

Approximate extent of the Site

South Caldecotte Business Park

Brickhills Greensand Ridge



Site Context Photograph 8: View north-east from the Redway along the A5 at the Kelly's Kitchen Roundabout.

This panorama is not to scale. For contextual information only

90° Horizontal field of view extract

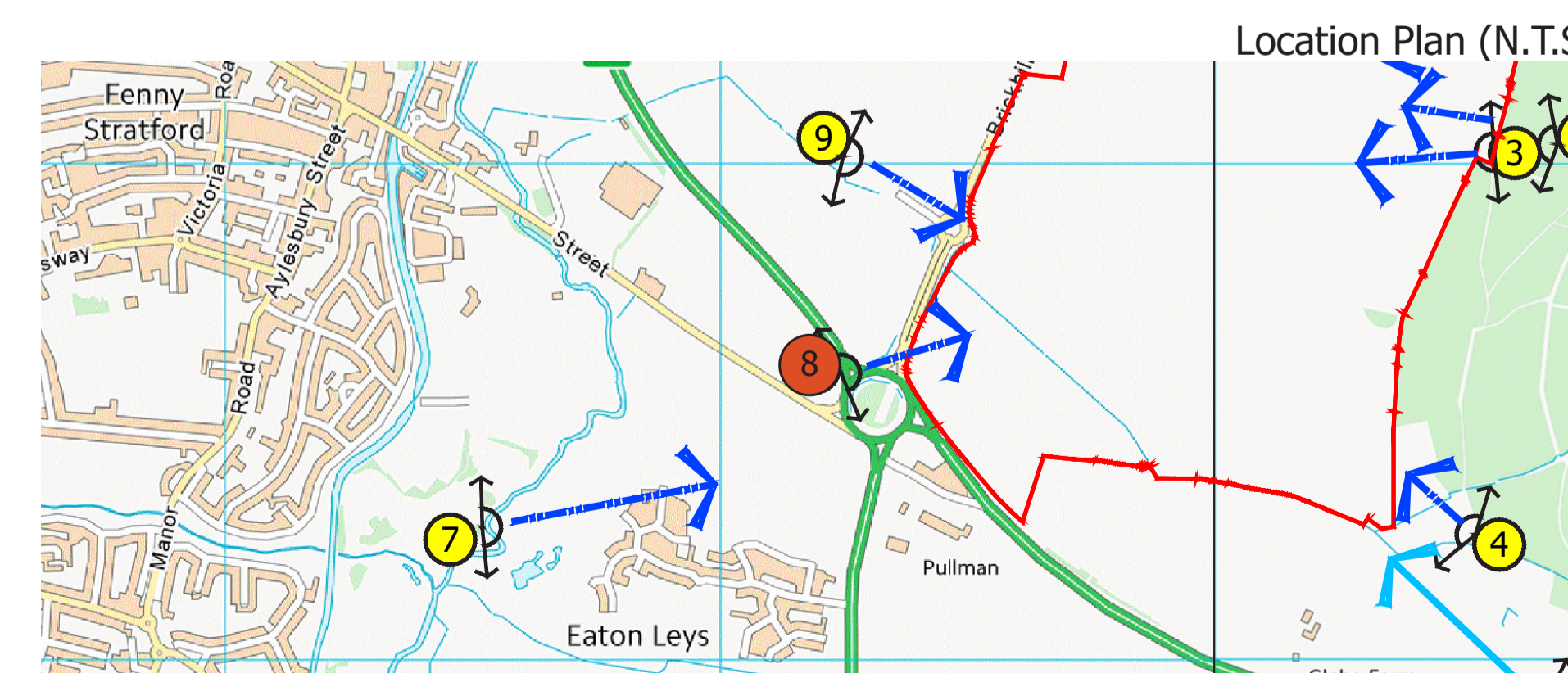


Easting / Longitude: 489247 / 51.993529°  
 Northing / Latitude: 233580 / -0.701593°  
 Elevation: 78m (AOD)  
 Distance to the Site: 131m

Date Taken: 21/08/2024  
 Camera: Canon 6D (Full Frame Sensor)  
 Lens: 50mm fixed lens

Visualisation Type: Type 1 Annotated Viewpoint Photograph  
 Enlargement Factor: 100%  
 Projection: Cylindrical

Drawn By: DW  
 Checked By: IK  
 Approved By: PC



Approximate extent of the Site



Site Context Photograph 9: View east from a Redway within the South Caldecote Business Park along the main access road.

This panorama is not to scale. For contextual information only

90° Horizontal field of view extract

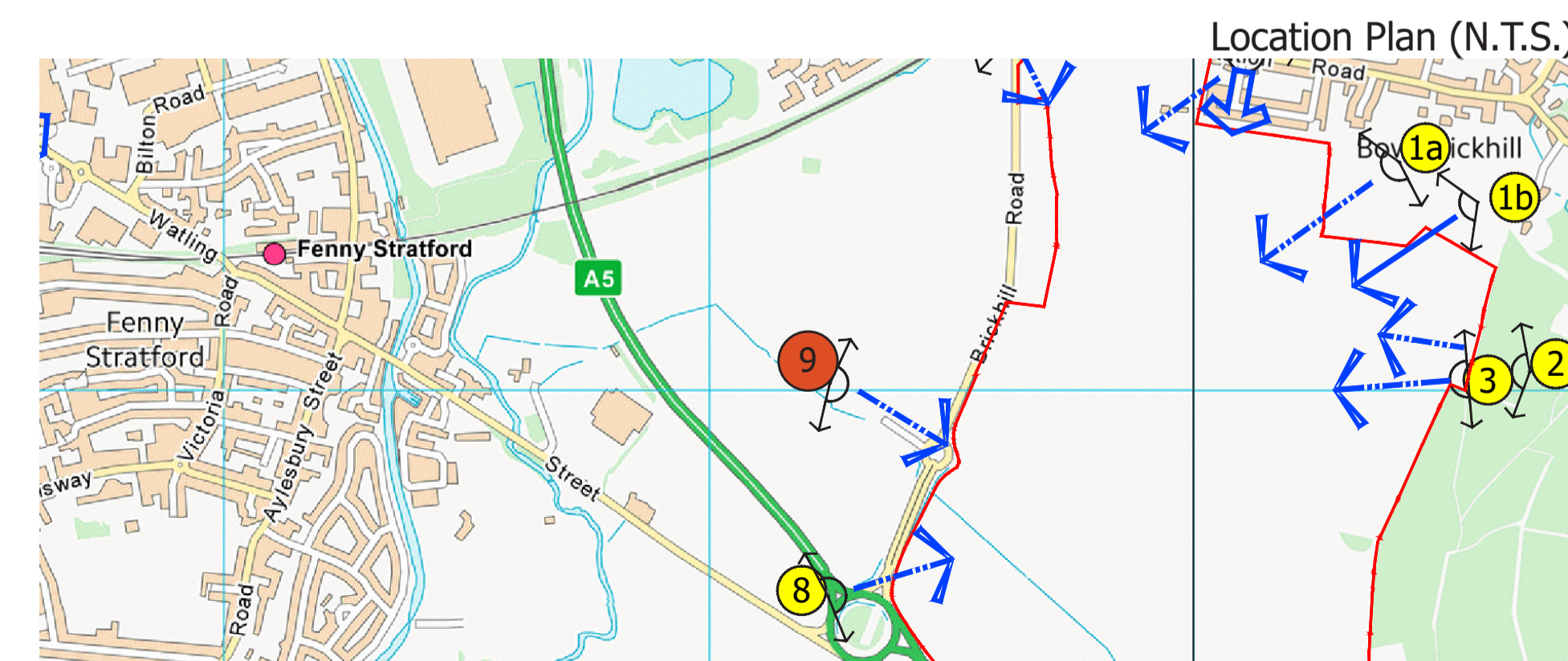


Easting / Longitude: 489251 / 51.997467°  
 Northing / Latitude: 234019 / -0.701422°  
 Elevation: 71m (AOD)  
 Distance to the Site: 272m

Date Taken: 21/08/2024  
 Camera: Canon 6D (Full Frame Sensor)  
 Lens: 50mm fixed lens

Visualisation Type: Type 1 Annotated Viewpoint Photograph  
 Enlargement Factor: 100%  
 Projection: Cylindrical

Drawn By: DW  
 Checked By: IK  
 Approved By: PC





**Site Context Photograph 10: View south-east from Brickhill Road, north of the Station Road junction.**

This panorama is not to scale. For contextual information only

90° Horizontal field of view extract

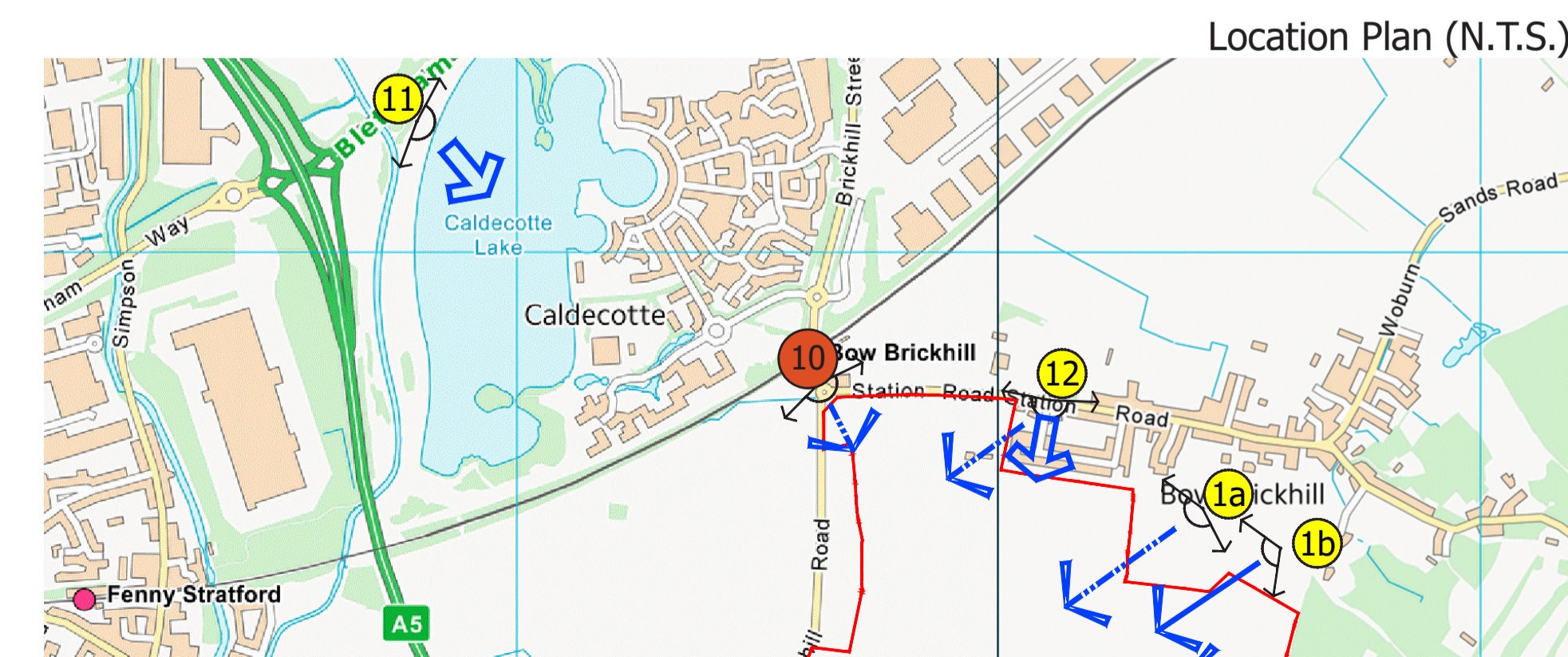


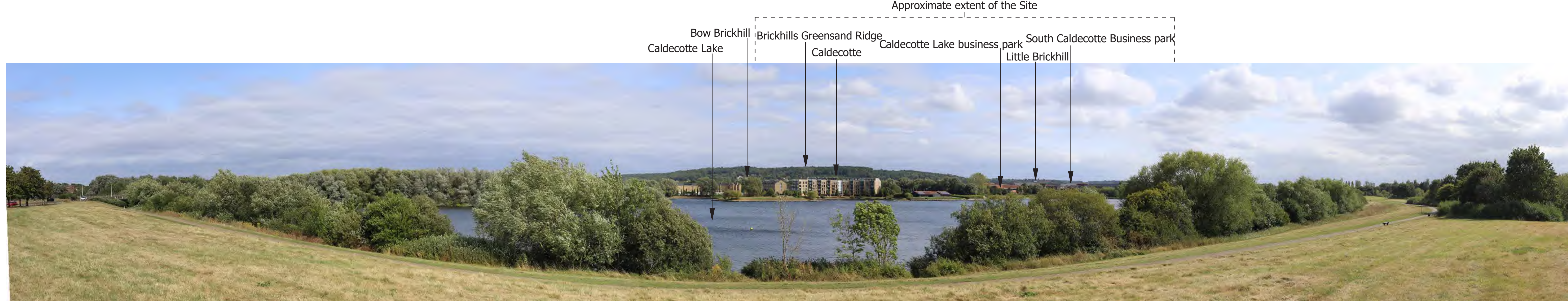
Easting / Longitude: 489629 / 52.003818°  
 Northing / Latitude: 234732 / -0.695731°  
 Elevation: 75m (AOD)  
 Distance to the Site: 47m

Date Taken: 21/08/2024  
 Camera: Canon 6D (Full Frame Sensor)  
 Lens: 50mm fixed lens

Visualisation Type: Type 1 Annotated Viewpoint Photograph  
 Enlargement Factor: 100%  
 Projection: Cylindrical

Drawn By: DW  
 Checked By: IK  
 Approved By: PC





**Site Context Photograph 11: View south-east from Caldecotte Lake Park, south of the A4146.**

This panorama is not to scale. For contextual information only

90° Horizontal field of view extract

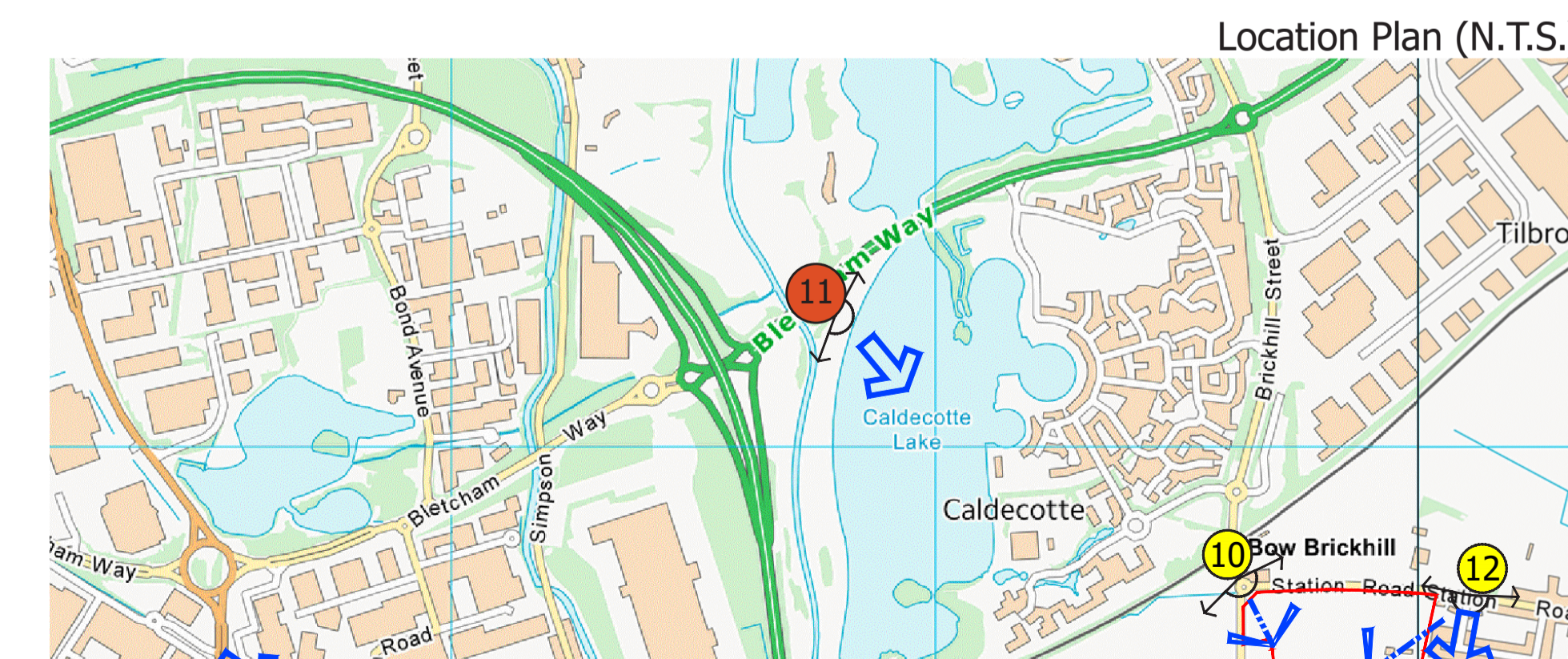


Easting / Longitude: 488795 / 52.008829°  
 Northing / Latitude: 235275 / -0.707726°  
 Elevation: 70m (AOD)  
 Distance to the Site: 1.04km

Date Taken: 21/08/2024  
 Camera: Canon 6D (Full Frame Sensor)  
 Lens: 50mm fixed lens

Visualisation Type: Type 1 Annotated Viewpoint Photograph  
 Enlargement Factor: 100%  
 Projection: Cylindrical

Drawn By: DW  
 Checked By: IK  
 Approved By: PC





**Site Context Photograph 12: View south from Station Road, within Bow Brickhill, opposite the entrance to Greenways**

This panorama is not to scale. For contextual information only

90° Horizontal field of view extract

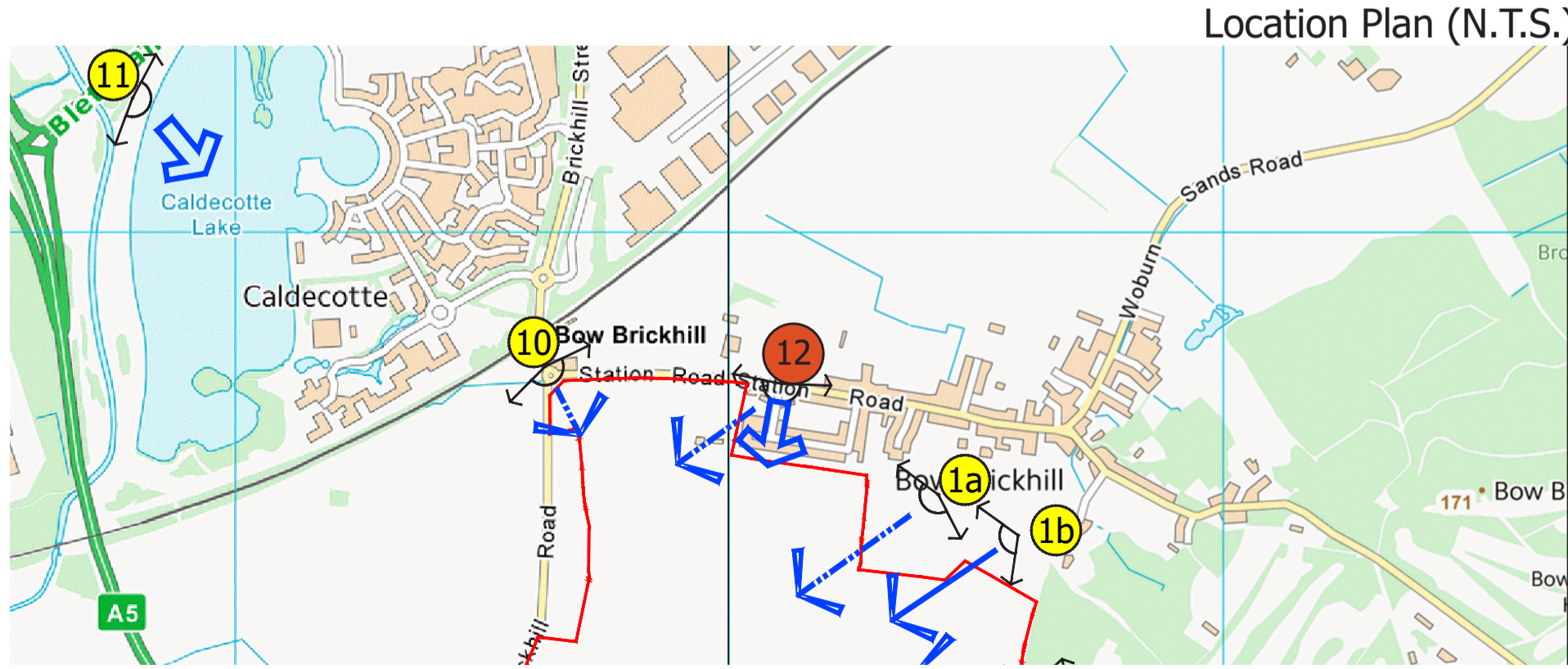


Easting / Longitude: 490107 / 52.003429°  
 Northing / Latitude: 234697 / -0.688772°  
 Elevation: 85m (AOD)  
 Distance to the Site: 70m

Date Taken: 21/08/2024  
 Camera: Canon 6D (Full Frame Sensor)  
 Lens: 50mm fixed lens

Visualisation Type: Type 1 Annotated Viewpoint Photograph  
 Enlargement Factor: 100%  
 Projection: Cylindrical

Drawn By: DW  
 Checked By: IK  
 Approved By: PC





**Site Context Photograph 13: View north-east from PRow, SHA/2/1 north of Stoke Hammond**

This panorama is not to scale. For contextual information only

90° Horizontal field of view extract

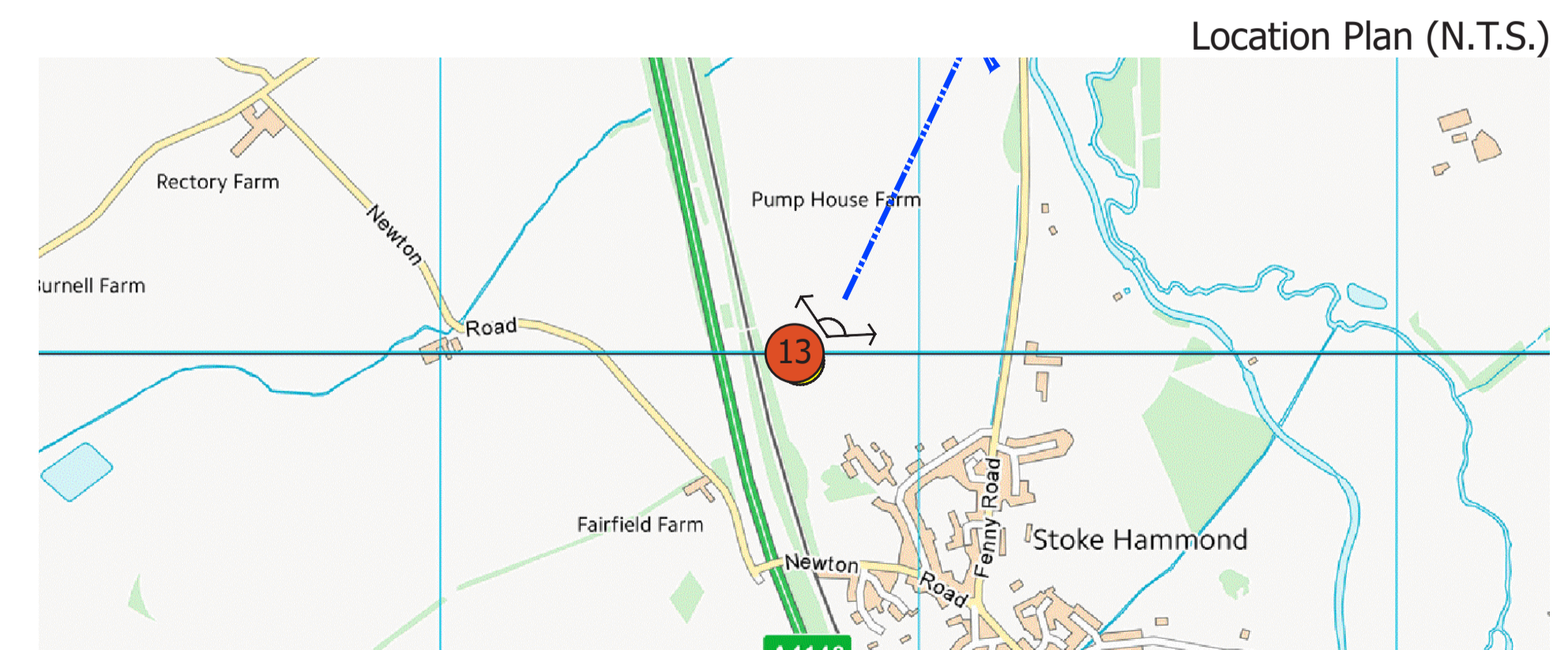


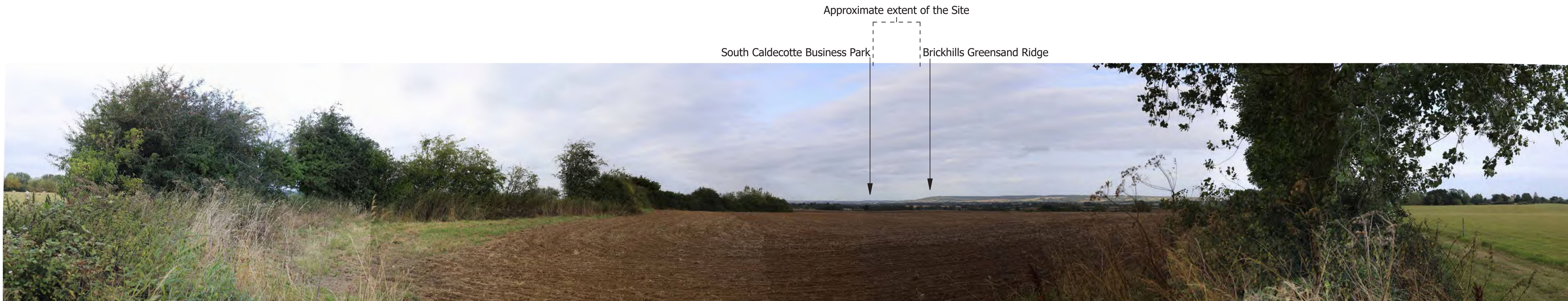
Easting / Longitude: 487811 / 51.961898°  
 Northing / Latitude: 230036 / -0.723401°  
 Elevation: 92m (AOD)  
 Distance to the Site: 3.71km

Date Taken: 21/08/2024  
 Camera: Canon 6D (Full Frame Sensor)  
 Lens: 50mm fixed lens

Visualisation Type: Type 1 Annotated Viewpoint Photograph  
 Enlargement Factor: 100%  
 Projection: Cylindrical

Drawn By: DW  
 Checked By: IK  
 Approved By: PC





**Site Context Photograph 14: View north-east from PRow, Bridleway MUR/16/2 between Mursley and Drayton Parslow.**

This panorama is not to scale. For contextual information only

90° Horizontal field of view extract

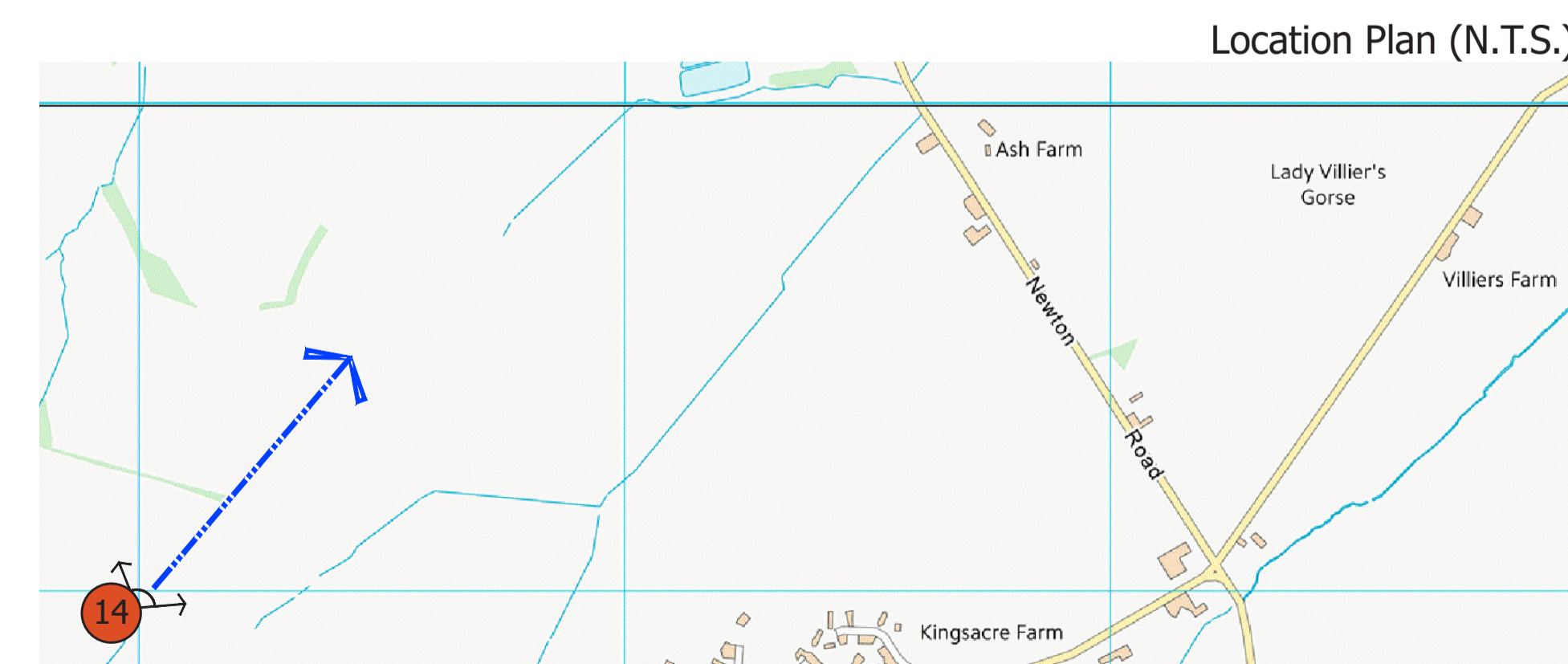


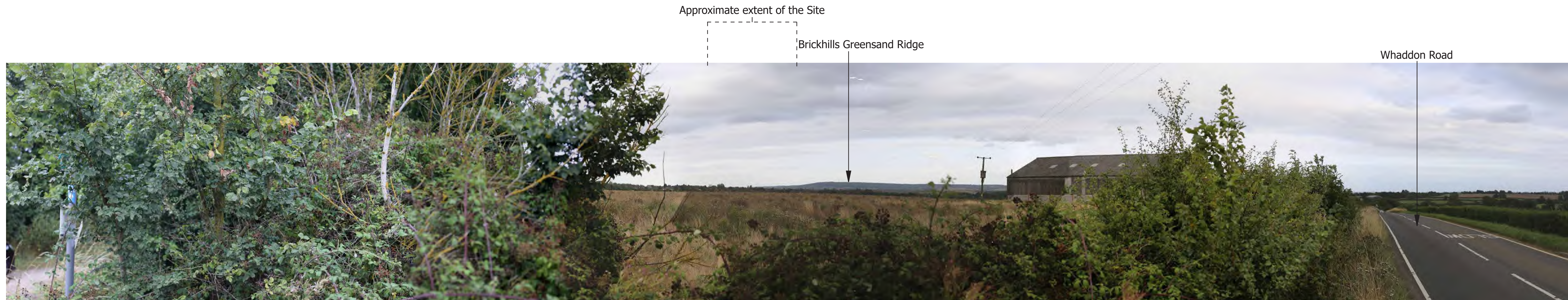
Easting / Longitude: 482995 / 51.953016°  
 Northing / Latitude: 228966 / -0.793735°  
 Elevation: 150m (AOD)  
 Distance to the Site: 7.87km  
 483058 / 51.981433°

Date Taken: 21/08/2024  
 Camera: Canon 6D (Full Frame Sensor)  
 Lens: 50mm fixed lens

Visualisation Type: Type 1 Annotated Viewpoint Photograph  
 Enlargement Factor: 100%  
 Projection: Cylindrical

Drawn By: DW  
 Checked By: IK  
 Approved By: PC





**Site Context Photograph 15: View north-east from Whaddon Road at the entrance to Weasal Lane**

This panorama is not to scale. For contextual information only

90° Horizontal field of view extract

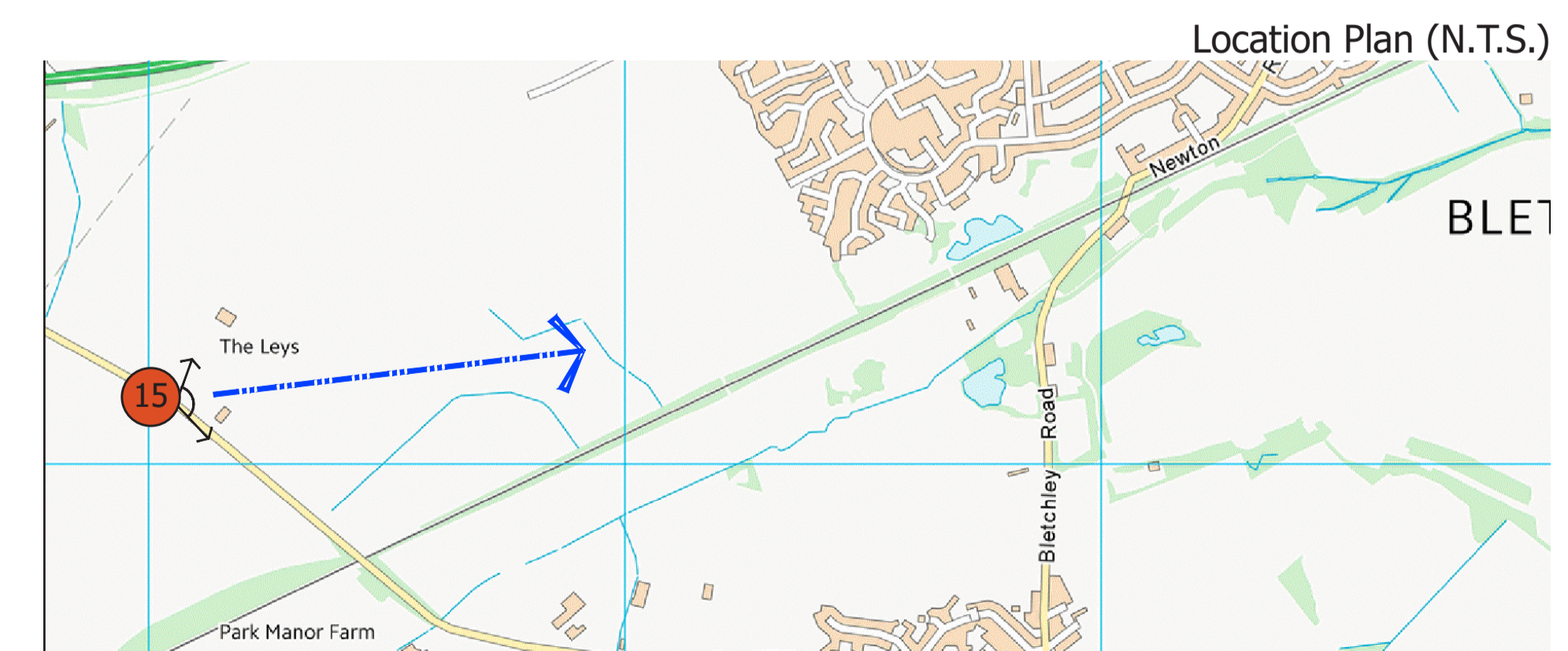


Easting / Longitude: 483058 / 51.981433°  
 Northing / Latitude: 232128 / -0.792059°  
 Elevation: 120m (AOD)  
 Distance to the Site: 6.48km

Date Taken: 21/08/2024  
 Camera: Canon 6D (Full Frame Sensor)  
 Lens: 50mm fixed lens

Visualisation Type: Type 1 Annotated Viewpoint Photograph  
 Enlargement Factor: 100%  
 Projection: Cylindrical

Drawn By: DW  
 Checked By: IK  
 Approved By: PC





## Introduction

As part of Natural England's responsibilities as set out in the Natural Environment White Paper,<sup>1</sup> Biodiversity 2020<sup>2</sup> and the European Landscape Convention,<sup>3</sup> we are revising profiles for England's 159 National Character Areas (NCAs). These are areas that share similar landscape characteristics, and which follow natural lines in the landscape rather than administrative boundaries, making them a good decision-making framework for the natural environment.

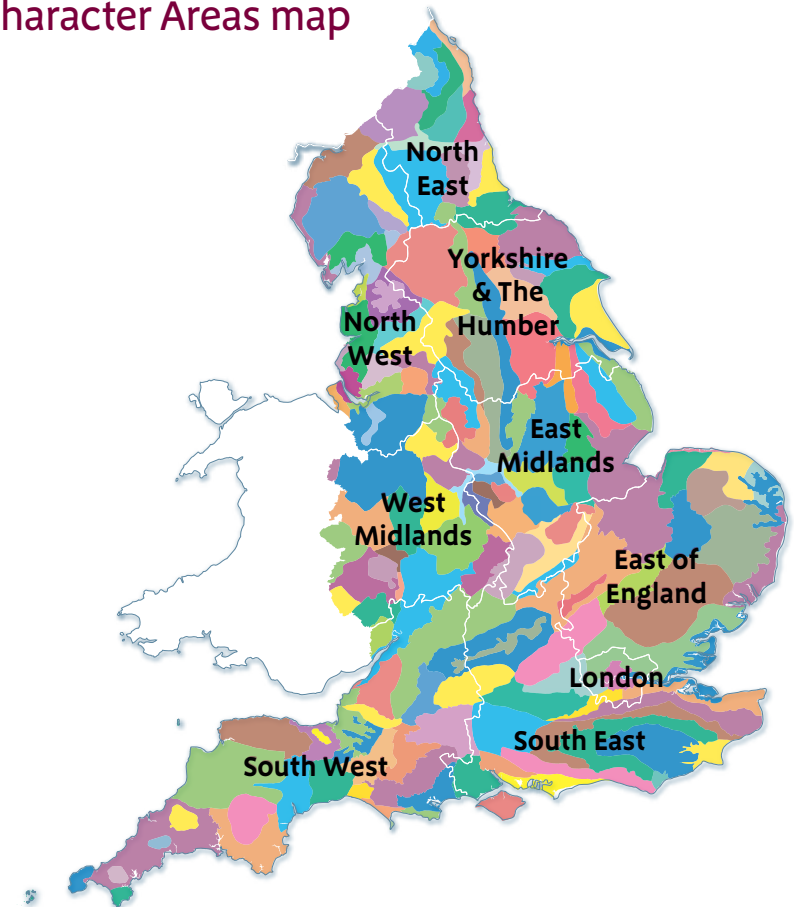
NCA profiles are guidance documents which can help communities to inform their decision-making about the places that they live in and care for. The information they contain will support the planning of conservation initiatives at a landscape scale, inform the delivery of Nature Improvement Areas and encourage broader partnership working through Local Nature Partnerships. The profiles will also help to inform choices about how land is managed and can change.

Each profile includes a description of the natural and cultural features that shape our landscapes, how the landscape has changed over time, the current key drivers for ongoing change, and a broad analysis of each area's characteristics and ecosystem services. Statements of Environmental Opportunity (SEOs) are suggested, which draw on this integrated information. The SEOs offer guidance on the critical issues, which could help to achieve sustainable growth and a more secure environmental future.

NCA profiles are working documents which draw on current evidence and knowledge. We will aim to refresh and update them periodically as new information becomes available to us.

We would like to hear how useful the NCA profiles are to you. You can contact the NCA team by emailing [ncaprofiles@naturalengland.org.uk](mailto:ncaprofiles@naturalengland.org.uk).

## National Character Areas map



<sup>1</sup> The Natural Choice: Securing the Value of Nature, Defra (2011; URL: [www.official-documents.gov.uk/document/cm80/8082/8082.pdf](http://www.official-documents.gov.uk/document/cm80/8082/8082.pdf))

<sup>2</sup> Biodiversity 2020: A Strategy for England's Wildlife and Ecosystem Services, Defra (2011; URL: [www.defra.gov.uk/publications/files/pb13583-biodiversity-strategy-2020-111111.pdf](http://www.defra.gov.uk/publications/files/pb13583-biodiversity-strategy-2020-111111.pdf))

<sup>3</sup> European Landscape Convention, Council of Europe (2000; URL: <http://conventions.coe.int/Treaty/en/Treaties/Html/176.htm>)

## Summary

The Bedfordshire and Cambridgeshire Claylands National Character Area (NCA) is a broad, gently undulating, lowland plateau dissected by shallow river valleys that gradually widen as they approach The Fens NCA in the east. Within it, but distinct from it, is the Bedfordshire Greensand Ridge, a contrasting narrow and elevated outcrop of Greensand, with its associated habitats on acidic soils such as grassland, heathland and woodland. Views of the Bedfordshire and Cambridgeshire Claylands NCA and its large-scale arable farmland can be seen in most directions, from the elevated ground of the Yardley Whittlewood Ridge, Bedfordshire Greensand Ridge, East Anglian Chalk and Chilterns NCAs.

The NCA contains the Forest of Marston Vale – one of 12 Community Forests in England – and to the south, around Luton, a small proportion of the Chilterns Area of Outstanding Natural Beauty (AONB). While predominantly an arable and commercially farmed landscape, a wide diversity of semi-natural habitats are also present within the NCA, including a number of internationally important and designated sites that support a range of species – some rare and scarce – and offer opportunities for people to have contact with the natural environment. The River Great Ouse and its tributaries meander slowly and gently across the landscape.

The Marston Vale and Peterborough areas have been subject to extensive clay extraction for brick making. Subsequent restoration has provided opportunities for recreation and biodiversity aided by new woodland planting and other green infrastructure initiatives. Extensive quarrying of sand and gravel within the river valleys has also left its mark with a series of restored and flooded waterbodies that benefit biodiversity and recreation.

The majority of the Bedfordshire and Cambridgeshire Claylands NCA is sparsely populated. Settlements are generally located along the river valleys and more recently along major road and rail corridors. A feeling of urbanisation is brought by the numerous large towns, including Milton Keynes, Bedford, Cambridge, Huntingdon and Peterborough, and major transport routes, including the M1, A1 and A14 and the Midlands and East Coast mainline railways.

Tranquillity within the NCA has declined, affected by visual intrusion, noise and light pollution from agriculture, settlement expansion and improvements in road infrastructure. Mineral extraction and landfill activities, particularly within the Marston Vale and around Peterborough, have affected local tranquillity. Many areas, however, retain a rural feel and there are numerous opportunities for nearby urban communities to enjoy quiet, informal recreation.

A sense of place and history provided by the area's rich geology and archaeology as well as historic features such as Stowe House, Wimpole Hall, Wrest Park, Bletchley Park, the Cardington Hangars, the Grand Union Canal and the post-industrial landscapes of the brickfields.

is

[Click map to enlarge; click again to reduce](#)

[Click map to enlarge; click again to reduce](#)

## Key characteristics

- Gently undulating, lowland plateau divided by shallow river valleys that gradually widen as they approach The Fens NCA in the east.
- Underlying geology of Jurassic and Cretaceous clays overlain by more recent Quaternary glacial deposits of chalky boulder clay (till) and sand and gravel river terrace deposits within the river valleys. Lime-rich, loamy and clayey soils with impeded drainage predominate, with better-drained soils in the river valleys.
- The River Great Ouse and its tributaries meander slowly across the landscape, and the River Nene and the Grand Union Canal are also features. Three aquifers underlie the NCA and a large manmade reservoir, Grafham Water, supplies water within and outside the NCA.
- Brickfields of the Marston Vale and Peterborough area form distinctive post-industrial landscapes with man-made waterbodies and landfill sites. Restoration of sand and gravel workings has left a series of flooded and restored waterbodies within the river valleys.
- Variable, scattered woodland cover comprising smaller plantations, secondary woodland, pollarded willows and poplar along river valleys, and clusters of ancient woodland, particularly on higher ground to the north-west representing remnant ancient deer parks and Royal Hunting Forests.
- Predominantly open, arable landscape of planned and regular fields bounded by open ditches and trimmed, often species-poor hedgerows which contrast with those fields that are irregular and piecemeal.
- Wide variety of semi-natural habitats supporting a range of species – some notably rare and scarce – including sites designated for species associated with ancient woodland, wetland sites important for birds, great crested newt and species of stonewort, and traditional orchards and unimproved grassland supporting a rich diversity of wild flowers.
- Rich geological and archaeological history evident in fossils, medieval earthworks, deserted villages and Roman roads. A number of historic parklands, designed landscapes and country houses – including Stowe House and Park, Kimbolton Park, Croxton Park, Wimpole Hall and Wrest Park – combine with Bletchley Park, Second World War airfields, the Cardington Airship Hangars and brickfields to provide a strong sense of history and place.
- Diversity of building materials including brick, render, thatch and stone. Locally quarried limestone features in villages such as Lavendon, Harrold and Turvey on the upper stretches of the River Great Ouse.
- Settlements cluster around major road and rail corridors, with smaller towns, villages and linear settlements widely dispersed throughout, giving a more rural feel. Small villages are usually nucleated around a church or village green, while fen-edge villages are often in a linear form along roads.
- Major transport routes cross the area, including the M1, M11, A1, A6, A5 and A14 roads, the East Coast and Midlands mainline railways, and the Grand Union Canal.
- Recreational assets include Grafham Water, the Grand Union Canal, Forest of Marston Vale Community Forest, Chilterns AONB, woodland and wetland sites, an extensive rights-of-way network and two National Cycle Routes. The cities of Cambridge and Peterborough and several of the historic market towns in the NCA are popular tourist destinations.

## Statements of Environmental Opportunity

**SEO 1: Maintain and manage a sustainable and productive claylands arable landscape, while managing, expanding and linking woodlands, hedgerows and other semi-natural habitats to benefit biodiversity, improve soil and water quality, and ameliorate climate change by promoting good agricultural practice.**

**For example, by:**

- Managing the arable landscape to retain the value of food provision through employing sustainable farming practices.
- Working with local farmers, landowners and managers to promote best practice such as the appropriate management of hedgerows, reducing herbicide and pesticide use, buffering field margins and woodland edges, and retaining winter stubble to support farmland birds and pollinators.
- Promoting good soil management to avoid compaction and maintain good soil structure.
- Encouraging the conservation and management of existing woodlands and the replacing of introduced species with native species, as well as undertaking new tree and woodland planting to link existing sites in order to enhance biodiversity and recreational opportunities.
- Seeking opportunities to develop biomass production through active woodland management and promote and stimulate local markets for wood products, biomass and wood fuel to support sustainable timber production.
- Ensuring that populations of wild deer are managed to reduce damage caused to the natural regeneration of trees and woodland.
- Preparing and implementing plans to control or limit the spread of new pests or disease – for example, ash die-back.
- Extending where appropriate the semi-natural vegetation cover, especially on steeper slopes where the Bedfordshire and Cambridgeshire Claylands National Character Area (NCA) meets the

Bedfordshire Greensand Ridge, Chilterns, and East Anglian Chalk NCAs, to improve soil quality and reduce run-off and erosion.

- Enhancing and expanding the network of semi-natural habitats through targeted environmental enhancements, including ponds, hedgerows, hedgerow trees and species-rich grasslands (such as areas found along road verges, green lanes and field margins) to support biodiversity.
- Encouraging the appropriate management and expansion of traditional orchards, bringing them back into active management to conserve their genetic diversity, biodiversity value and cultural heritage; and promoting and encouraging local markets for locally grown orchard produce.



**Species-rich roadside verges and hedges.**

**SEO 3: Plan and create high-quality green infrastructure to help accommodate growth and expansion, linking and enhancing existing semi-natural habitats. Regenerate the post-industrial landscapes of the Forest of Marston Vale and Peterborough to improve and create new opportunities for biodiversity, recreation, timber and biomass provision while strengthening sense of place, tranquillity, resilience to climate change, and people's health and wellbeing.**

**For example, by:**

- Supporting the creation and expansion of native woodlands, orchard, parkland, grasslands, and hedgerows to improve habitat connectivity within the landscape and provide increased benefits for biodiversity and recreation.
- Ensuring that areas of designated land remain in favourable condition, and improving their condition where possible.
- Promoting awareness of, and providing advice to landowners and managers on, managing habitats of biodiversity interest.
- Supporting initiatives that include well-planned green infrastructure that will increase people's access to and contact with the natural environment to benefit their health and wellbeing.
- Creating new woodland as appropriate on urban fringes to help screen and integrate new developments, and provide biodiversity and green infrastructure benefits.
- Managing recreational sites to accommodate visitor pressure and demand without conflict between different users, and without causing adverse effects on the natural environment.
- Maintaining, extending and promoting the use of the National Cycle Routes and the rights-of-way network.
- Conserving and managing traditional orchards, hedgerows, parkland, and ancient and veteran trees for the benefit of fauna (such as specialist invertebrates dependent on dead or decaying wood, pollinators and pest regulators).
- Protecting and conserving existing traditional orchards from inappropriate development and changes in land use.
- Retaining and enhancing the contrast in landscape character between the clay plateau and river valleys, aiming to maintain and enhance the balance between urban and rural landscapes.
- Preventing inappropriate development and promoting the use of local building stone to maintain the character of villages and historic buildings.
- Ensuring that any new developments incorporate well-designed green infrastructure, to include improved access and recreation opportunities for local communities and visitors.
- Supporting the work of the Forest of Marston Vale Community Forest to regenerate the area and repair the landscape, using trees and woodland to provide social, economic and environmental benefits.
- Supporting the work of the Chilterns Area of Outstanding Natural Beauty (AONB) to conserve and enhance the landscape and special qualities of the AONB.
- Ensuring that geodiversity sites continue to be protected, monitored and managed.
- Ensuring that mineral extraction sites are restored to contribute to local landscape character and offer opportunities to enrich people's understanding of landscape, and enhance biodiversity, recreation and geodiversity.



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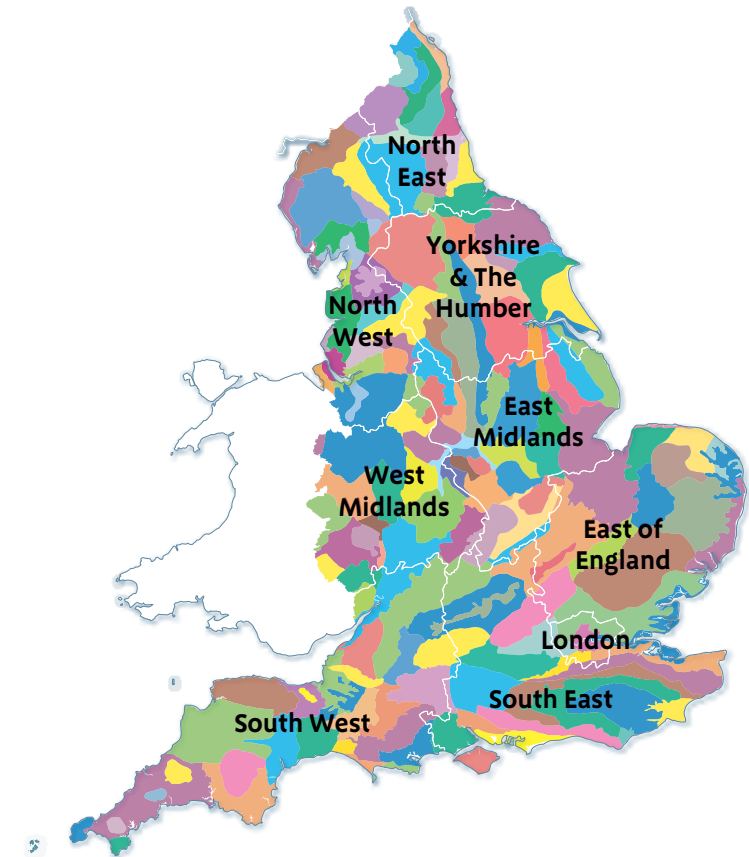
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<sup>3</sup> European Landscape Convention, Council of Europe (2000; URL: <http://conventions.coe.int/Treaty/en/Treaties/Html/176.htm>)

## Summary

The Bedfordshire Greensand Ridge National Character Area (NCA) is a narrow ridge running north-east, south-west, rising out of – and entirely surrounded by – the Bedfordshire and Cambridgeshire Claylands NCA. It is a distinctive ridge with a north-west-facing scarp slope, formed by the underlying sandstone geology which has shaped the landscape and industry of the Ridge. Its historic landscapes, including the farmland, parklands and historic architecture, combined with small settlements, greenbelt and woodlands ancient and modern, give parts of the NCA a more timeless feel than the Bedfordshire and Cambridgeshire Claylands which surround it.

There is a patchwork of semi-natural habitats throughout the NCA, including flood plain grazing marshes, lowland heathland and meadows and mixed deciduous woodland.

The north-west-facing scarp slope, with its mix of coniferous and deciduous woodland, pasture, arable and heathland, overlooks Milton Keynes and the Marston Vale, forming a significant landscape feature from a distance. There are a number of fine panoramic views over the surrounding landscape.

Food, timber and biomass provision on the Ridge are regionally important, and the Ridge is nationally important for recreation: Woburn Abbey and its associated safari and deer parks are well known and attract visitors from far and wide, as do other houses and estates along the Ridge – Haynes, Shuttleworth, Sandy Lodge and Southill. The historic houses, both great and small, with their vernacular architecture, are of significance.

The main pressures on the NCA are (or would result from) development, use of bland, non-local materials, increased congestion and increased traffic noise and light pollution.

Click map to enlarge; click again to reduce.

## Key characteristics

- Narrow escarpment resulting from the erosion-resistant sediments of the Lower Greensand Group, with a distinct scarp slope to the north-west and dip slope to the south-east.
- The rolling and elevated Ridge provides a north-west-facing wooded skyline offering extensive panoramic views across the lower-lying Bedfordshire and Cambridgeshire Claylands and towards the Chilterns.
- Well-drained acidic sandy soils are capped in places with drift deposits of Boulder Clay. Sand and gravel deposits are present in the Ouzel valley, and there are deposits of peat in the Flit valley between Flitwick and Clophill.
- Substantial blocks of ancient woodland and coniferous plantation are found on the Ridge and steeper slopes. Wood pasture and numerous hedgerow trees, copses and shelterbelts are associated with the estate farmland and parkland trees.
- Mixed field and roadside boundaries range from mature shelterbelts to gappy, short flailed boundaries to intact evergreen hedgerows. Commercial arable cropping within a network of large geometric fields is associated with the better soils on the dip slope.
- A patchwork of semi-natural habitats including mire habitats, lowland heathland and lowland mixed deciduous woodland species, including coppiced hazel which is important for dormice at Maulden Wood. Adders are particularly associated with heathland areas of the Ridge. The mire habitats are notable for their invertebrate interest, especially in terms of beetles.
- The Ridge is dissected by the rivers Ouzel and Ivel, which have carved distinct valleys with riparian habitats, and it is partially bounded to the south by the River Flit. Springs arising from the Ridge support important wetland habitats, including acid mire and wet woodland.
- Visible heritage of iron-age banks and ditches at Kings Wood and Glebe Meadows, Houghton Conquest Site of Special Scientific Interest (SSSI) and iron-age hill fort remains at Sandy. Remnant ridge and furrow at Hockliffe and Potsgrove. Historic parklands and estates associated with grand country houses such as Woburn.
- Dispersed settlement pattern along the Greensand Ridge, with the majority of towns and villages lying along the river valleys and southern dip slopes. Estate villages, houses and farmsteads use local building materials including clay brick and tile, locally quarried brown ironstone, thatch and render. Several of the villages (including Southill, Woburn and Old Warden) are estate villages and have their own distinct styles.
- Major communications infrastructure includes the Sandy Heath transmitter. Road and rail links cut north-south through the Ridge.

**SEO 4: Promote and protect the distinct character and geodiversity of the Greensand Ridge landscape, with its prominent sandstone ridgeline rising from the surrounding low-lying vales; protect the long open views and high levels of tranquillity to ensure continued enjoyment of the landscape and plan for the sustainable extraction and restoration of sites associated with the distinctive geology.**

**For example, by:**

- Identifying and conserving key geological features, including quarry exposures of Greensand and Gault (for example, Double Arches Pit SSSI and Nine Acres Pit SSSI).
- Preserving exposures of the local stratigraphy for research and education as well as for their aesthetic value
- Demonstrating the history of mineral extraction within the NCA, for building stone, high-quality sands and fuller's earth.
- Creating and promoting interpretation of, and access to, geological features and assets of the area, highlighting links to other interests including historic earthworks, local building materials, distinctive habitats, flora and fauna.
- Working to agree restoration plans and management agreements between landowners, operators and the Minerals Planning Authority for existing and former extraction and quarry sites that demonstrate geological, landscape, biodiversity and public access benefits, including those where extraction of nationally scarce minerals such as fuller's earth has taken place.
- Promoting the importance of smaller-scale locally distinctive features such as acidic mires, that are a feature of the local geology.

## Additional opportunity

### 1. Manage and plan for the recreational use of the area by putting in place multifunctional green infrastructure networks and green space provision which respects intrinsic character and provides enhanced access and connections for people and wildlife.

#### For example, by:

- Creating, promoting and improving interpretation of existing rights of way and strategic facilities (for example, the Greensand Ridge Walk), providing new and enhanced connections to strategic routes from adjacent settlements and increasing promotion of health walk initiatives.
- Providing enhanced sustainable access for longer journeys and promoting the use of buses and trains.
- Creating new access links within and between existing local communities and amenities, and creating natural public green space in areas of need as identified in Natural England access maps.
- Seeking opportunities to increase public access along river corridors.
- Reviewing adequacy and management of existing parking areas providing access to the countryside.
- Ensuring that formal sports facilities (for example, golf courses) are created and managed to respect and emphasise local landscape character and create/maintain public access opportunities.
- Ensuring that liaison and understanding are maintained with major landowners to balance the pressures of public access with private ownership interests.
- Promoting the creation of new green infrastructure, including quality green space provision for existing and new populations to meet any local short falls in resource.
- Identifying remaining tranquil areas and safeguarding them from further intrusive developments and activities.
- Creating access to the wider countryside for the benefits that would bring for the public using this access.
- Linking green infrastructure for the benefit of visitors as well as species.

**Milton Keynes Council**

# **Milton Keynes Landscape Character Assessment**

**Final report**

Prepared by LUC

May 2022



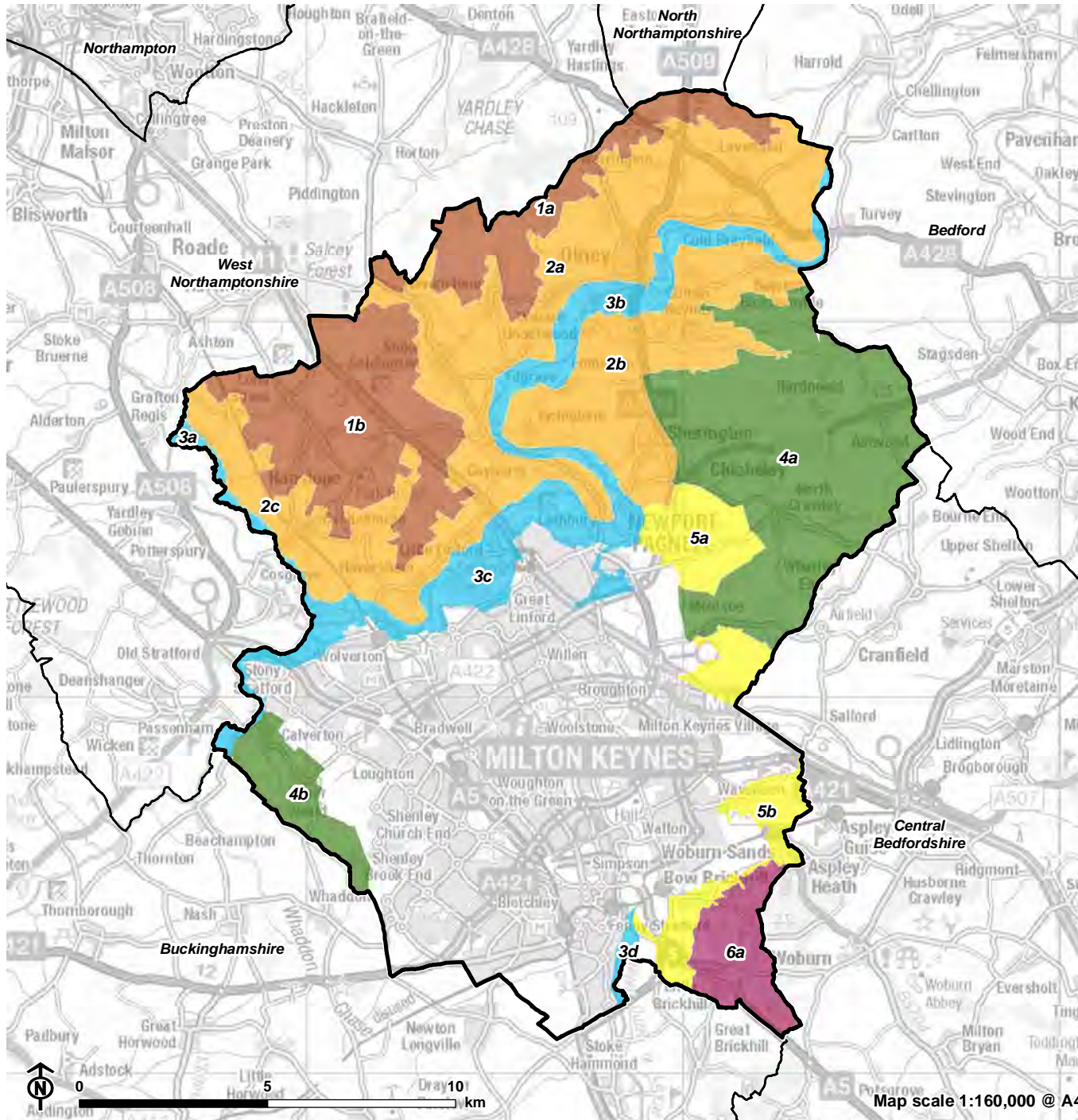
**Milton Keynes Council**

**Milton Keynes Landscape Character Assessment**

Version	Status	Prepared	Checked	Approved	Date
1.	Pilot	A Knight	K Davies	R Knight	20.10.2021
2.	Draft report	A Knight A Breen	K Davies	K Davies	18.02.2022
3.	Final draft report	A Knight	K Davies	K Davies	29.04.2022
4.	Final report	A Knight	K Davies	K Davies	20.05.2022

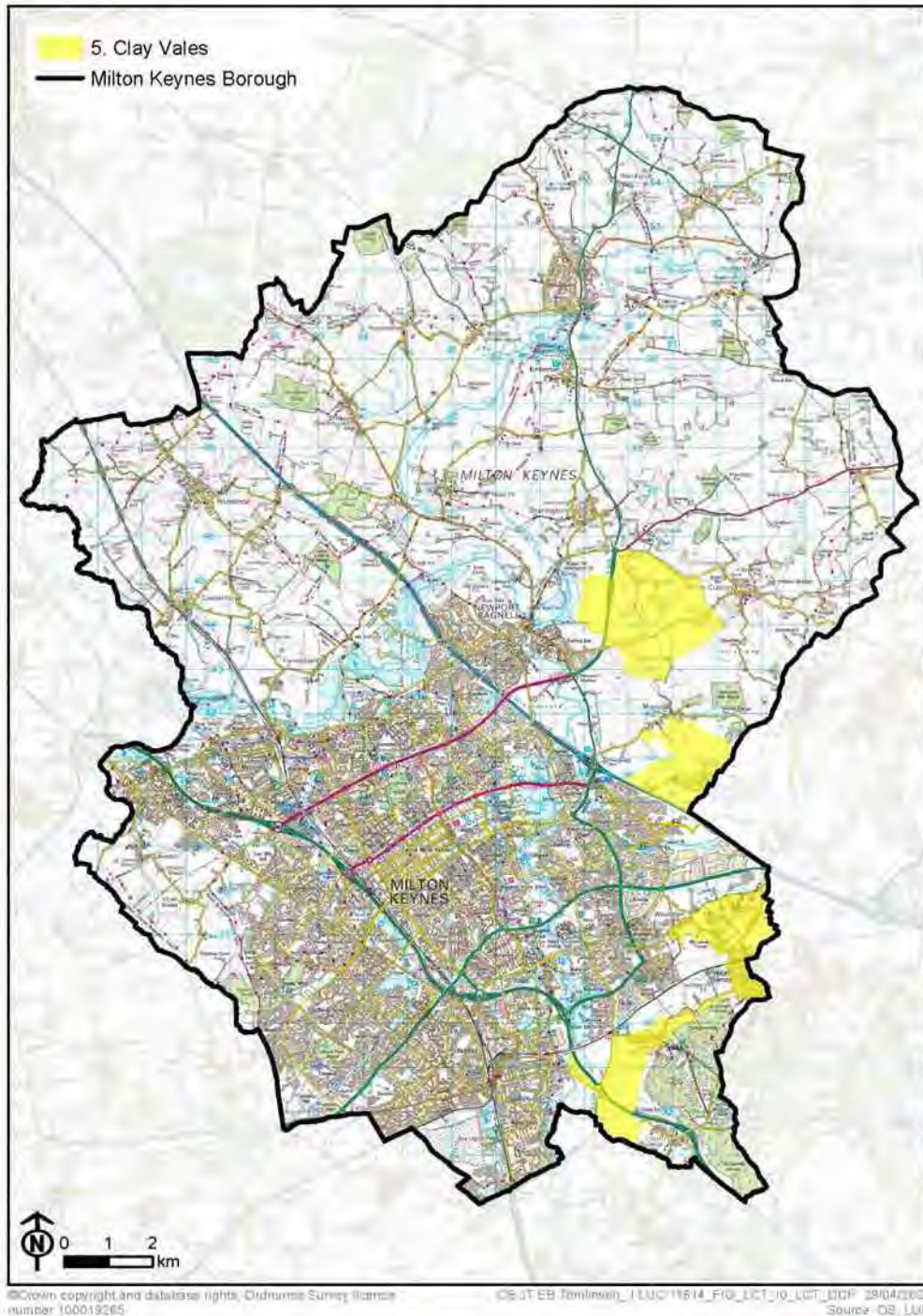


Figure 4.2: Landscape Character Areas



- Milton Keynes Borough
  - Neighbouring local authority
- Landscape Character Area (by type)**
- 1. Wooded Wolds
    - 1a. Yardley Chase Wooded Wolds
    - 1b. Gayhurst and Stokepark Wooded Wolds
  - 2. Undulating Valley Slopes
    - 2a. Ouse Northern Undulating Valley Slopes
    - 2b. Ouse Southern Undulating Valley Slopes
    - 2c. Tove Undulating Valley Slopes
  - 3. River Floodplains
    - 3a. Tove Floodplains
    - 3b. Ouse Floodplains
    - 3c. Ouse Lakes and Parkland Floodplains
    - 3d. Ouzel Parkland Floodplains
  - 4. Undulating Clay Plateaux
    - 4a. North Crawley Undulating Clay Plateau
    - 4b. Weald Undulating Clay Plateau
  - 5. Clay Vales
    - 5a. Lower Ouzel Clay Vale
    - 5b. Upper Ouzel Clay Vale
  - 6. Wooded Greensand Ridge
    - 6a. Brickhill Wooded Greensand Ridge

## LCT 5: Clay Vales



### Landscape Character Areas

The Clay Vales LCT is subdivided into two LCAs:

- 5a: Lower Ouzel Clay Vale
- 5b: Upper Ouzel Clay Vale

## Location and summary

The Clay Vales LCT comprises a sweep of relatively low-lying farmland that wraps around the eastern and south eastern edge of Milton Keynes city. Parts of the eastern and southern boundary of the LCT follow the borough boundary with Central Bedfordshire and Buckinghamshire authorities respectively. The boundary with LCT 6 marks the transition to the greensand geology and higher slopes of the wooded ridge above Bow Brickhill. The northern boundary with LCT 4 marks the transition to the higher undulating clay plateau around North Crawley.

This is a relatively flat, open landscape predominantly in arable use. It retains its rural character but is visually influenced by the urban edge of Milton Keynes city.



Flat arable fields visually influenced by the urban edge of Milton Keynes city, with a wooded horizon provided by the Wooded Wolds.

### Key Characteristics

- A relatively flat landscape which falls gently towards the Ouse and Ouzel rivers. Underlain by clay with till deposits in the east and north-east, giving rise to slightly acid loamy and clayey soils.
- Large scale arable landscape intensively farmed for mixed crops. Smaller areas of pasture in LCA 5b, often for horse grazing close to settlements. Hedgerows are often fragmented or overgrown.
- Limited woodland cover, except for priority habitat deciduous woodland around Wavendon House and along the Chicheley Brook, and some conifer shelterbelts.
- Field pattern formed by straight edged Parliamentary enclosure, with some pre-18<sup>th</sup> century irregular enclosure. Some ridge and furrow earthworks survive at Bow Brickhill and Dropshort Farm.
- Historic parkland at Wavendon House, with ornamental lakes and mature trees, designated as a Grade II listed Registered Park and Garden.
- Settlement concentrated at Woburn Sands and Bow Brickhill (in LCA 5b), which retain a rural character despite their proximity to Milton Keynes city. Scattered farms and farmsteads are often historic.
- The landscape is influenced by busy roads and railway links, as well as residential and commercial development expanding from Milton Keynes city.
- Public rights of way provide connections between Milton Keynes city and the wider countryside.
- Extensive open views to the higher landscapes of the North Crawley Undulating Clay Plateau (LCA 4a) and the Greensand Ridge (LCA 6a), due to the flat topography and limited woodland coverage. The built form of Milton Keynes city is evident in views. Small areas of visual enclosure are found along the wooded course of the Chicheley Brook.

### Physical and natural characteristics

■ A relatively flat landscape that gently slopes towards the River Great Ouse and Ouzel, with slopes ranging from 90m to 60m AOD. A network of field ditches and a small number of streams drain the LCT, including the Chicheley Brook, a tributary of the River Ouse (LCA 5a), and tributaries of the River Ouzel (LCA 5b) which drain the Brickhill Greensand Ridge (LCA 6a).

■ The geology is dominated by Kellaways Formation and Oxford Clay Formation (mudstones, siltstone and sandstone) dating from the Jurassic period, laid down in shallow seas. This is overlain by a band of glacial till deposits in the east.

■ The geology gives rise to medium to heavy, clayey loam to silty loam, soils which support arable farming in large open fields. Some pockets of pasture populate smaller, more enclosed fields around settlements, mostly in use as horse paddocks.

■ The intensively managed agricultural land has limited biodiversity. Priority habitats are limited to deciduous woodlands along the Chicheley Brook (locally notified as a Wildlife Corridor) and around Wavendon House. Tree cover elsewhere is limited to small scattered deciduous woodlands. Deciduous woodland blocks and conifer shelterbelts are located on the edge of the settlements and along roads. A small part of the Ouse Valley Biological Opportunity Area extends into LCA 5a.

■ Hedgerows are often gappy and unmanaged, or reinforced with wire fencing. Roadside hedgerows are more intact, with mature hedgerow trees.



Riparian woodland along Chicheley Brook.

### Historic and cultural characteristics

■ The field scale is mostly medium to large, with most fields originating from straight edge late 18<sup>th</sup> century Parliamentary enclosure, and smaller areas of irregular pre-18<sup>th</sup> century enclosure. There has been localised boundary loss in the 20<sup>th</sup> century, creating large fields. Some areas of ridge and furrow earthwork survive under pasture e.g. in Bow Brickhill and at Dropshort Farm, Watling Street (5b).

Land use is predominately arable, although there are areas of pasture for sheep and horse around the settlements in LCA 5b.

Historic assets are concentrated in LCA 5b, around Cross End and Wavendon House which is characterised by historic parkland, mature tree-lined hedges and sinuous narrow lanes. The parkland at Wavendon House, with linked ornamental lakes surrounded by mature trees, is designated as a Grade II listed Registered Park and Garden.

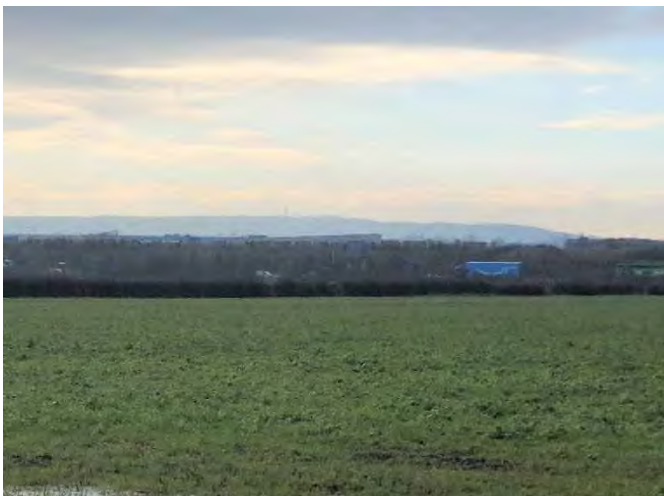
Settlement is concentrated in LCA 5b, at Woburn Sands, Wavendon and Bow Brickhill. Outside of these settlements, there are small farmsteads and hamlets, some of which are listed buildings. Vernacular materials in the LCT are typically red brick, with clay or grey slate tiles.

This is an accessible landscape with a number of PROW connecting settlements and providing access to the countryside within the borough and into Central Bedfordshire to the east. The Milton Keynes Boundary Walk promoted route runs from Wavendon Park to Woburn Sands.

Roads within the LCT are generally rural, although the A5 and A509 cross the landscape, and the M1 borders LCA 5a. The Bedford to Bletchley railway (formerly the Oxford to Cambridge route) passes through Woburn Sands.

### Visual and perceptual characteristics

Views within the LCT are relatively open, due to the flat landform of the agricultural landscape and limited woodland, with long distance views east to the elevated clay plateau around Moulsoe (LCA 4a) and the Greensand Ridge at Brickhill (LCA 6a). The LCT provides a rural foreground to views from Milton Keynes city towards the elevated landscapes to the east and south.



The M1 seen in views south from LCA 5b to the Greensand Ridge.

The built edge of Milton Keynes city is apparent in views from the LCT, particularly new development north of Lower

End Road. Large-scale commercial developments including warehouses and distribution centres along the M1 at Magna Park are a strong visual feature, which detract from the rural character.

The proximity of Milton Keynes city and presence of busy trunk roads introduce light pollution and reduce tranquillity across the LCT.



Open flat arable fields with intermittent hedgerows, with views to villages and woodlands on the horizon from LCT 4a.

## Landscape evaluation

### Landscape qualities

- The remaining semi-natural habitats including woodland copses, trees and hedgerows that support biodiversity, and provide carbon capture.
- The heritage features important to landscape character (particularly the surviving ridge and furrow earthworks, field patterns of irregular pre-18<sup>th</sup> century enclosure bound by hedgerows, the parkland at Wavendon Park, the historic spa town of Woburn Sands and historic buildings constructed from local materials) that provide a connection to history, cultural identity and aesthetic value.
- The rural character of the area, with open views across the flat farmland to higher wooded landscapes to the east, which provide a sense of separation between Milton Keynes city and the wider countryside and contributes to mental well-being and health – especially important in contrast to the adjacent urban area of Milton Keynes city.
- The network of PRoW, including the Milton Keynes Boundary Walk, that connect the settlements and wider countryside and provide recreational value and contribute to well-being and health.
- The rural foreground the LCT provides to the Greensand Ridge and Clay Plateau that forms a sense of place and a setting to Milton Keynes city.

### Landscape condition

■ The Clay Vales LCT is influenced by proximity to large-scale residential and commercial development expanding from Milton Keynes city. There are limited semi-natural habitats within the LCT, and fragmentation of historic field patterns and hedgerow field boundaries reduces condition in some areas. Modern influences on the landscape include the major road corridors of the M1, A5, A414 and A509, and visual influence of Milton Keynes city.

### Forces for change

■ Key forces for change include:

- Changes in agricultural practices to large scale arable cropping with consequent field boundary loss which has fragmented the traditional landscape pattern.
- The loss or decline of boundary hedgerows and their replacement with post and wire fencing.
- Increased horse grazing close to settlements, leading to subdivision of fields into paddocks, horse tape and fencing, stabling and shelters resulting in increased suburbanisation of the rural landscape.
- The increasingly limited connections between pockets of semi-natural habitats, with scattered woodland copses and fragmented hedgerows.
- The use of non-native species in hedgerows or shelterbelts (including conifer species) that are prominent features of the landscape and out of keeping with the character of the landscape.
- Potential changes in flora and increase in pests and diseases as a result of climate change, with ash die back becoming increasingly apparent in the local landscape.
- Changes in water quality entering the streams and ditches or loss of riparian vegetation due to harsh maintenance regimes, agricultural intensification and drainage works.
- The dilution of rural character due to the prevalence of urban fringe features (including garden centres and allotments) and the consequent lack of visual cohesiveness due to the variety in built form.
- Current and future expansion of built development on the urban edge of Milton Keynes city, especially South East Milton Keynes and Milton Keynes East, affecting the rural character of the landscape as well as levels of tranquillity.
- Increasing road traffic, particularly on the A5 and M1, but also on rural roads impacting landscape tranquillity. Road widening or new roads could also erode rural character.
- Potential pressure for renewable infrastructure (e.g. wind turbines and solar farms).

## Landscape strategy

■ The landscape strategy for the Clay Vales LCT is to retain a rural farmland landscape with a separate character to the urban areas of Milton Keynes city, with strong recreational links.

## Guidance

### Landscape Management

- Manage and increase the biodiversity of agricultural fields by creating uncultivated margins to arable fields or converting some arable land to permanent pasture.
- Conserve and strengthen the traditional landscape pattern and structure, as well as increasing biodiversity interest through the maintenance or restoration of hedgerows with native species.
- Increase the extent of native deciduous woodland/tree cover, particularly around settlements, using locally occurring species, to link with existing small deciduous woodlands, copses, and hedgerows, as set out in the Milton Keynes Green Infrastructure Strategy<sup>19</sup>.
- Encourage progressive removal of conifer hedgerows and shelter belts where appropriate and replacement with native species.
- Manage and monitor invasive native or harmful species in woodlands and the impact of pathogens, pests and diseases as a result of climate change.
- Encourage appropriate management of streams and drainage ditches to improve biodiversity and connectivity of these habitats and establish buffer strips to minimise run-off. Identify opportunities for green infrastructure enhancement.
- Protect the valued recreational use of the landscape (PRoW), further enhancing opportunities for informal access and enjoyment through well maintained linked routes through farmland, particularly adjacent to urban areas.
- Protect and enhance heritage assets within the LCT, including ridge and furrow earthworks and the historic parkland and Scheduled Monument at Wavendon Park.

### Development Management

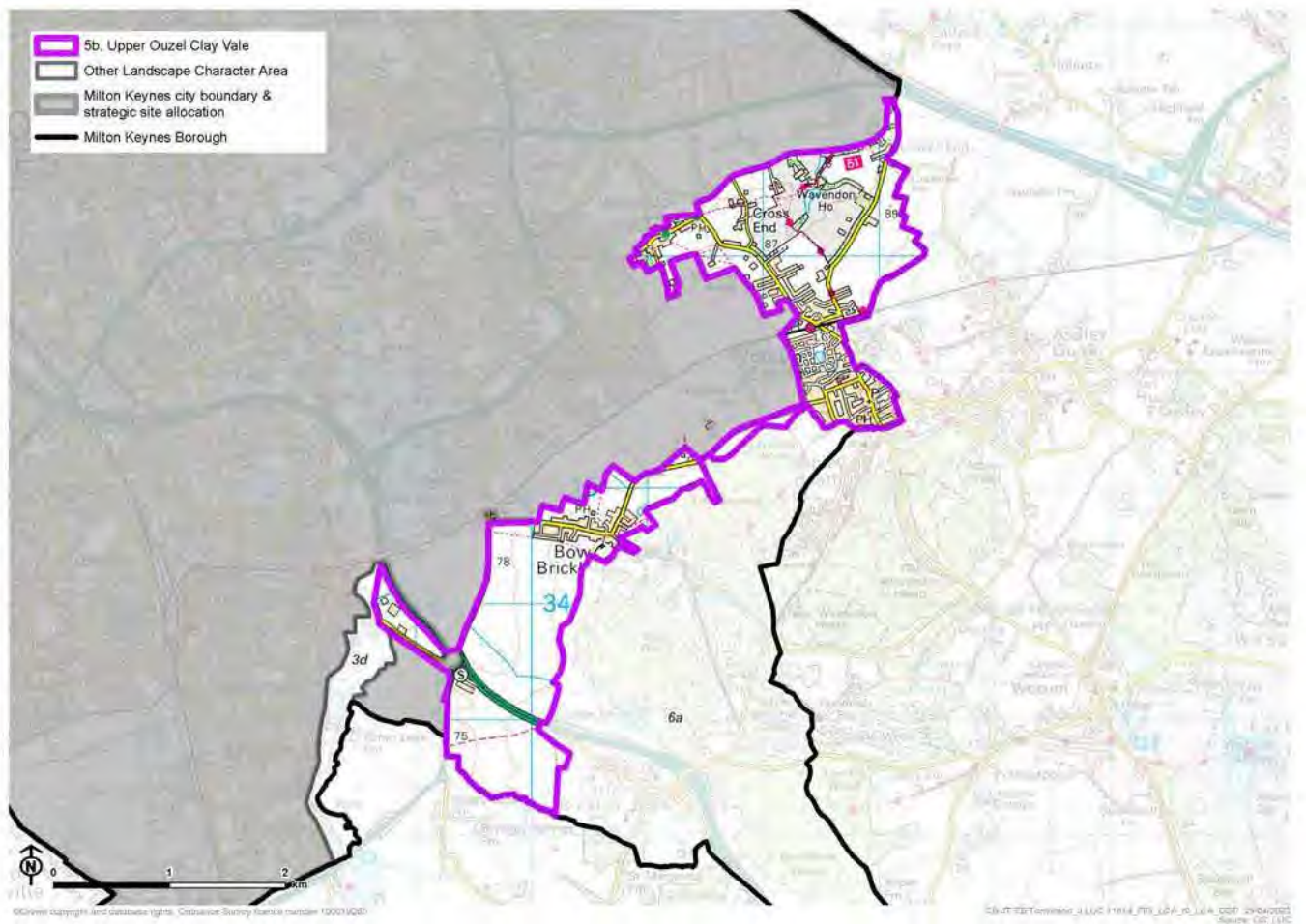
- Retain framed views across farmed landscape to the Brickhill Greensand Ridge and consider the impact on views from the surrounding higher land in relation to any proposed change.
- Integrate new development and improve the urban edge of Milton Keynes city through the use of native hedgerows and woodlands.
- Encourage sympathetic integration of horse paddocks and associated stables through maintenance and improvement of existing field boundaries.
- Conserve the distinctive vernacular of historic buildings and their rural setting, including within Woburn Sands Conservation Area. Reference the pattern of local buildings materials and local identity in any new development or boundary treatments.
- Ensure any renewable energy generation is compatible with the guidance above, and with guidance set out in the MK Renewable Energy Landscape Sensitivity Assessment<sup>20</sup>. Renewable energy should be in scale with the landscape where possible, acknowledging that wind turbines may transcend the scale of existing features in the landscape. Electricity infrastructure associated with renewable energy generation should be efficiently planned to minimise the number of lines required, routing in accordance with the Holford Rules<sup>21</sup>. Manage the existing PRoW network, and consider opportunities for extending it, particularly where this can tie-in with wider initiatives to promote and enable sustainable transport in association with proposed development.
- Conserve a rural separation between Milton Keynes city and outlying villages such as Bow Brickhill.

<sup>19</sup> AECOM, Milton Keynes Green Infrastructure Strategy (2018)

<sup>20</sup> Gillespies, Landscape Sensitivity to Wind Turbine and Solar PV Development (2016)

<sup>21</sup> <https://www.nationalgrid.com/sites/default/files/documents/13795-The%20Holford%20Rules.pdf>

## 5b Upper Ouzel Clay Vale



### Location and unique characteristics

Upper Ouzel Clay Vale LCA is located to the south of borough adjacent to the urban edge of Milton Keynes city, which lies to the north and west. This narrow area wraps around the Brickhill Greensand Ridge (LCA 6a) which rises to the south-east. The eastern and south-western boundaries are formed by the borough boundaries with Bedfordshire and Buckinghamshire respectively.

The landform gently slopes down from LCA 6a Brickhill Greensand Ridge at approximately 90m AOD westwards towards the edge of Milton Keynes city, at approximately 75m AOD. The slope is more pronounced south of Bow Brickhill where it falls towards the River Ouzel.

Land use is generally pasture, often sheep with some horse grazing. Arable fields are found south of Bow Brickhill. The former golf course at Wavendon has an unmanaged character and does not appear to be in use.

The Buckinghamshire HLC indicates historic field patterns around Bow Brickhill which are Parliamentary

enclosures which have subsequently been divided. There are remnant areas of pre-18<sup>th</sup> century irregular and regular enclosures around Wavendon, and pockets of ridge and furrow earthwork.

Buried archaeological remains of the Roman city of Magiovinium are evidence of Roman occupation in the area. The remains are designated as a Scheduled Monument, and although currently on the Heritage at Risk Register due to vulnerability to arable ploughing and new development at Eaton Leys, its status is improving and will be reverted to a lowland meadow park with interpretation.

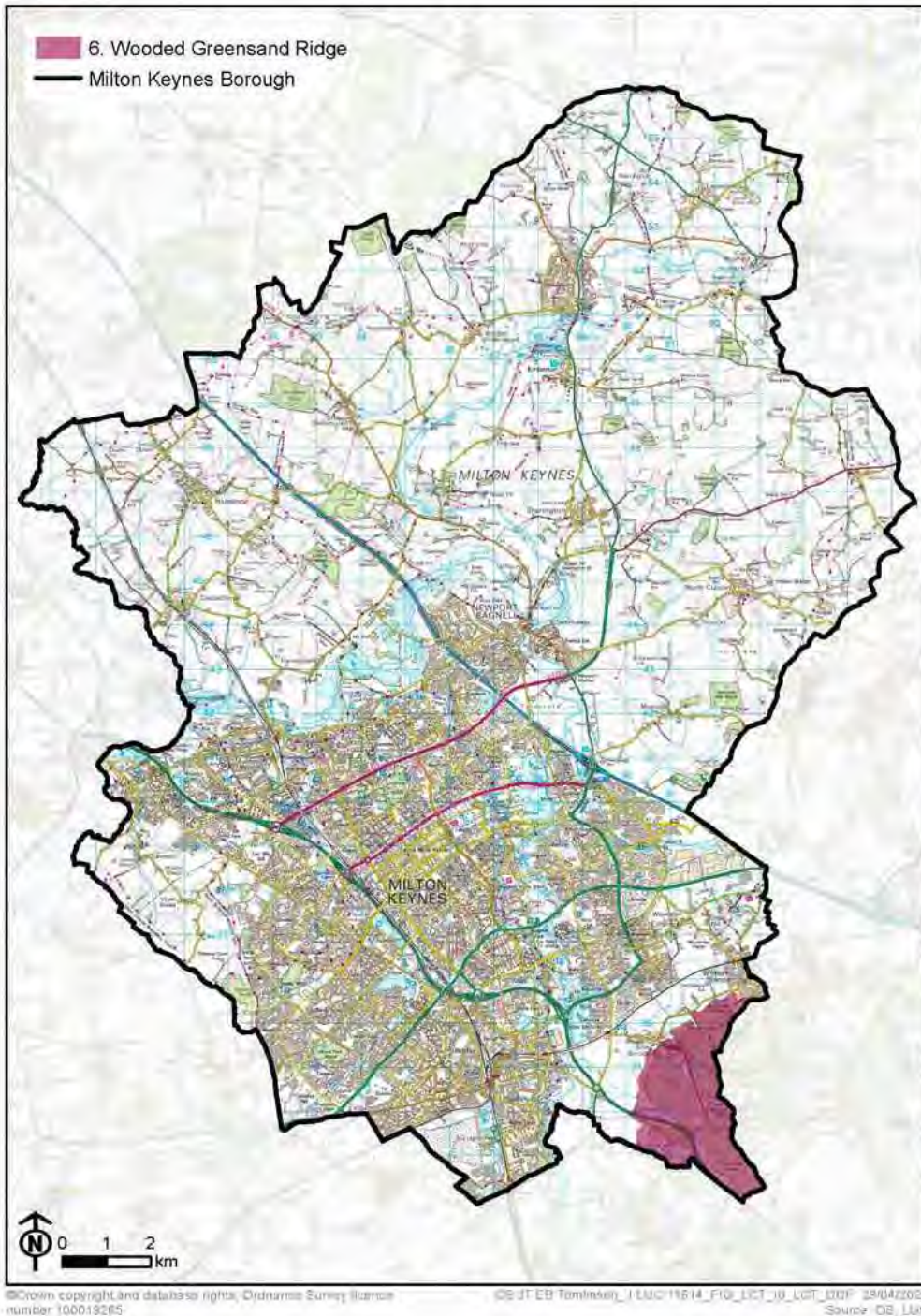
Wavendon is a small village with a Grade II\* church originally dating from the 13<sup>th</sup> and 14<sup>th</sup> century. The historic hamlet of Cross End, with a number of thatched cottages, lies between the village and Wavendon House. The parkland with large lakes at Wavendon House was laid out in the late 18<sup>th</sup> century by Richard Woods. The parkland is Grade II listed and forms a historic grouping with the Grade II\* listed country house, Grade II listed former stables, coach house and lodge and adjacent Scheduled Monument.

■■■■ Woburn Sands is the largest settlement in the LCT and developed as a health resort and spa in the 19<sup>th</sup> century, assisted by the opening of the railway, which became a popular stop for visitors to the Duke of Bedford's Woburn estate. The town is recognised as a Conservation Area for its special architectural and historic interest and has a number of fine Victorian and Edwardian villas although few of these are listed.

■■■■ New residential expansion of Milton Keynes city north of Lower End Road has impacted on the views of open fields from Wavendon and Cross End. However, the new development provides some screening for views to the warehouses at Kingston. The Greensand Ridge (LCA 6a) provides a wooded, steeply rising, backdrop to views to the south and south-east.

■■■■ The Bedford to Bletchley railway crosses the LCA and along with the A5, disrupt the rural tranquillity of the area.

## LCT 6: Wooded Greensand Ridge



### Landscape Character Areas

The Wooded Greensand Ridge LCT occurs in one location within the borough:

- 6a Brickhill Wooded Greensand Ridge

## Location and summary

The Wooded Greensand Ridge LCT is a distinctive escarpment located in the south-east of the borough. The eastern and southern boundaries are formed by the borough boundaries with Central Bedfordshire and Buckinghamshire County. The western boundary marks the change in elevation where the ridge rises sharply from the Clay Vales (LCT 5) and follows field boundaries around the 100m contour line. The northern boundary is formed by the settlement edge of Woburn Sands.

This is a distinctive elevated landscape which forms part a wider greensand ridge which extends into Central Bedfordshire and Buckinghamshire County. It is characterised by considerable woodland cover, including coniferous plantations, on the light sandy soils. The majority of the landscape is owned by the Woburn Estate, and is used for recreation, including the Woburn Golf Club.



A distinctive elevated landscape dominated by woodland and the Woburn Golf Club.

### Key Characteristics

- A prominent escarpment, rising steeply from 90m to a plateau at 171m AOD, predominantly underlain by Lower Greensand sandstones and mudstones.
- A wooded landscape, including both broadleaved woodlands, mixed and conifer plantations, with some ancient and replanted ancient woodland.
- Pasture fields on the lower slopes are bound by hedgerows with mature hedgerow trees, which contribute to the wooded character. Arable fields are found around Little Brickhill.
- Settlement is concentrated at Little Brickhill, a small village, with traditional building materials including brick and the local Greensand stone. Development on the plateau is limited to Grade II\* listed Church of All Saints, and buildings relating to the golf course.
- Narrow rural roads cross the landscape, with wide road verges.
- Good access by PRoW, including the Milton Keynes Boundary Walk. Formal recreational uses at Woburn Golf Club.
- Panoramic views over the surrounding landscape and north to Milton Keynes city from the steep open slopes contrast with an enclosed character within the woodland.
- Peaceful character away from the A5 and Bow Brickhill Road, with some darker skies in the south-east.

### Physical and natural characteristics

■ The LCT comprises a prominent escarpment with a plateau along its crest. The topography is a defining characteristic of the area, which forms the western slope of the plateau which continues over the borough boundary into Central Bedfordshire and Buckinghamshire County. The landscape rises from 90m AOD in the west (at the boundary with LCA 5b) to a maximum height of 171m AOD at Bow Brickhill Park, on the plateau.

■ The underlying geology of the LCT differentiates it from the landscape within the rest of the borough. Kellaways Formation and Oxford Clay Formation (mudstones, siltstone and sandstone), laid down in shallow seas in the Jurassic period, transition into the Lower Greensand Group of sandstones and mudstones, laid down in the Cretaceous Period. There is a small band of glacial till drift deposits in the south-east. Soils vary across the LCT generally in line with the topography and underlying geology: well drained and sandy soils with high iron content on the slopes (classified as poor grade 4), whilst the soils become poorer and loamier but still well drained on the plateau. The local greensand was quarried and some of the disused pits remain, including off Church Road.

■ The underlying greensand is naturally porous and is an important aquifer. Water stored in this aquifer is used as a water source for the surrounding area. A natural spring line occurs where the greensand meets the clay, and this creates some localised waterlogging.

■ The steeper slopes and plateau are heavily wooded, with a mix of priority habitat deciduous woodland and mixed or coniferous plantations. There are small pockets of ancient woodland, with larger replanted ancient woodlands, including

at Back Wood and Bell's Copse. Conifers on the sandy soils on the ridge provide a heathland character, and small areas of priority habitat lowland fen and purple moor grass and rush pastures are found on the ridgeline, which are important habitats scarce in south-east England. The Greensand Ridge Biological Opportunity Area covers the whole of the LCT.

■ Medium-scale fields are found on the lower slopes to the west and south, and retain their hedgerow boundaries. Land use is generally pastoral, including some land converted to horse grazing, with associated horse tape fencing. Arable fields are located around Little Brickhill along the A5.



Mixed broadleaved and conifer woodland at Aspley Woods.

### Historic and cultural characteristics

■ Historically, the landscape was open heath on the light unproductive soils, and in use as common land. Smaller strips of organic pre-18<sup>th</sup> century enclosure relate to the pasture on the lower slopes of the ridge. Ancient woodlands were

extended by planting in the 18<sup>th</sup> and 19<sup>th</sup> centuries, with more extensive conifer plantations in the 20<sup>th</sup> century.

■ Danesborough Camp is an Iron Age hill fort, dated between the first century BCE and first century CE. It may have been an important regional centre in the pre-Roman era. It is now a Scheduled Monument, although the afforestation period has disturbed the interior. Further earthworks in the LCT may relate to the medieval deer park pale at Bow Brickhill Park and medieval and post-medieval woodland management, e.g. wood banks and saw pits.

■ Settlement within the area is concentrated at Little Brickhill, which developed along the Roman road of Watling Street, and became a stopping point on the way to and from London. Traffic reached its height in the late 18<sup>th</sup> century, and the wealth generated by passing trade is reflected in a number of Georgian houses, all Grade II listed buildings. The construction of the railway at Bletchley reduced the coach traffic and the village's importance. The village became part of the Woburn Estate, owned by the Duke of Bedford, in the 1840s. It has largely retained its historic linear form, and is now designated as a Conservation Area. The A5 bypass, built in 1992, cuts off the village from its wider setting on the wooded slopes to the north.

■ The Grade II\* listed All Saints Church, Bow Brickhill, lies on the steep hillside isolated above rest of the village (within LCA 5b). The church is built of the local greensand and is the only historic building on the plateau.



Grade II\* listed All Saints Church sits on the steep hillside of the greensand ridge.

■ The LCT is crossed by the A5, but otherwise the road network consists of narrow, rural lanes which have wide grassed verges between the road and the woodland. Roads within the Woburn Estate are demarcated by picket fencing.

■ The Wooded Greensand Ridge is crossed by many PRoW, providing connections from the nearby settlements. Recreational opportunities including walking, horse riding and

mountain biking. Woburn Golf Course was laid out in the 1970s and dominates the plateau, although the manicured fairways and greens, car parking and club house are largely enclosed from view and sit relatively well within the landscape. Much of the golf course woodland replaced the naturally occurring heathland vegetation in this area.

■ Local paintings of the area include Thomas Webster's painting 'A village choir' 1847, and Stanley Roy Badmin's 1940 painting of Bow Brickhill which formed part of the "Recording Britain" project. Both paintings are held by the Victoria & Albert Museum.

### Visual and perceptual characteristics

■ Views within the LCT are generally enclosed due to the high woodland cover, which provides a sense of enclosure and tranquillity. In contrast, there are panoramic views from the edge of the woodland across the surrounding valleys and towards Milton Keynes city, which can be seen in the context of its planned landscaping. The Wooded Greensand Ridge is highly visible from Milton Keynes city, and is a distinctive element in the landscape of the borough, providing a wooded backdrop to the city.

■ Dark skies are limited to the south-east of the LCT, where there are fewer roads and no settlement. The A5 is a busy dual carriageway, which severs the ridgeline and cuts off Little Brickhill from its wooded setting. Road noise is heard across the LCT which reduces the sense of rural tranquillity.

■ Post and wire fencing reinforces hedgerows on the lower slope pasture fields. Other intrusive modern elements in the landscape include fencing around a former quarry on Church Road now in use as a reservoir, and communications towers on Church Road and in Little Brickhill. However, the wooded nature of the landscape means they are only locally visually intrusive.



Tree-lined rural roads with picket fencing typical of the Woburn Estate.

## Landscape evaluation

### Landscape qualities

- The distinctive geology and topography of the steep escarpment which rises to a wooded plateau and provides a unique landscape setting to Milton Keynes city.
- The extensive areas of woodland, which is usual in the borough, including semi-natural deciduous woodland, some of which is of ancient origin and support biodiversity, stabilise soil quality and play an important role in regulating local air quality.
- The remnant heathland on the ridge that supports biodiversity, and have a unique landscape character within the borough.
- The geology which is an aquifer, and maintains springs and base flows into rivers and streams (outside of the LCT).
- The general absence of development over much of the area, with the historic settlement pattern and buildings constructed from local materials associated with Little Brickhill that provide cultural identity and aesthetic value.
- The archaeological importance of the ridge, with its connections to pre-Roman and Roman occupation of area (including sites associated with Watling Street and Danesborough hill fort) that provide a connection to history.
- The network of PRow, including the Milton Keynes Boundary Walk, that connect the settlements and wider countryside, and provide recreational value and contribute to well-being and health.
- The contrasting sense of elevation and openness with uninterrupted views across the landscape from the slopes and enclosed intimate character of the dense woodland which provides a strong sense of place.
- The distinctive topography, strong woodland cover, heathy character and patchwork of pastoral and arable fields which create a strong sense of place

### Landscape condition

■ The Wooded Greensand Ridge LCT has a generally good condition due to the extensive woodland cover, management of semi-natural habitats, and limited development. Although it is often screened from view, the Woburn Golf Course is not in keeping with the wooded character. It does, however, provide recreational value. Modern influences on the landscape are limited to reinforcement of hedgerows by post and wire fencing, fencing around a former quarry on Church Road now in use as a reservoir, and communications towers on Church Road and in Little Brickhill. The A5 locally reduces tranquillity.

### Forces for change

■ Key forces for change include:

- Changes in forestry management, including the decline in traditional management techniques such as coppicing.
- Encroachment of scrub onto remaining areas of lowland fen and purple moor grass and rush pasture, partly due to under grazing.
- Recreational pressures from walkers, horse riders, mountain bikers and golfers, including for facilities such as car parks and toilets, and pressures on the narrow rural lanes.
- Increased temperatures from climate change may impact species composition, particularly the ancient woodlands. Increases in severe gales may cause significant damage on the edges of woodlands.
- Development pressures in Little Brickhill and encroachment of development into views across the surrounding valleys, particularly to the north towards Milton Keynes city.
- Increasing traffic noise from the A5 which significantly reduces tranquillity across the LCT.

## Landscape strategy

■ The landscape strategy for the Wooded Greensand Ridge LCT is to protect and enhance the sense of place created by the combination of the scarp landform and extensive tracts of woodland, including its role as a backdrop to the surrounding landscape.

## Guidance

### Landscape Management

- Protect the distinctive wooded escarpment which provide a visually important setting to Milton Keynes city.
- Conserve and enhance and explore opportunities to extend the existing woodland, promoting a balanced woodland community of native deciduous trees with indigenous conifers. Strengthen the woodland connecting into Central Bedfordshire, identifying opportunities for green infrastructure enhancements as set out in the Milton Keynes Green Infrastructure Strategy<sup>22</sup>.
- Plan for climate change, researching appropriate species mixes and designing woodland to minimise damage as a result of increased storms.
- Where appropriate, promote localised reversion from woodland to traditional heathland habitat. Seek to restore, extend and connect these sandy heathland habitats, including through appropriate grazing regimes.
- Manage and enhance hedgerows on lower slopes, including laying and gapping up of hedgerows to strengthen the small pasture fields.
- Promote responsible recreation, particularly during heat waves where there is increased risk to health as well as fires.
- Manage recreational access and infrastructure to minimise the erosion of the heathland habitats, and negative impacts on the tranquillity and remoteness of the landscape. Create new habitats to dissipate visitor pressure, as set out in the Green Infrastructure Opportunities mapping<sup>23</sup>.

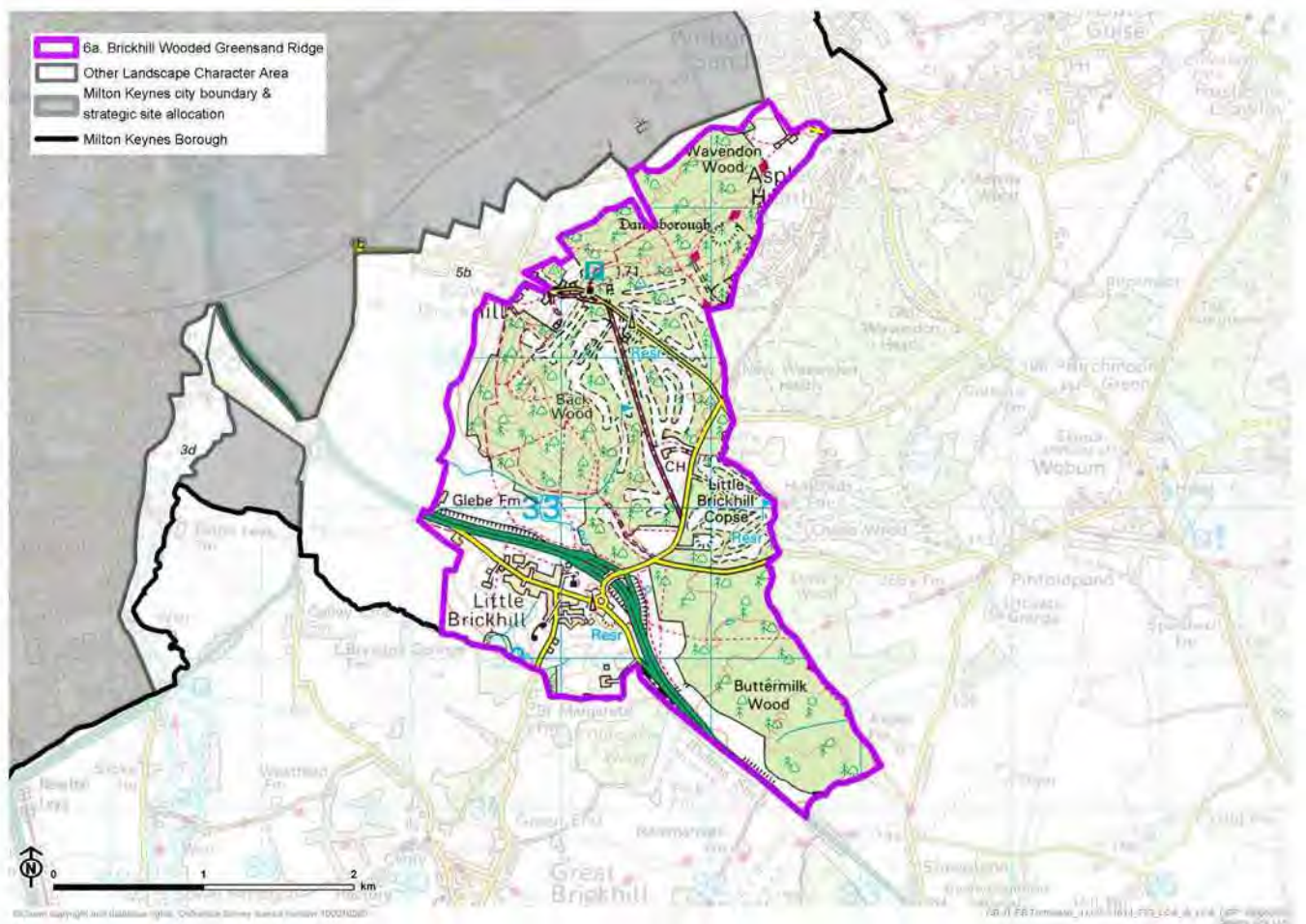
### Development Management

- Ensure recreational facilities such as toilet blocks and car parks are integrated in the wooded setting, and do not erode rural character.
- Avoid pressures to 'suburbanise' rural lanes with excessive lighting or signage.
- Protect the historic village of Little Brickhill conserving the strong vernacular of historic buildings in the Conservation Area.
- Maintain the general absence of development over much of the area, retaining the primary use for forestry, agriculture and informal recreational.
- Ensure long panoramic views across the surrounding valleys are retained and promoted. Consider views from the escarpment, particularly when planning tall buildings within Milton Keynes city.
- Avoid tall development that would break the existing wooded skyline as seen from within the LCT or from the wider landscape. Restrict further communications masts or aerials, and where possible remove the existing masts.

<sup>22</sup> AECOM, Milton Keynes Green Infrastructure Strategy (2018)

<sup>23</sup> <https://bucks.mknep.co.uk/wp-content/uploads/2018/10/Green-Infrastructure-Opportunity-Zone-10.pdf>

## 6a Brickhill Wooded Greensand Ridge



### Location and unique characteristics

■ The Brickhill Greensand Ridge LCA is the only area associated with the Greensand Ridge LCT within the borough. The descriptions above therefore apply to this single LCA.



## **Preliminary Flood Risk Assessment and Drainage Strategy**

**Project:** Land South of Bow Brickhill, Milton Keynes

**Clients:** Urban&Civic | The Bedford Estates

**Reference:** BR31221-JNP-XX-XX-RP-C-1001

**Date:** October 2024

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## Document Issue Record

Rev	Date	Description	Prepared	Checked	Approved
P01	24/07/2024	First issue.	PD	RM	RM
P02	22/08/2024	Updated site accesses.	PD	RM	RM
P03	03/10/2024	Updated concept master plan.	PD	RM	RM

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- APPENDIX A : Site Information
- APPENDIX B : Proposed Development
- APPENDIX C : Flood Risk Information
- APPENDIX D : Flood Risk Management

## 1 INTRODUCTION

### 1.1 Terms of Reference

1.1.1 JNP Group has been commissioned by Urban&Civic and The Bedford Estates to prepare a preliminary flood risk assessment and drainage strategy to promote inclusion of the envisaged Land South of Bow Brickhill development in the emerging *Milton Keynes City Plan 2050*.

1.1.2 This preliminary report assesses flood risk at the development site from all potential sources and outlines measures to be adopted in the master planning process to manage such risks. It has been prepared in compliance with current national and local planning policies and best practices to promote inclusion of the site in the emerging *Milton Keynes City Plan 2050*. The site is currently identified as a draft strategic allocation of approximately 1,500 dwellings.

### 1.2 Policy Framework and Key Stakeholders

1.2.1 The *National Planning Policy Framework (NPPF)* (December 2023) sets strict tests to protect people and property from flooding which all local planning authorities are expected to follow. Where these tests are not met, national policy is clear that new development should not be allowed.

1.2.2 In areas at risk of flooding or for sites of one hectare (ha) or more, developers must undertake a site-specific flood risk assessment to accompany applications for planning permission (or prior approval for certain types of permitted development).

1.2.3 In decision-taking, local planning authorities must ensure a sequential approach to site selection and master planning is followed so that development is, as far as reasonably possible, located where the risk of flooding (from all sources) is lowest, taking account of climate change and the vulnerability of future uses to flood risk.

1.2.4 Where development needs to be in locations where there is a risk of flooding, local planning authorities and developers must ensure development is appropriately flood resilient and resistant, safe for its users for the development's lifetime, and will not increase flood risk elsewhere.

1.2.5 The Environment Agency (EA) is a statutory consultee on applications where there is a risk of flooding from the sea or main rivers.

1.2.6 Lead local flood authorities (unitary authorities or county councils) are responsible for managing local flood risk from ordinary watercourses, surface water and groundwater, and for preparing local flood risk management strategies. Local planning authorities work with lead local flood authorities to ensure local planning policies are compatible with the local flood risk management strategy.

1.2.7 Milton Keynes City Council (MKCC) is the lead local flood authority (LLFA) and its strategy for managing local flood risk is set out in its *Milton Keynes Local Flood Risk Management Strategy* (February 2016) and *Surface Water Drainage Guidance for Developers* (May 2022).

1.2.8 MKCC is also the local planning authority (LPA) and its stance on flood risk management and drainage infrastructure is set out in *Policies FR1 to FR3* of the *Plan:MK 2016-2031* (March 2019), as transcribed below:

#### **Policy FR1: Managing Flood Risk**

- A. All new development must incorporate a surface water drainage system with acceptable flood control and demonstrate that water supply, foul sewerage and sewage treatment capacity is available or can be made available in time to serve the development. Suitable access is safeguarded for the maintenance of water supply and drainage infrastructure.
- B. Plan:MK will seek to steer all new development towards areas with the lowest probability of flooding. The sequential approach to development, as set out in national guidance, will therefore be applied across the Borough, taking into account all sources of flooding as contained within the Council's Strategic Flood Risk Assessment (SFRA).
- C. Development within areas of flood risk from any source of flooding, will only be acceptable if it is clearly demonstrated that it is appropriate at that location, and that there are no suitable available alternative sites at a lower flood risk.
- D. Development proposed in an area at risk of flooding will be required:
  - 1. To be supported by a site-specific Flood Risk Assessment (FRA) (subject to the triggers set out below);
  - 2. To take into account all forms of flooding including, but not limited to: fluvial, groundwater, surface water and reservoir flooding;
  - 3. To ensure that opportunities to reduce the causes and impacts of flooding to the site and the surrounding area are taken as far as possible, in order to improve the existing situation, taking into account climate change. At a minimum, proposals will need to demonstrate no increase in flood risk to the site or surrounding area;
  - 4. To clearly demonstrate that the benefits of the development to the community, outweigh the risk of flooding when applying the sequential test and exception test (where required);
  - 5. When applying the sequential test, to clearly demonstrate that the impacts of climate change are taken into account;
  - 6. To demonstrate the application of a sequential approach to the site design and layout to ensure highest vulnerability land uses are located within areas of the site at lowest risk of flooding;
  - 7. To build resilience into a site's design;
  - 8. To ensure that a site's design and any flood mitigation measures implemented are designed with an allowance for climate change and the potential impact it may have over the lifetime of the proposed development;
  - 9. To provide a safe access and egress route for future users of the development; and
  - 10. To attenuate surface water run-off in line with Policy FR2.
  - 11. To consult the Fire and Rescue Service as to the feasibility of undertaking rescue and recovery operations during and in the aftermath of flooding events.
- E. A site specific FRA will be required for:
  - 1. All sites of 1 ha or more in Flood Zone 1;
  - 2. All sites within Flood Zone 2 or 3;
  - 3. All sites highlighted as being at high risk from surface water flooding, or which are located within a Critical Drainage Catchment (CDC), as identified in the Milton Keynes Surface Water Management Plan. In this case the FRA will be required to demonstrate that the development will not increase the flood risk to the CDC and where possible will provide an improvement to the existing situation.
- F. The FRA should include an assessment of flood risk to and from the proposed development, and demonstrate how the development will be safe, will not increase flood risk elsewhere and where possible will reduce flood risk overall in accordance with the NPPF and PPG.

### **Policy FR2: Sustainable Drainage Systems (SuDS) and Integrated Flood Risk Management**

- A. Plan:MK advocates the continuation of a strategic, integrated approach to managing flood risk which seeks the management of surface water to be planned at the largest appropriate scale for the new development and incorporated into the site at the earliest opportunity in the design process.
- B. New development is required to incorporate SuDS; in line with national policy and guidance and, which meet the requirements set out in national standards and the Council's relevant local guidance. It is expected that:
1. Flood risk management and SuDS will be provided at a strategic scale and in an integrated manner, wherever possible;
  2. Space will be specifically set aside for SuDS and fluvial flood risk reduction features and used to inform the overall layout of development sites;
  3. Above ground attenuation will be provided in preference to below ground attenuation;
  4. SuDS will be designed as multi-purpose green infrastructure and open space, to maximise additional environmental, biodiversity, social and amenity value, wherever possible. The use of land to provide flood storage capacity should not conflict with required amenity and recreation provision - floodplains and floodplain habitats should be safeguarded;
  5. SuDS will be designed with an allowance for climate change and the potential impact it may have over the lifetime of the proposed development;
  6. Proposals for development within Critical Drainage Catchments, as identified in the Milton Keynes Surface Water Management Plan, should investigate the potential for the scheme to reduce or mitigate existing risk in the surrounding area;
  7. All surface water drainage proposals for new development must include full details of the means of achieving future management, maintenance and adoption of the systems, prior to approval of any planning permission, to ensure that it will function effectively over the lifespan of the development.  
  
This will include details of funding and should be formulated through discussion with the relevant responsible bodies, including Milton Keynes City Council, The Parks Trust, Anglian Water and the Internal Drainage Board;
  8. Development will ensure no adverse impact on the functions and setting of a watercourse and its associated corridor;
  9. Development should avoid building over or culverting watercourses, encourage the removal of existing culverts and seek opportunities to create wetlands and wet grasslands and woodlands and restore natural river flows and floodplains.

### **Policy FR3: Protecting and Enhancing Watercourses**

- A. All new development must be set back at a distance of at least 8 metres from any main rivers, at least 9 metres from all other ordinary watercourses, or at an appropriate width as agreed by the Environment Agency, Lead Local Flood Authority or Internal Drainage Board, in order to provide an adequate undeveloped buffer zone. Development that restricts future de-culverting of waterways should be avoided.
- B. The Council will resist proposals that would adversely affect the natural functioning of main rivers, ordinary watercourses and wet or dry balancing lakes, this includes through the culverting of open channels, unless for access purposes.

1.2.9 The above are retained as policies *CEA13*, *CEA14* and *CEA15* in the emerging *Milton Keynes City Plan 2050*.

1.2.10 Where relevant, local planning authorities and developers must also take advice from:

- Internal drainage boards (IDB), to identify the scope of their interests. The Bedford Group of Drainage Boards (BGDB) is the local IDB.

The potential impact on flood risk from future development, both within the drainage district and the wider catchment draining into the district, is fully recognised by BGDB. BGDB will take an active role in the assessment of local plans, major development and individual (planning) applications, to prevent inappropriate development and land use to ensure that flood risk is not increased. This will include, where appropriate, providing pre-application advice and checking of flood risk assessments.

Where appropriate BGDB will seek contributions from developers to cover the cost of both immediate and longer term works necessary to mitigate against any resultant increase in flood risk. Such contributions will be recorded in accordance with the NPPF and associated technical guidance.

- Sewerage undertakers, to ensure they can assess the impact of new development on their assets and plan any required improvements. Anglian Water (AW) is the local sewerage undertaker.
- Reservoir undertakers, to avoid an intensification of development within areas at risk from reservoir failure and ensure they can assess the cost implications of any reservoir safety improvements required due to change in land use downstream of their assets.
- Navigation authorities, in relation to developments adjacent to, or which discharge into, canals (particularly where water is impounded above surrounding ground levels).

### 1.3 Sources of Information

1.3.1 This preliminary flood risk assessment has been based on the following sources of information:

- DEFRA's LiDAR topographic data (1 m resolution).  
(<https://environment.data.gov.uk/survey>)
- British Geological Survey's (BGS) *GeoIndex*.  
(<http://mapapps2.bgs.ac.uk/geoindex/home.html>)
- Cranfield University's *Soilscapes*.  
(<http://www.landis.org.uk/soilscapes/>)
- DEFRA's *Multi-Agency Geographic Information for the Countryside* (MAGIC).  
(<https://magic.defra.gov.uk/MagicMap.aspx>)
- UK Centre for Ecology & Hydrology's *Flood Estimation Handbook Web Service*.  
(<https://fehweb.ceh.ac.uk/>)
- EA's *Flood Map for Planning*.  
(<https://flood-map-for-planning.service.gov.uk/>)
- EA's *Long Term Flood Risk*.  
(<https://www.gov.uk/check-long-term-flood-risk>)
- MKCC's *Level 1 Strategic Flood Risk Assessment* (SFRA) (April 2015).
- AW's Asset Location Search (July 2024).  
(*Appendix C*)

## 2 DEVELOPMENT SITE

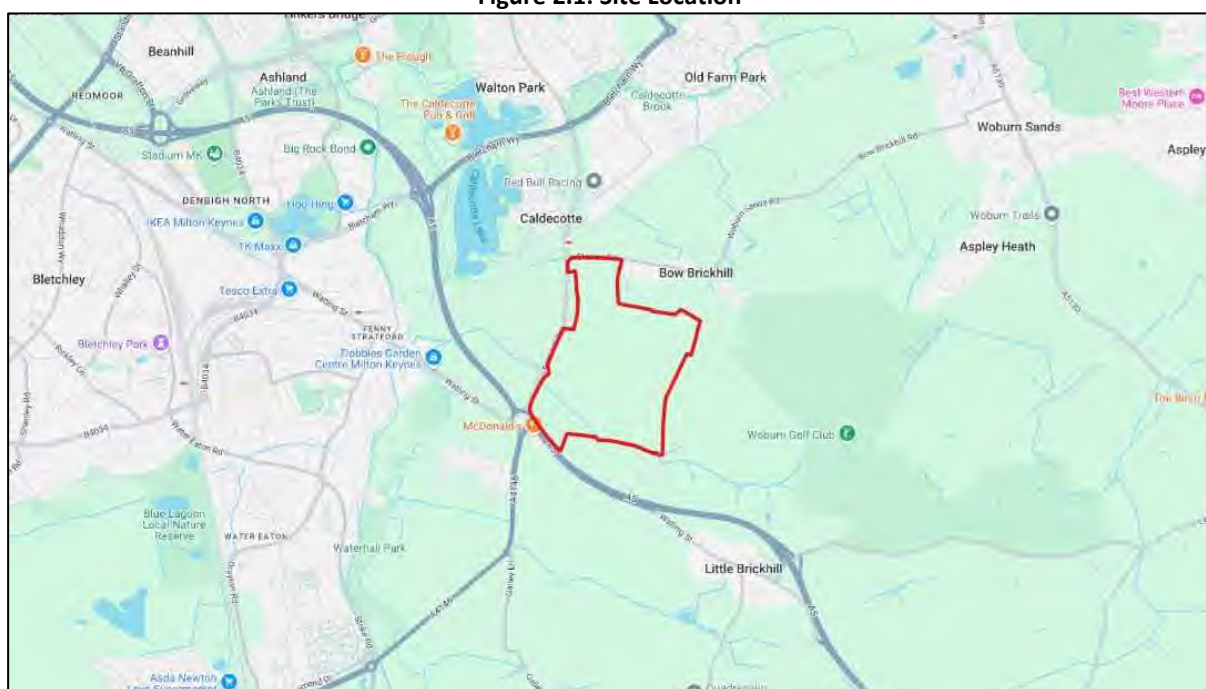
### 2.1 Location

- 2.1.1 The development site is located south of Bow Brickhill, Milton Keynes, off (east of) Brickhill Road (Table 2.1 and Figure 2.1).
- 2.1.2 The 105 ha greenfield site is bounded by Brickhill Road to the west, Station Road and Bow Brickhill (village) to the north, Back Wood to the east and the A5 to the south.

**Table 2.1: Site Location**

OS X	OS Y	National Grid Reference	Nearest Postcode
489980	233945	SP 89980 33945	MK17 9LG

**Figure 2.1: Site Location**



### 2.2 Topography

- 2.2.1 The available topographic information (1 m LiDAR) shows that ground levels within the development site range between 73 m AOD and 123 m AOD, generally falling in an east to west direction towards Brickhill Road.

### 2.3 Hydrology

- 2.3.1 Beyond the network of small field drainage ditches throughout the development site, the key water features relevant to the site are two ordinary watercourses tributaries of the river Ouzel.
- 2.3.2 The larger of the two ordinary watercourses bisects the southern part of the development site, flowing in an east to west direction towards Brickhill Road, defining a catchment area of c.2.2 km<sup>2</sup> at the point where it crosses the road.
- 2.3.3 The smaller (catchment area < 0.5 km<sup>2</sup>) ordinary watercourse flows in an east to west direction (and between) the northern boundary of the site and Station Road.

- 2.3.4 Both ordinary watercourses flow into the Caldecotte Lake c.0.5 km north-west of the development site before reaching the river Ouzel, which flows in a south to north direction through Milton Keynes c.0.8 km west of the development site.
- 2.3.5 While the ordinary watercourses adjacent to/crossing the development site are outside of BGDB's drainage district, they drain towards the (Buckingham and river Ouzel) district, which encompasses the Caldecotte Lake and the river Ouzel.

## 2.4 Geology and Hydrogeology

- 2.4.1 In accordance with BGS' *GeoIndex* (Appendix A), recorded superficial deposits are limited to a north-south band of clay, silt, sand and gravel (Head) through the centre of the development site and an east-west band of clay, silt, sand and gravel (Alluvium) along the ordinary watercourse crossing the southern part of the site. These superficial deposits are underlain by mudstone bedrock (Oxford Clay Formation to the north and West Walton Formation to the south).
- 2.4.2 Cranfield University's *Soilscapes* describes the site's soils as "*loamy and clayey soils with impeded drainage*" (Appendix A).
- 2.4.3 DEFRA's *MAGiC* classifies the site's superficial deposits as Secondary aquifers and its bedrock as Unproductive Strata (Appendix A).
- 2.4.4 The EA defines Secondary A aquifers as "*permeable layers capable of supporting water supplies at a local rather than strategic scale, in some cases forming an important source of base flow to rivers*" and Secondary B aquifers as "*predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering*". Secondary (Undifferentiated) are aquifers where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the superficial deposit.
- 2.4.5 Unproductive Strata are low permeability deposits that are unable to support significant water abstraction or base flow to rivers.
- 2.4.6 In accordance with DEFRA's *MAGiC*, the development site is not within any groundwater source protection zone.
- 2.4.7 Records of trial pits along the A5 to the south of the development site broadly confirm the expected geology, emphasizing the silty/clayey nature of the superficial deposits and bedrock. Groundwater was not encountered in the c.2 m deep pits.

### 3 PROPOSED DEVELOPMENT

- 3.1.1 It is envisaged the 105.365 ha site will accommodate c.1,500 dwellings, a cafe/employment area, a sustainable transport hub/local centre, a school, and a central park (Figure 3.1 and Appendix B). The eastern part of the site has been deemed undevelopable due to the very steep topography towards Back Wood.
- 3.1.2 This preliminary assessment assumes that 55% (24.591 ha) of the total area (44.711 ha) earmarked for residential development will be made impermeable. Allowing for 10% urban creep, the envisaged residential parcels' total impermeable area is estimated at 27.050 ha.
- 3.1.3 The cafe/employment area (0.307 ha), sustainable transport hub/local centre (1.432 ha) and school (2.396 ha) have been conservatively assumed to be 100% impermeable in this preliminary assessment.
- 3.1.4 A total impermeable area of 33.780 ha is estimated for the envisaged development.
- 3.1.5 Under [Annex 3](#) of the *NPPF*, the envisaged (largely residential) development is classified as 'more vulnerable'.

Figure 3.1: Proposed Development (Concept Master Plan)



## 4 FLOOD RISK ASSESSMENT

### 4.1 Overview

4.1.1 All potential sources of flood risk at the development site have been assessed based on the information listed in Section 1.3 and are summarised in Table 4.1. The key sources of flood risk to the proposed development are further described in the ensuing sections.

**Table 4.1: Potential Sources of Flood Risk**

Source	Flood Risk
<i>Coastal</i>	<i>No risk. Site levels &gt; 73 m AOD.</i>
<i>Fluvial (main rivers)</i>	<i>No risk. Site entirely in Flood Zone 1 (Appendix C).</i>
Surface Water	Very low risk in general, but some areas at low to high risk across the site, namely the overland flow path associated with the ordinary watercourse bisecting the southern part of the site (Section 4.3).
Groundwater	Potential high risk in areas underlain by superficial deposits of Head or Alluvium (Section 4.4).
<i>Sewers</i>	<i>No risk. No existing sewers within or upslope of the site (Appendix C).</i>
<i>Infrastructure Failure</i>	<i>No risk. No reservoirs or canals upslope of the site (Appendix C).</i>

### 4.2 Climate Change

4.2.1 The NPPF sets out how the planning system should help minimise vulnerability and provide resilience to the impacts of climate change. This includes demonstrating how flood risk will be managed now and over the development’s lifetime, taking climate change into account.

4.2.2 In accordance with the EA’s guidance [Flood Risk Assessment: Climate Change Allowances](#) (May 2022), the envisaged residential development with anticipated life span into the 2080’s (2070 to 2115) must take account of the following allowances (Upper and Bedford Ouse Management Catchment):

- Peak River Flow
  - Central ..... 19%
  - Higher Central..... 30%
  - Upper End ..... 58%
- Peak Rainfall Intensity (1.0% AEP)
  - Central ..... 25%
  - Upper End ..... 40%

### 4.3 Surface Water Flood Risk

4.3.1 Surface water flooding is a description for excessive overland flows that have yet to enter a natural or manmade receptor (e.g., aquifer, watercourse, or sewer). Surface water flooding also occurs when the amount of runoff exceeds the capacity of the collecting system and spills onto overland flow routes.

4.3.2 Surface water flooding is usually the result of very intense, short lived rainfall events, but can also occur during milder, longer lived rainfall events, when collecting systems are at capacity or the ground is saturated. It often results in the inundation of low points in the terrain.



#### 4.4 Groundwater Flood Risk

- 4.4.1 Groundwater flooding occurs when the level of water filling the pores and/or cracks in the underlying superficial deposits and/or bedrock (i.e., water table) rises and emerges on the surface. The level of the water table varies seasonally and depends upon long-term rainfall, thickness and porosity of the underlying strata and groundwater abstraction.
- 4.4.2 Groundwater flooding is most common in areas where the underlying bedrock and superficial deposits are very porous, but it can also happen at locations where superficial layers of sand or gravel overlay impermeable bedrock.
- 4.4.3 Groundwater flooding usually occurs after days or weeks of prolonged rainfall and often lasts for days or weeks, as subsiding of the water table can be a very slow process.
- 4.4.4 Besides posing a direct flood risk to developments (particularly basements), high water table levels can exacerbate other sources of flood risk by preventing infiltration and/or leaking into drainage systems of poor integrity.
- 4.4.5 In accordance with MKCC's *SFRA*, most of the development site is not considered prone to groundwater flooding, with areas at higher risk being those underlain by superficial deposits of Head or Alluvium (Section 2.4), where groundwater flooding can occur at surface (Appendix C). The potential high risk of groundwater flooding must be confirmed through site-specific ground investigations.
- 4.4.6 Measures envisaged to manage the potential high risk of groundwater flooding are described in Section 5.2.

## 5 FLOOD RISK MANAGEMENT

### 5.1 Sequential and Exception Tests

- 5.1.1 The sequential, risk-based approach to the location of development is designed to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk. The aim is to keep development out of medium and high flood risk areas (Flood Zones 2 and 3) and other areas affected by other sources of flooding where possible.
- 5.1.2 Application of the sequential approach in the master planning process, in particular application of the *Sequential Test*, helps ensure that development can be safely and sustainably delivered, and developers do not waste resources promoting proposals which are inappropriate on flood risk grounds.
- 5.1.3 The *Sequential Test* ensures that a sequential approach is followed to steer new development to areas with the lowest probability of flooding. The aim is to steer new development to Flood Zone 1 (areas with a low probability of flooding). Where there are no reasonably available sites in Flood Zone 1, local planning authorities in their decision making should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2 (areas with a medium probability of flooding), applying the *Exception Test* if required. Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 (areas with a high probability of flooding) be considered, taking into account the flood risk vulnerability of land uses, and applying the *Exception Test* if required.
- 5.1.4 [Annex 3](#) of the *NPPF* categorises different types of uses and development according to their vulnerability to flood risk. [Table 2](#) of the *Flood Risk and Coastal Change Guidance* (Table 5.1) maps these vulnerability classes against flood zones to indicate where development is appropriate and where it should not be permitted.

**Table 5.1: Flood Risk Vulnerability and Flood Zone Compatibility**

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

Key:

✓ Development is appropriate.

✗ Development should not be permitted.

- 5.1.5 The *Exception Test* is a method to demonstrate and help ensure that flood risk to people and property will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available.
- 5.1.6 Essentially, the two parts of the *Exception Test* require proposed development to show that it will:
- Provide wider sustainability benefits to the community that outweigh flood risk; and
  - Be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce flood risk overall.

5.1.7 The development site is entirely in Flood Zone 1 and mostly at very low risk of flooding from all potential sources. The envisaged more vulnerable development is therefore deemed appropriate and should not require application of the *Sequential* or *Exception Tests*.

5.1.8 Nevertheless, the ensuing section describes general measures to be implemented in the envisaged development's master planning to manage flood risk from all potential sources of flood risk (i.e., surface water and groundwater).

## 5.2 Flood Risk Management Measures

5.2.1 The following measures should be incorporated in the envisaged development's master plan to manage the potential flood risks identified in Section 4:

- All 'more vulnerable' development must be steered away from significant overland flow paths across the site, namely that associated with the ordinary watercourse crossing the southern part of the development site, thus providing blue corridor(s) to manage on (and off) site runoff through the development site without posing or increasing flood risk on site or elsewhere (potentially reducing it).
- While the EA's 0.1% AEP surface water flood extent generally provides a good proxy for the 1.0% AEP + 40% climate change flood extent, in this case it is deemed that the coarseness of the underlying model fails to represent the ordinary watercourse's main channel appropriately thus significantly overestimating out-of-bank flows. A more detailed site-specific model of the watercourse would be expected to (largely) resolve the issue. 20 m wide blue corridor(s) along the ordinary watercourses adjacent to/crossing the site are proposed to manage this potential flood risk (Appendix D).
- The finished floor levels of all 'more vulnerable' development must be set at least 150 mm above external ground levels, which in turn will be designed to safely route overland flows away from the more vulnerable features, using less vulnerable parts of the proposed development such as roads, parking areas and public open spaces to convey and attenuate overland flows.
- Should a site-specific ground investigation confirm high groundwater levels, the location and depth of proposed underground features (e.g., foundations, drainage infrastructure/SuDS, utilities, etc.) should duly consider the local water table in their design and construction.

## 6 SURFACE WATER DRAINAGE STRATEGY

### 6.1 Existing Drainage Regime

- 6.1.1 The greenfield (undeveloped) development site does not benefit from a formal surface water drainage system. Runoff generated within the site is expected to infiltrate into the ground or flow off-site across Brickhill Road and towards Caldecotte Lake and the river Ousel to the west.
- 6.1.2 Greenfield runoff rates (Table 6.1) for the proposed development’s estimated impermeable area of 31.321 ha (excluding urban creep) have been established using the *Institute of Hydrology* (IH124) methodology with *Interim Code of Practice for SuDS* (ICP SuDS) correction for small catchments (Appendix D).

**Table 6.1: Greenfield Runoff Rates**

Return Period (AEP)	Greenfield Runoff Rate	
	(l/s/ha)	(l/s)
<b>1 in 1 year (100.0% AEP)</b>	<b>3.6</b>	<b>112.8</b>
QBAR	4.1	128.4
1 in 30 year (3.3% AEP)	10.5	328.9
1 in 100 year (1.0% AEP)	14.7	460.4

### 6.2 General Drainage Principles

- 6.2.1 Based on the available geologic and hydrogeologic information (Section 2.4), infiltration drainage (shallow or deep bore) is unlikely to be feasible across the development site. Nevertheless, the feasibility of infiltration drainage should be confirmed through bespoke BRE 365 tests.
- 6.2.2 In line with MKCC’s *Surface Water Drainage Guidance for Developers* (December 2022), this preliminary drainage strategy assumes a worst-case scenario of no infiltration where the volume of runoff leaving the proposed development cannot be reduced to greenfield values and the excess volume must be discharge at a low rate that will not pose a flood risk downstream of the site. Given the site’s location upstream of (and partly within) a critical drainage catchment, the preliminary drainage strategy takes a precautionary approach of limiting off-site discharges to the 1 in 1-year greenfield runoff rate of 112.8 l/s for all storm events up to 1.0% AEP + 40% climate change allowance. This low discharge rate is beyond typical/standard requirements and is expected to reduce flood risk within ‘*CDC23 Bow Brickhill*’.
- 6.2.3 The drainage strategy must collect, convey, and attenuate runoff from all areas to be made impermeable (33.780 ha<sup>†</sup>) before discharge into the ordinary watercourses adjacent to/crossing the development site. Controlled discharge into a natural/open water feature is the second best method for disposal of surface water runoff following infiltration drainage.

<sup>†</sup> The estimated total impermeable area of 33.780 ha assumes that c.65% of the total development area of 51.441 ha will be made impermeable and includes an urban creep allowance of 10%.

### 6.3 Sustainable Drainage Systems (SuDS)

- 6.3.1 In accordance with the *NPPF*, (major) developments should incorporate sustainable drainage systems (SuDS) unless there is clear evidence that this would be inappropriate. In addition to water quantity control, SuDS should consider opportunities to provide water quality and amenity/biodiversity benefits (i.e., multifunctional approach).
- 6.3.2 Table 6.2 shortlists SuDS deemed compatible with the site's characteristics and which inclusion in the proposed development must be continuously assessed as the design progresses. The shortlist of SuDS reflects MKCC's *Surface Water Drainage Guidance for Developers* (December 2022).
- 6.3.3 It is important to note the need to remove silt from runoff prior to discharge into SUDS features or off-site receptors. SuDS such as filter drains, swales, bioretention systems and pervious pavements are sustainable alternatives to proprietary treatment systems otherwise required to manage silt.

**Table 6.2: Sustainable Drainage Systems (SuDS)**

SuDS Component	Description and Opportunities
Green Roofs	<p>Green roofs are areas of living vegetation installed on the top of buildings for a range of reasons including visual benefit, ecological value, enhanced building performance and reduction of surface water runoff.</p> <p>Green roofs can improve the thermal performance of buildings, help combat the urban heat island effect and contribute to improved air quality.</p> <p>Through evapotranspiration, green roofs can reduce peak flow rates to a site drainage system (principally for small and medium sized events) but are unlikely to have a significant impact on downstream attenuation storage requirements.</p> <p>Green roofs are more suitable in high-density developments (e.g., flat roofs of apartment blocks, courtyards above podium parking, etc.) than low-density developments (e.g., houses).</p>
Detention Basins	<p>Detention basins are landscaped depressions that are normally dry except during and immediately following storm events. They can be on-line components where surface runoff from regular events is routed through the basin or off-line components into which runoff is diverted once flows reach a specific threshold.</p> <p>Detention basins can be vegetated depressions (providing treatment in on-line components) or hard landscaped storage areas. Off-line basins will normally have an alternative principal use (e.g., amenity or recreational facility or urban (hard) landscaping).</p> <p>Detention basins are generally used as site control features and are better located in the lower-lying areas of a development (e.g., immediately upstream of off-site discharges).</p>
Filter Drains	<p>Filter drains are trenches filled with stone/gravel that create temporary subsurface storage for the filtration, attenuation, and conveyance of surface water runoff. Ideally, filter drains receive lateral inflow from adjacent impermeable surfaces pre-treated over a filter strip.</p> <p>Filter drains can help manage peak flows by naturally limiting rates of conveyance through the filter medium and by providing attenuation storage when the rate of flow at the outlet is controlled.</p> <p>Filter drains can be effectively incorporated into the landscape and public open spaces and can have minimal land-take requirements. The use of filter drains is typically restricted to flat sites (unless placed parallel to contours).</p> <p>Filter drains are best located adjacent to (small) impermeable surfaces such as car parks and roads/highways.</p>

SuDS Component	Description and Opportunities
Swales	<p>Swales are shallow, flat bottomed, vegetated open channels designed to treat, convey, and often attenuate surface water runoff. Swales can also provide aesthetic and biodiversity benefits.</p> <p>Swales can help reduce flow rates by facilitating infiltration and/or providing attenuation storage when flow at the outlet is controlled. Coarse to medium sediments and associated pollutants can be removed by filtration through surface vegetation and ground cover.</p> <p>Swales are well suited for managing runoff from linear features such as main roads/highways. Swales are generally difficult to incorporate into denser urban developments, where space is limited.</p>
Bioretention Systems	<p>Bioretention systems (including rain gardens) are shallow landscaped depressions that can reduce runoff rates and volumes and treat pollution. They also provide attractive landscape features and biodiversity.</p> <p>Bioretention systems can help reduce flow rates from a site by promoting infiltration/evapotranspiration and providing some attenuation storage. Bioretention systems can also provide very effective treatment functionality.</p> <p>Bioretention systems are a very flexible surface water management component that can be integrated into a wide variety of developments/densities using different shapes, materials, planting, and dimensions.</p> <p>Bioretention systems are source control features and can be used in the higher-lying areas of a development.</p>
Pervious Pavements	<p>Pervious pavements provide a pavement suitable for pedestrian and/or vehicular traffic, while allowing rainwater to infiltrate through the surface and into the underlying structural layers. The water is temporarily stored beneath the overlying surface before use, infiltration to the ground or controlled discharge downstream.</p> <p>Pervious pavements help reduce flow rates from a site by providing attenuation storage. A flow control structure is required to constrain the rate of discharged from the sub-base via an outlet pipe. Pervious pavement drainage has been shown to have decreased concentrations of a range of surface water pollutants, including heavy metals, oil and grease, sediment, and some nutrients.</p> <p>Pervious pavements are typically built as an alternative to impermeable surfaces and therefore require no extra development space for their construction.</p> <p>Pervious pavements are source control features and can be used in the higher-lying areas of a development.</p>
Attenuation Storage Tanks	<p>Attenuation storage tanks are used to create a below-ground void space for the temporary storage of surface water before use, infiltration, or controlled release.</p> <p>Attenuation storage tanks can help reduce flow rates from a site by providing significant attenuation storage. Storage tanks do not provide any form of treatment of surface water runoff and therefore need to be combined in a “management train” with other methods that do provide suitable treatment of all relevant pollutants (coarse sediment must always be removed upstream of a storage tank).</p> <p>The inherent flexibility in size and shape of the typical attenuation storage tank systems means that they can be tailored to suit the specific characteristics and requirements of any site. However, the lack of amenity and biodiversity benefits means that storage tanks should be a last resource in any surface water drainage strategy for a major development.</p>

## 6.4 Preliminary Surface Water Drainage Strategy

6.4.1 A preliminary surface water drainage strategy has been prepared in compliance with the *NPPF*, local requirements and current best practices<sup>‡</sup>, to collect, convey and attenuate runoff from the proposed development’s impermeable areas (33.780 ha) before discharge into the ordinary watercourses adjacent to/crossing the development site.

<sup>‡</sup> e.g. *Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015)* and *The SuDS Manual (2015)*.

- 6.4.2 The preliminary surface water drainage strategy (Appendix D) has been designed so that flooding does not occur on any part of the site for all events up to 1.0% AEP (1 in 100 year) + 40% climate change.
- 6.4.3 The preliminary design estimates that a total attenuation storage volume of c.30,580 m<sup>3</sup> (c.595 m<sup>3</sup> per hectare of development area) will be necessary across the proposed development. If provided in above ground SuDS features such as detention basins, filter drains or swales (as preferred by MKCC), the necessary storage volume is expected to take c.4.470 ha<sup>\*\*</sup> (c.870 m<sup>2</sup> per hectare of developable area, i.e., c.9% of the total development area).
- 6.4.4 Based on previous experience, the area required for above ground SuDS can usually be reduced once other SuDS such as green roofs, bioretention systems and pervious pavements are taken into account.

## 6.5 Exceedance Events

- 6.5.1 The finished floor levels of all ‘more vulnerable’ development must be set at least 150 mm above external ground levels, which in turn will be designed to safely route overland flows away from the more vulnerable features, using less vulnerable parts of the envisaged development such as roads, parking areas and public open spaces to convey and attenuate overland flows.
- 6.5.2 Overland flows resulting from exceedance events are expected to leave the developed site via existing overland flow paths, as currently occurs (i.e., pre-development conditions), without posing any increased flood risk on site or elsewhere (Appendix D).

## 6.6 Water Quality Management

- 6.6.1 The suitability of the preliminary drainage strategy to manage the development’s pollution risk has been assessed using the simple index approach in *The SuDS Manual* (2015), as summarized in Table 6.3.
- 6.6.2 The preliminary drainage strategy assumes that all runoff from the proposed development will flow through at least one detention basin.

**Table 6.3: Surface Water Quality Management (Simple Index Approach)**

Runoff Route/Treatment Train				
Land Use/SuDS	Hazard Level	TSS	Metals	Hydro-Carbons
<i>Pollution Hazard Indices</i>				
Residential Roof	Very Low	0.20	0.20	0.05
Driveway, residential car park or low traffic road	Low	0.50	0.40	0.40
<i>SuDS Mitigation Indices</i>				
Detention Basin	-	0.50	0.50	0.60
<b>Total SuDS Mitigation Index ≥ Pollution Hazard Index (for each contaminant type)</b>				

<sup>§</sup> The estimated attenuation storage volumes assume a maximum water depth of 1.2 m within detention basins.

<sup>\*\*</sup> The estimated footprints of SuDS features assume detention basins with (a) 1:4 banks, (b) 300 mm freeboard, and (c) 3 m wide maintenance strips around features.

## 6.7 Operation and Maintenance

- 6.7.1 The function of the surface water drainage system must be understood by those responsible for maintenance, regardless of whether individual components are below or above ground. In any system properly designed, monitored, and maintained, performance deterioration can usually be minimised.
- 6.7.2 The long term operation and maintenance of the preliminary surface water drainage strategy would be the responsibility of various entities, as summarised in Table 6.4. Appropriate legal agreements defining maintenance responsibilities and access rights over the lifetime of the envisaged development must be established prior to its construction/occupation.

**Table 6.4: Entities Responsible for SuDS Maintenance**

SuDS Component	Location	Function	Responsible Entity
Green Roofs	Individual plots	Attenuate & treat runoff	Owner or private management company
Detention Basins	Public open spaces	Attenuate & treat runoff	Local authority, IDB, water company or private management company
Filter Drains	Roadsides	Attenuate, convey, and treat runoff	Local highways authority or private management company
Swales	Roadsides	Attenuate, convey, and treat runoff	Local highways authority or private management company
Bioretention Systems	Individual plots	Attenuate & treat runoff	Owner or private management company
Pervious Pavements	Driveways & parking areas	Attenuate & treat runoff	Owner or private management company
Attenuation Storage Tanks	Public open spaces	Attenuate runoff	Private management company

- 6.7.3 Where the user/beneficiary of a system is not responsible for maintenance, then it is important to ensure that they know when the SuDS is not functioning correctly and who to contact if any issue arises.
- 6.7.4 Maintenance plans are often required to clearly identify who is responsible for maintaining proposed SuDS as well as the maintenance regime to be applied. Maintenance plans can also form a useful tool for public engagement with SuDS and understanding their wider benefits. The maintenance requirements of the proposed surface water drainage strategy are summarised in Table 6.5.

**Table 6.5: Typical Operation and Maintenance Requirements**

Operation and Maintenance Activity	SuDS Component						
	Green Roof	Detention Basin	Filter Drain	Swale	Bioretention System	Pervious Pavement	Attenuation Storage Tank
<b>Regular Maintenance</b>							
Inspection	■	■	■	■	■	■	■
Litter and debris removal		■	■	■	■	■	□
Grass cutting		■	■	■	■	□	□
Weed and invasive plant control	■	□	□			□	
Shrub management (including pruning)		□		□	□	□	
Shoreline vegetation management		□					
Aquatic vegetation management		□					
<b>Occasional Maintenance</b>							
Sediment management		■	■	■	■	■	■
Vegetation replacement	■	□		□	□		
Vacuum sweeping and brushing						■	
<b>Remedial Maintenance</b>							
Structure rehabilitation/repair	□	□	□	□	□	□	□
Infiltration surface reconditioning			□	□	□	□	

Key:

■ Will be required

□ May be required

---

## 7 FOUL WATER DRAINAGE STRATEGY

- 7.1.1 Sewerage undertakers have a legal obligation under the *Water Industries Act 1991* to collect foul water flows from developments with planning approval. The *1991 Act* also contains safeguards to ensure that flows resulting from new developments do not cause detriment to the existing public sewerage networks by imposing a duty on sewerage undertakers to engage with developers and carry out the reinforcement works required to accommodate additional foul flows.
- 7.1.2 The greenfield (undeveloped) site does not currently benefit from any foul water drainage infrastructure. In accordance with sewer records obtained from AW (Appendix C), the nearest public foul water sewers are located along Station Road to the north (Ø150 mm) and Watling Street to the south (unknown size).
- 7.1.3 Given the magnitude of the envisaged development (c.1,500 dwellings), a pre-development enquiry with AW is currently underway.
- 7.1.4 Although the routes between the development site and the existing foul water sewers are expected to be public highways/open spaces, *Section 98 Sewer Requisition(s)* may be required if crossing of any private third-party land is required to enable connections from the envisaged development.
- 7.1.5 Based on the available information, two on-site foul water pumping stations will likely be required to manage the envisaged development's foul water flows.

## 8 CONCLUSIONS AND RECOMMENDATIONS

- 8.1.1 JNP Group has been commissioned by Urban&Civic and The Bedford Estates to prepare a preliminary flood risk assessment and drainage strategy to promote inclusion of the envisaged Land South of Bow Brickhill development in the emerging *Milton Keynes City Plan 2050*. This preliminary report assesses flood risk at the development site from all potential sources and outlines measures to be adopted in the master planning process to manage such risks.
- 8.1.2 All potential sources of flood risk at the development site have been assessed based on the information listed in Section 1.3. Surface water and groundwater have been established as the key sources of flood risk to the proposed development.
- 8.1.3 In accordance with the available information, the development site is mostly at very low risk of surface water flooding, with areas at higher risk of surface water flooding largely restricted to overland flow paths associated with the ordinary watercourse crossing the southern part of the site. However, the overland flow path crossing the southern part of the site is thought to result from the coarseness of the underlying (EA) model, which fails to represent the ordinary watercourse's main channel appropriately. A more detailed site-specific model of the watercourse would be expected to (largely) resolve the issue.
- 8.1.4 A portion of the development site falls within 'CDC23 Bow Brickhill' (critical drainage catchment), forming part of the upstream catchment contributing to the significant surface water flood risk upstream of the A5 crossing of a railway embankment to the west of the site. The envisaged development creates opportunities to alleviate the area's existing (surface water) flood risk.
- 8.1.5 Except for the overland flow path/ordinary watercourse crossing the southern part of the development site, surface water flood risk is due to runoff generated on site which will be managed by the envisaged development's surface water drainage strategy.
- 8.1.6 In accordance with the available information, most of the development site is not considered prone to groundwater flooding, with areas at higher risk being those underlain by superficial deposits of Head or Alluvium, where groundwater flooding can occur at surface. The potential high risk of groundwater flooding must be confirmed through site specific ground investigations.
- 8.1.7 The following measures should be incorporated in the envisaged development's master plan to manage the potential flood risks identified above:
- All 'more vulnerable' development must be steered away from significant overland flow paths across the site, namely that associated with the ordinary watercourse crossing the southern part of the development site, thus providing blue corridor(s) to manage on (and off) site runoff through the development site without posing or increasing flood risk on site or elsewhere.
  - While the EA's 0.1% AEP surface water flood extent generally provides a good proxy for the 1.0% AEP + 40% climate change flood extent, in this case it is deemed that the coarseness of the underlying model fails to represent the ordinary watercourse's main channel appropriately thus significantly overestimating out-of-bank flows. A more detailed site-specific model of the watercourse would be expected to (largely) resolve the issue. 20 m wide blue corridor(s) along the ordinary watercourses adjacent to/crossing the site are proposed to manage this potential flood risk.

- The finished floor levels of all 'more vulnerable' development must be set at least 150 mm above external ground levels, which in turn will be designed to safely route overland flows away from the more vulnerable features, using less vulnerable parts of the proposed development such as roads, parking areas and public open spaces to convey and attenuate overland flows.
  - Should a site specific ground investigation confirm high groundwater levels, the location and depth of proposed underground features (e.g., foundations, drainage infrastructure/SuDS, utilities, etc.) should duly consider the local water table in their design and construction.
- 8.1.8 Based on the available geologic and hydrogeologic information, infiltration drainage (shallow or deep bore) is unlikely to be feasible across the development site. In the absence of infiltration, the volume of runoff leaving the proposed development cannot be reduced to greenfield values and the excess volume must be discharge at a low rate that will not pose a flood risk downstream of the site. Given the site's location upstream of (and partly within) a critical drainage catchment, the preliminary drainage strategy takes a precautionary approach of limiting off site discharges to the 1 in 1-year greenfield runoff rate of 112.8 l/s for all storm events up to 1.0% AEP + 40% climate change allowance. This low discharge rate is beyond typical/standard requirements and is expected to reduce flood risk within '*CDC23 Bow Brickhill*'.
- 8.1.9 A preliminary surface water drainage strategy has been prepared in compliance with national and local planning policies and guidance, to collect, convey and attenuate runoff from the proposed development's impermeable areas (33.780 ha) before discharge into the ordinary watercourses adjacent to/crossing the development site.
- 8.1.10 The preliminary design estimates that a total attenuation storage volume of c.30,580 m<sup>3</sup> (c.595 m<sup>3</sup> per hectare of development area) will be necessary across the proposed development. If provided in above ground SuDS features such as detention basins, filter drains or swales (as preferred by MKCC), the necessary storage volume is expected to take c.4.470 ha (c.870 m<sup>2</sup> per hectare of developable area, i.e., c.9% of the total development area). Based on previous experience, the area required for above ground SuDS can usually be reduced once other SuDS such as green roofs, bioretention systems and pervious pavements are taken into account.
- 8.1.11 Based on the information presented within this report, there are no flood risk or sustainable drainage issues that cannot be adequately managed within the development site, in line with current national and local requirements and best practices. There are no flood risk or drainage reasons to justify not bringing this site forward for development in the emerging *Milton Keynes City Plan 2050*.

# APPENDIX A: SITE INFORMATION



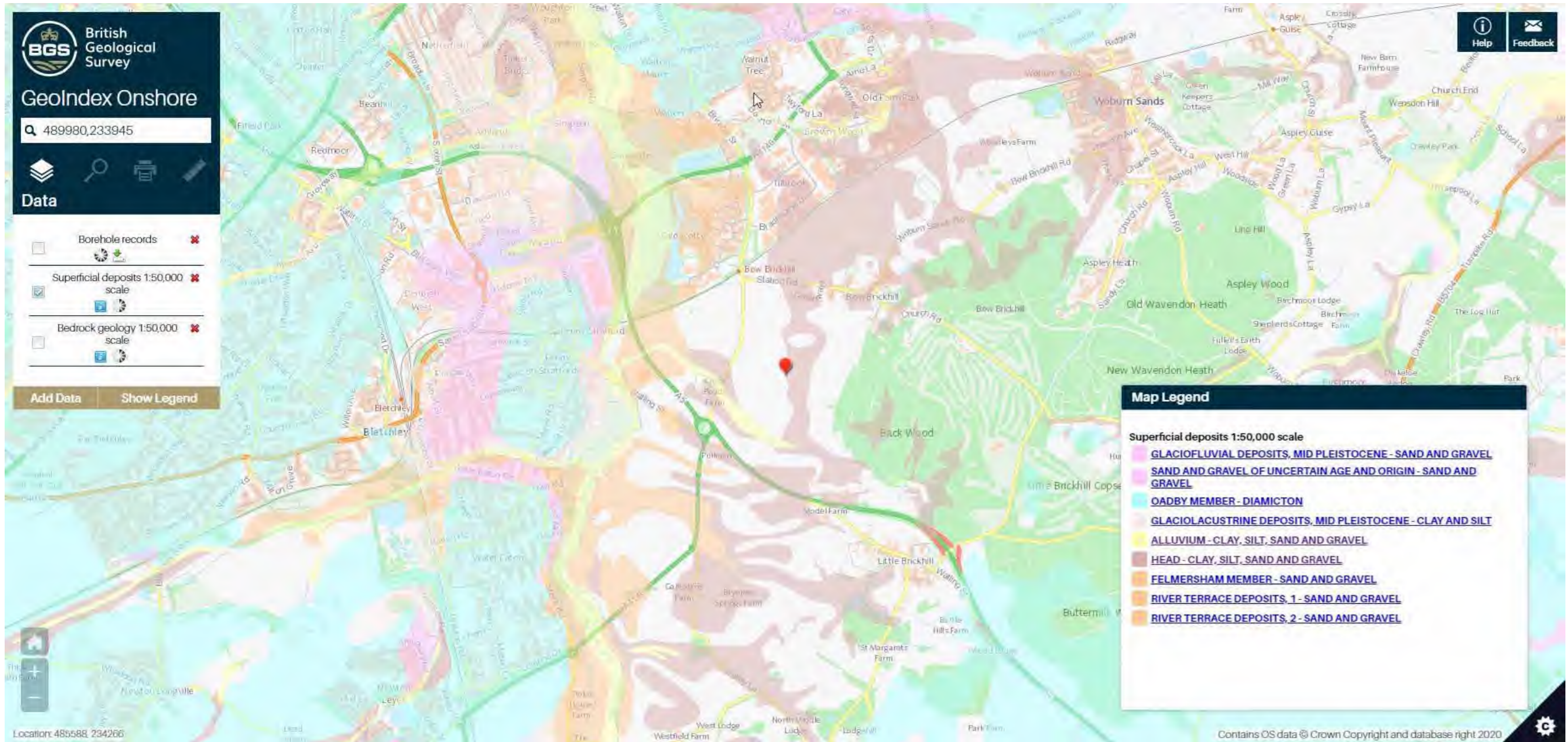
# GeoIndex Onshore

489980,233945

**Data**

- Borehole records
- Superficial deposits 1:50,000 scale
- Bedrock geology 1:50,000 scale

Add Data Show Legend



**Map Legend**

**Superficial deposits 1:50,000 scale**

- GLACIOFLUVIAL DEPOSITS, MID PLEISTOCENE - SAND AND GRAVEL**
- SAND AND GRAVEL OF UNCERTAIN AGE AND ORIGIN - SAND AND GRAVEL**
- OADBY MEMBER - DIAMICTON**
- GLACIOLACUSTRINE DEPOSITS, MID PLEISTOCENE - CLAY AND SILT**
- ALLUVIUM - CLAY, SILT, SAND AND GRAVEL**
- HEAD - CLAY, SILT, SAND AND GRAVEL**
- FELMERSHAM MEMBER - SAND AND GRAVEL**
- RIVER TERRACE DEPOSITS, 1 - SAND AND GRAVEL**
- RIVER TERRACE DEPOSITS, 2 - SAND AND GRAVEL**

Location: 485588, 234266

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489980,233945

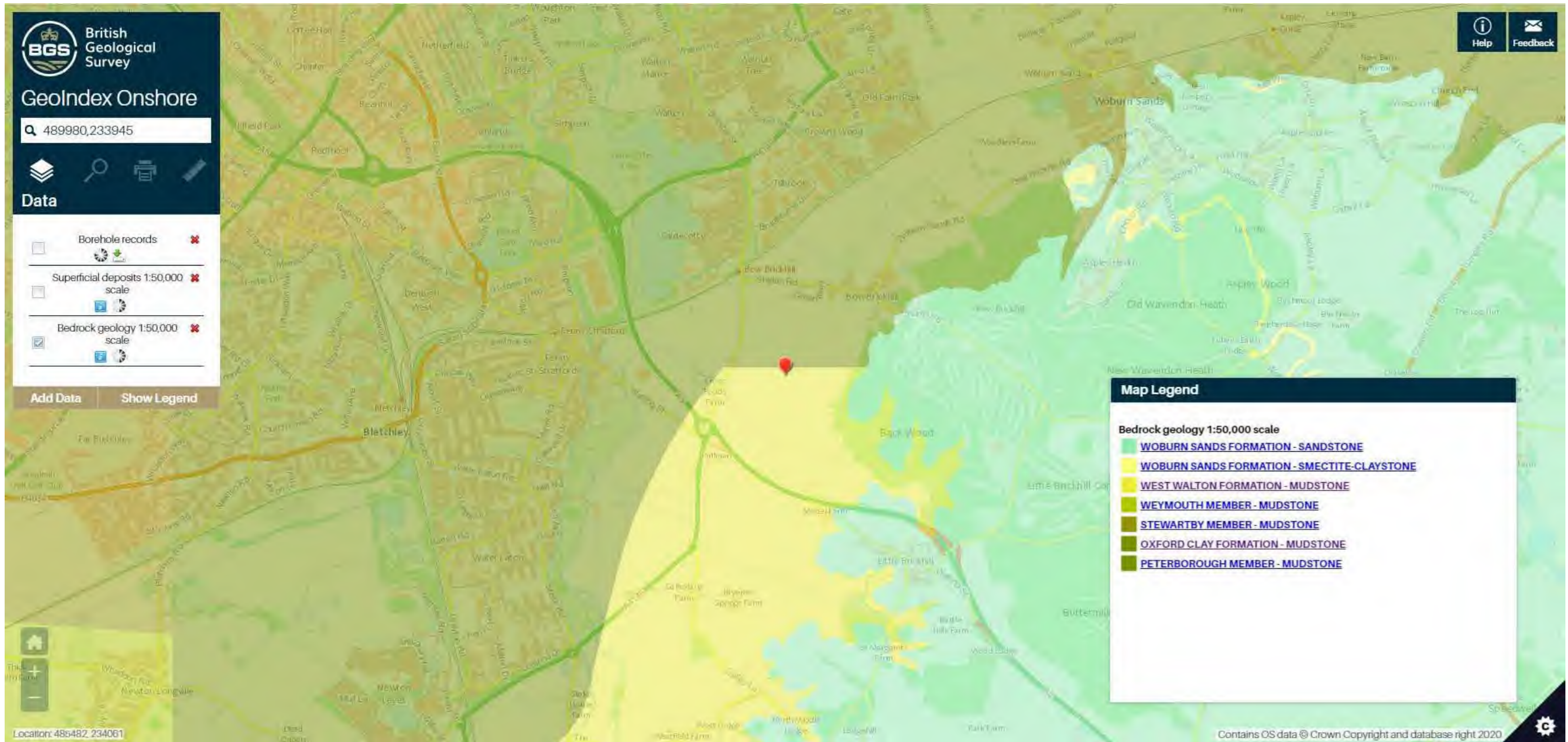
**Data**

Borehole records

Superficial deposits 1:50,000 scale

Bedrock geology 1:50,000 scale

Add Data Show Legend



**Map Legend**

**Bedrock geology 1:50,000 scale**

- WOBURN SANDS FORMATION - SANDSTONE**
- WOBURN SANDS FORMATION - SMECTITE-CLAYSTONE**
- WEST WALTON FORMATION - MUDSTONE**
- WEYMOUTH MEMBER - MUDSTONE**
- STEWARTBY MEMBER - MUDSTONE**
- OXFORD CLAY FORMATION - MUDSTONE**
- PETERBOROUGH MEMBER - MUDSTONE**



Search

Current location:

Get my current location

Search by:

OS grid reference

Easting:

489980

Northing:

233945

Go

Adjust Transparency



Legend



Soil Information

Soilscape 8:

Slightly acid loamy and clayey soils with impeded drainage

Texture:

Loamy some clayey

Coverage:

England: 10.6%, Wales: 1.9%, England & Wales: 9.4%

Drainage:

Slightly impeded drainage



Fertility:

Moderate to high



Landcover:

Arable and grassland

Habitats:

Wide range of pasture and woodland types

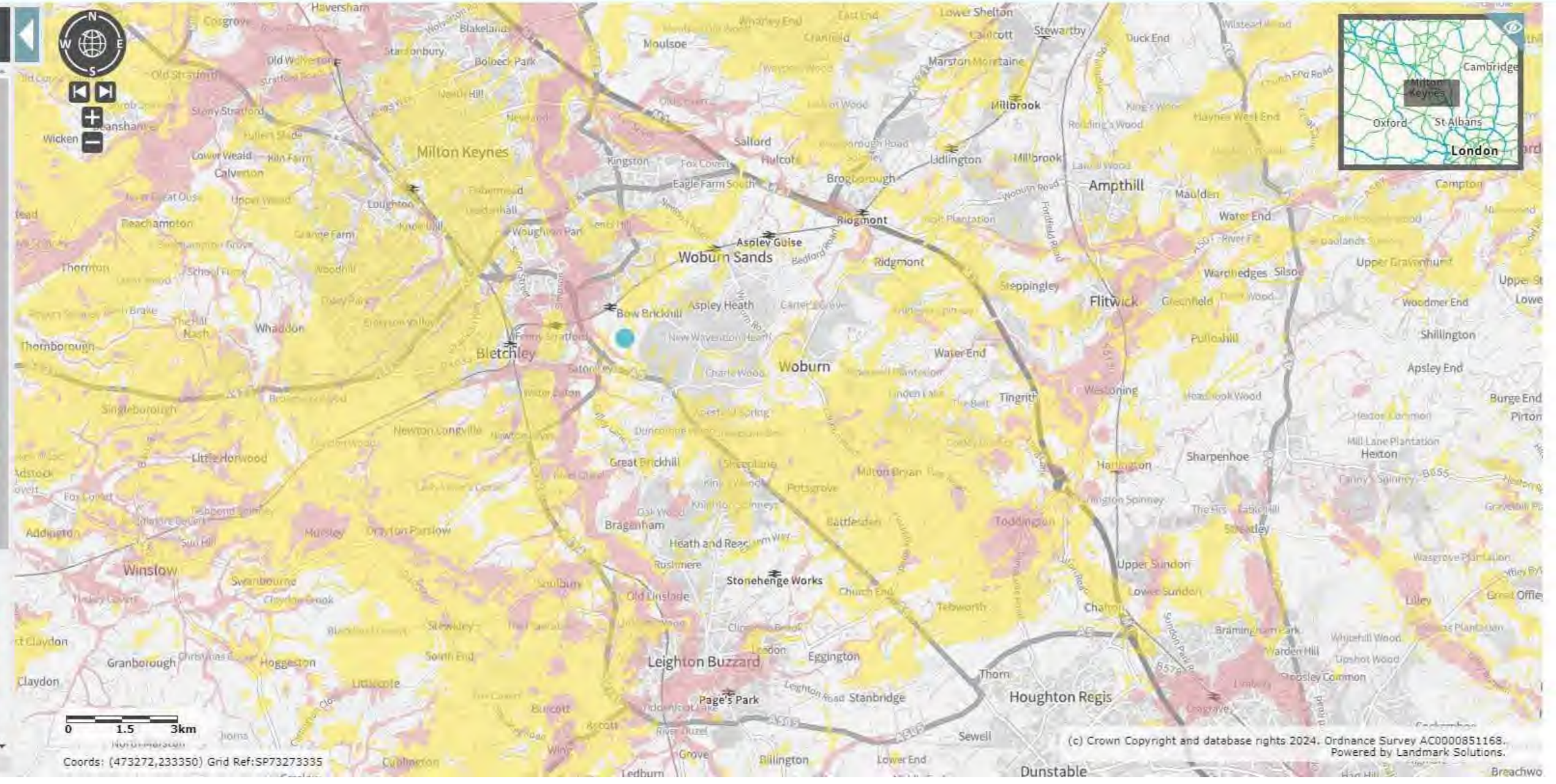
Carbon:

Low

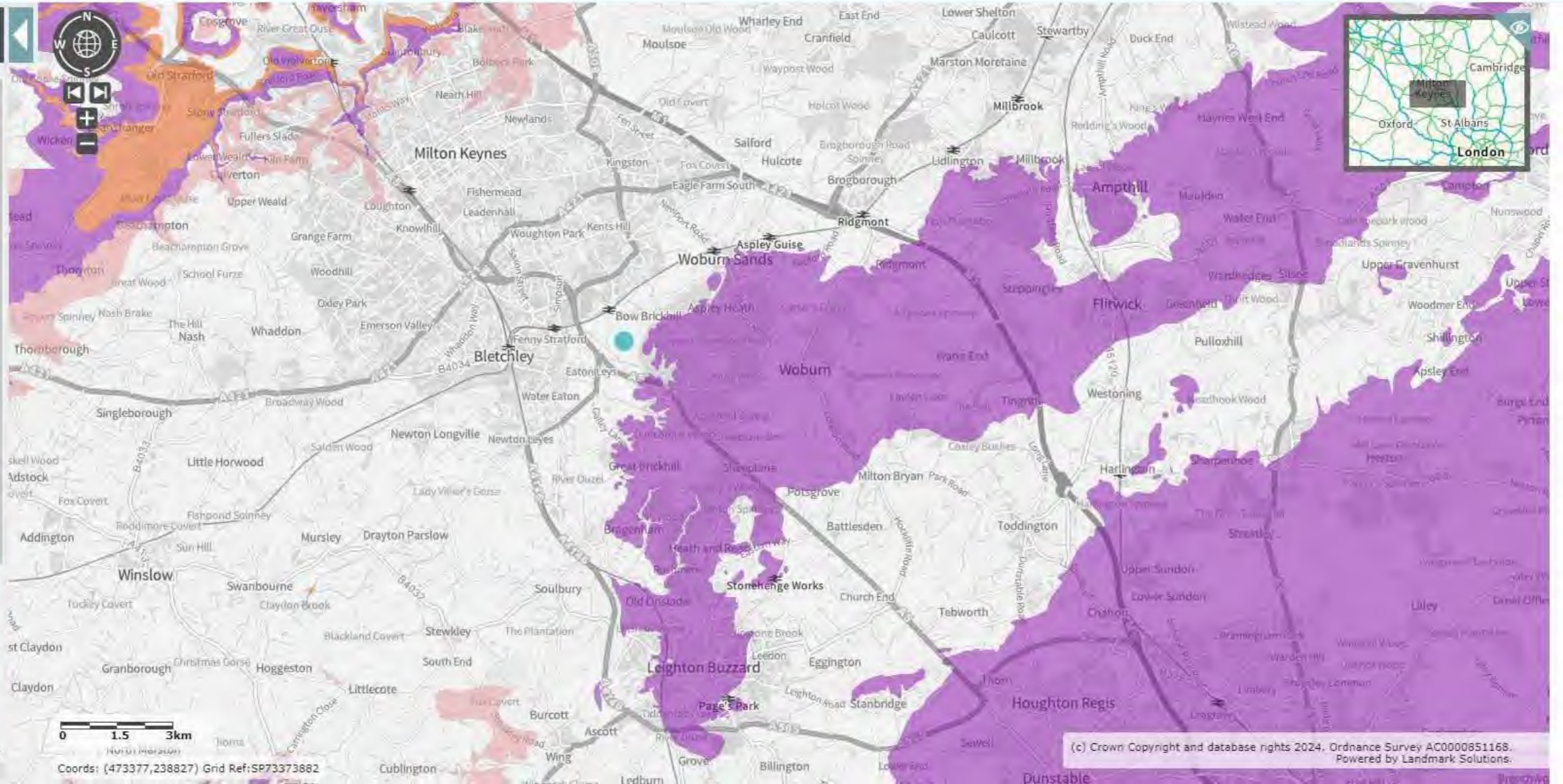
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- Land Based Schemes
- Landscape

- Geology and Soils**
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  - Aquifer Designation Map (Superficial Drift) (England)
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    - Secondary A
    - Secondary B
    - Secondary (undifferentiated)
    - Unknown (lakes+landslip)
    - Unproductive
  - Groundwater Vulnerability Map (England)
  - Geological Places to Visit (England)
  - Geological Descriptions (England)
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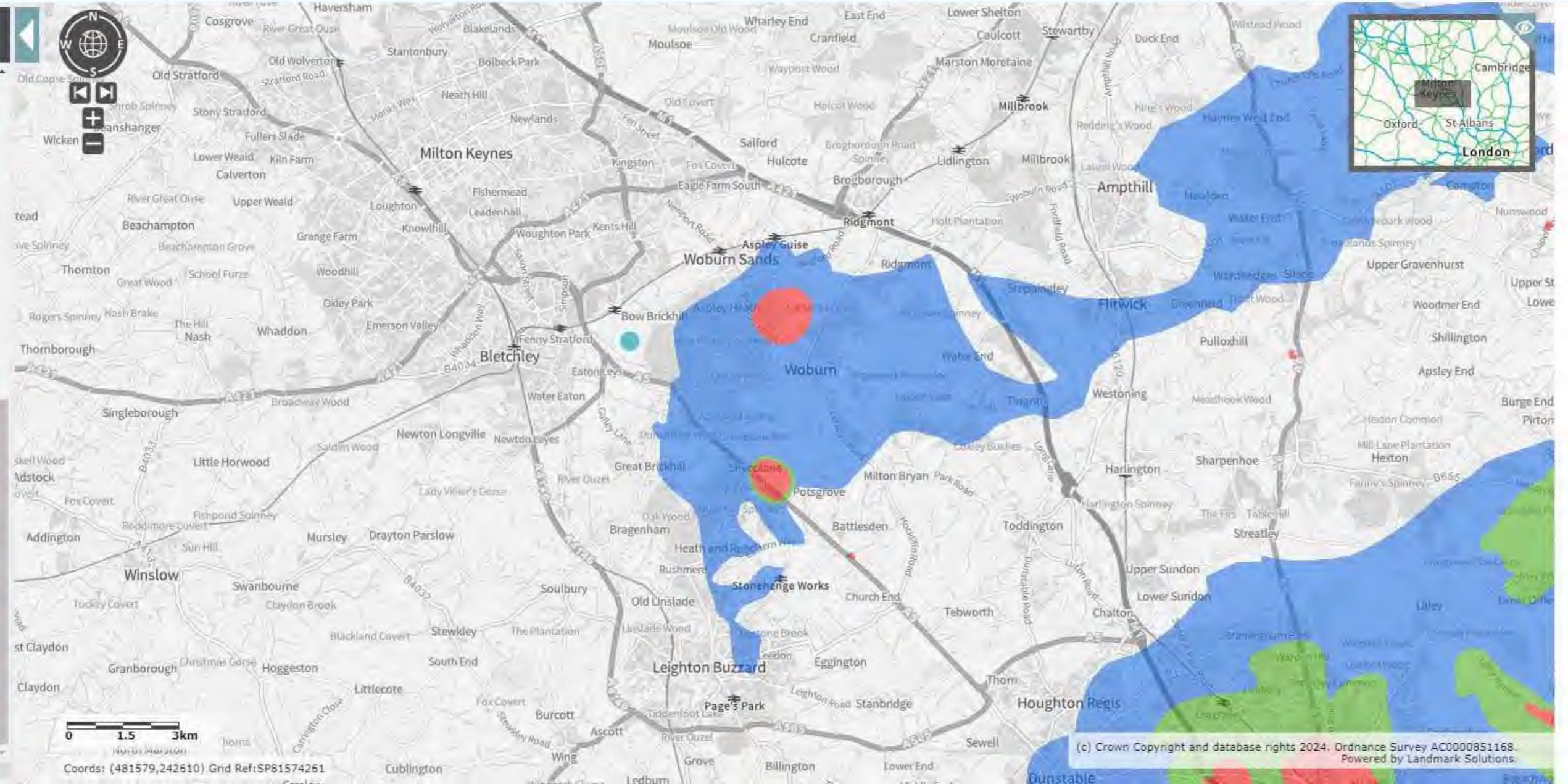


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# APPENDIX B: PROPOSED DEVELOPMENT

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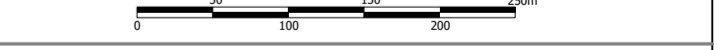
Revision	Date	Drn	Ckd
F	08.10.24	J.W.	M.A.

-  Site Boundary
-  Vehicular access
-  Existing woodland
-  Bow Brickhill Station
-  Railway
-  Redways
-  Proposed main route
-  Bus only route
-  PRoW
-  Pedestrian routes
-  Potential location for food retail/ cafe
-  Sustainable transport hub/Local Centre
-  Indicative extent of residential development
-  Drainage attenuation basins
-  Potential area for natural green space (human activity discouraged)
-  Central Park
-  Proposed School
-  Proposed play area/fields
-  Children's play
-  Parkland
-  Key green corridors /active travel links
-  Key panoramic views / views through green corridors
-  Draft Allocation
-  Ordinary Watercourse

Project  
**LAND SOUTH OF BOW BRICKHILL**

Drawing Title  
**CONCEPT MASTERPLAN**

Date 04.09.24	Scale 1:5,000@A2	Drawn by J.W.	Check by M.A.
Project No 333101362	Drawing No RG-M-Ai01	Revision E	



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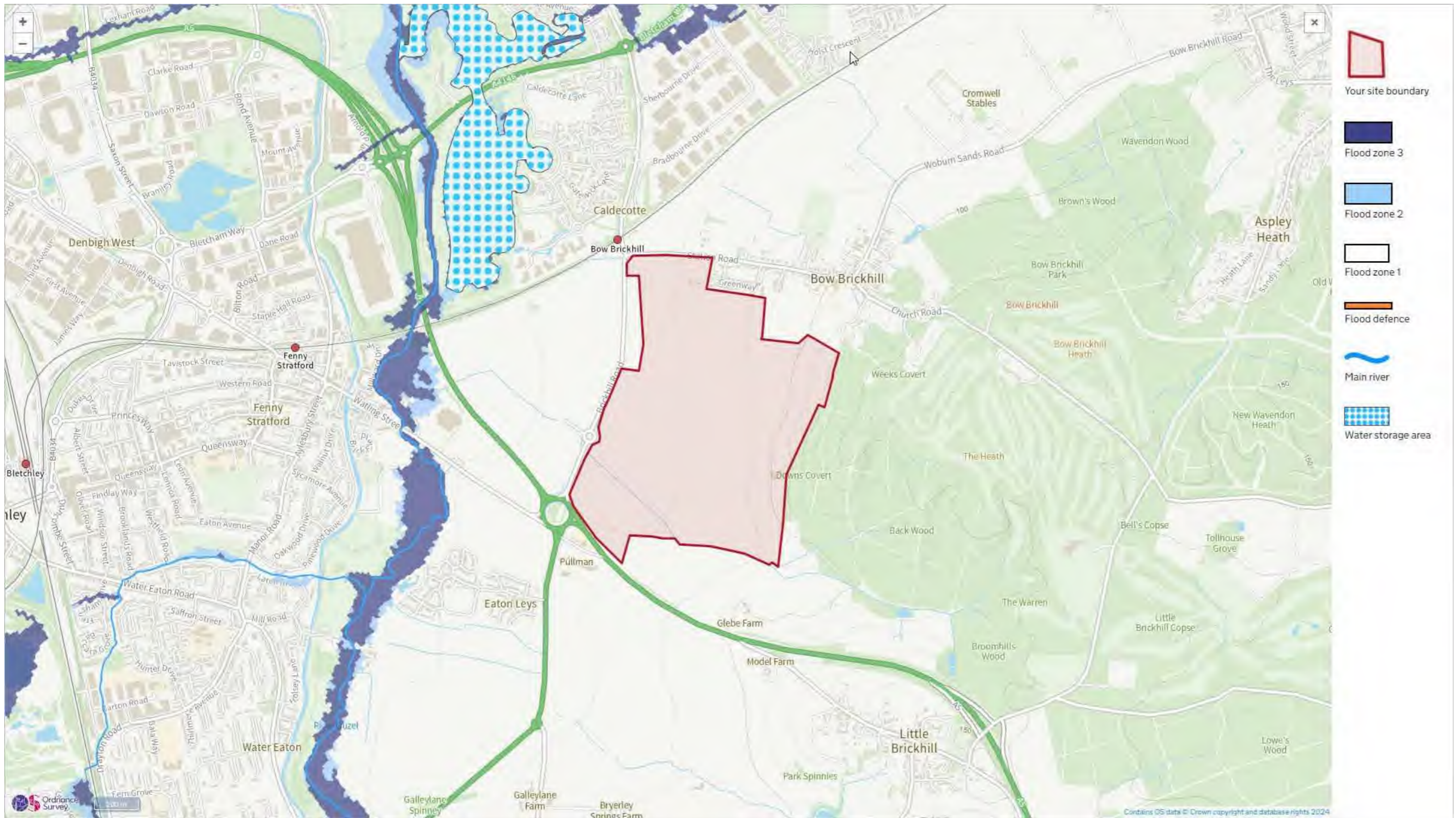
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# APPENDIX C: FLOOD RISK INFORMATION



Your site boundary



Flood zone 3



Flood zone 2



Flood zone 1



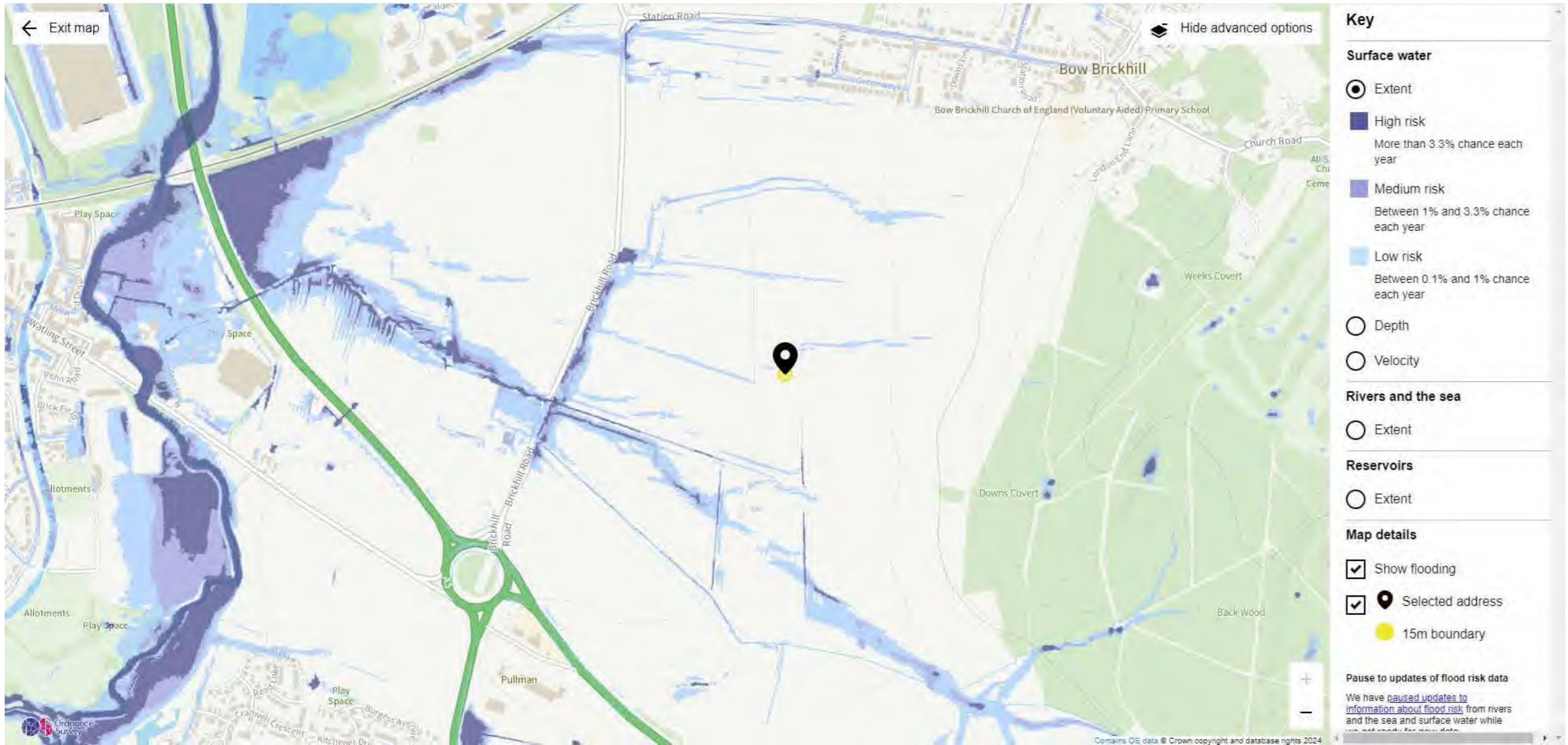
Flood defence



Main river



Water storage area

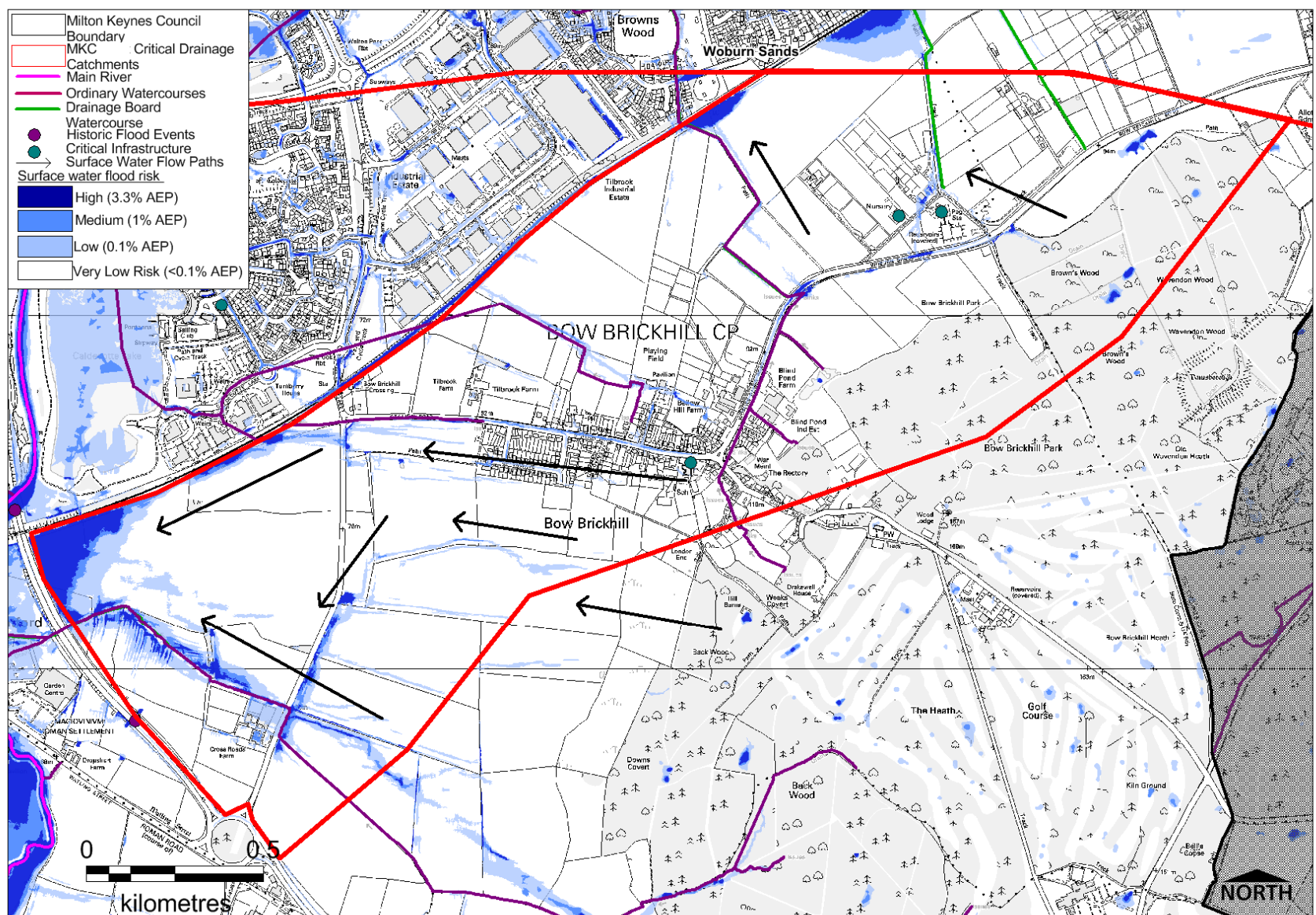


**CDC23: Bow Brickhill**

<b>Wards</b>	Danesborough
<b>Flood Source</b>	Surface water and ordinary watercourses.
<b>Description</b>	<p>Bow Brickhill is a rural area located towards the eastern extent of the borough, in close proximity to Woburn Sands. This CDC comprises a step decline in elevation from ~155mAOD in the south-east of the CDC to ~65mAOD to the west of the CDC. Consequently, surface water generally flows from east to west which is predicted to result in surface water ponding in areas near Fenny Stratford. Ponding is may also occur behind the railway embankment which constrains surface water flows. Across this CDC, there are very few residential areas which are shown to be at risk of surface water flooding.</p> <p>Whilst there are no incidents of historic flooding within the CDC, Highways England hold a record of highways flooding near Cross Roads Farm where an underpass reportedly flooded in 2006 due to a blocked ditch. Cross Roads Farm is located on the boundary of the CDC at the north-western extent.</p> <p>There are a number of watercourses within the area, some of which are managed by the Bedford Group of Drainage Boards.</p>

**Historical Flooding** None

<b>Surface Water Flood Risk</b>	<p><b>Summary of properties at risk of surface water flooding in Bow Brickhill:</b></p> <ul style="list-style-type: none"> <li>– 14 residential and 5 non-residential properties are at high risk (3.33% AEP).</li> <li>– 26 residential and 7 non-residential properties are at medium risk (1% AEP).</li> <li>– 45 residential and 14 non-residential properties are at low risk (0.1% AEP).</li> </ul> <p><b>Risk to critical infrastructure in Bow Brickhill:</b></p> <ul style="list-style-type: none"> <li>– 1 educational facility is shown to be at low risk of surface water flood risk (0.1%AEP).</li> </ul>
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 Figure 4-24 Bow Brickhill Surface Water Flood Risk



THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

**LEGEND**

- Milton Keynes Council Boundary
- Local Planning Authority Boundary

**BGS Susceptibility to Groundwater Flooding**

- Potential for groundwater flooding to occur at surface
- Potential for groundwater flooding of property situated below ground level
- Limited potential for groundwater flooding to occur
- Not considered to be prone to groundwater flooding

- Groundwater Flood Records (Environment Agency)

**Notes**

The 1:50,000 scale digital map data is generalised and the geological interpretation should be used only as a guide to the geology at a local level, not as a site-specific geological plan based on detailed site investigations.

This map is intended to provide a strategic overview of susceptibility to groundwater flooding and should not be used to assess flood risk for individual properties.

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Revision Details	By	Check	Date	Scale

Purpose of Issue

**FINAL**



Project Title

**MILTON KEYNES COUNCIL  
STRATEGIC FLOOD  
RISK ASSESSMENT**

Drawing Title

**SUSCEPTIBILITY TO  
GROUNDWATER FLOODING**

Drawn	Checked	Approved	Date
CB			
URS Internal Project No.	Scale at A3		
47070452	1:95,000		

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Drawing Number

**FIGURE B8**

Rev

**1**

N:\Water\Current Projects\47070452 Milton Keynes Level 1 SFRA Update\0700 WIP\0705 GIS\_Drain\WORS

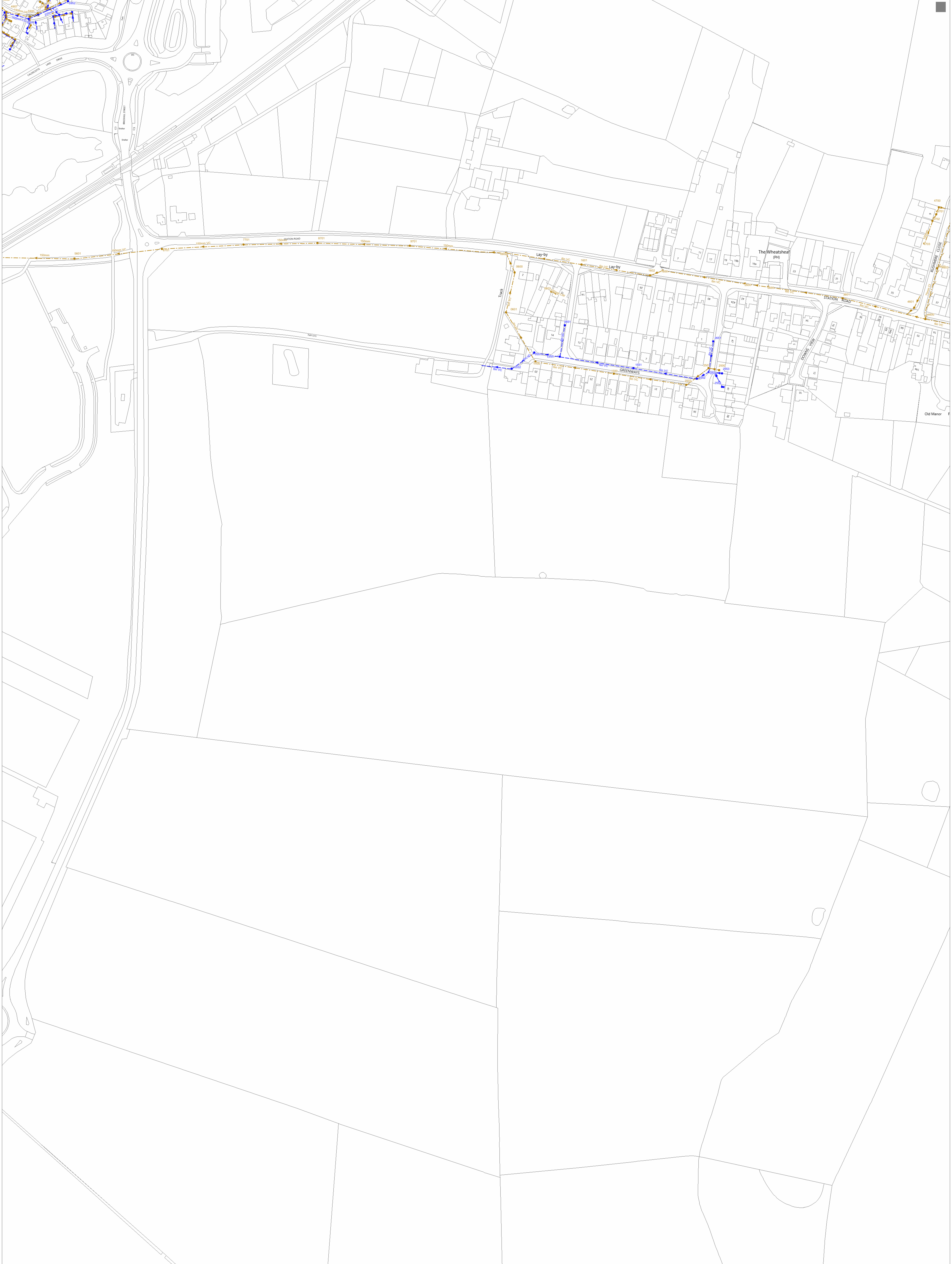
South Northamptonshire

Bedford

Mid Bedfordshire

Aylesbury Vale









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 Date updated: 31/05/24  
 Scale: 1:250  
 Map Centre: 49810.230726  
 Date: 02/07/24  
 Out Ref: 1000668 - 2  
 Worksheet: Plan A2  
 Produced by: dgiul

- Foul Sewer
- Surface Sewer
- Combined Sewer
- Final Effluent Sewer
- Private Sewer
- Decommissioned Sewer
- Outfall
- Inlet
- Manhole
- Manhole
- Manhole

- Sewage Treatment Works
- Public Pumping Station
- Decommissioned Pumping Station

PA2

This plan is provided by Anglian Water pursuant to obligations under the Water Industry Act 1989. It must be used in conjunction with any depth records available. The information on this plan is based on data currently recorded but position must be regarded as approximate. Services pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by one hole, 90 degree observation, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record or record at all, the location of any water main, discharge pipe, sewer or disposal main or any form of apparatus. This information is sold for the use permitted. This plan is produced by Anglian Water Services Limited (c) Crown copyright and database rights 2024 Ordnance Survey 100022432. This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert
1501	489770	233513	F	78.02	76.57	1.45
2401	489352	233465	F	79.24	77.71	1.53
3301	489359	233375	F	80.63	79.11	1.52
3302	489400	233356	F	81.25	79.6	1.65
3401	489308	233414	F	79.64	78.25	1.39
4301	489477	233304	F	82.56	80.82	1.74
5201	489540	233261	F	83.2	81.32	1.88
6101	489684	233142	F	-	-	-
6201	489613	233204	F	83.02	81.95	1.07
7001	489743	233095	F	86.71	85.39	1.32
7002	489738	233036	F	88.22	85.82	2.4

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert
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Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert
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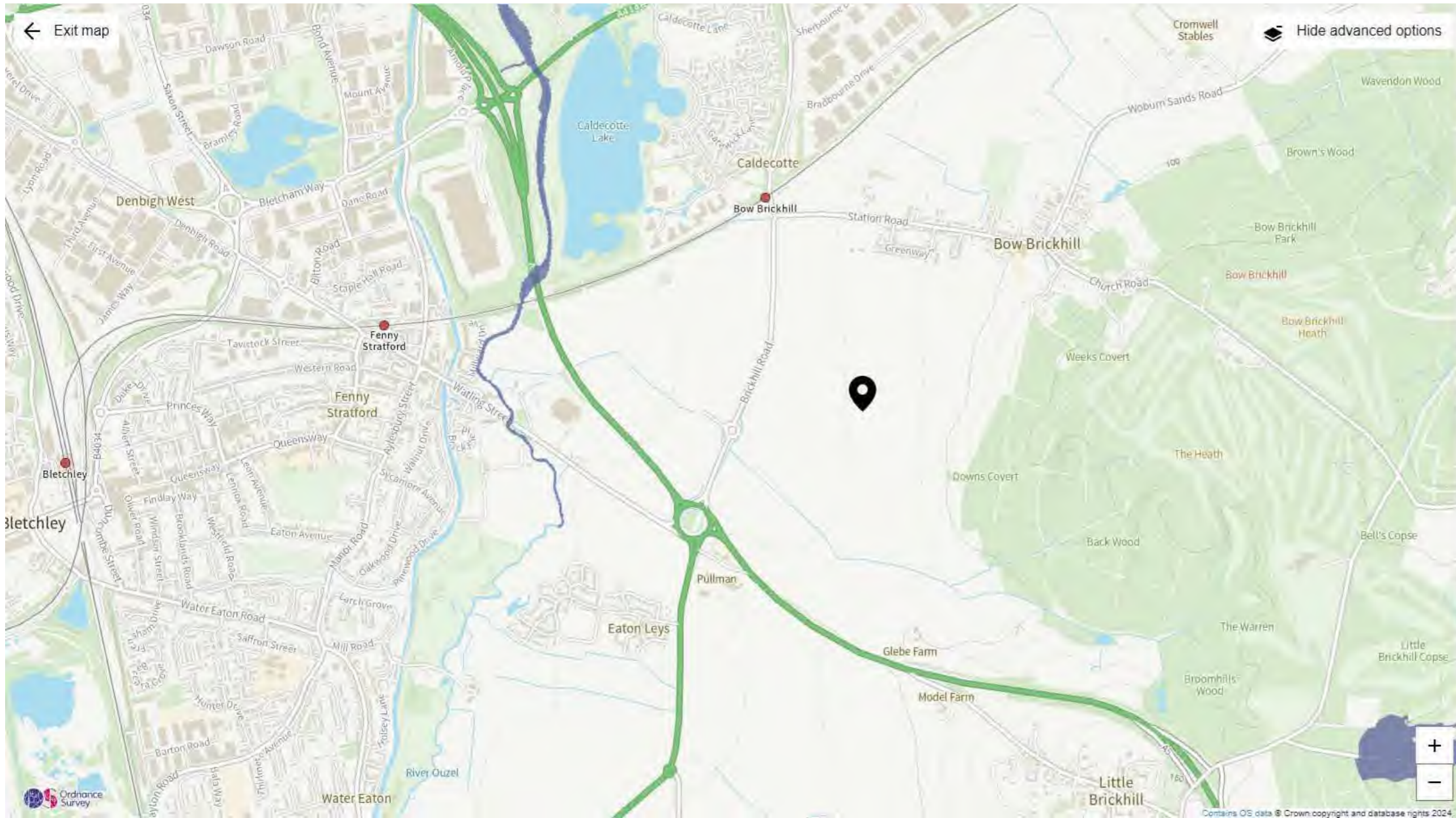
Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert
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Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert
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Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert
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Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert
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Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert
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**Key**

**Surface water**

- Extent
- Depth
- Velocity

**Rivers and the sea**

- Extent

**Reservoirs**

- Extent
- When river levels are normal
- When there is also flooding from rivers

**Map details**

- Show flooding
- Selected address

**Pause to updates of flood risk data**

We have [paused updates to information about flood risk](#) from rivers and the sea and surface water while we get ready for new data.

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# APPENDIX D: FLOOD RISK MANAGEMENT

**Simulation Settings**

Rainfall Methodology	FEH-22	Drain Down Time (mins)	1440	30 year (l/s)	10.5
Summer CV	1.000	Additional Storage (m <sup>3</sup> /ha)	0.0	100 year (l/s)	14.7
Winter CV	1.000	Check Discharge Rate(s)	✓	Check Discharge Volume	✓
Analysis Speed	Normal	1 year (l/s)	3.6	100 year 360 minute (m <sup>3</sup> )	279
Skip Steady State	x	2 year (l/s)	3.7		

**Storm Durations**

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0

**Pre-development Discharge Rate**

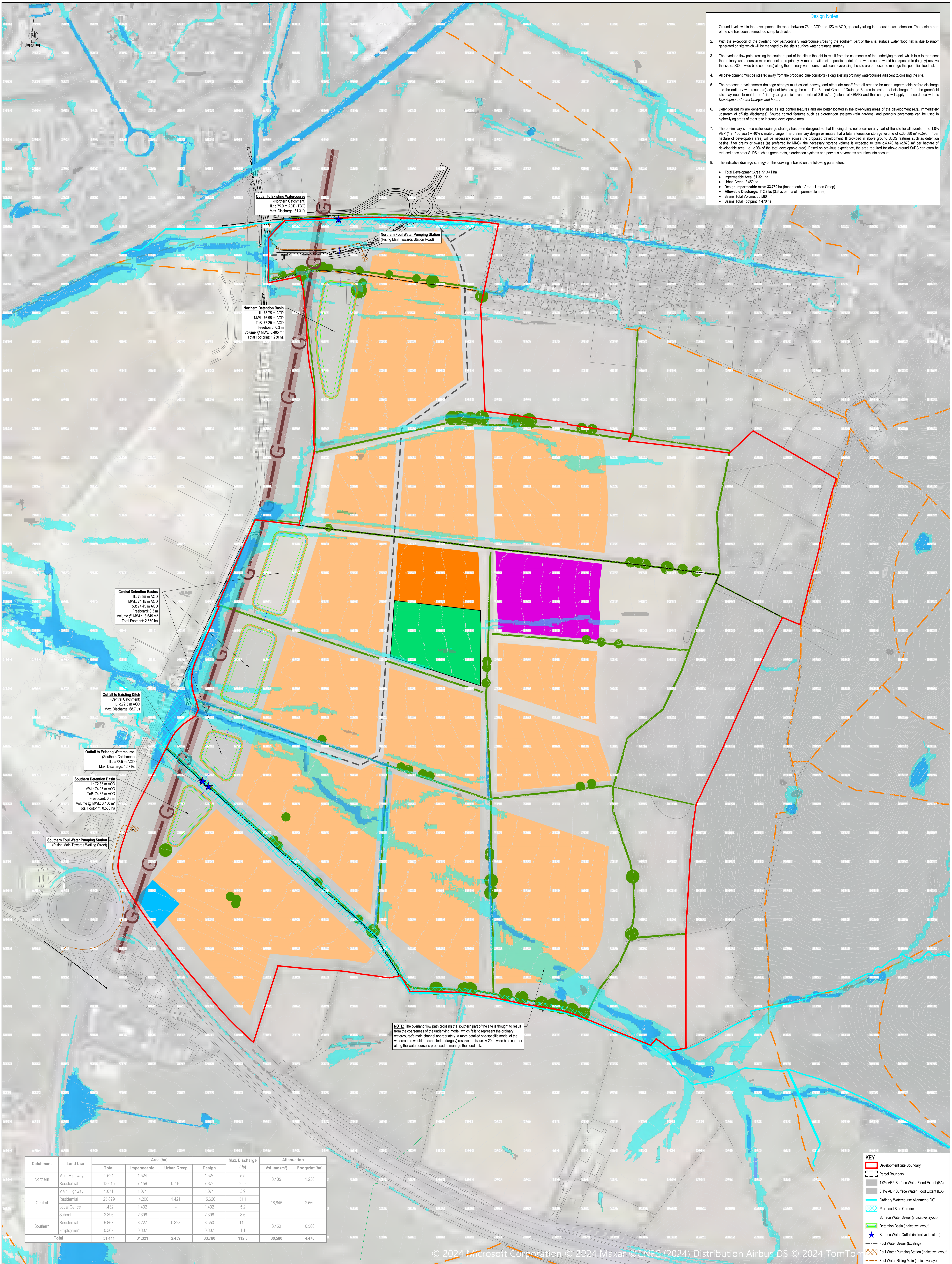
Site Makeup	Greenfield	Growth Factor 30 year	2.55
Greenfield Method	IH124	Growth Factor 100 year	3.56
Positively Drained Area (ha)	1.000	Betterment (%)	0
SAAR (mm)	611	QBar	4.1
Soil Index	4	Q 1 year (l/s)	3.6
SPR	0.47	Q 2 year (l/s)	3.7
Region	5	Q 30 year (l/s)	10.5
Growth Factor 1 year	0.87	Q 100 year (l/s)	14.7
Growth Factor 2 year	0.89		

**Pre-development Discharge Volume**

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)	1.000	Storm Duration (mins)	360
Soil Index	4	Betterment (%)	0
SPR	0.47	PR	0.430
CWI	92.000	Runoff Volume (m <sup>3</sup> )	279

**Design Notes**

- Ground levels within the development site range between 73 m AOD and 123 m AOD, generally falling in an east to west direction. The eastern part of the site has been deemed too steep to develop.
- With the exception of the overland flow path/ordinary watercourse crossing the southern part of the site, surface water flood risk is due to runoff generated on site which will be managed by the site's surface water drainage strategy.
- The overland flow path crossing the southern part of the site is thought to result from the coarseness of the underlying model, which fails to represent the ordinary watercourse's main channel appropriately. A more detailed site-specific model of the watercourse would be expected to (largely) resolve the issue. >30 m wide blue corridor(s) along the ordinary watercourses adjacent to/crossing the site are proposed to manage this potential flood risk.
- All development must be steered away from the proposed blue corridor(s) along existing ordinary watercourses adjacent to/crossing the site.
- The proposed development's drainage strategy must collect, convey, and attenuate runoff from all areas to be made impermeable before discharge into the ordinary watercourse(s) adjacent to/crossing the site. The Bedford Group of Drainage Boards indicated that discharges from the greenfield site may need to match the 1 in 1-year greenfield runoff rate of 3.6 l/s/ha (instead of QBAR) and that charges will apply in accordance with its Development Control Charges and Fees.
- Detention basins are generally used as site control features and are better located in the lower-lying areas of the development (e.g., immediately upstream of off-site discharges). Source control features such as bioretention systems (rain gardens) and pervious pavements can be used in higher-lying areas of the site to increase developable area.
- The preliminary surface water drainage strategy has been designed so that flooding does not occur on any part of the site for all events up to 1.0% AEP (1 in 100 year) + 60% climate change. The preliminary design estimates that a total attenuation storage volume of c.30,580 m<sup>3</sup> (c.555 m<sup>3</sup> per hectare of developable area) will be necessary across the proposed development. If provided in above ground SuDS features such as detention basins, filter drains or swales (as preferred by MWK), the necessary storage volume is expected to take 4,470 ha (c.870 m<sup>3</sup> per hectare of developable area, i.e., c.2% of the total developable area). Based on previous experience, the area required for above ground SuDS can often be reduced once other SuDS such as green roofs, bioretention systems and pervious pavements are taken into account.
- The indicative drainage strategy on this drawing is based on the following parameters:
  - Total Development Area: 51,441 ha
  - Impermeable Area: 31,321 ha
  - Urban Creep: 2,459 ha
  - Design Impermeable Area: 33,780 ha (Impermeable Area + Urban Creep)
  - Allowable Discharge: 112.8 l/s (3.6 l/s per ha of impermeable area)
  - Basins Total Volume: 30,580 m<sup>3</sup>
  - Basins Total Footprint: 4,470 ha



**Central Detention Basins**  
 IL: 72.95 m AOD  
 MWL: 74.15 m AOD  
 Td: 74.45 m AOD  
 Freeboard: 0.3 m  
 Volume @ MWL: 18,645 m<sup>3</sup>  
 Total Footprint: 2,660 ha

**Northern Detention Basin**  
 IL: 75.75 m AOD  
 MWL: 76.95 m AOD  
 Td: 77.25 m AOD  
 Freeboard: 0.3 m  
 Volume @ MWL: 8,485 m<sup>3</sup>  
 Total Footprint: 1,230 ha

**Outfall to Existing Ditch**  
 (Central Catchment)  
 IL: c.72.5 m AOD  
 Max. Discharge: 62.1 l/s

**Outfall to Existing Watercourse**  
 (Southern Catchment)  
 IL: c.72.5 m AOD  
 Max. Discharge: 12.7 l/s

**Southern Detention Basin**  
 IL: 72.95 m AOD  
 MWL: 74.05 m AOD  
 Td: 74.35 m AOD  
 Freeboard: 0.3 m  
 Volume @ MWL: 3,450 m<sup>3</sup>  
 Total Footprint: 0,580 ha

**Southern Foul Water Pumping Station**  
 (Rising Main Towards Watling Street)

**NOTE:** The overland flow path crossing the southern part of the site is thought to result from the coarseness of the underlying model, which fails to represent the ordinary watercourse's main channel appropriately. A more detailed site-specific model of the watercourse would be expected to (largely) resolve the issue. A 20 m wide blue corridor along the watercourse is proposed to manage the flood risk.

Catchment	Land Use	Area (ha)			Max. Discharge (l/s)	Attenuation	
		Total	Impermeable	Urban Creep		Volume (m <sup>3</sup> )	Footprint (ha)
Northern	Main Highway	1,524	1,524	-	1,524	5.5	8,485
	Residential	13,015	7,159	0,716	7,874	25.8	
Central	Main Highway	1,071	1,071	-	1,071	3.9	18,645
	Residential	25,829	14,205	1,421	15,626	51.1	
	Local Centre	1,432	1,432	-	1,432	5.2	
Southern	School	2,396	2,396	-	2,396	8.6	3,450
	Residential	5,867	3,227	0,323	3,550	11.6	
	Employment	0,307	0,307	-	0,307	1.1	0,580
<b>Total</b>		<b>51,441</b>	<b>31,321</b>	<b>2,459</b>	<b>33,780</b>	<b>112.8</b>	<b>30,580</b>

**KEY**

- Development Site Boundary
- Parcel Boundary
- 1.0% AEP Surface Water Flood Extent (EA)
- 0.1% AEP Surface Water Flood Extent (EA)
- Ordinary Watercourse Alignment (OS)
- Proposed Blue Corridor
- Surface Water Sewer (indicative layout)
- Detention Basin (indicative layout)
- Surface Water Outfall (indicative location)
- Foul Water Sewer (Existing)
- Foul Water Pumping Station (indicative layout)
- Foul Water Rising Main (indicative layout)

**General Notes**

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- Do not scale from this drawing. Only figured dimensions are to be relied upon. Don't hesitate to get in touch with JNP Group if additional information is required.
- Any discrepancies between drawings of different scales and between drawings and specifications, where appropriate, to be reported to JNP Group for decision.
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- This drawing should only be used for construction if the drawing status is "A4 - Approved/Stage Complete". JNP Group takes no responsibility for construction works undertaken to drawings that are not marked with this status.

Client: Urban&Civic and The Bedford Estates Location: Land South of Bow Brickhill, Milton Keynes		Project: Preliminary Drainage Strategy	
PO3 03/10/2024 Updated concept master plan.	PO2 22/06/2024 Updated site access.	PO1 24/07/2024 First issue.	Date: 03/10/2024
Scale: 1:2000		Drawing No: BR3122+JNP-XX-XX-DR-C-2001	

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**Simulation Settings**

Rainfall Methodology	FEH-22	Drain Down Time (mins)	1440	30 year (l/s)	10.5
Summer CV	1.000	Additional Storage (m <sup>3</sup> /ha)	0.0	100 year (l/s)	14.7
Winter CV	1.000	Check Discharge Rate(s)	✓	Check Discharge Volume	✓
Analysis Speed	Normal	1 year (l/s)	3.6	100 year 360 minute (m <sup>3</sup> )	279
Skip Steady State	x	2 year (l/s)	3.7		

**Storm Durations**

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

**Pre-development Discharge Rate**

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)	1.000	Betterment (%)	0
SAAR (mm)	611	QBar	4.1
Soil Index	4	Q 1 year (l/s)	
SPR	0.47	Q 30 year (l/s)	
Region	5	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

**Pre-development Discharge Volume**

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)	1.000	Storm Duration (mins)	360
Soil Index	4	Betterment (%)	0
SPR	0.47	PR	0.430
CWI	92.000	Runoff Volume (m <sup>3</sup> )	279

**Node Northern Basin Online Hydro-Brake® Control**

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	74.700	Product Number	CTL-SHE-0239-3130-1200-3130
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.300
Design Flow (l/s)	31.3	Min Node Diameter (mm)	1800

**Node Central Basin Online Hydro-Brake® Control**

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	71.900	Product Number	CTL-SHE-0335-6880-1200-6880
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.375
Design Flow (l/s)	68.8	Min Node Diameter (mm)	2100

**Node Southern Basin Online Hydro-Brake® Control**

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	71.900	Product Number	CTL-SHE-0159-1270-1200-1270
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	12.7	Min Node Diameter (mm)	1200

**Node Northern Basin Depth/Area Storage Structure**

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	74.700
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )
0.000	6292.6	0.0	1.200	8383.1	0.0	1.500	8928.3	0.0

**Node Central Basin Depth/Area Storage Structure**

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	71.900
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )
0.000	13753.8	0.0	1.200	18111.3	0.0	1.500	19268.6	0.0

**Node Southern Basin Depth/Area Storage Structure**

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	71.900
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )
0.000	2306.7	0.0	1.200	3457.6	0.0	1.500	3767.9	0.0

**Results for 2 year Critical Storm Duration. Lowest mass balance: 99.99%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
720 minute summer	Northern Basin	570	75.014	0.314	238.7	2065.4130	0.0000	SURCHARGED
15 minute summer	Northern Outfall	1	74.600	0.000	9.2	0.0000	0.0000	OK
960 minute summer	Central Basin	705	72.226	0.326	420.0	4680.1960	0.0000	OK
15 minute summer	Central Outfall	1	71.800	0.000	11.7	0.0000	0.0000	OK
480 minute winter	Southern Basin	464	72.233	0.333	91.0	821.7862	0.0000	SURCHARGED
15 minute summer	Southern Outfall	1	71.800	0.000	7.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Discharge Vol (m <sup>3</sup> )
720 minute summer	Northern Basin	Hydro-Brake®	Northern Outfall	30.9	2221.8
960 minute summer	Central Basin	Hydro-Brake®	Central Outfall	66.0	4692.2
480 minute winter	Southern Basin	Hydro-Brake®	Southern Outfall	12.7	916.2

**Results for 30 year Critical Storm Duration. Lowest mass balance: 99.99%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
600 minute winter	Northern Basin	585	75.366	0.666	369.3	4575.9560	0.0000	SURCHARGED
15 minute summer	Northern Outfall	1	74.600	0.000	30.6	0.0000	0.0000	OK
720 minute winter	Central Basin	705	72.573	0.673	692.2	10084.1500	0.0000	SURCHARGED
15 minute summer	Central Outfall	1	71.800	0.000	57.7	0.0000	0.0000	OK
600 minute winter	Southern Basin	600	72.603	0.703	151.6	1861.6750	0.0000	SURCHARGED
15 minute summer	Southern Outfall	1	71.800	0.000	12.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Discharge Vol (m <sup>3</sup> )
600 minute winter	Northern Basin	Hydro-Brake®	Northern Outfall	31.3	3408.4
720 minute winter	Central Basin	Hydro-Brake®	Central Outfall	68.7	7691.4
600 minute winter	Southern Basin	Hydro-Brake®	Southern Outfall	12.7	1384.9

**Results for 100 year Critical Storm Duration. Lowest mass balance: 99.99%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
720 minute winter	Northern Basin	705	75.532	0.832	391.9	5842.5920	0.0000	SURCHARGED
15 minute summer	Northern Outfall	1	74.600	0.000	31.2	0.0000	0.0000	OK
720 minute winter	Central Basin	705	72.740	0.840	855.9	12832.2500	0.0000	SURCHARGED
15 minute summer	Central Outfall	1	71.800	0.000	66.9	0.0000	0.0000	OK
720 minute winter	Southern Basin	705	72.774	0.874	160.8	2385.1200	0.0000	SURCHARGED
15 minute summer	Southern Outfall	1	71.800	0.000	12.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Discharge Vol (m <sup>3</sup> )
720 minute winter	Northern Basin	Hydro-Brake®	Northern Outfall	31.3	3488.8
720 minute winter	Central Basin	Hydro-Brake®	Central Outfall	68.7	7717.0
720 minute winter	Southern Basin	Hydro-Brake®	Southern Outfall	12.7	1367.7

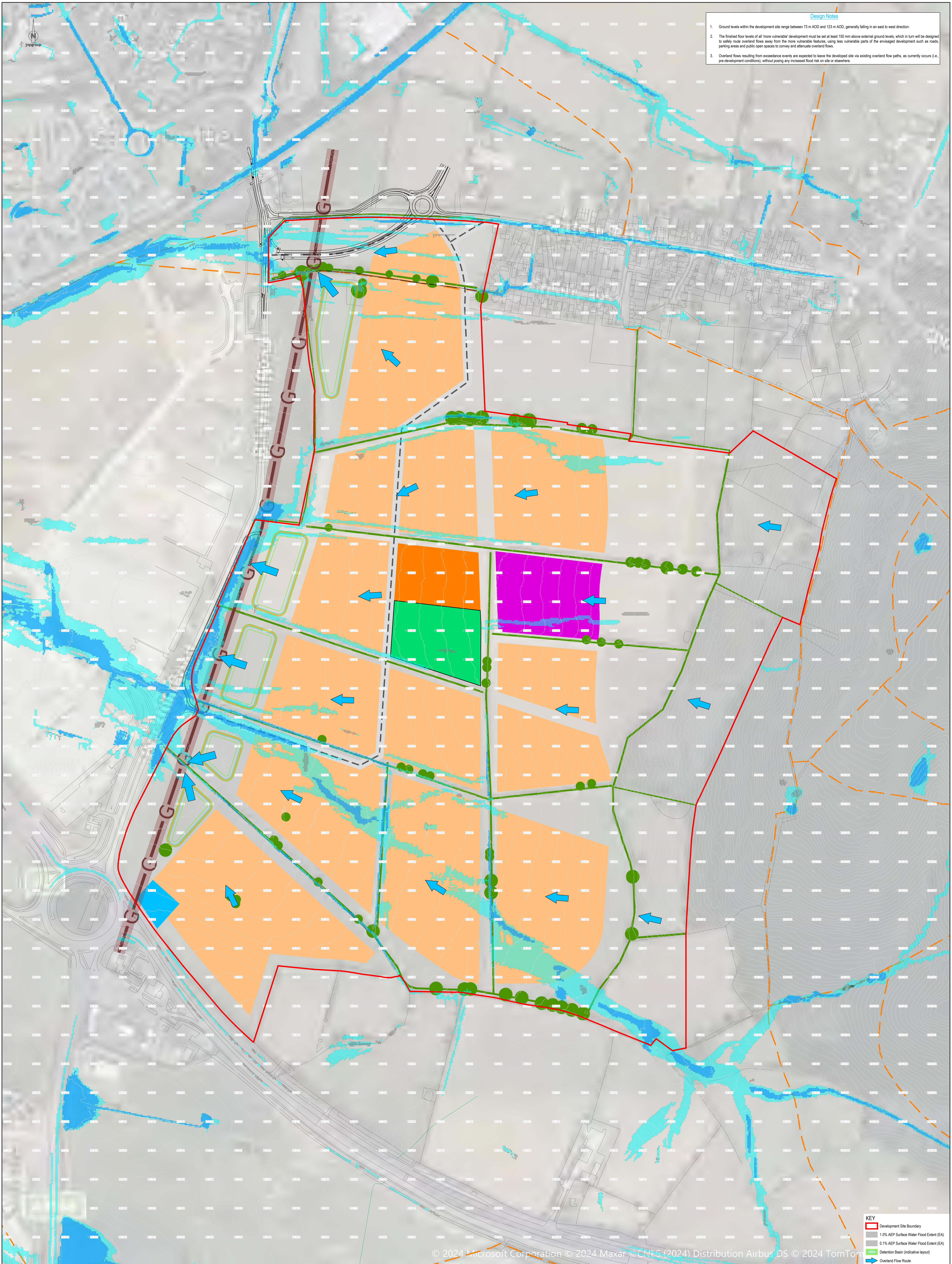
**Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.99%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
960 minute winter	Northern Basin	945	75.861	1.161	427.5	8481.1880	0.0000	SURCHARGED
15 minute summer	Northern Outfall	1	74.600	0.000	31.3	0.0000	0.0000	OK
960 minute winter	Central Basin	945	73.073	1.173	933.8	18644.7700	0.0000	SURCHARGED
15 minute summer	Central Outfall	1	71.800	0.000	68.7	0.0000	0.0000	OK
720 minute winter	Southern Basin	720	73.096	1.196	225.2	3448.0650	0.0000	SURCHARGED
15 minute summer	Southern Outfall	1	71.800	0.000	12.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Discharge Vol (m <sup>3</sup> )
960 minute winter	Northern Basin	Hydro-Brake®	Northern Outfall	31.3	3789.7
960 minute winter	Central Basin	Hydro-Brake®	Central Outfall	68.7	8262.1
720 minute winter	Southern Basin	Hydro-Brake®	Southern Outfall	12.7	1447.3

**Design Notes**

1. Ground levels within the development site range between 73 m AOD and 123 m AOD, generally falling in an east to west direction.
2. The finished floor levels of all 'more vulnerable' development must be set at least 150 mm above external ground levels, which in turn will be designed to safely route overland flows away from the more vulnerable features, using less vulnerable parts of the envisaged development such as roads, parking areas and public open spaces to convey and attenuate overland flows.
3. Overland flows resulting from exceedance events are expected to leave the developed site via existing overland flow paths, as currently occurs (i.e. pre-development conditions), without posing any increased flood risk on site or elsewhere.



**KEY**

- Development Site Boundary
- 1.0% AEP Surface Water Flood Extent (EA)
- 0.1% AEP Surface Water Flood Extent (EA)
- Detention Basin (indicative layout)
- Overland Flow Route

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**General Notes**

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Client		L&Q Estates Ltd.	
Address		Land South of Bow Brickhill, Milton Keynes	
Title		Exceedance Flow Routes	
PO3	03/10/2024	Updated concept master plan.	RM / RM / RM
PO2	22/06/2024	Updated site access.	RM / RM / RM
PO1	24/07/2024	First issue.	RM / RM / RM
Scale	FL 60, 20		Scale 1:2000
Author		S2 - Suitable for Information	

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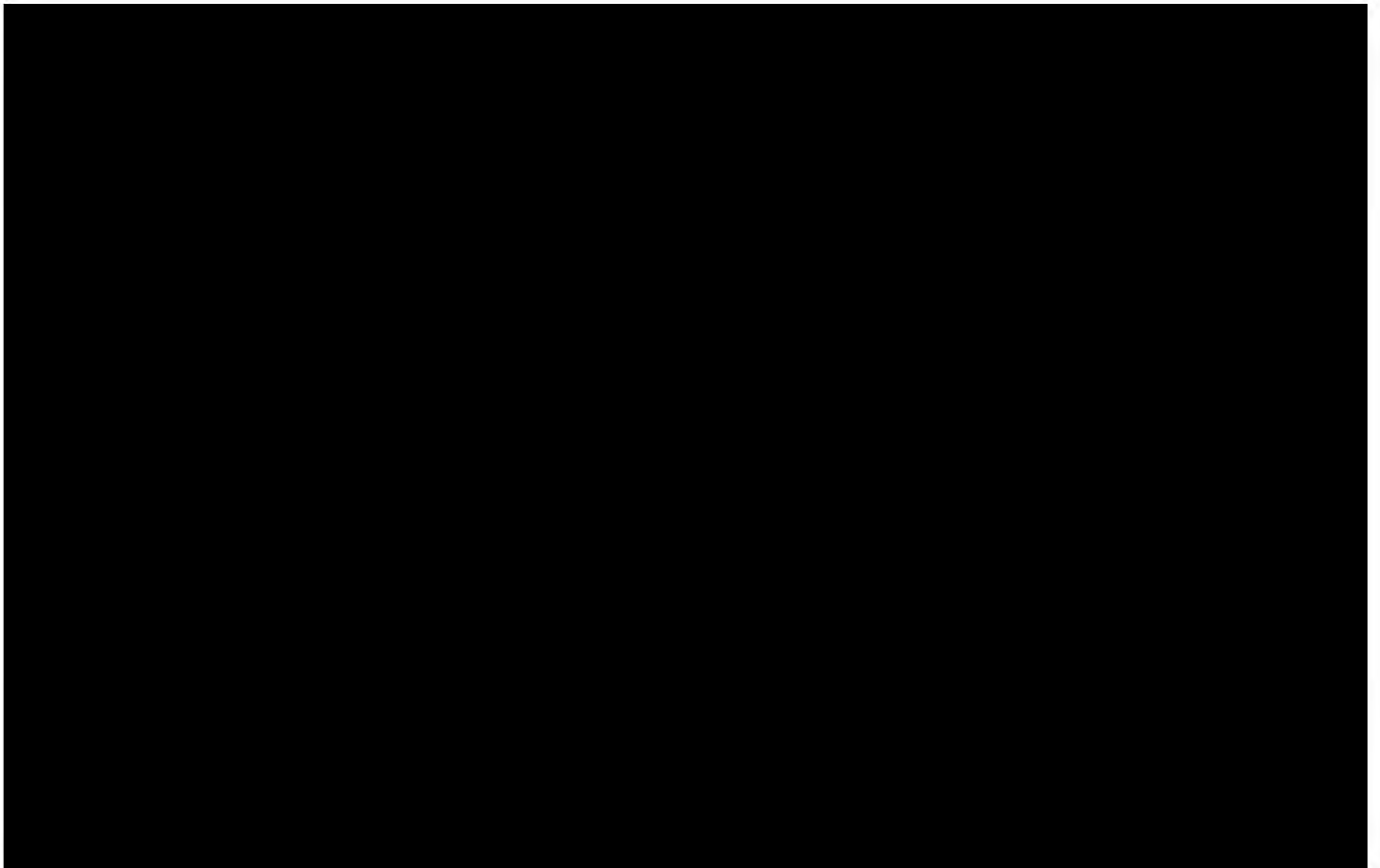
www.jnpgroup.co.uk

Project: BR3122+JNP-XX-XX-DR-C-2002

Sheet: P01



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# Transmittal

PROJECT: South of Bow Brickhill 333102427 DATE: 19/12/2025

SUBJECT: MK CITY PLAN 2050 - REGULATION 19 REPRESENTATIONS - SOUTH OF BOW BRICKHILL TRANSMITTAL ID: 00001

PURPOSE: For your use VIA: Info Exchange

## FROM

NAME	COMPANY	EMAIL	PHONE
Connor Sheffield	Stantec UK		

## TO

NAME	COMPANY	EMAIL	PHONE
ncp.engagement@milton-keynes.gov.uk		ncp.engagement@milton-keynes.gov.uk	

REMARKS: Dear Sir/Madam,

On behalf of Catesby Estates, please find attached a representation to the Milton Keynes Regulation 19 City Plan 2050 consultation regarding our client's site at South of Bow Brickhill – proposed allocation GS17.

This submission contains the following documents:

- 333102427 A3 CS South of Bow Brickhill Reg 19 Representations Cover Letter
- Appendix 1 – RG-M-01A – Site Boundary Plan
- Appendix 2 – RG-M-06 Land Holdings Plan
- Appendix 3 – South of Bow Brickhill Vision Doc A08
- Appendix 4 – RG-M-Ai01F Concept Masterplan
- Appendix 5 – 333102427 A3 SKB CS Regulation 19 Representation Forms South of Bow Brickhill
- Appendix 6 – 1001 – TN001 Rev B
- Appendix 7 – Land South of Milton Keynes LVA
- Appendix 7 – Land South of Milton Keynes LVA – BL-LP-01 Site Context Plan
- Appendix 7 – Land South of Milton Keynes LVA – BL-LP-02 Topography Plan
- Appendix 7 – Land South of Milton Keynes LVA – BL-LP-03 Landscape Character Plan
- Appendix 7 – Land South of Milton Keynes LVA – BL-LP-04 Site Appraisal Plan
- Appendix 7 – Land South of Milton Keynes LVA – BL-LP-05 ZTV Plan
- Appendix 7 – Land South of Milton Keynes LVA – BL-LP-06 – Visual Appraisal Plan
- Appendix 7 – Land South of Milton Keynes LVA – BL-LP-07 Landscape and

## Visual Opportunities and Constraints

- Appendix 7 – Land South of Milton Keynes LVA – Site Appraisal Photographs
- Appendix 7 – Land South of Milton Keynes LVA – Site Context Photographs
- Appendix 7 – Land South of Milton Keynes LVA – Published Landscape Character Assessment Extract
- Appendix 8 – BR31221-JNP-XX-XX-RP-C-1001

Please confirm that this representation has been received and that they have been registered as having been 'duly made'

If you would like further clarification, or to discuss further, please do get in touch using the details on the letter sent via file transfer.

Kind regards,

Connor

# Transmittal

DATE: 19/12/2025  
TRANSMITTAL ID: 00001

## DESCRIPTION OF CONTENTS

QTY	DATED	TITLE	NOTES
1	03/10/2024	Appendix 1 - RG-M-01A - Site Boundary Plan-(1-5000@A2).pdf	
1	03/10/2024	Appendix 2 - RG-M-06 - Land Holdings Plan-(1-5000@A2).pdf	
1	08/10/2024	Appendix 3 South of Bow Brickhill Vision Doc A08.pdf	
1	09/10/2024	Appendix 4 - RG-M-Ai01F - Concept Masterplan.pdf	
1	19/12/2025	Appendix 5 333102427 A3 SKB CS MK Regulation 19 Representation Forms South of Bow Brickhill.pdf	
1	18/12/2025	Appendix 6 -1001-TN001 Rev B (2).pdf	
1	08/10/2024	Appendix 7 - Land South of Milton Keynes - LVA - Final.pdf	
1	08/10/2024	Appendix 7 BL-LP-01 Site Context Plan-A1.pdf	
1	27/09/2024	Appendix 7 BL-LP-02 Topography Plan-A1.pdf	
1	08/10/2024	Appendix 7 BL-LP-03 Landscape Character Plan-A1.pdf	
1	27/09/2024	Appendix 7 BL-LP-04 Site Appraisal Plan-A1.pdf	
1	27/09/2024	Appendix 7 BL-LP-05 ZTV Plan-A1.pdf	
1	27/09/2024	Appendix 7 BL-LP-06 Visual Appraisal Plan-A1.pdf	
1	27/09/2024	Appendix 7 BL-LP-07 Landscape and Visual Opportunities and Constraints-A1.pdf	
1	27/09/2024	Appendix 7 Site Appraisal Photographs.pdf	
1	09/10/2024	Appendix 7 Site Context Photographs.pdf	
1	27/09/2024	Appendix 7 South Milton Keynes- Published Landscape Character Assessment Extracts.pdf	
1	11/12/2025	Appendix 8 BR31221-JNP-XX-XX-RP-C-1001 (1).pdf	
1	19/12/2025	333102427 A3 CS South of Bow Brickhill Reg 19 Representations Cover Letter FINAL.pdf	

### COPIES:

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Sumeen Kaur Baweja