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PROPOSED RETAIL UNIT

**NORTHWAY SERVICE STATION
GREAT NORTH ROAD, HINXWORTH, BALDOCK**

FLOOD RISK ASSESSMENT

September 2025

Commissioned by: Welcome Break

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Project Reference: NS_0178_02

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1.0 INTRODUCTION AND DEVELOPMENT DESCRIPTION

1.1 Project Introduction and Objectives

Welcome Break has commissioned NSugg Ltd. to prepare a Flood Risk Assessment (FRA) to support a planning application for a retail unit at Northway Service Station, Great North Road (A1 southbound), Hinxworth, Baldock.

This document represents a site-specific FRA for the proposed development.

1.2 Planning Policy and Guidance

This FRA has been undertaken in accordance with the relevant planning policy and guidance outlined below.

1.2.1 National Planning Policy

The National Planning Policy Framework (NPPF)¹ and associated technical guidance for flood risk and coastal change² aim to steer new development to areas with the lowest risk of flooding.

The NPPF recommends that development should only be allowed in areas at risk of flooding where a site-specific FRA (and the sequential and exception tests, as applicable) can demonstrate that:

- a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;
- b) the development is appropriately flood resistant and resilient;
- c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;
- d) any residual risk can be safely managed; and
- e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

Footnote 63 of the NPPF confirms that planning applications for the following development proposals must be supported by a site-specific FRA:

- All developments in Flood Zone 2 or 3.
- Development sites in Flood Zone 1 involving:
 - Sites of 1 hectare (ha) or more;
 - Land identified by the Environment Agency as having critical drainage problems;
 - Land identified in a Strategic Flood Risk Assessment as being at increased flood risk in the future; and

¹ GOV.UK, March 2012 (last updated: February 2025), National Planning Policy Framework.

² GOV.UK, March 2014 (last updated: August 2022), Planning Guidance, Flood Risk and Coastal Change.

- Land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.

1.2.2 Environment Agency Policy and Guidance

The Environment Agency's guidance for FRAs³ and associated flood risk standing advice supports the NPPF and specifies the requirements for site-specific FRAs, based on the level of flood risk and the vulnerability of the proposed development to flooding.

In addition, an Environment Agency Flood Risk Activity Permit (or exemption) is required for works or structures in, under, over or within eight metres of the top of the bank of the watercourse, designated a 'main river', (or sixteen metres in the case of a tidal watercourse).

1.2.3 Local Policy and Guidance

The following documents provide local flood risk policy and guidance for development within North Hertfordshire:

- North Hertfordshire Council's 2008 Level 1 Strategic Flood Risk Assessment (SFRA)⁴ and 2016 Update⁵ present a summary of the local hydrology, potential sources of flood risk across the region and flood risk information for planning.
- North Hertfordshire's Surface Water Management Plan (SWMP)⁶ assesses the risk of flooding from surface water and identifies flood risk hotspots within the district.
- Hertfordshire County Council's online Flood Risk Management Viewer presents mapping of local watercourses and flood risk in the region.
- Bedfordshire & River Ivel Internal Drainage Board (IDB) Byelaws (2018) are relevant within the IDB district and are designed to ensure the efficient working of the IDB drainage system and effectiveness of their flood risk management measures.
- North Hertfordshire's Local Plan 2011-2031, adopted November 2022, presents local planning policy up to 2031. **Policy NE7: Reducing Flood Risk** states:

Planning permission for development proposals will be granted provided that (as applicable):

a) Development is located outside of medium and high-risk flood areas (flood zone 2 and 3) and other areas affected by other sources of flooding where possible;

b) Where (a) is not possible, application of the sequential and exception tests is demonstrated where development is proposed in areas of flood risk using the Strategic Flood Risk Assessment (SFRA) and Environment Agency flood maps;

c) A FRA has been prepared in accordance with national guidance that considers the lifetime of the development, climate change impacts and safe access and egress;

d) It will be located, designed and laid out to ensure the risk of flooding is reduced whilst not increasing flood risk elsewhere;

³ Environment Agency, March 2014 (last updated: August 2025), Guidance – Flood Risk Assessments: applying for planning permission.

⁴ WSP, July 2008, North Hertfordshire District Council, Strategic Flood Risk Assessment.

⁵ North Hertfordshire District Council, September 2016, Strategic Flood Risk Assessment Update (2016).

⁶ WSP, Parsons Brinckerhoff, March 2017, North Hertfordshire District Surface Water Management Plan, Final Report.

e) The impact of any residual flood risk will be minimised through flood resistant, resilient design and construction;

f) Any flood protection and mitigation measures necessary will not cause harm to nature conservation, heritage assets, and/ or landscape and recreation and, where possible, will have a positive impact in these respects; and

g) Overland flow routes and functional floodplain areas are protected from all development other than that which is “water compatible” and this must be designed and constructed to remain operational and safe for users during flood events, resulting in no net loss of flood plain storage and not impeding water flows or increasing flood risk elsewhere.

1.3 Site Location & Requirement for a Site-Specific FRA

The application site comprises land at Northway Service Station, located off the southbound Great North Road (A1), Hinxworth, Baldock, SG7 5EX, as shown on the Site Location Plan within Appendix 1. Northway Service Station is within a semi-rural setting, approximately 2.5km south-west of the village of Hinxworth and approximately 5km north-north-west of Baldock, North Hertfordshire.

The application site includes the existing vehicular access and egress to the A1 on the western boundary, but the area of proposed development is limited to an existing, redundant storage area and compound in the north-east of the site.

The total area of the application site, as indicated on the Site Location Plan, is approximately 0.29 hectares.

The Environment Agency's on-line flood map for planning indicates that the area of proposed development is located within Flood Zone 3, defined as land with a high probability of fluvial/tidal flooding. The NPPF and associated technical guidance confirms that development sites within Flood Zone 3 must be accompanied by a site-specific Flood Risk Assessment.

1.4 Topography and Existing Land Use

Review of Ordnance Survey mapping indicates that the local topography is relatively flat-lying, with a gentle topographic fall from the site to the north, towards local watercourses. External ground levels of 44mAOD to 45mAOD are indicated within application site.

A topographic survey was undertaken in September 2023; a copy of the survey and existing site layout is included as Appendix 2. The survey confirms site levels generally fall across the site towards the north-east, from approximately 44.9mAOD at the south-western entrance, to approximately 44.1mAOD on the north-eastern boundary. A shallow, isolated depression is evident in the north-east of the site, at an elevation of 43.87mAOD. Site levels generally fall towards this feature and the minor drainage ditch located immediately to the north-east of the site (refer to Section 1.6).

The survey confirms that the area of proposed development comprises a tarmac yard/parking area to the immediate east of the existing service station infrastructure.

1.5 Ground Conditions

British Geological Survey mapping indicates that the local geology beneath the application site comprises Chalk of the West Melbury Marly Chalk Formation. The Chalk is potentially

overlain by superficial Glaciofluvial Deposits (sand and gravel) which extend to the west of the site⁷.

Review of Cranfield University's soil maps⁸ indicates that the soils beneath the application site are defined as Soilscape 5: freely draining, lime-rich loamy soils.

The topographic survey (Appendix 2) confirms that the proposed development area, in the north-east of the site, comprises an area of impermeable tarmac yard/parking; incident rainfall will form surface water runoff to local drainage features.

1.6 Hydrological Features

The application site lies within the jurisdiction of the Bedfordshire and River Ivel IDB; the IDB maintains and improves local watercourses for storm water management. Cat's Ditch, which flows in a westerly direction approximately 50m north of the site, is an IDB maintained watercourse. Cat's Ditch discharges into the River Ivel near Taylor's Road, approximately 0.6km north-west of the site. The River Ivel is also an IDB maintained watercourse.

A minor ditch is indicated on the site survey, immediately north of the development area and is shown to discharge into Cat's Ditch. A CCTV drainage survey undertaken in November 2023 reported this ditch as dry, with no formal drainage outfalls from the existing site; a copy of the CCTV survey is included as Appendix 6. However, the site topographic survey and existing site levels indicate surface water runoff from the application site would informally drain, via the north-east boundary, to this minor ditch.

Whilst the ditch appears to represent private drainage only, the IDB has confirmed the ditch is within the IDB's district and therefore falls under its statutory control. Review of Hertfordshire County Council's online Flood Risk Management Viewer indicates that the ditch is classified as an ordinary watercourse and is culverted beneath the site. However, the 2023 CCTV drainage survey found no evidence of the ditch extending upstream beneath the site.

The local hydrological site setting is presented as Figure 1.

⁷ British Geological Survey, GeoIndex Onshore, accessed 1st September 2025.

⁸ Cranfield University's Soilscape Map, accessed 1st September 2025.

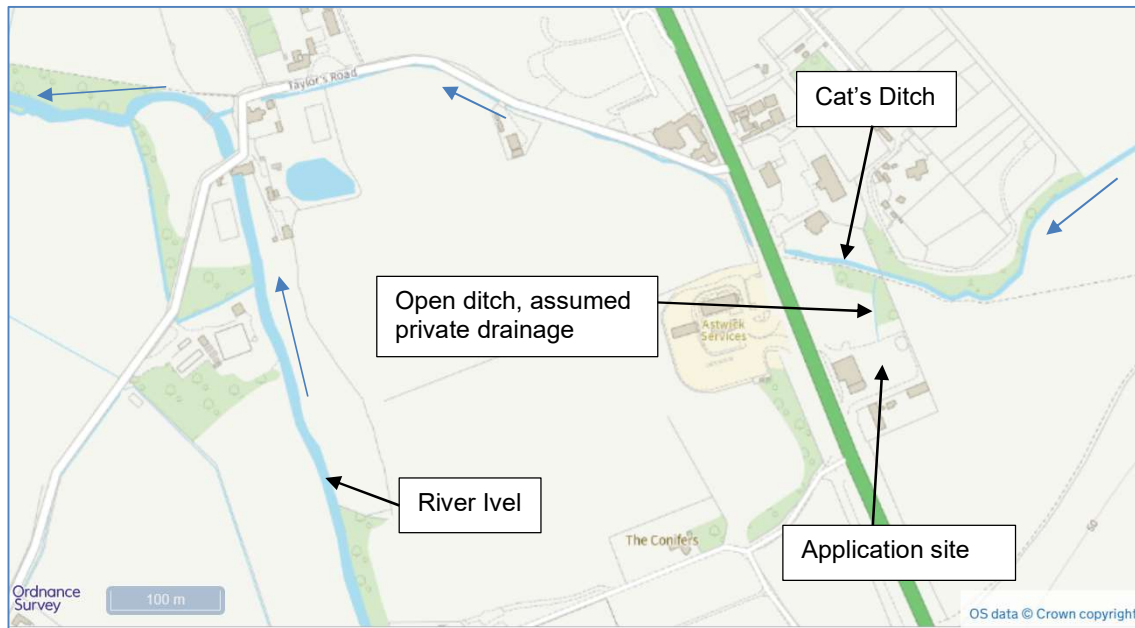


Figure 1. Hydrological Site Setting

1.7 Proposed Development and Flood Risk Vulnerability Classification

The proposed development comprises a standalone retail unit of footprint 73.5m² and associated parking; the development layout plan is included within Appendix 3.

In terms of flood risk vulnerability classification, Annex 3 of the NPPF confirms that shops, cafes and hot food takeaways are classified as 'less vulnerable' development. This is discussed further in Section 2.3.

2.0 FLOOD RISK ASSESSMENT

2.1 Sources of Information

In addition to the flood risk planning policy and guidance outlined in Section 1.2, the following sources of information have been consulted during the preparation of this FRA:

- Environment Agency website – for information regarding surface water, reservoir and fluvial flood risk and historic flooding.
- Environment Agency consultation response (Product 4 data) for site-specific flood data. A copy of the consultation response received from the Environment Agency on 10th October 2023 is included as Appendix 4.
- Site-specific hydraulic modelling of Cat's Ditch undertaken in April 2025⁹ to support wider development proposals at Northway service station. A copy of the hydraulic modelling report is included as Appendix 5.

2.2 Flood Hazard

All potential sources of flooding to the application site are considered within this section of the report.

2.2.1 Environment Agency Flood Zone Map and Fluvial/Tidal Flood Risk

The application site is not coastal or in the vicinity of a tidal watercourse and is not therefore at risk of tidal flooding.

The Environment Agency flood zone map presents information regarding the fluvial flood risk to the application site and is included as Figure 2 below. The flood zone map indicates that the site's western access and egress lie within low probability Flood Zone 1, defined as land with <0.1% annual probability of flooding from rivers. The footprint of the proposed retail unit lies within high probability Flood Zone 3 associated with fluvial flood risk from Cat's Ditch. Flood Zone 3 is defined as land with ≥1% annual probability of flooding from rivers.

⁹ Gondolin Land & Water, April 2025, Welcome Break Northway SS, Flood Risk Assessment Report.

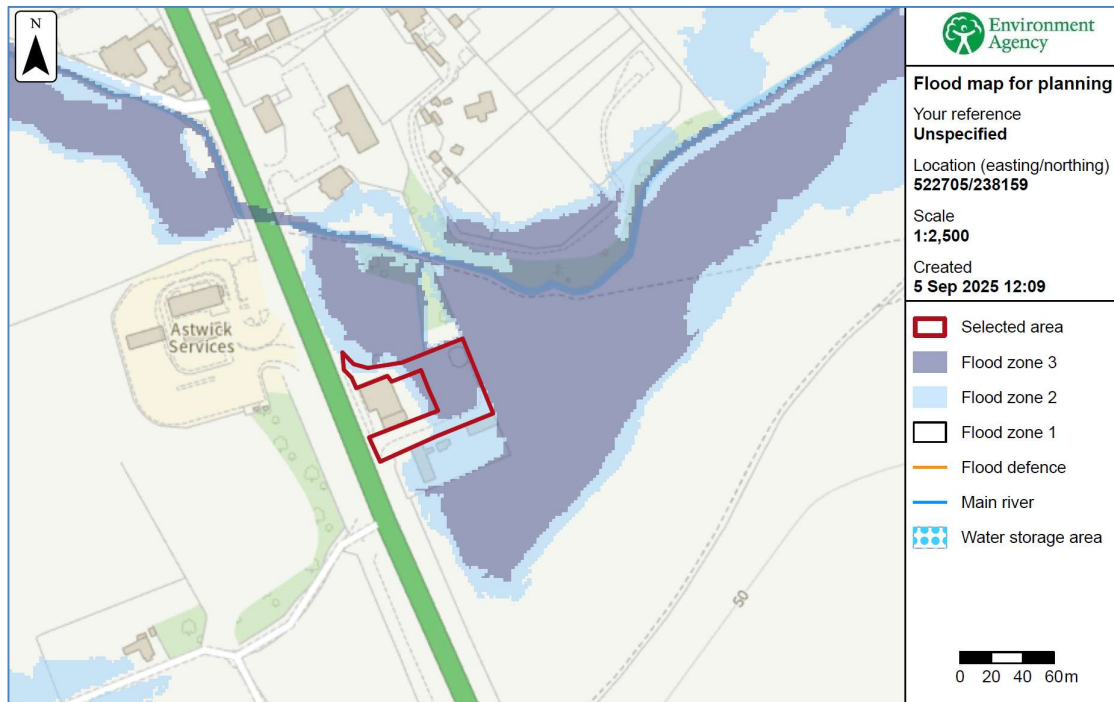


Figure 2. Environment Agency Flood Zone Map¹⁰

The Environment Agency was consulted for site-specific flood data (Product 4) in October 2023 to support wider site development proposals and their response is included as Appendix 4. The Environment Agency has confirmed they do not have a hydraulic model for the local watercourses and therefore, are unable to provide model data or predicted flood water levels for the application site. Review of the Environment Agency's flood model locations dataset (last updated 25 July 2025) confirms no hydraulic model is available for Cat's Ditch. In the absence of detailed hydraulic modelling, the published flood zone map (Figure 2) is based on the national flood model only.

Bedfordshire and River Ivel IDB was also consulted (2023) for any site-specific flood data; their response is included within Appendix 4 and confirms they hold no hydraulic model or predicted flood water levels for Cat's Ditch or the application site.

Review of the 2008 SFRA and 2016 SFRA Update confirm that they rely on the Environment Agency's published flood maps within the area of the application site, with no additional hydraulic modelling of the watercourses undertaken.

Therefore, in the absence of published data, Welcome Break commissioned a bespoke hydraulic model of Cat's Ditch, to determine peak predicted flood water levels to inform future development at the site. Appendix 5 presents the flood model report⁹ which includes details of the scope and parameterisation of the hydraulic modelling and the model results.

The design fluvial flood event is represented by the 1.0% annual probability event plus climate change. Section 2.2.4 confirms that a 19% climate change allowance is appropriate for the development, therefore the design flood event is the 1.0% annual probability event plus 19% climate change allowance. The site-specific hydraulic model for Cat's Ditch (Appendix 5)

¹⁰ www.flood-map-for-planning.service.gov.uk accessed 5th September 2025.

confirms that no flooding is predicted to occur within the application site during the design flood event.

Figure 3 presents the modelled design flood extent, equivalent to the 1.0% annual probability plus 19% climate change allowance. The red site boundary in Figure 3 extends around Northway service station, the approximate application site boundary is outlined in yellow. Figure 3 confirms no flooding is predicted within the application site or immediate vicinity, during the design flood event. Therefore, no part of the site extends into high probability Flood Zone 3.

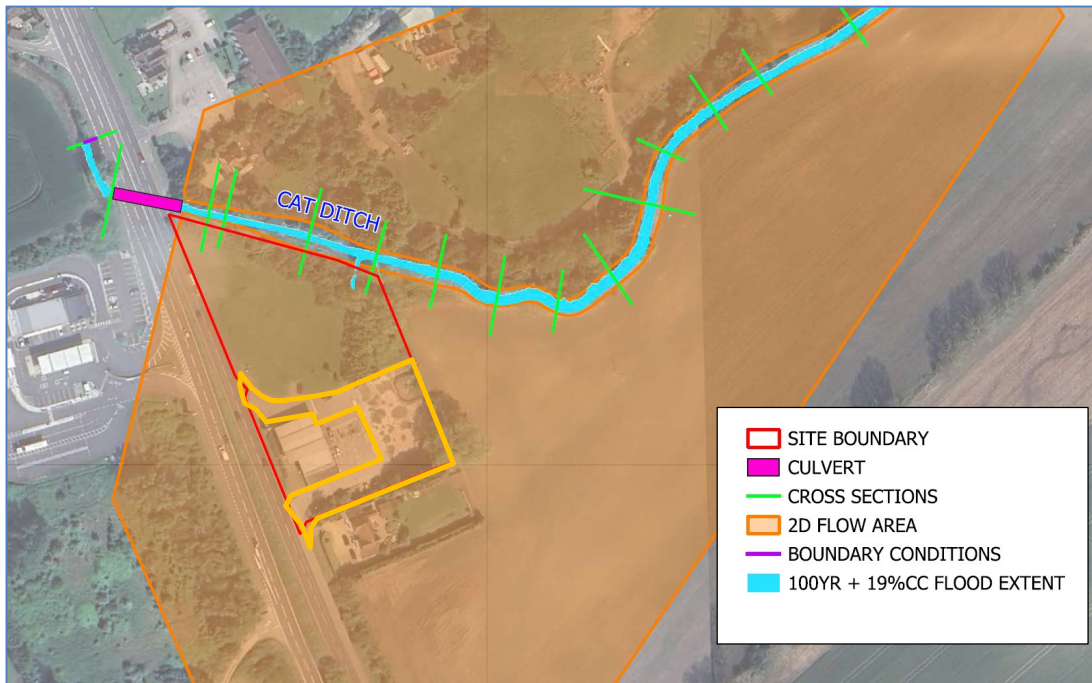


Figure 3. Design Flood Extent, 1.0% Annual Probability + 19% Climate Change (extracted from Gondolin Land & Water FRA⁹)

Figure 4 presents the predicted flood extent during the extreme, 0.1% annual probability flood event. This indicates significant local flooding, with the area of proposed development, in the north-east of the site, predicted to flood. Therefore, based on the bespoke flood modelling, the development footprint lies within medium probability Flood Zone 2. A peak flood water level of approximately 44.6mAOD is inferred within the development footprint during the extreme, 0.1% annual probability event. The site access and egress are not predicted to flood and remain within low probability Flood Zone 1.

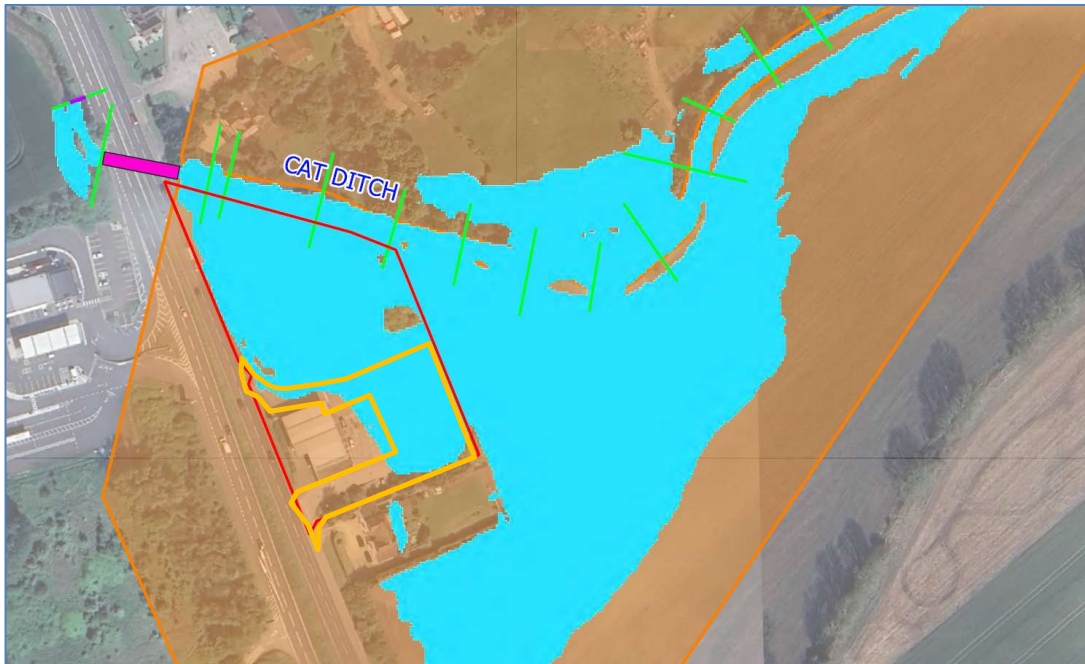


Figure 4. Extreme Flood Extent, 0.1% Annual Probability (extracted from Gondolin Land & Water FRA⁹)

The flood modelling also considered the residual risk of flooding in the event of a blockage of the Cat's Ditch culvert beneath the A1. The model indicates that the proposed development footprint would flood in the event of a 33% blockage of the culvert during the design flood event.

Appropriate flood risk mitigation measures are recommended in Section 2.4.

2.2.2 Other Potential Sources of Flooding

The local SFRA, SWMP and online flood maps have been reviewed to identify any other potential sources of flood risk to the application site and evidence of historic flood events in the local area. This information is presented in Table 1 below.

Table 1: Retail Unit, Northway Service Station – Potential Sources of Flooding

Potential Source	Flood Risk at Application Site	Reasoning
Fluvial Flooding	Medium	Cat's Ditch, an IDB maintained watercourse, passes approximately 50m to the north of the site and the risk of fluvial flooding is assessed in Section 2.2.1. Site-specific hydraulic modelling of Cat's Ditch confirms the development footprint lies within medium probability Flood Zone 2.
Tidal Flooding	None	The application site is not coastal or in the vicinity of a tidal watercourse.
Flooding from High Groundwater	Very Low	The Environment Agency's online long-term flood risk service indicates that flooding from groundwater is 'unlikely' in the local area. The application site is not within an area identified as being at risk of groundwater flooding within the SFRAs. No below ground (basement) development is proposed, therefore the risk of flooding from groundwater is assessed as very low and acceptable.
Surface Water Flooding	Very Low to High	The Environment Agency's online mapping indicates the majority of the site has a very low risk of surface water flooding. Localised depressions within the site are shown to have a high surface water flood risk; this is discussed further below.
Flooding from Artificial Drainage Systems	Low	As detailed below, the application site is not located within a Hertfordshire Council surface water drainage hotspot and there is no record of flooding from any source within or in the vicinity of the site. The site setting is semi-rural and it is assumed that the adjacent developments and trunk road benefit from appropriately designed drainage systems. Therefore, the risk of flooding from drainage systems is assessed as low and acceptable.
Flooding due to Infrastructure Failure	Negligible	The Environment Agency's online mapping confirms that the application site is not within the predicted maximum extent of flooding of local reservoir(s). There are no canals in the vicinity of the site; therefore, the risk of flooding from infrastructure failure is considered negligible.

Table 1 confirms that the only significant potential sources of flooding identified within the application site are fluvial flooding from Cat's Ditch and surface water flooding. The fluvial flood risk is detailed above in Section 2.2.1, with appropriate mitigation measures presented in Section 2.4.

Figure 5 presents the Environment Agency's surface water flood map for the application site. This indicates that the risk of surface water flooding within the majority of the site is very low (<0.1% annual probability of flooding). The low-lying area in the north-east of the site is shown to have a low to high risk of surface water flooding, with rainfall runoff ponding in this area

before overtopping and discharging north into the adjacent drainage ditch. The site survey (Appendix 2) indicates a minimum site level in this area of 43.87mAOD, with overtopping via the northern boundary occurring at an elevation of 44.13mAOD; therefore, peak surface water flood depths of approximately 0.26m would be anticipated based on current site levels.

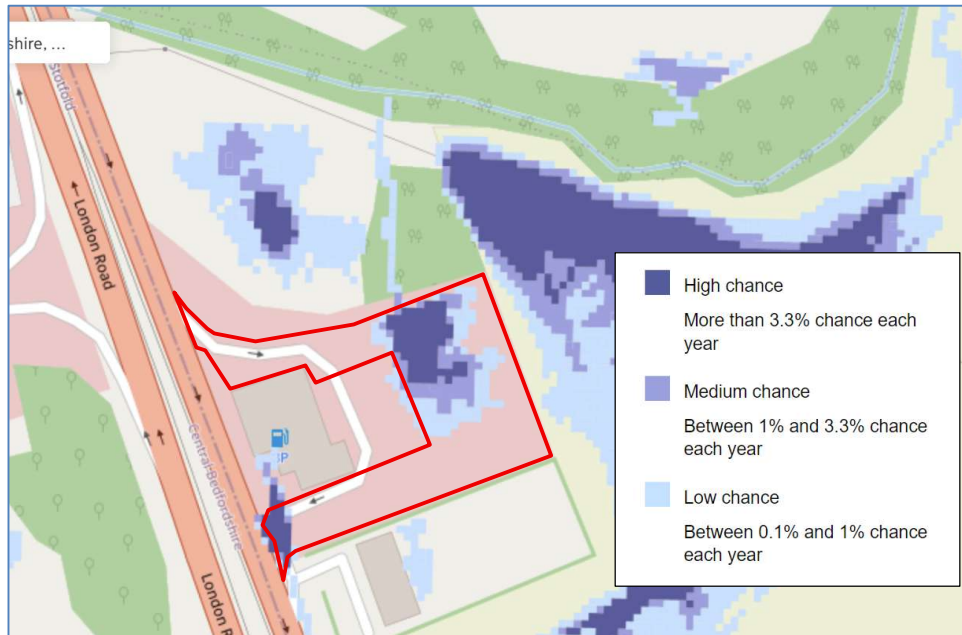


Figure 5. Environment Agency Surface Water Flood Risk Map

Figure 6 presents an extract of the Environment Agency's probable overland flow pathways map, which highlights the likely overland flow routes for surface water, based on LiDAR topographic data. Figure 6 confirms there are no overland flow pathways identified within the application site; therefore, the areas of potential surface water flood risk (Figure 5) are associated with isolated ponding of rainfall runoff and would be managed via appropriate site levels and drainage. The proposed development will benefit from a sustainable surface water drainage strategy, as outlined in Section 2.4.



Figure 6. Environment Agency Probable Overland Flow Pathways

Review of Hertfordshire Council's online Flood Risk Management Viewer confirms the application site does not lie within, or in the vicinity of, a surface water management hotspot.

2.2.3 Historic Flooding

Review of the Environment Agency's online map of recorded flood outlines confirms there is no record of flooding from rivers, groundwater or surface water within, or in the vicinity of, the application site¹¹.

Hertfordshire Council's online Flood Risk Management Viewer (Flood Incident Record) confirms there is no record of flooding from any source within, or in the vicinity of, the application site.

2.2.4 Climate Change

The Environment Agency's climate change allowances guidance¹² confirms that rainfall and river flows are predicted to increase as a result of climate change, which must be considered throughout the lifetime of the proposed development. The application site lies within the Upper and Bedford Ouse Management Catchment, where peak river flows are predicted to increase by between 19% (central allowance) and 58% (upper end allowance) by the 2080s.

The Environment Agency's guidance confirms that the central climate change allowance (19%) is appropriate for less vulnerable development within Flood Zone 2 or 3a. This has been considered within the assessment of fluvial flood risk (Section 2.2.1).

The Environment Agency's climate change allowances guidance also indicates that peak rainfall intensity for the 1% annual probability rainfall event within the Upper and Bedford Ouse Management Catchment is predicted to increase by between 25% (central allowance) and 40% (upper allowance) by the 2070's (2061 to 2125).

The Environment Agency's guidance confirms that drainage systems should be designed for new development to ensure there is no increase in the rate of runoff discharged from the site for the upper end climate change allowance appropriate to the lifetime of the development. A surface water drainage strategy has been prepared for the development, which includes allowance for long-term climate change (refer to Section 2.4).

2.3 Flood Risk Sequential Test & Flood Zone Compatibility

As set out in the NPPF, the aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding from all sources. The proposed development is limited to a retail unit of footprint 73.5m² and is associated with the existing service station. Footnote 62 of the NPPF confirms the sequential test does not apply to minor non-residential extensions of less than 250m²; therefore, the flood risk sequential test does not apply.

The proposed development is classified as 'less vulnerable' with regards flood risk, and the development footprint is located within Flood Zone 2. Table 2 of the NPPF technical guidance for flood risk and coastal change confirms that less vulnerable development is considered appropriate and compatible within Flood Zone 2.

¹¹Environment Agency, (Defra Data Services Platform) Recorded Flood Outlines, revision date: 20th August 2025, accessed 5th September 2025.

¹² Environment Agency, February 2016 (last updated: May 2022), Guidance: Flood Risk Assessments: Climate Change Allowances.

The low residual risk of flooding within the application site during an extreme fluvial flood event is recognised, and appropriate flood risk mitigation measures are recommended in Section 2.4 below.

2.4 Flood Risk Mitigation Measures

The following flood risk mitigation measures are based on the findings of this site-specific FRA and the Environment Agency's guidance for vulnerable development within Flood Zone 2. The site is not predicted to flood during the design fluvial flood event; therefore, there is only a residual risk of flooding during an extreme flood event.

Flood Warning & Evacuation Plan

It is recommended that a Flood Warning and Evacuation Plan be prepared for the development.

The site is not located within an Environment Agency Flood Warning Area but is located with the Flood Alert Area for the River Ivel in Hertfordshire and Central Bedfordshire. The site manager would sign up to the Environment Agency's free Flood Warning Service and would review the Environment Agency's online flood forecast, in the event of severe adverse weather conditions. The Flood Warning and Evacuation Plan would set out appropriate actions to be taken in the event of a flood alert being issued by the Environment Agency, flooding being forecast in the area, or a severe 'red' weather warning for rain being issued by the Met Office.

Surface Water Management

It is recognised that new development has the potential to increase the rate and volume of surface water runoff through the introduction of impermeable surfaces. The development footprint is within an area of existing impermeable tarmac and would not therefore increase surface water runoff rates or volumes. However, in order to reduce the risk of surface water ponding and to appropriately manage surface water runoff, appropriate site levels are proposed, together with a sustainable drainage strategy for the development, prepared by Goodson Associates and reported separately. The drainage strategy shall ensure the management of surface water runoff on-site, to minimise the risk of surface water flooding to the development and to ensure no increased surface water flood risk to others.

Culvert Monitoring and Maintenance

There is a residual risk of flooding in the event of partial blockage of the Cat's Ditch culvert beneath the A1. Therefore, it is recommended that routine visual inspection of the culvert and the open channel of Cat's Ditch along the northern boundary of Northway service station should be undertaken at least six monthly and following named storm events. Any debris or fallen trees/branches within the channel or culvert should be promptly removed, to ensure the flow capacity of the watercourse is maintained. Any further maintenance works should only be undertaken with appropriate IDB consent.

3.0 SUMMARY AND CONCLUSIONS

This report presents a site-specific Flood Risk Assessment to support a proposed retail unit at Northway Service Station, Great North Road (A1 southbound), Hinxworth, Baldock, SG7 5EX.

The Environment Agency flood map for planning indicates that the footprint of the proposed development lies within Flood Zone 3; therefore, a detailed site-specific FRA is required.

The FRA reviews all potential sources of flooding and concludes the only significant potential sources of flood risk identified within the site are fluvial flooding from Cat's Ditch (an IDB maintained watercourse) and surface water flooding. In the absence of detailed flood model data for Cat's Ditch, a bespoke hydraulic model was developed by Gondolin Land & Water. The model results confirm the application site is not predicted to flood during the design event, equivalent to the 1.0% annual probability plus climate change event. The site is however predicted to flood during the extreme 0.1% annual probability event and is also at residual risk of flooding in the event of partial blockage of the Cat's Ditch culvert beneath the A1.

Low-lying areas in the north-east of the site are also at risk of surface water ponding, with site drainage naturally overtopping from this area into the adjacent drainage ditch. No overland flood flow routes are identified within the application site.

Based on the findings of this FRA and the low residual risk of fluvial flooding, the following site-specific mitigation measures are recommended:

- The application site is located within the Environment Agency's Flood Alert Area for the River Ivel in Hertfordshire and Central Bedfordshire, and a Flood Warning and Evacuation Plan is recommended for the development. The Flood Warning and Evacuation Plan would set out appropriate actions to be taken in the event of a flood alert being issued by the Environment Agency, flooding being forecast in the area, or a severe 'red' weather warning for rain being issued by the Met Office.
- Appropriate site levels and a sustainable surface water drainage strategy are proposed and reported separately. The drainage strategy shall ensure the appropriate management of surface water runoff, to minimise the risk of surface water flooding to the development and to ensure no increased surface water flood risk to others.
- There is a residual risk of flooding in the event of partial blockage of the Cat's Ditch culvert beneath the A1. Therefore, it is recommended that routine visual inspection of the culvert and the open channel of Cat's Ditch along the northern boundary of Northway service station should be undertaken at least six monthly and following named storm events. Any debris or fallen trees/branches within the channel or culvert should be promptly removed, to ensure the flow capacity of the watercourse is maintained.

This FRA concludes that, with the proposed mitigation measures, the proposed development of a retail unit, classified as 'less vulnerable development' at the existing Northway Service Station, is appropriate and sustainable with regards to flood risk.

4.0 CLOSURE

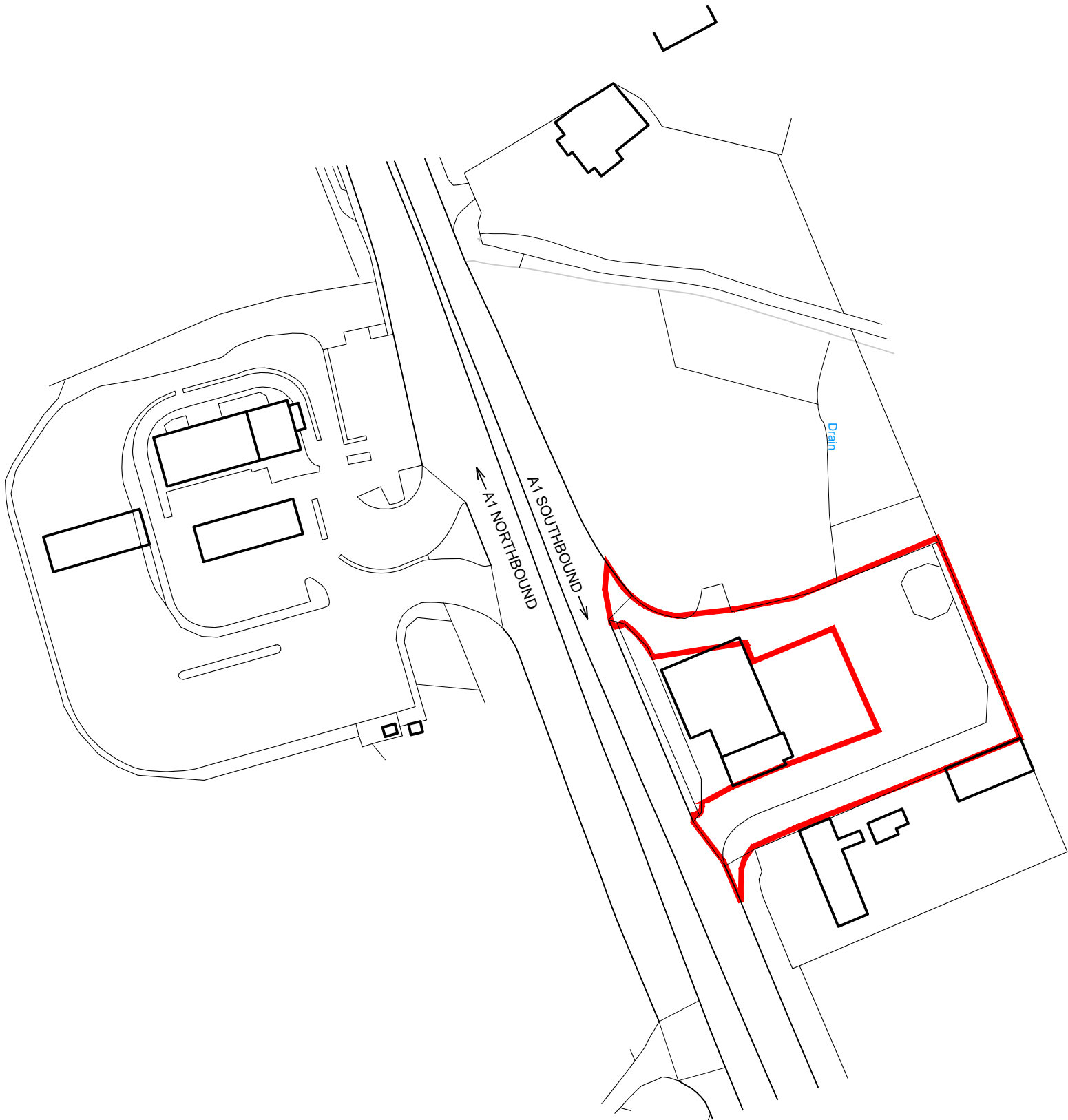
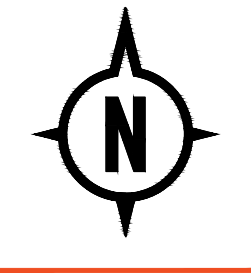
This report has been prepared by Nicola Sugg (trading style of NSugg Limited) with all reasonable skill and care, and in accordance with the services agreed with Welcome Break. Relevant information provided by Welcome Break and ADS Design has been accepted in good faith as being accurate and valid. This report is based on the relevant guidance and legislation in force at the date of the report and should be reviewed if such guidance and legislation are amended or superseded.

NSugg Ltd do not warrant that the advice in this report will guarantee the availability of flood insurance either now or in the future.

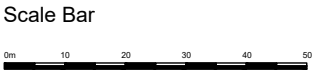
It will be the owner's /occupier's responsibility to ensure the recommended flood risk mitigation measures outlined within this FRA are implemented and to maintain the site drainage system throughout the lifetime of the development.

This report is for the exclusive use of Welcome Break; no warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from Nicola Sugg.

APPENDIX 1



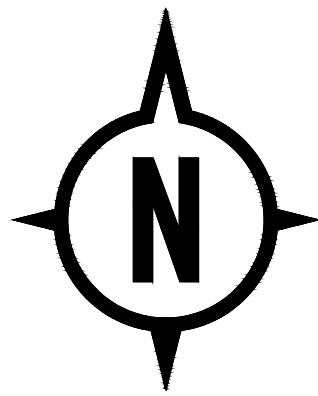
Mapping contents © Crown copyright and database rights 2022 Ordnance Survey 100035207



REVISIONS ^	
CLIENT	WELCOME BREAK
PROJECT	NORTHWAY S/S A1 SOUTHBOUND BALDOCK, SG7 5EX
TITLE	SITE LOCATION PLAN
DATE	01.09.25
SCALE	1:1250 @ A3
JOB ID	2050
DWG	21

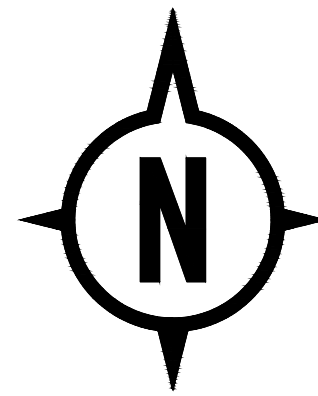
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REVISIONS	
CLIENT	WELCOME BREAK
PROJECT	NORTHWAY S/S GREAT NORTH ROAD (A1 SOUTHBOUND) BALDOCK, SG7 5EX
TITLE	PROPOSED SITE LAYOUT
DATE	01.09.25
SCALE	1:200 @ A1
JOB ID	2050
DWG	23

APPENDIX 3



- Key**
- Site boundary
 - Site Area 2885.8sqm / 0.71acres
 - Black Bitmac finish
 - Stoned with loose chippings
 - Concrete
 - Kerb
 - Pin Kerb
 - Drop Kerb
 - Soft Landscaping
 - Removed



A1 NORTHBOUND

A1 SOUTHBOUND

Existing access from A19 Southbound

Entrance

Existing hardstanding

Pedestrian access from forecourt

Existing fuel forecourt

Existing HGV refuelling

Existing forecourt shop kiosk

Exit

Existing hardstanding

Existing exit onto A19 Southbound

Existing ~2m high close boarded fence

Existing ~2m high close boarded fence

New area of planting

Retain and protect existing trees and hedgerows

Existing Hardstanding

Bin Store

Ramped Access

Retail Unit

GEA = 73.5m²

GIA = 66m²

Existing Redundant LPG Storage Area / Compound

Parking Area

Total Spaces = 11

Inc. DOA Bays = 2

A	05.09.25
	HARDSTANDING REVISED
REVISIONS	
CLIENT	WELCOME BREAK
PROJECT	NORTHWAY S/S GREAT NORTH ROAD (A1 SOUTHBOUND) BALDOCK, SG7 5EX
TITLE	PROPOSED SITE LAYOUT
DATE	02.09.25
SCALE	1:200 @ A1
JOB ID	2050
DWG	23a

APPENDIX 4

Flood risk assessment data

Location of site: 522664 / 238189 (shown as easting and northing coordinates)

Document created on: 12 September 2023

This information was previously known as a product 4.

Customer reference number: FM477EE8593Y

Map showing the location that flood risk assessment data has been requested for.



How to use this information

You can use this information as part of a flood risk assessment for a planning application. To do this, you should include it in the appendix of your flood risk assessment.

We recommend that you work with a flood risk consultant to get your flood risk assessment.

Included in this document

In this document you'll find:

- how to find information about surface water and other sources of flooding
- definitions for the terminology used throughout
- flood map for planning (rivers and the sea)
- information about strategic flood risk assessments
- information about this data
- information about flood risk activity permits
- help and advice

Not included in this document

This document does not include a Flood Defence Breach Hazard Map.

If your location has a reduced flood risk from rivers and sea because of defences, you need to request a Flood Defence Breach Hazard Map and information about the level of flood protection offered at your location from the East Anglia Environment Agency team at enquiries_eastanglia@environment-agency.gov.uk. This information will only be available if modelling has been carried out for breach scenarios.

Include a site location map in your request.

Information that's unavailable

This document **does not** contain:

- historic flooding
- flood defences and attributes
- modelled data
- climate change modelled data

We do not have historic flooding data for this location.

Please note that:

- flooding may have occurred that we do not have records for
- flooding can come from a range of different sources
- we can only supply flood risk data relating to flooding from rivers or the sea

You can contact your Lead Local Flood Authority or Internal Drainage Board to see if they have other relevant local flood information. Please note that some areas do not have an

Internal Drainage Board.

We aren't able to display flood defence locations and attributes as there are no formal flood defences in the area of interest.

There is not any modelled data available for this location. This is because detailed modelling hasn't been carried out in this area.

There is not any modelled climate change data for this location. This is because detailed modelling hasn't been carried out in this area. You will need to consider the [latest flood risk assessment climate change allowances](#) and factor in the new allowances to demonstrate the development will be safe from flooding.

Surface water and other sources of flooding

Use the [long term flood risk service](#) to find out about the risk of flooding from:

- surface water
- ordinary watercourses
- reservoirs

For information about sewer flooding, contact the relevant water company for the area.

Terminology used

Annual exceedance probability (AEP)

This refers to the probability of a flood event occurring in any year. The probability is expressed as a percentage. For example, a large flood which is calculated to have a 1% chance of occurring in any one year, is described as 1% AEP.

Metres above ordnance datum (mAOD)

All flood levels are given in metres above ordnance datum which is defined as the mean sea level at Newlyn, Cornwall.

Flood map for planning (rivers and the sea)

Your selected location is in flood zone 3.

Flood zone 3 shows the area at risk of flooding for an undefended flood event with a:

- 0.5% or greater probability of occurring in any year for flooding from the sea
- 1% or greater probability of occurring in any year for fluvial (river) flooding

Flood zone 2 shows the area at risk of flooding for an undefended flood event with:

- between a 0.1% and 0.5% probability of occurring in any year for flooding from the sea
- between a 0.1% and 1% probability of occurring in any year for fluvial (river) flooding

It's important to remember that the flood zones on this map:

- refer to the land at risk of flooding and do not refer to individual properties
- refer to the probability of river and sea flooding, ignoring the presence of defences
- do not take into account potential impacts of climate change

This data is updated on a quarterly basis as better data becomes available.



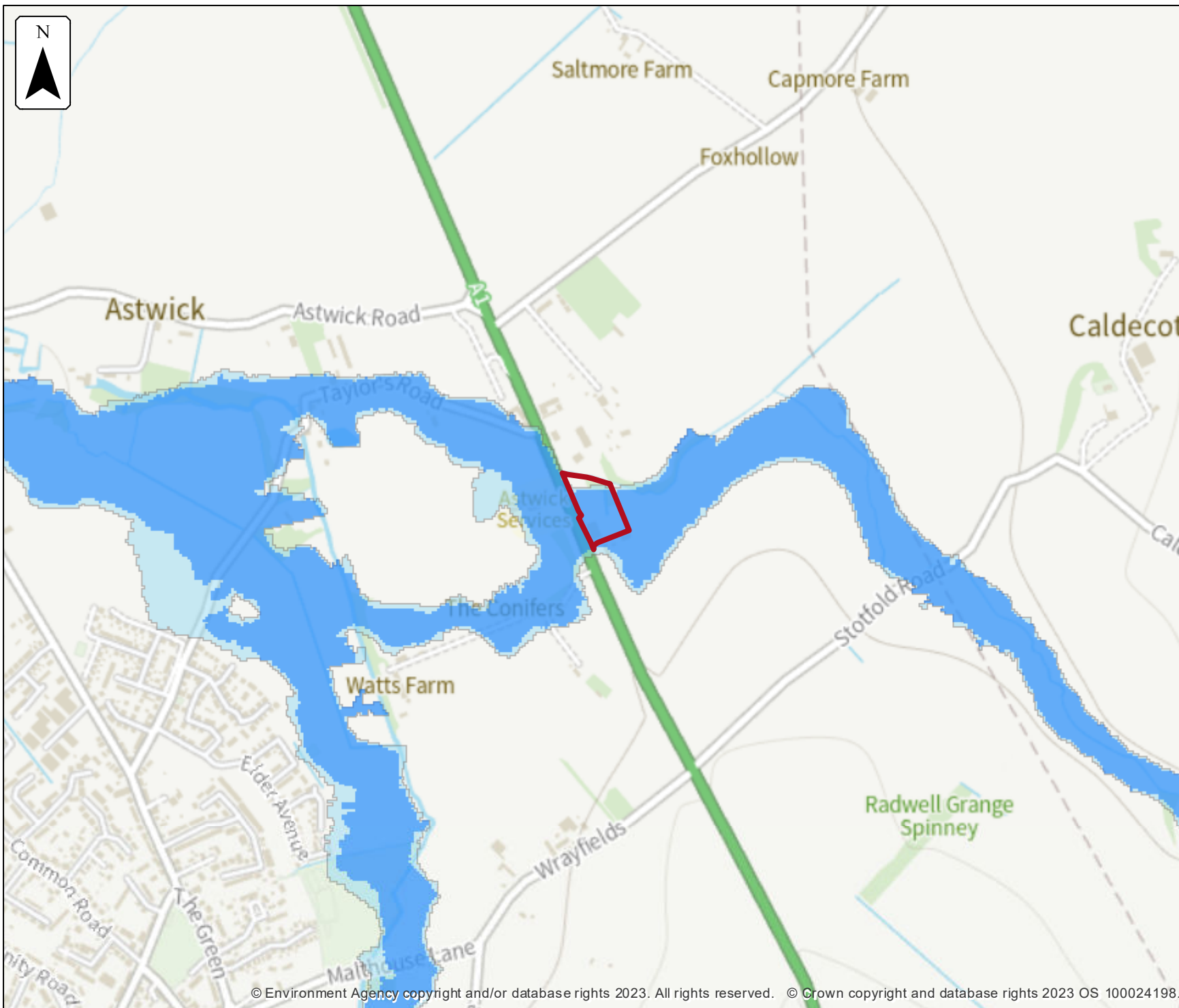
Flood map for planning

Location (easting/northing)
522664/238189

Scale
1:10,000

Created
12 Sep 2023

-  Selected area
-  Flood zone 3
-  Flood zone 2



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Strategic flood risk assessments

We recommend that you check the relevant local authority's strategic flood risk assessment (SFRA) as part of your work to prepare a site specific flood risk assessment.

This should give you information about:

- the potential impacts of climate change in this catchment
- areas defined as functional floodplain
- flooding from other sources, such as surface water, ground water and reservoirs

About this data

This data has been generated by strategic scale flood models and is not intended for use at the individual property scale. If you're intending to use this data as part of a flood risk assessment, please include an appropriate modelling tolerance as part of your assessment. The Environment Agency regularly updates its modelling. We recommend that you check the data provided is the most recent, before submitting your flood risk assessment.

Flood risk activity permits

Under the Environmental Permitting (England and Wales) Regulations 2016 some developments may require an environmental permit for flood risk activities from the Environment Agency. This includes any permanent or temporary works that are in, over, under, or nearby a designated main river or flood defence structure.

[Find out more about flood risk activity permits](#)

Help and advice

Contact the East Anglia Environment Agency team at enquiries_eastanglia@environment-agency.gov.uk for:

- [more information about getting a product 5, 6, 7 or 8](#)
- general help and advice about the site you're requesting data for

RE: Enquiry - Cats Ditch at Northway Service Station, SG7 5EX

Trevor Skelding <Trevor.Skelding@idbs.org.uk>

Fri 10/20/2023 12:28 PM

To: Nicola Sugg <nicola@nsugg.co.uk>

Hi Nicola,

Unfortunately, we do not hold any flood modelling or predicted water levels for this watercourse.

In addition to the 9m Byelaw, any proposed discharge of surface water to this watercourse shall be subject to obtaining the Board's prior consent and shall be restricted to the equivalent of 3 l/s per contributing impermeable hectare.

Regards

Trevor Skelding MSc IEng MICE
Principal Engineer

Bedford Group of Drainage Boards | Vale House | Broadmead Road | Stewartby | Bedfordshire | MK43 9ND



Tel: 01234 767995 | www.idbs.org.uk

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The Bedford Group is a consortium of the Bedfordshire and River Ivel Internal Drainage Board, the Buckingham and River Ouzel Internal Drainage Board and the Alconbury and Ellington Internal Drainage Board.

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From: Nicola Sugg <nicola@nsugg.co.uk>

Sent: Friday, October 20, 2023 9:01 AM

APPENDIX 5



GONDOLIN
Land & Water
Civil Engineering & Environmental Solutions

Welcome Break Northway SS

Flood Risk Assessment Report

Client:	Welcome Break Ltd
Project/Proposal No:	GON.0579.0387
Version:	1
Date:	30/04/2025



Document Information

Project Name:	Welcome Break Northway SS
Document Title:	Flood Risk Assessment
Client Name:	Welcome Break Ltd
Document Status:	Final for Issue
Author:	Annie Steingold
Reviewed:	Stephen Donnan
Approved:	Stephen Donnan
Date:	30/04/2025
Version:	1
Project Number:	GON.0579.0387

Revision History

Version	Date	Authored	Reviewed	Approved	Notes
1	30/04/2025	Annie Steingold	Stephen Donnan	Stephen Donnan	First Issue

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Appendix A – Proposed Development Plan

Appendix B – Photographs

Appendix C - Hydrographs

Drawings

Drawing FRA-001 – Site Location Plan

Drawing FRA-002 – Hydrological Overview

Drawing FRA-003 – Flood Model Overview

Drawing FRA-004 – 100yr Flood Extent

Drawing FRA-005 – 100yr +19%CC Flood Extent

Drawing FRA-006 – 1,000yr Flood Extent

Drawing FRA-007 – 33% Blockage Flood Extent

Drawing FRA-008 – 66% Blockage Flood Extent



1. Introduction

1.1 Preamble

Gondolin Land and Water Ltd (Gondolin) has been appointed by ADS (Yorkshire) Limited (the Agent) on behalf of Welcome Break Ltd (the Client) to prepare a Flood Risk Assessment (FRA) in support of a planning application for the upgrade and extension of the existing Northway Service Station along the Great North Road (A1 southbound), North Hertfordshire, SG5 5EX.

This report addresses any potential flood risk to the property from all possible sources in accordance with best practice and National Planning Policy Framework (NPPF).

The site was visited by an experienced Hydrologist in February 2025 to inform this assessment.

1.2 Site Context

The site is located on land adjacent to, and occupied by the current Northway Service Station, approximately 1.8km northeast of the town of Stotfold and 6.5km south of Biggleswade at approximate NGR: TL 22662 38152. The site is located in the North Herts Council local council authority with Hertfordshire County Council as the Lead Local Flood Authority (LLFA).

The proposed development area is currently comprised of the Northway Service Station (fuelling station and associated infrastructure) alongside a small area of disused grassland. There is agricultural land to the east of the site and the Cat Ditch bounds the site to the north. The west of the proposed development is bound by the A1 Road and the south by a residential property.

The site is accessed via an existing slip road which connects the site to the A1 Road.

A site location plan is included as Drawing FRA-001.

1.3 Development Details

The proposed development is for the upgrade and extension of the existing Northway Service Station. A proposed site plan is included in Appendix A.

1.4 Topography

A topographic survey was conducted by ADS Architects Ltd in September 2023 used in combination with freely available detailed DEFRA 1m LiDAR Data to inform this assessment. Review of the topographic data indicates that the site is largely flat with a slightly raised area in the southwest corner of the site surrounding the existing fuelling station. Another slightly raised area exists in the northeast of the site within the strip of forestry. Natural ground levels range from 44mAOD in the short grass at centre of the site to 45mAOD adjacent to the existing fuelling station in the southwest corner of the site.

1.5 Geology and Hydrogeology

1.5.1 Geology

1.5.1.1 Superficial

Review of the British Geological Survey (BGS)¹ online geology maps indicates that the underlying superficial deposits at the site comprise of both glaciofluvial deposits consisting of sand and gravel in the south of the site and alluvium deposits consisting of clay, silt, sand and gravel in the north of the site. There is also a small area void of superficial deposits in the centre of the site.

¹ British Geological Survey (2025) BGS Geology Viewer. available at: https://geologyviewer.bgs.ac.uk/?_ga=2.112428484.112553508.1726218286-2055959227.1726218286 (accessed on 21st April 2025)



BGS borehole data (Ref: TL23NW117) approximately 50m north of the site confirms the presence of sand, gravel and silt deposits in the area.

Review of the Soilscape² online soil mapping for England and Wales indicates the soil type at the site to consist of freely draining lie-rich loamy soils.

1.5.1.2 Bedrock

Review of the BGS online 1:50,000 bedrock map indicates that the entirety of the site is underlain by the West Melbury Marly chalk bedrock formation comprising of marly chalk and grey limestone.

BGS borehole data (Ref: TL23NW117) approximately 50m north of the site confirms the presence of chalk in the area.

Review of the BGS online geology mapping shows there are no linear features in proximity to the site.

1.5.2 Hydrogeology

Review of the BGS online hydrogeology maps indicates that the underlying geology of the entire site is the grey chalk subgroup rock unit, characterised by a highly productive aquifer and summarised as a 'marly chalk aquifer that can yield up to 5 L/s from wells with headings'.

1.6 Local Hydrology and Existing Drainage Scheme

Review of the Flood Estimation Handbook (FEH) Web Service³ and other available mapping indicates that the Cat Ditch runs along the northern site boundary from east to west before being culverted under the A1 Road and discharging into the River Ivel some 200m downstream. There is an unnamed mapped minor drainage ditch running through the northern half of the site which runs from south to north close to the eastern site boundary. The drainage ditch discharges into Cat Ditch along the northern site boundary. It is noted that during the site visit that the minor ditch is approximately 40m long and has no inflow at its upstream extents and was completely dry during the visit. It is considered that the only inflow to the ditch would be limited to the immediate site surrounds.

The entirety of the site is within the natural surface water drainage catchment of the Cat Ditch (31.6km²) and therefore, ultimately part of the wider River Ivel drainage catchment.

A hydrological summary and catchment characteristics of the Cat Ditch are shown in Table 1 below. The data shown is from the FEH Web Service and the catchment has been delineated from the NGR: TL 22600 38250, a point directly downstream of the site at the culvert under the A1 Road.

Table 1 Cat Ditch Catchment Hydrological Summary

Waterbody Catchment	Area (km ²)	SAAR ¹ (mm)	URBEXT ² (%)	PROPWET ³	SPRHOST ⁴ (%)	ALTBAR ⁵ (m)	FARL ⁶
Cat Ditch	31.66	595	0.0024	0.3	16.98	97	1

¹SAAR = Standard Annual Average Rainfall

²URBEXT = Extent of Urban and Suburban Land Cover

³PROPWET = Proportion of Time the Soil Moisture Deficit (SMD) was equal to, or below, 6mm during 1961-1990

⁴SPRHOST = Standard Percentage Runoff using UK Hydrology of Soil Types (HOST) Classification

⁵ALTBAR = Mean Catchment Altitude

⁶FARL = Flood Attenuation by Reservoirs and Lakes index

The FEH data indicates that Cat Ditch catchment experiences a low SAAR value for an English catchment and that the catchment is mainly rural with the PROPWET value showing that the soils are wet less than half the time. An SPRHOST value of 16.98% indicates a low runoff potential. A FARL value of 1 indicates there is no attenuation by lakes and reservoirs in the catchment.

Drawing FRDA-002 presents a hydrological overview for the site and immediate surroundings.

²LandIS - Soilscape online maps, available at: <https://www.landis.org.uk/soilscales/> (Accessed on 28th April 2025)

³ UK Centre for Ecology and Hydrology (2025) Flood Estimation handbook Web Service, available at: <https://fehweb.ceh.ac.uk/> (accessed on 21st April 2025)



2. Planning & Policy Context

2.1 Overview

This assessment has been completed in accordance with guidance presented within the current National Planning Policy Framework (NPPF).

This report has been prepared in accordance with the advice and requirements prescribed in current best practice documents relating to management of flood risk in development published by the Construction Industry Research and Information Association (CIRIA)⁴, the British Standards Institution (BSI) BS8533⁵ and the Environment Agency (EA) National Standing Advice on Development and Flood Risk⁶.

The assessment also references and takes due consideration (where appropriate) of the following principal guidance and policy documents:

- Environment Agency Flood Risk Assessment Standing Advice (2019);
- British Standards Institution Assessing and managing flood risk in development (2017);
- CIRIA Development and Flood Risk Guidance for the Construction Industry, Report C624 (2004);
- Planning Practice Guidance on Flood Risk and Coastal Change (2022);
- EA Fluvial Design Guide (2021);
- North Hertfordshire District Council Strategic Flood Risk Assessment Update (2016);
- Hertfordshire County Council Local Flood Risk Management Strategy 2019-2029 (2019); and
- Hertfordshire County Council Strategic Flood Risk Assessment Level 1 (2022).

2.2 National Planning Policy

2.2.1 Flood Zone Classification

The definition of EA Flood Zones is provided in PPG Table 1: Flood Zones:

- **Zone 1 - low probability** is defined as land which could be at risk of flooding from fluvial or tidal flood events with less than 0.1% (1:1,000 year) Annual Exceedance Probability (AEP) of occurrence.
- **Zone 2 - medium probability** is defined as land which could be at risk of flooding with an annual probability of occurrence between 1% and 0.1% from fluvial sources and between 0.5% and 0.1% from tidal sources.
- **Zone 3a - high probability** is defined as land which could be at risk of flooding with an annual probability of occurrence greater than 1% (1:100 year) from fluvial sources and greater than 0.5% (1:200 year) from tidal sources.
- **Zone 3b - the functional floodplain** is defined as land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain in agreement with the Environment Agency. However, in general it is defined as land that would flood with an annual probability of 1 in 20 (5%) or greater.

In assessing the Flood Zone Classification, the protection afforded by any flood defence structures is not taken into account by the EA.

⁴ CIRIA Report C624, Development and Flood risk: guidance for the construction industry (October 2004)

⁵ BS8533:2017, Assessing and managing flood risk in development: Code of Practice (December 2017)

⁶ Environment Agency, April 2012, Flood Risk Assessment: Standing Advice (updated March 2019)



Review of the EA Flood Map for Planning indicates that the site is located within Flood Zones 1, 2 and 3.

2.2.2 Flood Risk Vulnerability

With reference to PPG Table 2: *Flood Risk Vulnerability Classification*, whilst service station developments are not specifically addressed, it is considered that they are classified as 'less vulnerable infrastructure' and would fall under the following definition:

"Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'more vulnerable' class; and assembly and leisure."

2.2.3 Flood Risk Compatibility

PPG Table 3: *Flood Risk Vulnerability and Flood Zone 'Compatibility'* (replicated as Table 2 below) confirms that the site is appropriate for 'Less Vulnerable' use in Flood Zones 1, 2 and 3a. It is noted that this is based on an initial review of EA flood maps only which do not account for any flood defences which are known to protect the local area.

Table 2 Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Risk Vulnerability Classification (PPG Table 3)		Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Flood Zone (PPG Table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	Exception Test Required	✓	✓	✓
	Zone 3a	Exception Test Required	X	Exception Test Required	✓	✓
	Zone 3b (functional floodplain)	Exception Test Required	X	X	X	✓

Key: ✓ Development is appropriate x Development should not be permitted

3. Flood Risk Assessment

3.1 Sources of Information

3.1.1 Desktop Study

General data review, project file review, internet search of historical flood incidents, online mapping and site investigation data.

3.1.2 Environment Agency Mapping

Strategic information regarding the current flood risk at the site from various sources has been obtained from the EA website. EA flood mapping indicates areas at flood risk from rivers, the sea, surface water and reservoirs.

3.1.3 Strategic Flood Risk Assessment

Review of local Strategic Flood Risk Assessment (SFRA) reports and associated mapping has been undertaken to inform potential flood risk at the site location from all potential sources.

3.1.4 Historic Flooding

A review of EA Recorded Flood Outlines data has been undertaken to inform the assessment. It is noted that there are no recorded flood events within the site area or immediate vicinity.



3.2 Screening Assessment of Potential Sources of Flood Risk

3.2.1 Overview

There are a number of potential sources of flooding which should be evaluated in accordance with best practice and NPPF such as:

- Flooding from rivers or fluvial flooding;
- Flooding from the sea or tidal / coastal flooding;
- Flooding from land;
- Flooding from groundwater;
- Flooding from sewers; and
- Flooding from reservoirs, canals, and other artificial sources.

The flood risk from each of these potential sources is discussed in the following sections and a 'screening assessment' is presented in Section 3.2.8 which confirms any potential flood risk sources requiring a more detailed analysis and specification of bespoke mitigation measures.

Flood 'risk' definitions within the screening exercise are based on a qualitative technical assessment taking into account the information reviewed, risk to site users and the proposed development itself.

3.2.2 Fluvial Flooding

Review of the EA's Flood Map for planning indicates that the proposed development is situated almost entirely within Flood Zones 2 and 3. This flooding is attributed to the Cat Ditch located to the immediate north of the site.

It is noted that flood mapping in this area is not informed by a site specific model but rather the national generalised modelling approach – JFLOW. Although this modelling has been updated in 2025 it is unlikely to be reliable in the instance given that the site is located immediately adjacent to a culvert beneath the A1 which would not be accurately represented within the JFLOW modelling.

Taking the above into account, it is considered that there is a potential '**High Risk**' of flooding at the site from this source and therefore fluvial flooding will be considered further within the assessment.

3.2.3 Tidal/Coastal Flooding

The site is located sufficiently inland and away from tidally influenced waters to not be affected by tidal/coastal flooding.

Taking the above into account, it is considered that there is a potential '**No Risk**' of tidal flooding at the site.

3.2.4 Flooding from Land (Pluvial or Surface Water Flooding)

Review of the EA's Surface Water Flood Map indicates that there are two small areas at risk of surface water flooding. These areas are localised to depressions across the site and already noted in the fluvial flood extent.

Therefore, the surface water flooding on the site is interlinked with fluvial flooding thus any risk from surface water flooding will be encompassed within the fluvial assessment.

Taking the above into account it is considered that there is '**Low Risk**' of flooding to the site from land (that is not associated and encapsulated within the fluvial flooding assessment), therefore this source will not be considered further in the assessment.

3.2.5 Groundwater Flooding

Review of the EA long term flood risk portal indicates that flooding from groundwater is unlikely in the area. It is noted that nearby boreholes record considerable depths of firm silt deposits which are likely to inhibit the vertical movement of groundwater.



Review of the local SFRA's indicates that there have been no recorded groundwater flood events within or near to the site.

Taking the above into account it is considered that the Proposed Development site is at '**Low Risk**' of groundwater flooding and therefore flooding from this source is not considered further.

3.2.6 Flooding from Sewers / Drainage Systems

Due to the location of the proposed development, there is likely to be roadside drainage along the A1 Road to the west of the site. There is also likely to be public mains serving the existing services building in the south of the site.

These systems are likely monitored and maintained effectively by the management of existing infrastructure therefore, risk of these assets flooding is low.

Taking the above into account, it is considered that there is '**Low Risk**' of flooding to the development site from sewers and/or drainage systems and therefore this source will not be considered further in the assessment.

3.2.7 Flooding from Infrastructure Failure / Blockage

Review of the EA Flood Map for the area indicates that the site is not at risk of reservoir flooding.

There is no other significant infrastructure i.e. culverts, pumping stations, aqueducts etc located upstream or in hydraulic continuity / proximity to the site which may pose a flood risk during a failure scenario.

It is therefore considered that there is '**Low Risk**' of flooding at the site from this source and thus will not be considered further.

3.2.8 Flood Risk Screening Assessment Review

A summary of the potential flood risk to the site from the sources reviewed is presented in Table 3 below.

This 'Screening Assessment' is used to identify if any sources of flood risk are required to be investigated in more detail i.e., a 'Technical' more detailed assessment which may include consideration / specification of bespoke flood mitigation measures for the site development if considered necessary.

Table 3 Flood Risk Screening Assessment

Potential Flood Source	Screening Assessment of Flood Risk at Site ¹	Requiring Further Consideration i.e. Technical Assessment?
Fluvial flooding	High Risk	Yes
Tidal / Coastal flooding	No Risk	No
Flooding from land	Low Risk	No
Groundwater flooding	Low Risk	No
Flooding from sewers / artificial drains	Low Risk	No
Flooding due to infrastructure failure / blockage	Low Risk	No

Notes: ¹only Flood Risks designated as being 'medium' or 'high' warrant further investigation

The Screening Assessment above indicates that fluvial flooding with respect to the Cat Ditch requires further consideration in the context of the proposed development. This is discussed in detail in Section 4. All other sources of flooding have been identified as low risk or lower and therefore will not be considered further.



3.3 Climate Change

3.3.1 Context

The most recent advice on climate change is available online from the EA in "Flood risk assessments: climate change allowances"⁷. This advice supersedes previous climate change allowances to support NPPF and the EA has produced it as the government's expert on flood risk.

The publication confirms that peak rainfall intensity, sea level and peak river flow are all expected to increase in the future. This is based on climate change projections and different scenarios of carbon dioxide emissions to the atmosphere, and thus there are different allowances for various periods of time over the next century.

The guidance recommends that considerations for future climate change are included in FRAs for proposed developments.

3.3.2 Peak River flow

The EA's climate change guidance details uplifts to peak flow to be applied within each management catchment (sub-catchments of river basin districts) in England. Table 4 below replicates the EA's guidance for Peak River flow increases within the Upper and Bedford Ouse Management Catchment.

Table 4 Management Catchment Peak River Flow Climate Change Allowances

Total potential change anticipated for:	Central	Higher	Upper
2020s	5%	10%	24%
2050s	4%	11%	30%
2080s	19%	30%	58%

The proposed development is classified as less vulnerable infrastructure, and to be conservative the "Central" allowance should be applied for the '2080s' of 19%.

This increase in peak river flows has been applied to the technical fluvial assessment to appropriately consider climate change impacts on the Cat Ditch.

4. Technical Flood Risk Assessment

4.1 Introduction

4.1.1 Context

The screening assessment above concludes a potential '**High Risk**' of flooding from fluvial flooding from the Cat Ditch based on review of EA Flood Maps. As such, a detailed technical assessment of fluvial flooding at the site has been undertaken in the form of a detailed site-specific Hydraulic Flood Modelling Study.

4.1.2 Fluvial Flood Risk Overview

The local hydrology described in Section 1.6 of this report highlighted the locality of the Cat Ditch to the site. Given the proximity of the watercourse to the property there is a potential risk of high flows inundating parts of the site as outlined in Section 3.2.2 previously.

⁷Environment Agency (2016) Flood Risk Assessments: Climate Change Allowances (updated May 2022), available online at: <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances> (accessed 21st April 2025)



EA flood maps are not produced at a suitably accurate local scale to be relied upon for site specific assessments and thus a bespoke hydraulic flood model has been constructed to determine the site-specific risk.

4.1.3 Model Selection

To accurately assess the maximum water level that could occur both within the watercourse and out of bank flow, Gondolin have developed a 1D-2D linked hydraulic flood model using the Hydrologic Engineering Centre's River Analysis System (HEC-RAS). Additionally, the hydraulic flood model will assess the modes of flooding (i.e., onset of flooding, preferential flow routes etc.) and the maximum flood extents.

HEC-RAS has been successfully applied across the UK and is a recognised modelling package endorsed by the EA and Local Authorities.

4.1.4 Model Extents

The 1D-2D linked model has been constructed to include all hydraulically significant features within the vicinity of the proposed development for the 1D domain and site area and local surroundings for the 2D domain. Following a site visit undertaken by an experienced Hydrologist, it was determined that the model would include approximately 530m of channel length which encapsulates the full length of the Cat Ditch along the site boundary and adjacent culvert. The upstream extent of the model has been selected at a small bridge upstream of the site as an existing constraint point along the Cat Ditch to enable an accurate representation of flooding within the area of interest.

The 1D domain has been constructed to include a sufficient length of the Cat Ditch both upstream and downstream of the proposed development area. The total 1D reach length is approximately 530m with the site being located within the lower end of the reach.

The 2D domain incorporates the local area adjacent to the north and south overbanks of the Cat Ditch and is extended sufficiently outward from the watercourse to ensure all potential floodplain inundation extents are included within the model. The culvert which channels the Cat Ditch underneath the A1 Road has been included in the model as it is considered hydraulically significant to the site.

An overview of the hydraulic flood model is shown on Drawing FRA-003.

4.2 Data Collection

4.2.1 Model Requirements

The construction of the 1D-2D hydraulic flood model requires a number of data sets and parameters which can be summarised under the following headings:

- Channel topographic sections
- Terrain data
- Hydrological inputs
- Hydraulic boundaries
- Roughness (Manning's n)

4.2.2 Channel Topographic Cross-Sections

Cross-sections of the Cat Ditch channel and immediate overbanks were obtained from the site wide topographic survey and LiDAR data (for areas upstream and downstream of the site).

18no. cross-sections were extracted from the survey data. Cross-sections were extracted at regular intervals and where a significant change in river morphology occurred, such as a change in direction, channel width, channel depths and upstream / downstream of any structure. This allows the channel to be accurately represented within the 1D domain.



4.2.3 Terrain Data

To assess out of bank flows within the model, terrain data must be applied to the model that accurately represents the local topography. Terrain data was predominantly defined by the topographic survey. This data was supplemented by detailed LiDAR data from DEFRA Survey data for areas beyond the site extents.

4.2.4 Hydraulic Structures

Hydraulic structures within the model extents have been appropriately accounted for within the hydraulic flood model. All relevant structures have been surveyed as part of the topographic survey and measurements were undertaken during the site walkover.

The culvert which channels the Cat Ditch underneath the A1 Road (3m wide road deck) has been included in the model as it is considered hydraulically significant to the site. NGR reference: TL 22598 38264.

Appendix B includes a collection of photographs of the structures and general watercourse photographs.

4.2.5 Hydrological Inputs

The hydrological inputs used in the model are detailed within Section 4.3 of the report.

4.2.6 Hydraulic Boundaries

A single inflow and outflow hydraulic boundary (boundary condition) was applied within the 1D domain of the hydraulic flood model.

- 1D Inflow Boundary: Flow hydrograph to represent the inflow into the model at a small bridge upstream of the site. Inflow location has been located sufficiently upstream of the site to ensure flood extents are accurately captured.
- 1D Outflow Boundary: Normal Depth boundary to represent the outflow location of the 1D domain northwest of the site along the Cat Ditch after the culvert under the A1. The outflow location has been located sufficiently upstream of the site to ensure flood extents are accurately captured.

4.2.7 Roughness (Manning's n)

Channel and floodplain roughness were represented within the model by values of Manning's n . All values were chosen from standard values published in texts such as Chow⁸, in comparison with photographs collected during site visits / provided by the survey team, satellite imagery and from professional experience / judgement.

4.3 Hydrological Analysis

4.3.1 Overview

The FEH offers two principal methods of flood flow estimation; the Rainfall-Runoff Method and the Statistical Method. The Statistical Method estimates peak flow for a catchment for a given annual exceedence probability (AEP) event using a combination of historic gauging station data and catchment descriptors. The Rainfall-Runoff Method estimates the response of a catchment to a rainfall event of a given AEP and generates a peak flow based entirely on catchment descriptors.

The FEH is supported by WINFAP-FEH (WINFAP) and the Revitalised Flood Hydrograph V.2 (ReFH2) software applications published by Wallingford Hydrosolutions⁹ which are used in combination with the FEH Web Service.

⁸ Chow, V.T., Open Channel Hydraulics, 1959

⁹ <https://www.hydrosolutions.co.uk/software/>



The WINFAP software supports the statistical procedures for flood frequency estimation, using historic annual maxima data alongside catchment descriptors. The latest version of WINFAP, version 5.0, has been used in this study in conjunction with the latest version of WINFAP data files.

In accordance with EA guidance, the ReFH2 method is considered most appropriate for permeable catchments. A catchment is considered to be permeable when it has a BFIHOST values greater than 0.65. The BFIHOST value for the Cat Ditch catchment has been derived from the FEH Webservice as 0.786.

After review, the ReFH2 estimates are higher than those calculated using the WINFAP method. Therefore, to take a more conservative approach the ReFH2 estimates have been considered more appropriate for this assessment.

Catchment characteristics of the Cat Ditch outlined in Table 1 obtained from the FEH Web Service have been used within the hydrological analysis.

4.3.2 Revitalised Flood Hydrograph V.2 (ReFH2)

The catchment associated with the modelled reach of the Cat Ditch has been applied to the ReFH2 software to estimate peak flows for a range of AEP events and their respective hydrographs.

The hydrographs produced from the analysis are used as the basis of the upstream boundary conditions of the hydraulic flood model.

Table 5 below provides the peak flow estimate for a range of typical return periods. The peak flows shown are for a critical storm duration of 13 hours to produce the most conservative estimate of peak flow.

Table 5 ReFH2 Peak Flow Estimation Summary

Return Period (years)	AEP (%)	Peak Flow (m ³ /s)
2	50	0.9
10	10	1.59
50	5	2.31
100	1	2.70
100 +19% CC	0.5	3.21
1,000	0.1	5.87

4.3.3 Adopted Peak Flows and Model Hydrographs

ReFH2 has been selected as the preferred method for peak flow estimations to be used within the hydraulic flood model.

Final adopted hydrographs for the reported design events modelled (100-year and 100-year plus climate change) are presented in Appendix C. It is noted that the 1,000-year event has also been modelled for residual risk calculation as it is the worst-case event.

4.4 Model Implementation

4.4.1 1D Model Build

The 1D domain within the hydraulic flood model includes approximately 530m of the Cat Ditch.

Channel geometry has been created using the extracted cross-sections from the topographic survey data. All structures detailed in Section 4.2 have been modelled within the 1D domain.

1no. inflow boundary condition at the upstream 1D domain extents has been included as a flow hydrograph. A single 1D domain outflow boundary condition has been applied to the downstream model extents and is represented as a normal depth boundary.



4.4.2 2D Model Build

The 2D extents of the hydraulic flood model include the channel, overbanks and potential floodplain extents of the Cat Ditch. The 2D domain consists of 2no. 2D flow areas to represent the left overbank and right overbank of the Cat Ditch.

It is noted that for certain residual risk model runs (blockage scenarios and 1,000year event), 2D outflow boundaries were applied to the model to prevent glass walling at the edge of the computation extents. The outflow boundaries were selected at locations where any flood waters would continue downstream and no longer affect the site (e.g., once they overtop the A1).

4.4.3 1D/2D Model Build

The 1D reach within the hydraulic flood model has been connected to 2D flow areas at the overbanks using lateral structures. These structures allow flow to transition between the 1D and 2D domains of the hydraulic flood model. These parameters best represent the application of the lateral structures within the hydraulic flood model, i.e., overland flow escaping the main channel and no physical structure present.

4.5 Model Results

Model runs have been undertaken for the 100 year, 100 year plus climate change and 1,000 year events. Review of the model results are described below and represented in the following drawings:

- FRDA-004: 100 Year Flood Extent
- FRDA-005: 100 Year Plus 19% Climate Change Flood Extent
- FRDA-006: 1000 Year Flood Extent

Section 4.3 indicates that the 100-year plus climate change event is the design event for Less Vulnerable infrastructure and also yields the highest peak flow estimate (apart from the 1,000-year event) and thus this event was assessed in further detail.

During both the 100-year and 100-year plus climate change events there is no flooding at the site or within the 2D flow area. The watercourse remains within the banks of the Cat Ditch for the entirety of the duration of the storm event. There is a small amount of water observed to back up into the minor drain within the site.

In light of the results above indicating that the site is not at risk from flooding in the 100-year or 100-year plus climate change events, the site is considered to be suitable for development. In accordance with EA and relevant technical flood risk guidance – 'Flood Management' measures are outlined in Section 4.8.

The hydraulic model indicates that results show the site is at risk from flooding during the 1,000 year AEP event. During this event the model shows flooding across the majority of the site. Flood depths vary from 0-0.7m, the deepest section of flooding existing south of the ditch within the east of the flood extent. Thus, there is residual risk to the proposed development from the 1,000 year AEP event which is further discussed in Section 4.8.

4.6 Sensitivity Analysis

4.6.1 Overview

EA Fluvial Design guidance recommends that key parameters in any hydraulic flood model should be varied to ensure model performance, given the inherent uncertainty in the modelling process.

The following parameters and variable have therefore been varied with the impact to the model performance assessed for the 100-year plus Climate Change event:

- Channel and floodplain roughness
- Downstream boundary conditions
- Blockage Scenarios



Sensitivity analysis on the model inflows has already been assessed in that a range of model inflows for a variety of return periods were ran to ensure model stability.

4.6.2 Channel and Floodplain Roughness

Manning's values within the hydraulic flood model have been varied by $\pm 20\%$ as part of the sensitivity analysis. The change in water level was within $\pm 0.11\text{m}$ at all modelled cross-sections. The analysis demonstrates that the model is insensitive to changes in Manning's n values.

4.6.3 Downstream Boundary Conditions

The normal depth downstream boundary conditions within the hydraulic flood model have been varied by $\pm 20\%$ as part of the sensitivity analysis. No changes in water levels were observed at cross-sections upstream of the site. Small changes in water levels within $\pm 0.05\text{m}$ were observed upstream of the A1 culvert adjacent to the site. Downstream of the A1 culvert, changes in water levels are within $\pm 0.07\text{m}$. The analysis demonstrates that the model is insensitive to changes in normal depth values at the downstream boundary condition.

4.6.4 Blockage Scenarios

Two blockage scenarios of the A1 culvert have been modelled to assess the impact to the flooding extents within the model. A 33% and 66% blockage scenario were run. The results of these are presented in Drawings FRA-007 and FRA-008.

Two blockage scenarios were considered appropriate as the upper part of the catchment is very rural and travels through unobstructed arable land use. Therefore, other than silt there is not an excess of material to be carried down the ditch and block the culverts. There is a strip of forestry in the eastern part of the site which could contribute forest material. Therefore, in the unlikely event of a blockage, two scenarios have been run. Thus, the extent of blockage risk is local to the model extents only. It is noted that standard practice when applying a blockage percentage is to consider the site setting, blockages of 10% up to 100% can typically be applied.

As expected, the inclusion of blockage within the A1 culvert of the system results in an increase in flood risk to the site. The hydraulic model shows that 33% blockage scenario results in some flooding of the site. The majority of the flooding exists in the grass area in the centre of the site within the topographical depression with flood depths of 0.1-0.2m. There is also some flooding associated with the ditch running in the northern half of the site with flood depths of 0.1-0.25m at the southern end of the ditch.

The inclusion of the 66% blockage at the A1 culvert results in flooding of the entirety of the site excluding the raised area in the southwest of the site at the existing fuelling station. Most of the flood depth sits around 0.5m across the site with a maximum depth of 0.9m south of the ditch and at the grass area in the centre of the site.

As such, this indicates a residual risk to the site which is discussed further in residual risk section 4.8 below.

4.7 Mass Balance

It is noted that all hydraulic flood modelling of this nature carries inherent uncertainty, thus flood modelling guidance recommends that mass balance errors should be less than 1%. This check ensures the model is not gaining or losing inappropriate amounts of water volume. Mass errors were reviewed for the design events modelled.

All modelled scenarios exhibited mass balance errors of approximately 0.01% or less.

As such, there is very high confidence in the developed hydraulic flood model results used to inform the flood risk to the site.

4.8 Flood Management Measures

A summary of proposed Flood Management Measures for the development are outlined in the following sections.



4.8.1 Access and Egress

Safe pedestrian access and egress should be provided to the site during extreme flood events so that staff and users of the site can be safely evacuated in terms of flood.

As per the site plan the site access route will be using existing road infrastructure from the south of the site, far outside any modelled flood extent and away from the watercourse. Therefore, safe pedestrian (and vehicular) access and egress is afforded to the site at all times and is therefore considered to be satisfied.

4.8.2 Flood Emergency and Response Plan

A detailed flood emergency / response plan will be prepared by the applicant in consultation with a flood expert. These internal procedures should be integrated into the site operating plan and included within the staff training packs.

External contractors visiting / working on site should also be made aware of the potential flood risks as part of their induction pack.

As part of the development flood emergency / response plan, a responsible person for the Applicant will sign up to the local flood alert line (River Ivel) and Met Office weather warning service and disseminate information to staff and users of the site ahead of potential extreme flood events.

It is recommended that routine culvert clearing maintenance is undertaken to reduce the risk of blockage. The wider site should be kept clean and any material storage should be secured to prevent any materials entering the watercourse and posing a blockage risk.

4.8.3 Signage

Appropriate guidance should be provided to staff and users, including clear signage showing the safe access and egress routes (i.e. at the main site access).

4.8.4 Residual Risk

As mentioned in section 4.5 and 4.6 the model indicates that the site may be at risk during the 1000-year event as well as the 33% and 66% blockage scenarios. As such, a robust FAP should be prepared to protect any users of the site in this unlikely event. As mentioned in section 4.9 below, live flood alerts and warnings in the area can be accessed. It is noted that if a flood alert is issued this does not mean the site will flood. Only if the storm event reaches the 1 in 1000yr event or the culvert blocks will the proposed development be at risk of flooding. In case of a flood alert, river levels should be monitored via nearby river gauging stations and only if necessary, should action be taken.

Evacuation and site shut down will only be necessary with a 'Red Weather Warning', defined by the Met Office¹⁰ as:

"Dangerous weather is expected ... It is very likely that there will be a risk to life, with substantial disruption to travel, energy supplies and possibly widespread damage to property and infrastructure. You should avoid travelling, where possible, and follow the advice of the emergency services and local authorities."

Therefore, only essential travel will be in action and use of the site will be limited. Thus, if evacuation becomes necessary the commercial impact will be limited.

4.9 Flood Action Planning

In order to ensure that those responsible for operations onsite are better prepared to respond in an emergency and to reduce the impact of a flood event, a well-defined Flood Action Plan (FAP) should be prepared for the site.

A FAP would detail actions to be undertaken before a flood, actions to be taken in the event of a flood and actions to be taken following a flood event to ensure the safety of personnel.

¹⁰ Met Office (2025) Weather Warnings Guide, available at: <https://weather.metoffice.gov.uk/guides/warnings> (accessed on 21st April 2025)



It is expected that a detailed FAP would be developed at the post planning stages and an outline FAP is provided below.

4.9.1 Flood Warning and Flood Alert Procedures

The UK Government flood warning information service is freely available to all residents and business and provides "flood alerts" and "flood warnings" to monitored locations known to be at flood risk.

A flood alert indicates that flooding is possible, and an area should be prepared, implementing any temporary mitigations or defences, and staying up to date with the latest flood alerts. When a flood warning is issued, this indicates a greater level of severity – a flood is anticipated, and immediate action should be taken.

The development site is located within the Flood Alert Area for the River Ivel in Hertfordshire and Central Bedfordshire. Nearby network monitoring stations are also available to provide live updates on river levels, the closest being the "River Hiz at Arlesey". This information provides live updates on water level within the river and an indication of at which level flooding is anticipated.

4.10 Summary of Technical Flood Risk Assessment

The Flood Risk Screening Assessment undertaken in Section 3.1 identified that further assessment was required to determine the flood risk to the site in respect to the fluvial flooding from the Cat Ditch.

As such, a bespoke 1D/2D hydraulic flood model was developed for the site. This bespoke model has been developed in accordance with EA Fluvial Design Guide and has been constructed using present day detailed terrain and river survey information, including topographical survey data of the site area and local surroundings. The hydrological inputs to the model have been based on recognised flood estimation methods and two methods have been undertaken for comparison purposes and the most appropriate method has been adopted for the assessment.

During both the 100-year and 100-year plus climate change events there is no flooding at the site or within the 2D flow area. The watercourse remains within the banks of the Cat Ditch for the entirety of the duration of the storm event.

There is considered to be residual flood risks to the site as a result of the a potential culvert blockage scenario or the extreme 1,000 year flood event. An outline flood action plan has been prepared to demonstrate suitable actions to take place in the event of the impending flood.

Taking all the above into account, it is considered that the proposed development is suitable, safe and sustainable in flood risk planning terms.

5. Closure

Gondolin Land and Water Ltd (Gondolin) has been appointed by ADS (Yorkshire) Limited (the Agent) on behalf of Welcome Break Ltd (the Client) to prepare a Flood Risk Assessment (FRA) in support of a planning application for the upgrade and extension of the existing Northway Service Station along the Great North Road (A1 southbound), North Hertfordshire, SG5 5EX.

The Flood Risk Screening Assessment undertaken identified that further assessment was required to more accurately quantify the potential fluvial flood risk to the site from the Cat Ditch. No other flood risk sources required further assessment / consideration.

As such, a bespoke 1D/2D hydraulic flood model was developed for the site to more accurately understand the potential fluvial flood risk. This bespoke model has been developed in accordance with EA Fluvial Design Guide and has been constructed using present day detailed terrain and river survey information, including ground survey data of the site area and local surrounds. The hydrological inputs to the model have been based on recognised flood estimation methods and two methods have been undertaken for comparison purposes and the most appropriate method has been adopted for the assessment.

During both the 100-year and 100-year plus climate change events there is no flooding at the site or within the 2D flow area. The watercourse remains within the banks of the Cat Ditch for the entirety of the duration of the storm event.



There is considered to be residual flood risks to the site as a result of the a potential culvert blockage scenario or the extreme 1,000 year flood event. An outline flood action plan has been prepared to demonstrate suitable actions to take place in the event of the impending flood.

Taking all the above into account, it is considered that the proposed development is suitable, safe and sustainable in flood risk terms.



Appendix A

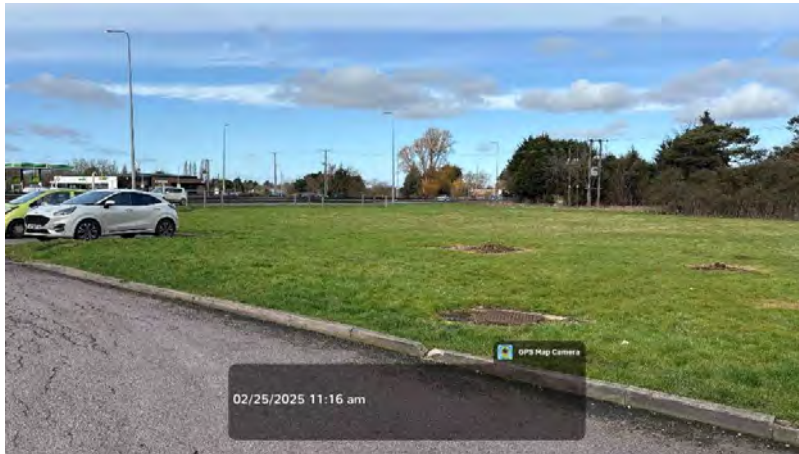
Proposed Development Plan





Appendix B

Photographs



Photograph 1 View of site from southeast facing north



Photograph 2 Southern opening of the dry Unnamed Minor Ditch



Photograph 3 Discharge of Unnamed Minor Ditch into the Cat Ditch along the northern site boundary



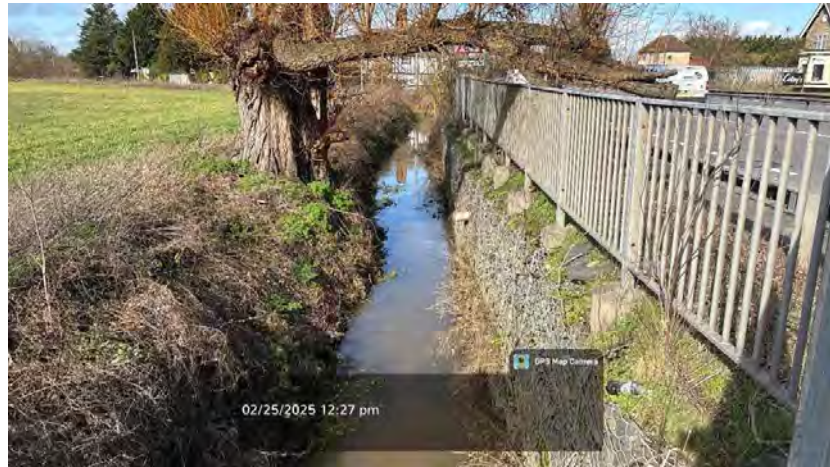
Photograph 4 View of Cat Ditch downstream



Photograph 5 View of upstream face of A1 culvert



Photograph 6 View of downstream face of A1 culvert (other side of A1)



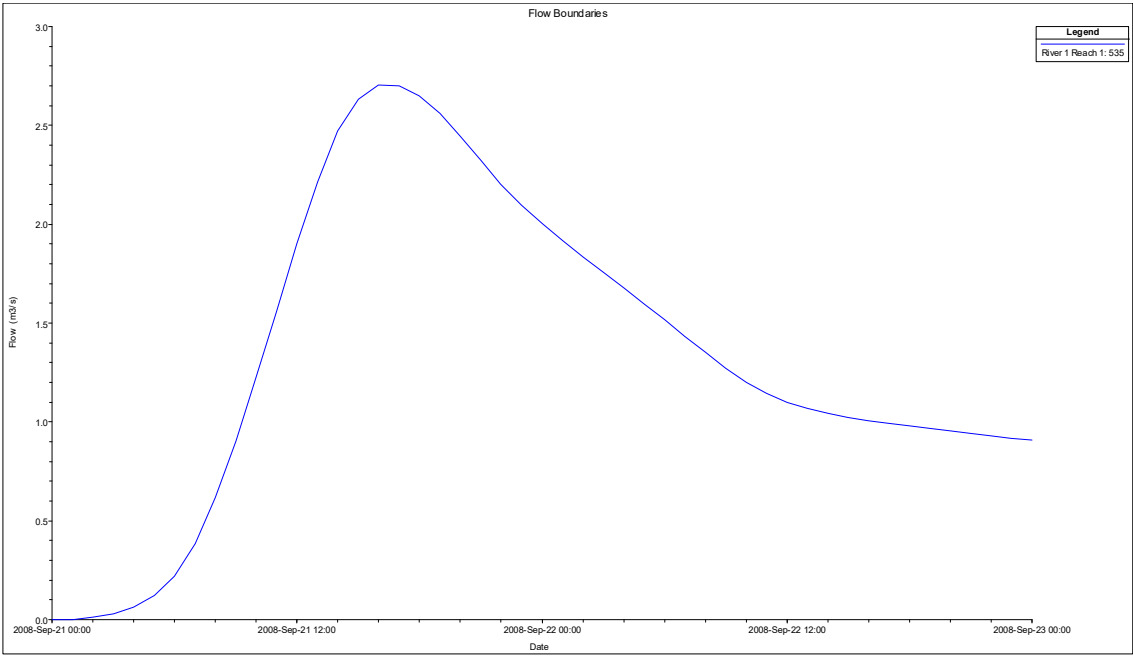
Photograph 7 Downstream of the A1 culvert



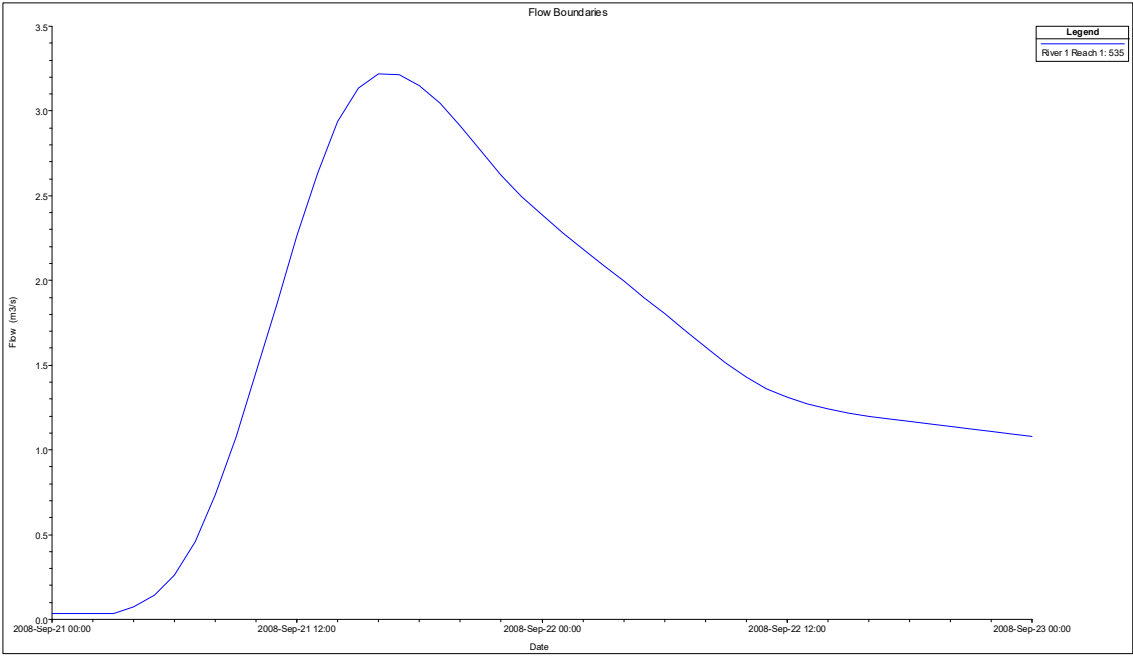
Appendix C

Hydrographs

100 – Year Hydrograph

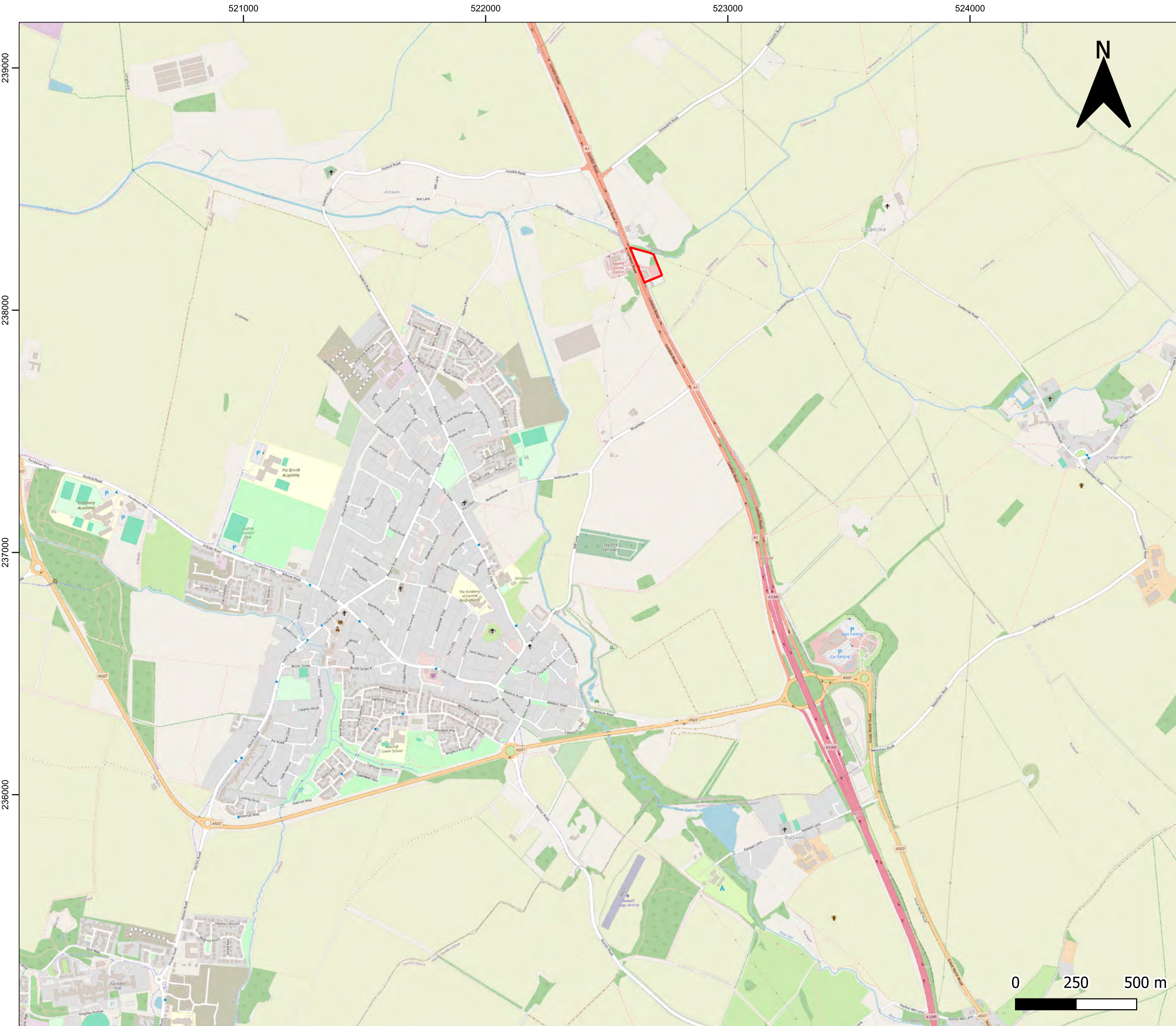


100 – Year Plus 19% Climate Change Hydrograph





Drawings



LEGEND

SITE BOUNDARY

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REV	DATE	DESCRIPTION	BY	CHK

CLIENT:
WELCOME BREAK LTD

PROJECT:
WELCOME BREAK NORTHWAY SERVICES

DRAWING TITLE:
SITE LOCATION PLAN

SCALE: 1:15,000@ A3	DATE: APRIL 2025
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DRAWING NUMBER: FRA-001	REV: 00
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DRAWING STATUS:
FOR PLANNING

GONDOLIN LAND & WATER LTD
15 Quayside St
Edinburgh
EH6 6EJ
Registered Company No. SC706920



GONDOLIN
Land & Water
The engineering & construction business



LEGEND

- SITE BOUNDARY
- WATERCOURSE
- DITCH
- CULVERT

00	04/25	INITIAL ISSUE	AS	SD
REV	DATE	DESCRIPTION	BY	CHK

CLIENT:
WELCOME BREAK LTD

PROJECT:
WELCOME BREAK NORTHWAY SERVICES

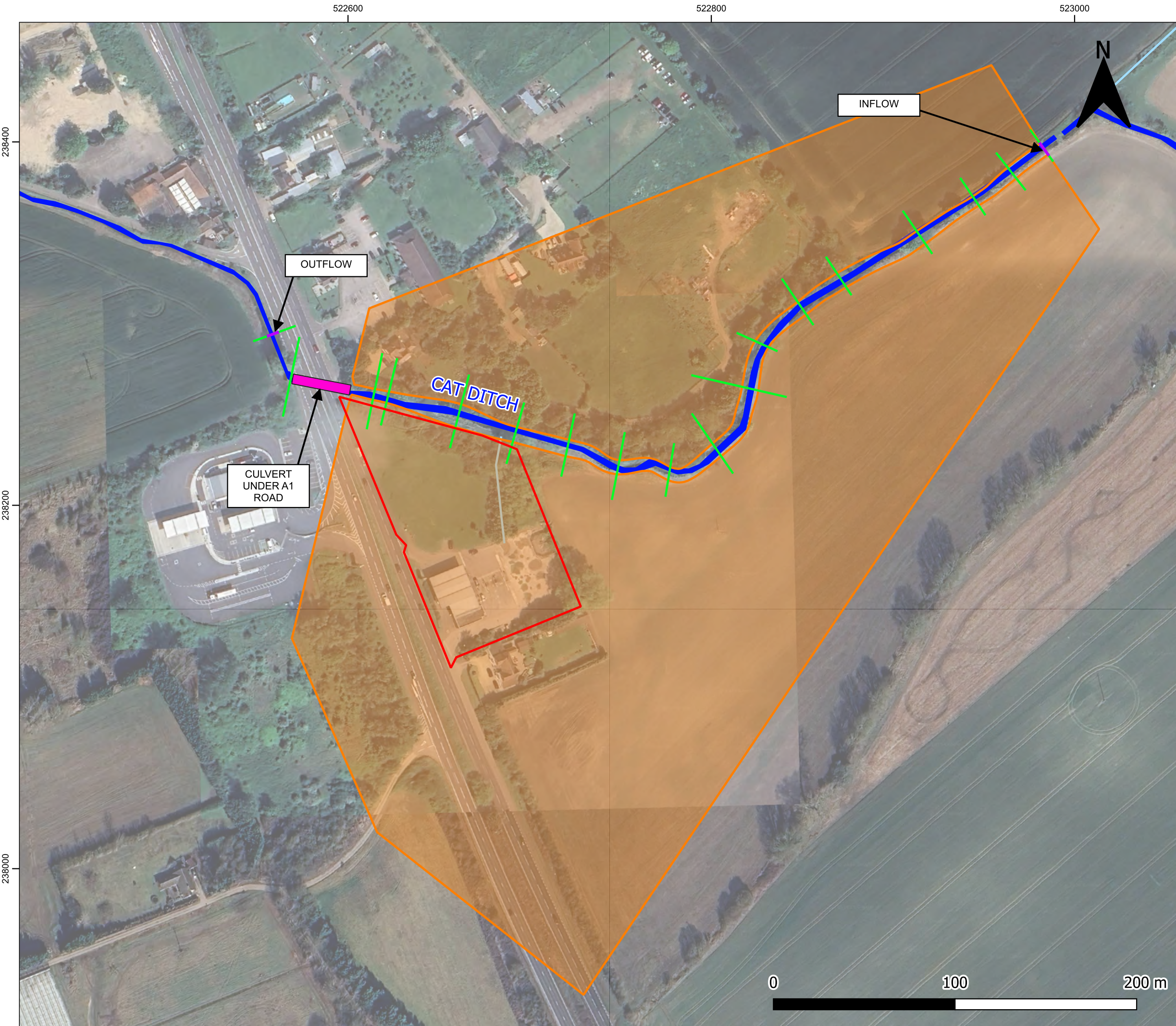
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HYDROLOGICAL OVERVIEW

SCALE: 1:1,000 @ A3	DATE: APRIL 2025
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DRAWING NUMBER: FRA-002	REV: 00
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DRAWING STATUS:
FOR PLANNING

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- LEGEND
- SITE BOUNDARY
 - WATERCOURSE
 - DITCH
 - CULVERT
 - CROSS SECTIONS
 - 2D FLOW AREA
 - BOUNDARY CONDITIONS

00	04/25	INITIAL ISSUE	AS	SD
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PROJECT: WELCOME BREAK NORTHWAY SERVICES				
DRAWING TITLE: FLOOD MODEL OVERVIEW				
SCALE: 1:2,000 @ A3			DATE: APRIL 2025	
DRAWING NUMBER: FRA-003				REV: 00
DRAWING STATUS: FOR PLANNING				
GONDOLIN LAND & WATER LTD 15 Quayside St Edinburgh EH6 6EJ Registered Company No. SC706920			 GONDOLIN Land & Water the engineering & environmental business	



LEGEND

- SITE BOUNDARY
- CULVERT
- CROSS SECTIONS
- 2D FLOW AREA
- BOUNDARY CONDITIONS
- 100YR FLOOD EXTENT

00	04/25	INITIAL ISSUE	AS	SD
REV	DATE	DESCRIPTION	BY	CHK

CLIENT:
WELCOME BREAK LTD

PROJECT:
WELCOME BREAK NORTHWAY SERVICES

DRAWING TITLE:
100YR FLOOD EXTENT

SCALE: 1:2,000 @ A3	DATE: APRIL 2025
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DRAWING NUMBER: FRA-004	REV: 00
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DRAWING STATUS:
FOR PLANNING

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- LEGEND
- SITE BOUNDARY
 - CULVERT
 - CROSS SECTIONS
 - 2D FLOW AREA
 - BOUNDARY CONDITIONS
 - 100YR + 19%CC FLOOD EXTENT

00	04/25	INITIAL ISSUE	AS	SD
REV	DATE	DESCRIPTION	BY	CHK
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PROJECT: WELCOME BREAK NORTHWAY SERVICES				
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DRAWING NUMBER: FRA-005				REV: 00
DRAWING STATUS: FOR PLANNING				
GONDOLIN LAND & WATER LTD 15 Quayside St Edinburgh EH6 6EJ Registered Company No. SC706920			 GONDOLIN Land & Water the engineering & environmental business	



LEGEND

- [Red line] SITE BOUNDARY
- [Magenta box] CULVERT
- [Green line] CROSS SECTIONS
- [Orange box] 2D FLOW AREA
- [Purple line] BOUNDARY CONDITIONS
- [Cyan box] 1000YR FLOOD EXTENT

00	04/25	INITIAL ISSUE	AS	SD
REV	DATE	DESCRIPTION	BY	CHK

CLIENT:
WELCOME BREAK LTD

PROJECT:
WELCOME BREAK NORTHWAY SERVICES

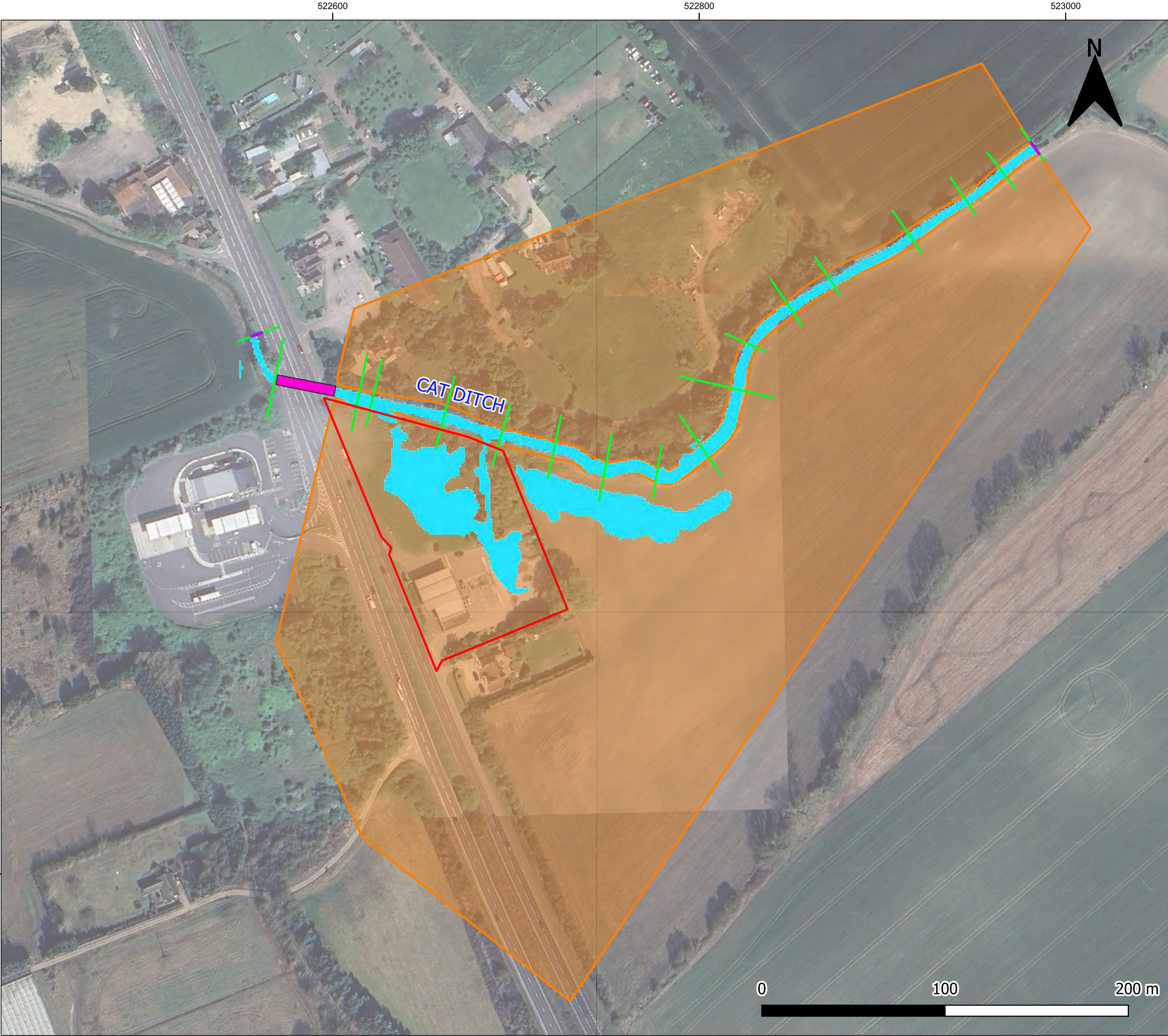
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SCALE: 1:2,000 @ A3	DATE: APRIL 2025
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DRAWING NUMBER: FRA-006	REV: 00
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DRAWING STATUS:
FOR PLANNING

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- LEGEND
- SITE BOUNDARY
 - CULVERT
 - CROSS SECTIONS
 - 2D FLOW AREA
 - BOUNDARY CONDITIONS
 - 33% BLOCKAGE FLOOD EXTENT

00	04/25	INITIAL ISSUE	AS	SD
REV	DATE	DESCRIPTION	BY	CHK
CLIENT: WELCOME BREAK LTD				
PROJECT: WELCOME BREAK NORTHWAY SERVICES				
DRAWING TITLE: 33% BLOCKAGE FLOOD EXTENT				
SCALE: 1:2,000 @ A3		DATE: APRIL 2025		
DRAWING NUMBER: FRA-007			REV: 00	
DRAWING STATUS: FOR PLANNING				
GONDOLIN LAND & WATER LTD 15 Quayside St Edinburgh EH6 6EJ Registered Company No. SC706920		 GONDOLIN Land & Water the engineering & environmental business		



- LEGEND
- SITE BOUNDARY
 - CULVERT
 - CROSS SECTIONS
 - 2D FLOW AREA
 - BOUNDARY CONDITIONS
 - 66% BLOCKAGE FLOOD EXTENT

00	04/25	INITIAL ISSUE	AS	SD
REV	DATE	DESCRIPTION	BY	CHK

CLIENT:
WELCOME BREAK LTD

PROJECT:
WELCOME BREAK NORTHWAY SERVICES

DRAWING TITLE:
66% BLOCKAGE FLOOD EXTENT

SCALE: 1:2,000 @ A3	DATE: APRIL 2025
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DRAWING NUMBER: FRA-008	REV: 00
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DRAWING STATUS:
FOR PLANNING

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GONDOLIN
Land & Water

Civil Engineering and Environmental Solutions

Gondolin Land and Water Ltd is a small environmental and engineering consultancy business based in Scotland with coverage throughout the UK.

Office Address:

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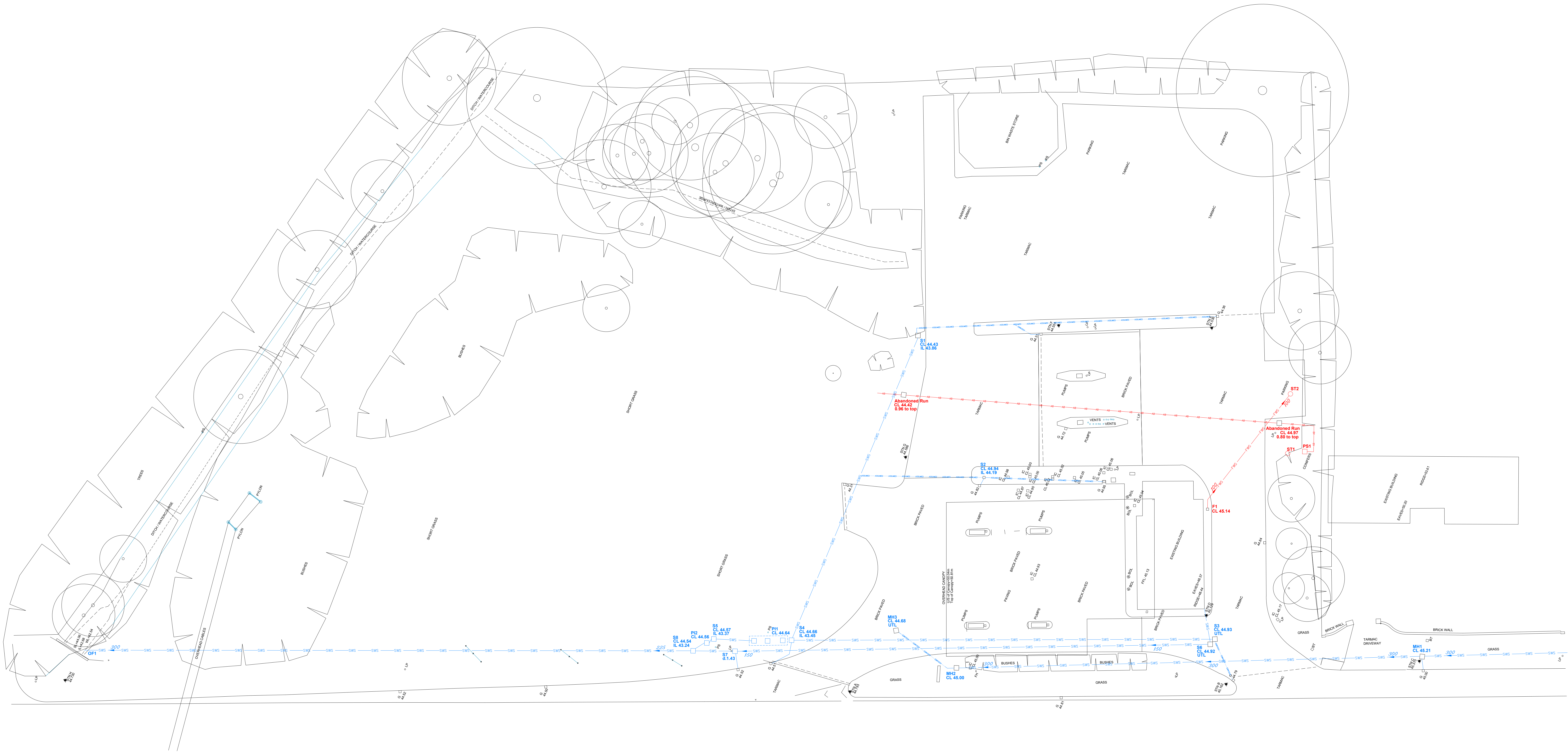
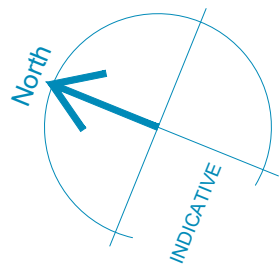
Registered Company No.

SC706920

Sectors:

Onshore Renewables & Storage | Infrastructure | Mining and Minerals
Property & Urban Regeneration | Retail, Industrial & Manufacturing |
Waste Management

APPENDIX 6



UTILITY KEY

— FWS —	— FWS —	FOUL DRAINAGE
— CWS —	— CWS —	CONTAMINATED SURFACE
— SWS —	— SWS —	SURFACE DRAINAGE
— CWS —	— CWS —	COMBINED DRAINAGE
— PWS —	— PWS —	PUMPING MAIN
— ASS —	— ASS —	FOUL ASSUMED RUN
— ASS —	— ASS —	SURFACE ASSUMED RUN
— TFR —	— TFR —	FOUL TAKEN FROM RECORDS
— TFR —	— TFR —	SURFACE TAKEN FROM RECORDS
— AB —	— AB —	ABANDONED RUN
— TE —	— TE —	TRADE EFFLUENT
— SB —	— SB —	SURVEY BOUNDARY

□ CABLE / PIPE RISER X END OF TRACE
● BACKDROP / TRAPPED EXIT X END OF RECORDS
+ DRAINAGE VALVE X HEAD OF RUN / CAPPED
+ PIPE INLET / OUTLET

ABBREVIATIONS

AR	ASSUMED ROUTE	MH	MANHOLE
BO	BACKDROP	MP	MONITORING WELL
BO	BORERHOLE	RE	RODDING EYE
CL	CHAINS LEVEL	RWP	RAIN WATER PIPE
CP	CACTUS	S/A	SLICE VALVE
DP	DEPTH	SV	SOAKAWAY
DP	DOWN PIPE	SV	SLICE VALVE
EOT	END OF TRACE	SVP	SOL VENT PIPE
EV	EARLYING FROD	TE	TRAPPED EXIT
GY	GALLY	TFR	TAKEN FROM RECORD
HR	HEAD OF ISAN	UTV	UNABLE TO SURVEY
IC	INSPECTION CHAMBER	UTV	UNABLE TO SURVEY
IL	INVERT LEVEL	UTV	UNABLE TO SURVEY
SWS	SURFACE WATER SINKER	UTV	UNABLE TO SURVEY
CWS	CONTAMINATED SURFACE WATER SINKER	UTV	UNABLE TO SURVEY
FWS	FOUL WATER SINKER	UTV	UNABLE TO SURVEY
CWS	COMBINED WATER SINKER	UTV	UNABLE TO SURVEY

DISCLAIMER

Client
GOODSON ASSOCIATES
LINE 2
LINE 3

Project
WELCIME BREAK A1 NORTHWAY
SOUTHBOUND
SG7 5EX

Title
DRAINAGE CONNECTIVITY PLAN

Drawing Number
TS23-701-1

Revision	Description	Rev. By	Date

Scale	1:200@A0	Sheet	1 of 1
Drawn by	NEM	Checked by	MH
Date of Survey	NOV 2023		

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