.54
Wetted Perimeter (m)	2.81
Hydraulic Radius (m)	0.19
Estimated flow (m ³ /s)	0.24

- 3.4.20 Assuming a roughly trapezoidal shape to the ditch, it has been calculated the ditch conveys approximately 0.24m³/s under the mapped depth conditions.
- 3.4.21 The values used for the downstream existing culvert full-bore discharge capacity assessment are provided in Table 3-4. The downstream culvert diameter was estimated from an image of a culvert along Hogmoor Lane, therefore using the assumption that all the culverts in the ditch are the same dimensions, and the Manning's value has been taken from site observations.
- 3.4.22 The existing downstream 300mm diameter culvert has an estimated full-bore capacity of 0.05m³/s when flowing. This assumes the culvert is running full but is not pressurised at the inlet, and is using the Manning's equation, which is a conservative estimate.
- 3.4.23 The dimensions of the proposed crossing have been assessed to ensure that the culvert required within the ditch to provide access to the site will not result in a restriction to channel flow. The calculated capacity is presented in Table 3-4. It has been assumed that the existing channel slope will be maintained and that the culvert will consist of a circular corrugated plastic pipe.

- 3.4.24 The culvert crossing to the site is proposed to be a 525mm diameter circular corrugated plastic pipe, which has an estimated full-bore capacity of 0.32m³/s when flowing. Again, this assumes the culvert is running full but is not pressurised at the inlet, and is using the Manning's equation, which is a conservative estimate.

Table 3-4 Culvert capacity details

Parameter	Downstream Culvert Details	Proposed Culvert Details
Diameter (m)	0.3	0.525
Slope (m/m)	0.007	0.007
Manning's n	0.02	0.015
Area (m²)	0.07	0.22
Hydraulic Radius (m)	0.075	0.13
Estimated flow (m³/s)	0.05	0.32

- 3.4.25 In conclusion, the existing culverted crossings present a greater restriction to flows than the proposed crossing, meaning the proposed would not present a restriction to flows. However, the restrictions presented by the existing crossings would not impact the assessment of flood risk posed to site by virtue of the assessment of flood risk posed to site by virtue of the RoFSW predicting water remains within the ditch despite clear blockages to flow along its reach.
- 3.4.26 Due to the assumptions used in this capacity assessment, the results should be considered to be an estimate.

3.5 Groundwater Flooding

- 3.5.1 The Wokingham Borough Council (WBC) SFRA contains maps showing the Areas Susceptible to Groundwater Flooding Map. This map identifies areas where geological and hydrogeological conditions could enable groundwater flooding to occur. The entirety of the site is located within an area where there is a >=75% chance for groundwater flooding to occur.
- 3.5.2 In addition, the JBA groundwater emergence maps show the site likely has emergence levels of less than 0.025m below the ground surface. No further commentary has been provided on this.
- 3.5.3 There are no records of Hurst flooding due to groundwater listed in the WBC SFRA, and no boreholes near the site which can be used to examine the likely groundwater depths.

- 3.5.4 As stated in paragraph 2.3.2, the bedrock geology for the site is a 'Low productivity aquifer' and is therefore unlikely to yield significant volumes of water to generate above ground flooding. This is supported by the lack of springs shown on the mapping.
- 3.5.5 The ditches and watercourses within the vicinity of the site would assist with the management of water levels and drainage of groundwater before it becomes a significant risk.
- 3.5.6 There is no proposal to include any basements for the proposed development. Therefore, because of the above, the site has been assessed as being at a **Medium** risk of groundwater flooding.
- 3.5.7 Therefore, it is recommended that the Finished Floor Levels or slabs for the dwellings are raised by 150mm above the ground, where possible and level access is feasible.

3.6 Flooding from Sewers

- 3.6.1 In the unlikely event of a sewer blockage or exceedance of the sewer network occurring upstream of the site, water would discharge in a similar manner to the surface water flood risk mapping shown on Figure 3-1.
- 3.6.2 Discharge would therefore be conveyed via the ditch running parallel to Hogmoor Lane. Although this feature lies within the site boundary, it is located outside the location of the proposed dwellings and is not anticipated to constrain development.
- 3.6.3 The risk of sewer flooding is therefore considered to be **Negligible**.

3.7 Flooding from Artificial Sources

- 3.7.1 The EA's 'Reservoir Flood Extents – Wet Day' national dataset predicts flooding in the northeast corner of the site. Again, this flood extent is limited to the ditch which runs parallel to Hogmoor Lane and would not impact the location of the proposed dwellings.
- 3.7.2 In addition, the likelihood of a reservoir breach occurring is considered to be highly unlikely. This is due to the strict legislation which regulates reservoirs such as the Reservoirs Act 1975, which requires regular inspections by qualified engineers, routine monitoring, and the implementation of maintenance and safety measures to ensure structural integrity.
- 3.7.3 These obligations mean that reservoirs are designed and managed to a very high safety standard, with any potential issues identified and addressed proactively. As a result, the residual risk of reservoir failure is extremely low.
- 3.7.4 No other artificial sources of flood risk have been identified in the vicinity of the site.
- 3.7.5 The risk of flooding from artificial sources is concluded to be **Very Low**.

3.8 Impact on Drainage

- 3.8.1 As the site currently comprises undeveloped greenfield land, the proposed development will alter the existing balance of permeable and impermeable surfaces across the site. Therefore, consideration should be given to the drainage of the site.
- 3.8.2 The site has viable drainage discharge locations in terms of the drainage ditch to the north and east of the site, and sufficient space to accommodate a sustainable drainage strategy that would meet the National Standards.
- 3.8.3 The design of the drainage system would be developed and confirmed at the detailed design stage of the development.

4 SUMMARY

- 4.1.1 It is proposed to submit a Planning in Principle application for the development of two dwellings at a site in Hogmoor Lane, Hurst.
- 4.1.2 The proposal is a residential development and therefore has a design lifetime of over 100 years, taking it to 2126, and is classed as *More Vulnerable*.
- 4.1.3 The Flood Map for Planning shows the site is located in Flood Zone 1 and is therefore suitable for development.
- 4.1.4 The EA RoFSW maps show an area of high surface water flood risk along the eastern boundary of the site, aligned with the drainage ditch which runs from south to north within the site boundary. No other areas within the site are shown to be affected by surface water flooding.
- 4.1.5 Flood depth data indicates depths of approximately 0.3m to 0.6m in the south of the site, reducing to 0.075m to 0.2m in the north. These depths are confined to the ditch.
- 4.1.6 Topographic data shows the ditch is deeper than the predicted flood depths, and an assessment of the LiDAR data shows it is likely underrepresenting the ditch due to presence of dense vegetation, meaning the RoFSW modelling does not fully capture its capacity.
- 4.1.7 The mapped flood extents appear discontinuous along the ditch, further indicating that flows are not well represented and are likely contained within the channel. The site is therefore considered to be at Low risk of surface water flooding overall.
- 4.1.8 An indicative capacity assessment using the Manning's equation, which presumes a conservative approach shows the ditch can convey approximately 0.24m³/s, while the existing downstream culverted sections have a lower capacity of around 0.05m³/s. This suggests the existing culverts may restrict flow.
- 4.1.9 The proposed culvert capacity would be greater than the existing culverted crossings and therefore not present a restriction to watercourse flows.
- 4.1.10 The site has been assigned a Medium risk of flooding from groundwater due to mapping showing a $\geq 75\%$ of groundwater emergence. Therefore, it is proposed the FFLs are raised 150mm above the ground elevations.
- 4.1.11 The site has been assessed as being at Low or Negligible risk from flooding from all sources.
- 4.1.12 This FRA shows that the development will be safe for its lifetime, whilst not increasing flood risk elsewhere, and therefore meets the requirements of the NPPF.

APPENDICES

APPENDIX A

Topographic Survey

APPENDIX B

Site Proposals



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