



**LAND AT ELLETRA AVENUE,
WATERLOOVILLE, HAMPSHIRE PO7 7XY**

**PROPOSED CLASS E (LIGHT INDUSTRIAL,
RETAIL, CAFÉ, RESTAURANTS, LEISURE /
GYM), B2, B8 AND B8 TRADE
COUNTERS DEVELOPMENT**

Flood Risk Assessment & Drainage Strategy

Prepared on Behalf of
Hargreaves Properties Limited

D2263/FRA1.1

June 2024

DOCUMENT CONTROL

Project: Land at Elletra Avenue, Waterlooville, Hampshire PO7 7XY
Proposed Class E (Light Industrial, Retail, Café, Restaurants, Leisure / Gym), B2, B8 and B8 Trade Counters Development

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1 INTRODUCTION

1.1 Background

- 1.1.1 BP Civils is instructed by Hargreaves Properties Limited to prepare a site-specific Flood Risk Assessment (FRA) and Drainage Strategy to accompany an outline planning application with all matters reserved apart from access for development within Class E (Light Industrial, Retail, Café, Restaurants, Leisure / Gym), B2, B8 and B8 Trade Counters.
- 1.1.2 This report has also considered the findings of the previous Flood Risk Assessment for the Client, Hargreaves Management Limited, at the site. This was completed by Peter Brett Associates LLP in September 2013.
- 1.1.3 This report has been undertaken in accordance with National Planning Policy Framework (NPPF) and The Planning Practice Guidance Flood Risk and Coastal Change in addition to the use of SuDS for achieving sustainable development.
- 1.1.4 In preparing this report, BP Civils has referred to the following documents and information:
- Environment Agency Flood Maps for Planning
 - Environment Agency Flood Risk Assessment Data (Product 4)
 - Long-term Flood Risk Maps for Rivers or the Sea, Surface Water and Reservoirs
 - British Geological Survey (BGS) Information and Records
 - Partnership for South Hampshire Strategic Flood Risk Assessment
 - Hampshire County Council Strategic Flood Risk Assessment
 - Havant Borough Council Strategic Flood Risk Assessment
 - Southern Water Public Sewer Records
- 1.1.5 This report has been prepared to assess flood risk at the site, and to advise of any mitigation which may be required to ensure that the proposed development remains safe for its design life in accordance with current design standards.
- 1.1.6 This report has been prepared for the benefit of the named client only.

2 SITE LOCATION AND DESCRIPTION

- 2.1.1 A site location plan is included within this report (drawing **001 'Site Location Plan'**).
- 2.1.2 The National Grid Reference for the site is SU67637 09865.
- 2.1.3 The site measures 4.1Ha (40,555m²) and is situated within an existing industrial/retail estate in Waterlooville.
- 2.1.4 The site is considered 'brownfield', consisting of impermeable hardstanding with the north-western extent currently used as a car park. The remaining extents of the site are not currently utilised for any specific purpose and are unoccupied.
- 2.1.5 An existing Lidl supermarket and McDonalds restaurant are both located immediately to the north-east of the site. Elletra Avenue bounds the northern and western boundaries of the site, with Silverthorne Way located adjacent to the southern boundary of the site. Hambledon Way is located adjacent to the eastern boundary of the site.
- 2.1.6 A topographic survey of the site has been undertaken by Lewis Brown Surveyors, dated October 2015. A copy of the survey is included within **Appendix A**.
- 2.1.7 The topographic survey demonstrates levels in the range of 36.40m AOD and 35.40m AOD at the north-western extent of the site, which is currently in use as a car park, falling in a southerly/south-westerly direction.
- 2.1.8 An historic slab is present centrally on site, with a level in the range of 35.70m AOD and 35.80m AOD.
- 2.1.9 2 No. large piles of crushed material are located on site, measuring c. 5m and c. 7m tall.
- 2.1.10 There is a c. 3.00m level difference along the eastern boundary of the site between Hambledon Road and the site.
- 2.1.11 Remaining levels on site are broadly in the range of 35.60m AOD and 34.18m AOD. Overall, the site is considered to be flat.
- 2.1.12 The site, in its current form, is predominantly hardstanding. The existing impermeable area is 33,554m² (3.36Ha), amounting to 82% of the overall site area.

3 GROUND CONDITIONS

- 3.1.1 Site-specific intrusive geotechnical investigation has not currently been undertaken at the site by the client.
- 3.1.2 In the absence of site-specific geotechnical investigation, reference has been made to the British Geological Survey (BGS) website.
- 3.1.3 The BGS geology viewer states that the bedrock geology is likely to consist of 'London Clay Formation - Clay, Silt and Sand', as seen in **Figure 1**.

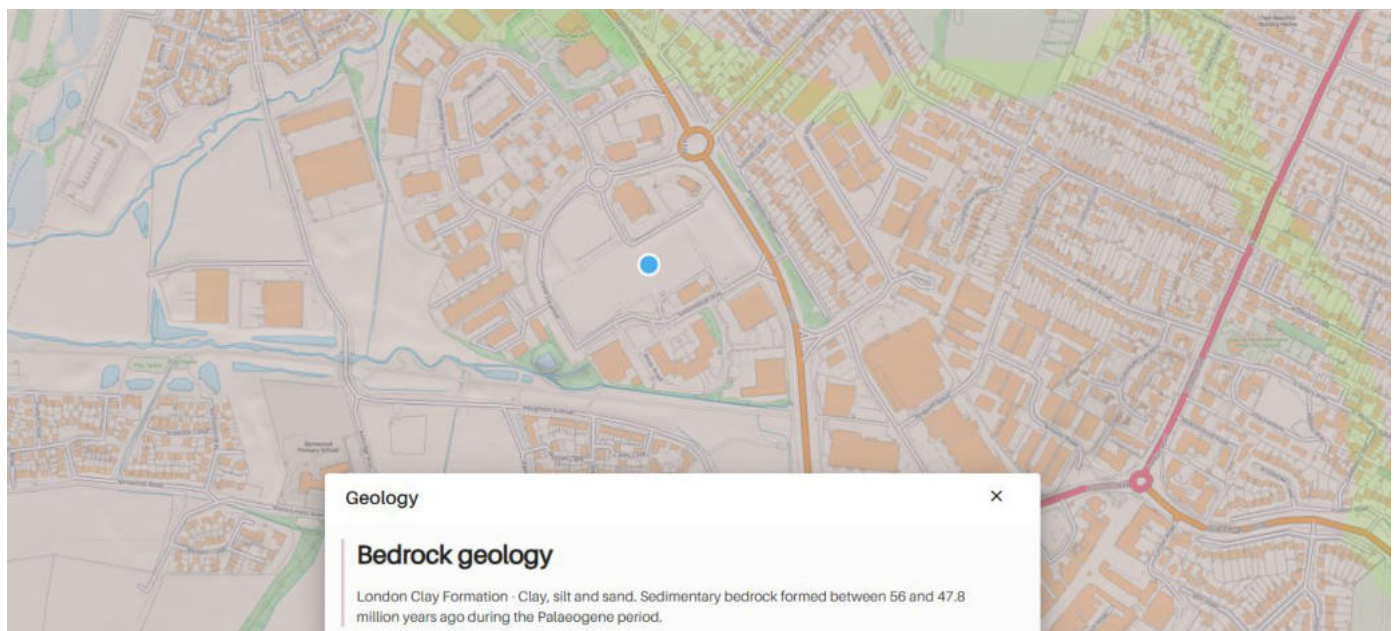


Figure 1. Geology of Britain Viewer – Bedrock Geology (BGS)

- 3.1.4 Superficial Deposits located at the site area are recorded as 'Head - Clay, Silt, Sand and Gravel', as seen in **Figure 2**.

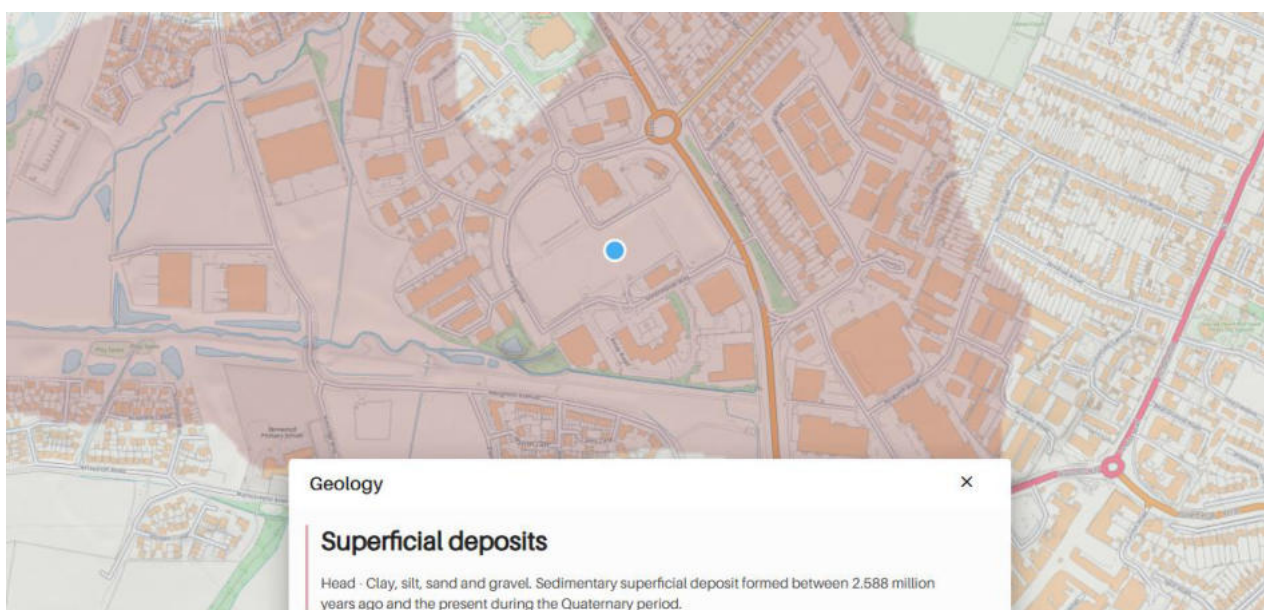


Figure 2. Geology of Britain Viewer – Superficial Deposits (BGS)

- 3.1.5 Historic borehole records from the Single Onshore Boreholes Index (SOBI) on the BGS website have also been reviewed in the absence of site-specific geotechnical investigation, as depicted in **Figure 3**.



Figure 3. Historic Borehole Locations (BGS)

- 3.1.6 Two boreholes in relation to the site are a borehole located at SU60NE176 in the south of the site, and a borehole SU60NE244 at the southwest boundary of the site. Both boreholes have similar geotechnical strata according to the BGS online mapping.
- 3.1.7 The log at SU60NE176 states that the geological composition encountered within the borehole consisted of 'Silty Clay' to the full depth of 10.0mbgl.
- 3.1.8 The log at SU60NE244 states that the geological composition encountered consisted of 'Clay' up to a depth of 49.5mbgl.
- 3.1.9 A copy of the BGS records reviewed can be found within **Appendix B** of this report.

3.2 Groundwater

- 3.2.1 Site-specific groundwater investigation and/or monitoring has not been undertaken at the site by the client.
- 3.2.2 At the recorded borehole SU60NE176 from the BGS records, the borehole did not encounter groundwater up to a borehole depth of 10.0mbgl.
- 3.2.3 A review of the Hampshire County Council (HCC) Groundwater Management Plan mapping shows that the general site area is situated within an area at moderate risk of groundwater emergence, however

this is not site specific.

- 3.2.4 Mapping managed by MAGIC (magic.defra.gov.uk) provides geographic information concerning the natural environment from across government. This mapping tool has been referred to in order to confirm whether the site is located within either any groundwater source protection zones or groundwater vulnerability zones.
- 3.2.5 The site is situated within an 'Unproductive' Bedrock strata, and a 'Secondary' Superficial Drift Aquifer, as seen in **Figures 4 and 5**.
- 3.2.6 This refers to bedrock geology that is impermeable and does not contribute to water supply, and drift deposits that exhibit moderate permeability and/or provide a moderate level of water storage. The deposits may support water supply and/or river base flow on a local scale.

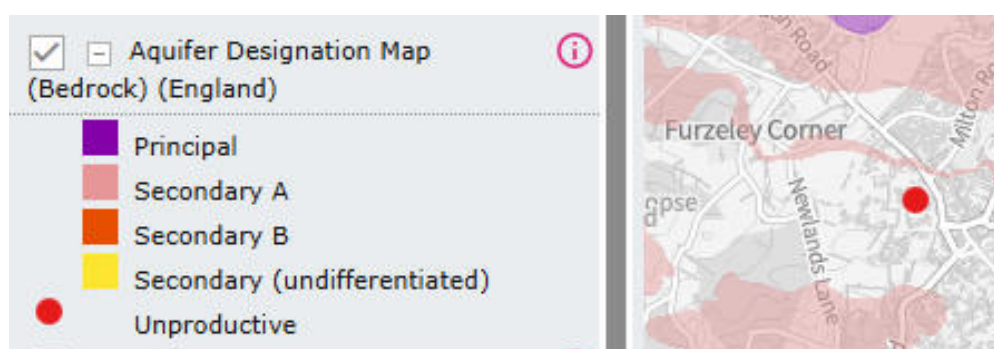


Figure 4. Bedrock Aquifer Designation Map (DEFRA)

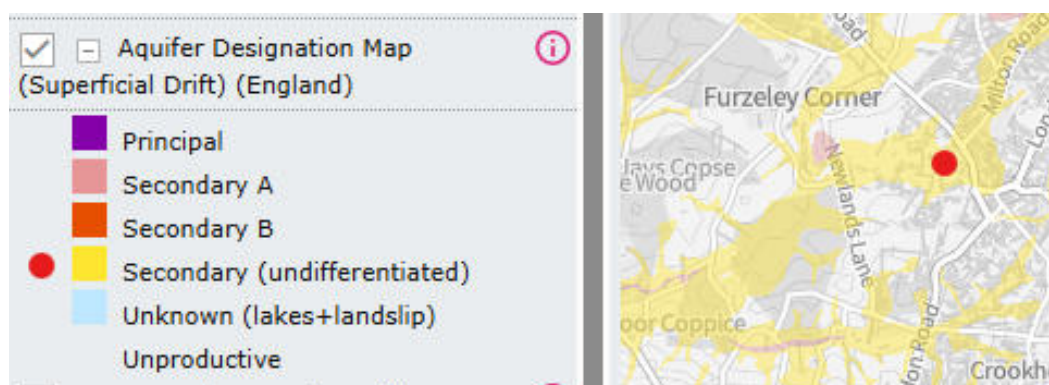


Figure 5. Superficial Drift Aquifer Designation Map (DEFRA)

- 3.2.7 The site falls within a 'Low' groundwater vulnerability zone, characterised by low-leaching soils and/or the presence of low-permeability superficial deposits.

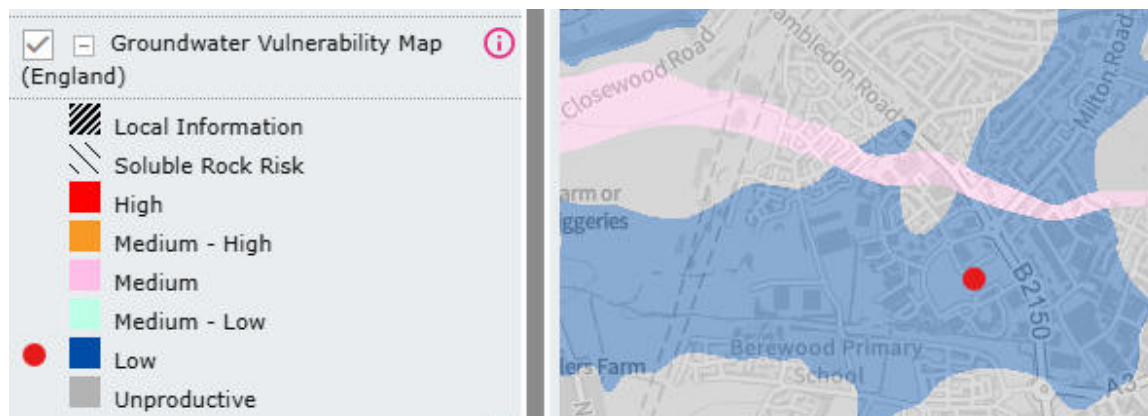


Figure 6. Groundwater Vulnerability Map (DEFRA)

3.2.8 The site is not indicated as within or in the vicinity of any drinking water protected areas or drinking water safeguard zones, although the site does fall within a 'Zone I – Subsurface Activity' Source Protection Zone.

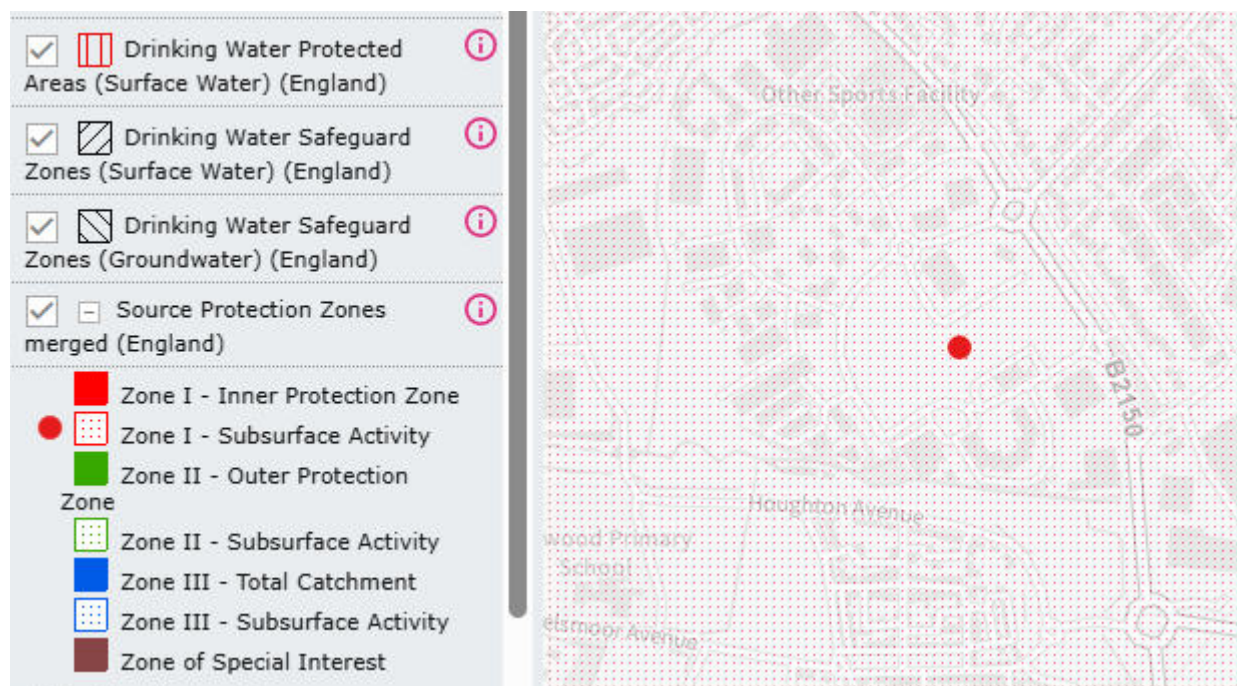


Figure 7. Drinking Water Protected Areas, Drinking Water Safeguard Zones and Source Protection Zones Map (DEFRA)

4 EXISTING DRAINAGE

4.1 Surface Water

- 4.1.1 The local sewerage authority is Southern Water, who provide sewerage services within the area. Public sewer records have been obtained from Southern Water, as contained within **Appendix C**.
- 4.1.2 The public sewer records identify an existing 1800mm dia. public surface water sewer crossing the site from the north-east to the south-west. This sewer is stated to be 2.30m deep (at existing manhole 5850) and discharges to a short section of open channel before discharging to twin 1200mm dia. culverts at the southern boundary of the site. The point at which the 1800mm dia. public sewer discharges to the open channel is classified as 'Main River'.
- 4.1.3 The twin 1200mm dia. culverts flow south-west beneath Silverthorne Way and discharge to an open channel (Main River) to the west of Tyak House (south-west of the site).
- 4.1.4 A 1050mm dia. surface water drain is also located at the south-western extent of the site, which discharges directly to an attenuation pond on the western side of Elletra Avenue. The pond is owned and operated by Southern Water and has a pumped outfall into the adjacent Main River.
- 4.1.5 It is understood that it is estimated that the attenuation pond has a capacity of between a current 1-in-30-year to 1-in-50-year event as detailed in an earlier Flood Risk Assessment prepared on behalf of the client (Peter Brett Associates, September 2013).
- 4.1.6 Public surface water sewers are also identified in Elletra Avenue (225mm dia. increasing to 900mm dia.) to the north and west of the site, as well as in Silverthorne Way (300mm dia. increasing to 750mm dia), both of which discharge to the attenuation pond to the south-west of the site.
- 4.1.7 The topographic survey undertaken at the site demonstrates that the site currently drains via a network of concrete slot drains, gullies and drains which discharge to the public surface water sewer network. The public sewers discharge to the attenuation pond to the south-west of the site, which discharges to the aforementioned Main River, flowing south-west away from the site.
- 4.1.8 Drawing **002 'Topographic Survey with Contours'** has been prepared to demonstrate existing levels and overland flow routes across the site. Drawing **007 'Existing Surface Water Drainage'** has been prepared to demonstrate the existing surface water drainage infrastructure on site and within the immediate vicinity of the site.
- 4.1.9 Greenfield run-off has been calculated as follows:
- $Q_{bar} = 22.43 \text{ l/s}$
 - 1-Year = 19.07 l/s
 - 30-Year = 51.59 l/s
 - 100-Year = 71.56 l/s
- 4.1.10 The site, as existing, is primarily impermeable and as such the rate of run-off will be greater than the greenfield run-off rates established. A 1D hydraulic model has been prepared of the existing drainage infrastructure, providing existing brownfield run-off rates as follows:
- 1-Year = 424.6 l/s

- 2-Year = 541.3 l/s
- 30-Year = 905.2 l/s
- 100-Year = 1,131.8 l/s

4.1.11 Calculations are contained within **Appendix D**.

4.2 Foul Water

- 4.2.1 The public sewer records identify an existing 225mm dia. public foul water sewer in Elletra Avenue to the west of the site. This sewer is identified as flowing in a southerly direction before diverting east along Silverthorne Way where it discharges to a foul water pumping station.
- 4.2.2 A 200mm dia. public foul water rising main is shown pumping east, to a 225mm dia. foul water sewer in Hambledon Road to the east of the site.
- 4.2.3 The existing on-site foul drainage arrangement has not been verified.

4.3 Highway Drainage

- 4.3.1 Elletra Avenue and Silverthorne Way are drained by highway gullies, however the connection arrangement of the highway drainage system has not been confirmed.

5 PROBABILITY

5.1 Sources of Information

5.1.1 The NPPF requires that all sources of flooding are considered being tidal, fluvial, pluvial, groundwater, sewers and man-made reservoirs/canals.

5.1.2 The likelihood of the site flooding has been established by reviewing the following information:

- Environment Agency Flood Maps for Planning
- Long-Term Flood Risk Map for Rivers or the Sea
- Long-Term Flood Risk Map for Surface Water
- Long-Term Flood Risk Map for Reservoirs
- Consultation with the Environment Agency (Product 4)
- Partnership for South Hampshire Strategic Flood Risk Assessment
- Hampshire County Council Strategic Flood Risk Assessment
- Havant Borough Council Strategic Flood Risk Assessment

5.2 Flood Maps and Modelling

5.2.1 Flood Maps for Planning identifies the majority of the site falling within Flood Zone 1. An area to the south-west of the site is located in Flood Zone 2.

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 0.1% annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map for Planning – all land outside Zones 2, 3a and 3b).
Zone 2 Medium Probability	Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding. (Land shown in light blue on the Flood Map).
Zone 3a High Probability	Land having a 1% or greater annual probability of river flooding; or land having a 0.5% or greater annual probability of sea. (Land shown in dark blue on the Flood Map).
Zone 3b The Functional Floodplain	This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of function floodplain should take account of local circumstances and not be defined

	solely on rigid probability parameters. Functional floodplain will normally comprise: • Land having a 3.3% or greater annual probability of flooding, with any existing flood management infrastructure operating effectively; or • Land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability flooding). Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map).
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- 5.2.2 Flood Risk Assessment Data (Product 4) has been obtained from the Environment Agency, as contained within **Appendix E**.
- 5.2.3 Modelled flood level data has been provided by the Environment Agency, taken from the River Wallington 2011 (Defended) fluvial model (January 2011).
- 5.2.4 The Environment Agency has confirmed in their response that the site is located in Flood Zone 2, with the south-western extent of the site affected.

5.2.5 Modelled flood levels have been provided for the site, as detailed, below:

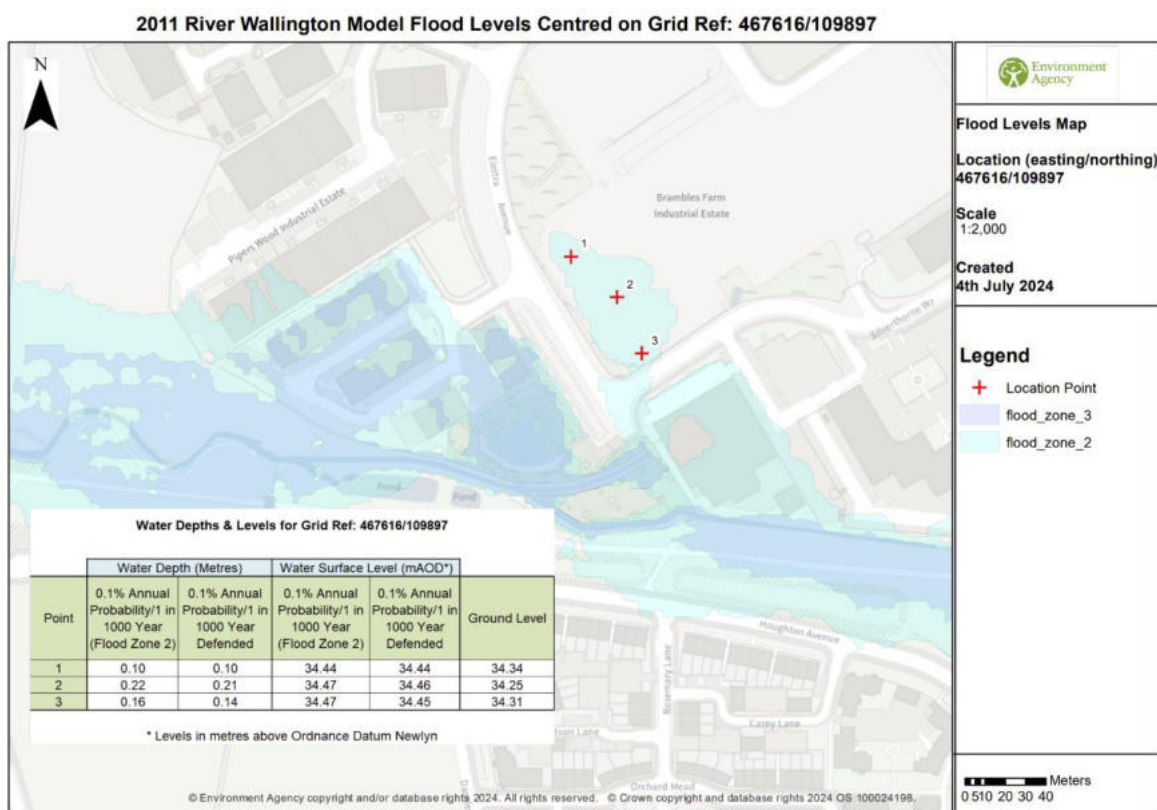


Figure 8. Environment Agency Product 4 Flood Risk Assessment Data – Modelled Flood Level Data

- 5.2.6 The peak modelled flood level for the site for the 0.1% AEP (1 in 1000-year, Flood Zone 2) Defended scenario is 34.47m AOD.
- 5.2.7 The Environment Agency mapping identifies ground levels in the range of 34.25 – 34.34m AOD in relation to the three locations provided for the site. Upon review of the site topographic survey, these indicated ground levels are broadly consistent with the levels surveyed on site.
- 5.2.8 In view of the modelled flood levels and indicated ground levels, flood levels in the range of 100 – 220mm may be experienced on site in relation to the 0.1% AEP (1 in 1000-year, Flood Zone 2) event to the south-western extent of the site (the extents identified as Flood Zone 2).

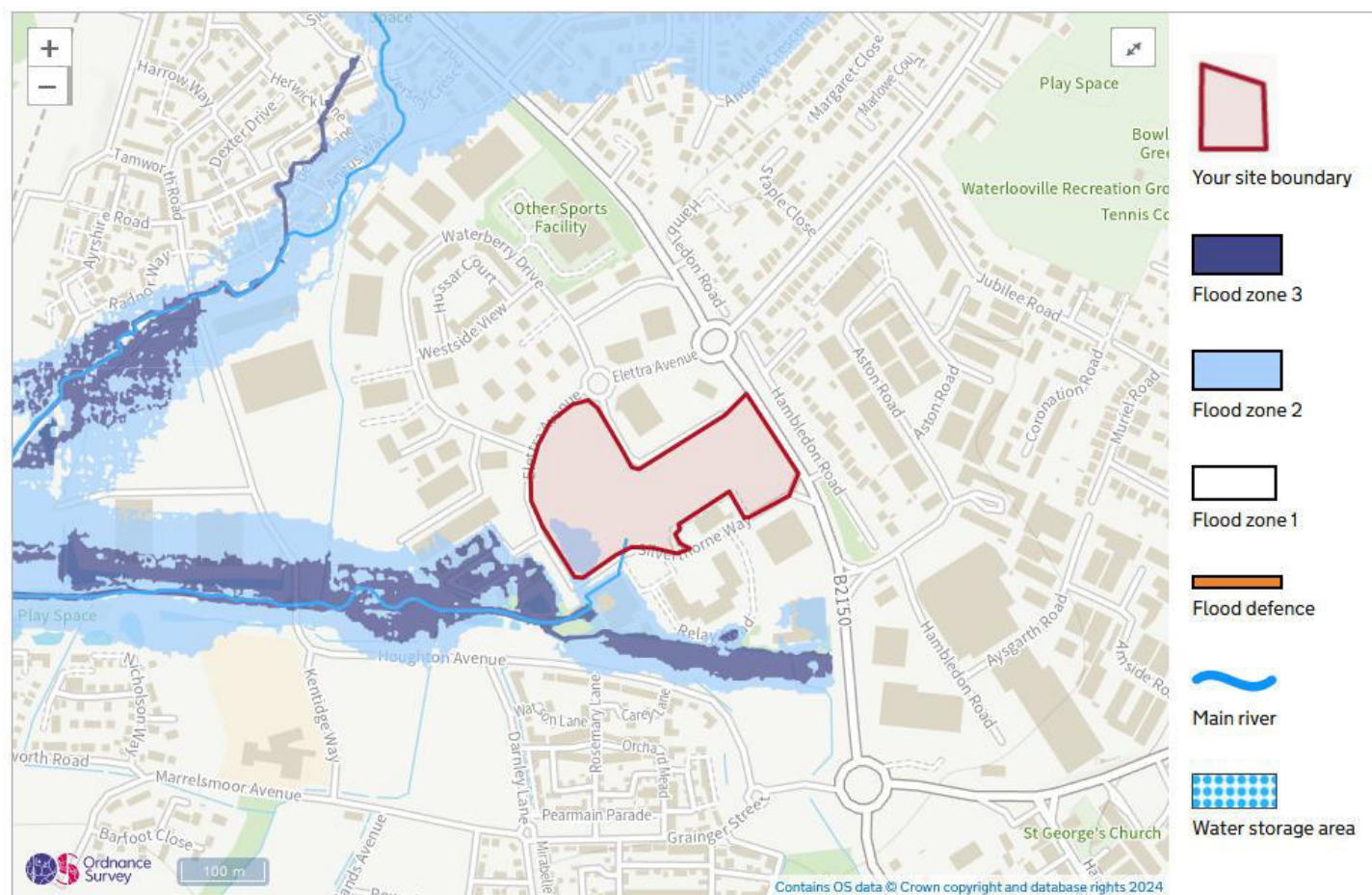


Figure 9. Flood Maps for Planning (Gov.uk)

5.2.9 The Long-term Flood Risk Map for Rivers or the Sea identifies the south-western extent of the site as being at 'Low' risk of flooding from rivers or the sea, with a lesser extent identified as being at 'Medium' risk of flooding from rivers or the sea. All remaining areas on site are not identified as being at risk of flooding from such sources.

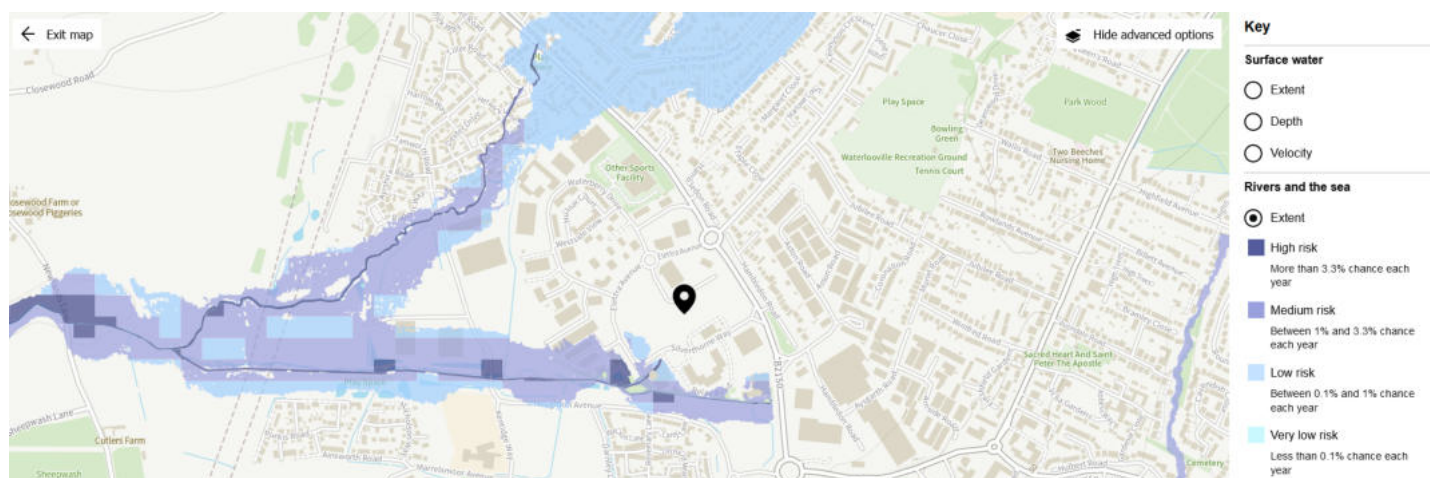


Figure 10, Long-term Flood Risk Map, Rivers or the Sea (Gov.uk)

5.2.10 The Long-term Flood Risk Map for Surface Water identifies isolated extents at risk of surface water flooding. The site is largely identified as being at 'Very Low' risk of surface water flooding, although the south-western corner of the site is identified as having an increased risk of surface water flooding ranging

from 'Low' to 'High'.

- 5.2.11 Areas along the eastern boundary of the site, at the foot of the embankment, are also identified as being at risk of flooding ('Low' and 'Medium' risk).
- 5.2.12 Central areas on site, around the historic slab (to the north, east and south of this feature), are also identified as being at 'Low' and/or 'Medium' risk of surface water flooding.

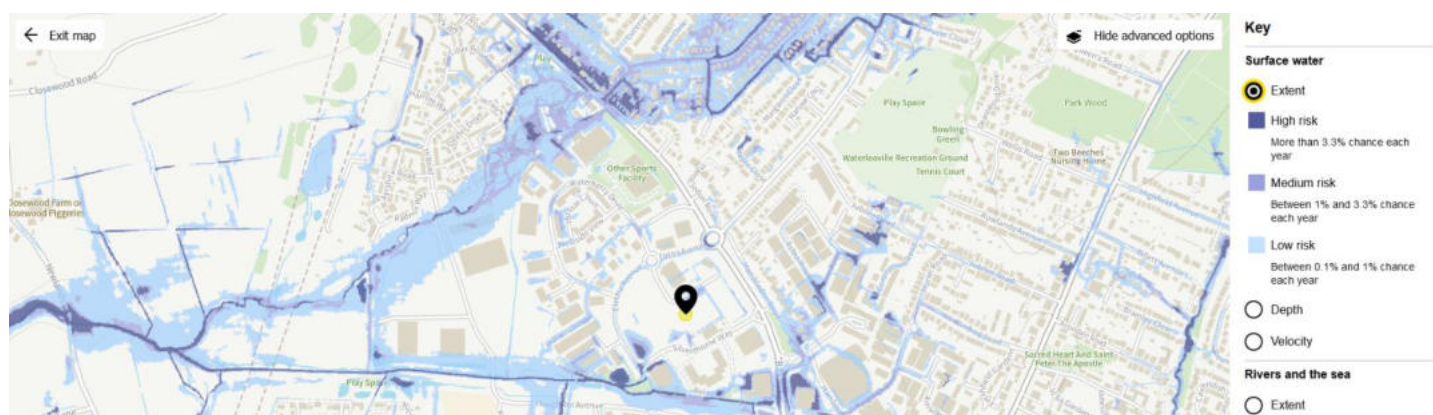


Figure 11. Long-term Flood Risk Map, Surface Water (Gov.uk)

- 5.2.13 The anticipated depths of surface water flooding have also been considered in relation to the areas and extents identified as being at risk of surface water flooding on site.
- 5.2.14 In 'High' risk scenarios, at the south-western corner of the site, anticipated depths of surface water flooding are identified as being 'Below 30cm'.

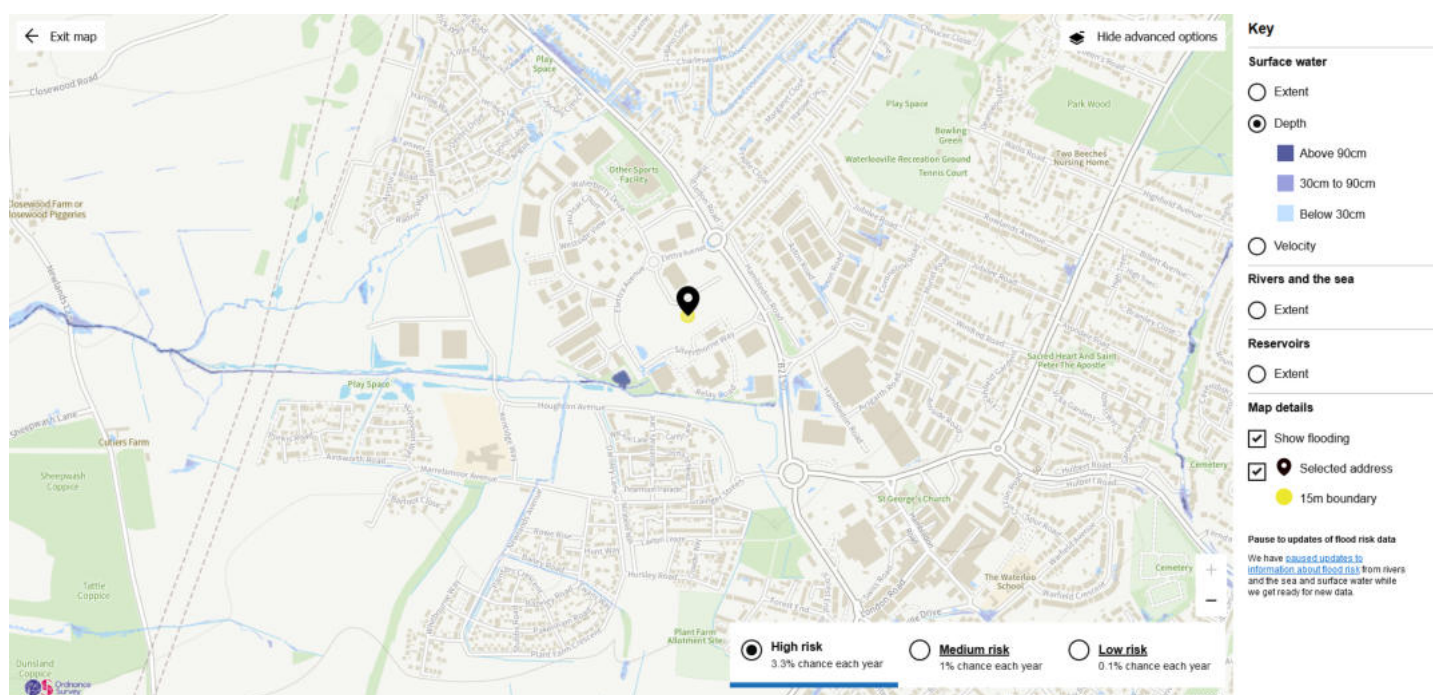


Figure 12. Long-term Flood Risk Map, Surface Water – 'High' Risk Scenario Depths (Gov.uk)

- 5.2.15 In 'Medium' risk scenarios, the anticipated depths of surface water flooding are almost exclusively stated as being 'Below 30cm', with minor extents to the south-western corner of the site identified as having anticipated depths in the range of '30cm to 90cm'.

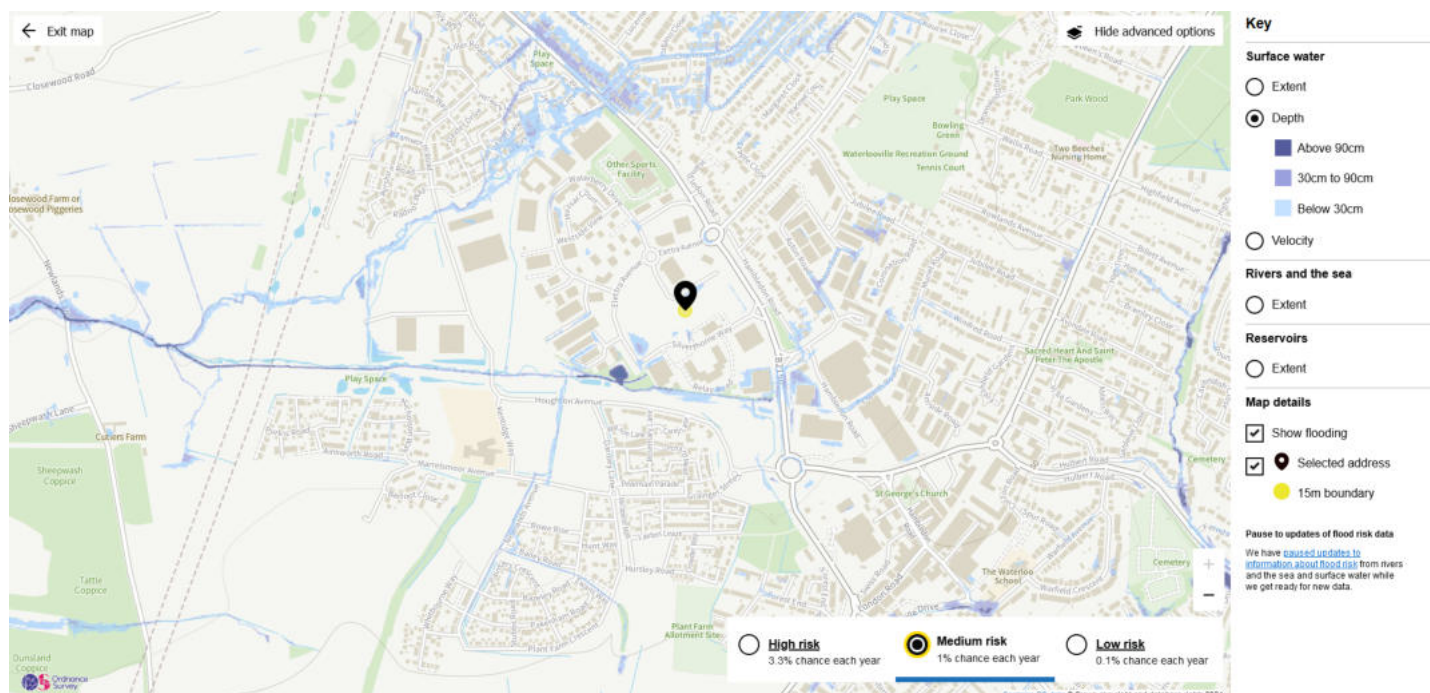


Figure 13. Long-term Flood Risk Map, Surface Water – 'Medium' Risk Scenario Depths (Gov.uk)

5.2.16 In 'Low' risk scenarios, the anticipated depths of surface water flooding are identified as being 'Below 30cm' and '30cm to 90cm' for similar areas of the site as in 'Medium' risk scenarios, albeit with increased extents.

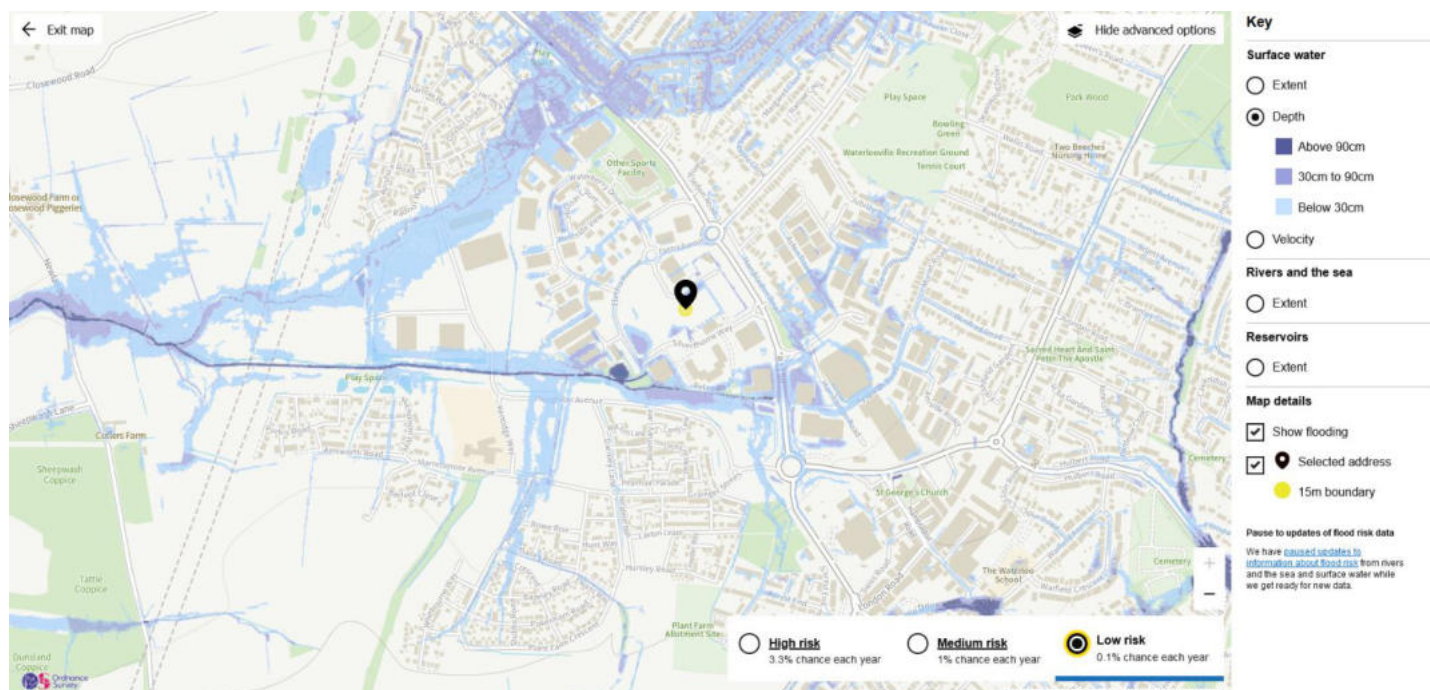


Figure 14. Long-term Flood Risk Map, Surface Water – 'Low' Risk Scenario Depths (Gov.uk)

5.2.17 The site is not identified as being at risk of flooding from reservoirs.

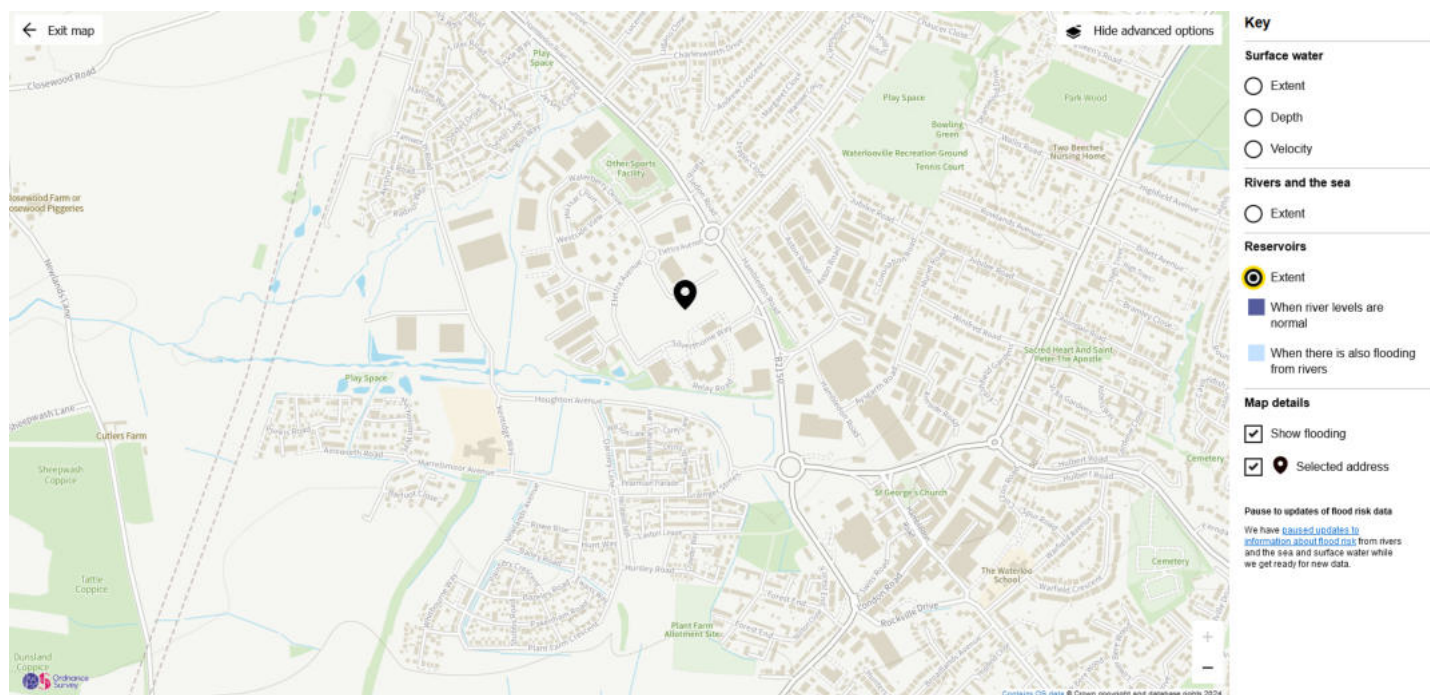


Figure 15. Long-term Flood Risk Map, Reservoirs

5.3 Strategic Flood Risk Assessment

- 5.3.1 The site is identified within the Havant Borough Council Strategic Flood Risk Assessment (Local Plan Sites), dated November 2018. The site is proposed for less vulnerable development.
- 5.3.2 The area already identified at the south-western extent of the site is shown to be at risk of fluvial flooding, however flood modelling does not show any additional flood risk in the future when taking into consideration climate change to the year 2115.
- 5.3.3 The SFRA recommends that allocation is acceptable at the site, and a Sequential Approach can be considered for development (i.e. avoiding the south-western part of the site).
- 5.3.4 Hampshire County Council also has a published Strategic Flood Risk Assessment, dated April 2011, although the site is not referenced specifically.
- 5.3.5 Partnership for South Hampshire also has a published Strategic Flood Risk Assessment, dated February 2024. The site is not specifically referenced within the report.
- 5.3.6 Interactive mapping relating to the Partnership for South Hampshire Strategic Flood Risk Assessment has been reviewed, and the following observations have been made:
- The site is largely identified as Flood Zone 1, with Flood Zone 2 identified at the south-western extent (consistent with all other mapping)
 - Surface water flood risk extents are also consistent with other mapping reviewed
 - The site is shown to be underlain by a low-permeability bedrock
 - The site is not identified as being at risk in view of climate change consideration (2025, 2055, 2085 or 2115).

5.4 Historic Flooding

- 5.4.1 As part of the Environment Agency's Product 4 Flood Risk Assessment Data response, mapping relating to historic mapping has been provided.
- 5.4.2 Of the mapping provided, no historic flood events are recorded at the site.
- 5.4.3 Anecdotal evidence refers to historic flooding at the site following heavy rainfall in September 1999 and latterly in October 2001. It is understood that flooding occurred to the south-western extents of the car park due to blockage of the inlet/outlet grilles upstream of the twin 1200mm dia. culverts as well as a lack of capacity where the twin 1200mm dia. culverts provide less capacity than the upstream 1800mm dia. public surface water sewer.
- 5.4.4 The above stated coincidence event led to the open channel breaching, resulting in flooding at the south-western corner of the car park, understood to be in the range of 300 to 500mm deep.
- 5.4.5 It is understood that the landowner at the time, along with Southern Water and the Environment Agency, sought to undertake remedial works which involved manholes being fitted with sealed covers, grilles on outlets being removed, an alarm being fitted to the open channel on-site to warn of high-water levels, as well as an alleviation scheme (2003) constructed by the landowner at the time.
- 5.4.6 The alleviation scheme sought to compensate for the stated lack of capacity provided by the twin 1200mm dia. culverts by providing a bund around the open channel to direct flows west along the car

park, providing an area of the car park as an 'overflow' area, a large collector drain at the western extent of the car park and finally a 1050mm dia. drain to convey flows to the Southern Water attenuation pond west of Elletra Avenue.

5.4.7 It is understood that since the alleviation scheme was implemented, no similar flood events have occurred on site.

5.4.8 A separate event of historic flooding occurred on 30th November 2003 following failure of the pump downstream of the Southern Water attenuation pond and intense rainfall led to the upstream surface water drainage network surcharging resulting in flooding in the south-western corner of the car park. It is understood that following this event, Southern Water installed telemetry kit and improved maintenance regimes to avoid further events of a similar nature from occurring.

5.5 Summary of Flood Risk

5.5.1 The potential sources of flooding are:

Source of Flooding	Level of Risk
Rivers and Coastal	Low The majority of the site is located in Flood Zone 1, with the south-western extent of the site located in Flood Zone 2. The Environment Agency has provided modelled flood level data for the site, which identifies a peak modelled flood level of 34.47m AOD for the south-western extent of the site, relating to the 0.1% AEP (1 in 1000-year, Flood Zone 2) event. All other areas of the site are not identified as being at risk of flooding from such sources.
Surface Water	Very Low to High There is a varying susceptibility to surface water flooding at the site, ranging from 'Very Low' to 'High' risk. The site is largely identified as being at 'Very Low' risk of surface water flooding. The area of the site identified at greatest risk of surface water flooding is the south-western corner of the site, where the risk ranges from 'Low' to 'High'. The anticipated depths of flooding have been assessed in 'Low', 'Medium' and 'High' risk scenarios. In 'High' risk scenarios, anticipated depths are stated as being 'Below 30cm', with depths ranging from 'Below 30cm' to '30cm to 90cm' in 'Medium' and 'Low' risk scenarios.

Groundwater	Low Review of BGS records found the site to have low groundwater vulnerability. Bedrock is considered unproductive. Nearby records found presence of Clay and no groundwater up to borehole depth of 10.0mbgl. The Hampshire County Council (HCC) Groundwater Management Plan mapping indicates that general site area is situated within an area at moderate risk of groundwater emergence, however this is not site specific.
Sewers	Low An instance of historic flooding occurred where the local surface water sewer network surcharged following intense rainfall and pump failure in relation to Southern Water's attenuation pond which resulted in the system backing up, causing localised flooding at the south-western corner of the site. No further instances of flooding have occurred since remedial works were undertaken.
Artificial Sources	None The site is not shown to be at risk of flooding due to artificial sources.

6 PROPOSED DEVELOPMENT

6.1 Description of Development

- 6.1.1 The outline planning application, with all matters reserved apart from access, relates to development within Class E (Light Industrial, Retail, Café, Restaurants, Leisure / Gym), B2, B8 and B8 Trade Counters.
- 6.1.2 The type of development proposed falls within the "Less Vulnerable" flood risk vulnerability classification (Annex 3: Flood risk vulnerability classification, NPPF) and is appropriate in Flood Zones 1 and 2 (Flood Risk and Coastal Change Table 2).

Flood Zones	Flood Risk Vulnerability Classification				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Flood Zone 1	✓	✓	✓	✓	✓
Flood Zone 2	✓	Exception Test Required	✓	✓	✓
Flood Zone 3a+	Exception Test Required +	✗	Exception Test Required	✓	✓
Flood Zone 3b*	Exceptions Test Required *	✗	✗	✗	✓*
✓ = Development is appropriate ✗ = Development should not be permitted					

- 6.1.3 For the outline planning application, a site layout has not been prepared. All matters are reserved, with the exception of access, which is to be provided off Elletra Avenue at the north of the site.
- 6.1.4 The use of Sustainable Drainage System (SuDS) methods and techniques (where site conditions and constraints allow) within the bounds of the site (whilst adhering to the SuDS hierarchy as stated within Building Regulations (Part H) and The CIRIA SuDS Manual C753) will be used to provide a betterment of surface water run-off compared to the existing site.
- 6.1.5 The specific surface water and foul water drainage proposals are detailed in **Section 8** of this report.

7 SEQUENTIAL AND EXCEPTION TESTS

7.1 Sequential Test

- 7.1.1 Paragraph 024 of Flood Risk and Coastal Change confirms that 'The Sequential Test ensures that a sequential, risk-based approach is followed to steer new development to areas with the lowest risk of flooding, taking all sources of flood risk and climate change into account. Where it is not possible to locate development in low-risk areas, the Sequential Test should go on to compare reasonably available sites; within medium risk areas; and then, only where there are no reasonably available sites in low and medium risk areas, within high-risk areas.'
- 7.1.2 The majority of the site is located within Flood Zone 1, with the exception of the south-western corner of the site, which is designated as Flood Zone 2. As confirmed in 6.1.3, "Less Vulnerable" development is compatible with Flood Zones 1 and 2.
- 7.1.3 The site is referenced within the Havant Borough Council Local Plan 2036, Strategic Flood Risk Assessment (Local Plan Sites) November 2018. This confirms that a sequential approach can be adopted on site to avoid the 'small area in the south western part of the site'. The site allocated is stated to be 'acceptable'.
- 7.1.4 As the proposed planning application is to be outline, a site layout has not been developed, and will be subject to a reserved matters application at a later date. At that time, the proposed development shall be set out sequentially to avoid areas identified as being at risk of flooding, or by providing sufficient mitigation to the associated risks, if acceptable.

7.2 Exception Test

- 7.2.1 Paragraph 031 of Flood Risk and Coastal Change states 'The Exception Test requires two additional elements to be satisfied (as set out in paragraph 164 of the National Planning Policy Framework) before allowing development to be located or permitted in situations where suitable sites at lower risk of flooding are not available following application of the sequential test. It should be demonstrated that; development that has to be in a flood risk area will provide wider sustainability benefits to the community that outweigh flood risk; and the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.'
- 7.2.2 Application of the Exception Test is not required for the type of development proposed; "Less Vulnerable" development is acceptable within Flood Zones 1 and 2 without the need for the Exception Test to be undertaken.

8 PROPOSED DRAINAGE STRATEGY

8.1 Surface Water

8.1.1 The SUDS Manual (CIRIA C753) and Building Regulations, Approved Document H (Drainage and Waste Disposal) set out a hierarchy of drainage methods to ensure that developments maximise the use of sustainable drainage techniques. The hierarchy favours infiltration methods of disposal over other methods such as watercourse and sewers, as detailed below;

- i. Utilise infiltration techniques
- ii. Attenuate rainwater in ponds or open water features for gradual release
- iii. Attenuate rainwater by storing in tanks or sealed water features for gradual release
- iv. Discharge rainwater direct to a watercourse
- v. Discharge rainwater to a surface water sewer/drain
- vi. Discharge rainwater to a combined sewer

SUDS Technique	Suitable	Comments
Living Roof	Yes	No initial constraints identified
Basins and Ponds (such as Wetlands, Balancing Ponds, Detention Basins, Retention Ponds)	Yes	No initial constraints identified
Filter strips and swales	Yes	No initial constraints identified
Infiltration Devices - Soakaways - Infiltration trenches and basins	No	The site is underlain by clay and is not suitable for infiltration techniques
Permeable surfaces and filter drains (such as gravelled areas and porous block paving)	Yes	The site is underlain by clay and not suitable for infiltration techniques. Tanked permeable paving would capture, treat, and attenuate run-off.
Tanked systems (such as oversized pipes or cellular tanks)	Yes	SuDS systems would be depth limited due to the necessity to connect into the existing drainage system.

8.1.2 As the planning application for which this Flood Risk Assessment has been prepared to accompany is an outline application, with all matters except for access arrangements to be determined at a later stage, a site layout has not been prepared. As such, is it not possible to confirm specific arrangements

where surface water drainage is concerned, only establishing the broad principles of the strategy.

- 8.1.3 It is proposed that the site will continue to drain via existing means; to the Southern Water public sewer network and, in turn, Southern Water's attenuation pond to the west of Elletra Avenue.
- 8.1.4 As discussed in Section 4.0 (Existing Drainage), the site currently drains via a network of concrete slot drains, gullies and drains which discharge to the public surface water sewer network, which in turn discharges to Southern Water's attenuation pond to the west of Elletra Avenue. The 1800mm dia. public surface water sewer which crosses the site discharges to a section of open channel (Main River), upstream of the twin 1200mm dia. culverts. It is understood that it is estimated that the attenuation pond west of Elletra Avenue has a capacity of between a current 1-in-30-year to 1-in-50-year event as detailed in an earlier Flood Risk Assessment prepared on behalf of the client (Peter Brett Associates, September 2013).
- 8.1.5 Following the principles set out in the Peter Brett Associates FRA, which BP Civils concurs with, it is proposed to provide surface water attenuation on site to ensure run-off does not exceed existing 1-in-30-year discharge rates.
- 8.1.6 Existing 1 in 30-year run-off has been calculated as 905.2 l/s, and existing 1 in 100-year run-off has been calculated as 1,131.8 l/s. Calculations are in **Appendix D**.
- 8.1.7 On-site proposals should adhere to the Four Pillars of SuDS; water quality, water quantity, amenity and biodiversity.
- 8.1.8 Proposals should be developed in view of the previously references drainage hierarchy; prioritising SuDS where site constraints and opportunities will allow.
- 8.1.9 A reduction in relation to existing brownfield run-off rates should be sought when developing surface water drainage proposals in relation to future development layout proposals, in order to provide betterment.
- 8.1.10 It is likely that permeable surfacing could be incorporated within the design to provide not only storage functionality, but also affording treatment to the run-off received.
- 8.1.11 Additional details are to be confirmed following development of site layout at reserved matters stage.
- 8.1.12 A S106 application will be required in order to establish connection to the surface water sewer.
- 8.1.13 All captured run-off from the proposed hardstanding areas should be attenuated up to the 100-year event, inclusive of 45% climate change allowance.

8.2 Treatment

- 8.2.1 In accordance with the CIRIA SuDS Manual C753 regarding methods for managing pollution risks, the risk posed by surface water run-off to the receiving environment depends on the pollution hazard at the site (the source), SuDS treatment techniques (the pathway), and the sensitivity of the environment (the receptor).
- 8.2.2 The simple index approach considers whether SuDS techniques are appropriate for the site. The states that for SuDS components to deliver adequate treatment, the total pollution mitigation index for each contaminant type should equal or exceed the pollution hazard index.
- 8.2.3 The SuDS Manual outlines three categories of pollution hazard identification, which vary depending on proposed land use, which are as follows:
- Total Suspended Solids (TSS).
 - Metals (M).
 - Hydrocarbons (H).
- 8.2.4 In accordance with C753 Table 26.2, the proposed land uses at the site are categorised as follows:
- Commercial yard and delivery areas, non-residential car parking with frequent change, all roads except low traffic roads and trunk roads/motorways TSS=0.7/M=0.6/H=0.7
- And/or;
- Sites with heavy pollution, lorry parks, highly frequented lorry approaches to industrial estates, waste sites, sites where chemicals and fuels are to be delivered, handled, stored or manufactured; industrial sites- TSS=0.8/M=0.8/H=0.9
- 8.2.5 In accordance with C753 Table 26.3, measures shall be included within the surface water drainage system to mitigate potential pollutants to ensure ongoing water quality. Full surface water drainage proposals, including treatment, will be subject to design at reserved matters stage.

8.3 Foul Water Drainage

- 8.3.1 It is proposed that foul water from the site will discharge to the Southern Water public sewer(s) located in Elletra Avenue and/or Silverthorne Way.
- 8.3.2 A S106 application will be required in order to establish connection to the existing foul sewer.

8.4 Climate Change

- 8.4.1 Gov.uk provides guidance for local planning authorities preparing strategic flood risk assessments and developers and their agents preparing flood risk assessments for planning applications, and development consent orders for nationally significant infrastructure projects.

- 8.4.2 Climate change allowances are predictions of anticipated change for peak river flow, peak rainfall intensity, sea level rise and offshore wind speed and extreme wave height.
- 8.4.3 Allowance for climate change shall be provided in the undertaking of site-specific flood risk assessments where new development is proposed to minimise vulnerability and provide resilience to flooding and coastal change.
- 8.4.4 The 'Peak Rainfall Allowances Map' shows anticipated changes in peak rainfall intensity.
- 8.4.5 Based on the latest allowances, for the 3.3% annual exceedance rainfall event, an increase of 40% should be applied to peak rainfall in relation to the proposed development.
- 8.4.6 For the 1% annual exceedance rainfall event, an increase of 45% should be applied to peak rainfall in relation to the proposed development.

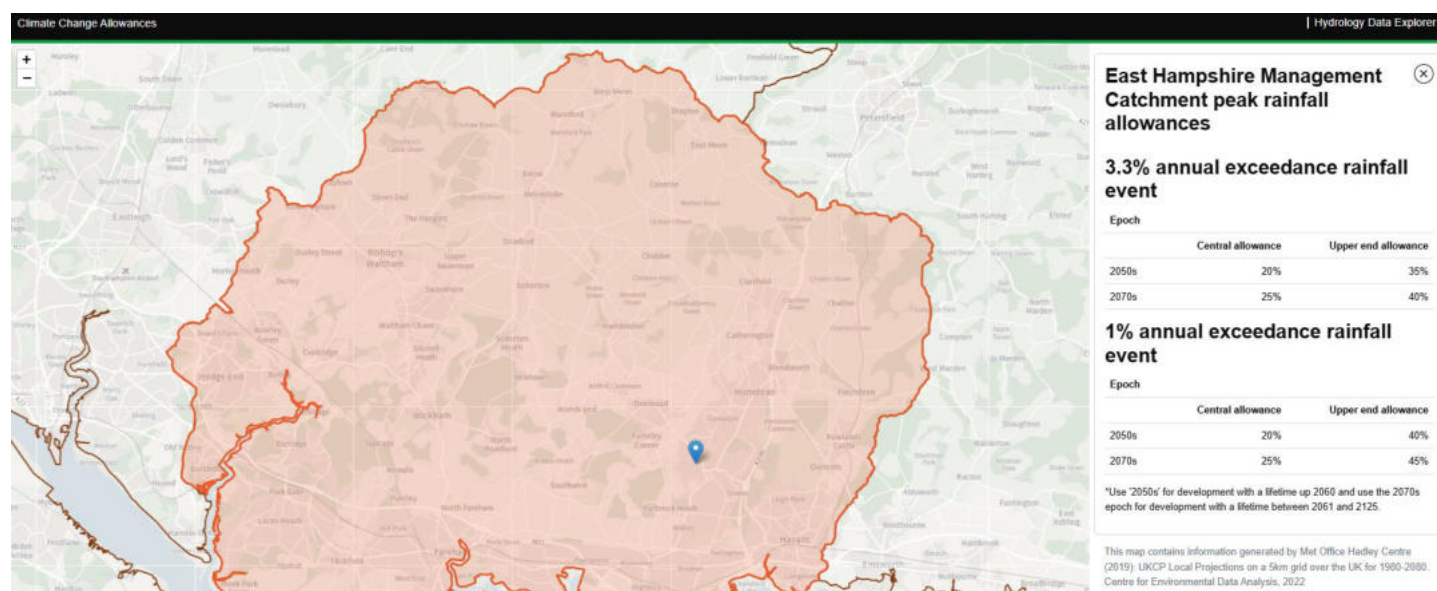


Figure 17. Climate Change Allowances – Peak Rainfall Allowances (Gov.uk)

8.5 Urban Creep

- 8.5.1 No allowance is required for the potential impacts of urban creep in relation to the proposed development, given that the proposed development is retail/commercial in nature. No such allowance for urban creep is required in such circumstances.

9 RESIDUAL RISK AND MITIGATION

9.1 Residual Risk

9.1.1 The following residual risks have been identified in relation to the proposed development:

- i. Flooding of buildings within flood zone extents, or within the vicinity of flood zones
- ii. Failure of Southern Water's pumping apparatus, downstream of the Southern Water attenuation pond
- iii. Increased flow through the Main River as a result of climate change
- iv. Blockage of any part of the on-site, upstream and/or downstream drainage network
- v. Extreme rainfall events that exceed the design criteria used for the drainage system

9.2 Mitigation

9.2.1 Consideration has been taken to the residual risks stated in Section 9.1, and the following mitigation measures are proposed:

- i. The site is located almost entirely within Flood Zone 1, with the exception of the south-western corner of the site which falls within Flood Zone 2. The Environment Agency has provided modelled flood level data for the site, which confirms a peak flood level of 34.47m AOD for the 0.1% AEP event. It is proposed that finished floor levels for buildings within the flood zone or within the vicinity of the flood zone will be raised above this level by 300mm – to a minimum level of 34.77m AOD.
- ii. It is understood, from anecdotal evidence, that Southern Water's pumping apparatus in association with the existing attenuation pond has failed historically which led to localised flooding. The risk of future failure is considered to be reduced, as it is understood that telemetry apparatus was installed and maintenance regimes were improved, therefore reducing the risk of future occurrences. Should the pump fail again in future, there is potential for the attenuation pond to breach, and/or the upstream system to surcharge. It is understood that the pond overflow weir has a level of 33.51m AOD above the pumped outfall level, with the banks of the attenuation pond understood to be finished to a level of 33.90m AOD around this. Flows exceeding the weir will fall directly to the Main River. The lowest levels on site are elevated above that of the weir overflow and the finished level of the attenuation pond around this, however the existing piped drainage network and associated levels may provide an exceedance back-up route to the site that could result in shallow flood depths. The proposed on-site surface water drainage design will help to mitigate this risk. Finished floor levels to the south-west of the site are also to be set at a level of at least 34.77m AOD – 300mm above the modelled flood level of 34.47m AOD.
- iii. The Main River is located downstream of Southern Water's attenuation pond and the twin 1200mm dia. culverts.

- iv. Maintenance plays a vital role in managing and reducing flood risk. The surface water drainage system should be designed to accommodate a 1-in-100-year storm event, inclusive of an allowance for the potential impacts of climate change (45%). Should blockage of the drainage system occur, there is the potential for flooding to occur at the site. Blockage of the drainage system would result in, effectively, an exceedance event. Collected run-off would breach the system, and travel overland, following the topography of the site. External levels can be engineered to ensure the conveyance of run-off, away from the proposed buildings. At reserved matters stage, a detailed maintenance document should be prepared detailing the required maintenance tasks and activities, as well as frequencies, in order to mitigate the potential risk of blockage, and subsequent risk of flooding.
- v. The surface water drainage system should be designed to accommodate a 1-in-100-year storm event, inclusive of an allowance for the potential impacts of climate change (45%). Should an event occur which exceeds this design criteria, exceedance flows would follow the natural topography of the site. Where existing levels demonstrate little to no fall, surface water flooding may occur. Floor levels are to be set to mitigate this risk.

10 FLOOD RISK MANAGEMENT

10.1 Safe Access and Egress

- 10.1.1 Access to the site is to be provided off Elletra Avenue, to the north.
- 10.1.2 The site is largely located within Flood Zone 1, therefore safe access and egress can be achieved providing a dry route of escape.
- 10.1.3 The south-western corner of the site is in Flood Zone 2. The finished floor level and surrounding external levels are to be set at a level above 34.77m AOD, at least 300mm above the 0.1% AEP modelled flood level of 34.47m AOD.

11 MAINTENANCE

11.1 Proposed Maintenance Regime

- 11.1.1 Maintenance is required to ensure the long-term operational performance any surface water drainage system.
- 11.1.2 Whilst systems should be designed to minimise maintenance requirements, a number of key tasks will always need to be undertaken so that the system remains in optimal condition.
- 11.1.3 Future maintenance tasks and activities will be confirmed as on-site drainage proposals are finalised as part of a later reserved matters application.

12 OFFSITE IMPACTS

- 12.1.1 The proposed development will ensure that there will be a reduction in surface water discharging off-site, with flows leaving the site being restricted. At present, the site drains without attenuation and/or any restriction of flows.
- 12.1.2 The effects of climate change shall be considered in the design of the proposed surface water drainage system, with an allowance of 45% to be considered in peak rainfall intensity.
- 12.1.3 Foul water will discharge to Southern Water's public foul water sewer.

13 SUMMARY

- 13.1.1 BP Civils is instructed by Hargreaves Properties Limited to prepare a site-specific Flood Risk Assessment (FRA) and Drainage Strategy to accompany an outline planning application with all matters reserved apart from access for development within Class E (Light Industrial, Retail, Café, Restaurants, Leisure / Gym), B2, B8 and B8 Trade Counters.
- 13.1.2 The site measures 4.1Ha (40,555m²) and is situated within an existing industrial/retail estate in Waterlooville.
- 13.1.3 The existing impermeable area at the site totals 33,554m² (82% of the overall site area).
- 13.1.4 The topographic survey demonstrates levels in the range of 36.40m AOD and 35.40m AOD at the north-western extent of the site, falling in a southerly/south-westerly direction. An historic slab is present centrally on site, with a level in the range of 35.70m AOD and 35.80m AOD. Remaining levels on site are broadly in the range of 35.60m AOD and 34.18m AOD.
- 13.1.5 The public sewer records identify an existing 1800mm dia. public surface water sewer crossing the site from the north-east to the south-west. This sewer discharges to a short section of open channel before discharging to twin 1200mm dia. culverts at the southern boundary of the site. The point at which the 1800mm dia. public sewer discharges to the open channel is classified as Main River.
- 13.1.6 The twin 1200mm dia. culverts flow south-west beneath Silverthorne Way and discharges to an open channel (Main River) to the west of Tyak House (south-west of the site).
- 13.1.7 A 1050mm dia. surface water drain is also located at the south-western extent of the site, which discharges directly to an attenuation pond on the western side of Elletra Avenue. The pond is owned and operated by Southern Water and has a pumped outfall into the adjacent Main River.
- 13.1.8 It is understood that it is estimated that the attenuation pond has a capacity of between a current 1-in-30-year to 1-in-50-year event as detailed in an earlier Flood Risk Assessment prepared on behalf of the client (Peter Brett Associates, September 2013).
- 13.1.9 The site currently drains via a network of concrete slot drains, gullies and drains which discharge to the public surface water sewer network.
- 13.1.10 The majority of the site is located in Flood Zone 1, with the exception of extents to the south-western corner of the site, which are identified as Flood Zone 2.
- 13.1.11 A site layout has not been developed in conjunction with the outline planning application.
- 13.1.12 Post-development surface water run-off will be managed through sustainable drainage measures, where site constraints and opportunities will allow. Proposals will be fully detailed as part of a reserved matters application. Drainage hierarchy shall be followed to maximise the highest-ranking opportunities, with acknowledgement of the 'Four Pillars of SuDS' also considered.
- 13.1.13 Wastewater from the proposed development will discharge to the public foul sewer network on Elletra Avenue/Silverthorne Way.
- 13.1.14 The completion of the development will not increase flood risk on or off the site and will instead provide betterment.
- 13.1.15 In conclusion, this development is suitable with regards to flood risk and surface water drainage.