Stantec

Greater Cambridge Integrated Water Management Study

Level 2 Strategic Flood Risk Assessment

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Executive Summary

This Level 2 Strategic Flood Risk Assessment (SFRA) document undertakes a Level 2 assessment of site options identified by the Greater Cambridge Shared Planning Service. It builds upon the Level 1 SFRA completed in October 2025 for Greater Cambridge area. This Level 2 SFRA involves the assessment of 22 proposed development sites.

The Planning Practice Guidance: Flood Risk and Coastal Change (PPG), last updated 17th September 2025, advocates a tiered approach to risk assessment and identifies the following two levels of SFRA:

- Level One: where flooding is not a major issue in relation to potential development sites and where development pressures are low. The assessment should be sufficiently detailed to allow application of the Sequential Test.

- Level Two: where land outside flood risk areas cannot appropriately accommodate all the necessary development creating the need to apply the National Planning Policy Framework (NPPF) Exception Test. In these circumstances the assessment should consider the detailed nature of flood characteristics considering all sources of flooding.

The Level 2 assessment supports application of the Sequential Test by identifying the severity and variation in risk within medium and high flood risk areas. It establishes whether proposed allocations or windfall sites, are capable of being made safe throughout their lifetime without increasing flood risk elsewhere, and applying the Exception Test, where relevant.

The Level 2 assessment includes detailed assessments of the proposed site options. These include:

- An assessment of all sources of flooding including fluvial flooding, tidal flooding, surface water flooding, sewer flooding, groundwater flooding, mapping of the functional floodplain and the potential increase in fluvial flood risk due to climate change.

- Reporting on current conditions of flood defence infrastructure, where applicable.

- An assessment of existing flood warning and emergency planning procedures, including an assessment of safe access and egress during an extreme event.

- Advice and recommendations on the likely applicability of sustainable drainage systems for managing surface water runoff.

- Advice on whether the Exception Test is required, and whether likely to pass the second part of the Exception Test with regards to flood risk and on the requirements for a site-specific FRA.

The Greater Cambridge Shared Planning Service determined the sites which required a Level 2 assessment with confirmation from the Environment Agency, based on the information from the Level 1 SFRA and proximity of the sites to watercourses and known flood risk areas. Detailed site summaries have been produced for the proposed sites. Each site summary is accompanied by mapped flood risk outputs.

Abbreviations and Glossary

AEP: Annual Exceedance Probability: the probability, expressed as a percentage, of a flood event of a given magnitude or greater occurring in any single year. For example, a 1% AEP is a 1 in 100 year flood event. Several of those magnitude events may take place within a few years of each other and then not again for a long time afterwards. The chance of a 1 in 100 year flood event occurring in any given year is always 1%.

Awarded Watercourses: Ordinary watercourses that have been assigned (”awarded”) to a public body such as the District Council or an Internal Drainage Board for maintenance.

BGS: British Geological Society

CCC: Cambridge City Council

CFMP: Catchment Flood Management Plan: a high-level document presenting the Environment Agency’s long-term policies for flood risk management in the catchment

DCLG: Department of Community and Local Government

Defra: Department of Environment, Flood and Rural Affairs

DTM: Digital Terrain Model

Environment Agency (EA): Environment Agency, a non-department public body, established in 1995 and with responsibilities relating to the protection and enhancement of the environment in England

Environmental Permitting Regulations: Framework for the regulation of “flood risk activities” by the Environment Agency, which in 2015-2016 replaced the ‘flood defence consent’ process

EU: European Union

FCERM: Flood and Coastal Erosion Risk Management

Flood Zone: Nationally consistent delineation of Zones at ‘high’, ‘medium’, and ‘low’ probability of flooding from fluvial (river) or tidal sources, updated on a quarterly basis by the Environment Agency

Formal Flood Defence: A structure built and maintained specifically for flood defence purposes

FRA: Flood Risk Assessment

Flood Risk Management Plan: Flood risk management Plans (FRMPs) explain the risk of flooding from rivers, the sea, surface water, groundwater and reservoirs for each river basin district. FRMPs set out how risk management authorities will manage flood risk over the next 6 years. Risk management authorities include the Environment Agency, lead local flood authorities (LLFAs), local councils, internal drainage boards, Highways England and water companies. FRMP are a requirement under the EU Floods Directive 2007.

GCSP: Greater Cambridge Shared Planning

IDB: Internal Drainage Board, a public body with permissive powers for managing land drainage and flood risk within their local area

Informal Flood Defence: A structure that provides a flood defence function, but was not built and/or maintained for this purpose

LiDAR: Light Detection and Ranging, a surveying method that measures distance to a target using lasers

LLFA: Lead Local Flood Authority, responsible at a local level for managing local flood risk from surface water, ground water and ordinary watercourses, as defined in the Flood & Water Management Act 2010

Main River: These are watercourses designated as “Main River” under the Water Resources Act (1991), as shown on the Main River map. Rights and responsibilities to Main rivers lie with the riparian owner (see owning a watercourse guidance). The Environment Agency have rights to carry out Flood Risk Management works, including maintenance, on Main Rivers. Under the Environmental Permitting Regulations (2016) a permit must be obtained from the Environment Agency for all works in, over, under or adjacent to main rivers.

NPPF: National Planning Policy Framework, the overarching UK planning policy document. NPPF Section 14 ‘Meeting the challenge of climate change, flooding and coastal change’ sets out the specific requirements relating to flood risk

Ordinary Watercourse: Ordinary watercourses are all watercourses which are not part of the Main River network. Rights and responsibilities to ordinary watercourses lie with the riparian owner. Under the Land Drainage Act (1991), consent is required from the Lead Local Flood Authority or Internal Drainage Board for any works that may alter the flow of water. Some ordinary watercourses are classified as “award drains” and maintained by the District Council or Internal Drainage Board.

Planning Policy Guidance: Planning Policy Guidance (PPG) are written documents that set out the government's policies on different aspects of planning policy. They give guidance to those involved in the operation of the planning system and explained the relationship between planning policies and other policies relating to

development and land use. These were replaced by Planning Policy Statements (PPS), written statements published by the government to help explain the statutory provisions of the planning policy. These again are superseded by the NPPF but unless specifically revoked by the framework, existing policies remained effective.

Preliminary Flood Risk Assessment (PFRA): A high-level summary of significant flood risk required under the Flood Risk Regulations (2009), based on available information and describing both the probability and consequences of past and future flooding

Residual Risk: A measure of the outstanding flood risks and uncertainties that have not been explicitly quantified and/or accounted for as part of the review process. It is the remaining risk after mitigation measures have been considered.

Riparian Owner: A person who owns land bounding a river, lake or other watercourse. Further riparian owner rights and responsibilities is available from the Environment Agency owning a watercourse guidance.

SCDC: South Cambridgeshire District Council

SFRA: Strategic Flood Risk Assessment

SuDS: Sustainable Drainage Systems

SPD: Supplementary Planning Document, providing additional guidance to policies and proposals contained within Development Plan Documents. They do not form part of the development plan.

SWMP: Surface Water Management Plan, which identifies the surface water flood risk and outlines management options and strategy in a particular location

Sustainability Appraisal: Appraisal of plans, strategies and proposals to test them against broad sustainability objectives

Sustainable Development: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs (The World Commission on Environment and Development, 1987)

Watercourse: Any natural or artificial channel above or below ground through which water flows, such as a river, brook, beck, ditch, mill stream or culvert.

WFD: Water Framework Directive

1 Introduction

1.1 Greater Cambridge Integrated Water Management Study

1.1.1 Stantec UK Ltd were commissioned by Greater Cambridge Shared Planning (GCSP) to prepare an Integrated Water Management Study (IWMS) to support the development of the Greater Cambridge Local Plan. The Greater Cambridge area represents South Cambridgeshire District Council (SCDC) and Cambridge City Council (CCC). The combined SCDC and CCC administrative areas will be referred to as “Greater Cambridge” in this report (Figure 1-1).

1.1.2 The Integrated Water Management Study consists of:

- A Level 1 Strategic Flood Risk Assessment (SFRA), to support a sequential, risk-based approach to the location of development, required as a standalone document under the National Planning Policy Framework.
- A Level 2 SFRA, which will provide more detailed information assessment on flood risk at a local level and guides users on the application of the Sequential Test and early consideration for application of the Exceptions Test.
- A Detailed Water Cycle Study, to provide advice on the broad strategy options being considered for the location of growth and the sites coming forward for allocation in the draft Local Plan and the water infrastructure required to support this growth.

1.1.3 This report comprises the Level 2 Strategic Flood Risk Assessment and draws upon information from the Level 1 SFRA and is summarised in the Detailed Water Cycle Study.

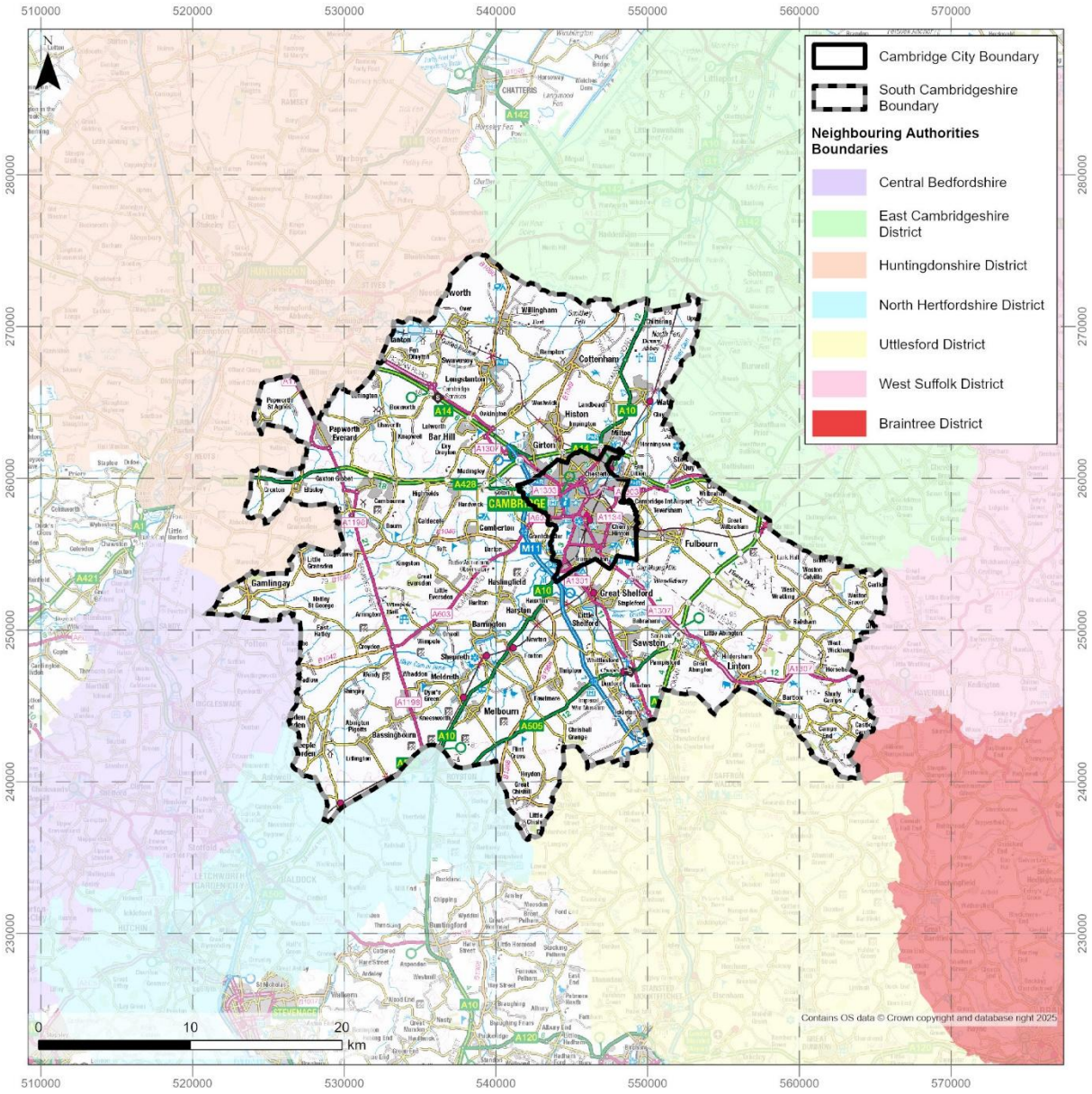

Figure 1-1: Study Area and Neighbouring Authorities

1.2 Planning Policy Context

1.2.1 The PPG identifies two levels of SFRA:

- Level 1: where flooding is not a major issue in relation to potential site allocations and where development pressures are low. The assessment should be of sufficient detail to enable the application of the Sequential test

- Level 2: where land outside flood risk areas cannot appropriately accommodate all necessary development, creating the possible need to apply the NPPF's Exception Test. In these circumstances the assessment should consider the detailed nature of flood characteristics considering all sources of flooding.

1.2.2 This report fulfils the requirements of a Level 2 SFRA.

1.3 Objectives

1.3.1 The objectives of the Level 2 SFRA are to:

- Undertake site-specific flood risk analysis for the sites identified, using the latest available flood risk data.
- Using available data, provide information and a comprehensive set of maps presenting flood risk from all sources for each site option.
- Where the Exception Test is required, provide recommendations for making the site safe throughout its lifetime.
- Take into account most recent policy and legislation in the NPPF, PPG and LLFA SuDS guidance

1.4 User Guide

1.4.1 The following outlines the structure of the Level 2 SFRA and how it should be used.

1.4.2 Chapter 1 Introduction

Contents: Outlines the purpose, objectives and requirements of the Level 2 SFRA.

Description of Use: For general information and context.

1.4.3 Chapter 2 Baseline Flood Risk Information

Contents: Outlines the baseline datasets used to assess each source of flood risk including historic, fluvial, surface water, sewer, groundwater and reservoir flooding.

Description of Use: Users should refer to this section in conjunction with the site assessments in **Error! Reference source not found.**to understand the data presented.

1.4.4 Chapter 3 Assessment Methodology

Contents: Summarises the contents and data used in the Level 2 SFRA reports, whilst highlighting the sites which require Level 2 assessment.

Description of Use: Outlines the relevant climate change datasets used to determine future flood risk, datasets used to advise safe access and egress

recommendations on a site-by-site basis, and flood mitigation techniques highlighted within the Level 1 SFRA report.

1.4.5 Chapter 4 Site Assessment Findings

Contents: Summarises the conclusions and recommendations from each site assessment in **Error! Reference source not found.**

Description of Use: Users should refer to this section for an overall summary of the site assessment findings. Further information may be obtained within Appendix B

1.4.6 Chapter 5 Conclusion

Contents: Summaries the overall findings of the Level 2 assessment.

Description of Use: This section should be used to understand the approach to the site assessments in **Error! Reference source not found.**

1.4.7 Appendix A Site Selection Considerations

Contents: Outlines considerations when selecting sites to be taken forward for this Level 2 SFRA.

Description of Use: For general information regarding the sites detailed within the assessments.

1.4.8 **Error! Reference source not found.Error! Reference source not found.**

Contents: This section provides detailed site assessments for the 22 sites considered as part of this Level 2 SFRA.

Description of Use: This section should be used by Planners to inform the application of the Sequential and Exception Tests, as relevant. Developers should use these assessments to understand flood risk to the site, access and egress requirements, impacts of climate change, SuDS and FRA requirements for site-specific assessments.

2 Baseline Flood Risk Information

2.1 Data Sources

2.1.1 This chapter outlines all the datasets used in the Level 2 SFRA when undertaking the site-specific assessments.

2.2 Historic Flooding

2.2.1 Map D7 of the Level 1 SFRA uses the Environment Agency Historic Flood Map, which shows the maximum extent of individual recorded flood outlines from river, the sea and groundwater springs that meet a set criteria. It shows areas of land that have previously been subject to flooding in England. It excludes flooding from surface water, except in areas where it is impossible to determine whether the source is fluvial or surface water, but the dominant source is fluvial.

2.2.2 If an area is not covered by the Historic Flood Map it does not mean that the area has never flooded; it may be the case that the EA do not currently have records of flooding in this area that meet the criteria for inclusion. It is also possible that the pattern of flooding in this area has changed and that this area would now flood or not flood under different circumstances. Outlines that don't meet this criterion are stored in the Recorded Flood Outlines dataset.

2.2.3 The Historic Flood Map takes into account the presence of defences, structures, and other infrastructure where they existed at the time of flooding. It will include flood extents that may have been affected by overtopping, breaches or blockages.

2.3 Sewer Flooding

2.3.1 Map D11 of the Level 1 SFRA shows the historic sewer flooding events for Greater Cambridge. The map uses the DG5 register provided by Anglian Water, which is the sewerage company for the area, and this is a record of all reported sewer flooding incidents.

2.3.2 The incidents are recorded on a postcode basis; therefore, each coloured area represents the total number of reported incidents, both internal and external, within that postcode.

2.4 Fluvial Flooding

2.4.1 Map D1 of the Level 1 SFRA shows the Flood Zones, which includes national and local modelled data, and information from past floods. The data shows the extent of land at present day risk of flooding from rivers, ignoring the benefits of defences, for the following scenarios:

- Flood Zone 1: land having a less that 0.1% (1 in 1000) annual probability of flooding.
- Flood Zone 2: land having between 0.1% - 1% (1 in 100 to 1 in 1000) annual probability of flooding from rivers or between 0.1% - 0.5% (1 in 200 to 1 in 1000) annual probability of flooding from the sea, and accepted recorded flood outlines.
- Flood Zone 3: areas shown to be at a 1% (1 in 100) or greater annual probability of flooding from rivers or 0.5% (1 in 200) or greater annual probability of flooding from the sea.

2.4.2 Map D6 of the Level 1 SFRA further subdivides Flood Zone 3 and shows the indicative functional floodplain defined as:

- Flood Zone 3b: Land where water must flow or be stored in times of flood, typically understood to be land having a 1 in 30 (3.3%) or greater annual probability of river flooding.

2.4.3 Where available, modelled flood extents detailed in Table 2-1, have been used as the primary data source to inform fluvial flood risk in the Level 2 SFRA reports. These are shown within Map D3 of the Level 1 SFRA. For ordinary watercourses not mapped within the models or available data, the surface water flood extents have been used as a proxy for assessing fluvial flood risk.

2.4.4 The Flood Zone and model information indicates the flood risk to areas of land and is not sufficiently detailed to show whether an individual property is at risk of flooding.

Table 2-1 SFRA Model Details

Model	Date	Type	Climate Change
Cottenham Lode PFS model	2003	ISIS	None
St Ives and Hemingford FAS model	2005	Mike 11 - 1D	None
Longstanton Brook Existing Situation	2006	Infoworks 1D	None
Fenland Flood Zone Improvements	2007	JFLOW	None
Vicars Brook Flood Zone improvements	2009	2D only JFLOW	None
Cam Phase 2 (Cam Lodes and Cam Urban)	2012	ISIS-TUFLOW 1D-2D	20% allowance
Coldhams Brook/Cherry Hinton Model	2013	ISIS-TUFLOW - 1D-2D	20% allowance for 0.1% probability event only

Model	Date	Type	Climate Change
Cam Rural (Bourn Brook, Granta, Ickleton, Cam, Rhee and Non-Main Rivers)	2014	ISIS-TUFLOW 1D-2D	20% allowance
Lower Ouse Model	2015	ISIS/ESTRY-TUFLOW 1D-2D	20% allowance (25%, 35% and 65% allowance simulations are unstable)
Hauxton	2016	Third party (not available)	Not available
Bin Brook	2023	2D TUFLOW	25%, 35% and 65% for 1% AEP; 25% for 0.1% AEP
Bin Brook Broadscale	2023	2D JFLOW	25%, 35% and 65% for 1% AEP; 25% for 0.1% AEP
Bottisham Lode	2023	2D TUFLOW	25%, 35% and 65% for 1% AEP; 25% for 0.1% AEP
Bottisham Lode Broadscale	2023	2D JFLOW	25%, 35% and 65% for 1% AEP; 25% for 0.1% AEP
Cam Urban	2023	linked 1D-2D (Flood Modeller – TUFLOW)	5%, 1% and 0.1% AEP (with Central +9%; Higher Central +19%, and Upper +45% uplifts in flow).
Hobsons Brook Broadscale	2023	2D TUFLOW	25%, 35% and 65% for 1% AEP; 25% for 0.1% AEP
New River Broadscale	2023	2D JFLOW	25%, 35% and 65% for 1% AEP; 25% for 0.1% AEP
Reach Lode	2023	2D TUFLOW	25%, 35% and 65% for 1% AEP; 25% for 0.1% AEP
Swaffham Lode	2023	2D TUFLOW	25%, 35% and 65% for 1% AEP; 25% for 0.1% AEP
Swaffham Lode Broadscale	2023	2D TUFLOW	25%, 35% and 65% for 1% AEP; 25% for 0.1% AEP

2.5 Surface Water Flooding

2.5.1 Map D8 of the Level 1 SFRA shows the risk of flooding from surface water, which is an assessment of where surface water flooding may occur when rainwater does not drain away through the normal drainage systems or soak into the ground, but lies or flows over the ground instead. It includes information about flooding extents and depths and is produced using national

scale modelling and enhanced with compatible, locally produced modelling from Lead Local Flood Authorities (LLFA).

2.5.2 The dataset used from the Environment Agency is a probabilistic product, meaning that it shows the overall risk, rather than the risk associated with a specific event or scenario. The dataset is displayed in one of three likelihood bandings:

- High Risk – greater than or equal to 3.3% chance in any given year (1 in 30 AEP)
- Medium Risk – less than 3.3% (1 in 30 AEP) but greater than or equal to 1% (1 in 100 AEP) chance in any given year
- Low Risk – less than 1% (1 in 100 AEP) chance in any given year

2.5.3 These outputs are advised to not be used at the property level, at scales more detailed than 1:50,000 as the data is open to misinterpretation. Due to how they are produced, these extents are not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of flood risk in relation to flooding at any scale without further supporting studies or evidence.

2.6 Groundwater Flooding

2.6.1 Map D10 of the Level 1 SFRA shows the Susceptibility to Groundwater Flooding dataset, which indicates areas where geological conditions could enable groundwater flooding to occur, whether that be close to ground or at the surface. The map has been produced by the British Geological Survey (BGS) and classifies the potential of groundwater flooding, based on geological and hydrogeological information, into three classes:

- Limited potential for groundwater flooding to occur.
- Potential for groundwater flooding of property situated below ground level.
- Potential for groundwater flooding to occur at surface.

2.6.2 Areas which do not fall under any of these classifications are not considered to be prone to groundwater flooding.

2.6.3 It should be noted that the data indicates susceptibility to groundwater flooding and does not illustrate hazard or risk; therefore, should not be used on its own to inform planning decisions at any scale. Furthermore, the map uses the same data as the 2021 Level 1 SFRA as the maps have not been updated in

recent years. There is also uncertainty about the impacts of climate change on groundwater flooding, so this has not been mapped at this stage.

2.7 Reservoir Flooding

2.7.1 Map D9 of the Level 1 SFRA shows the risk of flooding from reservoirs which uses data from Reservoir Flood Extents – Wet Day (National), Reservoir Flood Extents – Dry Day (National) and Reservoir Flood Extents – Fluvial Contribution (National).

2.7.2 The wet-day scenario data shows the individual flood extents for all large, raised reservoirs in the event that they were to fail and release the water held on a “wet day” when local rivers had already overflowed their banks.

2.7.3 The dry-day scenario data shows the individual flood extents for all large, raised reservoirs in the event that they were to fail and release the water held on a “dry day” when local rivers are at normal levels.

2.7.4 The fluvial contribution shows the extent of river flooding added to the reservoir model to determine the impacts of failure on a wet day. It is not exactly the same as the flooding from rivers shown in the Flood Map for Planning for rivers and the sea.

2.7.5 The data presents a prediction of a credible worst-case scenario, however it’s unlikely that any actual flood would be this large. The data gives no indication of likelihood or probability of reservoir flooding. The flood extents are not included for smaller reservoirs or for reservoirs commissioned after the reservoir modelling programme began in October 2016.

3 Assessment Methodology

3.1 Site Selection

3.1.1 The 22 sites taken forward for Level 2 assessment are shown in Figure 3-1. Appendix A provides further information on criteria used for site selection including the percentage area of the site falling within each source of flood risk.

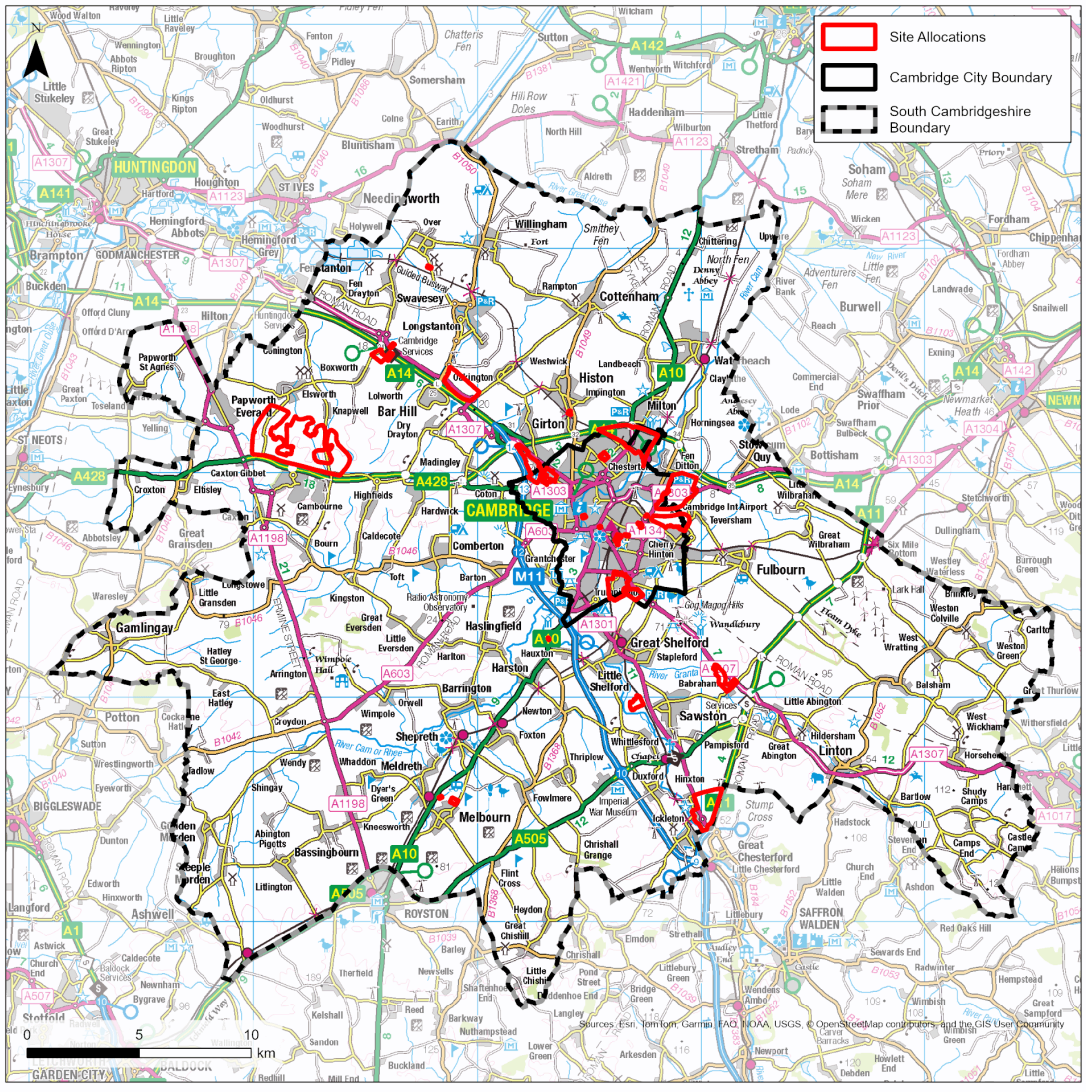

Figure 3-1 Site Allocations

3.2 Accounting for Climate Change

3.2.1 Re-simulation of existing hydraulic models for additional climate change scenarios was not undertaken as part of this Level 2 SFRA and instead the existing modelled results were used as a proxy. Recommendations have been made within the site-specific assessments where re-simulation of models for

climate change scenarios in line with current guidance is advised in order to inform design levels.

3.2.2 The impact of climate change on surface water flood risk in the absence of specific hydraulic modelling, has been assessed using the 0.1% AEP (1 in 1000 year) event as a conservative proxy for the 1% AEP (1 in 100 year) event plus climate change.

3.2.3 The potential impacts from climate change have also been assessed in reference to the following data sources:

- Environment Agency Flood Map for Planning Flood Zones with Climate Change map
- Long Term Risk of Flooding Map

3.3 Flood Risk Mitigation Measures

3.3.1 Section 5.1 of the Cambridgeshire Flood and Water SPD (2016) provides detailed guidance on how flood risk from all sources can be managed through site design to ensure that development will be safe from flooding. This is discussed further in Section 10.4 of the Level 1 SFRA.

3.3.2 Potential opportunities for flood risk management in relation to proposed development in the Greater Cambridge area are discussed within Chapter 8 of the Level 1 SFRA.

4 Site Assessment Findings

4.1.1 The following section of this report presents a summary of the findings for the 22 sites assessed within **Error! Reference source not found.**.

S/RRA/BBP: Land at Buckingway Business Park, Swavesey

- A sequential approach is adopted, prioritising the location of development outside of areas at risk of surface water flooding, taking into account the impacts of climate change.
- Safe access routes are located outside of areas identified as at risk of surface water flooding.
- Consideration is given to water reuse, water management and SuDS at the site, and how the site can contribute to flood and water management benefits in the local area.
- Infiltration testing is undertaken to determine the suitability of infiltrating SuDS features. Where infiltration is not possible, surface water should be attenuated and conveyed by SuDS features before being discharged into the watercourse on-site.

S/RRA/SCS: Land to the South of Cambridge Services, A14

- A sequential approach is adopted, prioritising the location of development within areas at lowest risk of flooding.
- Access routes are located outside of run-off flow paths and areas identified as at risk of surface water flooding. The access point into and out of the site is situated with respect to areas of surface water flood risk.
- If raising of access routes is required, this must not impact surface water flow routes or contribute to loss of floodplain storage.
- Consideration is given to the water management and SuDS at the site and how the site can contribute to wider flood and water management benefits across the catchment.
- Infiltration testing is required to determine the suitability of infiltrating SuDS features. Where infiltration is not possible surface water should be attenuated and conveyed by SuDS features before being discharged into the watercourse on-site.

S/RRA/SHF: Land North of A1307, Bar Hill (Slate Hall Farm)

- Site layout and design levels are informed by hydraulic modelling of the Oakington Brook
- A sequential approach is adopted to preferentially develop areas with the lowest flood risk
- Access routes are located outside of areas identified as at risk of surface water or fluvial flooding. Any proposed crossings over the Oakington Brook are to be raised above the 1% AEP event with climate change scenario plus a suitable freeboard allowance.
- Consideration is given to water management, water harvesting, and SuDS at the site, and how the site can contribute to wider flood and water management benefits across the catchment.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation and resilience measures.

S/RRA/CH: Compass House, Chivers Way, Histon and Impington

- Floor levels are set above the maximum surface water flood level taking into account climate change and including a suitable freeboard.
- The existing blockage of surface water flow paths is mitigated or removed.
- Safe access routes are identified outside of run-off flow paths and areas identified as at risk of surface water flooding.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation measures.
- Consideration is given to how the site can contribute to wider flood and water management benefits across the catchment.

S/CE: Cambridge East

- A sequential approach is adopted, prioritising the location of more vulnerable residential development outside of areas at risk of surface water flooding, taking into account the impacts of climate change.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation measures.

- Safe access routes are located outside of areas identified as at risk of surface water flooding.
- Consideration is given to water reuse, water management and SuDS at the site, and how the development of the site can contribute to wider flood and water management benefits across the catchment.

S/C/HRC: Horizon Resource Centre, 285 Coldham's Lane

- A sequential approach is adopted, prioritising development outside of areas impacted by surface water flooding, as much as practicable.
- Floor levels are set above the maximum surface water flood depth (for the 1% AEP event + climate change) with a suitable freeboard.
- The availability of safe access and egress will also need to be demonstrated for the 0.1% AEP rainfall event, including the climate change allowance applicable to the catchment.
- If raising of access routes is required, this must not impact surface water flow routes or contribute to loss of floodplain storage.
- Measures are implemented on site to manage and reduce surface water flood risk e.g. water harvesting and/or storage areas integrated into landscaping, use of SuDS.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation and resilience measures.

S/ED: Eddington

- A sequential approach is adopted, prioritising the location of more vulnerable residential development outside of Flood Zone 2 and areas at risk of surface water flooding, taking into account the impacts of climate change. The area of the northern site designated as Flood Zone 2 is proposed for commercial uses which are acceptable within this Flood Zone.
- Surface water flow paths are maintained, and the risk of surface water flooding is mitigated through the Surface Water Drainage Strategy for the sites/individual land parcels.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the required freeboard for finished floor levels.

- Safe access routes are located in areas outside of Flood Zone 2, and outside of any run-off flow paths and areas identified as at risk of surface water flooding.
- Consideration is given to the integration of water management and SuDS at the site; and how the site can contribute to wider flood and water management benefits across the catchment.

S/C/NCA: North Cambridge Academy, 108, Arbury Road

- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with proposed floor levels above projected surface water flood depths, taking into account climate change with a suitable freeboard.
- Existing overland surface water flow paths are maintained, and the risk of surface water flooding is mitigated through a Surface Water Drainage Strategy.
- A sequential approach is adopted, prioritising the location of more vulnerable development outside of the 1% and 0.1% AEP surface water flood extents, taking into account climate change.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation measures.
- Safe access routes are located outside of run-off flow paths and areas identified as at risk of fluvial and surface water flooding.
- Consideration is given to the integration of water management and SuDS at the site, in order to provide adequate drainage whilst contributing wider flood and water management benefits across the catchment.

S/NEC: North East Cambridge

- There is a known contaminated land issue with the site which requires further investigation.
- Access routes are located outside of areas identified as at risk of surface water flooding.
- A Sequential Approach is adopted, prioritising the location of more vulnerable residential development outside areas of fluvial and surface water flood risk.

- Consideration is given to the water management and SuDS at the site and how the site can contribute to wider flood and water management benefits across the catchment.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation measures.

S/CBC: Cambridge Biomedical Campus (including Addenbrooke's Hospital)

- A sequential approach is adopted, prioritising the location of more vulnerable residential development outside of areas at risk of surface water flooding, taking into account the impacts of climate change.
- Existing overland surface water flow paths are maintained, and the risk of surface water flooding is mitigated through a Surface Water Drainage Strategy.
- Consideration is given to the integration of water management and SuDS at the site, and how the site can contribute to wider flood management benefits across the catchment, including, where appropriate, retrofitting of SuDS within the existing campus.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the required freeboard for finished floor levels.
- Any changes to existing access routes are located outside of areas noted as overland flow paths, areas identified as at risk of surface water flooding including climate change.

S/C/DR: 2-28 Davy Road and Garage Blocks

- A sequential approach is adopted, prioritising the location of more vulnerable residential development outside of areas at risk of surface water flooding, taking into account the impacts of climate change.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation measures.
- Safe access routes are located outside of areas identified as at risk of surface water flooding.
- Consideration is given to water reuse, water management and SuDS at the site, and how the development of the site can contribute to wider flood and water management benefits across the catchment.

S/C/OPM: Old Press/Mill Lane

- A sequential approach is adopted, prioritising the location of more vulnerable development outside of Flood Zones 2 and 3 and areas impacted by surface water flooding, as much as practicable.
- Habitable floor levels are set above the maximum fluvial flood level (for the 1% AEP event with climate change scenario) with a suitable freeboard.
- Safe access routes are located outside areas identified as at risk of fluvial and surface water flooding.
- There are options available for safe access and egress routes generally heading in an easterly direction, away from the River Cam. A Flood Warning and Evacuation Plan should be prepared for the site covering both risk of flooding from fluvial and reservoir breach.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation and resilience measures.
- Measures are implemented on site to manage and reduce surface water and fluvial flood risk e.g. water storage areas integrated into landscaping, use of SuDS.

S/C/BFS: Brookfields

- A sequential approach is adopted, prioritising the location of more vulnerable residential development outside of the 1% and 0.1% AEP surface water flood extents, taking into account climate change.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with proposed floor levels above projected surface water flood depths, taking into account climate change with a suitable freeboard.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation measures.
- Safe access and egress routes must not be in the areas of high surface water risk (taking into account climate change).
- Consideration is given to the integration of water management and SuDS at the site, in order to provide adequate drainage whilst contributing wider flood and water management benefits across the catchment.

S/C/CLT: Clifton Road Area

- A sequential approach is adopted, prioritising the location of more vulnerable residential development outside of areas identified to be at surface water flood risk.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward.
- If flood mitigation measures are implemented, then they are tested to ensure that they will not displace water elsewhere.
- Safe access and egress will need to be demonstrated in the 1 in 0.1% AEP plus climate change rainfall events, using the depth, velocity and hazard outputs.

S/RSC/BRC: Babraham Research Campus

- A sequential approach is adopted, prioritising the location of more vulnerable development outside of the 1% AEP plus an appropriate allowance for climate change flood extent.
- Where development is proposed in area identified as at flood risk from a reservoir breach, an assessment into whether the reservoir design or maintenance schedule needs improving should be carried out. Expert advice may be required.
- No development (other than 'Water Compatible' development) takes place in the small proportion of the site designated as Flood Zone 3.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with floor levels above the 'wet day' reservoir and the fluvial design flood event (1% AEP) extents, taking into account climate change.
- If flood mitigation measures are implemented, then it can be demonstrated they will not displace water elsewhere.
- Further assessment of the potential for groundwater flooding (such as ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation measures.
- There are several options available for safe access and egress routes generally heading in a northerly direction, away from the River Granta. A Flood Warning and Evacuation Plan should be prepared for the site if development is located within Flood Zone 2 or 3a.

- Consideration is given to the integration of water management and SuDS at the site and how the site can contribute to wider flood management benefits across the catchment. The adjacent Strategic Enhancement Area (S/SEA/BRC: Babraham Research Campus: Green Belt Enhancement Land) should also be considered as it may offer opportunities to reduce flood risk through nature-based solutions.

S/RRA/CRH: Land Adjacent to Cambridge Road (A10) and Mill Lane, Hauxton

- The sequential approach is adopted to preferentially develop parts of the site at lowest risk of flooding.
- Flood mitigation measures are implemented that will not displace water and, subsequently, increase the risk of flooding elsewhere.
- SuDS opportunities that offer high drainage are integrated into the site (subject to infiltration testing and an investigation of ground conditions).
- Water harvesting and water re-use technologies into new buildings. Existing fluvial and overland surface water flow paths are maintained throughout the site or suitable flood compensation is provided in agreement with the EA and the Local Lead Flood Authority.
- Access routes are located outside of areas identified as at risk of fluvial and surface water flooding and avoiding existing run-off flow paths.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation measures.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with floor levels above the fluvial design flood event (1% AEP), taking into account climate change.
- An appropriate Flood Warning and Evacuation Plan is in place to ensure a strategy is in place for site users during a flood event.

S/RSC/FSS: Former Spicers Site, Sawston Business Park, Sawston

- Safe access and egress can be demonstrated in the 0.1% AEP plus climate change fluvial events using the depth, velocity, hazard and time of inundation outputs from hydraulic modelling.
- Existing overland surface water flow paths are maintained, and the risk of surface water flooding is mitigated through a Surface Water Drainage Strategy for the site's development.

- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken.
- Flood resilience measures are included for any basement areas to prevent sub-surface damage or infiltration of groundwater.
- Consideration is given to the integration of water management and SuDS at the site; and how the site can contribute to wider flood management benefits across the catchment.

S/RSC/WGC: Genome Campus, Hinxton

- A sequential approach is adopted, prioritising the location of more vulnerable residential development outside of areas at risk of surface water or fluvial flooding, taking into account the impacts of climate change.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation measures.
- Access routes are located outside of areas identified as at risk of surface water flooding.
- Consideration is given to water reuse, water management, and SuDS at the site and how the site can contribute to wider flood and water management benefits across the catchment.

S/RRA/CR Land to the west of Cambridge Road, Melbourn

- Existing overland surface water flow paths are maintained, and the risk of surface water flooding is mitigated through a Surface Water Drainage Strategy.
- Safe access routes are located outside of run-off flow paths and areas identified as at high risk of surface water flooding.
- A sequential approach is adopted, prioritising the location of more vulnerable residential development outside of the 1% AEP plus an appropriate allowance for climate change flood extents.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation measures.

S/RRA/ML The Moor, Moor Lane, Melbourn

- Hydraulic modelling of the ordinary watercourses in the vicinity of the site is undertaken to inform fluvial flood risk to the site.
- Access routes are located outside of areas identified as at risk of surface or fluvial water flooding.
- A sequential approach is adopted preferentially developing areas at lowest risk of flooding first.
- Consideration is given to the water management and SuDS at the site and how the site can contribute to flood and water management benefits in the local area.
- Infiltration testing is required to determine the suitability of infiltrating SuDS features. Where infiltration is not possible, surface water should be attenuated and conveyed by SuDS features before being discharged into the watercourse on-site.
- The site-specific FRA should further investigate risk of groundwater flooding and recommend appropriate mitigation measures as required.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation and resilience measures.

S/RRA/NW: Norman Way, Over

- A sequential approach is adopted, prioritising the location of development within areas at lowest risk of flooding.
- Access routes are designed in consideration of flow paths and areas identified as at risk of fluvial and surface water flooding.
- If raising of access routes is required, this must not impact surface water flow routes or contribute to loss of floodplain storage.
- Habitable floor levels are set above the surface water design flood event (1% AEP) taking into account climate change with a suitable freeboard.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation measures.

S/CBN: Cambourne North

- A sequential approach is adopted, prioritising the location of more vulnerable residential development outside of areas at risk of surface water flooding, taking into account the impacts of climate change.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation measures.
- Safe access routes are located outside of run-off flow paths and areas identified as at risk of surface water flooding.
- Consideration is given to the integration of water management and SuDS at the site into the wider strategy for Blue-Green Infrastructure for Cambourne; and how the site can contribute to wider flood and water management benefits across the catchment. The adjacent Strategic Enhancement Area (S/SEA/CBN: Non-development Area Adjacent to Cambourne North) may also offer opportunities to reduce flood risk through nature-based solutions.

5 Conclusion

5.1 Site Assessment Summary

5.1.1 This Level 2 SFRA has carried out detailed site assessments for 22 sites. The site assessments presented in **Error! Reference source not found.**summarise flood risk from all sources to each site based on a range of strategic and local datasets, considering both current risk and the future implications of climate change. Each assessment sets out the NPPF requirements for the site as well as guidance for the development of site-specific FRAs.

5.1.2 The assessments consider the need for the Exception Test. For each of the 22 sites considered as part of this Level 2 SFRA, there are large areas of Flood Zone 1, such that if the sequential approach is followed when considering development layout, the application of the Exception Test may not be deemed necessary. Recommendations have been made on flood risk mitigation measures such that it has been concluded development of the sites are capable of being made safe throughout their lifetime without increasing flood risk elsewhere.

5.1.3 A broadscale assessment of opportunities is presented for each site, alongside an assessment of suitable SuDS options, and FRA and site design requirements.

5.1.4 Each site assessment is accompanied by flood maps to illustrate the source, extent and severity of flooding. The maps should be viewed alongside each site assessment.

5.2 Limitations

5.2.1 This Level 2 SFRA has been prepared using the best available information at the time of preparation when assessing both the current risk of flooding from all sources and the potential impacts of climate change. This Level 2 SFRA should be treated as a live document, and should be updated when new information, or new planning guidance or legislation becomes available.

Appendix A Site Selection Considerations

Site Name and Reference	Flood Zone 3 (%)	Flood Zone 2 (%)	Flood Zone 1 (%)	Risk of Flooding from Surface Water 'High'(%)	Risk of Flooding from Surface Water 'Medium' (%)	Risk of Flooding from Surface Water 'Low'(%)	Risk of Flooding from Reservoirs – Dry Day (%)	Risk of Flooding from Reservoirs – Wet Day (%)	Susceptibility to Groundwater Flooding – Limited potential for groundwater flooding to occur (%)	Susceptibility to Groundwater Flooding – Potential for groundwater flooding of property situated below ground (%)	Susceptibility to Groundwater Flooding – Potential for groundwater flooding to occur at surface (%)	Historic Flooding (%)	Proximity to Unmodelled watercourse
S/RRA/BBP: Land at Buckingway Business Park, Swavesey			100	5	2	2							Yes
S/RRA/SCS: Land to the South of Cambridge Services, A14			100	13	7	13							Yes
S/RRA/SHF: Land North of A1307, Bar Hill (Slate Hall Farm)	3	4	93	3	1	4			30	9	25		
S/RRA/CH: Compass House, Chivers Way, Histon and Impington			100	10	5	6				16	61		
Policy S/CE: Cambridge East			100	3	2	7			1	78	21		Yes

Site Name and Reference	Flood Zone 3 (%)	Flood Zone 2 (%)	Flood Zone 1 (%)	Risk of Flooding from Surface Water 'High'(%)	Risk of Flooding from Surface Water 'Medium' (%)	Risk of Flooding from Surface Water 'Low'(%)	Risk of Flooding from Reservoirs – Dry Day (%)	Risk of Flooding from Reservoirs – Wet Day (%)	Susceptibility to Groundwater Flooding – Limited potential for groundwater flooding to occur (%)	Susceptibility to Groundwater Flooding – Potential for groundwater flooding of property situated below ground (%)	Susceptibility to Groundwater Flooding – Potential for groundwater flooding to occur at surface (%)	Historic Flooding (%)	Proximity to Unmodelled watercourse
S/C/HRC: Horizon Resource Centre, 285 Coldham's Lane			100	17	7	10					100		
S/ED: Eddington			100	3	2	5			12	41	1		Yes
S/C/NCA: North Cambridge Academy, 108, Arbury Road			100	17	8	17				100			
S/NEC: North East Cambridge			100	3	5	14		1	<0.5	2	73	5	
S/CBC: Cambridge Biomedical Campus (including Addenbrooke's Hospital)			100	6	3	16			62	38			
S/C/DR: 2-28 Davy Road and Garage Blocks			100	13	3	12			100				

Site Name and Reference	Flood Zone 3 (%)	Flood Zone 2 (%)	Flood Zone 1 (%)	Risk of Flooding from Surface Water 'High'(%)	Risk of Flooding from Surface Water 'Medium' (%)	Risk of Flooding from Surface Water 'Low'(%)	Risk of Flooding from Reservoirs – Dry Day (%)	Risk of Flooding from Reservoirs – Wet Day (%)	Susceptibility to Groundwater Flooding – Limited potential for groundwater flooding to occur (%)	Susceptibility to Groundwater Flooding – Potential for groundwater flooding of property situated below ground (%)	Susceptibility to Groundwater Flooding – Potential for groundwater flooding to occur at surface (%)	Historic Flooding (%)	Proximity to Unmodelled watercourse
S/C/OPM: Old Press/Mill Lane	10	36	54	1		10		43		63	37	4	
S/C/BFS: Brookfields			100	30	19	17					100		
S/C/CLT: Clifton Road Area			100	10	3	15			100				
S/RSC/BRC: Babraham Research Campus	5	6	89	1	2	5	31	35	33	61	6	4	
S/RRA/CRH: Land Adjacent to Cambridge Road (A10) and Mill Lane, Hauxton		25	75			5		92		100		27	
S/RSC/FSS: Former Spicers Site, Sawston Business Park, Sawston			100	2	2	6					100		

Site Name and Reference	Flood Zone 3 (%)	Flood Zone 2 (%)	Flood Zone 1 (%)	Risk of Flooding from Surface Water 'High'(%)	Risk of Flooding from Surface Water 'Medium' (%)	Risk of Flooding from Surface Water 'Low'(%)	Risk of Flooding from Reservoirs – Dry Day (%)	Risk of Flooding from Reservoirs – Wet Day (%)	Susceptibility to Groundwater Flooding – Limited potential for groundwater flooding to occur (%)	Susceptibility to Groundwater Flooding – Potential for groundwater flooding of property situated below ground (%)	Susceptibility to Groundwater Flooding – Potential for groundwater flooding to occur at surface (%)	Historic Flooding (%)	Proximity to Unmodelled watercourse
S/RSC/WGC: Genome Campus, Hinxton	1		99	1		2			71	12	16		
S/RRA/CR: Land to the west of Cambridge Road, Melbourn			100	1	1	7					100		Yes
S/RRA/ML: The Moor, Moor Lane, Melbourn	1	2	97			3					100		
S/RRA/NW: Norman Way, Over			100	7	5	6				1	99		Yes
S/CBN: Cambourne North			100	2	1	3			19	59	22		Yes

Appendix B Site Specific Assessments

Site Name: Cambridge East

1 Site Details

Site Reference S/CE
OS Grid reference: TL 48751 58553
Area: 255.22 Hectares
Proposed site use: Mixed Use (including Residential)
Vulnerability Classification: More Vulnerable

Existing Watercourses:

The proposed development site lies within the 'Cam Lower' Operational Catchment. The River Cam is an Environment Agency (EA) designated 'Main River' and is located approximately 800 metres northwest. An ordinary watercourse, likely a ditch purposed for land drainage, flows south to north through the southern parcel. This watercourse is fed my multiple other ordinary watercourses, which are also likely also drainage ditches, which run throughout the southern parcel.

There is an ordinary watercourse, likely a drainage ditch, on the northern parcels eastern border that flows along Airport Way flowing south. There is also another drainage ditch in the southwest of the northern parcel that briefly flows south through site.

2 Sources of Flood Risk

2.1 Fluvial

Flood Zone	Proportion of Site within Flood Zone (%)
Flood Zone 1	100%
Flood Zone 2	0%
Flood Zone 3	0%

Flood Zone mapping indicates that the site is entirely located in Flood Zone 1. The watercourses on site are not shown to be modelled within the Flood Zone mapping therefore the Risk of Flooding from Surface Water (RoFSW) map has been used as a conservative proxy to assess flood risk from these watercourses.

The RoFSW map indicates that the watercourse along Airport way, one of the drainage ditches in the southern parcel and the watercourse in the southwest of the

northern parcel flood in the 3.33% Annual Exceedance Probability (AEP) event. In the 1% and 0.1% AEP events, these flood extents become wider but are still indicated to remain within the channel.

The watercourse in the southwest of the northern parcel is indicated to be connected to a larger extent of flooding along Barnwell Road and in the south of the northern parcel. It is likely this extent is caused by surface water flooding and is not a result of the watercourse flooding.

2.2 Surface Water

Risk of Surface Water Flooding	Proportion of Site at Risk (%)
Low (0.1% AEP)	7%
Medium (1% AEP)	2%
High (3.33% AEP)	3%

The Risk of Flooding from Surface Water map indicates that the majority of the site is not affected by surface water flooding. For the 3.3% AEP event, surface water flood risk is predominantly associated with ponding. Notable extents of ponding occur in this event in the east of the southern parcel and the southwest of the northern parcel.

In the 1% AEP event surface water flood extents marginally increase from the 3.3% AEP event.

In the 0.1% AEP event, all extents of surface water ponding are more significant from the 1% AEP event. Areas of segmented ponding in the east of the southern parcel are now indicated to form a larger interconnected extent of surface water ponding.

2.3 Groundwater

The British Geological Survey (BGS) ‘Susceptibility to Groundwater Flooding’ dataset indicates that there is potential for groundwater flooding to occur at surface level (21% of the site area,) along the eastern and southwestern boundary of the northern parcel and the central section of the southern parcel. The rest of the site has a potential for flooding of property situated below ground level (78% of the site area).

The dataset indicates susceptibility to flooding and is not indicative of a specific level of hazard or risk.

BGS Geology mapping (at 1:50000 scale) indicates that the bedrock underlying the site is of the West Melbury Marly Chalk Formation. Chalk is considered highly permeable, allowing groundwater to percolate upwards and flood in periods of or after prolonged rainfall.

2.4 Reservoir

The site is not located in an area shown to be at risk from reservoir flooding.

2.5 Flood History

Anglian Water historic sewer flooding records indicate that external sewer flooding was recorded in the postcode CB5 8UQ along the northern site boundary on the 28/10/2020. The cause of sewer flooding is not identified.

3 Climate Change Implications

3.1 Fluvial flooding

The EA Flood Map for Planning climate change mapping (between 2070-20125) shows that there is no increase in fluvial flood risk on site due to climate change.

3.2 Surface water

Flood extents are shown to increase slightly from the present day 1% AEP scenario to the climate change scenario, shown in the Long Term Risk of Flooding from Surface Water map (2040-2060). The lifetime of the development is expected to extend beyond 2060, so the present day 0.1% AEP has been used as a conservative proxy for future climate change. As noted above, the 0.1% AEP event shows an amplification of the projected flood extents compared to the 1% AEP present day event.

3.3 Groundwater

The future impacts of climate change on groundwater levels are complex, difficult to model and not well understood.

Due to increased rainfall expectations with climate change, it should be assumed that the groundwater table could be impacted in future and may rise during wetter periods of the year. This will need to be considered for the design of finished ground floor levels, foundations and any basement areas.

4 Flood Risk Management Infrastructure

Defences

The site is not protected by any formal flood defences.

Residual Risk

There are no identified residual risks from flood management infrastructure.

5 Emergency Planning

Flood Warning

The site is not located in an area covered by Environment Agency flood warnings.

Access and Egress

Proposed access/egress routes should be located outside of the identified areas of high surface water and fluvial flood risk. Access and egress to the southern parcel can be located off of Coldham's Lane. Some minor extents of surface water ponding along its northern embankment should be avoided.

Access and egress to the northern parcel can be located off Airport Way. This would require an elevated crossing to be built over the existing watercourse, higher than the associated flood zone extents.

6 Broadscale Assessment of Sustainable Drainage Systems (SuDS) Suitability

BGS Geology mapping (at 1:50000 scale) indicates that bedrock of the West Melbury Marly Chalk Formation underlies the site. In the northern portion of the northern parcel, some of the existing infrastructure is indicated to be underlain by River Terrace Deposits, which is comprised of sand and gravel. Chalk, sand and gravel are all considered permeable. Due to the groundwater flood risk and likely high permeability of the underlying geology, infiltration SuDS may not be suitable. Infiltrating SuDS features could contribute to the groundwater flood risk on-site, therefore, infiltration testing will be required to determine the suitability of surface water discharge to groundwater.

It is therefore recommended that surface water management prioritises attenuation and conveyance features such as swales, detention basins, ponds, and permeable paving with lined sub-bases. These systems can provide effective storage and slow runoff rates. The site has two possible existing watercourses into which the development could discharge. Discharge should be directed to the watercourses to the east or the west of the site, subject to capacity and consent as per the Surface Water Drainage Hierarchy.

In accordance with the Surface Water Drainage Hierarchy, surface water discharge to a watercourse needs to be thoroughly investigated before the Lead Local Flood Authority (LLFA) would accept discharge into a sewer.

7 Opportunities for wider sustainability benefits and flood risk management

Due to the size of the site, community scale rainwater harvesting and other mechanisms should be considered to enable storage and re-use of water. There are

also opportunities for green-blue infrastructure such as swales, filter strips and attenuation to provide wider environmental, surface water management and amenity benefits. The existing watercourse on site can be maintained and possibly enhanced, providing increased stormwater attenuation and conveyance, benefiting the wider area. The use of SuDS and the enhancement of the existing watercourse could also contribute to improving water quality, providing flood protection, enhancing biodiversity and contributing to an attractive environment.

8 National Planning Policy Framework (NPPF) and Planning Implications

8.1 Exception Test Requirements

In accordance with the NPPF, 'More Vulnerable' development is considered compatible within Flood Zone 1 and does not require the application of the Exception Test. However, the sequential approach should be used to inform the siting and layout of development, locating all development away from areas at a higher risk of surface water flooding.

8.2 Site Design and FRA Requirements

The developer will need to provide a site-specific Flood Risk Assessment (FRA), which demonstrates that future users of the development will not be placed in danger from flood hazards from all sources throughout its lifetime. The applicant should demonstrate that the development meets the objectives of the NPPF's policy on flood risk and how mitigation measures will be secured for the lifetime of the development.

The sequential approach should be implemented at the site, prioritising more vulnerable residential development within areas outside of surface water flood risk.

The risk of surface water flooding must be addressed through a Surface Water Drainage Strategy (SWDS) for the site and should outline how development will manage and mitigate these risks.

Consultation with the LLFA should occur to discuss the enhancement of the existing watercourses on site, potentially providing increased flood relief, benefitting the wider area.

The site-specific FRA should further investigate risk of groundwater flooding (e.g. through groundwater level monitoring) and should include appropriate mitigation such as an additional freeboard to the finished ground floor levels.

9 Conclusions and Recommendations

The development is likely to be able to proceed if:

- A sequential approach is adopted, prioritising the location of more vulnerable residential development outside of areas at risk of surface water flooding, taking into account the impacts of climate change.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation measures.
- Safe access routes are located outside of areas identified as at risk of surface water flooding.
- Consideration is given to water reuse, water management and SuDS at the site, and how the development of the site can contribute to wider flood and water management benefits across the catchment.

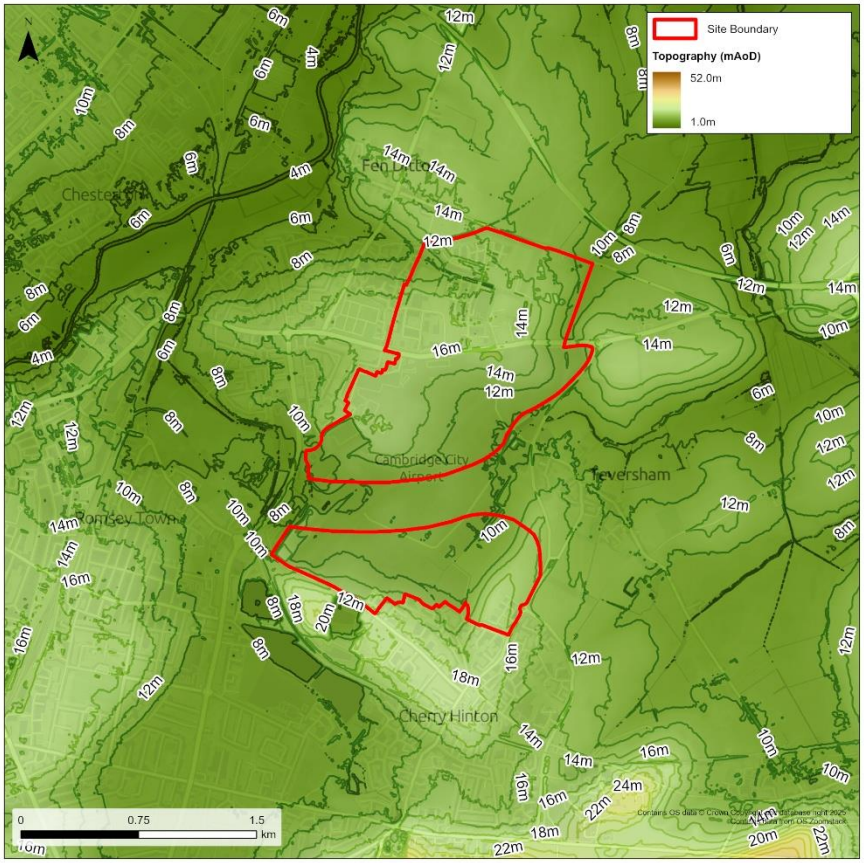

Figure 1: Site Topography

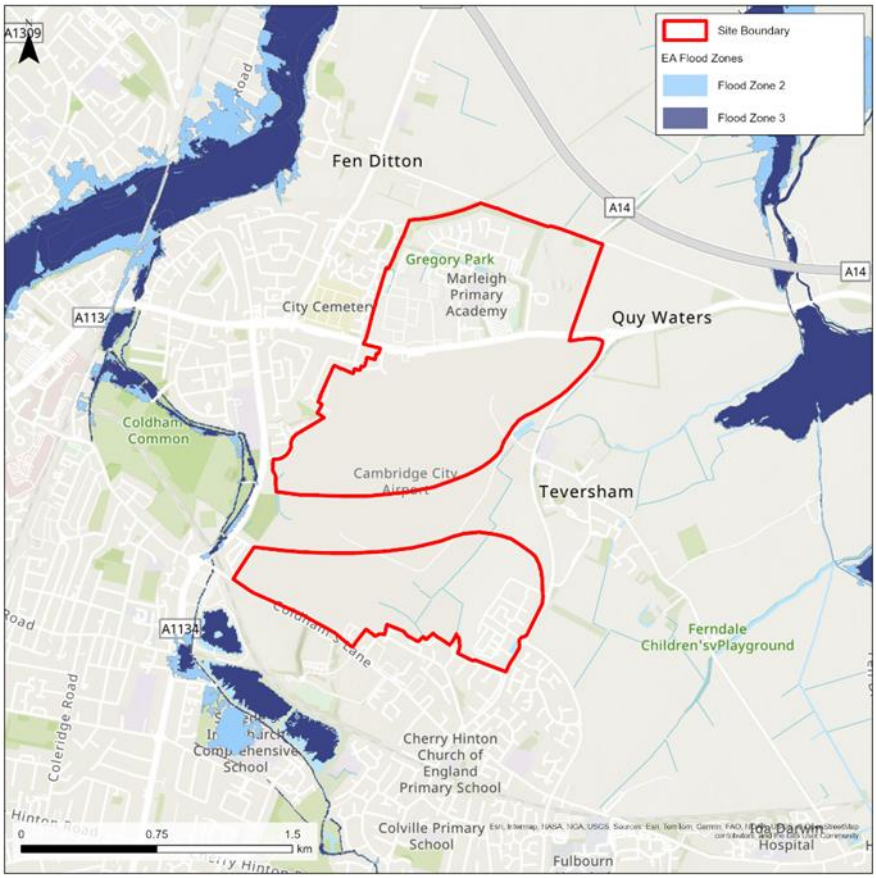

Figure 2: Flood Zones (Present Day)

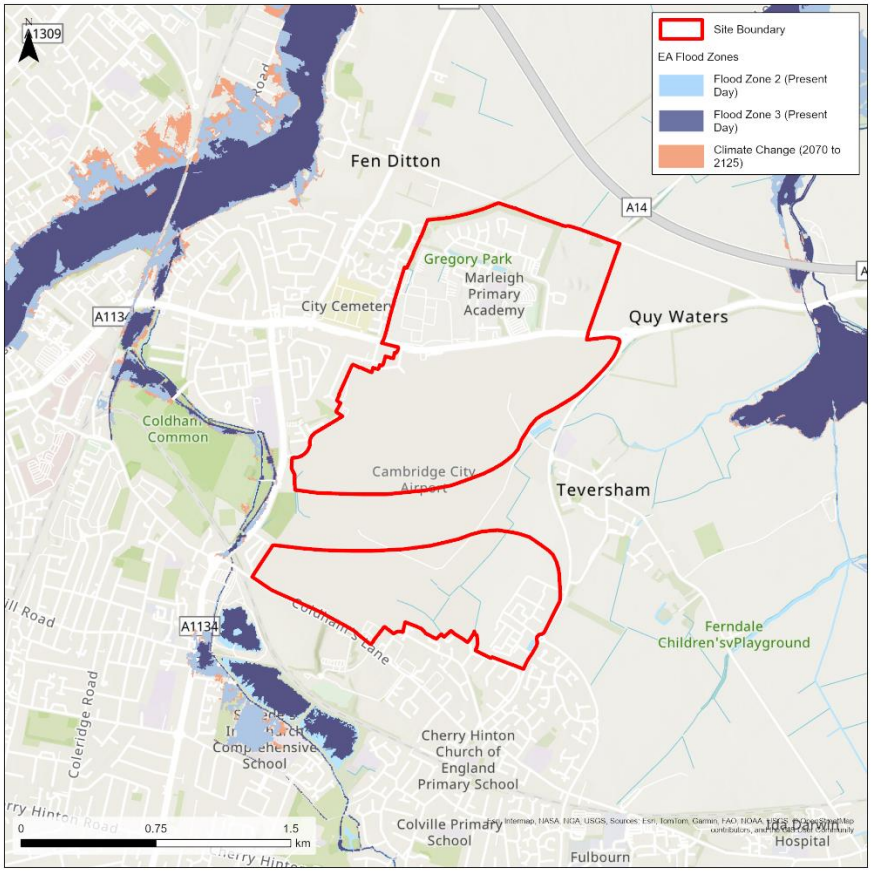

Figure 3: Flood Zones (Climate Change – 2070 to 2125)

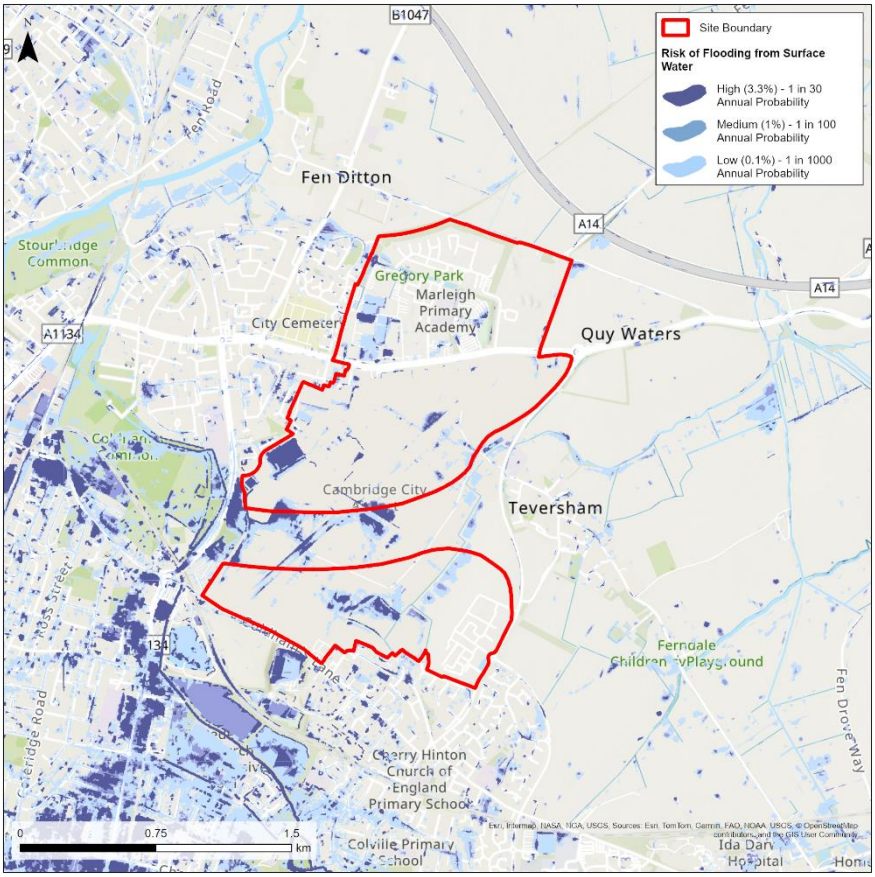

Figure 4: Risk of Flooding from Surface Water Map

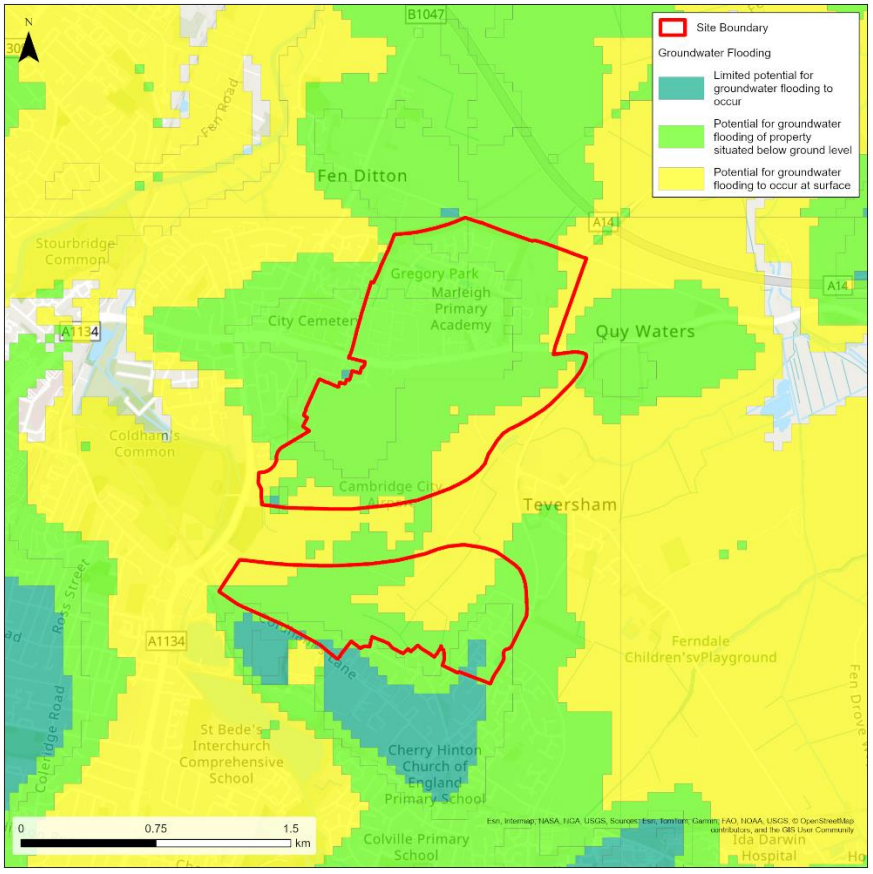

Figure 5: Susceptibility to Groundwater Flooding Map

Site Name: Genome Campus, Hinxton

1 Site Details

Site Reference S/RSC/WGC
OS Grid reference: TL 50407 45230
Area: 146.33 Hectares
Proposed site use: Mixed Use (inc. residential)
Vulnerability Classification: More Vulnerable

Existing Watercourses:

The site is in the Cam Rhee and Granta operational catchment. There are no recorded ordinary watercourses on-site; however, Environment Agency (EA) Statutory Main River mapping indicates the presence of several informal drainage ditches. A few of the ditches are located around the Wellcome Genome Campus, Mulberry Court building and another ditch is located at the bottom of a field in the centre of the site, flowing southeast until the A11.

The River Cam, a designated Main River, is located outside the site boundary to the south-west.

2 Sources of Flood Risk

2.1 Fluvial

Flood Zone	Proportion of Site within Flood Zone (%)
Flood Zone 1	99%
Flood Zone 2	0%
Flood Zone 3	1%

EA Flood Zones mapping indicates that all but a minor section of the site is located in Flood Zone 1. Directly to the west of the site, are Flood Zones 2 and 3, associated with the River Cam. 1% of the site is within these Flood Zones.

2.2 Surface Water

Risk of Surface Water Flooding	Proportion of Site at Risk (%)
Low (0.1% AEP)	2%
Medium (1% AEP)	0%
High (3.33% AEP)	1%

The EA Risk of Flooding from Surface Water map indicates that the whole site has sections of localised unconnected surface water ponding, likely due topographical

low points within the terrain. The majority of these areas are considered to be 'low' risk (3.33% Annual Exceedance Probability (AEP) event).

One notable area of surface water ponding occurs east of the A1301, where a significant amount of water ponds north along the embankment of the road. Depths here have a 'low' (0.1-1% AEP) chance of reaching up to 600 millimetres.

Larger surface water flood extents are seen in the lower AEP events however, the extents between the different AEP events do not change significantly.

2.3 Groundwater

The British Geological Survey's (BGS's) 'Susceptibility to Groundwater Flooding' map indicates that there is potential for groundwater flooding to occur at surface level for 16% of the site, and 12% of the site at risk of groundwater flooding of property situated below ground. These extents are in the southwest of the site, where the Wellcome Genome Campus is located.

The dataset indicates susceptibility to flooding and is not indicative of a specific level of hazard or risk.

Much of the site has been previously developed, so the natural ground conditions are likely to have been disturbed during previous construction works, which will impact on the potential for groundwater flooding.

BGS Geology Viewer indicates that the majority of the site is underlain by either the Holywell Nodular or the New Pit chalk formations. Chalk is considered to be highly permeable, likely a contributing factor to the groundwater flood risk at site allowing for groundwater to percolate upwards and flood during or after high rainfall events.

Ground investigation should be undertaken at the site to establish the present ground conditions and position of the groundwater table.

2.4 Reservoir

The EA Risk of Flooding from Reservoirs Map indicates that the site is not at reservoir flood risk.

2.5 Flood History

EA Historic Flood mapping indicates that some areas of the site have previously flooded. These areas are along the eastern border of the site and are associated with the River Cam.

3 Climate Change Implications

3.1 Fluvial

The EA Flood Map for Planning climate change mapping (between 2070 - 2125) shows a minor increase in fluvial flood extent at the site (1% flood zone 3 and 1% flood zone 2).

3.2 Surface Water

The flood extents and flood depths do not increase significantly from the present day less than1% AEP scenario to the climate change scenario shown in the EA Risk of Flooding from Surface Water mapping (2040-2060). The lifetime of the development is expected to extend beyond 2060, so the present day 0.1% AEP has been used as a conservative proxy for future climate change. As noted above, the 0.1% AEP event shows an amplification of the projected flood extents compared to the 1% AEP event.

3.3 Groundwater

The future impacts of climate change on groundwater levels are complex, difficult to model and not well understood.

Due to increased rainfall expectations with climate change, it should be assumed that the groundwater table could be impacted in future and may rise during wetter periods of the year. This will need to be considered for the design of finished ground floor levels, foundations and any basement areas

4 Flood Risk Management Infrastructure

Defences

There are no recorded flood defences protecting the site.

Residual Risk

There is no identified residual risk to the site from flood risk management infrastructure.

5 Emergency Planning

Flood Warning

The site is not part of any current Environment Agency Flood Alert, Flood Warning or Groundwater Flood Warning areas.

Access and Egress

Access routes are likely to be located off the A1301 which passes through the site. Access routes, both vehicular and pedestrian, into the site should be located outside of identified areas of significant surface water flood risk. There are a few areas of localised surface water ponding along the northern embankment of the A1301, which should be assessed to ensure safe access and egress.

6 Broadscale Assessment of Sustainable Drainage Systems (SuDS) Suitability

Infiltration SuDS may not be suitable in some areas of the site due to the potential for groundwater flood risk. Infiltration testing will be required to determine the suitability of surface water discharge to groundwater.

The site is adjacent to an existing watercourse, the River Cam, into which the development could discharge. In accordance with the Surface Water Disposal Hierarchy, discharge into a surface water body, such as the River Cam, needs to be thoroughly explored before the LLFA Lead Local Flood Authority (LLFA) would accept alternative discharge options such as into a surface water sewer. As the site is primarily undeveloped, it is unlikely that there is existing sewerage infrastructure in place.

Surface water management should prioritise attenuation and conveyance features such as swales, detention basins, ponds, and permeable paving with lined sub-bases. These systems can provide effective storage and slow runoff rates.

7 Opportunities for wider sustainability benefits and flood risk management

Due to the size of the site, there are likely to be opportunities for green infrastructure such as swales, permeable paving, filter strips and attenuation to provide wider environmental, surface water management and amenity benefits. The use of SuDS (where ground conditions are suitable) and enhancement of the existing watercourse can also contribute to improving water quality, providing flood protection, enhancing biodiversity and contributing to an attractive environment. Community scale rainwater harvesting and other mechanisms should also be considered to enable storage and re-use of water.

8 National Planning Policy Framework (NPPF) and Planning Implications

8.1 Exception Test Requirements

In accordance with the NPPF, ‘More Vulnerable’ development is considered compatible within Flood Zone 1 and does not require the application of the Exception Test.

8.2 Site Design and FRA Requirements

The sequential approach should be implemented at the site, prioritising more vulnerable residential development within areas outside of surface water or fluvial flood risk. It should be possible to locate all development outside of these extents.

The developer will need to provide a site-specific Flood Risk Assessment (FRA), which demonstrates that future users of the development will not be placed in danger from flood hazards from all sources throughout its lifetime. The applicant should demonstrate that the development meets the objectives of the NPPF's policy on flood risk and how mitigation measures will be secured for the lifetime of the development.

The sequential approach should be implemented at the site, prioritising more vulnerable residential development within areas outside of surface water or fluvial flood risk. It should be possible to locate all development outside of these extents.

The site layout should use the sequential approach, preferentially locating development in areas at lowest risk of flooding first.

The risk of surface water flooding must be addressed through a Surface Water Drainage Strategy (SWDS) for the site and should outline how development will manage and mitigate these risks.

The site-specific FRA should further investigate the risk of groundwater flooding (e.g. through groundwater level monitoring) and should include appropriate mitigation, such as an additional freeboard to the finished ground floor levels.

The availability of safe access and egress will need to be demonstrated using flood depth, velocity and hazard outputs for the 0.1% AEP for fluvial/rainfall flood events, including the climate change allowance applicable to the catchment.

9 Conclusions and Recommendations

The development is likely to be able to proceed if:

- A sequential approach is adopted, prioritising the location of more vulnerable residential development outside of areas at risk of surface water or fluvial flooding, taking into account the impacts of climate change.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation measures.
- Access routes are located outside of areas identified as at risk of surface water flooding.
- Consideration is given to water reuse, water management, and SuDS at the site and how the site can contribute to wider flood and water management benefits across the catchment.

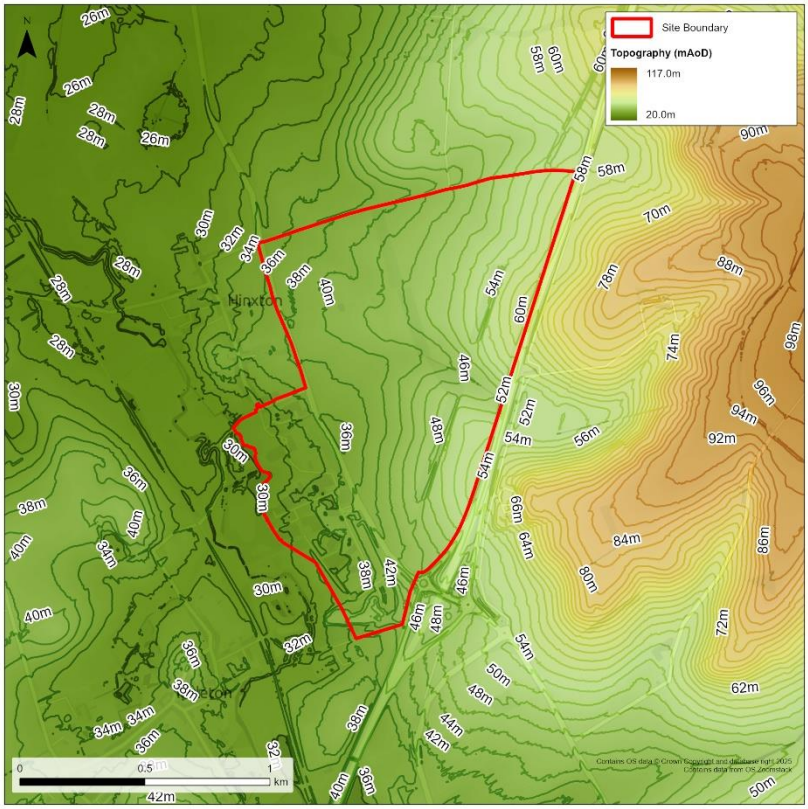

Figure 6: Site Topography

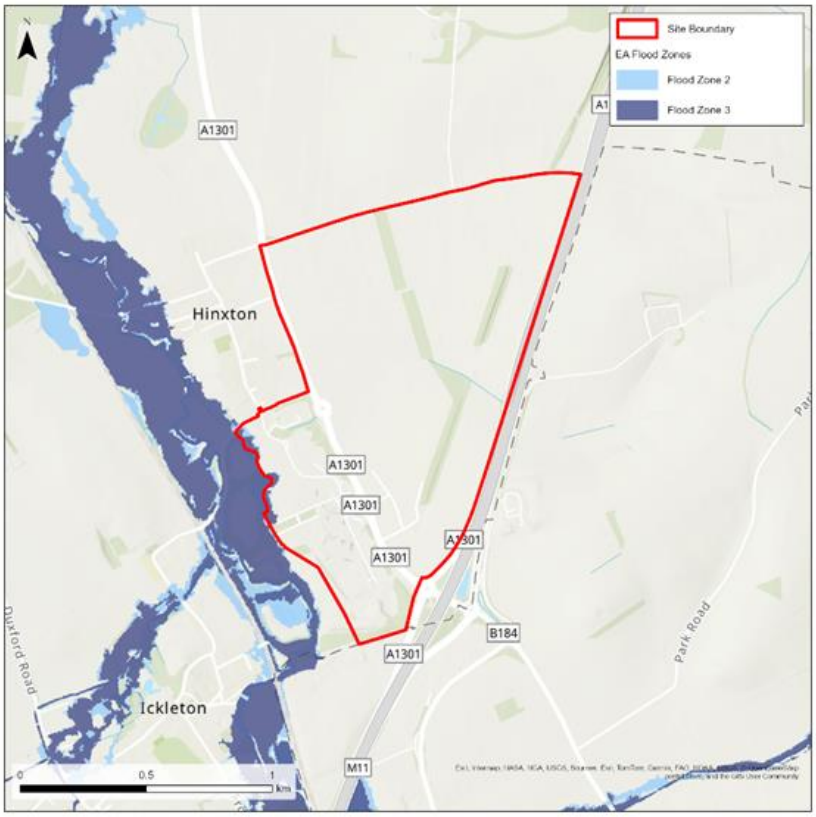

Figure 7: Flood Zones (Present Day)

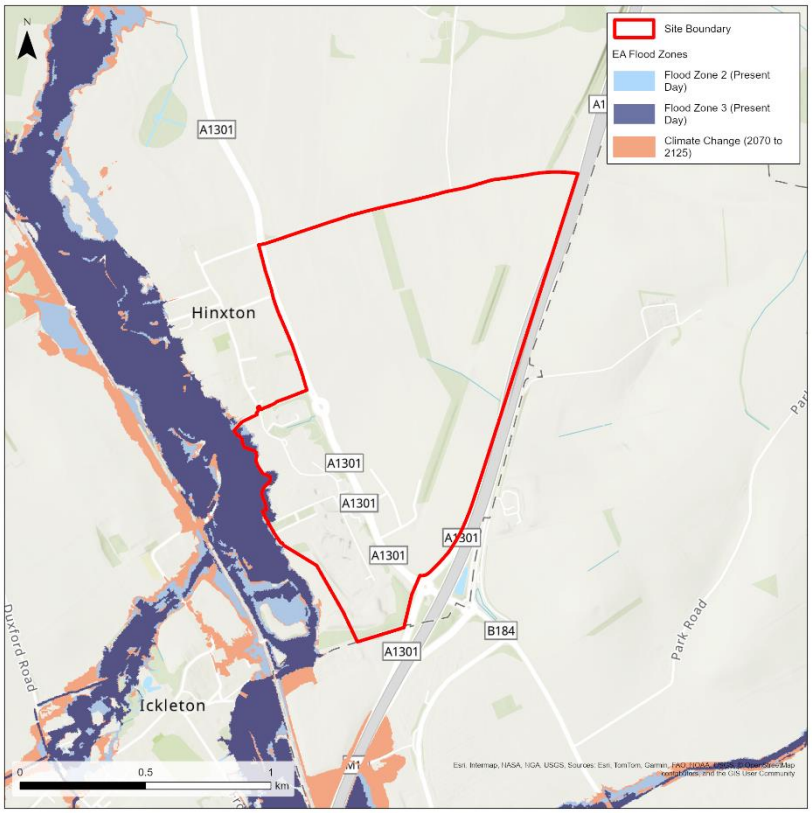

Figure 8: Flood Zones (Climate Change – 2070 to 2125)

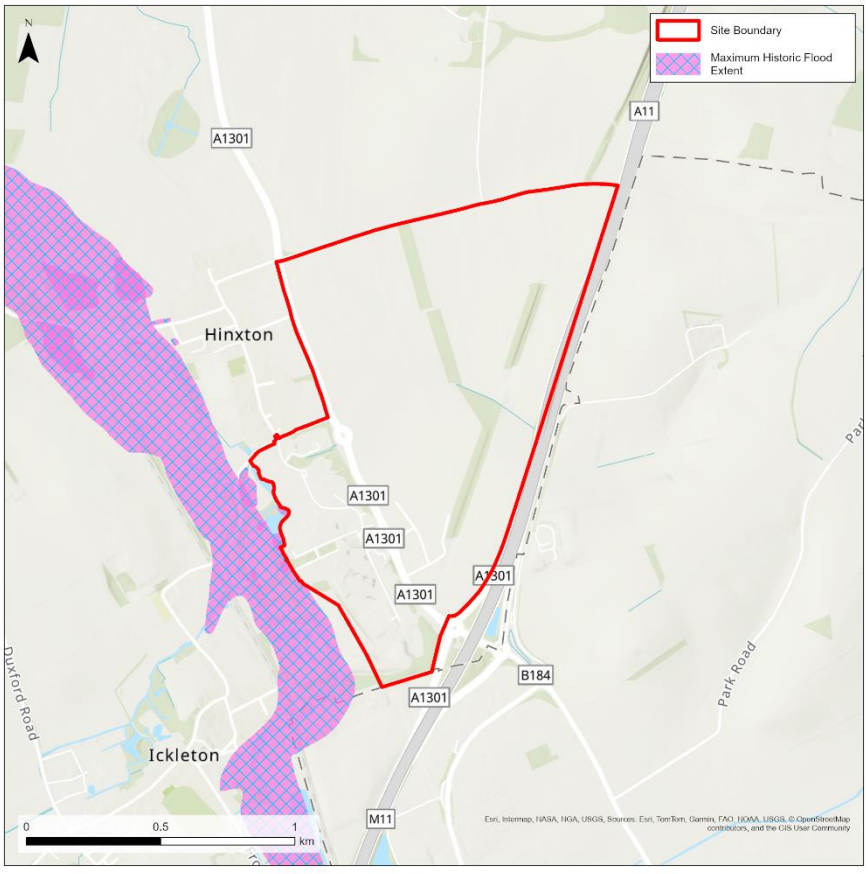

Figure 9: Historic Flood Extent

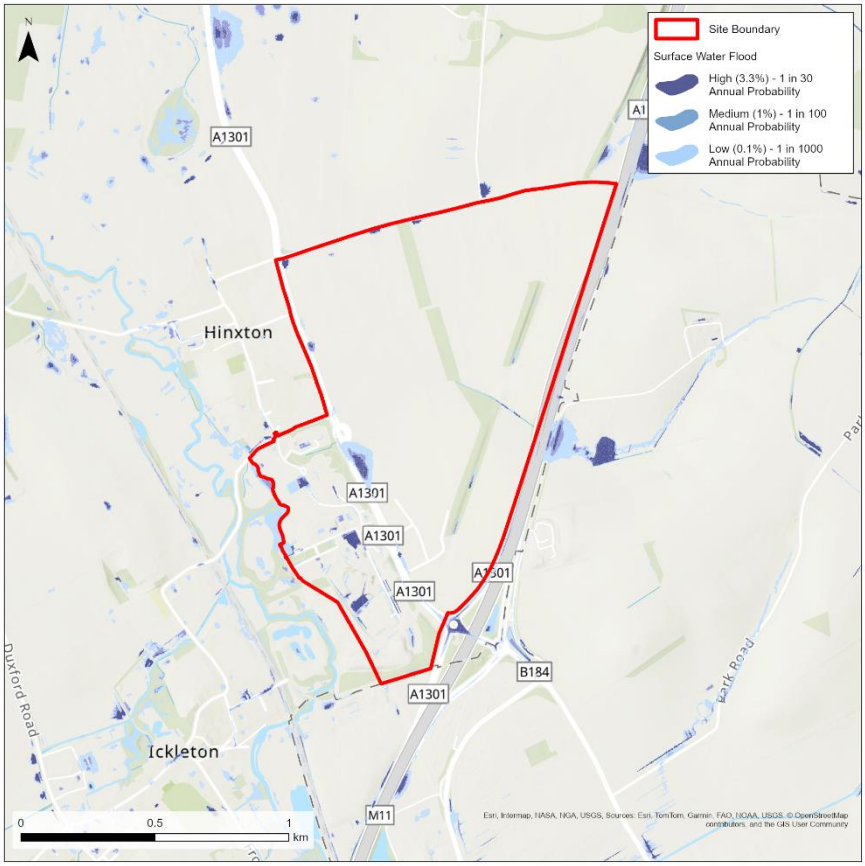

Figure 10: Risk of Flooding from Surface Water Map

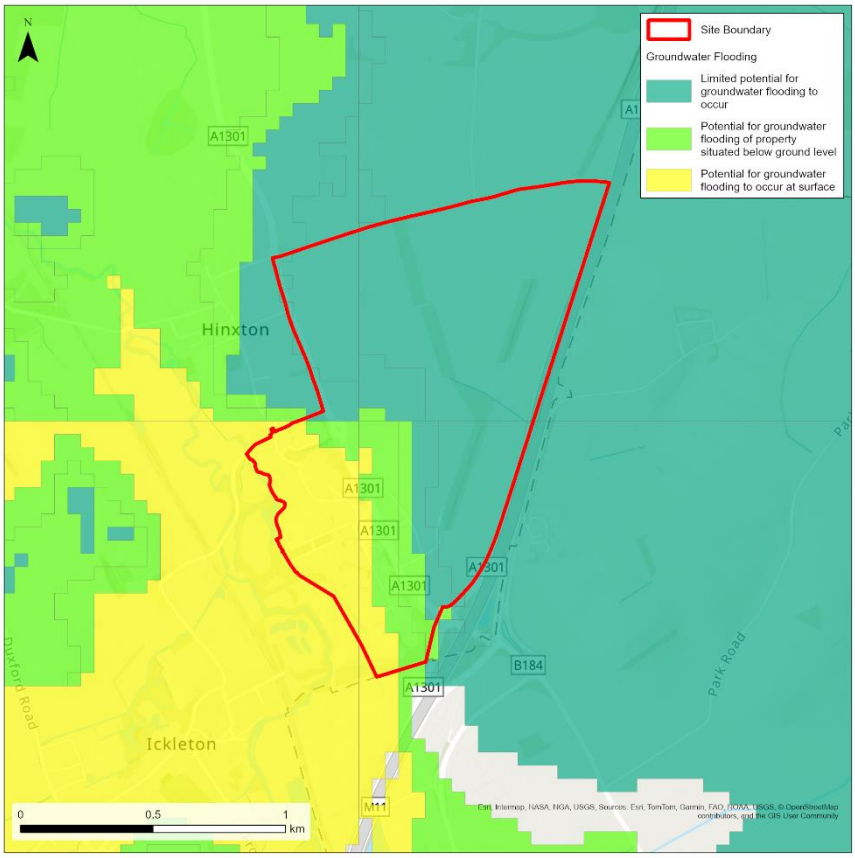

Figure 11: Susceptibility to Groundwater Flooding Map

Site Name: Land at Buckingway Business Park, Swavesey

1 Site Details

Site Reference: S/RRA/BBP
OS Grid reference: TL 36197 65670
Area: 2.11 Hectares
Proposed site use: Employment - Class B2 (General Industrial) or Class B8 (Storage or Distribution) with ancillary supporting uses
Vulnerability Classification: Less Vulnerable.

Existing Watercourses:

The proposed development site lies within the 'Great Ouse Lower' Operational Catchment. There is an ordinary watercourse that runs along the site's southern border, which turns north and flows along the site's western border eventually discharging into a larger attenuation feature north of the Buckingway Business Park. There is also an ordinary watercourse that runs along the northern border, which also discharges into the attenuation feature. This feature is assumed to discharge northwest into another watercourse that flows northeast. Ordinary watercourses along the site's border are likely ditches purposed for land drainage.

2 Sources of Flood Risk

2.1 Fluvial

Flood Zone	Proportion of Site within Flood Zone (%)
Flood Zone 1	100%
Flood Zone 2	0%
Flood Zone 3	0%

The site is located entirely within Flood Zone 1. The ordinary watercourses bordering the site are not modelled in the Environment Agency (EA) fluvial flood risk maps. Therefore, the EA Risk of Flooding from Surface Water map has been used as a proxy to estimate fluvial flood risk from these watercourses. The Risk of Flooding from Surface Water mapping shows flood water remains in bank for the ordinary watercourses flood for all Annual Exceedance Probability (AEP) events.

2.2 Surface Water

Risk of Surface Water Flooding	Proportion of Site at Risk (%)
Low (0.1% AEP)	2%
Medium (1% AEP)	2%
High (3.33% AEP)	5%

The Risk of Flooding from Surface Water mapping indicates that the majority of the site has a very low risk of surface water flooding. Localised ponding occurs in the 3.33% AEP, notably along the eastern border and the near the centre of the site. Also along the eastern border is a minor surface water flood extent that is delineated to flow into the northern channel. All flood extents increase slightly for the lower probability AEP events.

The mapping indicates that flood depths remain shallow at less than 200 millimetres.

2.3 Groundwater

The BGS ‘Susceptibility to Groundwater Flooding’ dataset indicates that there is no potential for groundwater flooding to occur on-site.

The dataset indicates susceptibility to flooding and is not indicative of a specific level of hazard or risk.

2.4 Reservoir

The site is not indicated to be at risk of flooding in event of a reservoir breach for both the wet and dry day scenarios.

2.5 Flood History

No historical flood events have been recorded within the site or its vicinity.

3 Climate Change Implications

3.1 Fluvial

The EA Long Term flood risk mapping for climate change (between 2036 to 2069) and the Flood Map for Planning (climate change scenario: 2070 to 2125) shows the site remains outside of fluvial flood extents when factoring climate change’s potential impacts on fluvial flood risk.

3.2 Surface Water

The flood extents and flood depths do not increase significantly from the present-day scenario to the climate change scenario shown in the Risk of Flooding from Surface Water mapping (2040-2060). The lifetime of the development is expected to extend beyond 2060, so the present day 0.1% AEP has been used as a conservative proxy for future climate change. As noted above, the 0.1% AEP shows a minor extent of localised ponding within the site boundary.

3.3 Groundwater

The future impacts of climate change on groundwater levels are complex, difficult to model and not well understood.

Due to increased rainfall expectations with climate change, it should be assumed that the groundwater table could be impacted in future and may rise during wetter periods of the year. This will need to be considered for the design of finished ground floor levels, foundations and any basement areas. x

4 Flood Risk Management Infrastructure

Defences

The site is not protected by any formal flood defences.

Residual Risk

There are no identified residual risks from flood management infrastructure.

5 Emergency Planning

Flood Warning

The proposed site is not part of any current EA Flood Alert, Flood Warning or Groundwater Flood Warning areas.

Access and Egress

Access routes to the site should consider surface water flood risk extents to ensure the route is compliant with access requirement specified in the Planning Practice Guidance ‘Flood Risk and Coastal Change’ emergency planning provisions. The only existing access point to the site is from Anderson Road along the northern boundary. This would necessitate crossing an unnamed ordinary watercourse. The requirements for the crossing should be agreed with the LLFA and ensure that any resultant increase in flood risk is mitigated.

6 Broadscale Assessment of Sustainable Drainage Systems (SuDS) Suitability

BGS Geology mapping (at 1:50000 scale) indicates that bedrock of the West Walton Formation and Ampthill Clay Formation - Mudstone underlies the site. Mudstone is generally considered impermeable; therefore, infiltration may not be a viable method of surface water discharge. Infiltration testing will be required to determine the suitability of surface water discharge to groundwater.

Surface water management should therefore prioritise attenuation and conveyance features such as swales, detention basins, ponds, and permeable paving. These systems can provide effective storage and slow runoff rates.

In accordance with the Surface Water Drainage Hierarchy, surface water discharge to a watercourse needs to be thoroughly explored before the Lead Local Flood Authority (LLFA) would accept discharge into a surface water sewer. There may be potential to discharge to the watercourses bordering the north, south and the west of the site. Discharge should be directed into a suitable watercourse, subject to capacity and consent as per the Surface Water Drainage Hierarchy. As the land is undeveloped, it is unlikely that there is existing surface water sewerage infrastructure underlying the site.

7 Opportunities for wider sustainability benefits and flood risk management

There are likely to be some opportunities for green infrastructure such as swales, filter strips and attenuation to provide wider environmental, surface water management and amenity benefits. Due to the size of the site larger, conveyance and attenuation features are not likely to be feasible.

The use of SuDS can contribute to managing surface water runoff, improving water quality, providing flood protection, enhancing biodiversity, reducing groundwater flood risk and contributing to an attractive environment. Rainwater harvesting and other mechanisms should also be considered to enable storage and re-use of water.

8 National Planning Policy Framework (NPPF) and Planning Implications

8.1 Exception Test Requirements

In accordance with the NPPF, the site is classified as a ‘Less Vulnerable’ development, which is considered compatible within Flood Zone 1.

8.2 Site Design and FRA Requirements

The developer will need to provide a site-specific Flood Risk Assessment (FRA), which demonstrates that future users of the development will not be placed in danger from flood hazards from all sources throughout its lifetime. The applicant should demonstrate that the development meets the objectives of the NPPF's policy on flood risk and how mitigation measures will be secured for the lifetime of the development.

The site borders a series of ordinary watercourses that have not been modelled. This assessment has used the Risk of Flooding from Surface Water map to assess flood risk from these watercourses which indicate the risk associated with the watercourses may be low.

Hydraulic modelling of the watercourses may be required to provide a site-specific understanding of fluvial flood risk, and it may also be required to set design requirements for any proposed crossings. Requirements should be discussed and agreed with the LLFA.

The availability of safe access and egress will need to be demonstrated using flood depth, velocity and hazard outputs for the 0.1% AEP fluvial/rainfall flood events, including the climate change allowance applicable to the catchment. Access routes should be raised at least 300 millimetres above the flood level. If raising of access routes is required, this must not impact on surface water flow routes or contribute to loss of floodplain storage.

The risk of surface water flooding must be addressed through a Surface Water Drainage Strategy (SWDS) for the site and should outline how development will manage and mitigate these risks.

9 Conclusions and Recommendations

The development is likely to be able to proceed if:

- A sequential approach is adopted, prioritising the location of development outside of areas at risk of surface water flooding, taking into account the impacts of climate change.
- Safe access routes are located outside of areas identified as at risk of surface water flooding.
- Consideration is given to water reuse, water management and SuDS at the site, and how the site can contribute to flood and water management benefits in the local area.
- Infiltration testing is undertaken to determine the suitability of infiltrating SuDS features. Where infiltration is not possible, surface water should be attenuated

and conveyed by SuDS features before being discharged into the watercourse on-site.

Figure 12: Site Topography

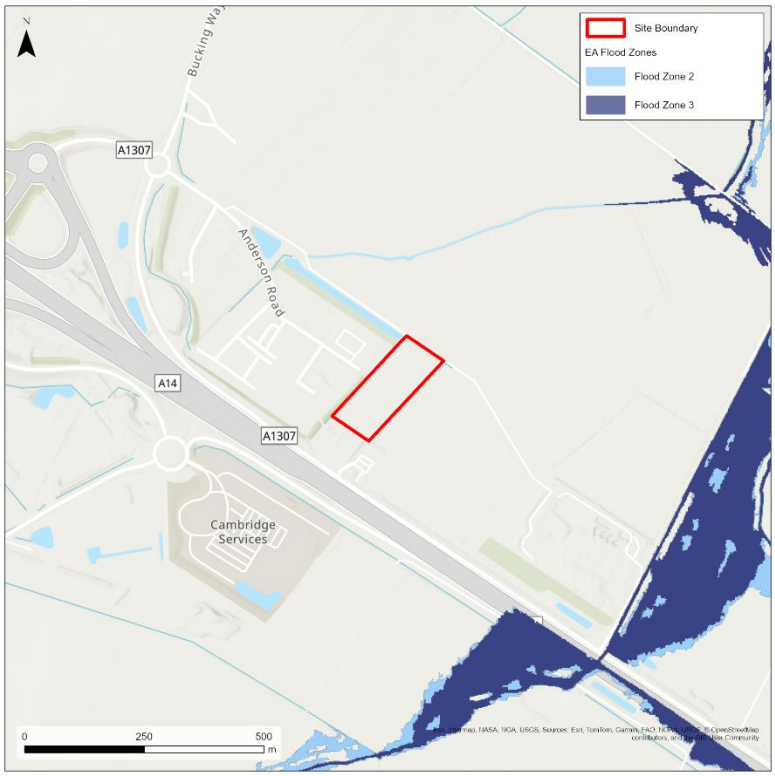

Figure 13: Flood Zones (Present Day)

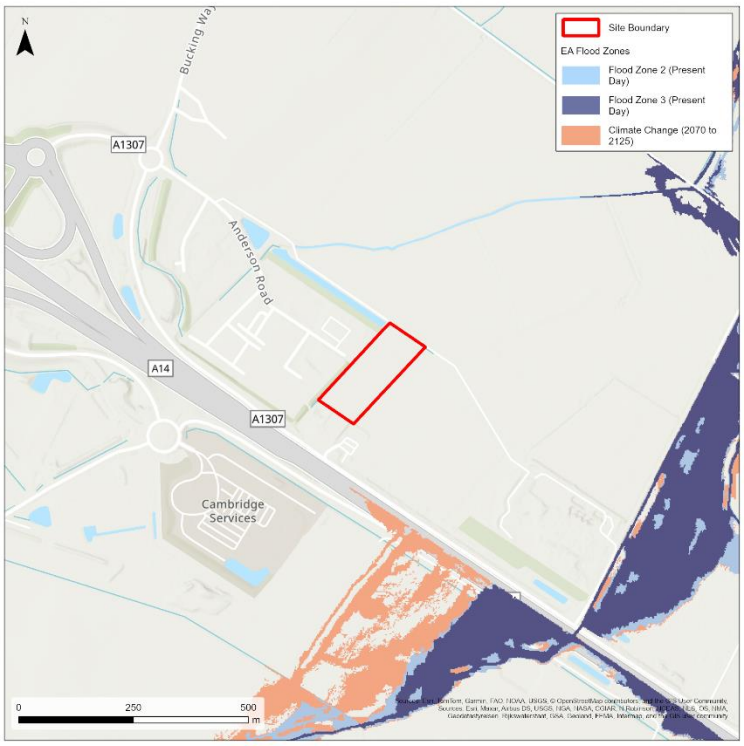

Figure 14: Flood Zones (Climate Change – 2070 to 2125)

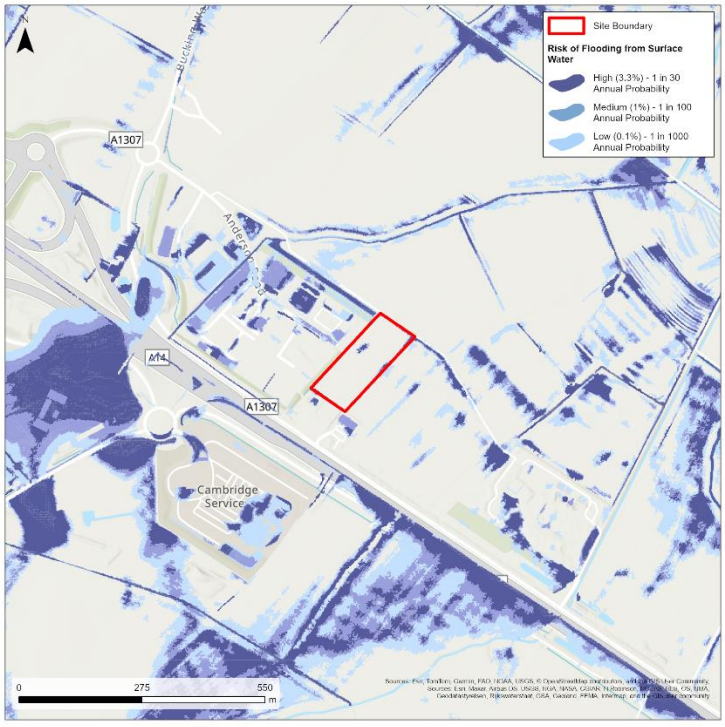

Figure 15: Risk of Flooding from Surface Water Map

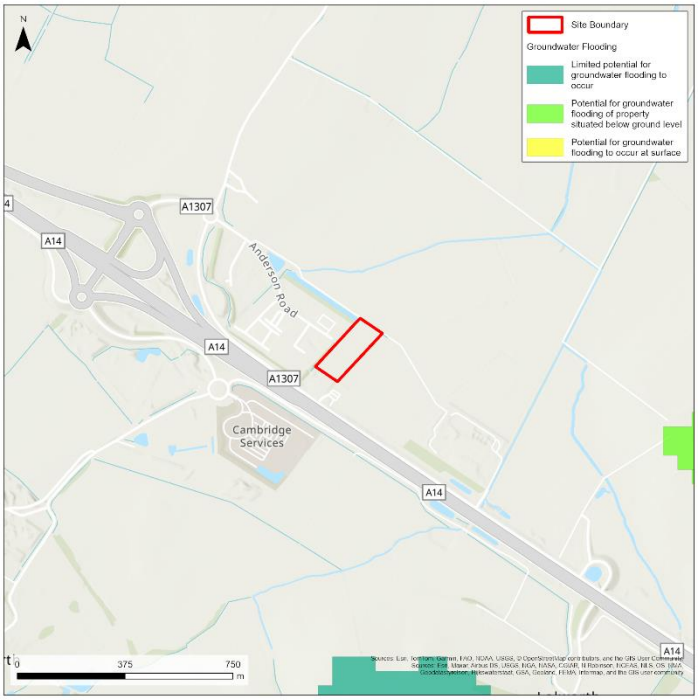

Figure 16: Susceptibility to Groundwater Flooding Map

Site Name: Land North of A1307, Bar Hill (Slate Hall Farm)

1 Site Details

Site Reference: **S/RRA/SHF**
OS Grid reference: TL 39245 63885
Area: 113.3 Hectares
Proposed site use: Employment
Vulnerability Classification: Less Vulnerable.

Existing Watercourses:

The site is located within the South Level and Cut-Off Channel Operational Catchment. The Oakington Brook, a designated Statutory Main River, bisects the site flowing in a northeast direction from a culvert underneath the A14.

There are a few unnamed ordinary watercourses within the site boundary, which are likely constructed ditches for land drainage.

An unnamed ordinary watercourse is also delineated as being culverted underneath the A14, flowing north, before discharging into Oakington Brook further east of where the Brook enters the site boundary. Another unnamed ordinary watercourse is identified as flowing southeast immediately north of the site's northern border before discharging into Oakington Brook immediately north of the site's northeastern boundary. This ordinary watercourse is likely a ditch purposed for land drainage. After confluence with the drainage ditch Oakington Brook continues flowing northeast towards Oakington.

2 Sources of Flood Risk

2.1 Fluvial

Flood Zone	Proportion of Site within Flood Zone (%)
Flood Zone 1	93%
Flood Zone 2	4%
Flood Zone 3	3%

The majority of the site is located within Flood Zone 1. Flood Zone 2 and 3 extents are associated with Oakington Brook. There are areas of the site identified to lie within Flood Zone 3b (functional floodplain) with a prominent area coming out of bank upstream of the existing access road running through the site.

The Oakington Brook has been modelled as part of the Cottentham Lode PFS Model. This model was developed in 2003 and includes no climate change allowance. The model is unlikely to be suitable to inform fluvial flood risk to the site without significant amendments due to its age.

Hydraulic modelling of the Oakington Brook and ordinary watercourses in the vicinity of the site will be required as part of a site-specific Flood Risk Assessment to inform site layout and design levels.

2.2 Surface Water

Risk of Surface Water Flooding	Proportion of Site at Risk (%)
Low (0.1% AEP)	4%
Medium (1% AEP)	1%
High (3.33% AEP)	3%

The Environment Agency (EA) Risk of Flooding from Surface Water mapping indicates that much of the site has minor sections of localised ponding. Small areas of ponding are delineated as occurring within the Oakington Brook floodplain that flows from the A14 culvert. A significant extent of surface water ponding occurs on an unnamed road in the west of the site. Flood waters associated with the drainage ditches on-site are identified to stay within bank. All of these extents appear in all Annual Exceedance Probability (AEP) events, increasing in size as the AEP decreases.

A flow path is indicated within the centre of the site in the 0.1% AEP event originating on-site and flowing northeast towards Oakington.

The majority of the minor sections of ponding are not indicated to reach up to depths of 200 millimetres, including the flow path. The larger flood extents indicated along the unnamed road is identified to have a ‘high’ (3.3%) chance to reach up to depths of 200 millimetres and flood extents within the drainage ditches are identified to have a ‘high’ chance to reach up to depths of 300 millimetres.

2.3 Groundwater

The British Geological Survey (BGS) ‘Susceptibility to Groundwater Flooding’ dataset indicates that 25% of the site has potential for groundwater flooding at surface level and 9% of the site has potential for groundwater flooding below the property line. The extents are located in the eastern half of the site and are indicated to be associated with the Statutory Main River that runs through site and its floodplain. Around 30% of the west/southwest region of the site is indicated as having limited potential for groundwater flooding to occur.

The dataset indicates susceptibility to flooding and is not indicative of a specific level of hazard or risk.

2.4 Reservoir

The site is not located in an area shown to be at risk from reservoir flooding.

2.5 Flood History

No historic flooding is recorded at the site location.

3 Climate Change Implications

3.1 Fluvial

The EA Flood Map for Planning climate change mapping (between 2070-2125) shows that 4% and 8% of the site are within Flood Zones 3 and 2 respectively in the climate change scenario. This is a minor increase on the present-day scenario extent associated with the watercourse culverted underneath the A14. The other watercourses on-site are not modelled within the fluvial flood extents, therefore, the surface water present day 0.1% AEP event can be used as proxy to delineate fluvial flood risk of the ditches. Flood extents of the ditches show that flooding remains primarily within the channel.

3.2 Surface Water

Flood extents are not shown to increase significantly from the present day 1% AEP scenario to the climate change scenario shown in the EA Risk of Flooding from Surface Water mapping (2040-2060). The lifetime of the development is expected to extend beyond 2060, so the present day 0.1% AEP has been used as a conservative proxy for future climate change. As noted above, the 0.1% AEP event shows an amplification of the projected flood extents compared to the 1% AEP present day event.

3.3 Groundwater

The future impacts of climate change on groundwater levels are complex, difficult to model and not well understood.

Due to increased rainfall expectations with climate change, it should be assumed that the groundwater table could be impacted in future and may rise during wetter periods of the year. This will need to be considered for the design of finished ground floor levels, foundations and any basement areas.

4 Flood Risk Management Infrastructure

Defences

The site is not protected by any formal flood defences.

Residual Risk

There are no identified residual risks from flood management infrastructure.

5 Emergency Planning

Flood Warning

The site is not part of any current EA Flood Alert, Flood Warning or Groundwater Flood Warning areas.

Access and Egress

Proposed access and egress routes should be located outside of the identified areas of high surface water and fluvial flood risk. Access into the site is possible via Dry Daton Road or the A1307.

Any new proposed crossings of the Oakington Brook are to be raised above the 1% AEP event with climate change scenario plus a suitable freeboard allowance. Flood levels should be informed by hydraulic modelling of the Oakington Brook with requirements agreed with the EA.

Groundwater

The future impacts of climate change on groundwater levels are complex, difficult to model and not well understood.

Due to increased rainfall expectations with climate change, it should be assumed that the groundwater table could be impacted in future and may rise during wetter periods of the year. This will need to be considered for the design of finished ground floor levels, foundations and any basement areas.

6 Broadscale Assessment of Sustainable Drainage Systems (SuDS) Suitability

BGS Geology mapping (at 1:50000 scale) indicates that the bedrock underlying the site is of the Woburn Sands Formation comprising of sandstone and the Kimmeridge Clay Formation comprising of mudstone. Mudstone is generally considered impermeable therefore infiltration SuDS may not be suitable in those areas of the

site, to the northwest. Sandstone is considered permeable however, therefore infiltration SuDS may be suitable in those areas of the site, to the southeast. Infiltration testing will be required to determine the suitability of surface water discharge to groundwater.

Surface water management should prioritise attenuation and conveyance features such as swales, detention basins, ponds, and permeable paving. These systems can provide effective storage and slow runoff rates. The site has multiple existing watercourses into which the development could discharge. Discharge should be directed to the on-site watercourses, subject to capacity and consent as per the Surface Water Drainage Hierarchy.

In accordance with the Surface Water Drainage Hierarchy, surface water discharge to a watercourse needs to be thoroughly investigated before the Lead Local Flood Authority (LLFA) would accept discharge into a surface water sewer. The site is currently undeveloped, therefore it is unlikely that there is sewerage infrastructure underlying the site.

7 Opportunities for wider sustainability benefits and flood risk management

Due to the size of the site, there are likely to be opportunities for green infrastructure such as swales, permeable paving, filter strips and attenuation to provide wider environmental, surface water management and amenity benefits. The existing watercourses on site can be maintained and, subject to consultation with the LLFA, enhanced, providing increased stormwater attenuation and conveyance, benefiting the wider area. The use of SuDS and enhancement of the existing watercourse can also contribute to improving water quality, providing flood protection, enhancing biodiversity and contributing to an attractive environment. Rainwater harvesting and other mechanisms should also be considered to enable storage and re-use of water across the site.

There should be no development within 8m of the Oakington Brook apart from permitted access. The EA recommend allowing for an 8 metre no development easement for all main rivers to enable access for maintenance activities. This area could be used as a green / blue corridor which can provide ecological, social and amenity value.

8 National Planning Policy Framework (NPPF) and Planning Implications

8.1 Exception Test Requirements

A large proportion of the site is in Flood Zone 1 and in accordance with the NPPF, ‘Less Vulnerable’ development is considered compatible within Flood Zone 1 and does not require the application of the Exception Test.

'Less Vulnerable' development is also permitted in FZ2 and FZ3a without the need for an Exception Test. The majority of the site is within Flood Zone 1 and as such, it should be possible to locate the development wholly within this area. 'Less vulnerable' development is not permitted in Flood Zone 3b.

8.2 Site Design and FRA Requirements

The developer will need to provide a site-specific Flood Risk Assessment (FRA), which demonstrates that future users of the development will not be placed in danger from flood hazards from all sources throughout its lifetime. The applicant should demonstrate that the development meets the objectives of the NPPF's policy on flood risk and how mitigation measures will be secured for the lifetime of the development.

The site layout should use the sequential approach, preferentially locating development in areas at lowest risk of flooding.

Hydraulic modelling of the Oakington Brook should be undertaken to inform site layouts and design levels. Model requirements should be agreed with the EA.

The risk of surface water flooding must be addressed through a Surface Water Drainage Strategy (SWDS) for the site and should outline how development will manage and mitigate these risks.

The availability of safe access and egress will need to be demonstrated using flood depth, velocity and hazard outputs for the 0.1% annual probability fluvial/rainfall flood events, including the climate change allowance applicable to the catchment.

9 Conclusions and Recommendations

The development is likely to be able to proceed if:

- Site layout and design levels are informed by hydraulic modelling of the Oakington Brook
- A sequential approach is adopted to preferentially develop areas with the lowest flood risk
- Access routes are located outside of areas identified as at risk of surface water or fluvial flooding. Any proposed crossings over the Oakington Brook are to be raised above the 1% AEP event with climate change scenario plus a suitable freeboard allowance.
- Consideration is given to water management, water harvesting, and SuDS at the site, and how the site can contribute to wider flood and water management benefits across the catchment.

- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation and resilience measures.

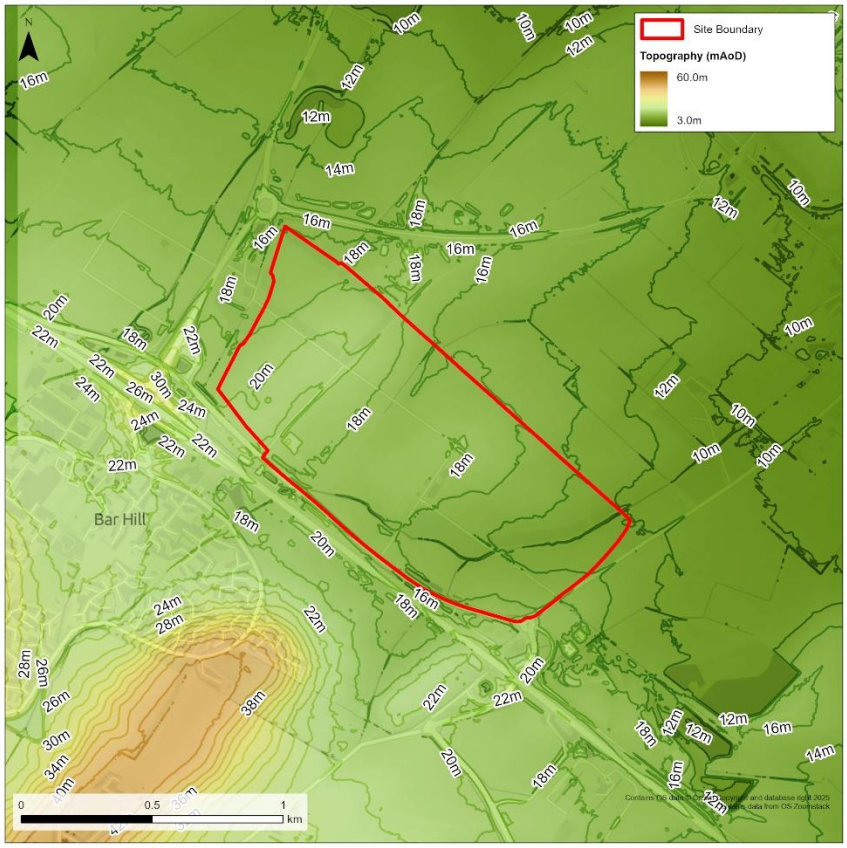

Figure 17: Site Topography

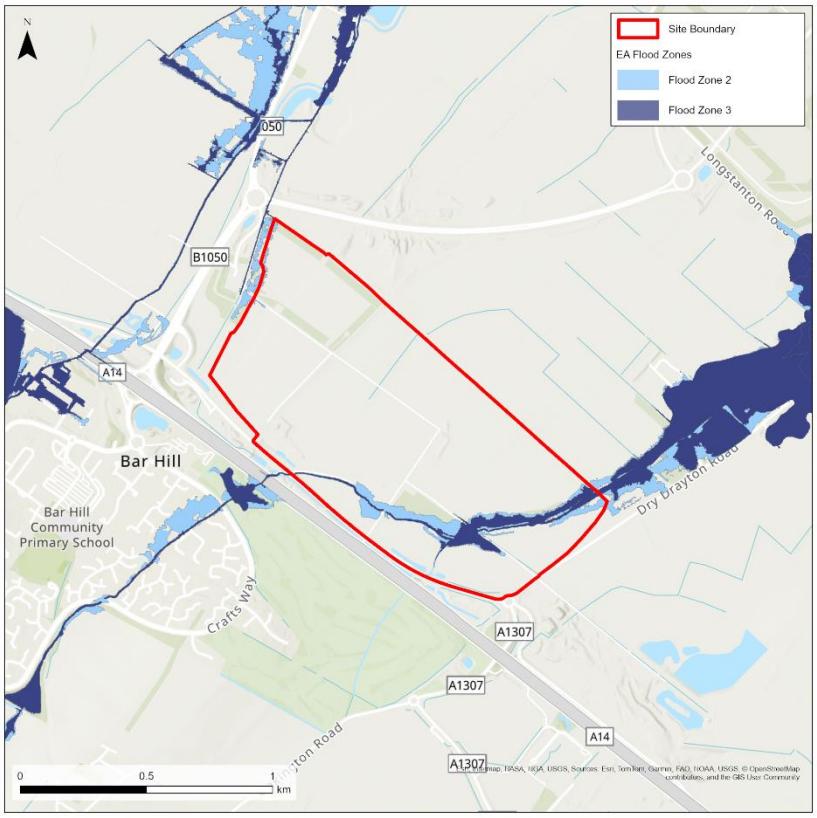

Figure 18: Flood Zones (Present Day)

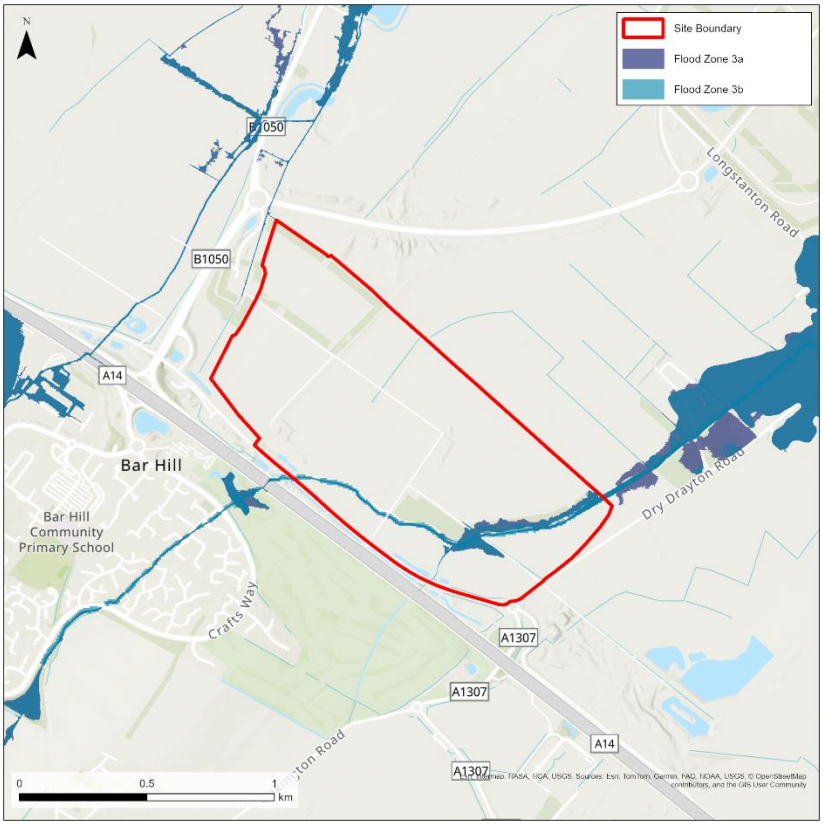

Figure 4: Functional Floodplain

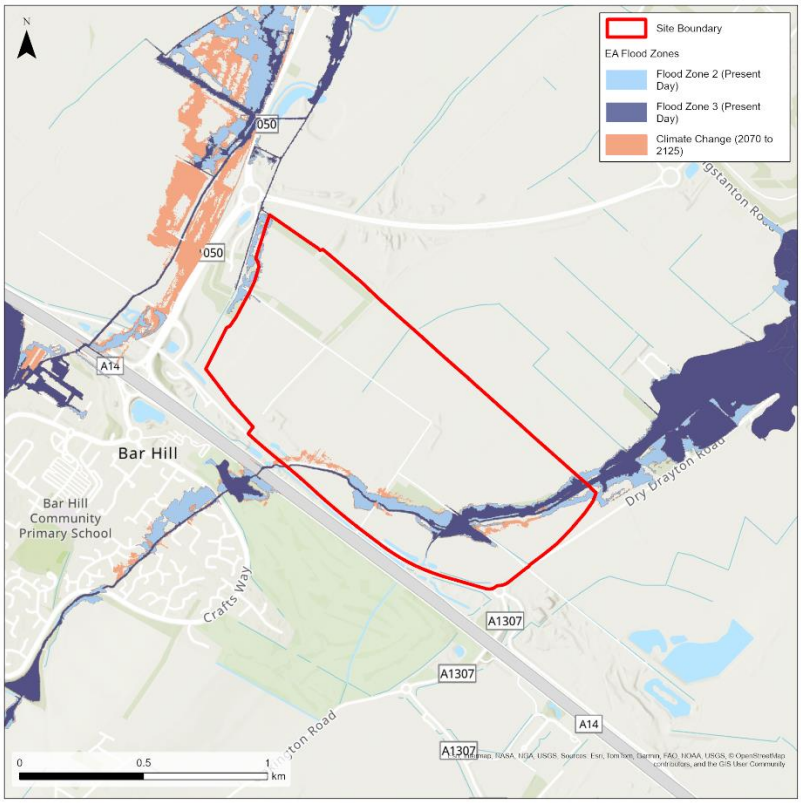

Figure 20: Flood Zones (Climate Change – 2070 to 2125)

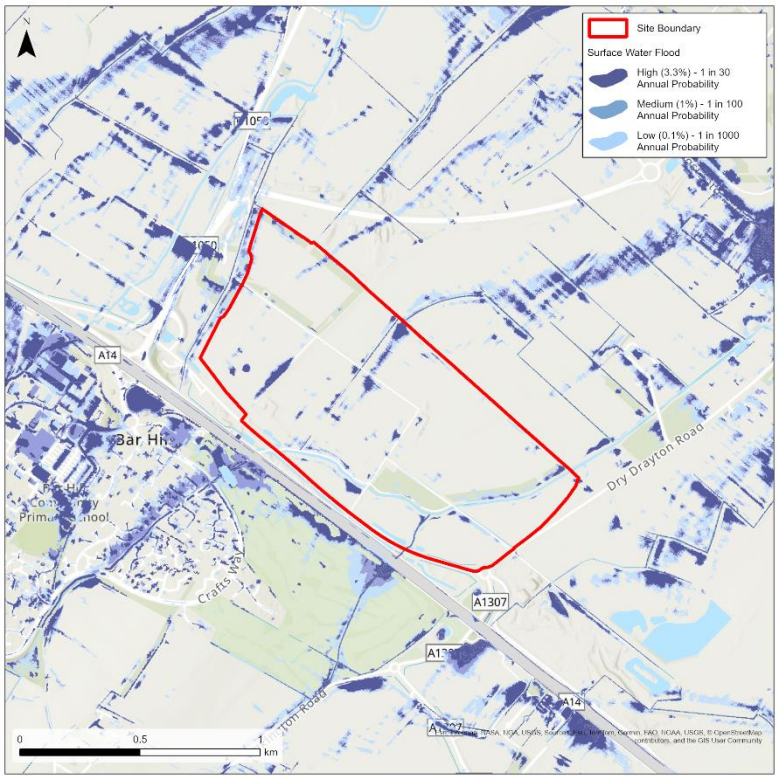

Figure 21: Risk of Flooding from Surface Water Map

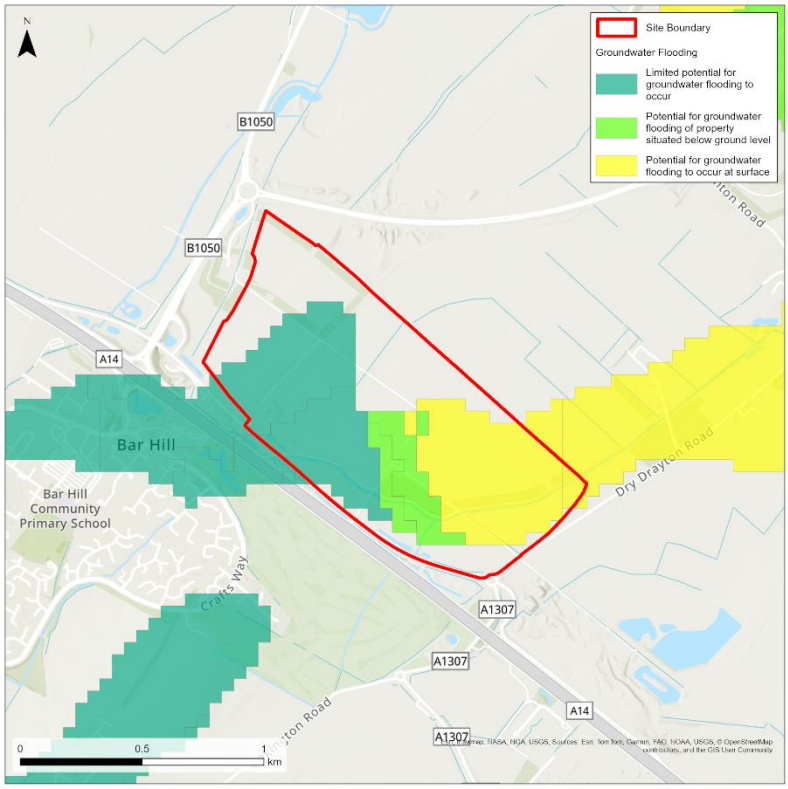

Figure 22: Susceptibility to Groundwater Flooding Map

Site Name: North East Cambridge

1 Site Details

Site Reference: S/NEC
OS Grid reference: TL 46975 61643
Area: 186.6 Hectares
Proposed site use: Mixed Use (inc. residential) and Employment (E(g), B2 and B8)
Vulnerability Classification: Residential uses – More Vulnerable; Employment uses – Less Vulnerable

Existing Watercourses:

The site is in the Lower Cam operational catchment. The First Public Drain is an ordinary watercourse that runs through the centre of the site flowing southeast. It then turns north towards Cambridge Water Recycling Centre, flowing past it before being culverted underneath the A14 before ultimately discharging into the River Cam. The River Cam is a designated Main River located to the East of the site. There are several ponds in the Cambridge Science Park and one adjacent to and owned by Cambridge Regional College.

2 Sources of Flood Risk

2.1 Fluvial

Flood Zone	Proportion of Site within Flood Zone (%)
Flood Zone 1	100%
Flood Zone 2	0%
Flood Zone 3	0%

The entire site is located within Flood Zone 1, although the eastern border of the site is identified to be within 100m of Flood Zone 2.

The model results from the Cam Urban Model (2023) show that the fluvial flood extents from the River Cam remain confined to the floodplain to the east of the railway in the most extreme 0.1% Annual Exceedance Probability (AEP) flood event, with no predicted impacts on the site.

Neither the Environment Agency (EA) Flood Zone map nor the Cam Urban Model results include the risk of flooding from the First Public Drain ordinary watercourse on site. The Risk of Flooding from Surface Water map has therefore been used as a proxy for the purposes of this site assessment. For all AEP events, the First Public Drain watercourse is shown to remain in bank.

2.2 Surface Water

Risk of Surface Water Flooding	Proportion of Site at Risk (%)
Low (0.1% AEP)	14%
Medium (1% AEP)	5%
High (3.33% AEP)	3%

The Risk of Flooding from Surface Water map indicates that the whole site has areas of localised, unconnected areas of surface water ponding apparent in Low, Medium, and High risk surface water events. The areas at risk are largely due to topographic depressions but are also shown to pond between existing buildings.

Depths are predicted to have a 'low' chance (<1%) to reach up to 200 millimetres where some of the surface water flooding occurs.

2.3 Groundwater

The British Geological Survey's (BGS) 'Susceptibility to Groundwater Flooding' dataset indicates that there is potential for groundwater flooding to occur at surface level for the majority of the site (73%). The western portion of the site is not shown to be susceptible to groundwater flooding. The dataset indicates susceptibility to flooding and is not indicative of a specific level of hazard or risk.

Much of the site has been previously developed so the natural ground conditions are likely to have been disturbed during previous construction works, which may impact the potential for groundwater flooding. Ground investigation should be undertaken at the site to establish the present ground conditions and position of the groundwater table.

2.4 Reservoir

The EA Risk of Flooding from Reservoirs Map indicates that a small proportion of the site (circa. 1%) floods from reservoirs during a 'wet day' scenario. The extent is located wholly within the First Public Drain channel in the west of the site, flooding as far as Cowley Road. The site is not indicated to be at a risk of flooding from reservoirs in the 'dry' day scenario.

2.5 Flood History

EA historical flood mapping indicates that fluvial flooding originating from the River Cam in 1947 impacted 5% of the site. The flooding originated north of the A14 from the point of confluence between the River Cam and the First Public Drain. Flooding from the River Cam inundated the First Public Drain, which led to flooding on-site. The historic flood extents on-site cover the area between Cambridge Commercial Park and the train tracks east of the site. The flood extent associated with this flood event were excluded from the EA historic flood map dataset following review in 2013.

Anglian Water historic sewer flooding records indicate that external sewer flooding was recorded in the postcode CB4 0PP 28/03/2023 and was caused by a collapsed sewer. Another external sewer flooding event occurred on 24/03/23 and within the postcode CB4 1TS; cause is not identified.

3 Climate Change Implications

3.1 Fluvial

The EA Flood Map for Planning flood risk mapping for climate change (between 2070-2125) shows no increase in fluvial flood risk at the site. The flood model for the River Cam used 5%, 1% and 0.1% AEP events (with Central +9%; Higher Central +19%, and Upper +45% uplifts in flow to account for climate change). Under the upper climate change scenario, fluvial flood extents from the River Cam remain contained within the floodplain east of the railway and north of the A14. There are slight encroachments of the climate change flood extents on the Flood Zone 2 extents to the east and south of the site, around the Cambridge North Railway Station.

The First Public Drain is an unmodelled watercourse and the assessment of flood risk associated with it has been undertaken based on the Risk of Flooding from Surface Water map, using the 0.1% AEP event as a proxy. This map shows the First Public Drain remains in channel for this event.

3.2 Surface Water

The flood extents and flood depths do not increase significantly from the present day <1% AEP scenario to the climate change scenario shown in the EA Risk of Flooding from Surface Water mapping (2040-2060). The lifetime of the development is expected to extend beyond 2060, so the present day 0.1% AEP has been used as a conservative proxy for future climate change. As noted above, the 0.1% AEP event shows an amplification of the projected flood extents compared to the 1% AEP event.

3.3 Groundwater

The future impacts of climate change on groundwater levels are complex, difficult to model and not well understood.

Due to increased rainfall expectations with climate change, it should be assumed that the groundwater table could be impacted in future and may rise during wetter periods of the year and/or in conjunction with rising water levels in the adjacent watercourses. This will need to be considered for the design of finished ground floor levels and foundations.

4 Flood Risk Management Infrastructure

Defences

The site is not protected by any formal flood defences.

Residual Risk

There is no highlighted residual risk to the site from flood risk management infrastructure.

5 Emergency Planning

Flood Warning

The Proposed site is not part of any current EA Flood Alert, Flood Warning or Groundwater Flood Warning areas.

Access and Egress

There are several access points into and out of the site including Cowley Road leading to Milton Road and the A14. Local roads associated with the existing Water Recycling Centre are shown to be at risk of surface water flooding. Redevelopment of the site offers opportunity to consider flood risk in the layout of internal access routes.

6 Broadscale Assessment of Sustainable Drainage Systems (SuDS) Suitability

Much of the site has been previously developed so the natural ground conditions will no longer be present, making SuDS suitability difficult to assess. Ground investigations should be undertaken at the site to establish the underlying soil conditions, level of contamination and infiltration potential.

An existing watercourse, the First Public Drain, flows through the site, into which the development could discharge. Where there are attenuation features such as wet ponds, surface water runoff may be acceptable to discharge into these features. In accordance with the Surface Water Disposal Hierarchy, discharge into a surface water body, such as the First Public Drain, needs to be thoroughly explored before the Lead Local Flood Authority (LLFA) would accept an alternative discharge method such as into a surface water sewer, or another piped surface water drainage system.

If discharge to a surface water sewer is required for drainage strategies, the use of existing drainage infrastructure should be prioritised over construction of new sewerage infrastructure. Most of the site is brownfield, therefore drainage systems and connections may already be in place.

7 Opportunities for wider sustainability benefits and flood risk management

Redevelopment of the site provides an opportunity to integrate water harvesting and water re-use technologies into the new buildings and manage and mitigate surface water flood risk on site. This will contribute to overall sustainability and flood risk benefits in the Greater Cambridge area.

8 National Planning Policy Framework (NPPF) and Planning Implications

8.1 Exception Test Requirements

In accordance with the NPPF, 'More Vulnerable' and 'Less Vulnerable' development is considered compatible within Flood Zone 1 and does not require the application of the Exception Test.

The sequential approach should be adopted when considering site layout to preferentially locate 'More Vulnerable' uses in areas at lowest risk of flooding. Site-specific hydraulic modelling of the ordinary watercourses through the site should be undertaken to define the fluvial flood risk associated with these waterbodies. Any modelling requirements are to be confirmed with the LLFA.

8.2 Site Design and FRA Requirements

The developer will need to provide a site-specific Flood Risk Assessment (FRA) which demonstrates that future users of the development will not be placed in danger from flood hazards from all sources throughout its lifetime. The applicant should demonstrate that the development meets the objectives of the NPPF's policy on flood risk and how mitigation measures will be secured for the lifetime of the development.

The sequential approach should be adopted when considering site layout to preferentially locate 'More Vulnerable' uses in areas at lowest risk of flooding. Site-specific hydraulic modelling of the ordinary watercourses through the site should be undertaken to define the fluvial flood risk associated with these waterbodies. Any modelling requirements are to be confirmed with the LLFA.

The site-specific FRA should address how surface water flood risk will be managed via the Surface Water Drainage Strategy for the site. Hydraulic modelling of the watercourses on site should be undertaken to inform site layout and design levels. Modelling requirements should be agreed with the LLFA. The availability of safe access and egress will need to be demonstrated using flood depth, velocity and hazard outputs for the 0.1% AEP fluvial/rainfall flood events, including the climate change allowance applicable to the catchment.

9 Conclusions and Recommendations

The development is likely to be able to proceed if:

- There is a known contaminated land issue with the site which requires further investigation.
- Access routes are located outside of areas identified as at risk of surface water flooding.
- A Sequential Approach is adopted, prioritising the location of more vulnerable residential development outside areas of fluvial and surface water flood risk.
- Consideration is given to the water management and SuDS at the site and how the site can contribute to wider flood and water management benefits across the catchment.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation measures.

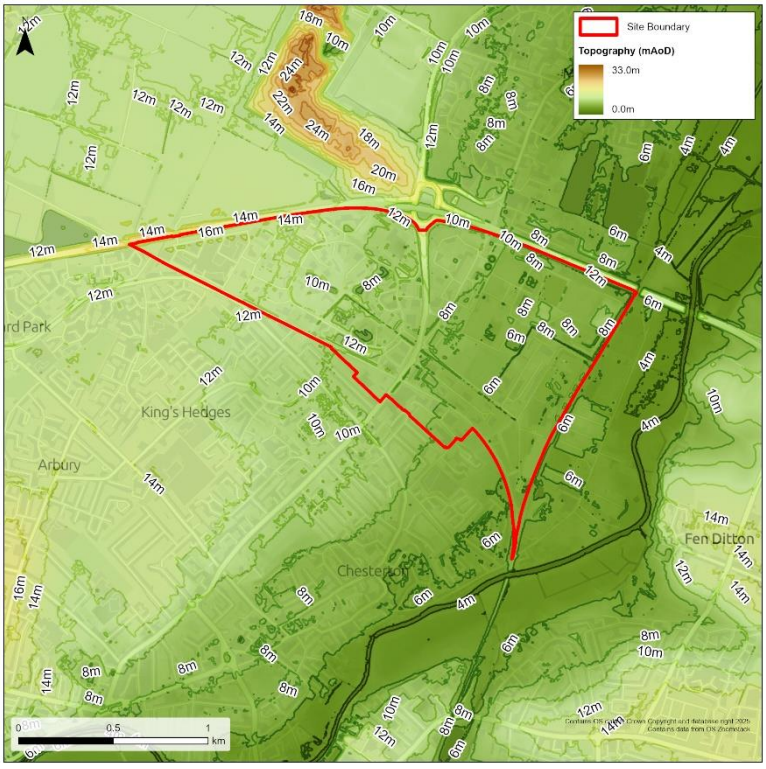

Figure 23: Site Topography

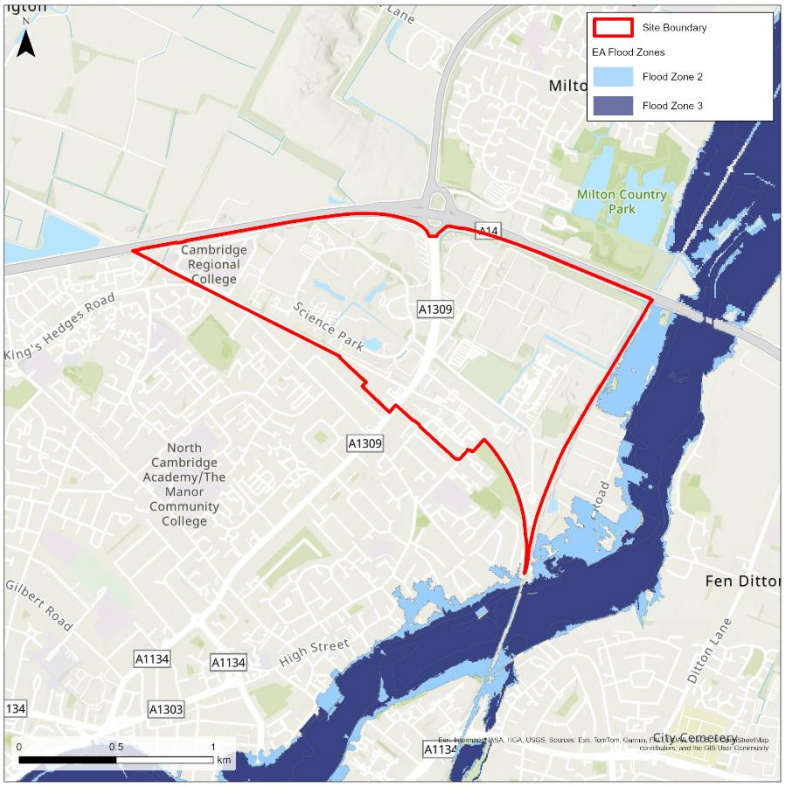

Figure 24: Flood Zones (Present Day)

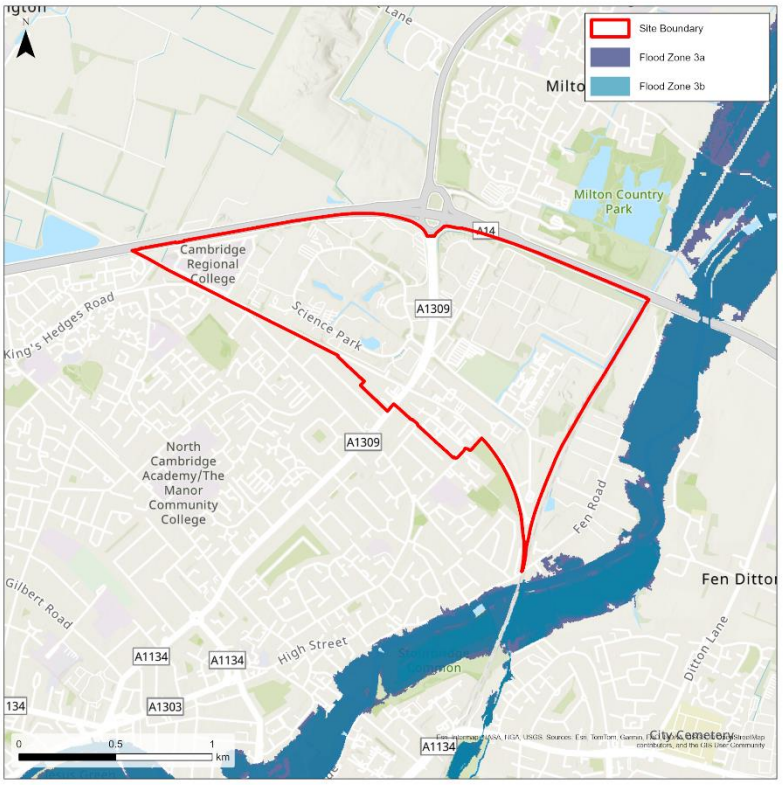

Figure 25: Functional Floodplain

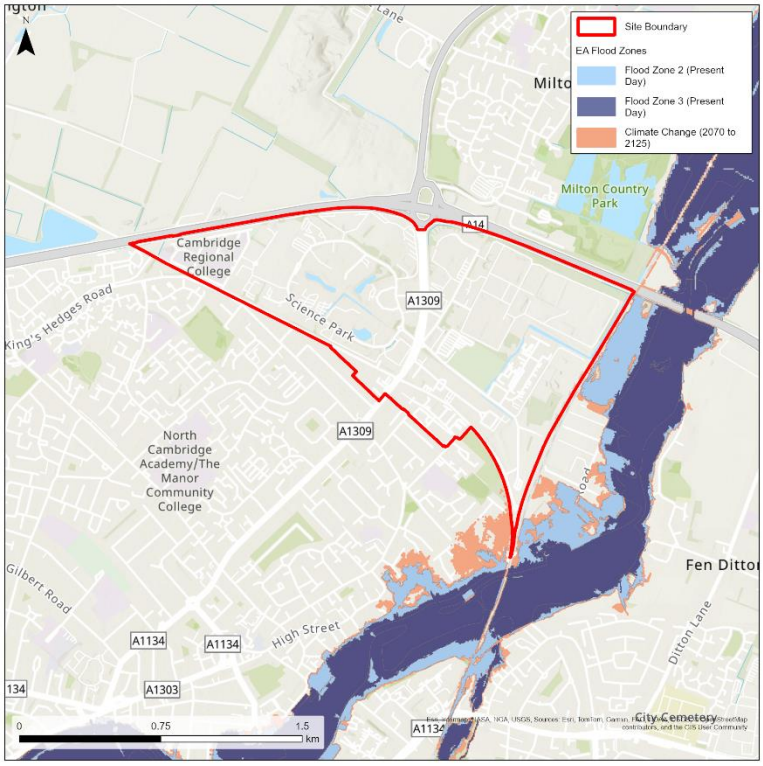

Figure 26: Flood Zones (Climate Change – 2070 to 2125)

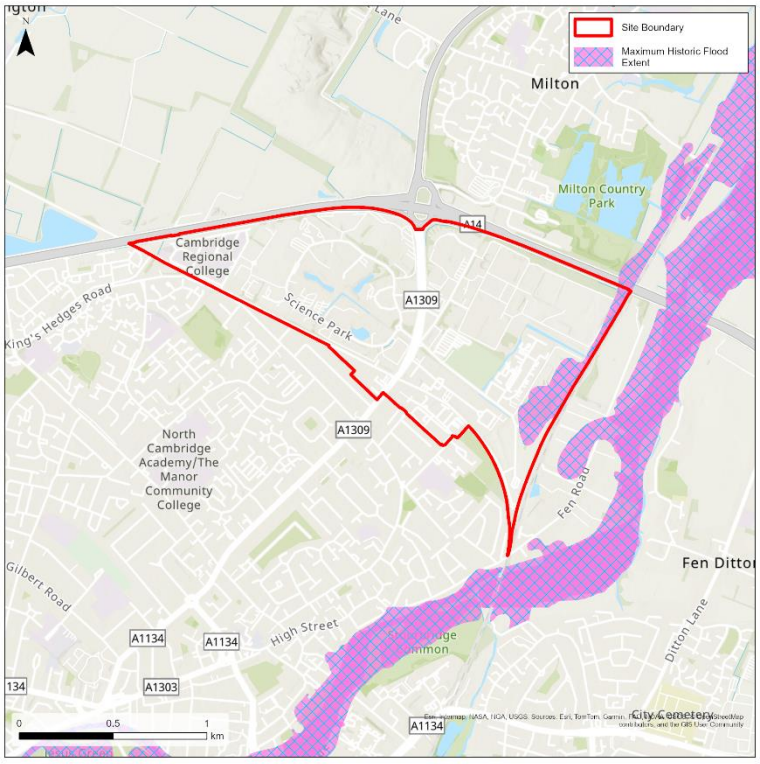

Figure 27: Historic Flood Extent

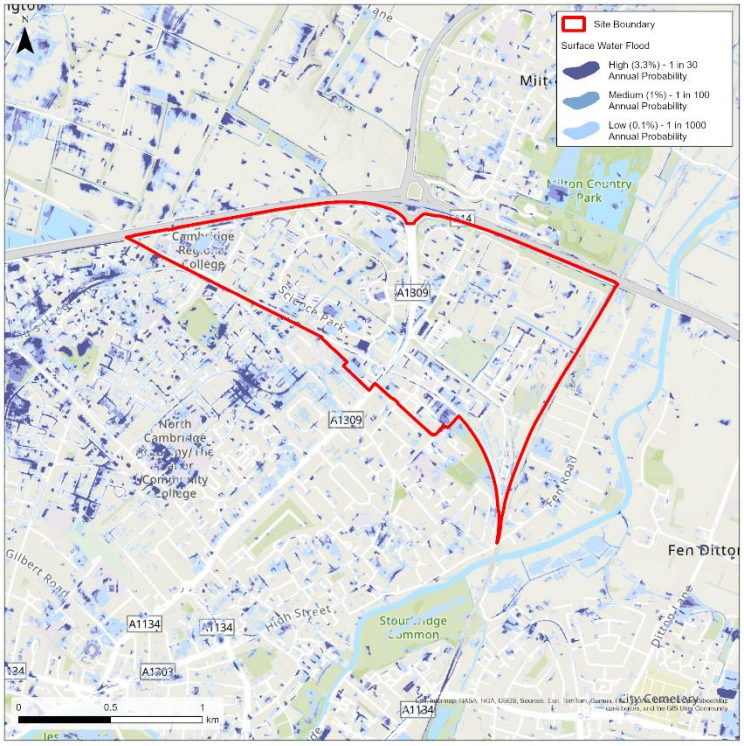

Figure 28: Risk of Flooding from Surface Water Map

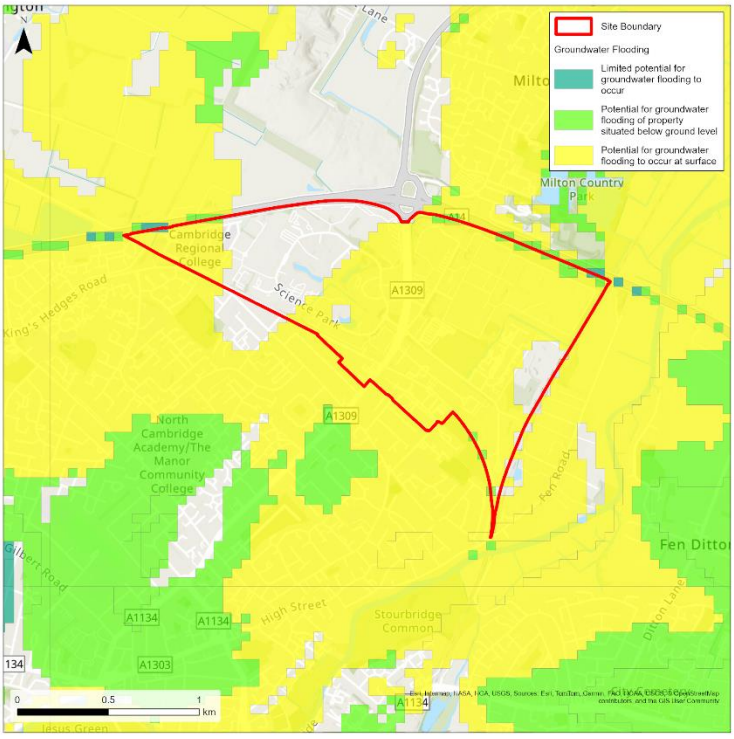

Figure 29: Susceptibility to Groundwater Flooding Map

Figure 30: Reservoir Flood Extent

Site Name: Old Press/Mill Lane

1 Site Details

Site Reference S/C/OPM
OS Grid reference: TL 44742 58067
Area: 1.47 Hectares
Proposed site use: Mixed Use (inc. Residential and Employment Use E(g))
Vulnerability Classification: More Vulnerable (Residential) and Less Vulnerable (Employment Use E(g))

Existing Watercourses:

The proposed development site lies within the 'Cam Lower' Operational Catchment. The River Cam, an EA Statutory Main River, borders the site along its western edge. Within the site boundary is a weir on the River Cam. Mapping also indicates a surface water feature in the east of the site along Trumpington Street. This feature is shown to be a small open channel alongside the road, which likely drains to Hobsons Conduit 450 metres to the south.

2 Sources of Flood Risk

2.1 Fluvial

Flood Zone	Proportion of Site within Flood Zone (%)
Flood Zone 1	54%
Flood Zone 2	36%
Flood Zone 3	10%

Approximately half the site, to the east, is located within Flood Zone 1. Flood Zone 2 is delineated to cover the buildings north and south of Mill Lane in the west of the site and much of Granta Place. Flood Zone 3 is identified in the west of the site, in which lies the River Cam weir, the buildings west of Laundress Lane and the junction between Laundress Lane, Mill Lane and Granta Place.

The buildings west of Laundress Lane are identified to be within Flood Zone 3b, the functional floodplain.

Hydraulic modelling was completed for the River Cam in 2023 using Flood Modeller and TUFLOW. The model was simulated for the 5%, 1% and 0.1% Annual Exceedance Probability (AEP) events extents, which are indicated to be marginally smaller than the corresponding Flood Zone extents.

2.2 Surface Water

Risk of Surface Water Flooding	Proportion of Site at Risk (%)
Low (0.1% AEP)	10%
Medium (1% AEP)	0%
High (3.33% AEP)	1%

The Risk of Flooding from Surface Water map indicates that the majority of the site is not identified to be at risk of surface water flooding.

There are two isolated areas of ponding water in the 0.1% AEP event along Laundress Lane in the north-west of the site and between Mill Lane and Granta Place, towards the south-western corner of the site.

Depths are identified to have a ‘low’ (0.1-1%) chance to reach up to 200 millimetres at Laundress Lane.

2.3 Groundwater

British Geological Survey (BGS) ‘Susceptibility to Groundwater Flooding’ map indicates that 37% of the site, in the western section, has the potential for groundwater flooding to occur at surface level. Mapping also indicates that 63% of the site, in the eastern section, has the potential for groundwater flooding to occur below surface level. This dataset indicates susceptibility to flooding and is not indicative of a specific level of hazard or risk.

BGS Geology mapping indicates that the site’s below-ground geology consists of mudstone bedrock, which is generally considered impermeable. Mudstone can act like an aquitard by impeding drainage, potentially increasing groundwater flood risk in periods of prolonged precipitation.

2.4 Reservoir

The site is indicated to be at risk of flooding in event of a reservoir breach. The flood extents for both the ‘Dry Day’ and ‘Wet Day’ scenario are very similar with the western part of the site potentially impacted. The source of the potential flood risk is from Dernford Reservoir.

The Environment Agency's (EA) SFRA guidance states that, where a proposed development site is at flood risk from a reservoir, an assessment into whether the reservoir design or maintenance schedule needs improving should be carried out. Expert advice may be required.

2.5 Flood History

EA historical flood mapping indicates that the site has flooded in the past. The weir, Scudamore's Boatyard Punting Station and the riverside walkway are all within the historic flood extent. The flood extent does not extend to or past Granta Place. It is indicated that this historic flood event happened in October 2001, when channel capacity was exceeded.

3 Climate Change Implications

3.1 Fluvial

The EA Flood Map for Planning climate change mapping (2070-2125) shows a slight increase in flood extent when compared to the present-day extents. The majority of the eastern portion of the site is shown to remain within Flood Zone 1 in the future.

The flood model for the River Cam included climate change allowances of Central +9%; Higher Central +19%, and Upper +45% uplifts in flow. The design fluvial flood event for 'more vulnerable' development is the 1% AEP event with 'Central' climate change allowance (+9%). Modelled results for this event show flooding is confined largely to the intersection of Laundress Lane and Mill Lane where the flood hazard is shown to range from 'low' to 'danger for most'.

3.2 Surface Water

The flood extents and flood depths do not increase significantly from the present-day scenario in the climate change scenario shown in the EA Risk of Flooding from Surface Water mapping (2040-2060). The lifetime of the development is expected to extend beyond 2060, so the present day 0.1% AEP event has been used as a conservative proxy to assess the impacts of climate change on the 1% AEP event. As noted above, the 1 in 0.1% AEP event shows an increase in surface water flood extents, but extents are still limited to isolated areas of surface water ponding.

3.3 Groundwater

The future impacts of climate change on groundwater levels are complex, difficult to model and not well understood.

Due to increased rainfall expectations with climate change, it should be assumed that the groundwater table could be impacted in future and may rise during wetter periods of the year. This will need to be considered for the design of finished ground floor levels, foundations and any basement areas.

4 Flood Risk Management Infrastructure

Defences

The site is indicated by the EA AIMS Spatial Flood Defences dataset to benefit from flood protection provided by natural high ground along both banks of the River Cam. The defences are maintained by the EA, and they extend the full length of the river adjacent to and near the site.

Residual Risk

Residual risks are associated with the River Cam weir infrastructure. The site is situated above the level of the weir crest meaning flooding due to structural failure is unlikely. Blockage of the weir however could cause upstream water levels to rise leading to localised flooding.

5 Emergency Planning

Flood Warning

The site north of Mill Lane and the western section of the site are included within the Flood Warning and Flood Alert areas. The site is not part of any EA Groundwater Flood Warning areas.

It is recommended that the site be registered to receive flood warnings from the EA. Given that the proposed development is intended for employment use, it may also be beneficial to prepare a site-specific flood plan. This would provide clear guidance for personnel on-site in the event of a flood, improving safety.

Access and Egress

The site is surrounded on all sides by residential streets. Proposed access routes into the site should be located outside of the identified areas of fluvial flood risk and surface water. Proposed access is likely to be suitable along the eastern boundary of the site, along Trumpington Street, furthest away from the River Cam.

6 Broadscale Assessment of Sustainable Drainage Systems (SuDS) Suitability

The site is developed so the natural ground conditions will no longer be present and existing drainage infrastructure are likely to be present beneath the site, making SuDS suitability difficult to assess. Ground investigations should be undertaken at the site to establish the underlying soil conditions and infiltration potential.

The British Geological Survey's (BGS's) Geology mapping (at 1:50000 scale) indicates that bedrock of the Gault Mudstone Formation and superficial River Terrace 1 deposits of sand and gravel underlay the site. Mudstone is generally considered impermeable, and sand and gravel are generally considered permeable. The high groundwater flood risk suggests that groundwater is stored in the superficial geology between the impermeable mudstone and the surface. Therefore, the site is may not to be able to discharge via infiltration. Infiltration testing will be required to determine the suitability of surface water discharge to groundwater.

Surface water management should therefore prioritise attenuation and conveyance features such as geocellular crates, rain gardens, and permeable paving. These systems can provide effective storage and slow runoff rates.

In accordance with the Surface Water Drainage Hierarchy, surface water discharge to a watercourse, such as the River Cam, needs to be thoroughly explored before the Lead Local Flood Authority (LLFA) would accept discharge into a surface water sewer. Discharge should be directed to the River Cam, subject to capacity and consent as per the Surface Water Drainage Hierarchy. Otherwise, discharge to a surface water sewer may be required as part of the drainage strategy. As all of the site is currently developed, drainage systems and connections are likely to already be in place. Use of existing drainage infrastructure should be prioritised over construction of new sewerage infrastructure.

7 Opportunities for wider sustainability benefits and flood risk management

Redevelopment of the site provides an opportunity to integrate water harvesting and water re-use technologies into the new buildings and manage and mitigate surface water flood risk on site. This will contribute to overall sustainability and flood risk benefits in the Greater Cambridge area.

8 National Planning Policy Framework (NPPF) and Planning Implications

8.1 Exception Test Requirements

The majority of the site is located in Flood Zone 1 and in accordance with the NPPF, ‘More Vulnerable’ and ‘Less Vulnerable’ development is permitted within Flood Zone 1 and does not require the application of the Exception Test.

‘More Vulnerable’ and ‘Less Vulnerable’ development are not permitted within Flood Zone 3b.

8.2 Site Design and FRA Requirements

The developer will need to provide a site-specific FRA which demonstrates that future users of the development are safe from flood hazards from all sources throughout its lifetime. The applicant should demonstrate that the development meets the objectives of the NPPF’s policy on flood risk and how mitigation measures will be secured for the lifetime of the development.

Consultation with the Local Authority, LLFA and the EA should be undertaken at an early stage. Particular discussion should be held on the topic of reservoir flooding and whether the design or maintenance schedule needs improving should be carried out.

A sequential approach should be adopted preferentially developing areas at little to no risk of flooding first. 'More Vulnerable' is permitted in Flood Zone 1 and 2. 'Less Vulnerable' development is permitted within areas of Flood Zone 1, 2 and 3a.

Design of the development should also be informed by the flood risk extents associated with the River Cam flood model. The sequential approach should be used, preferentially developing areas at a lower risk of fluvial and surface water flooding first.

Development should utilise flood resilience and resistant measures, where necessary, such as raised floor levels, elevated refuge spaces, and flood doors to mitigate fluvial flood risks posed by the River Cam.

The availability of safe access and egress will also need to be demonstrated for the 0.1% AEP rainfall and fluvial events, including the climate change allowance applicable to the catchment.

The site-specific FRA should address how surface water flood risk will be managed via a Surface Water Drainage Strategy for the site.

The site-specific FRA should further investigate risk of groundwater flooding (e.g. through groundwater level monitoring) to inform the need for mitigation and resilience measures. If any basement areas are proposed, groundwater flood mitigation and resilience measures should be identified and safe access and egress routes to basement areas should be determined.

9 Conclusions and Recommendations

The development is likely to be able to proceed if:

- A sequential approach is adopted, prioritising the location of more vulnerable development outside of Flood Zones 2 and 3 and areas impacted by surface water flooding, as much as practicable.
- Flood mitigation measures are implemented that ensure future users of the development are safe from flooding from all sources throughout its lifetime. It can be demonstrated through a site-specific FRA that that displacement of water will not occur and subsequently, increase the risk of flooding elsewhere.
- Flood resilience / resistance methods are incorporated within parts of the proposed development located within a flood risk area.
- Habitable floor levels are set above the maximum fluvial flood level (for the 1% AEP event with climate change scenario) with a suitable freeboard.
- Safe access routes are located outside areas identified as at risk of fluvial and surface water flooding, and reservoir breach.
- There are options available for safe access and egress routes generally heading in an easterly direction, away from the River Cam. A Flood Warning and

Evacuation Plan should be prepared for the site covering both risk of flooding from fluvial and reservoir breach.

- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation and resilience measures.
- Measures are implemented on site to manage and reduce surface water and fluvial flood risk e.g. water storage areas integrated into landscaping, use of SuDS.

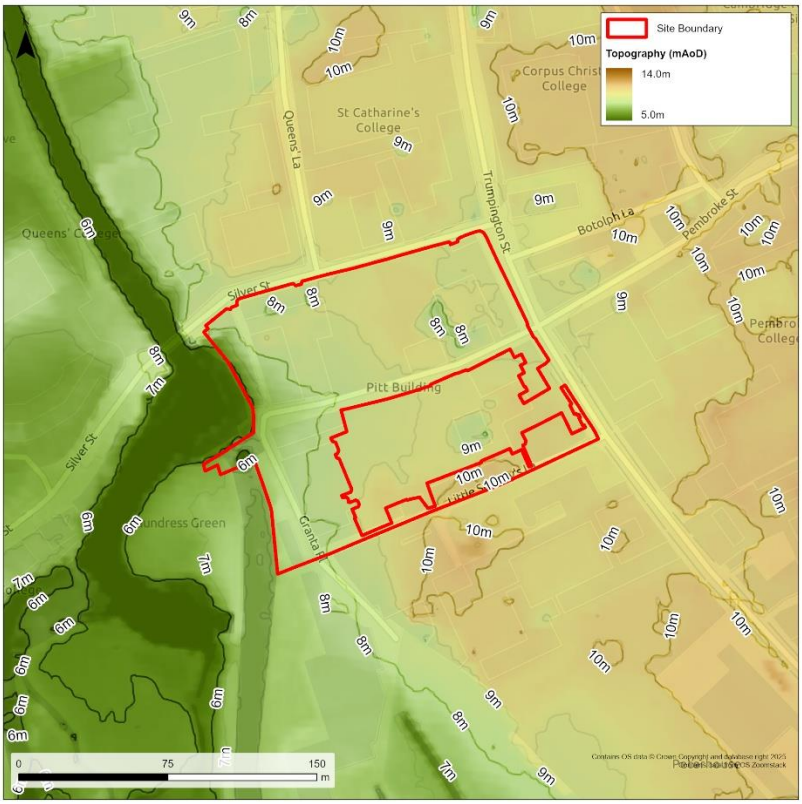

Figure 31: Site Topography

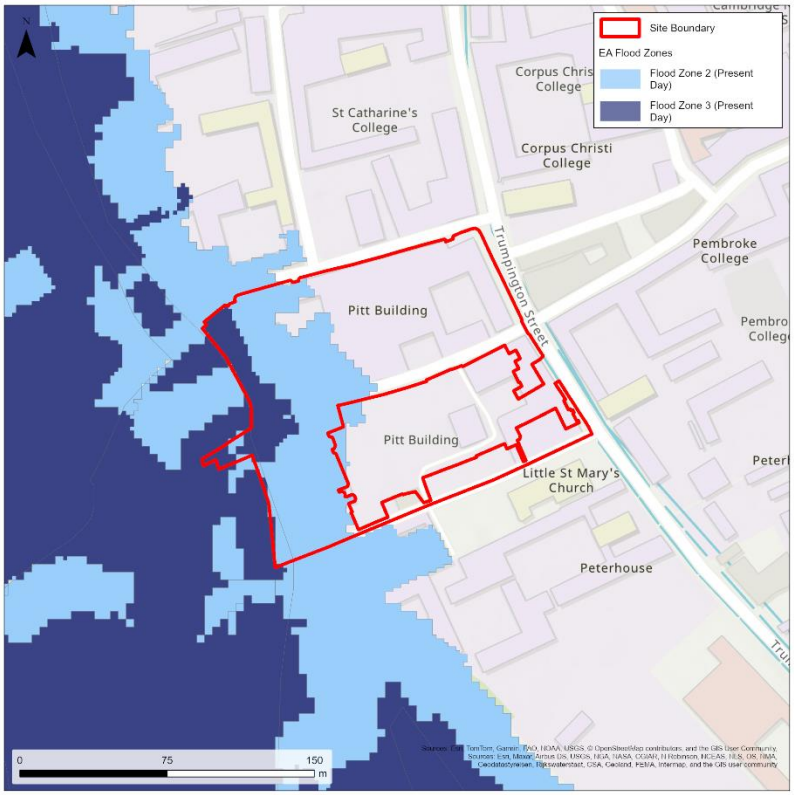

Figure 32: Flood Zones (Present Day)

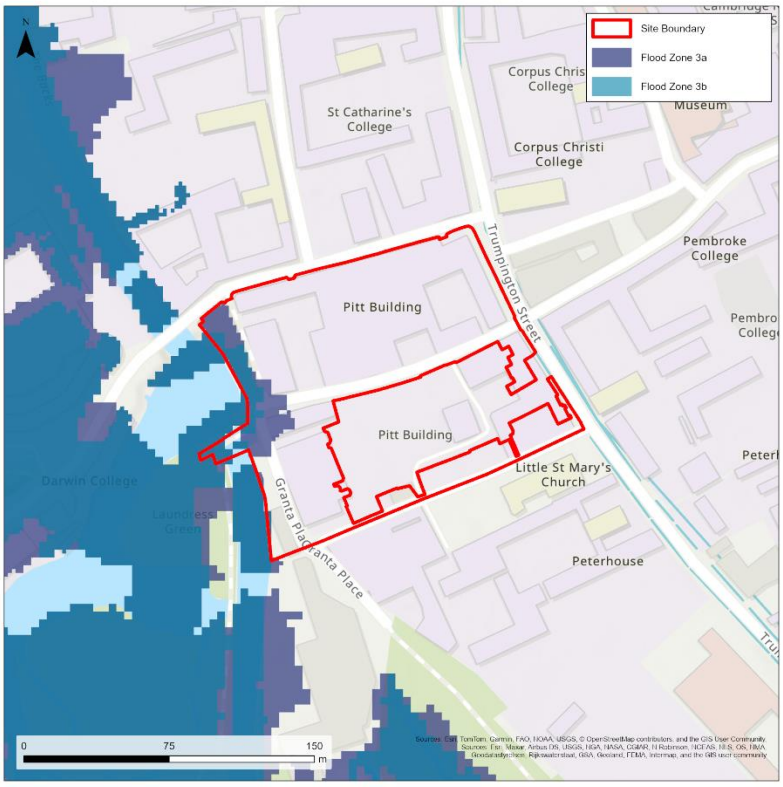

Figure 33: Functional Floodplain

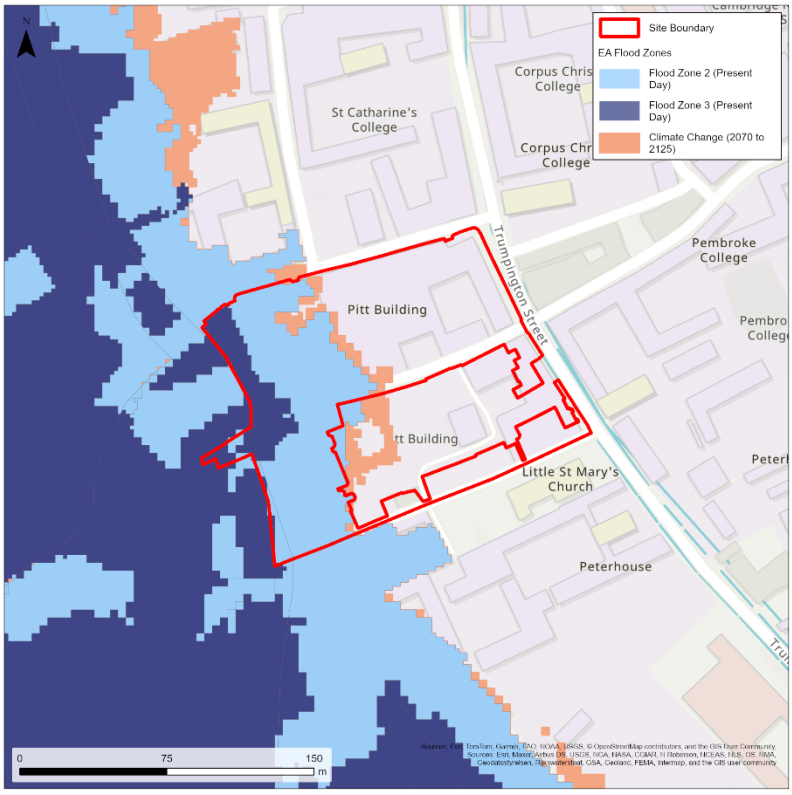

Figure 34: Flood Zones (Climate Change – 2070 to 2125)

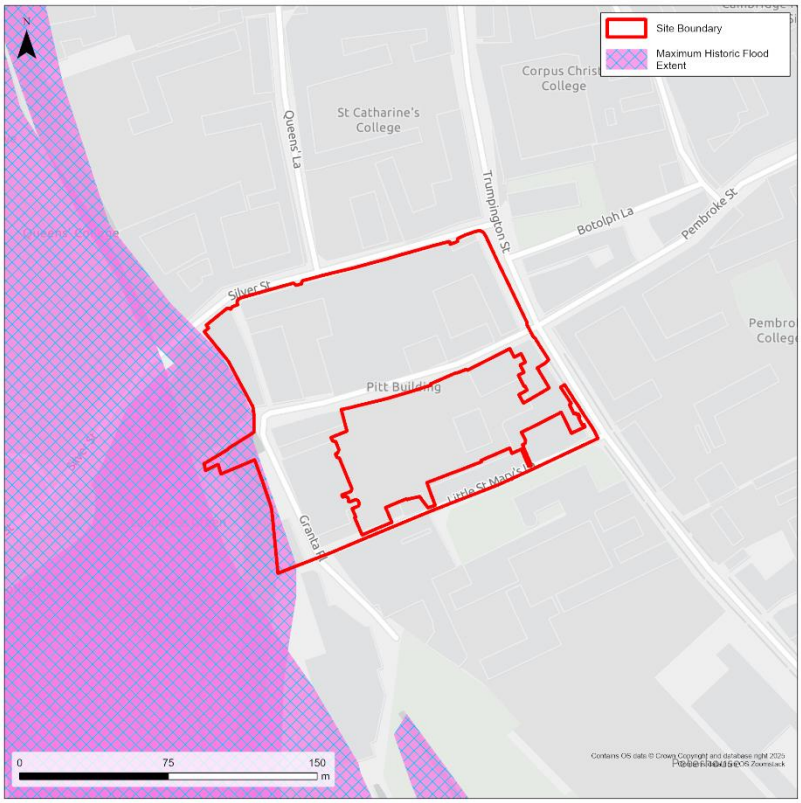

Figure *35*: Historic Flood Extent

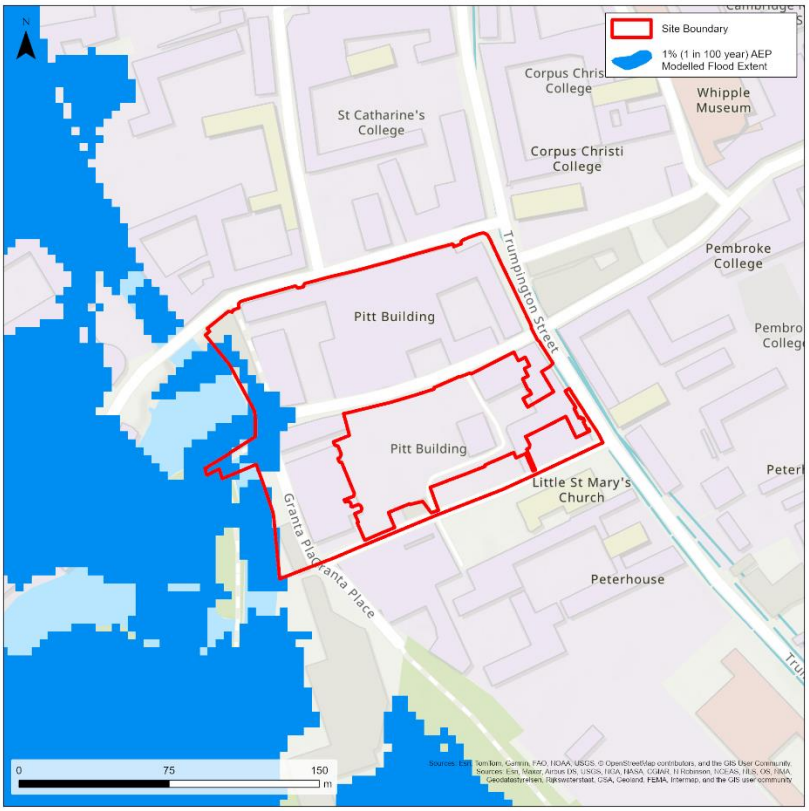

Figure *36*: Modelled Fluvial Flood Extent (1% AEP)

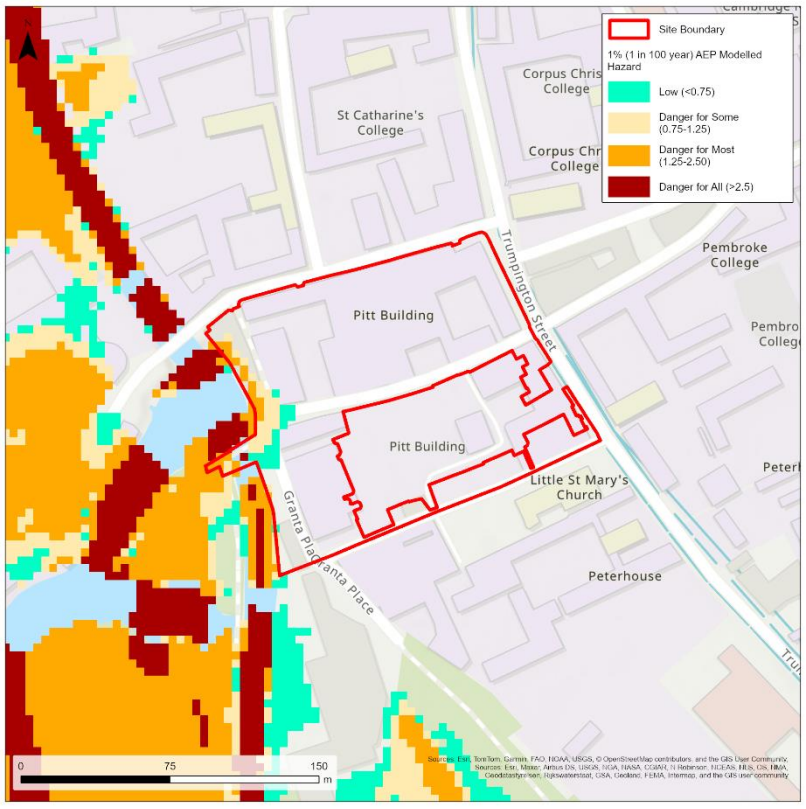

Figure *37*: Modelled Fluvial Flood Hazard (1% AEP)

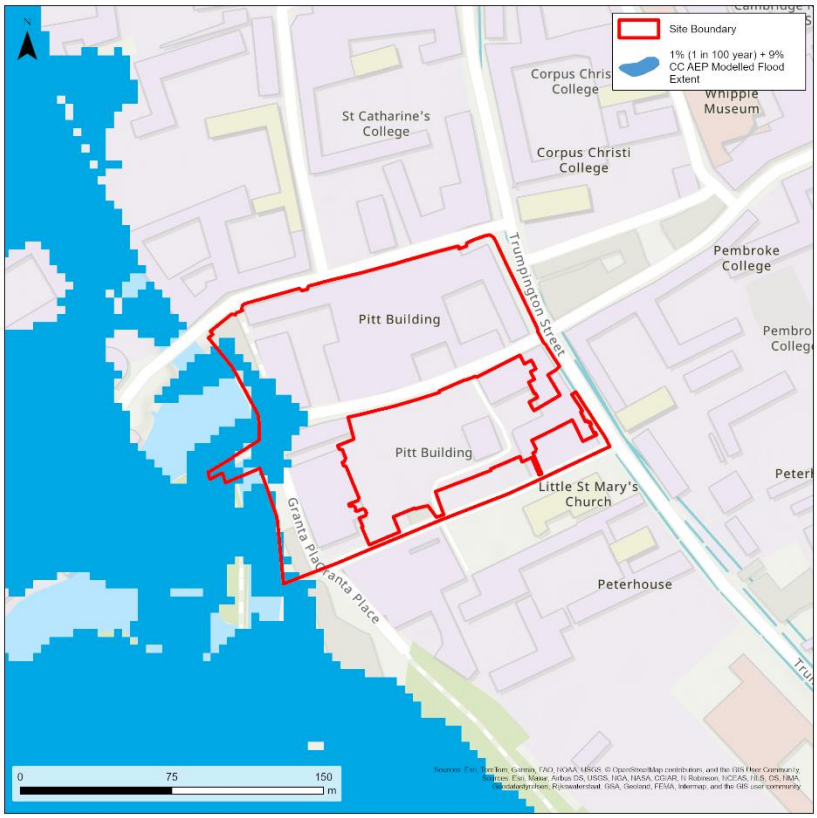

Figure *38*: Modelled Fluvial Flood Extent (1% AEP with Climate Change)

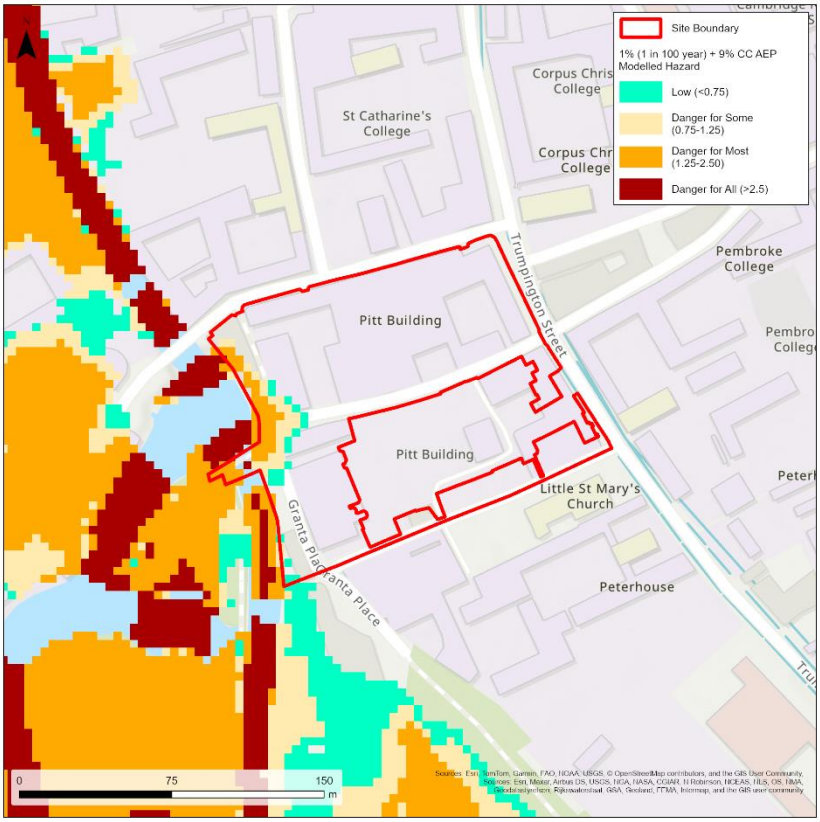

Figure *39*: Modelled Fluvial Flood Hazard (1% AEP with Climate Change)

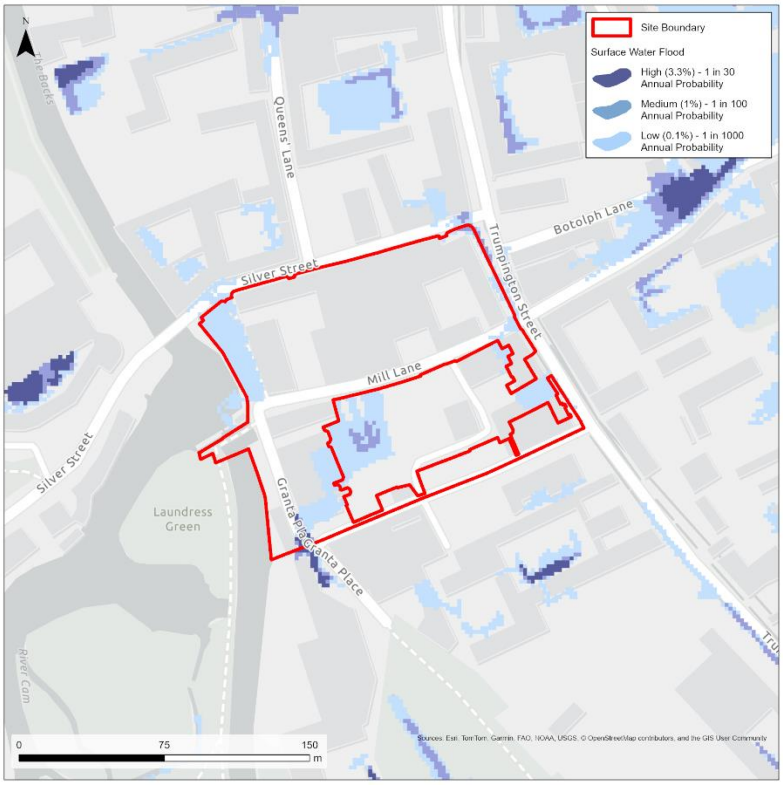

Figure *40*: Risk of Flooding from Surface Water Map

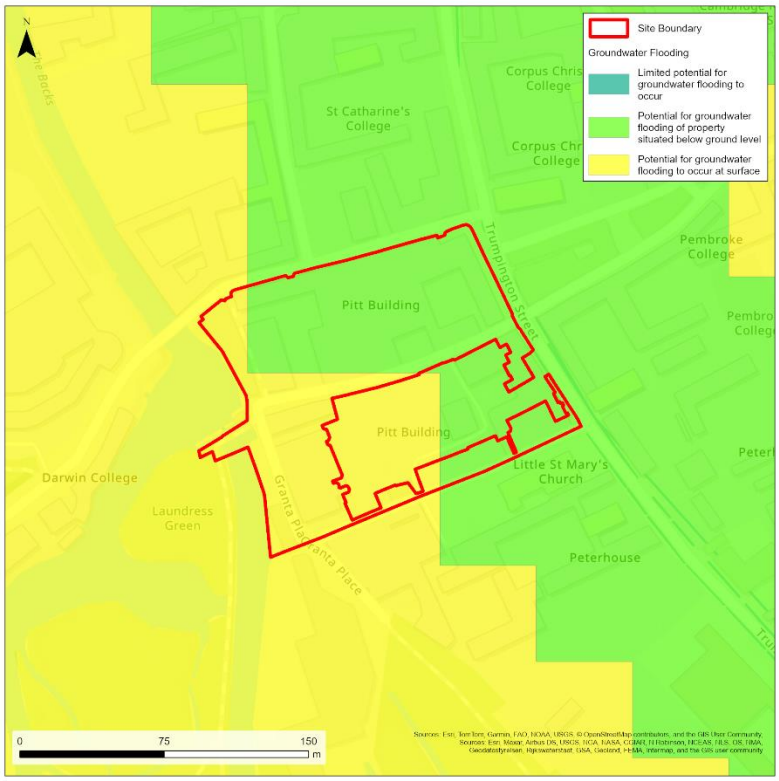

Figure *41*: Susceptibility to Groundwater Flooding Map

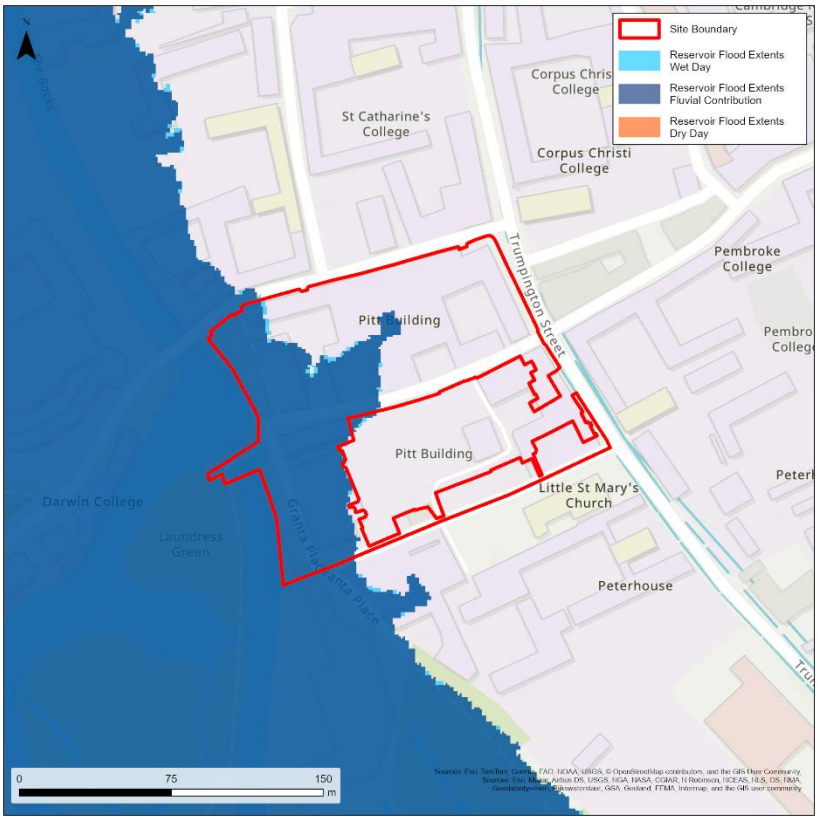

Figure 42: Reservoir Flood Extent

Site Name: The Moor, Moor Lane, Melbourn

1 Site Details

Site Reference S/RRA/ML
OS Grid reference: TL 38372 45523
Area: 1.08 Hectares
Proposed site use: Residential
Vulnerability Classification: More Vulnerable

Existing Watercourses:
The proposed development site lies within the 'Cam Rhee and Granta' Operational Catchment. There are no watercourses within the site boundary however, there are ordinary watercourses flowing northeast along the northern border of the site and north along the eastern border. These ditches eventually discharge into the River Cam or Rhee approximately 3 kilometres from the site

2 Sources of Flood Risk

2.1 Fluvial

Flood Zone	Proportion of Site within Flood Zone (%)
Flood Zone 1	97%
Flood Zone 2	2%
Flood Zone 3	1%

The site is predominately located within Flood Zone 1. Flood Zone 2 and 3 are shown to largely be confined to the ordinary watercourses, but the northwest of the site contains a very small extent of Flood Zone 2 located within a paddocked section of the site.

The ordinary watercourses bordering the site have not been modelled and as such the associated fluvial flood risk may be underestimated. The Environment Agency (EA) Risk of Flooding from Surface Water maps can be used as a proxy to estimate fluvial flood risk in the unmodelled sections of the north and eastern ditches bordering the site. The Risk of Flooding from Surface Water mapping indicates flood water is predominately confined within the river channels with a small proportion of out of bank flooding in the north-western corner of the site in a 'very low' (<1% Annual Exceedance Probability (AEP)) event.

2.2 Surface Water

Risk of Surface Water Flooding	Proportion of Site at Risk (%)
Low (0.1% AEP)	3%

Medium (1% AEP)	0%
High (3.33% AEP)	0%

The Risk of Flooding from Surface Water map indicates that the majority of the site is not affected by surface water flooding. The site is not identified to flood for the 3.33% or the 1% AEP events. Localised ponding is delineated to occur in the 0.1% AEP event in the northwest paddocked section the site.

The mapping indicates that surface water flood depths across the site are identified to have a 'low' chance (0.1% AEP event) of reaching up to 20 centimetres deep.

2.3 Groundwater

The British Geological Survey (BGS) 'Susceptibility to Groundwater Flooding' map indicates that there is a potential for groundwater flooding to occur at surface level across the whole of the site. This dataset indicates susceptibility to flooding and is not indicative of a specific level of hazard or risk.

BGS Geology mapping indicates bedrock geology of West Melbury Marly Chalk Formation, which is highly permeable. Due to the high storage potential of such geology, groundwater flood risk may be increased in periods of prolonged precipitation.

2.4 Reservoir

The site is not indicated to be at risk of flooding in event of a reservoir breach for both the wet and dry day scenarios.

2.5 Flood History

No historical flood events have been recorded within the site or its vicinity.

3 Climate Change Implications

3.1 Fluvial

The EA flood map for planning climate change mapping (2070-2125) shows no change in flood extent when climate change is taken into account. This is the same for the Long Term Rivers and Sea flood risk map (climate change scenario: 2036 to 2069).

3.2 Surface Water

The flood extents and flood depths do not increase significantly from the present-day scenario to the climate change scenario shown in the Risk of Flooding from Surface Water mapping (2040-2060). The lifetime of the development is expected to extend beyond 2060, so the present day 0.1% AEP has been used as a conservative proxy

for future climate change. As noted above, the 0.1% AEP shows a minor extent of localised ponding within the north-western corner of the site.

3.3 Groundwater

The future impacts of climate change on groundwater levels are complex, difficult to model and not well understood.

Due to increased rainfall expectations with climate change, it should be assumed that the groundwater table could be impacted in future and may rise during wetter periods of the year. This will need to be considered for the design of finished ground floor levels, foundations and any basement areas

4 Flood Risk Management Infrastructure

Defences

The site is not protected by any formal flood defences.

Residual Risk

There are no identified residual risks from flood management infrastructure.

5 Emergency Planning

Flood Warning

The proposed site is not part of any current EA Flood Alert, Flood Warning or Groundwater Flood Warning areas.

Access and Egress

Access routes to the site should consider surface water and fluvial flood risk extents to ensure the route is compliant with access requirement specified in the Planning Practice Guidance ‘Flood Risk and Coastal Change’ emergency planning provisions.

The Moor, along the western boundary of the site, is the only available option for access. The flood maps used for this assessment indicate that the road is dry in the 0.1% AEP surface water flood event and that it is not impacted by any fluvial flooding.

6 Broadscale Assessment of Sustainable Drainage Systems (SuDS) Suitability

BGS Geology mapping (at 1:50000 scale) indicates that bedrock of the West Melbury Marly Chalk Formation underlies the site. Chalk is a highly permeable aquifer that can transmit large volumes of groundwater. Due to the high groundwater

flood risk and highly permeable geology, infiltration may not be a viable method of surface water discharge. Infiltration testing will be required to determine the suitability of surface water discharge to groundwater. Discharge to either of the watercourses bordering the site may be possible, subject to Lead Local Flood Authority (LLFA) requirements.

Surface water management should therefore prioritise attenuation and conveyance features such as swales, detention basins, ponds, and permeable paving with lined sub-bases. These systems can provide effective storage and slow runoff rates. Lined systems may be necessary to prevent groundwater ingress and maintain functionality, due to the high potential for groundwater flood risk.

7 Opportunities for wider sustainability benefits and flood risk management

There are likely to be some opportunities for green/blue infrastructure such as swales, filter strips and attenuation to provide wider environmental, surface water management and amenity benefits.

The use of SuDS can contribute to managing surface water runoff, improving water quality, providing flood protection, enhancing biodiversity, reducing groundwater flood risk and contributing to an attractive environment. Rainwater harvesting and other mechanisms should also be considered to enable storage and re-use of water.

8 National Planning Policy Framework (NPPF) and Planning Implications

8.1 Exception Test Requirements

In accordance with the NPPF, the site is classified as a ‘More Vulnerable’ development which is considered compatible within Flood Zone 1. The Exception Test is therefore not required.

8.2 Site Design and FRA Requirements

The developer will need to provide a site-specific Flood Risk Assessment (FRA), which demonstrates that future users of the development will not be placed in danger from flood hazards from all sources throughout its lifetime. The applicant should demonstrate that the development meets the objectives of the NPPF’s policy on flood risk and how mitigation measures will be secured for the lifetime of the development.

A sequential approach should be adopted, with preferentially developing areas at lower risk of flooding first.

Hydraulic modelling of the ordinary watercourses in the vicinity of the site should be undertaken to provide a better understanding of fluvial flood risk. The model results should inform site layout, floor levels and access routes.

The risk of surface water flooding must be addressed through a Surface Water Drainage Strategy for the site's development, and this should outline how development will manage and mitigate these risks.

The site-specific FRA should further investigate risk of groundwater flooding (e.g. through groundwater level monitoring) and should include appropriate mitigation such as an additional freeboard to the finished ground-floor levels.

If any basement areas are proposed, groundwater flood mitigation and resilience measures should be identified and safe access and egress routes to basement areas should be determined.

9 Conclusions and Recommendations

The development is likely to be able to proceed if:

- Hydraulic modelling of the ordinary watercourses in the vicinity of the site is undertaken to inform fluvial flood risk to the site.
- Access routes are located outside of areas identified as at risk of surface or fluvial water flooding.
- A sequential approach is adopted preferentially developing areas at lowest risk of flooding first.
- Consideration is given to the water management and SuDS at the site and how the site can contribute to flood and water management benefits in the local area.
- Infiltration testing is required to determine the suitability of infiltrating SuDS features. Where infiltration is not possible, surface water should be attenuated and conveyed by SuDS features before being discharged into the watercourse on-site.
- The site-specific FRA should further investigate risk of groundwater flooding and recommend appropriate mitigation measures as required.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation and resilience measures.

Figure 43: Site Topography

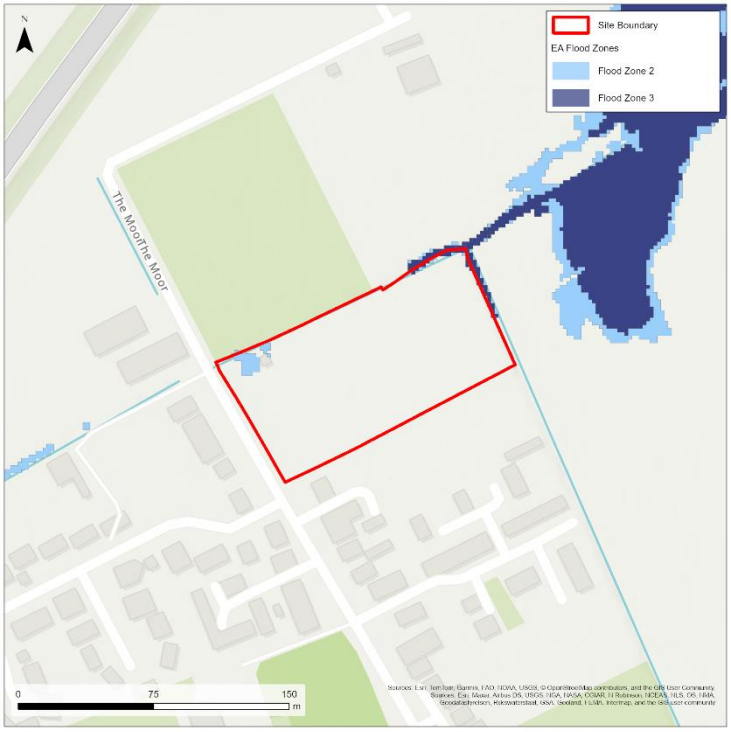

Figure 44: Flood Zones (Present Day)

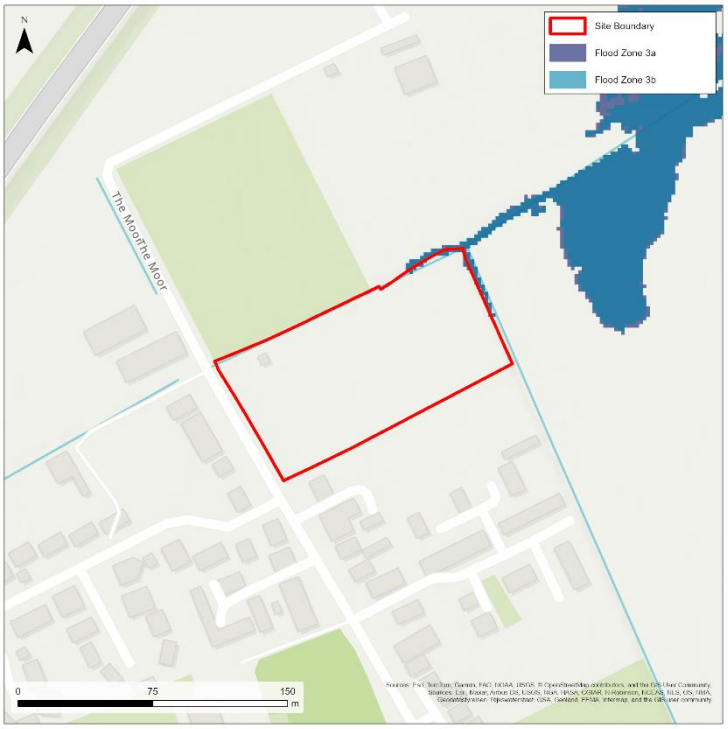

Figure 45: Functional Floodplain

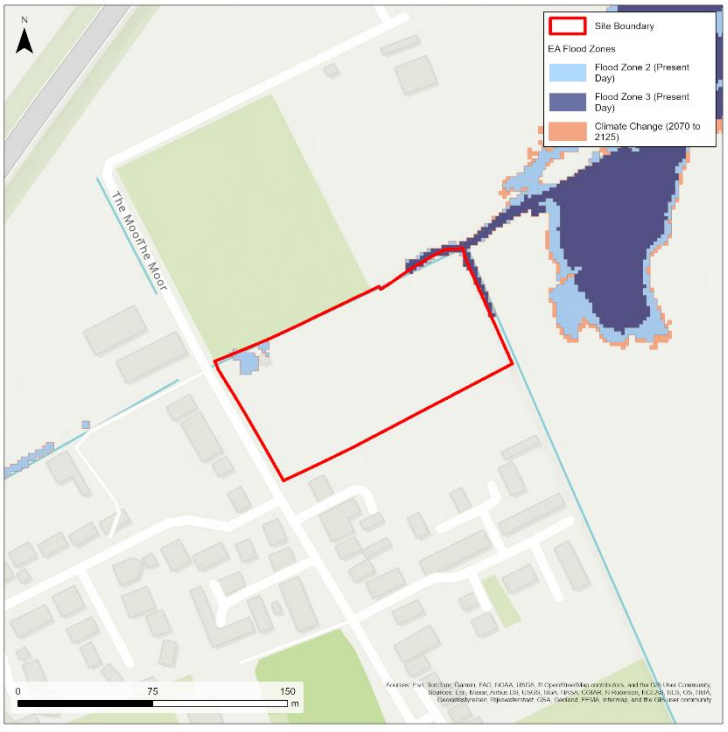

Figure 46: Flood Zones (Climate Change – 2070 to 2125)

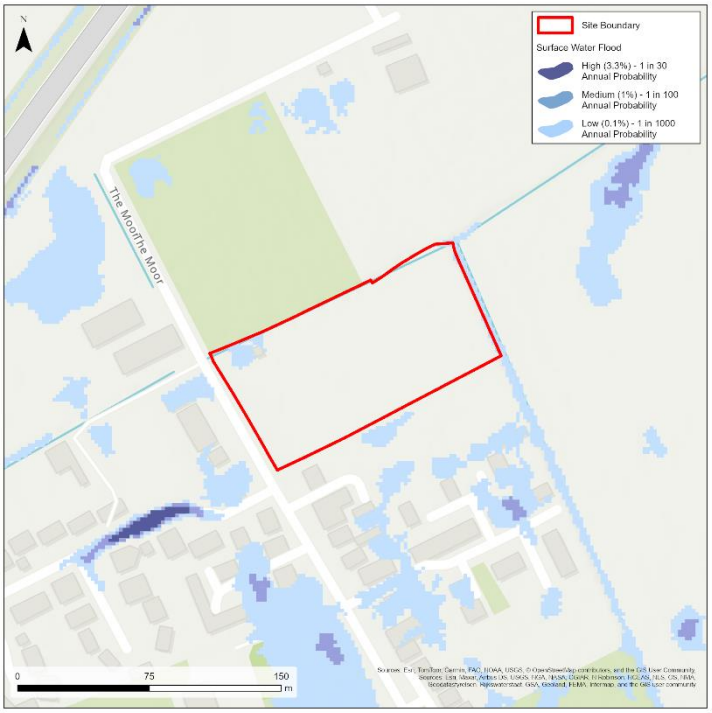

Figure 45: Risk of Flooding from Surface Water Map

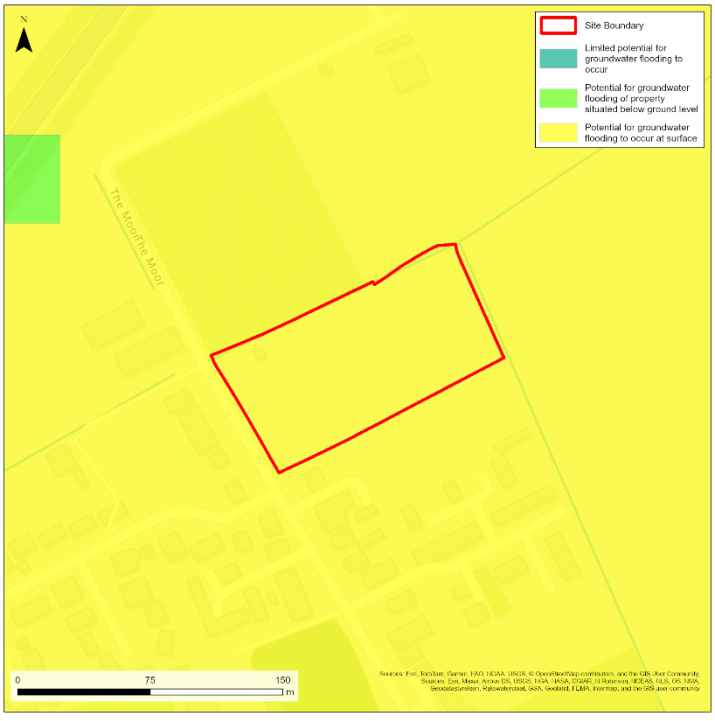

Figure 48: Susceptibility to Groundwater Flooding Map

Site Name: 2-28 Davy Road and Garage Blocks

1 Site Details

Site Reference: S/C/DR
OS Grid reference: TL 46699 57195
Area: 1.19 Hectares
Proposed site use: Residential
Vulnerability Classification: More Vulnerable

Existing Watercourses:

The proposed development site lies within the 'Cam Lower' Operational Catchment. The River Camis an Environment Agency designated 'Main River' and is located approximately 800 metres northwest. An ordinary watercourse, likely a ditch purposed for land drainage, flows south to north through the southern parcel. This watercourse is fed my multiple other ordinary watercourses, which are also likely also drainage ditches, which run throughout the southern parcel.

There is an ordinary watercourse, likely a drainage ditch, on the northern parcels eastern border that flows along Airport Way flowing south. There is also another drainage ditch in the southwest of the northern parcel that briefly flows south through site.

2 Sources of Flood Risk

2.1 Fluvial

Flood Zone	Proportion of Site within Flood Zone (%)
Flood Zone 1	100%
Flood Zone 2	0%
Flood Zone 3	0%

Flood Zone mapping indicates that the site is entirely located in Flood Zone 1. The watercourses on site are not shown to be modelled within the Flood Zone mapping therefore the Risk of Flooding from Surface Water (RoFSW) map has been used as a conservative proxy to assess flood risk from these watercourses.

The RoFSW map indicates that the watercourse along Airport way, one of the drainage ditches in the southern parcel and the watercourse in the southwest of the northern parcel flood in the 3.33% Annual Exceedance Probability (AEP) event. In the 1% and 0.1% AEP events, these flood extents become wider but are still indicated to remain within the channel.

The watercourse in the southwest of the northern parcel is indicated to be connected to a larger extent of flooding along Barnwell Road and in the south of the northern parcel. It is likely this extent is caused by surface water flooding and is not a result of the watercourse flooding.

2.2 Surface Water

Risk of Surface Water Flooding	Proportion of Site at Risk (%)
Low (0.1% AEP)	12%
Medium (1% AEP)	35%
High (3.33% AEP)	13%

The Risk of Flooding from Surface Water map indicates that the majority of the site is not affected by surface water flooding. For the 3.3% AEP event, surface water flood risk is predominantly associated with ponding. Notable extents of ponding occur in this event in the east of the southern parcel and the southwest of the northern parcel.

In the 1% AEP event surface water flood extents marginally increase from the 3.3% AEP event.

In the 0.1% AEP event, all extents of surface water ponding are more significant from the 1% AEP event. Areas of segmented ponding in the east of the southern parcel are now indicated to form a larger interconnected extent of surface water ponding.

2.3 Groundwater

The British Geological Survey (BGS) ‘Susceptibility to Groundwater Flooding’ dataset indicates that there is potential for groundwater flooding to occur at surface level (21% of the site area,) along the eastern and southwestern boundary of the northern parcel and the central section of the southern parcel. The rest of the site has a potential for flooding of property situated below ground level (78% of the site area).

The dataset indicates susceptibility to flooding and is not indicative of a specific level of hazard or risk.

BGS Geology mapping (at 1:50000 scale) indicates that the bedrock underlying the site is of the West Melbury Marly Chalk Formation. Chalk is considered highly permeable, allowing groundwater to percolate upwards and flood in periods of or after prolonged rainfall.

2.4 Reservoir

The site is not located in an area shown to be at risk from reservoir flooding.

2.5 Flood History

Anglian Water historic sewer flooding records indicate that external sewer flooding was recorded in the postcode CB5 8UQ along the northern site boundary on the 28/10/2020. The cause of sewer flooding is not identified.

3 Climate Change Implications

3.1 Fluvial

The EA Flood Map for Planning climate change mapping (between 2070-20125) shows that there is no increase in fluvial flood risk on site due to climate change.

3.2 Surface Water

Flood extents are shown to increase slightly from the present day 1% AEP scenario to the climate change scenario, shown in the Long Term Risk of Flooding from Surface Water map (2040-2060). The lifetime of the development is expected to extend beyond 2060, so the present day 0.1% AEP has been used as a conservative proxy for future climate change. As noted above, the 0.1% AEP event shows an amplification of the projected flood extents compared to the 1% AEP present day event.

3.3 Groundwater

The future impacts of climate change on groundwater levels are complex, difficult to model and not well understood.

Due to increased rainfall expectations with climate change, it should be assumed that the groundwater table could be impacted in future and may rise during wetter periods of the year. This will need to be considered for the design of finished ground floor levels, foundations and any basement areas.

4 Flood Risk Management Infrastructure

Defences

The site is not protected by any formal flood defences.

Residual Risk

There are no identified residual risks from flood management infrastructure.

5 Emergency Planning

Flood Warning

The site is not located in an area covered by Environment Agency flood warnings.

Access and Egress

Proposed access/egress routes should be located outside of the identified areas of high surface water and fluvial flood risk. Access and egress to the southern parcel can be located off of Coldham's Lane. Some minor extents of surface water ponding along its northern embankment should be avoided.

Access and egress to the northern parcel can be located off Airport Way. This would require an elevated crossing to be built over the existing watercourse, higher than the associated flood zone extents.

6 Broadscale Assessment of Sustainable Drainage Systems (SuDS) Suitability

BGS Geology mapping (at 1:50000 scale) indicates that bedrock of the West Melbury Marly Chalk Formation underlies the site. In the northern portion of the northern parcel, some of the existing infrastructure is indicated to be underlain by River Terrace Deposits, which is comprised of sand and gravel. Chalk, sand and gravel are all considered permeable. Due to the groundwater flood risk and likely high permeability of the underlying geology, infiltration SuDS may not be suitable. Infiltrating SuDS features could contribute to the groundwater flood risk on-site, therefore, infiltration testing will be required to determine the suitability of surface water discharge to groundwater.

It is therefore recommended that surface water management prioritises attenuation and conveyance features such as swales, detention basins, ponds, and permeable paving with lined sub-bases. These systems can provide effective storage and slow runoff rates. The site has two possible existing watercourses into which the development could discharge. Discharge should be directed to the watercourses to the east or the west of the site, subject to capacity and consent as per the Surface Water Drainage Hierarchy.

In accordance with the Surface Water Drainage Hierarchy, surface water discharge to a watercourse needs to be thoroughly investigated before the LLFA would accept discharge into a sewer.

7 Opportunities for wider sustainability benefits and flood risk management

Due to the size of the site, community scale rainwater harvesting and other mechanisms should be considered to enable storage and re-use of water. There are also opportunities for green-blue infrastructure such as swales, filter strips and attenuation to provide wider environmental, surface water management and amenity benefits. The existing watercourse on site can be maintained and possibly enhanced, providing increased stormwater attenuation and conveyance, benefiting

the wider area. The use of SuDS and the enhancement of the existing watercourse could also contribute to improving water quality, providing flood protection, enhancing biodiversity and contributing to an attractive environment.

8 National Planning Policy Framework (NPPF) and Planning Implications

8.1 Exception Test Requirements

In accordance with the NPPF, 'More Vulnerable' development is considered compatible within Flood Zone 1 and does not require the application of the Exception Test. However, the sequential approach should be used to inform the siting and layout of development, locating all development away from areas at a higher risk of surface water flooding.

8.2 Site Design and FRA Requirements

The developer will need to provide a site-specific Flood Risk Assessment (FRA), which demonstrates that future users of the development will not be placed in danger from flood hazards from all sources throughout its lifetime. The applicant should demonstrate that the development meets the objectives of the NPPF's policy on flood risk and how mitigation measures will be secured for the lifetime of the development.

The sequential approach should be implemented at the site, prioritising more vulnerable residential development within areas outside of surface water flood risk.

The risk of surface water flooding must be addressed through a Surface Water Drainage Strategy (SWDS) for the site and this should outline how development will manage and mitigate surface water flood risks.

Consultation with the LLFA should occur to discuss the enhancement of the existing watercourses on site, potentially providing increased flood relief, benefitting the wider area.

The site-specific FRA should further investigate risk of groundwater flooding (e.g. through groundwater level monitoring) and should include appropriate mitigation such as an additional freeboard to the finished ground floor levels.

9 Conclusions and Recommendations

The development is likely to be able to proceed if:

- A sequential approach is adopted, prioritising the location of more vulnerable residential development outside of areas at risk of surface water flooding, taking into account the impacts of climate change.

- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation measures.
- Safe access routes are located outside of areas identified as at risk of surface water flooding.
- Consideration is given to water reuse, water management and SuDS at the site, and how the development of the site can contribute to wider flood and water management benefits across the catchment.

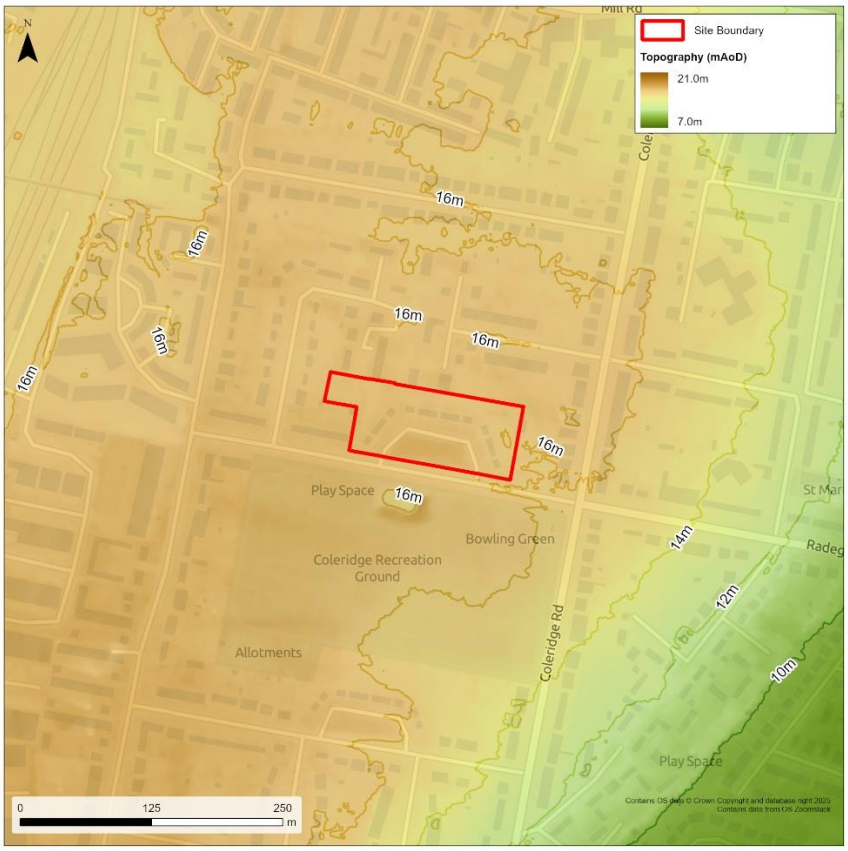

Figure 49: Site Topography

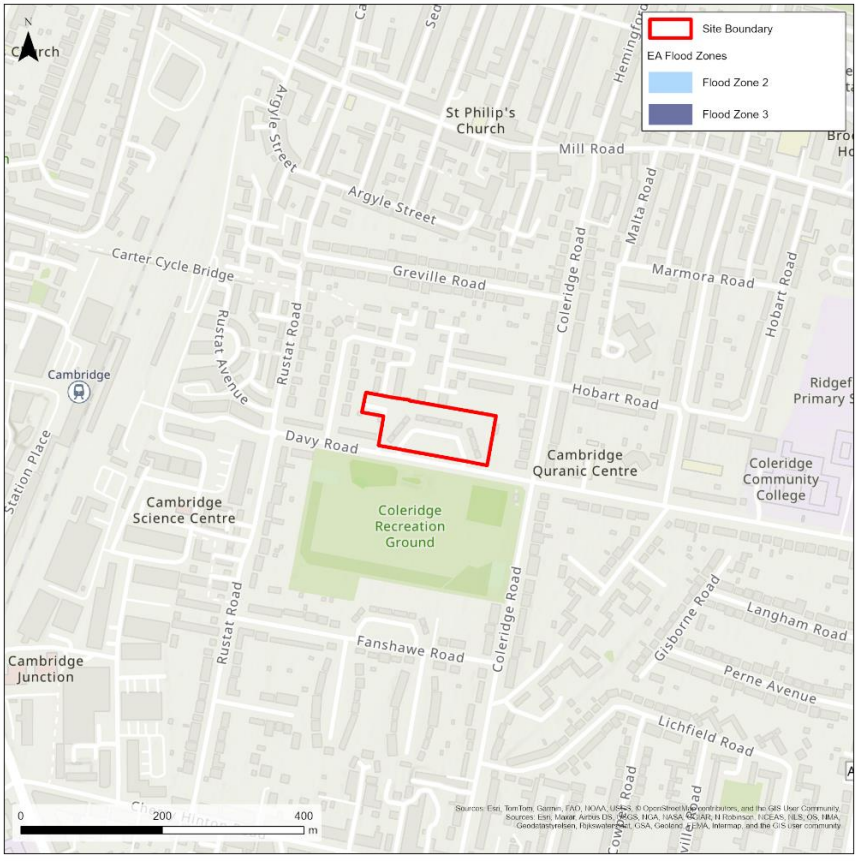

Figure 50: Flood Zones (Present Day)

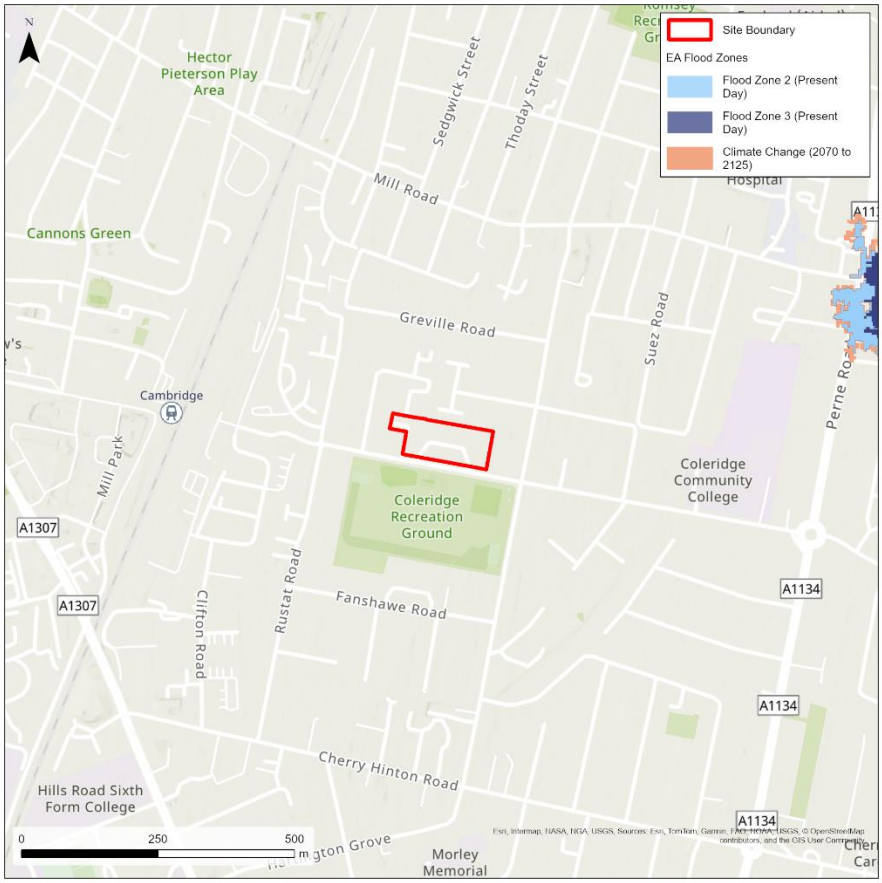

Figure 51: Flood Zones (Climate Change – 2070 to 2125)

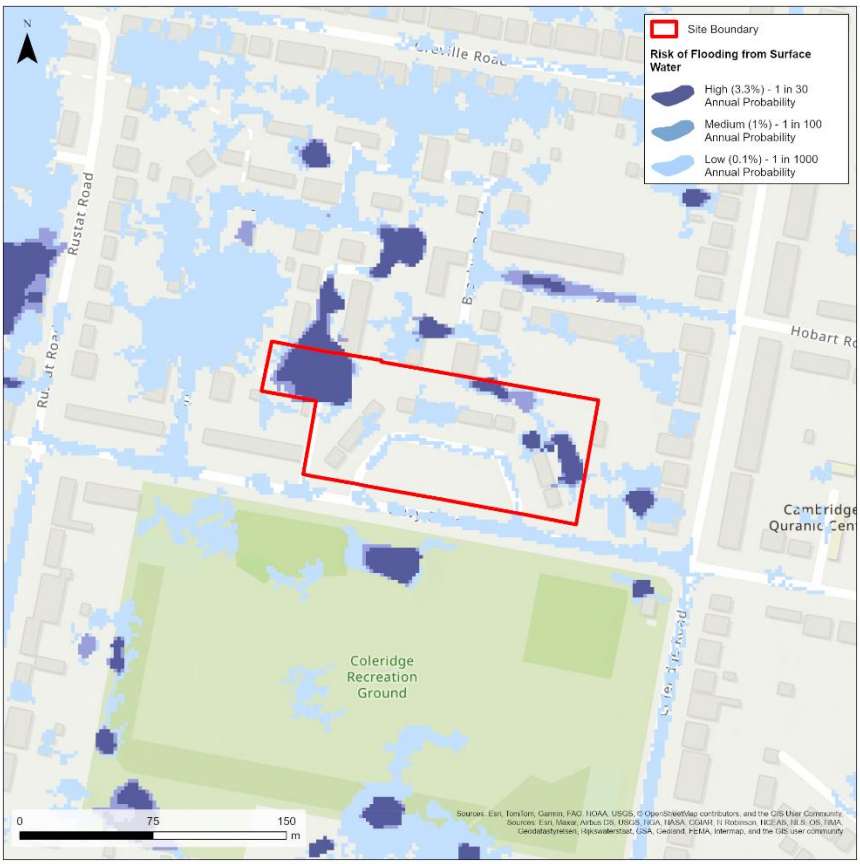

Figure 52: Risk of Flooding from Surface Water Map

Figure 53: Susceptibility to Groundwater Flooding Map

Site Name: Brookfields

1 Site Details

Site Reference: S/C/BFS
OS Grid reference: TL 47297 57669
Area: 2.32 Hectares
Proposed site use: Mixed use including residential, offices, research and development, and health services.
Vulnerability Classification: More Vulnerable (Residential) and Less Vulnerable (Employment uses)

Existing Watercourses:

The site lies within the 'Cam Lower' Operational Catchment. No watercourses exist within the site boundary.

The Cherry Hinton Brook flows from south to north, parallel with the site boundary roughly 170 metres to the east. A series of three lakes, referred to as the 'Burnside Lakes' and formerly used as chalk pits, exist immediately to the east of the Cherry Hinton Brook.

2 Sources of Flood Risk

2.1 Fluvial

Flood Zone	Proportion of Site within Flood Zone (%)
Flood Zone 1	100%
Flood Zone 2	0%
Flood Zone 3	0%

The Environment Agency (EA) Flood Map for Planning indicates that the site is wholly located within Flood Zone 1.

Fluvial flooding near the site is confined to the immediate areas surrounding Cherry Hinton Brook. The extent of Flood Zone 2 reaches as far as Seymour Street, located approximately 170 metres to the west of the site boundary.

2.2 Surface Water

Risk of Surface Water Flooding	Proportion of Site at Risk (%)
Low (0.1% AEP)	17%

Medium (1% AEP)	19%
High (3.33% AEP)	30%

EA Risk of Flooding from Surface Water mapping indicates that a significant portion of the site is affected by surface water flooding. However, due to the presence of existing buildings at the site, there may be existing drainage infrastructure within the site, and therefore, the available surface water mapping may not be wholly representative of surface water extents or flow paths.

In the 3.3% Annual Exceedance Probability (AEP) event, surface water flood risk in the west of the site is predominantly confined to open parking space and the existing access road. A significant parcel of surface water flood risk is indicated in the east of the site, where Brookfields Health Centre and its existing car park are located.

In the 1% AEP event, surface water flood extents are expanded, indicating an increased flood parcel around the Brookfields Hospital building in the west.

In the 0.1% AEP event, the flood extents are amplified, covering more of the open space in the site. The entire west section of the site, including the existing built development, carparks and green space around the exterior of the buildings, is indicated within the surface water flood extent.

2.3 Groundwater

The BGS ‘Susceptibility to Groundwater Flooding’ map indicates that the entirety of the site has a potential for groundwater flooding to occur at surface level. The dataset indicates susceptibility to flooding and is not indicative of a specific level of hazard or risk.

Furthermore, as much of the site has been previously developed, it is likely that the natural ground conditions have been disturbed during previous construction works, which may have an impact on the site's susceptibility to groundwater flooding. Groundwater investigation should be undertaken at the site to establish the present ground conditions and position of the groundwater table.

2.4 Reservoir

The site is not located in an area shown to be at risk from reservoir flooding.

2.5 Flood History

No historic flooding has been recorded at the site location.

3 Climate Change Implications

The impacts of climate change on flood risk from the ordinary watercourses has not been modelled as part of this SFRA. In accordance with the guidance provided in the Level 1 SFRA where modelled data is unavailable, the flood extents recorded as present-day Flood Zone 2, the NaFRA2 datasets for climate change as represented in the online Long Term Flood Risk mapping, and the low-risk surface water event have been used as a proxy.

3.1 Fluvial

The EA Flood Map for Planning mapping for climate change (between 2070-2125) shows only a very minor increase in the extent of fluvial flooding from present day extents, and the flood extents remain confined to areas immediately adjacent to the Ordinary Watercourse in the west of the site. All areas of the site remain in Flood Zone 1 with no prevalent flood risk.

3.2 Surface Water

Overland flow paths, flood extents and flood depths do not change drastically from the present- day scenario in the climate change scenario shown in the EA Risk of Flooding from Surface Water mapping (2040-2060). Similar areas of flood risk are shown, with increased likelihood of flooding compared to the present day. Flood parcels indicated during the medium and low likelihood present day events are indicated during the high likelihood event for 2040-2060.

The lifetime of the development is planned to extend beyond 2060, so the present day 1 in 1000 surface water mapping can be used as a conservative proxy for future climate change. As noted above, the 1 in 1000 event shows ponding in much of the site, specifically in the west around Brookfields Hospital, and the east around Brookfields Health Centre.

3.3 Groundwater

The future impacts of climate change on groundwater levels are complex, difficult to model and not well understood.

Due to increased rainfall expectations with climate change, it should be assumed that the groundwater table could be impacted in future and may rise during wetter periods of the year. This will need to be considered for the design of finished ground floor levels, foundations and any basement areas.

4 Flood Risk Management Infrastructure

Defences

The site is not protected by any formal flood defences.

Residual Risk

There are no identified residual risks from flood management infrastructure.

5 Emergency Planning

Flood Warning

The site is not located in an area covered by EA flood warnings. The Cherry Hinton Brook is highlighted as a warning area, but the extent does not impact the site.

Access and Egress

Currently, there is an access/egress point to the east of the site via Seymore Street. Access to Seymour Street can be routed through Brookfields Health Centre car park. There is also access/egress point via an unnamed road that connects the site to Mill Road on the southern boundary. This road is indicated at risk of surface water flooding in the 3.3% AEP flood event, both at its intersection with Mill Road, and further north into the site, along the central car parks.

Additional access routes to the site should consider the surface water flood risk that exists across a significant portion of the site, to ensure that the route is compliant with access requirements specified in the Planning Practice Guidance ‘Flood Risk and Coastal Change’ emergency planning provisions.

6 Broadscale Assessment of Sustainable Drainage Systems (SuDS) Suitability

Geology at the site consists of West Melbury Chalk Formation bedrock underlying the entirety of the site. Infiltration SuDS should be suitable due to the typical high permeability and storage of chalk bedrock formations. However, the site has also been previously developed so the natural ground conditions will likely no longer be present and existing drainage infrastructure may be present beneath the site, making SuDS suitability difficult to assess. Ground investigations should be undertaken at the site to establish the underlying soil conditions and infiltration potential.

Soil classification testing and infiltration testing will be required to confirm suitability of SuDS prior to the development of a Drainage Strategy for the site.

7 Opportunities for wider sustainability benefits and flood risk management

The Cambridgeshire Green Infrastructure Strategy identifies a focus on green infrastructure within the district and a requirement for SuDS as part of development proposals, where possible.

Potential opportunities for SuDS to manage surface water runoff and flood risk whilst providing wider sustainability benefits exist, despite the small size of the site. Opportunities that offer high drainage potential within limited space include, but are not limited to, permeable paving, bioretention areas, green roofs and swales – SuDS which are suitable for a brownfield site.

8 National Planning Policy Framework (NPPF) and Planning Implications

8.1 Exception Test Requirements

In accordance with the NPPF, 'More Vulnerable' development is considered compatible within Flood Zone 1 and does not require the application of the Exception Test.

8.2 Site Design and FRA Requirements

The sequential approach should be implemented at the site, prioritising more vulnerable residential development within areas outside of surface water flood risk first. Much of the site is indicated to be at risk from surface water flooding. Areas identified as being at 'low' risk (0.1% AEP) should therefore be prioritised above those at higher risk, with priority increasing in line with the probability of flooding.

The developer will need to provide a site-specific FRA which demonstrates that future users of the development are safe from flood hazards from all sources throughout its lifetime. The applicant should demonstrate that the development meets the objectives of the NPPF's policy on flood risk and how mitigation measures will be secured for the lifetime of the development.

The site-specific FRA should further investigate risk of groundwater flooding (e.g. through groundwater level monitoring) to inform the need for appropriate mitigation measures, which may include the incorporation of an appropriate freeboard to the finished ground-floor levels.

If basement areas are proposed in residential or commercial units, groundwater flood mitigation and resilience measures should be identified and safe access and egress routes to basement areas should be determined.

The availability of safe access and egress will need to be demonstrated for the 0.1% AEP surface water flood event, including the climate change allowance applicable to the catchment.

9 Conclusions and Recommendations

The development is likely to be able to proceed if:

- A sequential approach is adopted, prioritising the location of more vulnerable residential development outside of the 1% and 0.1% AEP surface water flood extents, taking into account climate change.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with proposed floor levels above projected surface water flood depths, taking into account climate change with a suitable freeboard.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation measures.
- Safe access and egress routes must not be in the areas of high surface water risk (taking into account climate change).
- Consideration is given to the integration of water management and SuDS at the site, in order to provide adequate drainage whilst contributing wider flood and water management benefits across the catchment.

Figure 54: Site Topography

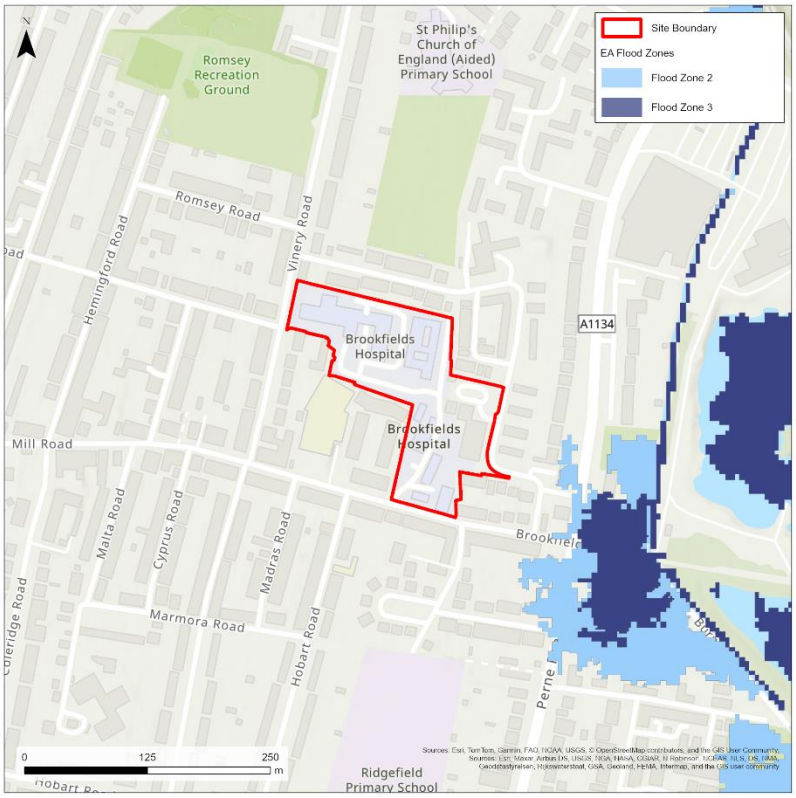

Figure 55: Flood Zones (Present Day)

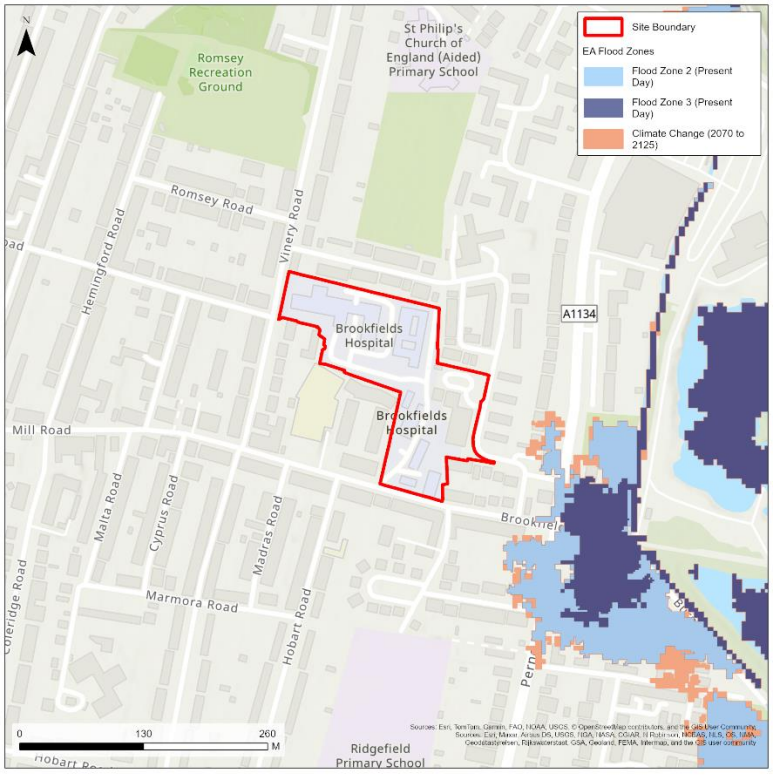

Figure 56: Flood Zones (Climate Change – 2070 to 2125)

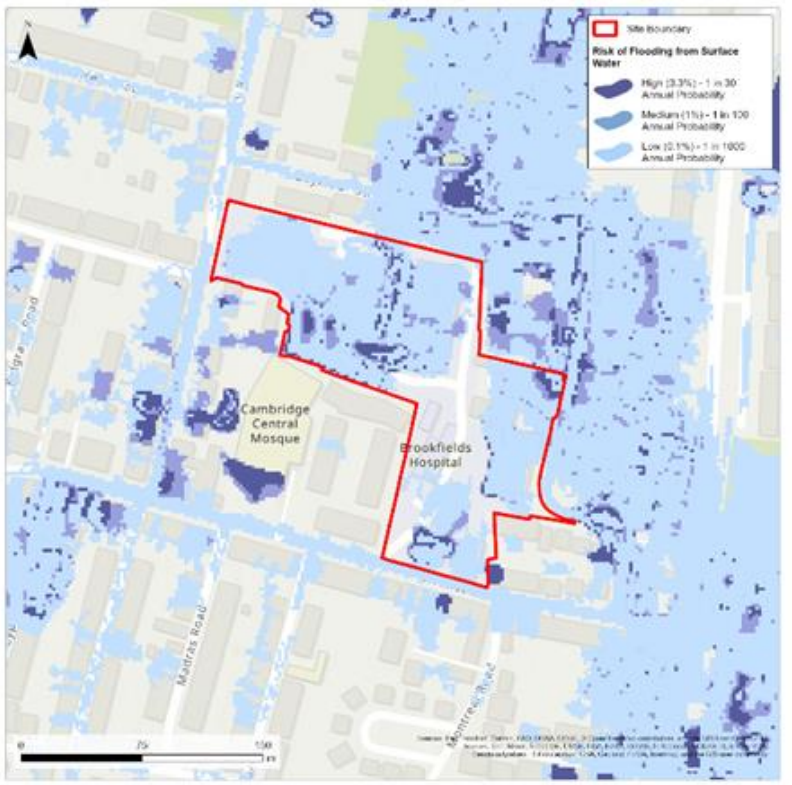

Figure 57: Risk of Flooding from Surface Water Map

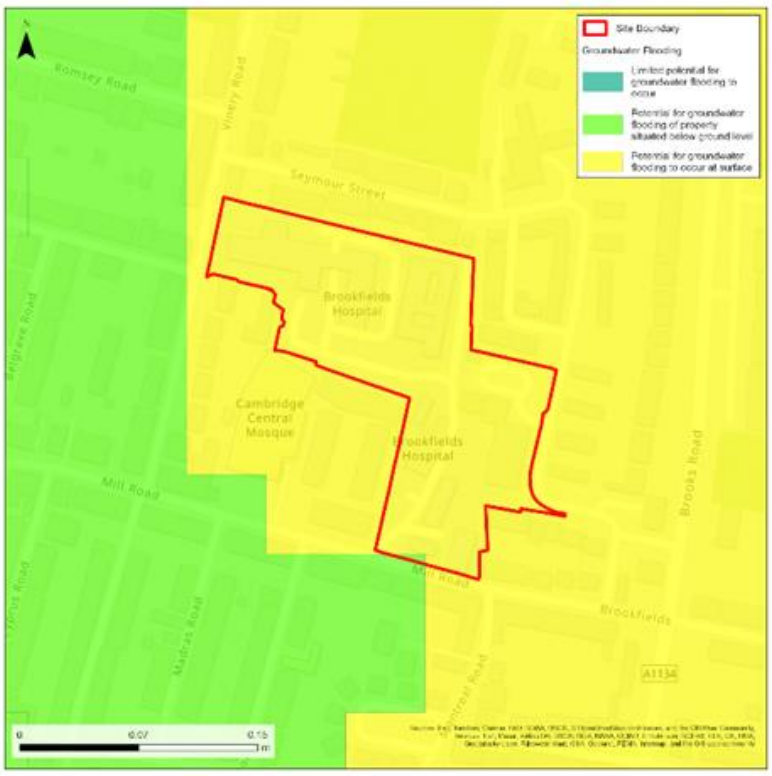

Figure 58: Susceptibility to Groundwater Flooding Map

Site Name: Babraham Research Campus

1 Site Details

Site Reference: S/RSC/BRC
OS Grid reference: TL 50933 50892
Area: 39.5 Hectares
Proposed site use: Mixed Use e.g. Research and Development and Ancillary Offices
Vulnerability Classification: More Vulnerable

Existing Watercourses:

The proposed development site lies within the 'Cam Rhee and Granta' Operational Catchment. The River Granta, an Environment Agency (EA) designated 'Main River', flows along the western boundary of the site, from southeast to northwest.

2 Sources of Flood Risk

2.1 Fluvial

Flood Zone	Proportion of Site within Flood Zone (%)
Flood Zone 1	89%
Flood Zone 2	6%
Flood Zone 3	5%

The site is predominately located within Flood Zone 1. The south-western part of the site is shown to be located within Flood Zone 2 and 3. Small areas of Flood Zone 3b are present within the site along the western boundary.

2.2 Surface Water

Risk of Surface Water Flooding	Proportion of Site at Risk (%)
Low (0.1% AEP)	5%
Medium (1% AEP)	2%
High (3.33% AEP)	1%

The Risk of Flooding from Surface Water map indicates that the majority of the site is not affected by surface water flooding. Risk is predominantly limited to ponding on the roads and within topographic low points in the central, west and southeast areas of the site. In the higher severity flood events, more of the built development and roads are indicated at risk of surface water flooding.

2.3 Groundwater

The British Geological Survey (BGS) 'Susceptibility to Groundwater Flooding' map indicates that there is potential for groundwater flooding to occur at surface level (6% of the site area), and a potential for flooding of property situated below ground level (61% of the site area). The dataset indicates susceptibility to flooding and is not indicative of a specific level of hazard or risk.

BGS Geology mapping indicates chalk bedrock with superficial River Terrace Deposits underly the majority of the site. Due to the high storage potential of such geology, groundwater flood risk may be increased in periods of prolonged precipitation.

2.4 Reservoir

The site is indicated to be at risk of flooding in event of a reservoir breach. The flood extents for the 'dry day' and 'wet day' scenarios are very similar with the south and southwestern sections of the site at a 35% to 31% risk of reservoir flooding respectively. The source of the potential flood risk is from Dernford Reservoir.

The EA's SFRA guidance states that, where a proposed development site is at flood risk from a reservoir, an assessment into whether the reservoir design or maintenance schedule needs improving should be carried out. Expert advice may be required.

2.5 Flood History

EA historical flood mapping indicates that fluvial flooding from the River Granta has historically impacted the site, of which 4% of is covered by historical flood outline. Existing built development, closest to the River Granta in the west, is indicated within the historic flood parcel.

3 Climate Change Implications

The site is within the 'Cam and Ely Ouse' management catchment. Peak climate change 'Central' allowance is 9%, up to the 2080s, for the catchment.

Hydraulic modelling was completed for the River Granta in 2014 using ISIS-TUFLOW. Re-simulation of the model was not undertaken as part of this SFRA. The existing model has simulated the 1% AEP event with climate change event with an allowance of 20% and this has been used as a conservative proxy for the purposes of this site assessment. Re-simulation of the model as part of a site-specific FRA to inform design levels with climate change allowances in line with current guidance will be required. Model requirements should be agreed with the EA.

3.1 Fluvial

Modelled climate change scenarios associated with the River Granta model show only a minor increase to the projected fluvial flood extent from the River Granta to the west, during the 1% AEP fluvial flood event. Existing built development to the west of the site is indicated to be affected by this minor increase. During the 1% AEP+CC event, predicted depths on site reach up to 0.4 metres, typically ranging between 0.2-0.4 metres deep around the existing built development closest to the River Granta.

The EA Flood Map for Planning climate change mapping (2070-2125) indicates that 13% and 6% of the site is in Flood Zone 2 and 3 respectively in the climate change scenario which is a minor increase from the present-day flood risk extents.

3.2 Surface Water

Overland flow paths, flood extents and flood depths do not change significantly from the present-day scenario in the climate change scenario shown in the EA Risk of Flooding from Surface Water mapping (2040-2060).

3.3 Groundwater

The future impacts of climate change on groundwater levels are complex, difficult to model and not well understood.

Due to increased rainfall expectations with climate change, it should be assumed that the groundwater table could be impacted in future and may rise during wetter periods of the year. This will need to be considered for the design of finished ground floor levels, foundations and any basement areas.

4 Flood Risk Management Infrastructure

Defences

The South Cambridgeshire DC and Cambridge City Council Level 1 SFRA Hydraulic Structures and Defences mapping indicates that no defences exist along the body of the River Granta bordering the development site.

Residual Risk

There is no highlighted residual risk to the site from flood risk management infrastructure.

5 Emergency Planning

Flood Warning

The site lies within the Linton to Stapleford River Granta Flood Warning area.

Access and Egress

There are various existing access/egress points to the site. The unnamed central road through the site joins the A1307 at a roundabout to the northeast and crosses the River Granta out of the site boundary in the west. Two unnamed roads in the southeast of the site connect to the main high street.

During the design 1% AEP plus climate change event, the roadways on the west of the site are within the flood extent but are predominantly highlighted as ‘low hazard’ during this event and therefore safe access and egress may be feasible.

The majority of the rest of the site is within Flood Zone 1, therefore safe access and egress should be possible from the existing roads to the northeast and south.

6 Broadscale Assessment of Sustainable Drainage Systems (SuDS) Suitability

Geology at the site consists of:

Bedrock – Zig Zag Chalk Formation along the River Granta and the western boundary of the site. Holywell Nodular Chalk Formation for the majority of the site.

Superficial – River Terrace Deposits of sand and gravel.

Most source control techniques are therefore likely to be suitable due to high permeability bedrock and superficial geology present across the areas of the site highlighted within pluvial and fluvial flood extents.

A report provided by the developers of the site in December 2023 divides the site into two separate sections for runoff:

- Within the Research and Development (R&D) development zone of the central campus area, most of the buildings discharge surface water via infiltration to soakaways. To ensure runoff is kept to greenfield runoff rates, further development in this area should maintain drainage via infiltration.
- Within the R&D development zone and green landscape buffer zone to the northwest of the site, the local ground conditions are not suitable for drainage

via infiltration. Greenfield runoff rates have been maintained in these areas by limiting surface water discharge to an existing river outfall via gravity connection, using existing underground cellular storage tanks to maintain the attenuation of flows, and including SuDS drainage via swales and permeable paving in proposed drainage design.

7 Opportunities for wider sustainability benefits and flood risk management

Due to the size of the site, there are likely to be opportunities for green infrastructure such as swales, permeable paving, filter strips and attenuation to provide wider environmental and amenity benefits.

There may also be opportunities for flood risk mitigation, drainage management and green infrastructure in the adjacent Strategic Enhancement Area (S/SEA/BRC: Babraham Research Campus: Green Belt Enhancement Land), where no built development is to be situated.

8 National Planning Policy Framework (NPPF) and Planning Implications

8.1 Exception Test Requirements

The majority of the site is located in Flood Zone 1 and in accordance with the NPPF, 'More Vulnerable' development is permitted within Flood Zone 1 without the need to pass the Exception Test.

A sequential approach should be adopted preferentially developing areas at little to no risk of flooding first. 'More Vulnerable' development within areas of Flood Zone 2 and 3a are permitted, with the latter subject to passing of the Exception Test.

'More Vulnerable' development is not permitted within Flood Zone 3b.

8.2 Site Design and FRA Requirements

The sequential approach should be implemented at the site, prioritising more vulnerable development within areas outside of fluvial and surface water flood risk.

The developer will need to provide a site-specific FRA which demonstrates that future users of the development are safe from flood hazards from all sources throughout its lifetime. The applicant should demonstrate that the development meets the objectives of the NPPF's policy on flood risk and how mitigation measures will be secured for the lifetime of the development.

The site-specific FRA should further investigate risk of groundwater flooding (e.g. through groundwater level monitoring) to inform the need for appropriate mitigation

measures which may include the incorporation of an appropriate freeboard to the finished ground floor levels.

Consultation with the Local Authority, Lead Local Flood Authority (LLFA) and the EA should be undertaken at an early stage. Particular discussion should be held on the topic of reservoir flooding and whether the design or maintenance schedule needs improving should be carried out.

The availability of safe access and egress will need to be demonstrated for the 0.1% annual probability fluvial/rainfall flood events, including the climate change allowance applicable to the catchment.

If basement areas are proposed in residential or commercial units, groundwater flood mitigation and resilience measures should be identified and safe access and egress routes to basement areas should be determined.

9 Conclusions and Recommendations

The development is likely to be able to proceed if:

- A sequential approach is adopted, prioritising the location of more vulnerable development outside of the 1% AEP plus an appropriate allowance for climate change flood extent.
- Where development is proposed in area identified as at flood risk from a reservoir breach, an assessment into whether the reservoir design or maintenance schedule needs improving should be carried out. Expert advice may be required.
- No development (other than ‘Water Compatible’ development) takes place in the small proportion of the site designated as Flood Zone 3.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with floor levels above the ‘wet day’ reservoir and the fluvial design flood event (1% AEP) extents, taking into account climate change.
- If flood mitigation measures are implemented, then it can be demonstrated they will not displace water elsewhere.
- Further assessment of the potential for groundwater flooding (such as ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation measures.
- There are several options available for safe access and egress routes generally heading in a northerly direction, away from the River Granta. A Flood Warning and Evacuation Plan should be prepared for the site if development is located within Flood Zone 2 or 3a.
- Consideration is given to the integration of water management and SuDS at the site and how the site can contribute to wider flood management benefits across the catchment. The adjacent Strategic Enhancement Area

(S/SEA/BRC: Babraham Research Campus: Green Belt Enhancement Land) should also be considered as it may offer opportunities to reduce flood risk through nature-based solutions.

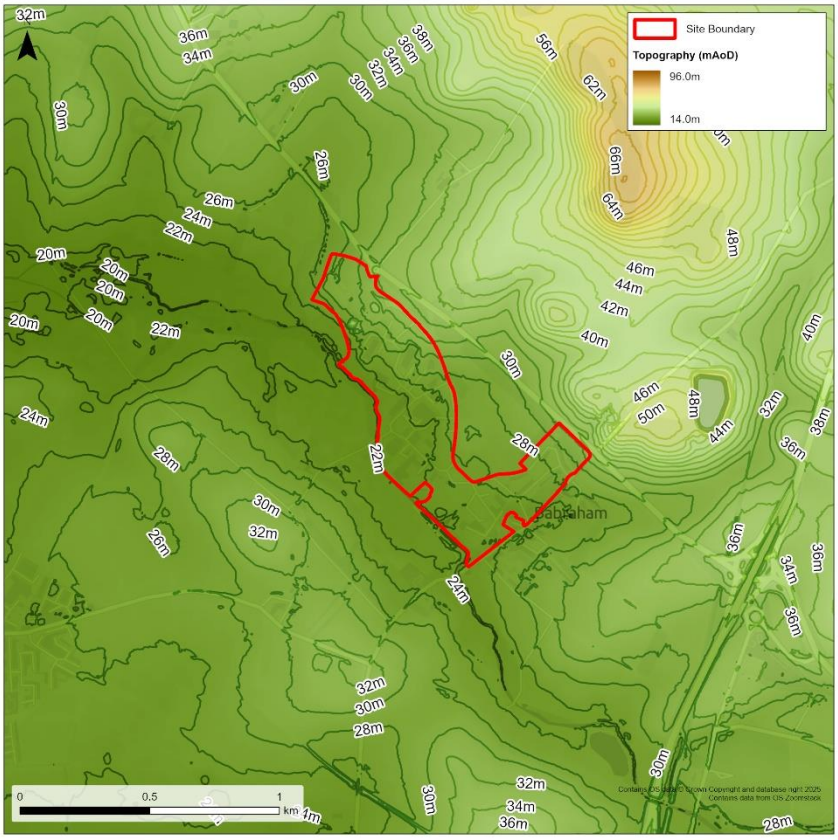

Figure 59: Site Topography

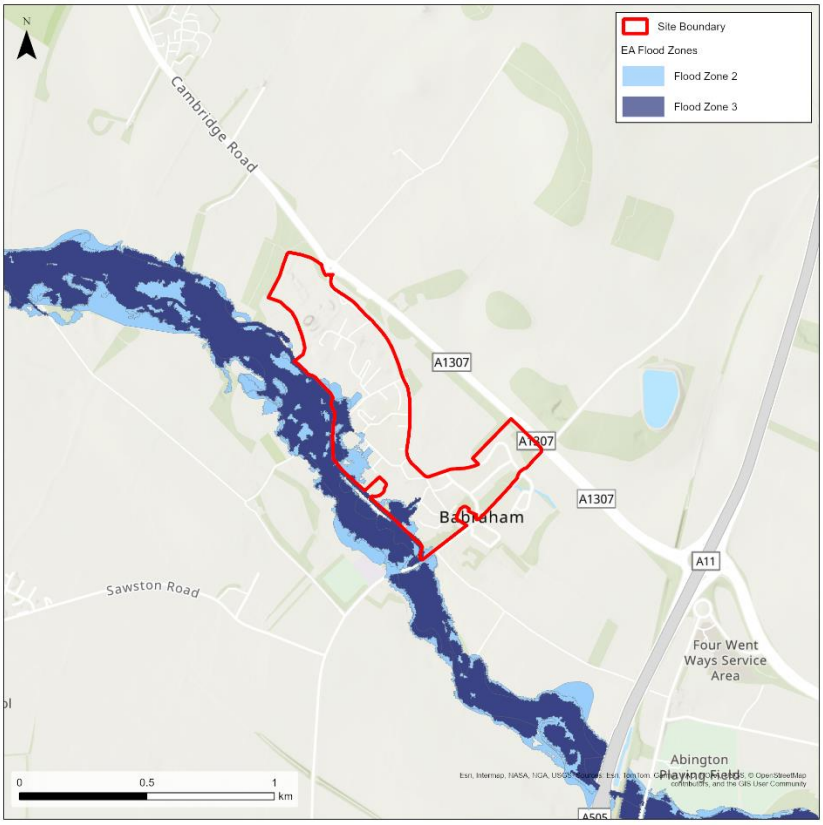

Figure 60:Flood Zones (Present Day)

Figure 61: Functional Floodplain

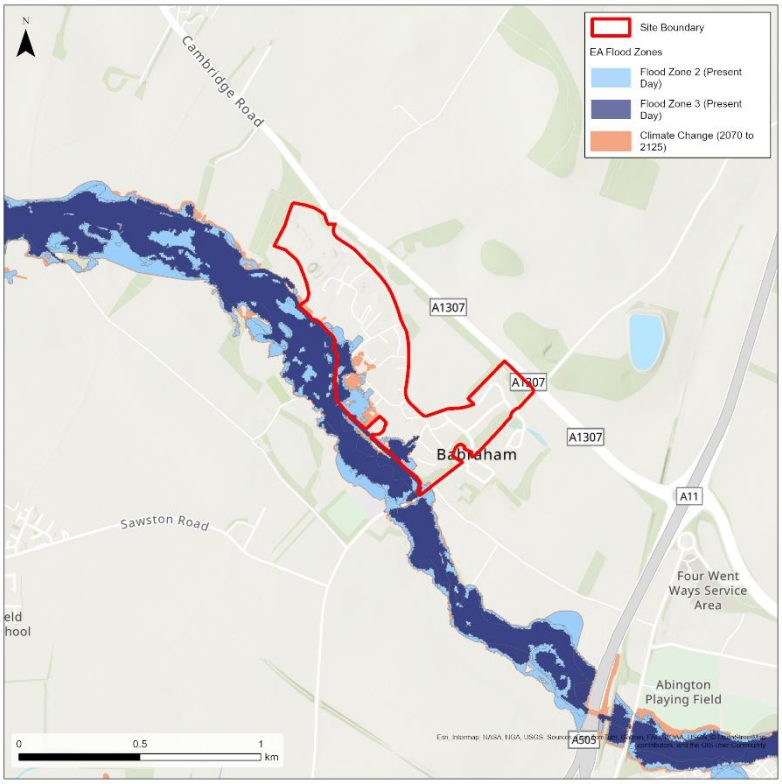

Figure 62: Flood Zones (Climate Change – 2070 to 2125)

Figure 63: Modelled Fluvial Flood Extent (1% AEP)

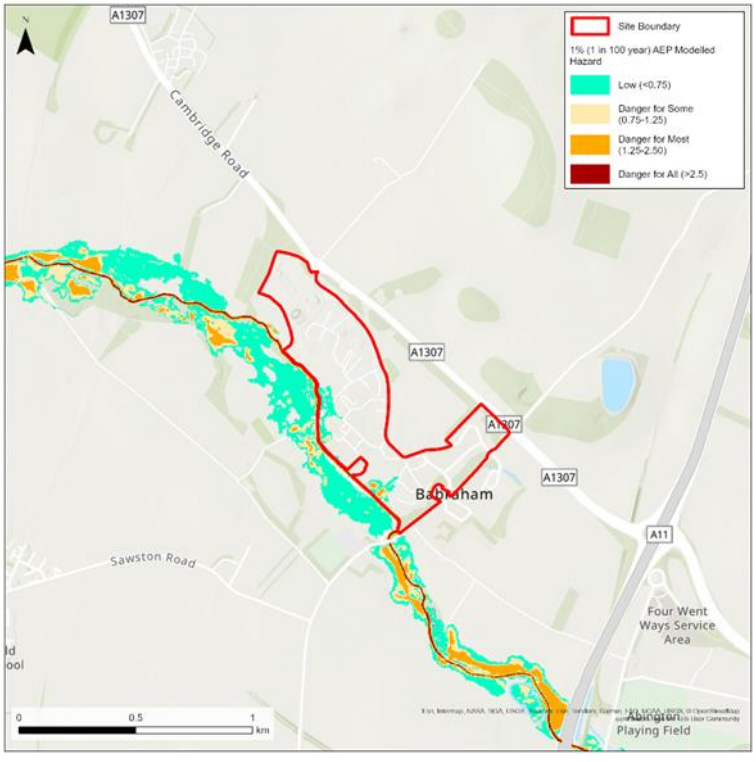

Figure 64: Modelled Fluvial Flood Hazard (1% AEP)

Figure 65: Modelled Fluvial Flood Extent (1% AEP with Climate Change)

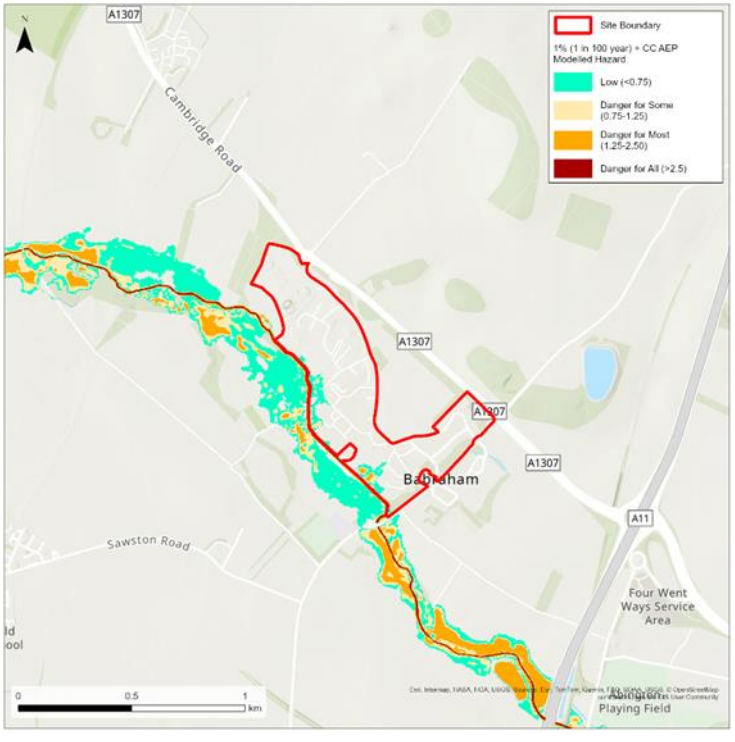

Figure 66: Modelled Fluvial Flood Hazard (1% AEP with Climate Change)

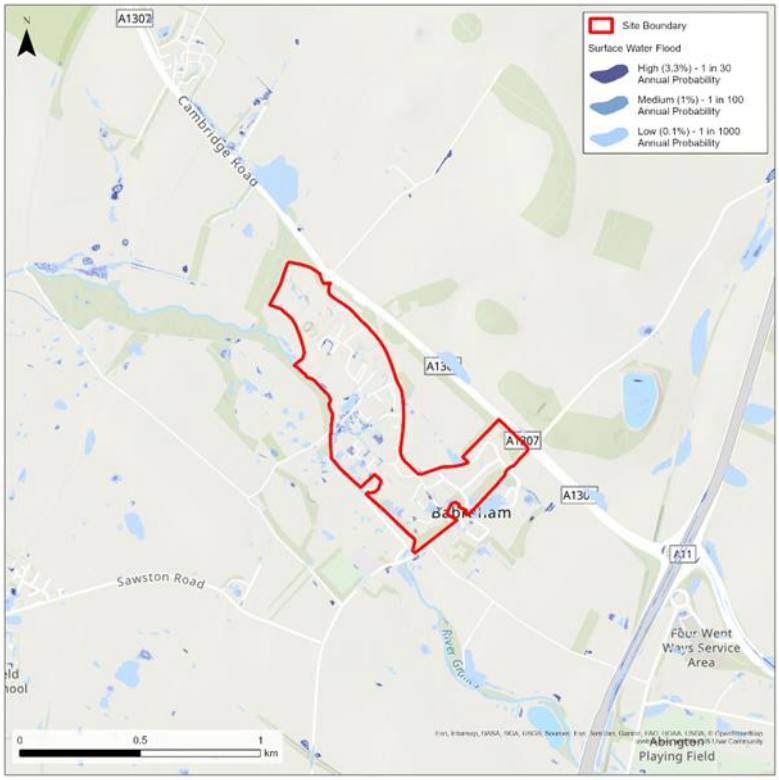

Figure 67: Risk of Flooding from Surface Water Map

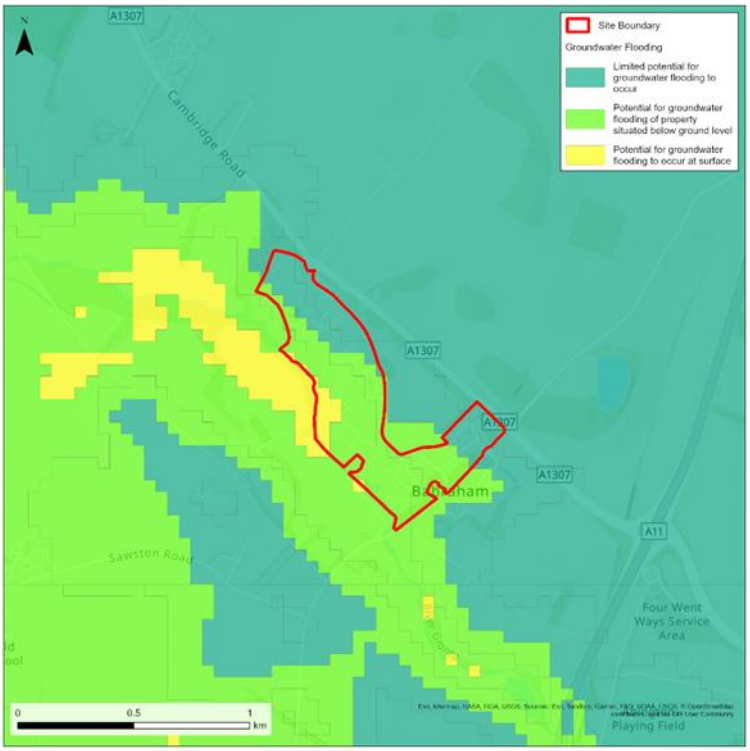

Figure 68: Susceptibility to Groundwater Flooding Map

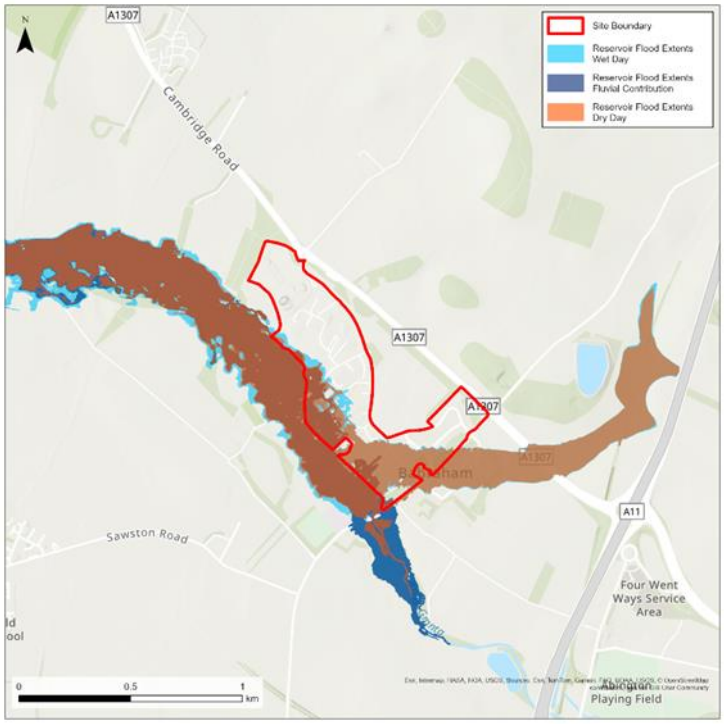

Figure 69: Reservoir Flood Extent

Site Name: Cambourne North

1 Site Details

Site Reference: S/CBN

Site Reference: S/CBN
OS Grid reference: TL 31694 60821
Area: 664.49 Hectares
Proposed site use: Mixed use including residential (new settlement/urban extension)
Vulnerability Classification: Residential – More Vulnerable; Commercial use – Less Vulnerable.

Existing Watercourses:

The site lies within the 'Upper and Bedford Ouse Management Catchment' and the 'Great Ouse Lower' Operational Catchment. There are no Main Rivers located in or close to the site. A branching network of ditches [designated as Ordinary Watercourses] is located in the central area of the proposed development site, flowing in a northerly direction.

2 Sources of Flood Risk

2.1 Fluvial

Flood Zone	Proportion of Site within Flood Zone (%)
Flood Zone 1	100%
Flood Zone 2	0%
Flood Zone 3	0%

Environment Agency (EA) Flood Zone mapping indicates that the entire site is located in Flood Zone 1.

The Flood Zone mapping does not cover the entire extent of Ordinary Watercourses on site. The Risk of Flooding from Surface Water map has therefore been used as a proxy to assess flood risk from these watercourses for the purposes of this site assessment.

Flood modelling is not available for the site.

2.2 Surface Water

Risk of Surface Water Flooding	Proportion of Site at Risk (%)
Low (0.1% AEP)	3%
Medium (1% AEP)	1%
High (3.33% AEP)	2%

EA Risk of Flooding from Surface Water mapping indicates that the majority of the site is not affected by surface water flooding. For the 3.3% Annual Exceedance Probability (AEP) (high risk) event, surface water flood risk is largely confined to areas immediately surrounding the ordinary watercourses, with areas of ponding to the west of St Neot's Road at the junction with A1198.

For the 1% AEP (medium risk) event additional small, scattered areas of ponding are shown in the southern half of the site.

In the 0.1% AEP (low risk) event, additional areas of ponding are shown in the central and southern parts of the site with additional overland flow paths running from south to north towards the ordinary watercourses in the northern part of the site.

EA Long Term flood risk mapping indicates that surface water flood depths across the site are likely to be less than 200mm with some localised depths of between 300-600mm in and around the Ordinary Watercourses.

According to the 'Cambourne Growth Strategy Programme, Review of Strategic Flood Risk Assessment' (dated June 2025), the medium risk and high risk surface water flood areas are primarily located in natural topographic depressions at the site, such as farm ditches, lakes, and low-lying areas.

A number of ornamental/angling lakes are located either within or just outside the site boundaries. EA Risk of Flooding from Surface Water mapping does not indicate any risk of flooding from these lakes to the site.

A small pond/reservoir is located within the site boundary and the mapping indicates some minor surface water flood impacts localised to the area surrounding the pond.

2.3 Groundwater

The BGS 'Susceptibility to Groundwater Flooding' dataset indicates that there is a potential for groundwater flooding to occur at surface level (22% of the site area, around the watercourses within the site); and a potential for flooding of property situated below ground level (59% of the site area). The dataset indicates susceptibility to flooding and is not indicative of a specific level of hazard or risk.

BGS Geology mapping (at 1:50000 scale) indicates that superficial deposits of the Oadby Till Formation overlie the site which is likely to have variable composition including clay, silt, sand, gravel and larger cobbles. Groundwater flood risk will therefore vary across the site dependent on the specific underlying geology.

2.4 Reservoir

The site is not located in an area shown to be at risk from reservoir flooding.

2.5 Flood History

No historic flooding is recorded at the site location.

3 Climate Change Implications

The impacts of climate change on flood risk from the ordinary watercourses has not been modelled as part of this SFRA. In accordance with the guidance provided in the Level 1 SFRA where modelled data is unavailable, the Flood Map for Planning Flood Zones plus Climate Change map, and the 'low' risk surface water event have been used as a proxy.

3.1 Fluvial

The EA Flood Map for Planning indicates the modelled climate change flood extents for the combined Flood Zones 2 and 3 for the period 2070-2125. The mapping shows only a very minor increase in the extent of fluvial flooding from present day extents, and the flood extents remain confined to areas immediately adjacent to the Ordinary Watercourse located to the north of the site. All areas of the site are shown to remain in Flood Zone 1.

3.2 Surface Water

Overland flow paths, flood extents and flood depths do not change significantly from the present- day scenario in the climate change scenario shown in the EA Risk of Flooding from Surface Water mapping (2040-2060). The lifetime of the development will extend beyond 2060, so the present day 0.1% AEP (low risk) surface water mapping has also been used as a conservative proxy for future climate change. As noted above, although minor areas of ponding and south to north flow paths are shown in the mapping, the majority of the site remains unaffected by surface water flooding.

3.3 Groundwater

The future impacts of climate change on groundwater levels are complex, difficult to model and not well understood.

Due to increased rainfall expectations with climate change, it should be assumed that the groundwater table could be impacted in future and may rise during wetter periods of the year. This will need to be considered for the design of finished ground floor levels, foundations and any basement areas.

4 Flood Risk Management Infrastructure

Defences

The site is not protected by any formal flood defences.

Residual Risk

There are no identified residual risks from flood management infrastructure.

5 Emergency Planning

Flood Warning

The site is not located in an area covered by EA flood warnings or Flood Alerts.

Access and Egress

There are several options available for access/egress to the site. These include access from existing roads around the site, including the A1198 road located to the west of the site, St Neot's Road to the south of the site, and the un-named road to the east of the site between St Neot's Road and Knapwell. There is also an existing access track to Cold Harbour Farm in the centre of the site.

Selection of access routes to the site should consider surface water flood risk to ensure that the route is compliant with access requirements specified in the Planning Practice Guidance 'Flood Risk and Coastal Change' emergency planning provisions. Ponding and overland flow paths are shown to be present in the south-west corner of the site to the north, east and west of St Neot's Road, and ponding is also present to the west of the access track to Cold Harbour Farm.

6 Broadscale Assessment of Sustainable Drainage Systems (SuDS) Suitability

Infiltration SuDS may not be suitable due to the underlying mudstone bedrock formations. The superficial deposits of the Oadby Till Formation overlying the site are likely to have variable composition and permeability.

Soil classification testing and infiltration testing will be required to establish suitability of SuDS prior to the development of a Drainage Strategy for the site.

7 Opportunities for Wider Sustainability Benefits and Flood Risk Management

The Cambourne Growth Strategy Programme 'Green and Blue Infrastructure Framework' (dated July 2025) outlines the potential for integrated water management strategies across the Cambourne urban extension area, including Cambourne North.

Development of the site should align with the principles and objectives of this Growth Strategy and consider the incorporation of measures that reduce surface water runoff and flood risk. This includes the use of SuDS to contribute to managing surface water runoff, improving water quality, providing flood protection, enhancing biodiversity and contributing to an attractive environment. Rainwater harvesting and other mechanisms should be considered to enable storage and re-use of water.

The watercourses should be maintained and included within the site design as a blue / green corridor to provide ecological, amenity and social value.

There may also be opportunities for flood risk mitigation, drainage management and green infrastructure in the adjacent Strategic Enhancement Area (S/SEA/CBN: Non-development Area Adjacent to Cambourne North), where no built development is to be situated.

8 National Planning Policy Framework (NPPF) and Planning Implications

8.1 Exception Test Requirements

In accordance with the NPPF, 'More Vulnerable' and 'Less Vulnerable' development is considered compatible within Flood Zone 1 and does not require the application of the Exception Test.

8.2 Site Design and FRA Requirements

The sequential approach should be implemented at the site, prioritising more vulnerable residential development within areas outside of surface water flood risk. It should be possible to locate all development outside of these extents, however this should be confirmed with site-specific hydraulic modelling of the ordinary watercourses through the site. Any modelling requirements are to be confirmed with the Lead Local Flood Authority (LLFA).

The developer will need to provide a site-specific FRA which demonstrates that future users of the development are safe from flood hazards from all sources throughout its lifetime. The applicant should demonstrate that the development meets the objectives of the NPPF's policy on flood risk and how mitigation measures will be secured for the lifetime of the development.

The site-specific FRA should undertake hydraulic modelling of the ordinary watercourses to inform the finished floor levels for the development. Modelling requirements should be agreed with the LLFA.

The site-specific FRA should further investigate risk of groundwater flooding (e.g. through groundwater level monitoring) to inform the need for appropriate mitigation measures which may include the incorporation of an appropriate freeboard to the finished ground floor levels.

The availability of safe access and egress will need to be demonstrated for the 0.1% AEP rainfall event, including the climate change allowance applicable to the catchment.

If any basement areas are proposed in residential or commercial units, groundwater flood mitigation and resilience measures should be identified and safe access and egress routes to basement areas should be determined.

9 Conclusions and Recommendations

The development is likely to be able to proceed if:

- A sequential approach is adopted, prioritising the location of more vulnerable residential development outside of areas at risk of surface water flooding, taking into account the impacts of climate change.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation measures.
- Safe access routes are located outside of run-off flow paths and areas identified as at risk of surface water flooding.
- Consideration is given to the integration of water management and SuDS at the site into the wider strategy for Blue-Green Infrastructure for Cambourne; and how the site can contribute to wider flood and water management benefits across the catchment. The adjacent Strategic Enhancement Area (S/SEA/CBN: Non-development Area Adjacent to Cambourne North) may also offer opportunities to reduce flood risk through nature-based solutions.

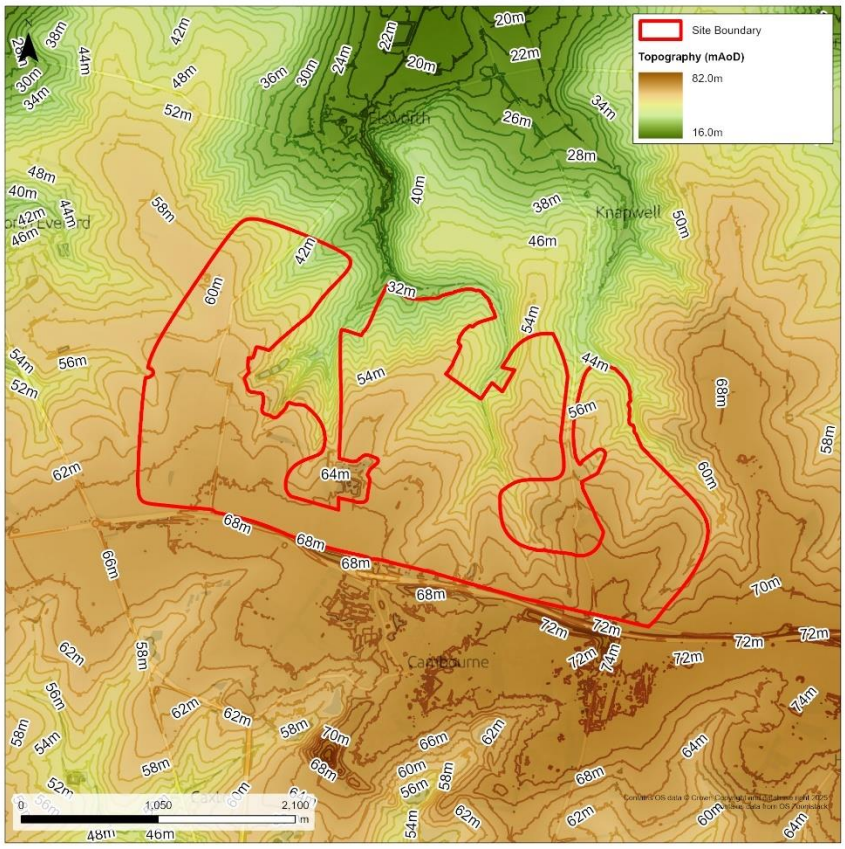

Figure 70: Site Topography

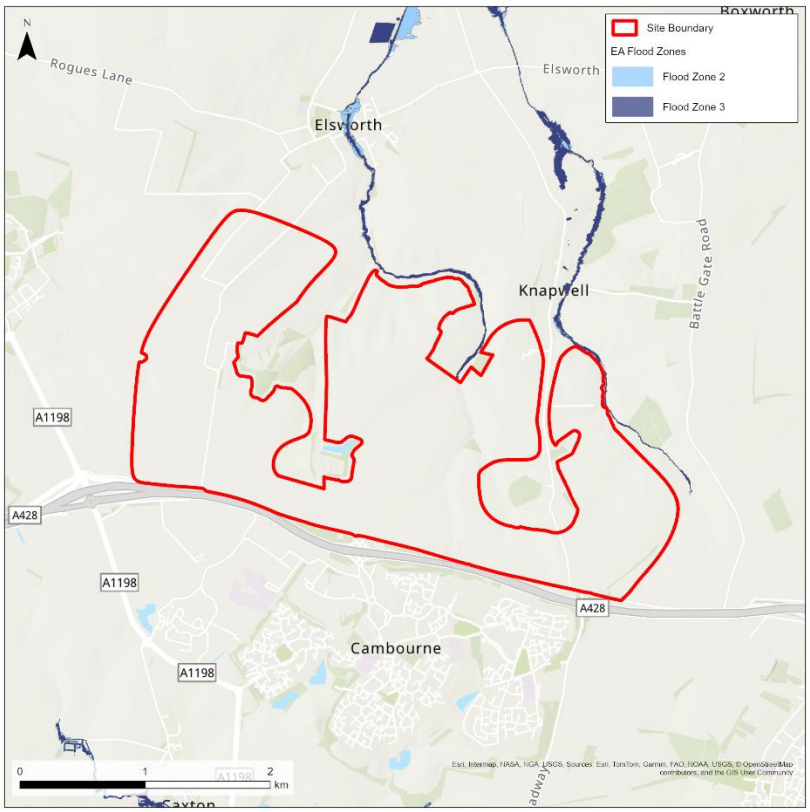

Figure 71: Flood Zones (Present Day)

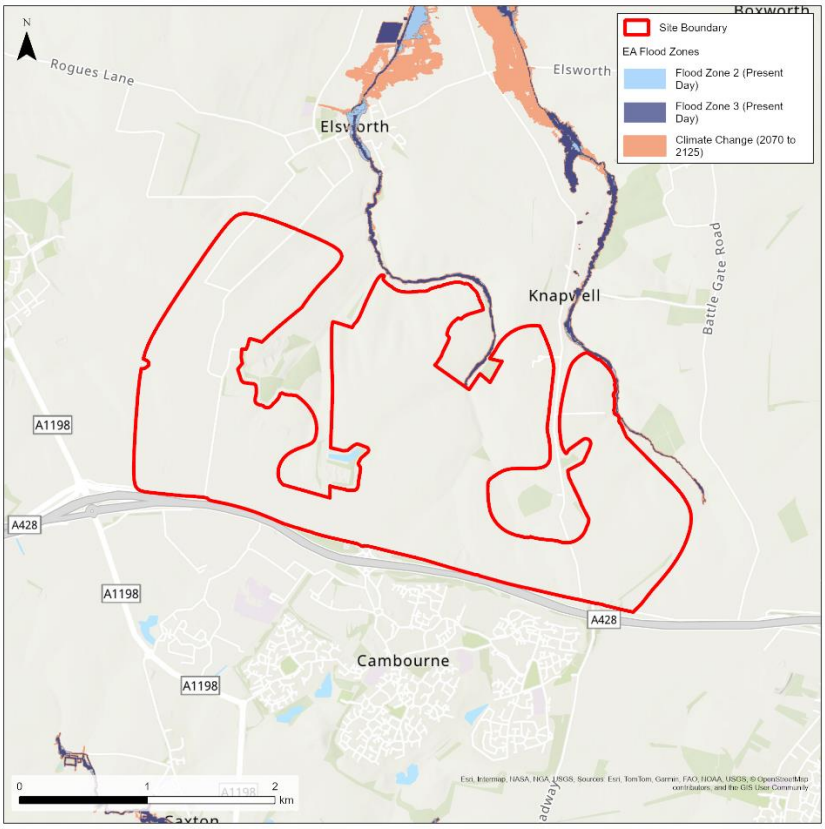

Figure 72: Flood Zones (Climate Change – 2070 to 2125)

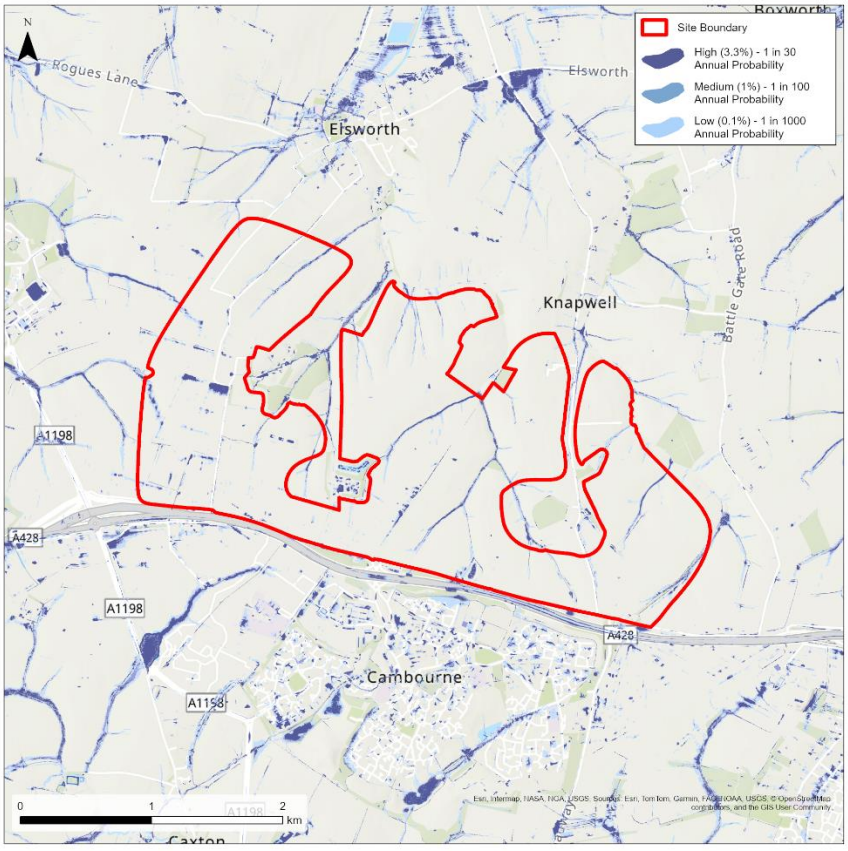

Figure 73: Risk of Flooding from Surface Water Map

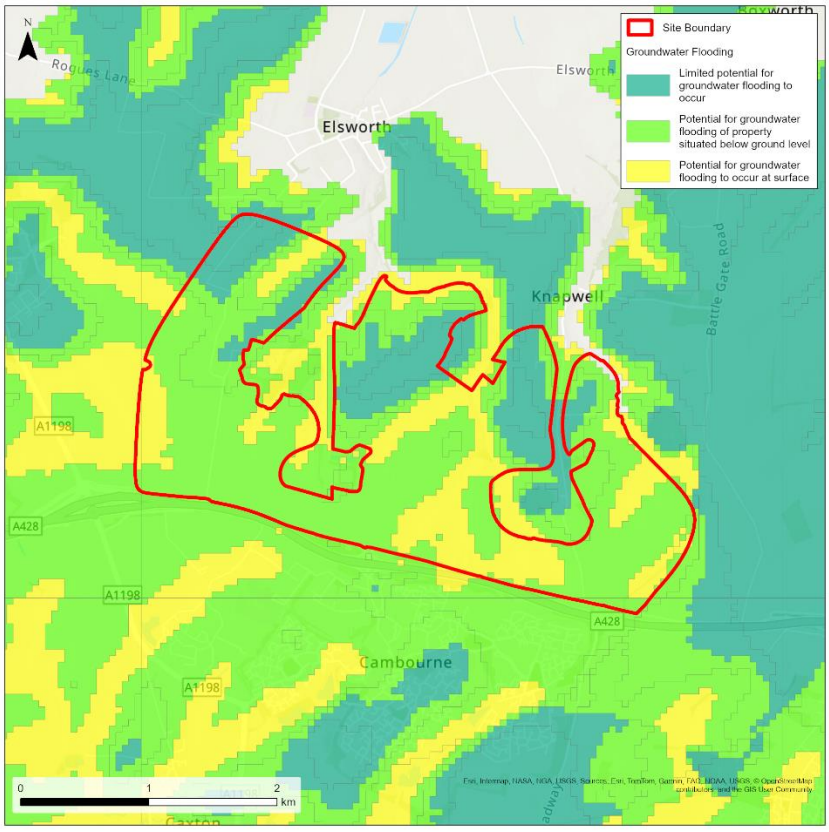

Figure 74: Susceptibility to Groundwater Flooding Map

Site Name: Biomedical Campus (including Addenbrooke's Hospital)

1 Site Details

Site Reference: S/CBC
OS Grid reference: TL 45562 54267
Area: 104.715 Hectares
Proposed site use: Employment including a hospital, research and development, and educational facilities.
Vulnerability Classification: More Vulnerable

Existing Watercourses:

The site lies within the 'Cam Lower' Operational Catchment. There are a series of drainage ditches in the centre and in the south of the site which drain west, culverted under the railway line and into Hobson's Brook. Hobson's Brook is located 400 metres west of the site at the closest point and flows south to north, becoming Vicar's Brook approximately 1 kilometres downstream.

2 Sources of Flood Risk

2.1 Fluvial

Flood Zone	Proportion of Site within Flood Zone (%)
Flood Zone 1	100%
Flood Zone 2	0%

Flood Zone 3	0%

Environment Agency (EA) Flood Zone mapping indicates that the site lies wholly within Flood Zone 1. Flood extents for the Hobson's Brook are contained to the west of the railway line and do not encroach into the site boundary.

The modelled flood extent mapping included in the Level 1 SFRA, derived from the Vicars Brook Flood Zone Improvements Model (2009) confirms that the modelled fluvial flood extents from the River Cam remain confined to the floodplain to the west of the railway line in the most extreme 0.1% Annual Exceedance Probability (AEP) flood event, with no impacts on the site.

EA Flood Zone mapping and the Vicars Brook Model do not appear to incorporate the drainage ditches in the site. The Risk of Flooding from Surface Water map has therefore been used as a proxy to further assess flood risk from these watercourses for the purpose of this assessment.

2.2 Surface Water

Risk of Surface Water Flooding	Proportion of Site at Risk (%)
Low (0.1% AEP)	16%
Medium (1% AEP)	3%
High (3.33% AEP)	6%

EA Risk of Flooding from Surface Water mapping indicates that in the 3.3% AEP event, surface water flooding is predominantly limited to ponding around Addenbrooke's Hospital and other low points in the topography scattered across the site, including around Granham's Road. During the 1% AEP event, there is a slight amplification of the projected flood parcels.

In the 0.1% AEP event, Addenbrooke's Hospital becomes heavily inundated with flood water ponding. There are also areas of significant ponding in the south of the around the existing drainage ditch, indicated to be as a result of runoff from the elevated agricultural fields to the south of the site.

The EA Long Term Flood Risk of Flooding from Surface Water mapping indicates surface water flood depths across the site are likely to be less than 300mm, with some localised depths between 600-900 millimetres around Addenbrooke's hospital.

The Cambridge University Hospitals NHS Foundation Trust Surface Water Management Plan (2018) attributed the risk of surface water flooding around Addenbrooke's Hospital to a lack of flood storage attenuation due to the use of a positive drainage system, and because of the limited capacity of the pumping systems.

2.3 Groundwater

The BGS 'Susceptibility to Groundwater Flooding' dataset indicates that 62% of the site has limited potential for groundwater flooding to occur, with 38% of the site having a potential for flooding of property situated below ground level. The dataset indicates susceptibility to flooding and is not indicative of a specific level of hazard or risk.

Anecdotal evidence within the Cambridge University Hospitals NHS Foundation Trust Surface Water Management Plan (2018) suggests basement levels of the hospital campus are susceptible to groundwater flooding.

BGS Geology mapping indicates that the site is underlain by high permeability chalk, including West Melbury Marly Chalk Formation, Tornhoe Stone Member, and Zig Zag Chalk Formation. The site is indicated to be underlain by a Principal Aquifer. Due to the high storage potential of such geology, groundwater flood risk may be increased in periods of prolonged precipitation.

2.4 Reservoir

The site is not located in an area shown to be at risk from reservoir flooding.

2.5 Flood History

EA Historic Flood Map indicates no historical flood events have been recorded within the site or its vicinity.

According to the Cambridge University Hospitals NHS Foundation Trust Surface Water Management Plan (2018) heavy rainfall in Cambridge City Centre in July 2015 resulted in flooding around Addenbrooke's hospital, in particular in the southwest of the campus at the ATC building and the Rosie Hospital basement.

3 Climate Change Implications

The Vicars Brook Flood Zone Improvements Model did not include climate change allowances. In accordance with the guidance provided in the Level 1 SFRA where modelled data is unavailable, the flood extents recorded as present-day Flood Zone 2, the NaFRA2 datasets for climate change as represented in the online Long Term Flood Risk mapping, and the low-risk surface water event have been used as a proxy.

3.1 Fluvial

The NAFRA2 EA fluvial climate change mapping shows the modelled flood zones for the 2070-2125 epoch, which indicates only a minor increase in the extent of fluvial flooding from present day, and the flood extents remain confined to the floodplain west of the railway line. All areas of the site remain in Flood Zone 1.

3.2 Surface Water

The climate change scenario shown in the EA Risk of Flooding from Surface Water mapping (2040-2060) shows an increase in the risk rating of surface water flooding but minimal changes to the overall extent. It should be noted this dataset takes account of the 'Central" climate change allowance for the 2050s epoch however the lifetime of the development will extend beyond 2060.

Modelling has previously been undertaken for the expansion land of the Biomedical Campus in 2023 using a direct rainfall model in ESTRY-TUFLOW, and this included a future baseline scenario which accounted for planned development in the vicinity of the site. Model outputs included the 1 in 100-year rainfall event plus a 40% allowance for climate change, which showed similar extents to the 0.1% AEP event in the EA Risk of Flooding from Surface Water mapping (2040-2060), with peak flood depths typically less than 300 millimetres.

3.3 Groundwater

The future impacts of climate change on groundwater levels are complex, difficult to model and not well understood.

Due to increased rainfall expectations with climate change, it should be assumed that the groundwater table could be impacted in future and may rise during wetter periods of the year. This will need to be considered for the design of finished ground floor levels, foundations and any basement areas.

4 Flood Risk Management Infrastructure

Defences

The site is not protected by any formal flood defences.

Residual Risk

There are no identified residual risks from flood management infrastructure.

5 Emergency Planning

Flood Warning

Parts of the site fall under the River Cam from Stapleford to Waterbeach Flood Alert Area. The site does not lie within a Flood Warning Area.

Access and Egress

There are a number of existing access/egress points to the site, including along Hills Road (A1307) in the east, and Long Road and the A1134 in the north. For the southern area of the site, access options include from the existing campus in the north, Addenbrooke's road in the southwest, and Granham's Road in the southeast.

Selection of access and egress routes to the site should consider surface water flood risk to ensure that the route is compliant with access requirements specified in the Planning Practice Guidance 'Flood Risk and Coastal Change' emergency planning provisions.

6 Broadscale Assessment of Sustainable Drainage Systems (SuDS) Suitability

Given the chalk bedrock, infiltration rates may prove favourable in the undeveloped land to the south. If infiltration is suitable, due consideration should be given to the potential for dissolution features. As the site is located on a Principal Aquifer, suitable levels of pre-treatment would be required prior to discharge to ground to reduce the risk of groundwater pollution.

Infiltration testing and groundwater monitoring will be required to establish suitability of SuDS prior to the creation of a Drainage Strategy for the site.

Discharge to watercourse would need to consider capacity restrictions of the existing downstream culverts.

7 Opportunities for wider sustainability benefits and flood risk management

Opportunity to provide an integrated green-blue infrastructure scheme which manages surface water flood risk at site and improves downstream flood risk around Hobson's Brook. This could include enhancement of the existing drainage ditch as a blue-green corridor to also provide ecological, amenity, and social value.

Development of the site should have due regard for the recommendations of the Cambridge University Hospitals NHS Foundation Trust Surface Water Management Plan (2018). This includes identifying opportunities to retrofit SuDS within the existing campus and providing additional storage capacity.

There may also be opportunities for flood risk mitigation, drainage management and green infrastructure in the adjacent Strategic Enhancement Area, where no built development is to be situated.

8 National Planning Policy Framework (NPPF) and Planning Implications

8.1 Exception Test Requirements

In accordance with the NPPF, 'More Vulnerable' development is considered compatible within Flood Zone 1 and does not require the application of the Exception Test.

The sequential approach should be implemented in the design of the site, prioritising more vulnerable development within areas outside of surface water flood risk.

8.2 Site Design and FRA Requirements

The developer will need to provide a site-specific FRA which demonstrates that future users of the development are safe from flood hazards from all sources throughout its lifetime. The applicant should demonstrate that the development meets the objectives of the NPPF's policy on flood risk and how mitigation measures will be secured for the lifetime of the development.

The sequential approach should be implemented in the design of the site, prioritising more vulnerable development within areas outside of surface water flood risk.

The risk of surface water flooding must be addressed through a Surface Water Drainage Strategy (SWDS) for the site and should outline how development will

manage and mitigate these risks. The SWDS should also address how the development will maintain existing overland surface water flow routes in the south of the site.

The SWDS should complement and expand upon the existing recommendations and actions from the Cambridge University Hospitals NHS Foundation Trust Surface Water Management Plan (2018).

If the existing access routes are amended, the availability of safe access and egress will need to be demonstrated using flood depth, velocity and hazard outputs for the 0.1% AEP rainfall flood events, including the climate change allowance applicable to the catchment. Access routes should be raised at least 300 millimetres above the flood level. If raising of access routes is required, this must not impact on surface water flow routes.

The site-specific FRA should also investigate the risk of groundwater flooding (e.g. through groundwater level monitoring) to inform the delivery of appropriate mitigation measures, which may include the incorporation of an appropriate freeboard to the finished ground floor levels.

If basement areas are proposed, the groundwater investigation should inform whether groundwater flood mitigation and resilience measures are to be required. Safe access and egress routes to basement should consequently be demonstrated.

9 Conclusions and Recommendations

The development is likely to be able to proceed if:

- A sequential approach is adopted, prioritising the location of more vulnerable residential development outside of areas at risk of surface water flooding, taking into account the impacts of climate change.
- Existing overland surface water flow paths are maintained, and the risk of surface water flooding is mitigated through a Surface Water Drainage Strategy.
- Consideration is given to the integration of water management and SuDS at the site, and how the site can contribute to wider flood management benefits across the catchment, including, where appropriate, retrofitting of SuDS within the existing campus. The adjacent Strategic Enhancement Area may also offer opportunities to reduce flood risk through nature-based solutions.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the required freeboard for finished floor levels.
- Any changes to existing access routes are located outside of areas noted as overland flow paths, areas identified as at risk of surface water flooding including climate change.

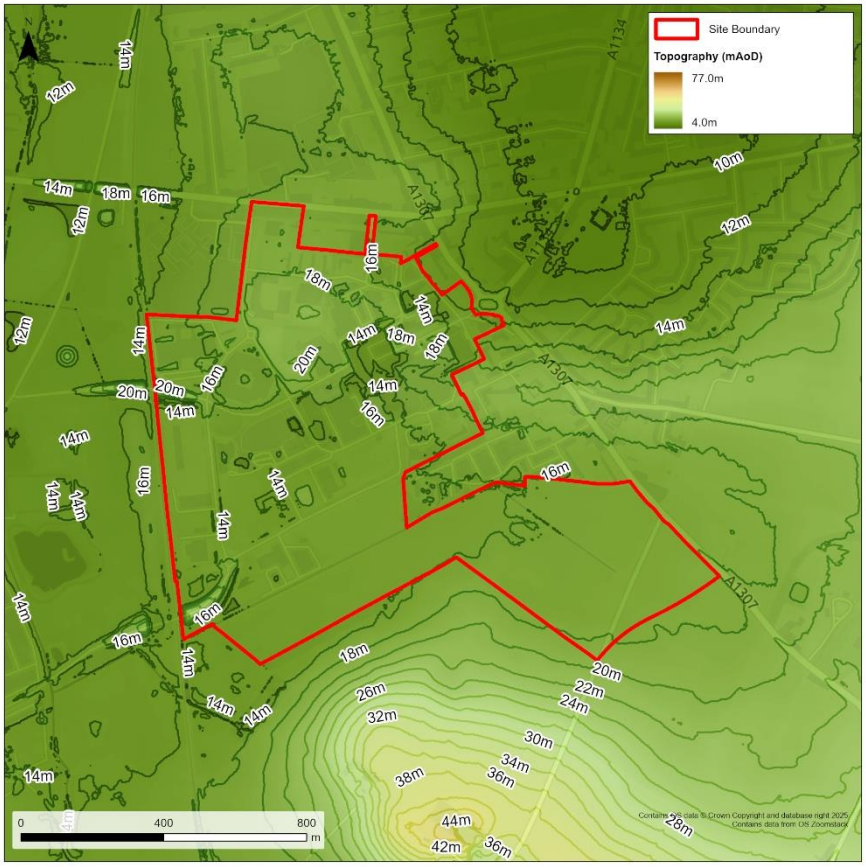

Figure 75: Site Topography

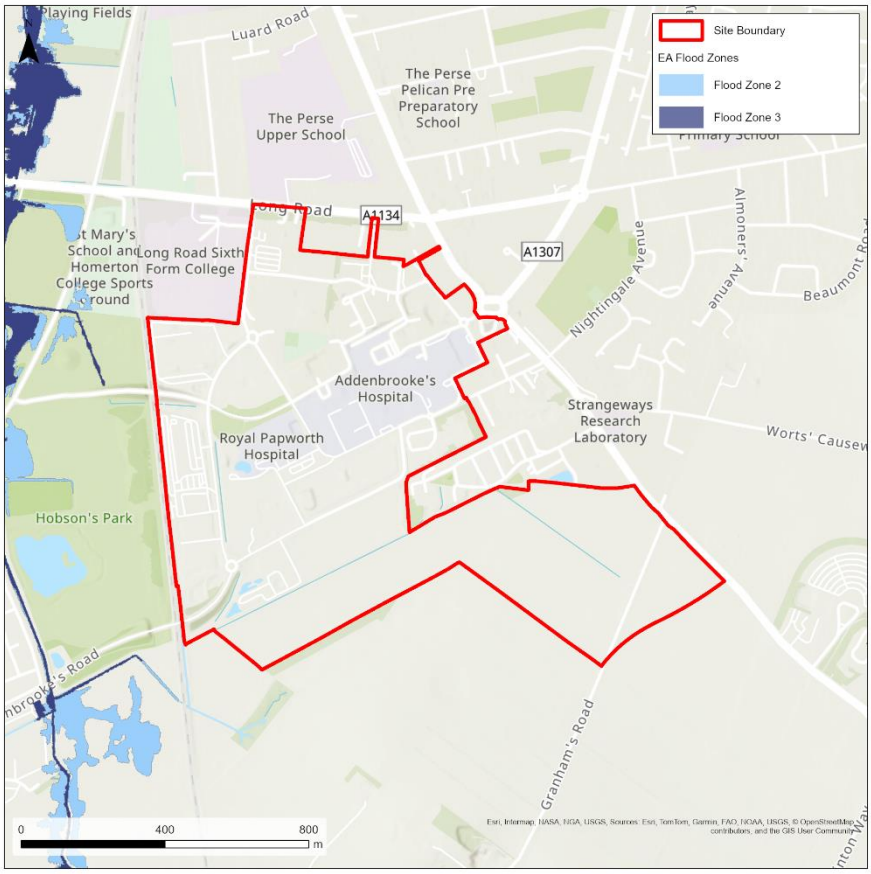

Figure 76: Flood Zones (Present Day)

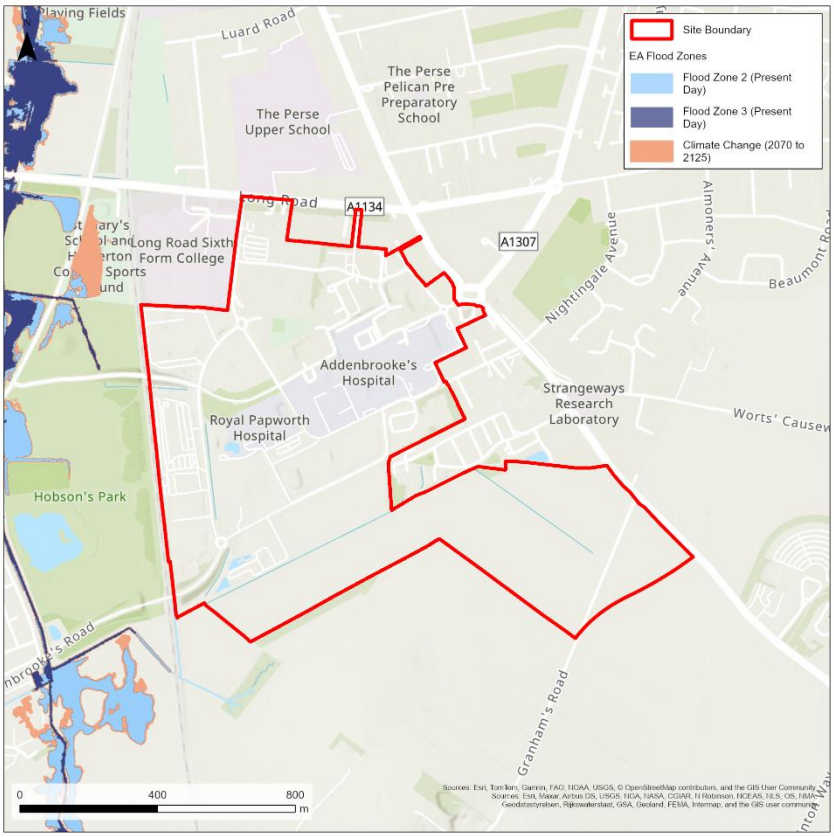

Figure 77: Flood Zones (Climate Change – 2070 to 2125)

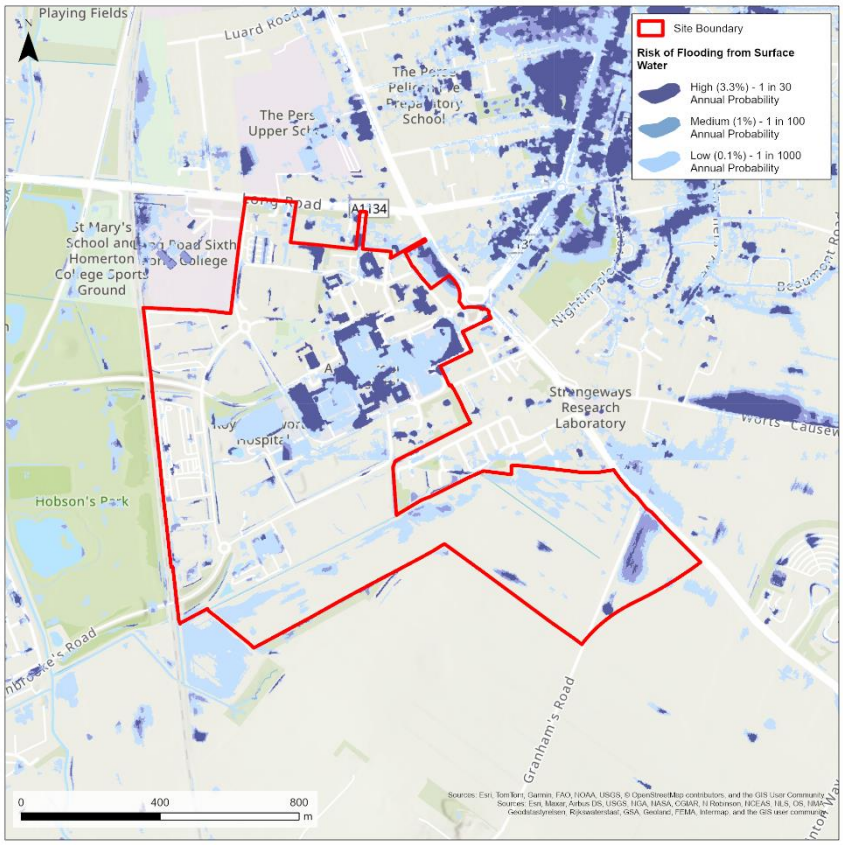

Figure 78: Risk of Flooding from Surface Water Map

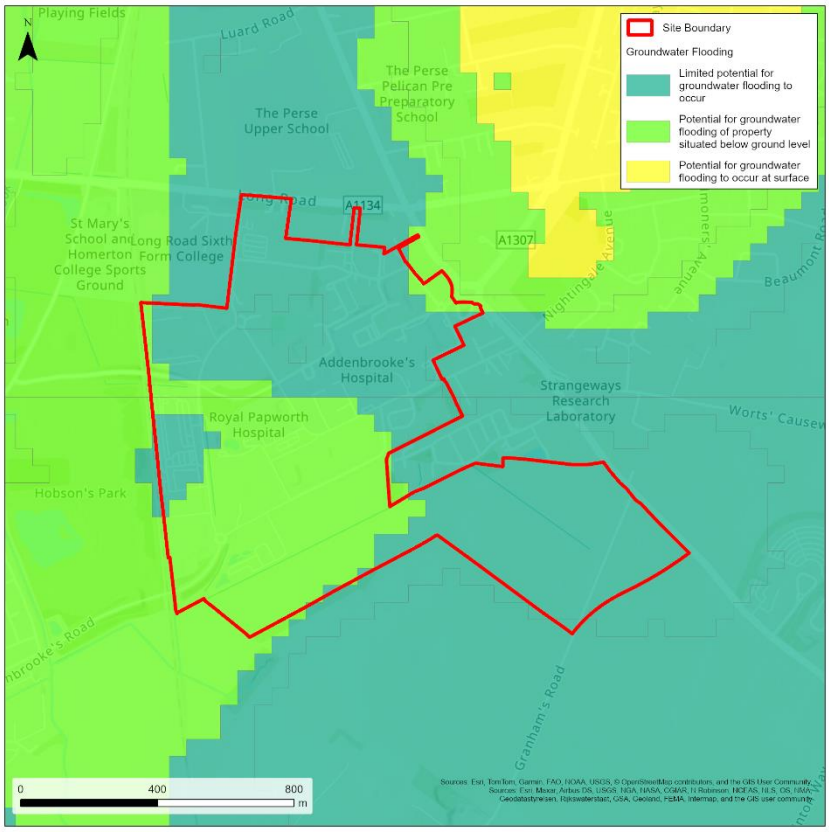

Figure 79: Susceptibility to Groundwater Flooding Map

Site Name: Clifton Road Area

1 Site Details

Site Reference S/C/CLT
OS Grid reference: TL 45562 54267
Area: 7.26 Hectares
Proposed site use: Mixed Use (Including residential)
Vulnerability Classification: More Vulnerable (residential) and Less Vulnerable (Employment)

Existing Watercourses:

The proposed development site lies within the 'Cam and Ely Ouse' Management Catchment and the 'Cam Lower' Operational Catchment.

No watercourses exist within or in proximity of the site boundary. The closest watercourse (Hobson's Brook) is situated approximately 670 metres to the south-west.

2 Sources of Flood Risk

2.1 Fluvial

Flood Zone	Proportion of Site within Flood Zone (%)
Flood Zone 1	100%
Flood Zone 2	0%
Flood Zone 3	0%

Environment Agency (EA) Flood Map for Planning showing each Flood Zone indicates that the entirety of the site is located within Flood Zone 1 (land assessed as having a less than 0.1% of river or sea flooding. As a result, the site is at very low risk of fluvial flooding.

2.2 Surface Water

Risk of Surface Water Flooding	Proportion of Site at Risk (%)
Low (0.1% AEP)	15%
Medium (1% AEP)	3%
High (3.33% AEP)	10%

The EA Risk of Flooding from Surface Water mapping indicates the site is at risk of surface water flooding.

During the 3.3% Annual Exceedance Probability (AEP) event, there is a notable area of pluvial flood risk in the north of the site where water is shown to pond in a low-lying area adjacent railway embankment. Across the remainder of the site, there are isolated areas at surface water flood risk shown between existing buildings and along roads.

During the 1% AEP event, the projected flood parcels are amplified, encroaching further on areas in the west and centre of the site.

During the 0.1% AEP event, a greater proportion of the site is inundated with new areas of flooding along Clifton Road. The area of ponding water adjacent to the railway line has extended to the north and south.

2.3 Groundwater

The BGS 'Susceptibility to Groundwater Flooding' map indicates that there is limited potential for groundwater flooding to occur at both surface level and below ground level for the entirety of the site.

The dataset indicates susceptibility to groundwater flooding and is not indicative of a specific level of hazard or risk.

BGS Geology mapping (at 1:50000 scale) indicates that the site is underlain by a bedrock of the West Melbury Marly Chalk Formation with river terrace deposits 3 - sand and gravel recorded superficial deposits.

Available borehole records were assessed, and no recent records were found that held groundwater level information in the area surrounding the site. The closest log at the Cambridge University Press site reports a water level of 2.25 metres below ground. This recorded groundwater level may not be representative of present-day groundwater levels and may not be reflected at the site location.

2.4 Reservoir

The site is not located in an area indicated to be at risk of reservoir flooding.

2.5 Flood History

Anglian Water historic sewer flooding records indicate that external sewer flooding occurred just outside the site's northwestern boundary (CB1 3QN) in 2015, 2017, 2023 and 2024. The cause of sewer flooding is not identified.

3 Climate Change Implications

3.1 Fluvial

The EA Flood Map for Planning climate change mapping (2070-2125) indicates that the site is not impacted by fluvial flooding in the climate change scenario.

3.2 Surface Water

The EA Risk of Flooding from Surface Water Mapping (2040-2060) dataset has been used to determine the impacts of climate change on surface water flood risk. Overland flow paths, flood extents and flood depths do not change significantly from the present-day scenario in the climate change scenario shown.

The 2040-2060 dataset has been used as it has been determined the most accurate current dataset for future surface water flood risk. As the lifetime of the proposed development extends beyond 2060, the 0.1% AEP surface water flood event may be used as proxy for future climate change. Similar flood extents are highlighted within this event, indicating that much of the site is at risk of pluvial flooding, including existing built development and the main access/egress road.

3.3 Groundwater

The future impacts of climate change on groundwater levels are complex, difficult to model and not well understood.

Due to increased rainfall expectations with climate change, it should be assumed that the groundwater table could be impacted in future and may rise during wetter periods of the year. This will need to be considered for the design of finished ground floor levels, foundations and any basement areas.

4 Flood Risk Management Infrastructure

Defences

No existing flood defences are located within the site or its direct vicinity. The site is not protected by any formal flood defences.

Residual Risk

There is no highlighted residual risk to the site from flood risk management infrastructure.

5 Emergency Planning

Flood Warning

The site is not located in an area covered by EA flood warnings.

Access and Egress

There are various existing access/egress points to the site. Selection of access routes to the site should consider surface water flood risk to ensure that the route is compliant with access requirements specified in the Planning Practice Guidance ‘Flood Risk and Coastal Change’ emergency planning provisions. Proposed access

and egress routes within the site should be located outside of areas of identified high surface water flood risk.

The existing main access and egress route is to the north and south via Clifton Road. This road is shown to be outside of the surface water flood extents for the 3.3% and 1% AEP events; however, it becomes inundated during the 0.1% AEP event. Flood depth and hazard mapping should be used to guide decision making on a safe access route.

6 Broadscale Assessment of Sustainable Drainage Systems (SuDS) Suitability

Geology at the site consists of the West Melbury Marly Chalk Formation with river terrace deposits 3 - sand and gravel recorded superficial deposits.

Most source control techniques are therefore likely to be suitable due to high permeability bedrock and superficial geology present across the areas of the site.

Soil classification testing and infiltration testing will be required to establish suitability of SuDS prior to the development of a drainage strategy for the site.

The site is not located in a Groundwater Source Protection Zone.

7 Opportunities for wider sustainability benefits and flood risk management

Redevelopment of the site provides an opportunity to integrate water harvesting and water re-use technologies into the new buildings and manage and mitigate surface water flood risk on site. This will contribute to overall sustainability and flood risk benefits in the Greater Cambridge area.

Potential opportunities for SuDS to manage surface water runoff whilst providing wider sustainability benefits exist, despite the small size of the site. Opportunities that offer high drainage potential within limited space include, but are not limited to, permeable paving, bioretention areas, green roofs and swales.

8 National Planning Policy Framework (NPPF) and Planning Implications

8.1 Exception Test Requirements

In accordance with the NPPF, the site is classified as a ‘More Vulnerable’ development, which is considered compatible within Flood Zone 1 and does not require the application of the Exception Test.

8.2 Site Design and FRA Requirements

The developer will need to provide a site-specific FRA which demonstrates that future users of the development are safe from flood hazards from all sources throughout its lifetime. The applicant should demonstrate that the development meets the objectives of the NPPF's policy on flood risk and how mitigation measures will be secured for the lifetime of the development.

The risk of surface water flooding must be addressed through a Surface Water Drainage Strategy (SWDS) for the site and should outline how development will manage and mitigate these risks. The SWDS should also address how the development will maintain existing overland surface water flow routes in the south of The sequential approach should be implemented at the site, prioritising more vulnerable residential development within areas outside of surface water flood risk.

The developer will need to provide a site-specific FRA which demonstrates that future users of the development are safe from flood hazards from all sources throughout its lifetime. The applicant should demonstrate that the development meets the objectives of the NPPF's policy on flood risk and how mitigation measures will be secured for the lifetime of the development.

The site-specific FRA should further investigate risk of groundwater flooding (for example through groundwater level monitoring) to inform the need for appropriate mitigation measures which may include the incorporation of an appropriate freeboard to the finished ground floor levels.

The risk of surface water flooding must be addressed through the Surface Water Drainage Strategy, and this should outline how the development will manage and mitigate these risks.

The availability of safe access and egress will need to be demonstrated for the 0.1% annual probability rainfall flood events, including the climate change allowance applicable to the catchment.

If basement areas are proposed in residential or commercial units, groundwater flood mitigation and resilience measures should be identified and safe access and egress routes to basement areas should be determined.

9 Conclusions and Recommendations

The development is likely to be able to proceed if:

- A sequential approach is adopted, prioritising the location of more vulnerable residential development outside of areas identified to be at surface water flood risk.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward.

- If flood mitigation measures are implemented, then they are tested to ensure that they will not displace water elsewhere.
- Safe access and egress will need to be demonstrated in the 1 in 0.1% AEP plus climate change rainfall events, using the depth, velocity and hazard outputs.

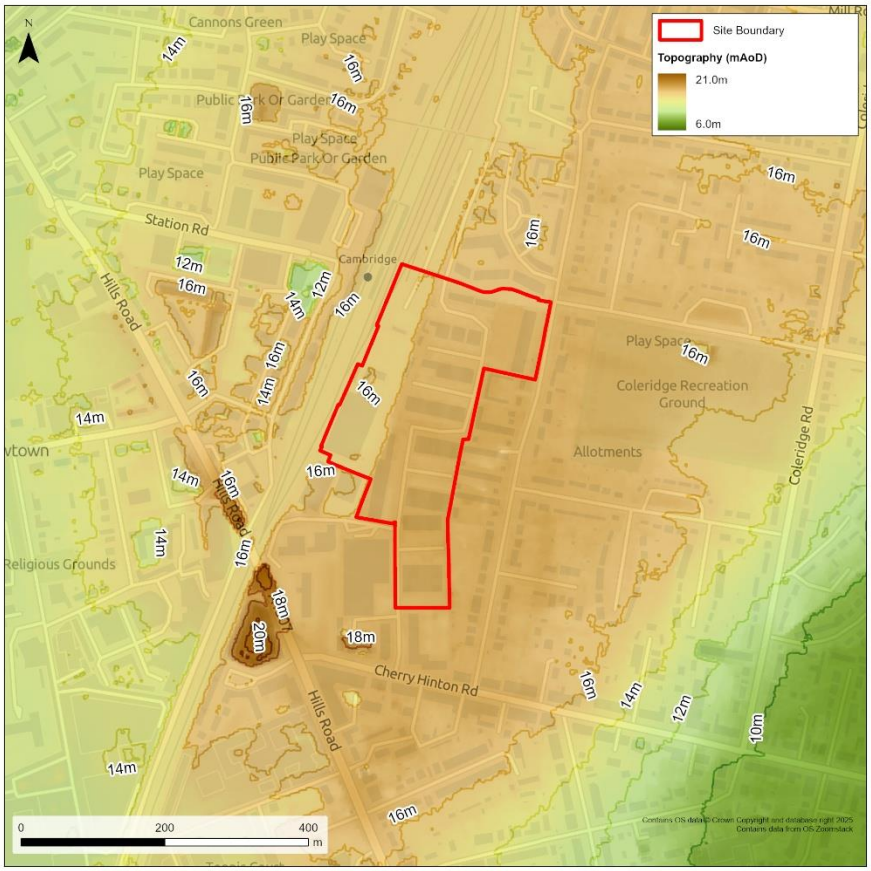

Figure 80: Site Topography

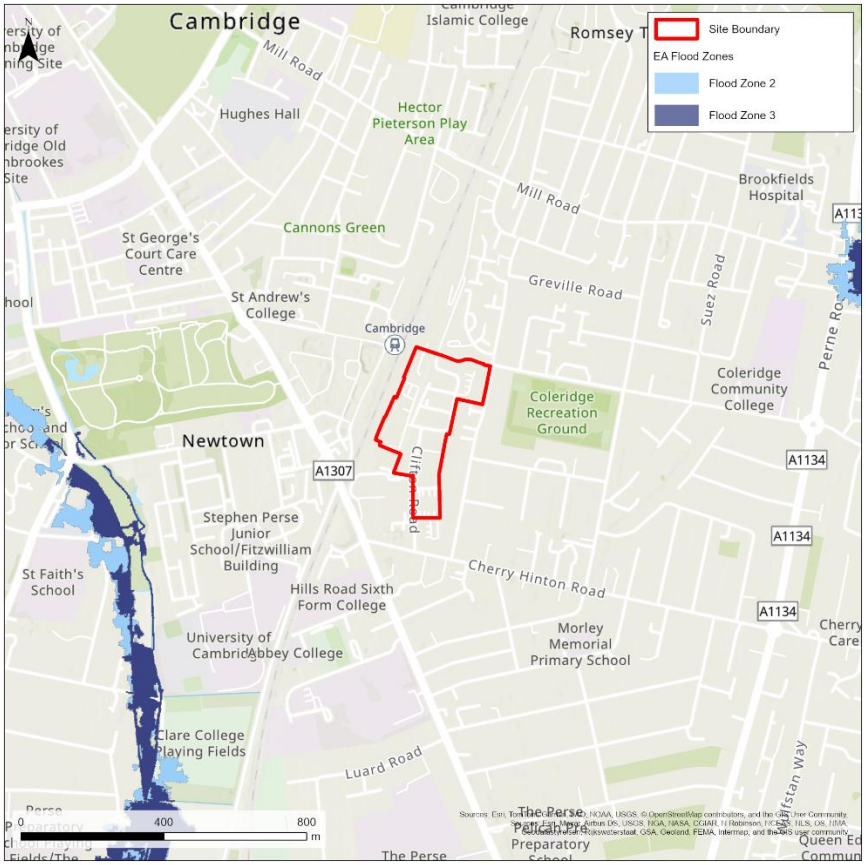

Figure 81: Flood Zones (Present Day)

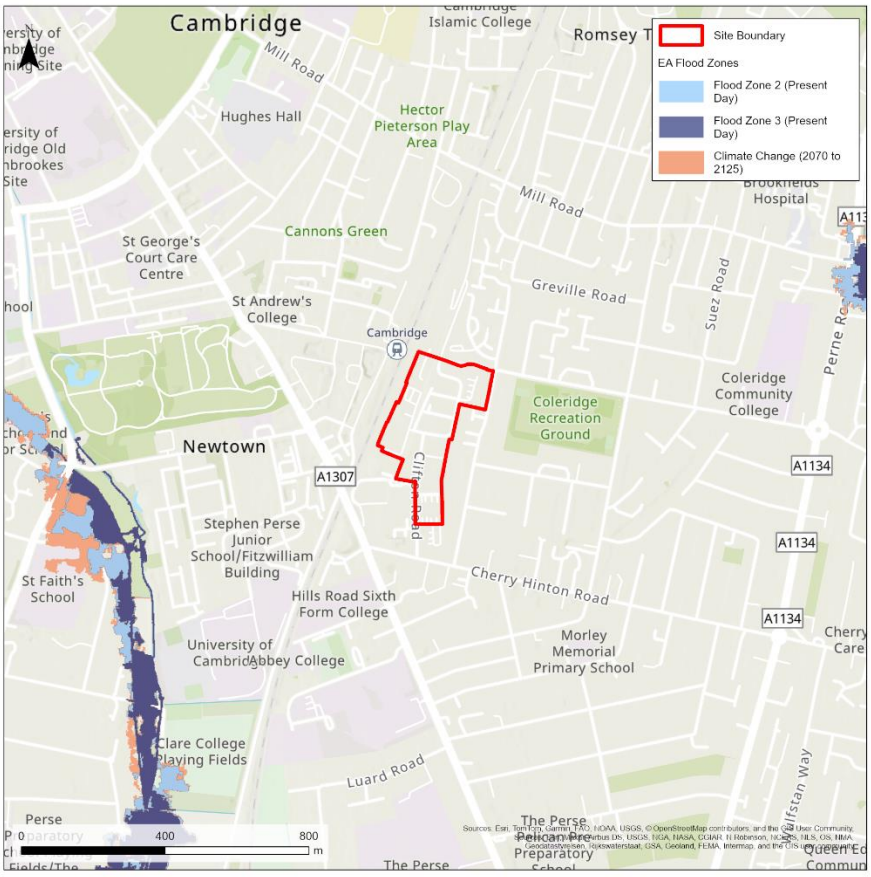

Figure 82: Flood Zones (Climate Change – 2070 to 2125)

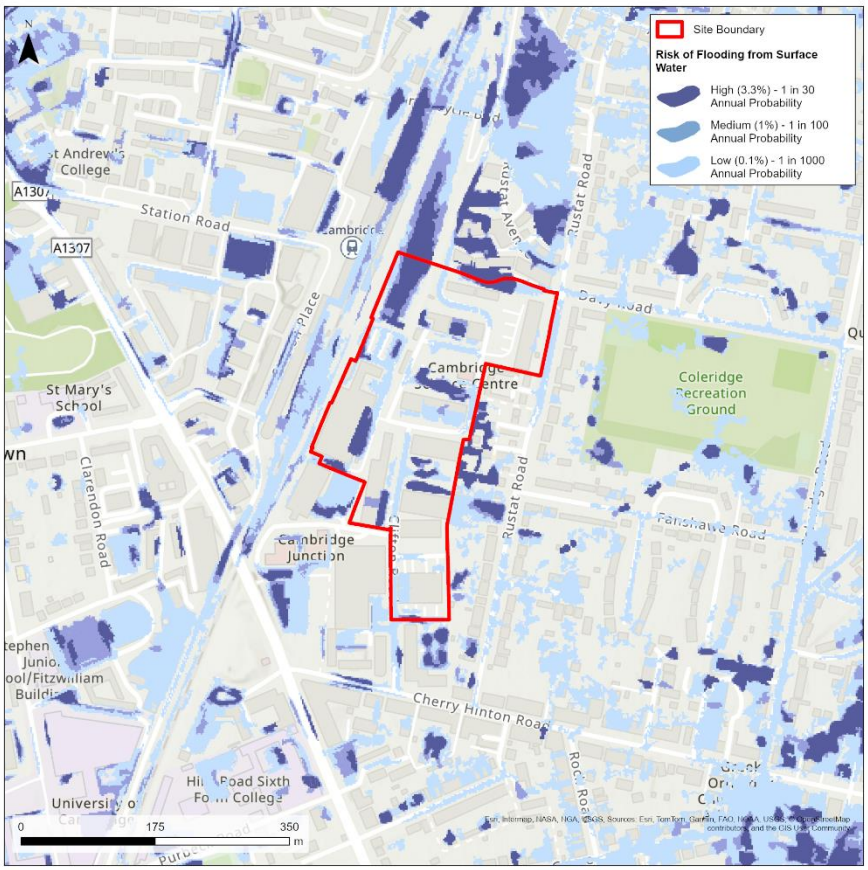

Figure 83: Risk of Flooding from Surface Water Map

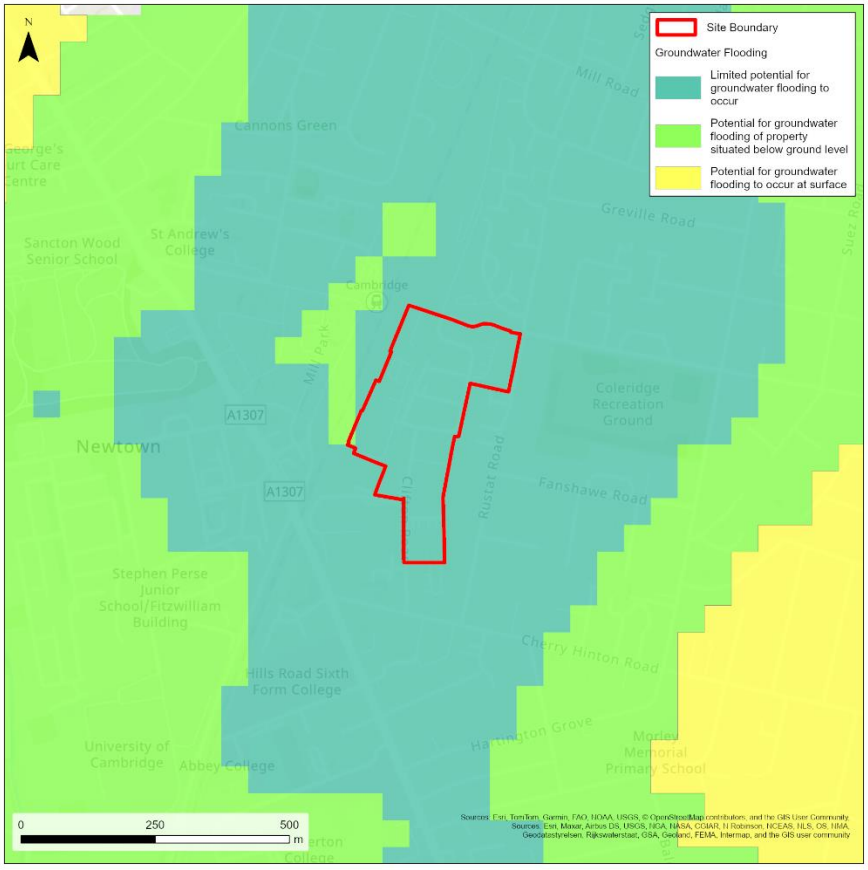

Figure 84: Susceptibility to Groundwater Flooding Map

Site Name: Compass House, Chivers Way, Histon and Impington

1 Site Details

Site Reference S/RRA/CH
OS Grid reference: TL 44130 62685
Area: 1.65 Hectares
Proposed site use: Employment
Vulnerability Classification: Less Vulnerable

Existing Watercourses:

The site lies within the 'Cambridge and Ely Ouse' Management catchment and the 'South Level and Cut Off Channel' Operational Catchment.

There are no watercourses or water bodies in or adjacent to the site.

A small pond is located approximately 100 metres north-west of the site, in the centre of an office complex. The closest Ordinary Watercourse (Public Drain) is located approximately 500 metres west of the site. A further unnamed Ordinary Watercourse is located approximately 650 metres east of the site. There are three lakes/reservoirs located 800-1000 metres south of the site.

2 Sources of Flood Risk

2.1 Fluvial

Flood Zone	Proportion of Site within Flood Zone (%)
Flood Zone 1	100%
Flood Zone 2	0%
Flood Zone 3	0%

Environment Agency (EA) Flood Zone mapping indicates that the entire site is located in Flood Zone 1. Present day flood extents from the Public Drain are confined to the floodplain to the east of the watercourse and do not reach the site.

The Flood Zone mapping may not cover the entire flood extent of the Ordinary Watercourses around the site. The Risk of Flooding from Surface Water map has therefore been used as a proxy to assess flood risk from these watercourses for the purposes of this site assessment.

2.2 Surface Water

Risk of Surface Water Flooding	Proportion of Site at Risk (%)

Low (0.1% AEP)	6%
Medium (1% AEP)	5%
High (3.33% AEP)	10%

The majority of the site is covered with buildings and hardstanding, increasing surface water flood risk. EA Risk of Flooding from Surface Water mapping indicates that the eastern side of the site is impacted by surface water flooding.

For the 3.3% Annual Exceedance Probability (AEP) (high risk) event, surface water ponding is shown to the east of the existing buildings at the site, in the central courtyard area of the buildings, and across the access route from Station Road/Chivers Way.

For the 1% AEP event, flooding is shown on Station Road to the east of the site, and more extensive areas of ponding around the existing buildings on site. Surface water flows are shown to encroach on the site from the west into the car park area; however aerial imagery indicates that the site is currently surrounded by a low brick wall which would block this flow path from entering the site.

For the 0.1% AEP event, all of Station Road to the west of the site, and most of Chivers Way to the north of the site, is shown to be impacted by surface water flooding. Large areas of ponding are shown to the east of the existing buildings, and additional encroachment of the flow paths from the west into the car park area are shown but as indicated above, are currently blocked from entering the site. In the south of the site, a small area of ponding is present just to the north of the Cambridgeshire Guided Busway.

The eastern part of the site, which is most affected by ponding, is assumed to represent the low point in the site.

The access route to the south of the site via Hart Close is not shown to be affected by surface water flooding, other than a very minor area of encroachment of surface water flows arising from the property to the immediate north (which is not included in the site boundary). Aerial imagery indicates that this building is also currently surrounded by low walls and wooden fencing which would prevent surface water flows from the north reaching Hart Close.

EA Long Term Risk of Flooding from Surface Water mapping indicates that surface water flood depths across the site are likely to be less than 200mm with some localised depths of up to 300 millimetres to the east of the existing buildings.

2.3 Groundwater

The British Geological Survey (BGS) ‘Susceptibility to Groundwater Flooding’ map indicates that there is a potential for groundwater flooding to occur at surface level (61% of the site area, according to the Screening Table prepared by Greater Cambridge Shared Planning (GCSP)); and a potential for flooding of property

situated below ground level (16% of the site area, according to the Screening Table prepared by GCSP). The eastern side of the site is not indicated to be at potential risk of groundwater flooding.

The dataset indicates susceptibility to flooding and is not indicative of a specific level of hazard or risk.

BGS Geology mapping (at 1:50000 scale) indicates that the site lies on a bedrock of the Gault Formation (mudstone) with superficial deposits of River Terrace gravels (gravel and sand), however the natural ground conditions may no longer be present due to the previous development of the site. Groundwater flood risk will therefore vary across the site dependent on the specific underlying geology and the extent of previous ground disturbance.

2.4 Reservoir

The site is not located in an area shown to be at risk from reservoir flooding.

2.5 Flood History

No historic flooding is recorded at the site location.

3 Climate Change Implications

3.1 Fluvial flooding

The EA Flood Map for Planning indicates the modelled climate change flood extents for the combined Flood Zones 2 and 3 for the period 2070-2125. The mapping shows that all areas of the site remain in Flood Zone 1. Flood extents from Public Drain are shown to remain confined to the floodplain to the east of the watercourse.

3.2 Surface water

Overland flow paths and flood extents do not change significantly from the present day scenario in the climate change scenario shown in the EA Risk of Flooding from Surface Water mapping (2040-2060). There is slightly more encroachment of surface water into the site from the west and south than in the present day scenarios. The lifetime of the development will extend beyond 2060, so the present day 0.1% AEP surface water mapping has also been used as a conservative proxy for future climate change. As noted above, the 0.1% AEP event shows significant areas of ponding around the existing buildings and along Station Road and Chivers Way, which impacts on the selection of access routes to the site. In this flood scenario, no increase in flood extents is shown to the south of the site for the access route via Hart Close.

3.3 Groundwater

The future impacts of climate change on groundwater levels are complex, difficult to model and not well understood.

Due to increased rainfall expectations with climate change, it should be assumed that the groundwater table could be impacted in future and may rise during wetter periods of the year. This will need to be considered for the design of finished ground floor levels, foundations and any basement areas.

4 Flood Risk Management Infrastructure

Defences

There are no recorded flood defences on the watercourses west of the site.

Residual Risk

There are no residual risks from flood management infrastructure.

5 Emergency Planning

Flood Warning

The site is not located in an area covered by EA Flood Warnings or Flood Alerts.

Access and Egress

Existing access to the site is via Station Road to the east and Chivers Way to the north of the site. The site boundary includes an additional partially constructed access route off Station Road via Hart Close, to the south of the site.

Selection of access routes to the site should consider surface water flood risk to ensure that the route is compliant with access requirements specified in the Planning Practice Guidance 'Flood Risk and Coastal Change' emergency planning provisions. Surface water flood risk mapping indicates that the potential access route via Hart Close would be preferable to the existing access via Chivers Way to meet the Planning Practice Guidance requirements.

6 Broadscale Assessment of Sustainable Drainage Systems (SuDS) Suitability

The superficial deposits at the site are permeable and the underlying ground conditions are potentially suitable for infiltration drainage features. However, the site has been previously developed so the natural ground conditions will have been altered, and potentially high groundwater levels would also preclude the use of infiltration drainage.

Soil classification testing, infiltration testing and groundwater level monitoring will be required to establish suitability of SuDS at the site.

7 Opportunities for wider sustainability benefits and flood risk management

Redevelopment of the site provides an opportunity to integrate water harvesting and water re-use technologies into the new buildings, and manage and mitigate surface water flood risk on site.

The addition of permeable landscape features to the site would provide a small-scale improvement to the quantity of rainfall run-off from the site into the wider drainage catchment, providing minor benefits.

8 National Planning Policy Framework (NPPF) and Planning Implications

8.1 Exception Test Requirements

In accordance with the NPPF, 'Less Vulnerable' development is considered compatible within Flood Zone 1 and does not require the application of the Exception Test.

8.2 Site Design and FRA Requirements

The developer will need to provide a site-specific FRA which demonstrates that future users of the development are safe from flood hazards from all sources throughout its lifetime. The applicant should demonstrate that the development meets the objectives of the NPPF's policy on flood risk and how mitigation measures will be secured for the lifetime of the development.

The sequential approach should be implemented at the site, locating development outside of areas identified as being impacted by surface water flooding. Surface water flood risk will need to be further assessed, and the development must ensure that existing flow paths are not blocked. Site-specific modelling may be required to verify the routes of existing flow paths. Any modelling requirements are to be confirmed with the Lead Local Flood Authority (LLFA).

The availability of safe access and egress will need to be demonstrated for the 0.1% AEP fluvial/rainfall flood events, including the climate change allowance applicable to the catchment.

The site-specific FRA should further investigate risk of groundwater flooding (for example through groundwater level monitoring) to inform the need for appropriate mitigation measures which may include the incorporation of an appropriate freeboard to the finished ground floor levels.

If any basement areas are proposed, groundwater flood mitigation and resilience measures should be identified and safe access and egress routes to basement areas should be determined.

9 Conclusions and Recommendations

The development is likely to be able to proceed if:

- Floor levels are set above the maximum surface water flood level taking into account climate change and including a suitable freeboard.
- The existing blockage of surface water flow paths is mitigated or removed.
- Safe access routes are identified outside of run-off flow paths and areas identified as at risk of surface water flooding.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation measures.
- Consideration is given to how the site can contribute to wider flood and water management benefits across the catchment.

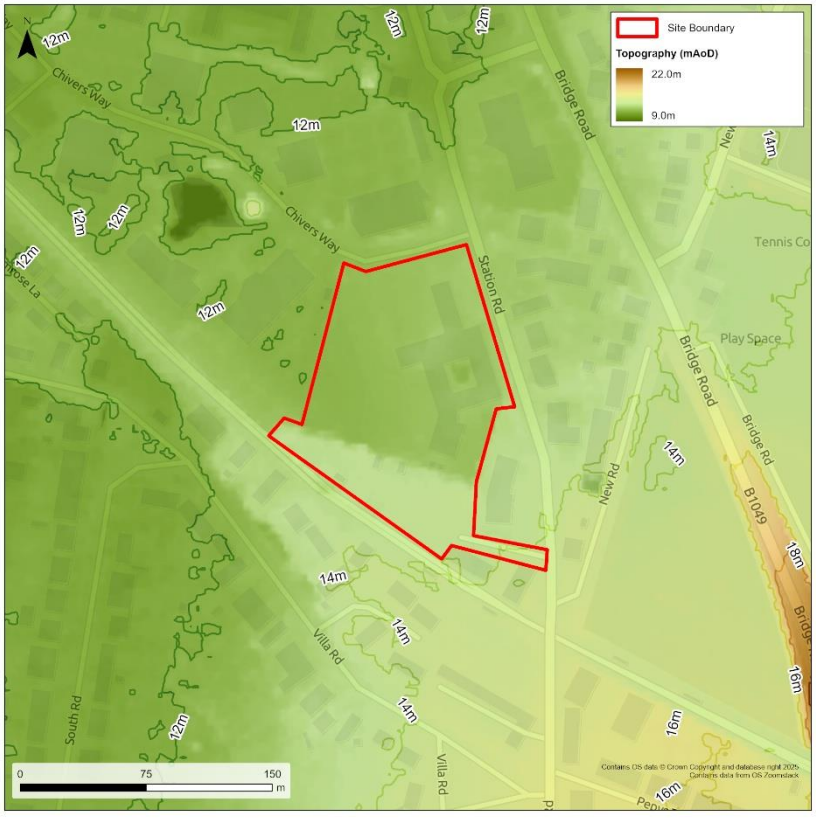

Figure 85: Site Topography

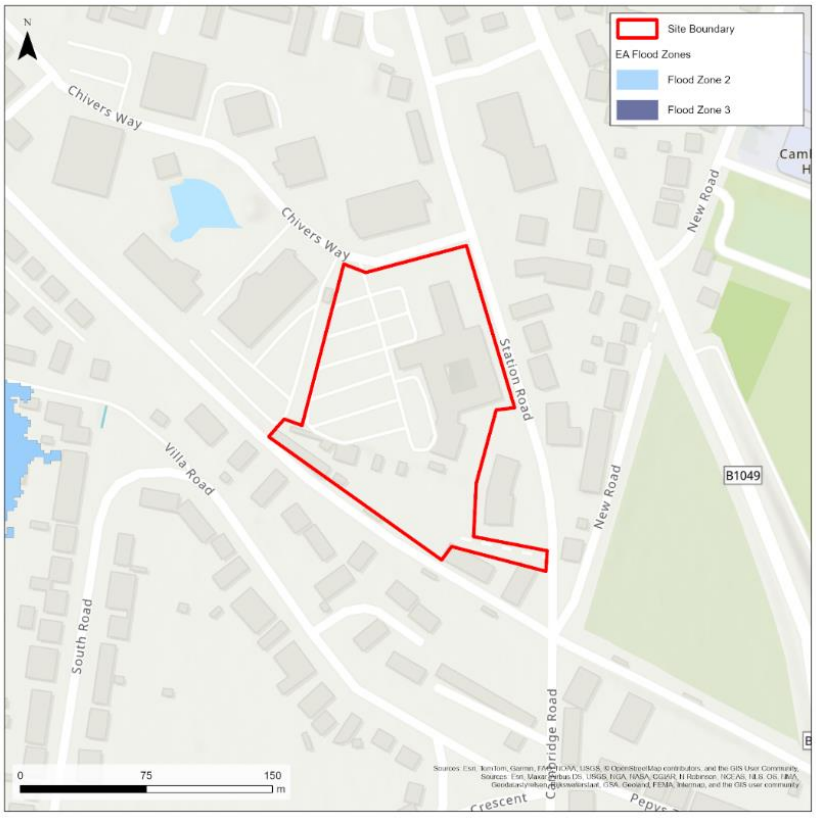

Figure 86: Flood Zones (Present Day)

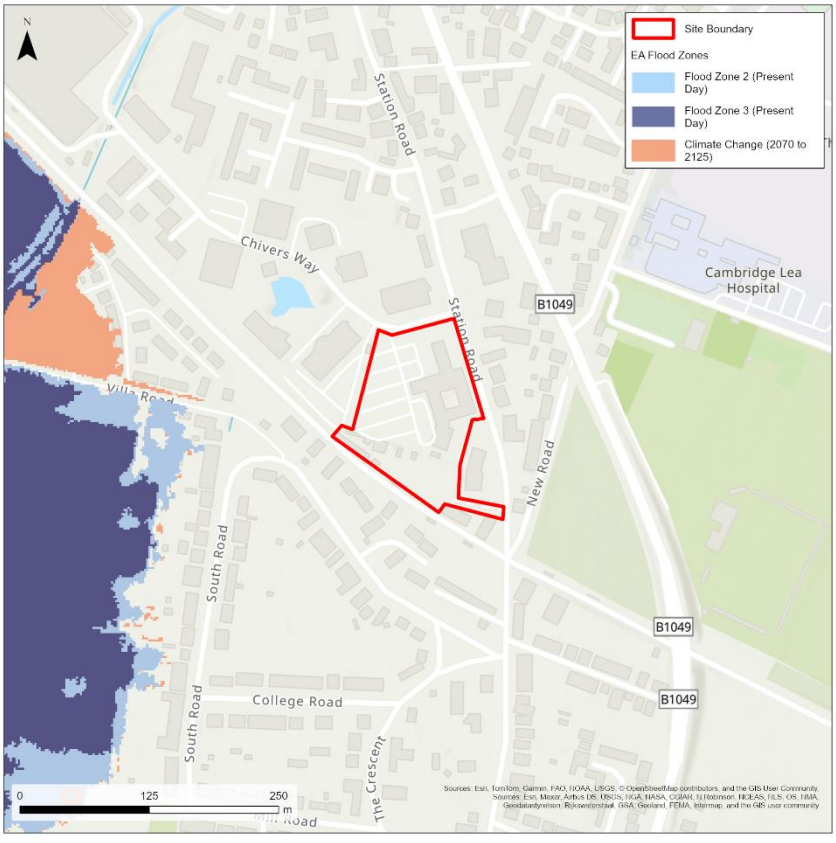

Figure 87: Flood Zones (Climate Change – 2070 to 2125)

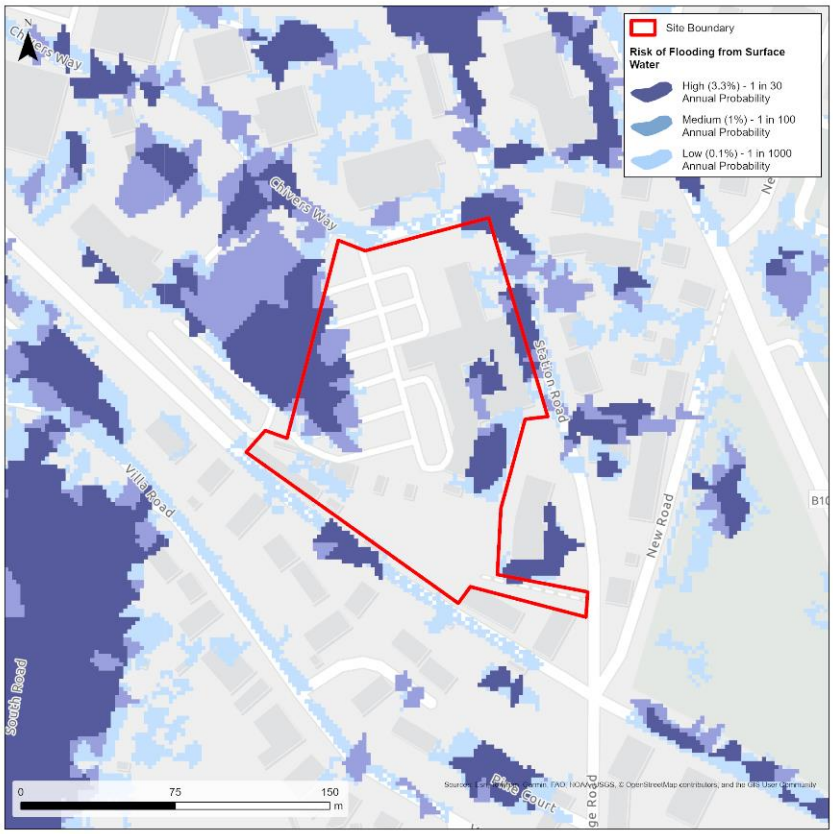

Figure 88: Risk of Flooding from Surface Water Map

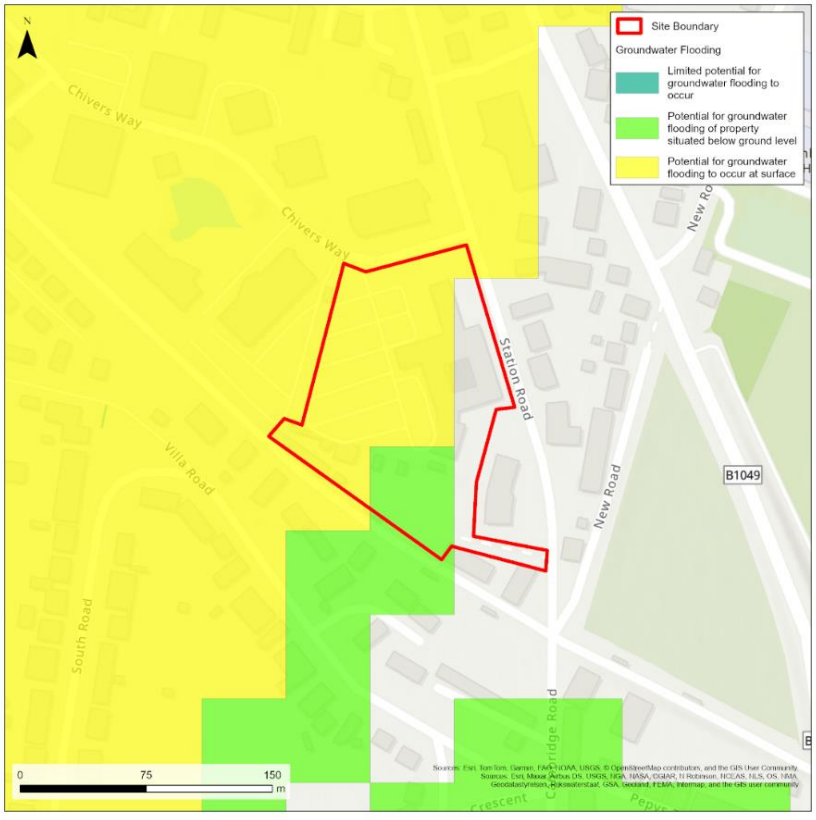

Figure 5: Susceptibility to Groundwater Flooding Map

Site Name: Eddington

1 Site Details

Site Reference	S/ED
OS Grid reference:	Split site – site centres at TL 42427 60270 (referred to hereafter as the 'northern site') and TL 43262 59890 (referred to hereafter as the 'southern site')
Area:	90.93 Hectares
Proposed site use:	Mixed use including residential.
Vulnerability Classification:	More Vulnerable (residential) Less Vulnerable (commercial)

Existing Watercourses

The sites lie within the 'Cam and Ely Ouse Management Catchment' and the 'South Level and Cut-Off Channel' Operational Catchment.

Three un-named Ordinary Watercourses are located in the northern site, the first aligned with the north-west site boundary, the second located to the south of the existing commercial buildings in the northern part of the site, and the third located within the areas under construction in the south of this site. It is noted that the latter watercourse is not visible in recent aerial imagery of the site, and it may have been culverted or relocated during construction.

An Awarded Watercourse (the Washpit Brook) is located approximately 25-35 metres outside the west boundary of the northern site. No Main Rivers are present within or adjacent to the northern site. No Ordinary Watercourses or Main Rivers are recorded as present within or adjacent to the southern site.

2 Sources of Flood Risk

2.1 Fluvial

Flood Zone	Proportion of Site within Flood Zone (%)
Flood Zone 1	>99%
Flood Zone 2	<1%
Flood Zone 3	0%

Environment Agency (EA) Flood Zone mapping indicates that the northernmost area between the Washpit Brook and the boundary of the northern site is located in Flood Zone 2, with very minor encroachment of the Zone 2 flood extent into the northern site boundary. The flood extent occupies less than 1% of the northern site area.

The remainder of both sites are located in Flood Zone 1.

Fluvial modelling data is not available for the sites and the Flood Zone mapping does not cover the entire extent of Ordinary Watercourses within the site. The Risk of Flooding from Surface Water map has therefore been used as a proxy to assess flood risk from these watercourses for the purposes of this site assessment.

2.2 Surface Water

Risk of Surface Water Flooding	Proportion of Site at Risk (%)
Low (0.1% AEP)	5%
Medium (1% AEP)	2%
High (3.33% AEP)	3%

Northern site – the EA Risk of Flooding from Surface Water mapping indicates that the primary areas of the northern site shown to be at risk of flooding in the 3.3% Annual Exceedance Probability (AEP) (high risk) event are clustered around the existing buildings in the northern part of the site adjacent to Huntingdon Road, which will be replaced as part of the development proposals, and an area adjacent to the south-western boundary of the site which is aligned with the Wash Brook. There are also some minor areas of ponding in the south-central parts of the site.

For the 1% AEP (medium risk) and 0.1% AEP (low risk) events, the same areas are shown to be affected with an increased extent of flooding, plus some additional areas of ponding in the south-eastern parts of the site and along the north-eastern boundary. The surface water flooding in the north-eastern corner of the site is likely to be associated with the adjacent Ordinary Watercourse (land drain).

Southern site – the EA Risk of Flooding from Surface Water mapping indicates that the primary areas of the southern site shown to be at risk of flooding in the 3.3% AEP event are located along the northern boundary of the site with scattered, small areas of ponding across the centre of the site.

For the 1% AEP and 0.1% AEP events the same areas are shown to be affected with an increased extent of flooding, with some additional areas of ponding in the western and southern parts of the site. In the 0.1% AEP event, an additional flow path is shown from the centre to the north of the site which is not present in lower-order events.

An existing large pond is located adjacent to the western boundary of the southern site (outside of the site boundary) and the extent of flooding from the pond is shown to increase in the higher-order flood events such that it may minorly encroach into the site.

2.3 Groundwater

The BGS ‘Susceptibility to Groundwater Flooding’ map indicates that there is a potential for groundwater flooding to occur at surface level in the southernmost

extents of the southern site (12% of the southern site area, according to the Screening Table prepared by GCSP), and the potential for groundwater flooding of property situated below ground level in the northern part of the southern site, and a small area in the south-eastern part of the southern site (totalling 41% of the combined site areas, according to the Screening Table prepared by GCSP).

The dataset indicates susceptibility to groundwater flooding and is not indicative of a specific level of hazard or risk.

BGS Geology mapping (at 1:50000 scale) indicates that the northern site is located on a bedrock of the Gault Formation (mudstone) with superficial deposits of Head (mixed composition) lying across the eastern side of the site. The southern site is primarily underlain by the West Melbury Marly Chalk Formation (Chalk and Marlstone) with no superficial deposits.

Groundwater flood risk will therefore vary across the sites dependent on the specific underlying geology.

2.4 Reservoir

The site is not located in an area shown to be at risk from reservoir flooding.

2.5 Flood History

No historic fluvial flooding is recorded at either of the site locations.

Anglian Water historic sewer flooding records indicate that sewer flooding was recorded in the postcode CB3 0JX (within the northern site boundary) on 9/12/2019 and 9/10/2024.

3 Climate Change Implications

3.1 Fluvial flooding

The EA Flood Map for Planning indicates the modelled climate change flood extents for the combined Flood Zones 2 and 3 (for the period 2070-2125). The mapping shows some additional encroachment of the linear flood extent along the Washpit Brook into the western boundary of the northern site.

All other areas of both sites remain outside of the mapped climate change Flood Zones.

3.2 Surface water

The climate change scenario shown in the EA Risk of Flooding from Surface Water mapping (2040-2060) shows slight encroachment of flooding into the western boundary of the northern site. arising from overtopping of the Washpit Brook. Water

levels may reach up to 600 millimetres depth along the eastern site boundary during low risk flood events.

In the southern site, ponding is shown along the existing field boundaries and in the south-eastern part of the site. The expected depth of ponding is less than 200 millimetres across the majority of the affected areas with the potential for depths of up to 600 millimetres in very localised areas along the north-eastern boundary, adjacent to the existing residential properties.

The lifetime of the development will extend beyond 2060, so the present day 0.1% AEP (low risk) surface water mapping has also been used as a conservative proxy for future climate change. As noted above, more extensive ponding is shown across the central areas of the southern site in this flood event, and slightly greater encroachment of the Washpit Brook into the western side of the northern site.

3.3 Groundwater

The future impacts of climate change on groundwater levels are complex, difficult to model and not well understood.

Due to increased rainfall expectations with climate change, it should be assumed that the groundwater table could be impacted in future and may rise during wetter periods of the year. This will need to be considered for the design of finished ground floor levels, foundations and any basement areas.

4 Flood Risk Management Infrastructure

Defences

The site is not protected by any formal flood defences.

Residual Risk

There are no identified residual risks from flood management infrastructure.

5 Emergency Planning

Flood Warning

The site is not located within any existing Flood Warning Areas.

Access and Egress

Existing access routes to the site are from the A1307 Huntingdon Road to the north, and the A1303 Madingley Road to the south, both connecting with Eddington Avenue which runs through the site. A new access route (Loverose Way) has been constructed off Madingley Road.

The selection of any further access routes into the site should consider surface water flood risk to ensure that the route is compliant with access requirements specified in

the Planning Practice Guidance 'Flood Risk and Coastal Change' emergency planning provisions.

6 Broadscale Assessment of Sustainable Drainage Systems (SuDS) Suitability

The majority of the northern site is located on impermeable bedrock (mudstone) which may not be suitable for infiltration SuDS. Part of the northern site is overlain by superficial head deposits which are likely to comprise a mixture of soil particle sizes with variable permeability.

The southern site is underlain by Marly Chalk, which will have variable permeability.

Soil classification testing and infiltration testing will be required to establish suitability of SuDS at both sites.

7 Opportunities for wider sustainability benefits and flood risk management

The development vision includes aspirations to maximise water harvesting and water re-use technologies, improve biodiversity and manage and mitigate flood risk on site. This will contribute to overall sustainability and flood risk benefits in the Greater Cambridge area.

8 National Planning Policy Framework (NPPF) and Planning Implications

8.1 Exception Test Requirements

The majority of both sites are located in Flood Zone 1, with a small extent of the northern site located in Flood Zone 2.

The proposed mixed use of the site (including 'More Vulnerable' residential units and 'Less Vulnerable' commercial uses) are permitted in both Zone 1 and Zone 2, and the Exception Test would not be required.

8.2 Site Design and FRA Requirements

The developer will need to provide a site-specific FRA which demonstrates that future users of the development will not be placed in danger from flood hazards from all sources throughout its lifetime. The applicant should demonstrate that the development meets the objectives of the NPPF's policy on flood risk and how mitigation measures will be secured for the lifetime of the development.

The sequential approach should be implemented at the site, prioritising more vulnerable residential development within areas outside of surface water flood risk. It should be possible to locate all development outside of these extents; however this

should be confirmed with site-specific hydraulic modelling of the ordinary watercourses through the site. Any modelling requirements are to be confirmed with the Lead Local Flood Authority (LLFA).

The risk of surface water flooding must also be addressed through the Surface Water Drainage Strategy for the site/individual development plot and should outline how the development will manage and mitigate these risks and how the development will avoid impacting on surface water flow routes.

The availability of safe access and egress will need to be demonstrated using flood depth, velocity and hazard outputs for the 0.1% AEP fluvial/rainfall flood events, including the climate change allowance applicable to the catchment. Access routes should be raised at least 300mm above the flood level. If raising of access routes is required, this must not impact on surface water flow routes or contribute to loss of floodplain storage.

The site-specific FRA should further investigate risk of groundwater flooding (e.g. through groundwater level monitoring) and should include appropriate mitigation which may include the incorporation of an appropriate freeboard to the finished ground floor levels.

If basement areas are proposed in any residential or commercial units, groundwater flood mitigation and resilience measures should be identified and safe access and egress routes to basement areas should be determined.

9 Conclusions and Recommendations

The development is likely to be able to proceed if:

- A sequential approach is adopted, prioritising the location of more vulnerable residential development outside of Flood Zone 2 and areas at risk of surface water flooding, taking into account the impacts of climate change. The area of the northern site designated as Flood Zone 2 is proposed for commercial uses which are acceptable within this Flood Zone.
- Surface water flow paths are maintained, and the risk of surface water flooding is mitigated through the Surface Water Drainage Strategy for the sites/individual land parcels.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the required freeboard for finished floor levels.
- Safe access routes are located in areas outside of Flood Zone 2, and outside of any run-off flow paths and areas identified as at risk of surface water flooding.
- Consideration is given to the integration of water management and SuDS at the site; and how the site can contribute to wider flood and water management benefits across the catchment.

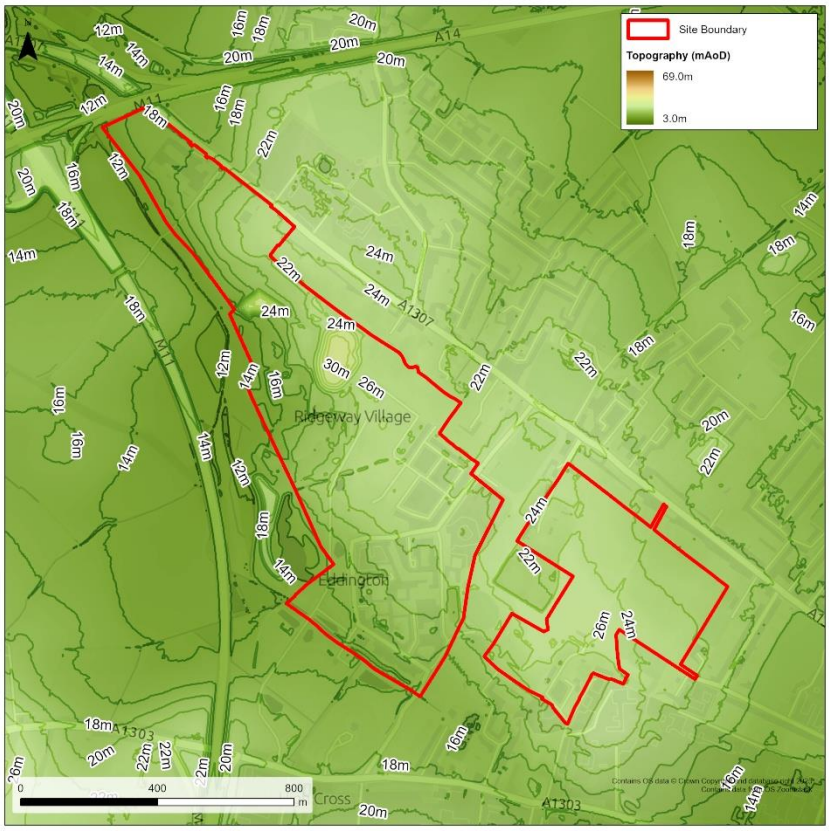

Figure 89: Site Topography

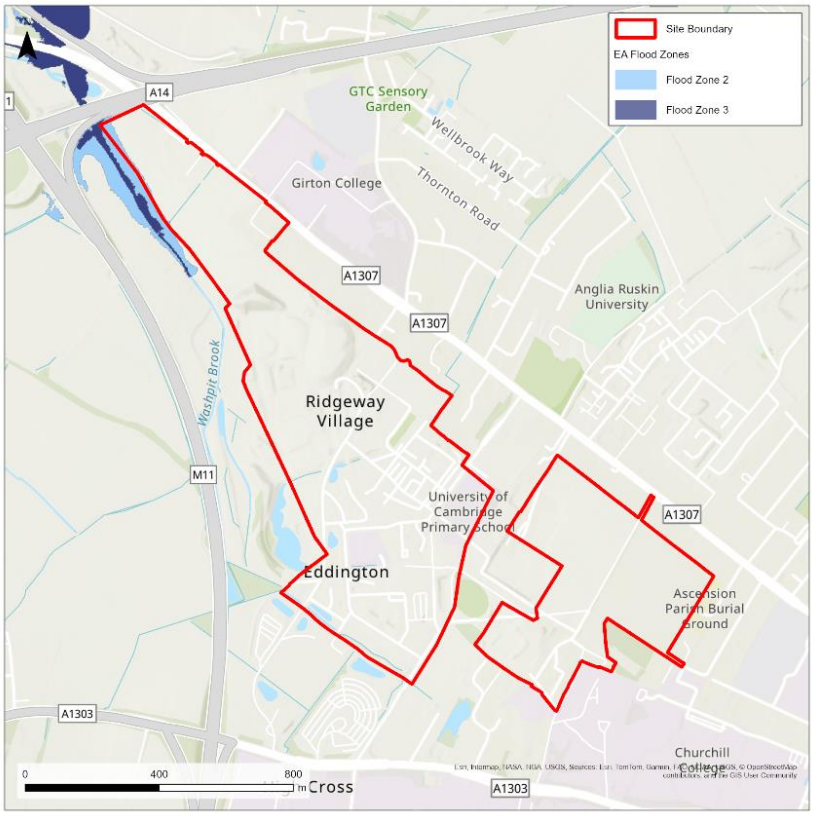

Figure 90: Flood Zones (Present Day)

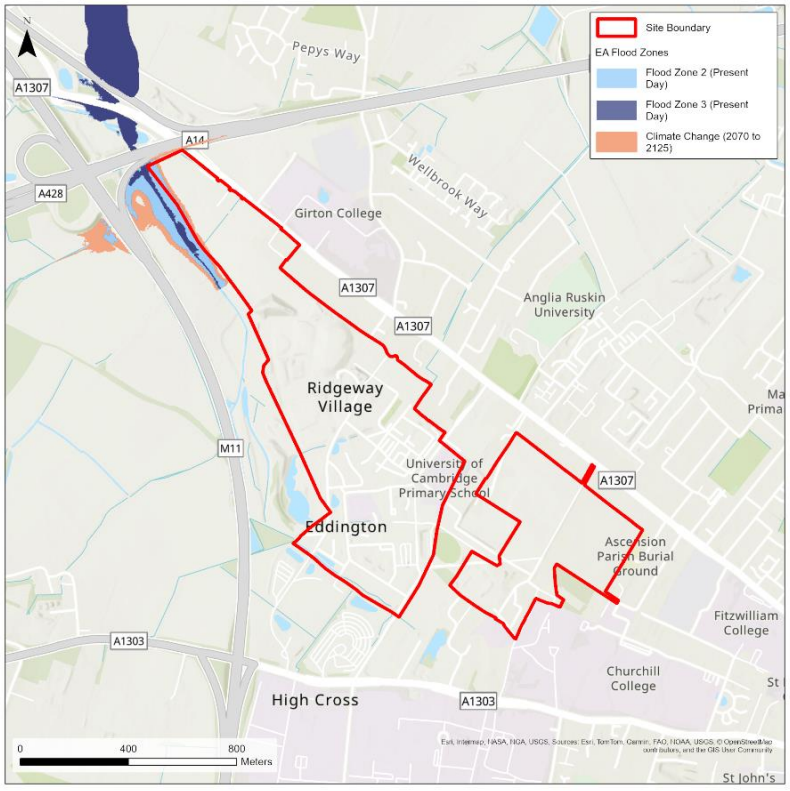

Figure 91: Flood Zones (Climate Change – 2070 to 2125)

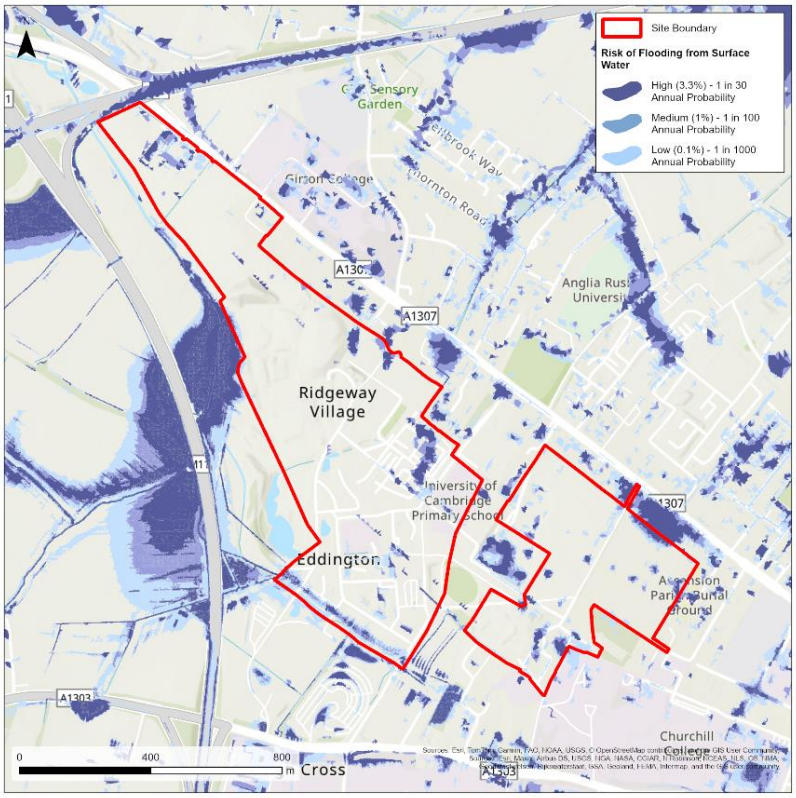

Figure 92: Risk of Flooding from Surface Water Map

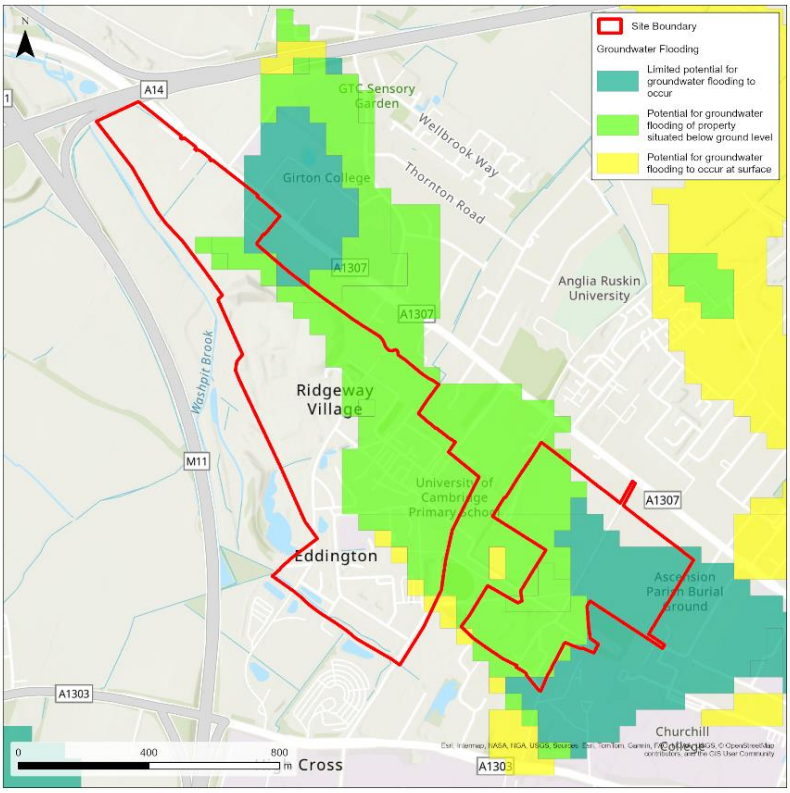

Figure 93: Susceptibility to Groundwater Flooding Map

Site Name: Former Spicers Site, Sawston Business Park, Sawston

1 Site Details

Site Reference S/RSC/FSS
OS Grid reference: TL 47161 49856
Area: 21.78 Hectares
Proposed site use: Employment
Vulnerability Classification: Less Vulnerable

Existing Watercourses

The site lies within the 'Cam and Ely Ouse' Management Catchment and the 'Cam Rhee and Granta' Operational Catchment. The River Cam (designated as a Main River) passes around the southern and western edges of the site, approximately 110 metres and 300 metres to the south and west of respectively, flowing northwards.

It is noted that the River Cam along these upper reaches is erroneously labelled in some publicly available flood mapping tools and datasets as the River Granta or is labelled with both names.

A network of drainage ditches is located to the immediate north and west of the site, with ditches extending the full length of the northern and western site boundaries.

An un-named, rectangular offline lake is located approximately 370 metres to the west of the site and immediately to the west of the River Cam channel.

Hydraulic modelling was completed for the River Cam in 2014 using ISIS-TUFLOW. Re-simulation of the model was not undertaken as part of this SFRA.

2 Sources of Flood Risk

2.1 Fluvial

Flood Zone	Proportion of Site within Flood Zone (%)
Flood Zone 1	100%
Flood Zone 2	0%
Flood Zone 3	0%

The Environment Agency (EA) Flood Map for Planning indicates that the site lies wholly within Flood Zone 1.

Flood extents from the River Cam are shown to approach the north-eastern and south-western fringes of the site, but are not shown to extend into the site boundary.

2.2 Surface Water

Risk of Surface Water Flooding	Proportion of Site at Risk (%)
Low (0.1% AEP)	6%
Medium (1% AEP)	2%
High (3.33% AEP)	2%

The EA Risk of Flooding from Surface Water mapping indicates that small areas of ponding are located around the perimeter of the existing buildings and between the existing buildings in the 3.3% Annual Exceedance Probability (AEP) (high risk) event, which may represent existing low points in the site topography.

In the 1% AEP (medium risk) event, the ditch network to the north of the site boundary begins to overtop and flow paths are created from north to south into the site, around the northernmost buildings. Localised ponding is present around the other buildings.

In the 0.1% AEP (low risk) event, more extensive flow paths are shown from the ditch network towards the site causing extensive ponding around the northernmost cluster of buildings at the site, and localised ponding around the other buildings.

2.3 Groundwater

The BGS ‘Susceptibility to Groundwater Flooding’ map indicates that there is a potential for groundwater flooding to occur at surface level across the entire site area.

The dataset indicates susceptibility to groundwater flooding and is not indicative of a specific level of hazard or risk.

BGS Geology mapping (at 1:50000 scale) indicates that the site is underlain by a bedrock of the Zig Zag Chalk Formation with no recorded superficial deposits.

A previous FRA was completed for part of the site in 2020 and contains some limited groundwater monitoring information. The FRA concluded that groundwater levels are likely to be located at 16-17m AOD and that groundwater was unlikely to reach the site surface due to the existing elevation of the site above these levels and the lower elevation of the local drainage to the north of the site. The recorded groundwater levels on which these conclusions were based may not be representative of present-day groundwater levels, and the current site boundary covers a wider area of the surrounding land than the previous FRA.

2.4 Reservoir

The site is not located in an area shown to be at risk from reservoir flooding.

2.5 Flood History

EA Historic Flood Mapping indicates that historic flooding was recorded in the area immediately to the south and west of the site, associated with the River Cam and lake. The site itself was not shown to be impacted by the flood event(s).

The EA Recorded Flood Outlines mapping provides details about these historic flood event(s); these flood extents are indicated to be from the March 1947 and October 2001 events.

3 Climate Change Implications

3.1 Fluvial

The Flood Map for Planning includes the combined extent of Flood Zones 2 and 3 for the 2070-2125 epoch, including the appropriate climate change allowance for the Cam and Ely Ouse Management Catchment in which the site lies; a 9% uplift to peak river flows.

Much of the area around the northernmost buildings at the site is shown to be flooded in this climate change scenario, which appears to arise from inundation of the ditch network to the north of the site. Localised flood extents are also shown in the areas adjacent to existing ditches on the west and east boundaries of the site, and parts of the access road to the immediate west of the A1301. This turns the site into a ‘dry island’ entirely surrounded by flood extents, which has implications for safe access (discussed above).

The Cam Rural flood model dates back to 2014 and therefore does not include the latest climate change allowances for the modelled scenarios. Instead, it uses the standard national 20% uplift to peak river flows, an approach that was superseded in 2016 with regional allowances by river basin districts, and later the current local allowances by management catchment. The 20% allowance used is similar to the ‘Higher Central’ allowance of 19% for the Cam and Ely Management Catchment and can be used as a conservative proxy for the ‘Central’ allowance of 9%.

The design fluvial flood event for ‘Less Vulnerable’ development is the 1% AEP event plus climate change (+9%). The modelled results show fluvial flooding from the River Cam extends onto the floodplain to the east of the river in the most extreme 0.1% AEP flood event, but does not extend as far upstream as the site.

The climate change flood extents shown in the Flood Map for Planning incorporate the latest Environment Agency climate change allowances and are therefore considered to be the best available representation, in accordance with current national policy and FRA guidance.

3.2 Surface Water

The climate change scenario shown in the EA Risk of Flooding from Surface Water mapping (2040-2060) indicates a potential for significant ponding of water around the perimeter of all existing buildings at the site and completely surrounding the building located furthest to the north of the site. This flooding appears to result from overland flow pathways from the area immediately north and west of the site. Flood depths are indicated to be less than 200mm across the majority of the areas shown to be impacted by flooding, with some localised ponding around the buildings to 300 millimetres depth, and the potential for small areas of ponding between 600-900 millimetres depth in the most extreme (0.1% AEP) scenario in the centre of the site.

3.3 Groundwater

The future impacts of climate change on groundwater levels are complex, difficult to model and not well understood.

Due to increased rainfall expectations with climate change, it should be assumed that the groundwater table could be impacted in future and may rise during wetter periods of the year. This will need to be considered for the design of finished ground floor levels, foundations and any basement areas.

4 Flood Risk Management Infrastructure

Defences

The site is not protected by any formal flood defences.

Residual Risk

There are no identified residual risks from flood management infrastructure.

5 Emergency Planning

Flood Warning

The site is adjacent to, but is not currently included within, the ‘Upper River Cam in Essex and Cambridgeshire’ Flood Warning Area.

Access and Egress

Selection of access routes to the site should consider flood risk to ensure that the route is compliant with access requirements specified in the Planning Practice Guidance ‘Flood Risk and Coastal Change’ emergency planning provisions.

Site access is limited to a single unnamed road in the south-eastern corner of the site which connects to the A1301 to the east and Whittlesford Road in the west.

Egress from the site along the unnamed road and onwards to the A1301 is possible during the 1% AEP, 1% AEP plus climate change, and 0.1% AEP fluvial flood events. The River Cam model has not been simulated for the 0.1% AEP plus climate change fluvial flood event. Therefore the Flood Zones plus Climate Change map has been used to assess the flood risk impact on site t. The EA Map shows for this flood event, the unnamed road to the south of the site is shown to be dry, however the A1301 is shown to be inundated. No other access routes are available.

Hydraulic modelling of the fluvial flood risk from the River Cam should be undertaken to inform safe access and egress routes to the site. The site-specific FRA should make use of depth, velocity, hazard and time of inundation model outputs to inform a safe access route for the site. A Flood Warning and Evacuation Plan for the site is to be in place.

6 Broadscale Assessment of Sustainable Drainage Systems (SuDS) Suitability

The site is located on a bedrock of the Zig Zag Chalk Formation which has variable permeability. The site is located in a Groundwater Source Protection Zone which will influence suitable types of SuDS and the requirements for the quality of any water being discharged from the site.

7 Opportunities for wider sustainability benefits and flood risk management

The provision of flood attenuation basins or ponds in the northern part of the site would assist with the wider strategy to implement small-scale flood attenuation schemes in the Rural Upper Cam catchment, which is further discussed in Table 8.2 of the Level 1 SFRA.

8 National Planning Policy Framework (NPPF) and Planning Implications

8.1 Exception Test Requirements

In accordance with the NPPF, the site is located in Flood Zone 1 and the proposed use of the site for employment purposes, classified as ‘Less Vulnerable’ development, is permitted in this Zone. The Exception Test would not be required.

8.2 Site Design and FRA Requirements

The developer will need to provide a site-specific FRA which demonstrates that future users of the development will not be placed in danger from flood hazards from all sources throughout its lifetime.

The applicant should demonstrate that the development meets the objectives of the NPPF's policy on flood risk and how mitigation measures will be secured for the lifetime of the development. A sequential approach should be implemented at the site, prioritising development outside of areas with surface water flood risk.

The risk of surface water flooding must be addressed through the Surface Water Drainage Strategy (SWDS) for the site and should outline how the development will manage and mitigate these risks. The SWDS should also address how the development will maintain existing overland surface water flow routes located in the northern part of the site, and how the quality of any water being discharged into the local watercourses will meet the requirements for the Source Protection Zone.

The availability of safe access to the site will need to be modelled and assessed using flood depth, velocity and hazard outputs for the 0.1% AEP fluvial flood event, including the climate change allowance applicable to the catchment. A Flood Warning and Evacuation Plan should be prepared such that future users of the site are made aware of the potential risks of flooding and the actions to take during a flood event.

The site-specific FRA should further investigate the risk of groundwater flooding (e.g. through groundwater level monitoring) and should include appropriate mitigation as required.

The previous FRA notes the presence of basement car parking. If this is to be considered, surface water and groundwater flood mitigation and resilience measures should be identified, and safe access and egress routes to any basement areas should be determined.

9 Conclusions and Recommendations

The development is likely to be able to proceed if:

- Safe access and egress can be demonstrated in the 0.1% AEP plus climate change fluvial events using the depth, velocity, hazard and time of inundation outputs from hydraulic modelling.
- Existing overland surface water flow paths are maintained, and the risk of surface water flooding is mitigated through a Surface Water Drainage Strategy for the site's development.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken.
- Flood resilience measures are included for any basement areas to prevent sub-surface damage or infiltration of groundwater.
- Consideration is given to the integration of water management and SuDS at the site; and how the site can contribute to wider flood management benefits across the catchment.

Figure 94: Site Topography

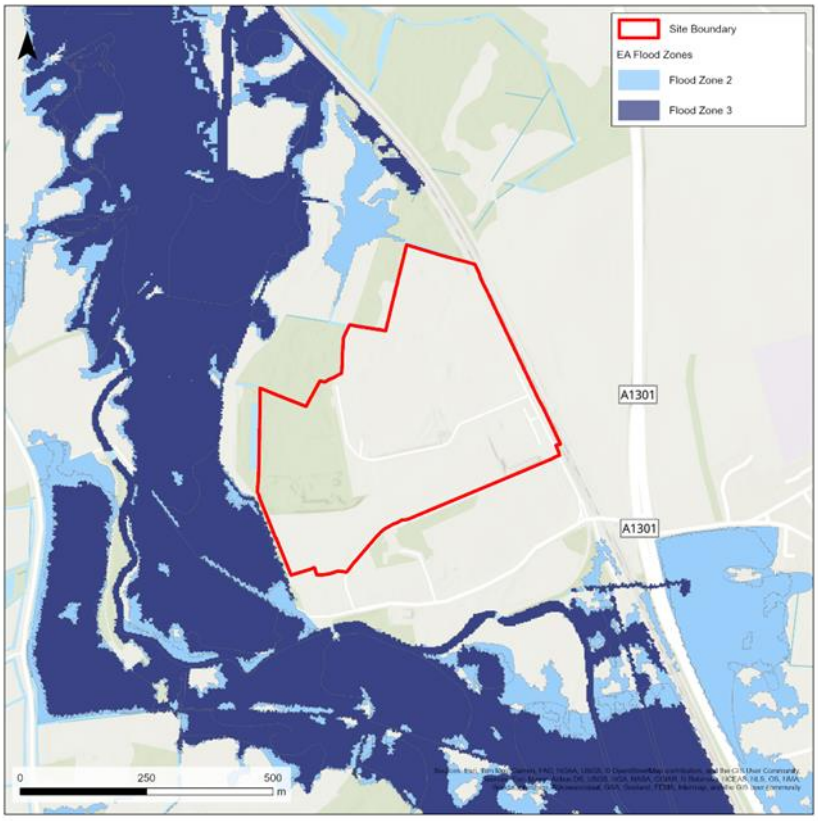

Figure 95: Flood Zones (Present Day)

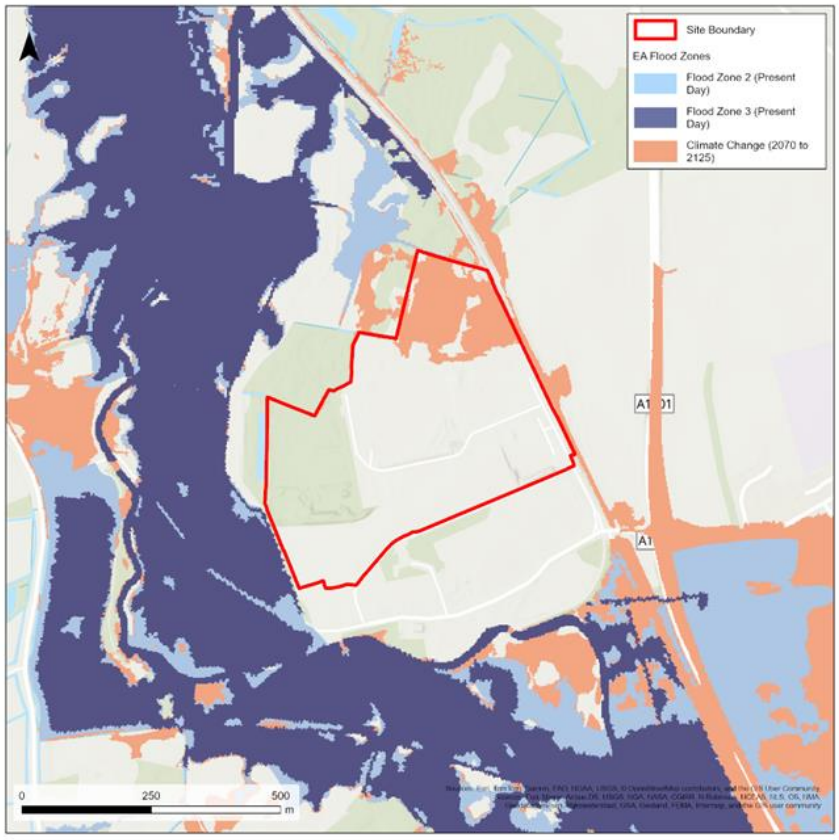

Figure 96: Flood Zones (Climate Change – 2070 to 2125)

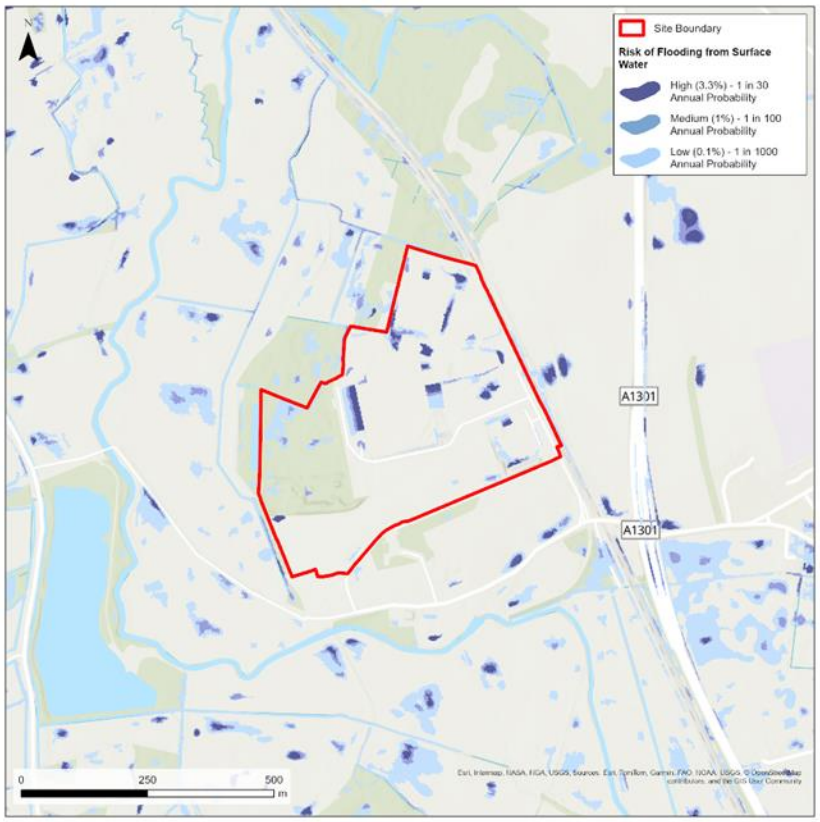

Figure 97: Risk of Flooding from Surface Water Map

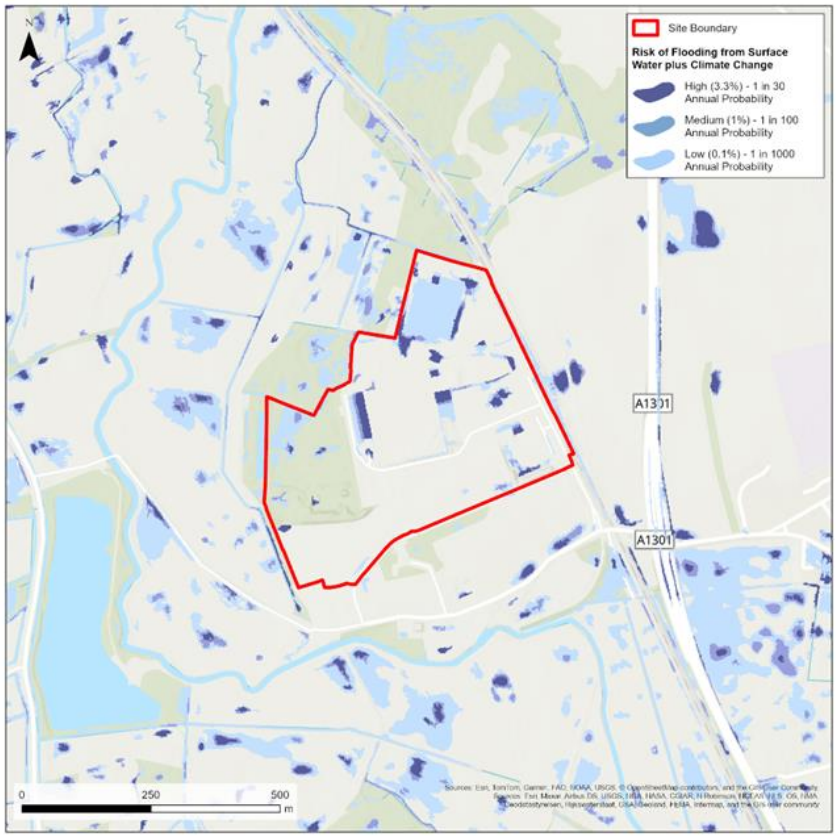

Figure 98: Risk of Flooding from Surface Water (Climate Change – 2070 to 2125)

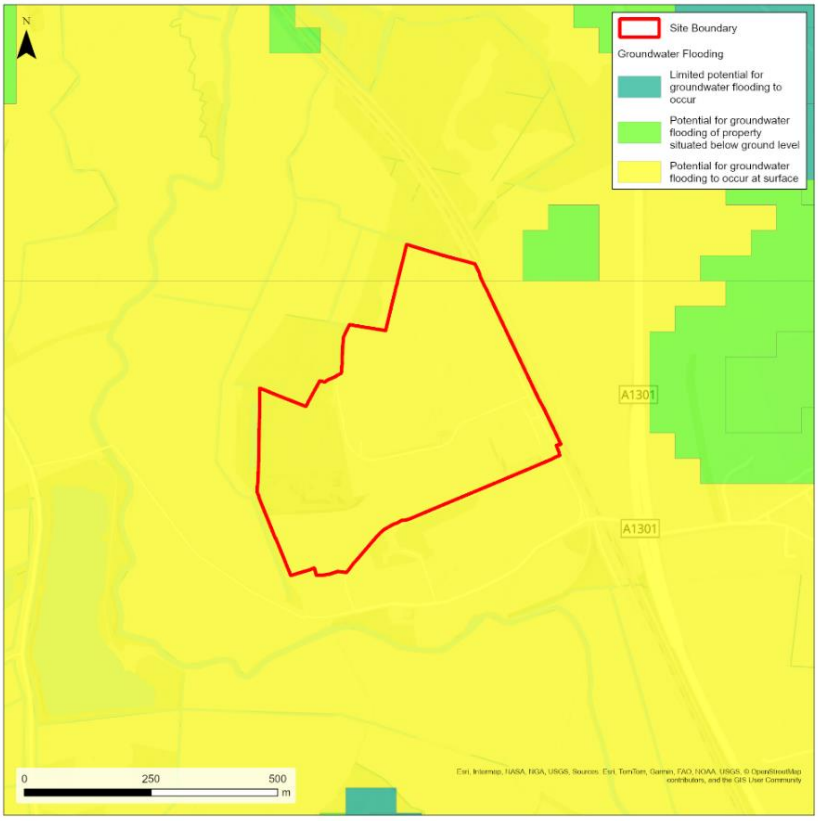

Figure 99: Susceptibility to Groundwater Flooding Map

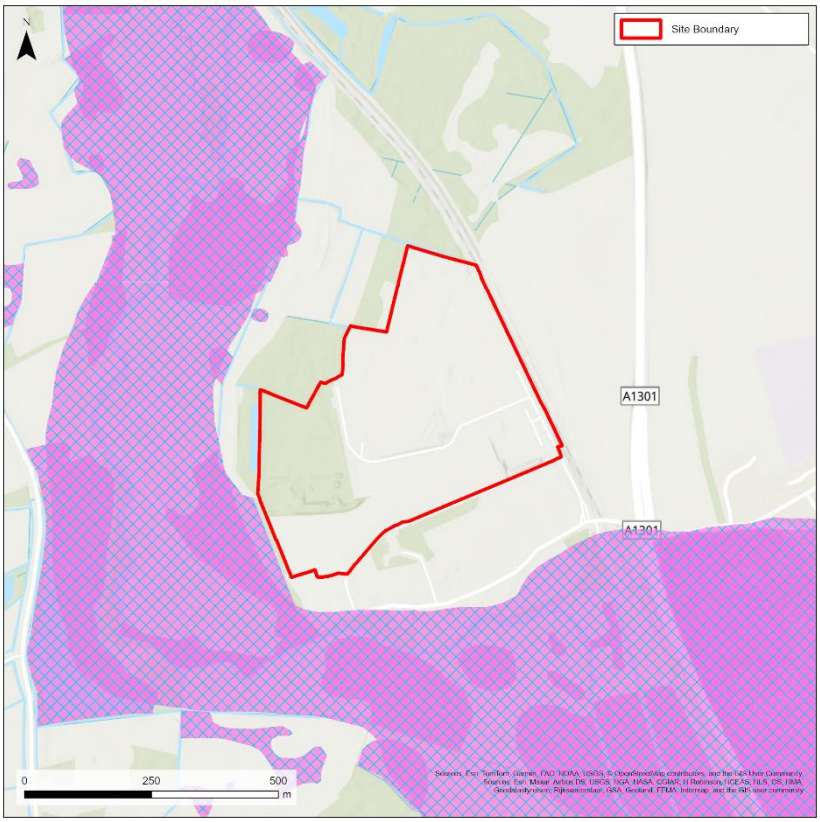

Figure 100: Historic Flood Extent

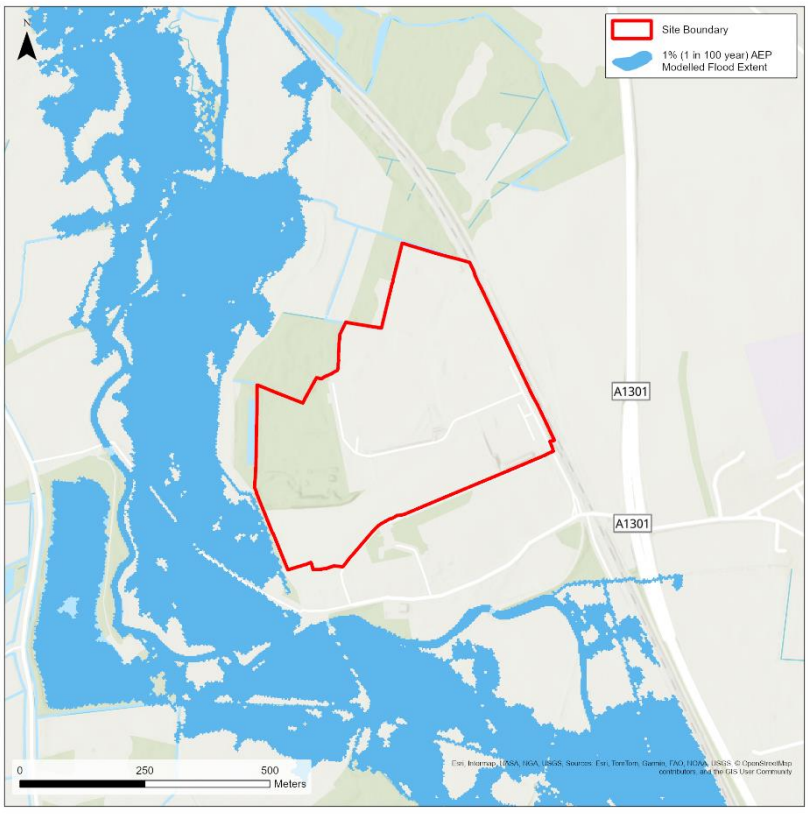

Figure 101: Modelled Fluvial Flood Extent (1% AEP)

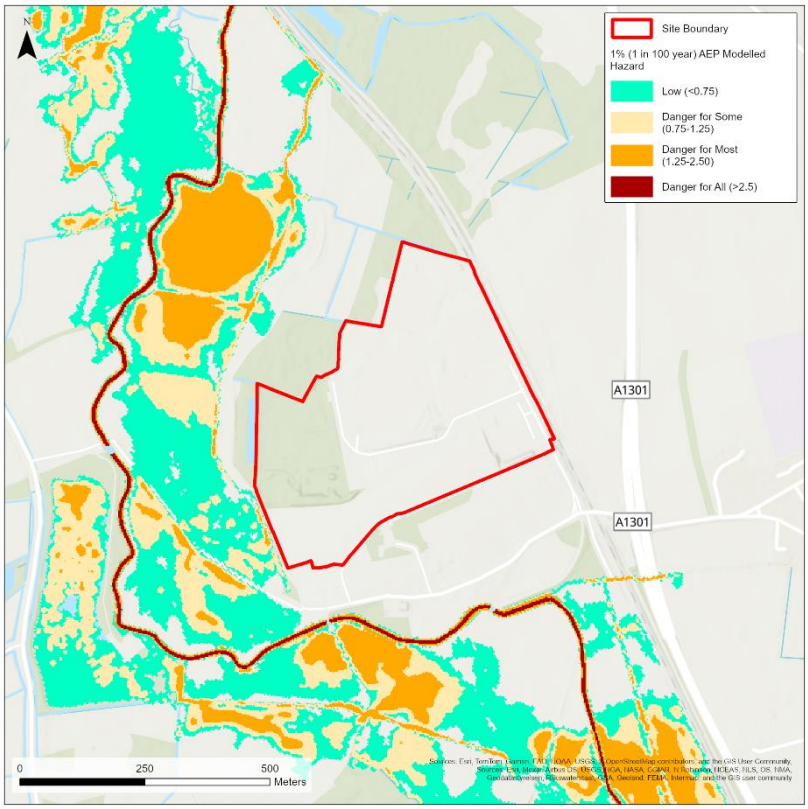

Figure 102: Modelled Fluvial Flood Hazard (1% AEP)

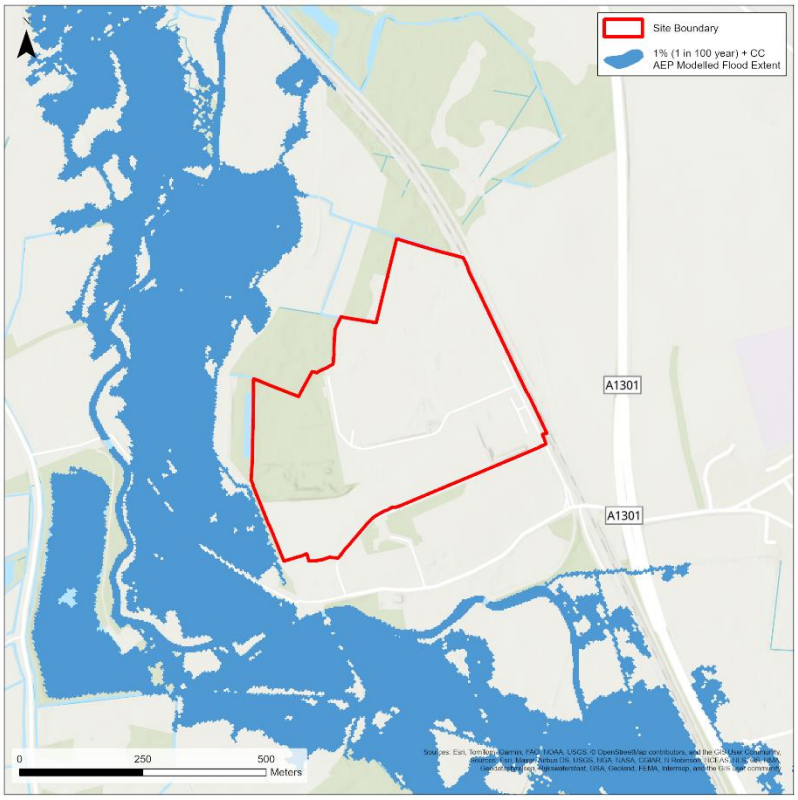

Figure 103: Modelled Fluvial Flood Extent (1% AEP with Climate Change)

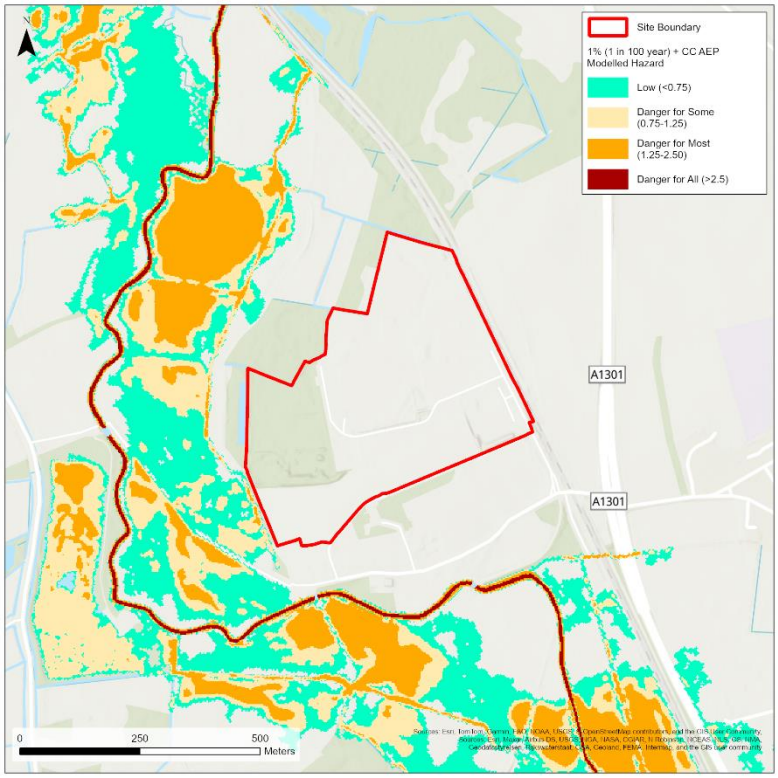

Figure 104: Modelled Fluvial Flood Hazard (1% AEP with Climate Change)

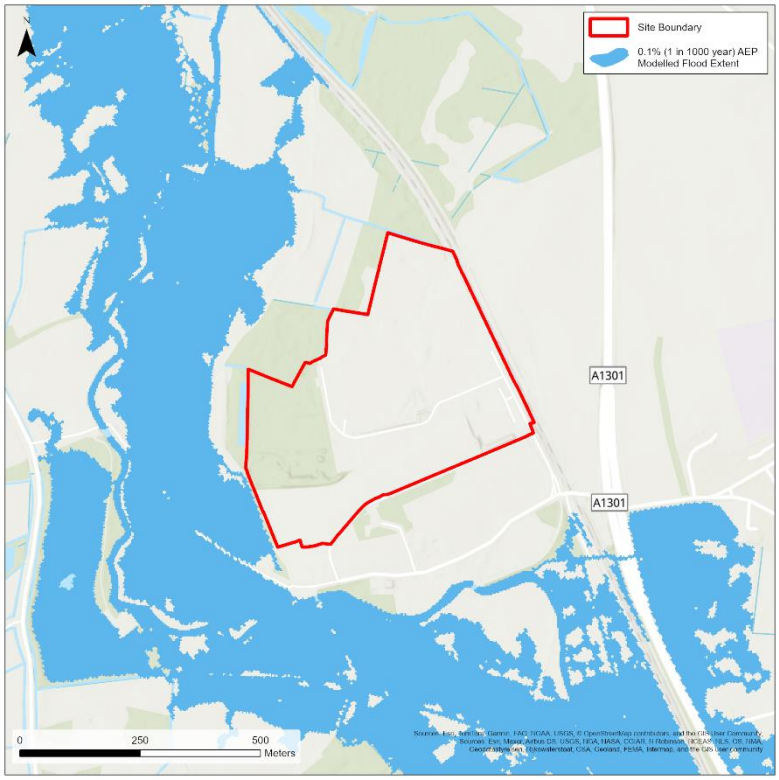

Figure 105: Modelled Fluvial Flood Extent (0.1% AEP)

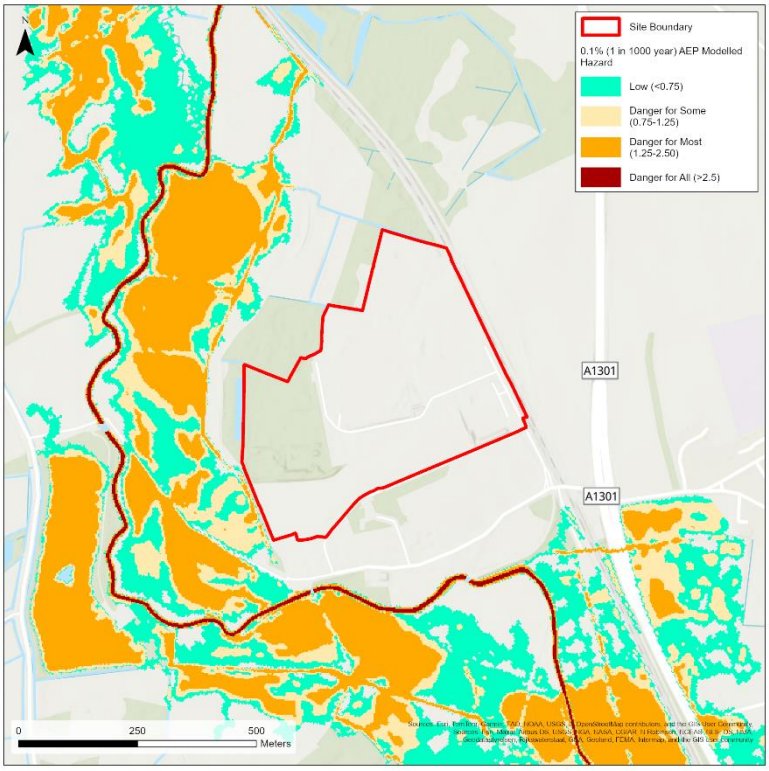

Figure 106: Modelled Fluvial Flood Hazard (0.1% AEP)

Site Name: Horizon Resource Centre, 285 Coldham's Lane

1 Site Details

Site Reference S/C/HRC
OS Grid reference: TL 47567 58099
Area: 0.73 Hectares
Proposed site use: Residential
Vulnerability Classification: More Vulnerable

Existing Watercourses

The site is located in the 'Cam and Ely Ouse Management Catchment' and the 'Cam Lower' Operational Catchment.

Cherry Hinton Brook is located approximately 40 metres to the south-east of the site, flowing south to north. To the north of the site, two parallel Awarded Watercourses, Coldham's Brook and an un-named watercourse, flow northwards through Coldham's Common, eventually joining the River Cam approximately 2 kilometres north of the site. Cherry Hinton Brook continues to flow northwards via culverts under the railway line and Barnwell Road to the east of the site, connecting with Coldham's Brook.

2 Sources of Flood Risk

2.1 Fluvial

Flood Zone	Proportion of Site within Flood Zone (%)
Flood Zone 1	>99%
Flood Zone 2	<1%
Flood Zone 3	0%

Environment Agency (EA) Flood Zone mapping indicates that the site is located in Flood Zone 1, with some very minor encroachment of Flood Zone 2 into the southern boundary of the site from the adjacent road (Barnwell Road). However, street-level mapping tools show that there is a wide, raised public footpath running alongside the southern boundary of the site, which is likely to prevent any floodwater present on the road from reaching the site.

Present day flood extents from Cherry Hinton Brook are confined to the immediate area around the watercourse. Flood extents from Coldham's Brook and the Awarded Watercourses to the north are shown to extend south of the watercourses along the southern end of Barnwell Road, towards the roundabout located south of the site, which is assumed to be a low point in the local topography.

The existing access point to the site is to the immediate west of the roundabout and is located outside of the mapped Flood Zone extents.

Hydraulic modelling for Coldham's Brook and Cherry Hinton Brook was undertaken in 2013. Re-simulation of the model was not undertaken as part of this SFRA.

2.2 Surface Water

Risk of Surface Water Flooding	Proportion of Site at Risk (%)
Low (0.1% AEP)	10%
Medium (1% AEP)	7%
High (3.33% AEP)	17%

The majority of the site is presently covered with buildings and hardstanding, increasing surface water flood risk.

EA Risk of Flooding from Surface Water mapping indicates that the eastern side of the site adjacent to the railway line is the primary area impacted by surface water flooding, but there are potential flood impacts to all sides of the site during lower probability storm events.

For the 3.3% Annual Exceedance Probability (AEP) (high risk) event, surface water ponding is shown in the northern corner of the site around the northernmost building at the site, with some minor areas of ponding along the eastern boundary adjacent to the railway line, in the south-east corner adjacent to Barnwell Road, and along the southern part of the access road within the site.

For the 1% AEP (medium risk) event, more extensive ponding is shown in the same locations, in particular increasing in the northern part of the site and extending further southwards towards the centre-east part of the site. There is also increased flooding in the vicinity of the access road.

For the 0.1% AEP (low risk) event, extensive surface water flooding is shown in the northern part of the site and extended areas of ponding along the eastern boundary. Additional ponding is shown in the centre of the site. A flow path is shown extending from the south of Coldham's Lane onto the road to the west of the site entrance.

EA Long Term Risk of Flooding from Surface Water mapping indicates that surface water flood depths across the site and along Coldham's Lane are likely to be less than 200 millimetres with some localised depths of up to 300 millimetres to the east of the existing buildings.

2.3 Groundwater

The British Geological Survey (BGS) 'Susceptibility to Groundwater Flooding' map indicates that there is a potential for groundwater flooding to occur at surface level across the entire site.

The dataset indicates susceptibility to flooding and is not indicative of a specific level of hazard or risk.

BGS Geology mapping (at 1:50000 scale) indicates that the site lies on a bedrock of the West Melbury Marly Chalk Formation, and there are no recorded superficial deposits at the site. However, the natural ground conditions may no longer be present due to the previous development of the site. Groundwater flood risk will therefore vary across the site, dependent on the specific underlying geology and the extent of previous ground disturbance, and groundwater monitoring may be required to establish current groundwater levels, if relevant for the proposed development.

2.4 Reservoir

The site is not located in an area shown to be at risk from reservoir flooding.

2.5 Flood History

No historic flooding is recorded at the site.

3 Climate Change Implications

3.1 Fluvial

The EA Flood Map for Planning fluvial flood risk mapping for climate change (between 2070-2125) and the modelled flood extents for the 0.1% AEP event + climate change allowance show that the vast majority of the site (99%) remains in Flood Zone 1.

Flood extents from Cherry Hinton Brook remain confined to the area immediately surrounding the watercourse. More extensive flooding is shown arising from the watercourses north of the site onto Barnwell Road, then flowing southwards towards the roundabout. As noted above, the footpath to the immediate south of the site is raised above the road level and therefore any flooding at the southern end of Barnwell Road and the adjacent roundabout would not be expected to enter the site.

The existing site entrance is not shown to be impacted by fluvial flooding in the climate change scenarios.

The hydraulic modelling exercise in 2013 assessed the impacts of climate change using an allowance of 20%. The 20% allowance used is similar to the ‘Higher Central’ allowance of 19% for the Cam and Ely Ouse Management Catchment, and can be used as a conservative proxy for the ‘Central’ allowance of 9%

3.2 Surface water

The EA Risk of Flooding from Surface Water mapping (2040-2060) shows additional ponding around the buildings on site, and more encroachment of surface water into the central area of the site (from the north) than the present-day scenarios. The

lifetime of the development will extend beyond 2060, so the present day 0.1% AEP surface water mapping has also been used as a conservative proxy for future climate change. As noted above, the 0.1% AEP event shows extensive areas of ponding around the site and along key access routes, which impacts on the selection of the primary access route to the site.

3.3 Groundwater

The future impacts of climate change on groundwater levels are complex, difficult to model and not well understood.

Due to increased rainfall expectations with climate change, it should be assumed that the groundwater table could be impacted in future and may rise during wetter periods of the year. This will need to be considered for the design of finished ground floor levels, foundations and any basement areas.

4 Flood Risk Management Infrastructure

Defences

There are no recorded flood defences on the watercourses located to the east and north of the site.

Residual Risk

There are no residual risks from flood management infrastructure.

5 Emergency Planning

Flood Warning

The site is not located in an area covered by EA Flood Warnings or Flood Alerts.

Access and Egress

Existing access to the site is off Coldham's Lane, and dry access is available via Coldham's Lane or Brooks Road in all modelled scenarios for fluvial flooding. However, in the 0.1% AEP event for surface water flooding, access via Barnwell Road and Coldham's Lane are both shown to be impacted by surface water flooding, with minor areas of flood encroachment onto Brooks Road.

Surface water flooding of the access route inside the site boundary is indicated for all scenarios including the 3.3% AEP event. Water depths are indicated to be up to 300mm, although most of the access route is shown to reach depths of less than 200mm in both the present day and climate change scenarios shown in the EA Long Term Risk of Flooding mapping.

6 Broadscale Assessment of Sustainable Drainage Systems (SuDS) Suitability

The site has been previously developed so the natural ground conditions will no longer be present and existing drainage infrastructure may be present beneath the site, making SuDS suitability difficult to assess. Ground investigations should be undertaken at the site to establish the underlying soil conditions and infiltration potential.

7 Opportunities for wider sustainability benefits and flood risk management

Redevelopment of the site provides an opportunity to integrate water harvesting and water re-use technologies into any new buildings, and opportunities to manage and mitigate surface water flood risk on site via small-scale SuDS and landscape features. This will contribute to overall sustainability and flood risk benefits in the Greater Cambridge area.

8 National Planning Policy Framework (NPPF) and Planning Implications

8.1 Exception Test Requirements

In accordance with the NPPF, ‘More Vulnerable’ development is considered compatible within Flood Zone 1 and does not require the application of the Exception Test.

8.2 Site Design and FRA Requirements

The developer will need to provide a site-specific FRA which demonstrates that future users of the development are safe from flood hazards from all sources throughout its lifetime. The applicant should demonstrate that the development meets the objectives of the NPPF’s policy on flood risk and how mitigation measures will be secured for the lifetime of the development.

A sequential approach should be implemented to address significant risks of surface water flooding within and around the site, locating vehicular access to the site and pedestrian access routes into buildings within areas at the lowest risk of surface water flooding (to the south of the existing buildings).

The site-specific FRA should address how surface water flood risk will be managed via the Surface Water Drainage Strategy (SWDS) for the site, and undertake surface water flood depth and velocity modelling to inform the finished floor levels for the development. Modelling requirements should be agreed with the Lead Local Flood Authority (LLFA).

The availability of safe access and egress will also need to be demonstrated for the 0.1% AP rainfall event, including the climate change allowance applicable to the catchment.

The site-specific FRA should further investigate risk of groundwater flooding (e.g. through groundwater level monitoring) to inform the need for mitigation and resilience measures, which may include the incorporation of an appropriate freeboard to the finished ground floor levels.

If any basement areas are proposed, groundwater flood mitigation and resilience measures should be identified and safe access and egress routes to basement areas should be determined.

9 Conclusions and Recommendations

The development is likely to be able to proceed if:

- A sequential approach is adopted, prioritising development outside of areas impacted by surface water flooding, as much as practicable.
- Floor levels are set above the maximum surface water flood depth (for the 1% AEP event + climate change) with a suitable freeboard.
- The availability of safe access and egress will also need to be demonstrated for the 0.1% AEP rainfall event, including the climate change allowance applicable to the catchment.
- If raising of access routes is required, this must not impact surface water flow routes or contribute to loss of floodplain storage.
- Measures are implemented on site to manage and reduce surface water flood risk e.g. water harvesting and/or storage areas integrated into landscaping, use of SuDS.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation and resilience measures.

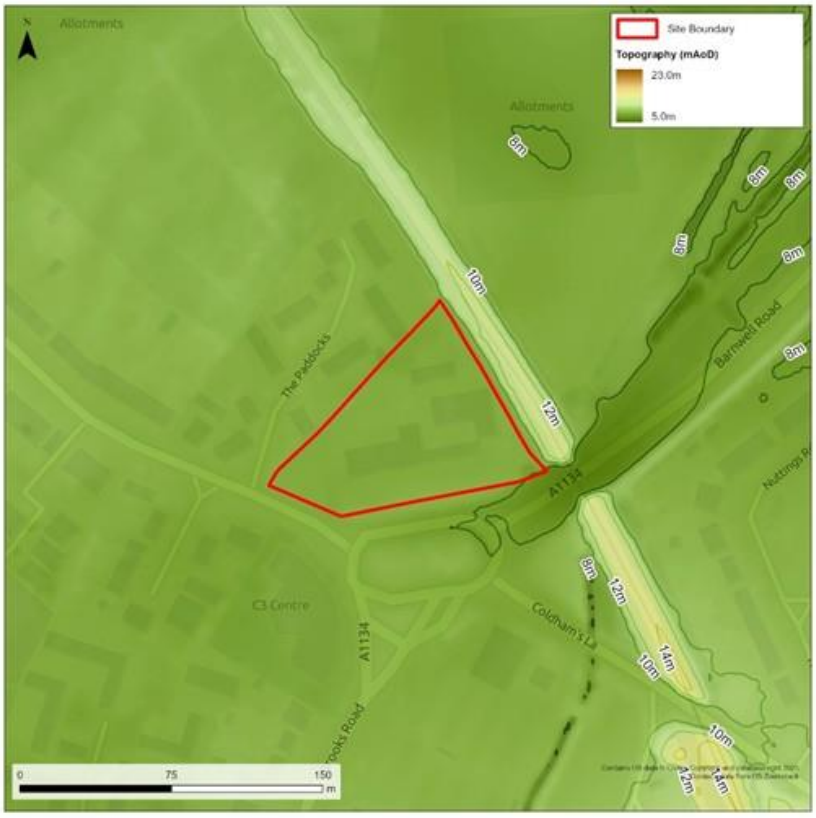

Figure 107: Site Topography

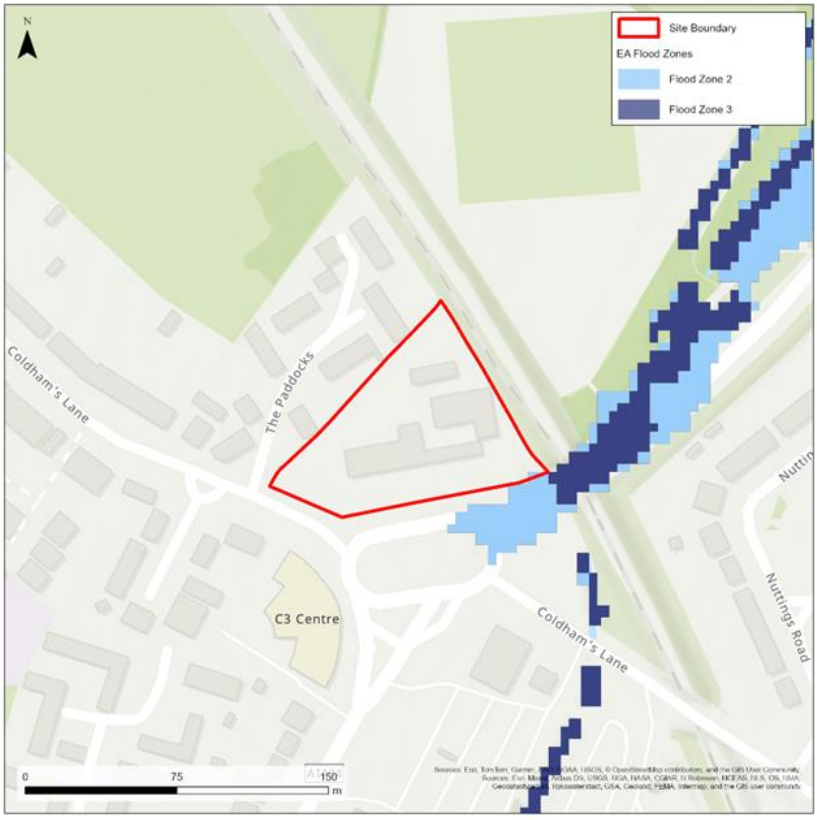

Figure 108: Flood Zones (Present Day)

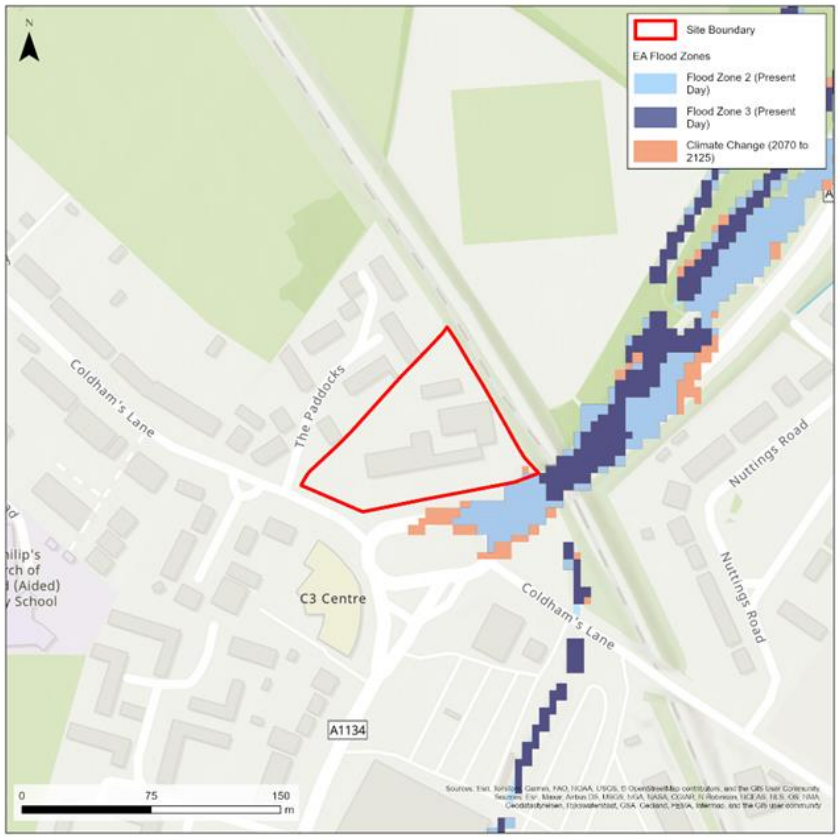

Figure 109: Flood Zones (Climate Change – 2070 to 2125)

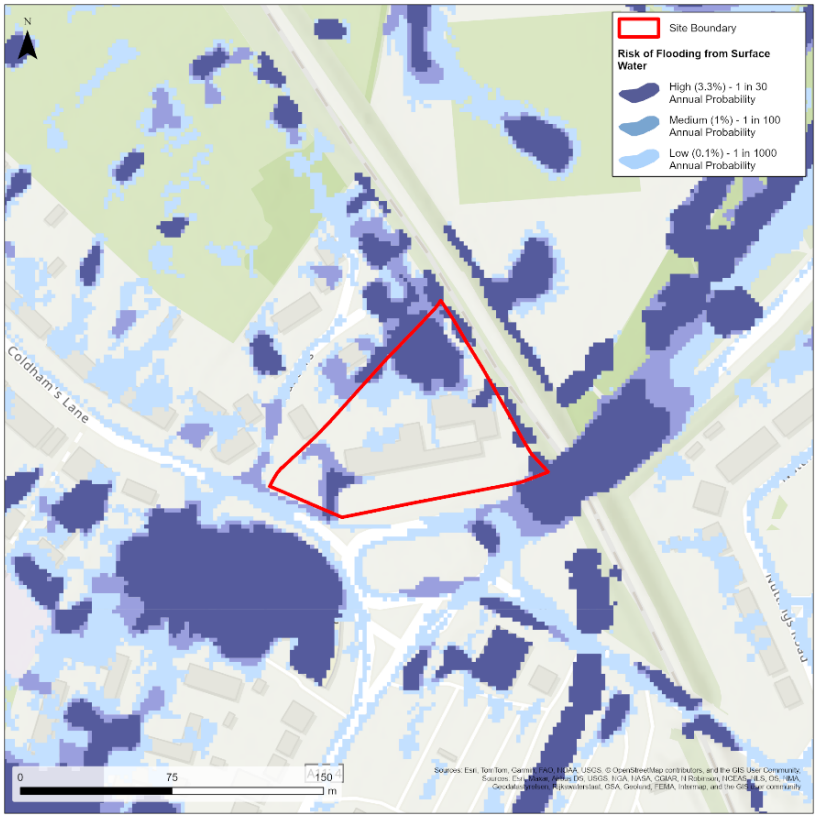

Figure 110: Risk of Flooding from Surface Water Map

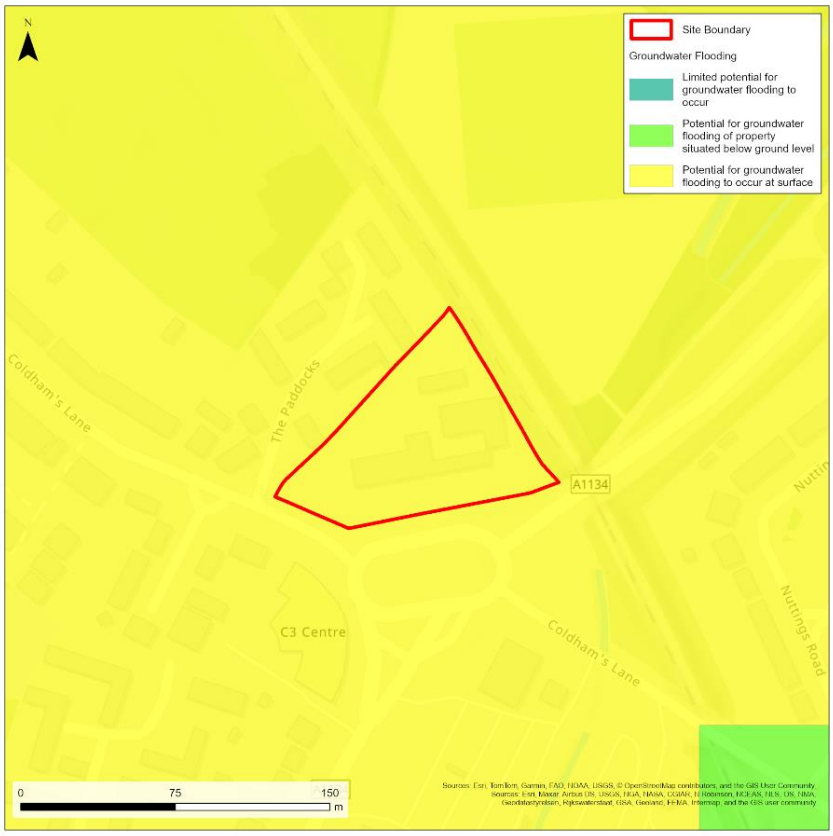

Figure 111: Susceptibility to Groundwater Flooding Map

Site Name: Land Adjacent to Cambridge Road (A10) and Mill Lane, Hauxton

1 Site Details

Site Reference: S/RRA/CRH
OS Grid reference: TL 43195 52596
Area: 0.4 Hectares
Proposed site use: Employment
Vulnerability Classification: Less vulnerable

Existing Watercourses:

The site lies within the 'Cam Rhee and Granta' Operational Catchment. The River Cam flows northwards to the east of the A10, passing beneath the road to the north of the site. The northern site boundary lies approximately 30m south of the River Cam.

There are no ordinary watercourses at the site, but a ditch flows alongside Hauxton Sports Ground to the immediate west of the A10, opposite the site. The ditch is located approximately 15m from the western site boundary.

Hydraulic modelling was completed for the River Cam (Cam Urban) in 2023 using Flood Modeller 6 and TUFLOW.

2 Sources of Flood Risk

2.1 Fluvial

Flood Zone	Proportion of Site within Flood Zone (%)
Flood Zone 1	75%
Flood Zone 2	25%
Flood Zone 3	0%

Environment Agency (EA) Flood Zone Mapping indicates that a majority of the site is situated in Flood Zone 1, however approximately 25% of the site area is located in Flood Zone 2. The mapping indicates that flood extents from the River Cam are shown to encroach into the site along the north boundary and from the floodplain located between the River Cam and Hauxton House to the north-east of the site.

The hydraulic modelling of the River Cam was completed in 2023. Modelled results indicates that the risk associated with fluvial flood extents in the north is identified as

'low' and 'Danger for Some' hazard. The modelled results also show flood depths of up to approximately 0.5 metres at the at-risk areas in the north.

2.2 Surface Water

Risk of Surface Water Flooding	Proportion of Site at Risk (%)
Low (0.1% AEP)	5%
Medium (1% AEP)	0%
High (3.33% AEP)	0%

EA Risk of Flooding from Surface Water mapping shows minimal risk of surface water flooding on site. Localised surface water ponding is dispersed in areas surrounding the site boundary in what can be assumed to be points of topographic depression, however ponding within the site boundary is minimal.

During the mapped 1% and greater than 0.1% Annual Exceedance Probability (AEP) events, an overland flow path extending south-west from the River Cam across Mill Lane towards the A10 Cambridge Road can be observed, however encroachment within the site boundary appears to be minimal even in the low probability flood event.

It should be noted, however, that although there are no existing built structures within the site boundary, the surrounding area is extensively developed. Consequently, the mapping may not accurately represent the true extent or pathways of surface water, as existing drainage infrastructure could alter the natural flow patterns.

EA Long Term Risk of Flooding from Surface Water mapping indicates that surface water flood depths across the site are likely to be less than 200 millimetres.

2.3 Groundwater

The British Geological Survey (BGS) 'Susceptibility to Groundwater Flooding' map indicates that there is a high potential for groundwater flooding of property situated below ground level (100% of the site area, according to the Screening Table prepared by GCSP). The dataset indicates susceptibility to flooding and is not indicative of a specific level of hazard or risk.

BGS Geology mapping (at 1:50000 scale) indicates that superficial deposits of the River Terrace Deposits overlie the site, which is likely to have variable composition including sand, gravel, clay and silt. However, the natural ground conditions may have been affected by the previous use of the site as a car park.

Groundwater flood risk will therefore vary across the site, dependent on the specific underlying geology, and groundwater level monitoring and soil testing may be required to establish the current groundwater conditions.

2.4 Reservoir

The EA Risk of Flooding from Reservoirs mapping shows that the site is unaffected in the 'dry day' (reservoir flooding only) scenario. 92% of the site is indicated to be at risk of flooding in the event of a breach of the Dernford Reservoir for the 'wet day' scenario (if reservoir flooding were to occur simultaneously with river flooding).

In this scenario, reservoir flood extents are indicated to cover almost the entirety of the site with the exception of 8% of the south-eastern part of the site, adjacent to Mill Lane.

90% of the mapped flood extents in the 'wet day' scenario are attributed to fluvial sources, therefore any risk posed by a reservoir breach is minor.

2.5 Flood History

EA historical flood mapping indicates that fluvial flooding originating from the River Cam in October 2001 impacted the north-east sector of the site adjacent to Mill Lane. This part of the site is located within Flood Zone 2. Historic aerial mapping indicates that in 2001, the entire site area, along with the land to the north extending up to the riparian buffer zone, was utilised as a paved parking area, and the large area of impermeable surfacing may have influenced the historic flood extents.

3 Climate Change Implications

The impacts of climate change on flood risk from the ordinary watercourses has not been modelled as part of this SFRA. In accordance with the guidance provided in the Level 1 SFRA where modelled data is unavailable, the flood extents recorded as present-day Flood Zone 2, the NaFRA2 datasets for climate change as represented in the online Long Term Flood Risk mapping, and the low-risk surface water event have been used as a proxy.

3.1 Fluvial

The EA Long Term fluvial flood risk mapping for climate change (between 2070-2125) shows a major increase in the extent of fluvial flooding from present day extents, with almost the entirety of the site being located in Flood Zone 2.

Modelled climate change scenarios only show a very minor increase to the projected fluvial flood depths from the present day 1% AEP scenario to the 1% AEP + 45% climate change scenario. In the present day 1% AEP scenario, there is not a hazard rating indicated within the site boundary. However, in the 1% AEP +45% climate change scenario, there are areas of 'Low' and 'Danger for Some' hazard rating.

3.2 Surface Water

Overland flow paths, flood extents and flood depths do not change significantly from the present-day scenario in the climate change scenario shown in the EA Risk of

Flooding from Surface Water mapping (2040-2060) for a vast majority of the site. The lifetime of the development will extend beyond 2060, so the present day 1 in 1000 surface water mapping has also been used as a conservative proxy for future climate change. As previously noted, the 1 in 1000 AEP event does not demonstrate any significant intensification in the extent of surface water flooding on site. Areas already identified as being at risk of flooding are subject to increased flood extents, but the associated flood depths exhibit only minimal increases, remaining below 200mm.

3.3 Groundwater

The future impacts of climate change on groundwater levels are complex, difficult to model and not well understood.

Due to increased rainfall expectations with climate change, it should be assumed that the groundwater table could be impacted in future and may rise during wetter periods of the year. This will need to be considered for the design of finished ground floor levels, foundations and any basement areas.

4 Flood Risk Management Infrastructure

Defences

The site is not protected by any formal flood defences.

Residual Risk

There is no highlighted residual risk to the site from flood risk management infrastructure.

5 Emergency Planning

Flood Warning

The site is located in the EA ‘River Cam at Stapleford, Great Shelford and Hauxton’ Flood Alert Area, indicating that the risk of flooding on site in any given year is greater than 1%.

It is recommended that the site be registered to receive flood warnings from the EA. Given that the proposed development is intended for employment use, it may also be beneficial to prepare a site-specific flood warning and evacuation plan. This would provide clear guidance for personnel on-site in the event of a flood, improving safety.

Access and Egress

Cambridge Road adjacent to the site is a public highway accessible to both pedestrian and vehicular traffic. The main existing access route to the site is off Cambridge Road via St Edmunds Way and Mill Lane.

Selection of access routes to the site should consider fluvial and surface water flood risk to ensure that the route is compliant with access requirements specified in the Planning Practice Guidance 'Flood Risk and Coastal Change' emergency planning provisions.

EA Flood Map for Planning indicates that present-day fluvial flood extents have minimal impact on the access to site from Cambridge Road as the flood extents do not encroach past Mill Lane. However, the climate change adjusted fluvial extents are indicated to spill over the site onto Cambridge Road which may have an impact on

EA Flood Map for Planning indicates that the majority of Cambridge Road is not at risk from surface water flooding, however a small area of ponding is indicated in the 0.1% AP event just south of the site boundary. A flow path is shown extending diagonally south-west from the River Cam across the northern end of Mill Road, towards Cambridge Road.

EA Long Term Risk of Flooding from Surface Water mapping indicates however, that the surface water flood depths are likely to be less than 200mm meaning that the impact on access is likely to be minimal.

6 Broadscale Assessment of Sustainable Drainage Systems (SuDS) Suitability

Infiltration SuDS may be suitable on site as the River Terrace Deposits are permeable and the underlying ground conditions are potentially suitable for infiltration drainage features. Ground investigations should be undertaken at the site to establish the underlying soil conditions and infiltration potential.

Surface and fluvial water management could incorporate infiltration features such as soakaways, permeable paving or rain gardens. These systems can help reduce flood risk by increasing the volume of water infiltrating the ground, reducing pressure on conventional drainage networks. The feasibility of such measures is subject to geo-environmental assessments, soil classification testing and infiltration testing to establish suitability of SuDS to inform the Surface Water Drainage Strategy for the site.

There is a potential presence of existing drainage infrastructure beneath the site as the surrounding area comprises a developed urban landscape. This presents challenges in accurately assessing the suitability of Sustainable Drainage Systems (SuDS).

7 Opportunities for wider sustainability benefits and flood risk management

Potential opportunities exist for SuDS to be integrated into the site, to manage surface water runoff and flood risk whilst providing wider sustainability benefits and enhancing local flood resilience. Opportunities that offer high drainage potential within limited space include permeable paving, bioretention areas, green roofs and swales.

Development of the site also provides an opportunity to integrate water harvesting and water re-use technologies into new buildings, to further contribute to overall sustainability and flood risk benefits in the Greater Cambridge area.

8 National Planning Policy Framework (NPPF) and Planning Implications

8.1 Exception Test Requirements

In accordance with the NPPF, 'Less Vulnerable' development is considered compatible within Flood Zone 2 and does not require the application of the Exception Test.

8.2 Site Design and FRA Requirements

A sequential approach should be adopted, preferentially developing areas at little to no risk of fluvial and surface water flooding and ensuring that existing flood flow paths are maintained.

The developer will need to provide a site-specific FRA which demonstrates that future users of the development are safe from flood hazards from all sources throughout its lifetime. The applicant should demonstrate that the development meets the objectives of the NPPF's policy on flood risk and how mitigation measures will be secured for the lifetime of the development.

Flood resilience and resistance methods should be considered including but not limited to raised finished floor levels, elevated refuge spaces and flood doors. Finished floor levels should be situated above the 1% AEP flood level, taking into account climate change and including an appropriate freeboard. Modelling requirements should be agreed with the local authority.

The availability of safe access and egress will need to be demonstrated using flood depth, velocity and hazard outputs for the modelled 0.1% AEP fluvial flood events and 'wet day' reservoir flood event, including the climate change allowance applicable to the catchment. The developer should also prepare a site-specific flood warning and evacuation plan supporting safe access and egress. The site-specific FRA should further investigate risk of groundwater flooding (e.g. through groundwater level monitoring) to inform the need for appropriate mitigation

measures, which may include the incorporation of an appropriate freeboard to the finished ground floor levels.

The availability of safe access and egress will need to be demonstrated for the 1 in 1000 (0.1%) annual probability fluvial and rainfall flood events, including the climate change allowances applicable to the catchment.

Due to the groundwater flood risk, proposal of basement areas should be avoided and are not likely to be approved.

9 Conclusions and Recommendations

The development is likely to be able to proceed if:

- The sequential approach is adopted to preferentially develop parts of the site at lowest risk of flooding.
- Flood mitigation measures are implemented that ensure future users of the development are safe from flooding from all sources throughout its lifetime. It can be demonstrated through a site-specific FRA that that displacement of water will not occur and subsequently, increase the risk of flooding elsewhere.
- Flood resilience / resistance methods are incorporated within parts of the proposed development located within a flood risk area.
- SuDS opportunities that offer high drainage are integrated into the site (subject to infiltration testing and an investigation of ground conditions).
- Water harvesting and water re-use technologies into new buildings. Existing fluvial and overland surface water flow paths are maintained throughout the site or suitable flood compensation is provided in agreement with the Environment Agency and the Local Lead Flood Authority.
- Access routes are located outside of areas identified as at risk of fluvial and surface water flooding and avoiding existing run-off flow paths.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation measures.
- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with floor levels above the fluvial design flood event (1% AEP), taking into account climate change.
- An appropriate Flood Warning and Evacuation Plan is in place to ensure a strategy is in place for site users during a flood event.

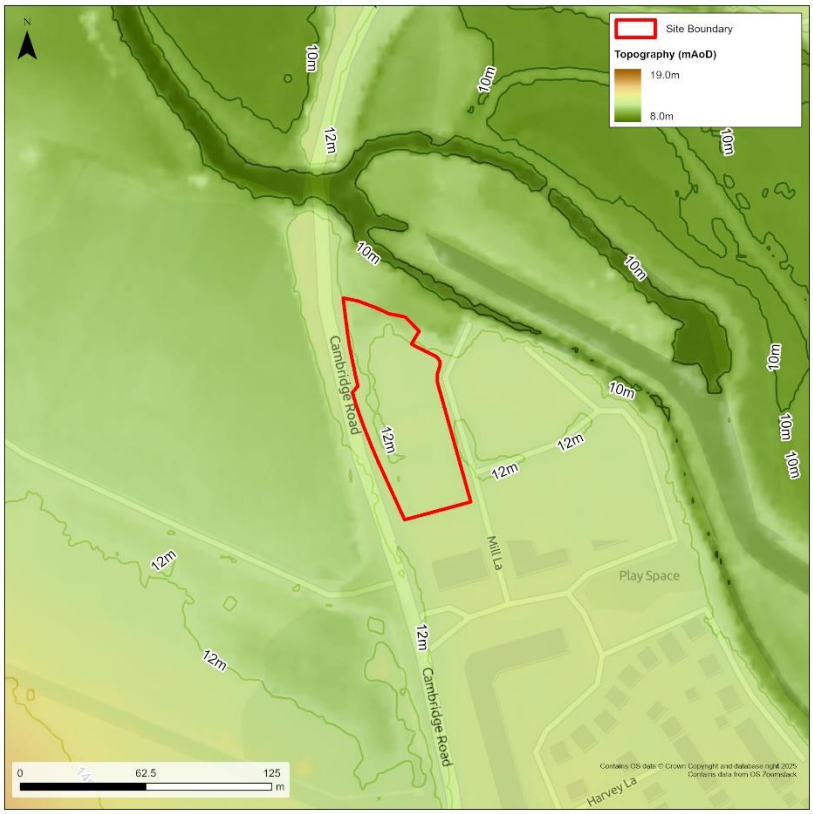

Figure 112: Site Topography

Figure 113: Flood Zones (Present Day)

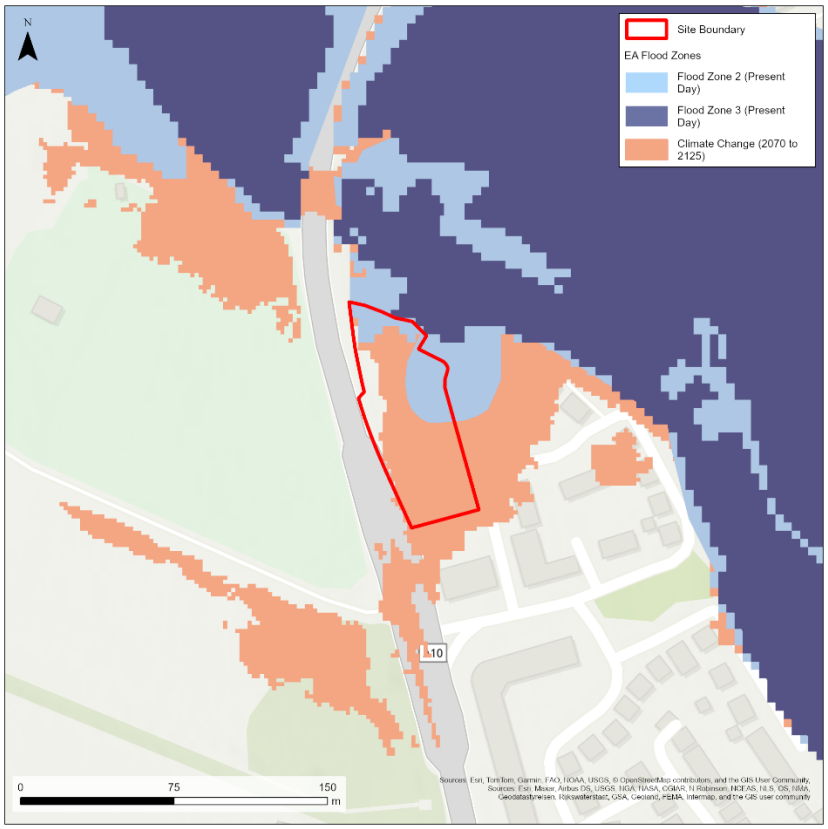

Figure 114: Flood Zones (Climate Change – 2070 to 2125)

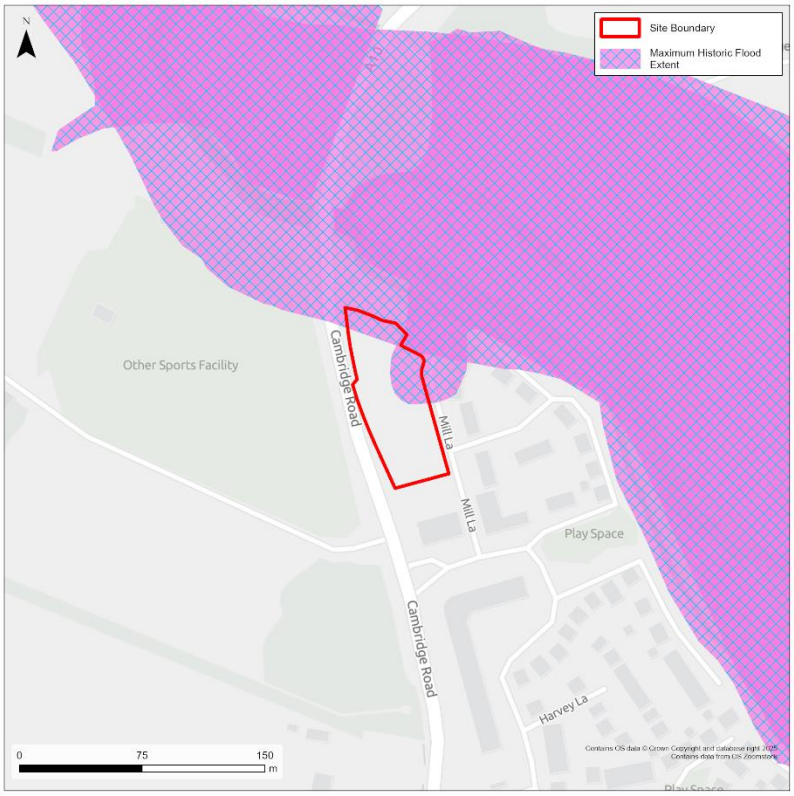

Figure 115: Historic Flood Extent

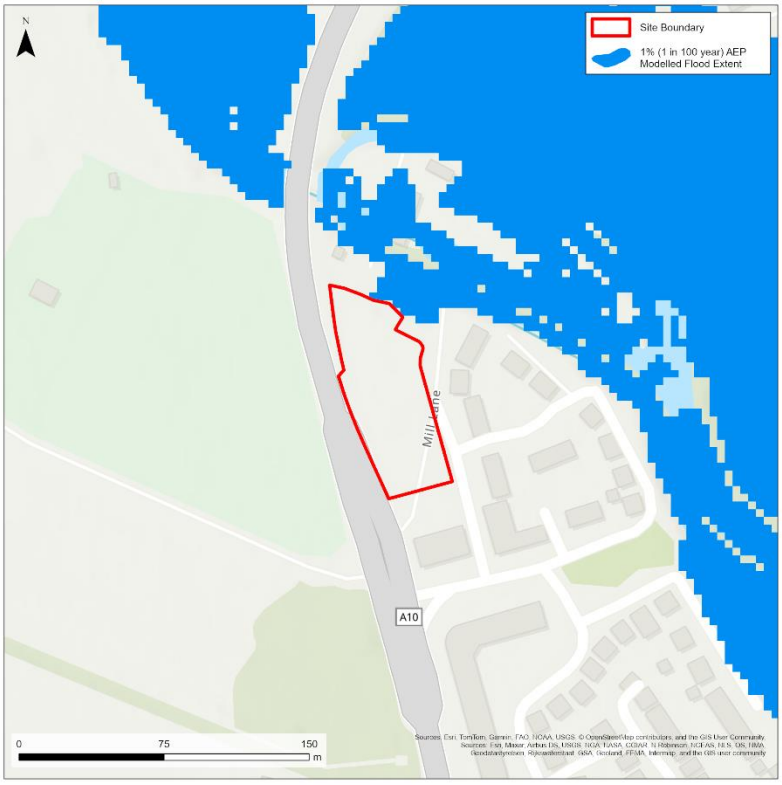

Figure 116: Modelled Fluvial Flood Extent (1% AEP)

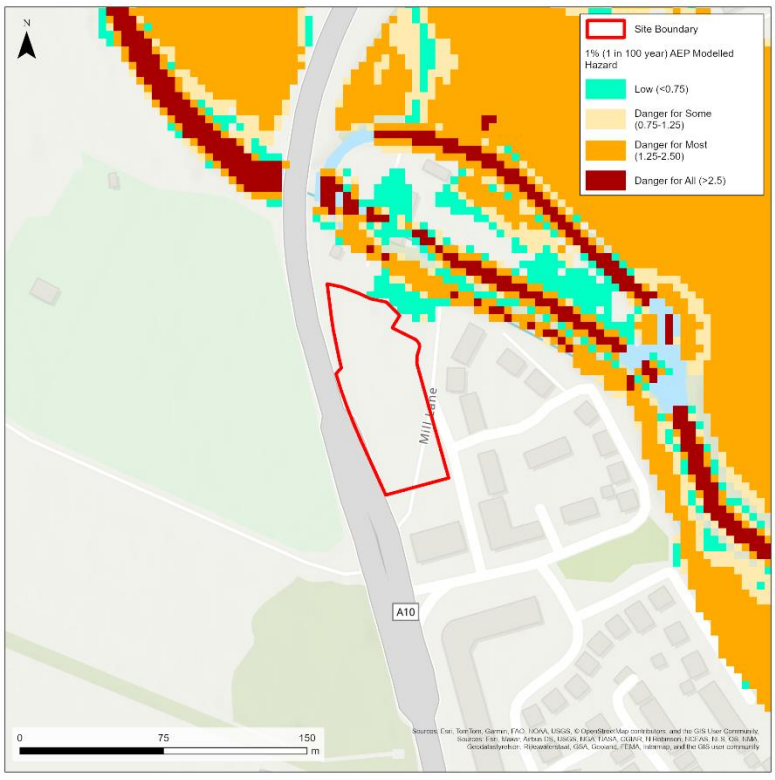

Figure 117: Modelled Fluvial Flood Hazard (1% AEP)

Figure 118: Modelled Fluvial Flood Extent (1% AEP with Climate Change)

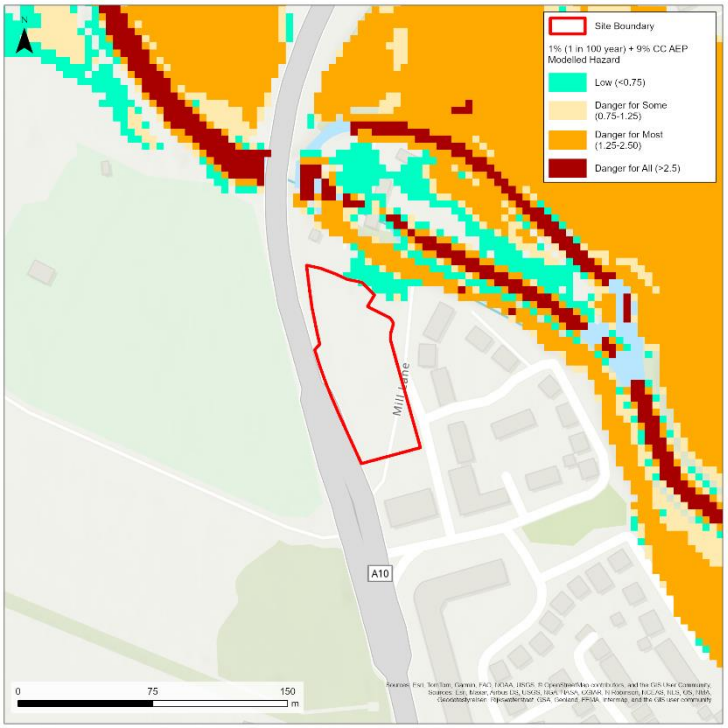

Figure 119: Modelled Fluvial Flood Hazard (1% AEP with Climate Change)

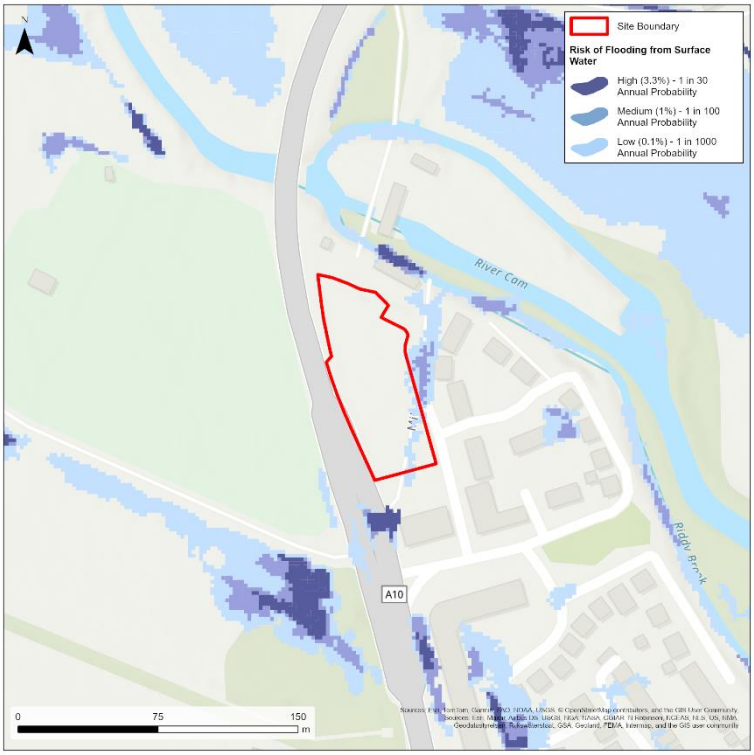

Figure 120: Risk of Flooding from Surface Water Map

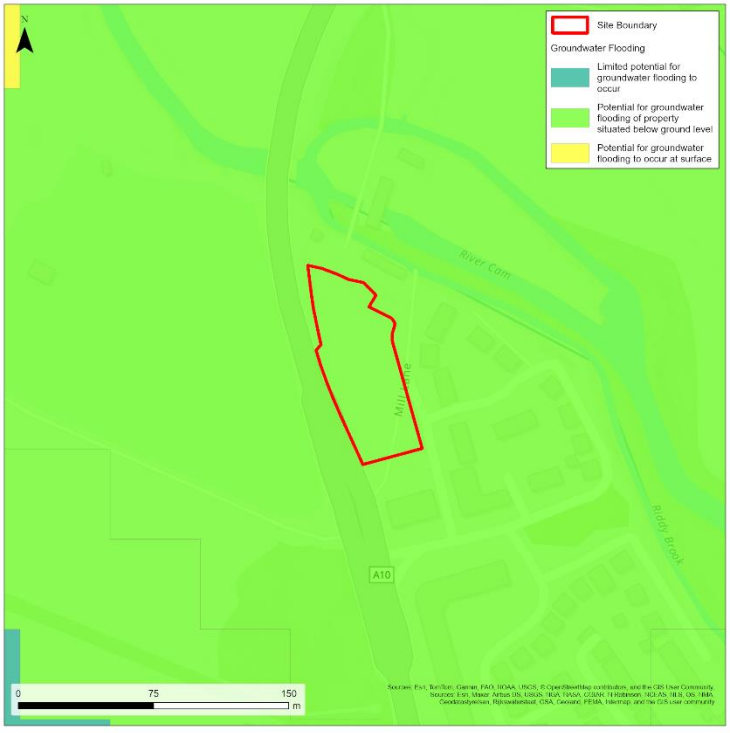

Figure 121: Susceptibility to Groundwater Flooding Map

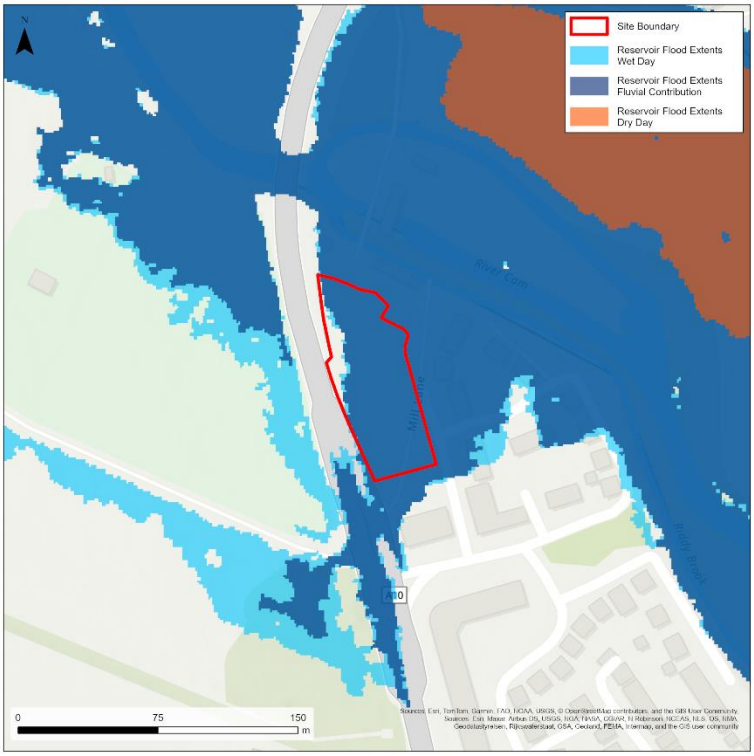

Figure 122: Reservoir Flood Extent

Site Name: Land to the South of Cambridge Services, A14

1 Site Details

Site Reference S/RRA/SCS
OS Grid reference: TL 35634 65223
Area: 24.58 Hectares
Proposed site use: Employment
Vulnerability Classification: Less Vulnerable

Existing Watercourses:

The site is located within the Great Ouse Lower operational catchment. There is an ordinary watercourse, likely a drainage ditch, running adjacent to the western boundary of the site for approximately 50 metres before heading southeast through the centre of the site. The ditch discharges to another ditch approximately 150 metres southeast of the site, which flows in a northeasterly direction. Another ordinary watercourse runs parallel to the A14 on the northern border of the site, which then connects to the ditch flowing northeast before passing underneath the A14 in a large culvert, flowing north.

2 Sources of Flood Risk

2.1 Fluvial

Flood Zone	Proportion of Site within Flood Zone (%)
Flood Zone 1	100%
Flood Zone 2	0%
Flood Zone 3	0%

The entire site is located in Flood Zone 1. The ordinary watercourses on site and to the north of the site are not shown to have a modelled extent within the Environment Agency (EA) fluvial flood risk maps. Therefore, the EA Risk of Flooding from Surface Water maps can be used as a proxy to delineate fluvial flood risk from these watercourses.

2.2 Surface Water

Risk of Surface Water Flooding	Proportion of Site at Risk (%)
Low (0.1% AEP)	13%
Medium (1% AEP)	7%
High (3.33% AEP)	13%

The Risk of Flooding from Surface Water map indicates that a significant portion of the site is affected by surface water flooding.

In the 3.33% Annual Exceedance Probability (AEP) event, a wide flow path is identified on the eastern border of the site, flowing northwest towards the A14 culvert. Surface water flooding is also noted in topographical low points in the west and north (between Boxworth road and Cambridge Services).

In the 1% AEP event, all flood extents increase, notably along the site's northern border south of Cambridge Services. Flow paths also begin to appear connecting the ponding areas within the topographical low points to the wider flood extents.

During the 0.1% AEP event, the surface water flood extents expand significantly across the site, with overland flow paths forming that interconnect the various inundated areas to the existing ditch and the flow path along the eastern border of the site. There are two distinct surface water flow routes passing through the site.

EA Long Term Risk of Flooding mapping indicates flood depths in the western and northern sections of localised ponding can range between 100–600 millimetres and 100-300 millimetres respectively, with the deepest areas being associated with the highest probability (3.33%) AEP events. The depths in the flow path in the east of the site are only identified to reach up to 200 millimetres in a very small section of the site.

2.3 Groundwater

The British Geological Survey (BGS) 'Susceptibility to Groundwater Flooding' map indicates that the site is not within an area susceptible to groundwater flooding.

2.4 Reservoir

The site is not located in an area shown to be at risk from reservoir flooding.

2.5 Flood History

EA Historic Flood Map indicates no historical flood events have been recorded within the site or its vicinity.

3 Climate Change Implications

3.1 Fluvial

The EA Flood Map for Planning climate change mapping (2070-2125) shows 1% of the site along the eastern boundary of the site is at 'low' risk of flooding (between 0.1% and 1% AEP). This extent is associated with the drainage ditch east of the site which floods out of bank inundating a minor section of the site. The Flood Map for Planning however does not include the ordinary watercourse in, or bordering, the north of the site within its modelling. Therefore, the EA Long Term Risk of Flooding

mapping for climate change (between 2036-2069) has been used as a proxy for these watercourses. Flooding is delineated as remaining in channel for the watercourse on-site.

3.2 Surface Water

Flood extents are not shown to increase significantly from the present day 1% AEP scenario to the climate change scenario shown in the EA Risk of Flooding from Surface Water mapping (2040-2060). The lifetime of the development is expected to extend beyond 2060, so the present day 0.1% AEP has been used as a conservative proxy for future climate change. As noted above, the 0.1% AEP event shows an amplification of the projected flood extents compared to the 1% AEP event.

3.3 Groundwater

The future impacts of climate change on groundwater levels are complex, difficult to model and not well understood.

Due to increased rainfall expectations with climate change, it should be assumed that the groundwater table could be impacted in future and may rise during wetter periods of the year. This will need to be considered for the design of finished ground floor levels, foundations and any basement areas.

4 Flood Risk Management Infrastructure

Defences

The site is not protected by any formal flood defences.

Residual Risk

There are no identified residual risks from flood management infrastructure.

5 Emergency Planning

Flood Warning

The site is not part of any current EA Flood Alert, Flood Warning or Groundwater Flood Warning areas.

Access and Egress

Proposed access/egress routes should be located outside of the identified area of high surface water flood risk. Access is possible via Boxworth Road, between the two identified surface water flow routes.

Parts of the site, particularly towards the east and south are dry islands during the 0.1% AEP rainfall event. Development in these areas require consideration of

elevated access routes to be designed in conjunction with the EA/LLFA to allow site egress during a flood event.

6 Broadscale Assessment of Sustainable Drainage Systems (SuDS) Suitability

BGS Geology mapping (at 1:50000 scale) indicates that the site is underlain by bedrock of the West Walton Formation and Ampthill Clay Formation which comprises of mudstone. The Cranfield Soilscapes Viewer identifies the soil as soil type 9 'Lime-rich loamy and clayey soils with impeded drainage'. Therefore, infiltration SuDS may not be suitable due to the underlying mudstone bedrock formations and impeded soil drainage. Infiltration testing will be required to determine the suitability of surface water discharge to groundwater.

Surface water management should therefore prioritise attenuation and conveyance features such as swales, detention basins, ponds, and permeable paving with lined sub-bases. These systems can provide effective storage and slow runoff rates. The site has two possible existing watercourses into which the development could discharge. Discharge should be directed to the on-site or northern watercourse, subject to capacity and consent as per the Surface Water Drainage Hierarchy.

In accordance with the Surface Water Drainage Hierarchy, surface water discharge to a watercourse needs to be thoroughly investigated before the Lead Local Flood Authority (LLFA) would accept discharge into a surface water sewer.

7 Opportunities for wider sustainability benefits and flood risk management

Due to the size of the site, there are likely to be opportunities for green infrastructure such as swales, permeable paving, filter strips and attenuation to provide wider environmental, surface water management and amenity benefits. The existing watercourse on site can be maintained and enhanced, providing increased stormwater attenuation and conveyance that could benefit the wider area. The use of SuDS and enhancement of the existing watercourse can also contribute to improving water quality, providing flood protection, enhancing biodiversity and contributing to an attractive environment. Rainwater harvesting and other mechanisms should also be considered to enable storage and re-use of water.

8 National Planning Policy Framework (NPPF) and Planning Implications

8.1 Exception Test Requirements

In accordance with the NPPF, 'Less Vulnerable' development is considered compatible within Flood Zone 1 and does not require the application of the Exception Test.

8.2 Site Design and FRA Requirements

The developer will need to provide a site-specific FRA which demonstrates that future users of the development will not be placed in danger from flood hazards from all sources throughout its lifetime. The applicant should demonstrate that the development meets the objectives of the NPPF's policy on flood risk and how mitigation measures will be secured for the lifetime of the development.

The site layout should use the sequential approach, preferentially locating development in areas at lowest risk of flooding.

Hydraulic modelling of the network of watercourses that pass through and in the vicinity of the site will be required to better understand the associated flood risk and inform design parameters for proposed development. Modelling requirements should be agreed with the LLFA.

The risk of surface water flooding must be addressed through a Surface Water Drainage Strategy (SWDS) for the site and should outline how development will manage and mitigate these risks.

The availability of safe access and egress will need to be demonstrated using flood depth, velocity and hazard outputs for 0.1% AEP fluvial/rainfall flood events, including the climate change allowance applicable to the catchment. Access routes should ideally be raised at least 300 millimetres above the flood level. If raising of access routes is required, this must not impact surface water flow routes or contribute to the loss of floodplain storage. Consideration should be given to the location of site access points, with particular regard to areas of surface water flood risk. A Flood Warning and Evacuation plan should be in place for the site.

9 Conclusions and Recommendations

The development is likely to be able to proceed if:

- A sequential approach is adopted, prioritising the location of development within areas at lowest risk of flooding.
- Access routes are located outside of run-off flow paths and areas identified as at risk of surface water flooding. The access point into and out of the site is situated with respect to areas of surface water flood risk.
- If raising of access routes is required, this must not impact surface water flow routes or contribute to loss of floodplain storage.
- Consideration is given to the water management and SuDS at the site and how the site can contribute to wider flood and water management benefits across the catchment.
- Infiltration testing is required to determine the suitability of infiltrating SuDS features. Where infiltration is not possible surface water should be attenuated and conveyed by SuDS features before being discharged into the watercourse on-site.

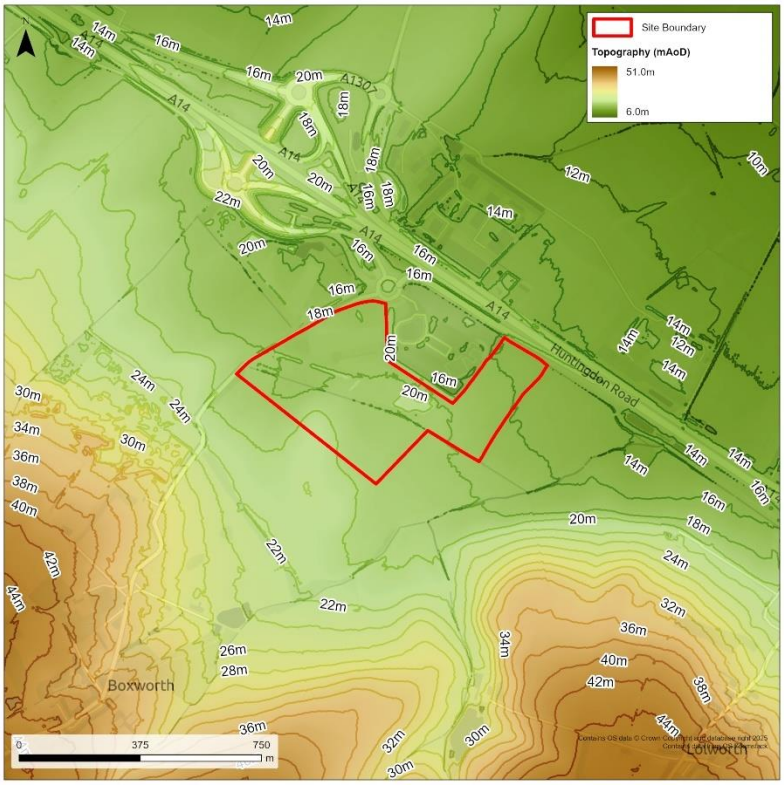

Figure 123: Site Topography

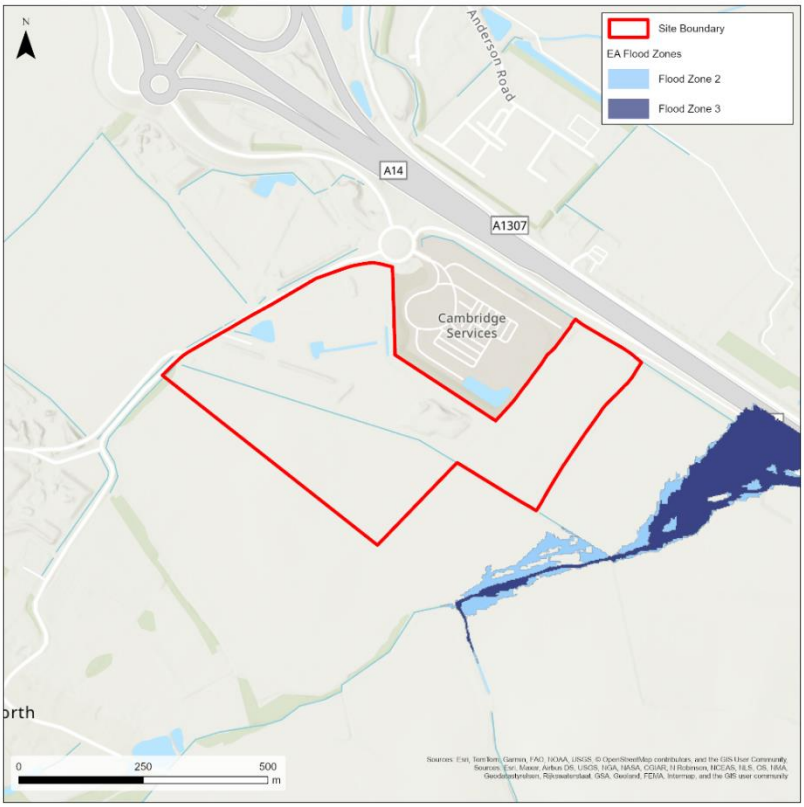

Figure 124: Flood Zones (Present Day)

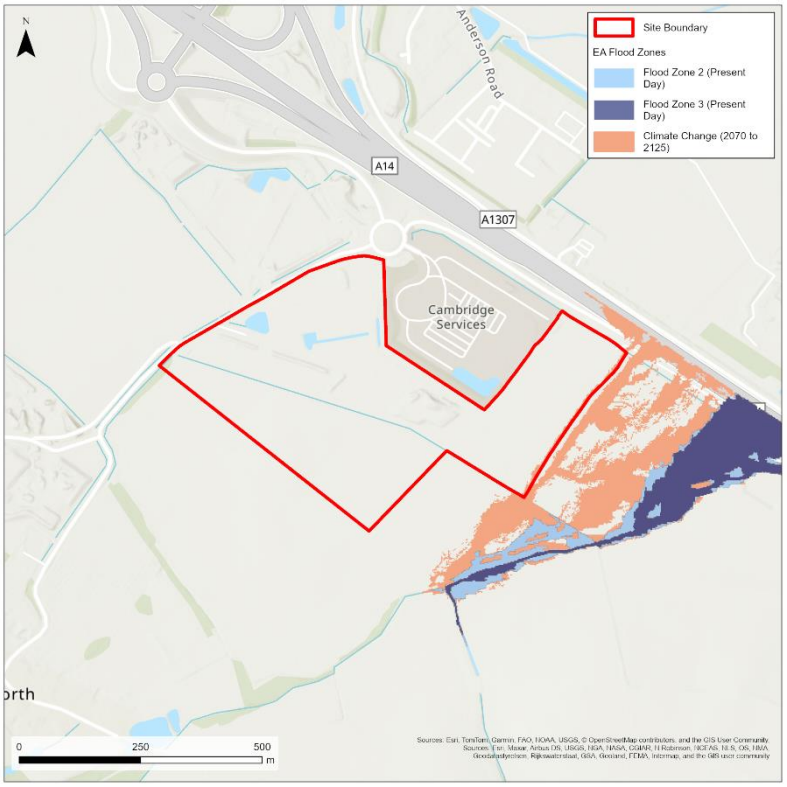

Figure 125: Flood Zones (Climate Change (2070 to 2125)

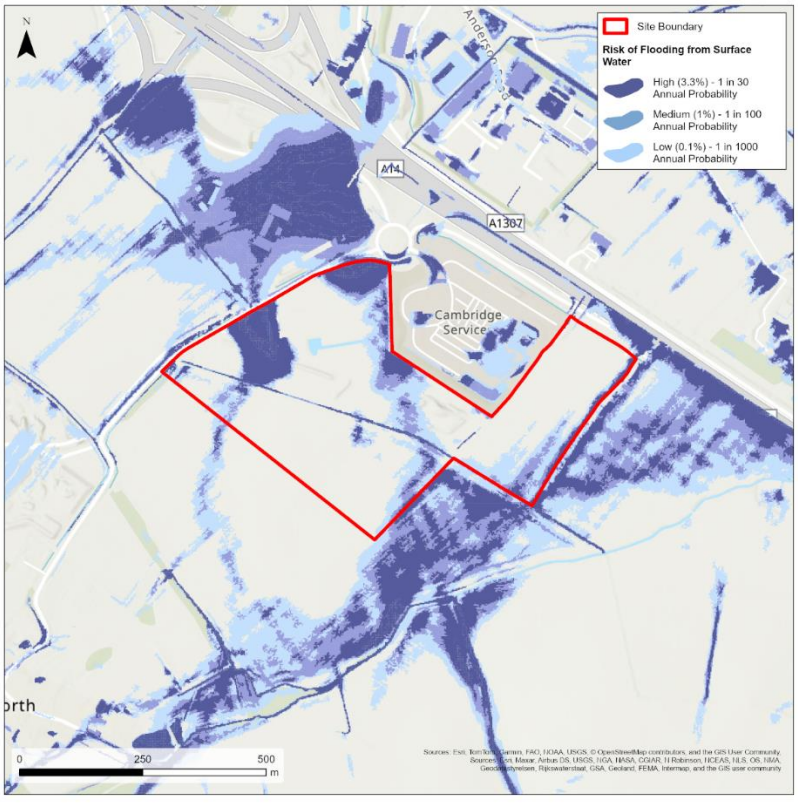

Figure 126: Risk of Flooding from Surface Water Map

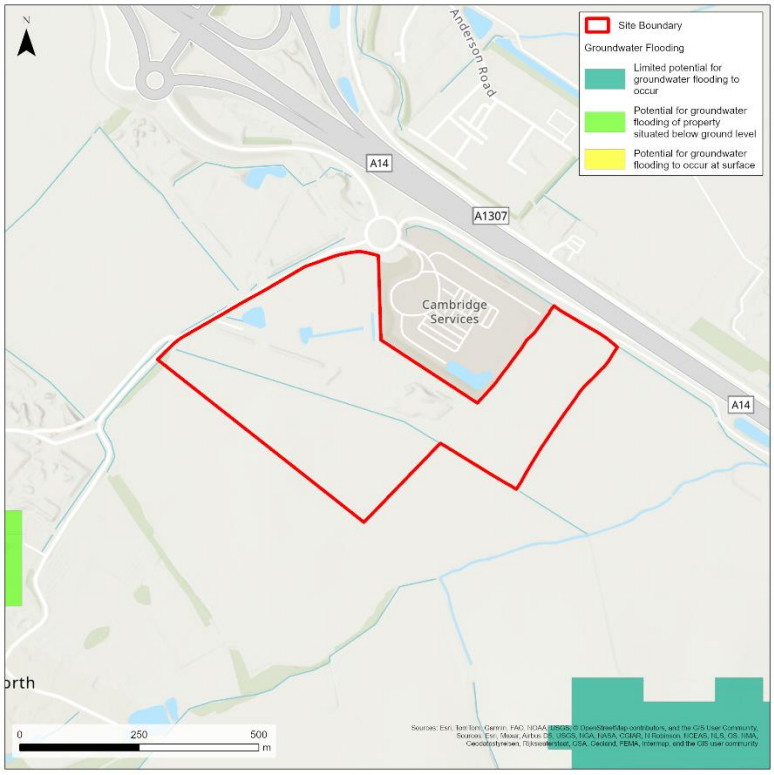

Figure 127: Susceptibility to Groundwater Flooding Map

Site Name: Land West of Cambridge Road, Melbourn

1 Site Details

Site Reference: S/RRA/CR
OS Grid reference: TL 38979 45366
Area: 6.65 Hectares
Proposed site use: Mixed use including residential
Vulnerability Classification: Residential – More Vulnerable
Commercial Use – Less Vulnerable

Existing Watercourses:

The site lies within the 'Cam Rhee and Granta' Operational Catchment. An ordinary watercourse is located to the west of the proposed development site. The direction of flow is assumed to flow northwards towards Guilden Brook.

Flood modelling is not available for the site

2 Sources of Flood Risk

2.1 Fluvial

Flood Zone	Proportion of Site within Flood Zone (%)
Flood Zone 1	100%
Flood Zone 2	0%
Flood Zone 3	0%

Environment Agency (EA) Flood Zone mapping indicates that the entire site is located in Flood Zone 1.

The Flood Zone mapping does not cover the entire extent of the ordinary watercourse on the site. Therefore, the Risk of Flooding from Surface Water map has been used as a proxy to assess flood risk from this watercourse for the purposes of this site assessment.

2.2 Surface Water

Risk of Surface Water Flooding	Proportion of Site at Risk (%)
Low (0.1% AEP)	7%
Medium (1% AEP)	1%
High (3.33% AEP)	1%

EA Risk of Flooding from Surface Water mapping indicates that the majority of the site is not affected by surface water flooding, however the mapping does indicate significant areas of ponding in the North-West section of the site in the 0.1% Annual Exceedance Probability (AEP) event.

For the 3.3% AEP event, surface water flood risk is minimal, largely confined to scattered areas of ponding in the northern sector of the site. For the 1% AEP event, increased areas of ponding are shown in the northern sector of the site, particularly concentrated around the ordinary watercourse on site, indicating signs of overtopping. A comparable pattern is observed during the 0.1% AEP event, with surface water mapping indicating significant levels of scattered ponding across the site. This ponding is primarily concentrated in the northern sector, although the central area also exhibits notable accumulation. An overland flow path is also indicated during the 0.1% AEP event with an encroachment from the overtopping ordinary watercourse into the central area.

Additionally, overland flow paths have been shown running from south to north along the length of Cambridge Road. Although the impact of the risk is minimal during the 3.3% and 1% AEP events, during the 0.1% flood event the mapping indicates that the entirety of the length of Cambridge Road adjacent to the site is at risk of flooding.

EA Long Term Risk of Flooding from Surface Water mapping indicates that surface water flood depths across the site are likely to be less than 200mm with some localised depths of between 300-600 millimetres in and around the Ordinary Watercourses.

2.3 Groundwater

The British Geological Survey's) (BGS) 'Susceptibility to Groundwater Flooding' map indicates that there is a high potential for groundwater flooding to occur at surface level (100% of the site area, according to the Screening Table prepared by GCSP). The dataset indicates susceptibility to flooding and is not indicative of a specific level of hazard or risk.

BGS Geology mapping (at 1:50000 scale) indicates that the overlying bedrock geology on site is the Zig Zag Chalk Formation; however, there are no superficial deposits on site. Groundwater flood risk, therefore, is relatively homogenous on site.

2.4 Reservoir

The site is not located in an area shown to be at risk from reservoir flooding.

2.5 Flood History

No historic flooding is recorded at the site location.

3 Climate Change Implications

The impacts of climate change on flood risk from the ordinary watercourses has not been modelled as part of this SFRA. In accordance with the guidance provided in the Level 1 SFRA where modelled data is unavailable, the flood extents recorded as present-day Flood Zone 2, the NaFRA2 datasets for climate change as represented in the online Long Term Flood Risk mapping, and the low-risk surface water event have been used as a proxy.

3.1 Fluvial

The EA Flood Map for Planning for climate change (between 2070-2125) shows only a very minor increase in the extent of fluvial flooding from present day extents. It should be noted that the network of ditches located to the north of the site, in proximity to Guilden Brook, indicates an increase in the extent of fluvial flooding from present-day. The modelled flood extent currently lies approximately 320 metres from the site boundary, suggesting that the site is presently subject to minimal fluvial flood risk though this may be subject to change in the future. The entirety of the site remains in Flood Zone 1.

3.2 Surface Water

Overland flow paths, flood extents and flood depths do not change significantly from the present-day scenario in the climate change scenario shown in the EA Risk of Flooding from Surface Water mapping (2040-2060). However, flood extents immediately adjacent to the Ordinary Watercourse in the west sector of the site and scattered ponding in the northern sector of the site are indicated to be at a higher risk of flooding. The lifetime of the development will extend beyond 2060, so the present day 1 in 1000 surface water mapping has also been used as a conservative proxy for future climate change.

3.3 Groundwater

The future impacts of climate change on groundwater levels are complex, difficult to model and not well understood.

Due to increased rainfall expectations with climate change, it should be assumed that the groundwater table could be impacted in future and may rise during wetter periods of the year. This will need to be considered for the design of finished ground floor levels, foundations and any basement areas.

4 Flood Risk Management Infrastructure

Defences

The site is not protected by any formal flood defences.

Residual Risk

There are no identified residual risks from flood management infrastructure.

5 Emergency Planning

Flood Warning

The site is not located in an area covered by Environment Agency flood warnings.

Access and Egress

Cambridge Road adjacent to the site is a public highway accessible to both pedestrian and vehicular traffic. An access gate lies directly adjacent to Cambridge Road from which the site can be accessed by foot.

Decisions on access/egress routes to/from the site should consider surface water flood risk to ensure that the route is compliant with access requirements specified in the Planning Practice Guidance 'Flood Risk and Coastal Change' emergency planning provisions.

Ponding and overland flow paths are shown to be present in the southern sector of the site where the existing access gate is located; however, the ponding is only prevalent in the area around the gate during 1% AEP and 0.1% AEP events.

However, the EA Long Term Risk of Flooding from Surface Water mapping indicates that the surface water flood depths around the gate are likely to be less than 200 millimetres meaning that the impact on access is likely to be minimal.

6 Broadscale Assessment of Sustainable Drainage Systems (SuDS) Suitability

Given the chalk bedrock, infiltration rates may prove favourable. If infiltration is suitable, due consideration should be given to the potential for dissolution features. As the site is located on a Principal Aquifer, a hydrogeological risk assessment will need to be undertaken, and most likely pollution prevention measures will need to be implemented on site prior to discharge to ground.

Soil classification testing and infiltration testing will be required to establish suitability of SuDS prior to the development of a Drainage Strategy for the site.

7 Opportunities for wider sustainability benefits and flood risk management

There is an opportunity to capture flood water via flood retention basins in the northern sector of the site, where high levels of ponding have been indicated, which would provide a small reduction in surface water runoff in the overall catchment and contribute to flood resilience.

Enhancement of the existing drainage ditch as a blue-green corridor would also provide ecological, amenity, and social value to the site and surrounding area.

8 National Planning Policy Framework (NPPF) and Planning Implications

8.1 Exception Test Requirements

In accordance with the NPPF, 'More Vulnerable' and 'Less Vulnerable' development is considered compatible within Flood Zone 1 and does not require the application of the Exception Test.

The sequential approach should be implemented at the site, prioritising More Vulnerable residential development within areas outside of fluvial and surface water flood risk. It should be possible to locate all development outside of these extents; however, this should be confirmed with site-specific hydraulic modelling of the ordinary watercourses around the site. Any modelling requirements are to be confirmed with the Lead Local Flood Authority (LLFA).

8.2 Site Design and FRA Requirements

The developer will need to provide a site-specific FRA which demonstrates that future users of the development are safe from flood hazards from all sources throughout its lifetime.

The applicant should demonstrate that the development meets the objectives of the NPPF's policy on flood risk and how mitigation measures will be secured for the lifetime of the development.

The risk of surface water flooding must be addressed through the Surface Water Drainage Strategy (SWDS) for the site and should outline how the development will manage and mitigate these risks. The SWDS should also address how the development will maintain existing overland surface water flow routes located in the northern part of the site

The availability of safe access to the site will need to be modelled and assessed using flood depth, velocity and hazard outputs for the 0.1% APEP fluvial/rainfall flood events, including the climate change allowance applicable to the catchment. Modelling requirements should be agreed with the LLFA.

The site-specific FRA should further investigate risk of groundwater flooding (e.g. through groundwater level monitoring) to inform the need for mitigation and resilience measures, which may include the application of an appropriate freeboard to the finished ground floor levels.

If basement areas are proposed in residential or commercial units, groundwater flood mitigation and resilience measures should be identified and safe access and egress routes to basement areas should be determined.

9 Conclusions and Recommendations

The development is likely to be able to proceed if:

- Existing overland surface water flow paths are maintained, and the risk of surface water flooding is mitigated through a Surface Water Drainage Strategy.
- Safe access routes are located outside of run-off flow paths and areas identified as at high risk of surface water flooding.
- A sequential approach is adopted, prioritising the location of more vulnerable residential development outside of the 1% AEP plus an appropriate allowance for climate change flood extents.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation measures.

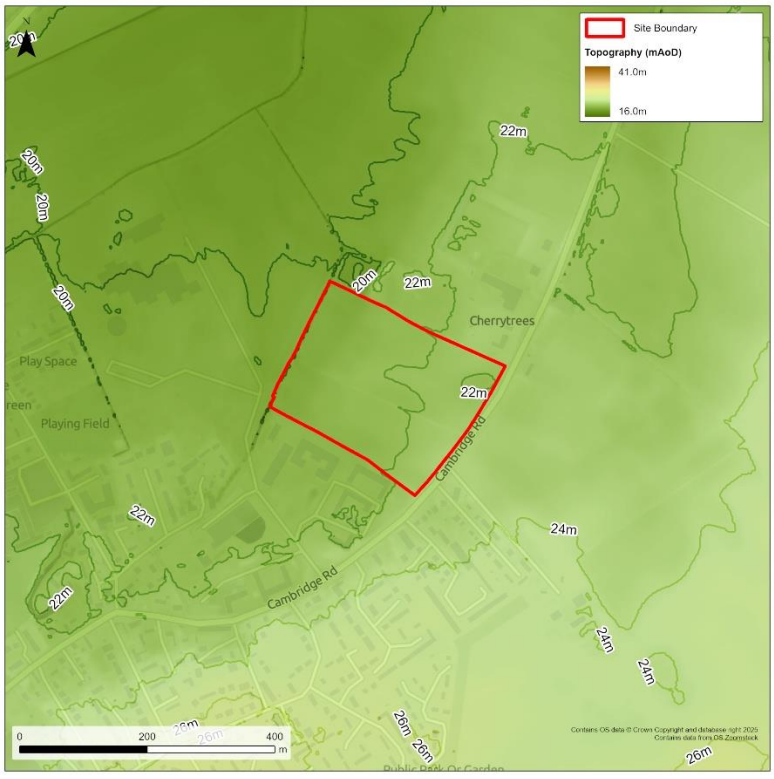

Figure 128: Site Topography

Figure 129: Flood Zones (Present Day)

Figure 130: Flood Zones (Climate Change – 2070 to 2125)

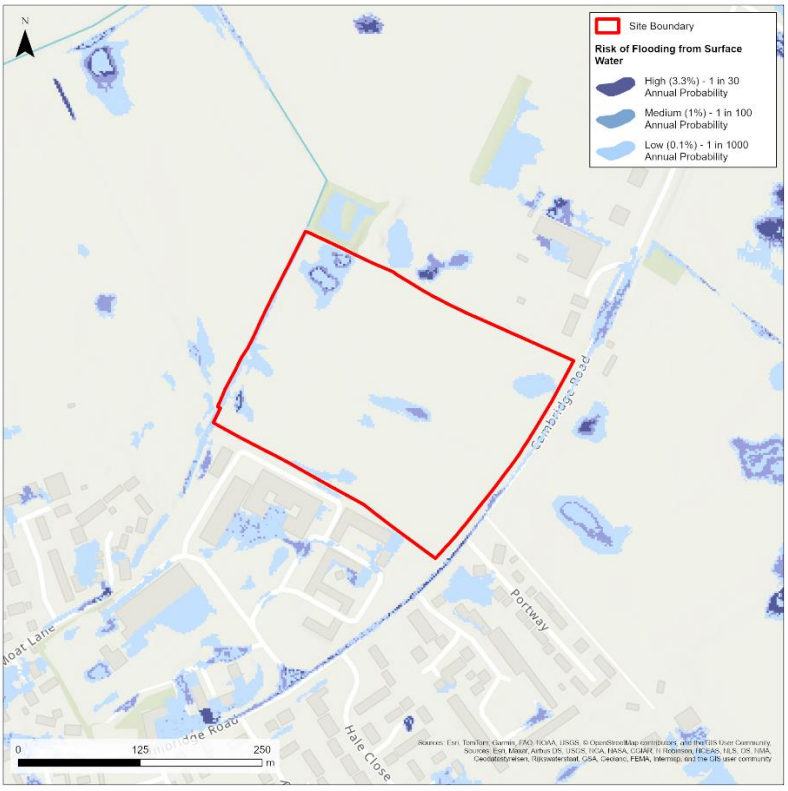

Figure 131: Risk of Flooding from Surface Water Map

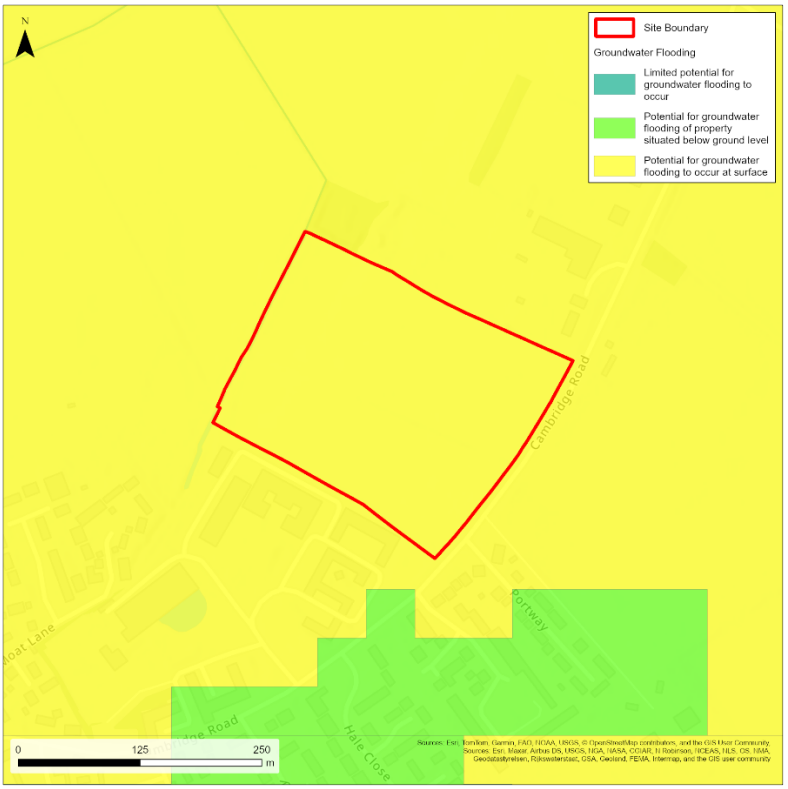

Figure 132: Susceptibility to Groundwater Flooding Map

Site Name: Norman Way, Over

1 Site Details

Site Reference: S/RRA/NW:
OS Grid reference: TL 37850 69156
Area: 1.726 Hectares
Proposed site use: Employment
Vulnerability Classification: Less Vulnerable

Existing Watercourses:

The site lies within the 'Great Ouse Lower' Operational Catchment. An un-named ditch (classified as an Awarded Watercourse) is located alongside the eastern boundary of the proposed development site. The watercourse flows south and discharges into the Swavesey Drain, a tributary of the River Great Ouse located 2.5 kilometres to the west of the site.

2 Sources of Flood Risk

Flood modelling of the watercourses in the vicinity of the site is not available.

2.1 Fluvial

Flood Zone	Proportion of Site within Flood Zone (%)
Flood Zone 1	100%
Flood Zone 2	0%
Flood Zone 3	0%

Environment Agency (EA) Flood Zone mapping indicates that the entire site is located in Flood Zone 1. However, mapping also indicates that the site is located only approximately 500 metres from Flood Zone 3 associated with the Swavesey Drain. Flood defences are also present along the length of Swavesey Drain to the south of the site. This will be further discussed below.

The Flood Zone mapping does not show the flood extent of the un-named ditch on the site. The Risk of Flooding from Surface Water map has therefore been used as a proxy for the purposes of this site assessment.

2.2 Surface Water

Risk of Surface Water Flooding	Proportion of Site at Risk (%)
Low (0.1% AEP)	6%
Medium (1% AEP)	54%

High (3.33% AEP)	76%

EA Risk of Flooding from Surface Water mapping indicates that the majority of the site is not affected by surface water flooding. Surface water flood risk is shown to be largely concentrated in the east of the site around the ordinary watercourse. Areas of ponding are also indicated on the adjacent Longstanton Road, east of the proposed development site.

For the 3.3% Annual Exceedance Probability (AEP) event, surface water flood risk is confined to areas immediately surrounding the un-named ditch in the south-east of the site. An overland flow path can be seen forming between areas of ponding to the east of Longstanton Road and the ditch. These patterns persist during both the 1% and 0.1% AEP flood events, and overland flow paths encroaching further from the ditch into the south-eastern sector of the site are indicated.

Additionally, during the 0.1% AEP event, minor ponding is evident in the northern section of the site, related to surface runoff from the adjacent industrial park.

EA Long Term Risk of Flooding from Surface Water mapping indicates that surface water flood depths across the site are likely to be less than 200 millimetres with some localised depths of between 300-600mm millimetres in and around the Ordinary Watercourse.

2.3 Groundwater

The BGS ‘Susceptibility to Groundwater Flooding’ map indicates that there is a high potential for groundwater flooding to occur at surface level (100% of the site area, according to the Screening Table prepared by GCSP, around the watercourses within the site). The dataset indicates susceptibility to flooding and is not indicative of a specific level of hazard or risk.

BGS Geology mapping (at 1:50000 scale) indicates that superficial deposits of the Oadby till Formation overlie the site which is likely to have variable composition including clay, silt, sand, gravel and larger cobbles. Groundwater flood risk will therefore vary across the site dependent on the specific underlying geology.

2.4 Reservoir

The site is not located in an area shown to be at risk from reservoir flooding.

2.5 Flood History

No historic flooding is recorded at the site location.

3 Climate Change Implications

The impacts of climate change on flood risk from the ditch on site has not been modelled as part of this SFRA. In accordance with the guidance provided in the

Level 1 SFRA where modelled data is unavailable, the flood extents recorded as present-day Flood Zone 2, the NaFRA2 datasets for climate change as represented in the online Long Term Flood Risk mapping, and the 'low' risk surface water flood map extent have been used as a proxy.

3.1 Fluvial

The EA fluvial flood risk mapping for climate change (between 2070-2125) shows only a very minor increase in the extent of fluvial flooding from present day extents. The flood extents remain outside of the proposed site boundary with the entire site remaining in Flood Zone 1.

3.2 Surface water

Overland flow paths, flood extents and flood depths do not change significantly from the present-day scenario in the climate change scenario shown in the EA Risk of Flooding from Surface Water mapping (2040-2060) for a vast majority of the site. However, areas immediately adjacent to the Ordinary Watercourse in the south-eastern sector of the site are indicated as being at higher risk of flooding. Furthermore, surface water flood risk associated with the industrial area to the north is shown to encroach within the northern part of the site.

3.3 Groundwater

The future impacts of climate change on groundwater levels are complex, difficult to model and not well understood.

Due to increased rainfall expectations with climate change, it should be assumed that the groundwater table could be impacted in future and may rise during wetter periods of the year. This will need to be considered for the design of finished ground floor levels, foundations and any basement areas

4 Flood Risk Management Infrastructure

Defences

The site is not protected by any formal flood defences. However, Swavesey Drain, located to the south and west of the site, is indicated to have flood defence measures in place. These defences may serve to mitigate flood extents in areas situated to the east of the drain, potentially offering a degree of protection to the site.

Residual Risk

There are no identified residual risks from flood management infrastructure.

5 Emergency Planning

Flood Warning

The site is not located in an area covered by EA flood warnings.

Access and Egress

The principal access point to the site is via Longstanton Road in the east. There is also a public bridleway extending from Longstanton Road providing pedestrian access only. Proposed development on site will likely need to pass through identified areas of surface water flooding to reach the access point on Longstanton Road.

Hydraulic modelling of the unnamed ditch should be undertaken to inform the design of safe access and egress routes using results for flood depth, velocity, hazard and time of inundation. The selection of access routes to the site should consider surface water and fluvial flood risk to ensure that the route is compliant with access requirements specified in the Planning Practice Guidance 'Flood Risk and Coastal Change' emergency planning provisions.

6 Broadscale Assessment of Sustainable Drainage Systems (SuDS) Suitability

Infiltration SuDS may not be suitable due to the underlying mudstone bedrock formations. The superficial deposits of the Oadby Till Formation overlying the site are likely to have variable composition and permeability.

Soil classification testing and infiltration testing will be required to establish suitability of SuDS prior to the development of a Drainage Strategy for the site.

7 Opportunities for wider sustainability benefits and flood risk management

There is an opportunity to include attenuation features such as detention basins, swales, or underground storage tanks into the site design to temporarily store excess surface water during rainfall events. The areas located to the north and south of the site, where the highest risk of surface water flooding has been identified, are likely to derive the greatest benefit from the implementation of attenuation features.

Consider installing a rooftop rainwater harvesting system to help collect, filter and store rainwater on site helping mitigate flood risk. The harvested rainwater can also be used for non-potable purposes on site such as cleaning helping reduce the reliance on mains water, lowering utility costs. Additionally, capturing and storing rainwater on site would provide benefits to the wider catchment as a reduction to the volume of water entering local watercourses would help reduce flood risk downstream.

8 National Planning Policy Framework (NPPF) and Planning Implications

8.1 Exception Test Requirements

In accordance with the NPPF, the site is located in Flood Zone 1 and the proposed use of the site for employment purposes, classified as 'Less Vulnerable' development, is permitted in this Zone. The Exception Test would not be required.

8.2 Site Design and FRA Requirements

The developer will need to provide a site-specific FRA which demonstrates that future users of the development will not be placed in danger from flood hazards from all sources throughout its lifetime.

The applicant should demonstrate that the development meets the objectives of the NPPF's policy on flood risk and how mitigation measures will be secured for the lifetime of the development. A sequential approach should be implemented at the site, prioritising development outside of areas with surface water flood risk.

The risk of surface water flooding must be addressed through a Surface Water Drainage Strategy (SWDS) for the site's development, and it should outline how the development will manage and mitigate these risks. The SWDS should also address how the development will maintain existing overland surface water flow routes located in the northern part of the site, and how the quality of any water being discharged into the local watercourses will meet the requirements for the Source Protection Zone.

The availability of safe access to the site will need to be modelled and assessed using flood depth, velocity and hazard outputs for the 0.1% AEP fluvial flood event, including the climate change allowance applicable to the catchment. A Flood Warning and Evacuation Plan should be prepared such that future users of the site are made aware of the potential risks of flooding and the actions to take during a flood event.

The site-specific FRA should further investigate the risk of groundwater flooding (e.g. through groundwater level monitoring) and should include appropriate mitigation as required.

The previous FRA notes the presence of basement car parking. If this is to be considered, surface water and groundwater flood mitigation and resilience measures should be identified, and safe access and egress routes to any basement areas should be determined.

9 Conclusions and Recommendations

The development is likely to be able to proceed if:

- A sequential approach is adopted, prioritising the location of development within areas at lowest risk of flooding.
- Access routes are designed in consideration of flow paths and areas identified as at risk of fluvial and surface water flooding.
- If raising of access routes is required, this must not impact surface water flow routes or contribute to loss of floodplain storage.
- Habitable floor levels are set above the surface water design flood event (1% AEP) taking into account climate change with a suitable freeboard.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation measures.

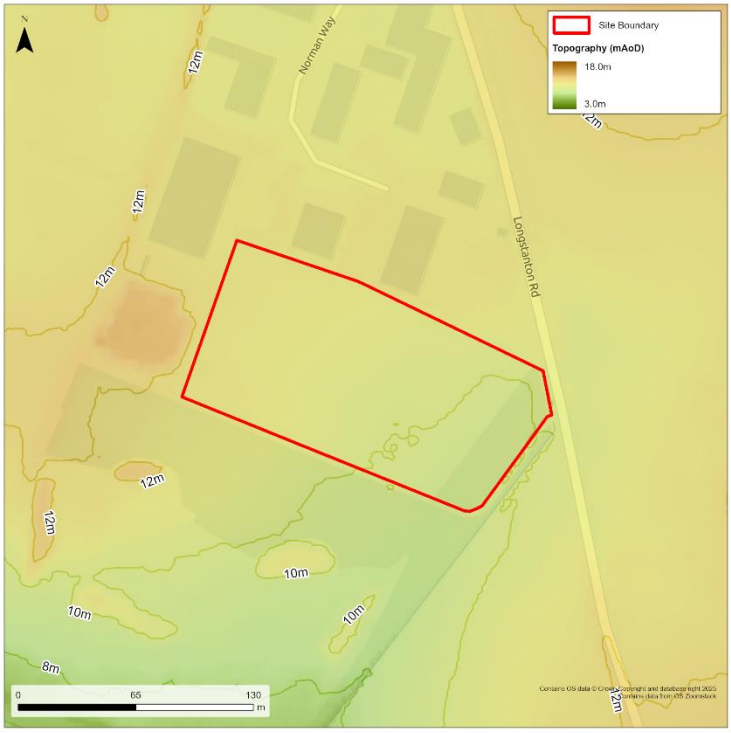

Figure 133: Site Topography

Figure 134: Flood Zones (Present Day)

Figure 135: Flood Zones (Climate Change – 2070 to 2125)

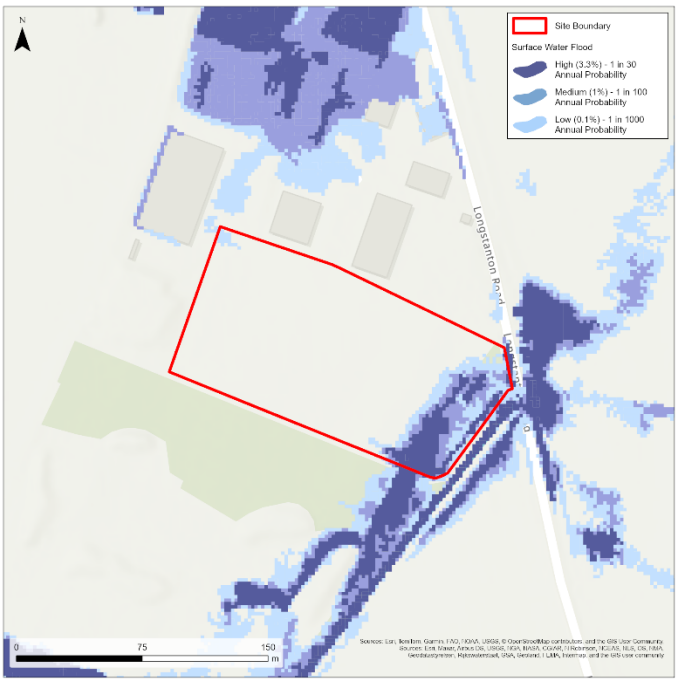

Figure 136: Risk of Flooding from Surface Water Map

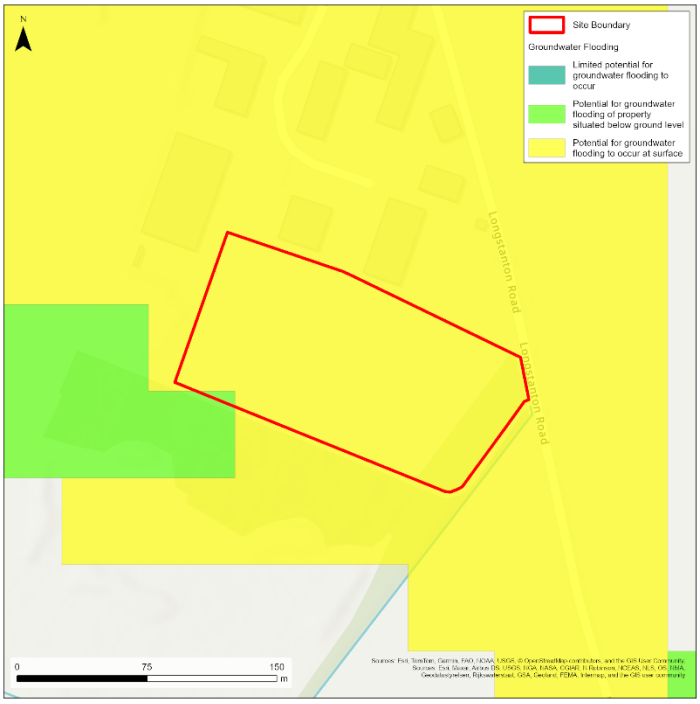

Figure 137: Susceptibility to Groundwater Flooding Map

Site Name: North Cambridge Academy, 108, Arbury Road

1 Site Details

Site Reference: S/C/NCARRA/CR
OS Grid reference: TL 45642 60742
Area: 7.68 Hectares
Proposed site use: Mixed use (including Residential)
Vulnerability Classification: More Vulnerable

Existing Watercourses:

The site lies within the 'Cam Lower' Operational Catchment. There are no main or ordinary watercourses located on site with the closest ordinary watercourse being located 1.1 kilometres north-east of the site. The River Cam, the principal watercourse in the Cambridge area, is situated approximately 1.5 kilometres to the south-east of the site.

Flood modelling is not available for the site.

2 Sources of Flood Risk

2.1 Fluvial

Flood Zone	Proportion of Site within Flood Zone (%)
Flood Zone 1	100%
Flood Zone 2	0%
Flood Zone 3	0%

Environment Agency (EA) Flood Zone mapping indicates that the entire site is located in Flood Zone 1. Flood Zones 2 and 3 within the surrounding area are predominantly concentrated along the River Cam, which is located approximately 1.5 kilometres to the south-east of the site. The site lies outside the fluvial flood extents of the River Cam.

2.2 Surface Water

Risk of Surface Water Flooding	Proportion of Site at Risk (%)
Low (0.1% AEP)	17%
Medium (1% AEP)	8%
High (3.33% AEP)	17%

EA Risk of Flooding from Surface Water mapping indicates that the site is impacted by surface water flooding to a moderate degree. Surface water ponding is dispersed across the site, predominantly in the southern and western sectors.

During the 3.3% Annual Exceedance Probability (AEP) flood event, surface water flooding is primarily concentrated in the central southern portion of the site, where the highest density of impermeable surfacing is present. The central academy building is also identified as being at risk of surface water accumulation, likely attributable to its location within a topographical depression. However, the likelihood of floodwater entering the building footprint is minimal due to the presence of physical barriers, such as the external walls of the academy building. Furthermore, the access path located to the north-west of the academy building is identified as being at high risk of flooding, with northern surface water flood extent extending westward from the central building.

A similar pattern is indicated during the 1% and 0.1% AEP flood events, with an increased flood risk across the site due to additional ponding in the southern and western sectors. The mapping also indicates the presence of additional overland flow pathways within the site, particularly in areas such as the existing school buildings and parking, where there is a concentration of impermeable surfacing. Notably, surface water flood risk also encroaches into the north-eastern side of the site via an overland flow path along Haviland Way.

It should be noted however, due to the presence of existing built structures on the site, the available surface water mapping may not fully reflect the actual surface water extents or pathways, as current drainage infrastructure may influence natural flow patterns.

EA Long Term Risk of Flooding from Surface Water mapping indicates that surface water flood depths across the site are likely to be less than 200 millimetres with some localised depths of 300 millimetres at topographical depressions on site.

2.3 Groundwater

The BGS) ‘Susceptibility to Groundwater Flooding’ map indicates that there is a high potential for groundwater flooding of property situated below ground level (100% of the site area, according to the Screening Table prepared by GCSP). The dataset indicates susceptibility to flooding and is not indicative of a specific level of hazard or risk.

BGS Geology mapping (at 1:50000 scale) indicates that superficial deposits of the River Terrace Deposits overlie the site, which is likely to have variable composition including sand, gravel, clay and silt. Groundwater flood risk will therefore vary across the site, dependent on the specific underlying geology.

Furthermore, as much of the site has been previously developed, it is likely that the natural ground conditions have been disturbed during previous construction works, which may have an impact on the site's susceptibility to groundwater flooding.

Groundwater investigation should be undertaken at the site to establish the present ground conditions and position of the groundwater table.

2.4 Reservoir

The site is not located in an area shown to be at risk from reservoir flooding.

2.5 Flood History

No historic flooding is recorded at the site location.

3 Climate Change Implications

3.1 Fluvial

The Flood Zones plus climate change map (between 2070 – 2125) shows a minor increase in the extent of fluvial flooding north of the River Cam. However, the flood extents remain outside of the proposed site boundary with the entire site remaining located in Flood Zone 1.

3.2 Surface Water

Overland flow paths, flood extents and flood depths do not change significantly from the present-day scenario in the climate change scenario shown in the EA Risk of Flooding from Surface Water mapping (2040-2060) for a vast majority of the site. The lifetime of the development will extend beyond 2060, so the present day 0.1% AEP event surface water flood extent has also been used as a conservative proxy for future climate change. As previously noted, the 0.1% AEP event does not demonstrate any significant intensification in the extent of surface water flooding on site. While areas already identified as being at risk of flooding are shown to be subject to an increased level of risk, the associated flood depths across the site exhibit only minimal increases.

3.3 Ground Water

The future impacts of climate change on groundwater levels are complex, difficult to model and not well understood.

Due to increased rainfall expectations with climate change, it should be assumed that the groundwater table could be impacted in future and may rise during wetter periods of the year. This will need to be considered for the design of finished ground floor levels, foundations and any basement areas.

4 Flood Risk Management Infrastructure

Defences

The site is not protected by any formal flood defences.

Residual Risk

There are no identified residual risks from flood management infrastructure.

5 Emergency Planning

Flood Warning

The site is not located in an area covered by Environment Agency flood warnings.

Access and Egress

Arbury Road, located to the south-west of the site, is a public highway accessible to both pedestrian and vehicular traffic. The site is accessible via two entry points from Arbury Road, one of which is an unnamed access road leading to the western parking area. The other is the southern parking area directly accessible via Arbury Road. Additionally, an alternative pedestrian access point connecting to the main academy building is located further along Arbury Road. There is also an existing pedestrian access route available from Haviland Way in the northern section of the site.

Selection of access routes to the site should consider surface water flood risk to ensure that the route is compliant with access requirements specified in the Planning Practice Guidance 'Flood Risk and Coastal Change' emergency planning provisions. Ponding is shown to be present at the access entrance for both routes from Arbury Road and present at Haviland Way.

6 Broadscale Assessment of Sustainable Drainage Systems (SuDS) Suitability

BGS Geology mapping (at 1:50000 scale) indicates that bedrock of the Gault Formation – Mudstone underlies the site and overlain by River Terrace Superficial Deposits. Infiltration SuDS may be suitable on site as the River Terrace Deposits are permeable, however mudstone is generally considered impermeable and therefore there is a risk of water permeating through the surface deposits and accumulating above the mudstone later resulting in perched groundwater conditions.

However, the site has also been previously developed so the natural ground conditions will likely be no longer present and existing drainage infrastructure may be present beneath the site, making SuDS suitability difficult to assess. Ground investigations should be undertaken at the site to establish the underlying soil conditions and infiltration potential.

Soil classification testing and infiltration testing will be required to establish suitability of SuDS prior to the development of a Drainage Strategy for the site.

7 Opportunities for wider sustainability benefits and flood risk management

Potential opportunities for SuDS to manage surface water runoff and flood risk whilst providing wider sustainability benefits exist. Opportunities that offer high drainage potential within limited space include, but are not limited to, permeable paving, bioretention areas, green roofs and swales. The implementation of these drainage features would mitigate surface water runoff on site, thereby reducing pressure on the surrounding drainage network, enhancing local flood resilience, and limiting the extent of surface water flooding.

Redevelopment of the site provides an opportunity to integrate water harvesting and water re-use technologies into the new buildings and manage and mitigate surface water flood risk on site. This could contribute to overall sustainability and flood risk benefits in the Greater Cambridge area.

8 National Planning Policy Framework (NPPF) and Planning Implications

8.1 Exception Test Requirements

In accordance with the NPPF, ‘More Vulnerable’ development is considered compatible within Flood Zone 1 and does not require the application of the Exception Test.

The sequential approach should be implemented at the site, prioritising more vulnerable development within areas outside of surface water flood risk. It should be possible to locate all development outside of these extents; however, this should be confirmed with site-specific hydraulic modelling. Any modelling requirements are to be confirmed with the LLFA.

8.2 Site Design and FRA Requirements

The developer will need to provide a site-specific FRA which demonstrates that future users of the development are safe from flood hazards from all sources throughout its lifetime. The applicant should demonstrate that the development meets the objectives of the NPPF’s policy on flood risk and how mitigation measures will be secured for the lifetime of the development.

The sequential approach should be implemented at the site, prioritising more vulnerable development within areas outside of surface water flood risk. It should be possible to locate all development outside of these extents; however, this should be confirmed with site-specific hydraulic modelling. Any modelling requirements are to be confirmed with the LLFA.

The site-specific FRA should further investigate risk of groundwater flooding (e.g. through groundwater level monitoring) to inform the delivery of appropriate mitigation

measures, which may include the incorporation of an appropriate freeboard to the finished ground floor levels.

The availability of safe access and egress will need to be demonstrated for the 0.1% APE rainfall event, including the climate change allowance applicable to the catchment.

If basement areas are proposed in any of the mixed-use development units, groundwater flood mitigation and resilience measures should be identified and safe access and egress routes to basement areas should be determined.

9 Conclusions and Recommendations

The development is likely to be able to proceed if:

- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with proposed floor levels above projected surface water flood depths, taking into account climate change with a suitable freeboard.
- Existing overland surface water flow paths are maintained, and the risk of surface water flooding is mitigated through a Surface Water Drainage Strategy.
- A sequential approach is adopted, prioritising the location of more vulnerable development outside of the 1% and 0.1% AEP surface water flood extents, taking into account climate change.
- Further assessment of the potential for groundwater flooding (including ground investigations and groundwater monitoring) is undertaken to establish the requirement for any mitigation measures.
- Safe access routes are located outside of run-off flow paths and areas identified as at risk of fluvial and surface water flooding.
- Consideration is given to the integration of water management and SuDS at the site, in order to provide adequate drainage whilst contributing wider flood and water management benefits across the catchment.

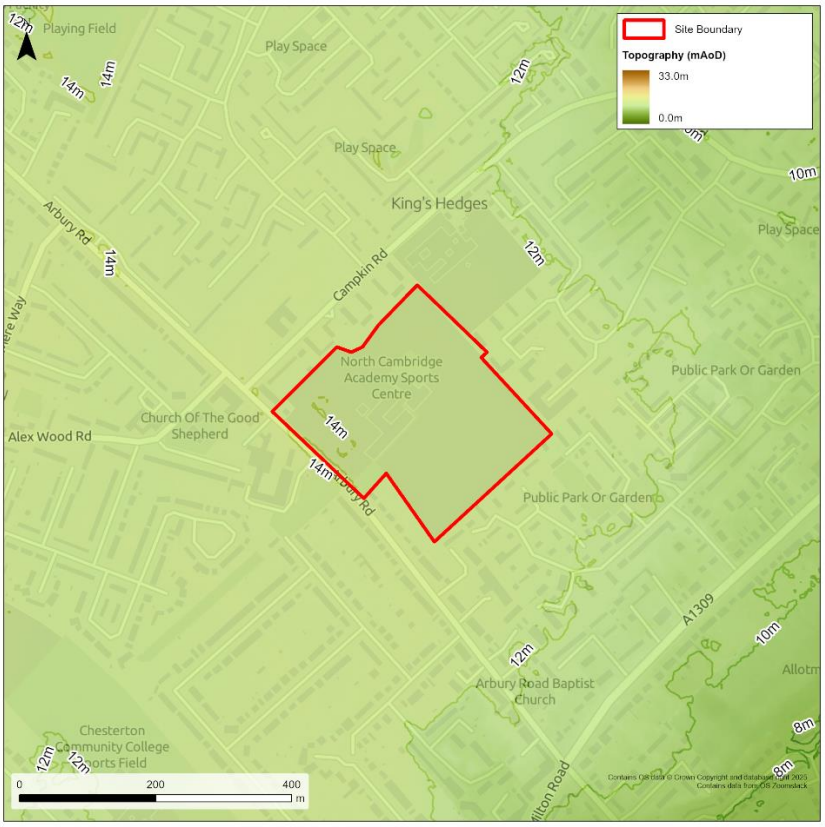

Figure 138: Site Topography

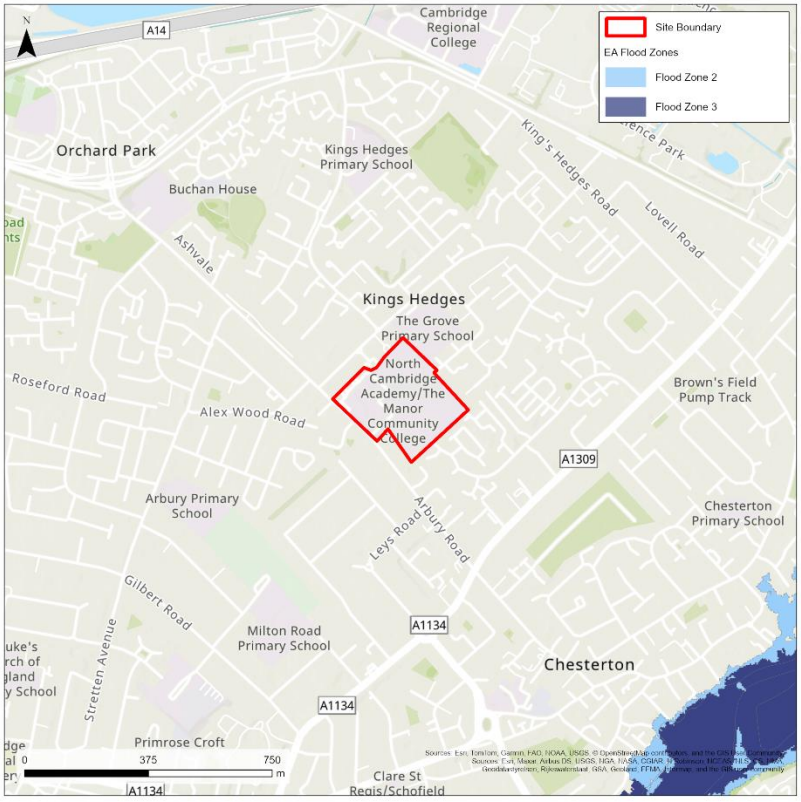

Figure 139: Flood Zones (Present Day)

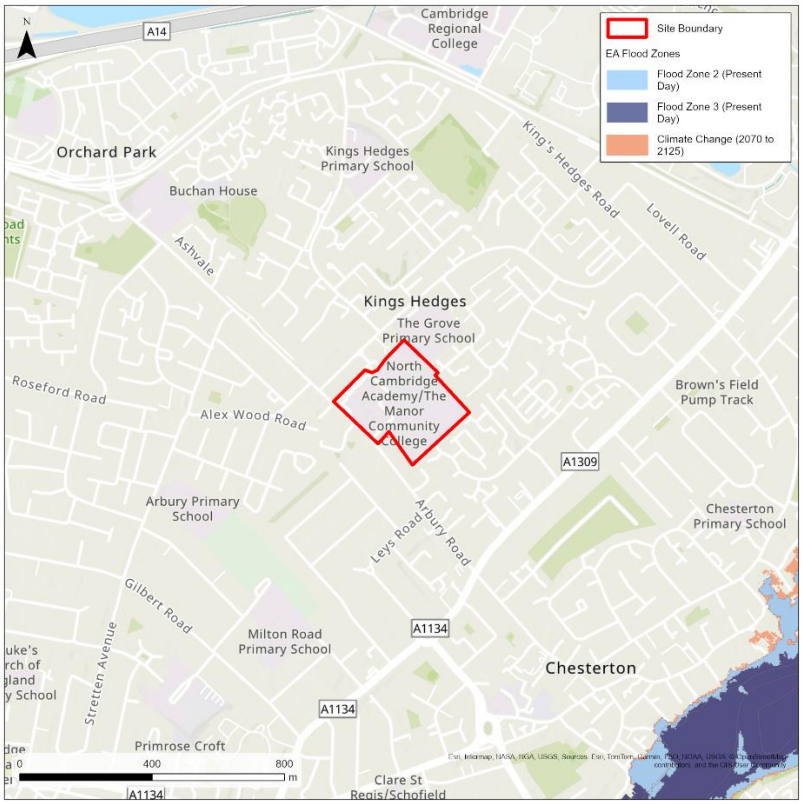

Figure 140: Flood Zones (Climate Change – 2070 to 2125)

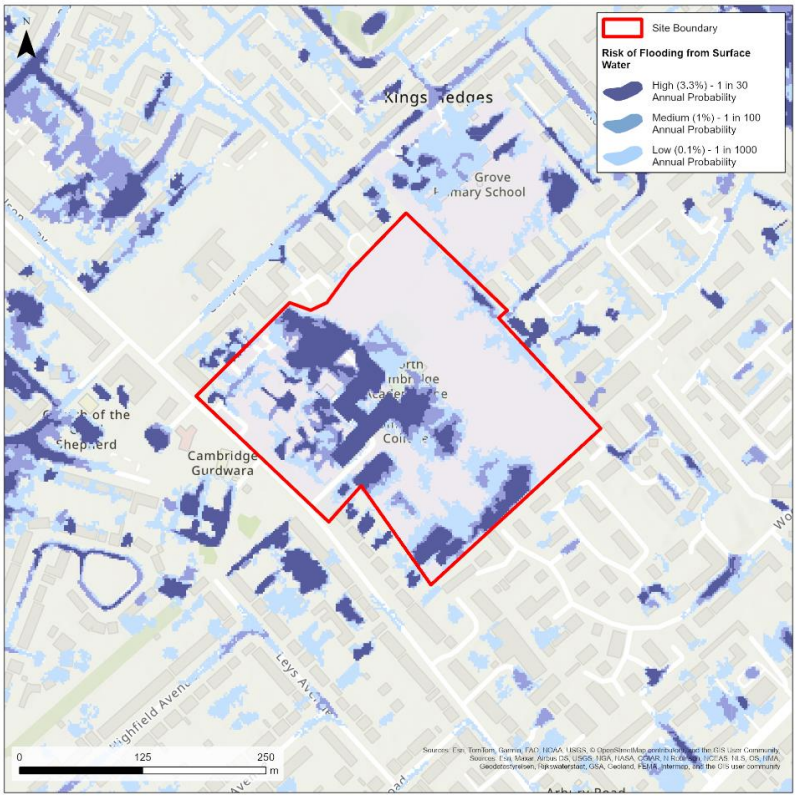

Figure 141: Risk of Flooding from Surface Water Map

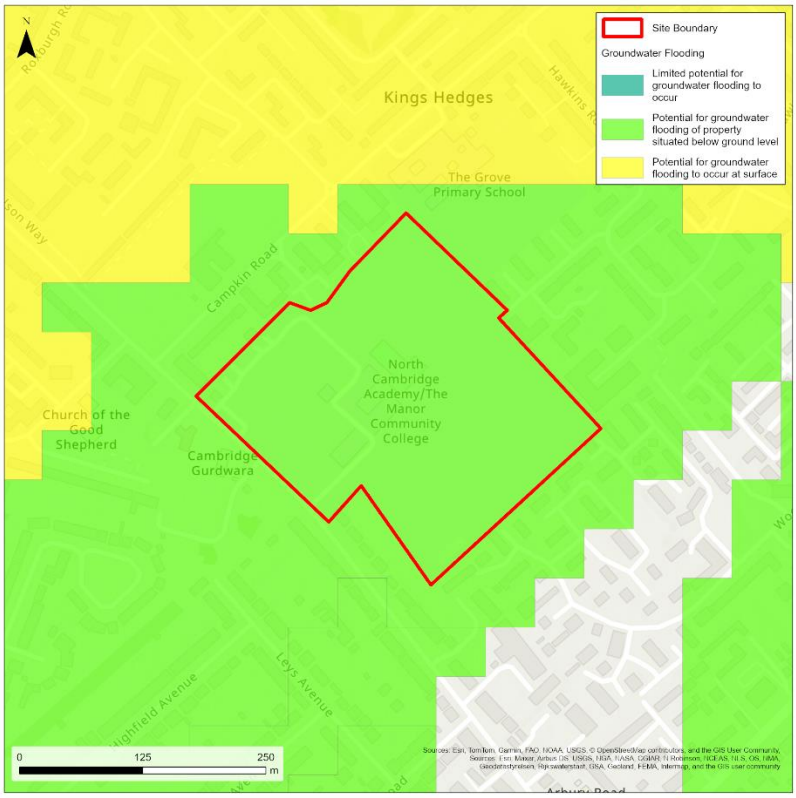

Figure 142: Susceptibility to Groundwater Flooding Map