Flood Risk Assessment and Drainage Strategy

Bridge Point, Weybridge

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APPENDICES

1.0 INTRODUCTION

1.1 REPORT PURPOSE

1.1.1 HDR Consulting Limited has been commissioned by Bridge UK Properties 7 LP to produce a Flood Risk Assessment and Drainage Strategy to support a planning application for a proposed development known as Bridge Point Weybridge.

1.1.2 The scheme is intended to comprise demolition of all existing buildings and the construction of three employment units within Classes E(g)ii, E(g)iii, B2 and B8, with ancillary office accommodation, new vehicular access, associated external yard areas, HGV and car parking, servicing, external lighting, hard and soft landscaping, infrastructure and all associated works.

1.1.3 The site is divided into two development areas, north and south of Addlestone Road; an architect's drawing illustrating the development proposals is provided in Appendix A.

1.1.4 This assessment has been prepared in accordance with the UK National Planning Policy Framework (NPPF), the associated Planning Practice Guidance (PPG) website, and other applicable technical guidance as detailed below.

1.1.5 The NPPF sets out the criteria for development and flood risk by stating that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere. The key definitions are:

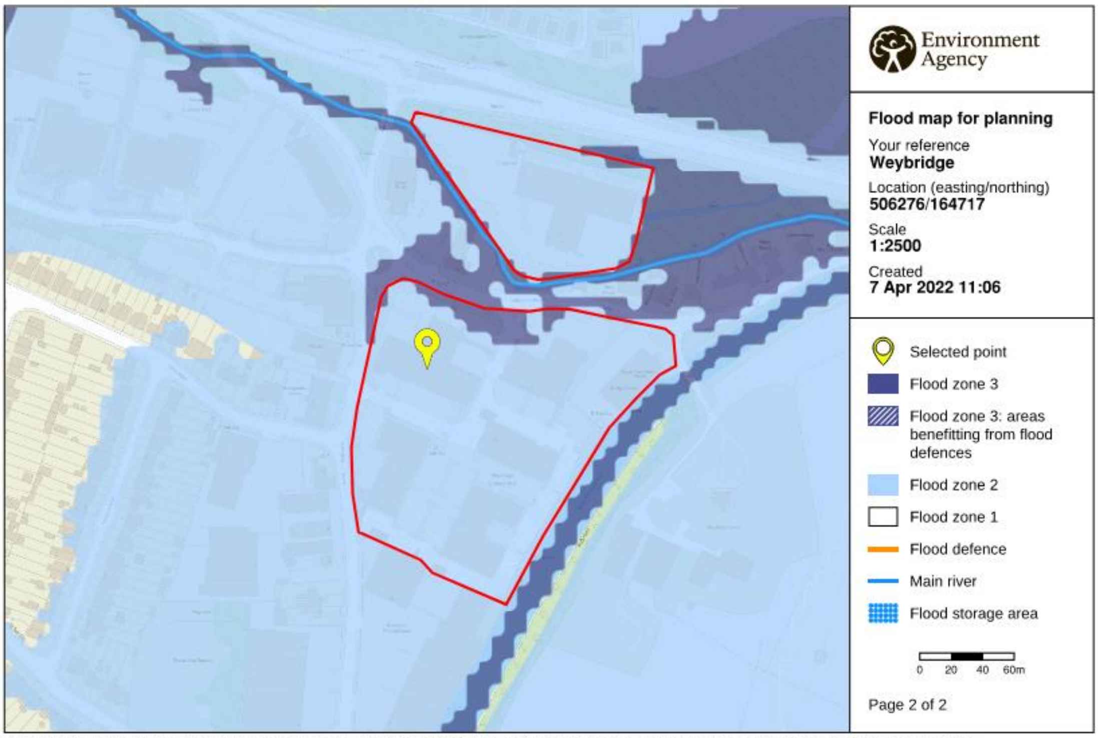
- "areas at risk of flooding" means land within Flood Zones 2 and 3; or land within Flood Zone 1 which has critical drainage problems, and which has been notified to the local planning authority by the Environment Agency.
- "flood risk" means risk from all sources of flooding - including from rivers and the sea, directly from rainfall on the ground surface and rising groundwater, overwhelmed sewers and drainage systems, and from reservoirs, canals and lakes and other artificial sources.

1.2 FLOOD ZONE

1.2.1 The Environment Agency's indicative flood map for planning (see below) shows the majority (about 95%) of the site lies within Flood Zone 2. This zone applies to 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 sea flooding.

1.2.2 A small area along the northern edge of the southern part of the site is indicated to lie within flood zone 3a. This applies to land having a 1 in 100 or greater annual probability of river flooding; or having a 1 in 200 or greater annual probability of sea flooding.

Figure 1: Environment Agency Flood Map for Planning:



1.3 SUPPORTING REPORT

1.3.1 A Flood Risk Appraisal report has been produced for HDR by Ramboll (report ref. 1620014229 dated April 2022) to provide further details of modelled extent of flood risk at the site. Ramboll has undertaken numerous phases of flood risk modelling and assessment at this site over a period of many years, and has liaised with the Environment Agency who has confirmed that Ramboll's modelling remains the basis of their flood maps and zoning locally.

1.3.2 A copy of the Ramboll report is enclosed as Appendix C of this HDR report.

2.0 PROJECT DETAILS AND SETTING

2.1 LOCATION AND DESCRIPTION

2.1.1 The main, southern part of the site comprises the disused Weybridge Business Park on Addlestone Road, post code KT15 2UP. It can be approximately centred on Ordnance Survey grid reference TQ 063 646. Weybridge Business Park comprises several vacant office buildings with predominantly block paved external surfacing.

2.1.2 The northern boundary of this part of the site is defined by Addlestone Road, and Hamm Hall Lane defines the western boundary. The River Wey navigation canal is located immediately to the east, and neighbouring commercial premises are situated to the south.

2.1.3 The northern part of the site, north of Addlestone Road, comprises a roughly triangular shaped plot occupied by a disused former business premises previously occupied by Toshiba. It is accessed via a road bridge which extends from Addlestone Road over a 'linking watercourse' which is part of the Addlestone Bourn (see Hydrology section below). This defines the south-western and south-eastern boundaries, and Weybridge Road is located immediately beyond the northern boundary of this part of the site.

2.1.4 In total the two parts of the site cover a total area of about 3.4 hectares.

2.1.5 A location plan is provided in Appendix B.

2.2 PROPOSED DEVELOPMENT

2.2.1 The southern part of the site is proposed to be redeveloped for a single light industrial / warehouse unit referred to as Unit 100. The land to the north of Addlestone Road is to be redeveloped for two light industrial units referred to as Units 210 and 220. External areas will comprise car parking, service yards and boundary landscaping. UMC architect's drawing 21490-UMC-ZZZ-SI-DR-A-0602 illustrates the proposals.

2.3 TOPOGRAPHY

2.3.1 A 2022 topographical survey (see Appendix D) indicates that at present ground levels external to the existing buildings at both parts of the site range between about 12.20 and 12.60 mAOD. The floor level of buildings in the Weybridge Business Park area are generally between about 12.80 and 12.85 mAOD. The floor level of the former Toshiba building in the northern site is approximately 12.90 mAOD.

2.4 GEOLOGY

2.4.1 A ground investigation was undertaken by TRC in 2021 comprising exploratory boreholes and trial pits. This identified the following generalised lithological sequence:

Stratum	Description	Thickness range (m)
Made Ground	Generally comprising a dark brown or grey very sandy gravel layer over a dark grey clay layer.	0.6 - 2.7

Stratum	Description	Thickness range (m)
Alluvium	Generally comprising a Clay or Silt with variable amounts of sands and gravels.	0.6 – 3.0
Kempton Park Gravel	Generally comprising a medium dense to very dense sand with varying gravel content.	>1.7 m

2.4.2 The Kempton Park Gravel is mapped to be underlain by bedrock of the Bagshot Formation (yellow-brown and pale-grey locally clayey sand), but this was not reached during the TRC investigation.

2.5 HYDROGEOLOGY

2.5.1 The Alluvium is a Secondary 'A' aquifer and the Kempton Park Gravel is Principal aquifer.

2.5.2 Resting groundwater has been measured in monitoring wells at depths of between 0.7 m and 1.8 m below ground level, corresponding to levels of between about 10.7 and 11.7 mAOD. The data indicate the sand and gravel soils to be fully saturated and a shallow prevailing groundwater table.

2.5.3 The site is not located within a groundwater source protection zone.

2.6 HYDROLOGY

2.6.1 The nearest surface watercourse is the River Wey Navigation Canal which lies adjacent to the eastern boundary of the southern part of the site. This watercourse flows in a northerly and easterly direction to its confluence with the River Wey approximately 400 m east of the site. This stretch of the river is known as the Lower Wey and reaches the River Thames approximately 1 km north-east of the site.

2.6.2 Other watercourses around the site are referred to collectively as the Addlestone Bournes. A watercourse flows in a westerly direction within a channel between the north and south areas of the site, roughly parallel with Addlestone Road, and is referred to as the 'linking watercourse'. This connects the main Addlestone Bourne channel located approximately 330 m to the west of the site at its closest point, to the Lower Wey, approximately 470 m to the east of the site. The Addlestone Bourne flows beneath Weybridge Road where it becomes Woburn Park Stream, 320 m northwest of the site.

3.0 POLICY AND GUIDANCE

3.1 NATIONAL PLANNING POLICY FRAMEWORK (JULY 2021)

3.1.1 In determining an approach for the assessment of flood risk for the development proposal there is a need to review the policy context. Government guidance requires that consideration be given to flood risk in the planning process. The National Planning Policy Framework (NPPF) was last updated in July 2021 and outlines the national policy position on development and flood risk assessment.

3.1.2 The Framework states that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk. Where development is necessary in flood risk areas, it can be permitted provided it is made safe without increasing flood risk elsewhere.

3.1.3 The essence of NPPF is that:

- Local Plans should be supported by Strategic Flood Risk Assessment and develop policies to manage flood risk from all sources, taking advice from the Environment Agency and other relevant flood risk management bodies, such as lead local flood authorities and internal drainage boards.
- Polices in development plans should outline the consideration, which will be given to flooding issues, recognising the uncertainties that are inherent in the prediction of flooding and that flood risk is expected to increase as a result of climate change.
- Planning authorities should apply the precautionary principle to the issue of flood risk, using a risk-based search sequence to avoid such risk where possible and managing it elsewhere;
- The vulnerability of a proposed land use should be considered when assessing flood risk;
- Opportunities offered by new developments should be used to reduce the causes and impacts of flooding;
- Planning authorities should recognise the importance of functional floodplains, where water flows or is held at times of flood, and avoid inappropriate development on undeveloped and undefended floodplains; and
- The concept of Flood Risk Reduction, particularly in circumstances where development has been sanctioned on the basis of the “Exception Test”.

3.2 FLOOD AND WATER MANAGEMENT ACT 2010

3.2.1 Combined with the Flood Risk Regulations 2009 (‘the Regulations’), (which enact the EU Floods Directive in the England and Wales) the Flood and Water Management Act 2010 (‘the Act’) places significantly greater responsibility on Local Authorities to manage and lead on local flooding issues.

3.2.2 The Act and the Regulations together raise the requirements and targets Local Authorities need to meet, including:

- Playing an active role leading Flood Risk Management;

- Development of Local Flood Risk Management Strategies (LFRMS);
- Implementing requirements of Flood and Water Management legislation;
- Development and implementation of drainage and flooding management strategies;
- Responsibility for first approval, then adopting, management and maintenance of Sustainable Drainage System (SuDS) where they service more than one property.

3.2.3 The Flood and Water Management Act also clarifies three key areas that influence development:

1. Sustainable Drainage Systems (SuDS) - the Act makes provision for a national standard to be prepared on SuDS, and developers will be required to obtain local authority approval for SuDS in accordance with the standards, likely with conditions. Supporting this, the Act requires local authorities to adopt and maintain SuDS, removing any ongoing responsibility for developers to maintain SuDS if they are designed and constructed robustly.
2. Flood risk management structures - the Act enables the EA and local authorities to designate structures such as flood defences or embankments owned by third parties for protection if they affect flooding or coastal erosion. A developer or landowner will not be able to alter, remove or replace a designated structure or feature without first obtaining consent from the relevant authority.
3. Permitted flooding of third party land - The EA and local authorities have the power to carry out work which may cause flooding to third party land where the works are deemed to be in the interest of nature conservation, the preservation of cultural heritage or people's enjoyment of the environment or of cultural heritage.

3.3 PLANNING PRACTICE GUIDANCE FLOOD RISK AND COASTAL CHANGE

3.3.1 The Planning Practise Guidance (PPG) for Flood Risk and Coastal Change (last updated August 2021) sets strict tests to protect people and property from flooding which all local planning authorities are expected to follow. Where these tests are not met, national policy is clear that new development should not be allowed. A key aspect of the guidance is that if there are better sites in terms of flood risk, or a proposed development cannot be made safe, it should not be permitted.

3.3.2 The document provides guidance on how local planning authorities should:

- Assess flood risk;
- Avoid flood risk; and
- Manage and Mitigate flood risk and coastal change.

3.3.3 There is also information on the requirements to consult the Environment Agency, on the role of lead local flood authorities and on flood risk in relation to minor developments.

3.3.4 The latest update provides additional guidance on SuDS, including:

- The importance of SuDS;
- When SuDS should be considered;
- The SuDS discharge hierarchy;

- Factors a local authority will address when considering SuDS as part of a planning application;
- When SuDS are inappropriate and relevant flood risk consultees;
- Applicability of Defra's Non-statutory Technical Standards for Sustainable Drainage Systems;
- Design and construction cost considerations;
- Operation and maintenance considerations; and
- Where to go for further SuDS advice.

3.4 SUDS MANUAL, CIRIA C753 (2015)

3.4.1 The CIRIA SuDS Manual provides advice on the implementation of sustainable drainage techniques in the UK. It provides guidance on:

- Initial planning;
- Design through to construction;
- The management of SuDS in the context of the current regulatory framework; and
- Advice on landscaping, waste management, cost, and community engagement.

3.5 RUNNYMEDE BOROUGH COUNCIL SURFACE WATER MANAGEMENT GUIDANCE

3.5.1 Runnymede Council has published online guidance (https://www.runnymede.gov.uk/environmental-health/surface-water-management) describing its preferred and required approach to the management of surface water runoff from new developments in the borough. This states that all major development must make provision for SuDS, which should be properly planned at the beginning of the design process for the development.

3.5.2 Surface water run-off should be controlled as near to its source as possible through a sustainable drainage approach to surface water management.

3.5.3 In accordance with paragraph 080 of the NPPG, applicants must follow the hierarchy for drainage options. Where it is not possible to achieve the first level in the hierarchy (discharge through the ground – i.e. infiltration), applicants must demonstrate in sequence why the subsequent drainage option (discharge destination) has been selected.

3.5.4 Where the intention is to dispose to soakaway, these should be shown to work through an appropriate assessment carried out under the methodology described in Building Research Establishment (BRE) Digest 365.

3.5.5 Where disposal of surface water into the ground is not practicable, nor into a surface water body, subject to the evidence being provided to support the choice of discharge destination, proposals to dispose of surface water into a surface water sewer, highway drain or another drainage system, should be accompanied by evidence of the system having spare capacity downstream. Developers need to contact the relevant Water Company to discuss this option.

3.5.6 SuDS must be properly designed to ensure that the maintenance and operation costs are proportionate and sustainable for the lifetime of the development.

3.6 SURREY FLOOD RISK MANAGEMENT STRATEGY 2017-2032

3.6.1 As the Lead Local Flood Authority (LLFA) for Surrey, the County Council is responsible for publishing a Local Flood Risk Management Strategy, describing the management of flood risk across the County.

3.6.2 The County Council is designated as LLFA under the Flood and Water Management Act (2010). The Act states that an LLFA has a duty to "develop, maintain, apply and monitor a Strategy for local flood risk management in its area".

3.6.3 Objective 6 of the Strategy states: “We will reduce the risk of flooding to and from development through local planning policy and processes” and that “To achieve this we will…educate planning officers, members and developers on flood risk and drainage, particularly SuDS and environmentally beneficial measures.”

4.0 FLOOD PROBABILITY AND HAZARD

4.1 POTENTIAL SOURCES

4.1.1 The flood risk elements that need to be considered for any site are defined in BS 8533 as the “Forms of Flooding” and are listed as:

- flooding from Rivers (fluvial flood risk)
- flooding from the Sea (tidal flood risk)
- flooding from the Land
- flooding from Groundwater
- flooding from Sewers (sewer and drain exceedance, pumping station failure etc)
- flooding from Reservoirs, Canals and other Artificial Structures.

4.2 FLUVIAL FLOOD RISK - HYDRAULIC MODELLING

4.2.1 Fluvial flooding occurs when the amount of water exceeds the flow capacity of the channel. Most rivers have a natural floodplain into which the water spills in times of flood.

4.2.2 As noted in the introduction, most of the study site is mapped to fall within EA-designated Flood Zone 2 and a small area in Flood Zone 3a.

4.2.3 With reference to the Ramboll 2022 report, modelling of EA Lower Wey flood level data has been undertaken to determine the actual peak flood levels, and therefore the actual extent of flooding at the site, prior to any future redevelopment.

4.2.4 The plausible sources of flood risk are from the Lower Wey and the Addlestone Bourne watercourses. These flood separately and therefore there are two different flood models that are relevant to the site.

4.2.5 The outputs of the Ramboll modelling are set out in their appended report and the following modelled flood levels have been determined for various return periods:

Source	100 year	100 year +9% (m AOD)	100 year + 20% (m AOD)	100 year + 24% (m AOD)	100 year + 35% (m AOD)
Addlestone Bourne	No Flooding	Not Modelled	12.30	Not Modelled	12.34
Lower Wey	12.26	12.36	Not Modelled	12.46	Not Modelled

4.3 ENVIRONMENT AGENCY PRODUCT 4 DATA

4.3.1 The Environment Agency has provided Product 4 flood level for the site. Data for the River Wey is based on information taken from the Lower Wey (Byfleet/Weybridge) Baseline Modelling Report undertaken by Capita/AECOM in 2019.

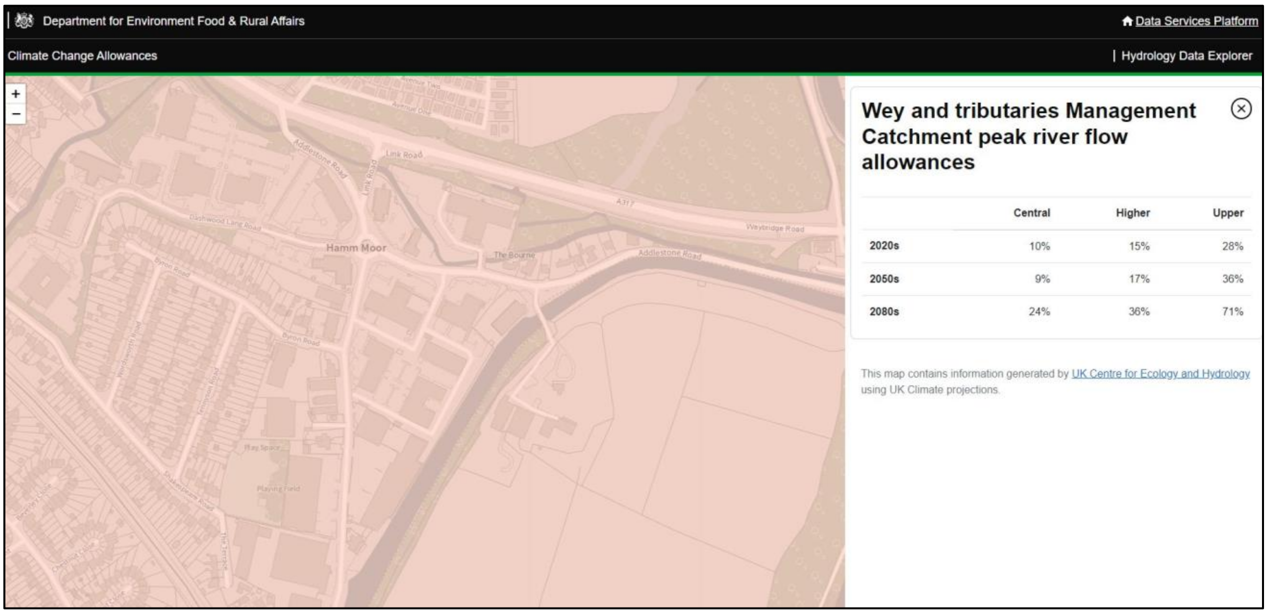
4.3.2 Data for the Addlestone Bourn is taken from the Addlestone Bourn/Hale Bourn Detailed Flood Risk Mapping Study completed in 2007.

4.3.3 The data is provided in full in Appendix E and in summary identifies a modelled floodplain level of **12.46 mAOD** at location reference ‘floodplain 4’ for the 1 in 100 year plus 25% scenario. This location lies towards the northern boundary of the southern part of the site, near the entrance off Addlestone Road.

4.4 PEAK RIVER FLOW CLIMATE CHANGE ALLOWANCE

4.4.1 Projections of climate change related increases in peak river flow for various UK main river catchments have been published by DEFRA. The allowances for the River Wey and its tributaries are as follows:

Figure 2: Peak River Flow Climate Change Allowances



4.4.2 These allowances are time-related, so the anticipated lifespan of the development materially affects the value to be adopted in any assessment of flood risk. It has been confirmed to HDR by the developer – Bridge Industrial – that the design life of the development is approximately 25 years. As such the allowance for the 2050s will apply.

4.4.3 For less vulnerable development such as the light industrial scheme under consideration, the guidance states that sites in Flood Zone 3a should be assessed using “central” allowances.

4.4.4 On this basis HDR has assessed a 9% increase in peak flows on the Lower Wey due to climate change (central allowance to the 2050s) for this assessment. However as a precautionary approach an assessment of the 24% increase has also been undertaken.

4.5 FLOOD MODEL AND FLUVIAL FLOOD COMPENSATION

4.5.1 It is recognised that there should be no loss of floodplain storage within the site following its redevelopment. The volume of flooding based on the site's present-day layout has been determined with reference to the existing topographical survey – as illustrated on HDR drawing 603 in Appendix F. This assessment is based on fluvial flood levels applicable to both the 1 in 100 +9% (12.36 mAOD) and the 1 in 100 +24% (12.46 mAOD) climate change scenarios.

4.5.2 Existing ground levels along the western bank of the River Wey where it borders the site range between about 12.90 to 13.20 mAOD, so flood waters can only reach the site by overtopping the watercourse further to the north and flowing southwards along Addlestone Road. A ridge line in this road of 12.30 mAOD must itself also be overtopped. Flood waters are modelled to enter the main part of the site south of its existing entrance off Addlestone Road and the extent of this and associated volumes are as shown on the drawing. Flood waters will not enter the area north of Addlestone Road because the Addlestone Bourn linking watercourse will provide an overflow channel.

4.5.3 The following table provides a summary of the predicted floodplain storage pre- and post-development:

Existing and Proposed Floodplain Volumes for the 1 in 100 year +9% and +24% climate change allowance events

Event	Flood Level (mAOD)	Pre-development flood storage (m3)	Post-development flood storage (m3)	Level-for-level requirement (m3)	Level-for-level storage acheived (m3)
1:100 +9%	12.360	300	600	300	600
1:100 +24%	12.460	750	1050	450	450

4.5.4 Enclosed HDR drawing 604 in Appendix G illustrates the modelled flood volumes, identifying the areas within the site where future flood water would be stored. These have been determined using proposed development levels and are based on a future building finished floor level of 13.00 mAOD. This provides 540 mm freeboard above the 1:100 + 24% flood level.

4.5.5 The drawings demonstrate that the proposed development will not reduce floodplain storage within the site and will provide adequate capacity for all modelled flood events. Safe access and egress during the flood event are also demonstrably available.

4.6 HISTORICAL FLOODING

4.6.1 Environment Agency records indicate flooding incidents have affected the site in 1947, 1968 and 1974. These are understood to have been a result of fluvial flooding from the adjacent watercourses. These events pre-date the current development in the late 1980s at which time building flood levels were raised to their current levels. A map indicating the extent of such flooding is provided with the appended EA Product 4 data.

4.7 FLOODING FROM THE SEA

4.7.1 On the coast, storm surges and high tides can threaten low lying areas and can sometimes be large and rapid enough to overtop defences. However tidal flooding is not considered a risk to the site, due to its inland location upstream of any tidal influence.

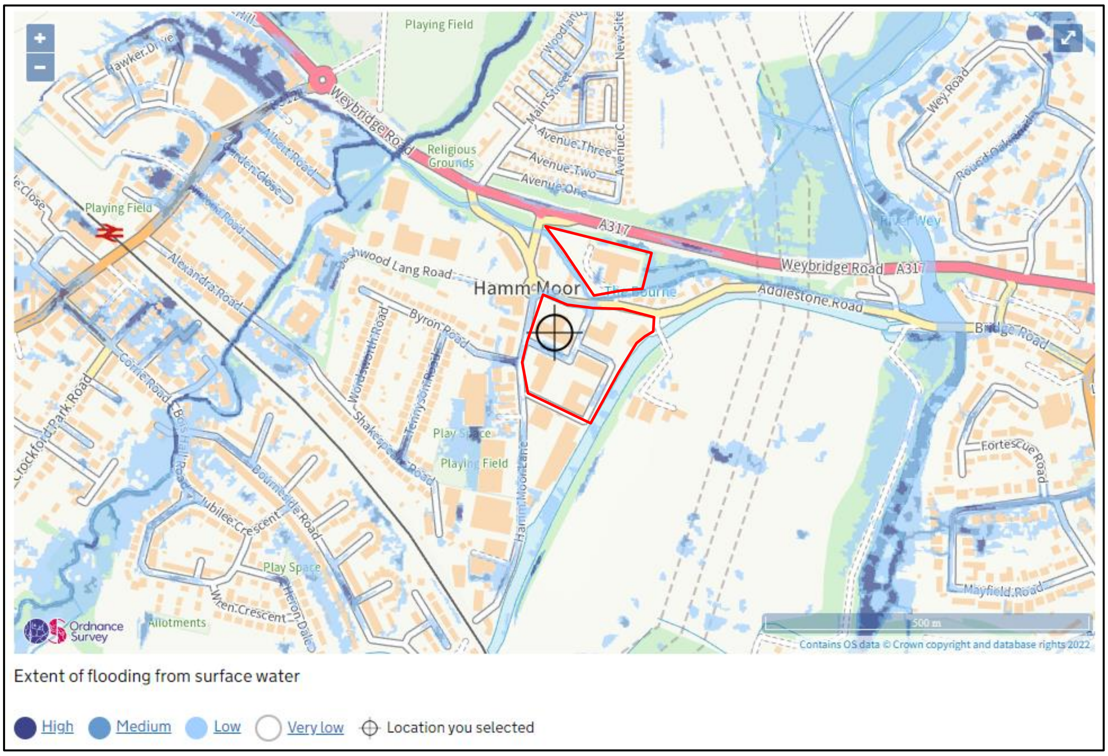
4.8 PLUVIAL FLOOD RISK

4.8.1 If intense rain is unable to soak into the ground or be carried through manmade drainage systems, for a variety of reasons, it can run off over the surface causing localised floods before reaching a river or another watercourse.

4.8.2 Generally, where there is impermeable surfacing or where the ground infiltration capacity is exceeded, surface water runoff will occur.

4.8.3 The Environment Agency's surface water flood map, reproduced below, shows that the majority of the site is at very low risk of flooding from pluvial sources:

Figure 3: EA Map of Flood Risk from Surface Water



4.8.4 It is recognised that the impermeable surfacing associated with the proposed development will increase the volume of surface water runoff (compared with its undeveloped greenfield condition), and so lead to a greater volume of surface water flow. A drainage strategy has been developed to mitigate the associated flood risk, as described in Section 5 below.

4.9 GROUNDWATER

4.9.1 Groundwater flooding tends to occur after prolonged periods of sustained high rainfall. Higher rainfall means more water will infiltrate into the ground and cause the water table to rise above normal levels. Groundwater tends to flow from areas where the ground level is high, to areas where the ground level is low. In low-lying areas, the water table is usually at shallower depths anyway, but during very wet periods, with all the additional groundwater flowing towards these areas, the water table can rise up to the surface causing groundwater flooding.

4.9.2 As noted above, the site is underlain by a sequence of made ground, silt/clay alluvium and granular river terrace deposits of the Kempton Park Gravel formation. Groundwater has been measured to be present at between about 0.7 and 1.8 mbgl (10.7 and 11.7 mAOD).

4.9.3 Notwithstanding, the risk of groundwater flooding is considered to be relatively low given that no basements are proposed within the development and the finished floor level will be of the order of 1.3 to 2.3 m above the water table.

4.10 FLOODING FROM SEWERS

4.10.1 Flooding from artificial drainage occurs when flow entering the system exceeds its conveyance capacity, the system becomes blocked, or it cannot discharge due to a high-water level in the receiving watercourse.

4.10.2 The proposed development will lead to a significant increase in impermeable area (compared with a greenfield condition) and therefore an associated increase in surface water runoff rates and volumes.

4.10.3 In this context, a surface water drainage scheme has been designed to accommodate the projected runoff, the details of which are set out in section 5 of this report.

5.0 DRAINAGE STRATEGY AND SUDS

5.1 INTRODUCTION

5.1.1 This section of the report describes the site's existing drainage status and considers the appropriateness of various SuDS options. It then describes the proposed surface and foul water drainage arrangements for the new development.

5.2 EXISTING RUNOFF

5.2.1 With reference to topographical and utilities survey information (see Appendix D), at present runoff from southern part the site is understood to be directed into the 'linking watercourse' north of Addlestone Road, via an existing pumping station and two parallel outfall pipes which pass under the road. The survey indicates an outfall headwall on the southern bank of the watercourse. There is no known restriction on the rate of discharge, which is assumed to be a function of the pump capacity.

5.2.2 Runoff from the northern part of the site is also currently directed into the linking watercourse. An outfall headwall is located on the northern bank, close to (almost opposite) that serving the southern site. This appears to discharge at an unrestricted rate at present.

5.3 GREENFIELD RUNOFF RATES

5.3.1 The theoretical greenfield run-off rate has been calculated for the site based on the FEH method, with a pro-rata value to account for the actual site area.

5.3.2 The runoff calculations (provided in Appendix I) indicate:

- Q bar (mean maximum annual flow rate) = 3.4 l/s/ha

5.4 SOIL INFILTRATION

5.4.1 Soil infiltration rate testing in accordance with the methodology described in BRE 365 (2016) was undertaken at the site by TRC Limited in March 2022. A copy of the TRC report is provided in Appendix J.

5.4.2 Six trial pits - TP101 to TP106 - were excavated to base depths of between 1.2 and 2.7 m below existing ground level. Testing was undertaken in four of these locations but was not carried out in TP103 and TP105 due to encountering shallow groundwater in the made ground.

5.4.3 The TRC report states that the variable granular and cohesive deposits (i.e. sand and clay) recorded in TP101, TP102, TP104 and TP106 had a very low soakage potential and no permeability coefficient could be calculated for any of the locations during the testing.

5.4.4 It has therefore been concluded that soakaway drainage is not feasible at the site.

5.5 BASINS

5.5.1 Construction of detention basins/swales is not feasible at the site given occupier requirements to ensure efficient use of space for this type of urban light industrial development.

5.6 GREEN ROOFS

5.6.1 The site is proposed to be developed for new steel-framed industrial / commercial units. By their nature such buildings span wide areas and are of lightweight and economic construction. The adoption of green roofs would require significant and costly modifications to the structural design including significantly upgraded foundations and more extensive use of structural steelwork. It has been determined that such an option is not compatible within the proposed development.

5.7 DRAINAGE STRATEGY

5.7.1 The surface water drainage strategy for the development is provided on the drawings in Appendix K, with supporting calculations in Appendix L.

5.7.2 It is proposed that below-ground storage systems be used at source to attenuate runoff to the QBAR greenfield rate prior to discharge into the linking watercourse (park of the Addlestone Bourn). Development levels are such that a pumped system and rising main will be required to serve the southern sector (Unit 100), while a gravity system will be used for the northern development (Units 210 and 220).

5.7.3 Permeable paving is proposed to be installed to all external car parking areas of the southern part of the development. This will be a 'Type B' system (after CIRIA 735), where the proportion of rainfall that exceeds the (negligible) infiltration capacity of the subsoil will flow into the engineered drainage network.

5.7.4 The drainage network for all of the site has been designed to accommodate the critical storm event up to and including the 1 in 100 year return period plus a 20% allowance for climate change, whilst still preventing off-site flooding. This is considered appropriate given the design life of the buildings has been confirmed by the developer to be approximately 25 years.

5.7.5 An exceedance analysis has been carried out based on the critical 1 in 100 year return period storm plus a 40% climate change allowance – locations of exceedance ponding are identified on the appended drawings.

5.7.6 The drainage system will be designed in accordance with the requirements of BS EN 752:2017 which stipulates that no surcharging should occur during a critical storm event of 1 in 2 years return period. It also requires that no exceedance flooding should occur during a critical storm event of 1 in 30 years return period.

5.7.7 The proposed foul network will operate by gravity and for the southern site (Unit 100) will discharge into an existing Thames Water public foul sewer manhole located on Hamm Hall Road. Foul drainage from the northern site will be directed into Thames Water foul sewer manhole 2801 located close to that part of the site's western boundary.

5.7.8 All sewer connections are subject to Section 106 public sewer connection agreements, and in this regard a pre-development enquiry has been submitted to Thames Water to determine availability to accept the proposed surface and foul water flows. A copy of the response to this enquiry, which confirms available capacity, is provided in Appendix O.

5.7.9 An assessment of the proposed foul flows can be found in Appendix N.

6.0 DRAINAGE MAINTENANCE AND OWNERSHIP

6.1 GENERAL PRINCIPLES

6.1.1 In general, sewers, manholes and drainage channels are unlikely to require maintenance other than periodic inspections, unless a blockage occurs. Sewers, manholes, drainage channels and silt pits should be inspected at 6 monthly intervals and cleaned out at 12 monthly intervals. A full CCTV survey should also be carried out at 10 yearly intervals.

6.1.2 In conjunction with HDR Consulting Final Construction Issue drainage layout and detail drawings, reference should also be made to the manufacturer's information and maintenance requirements for recommended intervals and safe methods of cleaning for the following proprietary systems:

- storm water storage systems
- drainage channels
- oil separators
- flow controls

6.1.3 In all instances, inspection and cleaning is to be carried out only by a suitable Specialist Contractor, following the guidelines given in BE EN 752:2008 "Maintenance Considerations" and "Safe Working in Sewers and at Sewage Works", published by the National Joint Health and Safety Committee for the Water Services.

6.1.4 All underground and under-floor drains and manholes (including oil separators) represent confined spaces. Appropriate precautions should be taken before entering drains and manholes. Access should only be undertaken by appropriately trained personnel.

6.2 GENERAL INSPECTION

6.2.1 A comprehensive inspection of all readily accessible drainage systems is to be carried out as detailed in the below schedule, to confirm the system is operating satisfactorily and to highlight if any blockages are present or beginning to develop. This will include all sewer runs, inspection chambers, manholes, drainage channels, silt pits and any proprietary items.

6.3 GATIC SLOTDRAIN

6.3.1 Gatic Slotdrains should always be maintained in accordance with the manufacturer's recommendations and guidance.

6.3.2 Regular inspection, as detailed in the below schedule, for any damage or blockages together with cleaning of the Slotdrain throat is to be undertaken to ensure uninterrupted flows into the channel. Routine cleaning of the Slotdrain channel using high pressure hose jetting through access units along the channel is to be carried out as detailed.

6.4 PETROL INTERCEPTORS

6.4.1 To prevent pollution and minimise running costs the petrol interceptors are to be regularly maintained as detailed in the below schedule. All parts of the separator requiring regular maintenance must always be accessible. Experienced personnel should:

- Physically inspect the integrity of the separator and all mechanical parts.
- Assess the depth of accumulated oil and silt.
- Service all electrical equipment such as alarms and separator management systems.
- Check the condition of any coalescing device and replace it if necessary.
- Keep a detailed log of when the separator is inspected, maintained, emptied and serviced. Also record specific events relating to the separator system such as cleaning, repairs, accidents and incidents.

6.4.2 Separators should be emptied as soon as a significant quantity of oil and/or silt has built up. The retained waste, including the silt, must be removed and the separator must be refilled with clean water before being put back in to service to prevent damage and to prevent oil passing through it. In addition to normal emptying of the separator, it will also need to be emptied right away if oil or silt levels exceed 90 per cent of the storage volume of the separator and the alarm is activated. When the oil or silt reaches this level or after a spillage, employ a registered waste removal company to empty the separator. For all waste removal operations it should be checked that the waste removal company has experience in emptying separators and that they do not allow any of the contents to escape from the outlet during emptying.

6.4.3 Every five years it is recommended that separators be emptied and given a general inspection to test the integrity and performance of the system. The separator must be refilled with clean water following such an inspection.

6.4.4 All waste must be handled, stored and disposed of correctly to avoid pollution. Waste oil is designated as hazardous / special waste and disposal must comply with the Hazardous Waste (England and Wales) Regulations 2005.

6.4.5 As a producer of hazardous / special waste the disposer must follow the Duty of Care Code of Practice which requires the disposer to make sure that the waste oil:

- Does not escape from the control of the disposer.
- Is transferred only to a registered waste carrier to be sent for recycling or disposal at a suitably licensed facility.
- Is accompanied by an appropriate transfer note with a full written description of the waste.

6.5 SCHEDULE OF MAINTENANCE

Ref.	Item	Activity	Frequency
1	General Inspection	Visual inspection and report of accessible drainage systems, to determine items 2, 3 and 4 below.	Every 6 months
2	General Cleaning	Cleaning of drainage system to include all pipework, inspection chambers, manholes, silt pits etc.	Yearly
3	Gatic Slotdrain	Inspection for damage / blockage and cleaning of slotdrain throat.	Monthly

		High pressure hose jetting of slotdrain channel. Carry out any additional maintenance requirements if required by manufacturer.	Yearly Manufacturer to advise
4	Petrol Interceptors	Inspect integrity of petrol interceptor and all mechanical parts. Assess and record depth of accumulated oil and silt. Service all electrical equipment. Checking condition of coalescing device. Emptying of any significant oil and / or silt build ups ensuring any waste is suitably disposed. Complete emptying of the petrol interceptor to allow full testing of the integrity and performance of the system followed by refilling with clean water. Maintain a detailed log of petrol interceptor servicing, cleaning, repair, accidents and incidents. Maintaining a maintenance service agreement with an approved petrol interceptor servicing specialist. Carry out any additional maintenance requirements if required by manufacturer.	Every 6 months Every 6 months Every 6 months Every 6 months As necessary Every 5 years As necessary Full life cycle Manufacturer to advise
6	CCTV Survey	Full CCTV survey of site wide drainage system and reviewed by a suitably qualified person.	Every 10 years

6.6 DRAINAGE OWNERSHIP

6.6.1 Bridge UK Properties, as owner and developer of the site, will retain ultimate ownership of the on-site drainage infrastructure. Bridge has confirmed that the building occupiers will be responsible for the maintenance of all the drainage within their demise/boundary including petrol interceptors and Gatic drains. This will be an obligation in the leases which will be monitored and enforced.

7.0 SUMMARY AND CONCLUSIONS

7.1 HDR Consulting was appointed by Bridge UK Properties 7 LP (the Client) to provide a Flood Risk Assessment and Drainage Strategy to support a full planning application for a proposed development known as Bridge Point Weybridge. The site is located at Weybridge Business Park, north and south of Addlestone Road in Surrey.

7.2 Most of the site is located in Flood Zone 2, with a small area in Zone 3, associated with the nearby River Wey and Addlestone Bourn watercourses. Flood level modelling, supported by Environment Agency Product 4 data, indicates a maximum flood level of 12.46 mAOD for the 1 in 100 year fluvial flood event plus 24% climate change allowance. However the development design life is approximately 25 years, such that the flood level for the 1 in 100 year plus 9% climate change allowance applies, for which a level of 12.36 mAOD has been determined. The extent of on-site flooding based on both of these scenarios has been determined based on the site's current (pre redevelopment) topography.

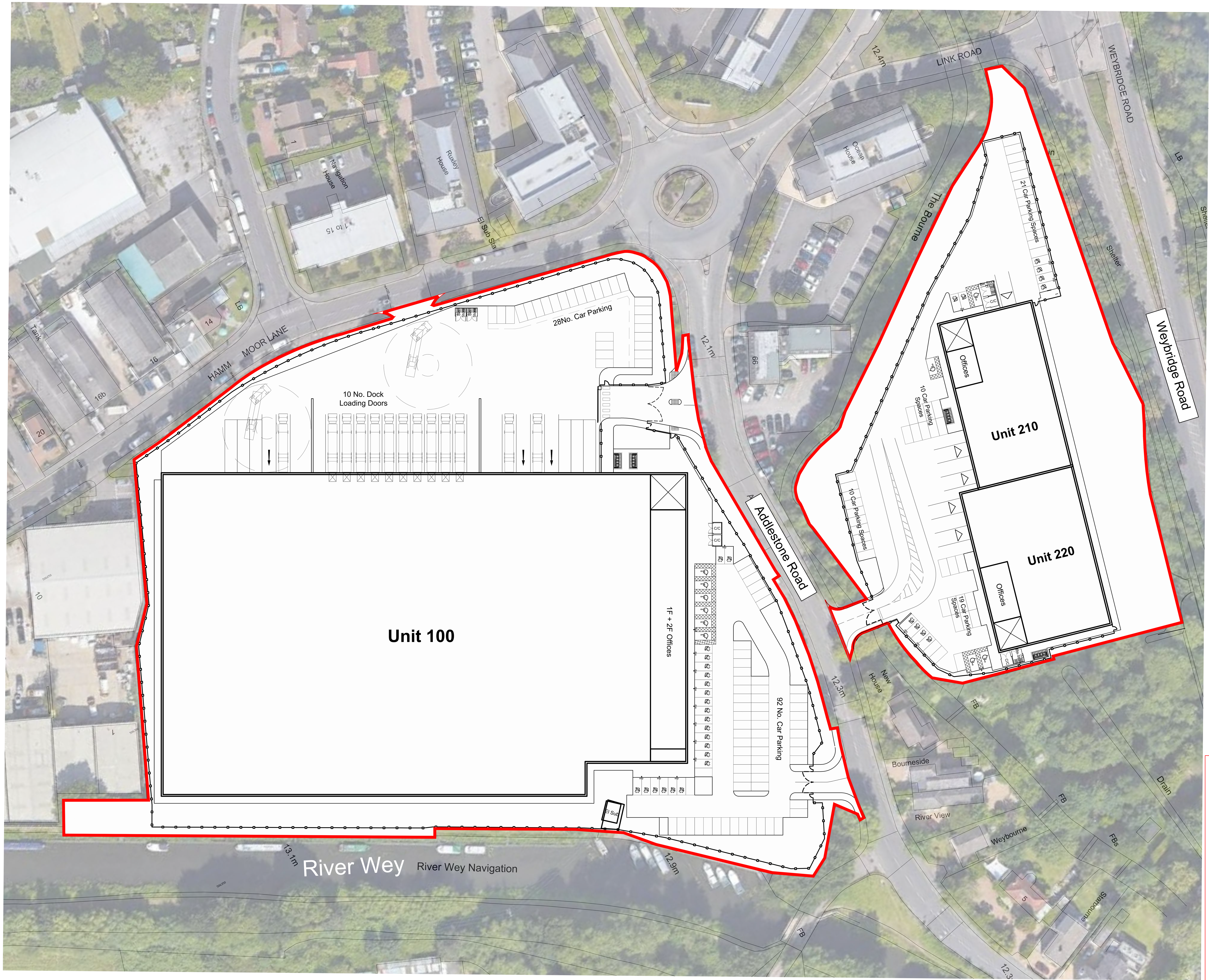
7.3 Further analysis has been undertaken which demonstrates that the proposed development levels allow for level-for-level flood water storage ('compensation') to be incorporated into the development design with no loss of floodplain capacity. New building finished floor levels of 13.00 mAOD provide 540 mm freeboard above the maximum flood level and safe access and egress has been demonstrated for the proposed development layout.

7.4 Future flood risk, both on and off-site, from site-generated runoff has been addressed via a detailed surface water drainage strategy. This is proposed to comprise below-ground storage with off-site runoff being attenuated to greenfield rate. All flows are to be directed into the existing adjacent surface watercourse (part of the Addlestone Bourn), subject to the necessary consents. The drainage arrangements are designed to accommodate runoff up to the 1 in 100 year storm event plus a 20% allowance for climate change.

7.5 This FRA has been produced to demonstrate that the proposed redevelopment can be brought forward without increasing the risk of fluvial flooding to either the site or adjacent properties. The surface water drainage strategy has been designed to incorporate appropriate SuDS techniques and accommodate the critical 1 in 100 year plus 20% climate change storm event. Flood risk at the site from all sources is therefore considered to be acceptable and the development will not increase flood risk to others.

APPENDIX A

ARCHITECT'S PROPOSED DEVELOPMENT PLAN



Site Layout
Scale 1:500

- Dimensions are in millimeters, unless stated otherwise.
- Scaling of this drawing is not recommended.
- It is the recipients responsibility to print this document to the correct scale.
- All relevant drawings and specifications should be read in conjunction with this drawing.

UNIT 100 GIA		
Warehouse Area	139,980 ft^2	13,004 m^2
Ground Floor Core	1,109 ft^2	103 m^2
First Floor Office	8,659 ft^2	804 m^2
Second Floor Office	8,659 ft^2	804 m^2
Escape Stair	389 ft^2	36 m^2
Total GIA Area	**158,795 ft^2**	**14,752 m^2**

UNIT 100 GEA		
Warehouse Area	142,371 ft^2	13,227 m^2
Ground Floor Core	1,221 ft^2	113 m^2
First Floor Office	9,430 ft^2	876 m^2
Second Floor Office	9,430 ft^2	876 m^2
Escape Stair	465 ft^2	43 m^2
Total GEA Area	**162,916 ft^2**	**15,135 m^2**

UNIT 210 GIA		
Warehouse Area	12,875 ft^2	1,196 m^2
Ground Floor Core	715 ft^2	66 m^2
First Floor Office	1,560 ft^2	145 m^2
Total GIA Area	**15,150 ft^2**	**1,407 m^2**

UNIT 210 GEA		
Warehouse Area	13,519 ft^2	1,256 m^2
Ground Floor Core	805 ft^2	75 m^2
First Floor Office	1,778 ft^2	165 m^2
Total GEA Area	**16,102 ft^2**	**1,496 m^2**

UNIT 220 GIA		
Warehouse Area	15,029 ft^2	1,396 m^2
Ground Floor Core	805 ft^2	75 m^2
First Floor Office	2,032 ft^2	189 m^2
Total GIA Area	**17,866 ft^2**	**1,660 m^2**

UNIT 220 GEA		
Warehouse Area	15,712 ft^2	1,460 m^2
Ground Floor Core	715 ft^2	66 m^2
First Floor Office	2,295 ft^2	213 m^2
Total GEA Area	**18,722 ft^2**	**1,739 m^2**

Total Area GIA	**191,812 ft^2**	**17,820 m^2**
Total Area GEA	**197,741 ft^2**	**18,371 m^2**

Northern Boundary	**2.66 Acres**	**1.07 Hectares**
Southern Boundery	**6.56 Acres**	**2.65 Hectares**
Application Boundary Total	**9.22 Acres**	**3.72 Hectares**

rev	amendments	by	ckd	date
F	Drawing revised inline with topographical survey.	LAH	MT	12.04.22
E	Drawing revised inline with planning comments.	LAH	MT	05.04.22
D	Drawing revised inline with Mode Transport drawing 326431_PS-002.	LAH	MT	24.03.22
C	Mode transport planning coordinated.	LAH	MT	22.03.22
B	Mode transport planning coordinated.	LAH	MT	21.03.22
A	Initial Issue	LAH	MT	10.03.22

PLANNING

THIS DRAWING IS TO BE USED FOR THE STATED PURPOSE ONLY AND SHOULD NOT BE USED FOR ANY OTHER

Weybridge Business Park, Weybridge

Site Layout

BRIDGE

umc architects

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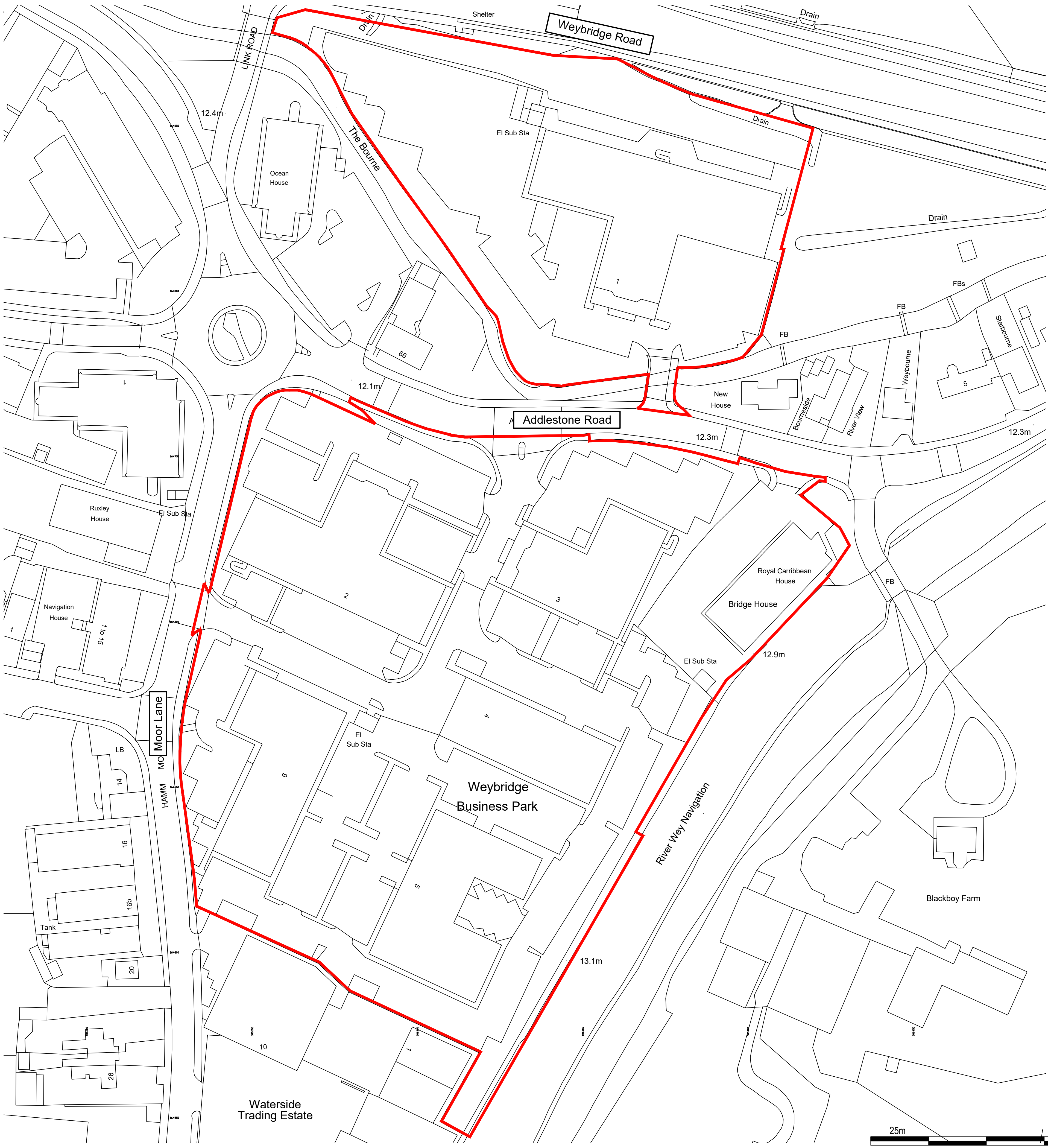
RIBA PoW Stage:	2 - Concept Design
Document Suitability:	S1
Drawn / Checked:	LAH / MT
Date:	09.03.22
Scale:	1:500 A1
UMC Project Number:	21490

Document Reference:	Drawing no:	Revision:
21490 - UMC - ZZZZ - SI - DR - A	0602	F

10m SCALE 1:500

APPENDIX B

SITE LOCATION PLAN



25m

SCALE 1:1250

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N

Site Boundary - 9.22 Acres / 3.72 Hectares

PLANNING

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rev	amendments	by	ckd	date

Weybridge Business Park, Weybridge

Site Location Plan

BRIDGE

umc architects

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RIBA PoW Stage:	2 - Concept Design
Document Suitability:	S1
Drawn / Checked:	LAH / MT
Date:	02.02.22
Scale:	1:1250 A3
UMC Project Number:	21490

Document Reference:	Drawing no:	Revision:
21490 - UMC - ZZZZ - SI - DR - A	0502	B

APPENDIX C

RAMBOLL FLOOD RISK APPRAISAL

Intended for
HDR Incorporated

Date
April 2022

Project Number
1620014229

WEYBRIDGE BUSINESS PARK, ADDLESTONE, KT15 2UP
FLOOD RISK APPRAISAL

WEYBRIDGE BUSINESS PARK, ADDLESTONE, KT15 2UP
FLOOD RISK APPRAISAL

Project No.	**1620014229**
Issue No.	**1**
Date	**05/04/2022**
Made by	**Jo Thorp**
Checked by	**Simon Gaskell**
Approved by	**Simon Gaskell**

Made by:

Checked/Approved by:

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Version Control Log

Revision	Date	Made by	Checked by	Approved by	Description
1	05/04/2022	JT	SG	SG	Draft for Client Comment

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CONTENTS

1. EXECUTIVE SUMMARY

Ramboll UK Limited (Ramboll) was instructed by HDR Incorporated (the 'client') to investigate and report on flood risk issues at Weybridge Business Park between Addlestone and Weybridge in Surrey (the 'site'). The client is assisting a developer take forward a proposed light industrial scheme at the site and requires details on flood risk issues to guide its design and to support planning applications.

Ramboll has undertaken numerous phases of flood risk modelling and assessment at this site over a period of many years and successfully challenged the EA's Flood Map in 2014 on the basis of this work. In consultation, the EA has confirmed that Ramboll's modelling remains the basis of their flood maps and zoning locally.

The EA's online flood mapping shows that the site is predominantly situated within Flood Zone 2, indicating an annual probability of flooding from rivers and sea between 1 in 100 (1%) and 1 in 1,000 (0.1%). Approximately 95% of the total site area and all building footprints are located within Flood Zone 2. A limited area of the site adjacent to the south of Addlestone Road is within Flood Zone 3, indicating an annual probability of flooding from rivers and sea of greater than a 1 in 100 (1%) annual probability. Approximately 5% of the total site area is within Flood Zone 3. For the purposes of planning, the site must therefore be designated as being within Flood Zone 3a (as it is not within the functional floodplain).

There are two different watercourses that potentially impact on the site: the River Wey (at this point called the Lower Wey) and the Addlestone Bourne. In respect of the former, flood risks have been determined by the EA based on the most recent modelling work done on the Lower Wey (the Lower Wey 2019 model). For the latter, the EA has reverted to presenting Flood Zone outlines based on modelling completed in 2007 despite these having been superseded by Ramboll's modelling (agreed with the EA in 2015 and confirmed as the most appropriate basis for determining flood risks from the Addlestone Bourne). Ramboll's modelling work on the Addlestone Bourne is used to determine risks for this watercourse.

Hydraulic modelling carried out by the EA predicts that shallow flooding could occur on very limited areas at the site boundaries in close proximity to Addlestone Road were a 1 in 100 (1%) annual probability flood to occur on the Lower Wey. The site would remain otherwise unaffected by flooding during such a flood. A peak flood level of 12.26 m Above Ordnance Datum (mAOD) is predicted for this event. No flooding is predicted on-site during the 100 year event from Ramboll's Addlestone Bourne modelling.

For less vulnerable development such as continued office use or light industrial, Government guidance requires that sites in Flood Zone 3a are assessed using central allowances. Taking into account a 9% increase in peak flows on the Lower Wey due to climate change (central allowance to the 2050s), the peak on-site flood level for the Lower Wey is predicted to be 12.36 mAOD. With a 24% increase (central allowance to the 2080s), the peak on-site flood level for the Lower Wey is predicted to be 12.46 mAOD. For the Addlestone Bourne, peak flood levels allowing for climate change have only been modelled with a 20% and 35% increase. The resultant flood levels are not predicted to affect the site during the former and would rise to approximately 12.34 mAOD for the latter. Existing finished floor levels for the on-site building are set at 12.80 mAOD (or higher) so none would be overtopped by any of these floods.

Most of the external areas of the site would not be affected by flooding now or even in the future. Nevertheless, the lowest site levels (in the north towards Addlestone Road) are generally above 12.2 mAOD meaning that, even with a 100 year flood with allowances for climate change, shallow flood depths are such that it is unlikely that there would be a significant risk to people or traffic movement to/from the site.

The site is assessed to be at a predominantly Very Low risk of surface water flooding by the EA. While limited external areas of the site are assessed to be at a Low or Medium risk of surface water flooding, the highly localised nature of this area suggests that site operations are unlikely to be affected by surface water flooding.

Groundwater may be present at a relatively shallow depth within the alluvium and may be in continuity with deeper groundwater in the gravels and alluvium present below the site may contain clay bands which may potentially retard downward migration of shallow groundwater. However, there are no records of groundwater flooding on the site and the potential for groundwater emergence above the surface is considered to be low.

The EA's indicative reservoir flood risk maps show that, the site is within an area at residual risk of reservoir flooding. The likelihood of such an event affecting the site is considered to be of a very low probability.

2. INTRODUCTION

2.1 Background

Ramboll UK Limited (Ramboll) was instructed by HDR Incorporated (the client) to undertake a Flood Risk Appraisal of Weybridge Business Park, Addlestone Road, Addlestone, KT15 2UP (the site). The report includes an assessment of the existing site and surroundings against current flood risk information (e.g. previous site-specific FRAs, historic flood data, flood defences and aerial topographic survey information) and uses this to assess potential flood risk at the site.

2.2 Scope and Objectives

The objective of the appraisal is to assess the potential for flooding at the site from fluvial, tidal, surface water (pluvial), groundwater or artificial (reservoir) sources. The scope of works comprised consultations with the Environment Agency (EA) and review of topographic data to provide an assessment of readily-available flood risk information based on sources including site-specific FRAs previously submitted for planning, published Strategic Flood Risk Assessments (SFRAs), historical flood records and details of relevant flood defences (where available).

2.3 Limitations

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

Ramboll's services are not intended as legal advice, nor an exhaustive review of site conditions and/or compliance. This report and accompanying documents are initial and intended solely for the use and benefit of the Applicant for this purpose only and may not be used by or disclosed to, in whole or in part, any other person without the express written consent of Ramboll. Ramboll neither owes nor accepts any duty to any third party, unless formally agreed by Ramboll through that party entering into, at Ramboll's sole discretion, a written reliance agreement.

3. BASELINE DATA REVIEW

3.1 Site Setting

The site comprises an irregular shaped plot of land, occupying an area of approximately 3.3 ha. It is occupied by 6 buildings and associated car parking/hardstanding as presented in Appendix 1. Vegetation and soft landscaping cover approximately 10-15% of the total site area. Building 1, in the north of the site, is occupied by former Toshiba offices and is separated from Buildings 2-6 in the southern area of the site by Addlestone Road which runs in an east to west orientation.

There are three vehicular access points to the southern area of the site (Buildings 2 to 6); two are via Hamm Moor Lane to the west and one is via Addlestone Road to the north. To the north of the entire site is Weybridge Road (A317); to the east is the River Wey Navigation Canal and to the south and west are further retail/light industrial units and office buildings. Residential housing is located to the west and to the north east of the site on Byron Road and Addlestone Road.

Figure 3.1: site Location

3.2 Topography

A topographic survey was undertaken in April and May 2013 by Survey Solutions. The scope of the survey included buildings and external areas within the site boundary and ground elevations along the course of the River Wey Navigation Canal which lies adjacent to the site's eastern boundary. The results of this survey data are attached in Appendix 1 and it is understood that alterations to finished floor levels have not been carried out since this survey was completed.

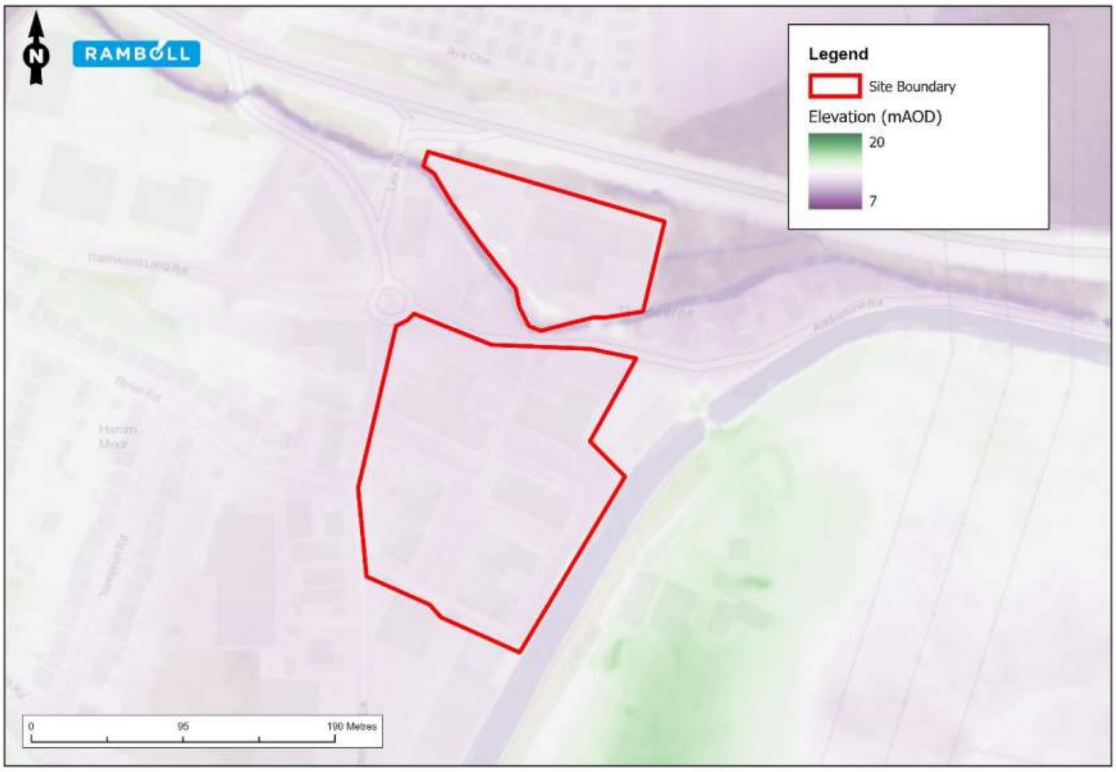
In summary:

- Units 2, 3, 4 ,5 and 6 were confirmed to have Finished Floor Levels (FFLs) of 12.80 m Above Ordnance Datum (mAOD).
- The FFL at Building 1 (former Toshiba offices) is between 12.89 and 12.95 mAOD.
- Lower elevations are present throughout the areas to the north and south of Addlestone Road.

- To the south, these levels are generally between 12.4 and 12.6 mAOD.
- To the north, external levels are generally between 12.5 and 12.8 mAOD.
- The bridge crossing at the entrance to the Unit 1 car park is generally above 12.6 mAOD.
- An embankment runs along the northern and western side of the River Wey Navigation Canal. This is generally above 13 mAOD although there is a short stretch of approximately 20 m in length which is at 12.83 mAOD.

Light Detection and Ranging (LiDAR) data has also been obtained for the site and surrounding area. This ground elevation data confirms that external levels on-site are generally around 12.5 mAOD. Figure 3.2 presents the LiDAR data for the site.

Figure 3.2: LiDAR Aerial Topographic Survey Data



Coordinate System: British National Grid. Projection: Transverse Mercator. Datum: OSGB 1936.

3.3 Hydrological Setting

The closest surface water feature to the site is the River Wey Navigation Canal which lies adjacent to the east of the site. Other watercourses around the site are referred to collectively as the Addlestone Bournes. A watercourse flows in a westerly direction within a channel between the north and south areas of the site, referred to as the 'linking watercourse' which is shown to connect the main Addlestone Bourne channel located, approximately 330 m to the west of the site at its closest point, to the Lower Wey, approximately 470 m to the east of the site. A plan of the watercourses in the local area is presented in Figure 3.3.

The Addlestone Bourne flows beneath Weybridge Road where it becomes Woburn Park Stream (320 m northwest of the site). The River Wey flows in a northerly direction to its confluence with the River Thames. The River Thames is approximately 985 m to the north of the site, at its closest point.

Figure 3.3: Hydrological Setting

Coordinate System: British National Grid. Projection: Transverse Mercator. Datum: OSGB 1936.

3.4 Tidal/Fluvial Flood Risk

The EA's online indicative Flood Map for Planning[1] identifies areas in England at risk of tidal or fluvial flooding by allocating them into Flood Zones. The EA's online flood mapping (reproduced in Figure 3.4) shows that the site is predominantly situated within Flood Zone 2, indicating an annual probability of flooding from rivers and sea between 1 in 100 (1%) and 1 in 1,000 (0.1%). Approximately 95% of the total site area and all building footprints are located within Flood Zone 2. A limited area of the site adjacent to the south of Addlestone Road is within Flood Zone 3, indicating an annual probability of flooding from rivers and sea of greater than a 1 in 100 (1%) annual probability. Approximately 5% of the total site area is within Flood Zone 3.

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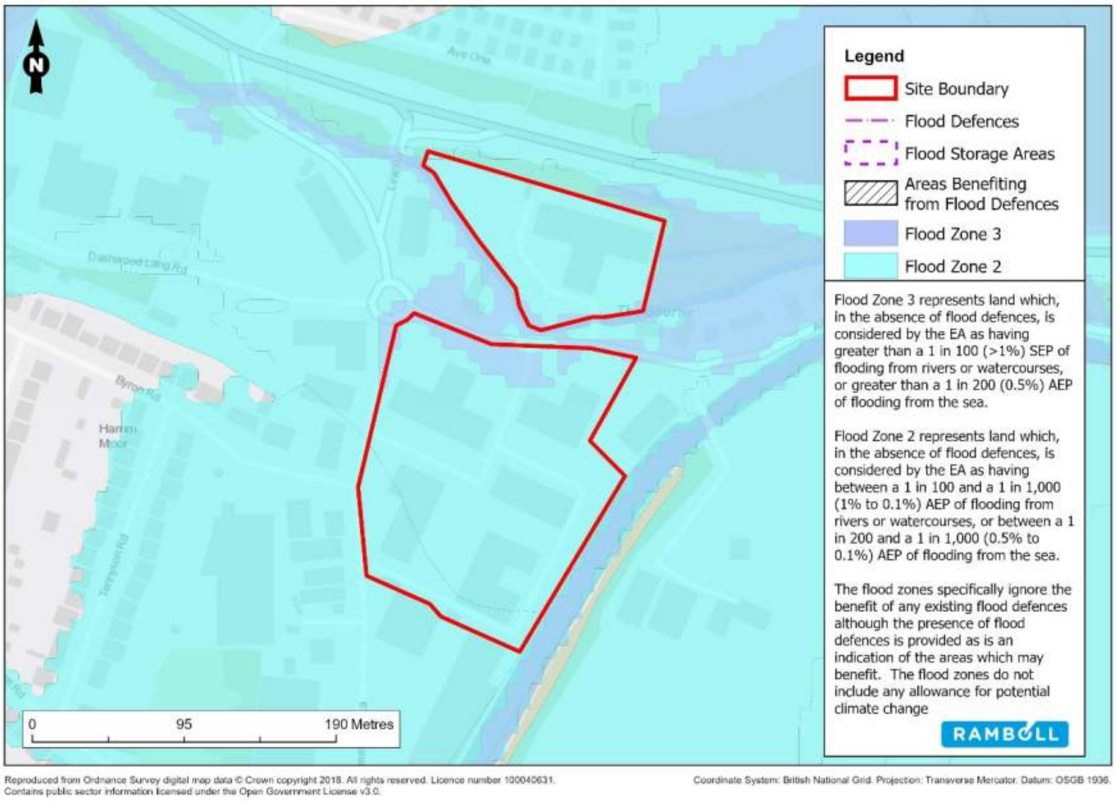
[1] https://flood-map-for-planning.service.gov.uk/

The Flood Map suggests that the inclusion of a small area of the site within Flood Zone 3 relates to the potential for exceedance of channel capacity of the linking watercourse which flows between the two areas of the site. The remainder of the site and much of the surrounding area are located within Flood Zone 2, and the extent of the surrounding area within Flood Zone 2 suggests that, were a 1 in 1,000 (0.1%) annual probability flood to occur, the channel capacity across the surrounding Addlestone Bourne and River Wey drainage network would be exceeded.

Figure 3.4: Flood Zone Designation



3.5 Flood Defences

EA geospatial records of flood defences (Figure 3.5) show that defences are present on the south bank of the linking watercourse between the two area of the site. Defences in this area comprise high ground assessed by the EA to offer a standard of protection up to a 1 in 25 (4%) annual probability flood. While defences of the same standard are present on the north bank of the linking channel (adjacent to building 1), these are not continuous and may therefore provide a lower standard of protection. According to EA geospatial records, there are no EA maintained defences present along the River Wey Navigation channel, which is adjacent to the east of the site.

Figure 3.5: EA Flood Defence Records

Reproduced from Ordnance Survey digital map data © Crown copyright 2018. All rights reserved. Licence number 100040631. Contains public sector information licensed under the Open Government License v3.0. Coordinate System: British National Grid. Projection: Transverse Mercator. Datum: OSGB 1936.

3.6 Hydraulic Modelling

The results of the EA's Lower Wey (2019) model have been acquired for the site and surrounds. This has been used to determine flood levels and compared with ground elevations and FFLs on-site.

Ramboll has also undertaken extensive work including numerous consultations with the EA with respect to flood risks at the site between June 2011 until 2021. A formal Flood Map Challenge was submitted to the EA in August 2013 based on flood modelling completed by Ramboll. As a result of many detailed consultations with the EA, this was accepted in November 2014. Appendix 2 presents a letter from the EA confirming that, as of December 2020: *"We agree that the information submitted as part of the FMC* [Flood Map Challenge] *is still informing Flood Zone 3 in the Weybridge Business Park area. As such, we consider there to be no obvious reason why you should not use the model informing this FMC, on the understanding that there will be no changes to the model build."* Appendix 3 contains two summary reports describing how Ramboll (previously ENVIRON) developed modelling of Addlestone Bourne (as well as the Lower Wey).

The most likely sources of flood risk are from the Lower Wey and the Addlestone Bourne watercourses. These flood separately and therefore there are two different flood models that are relevant to the site. The EA's online flood map, accessed April 2022, reflects the outputs from the Lower Wey (2019) modelling completed by the EA but appears to have reverted to a version of the flood outline for the Addlestone Bourne produced in 2007 for that watercourse. On the basis of the above statement, it is considered that Ramboll's modelling of Addlestone Bourne supersedes this and should be used to determine risks from the west.

Ramboll modelling predicts that shallow flooding could occur on very limited areas at the site boundaries in close proximity to Addlestone Road, were a 1 in 100 (1%) annual probability flood to occur on the Addlestone Bourne. The site would remain otherwise unaffected by flooding during such a flood. Taking into account a 20% increase in peak flows on the Addlestone Bourne due to climate change, a 1 in 100 (1%) annual probability flood could lead to shallow flooding in a limited area adjacent to the south of Addlestone Road but still not flood the site. Modelling predicts that buildings on site would not be affected by flooding during such a flood event. During the 1 in 100 year flood with a 35% allowance for climate change, more of the area would be flooded but still not the on-site buildings (Figure 3.6).

Figure 3.6: Addlestone Bourne, 1 in 100 (1%) Fluvial Flood with 35% Allowance for Climate Change

On the Lower Wey, flooding from the 100 year event without climate change is presented in Figure 3.7. For less vulnerable development such as continued office use or light industrial, Government guidance[2] requires that sites in Flood Zone 3a are assessed using central allowances. Figures showing peak flood extents taking into account a 9% increase in peak flows on the Lower Wey due to climate change (central allowance to the 2050s) and a 24% increase (central allowance to the 2080s) are presented in Figures 3.8 and 3.9.

2 https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

Figure 3.7: Lower Wey, 1 in 100 (1%) Fluvial Flood

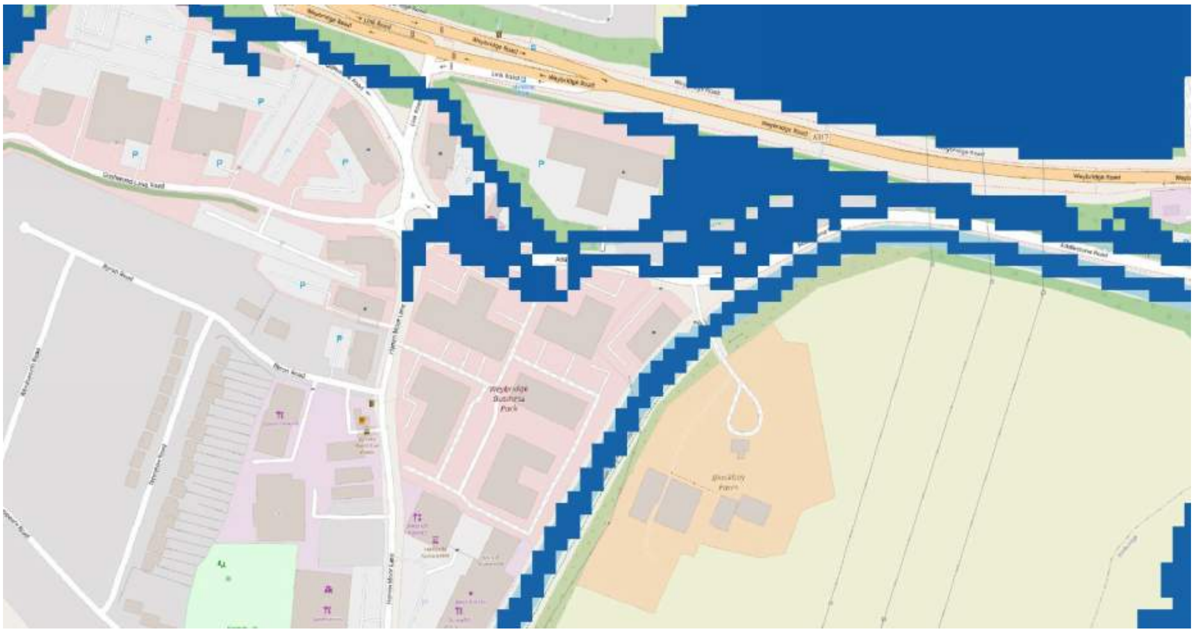


Figure 3.8: Lower Wey, 1 in 100 (1%) + 9% CC Fluvial Flood

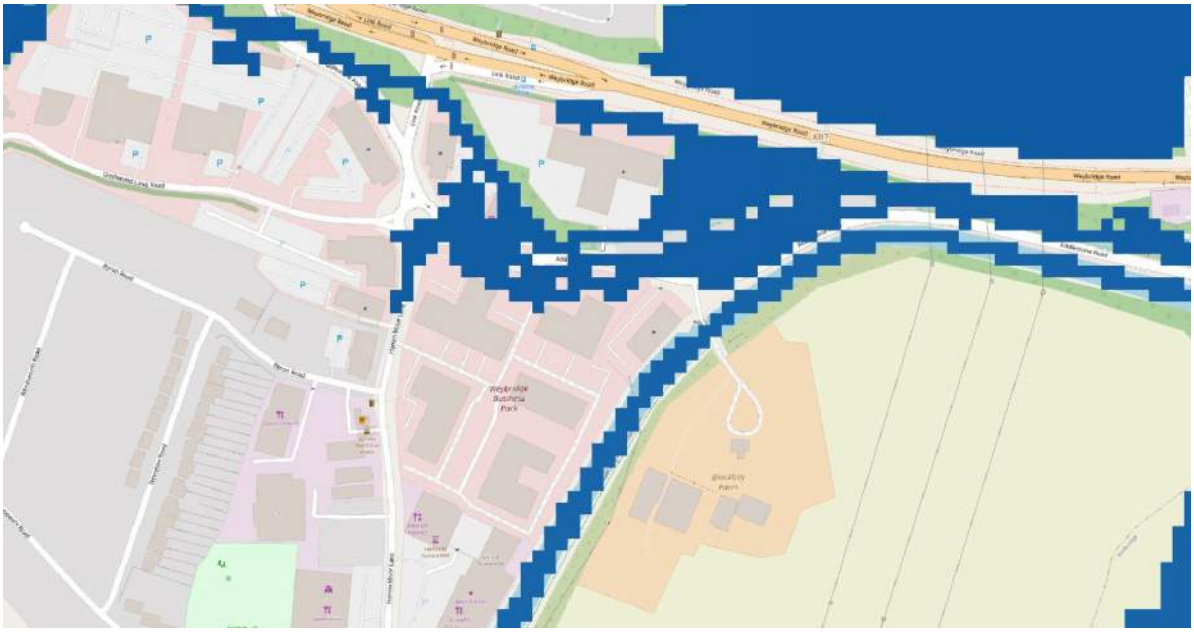
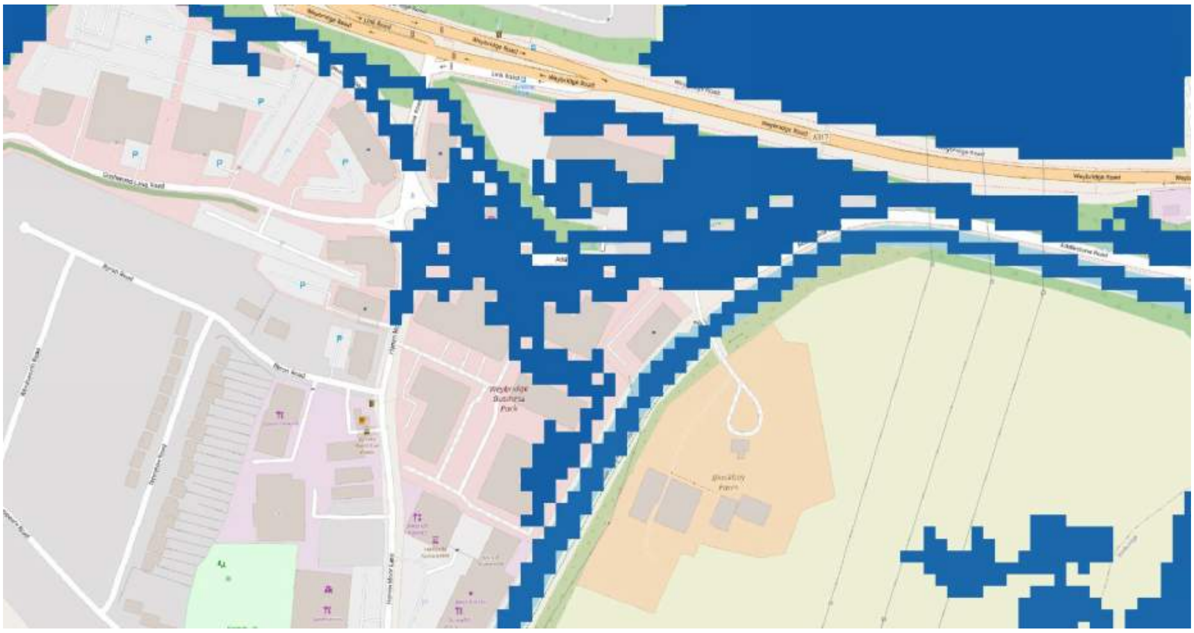


Figure 3.9: River Wey, 1 in 100 (1%) + 24% CC Fluvial Flood



The following table presents indicative peak flood levels in m Above Ordnance Datum (mAOD) on the site, taking into account central climate change allowances:

Source	100 year	100 year +9% (m AOD)	100 year + 20% (m AOD)	100 year + 24% (m AOD)	100 year + 35% (m AOD)
Addlestone Bourne	No Flooding	Not Modelled	12.30	Not Modelled	12.34
Lower Wey	12.26	12.36	Not Modelled	12.46	Not Modelled

The peak flood level for any of these scenarios is therefore 12.46 mAOD.

3.7 Surface Water Flood Risk

The EA's indicative surface water flood risk mapping identifies areas in England and Wales at potential risk of surface water flooding according to the following risk categories:

- High Risk - Considered to have a greater than 1 in 30 annual probability of surface water flooding in any year (>3.3%).
- Medium Risk - Considered to have between a 1 in 30 and 1 in 100 annual probability of surface water flooding in any year (between 3.3% and 1%).
- Low Risk - Considered to have between a 1 in 100 and 1 in 1,000 annual probability of surface water flooding in any year (between 1% and 0.1%).
- Very Low Risk - Considered to have a less than 1 in 1,000 annual probability surface water flooding in any year (<0.1%).

The majority of the site is shown to be at Very Low risk of surface water flooding (Figure 3.10). There are areas at Low and Medium Risk of surface water flooding on access routes in the south area of the site and in a very limited area of hardstanding in the norther annexed area of the site.

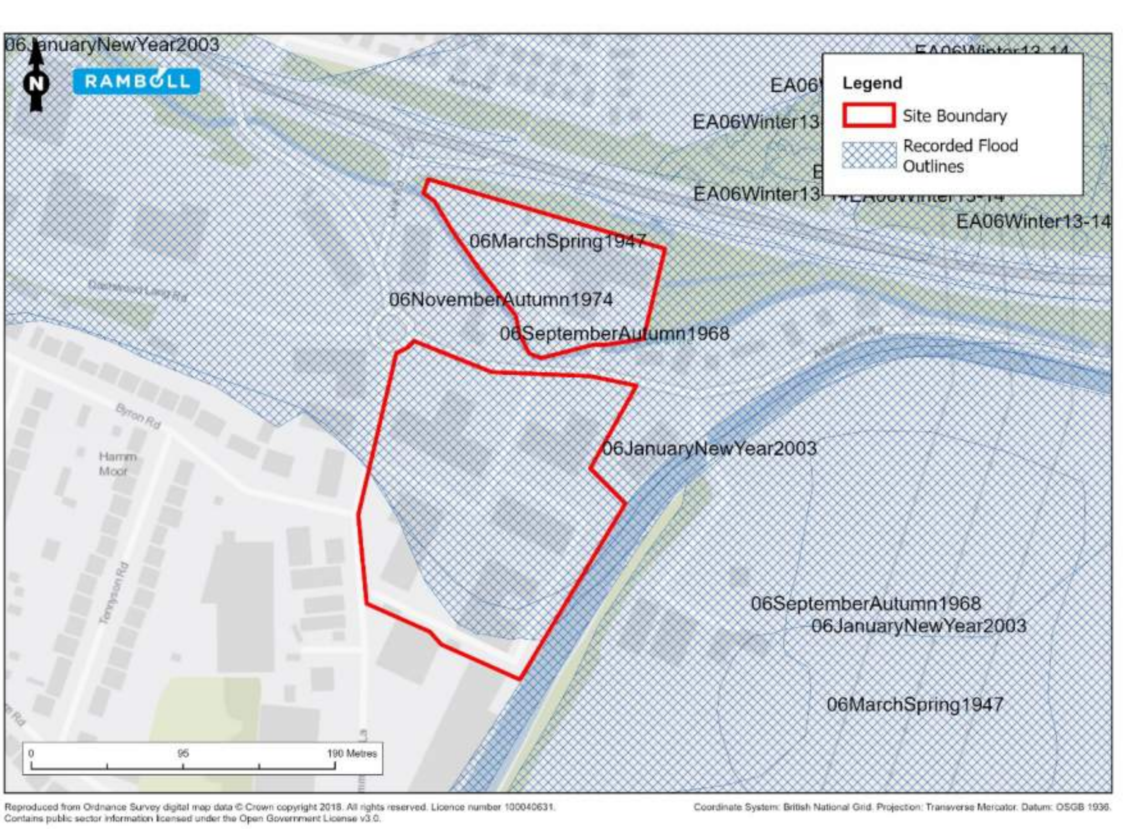
It is understood by Ramboll that surface drains at the site are served by a 300 mm diameter surface water sewer located on Hamm Moor Lane which flows into a 600 mm diameter sewer which discharges into Addlestone Bourne (north of the site).

Figure 3.10: EA Surface Water Flood Map

3.8 Historical Flooding

According to the EA, flooding incidents that have affected the site occurred in 1947, 1968 and 1974 and are considered to have been a result of fluvial flooding from the adjacent watercourses. These events pre-date the current development in the late 1980s at which time FFLs were raised to their current levels.

Figure 2.8: Recorded Flood Extents



3.9 Other Sources of Flood Risk

According to the BGS 1:50,000 Solid and Drift map of the area, the site is directly underlain by alluvial drift deposits (up to 5-10 m in thickness) overlying River Terrace Gravels (up to 10 m thickness). The underlying solid geology beneath the site comprises the Bagshot Beds which comprise fine sands and clays and can reach up to 35 m in thickness.

The EA aquifer classification of the underlying geology is as follows:

- Alluvium: Secondary A Aquifer 'rocks of variable permeability or fractured rocks of low primary permeability capable of supporting water supplies at a local rather than strategic scale, and in some cases forming a source of base flow to rivers'.
- River Terrace Gravels: Principal Aquifer 'deposits of high intergranular and/or fracture permeability and have the potential to support water supply and/or river base flow on a strategic scale'.
- Bagshot Beds: Secondary A Aquifer (as above).

Groundwater is expected to be present at a relatively shallow depth within the alluvium and may be in continuity with deeper groundwater in the gravels. In addition, the alluvium may contain clay bands which may potentially retard downward migration of shallow groundwater. There are no records of groundwater flooding on-site reported in the Runnymede 2018 SFRA.

The EA's indicative reservoir flood risk maps show that, similarly to extensive areas of development in the surrounding area and Surrey to the south west of London, the site is within an area at residual risk of reservoir flooding. The likelihood of such an event affecting the site is considered to be of a very low probability.

4. FLOOD RISK SUMMARY

Based on the assessment of flooding sources above, a flood risk summary for the site is presented in Table 3.1:

Table 3.1: Application site Flooding Sources

Flood Risk	High	Medium	Low	Comments
Tidal/Fluvial		X (Building)		The site is located within Flood Zone 2 (medium probability). A limited area of the site adjacent to the Addlestone Road is within Flood Zone 3 (high probability.
Surface Water and Drainage Flood Risk			X	The site is assessed to be at a predominantly Very Low risk of surface water flooding by the EA and limited areas on access routes are within Low and Medium risk areas, the highly localised nature suggests site operations are unlikely to be affected by surface water flooding.
Groundwater			X	The site is underlain by alluvial drift deposits (up to 5-10 m in thickness) overlying River Terrace Gravels, these strata are classified as secondary aquifers and the likelihood of groundwater emergence affecting the site is considered to be low.
Reservoirs, canals and other artificial sources			X	Similar to extensive areas in the surrounding area, the site is within an area at residual risk of reservoir flooding were the failure of an upstream reservoir to occur. However, such an event is considered to be of a very low probability.

5. CONCLUSIONS

The EA's online flood mapping shows that the site is predominantly situated within Flood Zone 2, indicating an annual probability of flooding from rivers and sea between 1 in 100 (1%) and 1 in 1,000 (0.1%). Approximately 95% of the total site area and all building footprints are located within Flood Zone 2. This is thought likely to be a result of there having been historical records of flooding at the site (which the EA retain the right to define as Flood Zone 2 even where such risks are unlikely to re-occur as a result of redevelopment). A limited area of the site adjacent to the south of Addlestone Road is within Flood Zone 3, indicating an annual probability of flooding from rivers and sea of greater than a 1 in 100 (1%) annual probability. Approximately 5% of the total site area is within Flood Zone 3. For the purposes of planning, the site must therefore be designated as being within Flood Zone 3a (as it is not within the functional floodplain).

Hydraulic modelling carried out by the EA predicts that shallow flooding could occur on very limited areas at the site boundaries in close proximity to Addlestone Road were a 1 in 100 (1%) annual probability flood to occur on the Lower Wey. The site would remain otherwise unaffected by flooding during such a flood. A peak flood level of 12.26 m Above Ordnance Datum (mAOD) is predicted for this event. No flooding is predicted on-site during the 100 year event from Ramboll's Addlestone Bourne modelling.

For less vulnerable development such as continued office use or light industrial, Government guidance requires that sites in Flood Zone 3a are assessed using central allowances. Taking into account a 9% increase in peak flows on the Lower Wey due to climate change (central allowance to the 2050s), the peak on-site flood level for the Lower Wey is predicted to be 12.36 mAOD. With a 24% increase (central allowance to the 2080s), the peak on-site flood level for the Lower Wey is predicted to be 12.46 mAOD. For the Addlestone Bourne, peak flood levels allowing for climate change have only been modelled with a 20% and 35% increase. The resultant flood levels are not predicted to affect the site during the former and would rise to approximately 12.34 mAOD for the latter. Existing finished floor levels for the on-site building are set at 12.80 mAOD (or higher) so none would be overtopped by any of these floods.

Most of the external areas of the site would not be affected by flooding now or even in the future. Nevertheless, the lowest site levels (in the north towards Addlestone Road) are generally above 12.2 mAOD meaning that, even with a 100 year flood with allowances for climate change, shallow flood depths are such that it is unlikely that there would be a significant risk to people or traffic movement to/from the site.

The site is assessed to be at a predominantly Very Low risk of surface water flooding by the EA. While limited external areas of the site are assessed to be at a Low or Medium risk of surface water flooding, the highly localised nature of this area suggests that site operations are unlikely to be affected by surface water flooding.

Groundwater may be present at a relatively shallow depth within the alluvium and may be in continuity with deeper groundwater in the gravels and alluvium present below the site may contain clay bands which may potentially retard downward migration of shallow groundwater. However, there are no records of groundwater flooding on the site and the potential for groundwater emergence above the surface is considered to be low.

The EA's indicative reservoir flood risk maps show that, the site is within an area at residual risk of reservoir flooding. The likelihood of such an event affecting the site is considered to be of a very low probability.

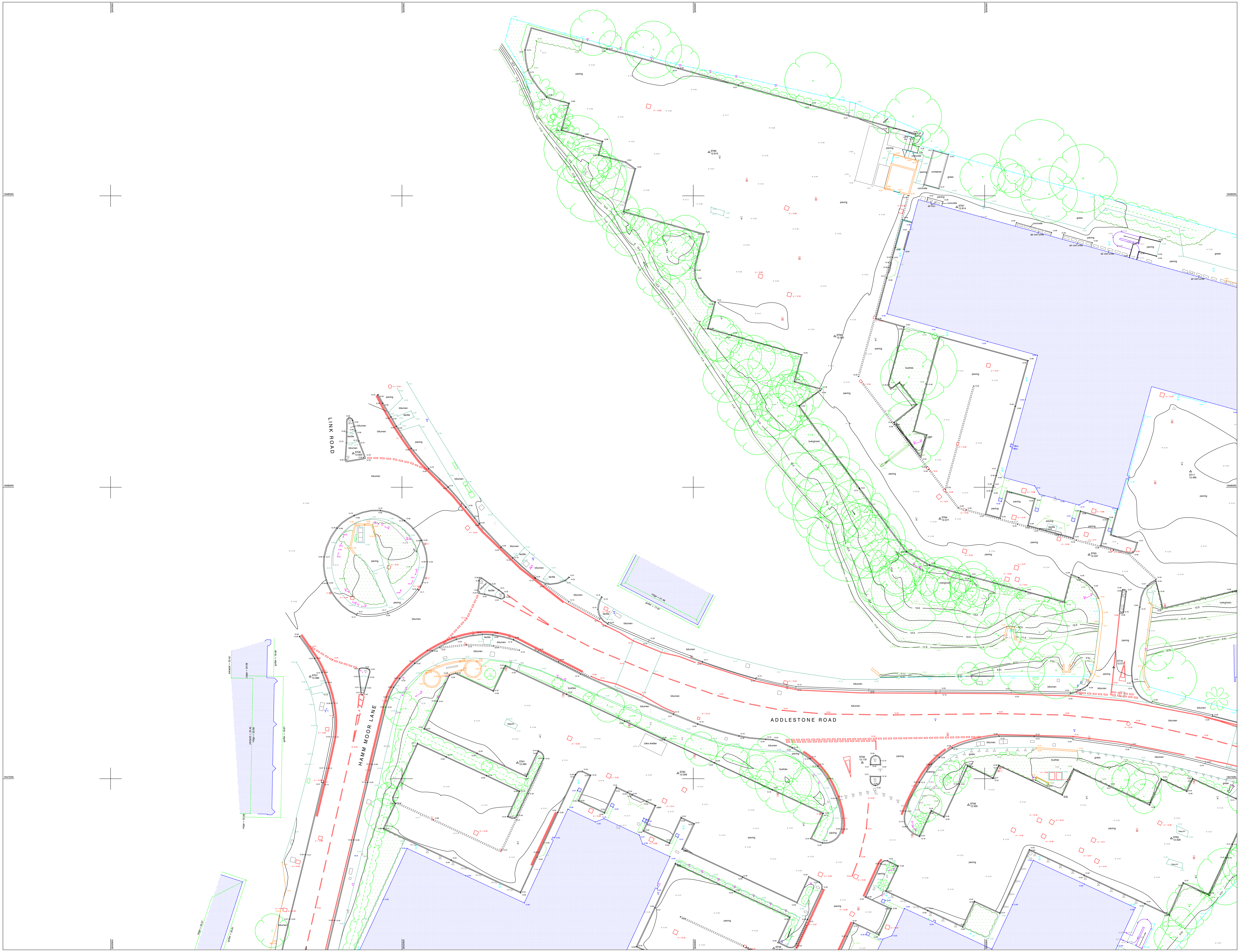
APPENDIX 1: TOPOGRAPHIC SURVEY

APPENDIX 2: EA CORRESPONDENCE

APPENDIX 3: PREVIOUS REPORTING (ENVIRON AND RAMBOLL)

APPENDIX D

TOPOGRAPHICAL SURVEY



Symbol & Abbreviation Key.

BARBED WIRE FENCE
POST & RAIL FENCE
CLOSE BOARD FENCE
RAILINGS
CHAIN LINK FENCE
OTHER FENCE
KERB
DROPPED KERB
GULLY CHANNEL
TOP / BOTTOM OF BANK
FOLIAGE
DITCH
VERGE
OVERHEAD CABLES
GATE
HEDGE
TREE - BROAD LEAVED
TREE - CONIFEROUS
BUSH
BUILDING
BOREHOLE
SURVEY STATION
ORDNANCE SURVEY BENCH MARK

A/C	AIR CONDITIONING UNIT	KO	KERB OFFLET
AV	AIR VALVE	LC	LIGHTING COLUMN
BOL	BOLLARD	LP	LAMP POST
BH	BOREHOLE	NP	NAME PLATE
BL	BED LEVEL	NB	NOTICE BOARD
BM	BENCH MARK	PR	PIPE RISER
BT	BRITISH TELECOM	RP	RODDING POINT
CTV	CABLE TV	RS	ROAD SIGN
CL	COVER LEVEL	SP	SIGN POST
CR	CABLE RISER	SV	STOP VALVE
DP	DOWN PIPE	TL	TRAFFIC LIGHT
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EP	ELECTRICITY POLE	TOF	TOP OF FENCE
EM	ELECTRICITY MARKER	TOH	TOP OF HEDGE
FB	FUSE BOX	TOR	TOP OF RAILINGS
FH	FIRE HYDRANT	TOS	SERVICE LEVEL
FP	FENCE POST	TOW	TOP OF WALL
FL	FLOOR LEVEL	UTL	UNABLE TO LIFT
GV	GAS VALVE	VM	VALVE MARKER
GM	GAS MARKER	VP	VENT PIPE
GU	GULLY	WL	WATER LEVEL
HM	HYDRANT MARKER	WM	WATER MARKER
IL	INVERT LEVEL	WO	WASH OUT

General.

This survey has been prepared with a scaling accuracy for a plot at a scale of 1:200.

All tree heights and spreads are approximate. We have tried to identify tree types, however if tree species are critical specialist advice should be gained.

Drainage pipe sizes have been measured from the surface. Chamber access has not been gained for safety reasons, therefore sizes should be regarded as approximate.

Some detail may have been omitted due to parked vehicles.

Notes.

Coordinates related to OS National Grid from ST05 by GPS (No scale factor added).
Levels related to GPS.

N
INDICATIVE ONLY

Rev	Details of Revision	Drawn	Date

Surveyed	Drawn	Date	Checked	Date	Approved	Date
SE/EP	SE	08/04/22	GD	08/04/22	GD	08/04/22

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Client.

SAVILLS
33 MARGARET STREET
LONDON
W1G 0JD

Title.

TOPOGRAPHICAL SURVEY

WEYBRIDGE BUSINESS PARK
ADDLESTONE
KT15 2UP

Dwg No. **220126** Sheet **1 of 3**

Scale 1:200 A0 Sheet Rev. -

Symbol & Abbreviation Key.

- BARBED WIRE FENCE
- POST & RAIL FENCE
- CLOSE BOARD FENCE
- RAILINGS
- CHAIN LINK FENCE
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Scale 1:200 A0 Sheet Rev. -

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TOPOGRAPHICAL SURVEY

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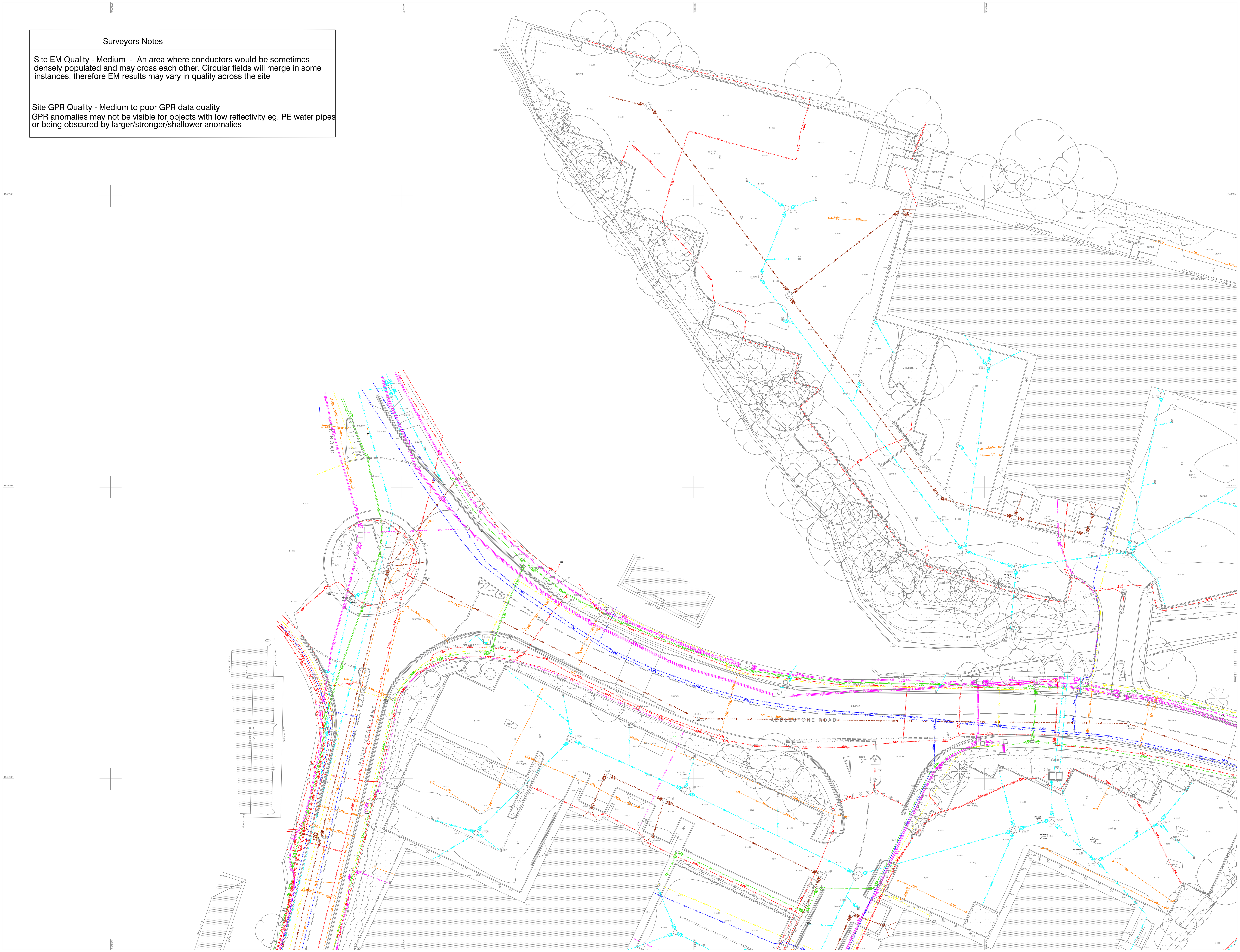
Dwg No. **220126** Sheet **3 of 3**

Scale 1:200 A0 Sheet Rev. -

Surveyors Notes

Site EM Quality - Medium - An area where conductors would be sometimes densely populated and may cross each other. Circular fields will merge in some instances, therefore EM results may vary in quality across the site

Site GPR Quality - Medium to poor GPR data quality
GPR anomalies may not be visible for objects with low reflectivity eg. PE water pipes or being obscured by larger/stronger/shallower anomalies



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Limit of Liability.

This survey has been carried out under the British Standards Institution **PAS 128:2014**. Specification for underground utility detection, verification and location.

The location and/or identification of a service will not necessarily indicate whether it is live or dead.

The fact that a service has not been located or identified and added as (QL-D) does not necessarily imply that it does not exist or is dead, their presence should be anticipated.

This survey is as a guide, safe digging practices are to be used in conjunction with this plan before any mechanical plant is used. On site verification (C.A.T. & Genny) by a trained operative is strongly advised during the excavation process.

At Interlocks Surveys Ltd we use skilled staff and modern, calibrated equipment to perform our surveys to the highest of qualities. However, a well-designed and executed survey should find 80%-95% of services, but it may not be possible to achieve a 100% detection rate. As a result, these types of surveys are not infallible.

Notes.

Coordinates related to OS National Grid from ST-- by GPS (No scale factor added).
Levels related to GPS.

Interlocks Surveys
PAS 128 Utility Survey Legend

HV(B1)	High Voltage Electricity Cable (QL-B1)(+/- 150mm or +/- 15% of detected depth or location)
HV(B2)	High Voltage Electricity Cable (QL-B2)(+/- 250mm or +/- 40% of detected depth or location)
HV(B3)	High Voltage Electricity Cable (QL-B3)(+/- 500mm)
HV(B4)	High Voltage Electricity Cable (QL-B4) (Assumed Route)
HV(D)	High Voltage Electricity Cable (QL-D) (Taken From Records)
LV(B1)	Low Voltage Electricity Cable (QL-B1)(+/- 150mm or +/- 15% of detected depth or location)
LV(B2)	Low Voltage Electricity Cable (QL-B2)(+/- 250mm or +/- 40% of detected depth or location)
LV(B3)	Low Voltage Electricity Cable (QL-B3)(+/- 500mm)
LV(B4)	Low Voltage Electricity Cable (QL-B4) (Assumed Route)
LV(D)	Low Voltage Electricity Cable (QL-D) (Taken From Records)
E(B1)	Electricity Cable (QL-B1)(+/- 150mm or +/- 15% of detected depth or location)
E(B2)	Electricity Cable (QL-B2)(+/- 250mm or +/- 40% of detected depth or location)
E(B3)	Electricity Cable (QL-B3)(+/- 500mm)
E(B4)	Electricity Cable (QL-B4)(Assumed Route)
E(D)	Electricity Cable (QL-D) (Taken From Records)
BT(B1)	BT Cable (QL-B1)(+/- 150mm or +/- 15% of detected depth or location)
BT(B2)	BT Cable (QL-B2)(+/- 250mm or +/- 40% of detected depth or location)
BT(B3)	BT Cable (QL-B3)(+/- 500mm)
BT(B4)	BT Cable (QL-B4) (Assumed Route)
BT(D)	BT Cable (QL-D) (Taken From Records)
T(B1)	Telecommunication Cable (QL-B1)(+/- 150mm or +/- 15% of detected depth or location)
T(B2)	Telecommunication Cable (QL-B2)(+/- 250mm or +/- 40% of detected depth or location)
T(B3)	Telecommunication Cable (QL-B3)(+/- 500mm)
T(B4)	Telecommunication Cable (QL-B4) (Assumed Route)
T(D)	Telecommunication Cable (QL-D) (Taken From Records)
W(B1)	Water (QL-B1)(+/- 150mm or +/- 15% of detected depth or location)
W(B2)	Water (QL-B2)(+/- 250mm or +/- 40% of detected depth or location)
W(B3)	Water (QL-B3)(+/- 500mm)
W(B4)	Water (QL-B4) (Assumed Route)
W(D)	Water (QL-D) (Taken From Records)
G(B1)	Gas (QL-B1)(+/- 150mm or +/- 15% of detected depth or location)
G(B2)	Gas (QL-B2)(+/- 250mm or +/- 40% of detected depth or location)
G(B3)	Gas (QL-B3)(+/- 500mm)
G(B4)	Gas (QL-B4) (Assumed Route)
G(D)	Gas (QL-D) (Taken From Records)
H(B1)	Heating (QL-B1)(+/- 150mm or +/- 15% of detected depth or location)
H(B2)	Heating (QL-B2)(+/- 250mm or +/- 40% of detected depth or location)
H(B3)	Heating (QL-B3)(+/- 500mm)
H(B4)	Heating (QL-B4) (Assumed Route)
H(D)	Heating (QL-D) (Taken From Records)
O(B1)	Oil (QL-B1)(+/- 150mm or +/- 15% of detected depth or location)
O(B2)	Oil (QL-B2)(+/- 250mm or +/- 40% of detected depth or location)
O(B3)	Oil (QL-B3)(+/- 500mm)
O(B4)	Oil (QL-B4) (Assumed Route)
O(D)	Oil (QL-D) (Taken From Records)
A(B1)	Air (QL-B1)(+/- 150mm or +/- 15% of detected depth or location)
A(B2)	Air (QL-B2)(+/- 250mm or +/- 40% of detected depth or location)
A(B3)	Air (QL-B3)(+/- 500mm)
A(B4)	Air (QL-B4) (Assumed Route)
A(D)	Air (QL-D) (Taken From Records)
T/L(B1)	Traffic Light Cable (QL-B1)(+/- 150mm or +/- 15% of detected depth or location)
T/L(B2)	Traffic Light Cable (QL-B2)(+/- 250mm or +/- 40% of detected depth or location)
T/L(B3)	Traffic Light Cable (QL-B3)(+/- 500mm)
T/L(B4)	Traffic Light Cable (QL-B4) (Assumed Route)
T/L(D)	Traffic Light Cable (QL-D) (Taken From Records)
(B1)	Surface Water Drainage (QL-B1)(+/- 150mm or +/- 15% of detected depth or location)
(B2)	Surface Water Drainage (QL-B2)(+/- 250mm or +/- 40% of detected depth or location)
(B3)	Surface Water Drainage (QL-B3)(+/- 500mm)
(B4)	Surface Water Drainage (QL-B4) (Assumed Route)
(D)	Surface Water Drainage (QL-D) (Taken From Records)
(B1)	Foul Water Drainage (QL-B1)(+/- 150mm or +/- 15% of detected depth or location)
(B2)	Foul Water Drainage (QL-B2)(+/- 250mm or +/- 40% of detected depth or location)
(B3)	Foul Water Drainage (QL-B3)(+/- 500mm)
(B4)	Foul Water Drainage (QL-B4) (Assumed Route)
(D)	Foul Water Drainage (QL-D) (Taken From Records)
(B1)	Combined Water Drainage (QL-B1)(+/- 150mm or +/- 15% of detected depth or location)
(B2)	Combined Water Drainage (QL-B2)(+/- 250mm or +/- 40% of detected depth or location)
(B3)	Combined Water Drainage (QL-B3)(+/- 500mm)
(B4)	Combined Water Drainage (QL-B4) (Assumed Route)
(D)	Combined Water Drainage (QL-D) (Taken From Records)
(B1)	Rising Main (QL-B1)(+/- 150mm or +/- 15% of detected depth or location)
(B2)	Rising Main (QL-B2)(+/- 250mm or +/- 40% of detected depth or location)
(B3)	Rising Main (QL-B3)(+/- 500mm)
(B4)	Rising Main (QL-B4) (Assumed Route)
(D)	Rising Main (QL-D) (Taken From Records)
GPR	Unknown Service located by Ground Probing Radar
U	Unknown Service located by Electro Magnetic Locator
P	Unknown Service Power Sweep
R	Unknown Service Radio Sweep

Utility Survey Abbreviations

EoT	End of Trace	CAP	Capped Pipe/Duct
B	Blocked/Sonde unable to pass	UTS	Unable To Sonde/Survey
UTT	Unable To Trace	PR	Pipe Riser
UTL	Unable To Lift	WL	Water Level from Manhole Cover
CR	Cable Riser	PD	Pit Depth from Manhole Cover
888	Duct Configuration	OSA	Out of Survey Area
PT	P Trap	100ø	Pipe Diameter
PE	Pot Ended Cable	0.50m	Depth below surface in metres

N
INDICATIVE ONLY

Rev	Details of Revision	Drawn	Date

Surveyed	Drawn	Date	Checked	Date	Approved	Date
AN	AN	08/04/22	GD	11/04/22	GD	11/04/22

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Title.

UNDERGROUND UTILITY SURVEY
WEYBRIDGE BUSINESS PARK
ADDLESTONE
KT15 2UP

Dwg No. **220126 UGS** Sheet **1 of 3**

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